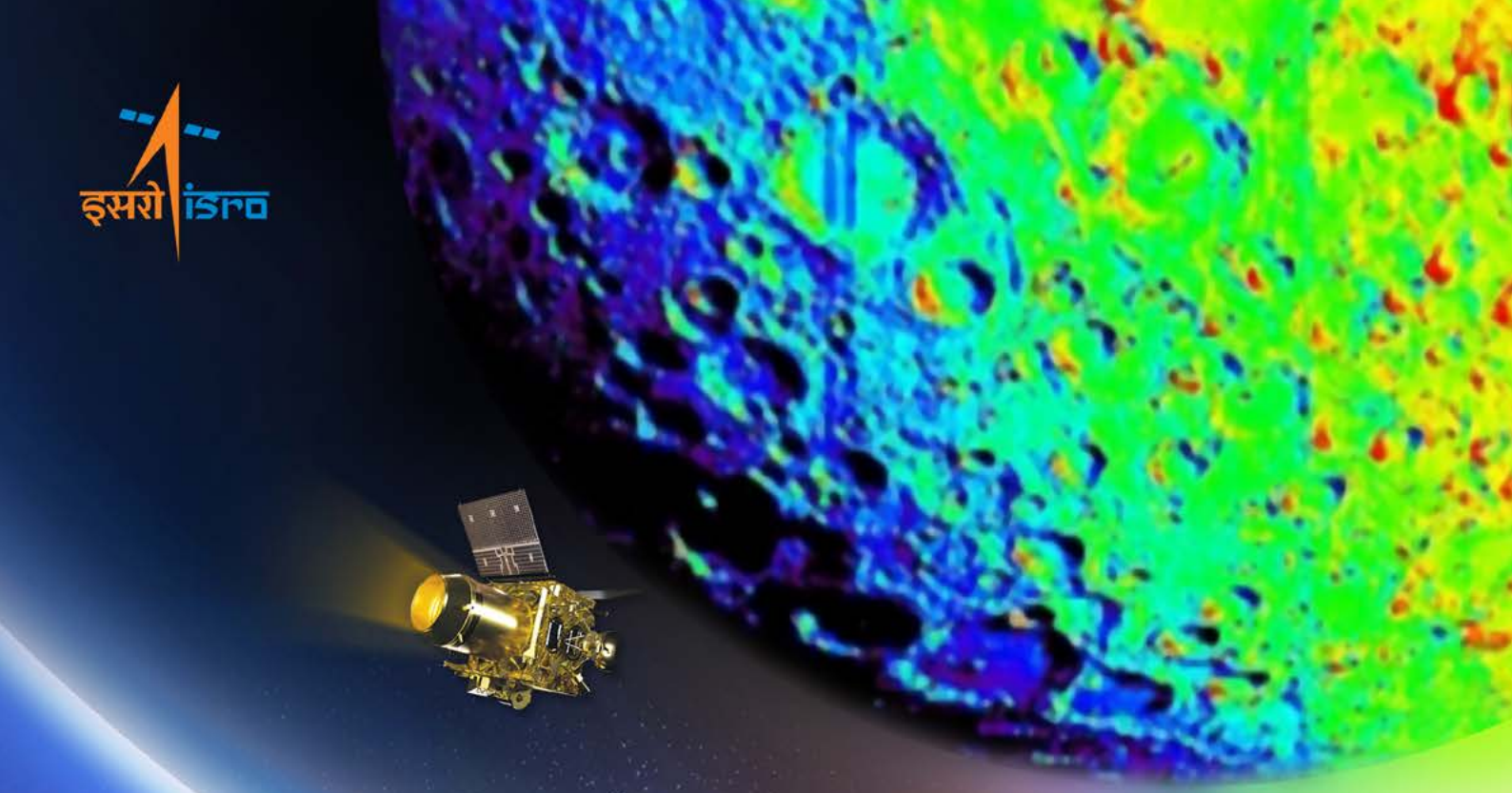



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Orbiter
Payloads and Data Products

Indian Space Research Organisation
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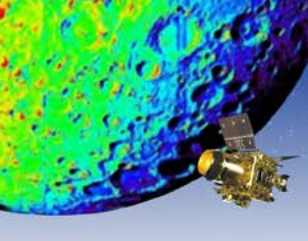

CHANDRAYAAN 2

Orbiter Payloads and Data Products

Version-1.0

August, 2021

INDIAN SPACE RESEARCH ORGANISATION
Bengaluru



Compiled and Edited by

Science Program Office

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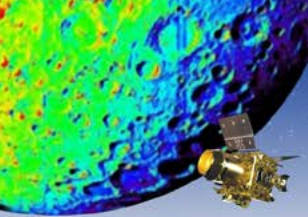
Cover Page: *3000-nm Integrated Band Depth (IBD) image of part of lunar northern hemisphere on the far side of the Moon highlighting the presence of wide-spread hydration as detected by Imaging Infra-Red Spectrometer (IIRS) onboard Chandrayaan-2 from an altitude of about ~4300 km on August 23, 2019.*



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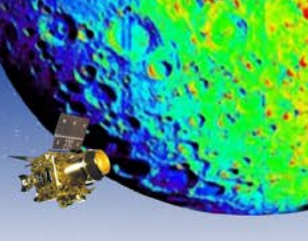

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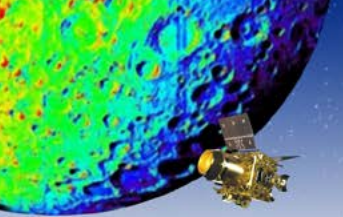

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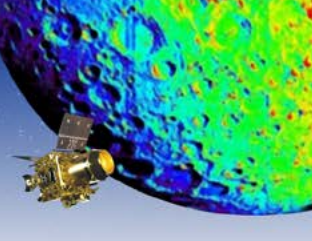

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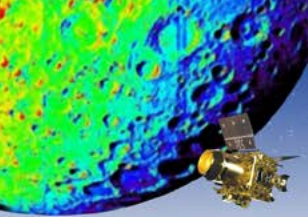

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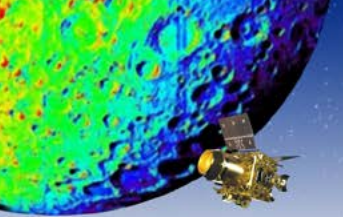

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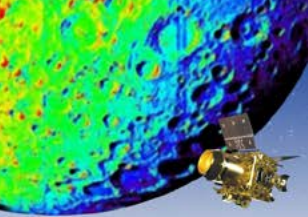
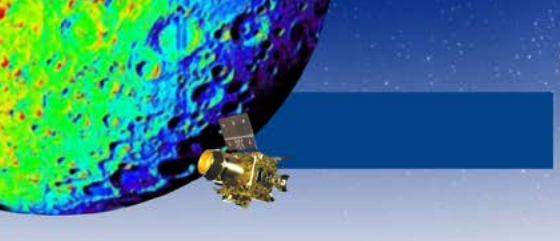


List of Abbreviations

AIS-SB	Space Based Automatic Identification System
C1XS	Chandrayaan-1 Soft X-ray Spectrometer
CHACE-2	CHandra Atmospheric Composition Explorer 2
CLASS	Chandrayaan-2 Large Area Soft X-ray Spectrometer
CME	Continuing Medical Education
DCIXS	Demonstration Compact Imaging X-Ray Spectrometer
DEM	Digital Elevation Model
DFRS	Dual Frequency Radio Science
DFSAR	Dual Frequency Synthetic Aperture Radar
DGA	Dual Gimballed Antenna
DPSIS	Data Product Software Interface Specification
EMXO	Evacuated Miniaturized Crystal Oscillator
EPO	Earth Parking Orbit
FCC	False Colour Composite
FOV	Field Of View
GSD	Ground Sampling Distance
HySI	Hyper Spectral Imager
IBD	Integrated Band Depth
IDSN	Indian Deep Space Network
IIRS	Imaging IR Spectrometer

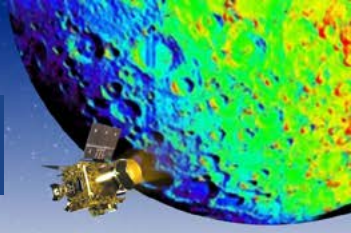


IPDA	International Planetary Data Alliance
ISDA	ISRO Science Data Archive
ISSDC	Indian Space Science Data Centre
LROC-NAC	Lunar Reconnaissance Orbiter Camera-Narrow Angle Camera
LTA	Long Term Archive
MIDAS	Microwave Data Analysis Software
MOM	Mars Orbiter Mission
OC	Orbiter Craft
OHRC	Orbiter High Resolution Camera
PAN	Panchromatic
PDS	Planetary Data System
PIXE	Particle Induced X-ray Emission
POC	Payload Operation Centre
PPS	Payload Planning System
PRADAN	Policy Based data Retrieval, Analytics, Dissemination and Notification System
QMA	Quadrupole Mass Analyzer
SAR	Synthetic Aperture Radar
SARAL	Satellite with ARGOS and ALTIKA
SCDs	Swept Charge Devices



SDD	Silicon Drift Detector
SMART-1	Small Missions for Advanced Research in Technology-1
SSR	Solid State Recorder
TMC 2	Terrain Mapping Camera -2
UTC	Universal Time
XRF	X-ray Fluorescence
XRS	X-ray Spectrometer
XSM	Solar X-ray Monitor
XSMDAS	XSM Data Analysis Software

CHAPTER 1



Chandrayaan-2 Mission

1.1 Introduction

Chandrayaan-2, is the second spacecraft in the Indian series of Lunar exploration satellites. It comprises of an Orbiter, Lander named Vikram and Rover named Pragyan to explore the unexplored South Polar region of the Moon.

It was launched on 22 Jul 2019 from the Indian Space Port, Sriharikota by GSLV Mk-III. It was a highly complex mission, comprising of many new technological developments. The mission is designed to expand the lunar scientific knowledge through detailed study of topography, mineral identification and distribution, surface chemical composition, mapping, seismology, characterisation of top soil and compositional studies of the tenuous lunar atmosphere, leading to a new understanding of the origin and evolution of the Moon.

1.2 Objectives

1.2.1 Mission Objectives

Mission objectives are as follows:

- Expanding the technologies inherited from Chandrayaan-1 spacecraft and “Develop and Demonstrate” newer technologies that will be useful for future planetary missions.
- To design, realize and deploy Lander-Vikram capable of soft landing on a specified lunar site and deploy a Rover to carry out in-situ analysis of elements.
- To carry payloads in the Orbiter-craft that will enhance the scientific objectives of Chandrayaan-1 with improved resolution.

A lunar landing site was selected in the lunar south pole region at about 70 deg Latitude.

1.2.2 Science Objectives

The scientific objective of the mission is to expand the lunar scientific knowledge through detailed study of topography, mineralogy, surface chemistry, regolith characterisation and exospheric molecules leading to a better understanding of the origin and evolution of the Moon.

1.3 Mission Description

1.3.1 Mission Overview

A highly complex mission with many time critical events, was divided into different phases as detailed below.

- **Earth-Centric Phase**
  Chandrayaan-2, as a composite module (Lander stacked on the orbiter) with a mass of 3846 kg, was injected into an Earth Parking Orbit (EPO) of 170 km X 40,421 km on 22 Jul 2019. After 5 successful orbit maneuvers, it was injected into the Lunar Transfer Trajectory on 14 Aug 2019.
- **Lunar-Transfer Phase**
  After 6 days of cruise in the transfer trajectory it was inserted into a lunar orbit on 20 Aug 2019 with firing of thrusters on the orbiter.
- **Moon-Centric Phase**
  In this phase, 4 maneuvers were carried out to reach a lunar orbit of 100km X 100km. Further, the Orbiter and Lander modules were separated as two independent satellites at a pre-defined time on 2 Sep 2019. Both remained in the same orbit for about one day. Later, a de-boost maneuver was performed to attain an interim orbit of 100 km x 30 km. Vikram remained in this orbit for ~4 days to verify and validate the performance of all sub-systems followed by a powered descent.

The Orbiter High Resolution Camera (provides the highest resolution of 0.3 m of any lunar mission to date) was used to image the landing site prior to landing (nearly 10 hours before) and the data were downloaded, analyzed and with the help of decision support system, hazards were identified and uplinked to the Vikram Lander, 4 hours prior to landing.

Vikram Lander descent was as planned and normal performance was observed up to an altitude of 2.1 km. Subsequently communication from lander to the ground stations was lost and the lander had a hard landing on the lunar surface.

The Orbiter, placed in its intended orbit around the Moon, will enrich our understanding of the Moon's evolution and mapping of minerals and water molecules in polar regions, using its eight advanced scientific instruments. The Orbiter camera with the highest resolution will provide high resolution images which will be immensely useful to the global scientific community. The precise launch and optimised mission management has ensured a long life of almost seven years instead of the planned one year.

The mission profile is shown in the Figure 1.1 below:

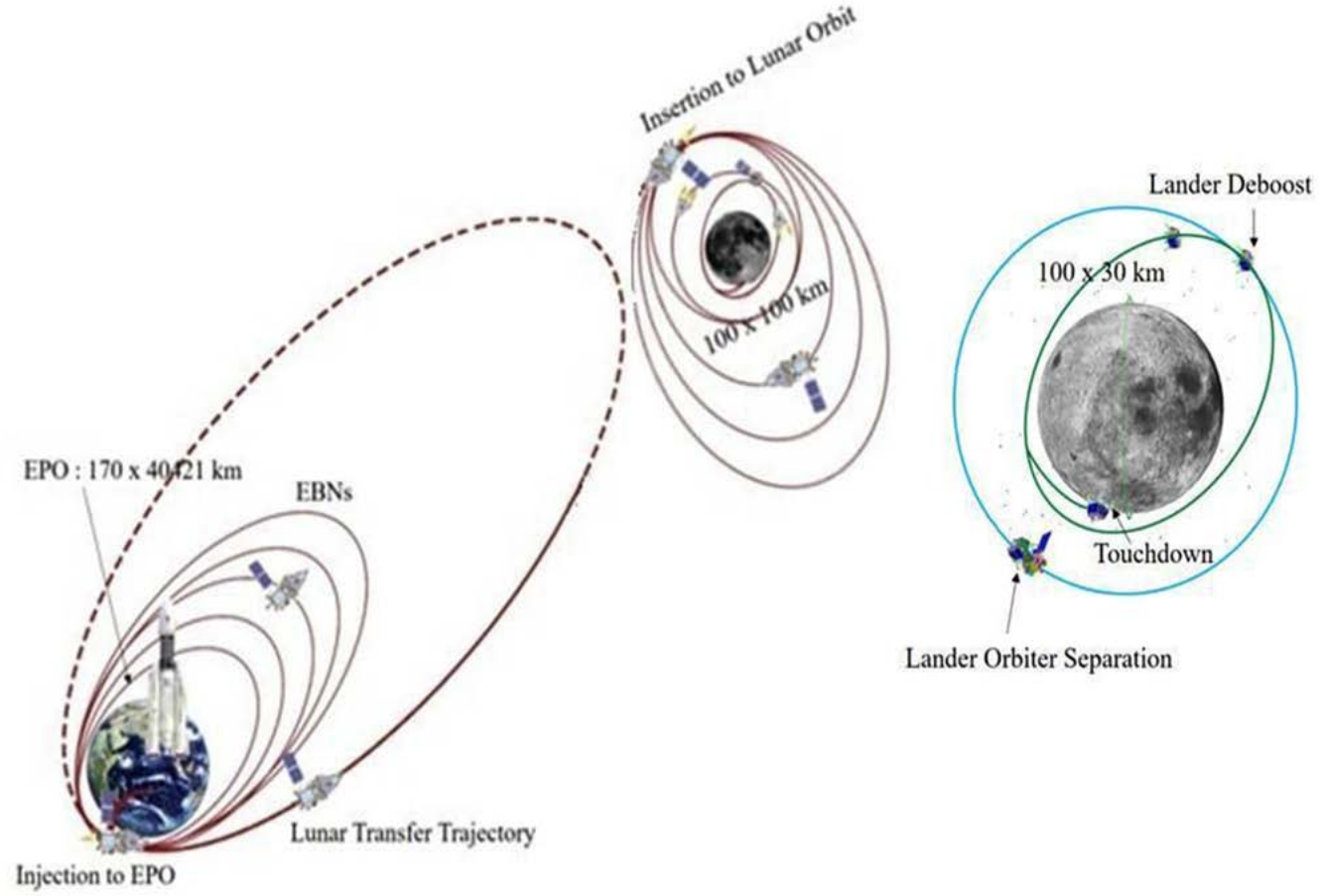


Figure 1.1: Chandrayaan-2 mission profile.

1.3.2 Spacecraft

Chandrayaan-2 spacecraft consists of an Orbiter Craft (OC) and a Vikram Lander, with a six wheeled Pragyan Rover accommodated inside Vikram. The Orbiter and Lander modules are interfaced mechanically by an inter module adapter.

The Chandrayaan-2 Orbiter is shown in Figure 1.2

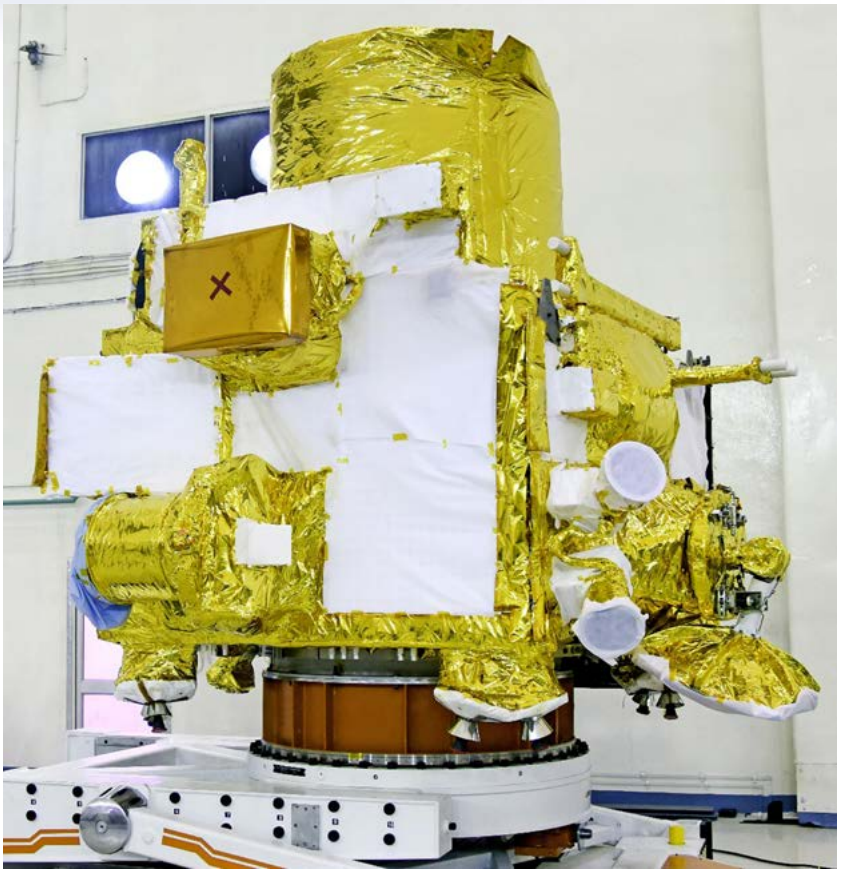


Figure 1.2: Chandrayaan-2 Spacecraft.

Orbiter craft carried scientific payloads is shown in Figure 1.3.

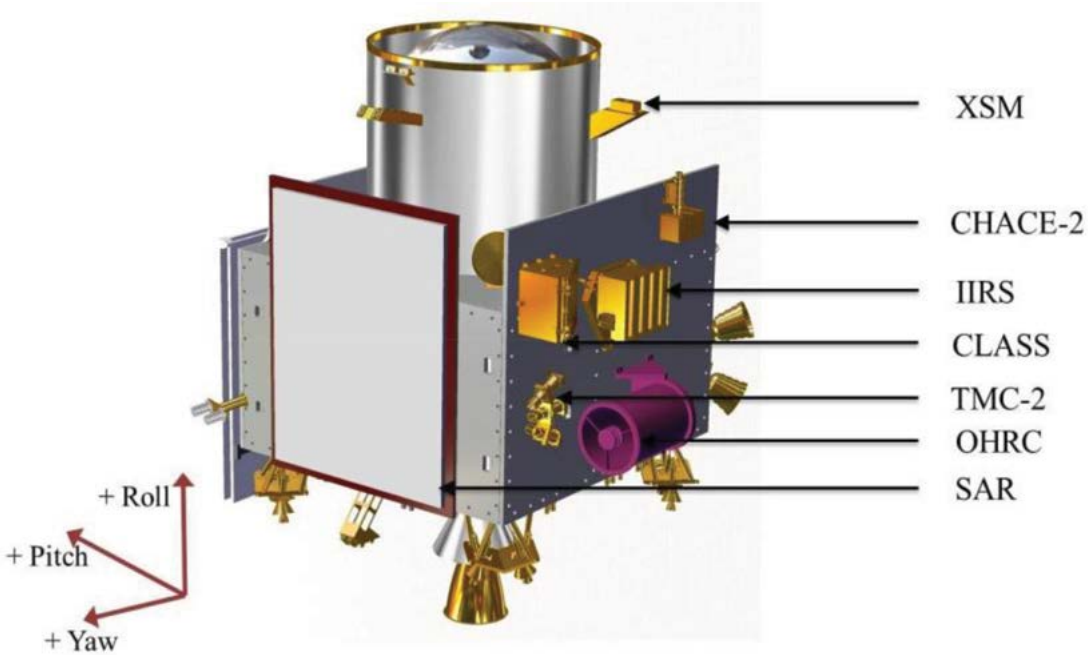


Figure 1.3: Chandrayaan-2 Orbiter craft Payloads.

1.3.3 Orbiter Payloads

There were eight scientific payloads hosted on the orbiter craft. Brief details about payloads are given below:

Chandrayaan-2 Large Area Soft X-ray Spectrometer (CLASS)

CLASS measures the Moon's X-ray Fluorescence (XRF) spectra to examine the presence of major elements such as Magnesium, Aluminium, Silicon, Calcium, Titanium, Iron, and Sodium. The XRF technique will detect these elements by measuring the characteristic X-rays they emit when excited by solar X-ray emission.

Solar X-ray Monitor (XSM)

XSM detects X-rays emitted by the Sun and its corona, measures its intensity, and supports the CLASS payload. It provides the solar X-ray spectrum in the energy range of 1-15 keV incident on the lunar surface. XSM provides high energy resolution and high-cadence measurements (full spectrum every second) as input for analysis of data from CLASS.

CHandra's Atmospheric Compositional Explorer 2 (CHACE 2)

CHACE 2 will expand upon the CHACE experiment on Chandrayaan-1. It is a Quadrupole Mass Spectrometer (QMA) capable of studies of the lunar neutral exosphere in the mass range of 1 to 300 amu with the mass resolution of ~0.5 amu. CHACE 2's primary objective is to carry out an in-situ study of the composition and distribution of the lunar neutral exosphere and its variability.

Dual Frequency Synthetic Aperture Radar (DFSAR)

The dual frequency (L and S) SAR will provide enhanced capabilities compared to Chandrayaan-1's S-band mini SAR in areas such as:

- L-band for greater depth of penetration (About 5m — twice that of S-band)
- Circular and full polarimetry — with a range of resolution options (2-75 m) and incident angles (9°-35°) — for understanding scattering properties of permanently shadowed regions

The main scientific objectives of this payload are:

- Quantitative estimation of water-ice in the polar regions
- High-resolution lunar mapping in the polar regions
- Estimation of regolith thickness and its distribution

Imaging Infra-Red Spectrometer (IIRS)

Imaging Infra-Red Spectrometer (IIRS) is a hyper-spectral optical imaging instrument. This instrument maps geomorphology and mineralogy of lunar surface. The mission is intended to cover the Moon surface. The prime objectives of IIRS are:

- Global mineralogical and volatile mapping of the Moon in the spectral range of ~0.8-5.0 μm for the first time, at the high resolution of ~20 nm
- Complete characterization of water/hydroxyl feature near 3.0 μm for the first time at high spatial (~80 m) and spectral (~20 nm) resolutions

IIRS will measure the solar radiation reflected off the Moon's surface in 256 contiguous spectral bands from a 100 km lunar orbit.

Terrain Mapping Camera (TMC 2)

TMC 2 is a miniature version of the Terrain Mapping Camera on Chandrayaan-1 mission. Its primary objective is to map the lunar surface in the panchromatic spectral band (0.5-0.8 microns) with a high spatial resolution of 5 m and a swath of 20 km from 100 km lunar polar orbit. The data collected by TMC 2 will give us clues about the Moon's evolution and help us prepare 3D maps of the lunar surface.

Orbiter High Resolution Camera (OHRC)

OHRC provides high-resolution images of the landing site which ensure the Lander's safe touchdown by detecting any craters or boulders, prior to separation. The images it captures, taken from two different look angles, serve dual purposes. First, these images are used to generate DEMs (Digital Elevation Models) of the landing site. Second, they are used for scientific research after its initial role in the landing phase. OHRC's images can capture the same area on the lunar surface from two different orbits. The coverage area in this case is of 12 km x 3 km with ground resolution of 0.32 m.

Dual Frequency Radio Science (DFRS) Experiment

To study the temporal evolution of electron density in the Lunar ionosphere. Two coherent signals at X (8496 MHz), and S (2240 MHz) band are transmitted simultaneously from satellite, and received at ground-based receivers.

2 Payload Operations

The Orbiter is in a 100km X 100km polar orbit around the Moon. The angle between sun's location, lunar region of study and the payload on the Orbiter (sun aspect angle) varies widely giving rise to extreme sun illumination conditions. Moreover, some are optical/IR payloads like TMC-2, IIRS and OHRC requiring certain illumination conditions for optimal operation of payload. Hence, payload operations are season based and classified as follows:

- **Dawn-Dusk Season:** Angle b/w sun and orbital plane is more than 30 deg. The primary payload (nominal) is the Dual Frequency SAR.
- **Noon-Midnight Season:** Angle b/w sun and orbital plane is less than 30 deg. The primary payload (nominal) is TMC 2 and IIRS.
- CLASS, CHACE 2 and XSM are all operated during all seasons.
- DFRS is operated whenever the constraints are met (i.e. S-band antenna looking at ground station and X-band antenna will be steered to the ground station). It is planned once a month. During DFRS operation, other payloads are not operated.
- OHRC operations are done based on feasibility and user requirements in campaign mode

The attitude followed is also different, based on the season to ensure maximum power generation. The spacecraft attitude followed during dawn-dusk season is called AD1 and attitude during noon-midnight season is AD2 (orbit reference frame attitude). While in AD2, yaw flip is needed to ensure sun on solar panel side and also provide better thermal environment. Thus twice a year, a yaw flip is required. The figure below summarizes the season-based payload operation:

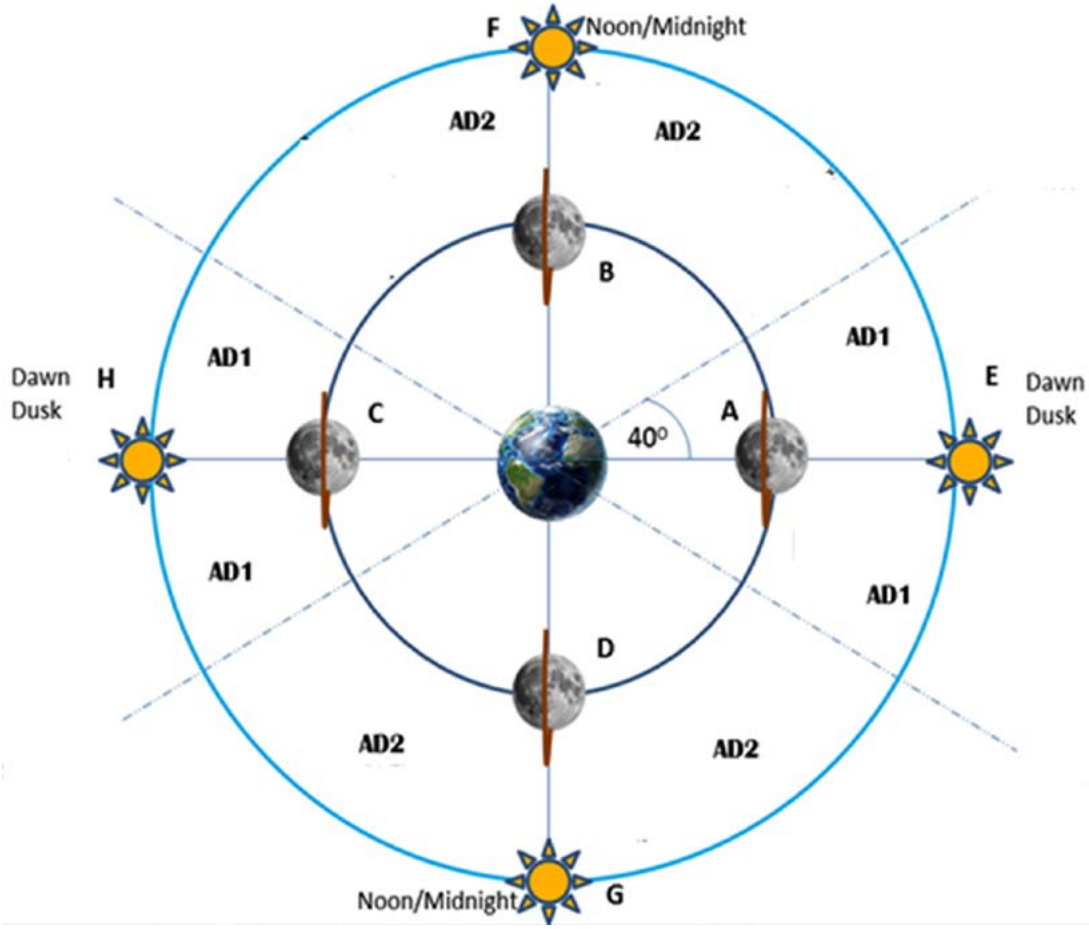


Figure 1.4: Orbiter Season Definition.

The nominal operations durations for different payloads are as follows:

OHRC : 10 sec
XSM : Continuously ON
CLASS : During sunlit, continuously ON 10 days around full Moon.
CHACE-2 : 130 min-260 min/twice a day 6 orbits apart
SAR : 2 min
TMC-2 : 10 min
IIRS : 12 min (10 min of Imaging)
DFRS : 6 min

The payload data is recorded onto onboard SSR of 40 Gb capacity which is partitioned into channels. The figure below shows the streamline of Payload data storage:

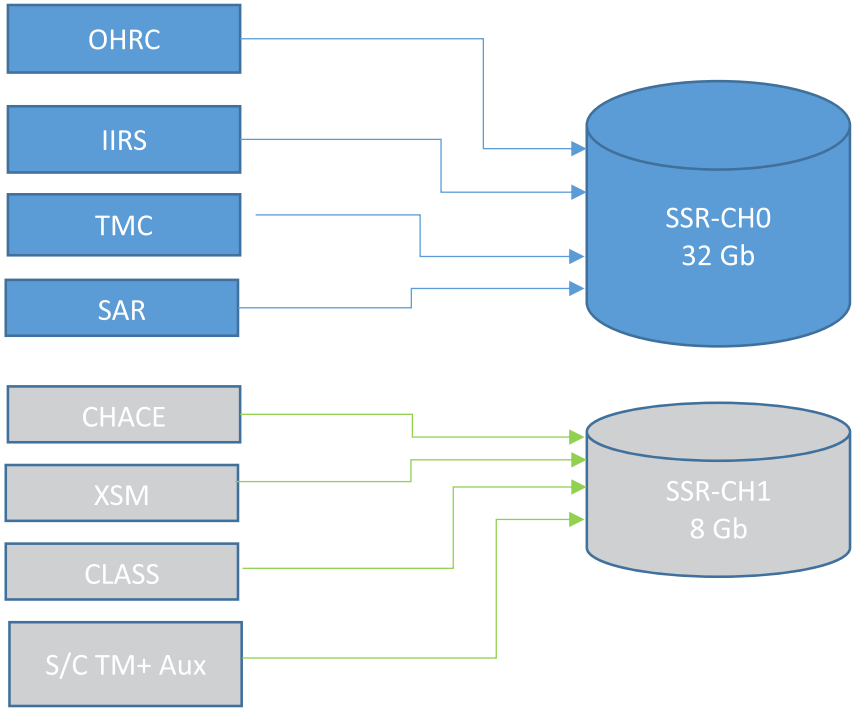


Figure 1.5: Payload Data Storage Streamline.

The data stored onboard is transmitted through X-band using DGA (Dual Gimballed Antenna) at a rate of 8.4 Mbps over IDSN stations and 4.2 Mbps over other stations network. The DGA is steered to the required position by onboard look vector generation algorithm based on the station index. The spacecraft is steered to the imaging attitude from the nominal attitude based on the requirement in each payload session. All payload operations and data download operations are automated and triggered onboard using macros and onboard-timer based commands. The user request handling, nominal payload operations planning and scheduling and translation of the plan to spacecraft commands and handled by the Payload Planning System (PPS) software. The space and ground segment chain are shown below:

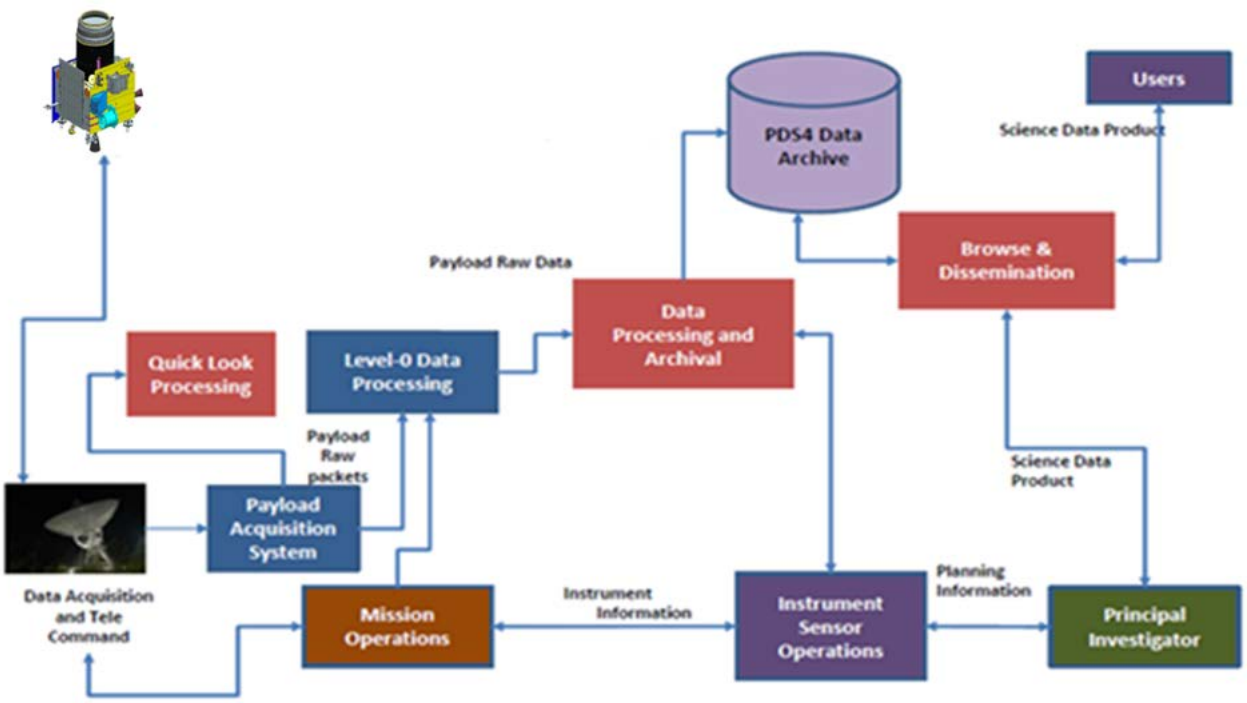
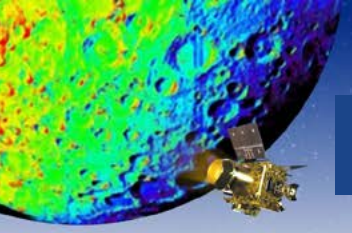


Figure 1.6 : Space and Ground Segment chain.

The typical operation plan during different scenarios is shown below:

Table 1.2: *Typical Payload Operation plan*

Plan	Attributes	Imaging payloads	Visibility Time / Playback(PB) Time	Imaging to PB ratio
Plan-A	NM + Edge-On+ Near Side SunLit	TMC+IIRS(10 mins) XSM+CLASS(10 mins) + CHACE(Continuous)	72 mins/ 60 mins	~ 1:6
Plan-B	NM + Edge-On+ Far Side SunLit	TMC+IIRS(10 mins) XSM+CLASS(20 mins) + CHACE(Continuous)	72 mins/ 65 mins	~1:6
Plan-C	NM + Face-On	TMC+IIRS(10 mins) XSM+CLASS(20 mins) + CHACE(Continuous) + SAR(3 mins Low Mode)	118 mins/80 mins	~1:6
Plan-D	DD + Face-On	XSM+Class(Continuous) SAR – L3 Mode(5mins) Or SAR-S3 mode(7 mins)	118mins/105 mins	~ 1:18 (SAR L3)
Plan-E	DD + Edge-On	XSM+Class(Continuous) SAR – L3 Mode(2.5 mins) Or SAR-S3 mode(3.5 mins)	72 mins/ 60 mins	~ 1:18 (SAR L3)



CHAPTER 2

Chandrayaan-2 Orbiter Payloads

The previous chapter has introduced about the Chandrayaan-2 mission. This chapter provides the brief introduction of the various payloads onboard Chandrayaan-2 Orbiter.

2. 1 Chandrayaan-2 Large Area Soft X-ray Spectrometer (CLASS)

Lunar composition involves identification of elements and minerals present on the lunar surface. Minerals reveal the evolution of the crust and direct detection of elements, which are the building blocks of minerals is crucial to understand the formation of Moon and various type of lithologies. All of the returned samples collected by the Apollo missions are from the nearside equatorial region which serve as a calibration standard for remote sensing measurements. However, we know today that the highland compositions are more diverse than what is represented in the returned samples.

Global elemental maps are derived with both direct (gamma ray measurements) and indirect (UV-Vis-NIR measurements) methods. X-ray fluorescence spectrometers on Apollo-15 and 16 measured Mg/Si and A/Si ratios for about 10% of the Moon on the equatorial region. Gamma-ray spectrometers on Lunar Prospector and Kaguya have mapped the radioactive elements globally along with some of the major elements at resolution of hundreds of kilometres. DCIXS on SMART-1 measured Ca and Ti along with Mg, Al and Si on a few regions of the Moon. Kaguya XRS, owing to extreme degradation of the detectors, did not function as desired. Chang'E-2 X-ray spectrometer generated global Mg/Si and Al/Si ratio maps. C1XS on Chandrayaan-1 measured all the major elements such as Mg, Al, Si, Ca and Fe for a few regions and also Na for the first time. Due to the limited mission life of the Chandrayaan-1 and low solar activity, global mapping could not be achieved. CLASS experiment, with a spatial resolution of 12.5 km at its best, is a significant improvement over C1XS, and would be the most sensitive lunar spectrometer to produce surface elemental maps of Mg, Al, Si, Ca, Ti and Fe.

X-ray spectroscopy being one of the most direct approaches, CLASS delivers the promise of higher spatial resolution global maps for major elements on the lunar surface, the first of its kind. X-ray Fluorescence (XRF) technique involves detecting characteristic X-rays emitted by the constituent elements of the lunar surface, when excited by the incident solar X-rays having sufficiently high flux. Measuring the flux of individual characteristic line can then provide the quantitative estimation of the abundance of the corresponding element,

provided the flux and spectrum of the incident X-rays is accurately known. As solar X-rays are extremely variable in both intensity as well as their spectral shape, it is essential to have simultaneous measurements of both the incident X-rays form the Sun, as well as the fluorescence X-rays from the lunar surface.

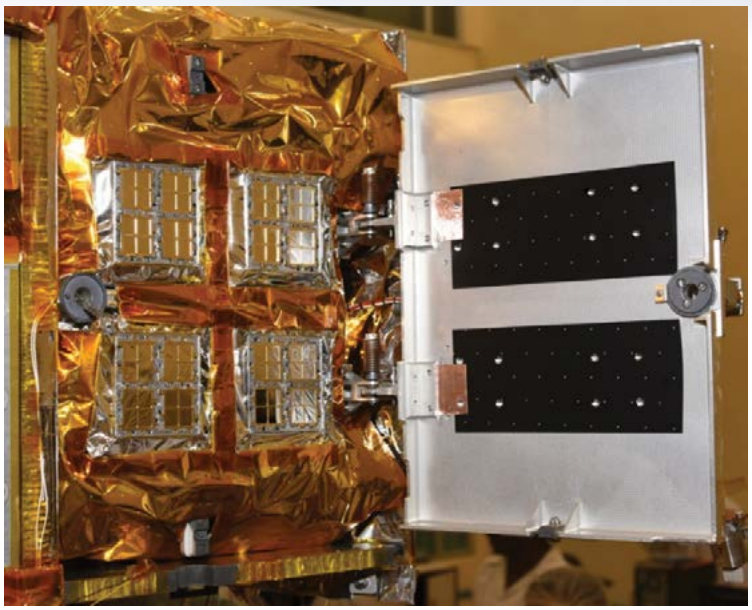


Figure 2.1: CLASS Flight Instrument.

CLASS consists of sixteen Swept Charge Devices (SCDs) of area 64 cm^2 arranged in four quadrants. Gold coated copper collimators define the field of view (FOV) of 12.5 km x 12.5 km from an altitude of 100 km above the lunar surface. Aluminium filters block visible light from reaching the devices. A door protects the devices from radiation damage en-route and also houses sixteen radioactive sources that are used for on board calibration before door deployment in orbit. The detectors are passively cooled to -20°C.

2.2 Solar X-ray Monitor (XSM)

XSM is a scientific instrument on-board the orbiter of Chandrayaan-2 mission. XSM, along with another instrument CLASS, comprise a scientific experiment known as remote X-ray fluorescence spectroscopy. It provides the measurement of soft X-ray spectrum from the Sun, which is used for the quantitative analysis of the Lunar X-ray fluorescence measurements by CLASS to obtain estimate of the elemental composition of Lunar surface on global scale. XSM instrument employs Silicon Drift Detector (SDD) to cover the X-ray energy range of 1-15 keV with a spectral resolution of better than 180 eV at 5.9 keV. XSM also incorporates

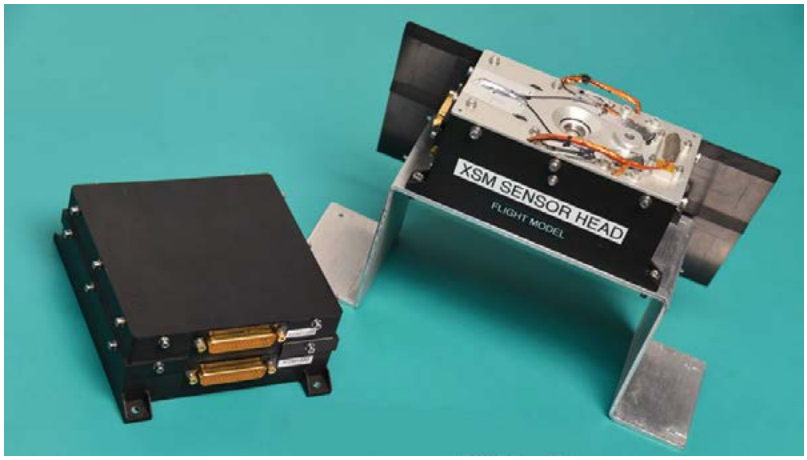


Figure 2.2: XSM Flight Instrument.

an innovative moving mechanism in order to cover the wide range of intensities of X-rays during large solar flares. Apart from providing support to CLASS experiment, the high cadence X-ray spectral measurements during wide range of Solar flare classes will be useful in improving our understanding of the Solar corona.

2.3 CHandra's Atmospheric Composition Explorer-2 (CHACE-2)

The lunar exosphere observed in the Na-D lines from Earth shows temporal and spatial variations not fully explained. Mass spectrometry would provide precise in-situ measurements on the composition of the exosphere including possibilities of water. The source of atoms in the exosphere is primarily the surface and hence these measurements would also aid models that attempt to identify processes that dislodge surface atoms into the exopsphere.



Figure 2.3: CHACE-2 flight instrument

The CHACE-2 experiment is a sequel to the CHACE experiment onboard Chandrayaan-1. It is a quadrupole mass spectrometer (QMA) capable of scanning the lunar neutral exosphere in the mass range of 1 to 300 amu with the mass resolution of ~0.5 amu. The scientific objective of this instrument is to study the neutral composition of the tenuous lunar exosphere. The CHACE-2 instrument, apart from having a quadrupole mass filter, also has a Bayard Alpert gauge to measure the total pressure.

2.4 Dual Frequency Synthetic Aperture Radar (DFSAR)

Previous observations of lunar poles carried out with ground-based radars as well as orbital-based SAR data from Mini-SAR (Chandrayaan-1) and Mini-RF (Lunar Reconnaissance Orbiter) yielded ambiguous results on the possible presence of water ice in the permanently shadowed regions. These observations were constrained by limited viewing geometry and polarization measurements of aforementioned radar instruments. Chandrayaan-2 DFSAR, with its capability to acquire images at multiple incident angles with multiple polarization modes, has been imaging the lunar surface at both L and S-band wavelengths. In addition, full-polarimetric imaging capability of DFSAR would provide new insights into the nature

and distribution of lunar water-ice deposits. SAR backscatter intensity is highly influenced by small-scale surface roughness and dielectric constants of lunar regolith. These two parameters are also crucial for identification of regions with probable presence of lunar volatiles such as water-ice.

The Dual-frequency (L and S) SAR is aimed at providing continuity to the Chandrayaan-1 S-band MiniSAR measurements with enhancements such as

- L-band for greater depth of penetration (~5-10m i.e twice that of S-band) will have potential to retrieve scattering from sub-surface.
- Circular and full polarimetry with range of resolution options (2m – 75m) and incident angles (9° - 35°) for understanding scattering properties of permanently shadowed regions.
- L and S band operation in stand-alone and simultaneous mode to validate Mini-SAR observations.

The SAR payload has been designed as two independent and physically separate systems, viz. L-band SAR and S-band SAR, sharing a common antenna. The payload, as a whole, is configured to operate in either standalone (L-band/S-band) or synchronous (L- and S-band) modes of operation. The imaging system is capable of operating in fully polarimetric mode, which is crucial for unambiguous detection of water-ice. Thus, Chandrayaan-2 L- and S-band SAR will be the first fully polarimetric instrument in a lunar orbit and poised to yield important scientific findings. It is also capable of operating in hybrid polarimetric mode (transmit in circular and receive in linear H and V polarizations) and dual-pol mode (transmit in H and receive in both H and V polarizations: HH + HV).

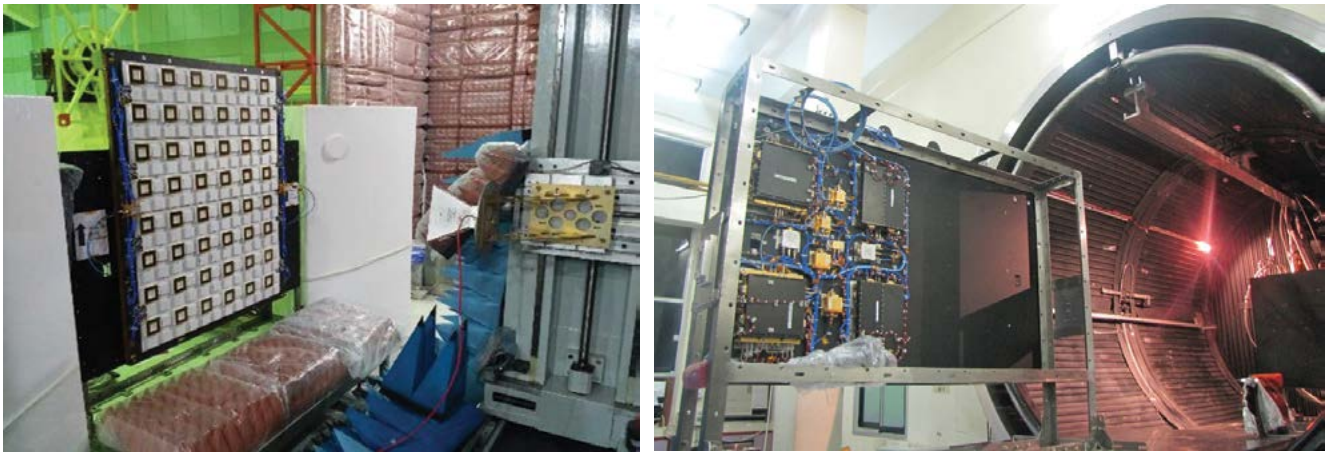


Figure 2.4: DFSAR flight instrument

2.5 Imaging Infra-red Spectrometer (IIRS)

Remote detection of water and/or hydroxyl signatures on the lunar surface has recently acquired importance as it provides important clues to understand the exogenous and endogenous sources and formation mechanisms that have led to their detection on the surface. In this context, Chandrayaan-1's M3 has contributed immensely towards the detection of widely distributed hydration signatures across the Moon and at places, localized and more isolated occurrences have also been noticed. However, due to the limited spectral coverage of M3 up to 3.0 μm, the exact nature of the observed hydration signatures cannot be ascertained.

IIRS aims to confirm OH, H_2O and water-ice signatures by extending the wavelength range to 5 micron. In addition, the lunar surface minerology is best captured in the near-infra red wavelengths. It is an advanced version of three payloads on Chandrayaan-1 i.e Hyper Spectral Imager (HySI), Moon Mineralogy Mapper (M3) and near-IR spectrometer (SIR-2).

IIRS measures the solar radiation reflected from the lunar surface in 256 contiguous spectral bands from 100 km lunar orbit. It provides images with high spatial (~80m) and spectral (~20nm) resolution. IIRS is a grating-based dispersive instrument to provide instantaneous spectra of the lunar surface. The reflected and emitted radiation from the lunar surface, in the spectral range 0.8–5 μm, would be mapped. IIRS imagery in 2–5 μm spectral region would confirm and quantify findings of instruments onboard Chandrayaan-1 with greater certainty. Imaging in the 4–5 μm spectral region would be used to independently assess thermal emissions from the lunar surface.

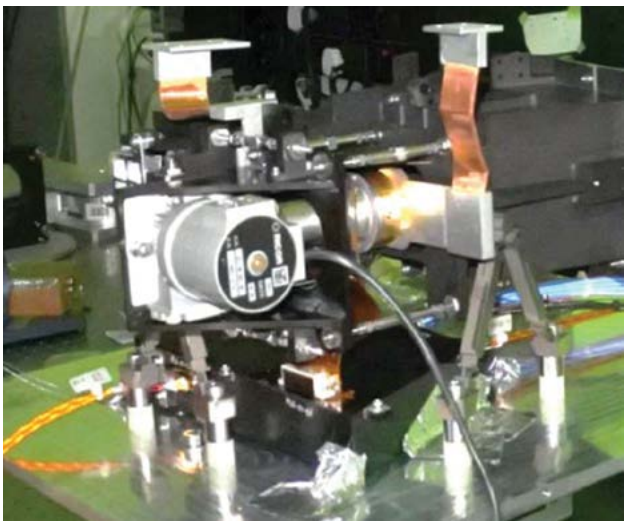


Figure 2.5: Imaging Infra-red Spectrometer (IIRS)

IIRS requires Terrain Mapping Camera (TMC-2) DEM data for studying the mineralogical features of the Moon in 3D spatial context. IIRS also requires SAR observations over the lunar polar regions and locations having endogenic water.

2.6 Terrain Mapping Camera-2 (TMC-2)

TMC-2 is a follow-on the TMC onboard Chandrayaan-1 mission for topographic coverage of the moon. TMC-2 measures the solar radiation reflected / scattered from the Moon's

surface. TMC onboard Chandrayaan-1 mission has mapped about 40% of the lunar surface. Morphological mapping and stratigraphic correlation of lunar features require reasonable continuous coverage. This can be achieved by acquisition of TMC-2 datasets in the gap regions of TMC of Chandrayaan-1.



Figure 2.6: TMC-2 flight instrument

TMC-2 operates in visible panchromatic band (0.4 – 0.85 micron). It comprises three identical electro-optical chains aligned for three views (–25, 0 and +25 degree) along track direction for generation of stereo images. It provides data with 5 m horizontal ground sampling distance to generate digital elevation model. TMC-2 based on the new configuration and sub-system designs has reduction in mass and power by more than 40% compared to TMC, without compromising the performance.

It will provide stereo triplet (fore, nadir and aft views) images for preparing detailed 3-D map of the complete lunar surface. The fore and aft view angles are ±25° respectively with respect to Nadir. Digital Elevation Model (DEM) generated using TMC-2 images will be of 10 meter spatial resolution.

2.7 Orbiter High Resolution Camera (OHRC)

OHRC is a very high spatial resolution camera operating in visible panchromatic (PAN) band. OHRC's primary goal is to image landing-site region prior to landing for characterization and finding hazard-free zones. Post landing operation of the OHRC are for scientific studies of small-scale features on lunar surface. Ground sampling distance (GSD) and swath of OHRC (in nadir view) are 0.25m and 3km respectively, from 100 km altitude.

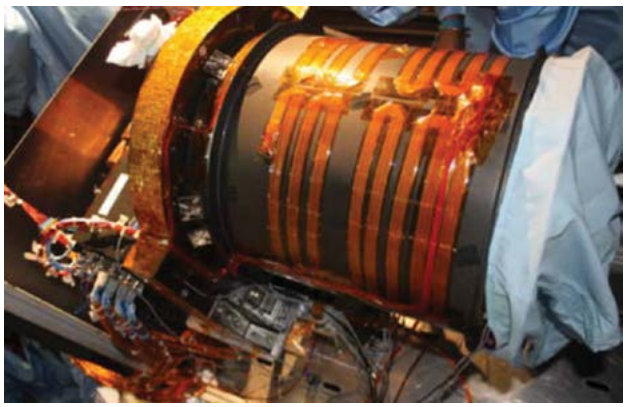


Figure 2.7: OHRC flight instrument

Boulders can be easily identified using OHRC images due to its very high spatial resolution. Hundreds of boulders, ranging from 1m to 50m in diameter, are distributed within an ejecta close to the crater rim. These boulders

represent the deepest material excavated during crater formation. Boulders on the Moon surface are often found around young impact craters. Apart from characterizing the landing sites, the OHRC images allow scientists to study boulder populations in the region of interest and help them to interpret geologic features and derive geologic history for a region.

2.8 Dual Frequency Radio Science (DFRS) Experiment

DFRS experiment aboard Chandrayaan-2 uses communication channel between Orbiter and ground in Radio Occultation mode to study the temporal evolution of electron density in the Lunar ionosphere. It consists of a highly stable 20 MHz EMXO source, having a stability of the order of 10-11, which generates two coherent signals at X (8496 MHz), and S (2240 MHz) band of radio frequencies. The coherent radio signals, transmitted simultaneously from satellite, and received at ground based deep station network receivers would be used to study temporal and spatial variations in the Lunar ionosphere. the major science objectives of the experiments include, (a) to study the variations in the ionosphere/ atmosphere at Moon, (b) to explore if the Ionosphere at Moon is omnipresent or has episodic appearances and, (c) to confirm the source of the ions in the lunar ionosphere, whether dusty or molecular ions.

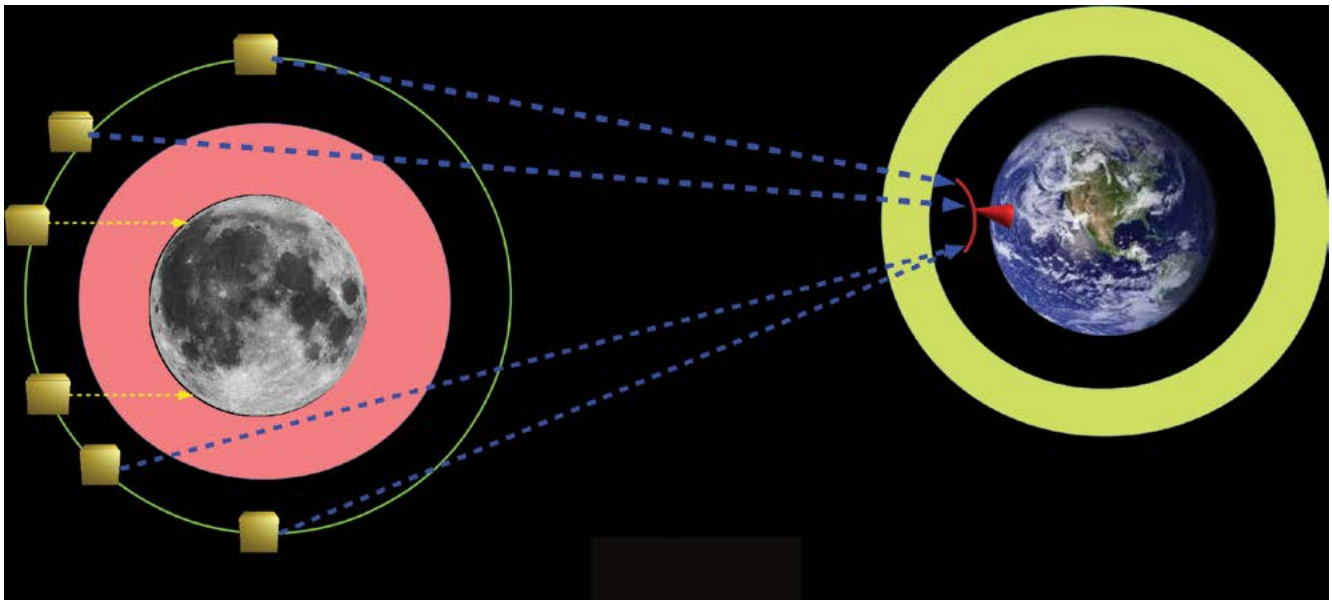


Figure 2.8: DFRS experiment

The orbiters' payloads are also discussed in greater detail in Chapter-2 of the document 'Science Results from Chandrayaan-2 Mission'.

CHAPTER 3

Payload Data Flow to Public Domain

In the previous chapter, brief details about the Chandrayaan-2 Orbiter payloads were presented. This chapter details with the dissemination of the data acquired by these payloads in public domain to enable wider science use.

3.1 Brief Introduction to ISSDC

Indian Space Science Data Centre (ISSDC) is the prime data centre of the ISRO for all the science, lunar and interplanetary missions of ISRO. It is the state-of-the-art facility which provides the data ingest, processing, archival and dissemination services for all the space science missions. ISSDC was established in the year 2008 to meet the requirements of Chandrayaan-1.



Figure 3.1: Indian Space Science Data Centre (ISSDC) building at Indian Deep Space Network (IDSN)

Besides supporting real time operations of Chandrayaan-2, Mega-Tropiques, Mars Orbiter Mission (MOM), SARAL, AIS-SB/Resourcesat-2 & AstroSat, ISSDC has supported post mission life activities for Chandrayaan-1 and Youthsat. ISSDC is supporting another India's next major Lunar Mission Chandrayaan-3, maiden Solar Mission Aditya-L1 and Astronomical Mission XPoSat.

3.2 ISRO Science Data Archive (ISDA)

ISRO Science Data Archive (ISDA) is the central repository for all scientific and engineering data acquired by different ISRO's planetary missions. ISDA makes the planetary data sets accessible to the world-wide scientific community.

ISDA was established at Indian Space Science Data Centre (ISSDC) Bangalore (http://issdc.gov.in) during Chandrayaan-1 mission in 2008. ISDA archives data sets from following missions:

- Chandrayaan-1
- Mars Orbiter Mission
- AstroSat
- Chandrayaan-2
- Upcoming missions: Aditya-L1, XPoSat

All ISDA data are compliant with NASA's Planetary Data System (PDS) Standards for formatting and labelling files, including requirements for documentation and the structuring of data sets. ISDA provides an opportunity for international collaboration of space agencies with a mission of providing access to scientific data like other international science data centres. Chandrayaan-2 mission is the first planetary mission of ISRO to adopt the PDS4 standards.

3.2.1 PDS4 Archival System for Chandrayaan-2 Mission

PDS4 is next generation archive which is latest version 4 entirely based on the new concept. Basic understanding of PDS is required for generating PDS4 archive for any mission. ISRO has adopted PDS4 data archive for Chandrayaan-2 mission.

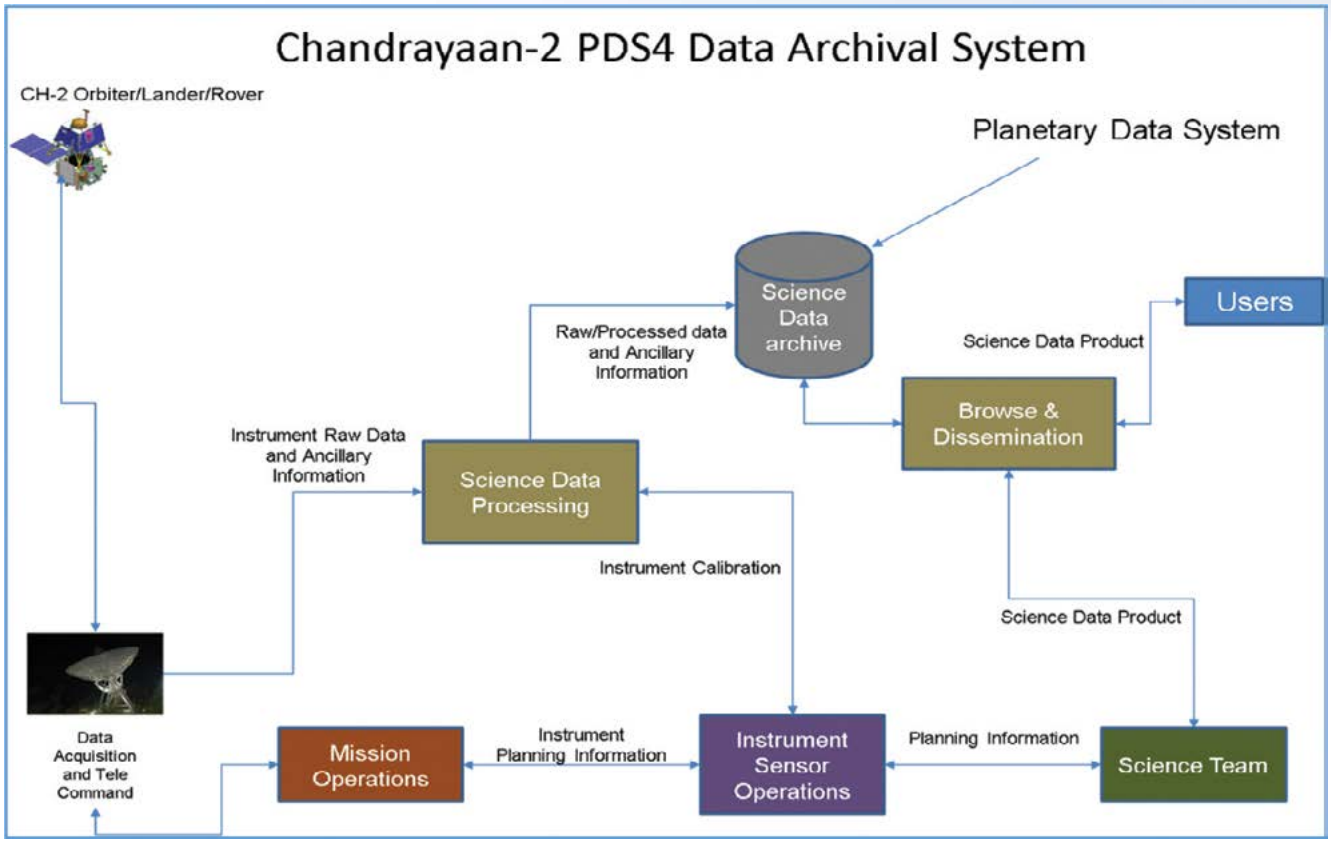


Figure 3.2: Chandrayaan-2 PDS4 Data Archival System

3.3 Policy Based Data Retrieval, Analytics, Dissemination and Notification System (PRADAN):

All the payload's data from Chandrayaan-2 is down linked to the deep space network ground stations. The data then flows to ISSDC and undergoes a series of processing both at ISSDC and Payload Operation Centres (POCs) which is defined by the ISSDC pipeline and Ground Segment. One of the output of ISSDC pipeline is payload archive data in PDS4 standard. Subsequently, based on the mission policy for each of the payloads (lock-in period), the PDS4 data is being released for the use of general public. Interface of general public to access the released data is from ISSDC website or via PRADAN at ISSDC. (URL: https://pradan.issdc.gov.in).

PRADAN is the data dissemination web application for Chandrayaan-2. It is a generic web application that can be configured to host data sets which the users can search, browse and download. The data sets to be hosted using PRADAN should be accompanied with the meta information of the data, as in PDS4 standard as per International Planetary Data Alliance (IPDA).

Payload Data Flow to Public Domain

The following are the major features available to the users in PRADAN:

1. Browse the science data
2. Search data based on payload specific parameters like: location, observation time, etc.
3. Adding multiple filters when searching
4. Download the data in compressed form
5. Pause/resume the download
6. Group small files and download as single file
7. PDS4 compliant archive dissemination
8. Search result display tuning
9. Provision to view detailed metadata

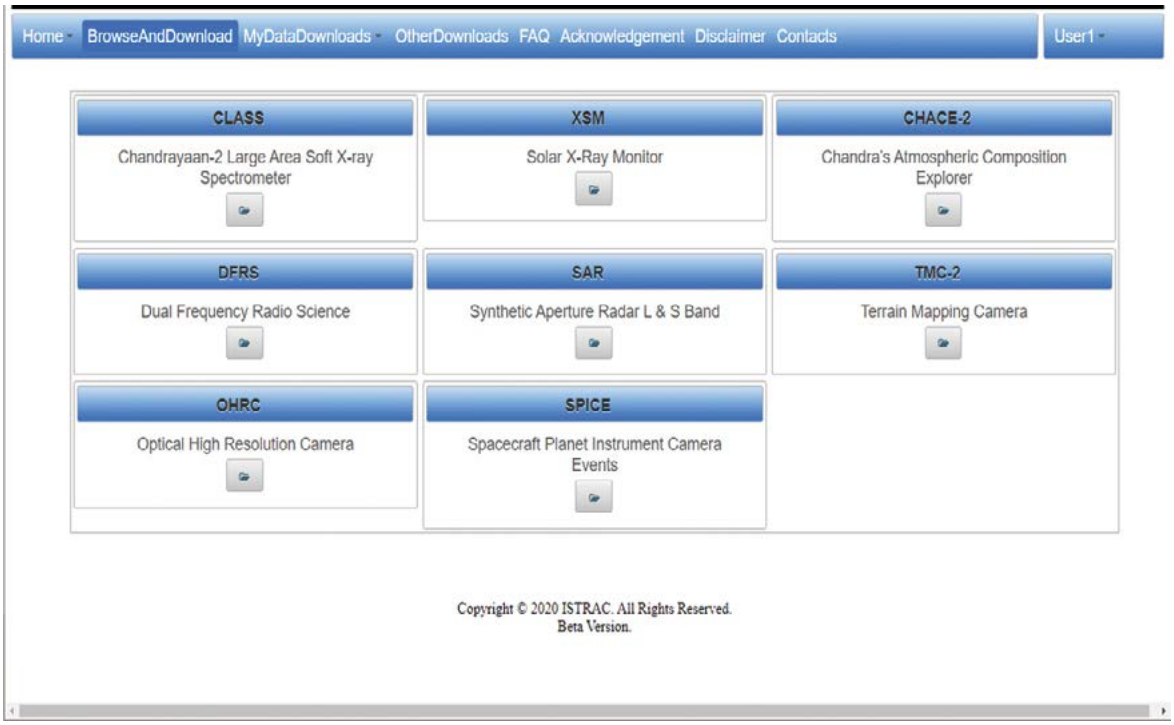
URL: https://pradan.issdc.gov.in

The user can signup and login to PRADAN to access the data.

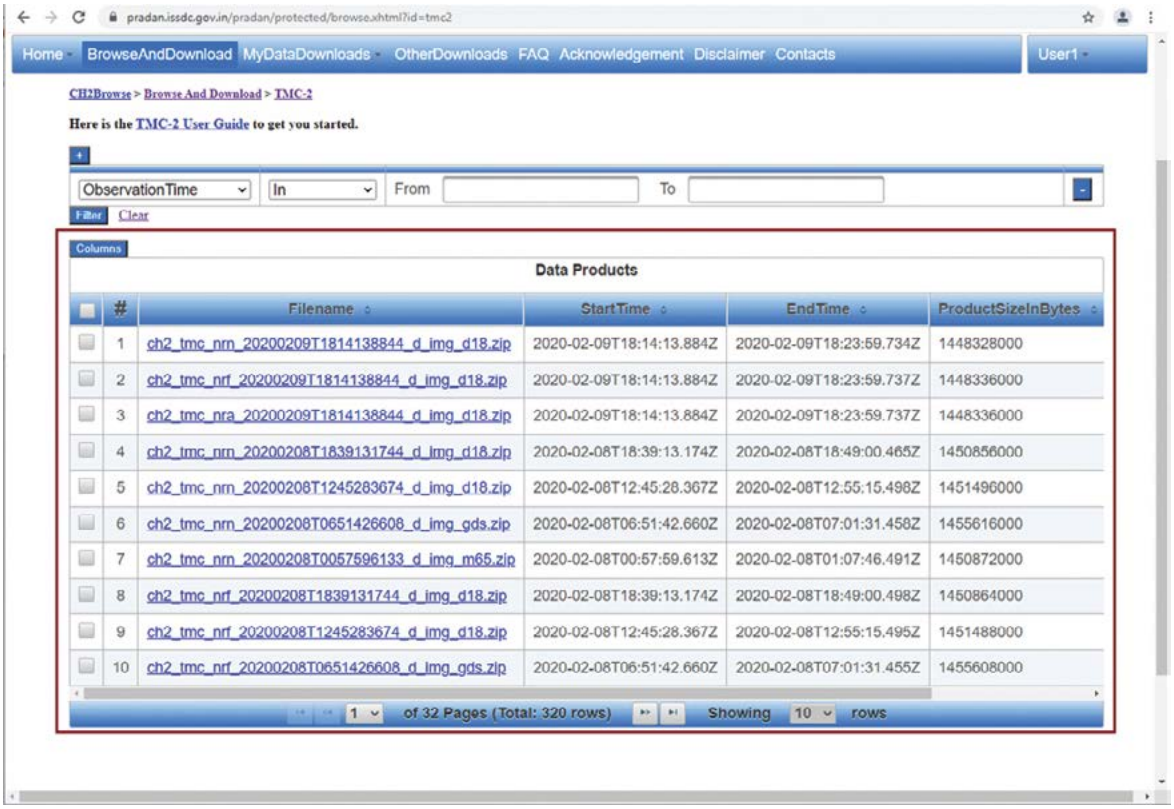


Basic features provided by PRADAN are:

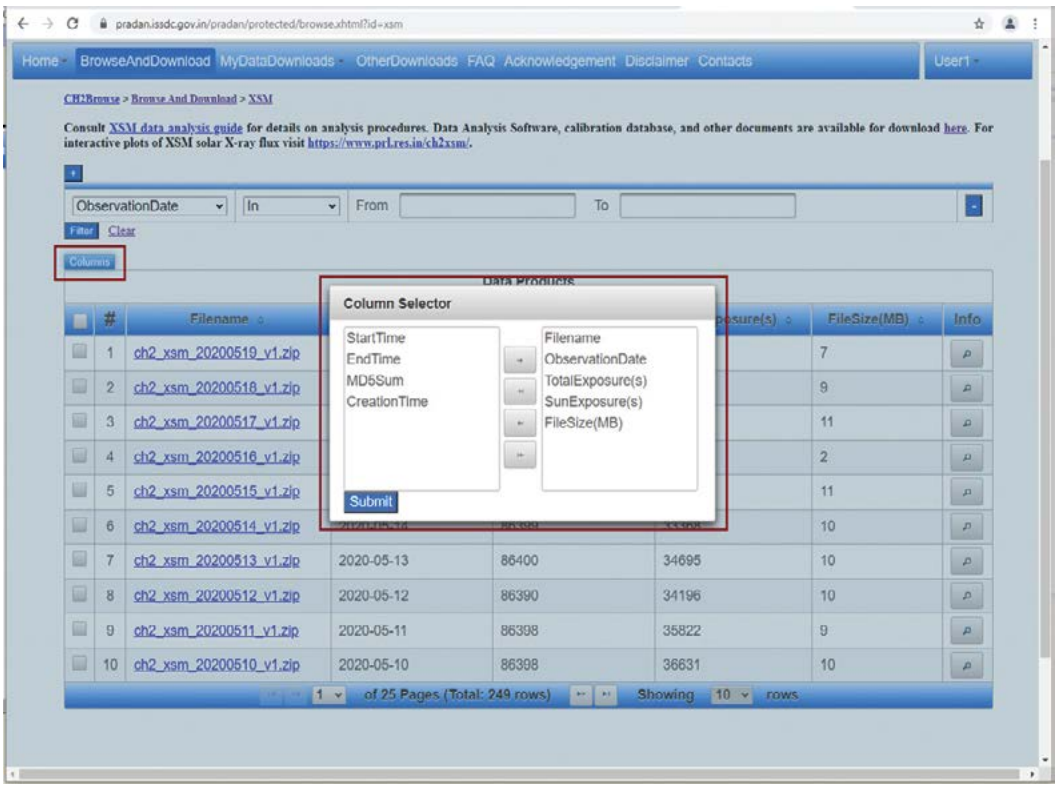
- Access payload-wise data



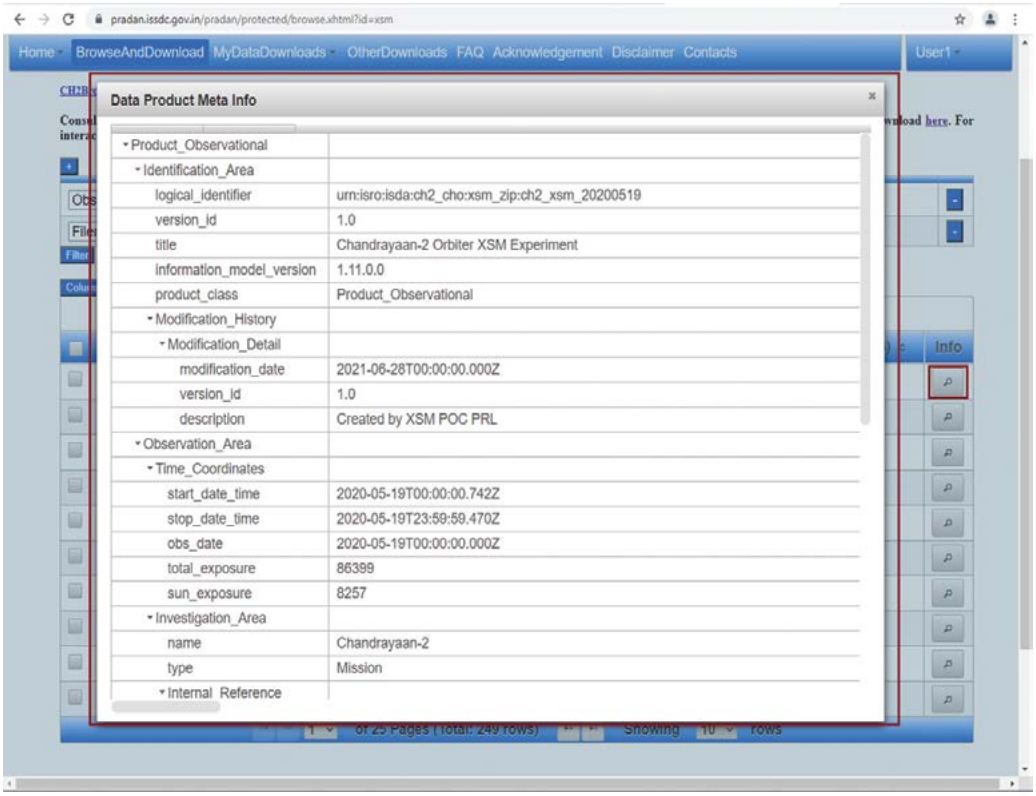
- Browse through complete list of released data for a given payload



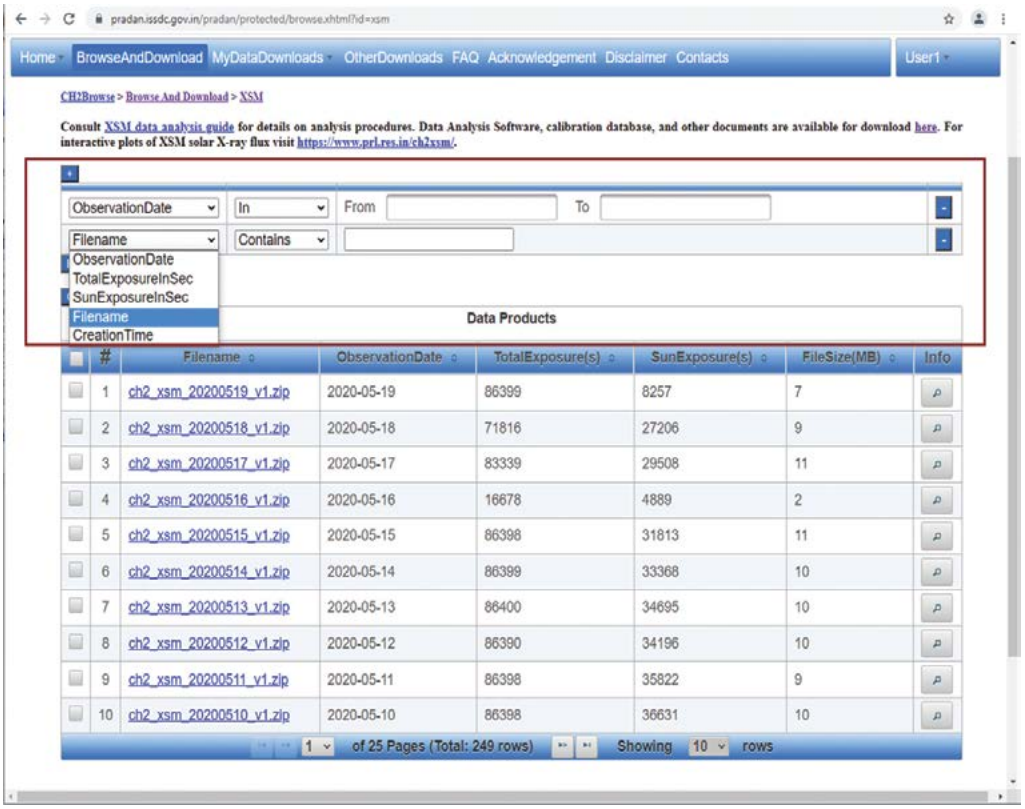
- User may even choose what columns interest them while browsing through the data list



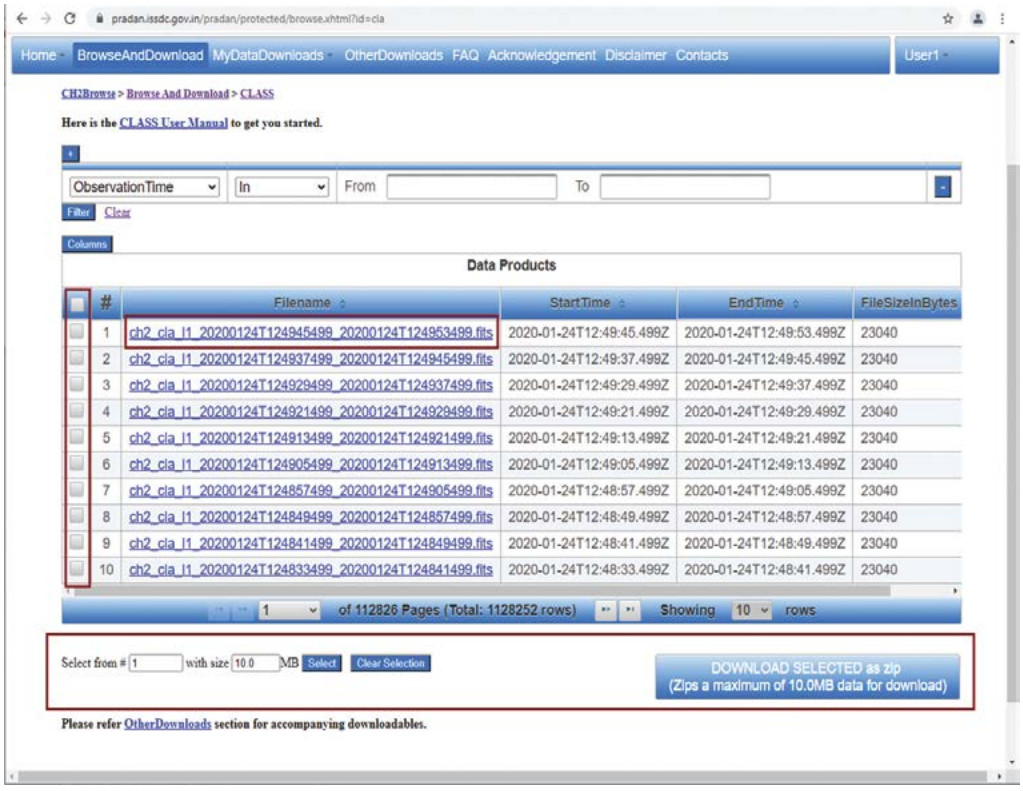
- User can preview the meta information about the data product



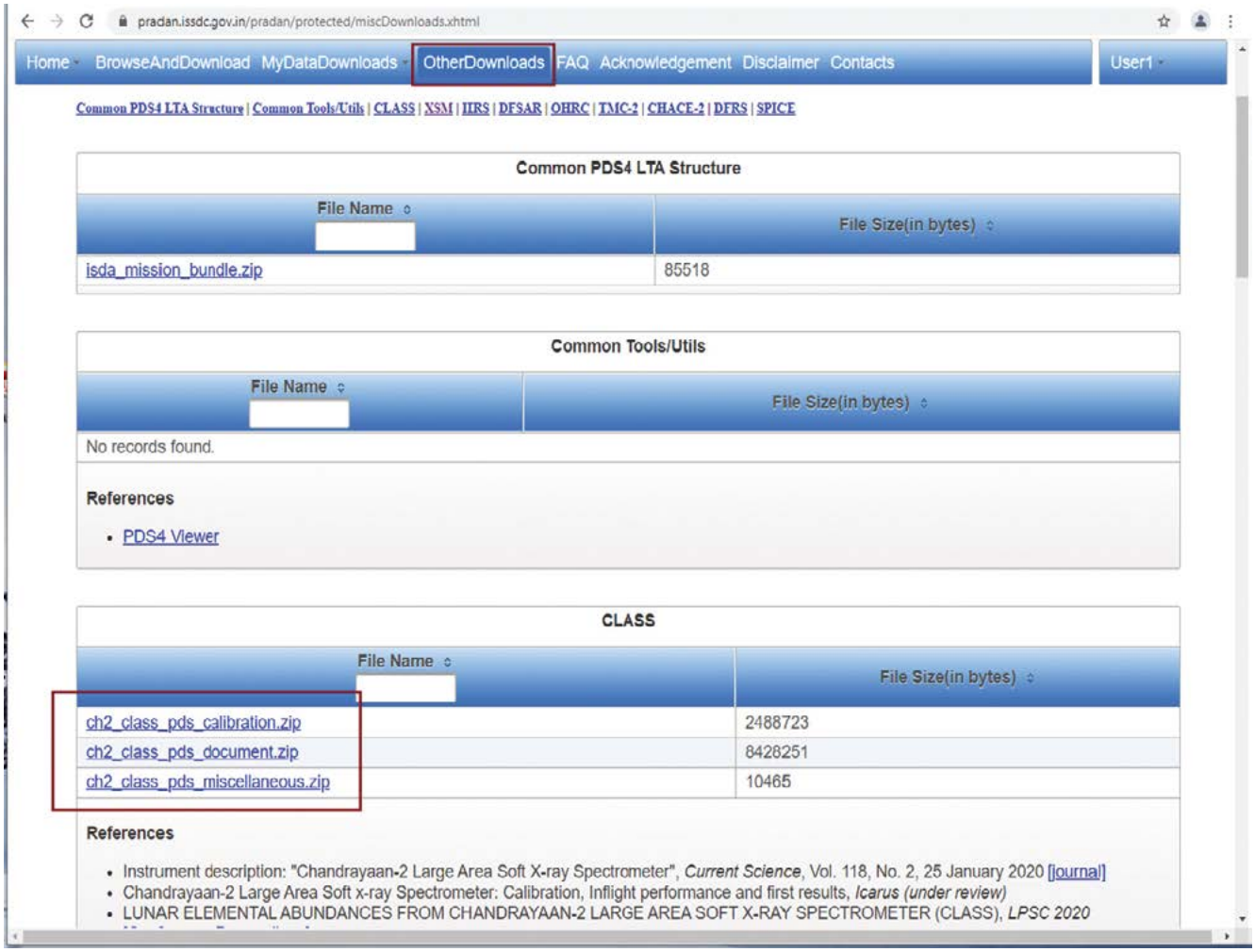
- Filter data with payload specific parameters



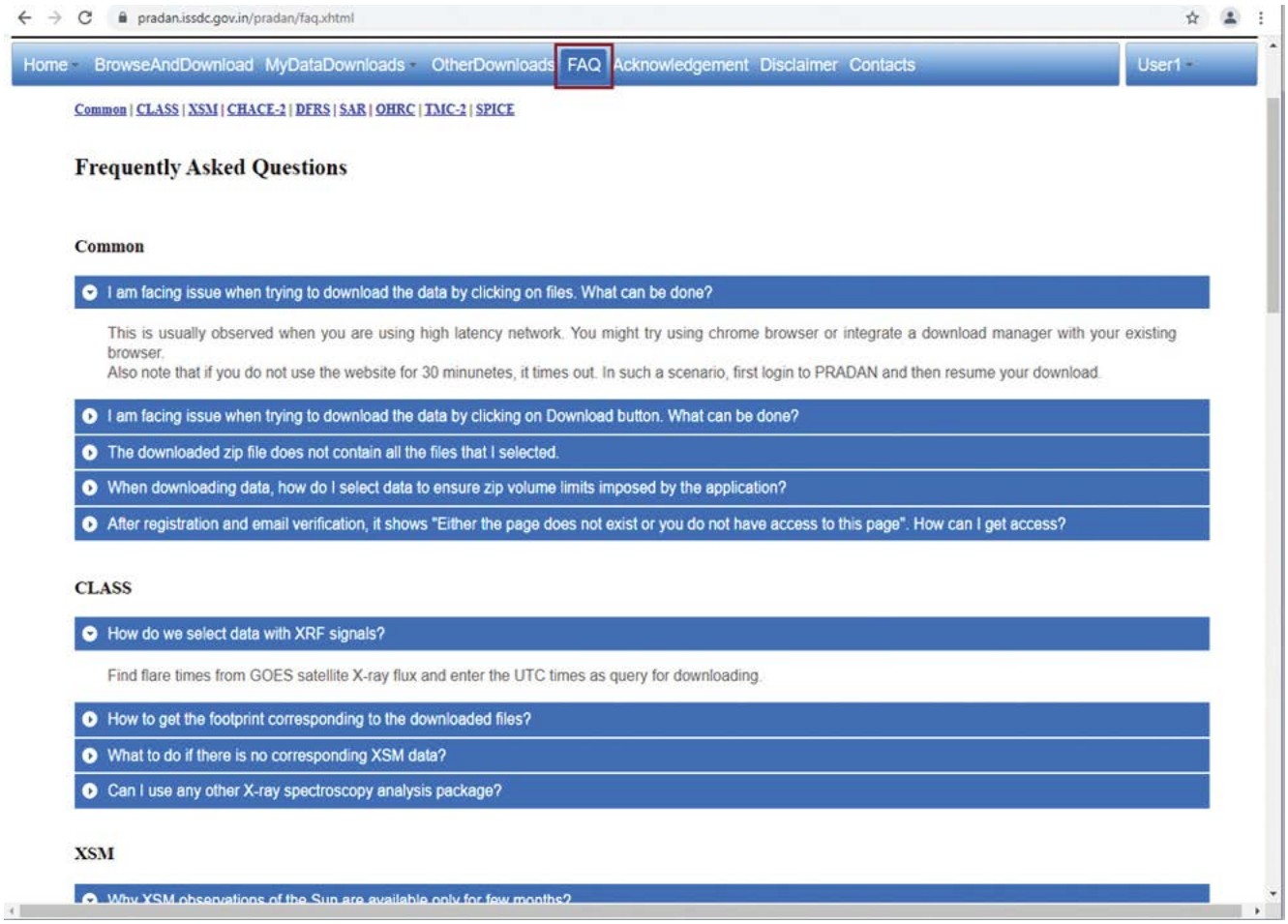
- Download data by clicking on individual files or as zip of selected files



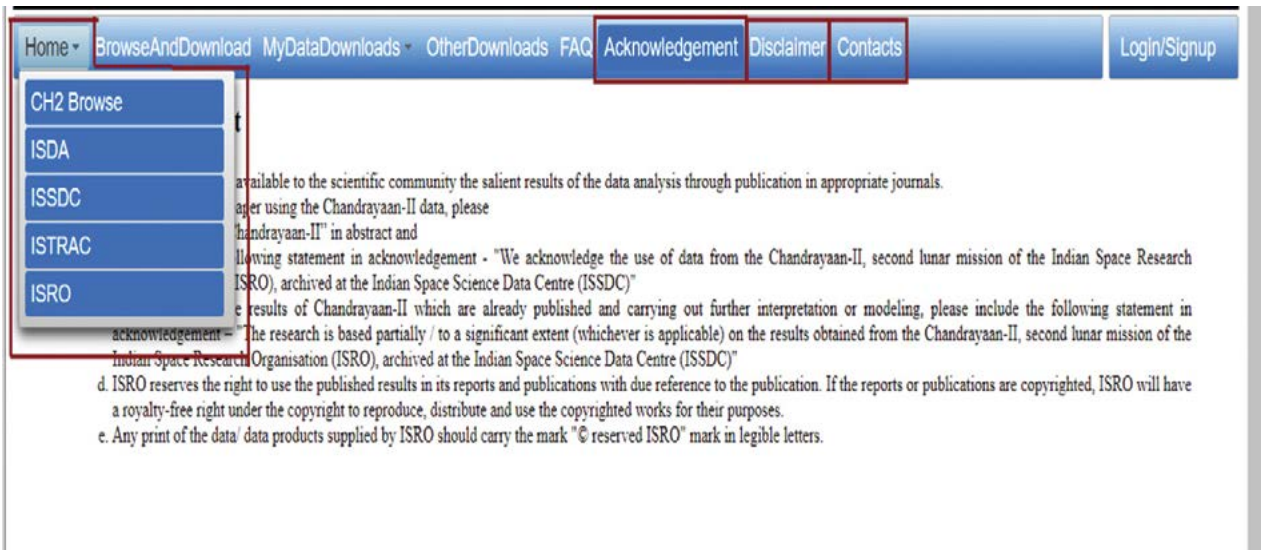
- Other than the data, all the related documents, calibration files, references required to use the data are available in 'OtherDownloads' section



- Payload-wise frequently asked questions are available in 'FAQ' section



- Acknowledgement guidelines, disclaimer and payload-wise contact points are made available, along with the home links to find more information about the mission



3.4 Data in Public Domain

Scientific data obtained from Chandrayaan-2 Orbiter payloads are planned to be released in public domain to enable the wider use of these data sets to bring out more science. Table 3.1 below shows the number of the data sets of each payload released in public domain during Dec 2020 and Jul 2021. More data sets will be added to these in future. Table 3.2 shows that volume of the data for each payload released in public domain. A total of around 1.25 TB data of orbiter's payloads has been released to public for science use.

Table 3.1: *Publicly Available Data of Chandrayaan-2 Orbiter Payloads*

Payload	Data sets released in Dec 2020	Data sets released in Jul 2021	Total data sets in public domain
CLASS	180	870	1050
XSM	69	180	249
CHACE-2	134	269	403
DFSAR	49	53	102
TMC-2	40	93	133
OHRC	01	28	29
DFRS	07	0	07
IIRS	0	5	5

Table 3.2*: Data volume of Chandrayaan-2 Orbiter Payloads available in public domain.*

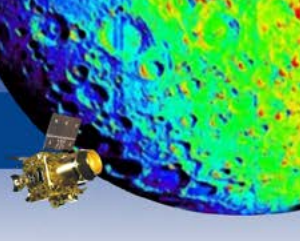
Payload	Data Size (in GB)	Total data (in TB)
CLASS	40	1.27
XSM	2.4	
CHACE-2	0.04	
DFSAR	541	
TMC-2	637	
OHRC	22	
DFRS	11	
IIRS	21	

Table 3.3 below list observation strategy of payloads, total data sets released in public domain and various analysis tools and documents provided at PRADAN portal for the analysis of the data sets.

Table 3.3: *Analysis tools and documents available in public domain for Chandrayaan-2 Orbiter Payloads*

Payload Name	Observation Strategy	Number of datasets released in public	Analysis tools available in PRADAN	Documents available in PRADAN
CLASS	Always ON Continuous observation on the sunlit side. Geotail observations for 6 days centered around full moon. Active Sun is desirable.	1050	CLASS_add_L1_files_time.pro Re-distribution matrix file Ancillary response file Background file	ch2_class_pds4_sis.pdf(s/w interface specs) Ch2_class_user_manual.pdf (for L1 data analysis)
XSM (looks at Sun)	Always ON 30 days observations in the middle of DD season. ~20 days observations in the stand and end of NM season	249	xsmgtigen xsmgenspec xsmgenlc xsmaddspec xsmmet2utc xsmutc2met ch2xsm_read_data.pro, ch2xsm_read_drm.pro	XSM Data Analysis Guide (V1.0) XSM Data Products and Archive SIS (V1.0)

CHACE-2	Always ON Operated for 2 hrs/ 4 hrs per day After degas mode operation on 22 May, one operation (4 hrs)/ day is being done.	403	Nil	CHACE2_ readme.pdf CHACE2_User_ manual.pdf ch2_chace2_ dp_archive_ sis.pdf
DFSAR	Operated during Dawn-Dusk season. S/C is roll-tilted for imaging operation. Systematic coverage of lunar poles (85 to 90 deg in the initial seasons; 80 to 85 deg in subsequent seasons)	102	Microwave Data Analysis Software (MIDAS V2.1)	Data Product SIS and PDS4 archival DFSAR user manual.
TMC-2	Operated during Noon-Midnight (N-M) season which lasts for ~3 months. 10 min to 30 min operation Different modes and exposure settings. Completed 3 imaging seasons. 4th season is going on from 15 May 2021.	133	PDS4 Viewer	Data Product User Guide. LTA (Long Term Archive) Assembly Procedure



OHRC	Targeted observations only, Imaging in low illumination conditions (6 to 12 deg Sun elevation) 2 sec to 20 sec operation. Time delay integration settings.	29	PDS4 Viewer	Data Product User Guide LTA (Long Term Archive) Assembly Procedure
DFRS	Limited operations due to mounting related technical issues. 250 minutes observations done so far with varying duration.	07	Nil	DPSIS document Technical report on data analysis.
IIRS	Operated during N-M season. Completed 3 imaging seasons. 4th season is going on from 15 May. Dark sky data for Cal purposes. Given priority to complete coverage of entire moon (unique extended IR region data, for the first time).	5	PDS4 Viewer	Data Product User Guide LTA (Long term Archive) Assembly Procedure

CHAPTER 4

Data Products of Orbiter Payloads

In this chapter, the data products of all the Chandrayaan-2 Orbiter Payloads are discussed. The forthcoming section provide the payload wise description of data products.

4.1 Chandrayaan-2 Large Area Soft X-ray Spectrometer (CLASS)

CLASS measures the X-ray photons from the lunar surface when there is a solar activity. Particles in the ambient lunar environment also deposit energy in CLASS detectors and is termed as the 'background'. Data from the measurements are binned into a spectrum for analysis. The data product released in the public domain are spectra of 8s time resolution.

Spectrograms are generated for quick look which helps to identify X-ray Fluorescence signals, times of geotail passes and other sources of background. A spectrogram is a representation of how the spectrum varies in time. The spectra of 100 s integration time observed by the sixteen detectors in CLASS are added after temperature dependent correction of the energy value. In the spectrogram, time is plotted in the X direction and energy in keV in the Y direction. The colour in the third dimension represents the observed counts which is the measure of the signal strength at a given energy. The spectrogram shown in Figure 4.1-4.5 is the counts/s/cm^2 (log scale) in all the CLASS X ray detectors together plotted as a function of time in Universal Time (UTC).

At quite times (Figure 4.1) when there is no solar activity, the low counts observed are from particles in the lunar enviroment. Faint lines at 1.48 keV and 8 keV are observed which arises from particle induced X-ray emission (PIXE) from the instrument elements. CLASS observes XRF lines from Mg, Al and Si during weak solar flares (Figure 4.2) and Ca, Ti and Fe during strong flares (~ C flare and above) as between 10 to 11 UTC in Figure 4.2.

During geotail passes once a month, the particle population encountered changes and counts above ~ 7 keV increases significantly as shown in Figures 4.3 and 4.4. The bright streaks that span the entire energy range are due to particles in the geotail. Figure 4.5 shows the case of a passage of a coronal mass ejection where the particle generated counts appear a streaks in the Y direction of the image for several orbits (until the CME passes by).

4.1.1 How to use the spetcrogram for data selection

- Identify the time in UTC when XRF lines are visible
- Sort times of weak and strong flares

- Identify times of geotail
- Identify times when background is high (due to CMEs)

With the selection of the best data sets using the spectrogram, spectra for the chosen UTC intervals can be downloaded from the PRADAN archive (https://pradan.issdc.gov.in/pradan). A total of 589 spectrograms acquired by CLASS payload are provided in Annexure-1.

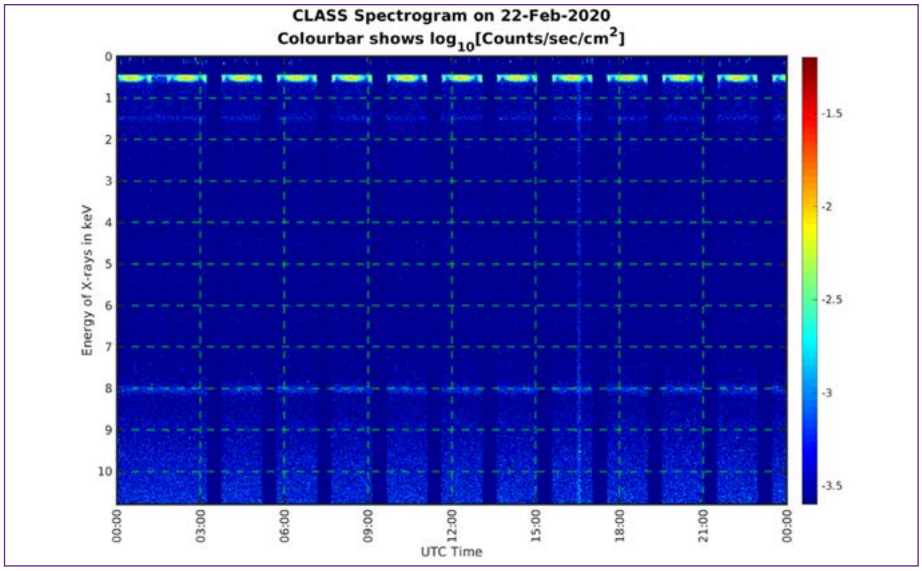


Figure 4.1: Quiet times when there is no solar activity and Moon is outside the geotail.

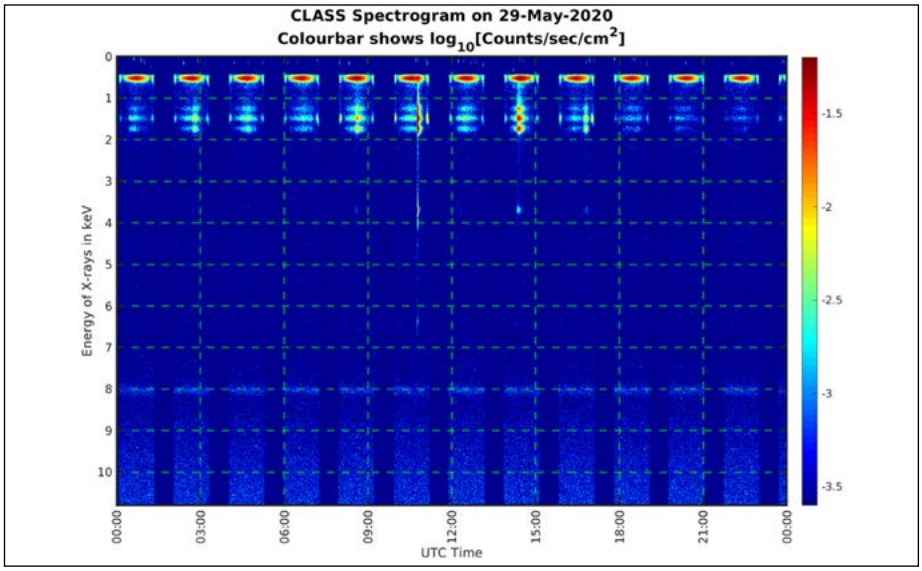


Figure 4.2 : Low to medium solar activity shows XRF signals from Mg, Al, Si throughout the day. A ~C7 flare 10.40 Hrs shows Ca signature as well.

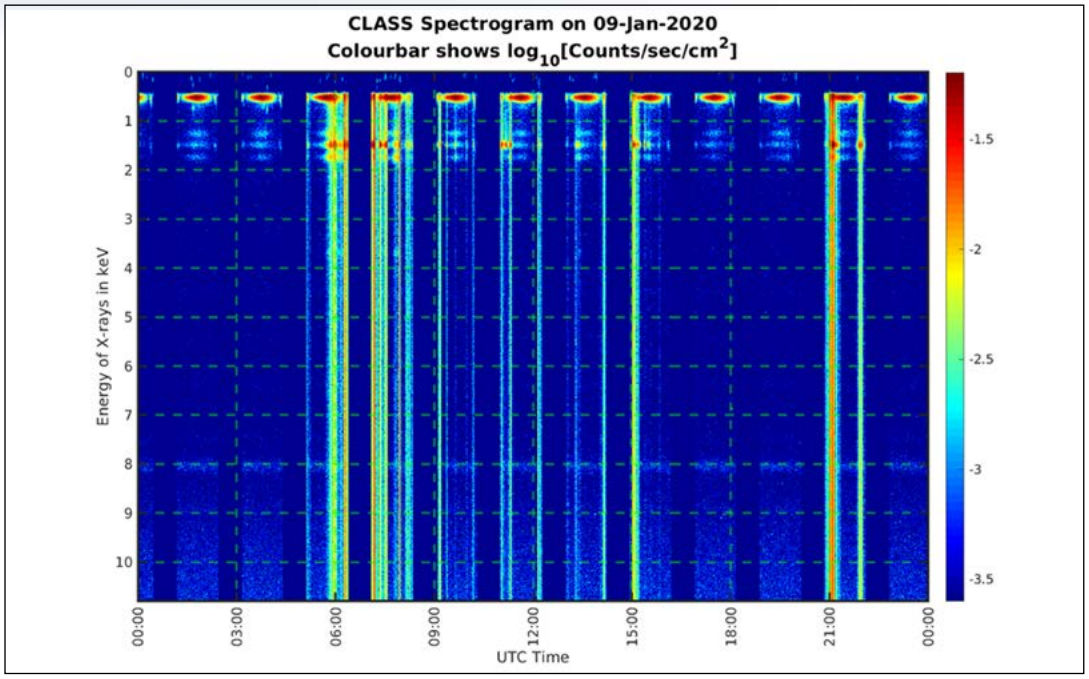


Figure 4.3: CLASS during a moderately strong geotail. The increase in counts and spectral hardening can be seen as bright streaks.

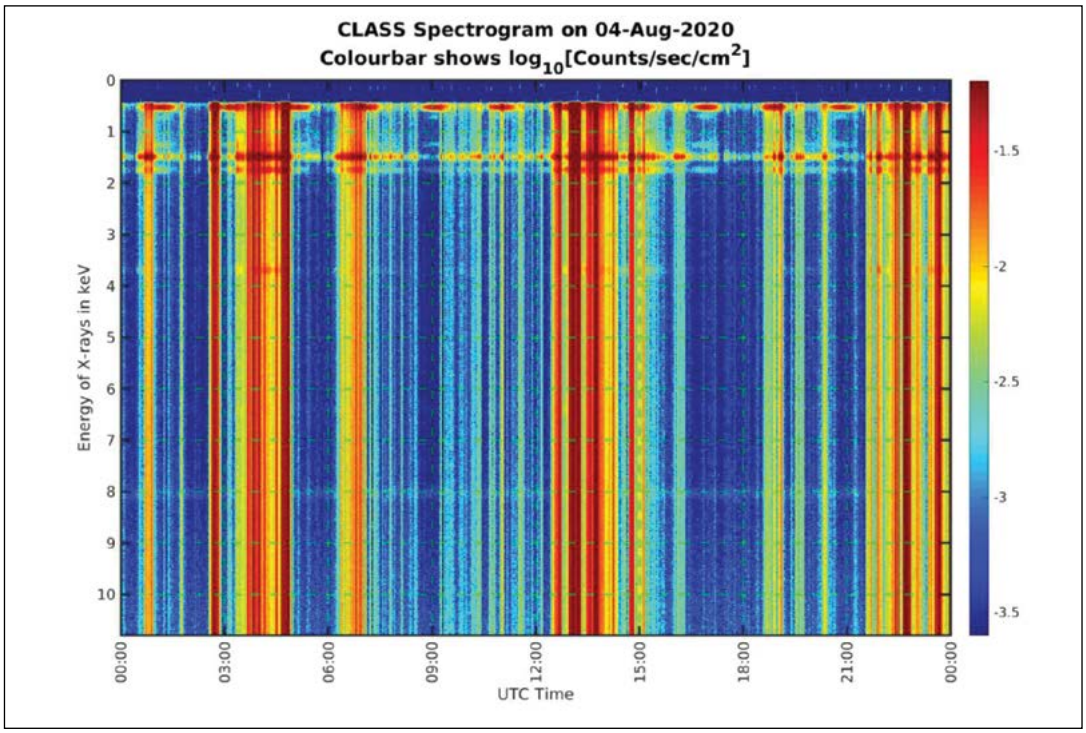


Figure 4.4: Strong geotail time where the particle flux and spectral hardening is more frequent and significant.

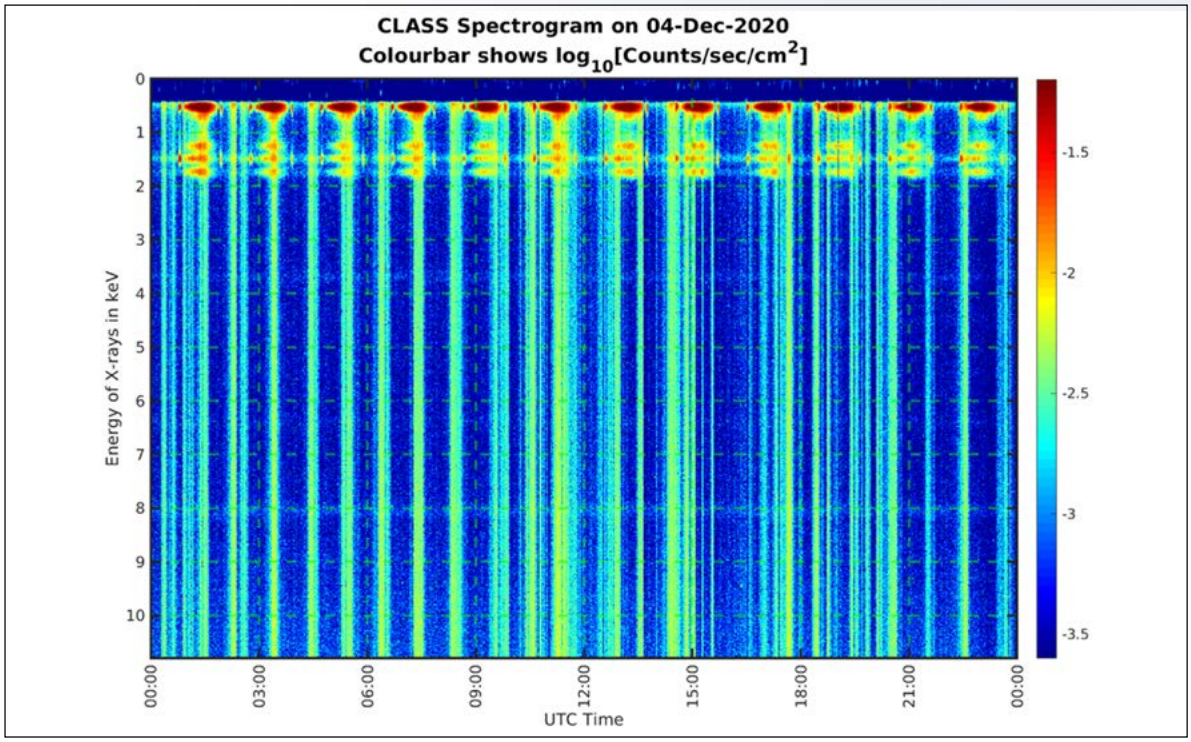


Figure 4.5: Particles observed in CLASS during the passage of a Coronal Mass Ejection following a strong solar flare.

4.2 Solar X-ray Monitor (XSM)

Solar X-ray Monitor (XSM) on-board Chandrayaan-2 provides measurement of soft X-ray spectrum of the Sun. XSM data is archived day wise, and the final data products are light curves and spectra. Here the representative plots of the XSM data products for observations on few selected days are provided. Figures 4.6- 4.10 show the plots of daily XSM light curve in flux units for two energy/wavelength ranges of 1–15 keV and 1–8 Å with the time cadence of one minute and total solar X-ray spectrum integrated over total exposure available over that day. The light curve is the plot of solar flux with time. Similar plots are provided in Annexure-2 for all days when solar observation were available. It is to be noted that these plots are provided for reference purpose, and the XSM data allows generation of light curves and spectra for different time cadences and integration time using the XSM data analysis software (XSMDAS).

In Figure 4.6, the top curve shows the light curve for the date 12 Sep 2019. Representative light curves for the other dates are also provided in subsequent figures. It may be noted that during noon-midnight seasons, Sun is out of FOV of XSM for ~20 days at the beginning and end of seasons and thus no solar observations are available for those days. Similarly, there are occasions when XSM was powered OFF for various mission operations requirements.

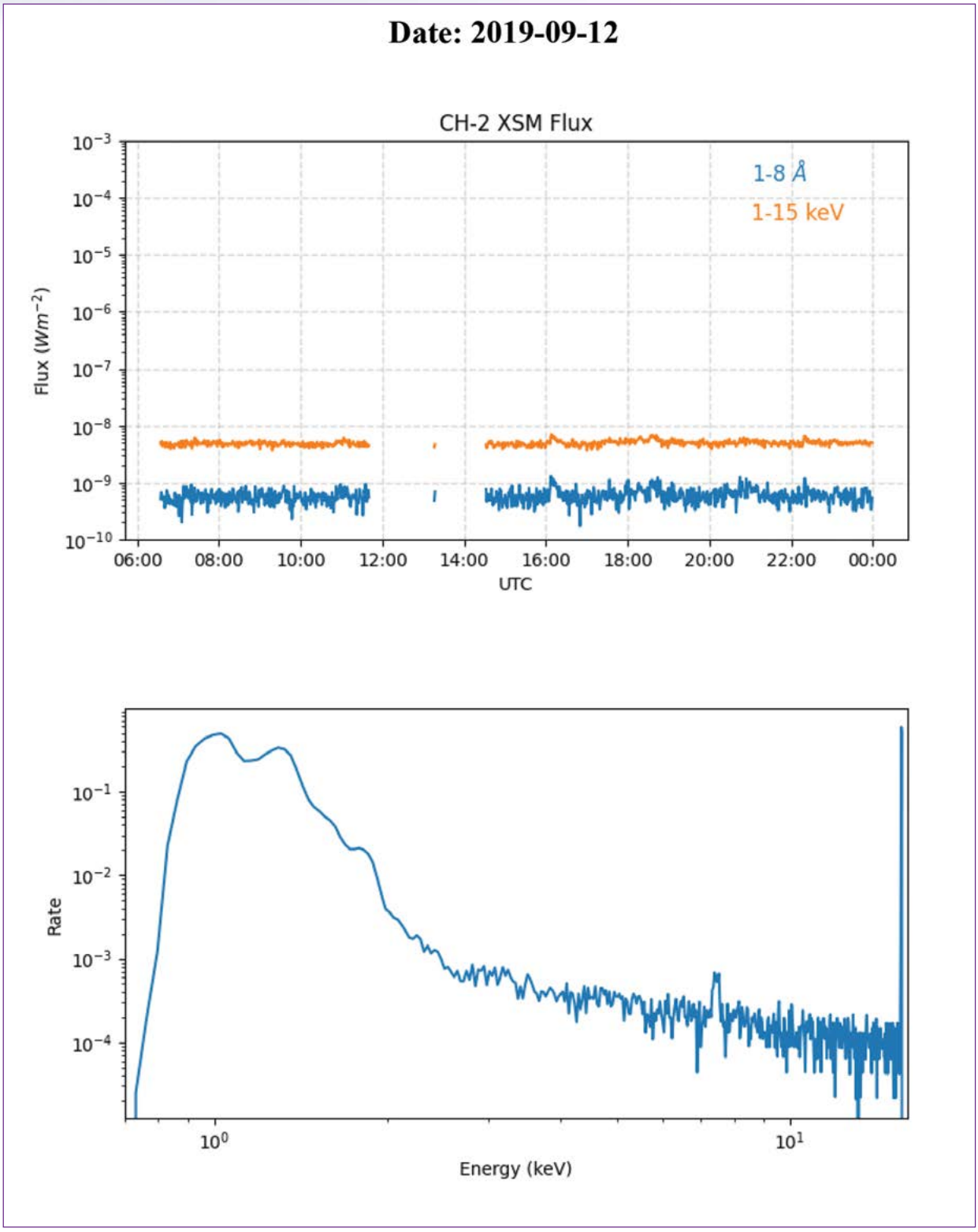


Figure 4.6: The light curve (top figure) and spectra (bottom figure) as observed by XSM on 12 Sep 2019.

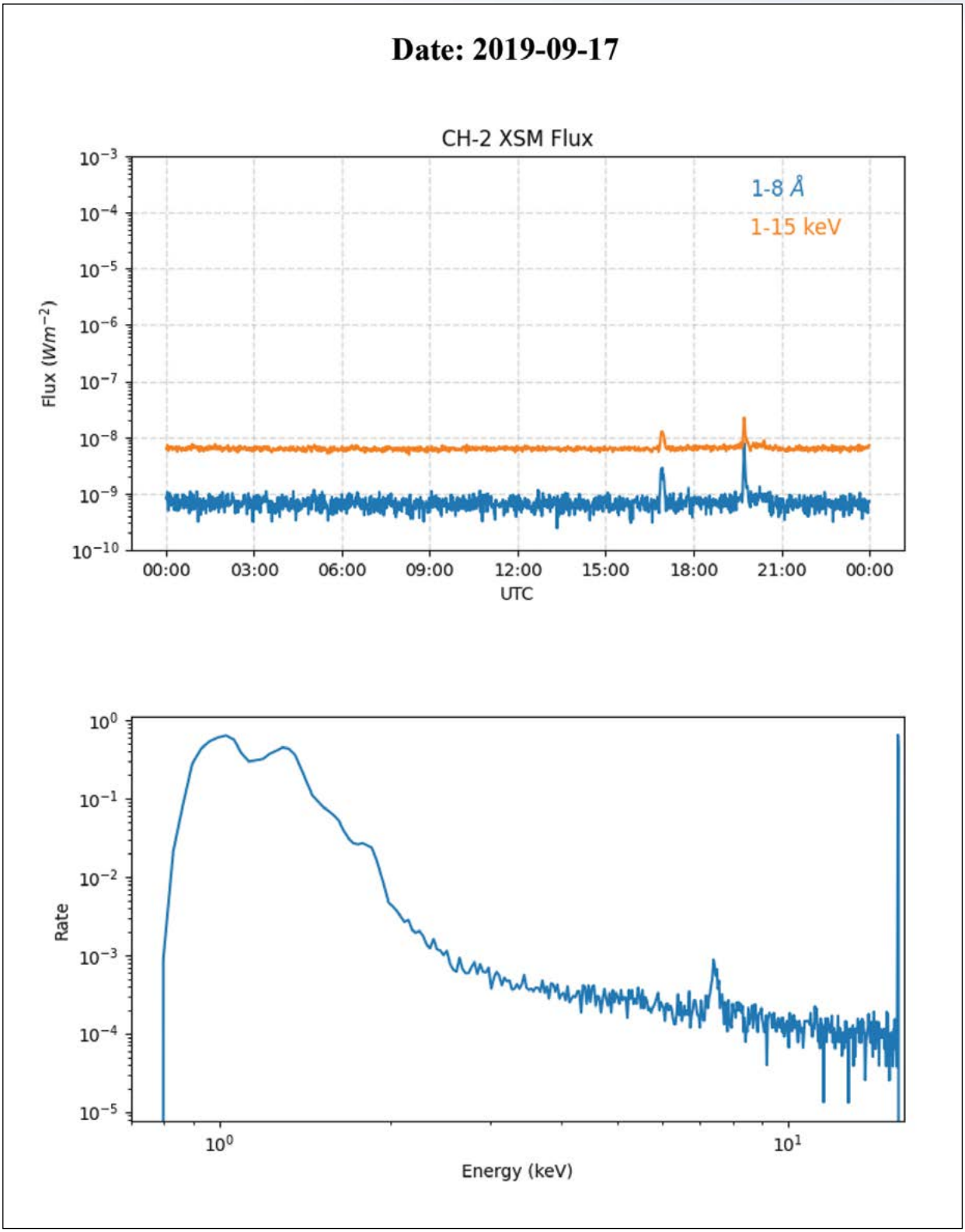


Figure 4.7: The light curve (top figure) and spectra (bottom figure) as observed by XSM on 17 Sep 2019.

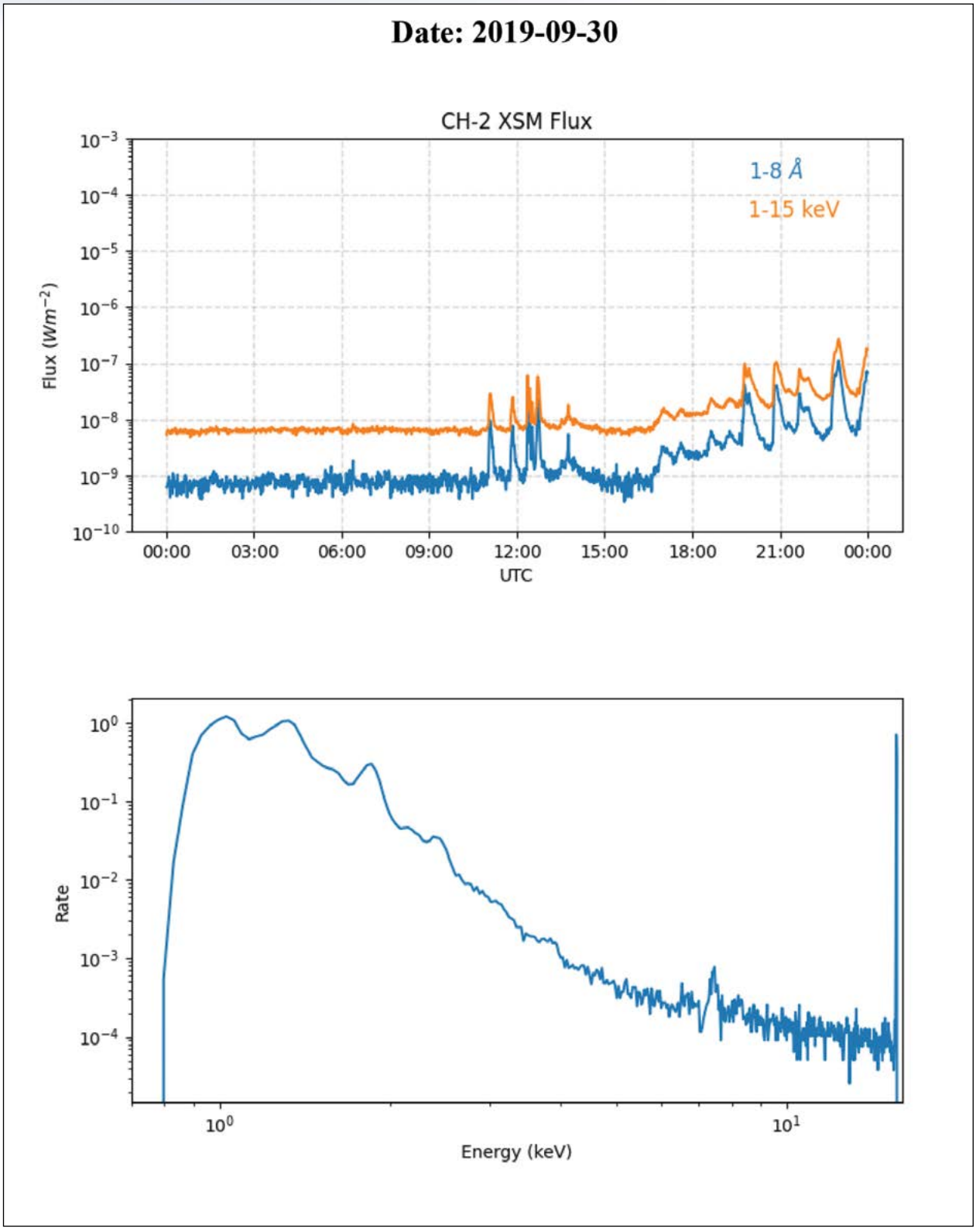


Figure 4.8: The light curve (top figure) and spectra (bottom figure) as observed by XSM on 30 Sep 2019.

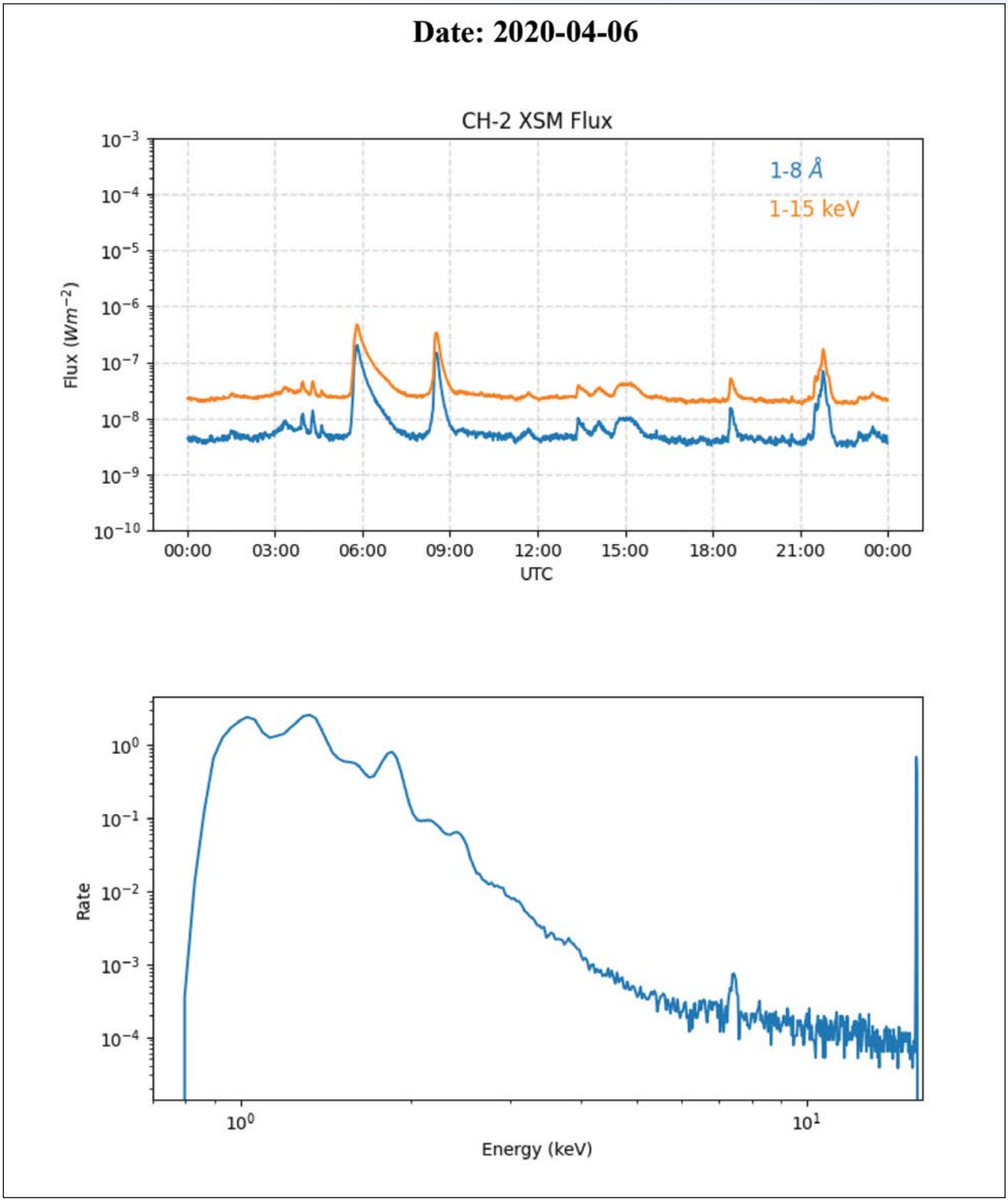


Figure 4.9: The light curve (top figure) and spectra (bottom figure) as observed by XSM on 6 Apr 2020.

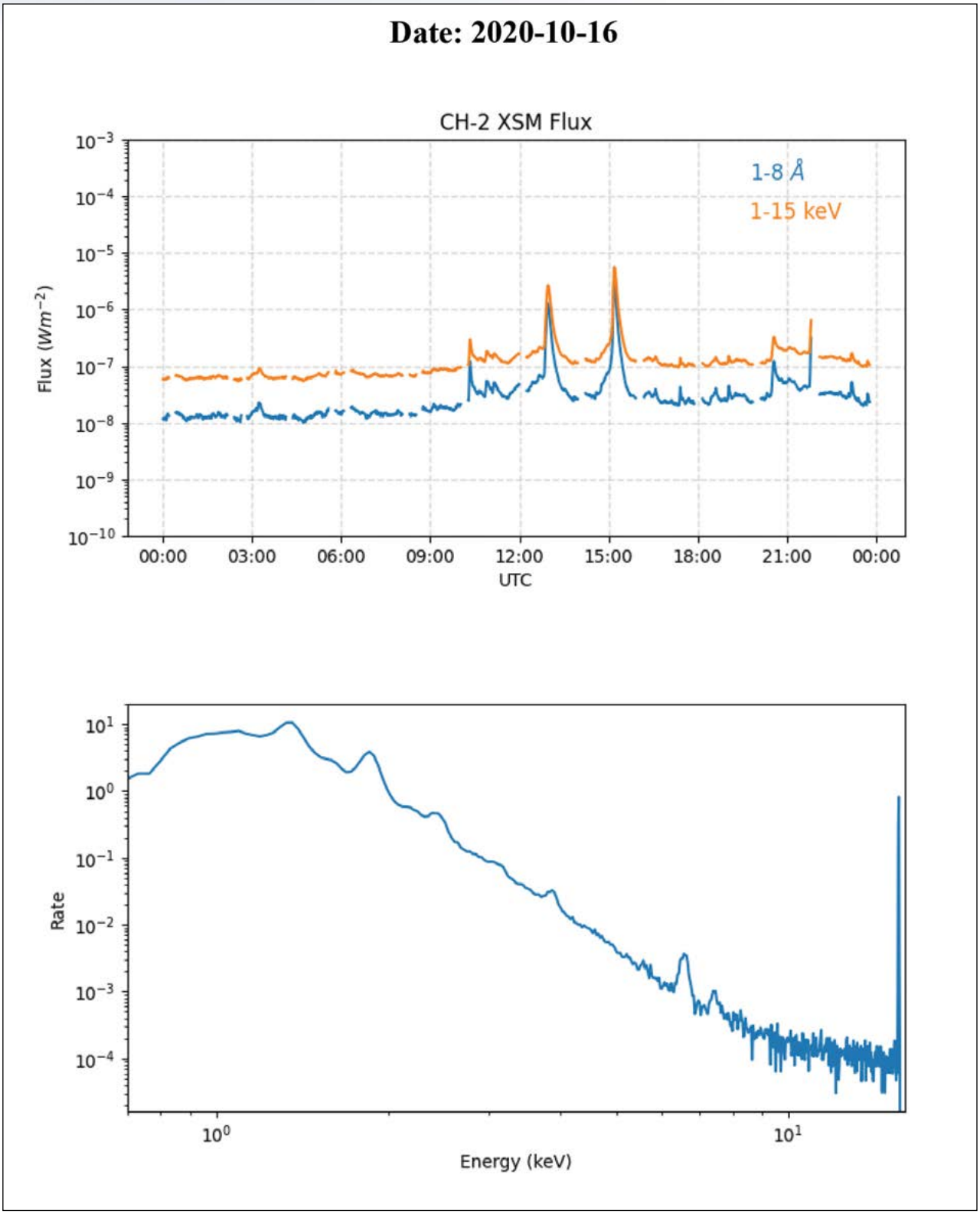


Figure 4.10: The light curve (top figure) and spectra (bottom figure) as observed by XSM on 16 Oct 2020.

4.3 CHandra's Atmospheric Composition Explorer-2 (CHACE-2)

The mass sweep mode of operation is the default mode of operation of CHACE-2 and the data product of this mode of operation is the 'mass spectrum'. This mode is useful to analyse the relative composition of the constituents of a given medium at a given instant of time. Examples of typical mass spectra is shown in Figure 4.11a and b. Figure 4.11a corresponds to the CHACE-2 operation on 11 Sep 2019, when Chandrayaan-2 Orbiter was at ~85 km altitude. Similarly, Figure 4.11b corresponds to the CHACE-2 operation on 30 Apr 2020, when Chandrayaan-2 Orbiter was at ~95 km altitudee. The X-axis in these plots corresponds to amu (atomic mass unit) and the Y-axis values are the raw partial pressures (i.e. ion currents for different species with different mass-to-charge ratio, constituting a mass spectrum). For instance, the peak at amu-40 corresponds to the raw partial pressure of Argon-40.

The operating parameters during these observations are shown in Figure 4.12 a and Figure 4.12 b. The parameters such as scan rate, number of samples per amu, Electron Multiplier Voltage, mass range etc are shown in this plot. During these orbits, the entire operation was of mass sweep mode (=1), and the mass range covered was from 1-100 amu. The plot also shows that the CEM detector was invoked after initial observations in Faraday cup mode, with voltage of ~1800 V throughout the operation. The mass spectrometer makes use of electron impact ionization to ionize the neutrals of the medium, and for these operations 70eV electron energy was used.

Figure 4.13 a and Figure 4.13 b shows the house keeping parameters which help to assess the health of the instrument. These are basically time series plots of different voltages and temperatures during the operation. For example, the filament resistance values indicate that the filament is ON and healthy. Similarly the RF voltage values show that the mass scanning is enabled in the quadrupole mass analyzer. The plots are identical showing that all HK parameters remained same and this shows the instrument is healthy.

Figure 4.14 a and Figure 4.14 b shows the variation of Roll angle, altitude and Total pressure (observed by the Bayard Alpert Gauge) during these operations. It can be seen that compared to September 19, the total pressure has dropped considerably in April 2020, indicating the reduction in background. More such plots are compiled in Annexure-3 for CHACE-2 payloads.

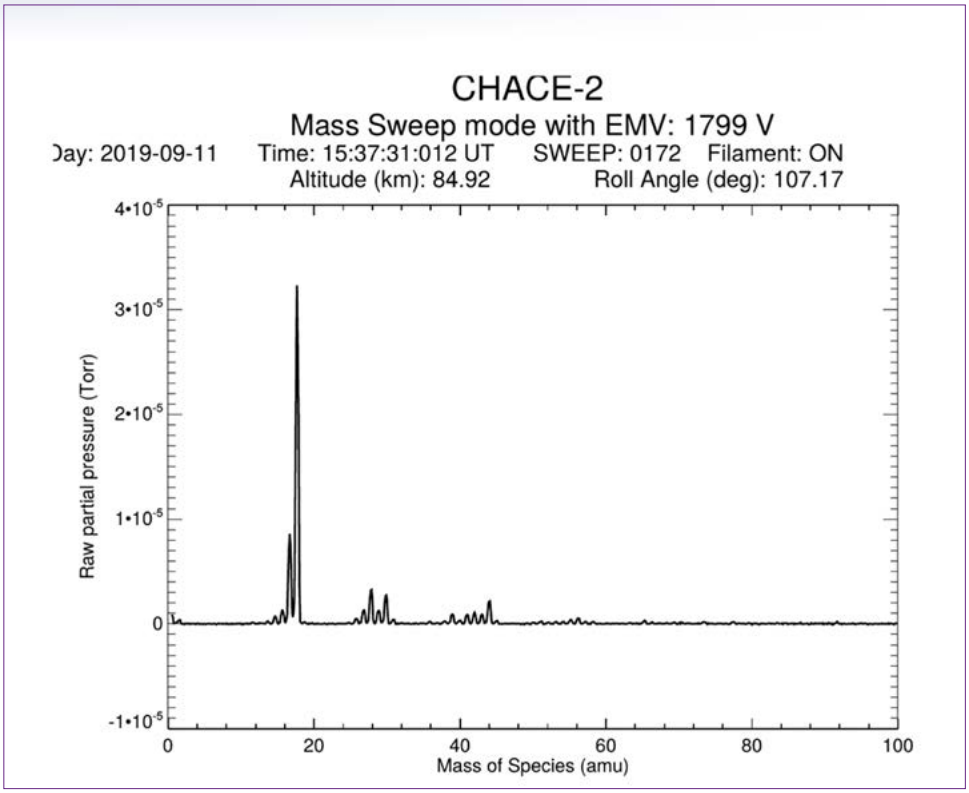


Figure 4.11a: Observed mass spectrum from CHACE-2 on 11 Sep 2019.

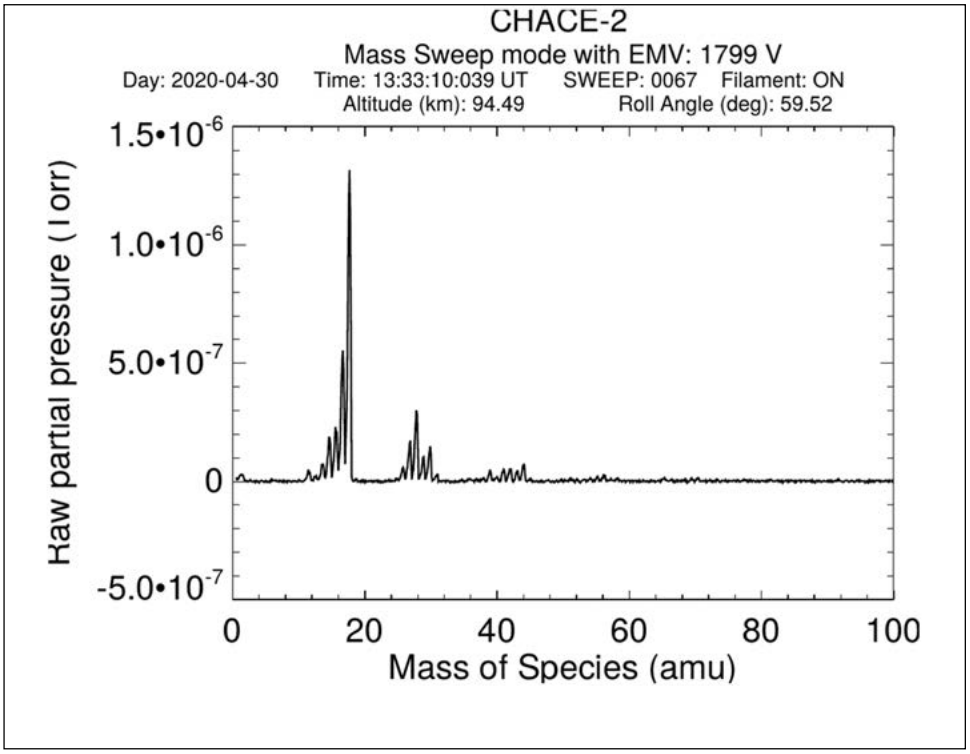


Figure 4.11b: Same as Figure 5.11a, but for 30 Apr 2020.

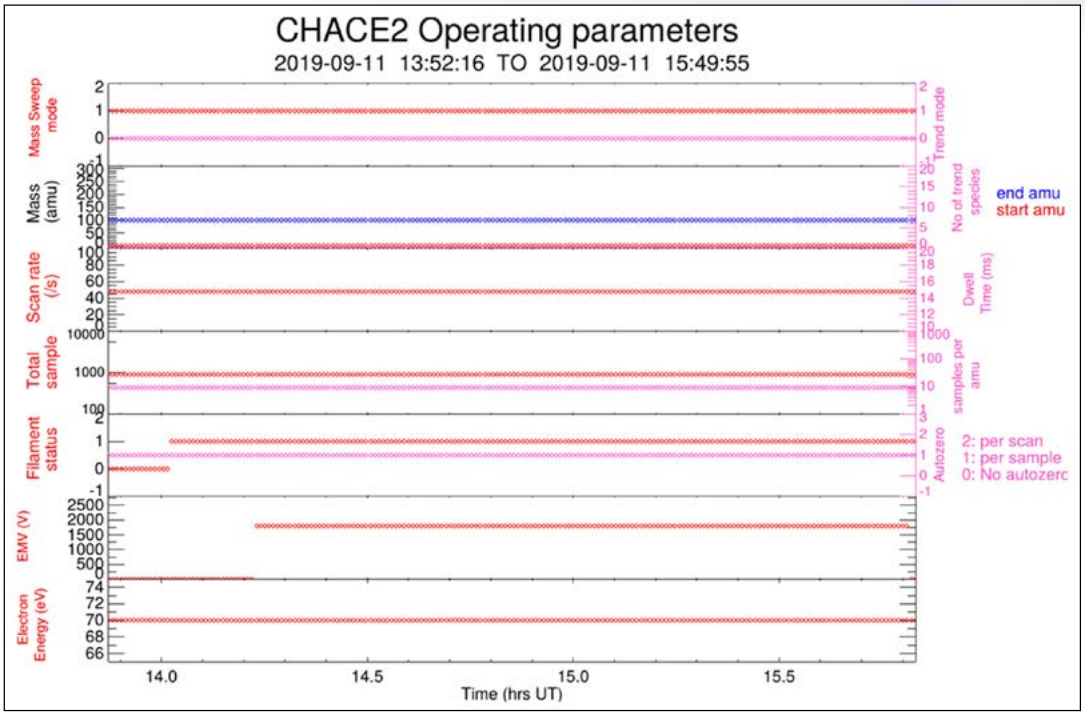


Figure 4.12a: Operating parameters for the CHACE-2 operation on 11 Sep 2019.

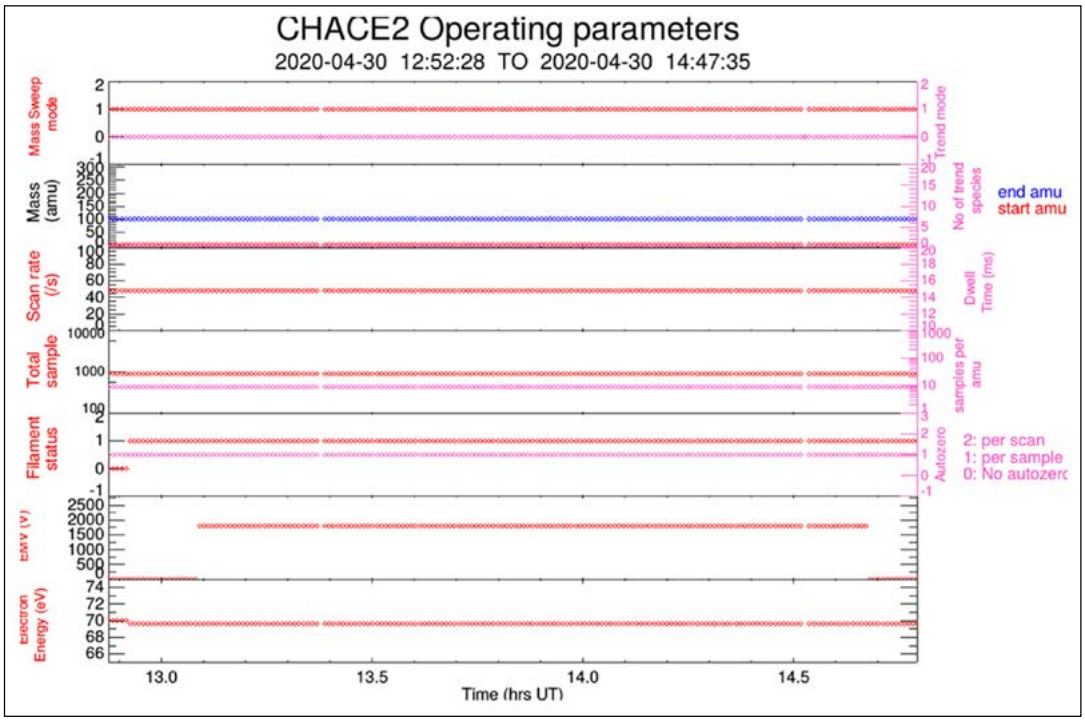


Figure 4.12b: Operating parameters for the CHACE-2 operation on 30 Apr 2020.

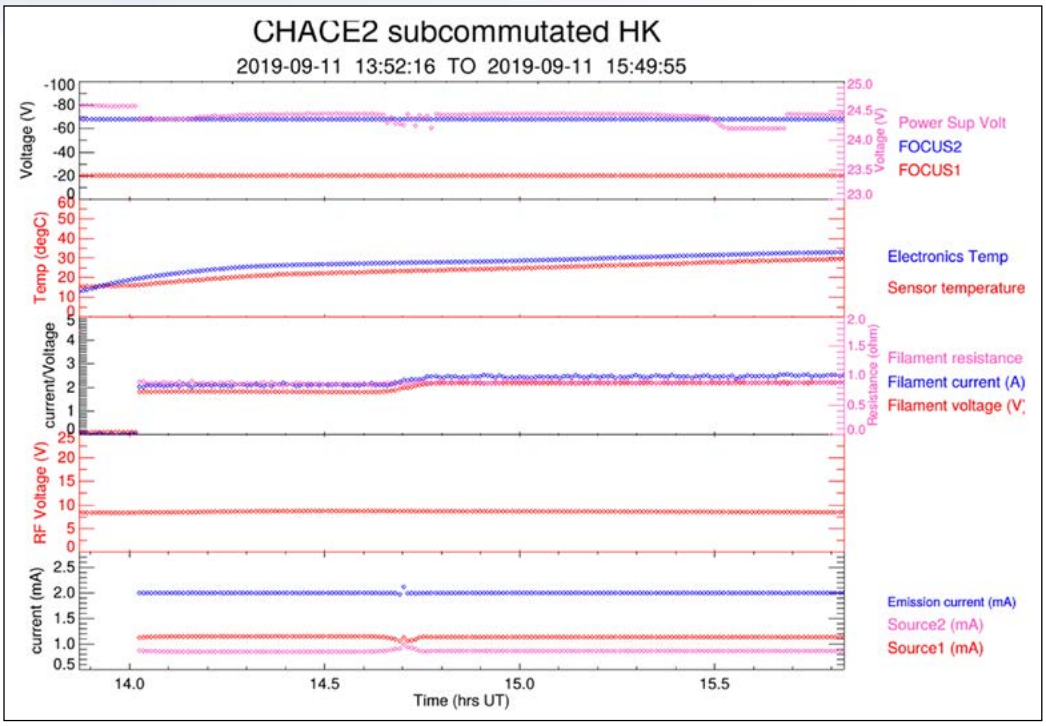


Figure 4.13 a: Housekeeping parameters the CHACE-2 operation on 11 Sep 2019.

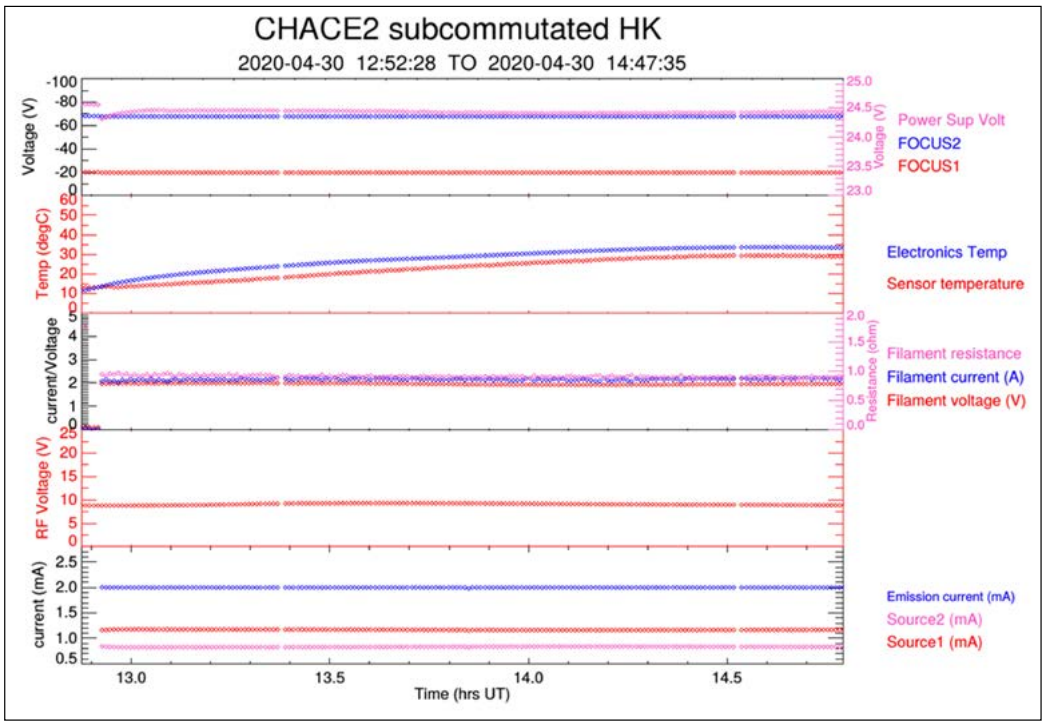


Figure 4.13 b: Housekeeping parameters the CHACE-2 operation on 30 Apr 2020.

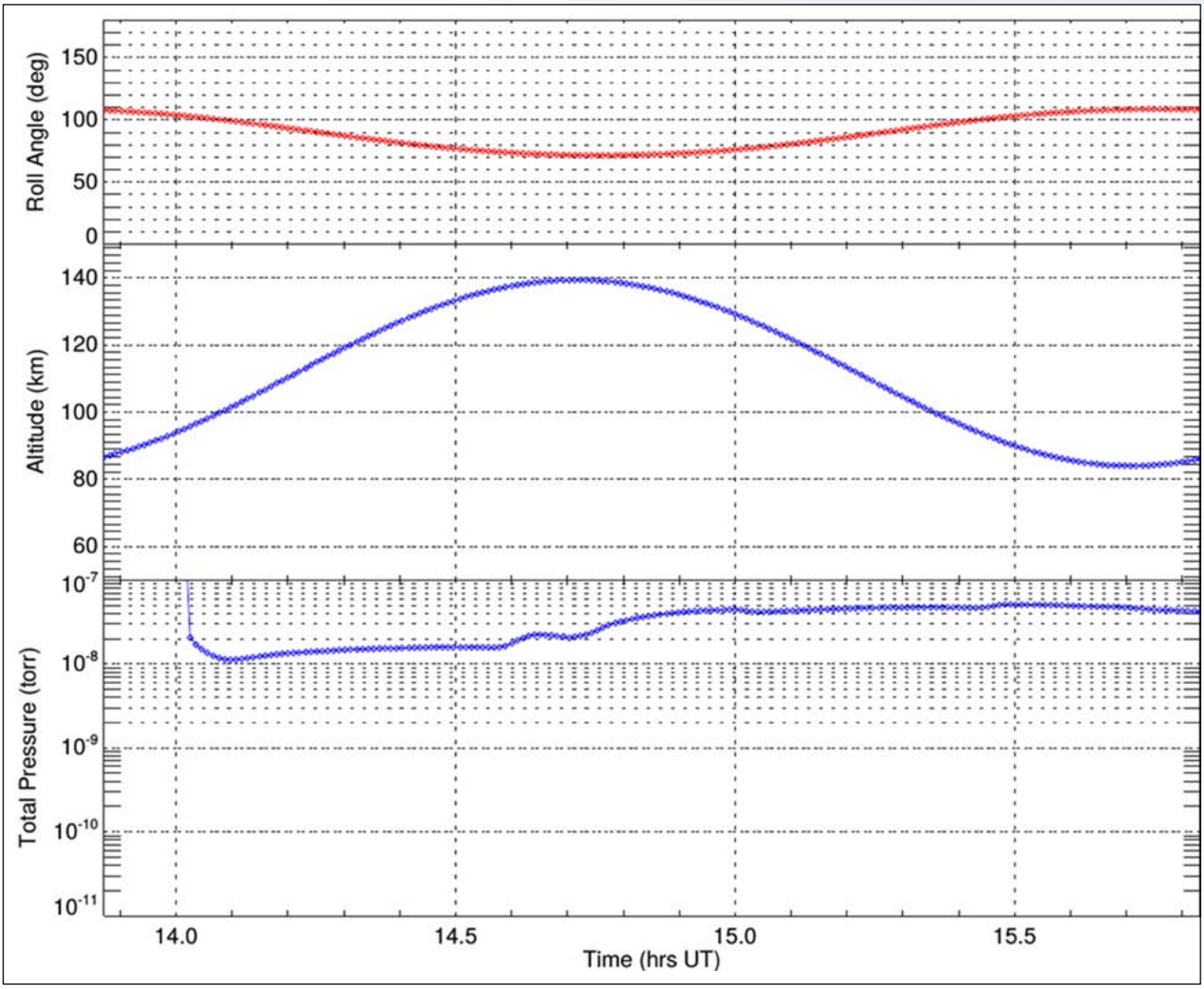


Figure 4.14 a: Time series of roll angle, altitude of Ch-2 and total pressure observed by CHACE-2 during the operation on 11 Sep 2019

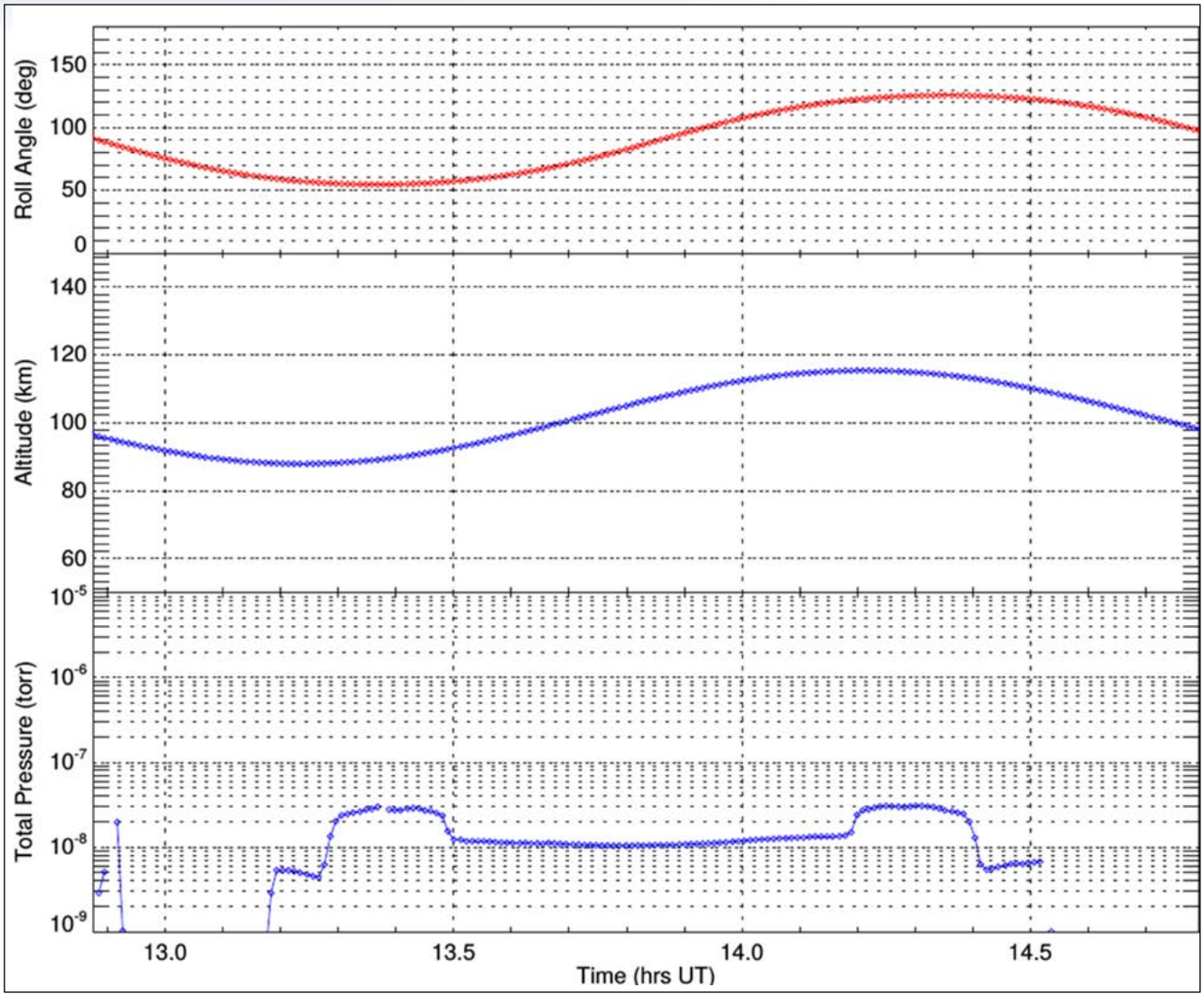


Figure 4.14 b: Time series of roll angle, altitude of Ch-2 and total pressure observed by CHACE-2 during the operation on 30 April 2020.

4.4 Dual Frequency Synthetic Aperture Radar (DFSAR)

DFSAR onboard Chandrayaan-2 orbiter is the first imaging radar on lunar orbit to acquire images of lunar surface using dual-frequency (L-band and S-band) in Hybrid-Pol and Full-Pol modes. The antenna points to the left/right side of the nadir with a beam illuminating the footprint corresponding to beam width in range and azimuth directions. DFSAR transmits energy towards lunar surfaces and measures the backscattering from the target. The backscattered energy from the lunar surfaces are processed using standard Synthetic Aperture Radar (SAR) signal processing methods to generate two dimensional images.

4.4.1 Imaging geometry:

In order to meet the science requirements, the SAR sensor has the capability to acquire image with incidence angle from 9.6° to 36.9° (Figure 4.15), at an altitude of 100 km. Thus the instrument can provides range coverage from 16km to 70km off-nadir corresponding to look-angle of 9.1° to 34.6°.

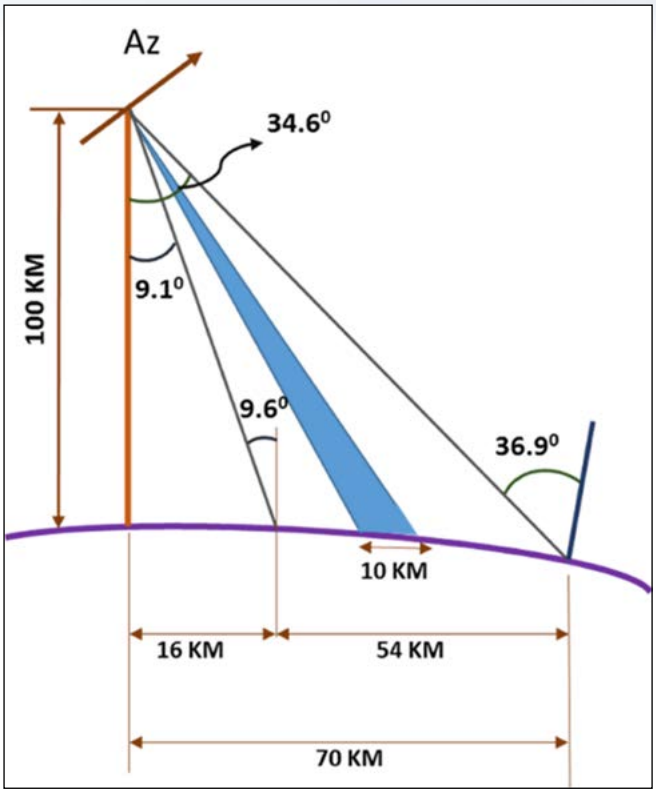


Figure 4.15: Imaging geometry of DFSAR

5.4.1 Image Interpretation:

Since radar interacts with the lunar features in ways different from the optical radiation, interpretation of SAR images is not always straightforward, in part because of the non-intuitive, side-looking geometry. As a useful rule of thumb, the higher the backscattered intensity, the rougher is the surface being imaged. Various features and how they may appear in SAR image are given below:

1. **Surfaces:** Rough surfaces appear brighter (high intensity), as they reflect the incident microwave energy in all directions, thus, more of the energy is scattered back to the antenna. Surface variations equivalent to the radar imaging wavelength cause strong backscattering. Smooth surfaces appear dark as most of the incident energy undergo forward scattering (the radar reflects away from the spacecraft). Moreover. homogeneous regions give uniform backscatter as shown in Figure 4.16.

2. **Slopes:** Any slope leads to geometric distortion. Three effects are most prominent:

    - Radar signals that return to the spacecraft from a mountain-top arrive earlier or at the same time as the signal from the foot of the mountain seeming to indicate that the mountain-top and the foot of the mountain are in nearly the same place or the mountain-top may also appear before the foot, this phenomenon is called *layover*. In a SAR image with layover, the mountains look as if they have fallen over toward the sensor. Steeper angles lead to more extreme layover, where mountain tops appear to lay over their base. Layover appears bright as the slope face almost normal to the incident radar beam.

- Hills and other large-scale surface variations tend to appear bright on one side and dim on the other. The side that appears bright was facing the SAR. Where slopes are very steep, the dim side may be completely dark because no radar signal is returned at all. This is called *shadow*. This is shown in Figure 4.16.

- **Foreshortening** is a dominant effect in SAR images of mountainous areas. Especially in the case of steep-looking space borne sensors, the across-track slant-range differences between two points located on fore-slopes of mountains are smaller than they would be in flat areas. This effect results in across track compression of the radiometric information backscattered from fore-slope areas.

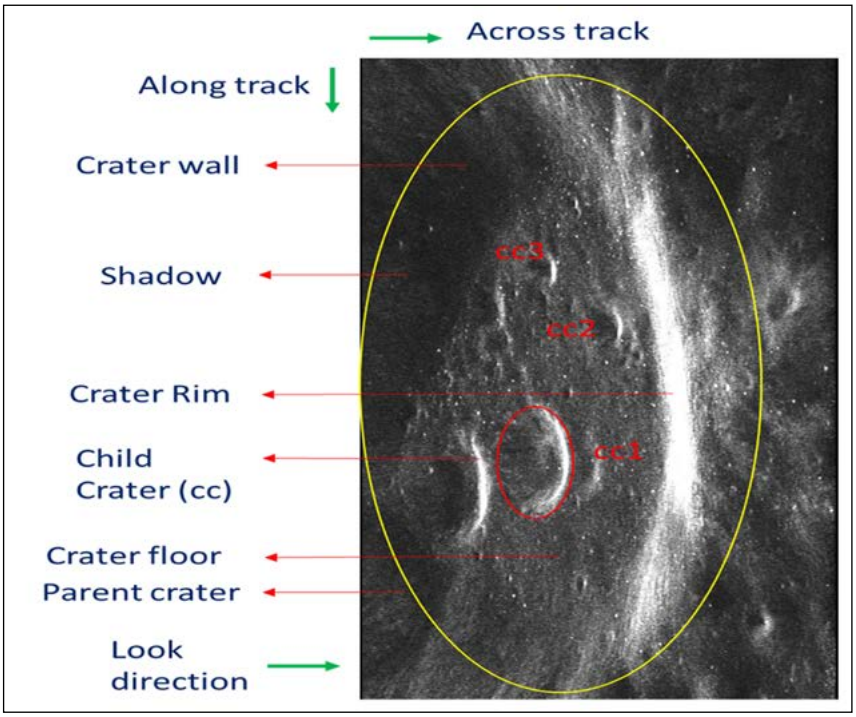


Figure 4.16: Peary region, North pole. L-Band DFSAR Images

3. **Regolith/Soil:** The brightness of areas covered by bare soil may vary from very dark to very bright depending on its roughness and dielectric constant. Typically, rough soil appears bright in the image. For similar soil roughness, the surface with a higher dielectric constant will appear brighter. Some of the incident radar energy is able to penetrate into the soil surface, resulting in less backscattered intensity.

4. **Craters:** The backscatter from a crater depends on the imaging geometry. In general, the crater rim facing the radar will appear very bright and give very high return as depicted in Figure 4.16. The wall facing the radar gives more or less a uniform backscatter. The wall facing away from the radar remains in the shadow will appear dark.

5. **Crater ejecta:** An ejecta blanket is a generally symmetrical apron of ejecta that surrounds an impact crater; it is layered thickly at the crater's rim and thin to discontinuous at the blanket's outer edge. The distribution of the material ejected from the craters gives

information on the nature of the projectile, its energy, and direction of impact. The region between concentric yellow and red circle in Figure 4.17 depicts ejecta. Presence of ejecta in the exterior and interior part of the crater helps to differentiate various kinds of lunar craters with different degradation stages.

6. **Boulders:** Generally, boulders with diameter equivalent to the radar wavelength acts similar to rough surface and responsible for volume scattering. Large size boulders with diameter of few times of the radar wavelength may appear bright in the image due to the double-bounce effect where the radar pulse bounces off the horizontal ground towards the target, and then reflected from one vertical surface of the target back to the sensor.

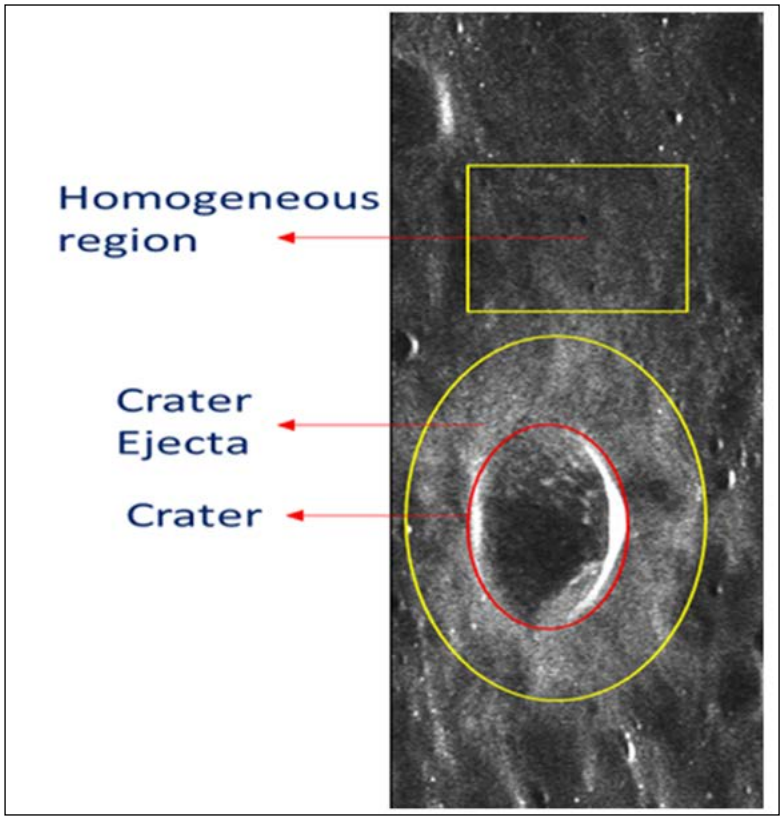
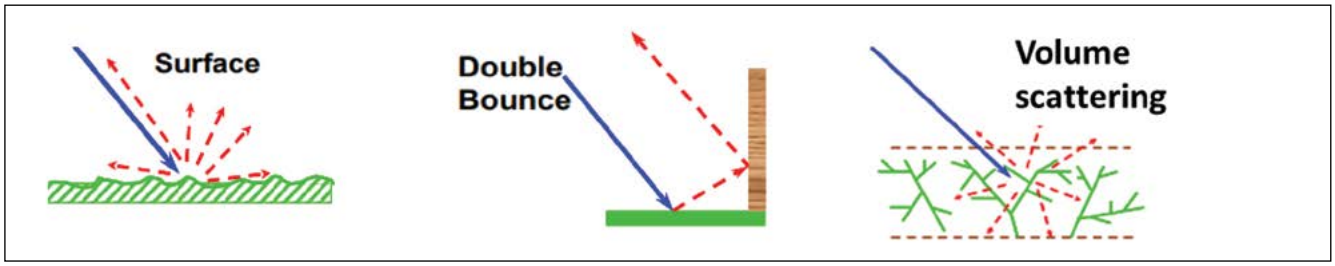


Figure 4.17: Peary region, North pole, L-Band DFSAR images

7. **Speckle:** Unlike optical images, radar images are formed by coherent interaction of the transmitted microwave with the targets. Hence, it suffers from the effects of speckle noise which arises from coherent summation of the signals scattered from ground scatterer distributed randomly within each pixel. Constructive interference of the scattered wavelets from individual scatters within a resolution cell give rise to high reflected intensity (bright pixel). Whereas, destructive interference of the wavelets causes low intensity (dark pixel). Thus, a radar image appears noisier than an optical image.

8. **Polarimetry:** Chandrayaan-2 DFSAR has full polarisation capability i.e. transmit H and V pol. alternately and receive in both H and V simultaneously, generating HH, HV, VH and VV pol. images. Using the phase information and polarisation information available in the images, target properties like single bounce, double bounce and volume scattering

can be extracted using various polarimetric decomposition techniques like Yamaguchi decomposition, Freeman-Durden decomposition etc. The rough surfaces will generate volume scattering and are shown in green, smooth surface will give odd-bounce



Eg. Smooth regolith

Eg. Large boulders oriented towards radar

Eg. Crater Ejecta, Rough surface, small boulders

Figure 4.18: Different types of scattering mechanisms

shown in blue colour, double bounce is represented by red. These scattering mechanisms are depicted in Figure 4.18. Yamaguchi decomposed FCC image of Cabeus carter in lunar south pole is shown in Figure 4.19. The polarimetric decomposition of the Cabeus crater depicts that, volume scattering is dominated in the crater walls, whereas surface scattering is dominated in the interior (floor) and exterior part of the crater. The volume scattering in the crater wall is due to presence of wavelength scale debris and rough surface. The floor and exterior part of the crater has regolith cover, hence, showing surface scattering. Absence double bounce scattering within the crater reveals absence of big size boulders.

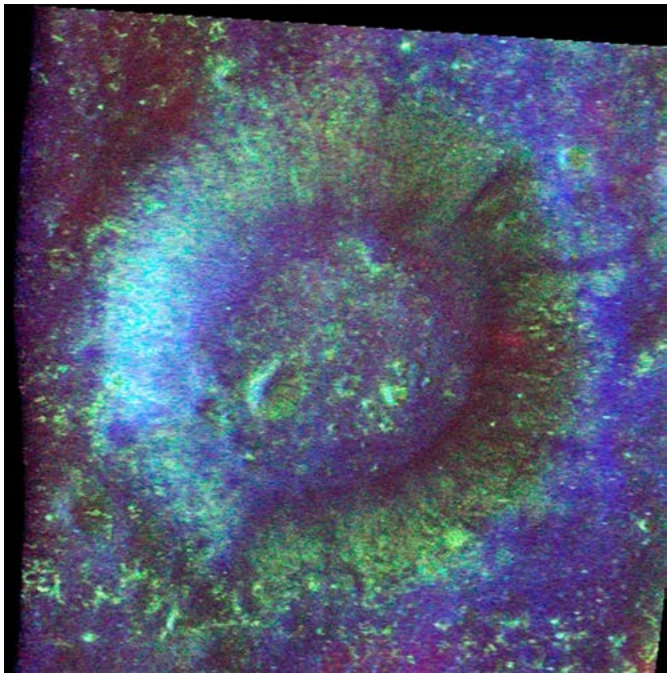


Figure 4.19: Near Cabeus crater, South pole – L-Band Images (Yamaguchi decomposition) (Red-Even, Green-Volume, Blue-Odd)

More images from DFSAR payload are provided in Annexure-4.

4.5 Imaging Infra-Red Spectrometer (IIRS)

Remote detection of water and/or hydroxyl on the Moon has recently acquired great importance as it provides important clues to understand the exogenous and endogenous sources and formation mechanisms that have led to their detection on the surface. Thus, in order to understand the exact nature of the lunar hydration feature, Imaging Infra-Red Spectrometer (IIRS) has been designed and flown onboard Chandrayaan-2 with an extended spectral range from ~0.8 μm to 5.0 μm to detect and map the lunar surface composition and hydroxyl/water associated with the lunar soil/regolith and thereby, understanding the origin and evolution of the Moon in a geologic context.

The final data outcome of IIRS is the reflectance spectra over a given region on the lunar surface. The various absorption features present in the reflectance spectra can be used to understand the composition of the lunar surface and to infer the nature of the wide-spread and localized lunar hydration. Some representative observations from IIRS are shown and discussed here.

4.5.1 North polar region

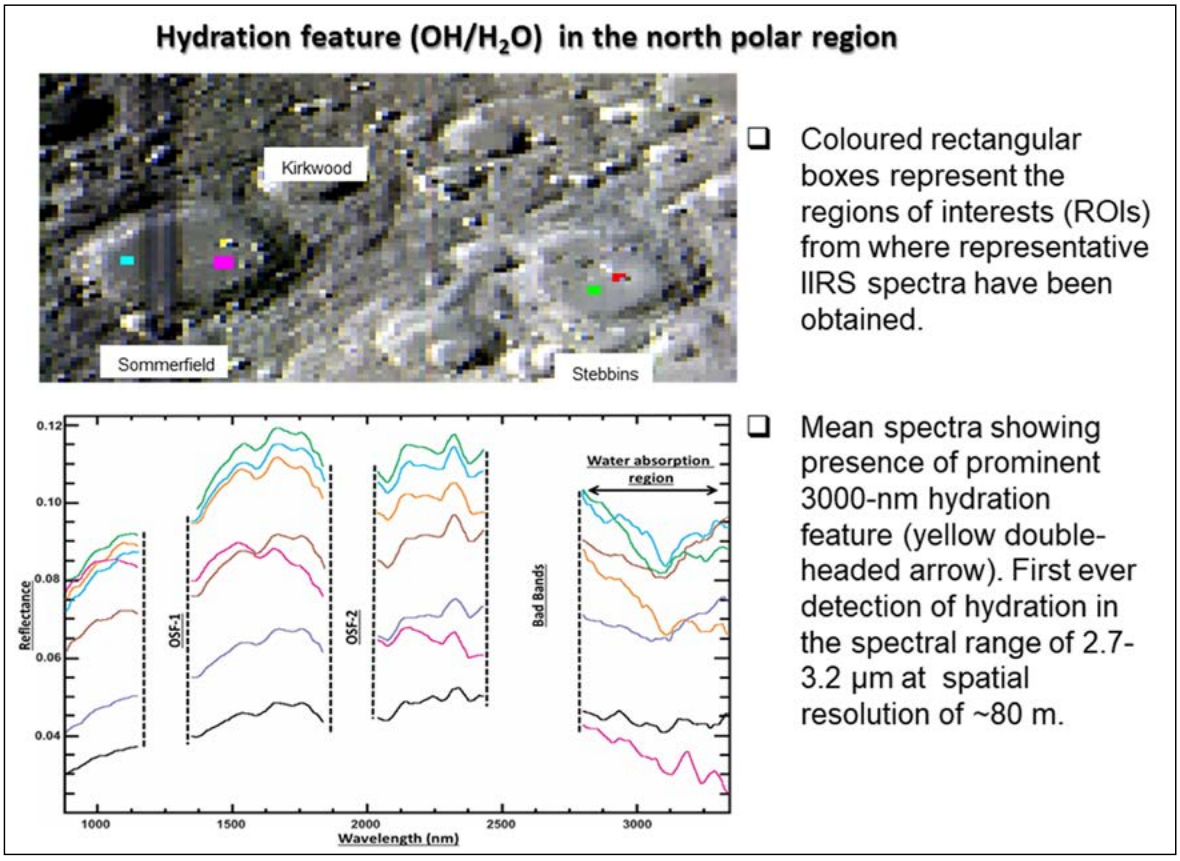


Figure 4.20: Hydration features in the north polar region.

Figure 4.20 shows the hydration feature over the north polar region along with the associated reflectance spectra of that region. IIRS could successfully measure the variations in the reflected solar and emitted lunar radiation from the Moon surface from different kinds of surface types, namely, crater central peaks (e.g., Stebbins), crater floors (e.g., Stebbins and Sommerfield), very fresh reworked ejecta associated with small craterlets within the crater floor of a large crater (e.g., Sommerfield) and the sun-illuminated inner rims of craters (e.g., Kirkwood). Band Center value of the 3000-nm feature is found to vary from ~2.82 to 3.16 μm having two modes with mean Band Center locations near ~2.86- and 2.95 μm, respectively suggesting the presence of both OH and H_2O in the north polar region on the far side of the Moon. Figure 4.21 shows the characterization of hydration features in the north polar regions based on variations in the band center values.

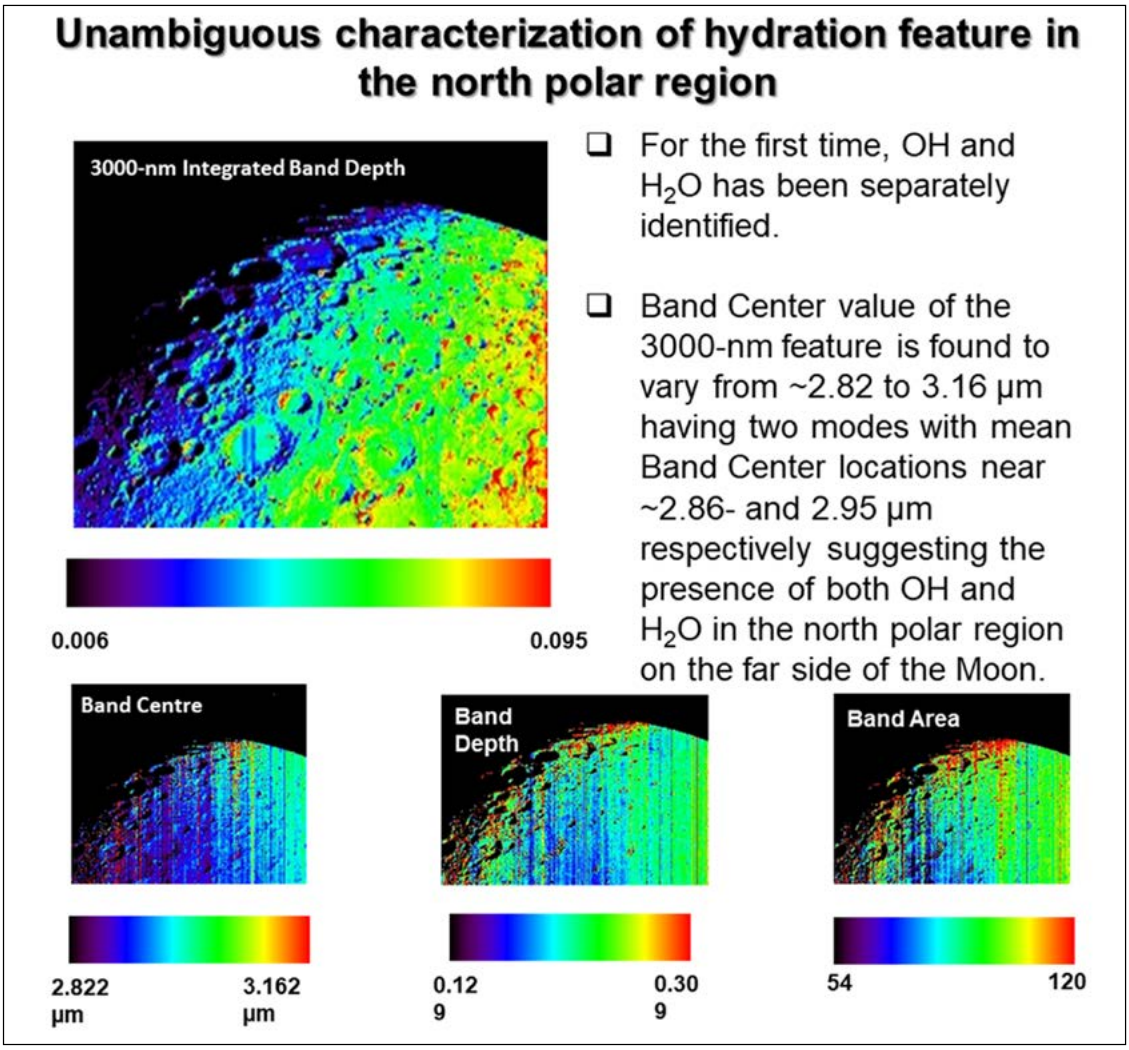


Figure 4.21: Hydration features can be characterized based on the variations in the band center values.

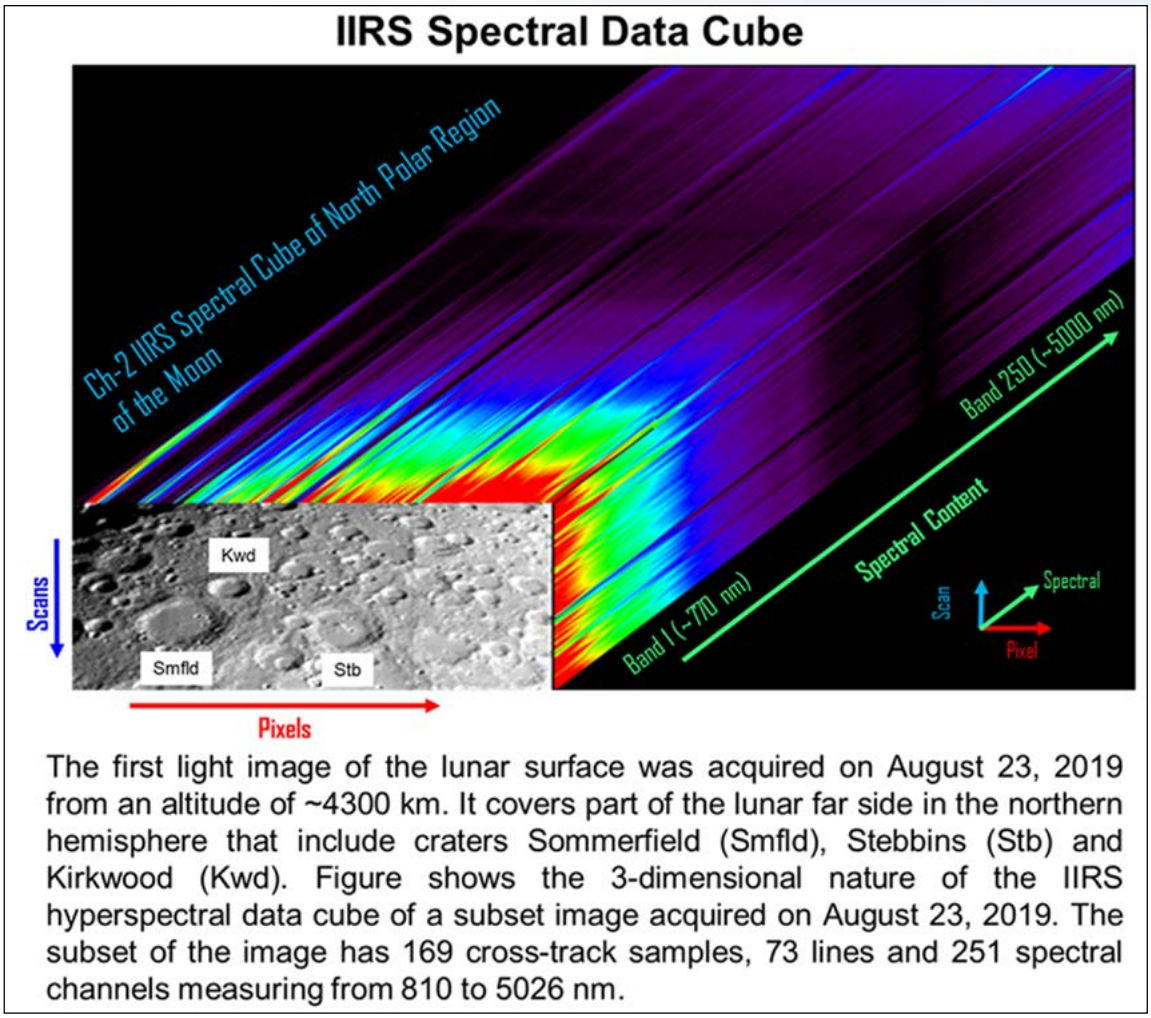


Figure 4.22: Representation of IIRS spectral data cube

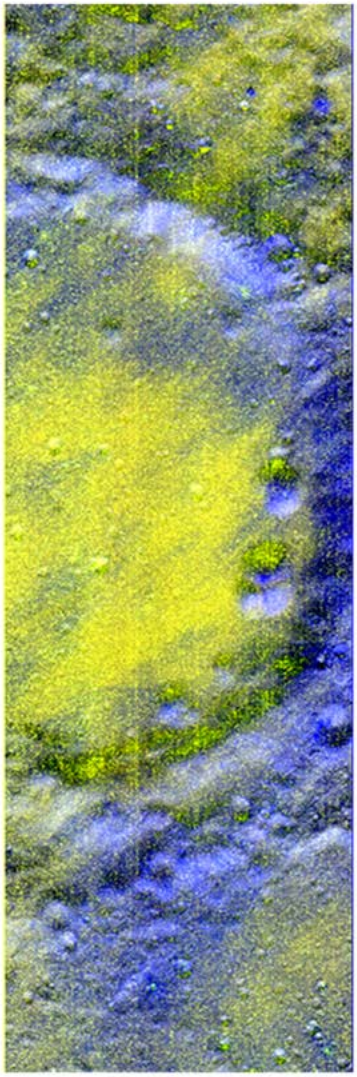
4.5.2 IIRS observation of Crater Thales-F

Situated East of crater Gartner and NW of crater Endymion, crater Thales-F is filled by mare basalts and the craterlets within the mare chiefly comprise of pyroxene-rich dark colored materials characterized by prominent absorptions near 1000 and 2000 nm arising due to the electronic transition of Fe^{2+} in the crystal lattice of pyroxenes.

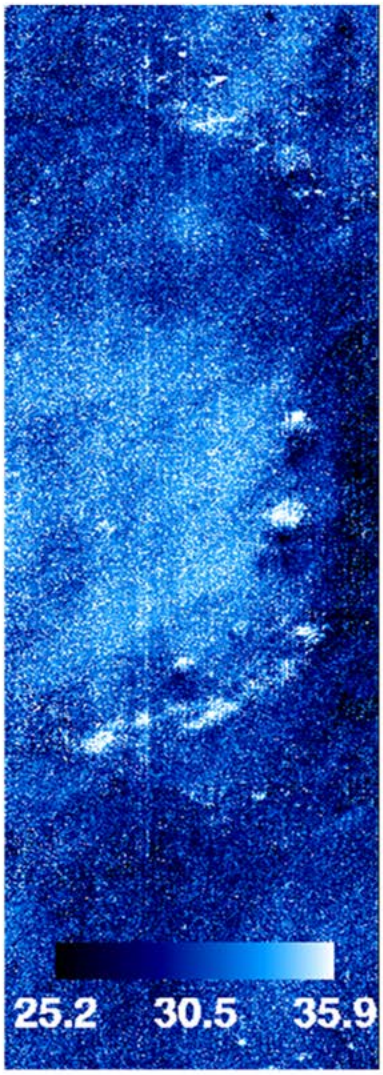
Integrated Band Depth (IBD) parameters are generally used to characterize the variations in the strengths of the 1000-nm and 2000-nm mafic features that capture the spectral variations related to mafic minerals, soil maturity and space weathering. In IBD-FCC, the dark colored lunar minerals appear in green to yellow, whereas, lunar highland rocks appear in the shades of blue. The observation is shown in Figure 4.23. Figure 4.24 shows the IIRS reflectance spectra of a location inside the crater. From the study of the variation in reflectance with wavelength, important information can be derived about the mineralogy.



FCC mosaic Crater Thales-F
R: 1.08 micron IIRS band
G: 1.67 micron IIRS band
B: 2.27 micron IIRS band



IBD mosaic Crater Thales-F
R: IBD-1 (1-µm feature)
G: IBD-2 (2-µm feature)
B: 1.56-µm IIRS Albedo Channel



Crater Thales-F
IBD-3 (3-µm hydration feature)

Figure 4.23: IBD-FCC image of crater Thales-F as obtained from IIRS. The dark colored lunar minerals appear in green to yellow, whereas, lunar highland rocks appear in the shades of blue.

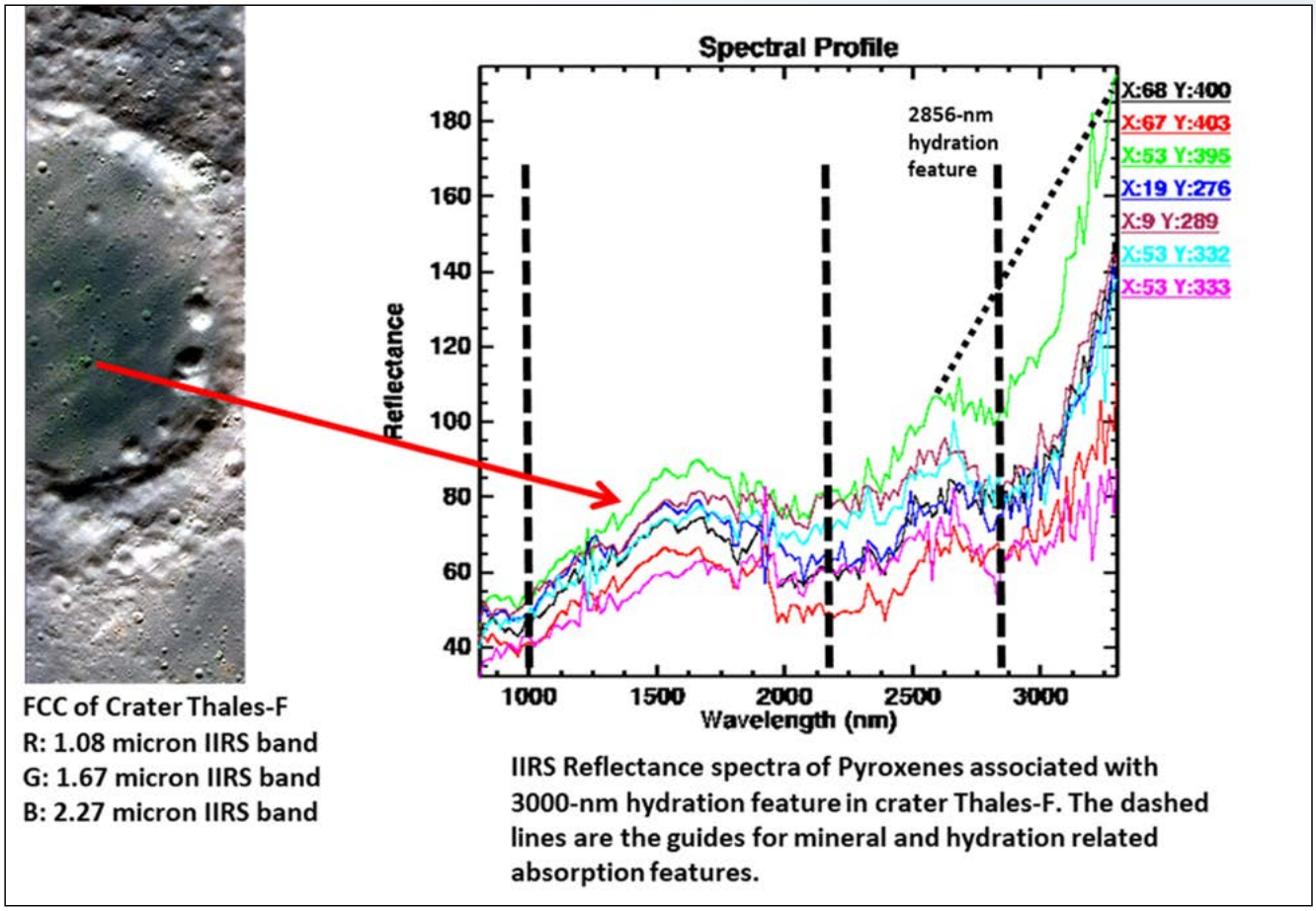


Figure 4.24: IIRS reflectance spectra in the crater Thales-F. The variation of reflectance with the wavelength contain important information about the mineralogy.

4.5.3 Image data of Crater Gardner from IIRS

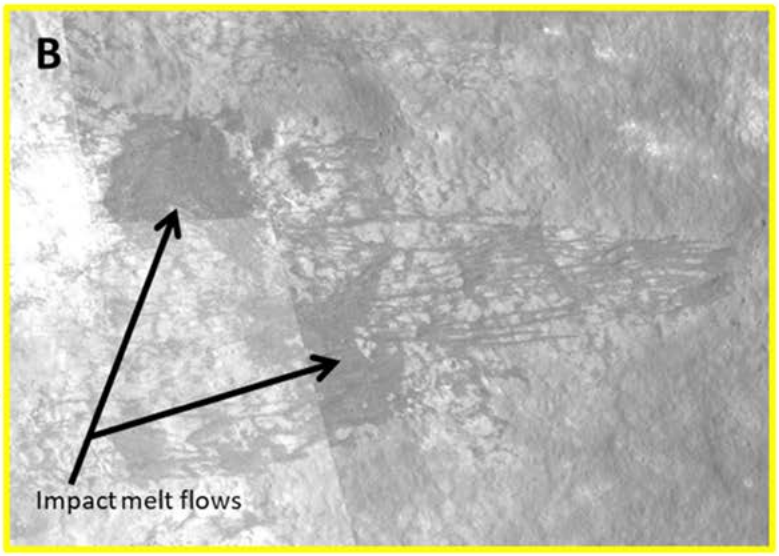
IIRS scene over part of crater Gardner is shown in Figure 4.25. The fresh impact melt rich regions appear green in FCC generated by assigning 995-nm as the red channel, 2177-nm as green and 1538-nm albedo channel as the blue. The impact melt flows are found to be clast-enriched having a moderately coarse texture when observed in very high-resolution LROC-NAC data.

Mineralogically, the impact melt flows appear to be of pyroxene-bearing as suggested by their diagnostic absorption features near 1000 and 2000 nm.

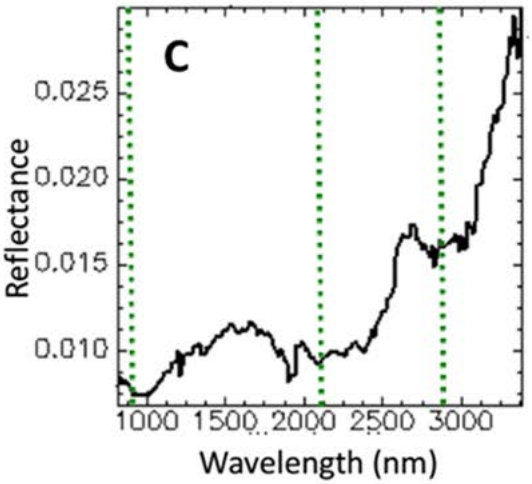
More images from IIRS payload and associated description are provided in Annexure-5.



A. Ch-2 IIRS image covering parts of crater Gardner



B. High-resolution (~0.5 m) LROC-NAC image of the Gardner impact melt flow feature corresponding to the yellow rectangular box shown in Figure A.



C. Ch-2 IIRS spectral plot of the crater Gardner impact melt flow feature. Solid black spectra is from Ch-2 IIRS highlighting the presence of pyroxene-bearing lithologies. The green dotted lines are the guides for mineral and hydration related absorptions.

Figure 4.25: IIRS image and reflectance spectrum over part of Crater Gardner.

4.6 Terrain Mapping Camera-2 (TMC-2)

Terrain Mapping Camera-2 (TMC-2) provides triplet images of same area of lunar surface with a spatial resolution of 5 m and swath 20 km from the spacecraft altitude of 100 km. Three images provided by the camera are actually taken from three different view angles (-26, 0 & +26 degrees) which enables to generate the Digital Elevation Model (DEM) and Ortho-image using the stereo photogrammetry technology. TMC-2 Ortho-images

and DEM data sets can be collectively used for detailed morphological, morphometric, morpho-structural, rheological analysis and surface age estimation of geological units for understanding the lunar surface processes and origin/evolution of the Moon.

TMC-2 Data Products are available in three different level of processing (raw, calibrated and Derived) in PDS (Planetary Data System) format. Derived PDS product contain DEMs and Ortho-images in Geotiff format and can be visualized and used for scientific analysis on any of the open source or commercial image processing software. The Geotiff header as well as the label (.xml) file also contain the description of the location and other attributes of the DEM and Ortho-image. These products can also be visualized in PDS viewer, which can be downloaded from ISSDC PRADAN website (https://pradan.issdc.gov.in/pradan).

The images from TMC-2 and their description are provided in subsequent figures below.

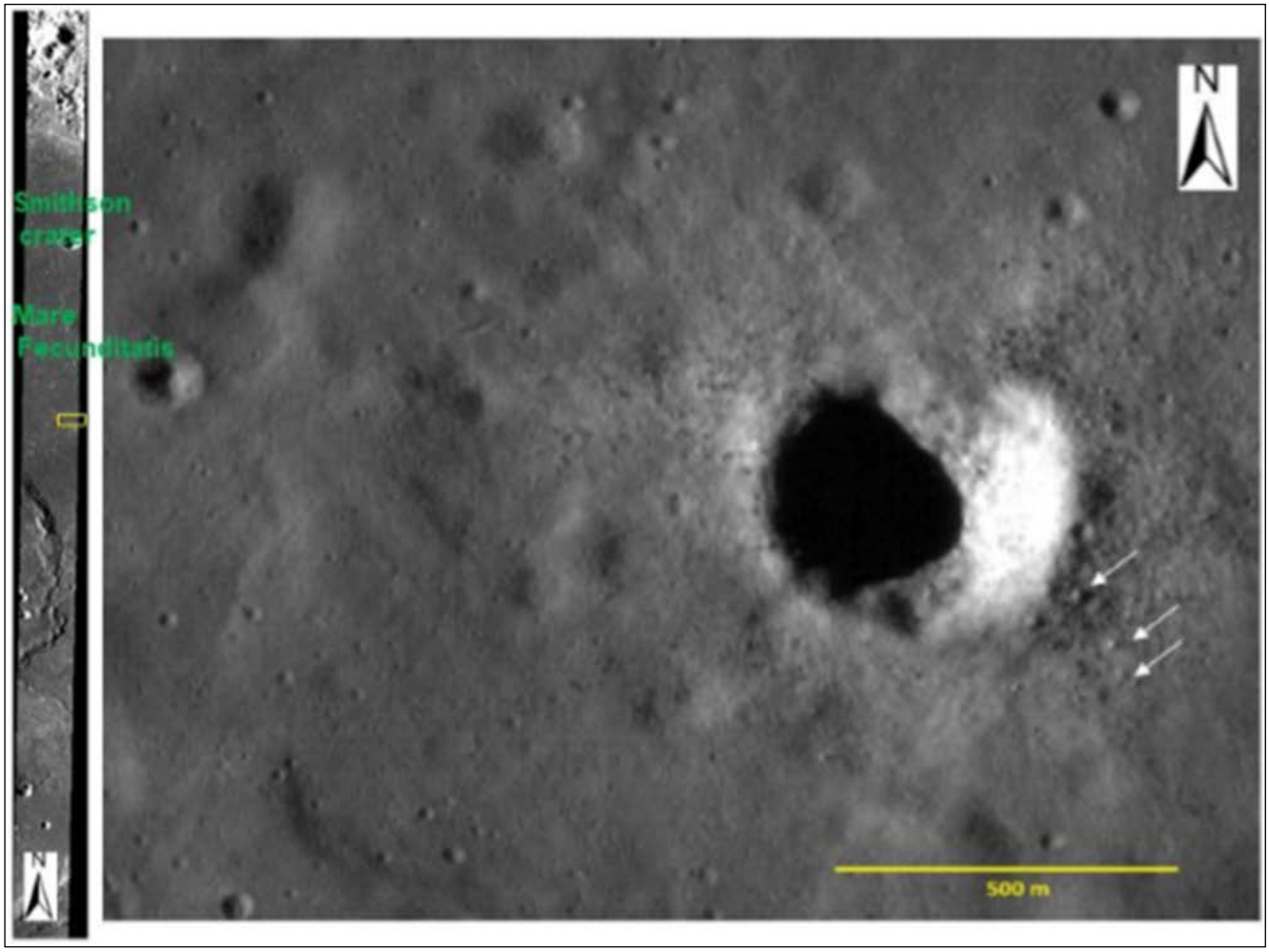


Figure 4.26: Boulders (white arrows) seen in the TMC-2 Image Acquired on 15 Oct 2019.

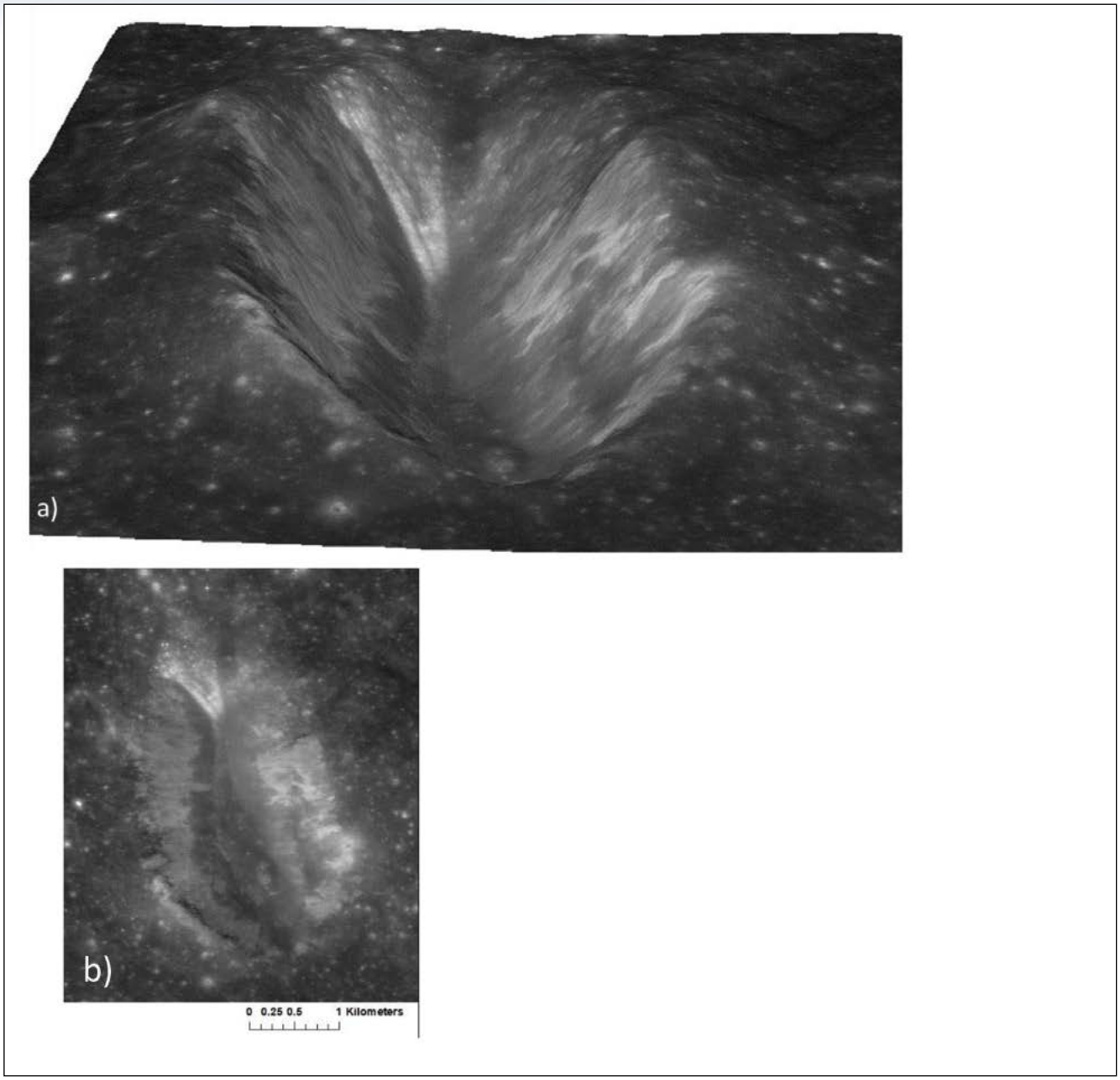
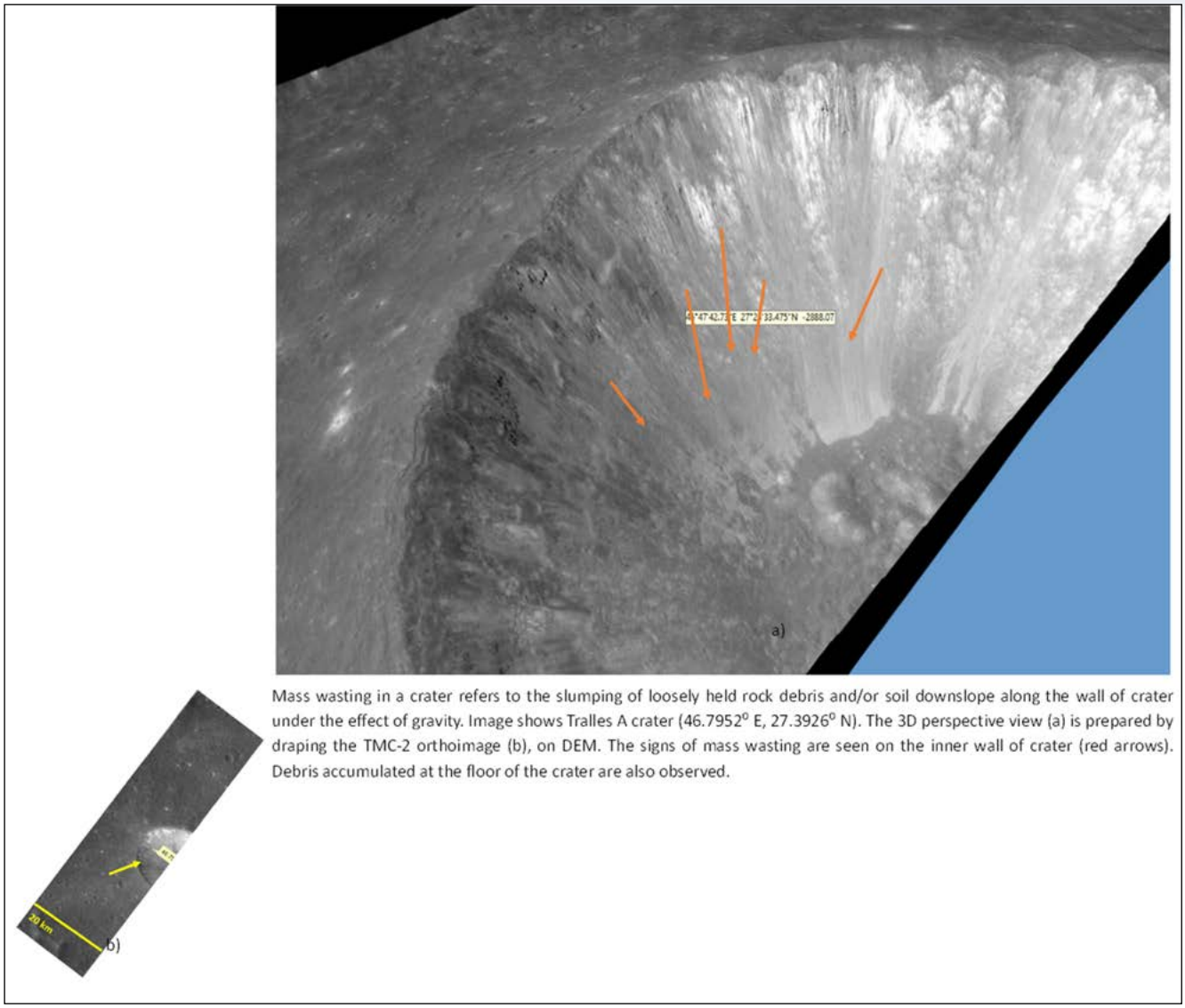


Figure 4.27: TMC-2 Image of oblique crater. Oblique craters are generally believed to be created by high speed angular impacts (b). A 3D perspective view (a) of an oblique crater is prepared by draping the TMC-2 orthoimage on DEM. This crater (23.2799^{0}W, 18.7235^{0}N) lies near DraperA crater in the southern part of Mare Imbrium region. Study of such craters reveal the past impact dynamics of the incoming projectiles hitting the Moon.



Mass wasting in a crater refers to the slumping of loosely held rock debris and/or soil downslope along the wall of crater under the effect of gravity. Image shows Tralles A crater (46.7952° E, 27.3926° N). The 3D perspective view (a) is prepared by draping the TMC-2 orthoimage (b), on DEM. The signs of mass wasting are seen on the inner wall of crater (red arrows). Debris accumulated at the floor of the crater are also observed.

Figure 4.28: TMC-2 Image showing mass wasting in crater.

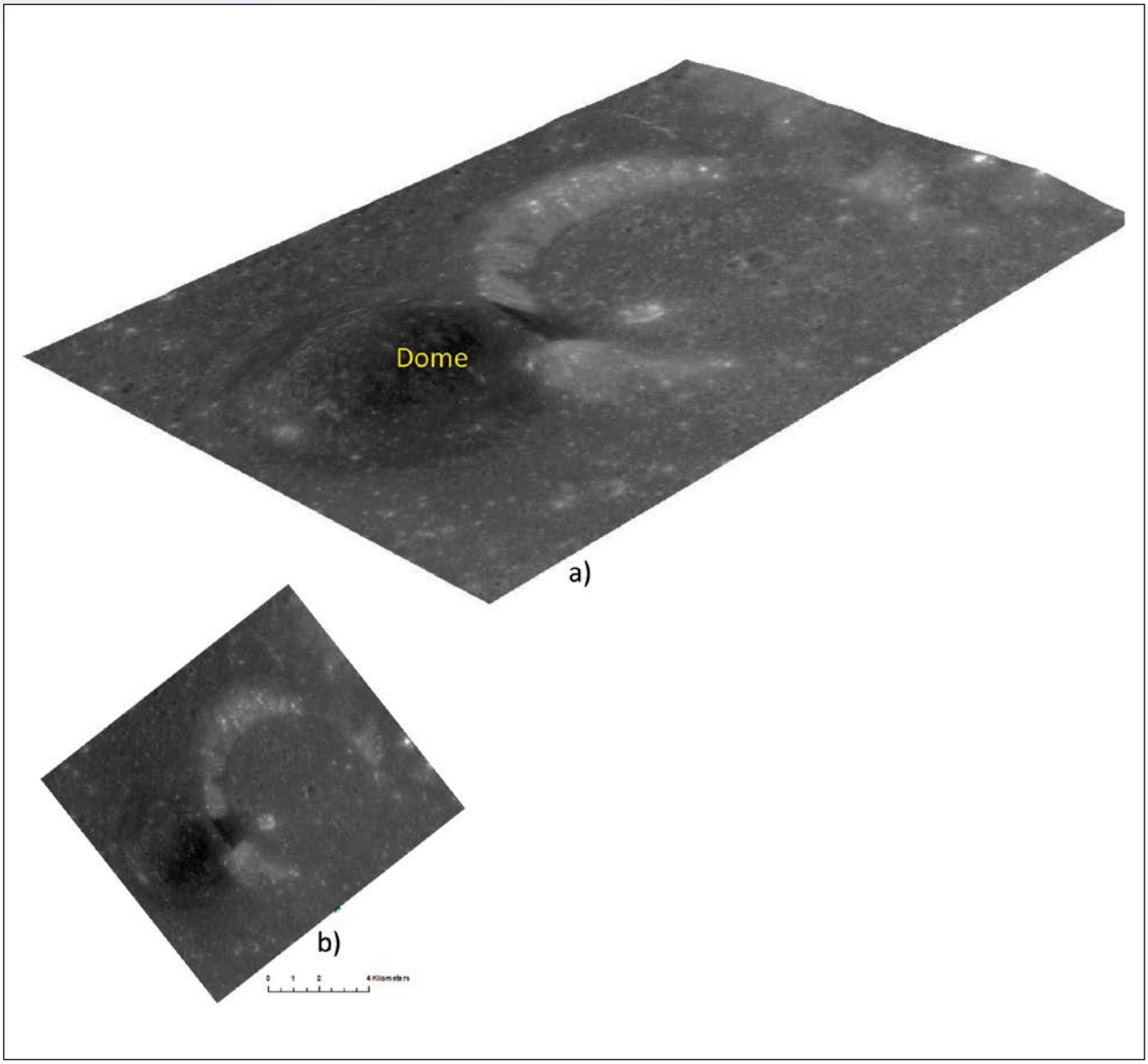


Figure 4.29: TMC-2 Image showing Lava-Filled Crater and an effusive dome. Image shows partially exposed rims of a crater (Yellow Arrow; 3.2696^{0}E, 16.4446^{0}N) lying in Mare Vaporum region near Yangel' crater. The crater has been filled with Lava, probably supplied by an effusive dome adjacent to the crater (b). The 3D perspective view (a) is prepared by draping the TMC-2 orthoimage on DEM.

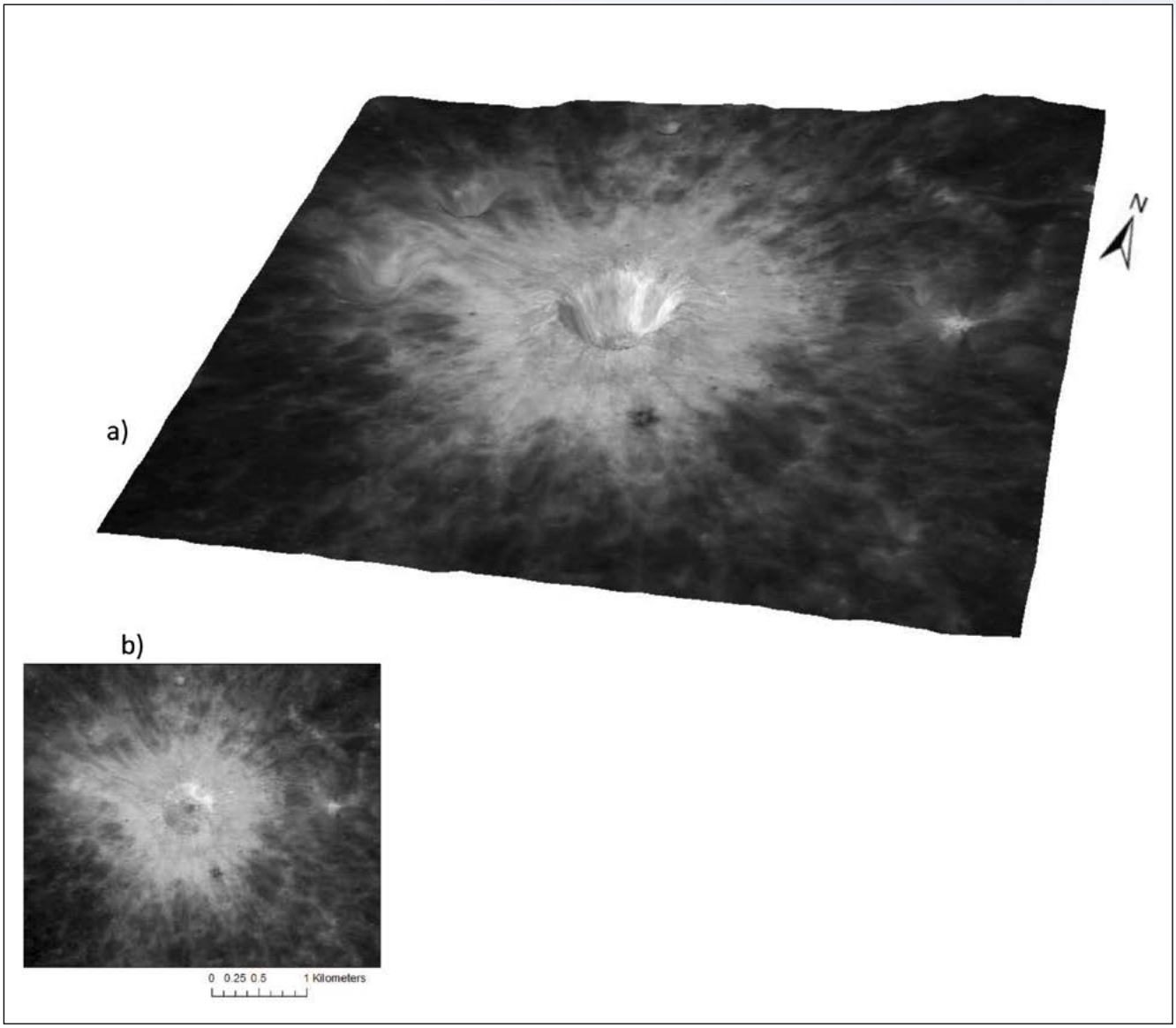


Figure 4.30: TMC-2 Image showing fresh young crater. The fresh young craters are identified by bright rays radially and uniformly distributed around them. TMC-2 Image shows star shaped bright ejecta material spread around a fresh young crater (64.1461^{0}W, 14.5529^{0}N) in western Oceanus Procellarum region near Galilaei S crater. The ejecta material (bright) can be seen uniformly spread in all directions for this fresh crater (b). The 3D perspective view (a) is prepared by draping the TMC-2 orthoimage on DEM.

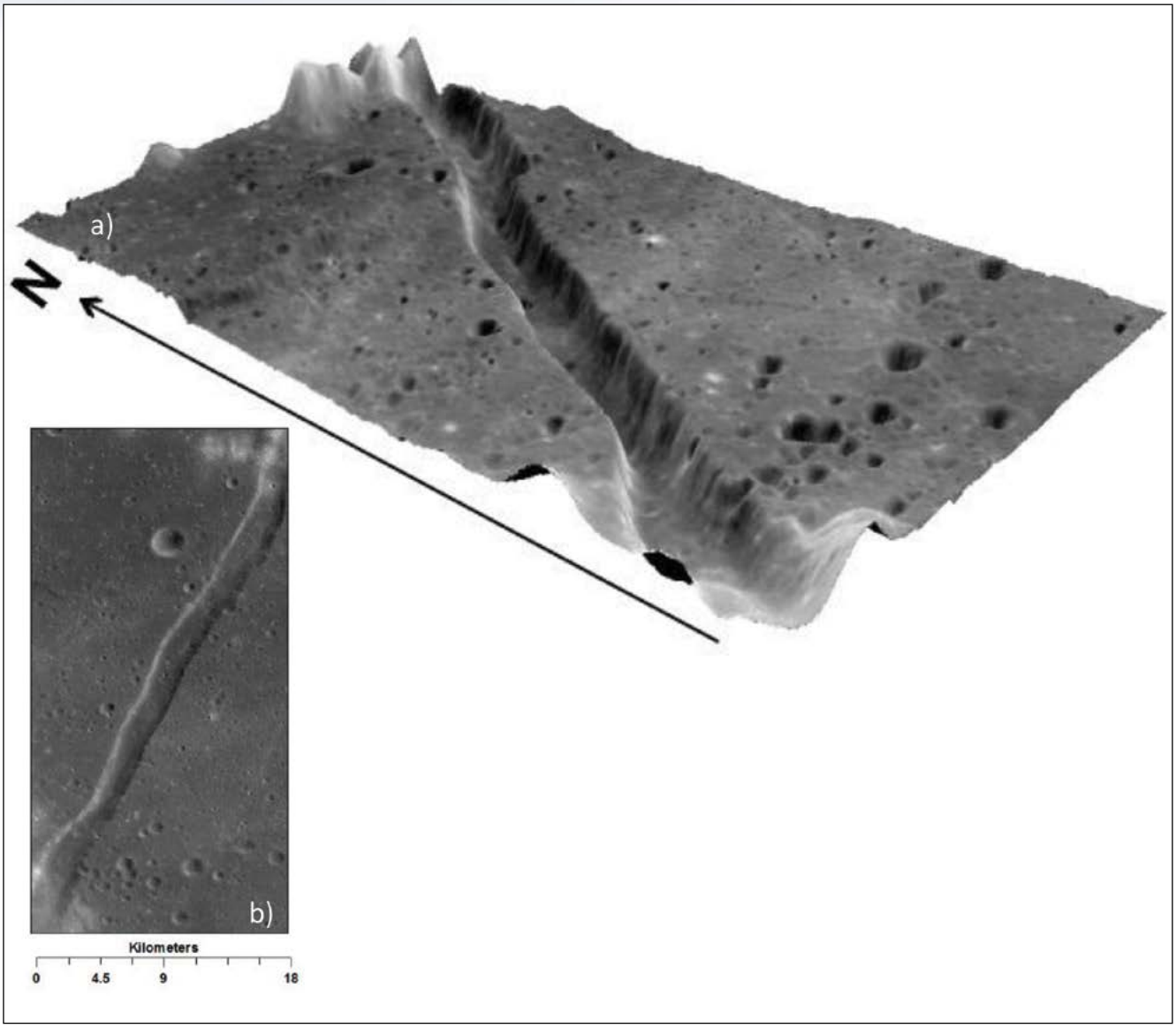


Figure 4.31: TMC-2 Image showing Lunar rilles proximal to basin margin. Many large rilles (trench like structures) running for 100s of kilometer some times tend to follow the margins of Mare basins in curvilinear/concentric form. This Rille (b, 329.3^{0}E,26.4^{0}N) is part of a large concentric rille at the basin margin of Mare Humorum. This might have been emplaced due to tectonic/volcanic processes. 3D perspective view of the same is shown in (a).

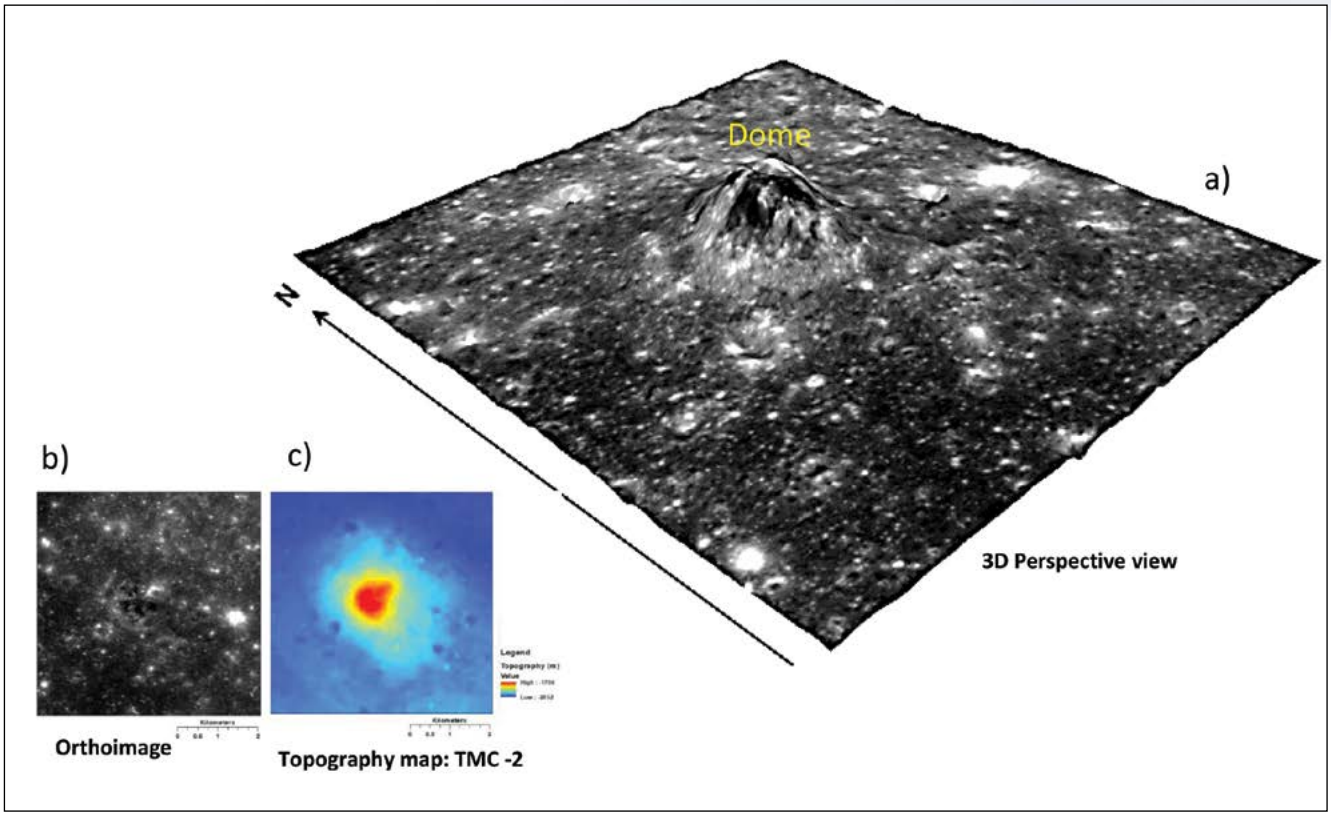


Figure 4.32: TMC-2 Image showing a lunar volcanic dome. Lunar domes represent past volcanic activity of the Moon and they are important evidences of sites of lava effusion. TMC-2 DEM at spatial resolution of 10 m , enhances topographic variations (c) and helps in identification / mapping of lunar domes/cones having small relief. Merging of orthoimage (b) and DEM (c) helps in creating 3D perspective view (a). TMC-2 data also helps in surface age determination and estimation of rheological properties (viscosity of lava, effusion rate etc.) based on morphometric parameters (diameter, height). Orthoimage (b), topography (c) and 3D perspective view (a) of a dome (57.930W, 15.300N) mapped in the Marius hills region are shown in the maps

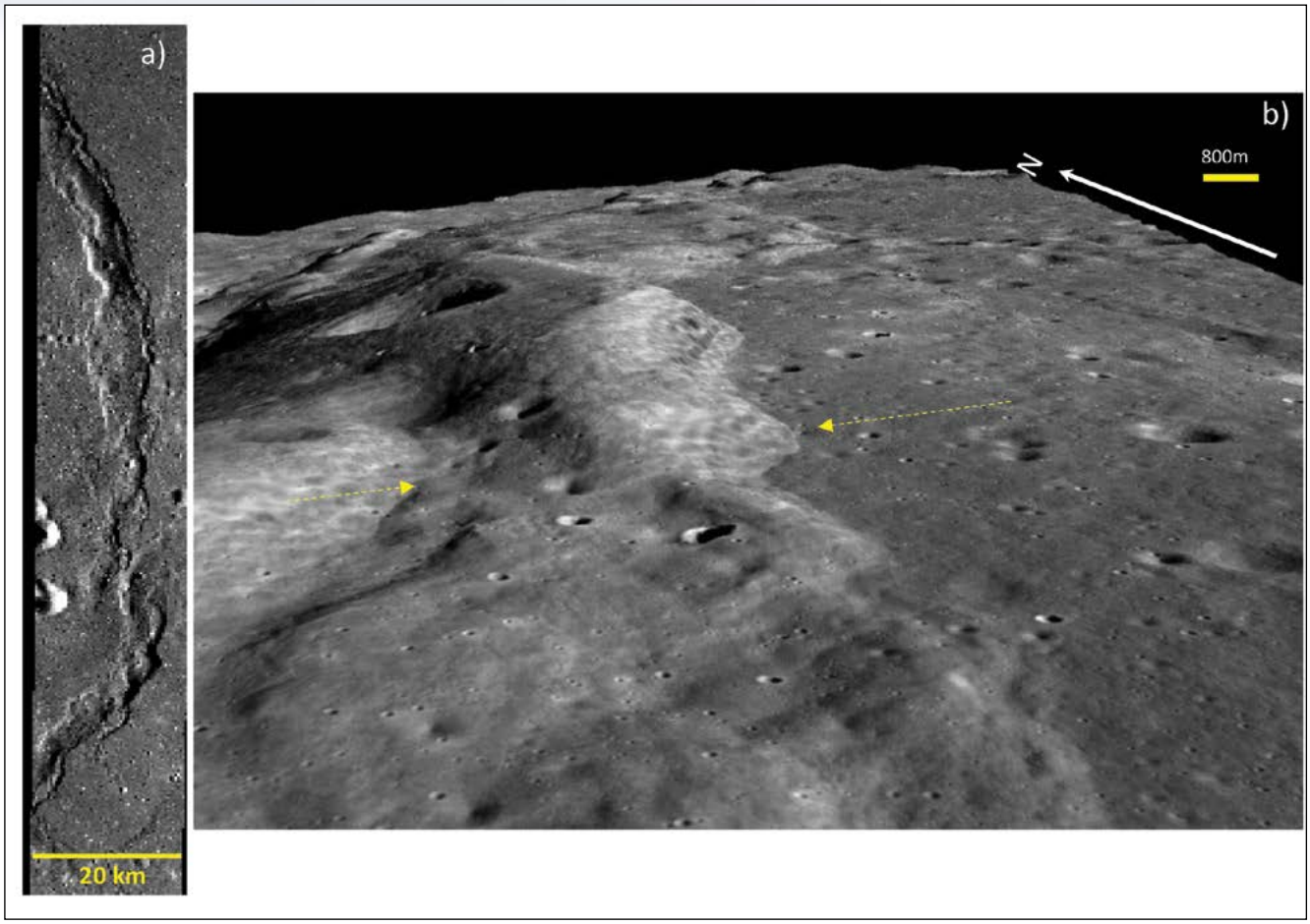


Figure 4.32 a: TMC-2 Image showing a wrinkle ridge. Wrinkle Ridges are low sinuous ridges found in Lunar Maria regions and involve faulting / folding of the lunar crust and believe to be of tectonic origin. They are evidence of lunar crustal shortening. Orthoimage (a) and 3D perspective views (b) of wrinkle ridge Dorsa Geikeie are shown. Yellow arrows indicate direction of compressional stress perpendicular to the ridge.

4.7 Orbiter High Resolution Camera (OHRC)

Orbiter High Resolution Camera (OHRC) is a panchromatic (0.45-0.70 μm) camera with a very high spatial resolution of 0.25 m (at nadir) onboard Chandrayaan-2 orbiter. OHRC is designed for imaging in very low sun elevation conditions. OHRC was primarily used to image the landing site at two different look angles from consecutive orbits to prepare a DEM and extract the hazard map. OHRC provide high resolution imaging of selected targets.

Figure 4.33 below shows the OHRC image which was acquired on 24 Aug 2020 near Hagecius L crater from an altitude of 101 km and at 0.26 m/pixel resolution. The sun elevation was ~14 degrees. The swath of the left image is 3.12 km and length is 24.36 km. The red box

on the left image shows the region of subset in the center image. The right image has the same swath as the original image and the length of 7.52 km. The centre image is marked with 4 red boxes labelled as 1, 2 , 3 and 4. In the subsequent discussion, the features from OHRC images of these 4 red boxes are described.

Figure 4.34 shows the OHRC image highlighted marked in red box and labelled as '1'. The width of the subset is 354 m and height is 253 m. The image shows that the lunar surface is full of craters and there's no place devoid of these. The craters may range in size from micrometre scale to hundreds of kms. These craters are mainly formed by the impact of other planetary materials that collide with the Moon. As the resolution of the selected image is 0.26 m/pixel, craters of size greater than 1 m can be easily discerned from the image.

The image shown in Figure 4.35 is the subset from Figure 4.33 image highlighted by the red box and labelled as '2'. The width of the subset is 354 m and height is 253 m. The image shows a boulder field, full of boulders of varied sizes. The boulders may range in size from micrometre scale to hundreds of meters. These boulders are mainly formed during the impact on the lunar surface which excavates the basement material. The image shows boulders of upto a few meters on the wall of the big crater. The boulders breakdown with time due to continuous impacts, therefore, young craters have a much larger population of boulders as compared to the older craters.

The image shown in Figure 4.36 is the subset from the image highlighted by the red box labelled as '3' in Figure 4.33. The width of the subset is 608 m and height is 535 m. The image shows a crater (diameter = ~380 m) with one side of its wall illuminated directly by the Sun and resulting in very high reflected light. The wall opposite to the illuminated side is in dark and the rim over it casts a shadow on the floor. Many smaller craters and a few boulders are also visible near the central crater.

The image shown in Figure 4.37 is the subset from the image highlighted by the red box labelled as '4' in Figure 4.33. This is same crater as in Figure 4.36. The subset is taken from the shadowed portion of the crater floor. The width of this region is 196 m and height is 136 m.

As there is no direct sunlight entering the floor of the crater, it is expected that the floor will be completely dark. But looking at the bottom image it is clear that some details are visible on the floor. A few craters and a trail of boulders in the lower portion can be easily marked out. This became possible due to the reflected light of the illuminated wall that has penetrated the shadow. The OHRC instrument is well suited for capturing the details from the crater floors in low light.

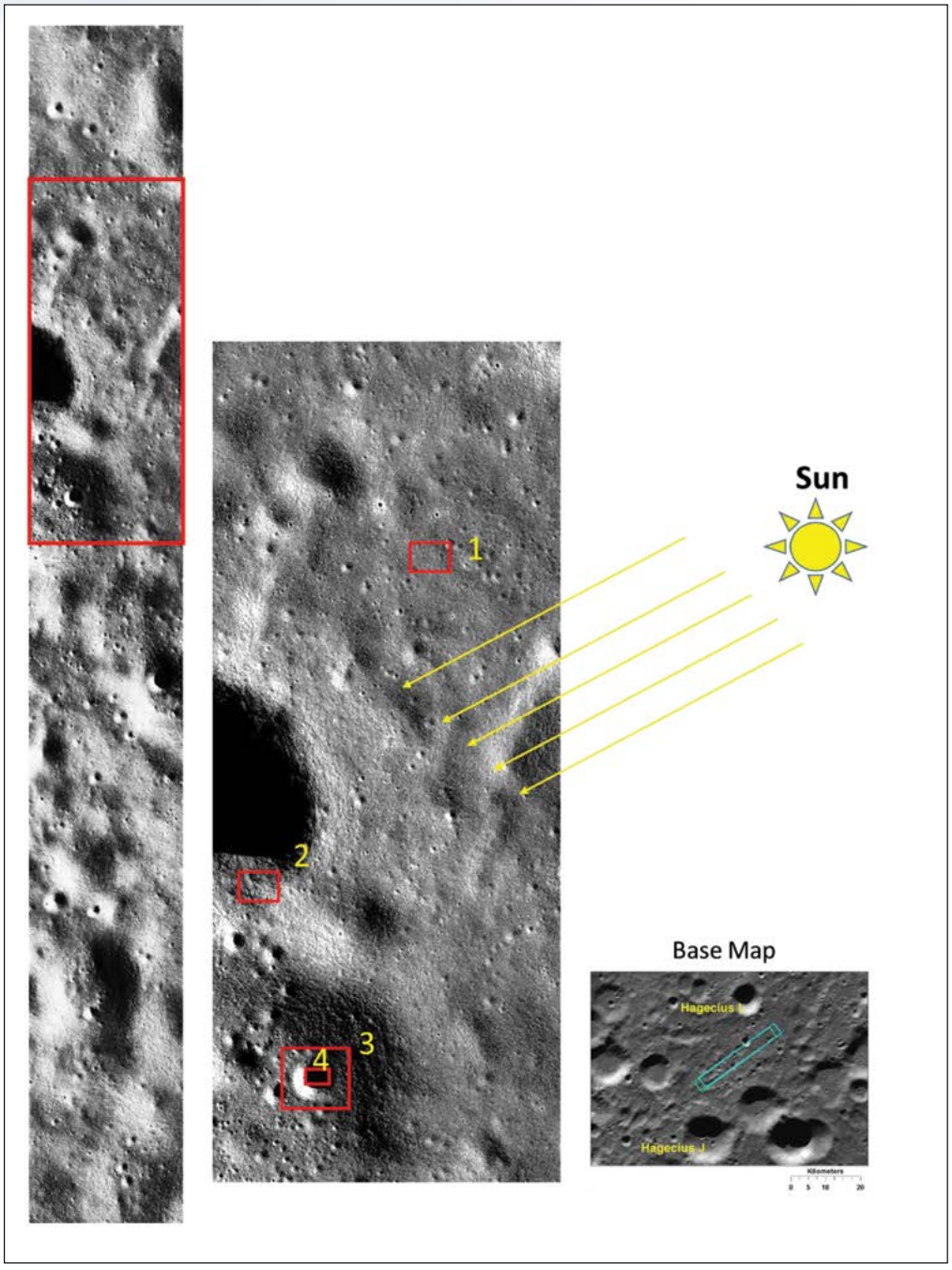


Figure 4.33: The OHRC image on the left was acquired on 24 Aug 2020 near Hagecius L crater from an altitude of 101 km and at 0.26 m/pixel resolution. The sun elevation was ~14 degrees. The swath of the image is 3.12 km and length is 24.36 km. The red box on the left image shows the region of subset in the centre image. The right image has the same swath as the original image and the length of 7.52 km. There are 4 red boxes marked in the centre imager for further description.

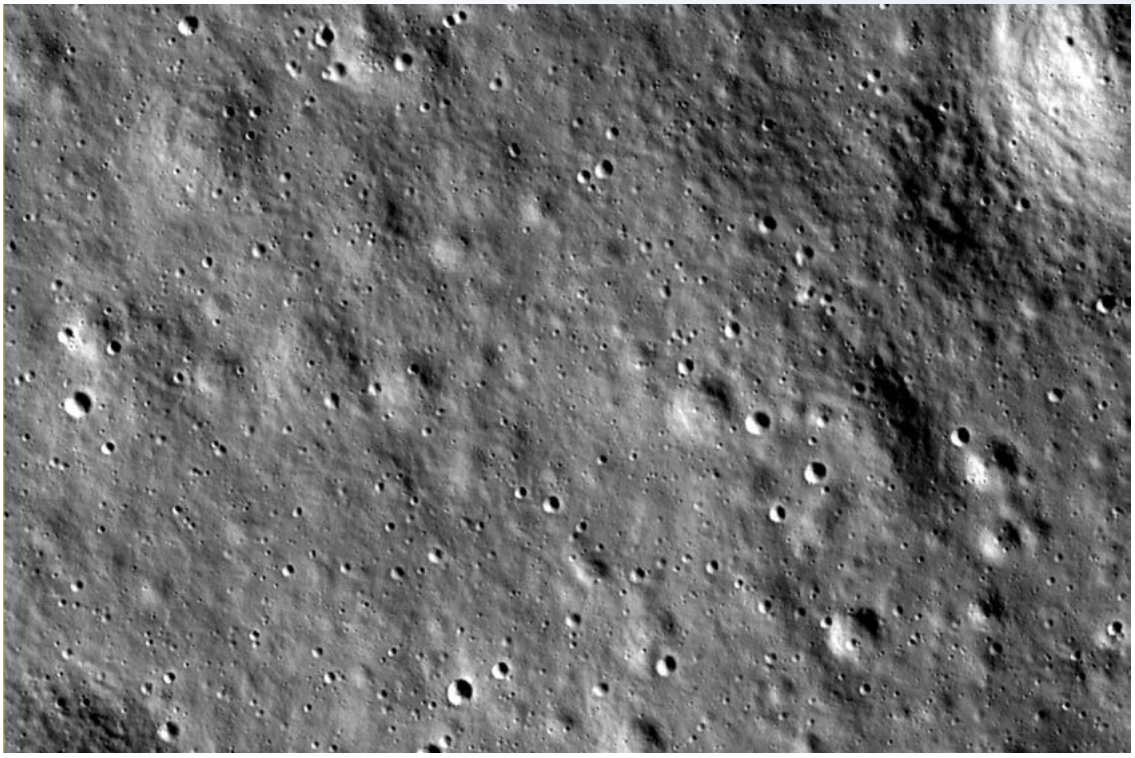


Figure 4.34: OHRC Image of the area labelled as '1' in red box in Figure-1.

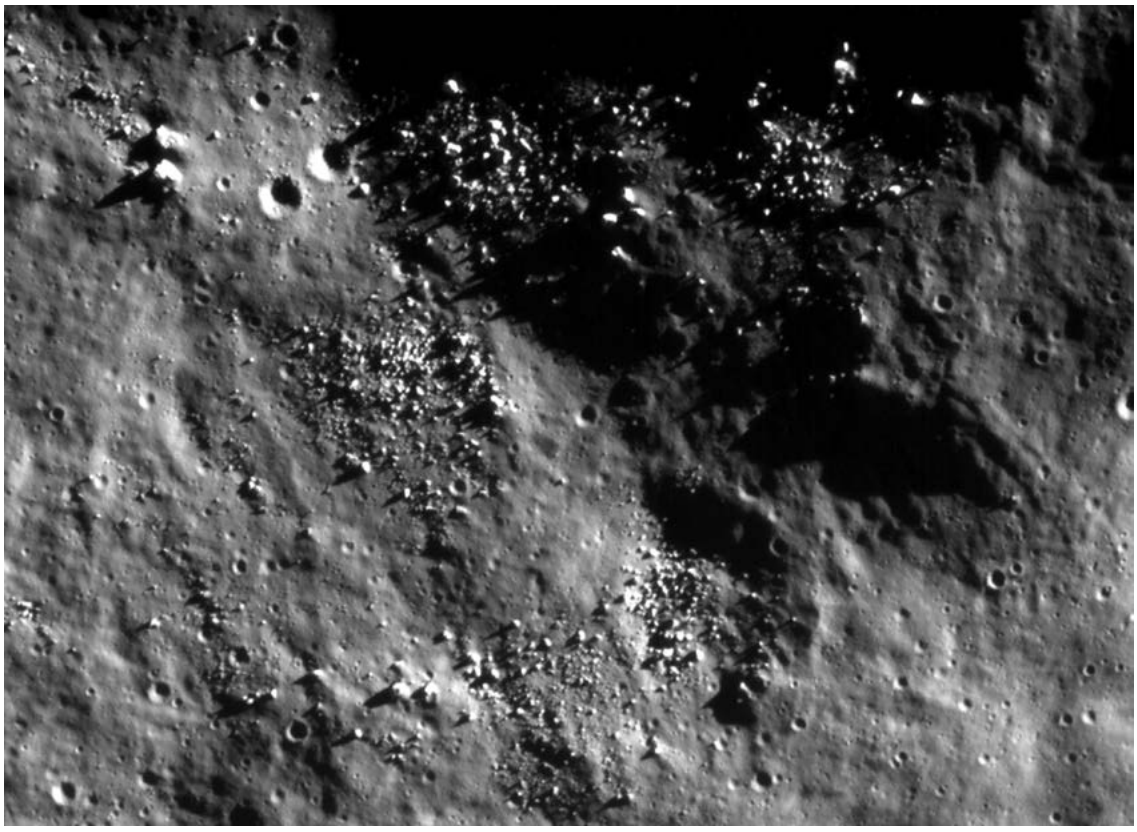


Figure 4.35: OHRC Image of the area labelled as '2' in red box in Figure-1.

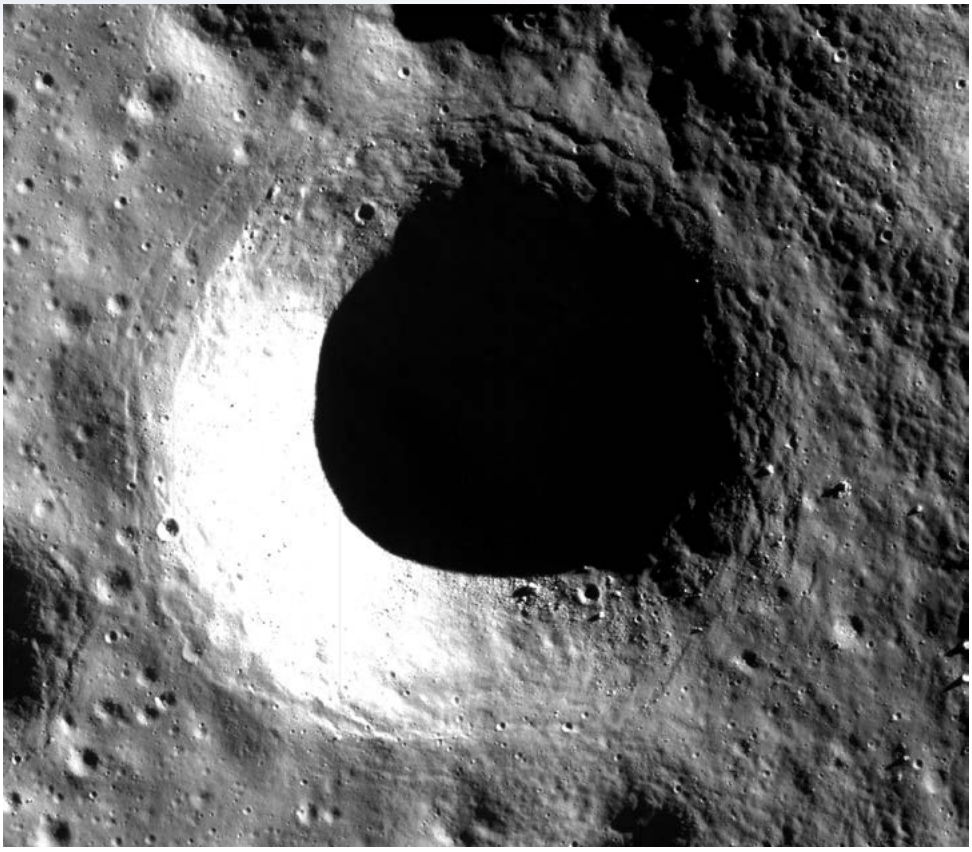


Figure 4.36: OHRC Image of the area labelled as '3' in red box in Figure-1.

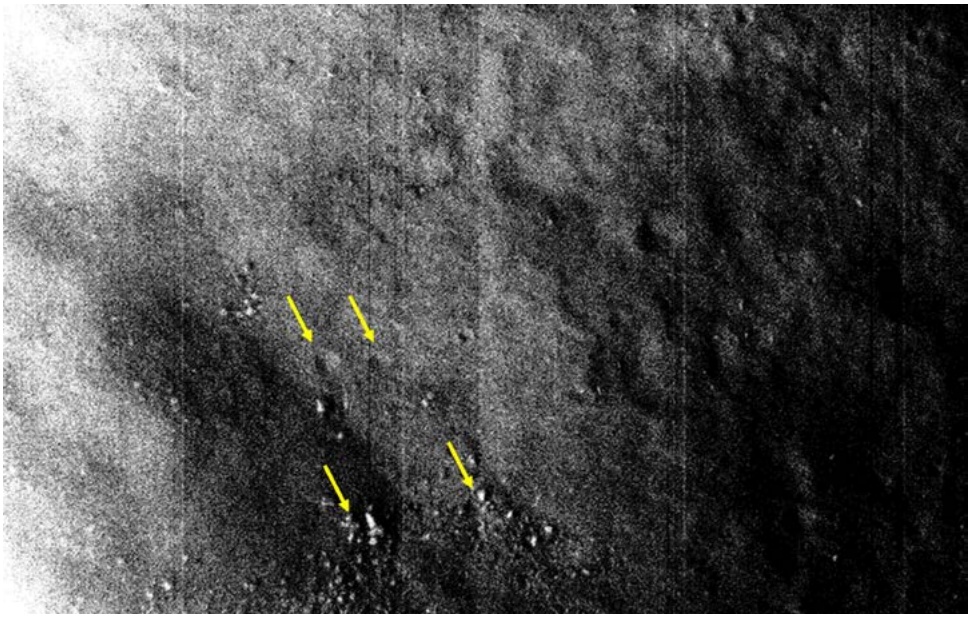


Figure 4.37: OHRC Image of the area labelled as '4' in red box in Figure-1.

More images from OHRC payload are provided in Annexure-7

4.8 Dual Frequency Radio Science Experiment (DFRS)

DFRS (Dual Frequency Radio Science) is a radio science experiment aimed to study both the neutral and plasma environment of the lunar exosphere, It uses two highly coherent radio signals at X- and S-bands of radio frequencies. The received signals at the two frequencies are Fourier analyzed to derive the line of sight Doppler velocity of the orbiting satellite. Using information about the satellite trajectory, relative motion between the Sun, the Earth, and the moon, the line of sight Doppler velocity is derived theoretically. As a next step, the theoretical Doppler, thus derived, is subtracted from the observed Doppler and residual Doppler is obtained which forms the base of the radio occultation data.

4.8.1 Frequency Residuals: Temporal variations

The frequency residuals, which serve as the input data for further analysis contain the

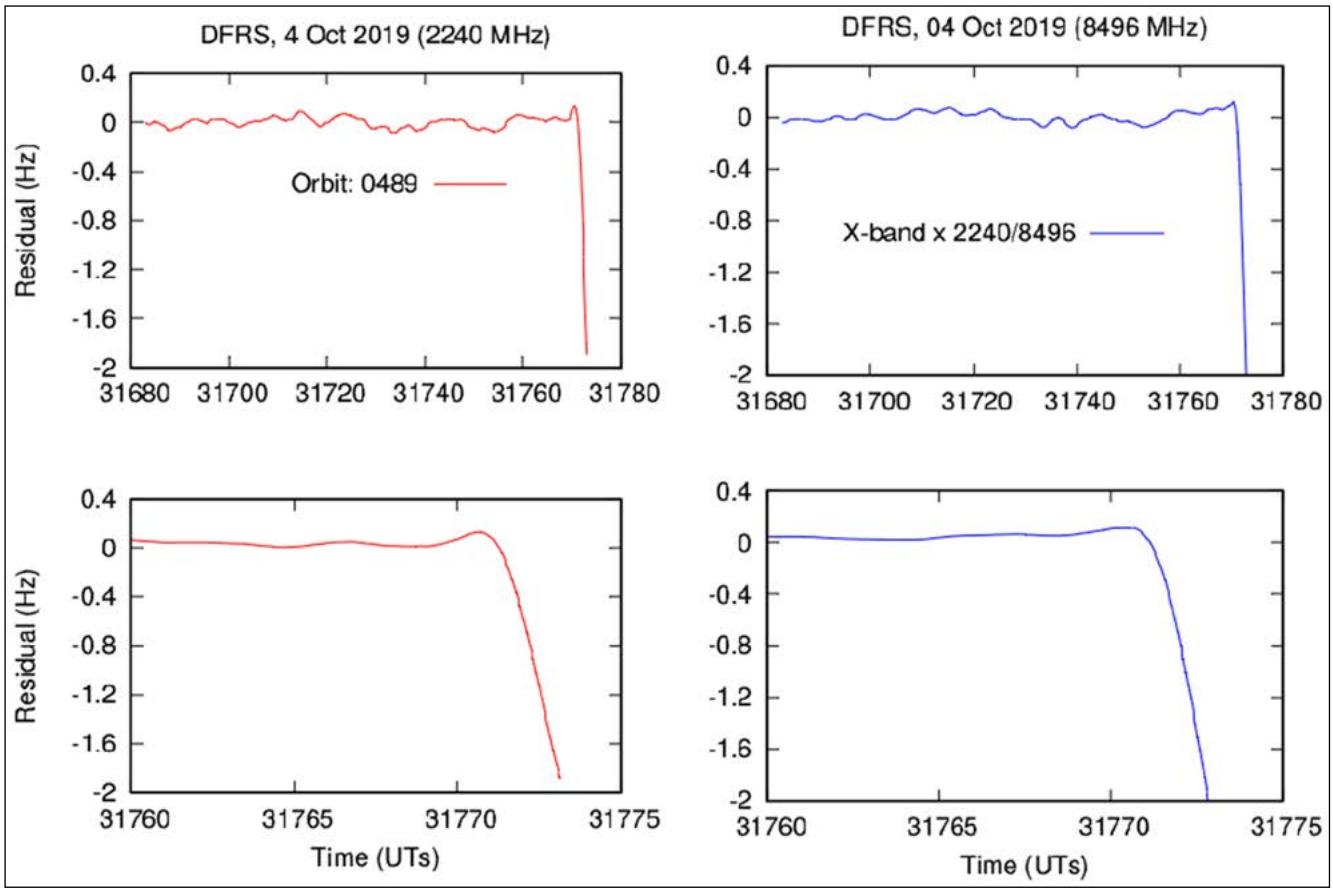


Figure 4.38: Time variation in calibrated frequency residual due to Lunar atmosphere on 04 Oct 2019 (orbit No. 0489). Left panel is showing variation in S-band signal (red curve) and Right panel is showing variations in X-band (multiplied with frequency ratio of S and X band).

effect of interplanetary medium and terrestrial atmosphere/ ionosphere along with that of the Lunar atmosphere/ ionosphere. A base line correction technique is used to remove the effects of interplanetary, and terrestrial impacts on the residual data. The calibrated residuals for both X and S band radio signals for an experiment conducted on 04 Oct 2019 are shown in the Figure 4.38. The top left panel of the figure shows calibrated residual frequency for S-band of radio signals (2240 MHz) between 31680 and 31780 UT second on 04 Oct 2019. The top right panel of the figure shows the same but for X-band of the radio signal (8496 MHz). The zoomed portion of the top panels of the figure between 31760 and 31775 UT seconds are shown in the bottom left and right panels for S, and X band radio signals. We may note an uniformity in the phase fluctuations for both the X and S band of radio signals from the figure. Plot corresponding to X-band is normalized for the frequency of S-band signal. An important feature in this figure is the deviation of residual in last 2-3 seconds (before signals getting occulted by the Lunar surface). The negative change in residual during ingress event implies a phase loss in signal.

4.8.2. Frequency Residuals: Altitude profile

Assuming spherical symmetric about center, the Lunar atmosphere is divided in concentric spherical shells. It is also assumed that the medium inside each shell is homogeneous and isotropic in nature. Utilizing the concept of geometrical optics and information about position of spacecraft, Moon and Earth, the time variation is converted to the altitude variation of residual. Figure 4.39 shows the altitude variations of the calibrated Doppler residuals corresponding to the time periods shown in Figure 4.38. Sudden decrease in frequency residual below 5 km altitude could be noticed in bottom panel of Figure 4.39.

Similar Analysis has been done for rest of the five ingress experiments and the time evolution is plotted in Figures 4.40 to 4.44. In all the cases we may note sharp decrease in the frequency residuals by the same magnitude at both the frequencies. It is to be noted that the height regions where the sharp changes in the Doppler residual happens vary from orbit to orbit.

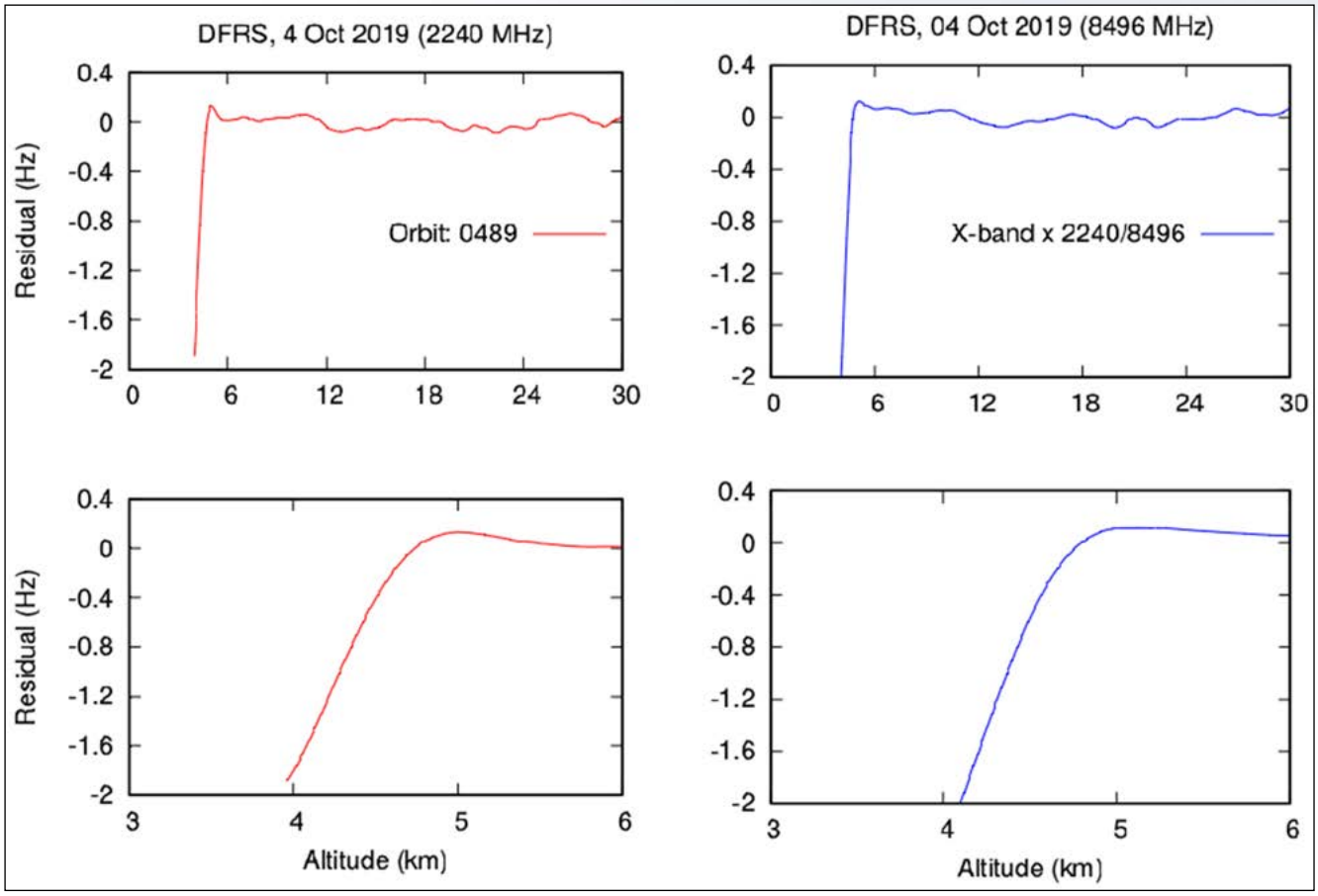


Figure 4.39: Altitude variation in calibrated frequency residual due to Lunar atmosphere on 04 Oct 2019 corresponding to the time period shown in Figure 5.8.1. As in Figure 5.8.1, top left panel shows variation in S-band signal (red curve) and the right panel shows variations in X-band (multiplied with frequency ratio of S and X band). The bottom panels are the zoomed portions of the top panels. We may note a sharp negative Doppler residual between 4 and 5 km. As discussed earlier, the negative Doppler change in the residual indicates for the presence of an layer of neutral particles leading to the bending of the radio signals.

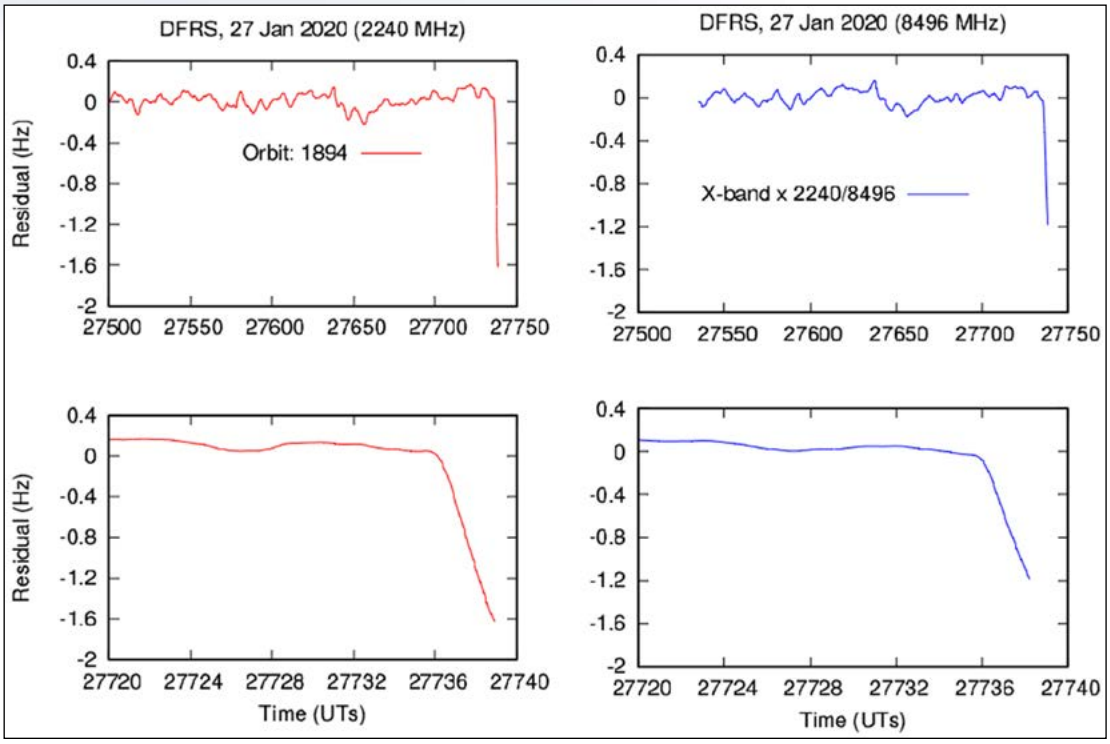


Figure 4.40: Time variation in calibrated frequency residual due to Lunar atmosphere on 27 Jan 2020 (orbit No. 1894).

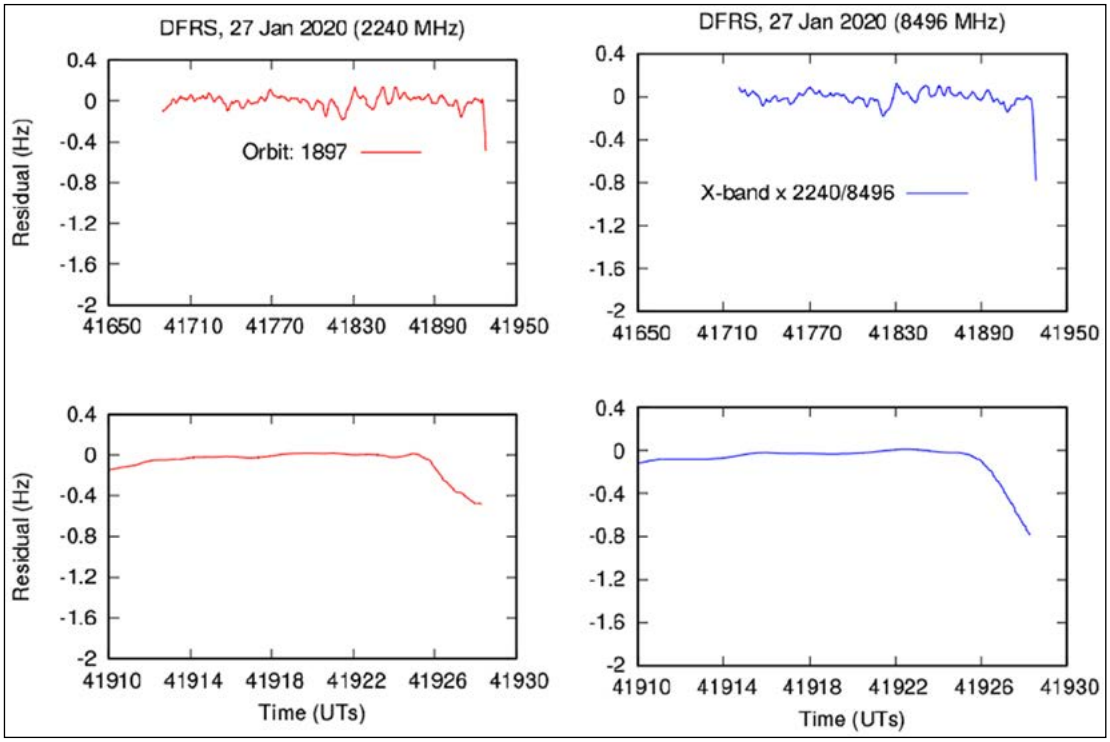


Figure 4.41: Time variation in calibrated frequency residual due to Lunar atmosphere on 27 Jan 2020 (orbit No. 1897).

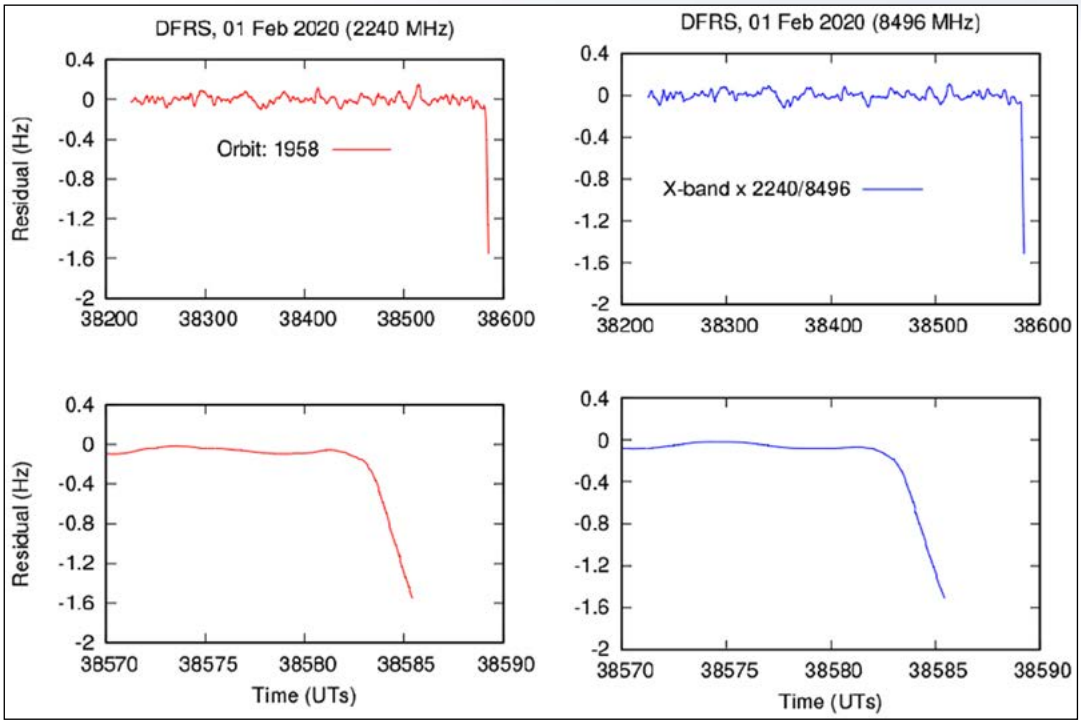


Figure 4.42: Time variation in calibrated frequency residual due to Lunar atmosphere on 01 Feb 2020 (orbit No. 1958).

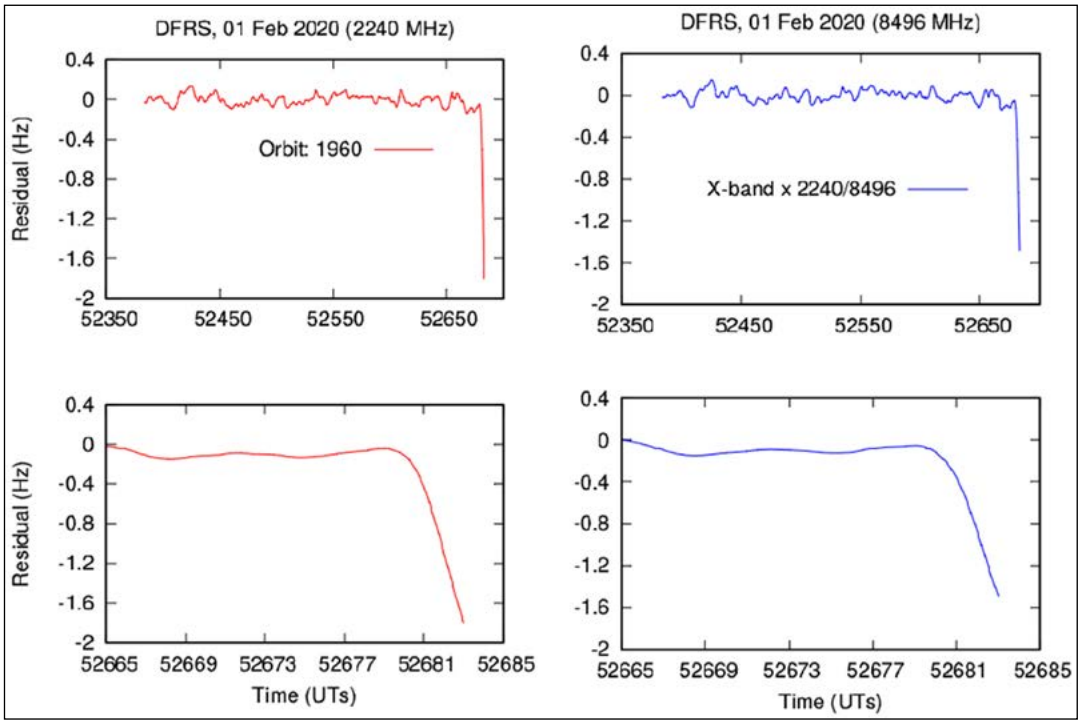


Figure 4.43: Time variation in calibrated frequency residual due to Lunar atmosphere on 01 Feb 2020 (orbit No. 1960).

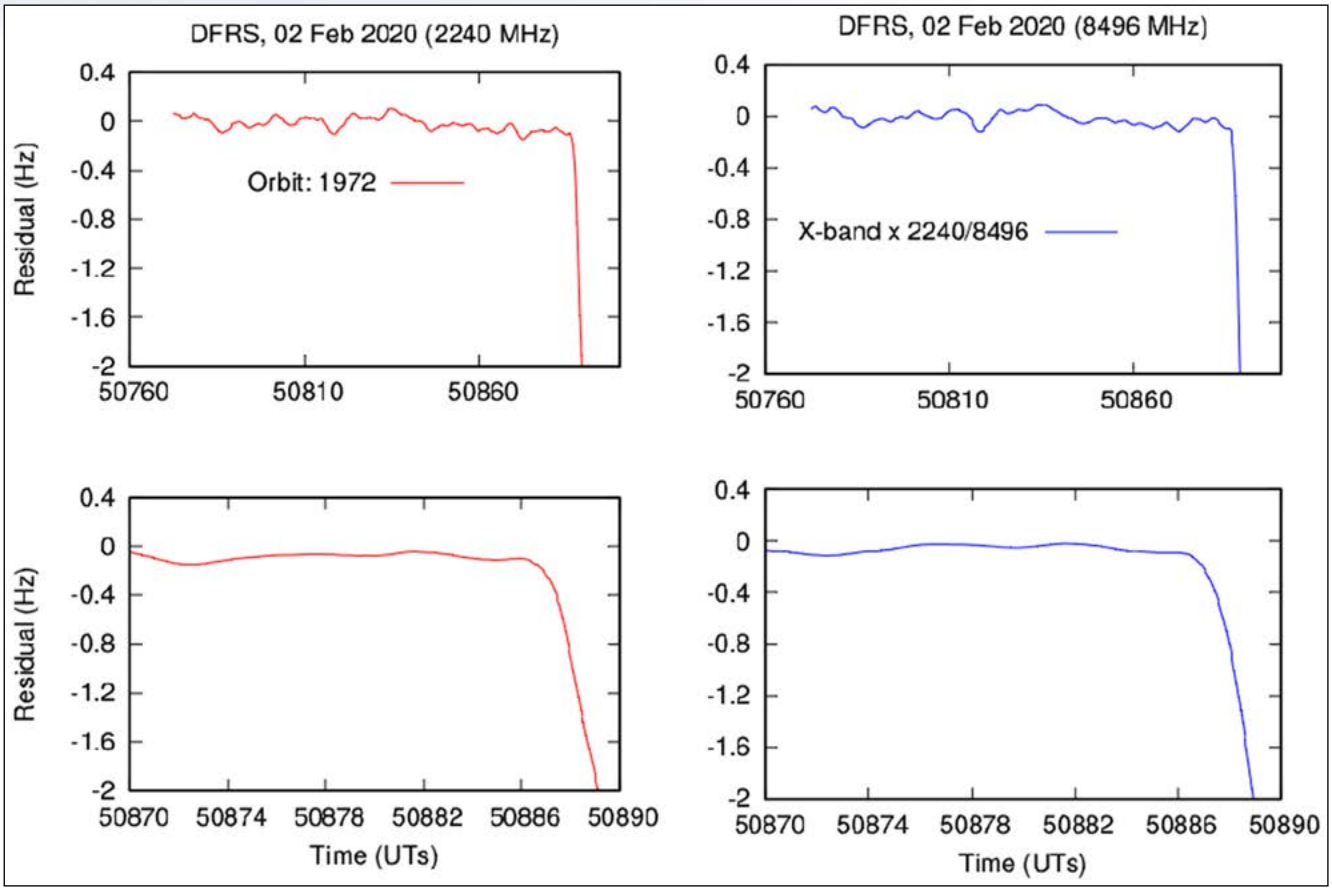
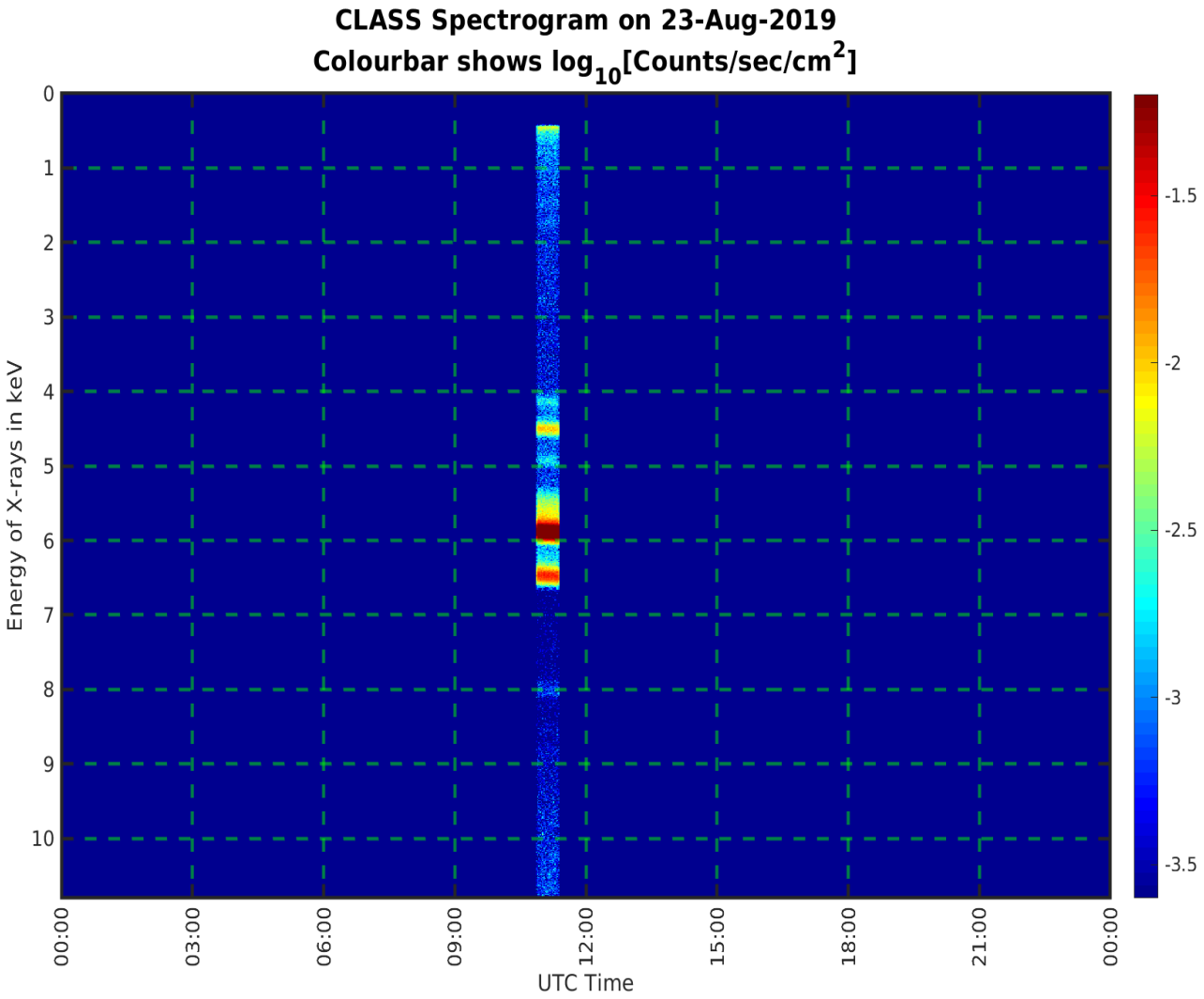


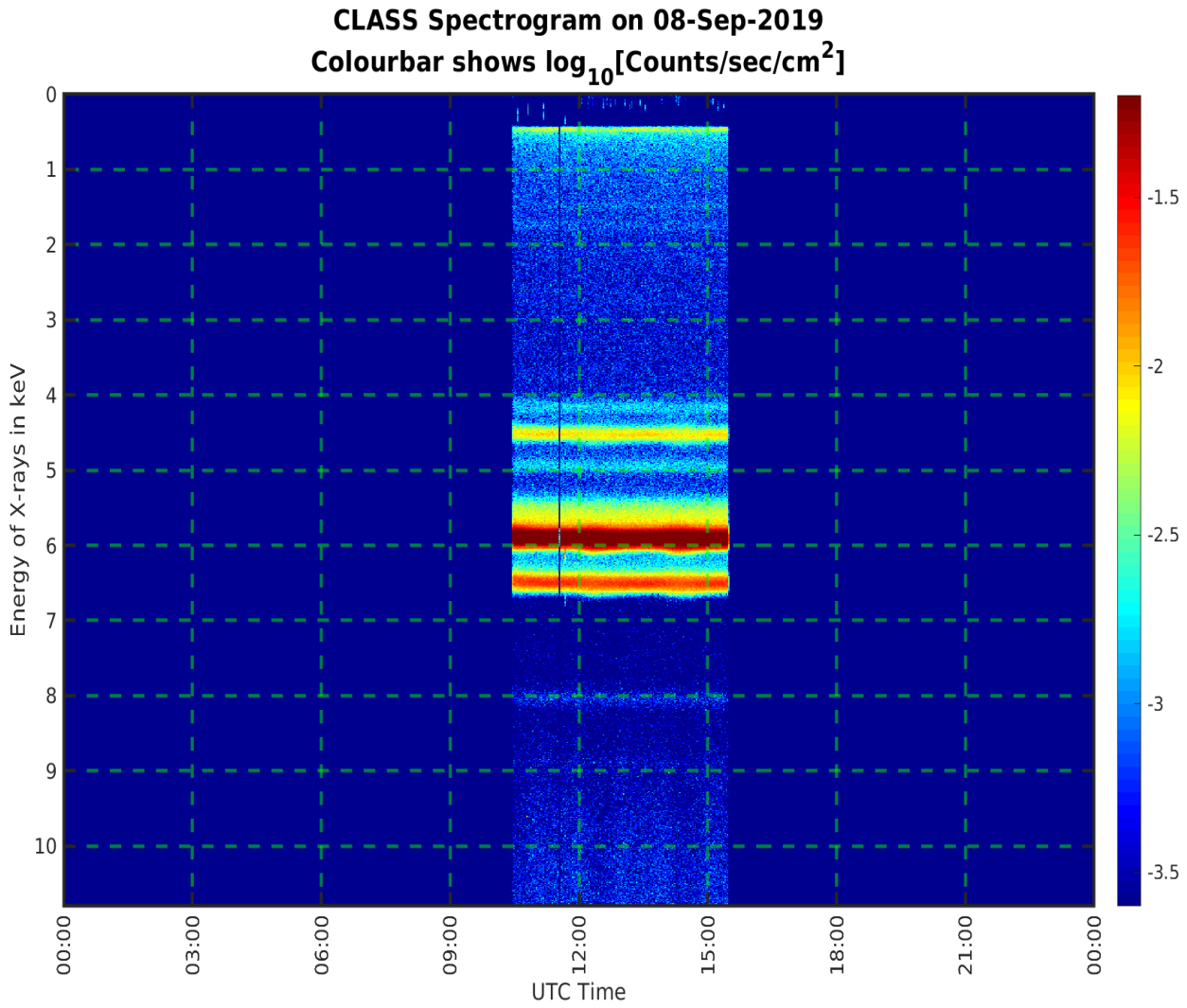
Figure 4.44: Time variation in calibrated frequency residual due to Lunar atmosphere on 01 Feb 2020 (orbit No. 1972).



Annexure- I

Data Products of Chandrayaan-2 Large Area Soft X-ray Spectrometer (CLASS)


CLASS Spectrogram on 23-Aug-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
UTC Time


CLASS Spectrogram on 08-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
06:00
09:00
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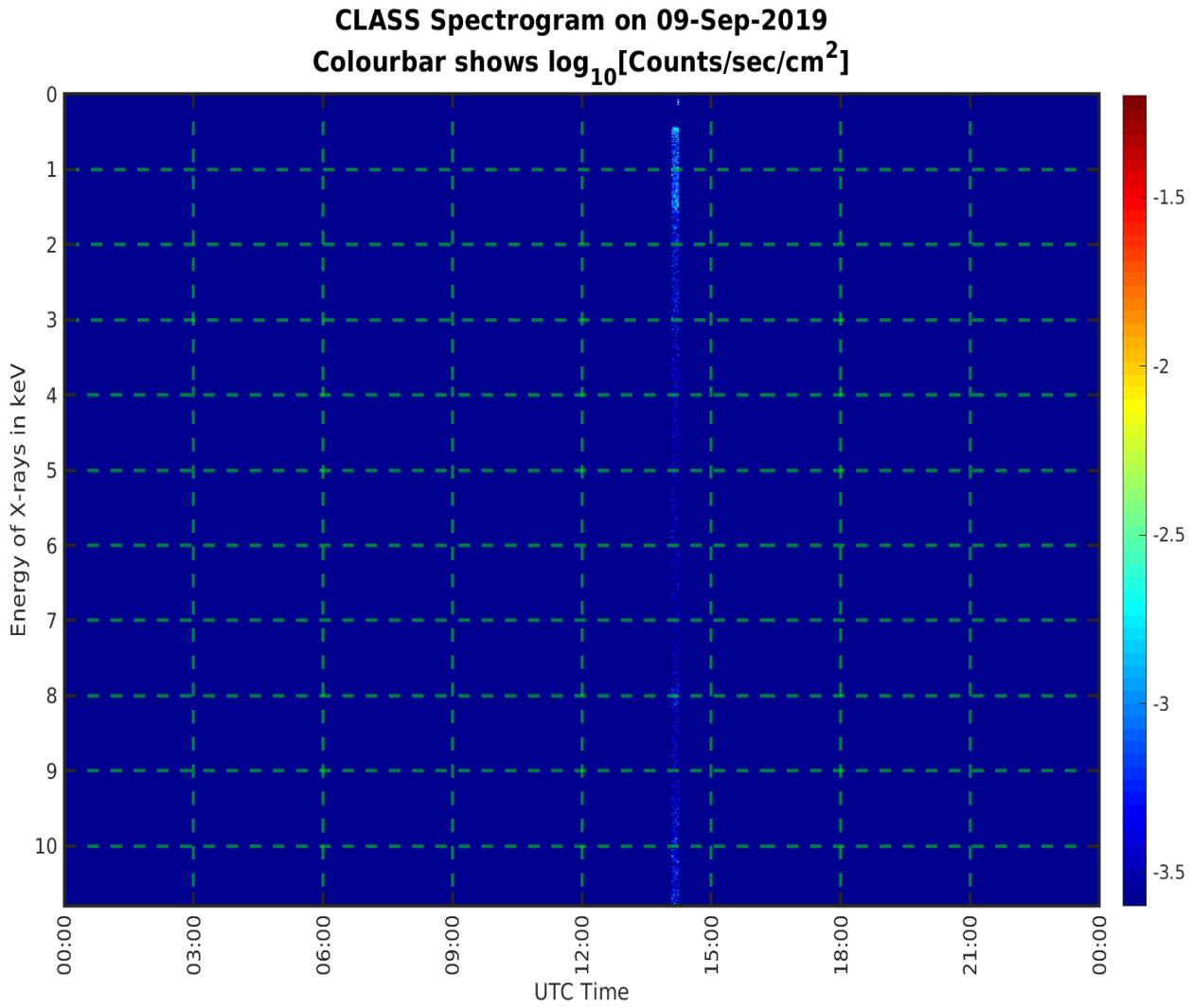
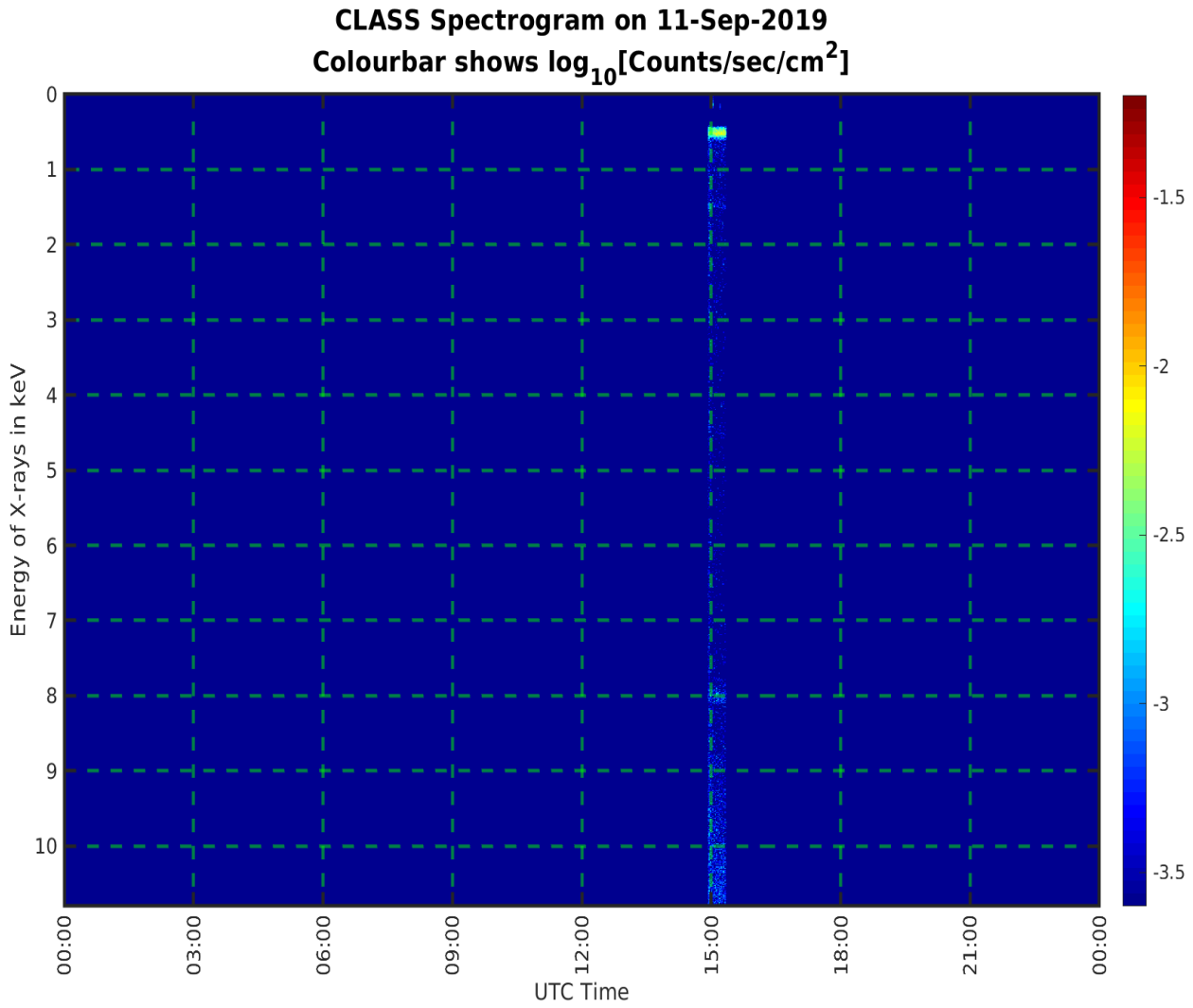
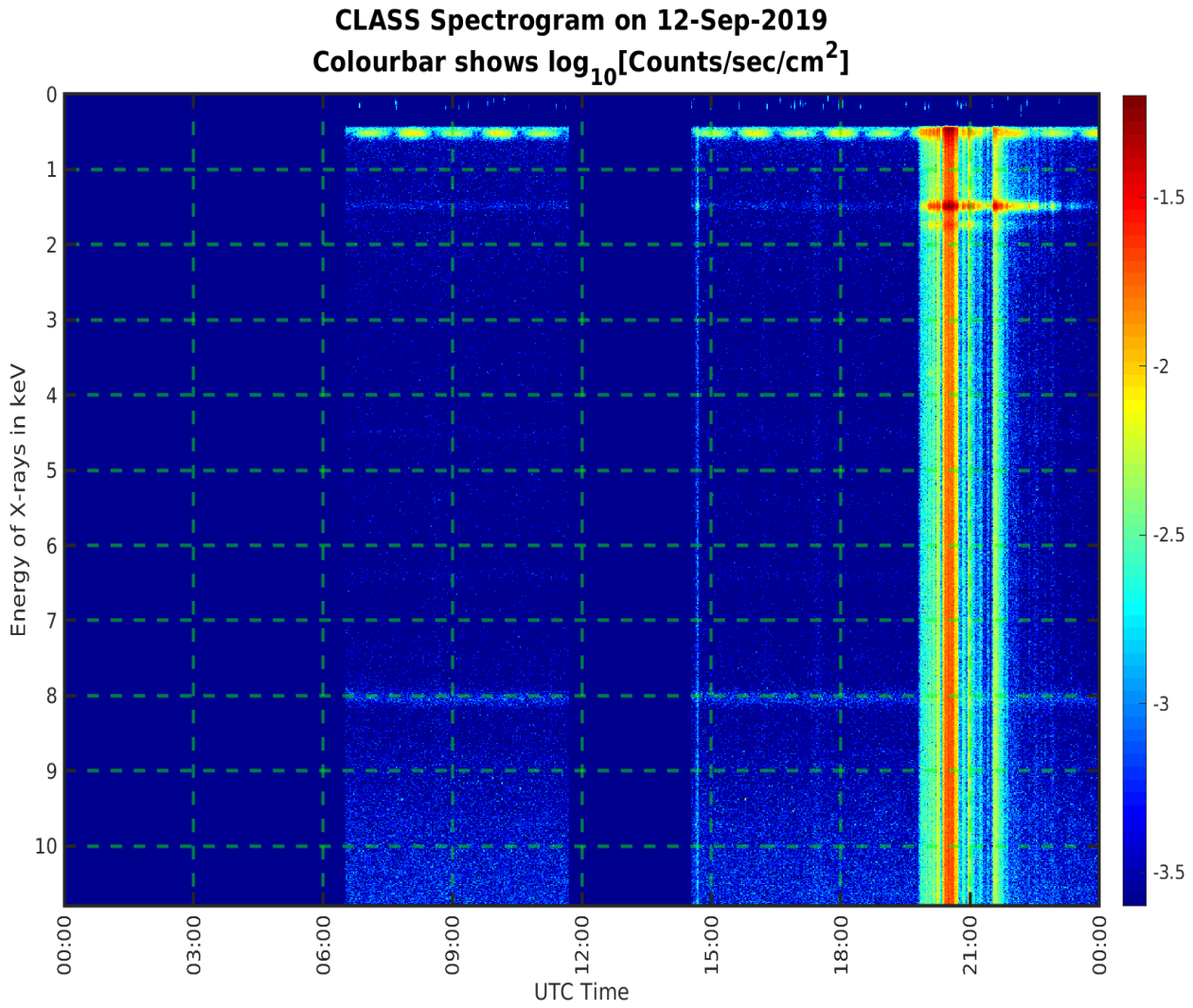
15:00
18:00
21:00
00:00
UTC Time


CLASS Spectrogram on 09-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
UTC Time


CLASS Spectrogram on 11-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
UTC Time
-1.5
-2
-2.5
-3
-3.5


CLASS Spectrogram on 12-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
00:00
03:00
06:00
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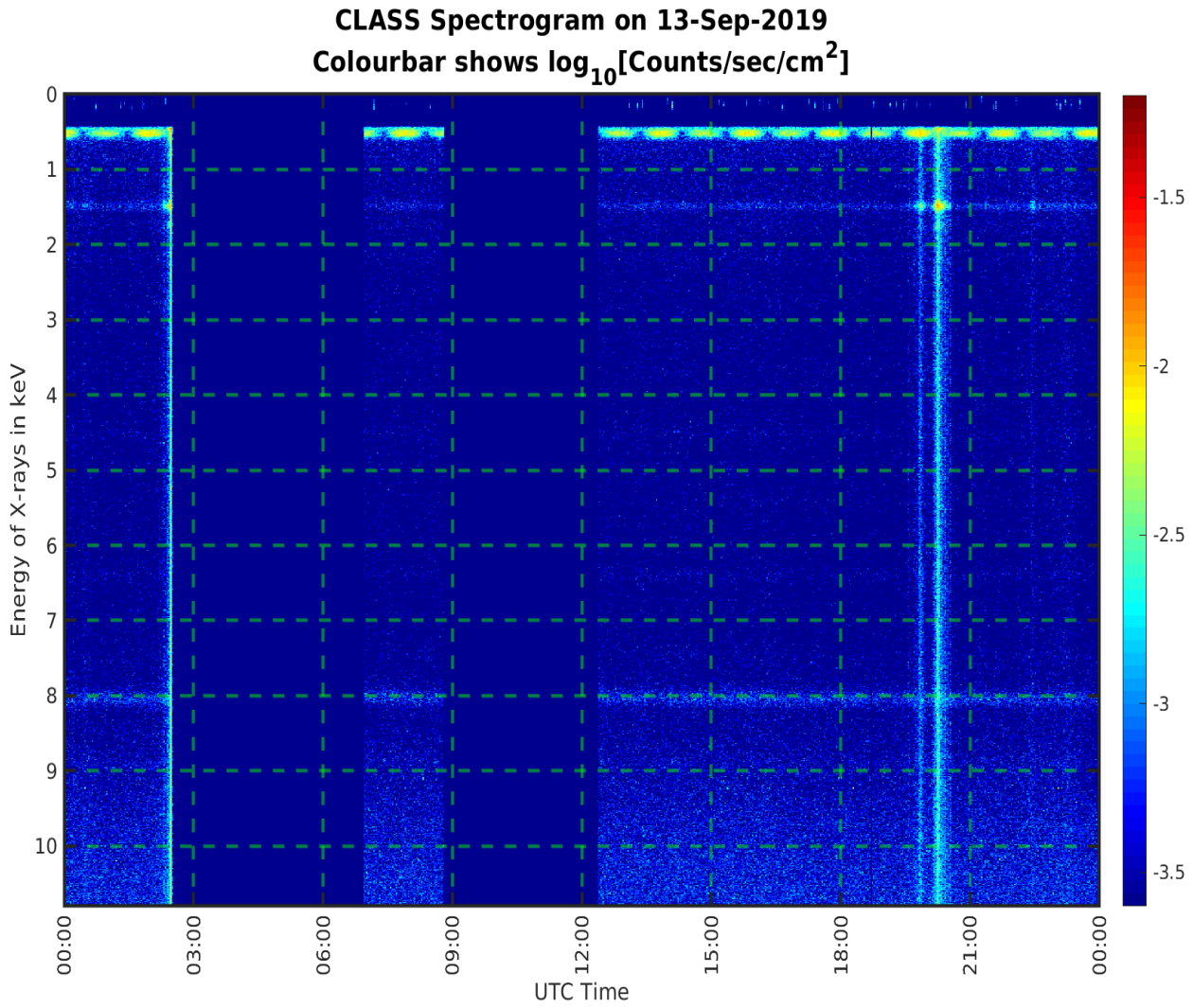
-2.5
-3
-3.5


CLASS Spectrogram on 13-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
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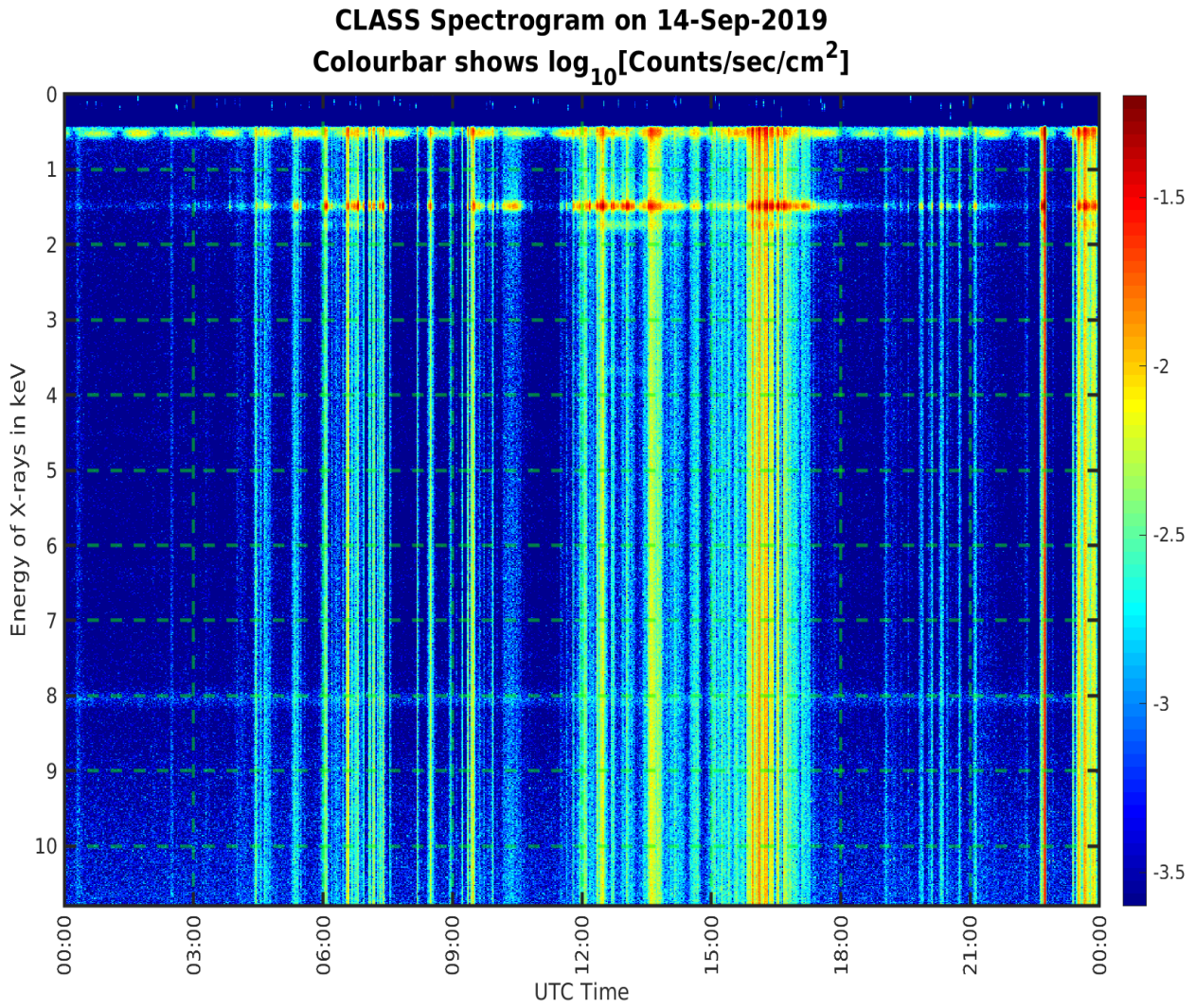
09:00
12:00
15:00
18:00
21:00
00:00
UTC Time


CLASS Spectrogram on 14-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
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00:00
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18:00
21:00
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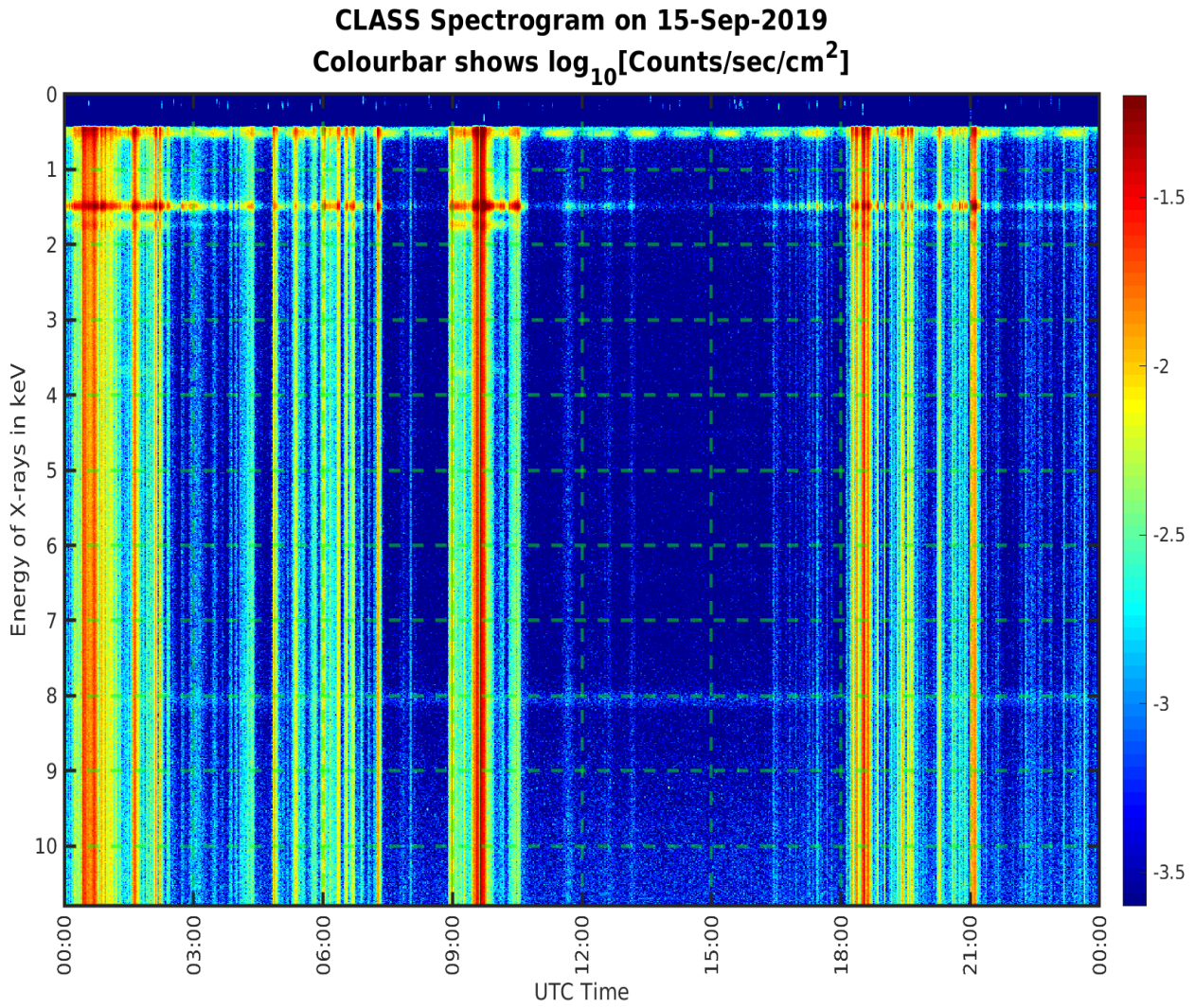
UTC Time


CLASS Spectrogram on 15-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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15:00
18:00
21:00
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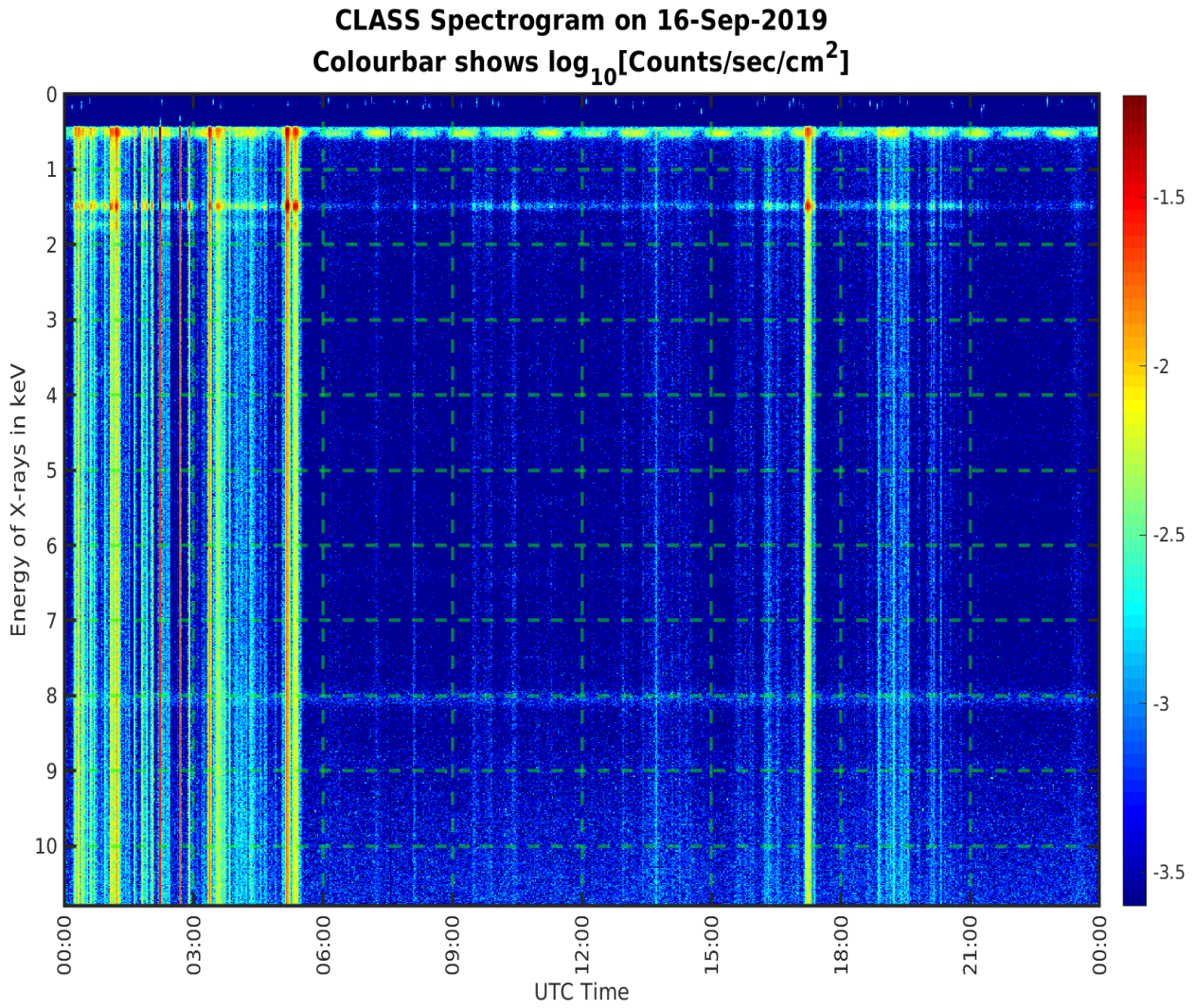
UTC Time


CLASS Spectrogram on 16-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
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09:00
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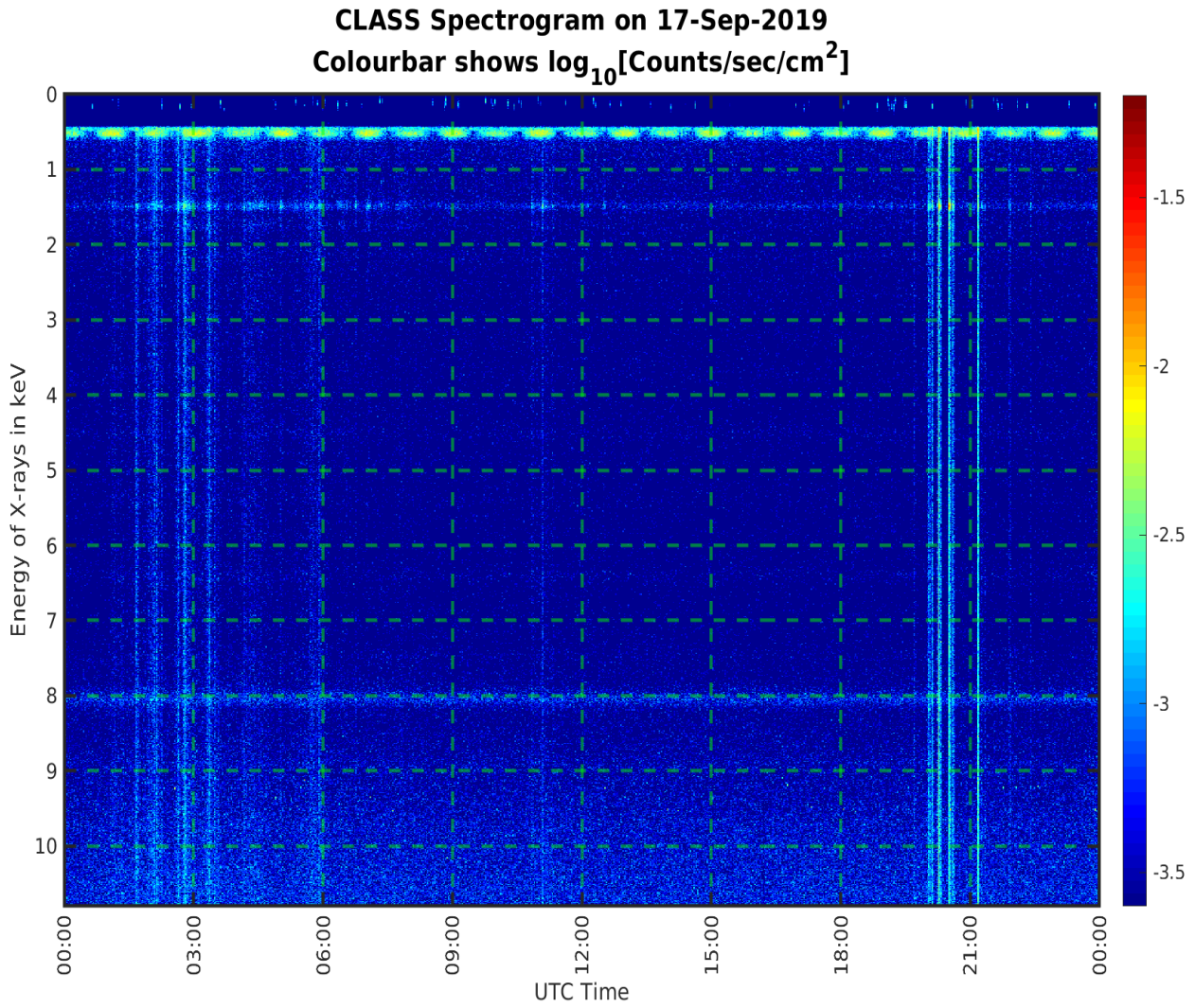
15:00
18:00
21:00
00:00
UTC Time


CLASS Spectrogram on 17-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
06:00
09:00
12:00
15:00
18:00
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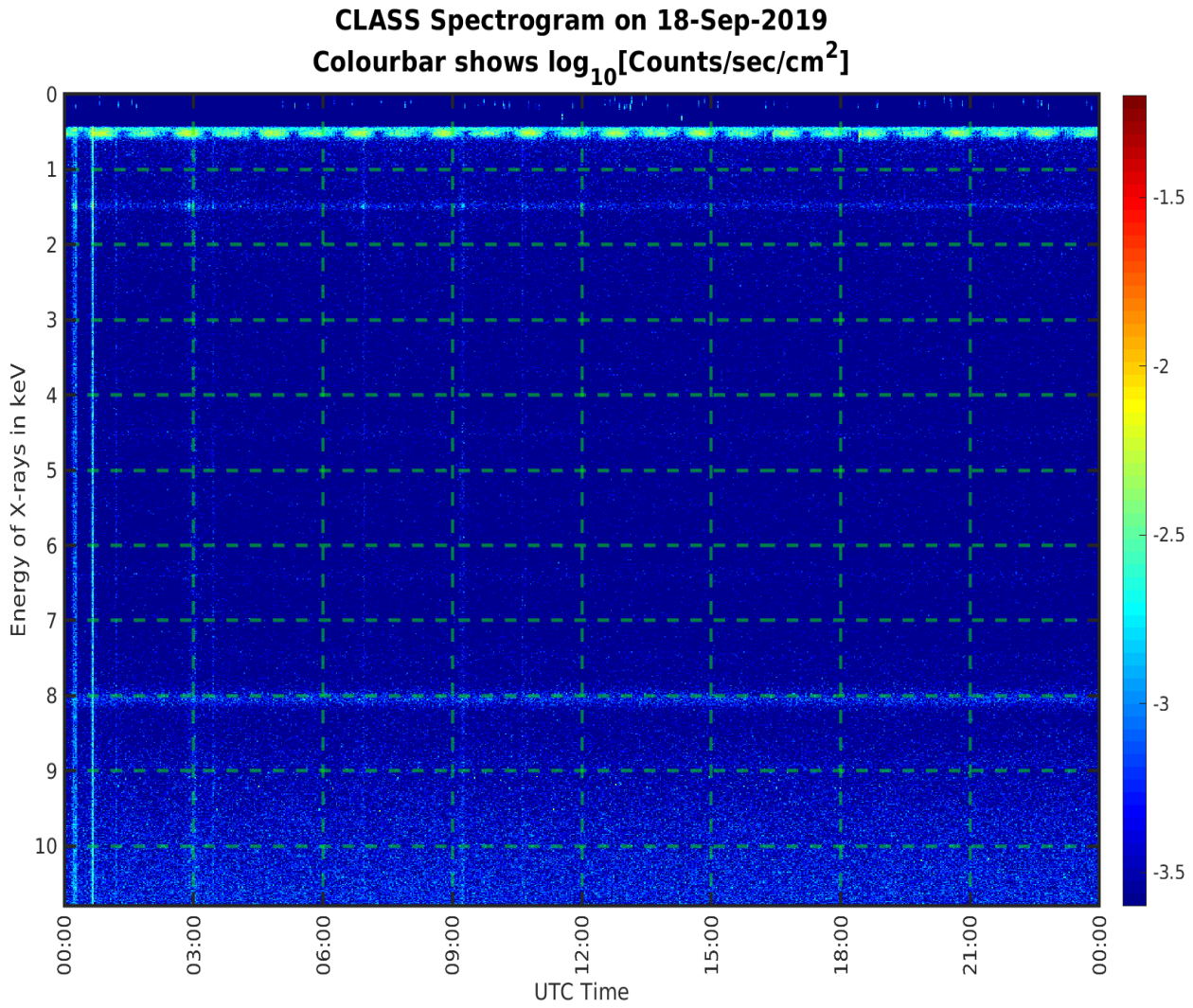
00:00
UTC Time


CLASS Spectrogram on 18-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
06:00
09:00
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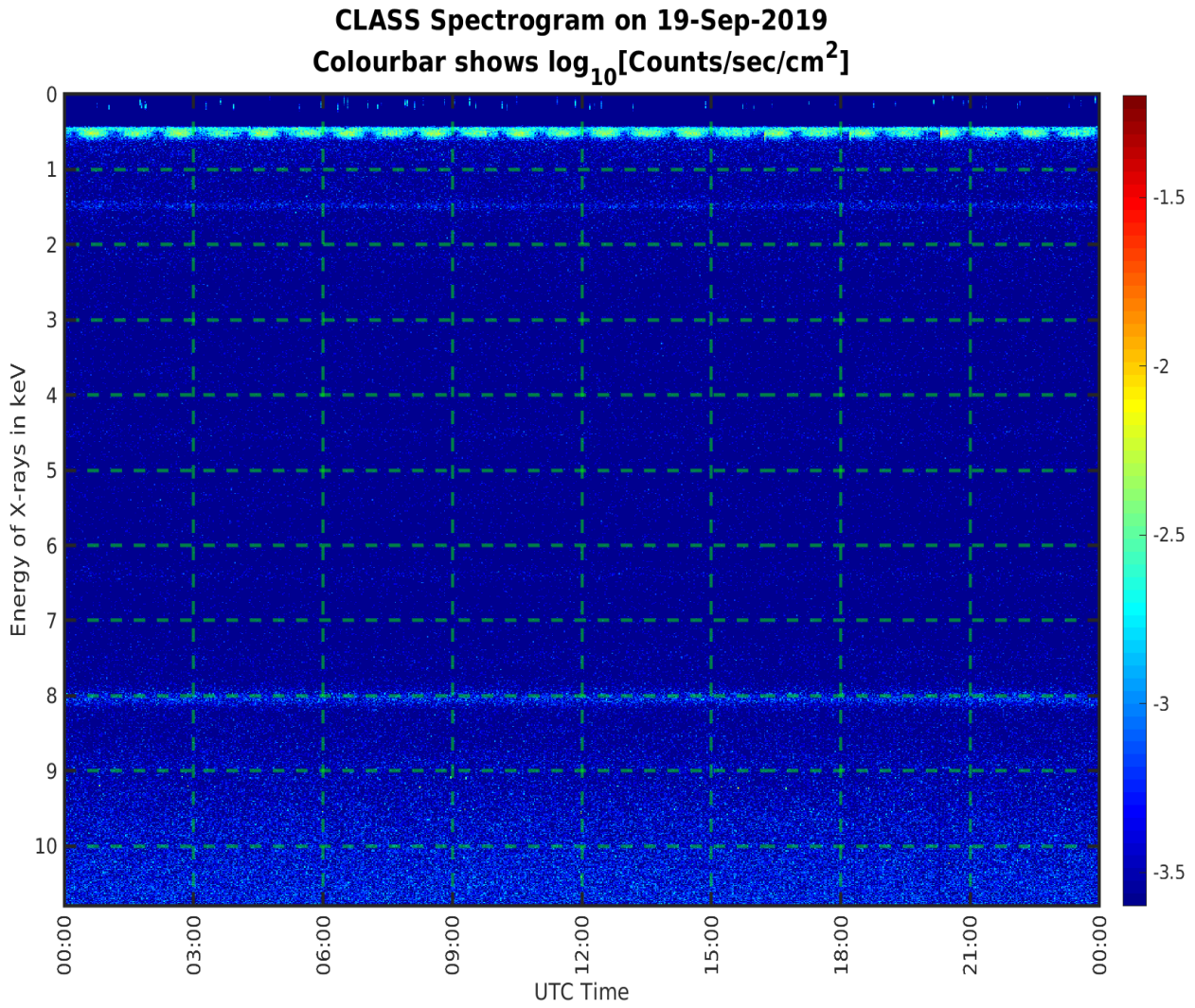
18:00
21:00
00:00
UTC Time


CLASS Spectrogram on 19-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
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8
9
10
-1.5
-2
-2.5
-3
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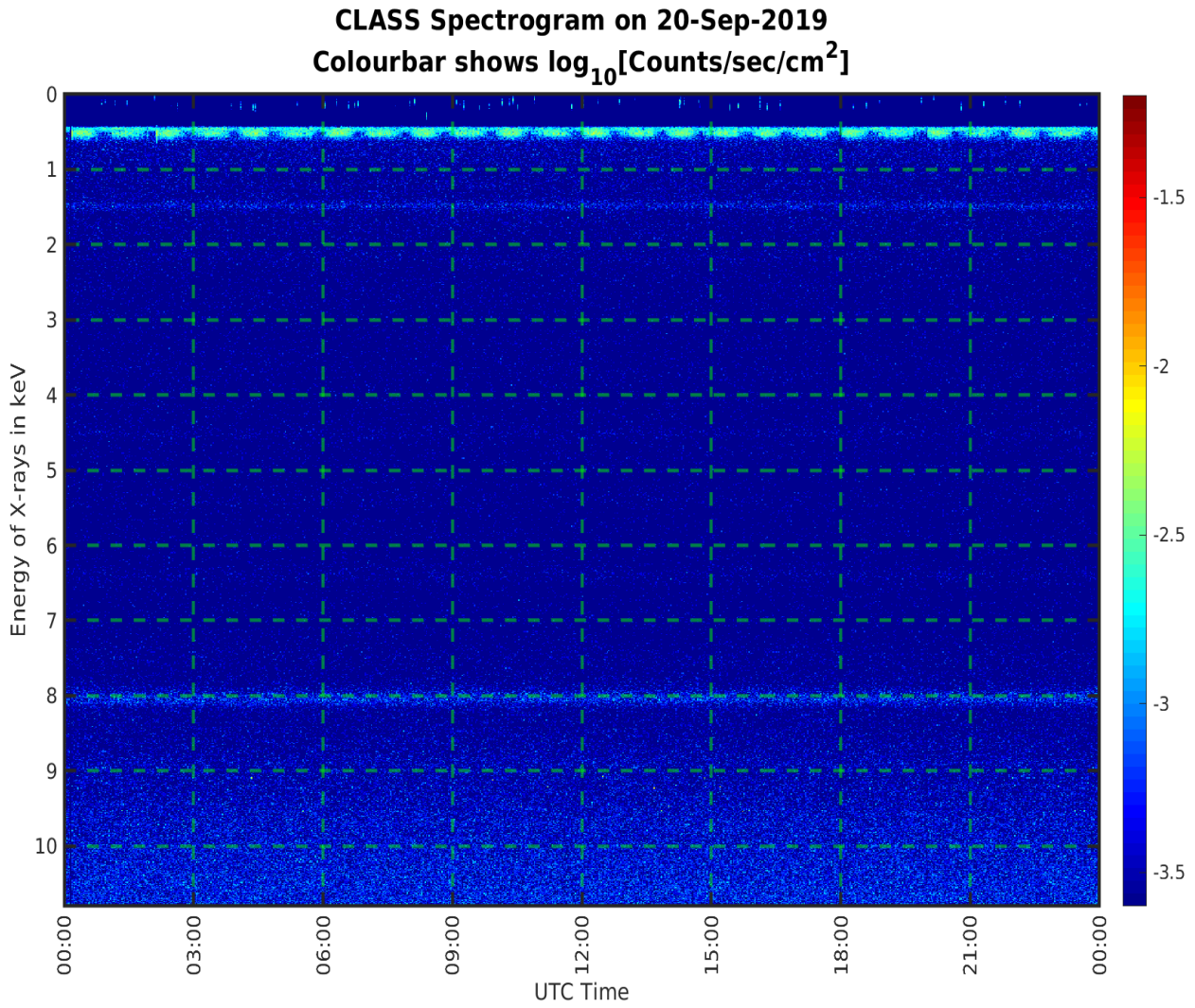
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
UTC Time


CLASS Spectrogram on 20-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
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8
9
10
-1.5
-2
-2.5
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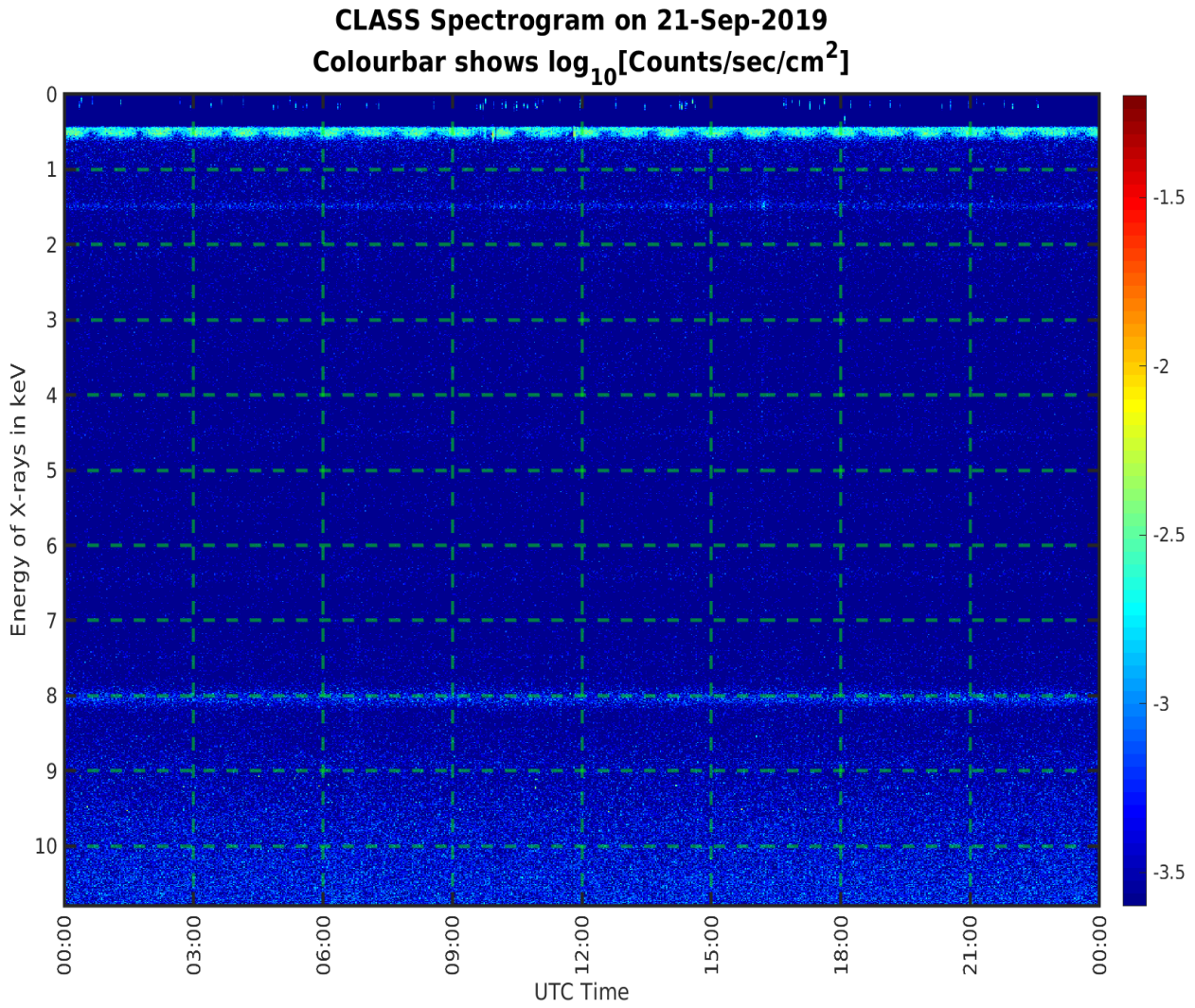
21:00
00:00
UTC Time


CLASS Spectrogram on 21-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
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7
8
9
10
-1.5
-2
-2.5
-3
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03:00
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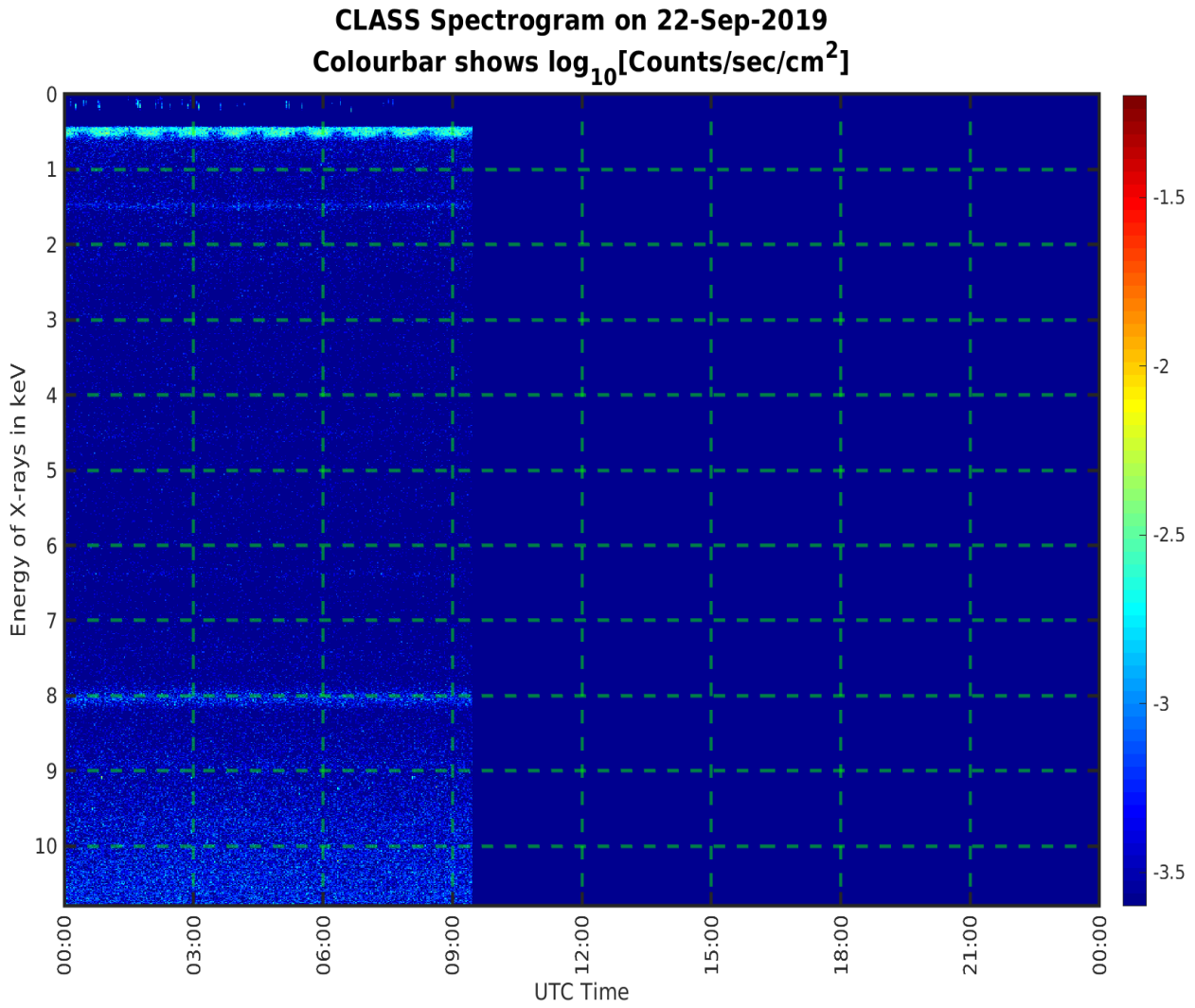
18:00
21:00
00:00
UTC Time


CLASS Spectrogram on 22-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
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7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
06:00
09:00
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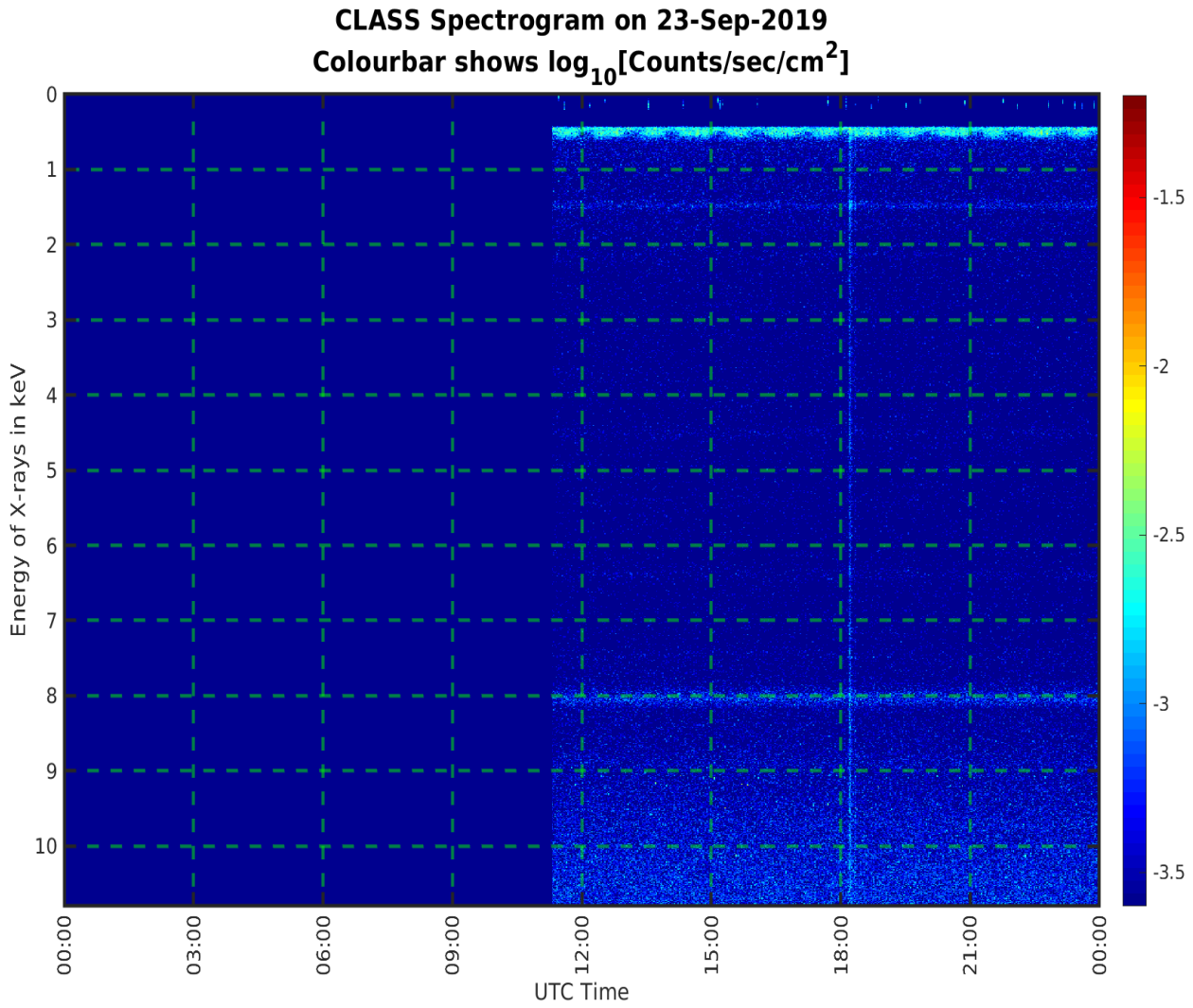
15:00
18:00
21:00
00:00
UTC Time


CLASS Spectrogram on 23-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
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15:00
18:00
21:00
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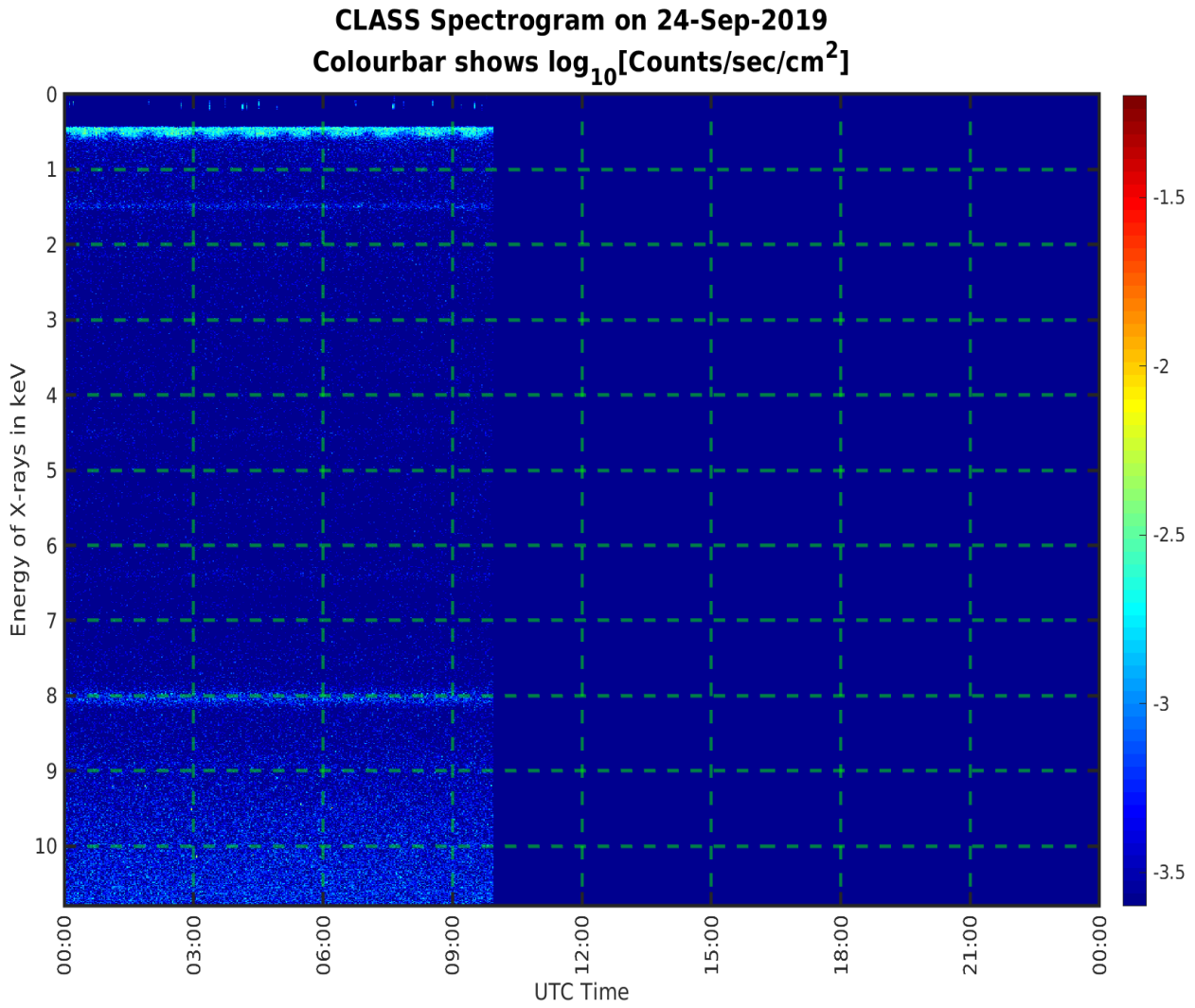
UTC Time


CLASS Spectrogram on 24-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
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03:00
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15:00
18:00
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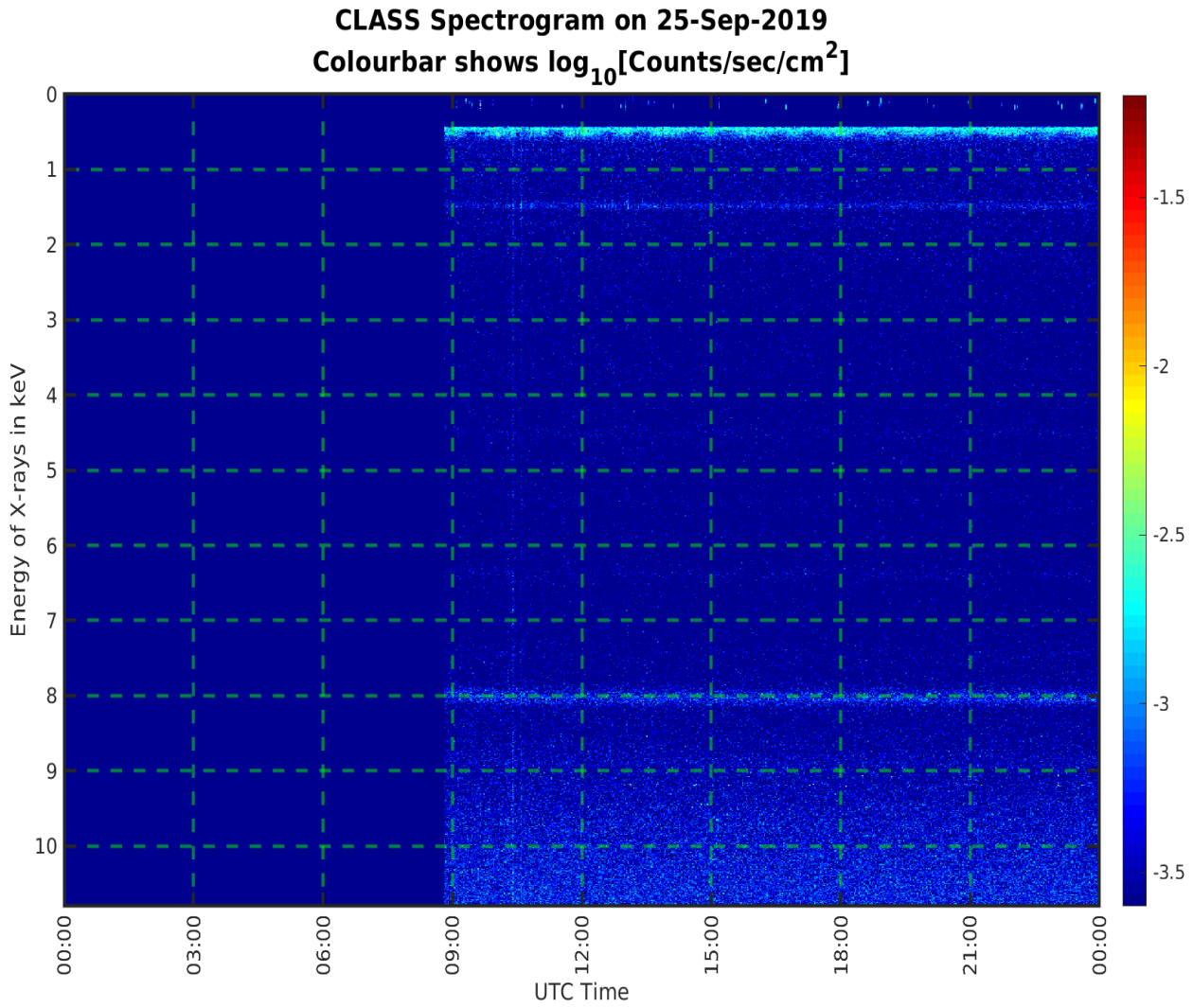
UTC Time


CLASS Spectrogram on 25-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
00:00
03:00
06:00
09:00
12:00
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21:00
00:00
UTC Time
-1.5
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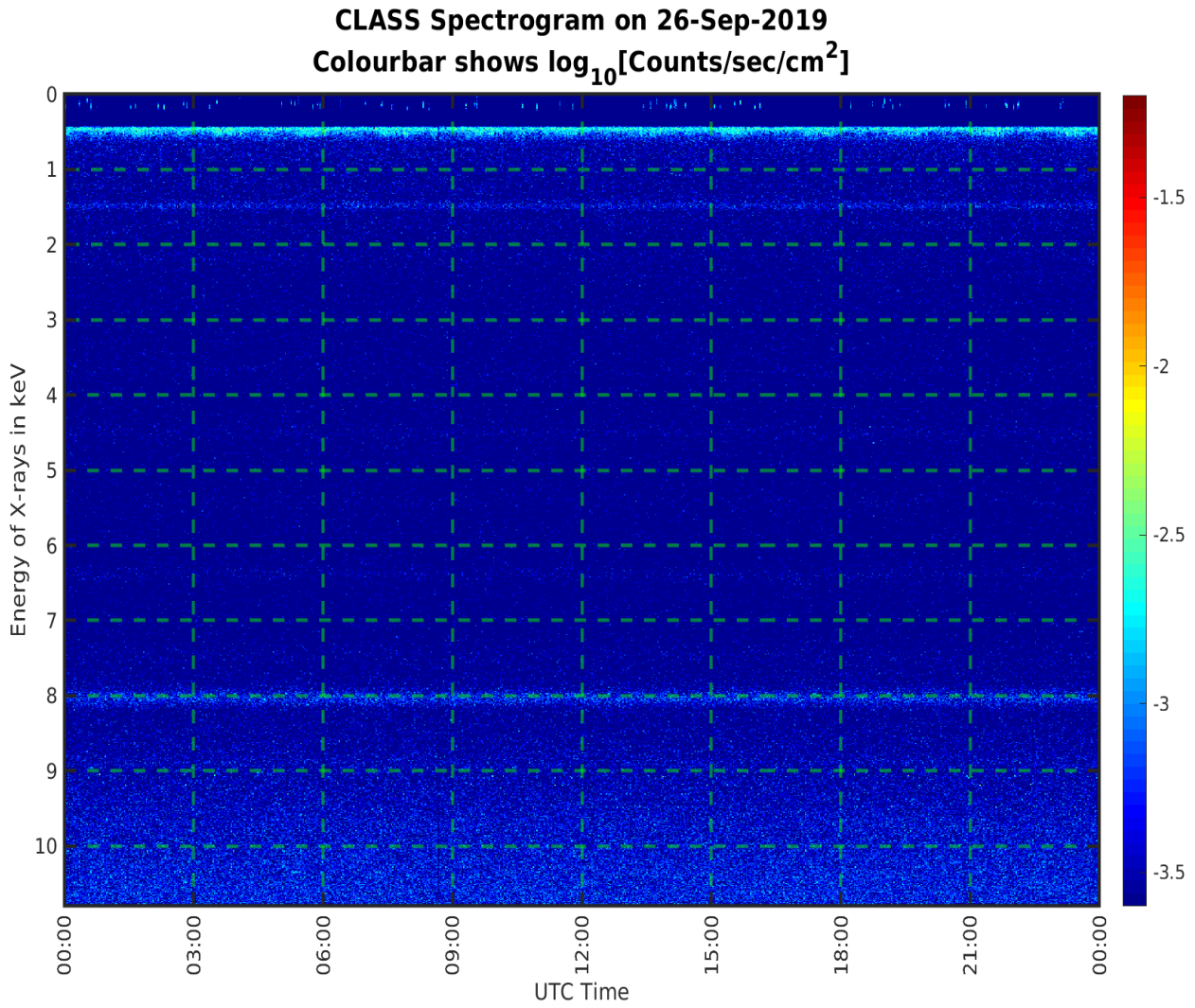
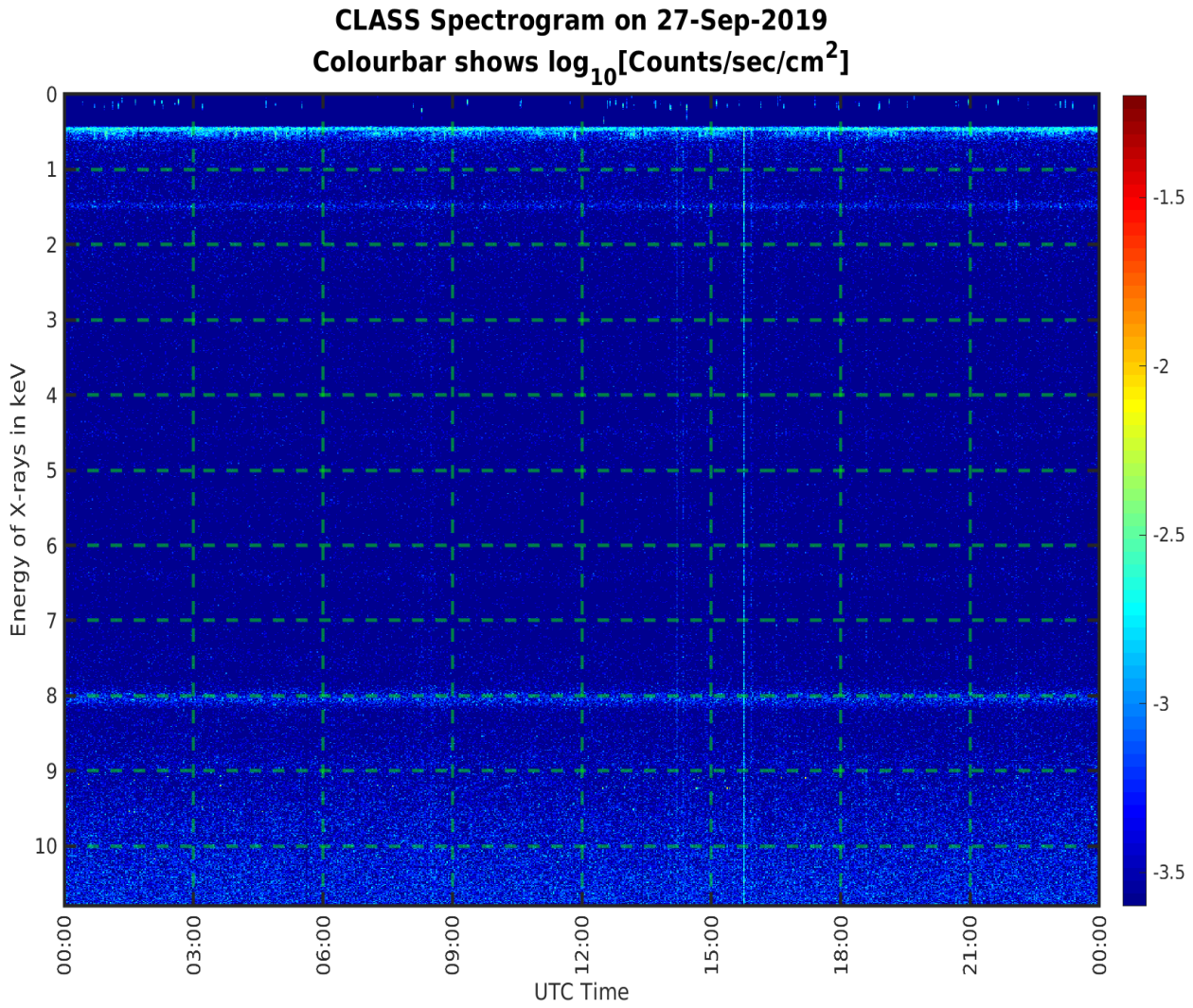
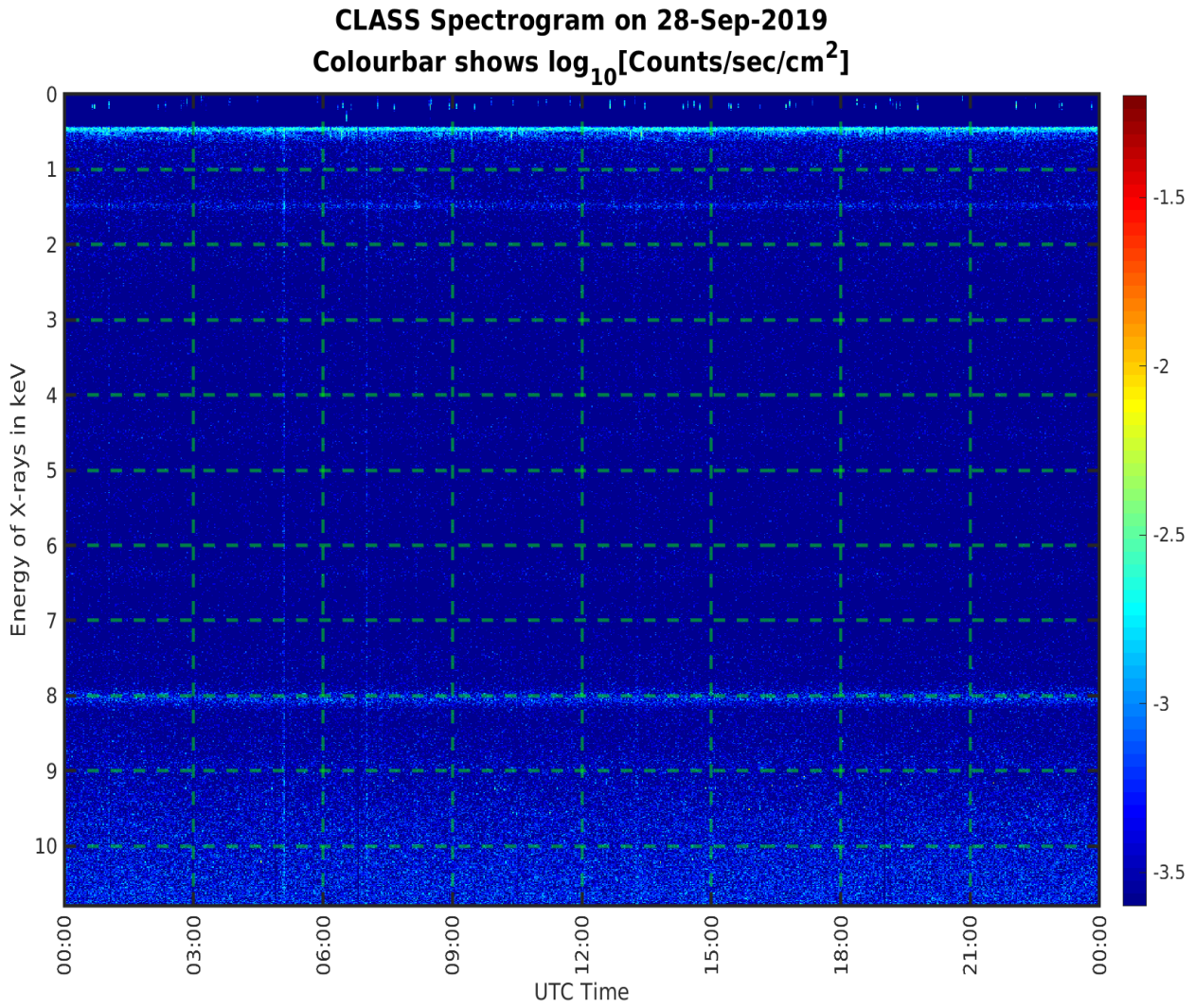
-3
-3.5


CLASS Spectrogram on 26-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
UTC Time


CLASS Spectrogram on 27-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
UTC Time


CLASS Spectrogram on 28-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
06:00
09:00
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15:00
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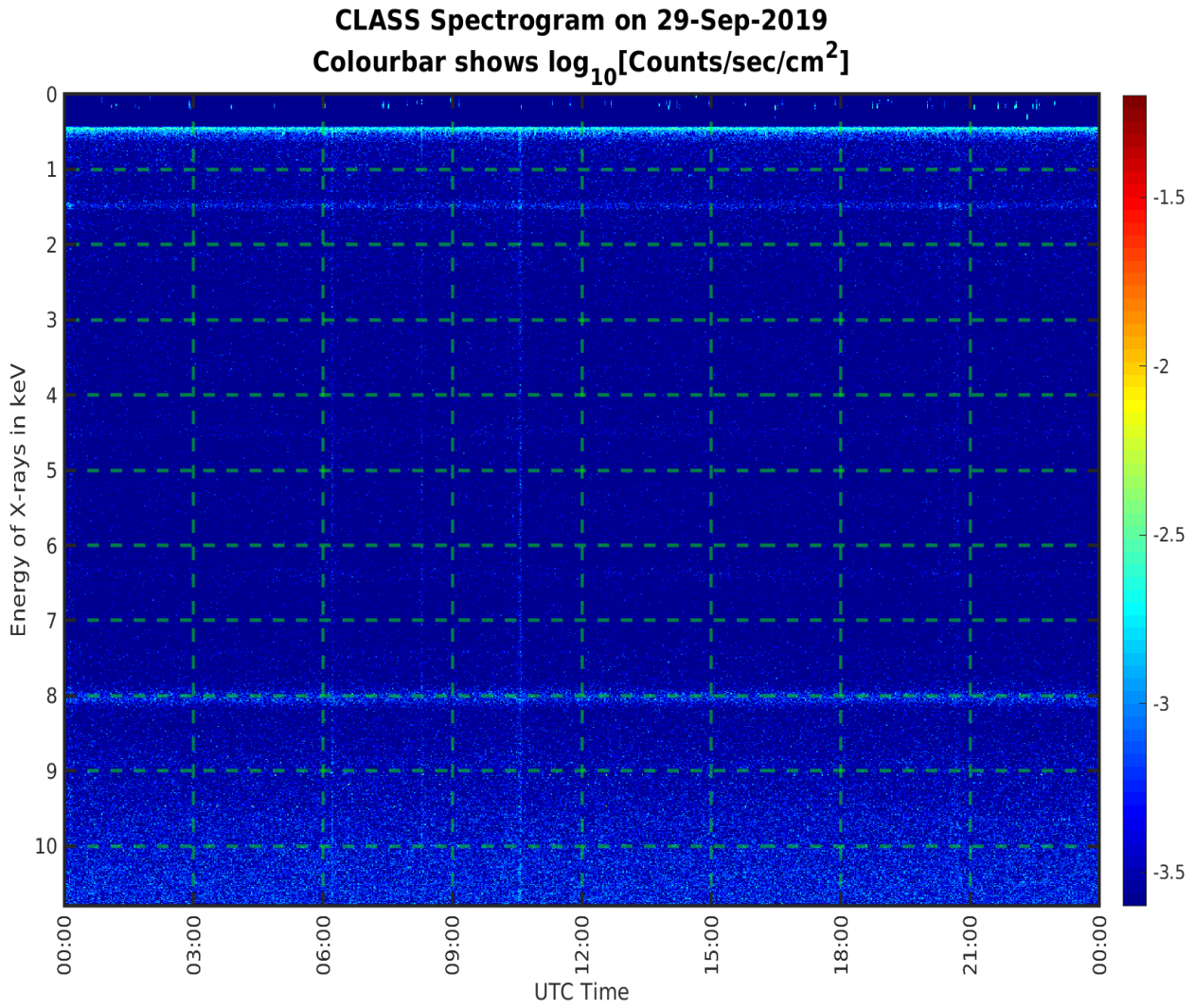
00:00
UTC Time


CLASS Spectrogram on 29-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
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8
9
10
-1.5
-2
-2.5
-3
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00:00
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15:00
18:00
21:00
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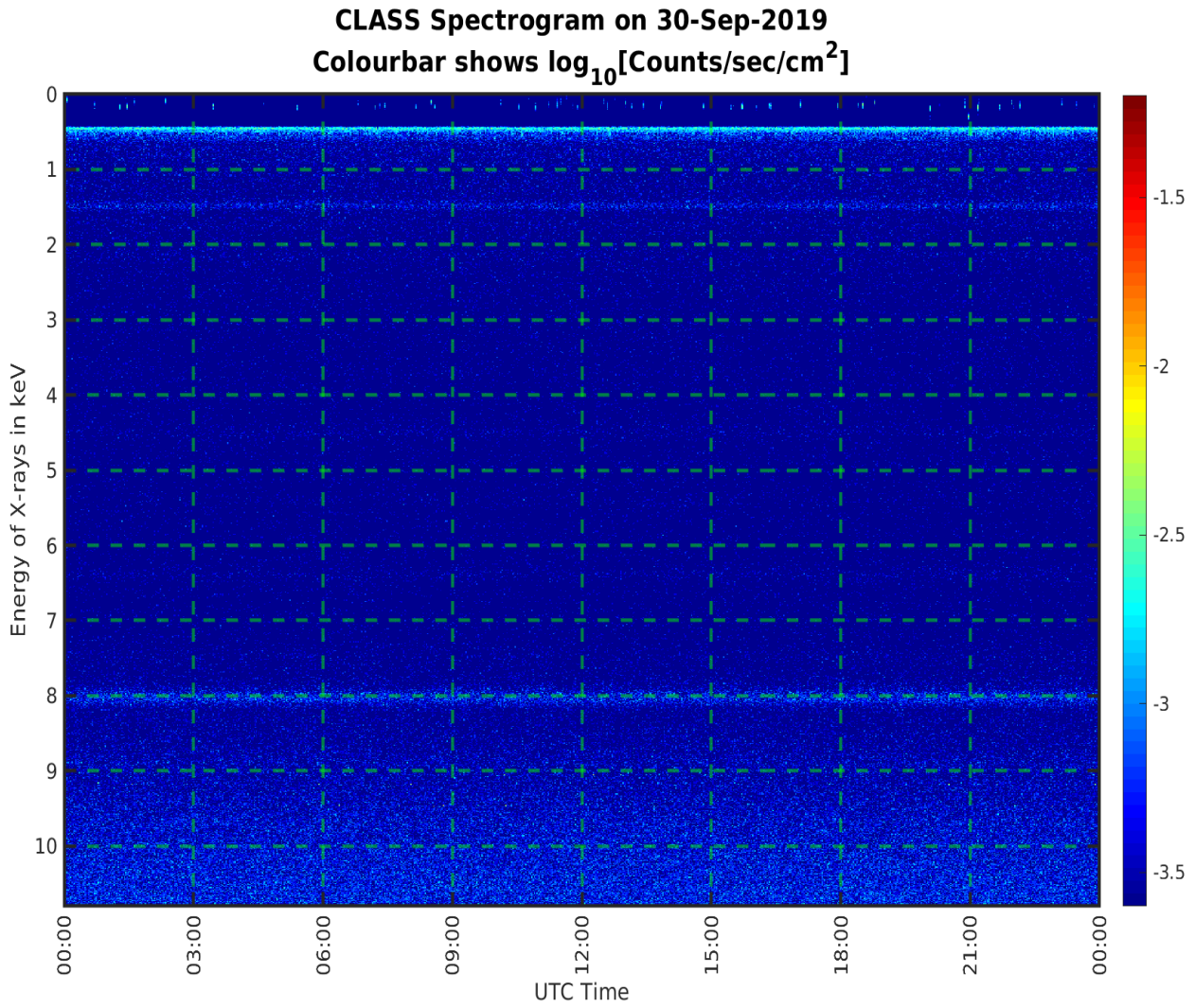
UTC Time


CLASS Spectrogram on 30-Sep-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
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8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
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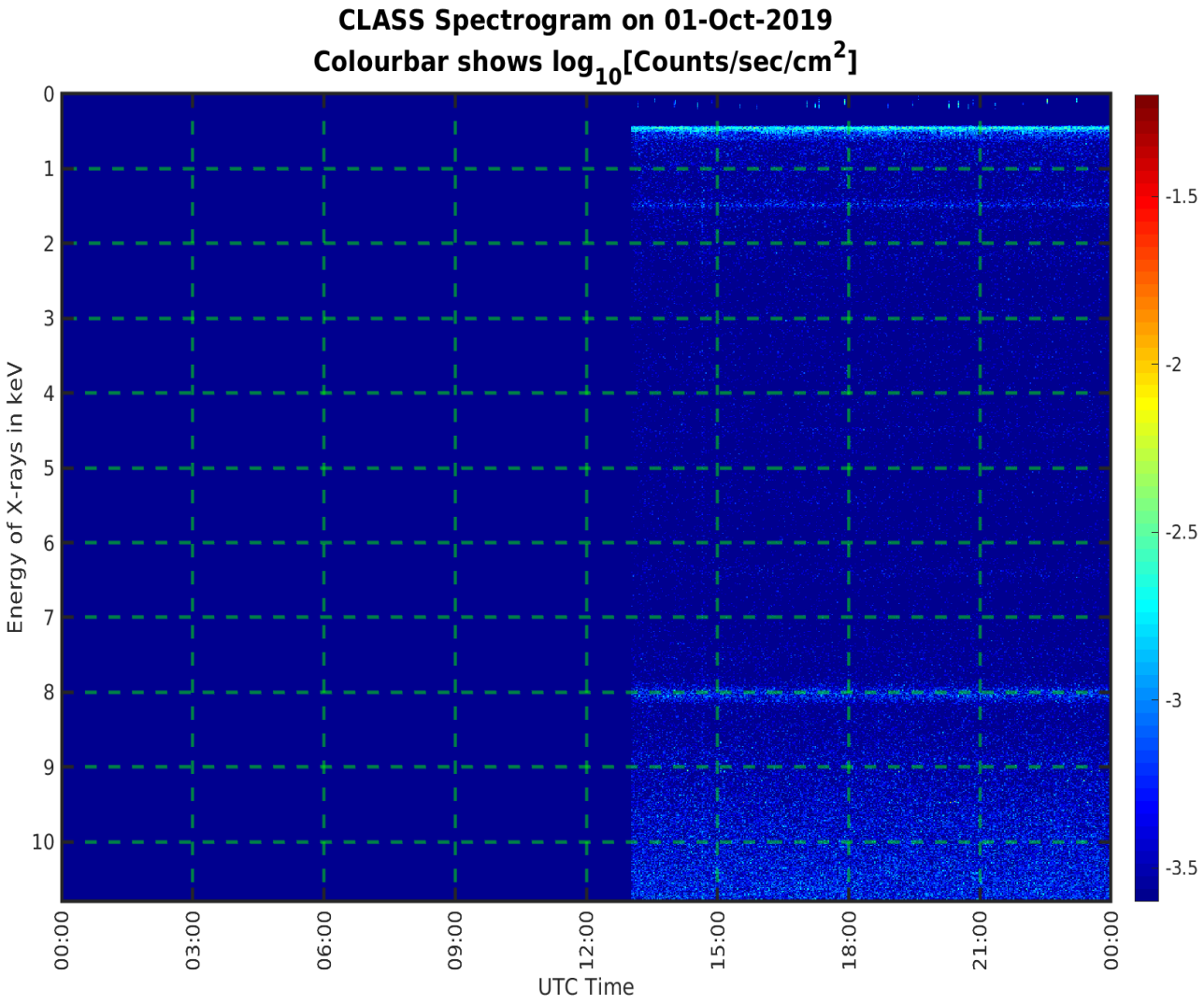
UTC Time


CLASS Spectrogram on 01-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
00:00
03:00
06:00
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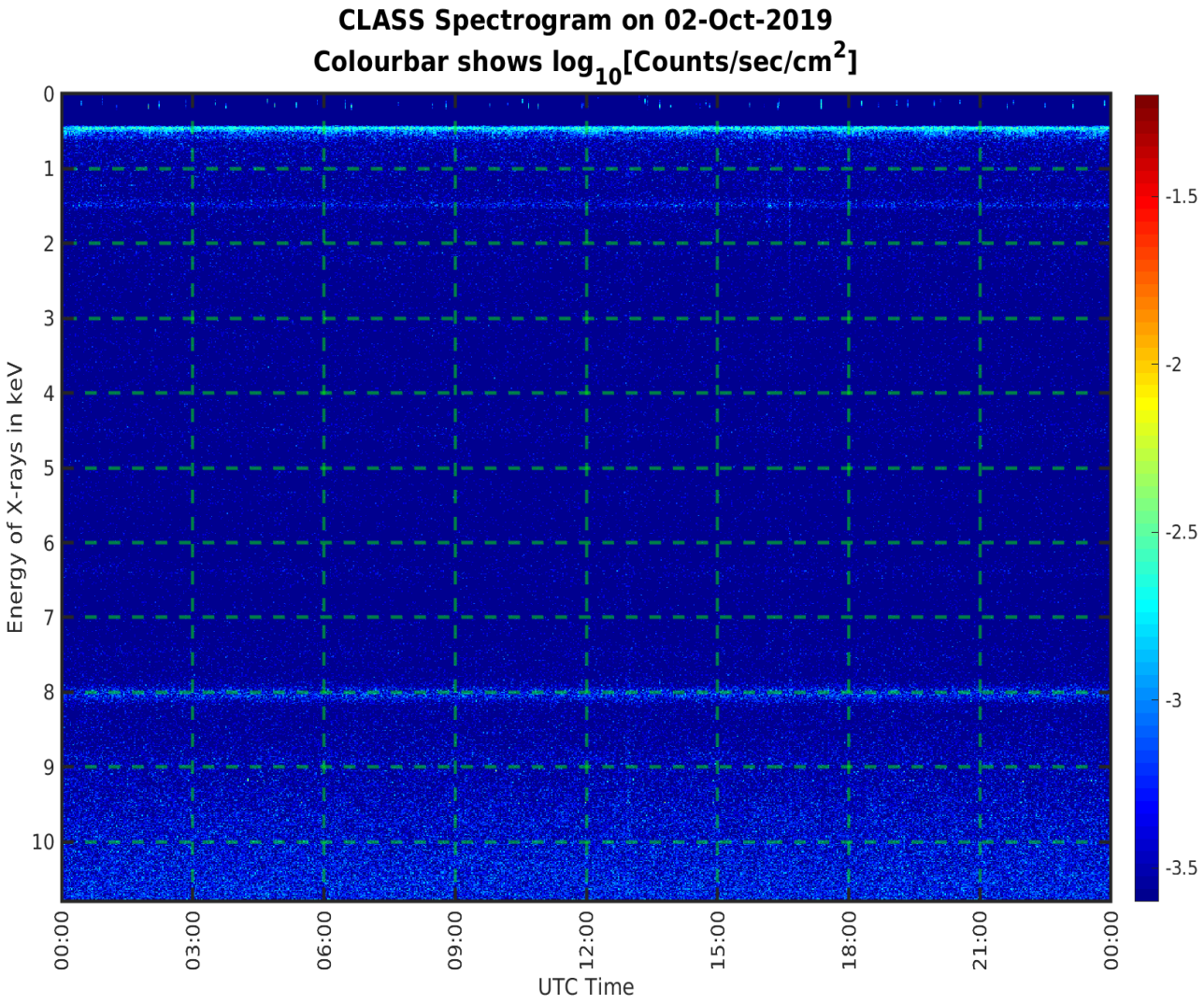
-3.5


CLASS Spectrogram on 02-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
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03:00
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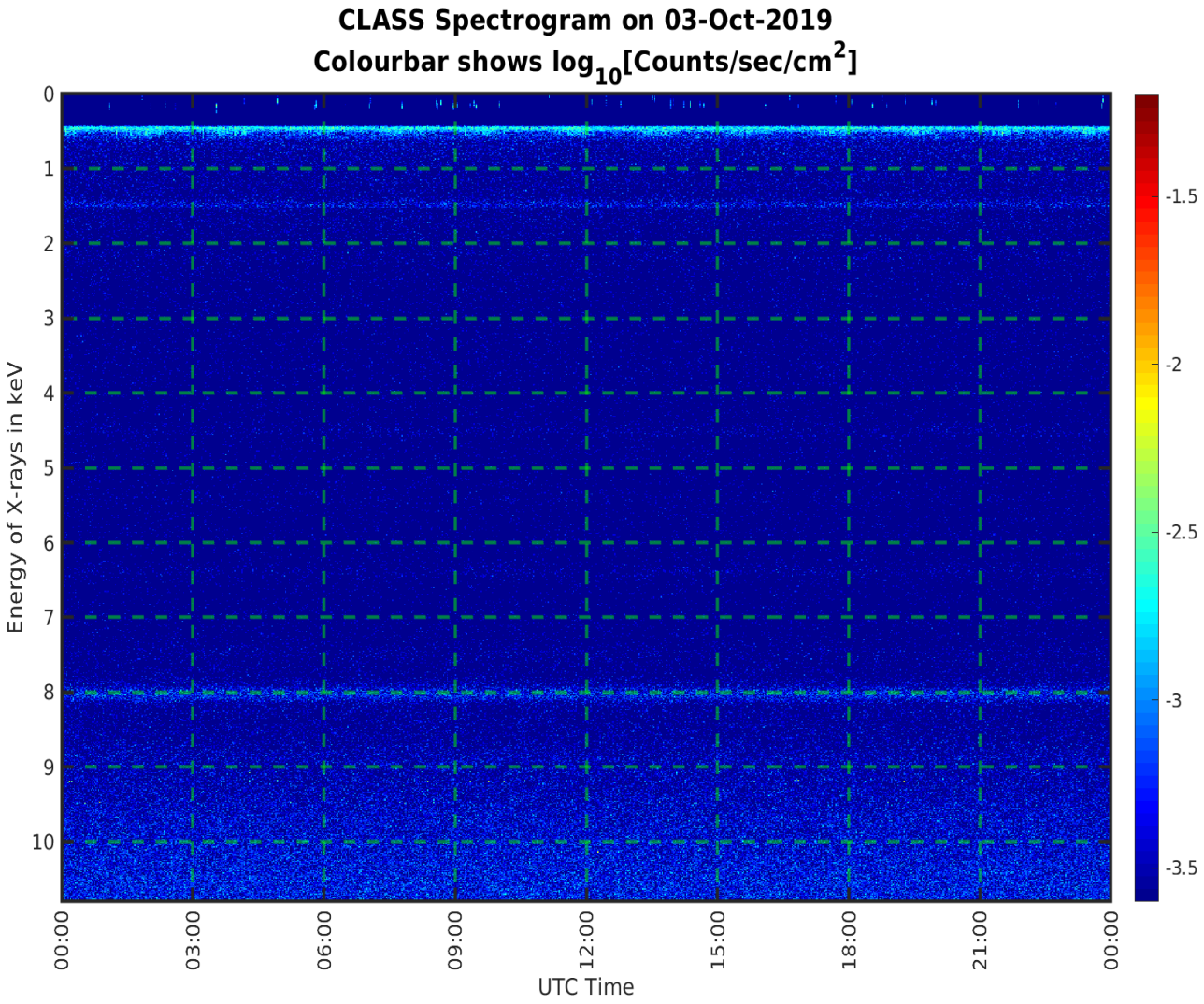
CLASS Spectrogram on 03-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
00:00
03:00
06:00
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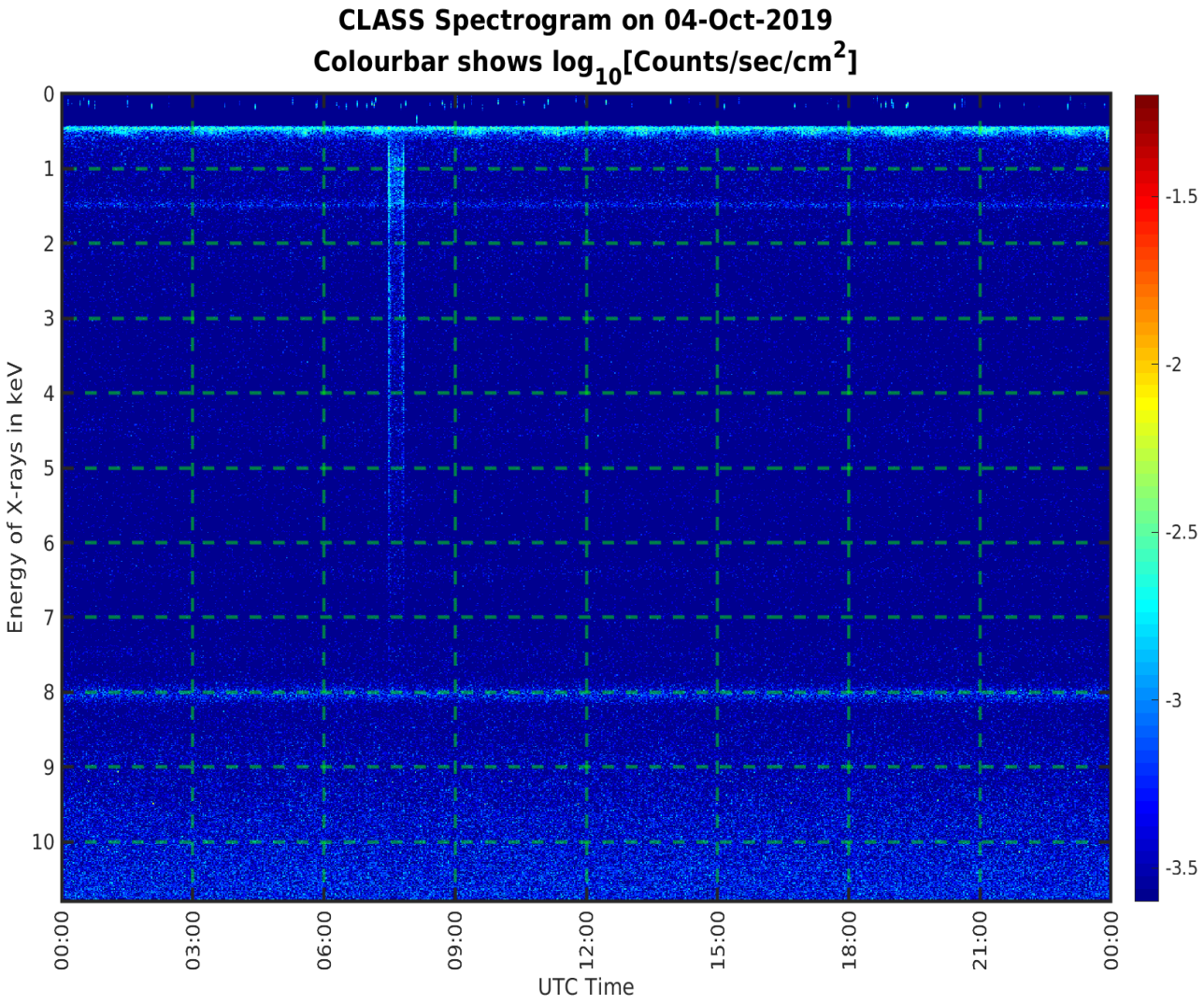
-3
-3.5


CLASS Spectrogram on 04-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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1
2
3
4
5
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9
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-2
-2.5
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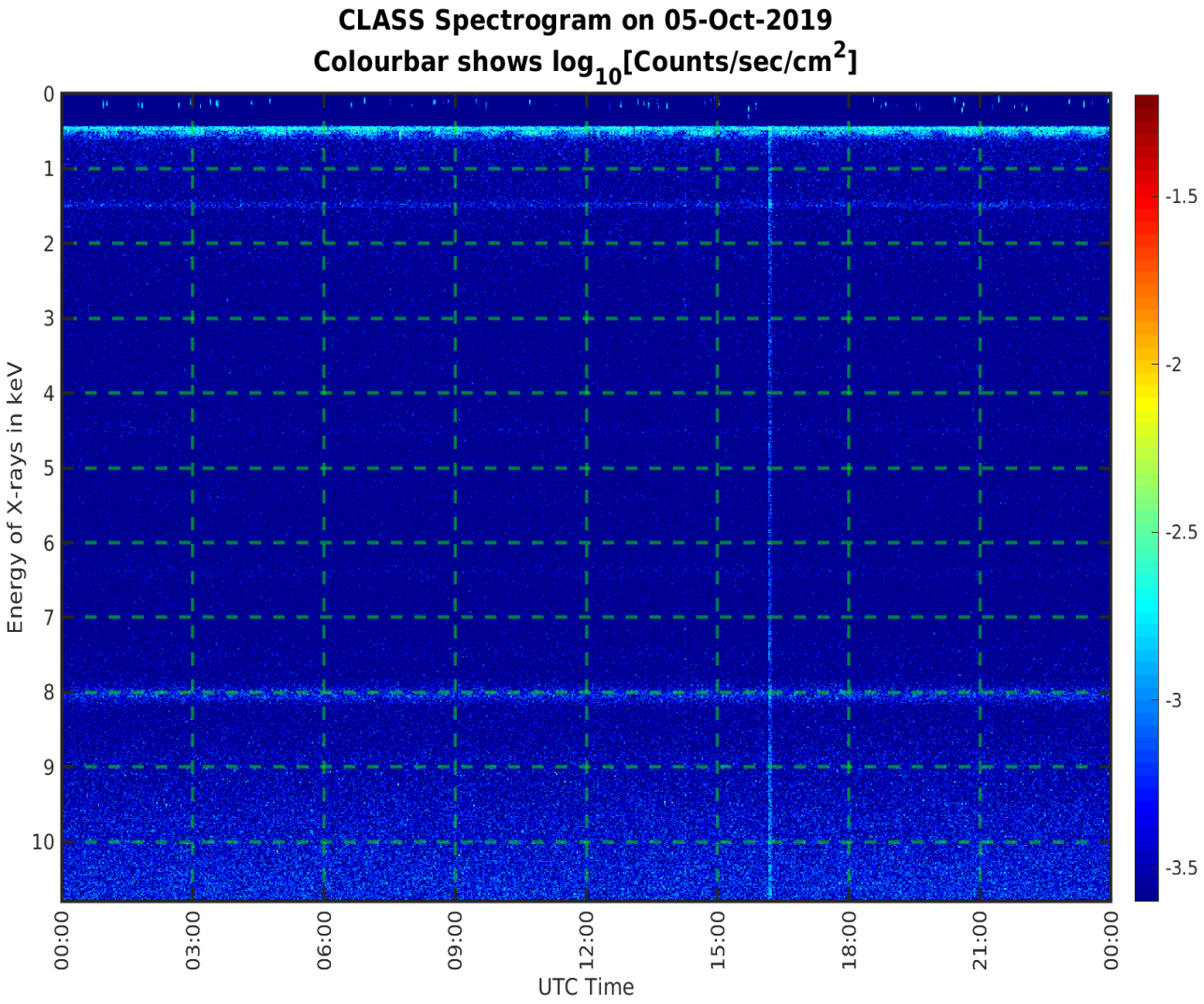
15:00
18:00
21:00
00:00
UTC Time


CLASS Spectrogram on 05-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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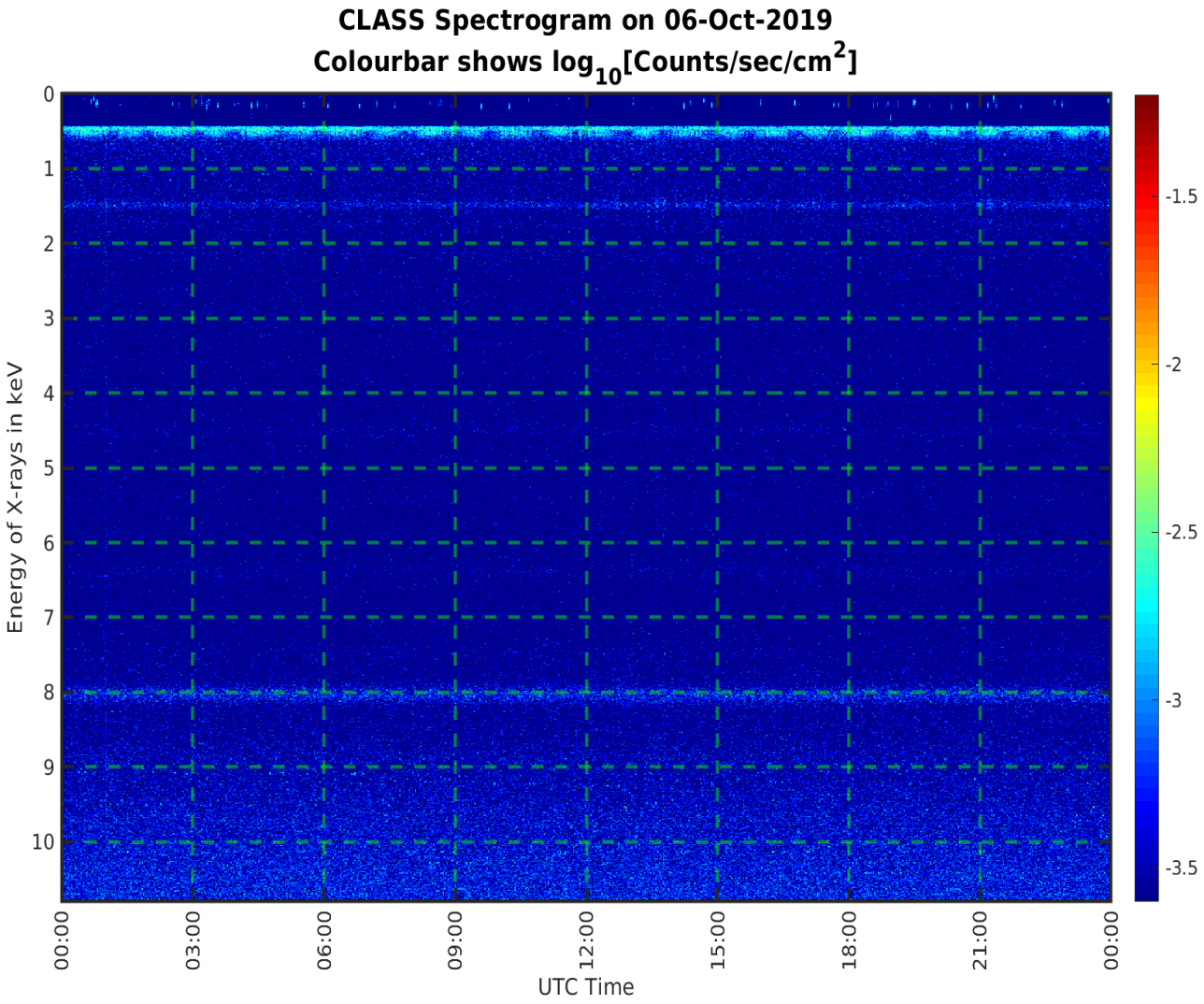
CLASS Spectrogram on 06-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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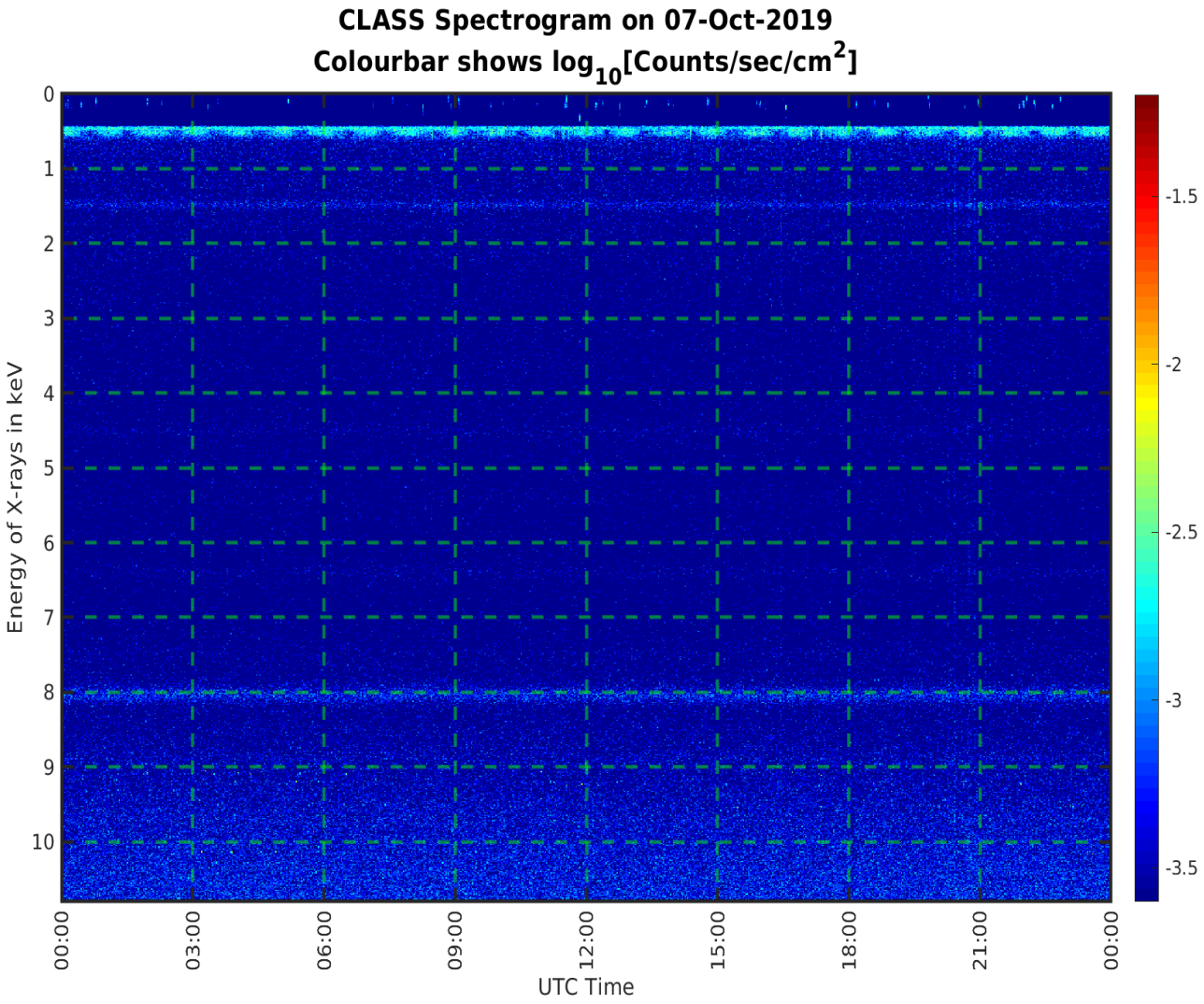
CLASS Spectrogram on 07-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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03:00
06:00
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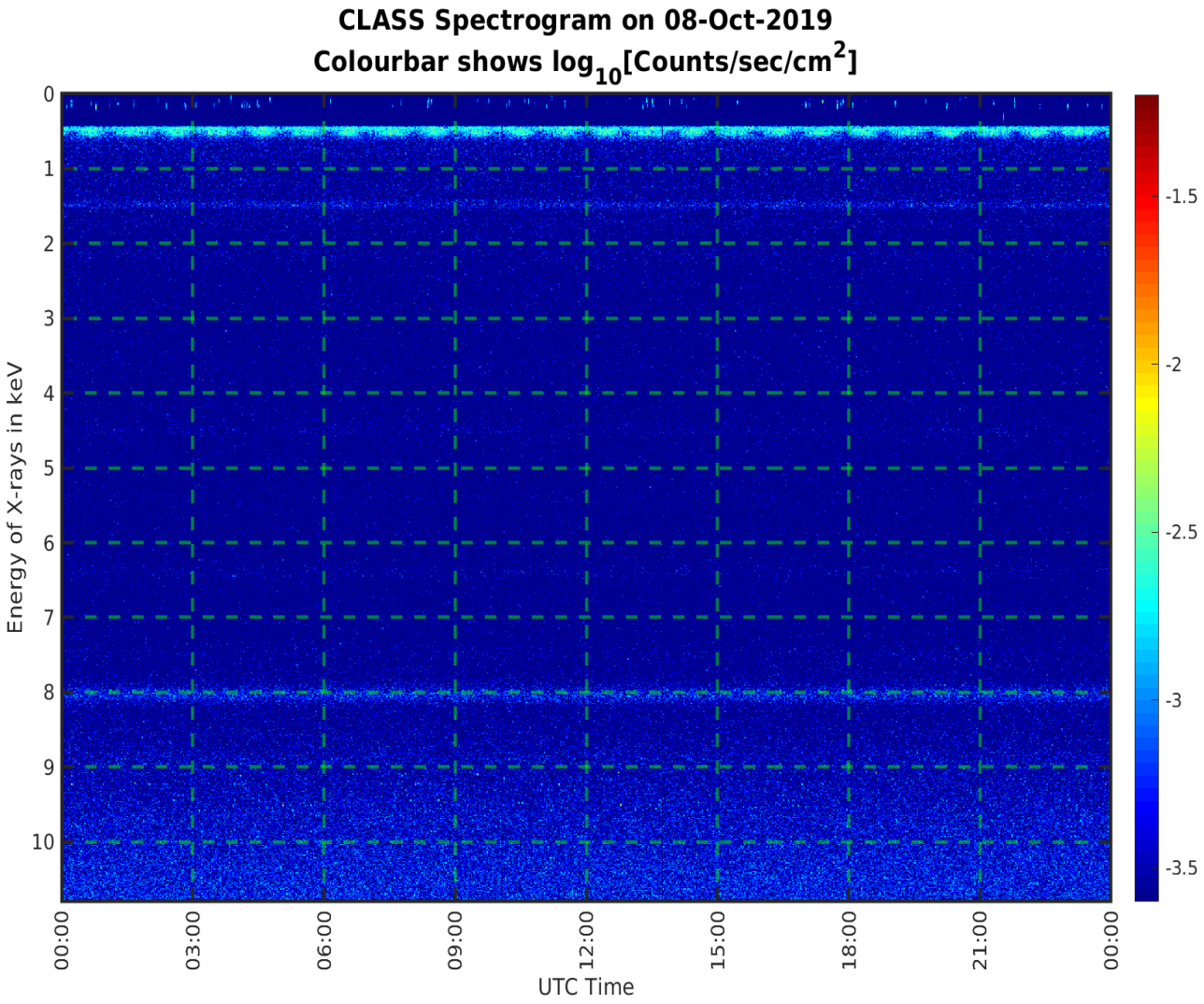
-3.5


CLASS Spectrogram on 08-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
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-1.5
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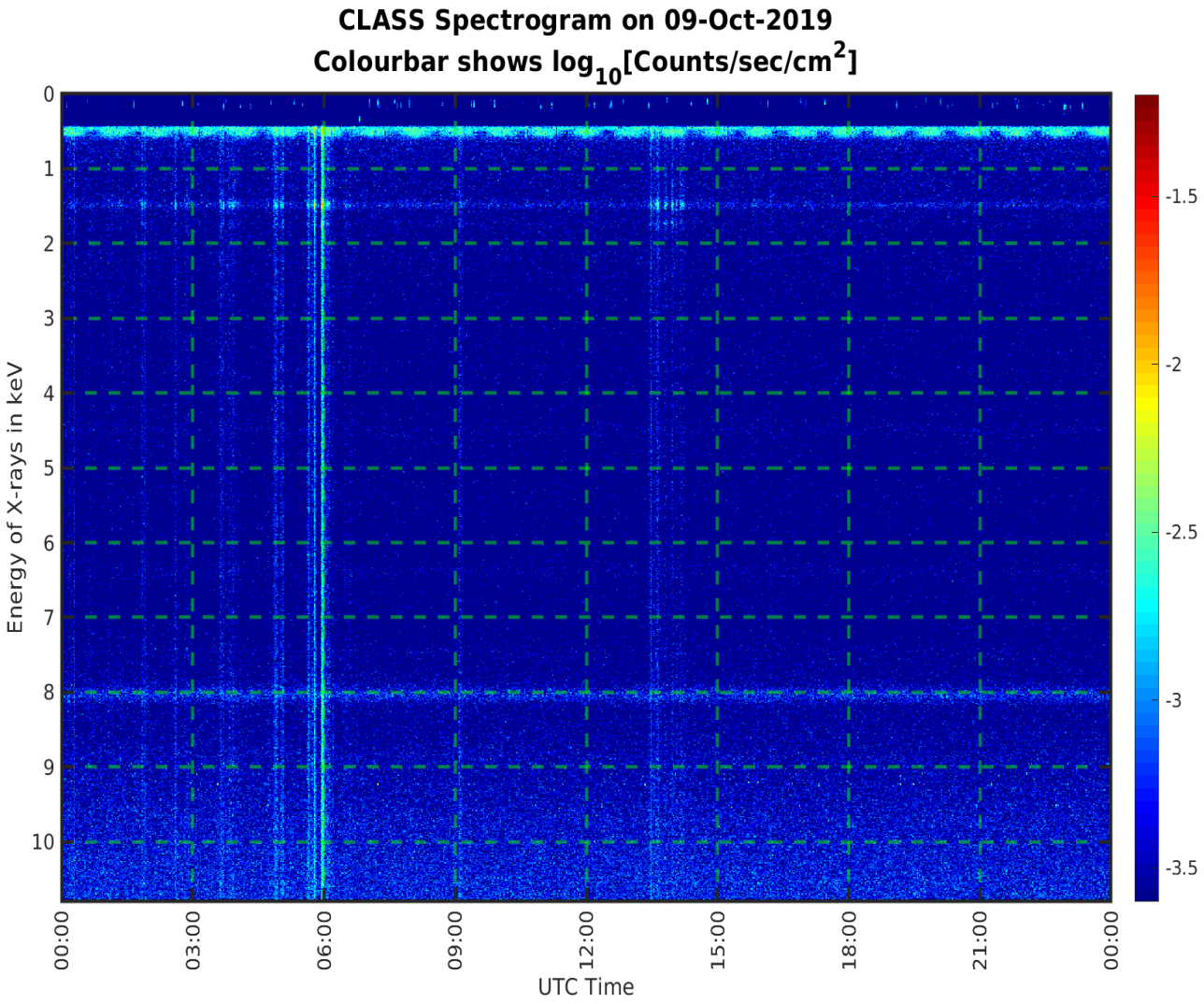
UTC Time


CLASS Spectrogram on 09-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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03:00
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-2.5
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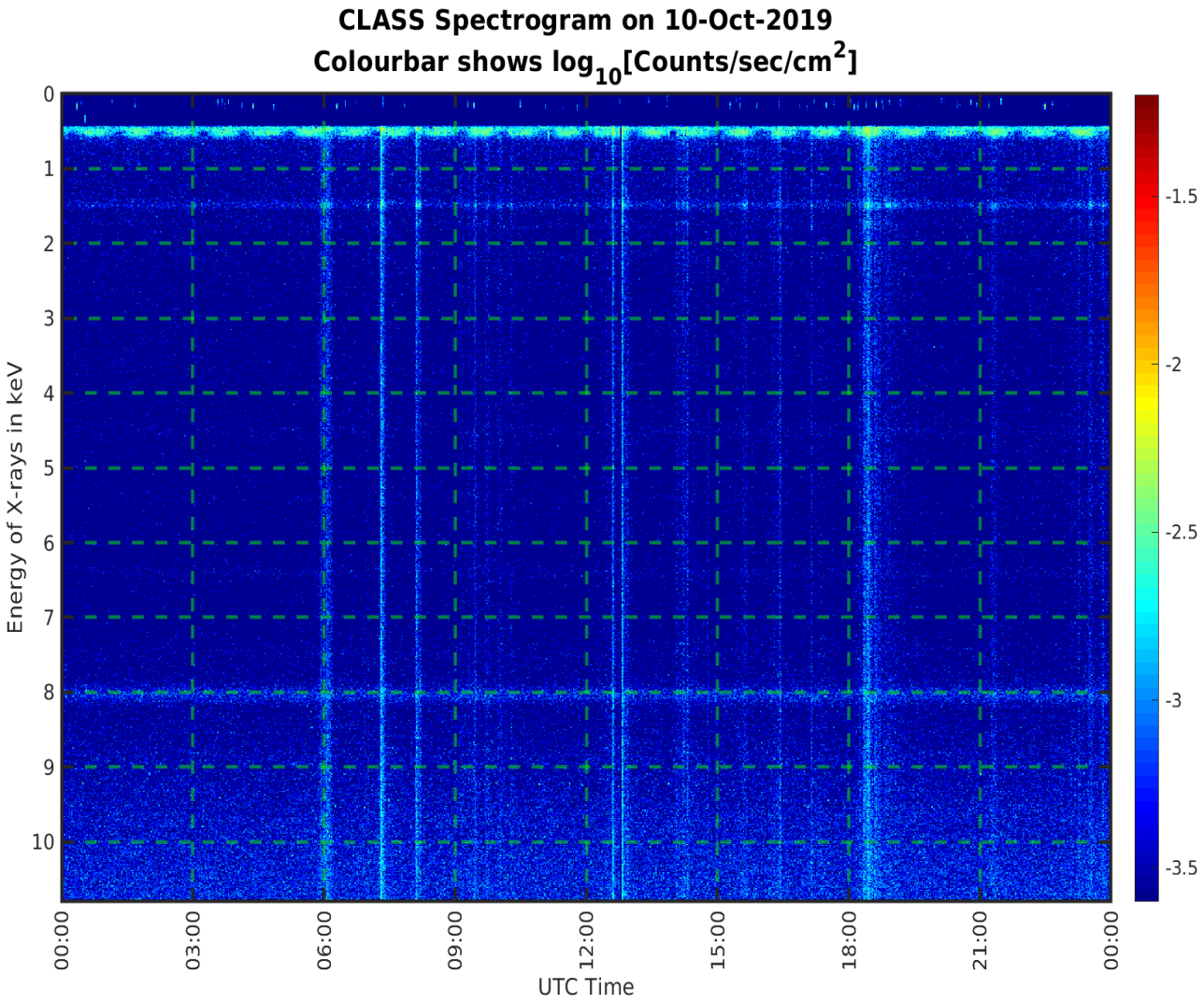
CLASS Spectrogram on 10-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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03:00
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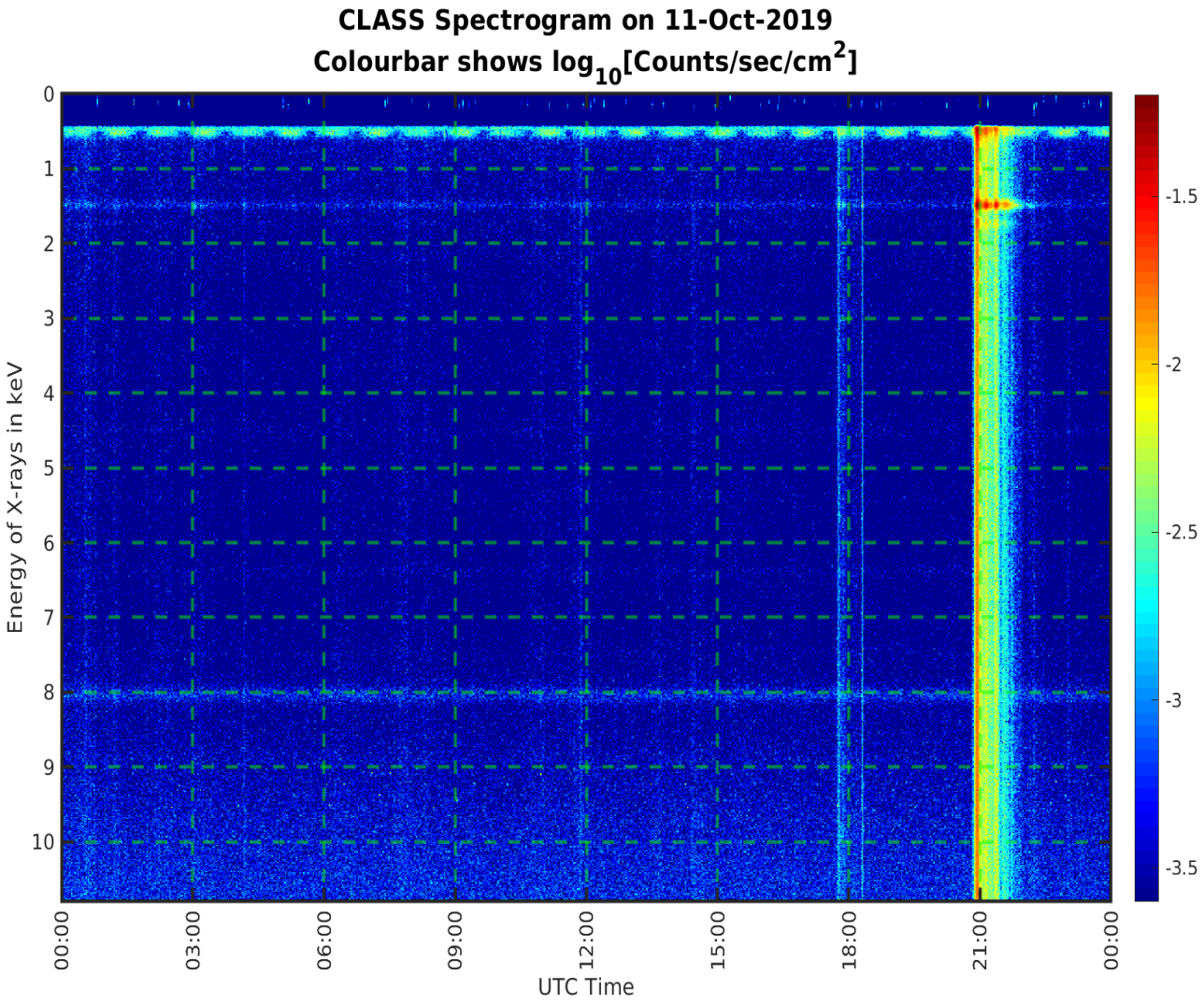
CLASS Spectrogram on 11-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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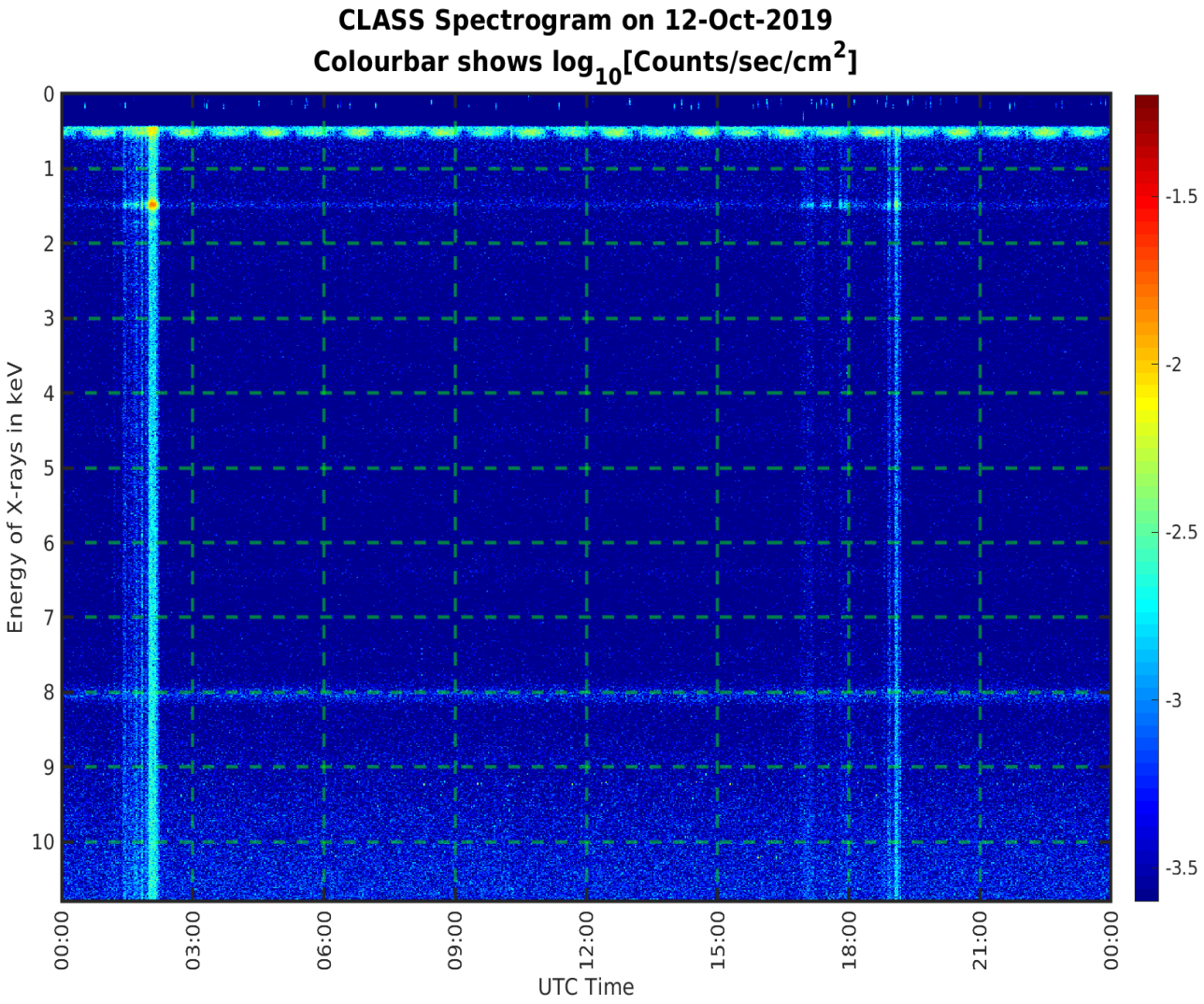
CLASS Spectrogram on 12-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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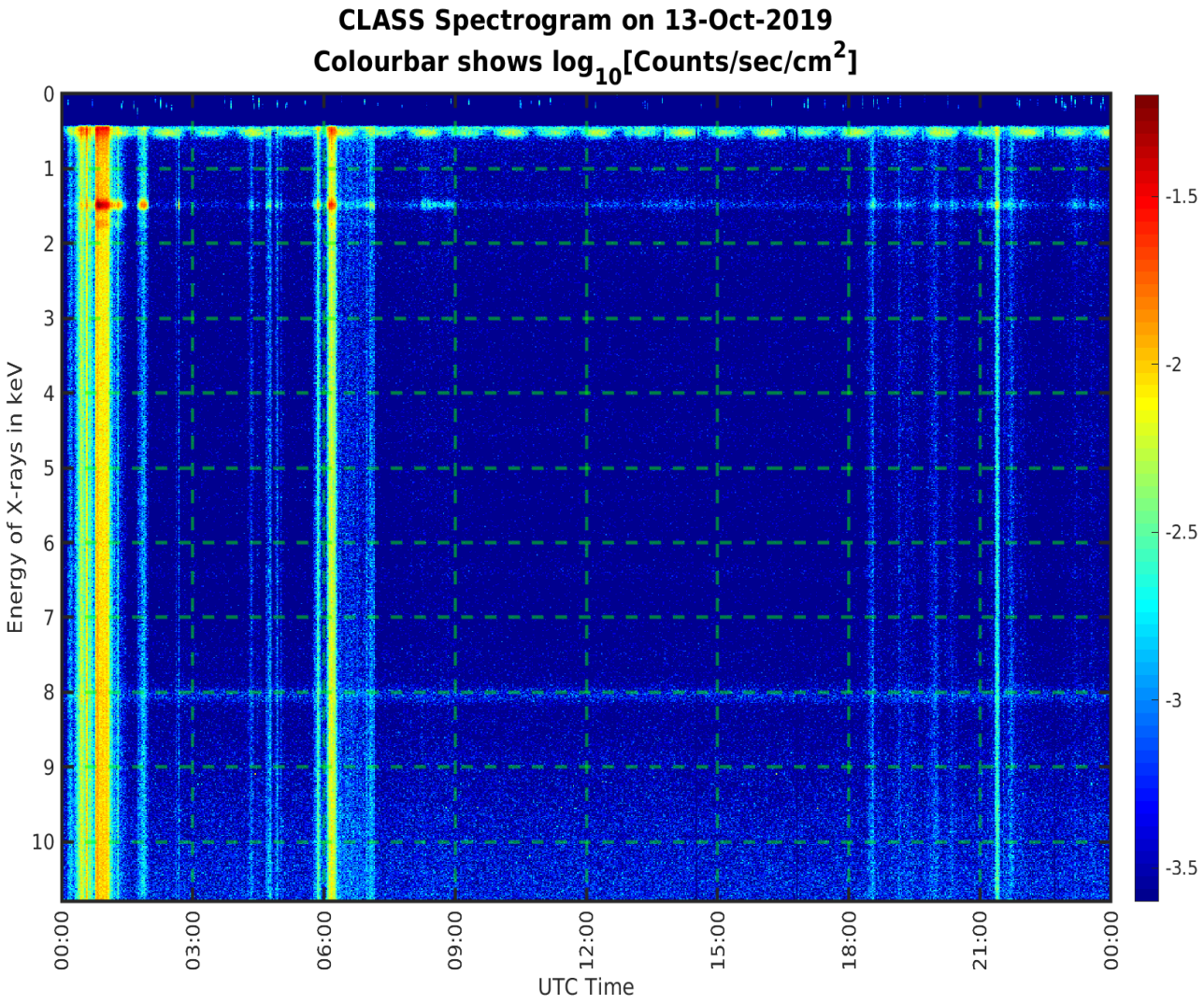
CLASS Spectrogram on 13-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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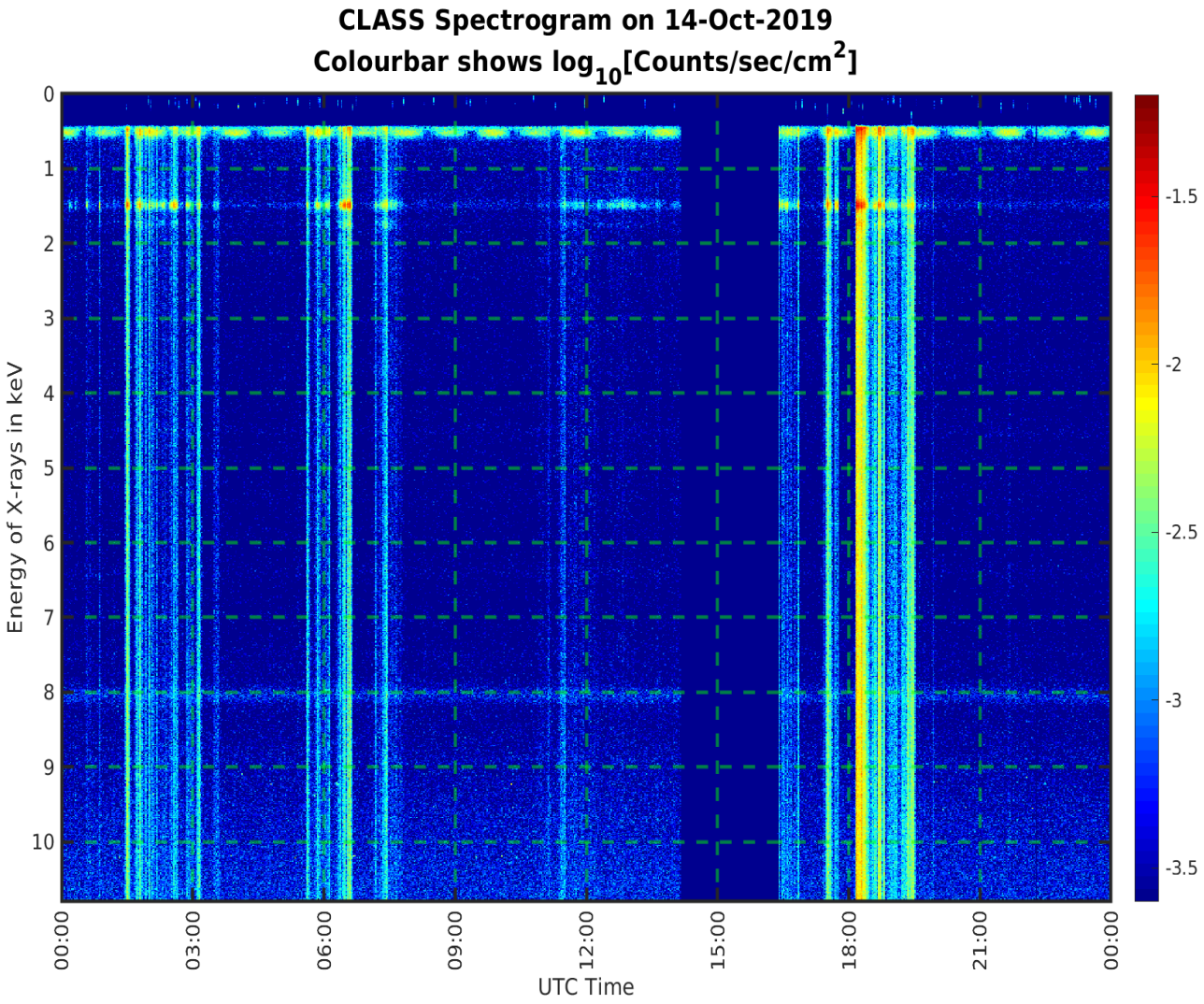
UTC Time


CLASS Spectrogram on 14-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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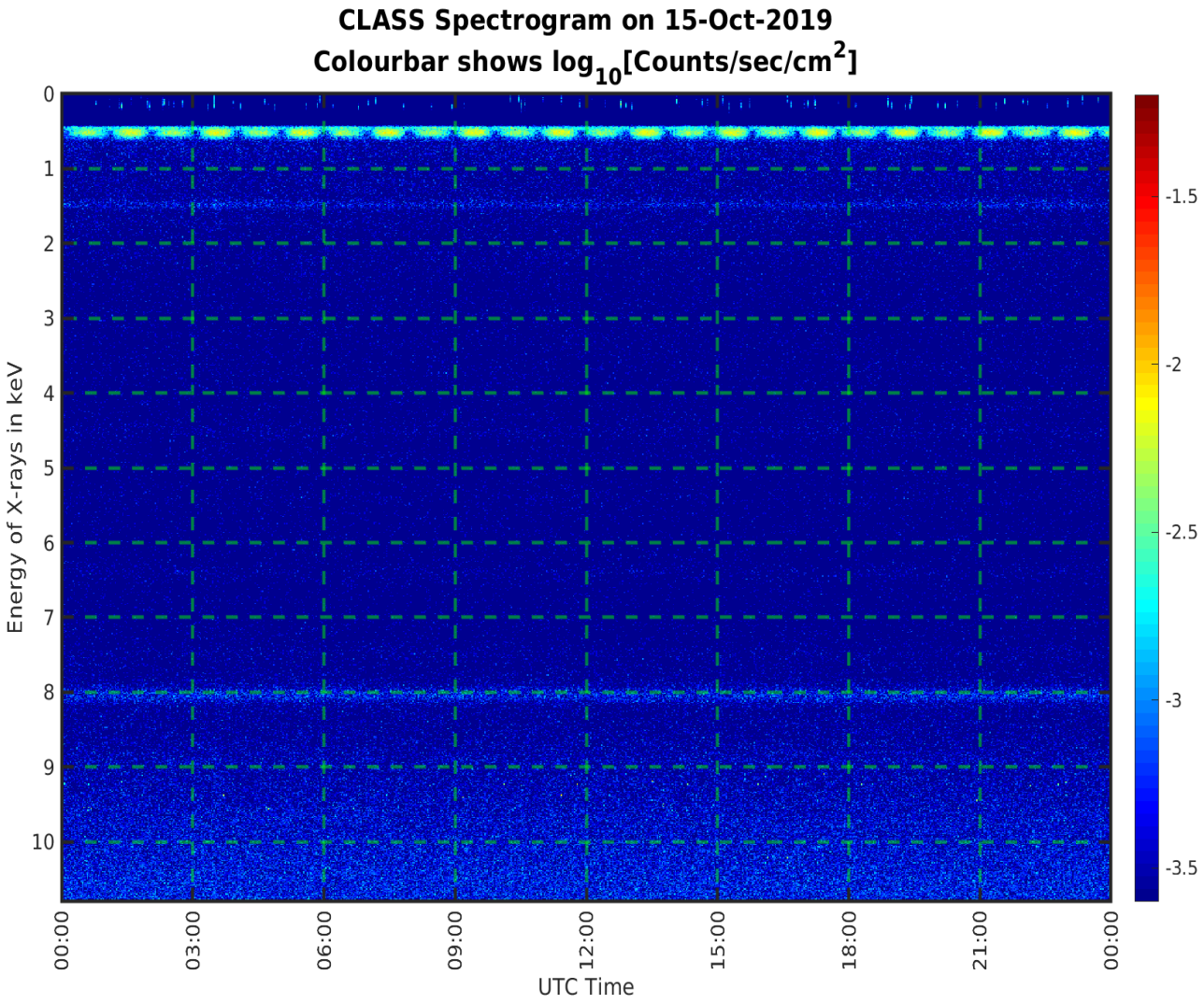
UTC Time


CLASS Spectrogram on 15-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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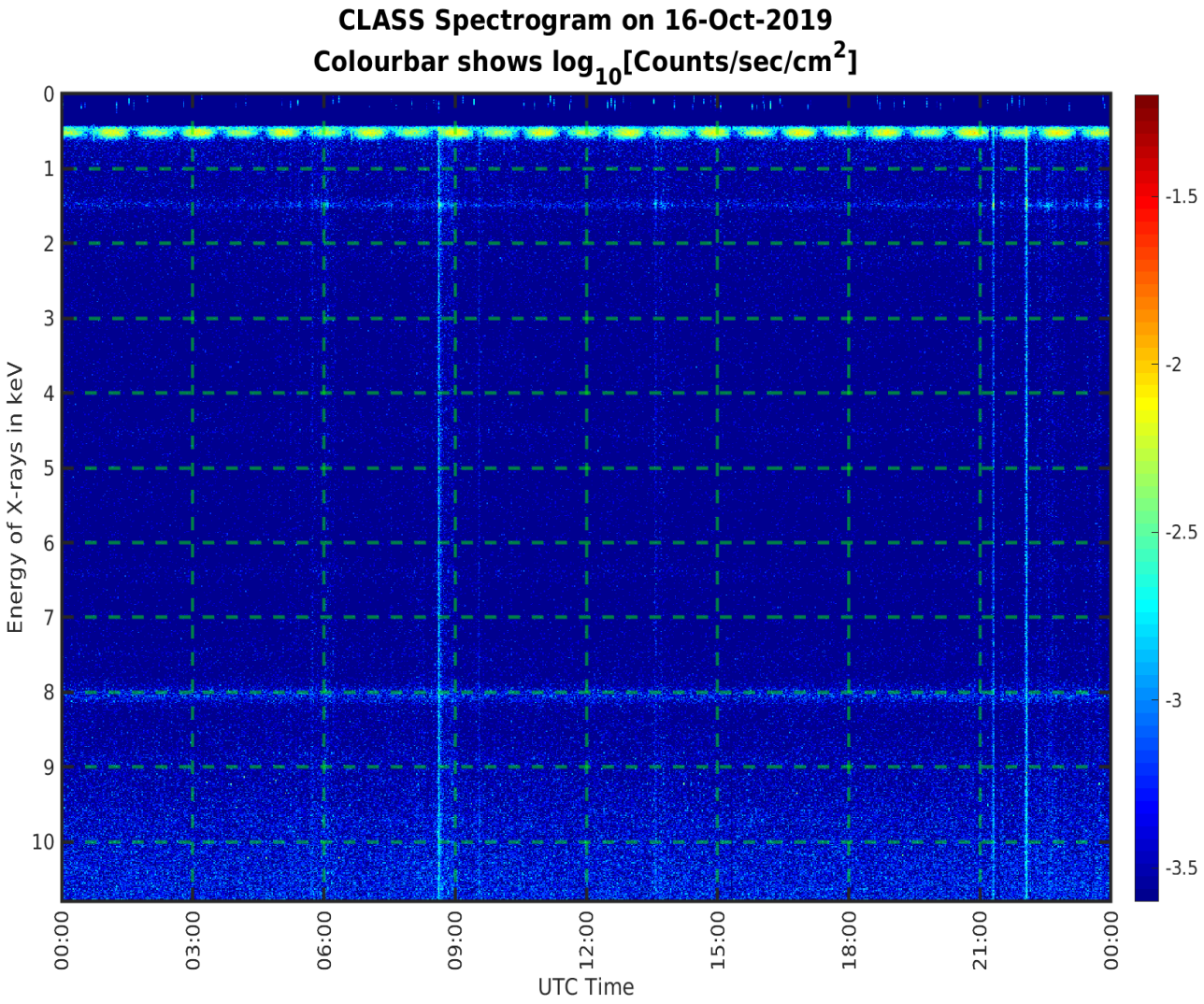
CLASS Spectrogram on 16-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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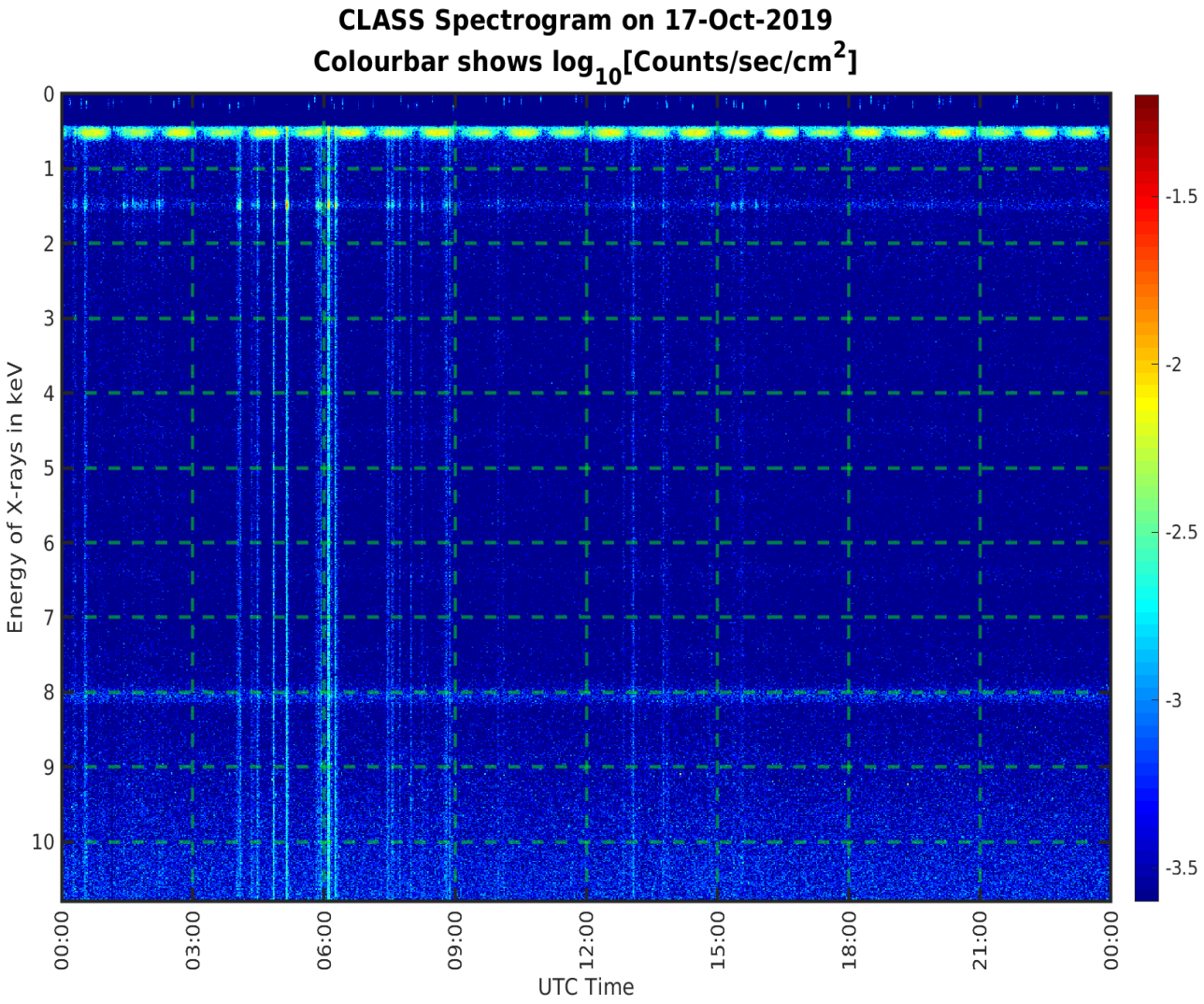
CLASS Spectrogram on 17-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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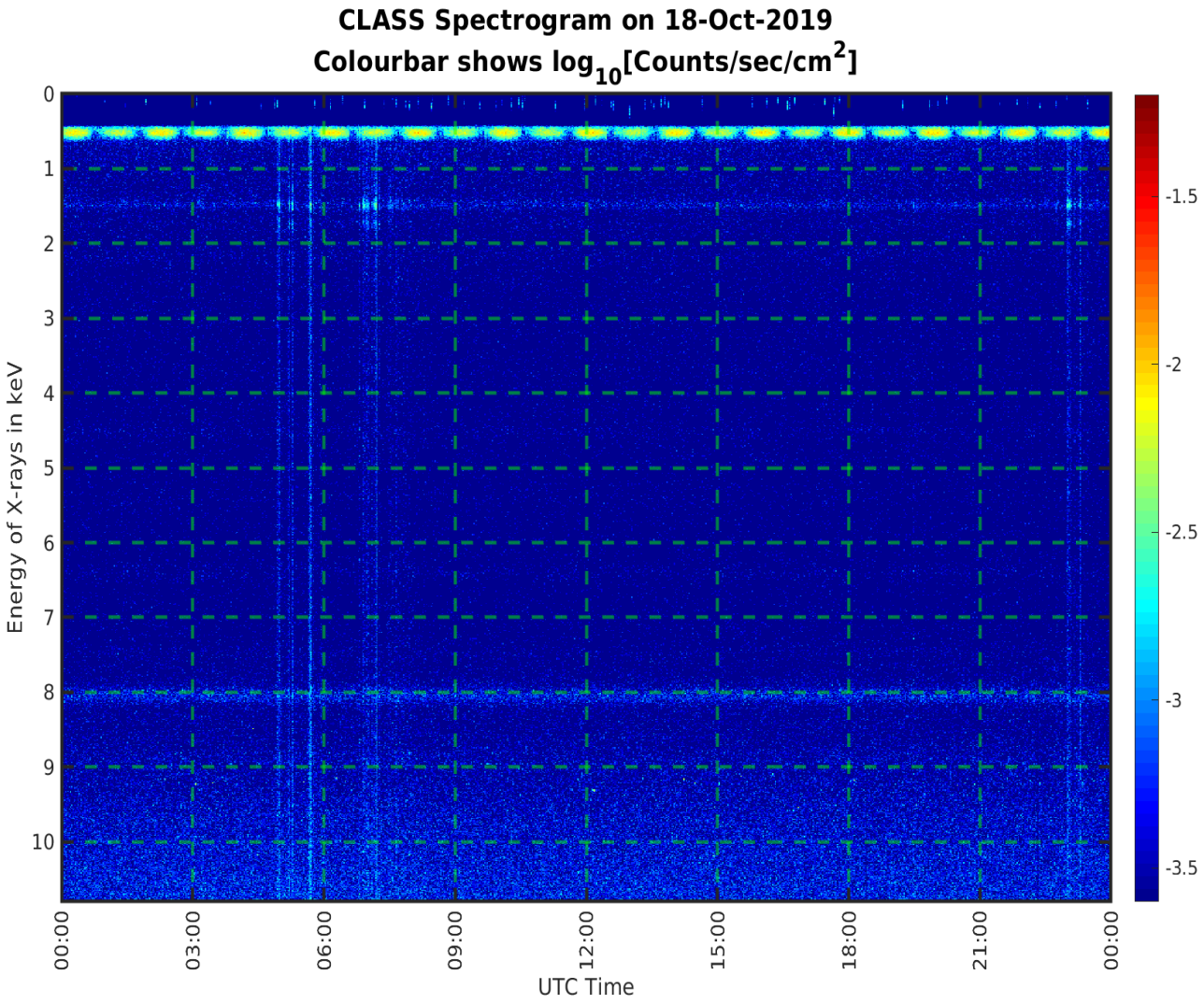
CLASS Spectrogram on 18-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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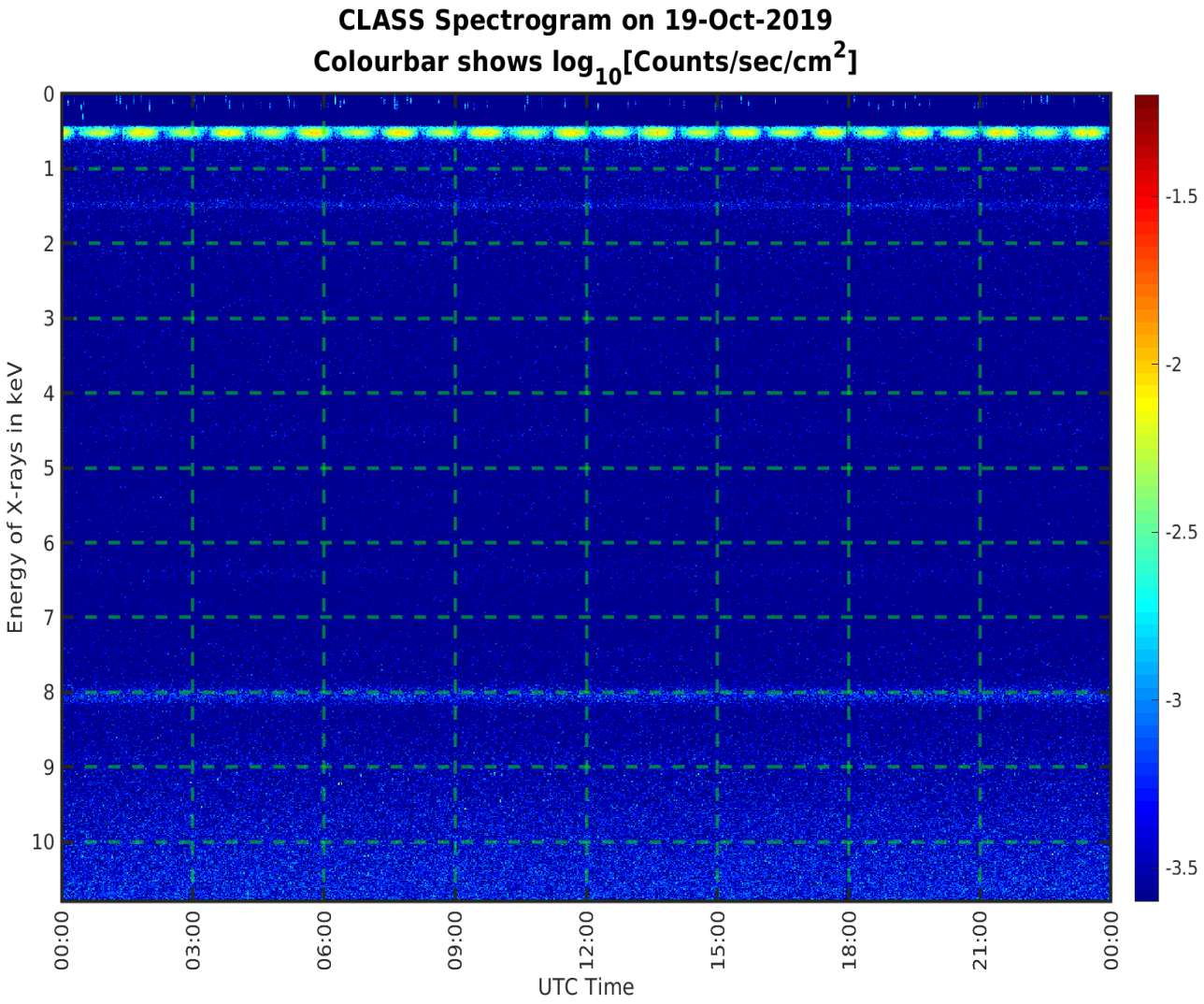
CLASS Spectrogram on 19-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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03:00
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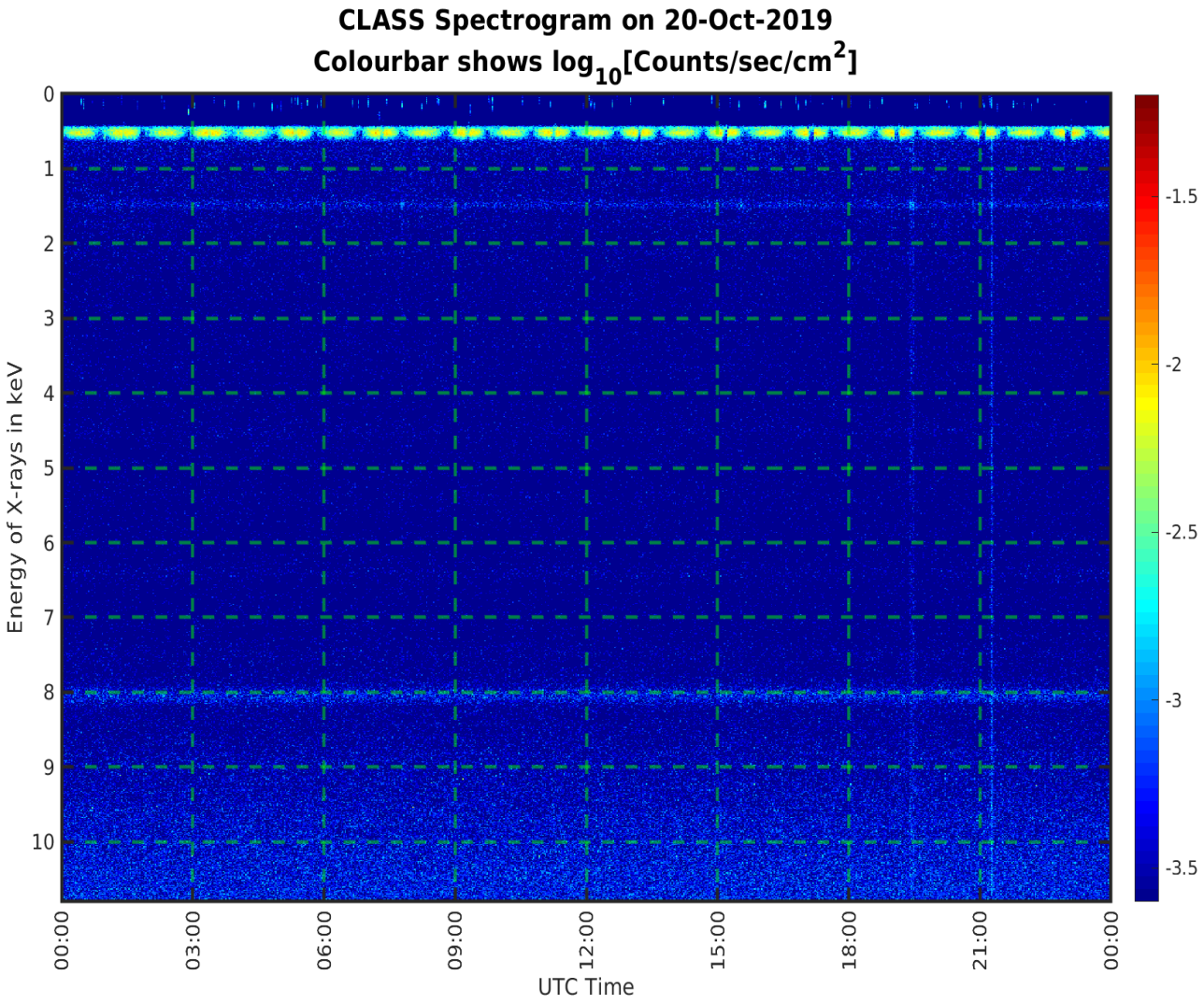
CLASS Spectrogram on 20-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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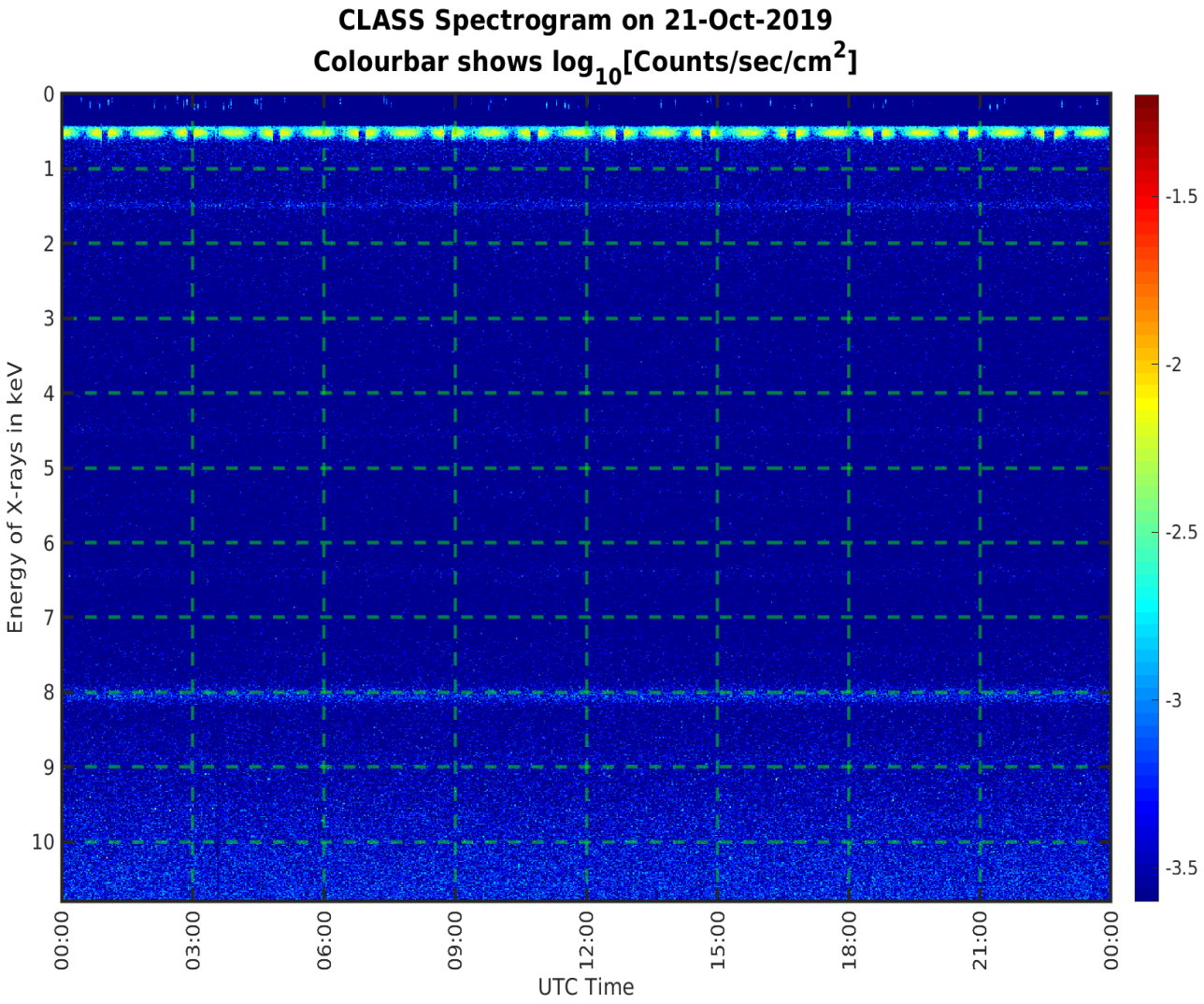
UTC Time


CLASS Spectrogram on 21-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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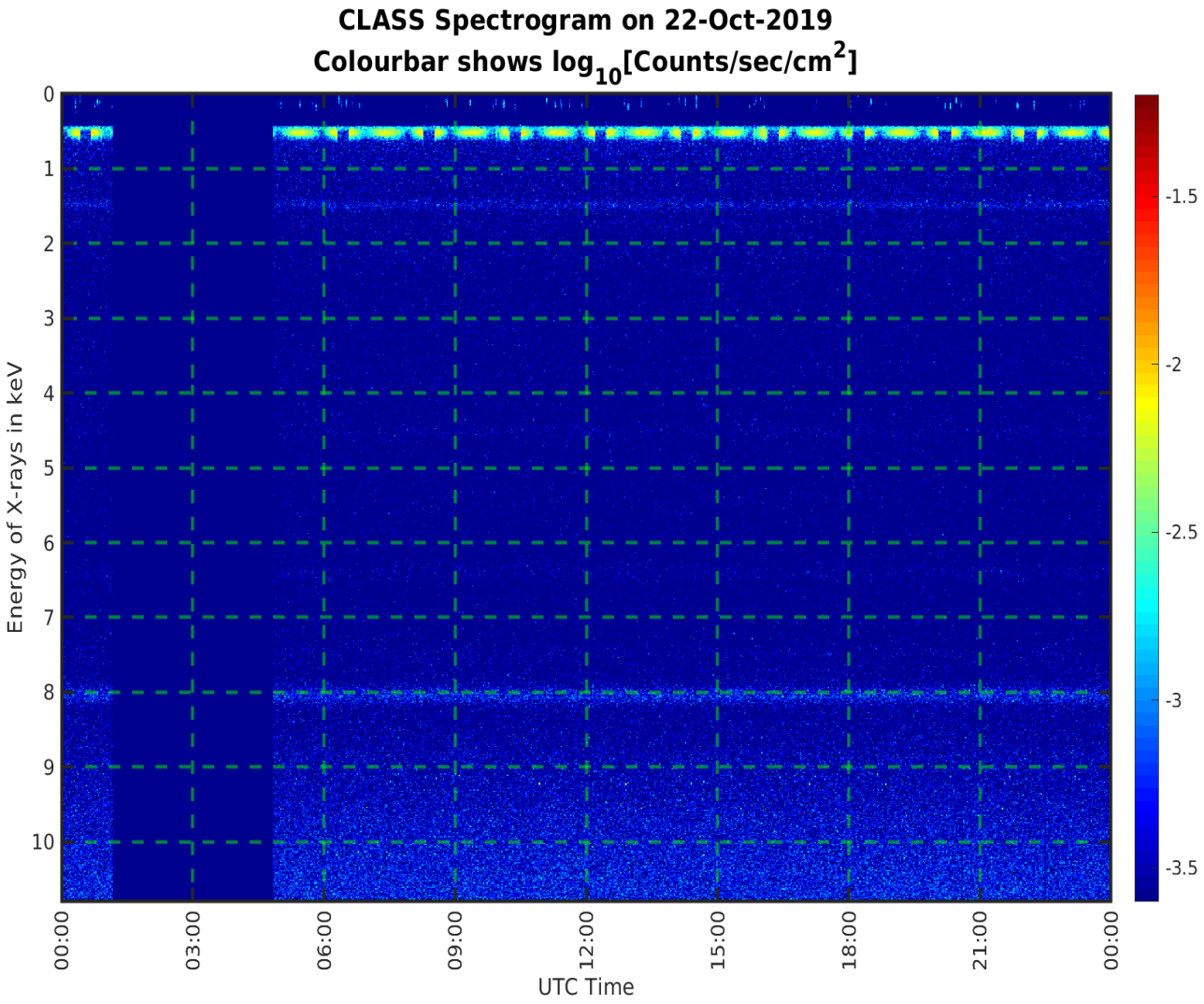
CLASS Spectrogram on 22-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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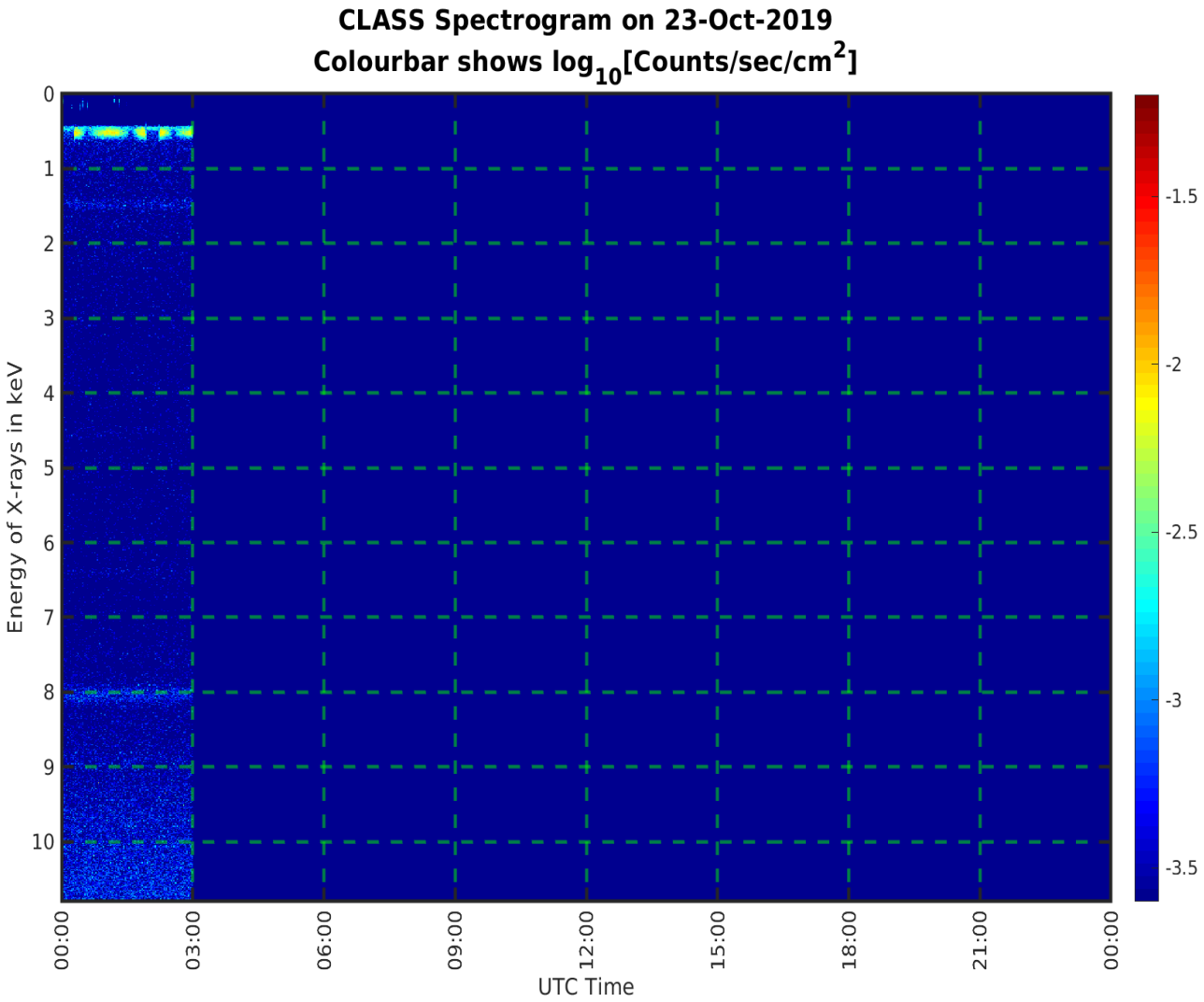
UTC Time


CLASS Spectrogram on 23-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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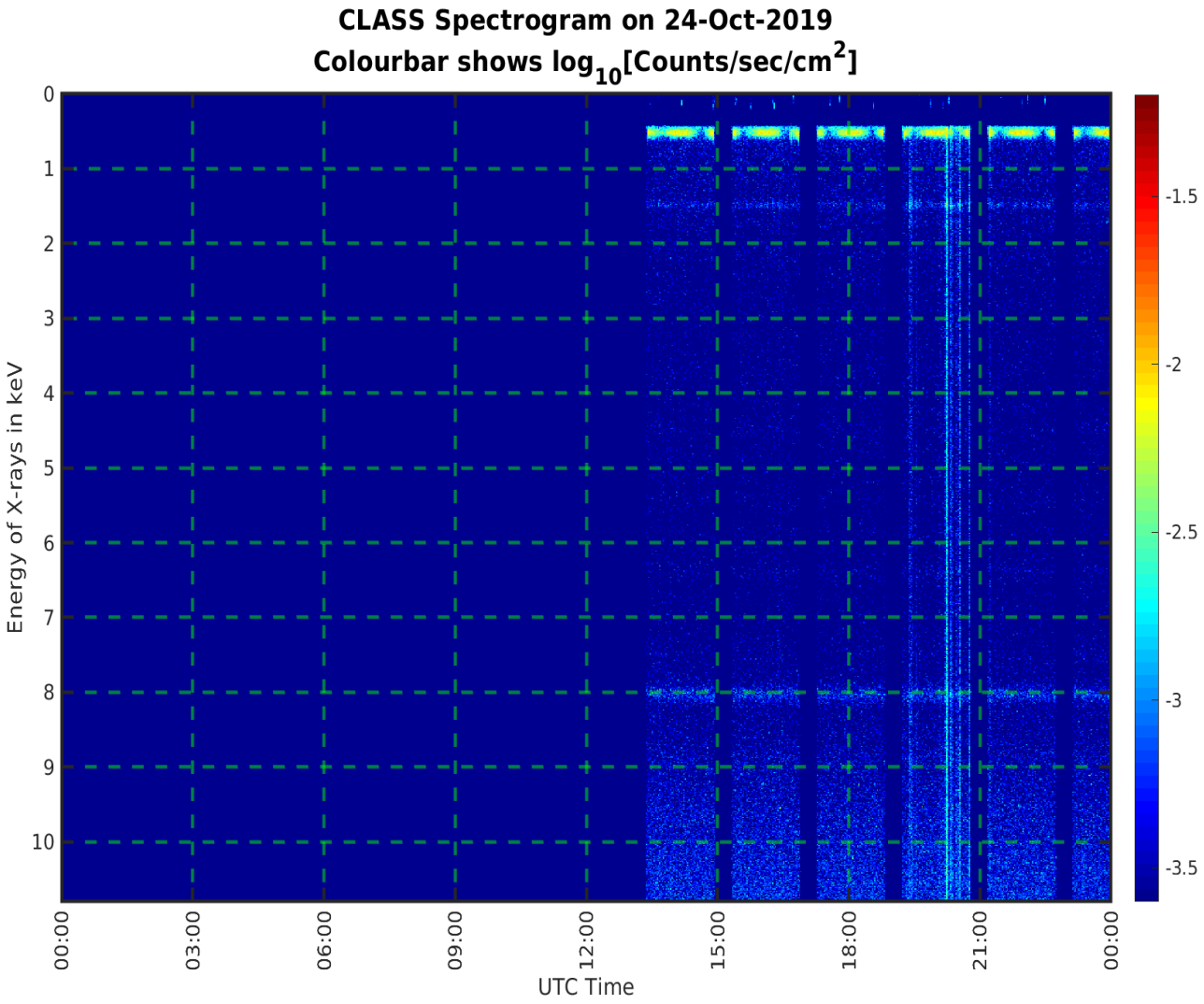
CLASS Spectrogram on 24-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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UTC Time
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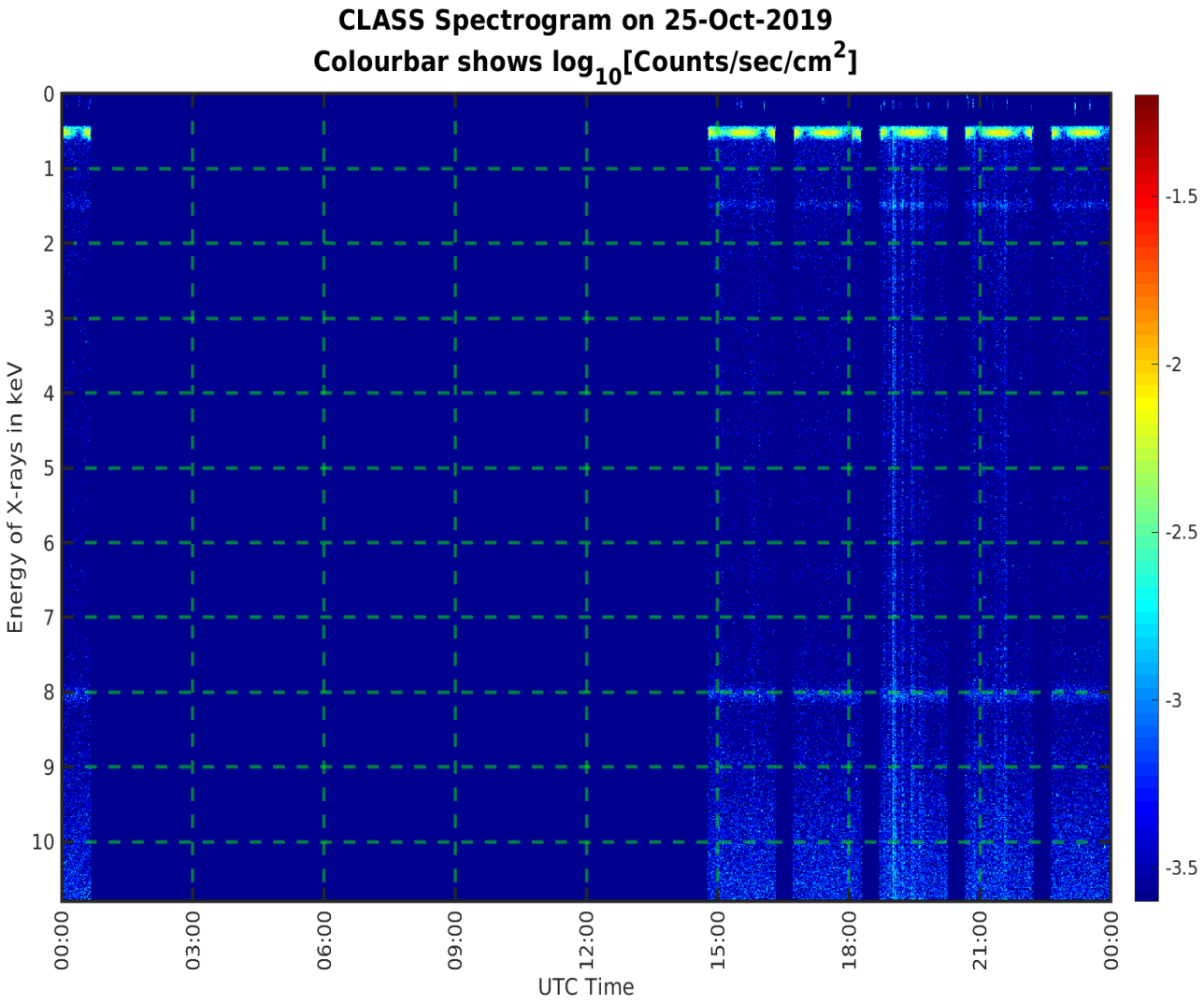
CLASS Spectrogram on 25-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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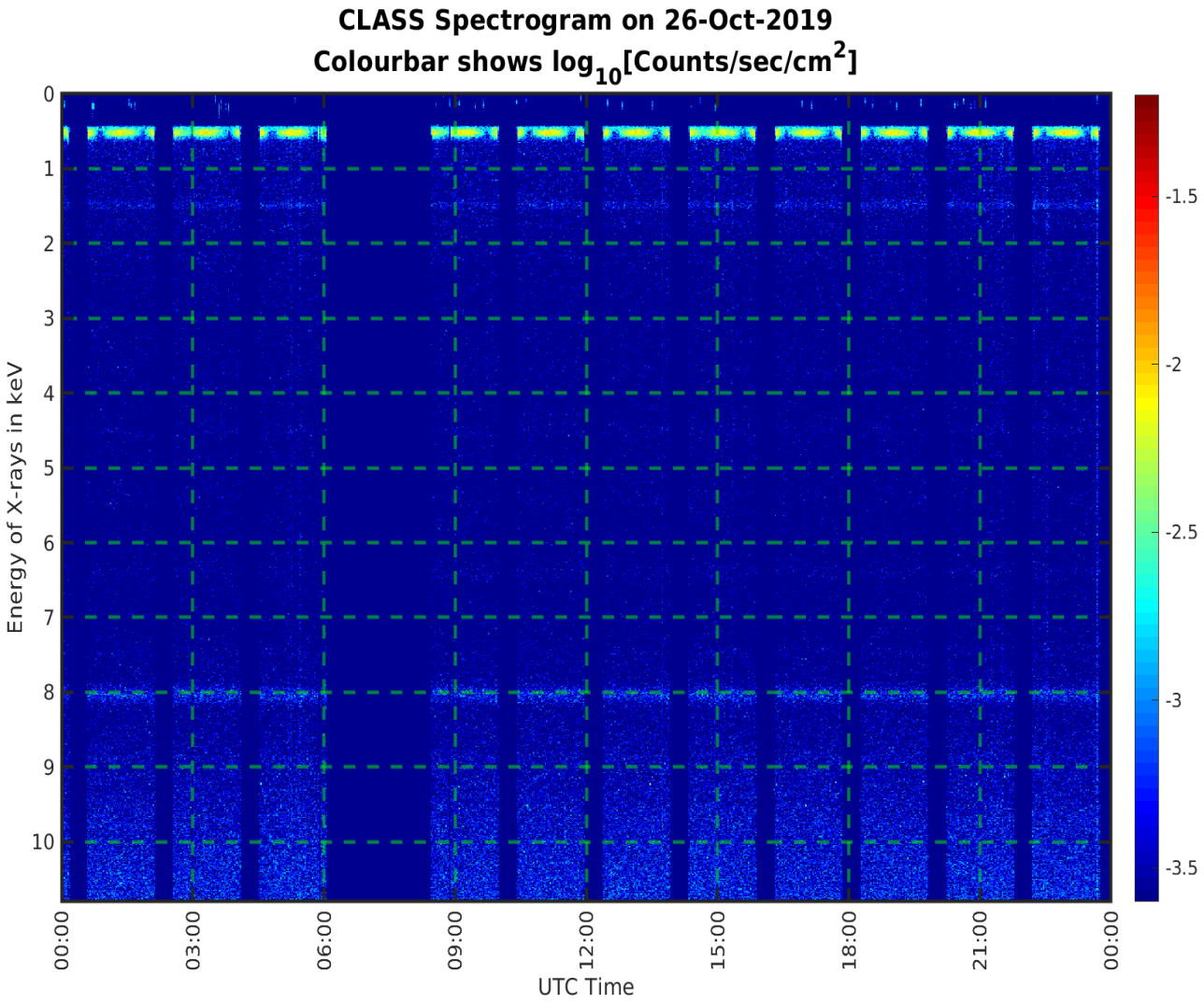
CLASS Spectrogram on 26-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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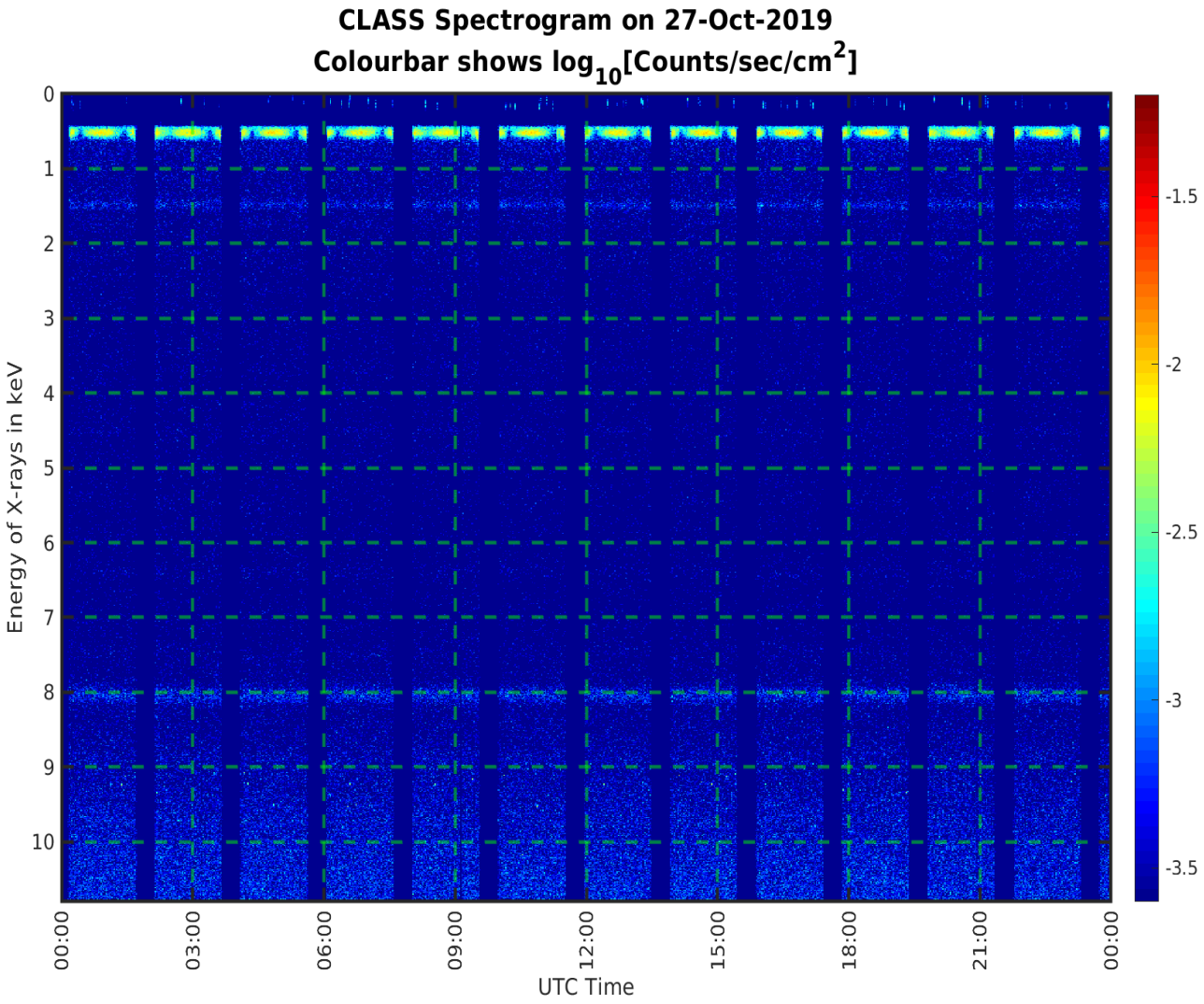
CLASS Spectrogram on 27-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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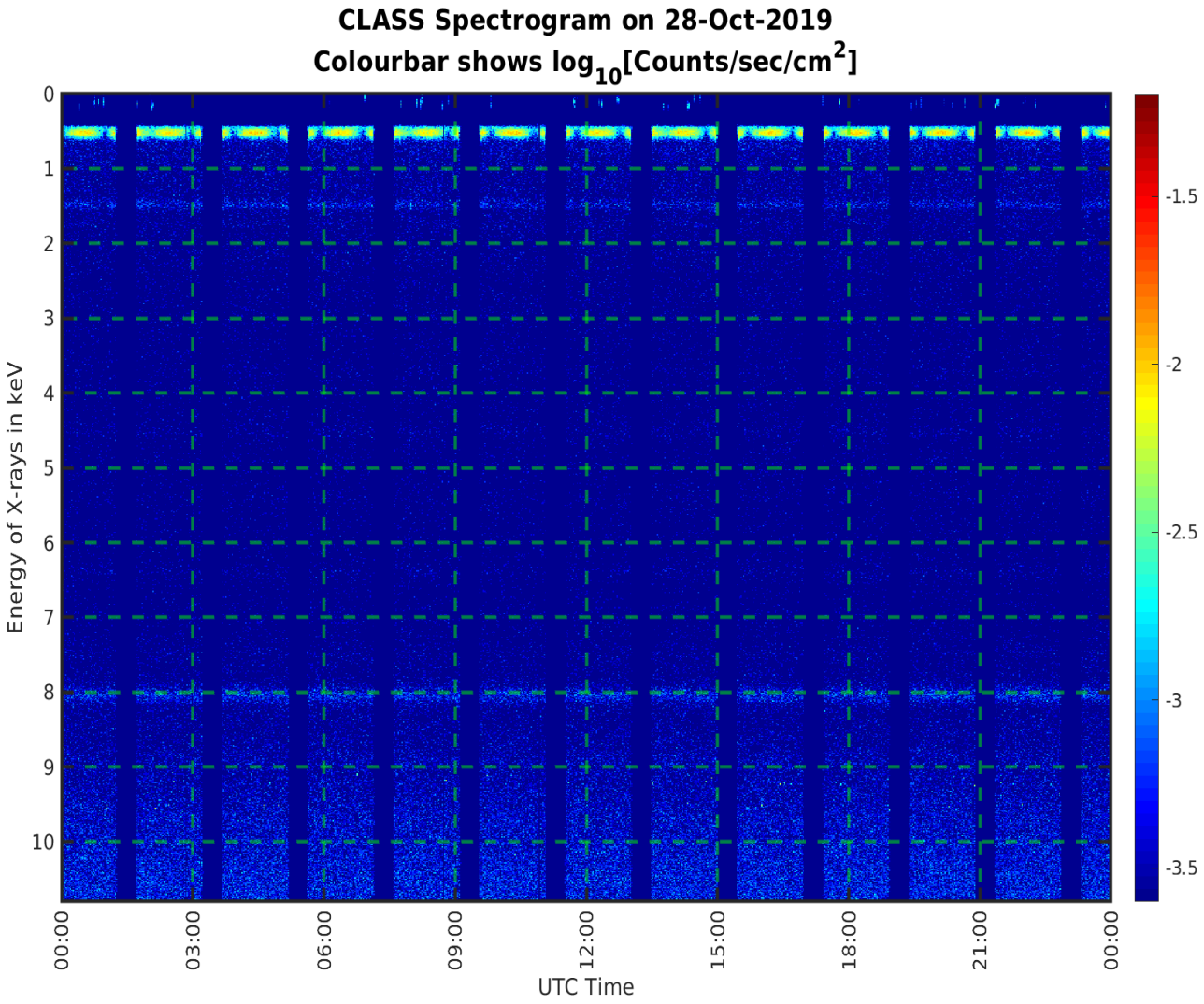
CLASS Spectrogram on 28-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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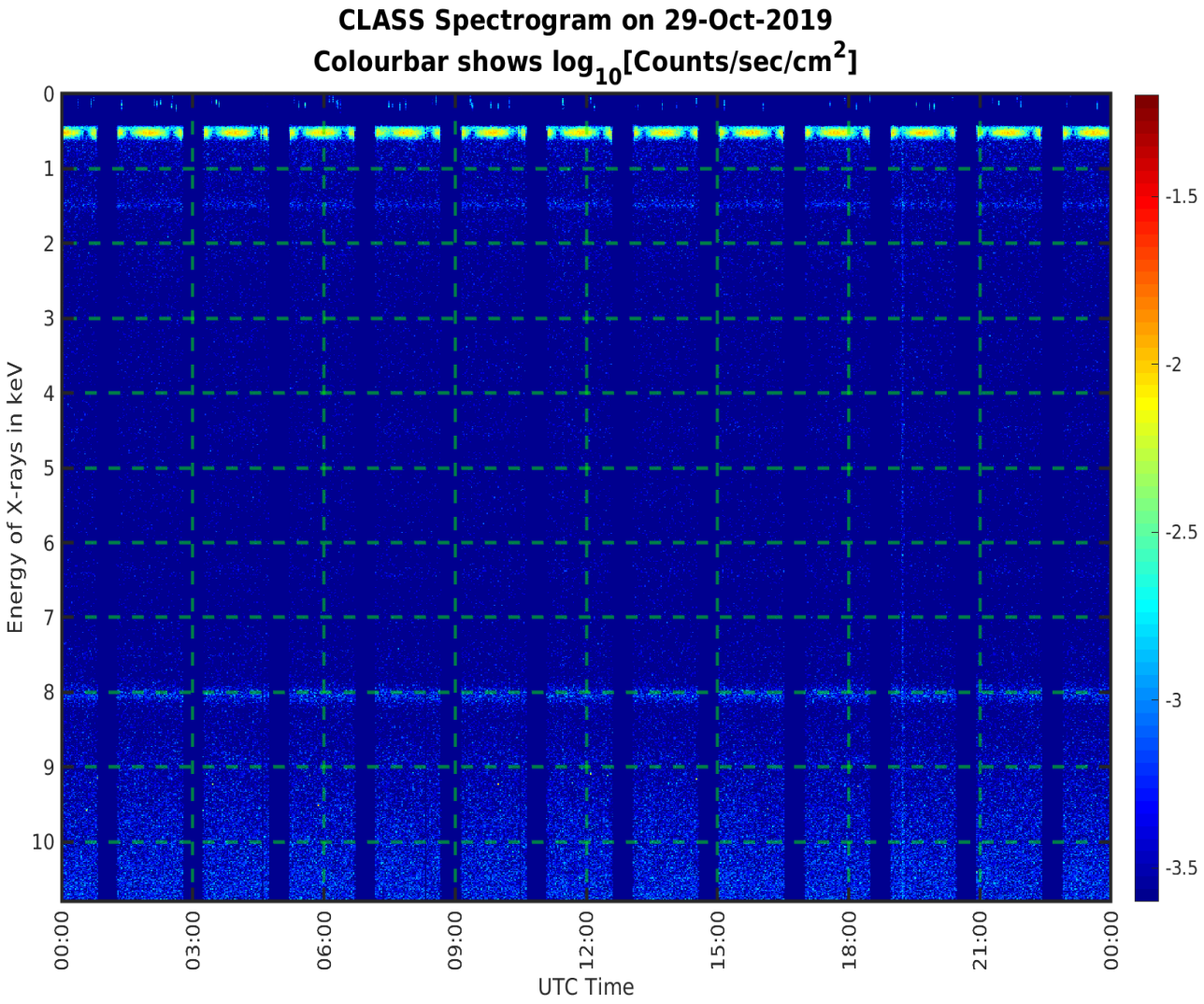
CLASS Spectrogram on 29-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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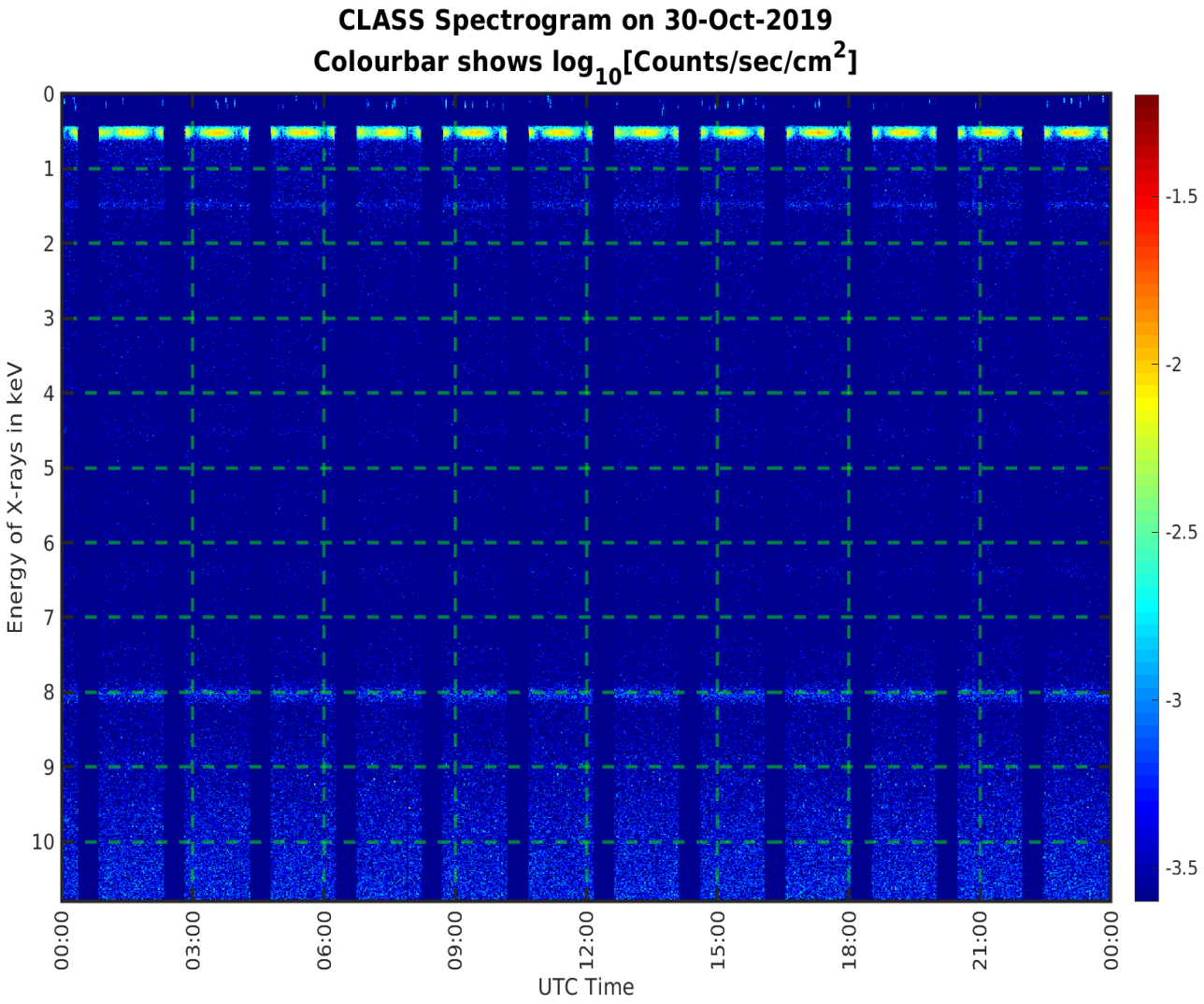
CLASS Spectrogram on 30-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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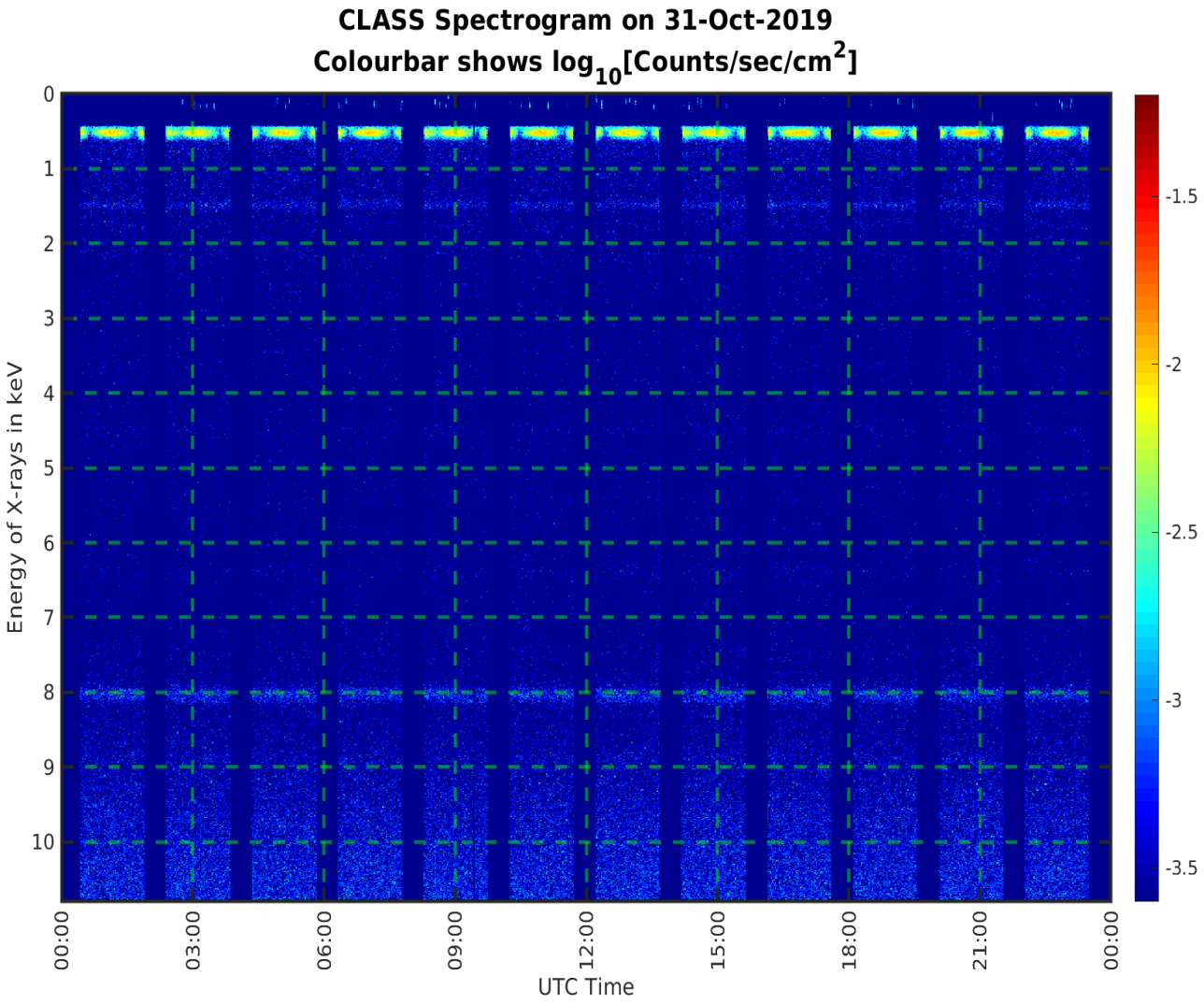
UTC Time


CLASS Spectrogram on 31-Oct-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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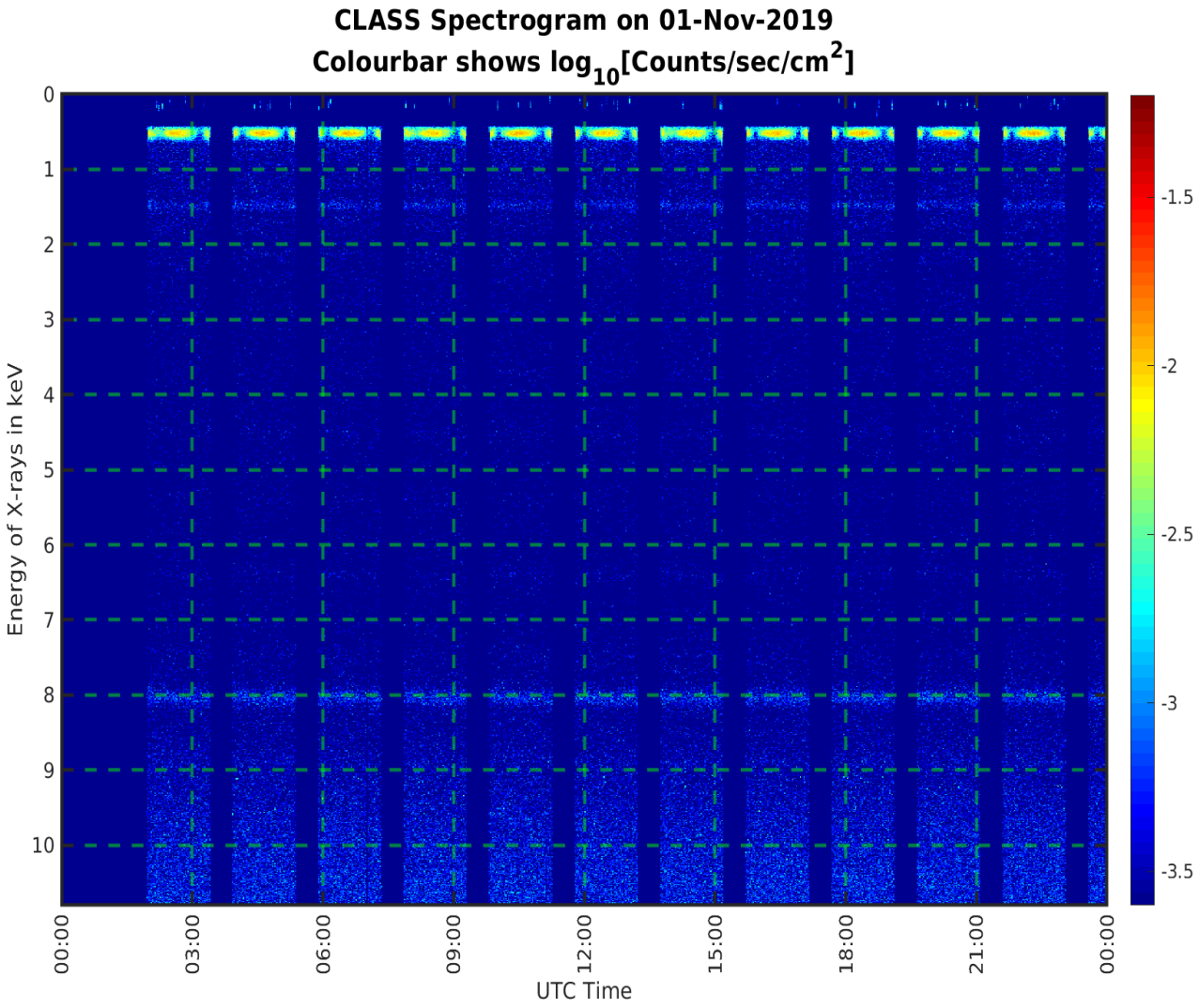
UTC Time


CLASS Spectrogram on 01-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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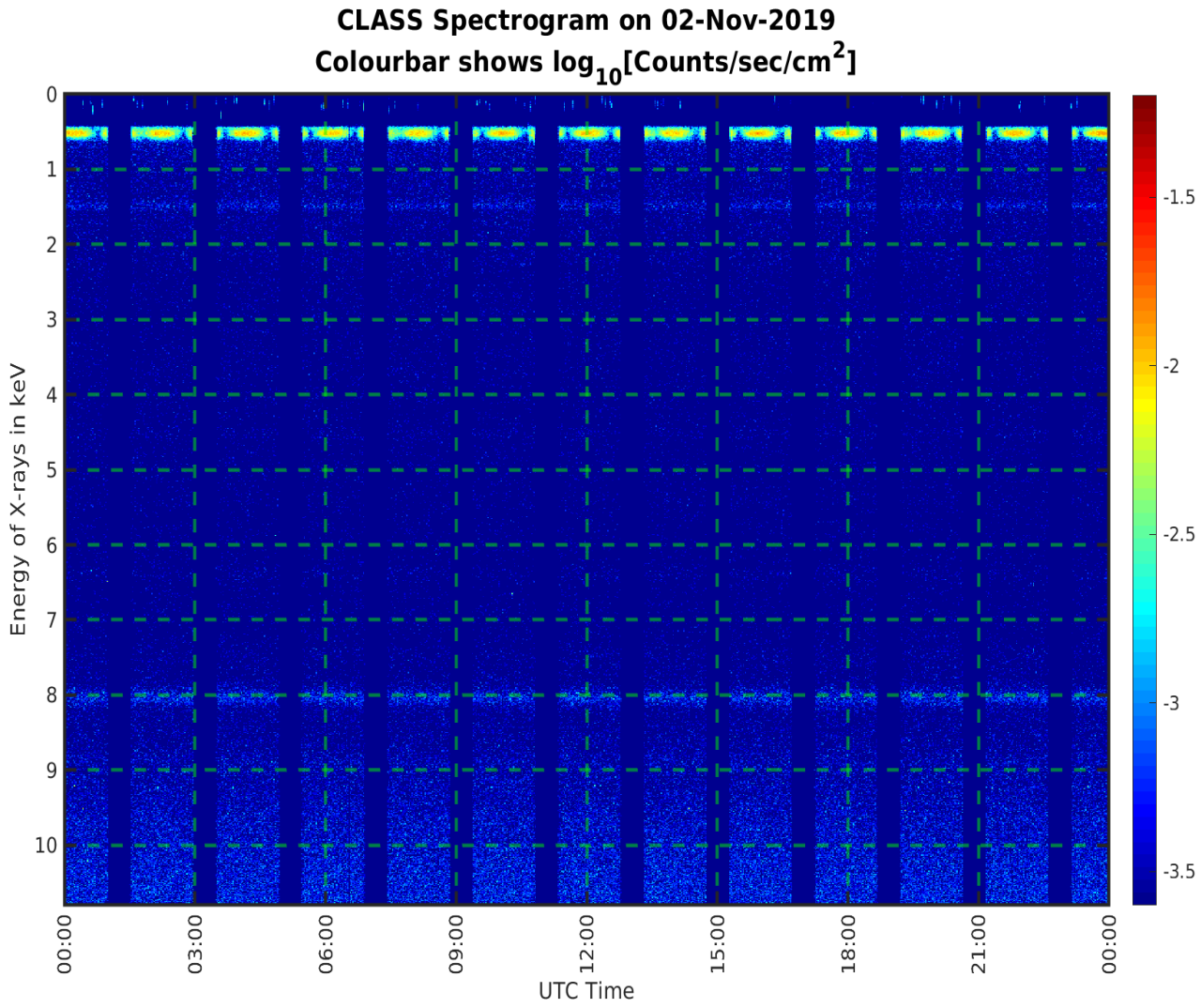
CLASS Spectrogram on 02-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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03:00
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UTC Time
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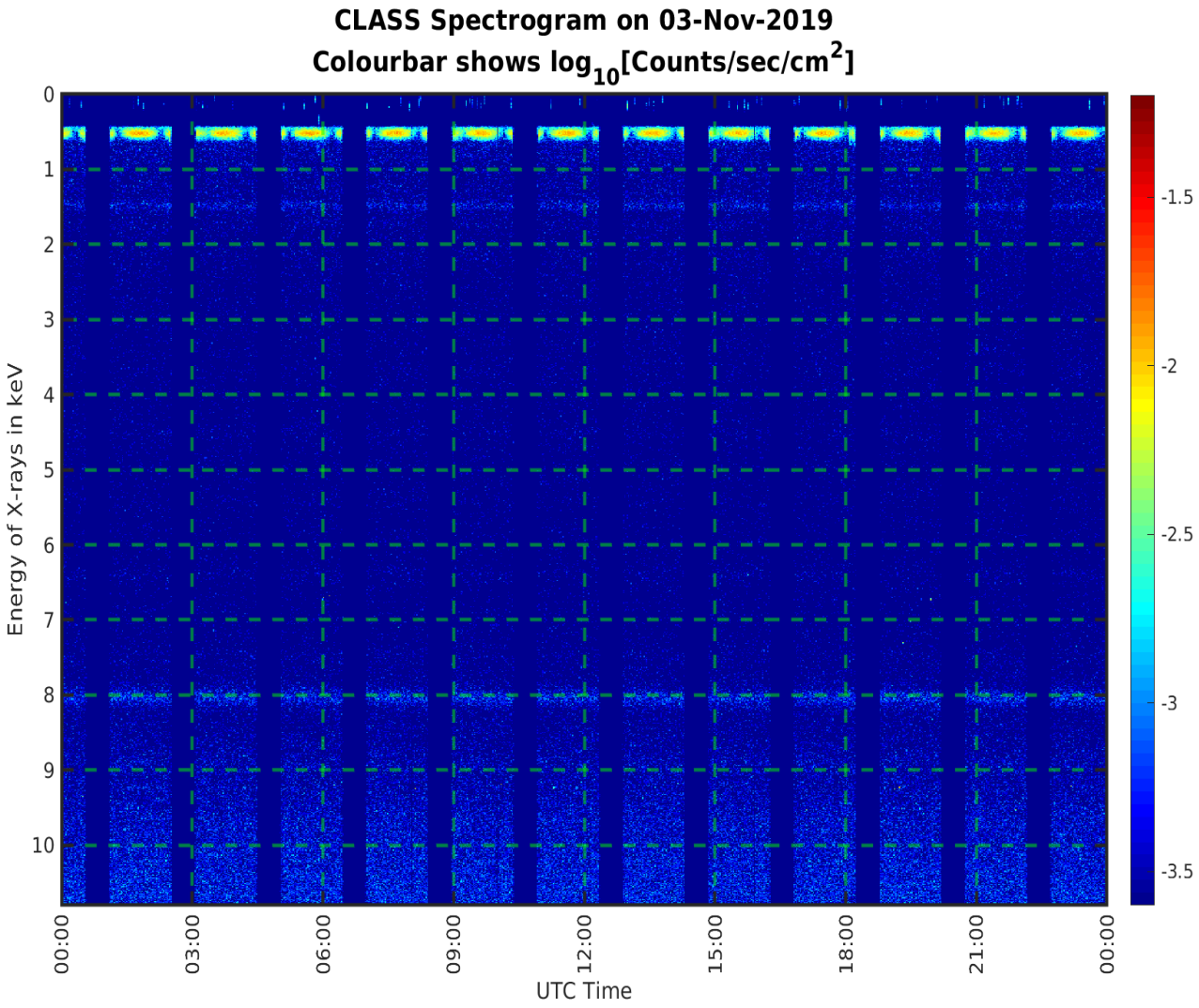
CLASS Spectrogram on 03-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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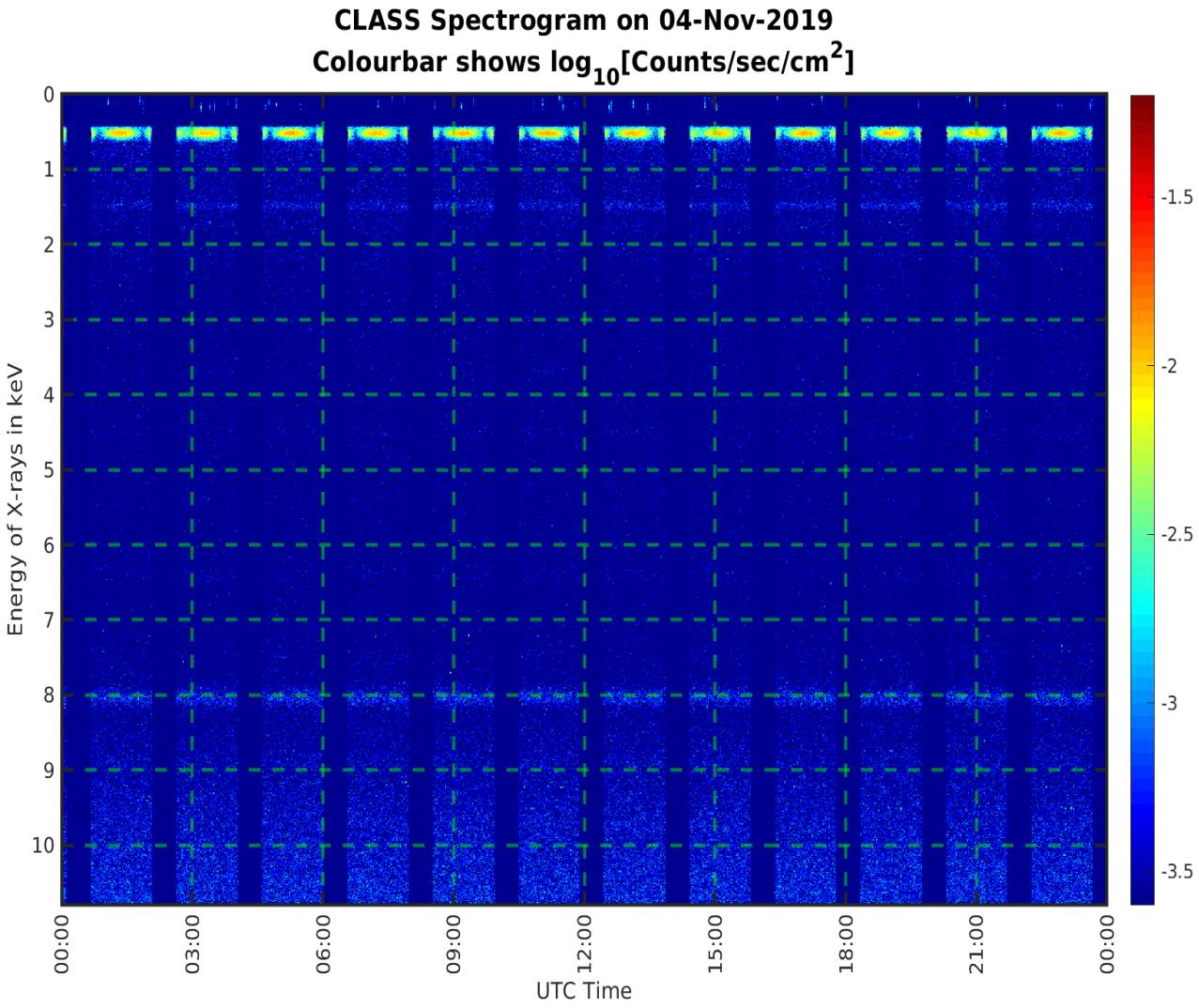
CLASS Spectrogram on 04-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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03:00
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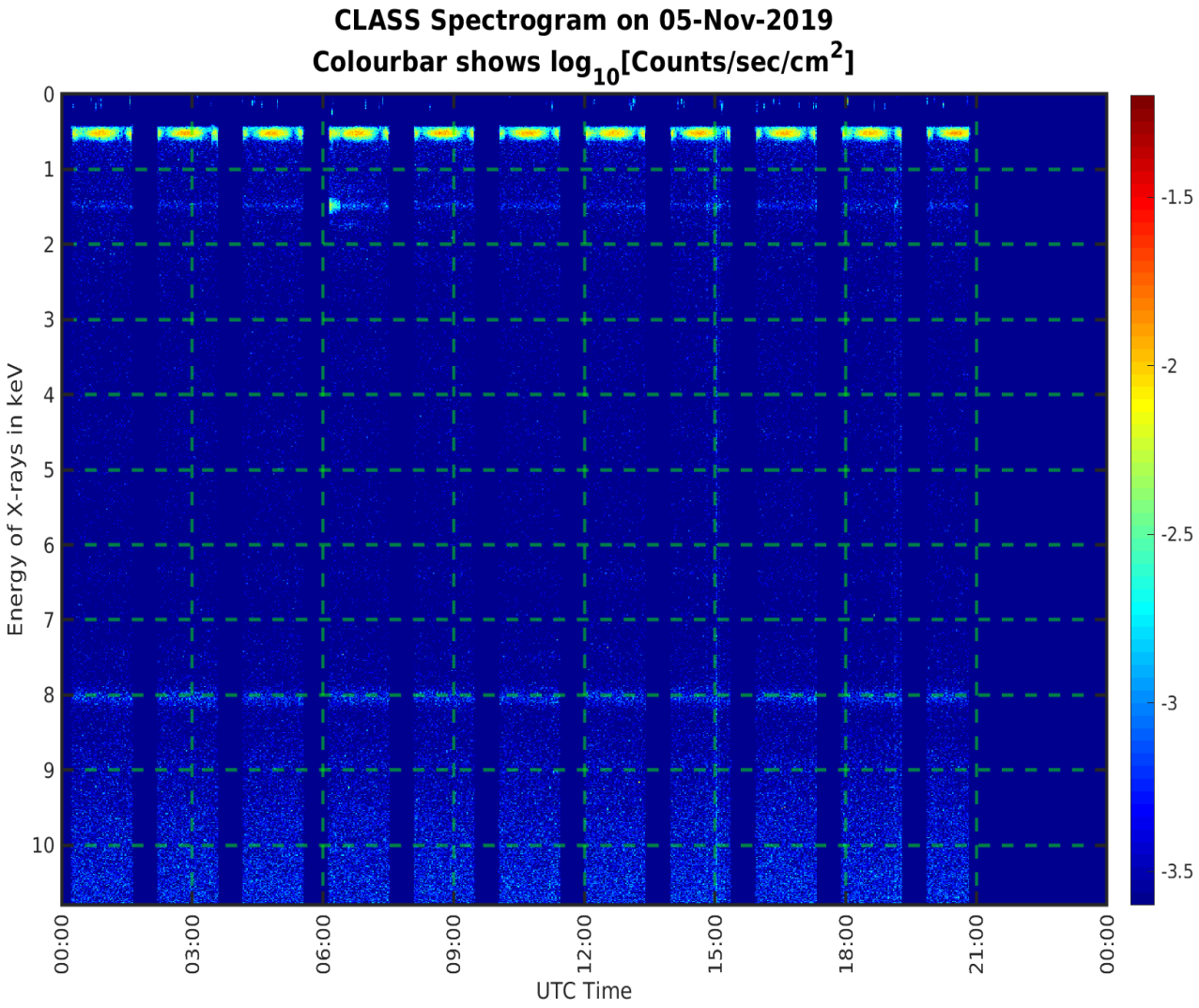
CLASS Spectrogram on 05-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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03:00
06:00
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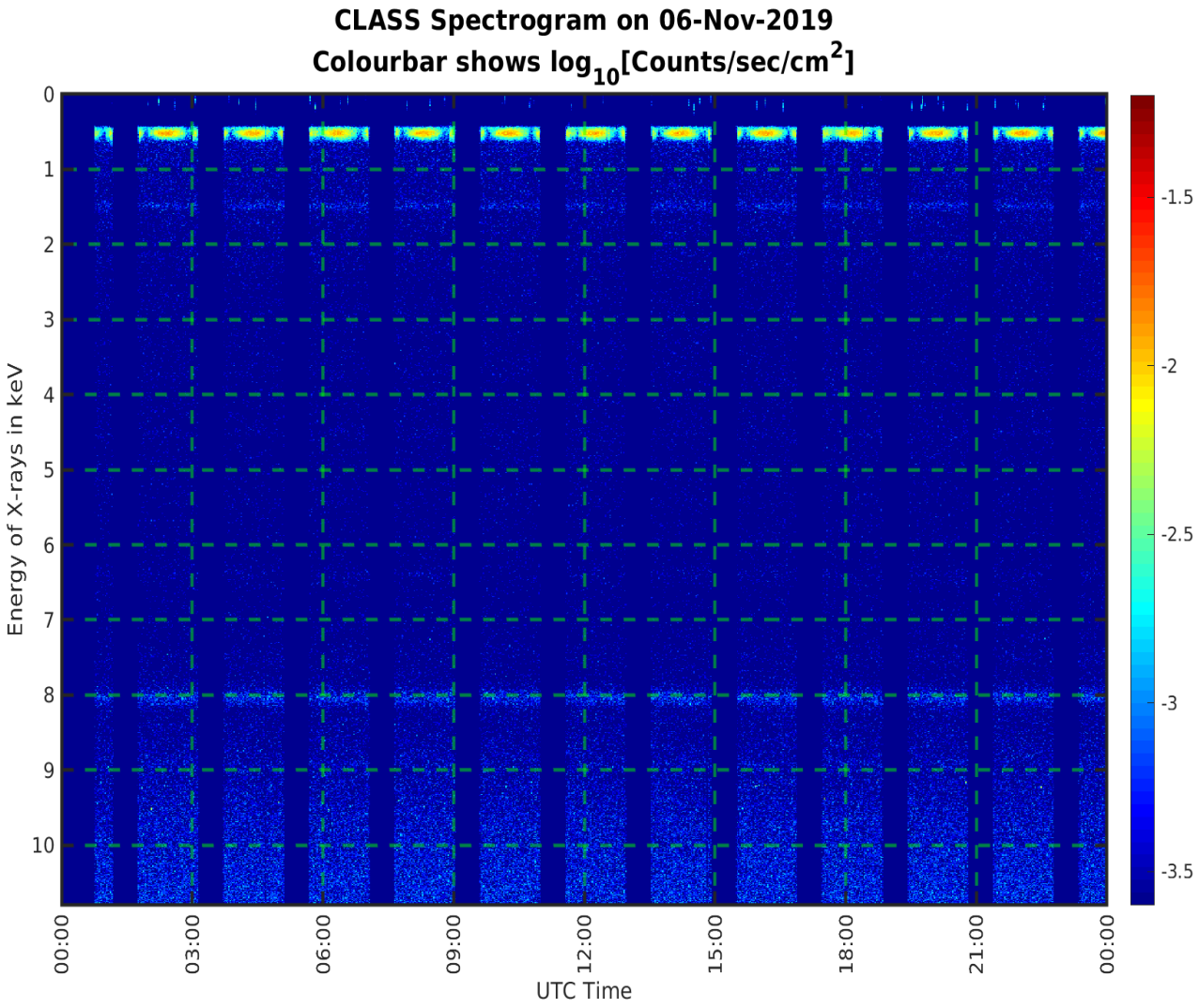
CLASS Spectrogram on 06-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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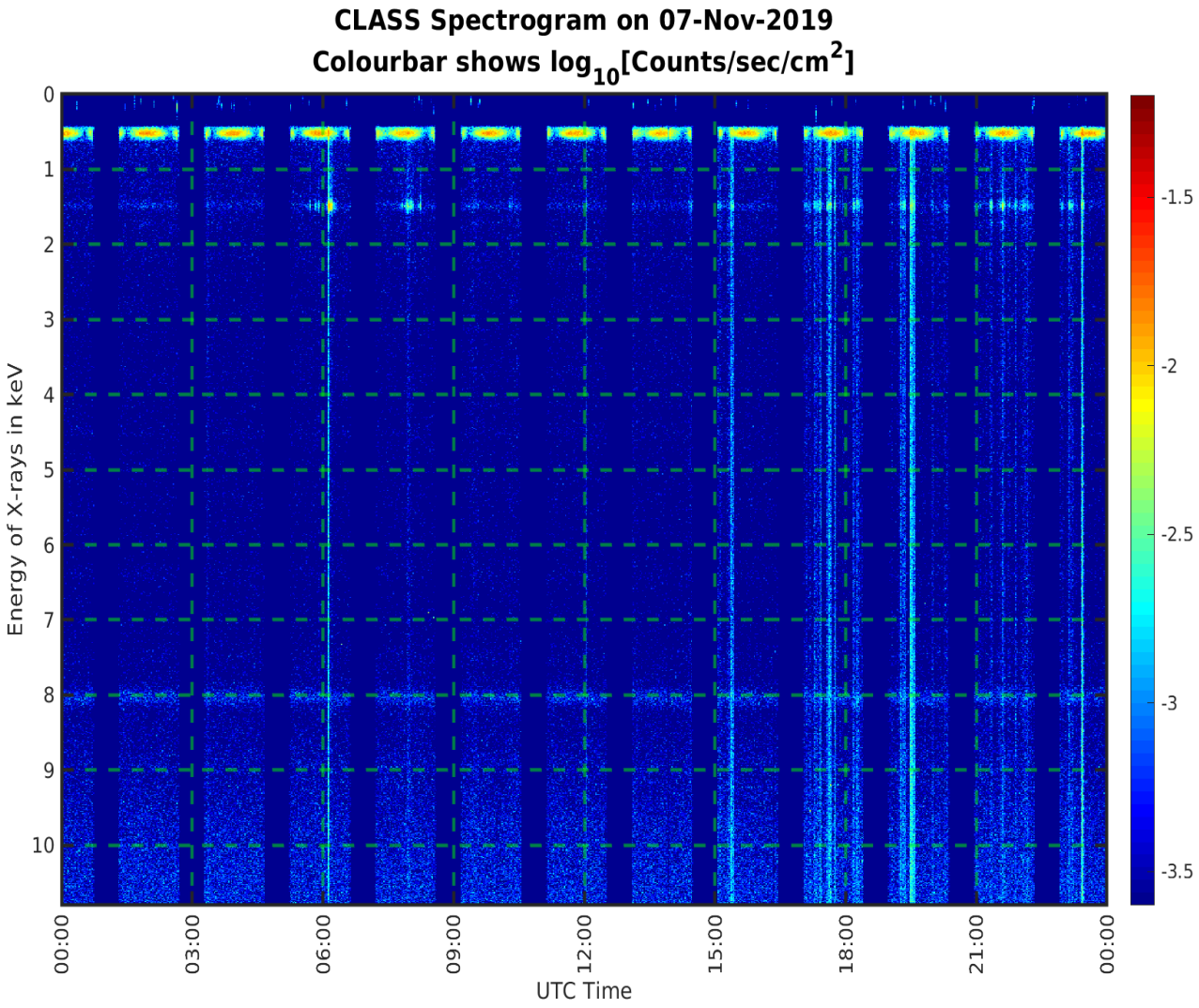
CLASS Spectrogram on 07-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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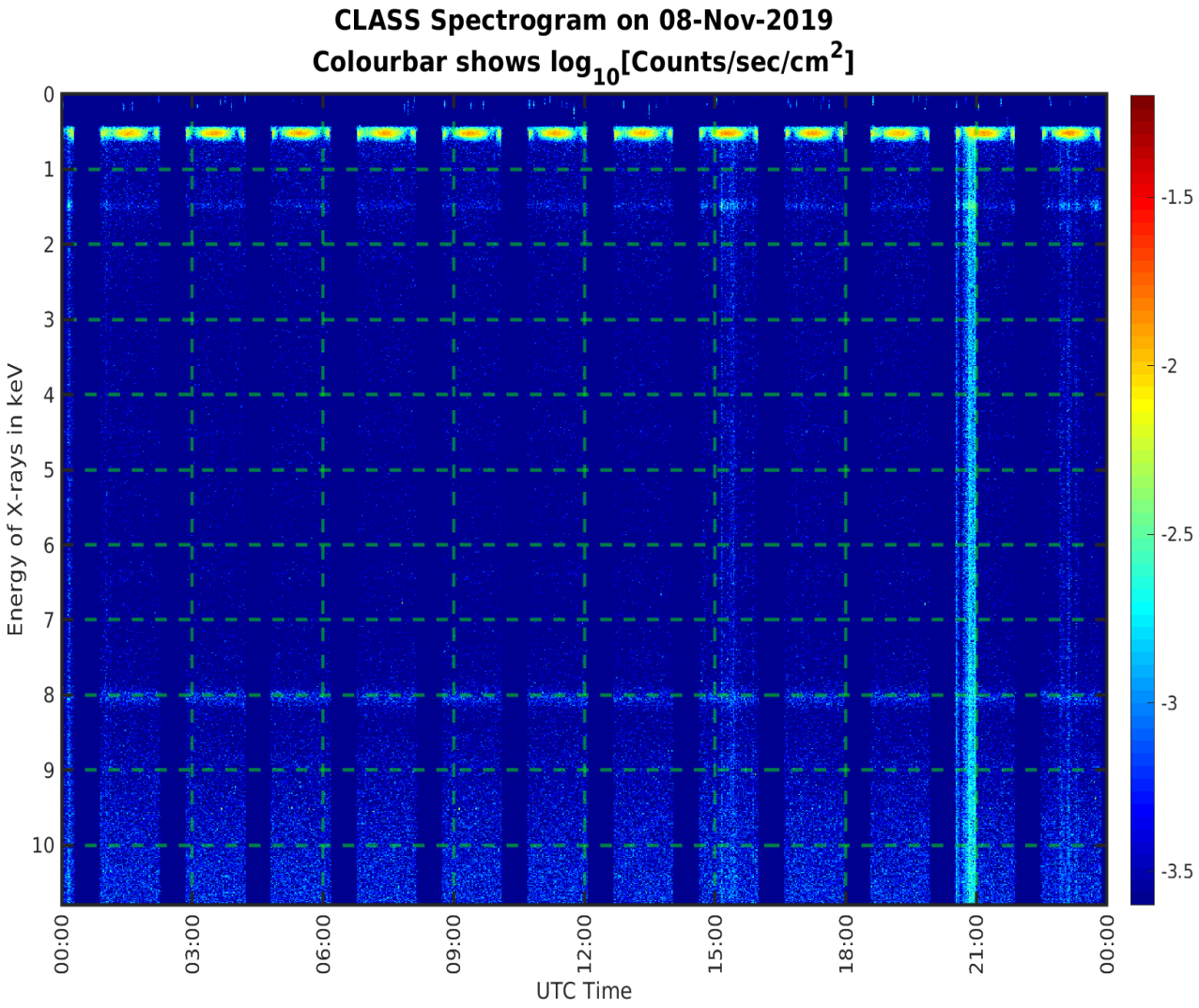
CLASS Spectrogram on 08-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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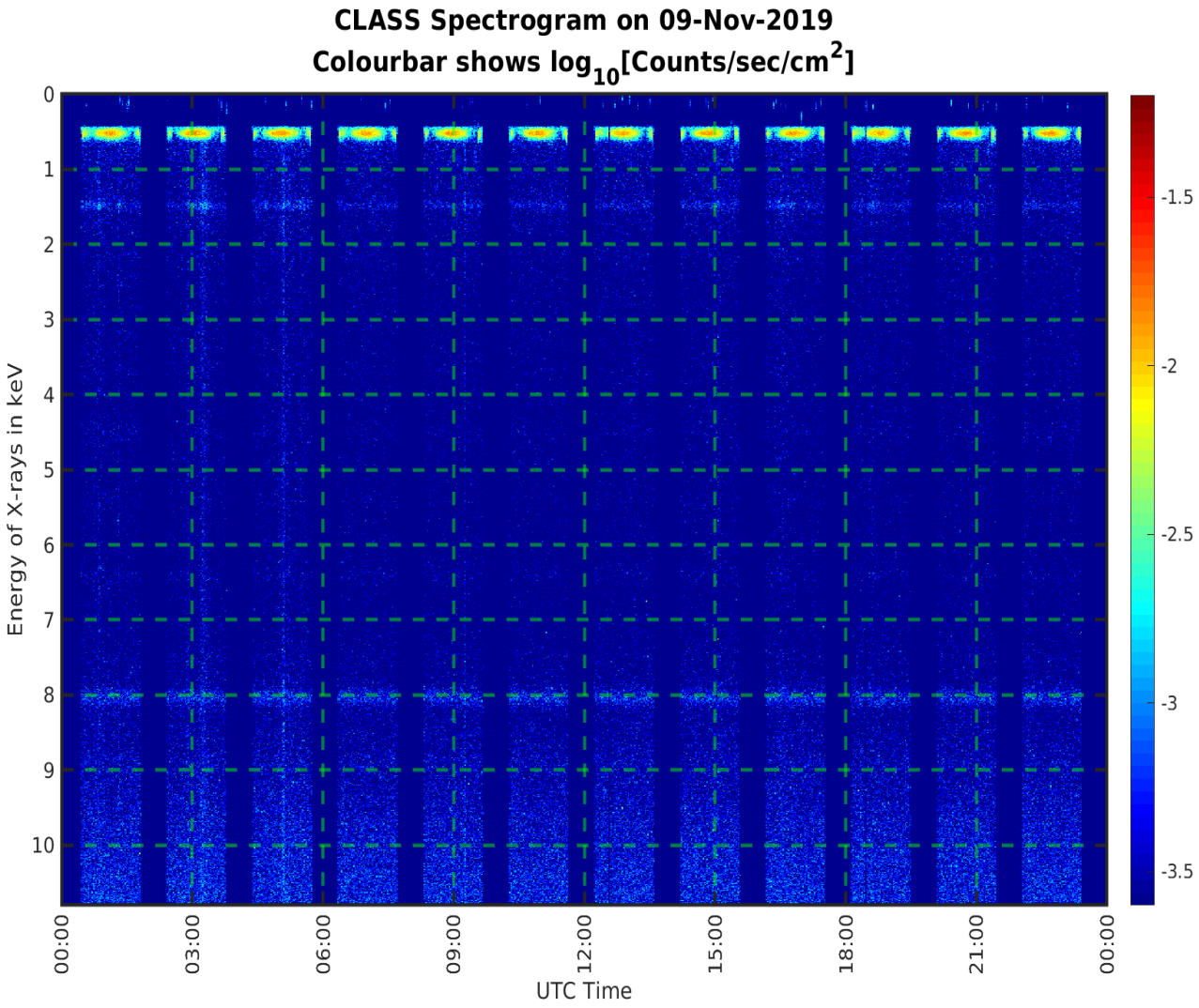
CLASS Spectrogram on 09-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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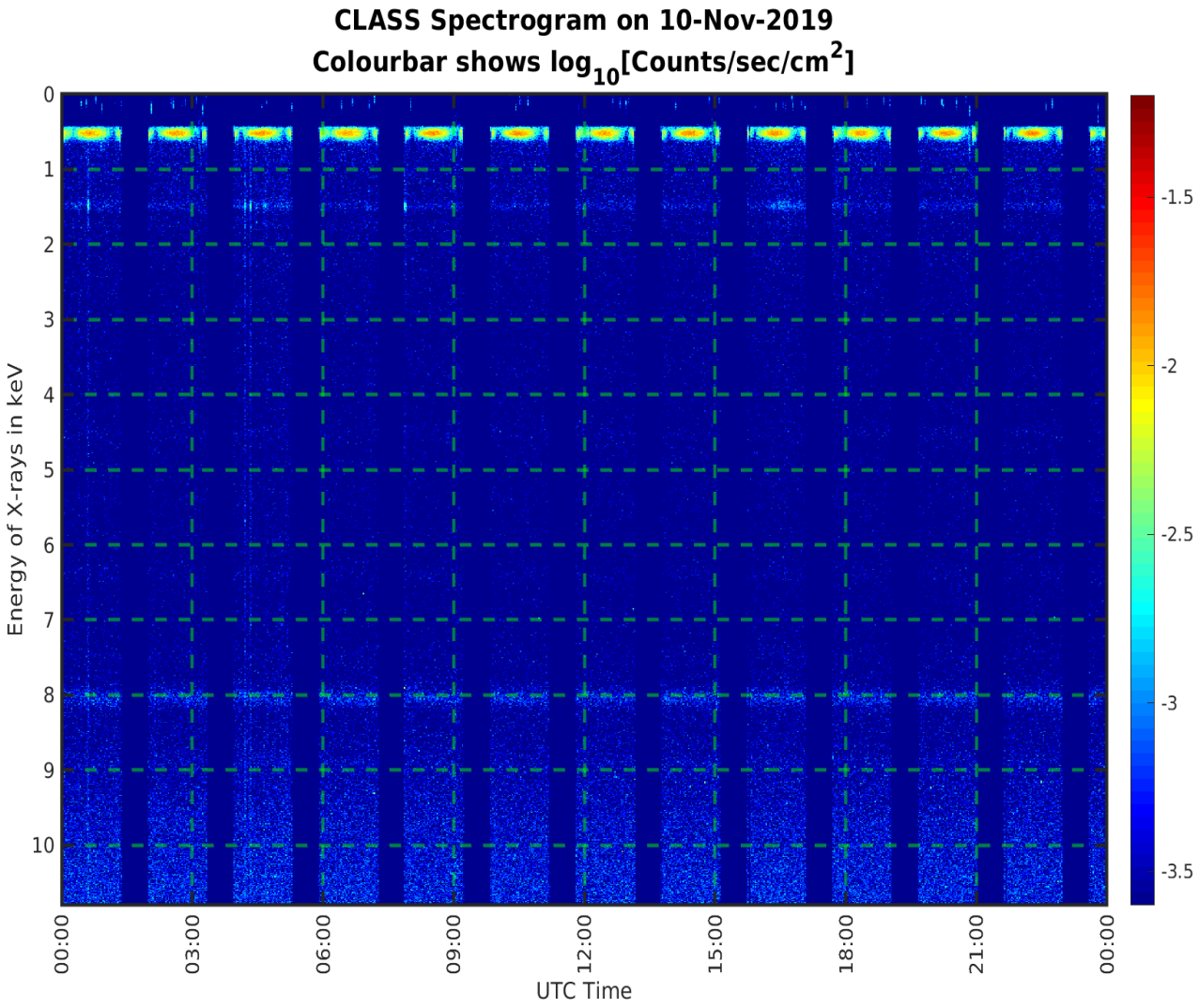
CLASS Spectrogram on 10-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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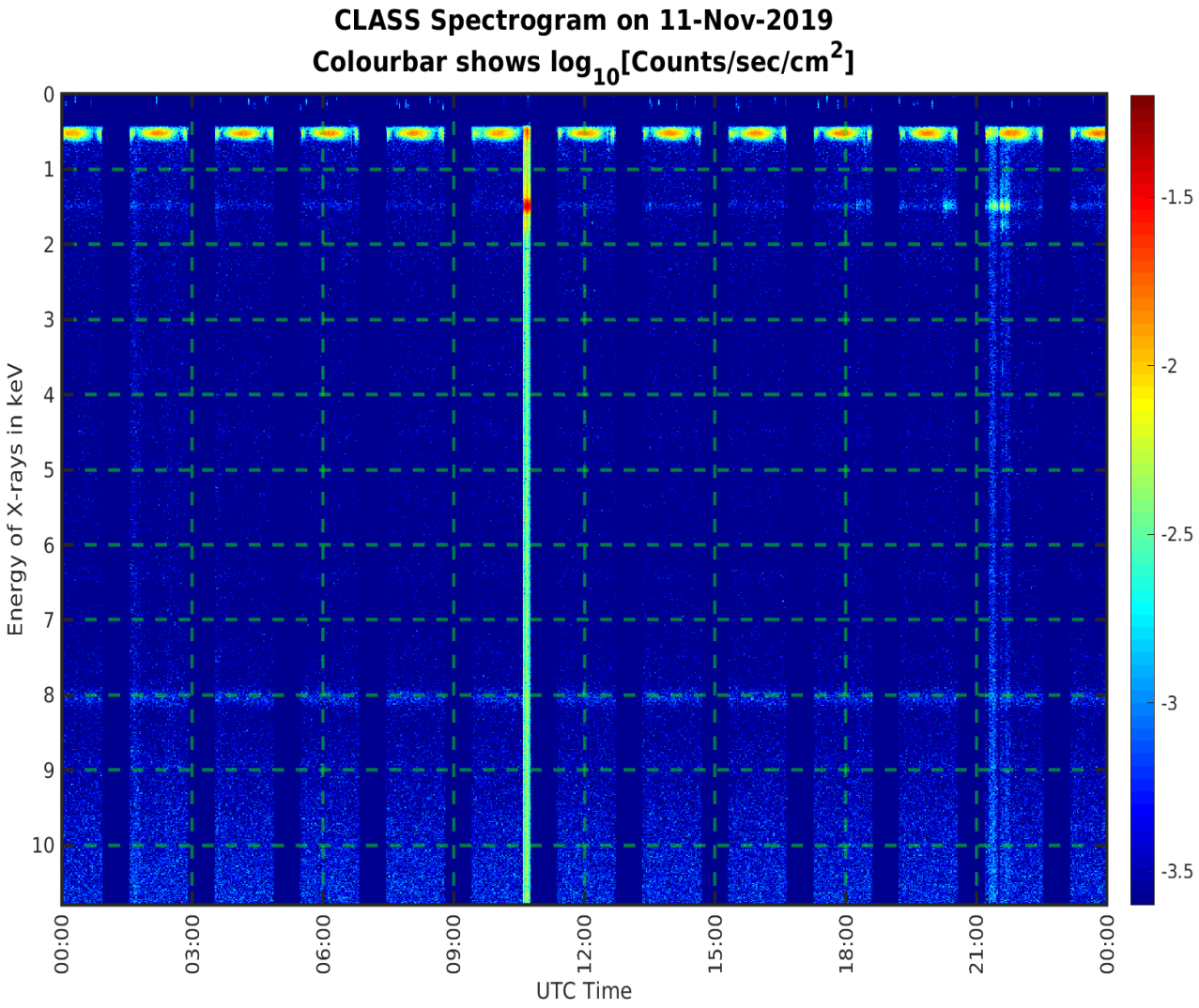
CLASS Spectrogram on 11-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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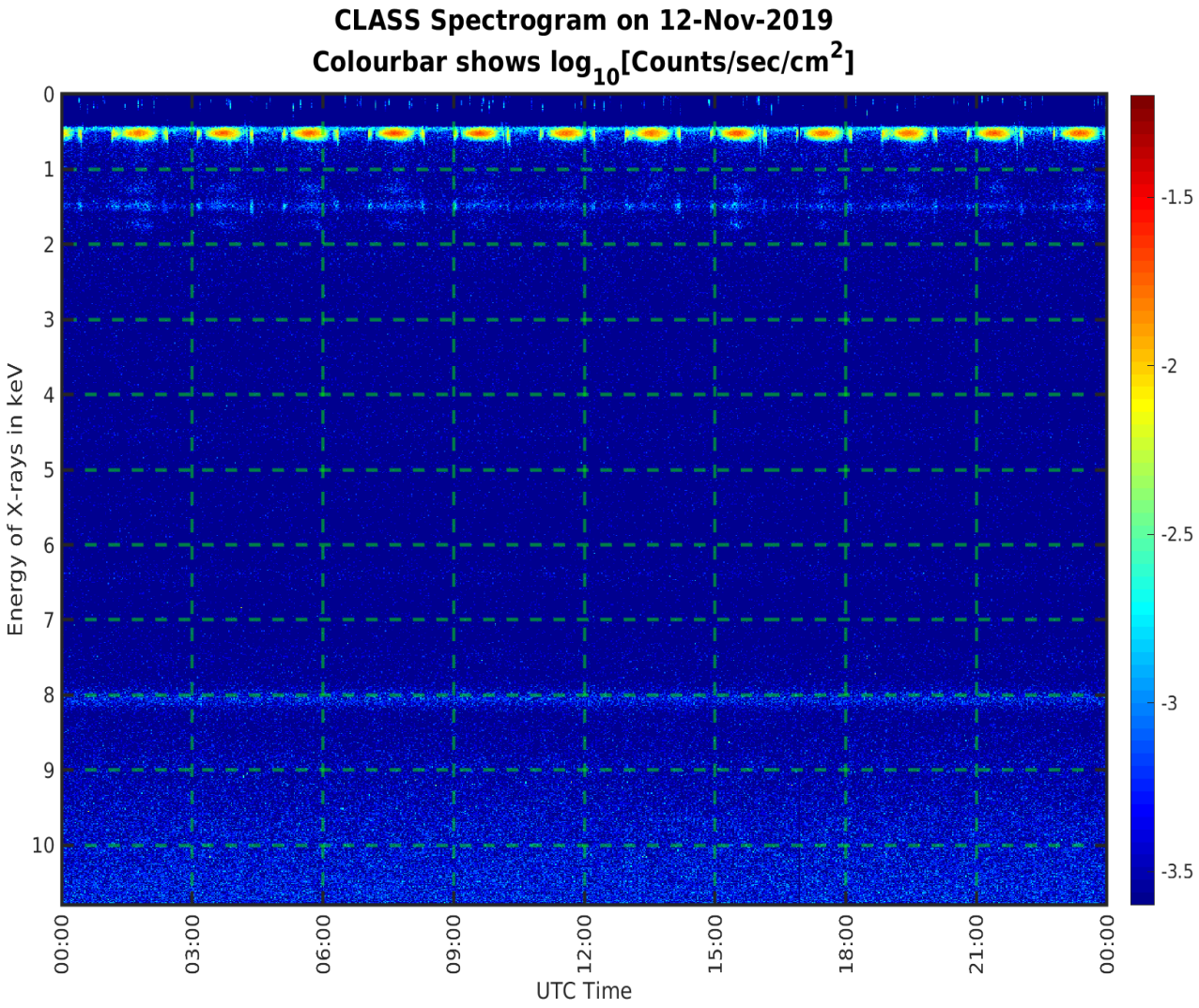
CLASS Spectrogram on 12-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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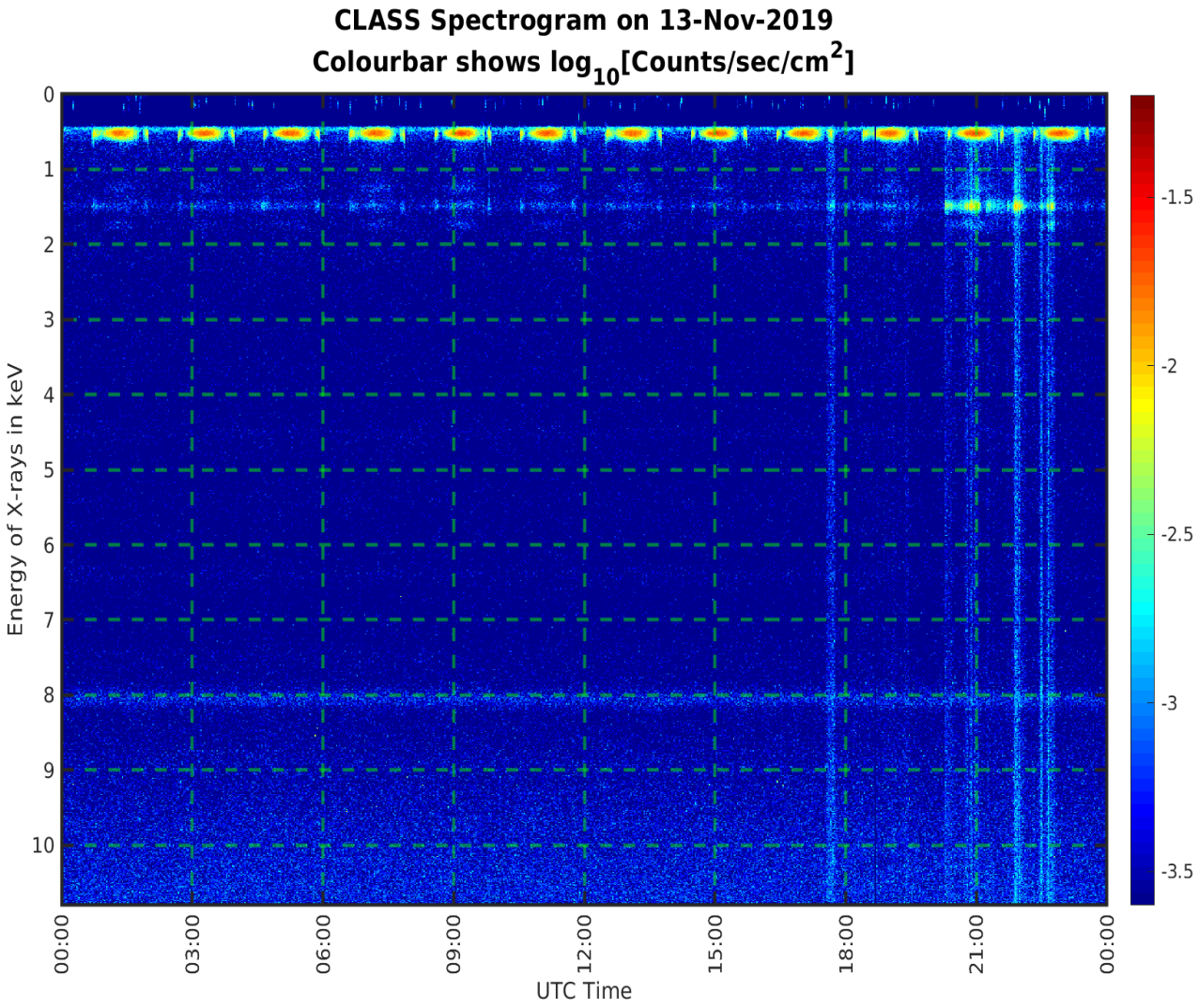
CLASS Spectrogram on 13-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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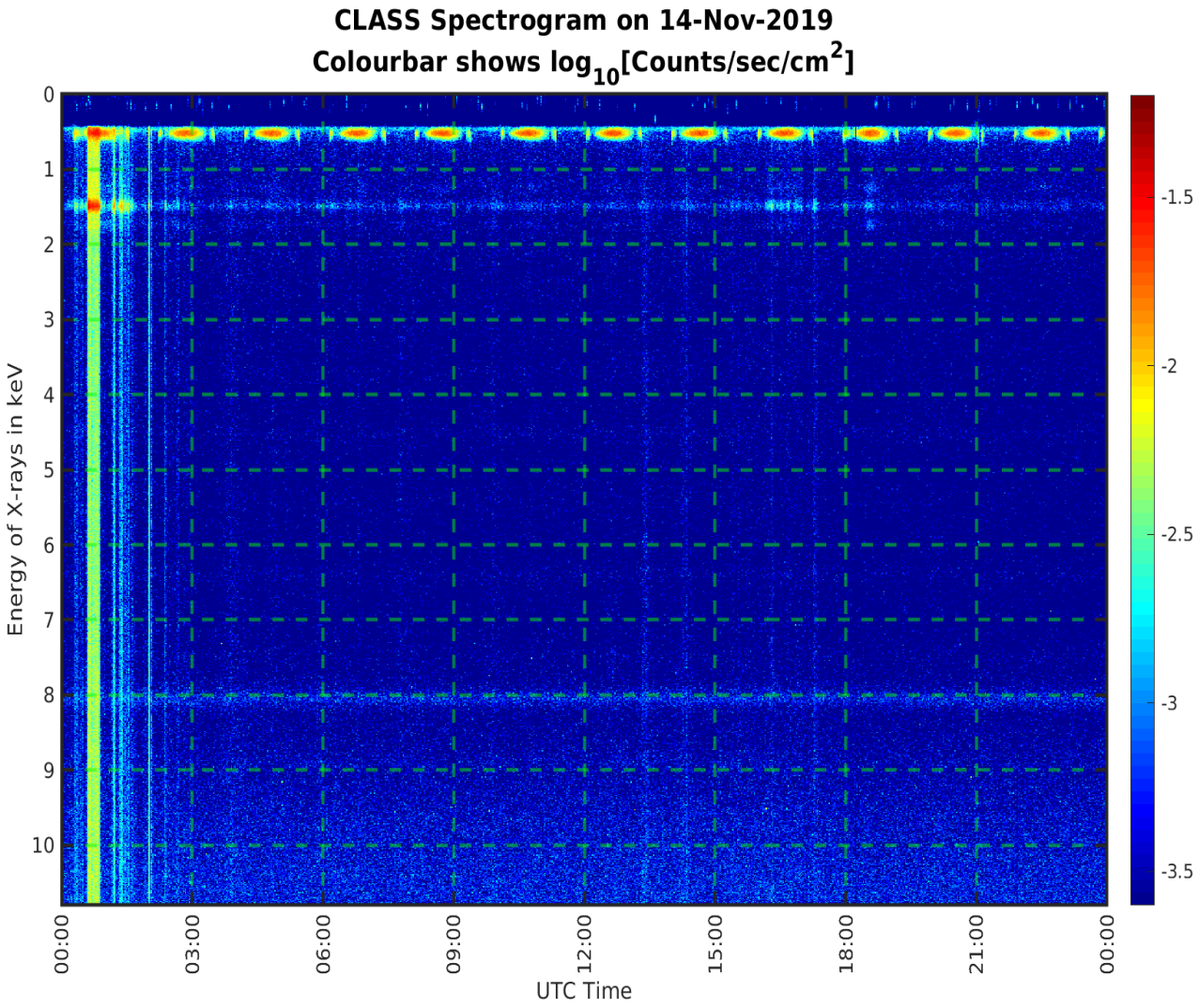
CLASS Spectrogram on 14-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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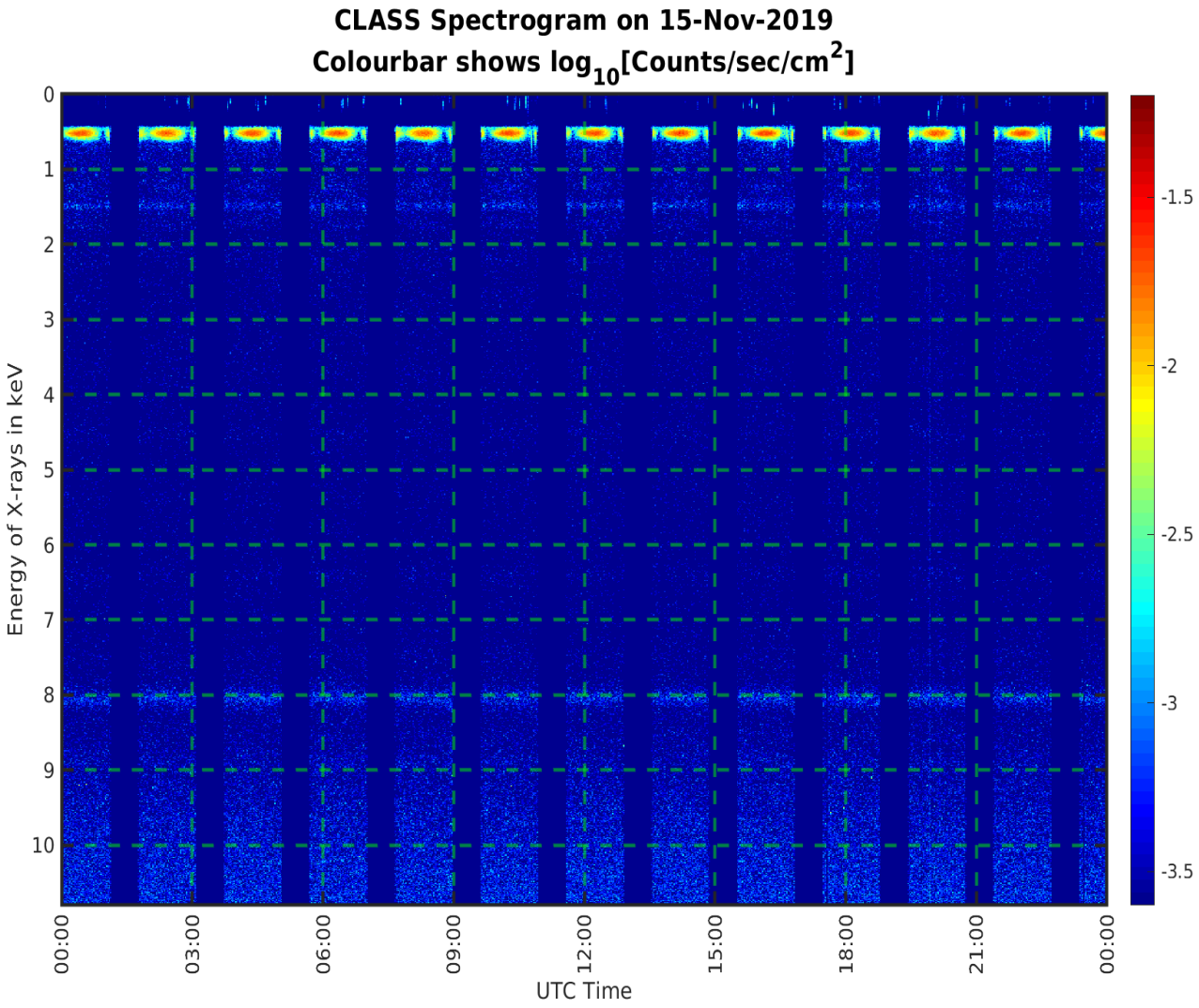
UTC Time


CLASS Spectrogram on 15-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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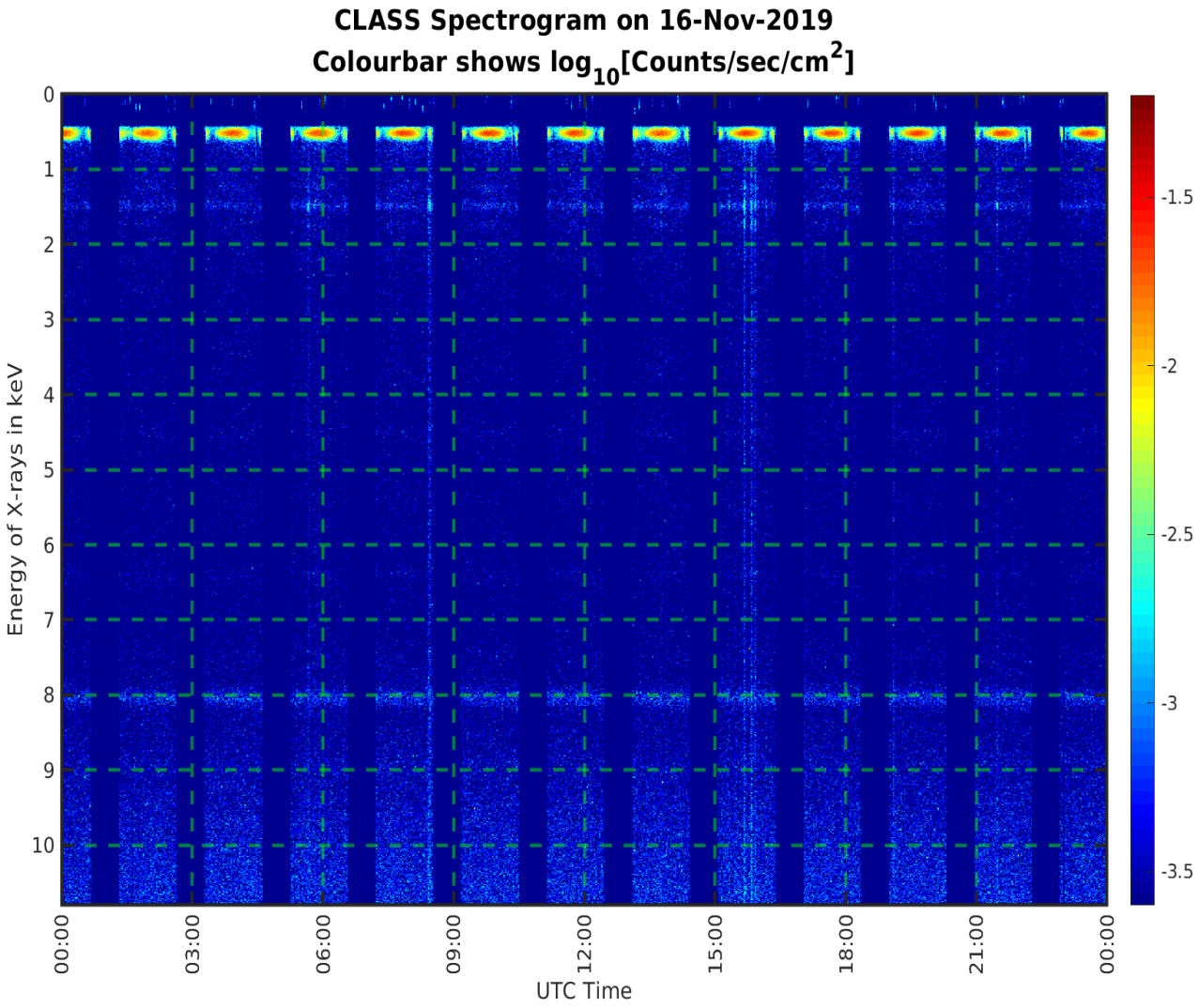
CLASS Spectrogram on 16-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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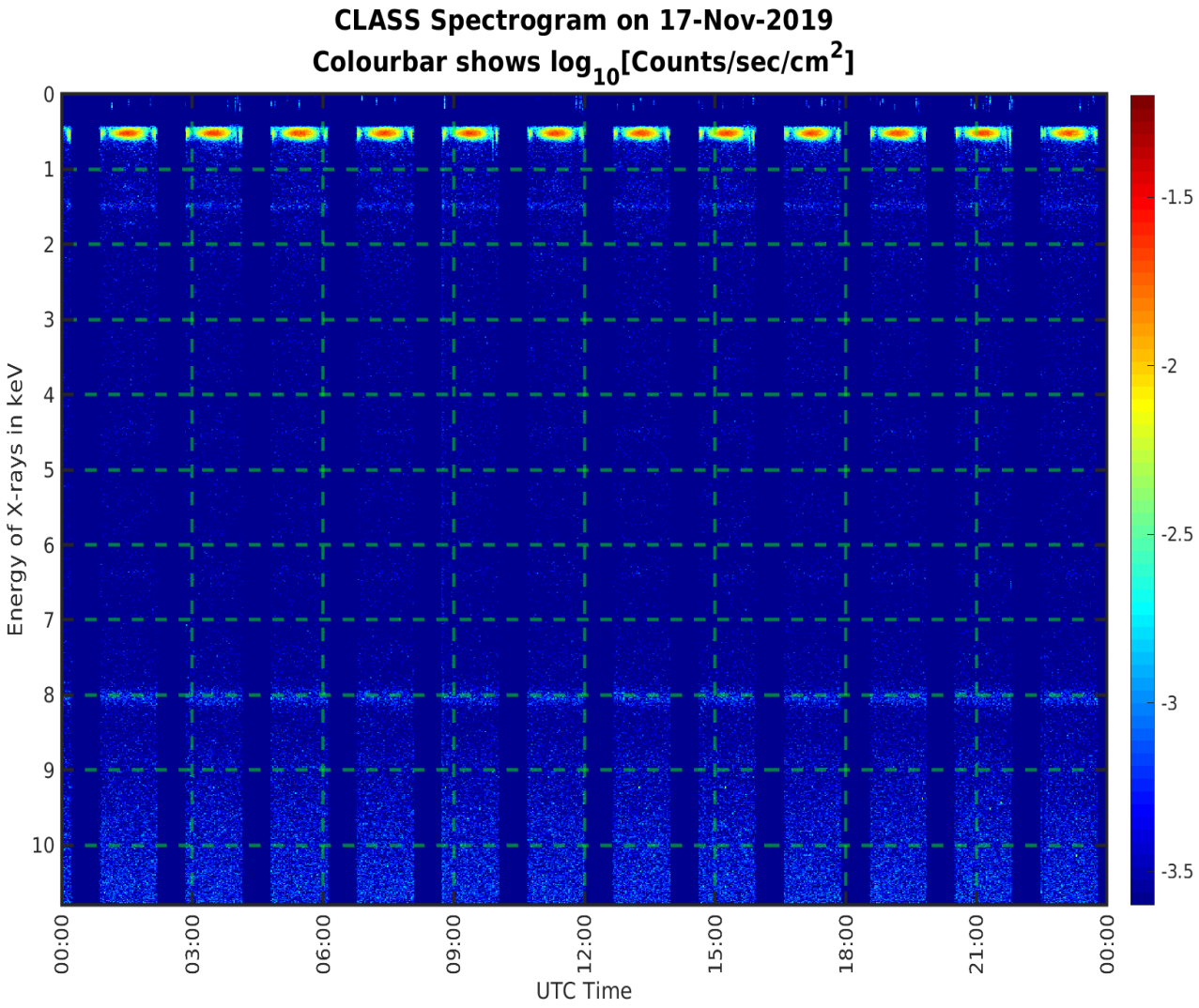
CLASS Spectrogram on 17-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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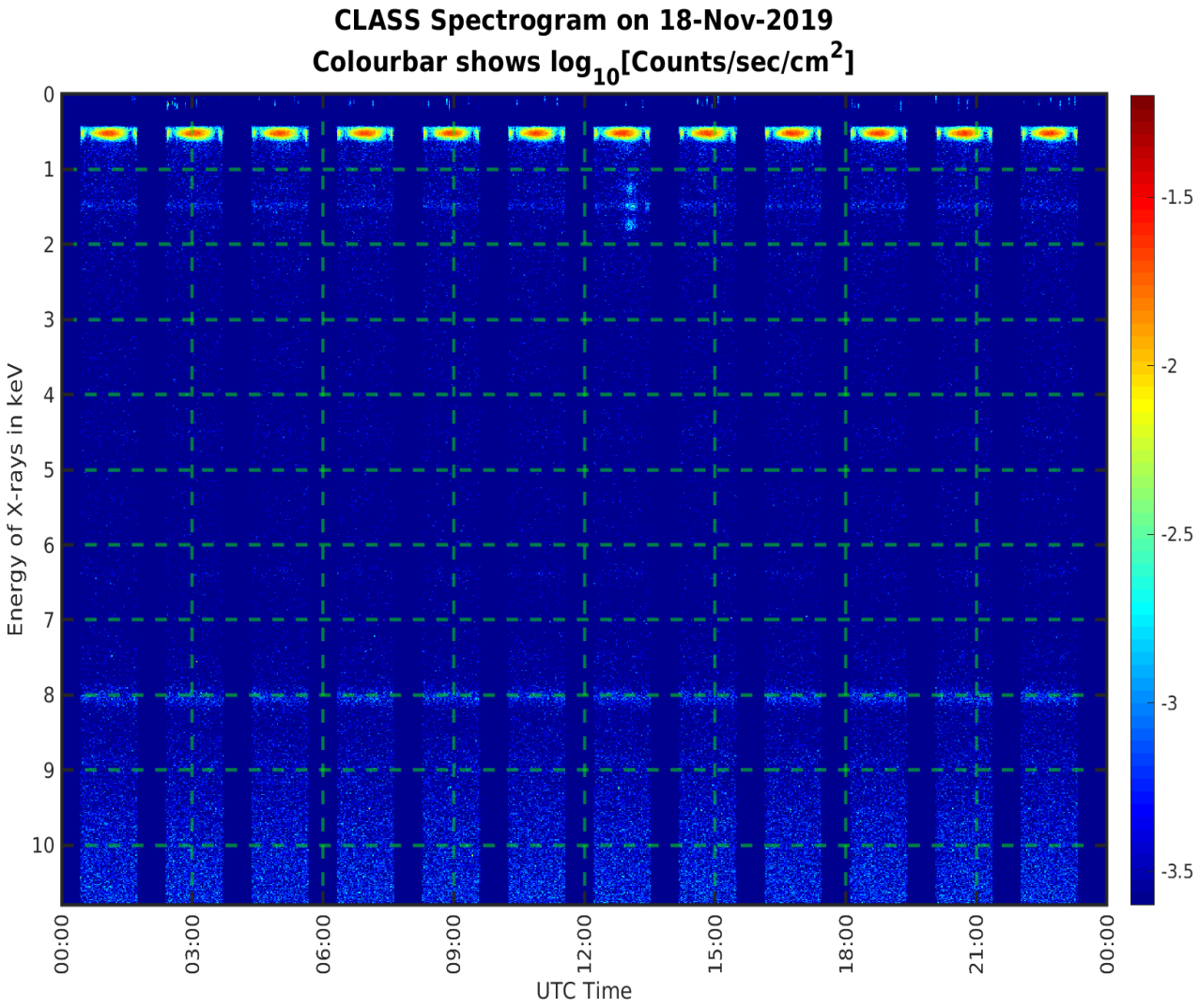
CLASS Spectrogram on 18-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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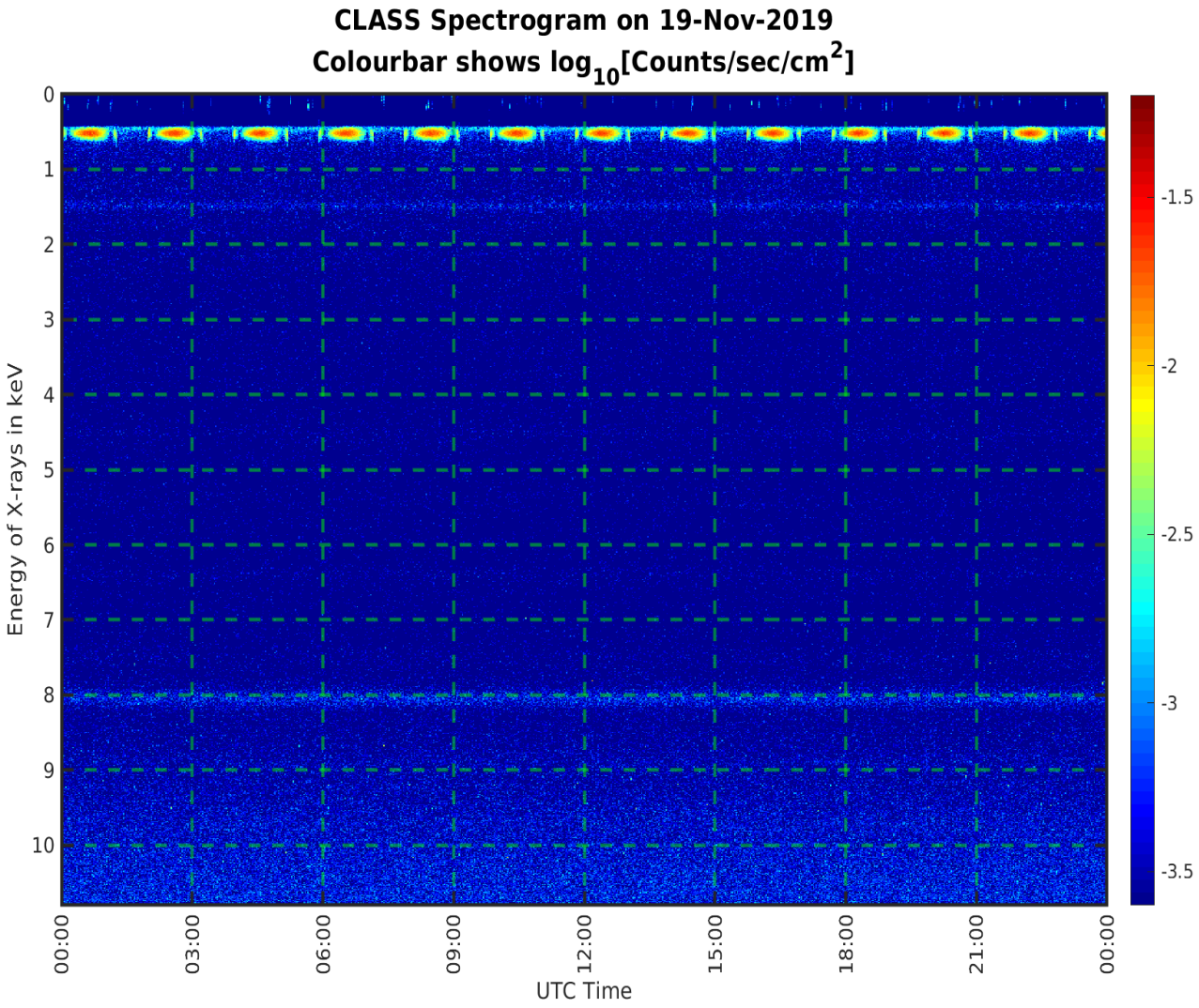
CLASS Spectrogram on 19-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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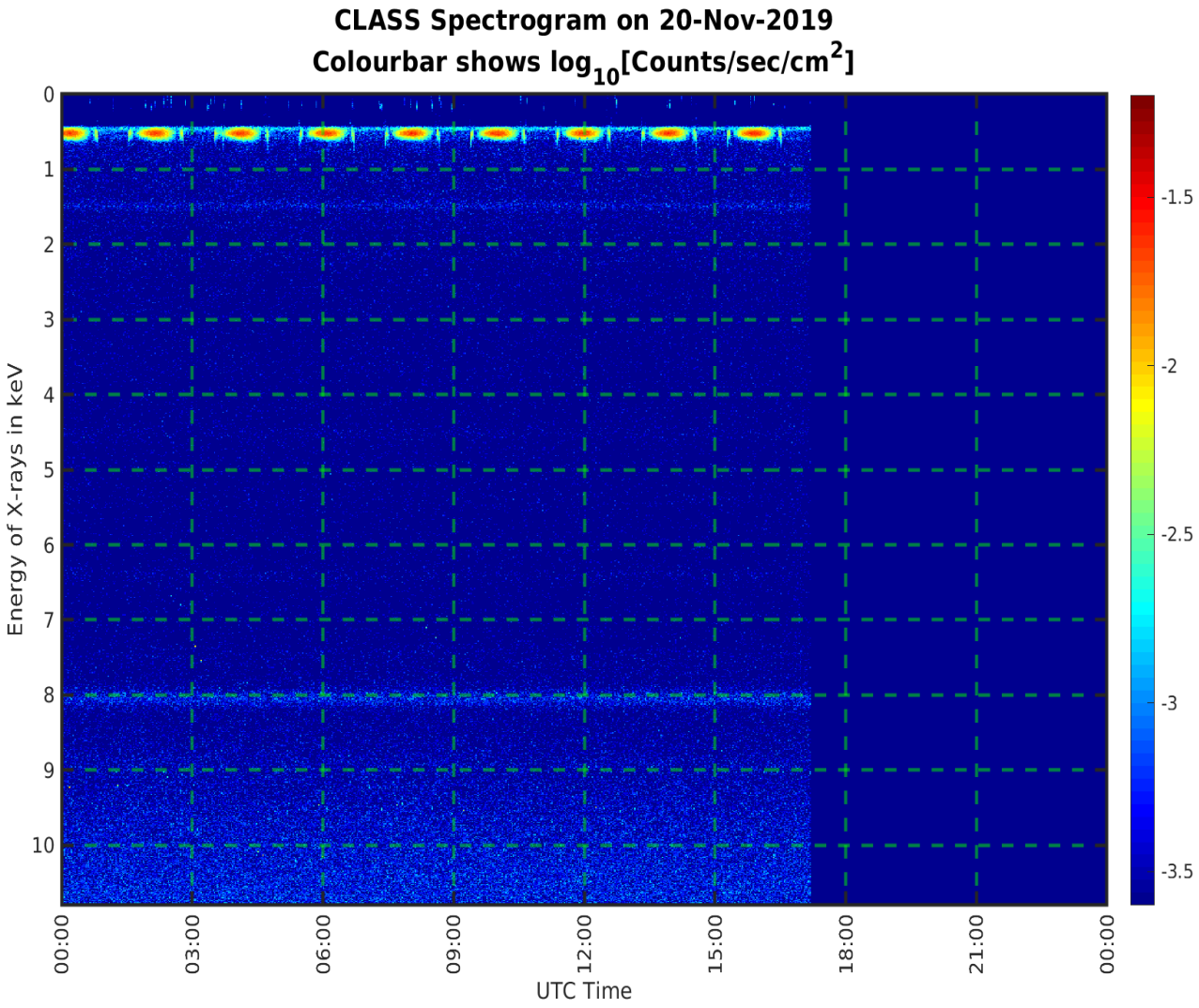
CLASS Spectrogram on 20-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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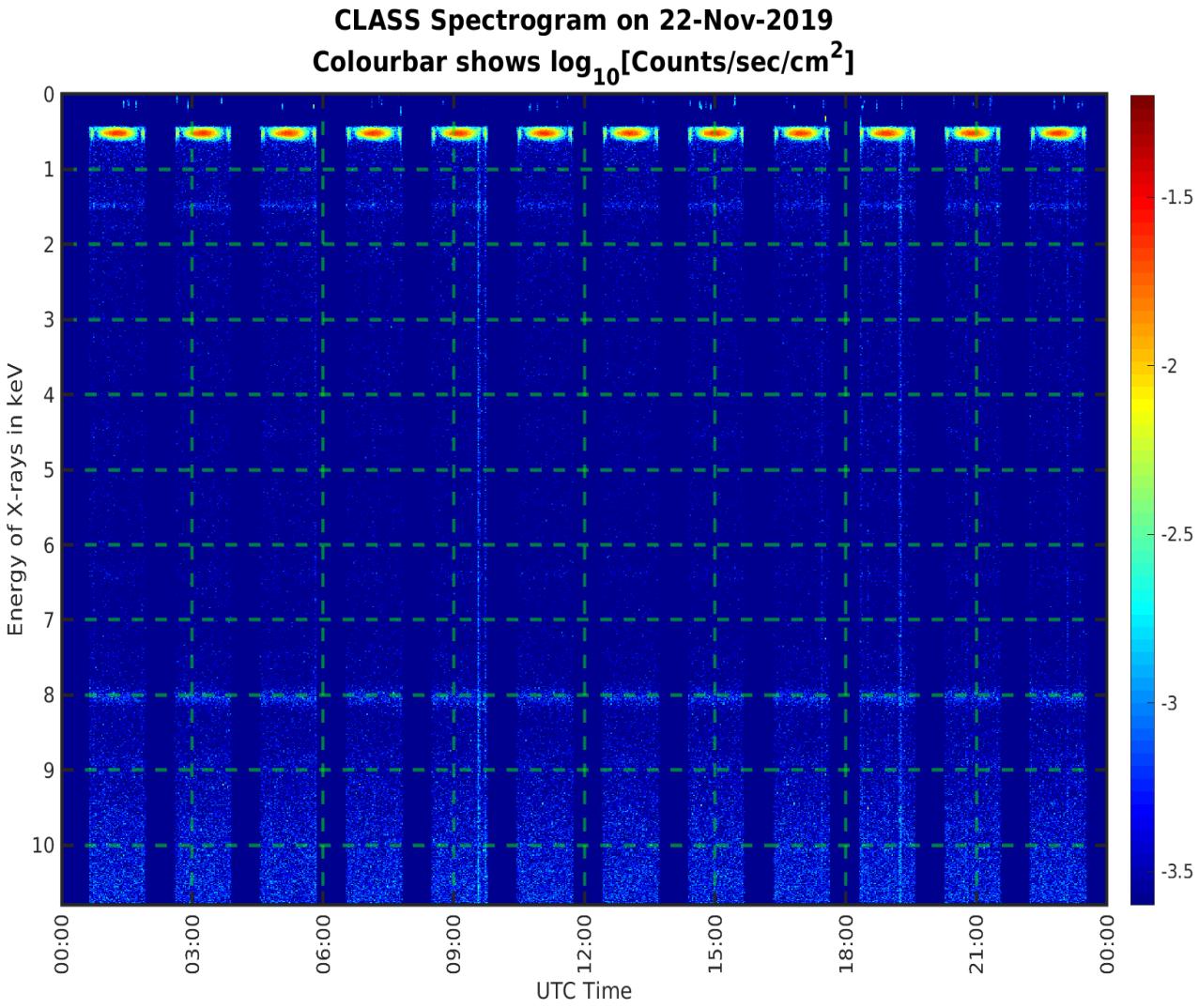
UTC Time


CLASS Spectrogram on 22-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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UTC Time
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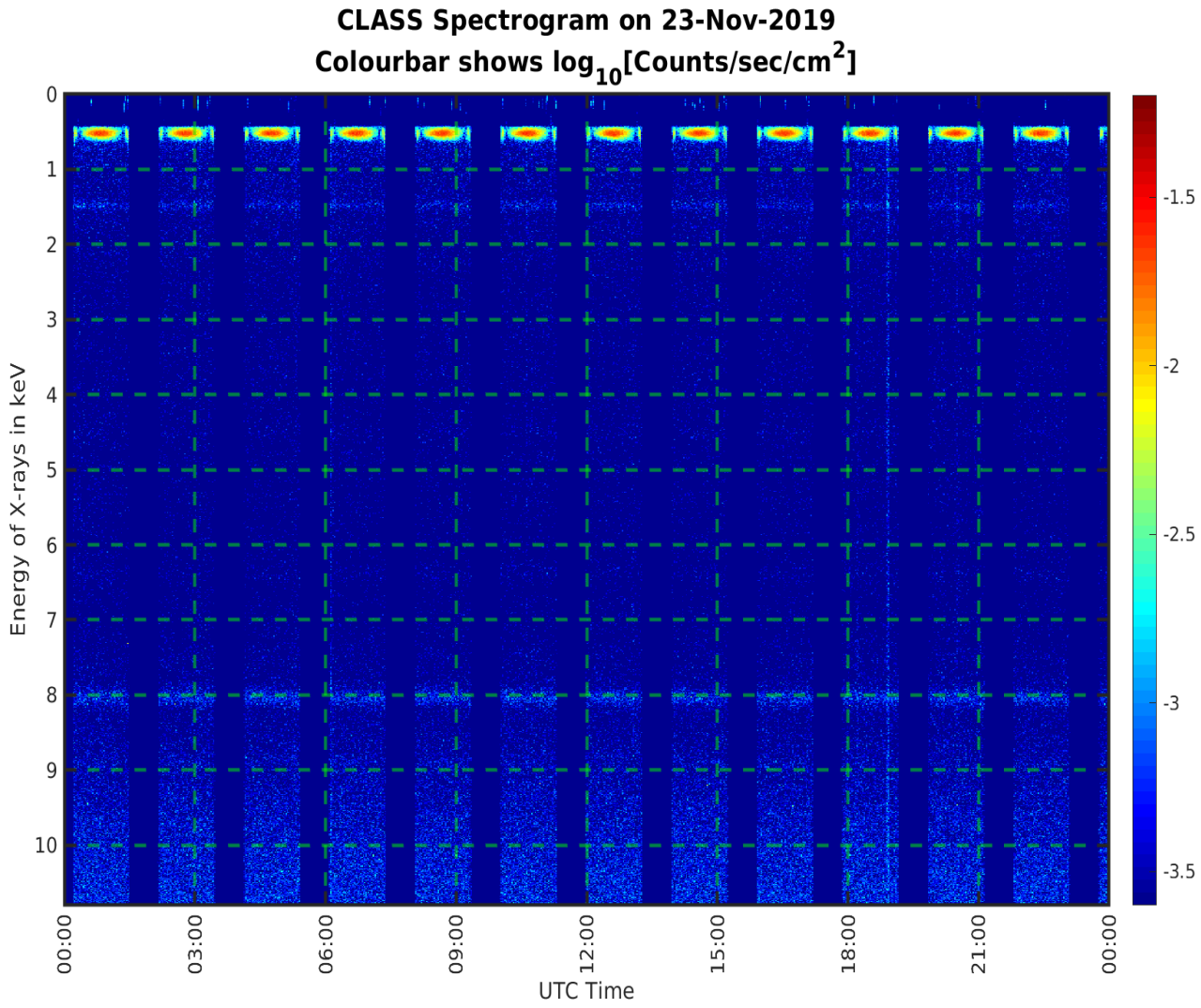
CLASS Spectrogram on 23-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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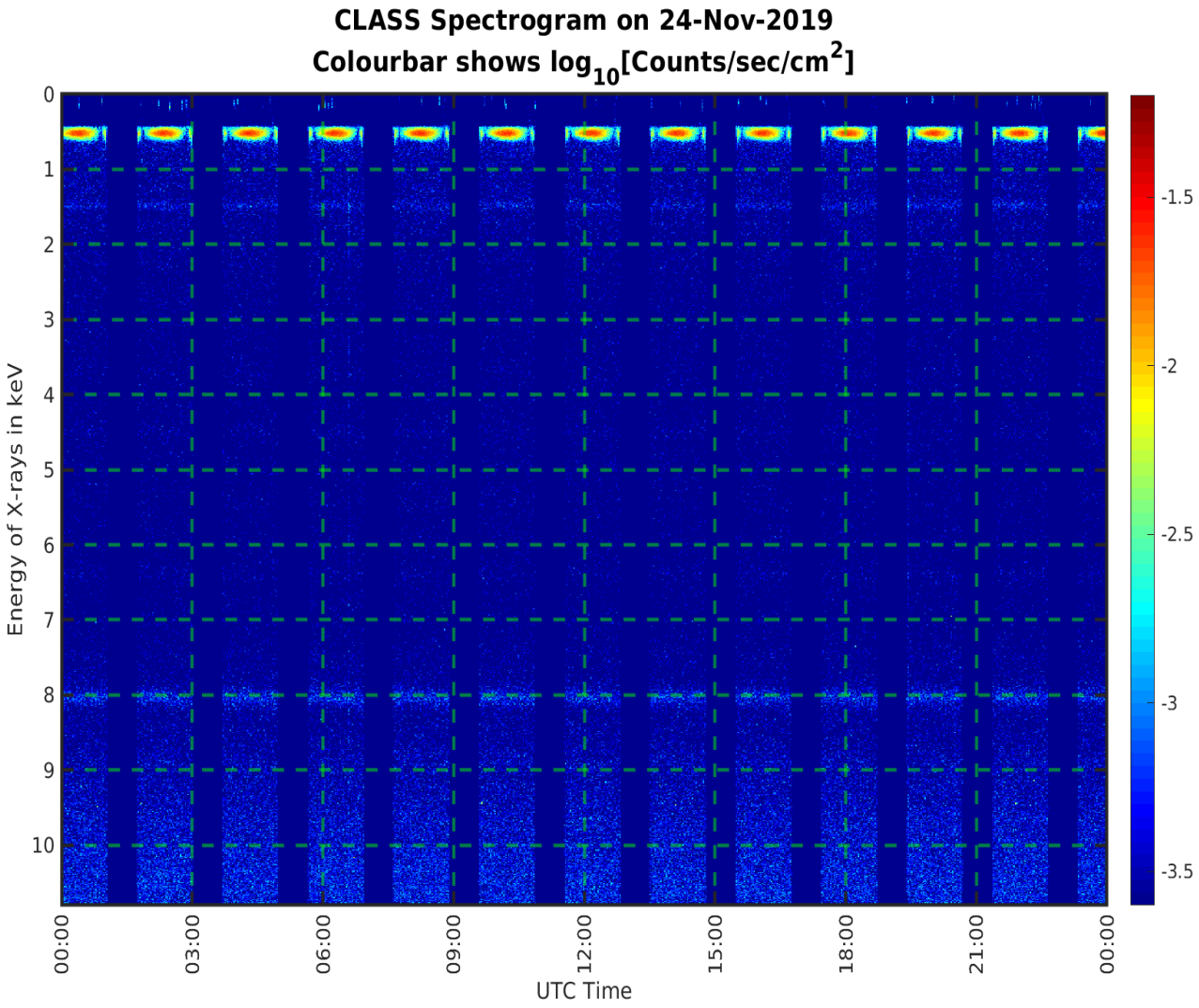
CLASS Spectrogram on 24-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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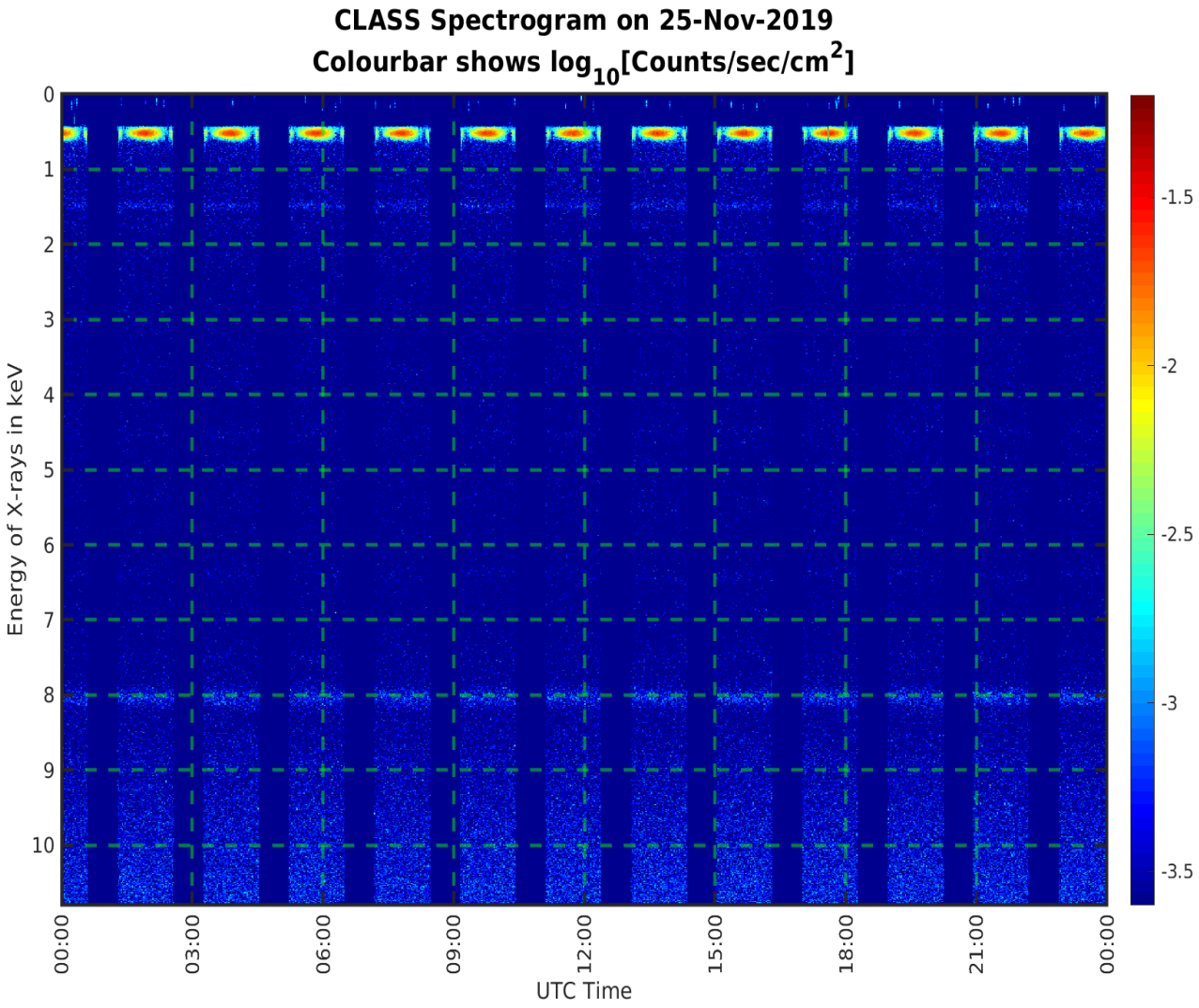
CLASS Spectrogram on 25-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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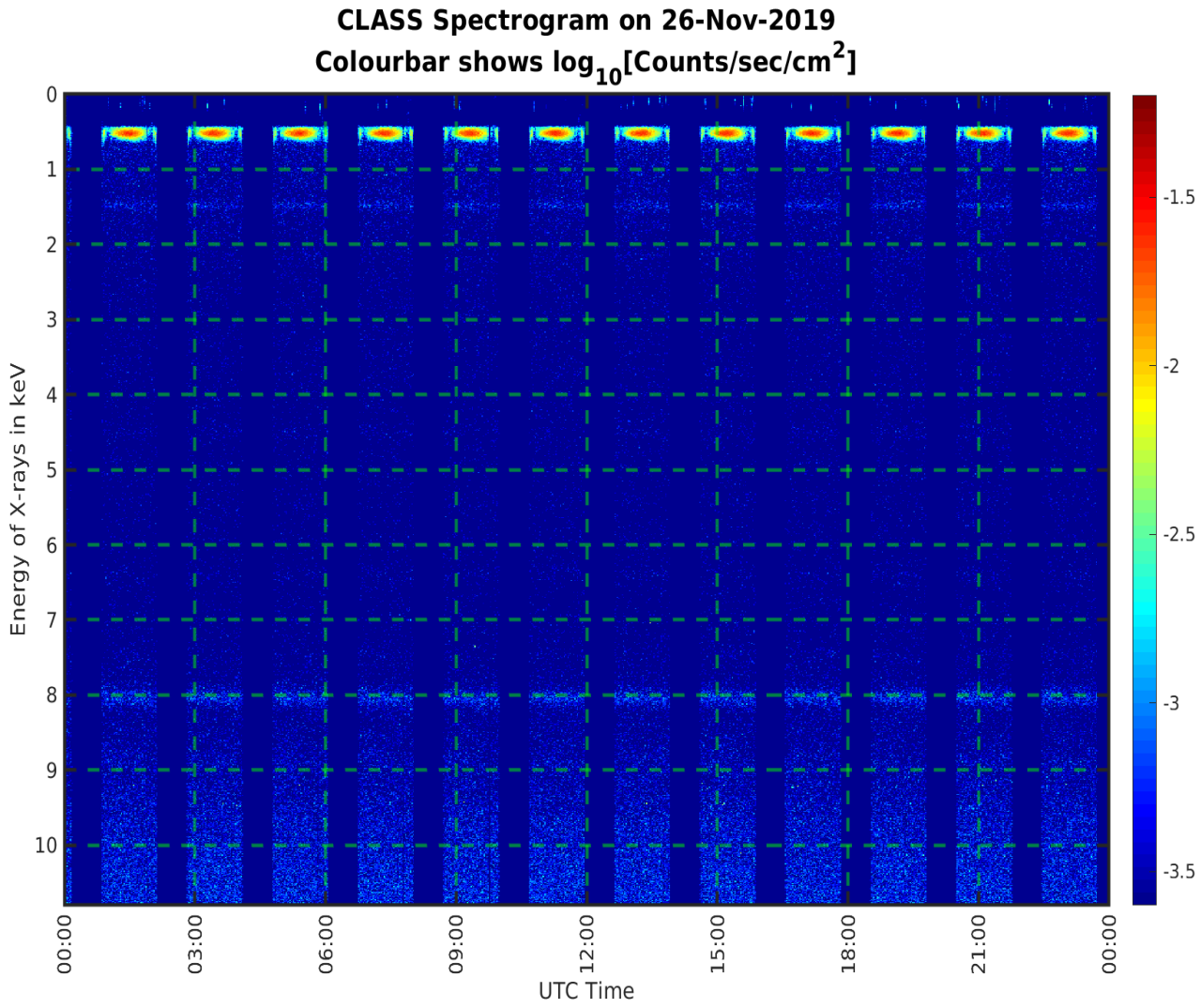
CLASS Spectrogram on 26-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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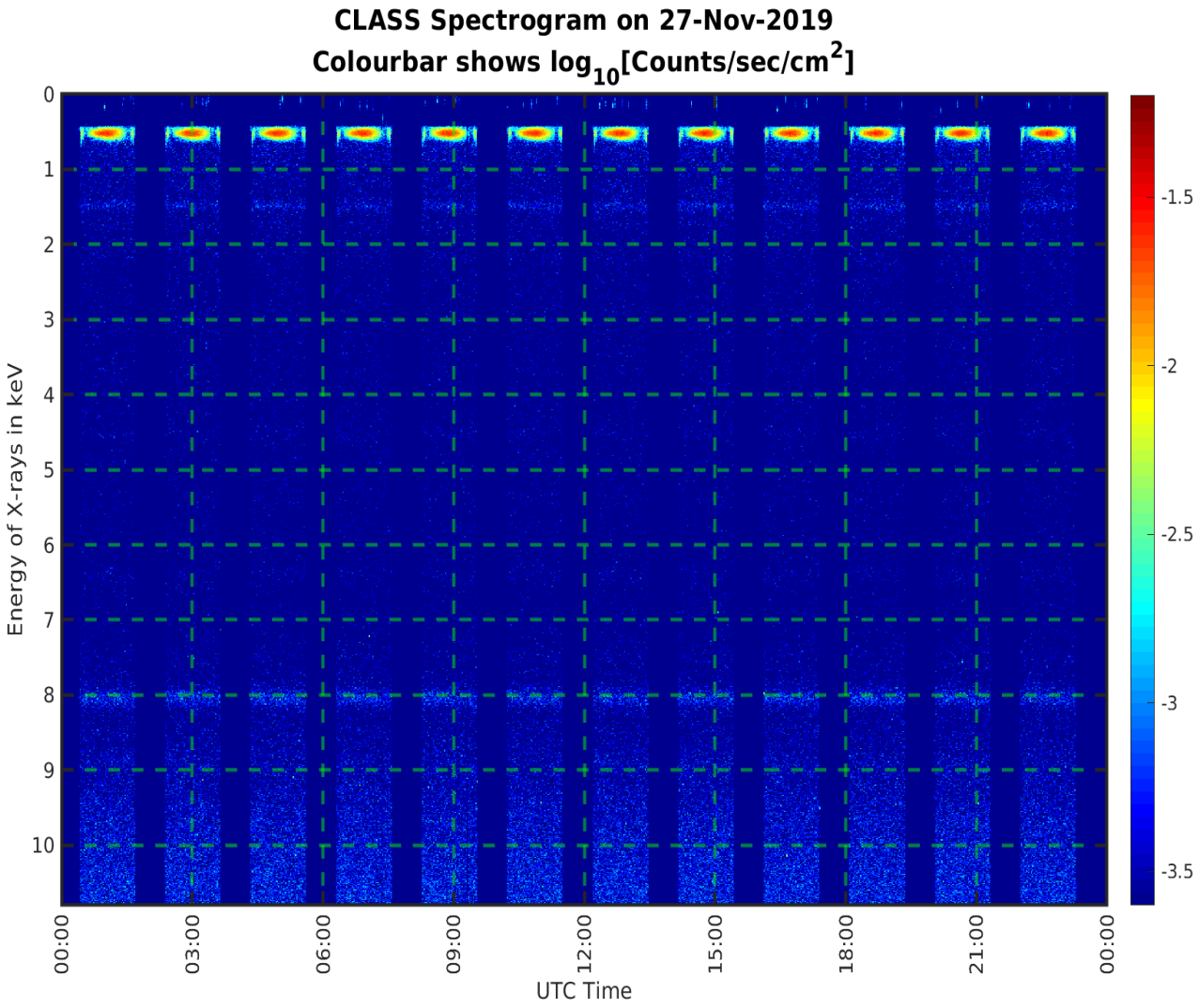
CLASS Spectrogram on 27-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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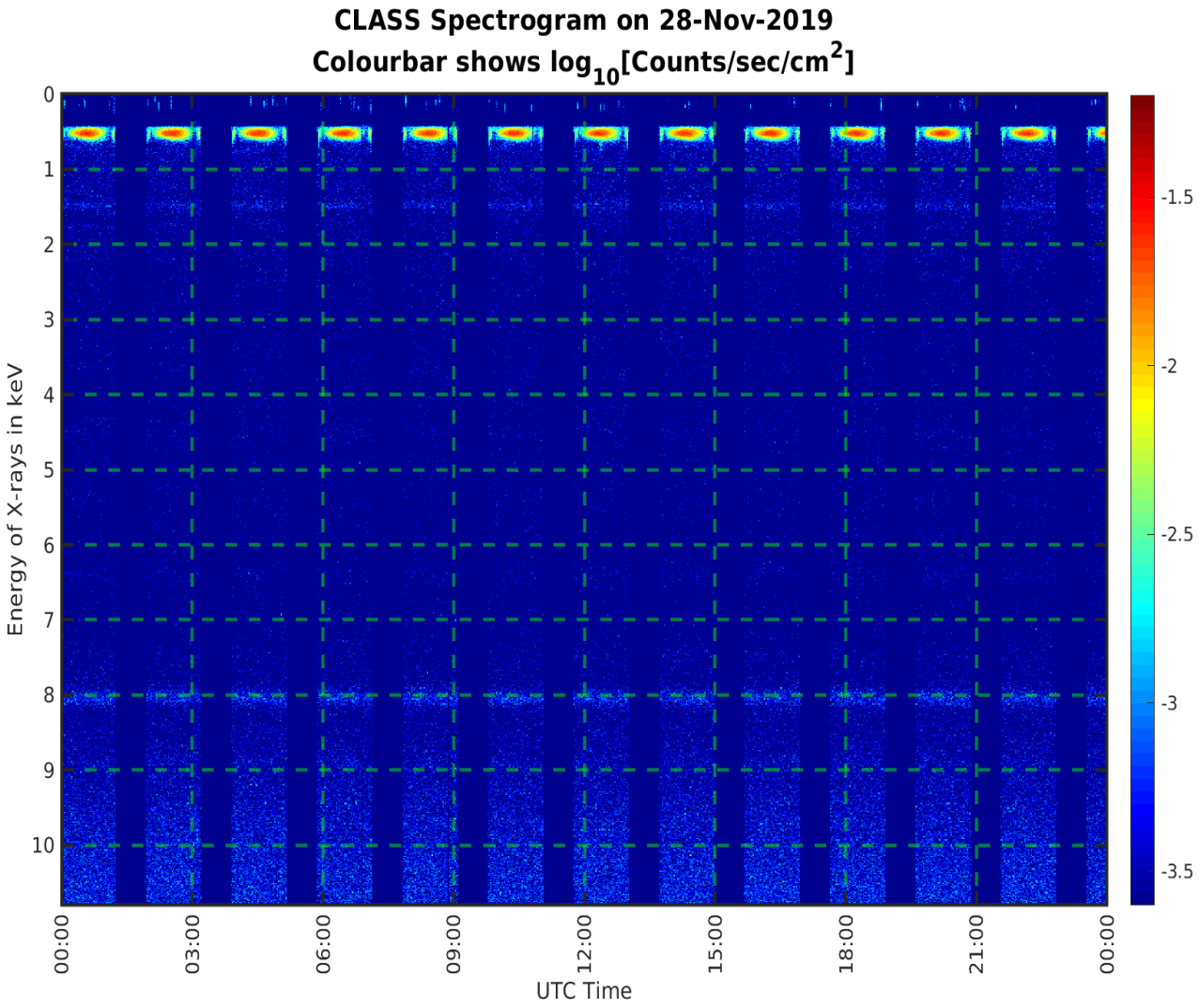
UTC Time


CLASS Spectrogram on 28-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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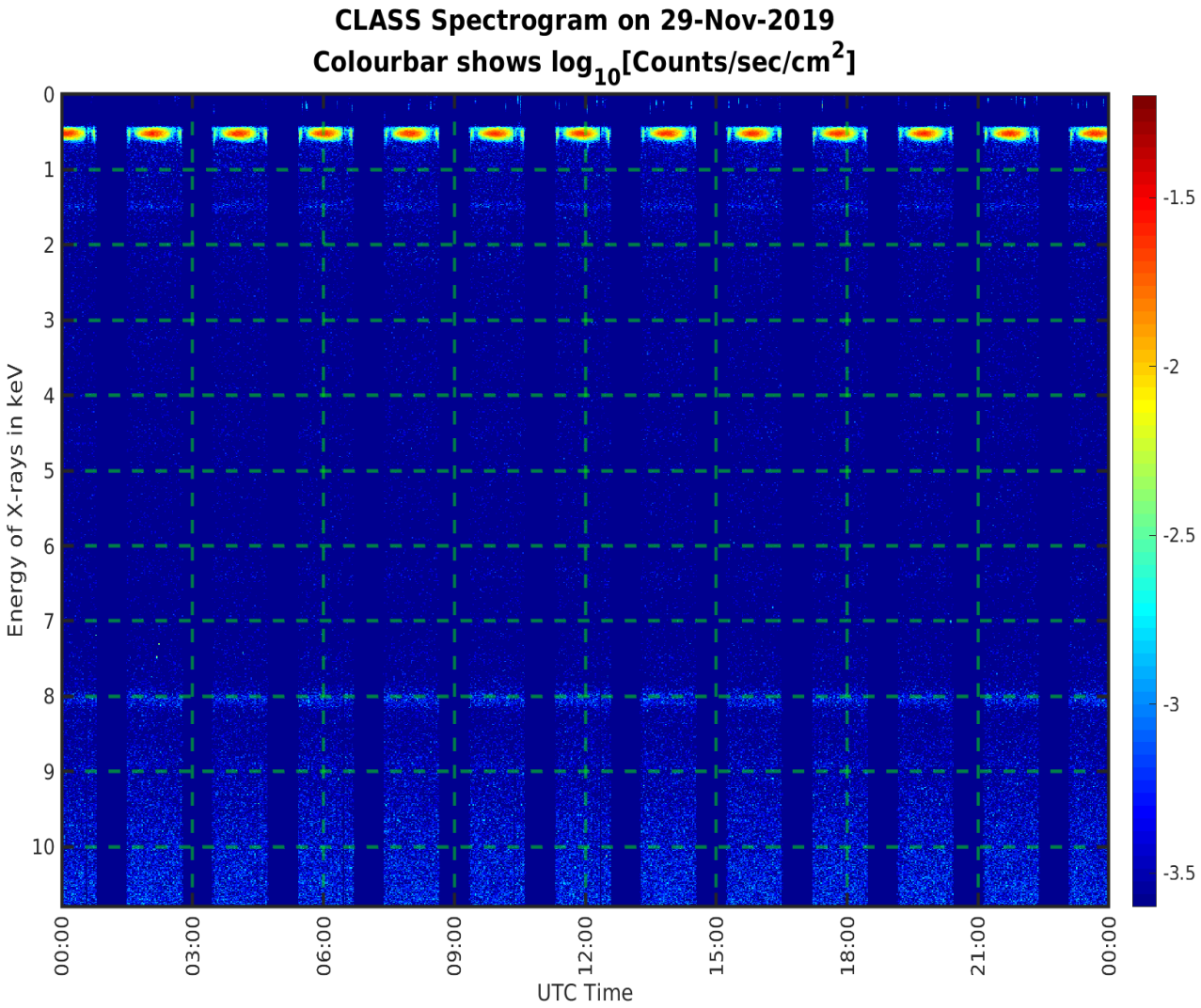
CLASS Spectrogram on 29-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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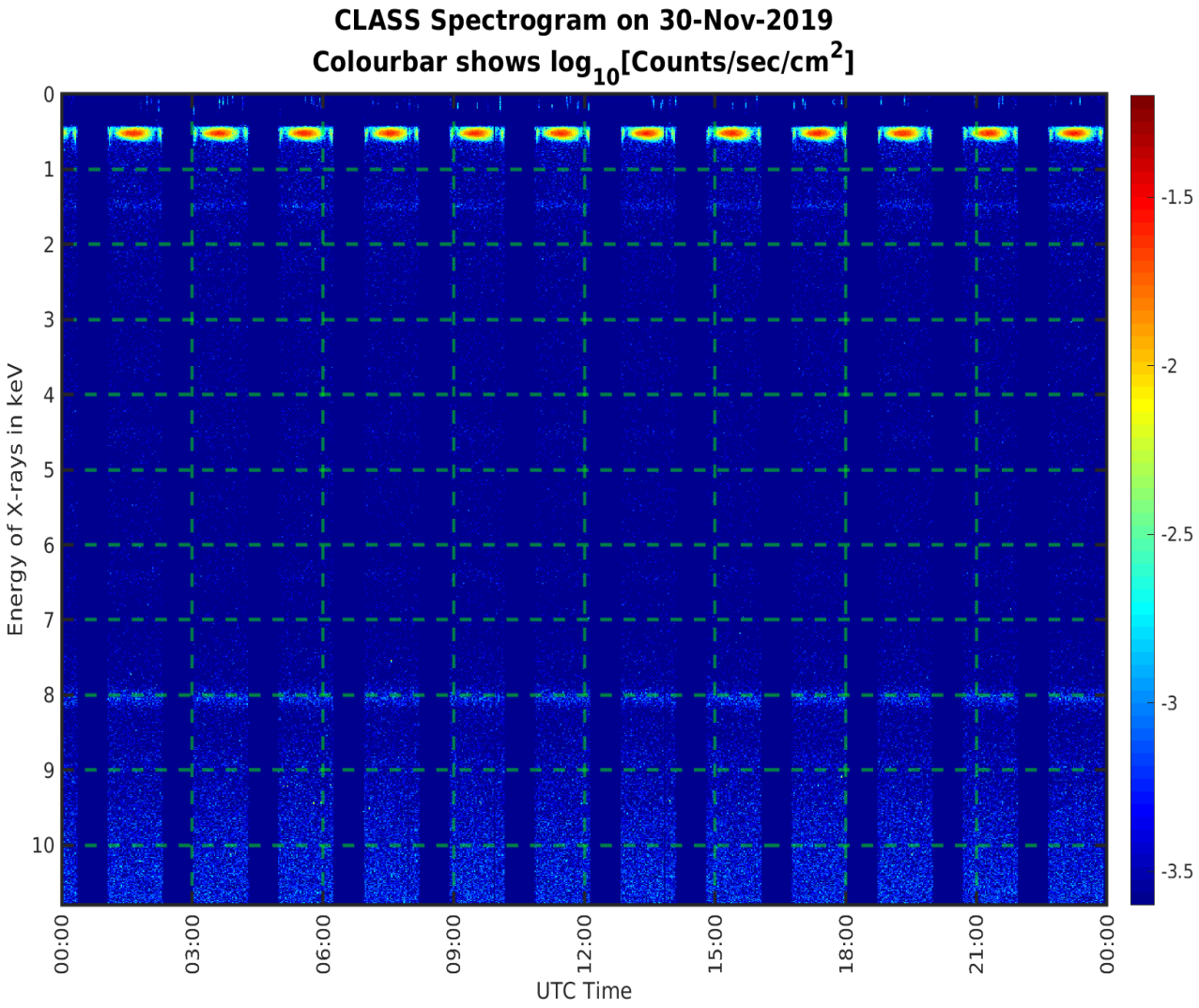
CLASS Spectrogram on 30-Nov-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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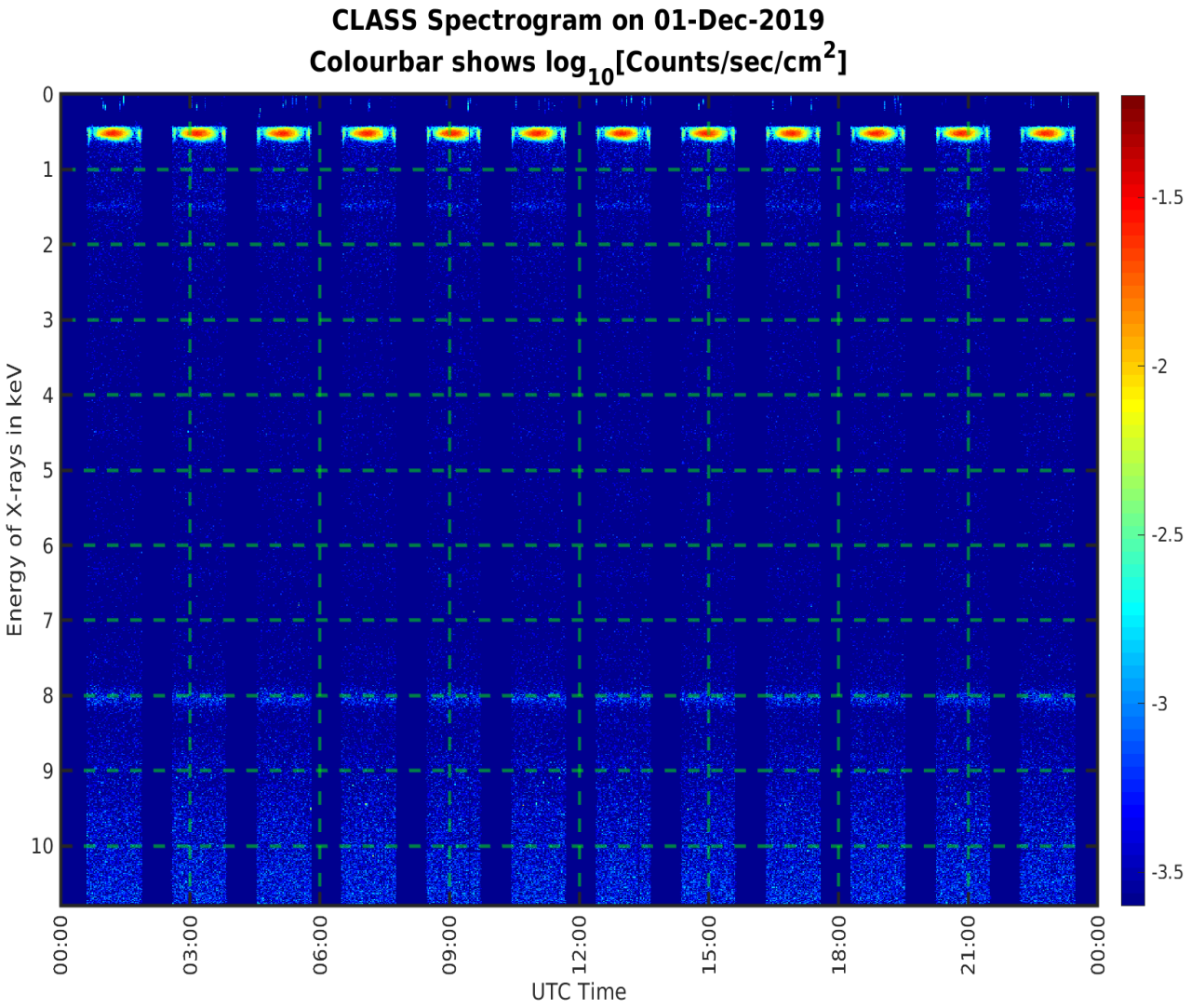
CLASS Spectrogram on 01-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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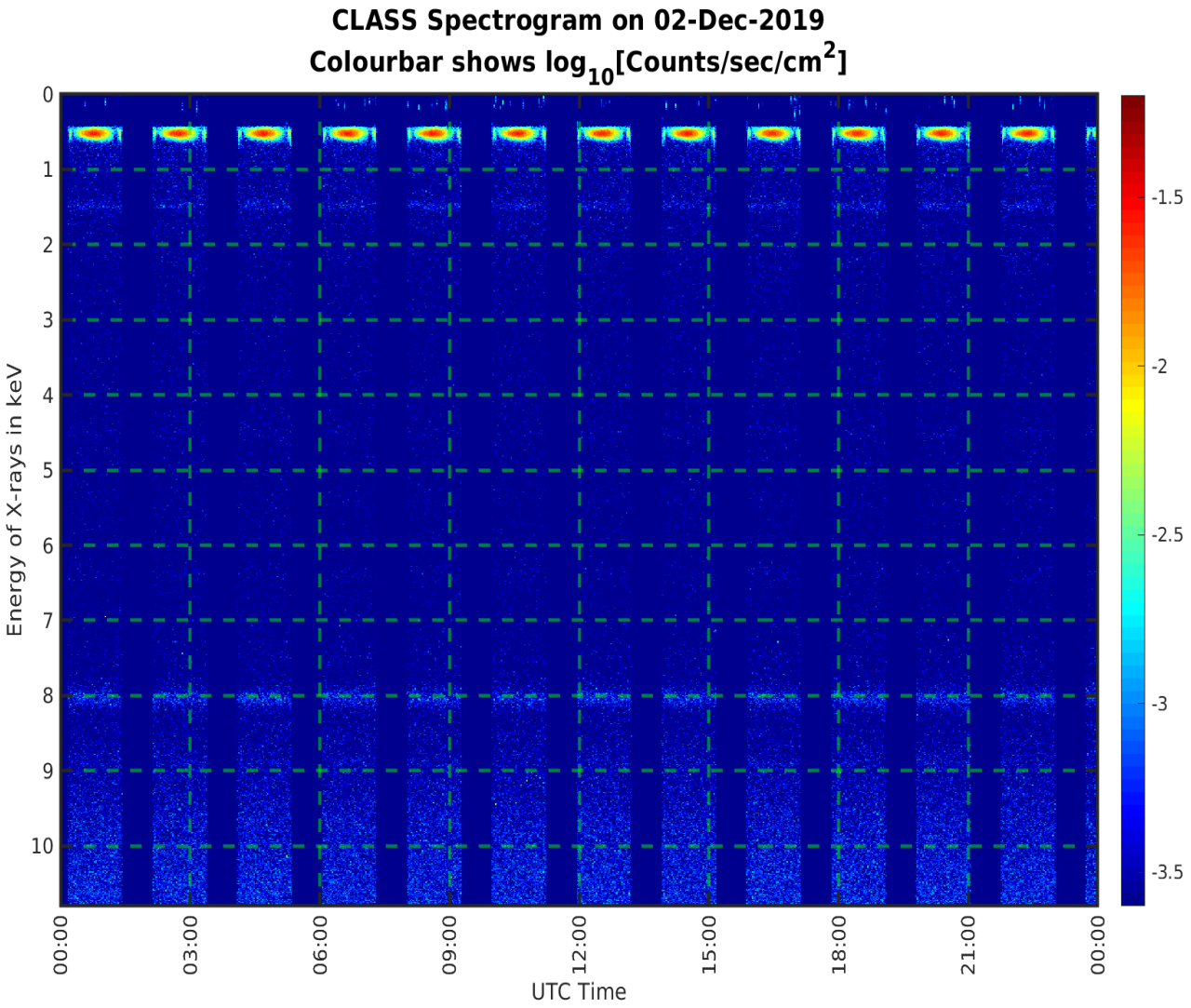
UTC Time


CLASS Spectrogram on 02-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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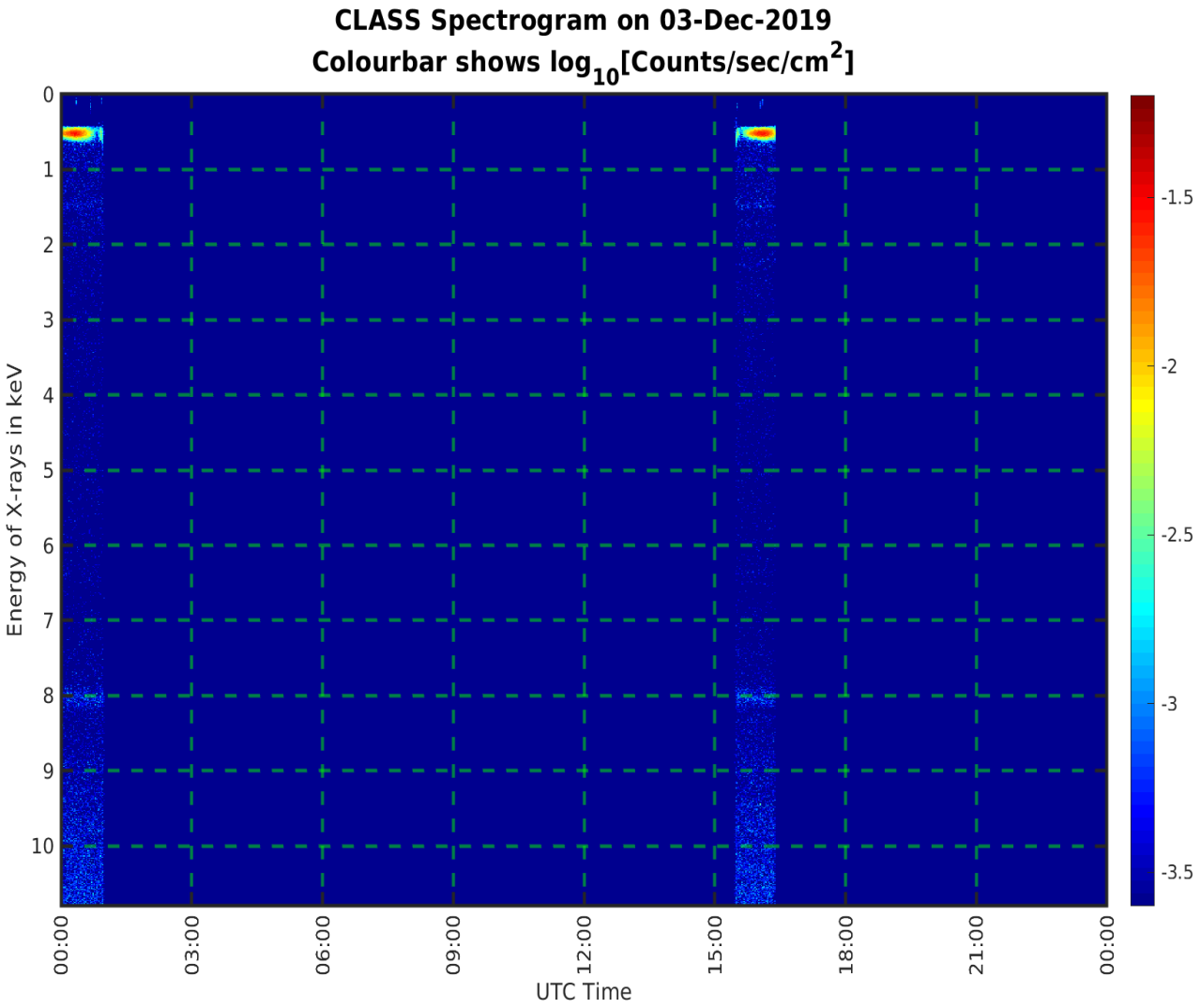
UTC Time


CLASS Spectrogram on 03-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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8
9
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-1.5
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-3.5
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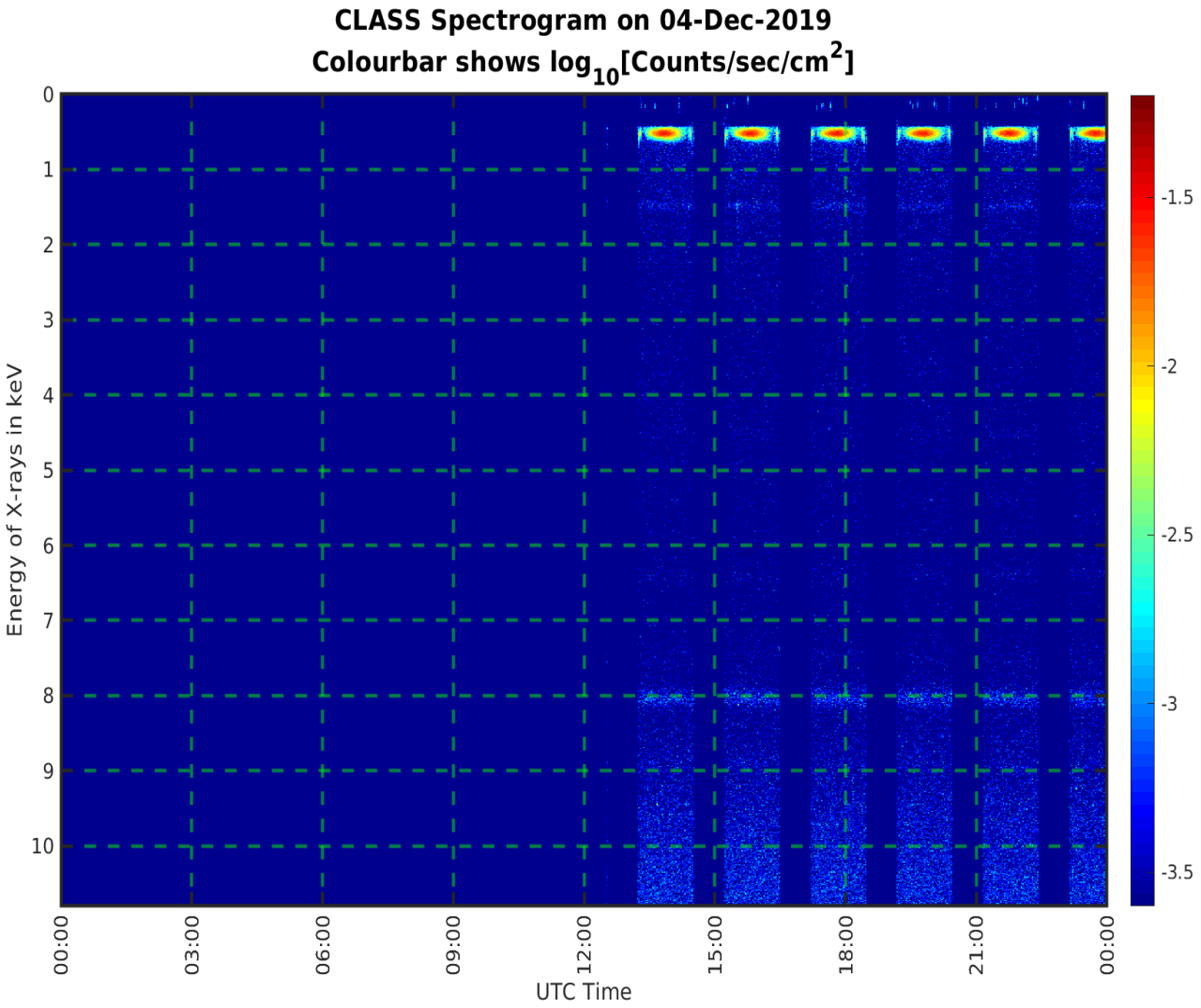
UTC Time


CLASS Spectrogram on 04-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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8
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00:00
03:00
06:00
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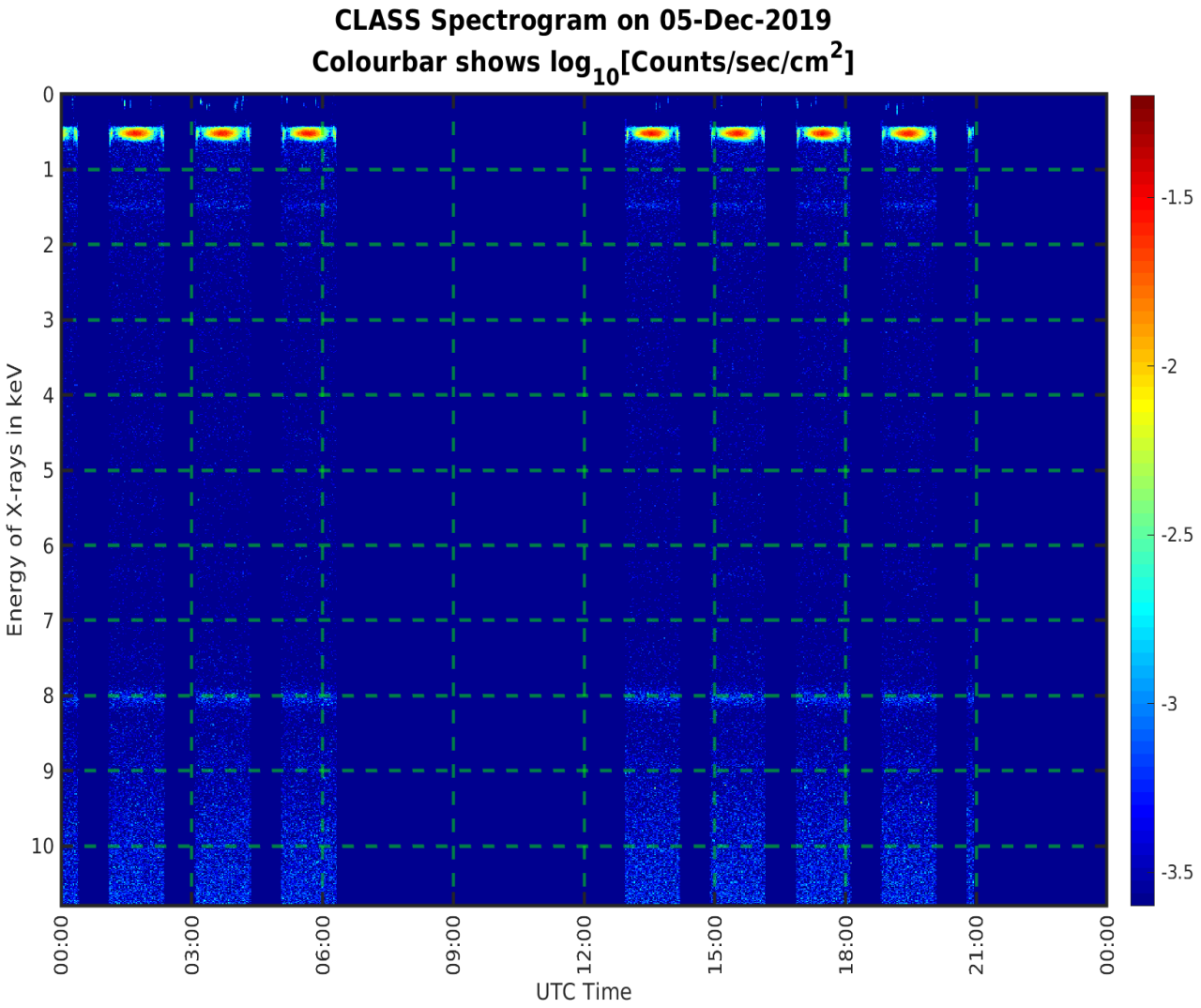
CLASS Spectrogram on 05-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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8
9
10
-1.5
-2
-2.5
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-3.5
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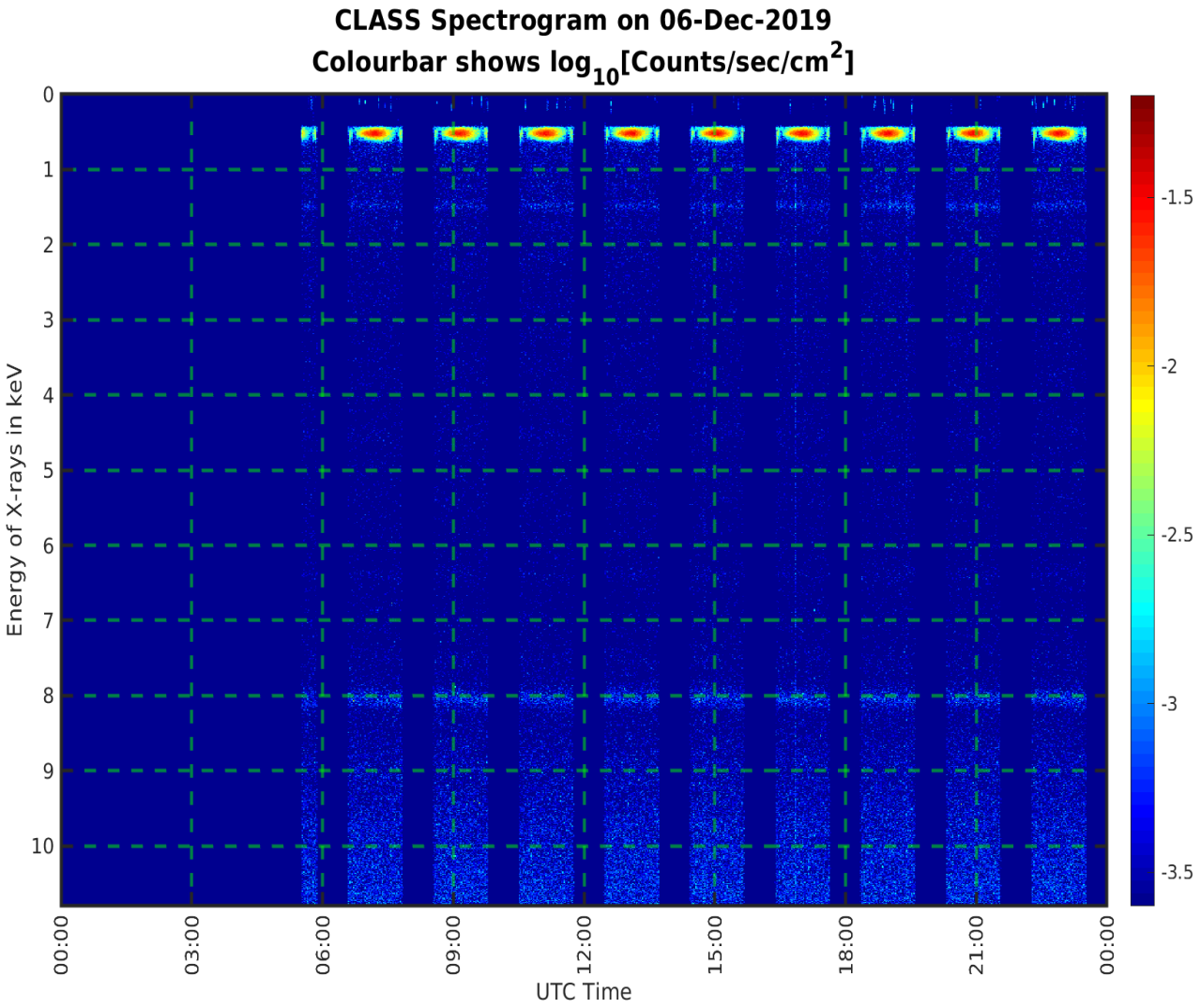
UTC Time


CLASS Spectrogram on 06-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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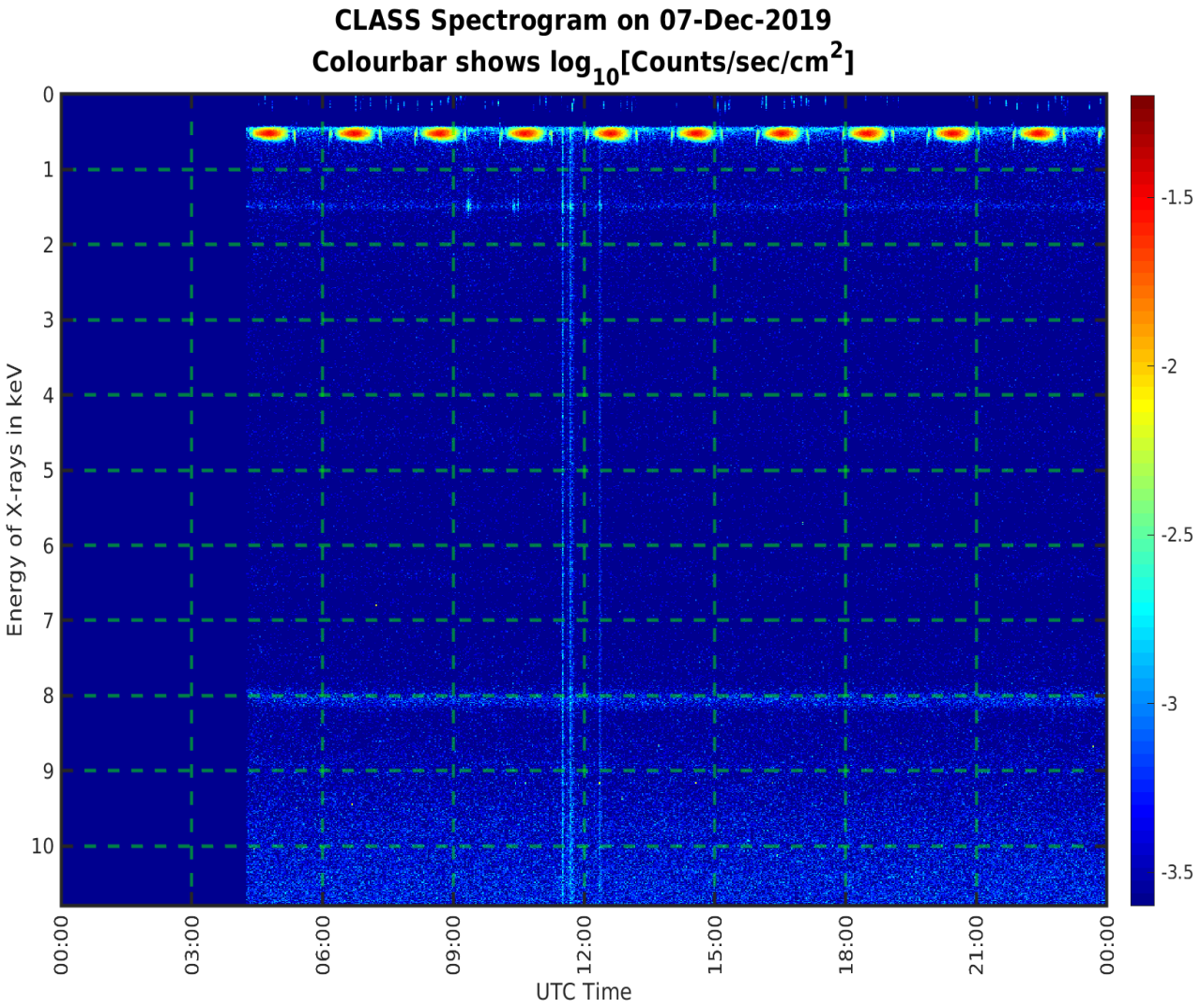
CLASS Spectrogram on 07-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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8
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-1.5
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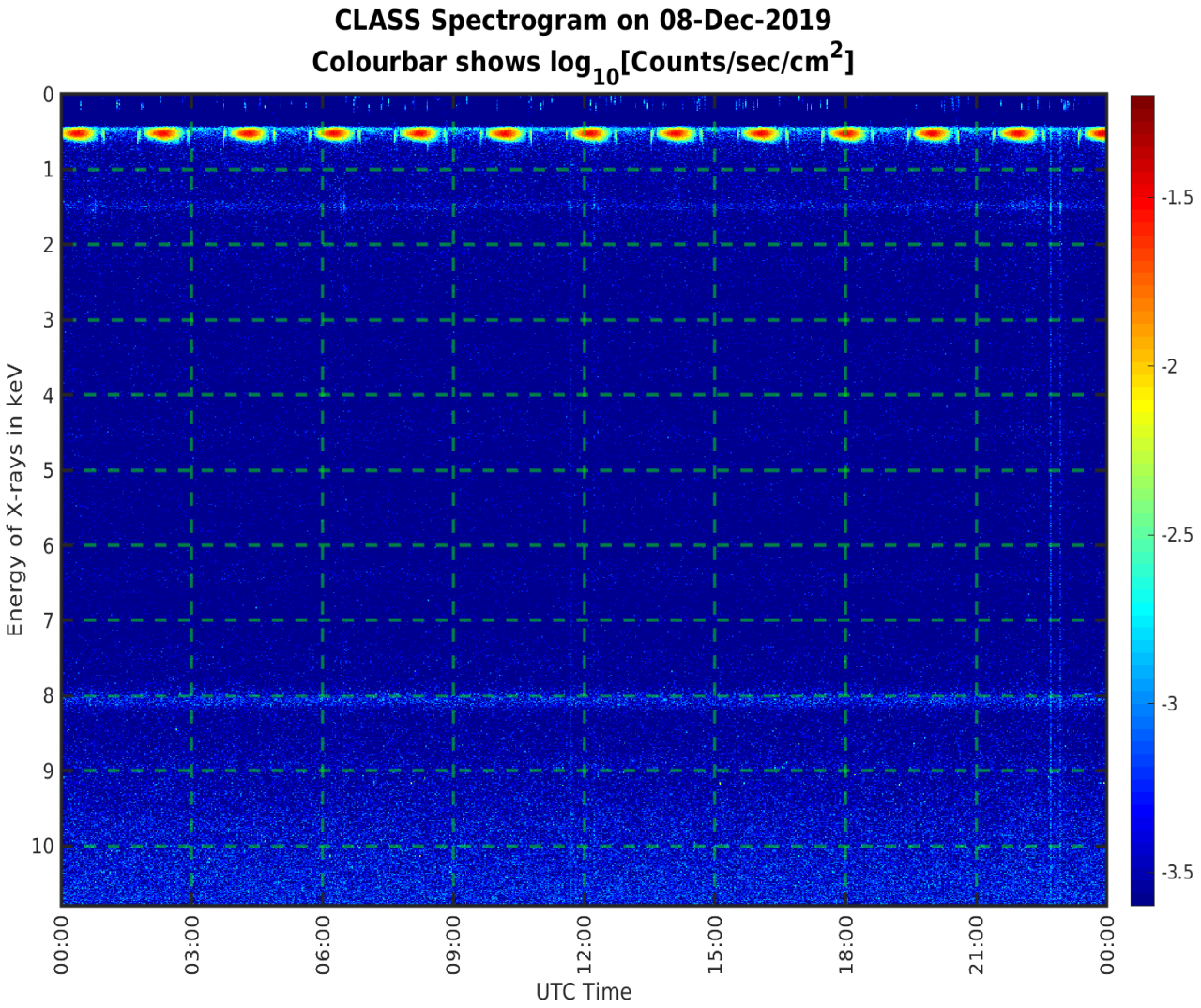
UTC Time


CLASS Spectrogram on 08-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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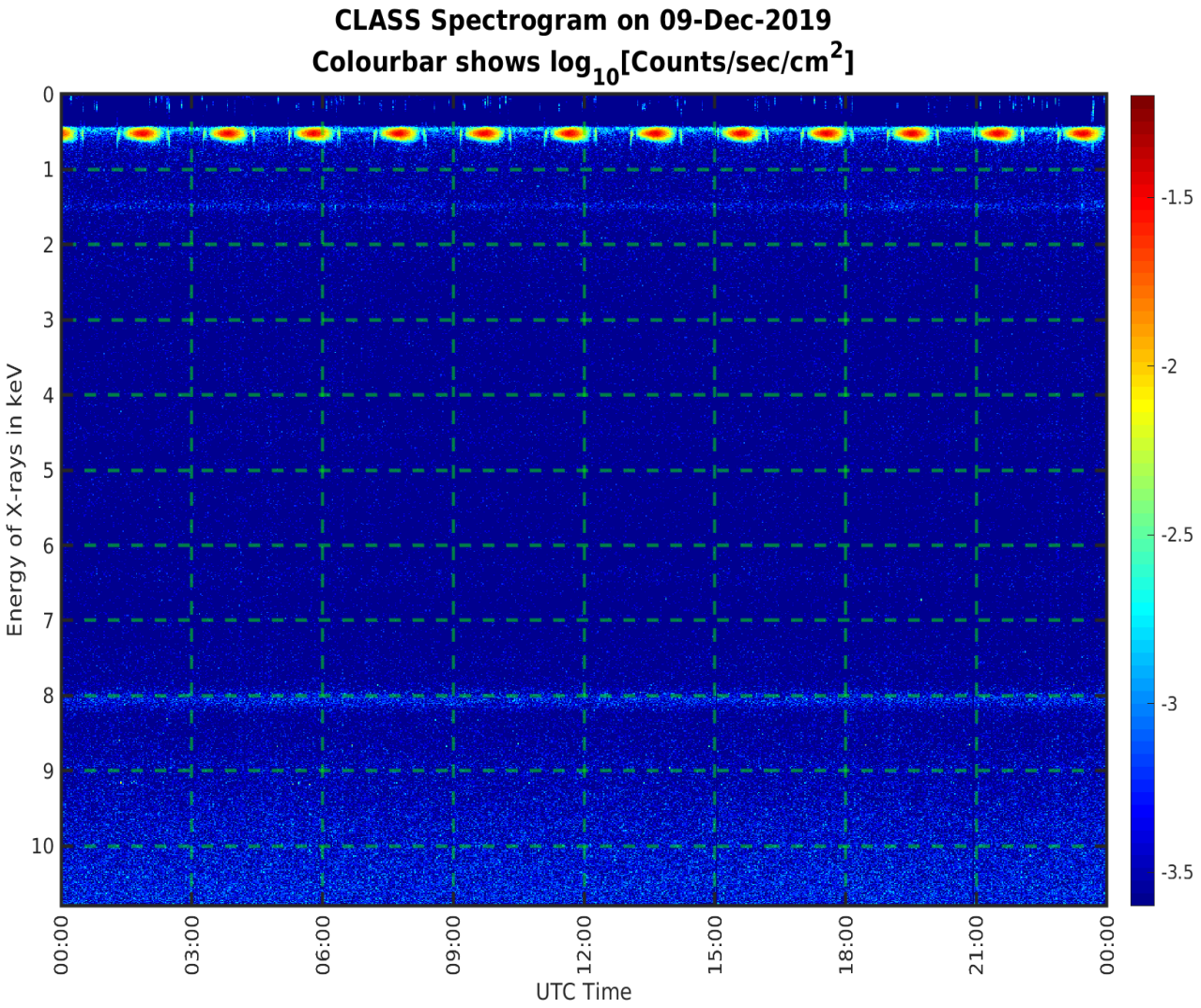
UTC Time


CLASS Spectrogram on 09-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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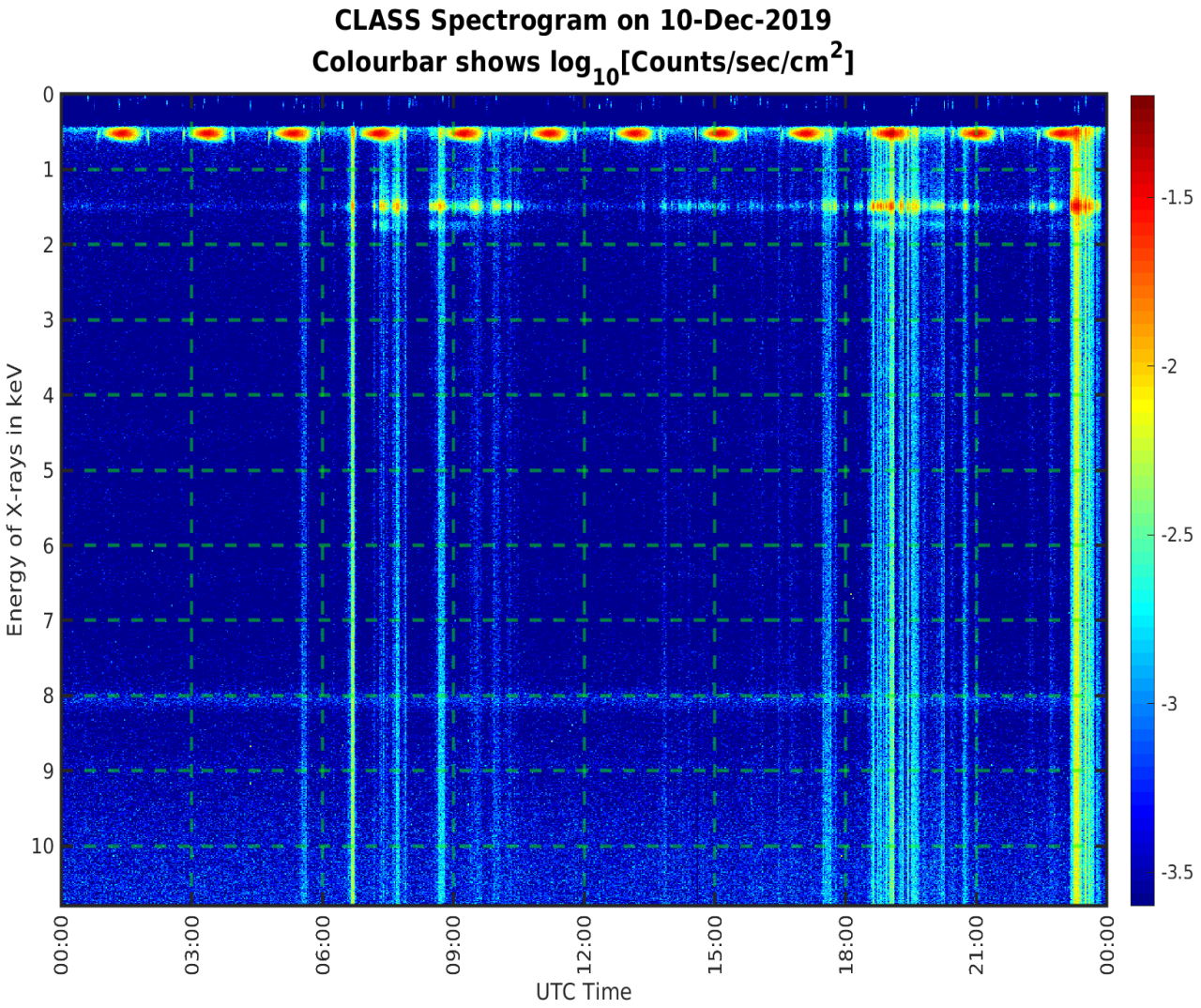
CLASS Spectrogram on 10-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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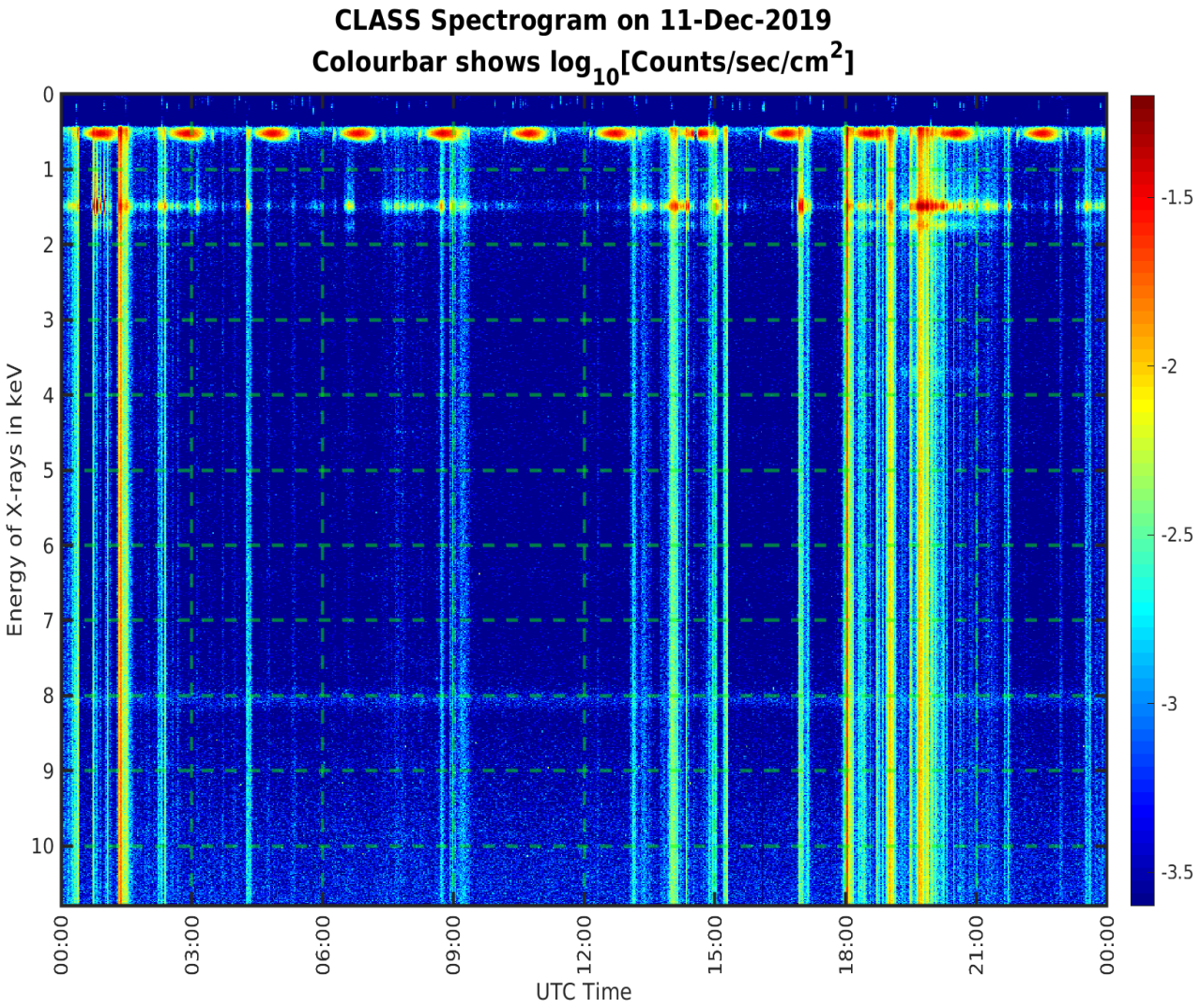
UTC Time


CLASS Spectrogram on 11-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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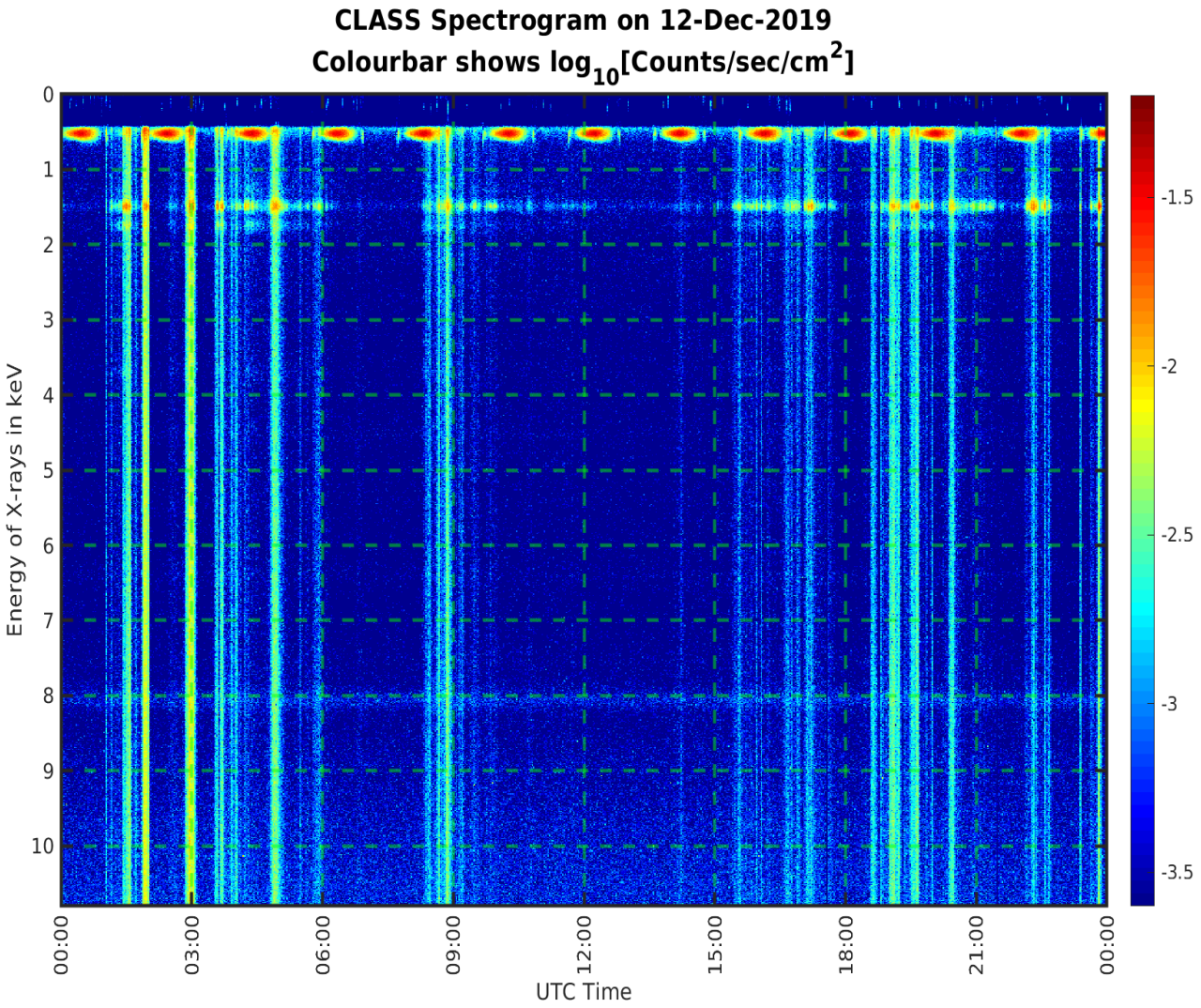
UTC Time


CLASS Spectrogram on 12-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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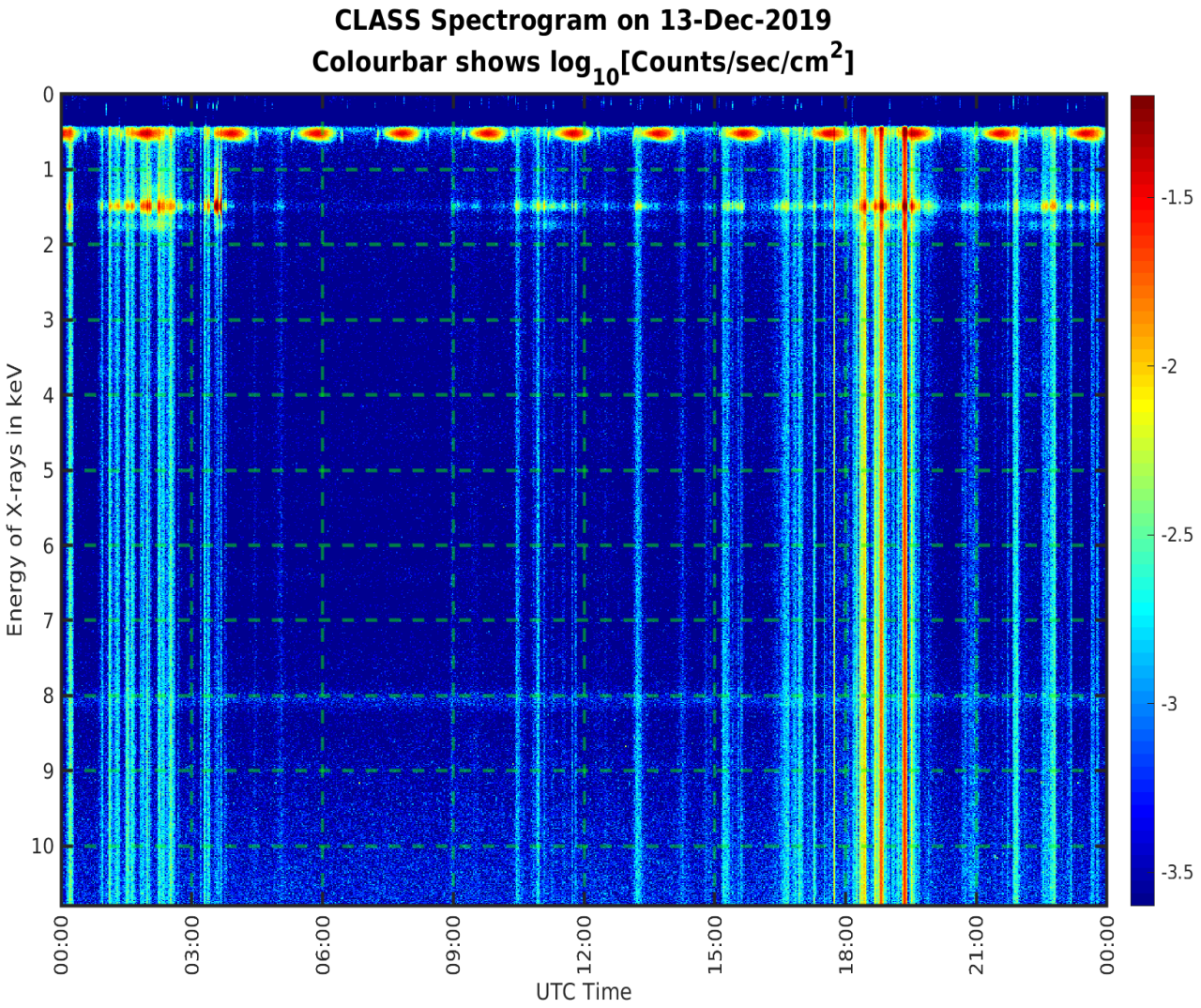
CLASS Spectrogram on 13-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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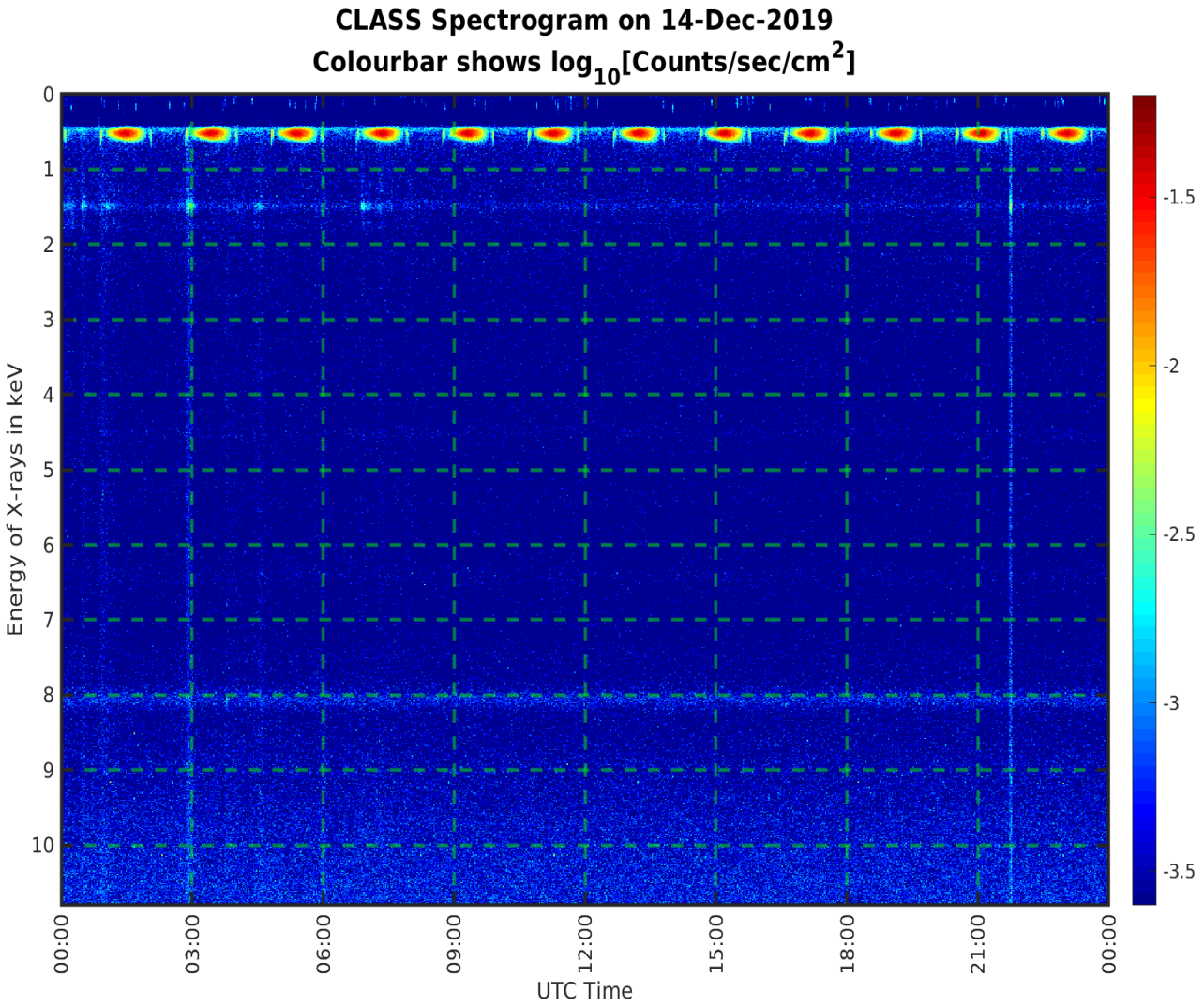
CLASS Spectrogram on 14-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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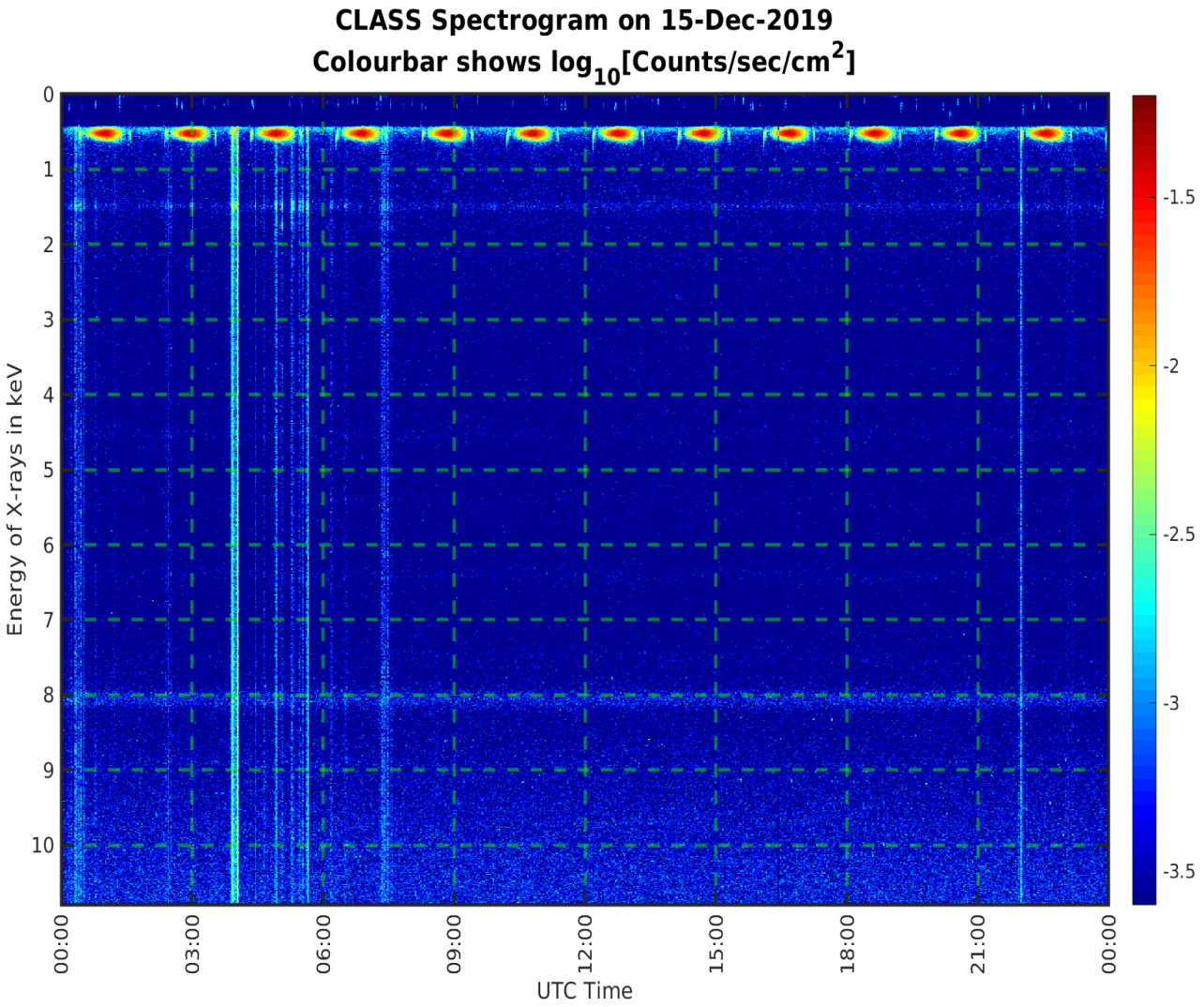
UTC Time


CLASS Spectrogram on 15-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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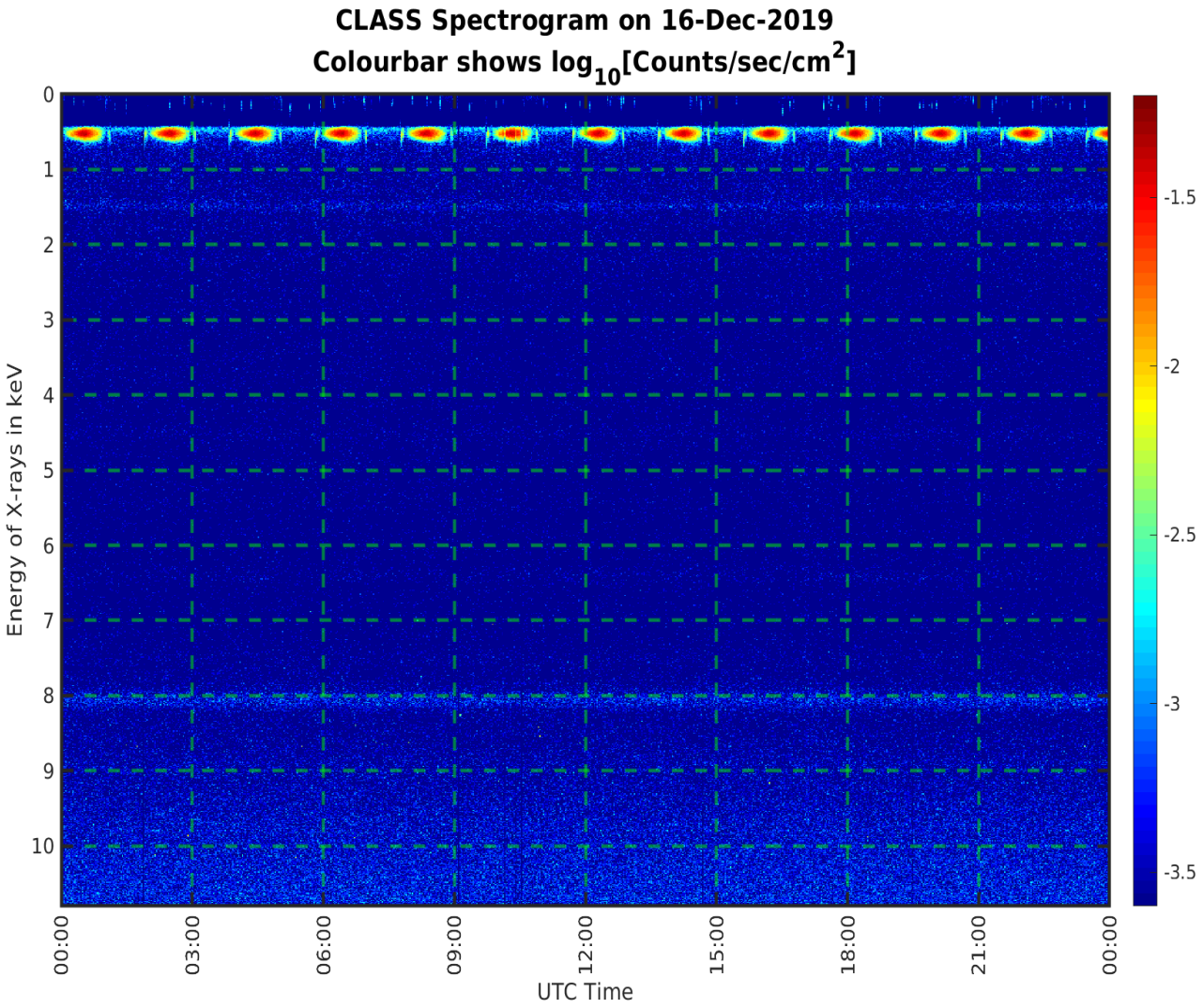
UTC Time


CLASS Spectrogram on 16-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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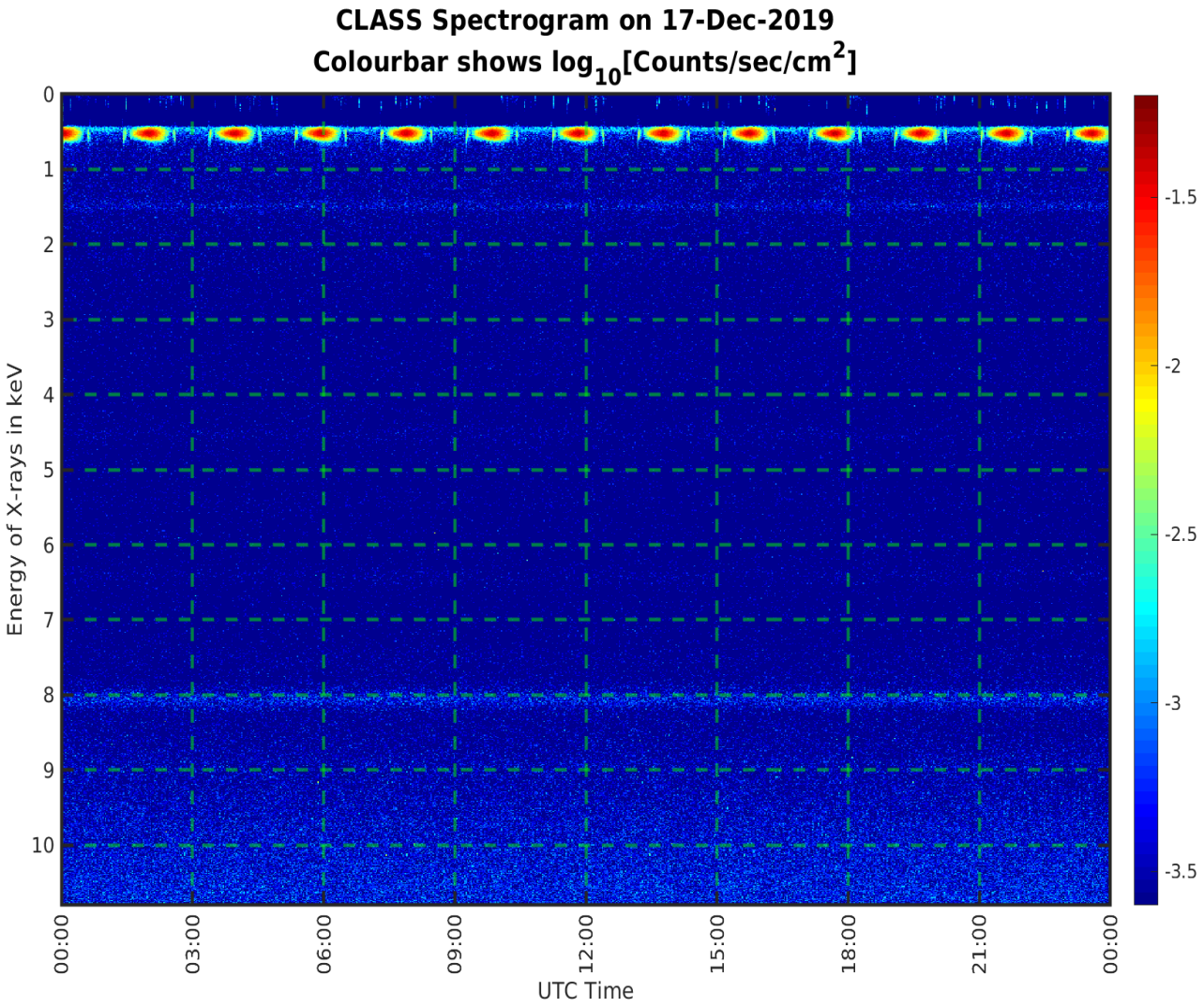
UTC Time


CLASS Spectrogram on 17-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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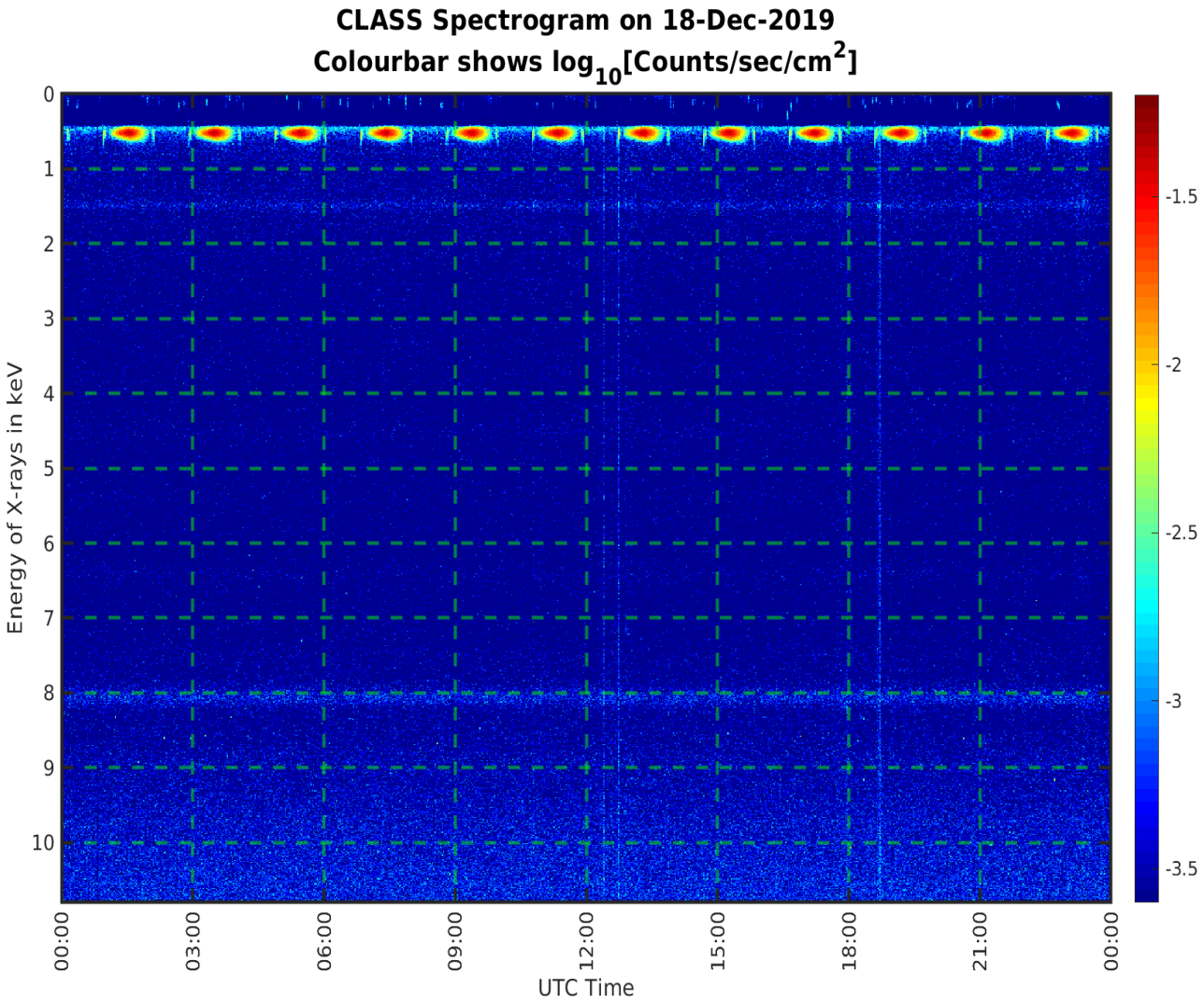
UTC Time


CLASS Spectrogram on 18-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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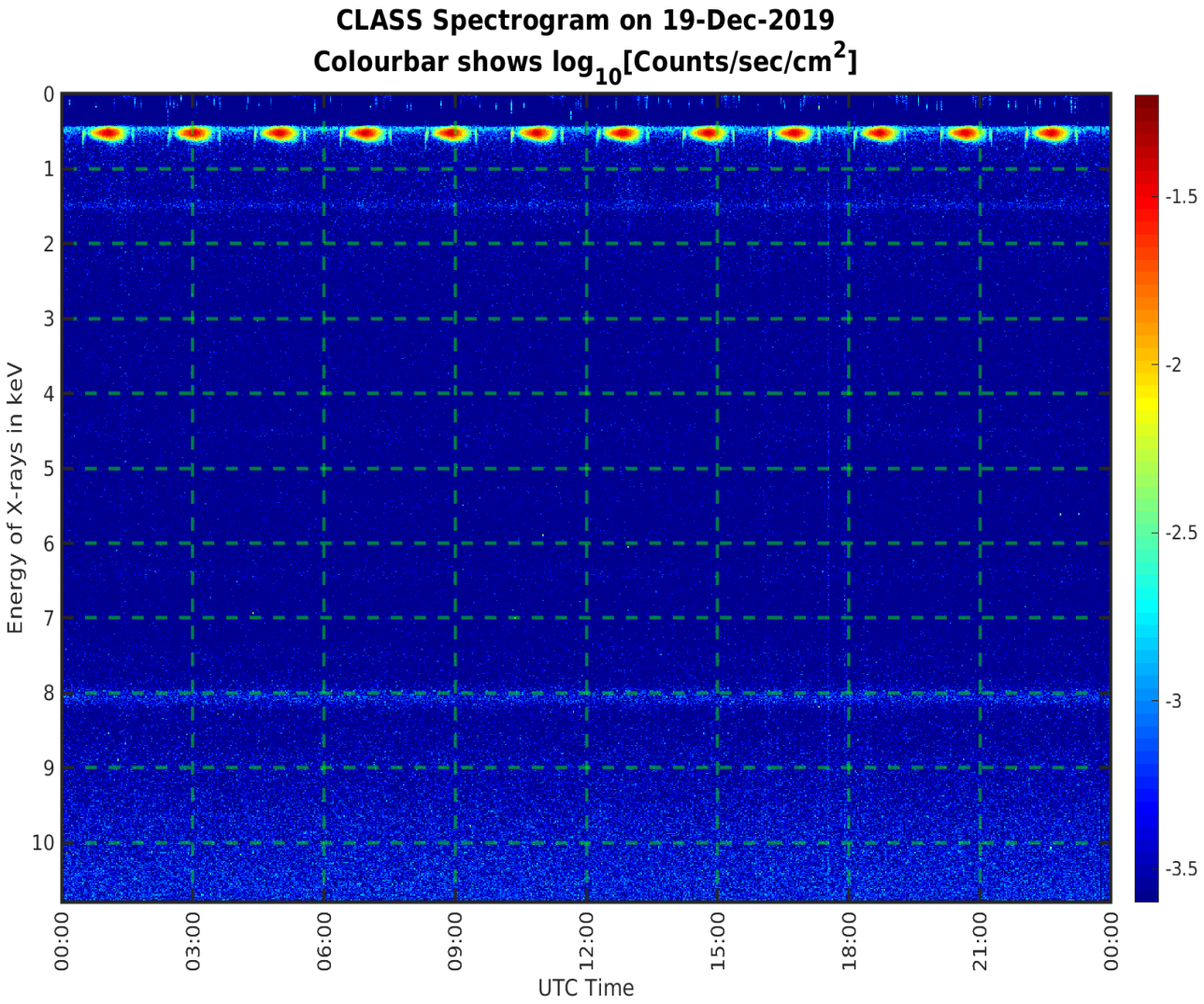
UTC Time


CLASS Spectrogram on 19-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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-1.5
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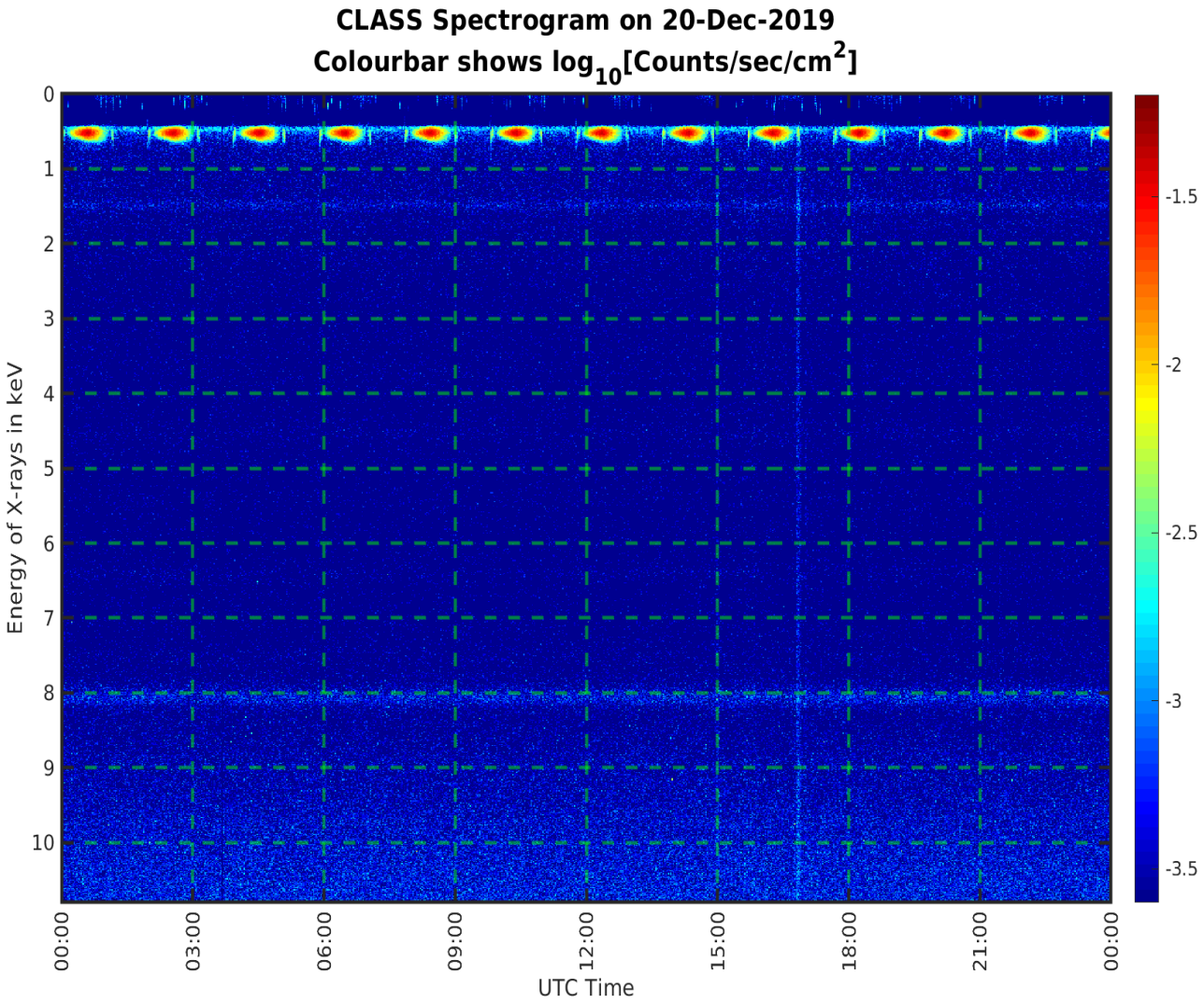
UTC Time


CLASS Spectrogram on 20-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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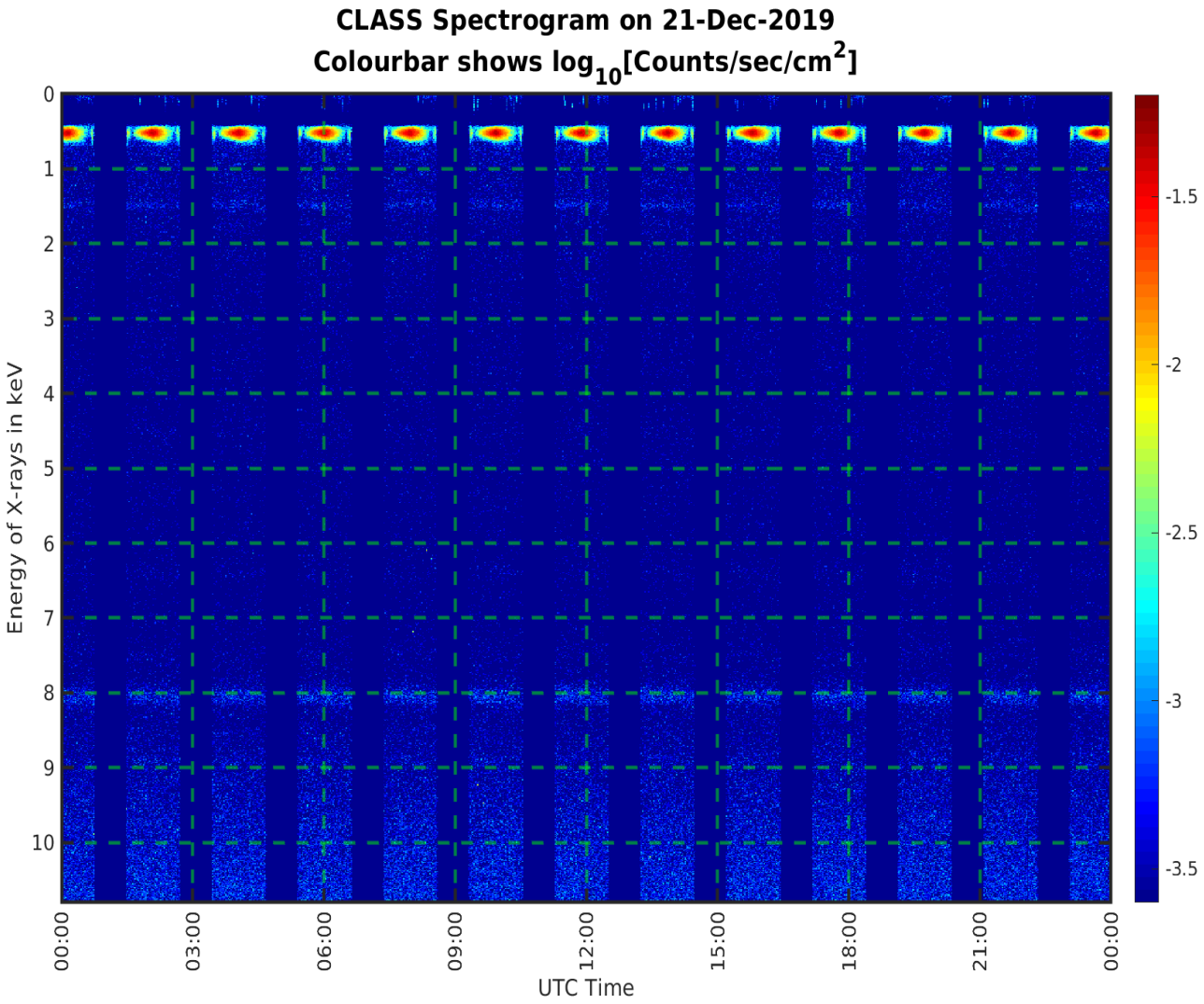
UTC Time


CLASS Spectrogram on 21-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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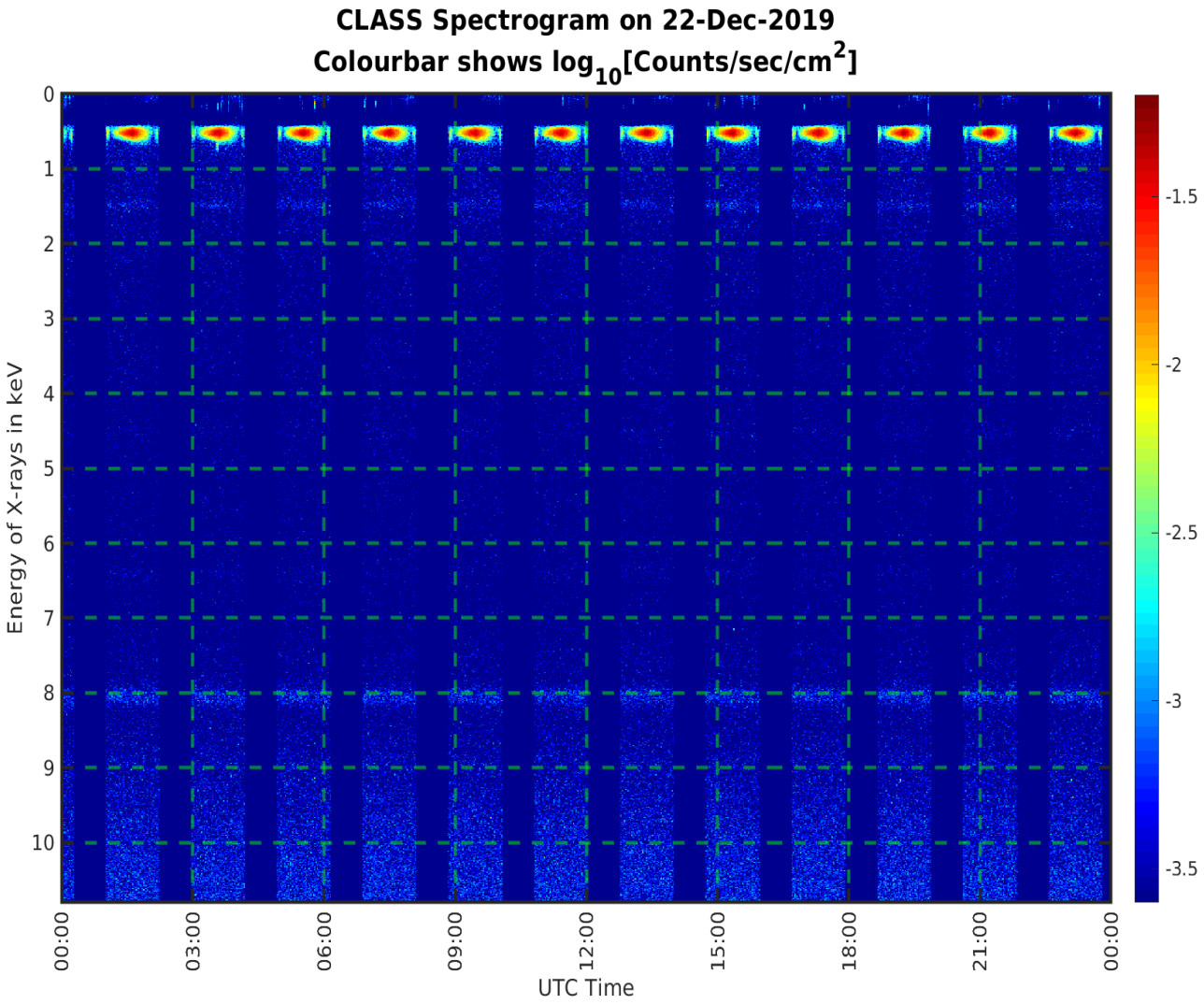
UTC Time


CLASS Spectrogram on 22-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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UTC Time
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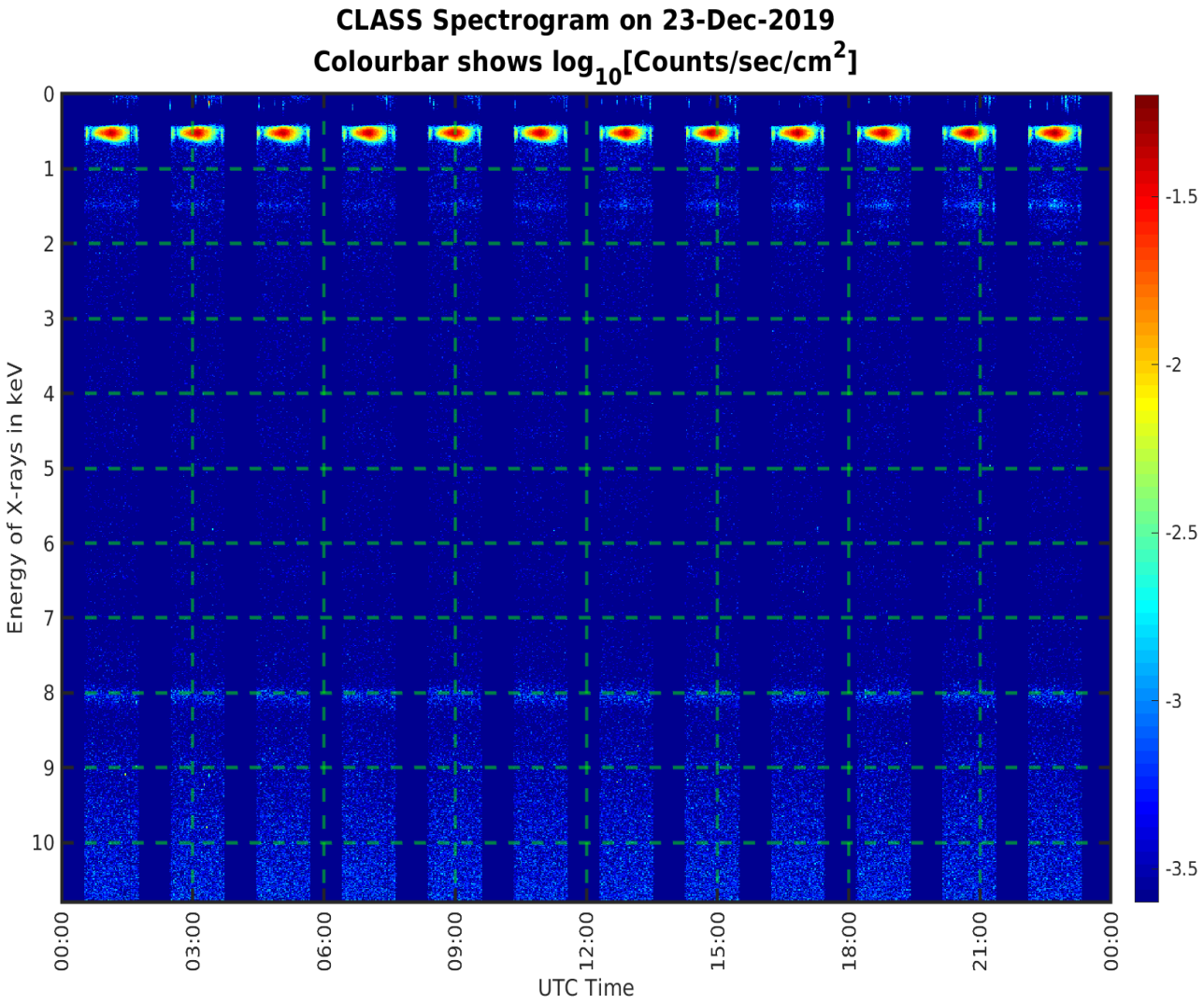
CLASS Spectrogram on 23-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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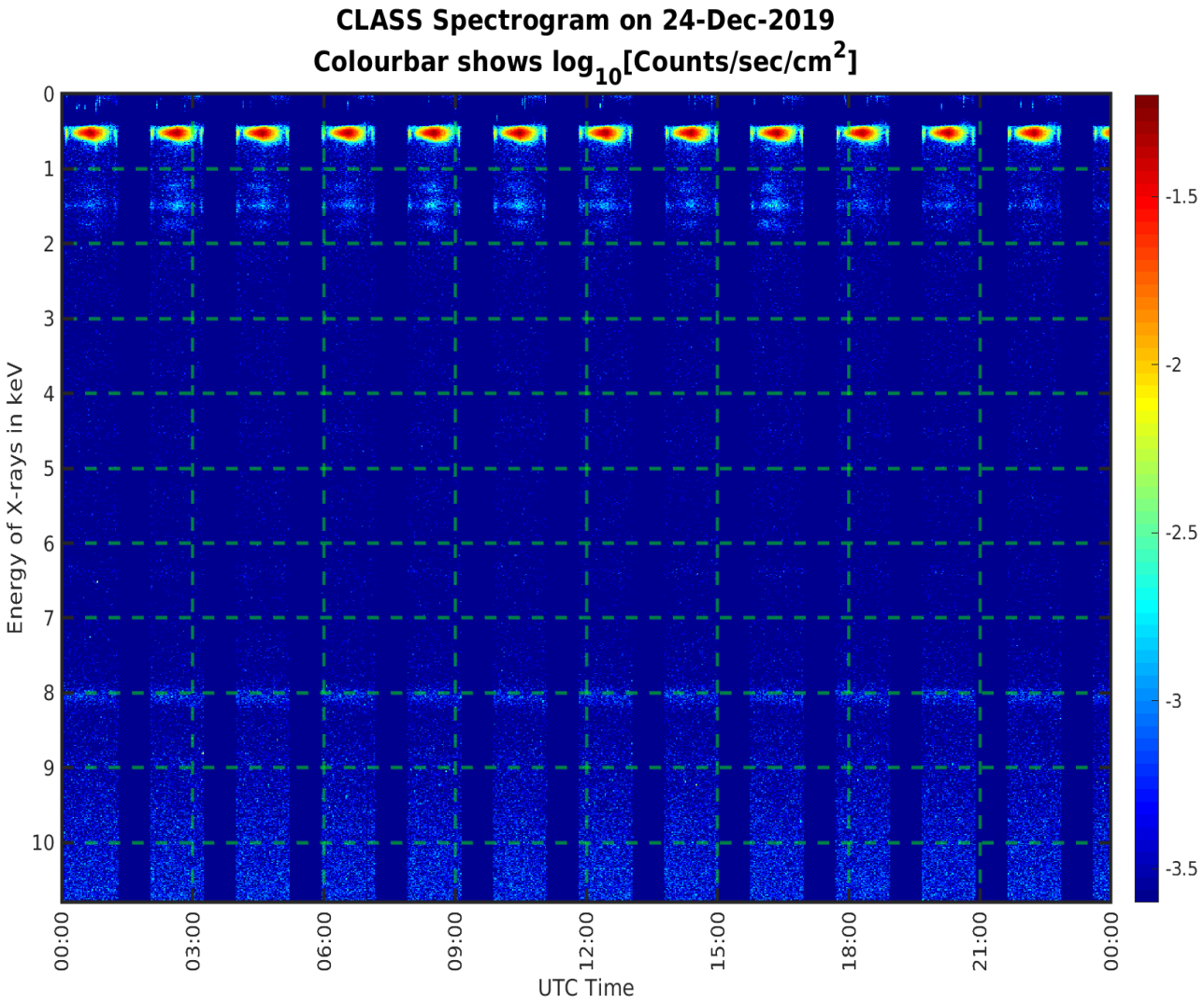
UTC Time


CLASS Spectrogram on 24-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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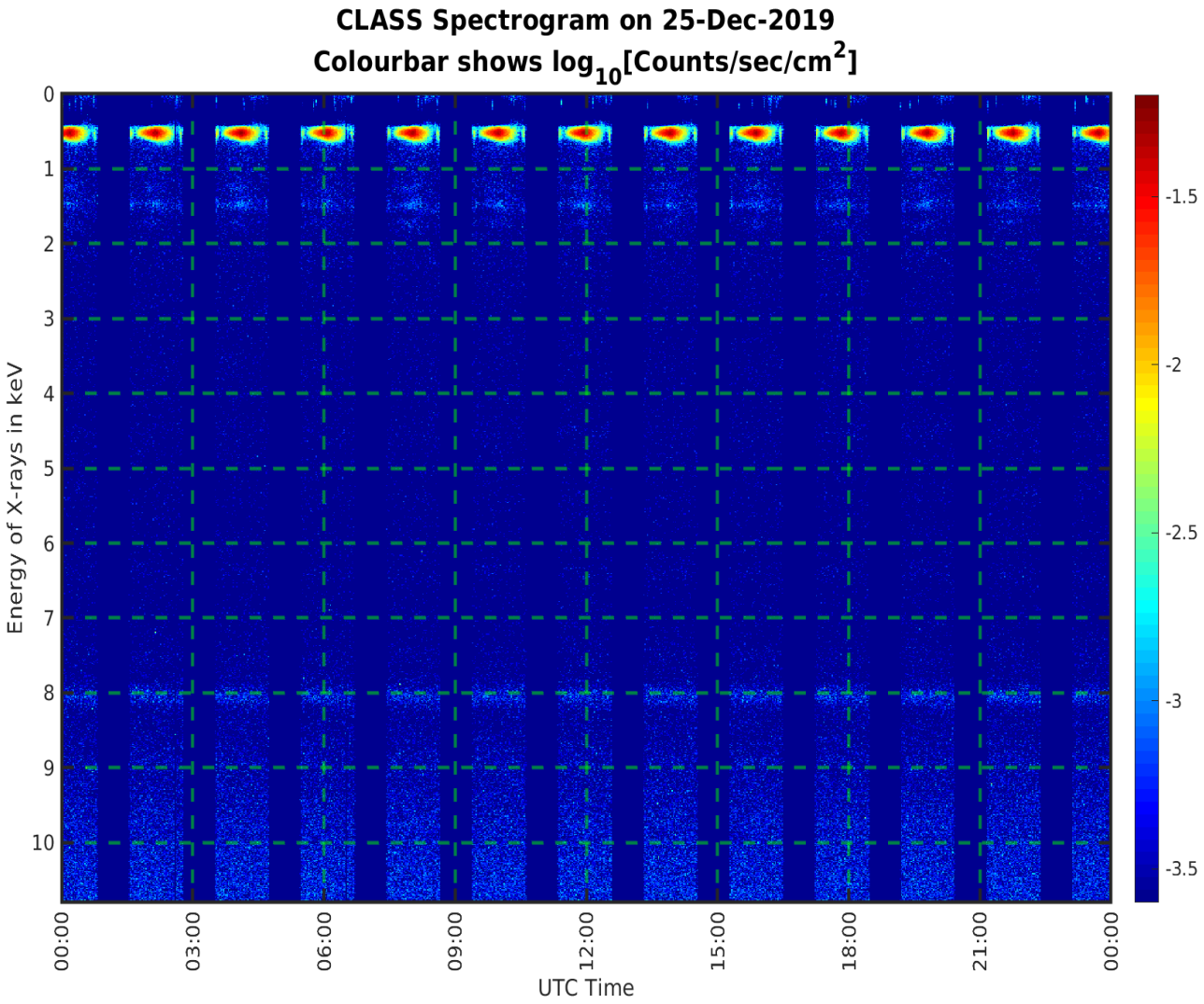
CLASS Spectrogram on 25-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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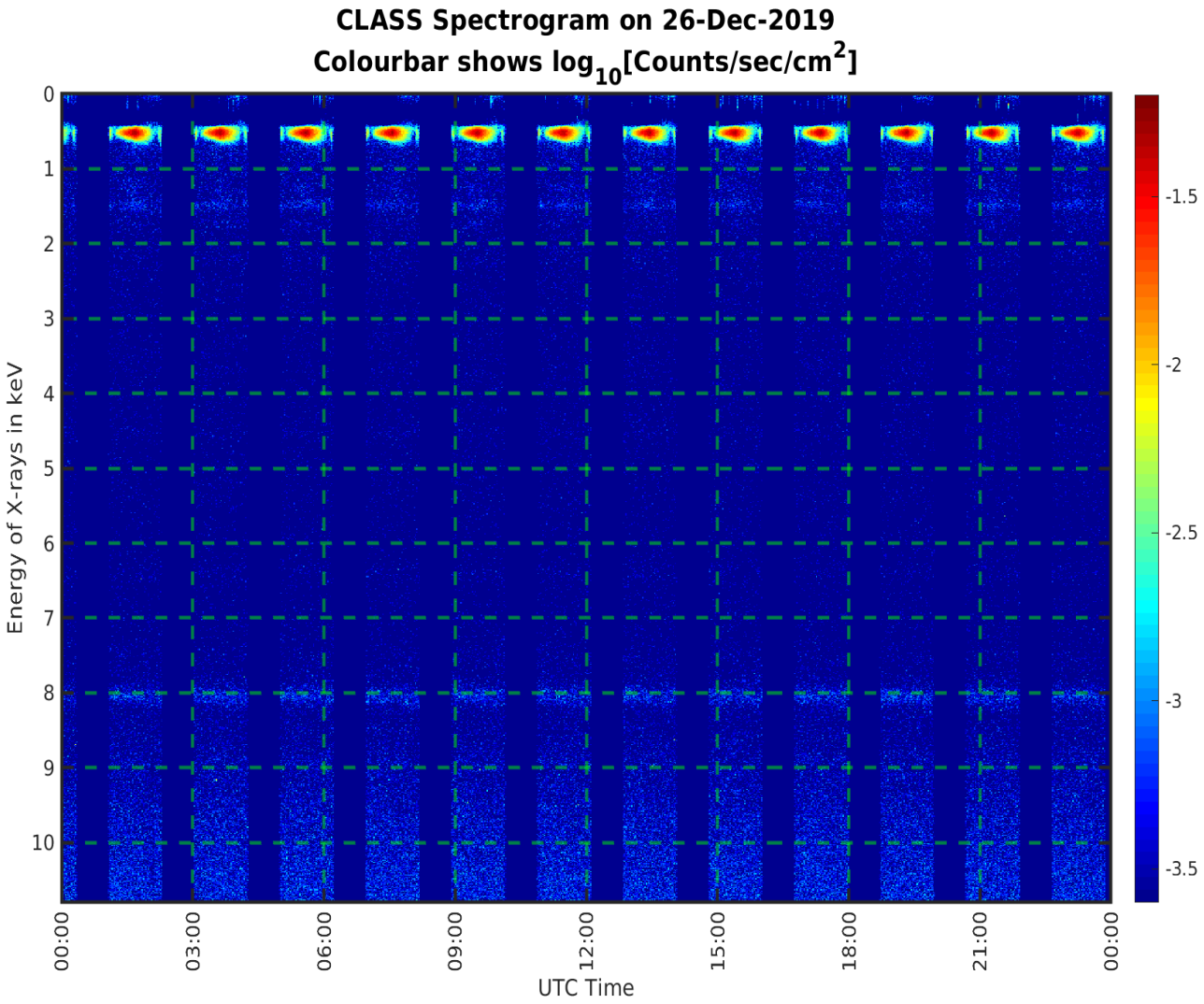
UTC Time


CLASS Spectrogram on 26-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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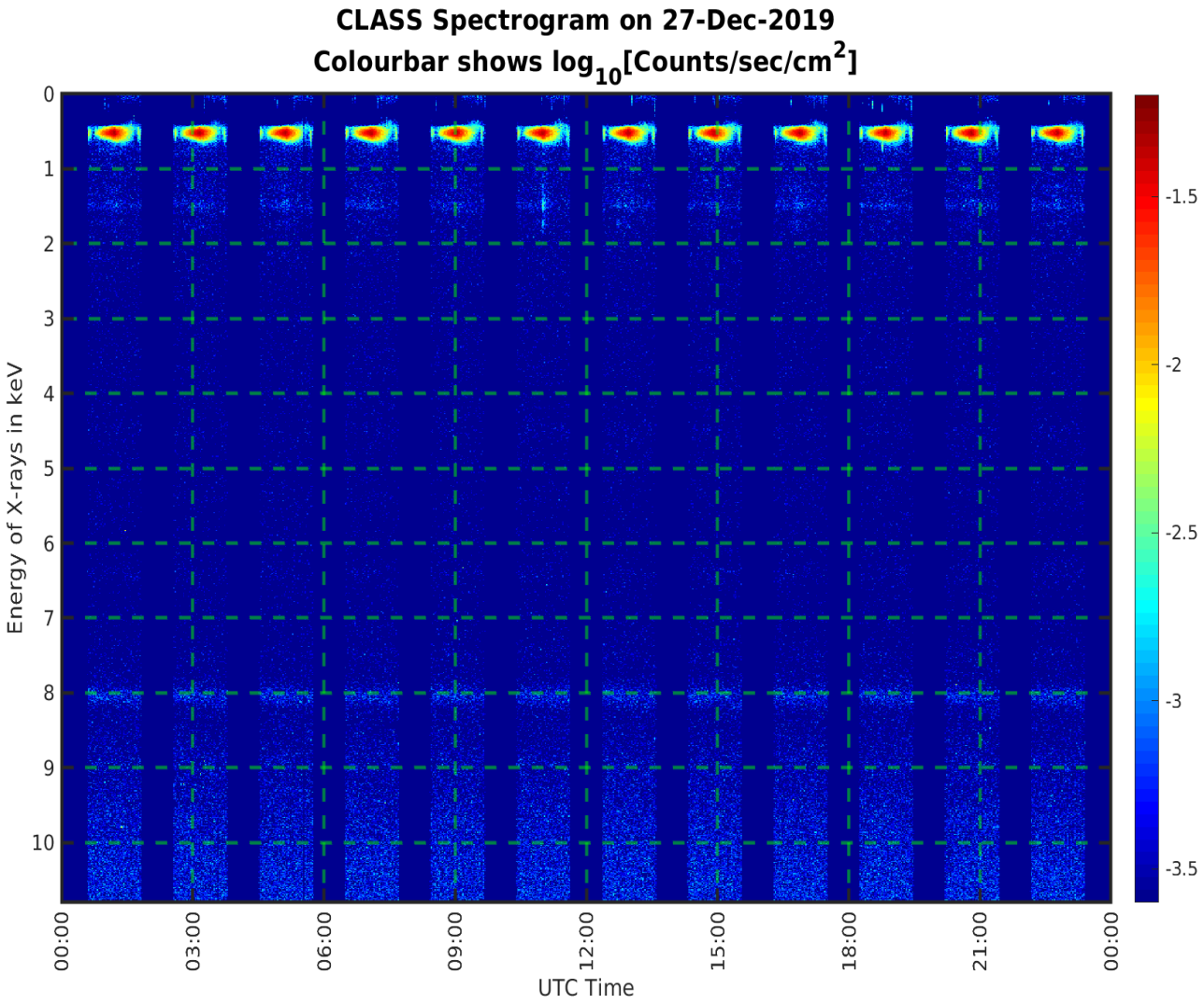
UTC Time


CLASS Spectrogram on 27-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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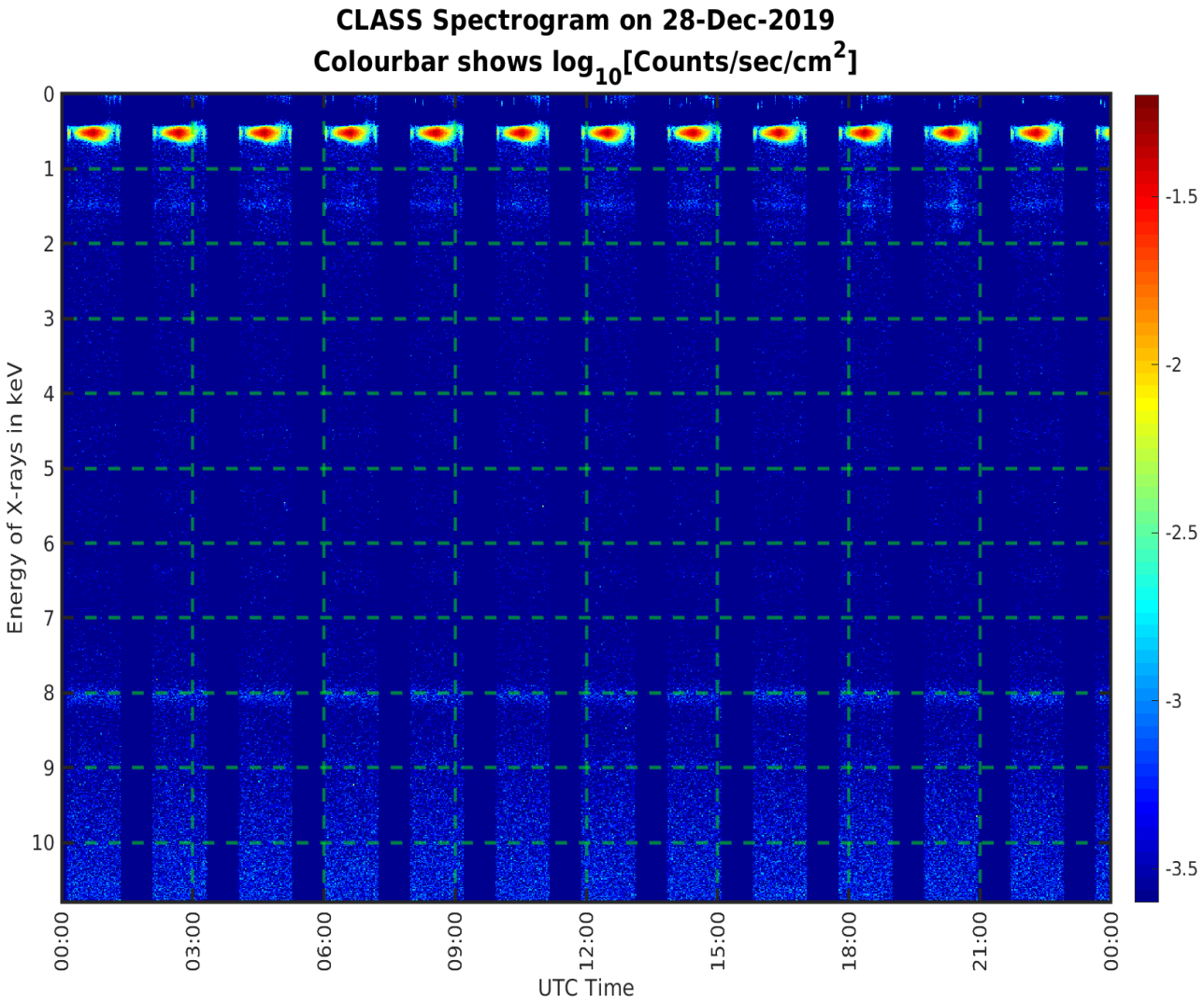
UTC Time


CLASS Spectrogram on 28-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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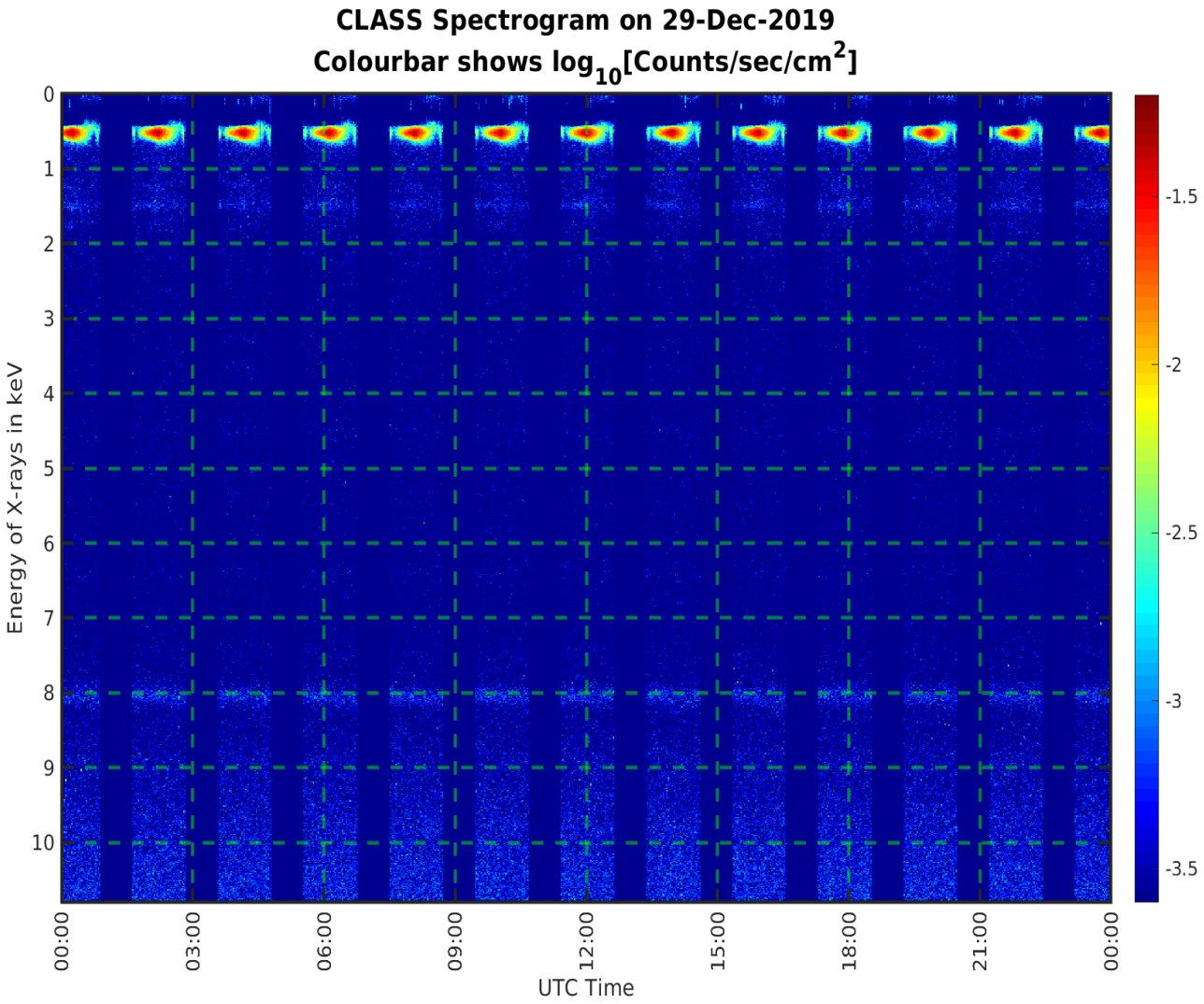
CLASS Spectrogram on 29-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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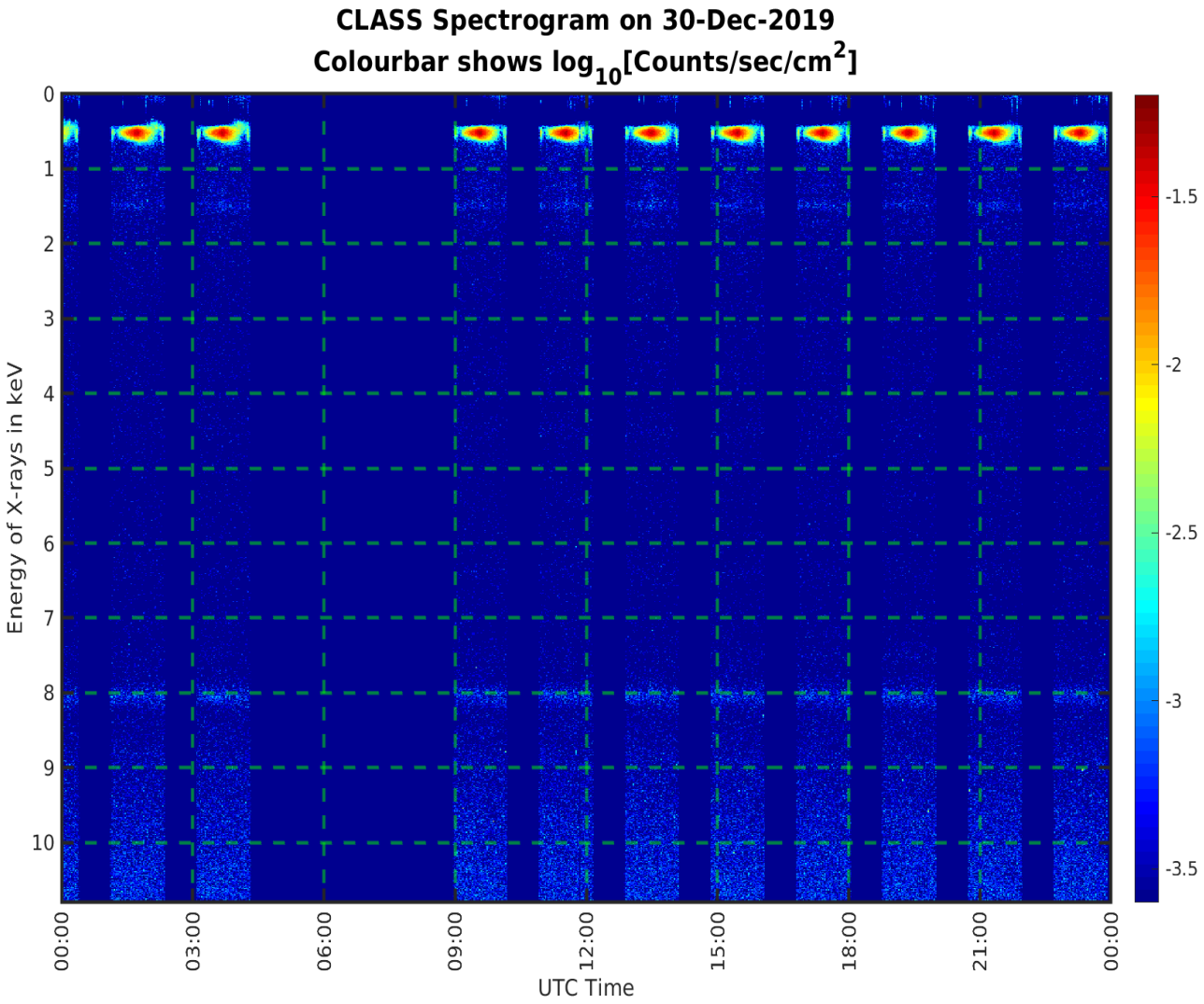
CLASS Spectrogram on 30-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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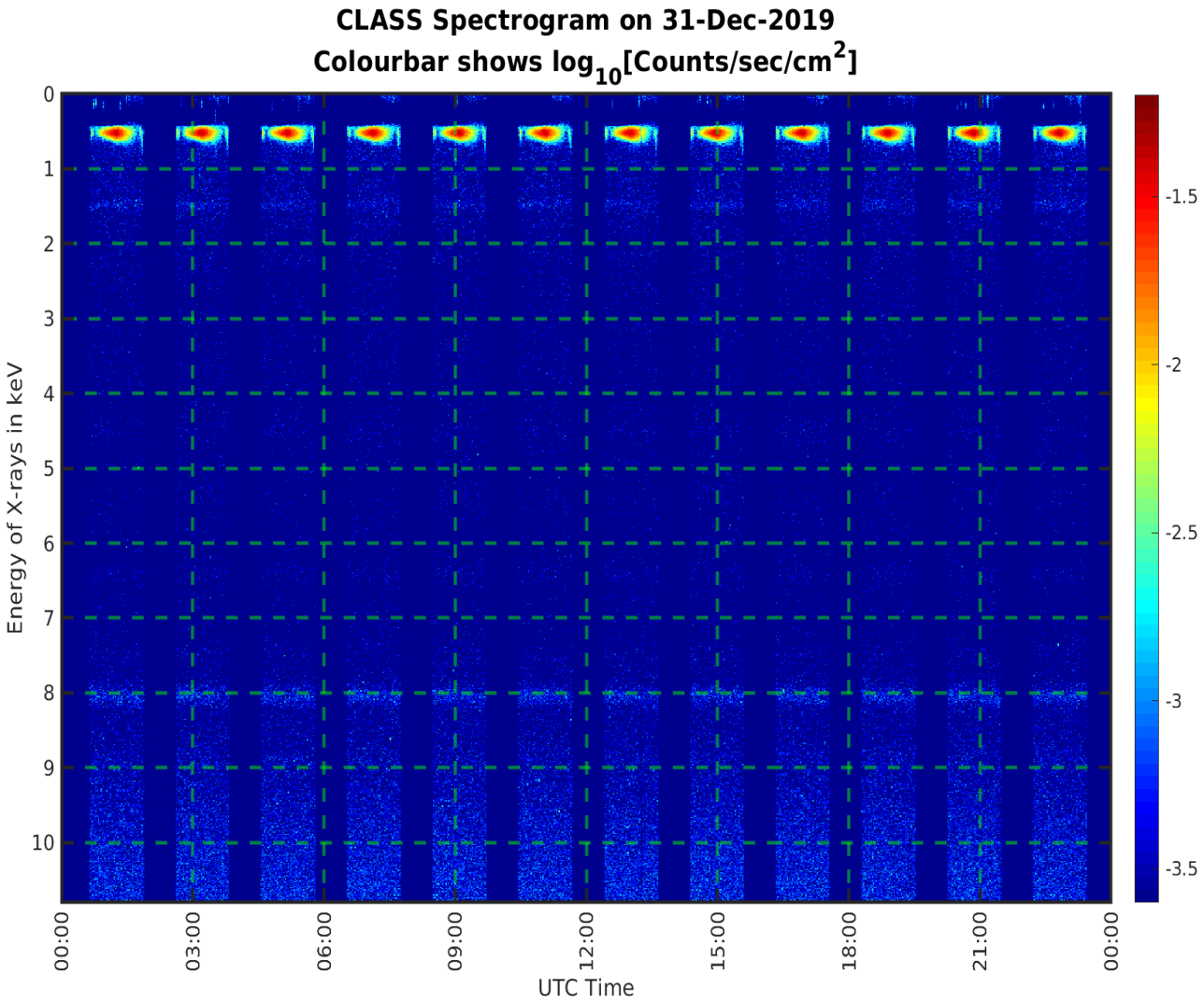
-3
-3.5


CLASS Spectrogram on 31-Dec-2019
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
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-1.5
-2
-2.5
-3
-3.5
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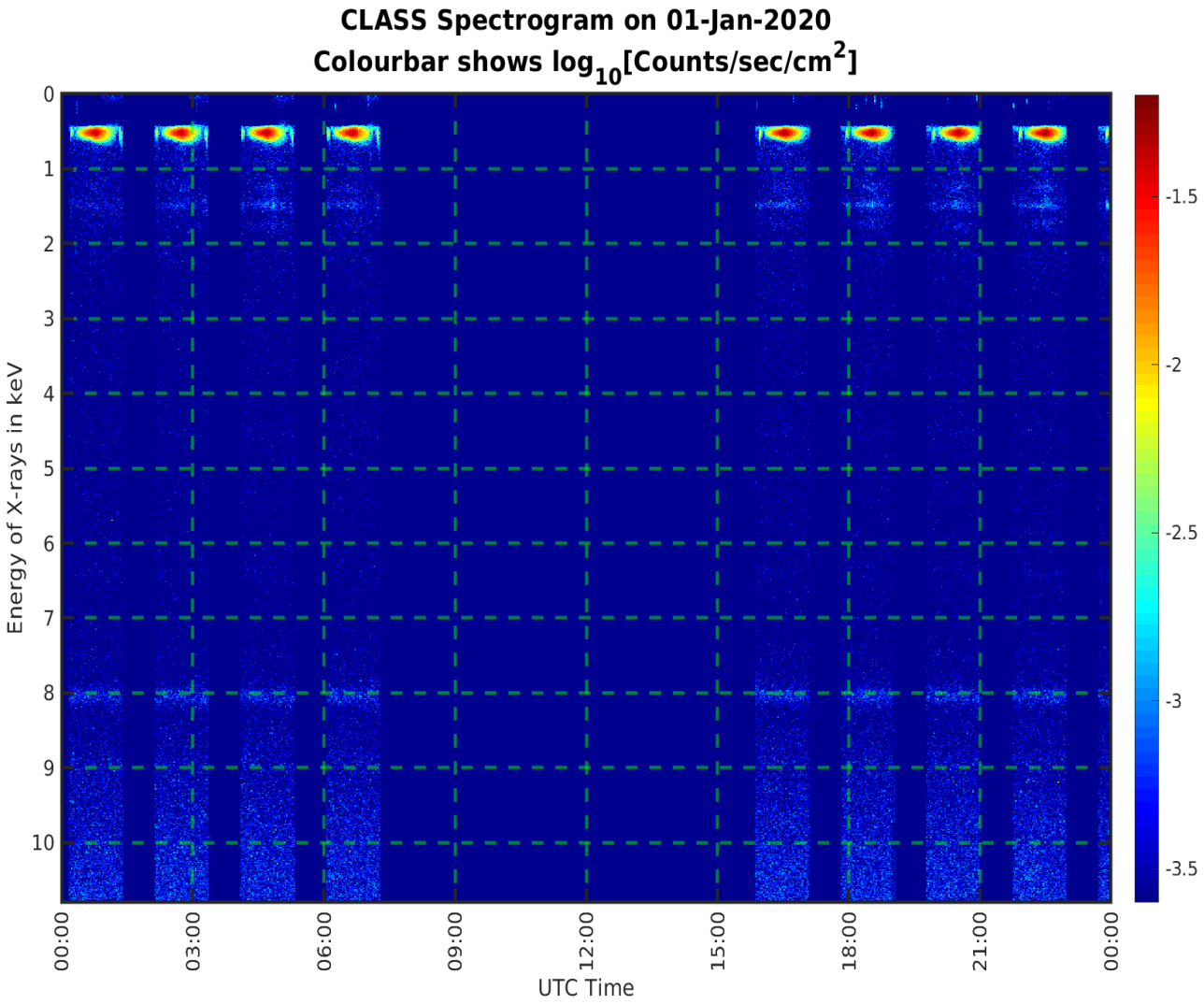
UTC Time


CLASS Spectrogram on 01-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
00:00
03:00
06:00
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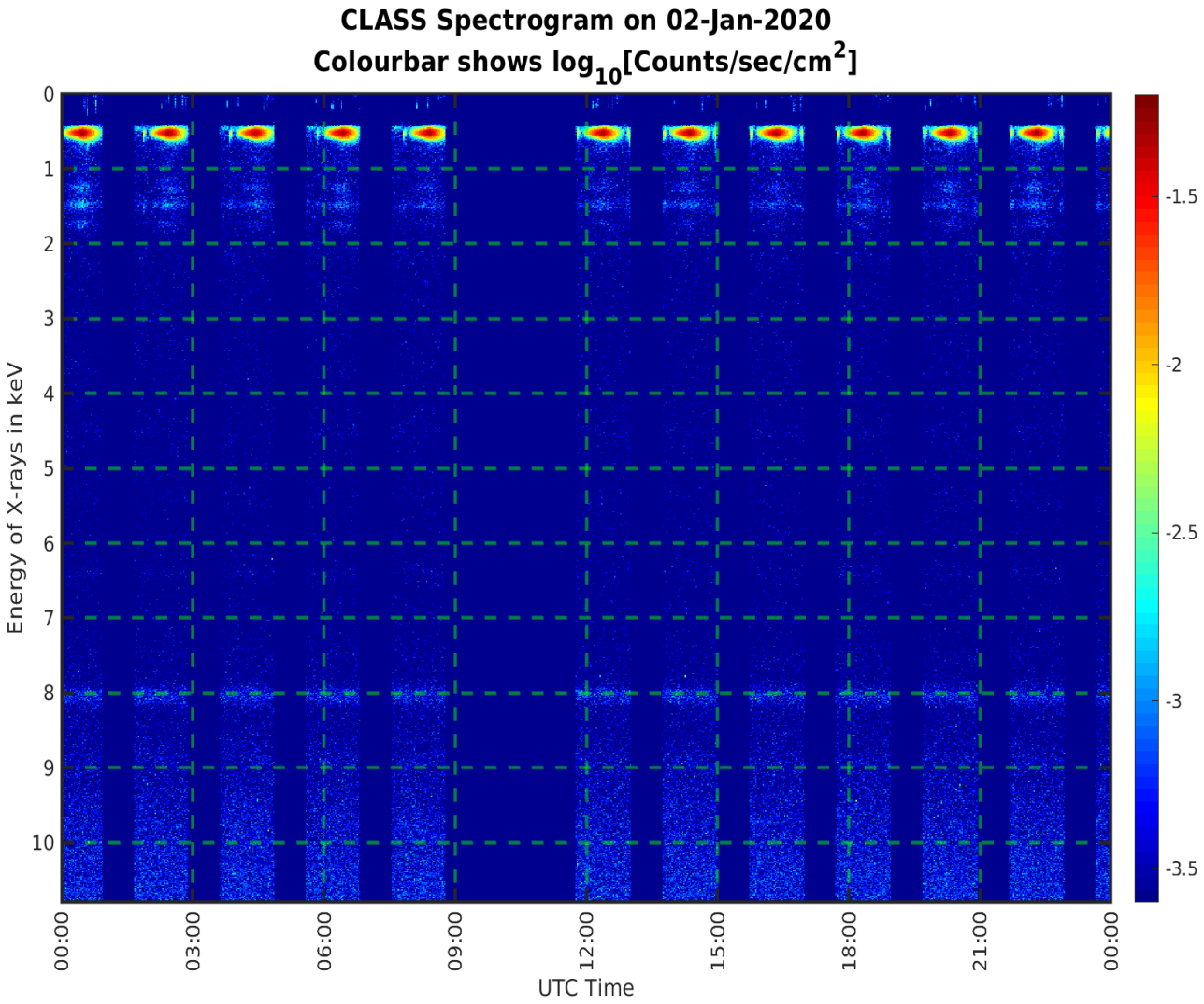
-2.5
-3
-3.5


CLASS Spectrogram on 02-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
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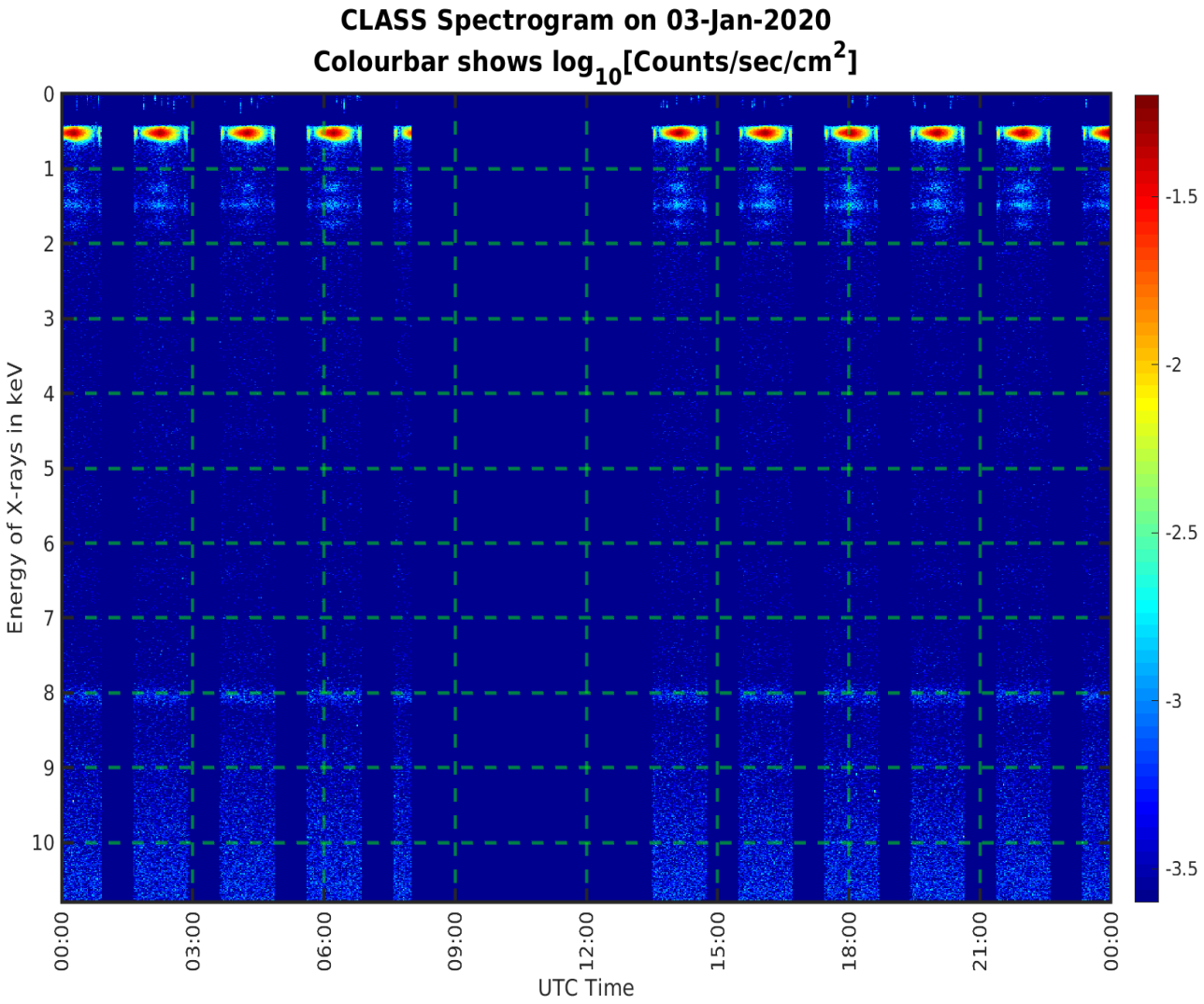
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
UTC Time
-1.5
-2
-2.5
-3
-3.5


CLASS Spectrogram on 03-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
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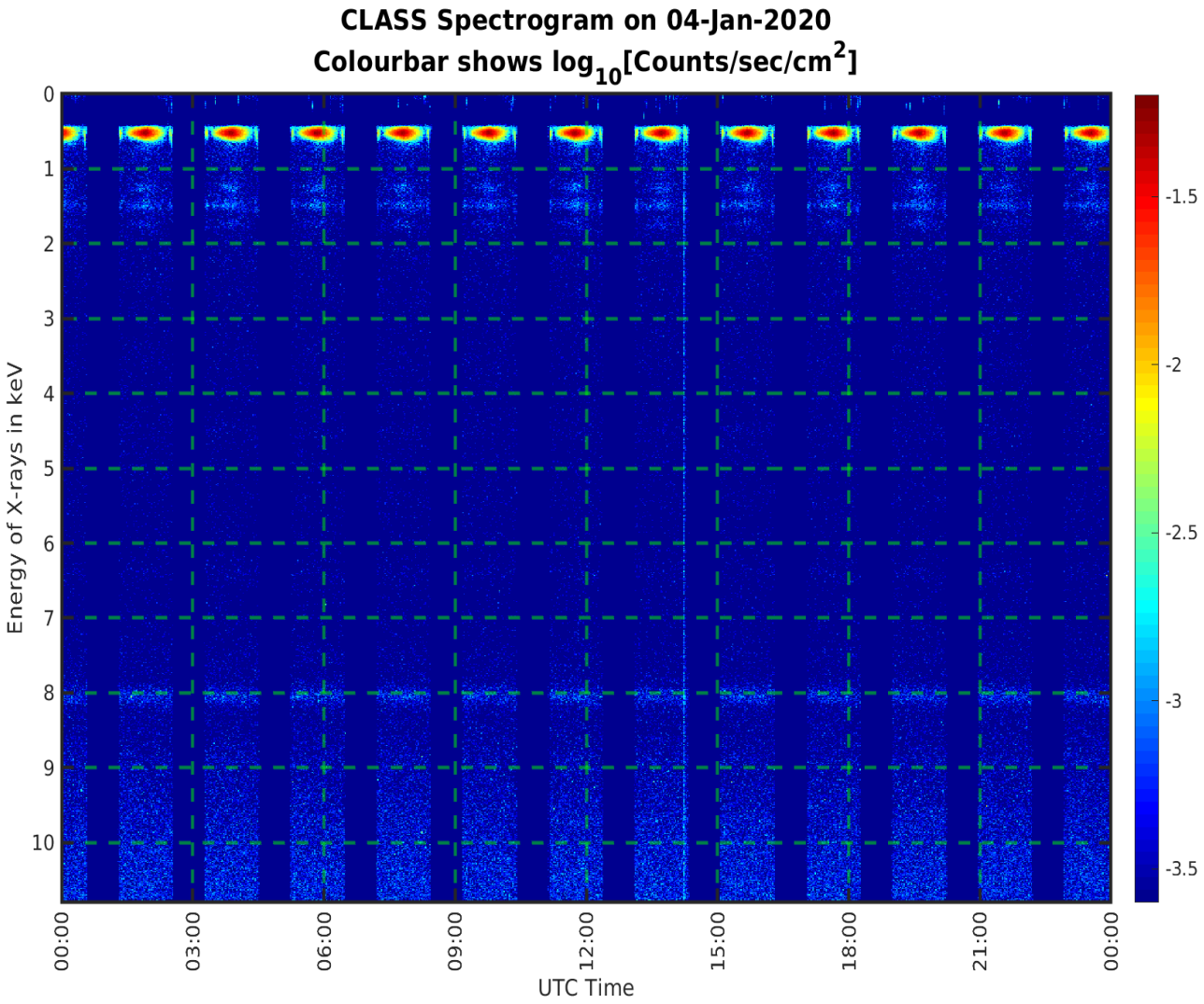
18:00
21:00
00:00
UTC Time


CLASS Spectrogram on 04-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
00:00
03:00
06:00
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UTC Time
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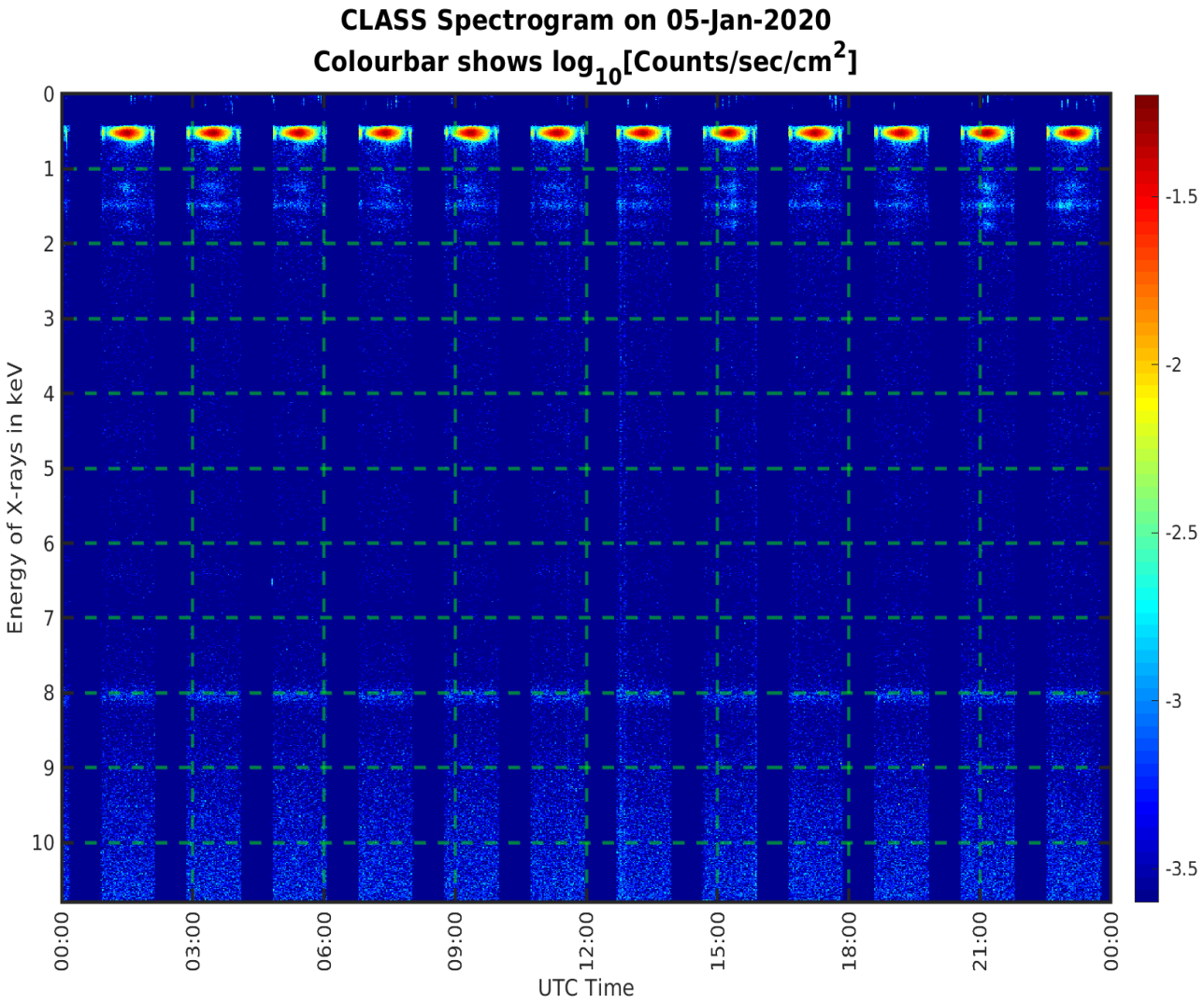
-2.5
-3
-3.5


CLASS Spectrogram on 05-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
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18:00
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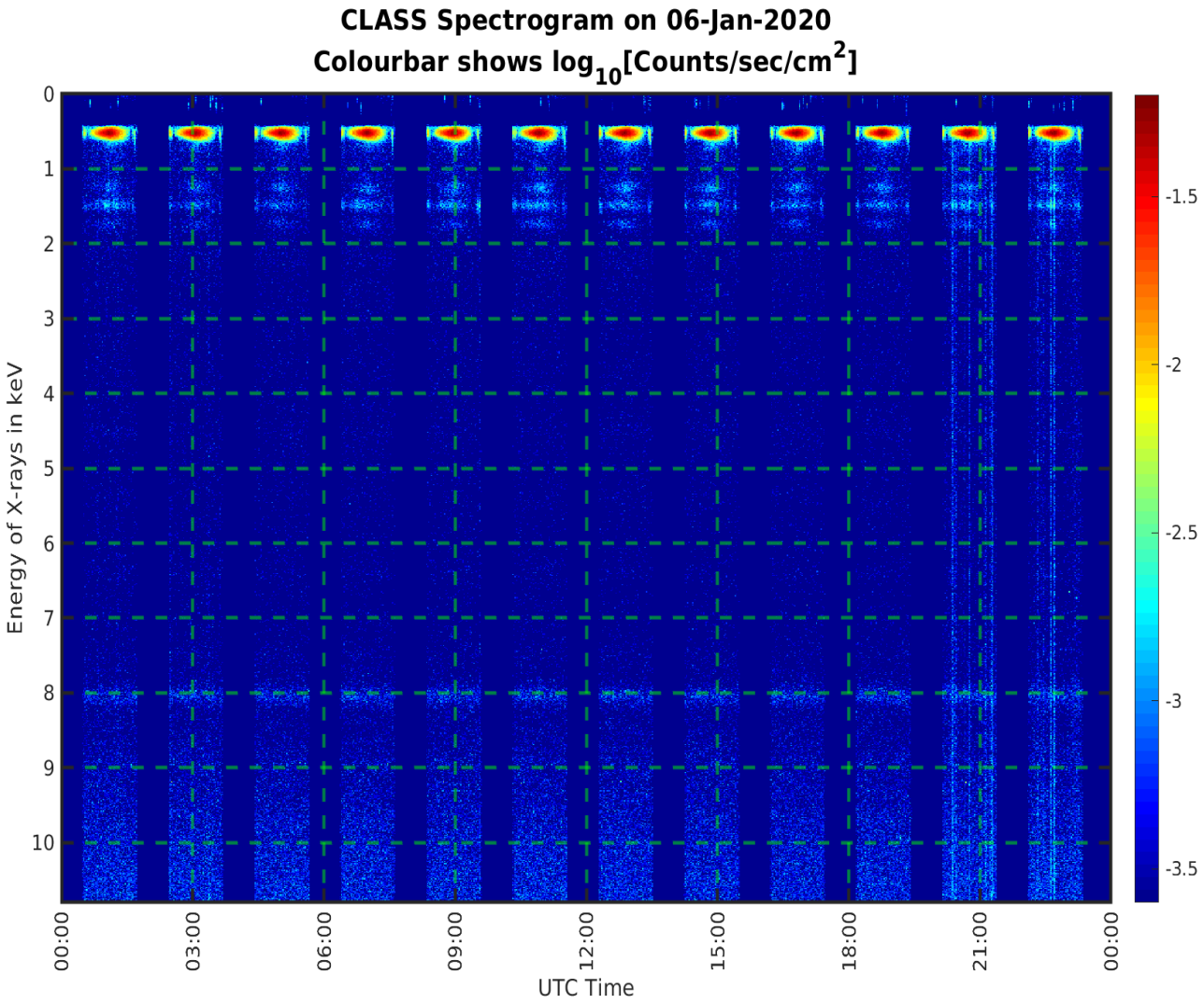
UTC Time


CLASS Spectrogram on 06-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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09:00
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15:00
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UTC Time
-1.5
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-2.5
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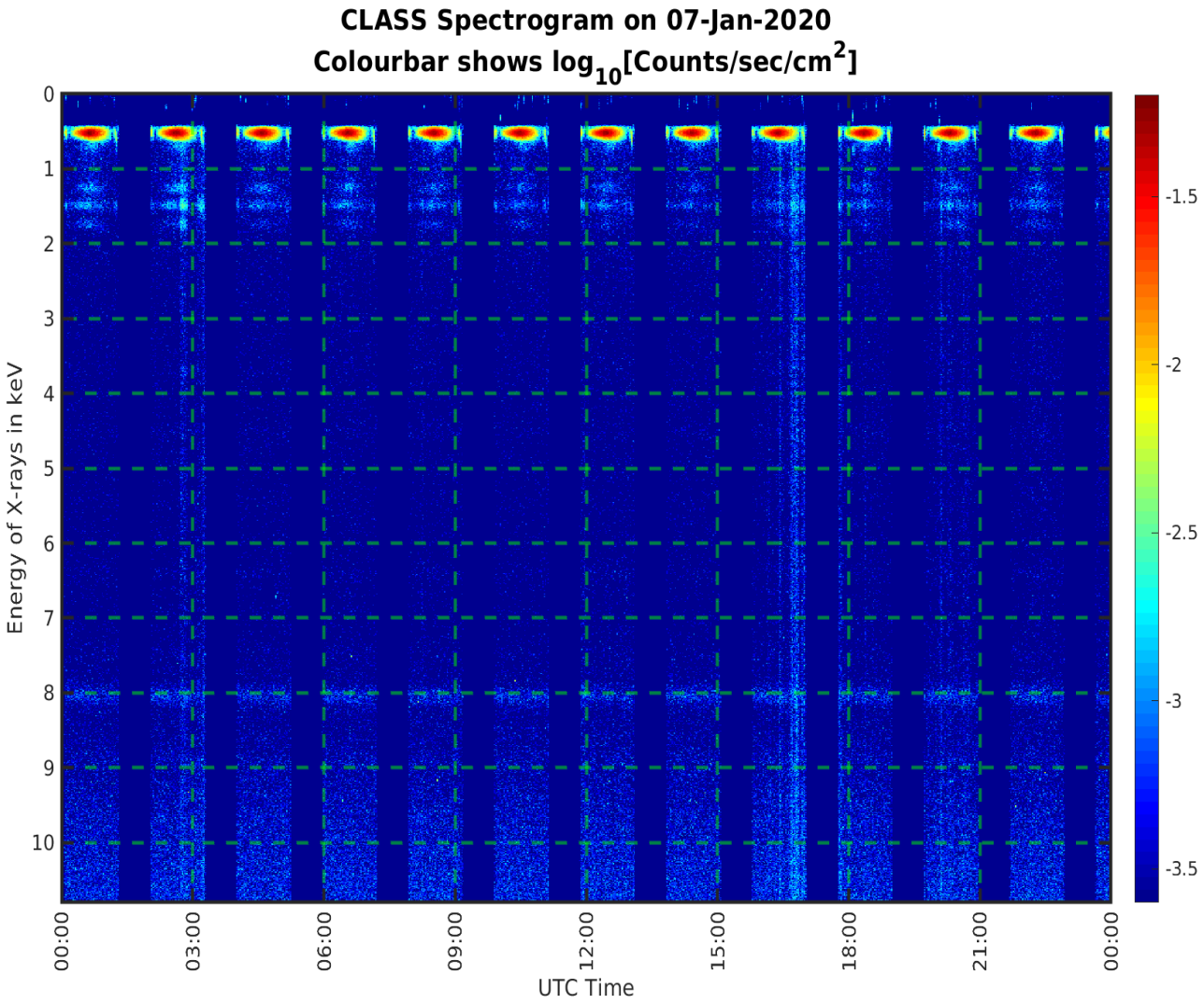
-3.5


CLASS Spectrogram on 07-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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03:00
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UTC Time
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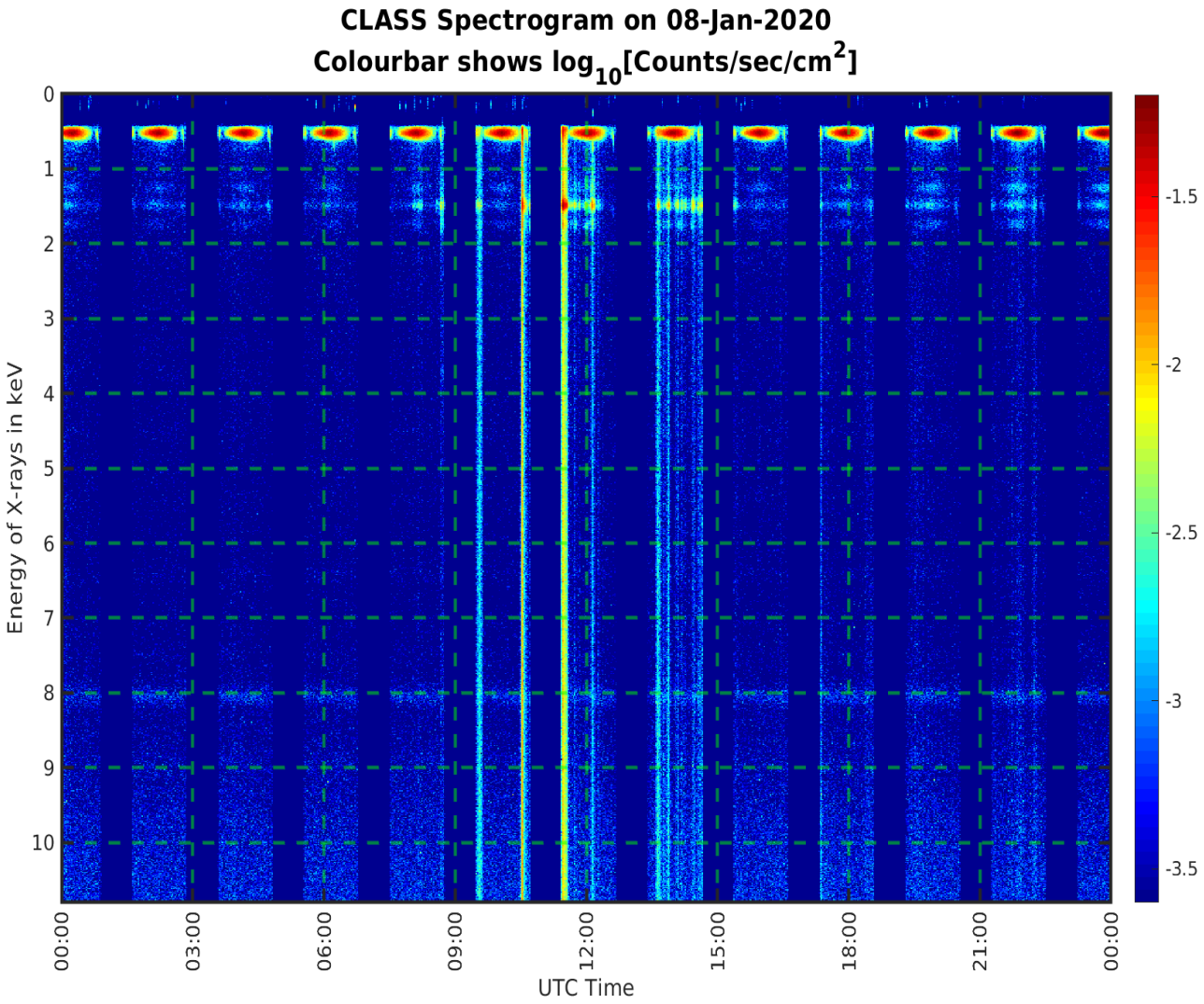
CLASS Spectrogram on 08-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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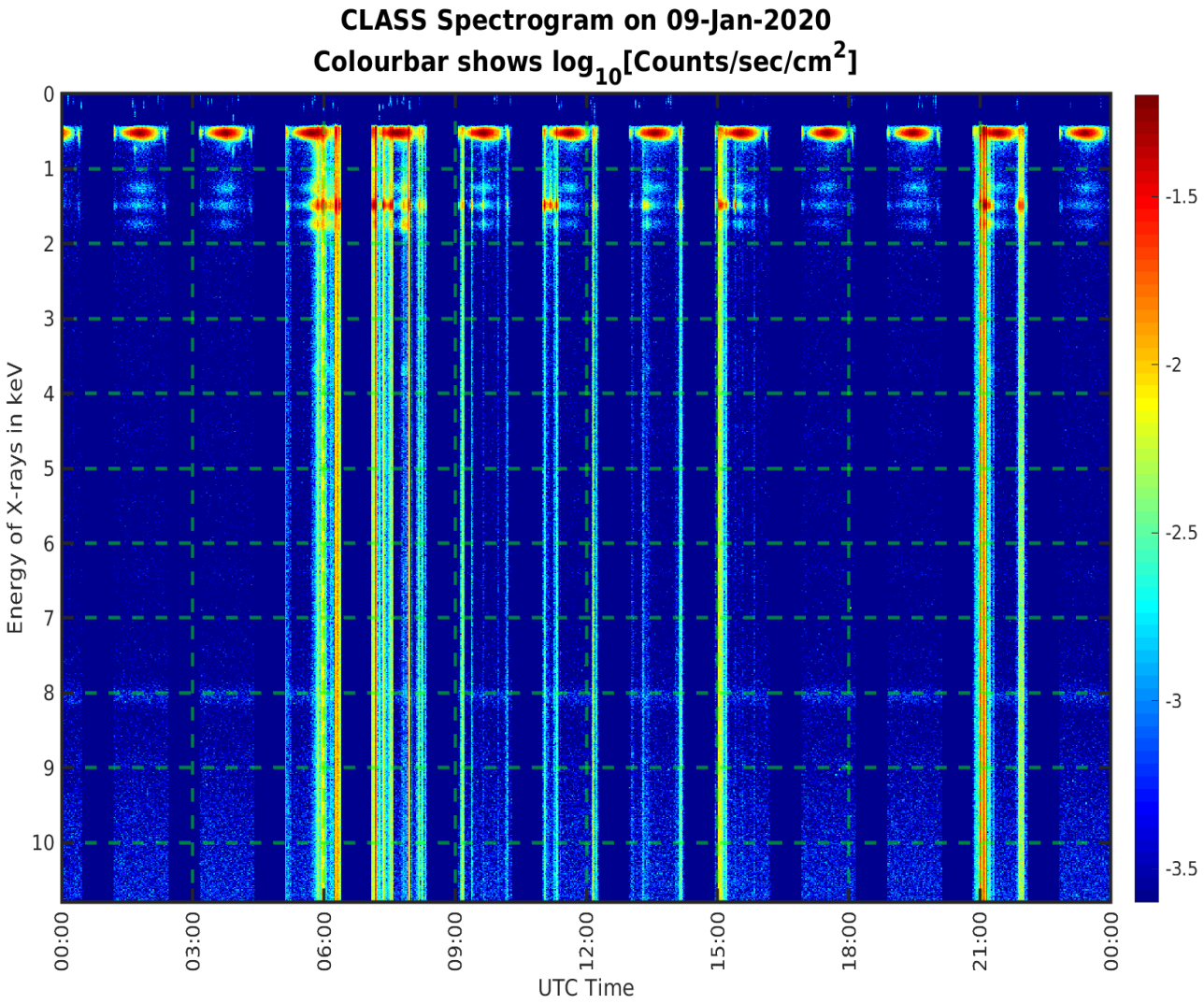
CLASS Spectrogram on 09-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
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03:00
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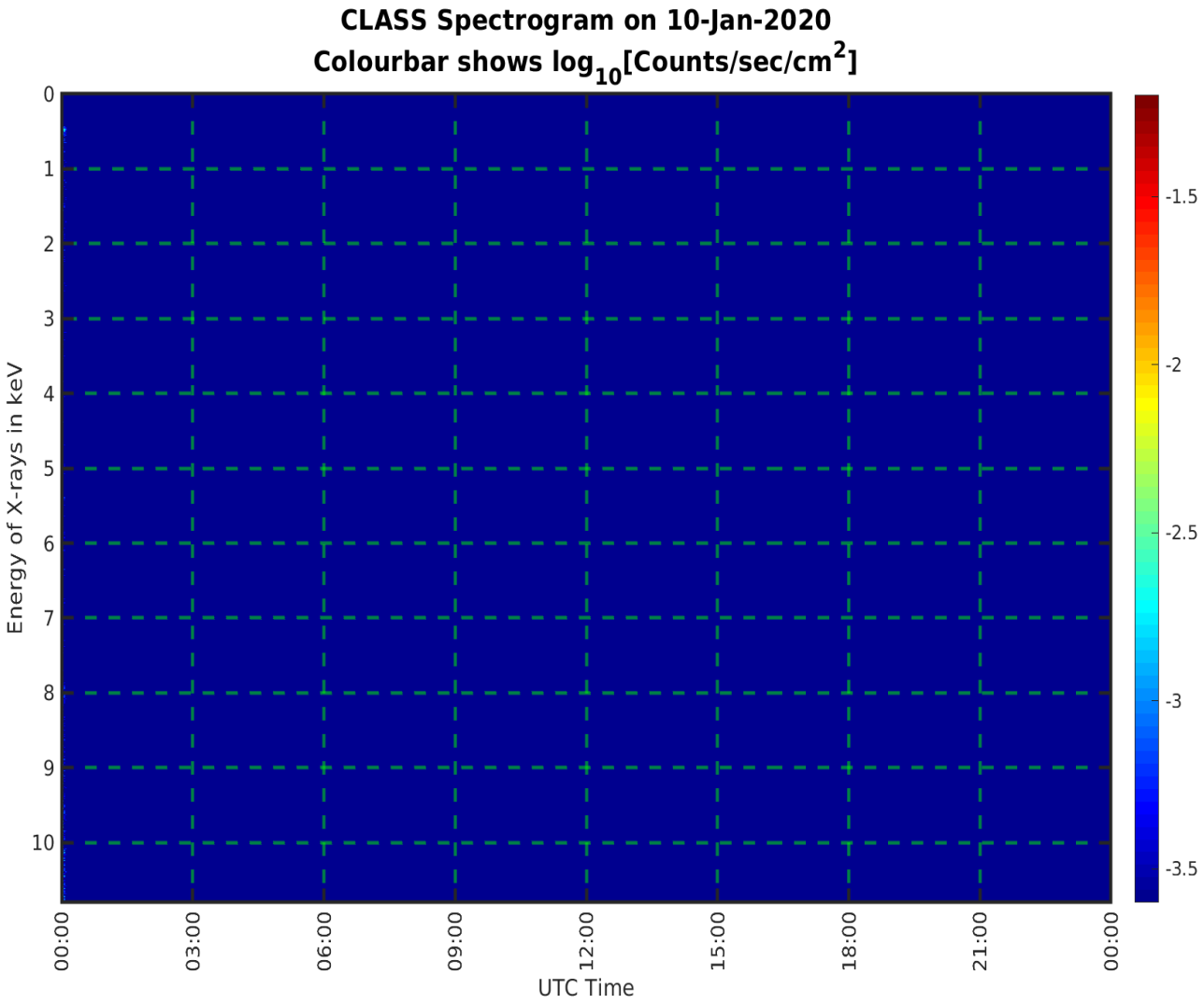
CLASS Spectrogram on 10-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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03:00
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09:00
12:00
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18:00
21:00
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UTC Time
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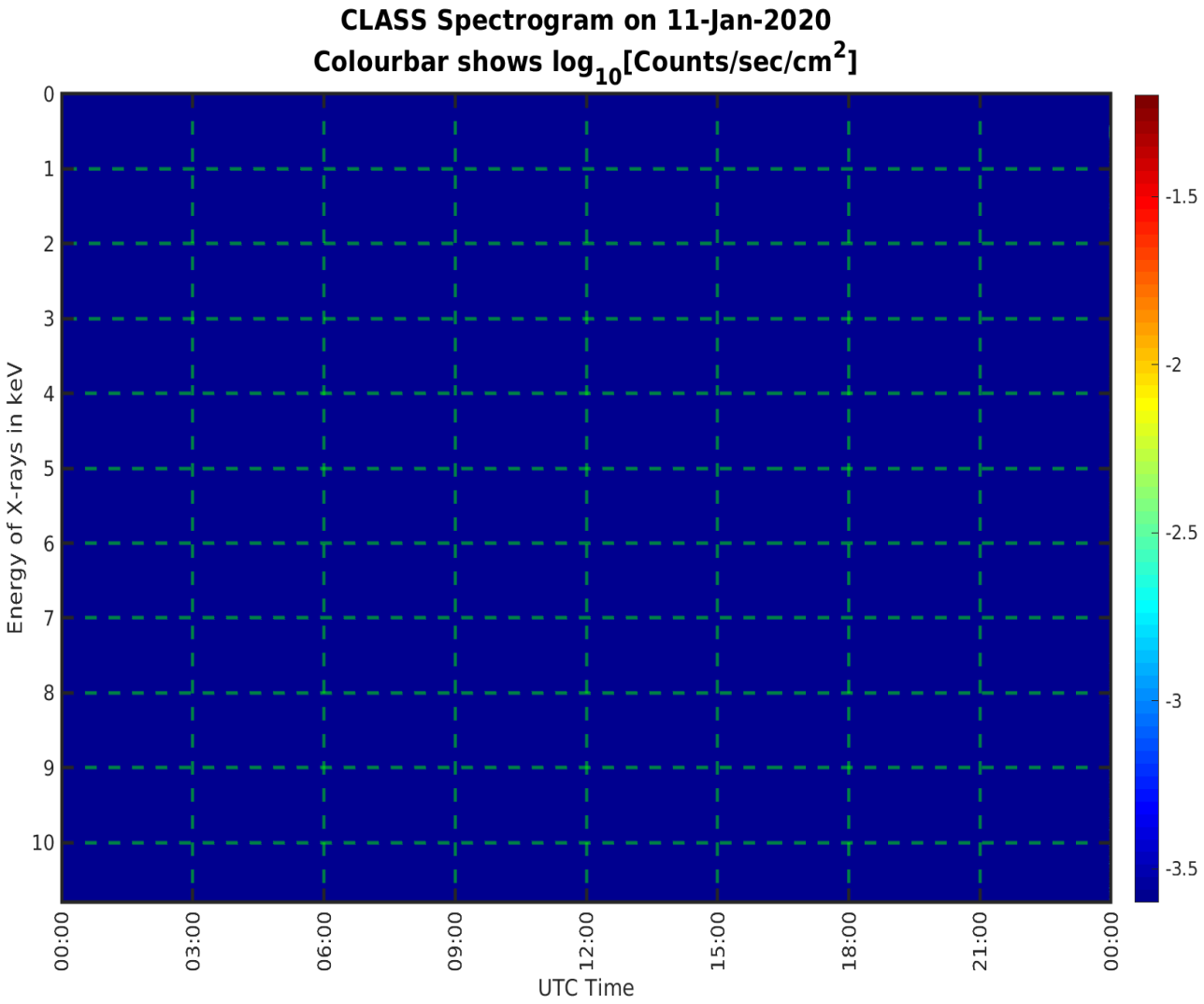
-3.5


CLASS Spectrogram on 11-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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03:00
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UTC Time
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-2.5
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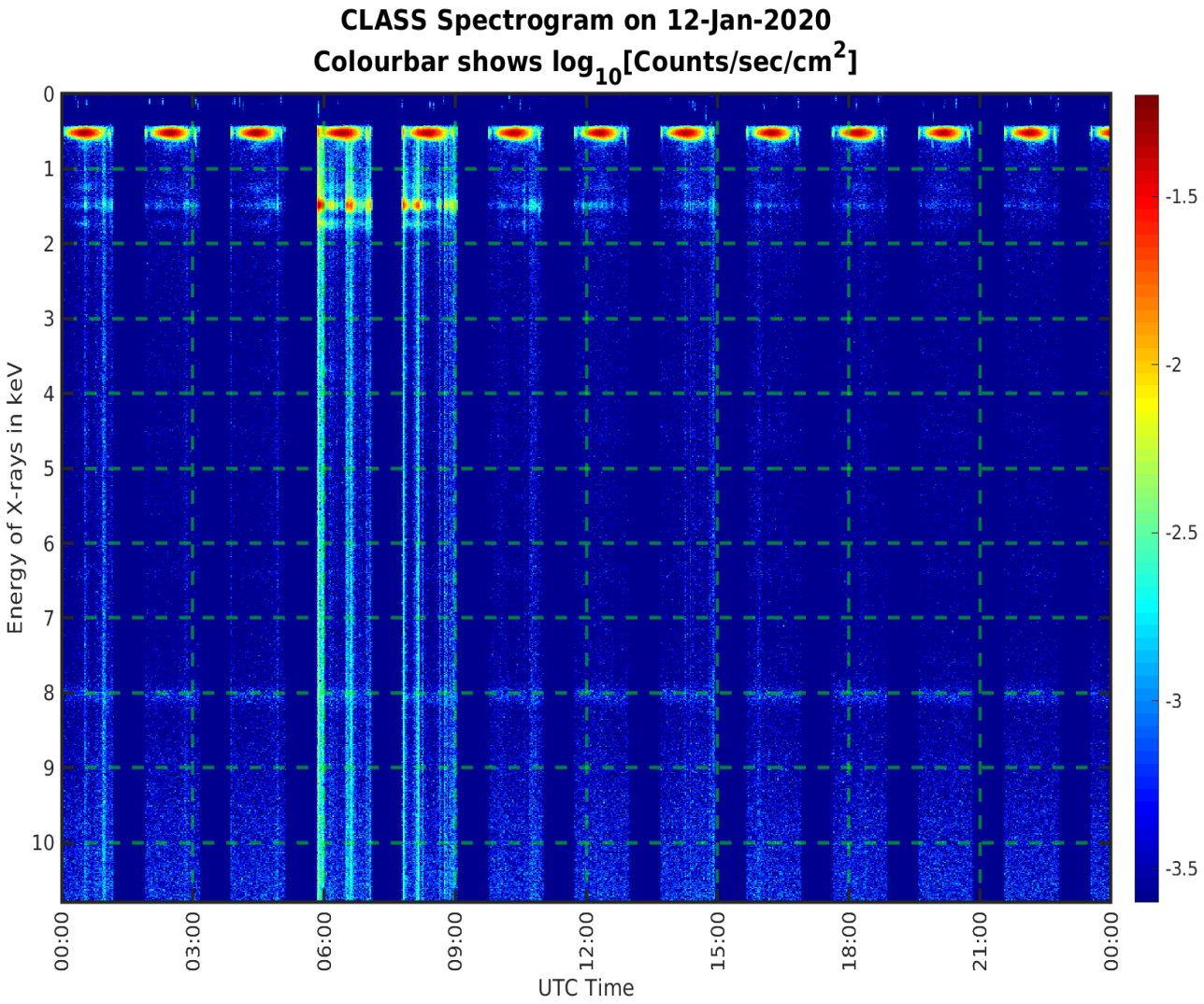
-3.5


CLASS Spectrogram on 12-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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00:00
03:00
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-2.5
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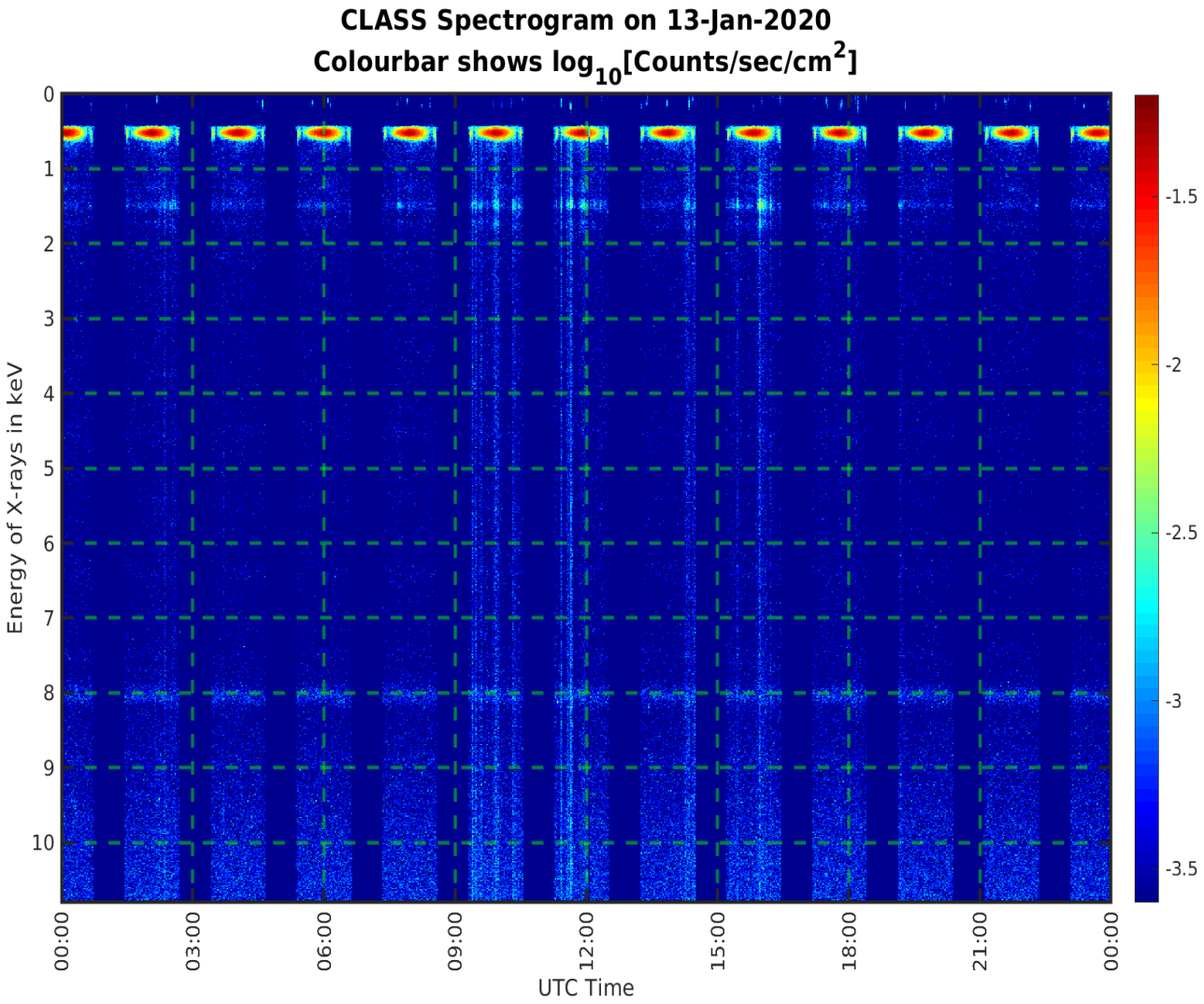
-3.5


CLASS Spectrogram on 13-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
00:00
03:00
06:00
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-2.5
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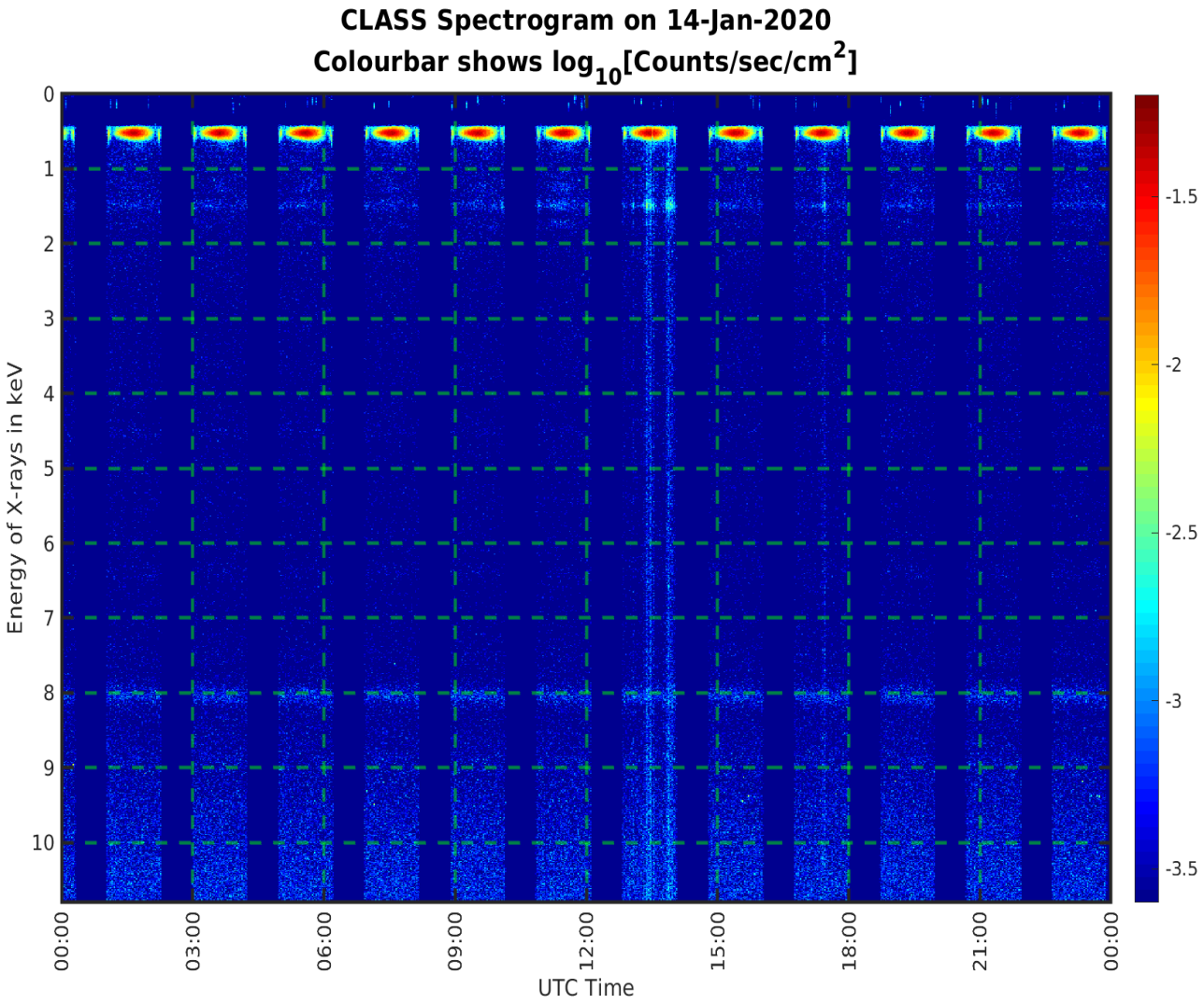
CLASS Spectrogram on 14-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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00:00
03:00
06:00
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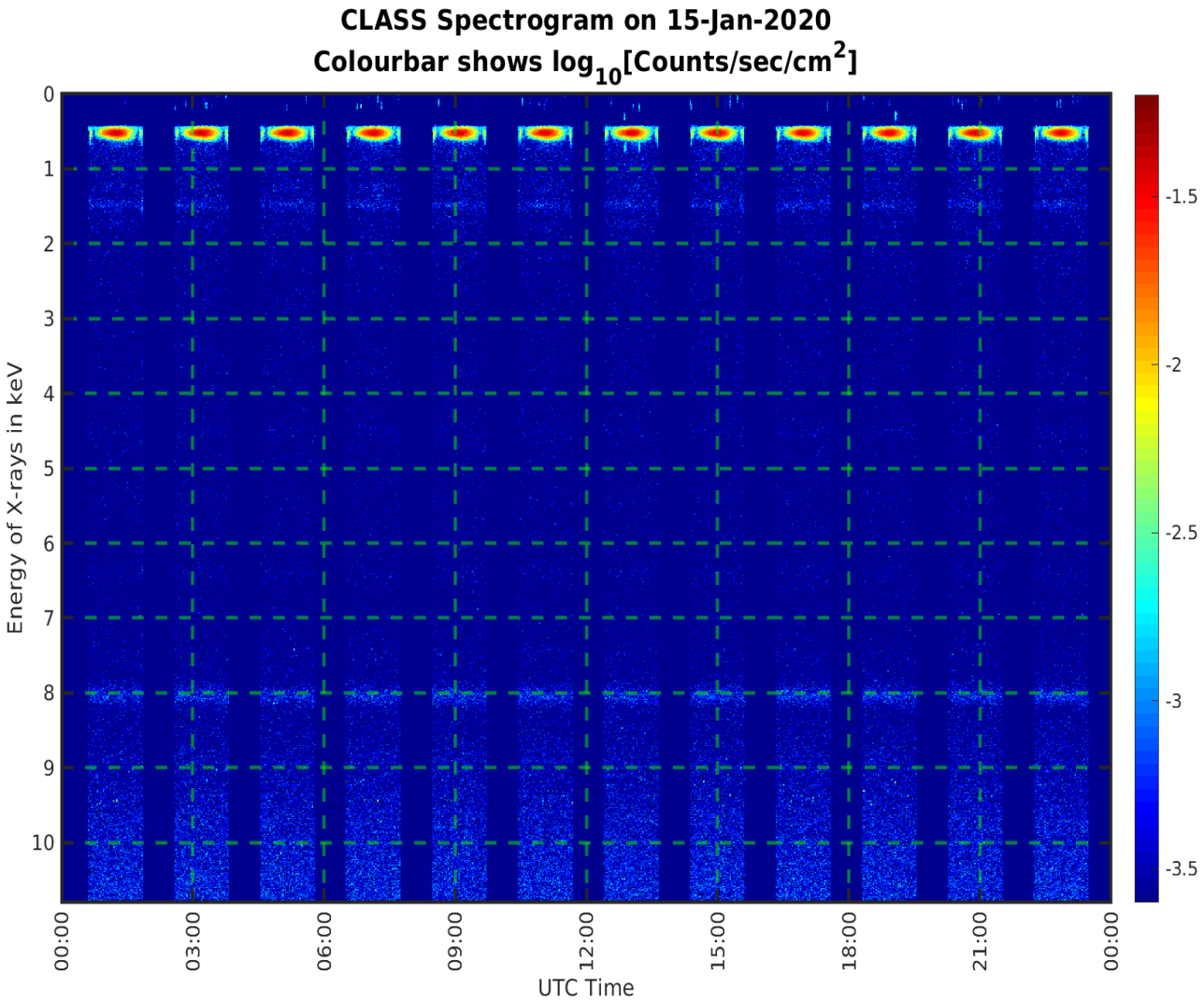
-2.5
-3
-3.5


CLASS Spectrogram on 15-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
-2.5
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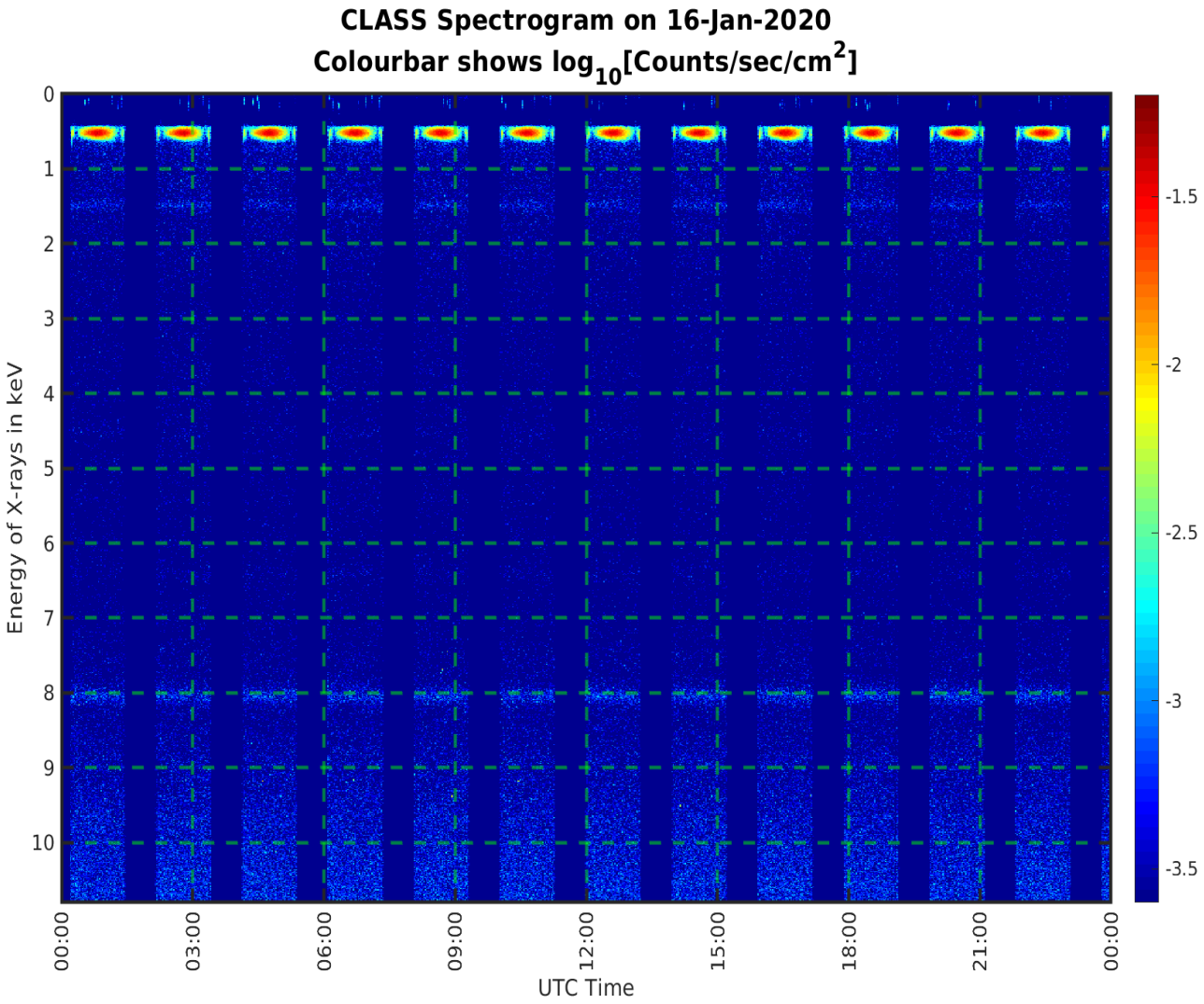
UTC Time


CLASS Spectrogram on 16-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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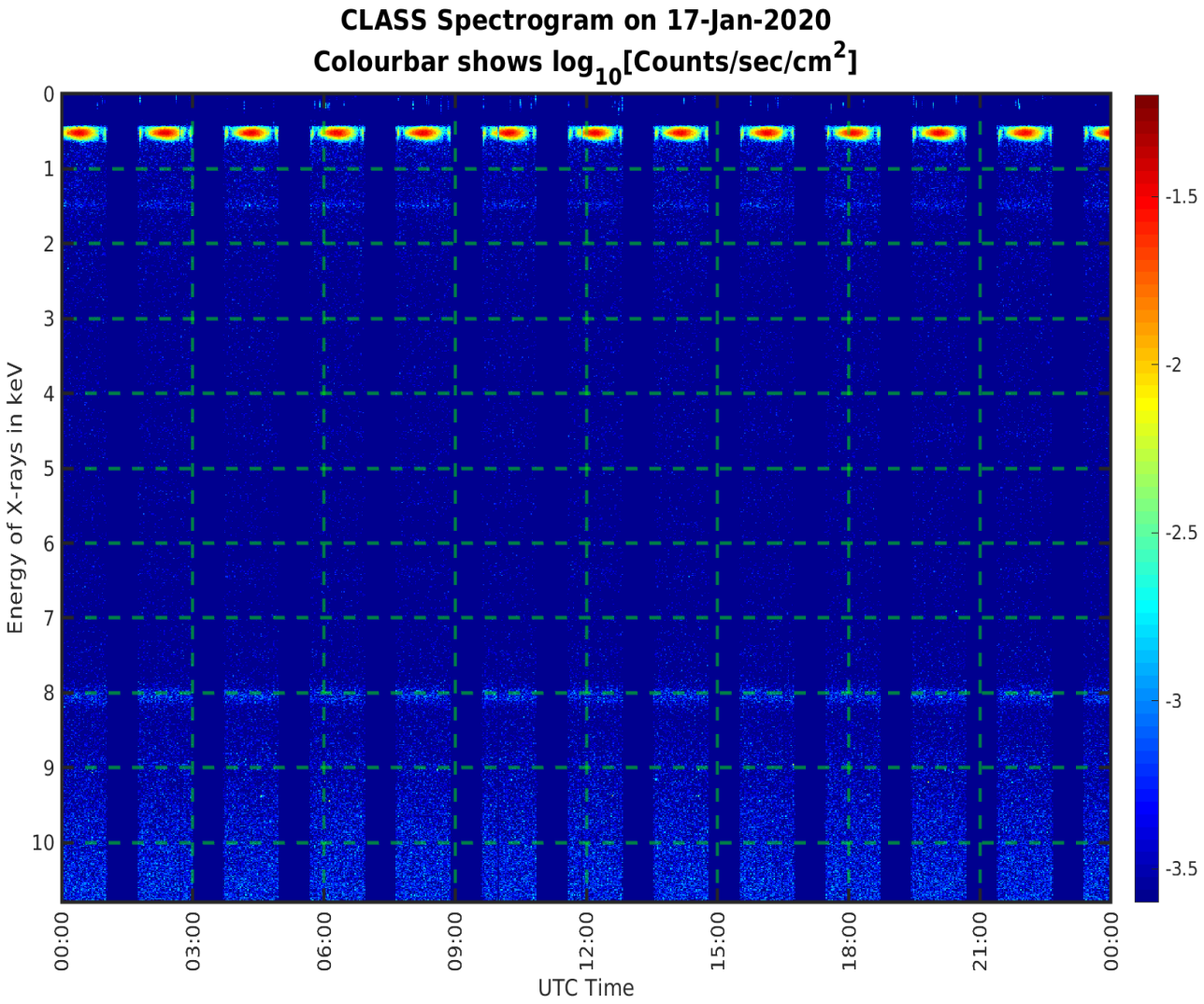
UTC Time


CLASS Spectrogram on 17-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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-1.5
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-3.5
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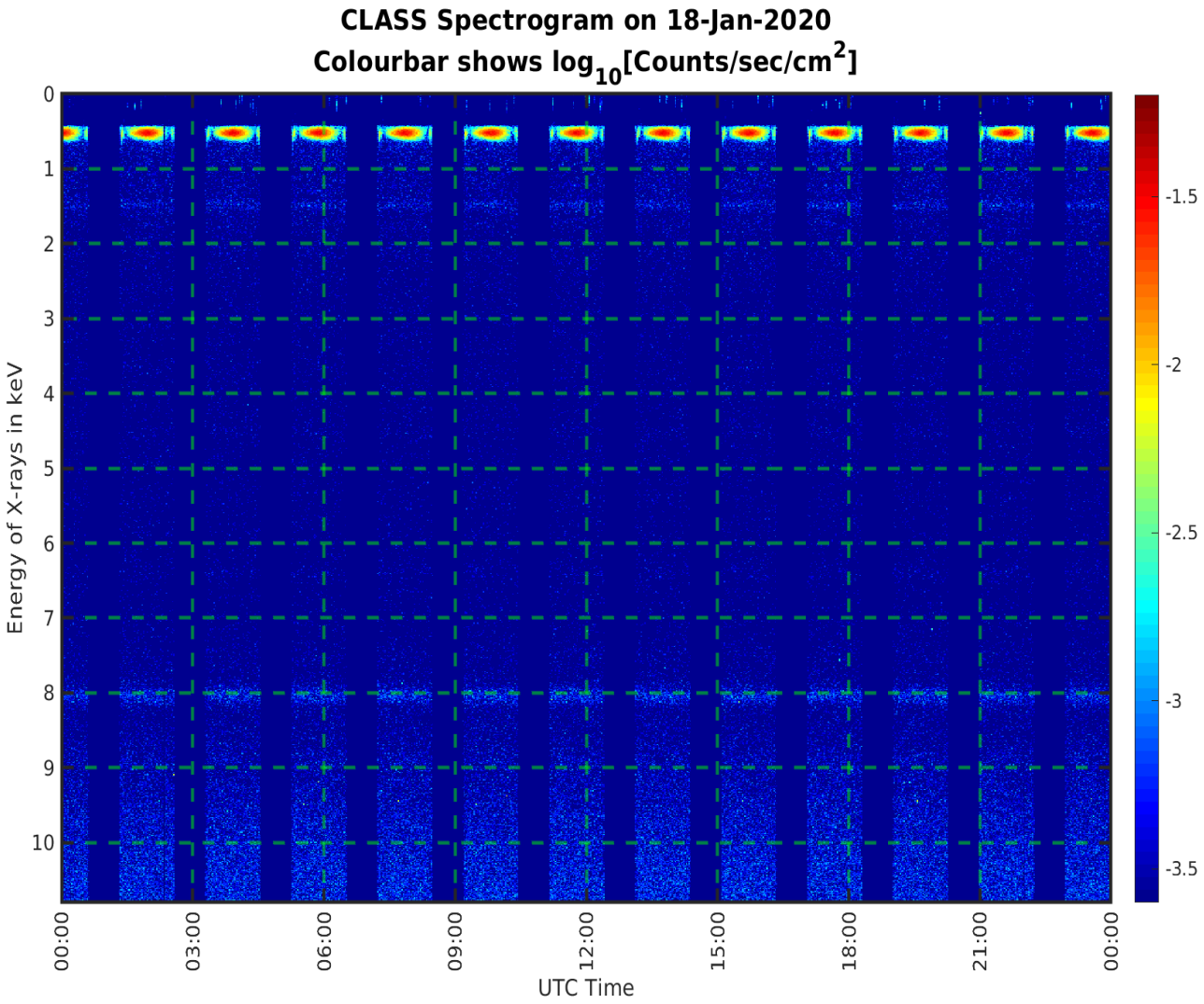
UTC Time


CLASS Spectrogram on 18-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
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9
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-1.5
-2
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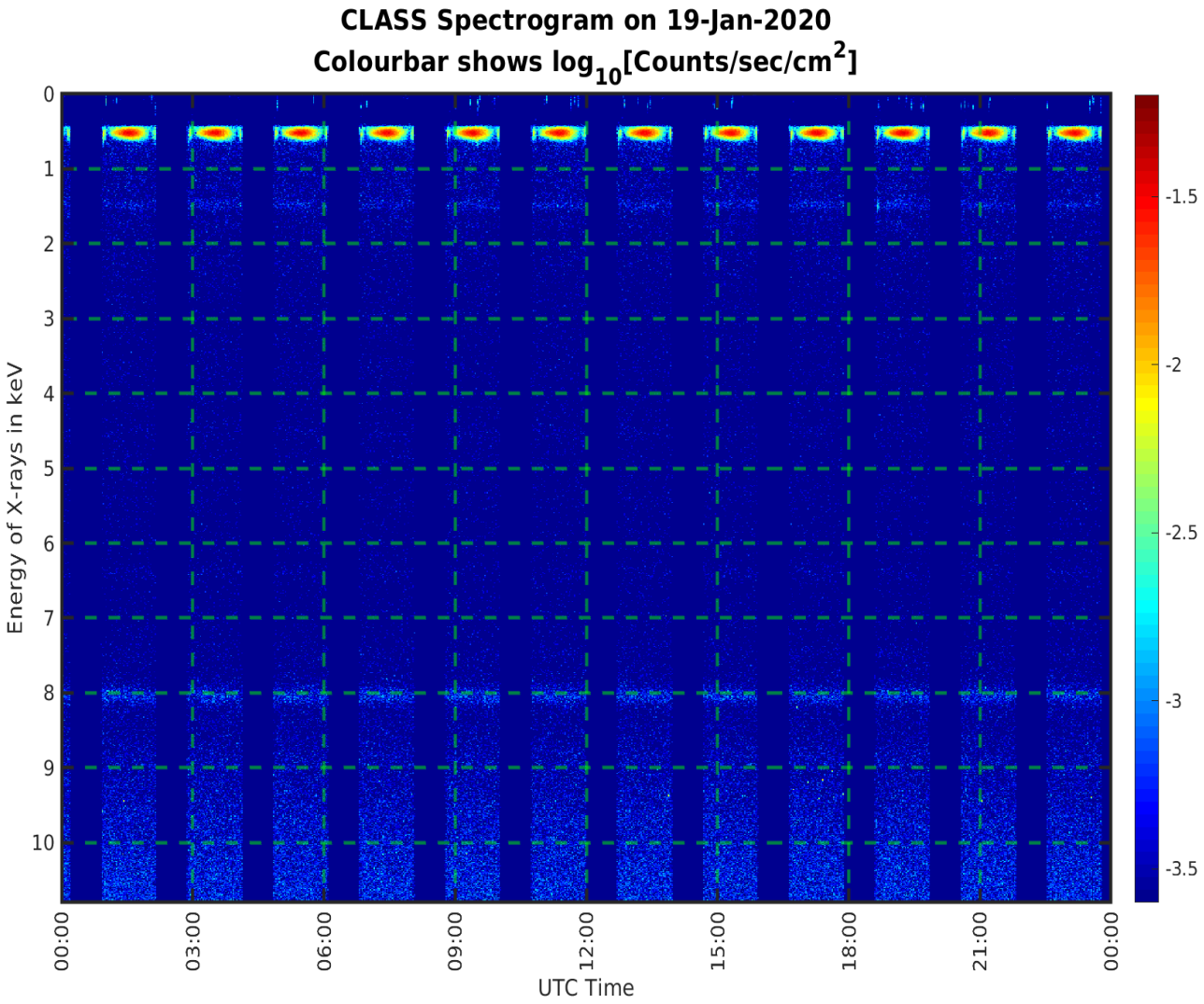
UTC Time


CLASS Spectrogram on 19-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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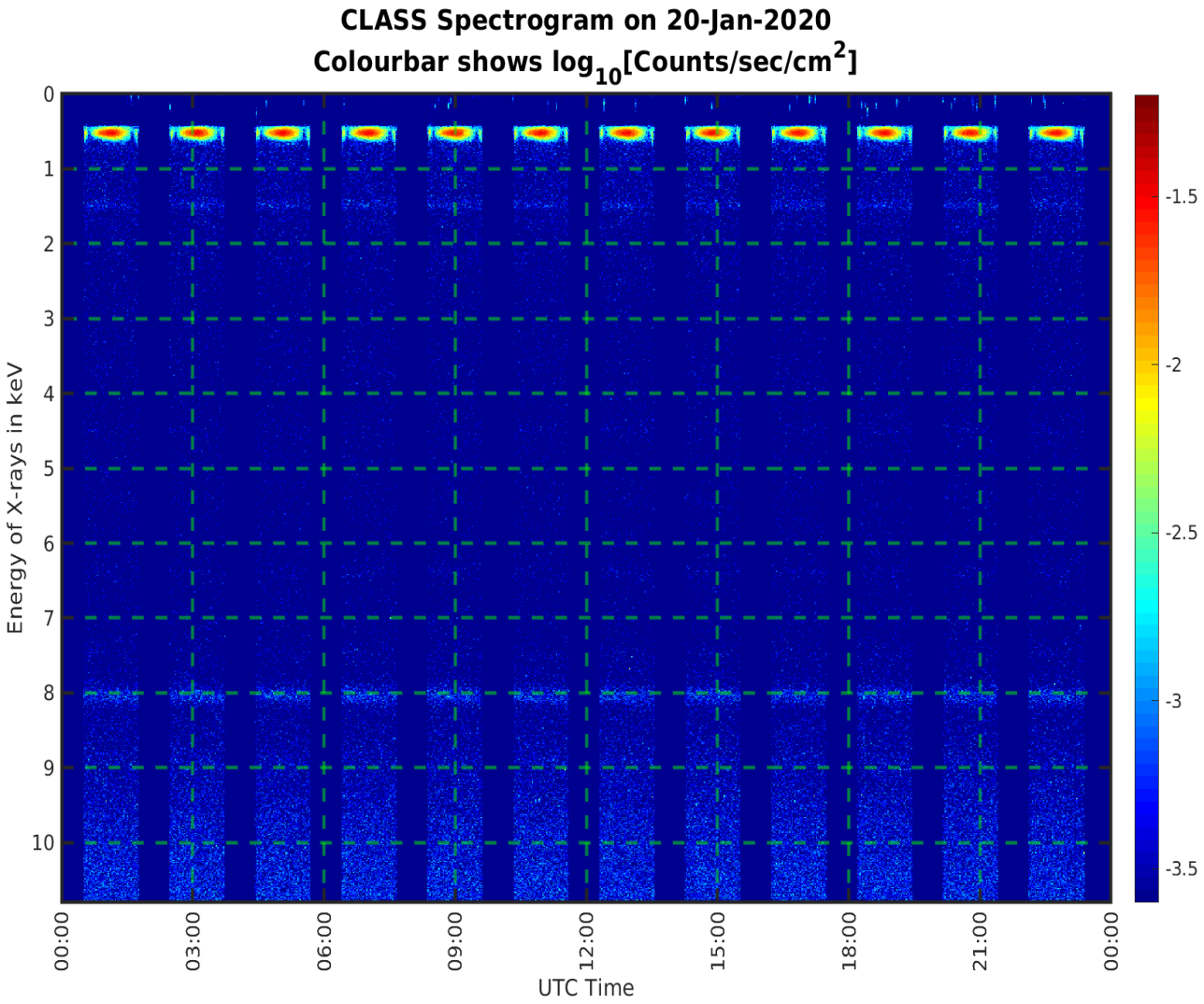
CLASS Spectrogram on 20-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
-2.5
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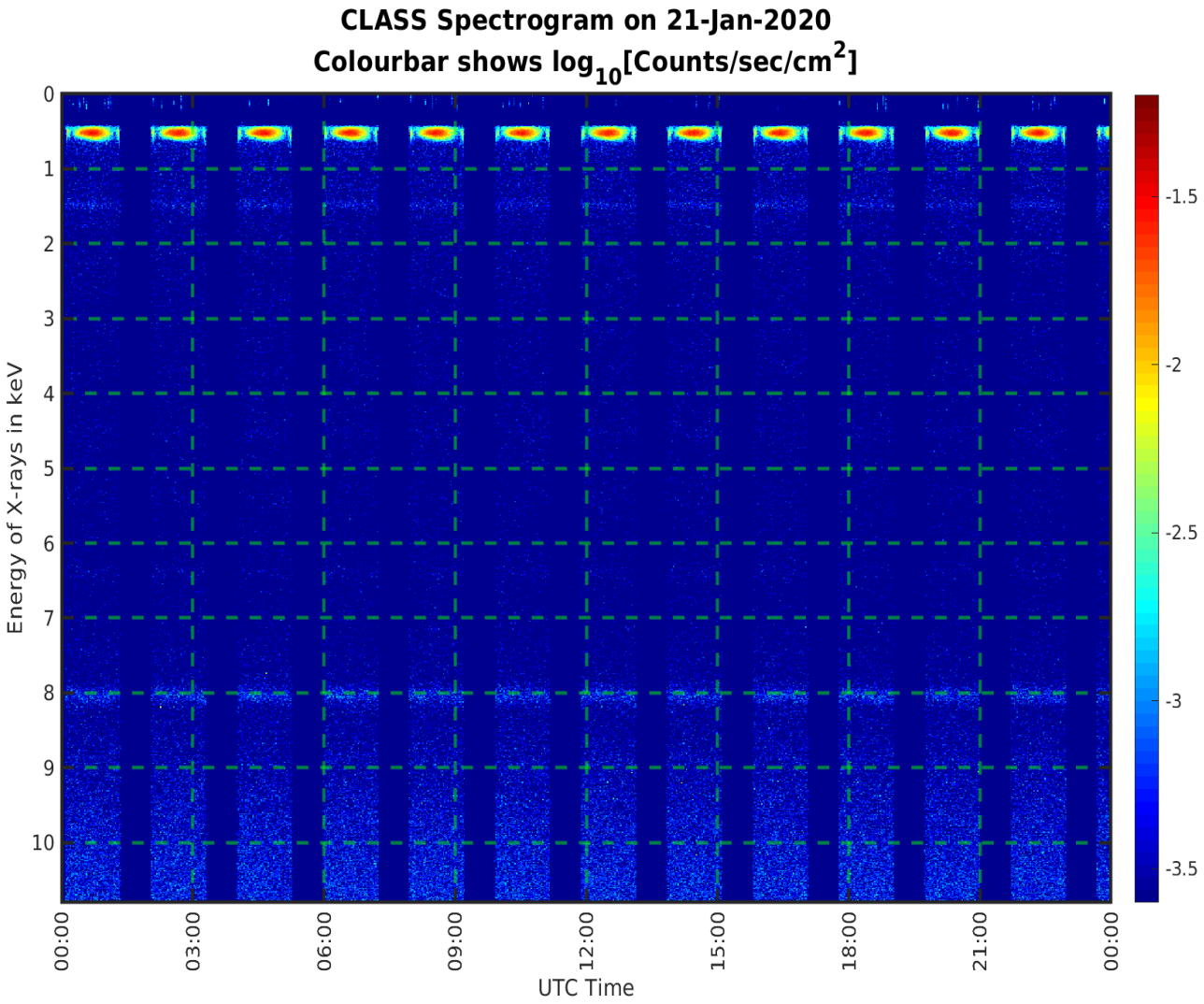
UTC Time


CLASS Spectrogram on 21-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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03:00
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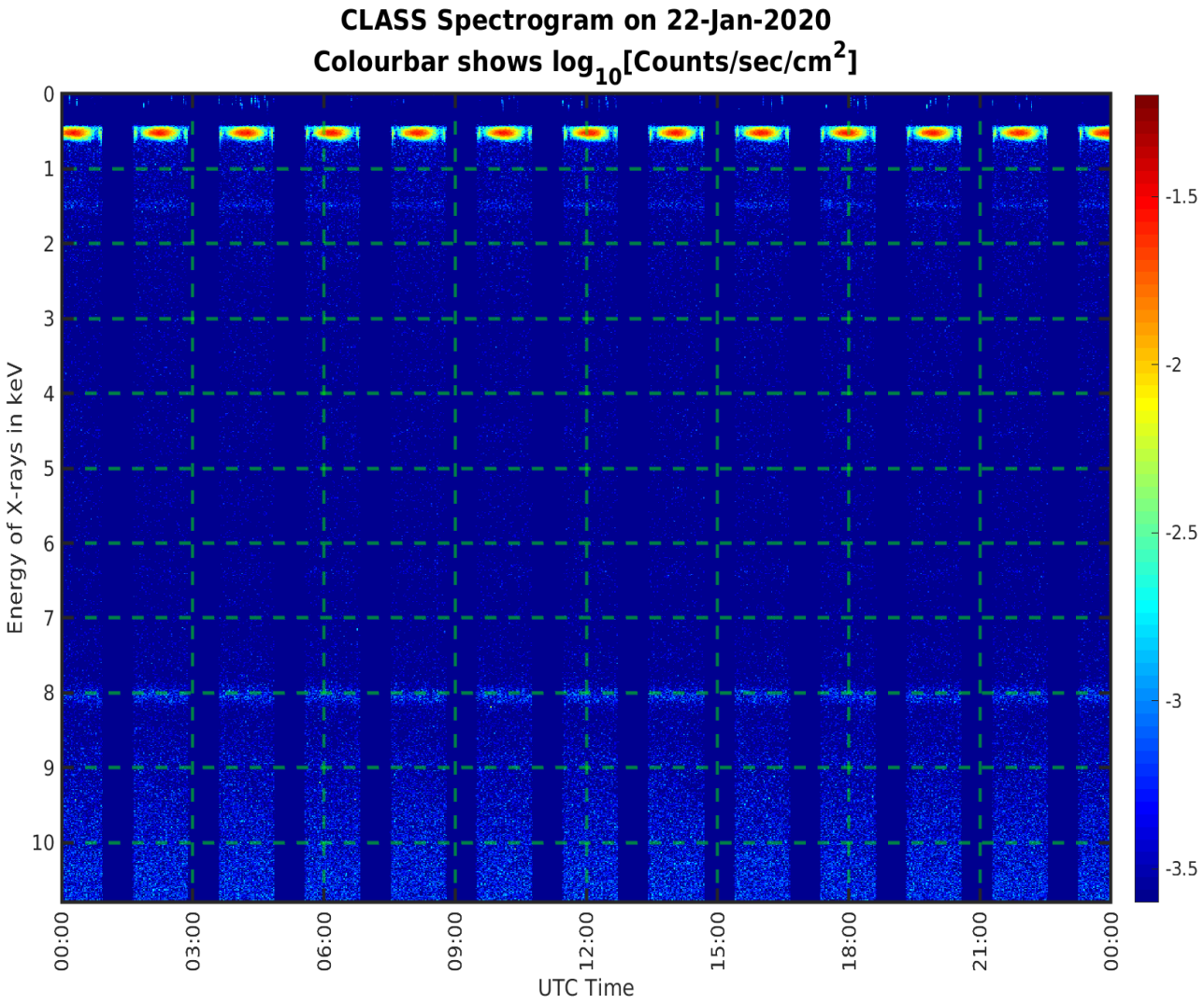
-3.5


CLASS Spectrogram on 22-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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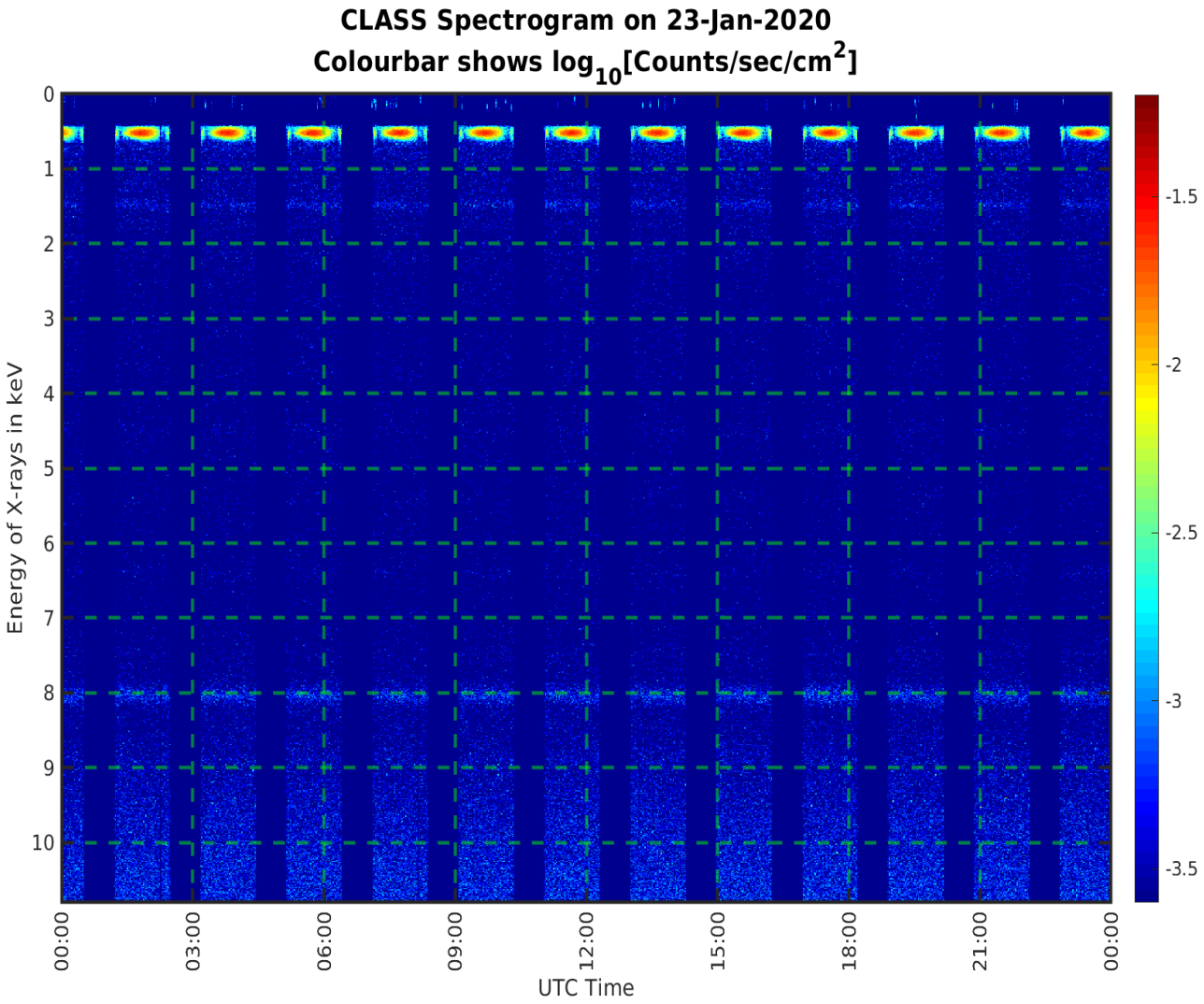
UTC Time


CLASS Spectrogram on 23-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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9
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-1.5
-2
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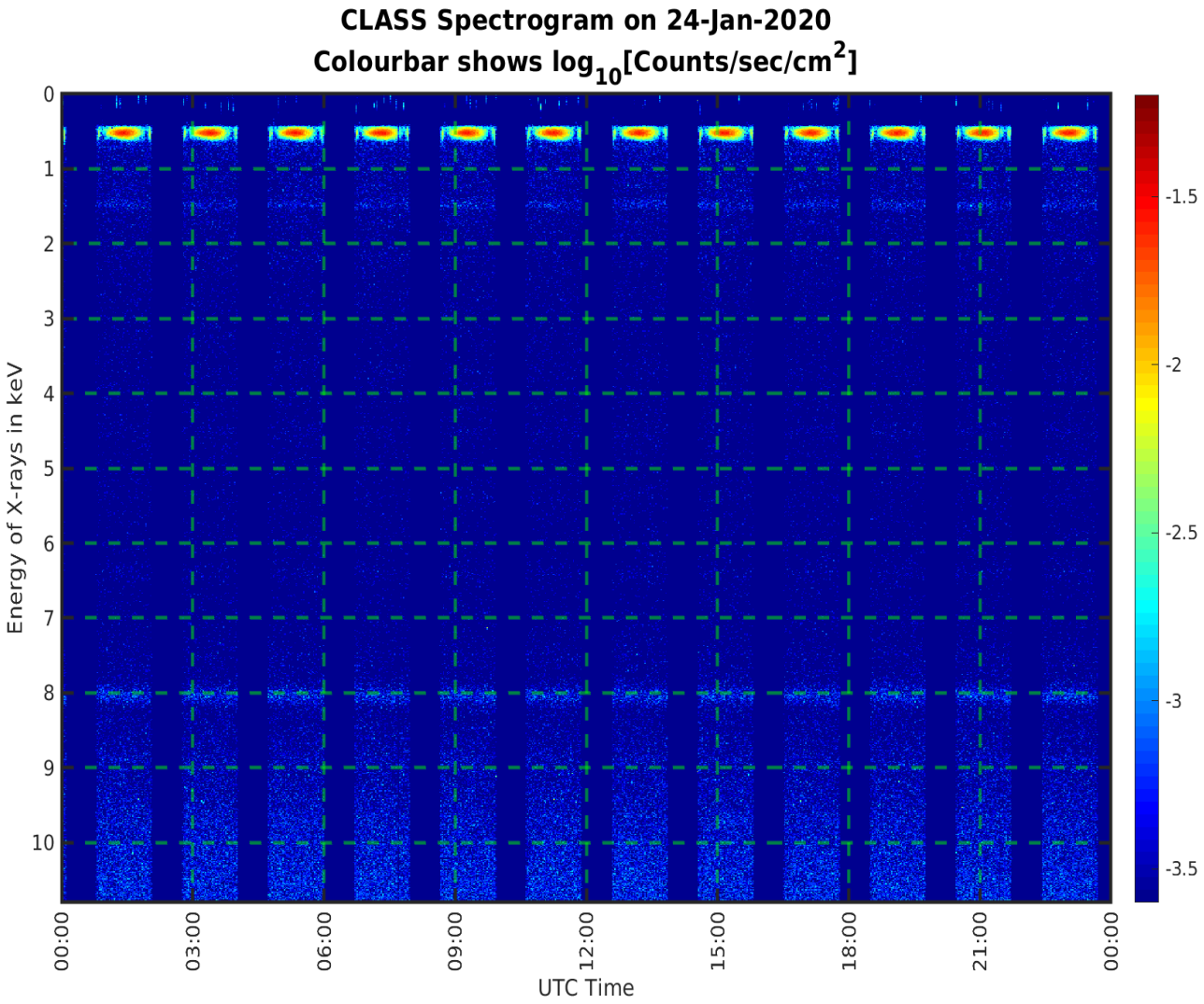
UTC Time


CLASS Spectrogram on 24-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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03:00
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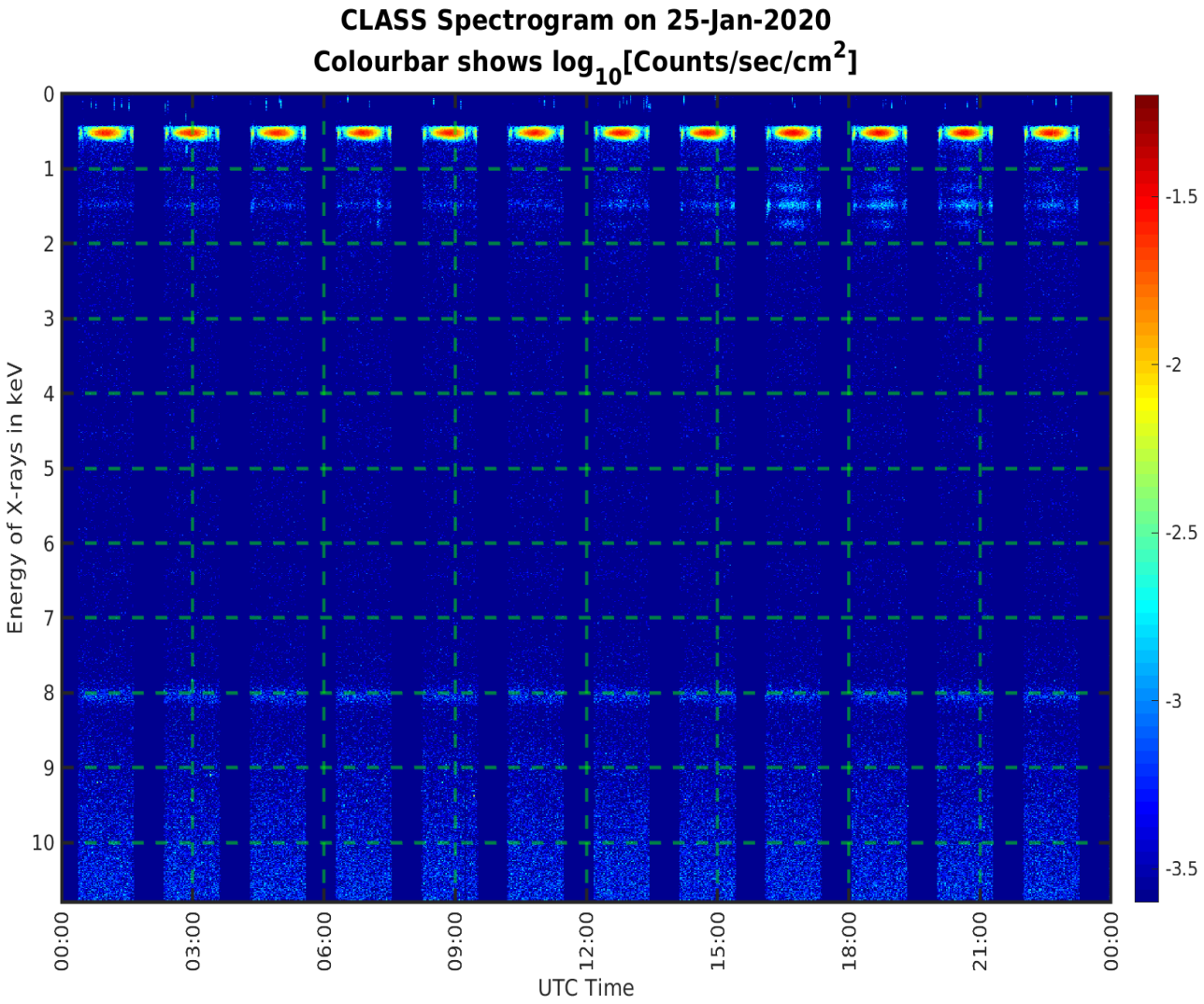
CLASS Spectrogram on 25-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
-2.5
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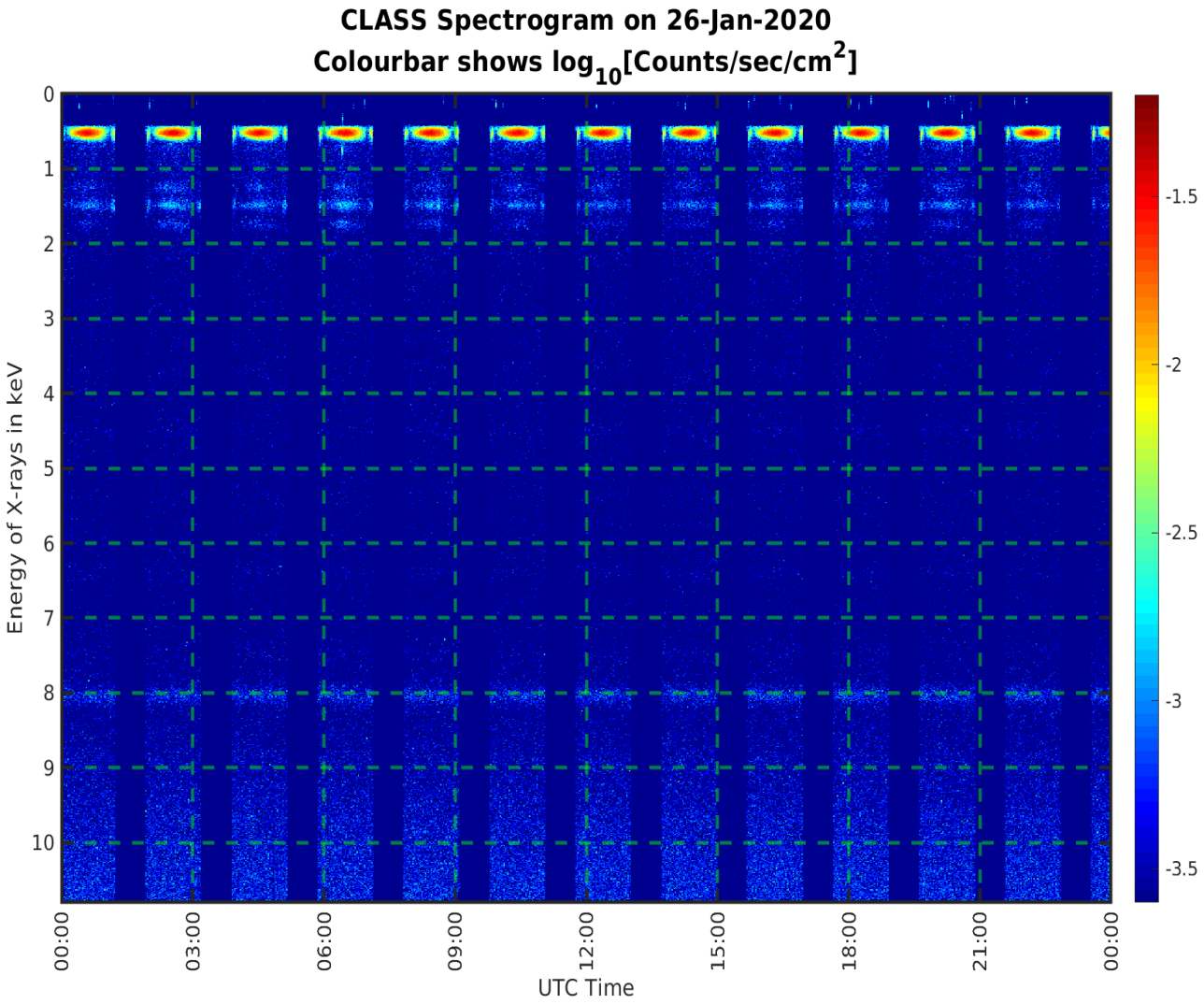
UTC Time


CLASS Spectrogram on 26-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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03:00
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-2.5
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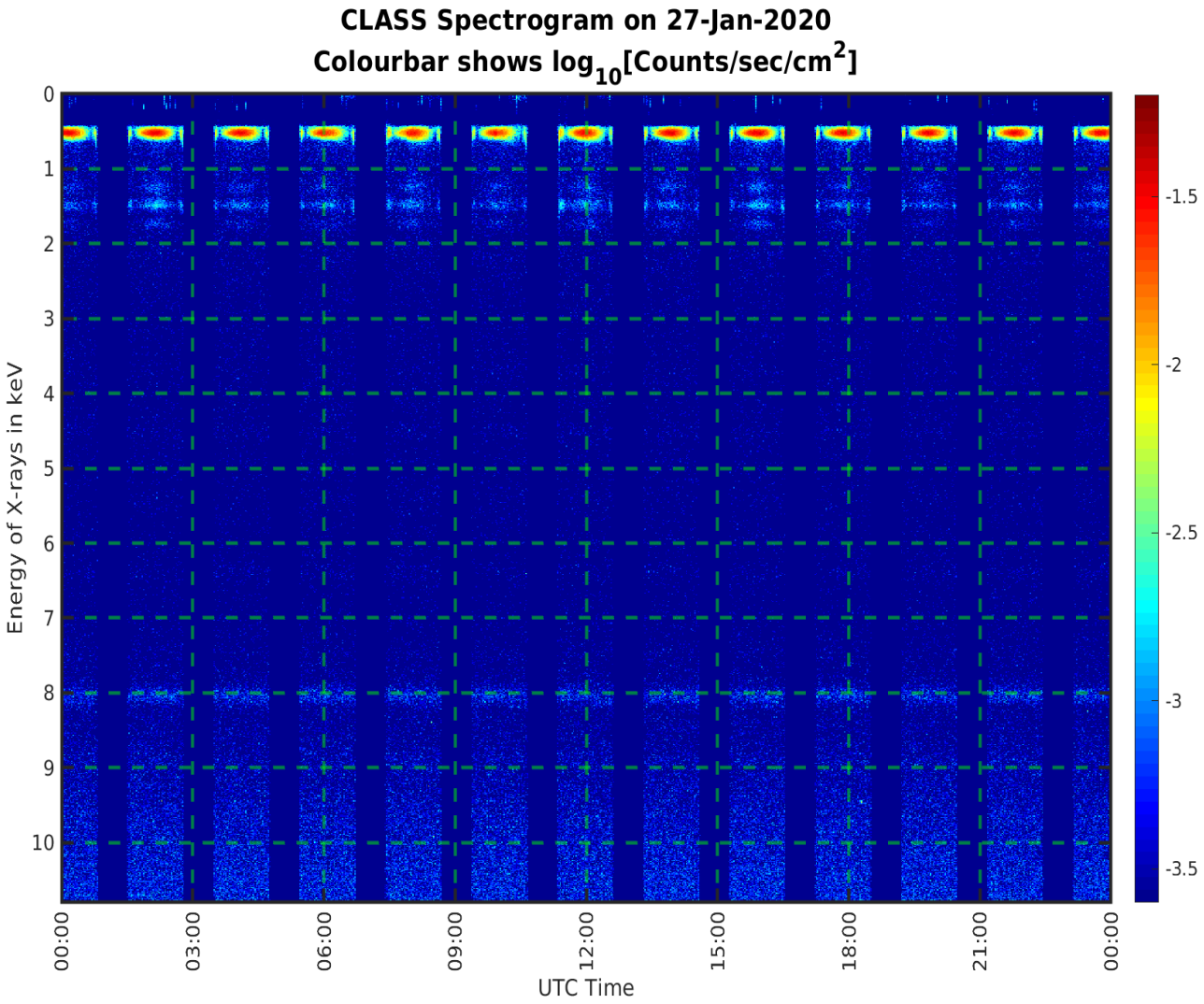
-3.5


CLASS Spectrogram on 27-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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8
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03:00
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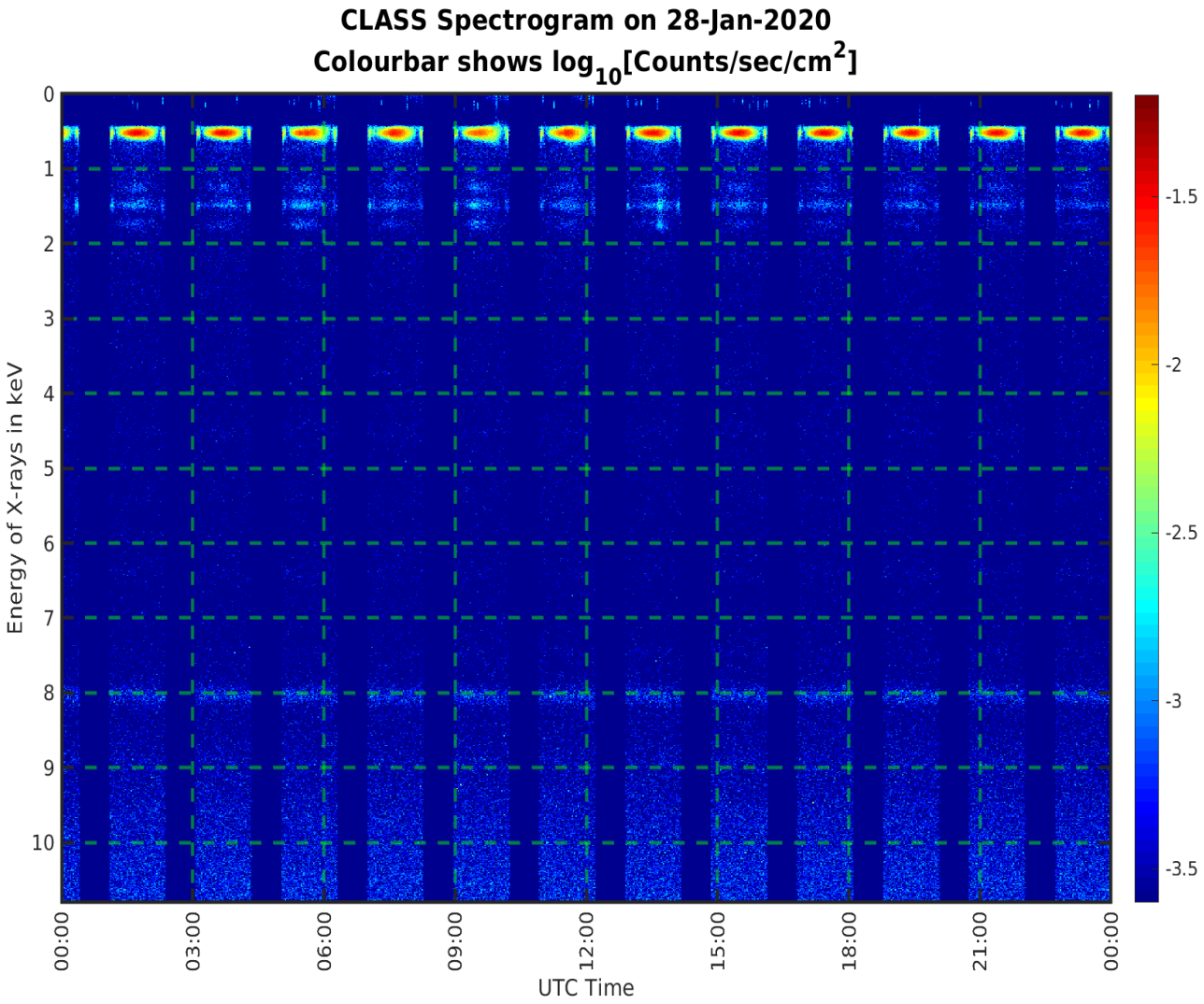
CLASS Spectrogram on 28-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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8
9
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UTC Time
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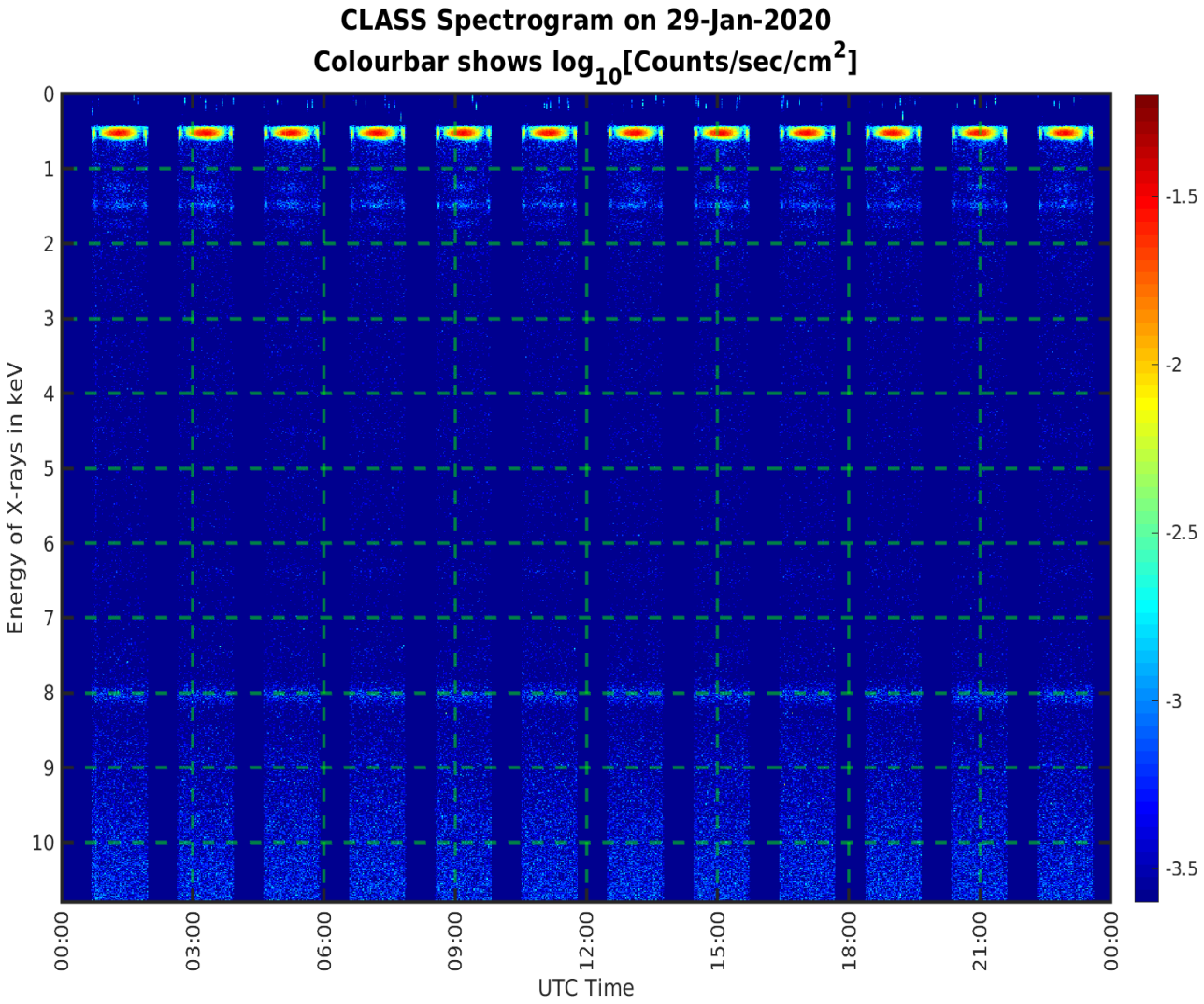
CLASS Spectrogram on 29-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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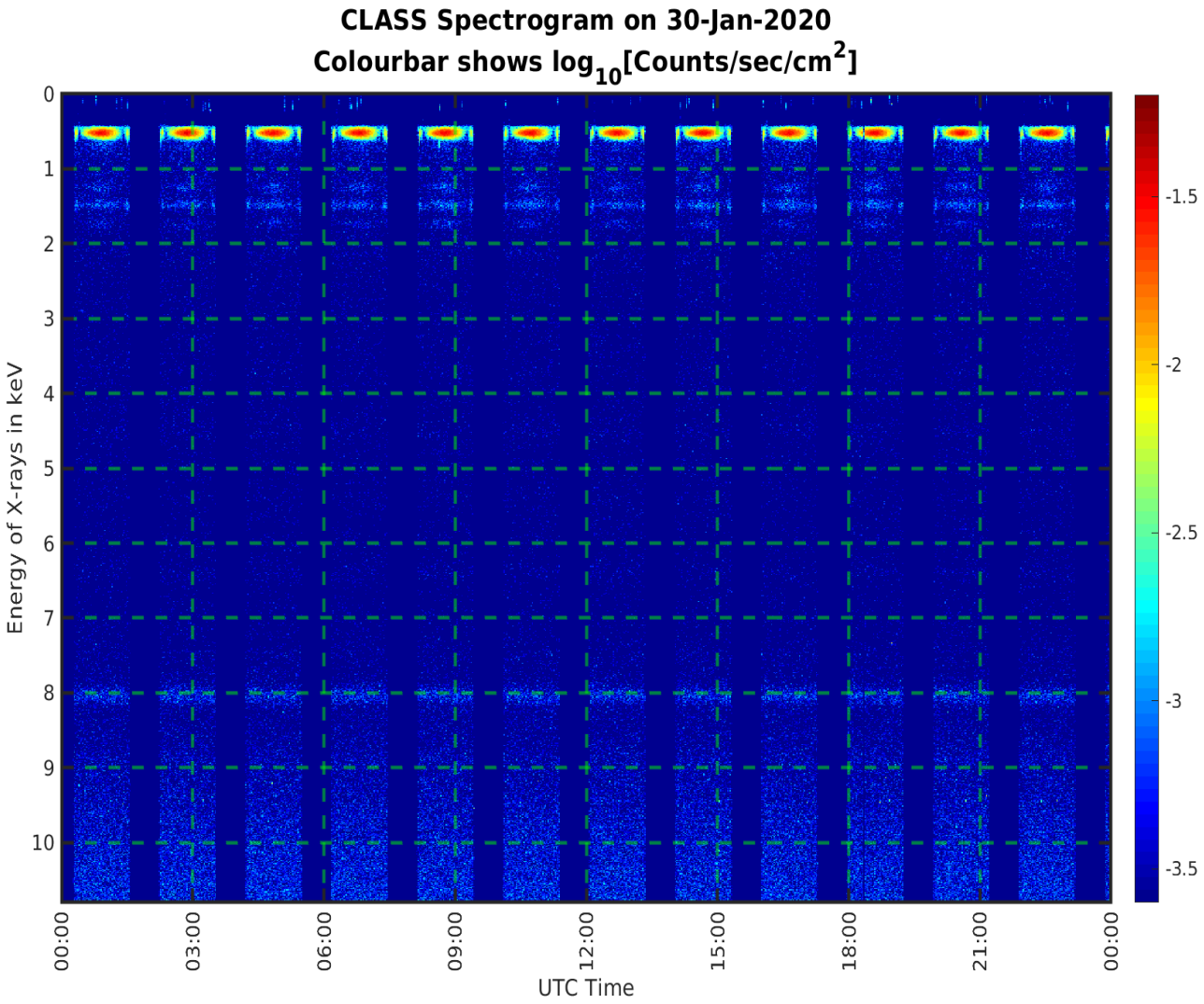
CLASS Spectrogram on 30-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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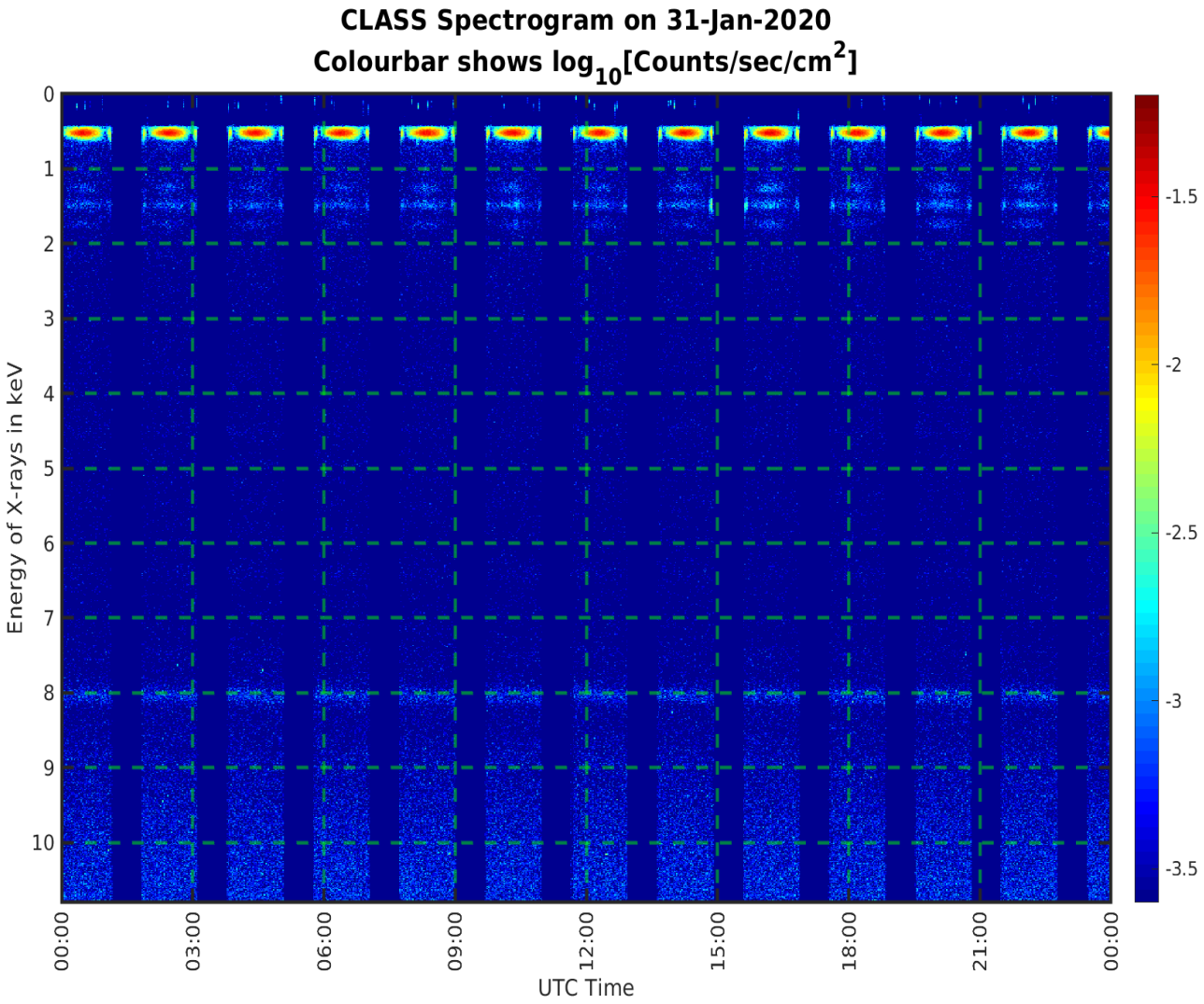
CLASS Spectrogram on 31-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
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-1.5
-2
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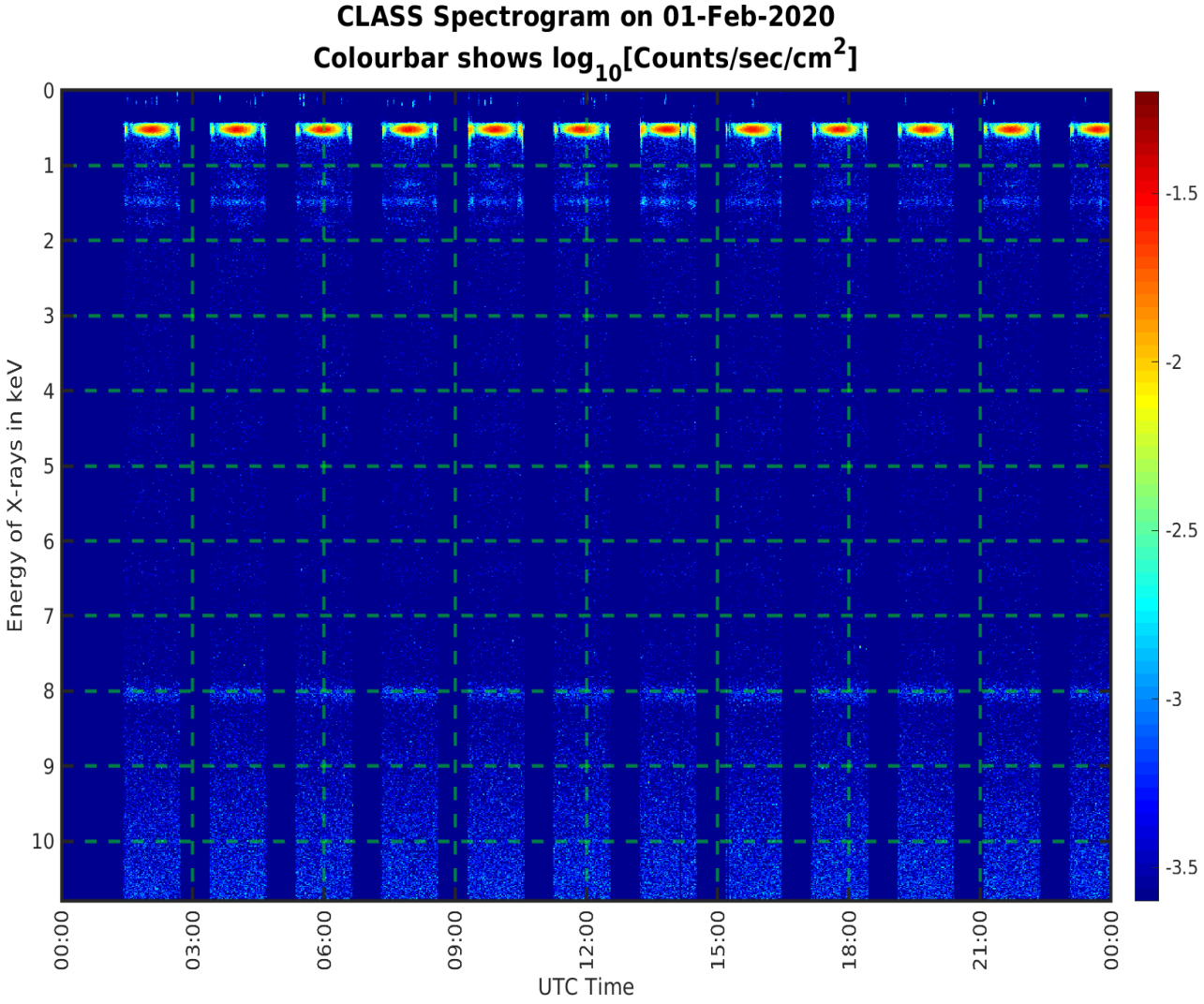
UTC Time


CLASS Spectrogram on 01-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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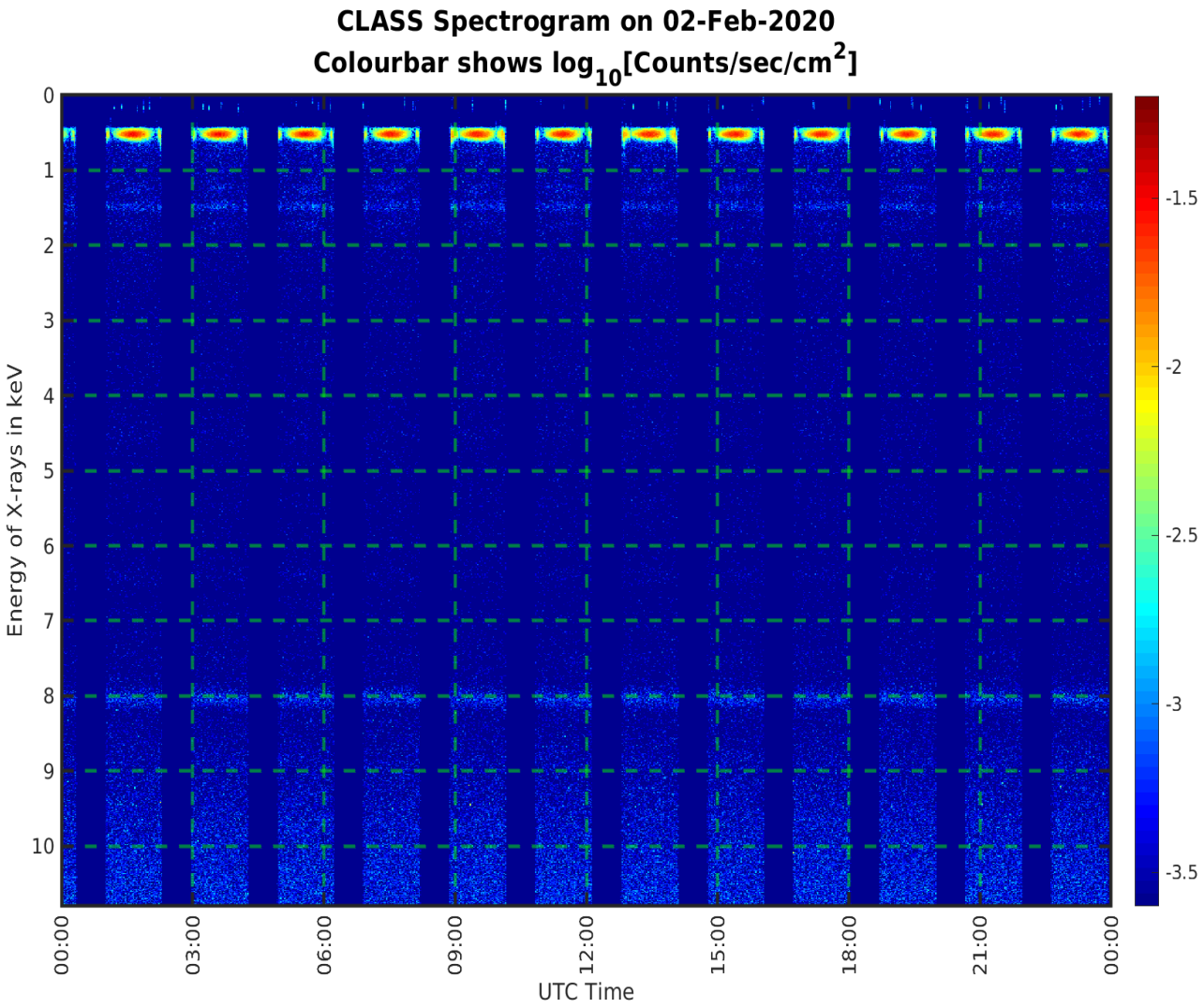
UTC Time


CLASS Spectrogram on 02-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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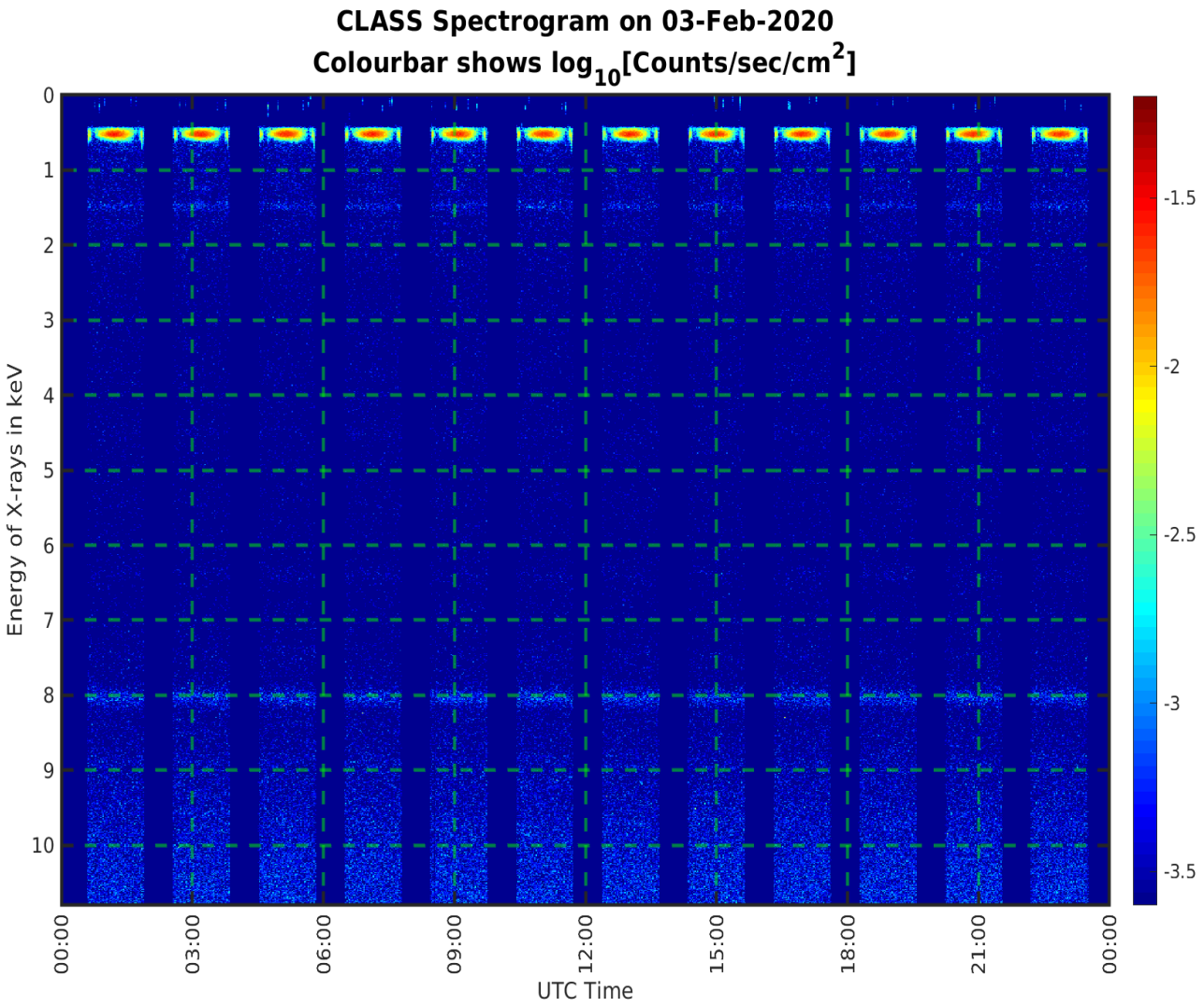
UTC Time


CLASS Spectrogram on 03-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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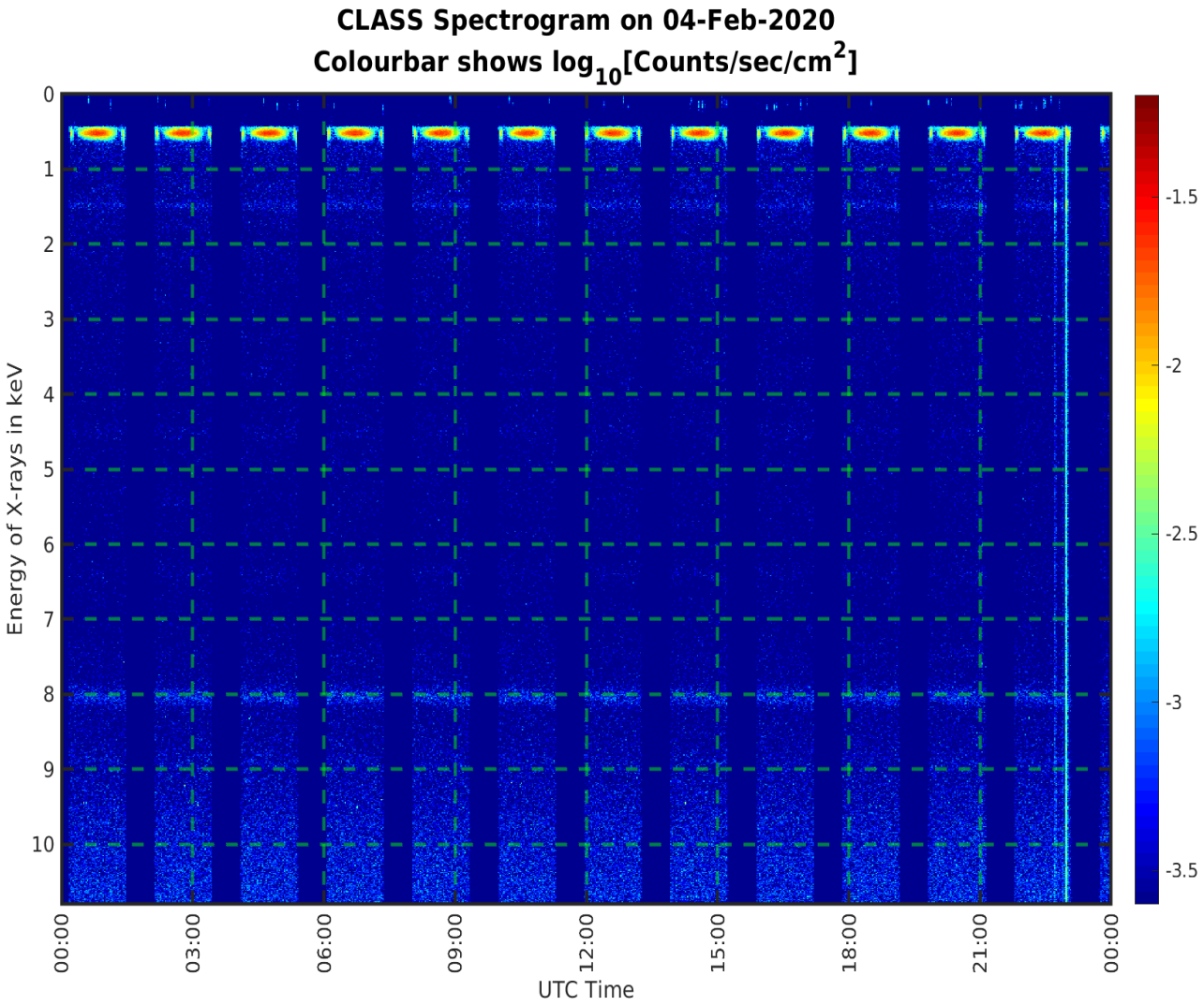
UTC Time


CLASS Spectrogram on 04-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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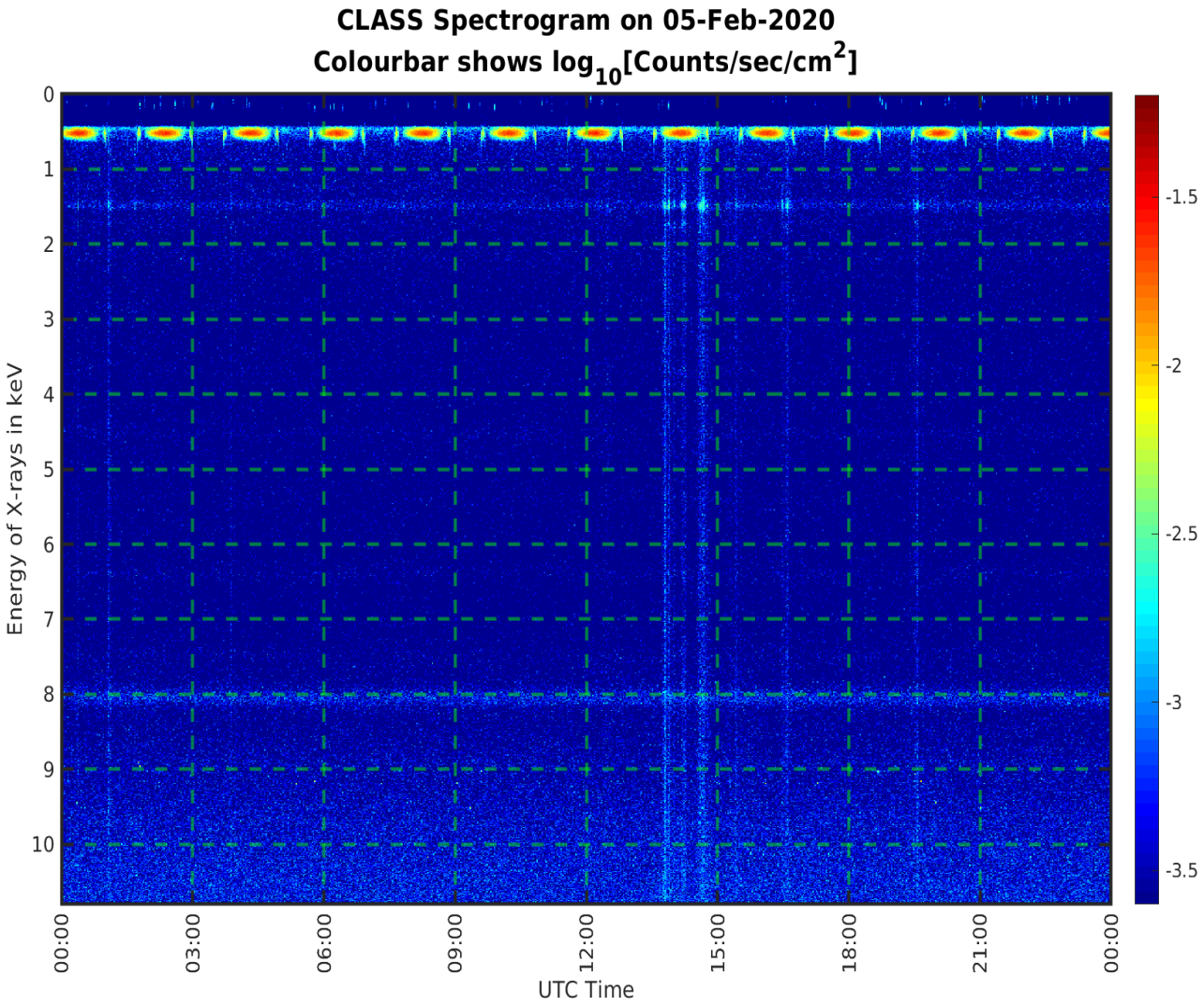
CLASS Spectrogram on 05-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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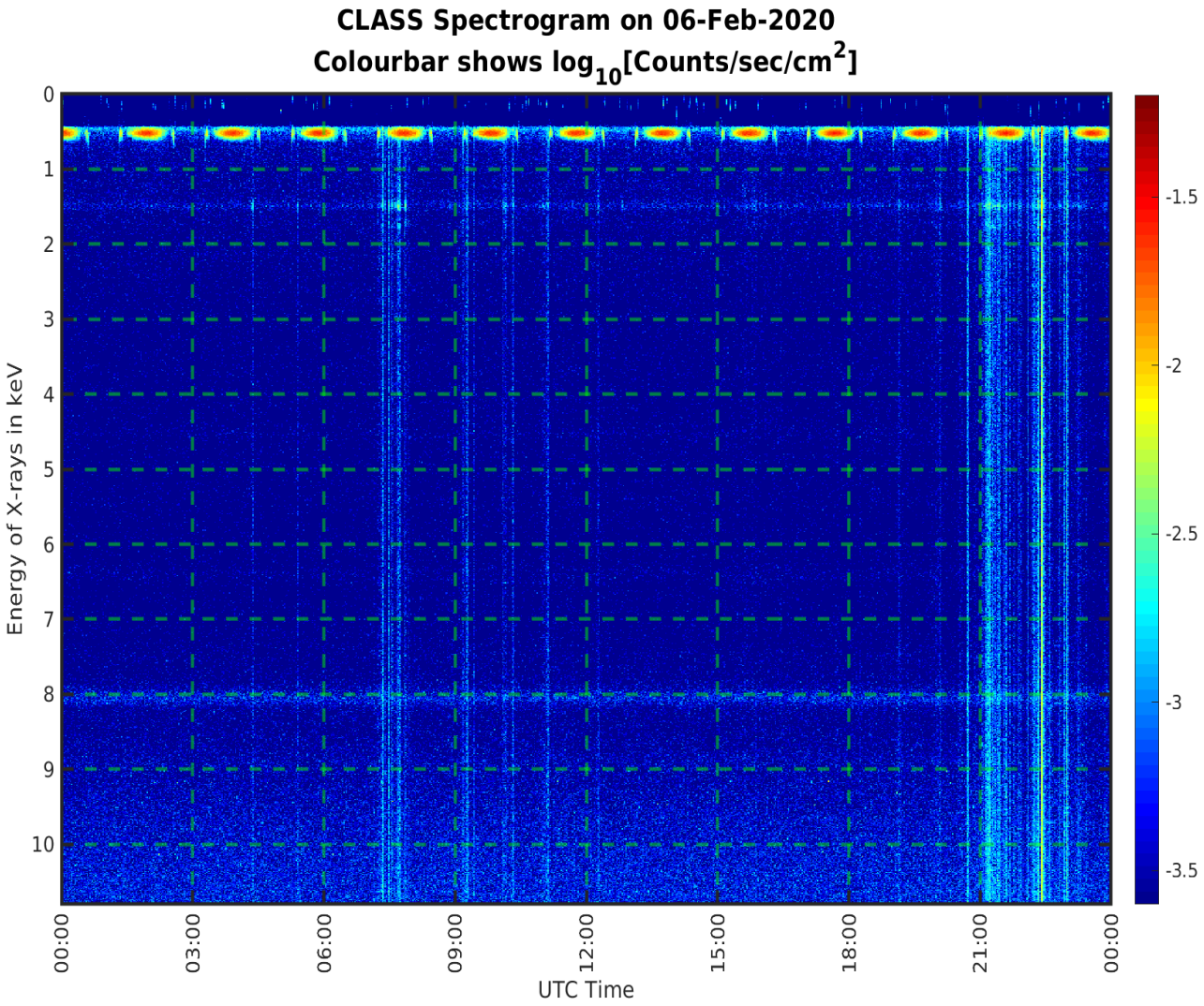
CLASS Spectrogram on 06-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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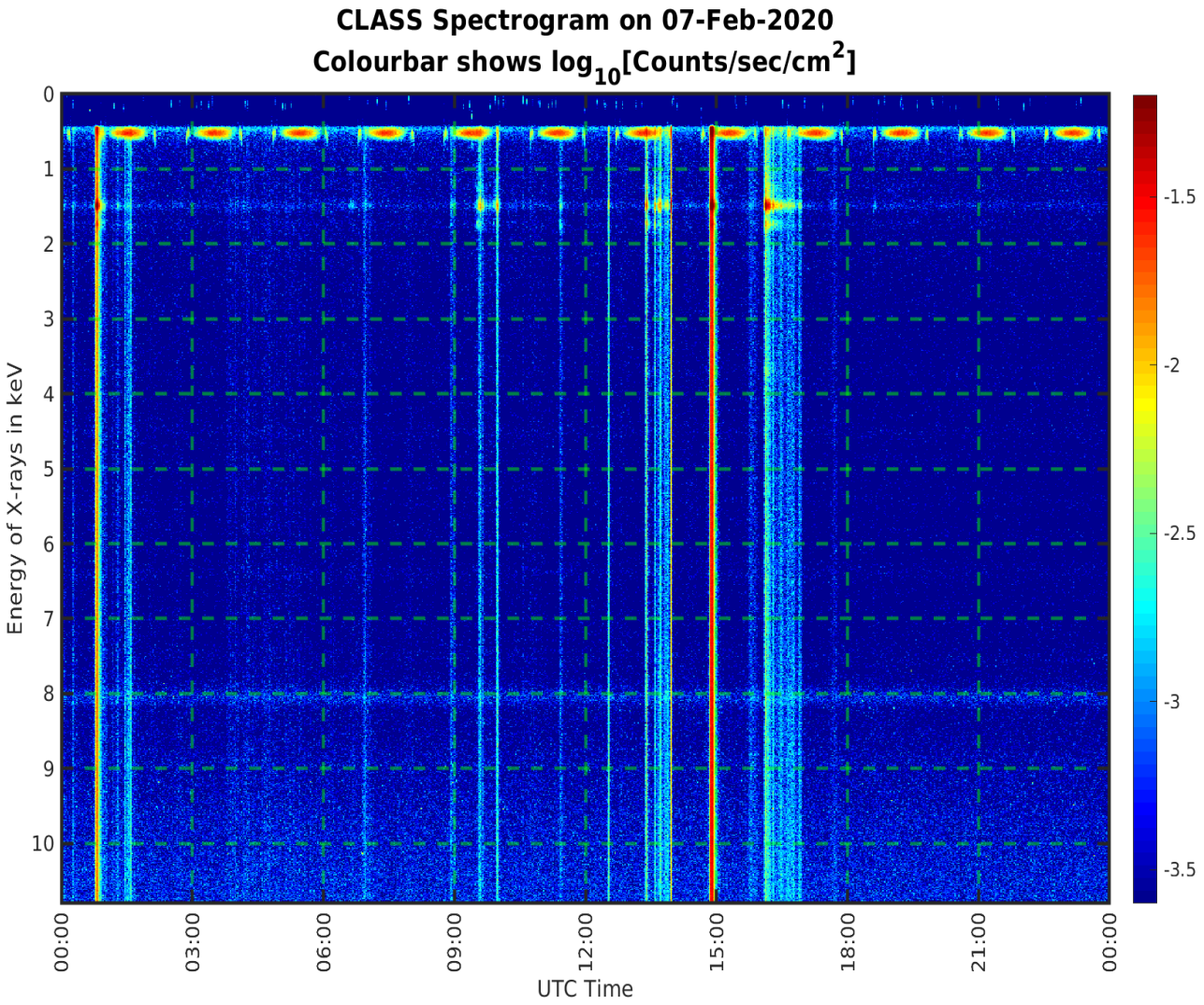
CLASS Spectrogram on 07-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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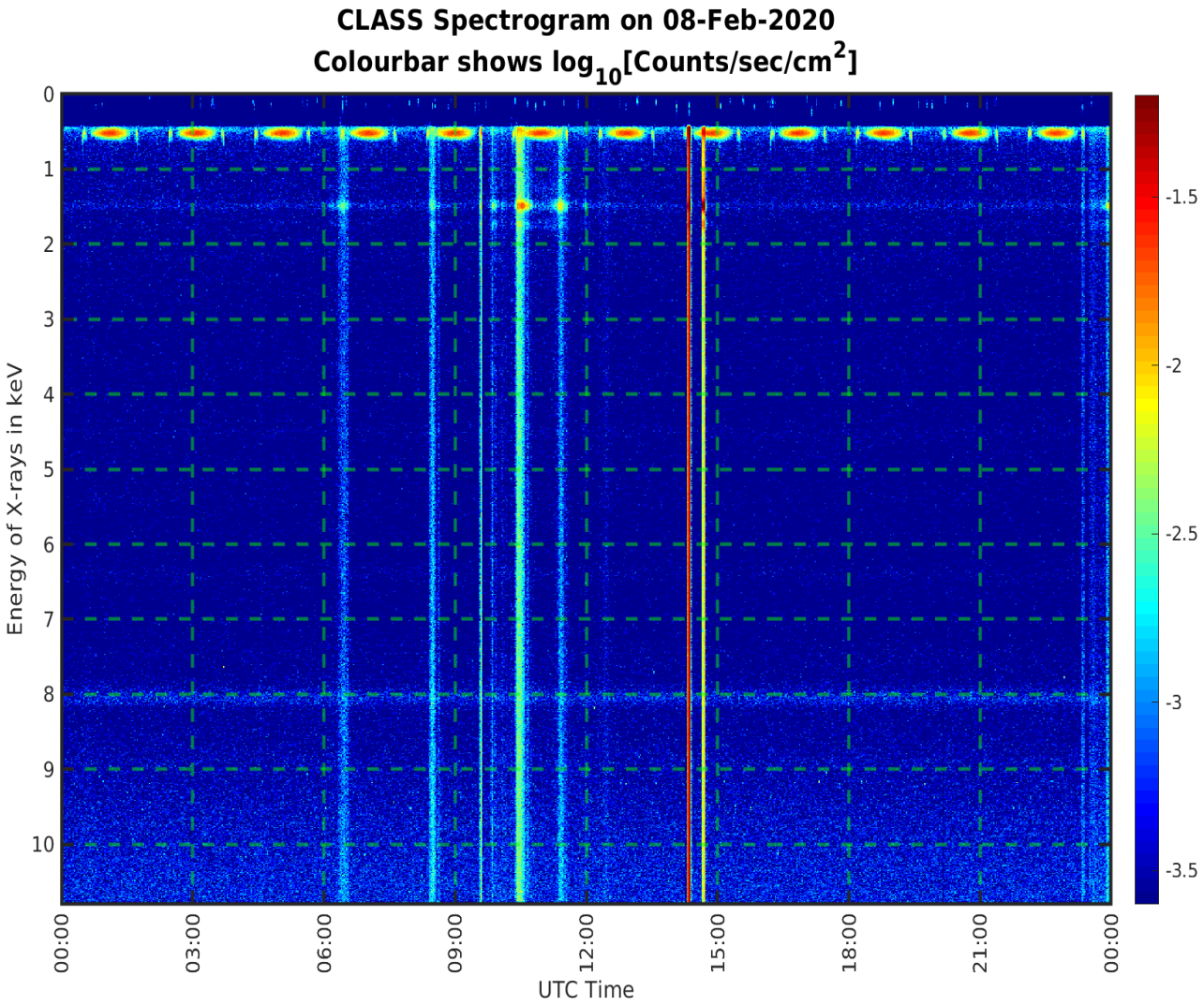
CLASS Spectrogram on 08-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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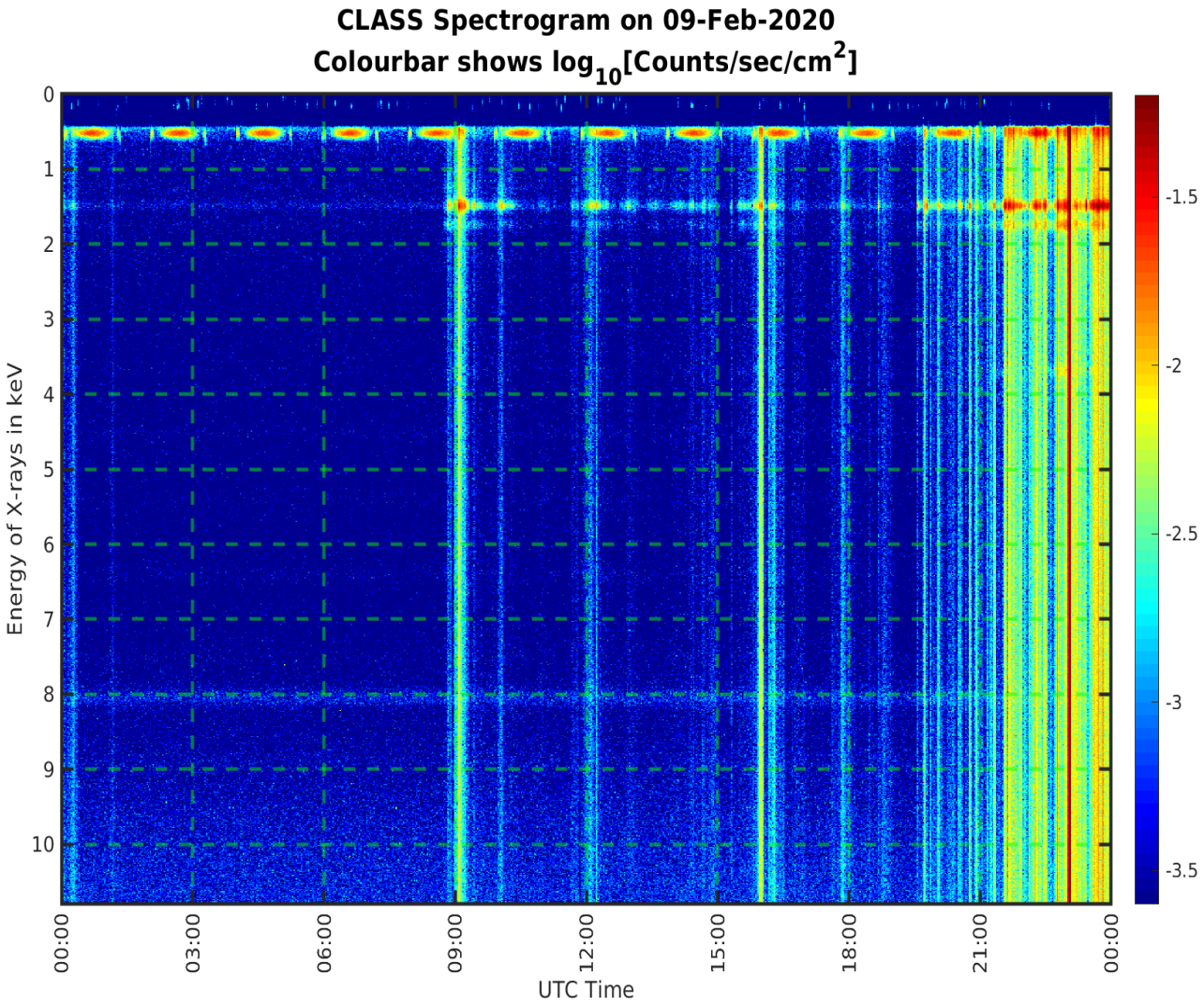
CLASS Spectrogram on 09-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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UTC Time
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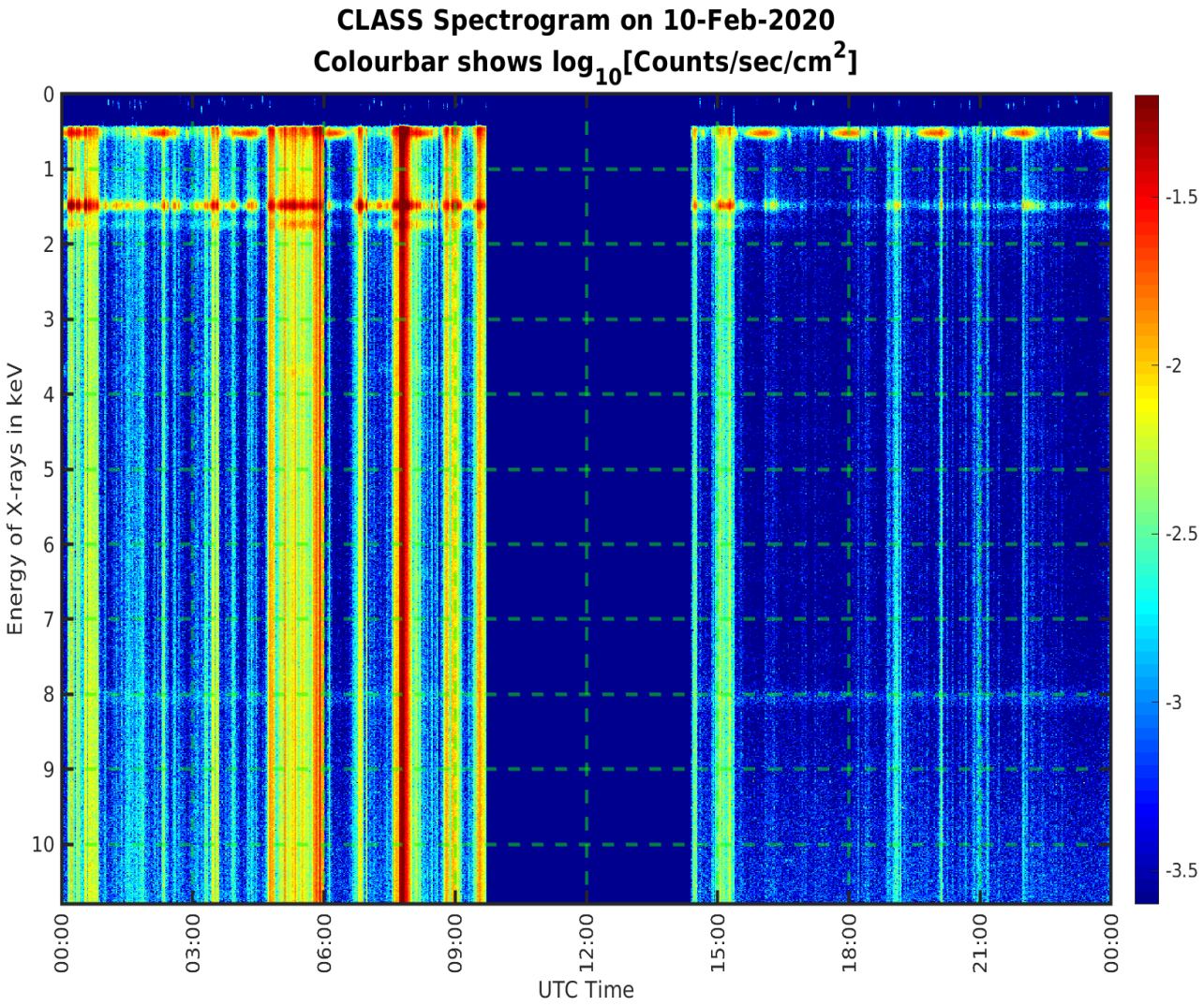
CLASS Spectrogram on 10-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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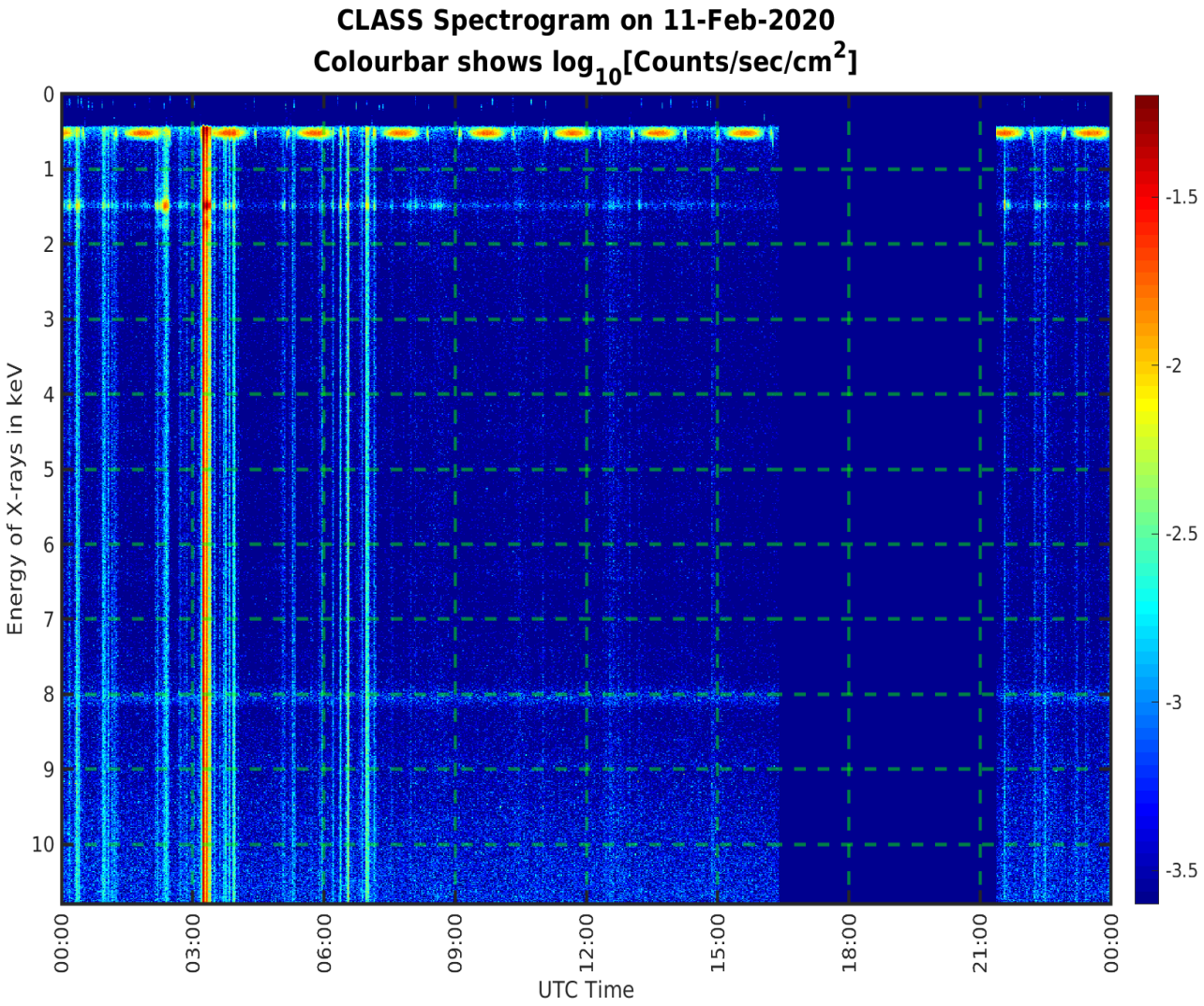
UTC Time


CLASS Spectrogram on 11-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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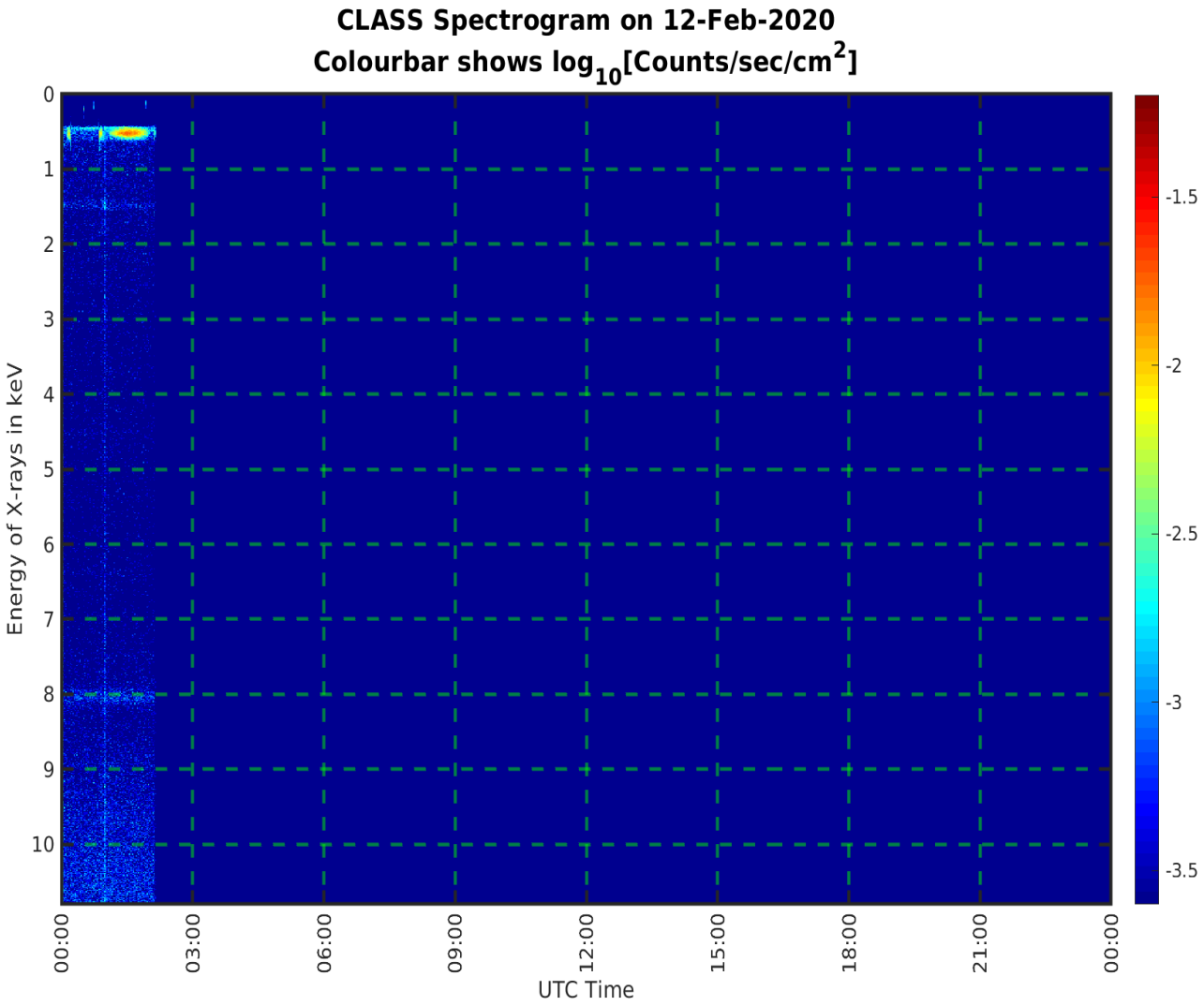
CLASS Spectrogram on 12-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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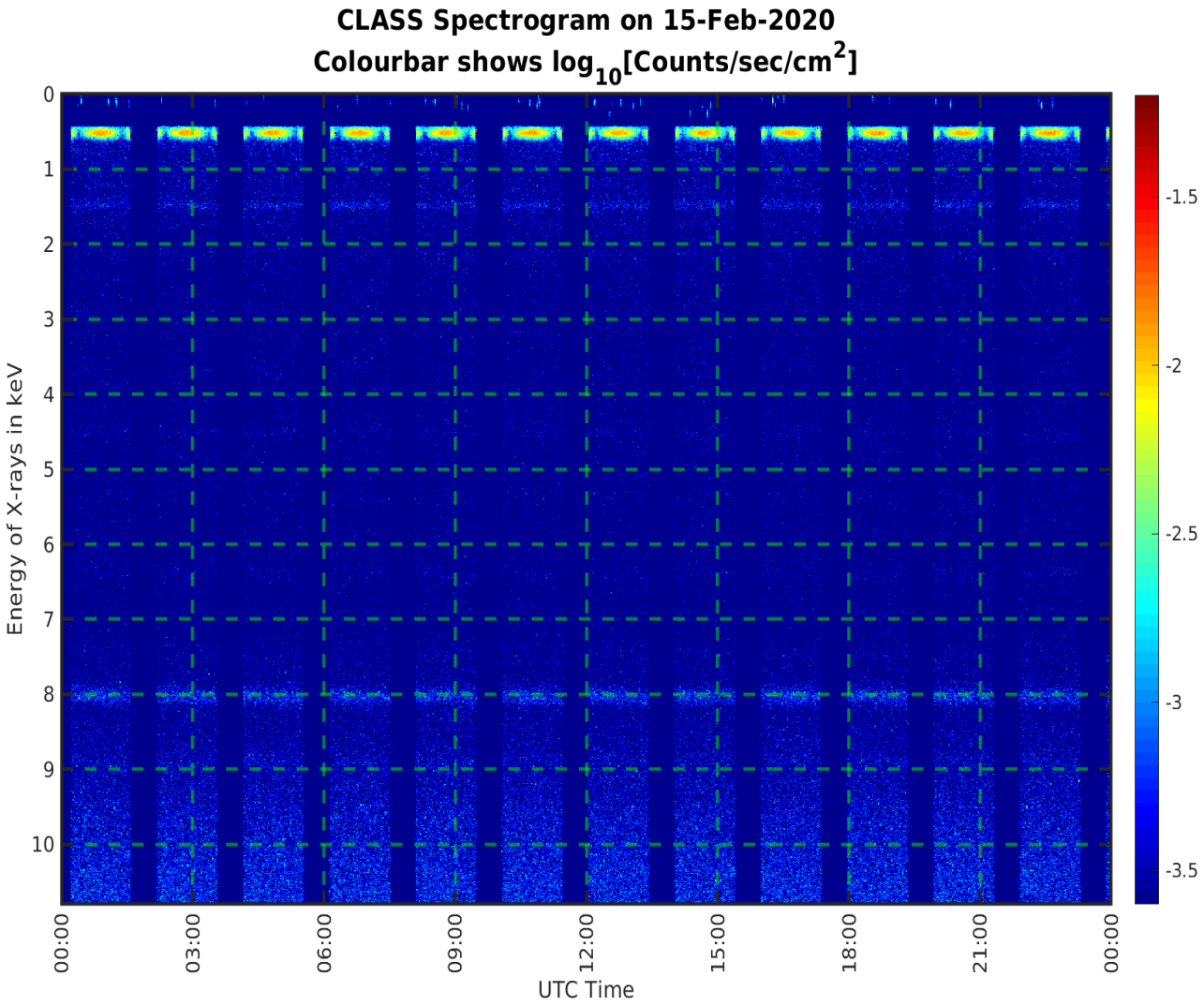
CLASS Spectrogram on 15-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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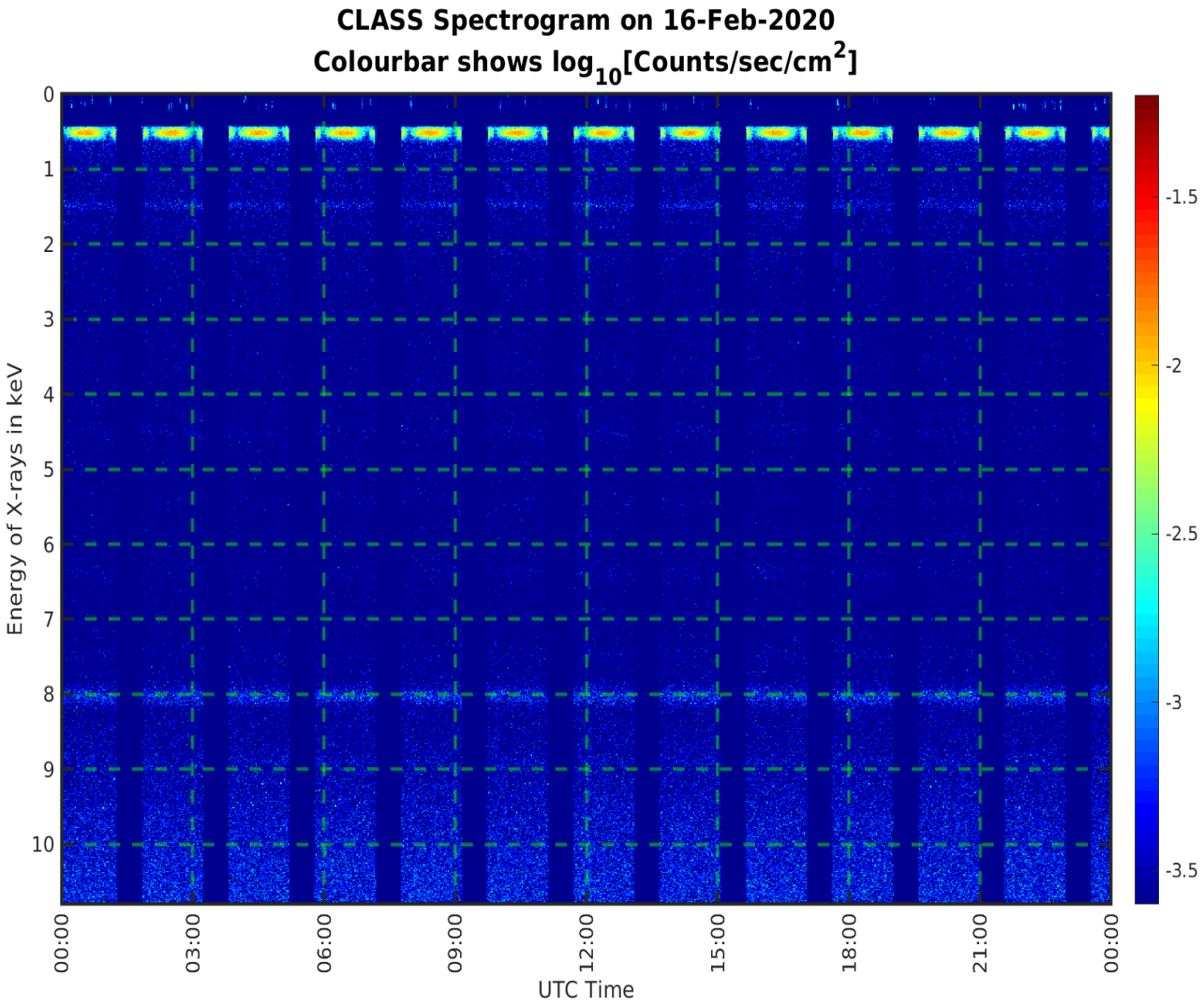
CLASS Spectrogram on 16-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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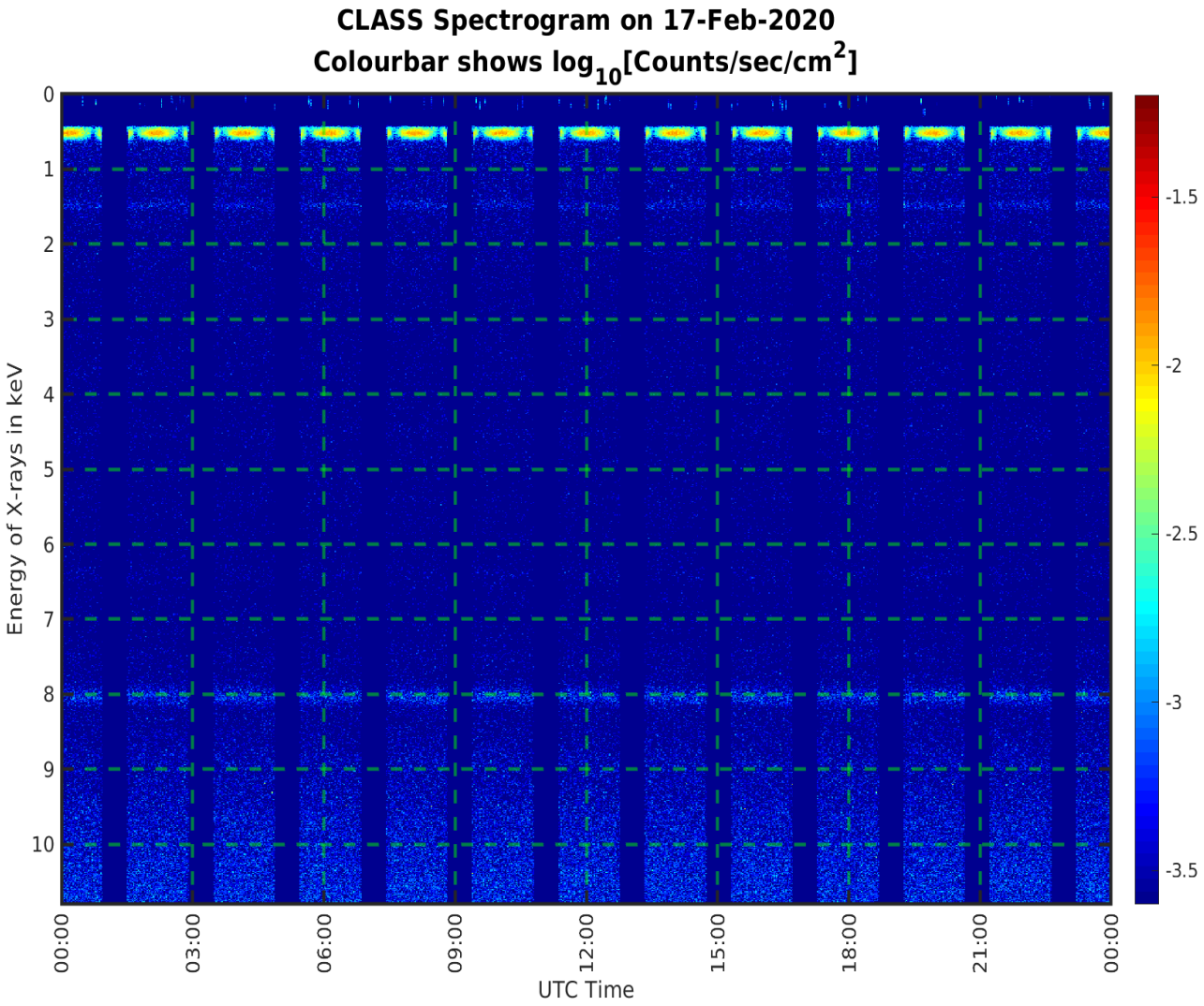
CLASS Spectrogram on 17-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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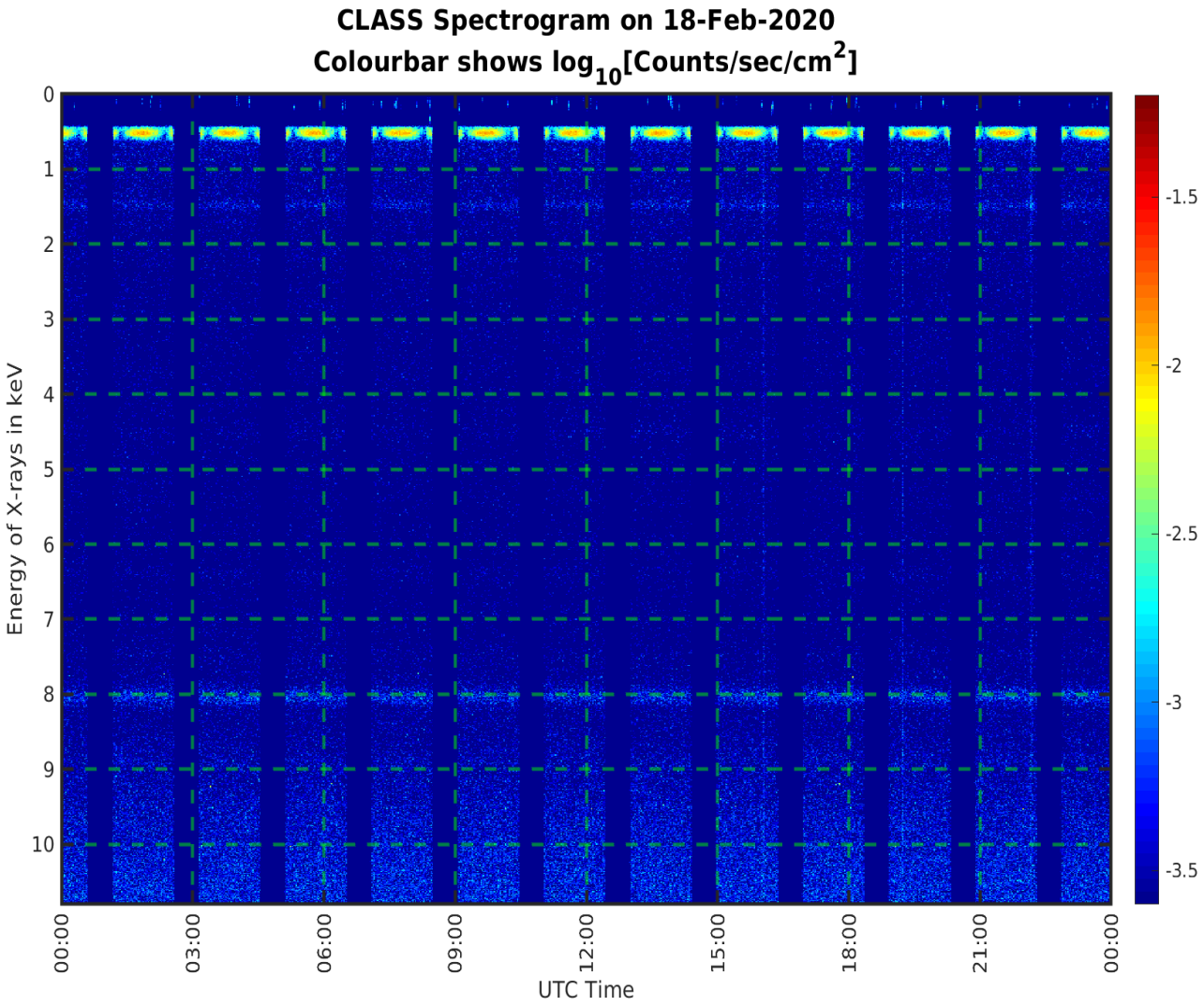
CLASS Spectrogram on 18-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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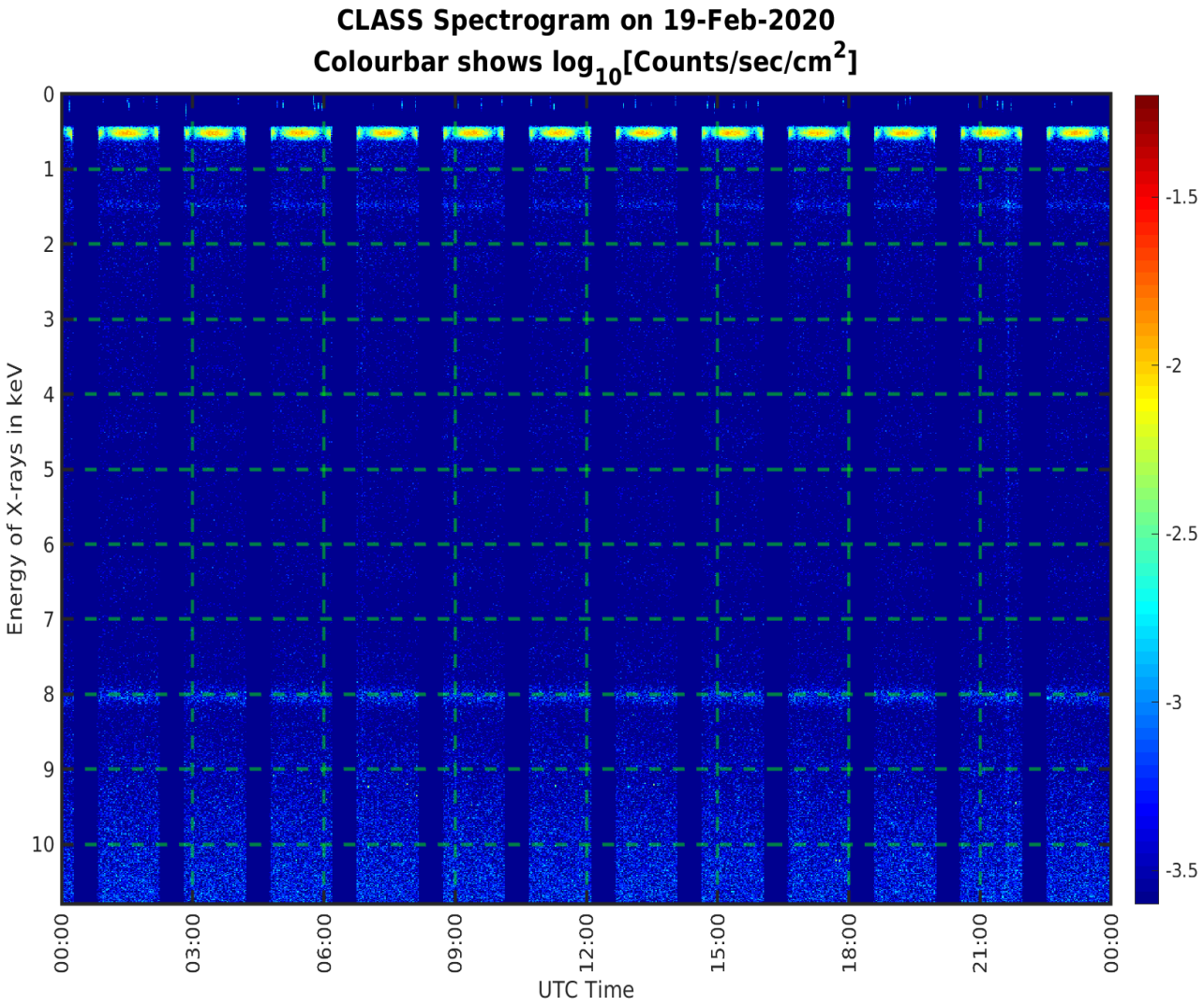
CLASS Spectrogram on 19-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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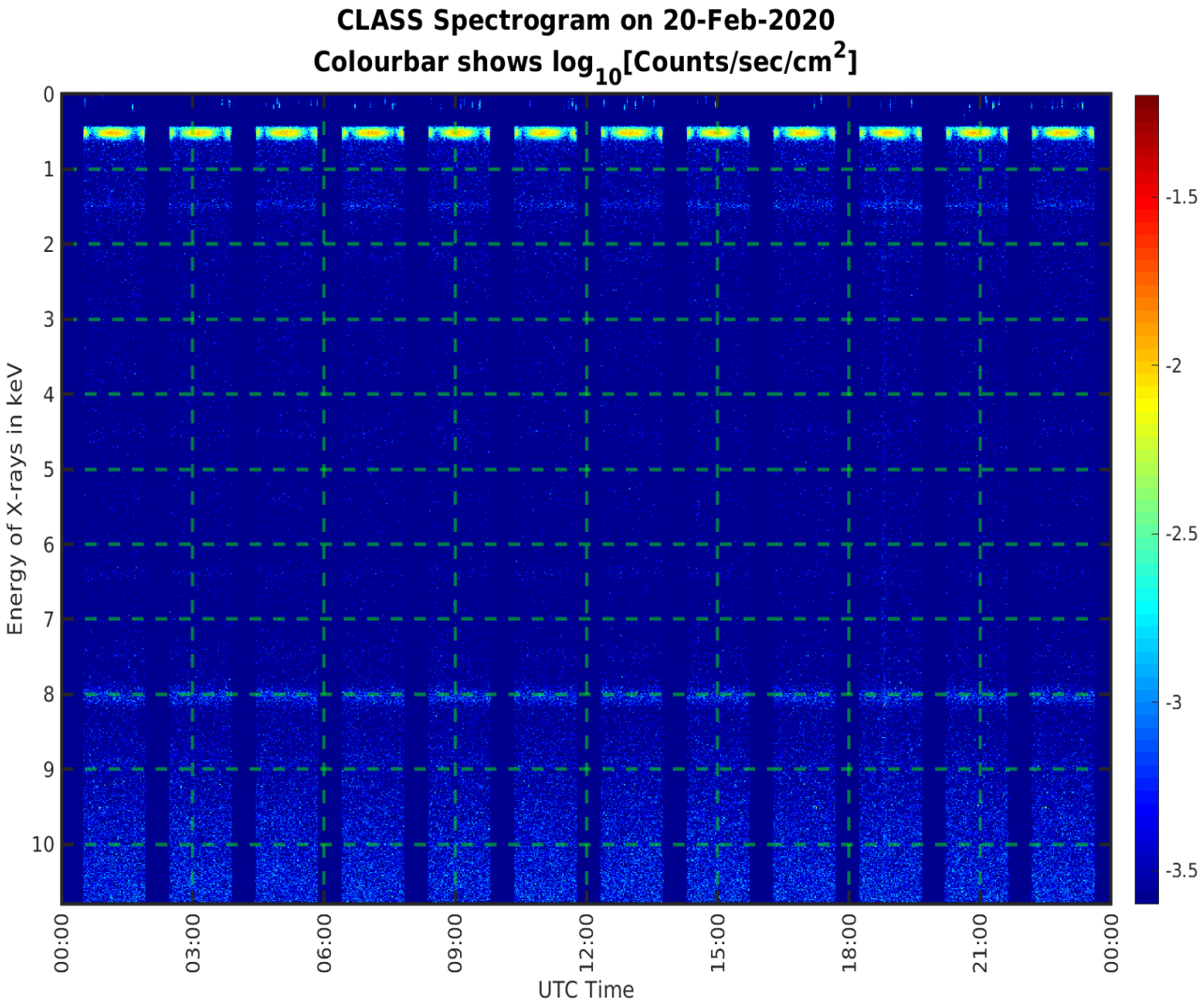
UTC Time


CLASS Spectrogram on 20-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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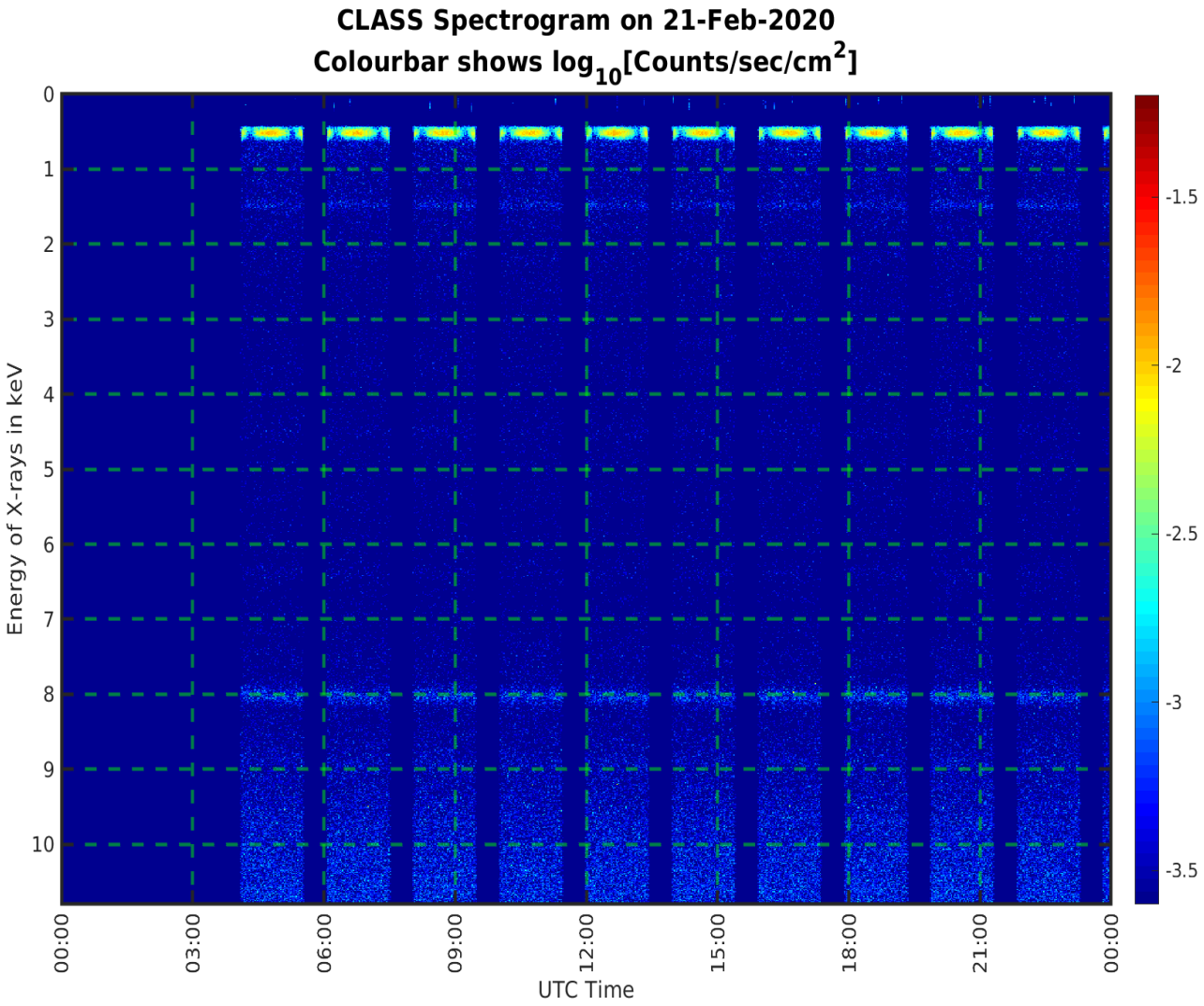
UTC Time


CLASS Spectrogram on 21-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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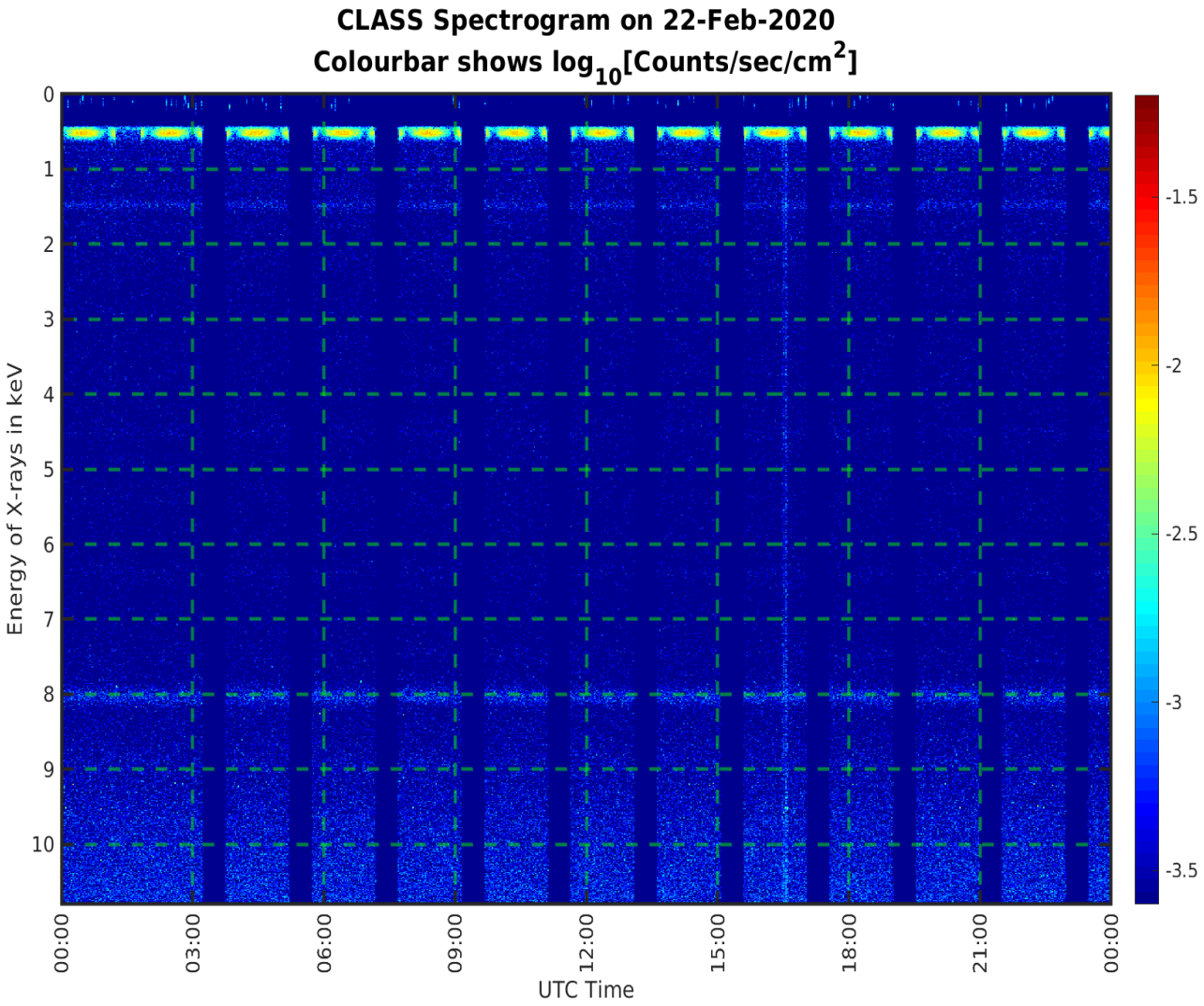
CLASS Spectrogram on 22-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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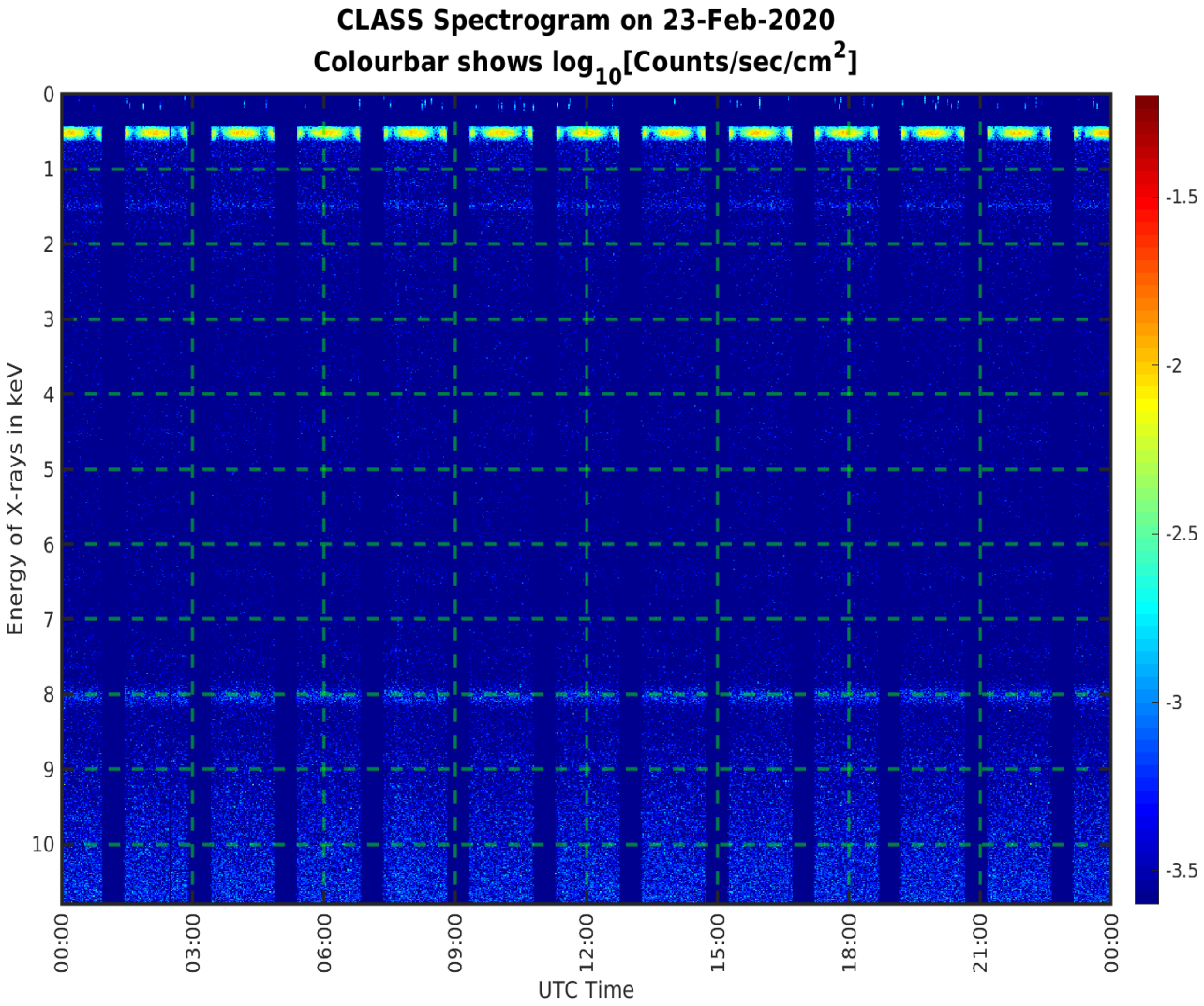
CLASS Spectrogram on 23-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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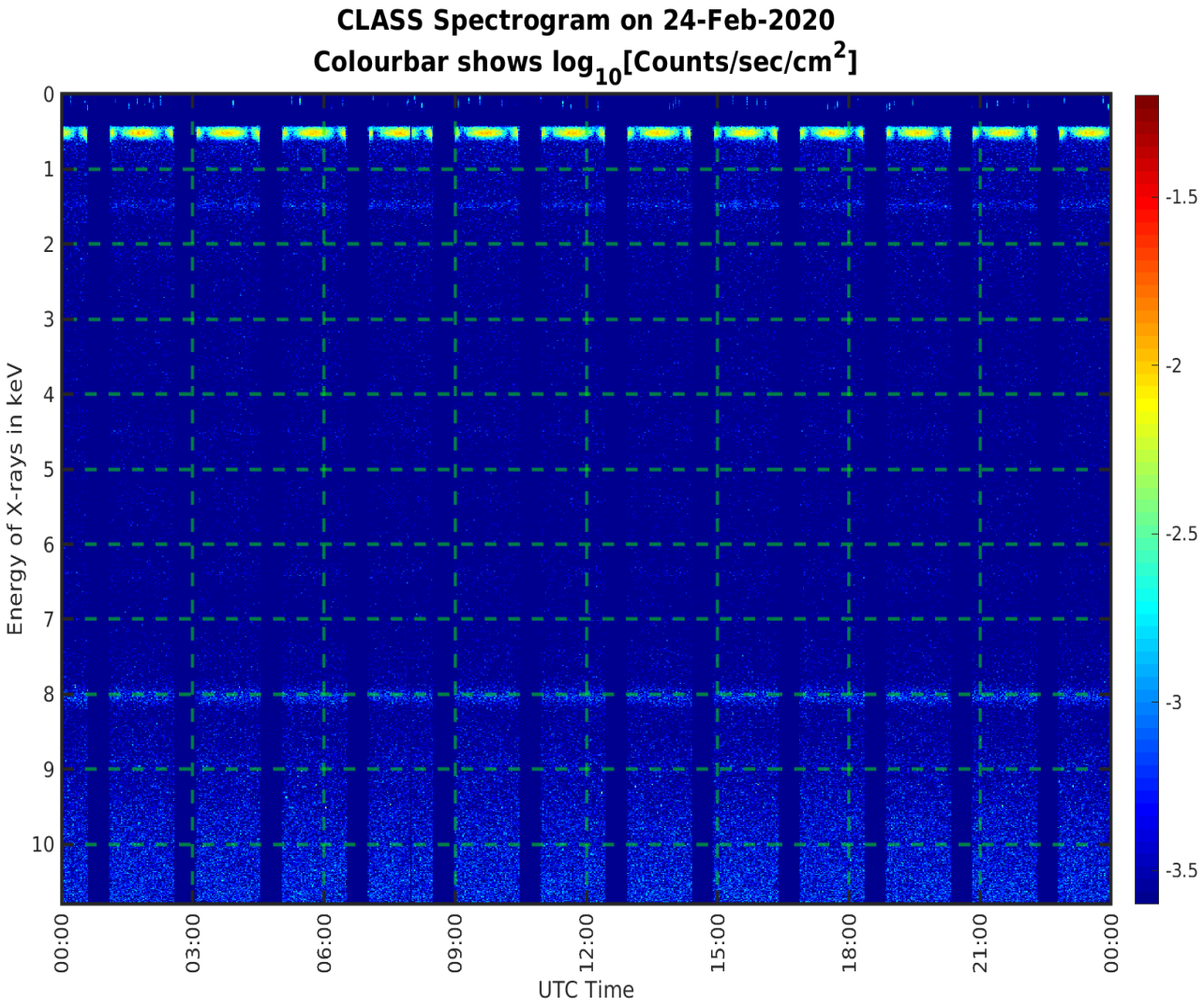
CLASS Spectrogram on 24-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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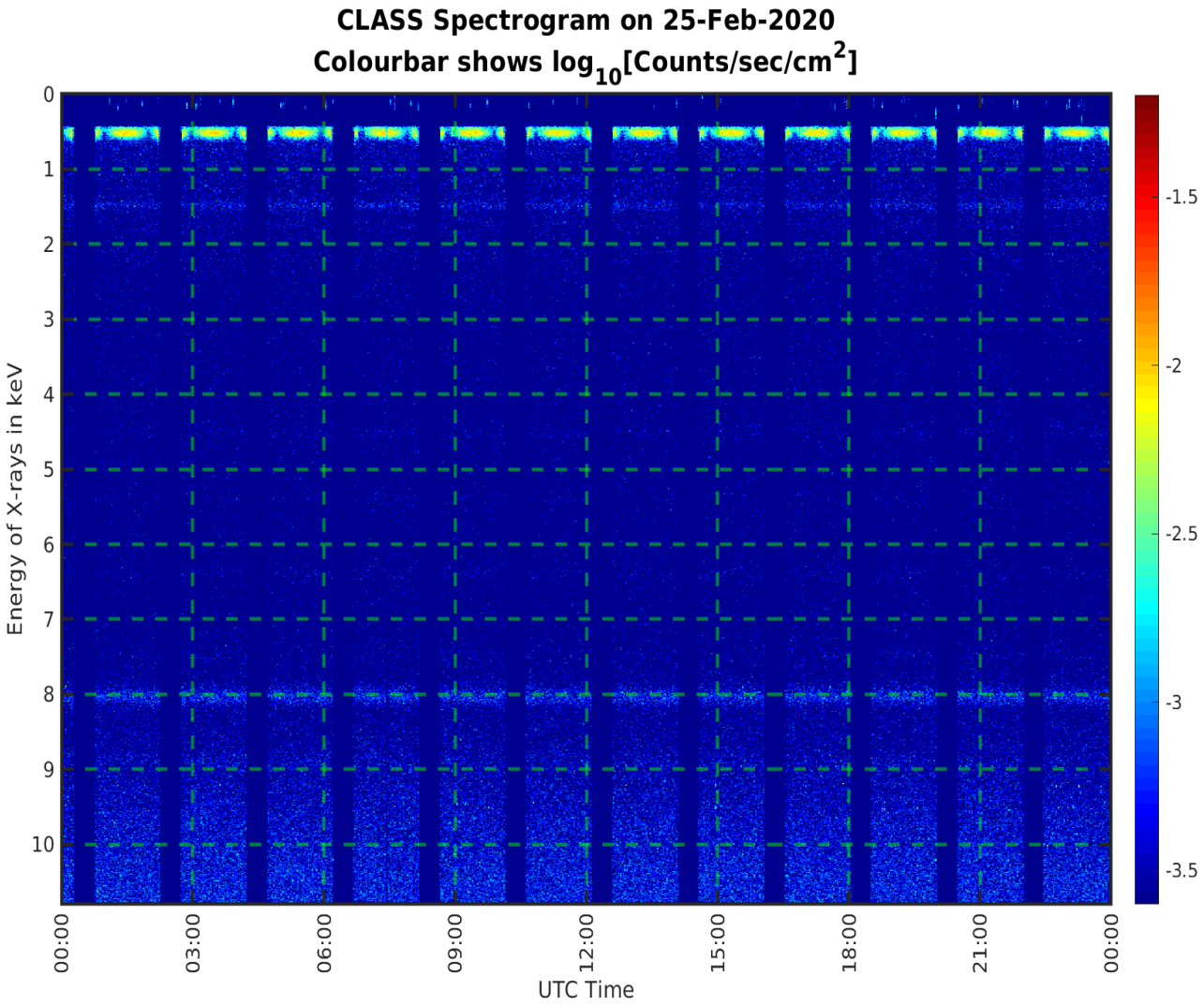
CLASS Spectrogram on 25-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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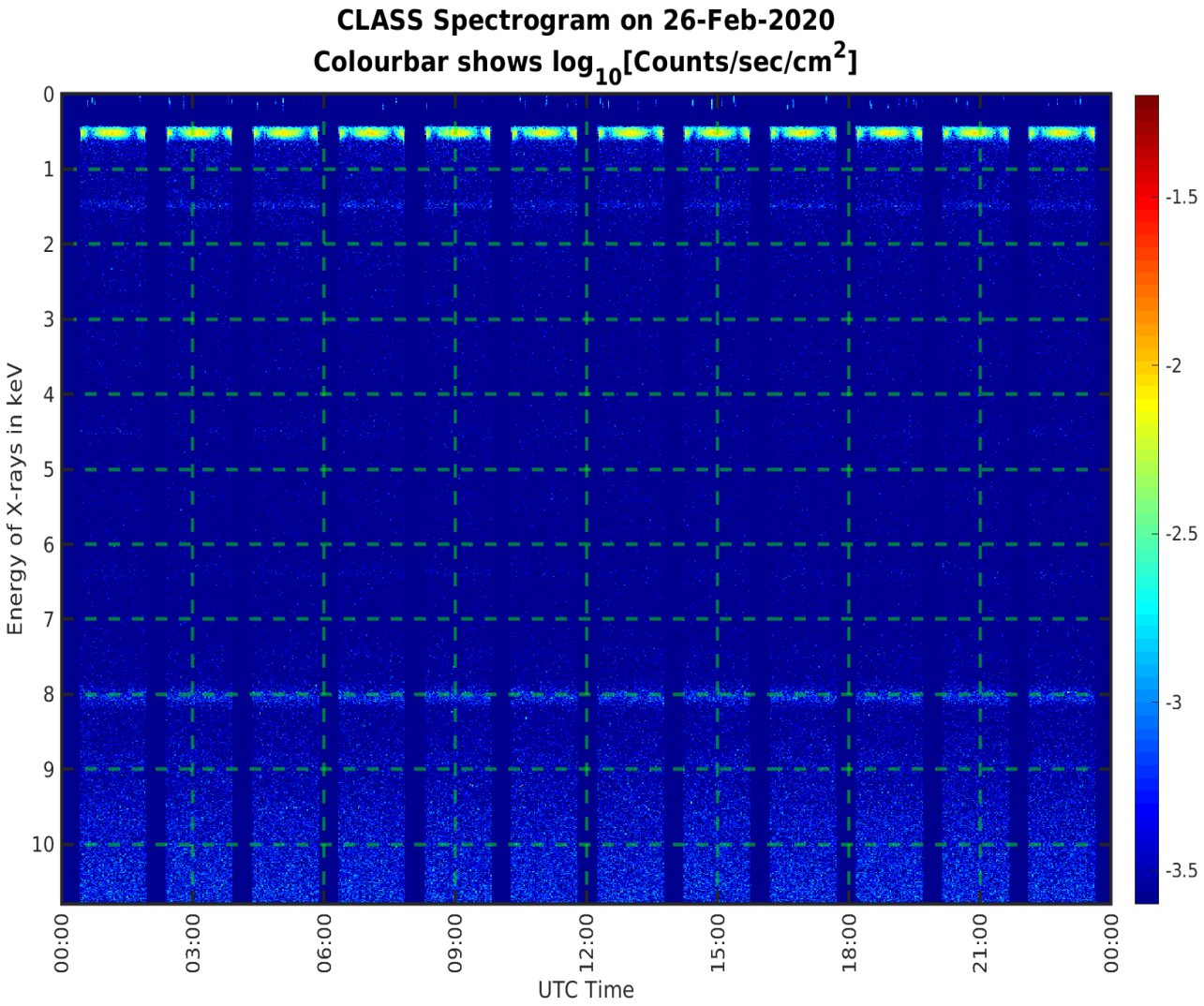
CLASS Spectrogram on 26-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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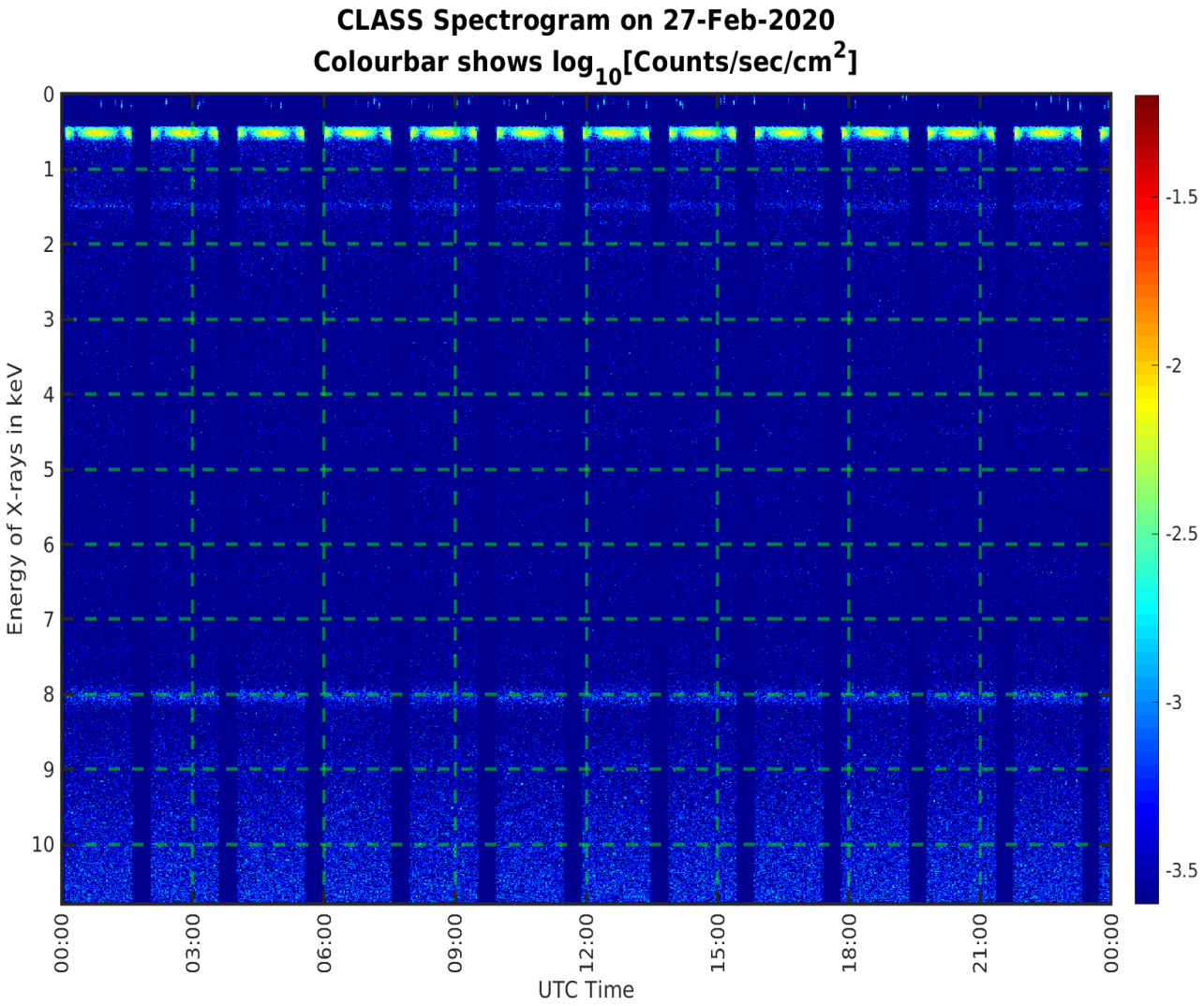
CLASS Spectrogram on 27-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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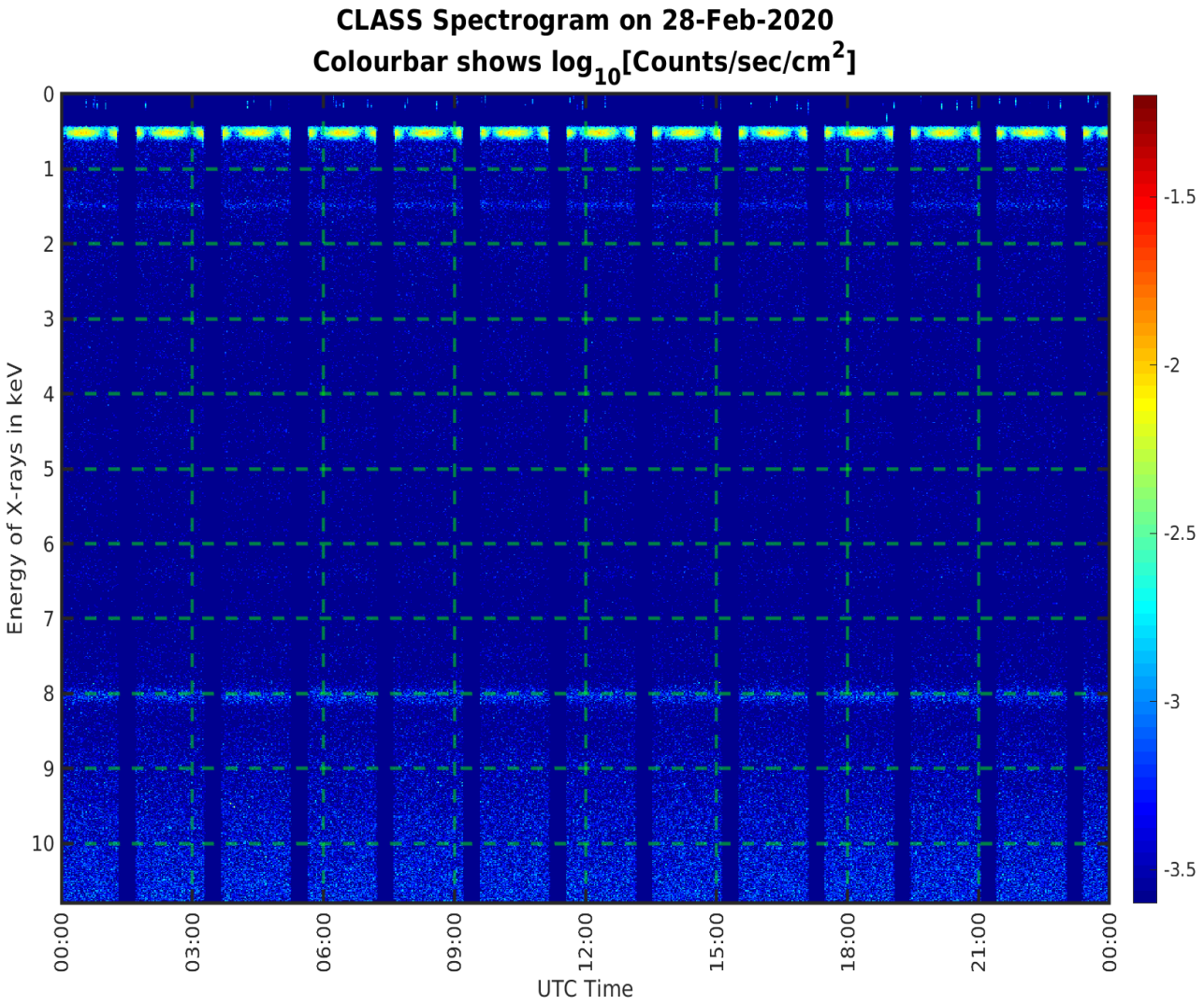
CLASS Spectrogram on 28-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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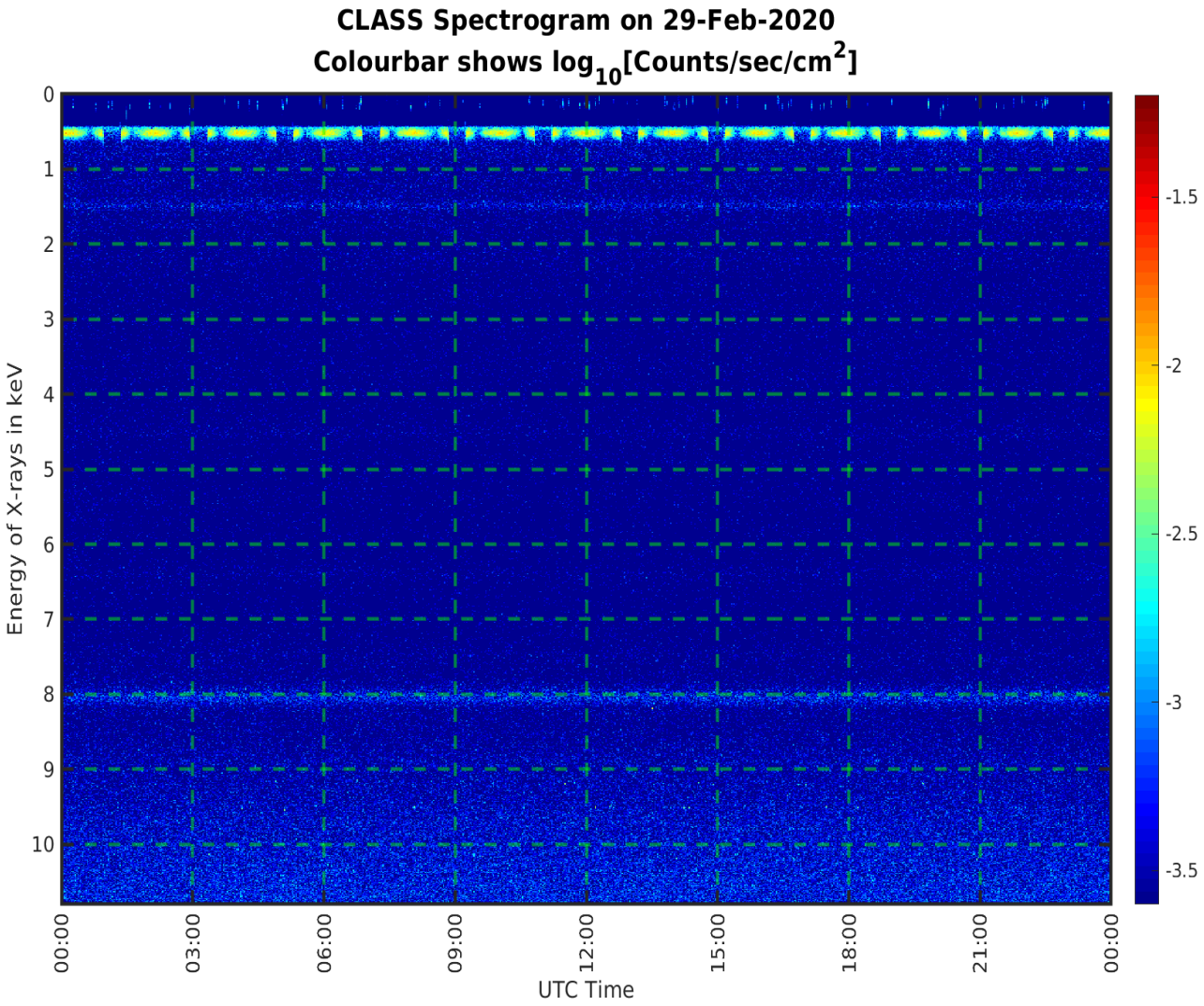
UTC Time


CLASS Spectrogram on 29-Feb-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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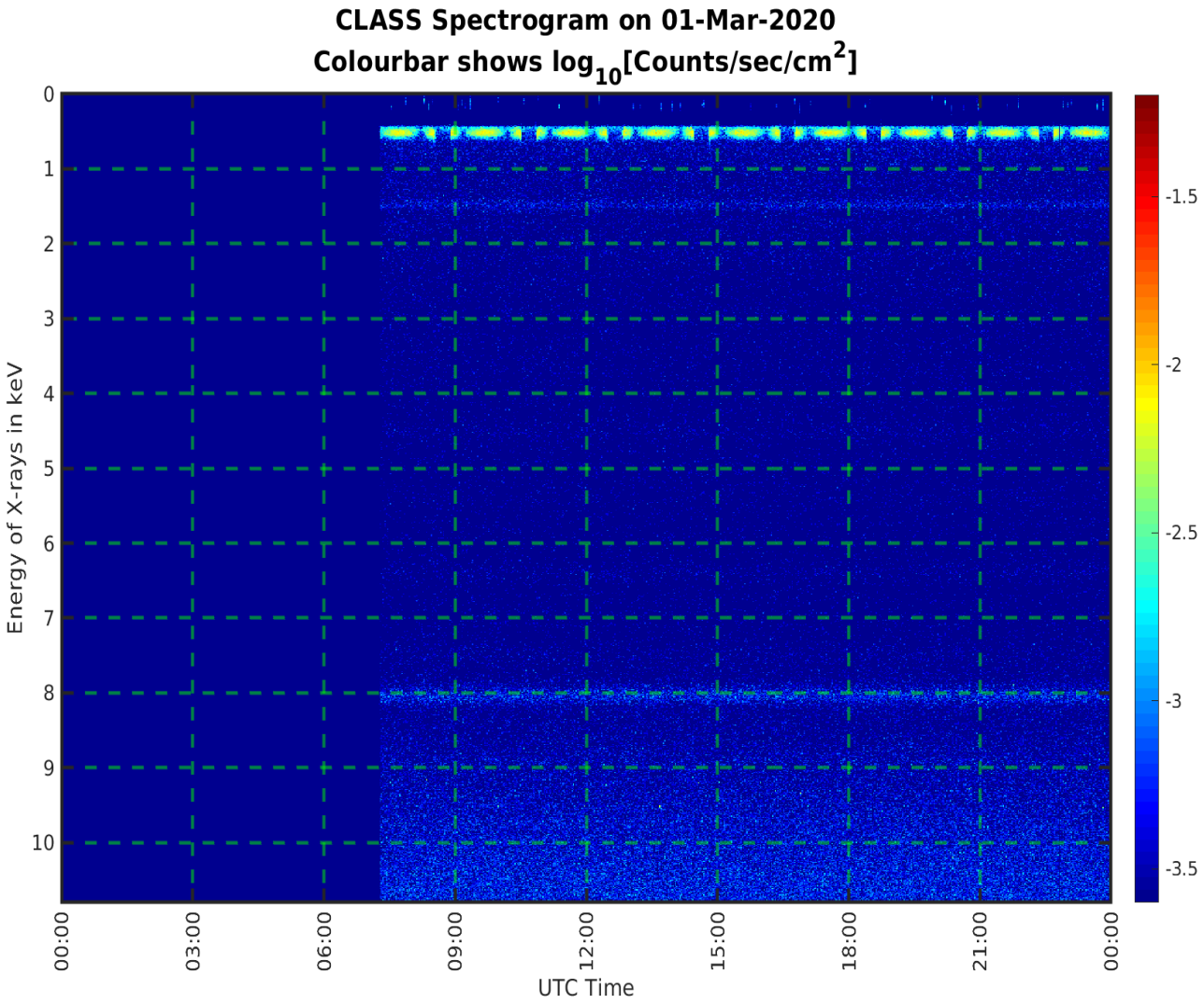
UTC Time


CLASS Spectrogram on 01-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
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-1.5
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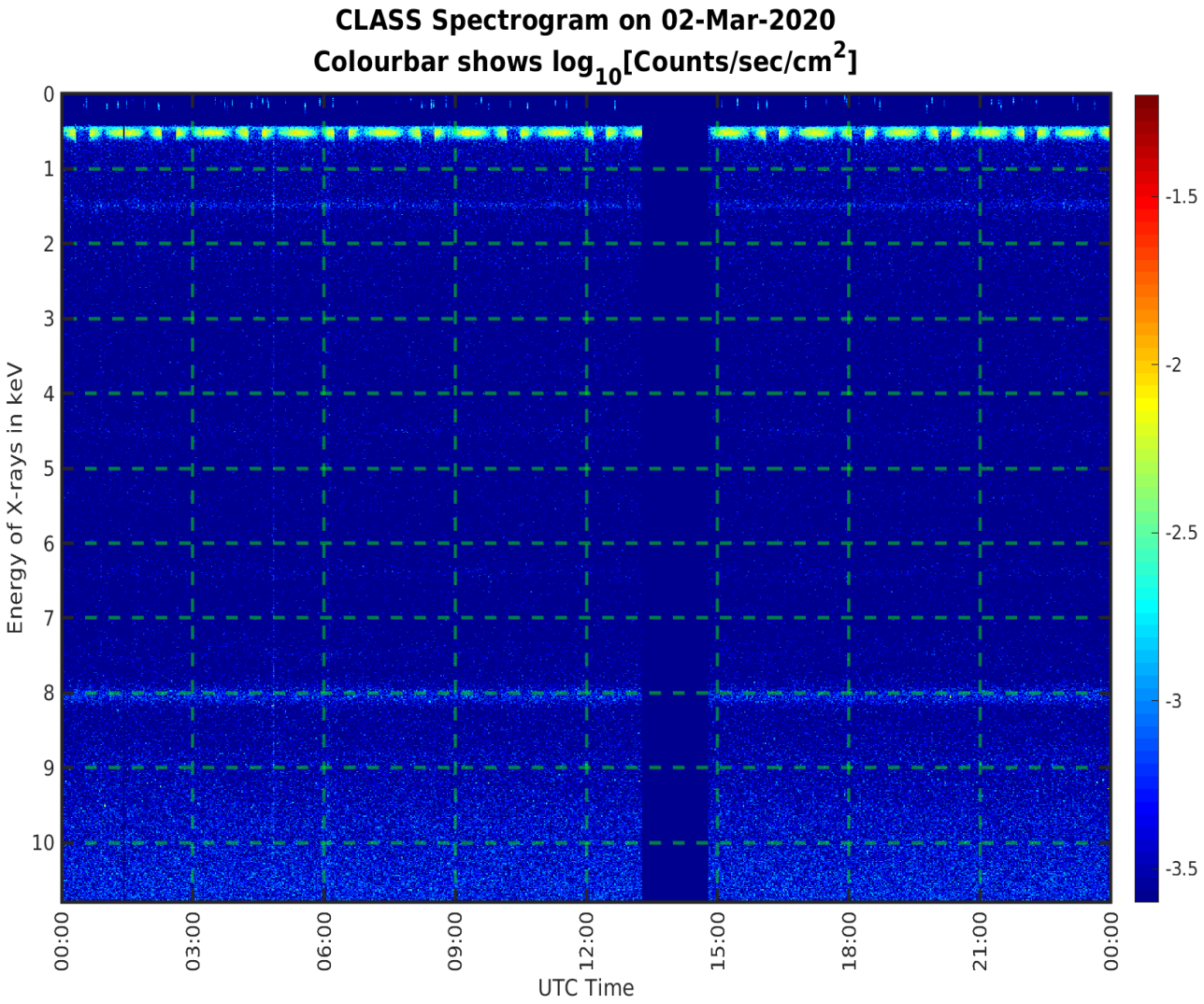
UTC Time


CLASS Spectrogram on 02-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
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-1.5
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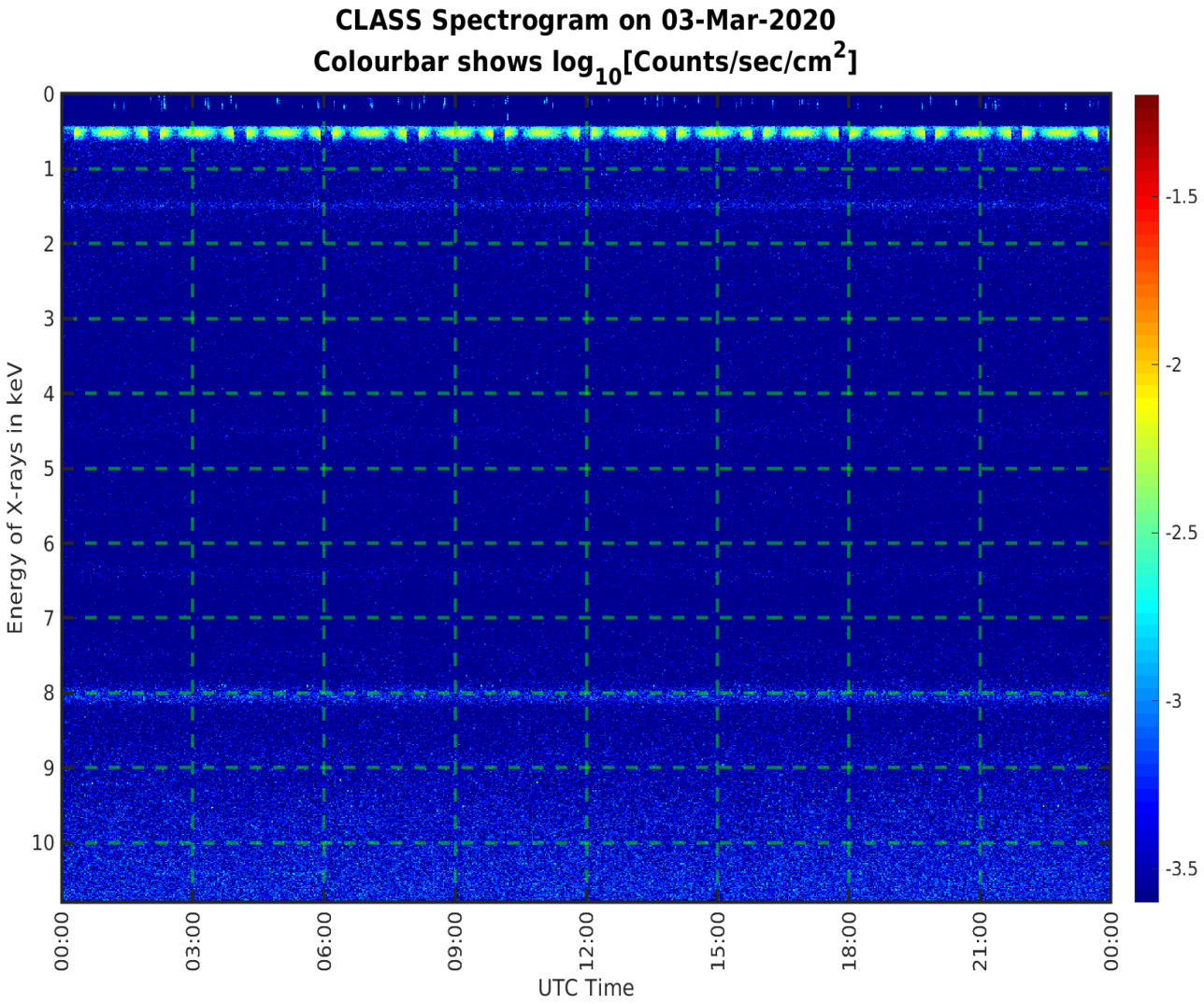
UTC Time


CLASS Spectrogram on 03-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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6
7
8
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-1.5
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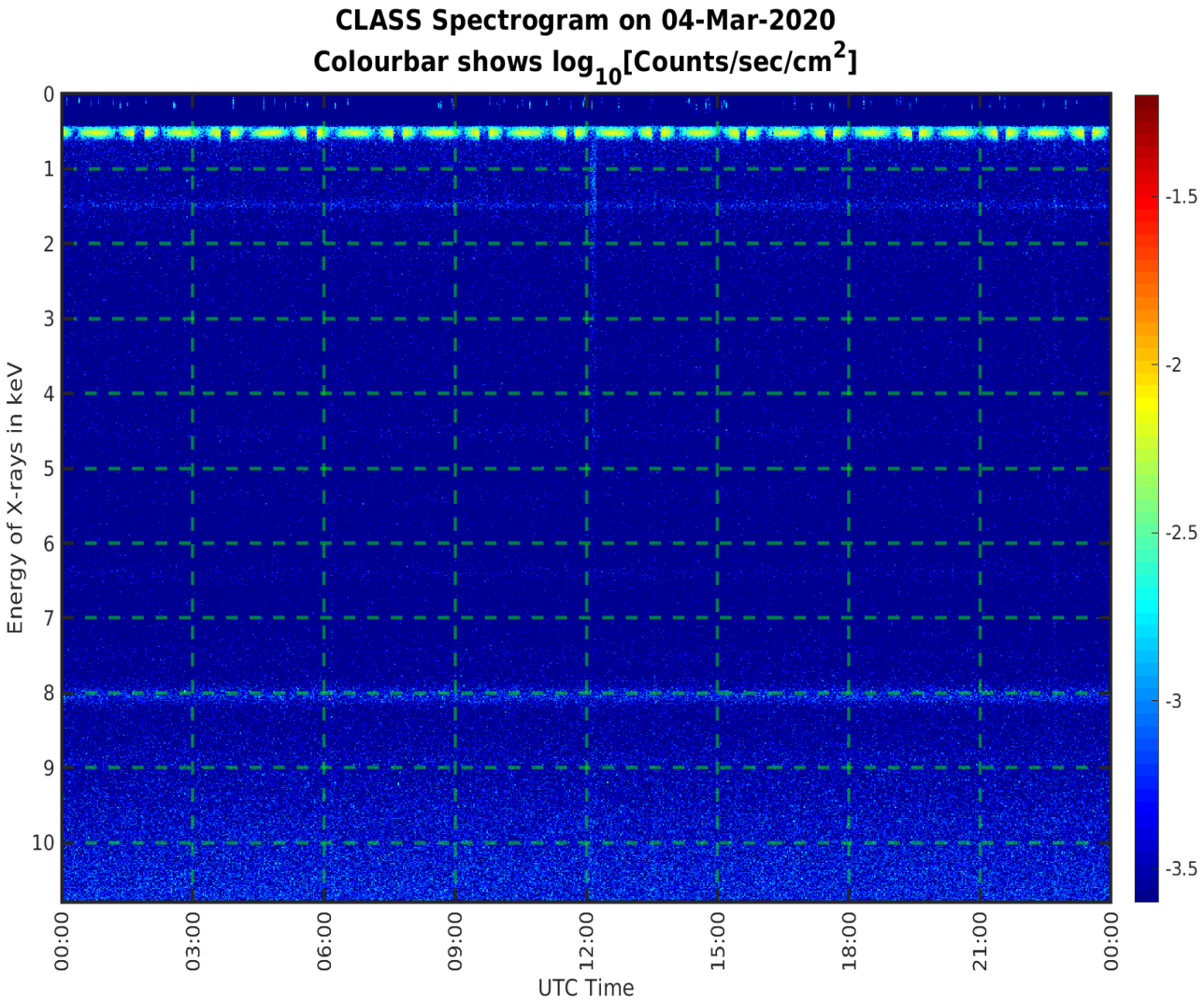
UTC Time


CLASS Spectrogram on 04-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
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-1.5
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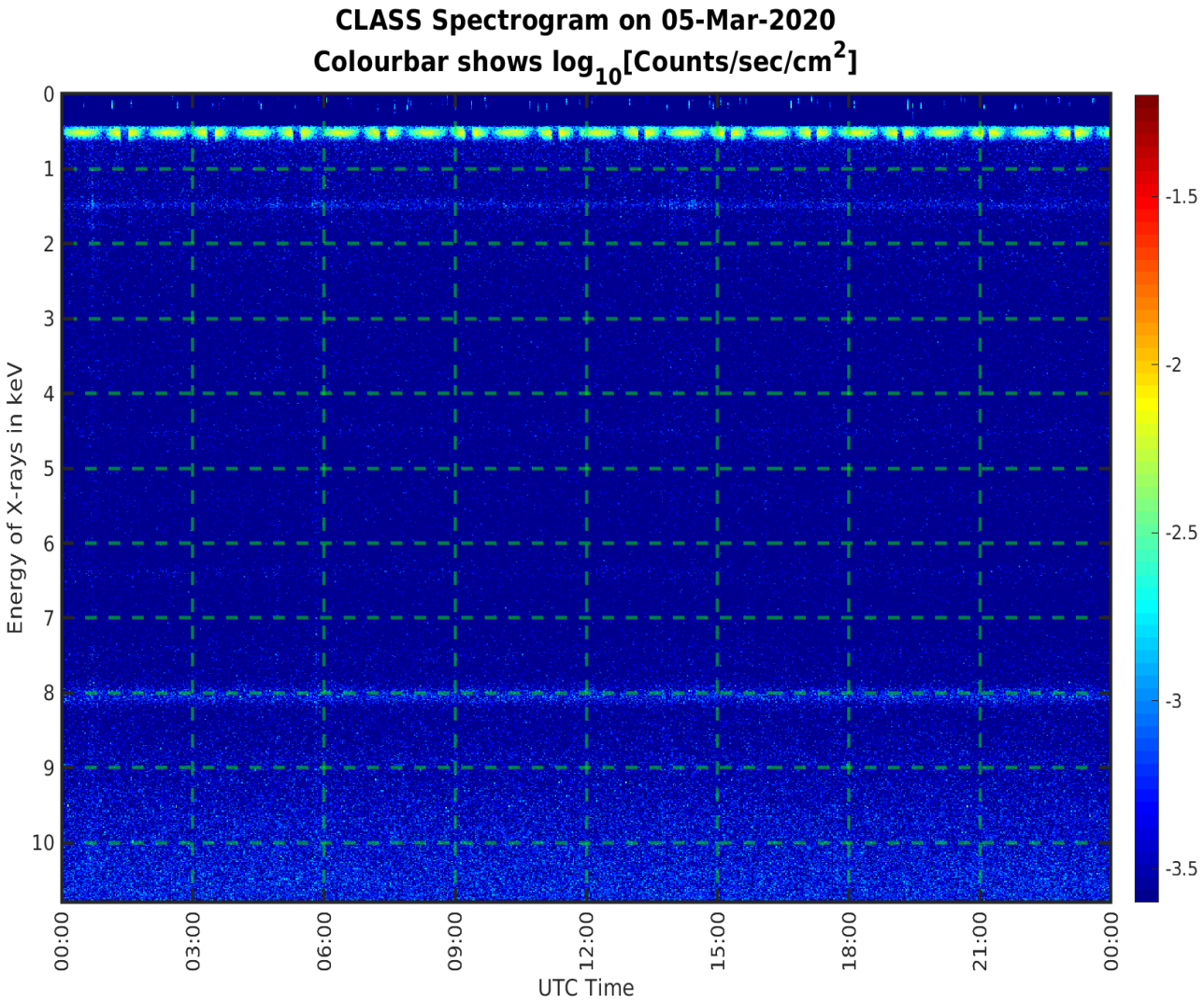
UTC Time


CLASS Spectrogram on 05-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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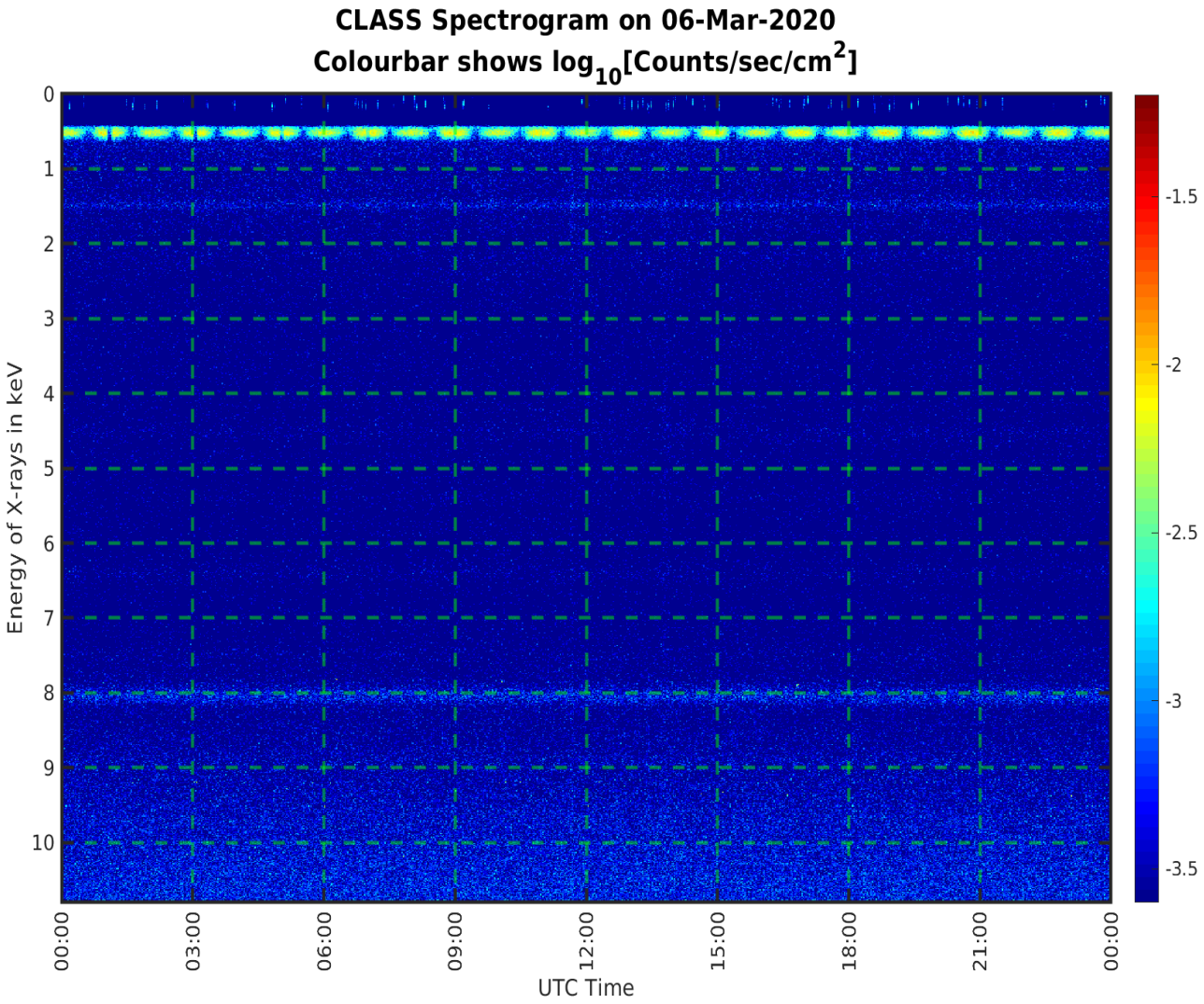
UTC Time


CLASS Spectrogram on 06-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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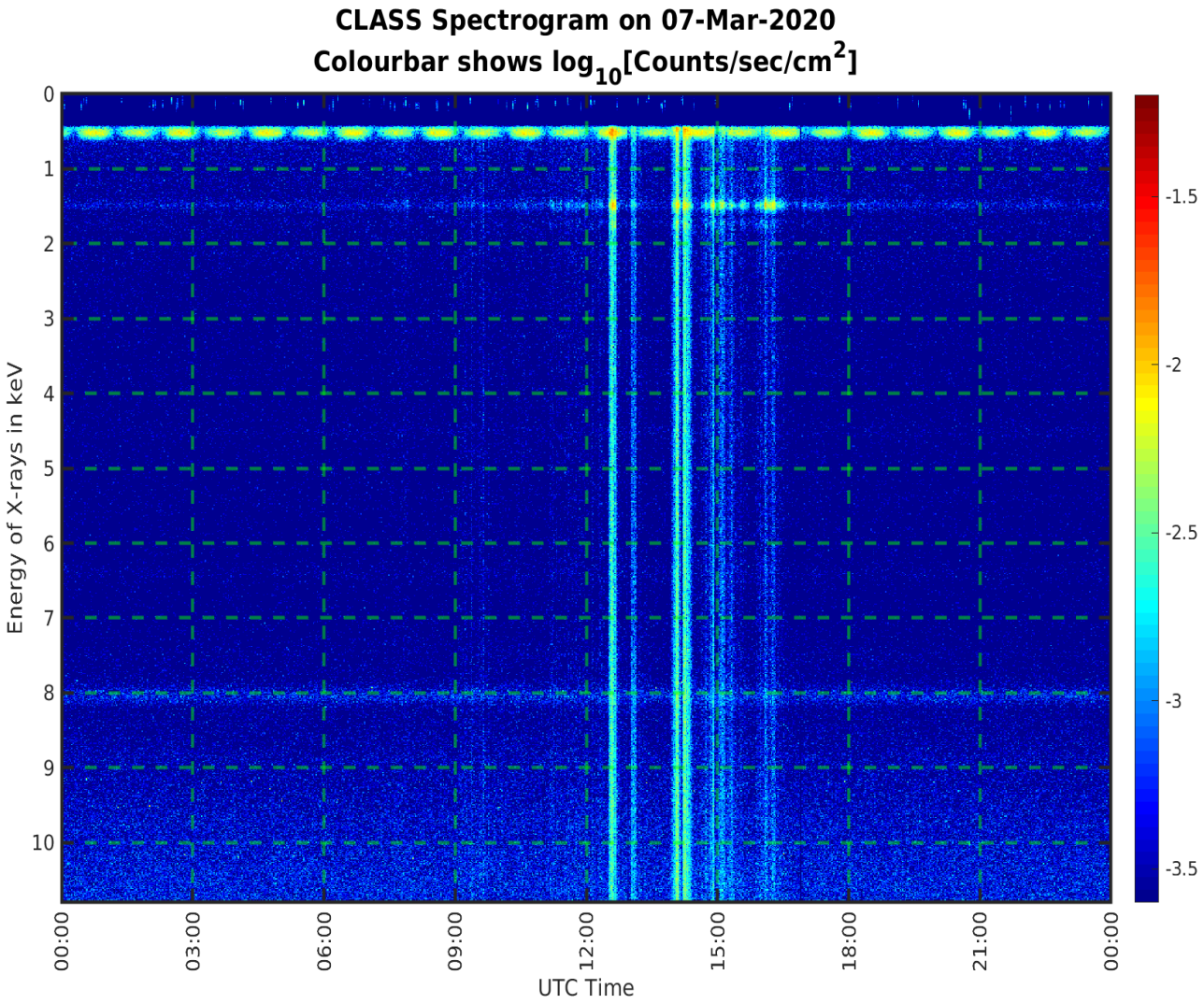
CLASS Spectrogram on 07-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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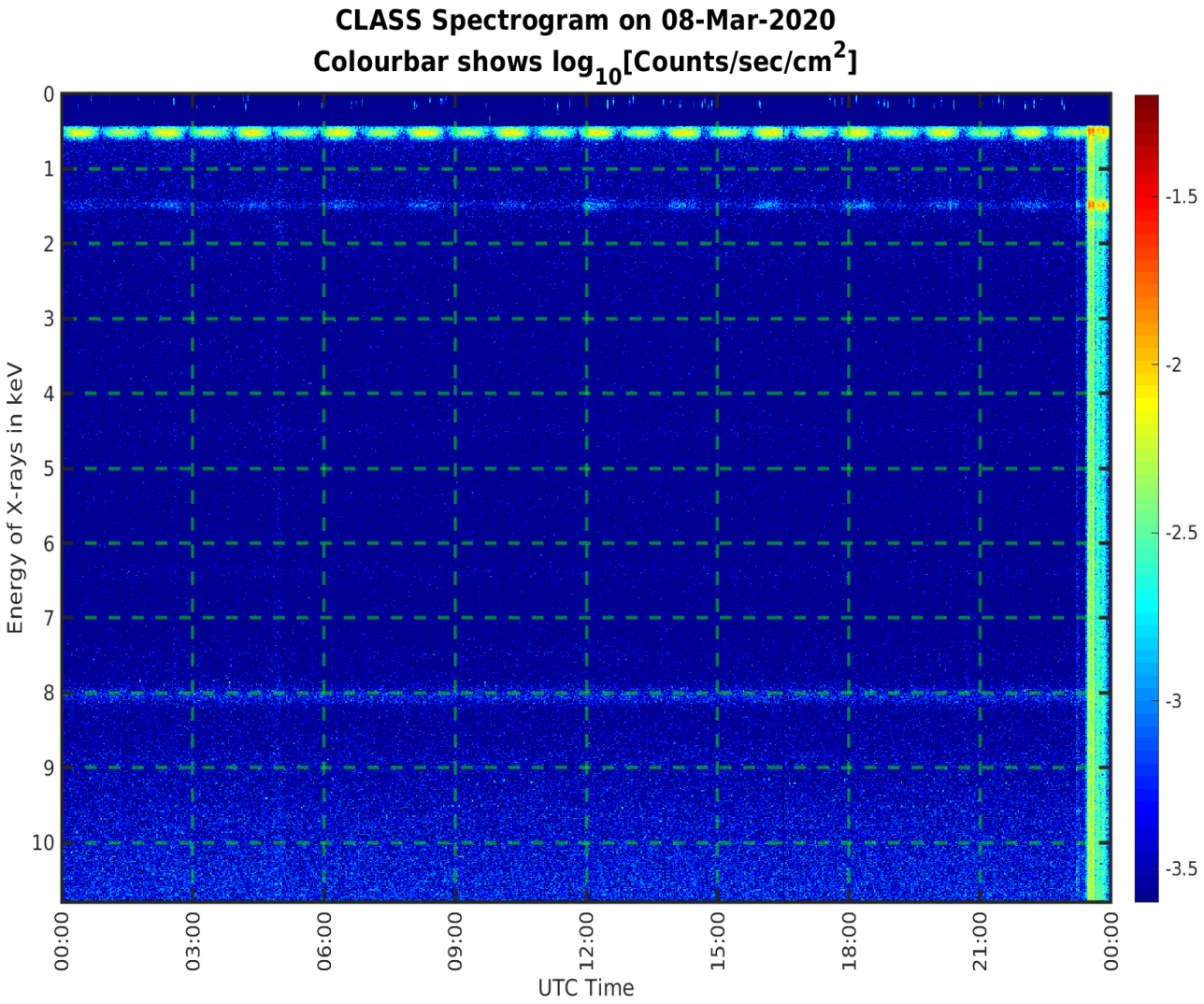
UTC Time


CLASS Spectrogram on 08-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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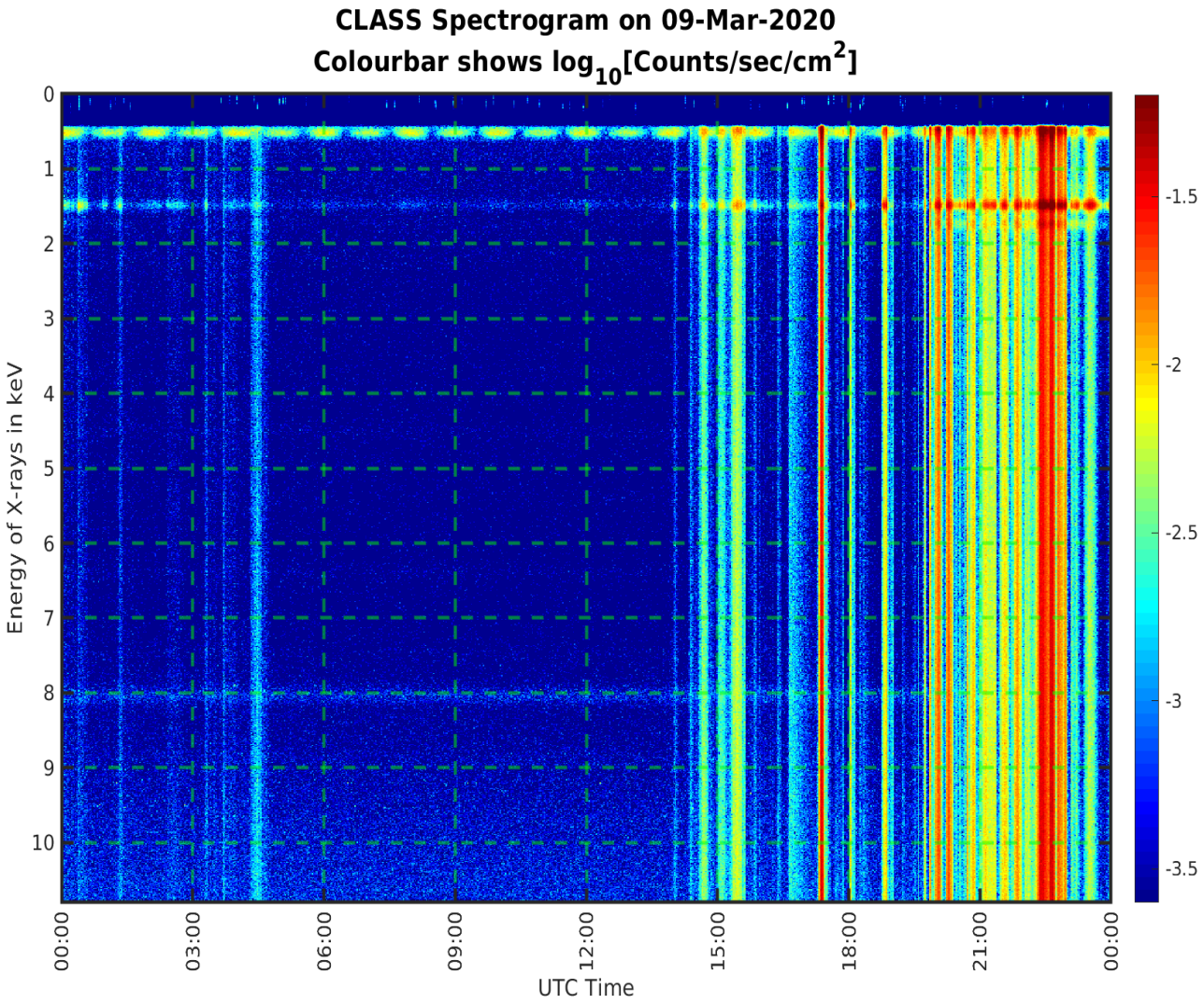
CLASS Spectrogram on 09-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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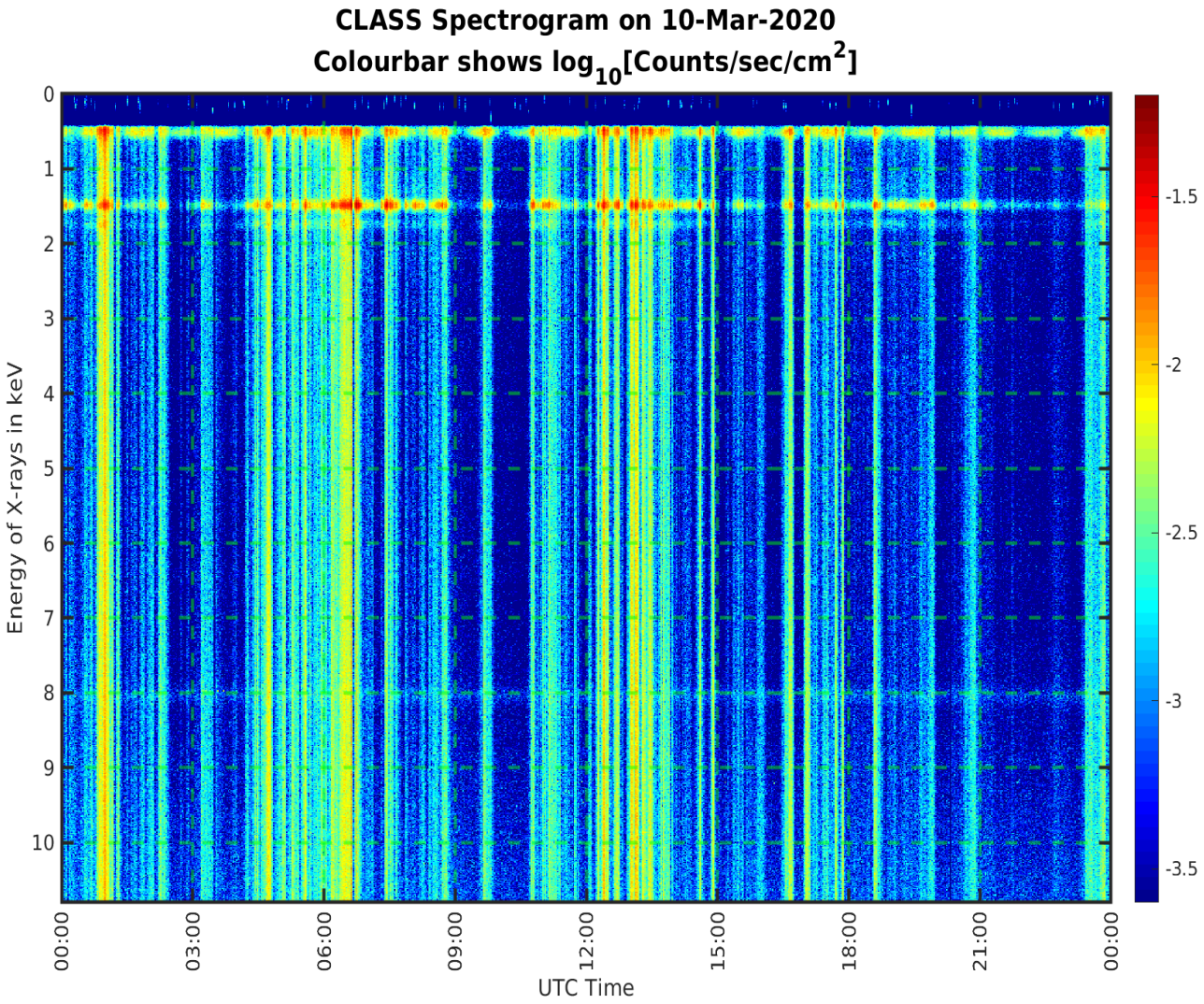
UTC Time


CLASS Spectrogram on 10-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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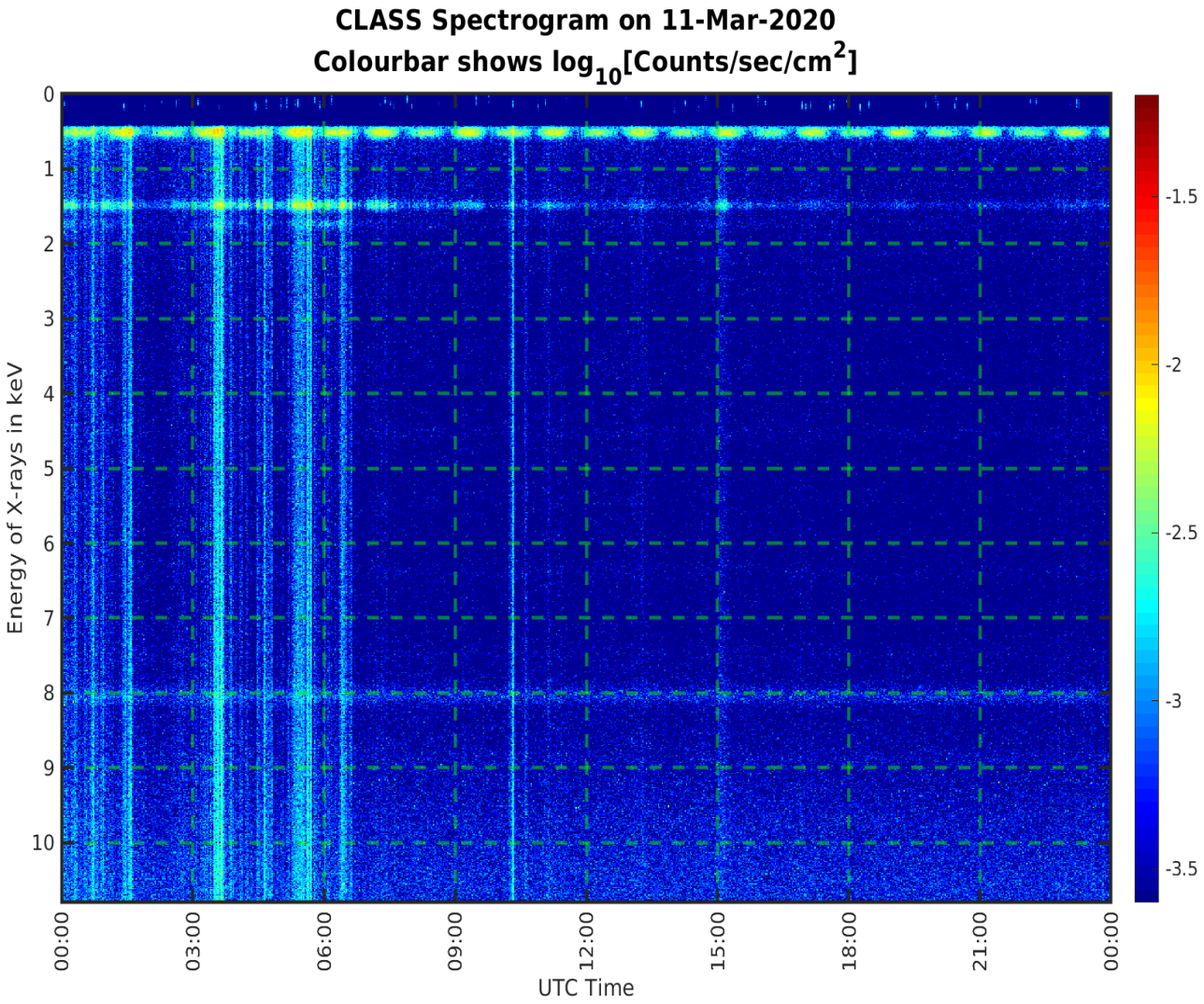
CLASS Spectrogram on 11-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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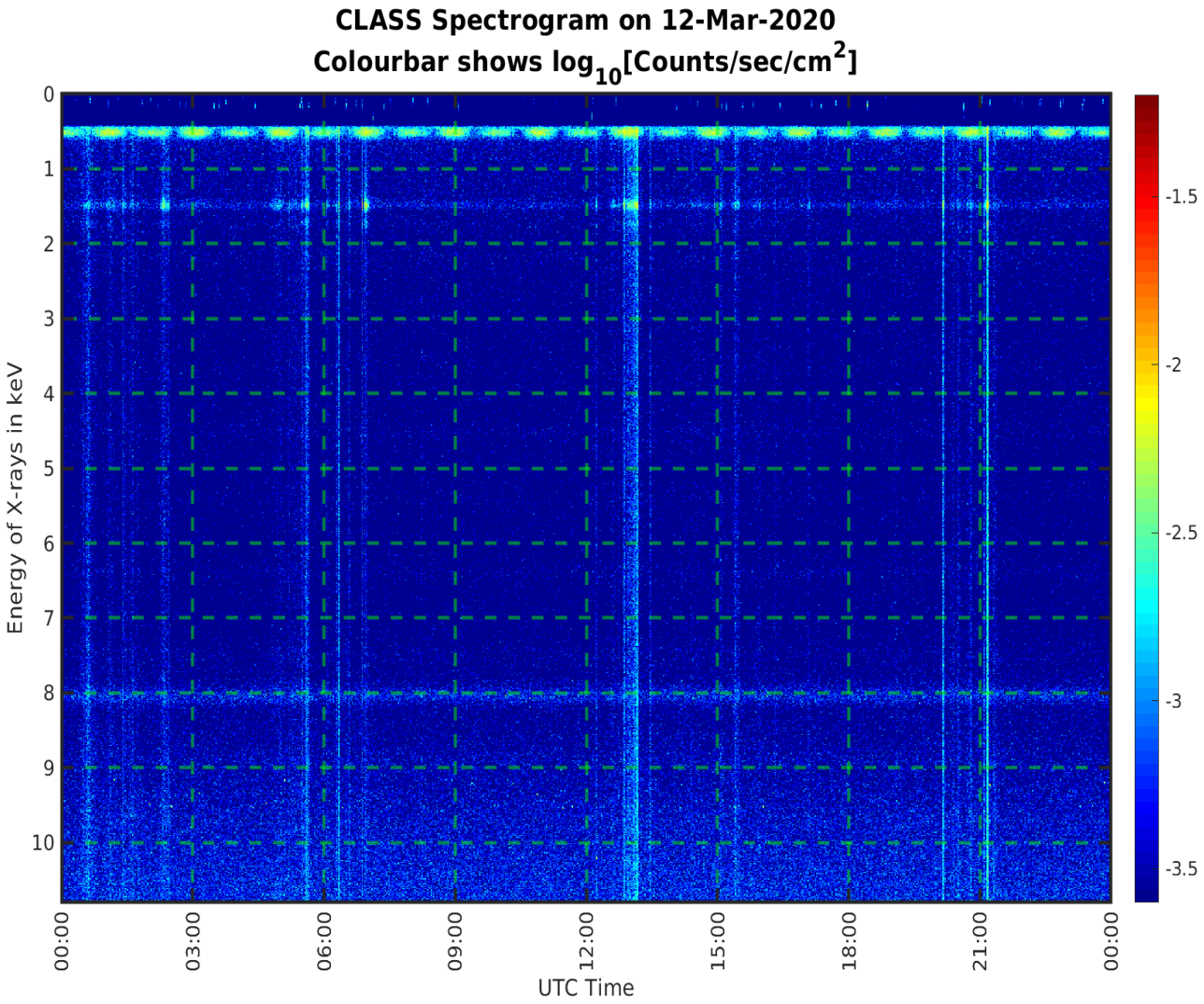
UTC Time


CLASS Spectrogram on 12-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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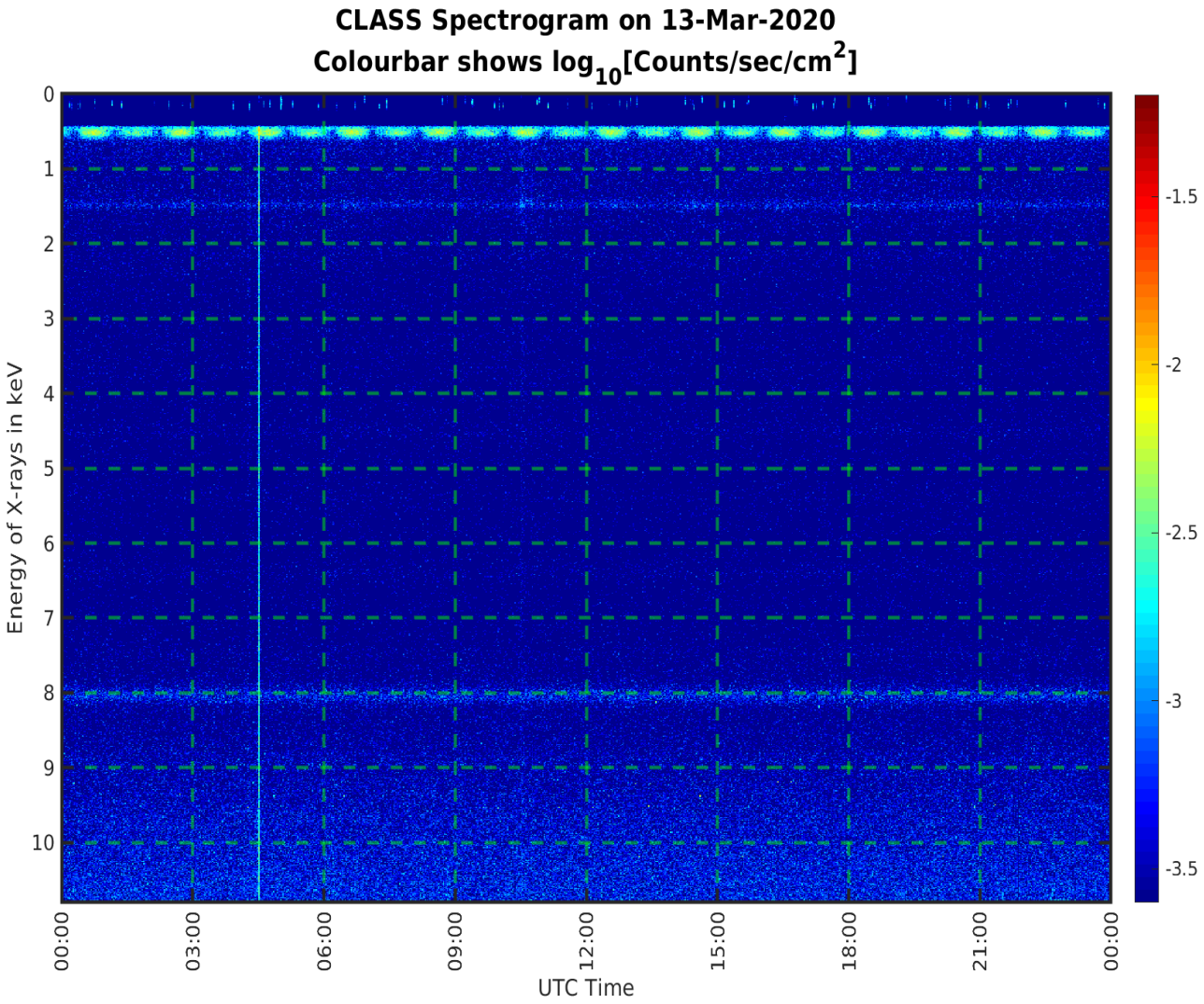
CLASS Spectrogram on 13-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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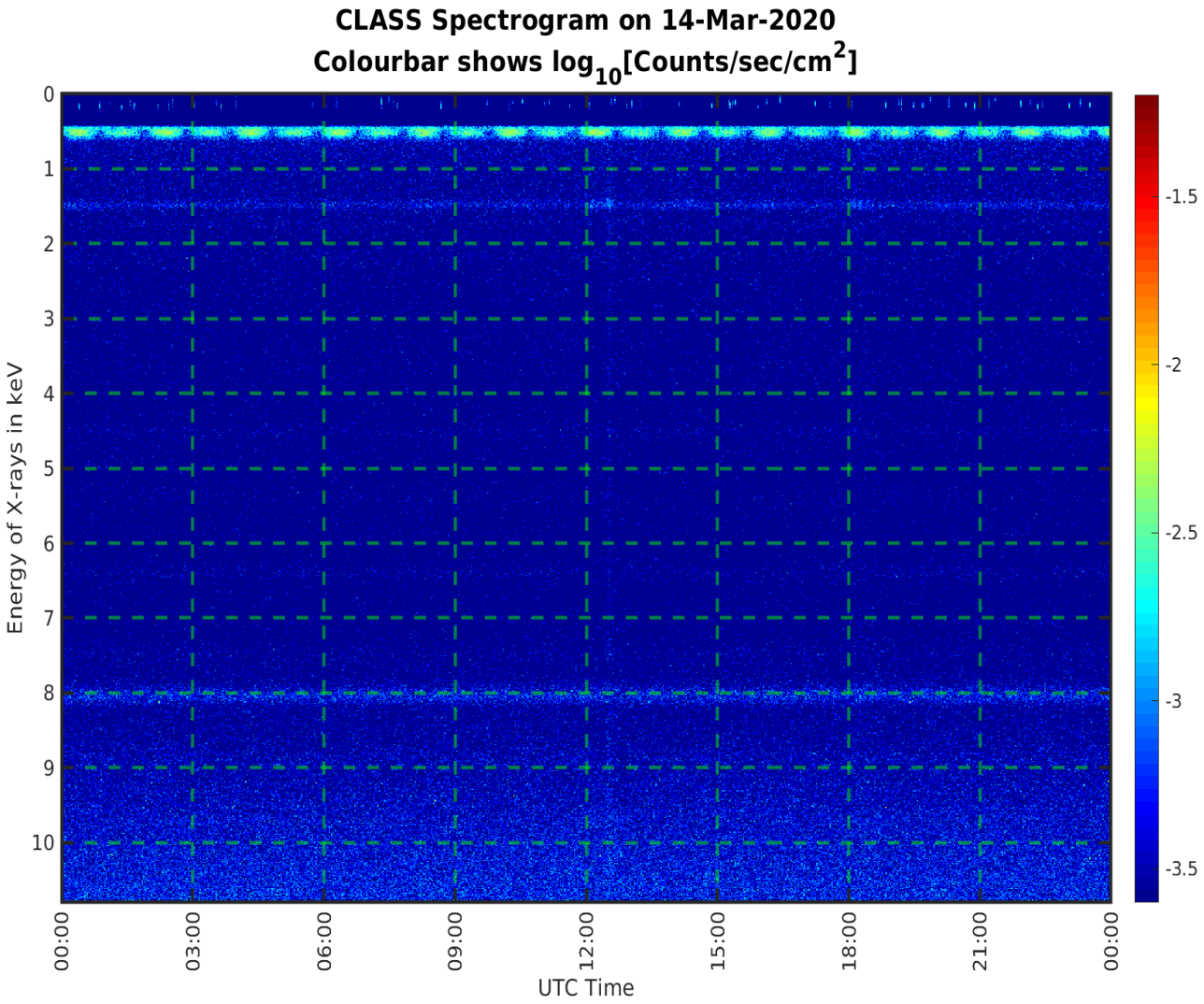
UTC Time


CLASS Spectrogram on 14-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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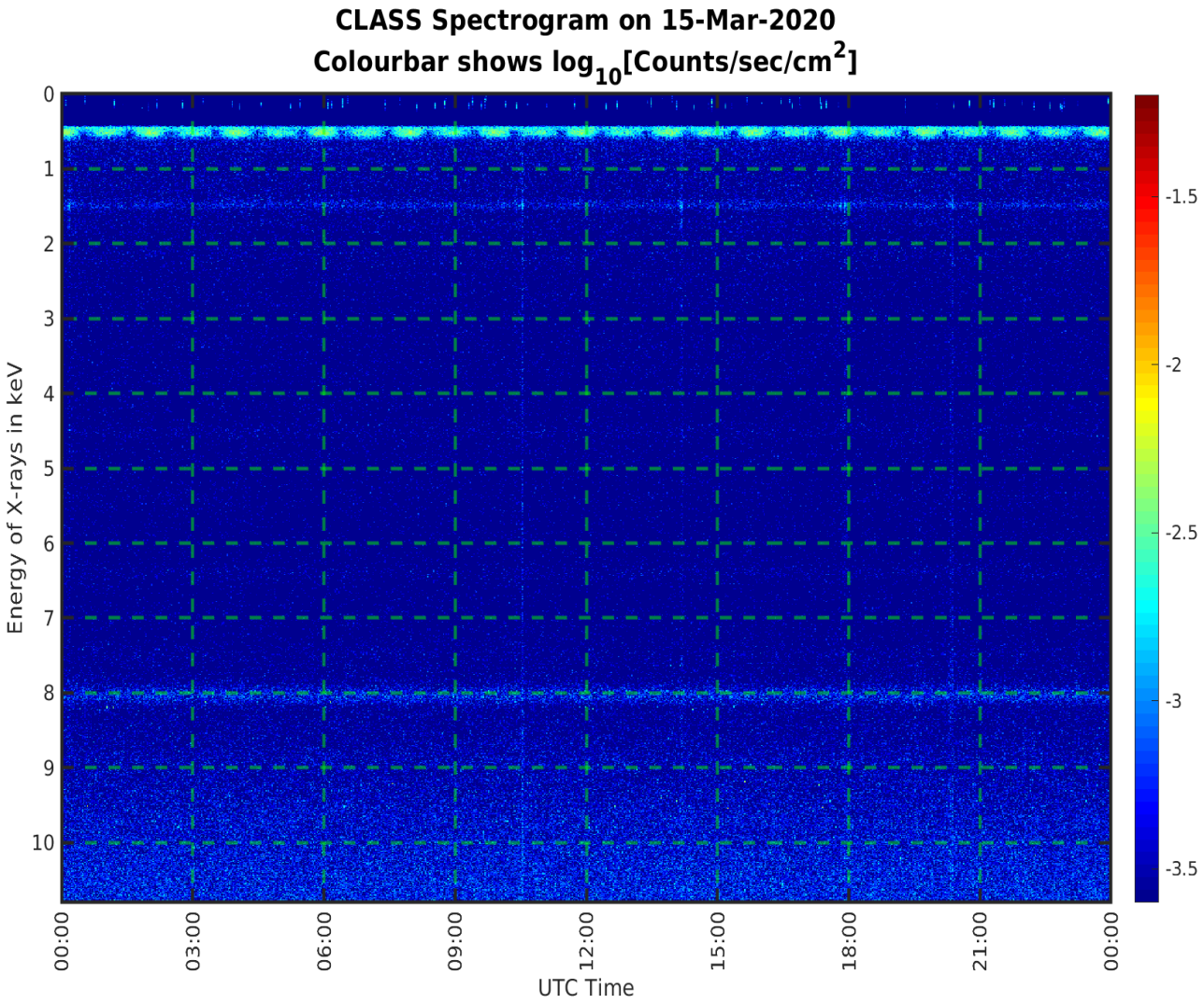
UTC Time


CLASS Spectrogram on 15-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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6
7
8
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-1.5
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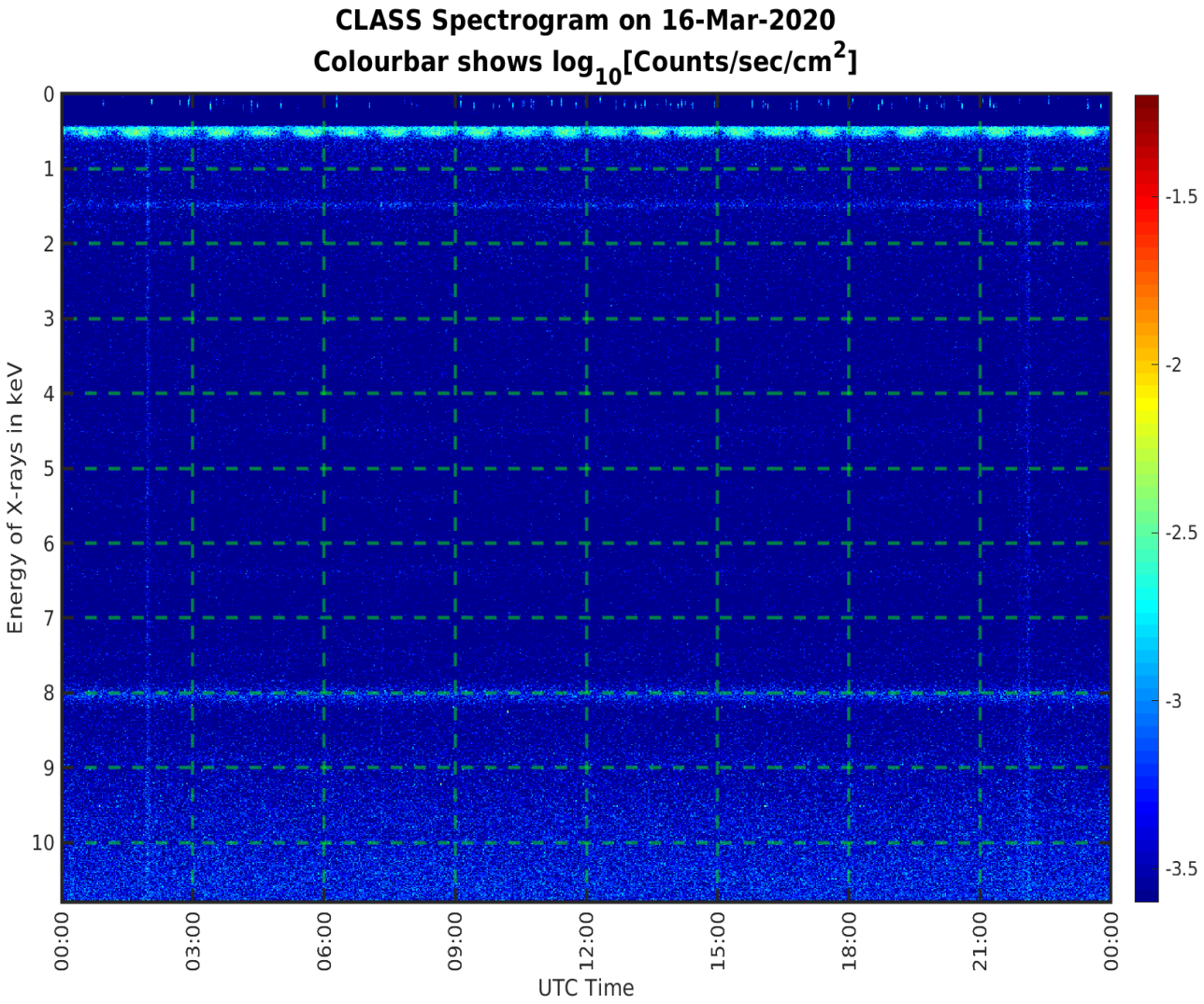
UTC Time


CLASS Spectrogram on 16-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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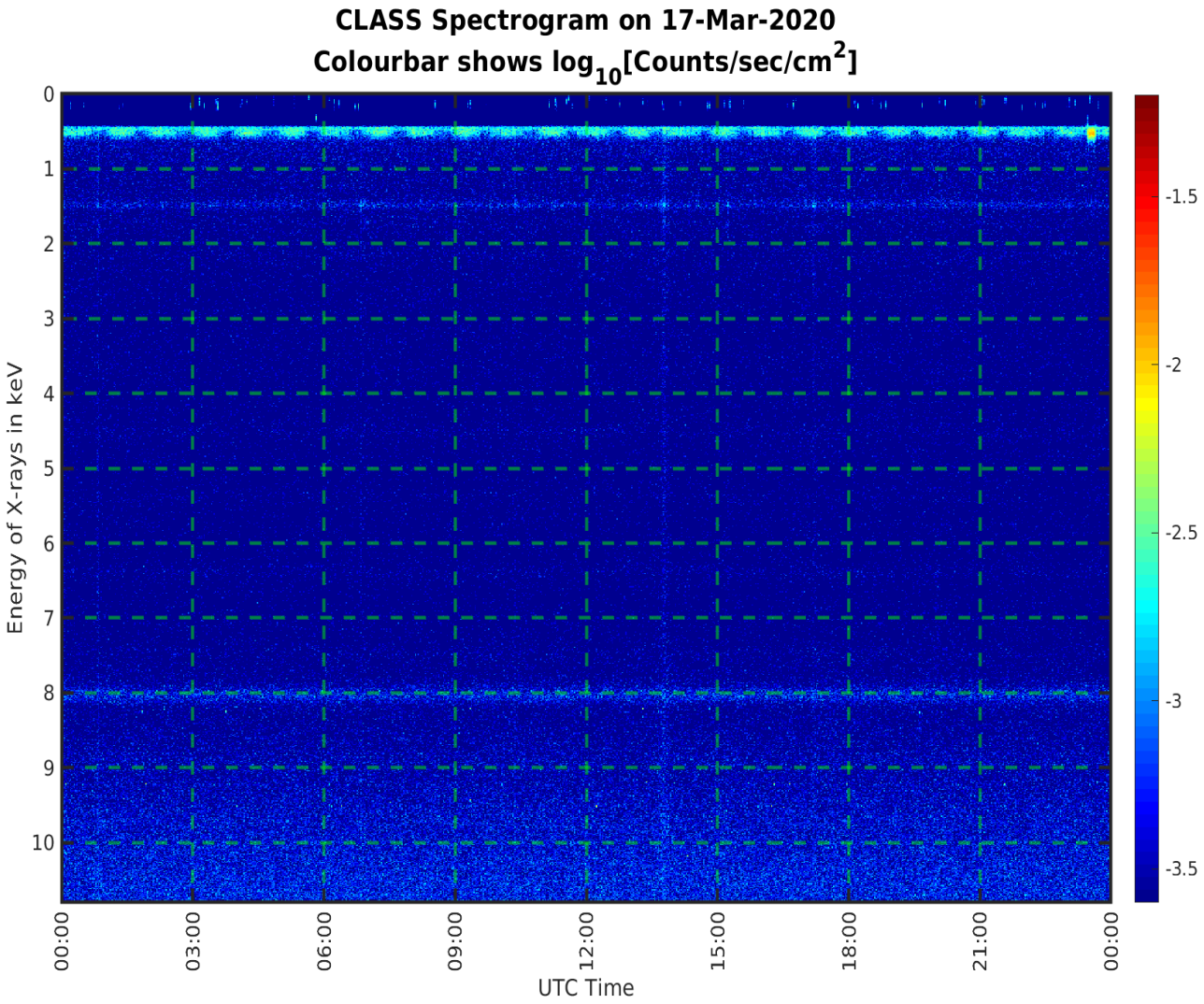
CLASS Spectrogram on 17-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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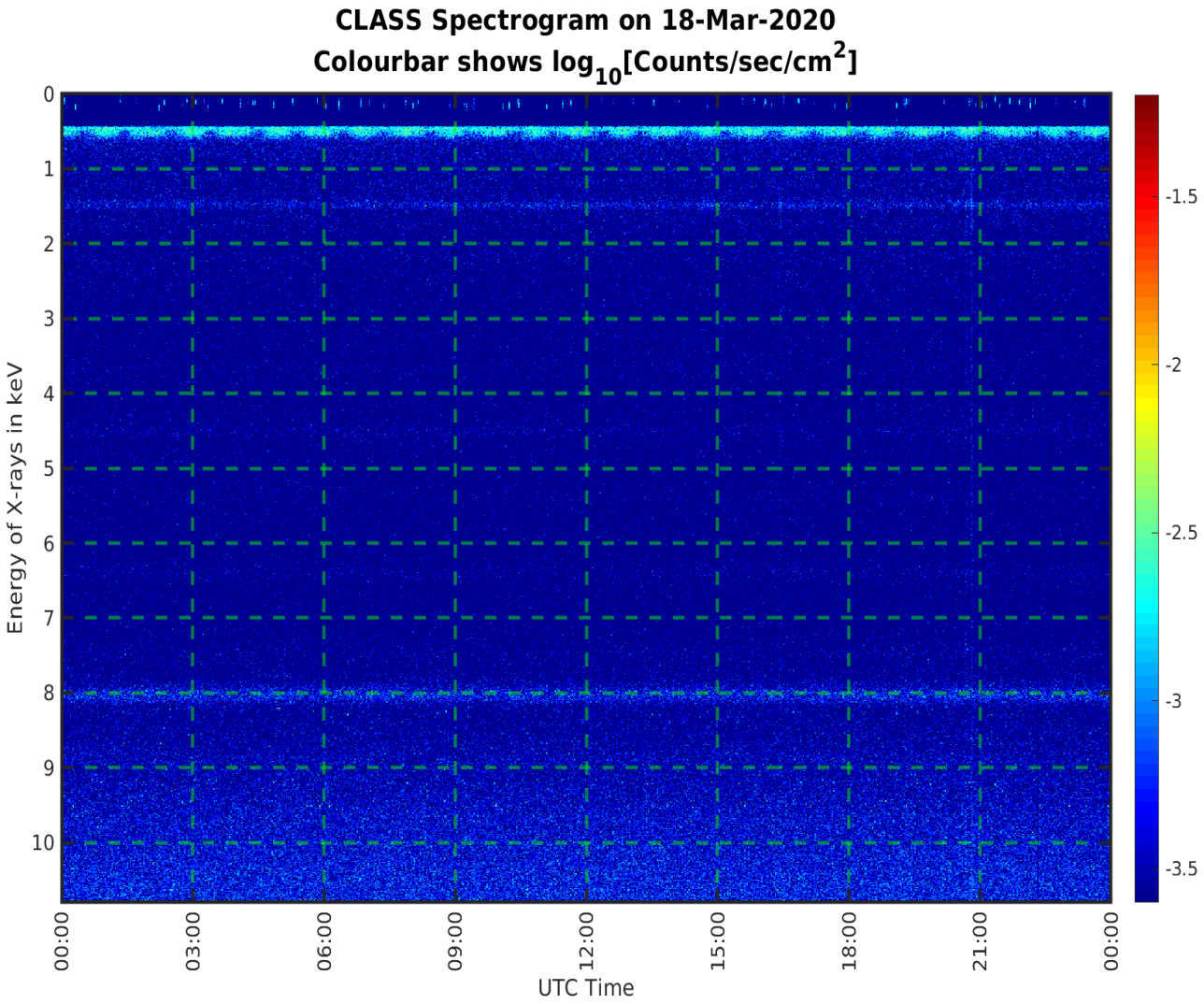
UTC Time


CLASS Spectrogram on 18-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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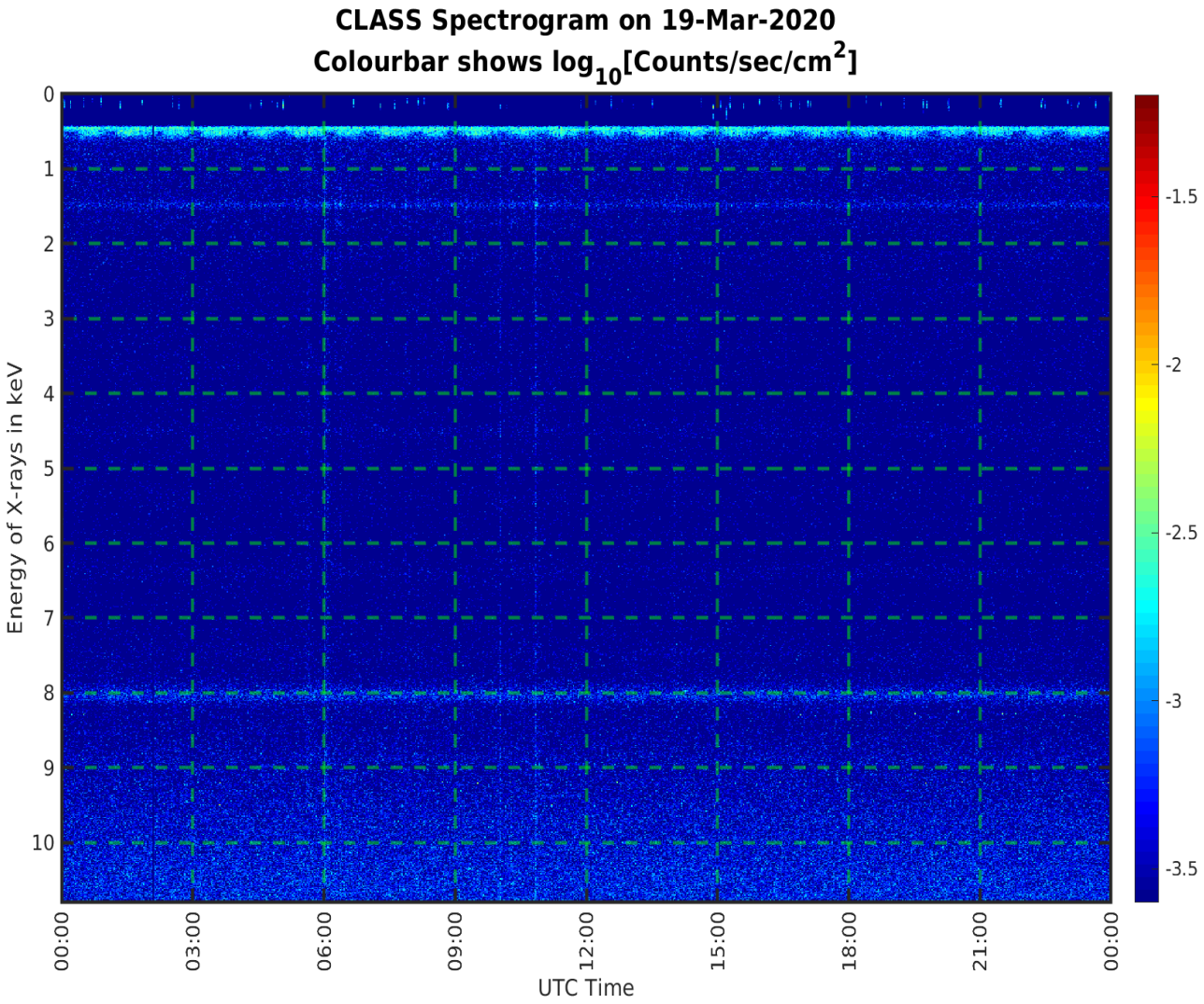
CLASS Spectrogram on 19-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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UTC Time
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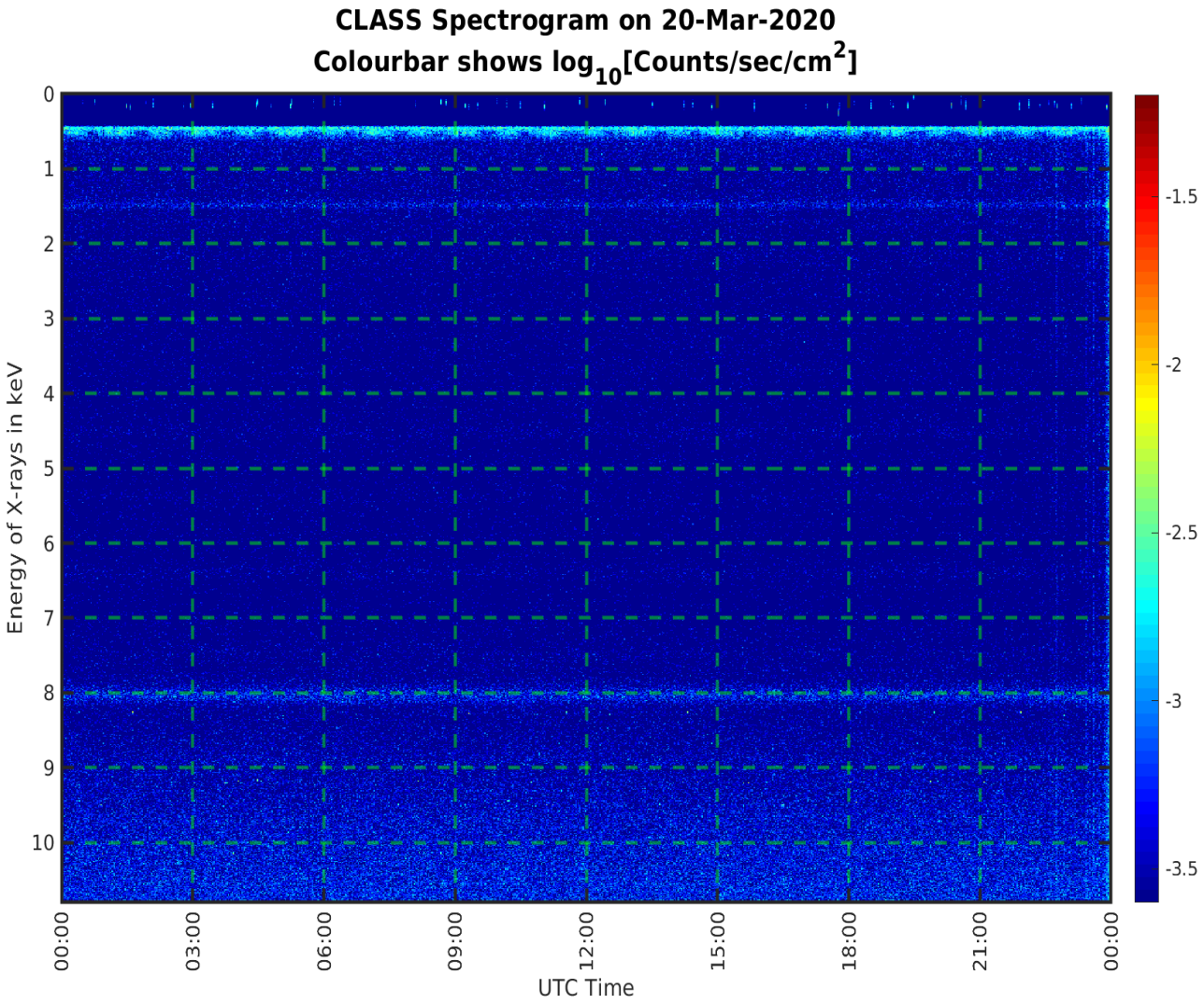
CLASS Spectrogram on 20-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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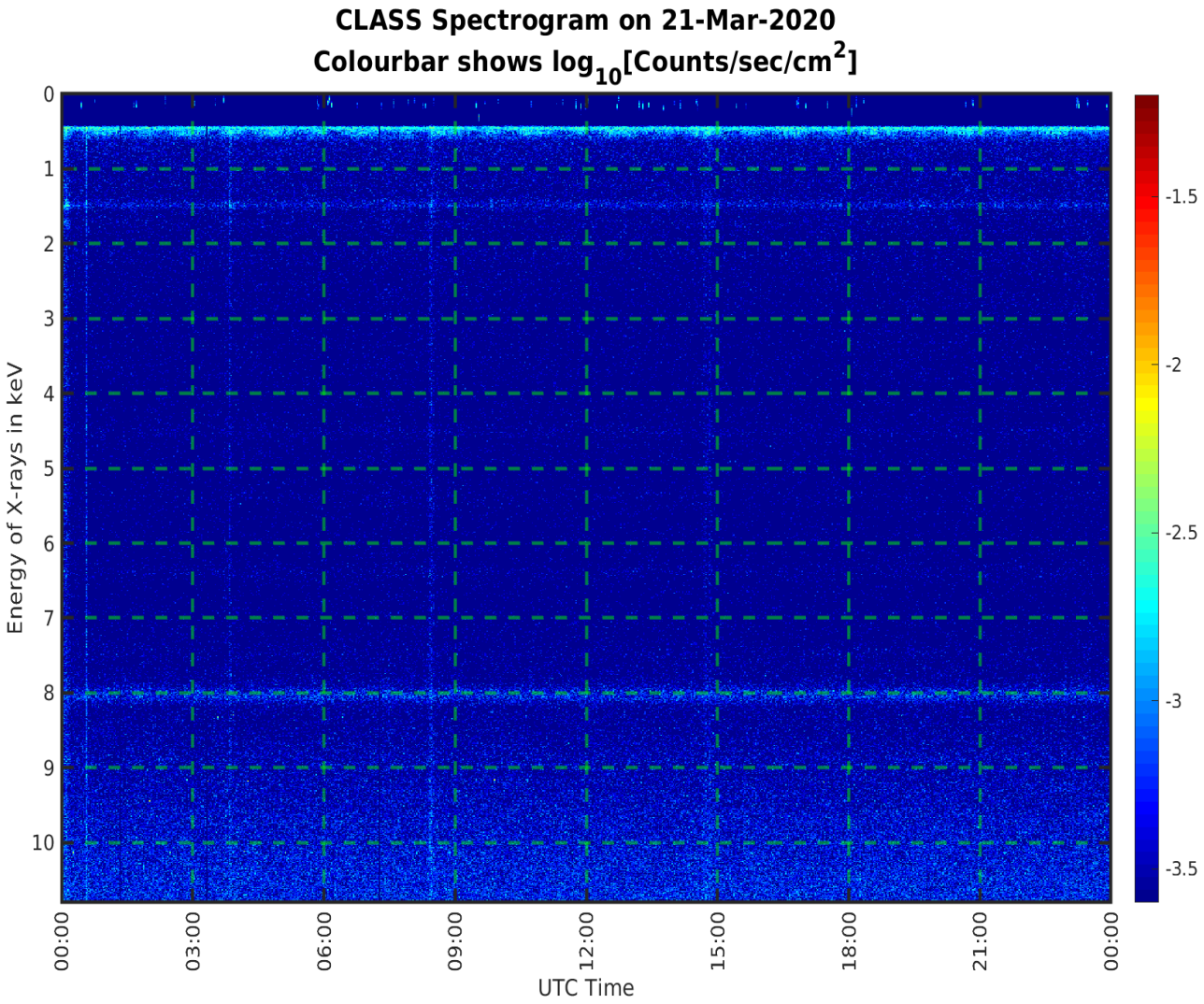
CLASS Spectrogram on 21-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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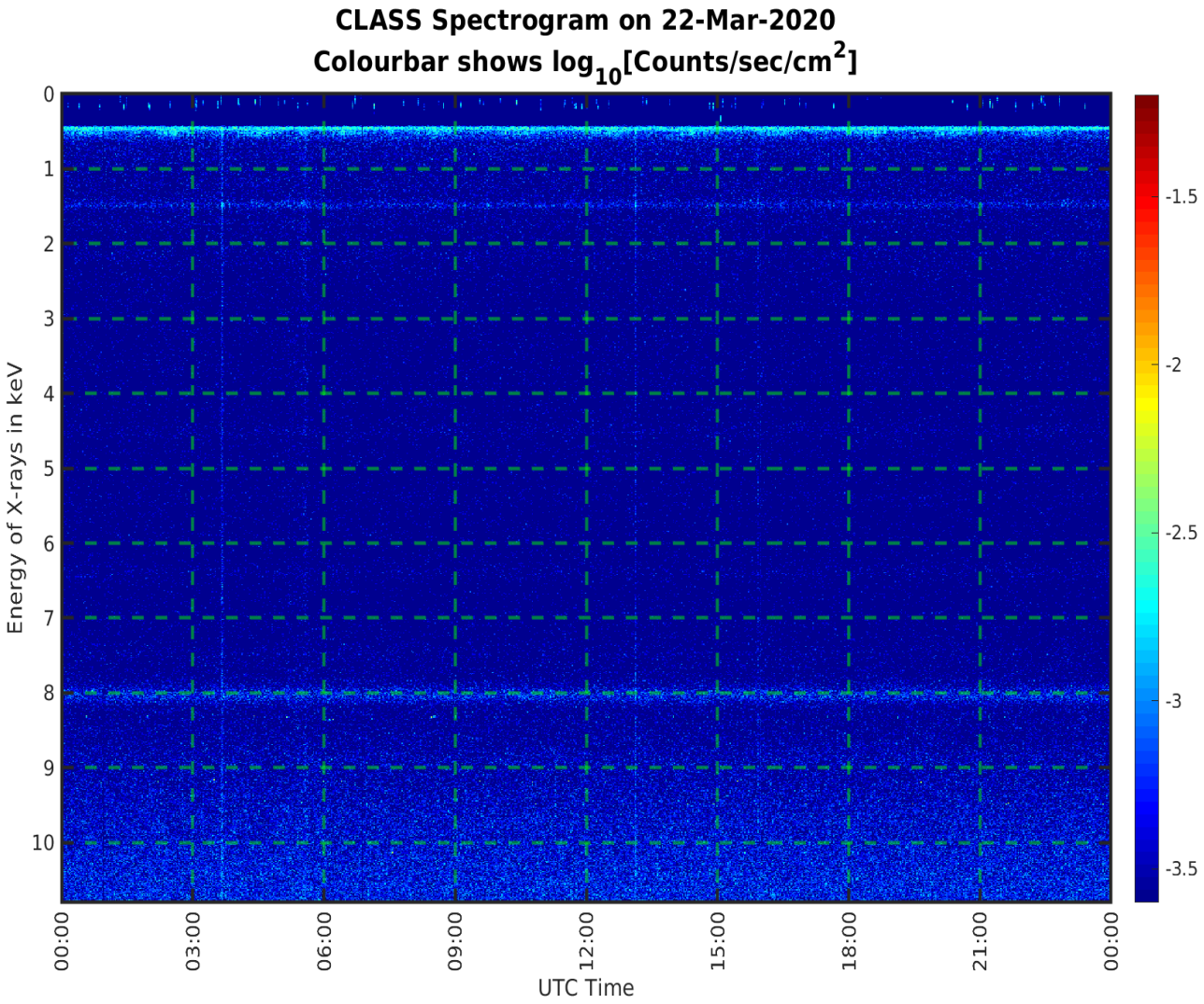
UTC Time


CLASS Spectrogram on 22-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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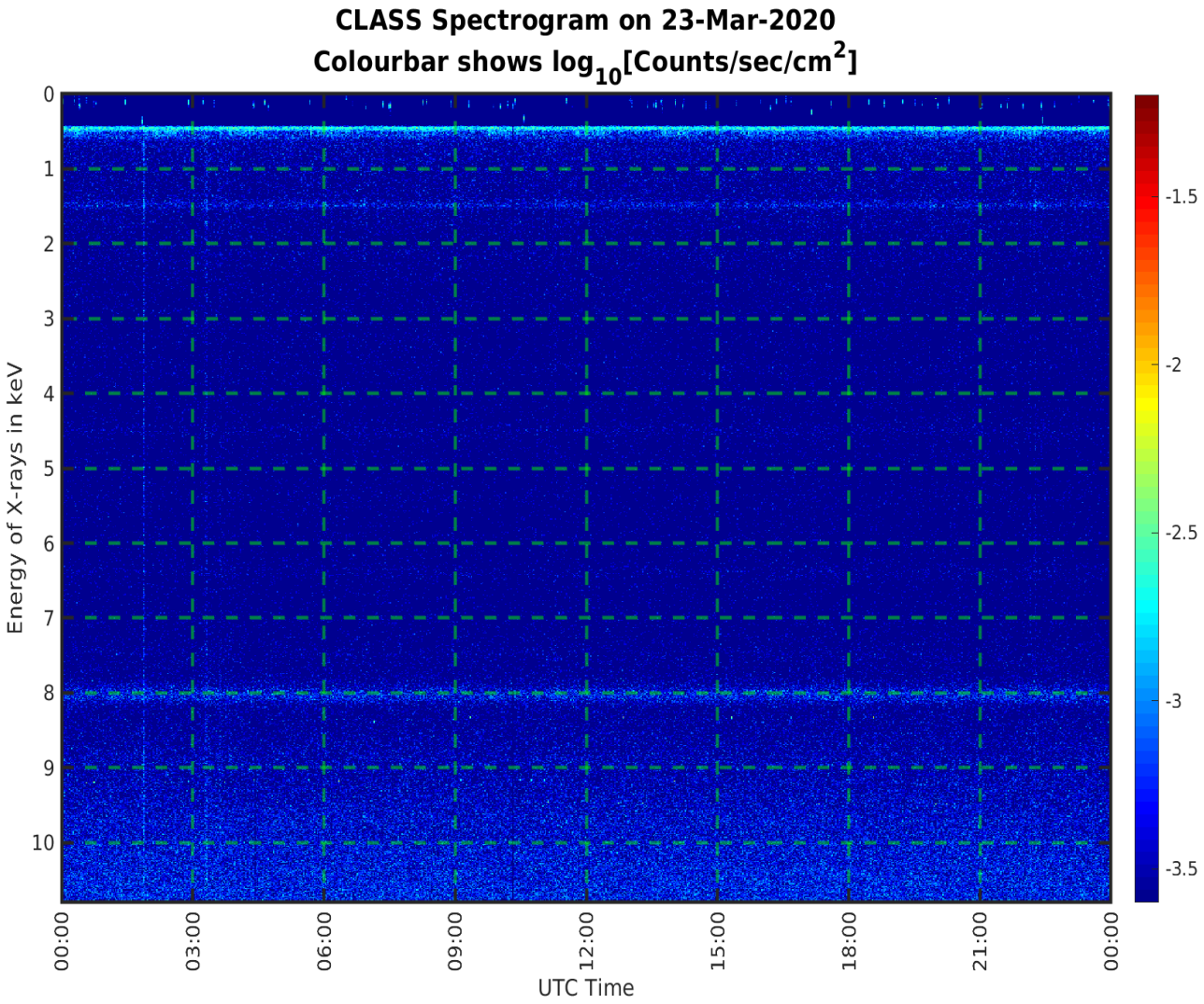
CLASS Spectrogram on 23-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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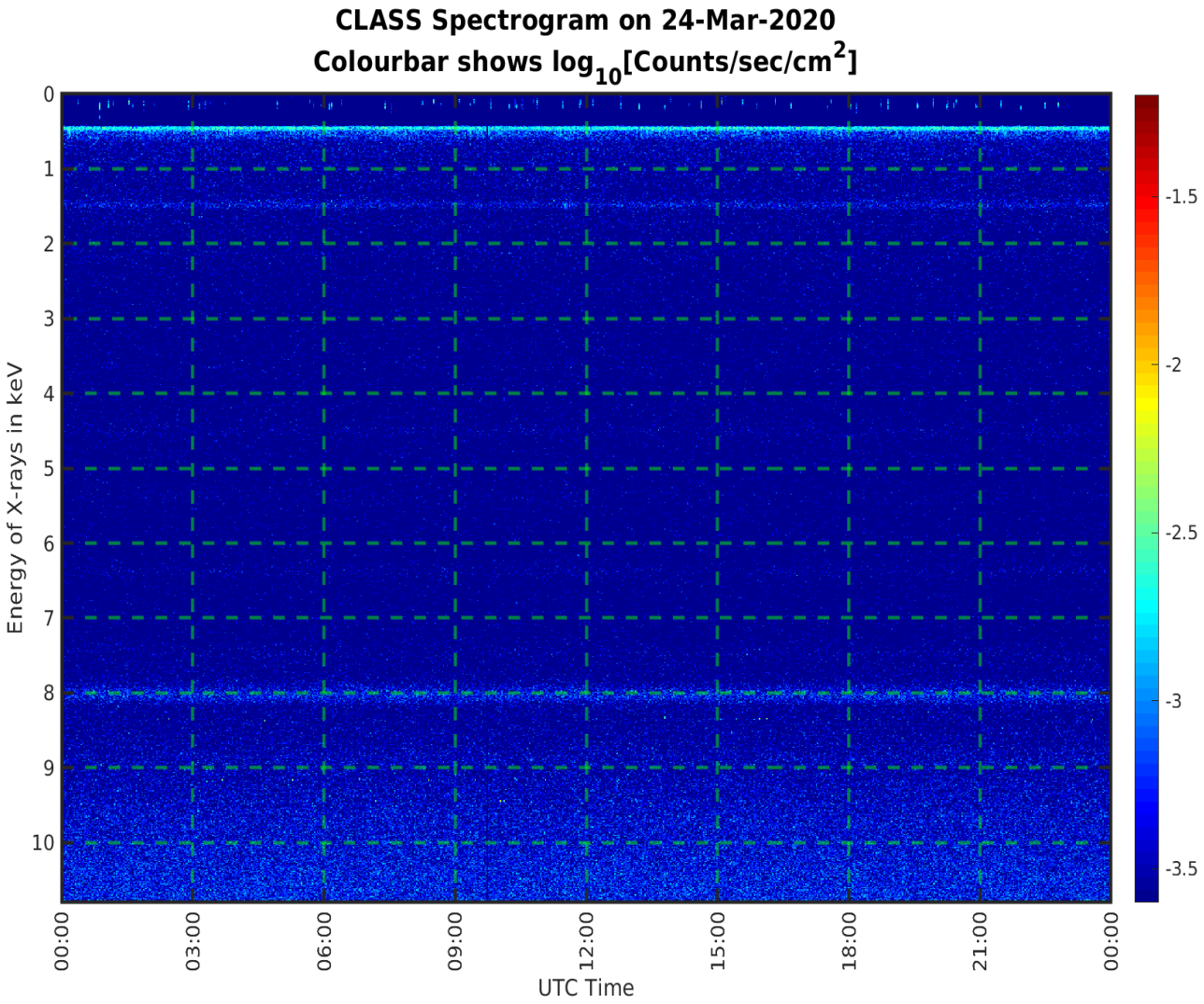
UTC Time


CLASS Spectrogram on 24-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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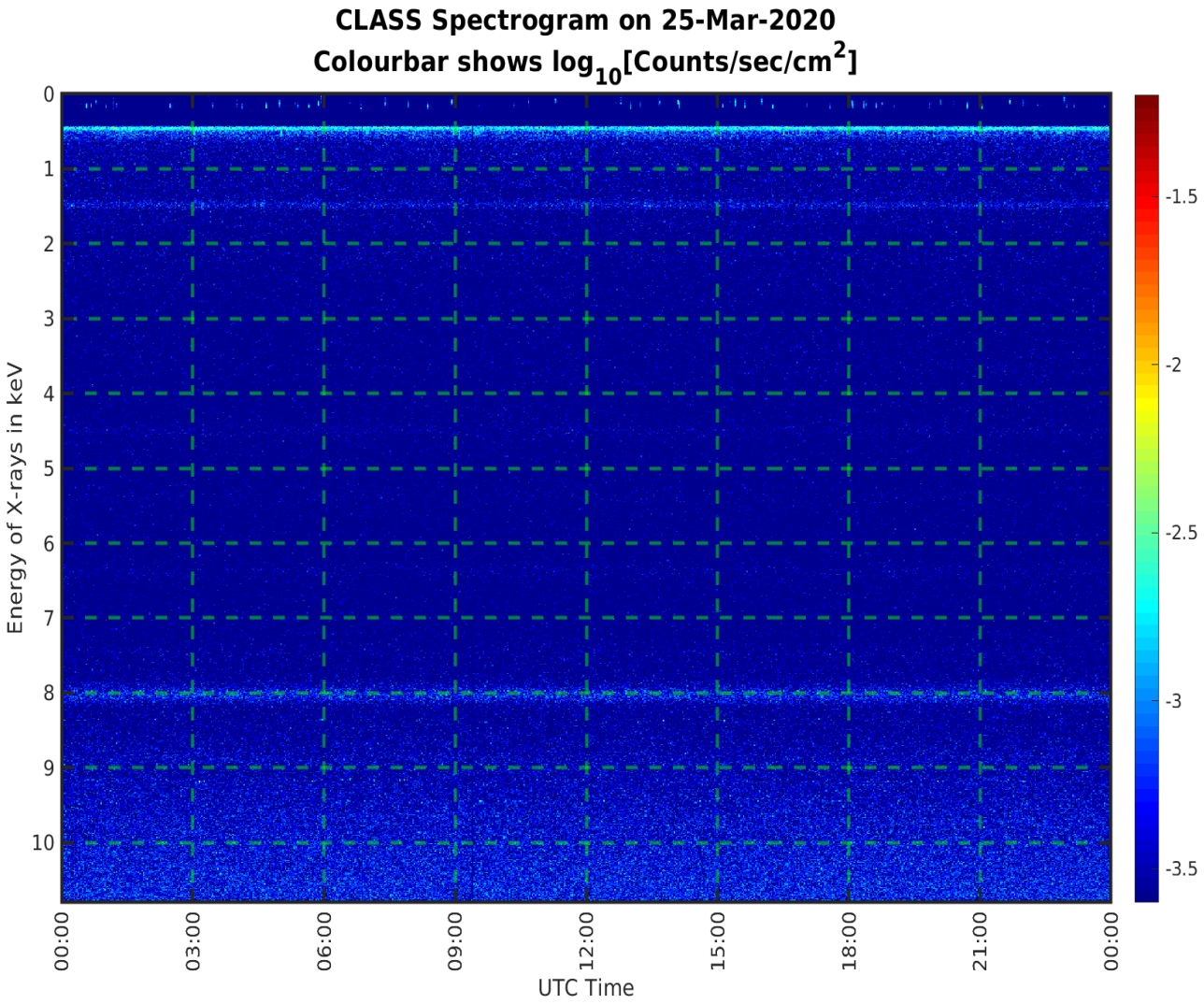
CLASS Spectrogram on 25-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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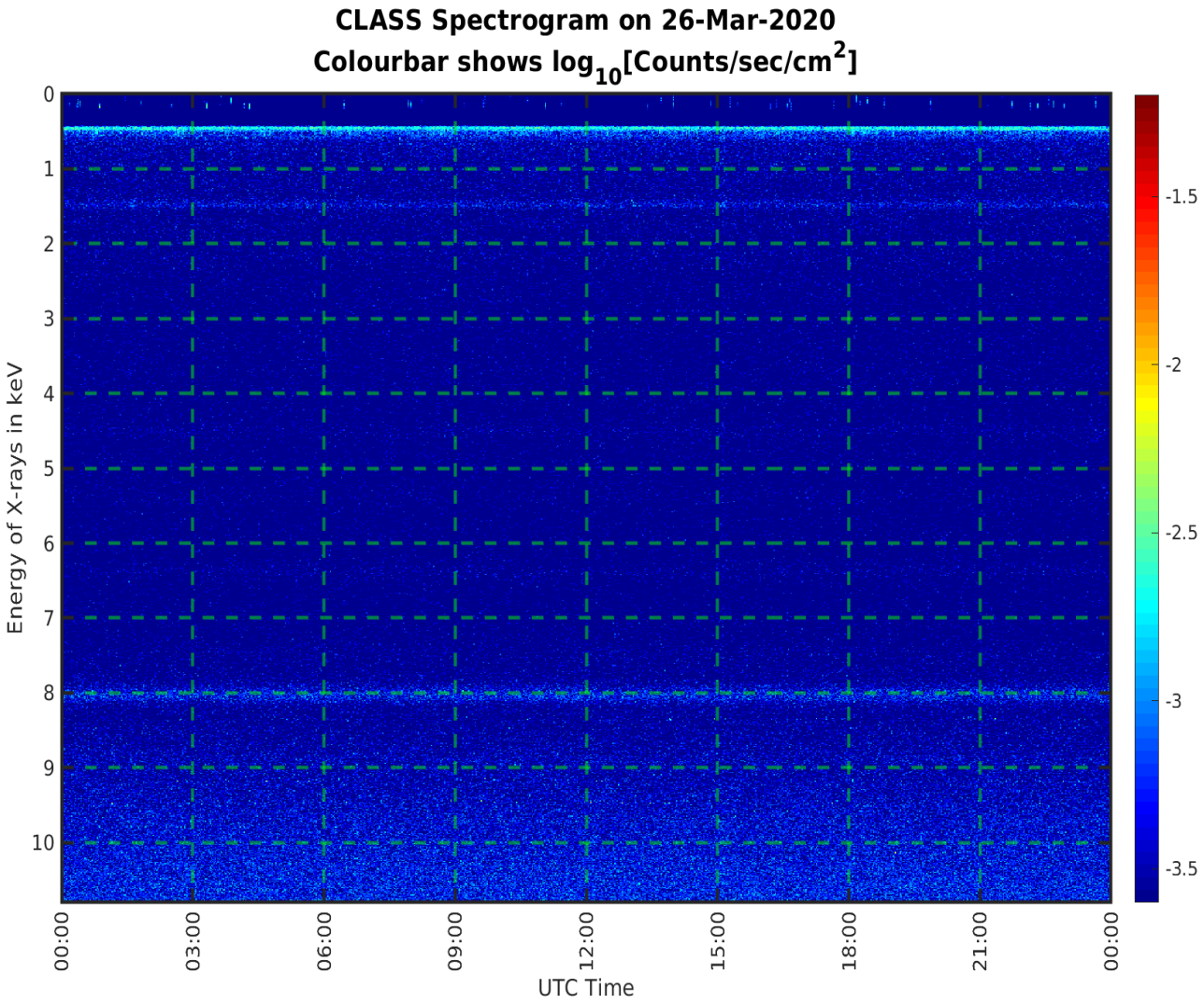
CLASS Spectrogram on 26-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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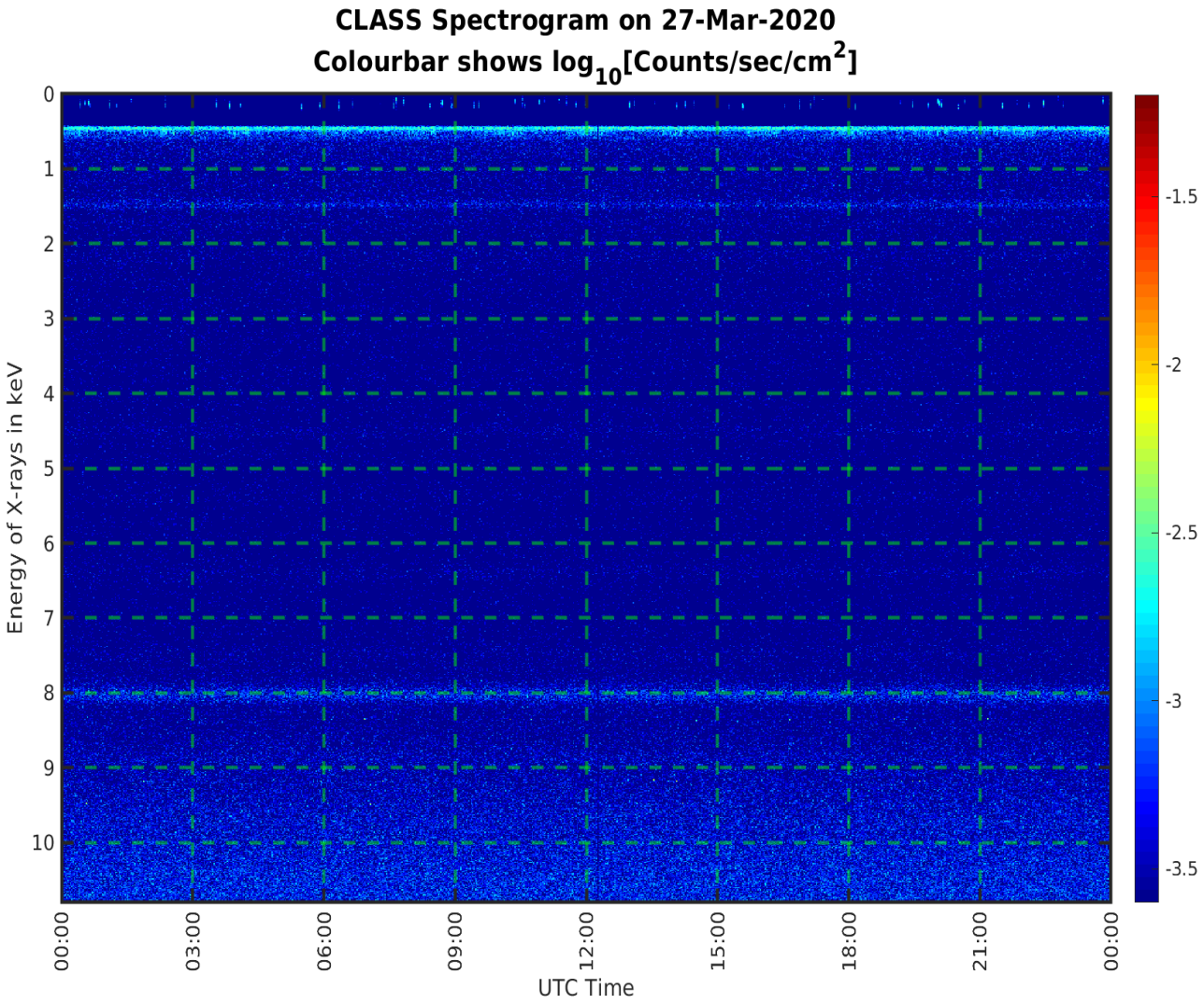
UTC Time


CLASS Spectrogram on 27-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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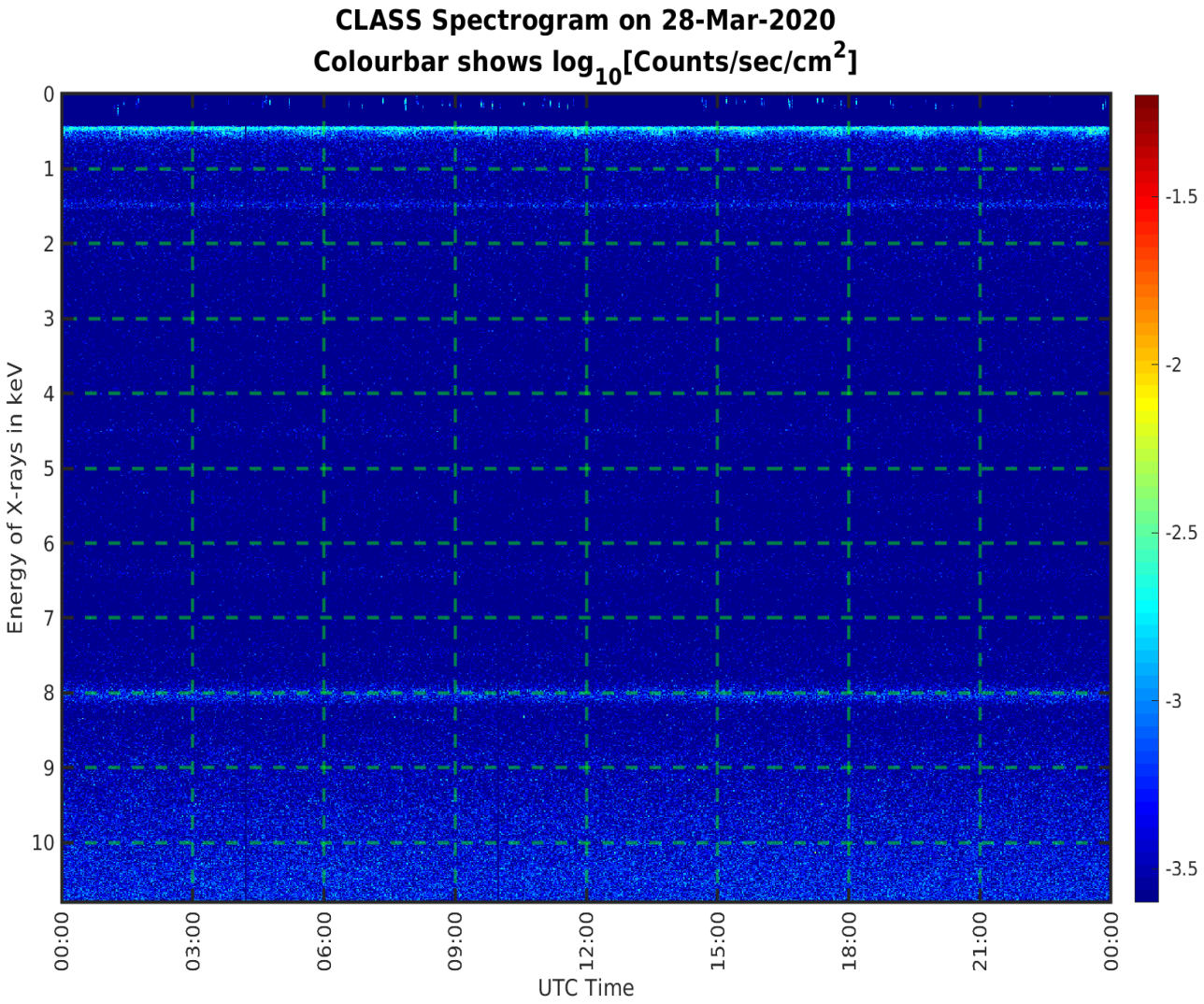
UTC Time


CLASS Spectrogram on 28-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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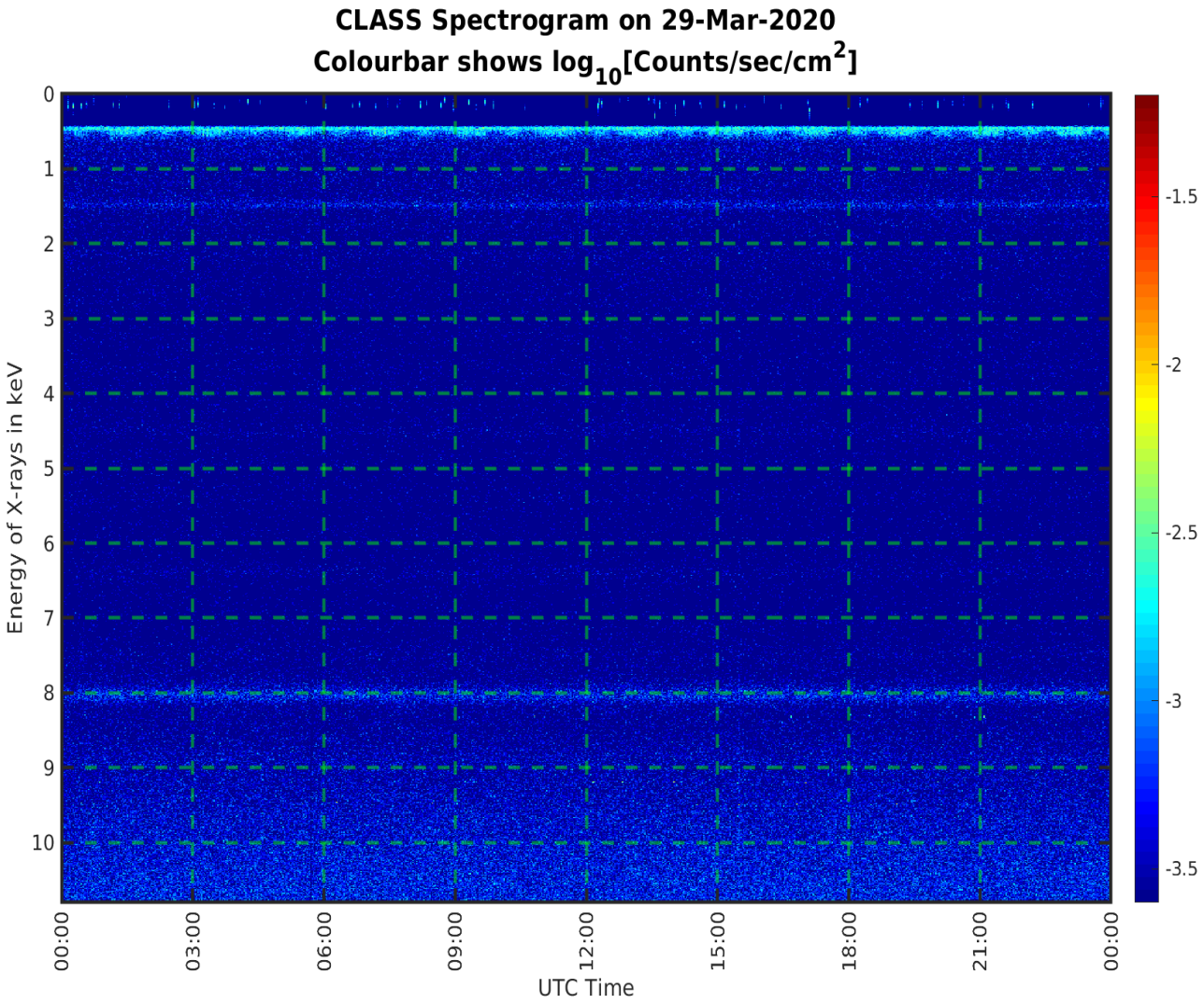
CLASS Spectrogram on 29-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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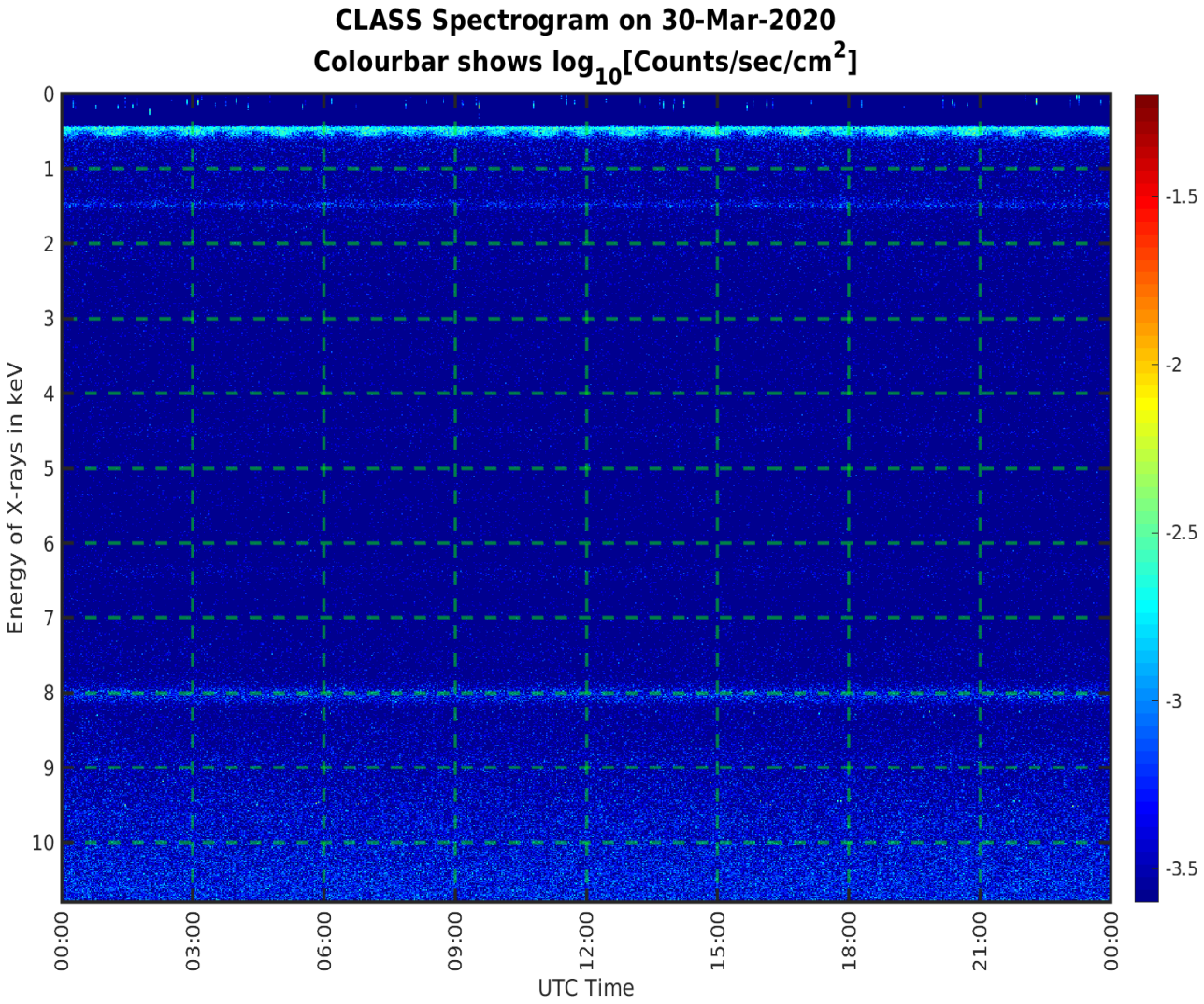
CLASS Spectrogram on 30-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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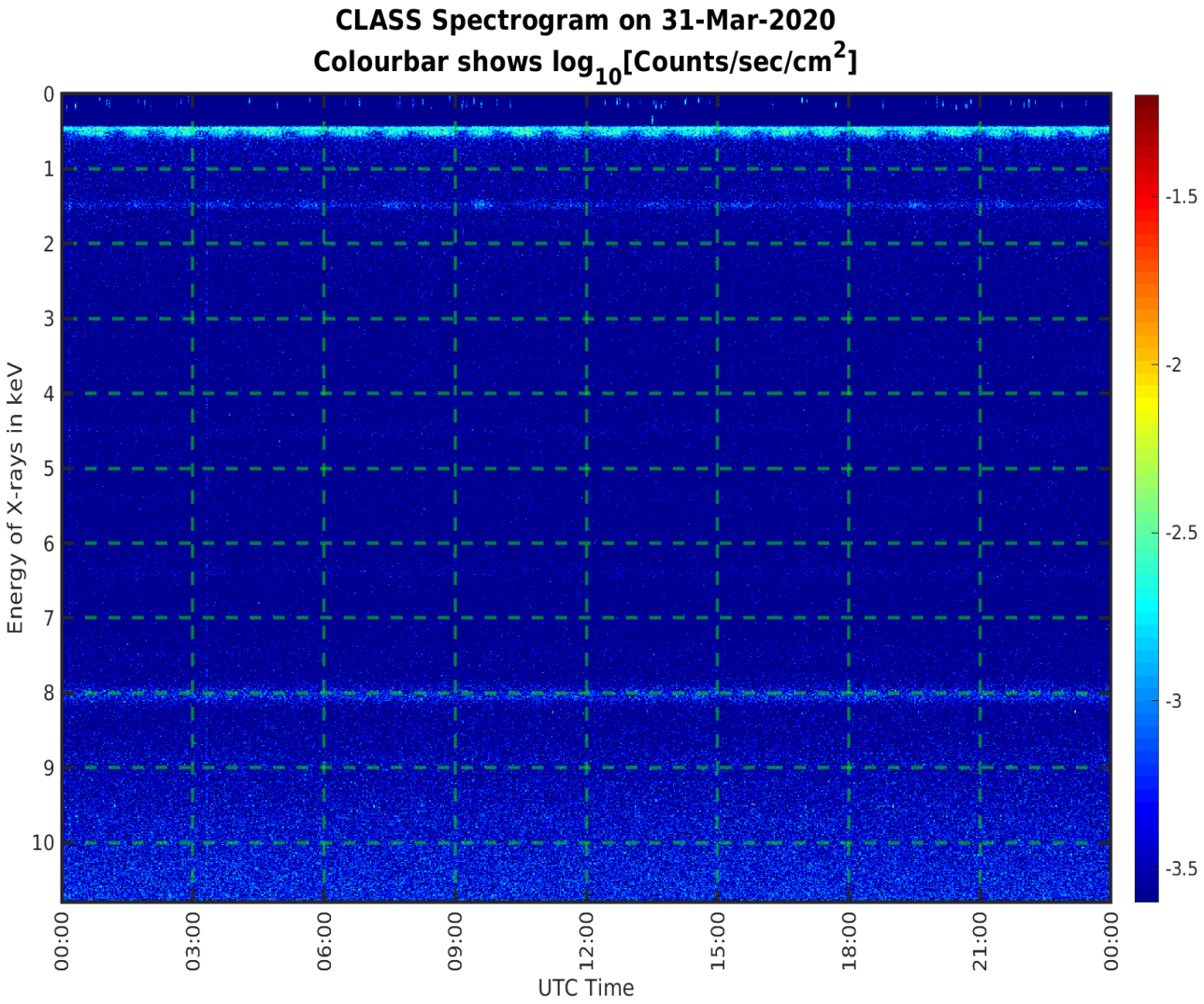
CLASS Spectrogram on 31-Mar-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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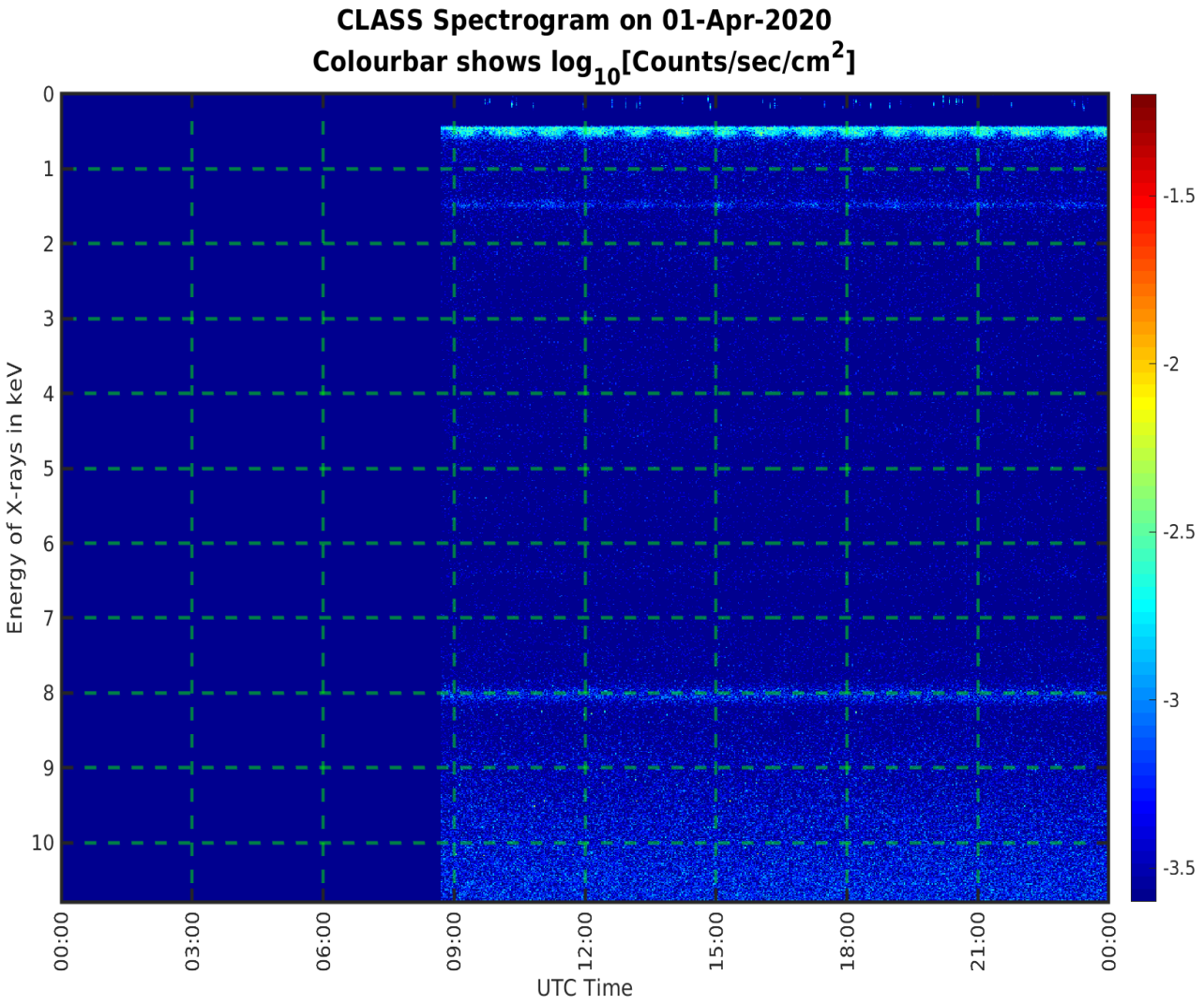
CLASS Spectrogram on 01-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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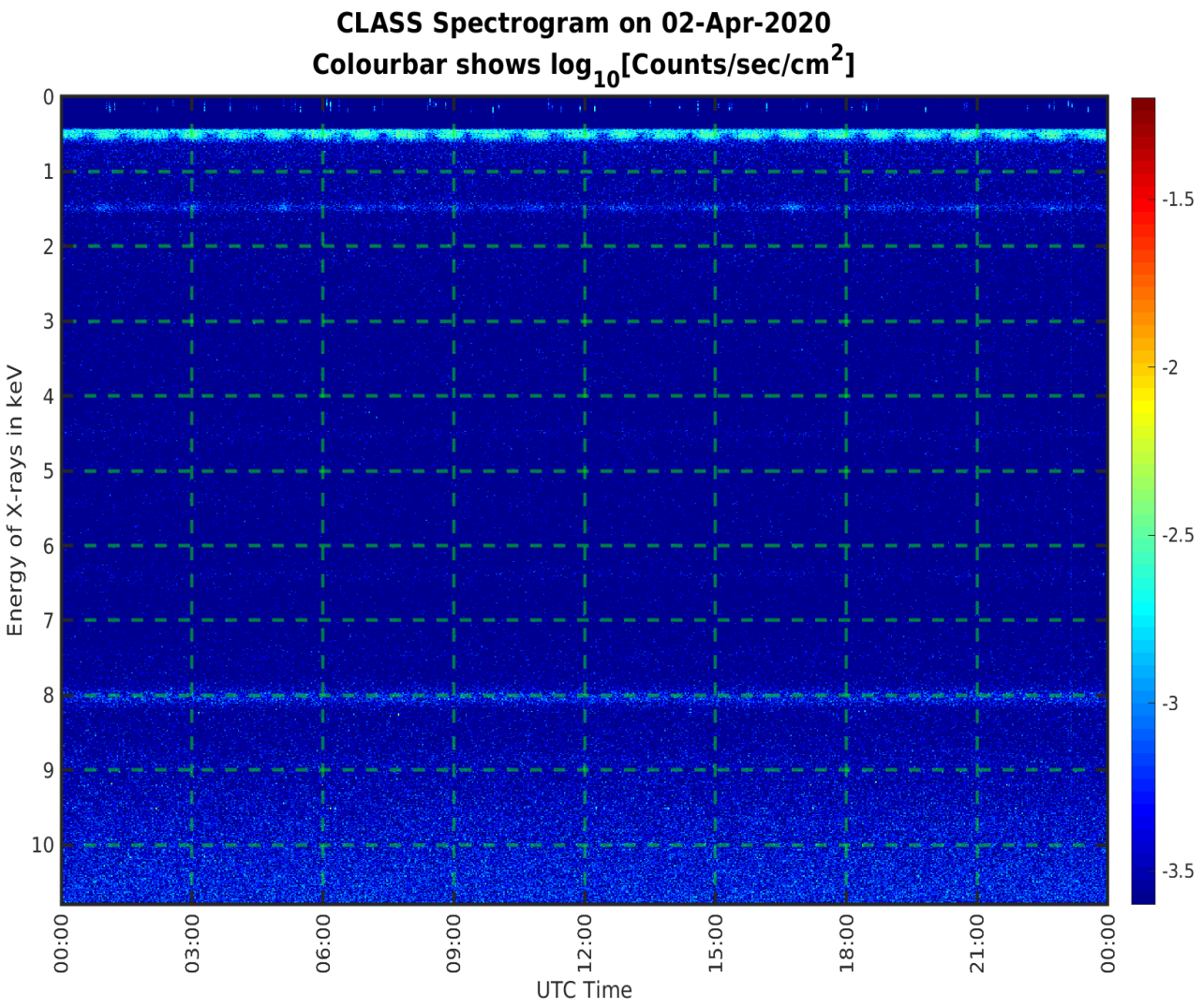
CLASS Spectrogram on 02-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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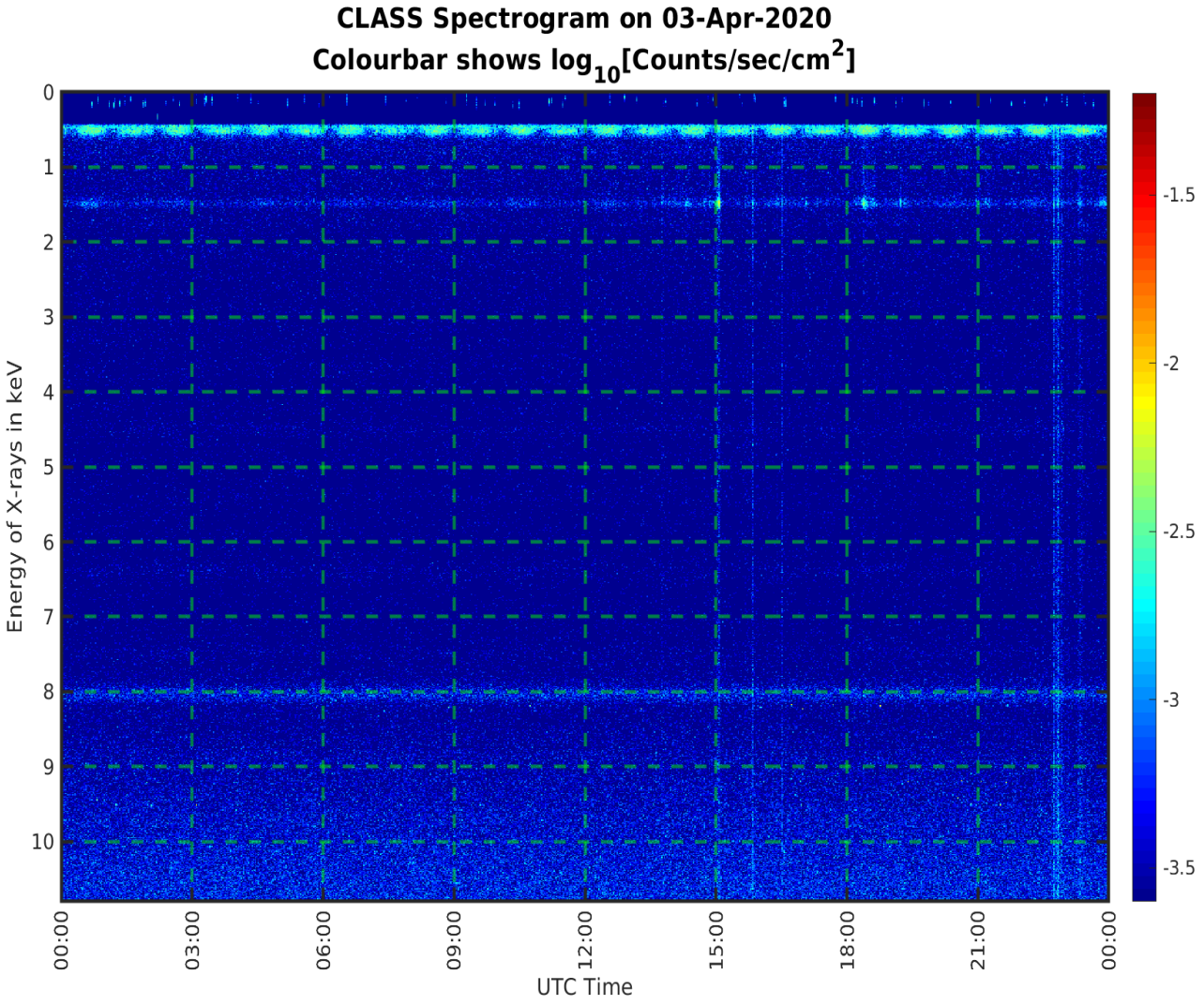
CLASS Spectrogram on 03-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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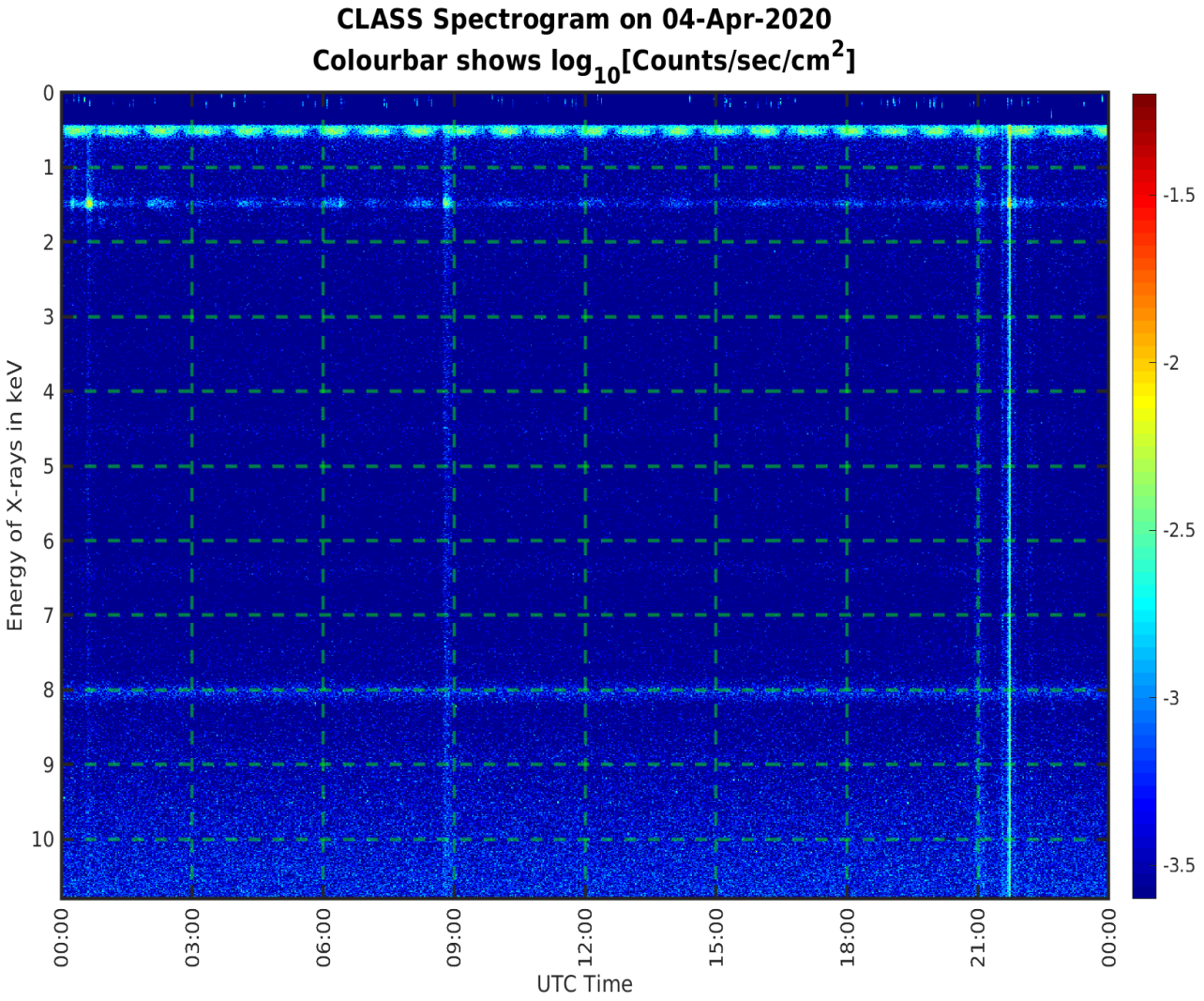
CLASS Spectrogram on 04-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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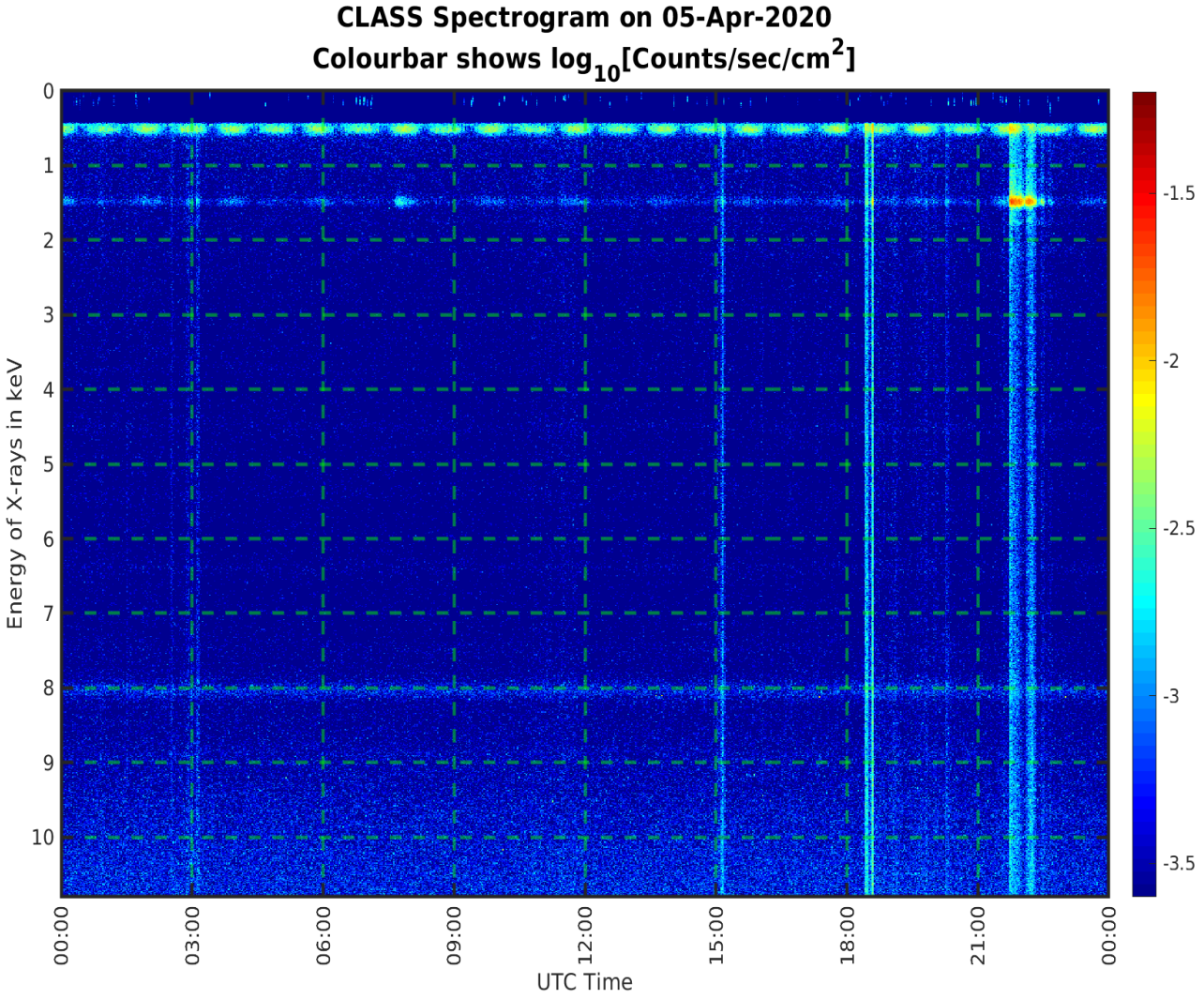
CLASS Spectrogram on 05-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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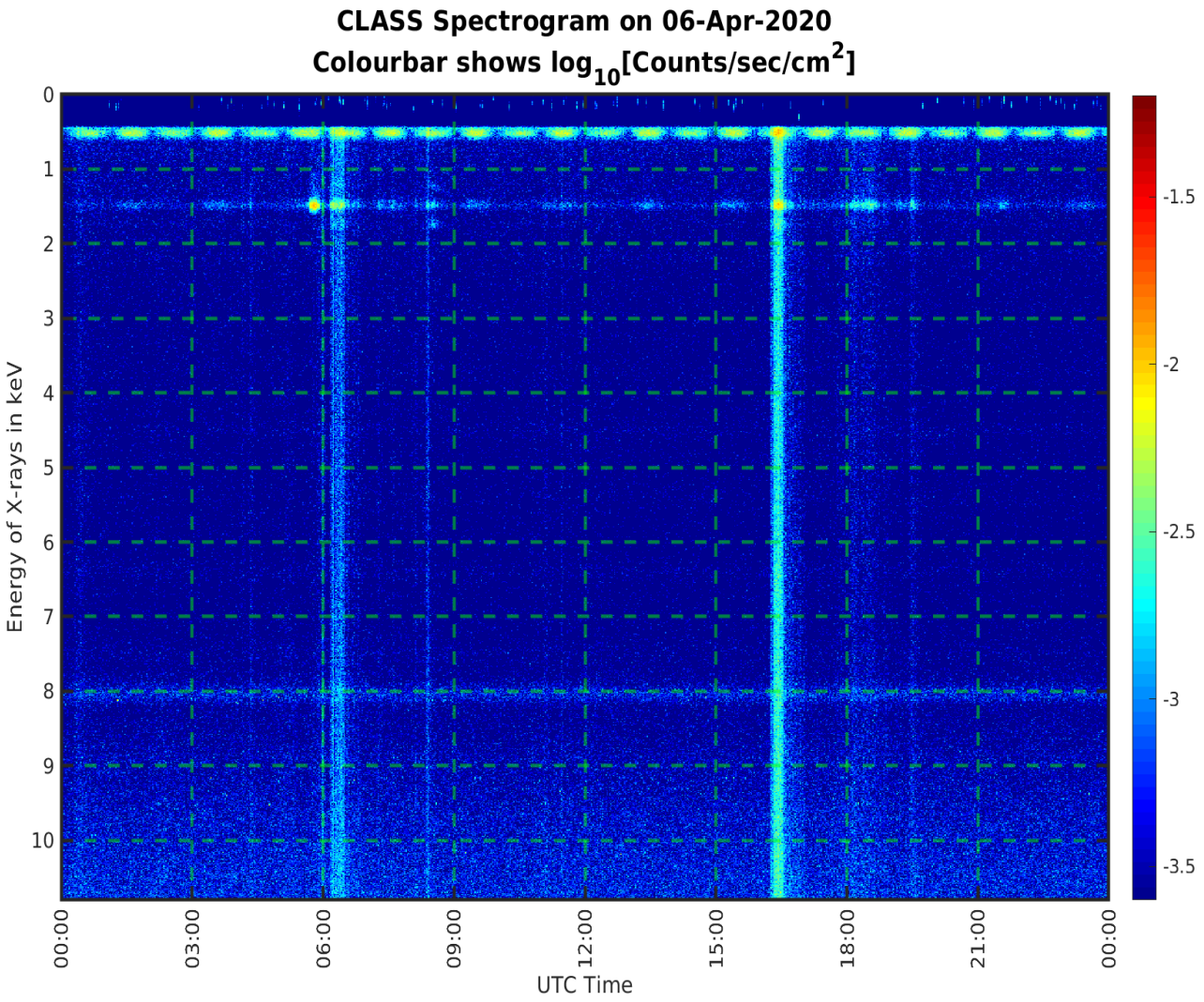
CLASS Spectrogram on 06-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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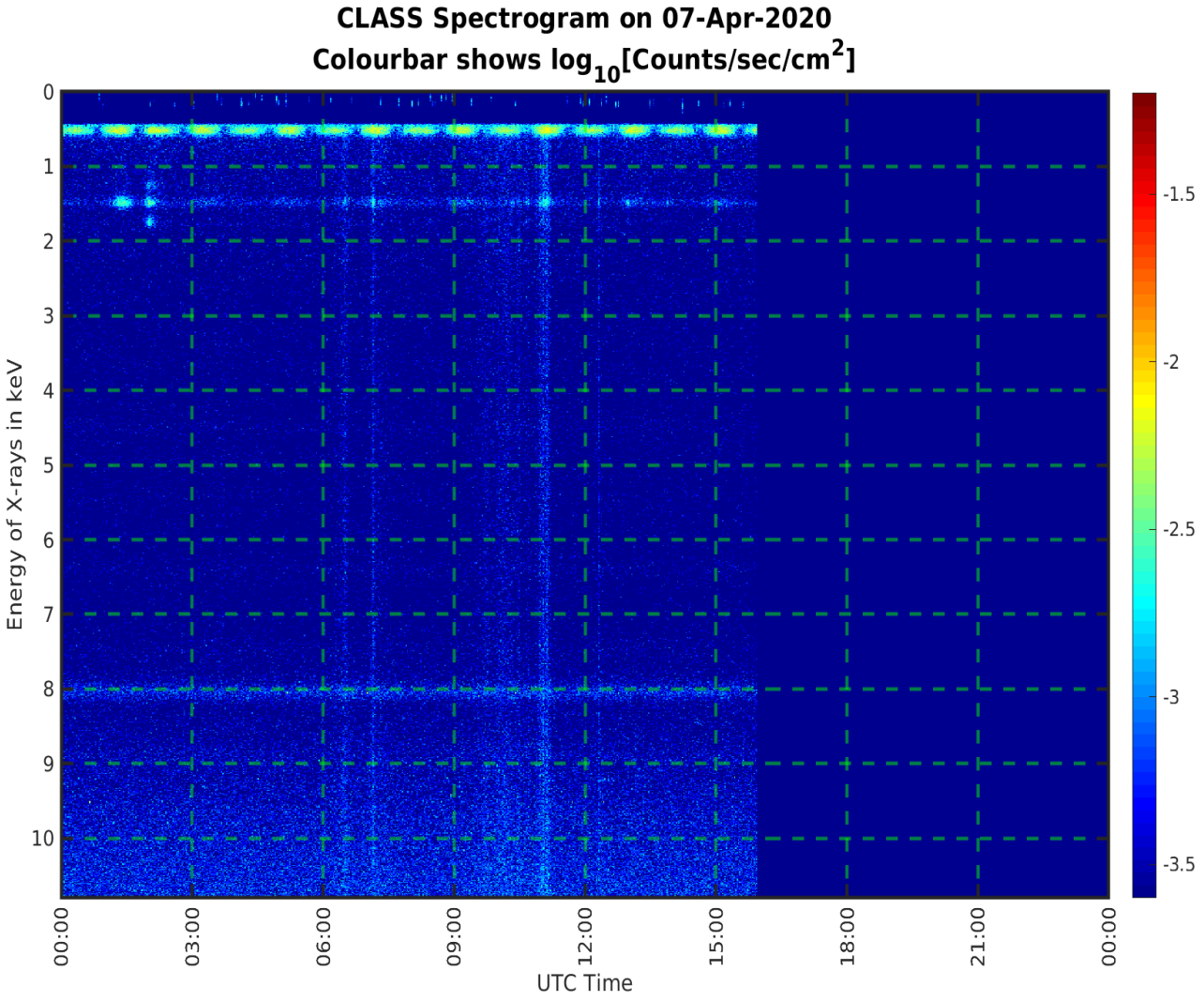
CLASS Spectrogram on 07-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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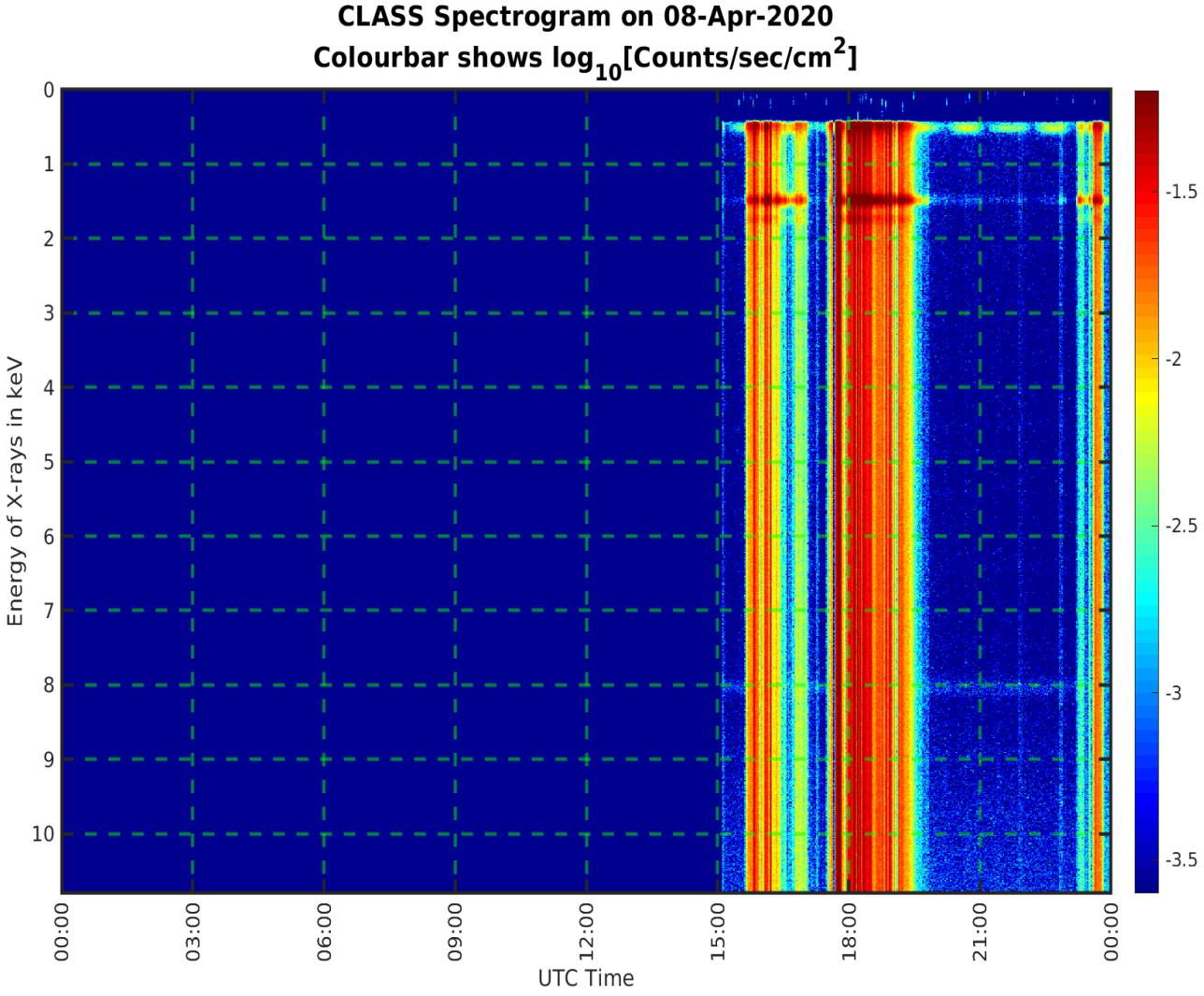
UTC Time


CLASS Spectrogram on 08-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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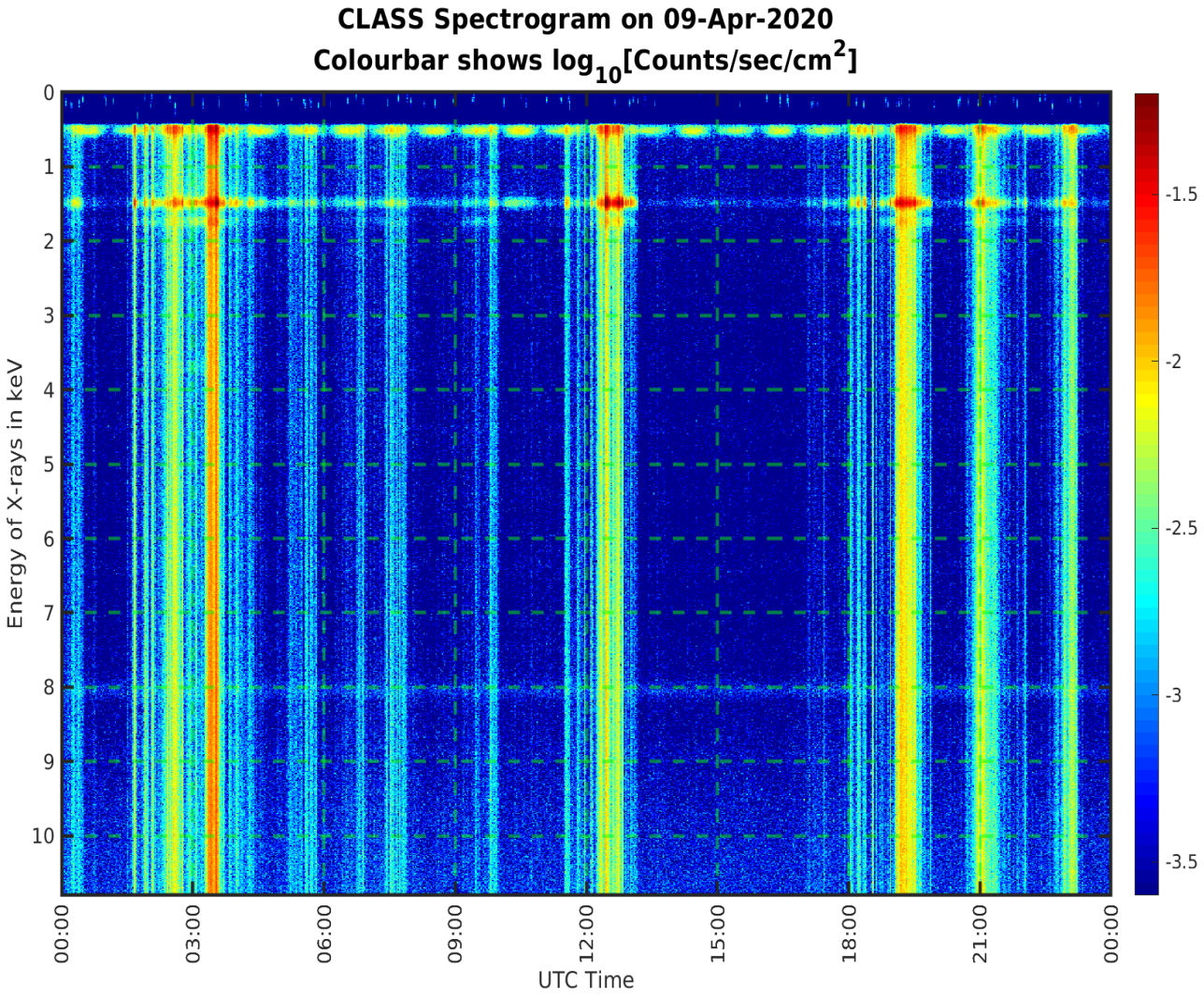
CLASS Spectrogram on 09-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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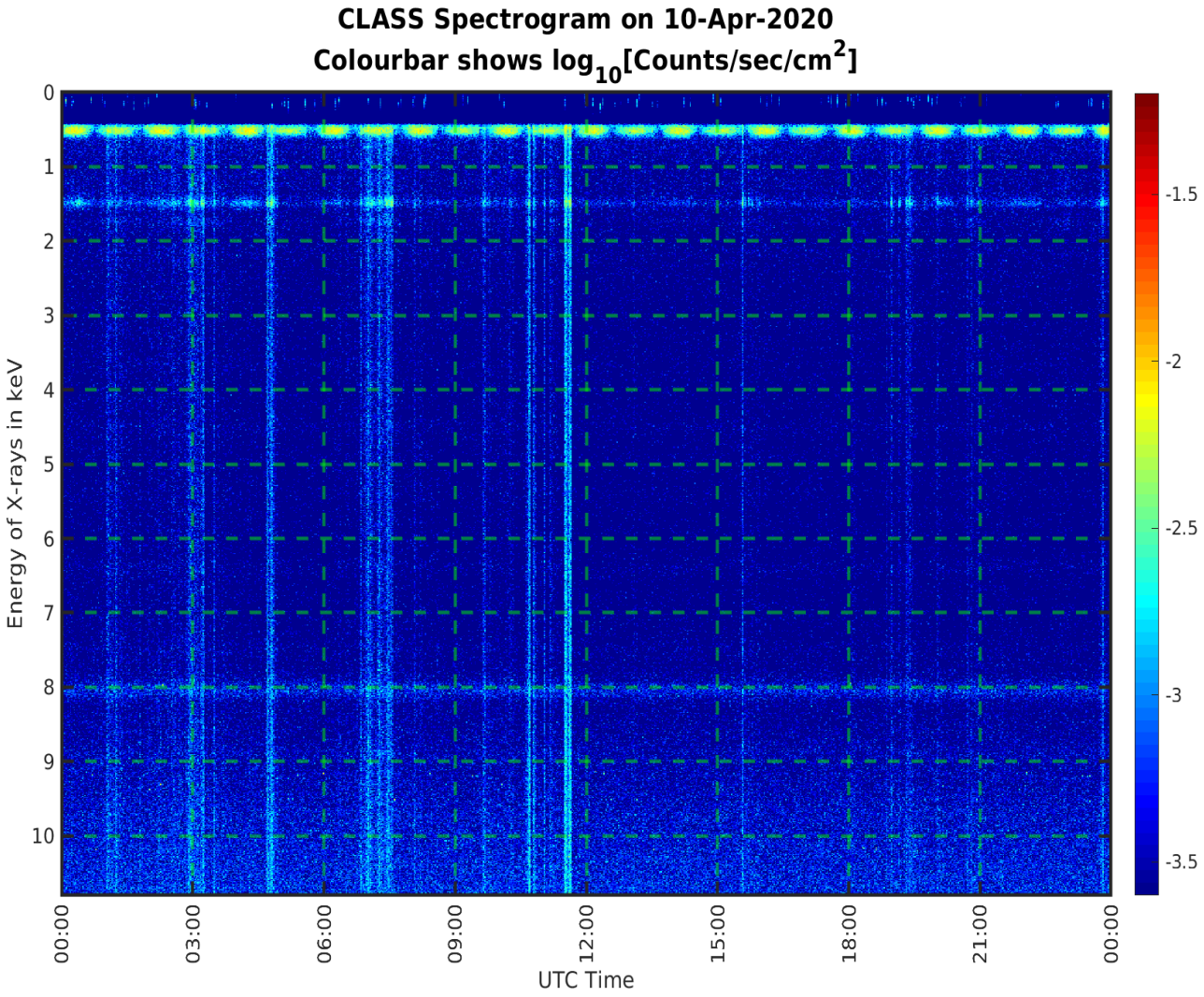
UTC Time


CLASS Spectrogram on 10-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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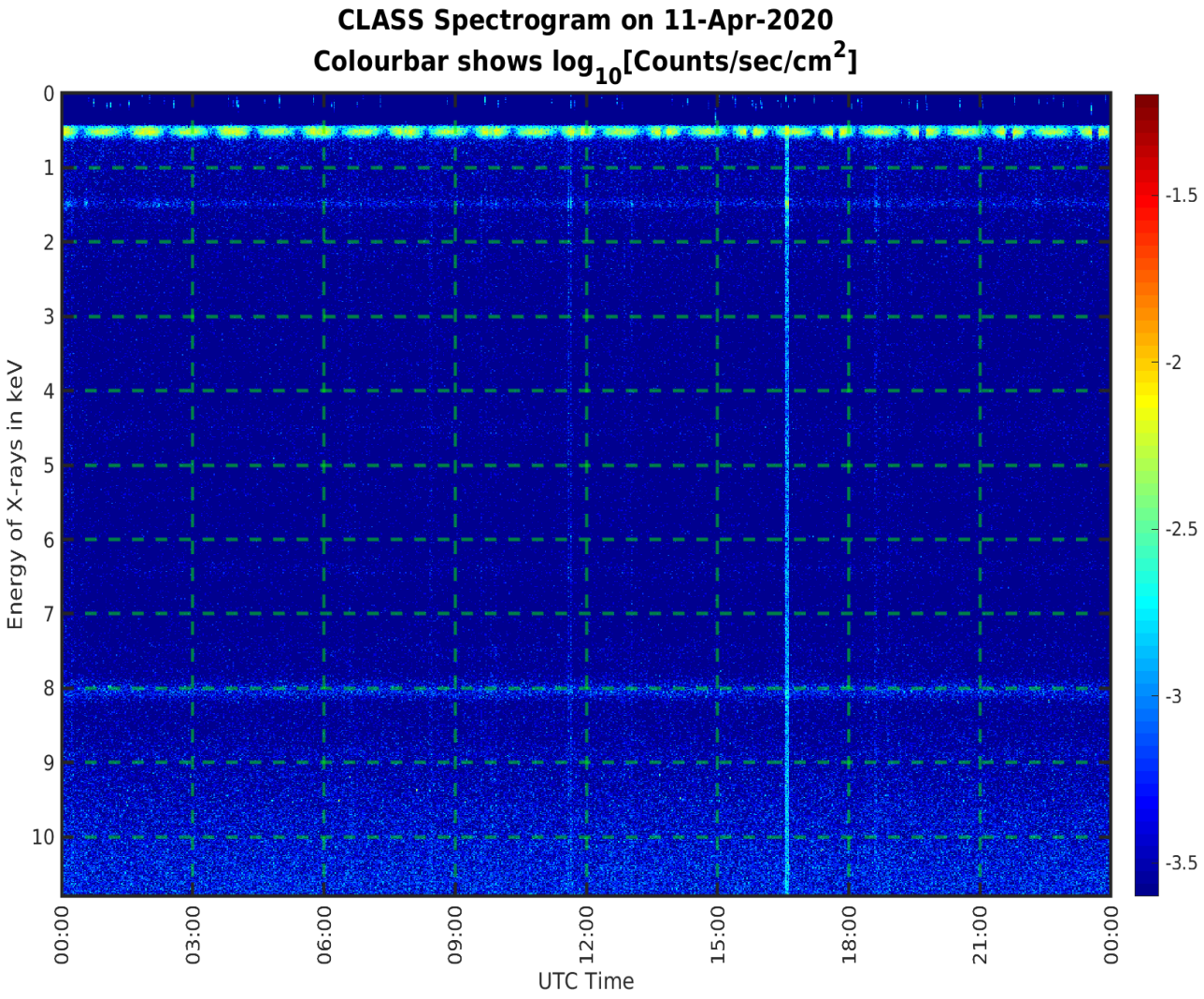
CLASS Spectrogram on 11-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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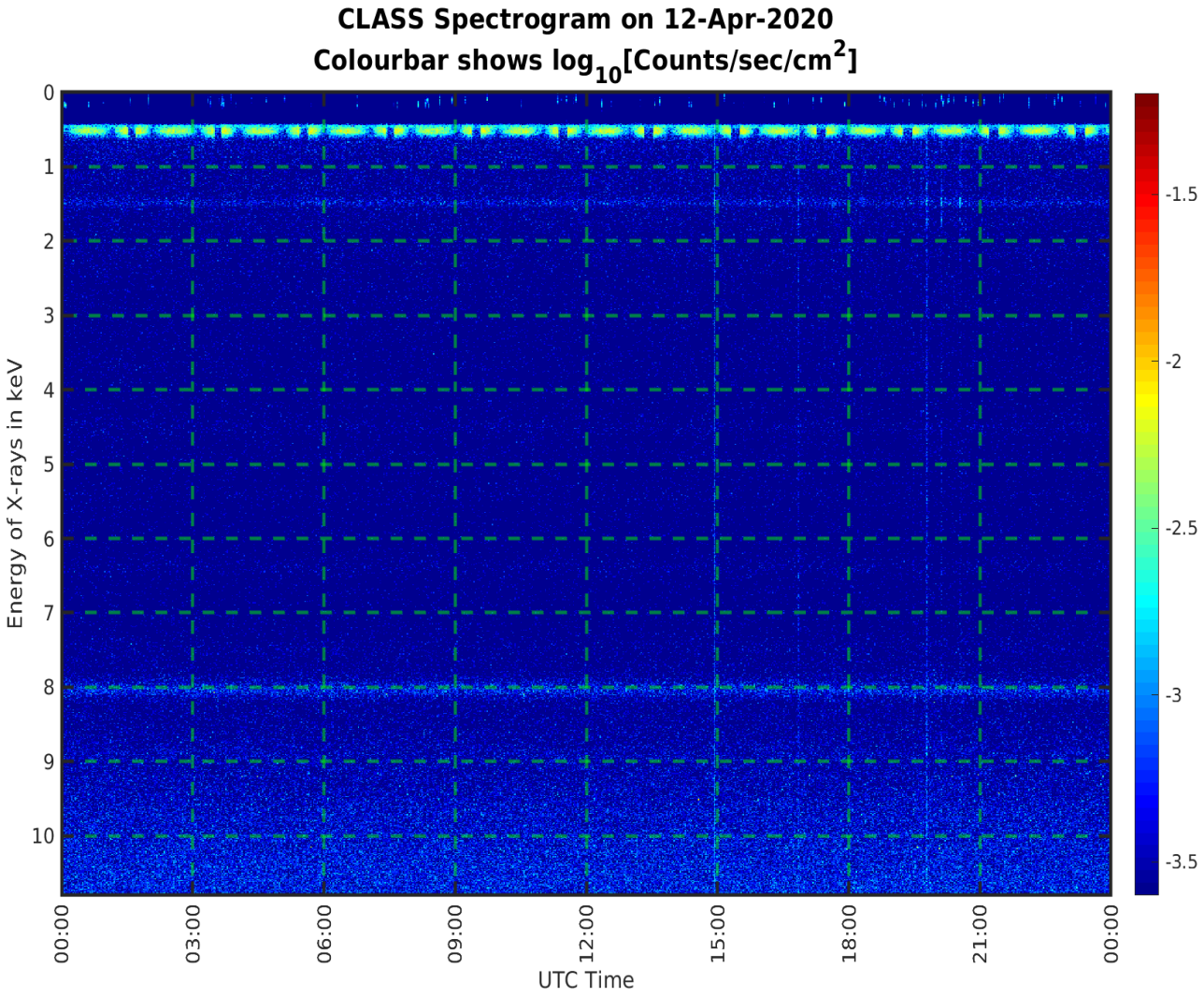
UTC Time


CLASS Spectrogram on 12-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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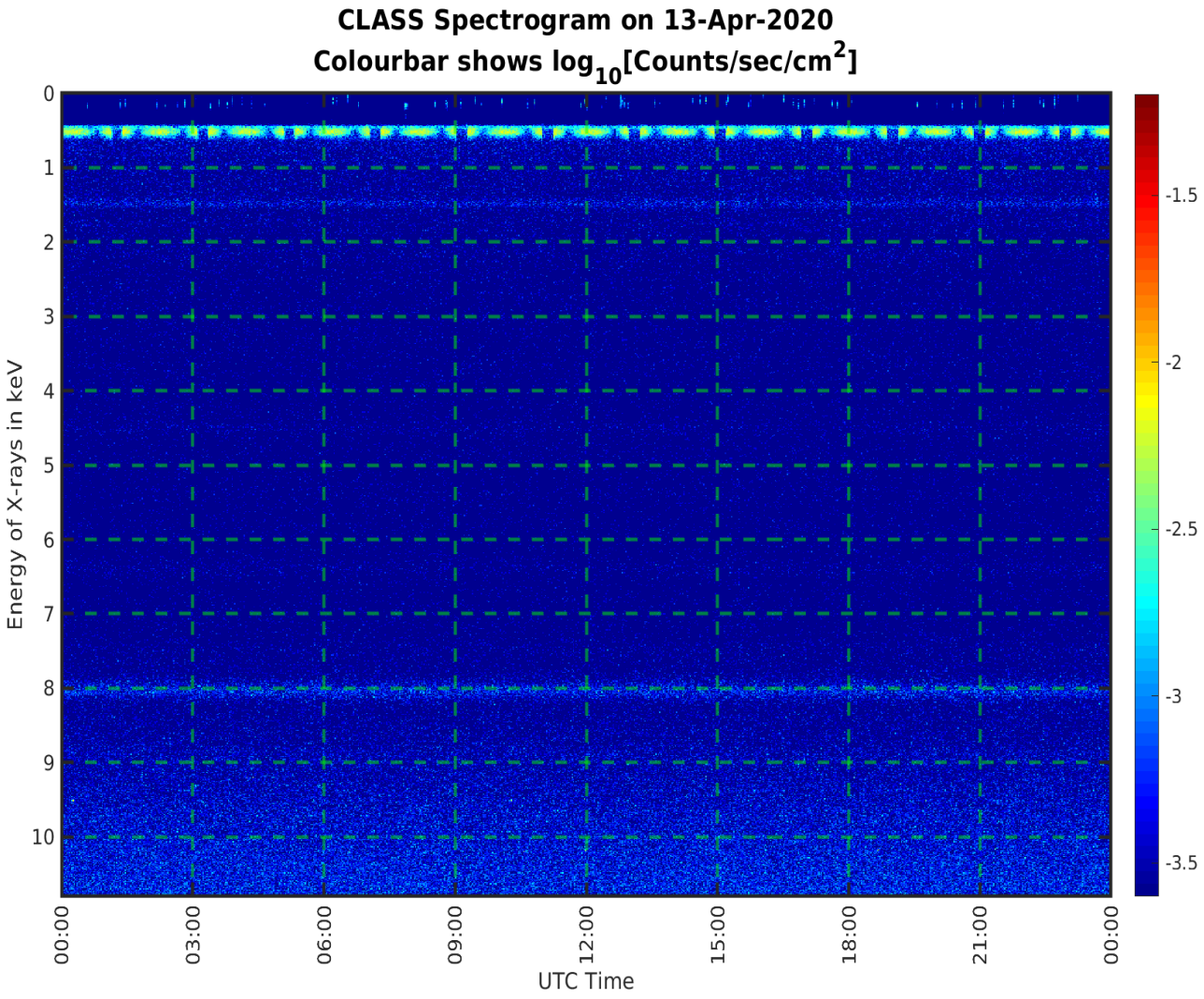
CLASS Spectrogram on 13-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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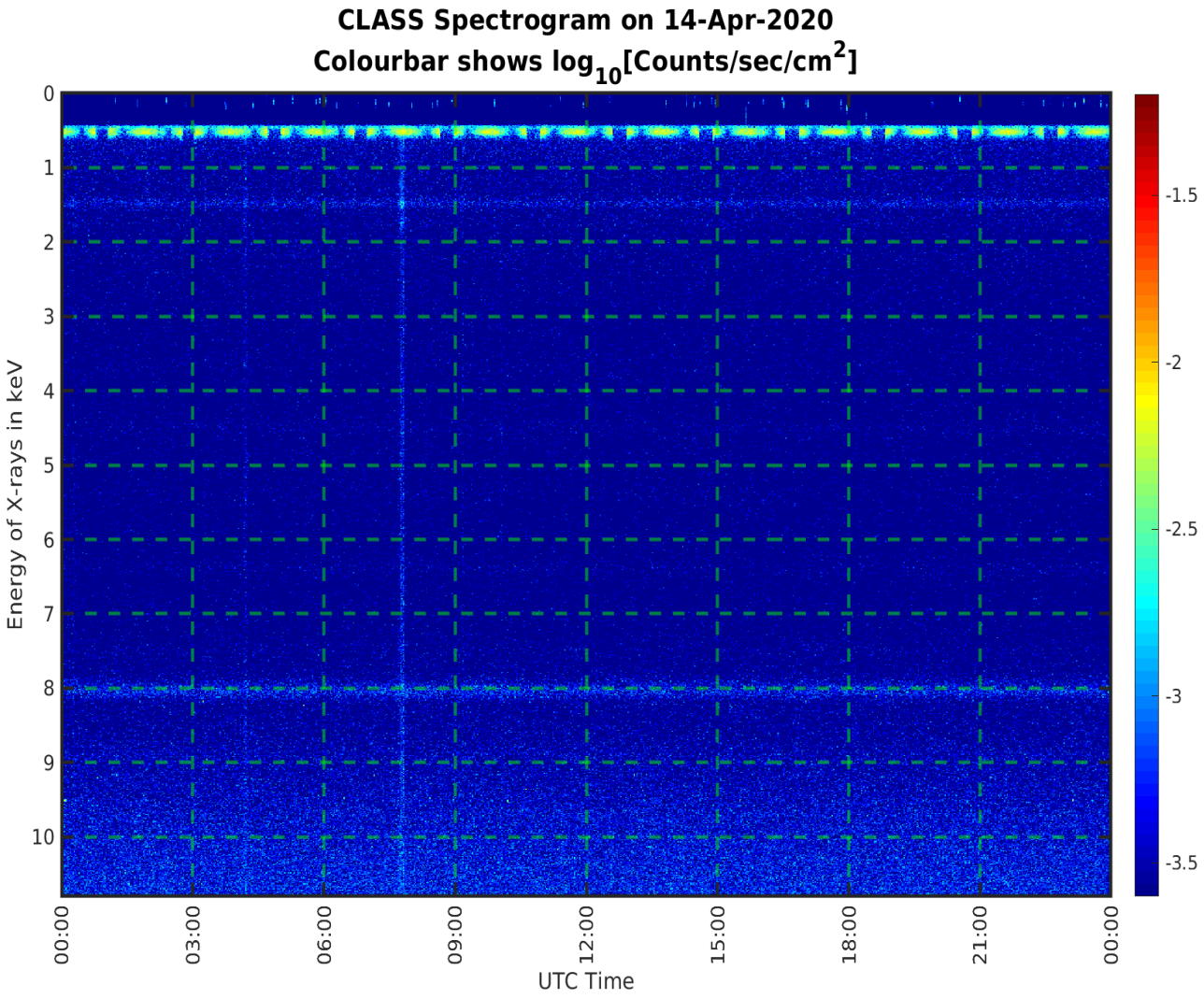
UTC Time


CLASS Spectrogram on 14-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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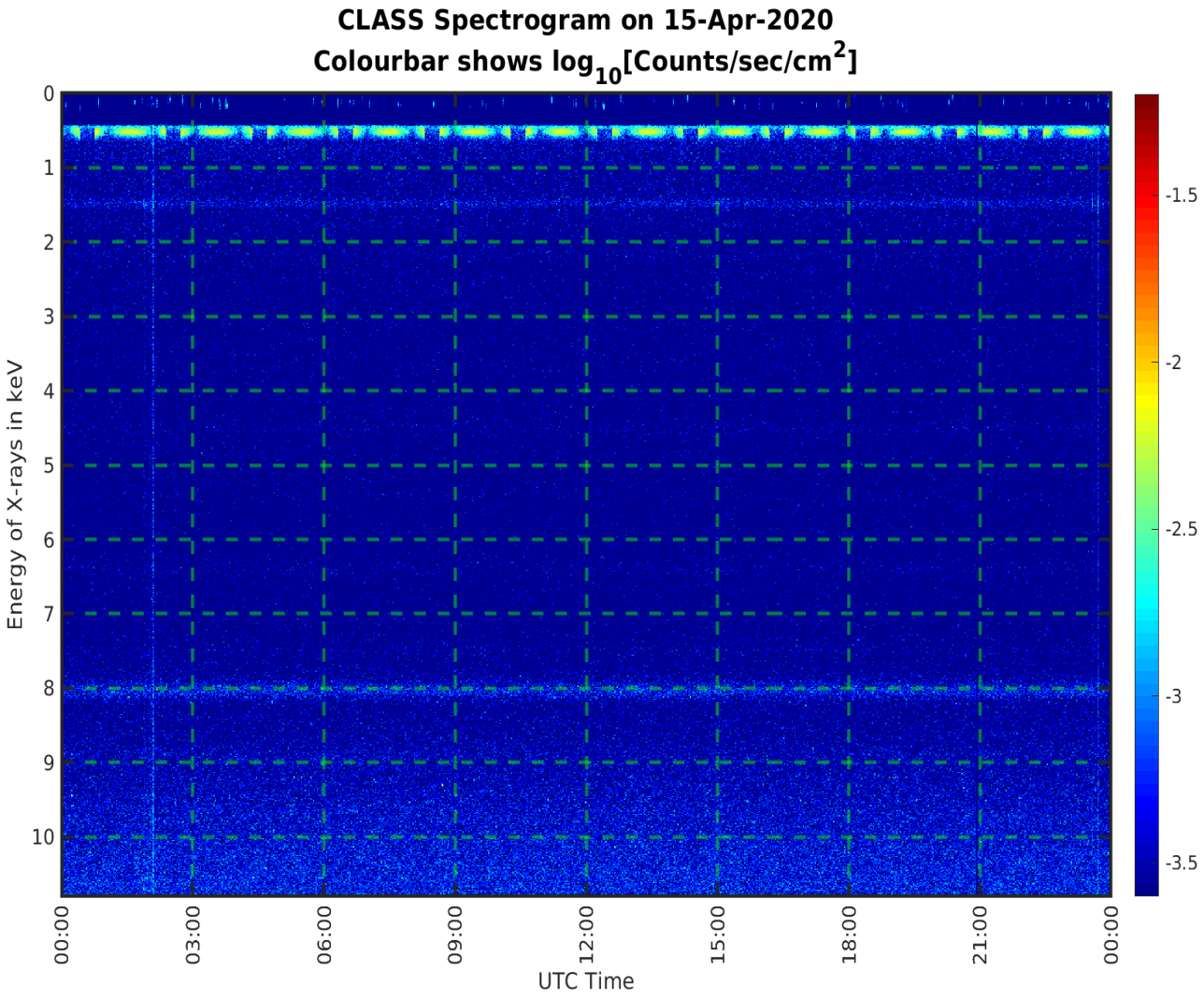
UTC Time


CLASS Spectrogram on 15-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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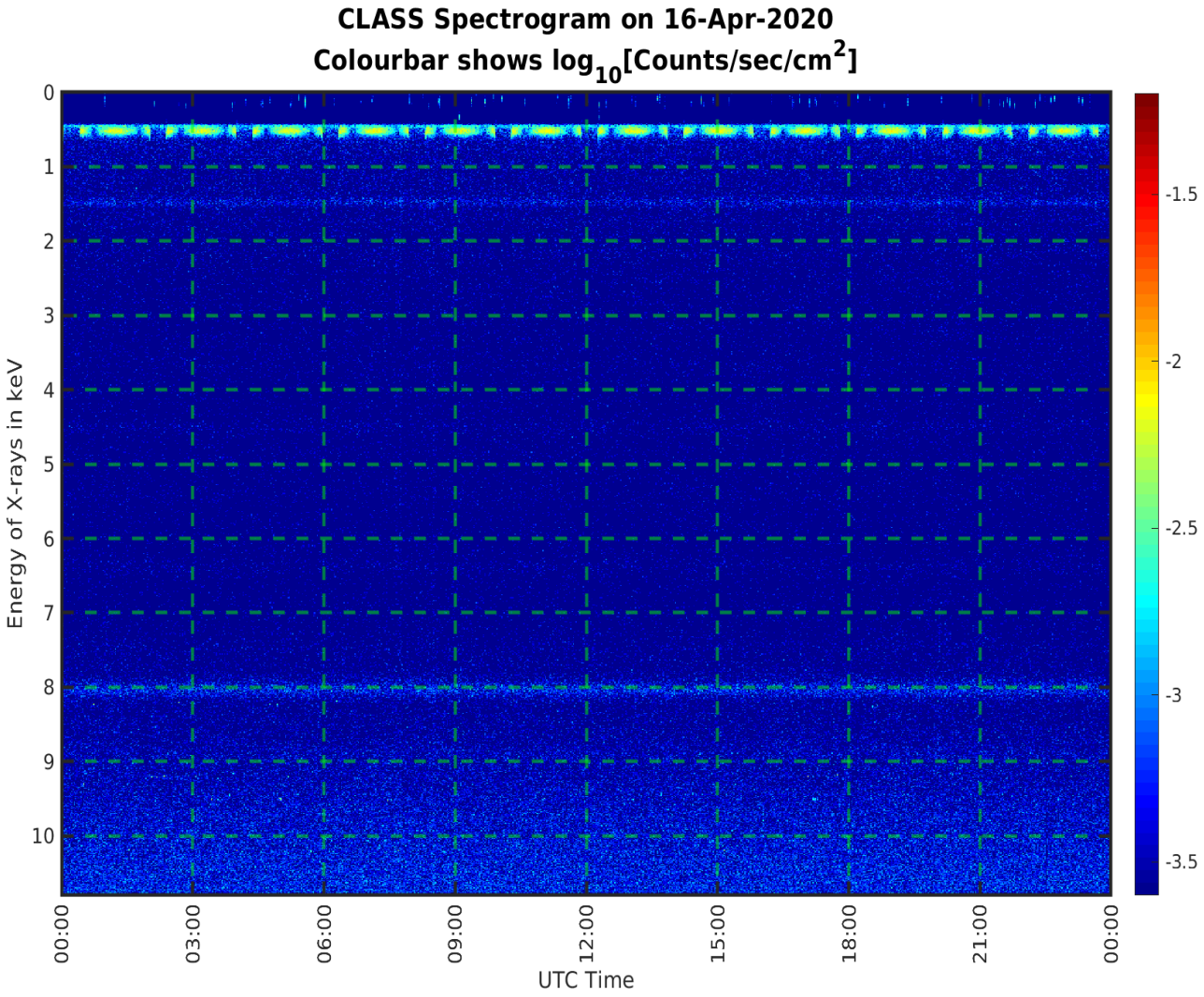
UTC Time


CLASS Spectrogram on 16-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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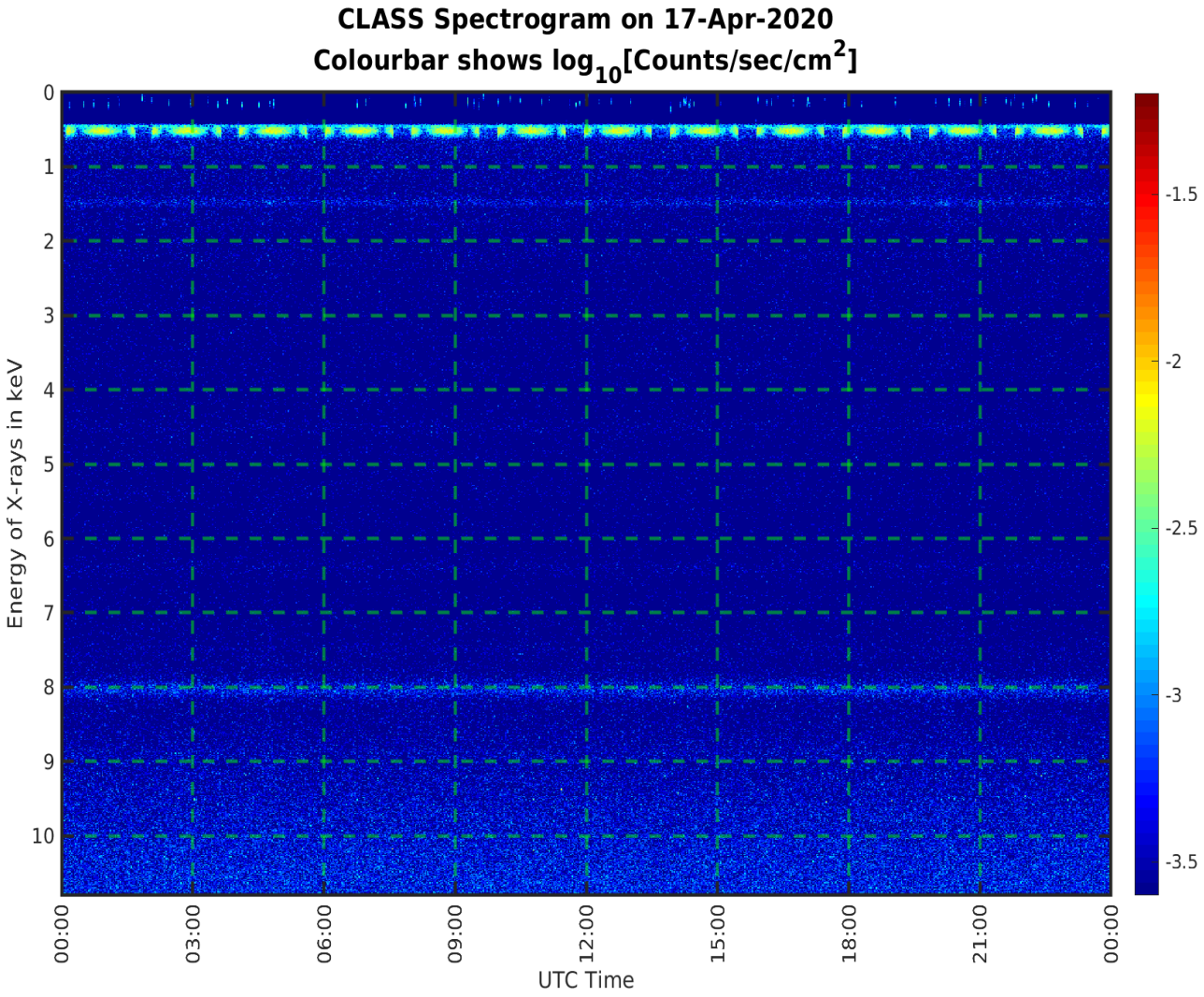
CLASS Spectrogram on 17-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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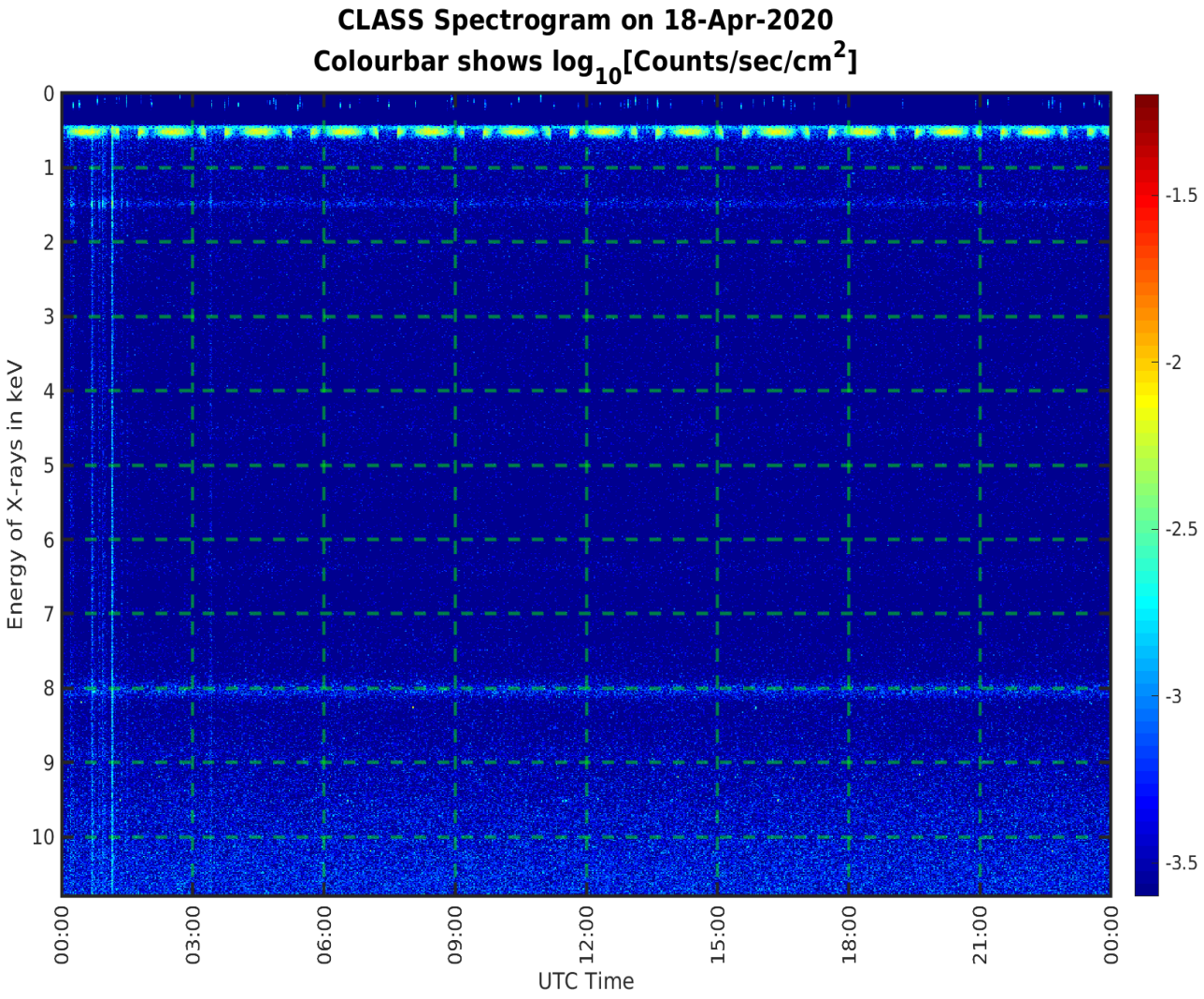
CLASS Spectrogram on 18-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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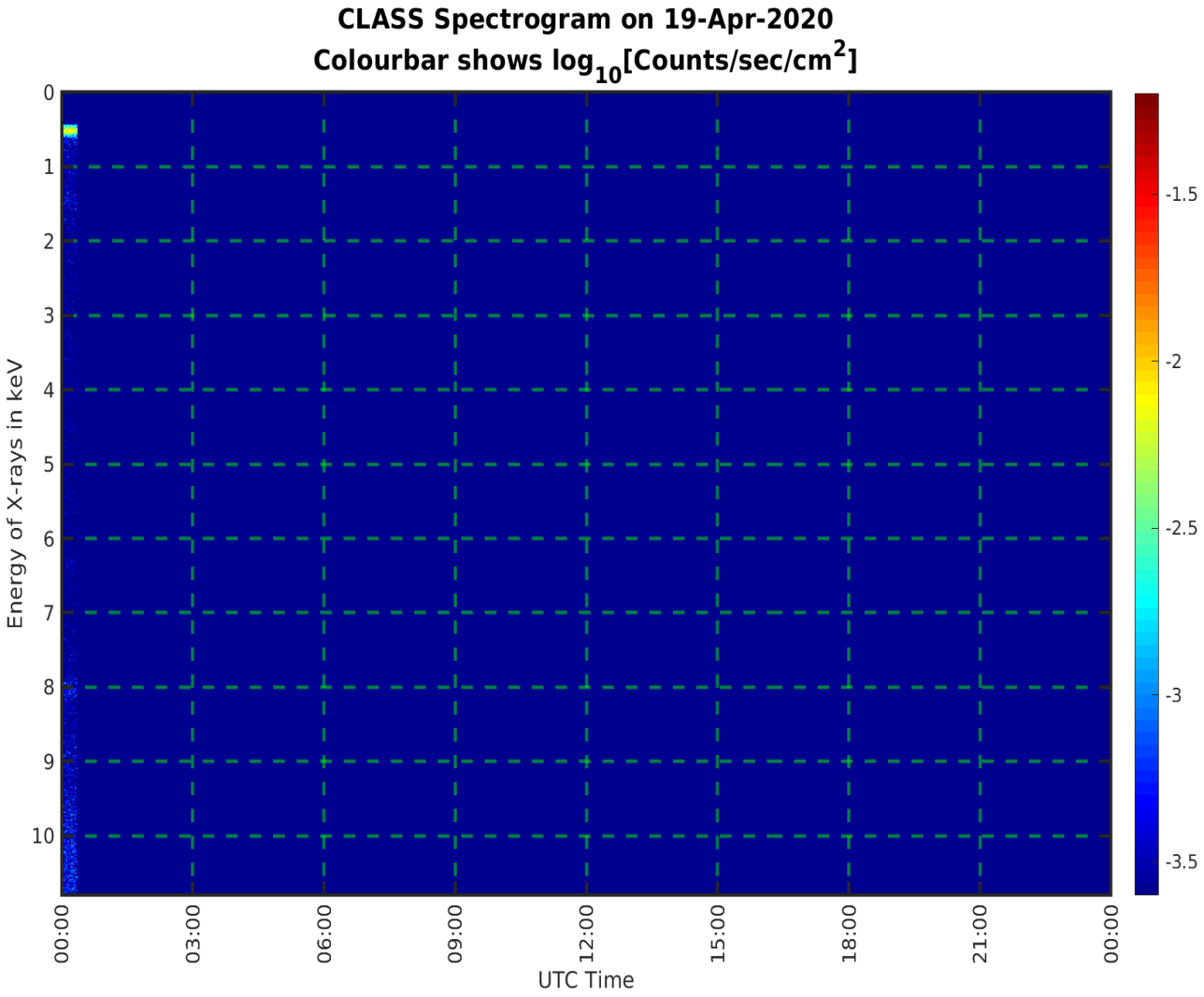
CLASS Spectrogram on 19-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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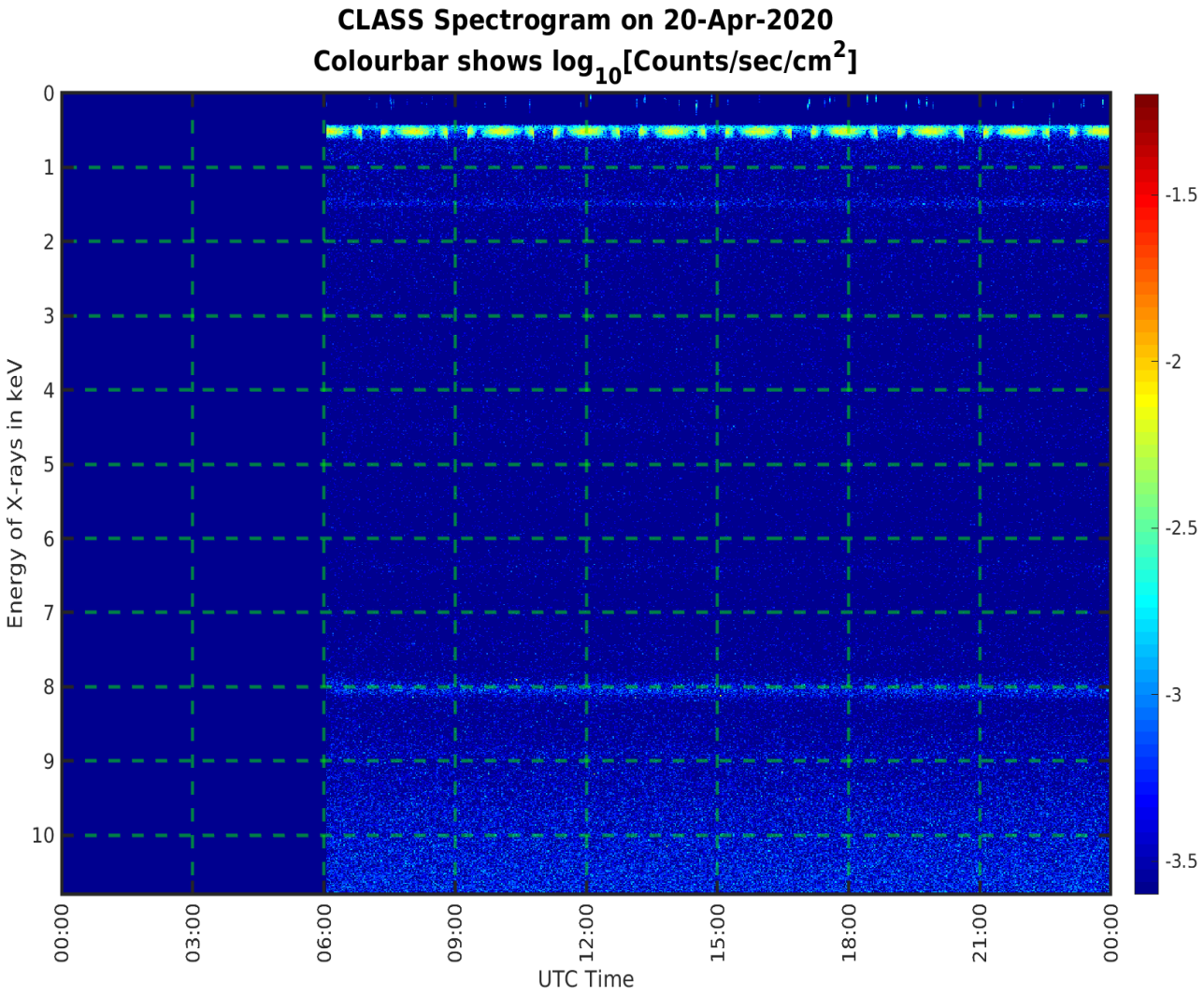
CLASS Spectrogram on 20-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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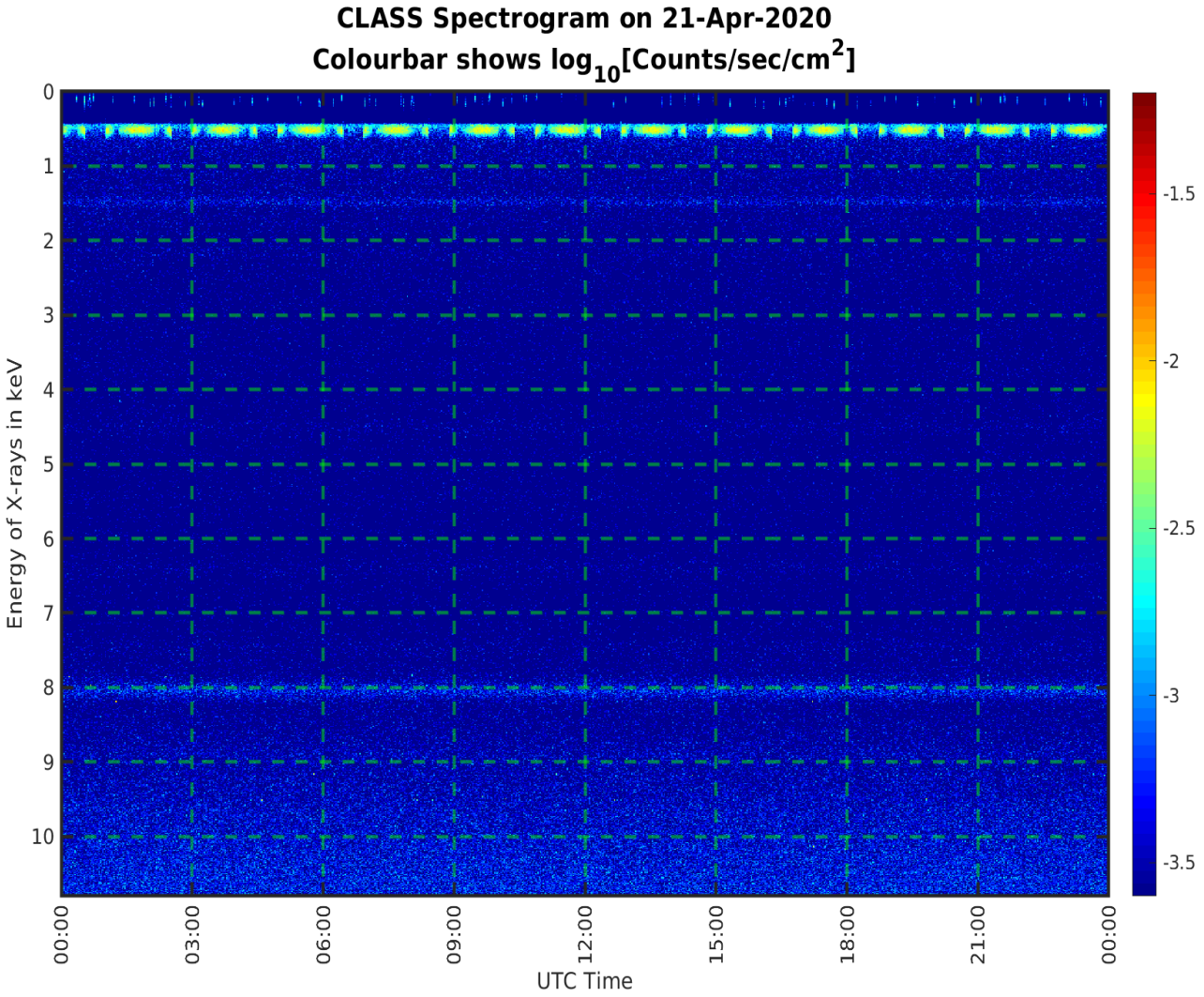
CLASS Spectrogram on 21-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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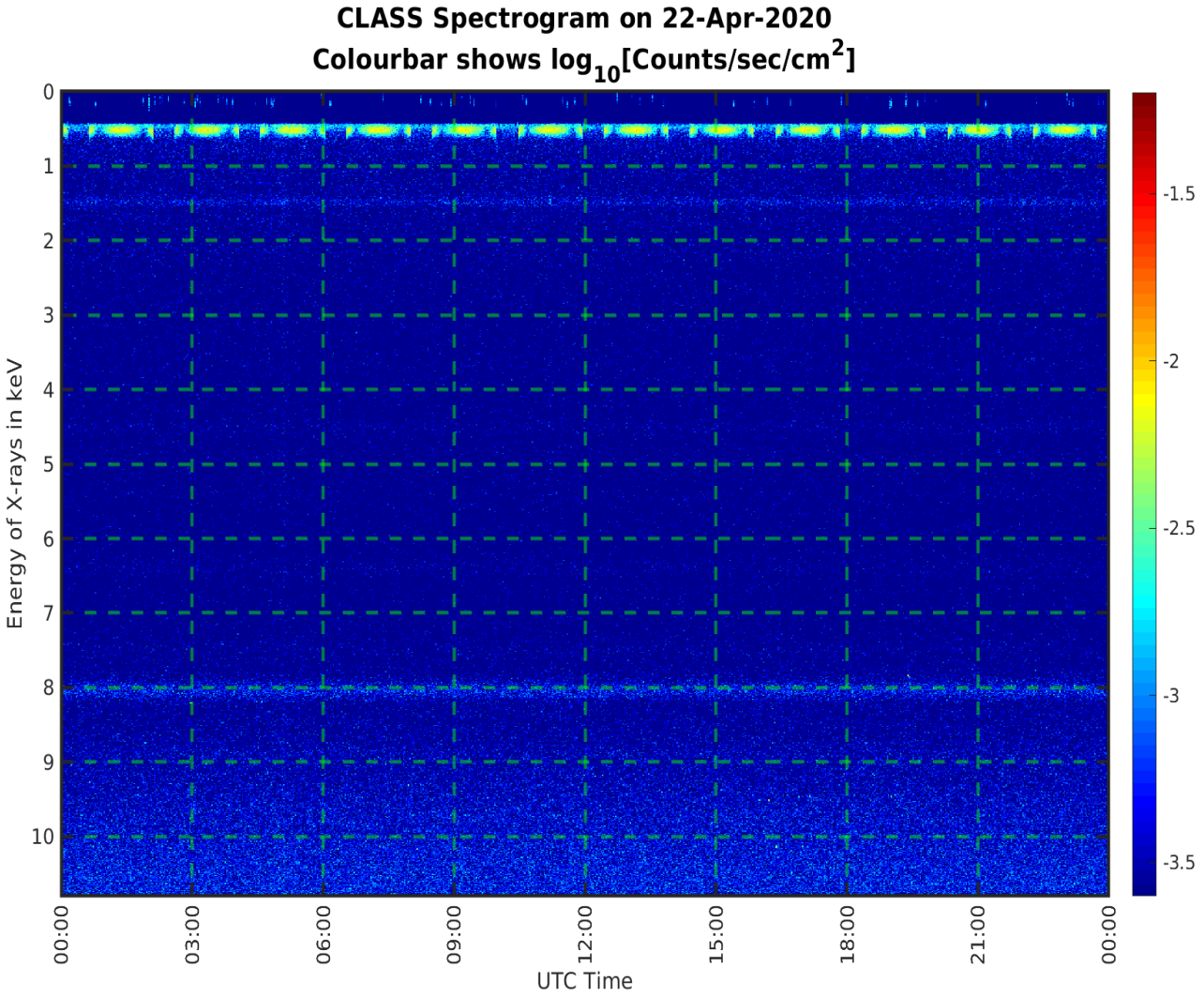
UTC Time


CLASS Spectrogram on 22-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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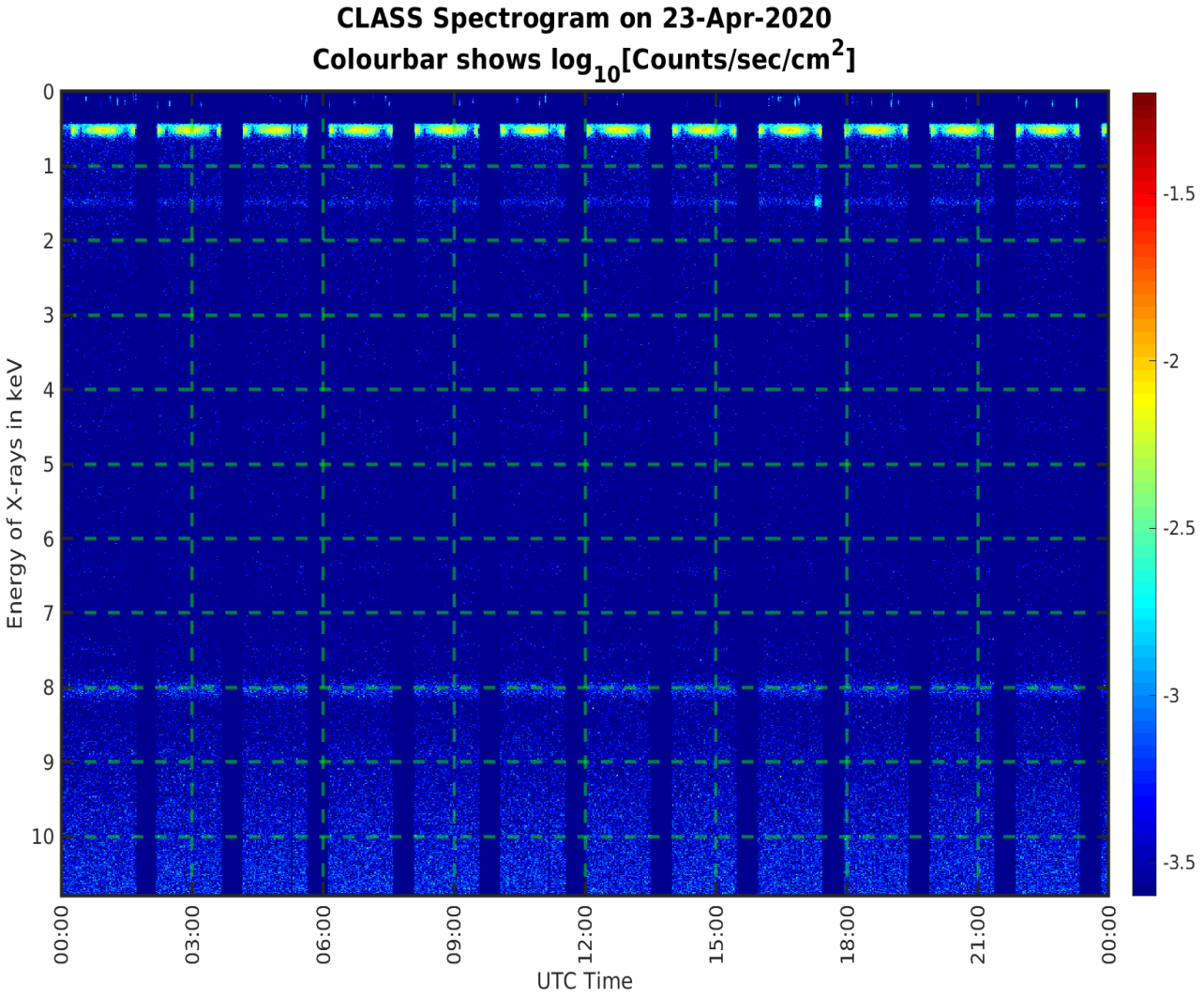
UTC Time


CLASS Spectrogram on 23-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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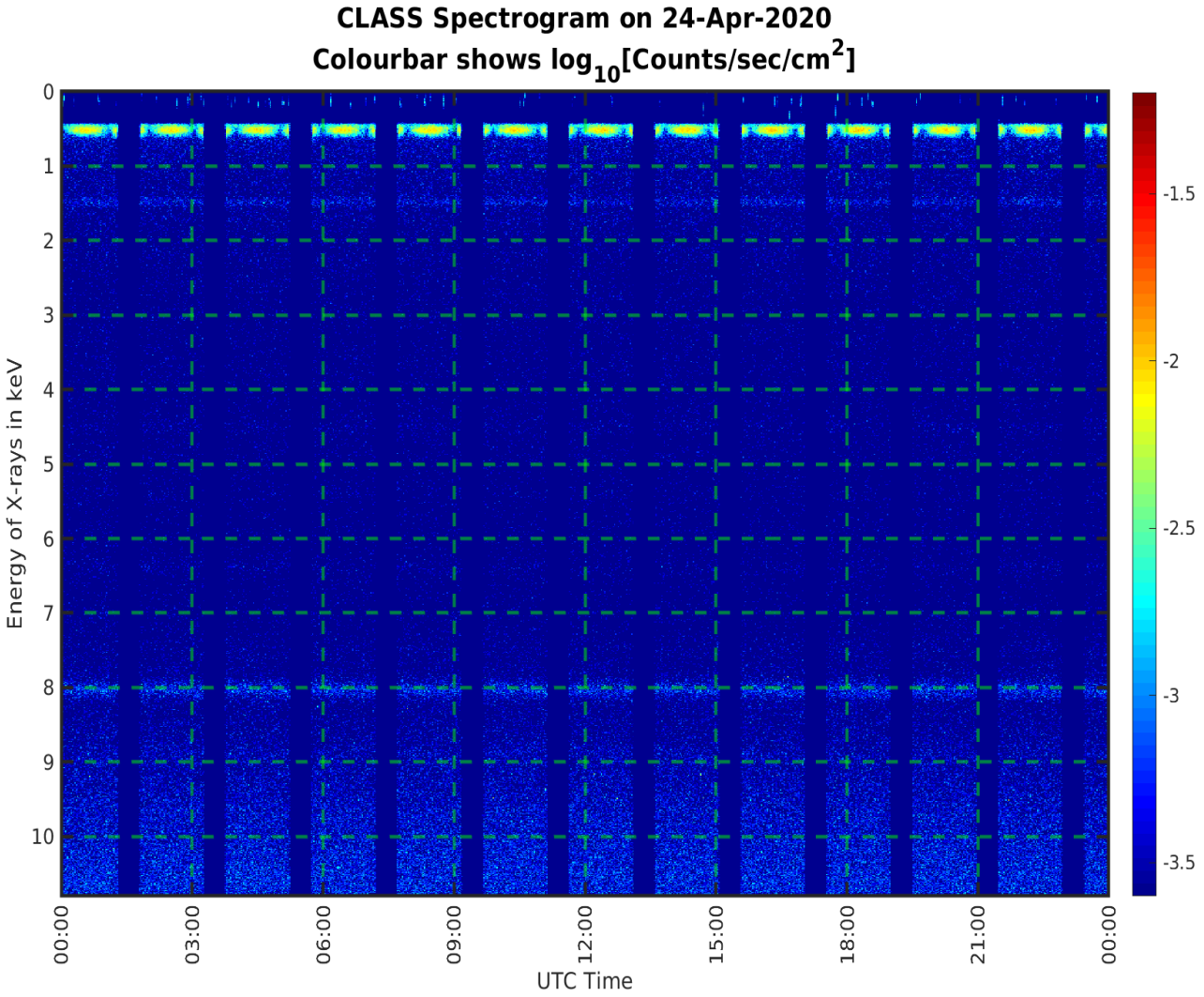
CLASS Spectrogram on 24-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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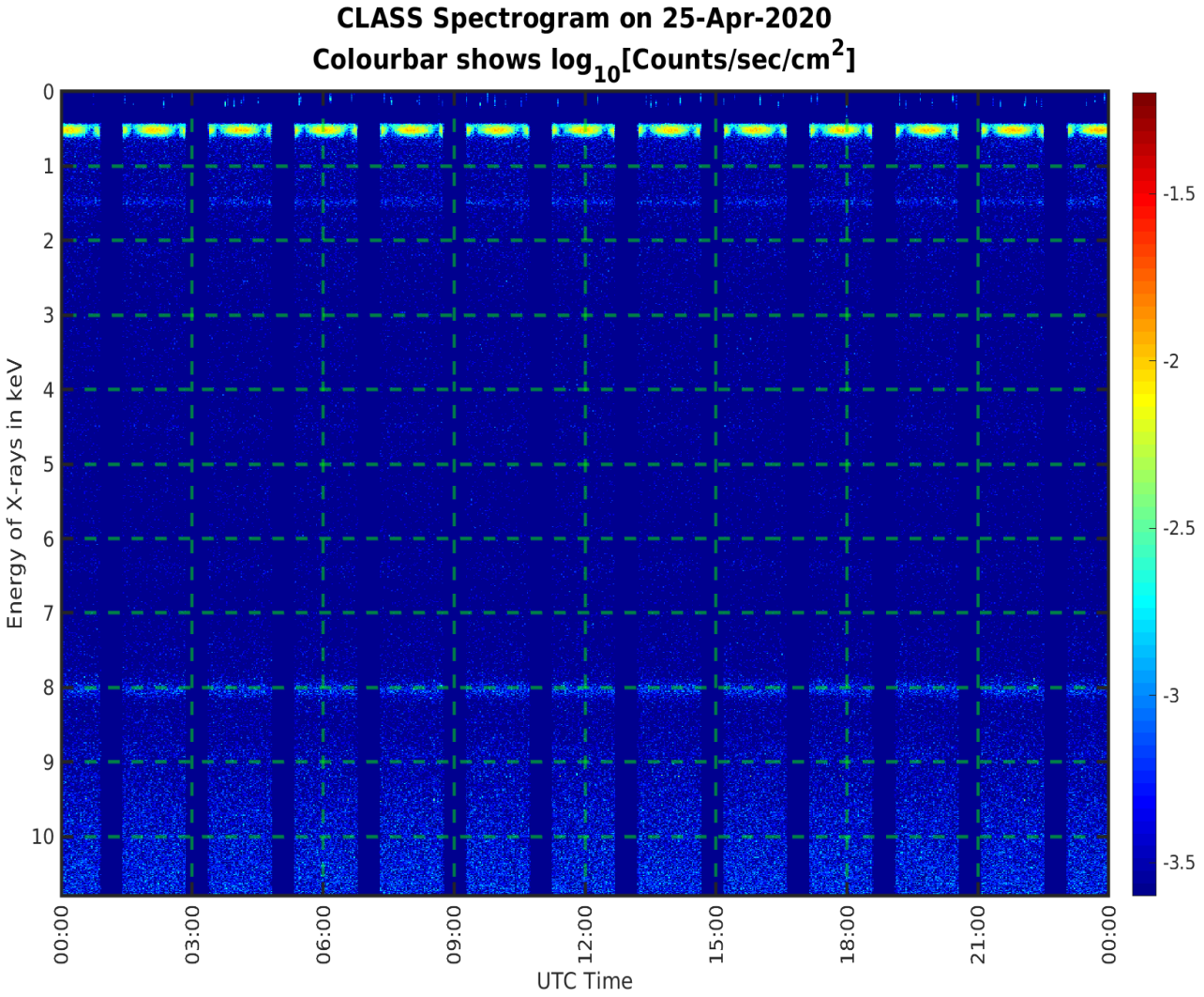
CLASS Spectrogram on 25-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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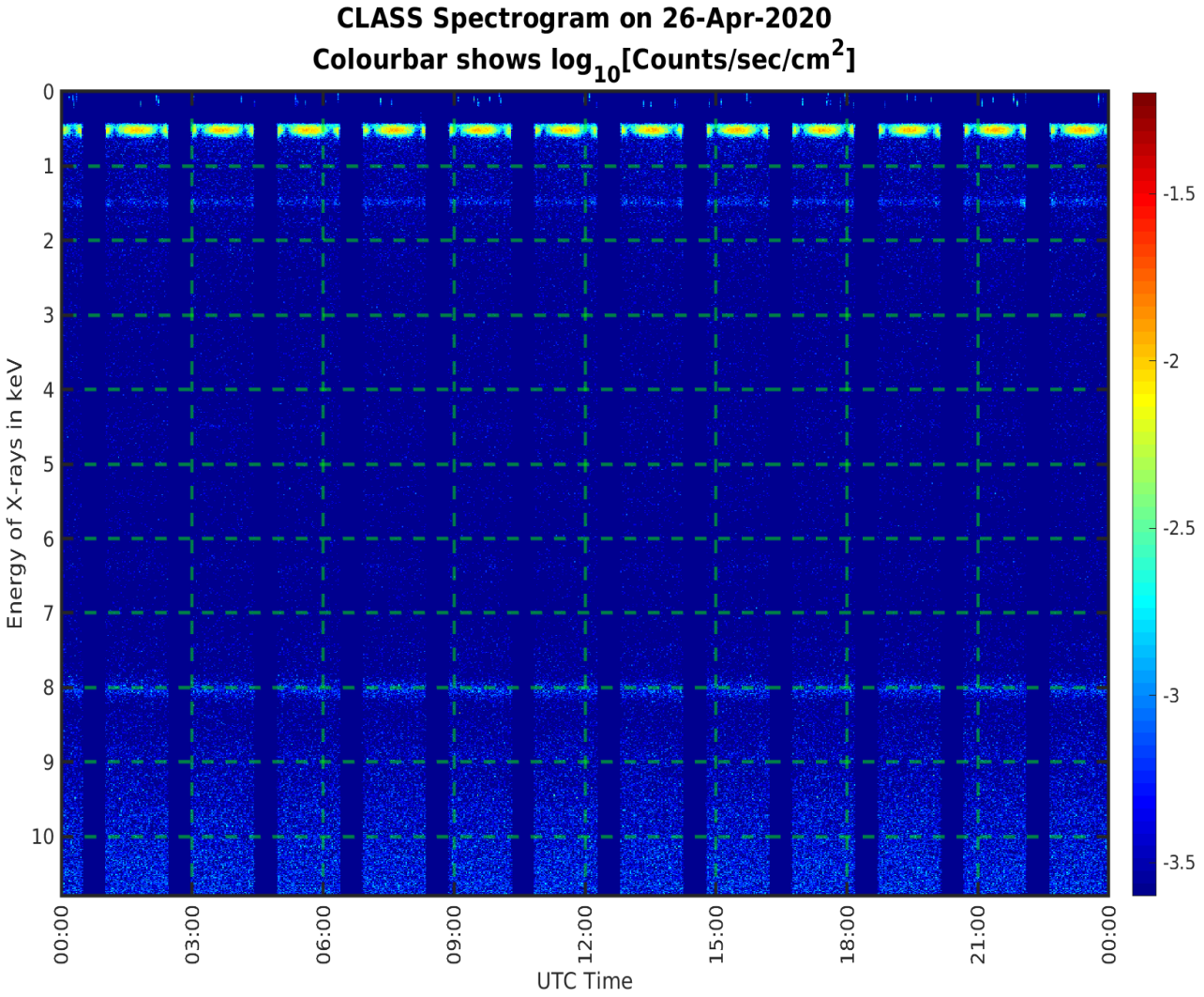
UTC Time


CLASS Spectrogram on 26-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
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-1.5
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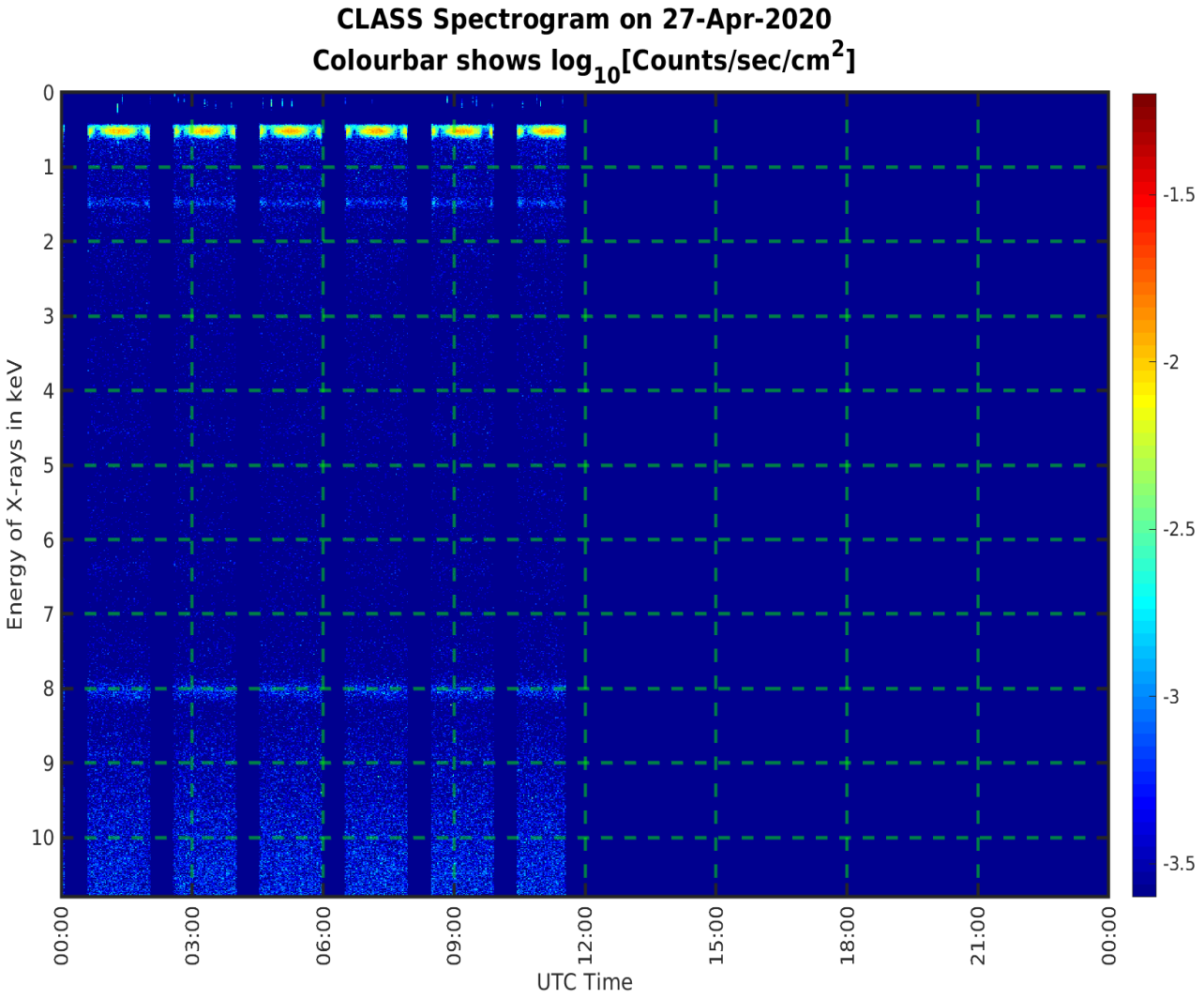
UTC Time


CLASS Spectrogram on 27-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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-2.5
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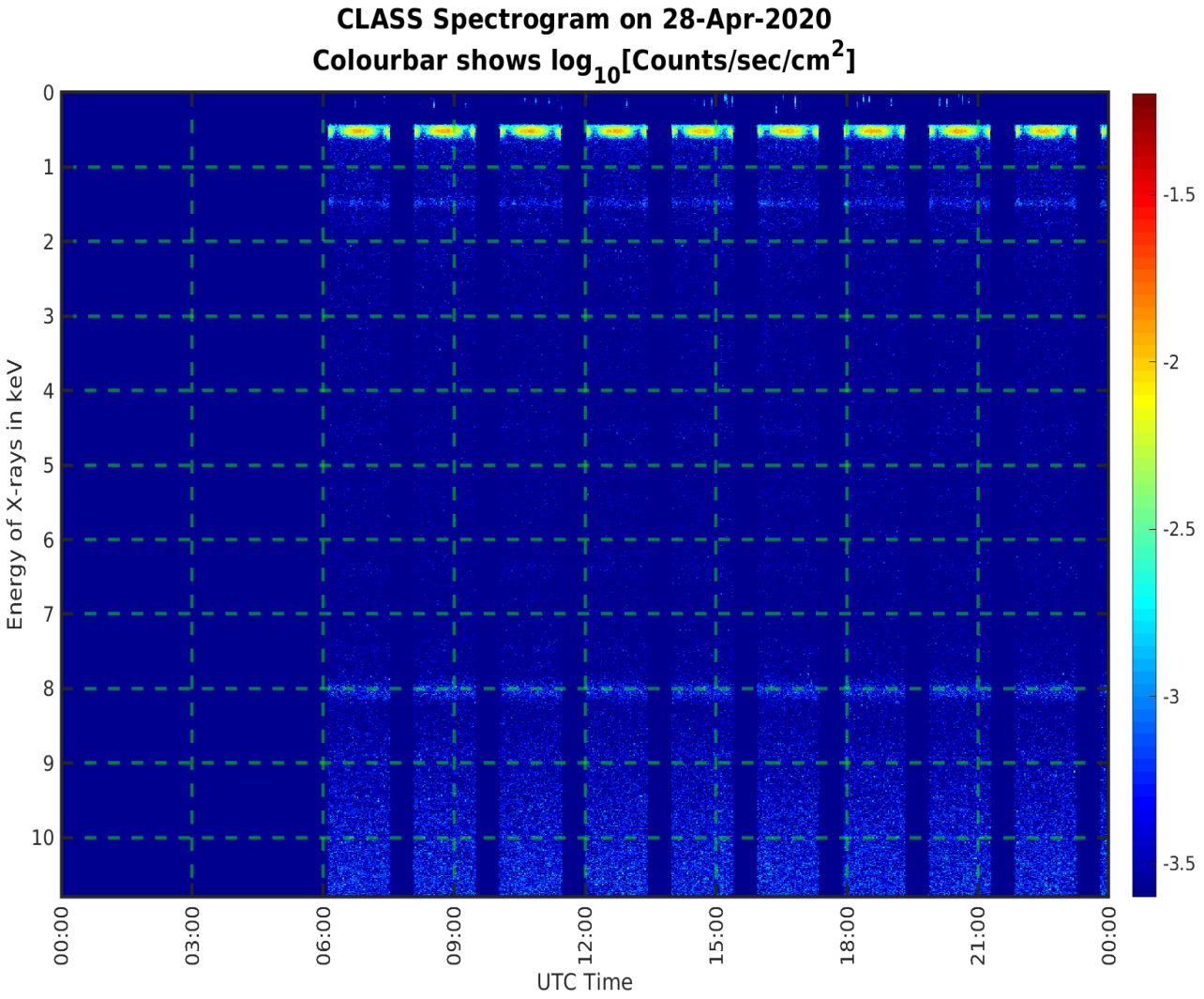
UTC Time


CLASS Spectrogram on 28-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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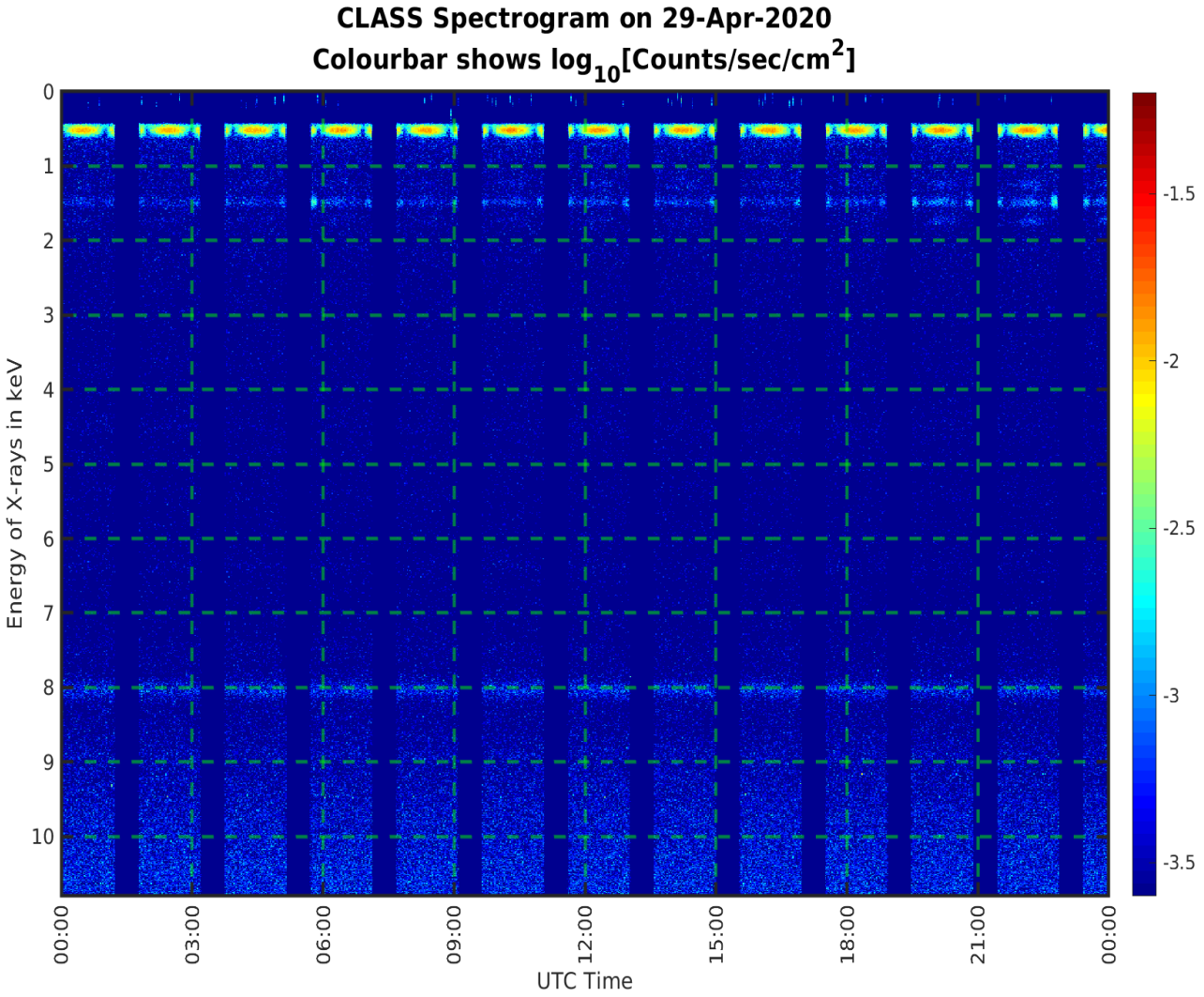
UTC Time


CLASS Spectrogram on 29-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
-2.5
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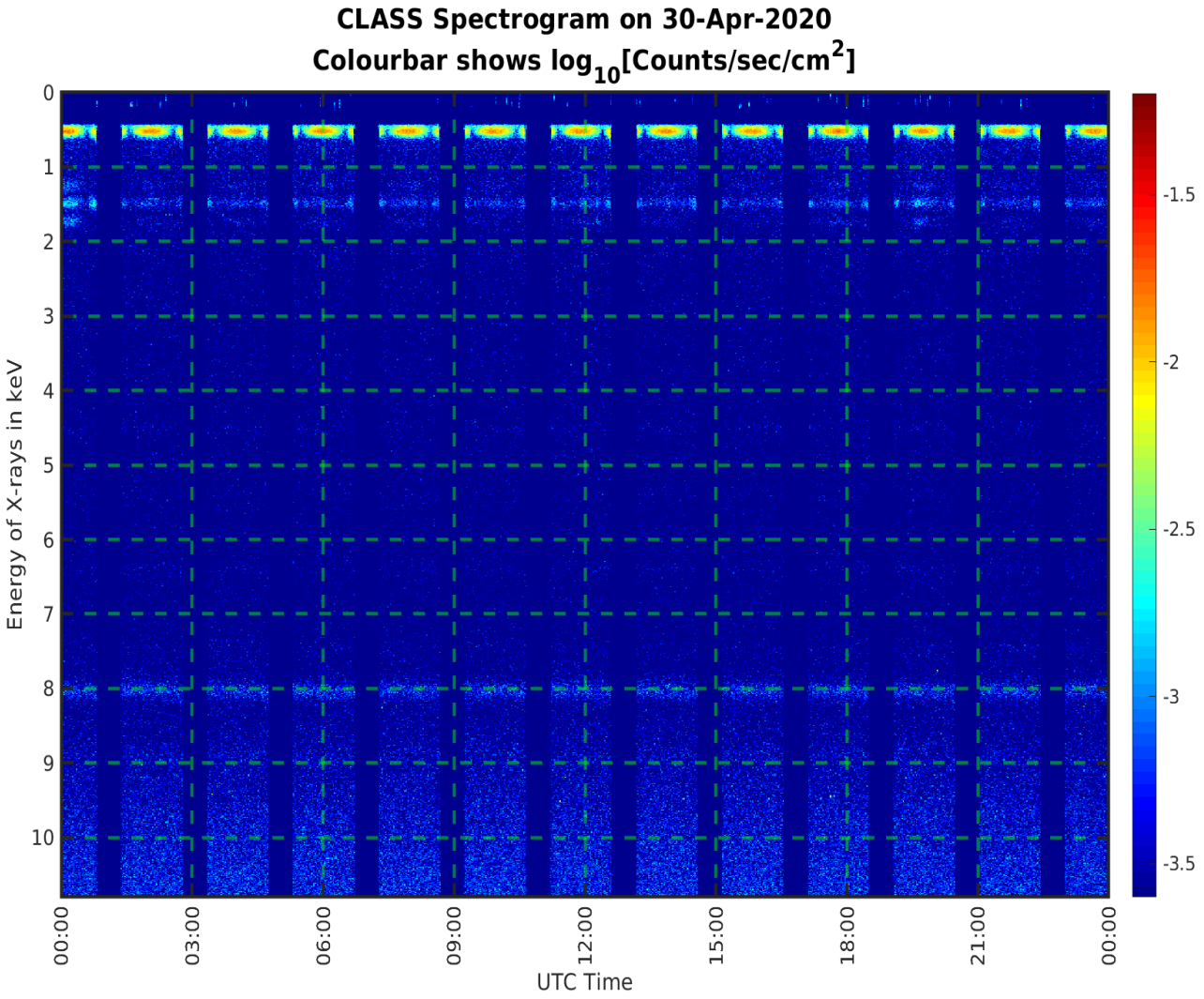
UTC Time


CLASS Spectrogram on 30-Apr-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
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-1.5
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-2.5
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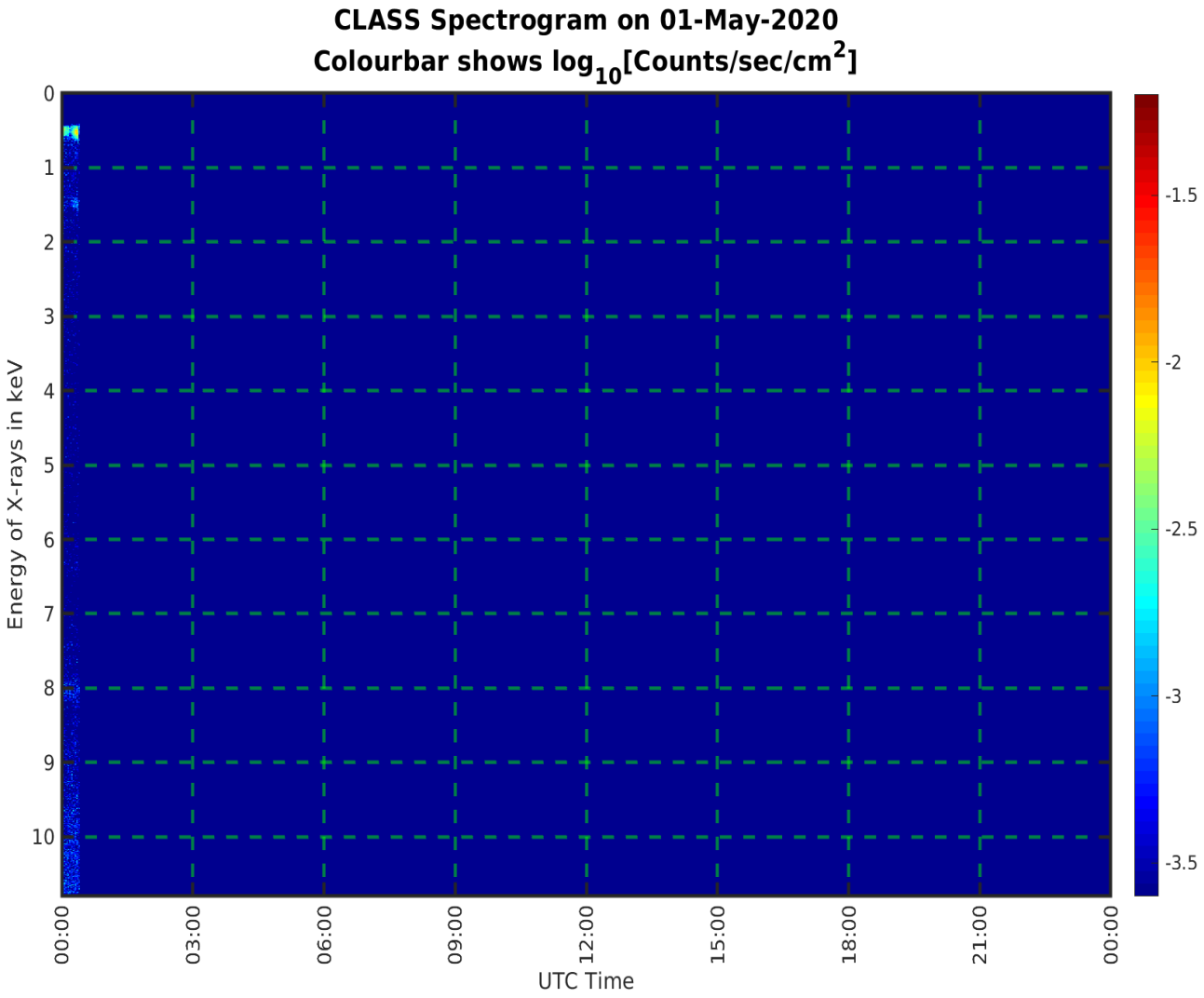
UTC Time


CLASS Spectrogram on 01-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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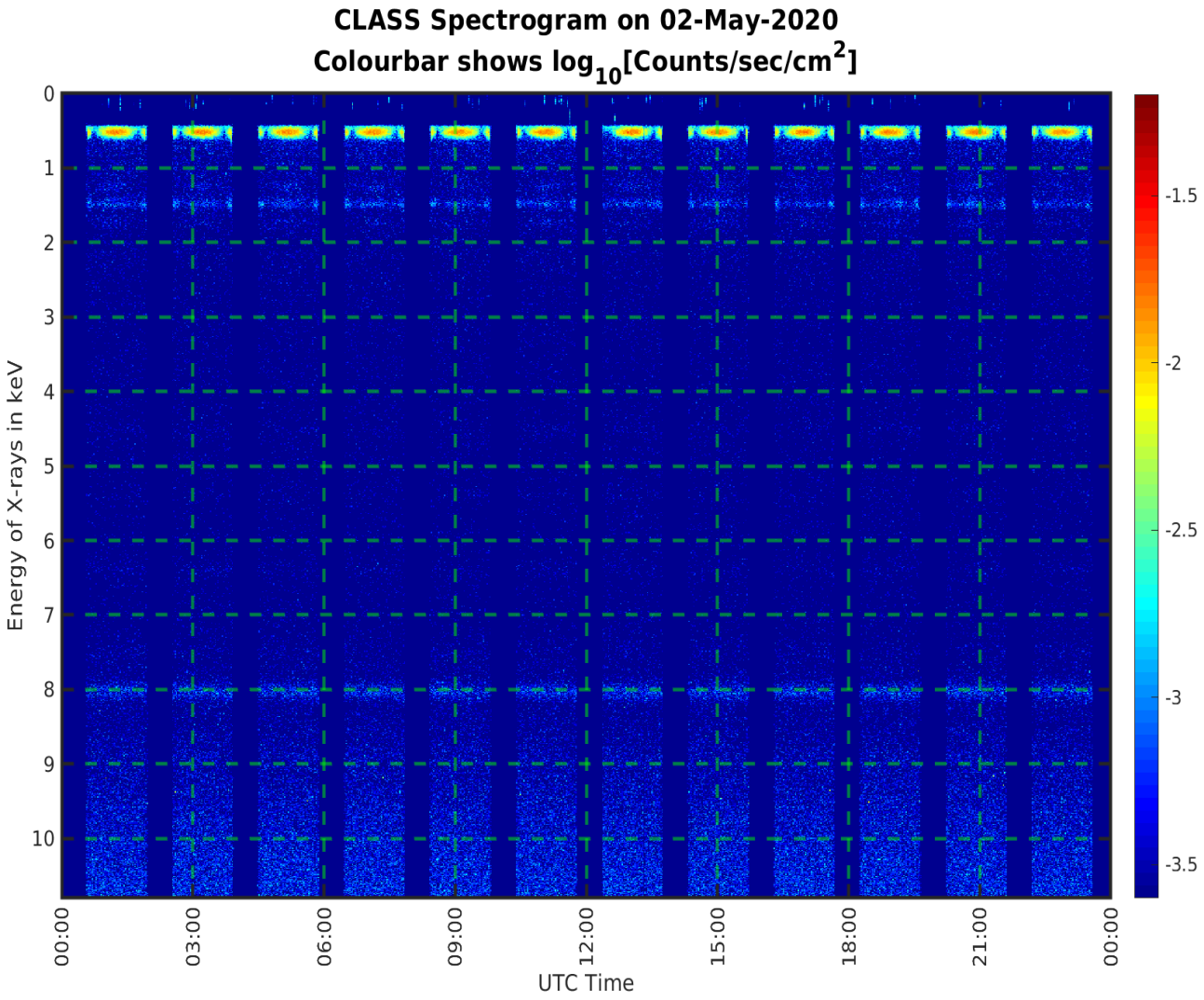
CLASS Spectrogram on 02-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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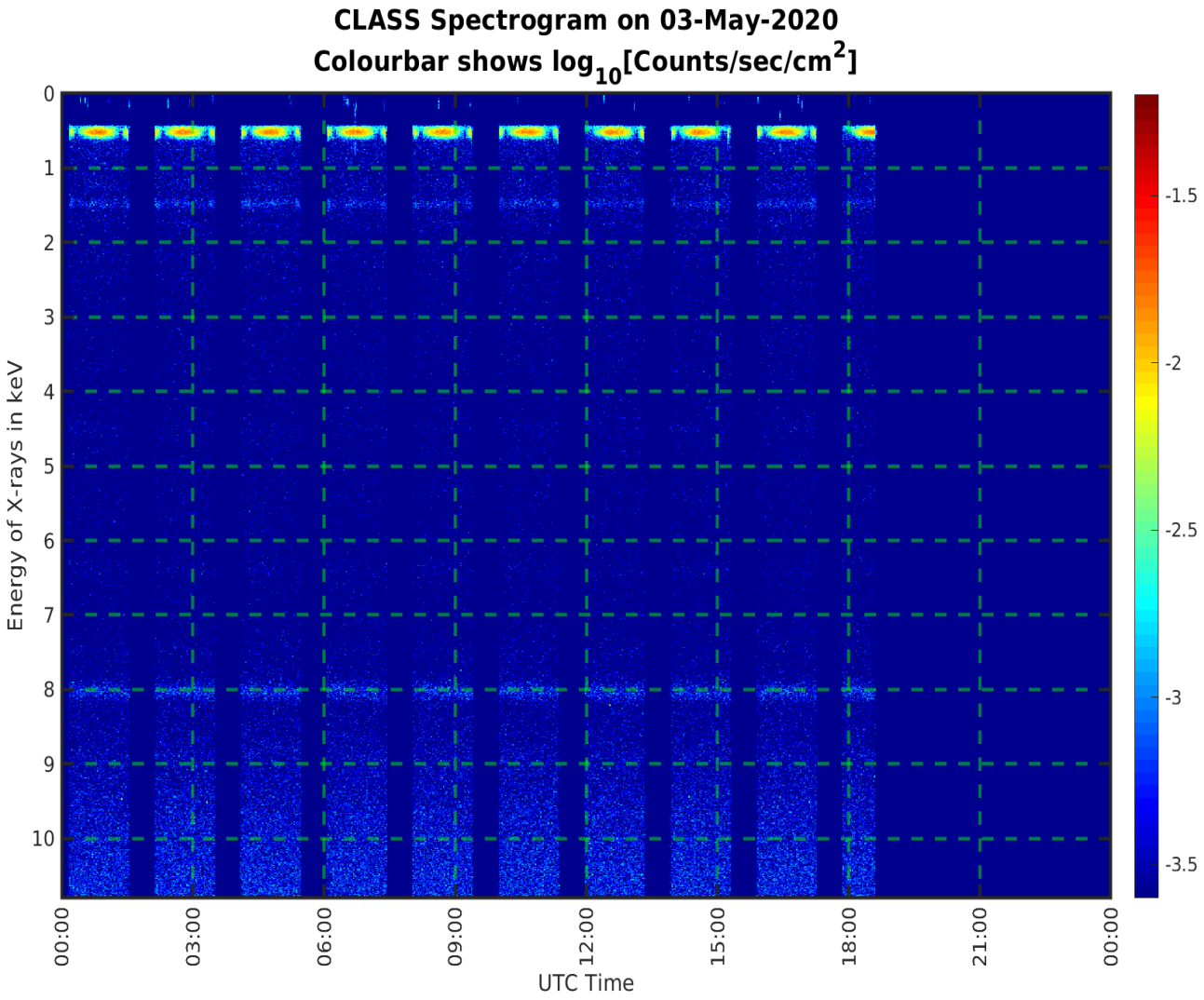
UTC Time


CLASS Spectrogram on 03-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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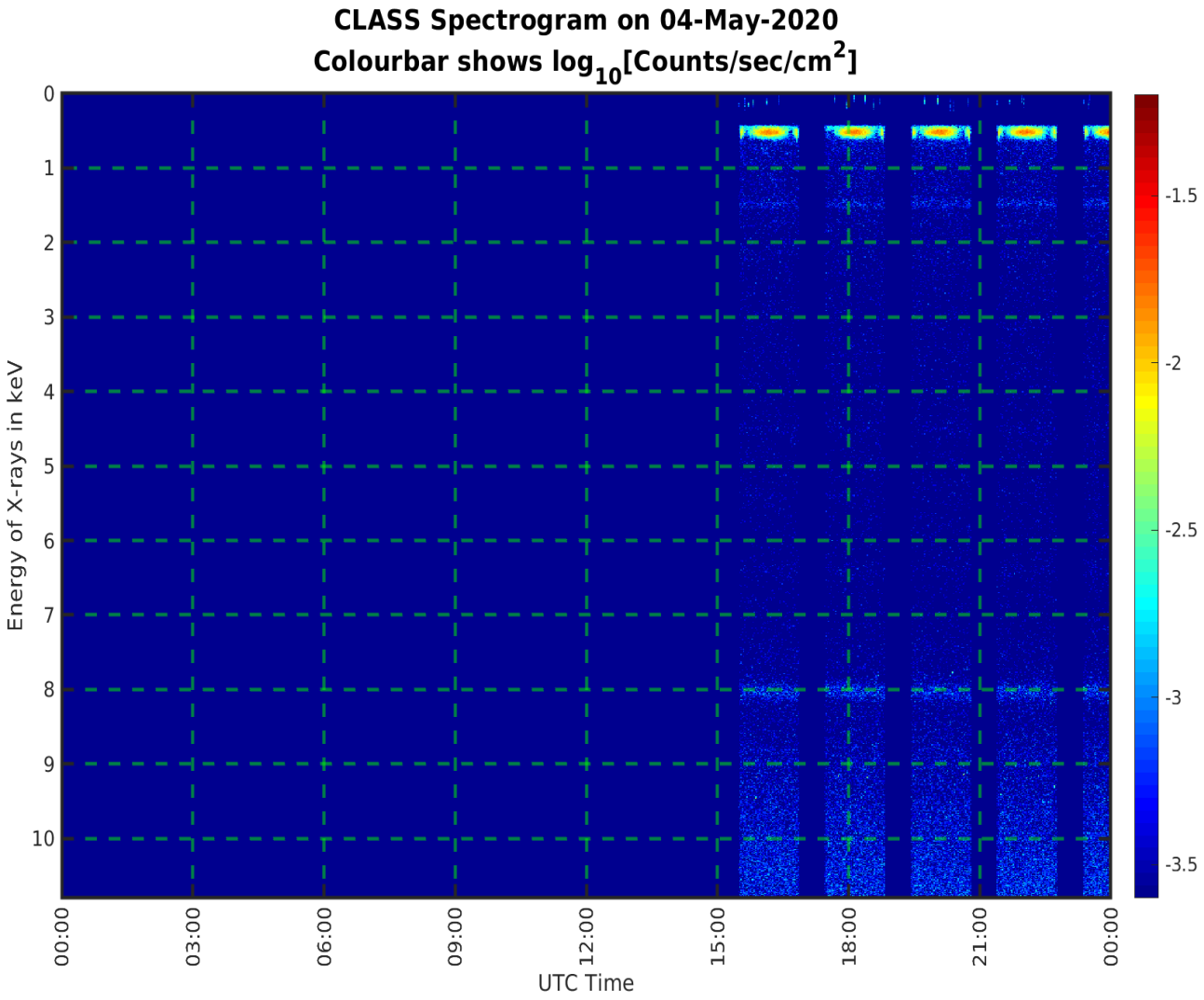
CLASS Spectrogram on 04-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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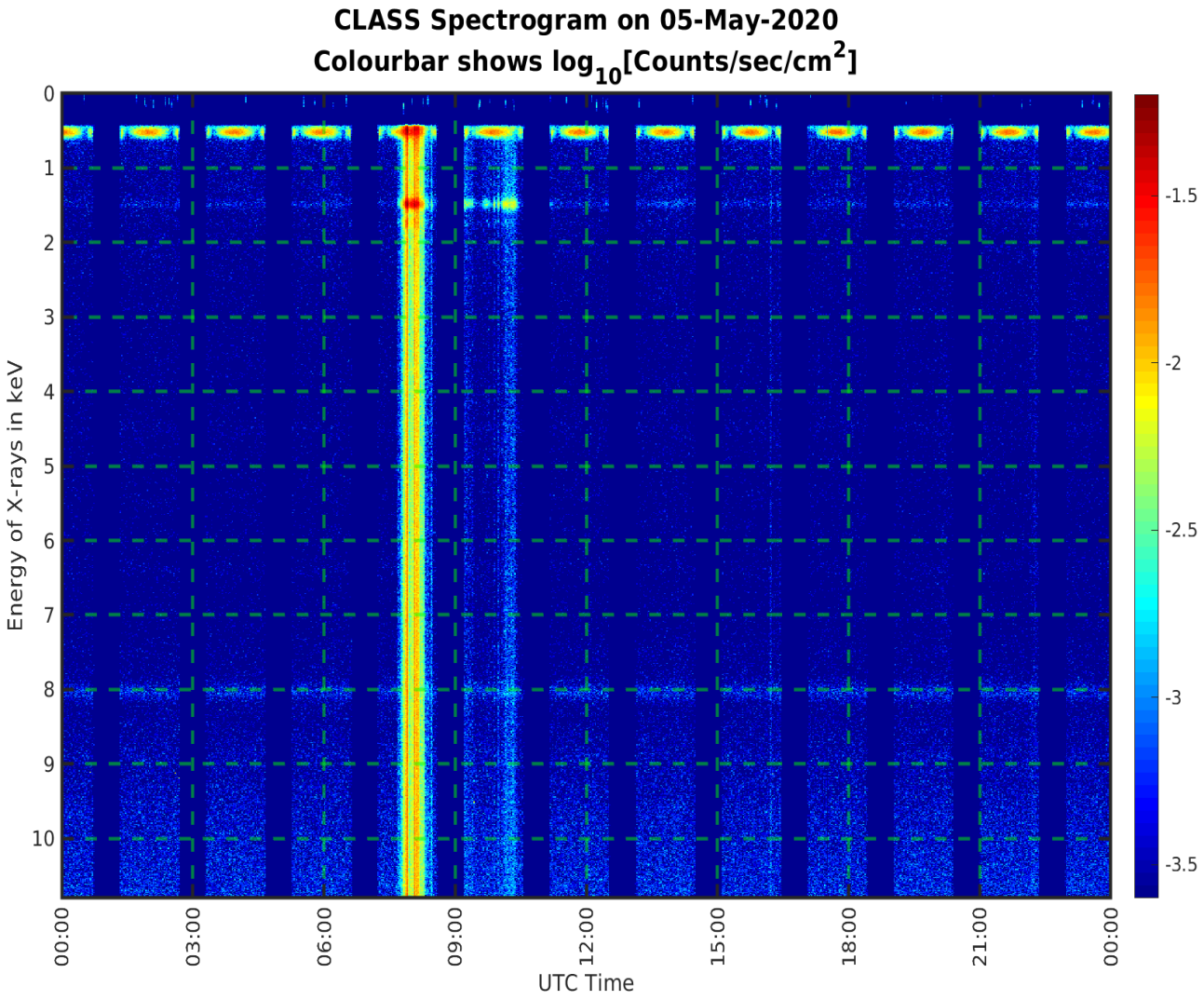
CLASS Spectrogram on 05-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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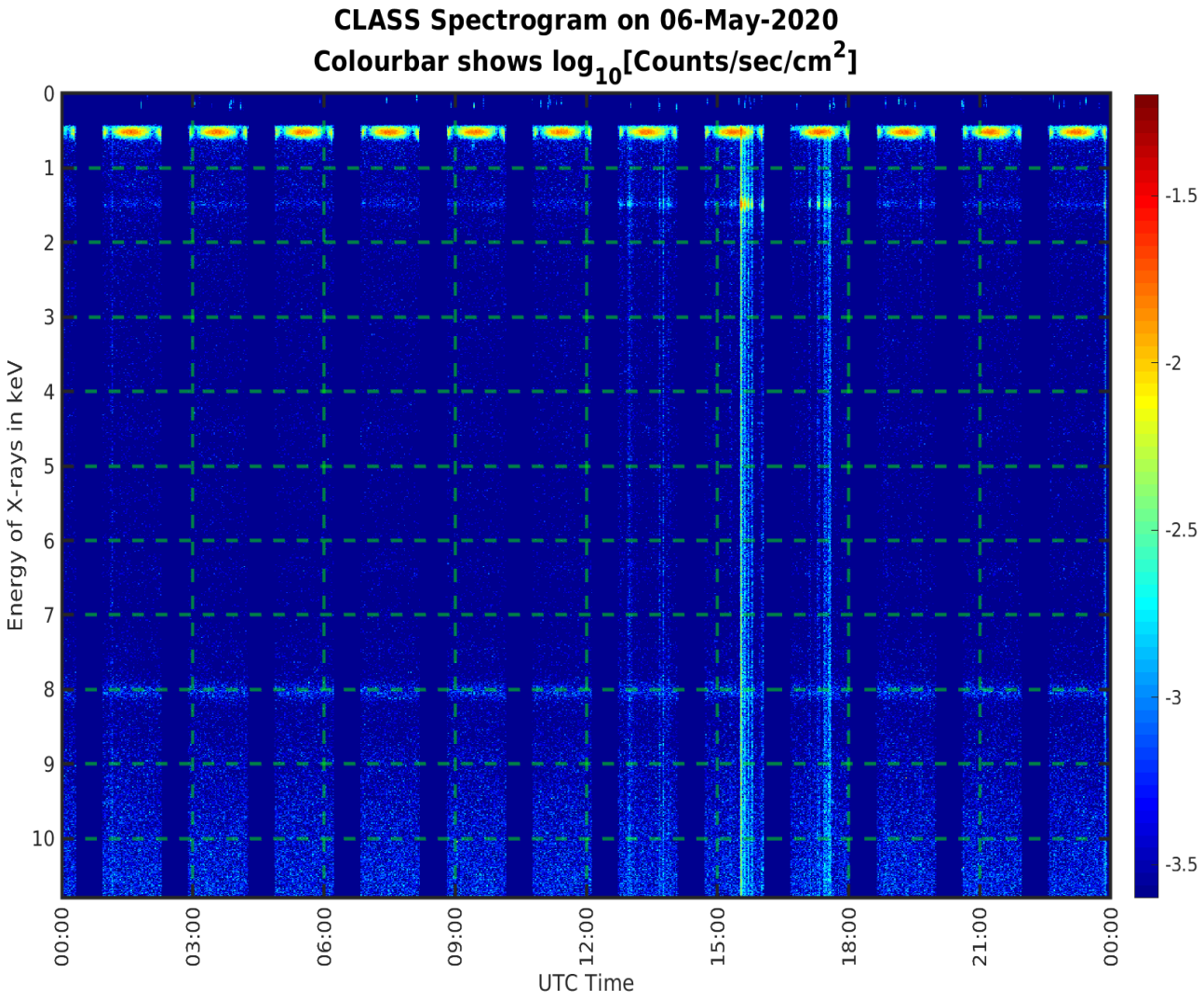
CLASS Spectrogram on 06-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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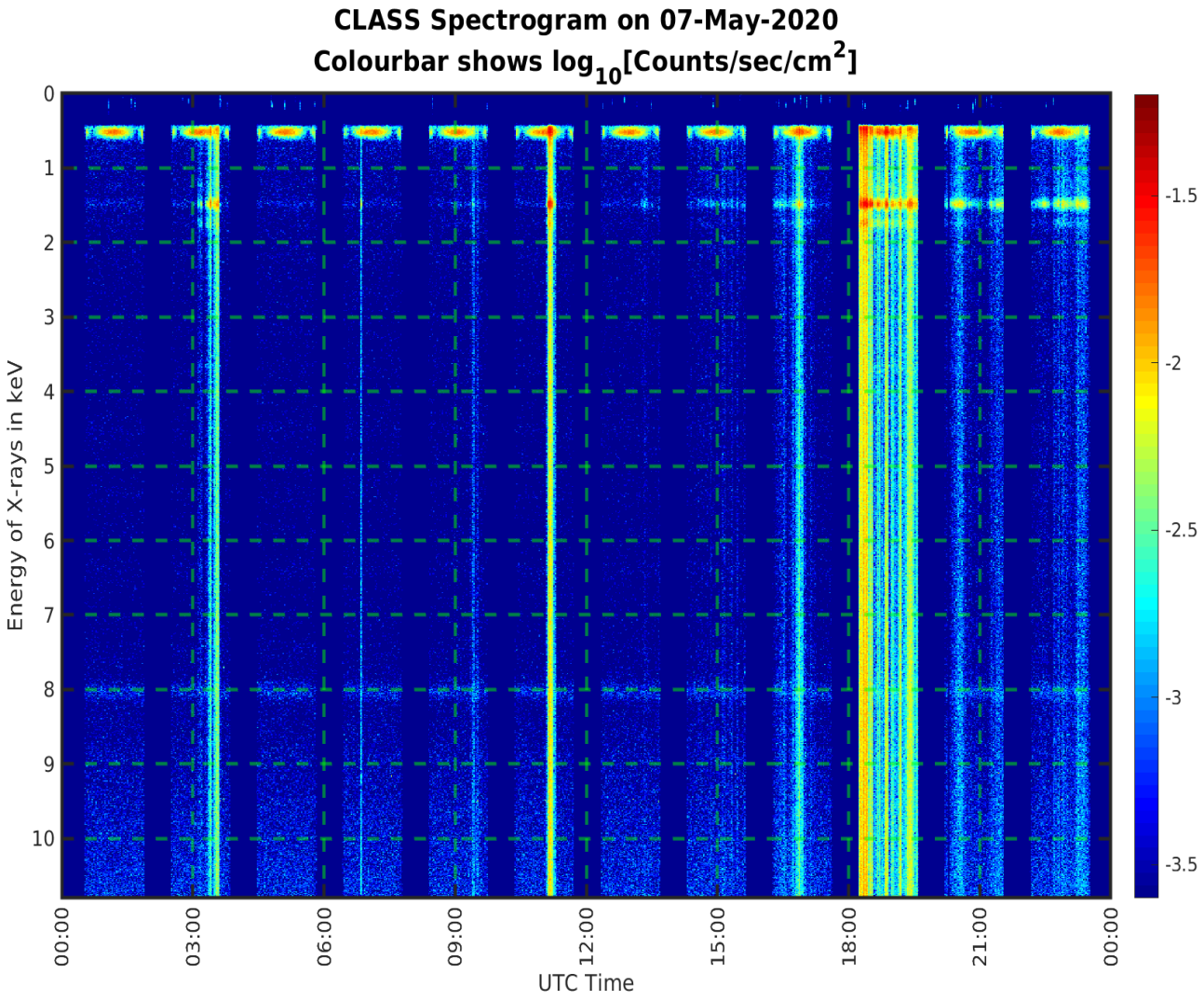
CLASS Spectrogram on 07-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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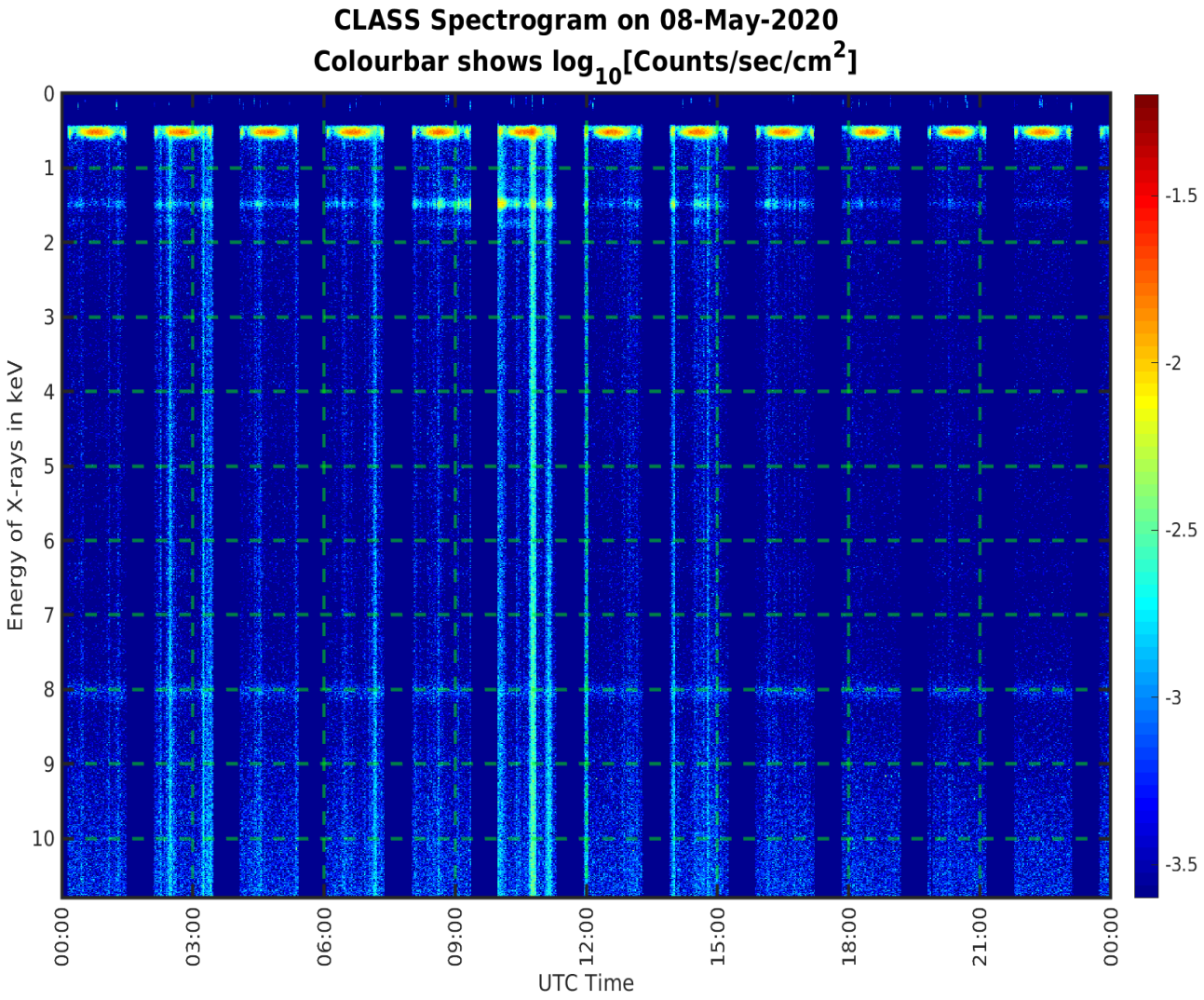
CLASS Spectrogram on 08-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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UTC Time
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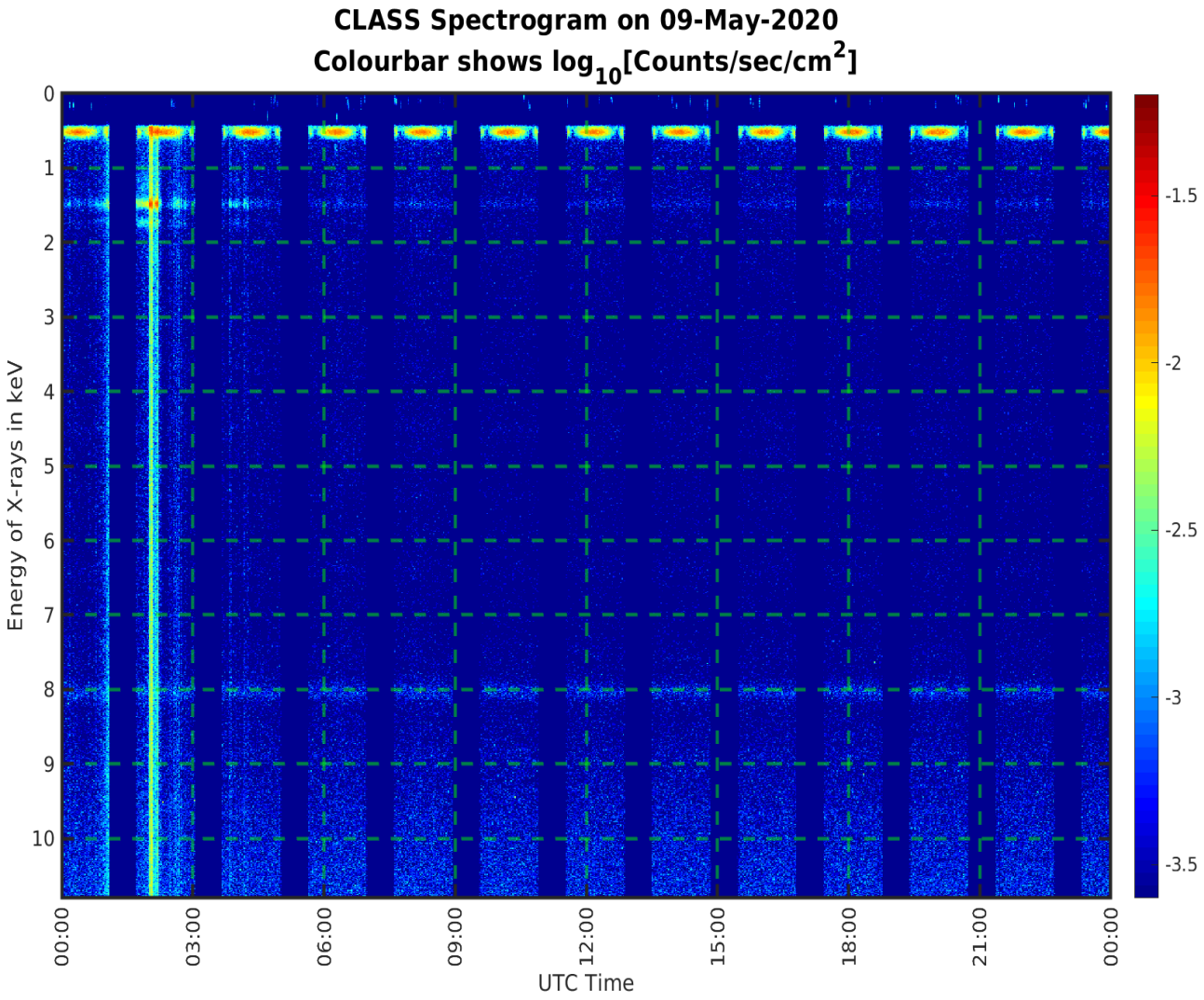
CLASS Spectrogram on 09-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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03:00
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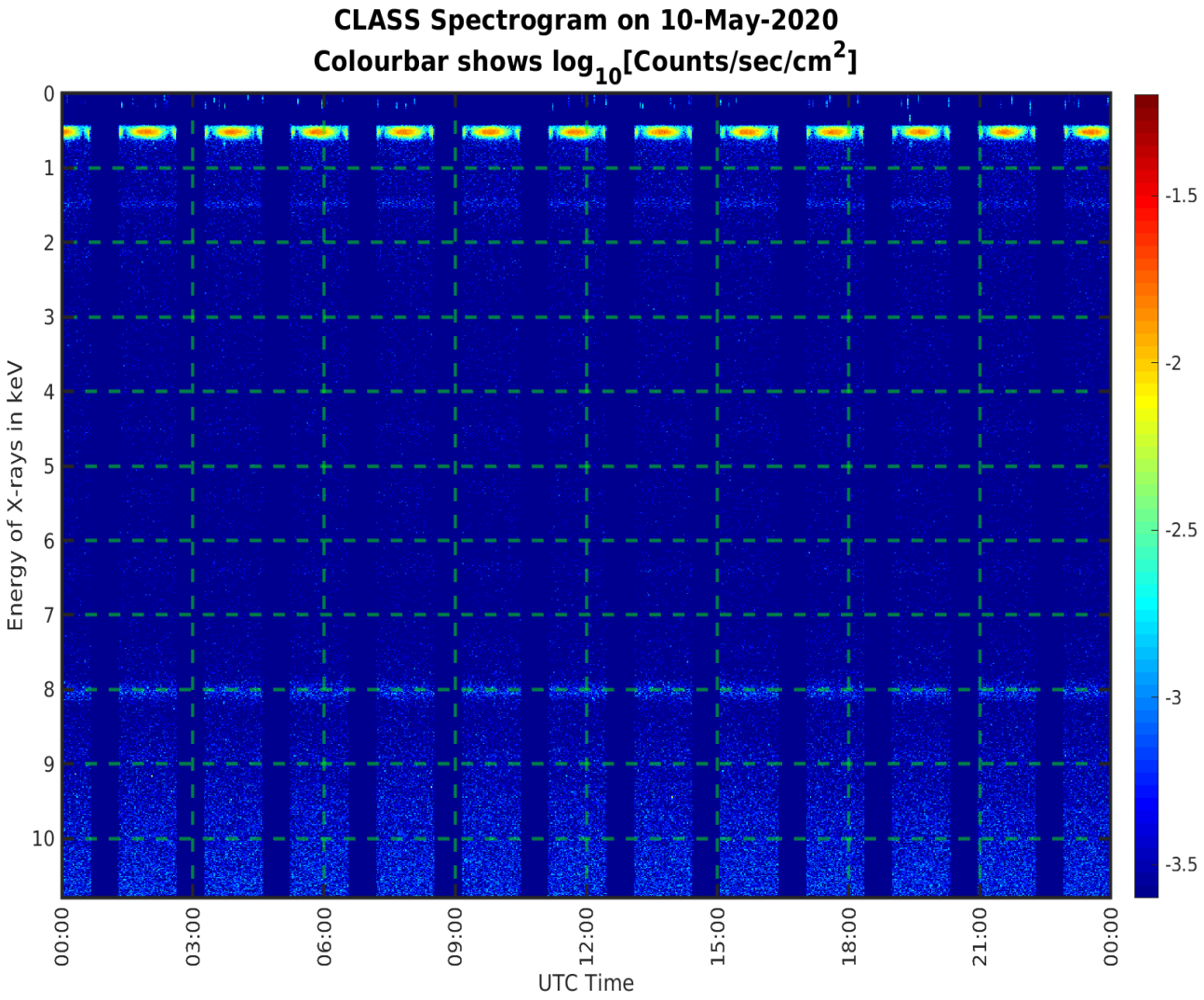
CLASS Spectrogram on 10-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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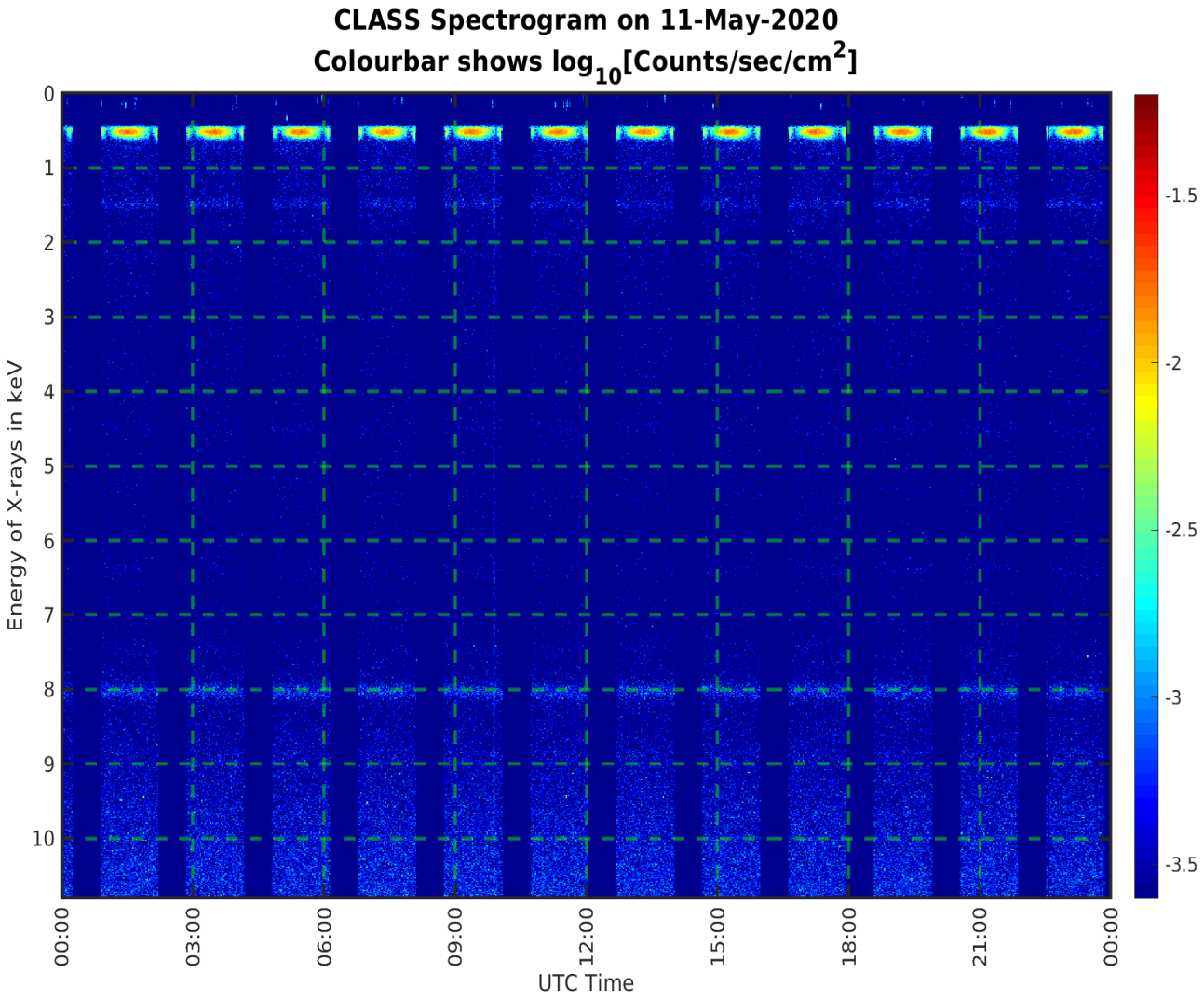
CLASS Spectrogram on 11-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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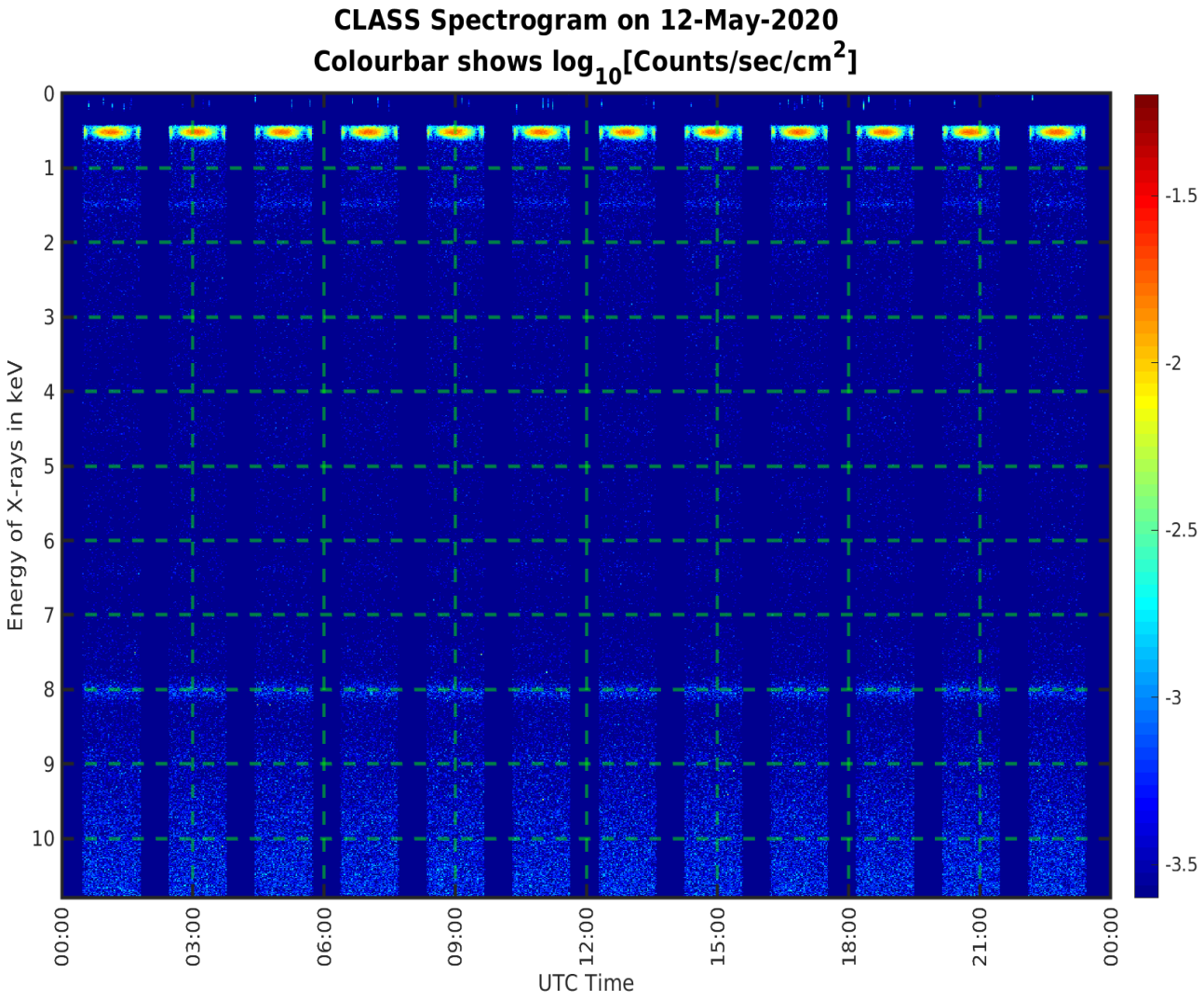
CLASS Spectrogram on 12-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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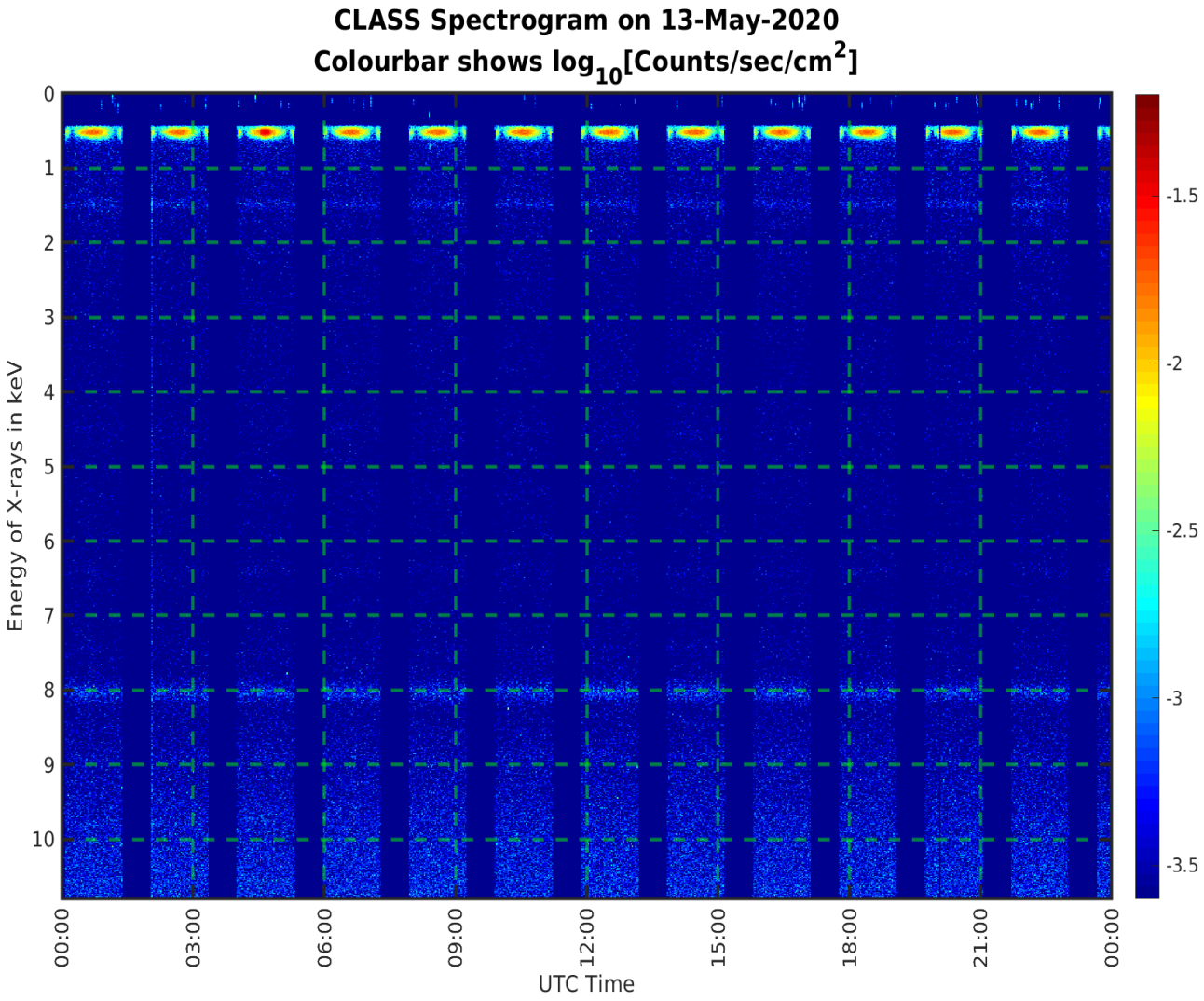
UTC Time


CLASS Spectrogram on 13-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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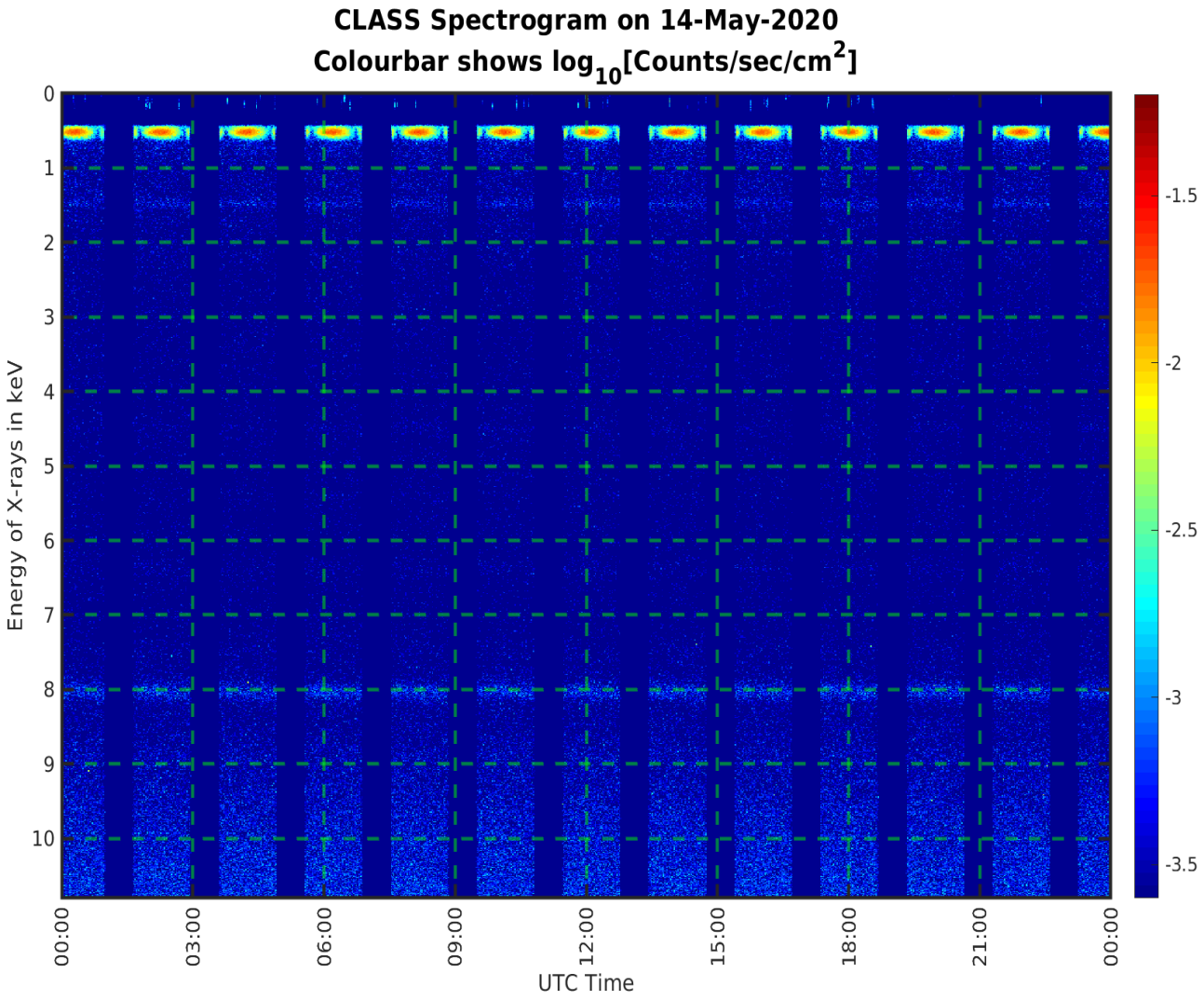
CLASS Spectrogram on 14-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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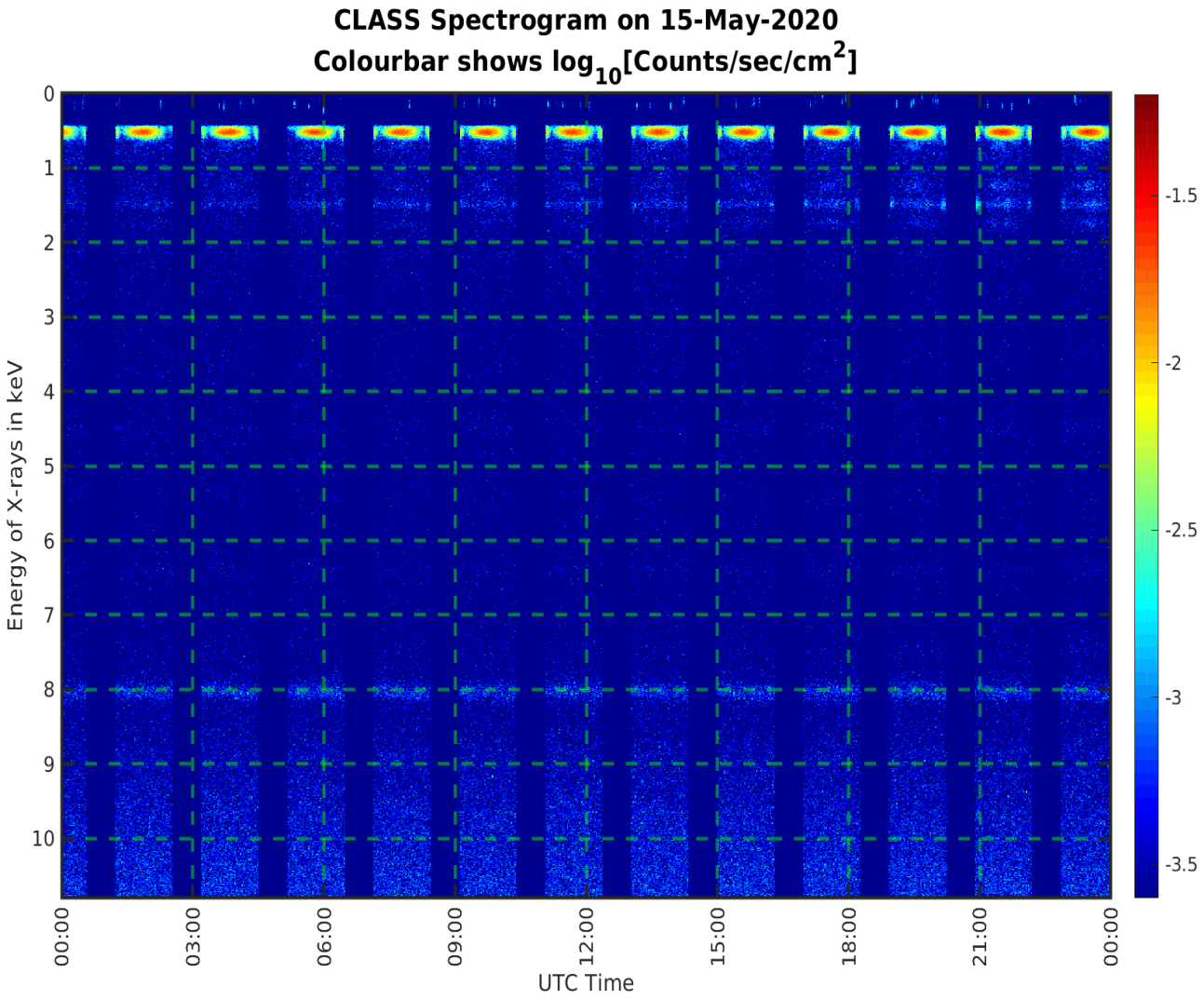
CLASS Spectrogram on 15-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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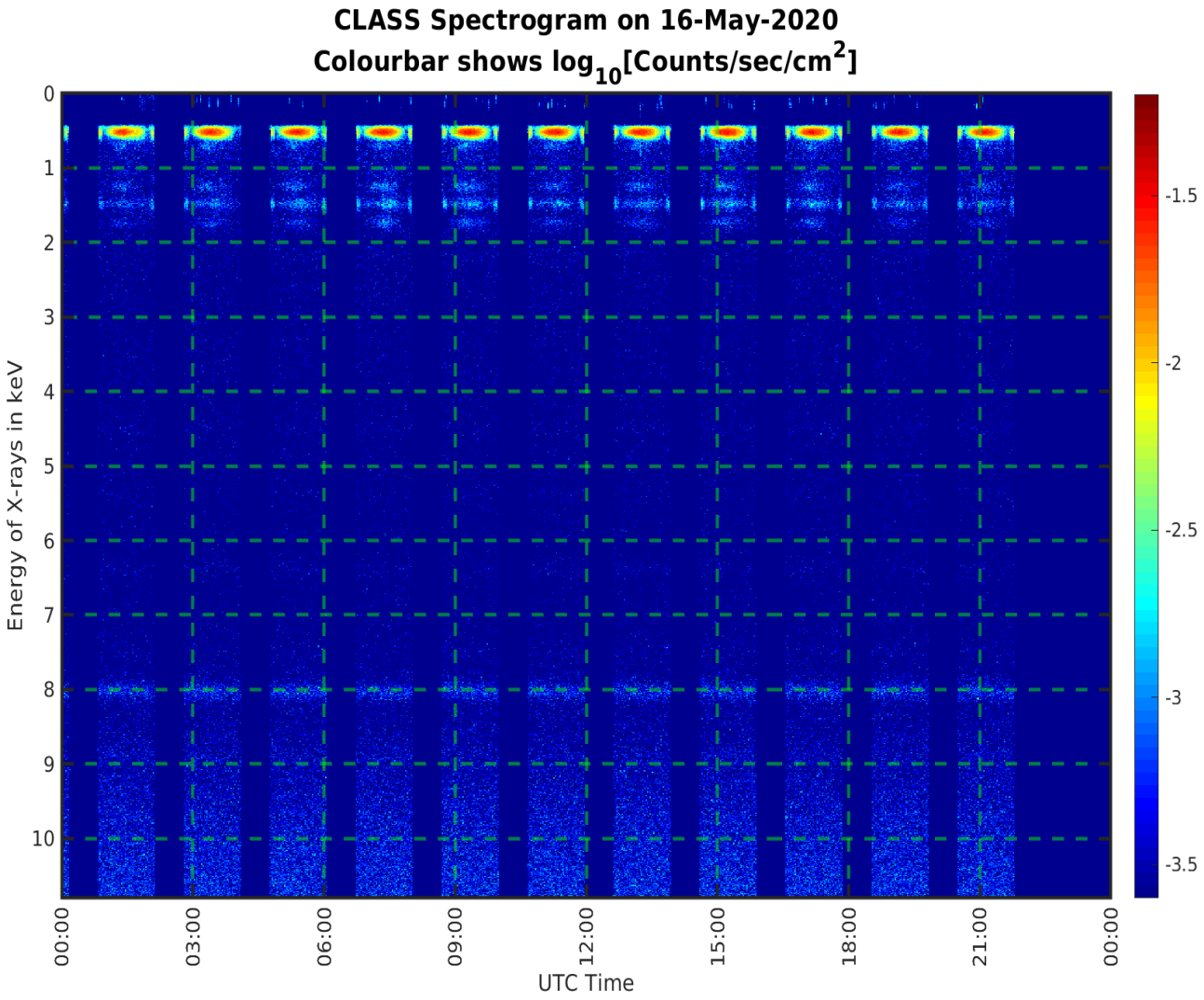
CLASS Spectrogram on 16-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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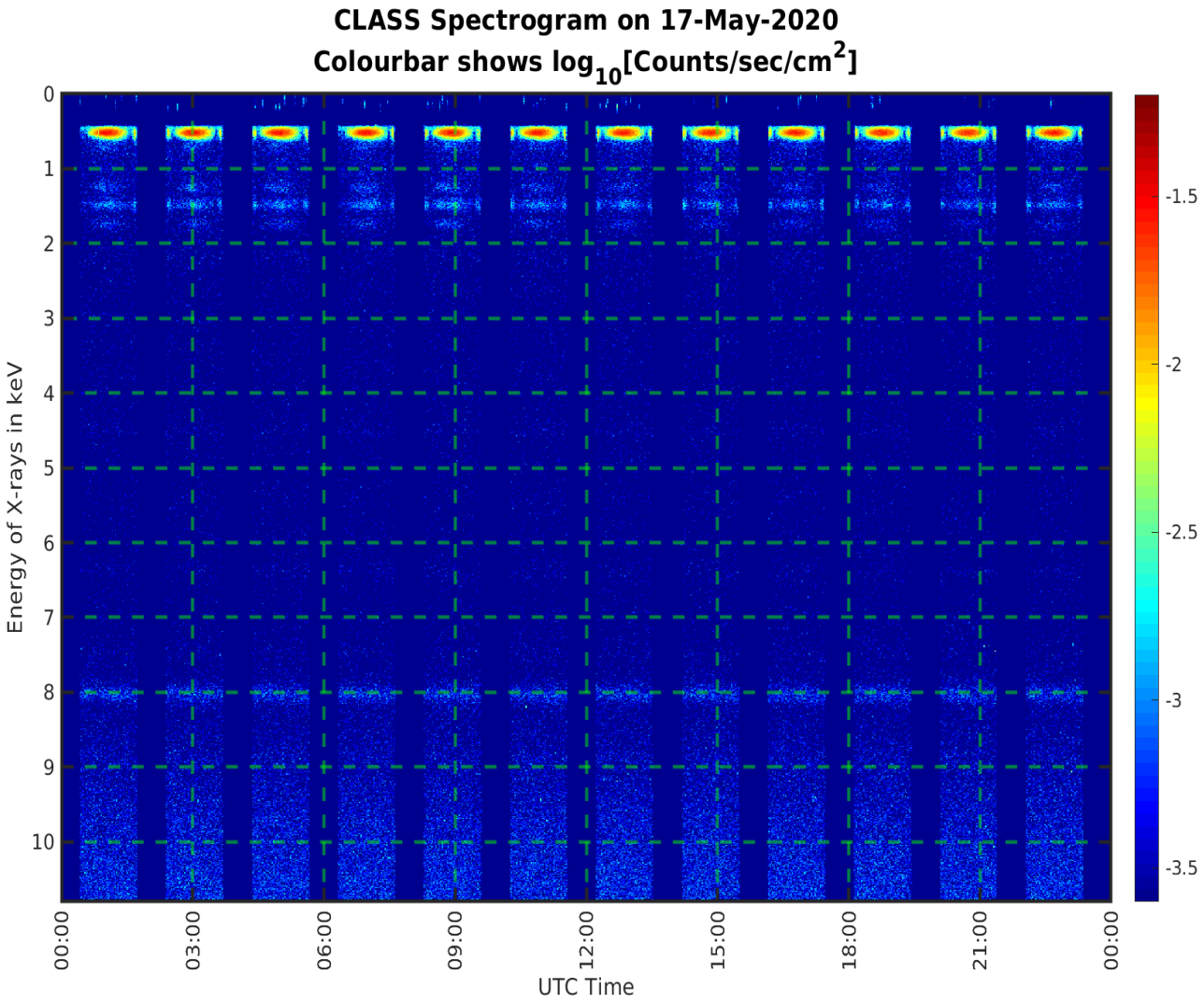
CLASS Spectrogram on 17-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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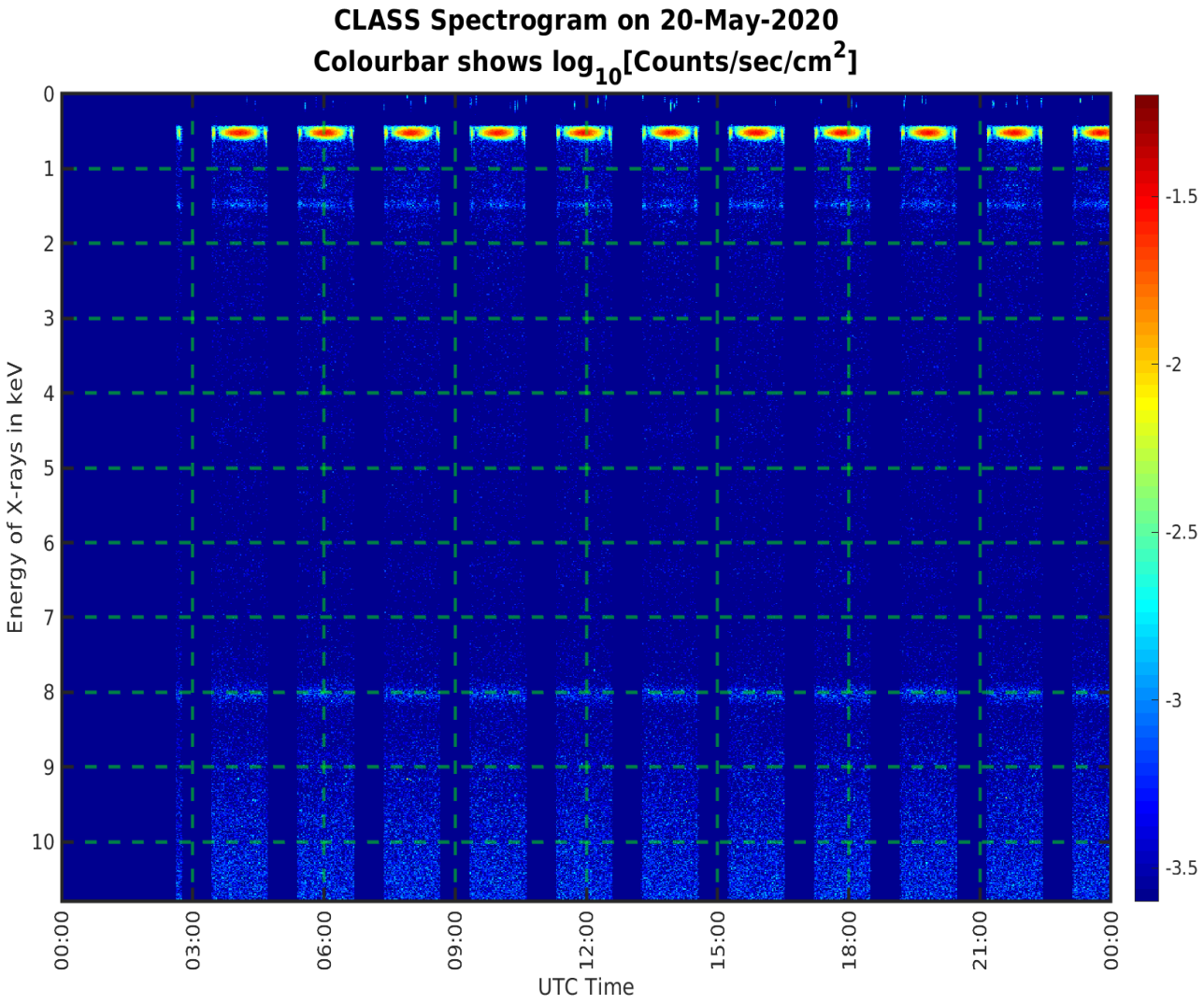
CLASS Spectrogram on 20-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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UTC Time
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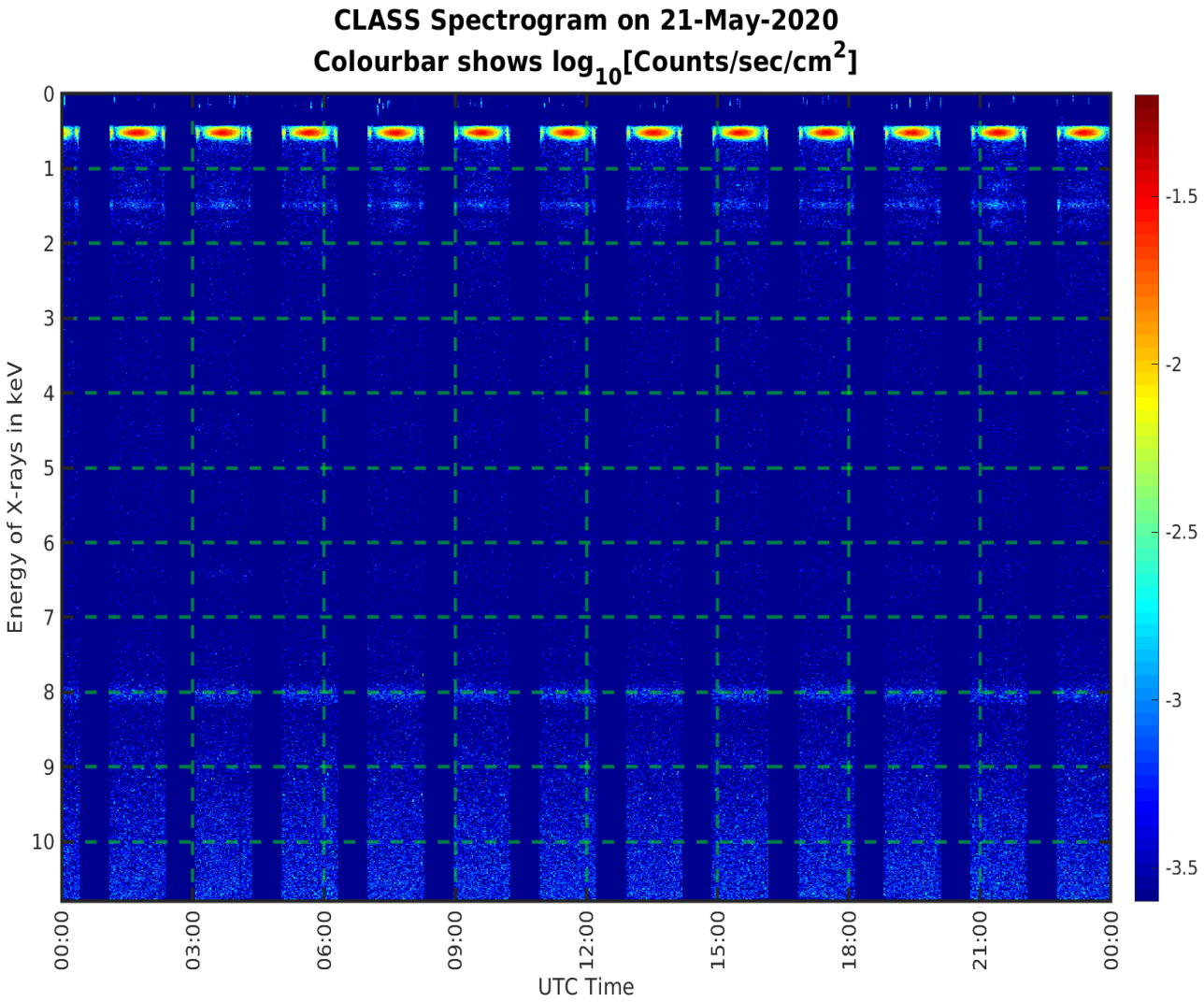
CLASS Spectrogram on 21-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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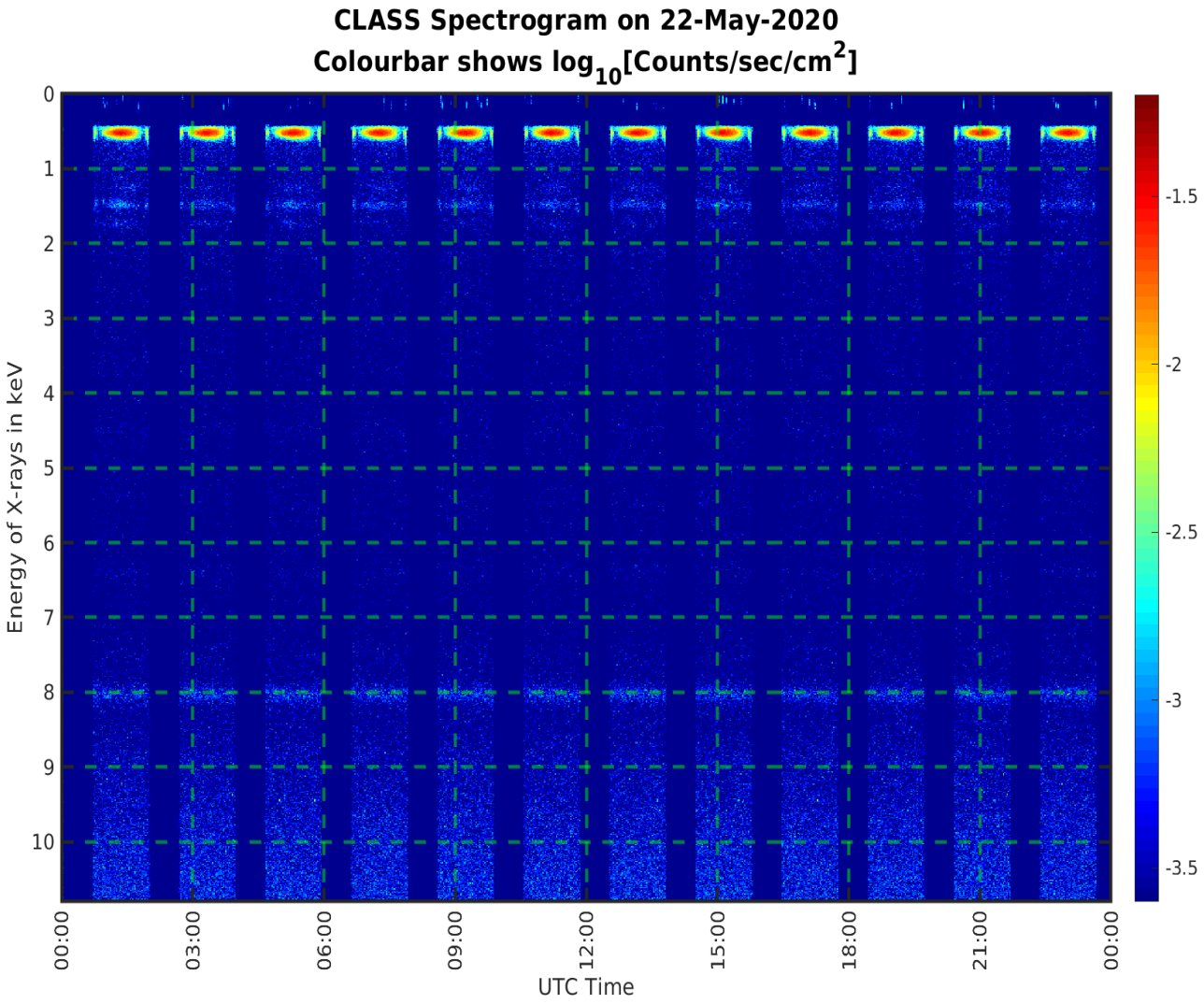
CLASS Spectrogram on 22-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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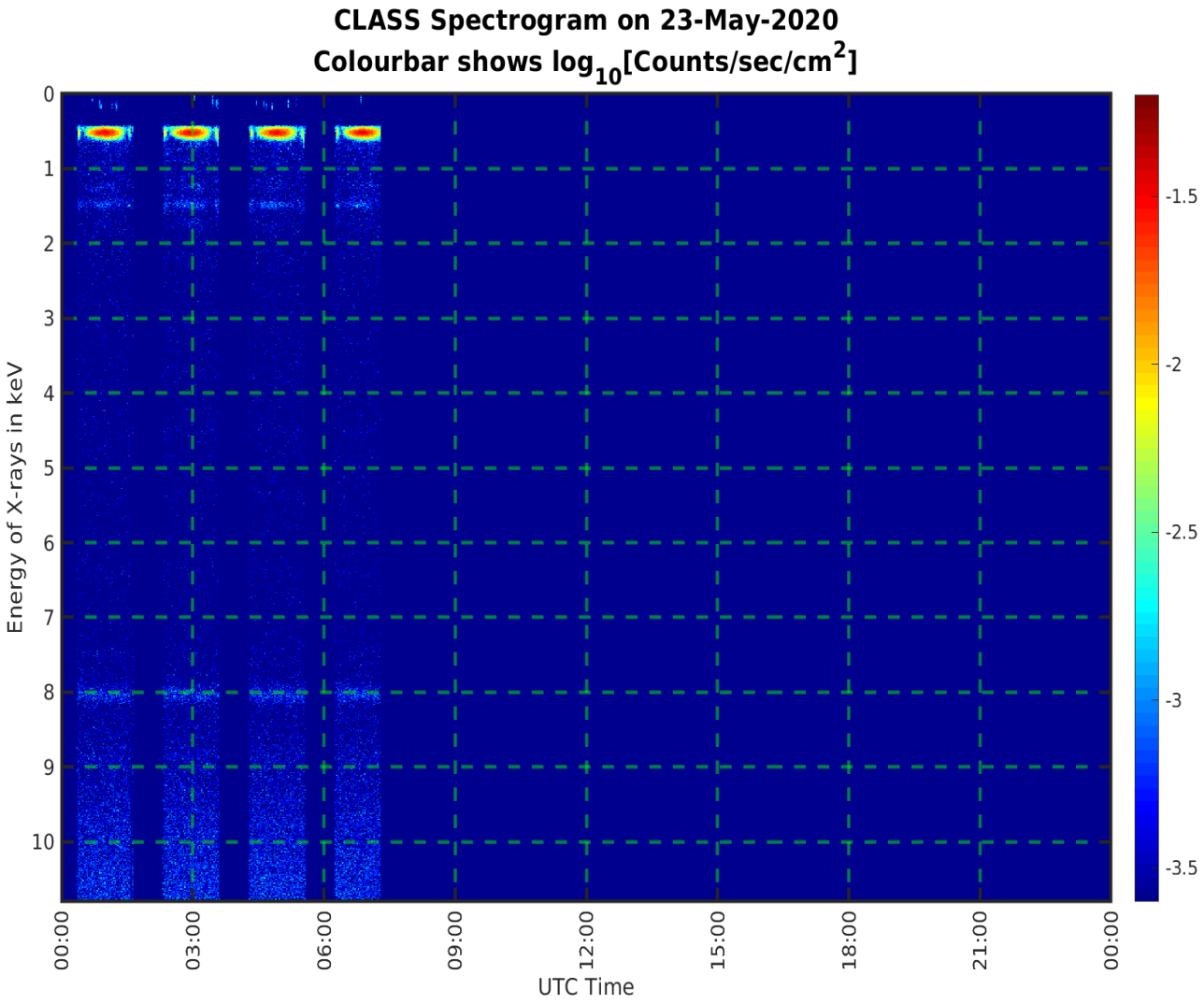
CLASS Spectrogram on 23-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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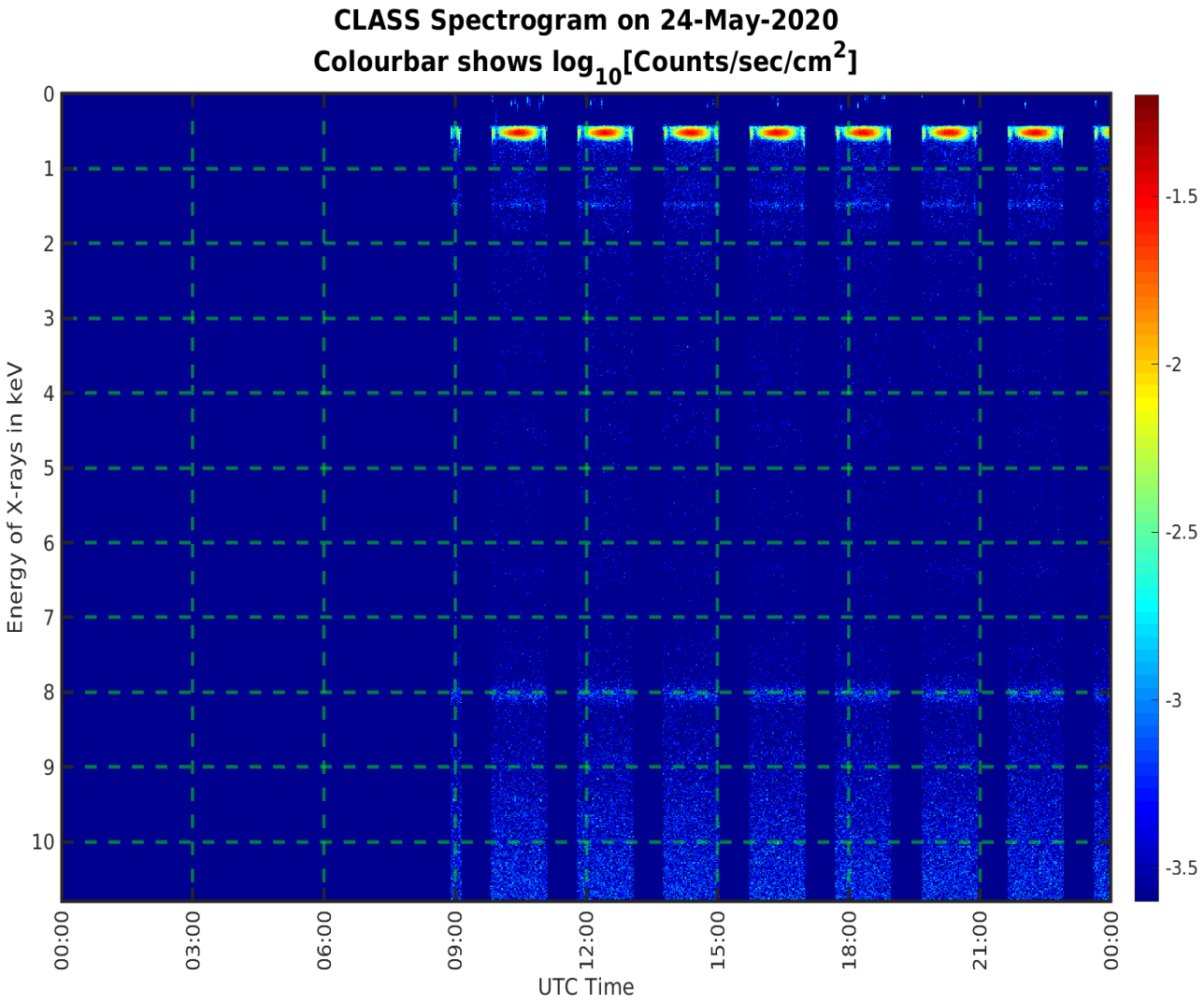
CLASS Spectrogram on 24-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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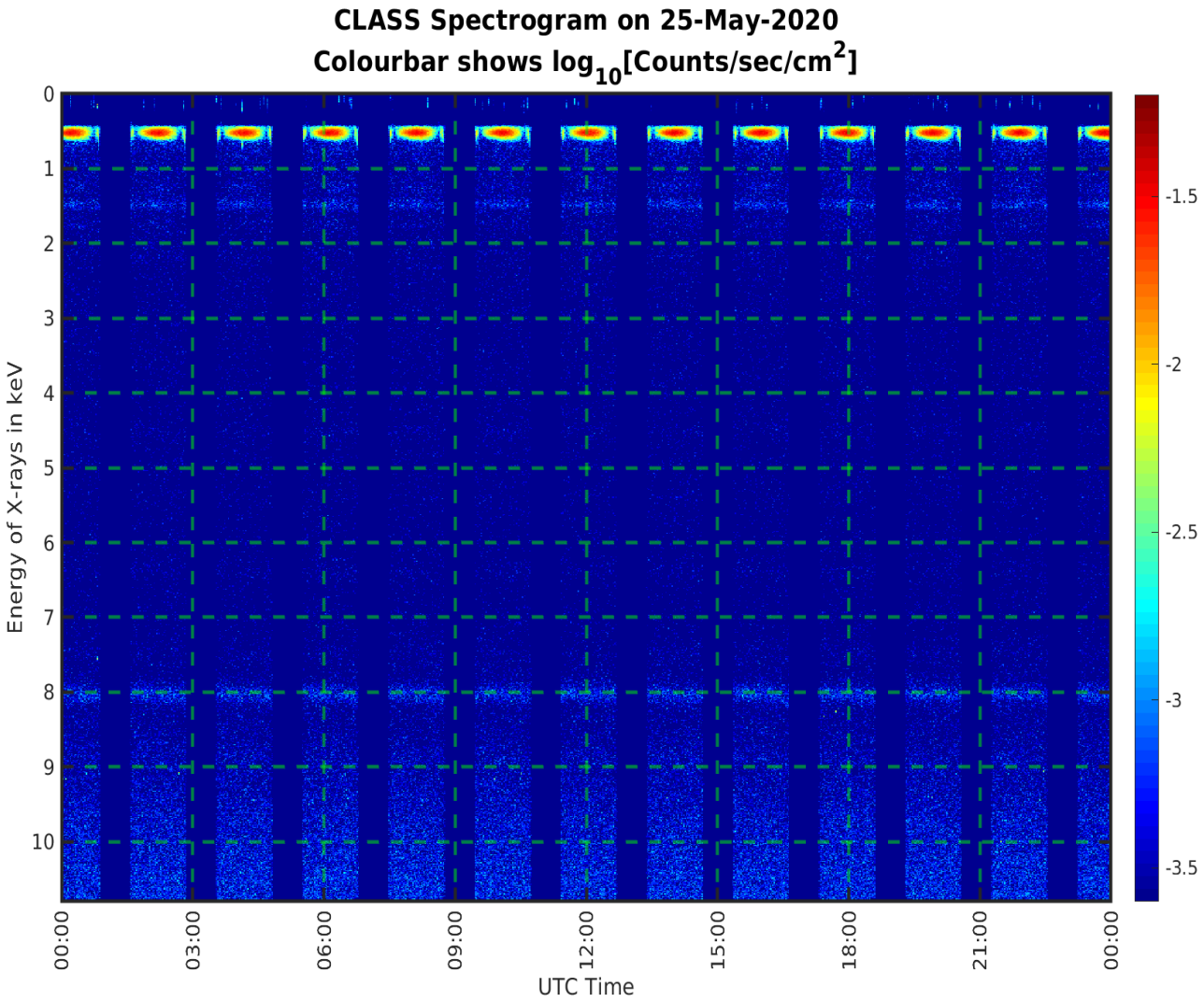
CLASS Spectrogram on 25-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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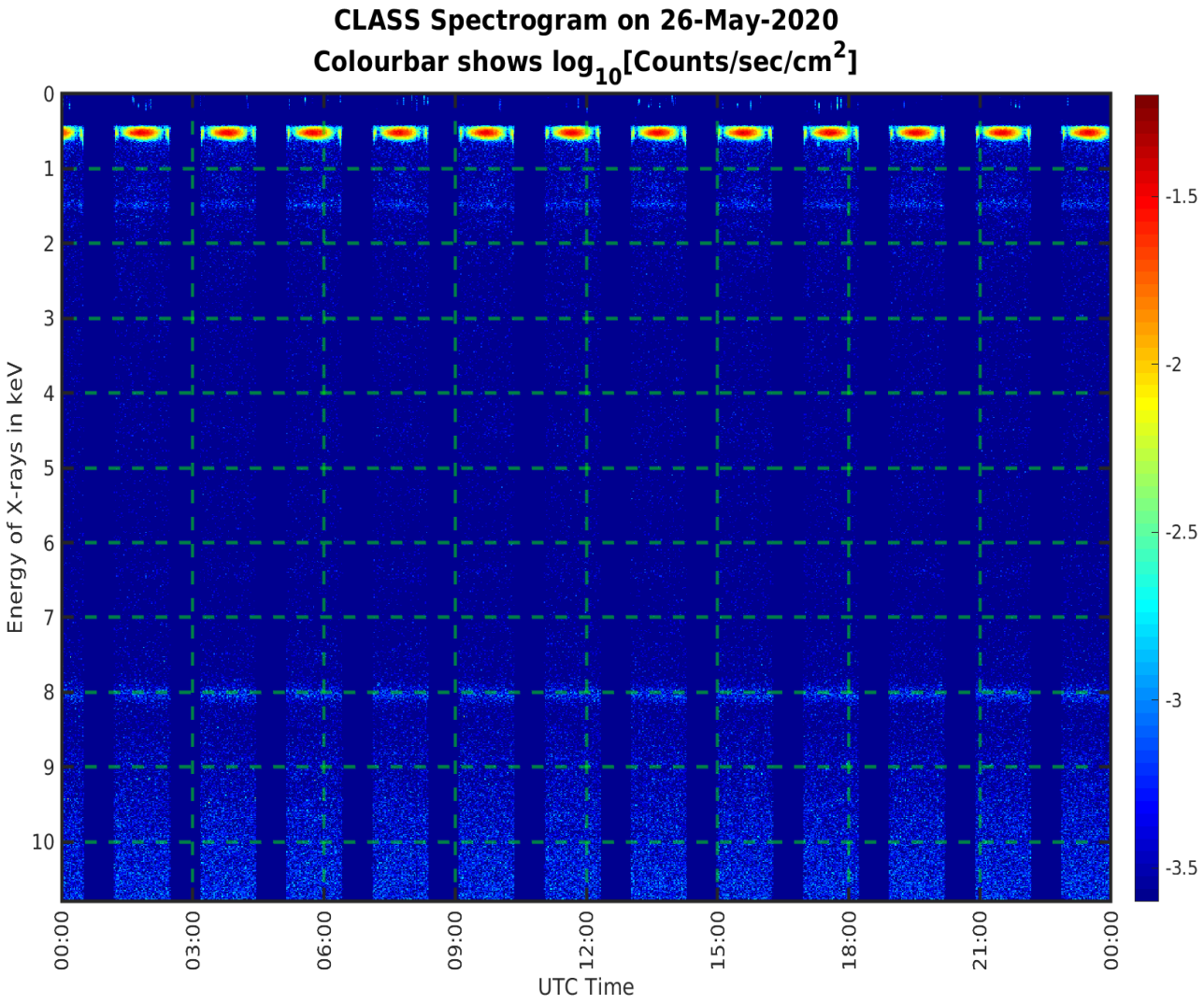
CLASS Spectrogram on 26-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
-1.5
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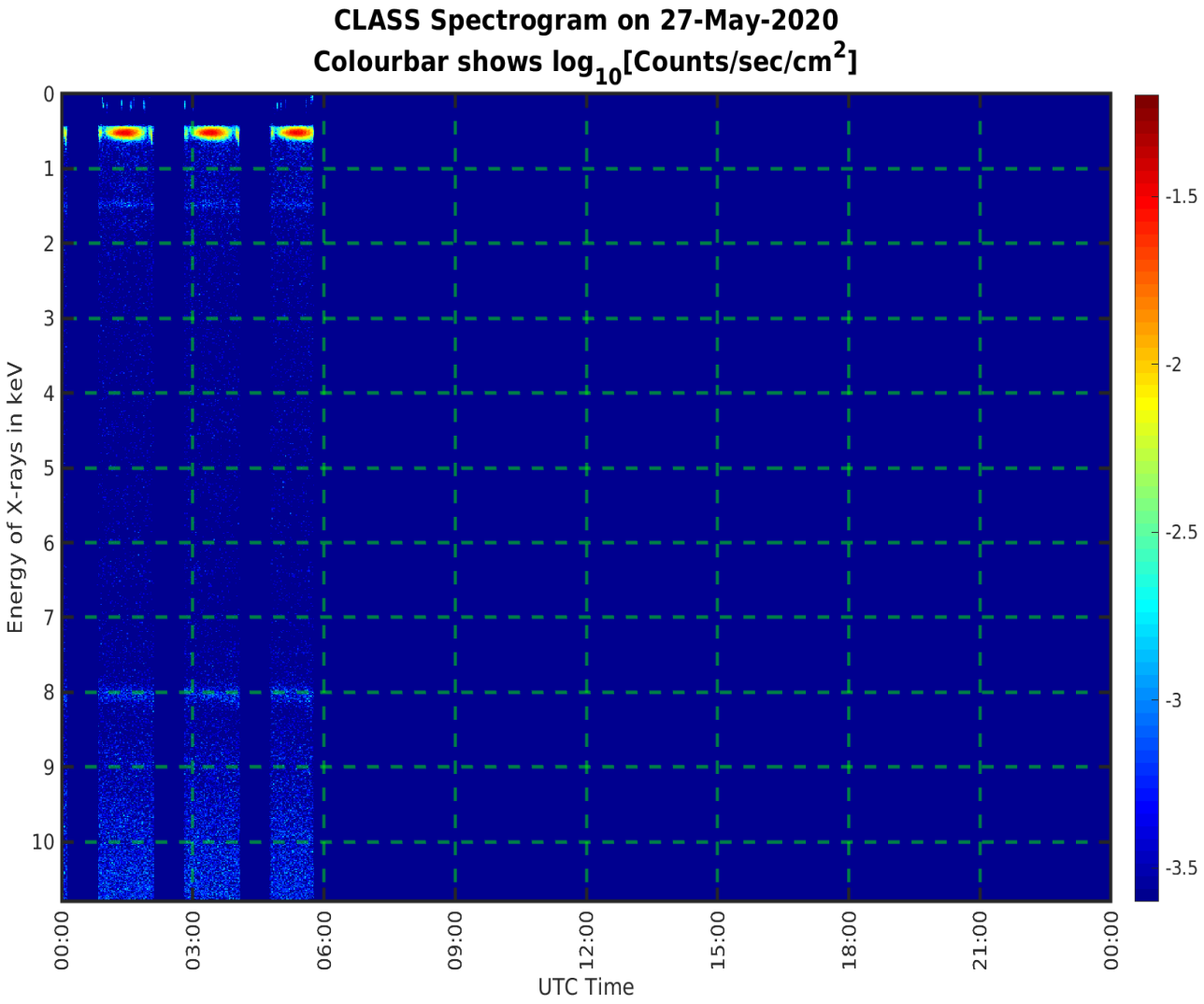
-3.5


CLASS Spectrogram on 27-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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18:00
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UTC Time
-1.5
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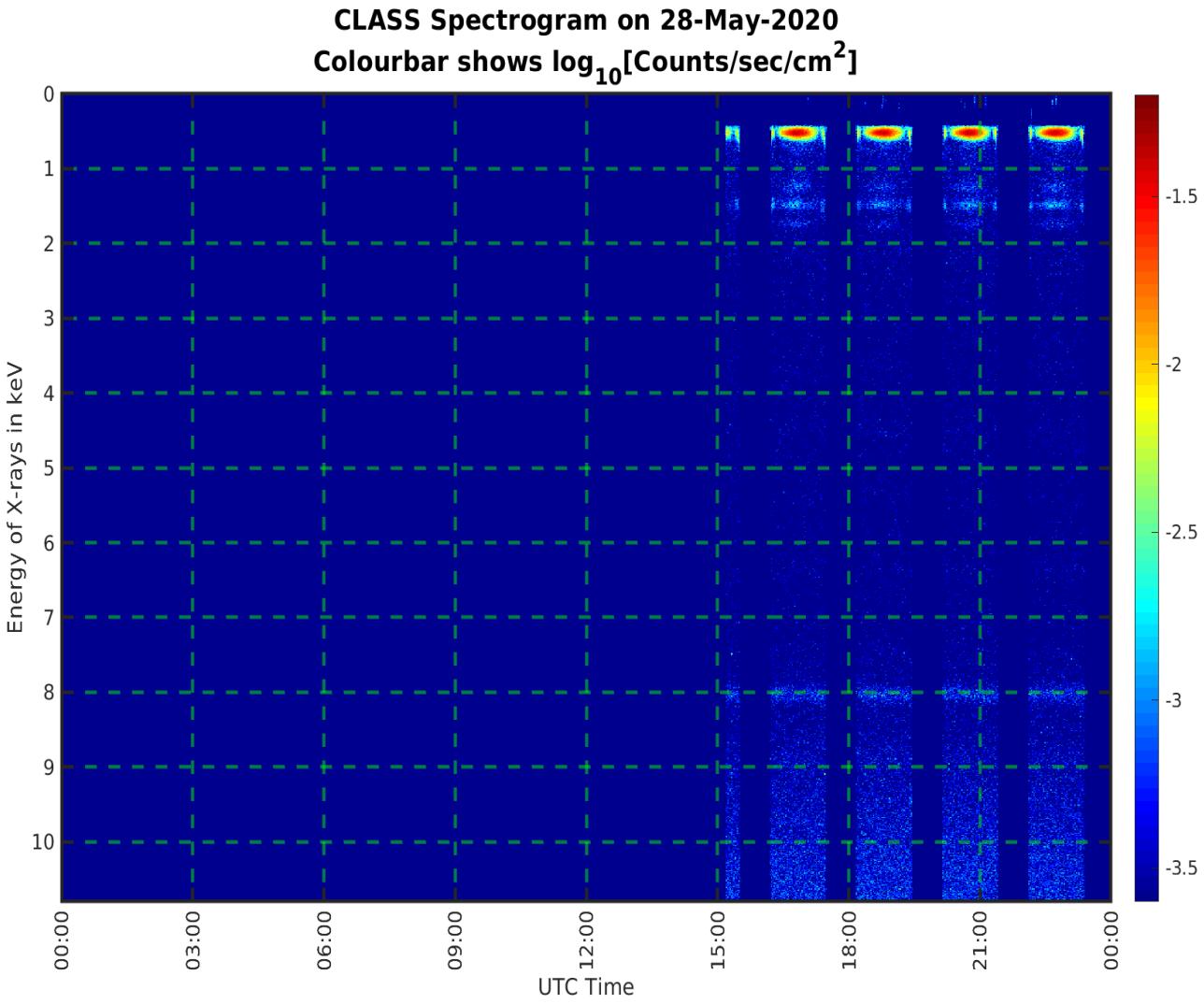
-3.5


CLASS Spectrogram on 28-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
00:00
03:00
06:00
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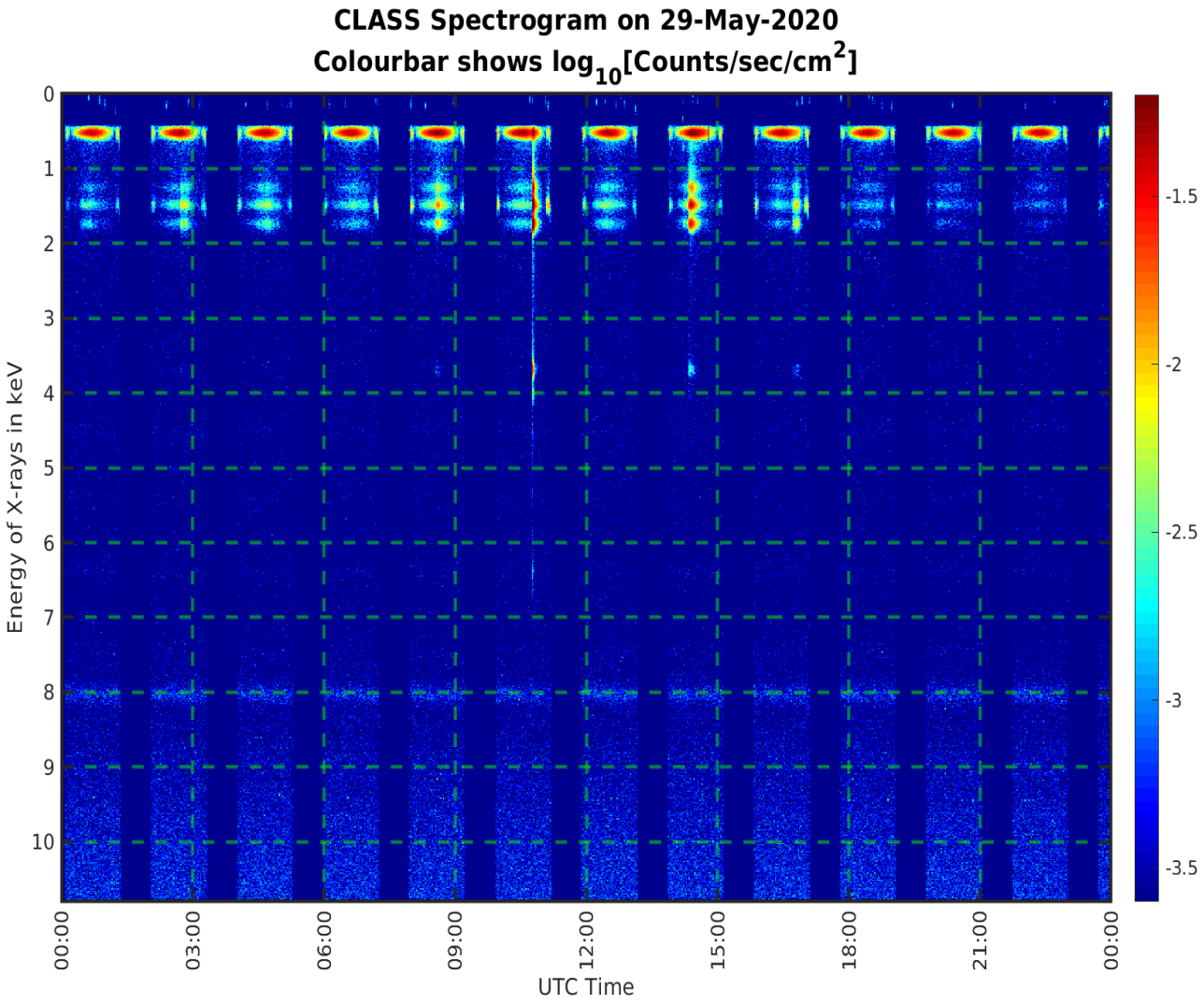
CLASS Spectrogram on 29-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
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00:00
03:00
06:00
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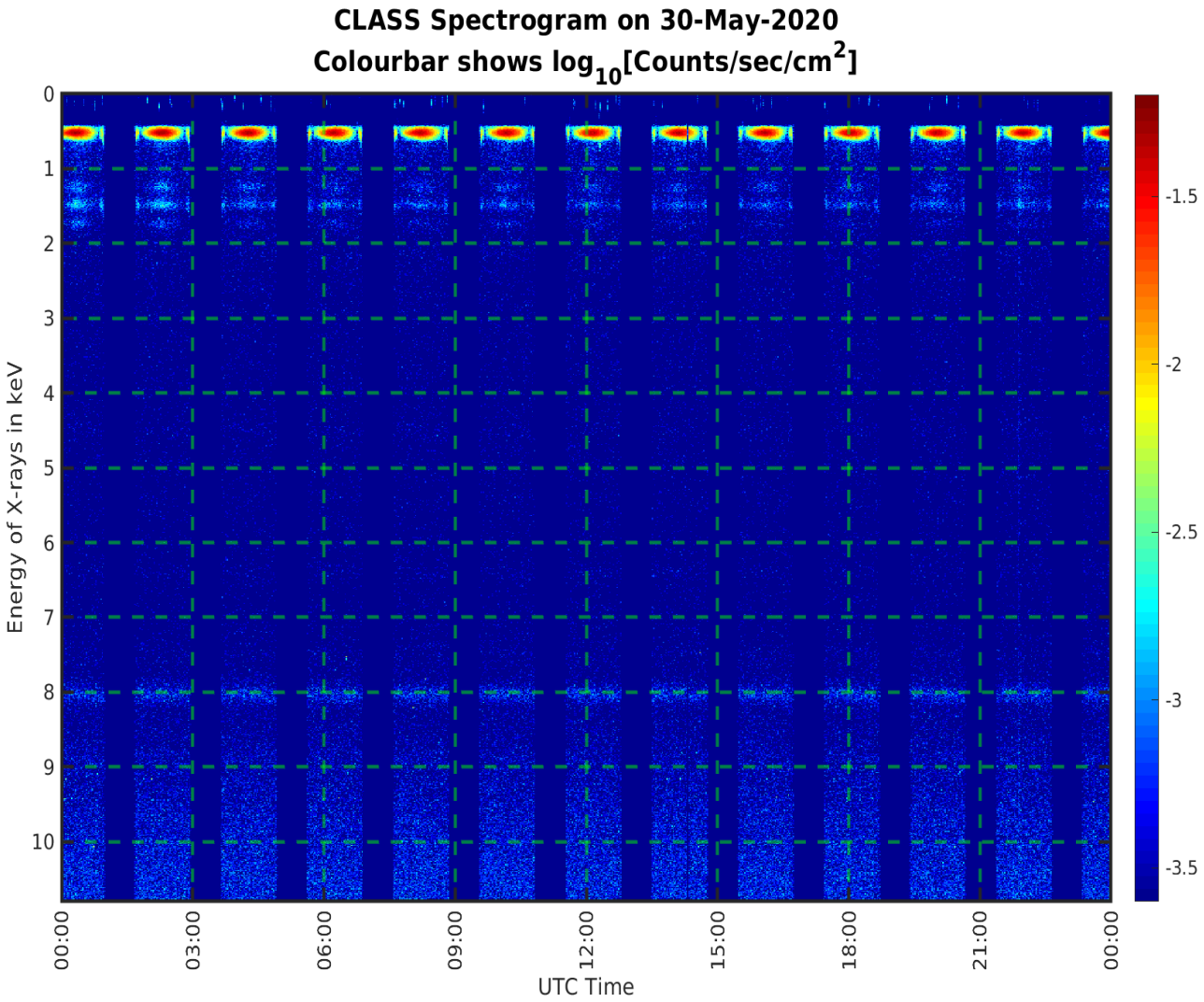
-3.5


CLASS Spectrogram on 30-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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UTC Time
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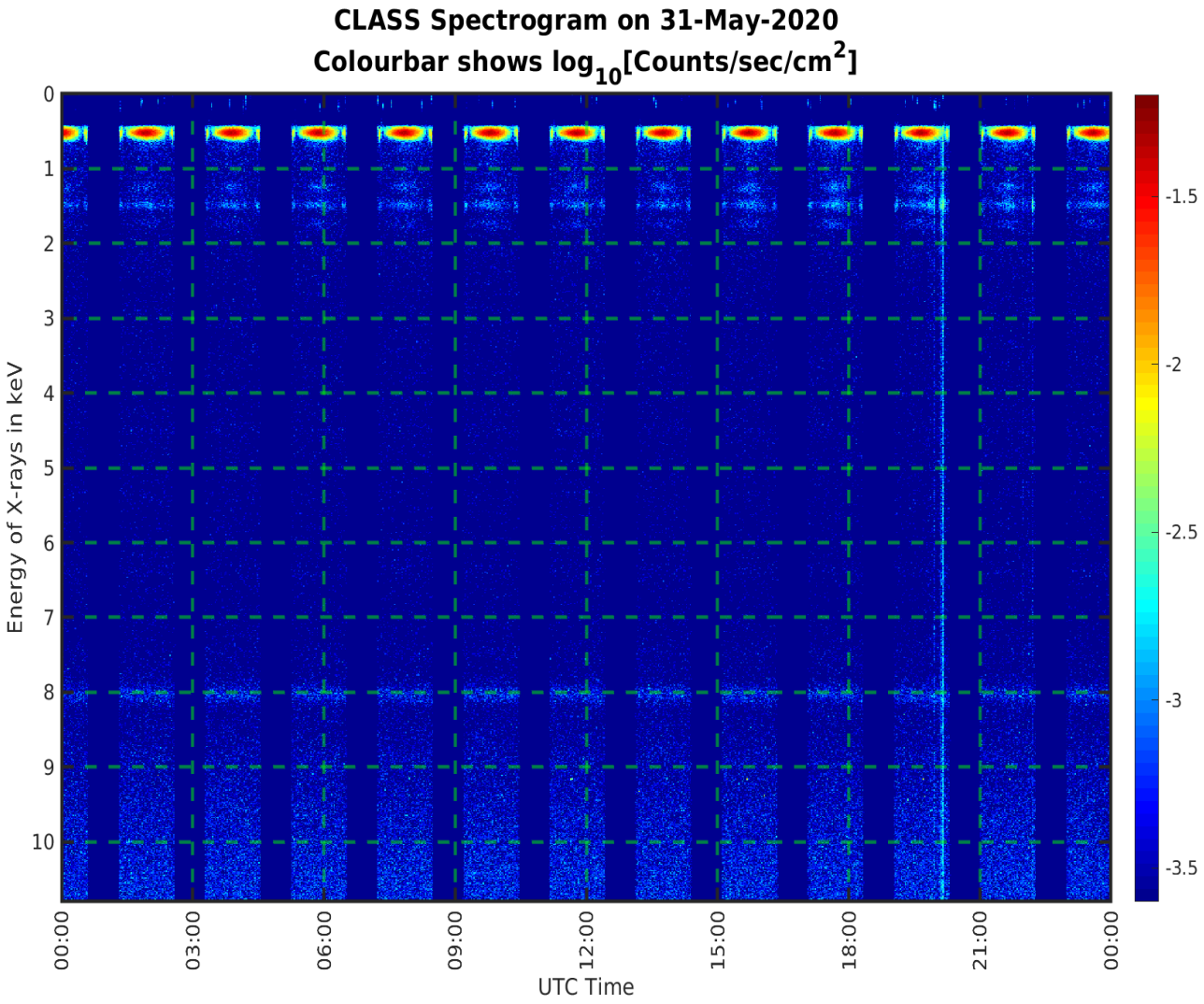
CLASS Spectrogram on 31-May-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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10
00:00
03:00
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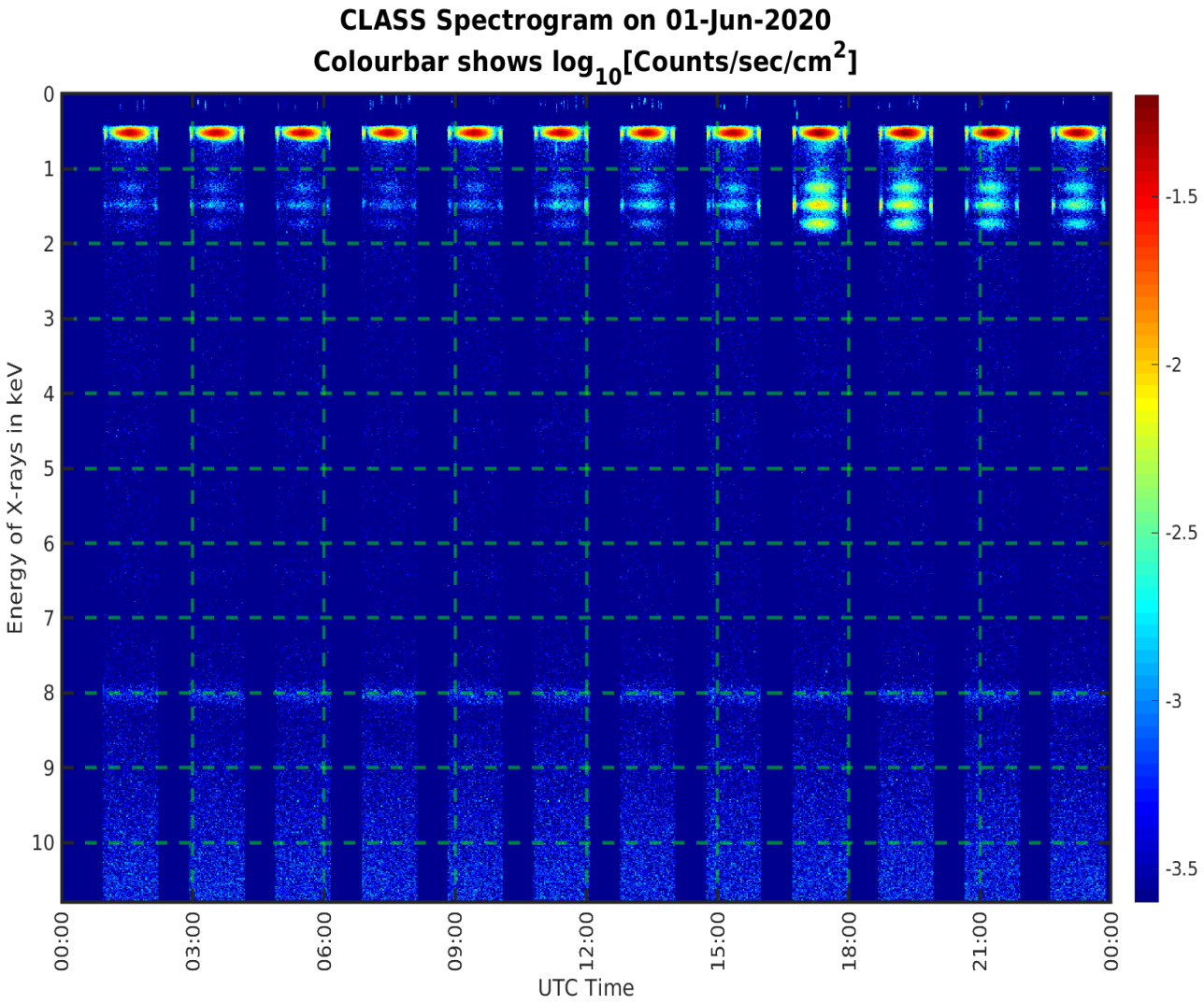
CLASS Spectrogram on 01-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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00:00
03:00
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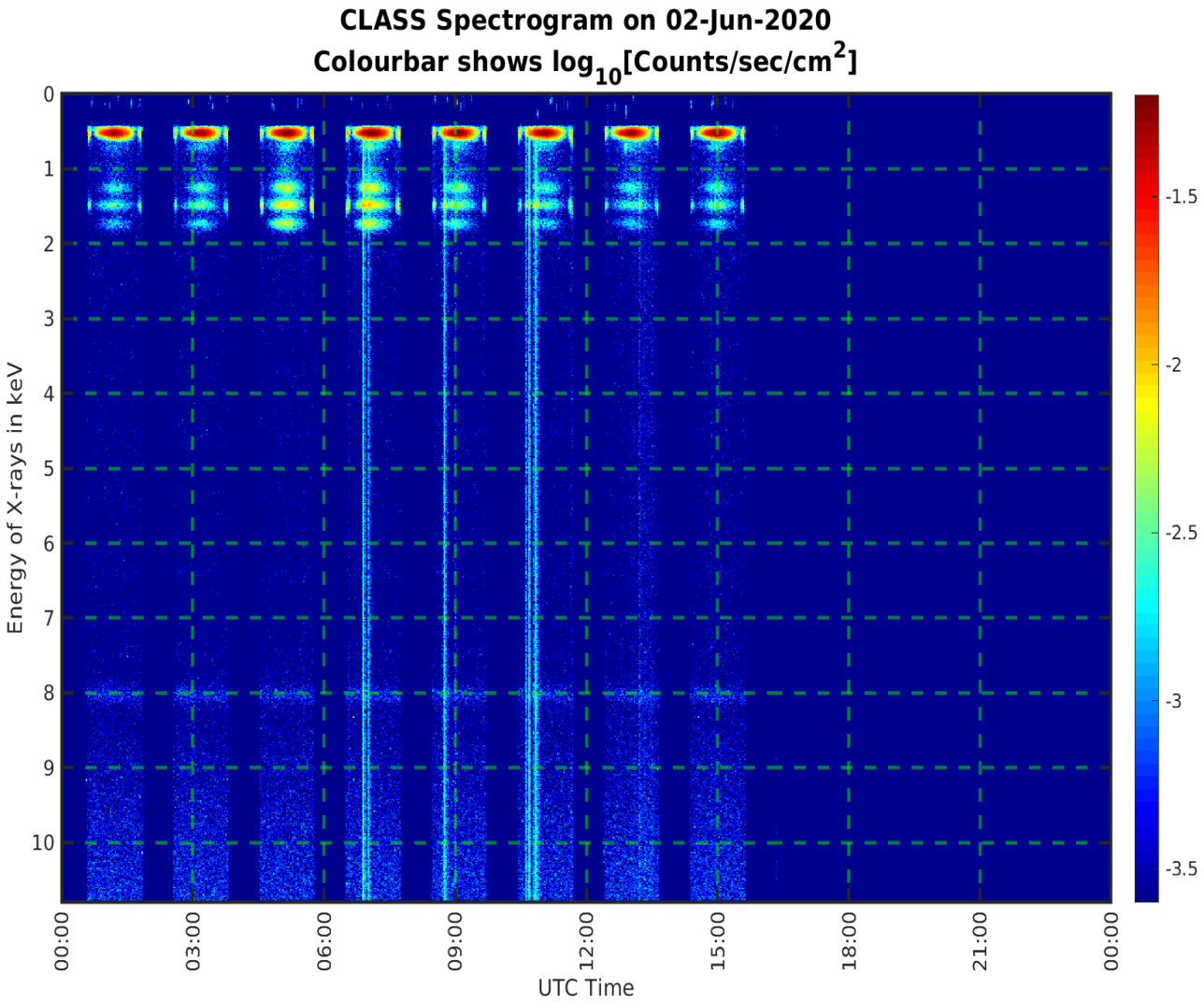
CLASS Spectrogram on 02-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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03:00
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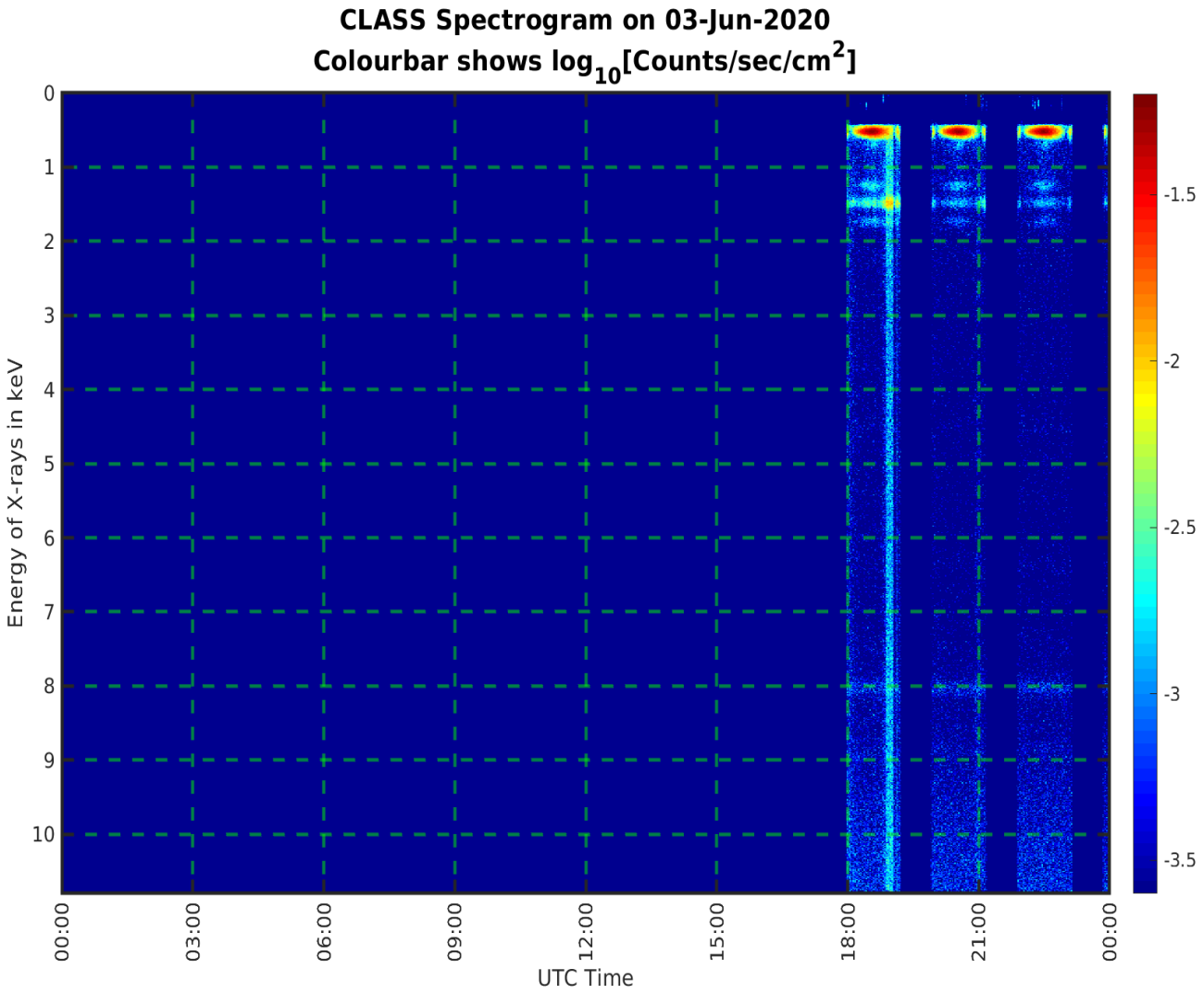
CLASS Spectrogram on 03-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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6
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-1.5
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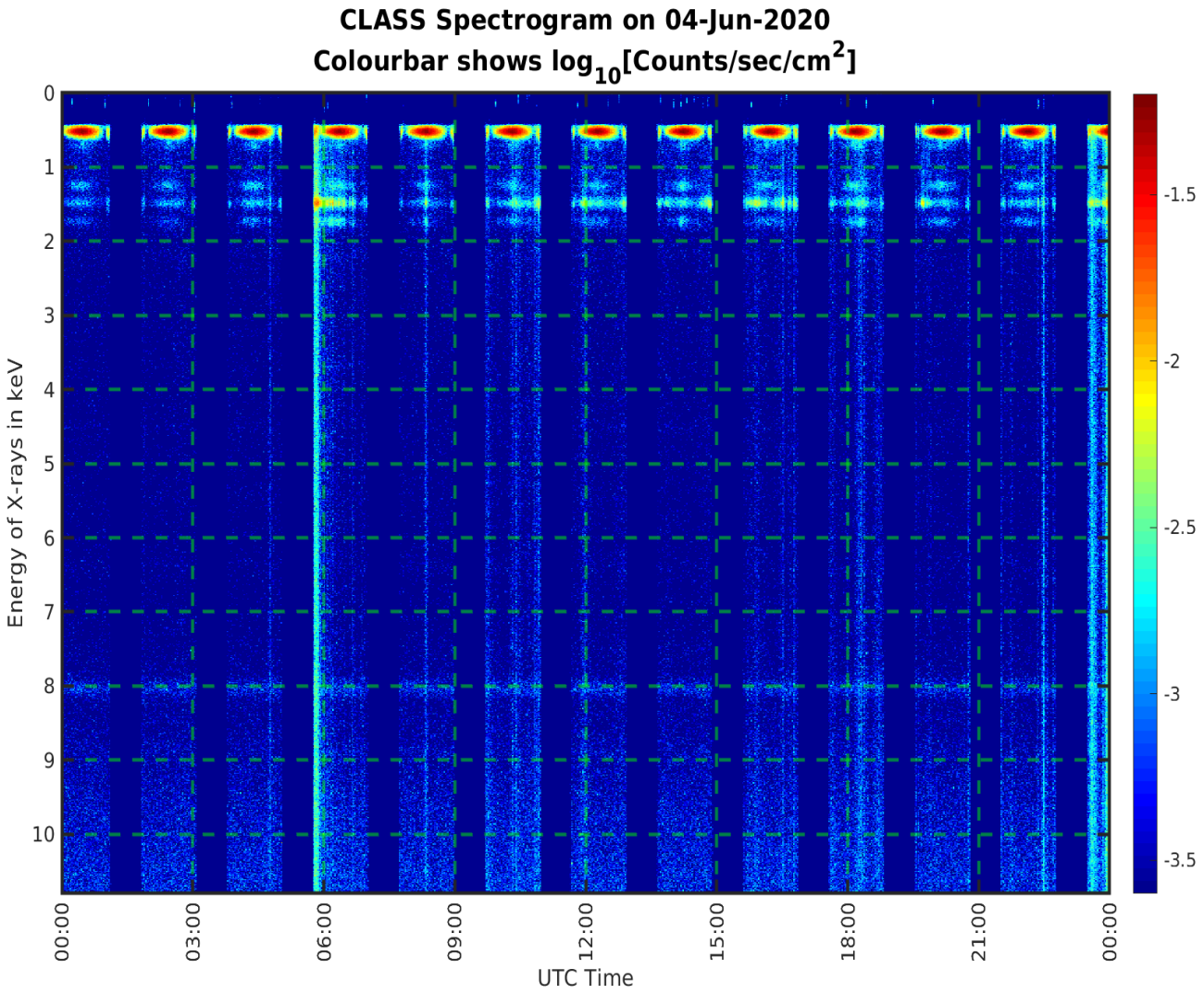
CLASS Spectrogram on 04-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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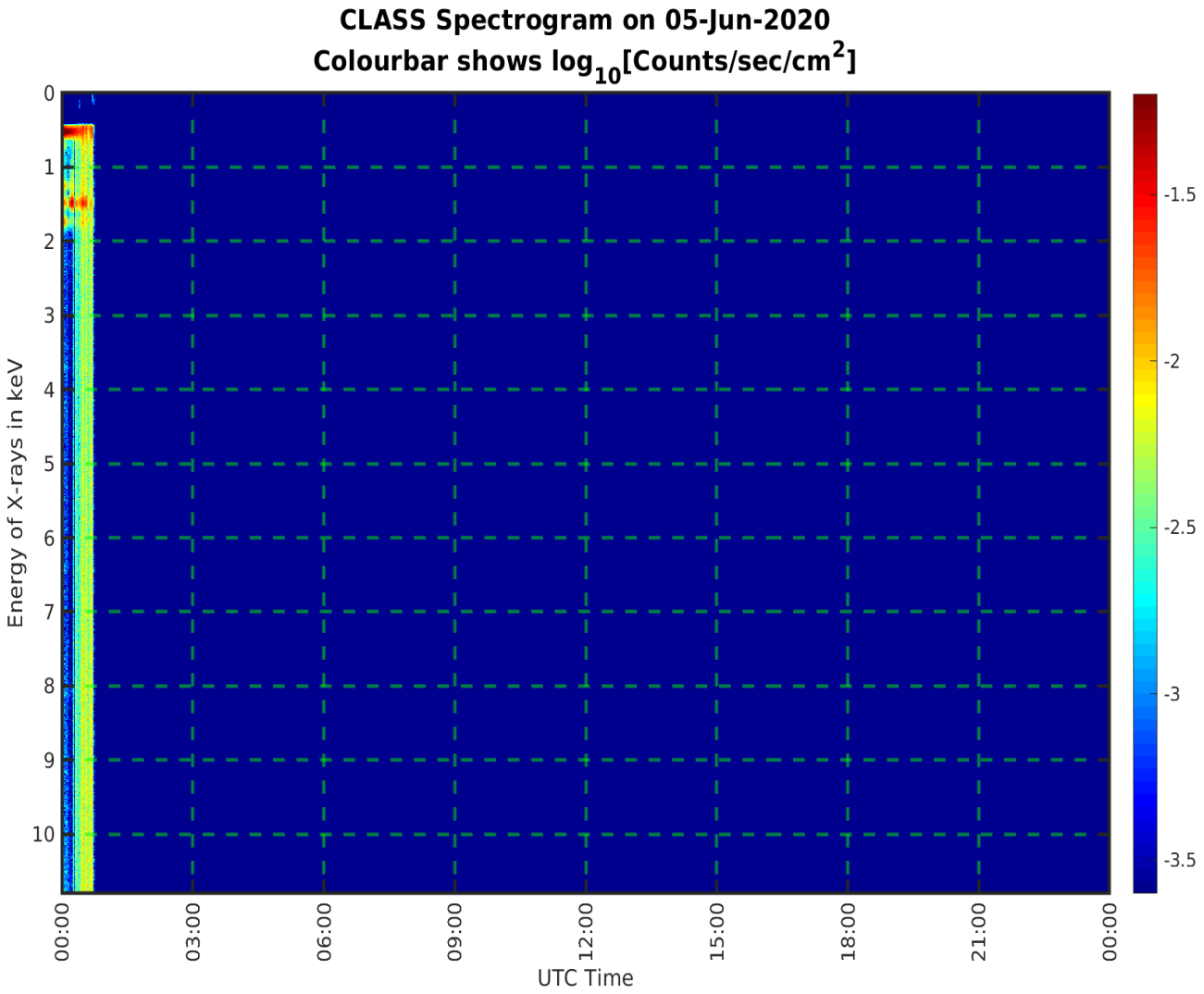
UTC Time


CLASS Spectrogram on 05-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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UTC Time
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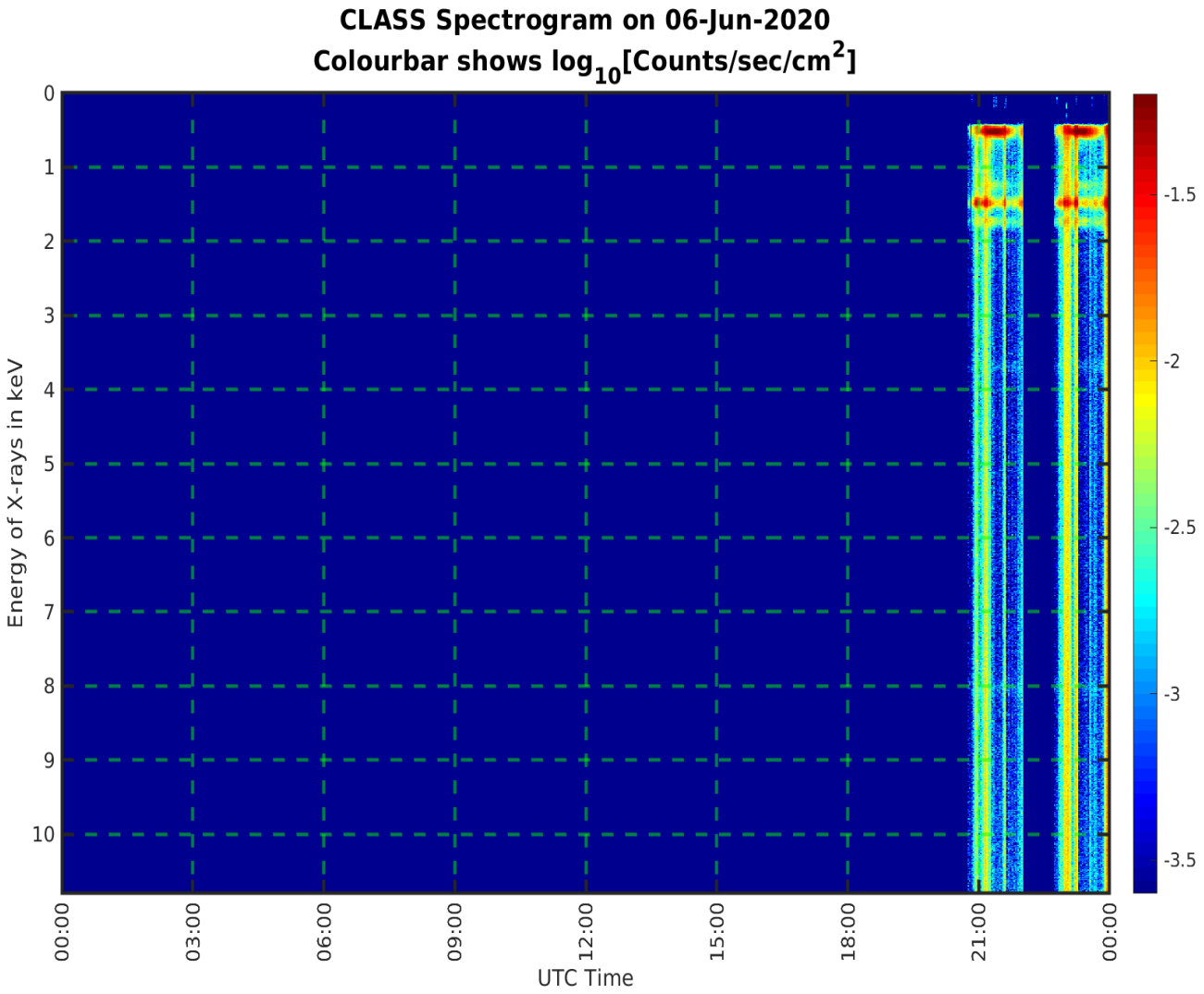
CLASS Spectrogram on 06-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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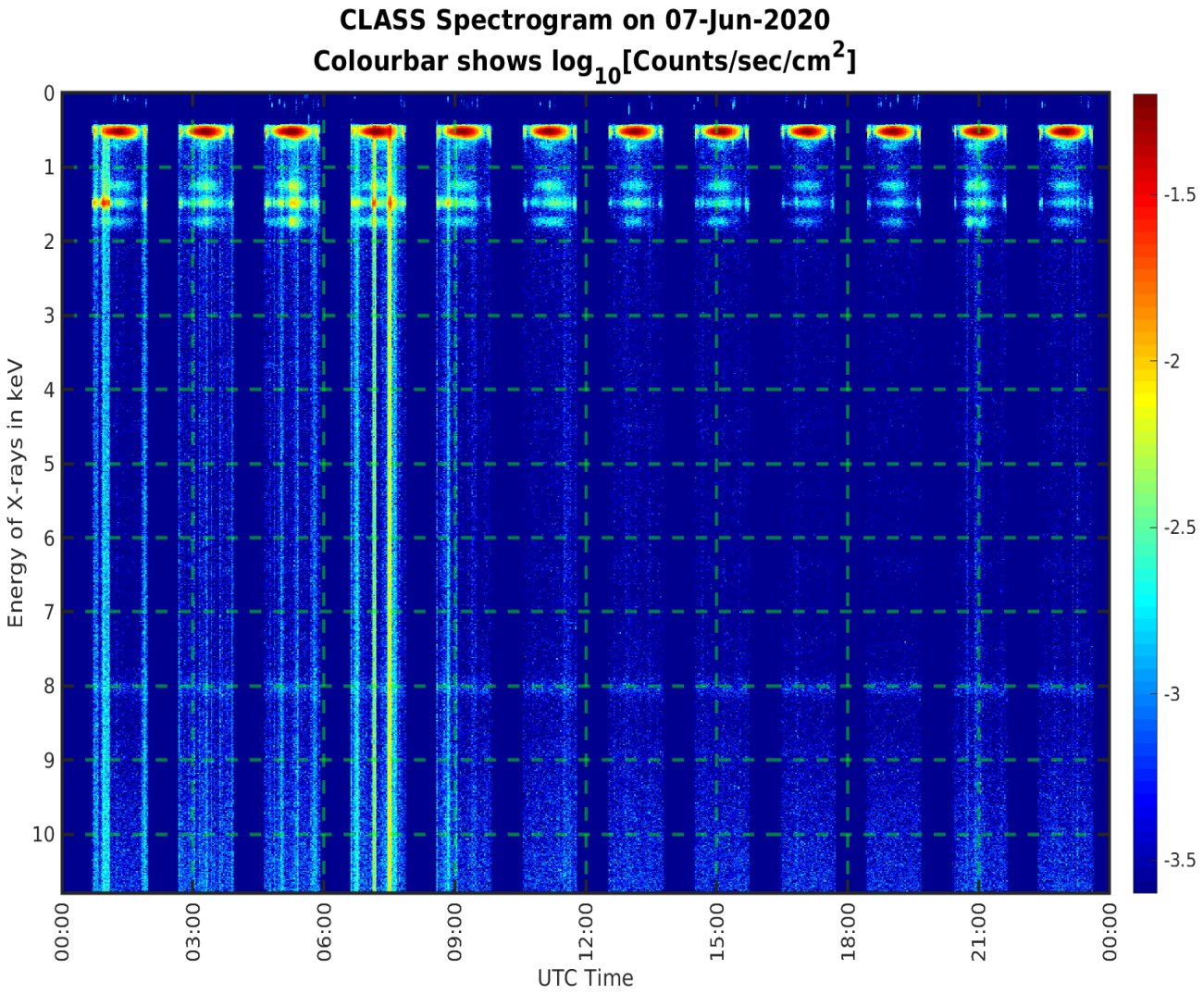
CLASS Spectrogram on 07-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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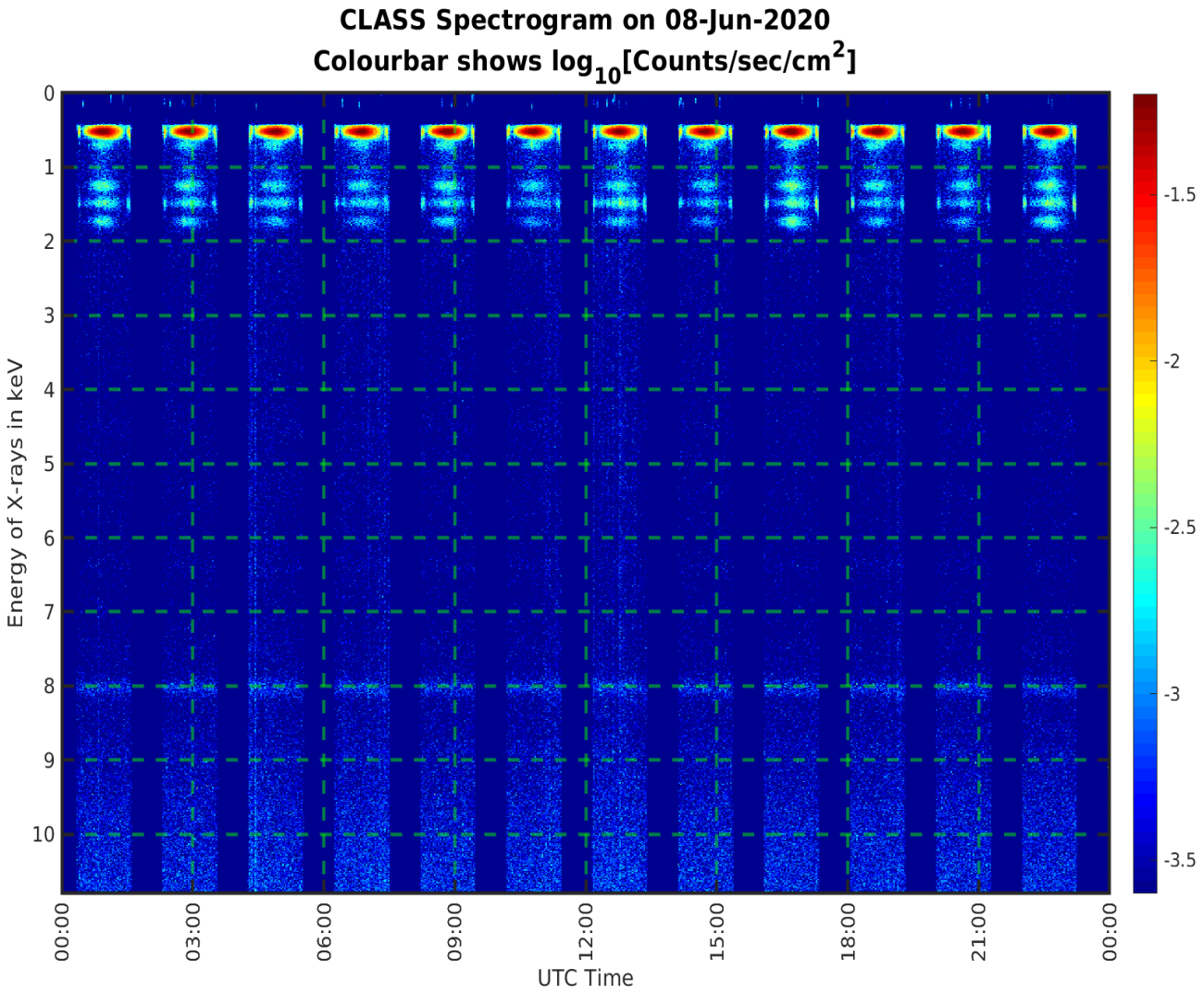
UTC Time


CLASS Spectrogram on 08-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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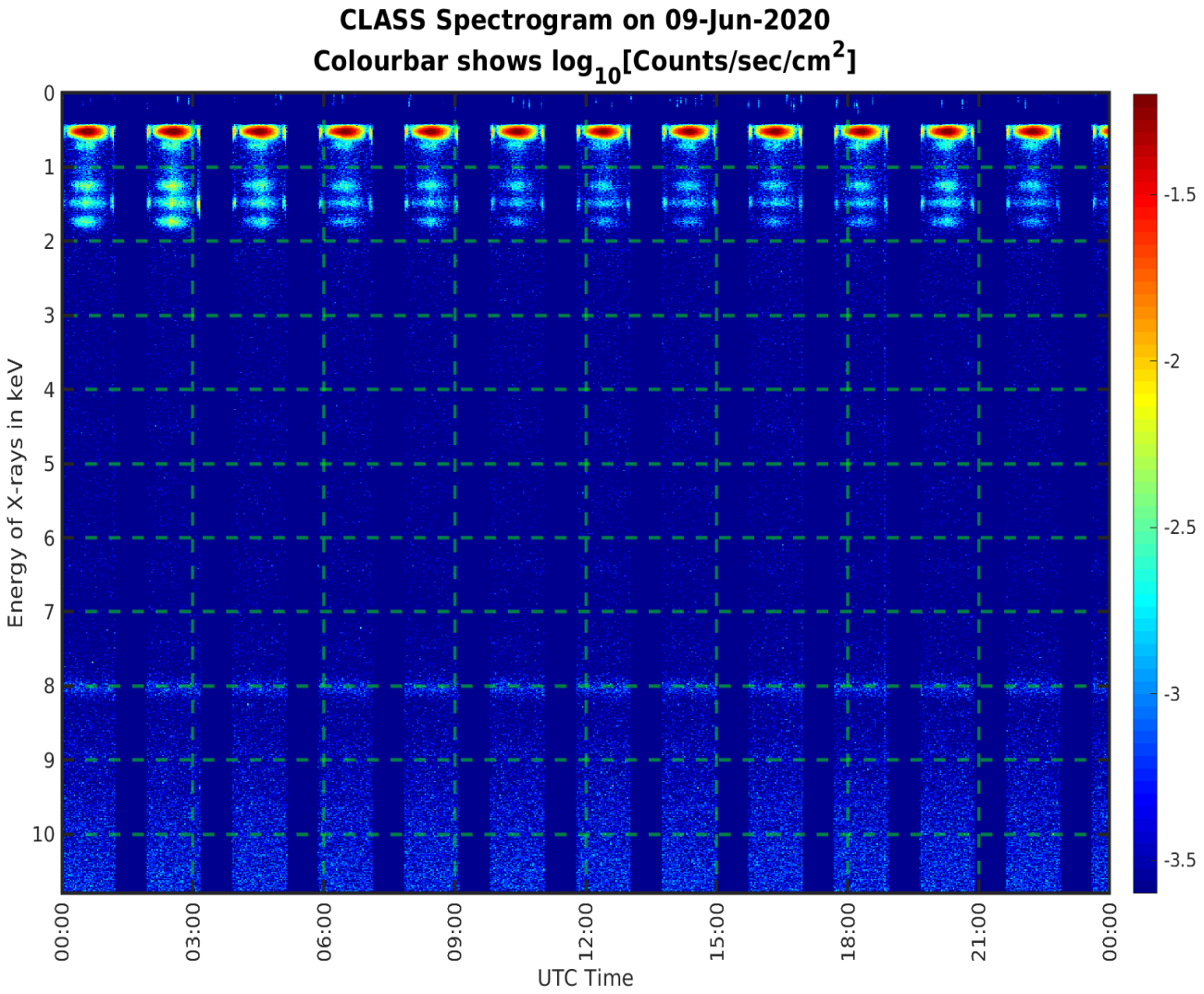
CLASS Spectrogram on 09-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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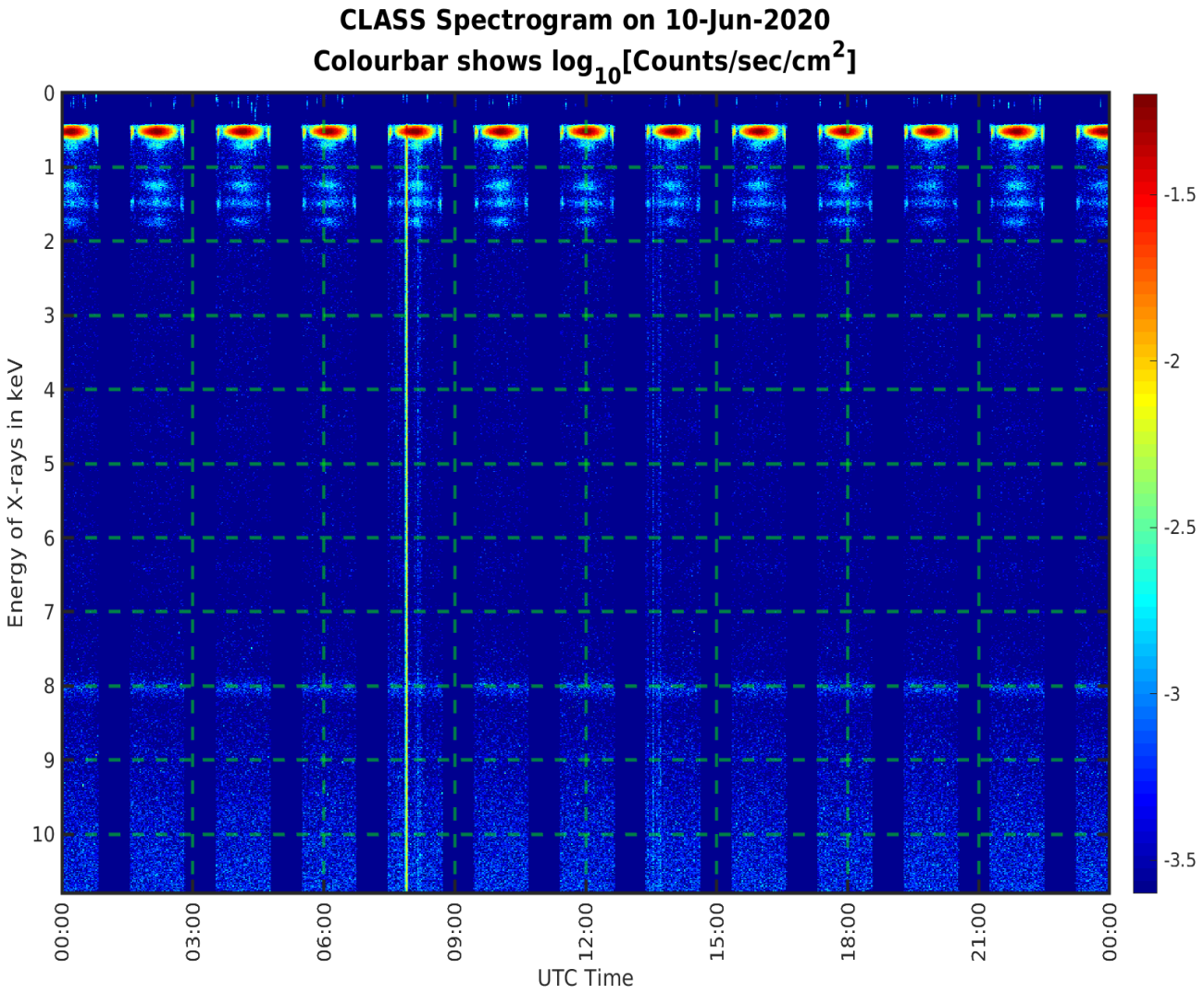
CLASS Spectrogram on 10-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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8
9
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-1.5
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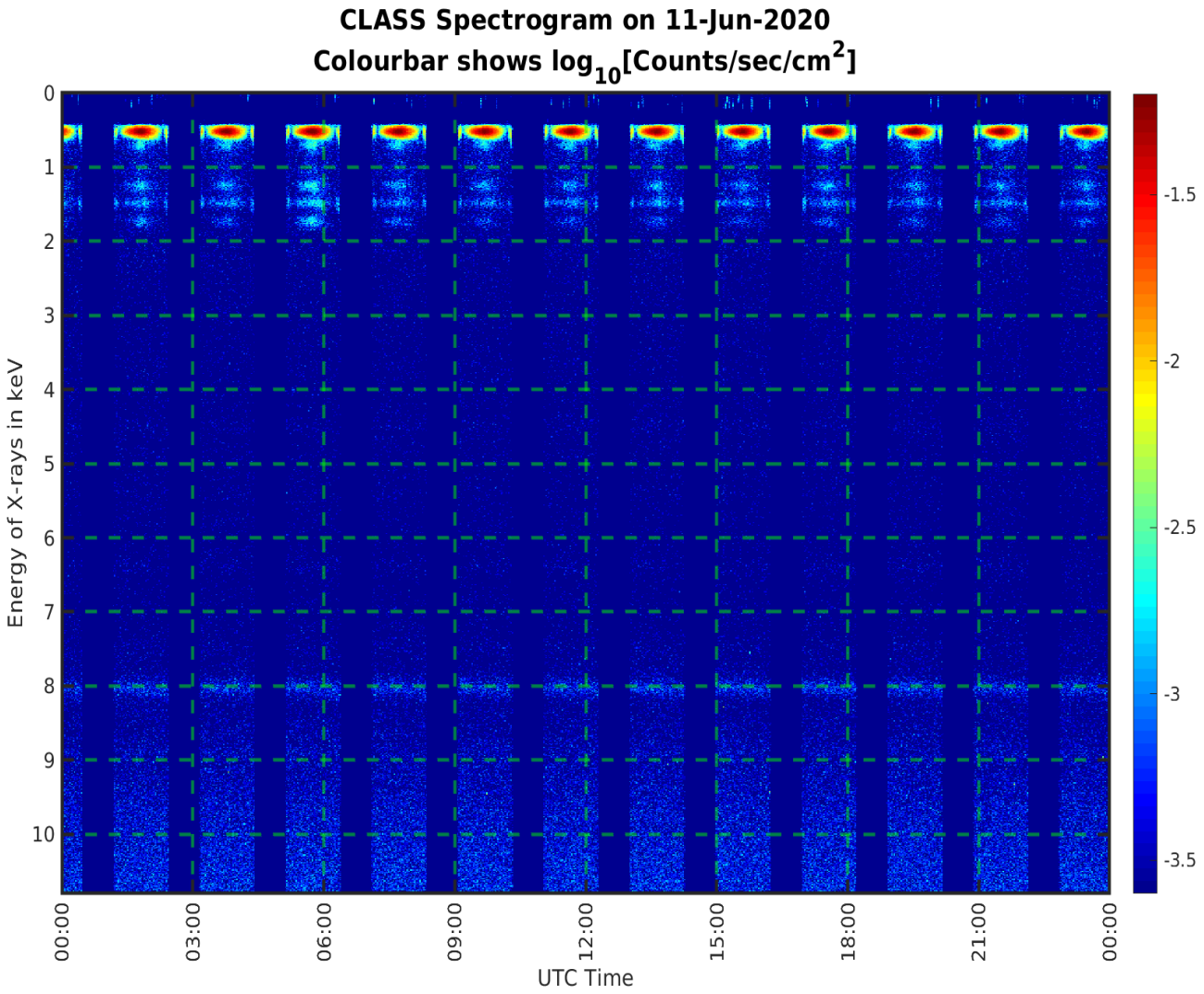
UTC Time


CLASS Spectrogram on 11-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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9
10
-1.5
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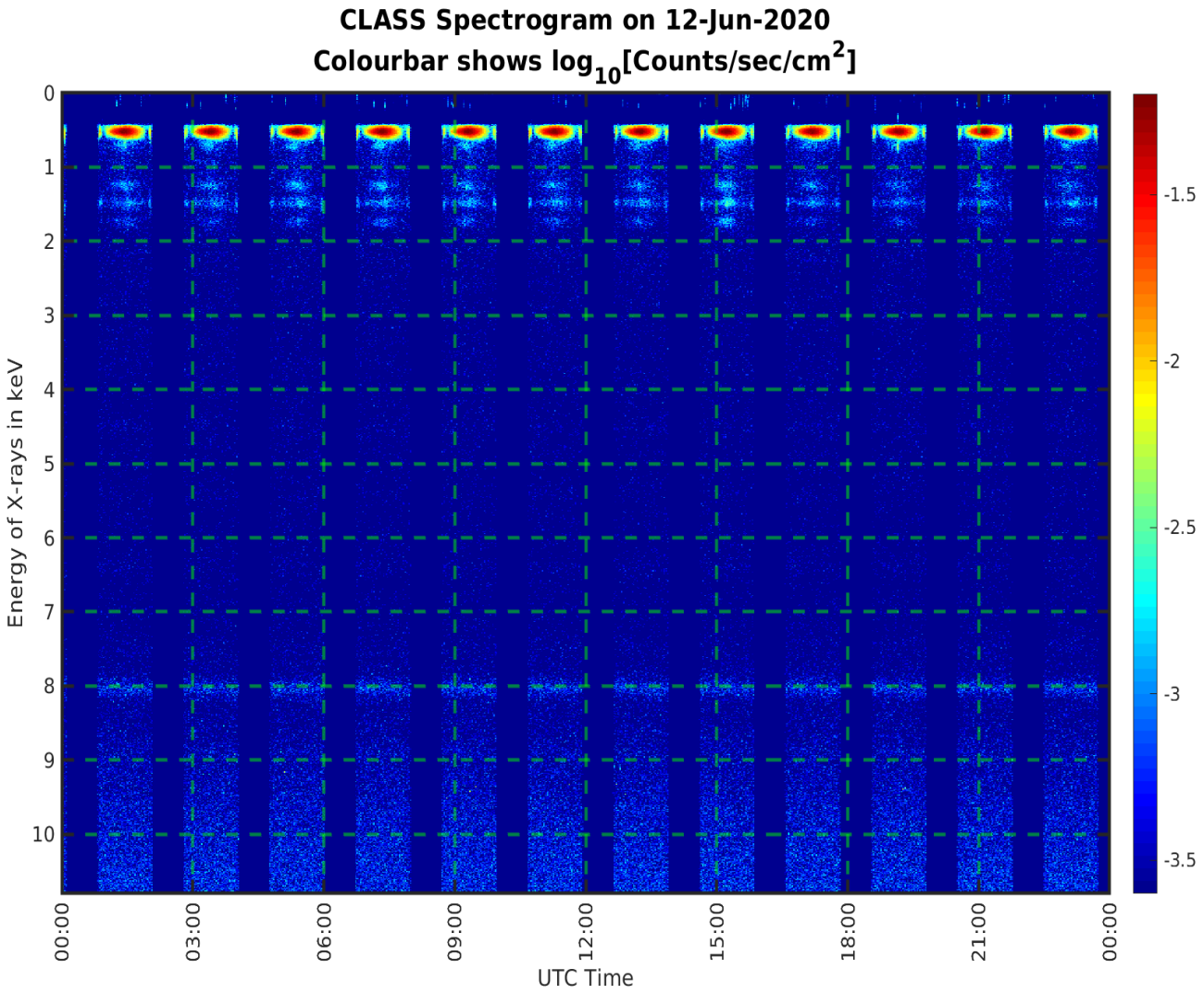
UTC Time


CLASS Spectrogram on 12-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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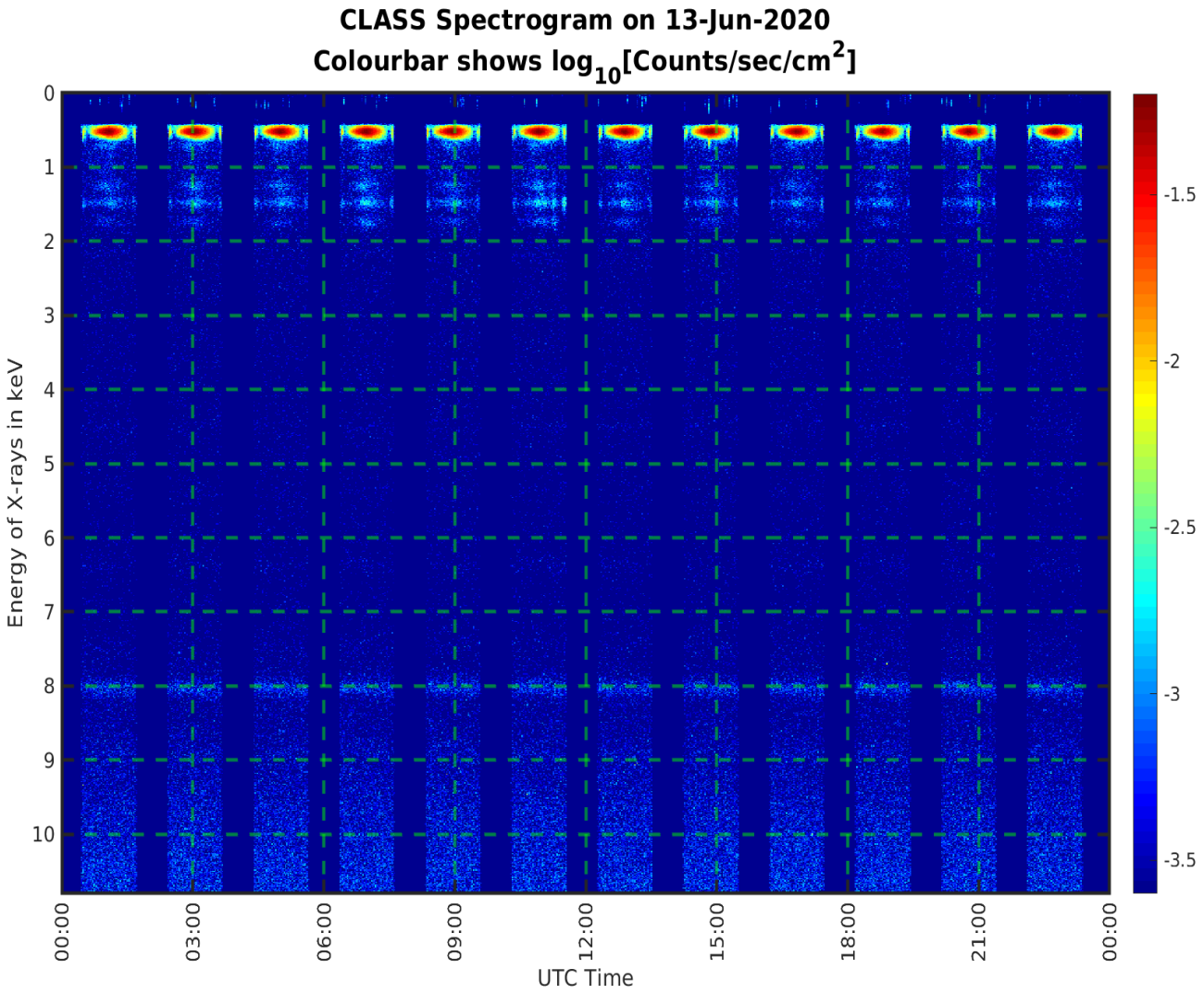
UTC Time


CLASS Spectrogram on 13-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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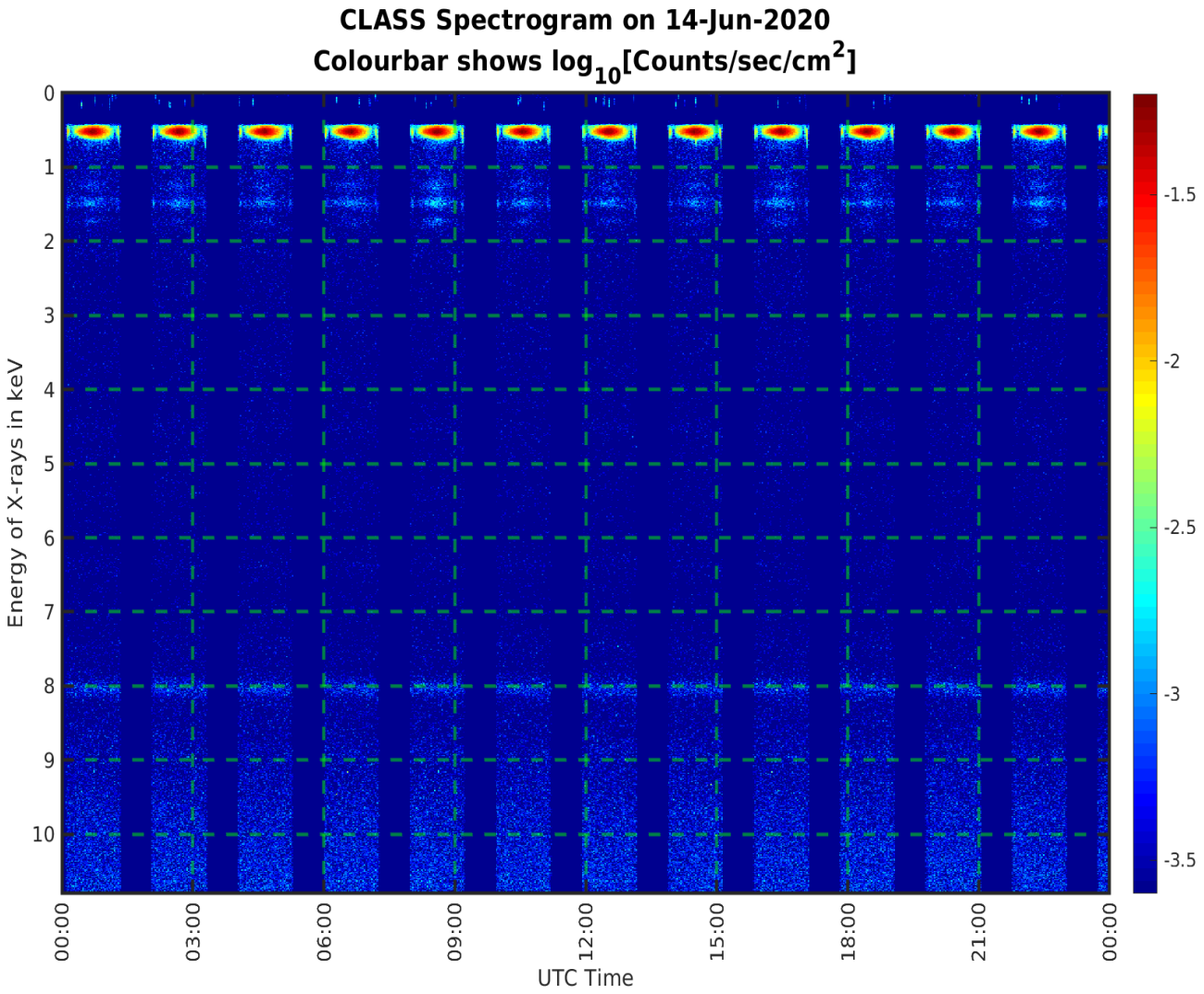
UTC Time


CLASS Spectrogram on 14-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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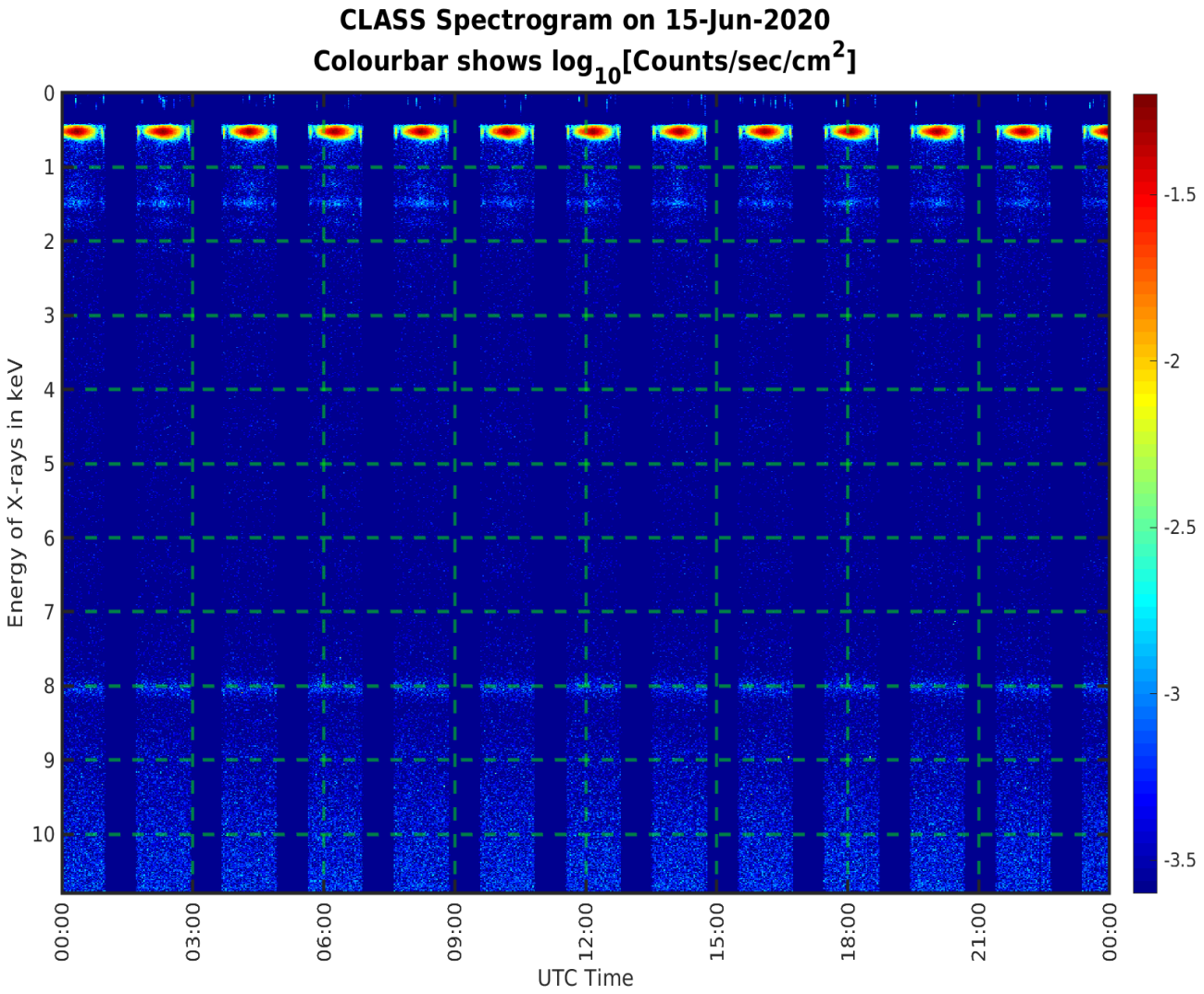
UTC Time


CLASS Spectrogram on 15-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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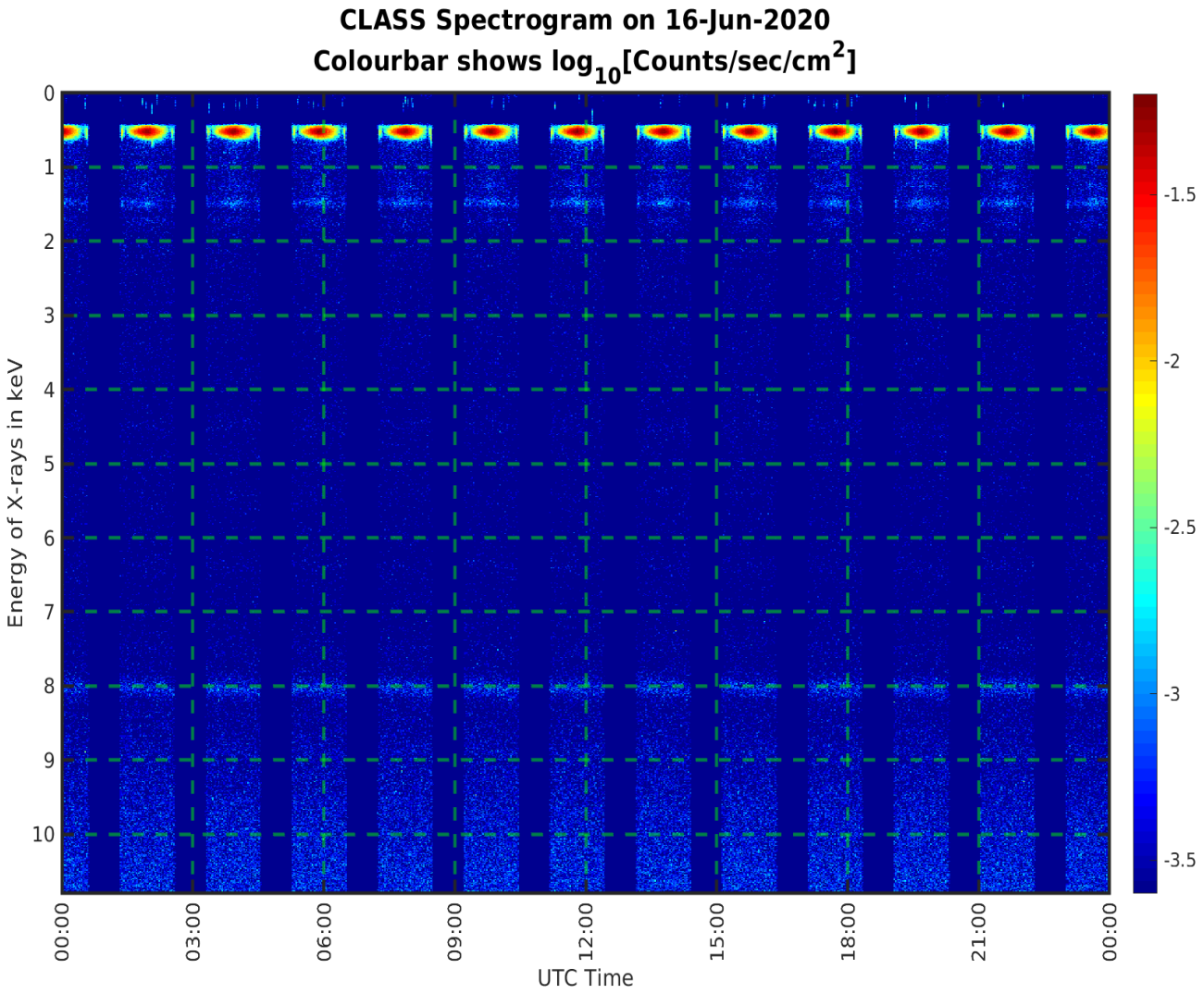
UTC Time


CLASS Spectrogram on 16-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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8
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-1.5
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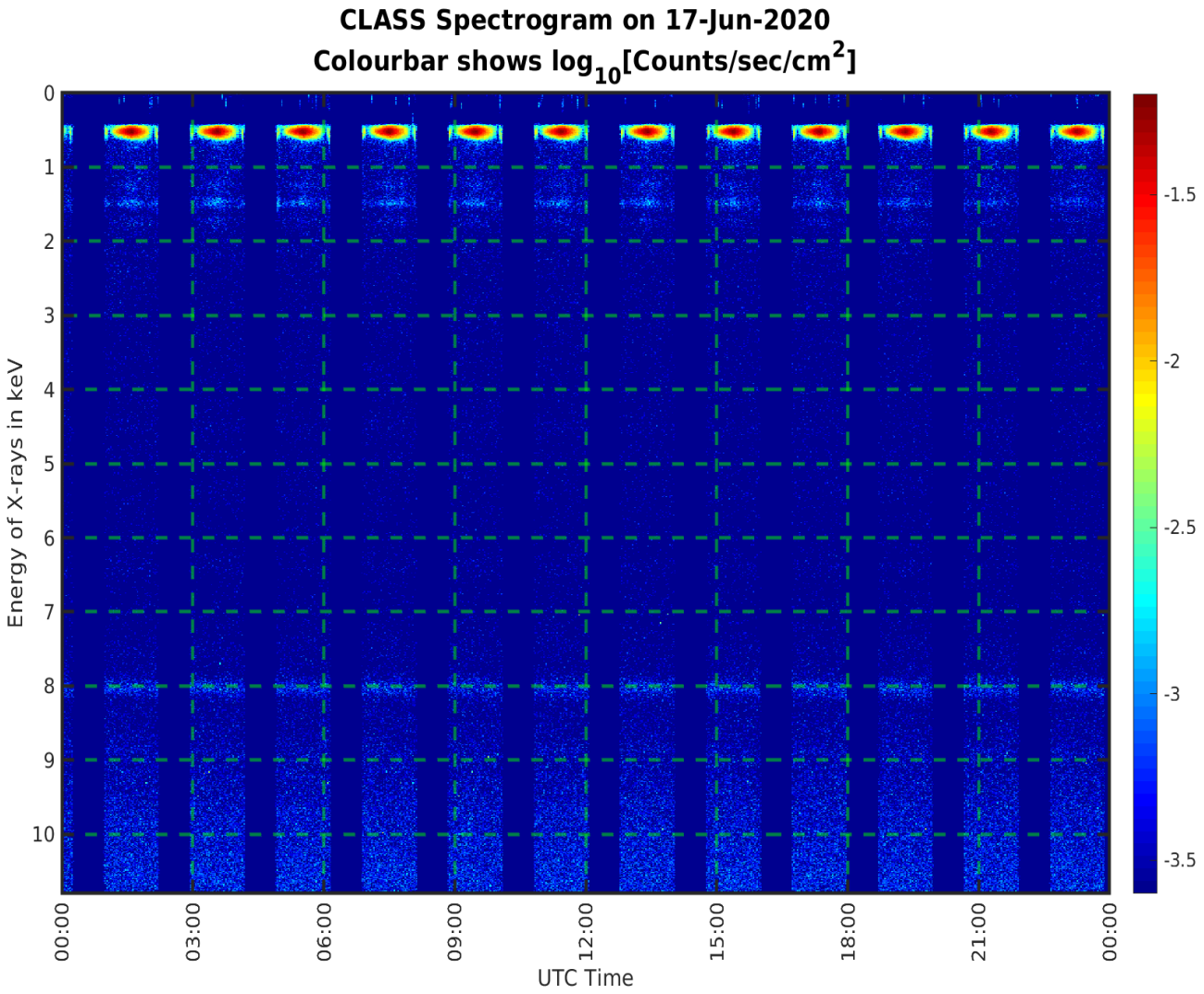
UTC Time


CLASS Spectrogram on 17-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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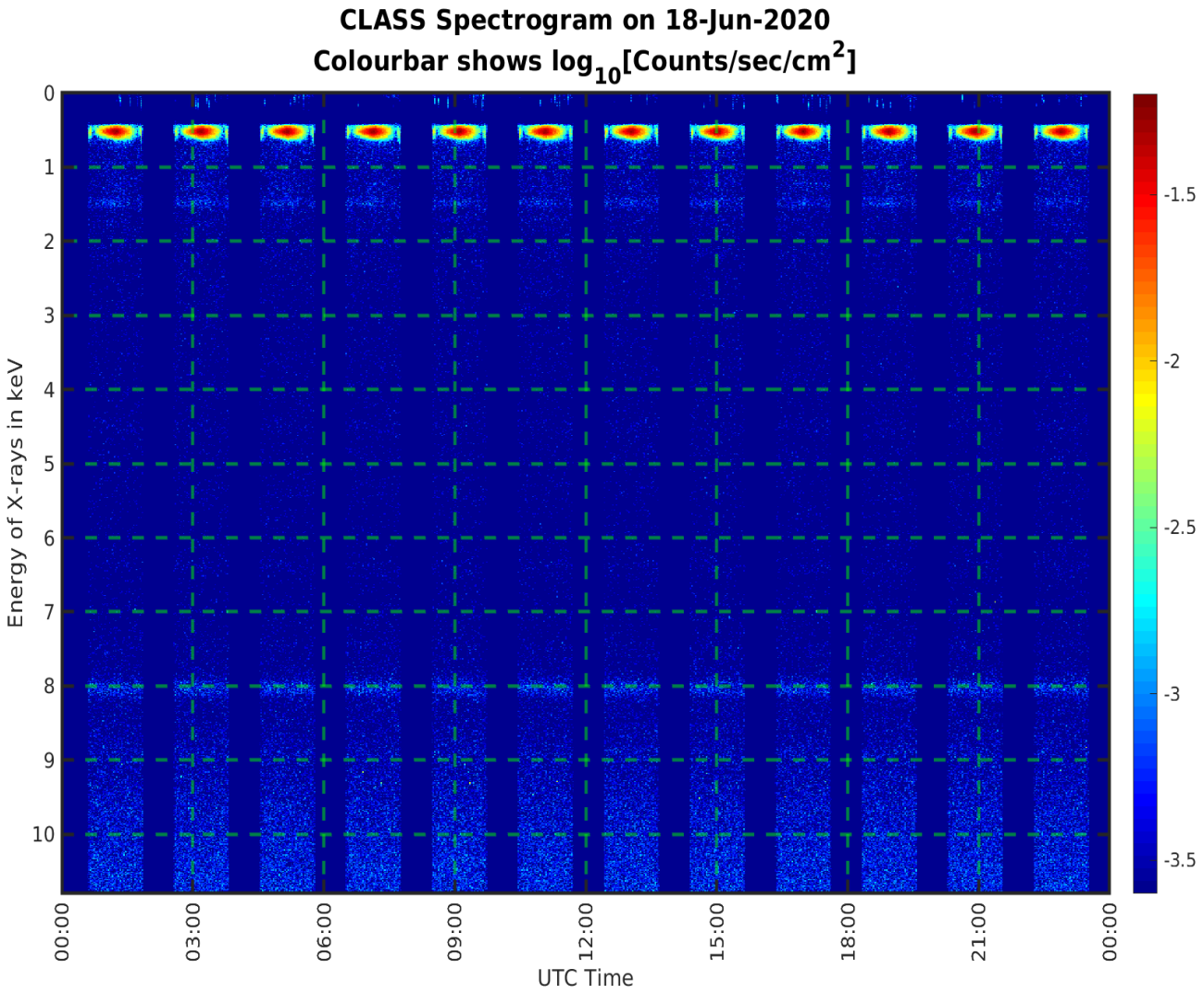
UTC Time


CLASS Spectrogram on 18-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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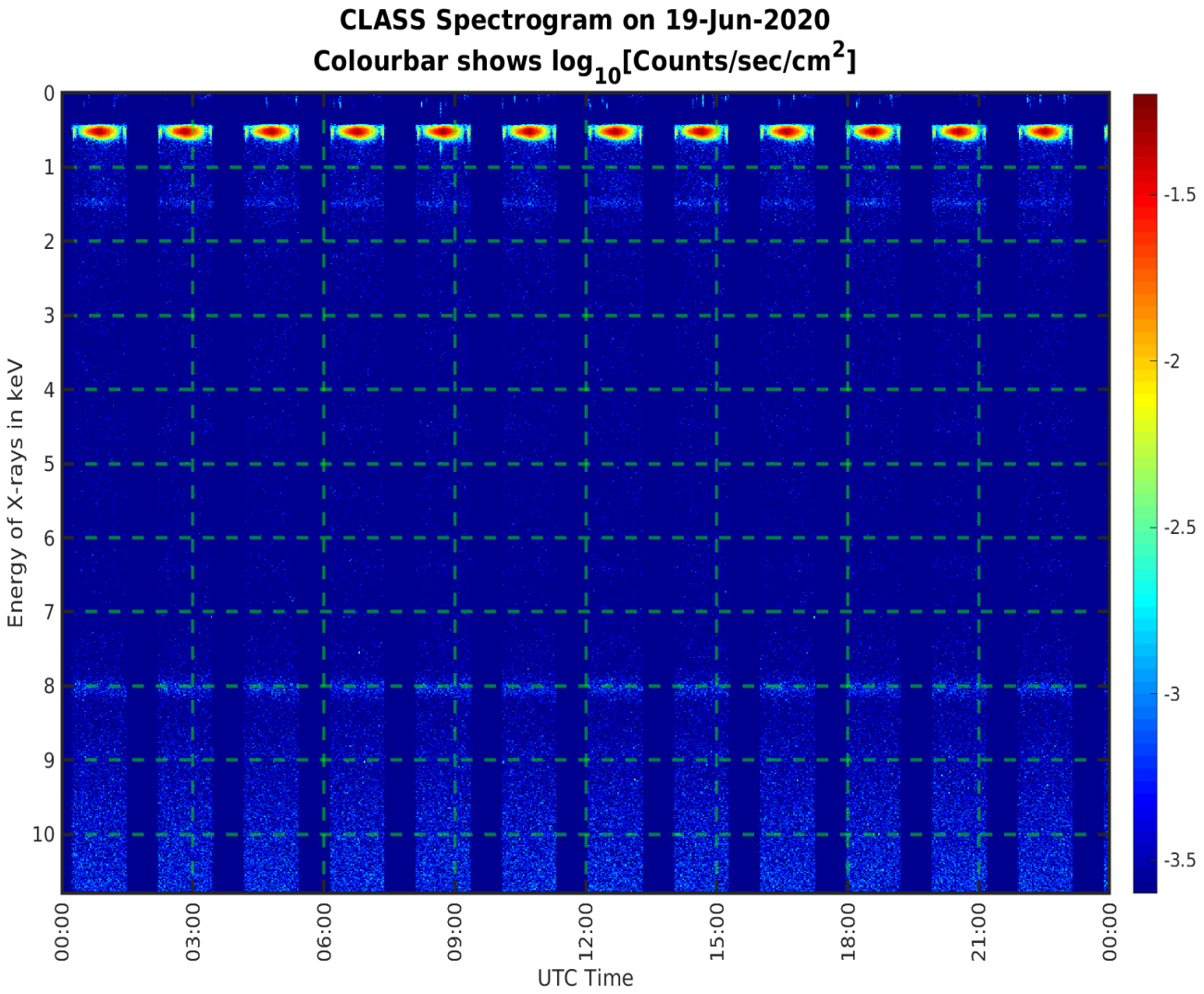
UTC Time


CLASS Spectrogram on 19-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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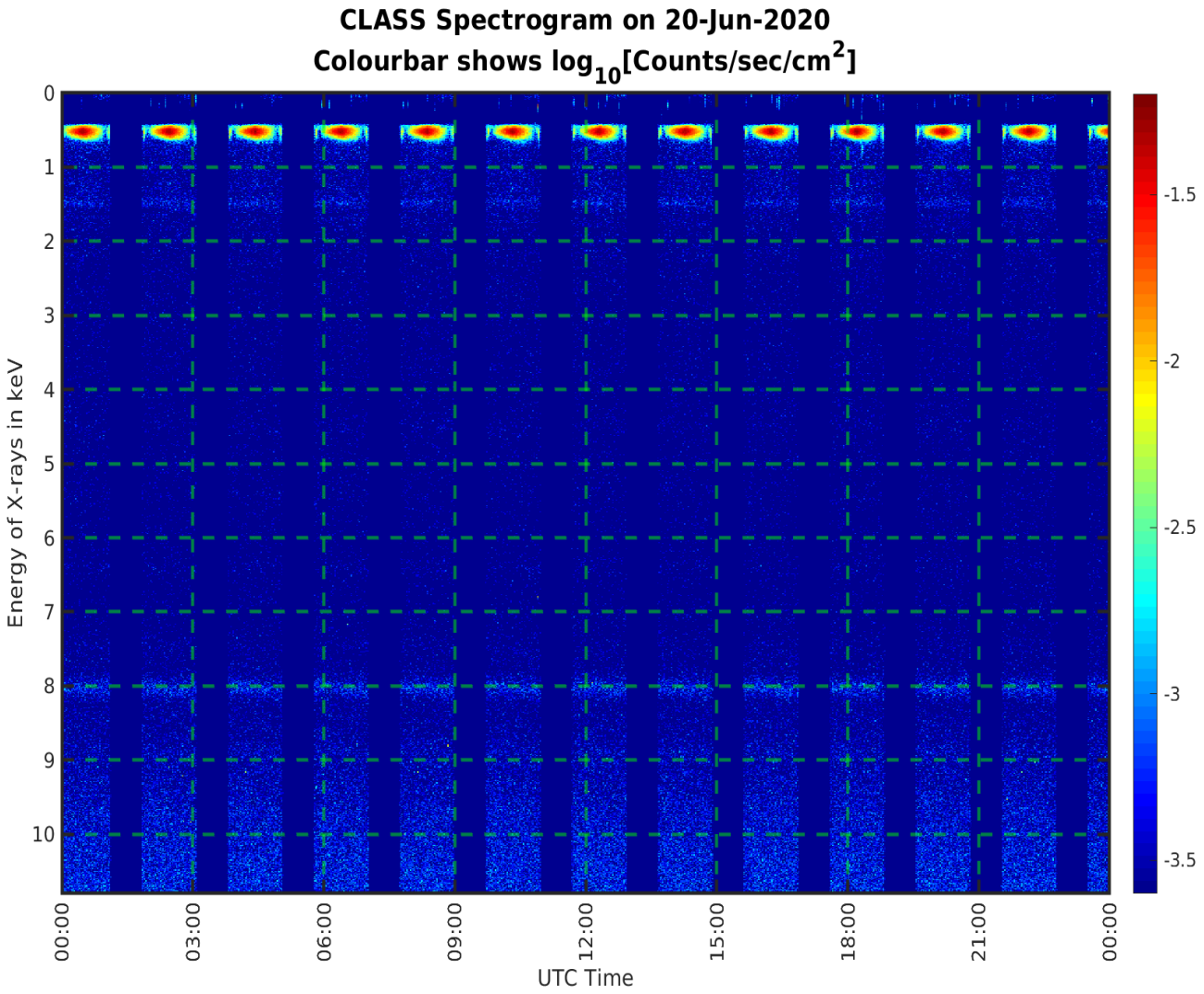
UTC Time


CLASS Spectrogram on 20-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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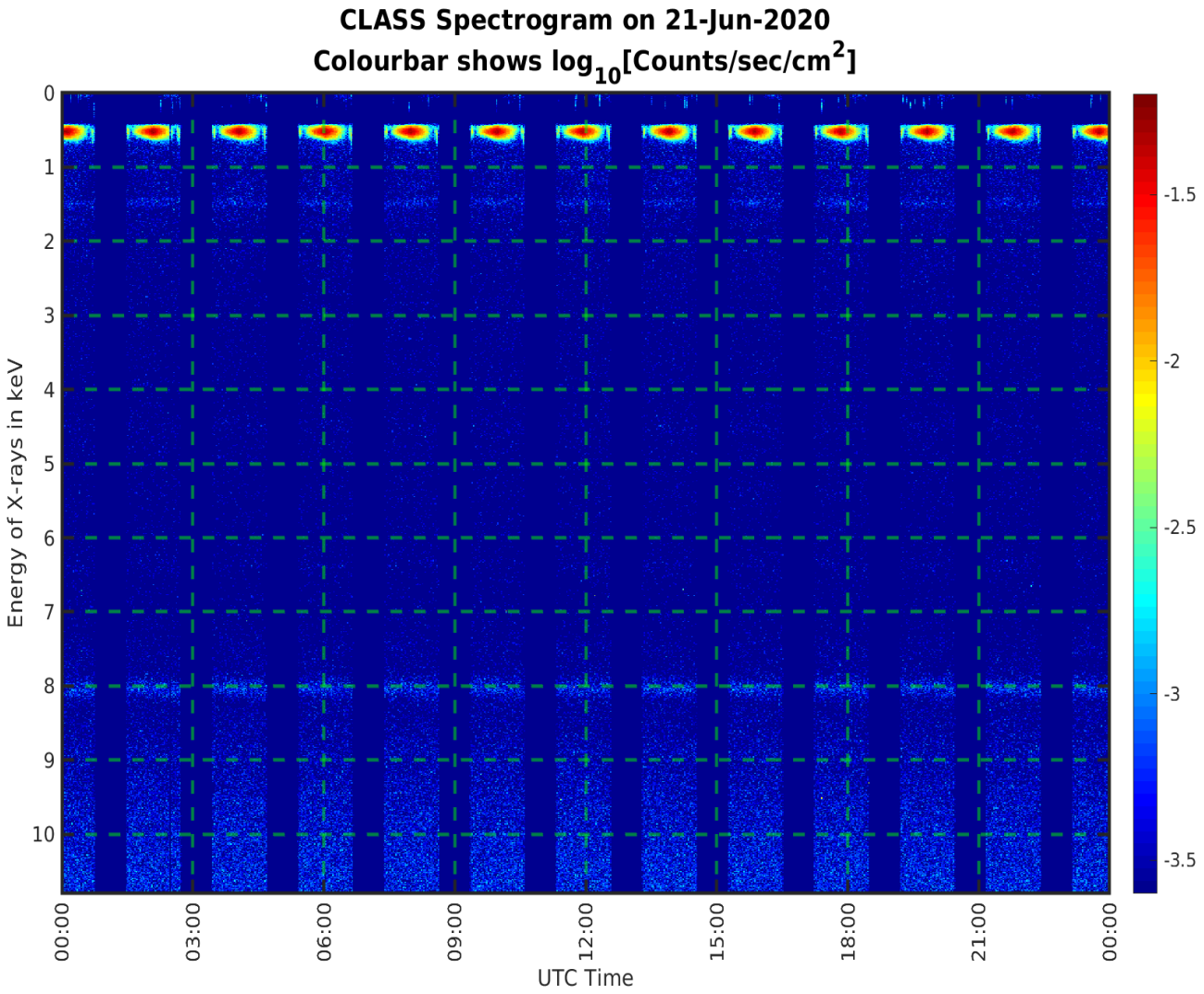
UTC Time


CLASS Spectrogram on 21-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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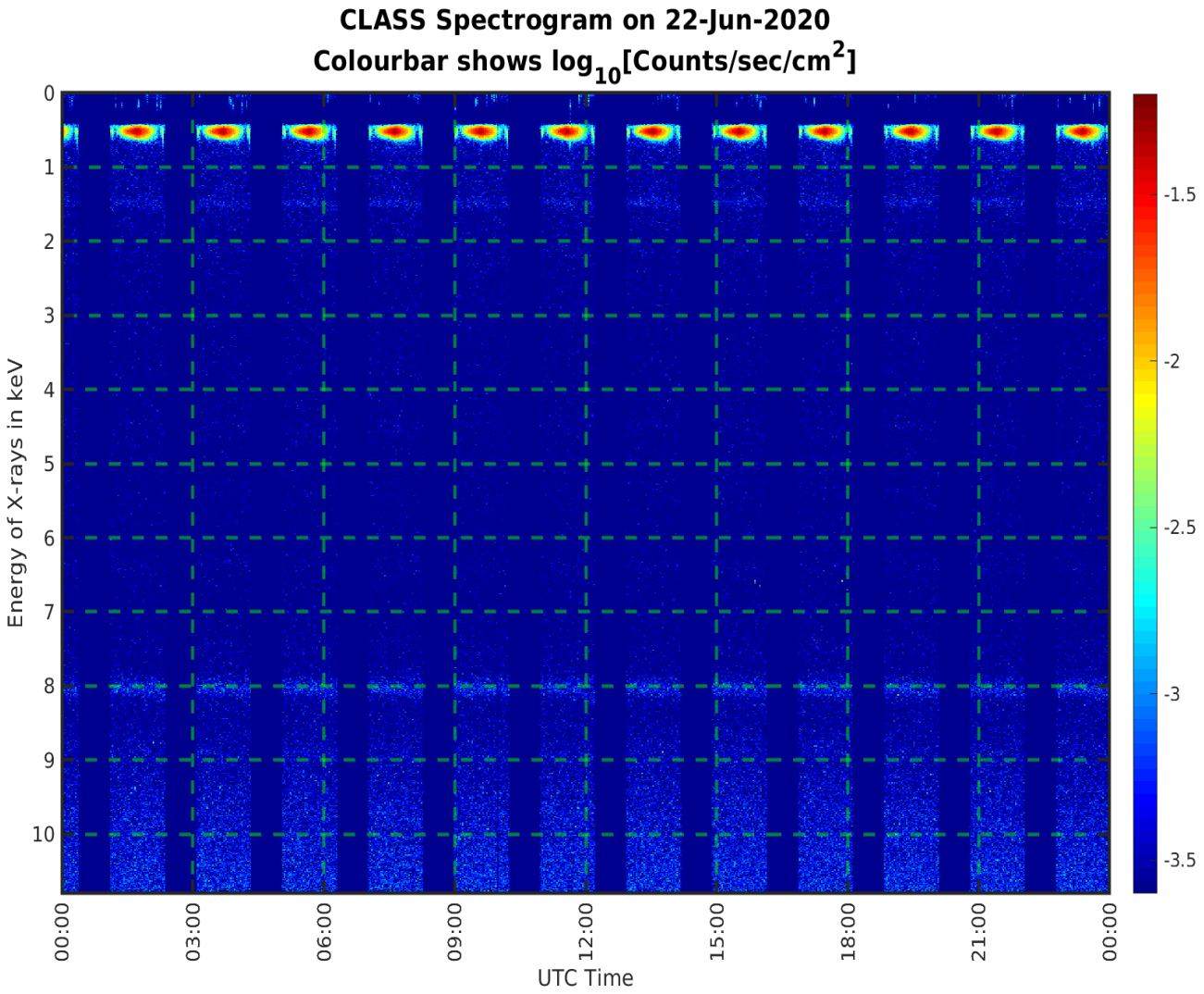
UTC Time


CLASS Spectrogram on 22-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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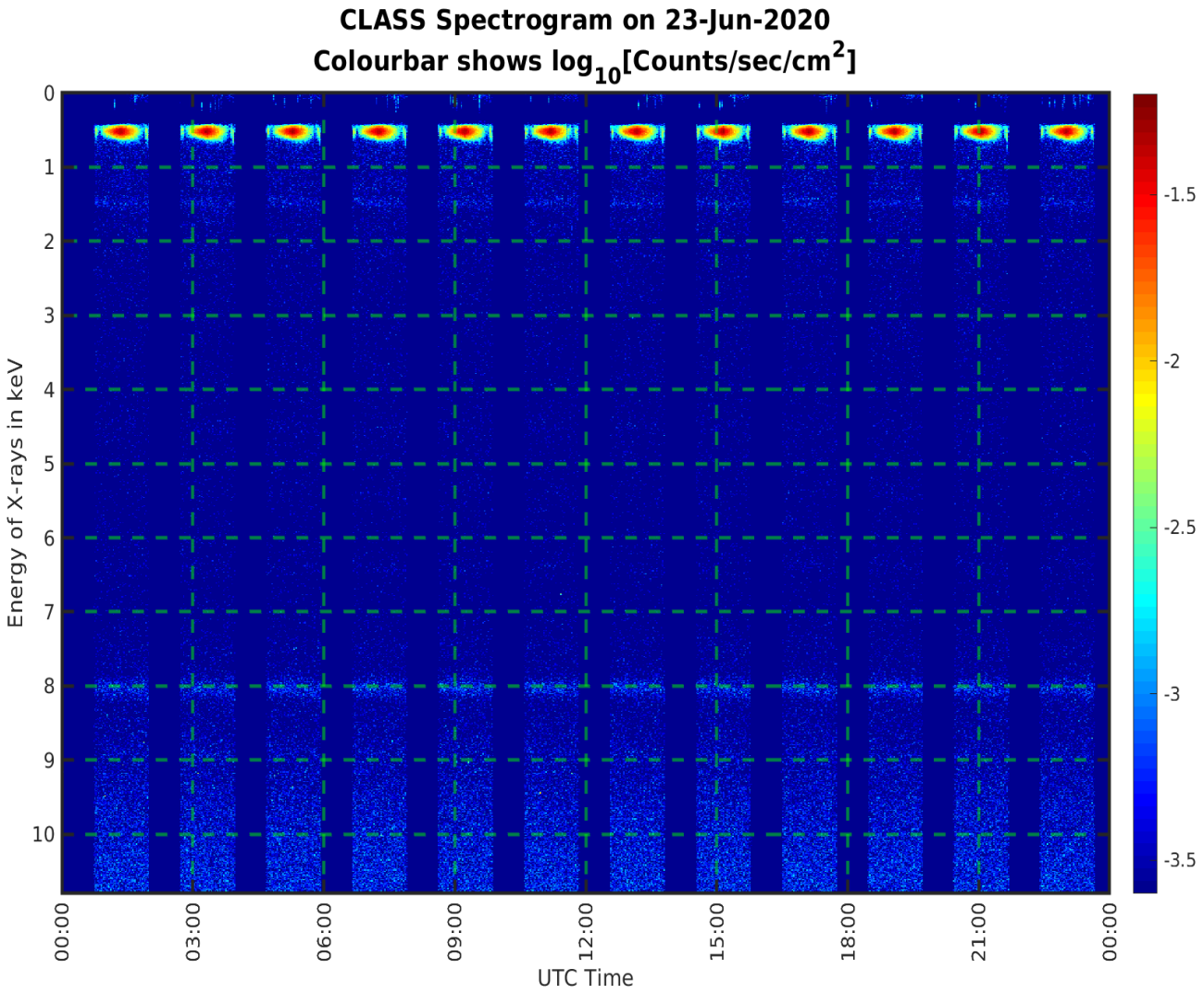
UTC Time


CLASS Spectrogram on 23-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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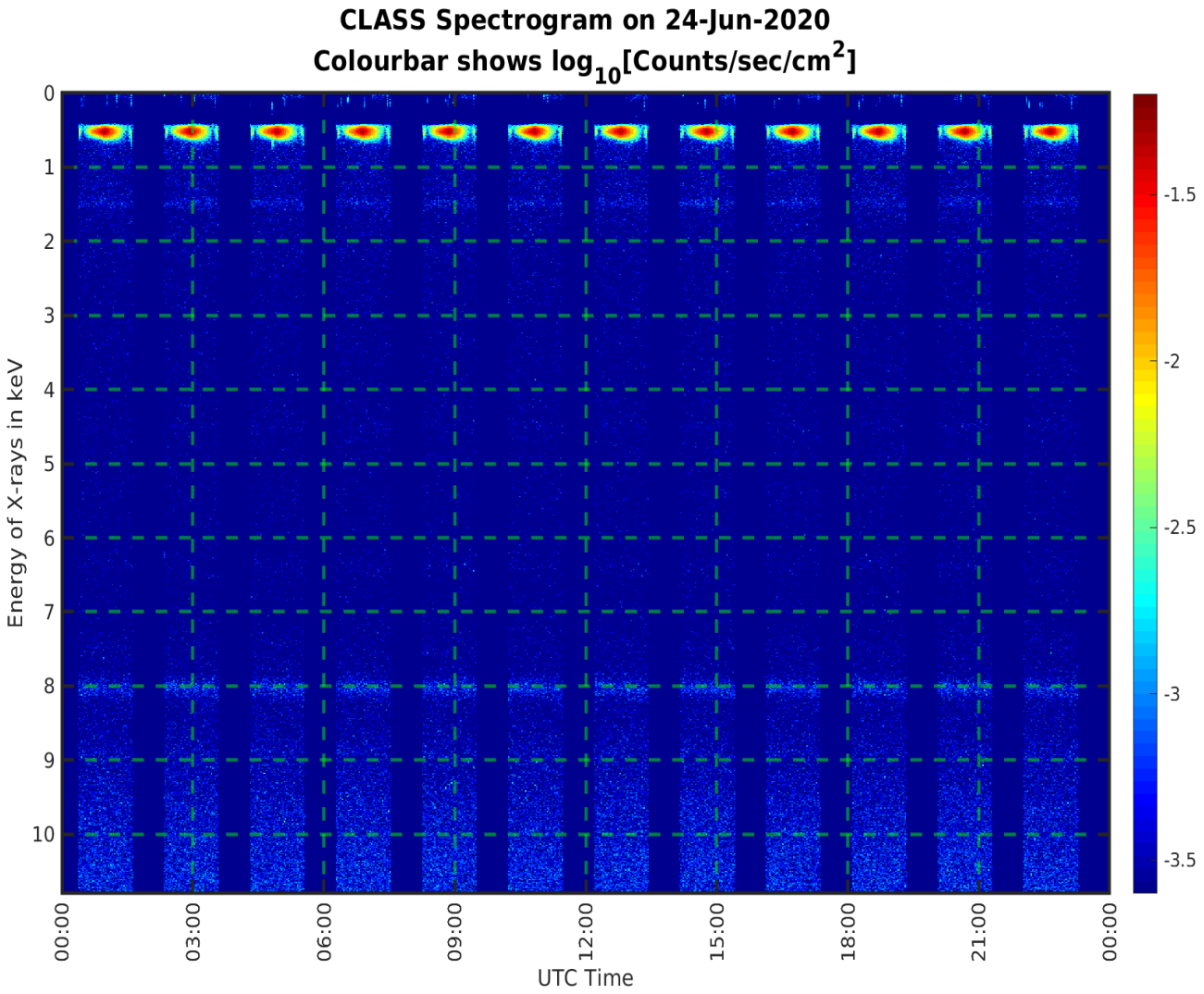
UTC Time


CLASS Spectrogram on 24-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
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-1.5
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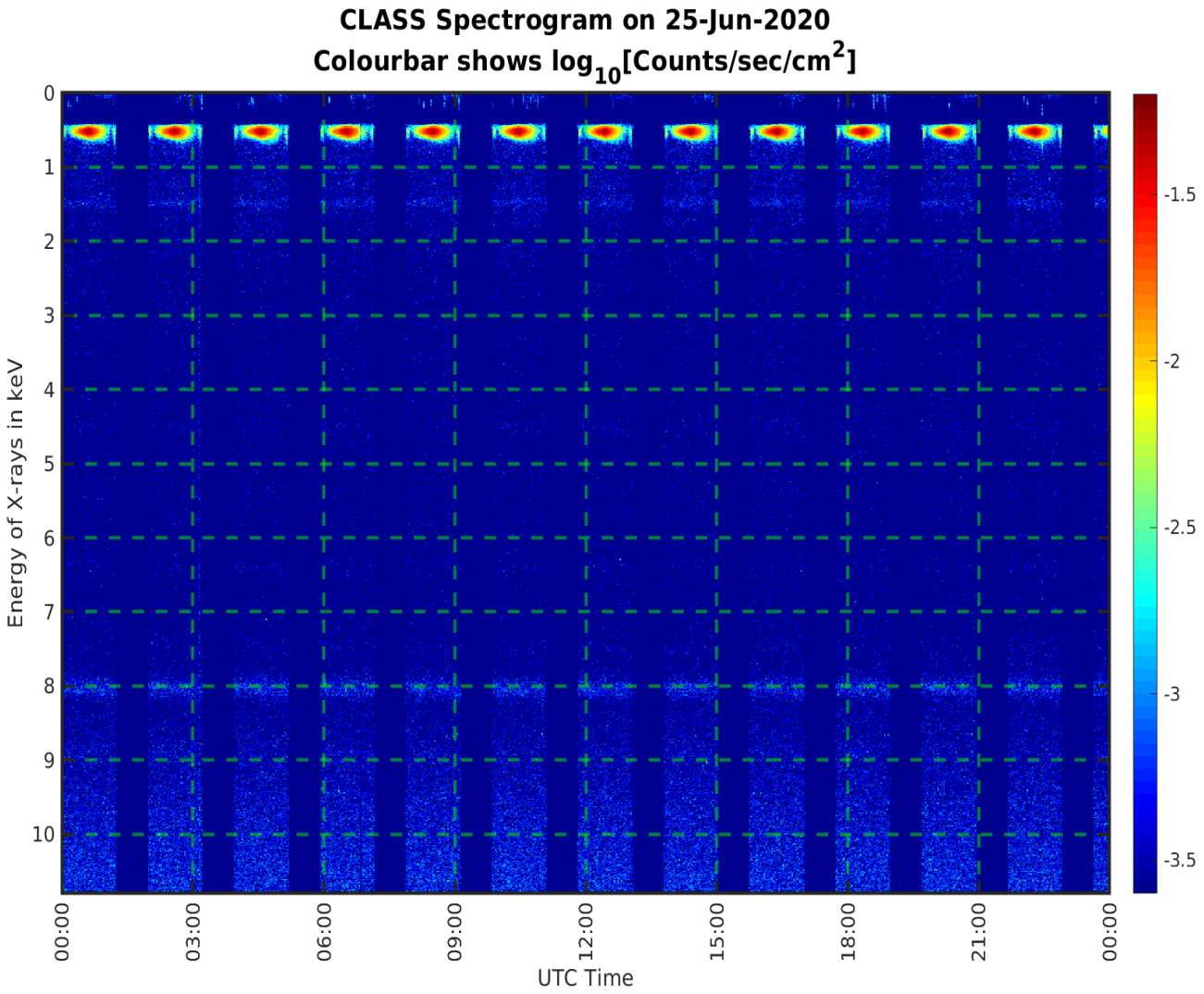
UTC Time


CLASS Spectrogram on 25-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
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-1.5
-2
-2.5
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-3.5
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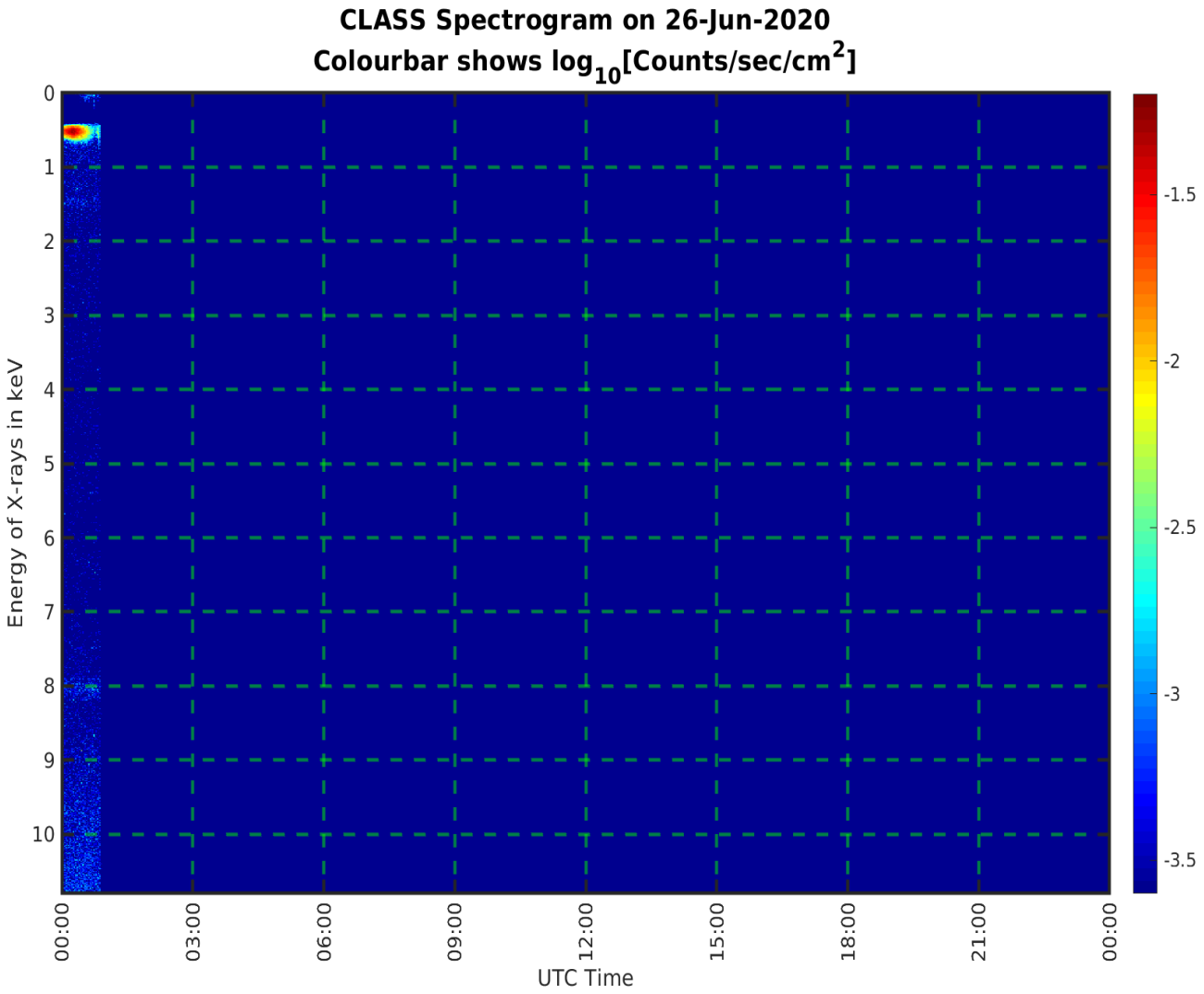
UTC Time


CLASS Spectrogram on 26-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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4
5
6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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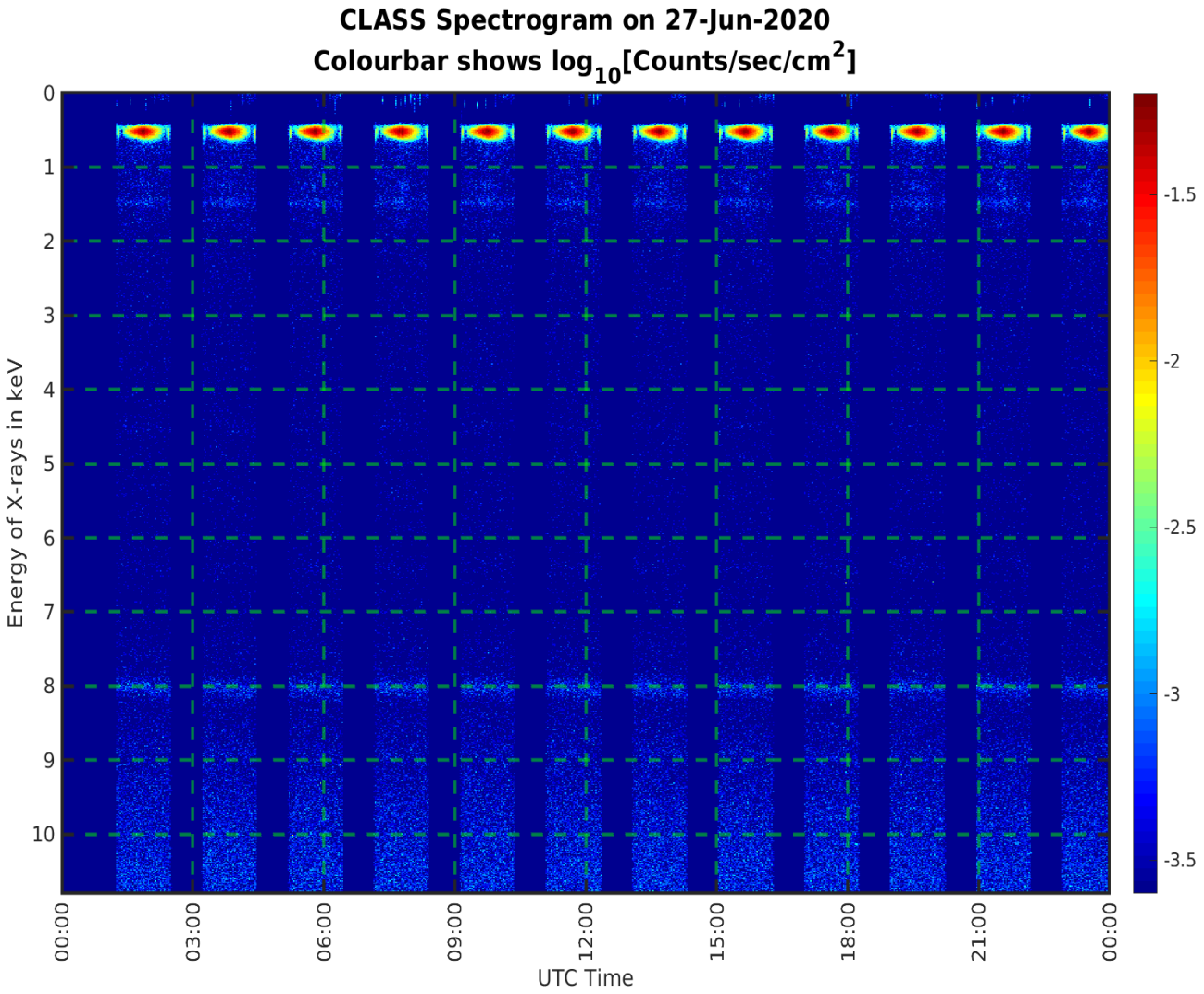
UTC Time


CLASS Spectrogram on 27-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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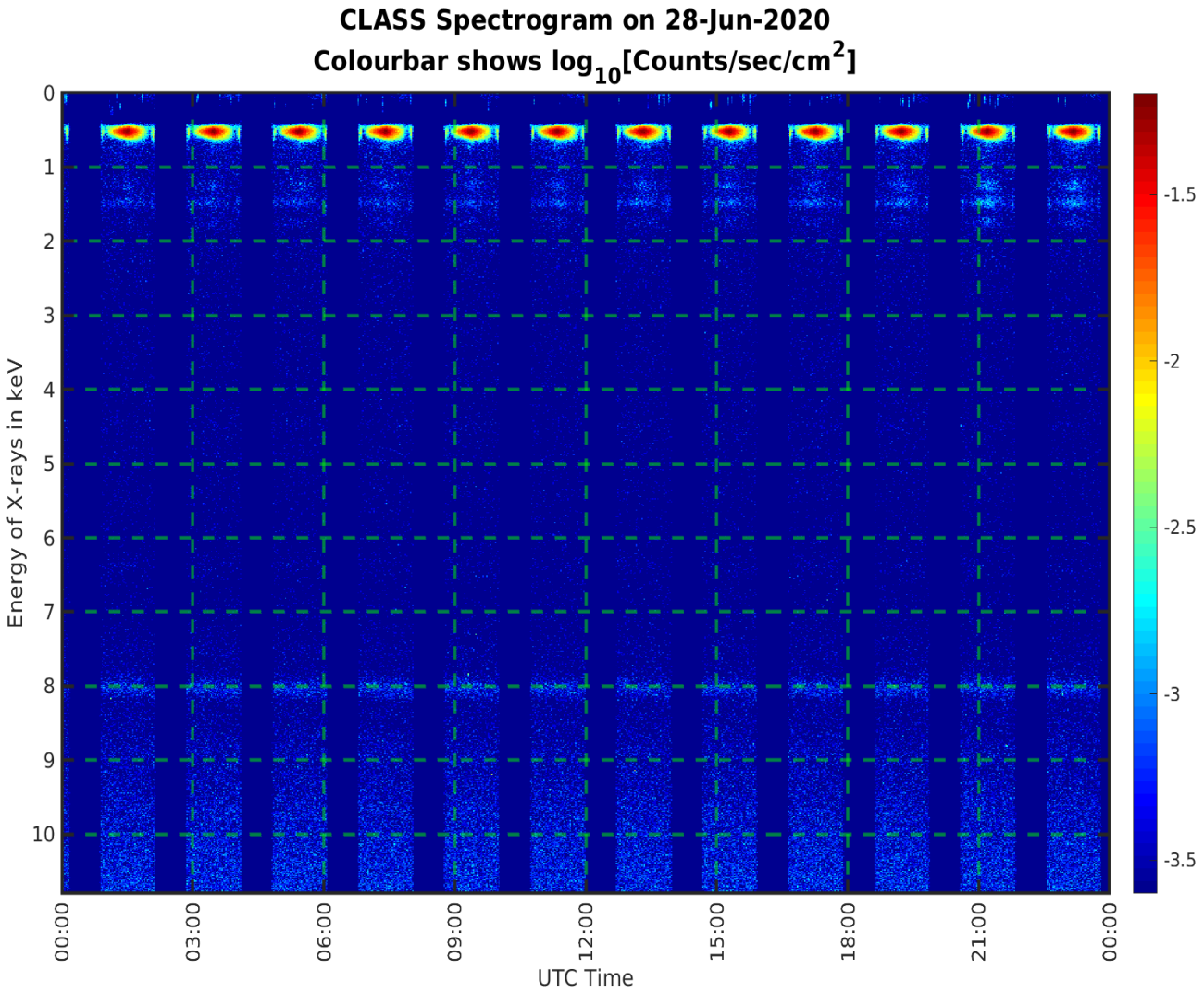
UTC Time


CLASS Spectrogram on 28-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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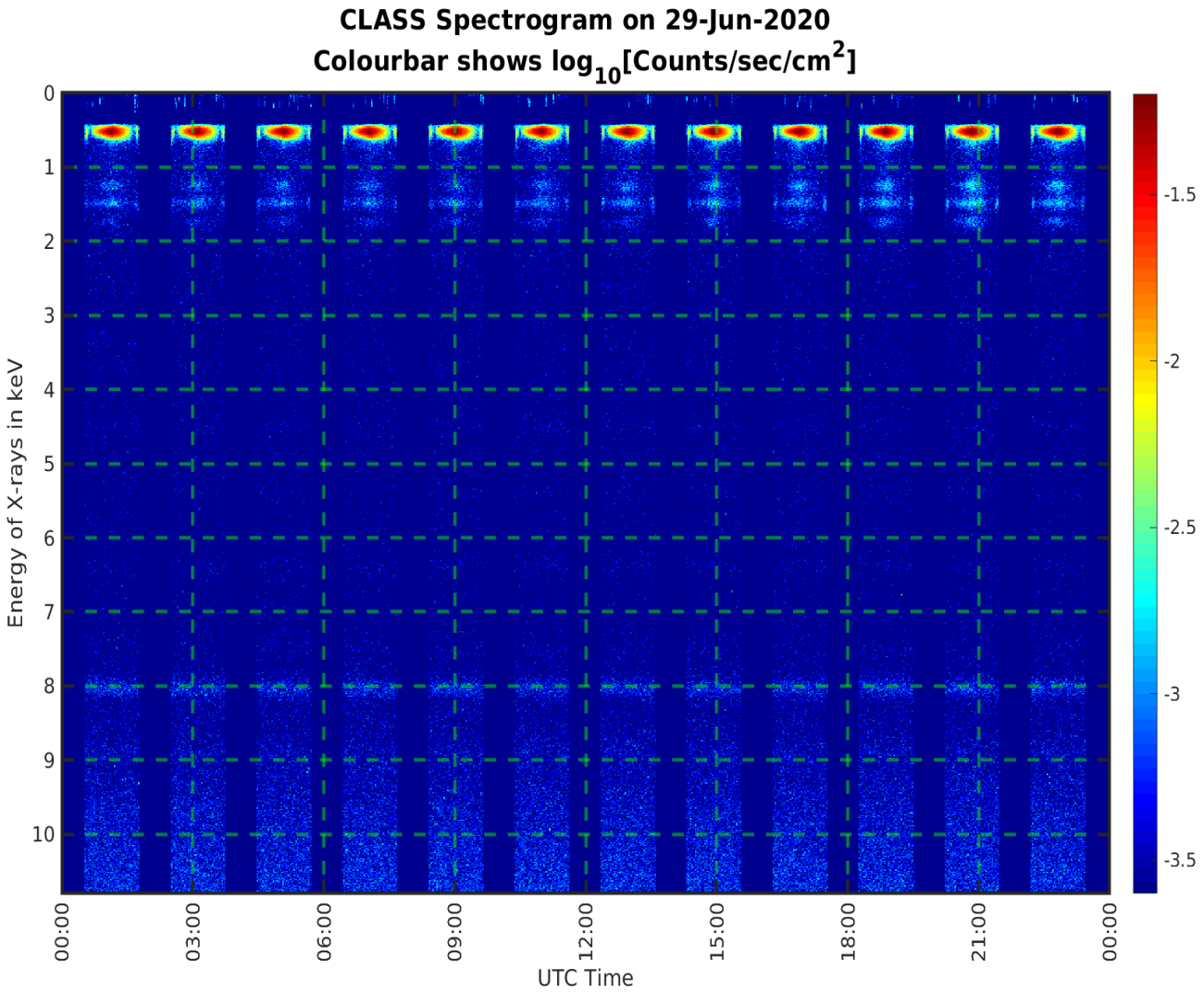
UTC Time


CLASS Spectrogram on 29-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
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-3.5
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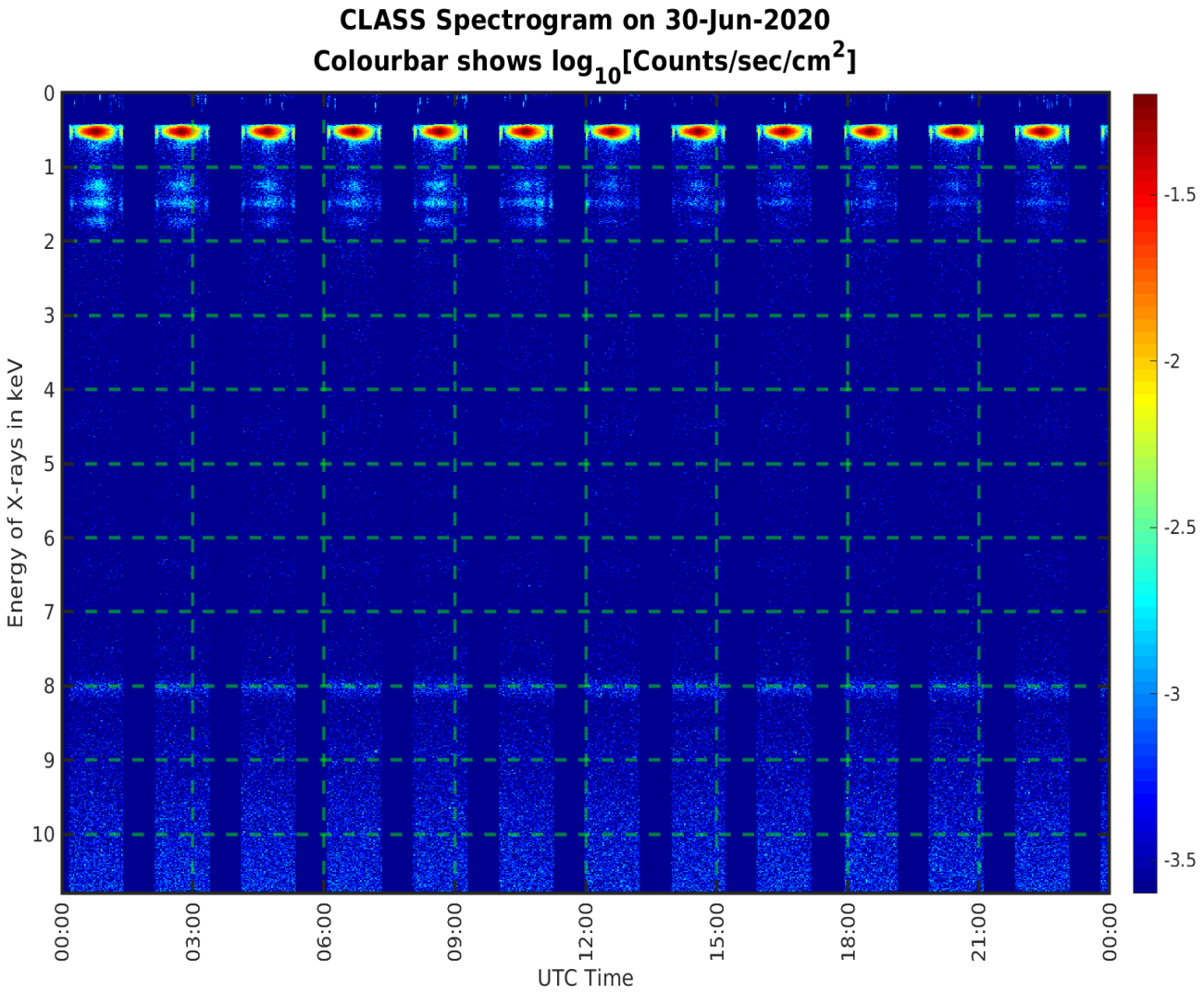
UTC Time


CLASS Spectrogram on 30-Jun-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
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-3.5
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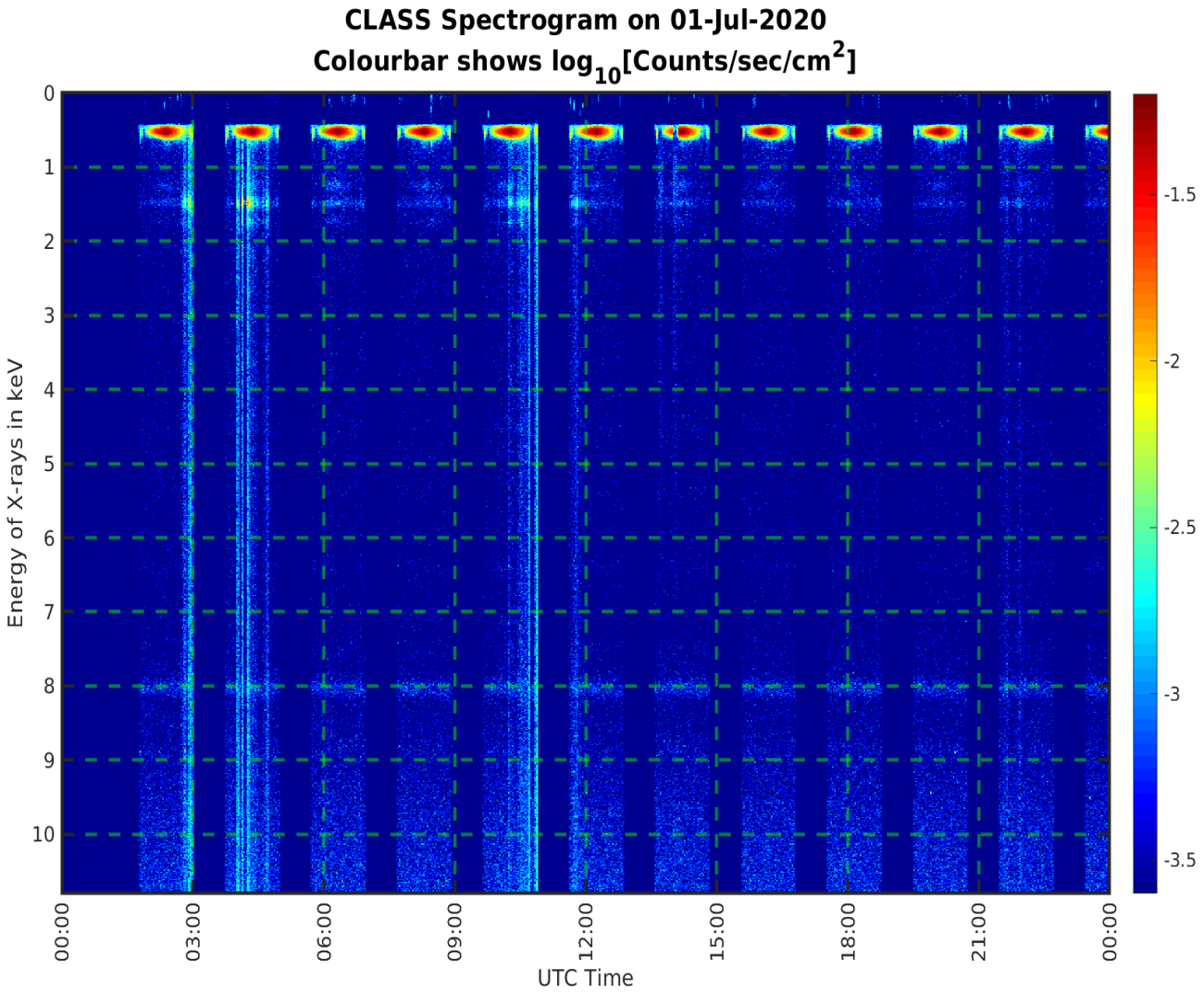
UTC Time


CLASS Spectrogram on 01-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
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-1.5
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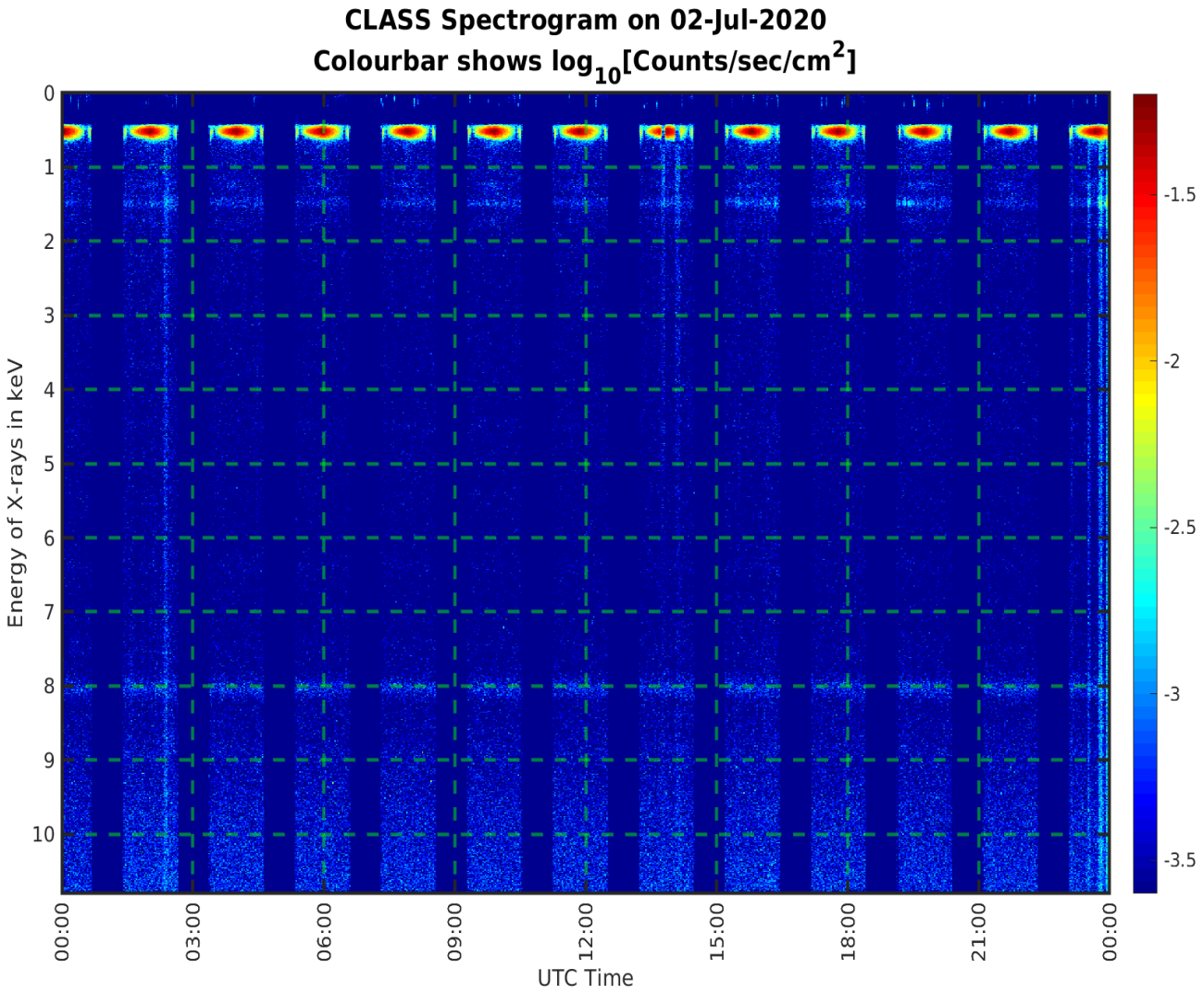
UTC Time


CLASS Spectrogram on 02-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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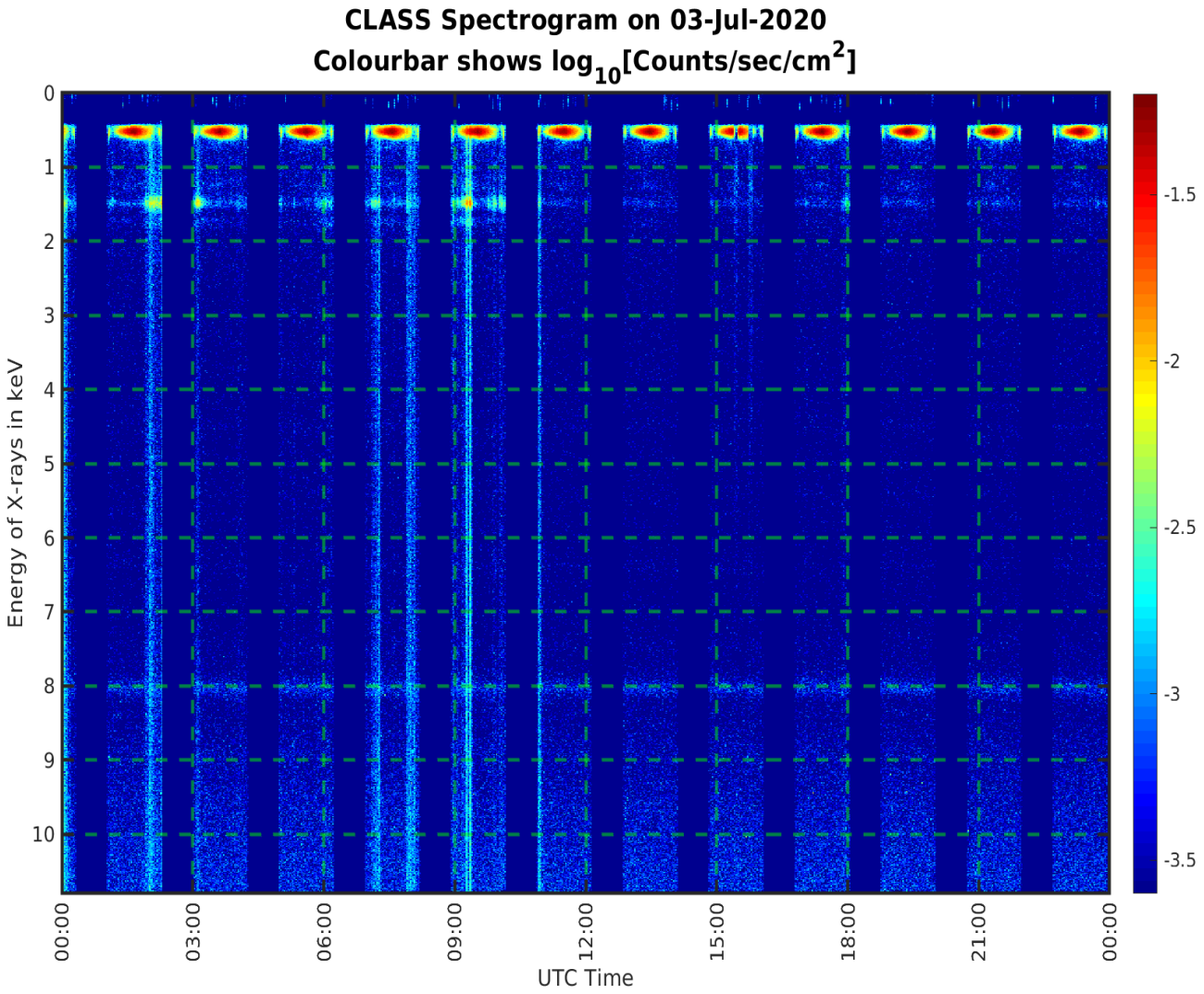
UTC Time


CLASS Spectrogram on 03-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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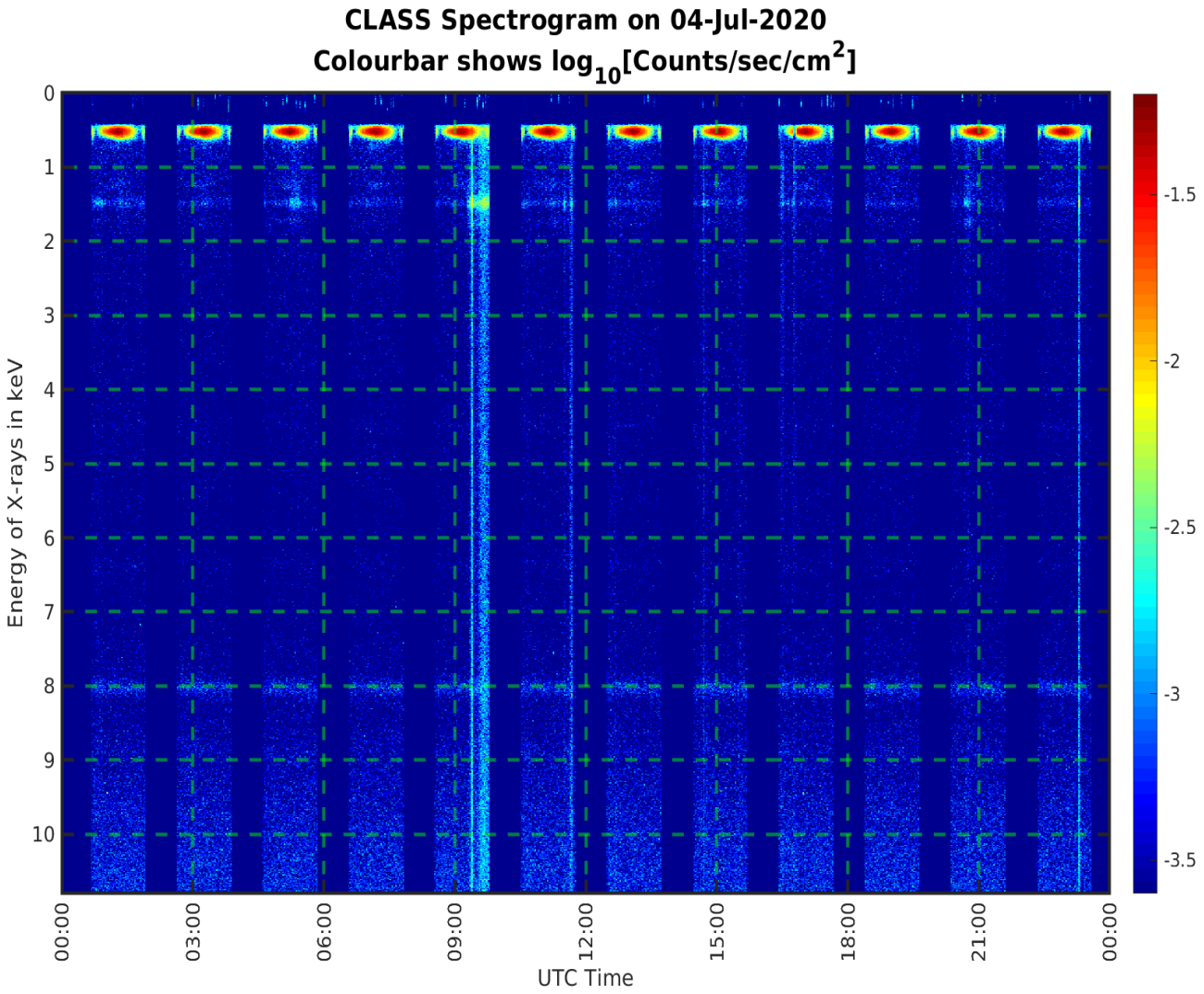
CLASS Spectrogram on 04-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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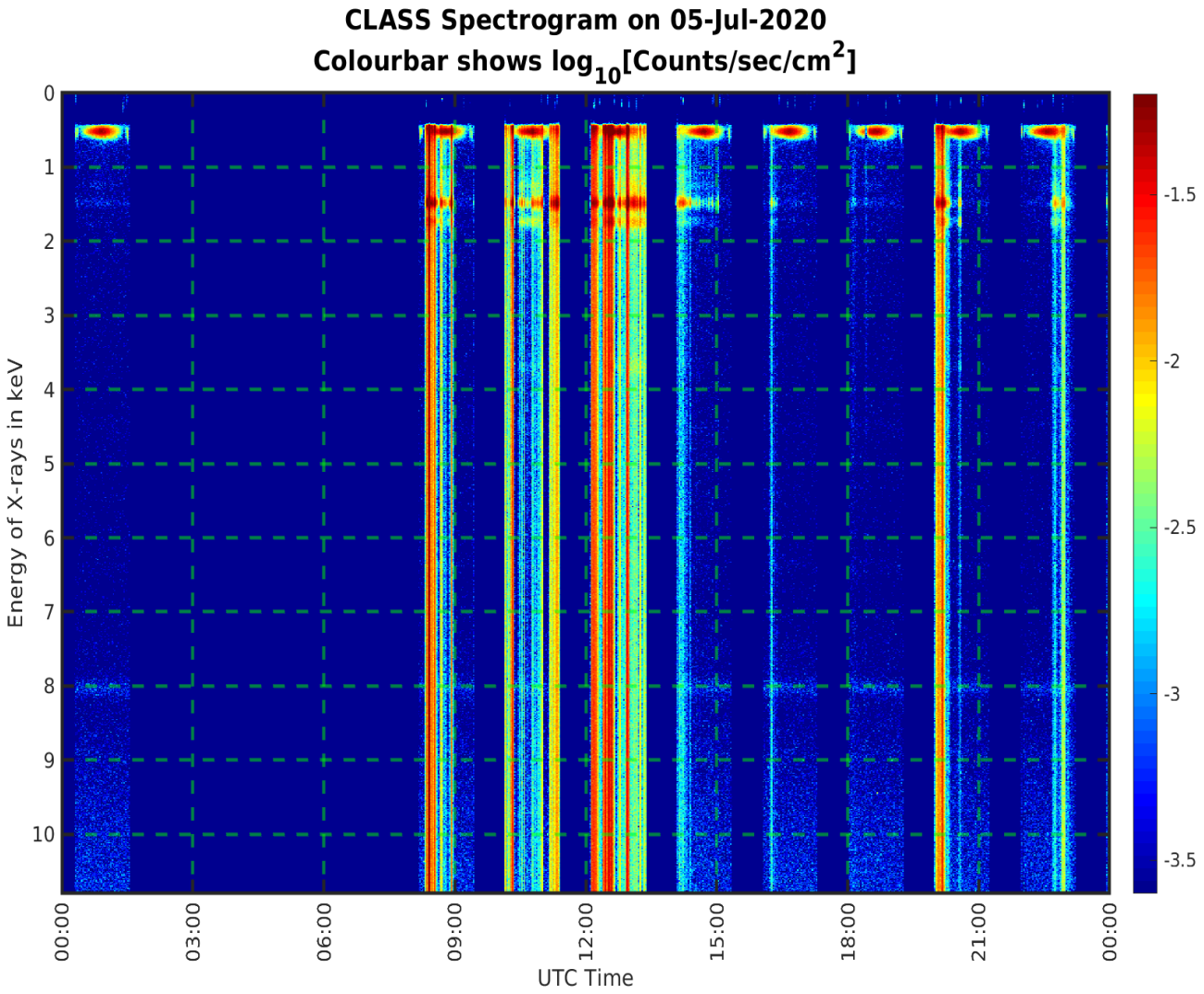
UTC Time


CLASS Spectrogram on 05-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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18:00
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UTC Time
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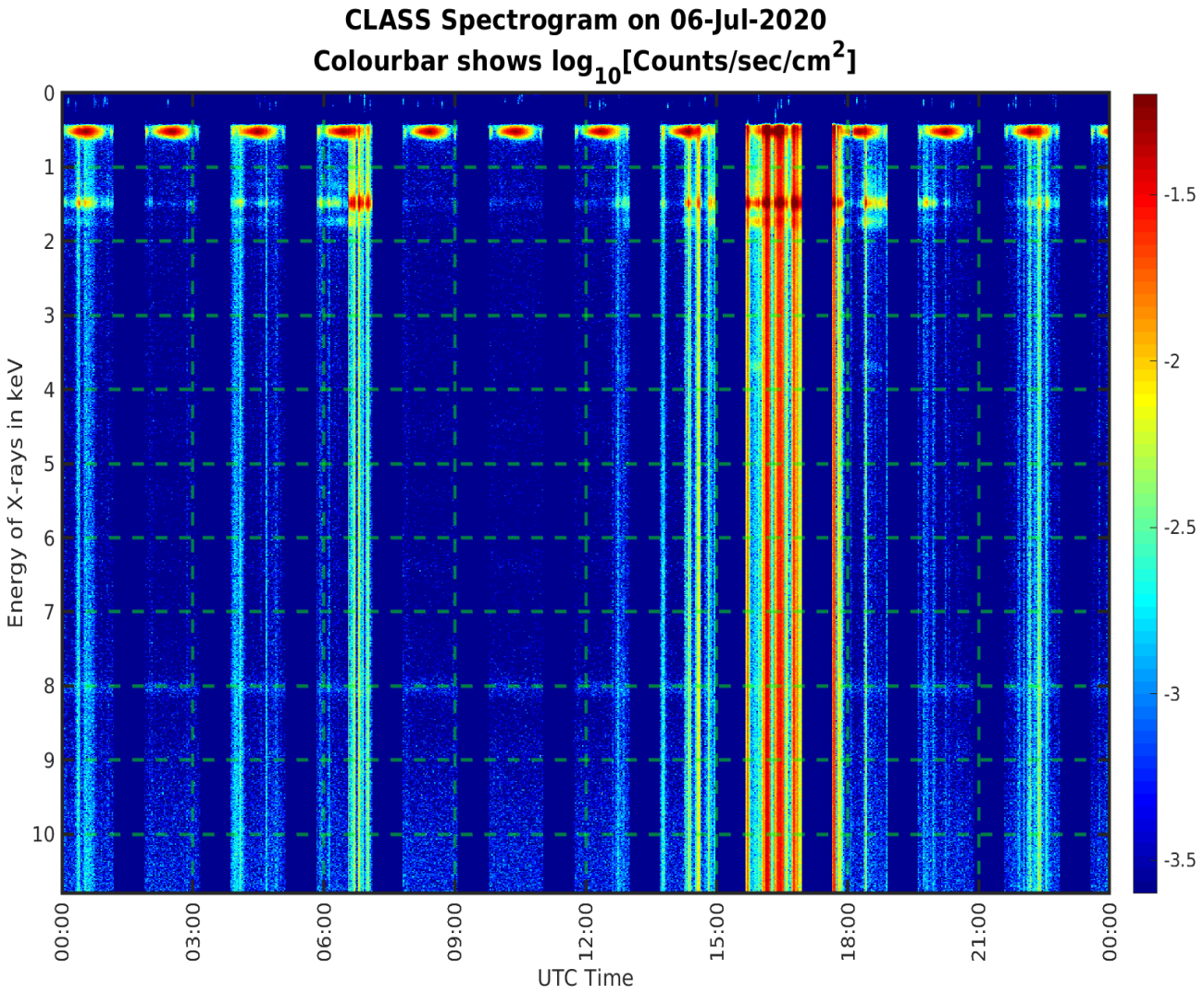
CLASS Spectrogram on 06-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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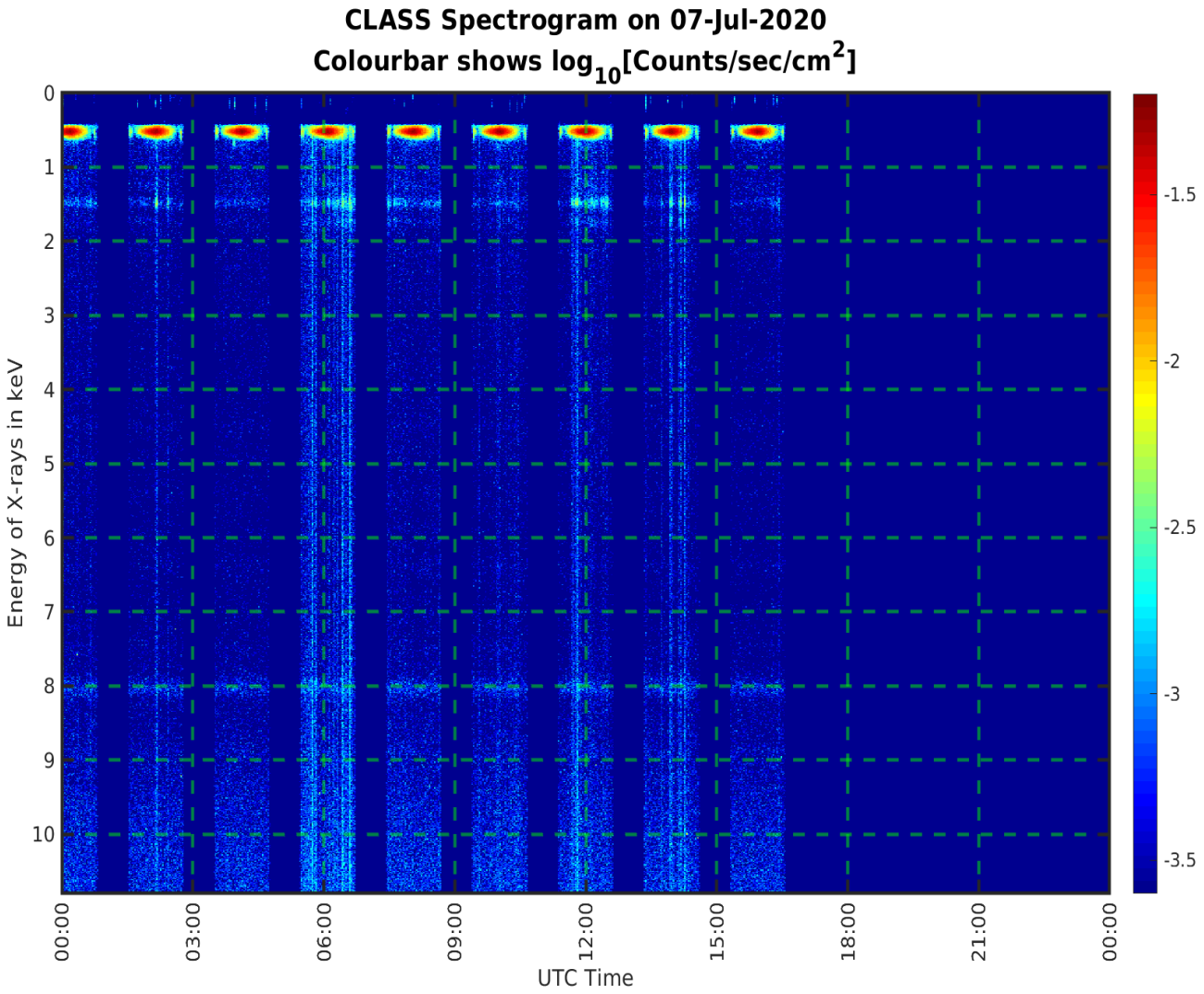
CLASS Spectrogram on 07-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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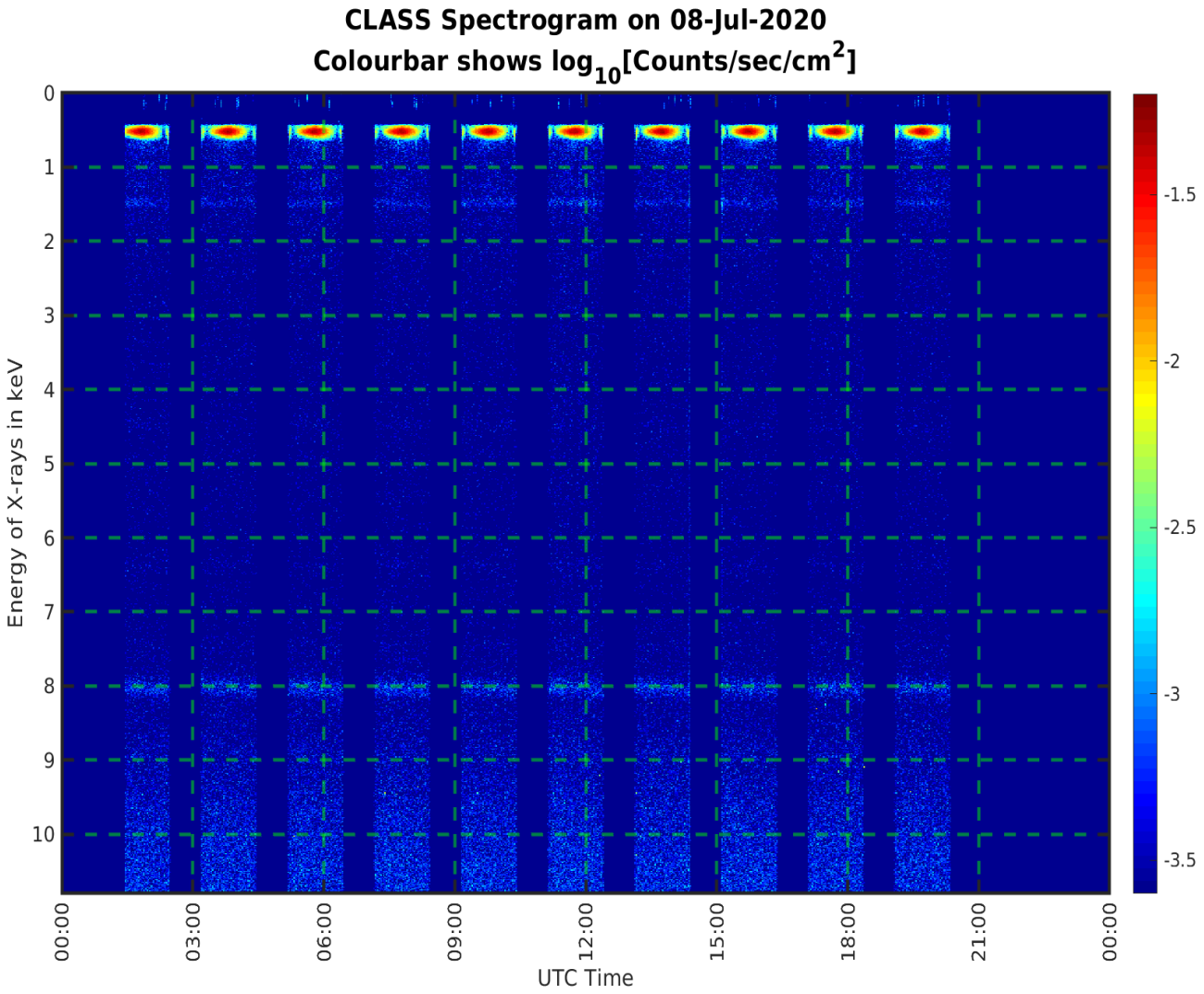
CLASS Spectrogram on 08-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
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-1.5
-2
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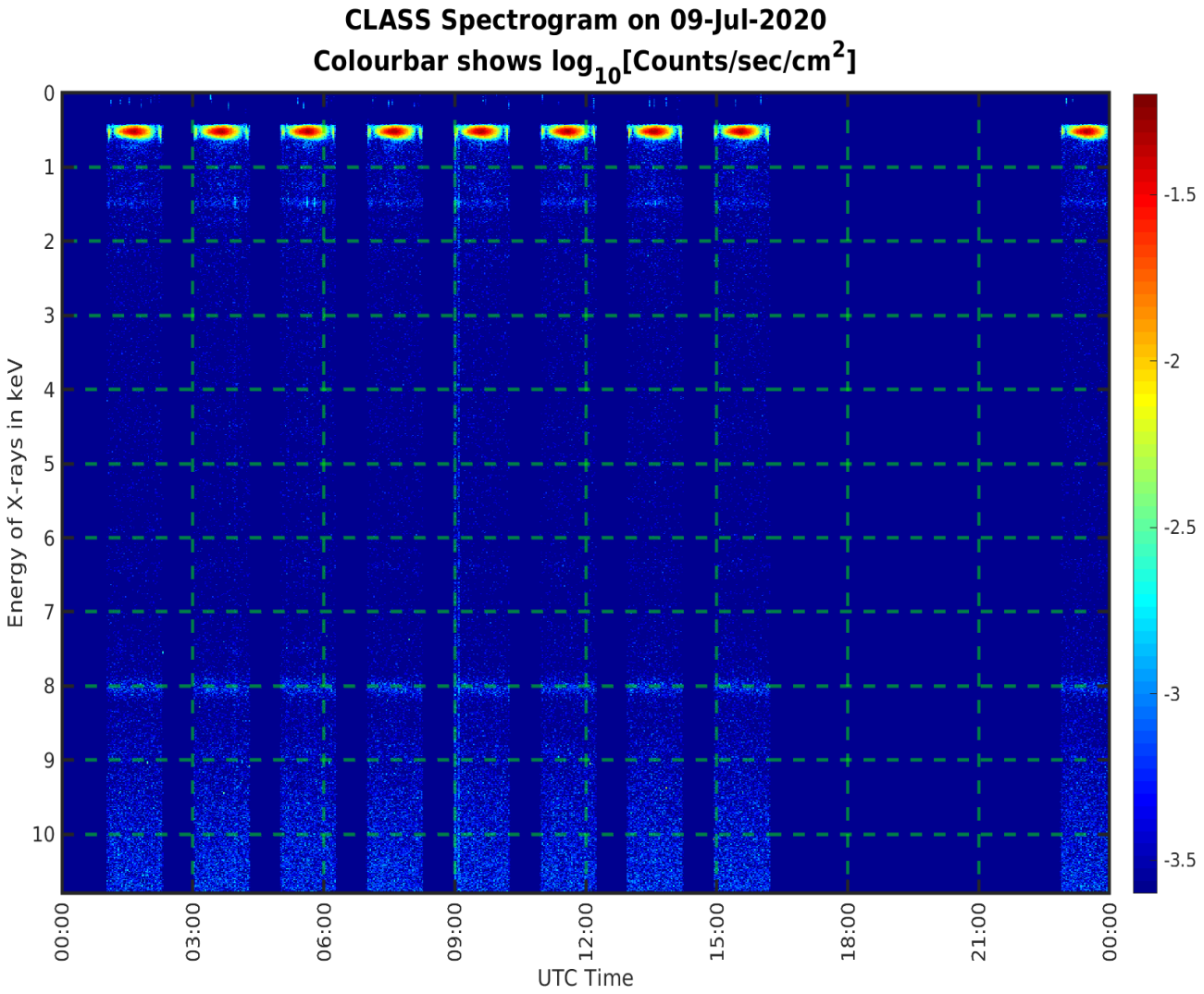
UTC Time


CLASS Spectrogram on 09-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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8
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-1.5
-2
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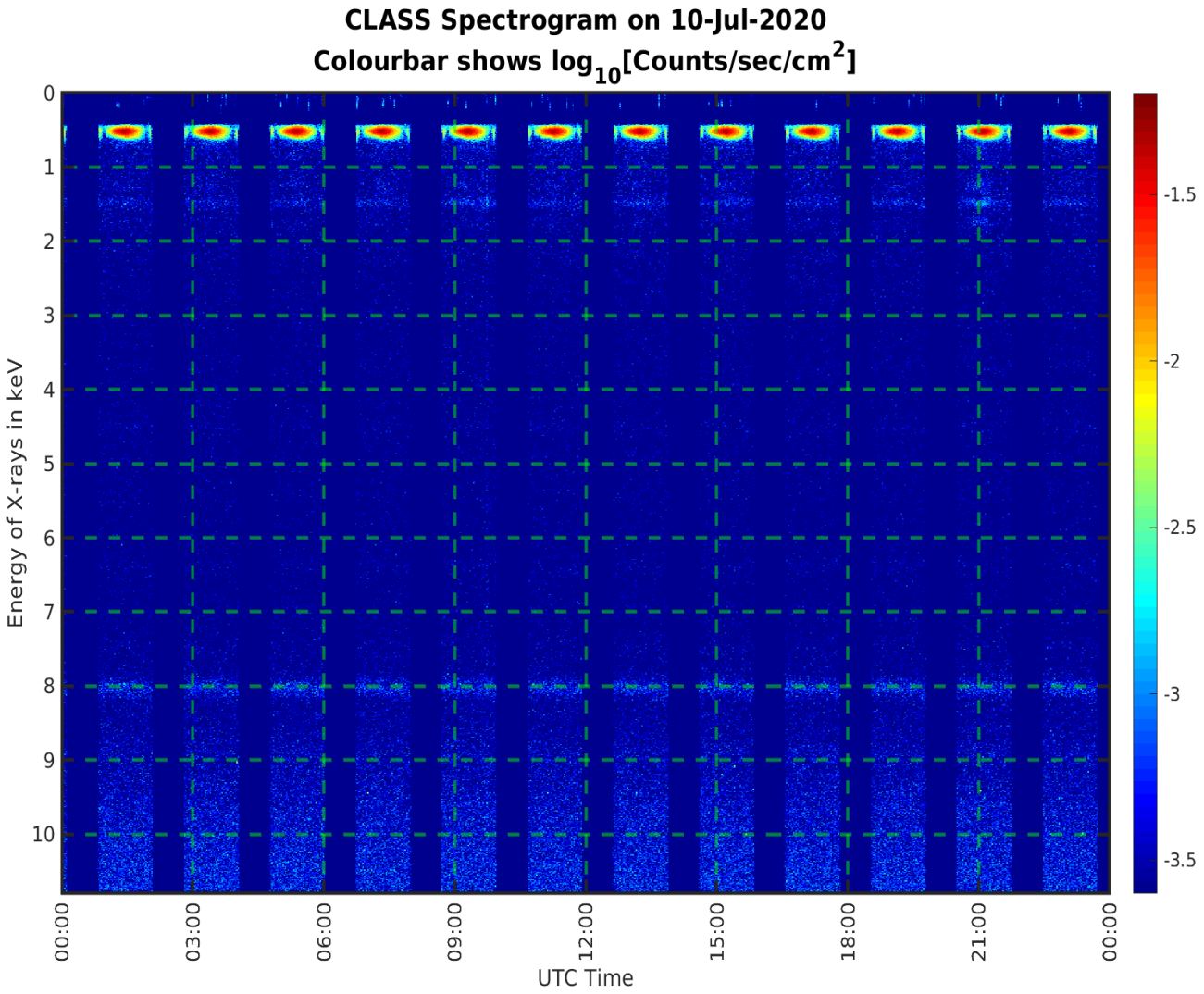
UTC Time


CLASS Spectrogram on 10-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
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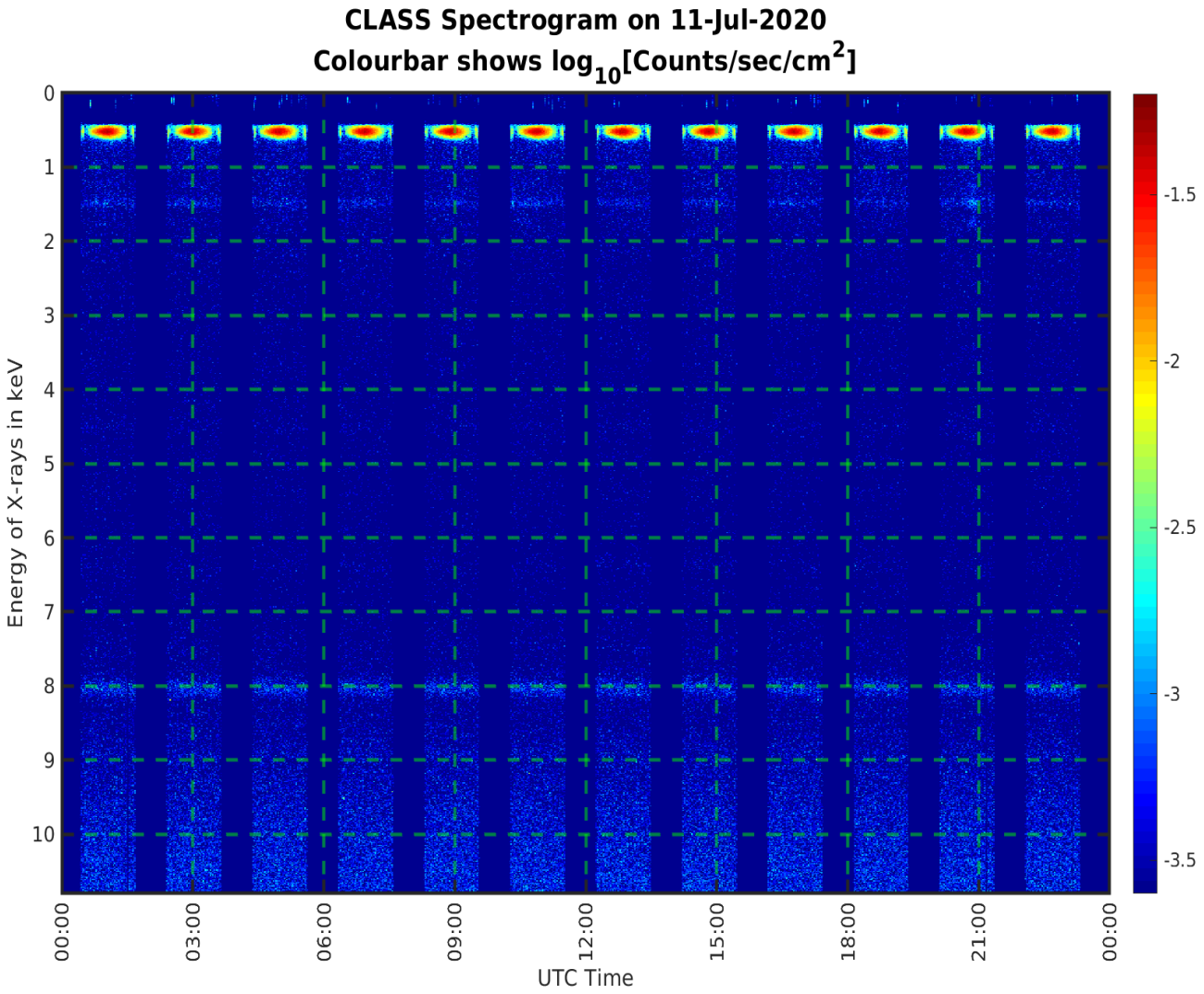
UTC Time


CLASS Spectrogram on 11-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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8
9
10
-1.5
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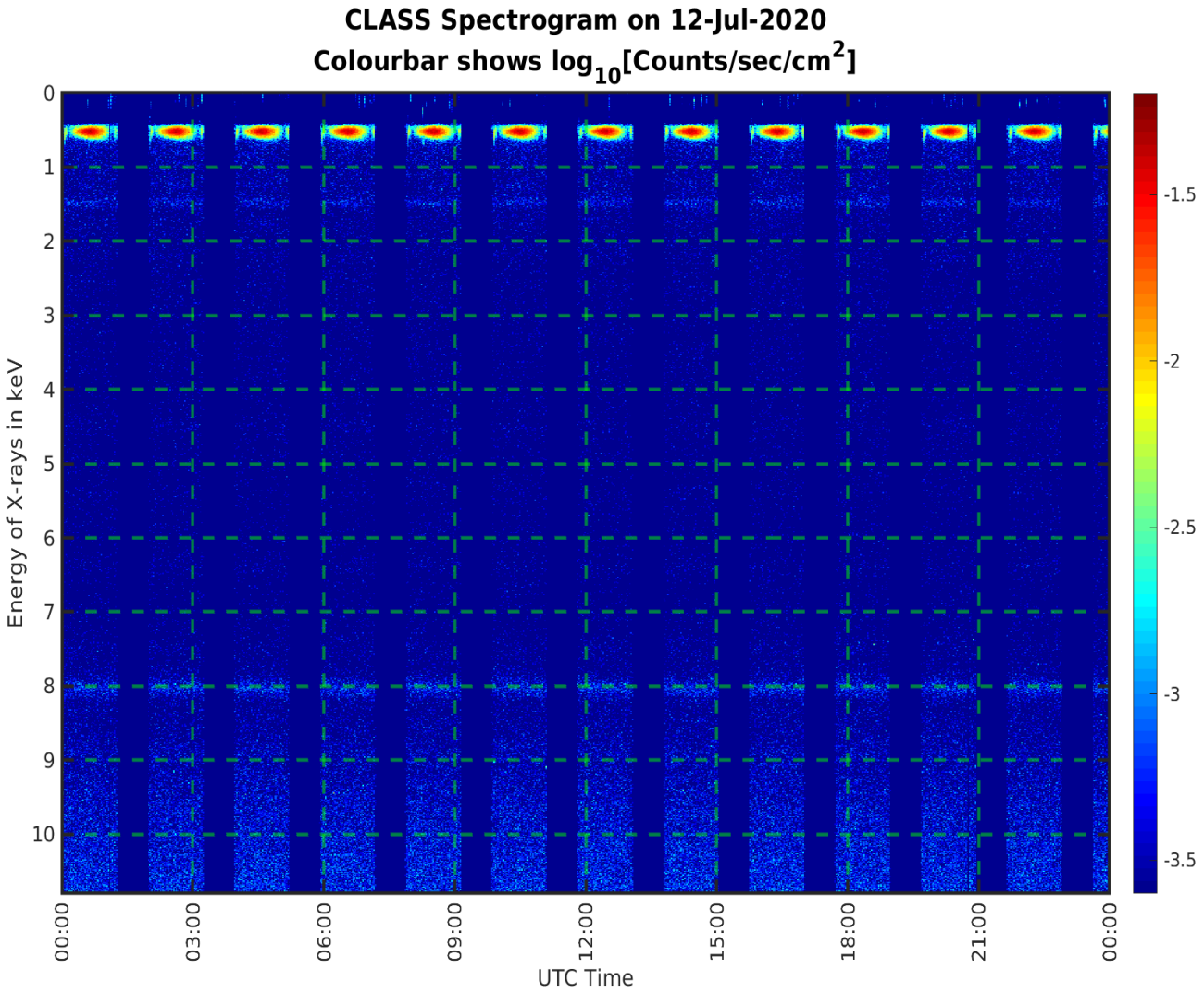
UTC Time


CLASS Spectrogram on 12-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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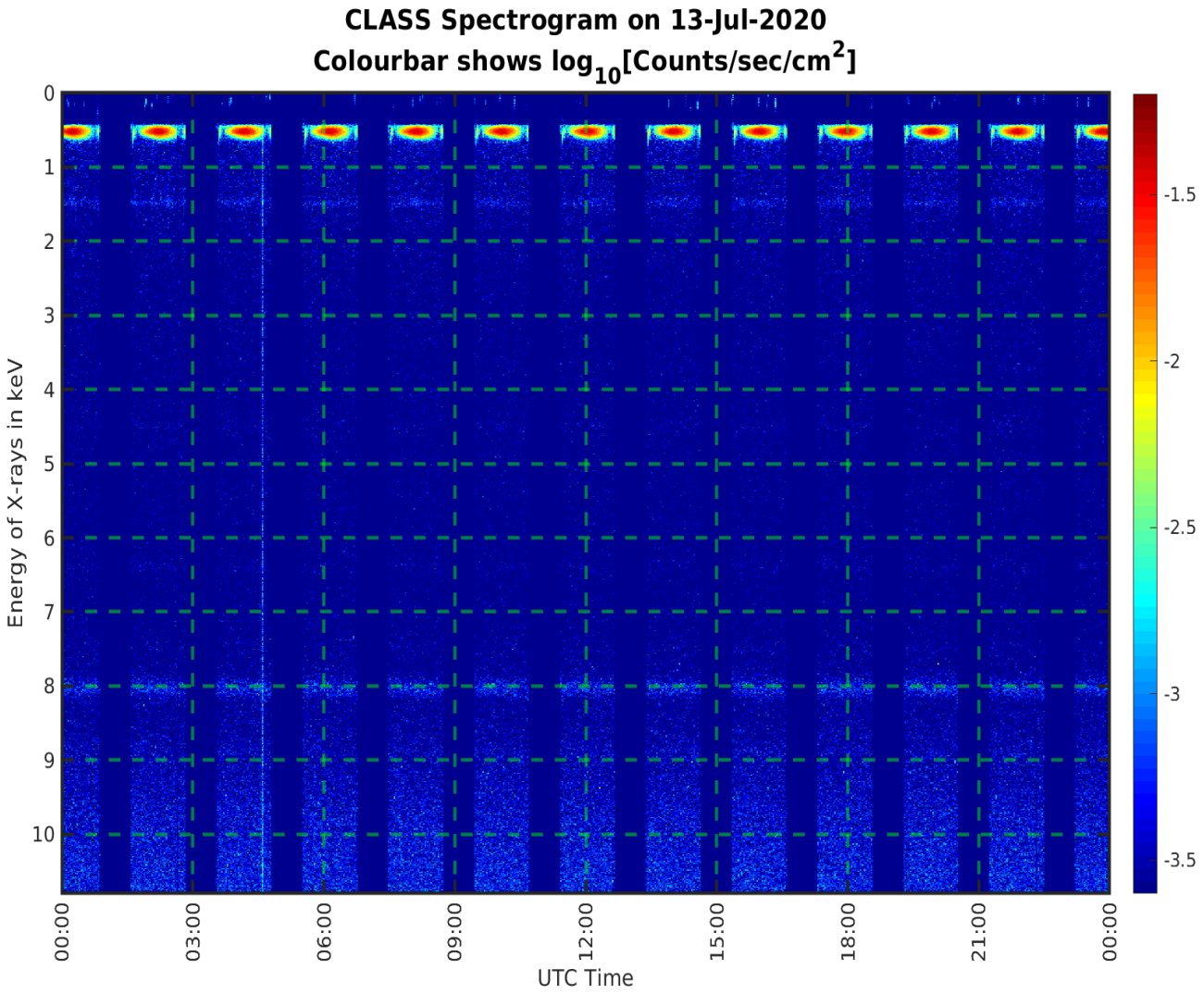
UTC Time


CLASS Spectrogram on 13-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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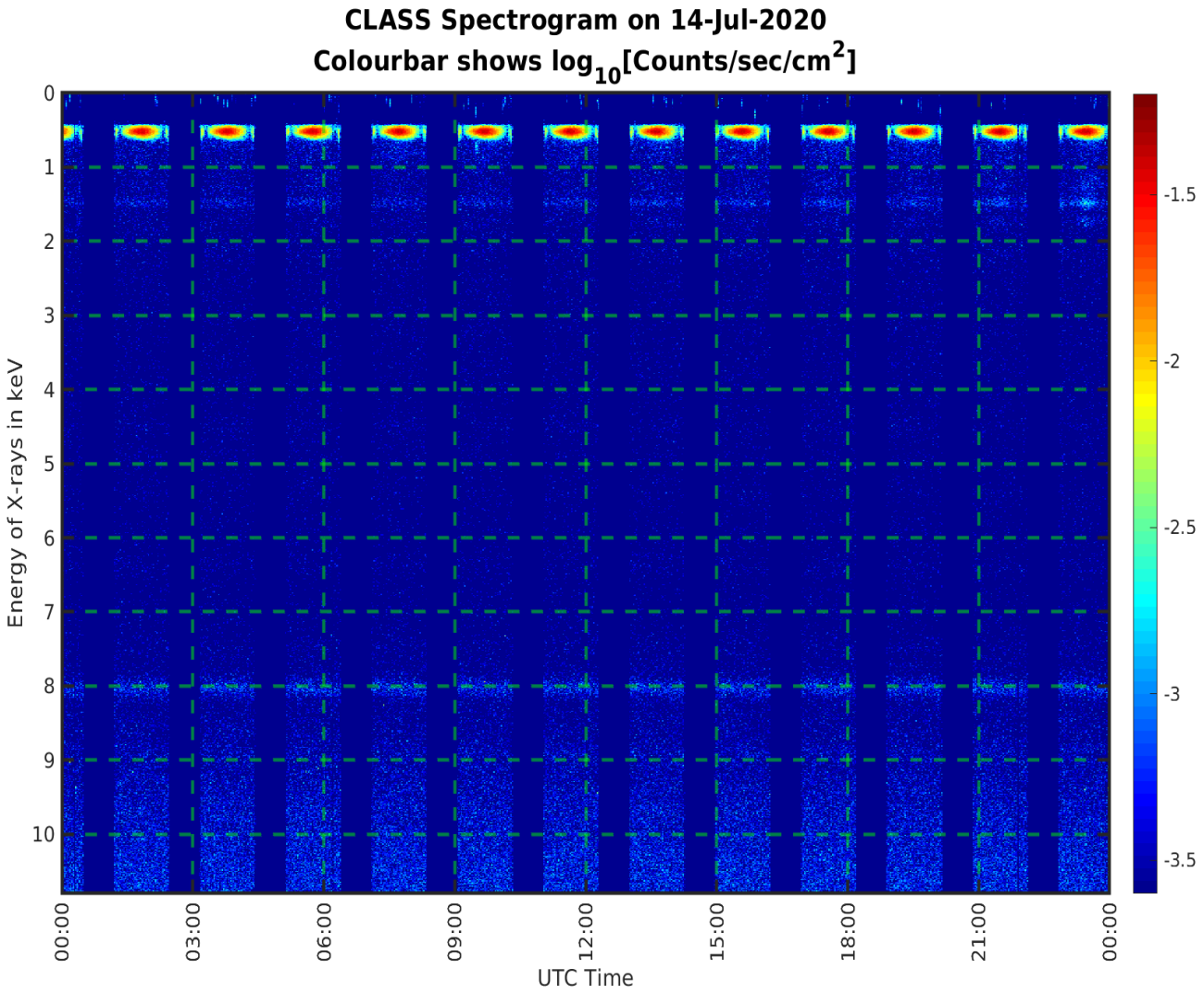
UTC Time


CLASS Spectrogram on 14-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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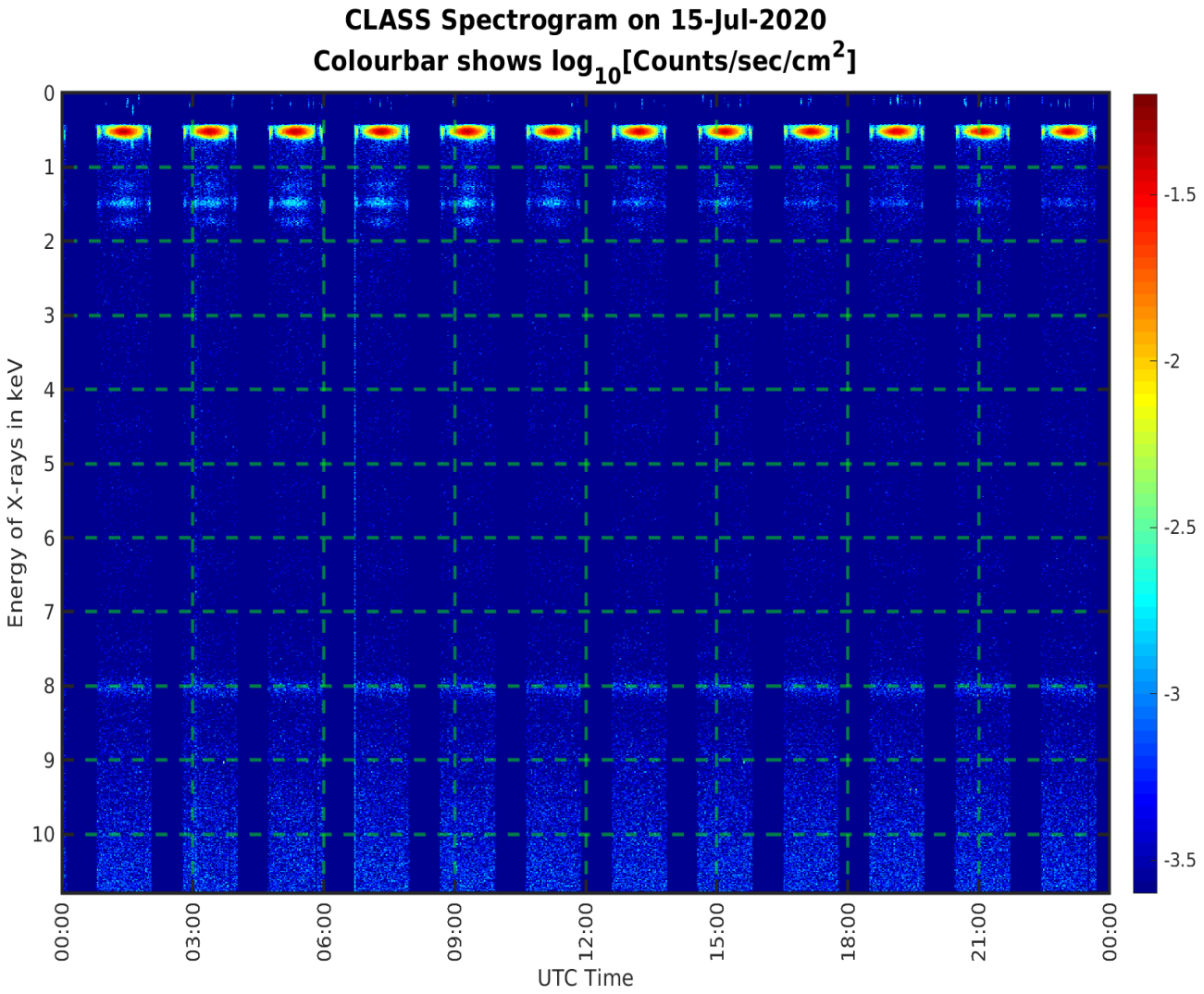
CLASS Spectrogram on 15-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
-2
-2.5
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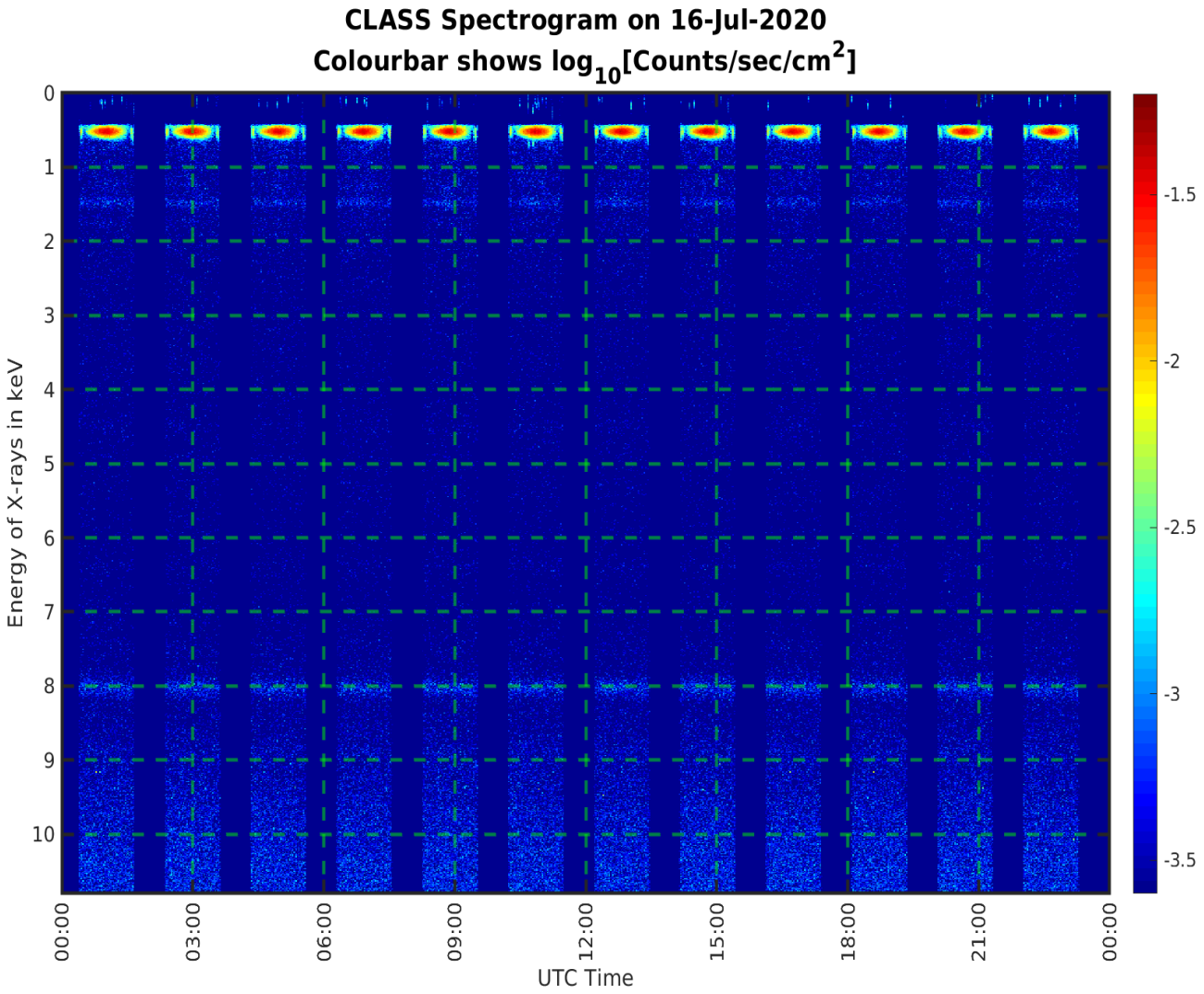
UTC Time


CLASS Spectrogram on 16-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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7
8
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-1.5
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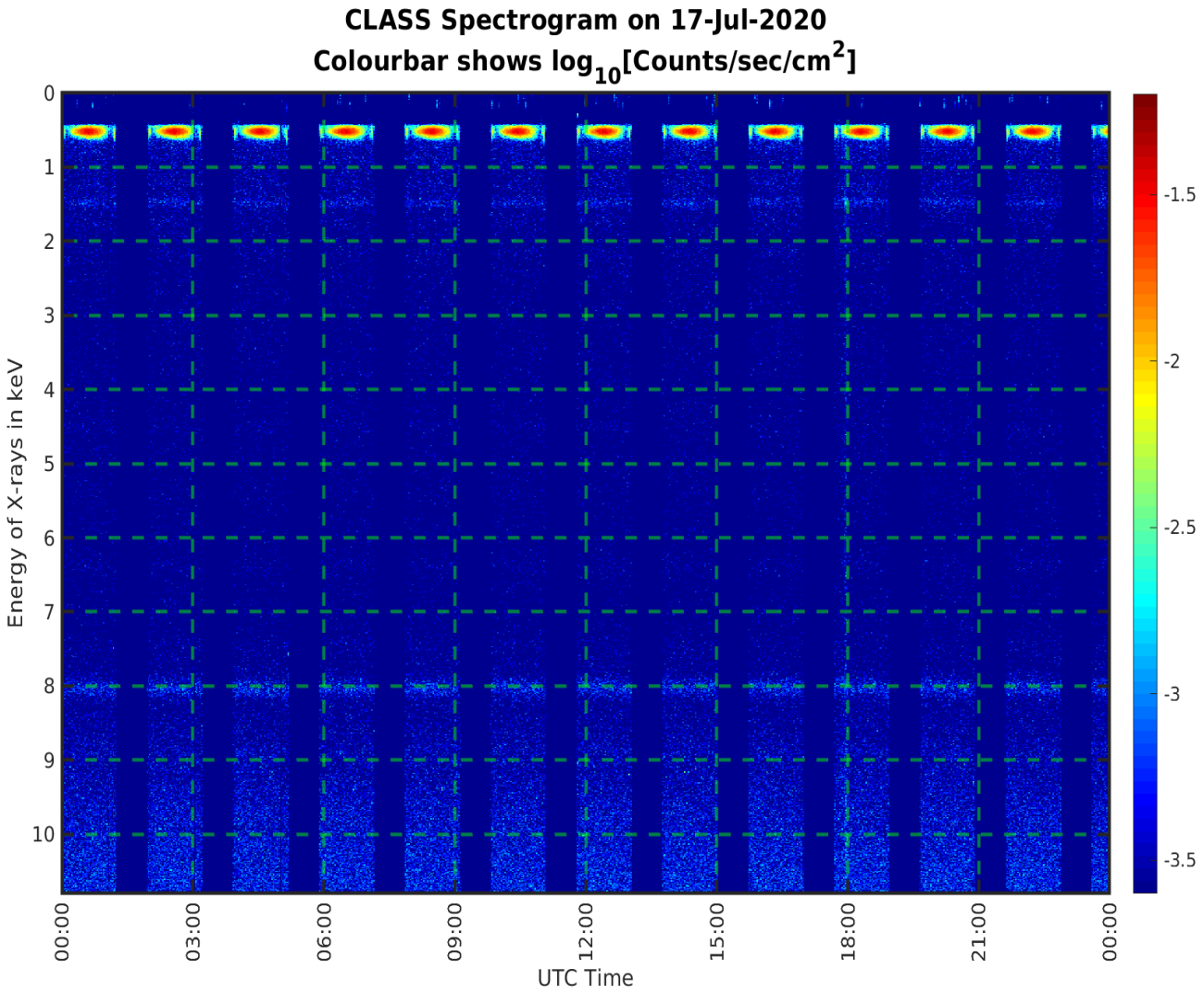
UTC Time


CLASS Spectrogram on 17-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
-2
-2.5
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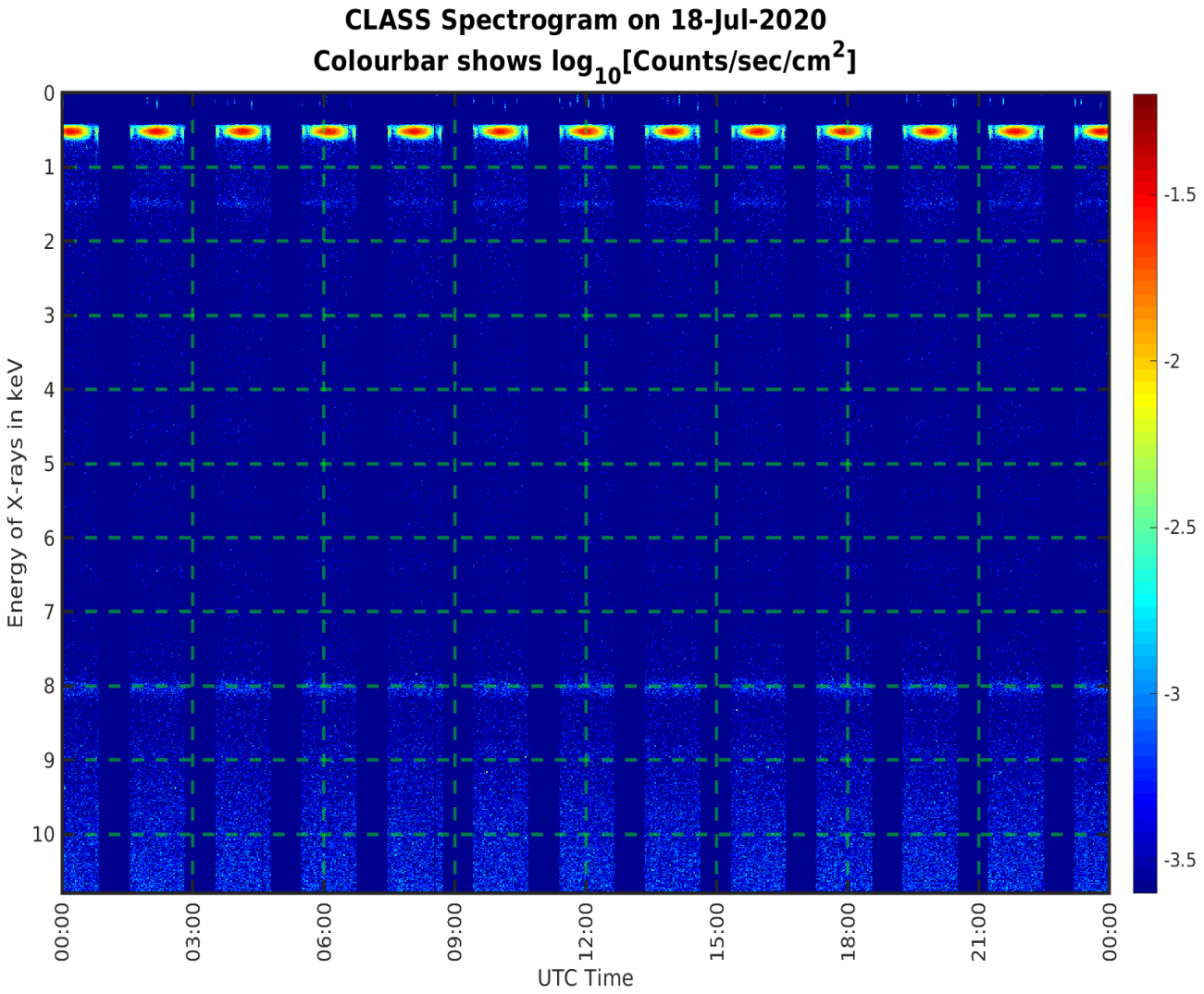
UTC Time


CLASS Spectrogram on 18-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
-2
-2.5
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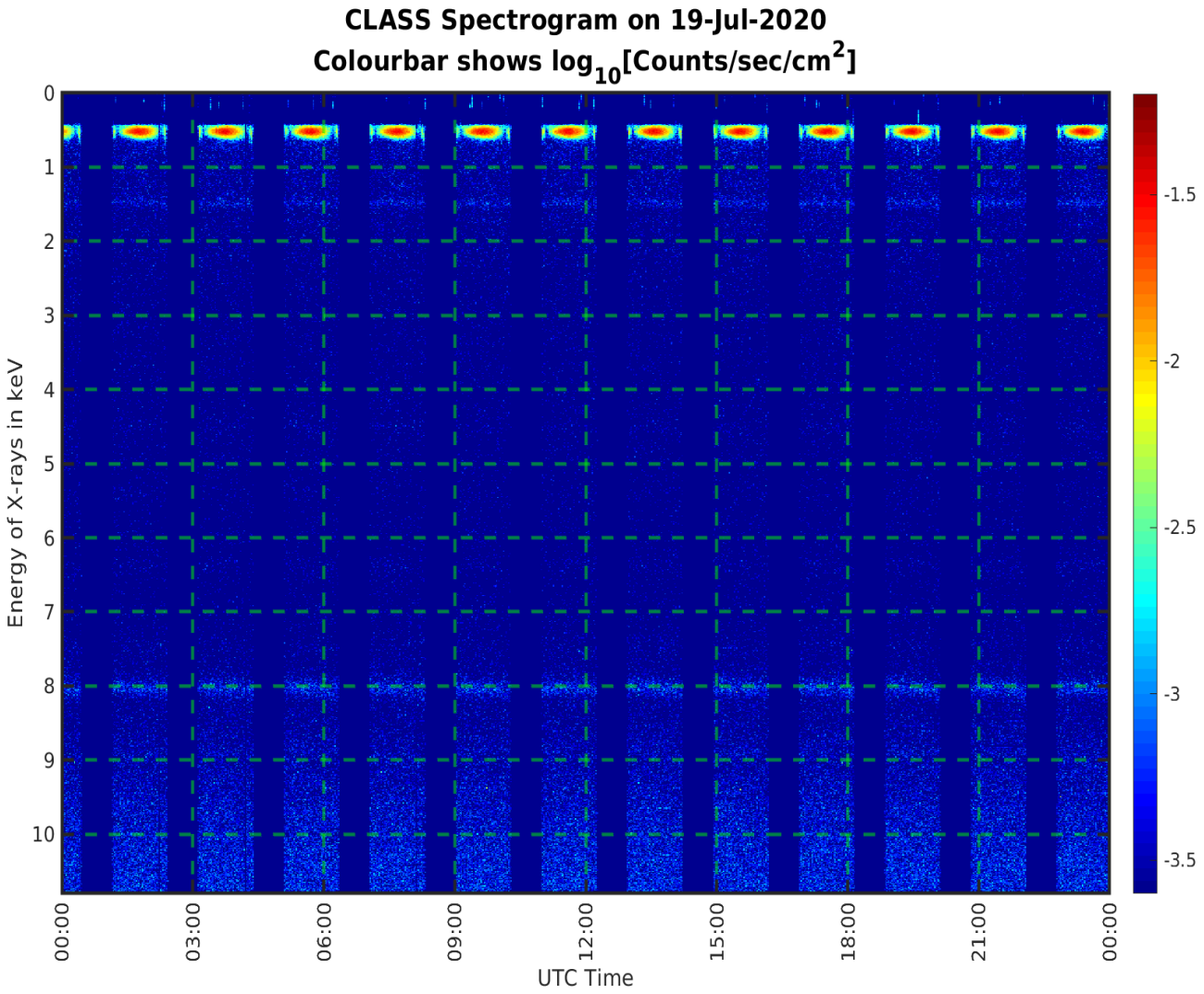
UTC Time


CLASS Spectrogram on 19-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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8
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-1.5
-2
-2.5
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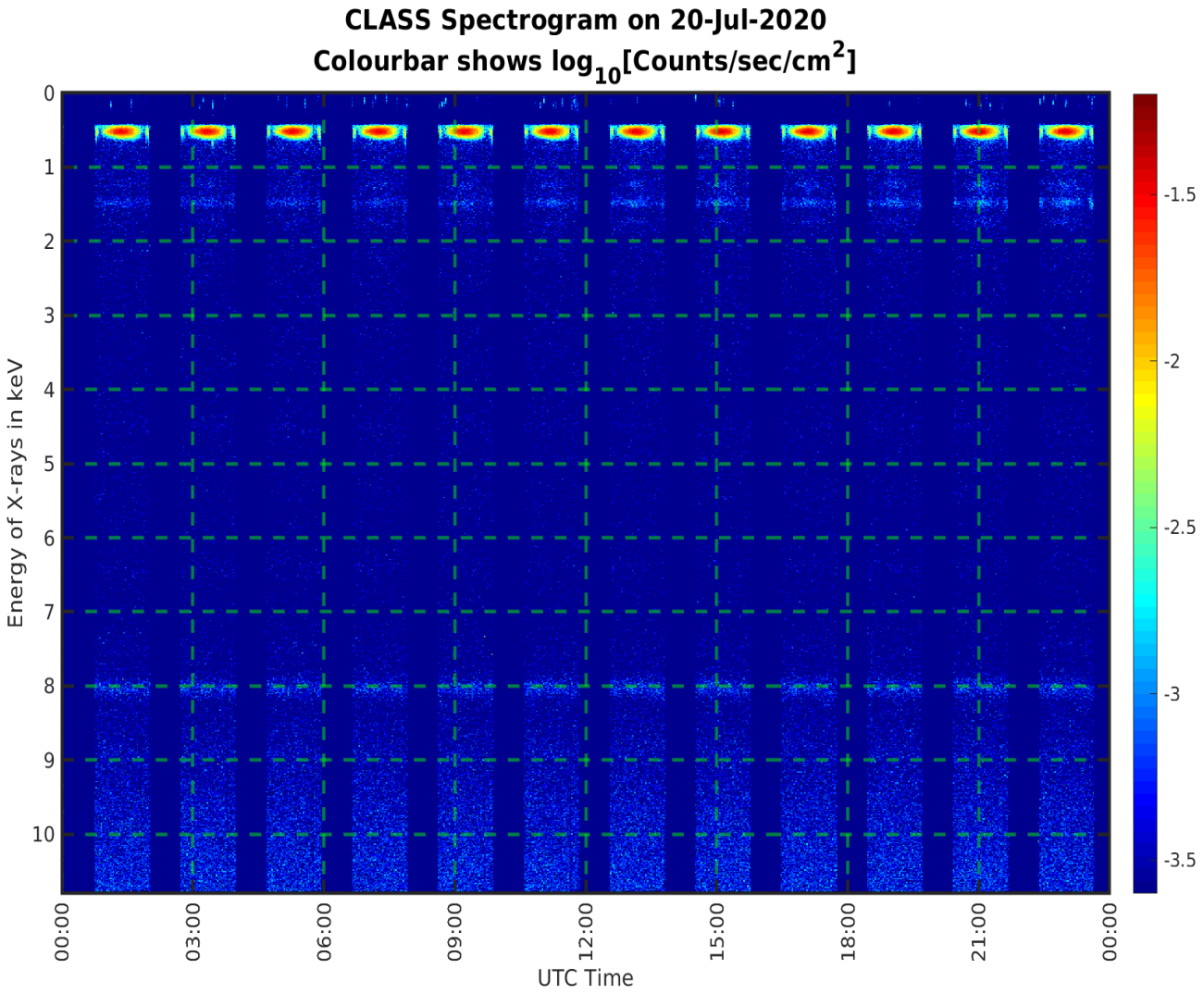
UTC Time


CLASS Spectrogram on 20-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
-2
-2.5
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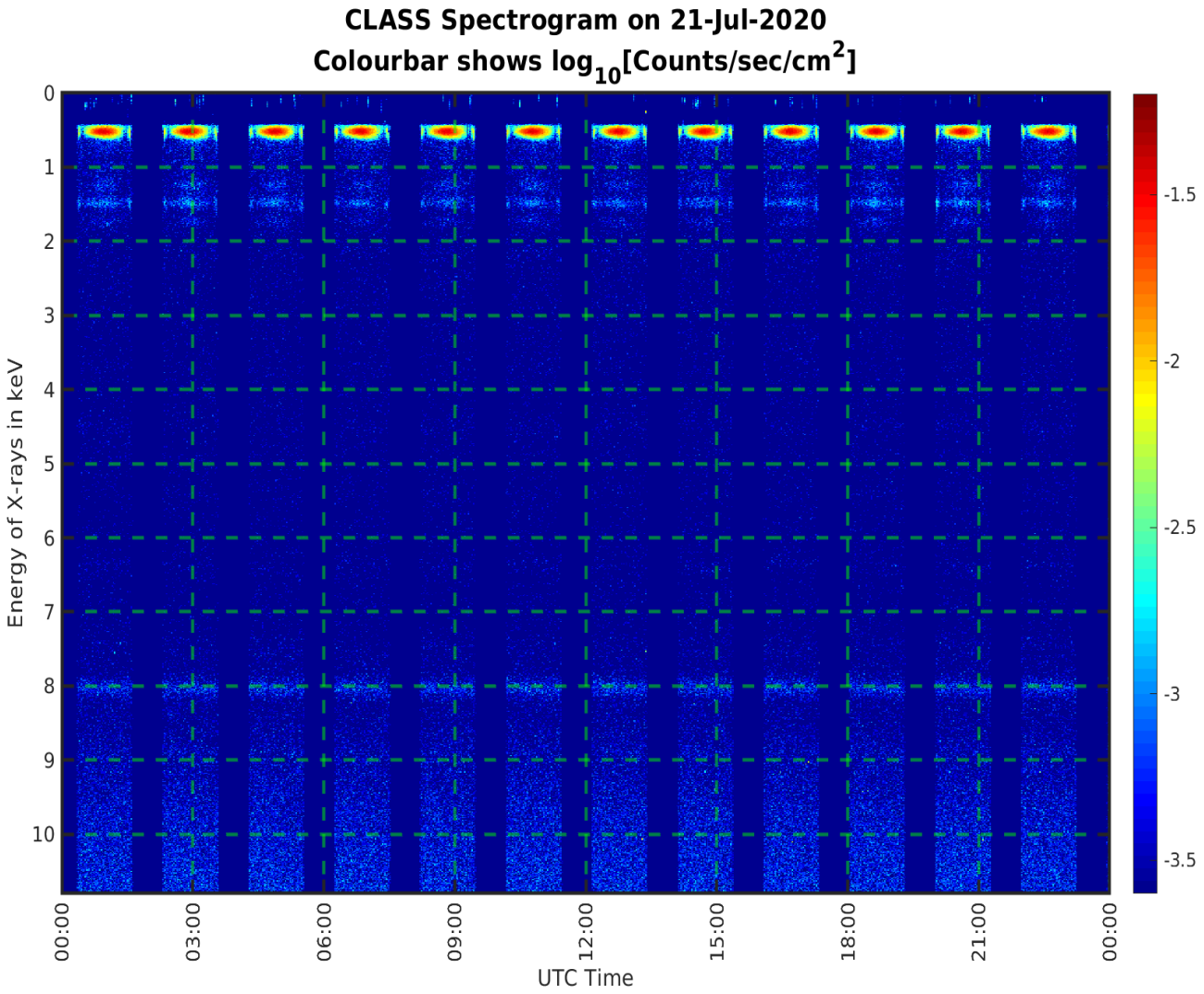
UTC Time


CLASS Spectrogram on 21-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
-2
-2.5
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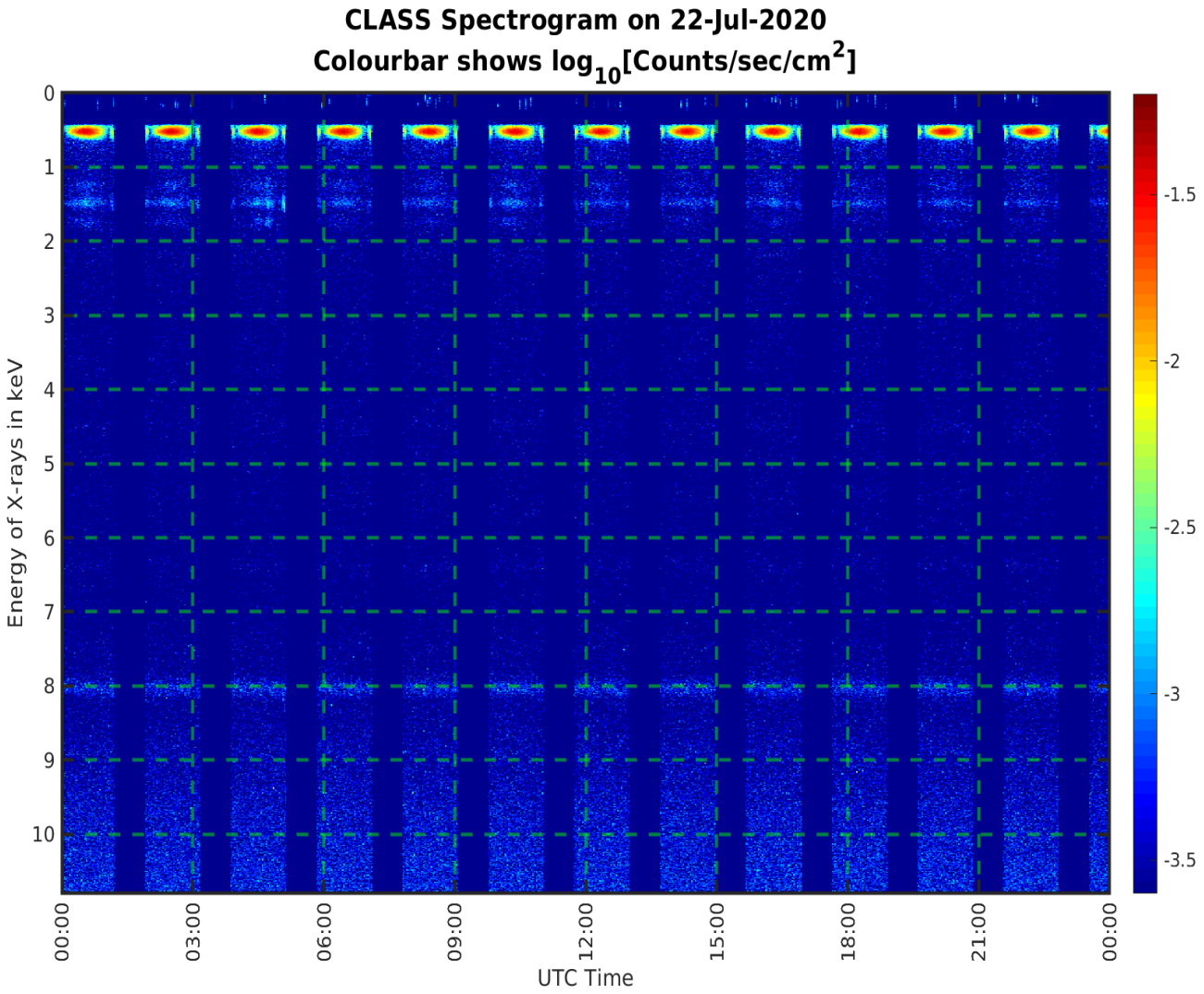
UTC Time


CLASS Spectrogram on 22-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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18:00
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UTC Time
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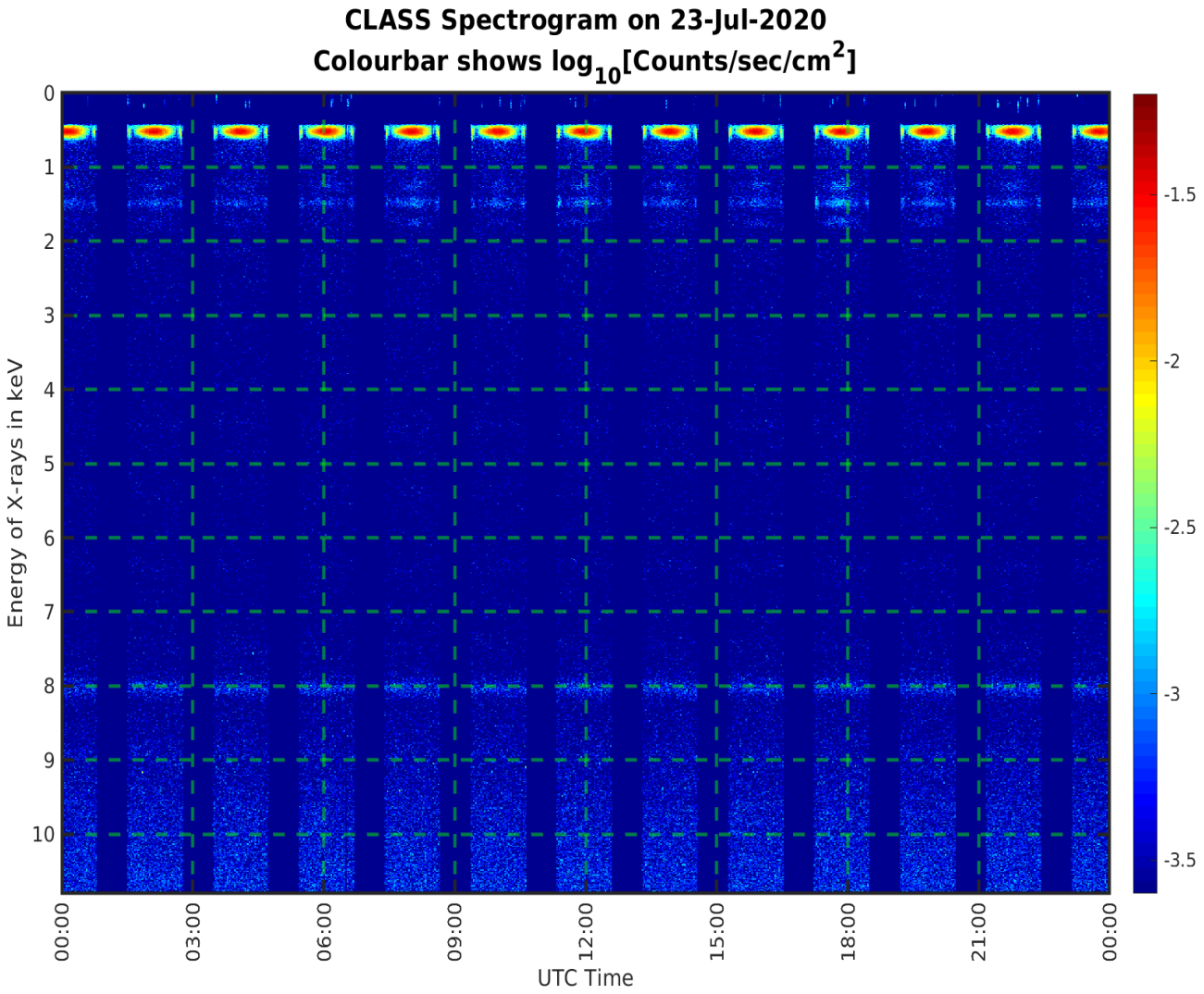
-3
-3.5


CLASS Spectrogram on 23-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
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12:00
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18:00
21:00
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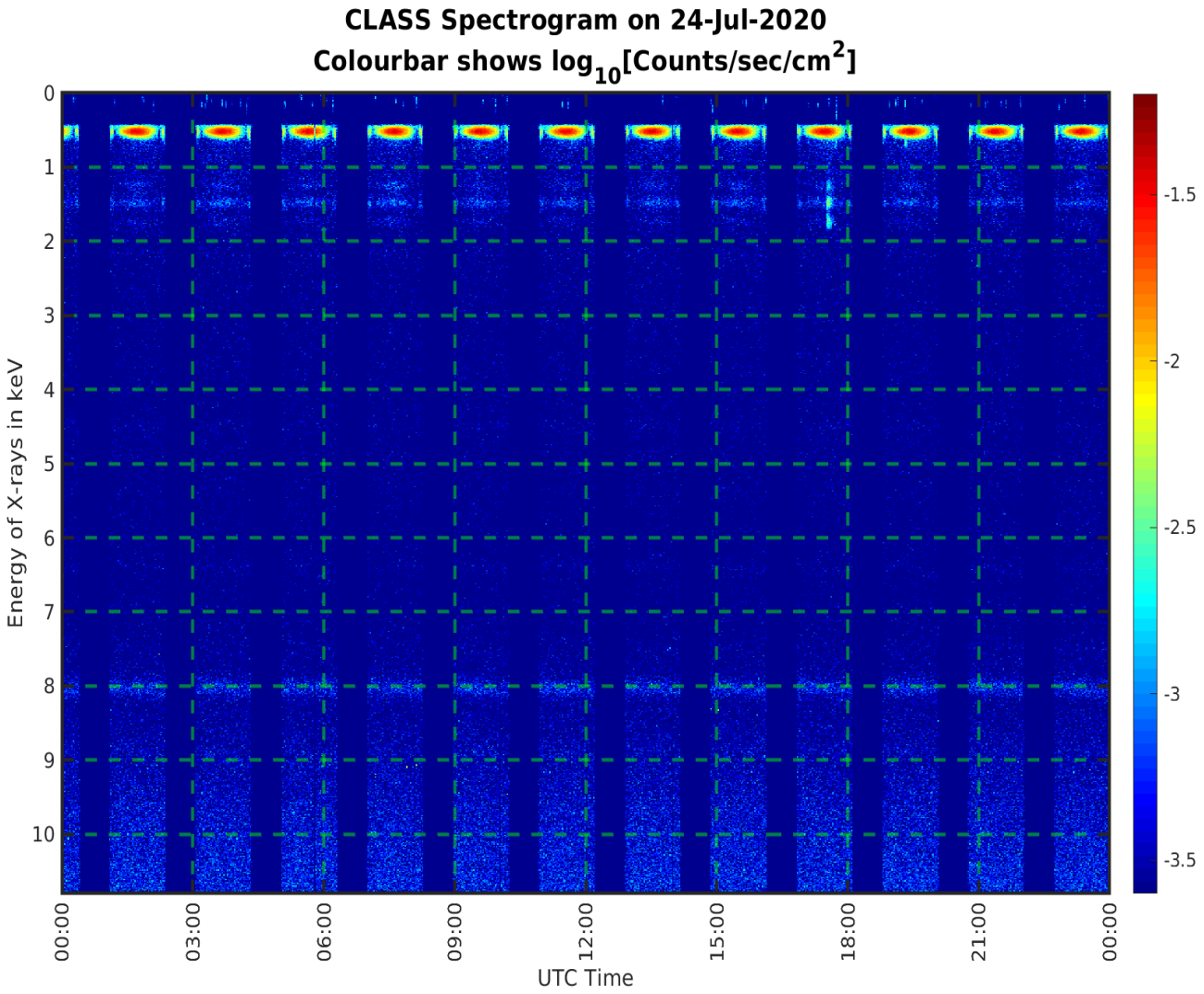
UTC Time


CLASS Spectrogram on 24-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
00:00
03:00
06:00
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18:00
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00:00
UTC Time
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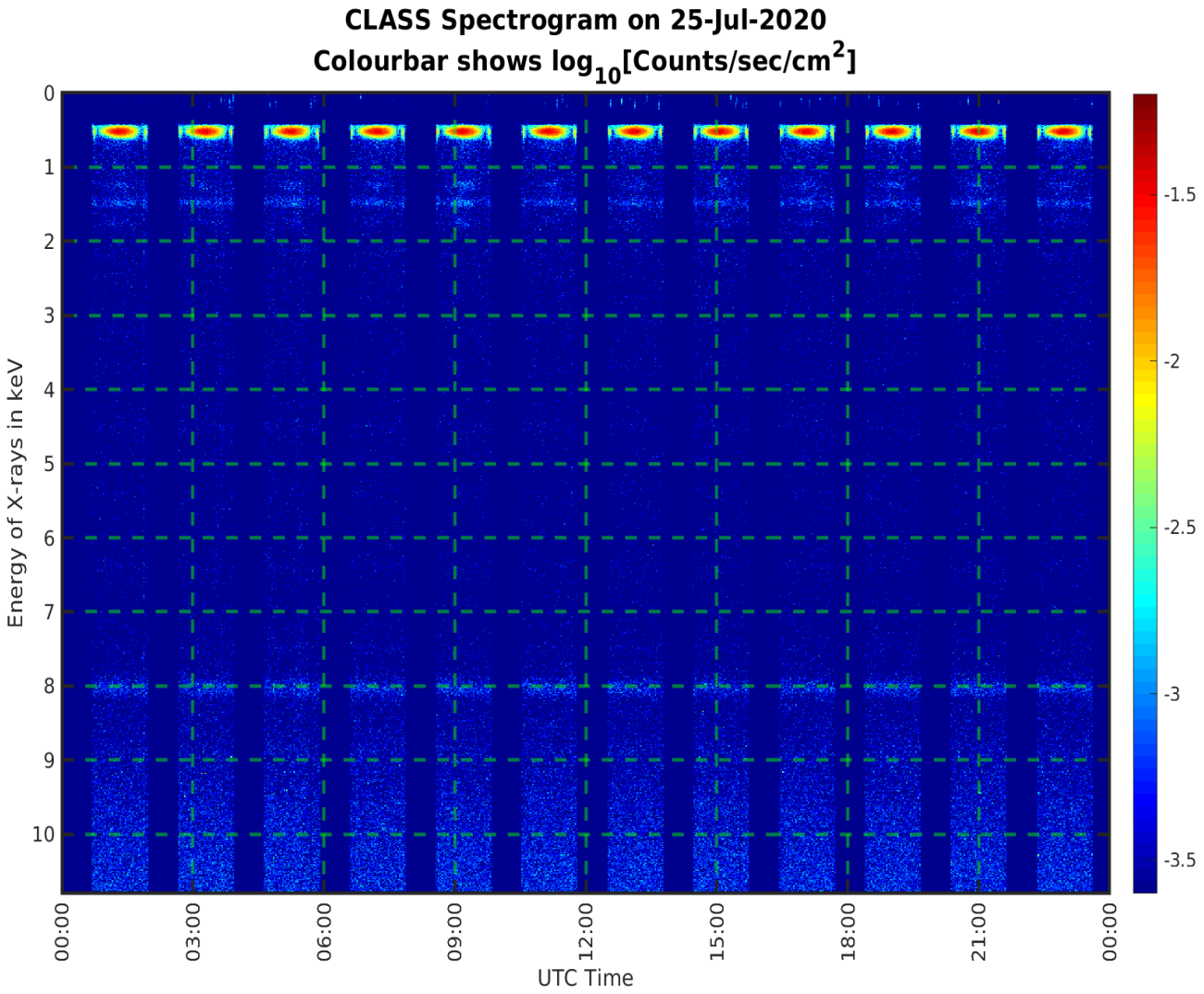
-2
-2.5
-3
-3.5


CLASS Spectrogram on 25-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
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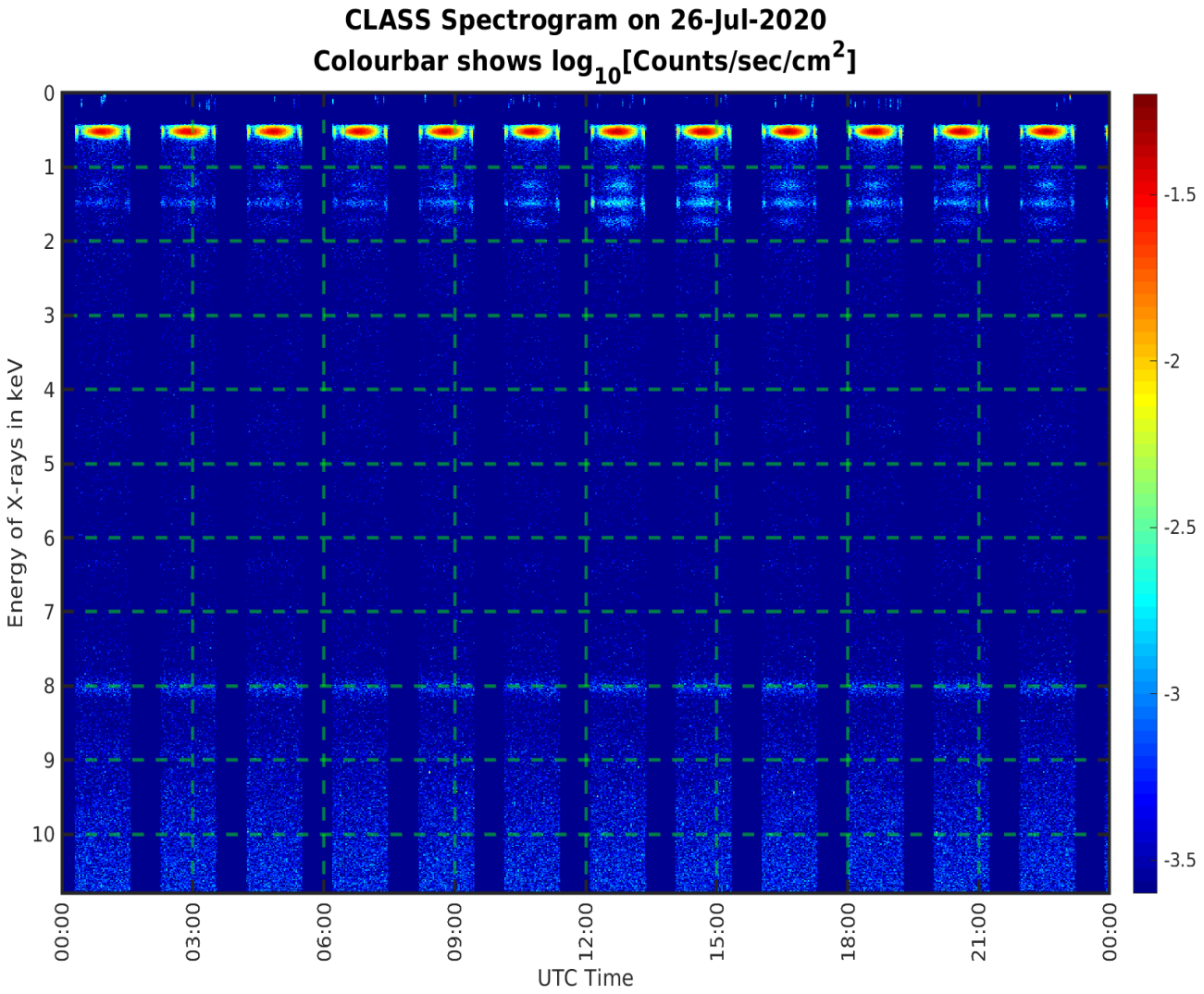
09:00
12:00
15:00
18:00
21:00
00:00
UTC Time


CLASS Spectrogram on 26-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
03:00
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15:00
18:00
21:00
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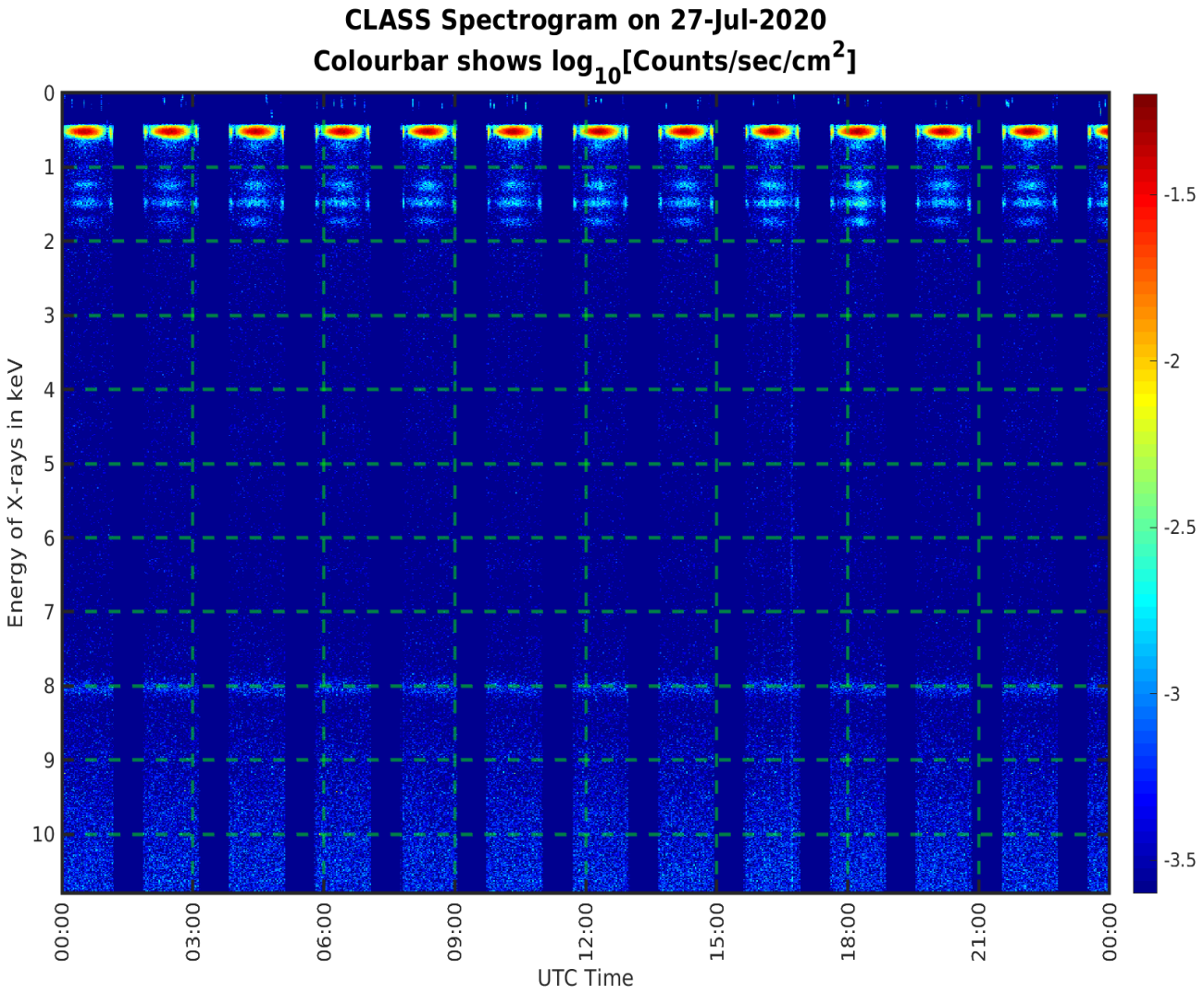
UTC Time


CLASS Spectrogram on 27-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
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09:00
12:00
15:00
18:00
21:00
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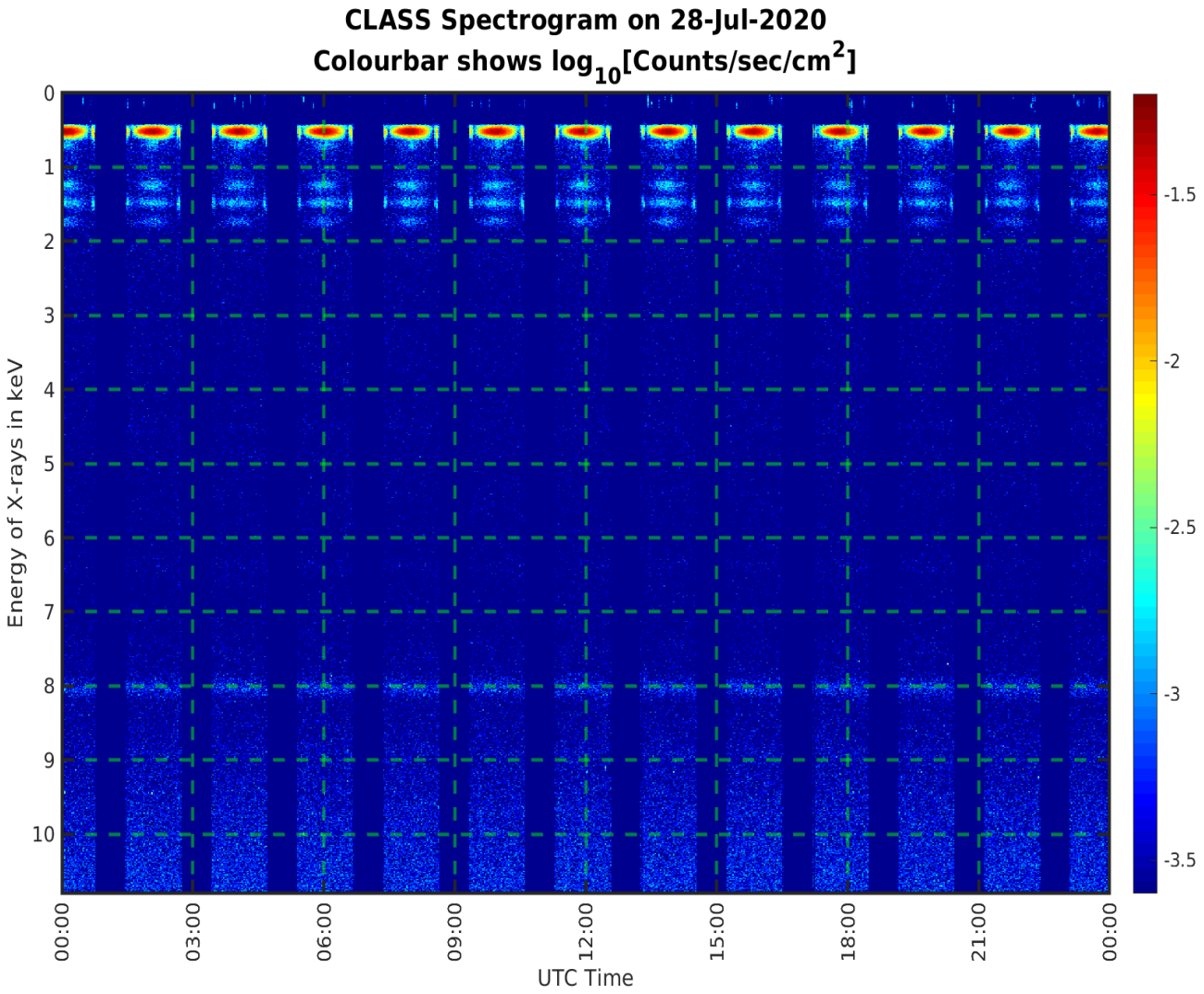
UTC Time


CLASS Spectrogram on 28-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
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15:00
18:00
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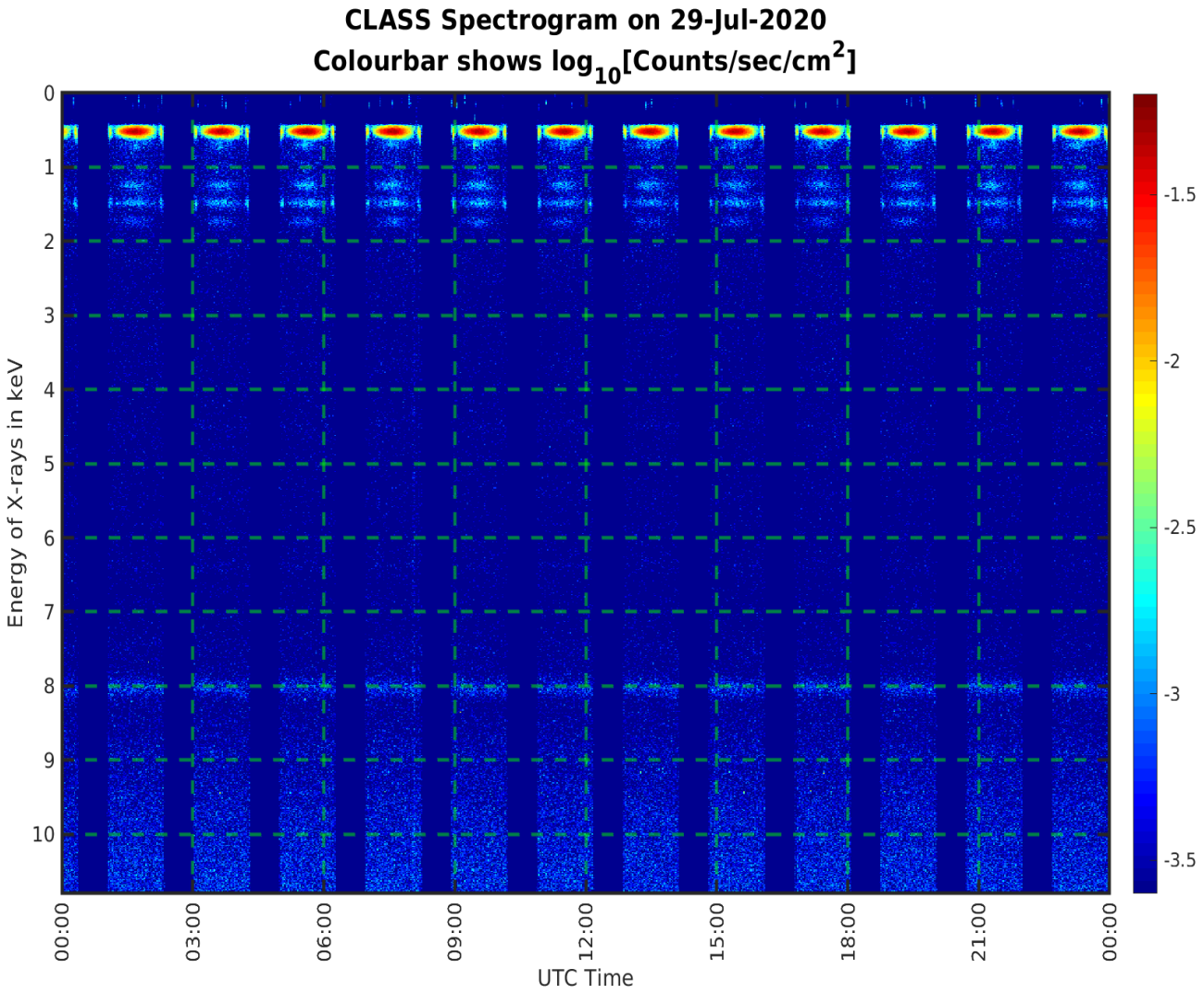
UTC Time


CLASS Spectrogram on 29-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
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6
7
8
9
10
00:00
03:00
06:00
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18:00
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UTC Time
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-2.5
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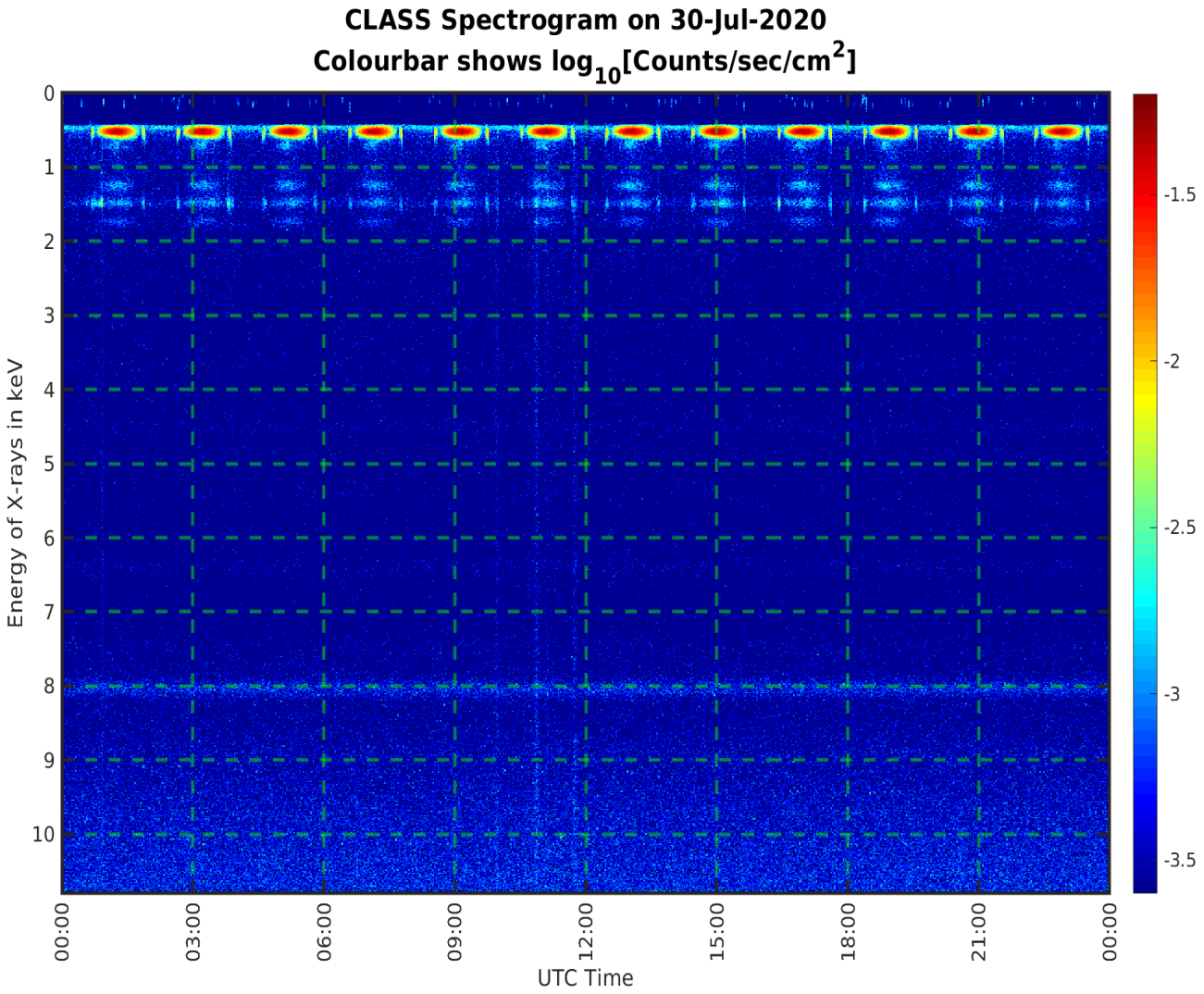
-3.5


CLASS Spectrogram on 30-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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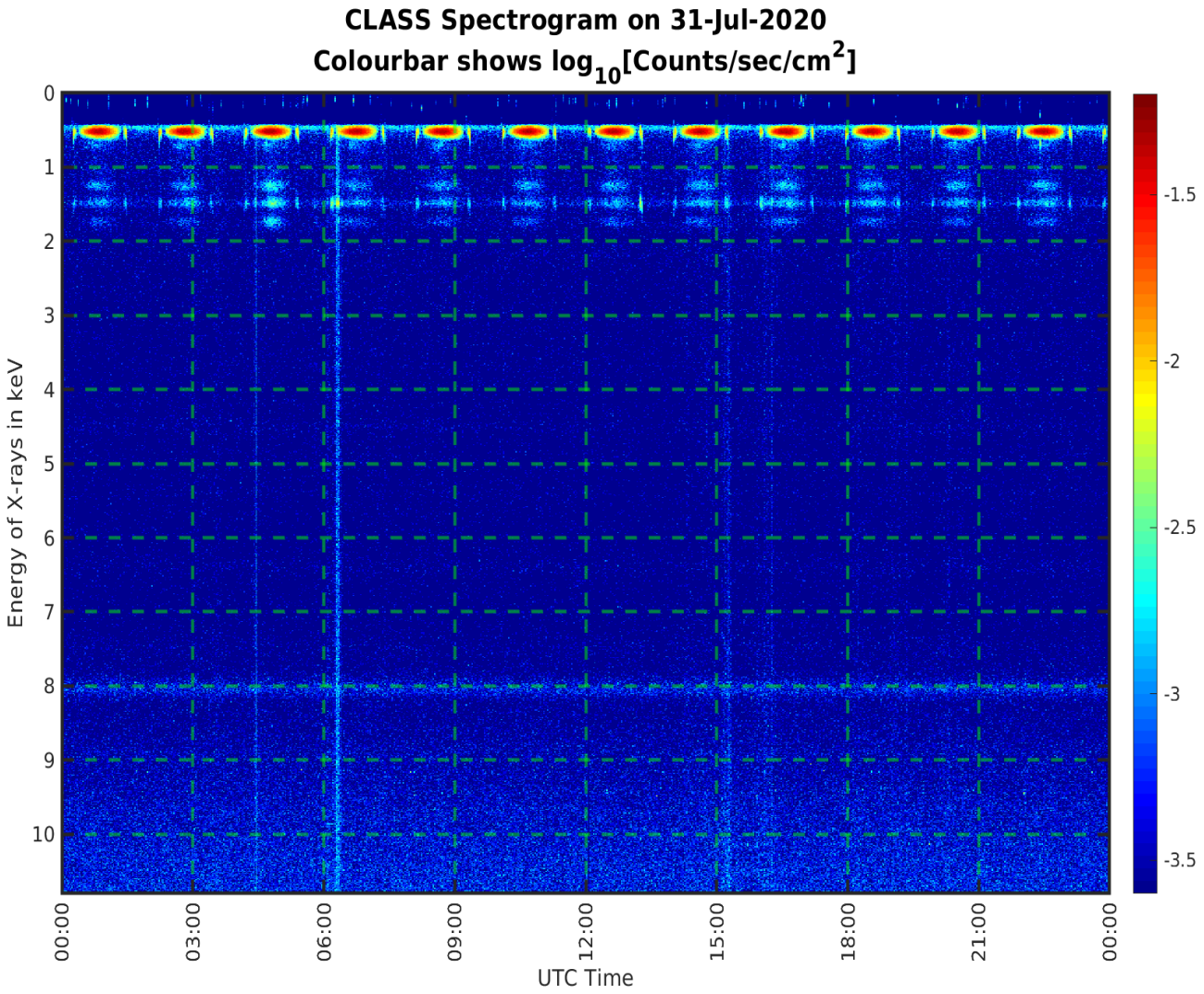
UTC Time


CLASS Spectrogram on 31-Jul-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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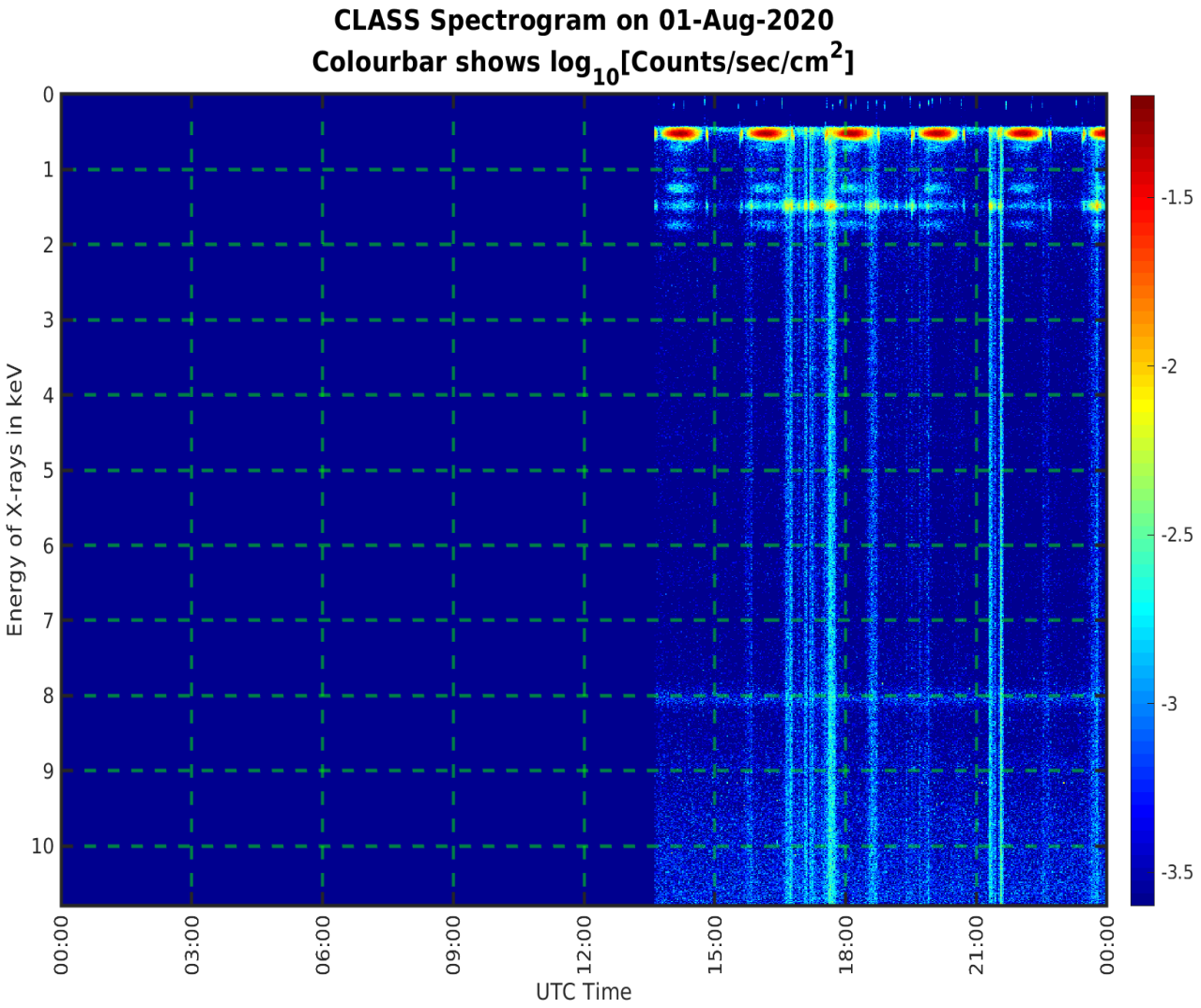
UTC Time


CLASS Spectrogram on 01-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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7
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03:00
06:00
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18:00
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UTC Time
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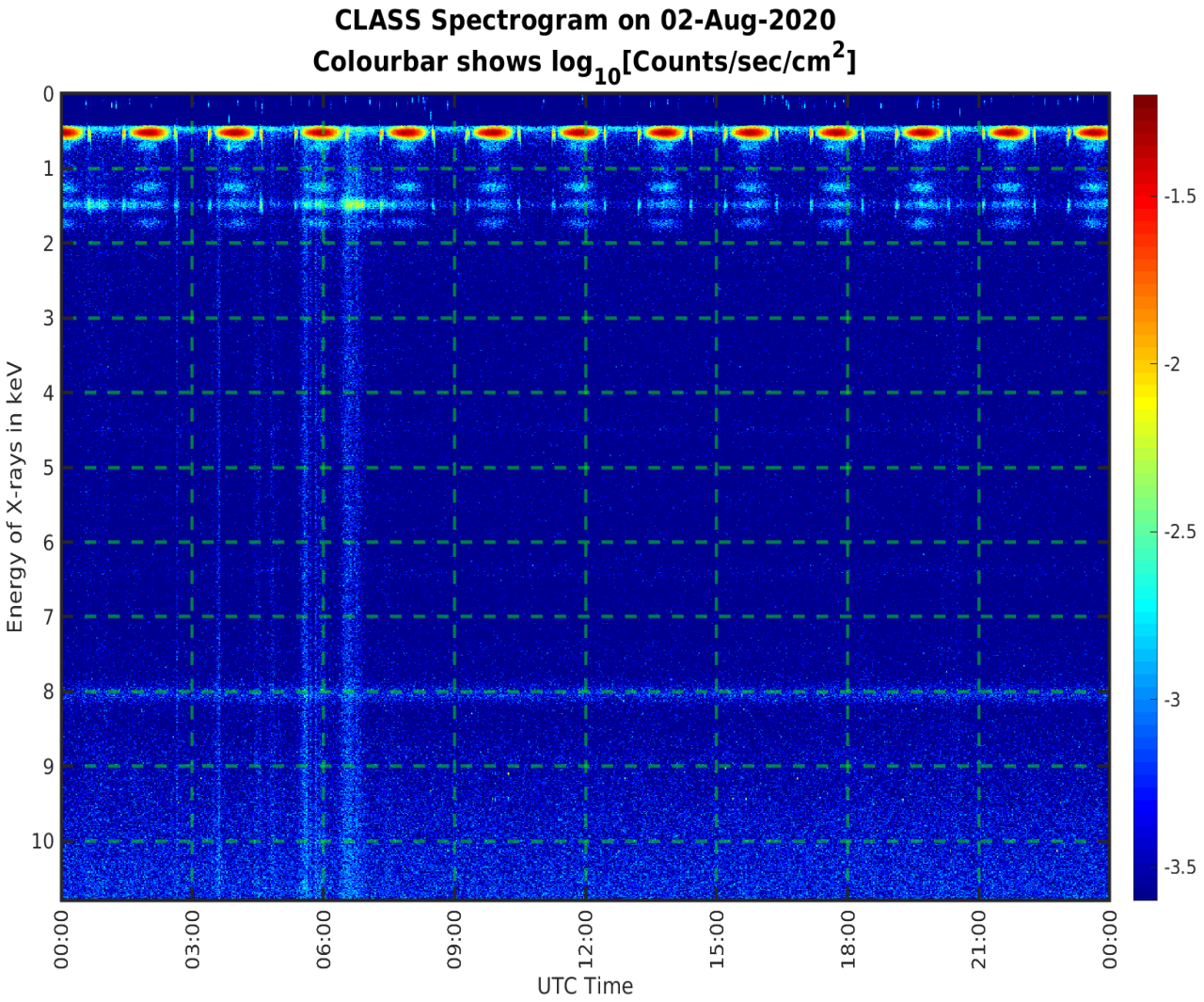
CLASS Spectrogram on 02-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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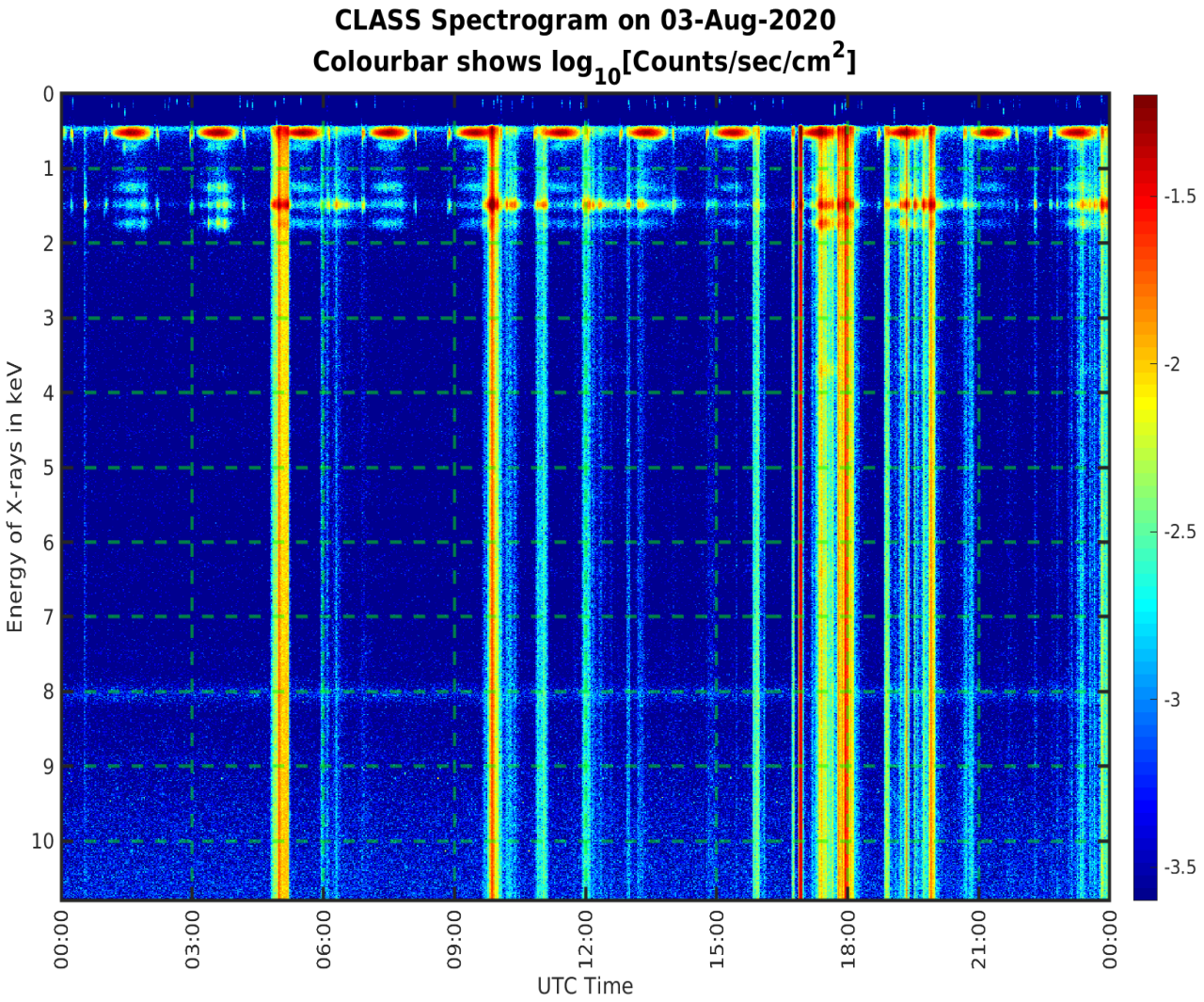
UTC Time


CLASS Spectrogram on 03-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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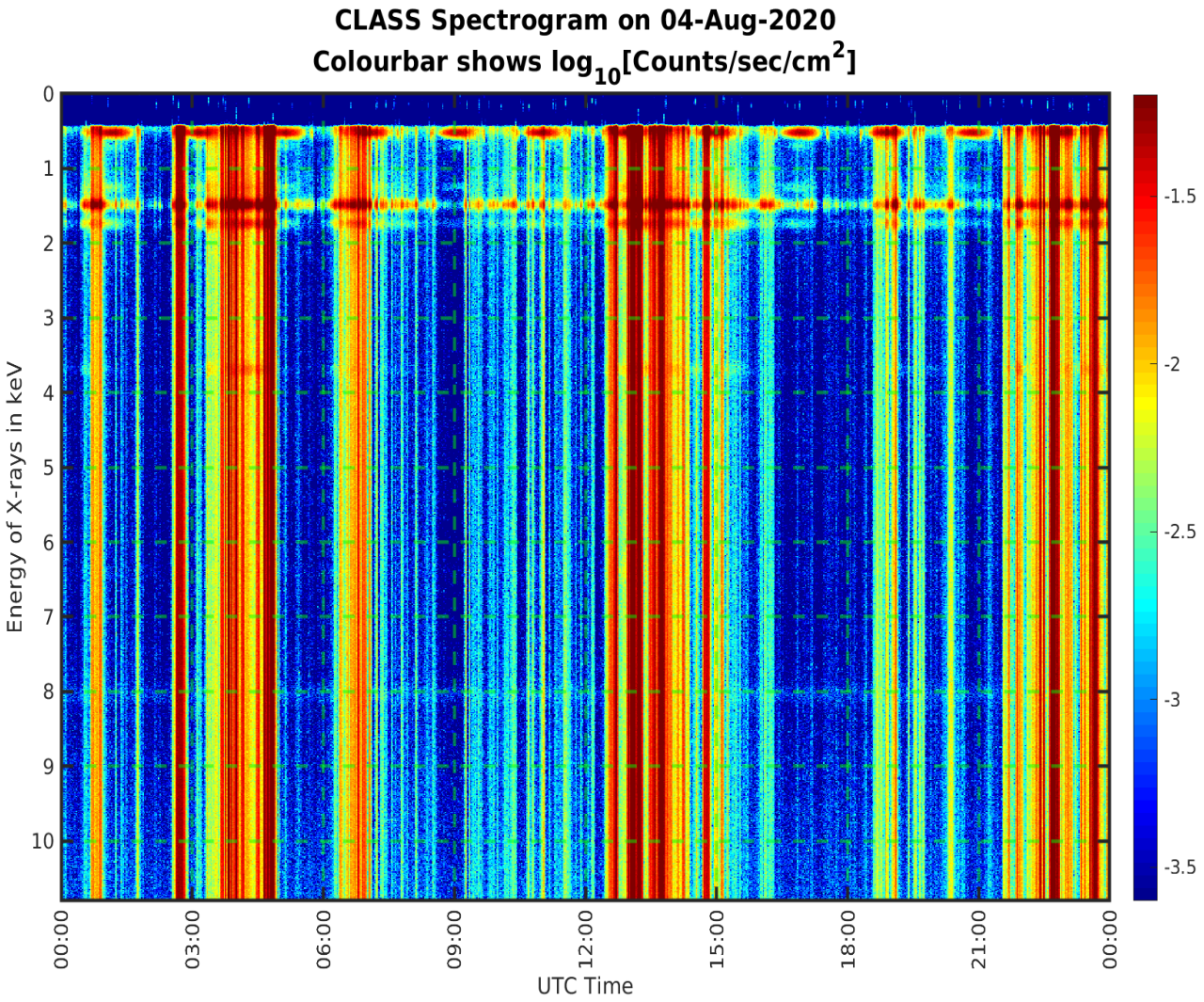
UTC Time


CLASS Spectrogram on 04-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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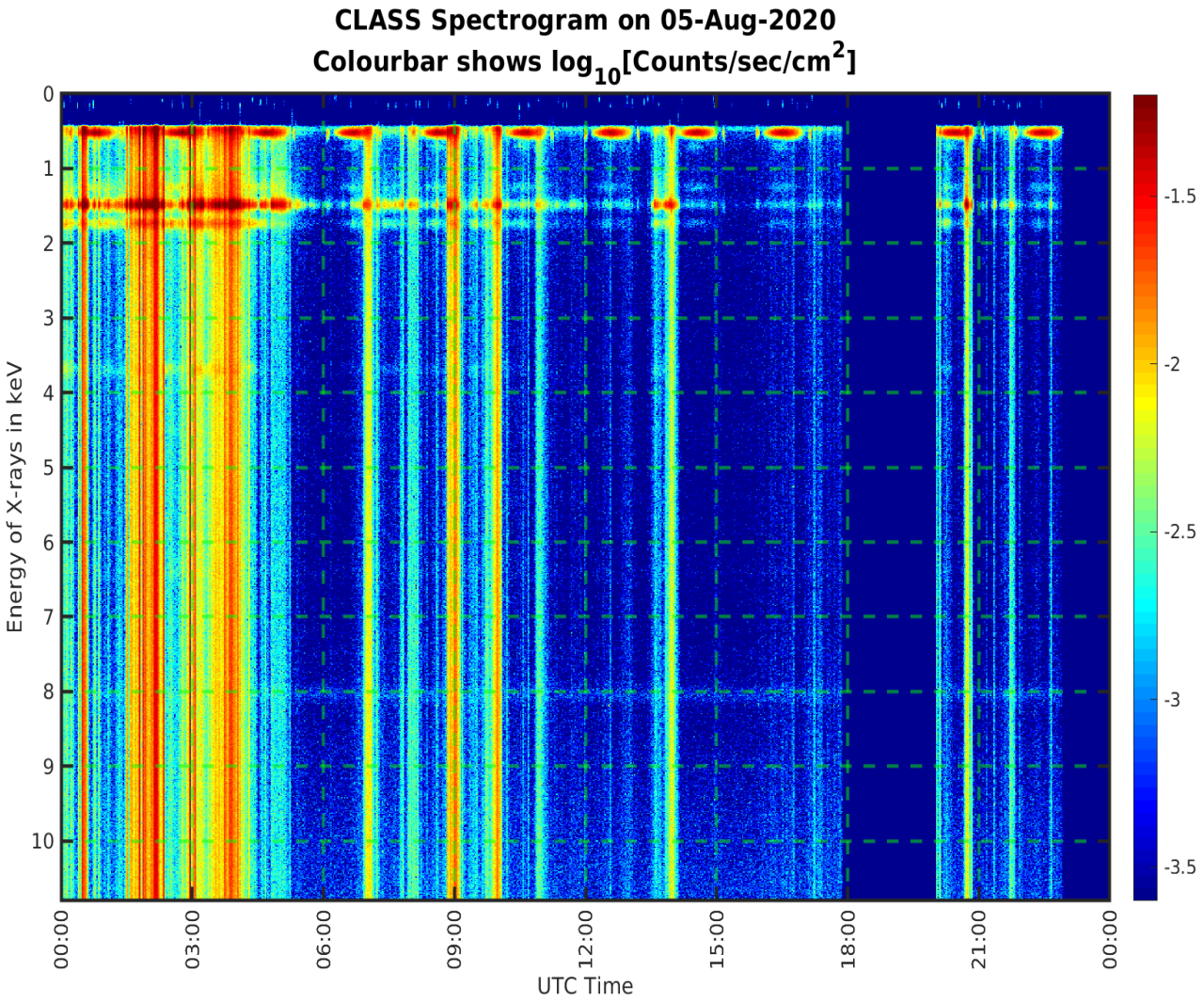
UTC Time


CLASS Spectrogram on 05-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
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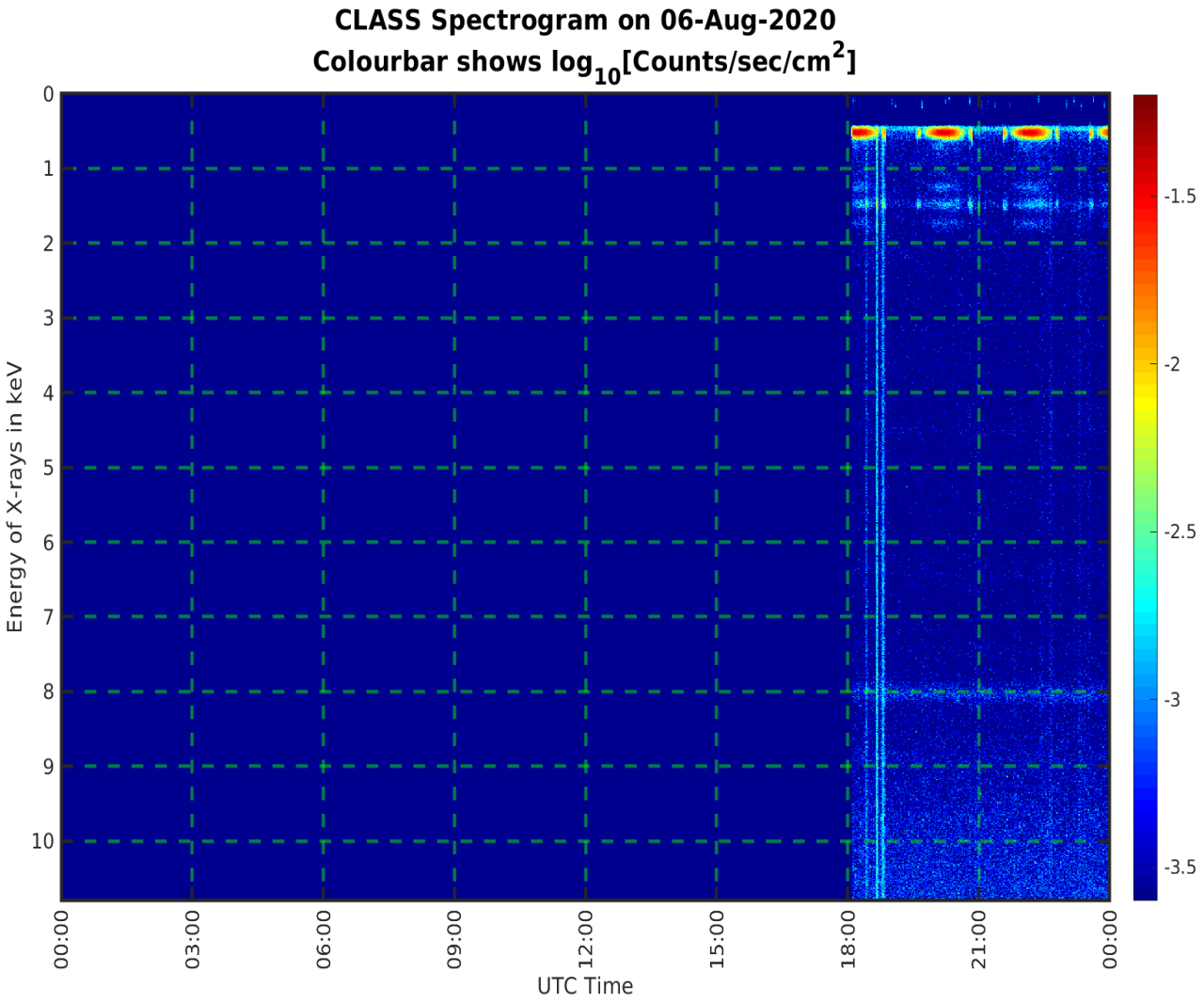
UTC Time


CLASS Spectrogram on 06-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
00:00
03:00
06:00
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UTC Time
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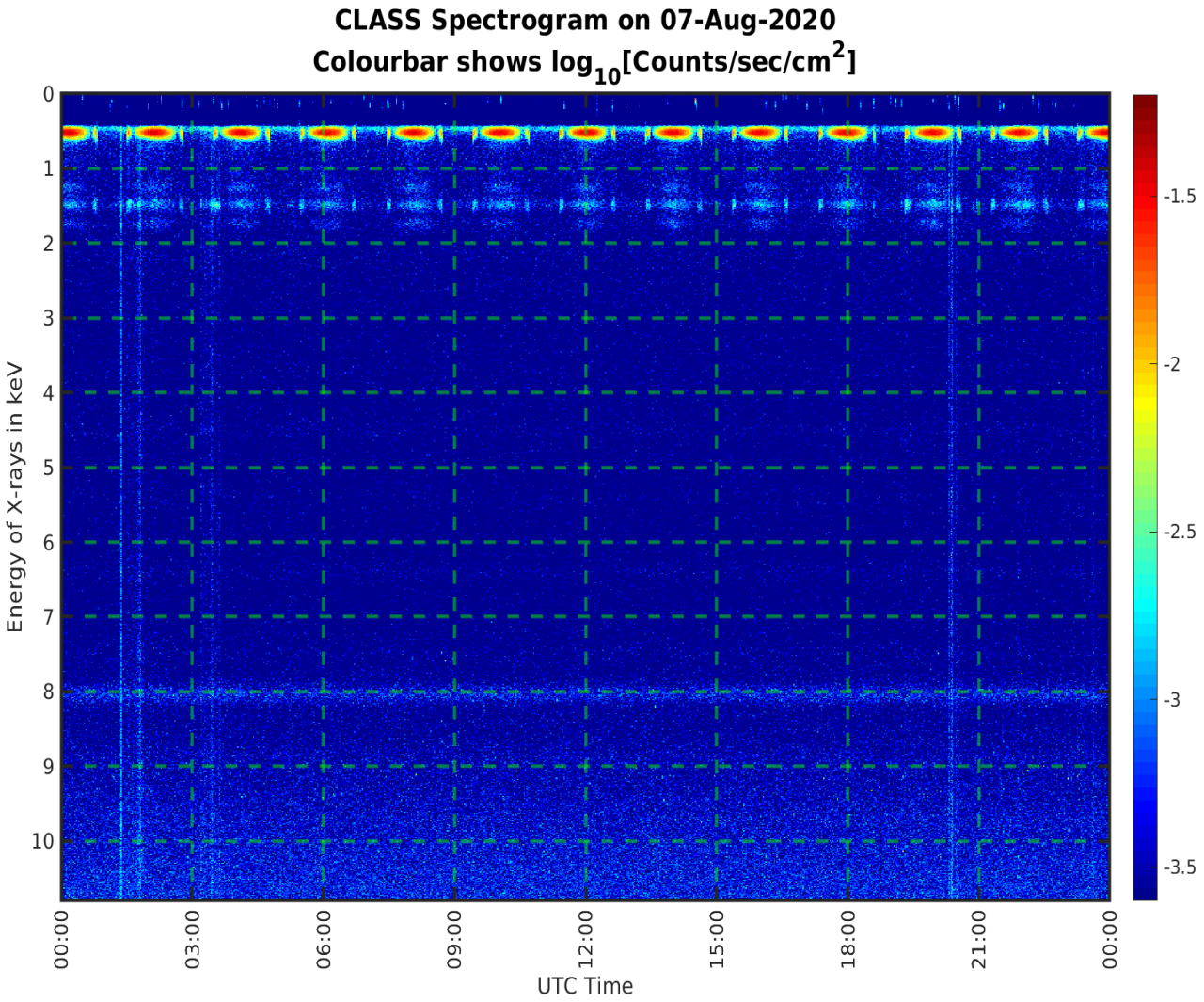
-2.5
-3
-3.5


CLASS Spectrogram on 07-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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18:00
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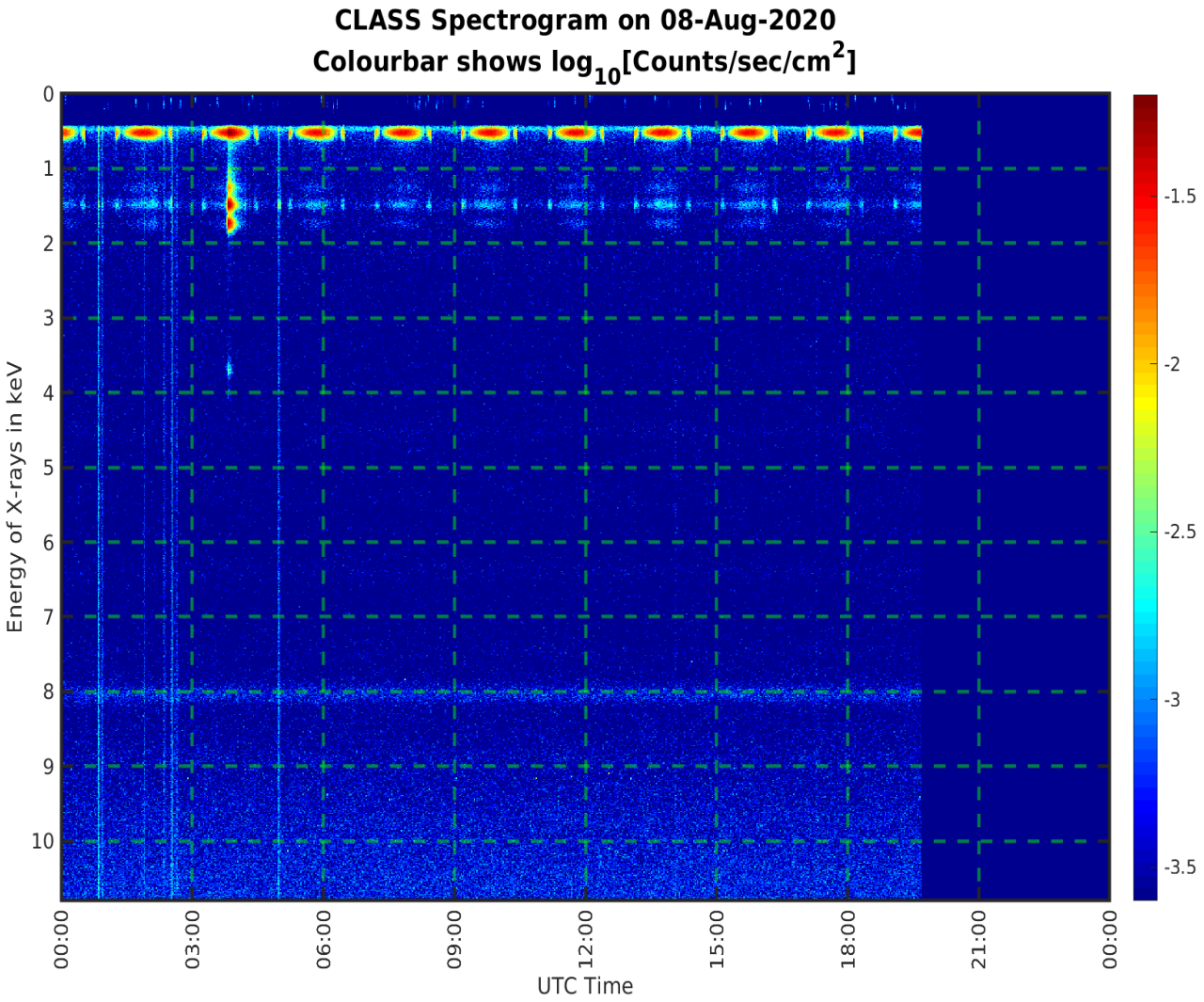
UTC Time


CLASS Spectrogram on 08-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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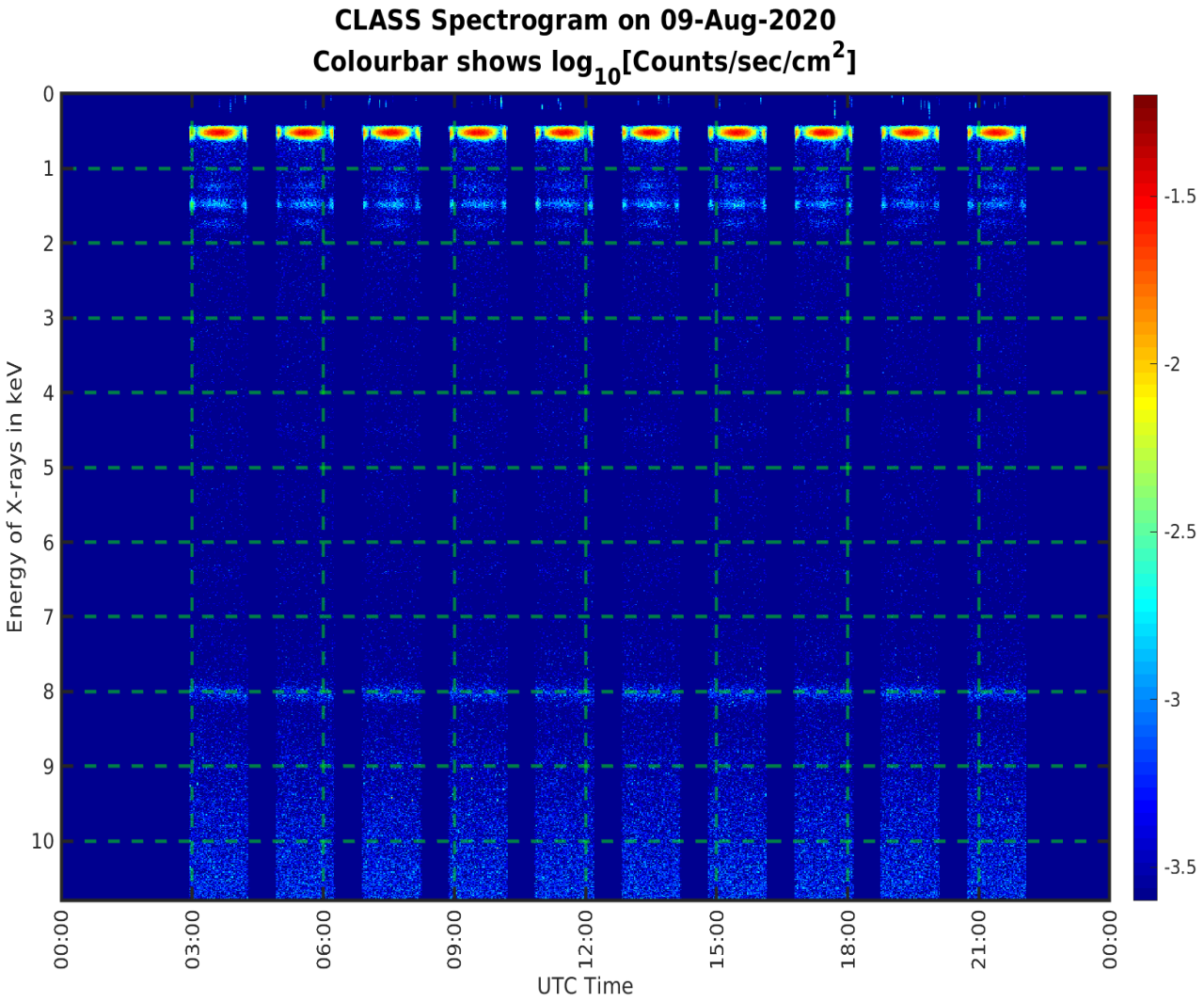
UTC Time


CLASS Spectrogram on 09-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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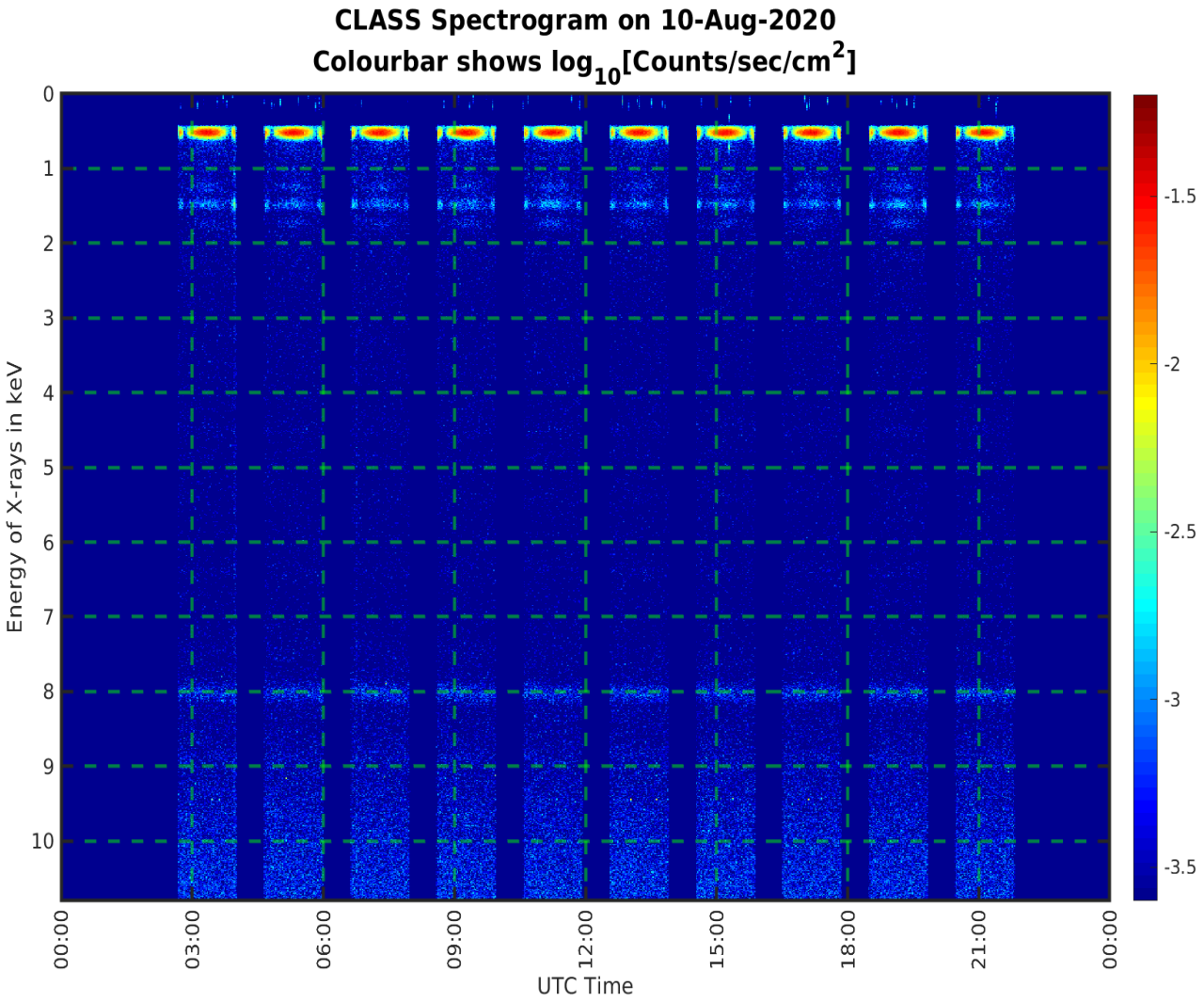
UTC Time


CLASS Spectrogram on 10-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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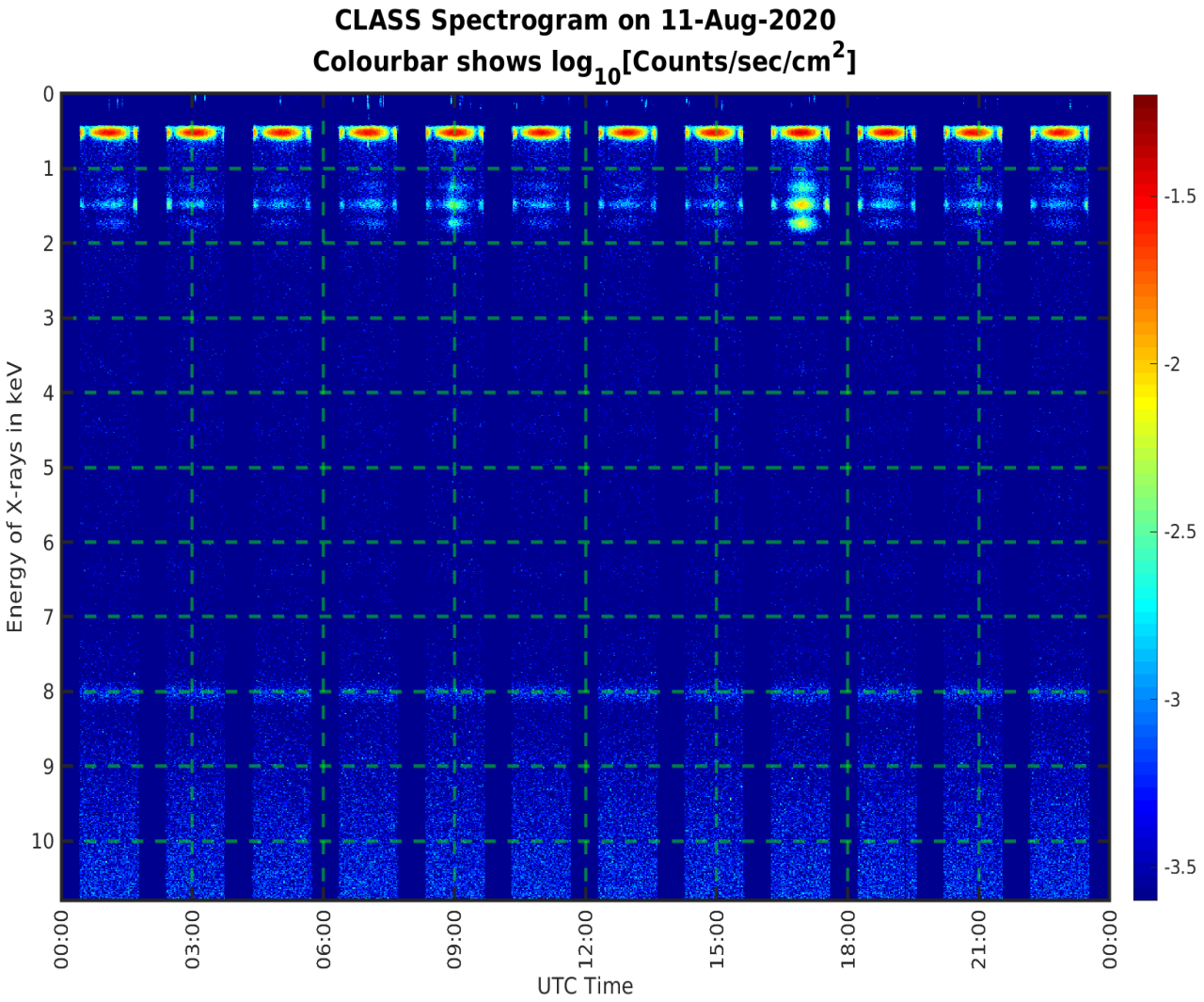
UTC Time


CLASS Spectrogram on 11-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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4
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6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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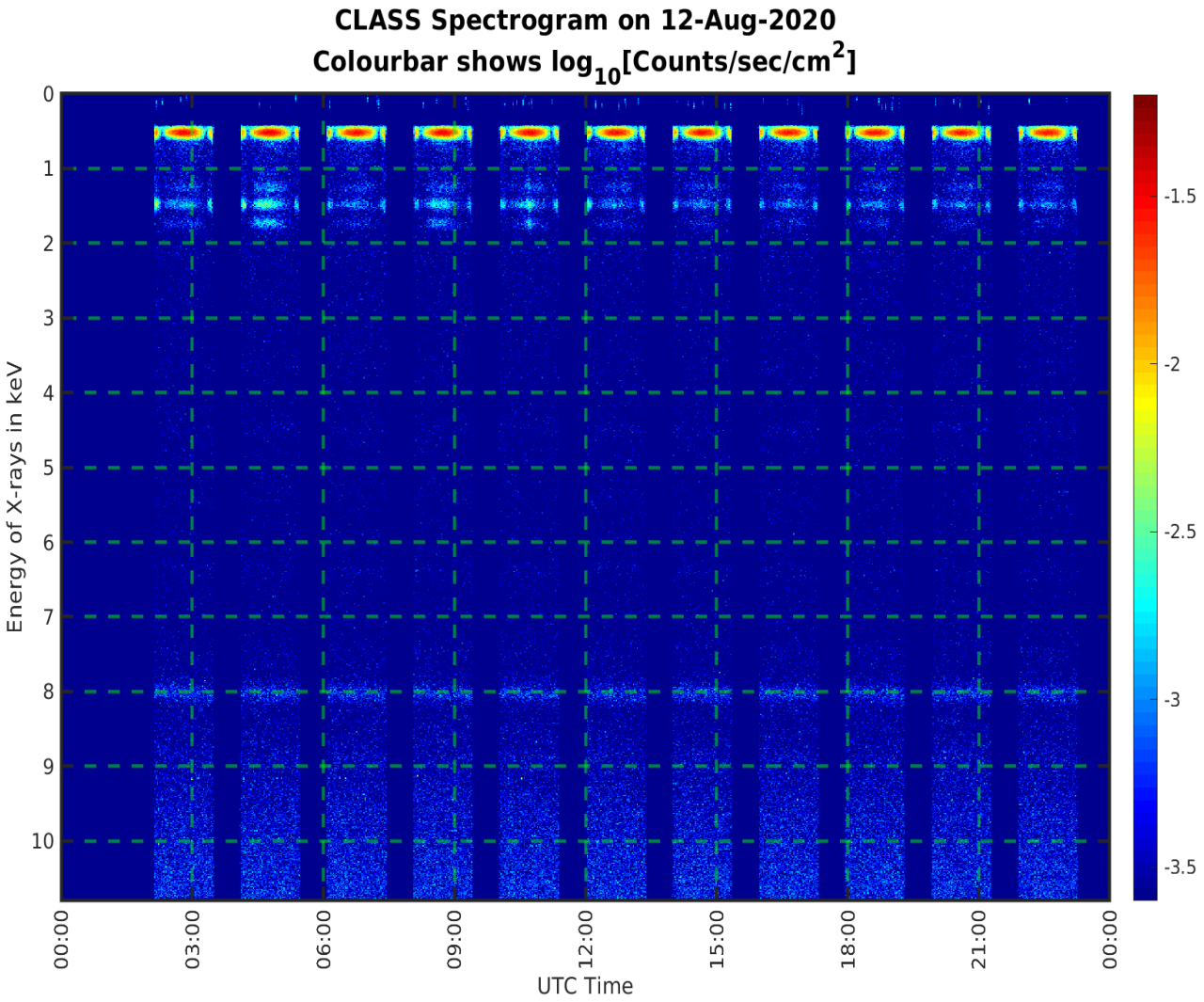
UTC Time


CLASS Spectrogram on 12-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
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6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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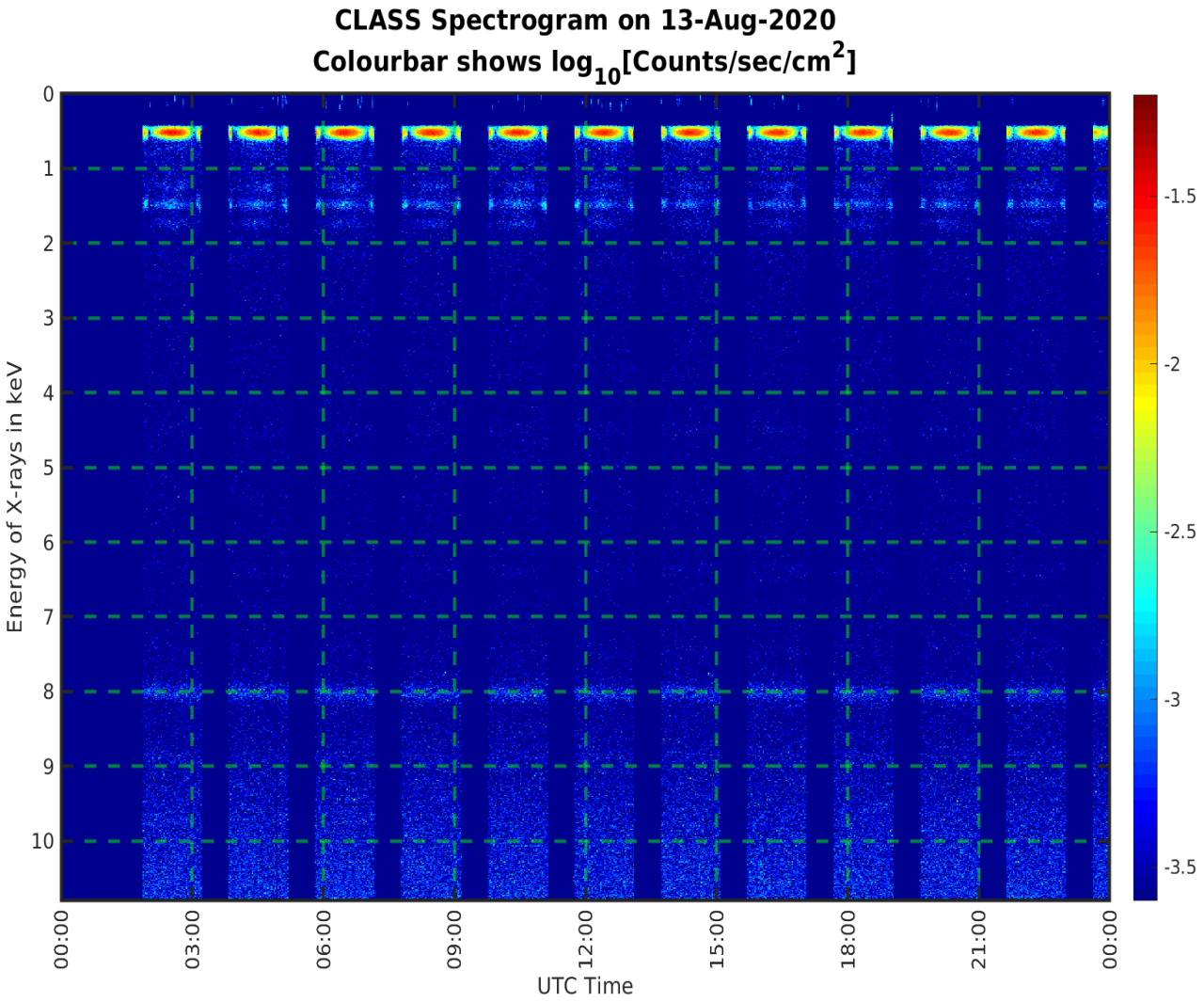
UTC Time


CLASS Spectrogram on 13-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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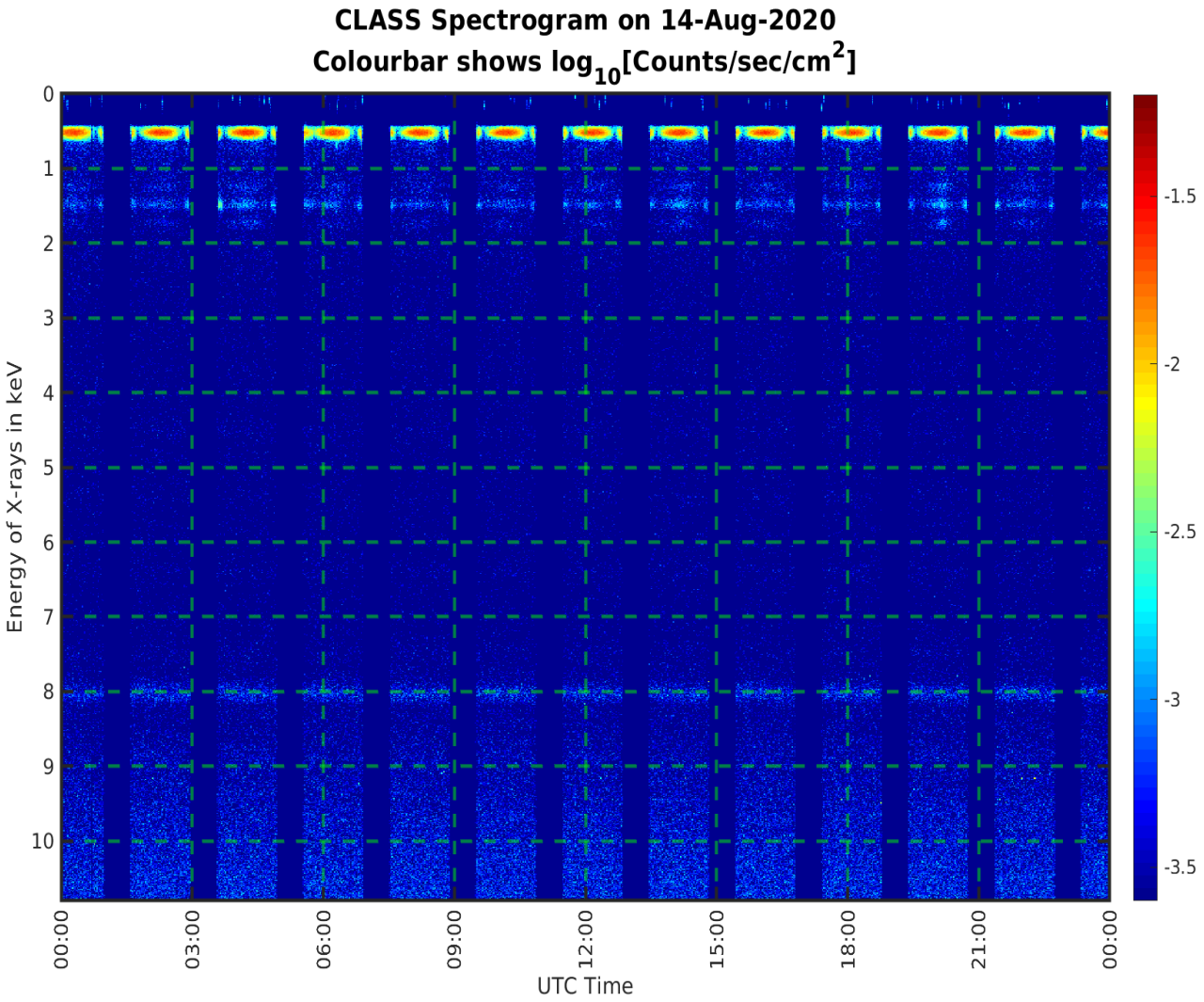
UTC Time


CLASS Spectrogram on 14-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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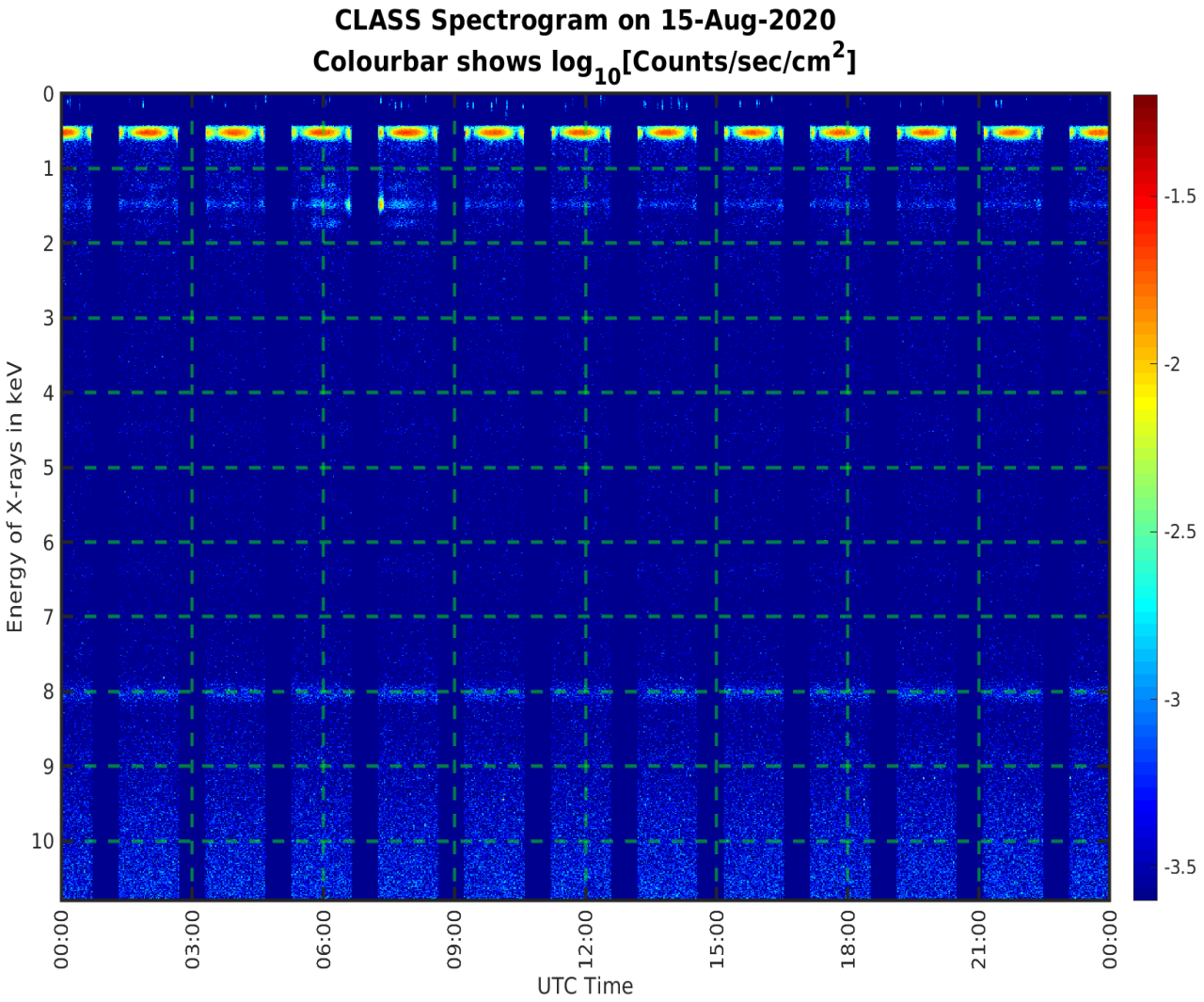
UTC Time


CLASS Spectrogram on 15-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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7
8
9
10
-1.5
-2
-2.5
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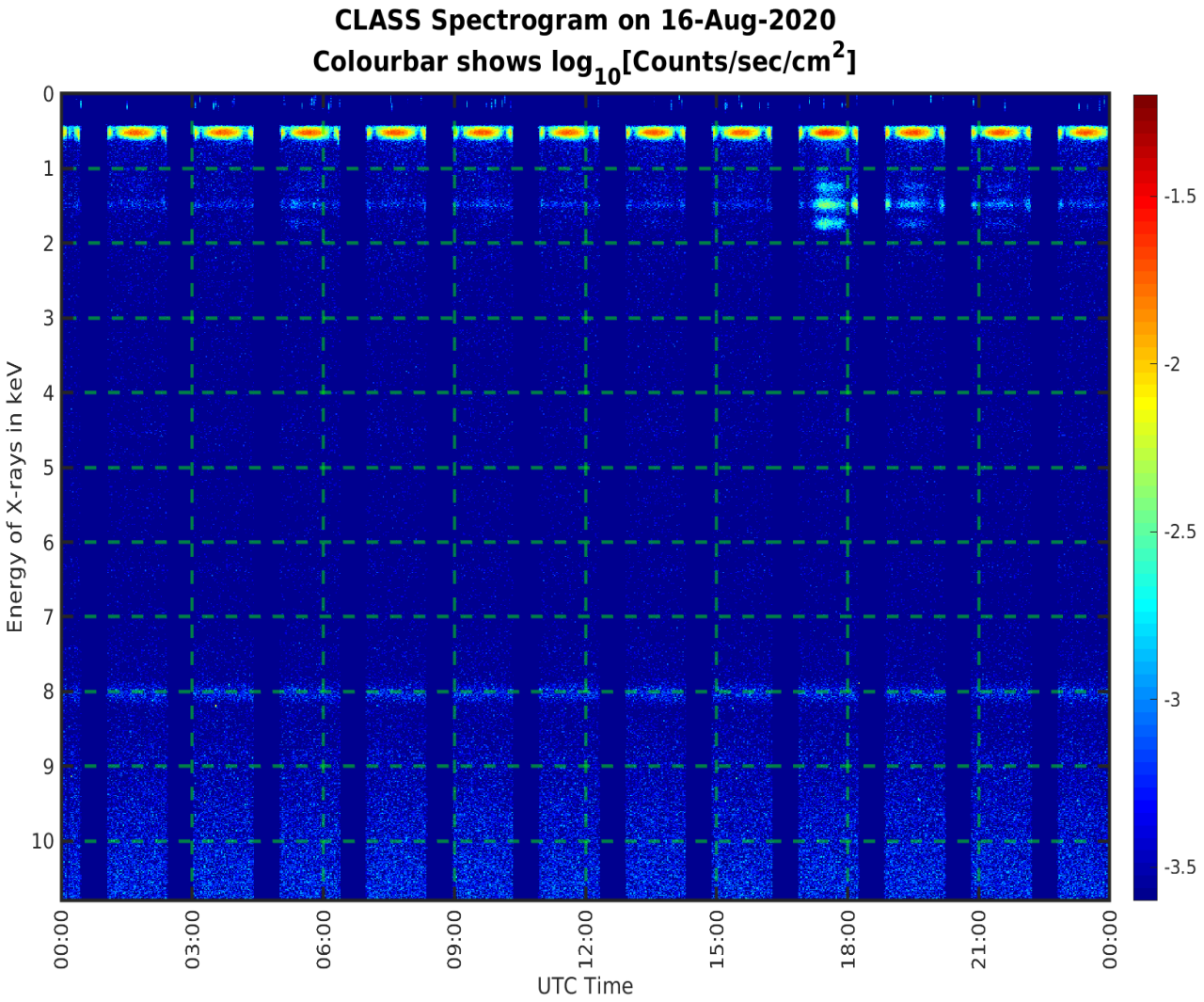
UTC Time


CLASS Spectrogram on 16-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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7
8
9
10
-1.5
-2
-2.5
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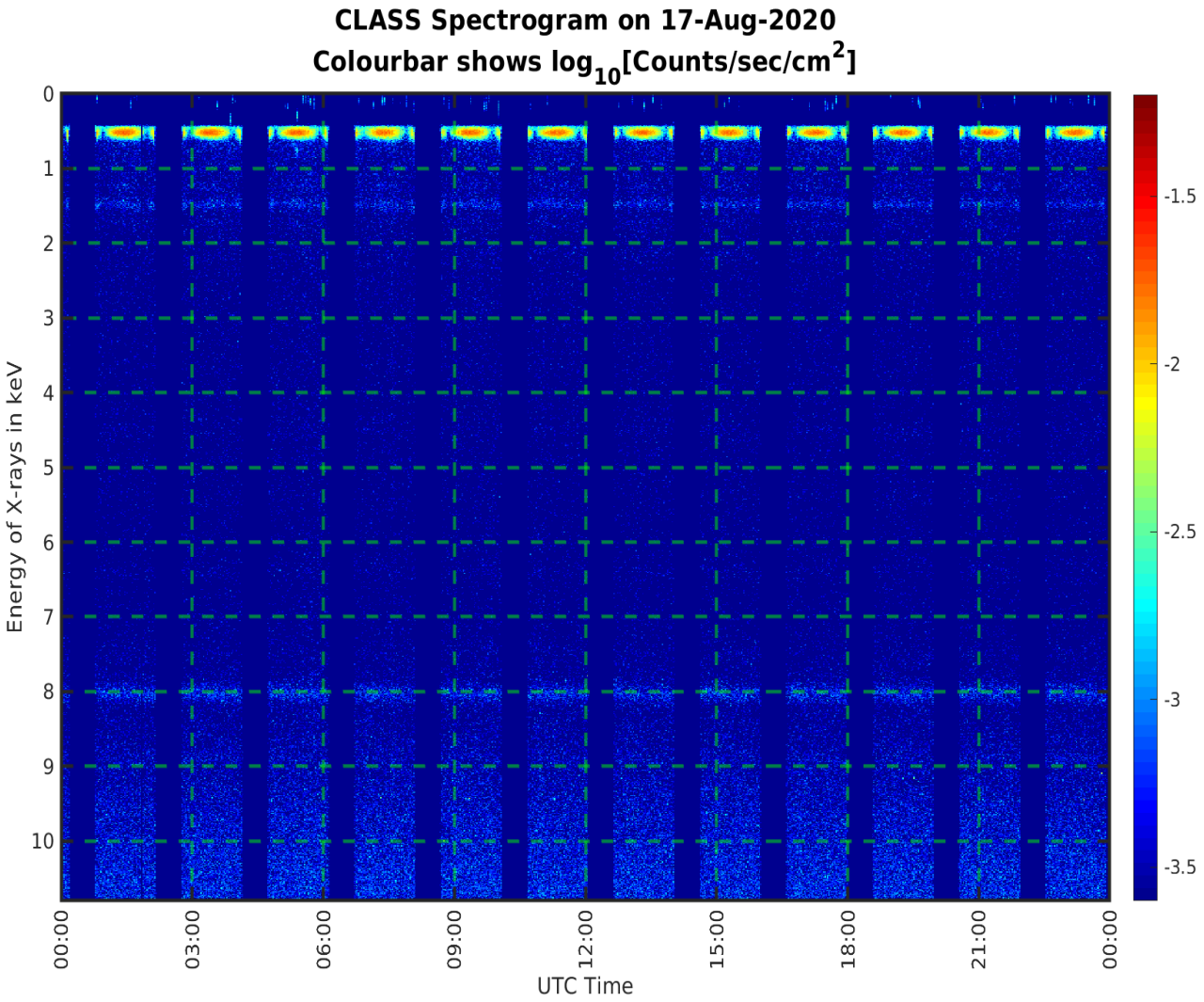
UTC Time


CLASS Spectrogram on 17-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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7
8
9
10
-1.5
-2
-2.5
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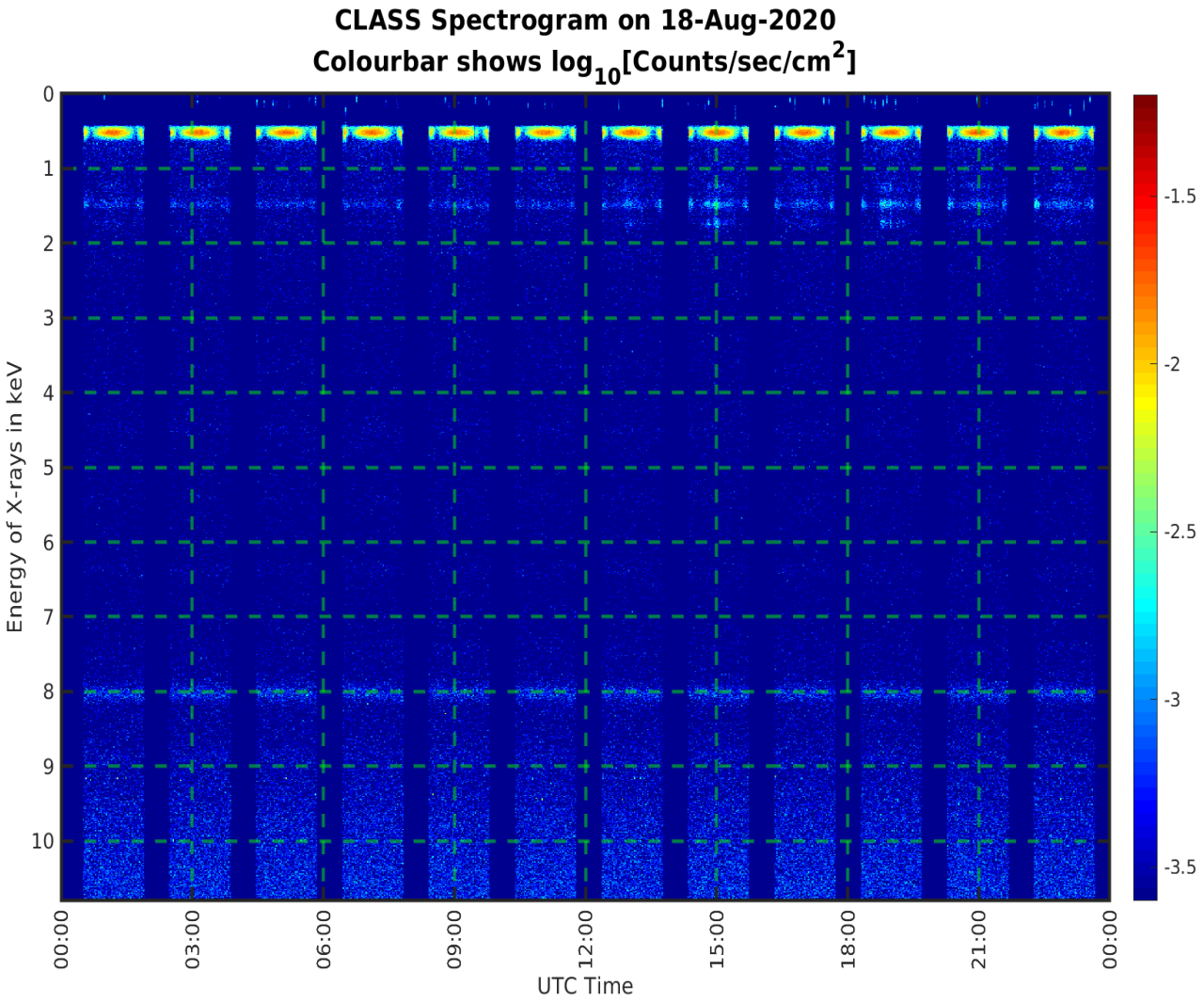
UTC Time


CLASS Spectrogram on 18-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
-2
-2.5
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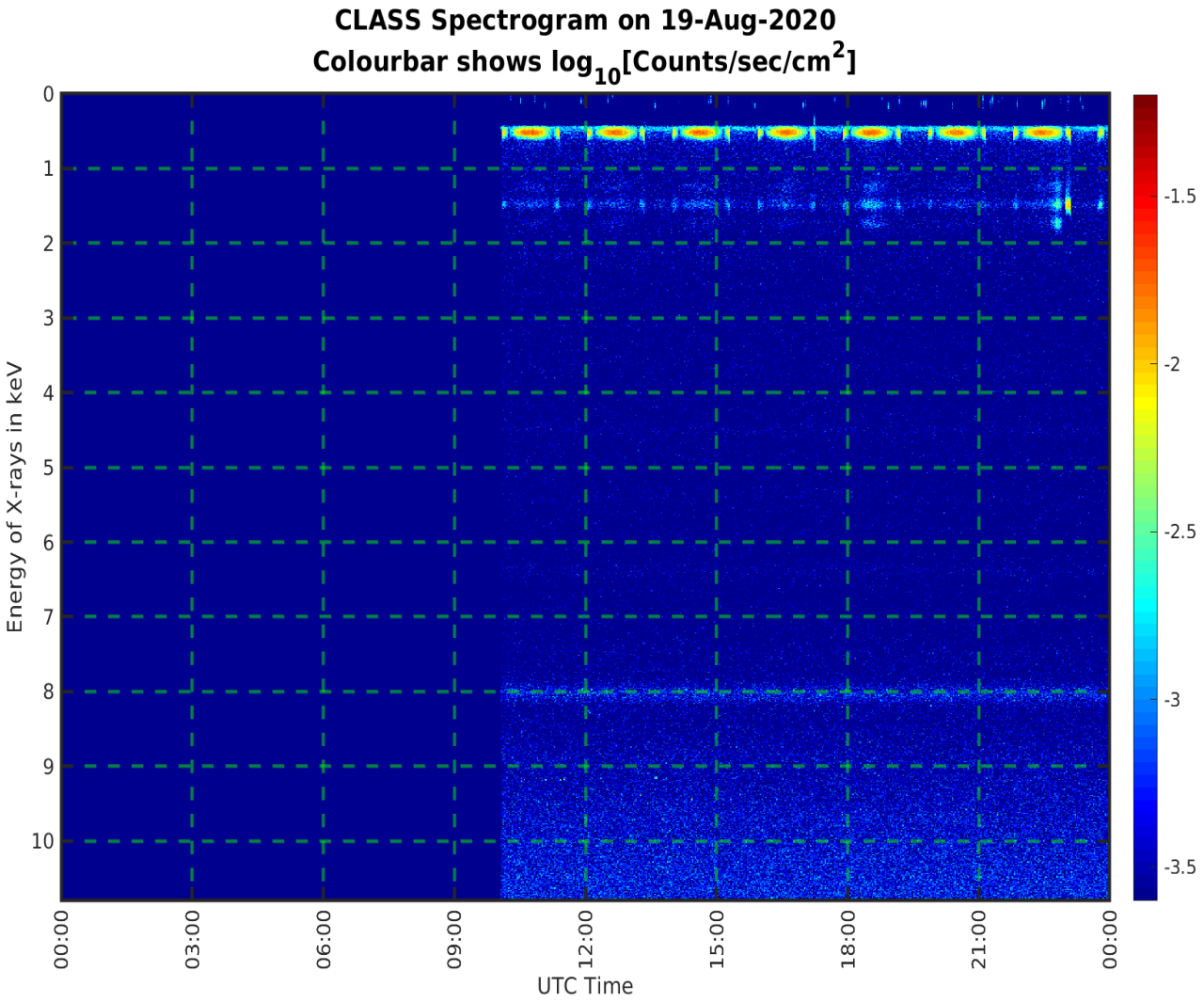
UTC Time


CLASS Spectrogram on 19-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
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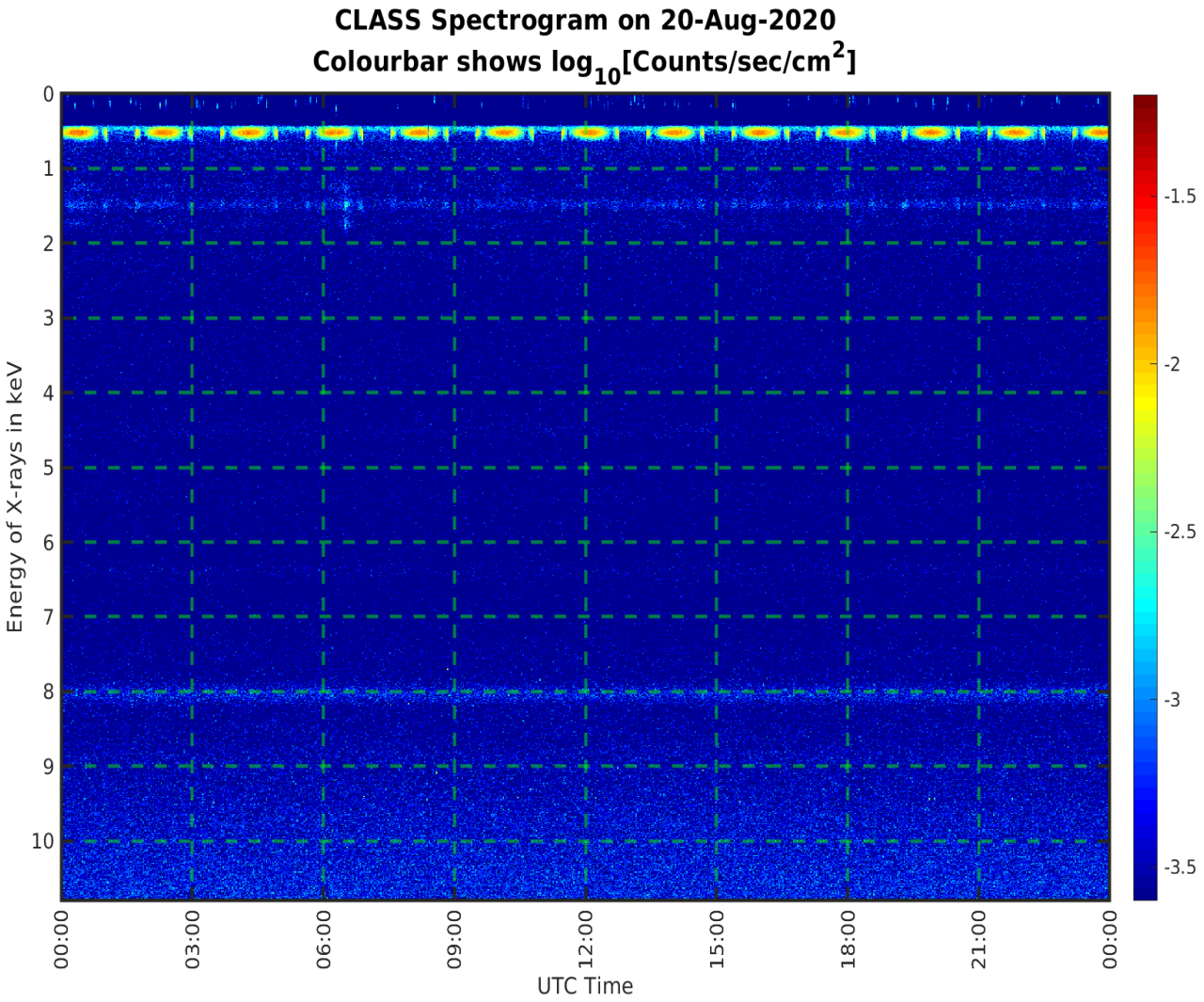
UTC Time


CLASS Spectrogram on 20-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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7
8
9
10
-1.5
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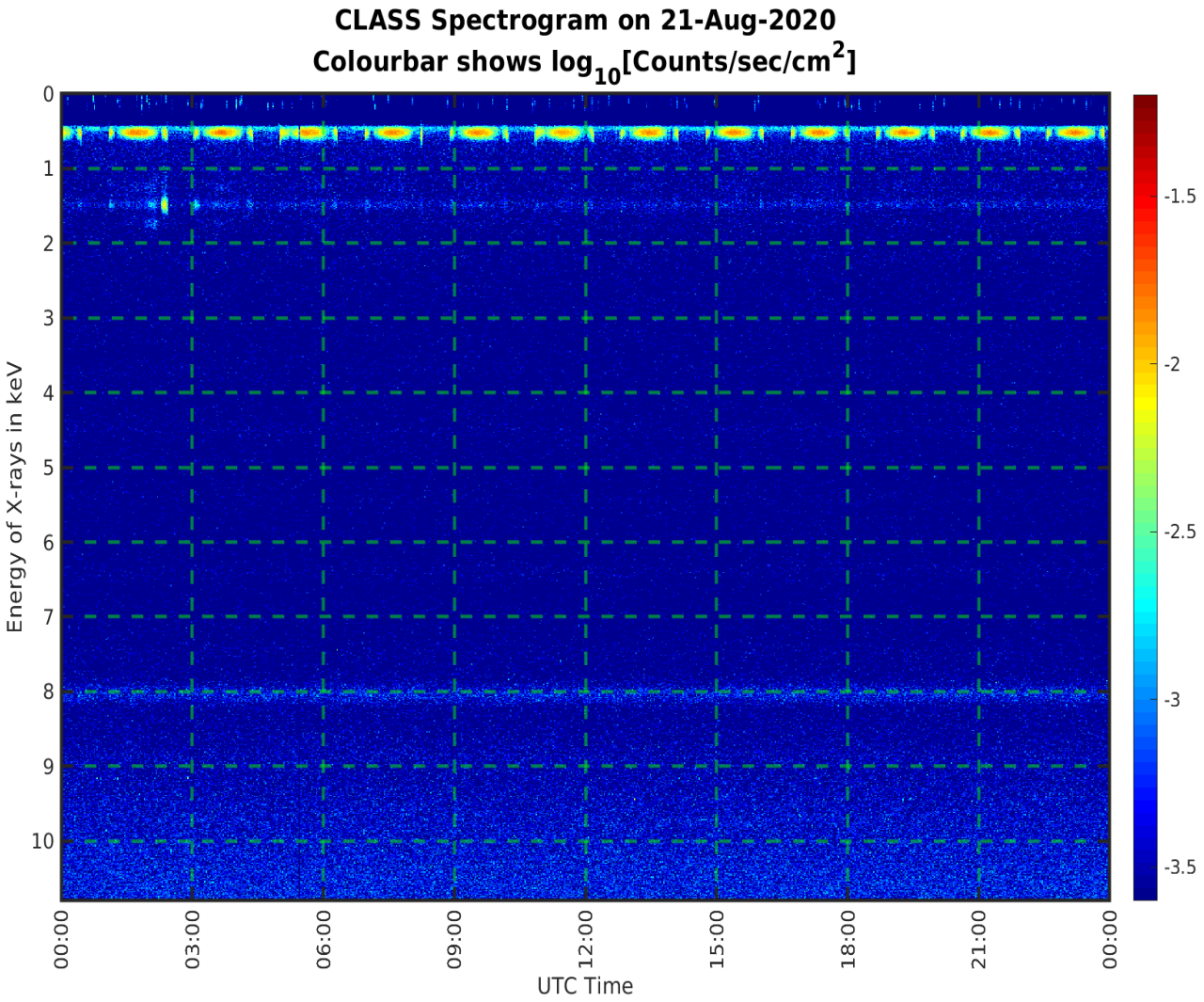
UTC Time


CLASS Spectrogram on 21-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
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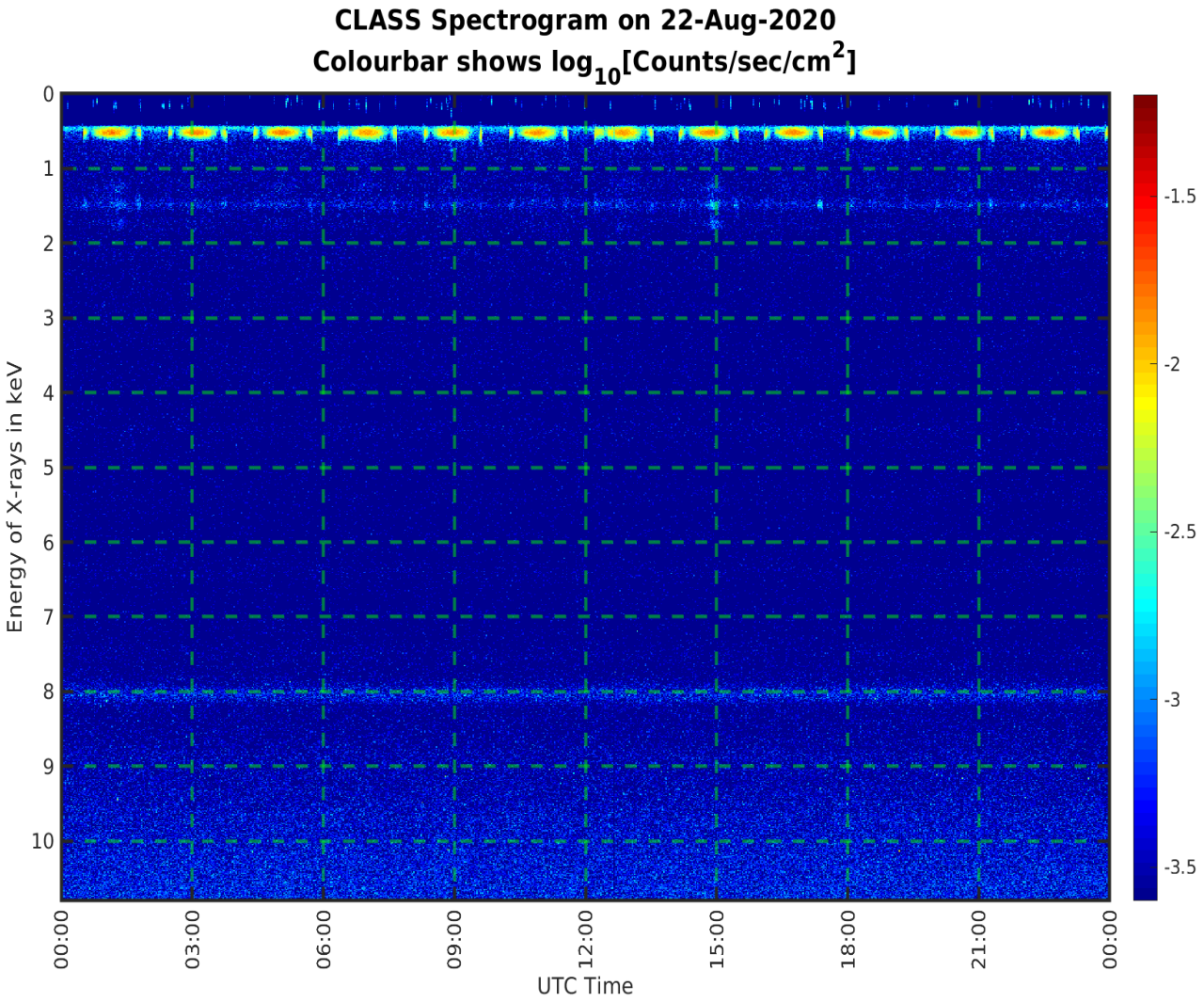
UTC Time


CLASS Spectrogram on 22-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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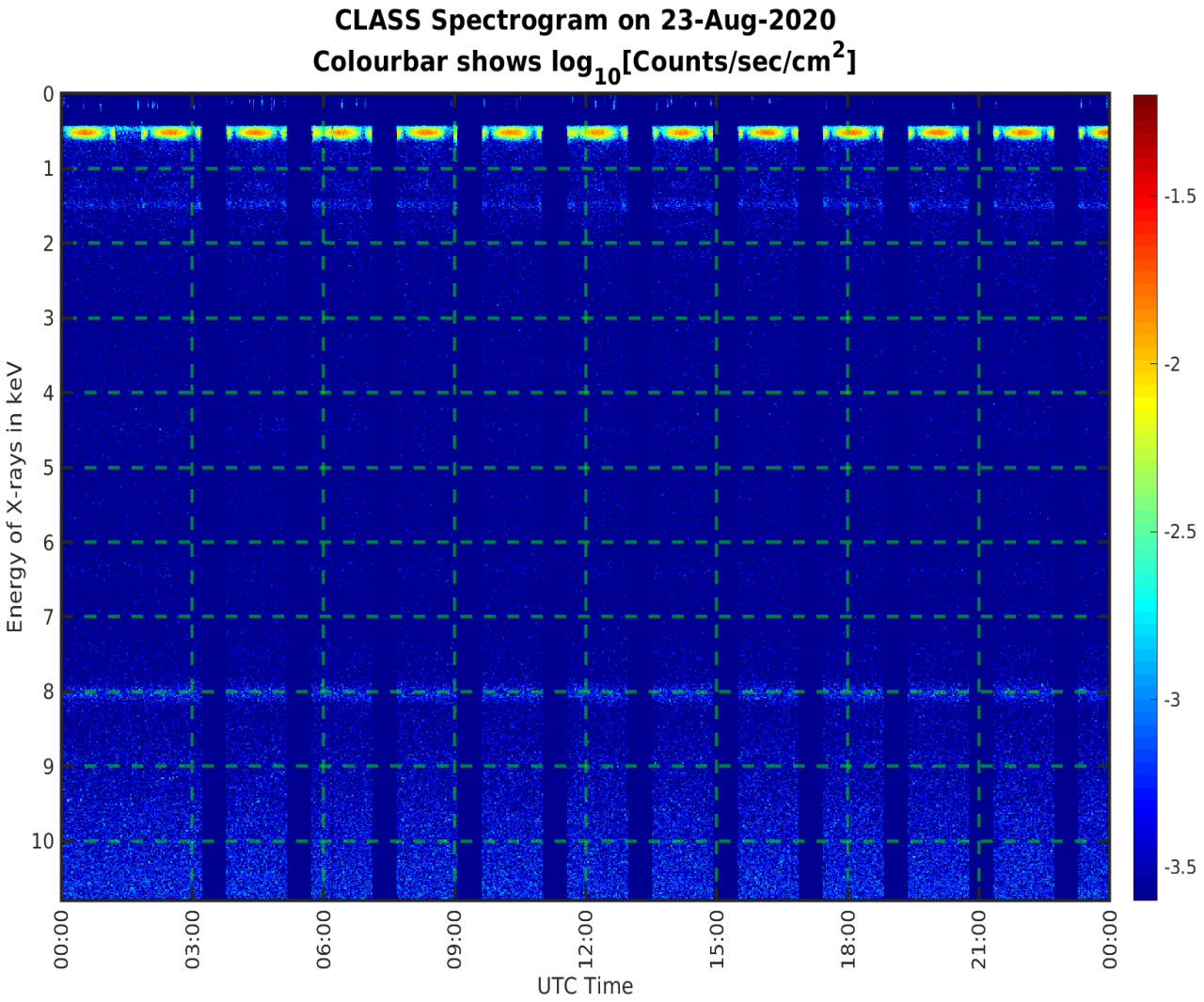
UTC Time


CLASS Spectrogram on 23-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
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6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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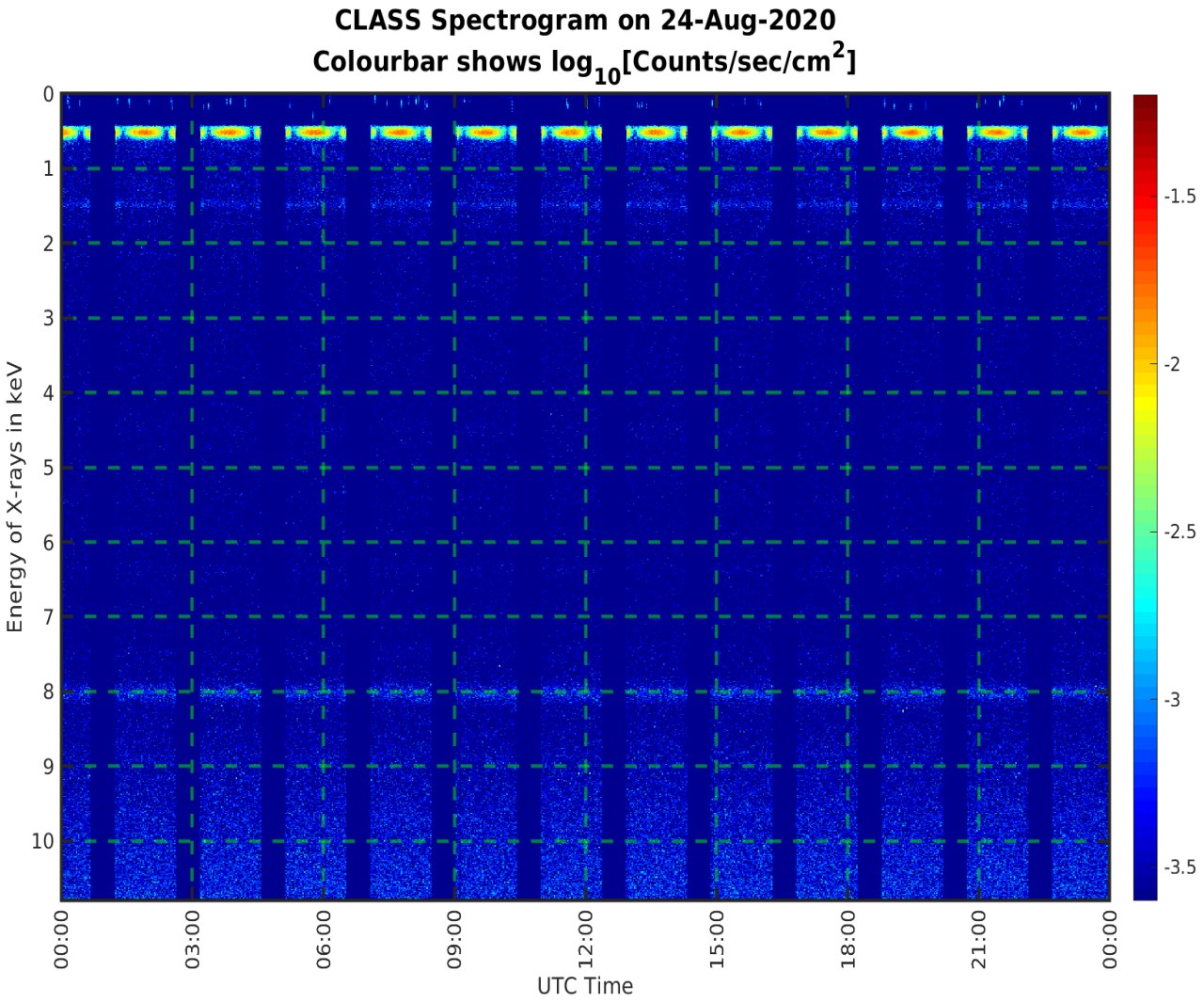
UTC Time


CLASS Spectrogram on 24-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
00:00
03:00
06:00
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UTC Time
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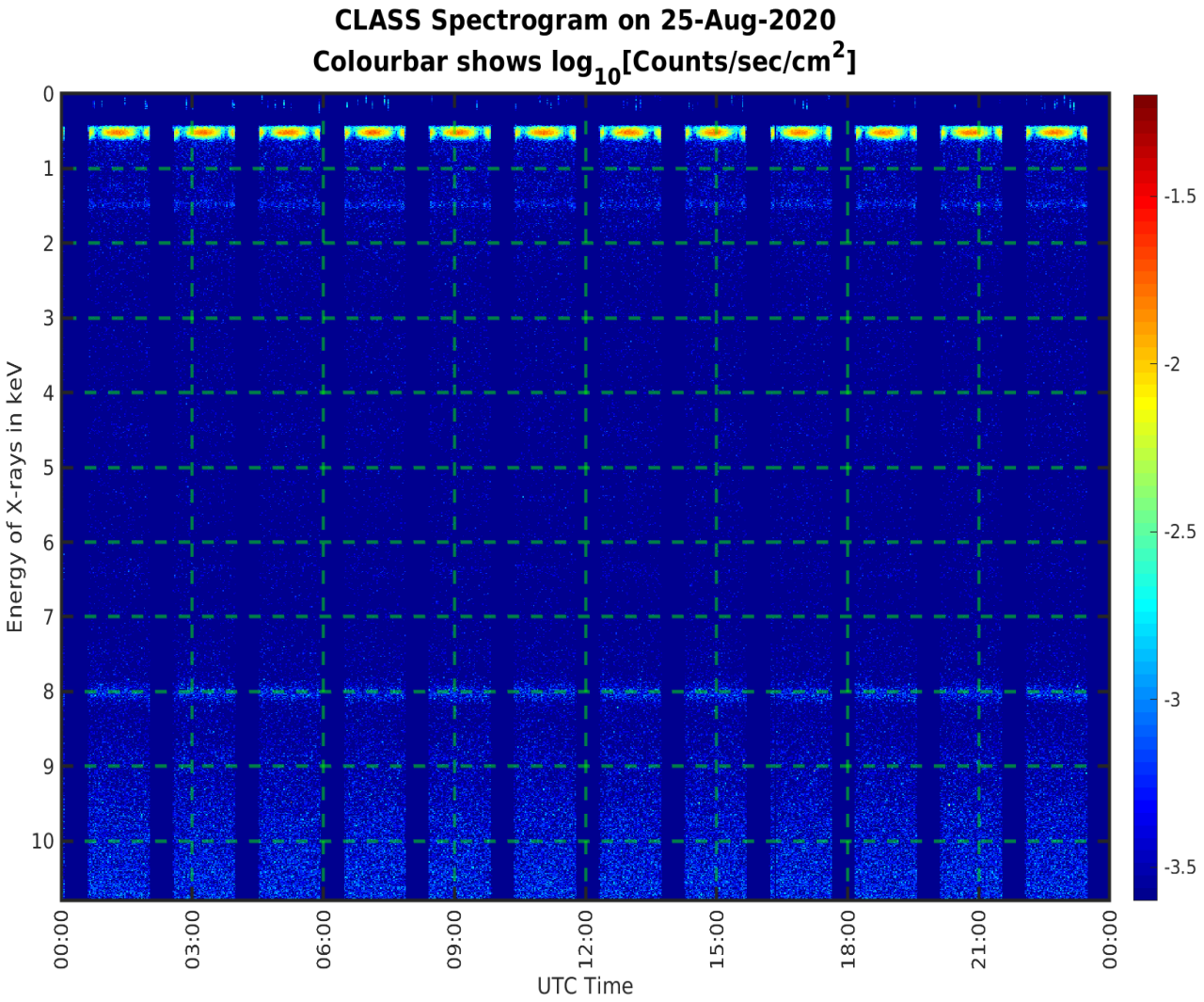
CLASS Spectrogram on 25-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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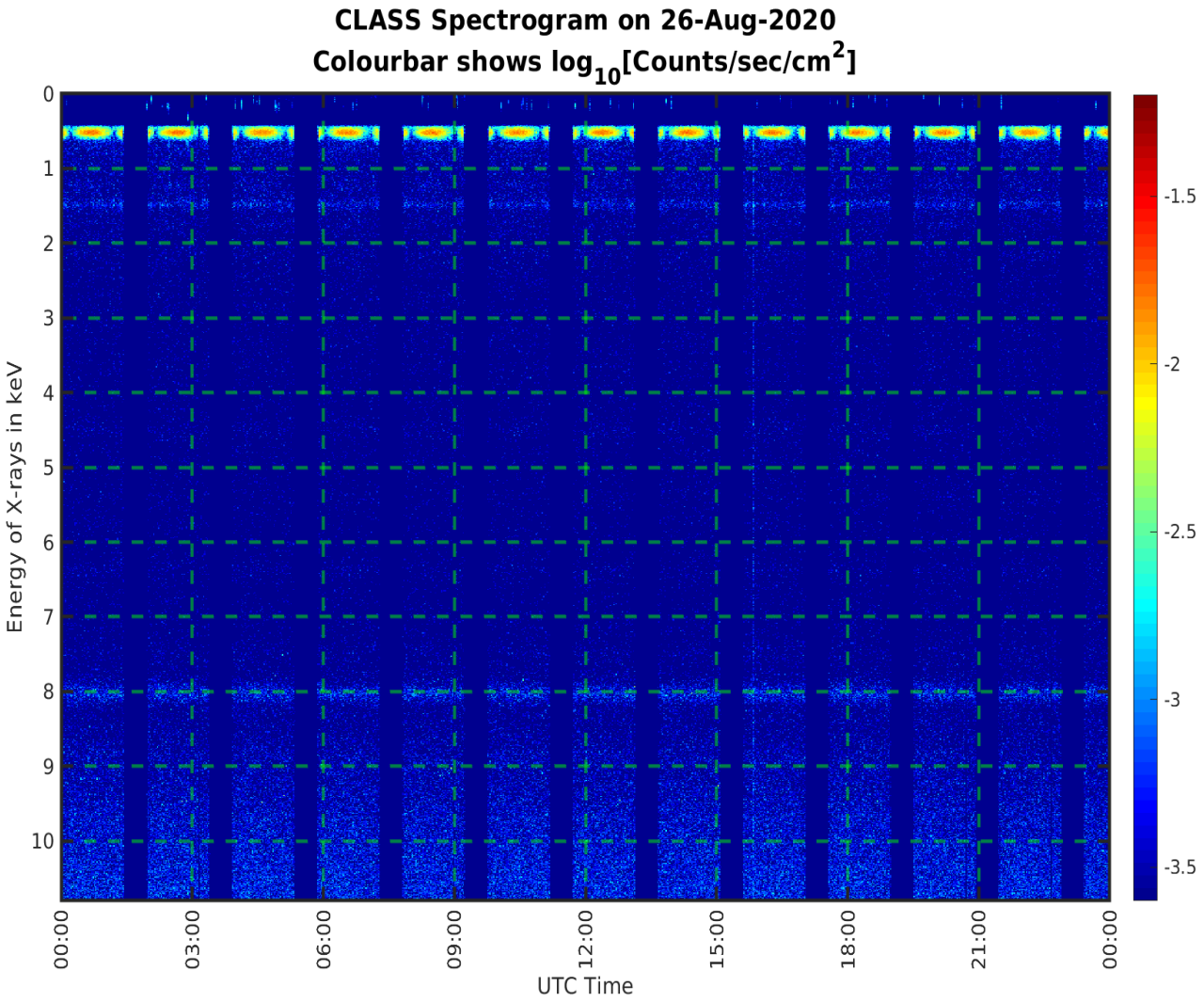
UTC Time


CLASS Spectrogram on 26-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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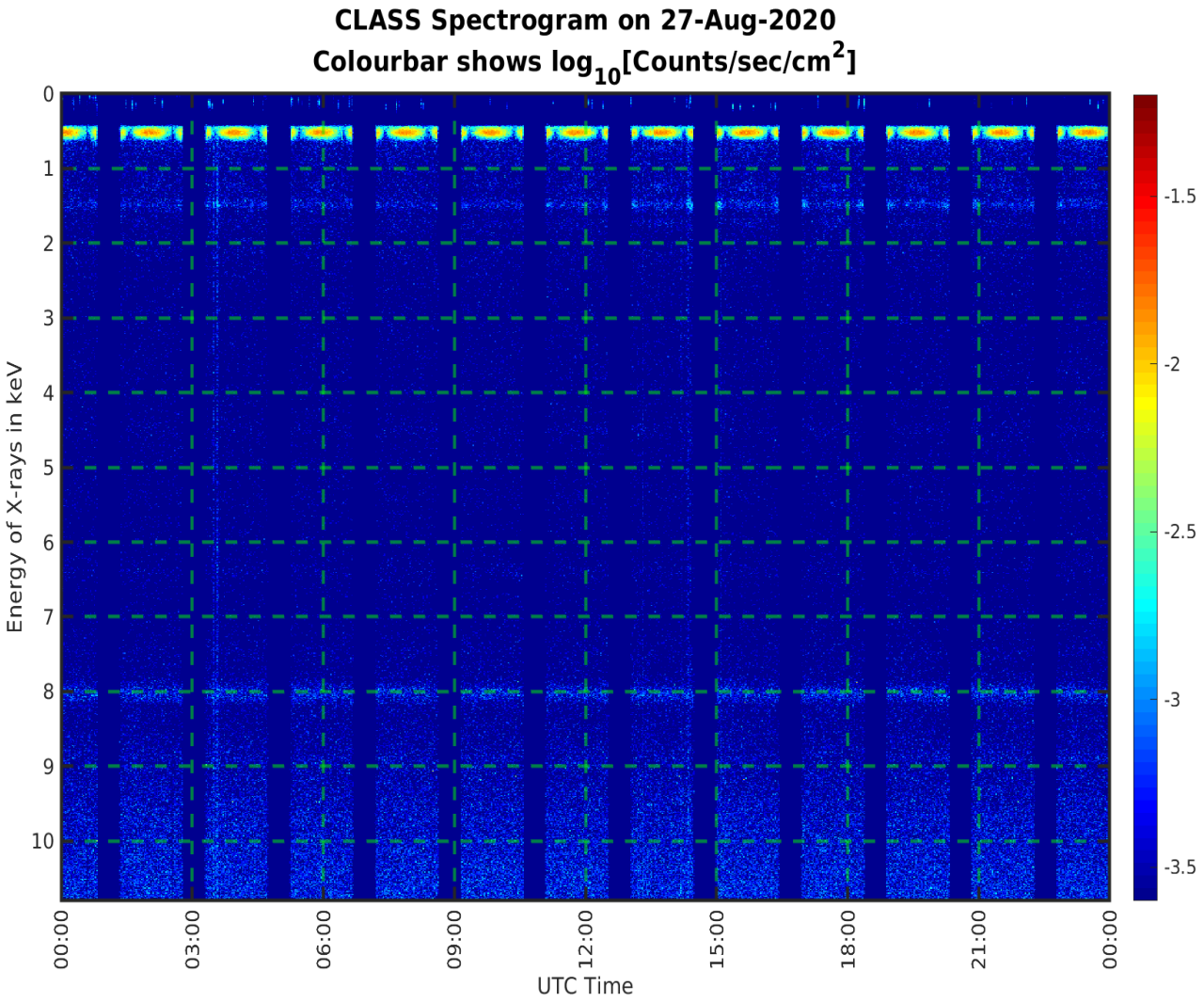
UTC Time


CLASS Spectrogram on 27-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
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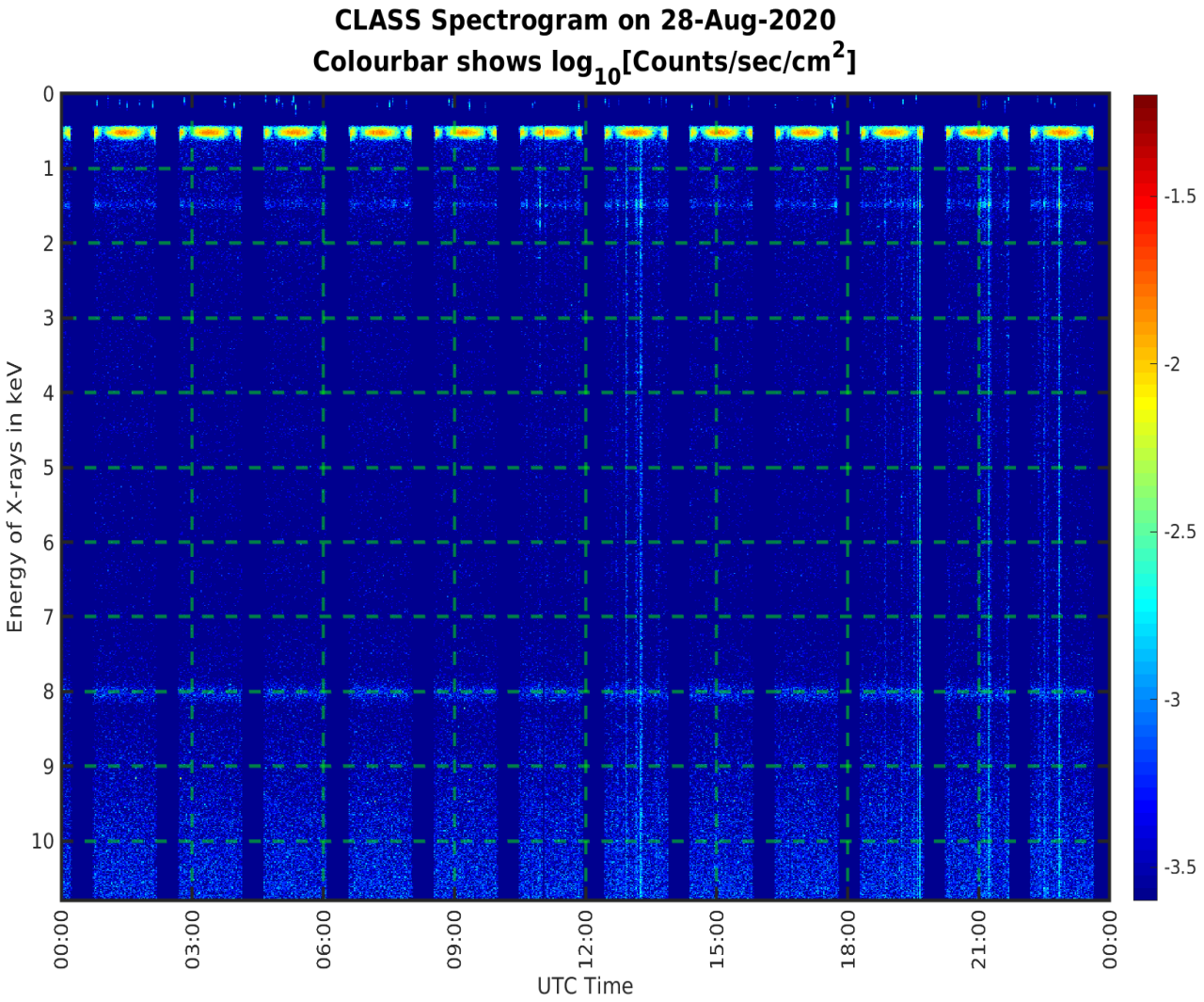
UTC Time


CLASS Spectrogram on 28-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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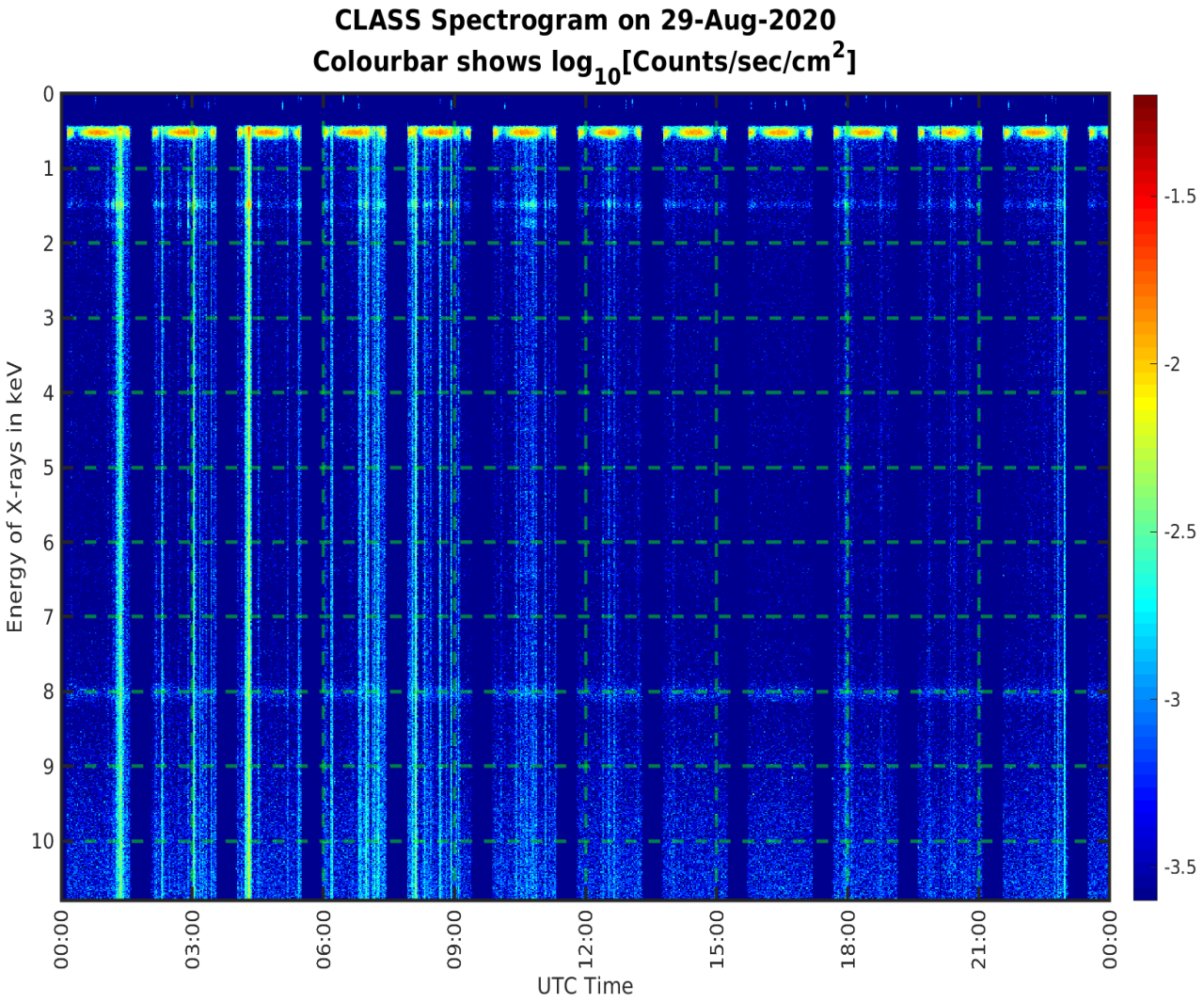
UTC Time


CLASS Spectrogram on 29-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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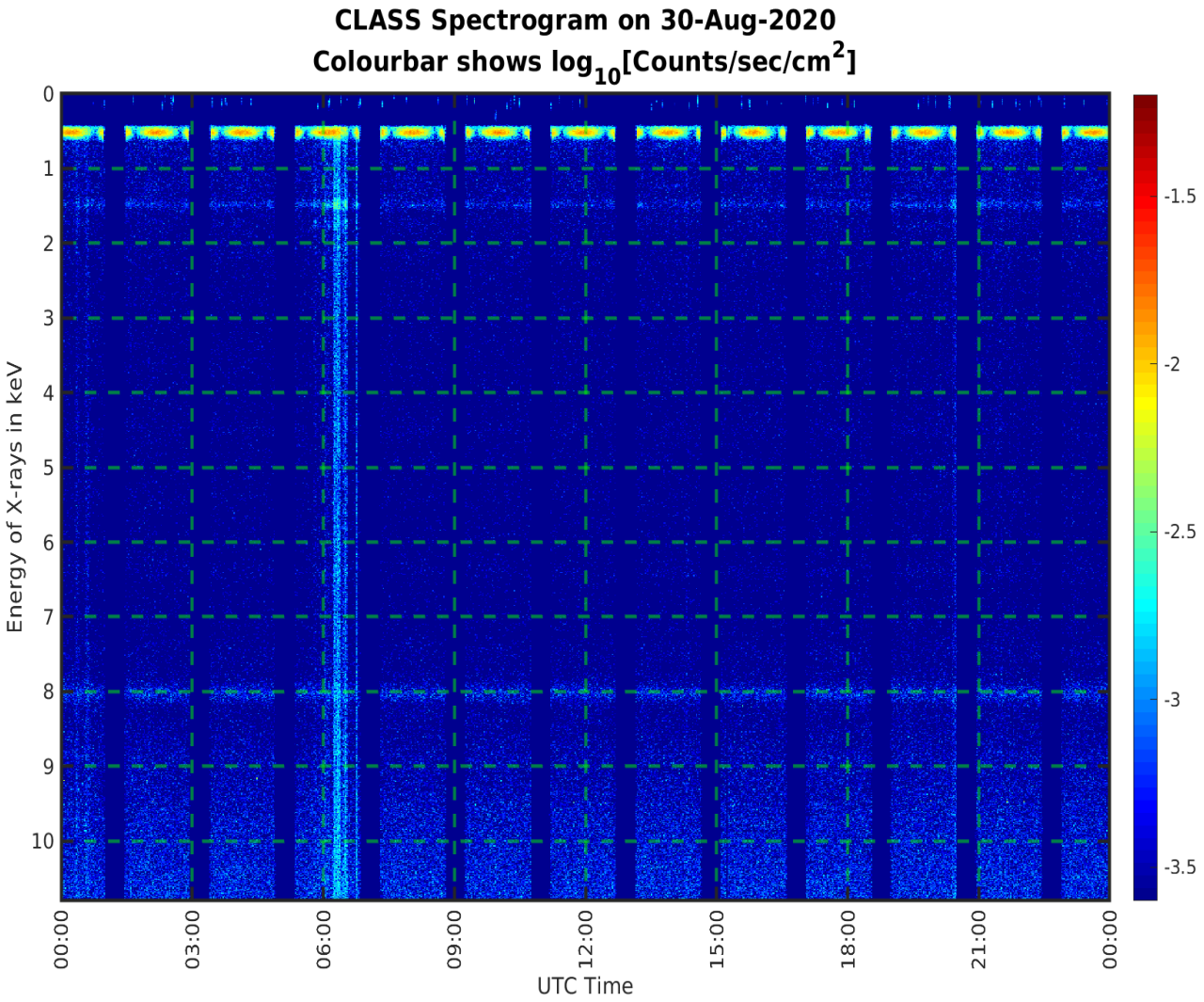
UTC Time


CLASS Spectrogram on 30-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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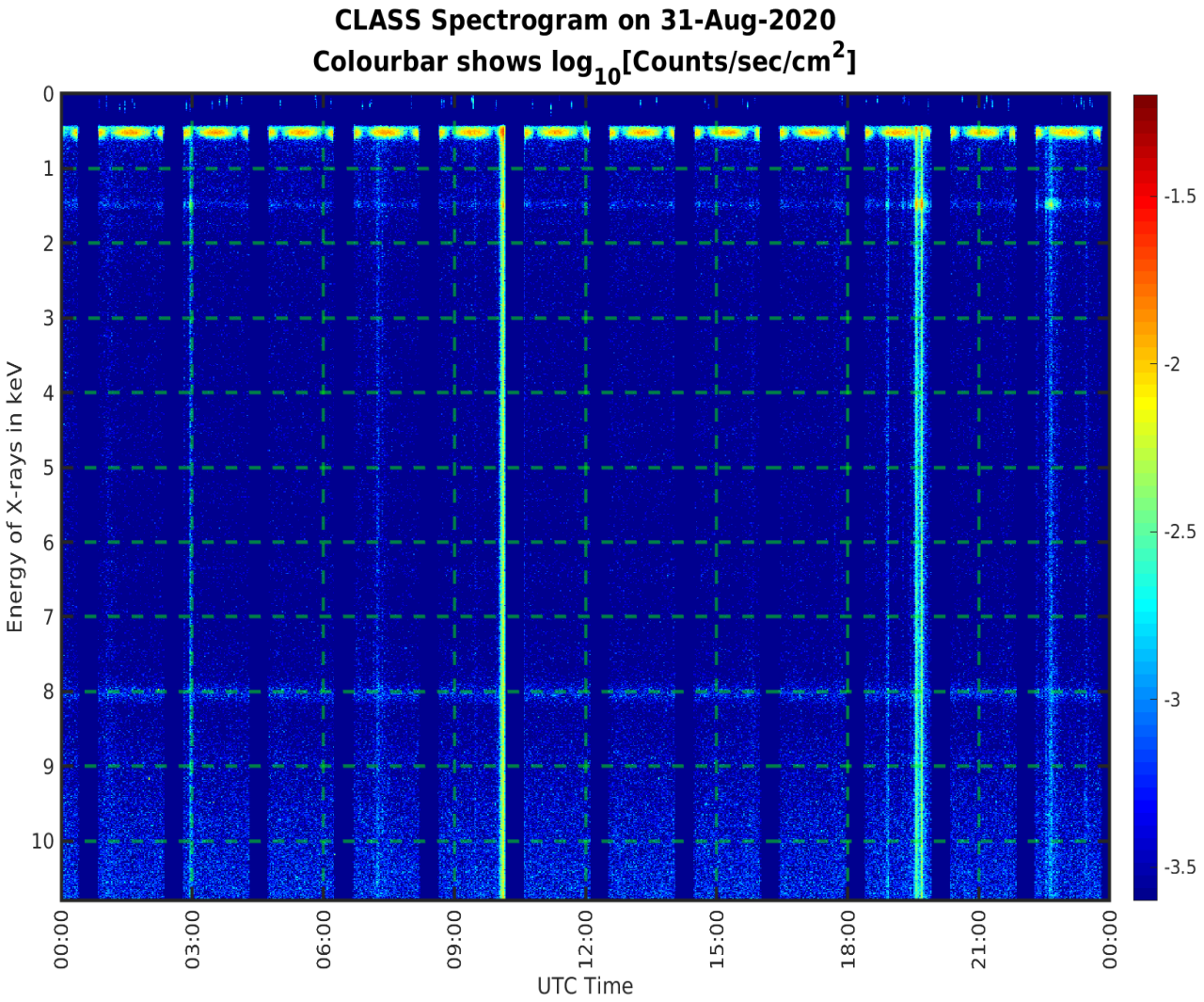
CLASS Spectrogram on 31-Aug-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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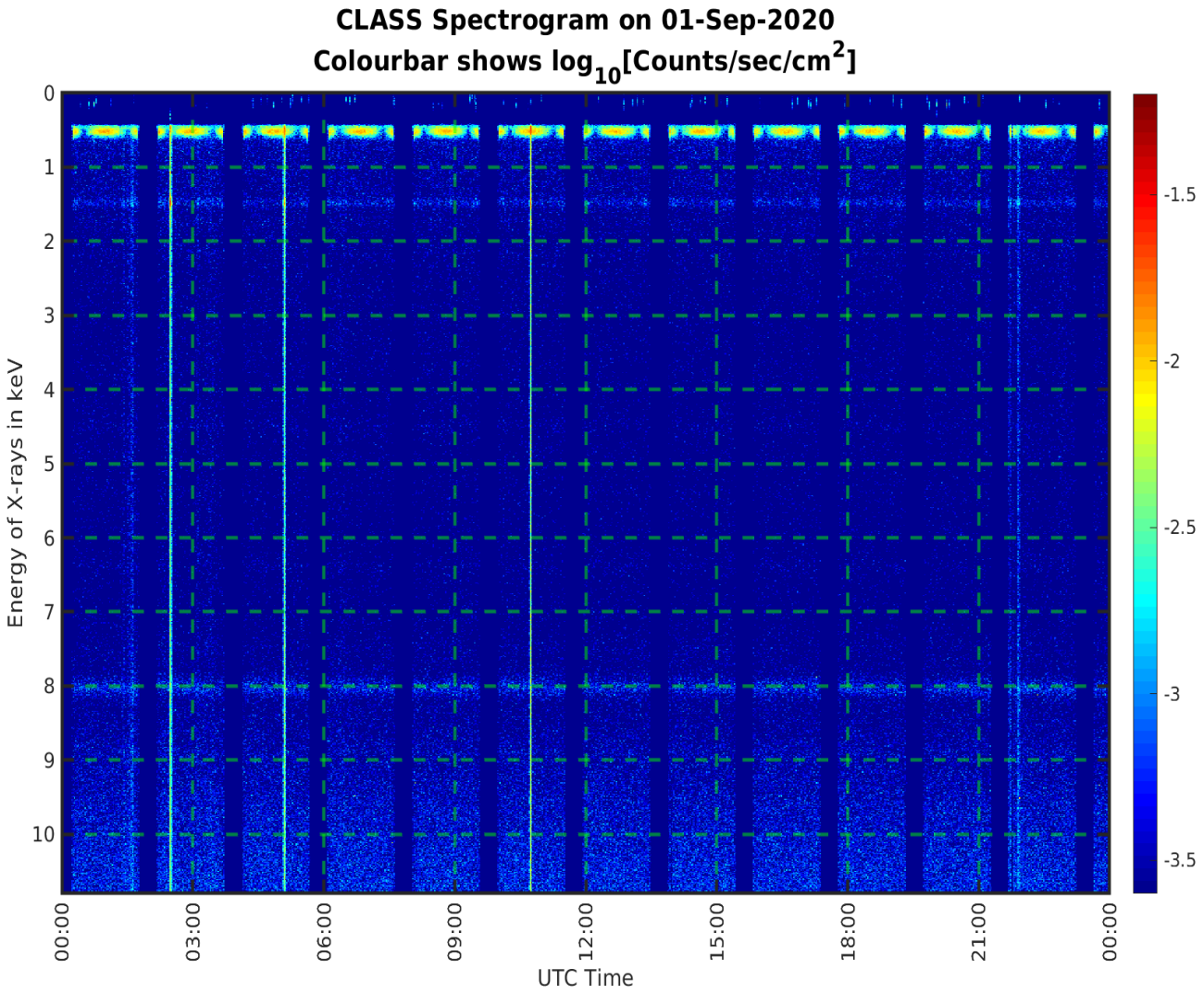
UTC Time


CLASS Spectrogram on 01-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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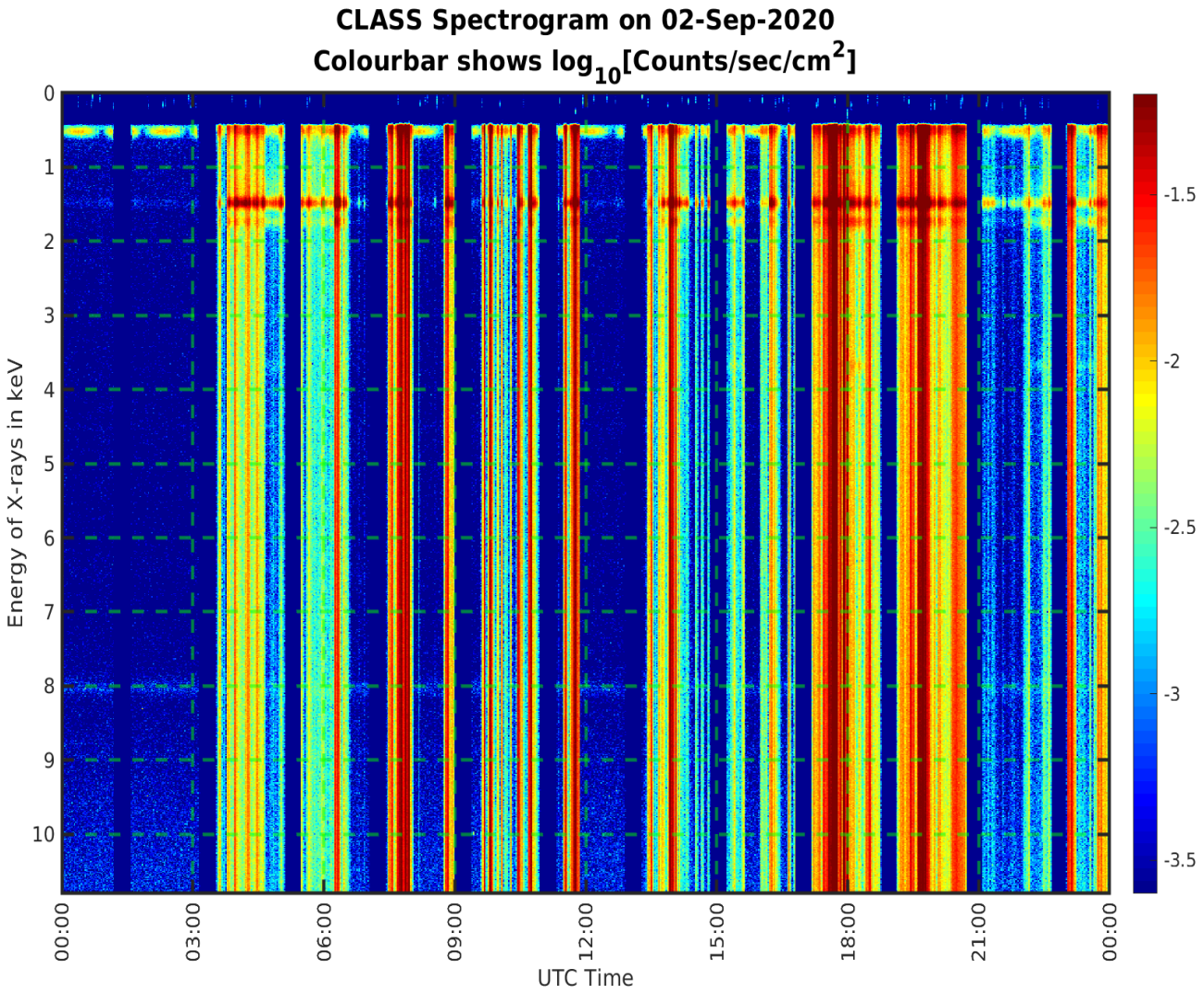
UTC Time


CLASS Spectrogram on 02-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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UTC Time
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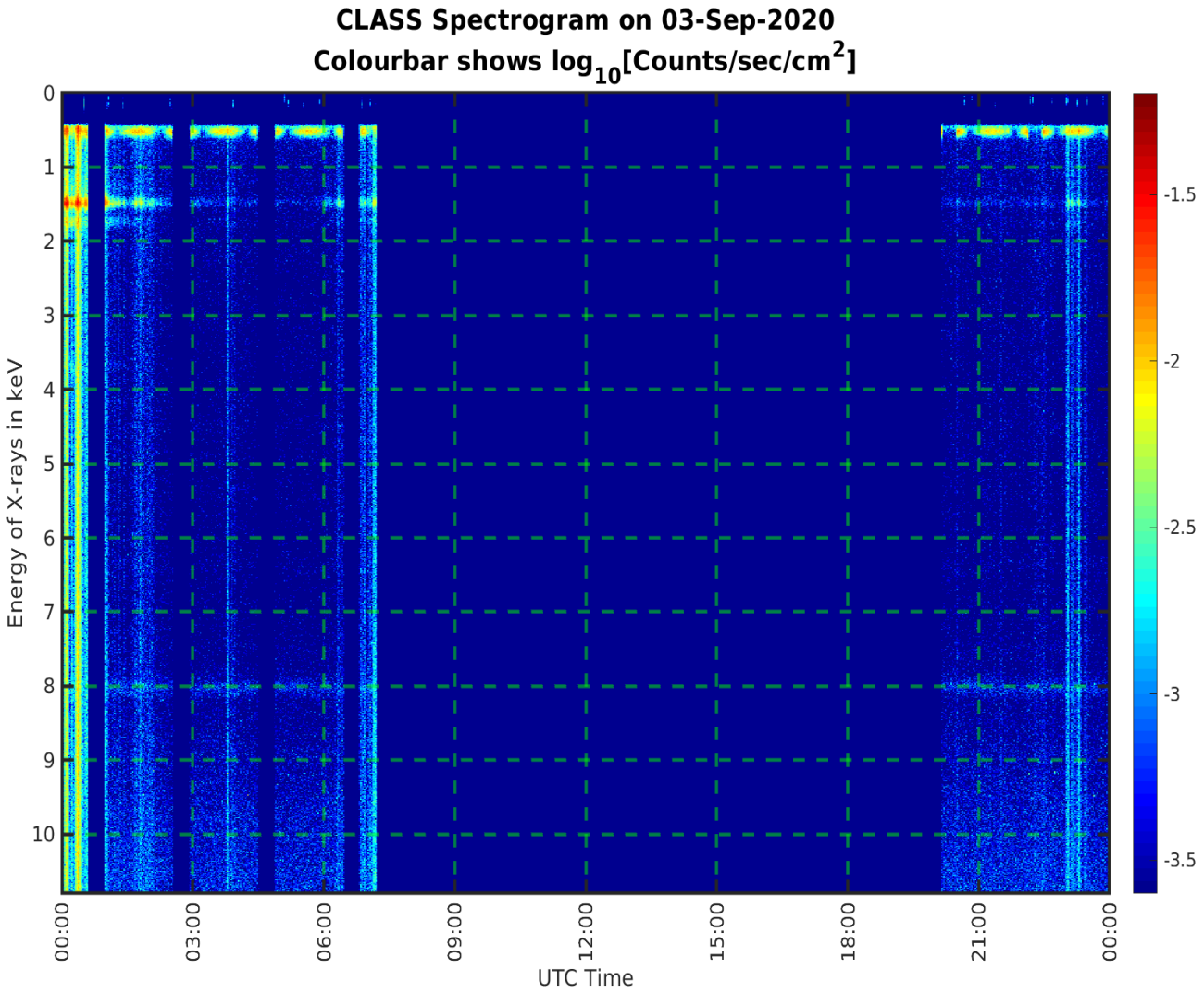
CLASS Spectrogram on 03-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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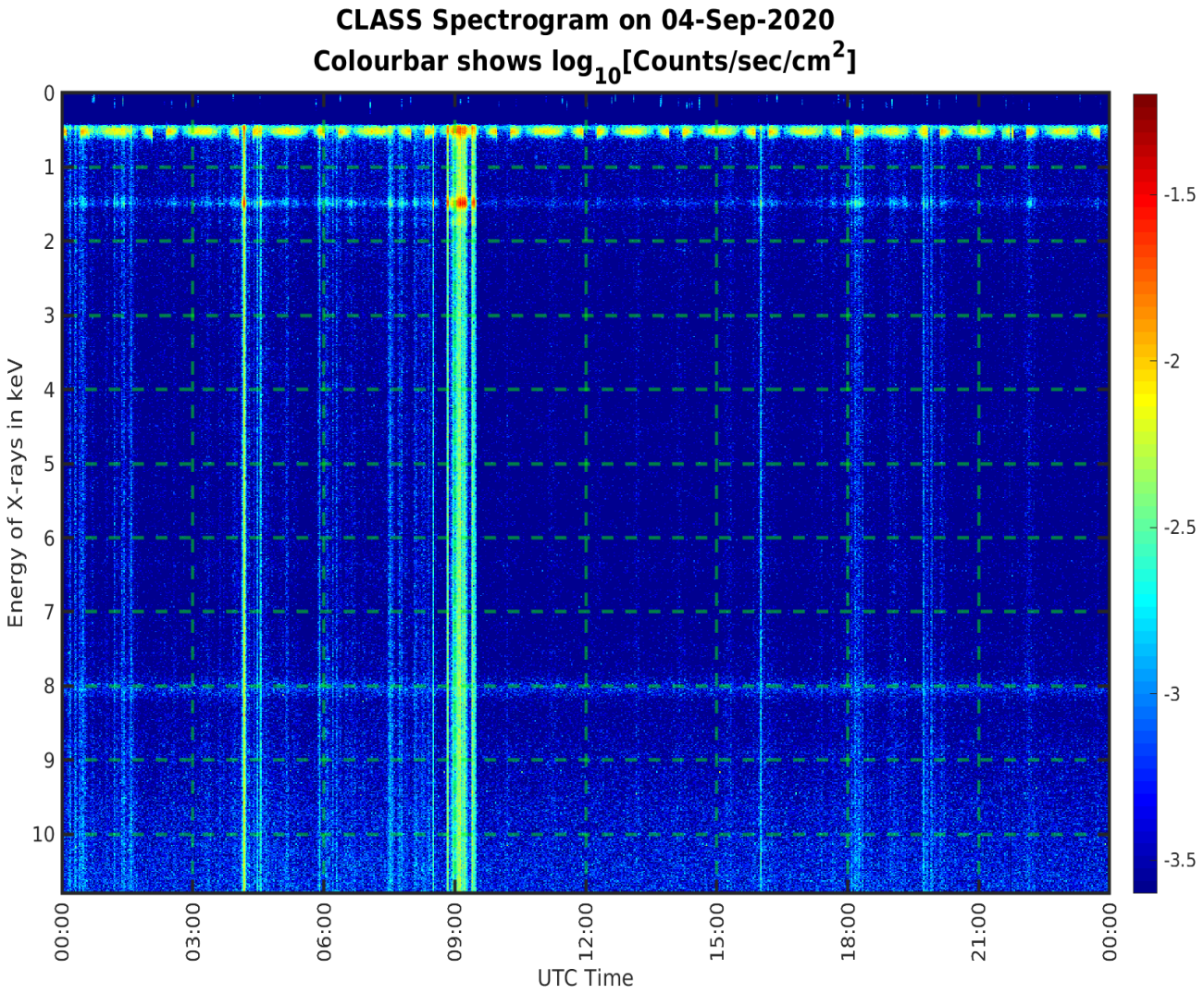
UTC Time


CLASS Spectrogram on 04-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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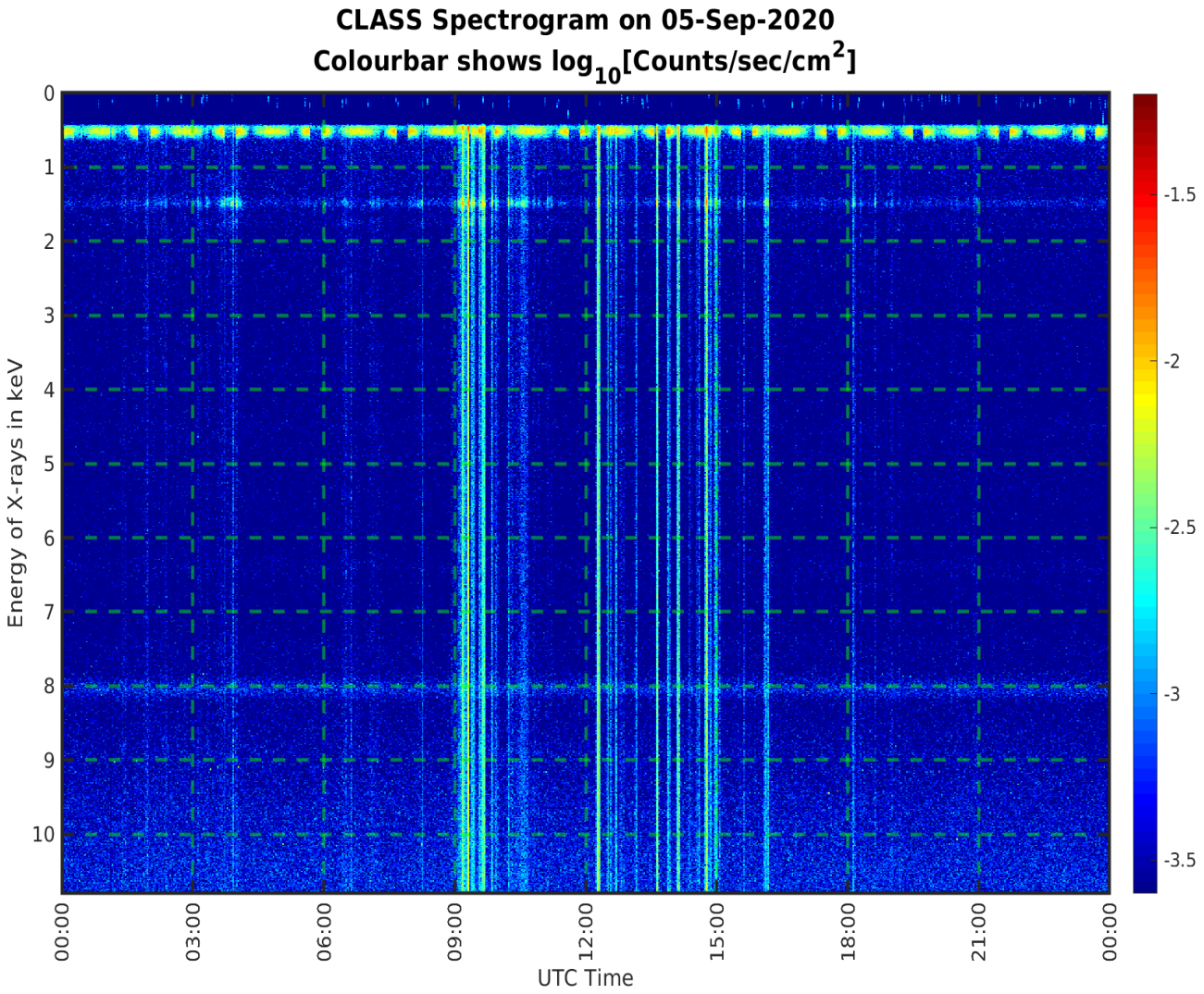
UTC Time


CLASS Spectrogram on 05-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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8
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-1.5
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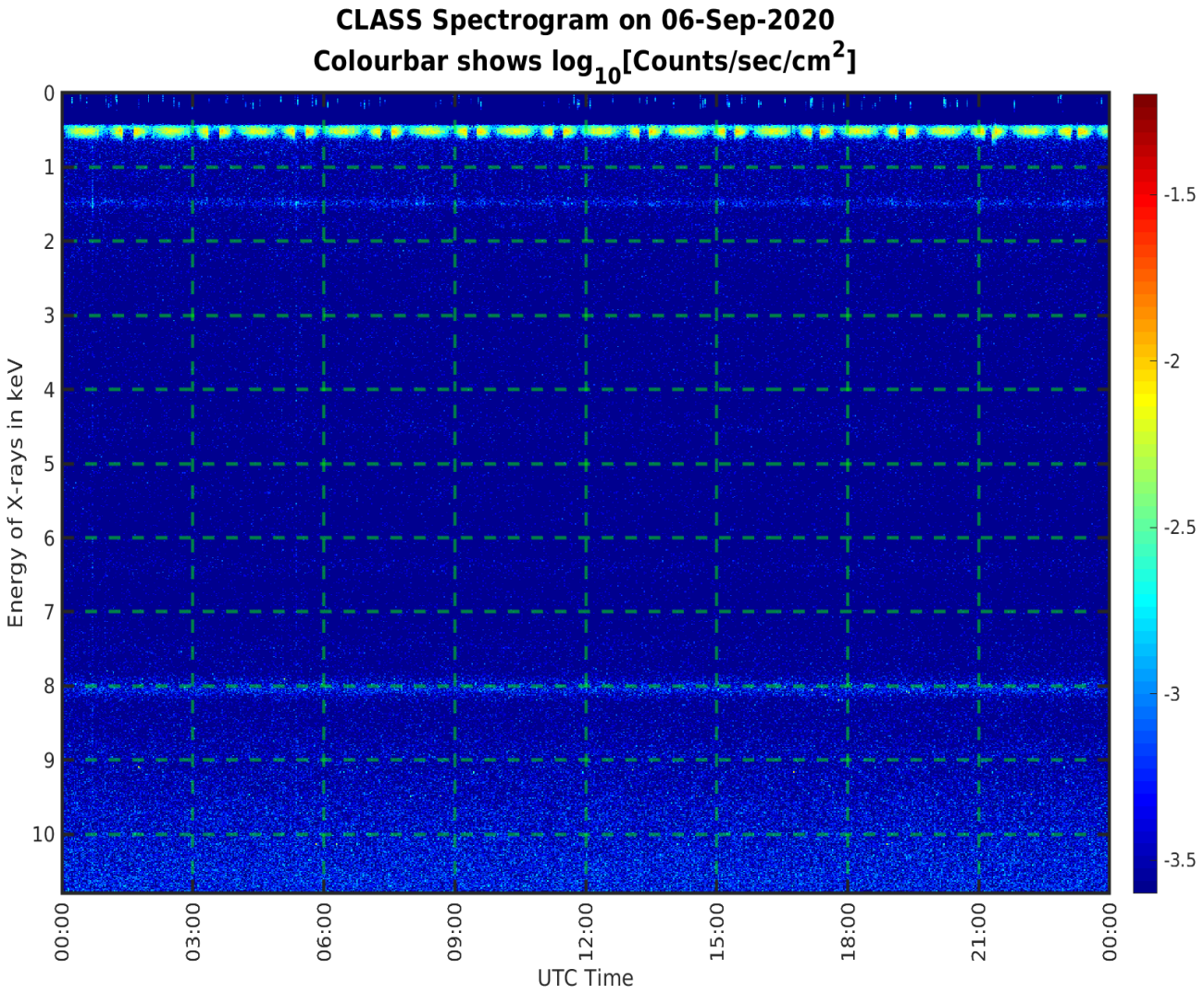
UTC Time


CLASS Spectrogram on 06-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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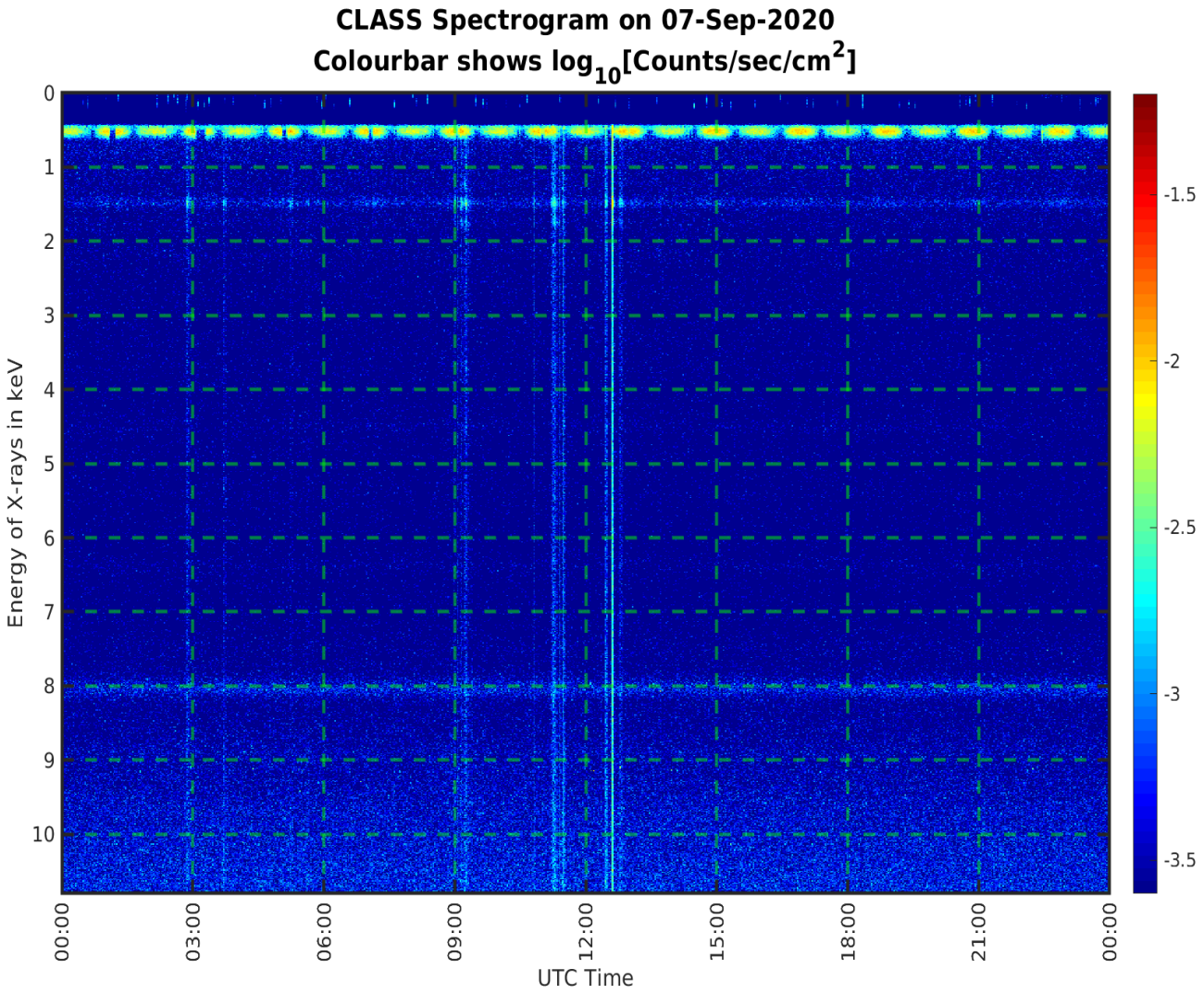
UTC Time


CLASS Spectrogram on 07-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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8
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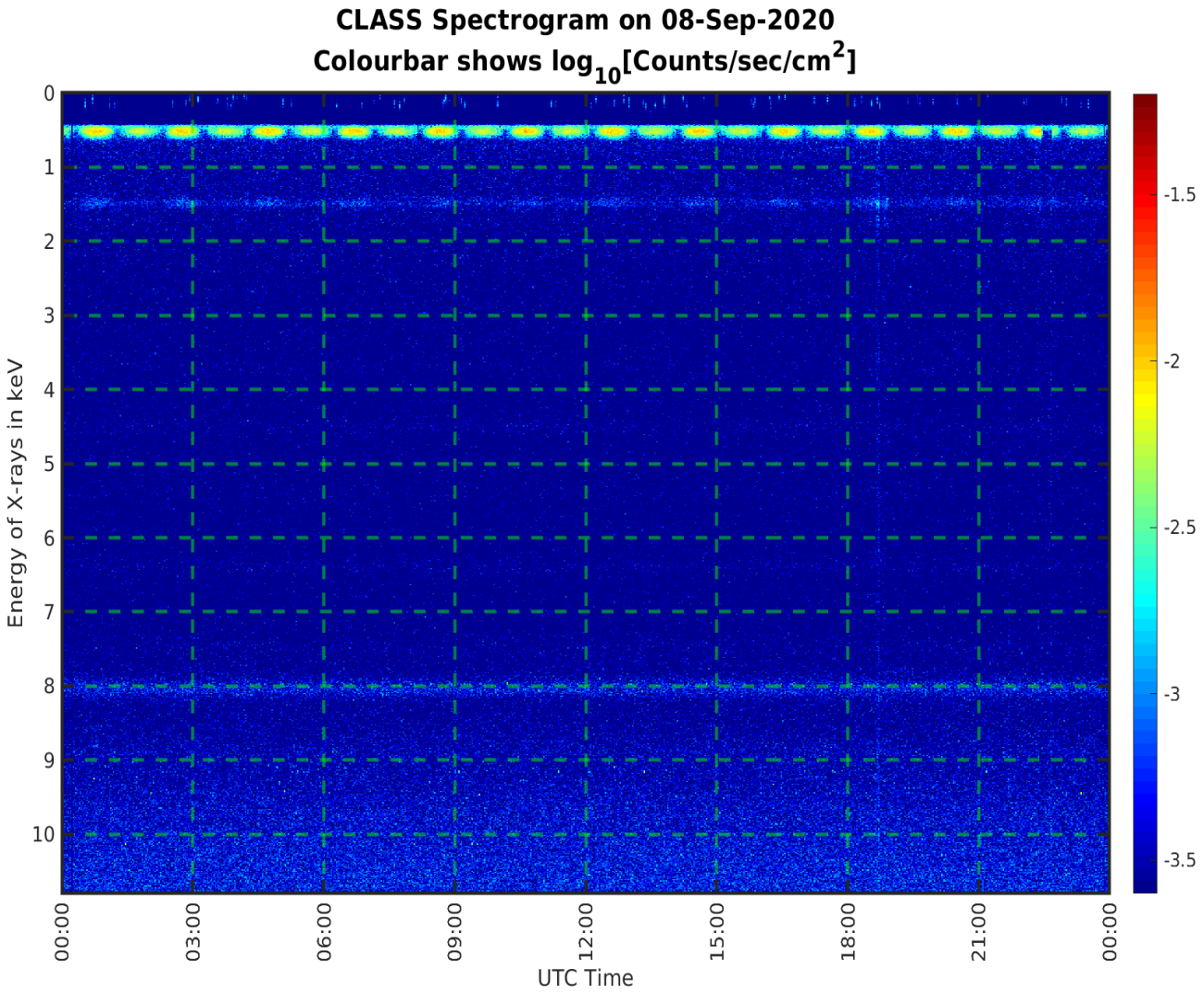
UTC Time


CLASS Spectrogram on 08-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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UTC Time
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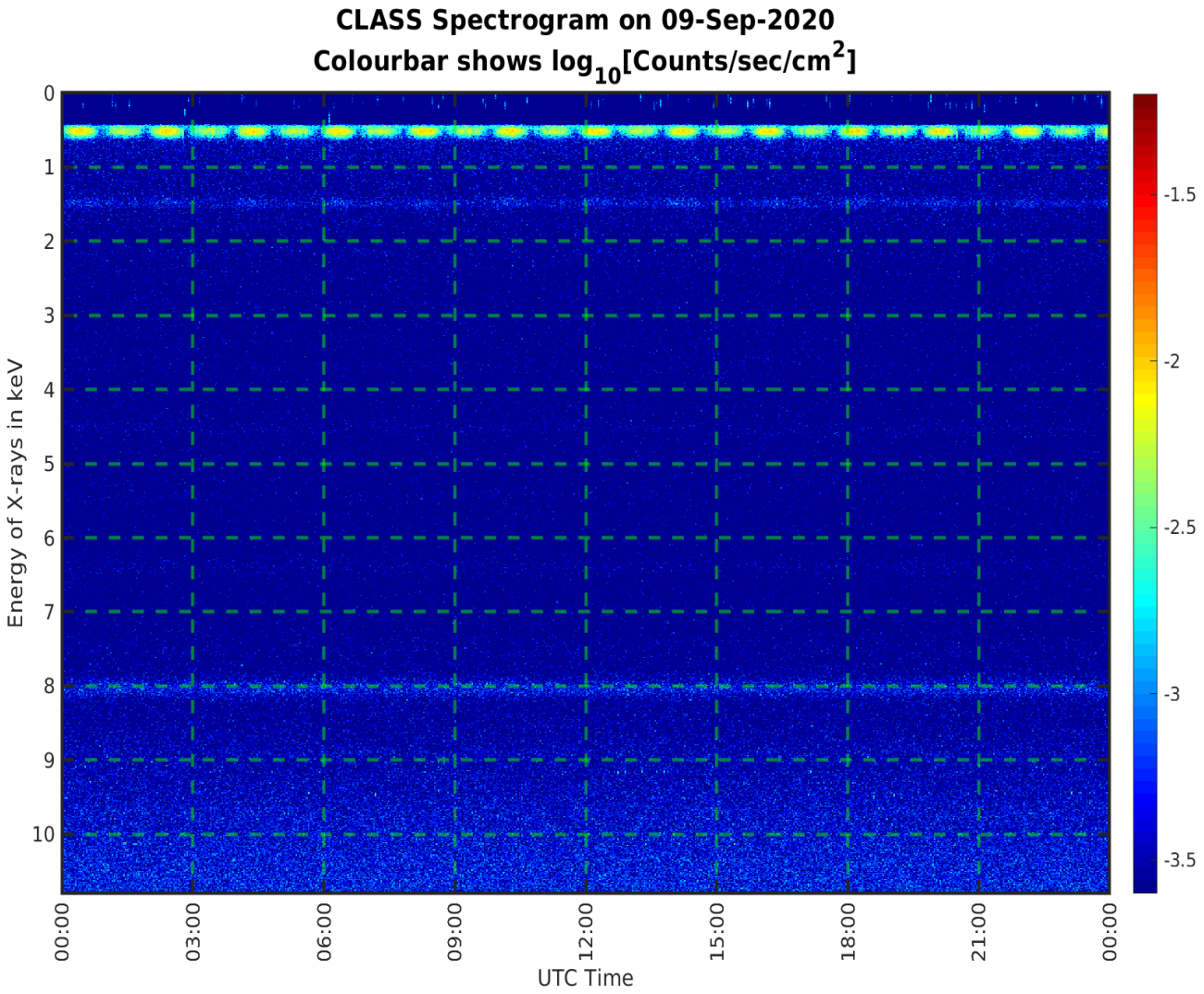
CLASS Spectrogram on 09-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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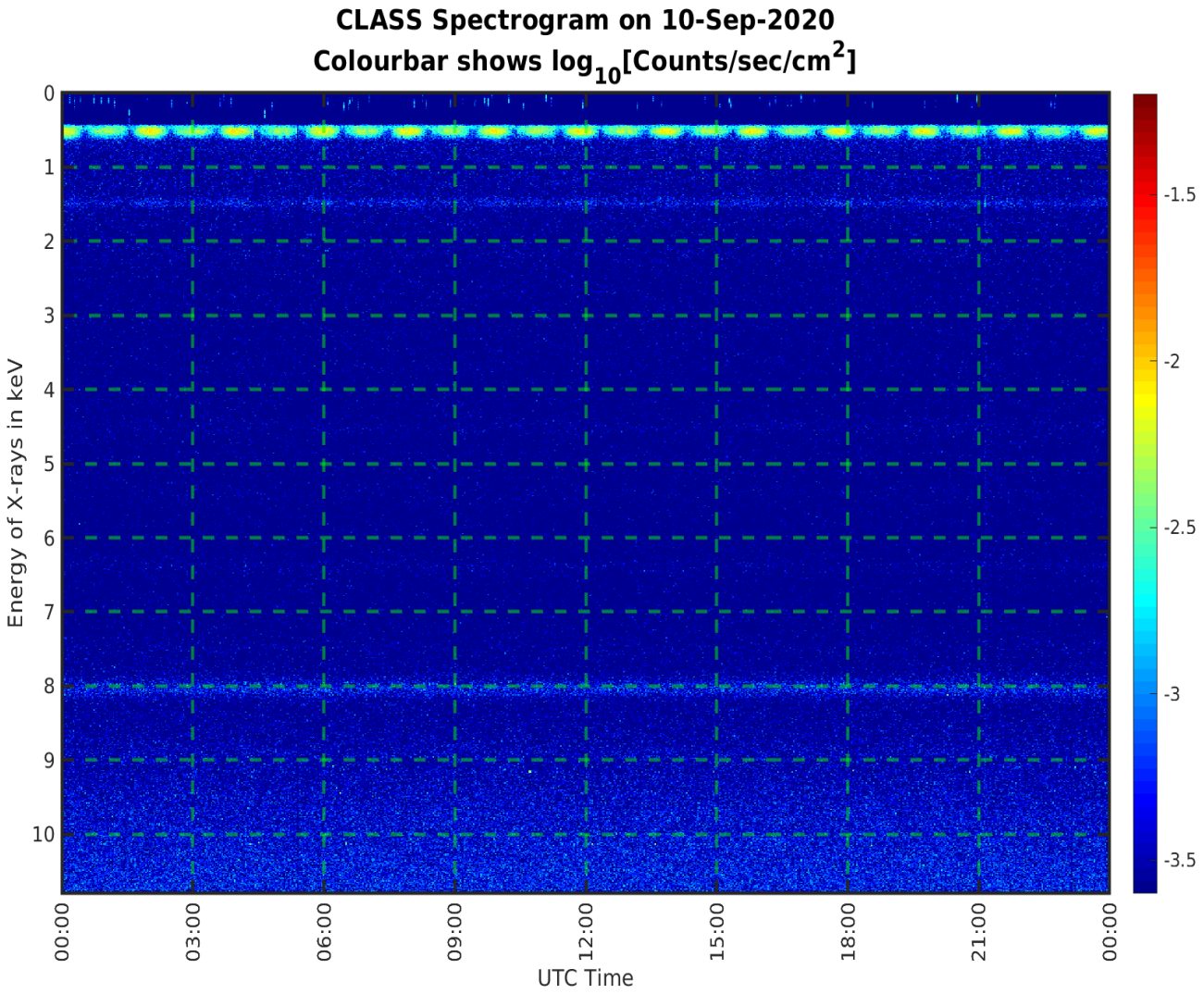
UTC Time


CLASS Spectrogram on 10-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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7
8
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-1.5
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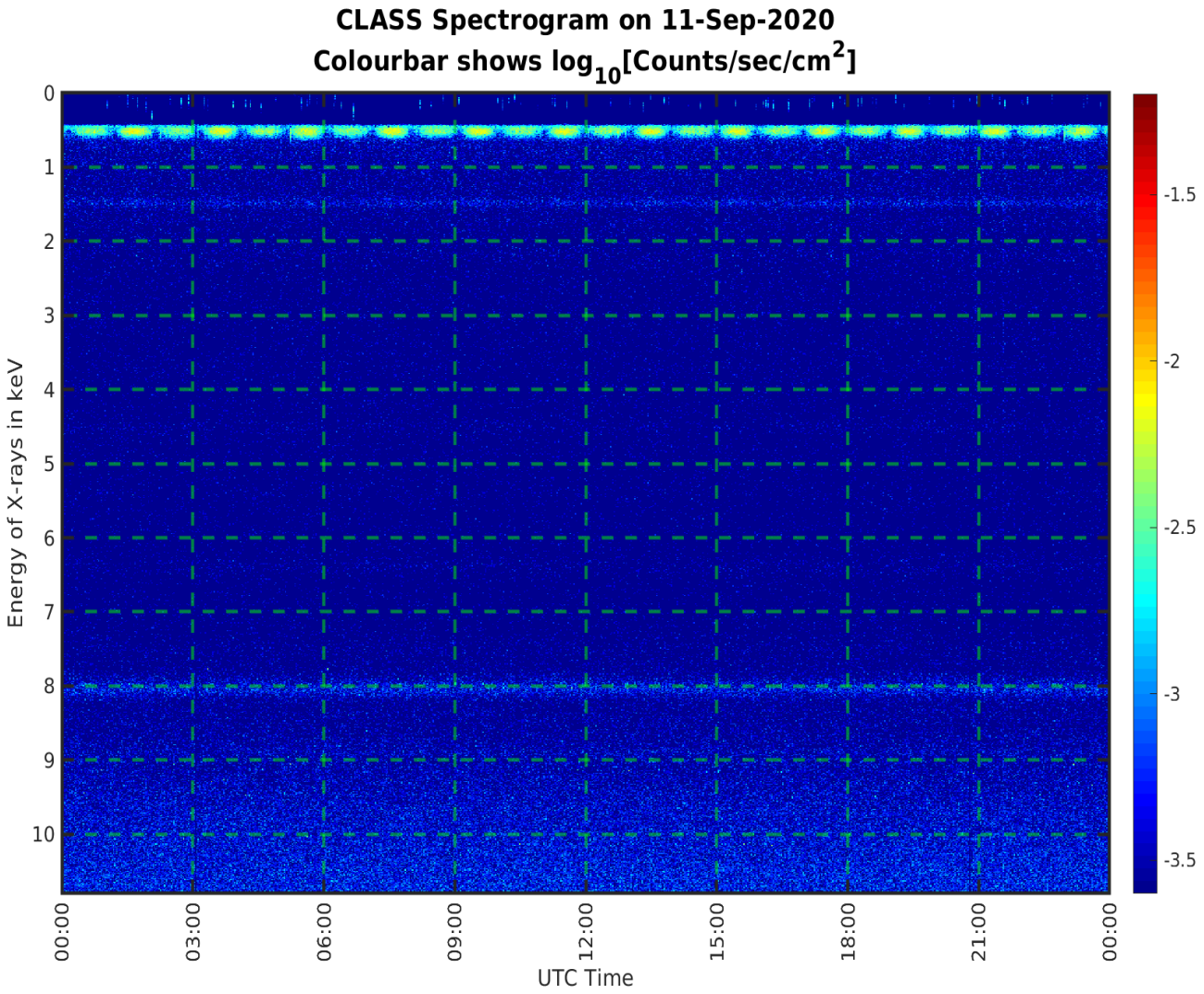
UTC Time


CLASS Spectrogram on 11-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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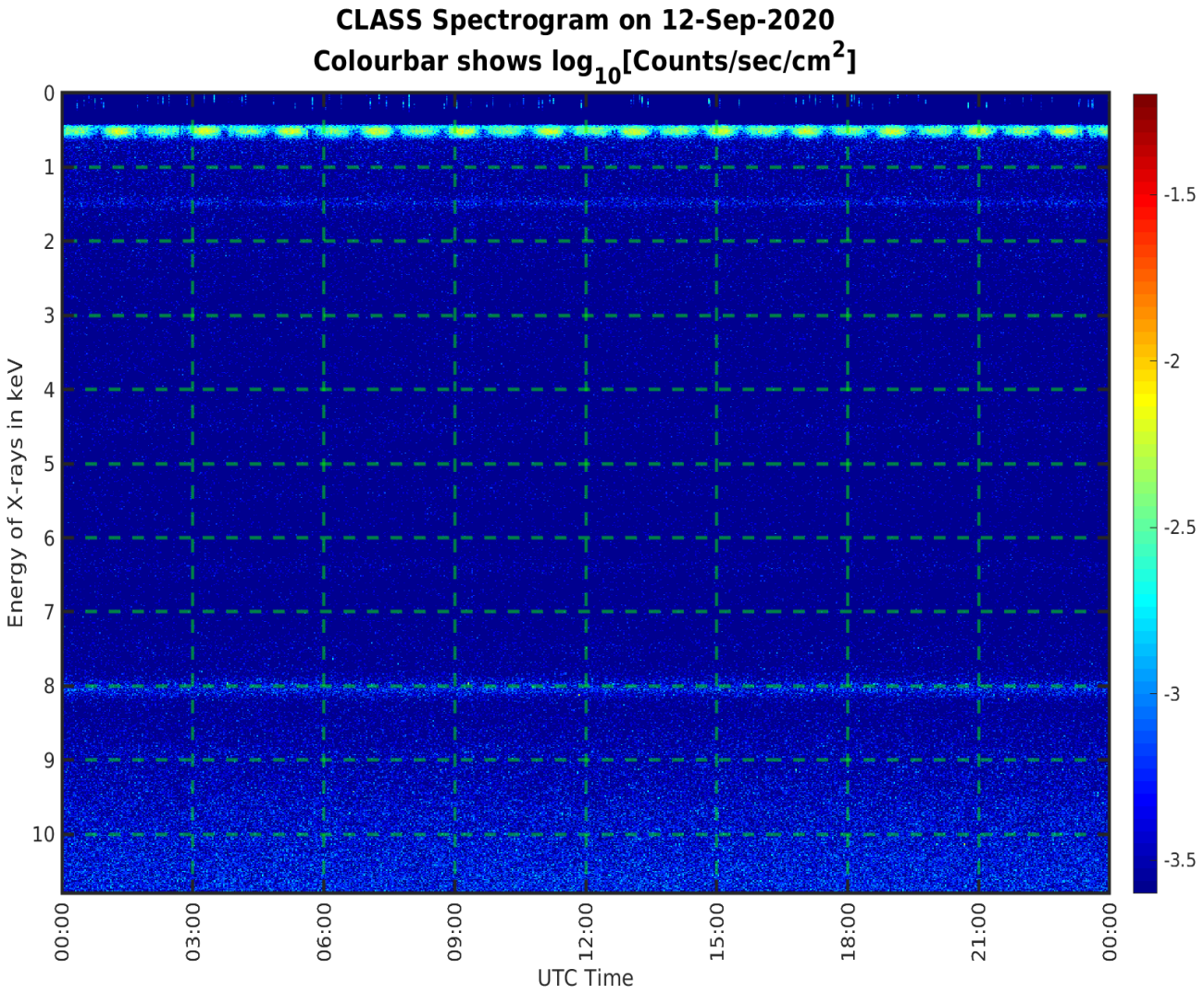
UTC Time


CLASS Spectrogram on 12-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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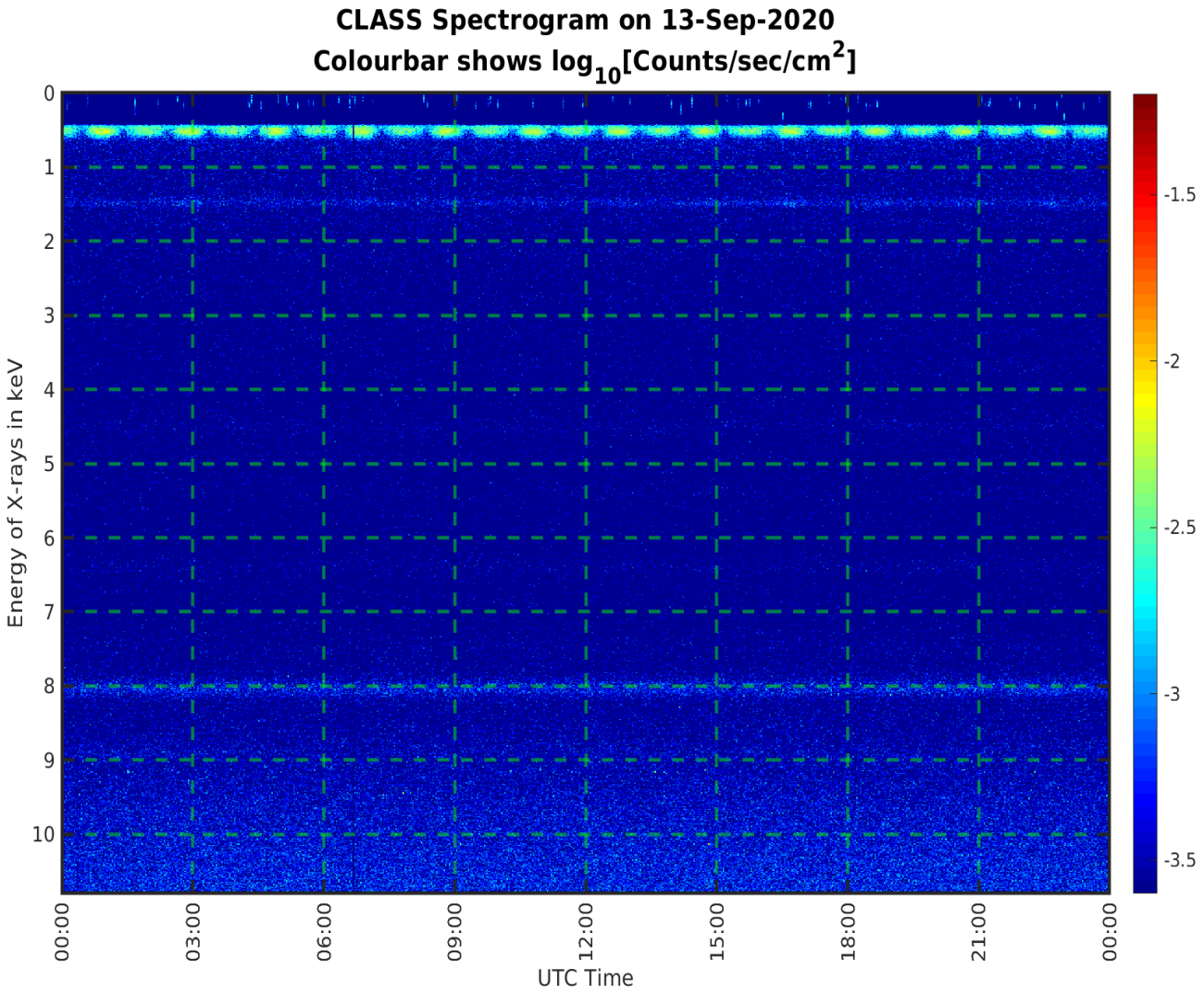
UTC Time


CLASS Spectrogram on 13-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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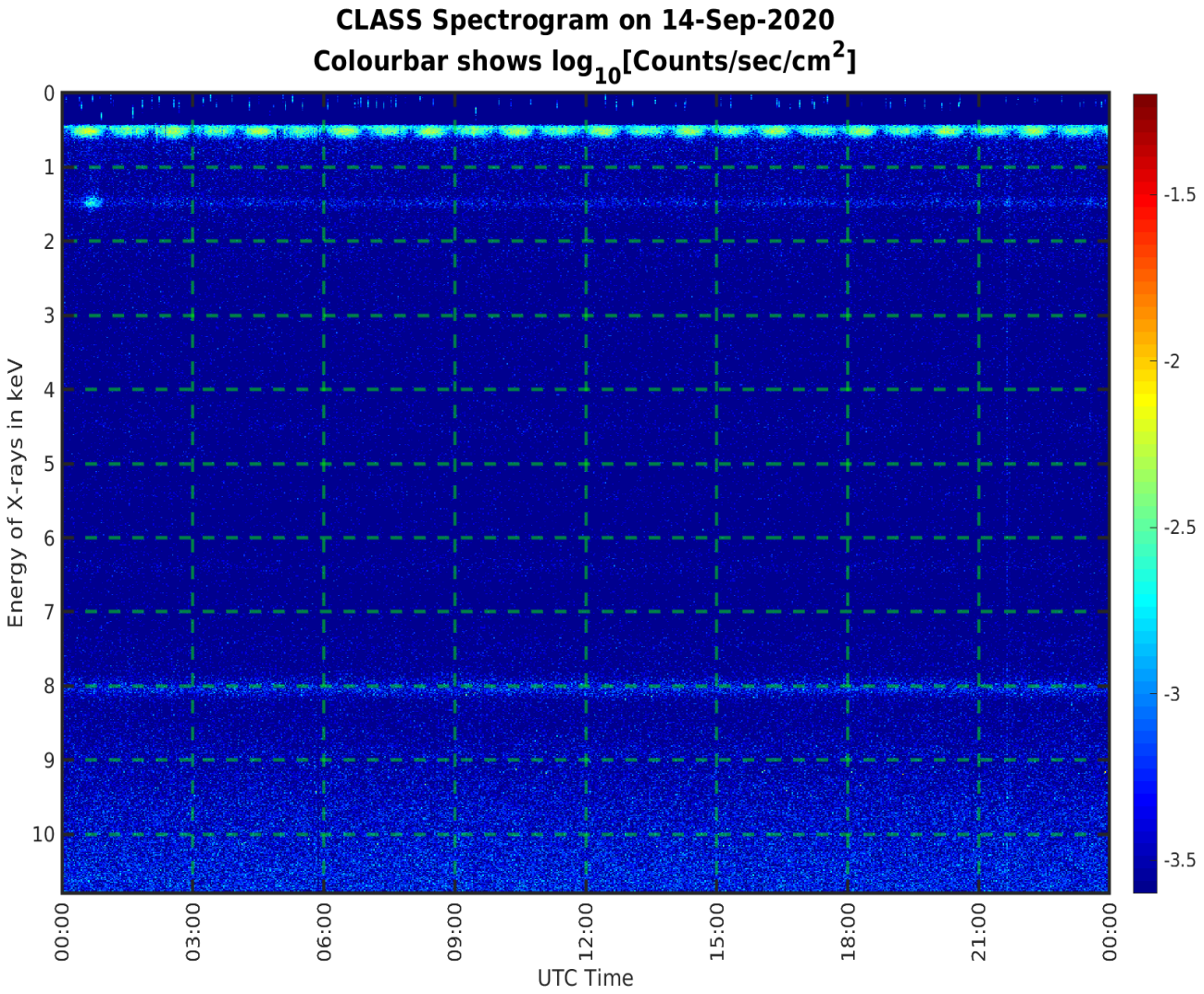
UTC Time


CLASS Spectrogram on 14-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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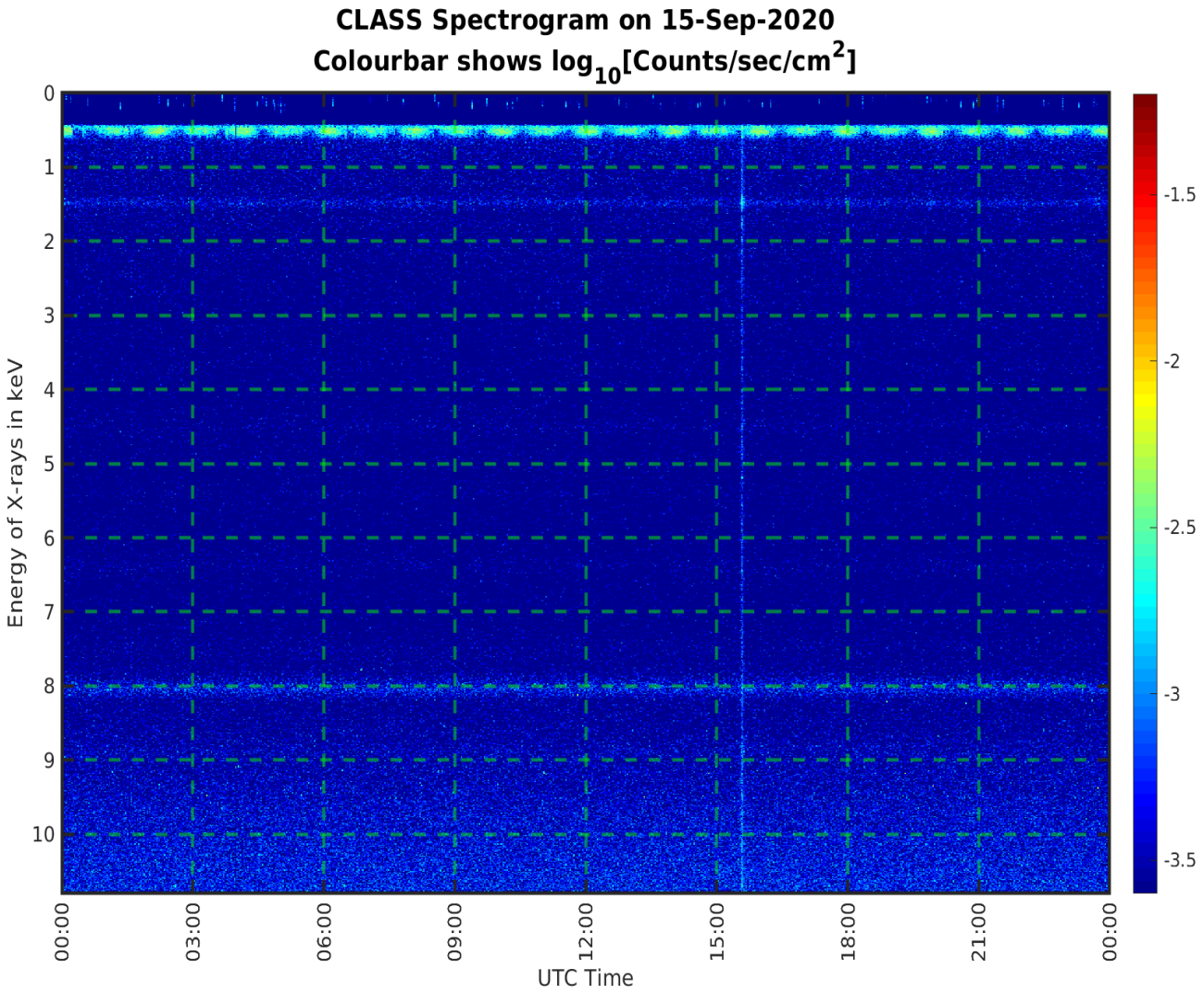
UTC Time


CLASS Spectrogram on 15-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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-1.5
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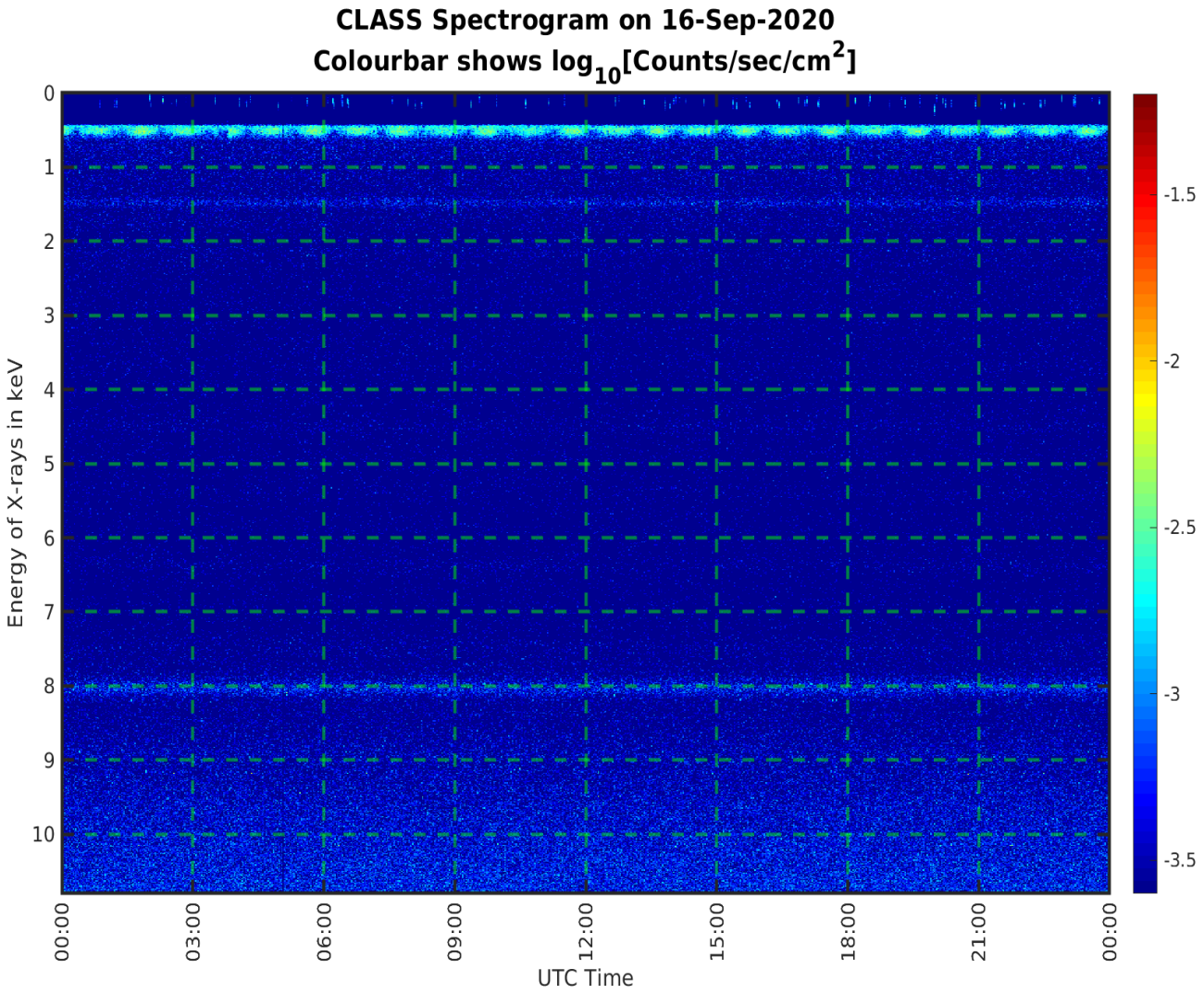
UTC Time


CLASS Spectrogram on 16-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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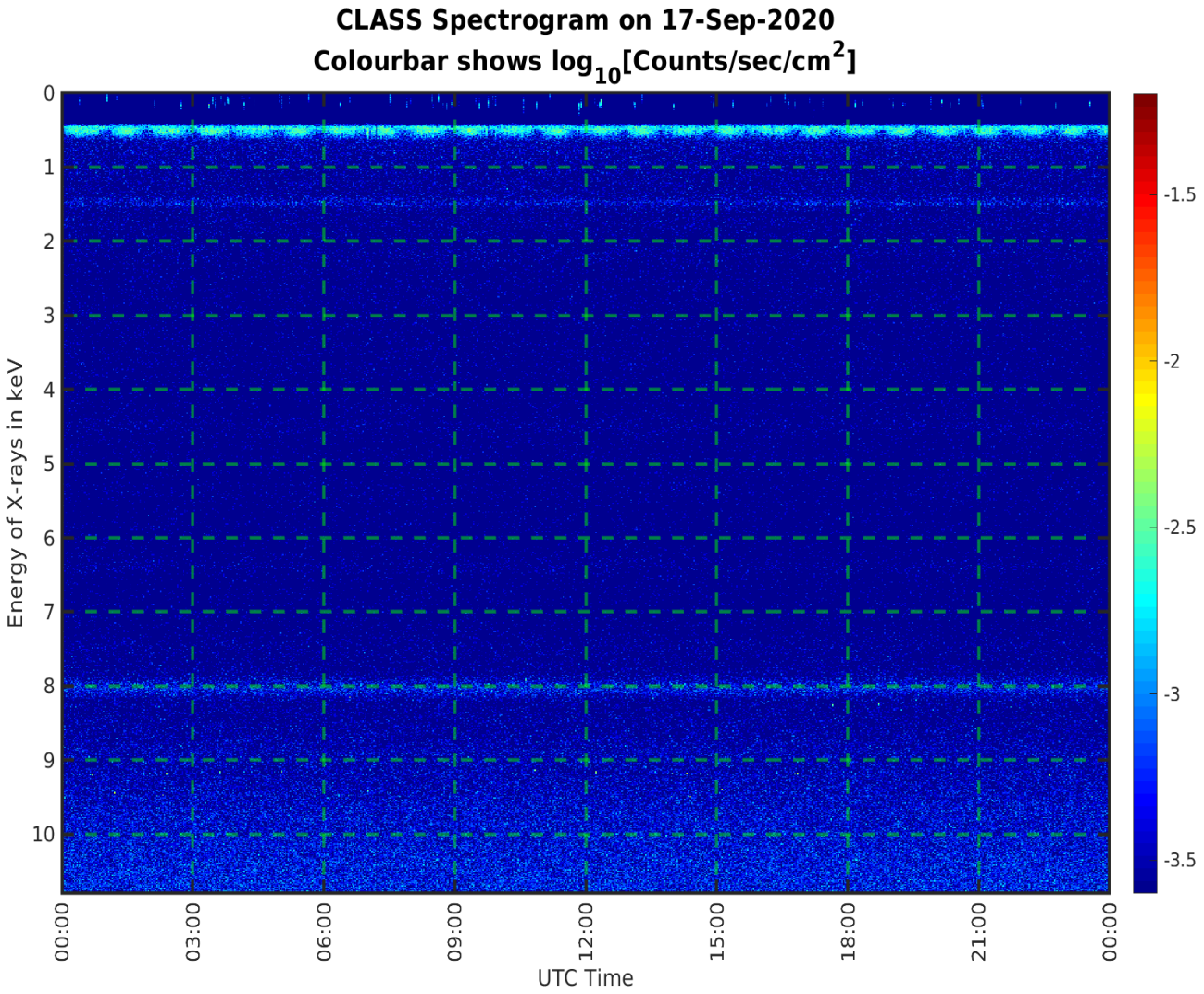
UTC Time


CLASS Spectrogram on 17-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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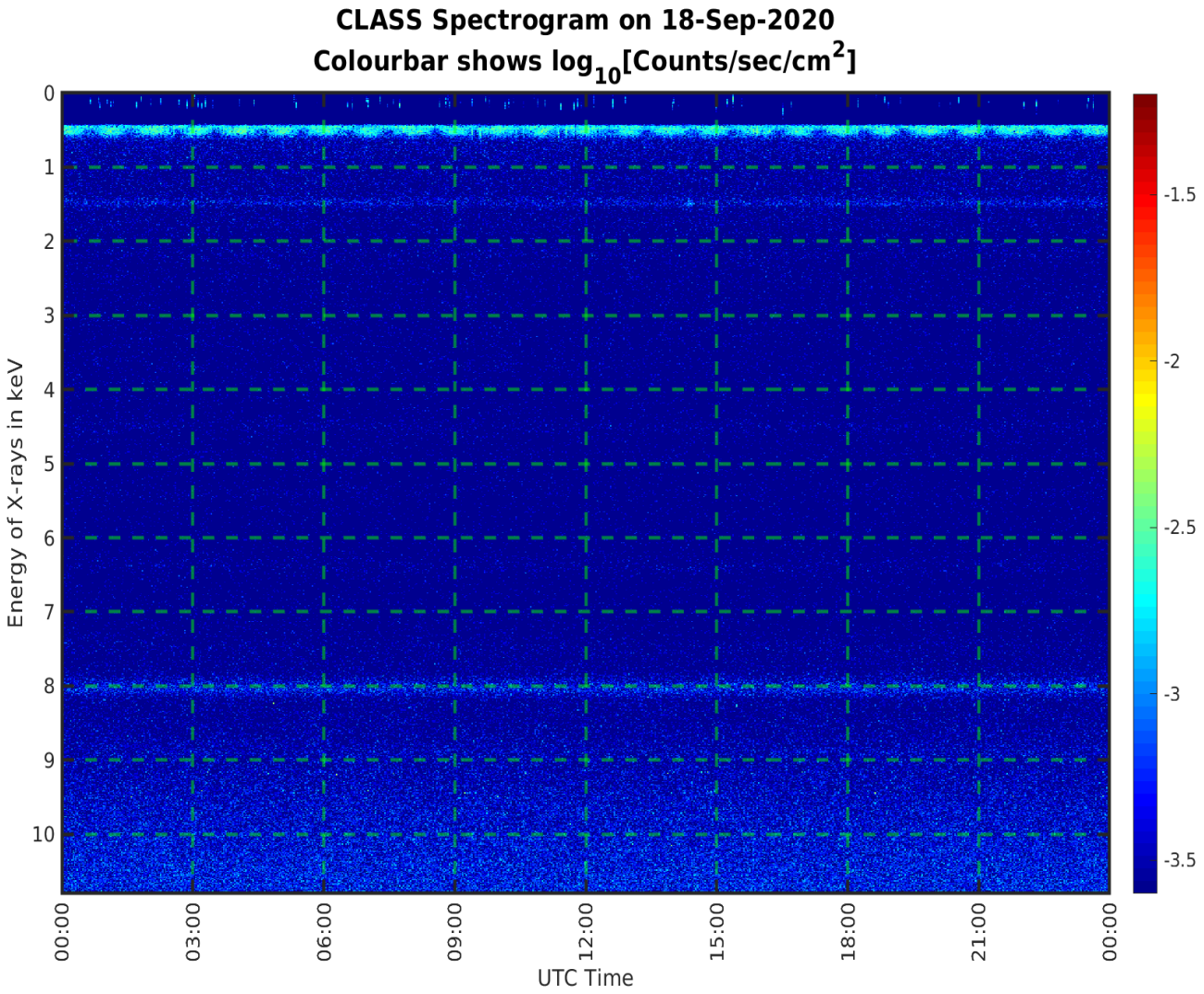
UTC Time


CLASS Spectrogram on 18-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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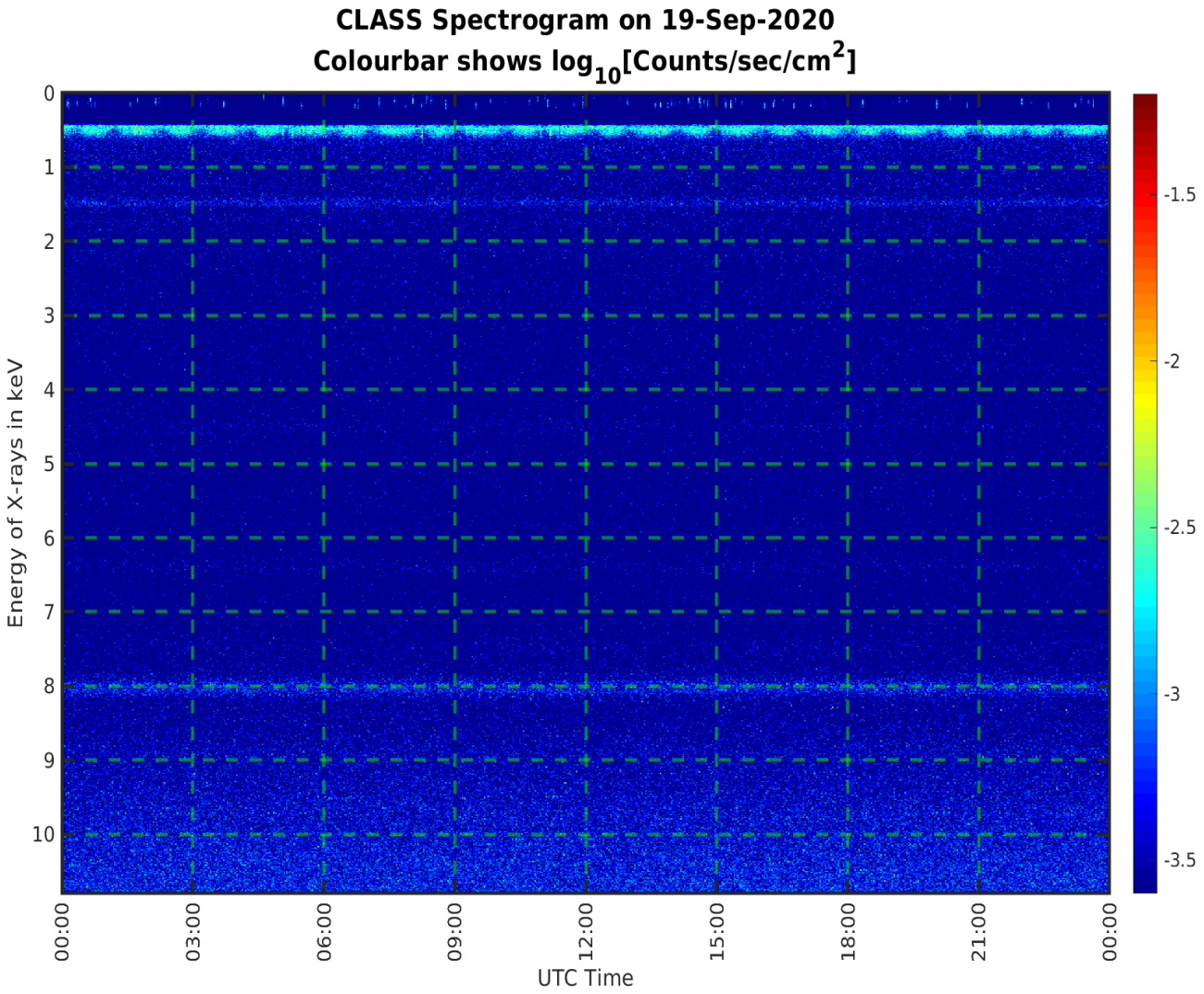
UTC Time


CLASS Spectrogram on 19-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
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-1.5
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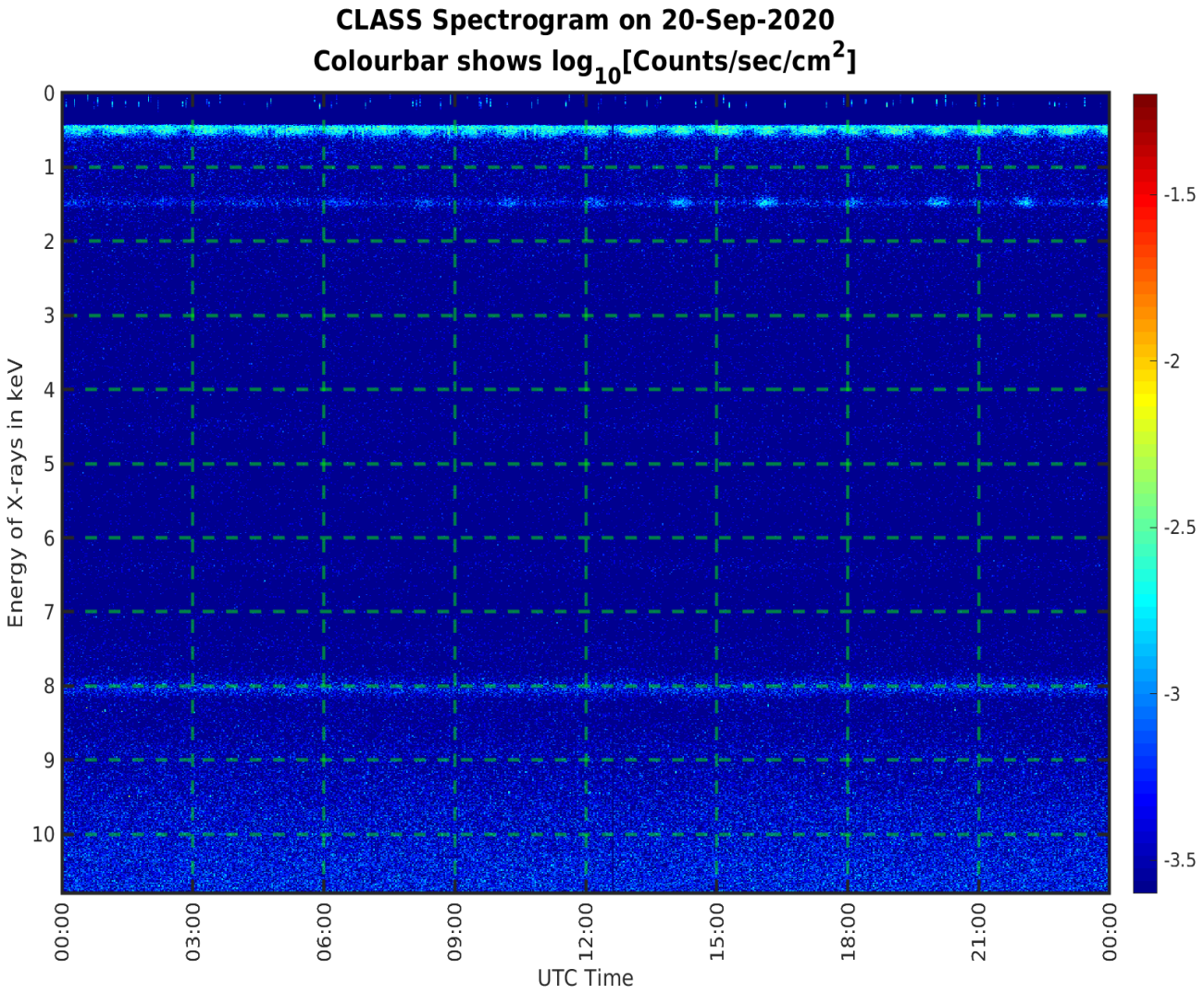
UTC Time


CLASS Spectrogram on 20-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
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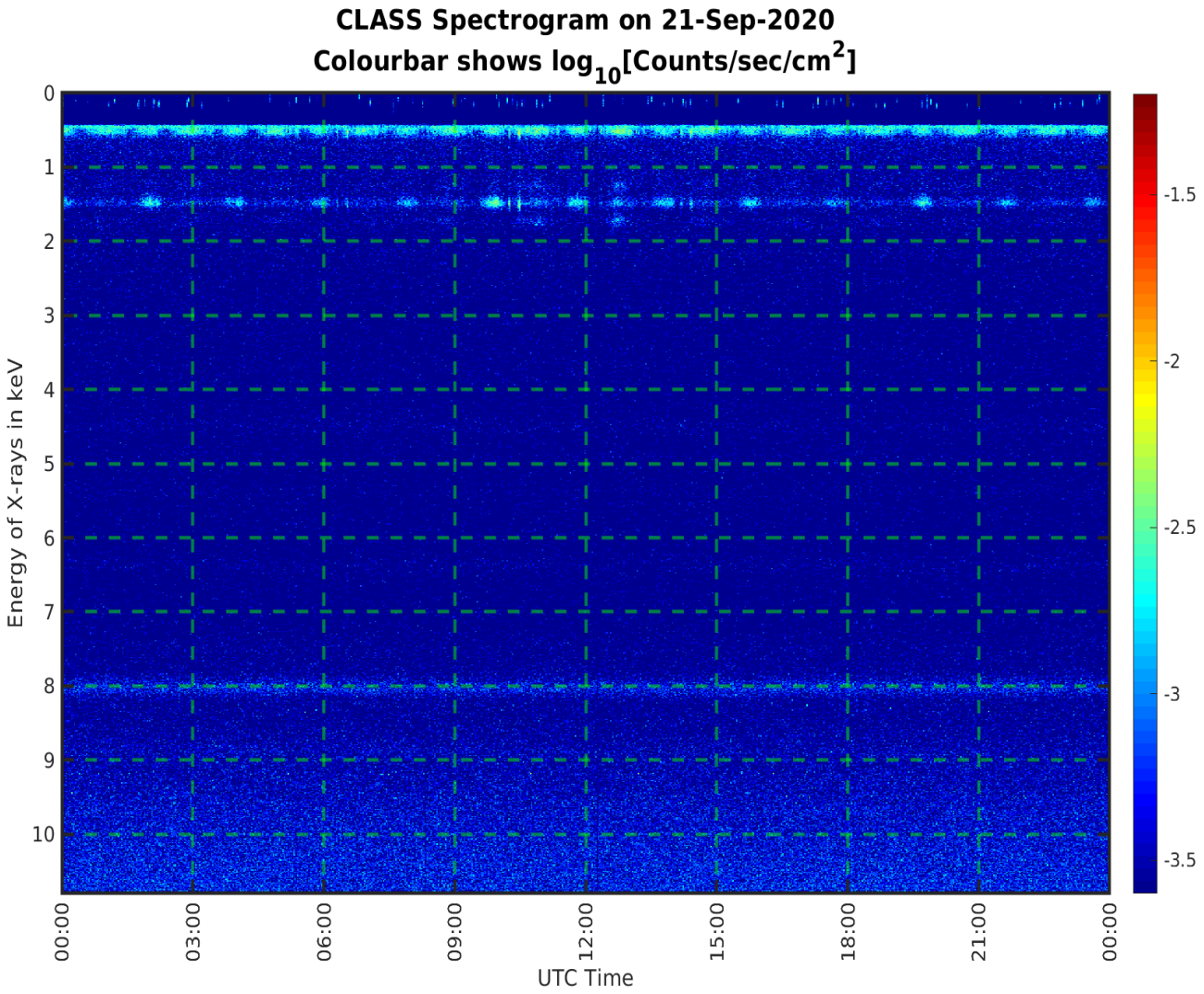
UTC Time


CLASS Spectrogram on 21-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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4
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6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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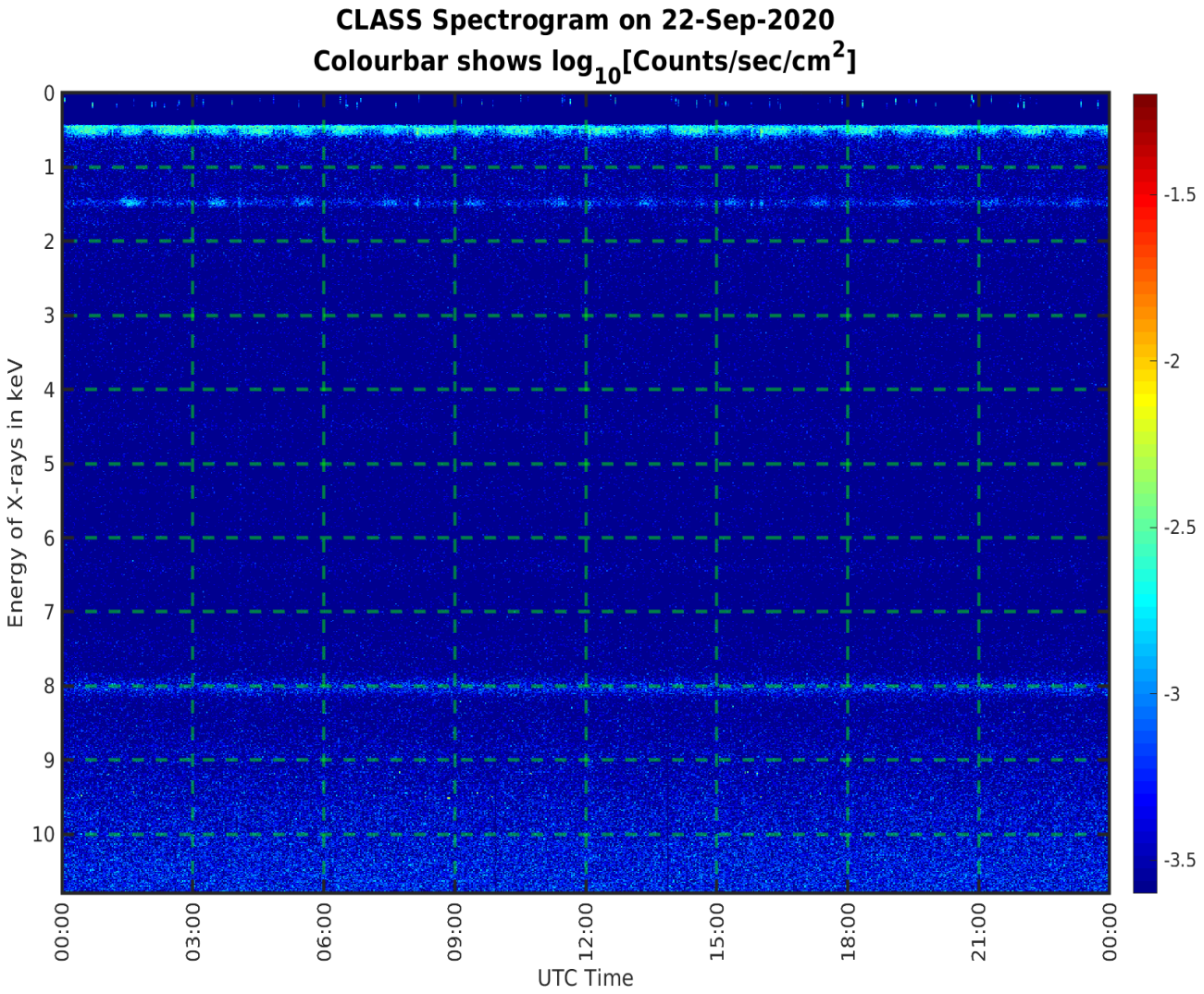
UTC Time


CLASS Spectrogram on 22-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
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-1.5
-2
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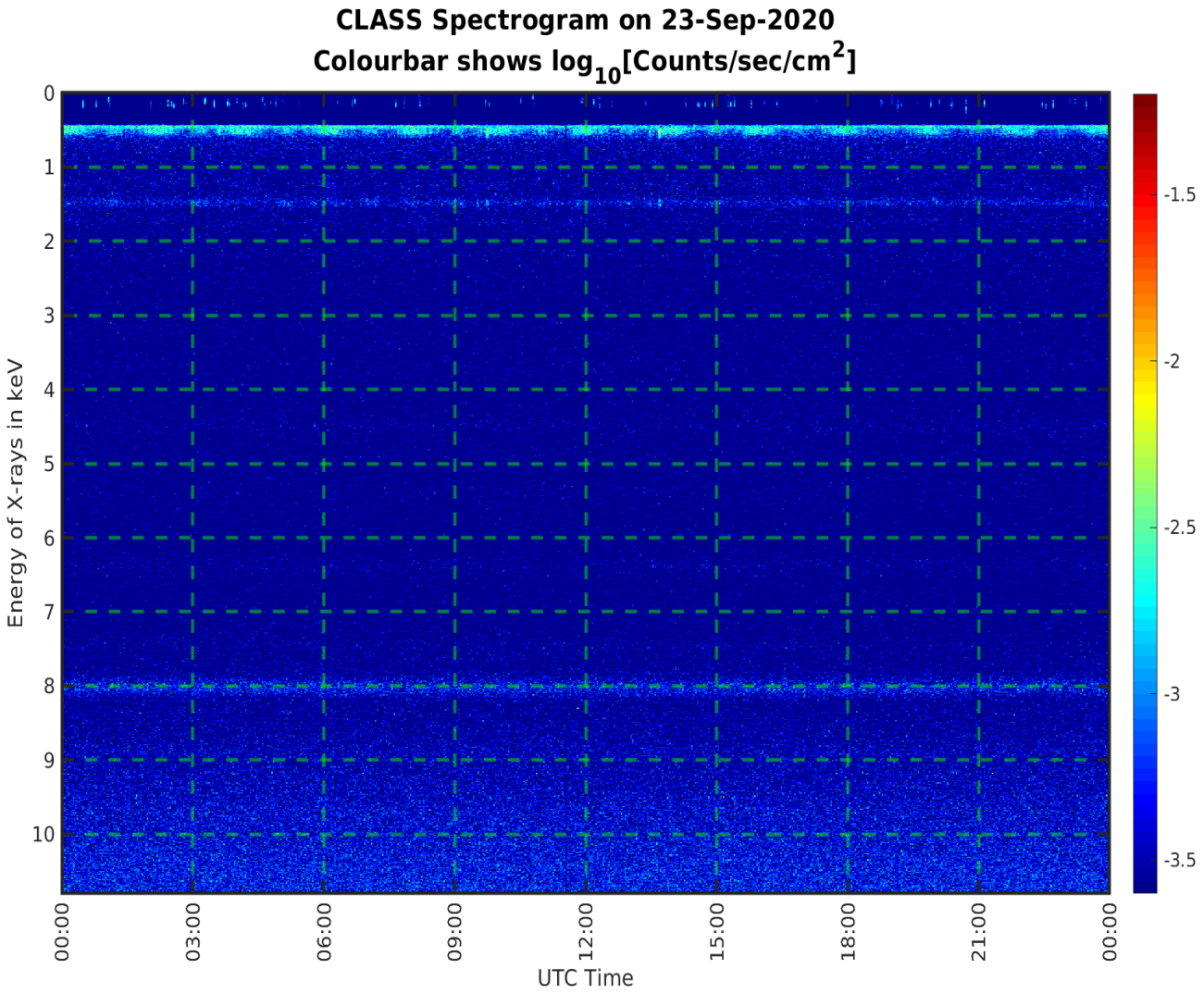
UTC Time


CLASS Spectrogram on 23-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
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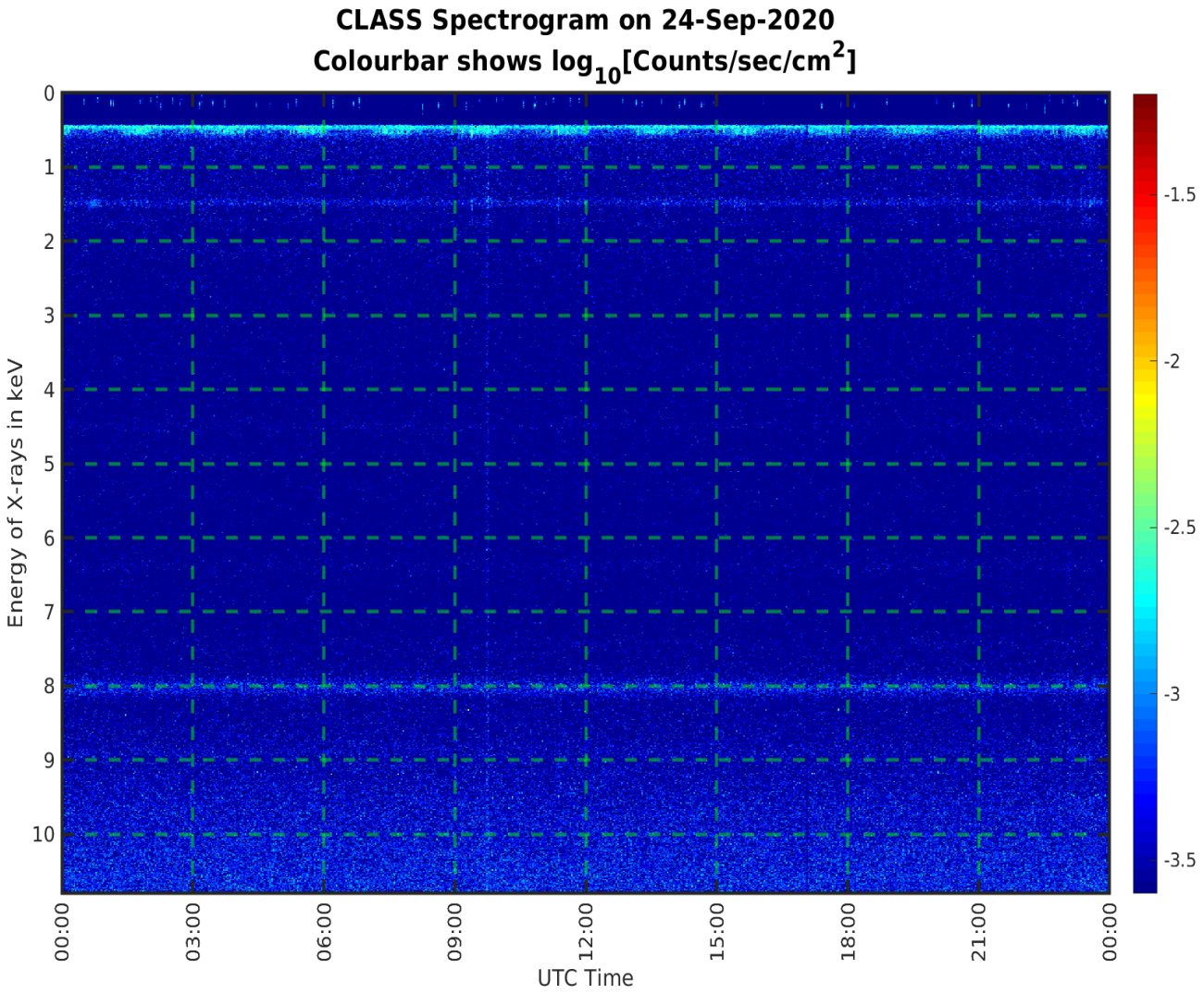
UTC Time


CLASS Spectrogram on 24-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
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10
-1.5
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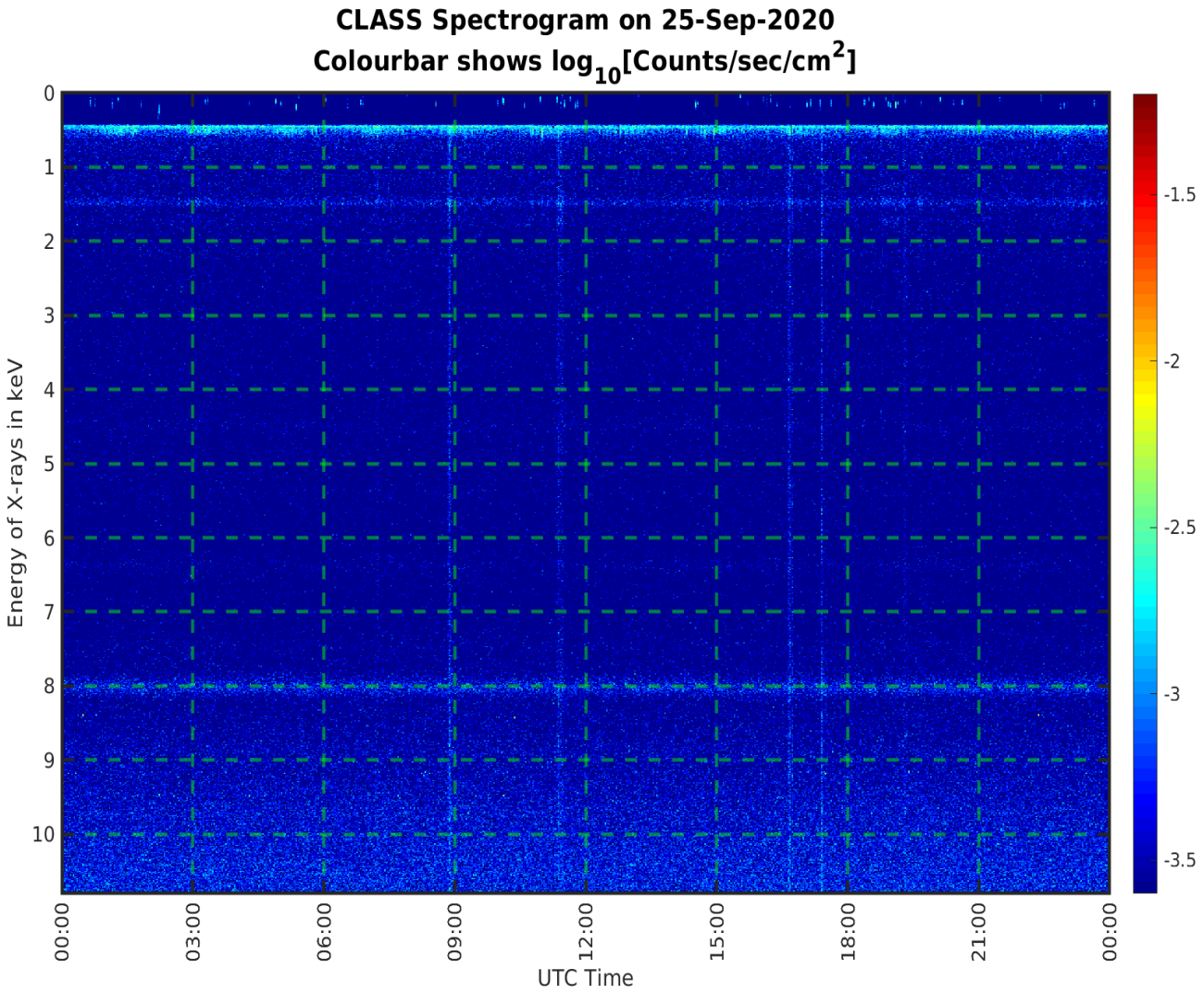
UTC Time


CLASS Spectrogram on 25-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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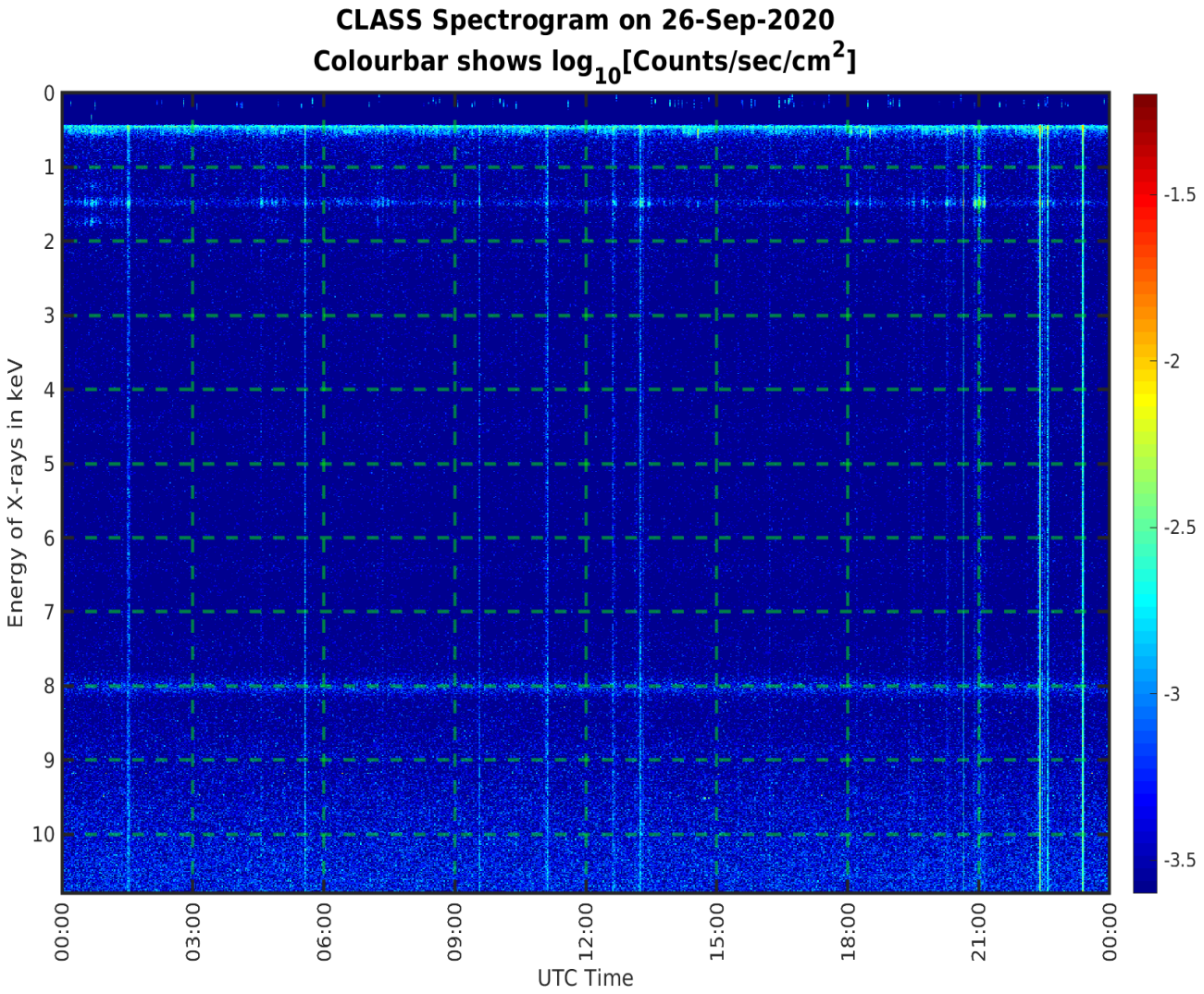
UTC Time


CLASS Spectrogram on 26-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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8
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-1.5
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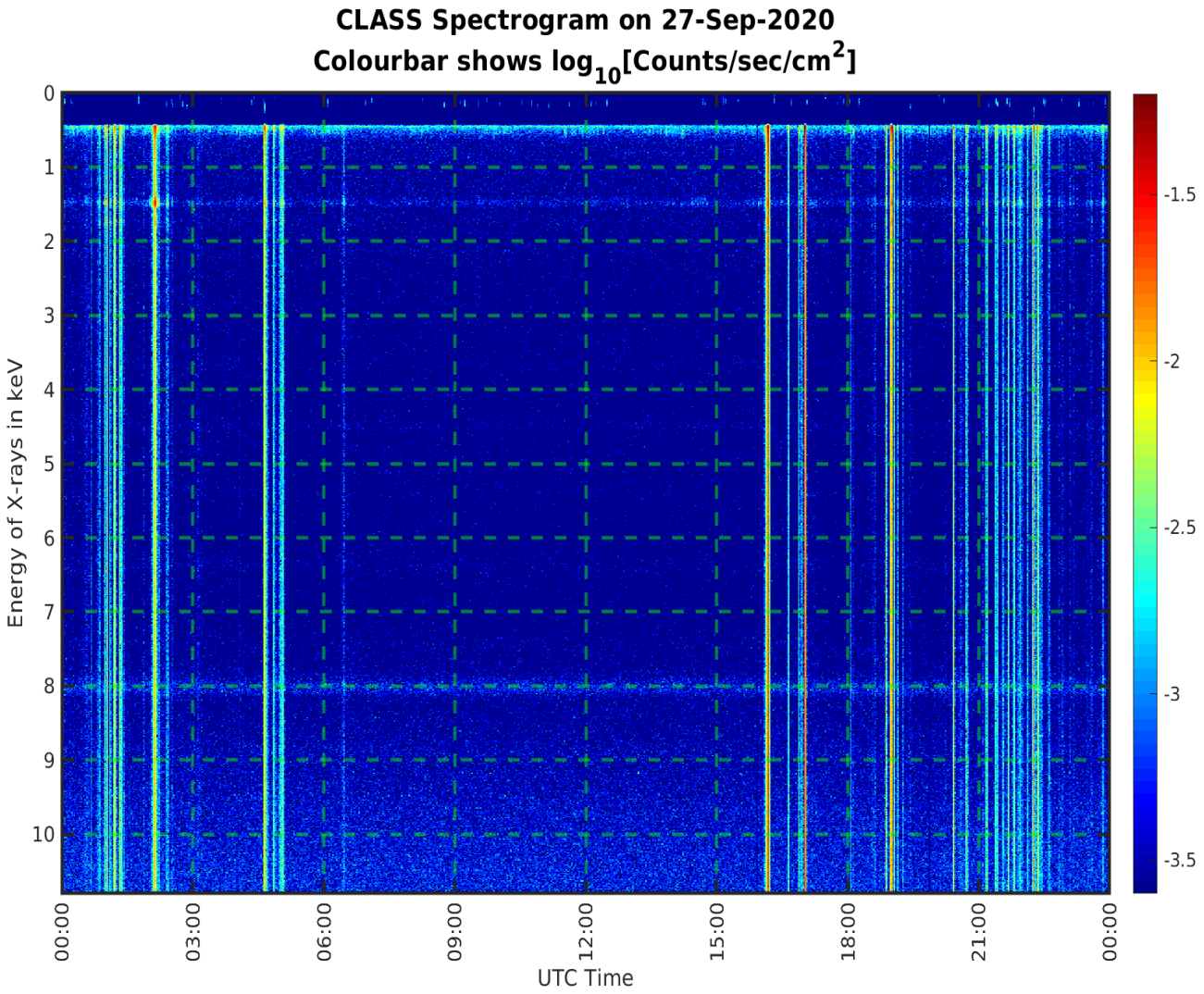
UTC Time


CLASS Spectrogram on 27-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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8
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-1.5
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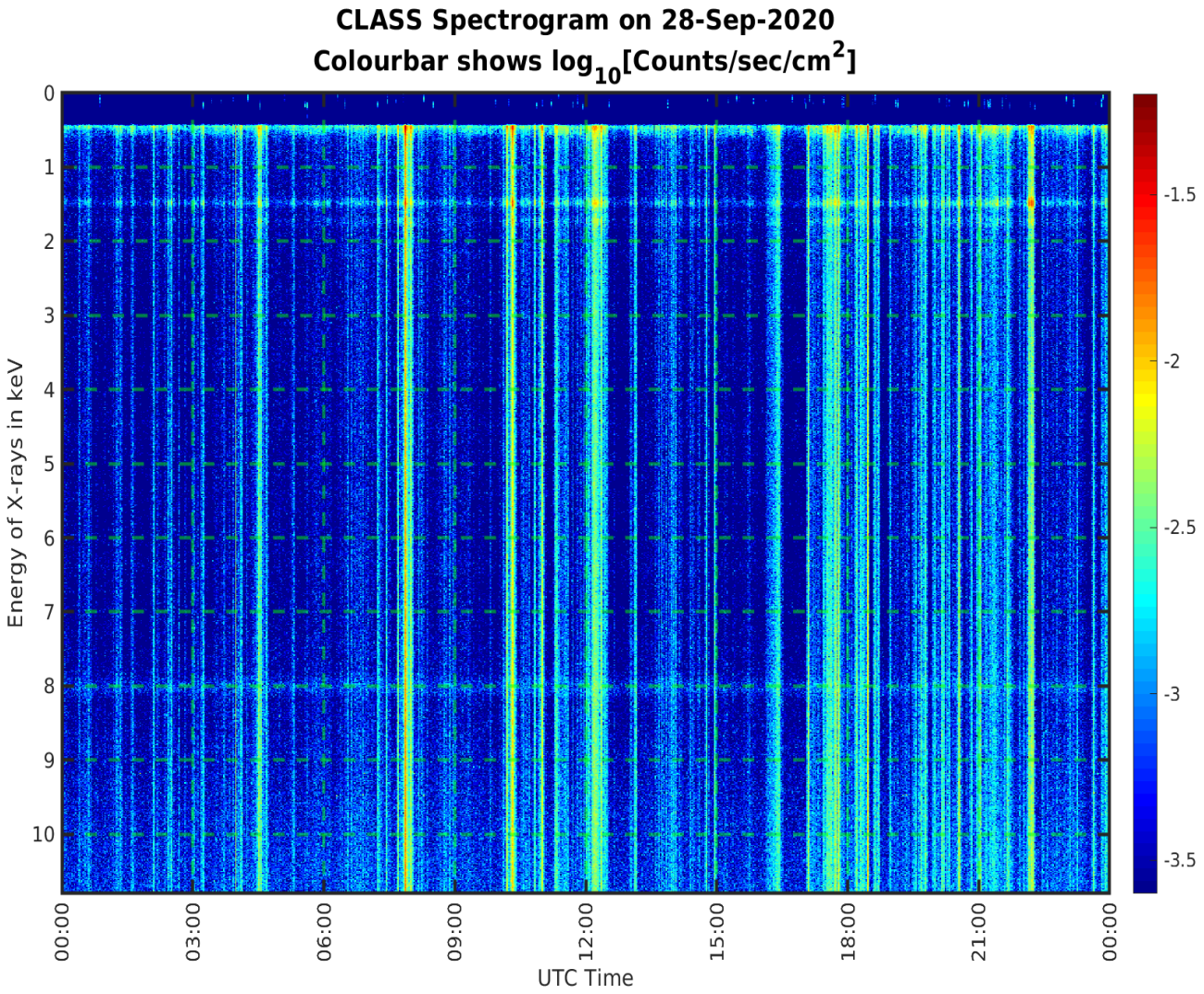
UTC Time


CLASS Spectrogram on 28-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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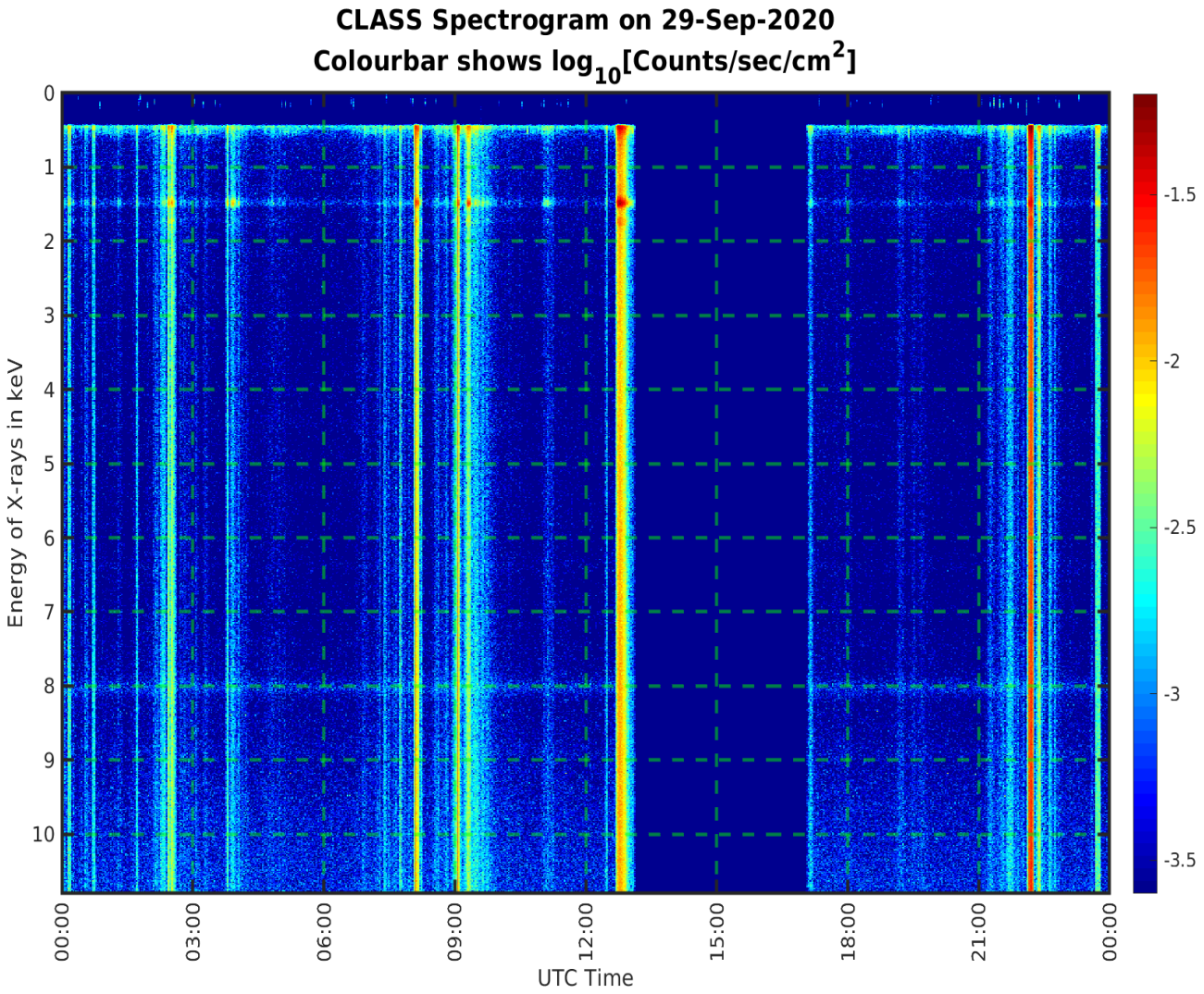
CLASS Spectrogram on 29-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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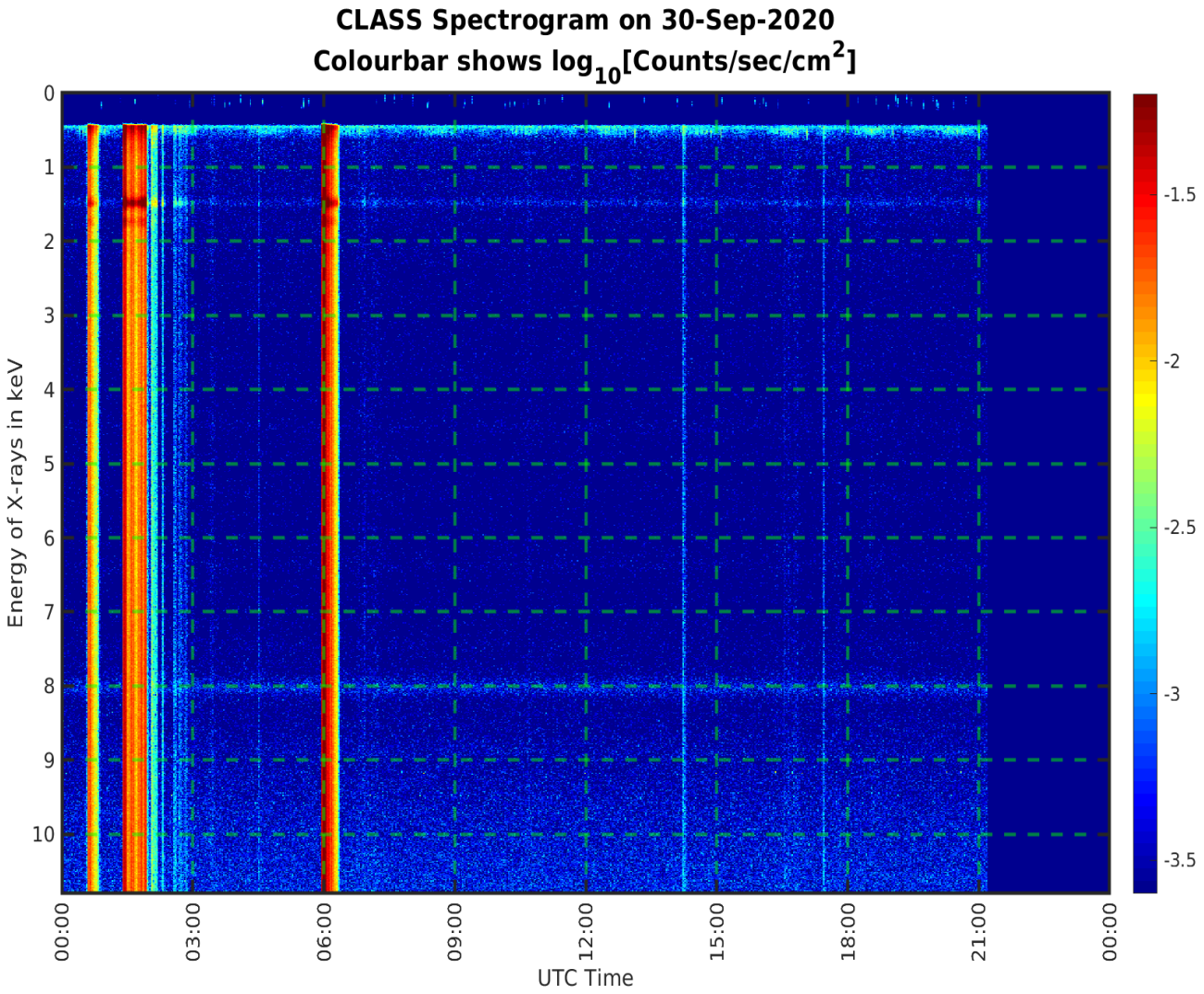
UTC Time


CLASS Spectrogram on 30-Sep-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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8
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-1.5
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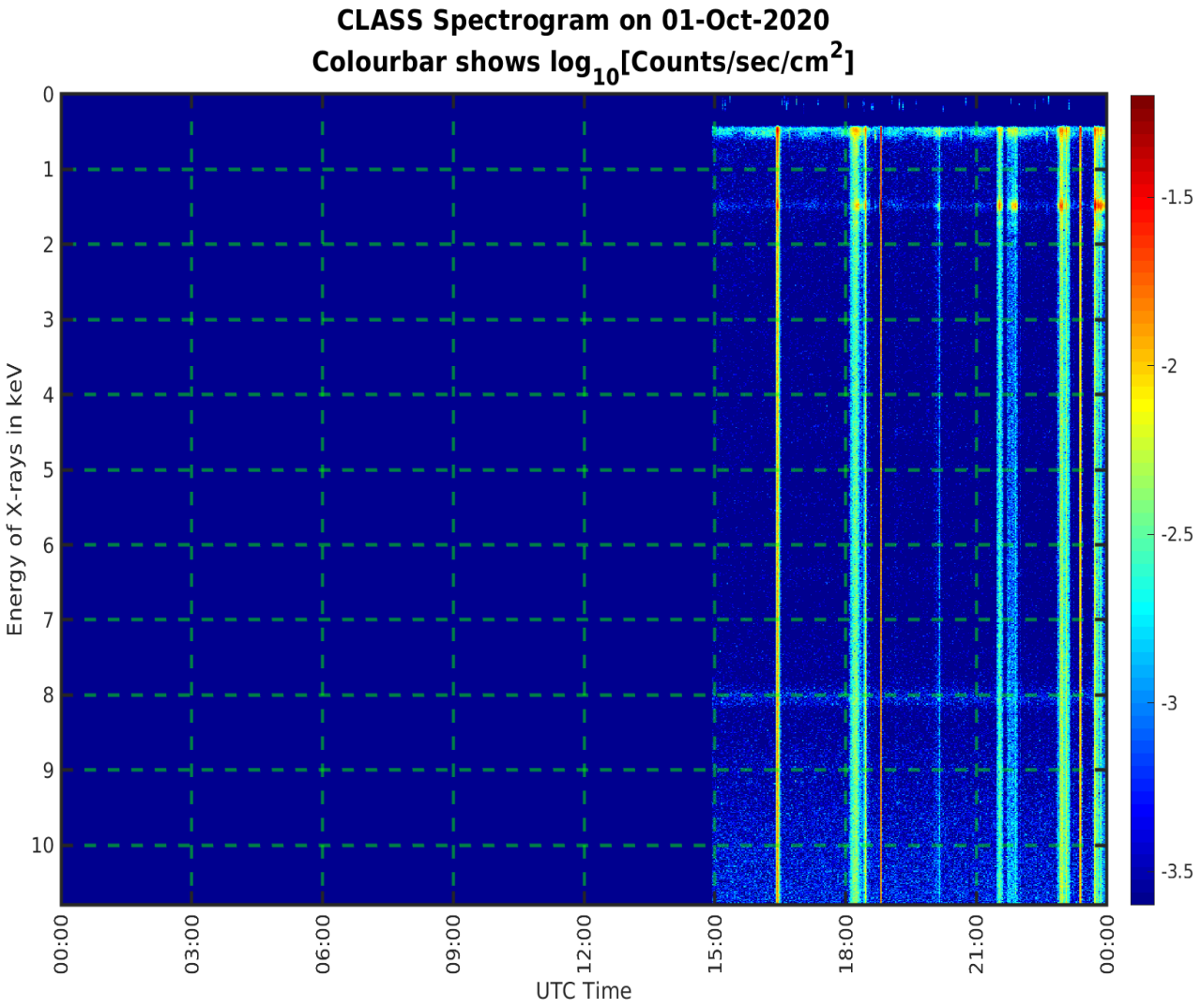
UTC Time


CLASS Spectrogram on 01-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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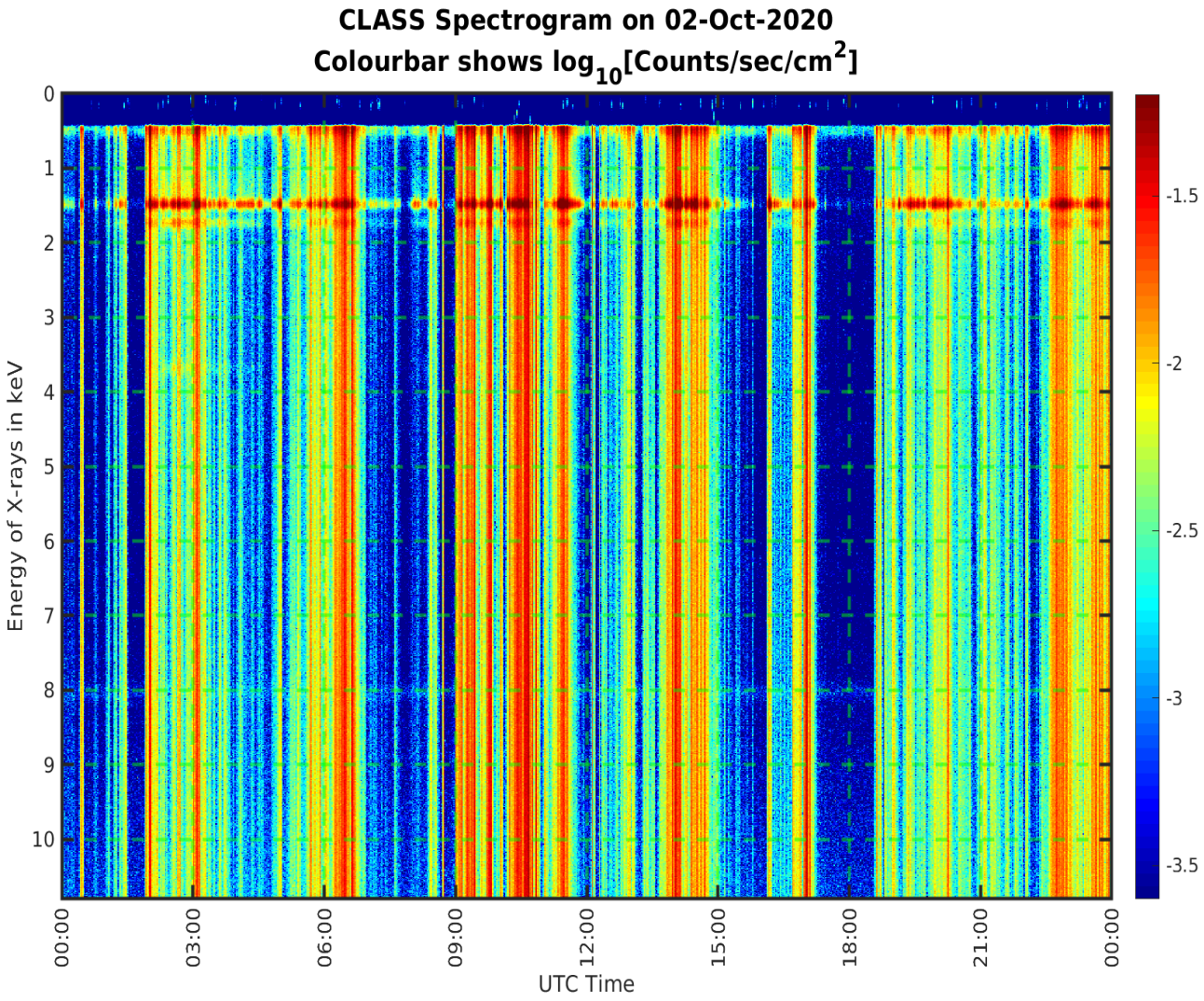
CLASS Spectrogram on 02-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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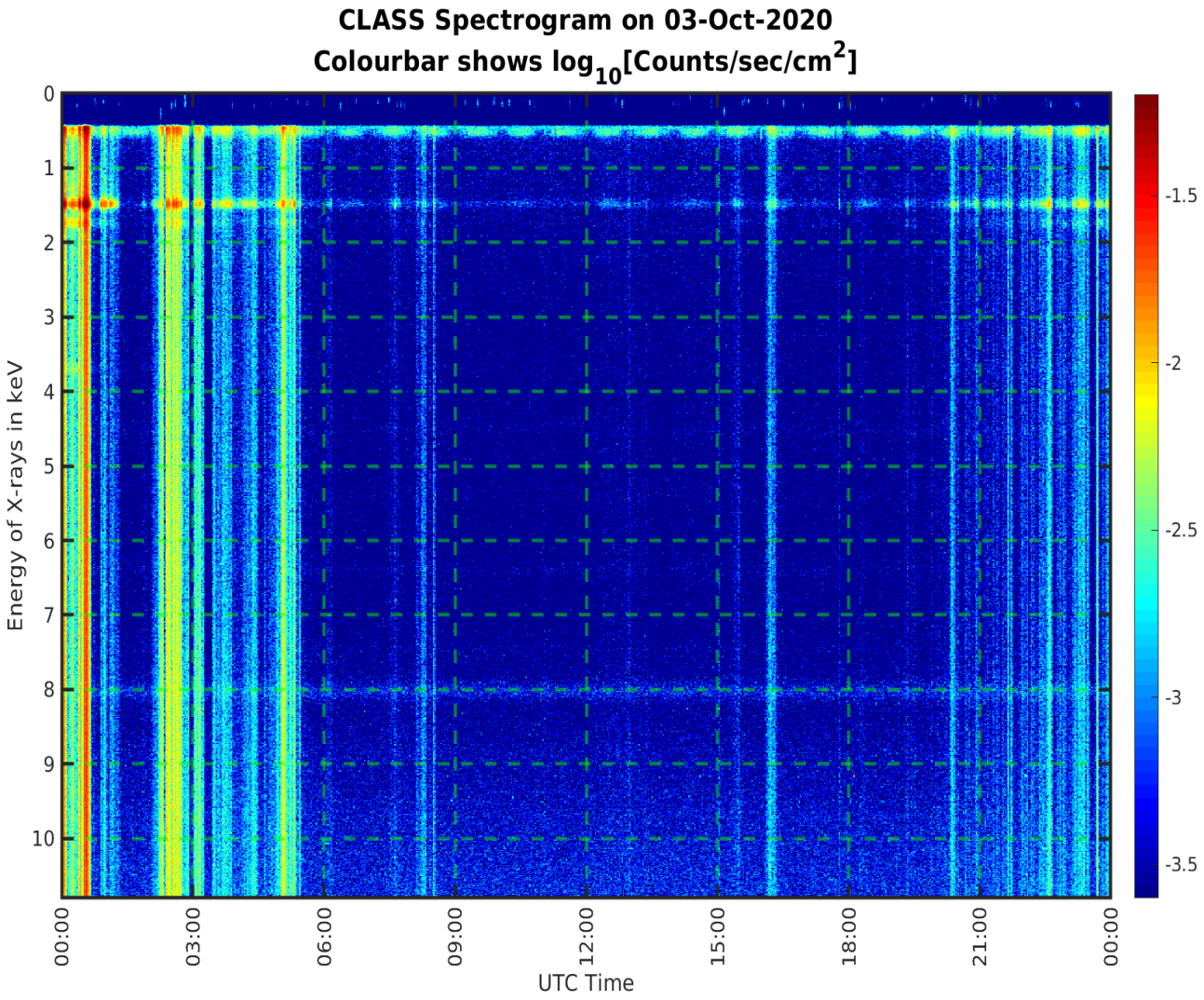
CLASS Spectrogram on 03-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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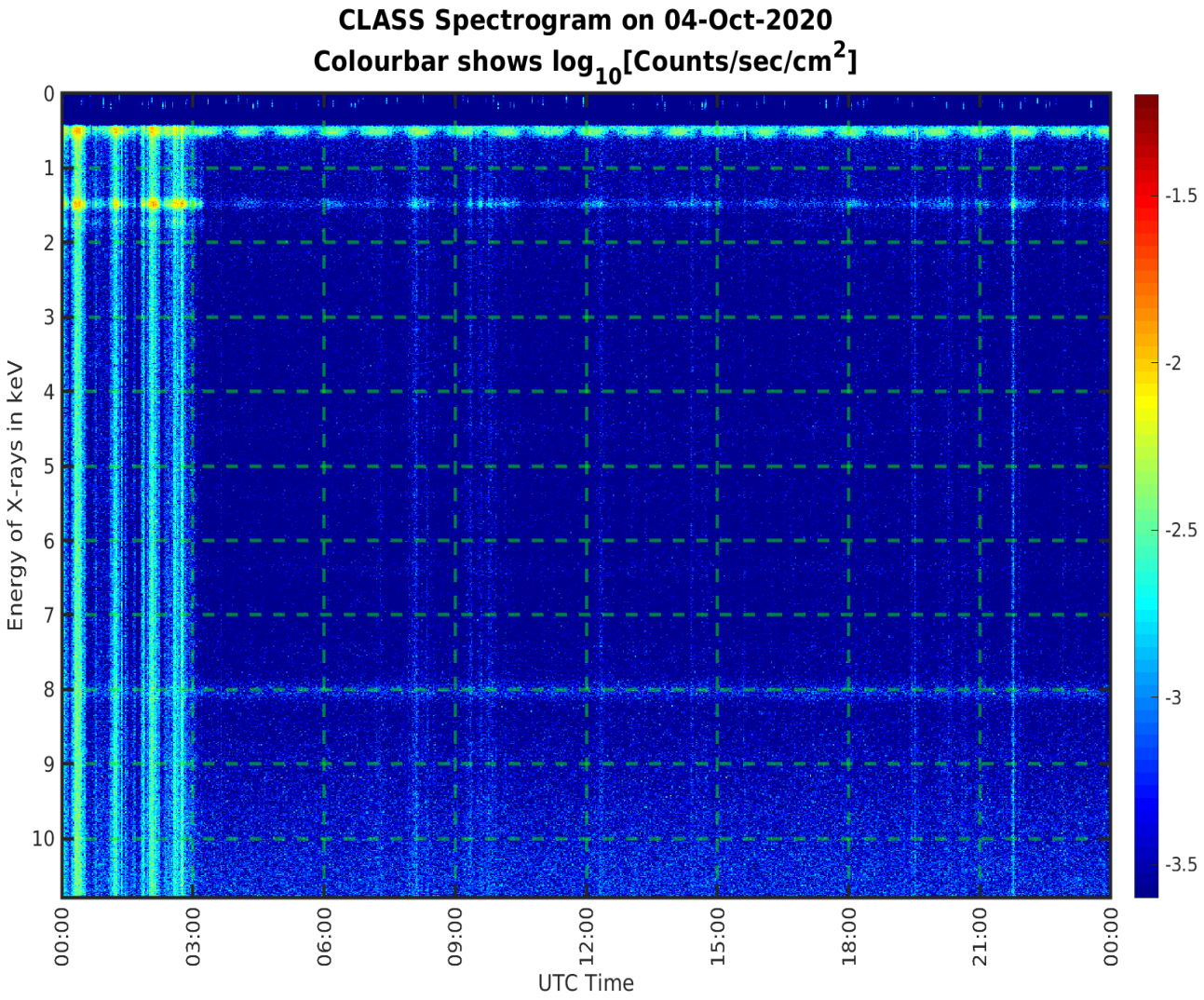
UTC Time


CLASS Spectrogram on 04-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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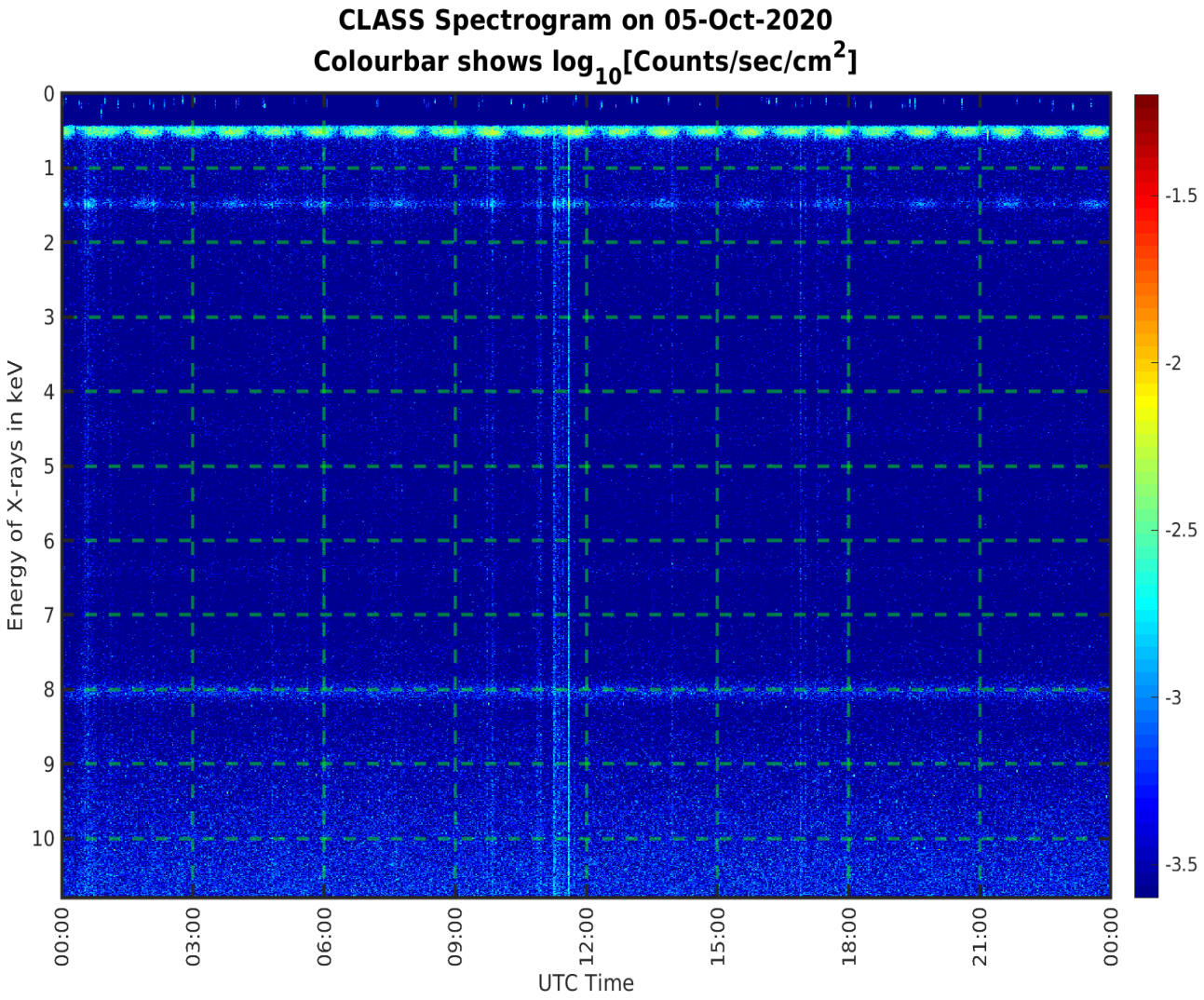
UTC Time


CLASS Spectrogram on 05-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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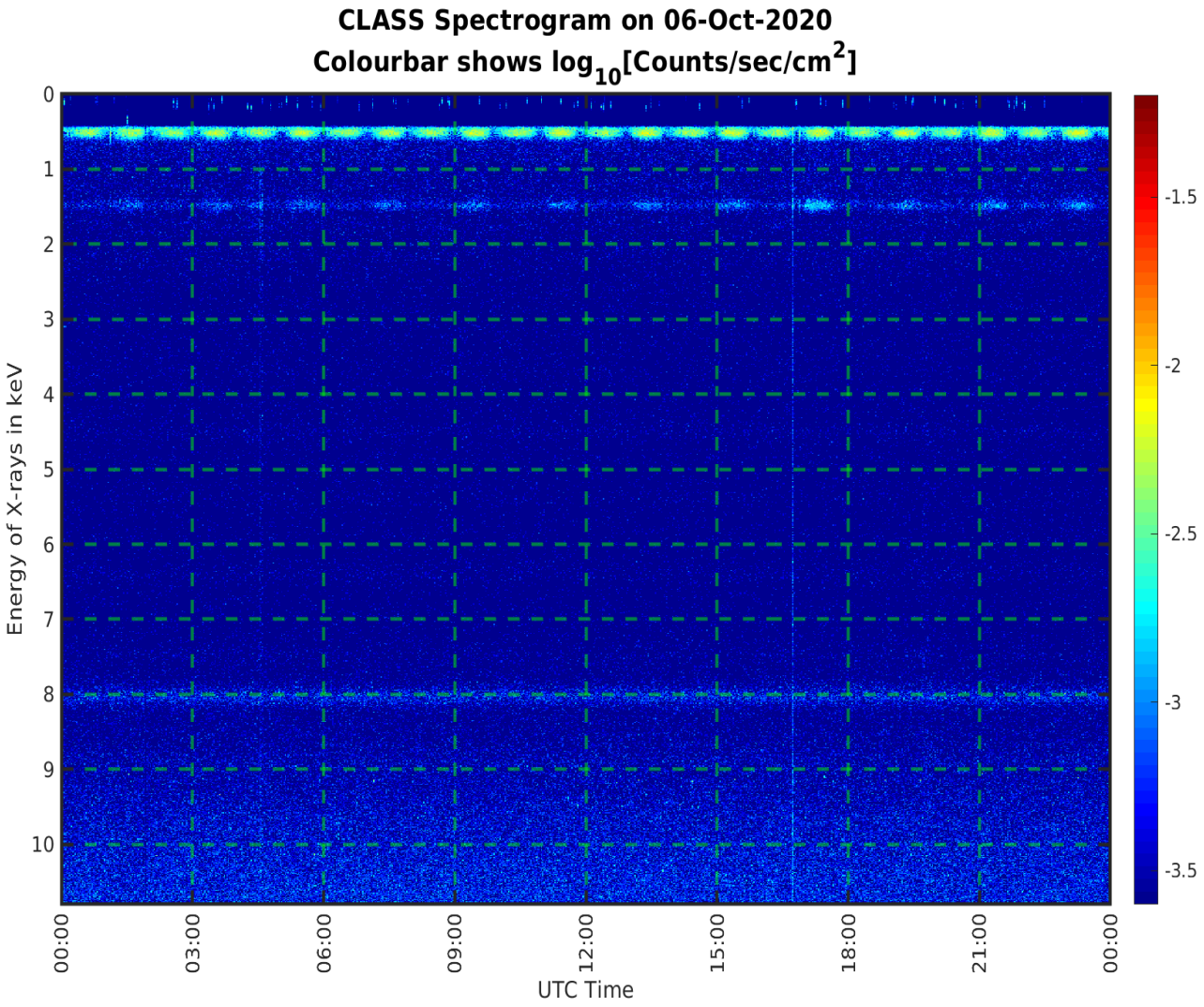
UTC Time


CLASS Spectrogram on 06-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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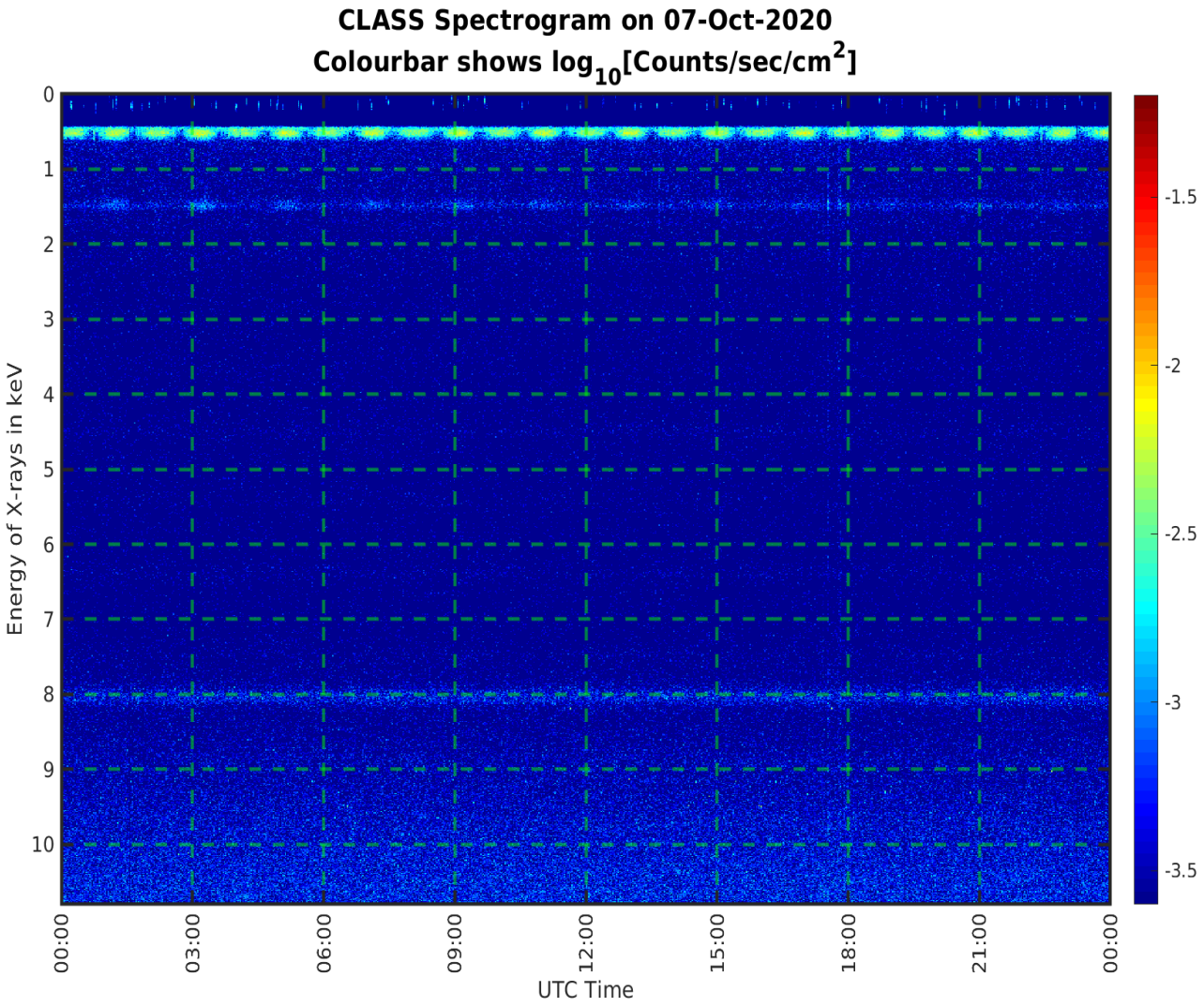
UTC Time


CLASS Spectrogram on 07-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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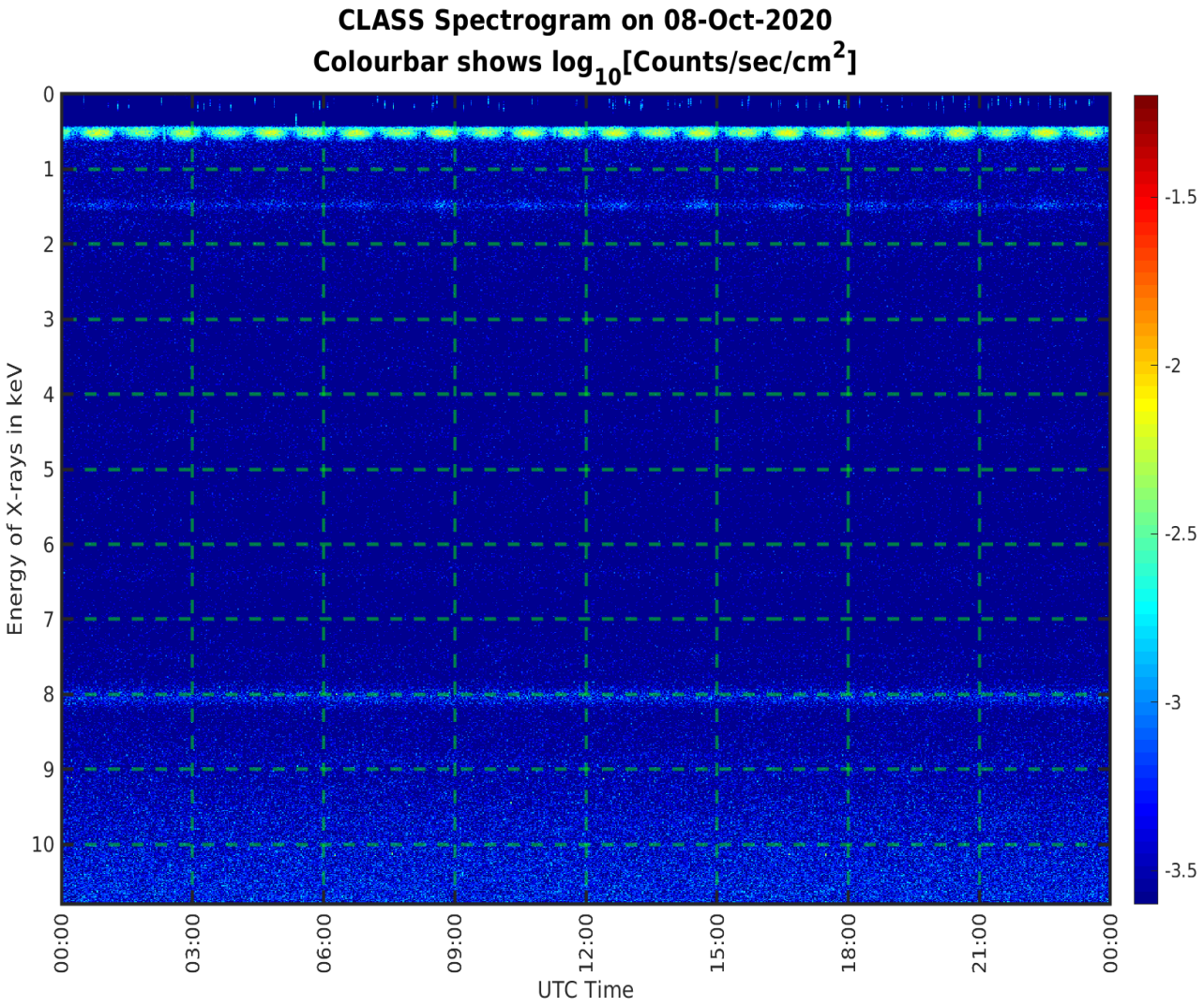
UTC Time


CLASS Spectrogram on 08-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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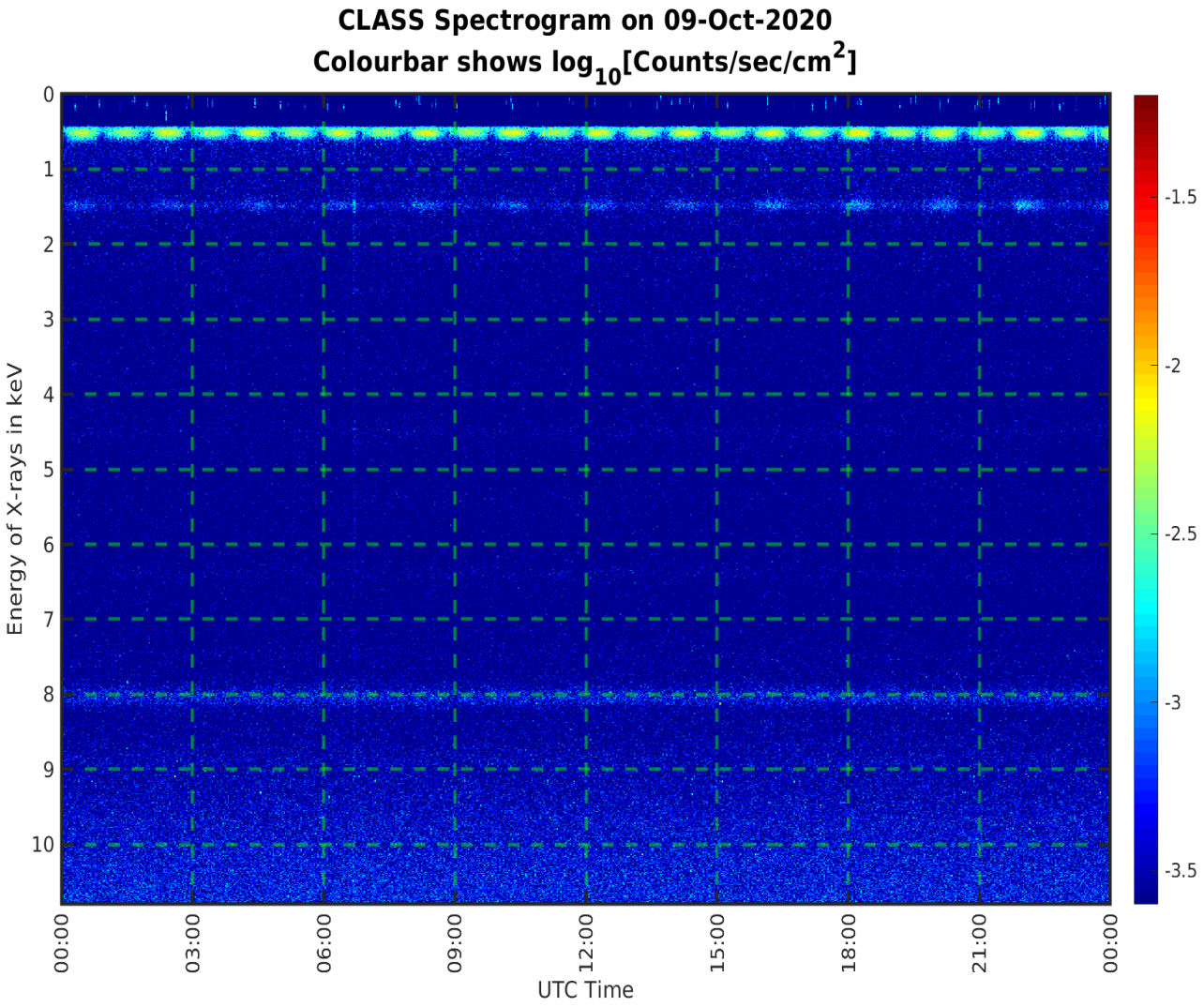
CLASS Spectrogram on 09-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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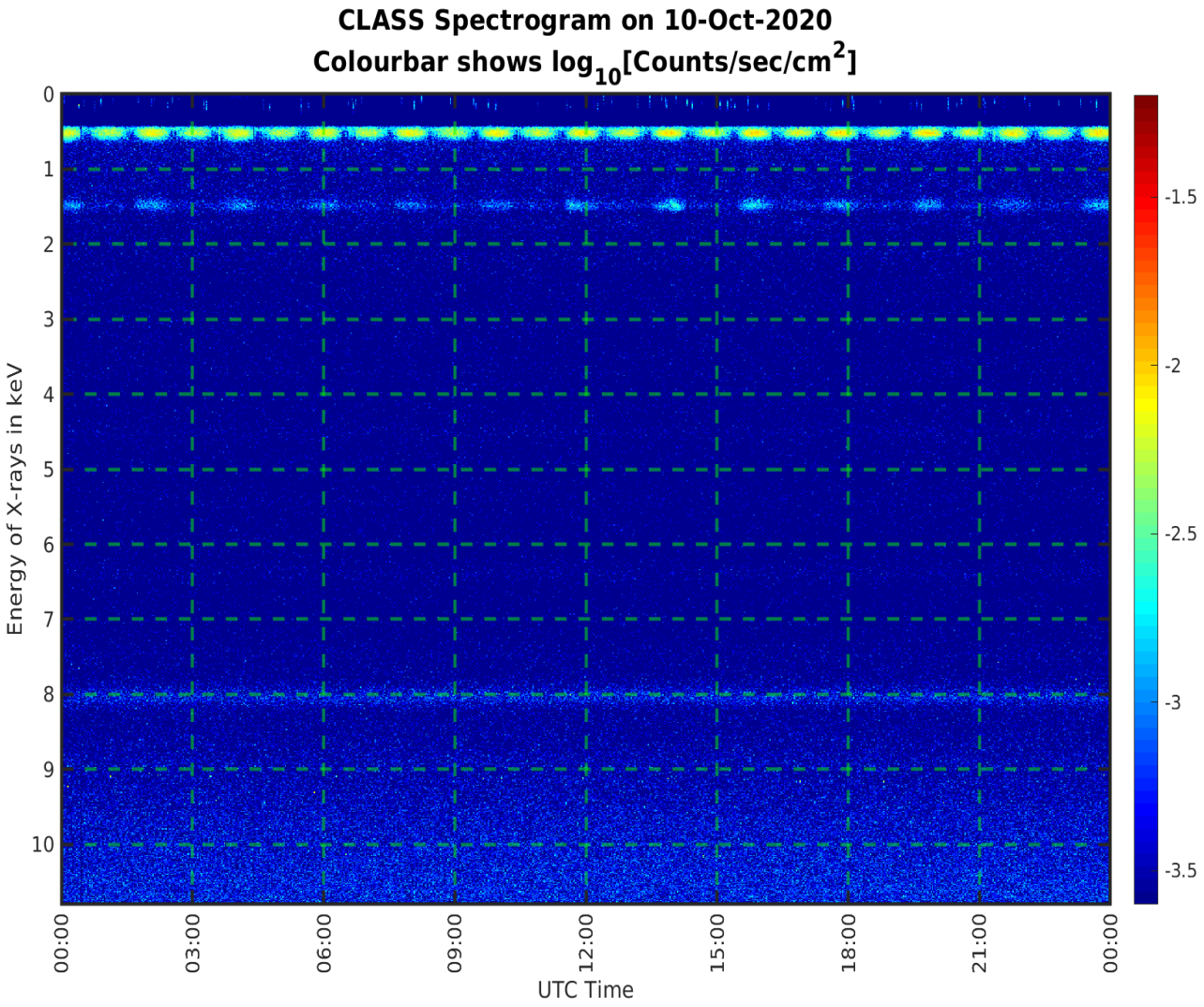
CLASS Spectrogram on 10-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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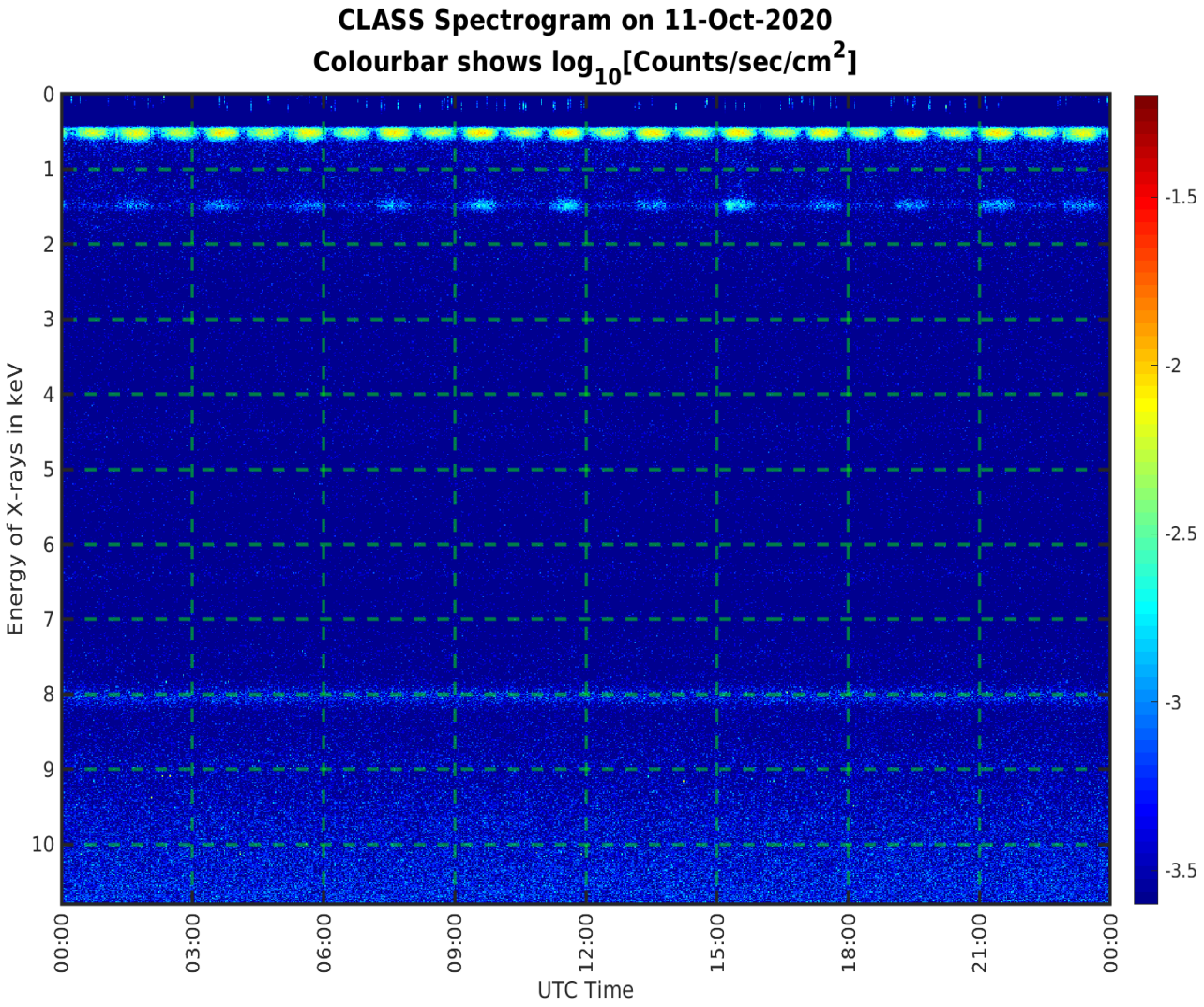
UTC Time


CLASS Spectrogram on 11-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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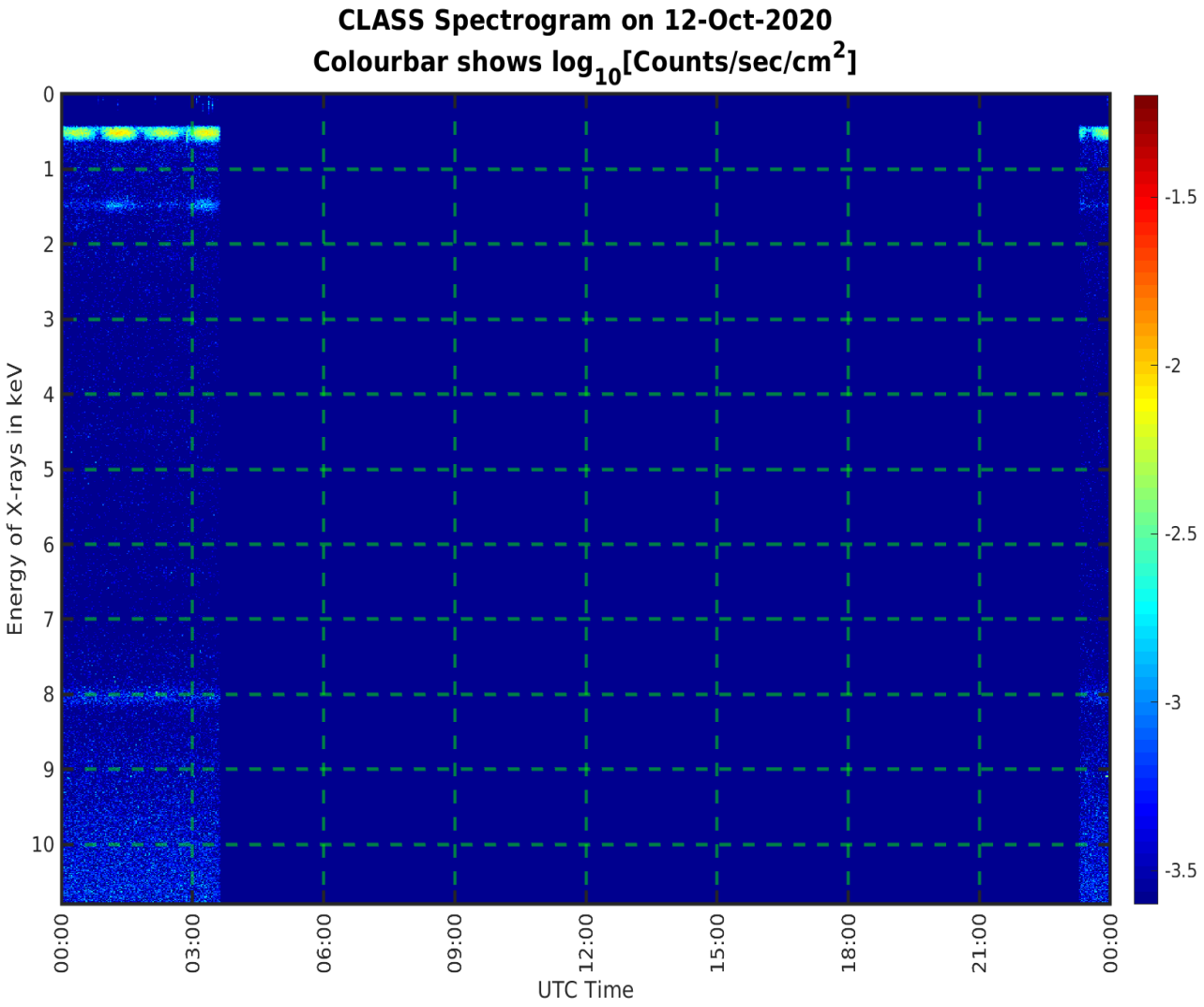
CLASS Spectrogram on 12-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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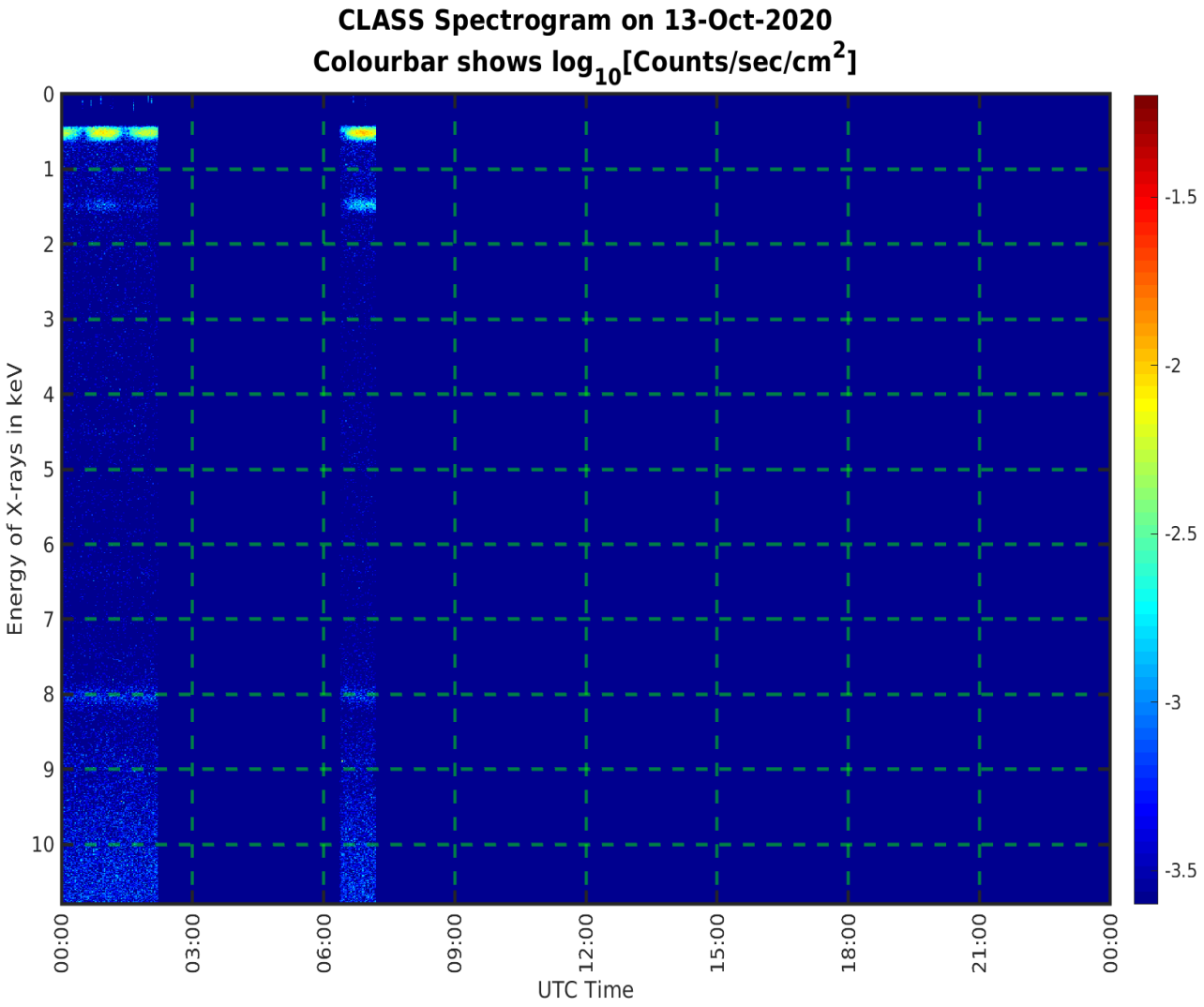
CLASS Spectrogram on 13-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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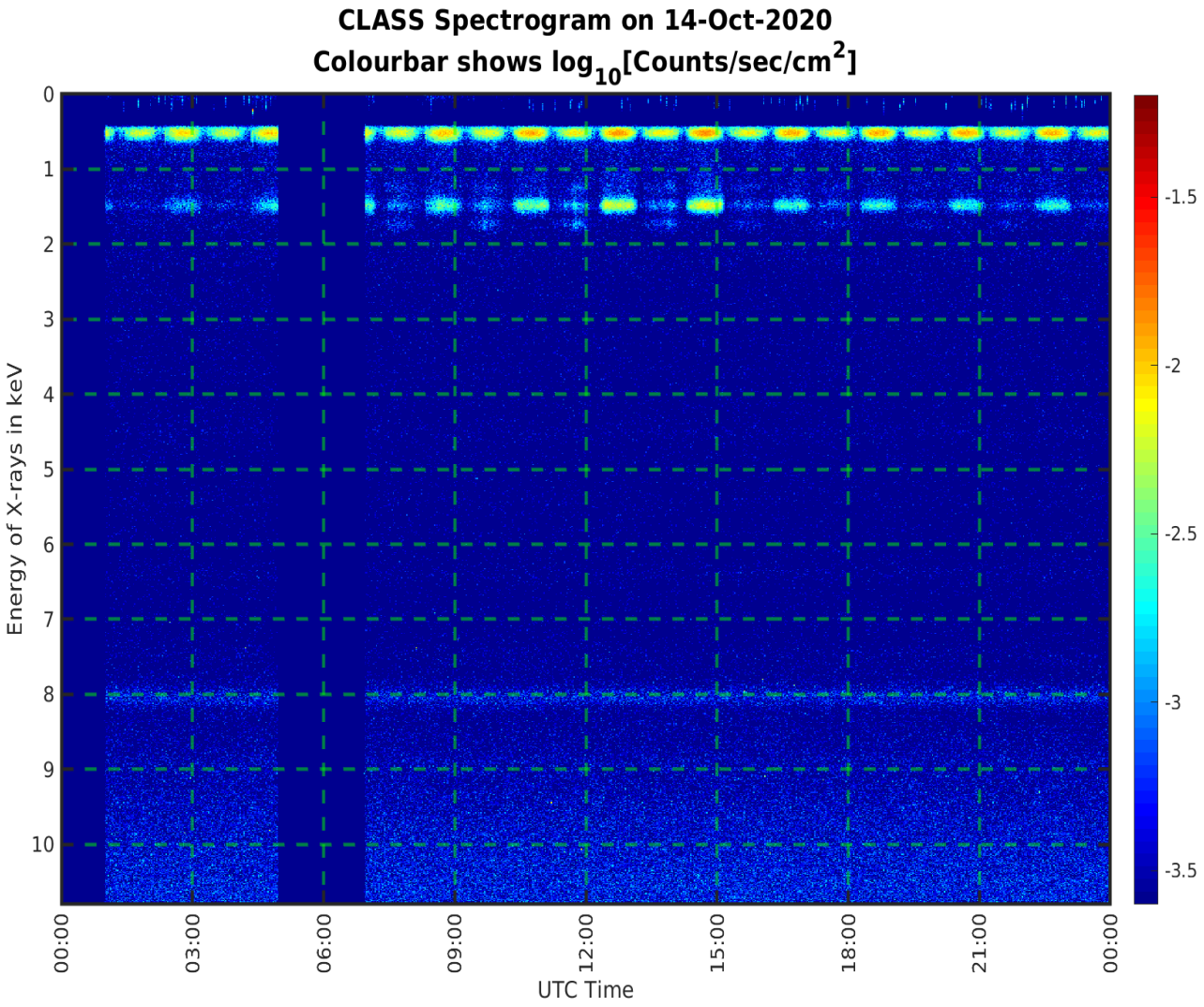
CLASS Spectrogram on 14-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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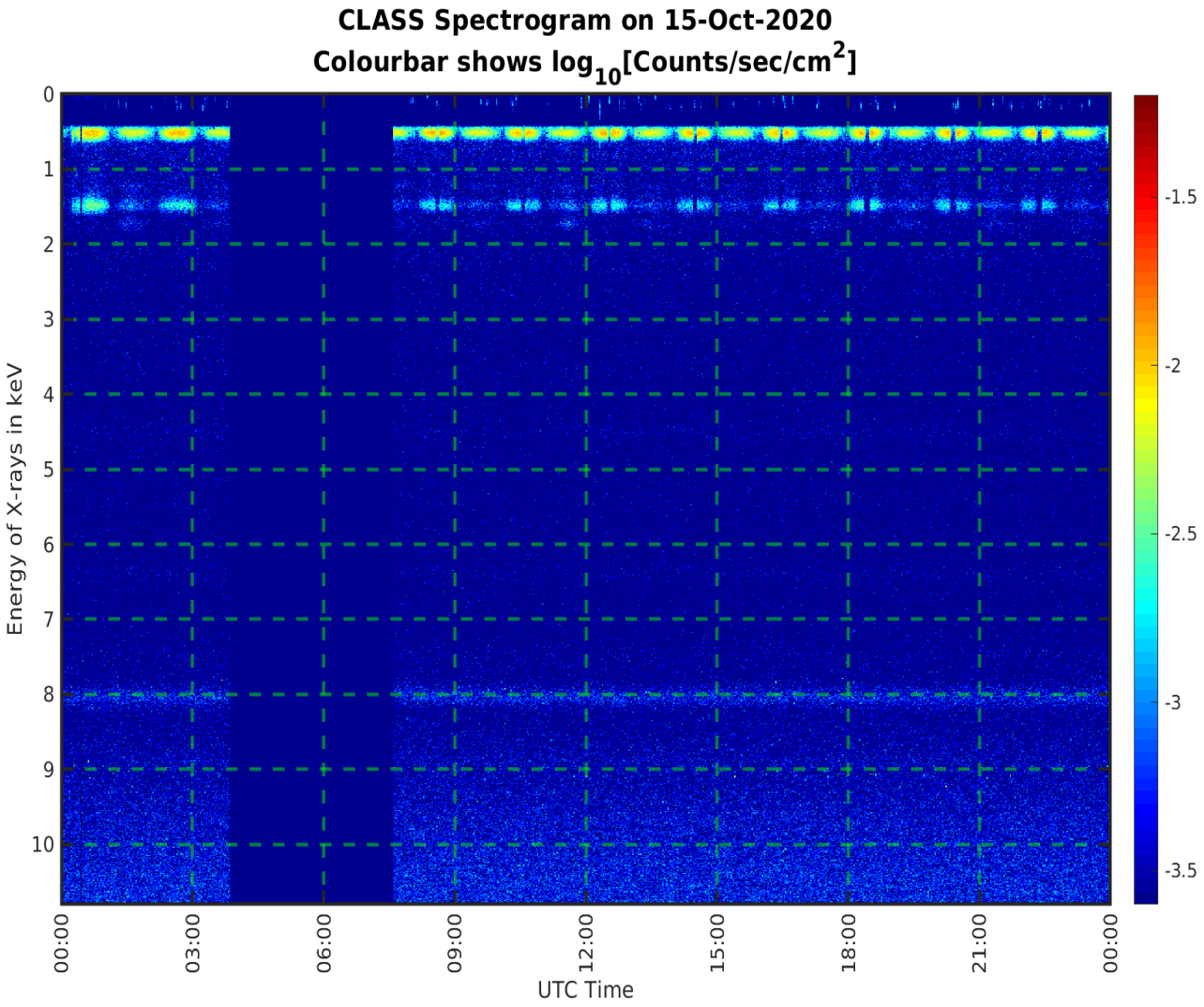
UTC Time


CLASS Spectrogram on 15-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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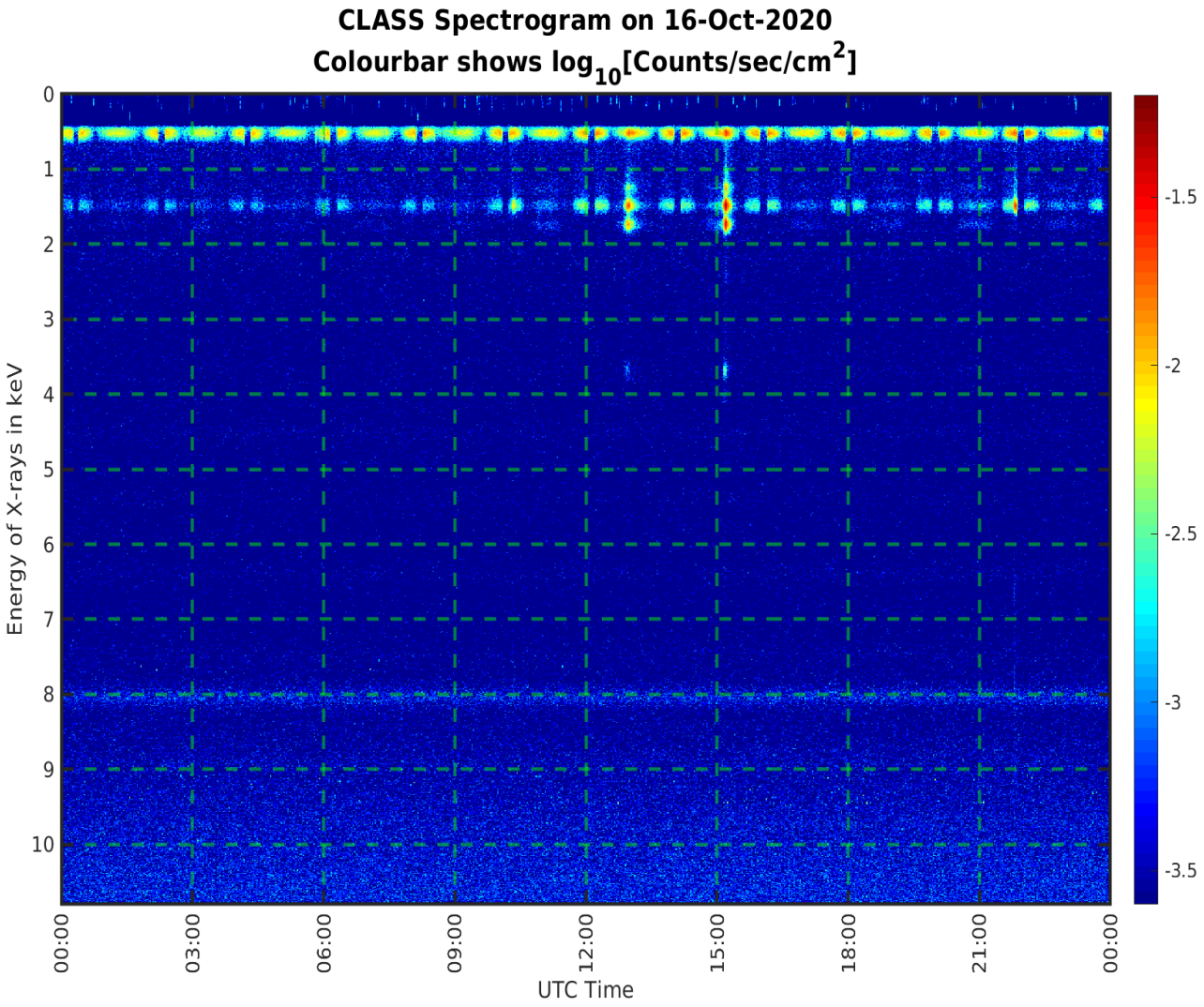
UTC Time


CLASS Spectrogram on 16-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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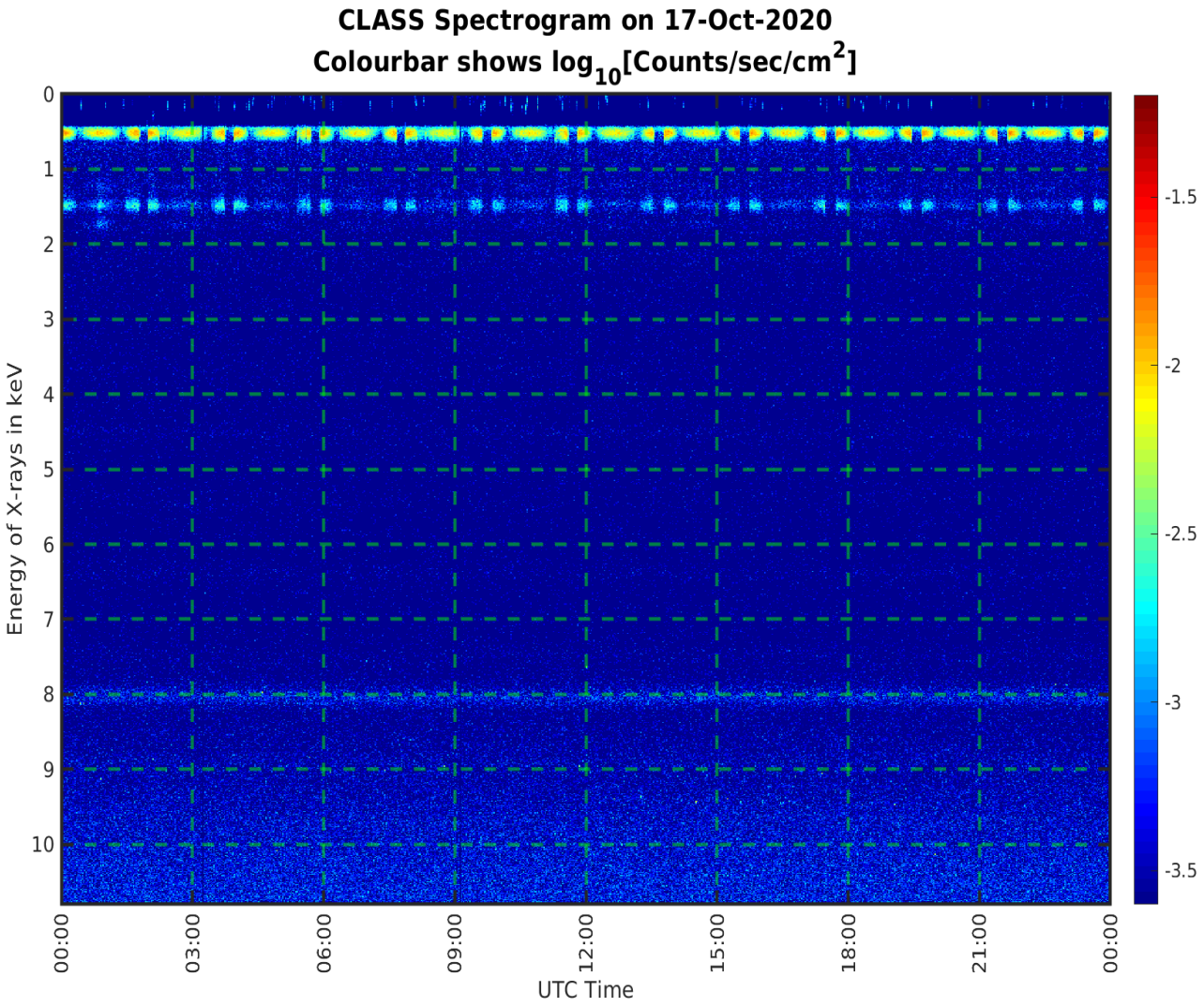
-3
-3.5


CLASS Spectrogram on 17-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
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18:00
21:00
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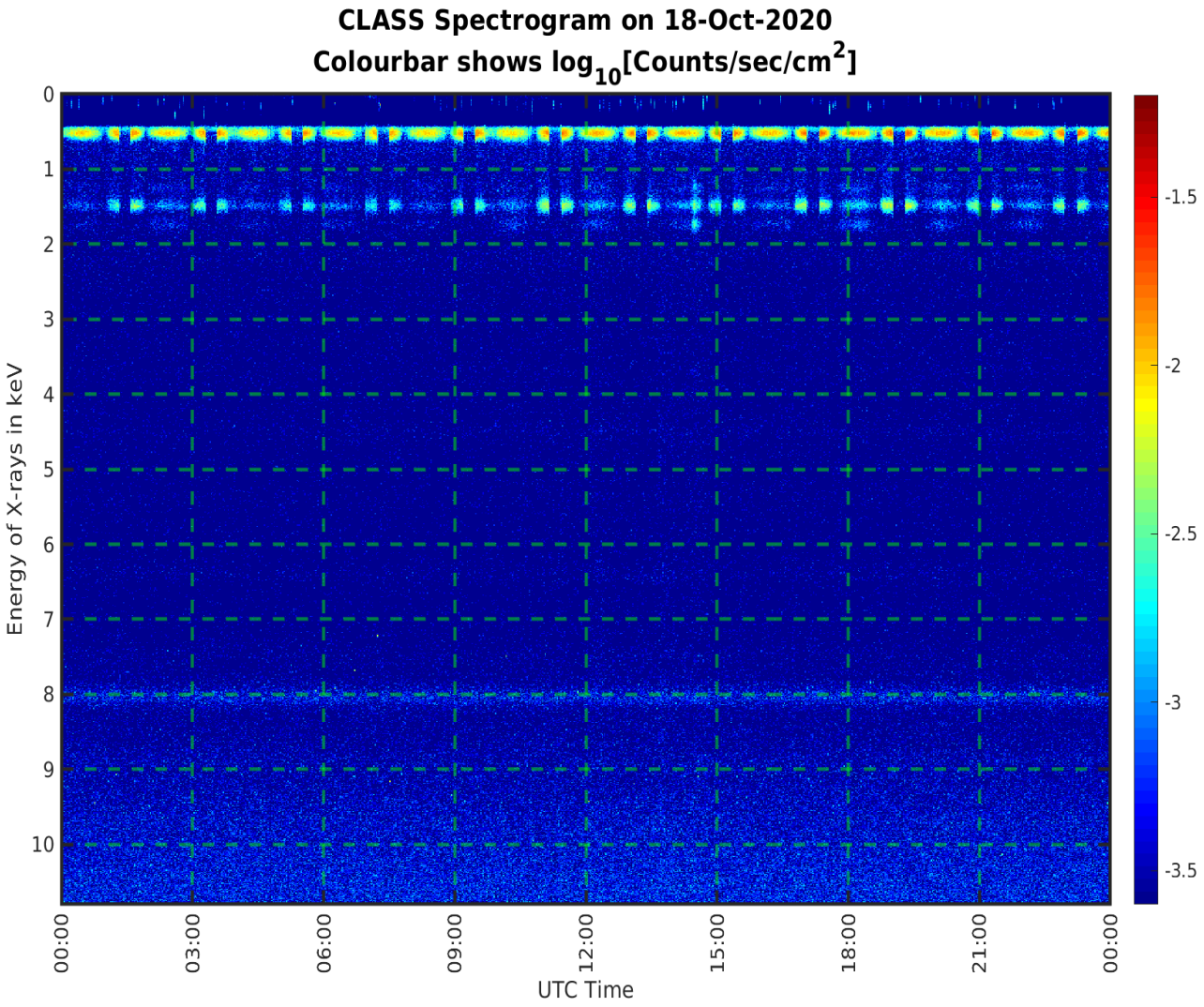
UTC Time


CLASS Spectrogram on 18-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
00:00
03:00
06:00
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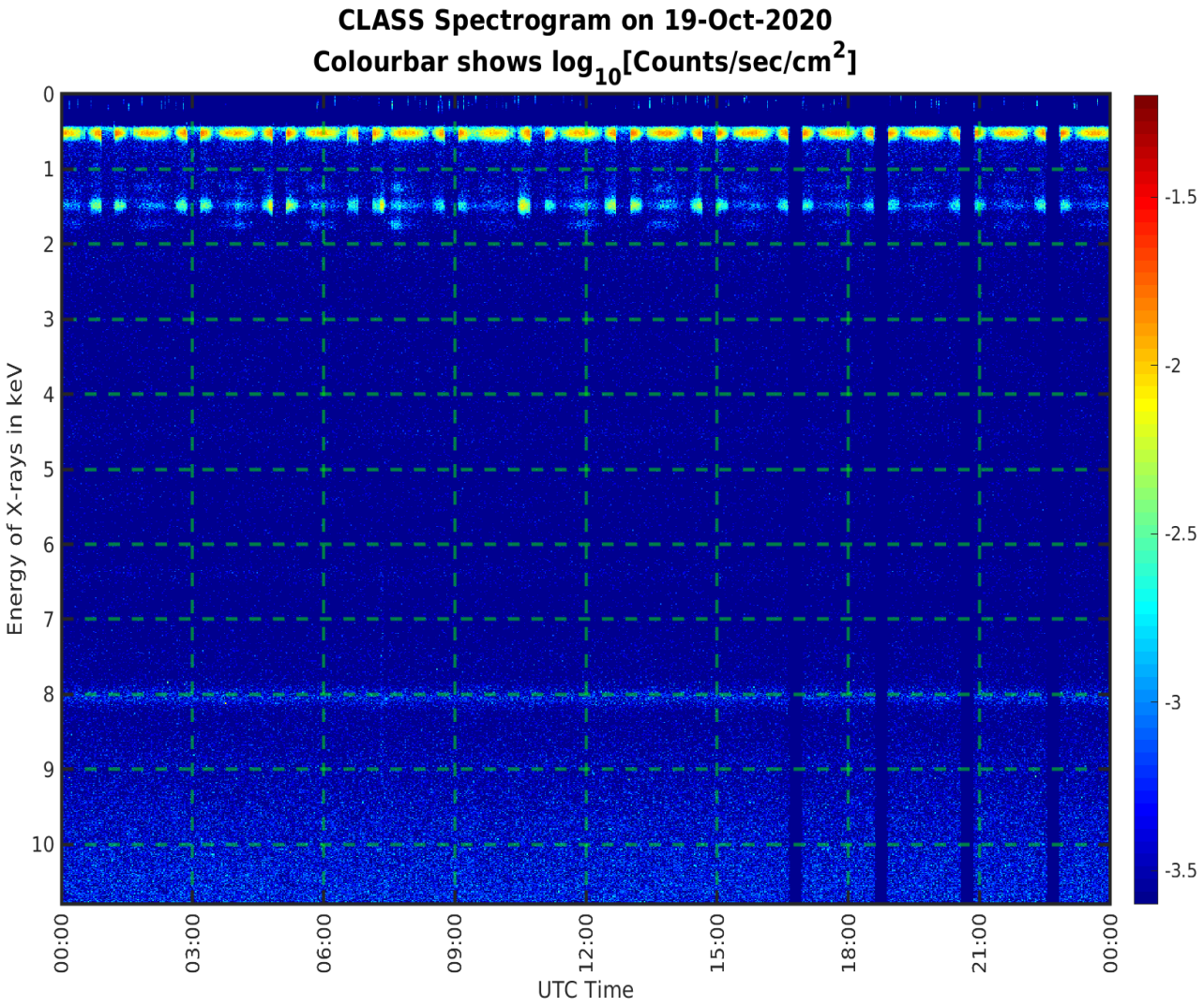
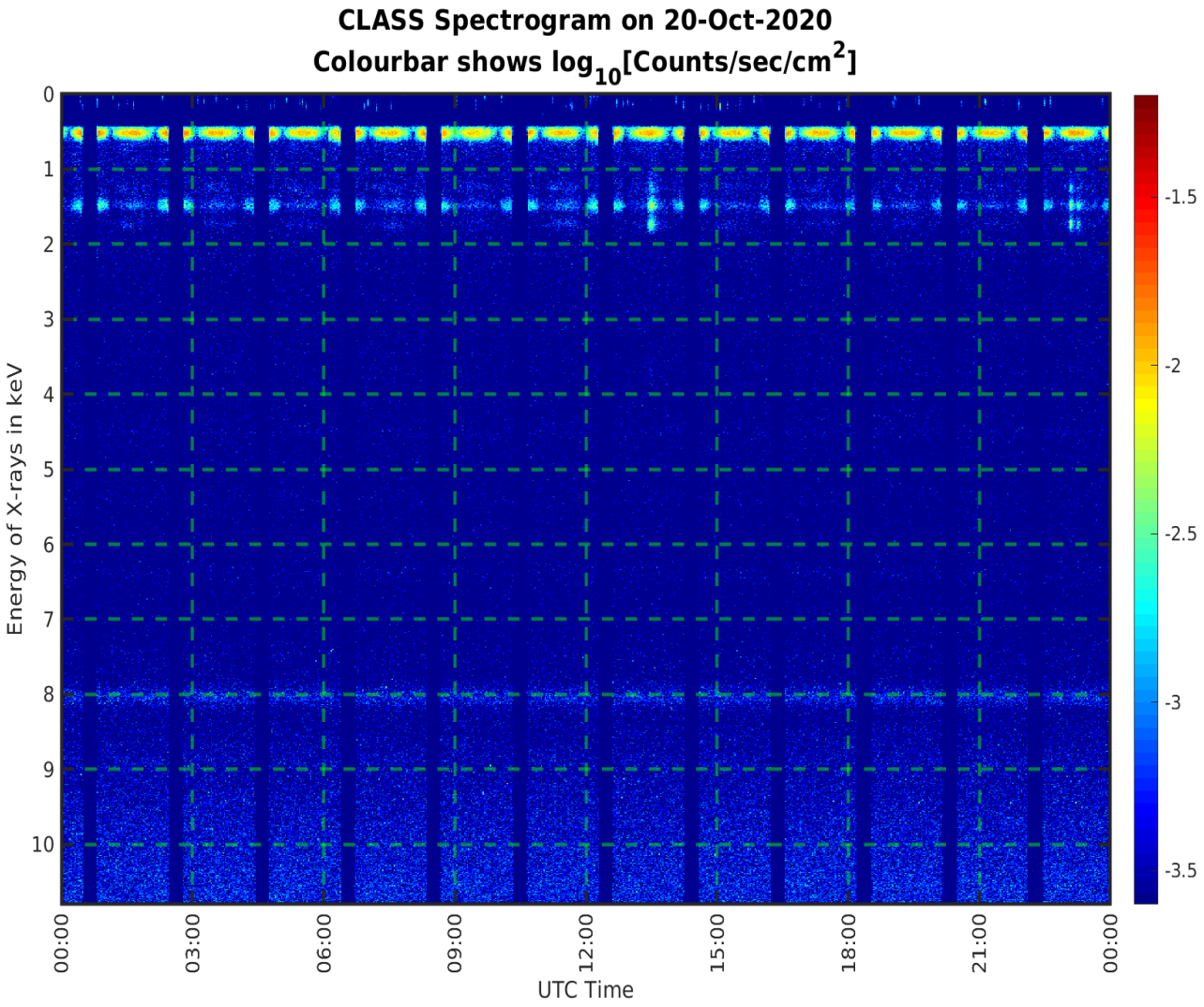
-2.5
-3
-3.5


CLASS Spectrogram on 19-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
UTC Time
-1.5
-2
-2.5
-3
-3.5


CLASS Spectrogram on 20-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
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21:00
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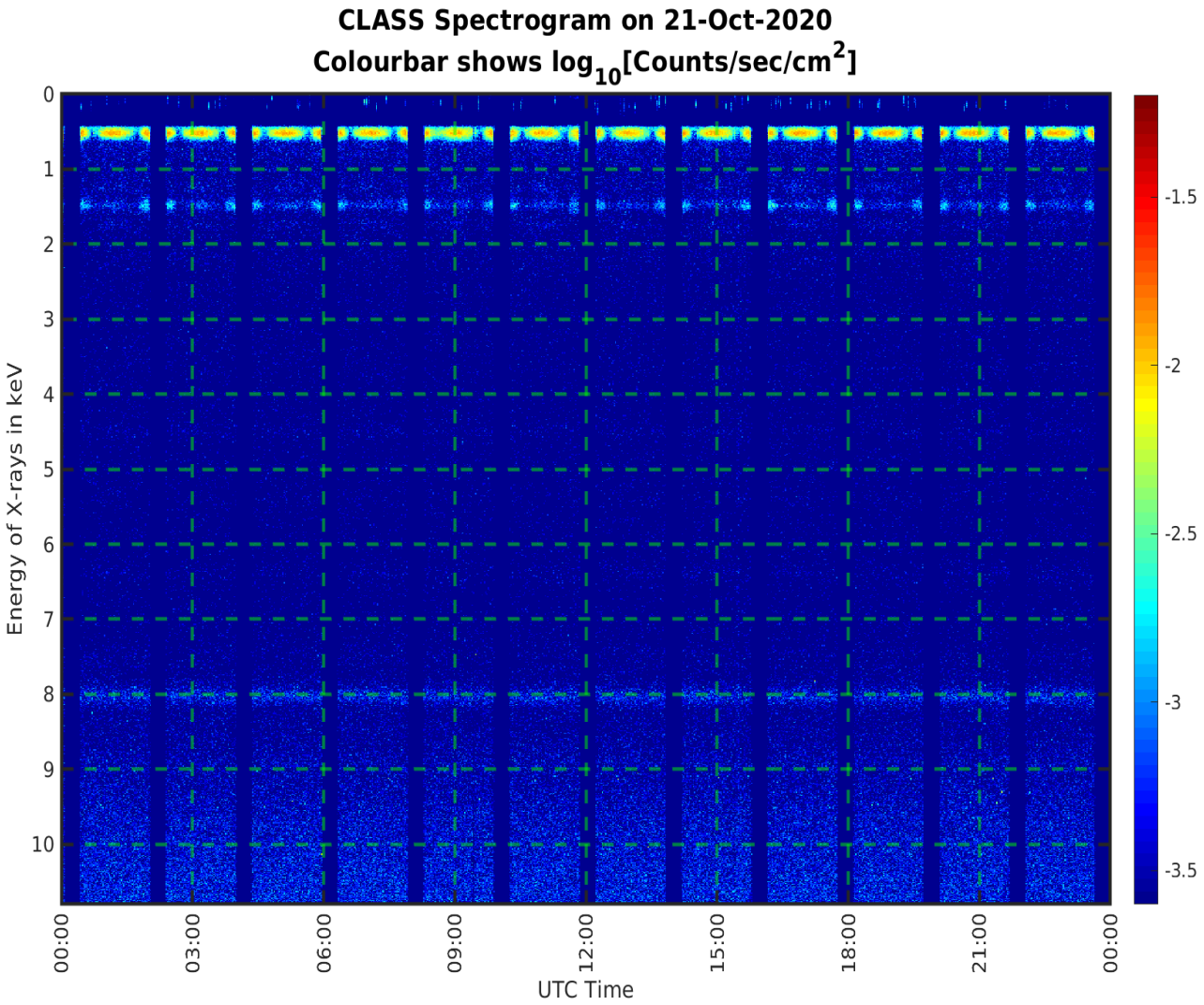
UTC Time


CLASS Spectrogram on 21-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
00:00
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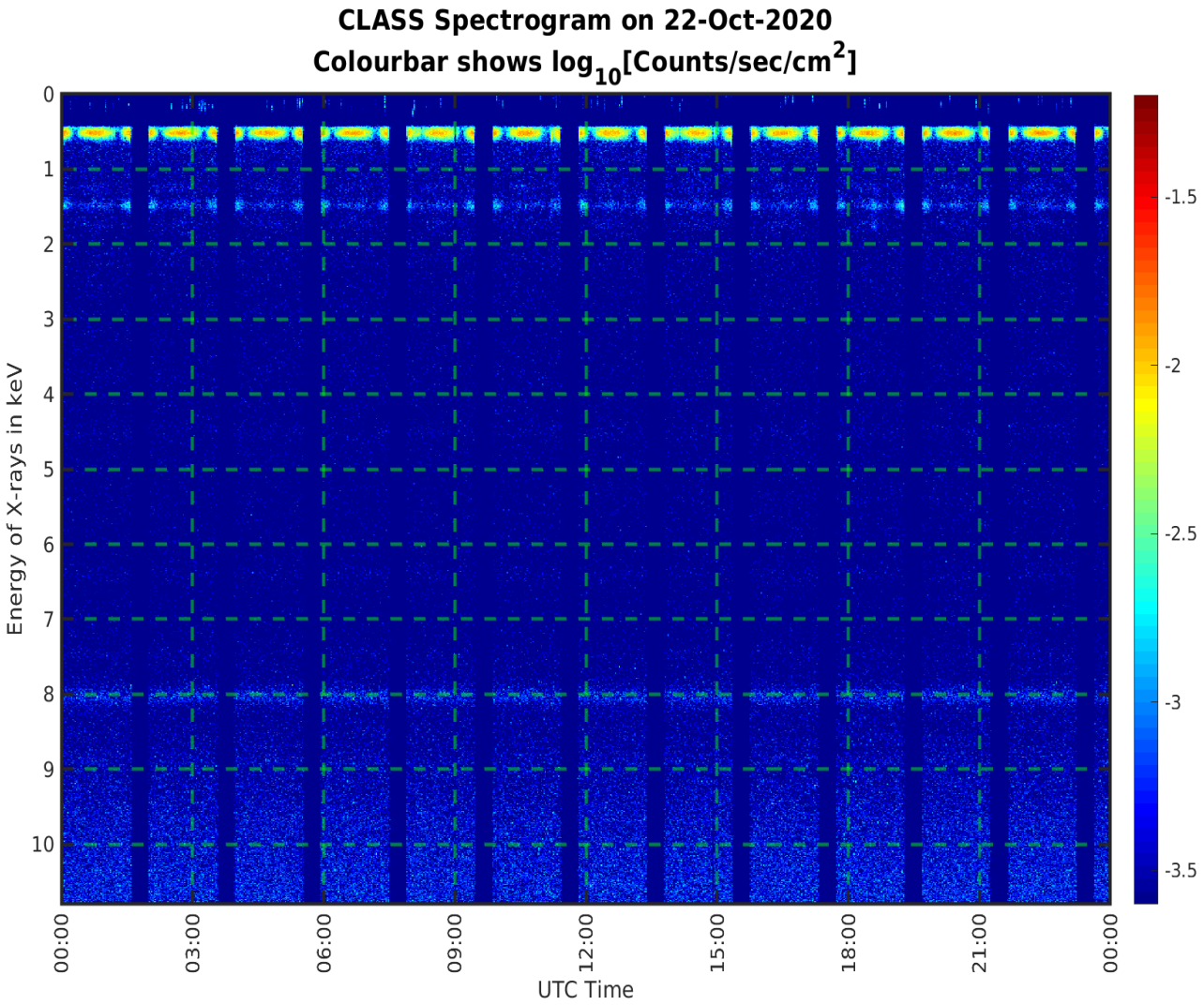
UTC Time


CLASS Spectrogram on 22-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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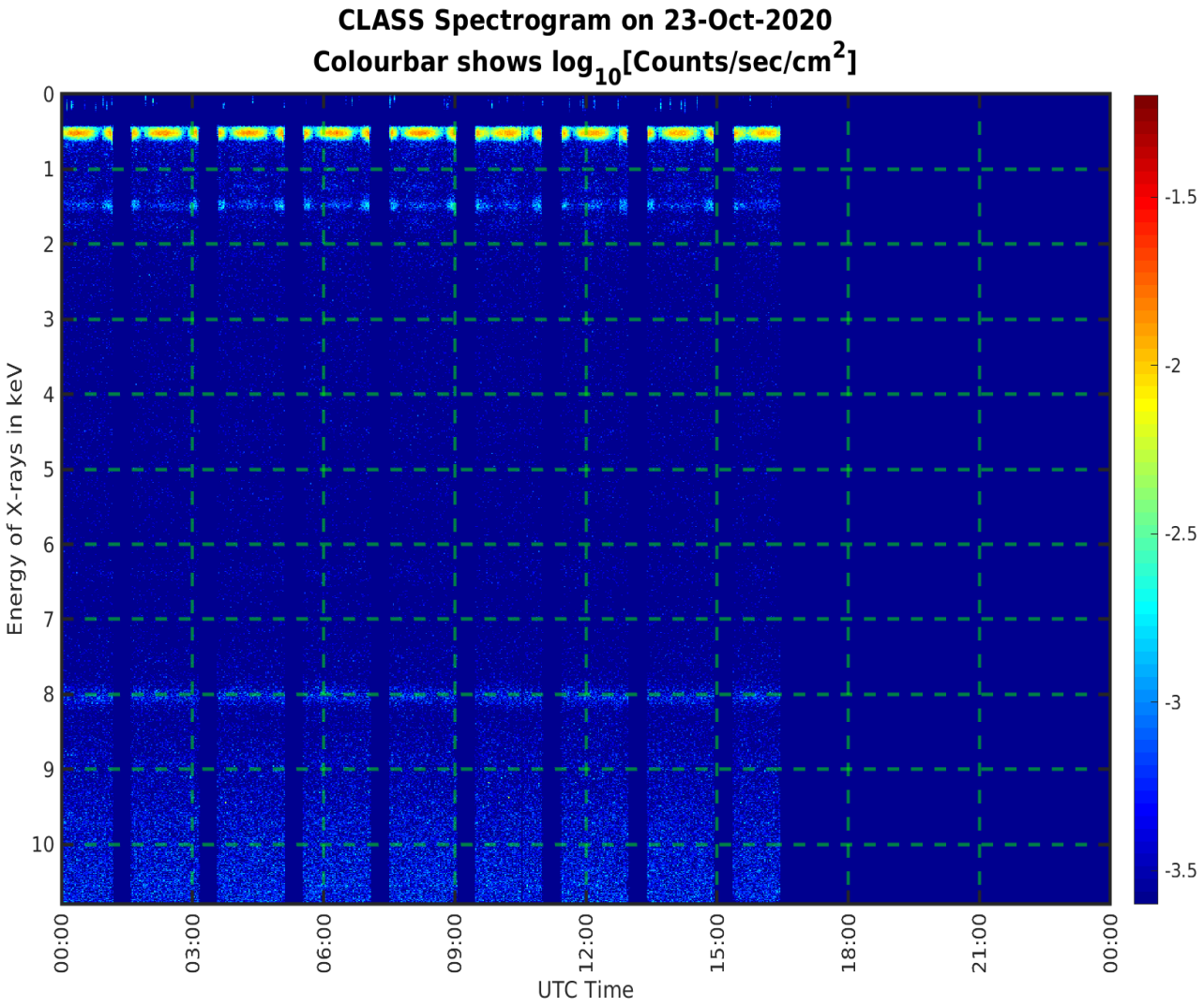
UTC Time


CLASS Spectrogram on 23-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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4
5
6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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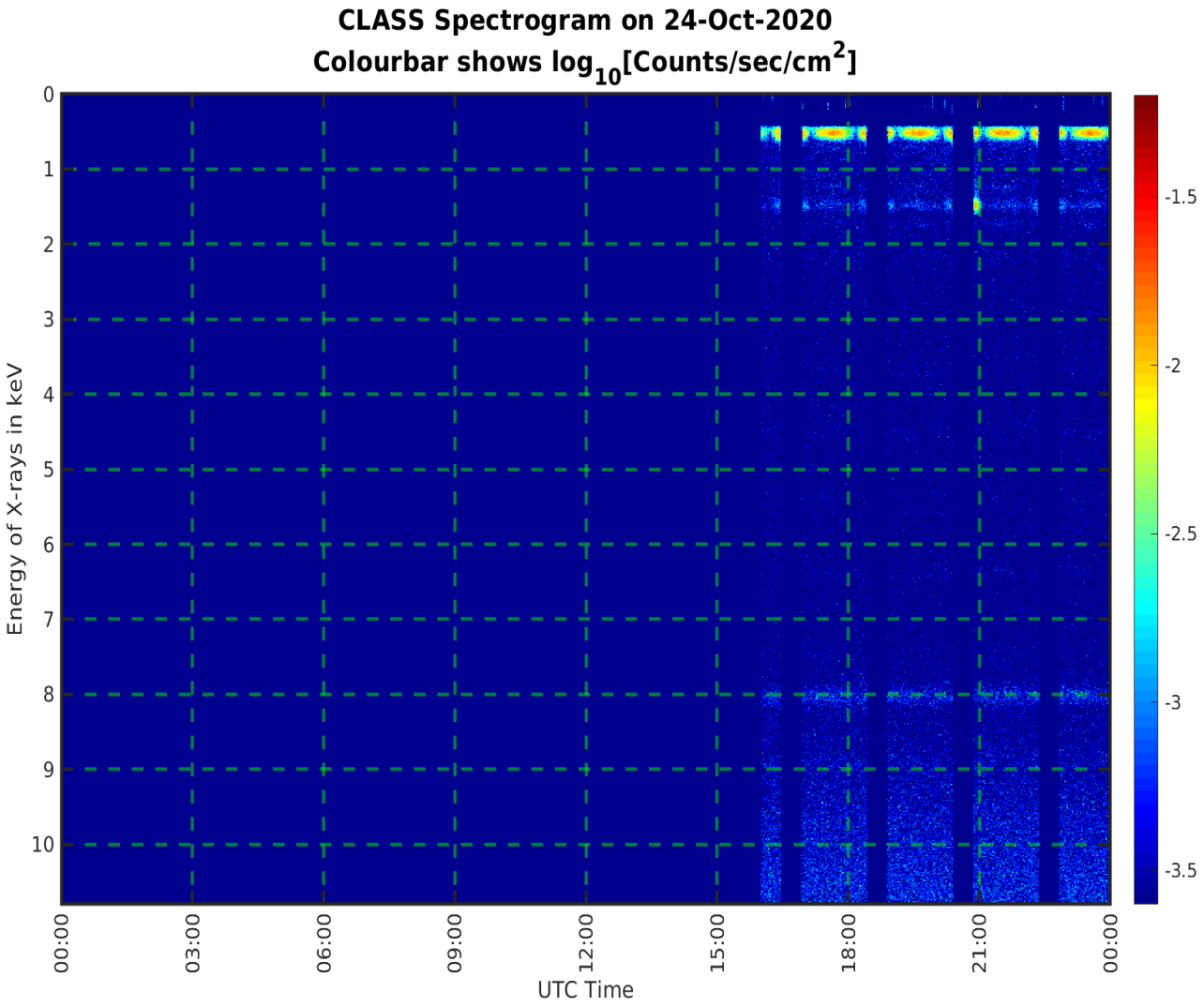
UTC Time


CLASS Spectrogram on 24-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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03:00
06:00
09:00
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18:00
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UTC Time
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-2.5
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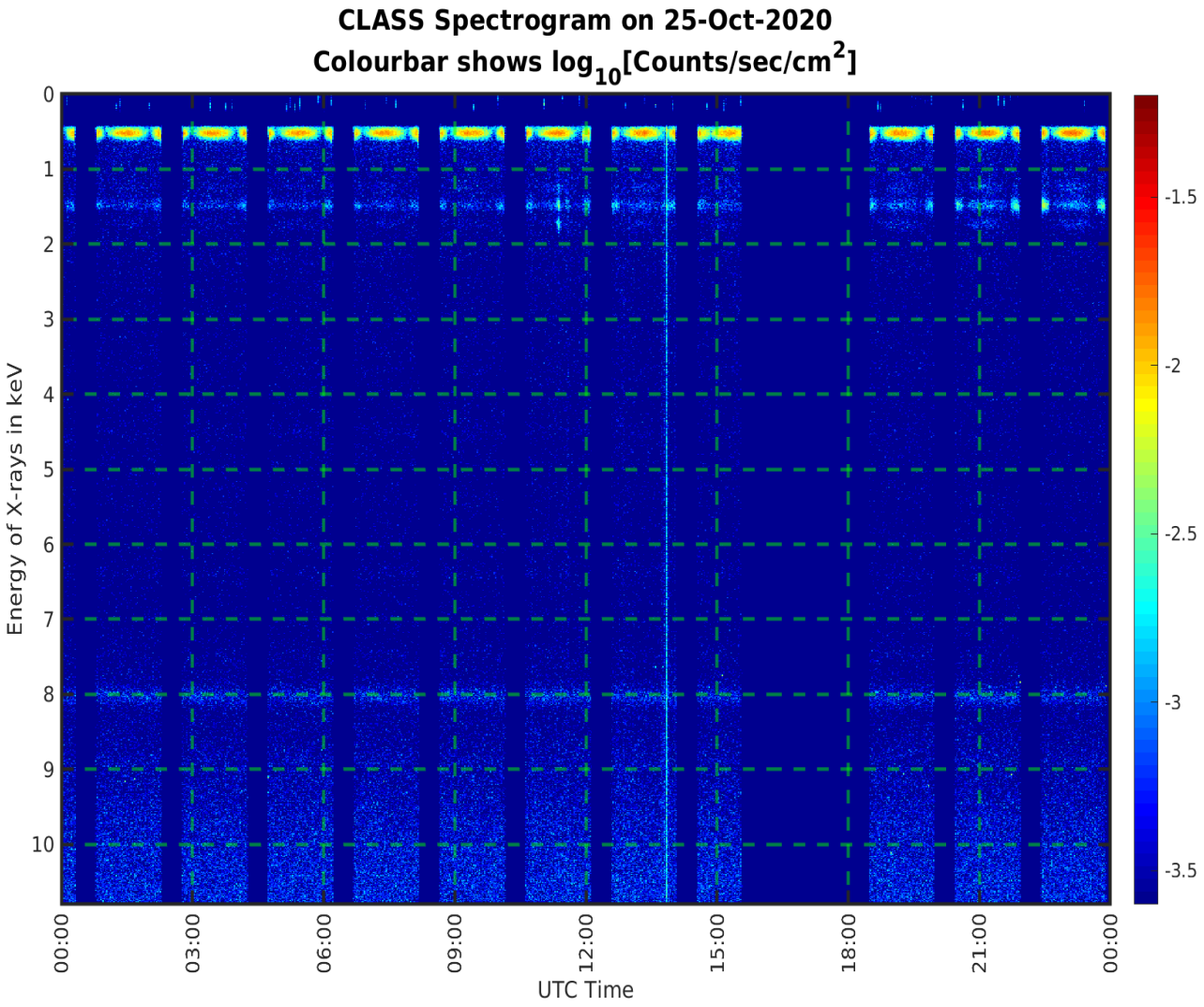
-3.5


CLASS Spectrogram on 25-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
-1.5
-2
-2.5
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-3.5
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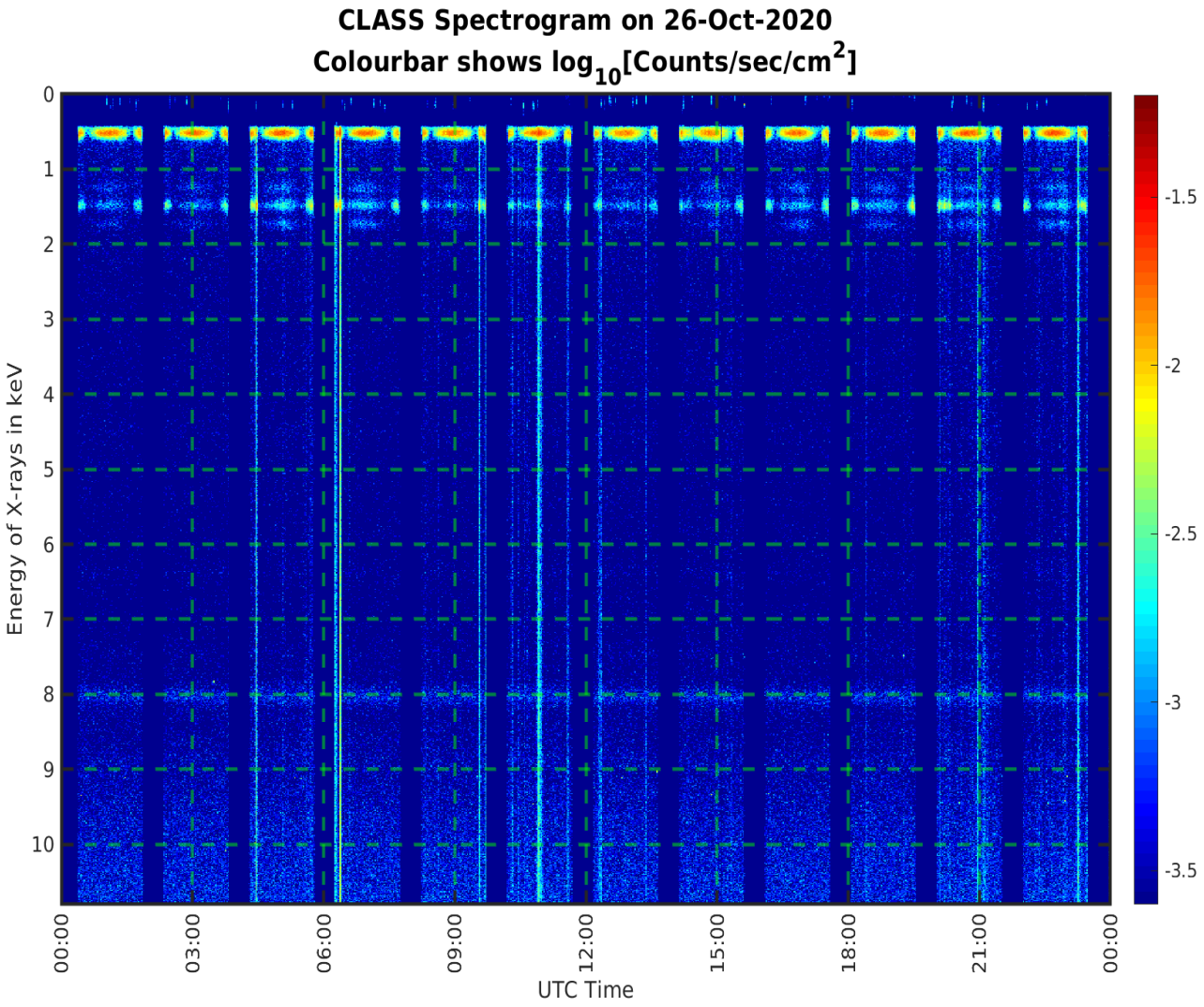
UTC Time


CLASS Spectrogram on 26-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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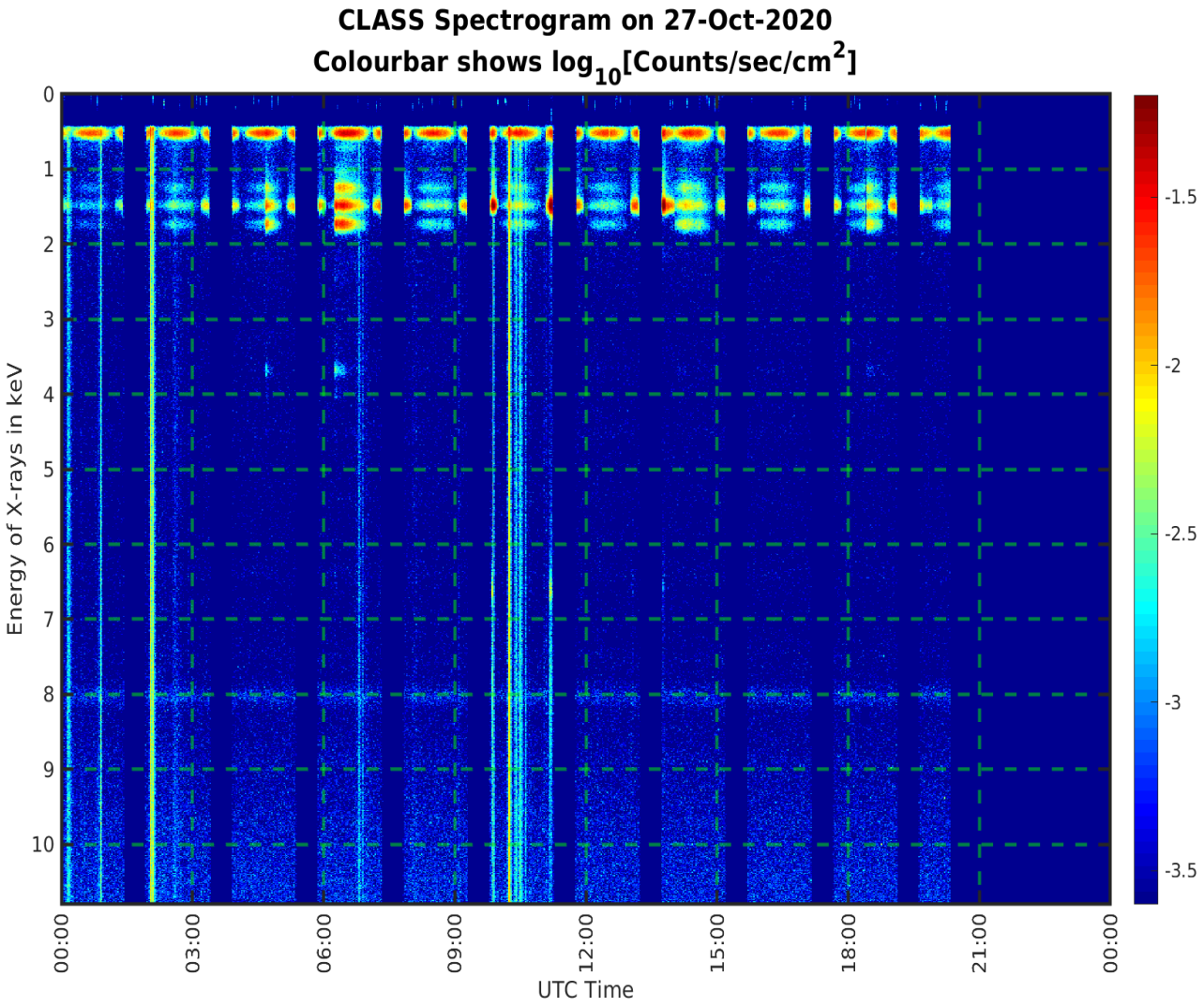
UTC Time


CLASS Spectrogram on 27-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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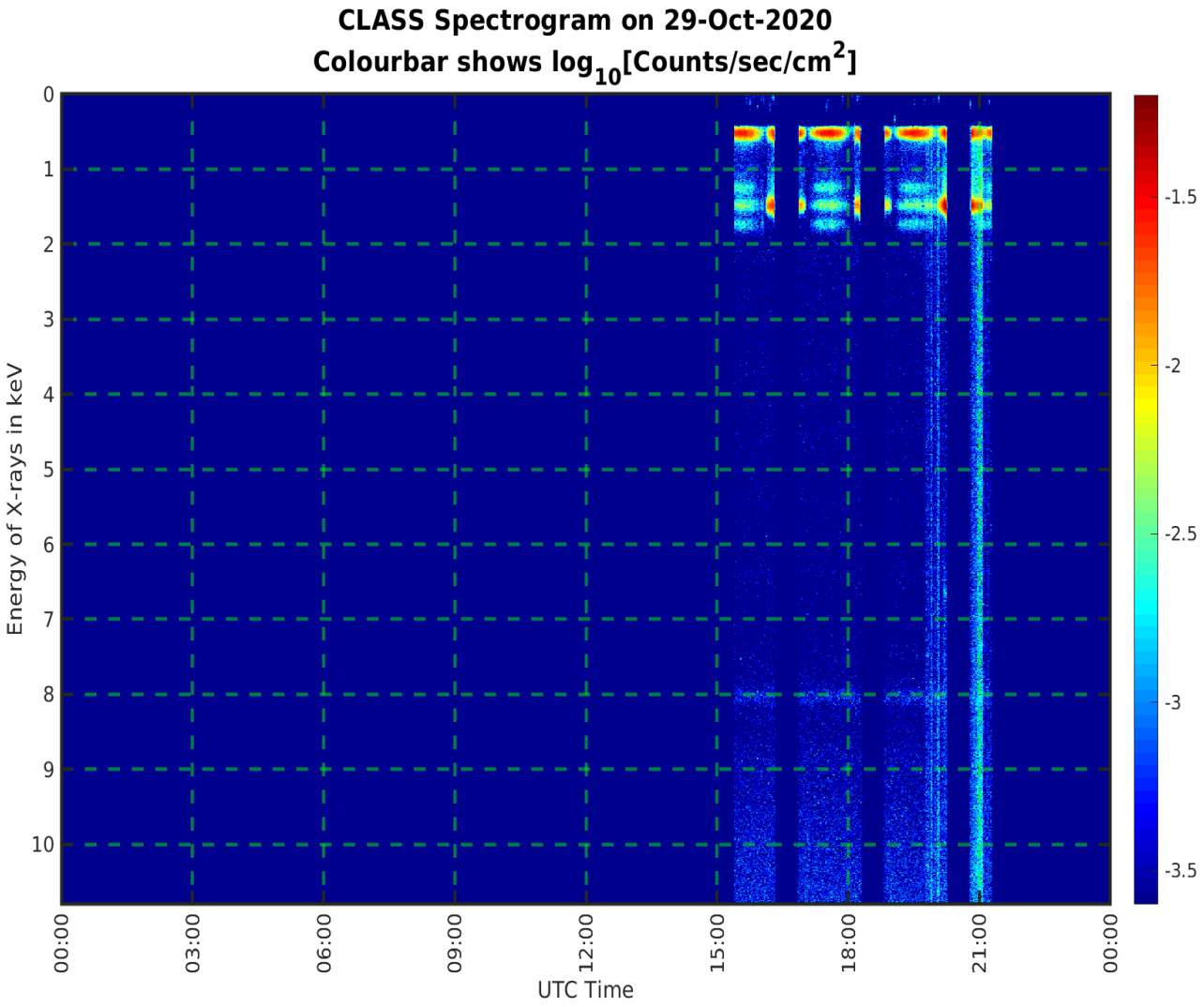
UTC Time


CLASS Spectrogram on 29-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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03:00
06:00
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UTC Time
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-2.5
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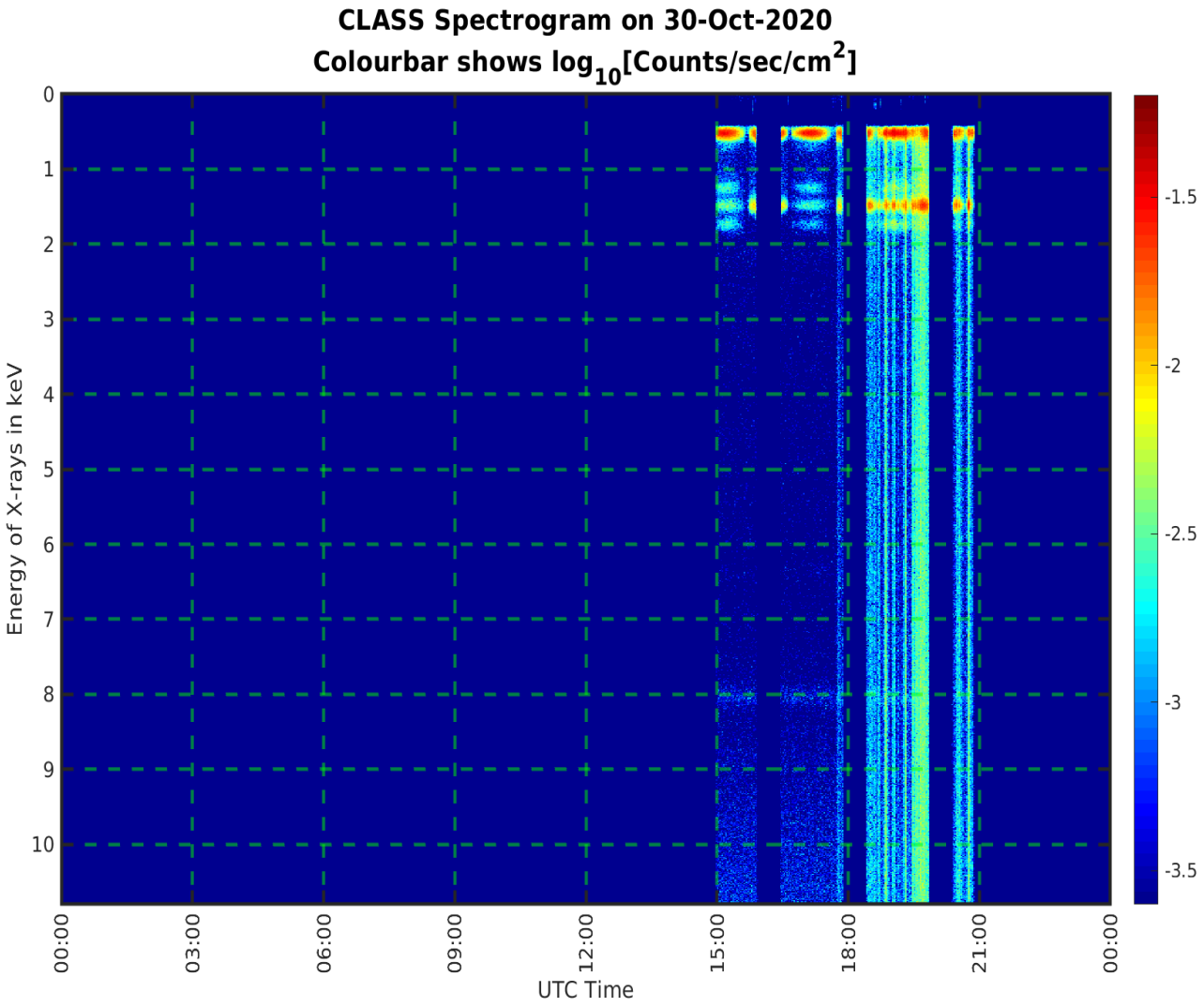
-3.5


CLASS Spectrogram on 30-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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03:00
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UTC Time
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-2.5
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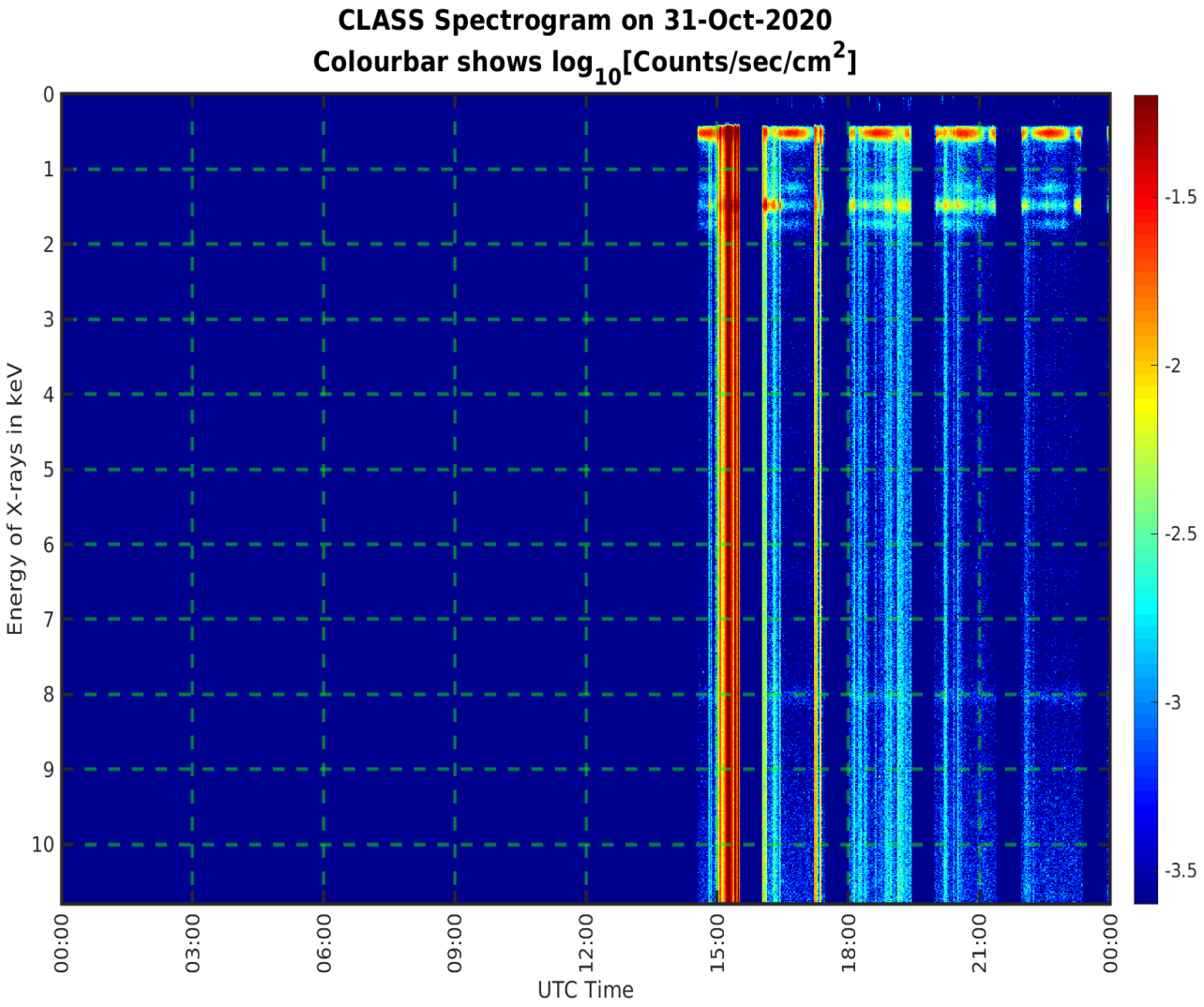
-3.5


CLASS Spectrogram on 31-Oct-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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10
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03:00
06:00
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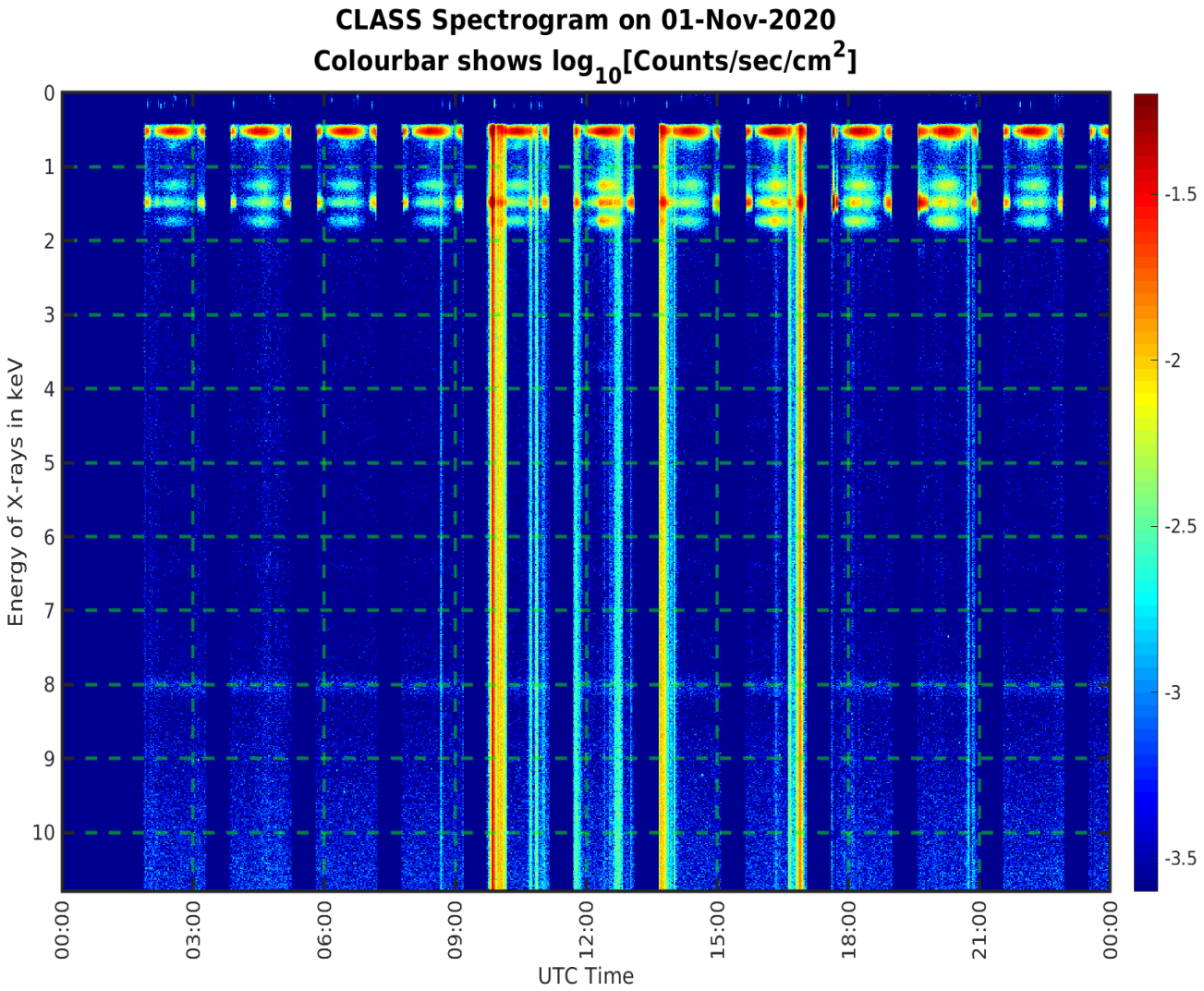
-3.5


CLASS Spectrogram on 01-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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03:00
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09:00
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15:00
18:00
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UTC Time
-1.5
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-2.5
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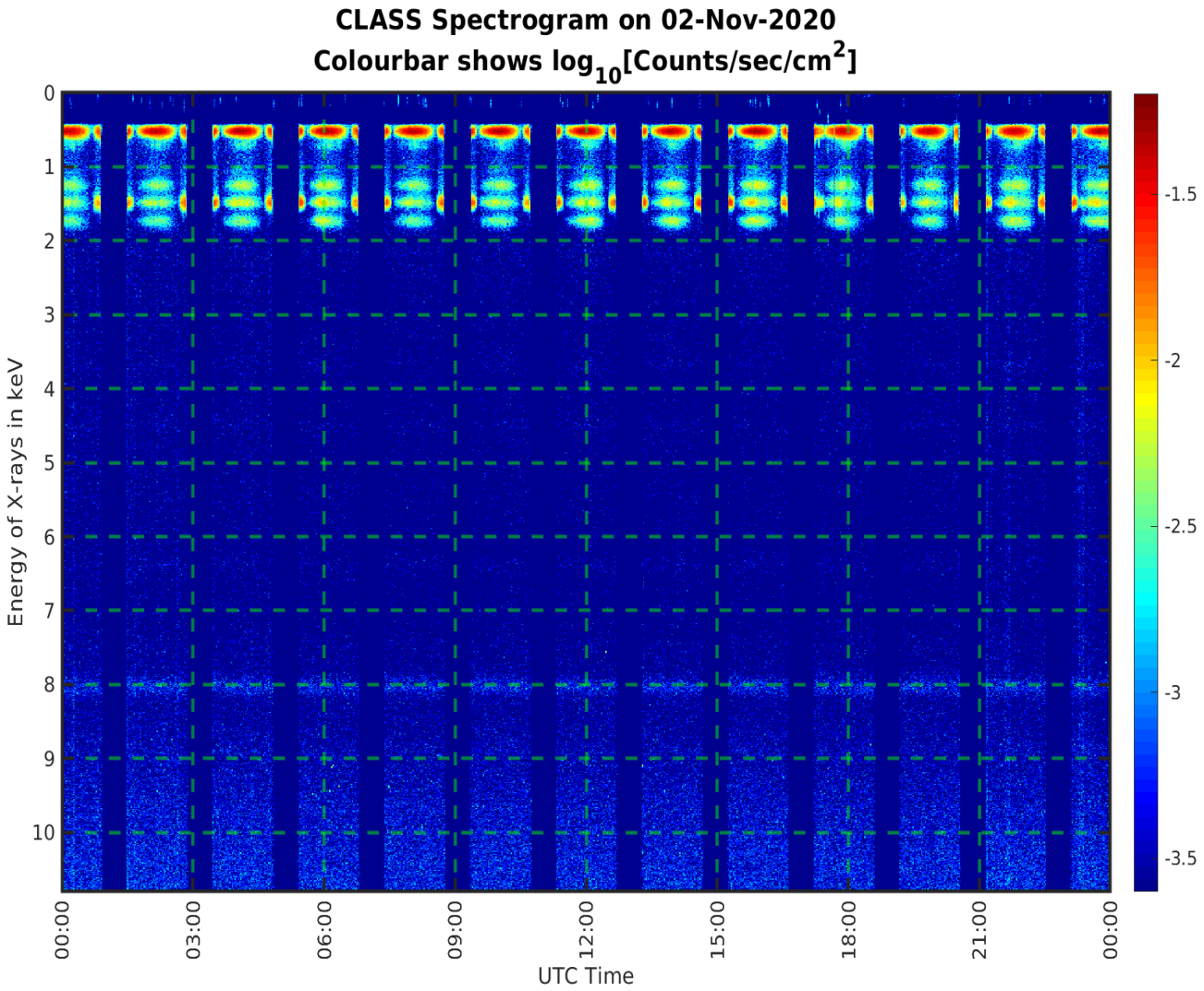
-3.5


CLASS Spectrogram on 02-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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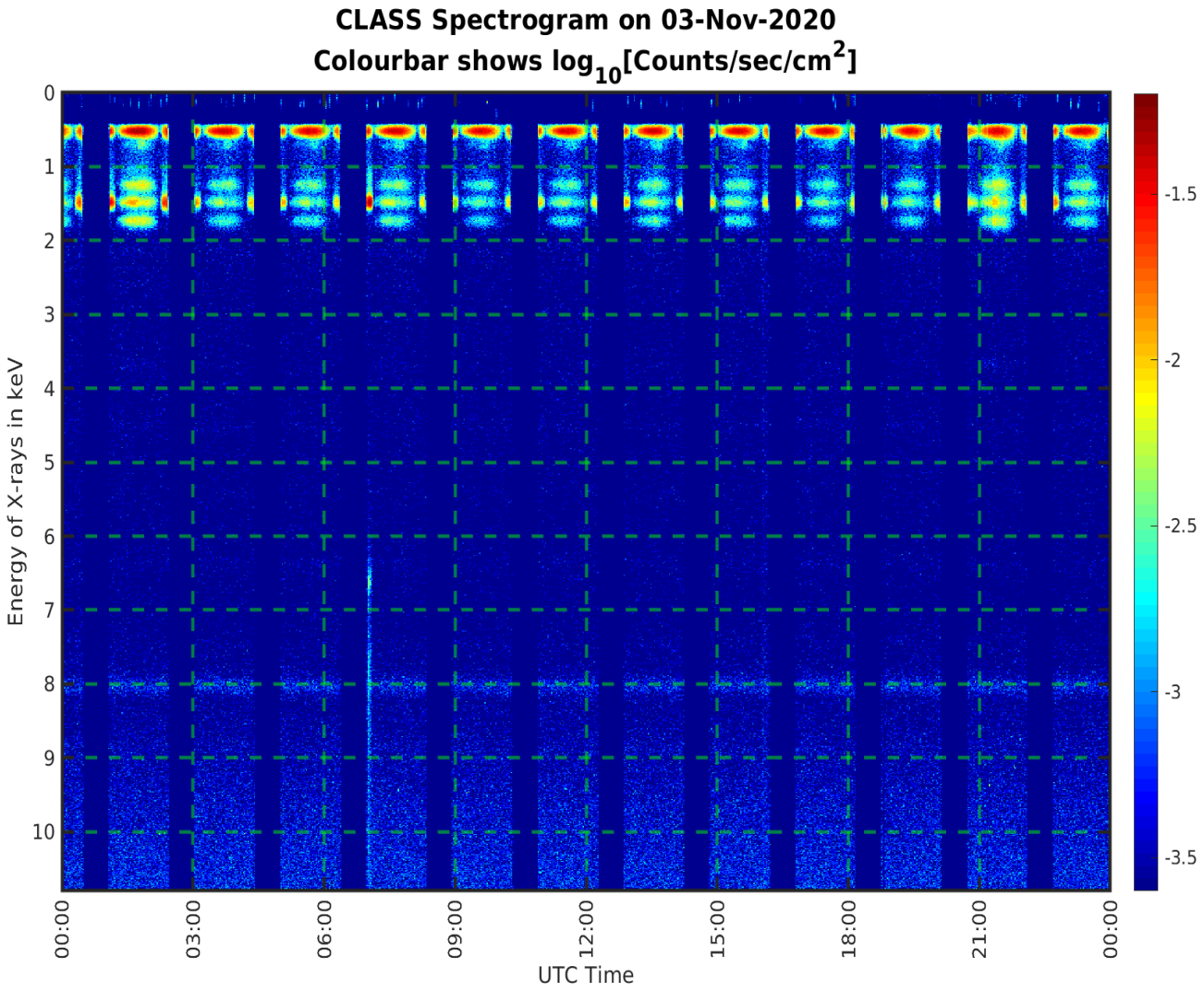
CLASS Spectrogram on 03-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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18:00
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UTC Time
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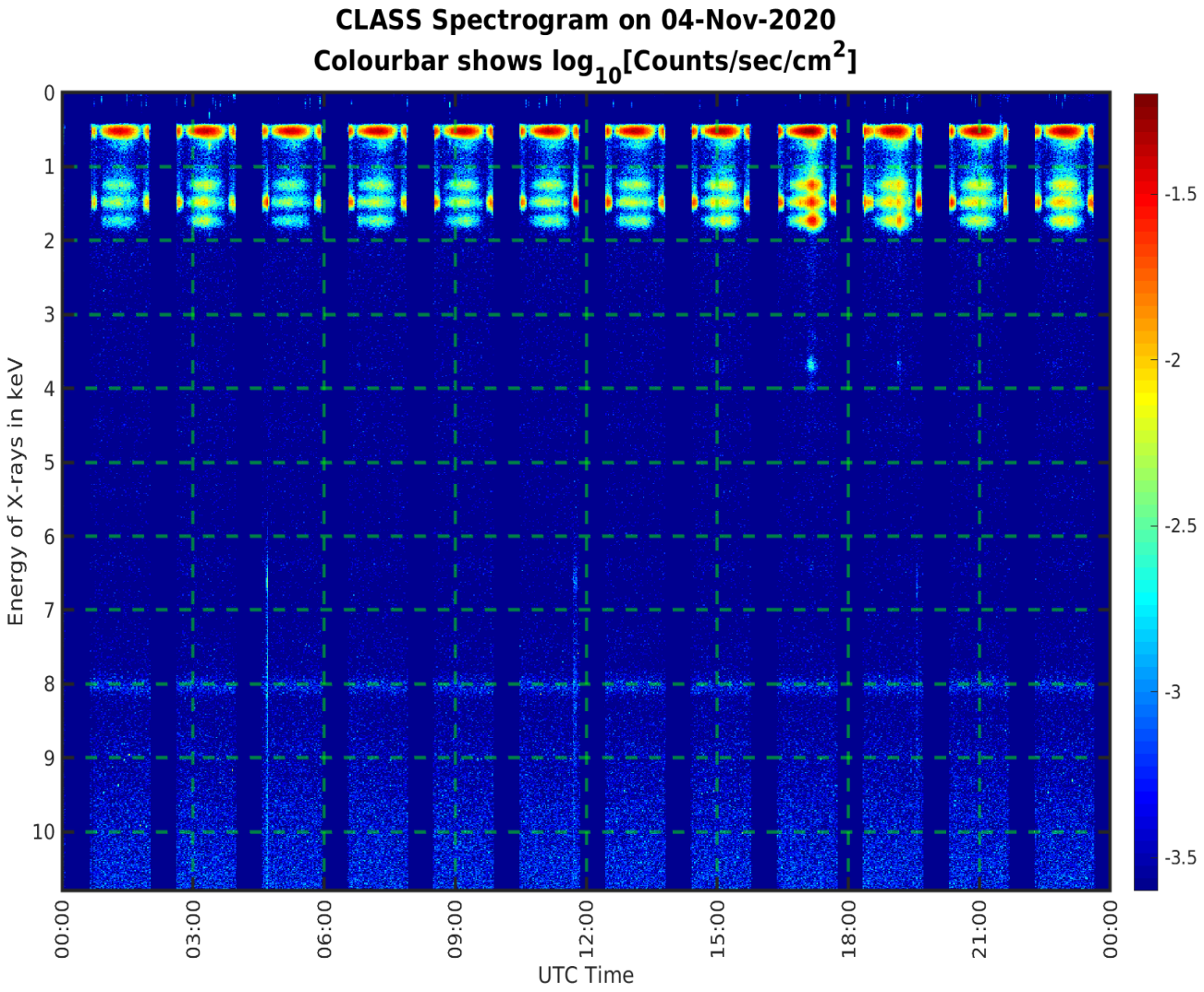
CLASS Spectrogram on 04-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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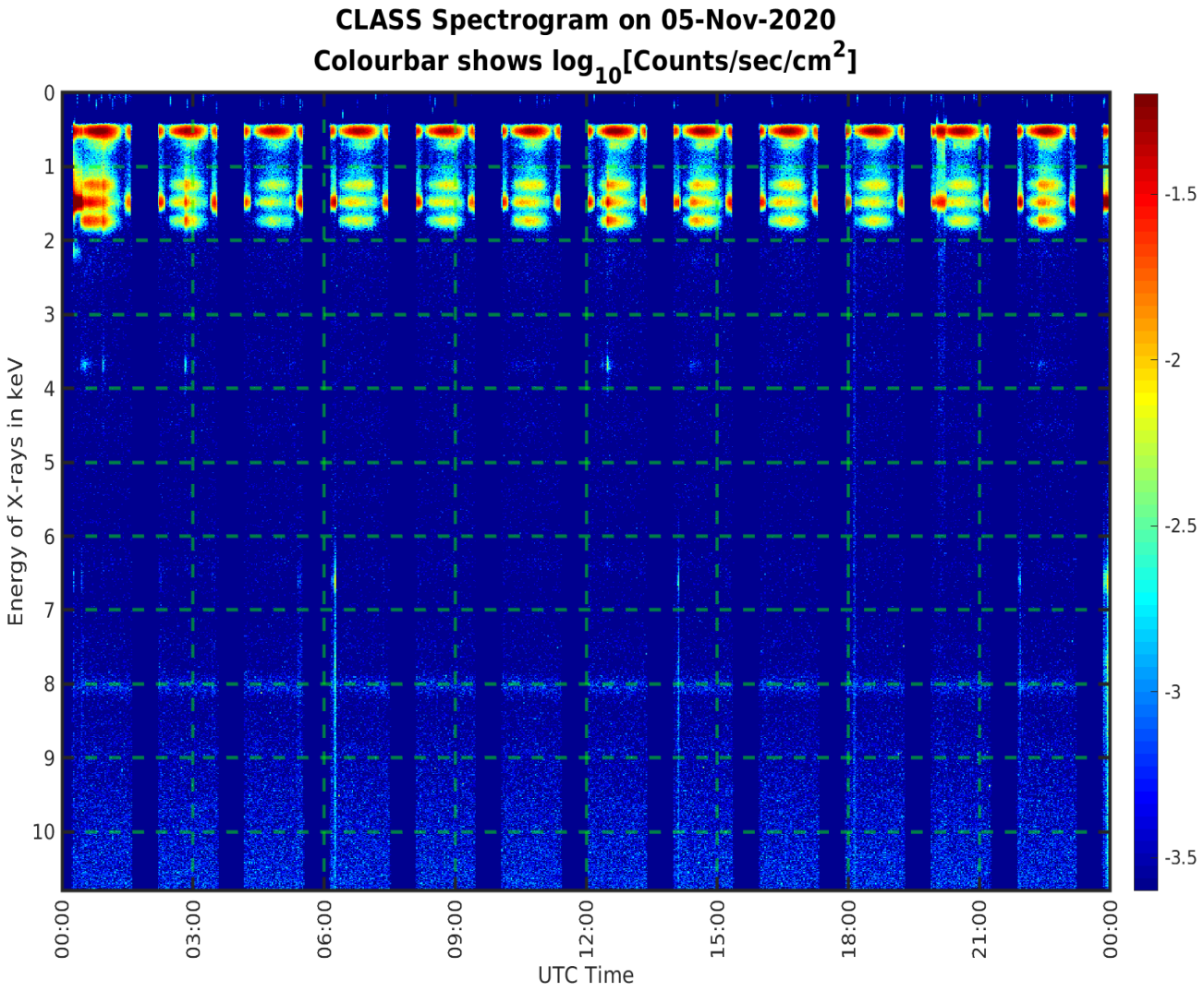
CLASS Spectrogram on 05-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
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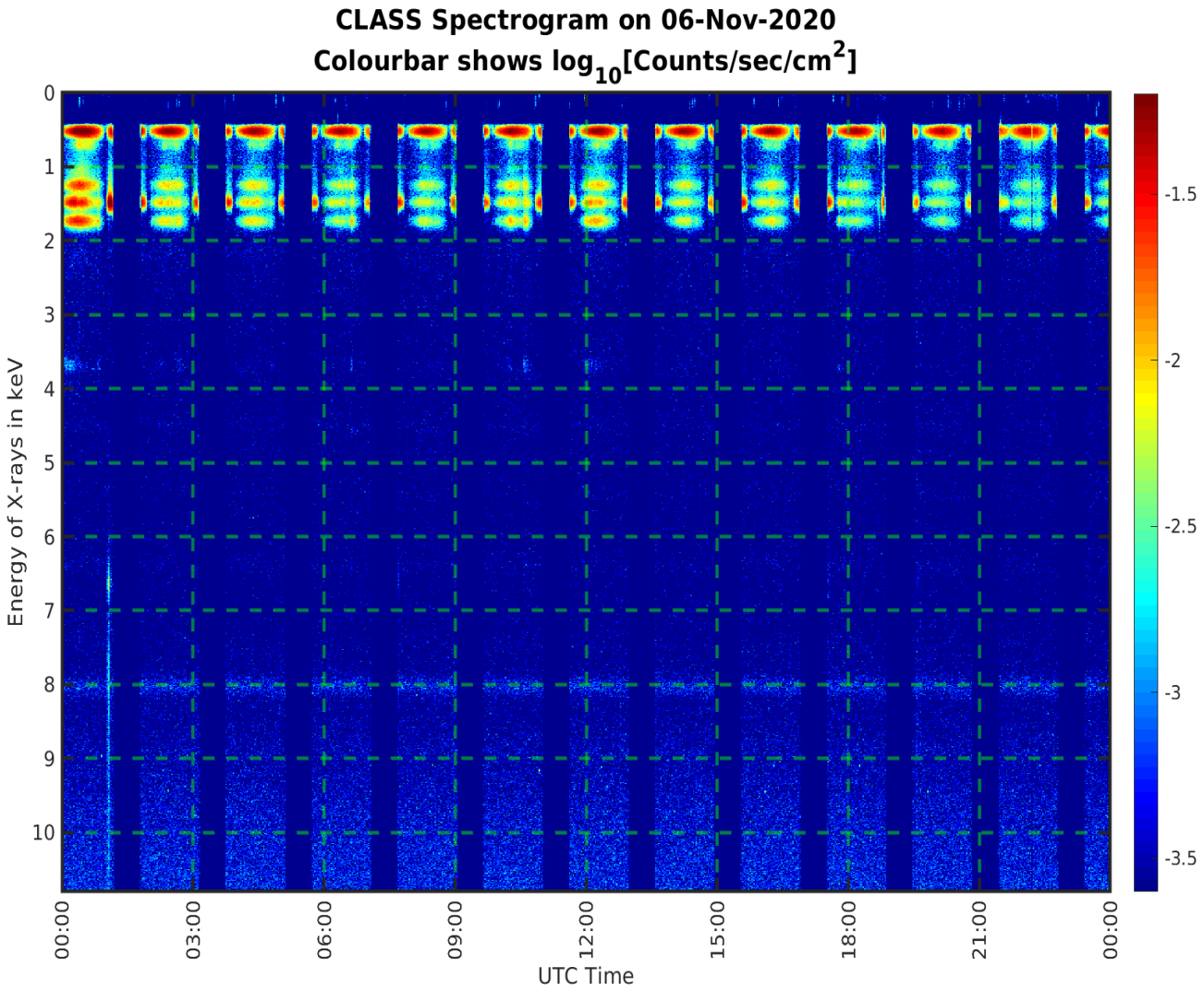
UTC Time


CLASS Spectrogram on 06-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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7
8
9
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-1.5
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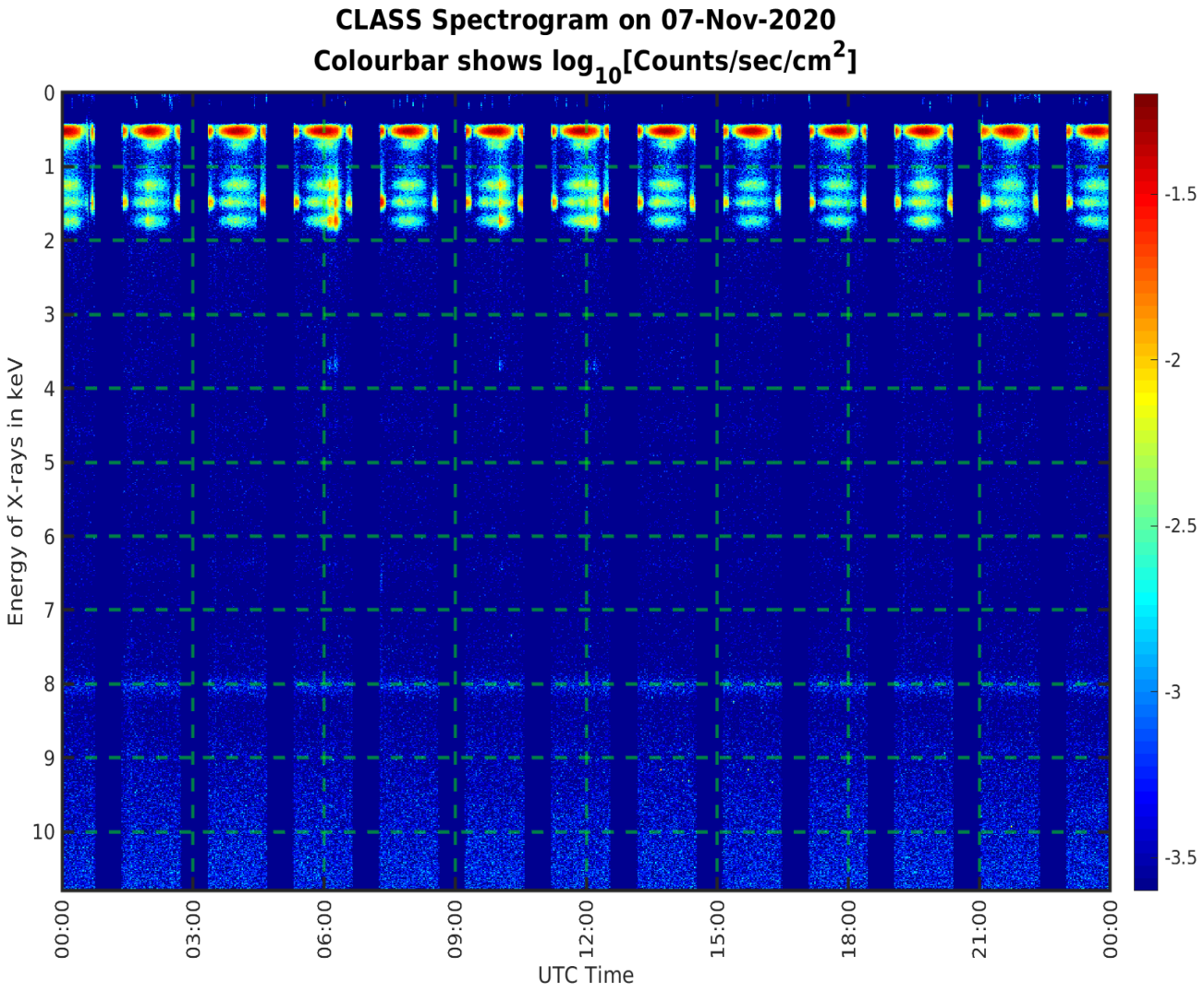
UTC Time


CLASS Spectrogram on 07-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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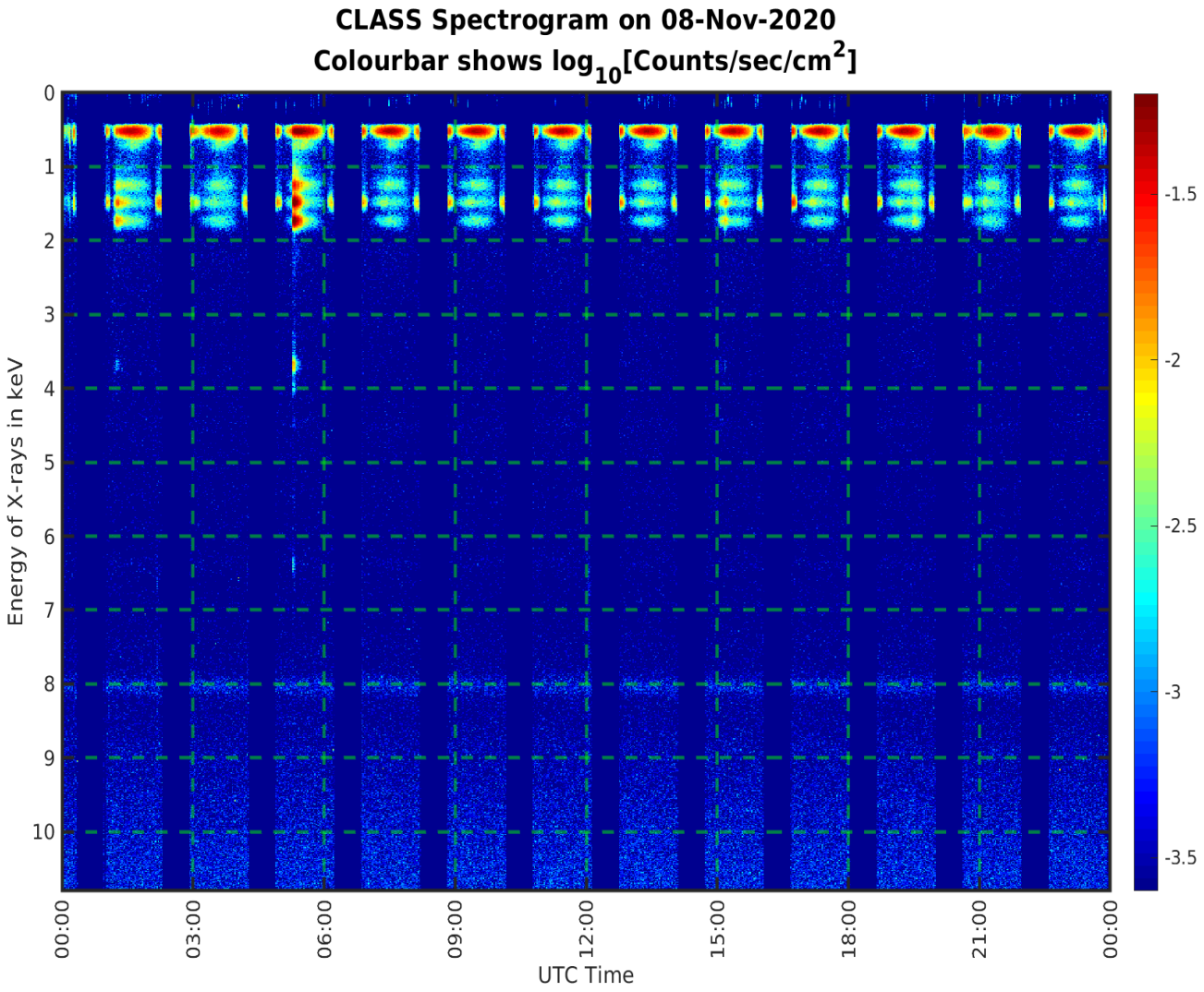
CLASS Spectrogram on 08-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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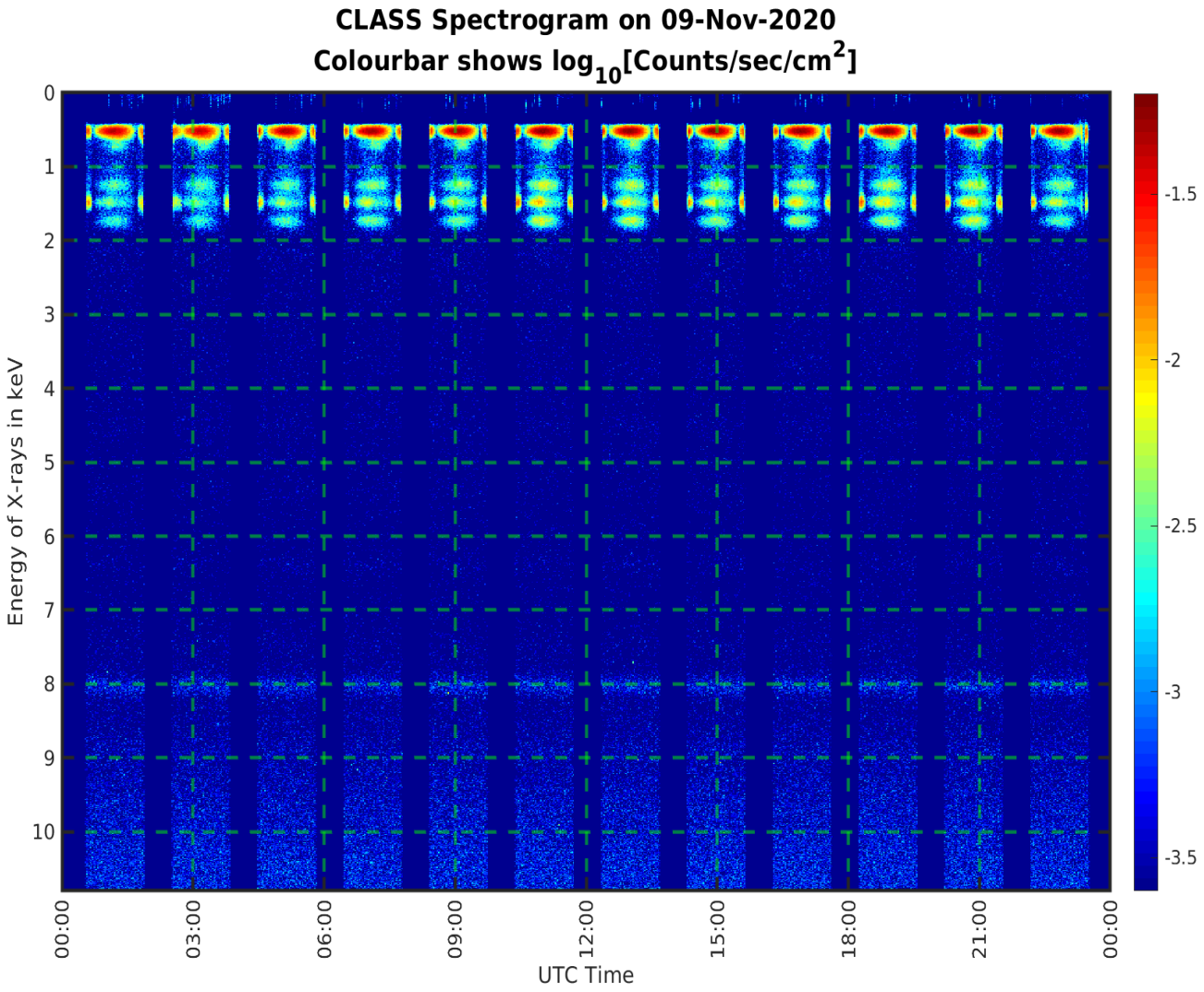
CLASS Spectrogram on 09-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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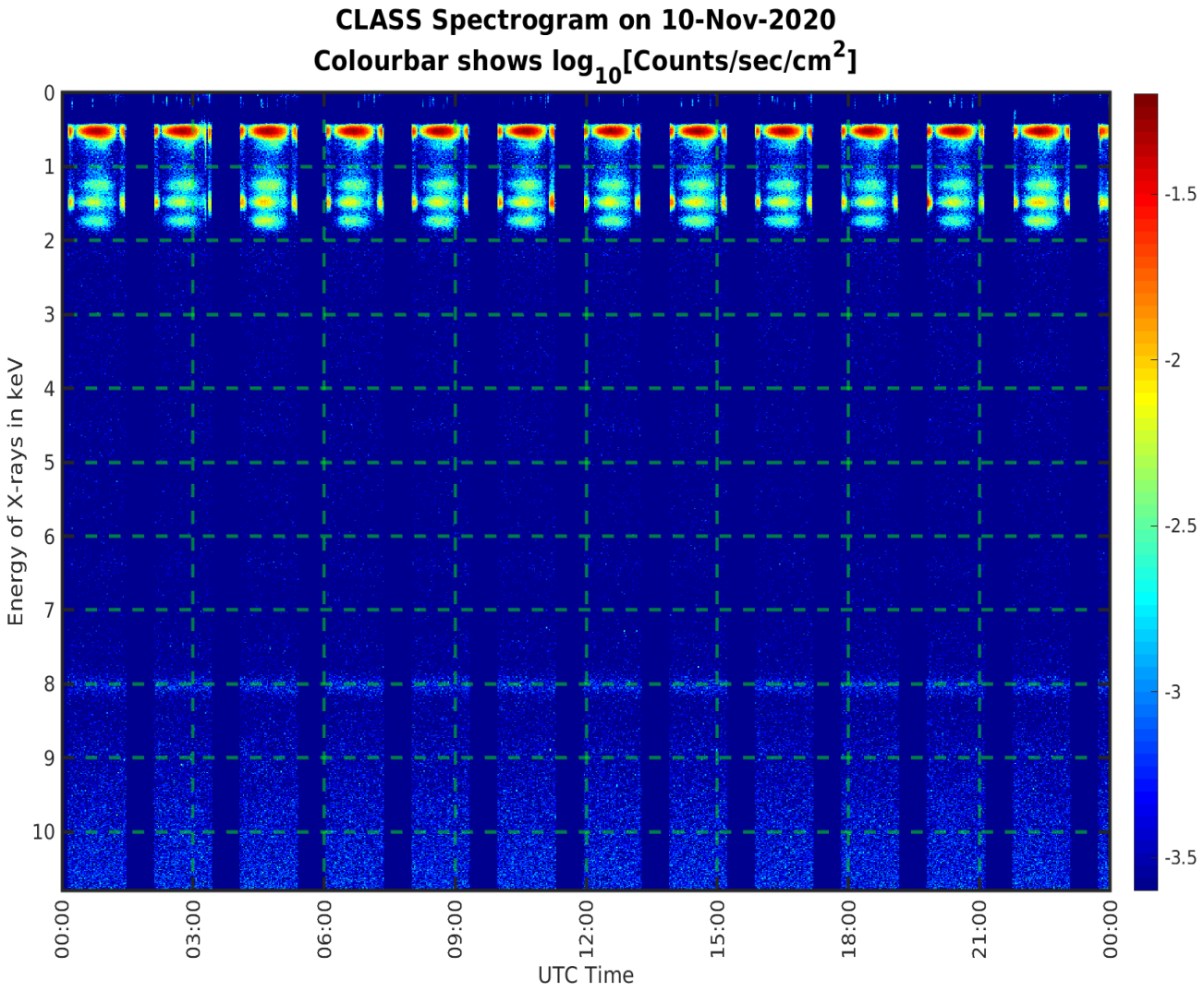
CLASS Spectrogram on 10-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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8
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-1.5
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-2.5
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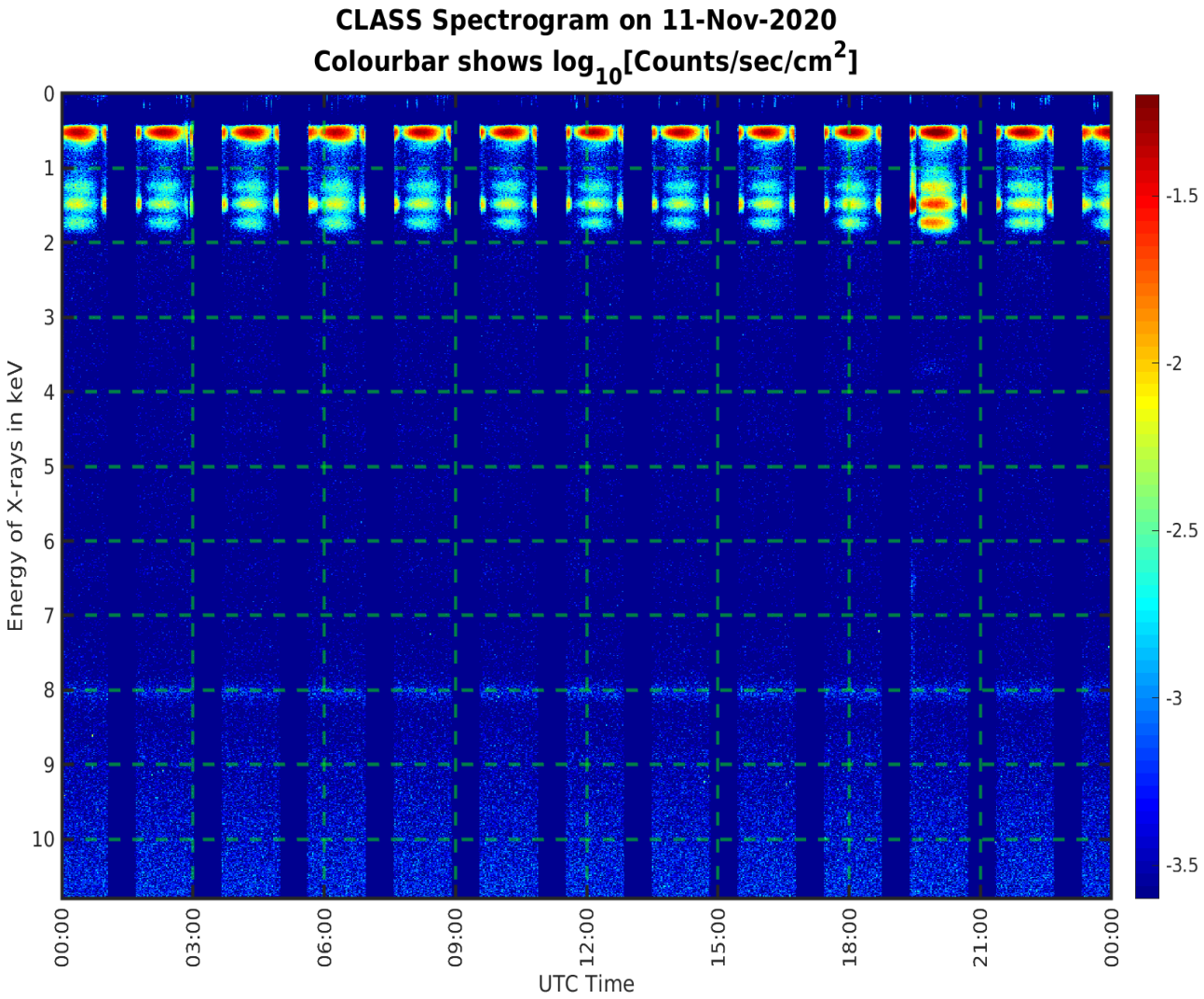
UTC Time


CLASS Spectrogram on 11-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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9
10
-1.5
-2
-2.5
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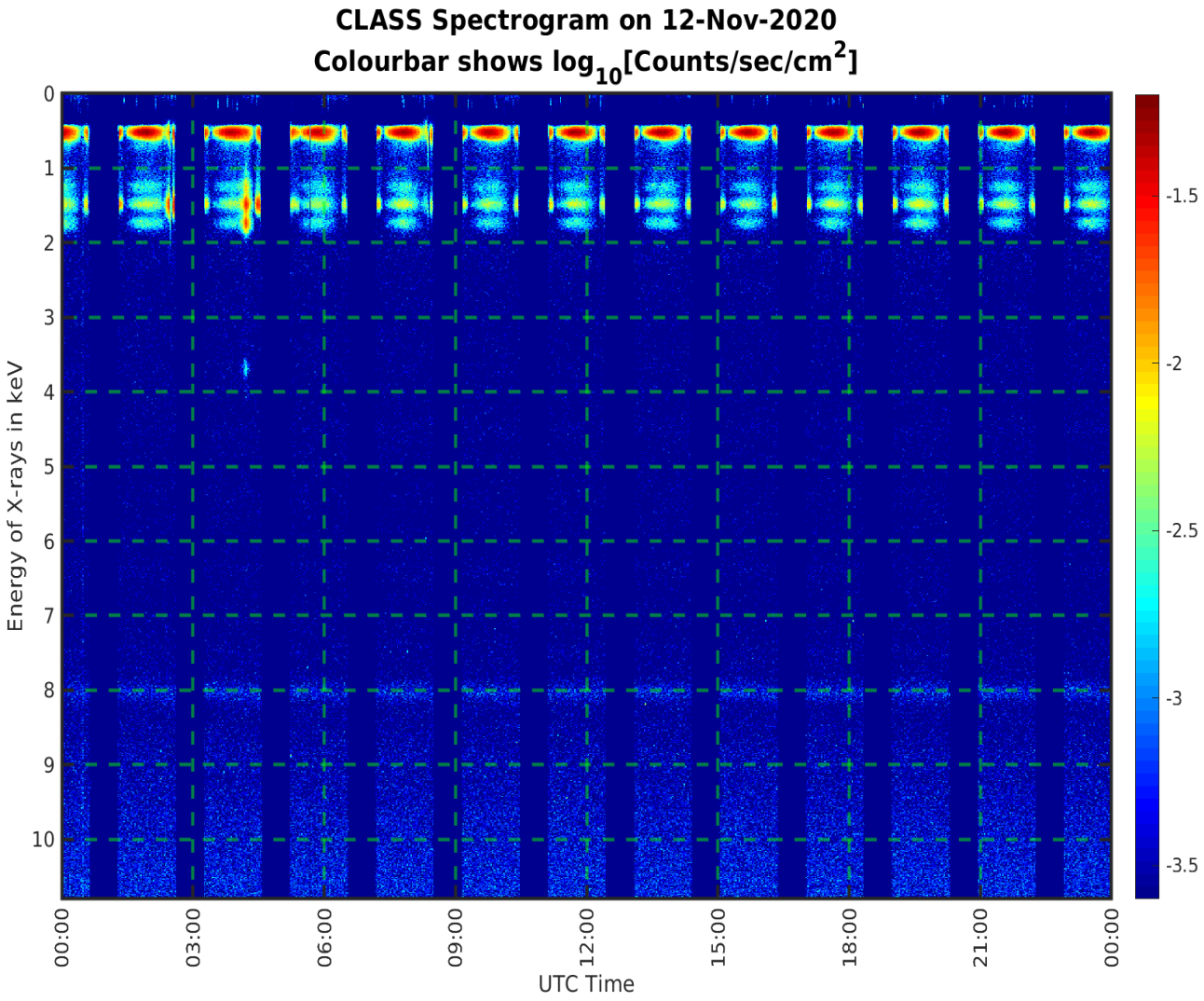
UTC Time


CLASS Spectrogram on 12-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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8
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-1.5
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-2.5
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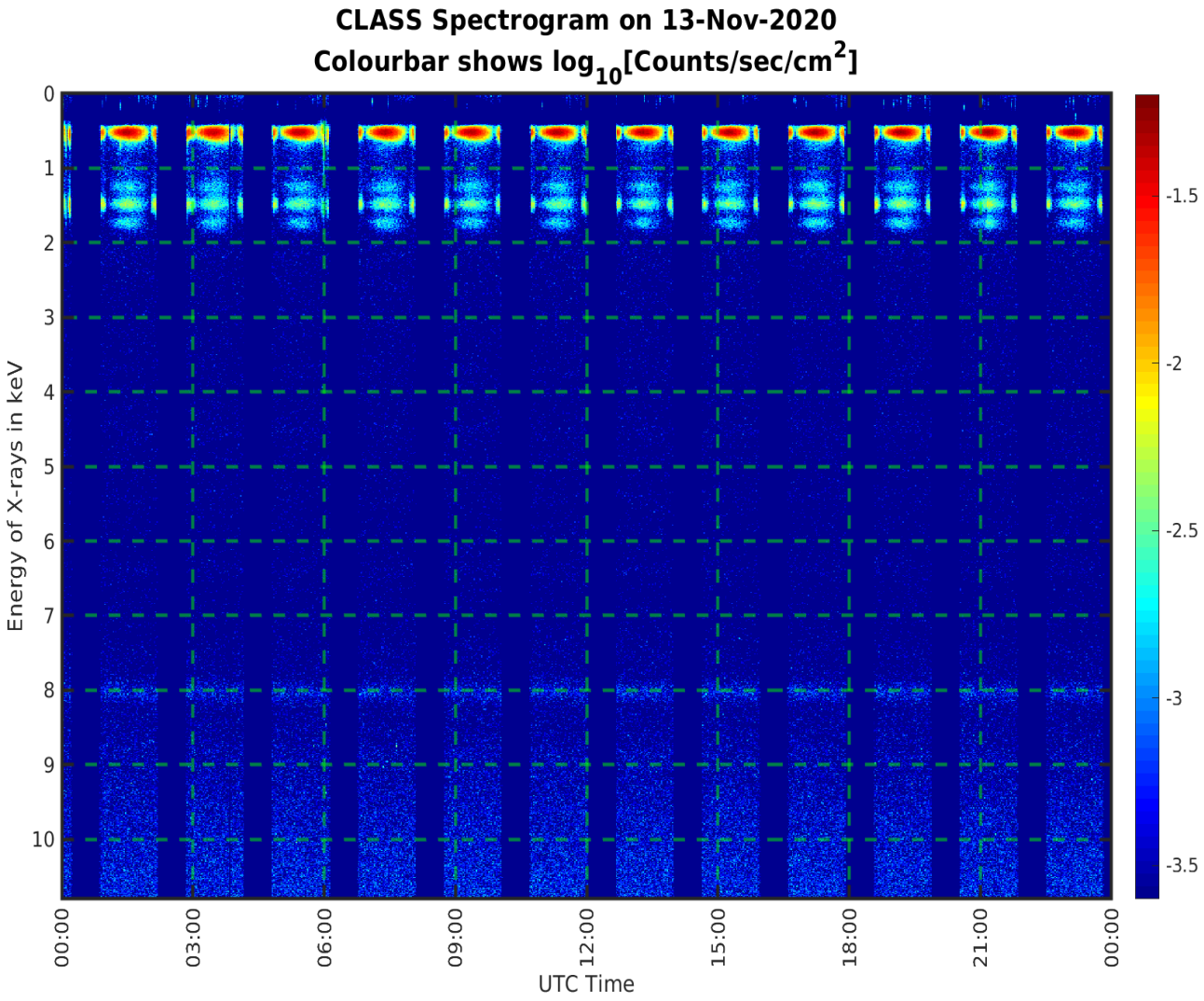
UTC Time


CLASS Spectrogram on 13-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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03:00
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-2.5
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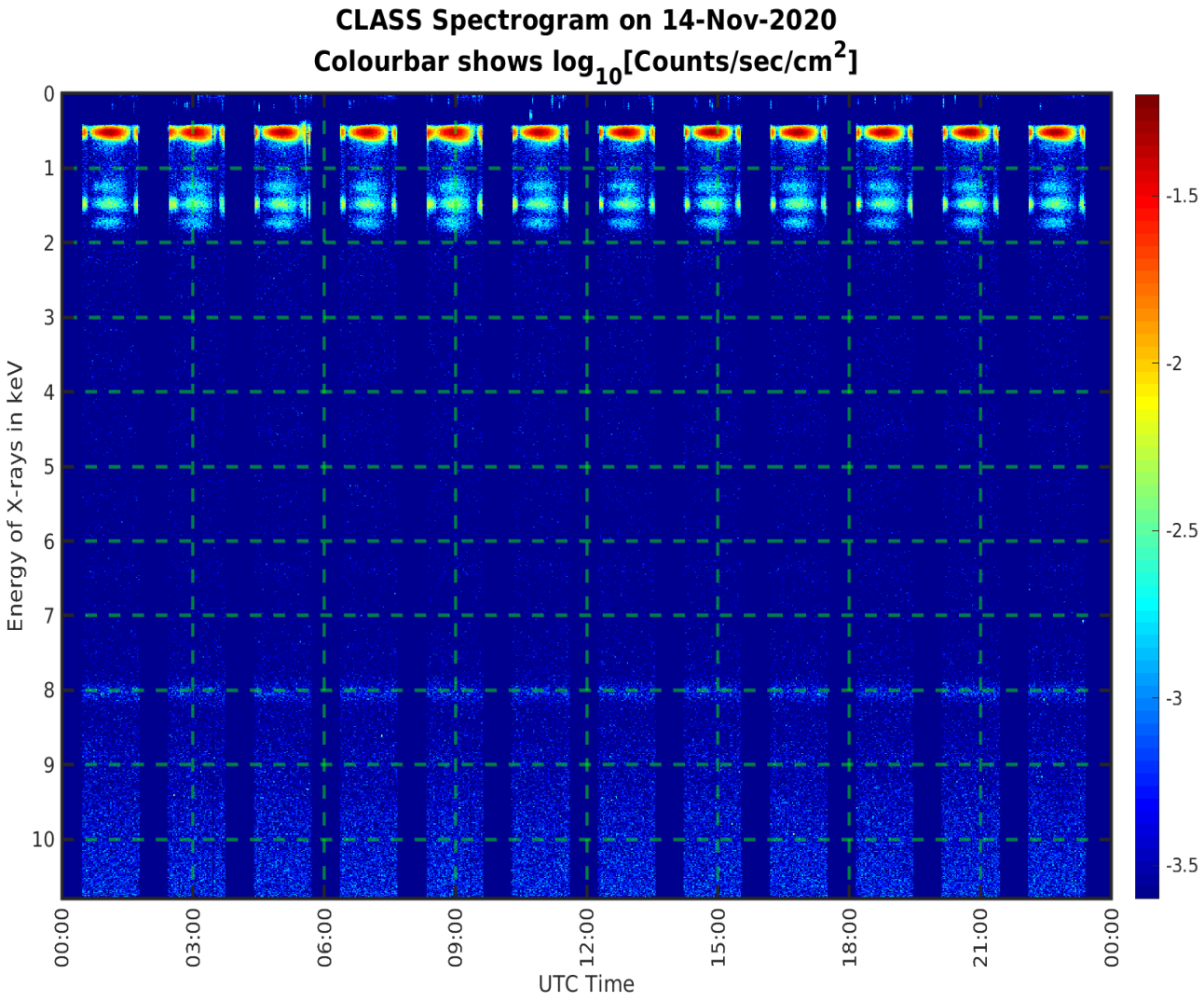
-3.5


CLASS Spectrogram on 14-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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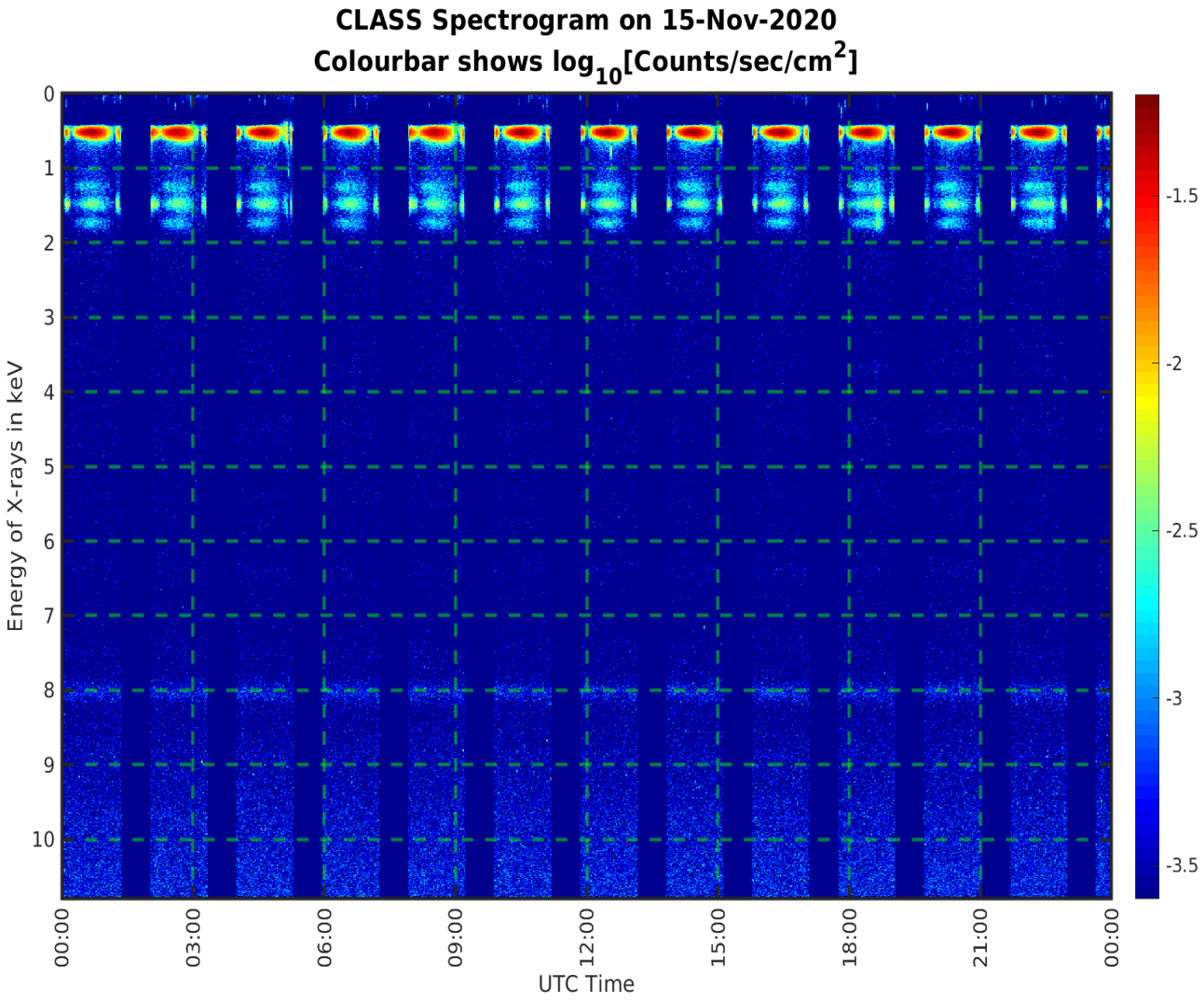
CLASS Spectrogram on 15-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
-2
-2.5
-3
-3.5
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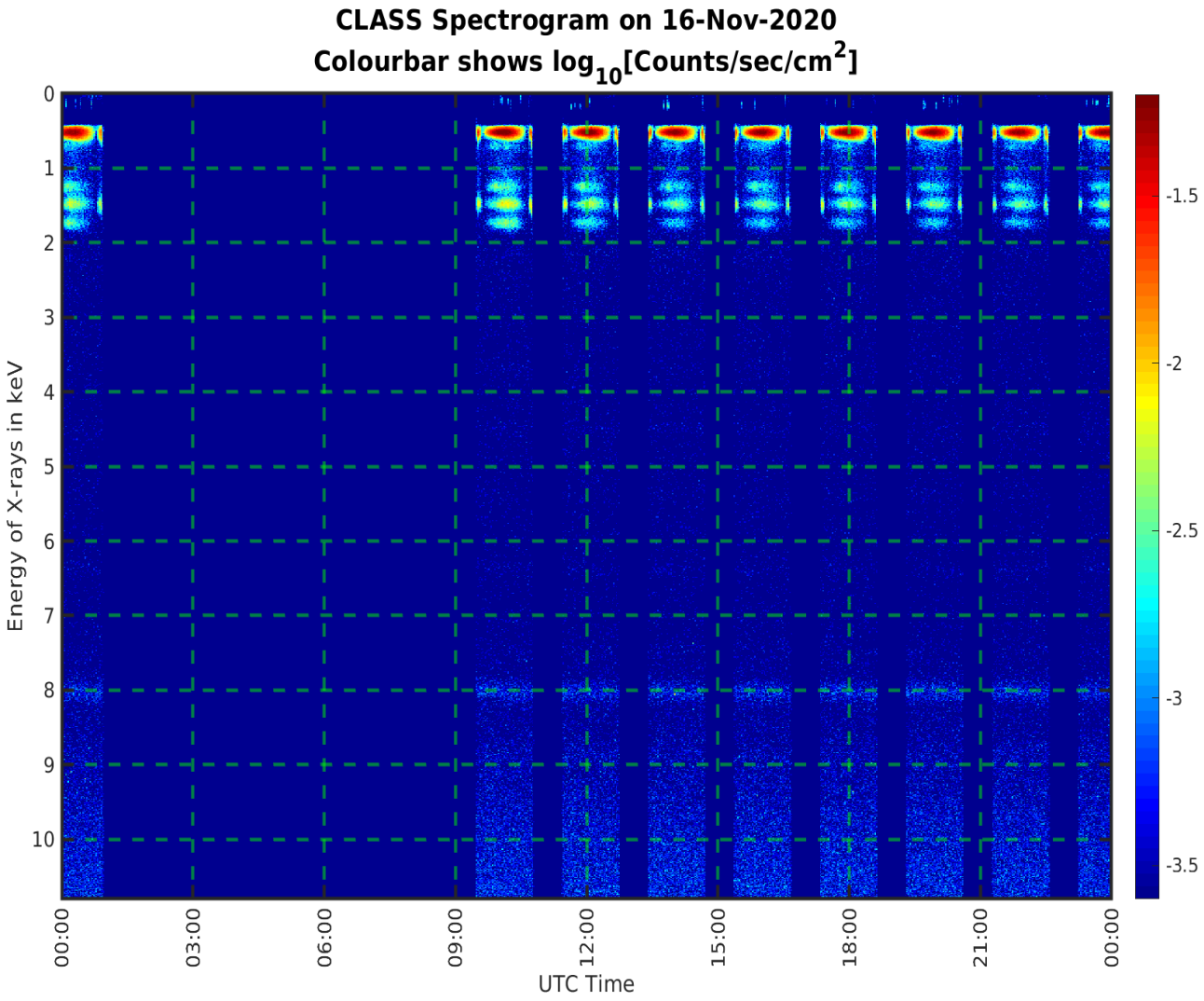
UTC Time


CLASS Spectrogram on 16-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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UTC Time
-1.5
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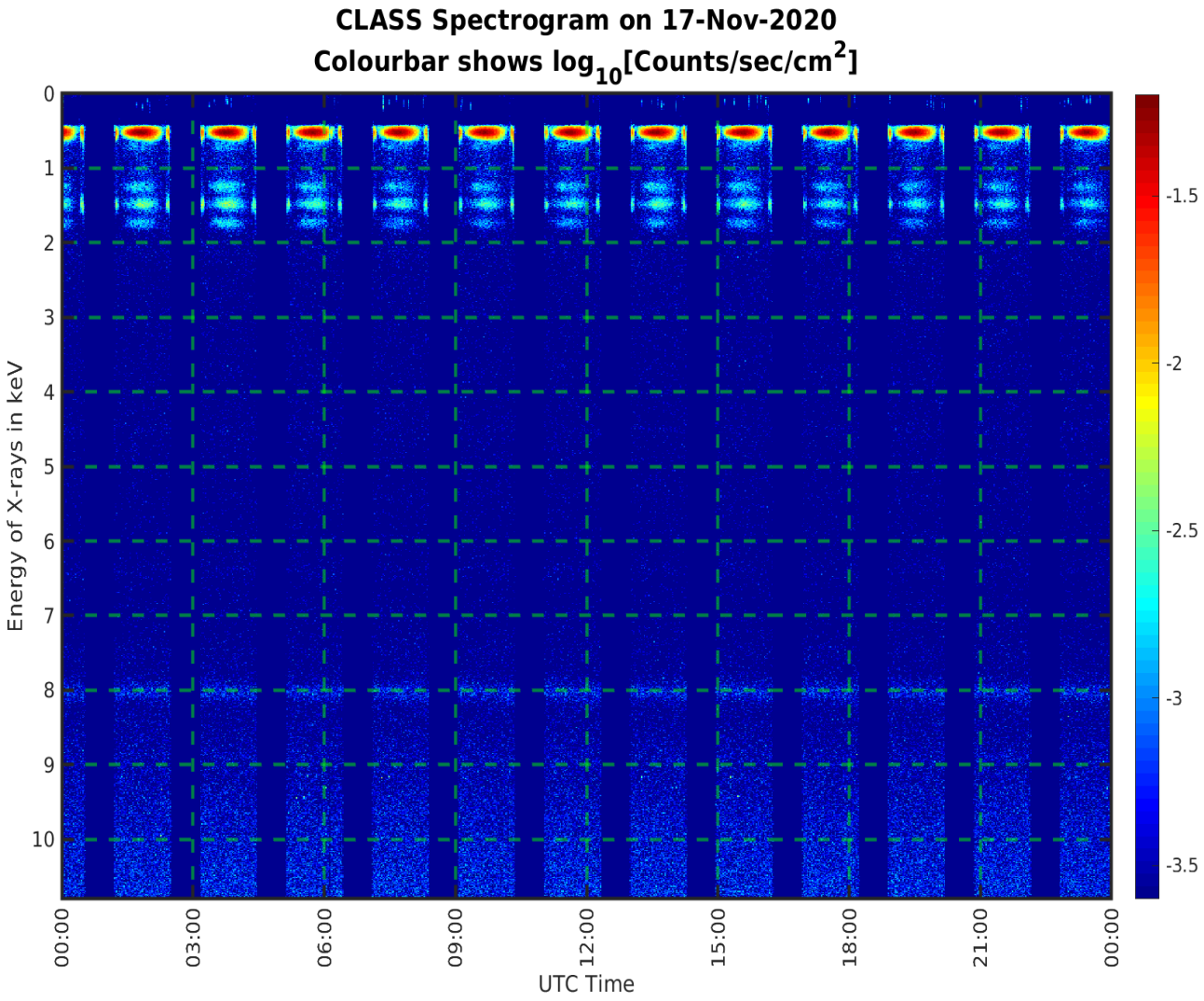
-3.5


CLASS Spectrogram on 17-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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09:00
12:00
15:00
18:00
21:00
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UTC Time
-1.5
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-2.5
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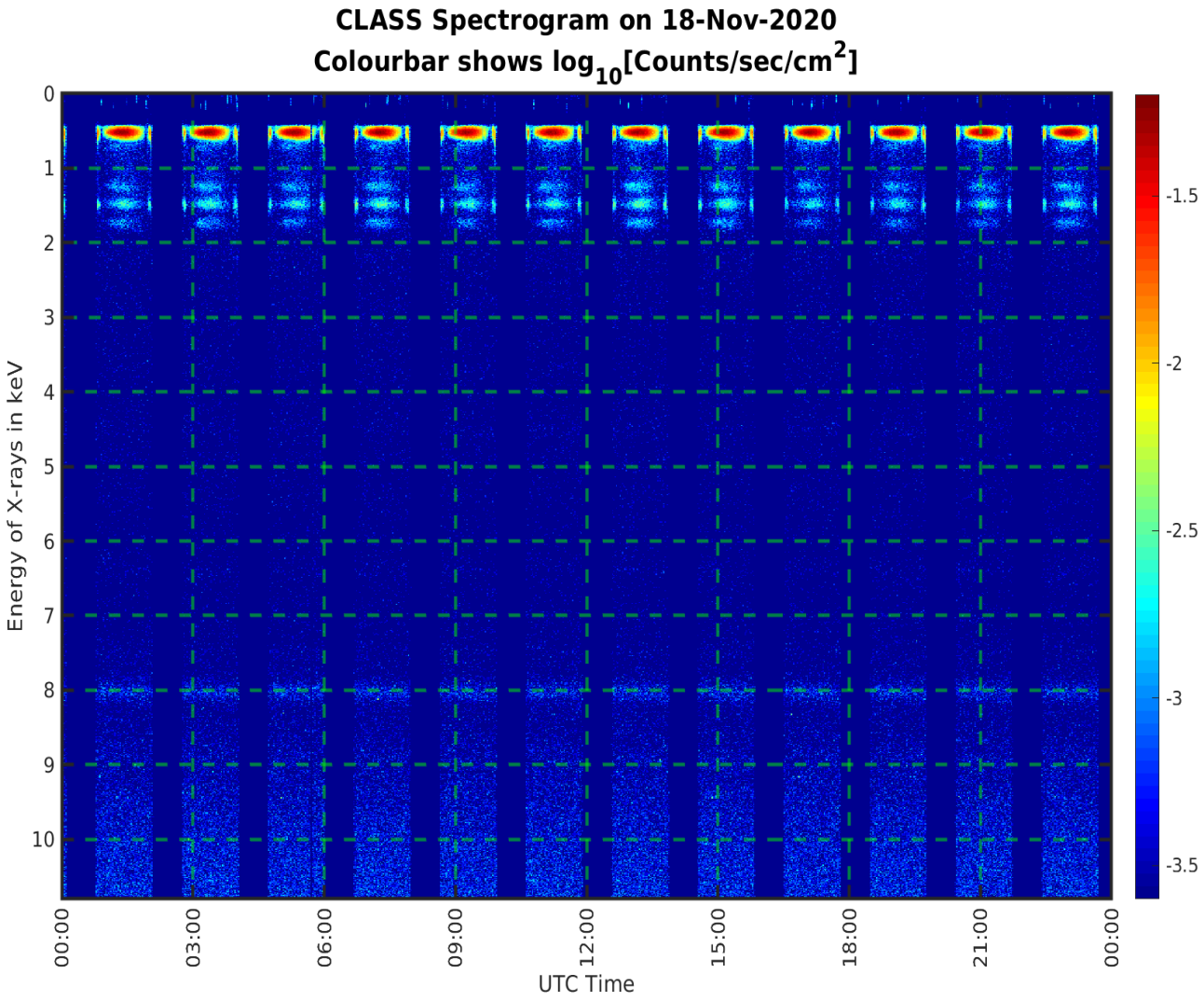
-3.5


CLASS Spectrogram on 18-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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UTC Time
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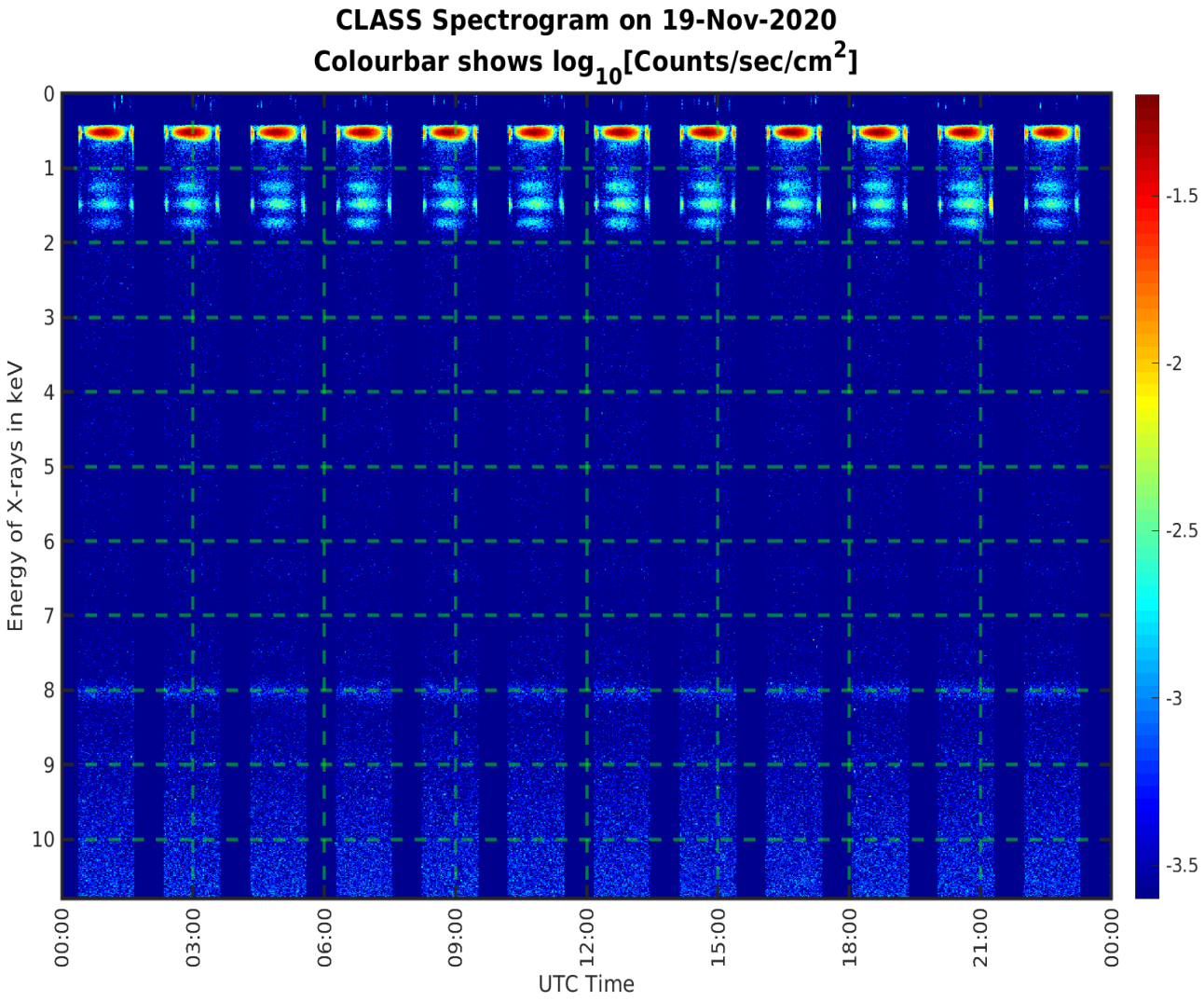
-3.5


CLASS Spectrogram on 19-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
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-3.5
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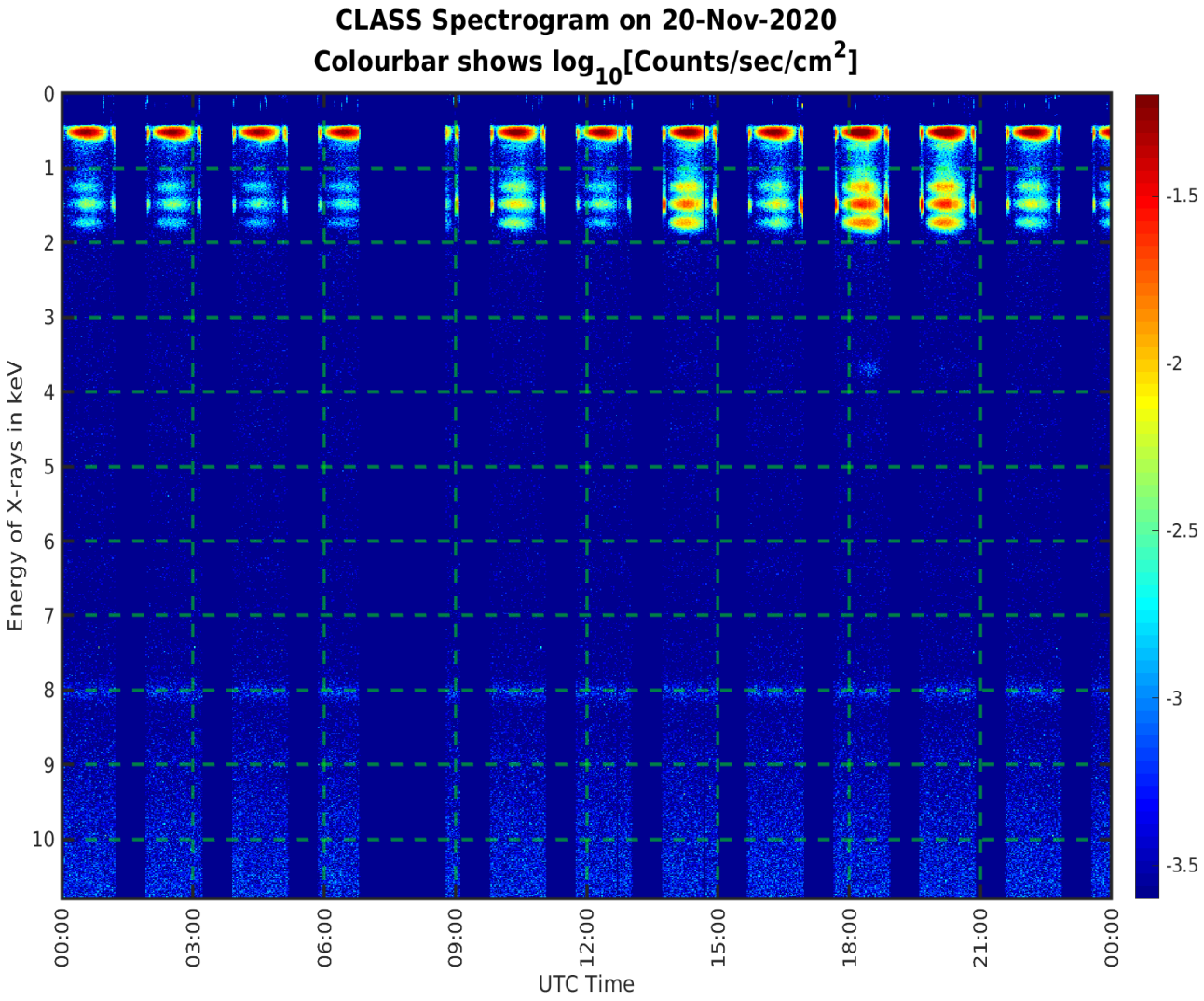
UTC Time


CLASS Spectrogram on 20-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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10
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03:00
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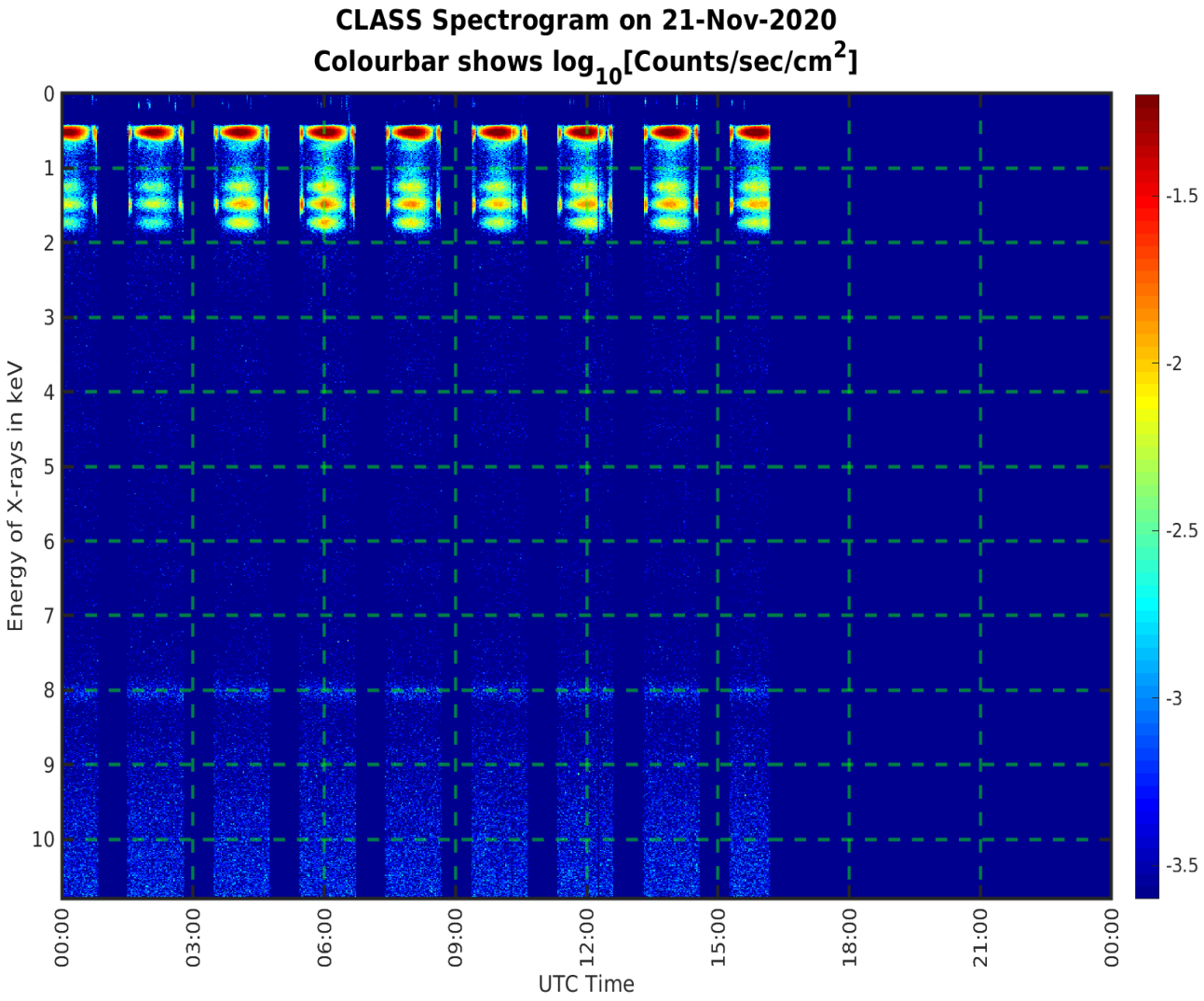
CLASS Spectrogram on 21-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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10
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03:00
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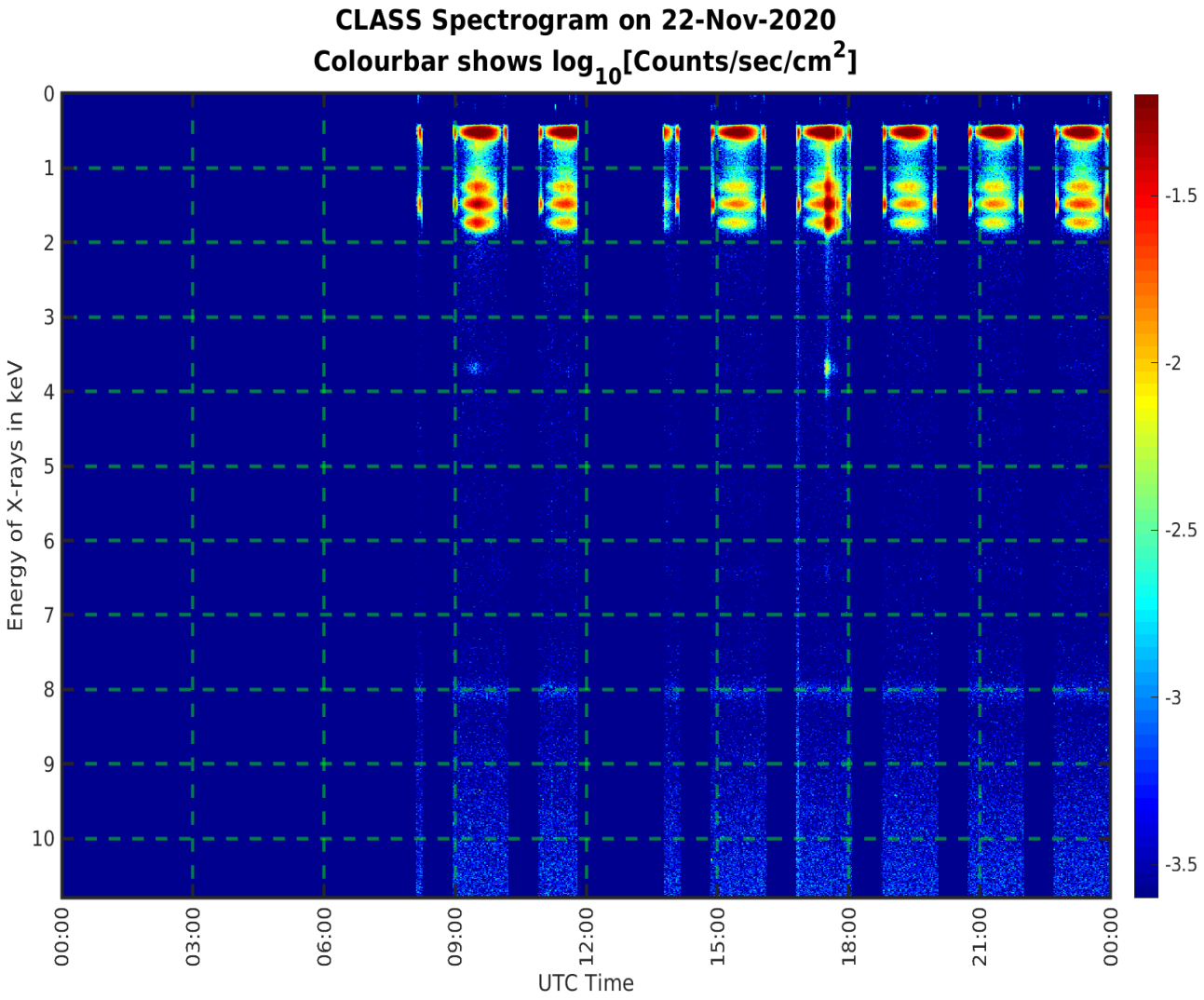
CLASS Spectrogram on 22-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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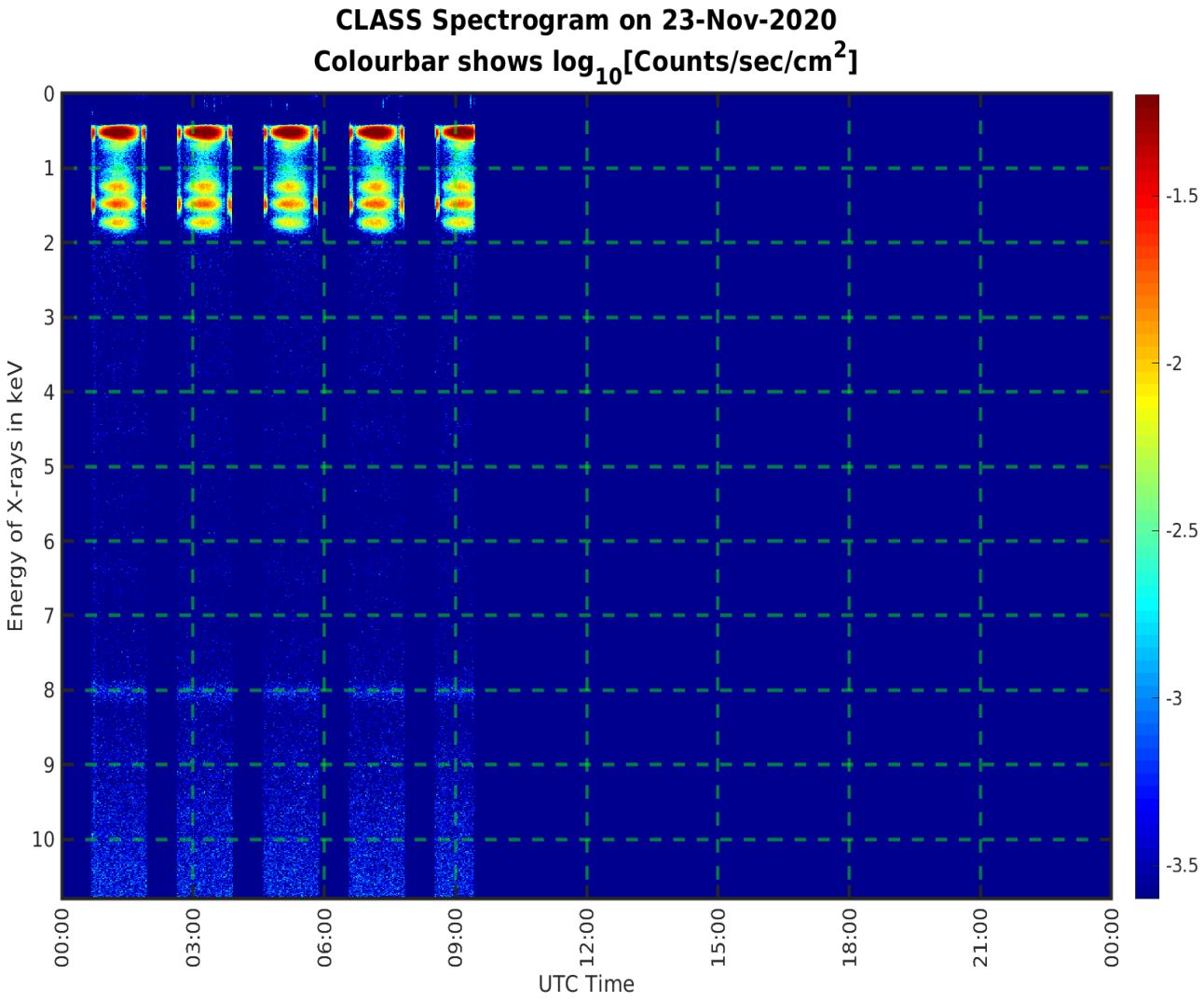
CLASS Spectrogram on 23-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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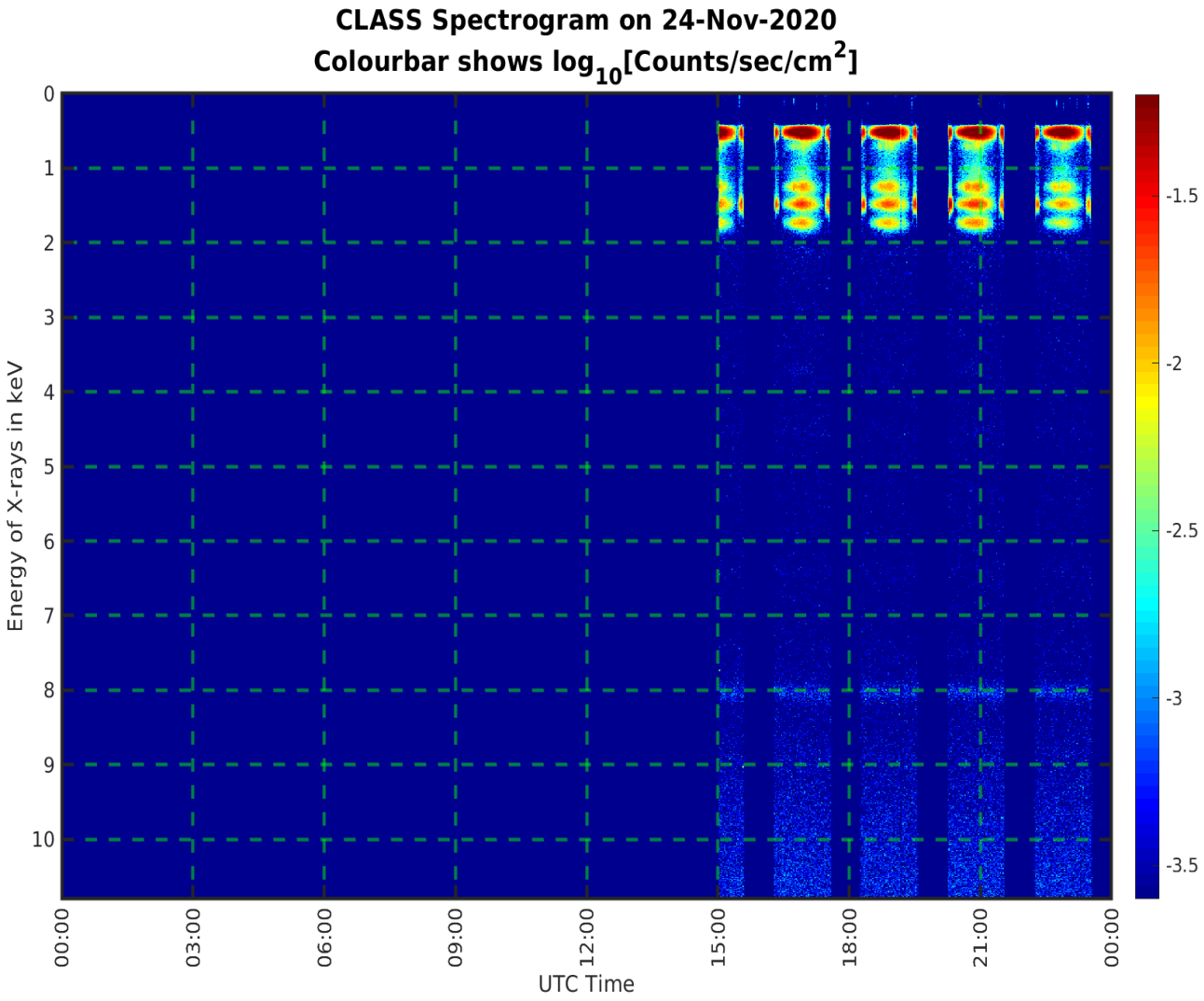
CLASS Spectrogram on 24-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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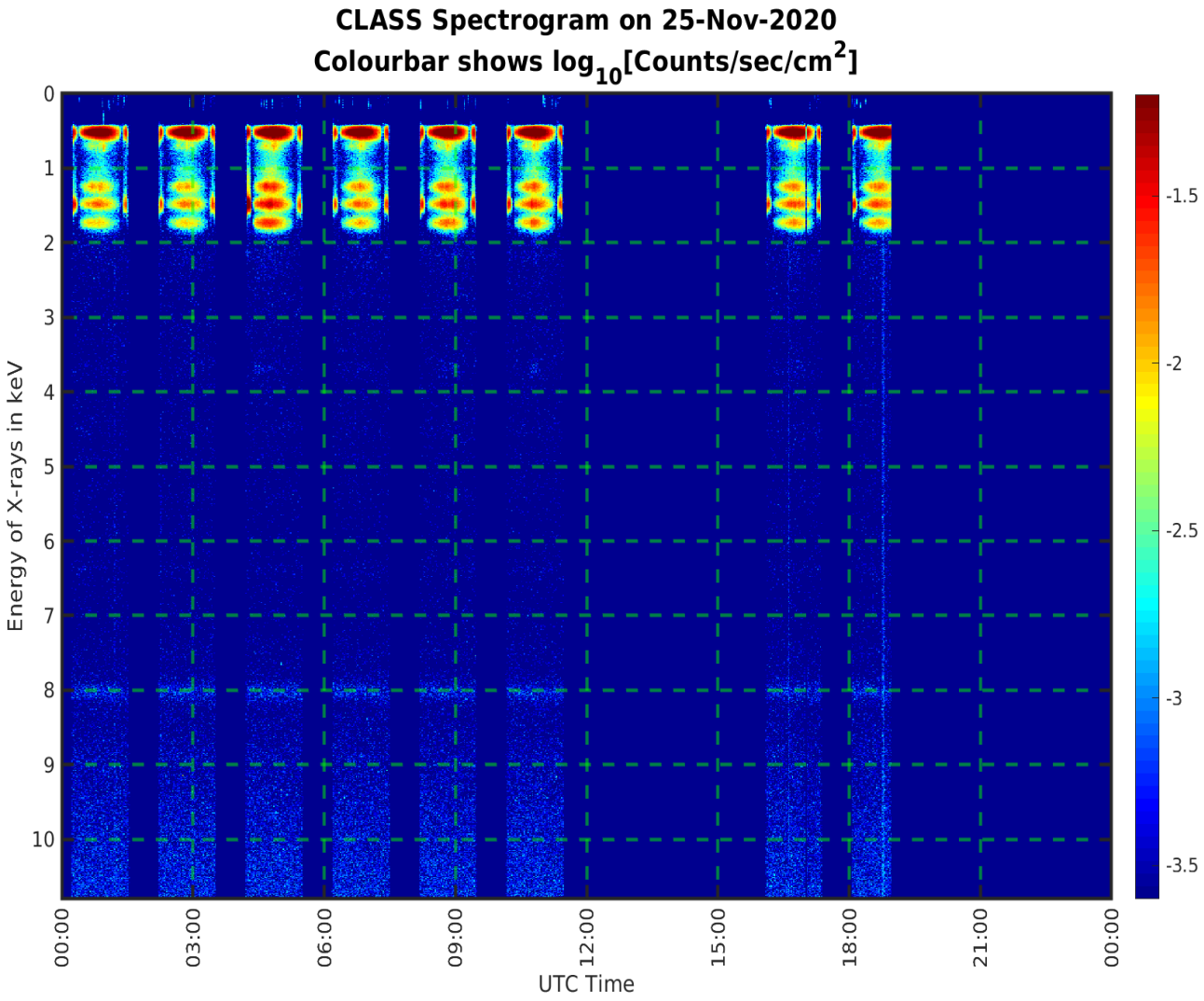
CLASS Spectrogram on 25-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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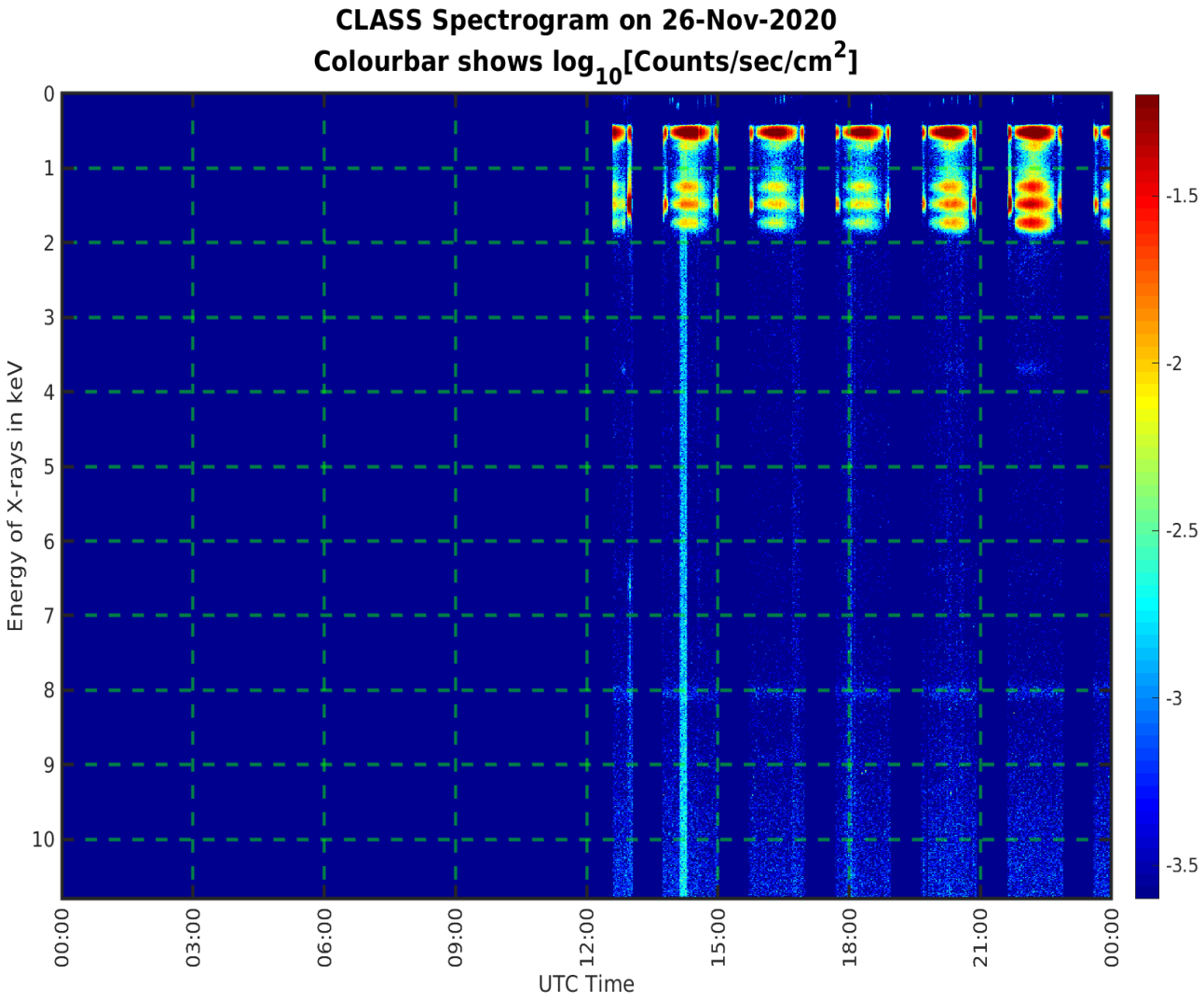
CLASS Spectrogram on 26-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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UTC Time
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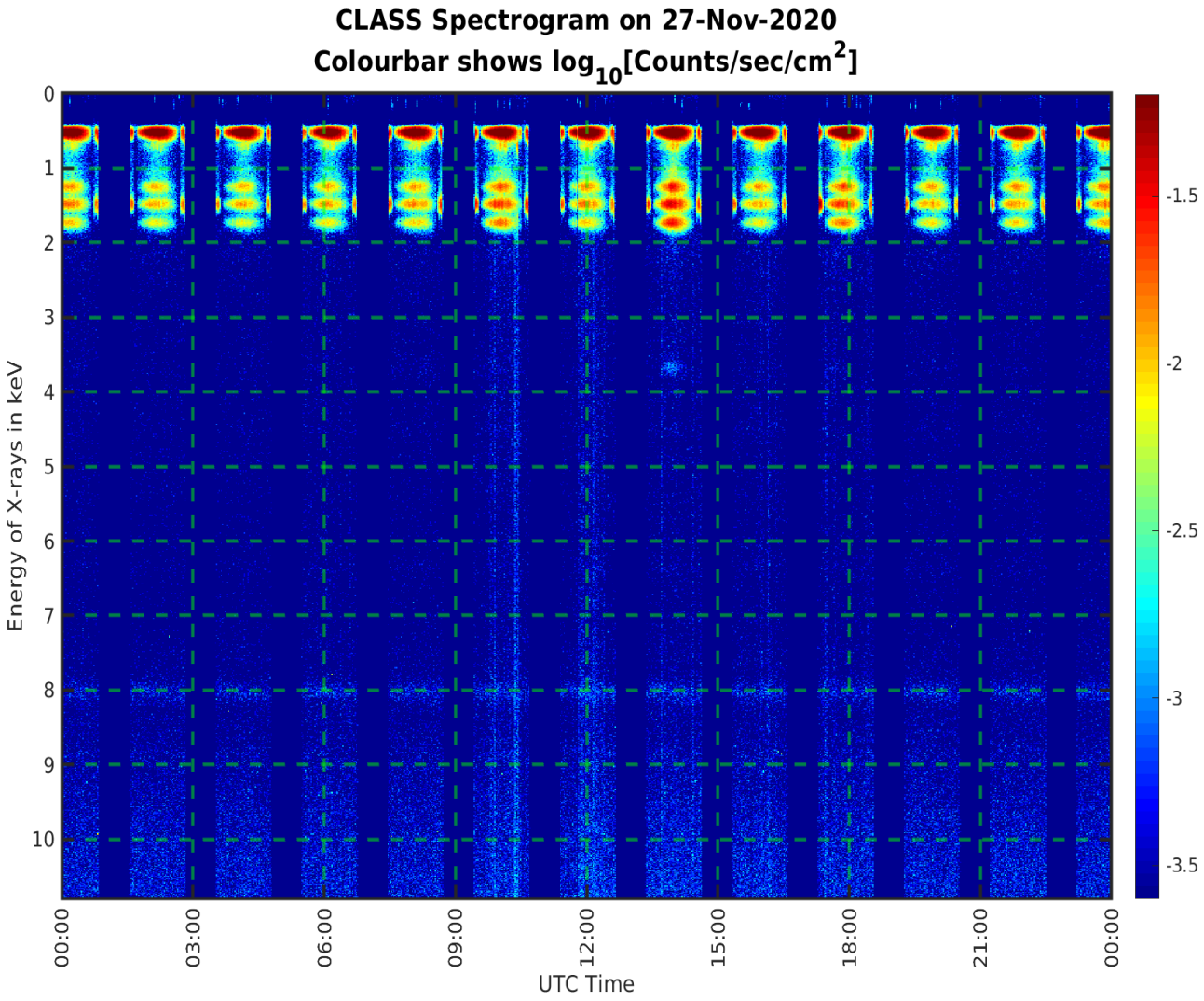
CLASS Spectrogram on 27-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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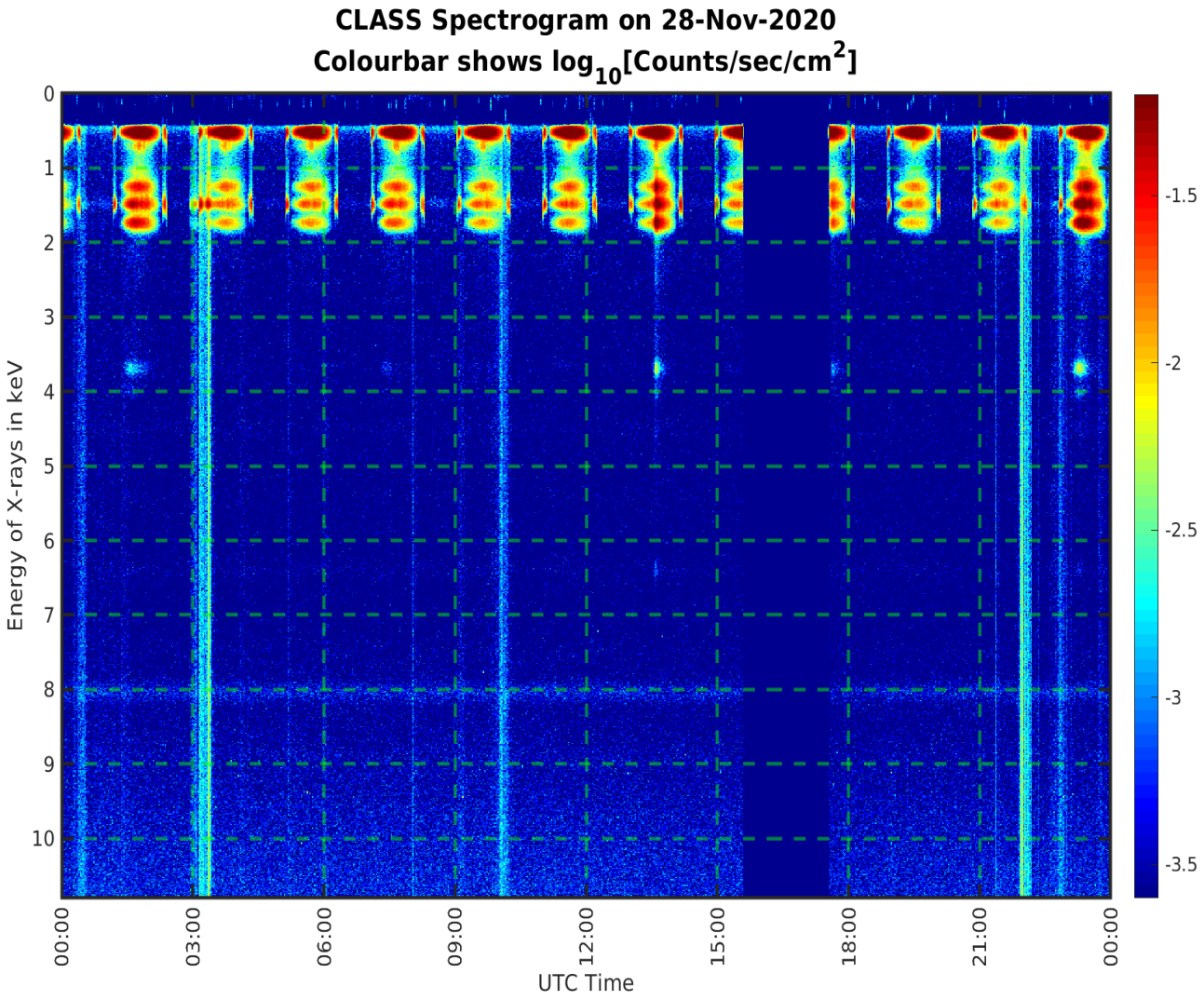
CLASS Spectrogram on 28-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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-1.5
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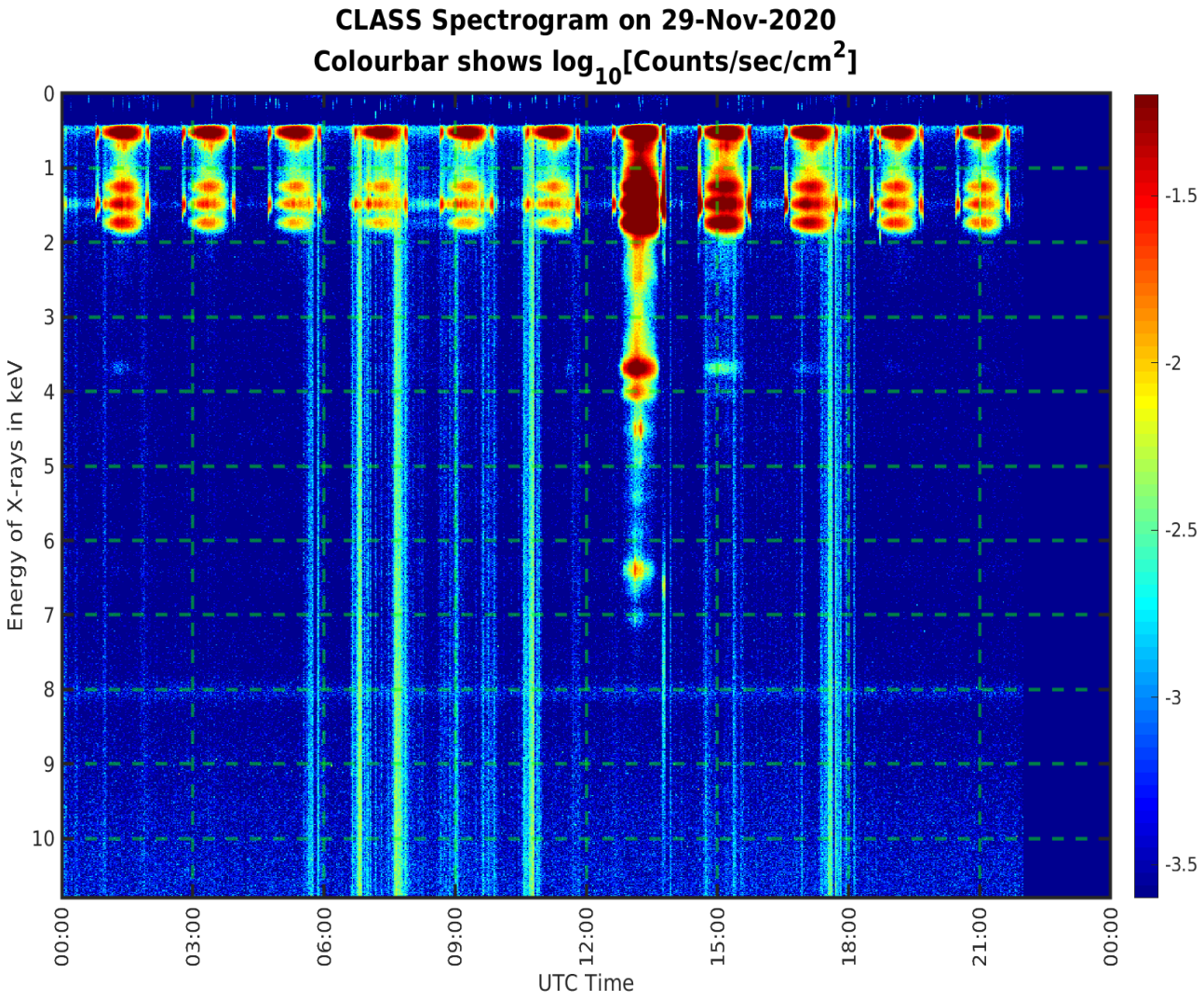
UTC Time


CLASS Spectrogram on 29-Nov-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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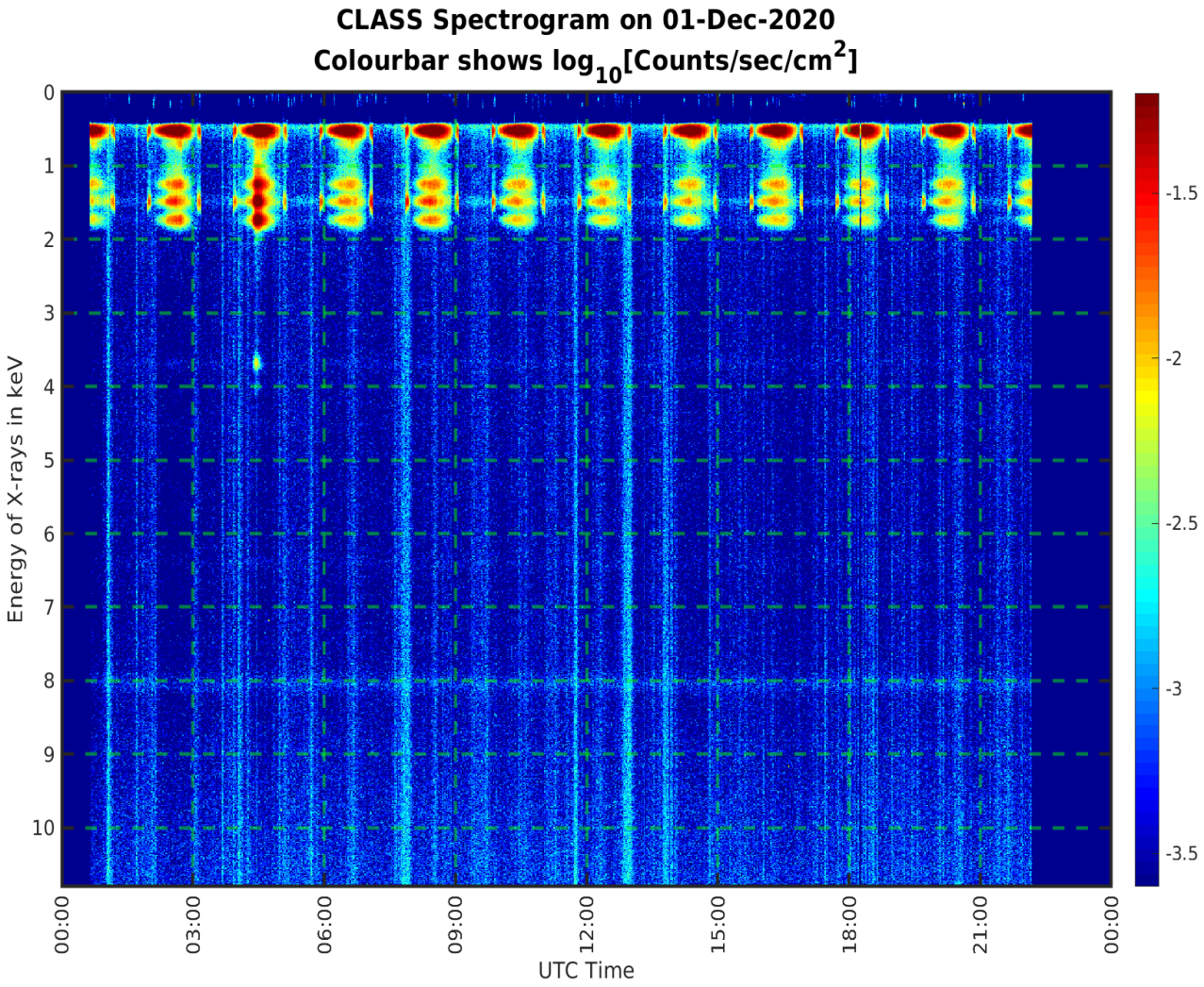
CLASS Spectrogram on 01-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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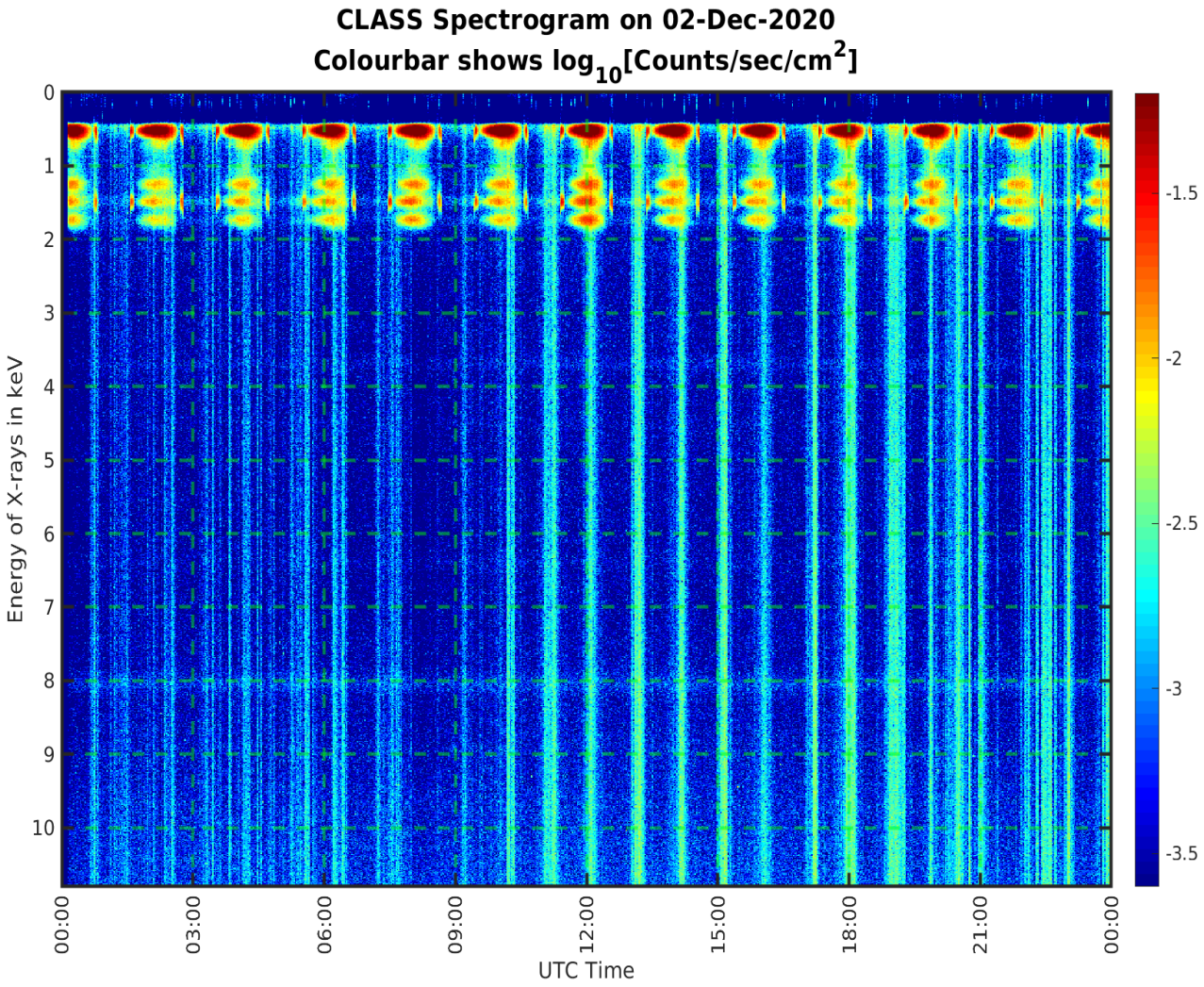
UTC Time


CLASS Spectrogram on 02-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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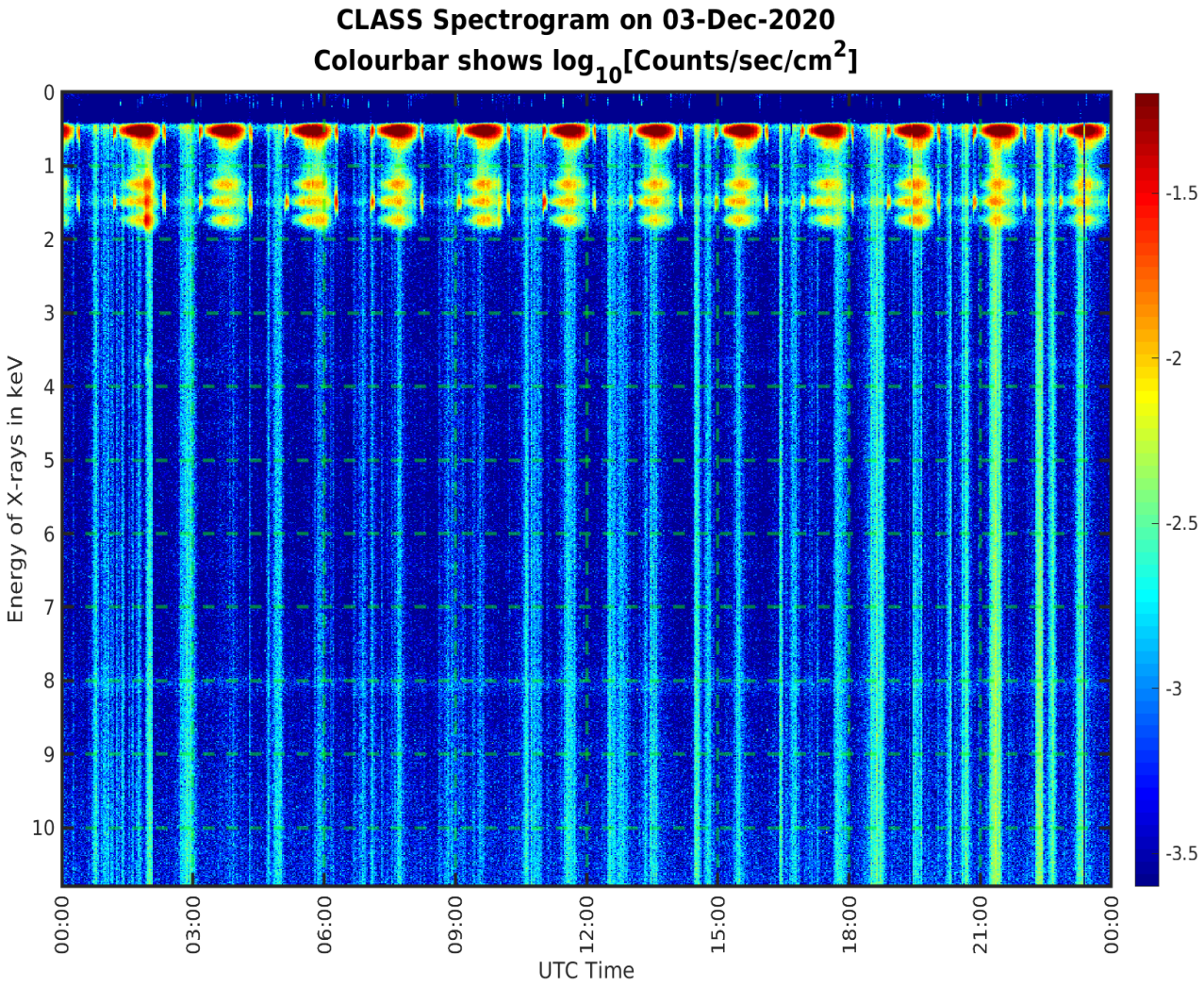
CLASS Spectrogram on 03-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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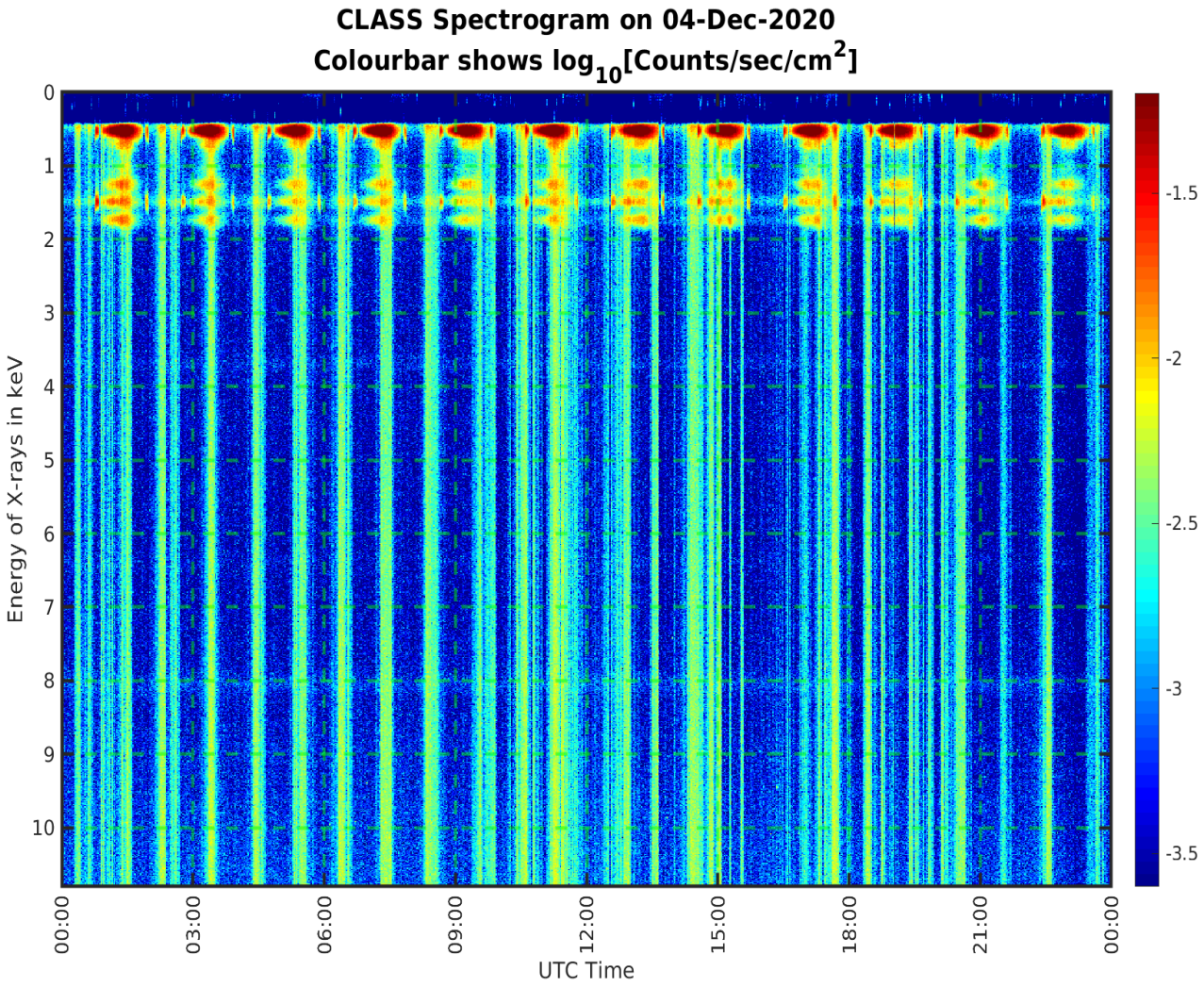
CLASS Spectrogram on 04-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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7
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-1.5
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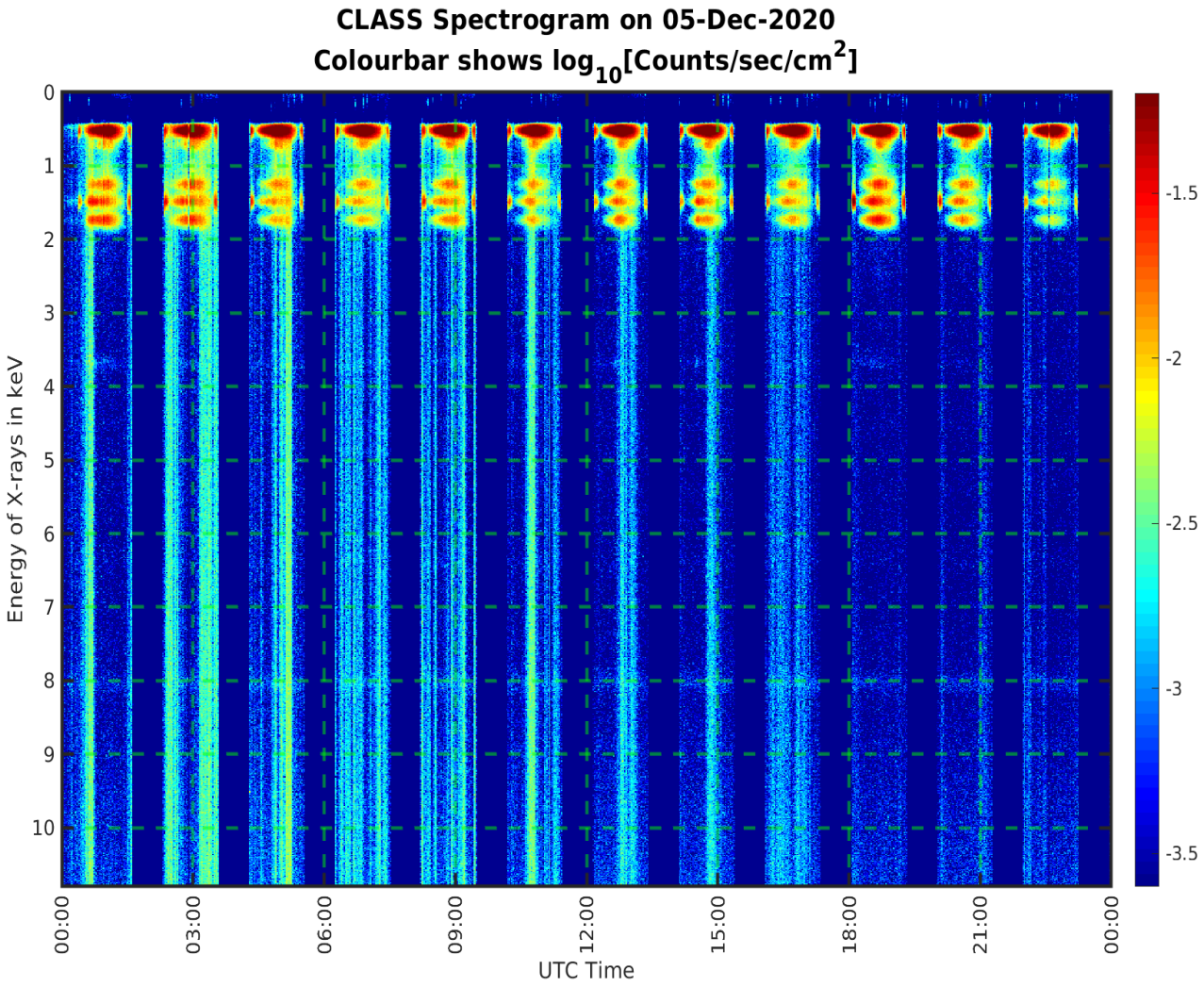
UTC Time


CLASS Spectrogram on 05-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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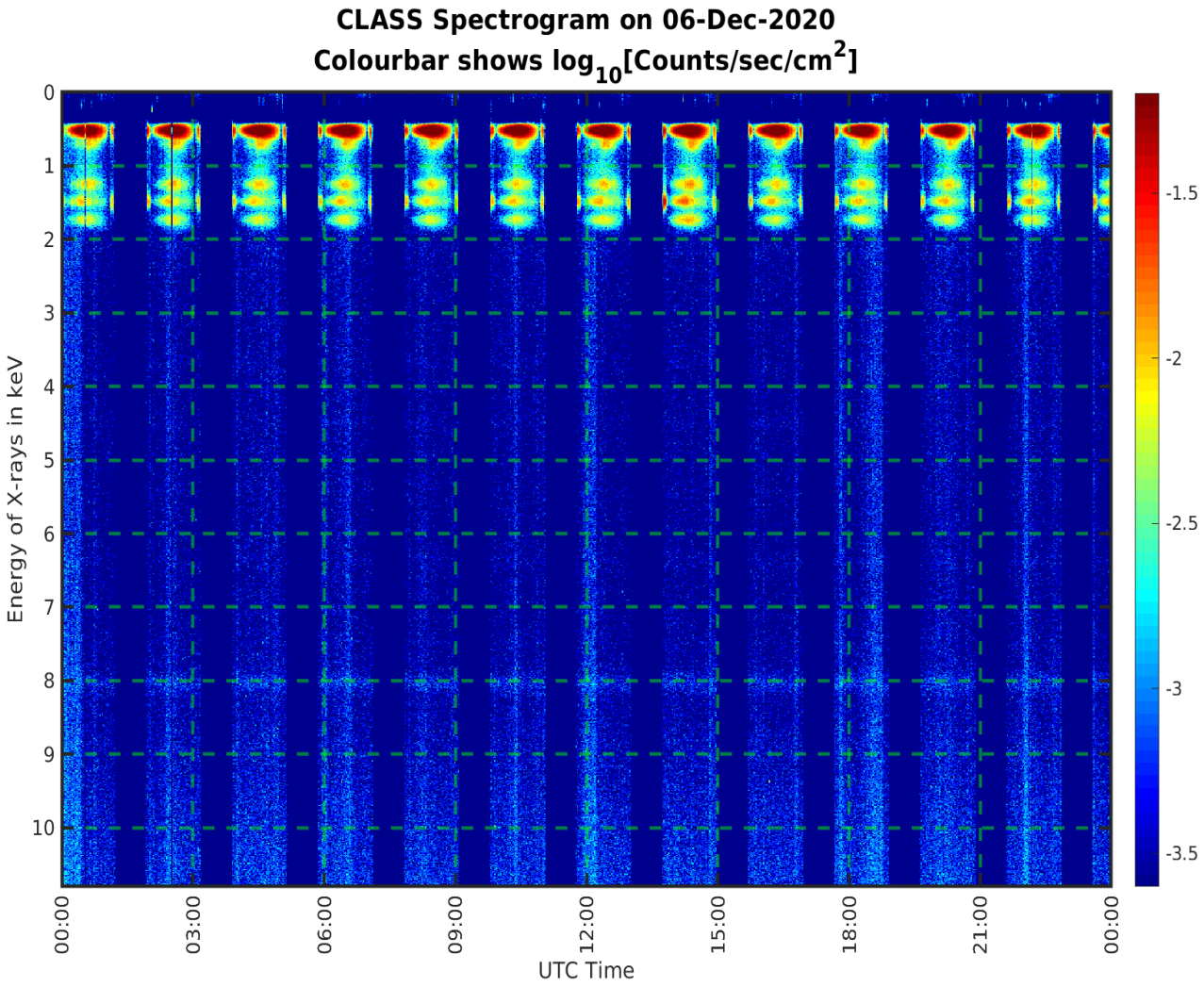
UTC Time


CLASS Spectrogram on 06-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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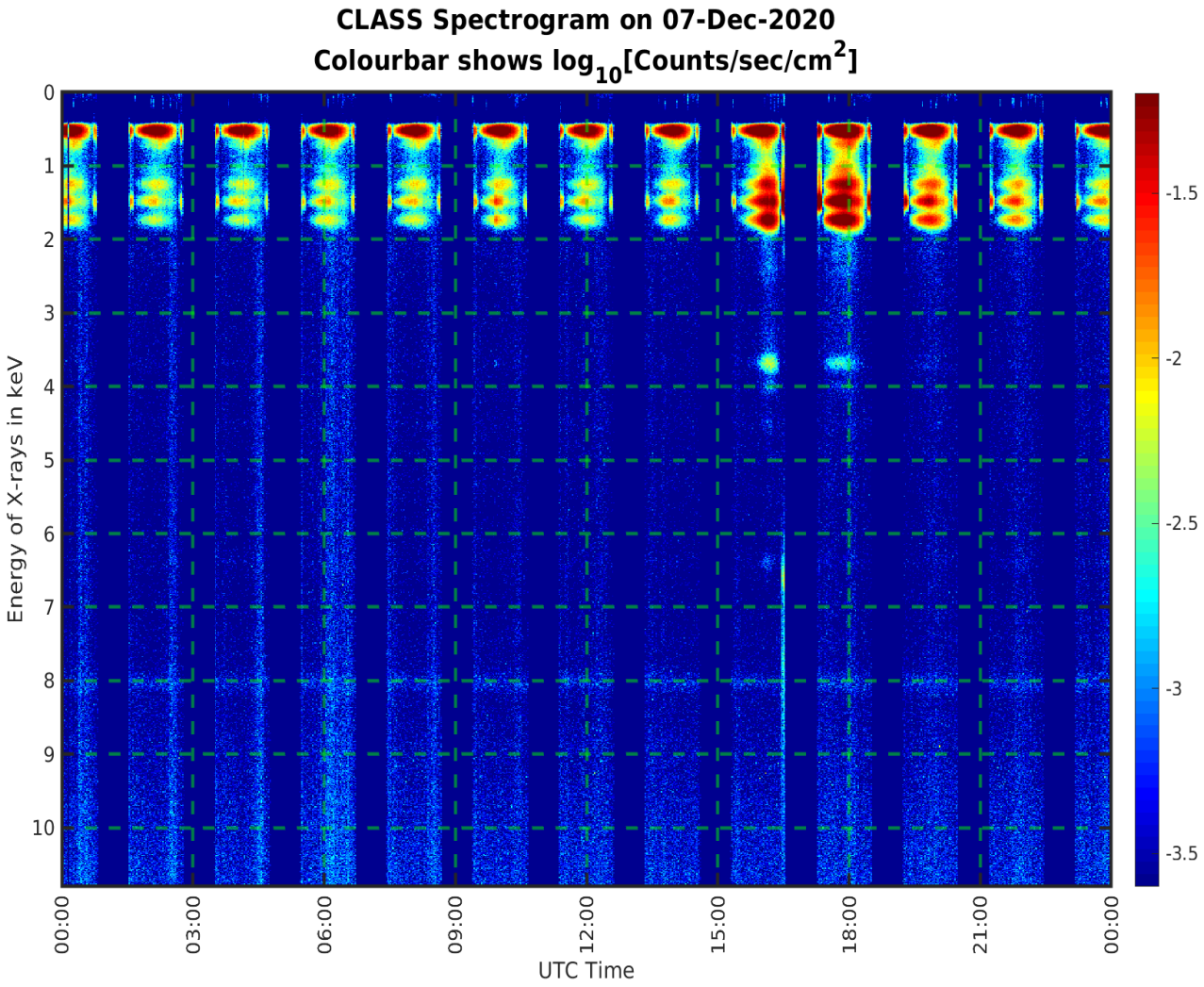
UTC Time


CLASS Spectrogram on 07-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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-1.5
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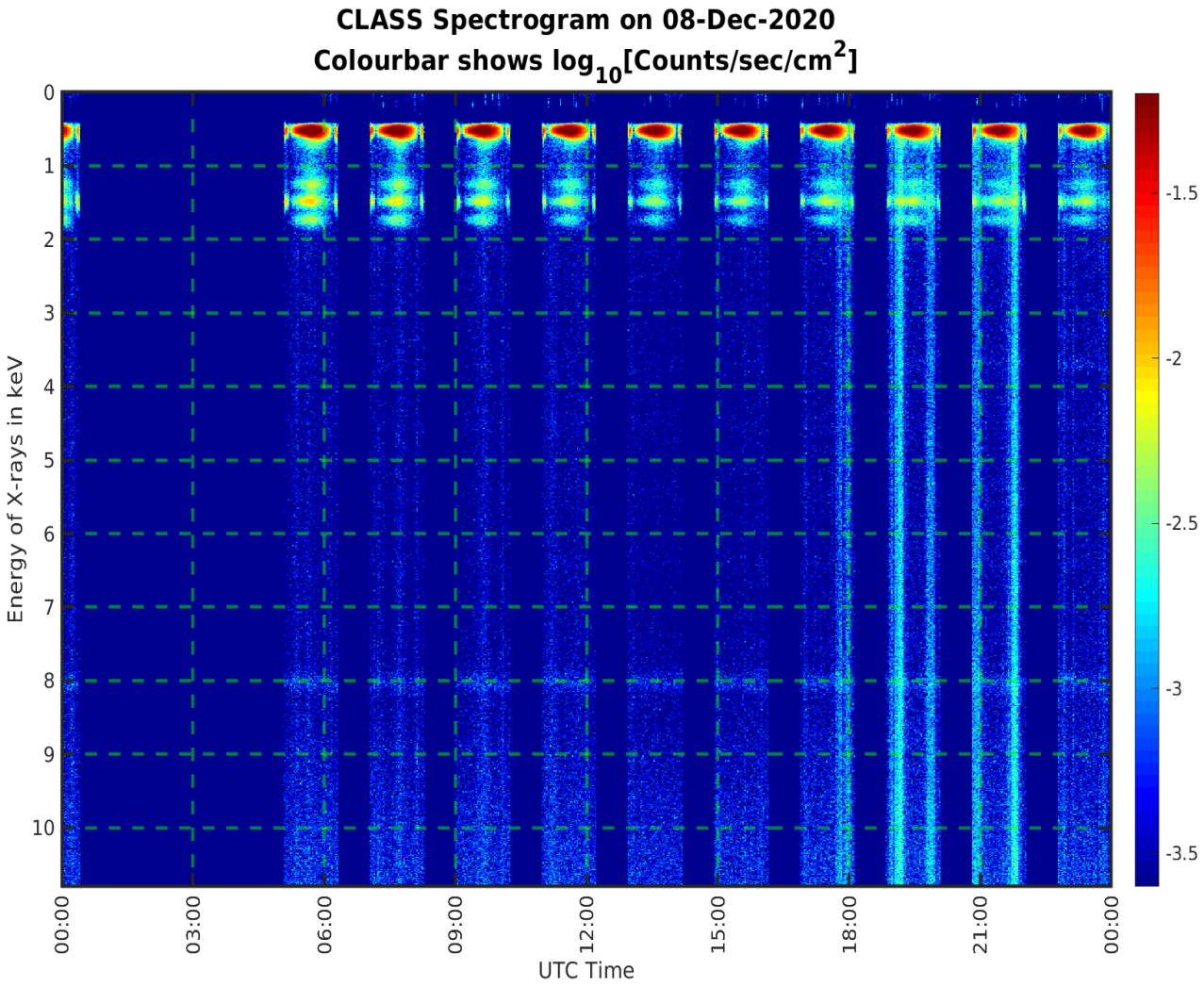
UTC Time


CLASS Spectrogram on 08-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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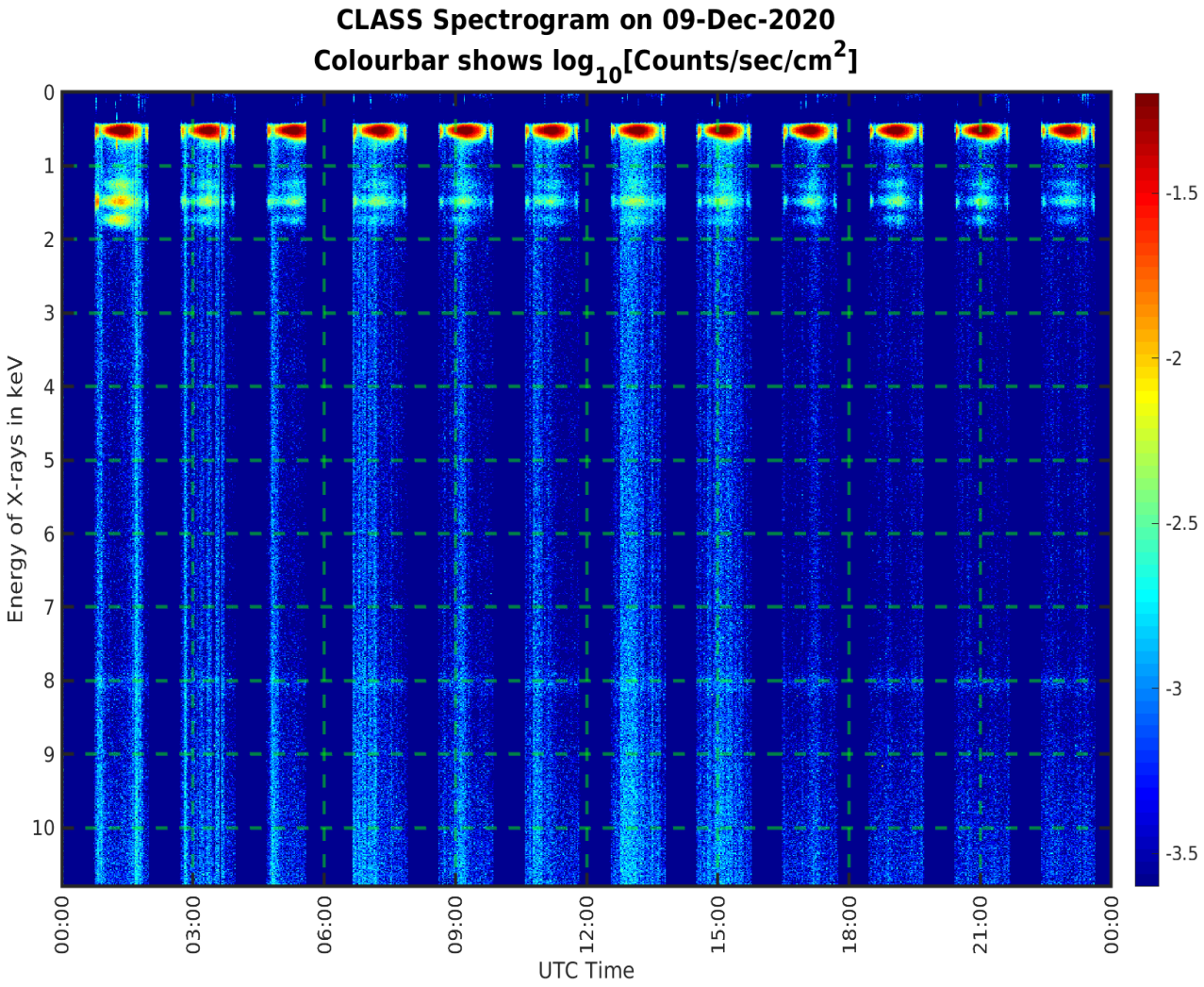
UTC Time


CLASS Spectrogram on 09-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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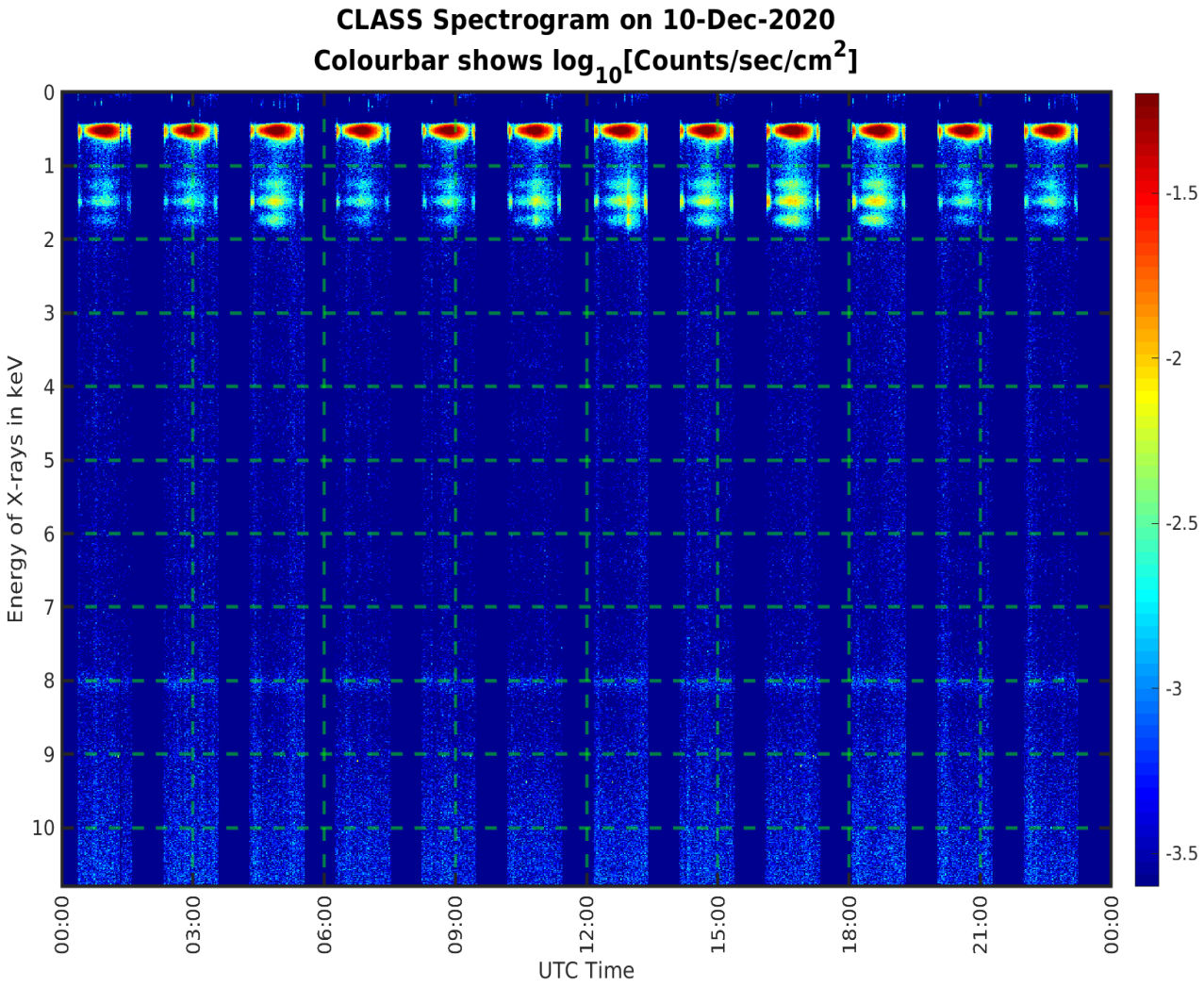
UTC Time


CLASS Spectrogram on 10-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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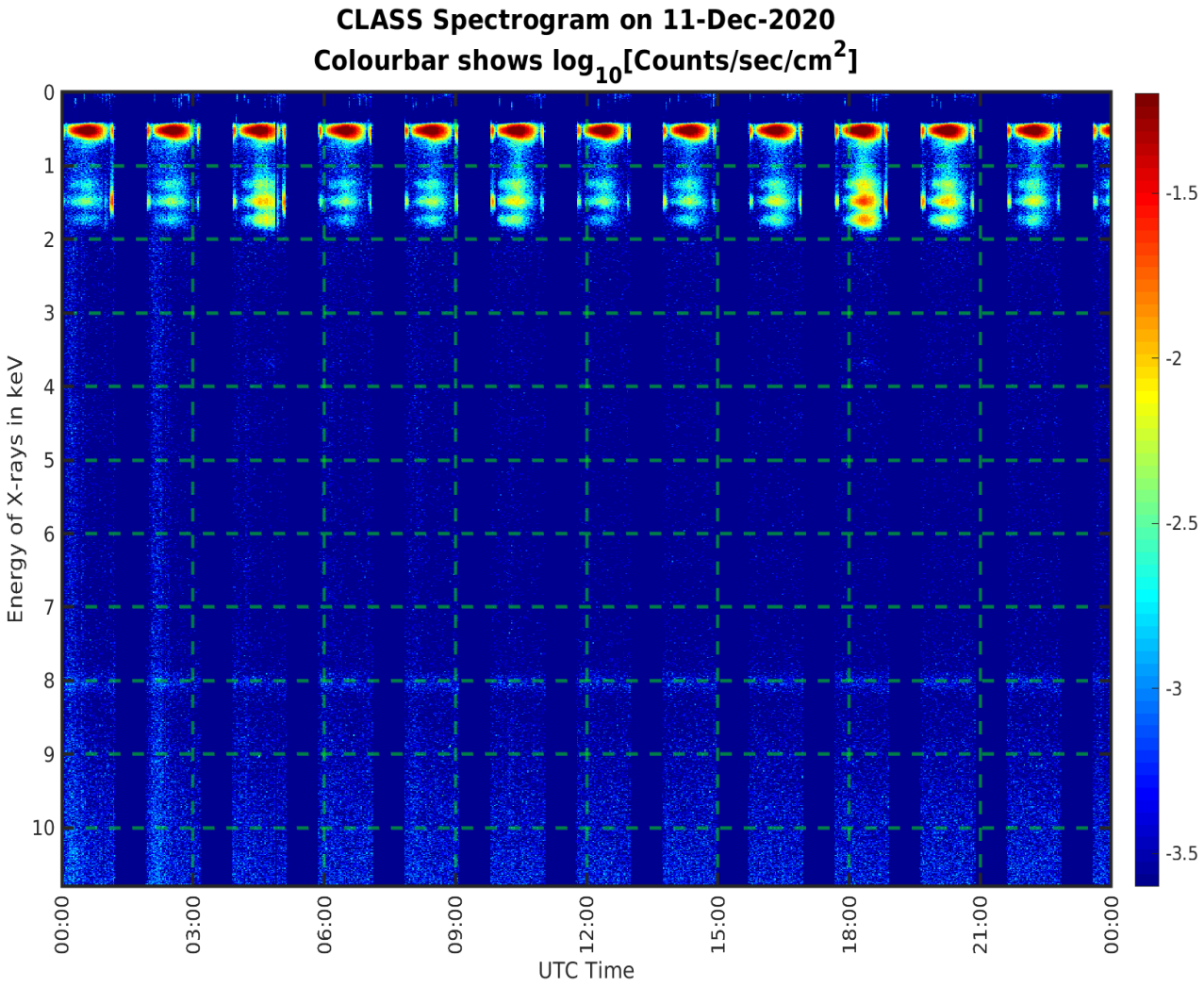
UTC Time


CLASS Spectrogram on 11-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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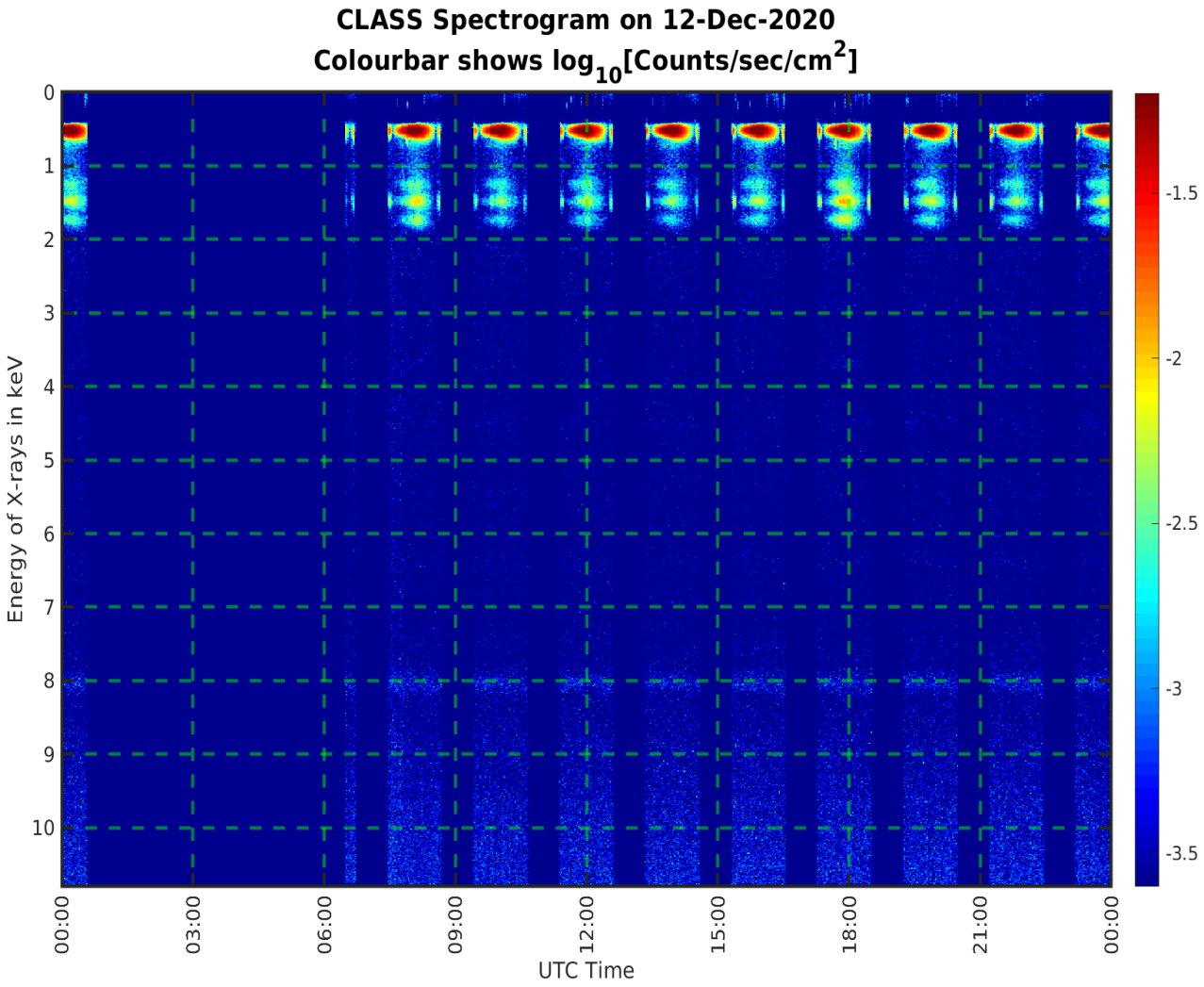
UTC Time


CLASS Spectrogram on 12-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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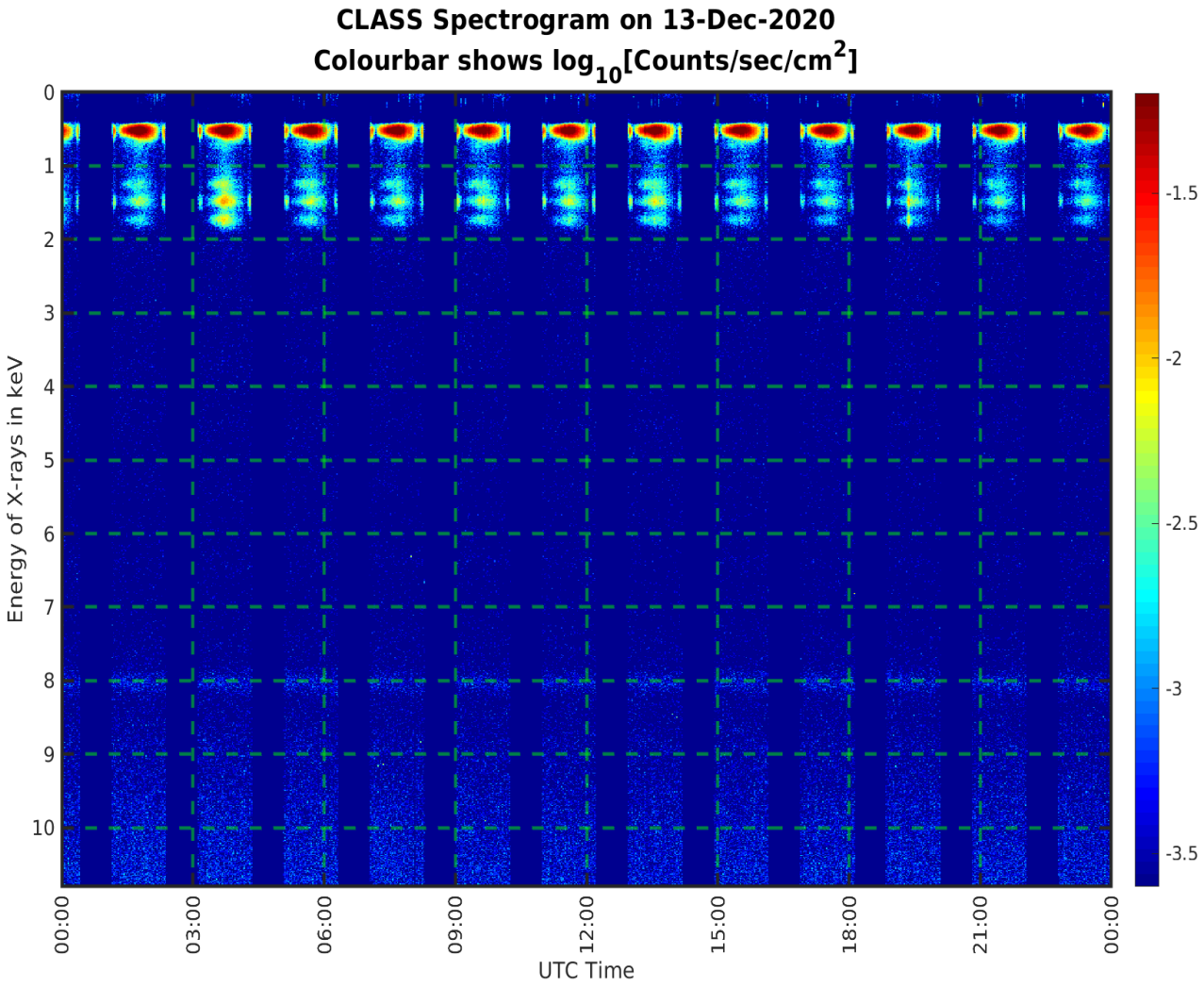
UTC Time


CLASS Spectrogram on 13-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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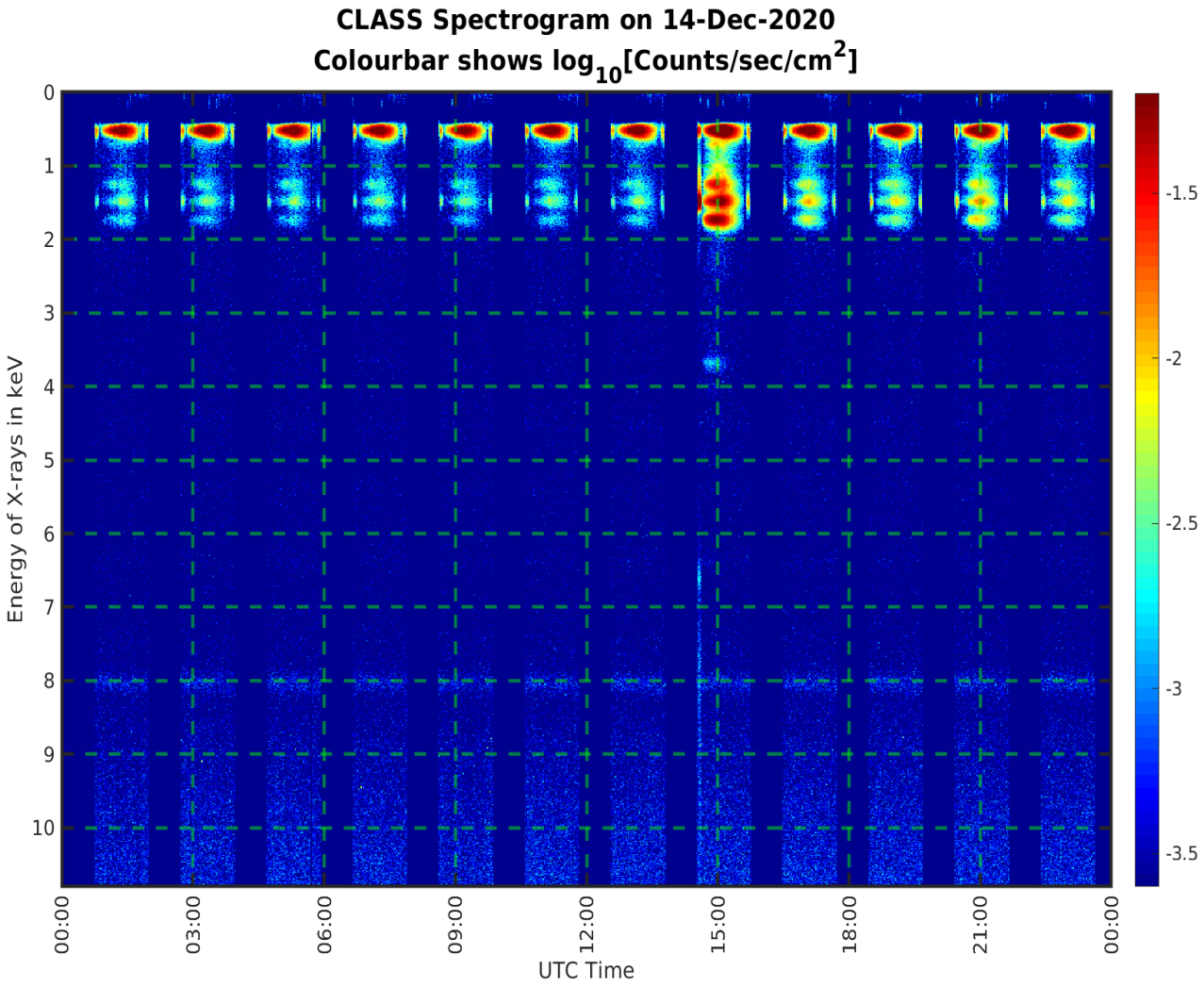
CLASS Spectrogram on 14-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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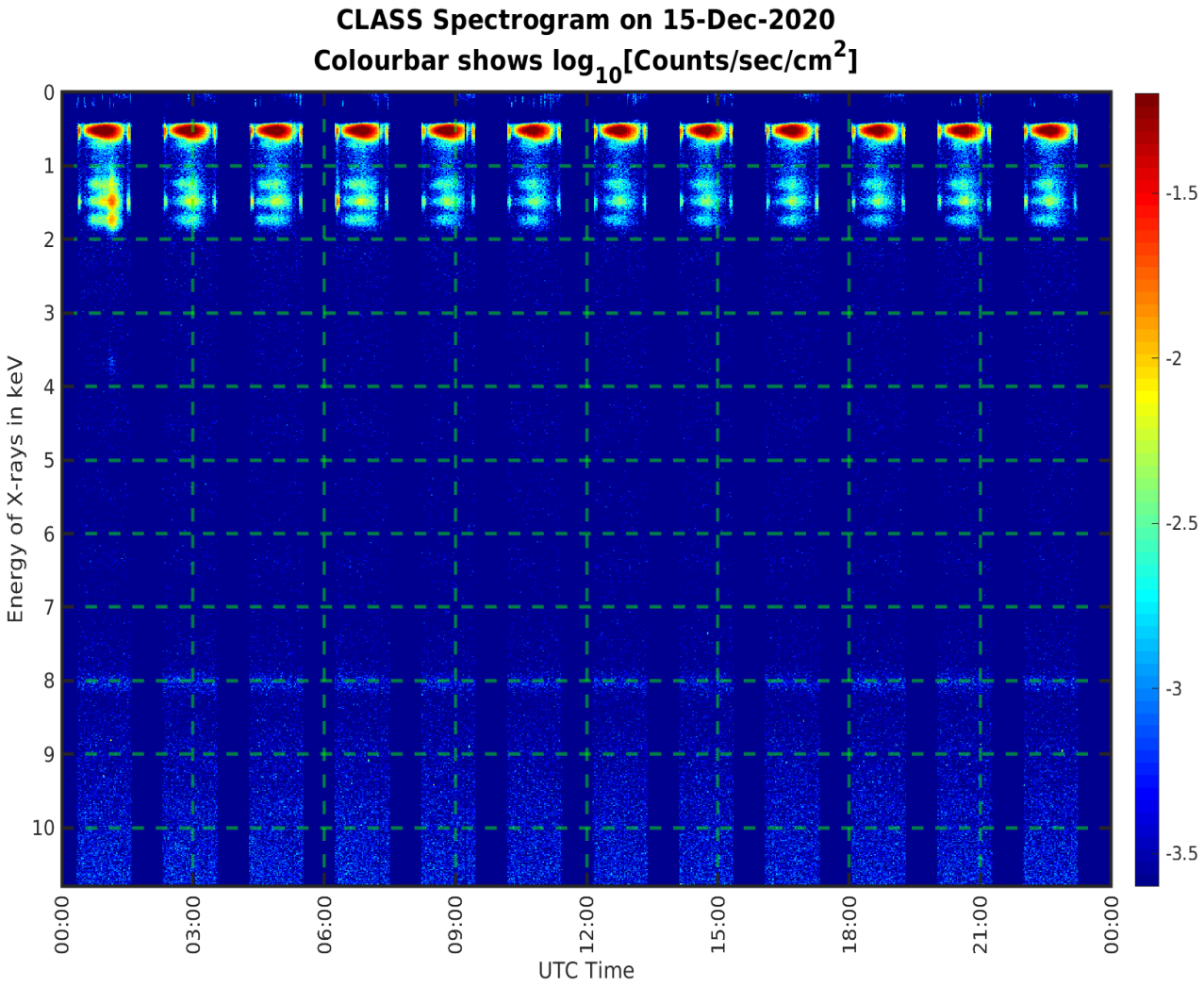
CLASS Spectrogram on 15-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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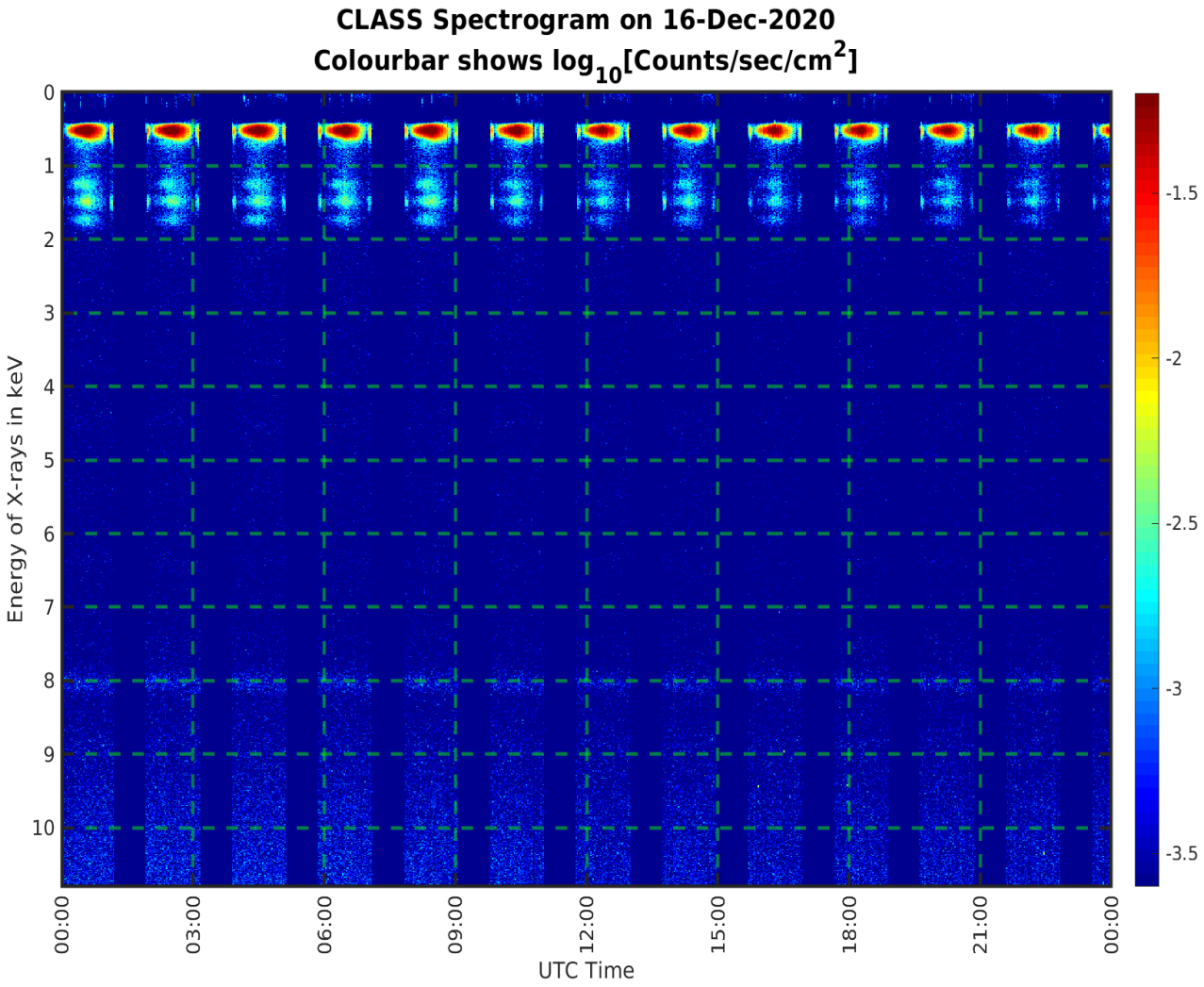
UTC Time


CLASS Spectrogram on 16-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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8
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-1.5
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-3.5
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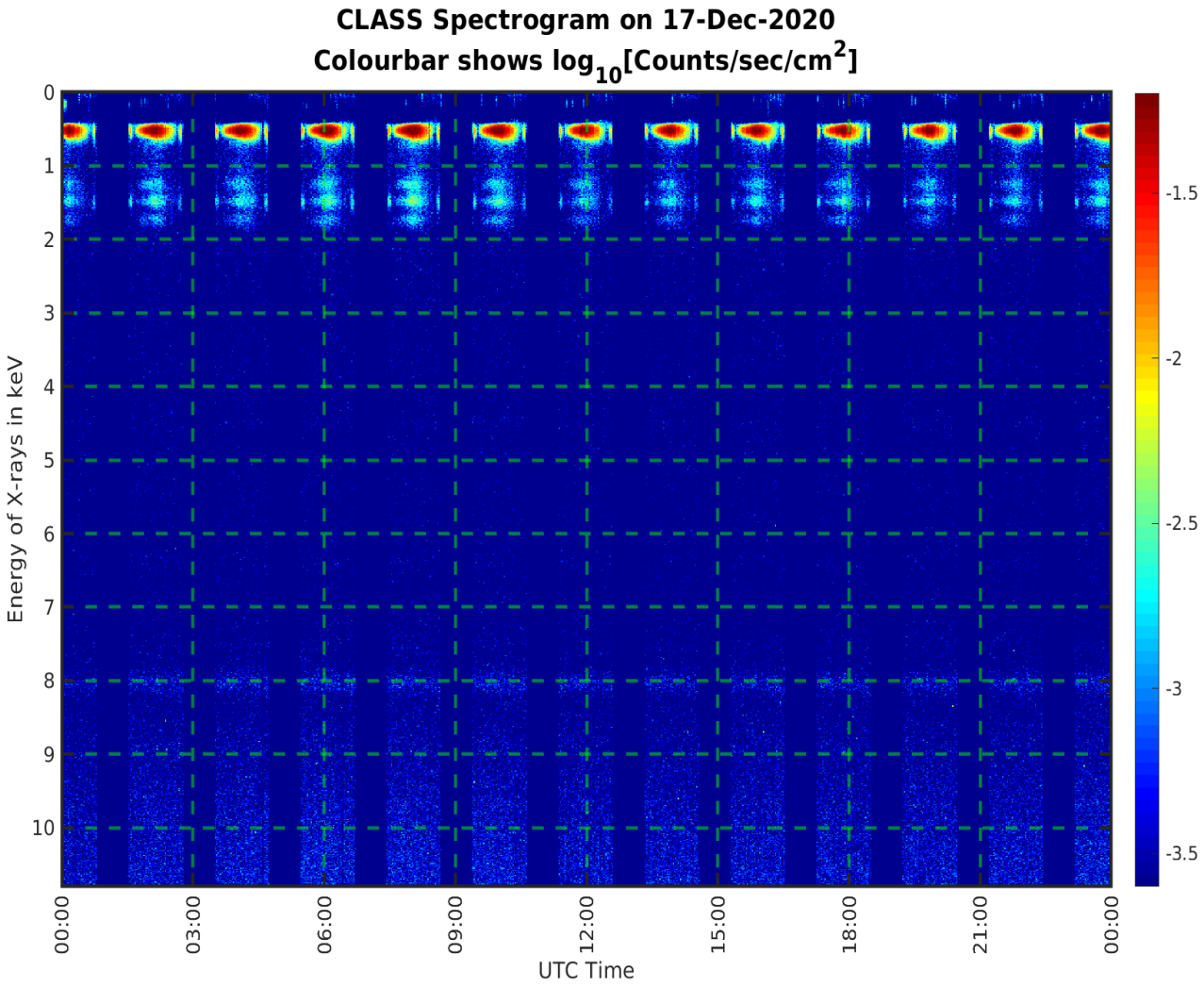
UTC Time


CLASS Spectrogram on 17-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
-2
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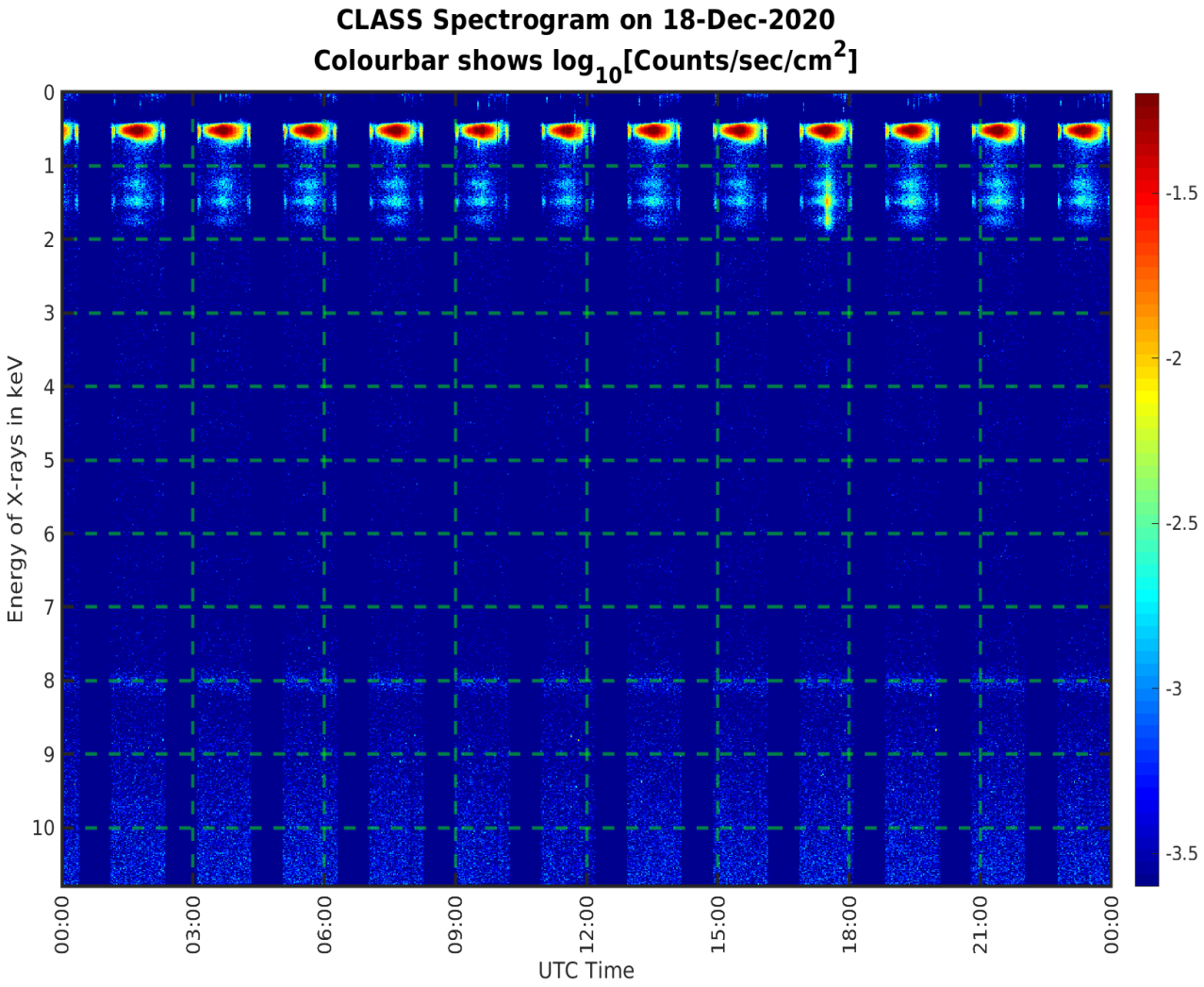
UTC Time


CLASS Spectrogram on 18-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
-2
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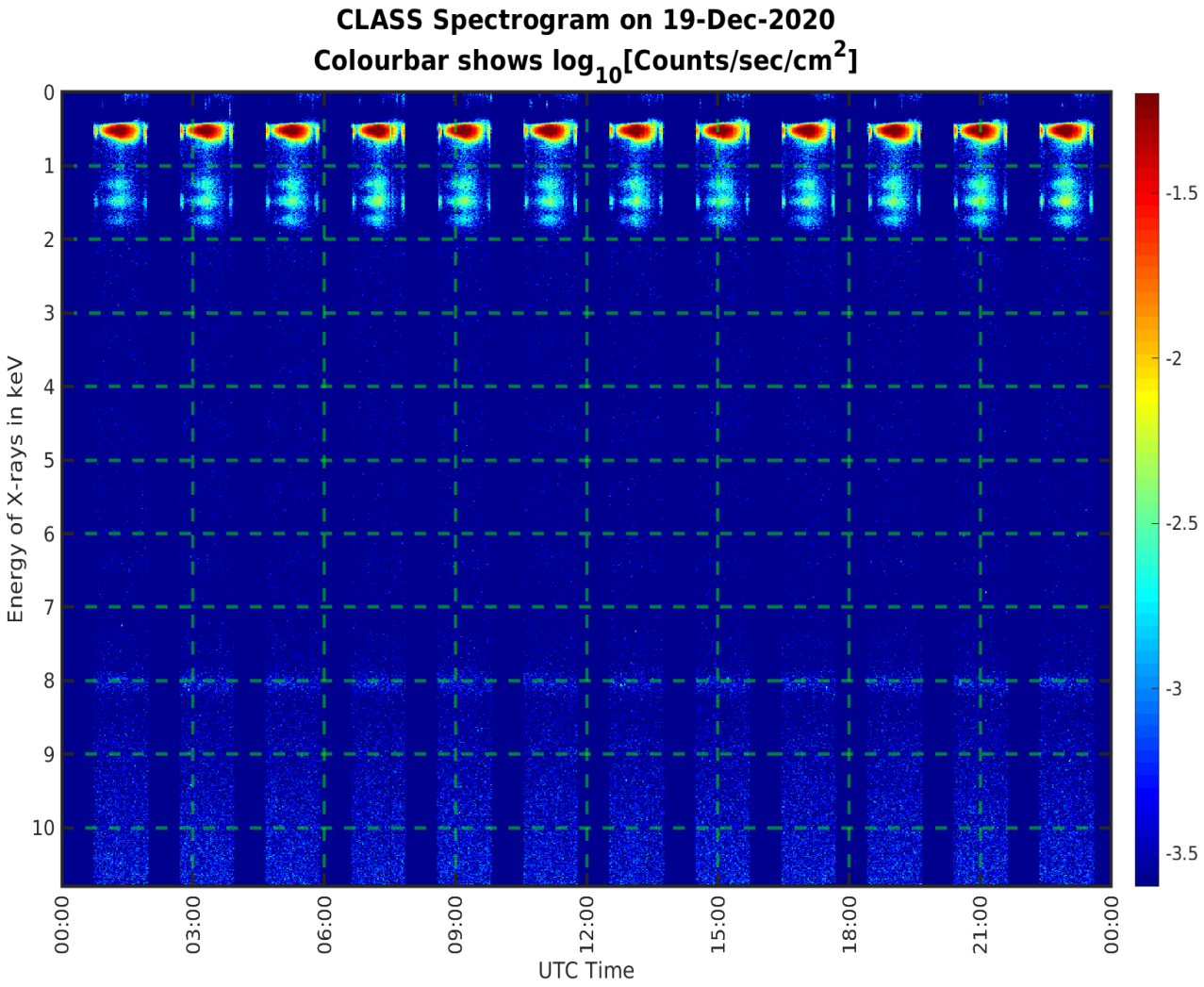
UTC Time


CLASS Spectrogram on 19-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
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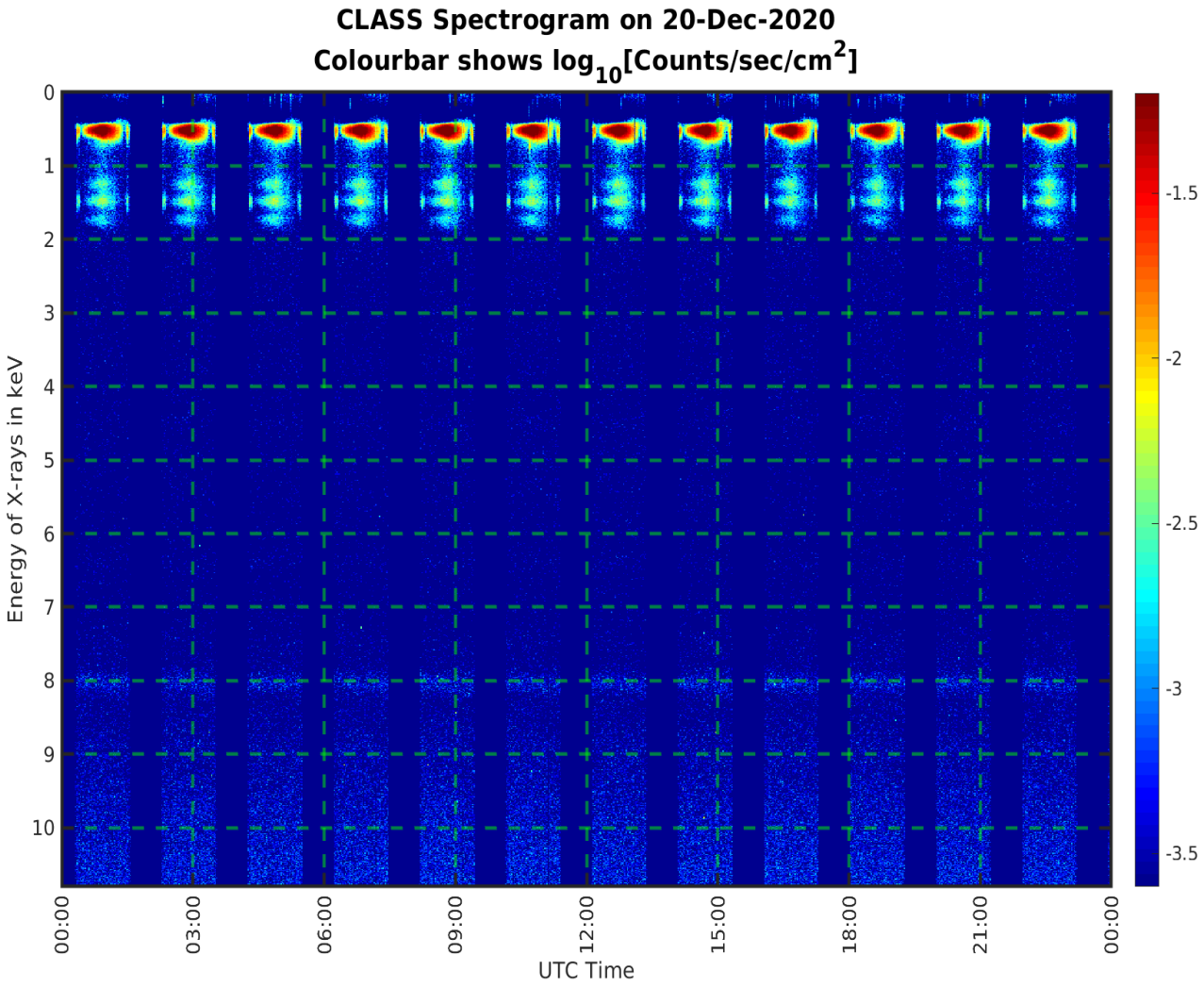
UTC Time


CLASS Spectrogram on 20-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
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-2.5
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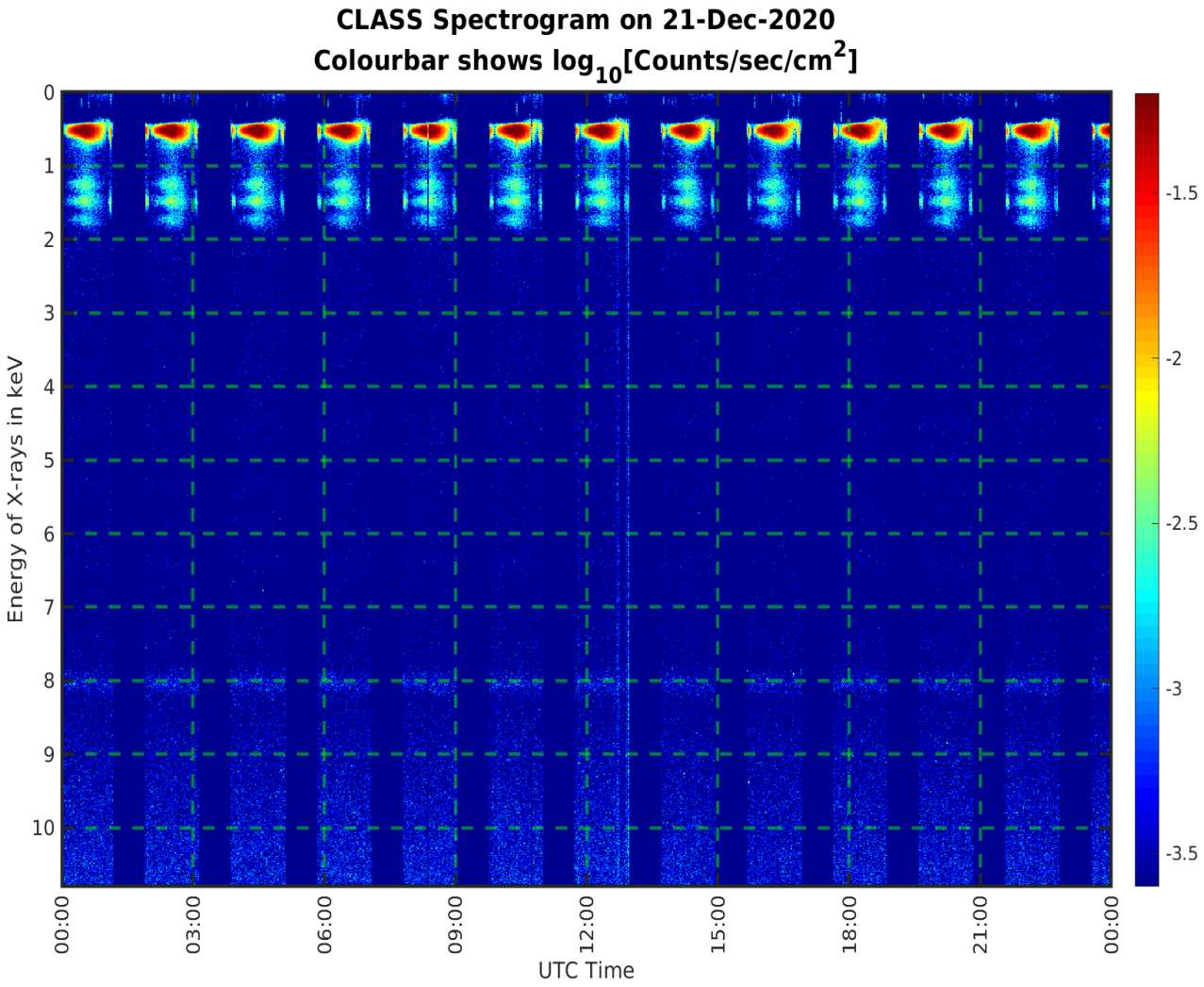
UTC Time


CLASS Spectrogram on 21-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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6
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8
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-1.5
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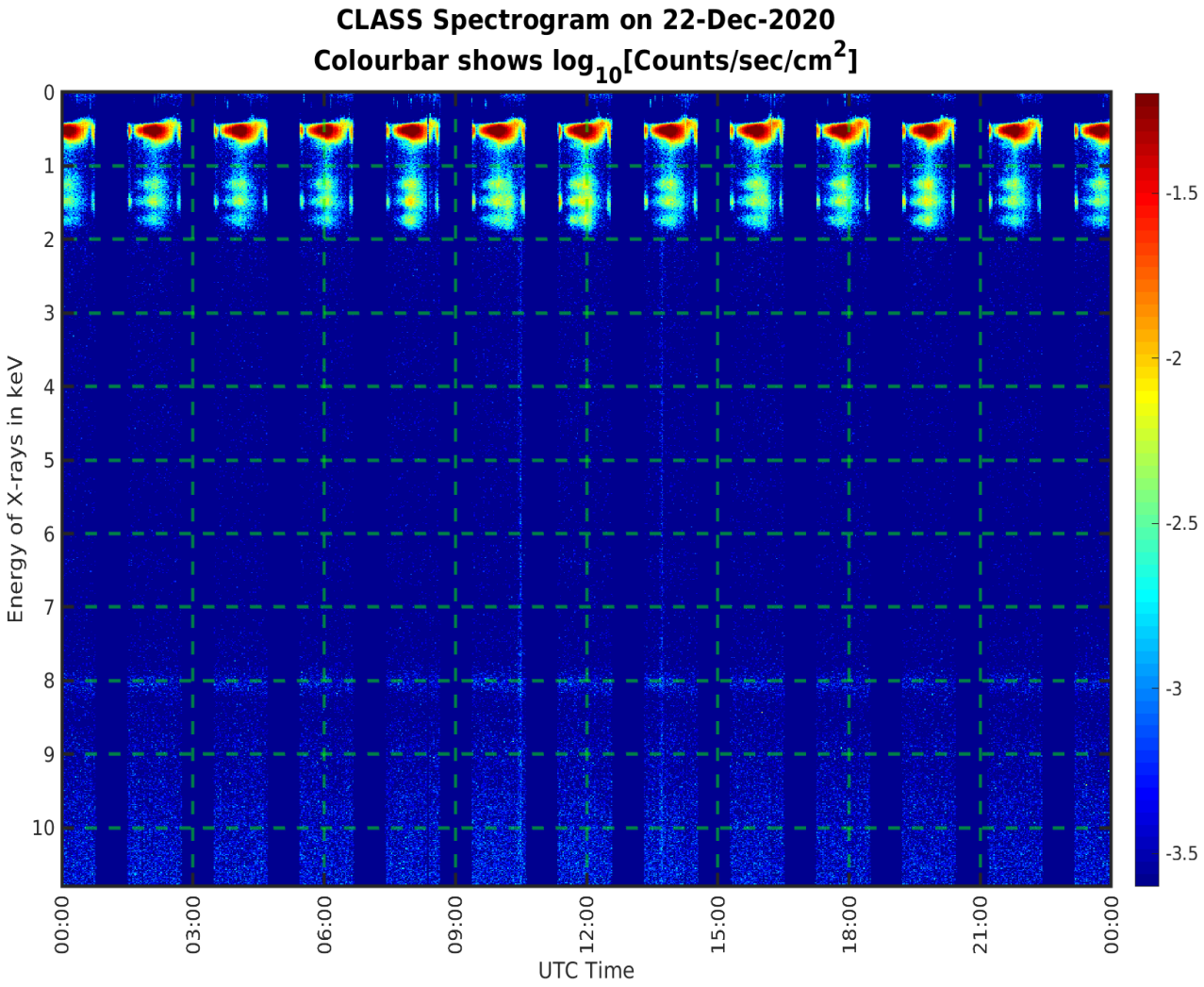
UTC Time


CLASS Spectrogram on 22-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
10
-1.5
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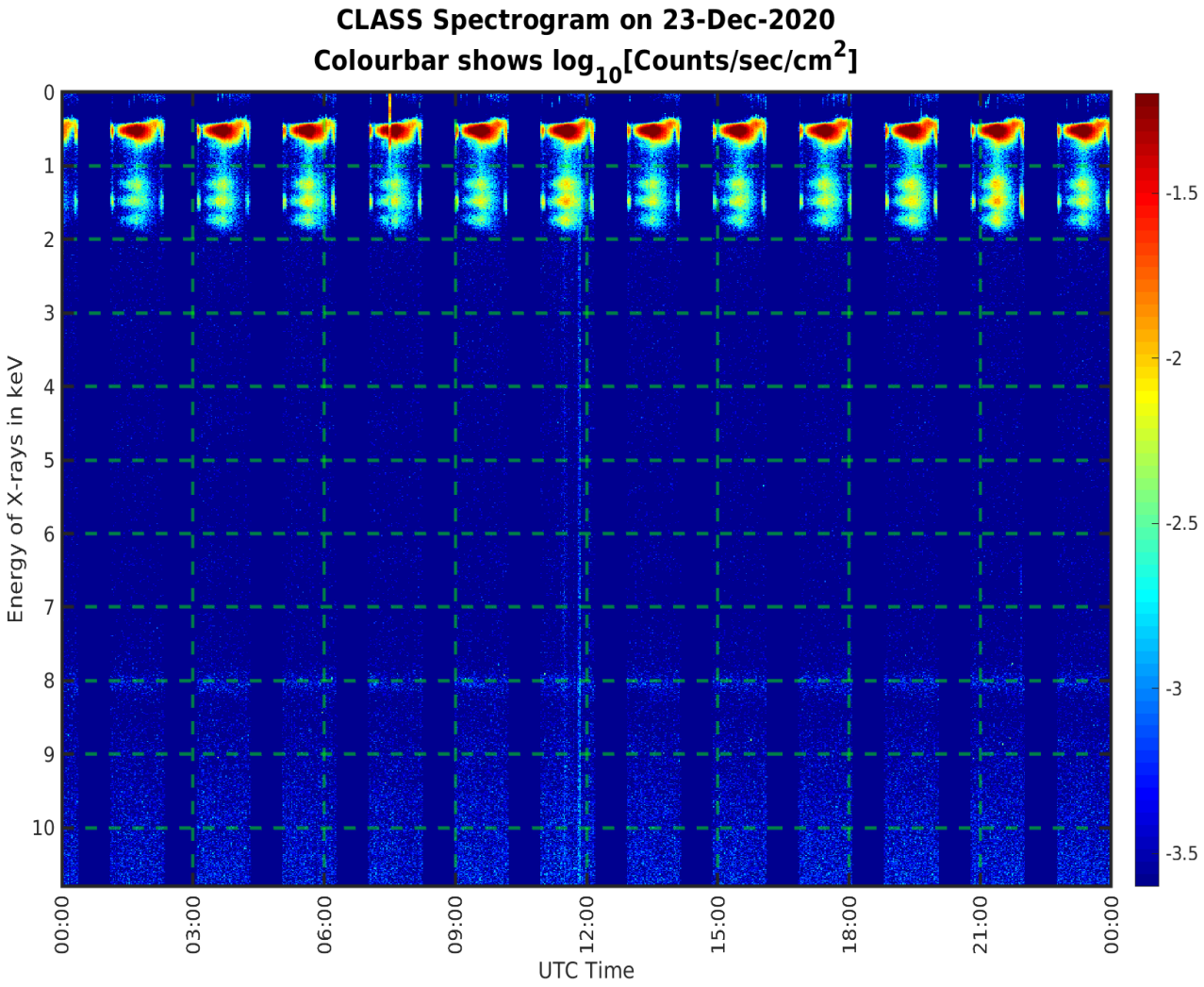
UTC Time


CLASS Spectrogram on 23-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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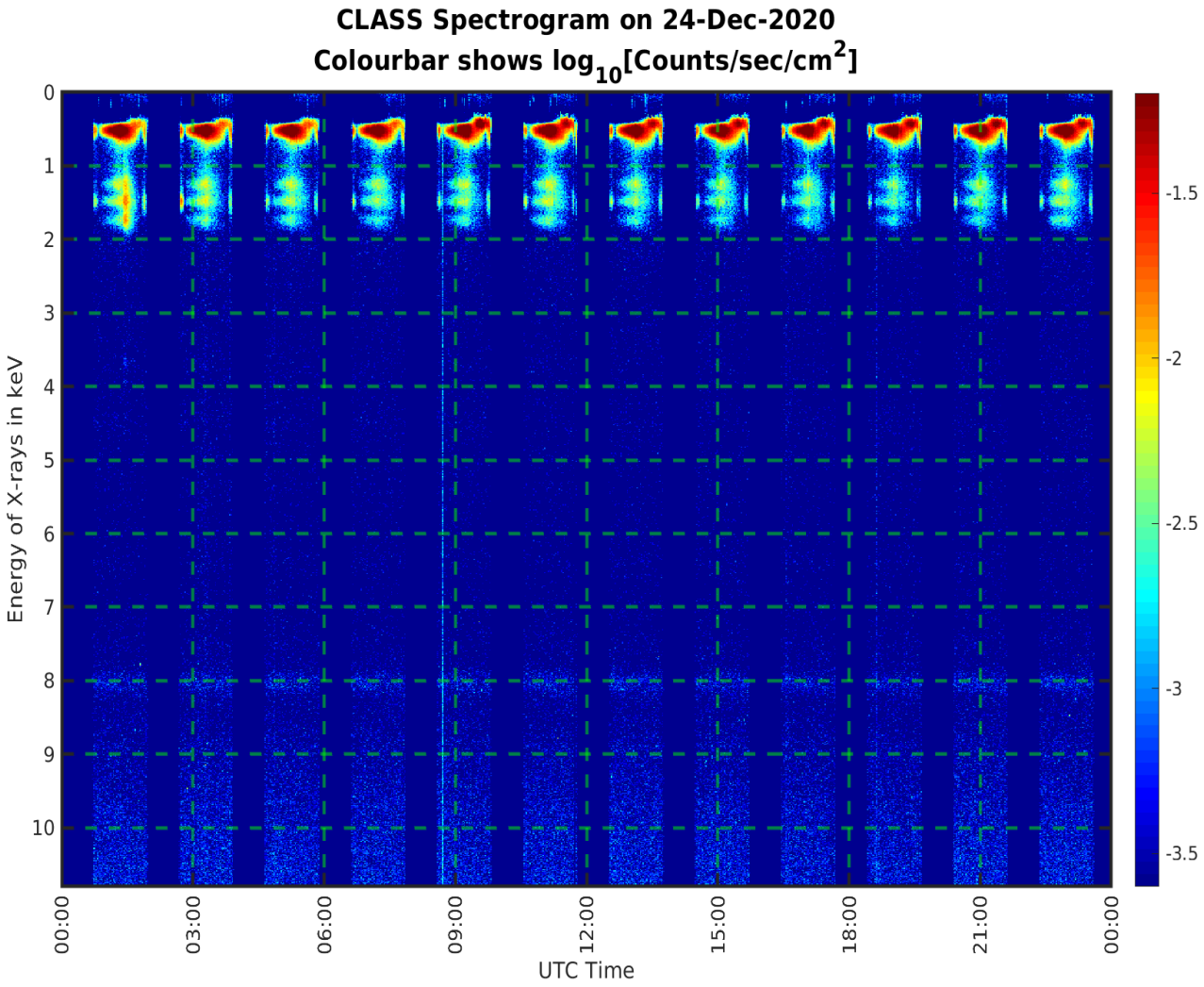
UTC Time


CLASS Spectrogram on 24-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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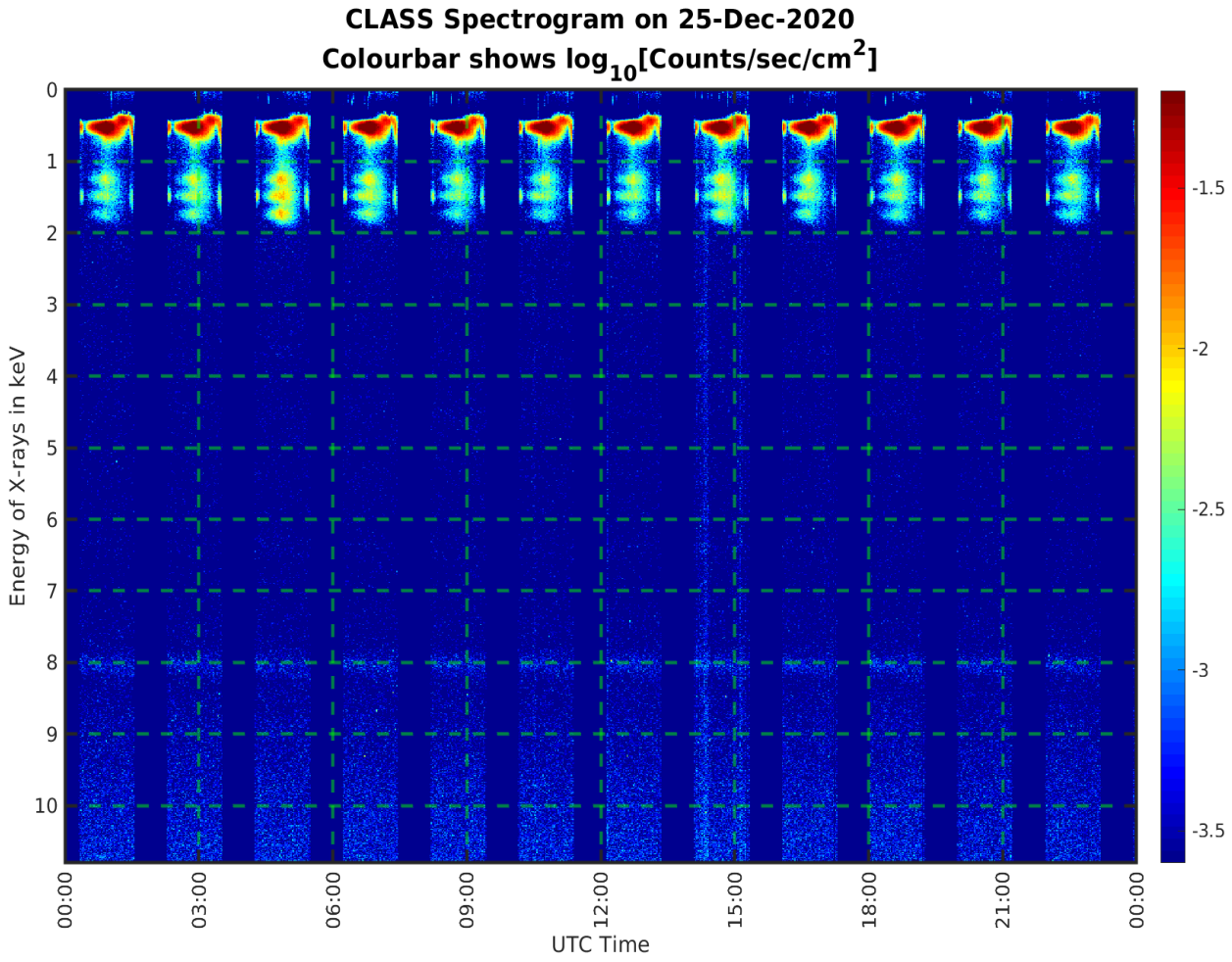
UTC Time


CLASS Spectrogram on 25-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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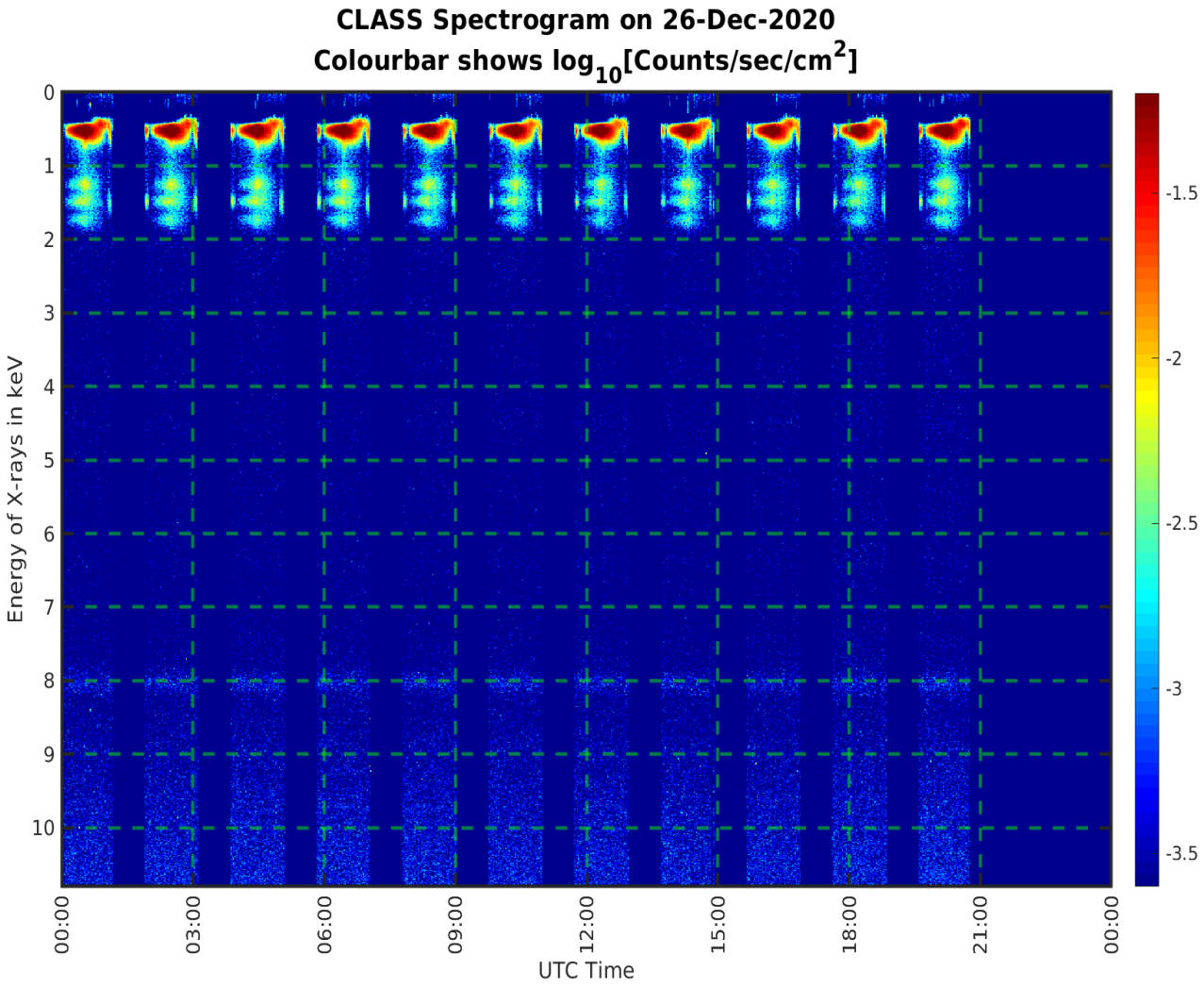
CLASS Spectrogram on 26-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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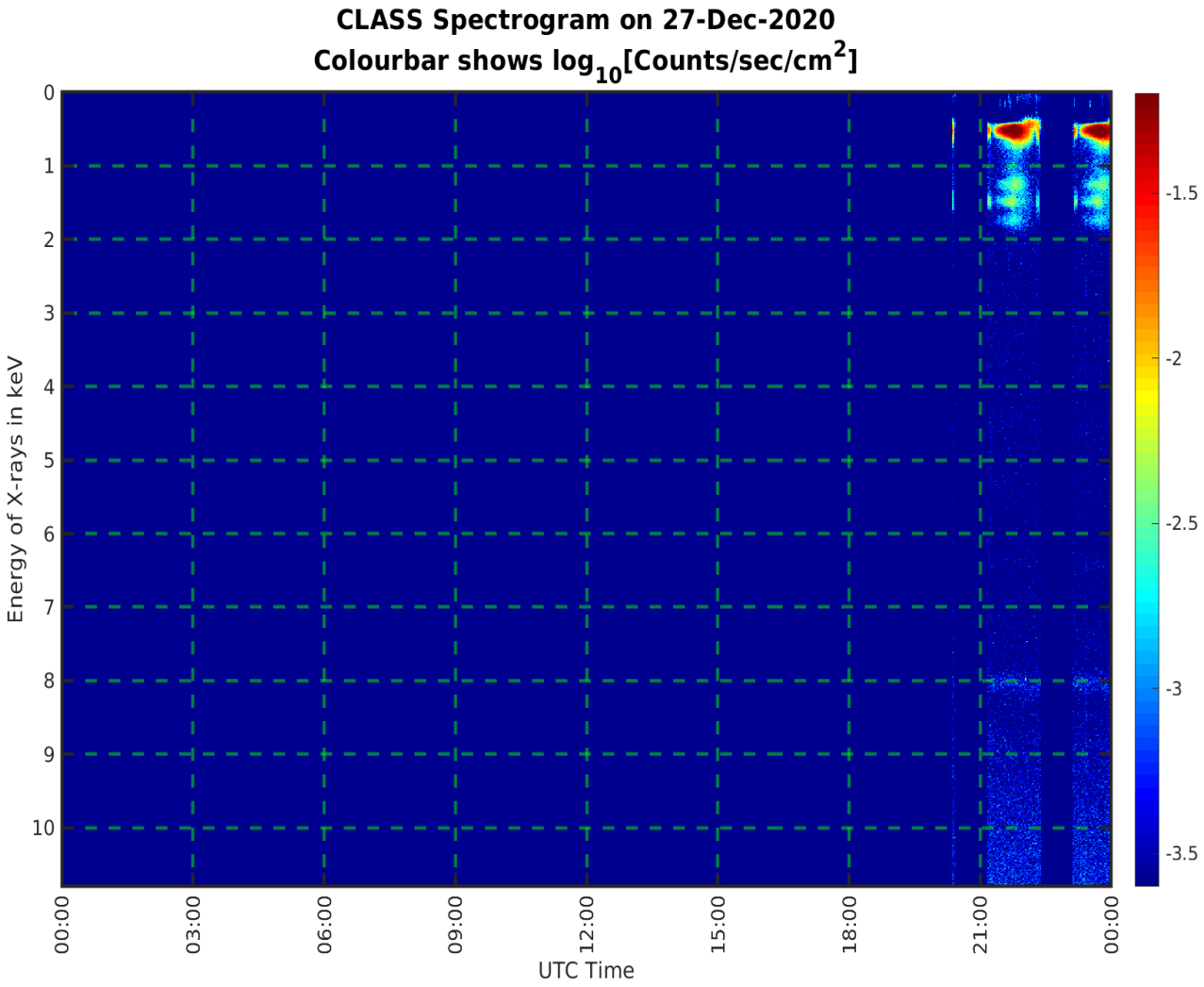
UTC Time


CLASS Spectrogram on 27-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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-1.5
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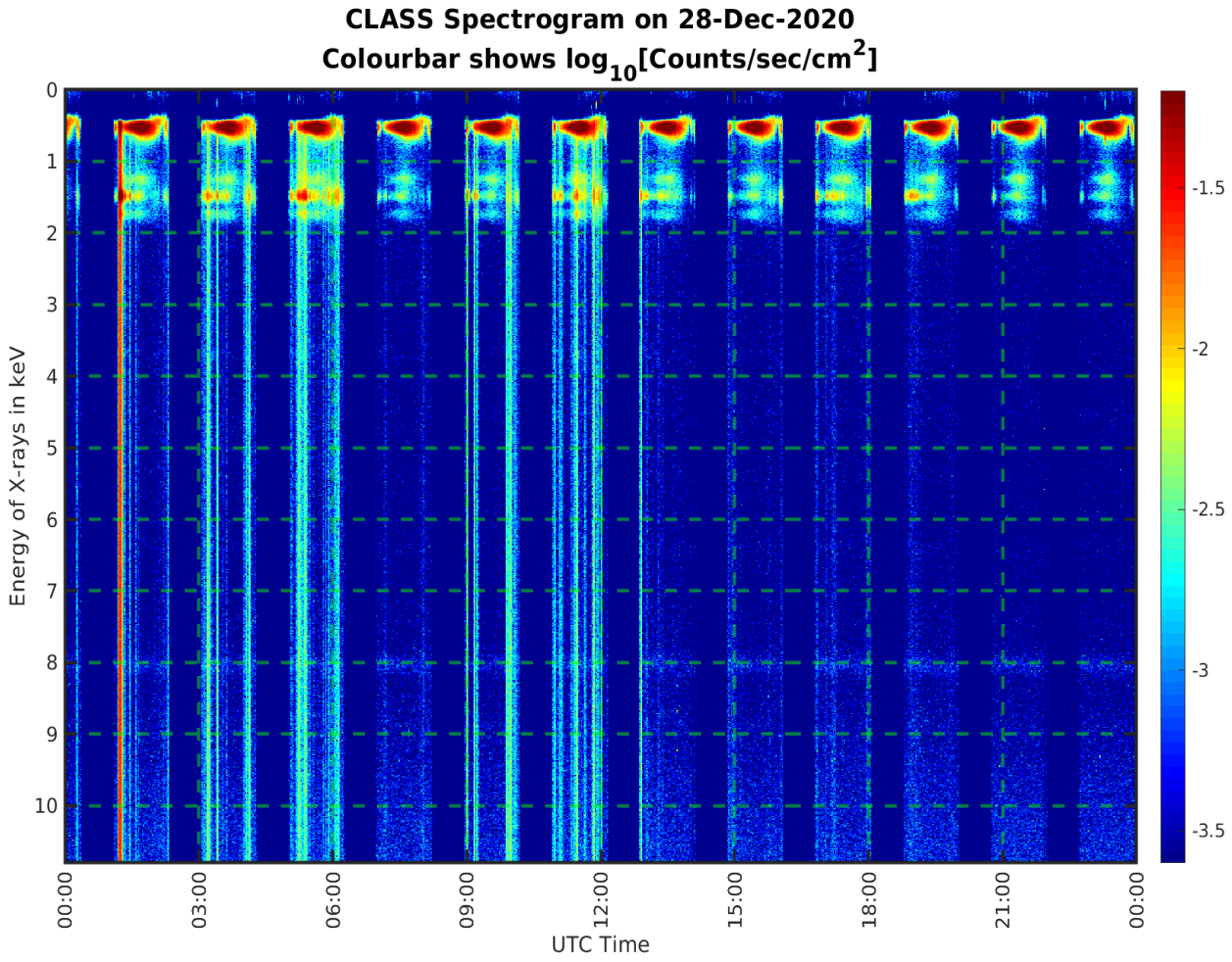
UTC Time


CLASS Spectrogram on 28-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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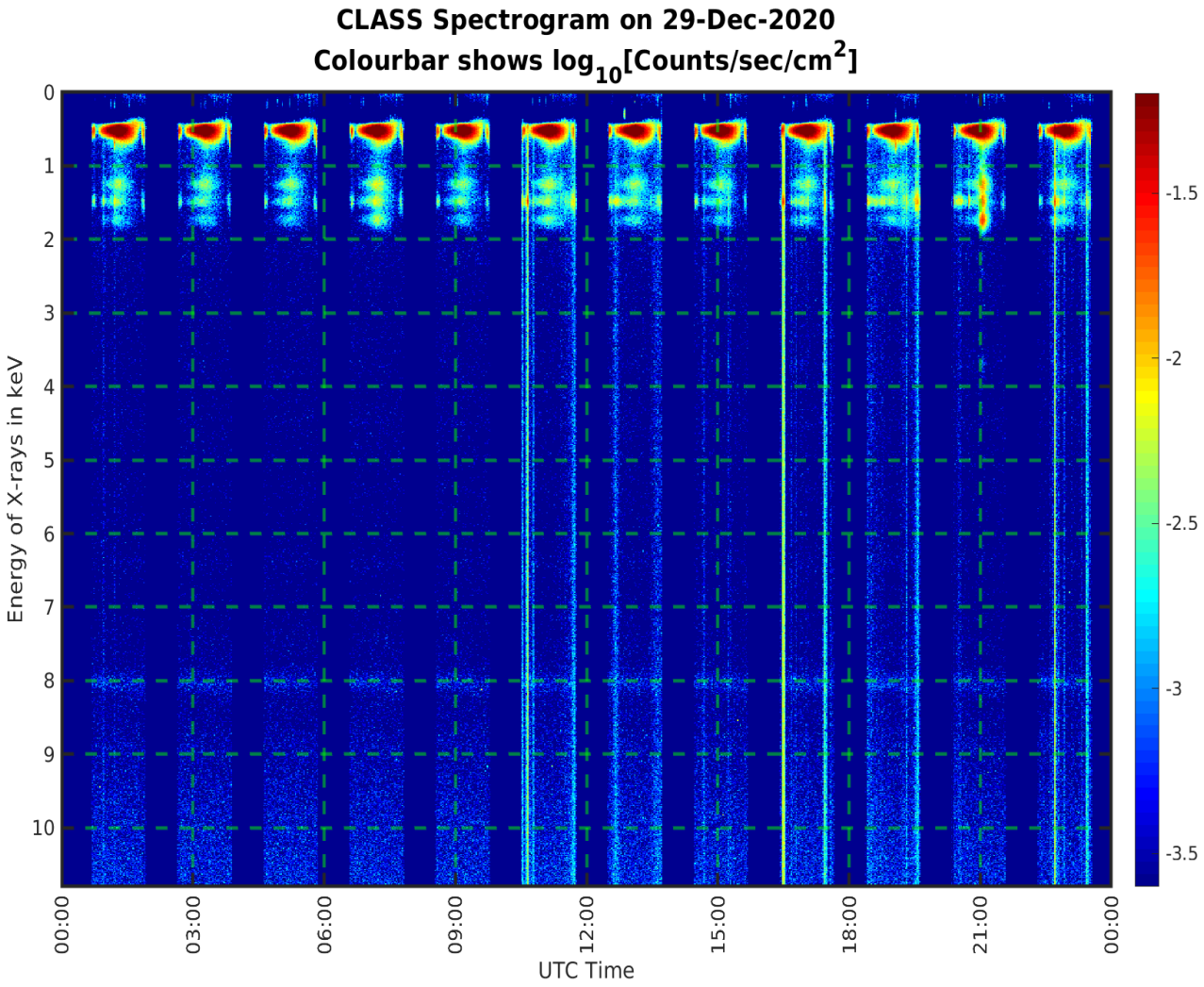
CLASS Spectrogram on 29-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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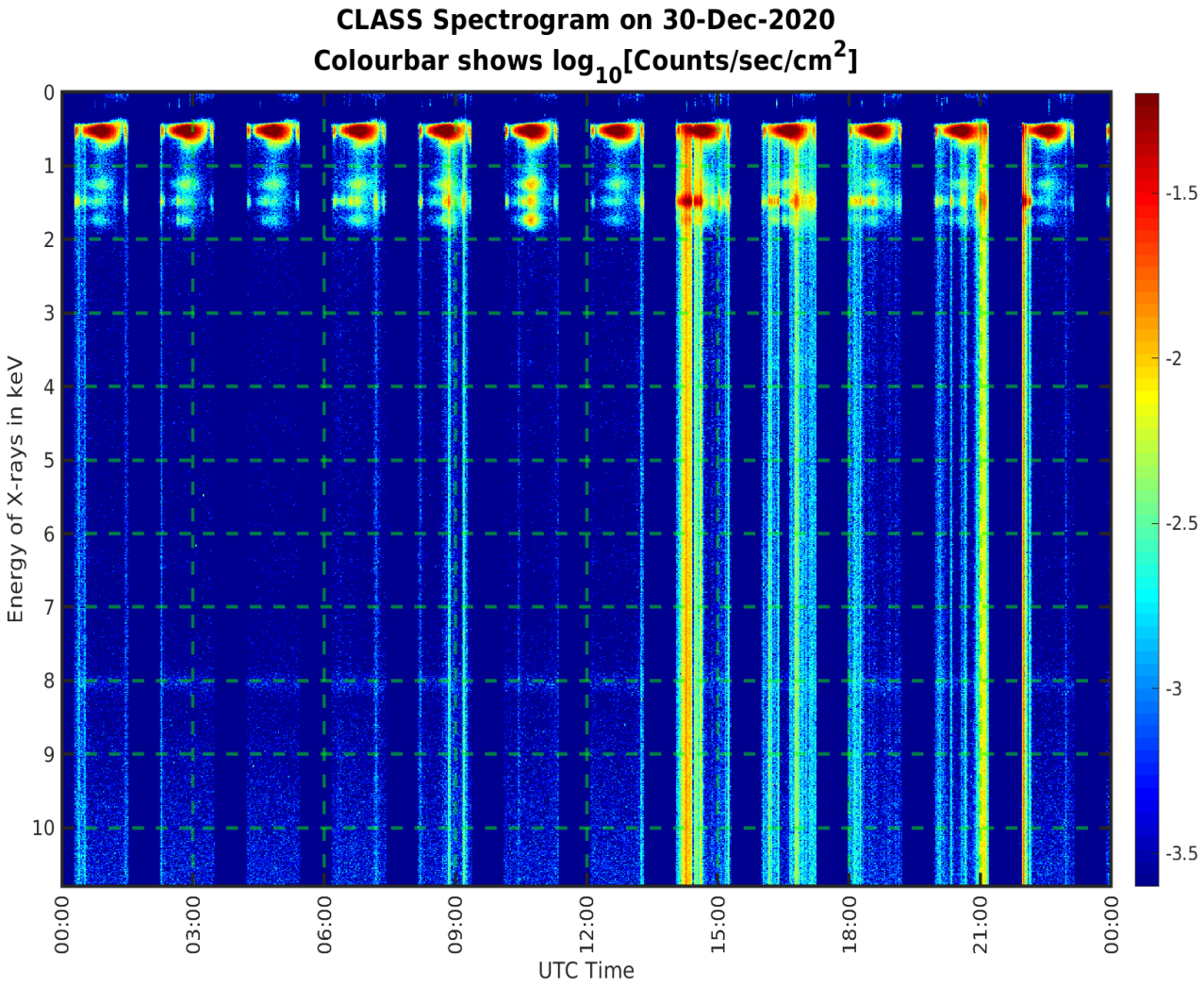
CLASS Spectrogram on 30-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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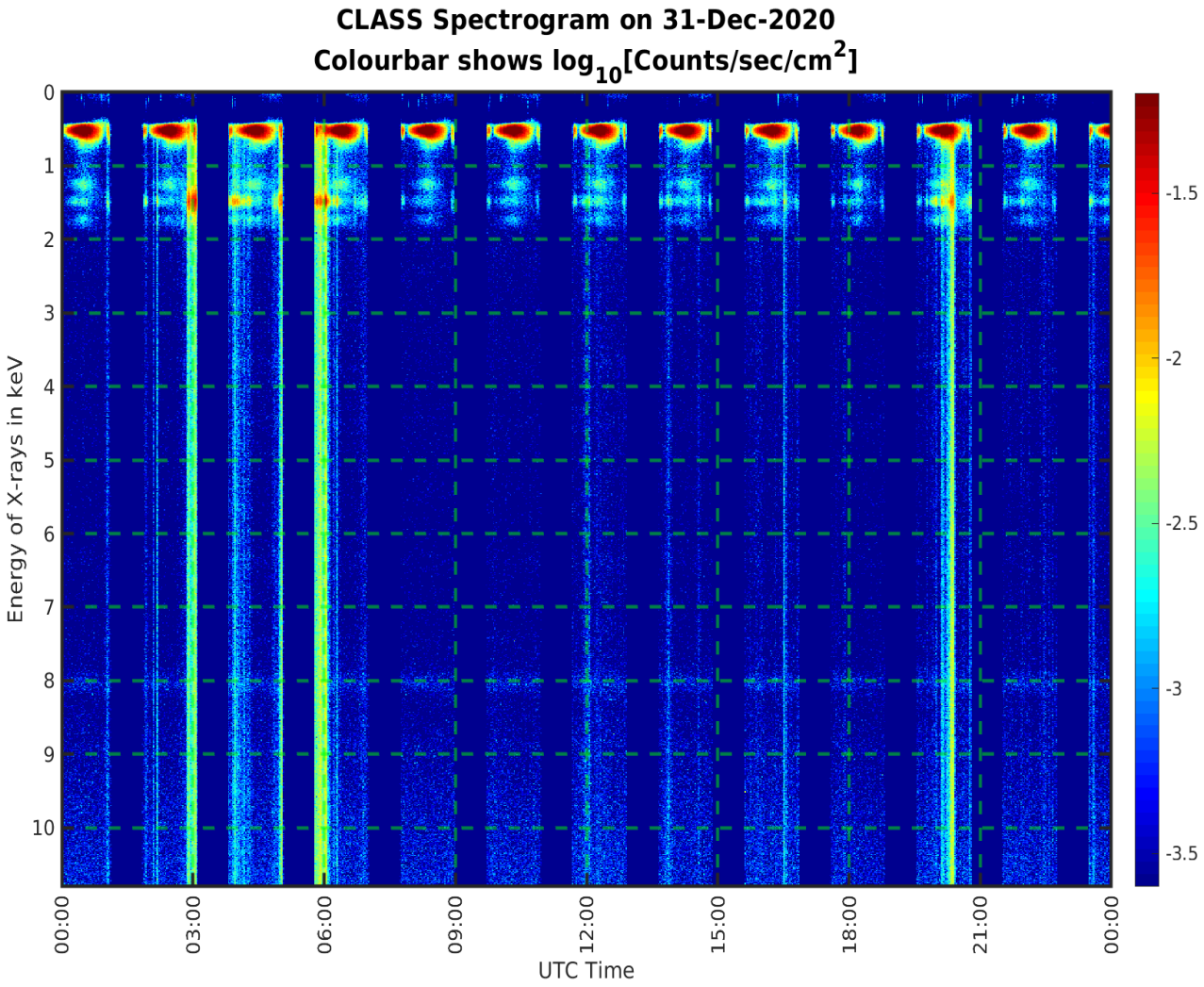
UTC Time


CLASS Spectrogram on 31-Dec-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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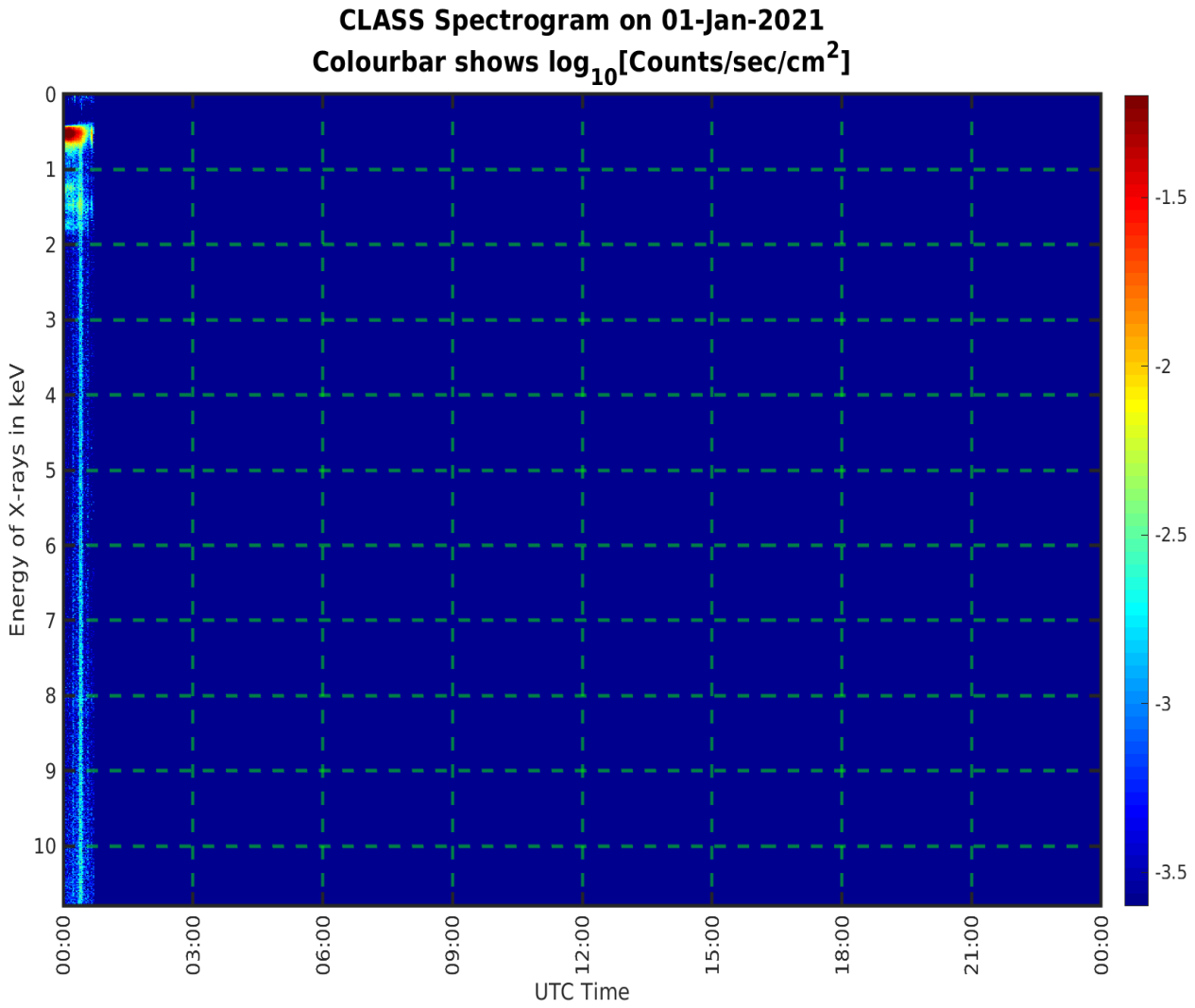
CLASS Spectrogram on 01-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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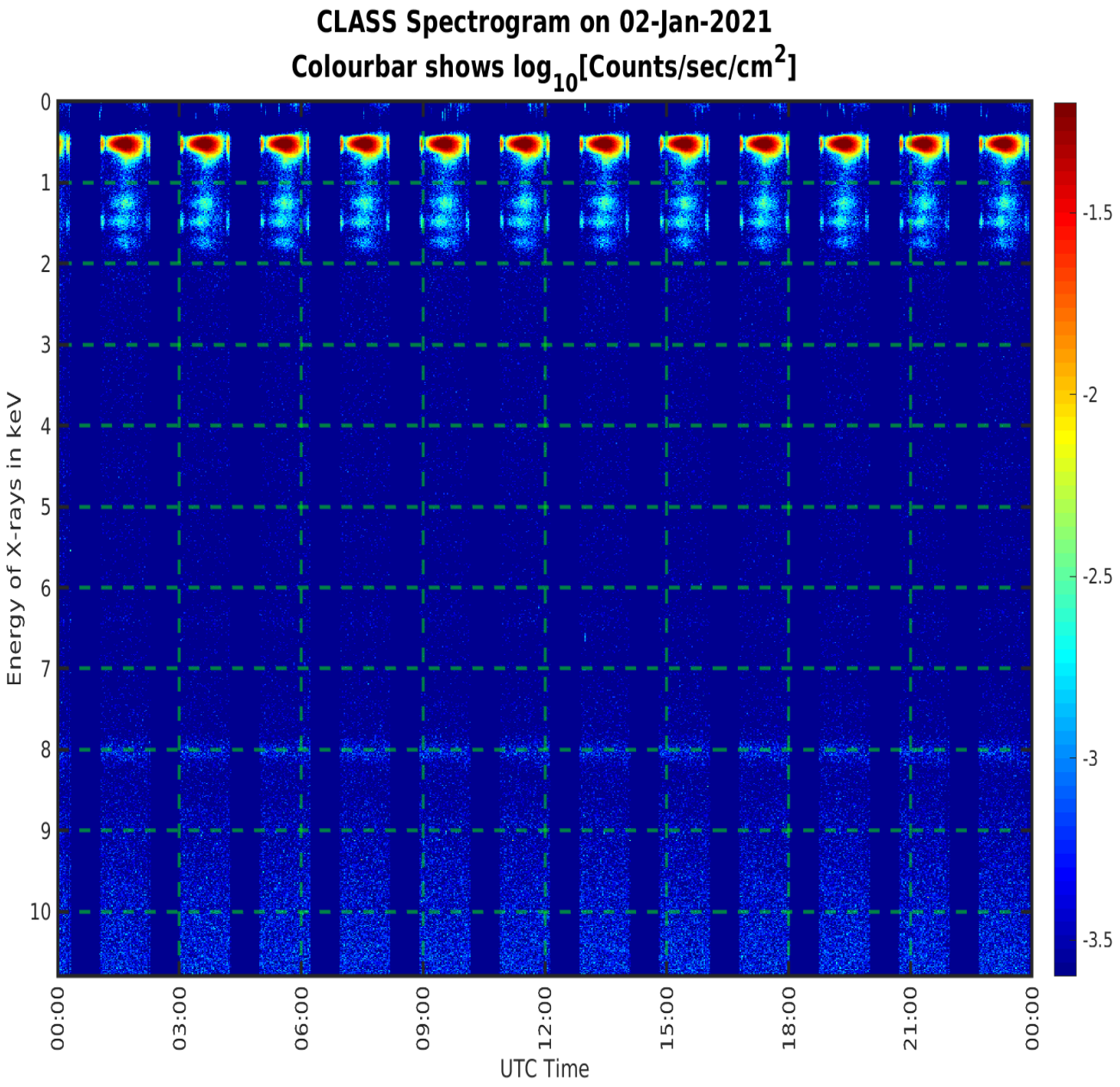
CLASS Spectrogram on 02-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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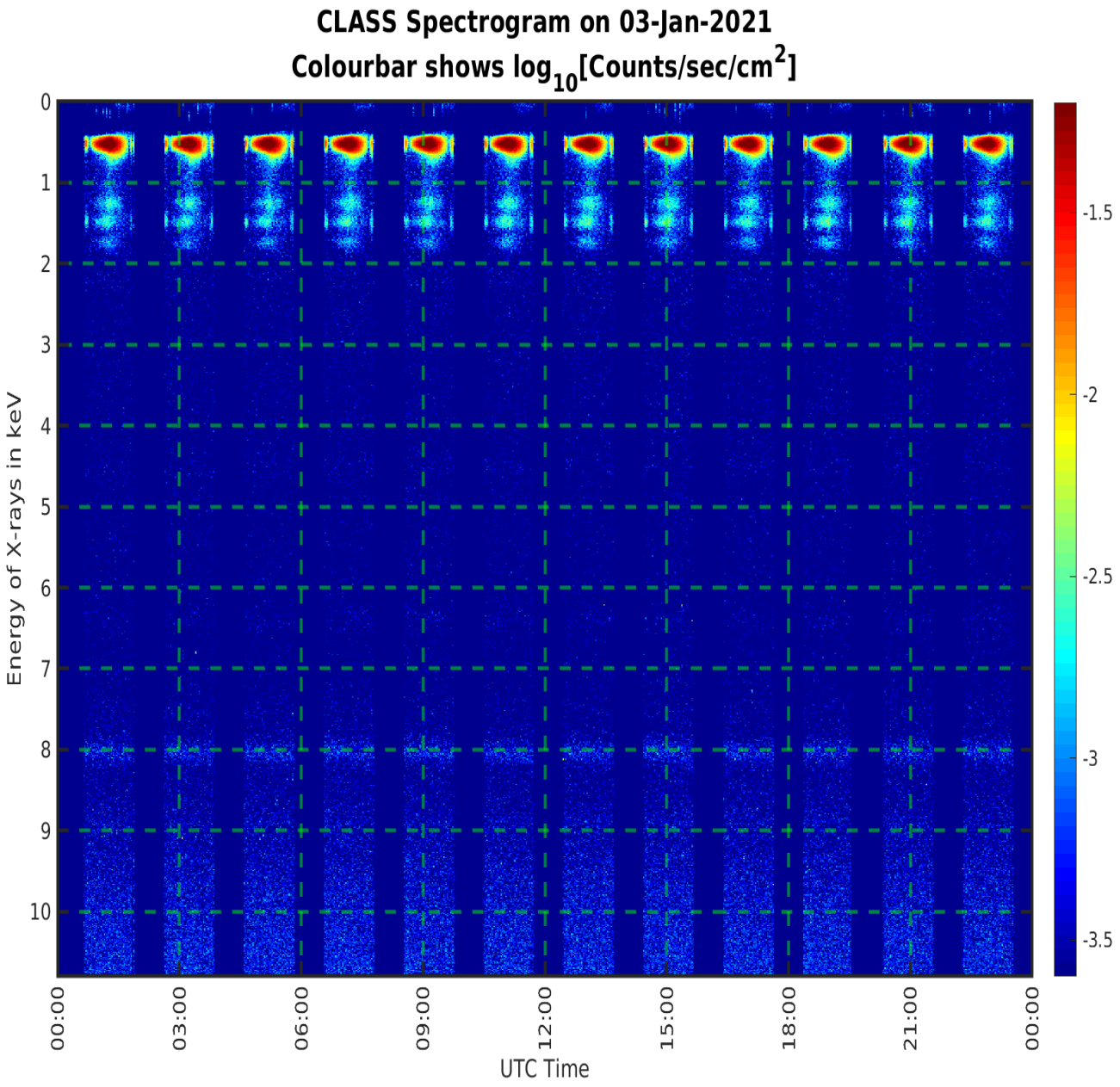
UTC Time


CLASS Spectrogram on 03-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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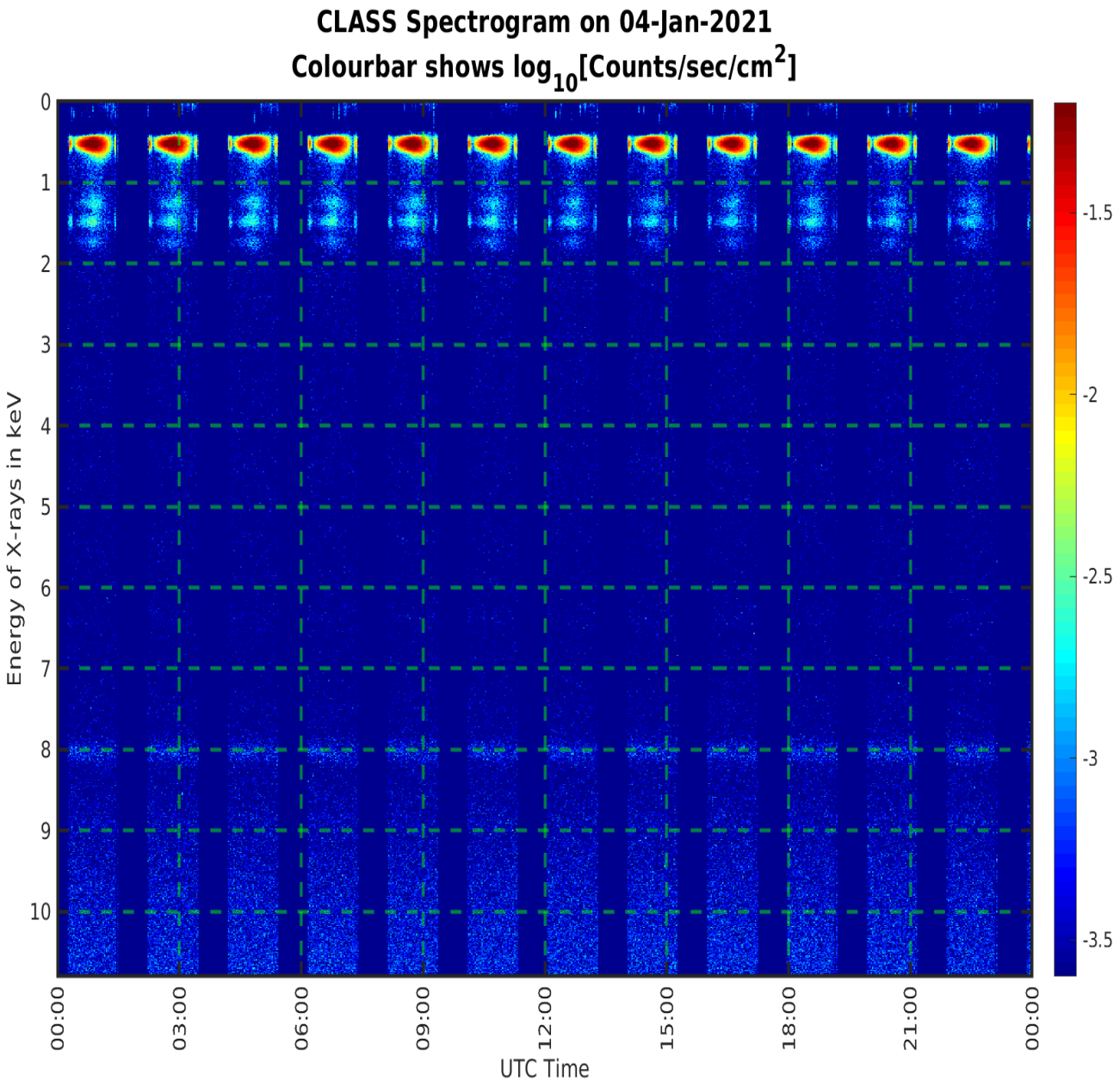
UTC Time


CLASS Spectrogram on 04-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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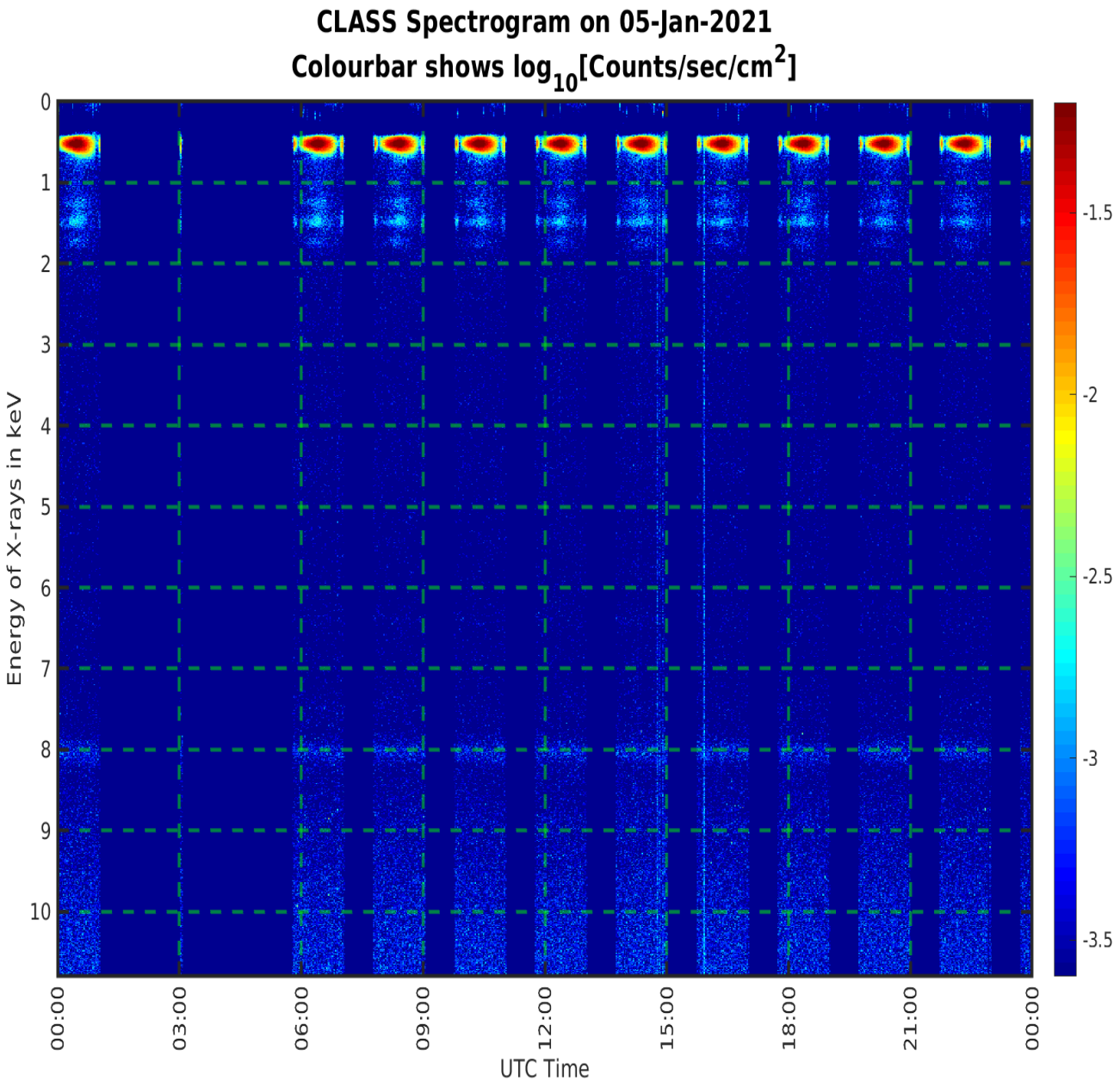
UTC Time


CLASS Spectrogram on 05-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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6
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-1.5
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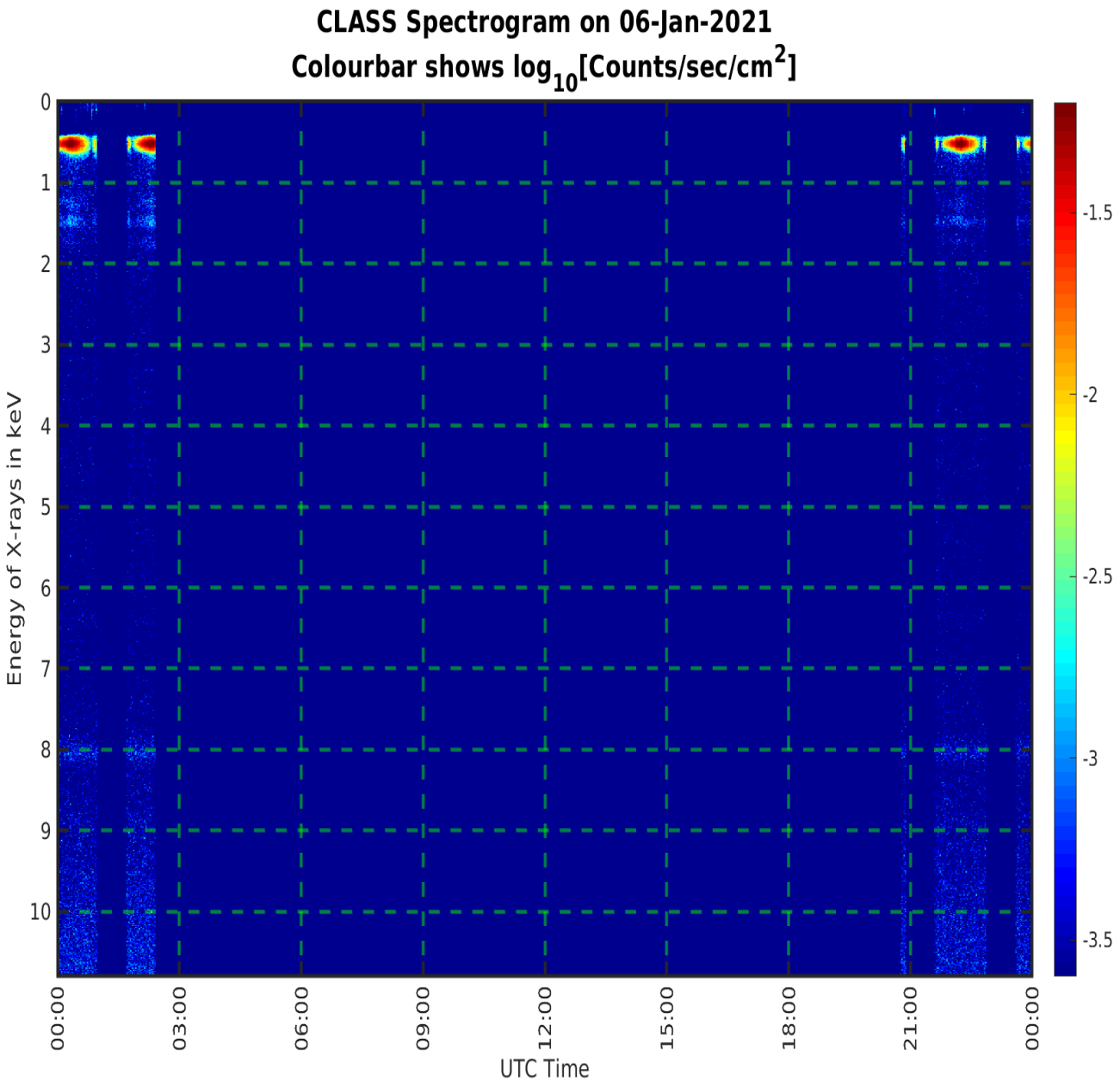
UTC Time


CLASS Spectrogram on 06-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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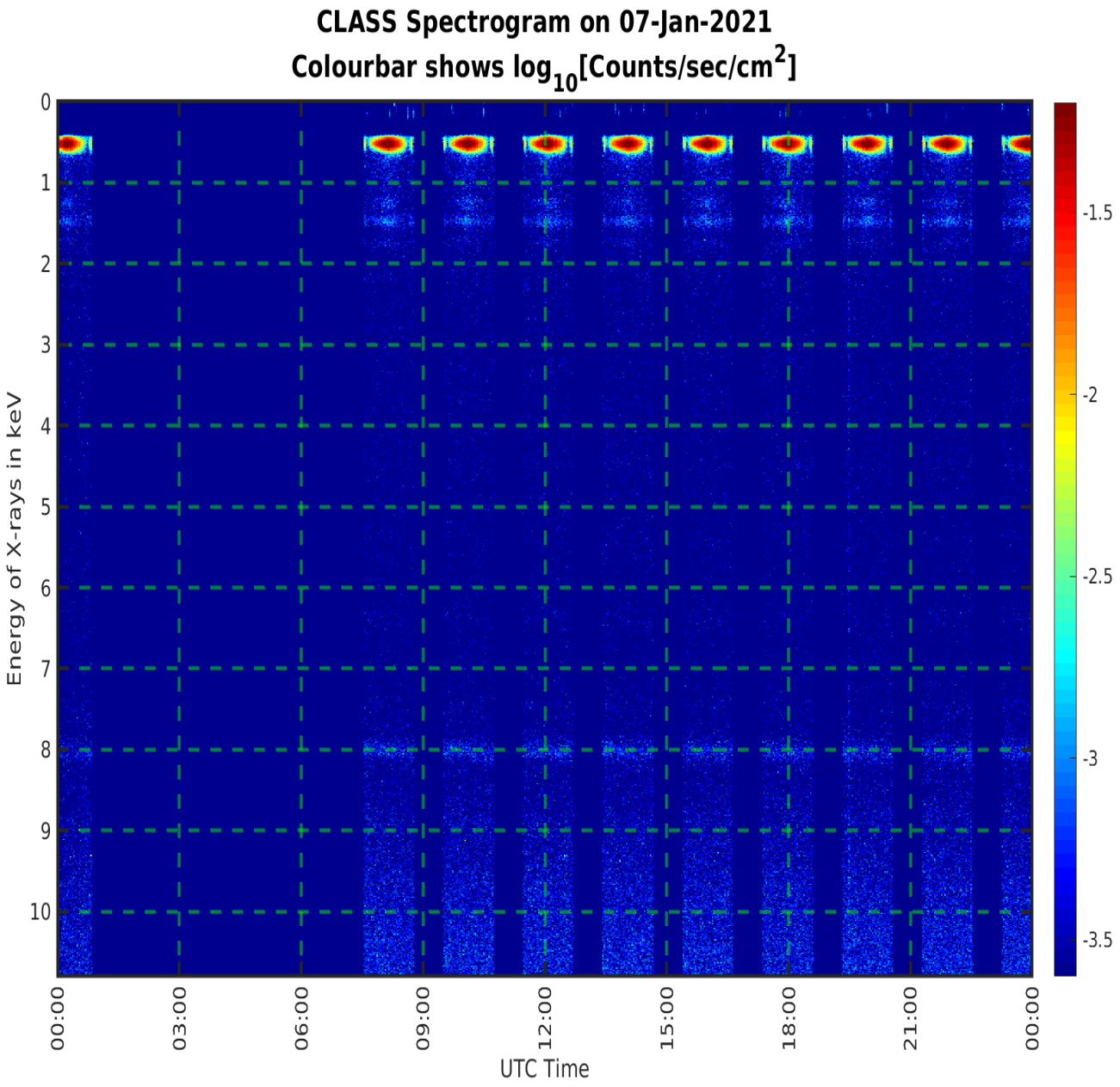
UTC Time


CLASS Spectrogram on 07-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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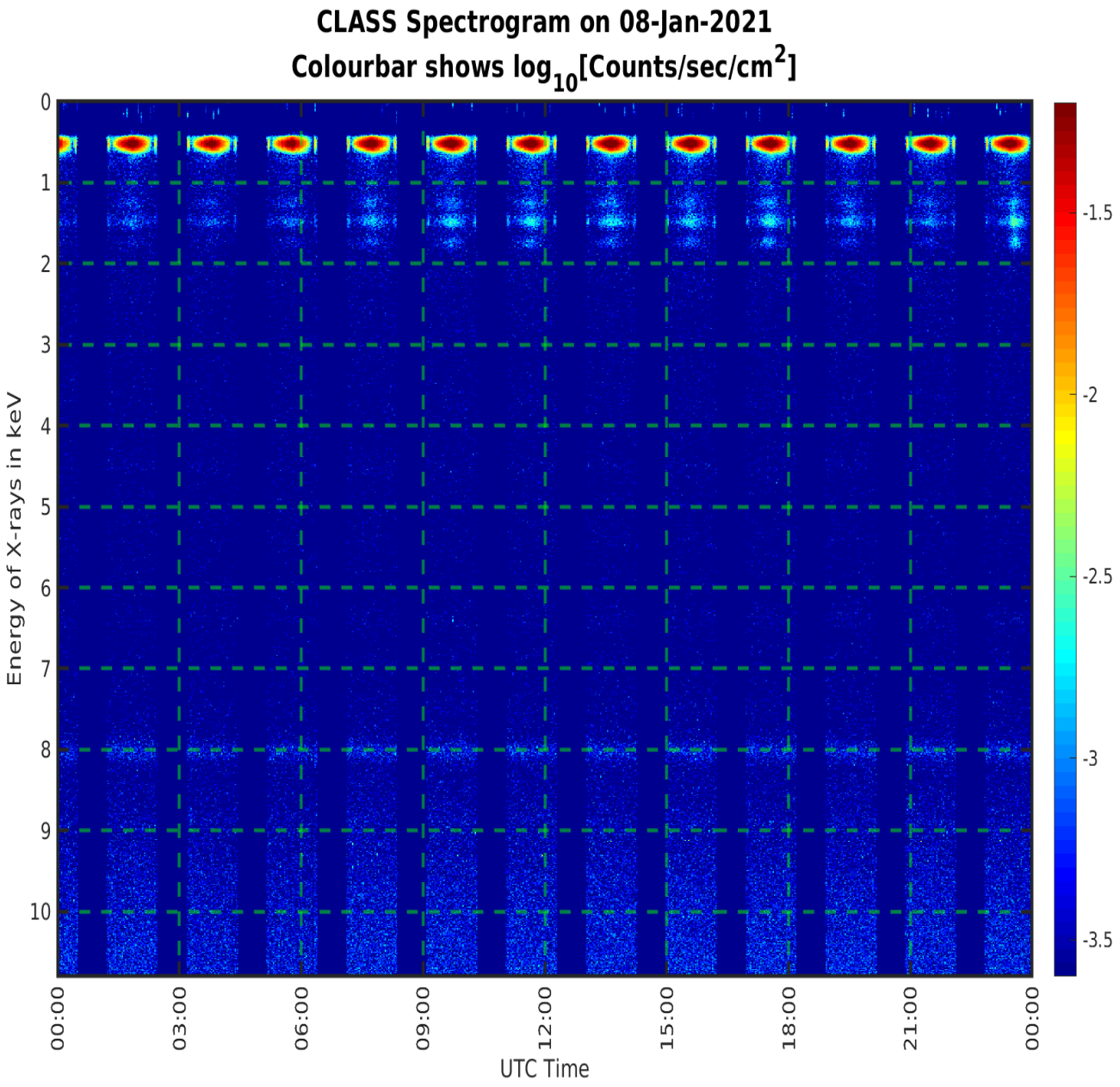
UTC Time


CLASS Spectrogram on 08-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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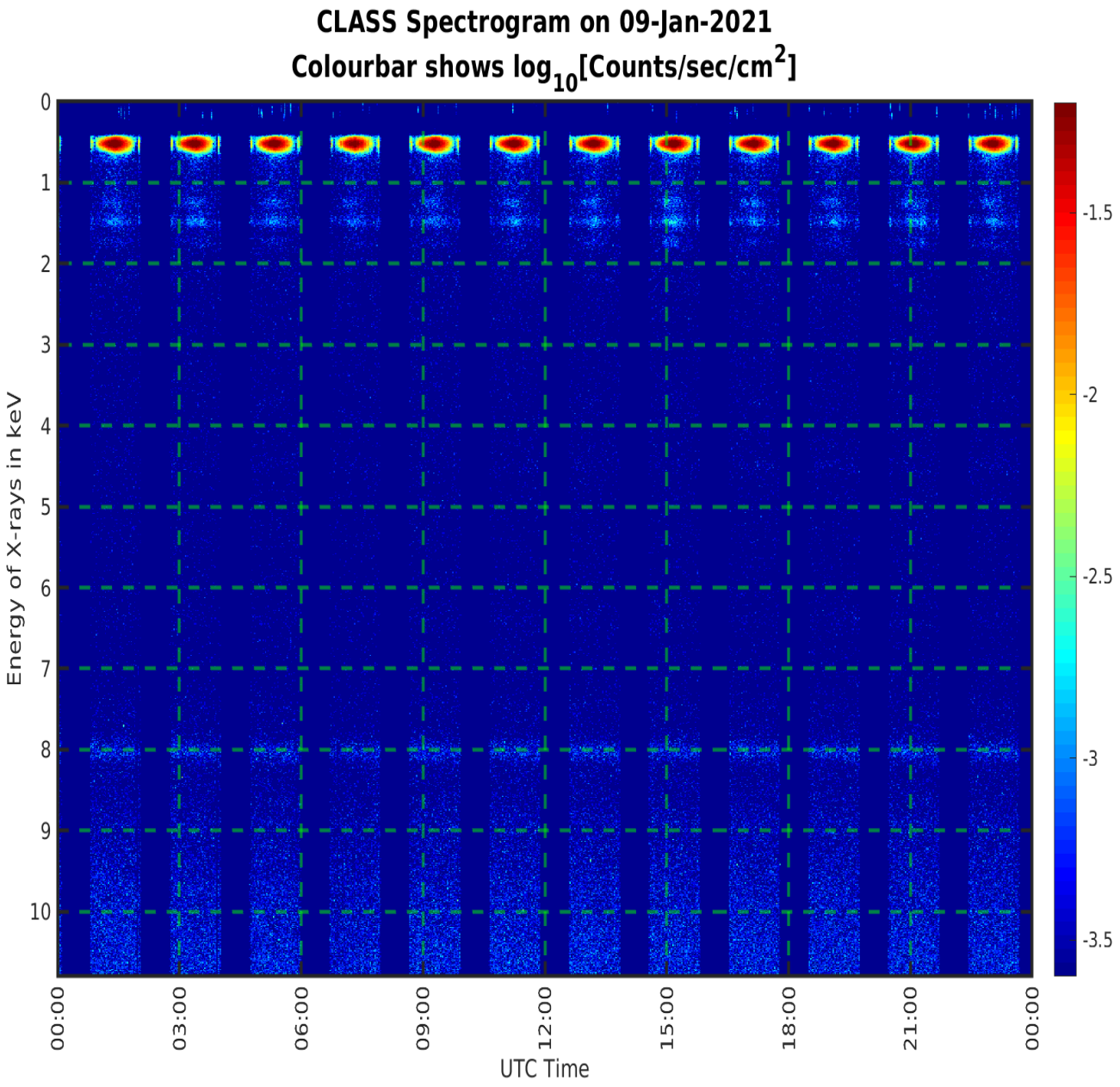
UTC Time


CLASS Spectrogram on 09-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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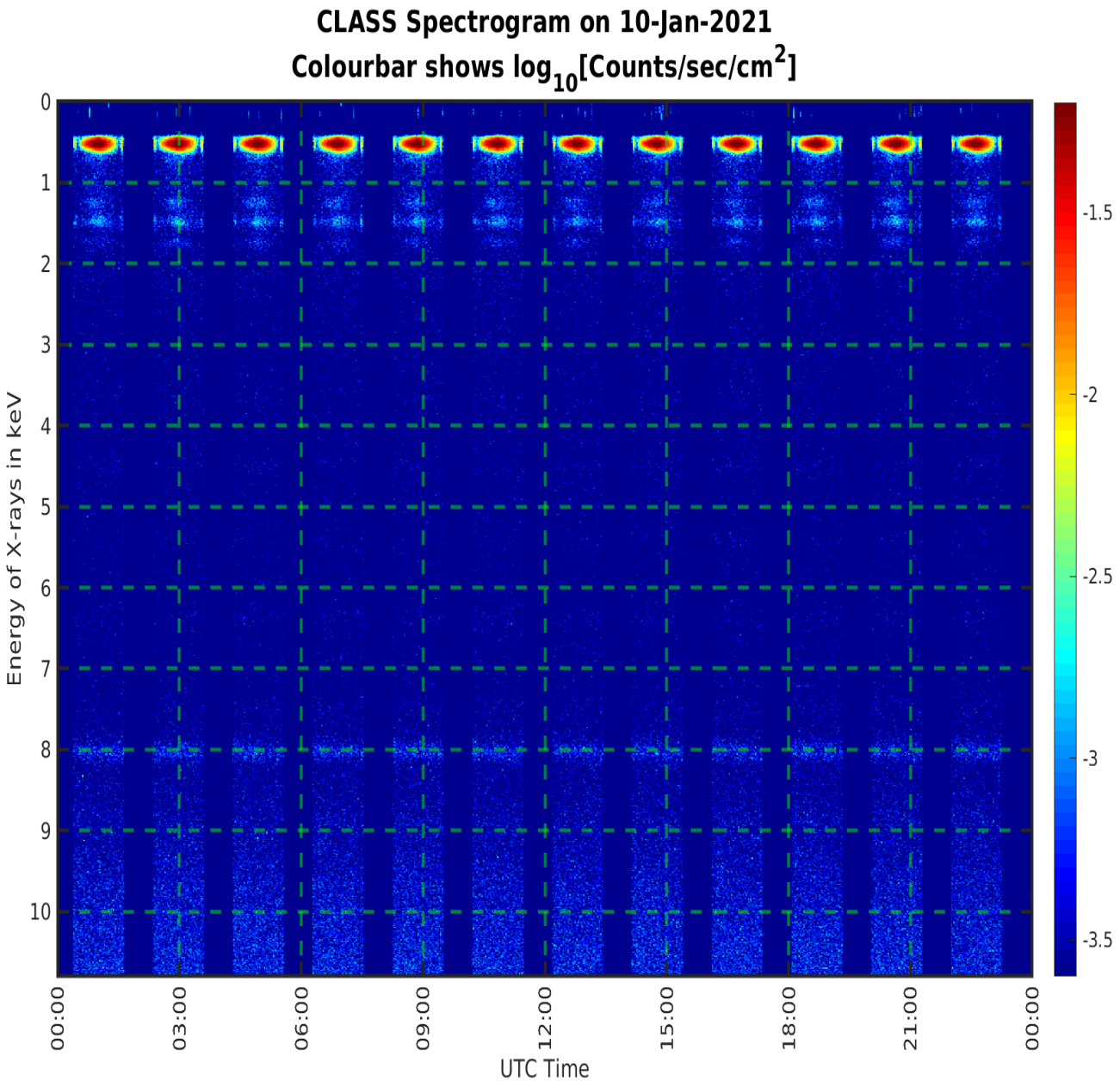
UTC Time


CLASS Spectrogram on 10-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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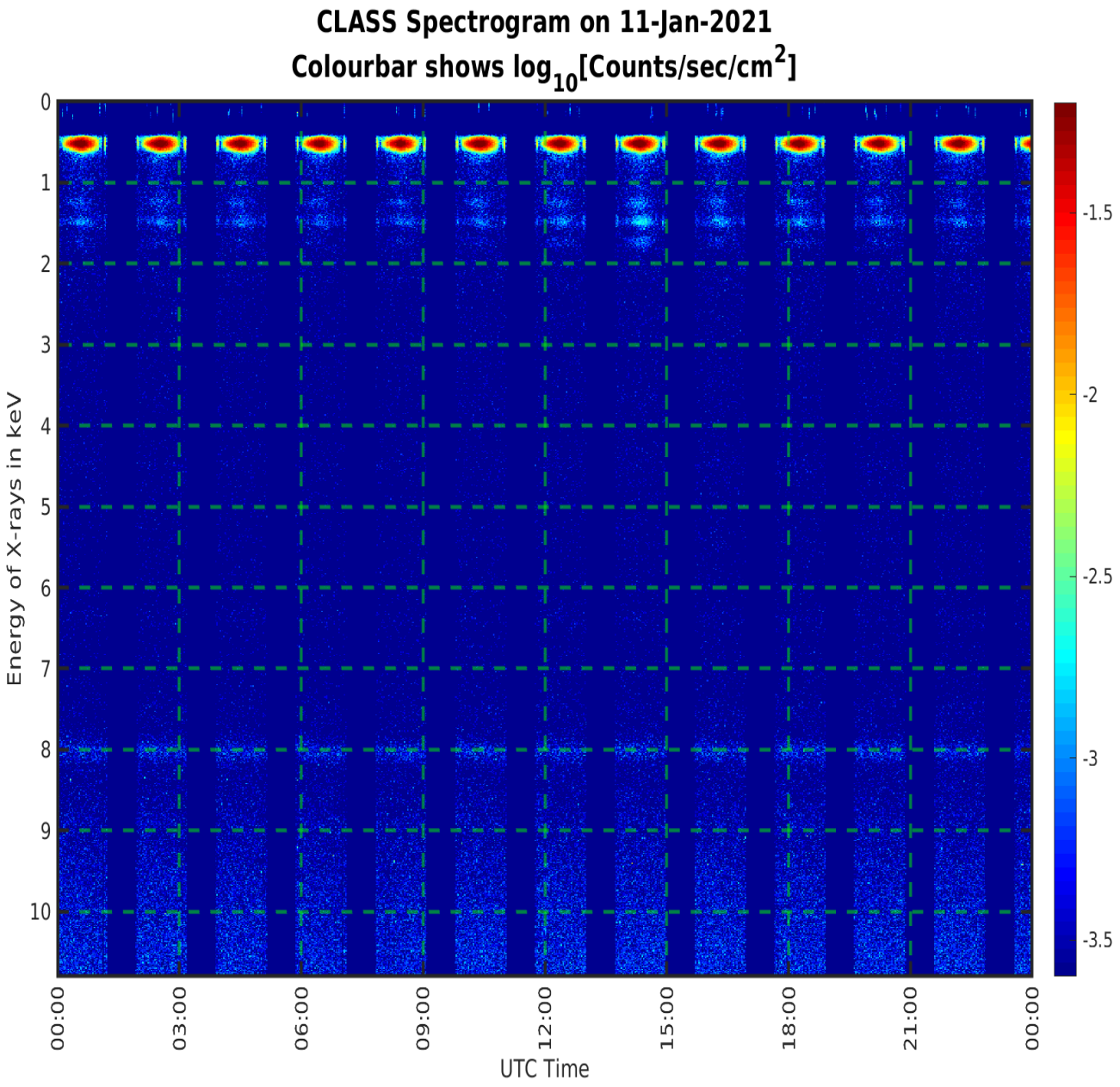
UTC Time


CLASS Spectrogram on 11-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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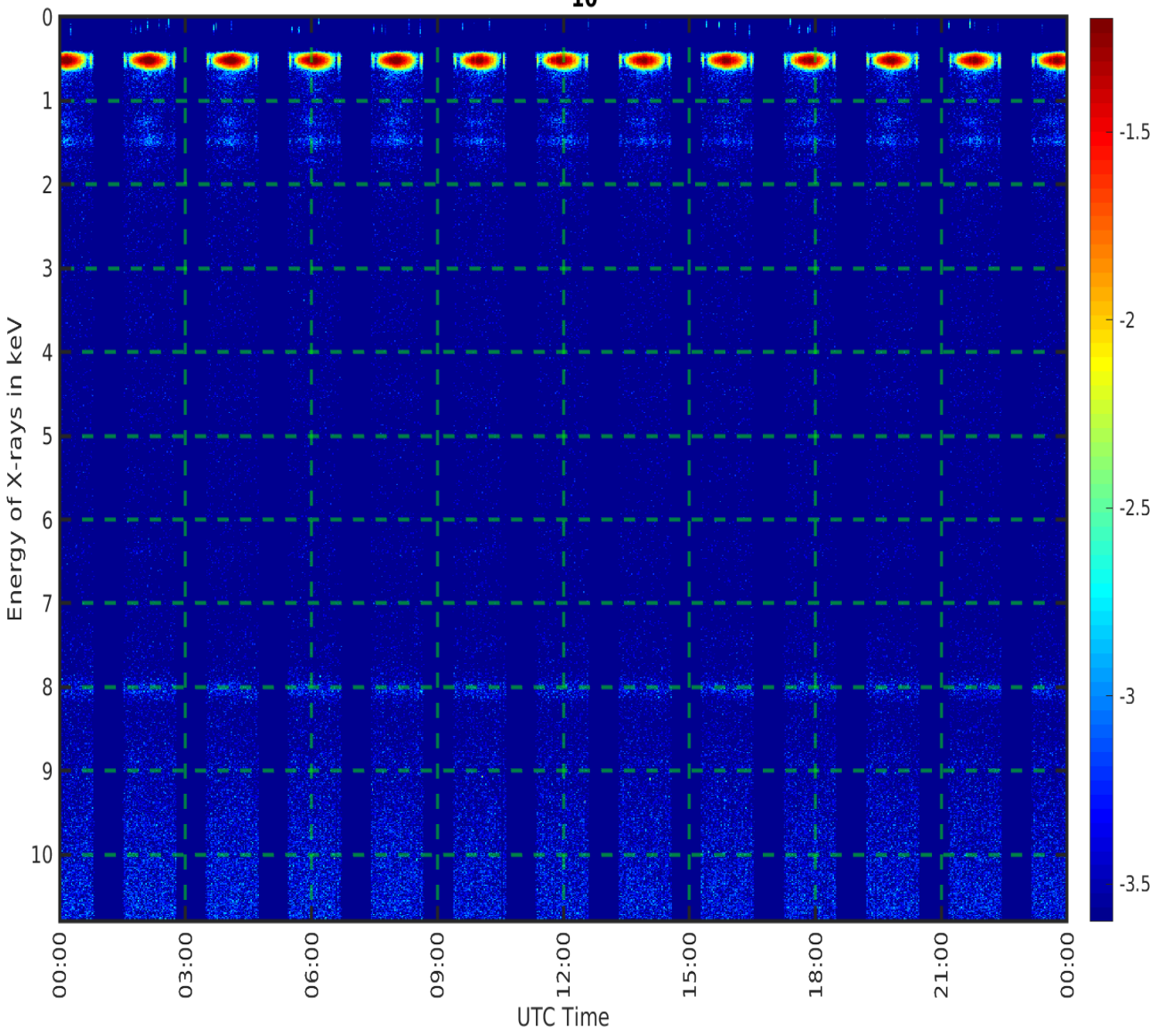
UTC Time


CLASS Spectrogram on 12-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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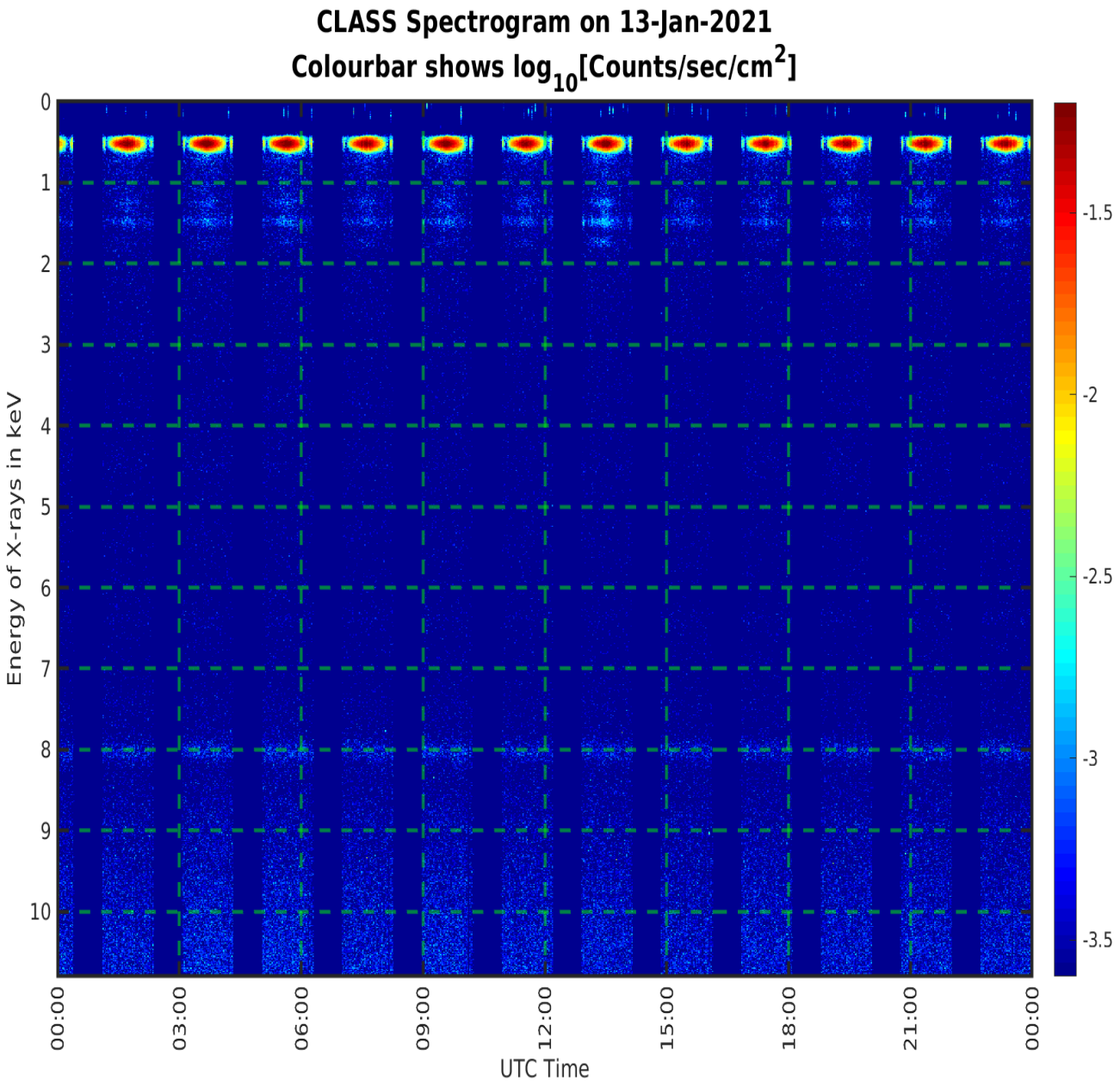
UTC Time


CLASS Spectrogram on 13-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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-1.5
-2
-2.5
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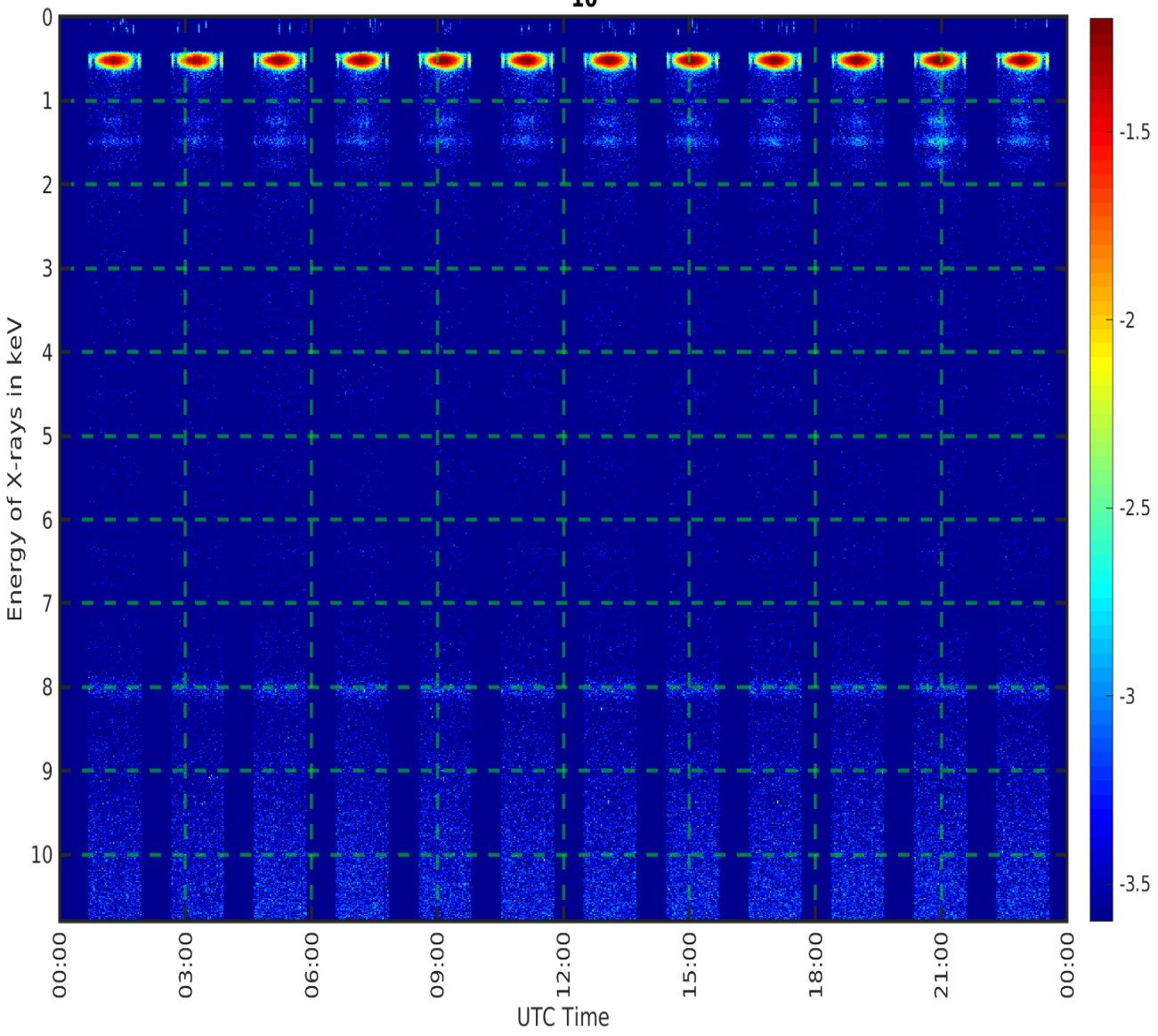
UTC Time


CLASS Spectrogram on 14-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
-2
-2.5
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-3.5
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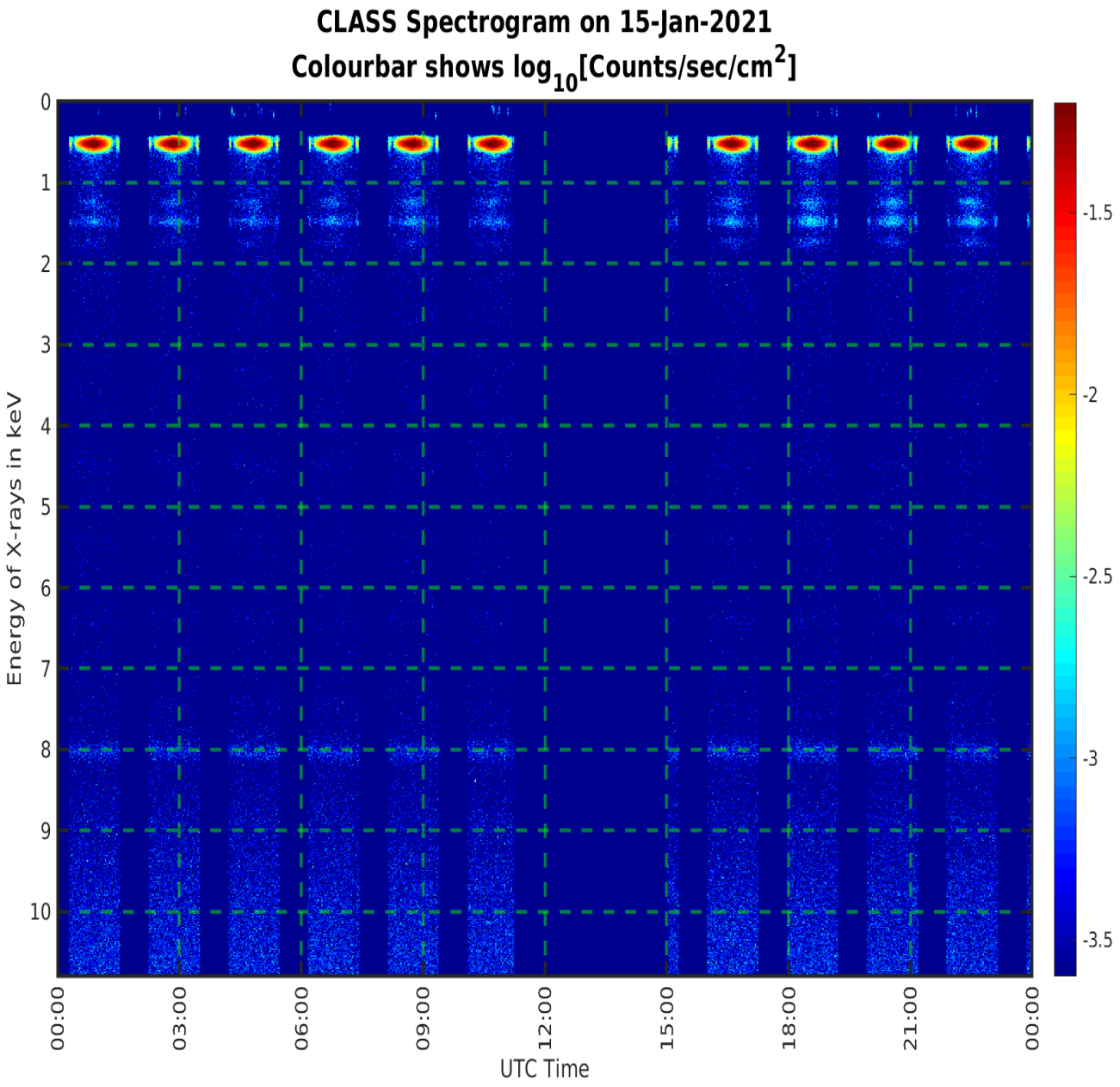
UTC Time


CLASS Spectrogram on 15-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
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-1.5
-2
-2.5
-3
-3.5
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18:00
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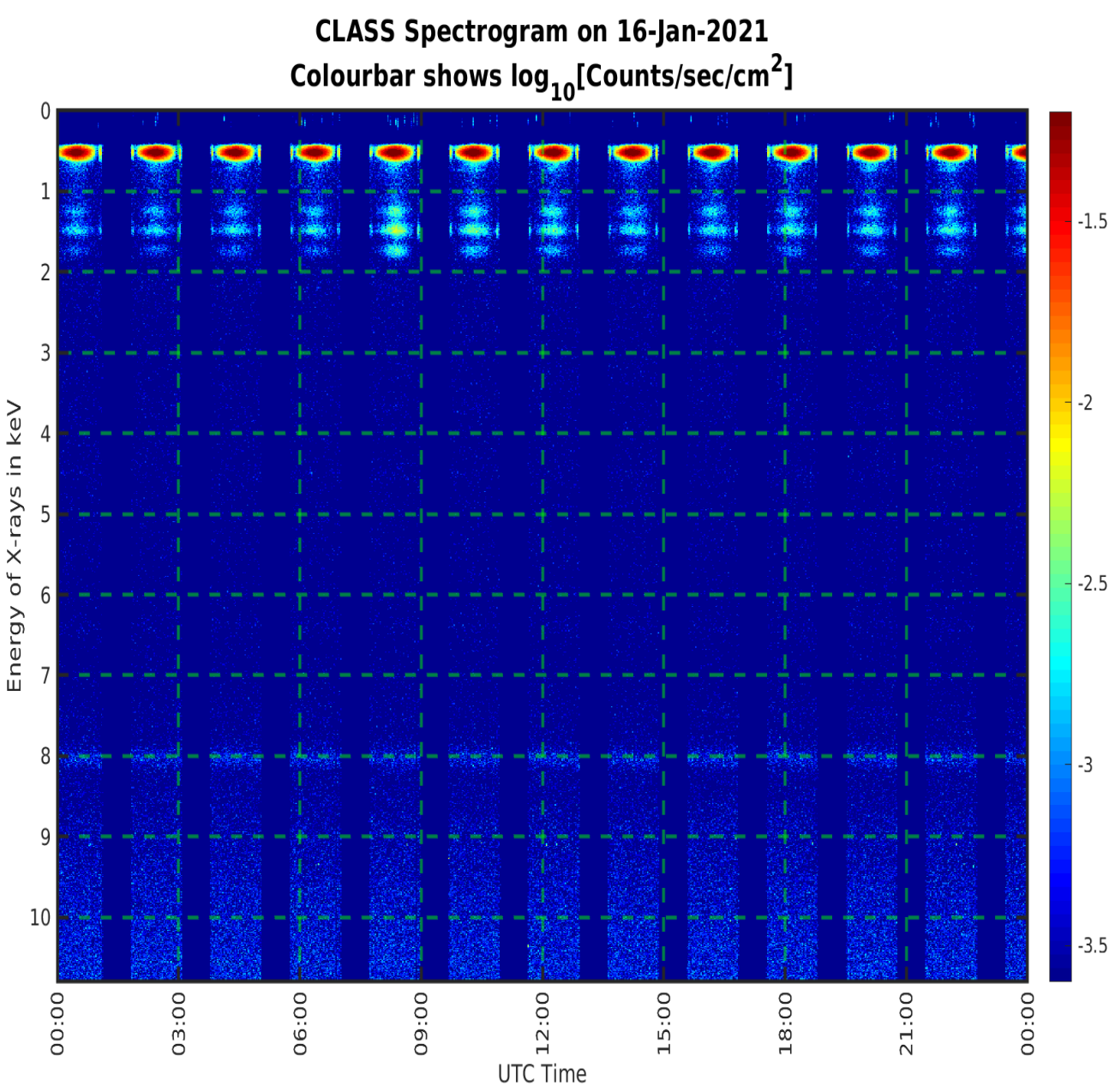
UTC Time


CLASS Spectrogram on 16-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
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-1.5
-2
-2.5
-3
-3.5
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18:00
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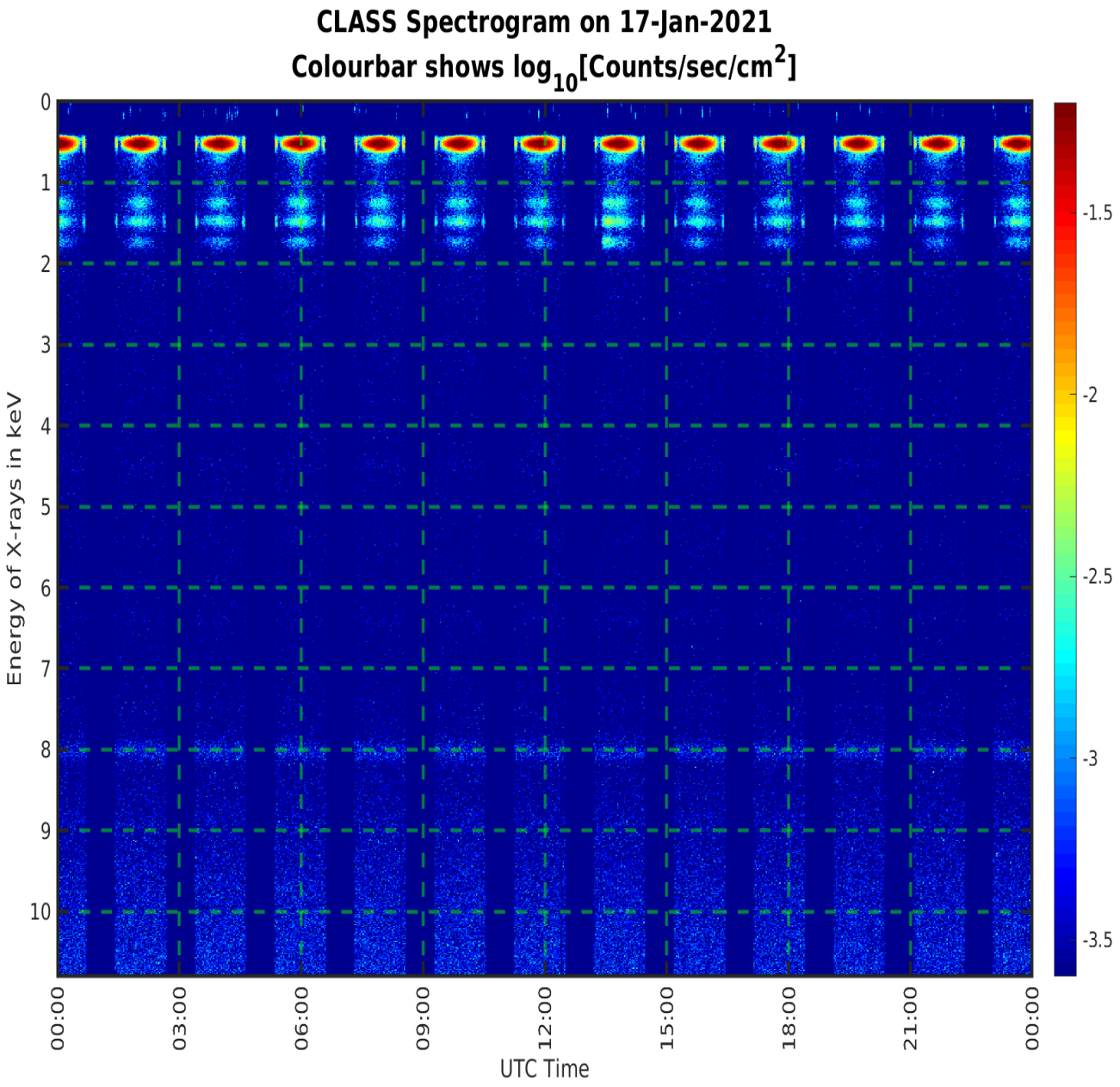
UTC Time


CLASS Spectrogram on 17-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
-2
-2.5
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-3.5
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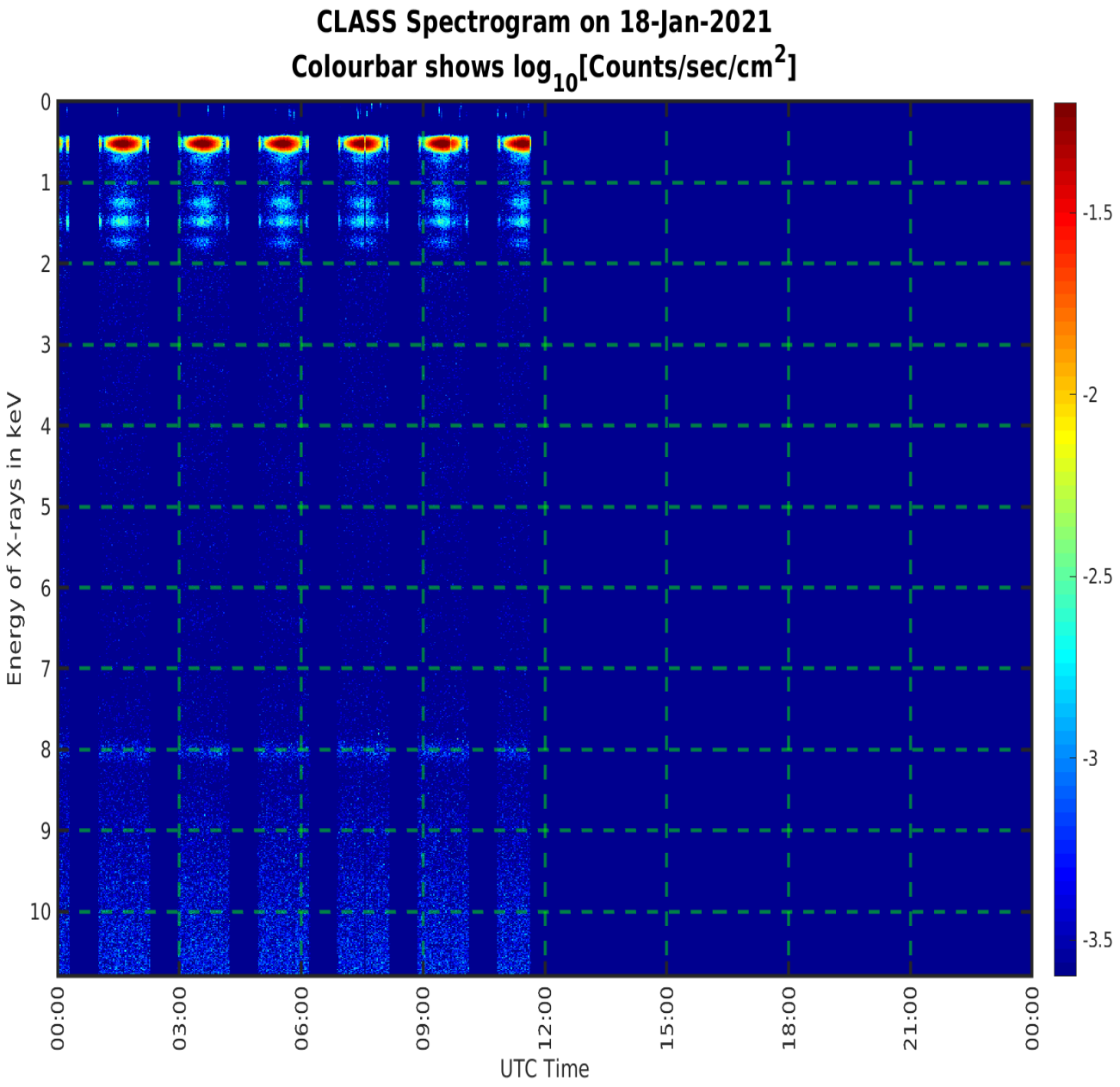
UTC Time


CLASS Spectrogram on 18-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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-2.5
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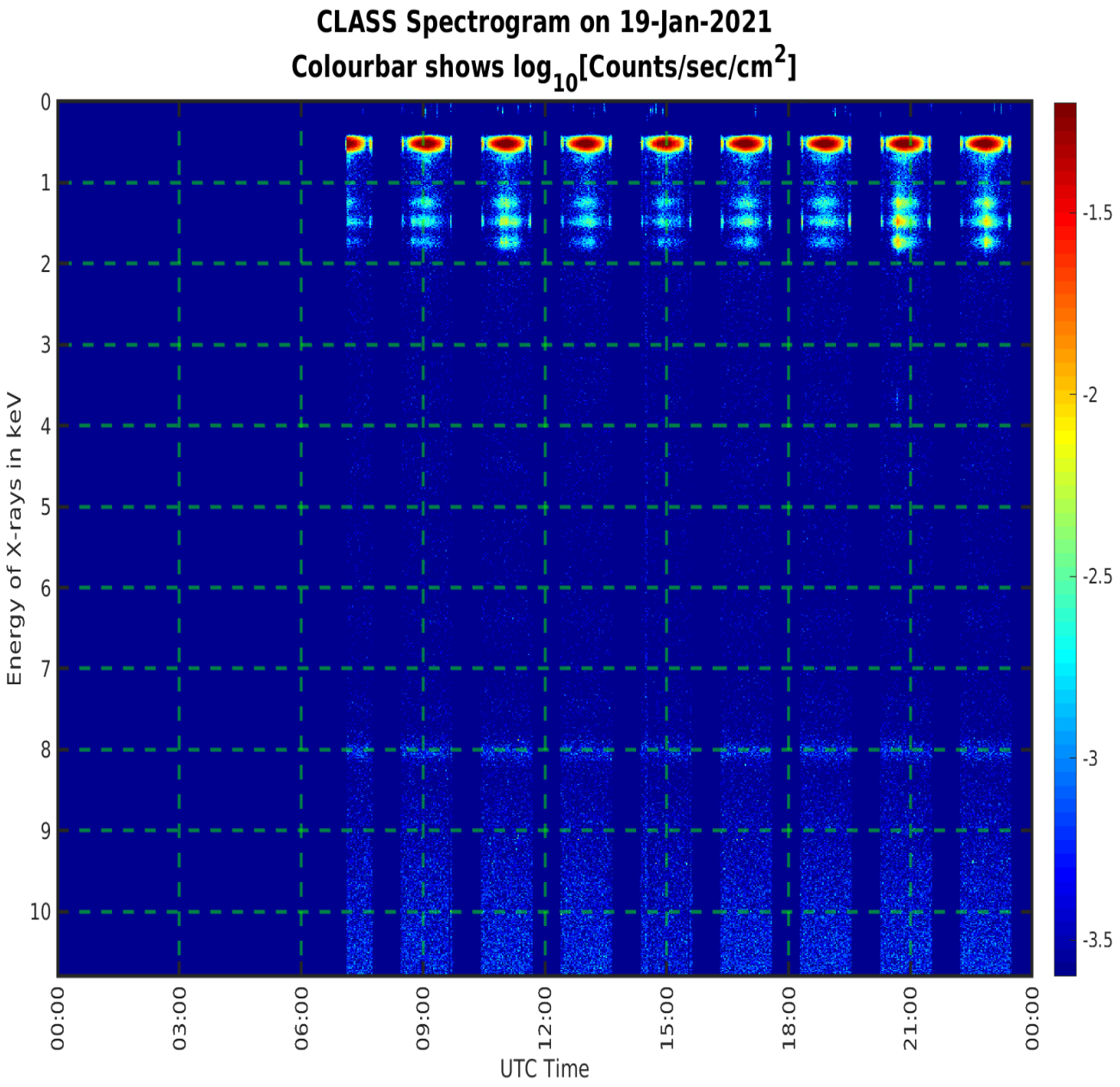
UTC Time


CLASS Spectrogram on 19-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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-2.5
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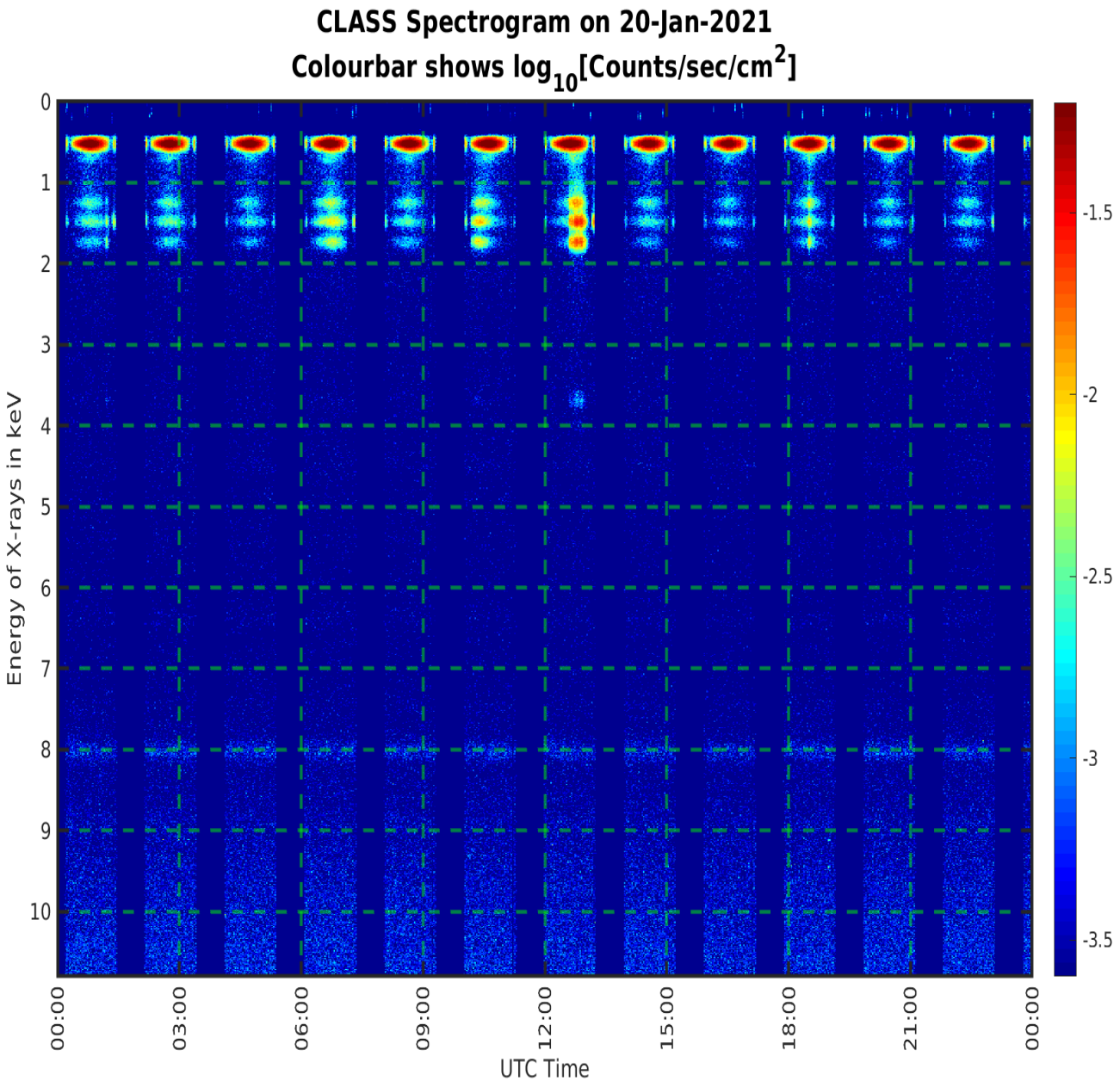
UTC Time


CLASS Spectrogram on 20-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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-1.5
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-2.5
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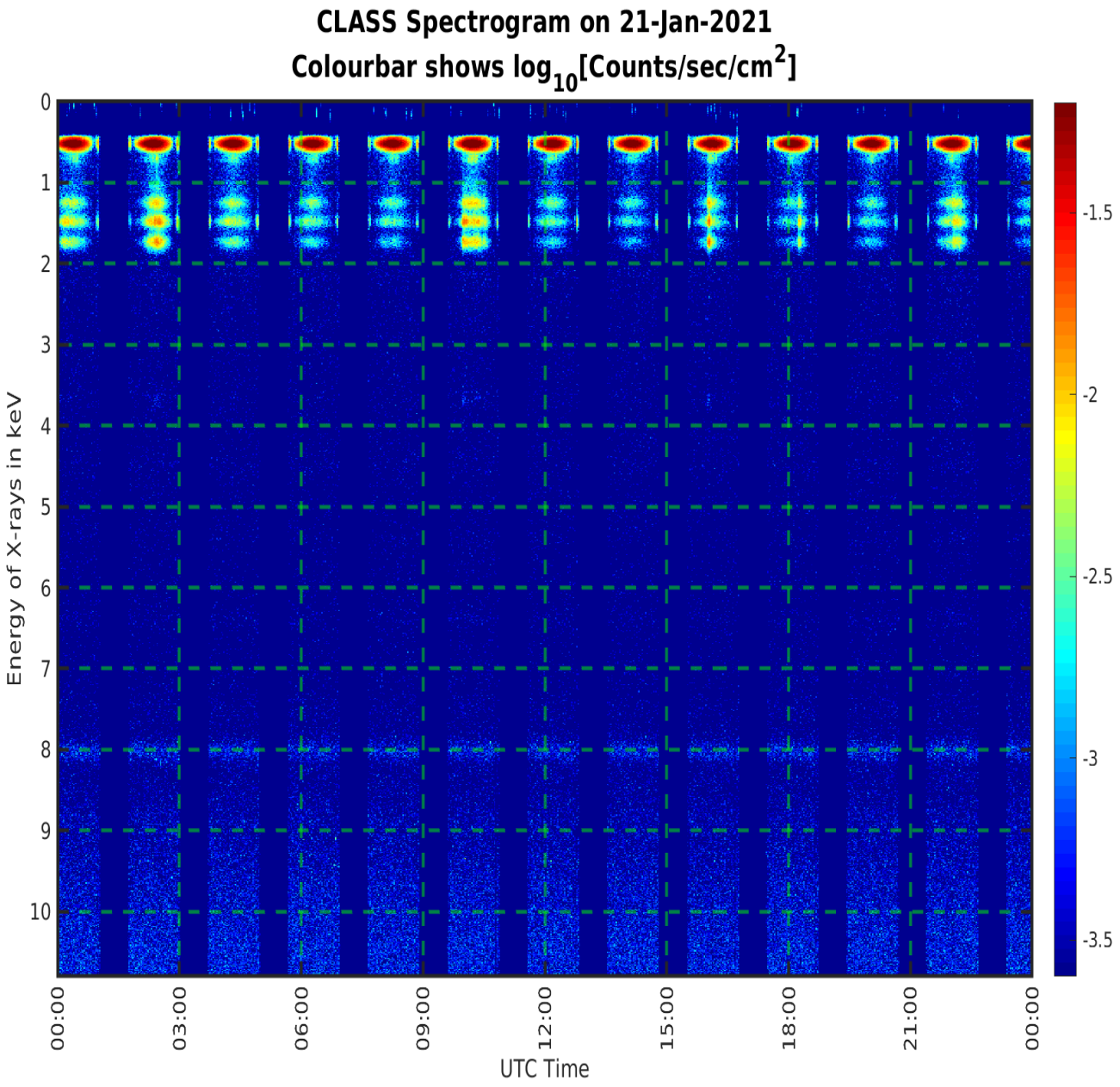
UTC Time


CLASS Spectrogram on 21-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
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-1.5
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-2.5
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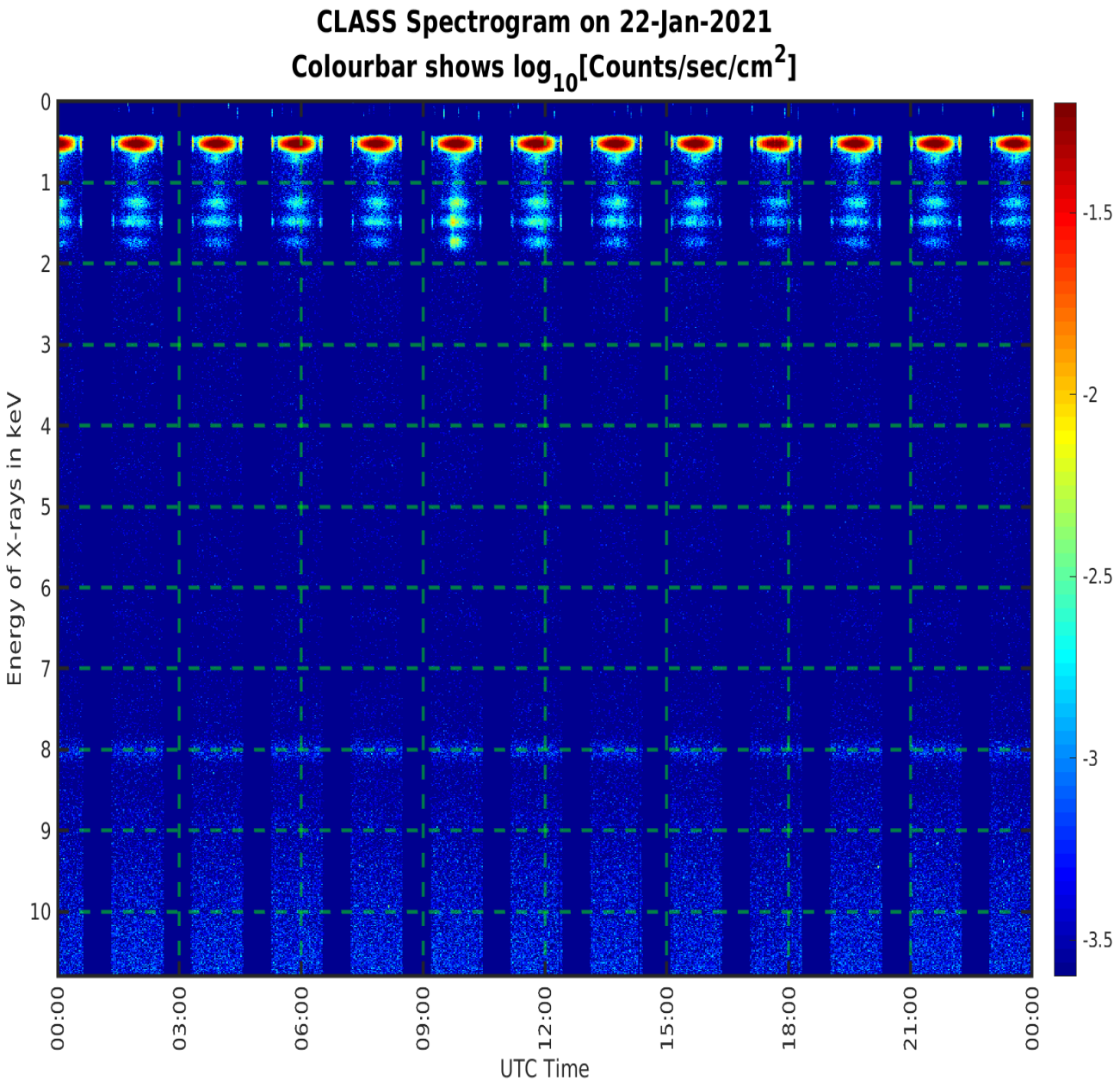
UTC Time


CLASS Spectrogram on 22-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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-1.5
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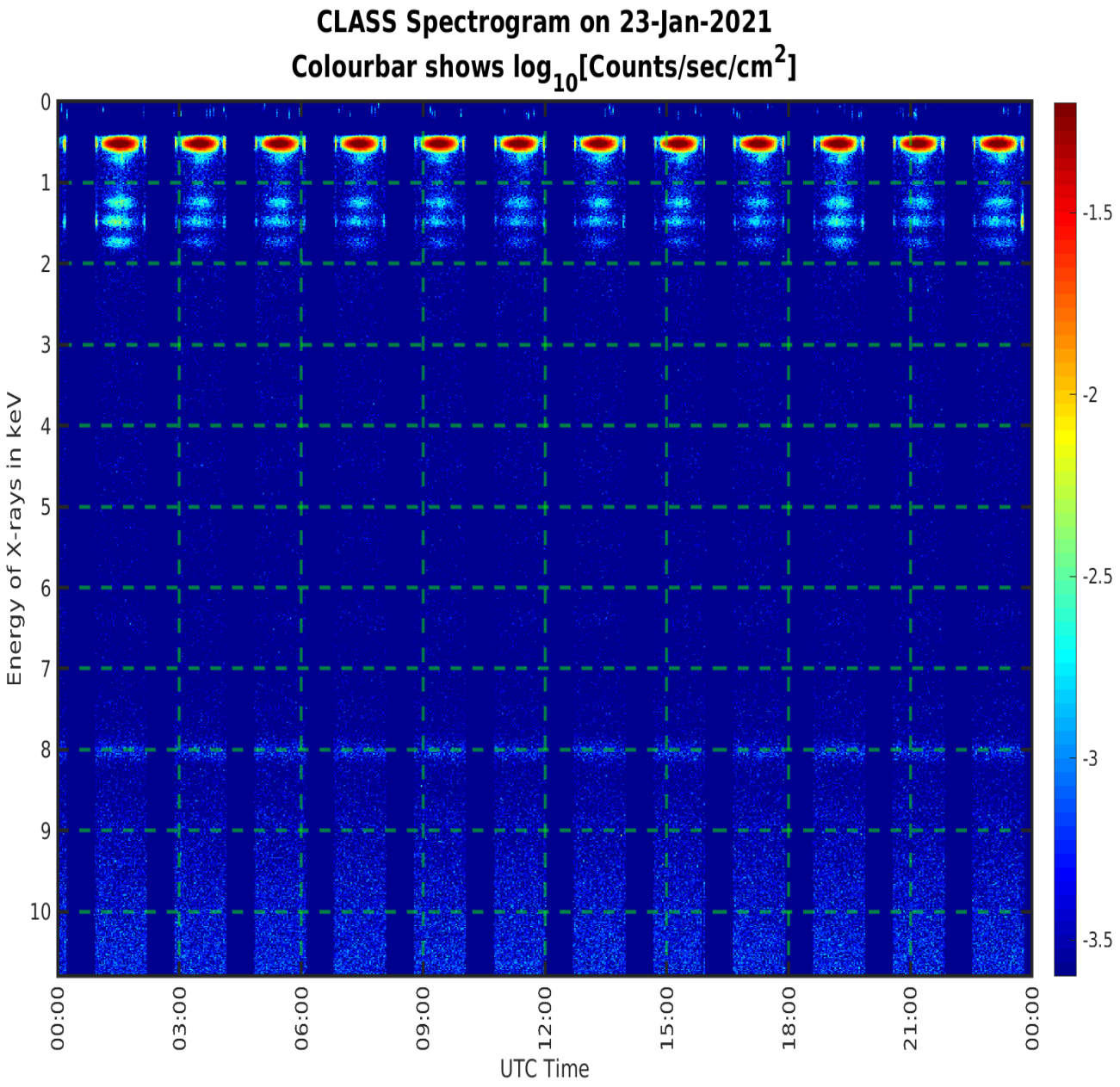
UTC Time


CLASS Spectrogram on 23-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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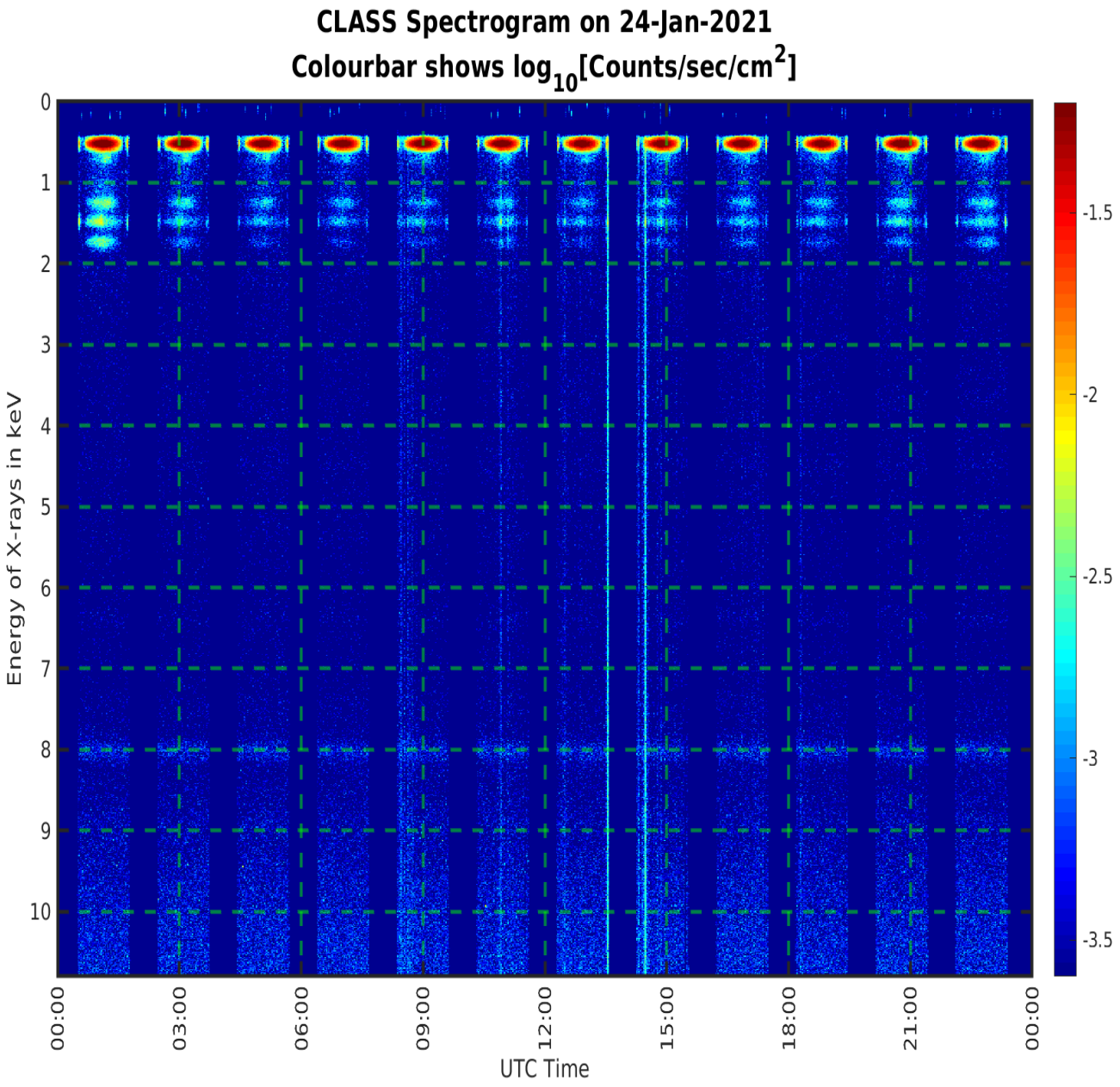
UTC Time


CLASS Spectrogram on 24-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
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-1.5
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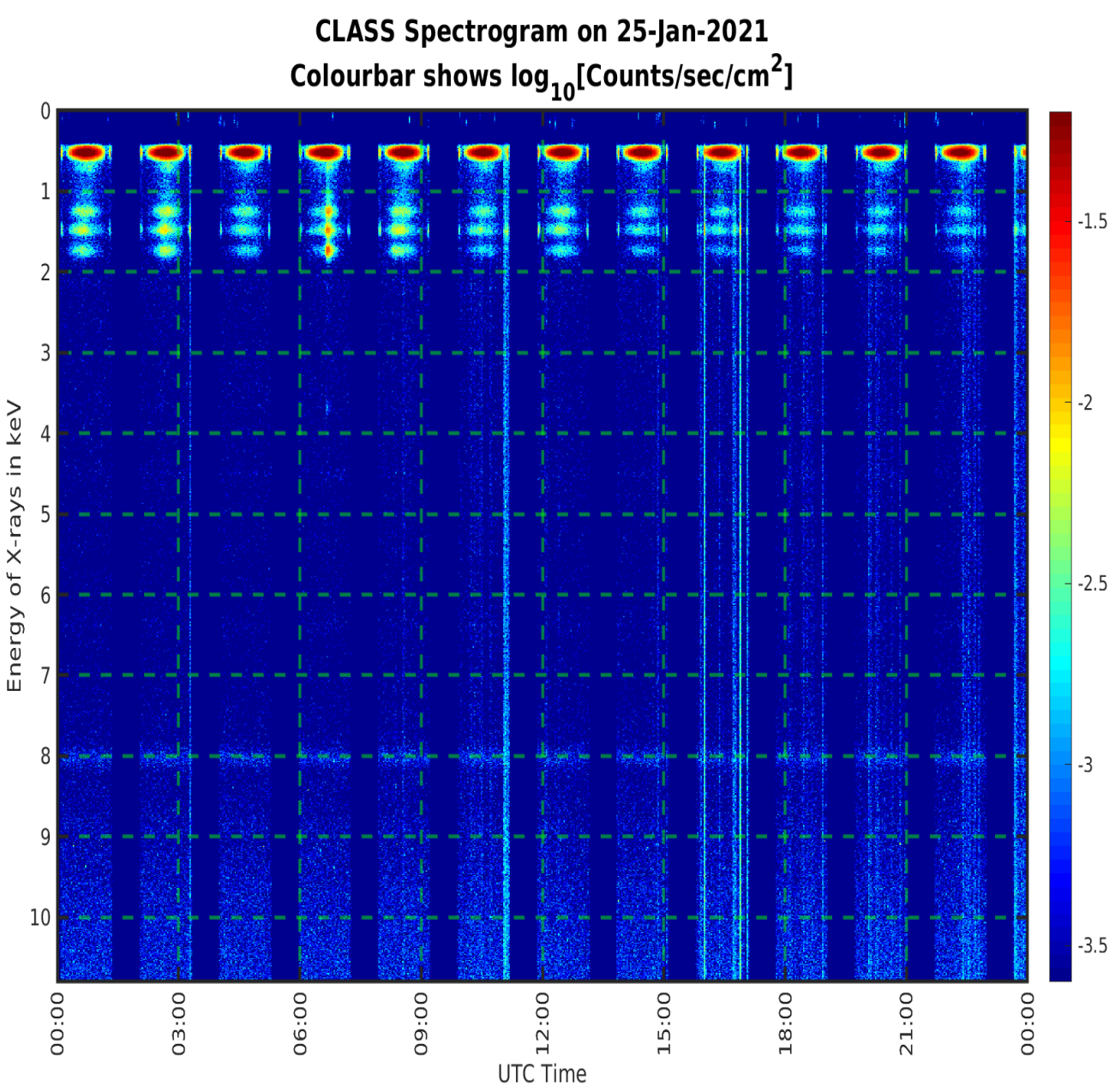
UTC Time


CLASS Spectrogram on 25-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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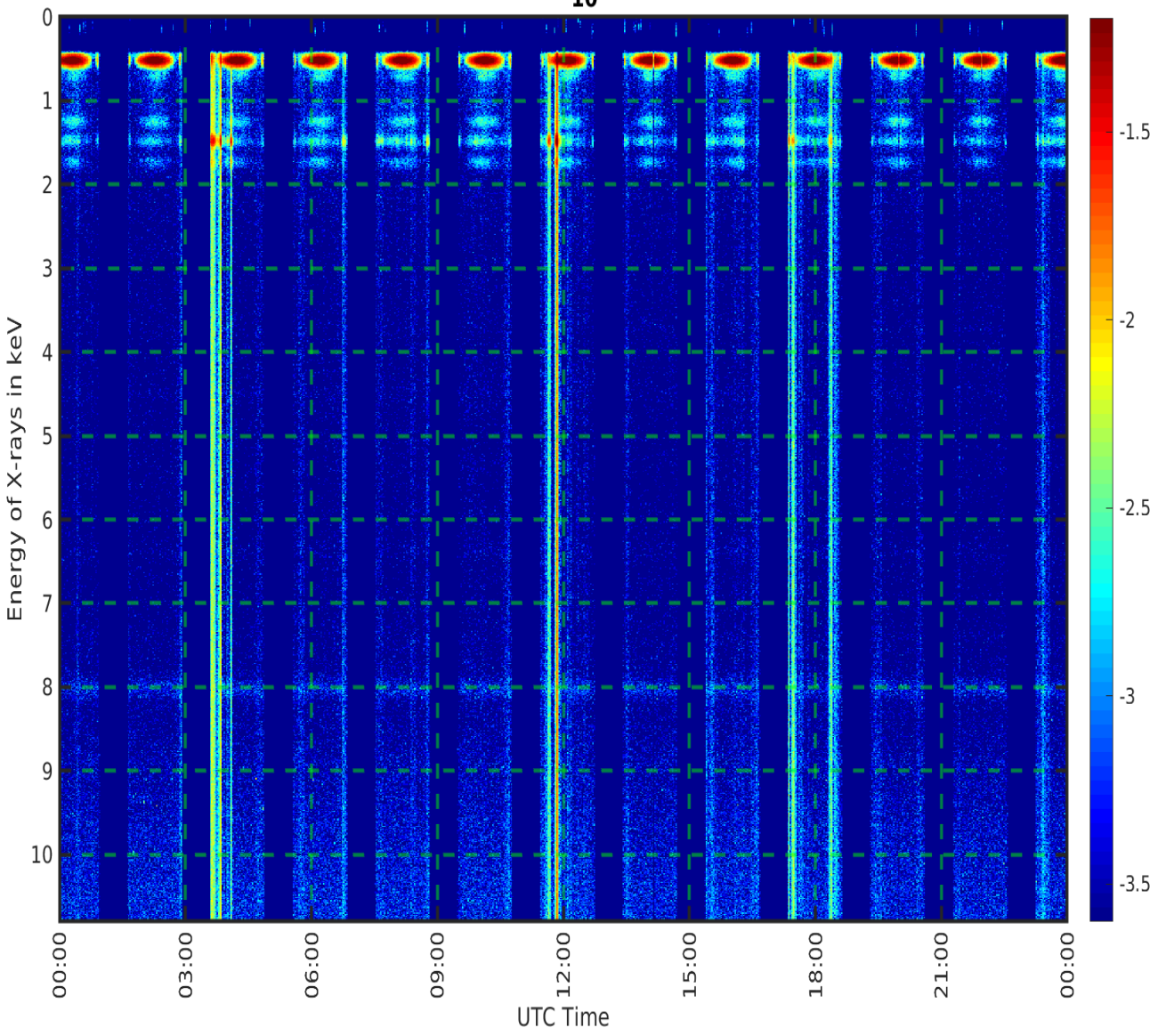
UTC Time


CLASS Spectrogram on 26-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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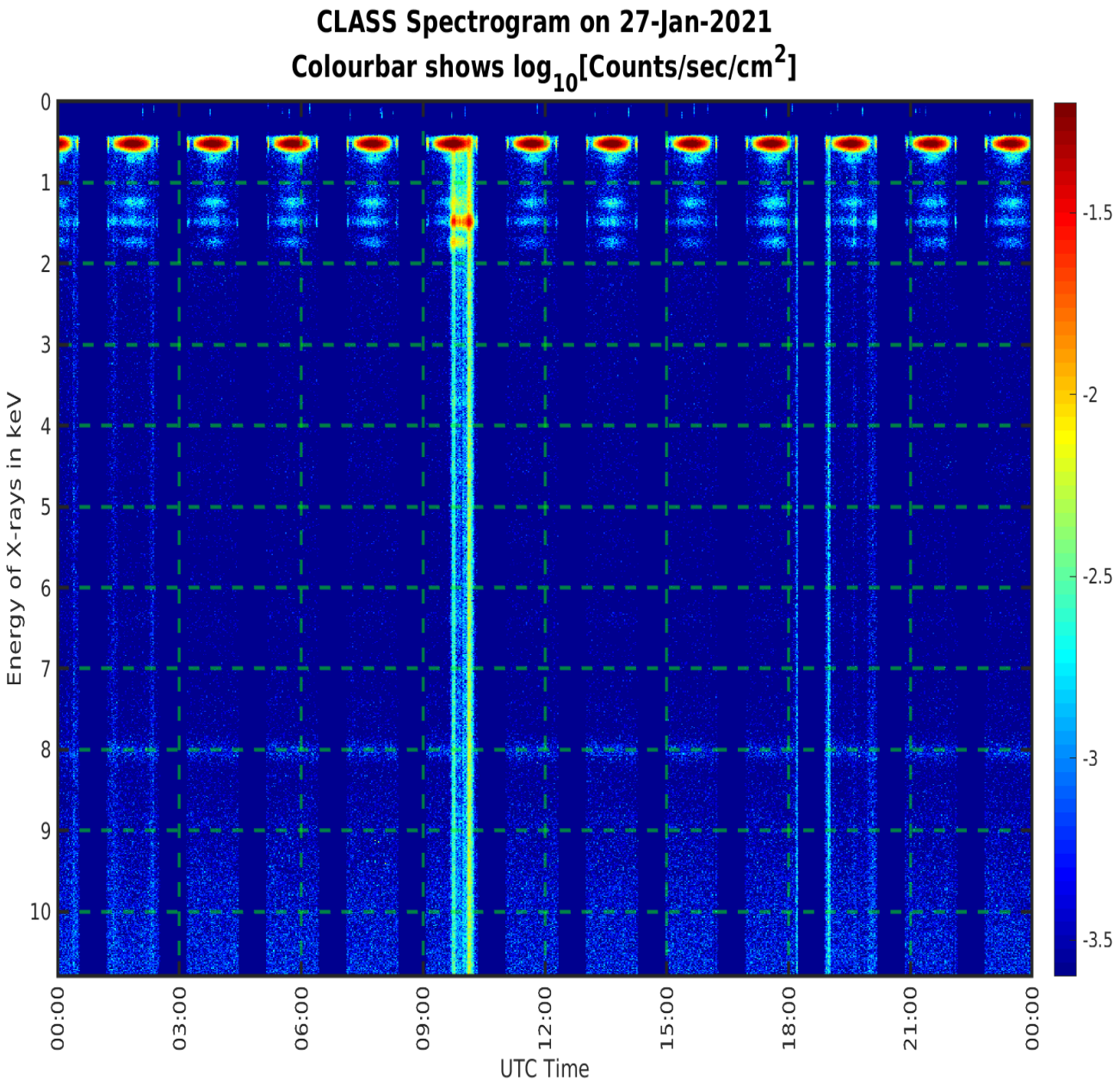
UTC Time


CLASS Spectrogram on 27-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
-2
-2.5
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-3.5
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18:00
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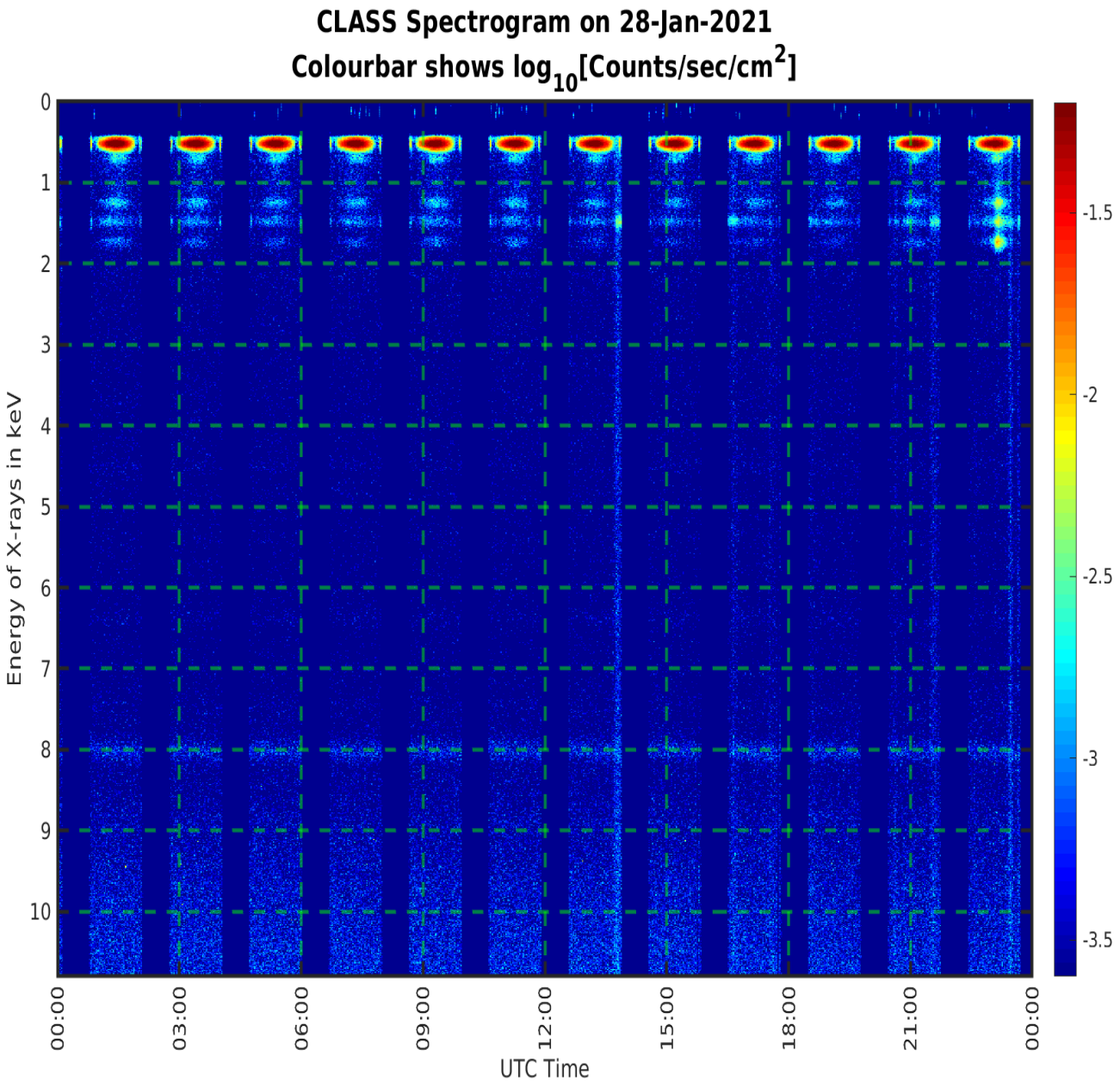
UTC Time


CLASS Spectrogram on 28-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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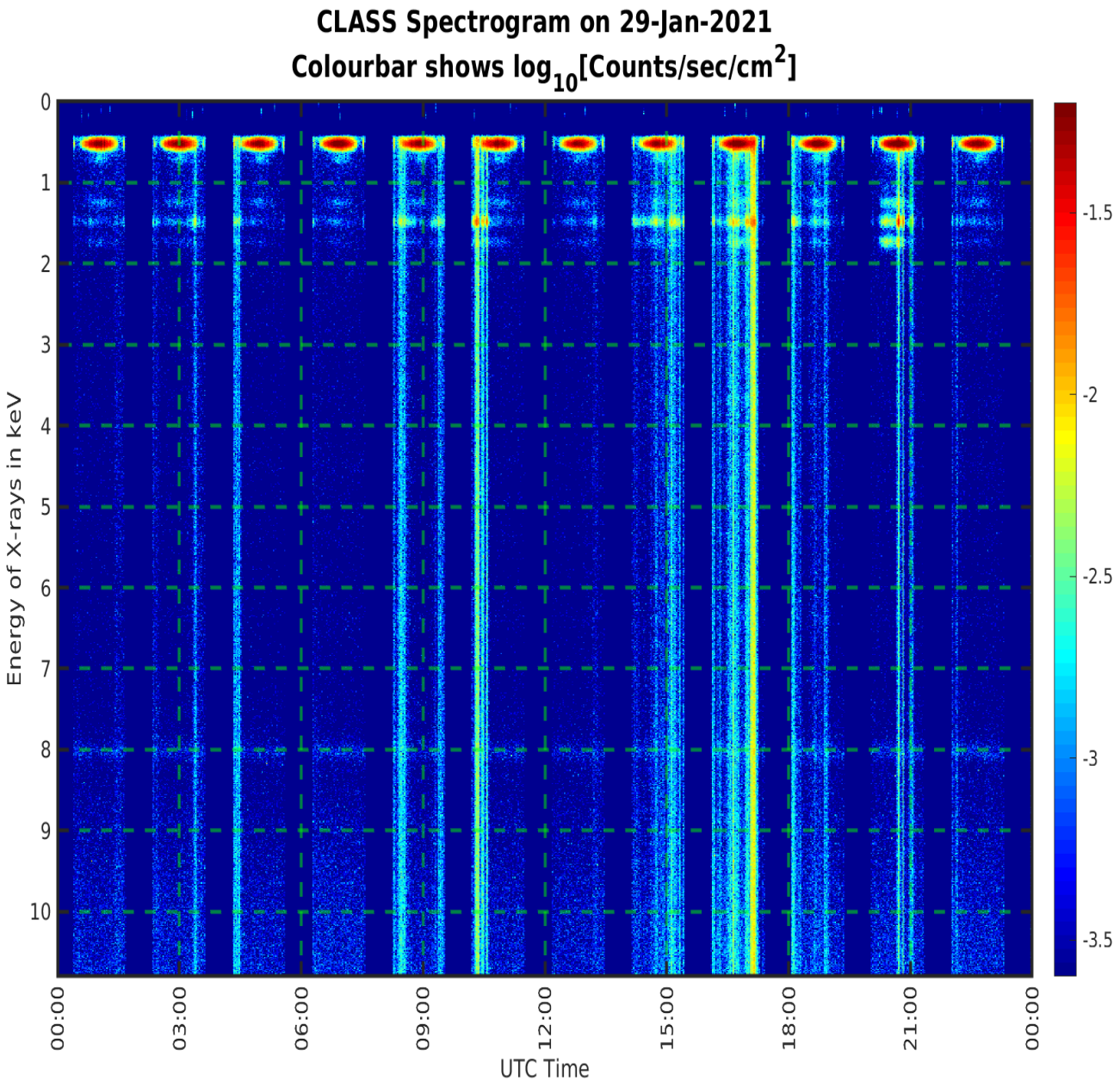
UTC Time


CLASS Spectrogram on 29-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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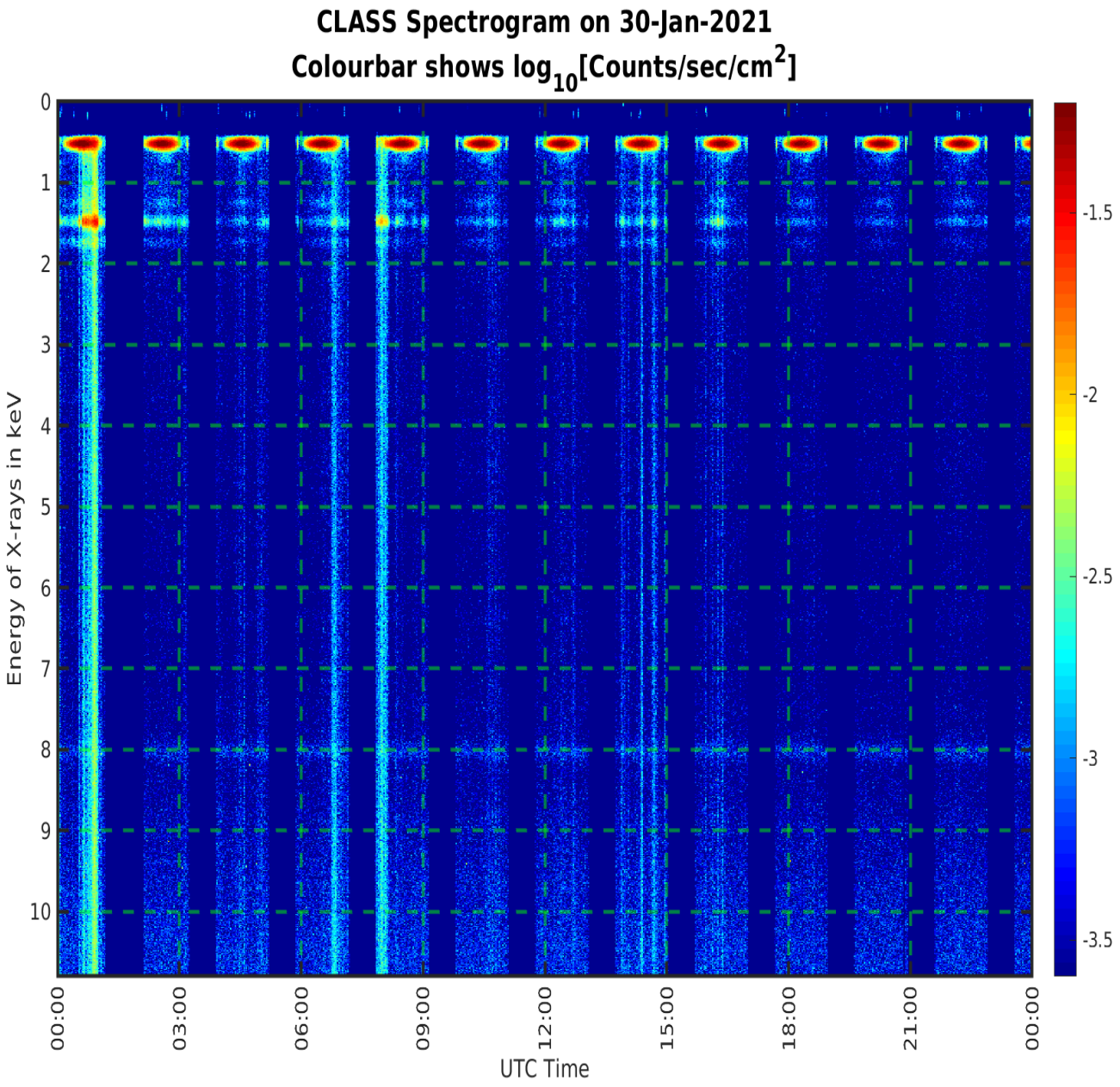
UTC Time


CLASS Spectrogram on 30-Jan-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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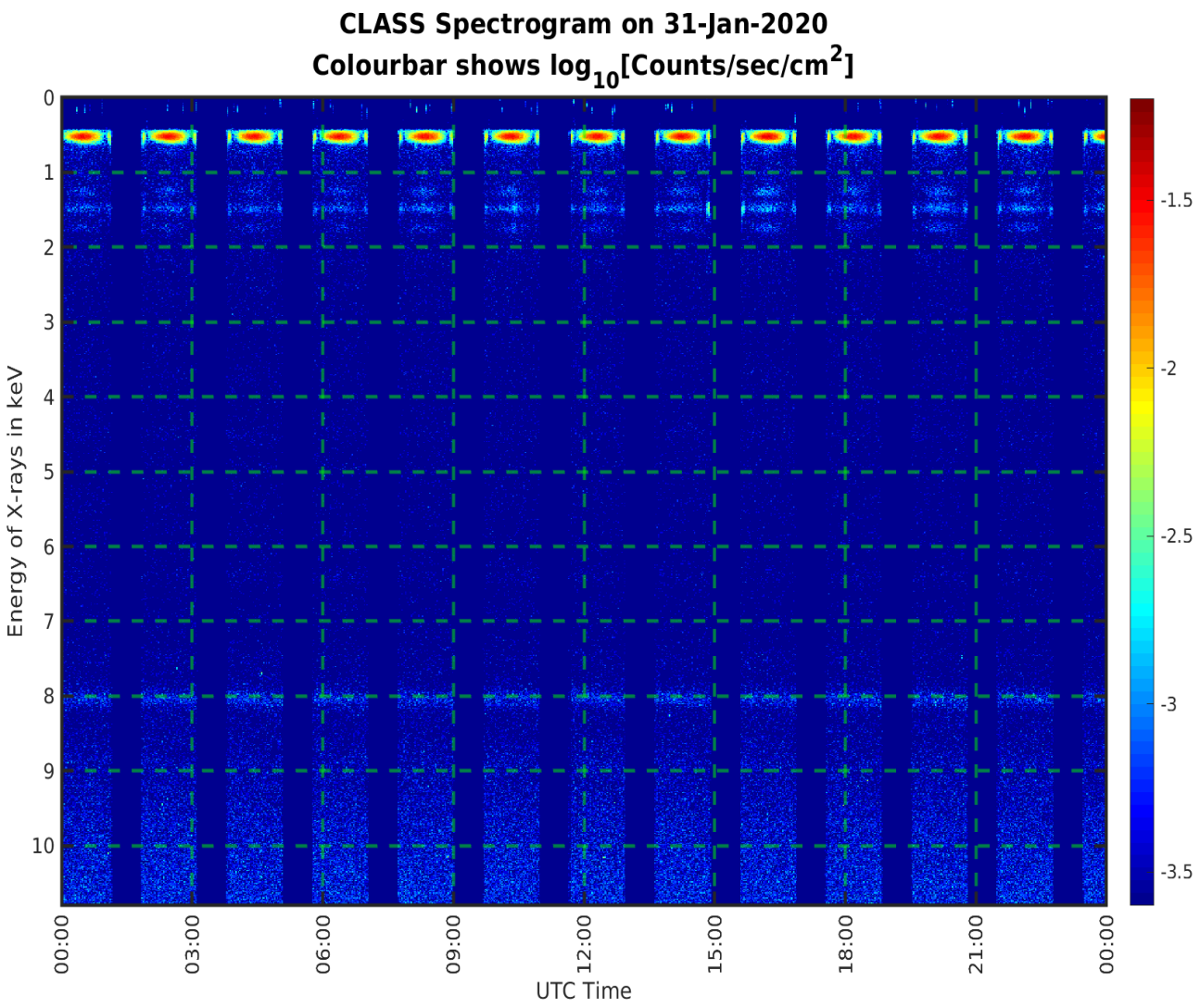
UTC Time


CLASS Spectrogram on 31-Jan-2020
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
8
9
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-1.5
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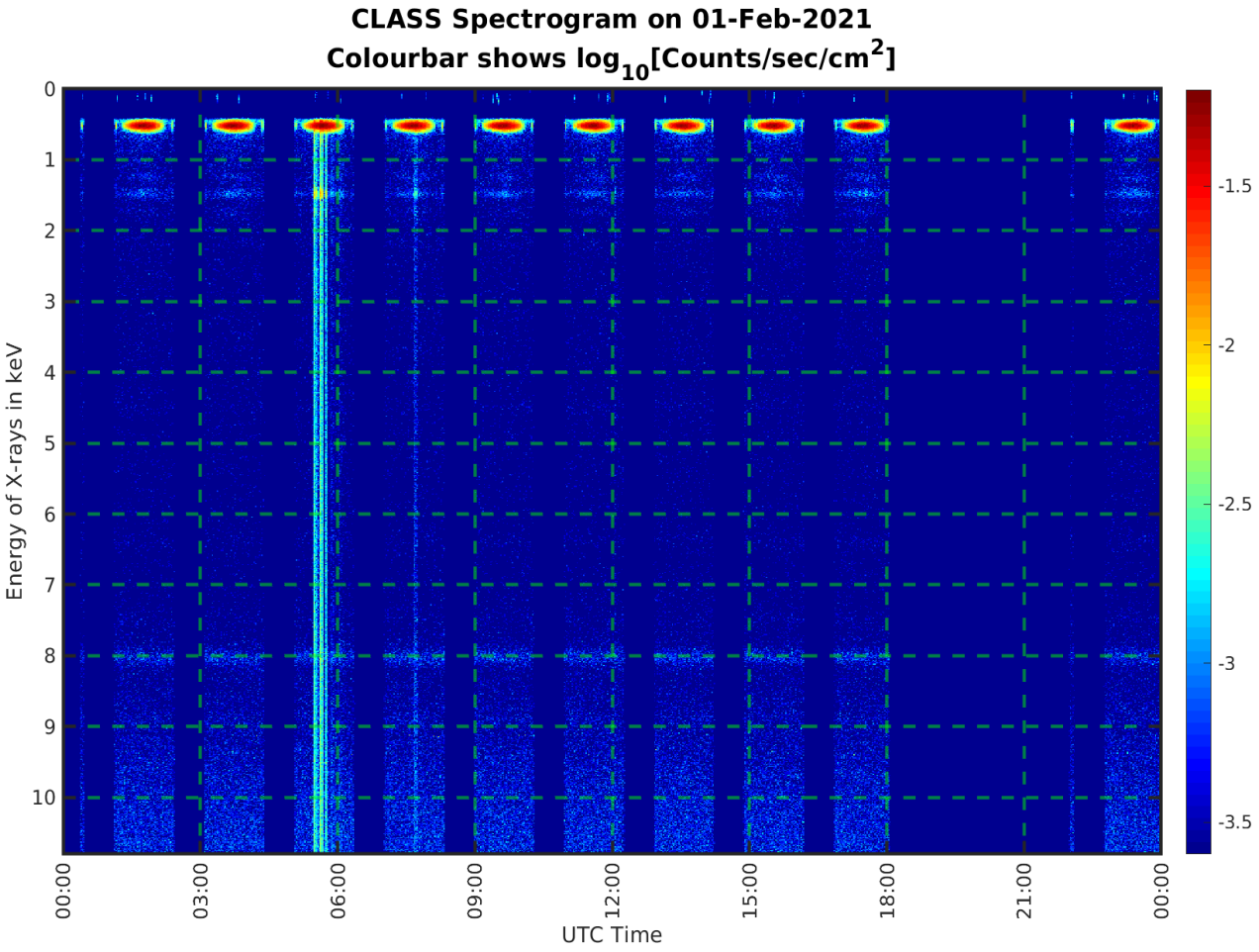
UTC Time


CLASS Spectrogram on 01-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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UTC Time
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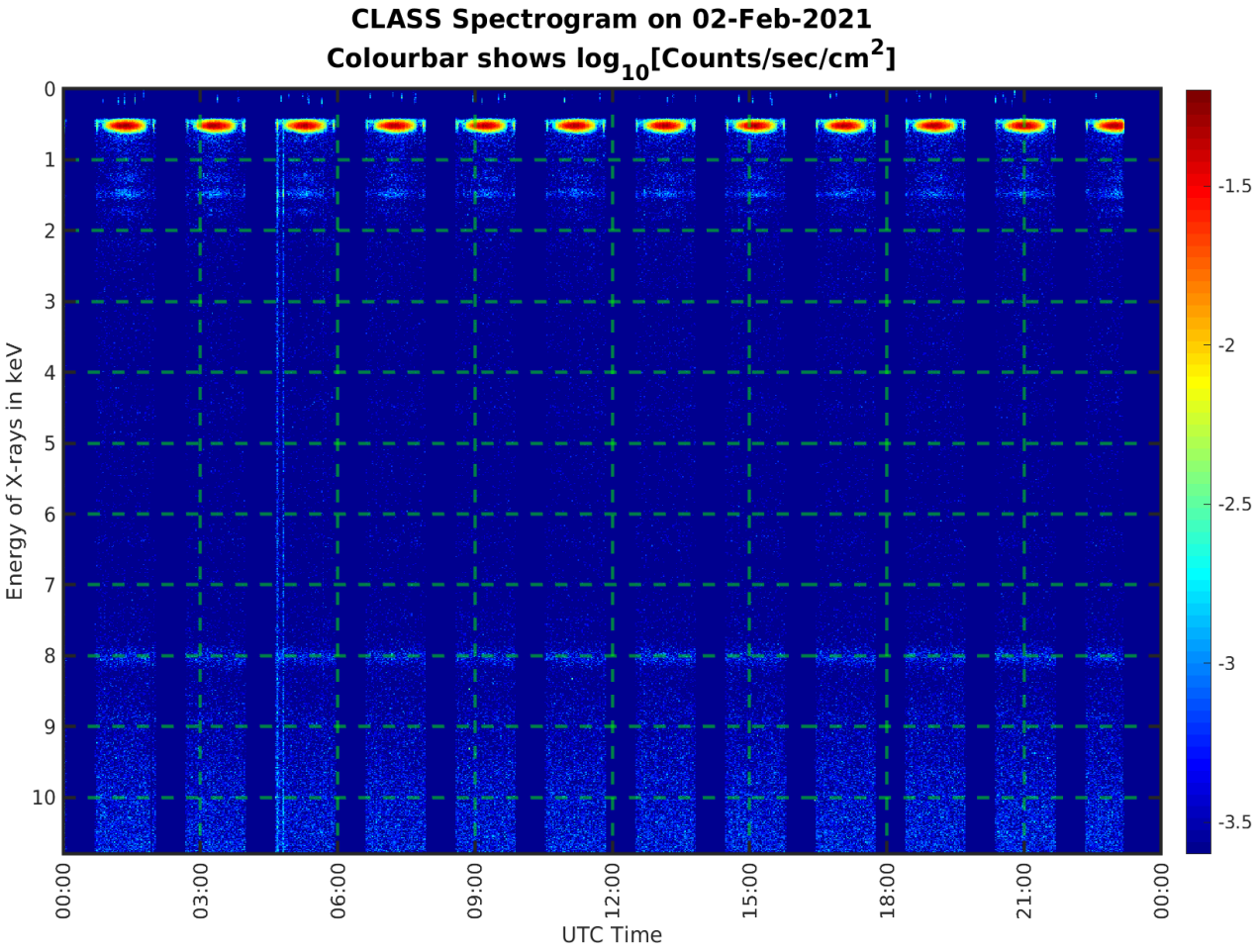
CLASS Spectrogram on 02-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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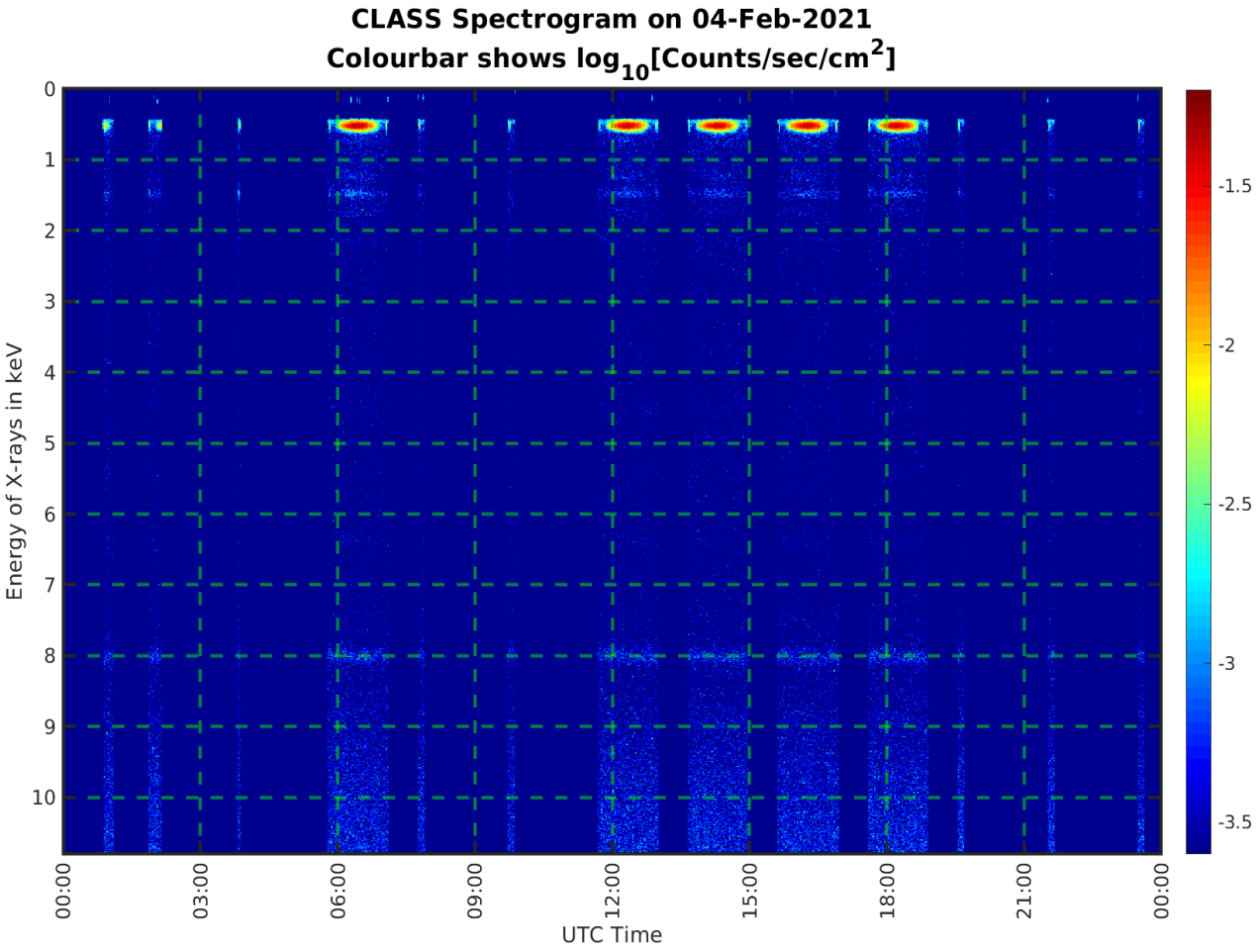
CLASS Spectrogram on 04-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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03:00
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UTC Time
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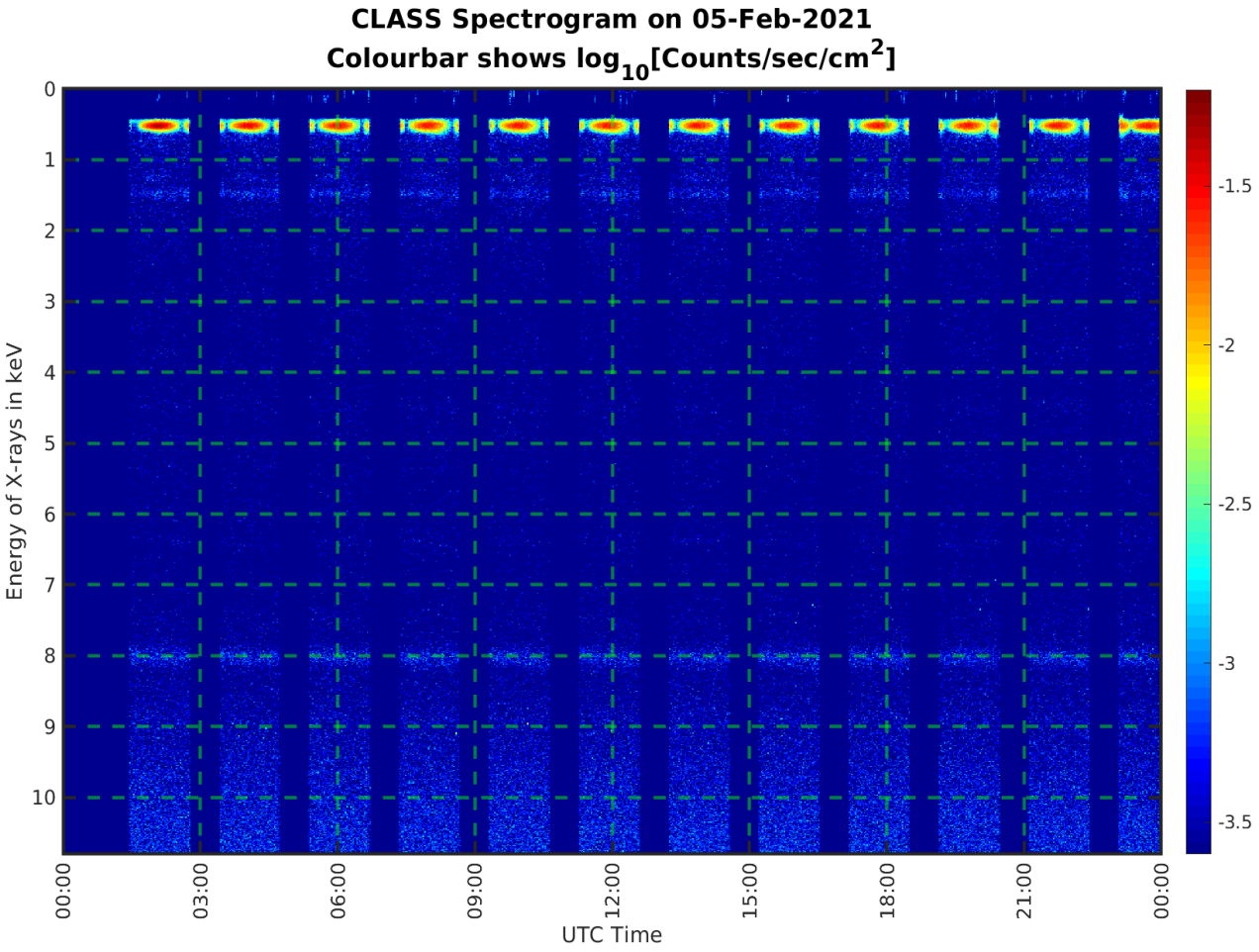
-3.5


CLASS Spectrogram on 05-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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03:00
06:00
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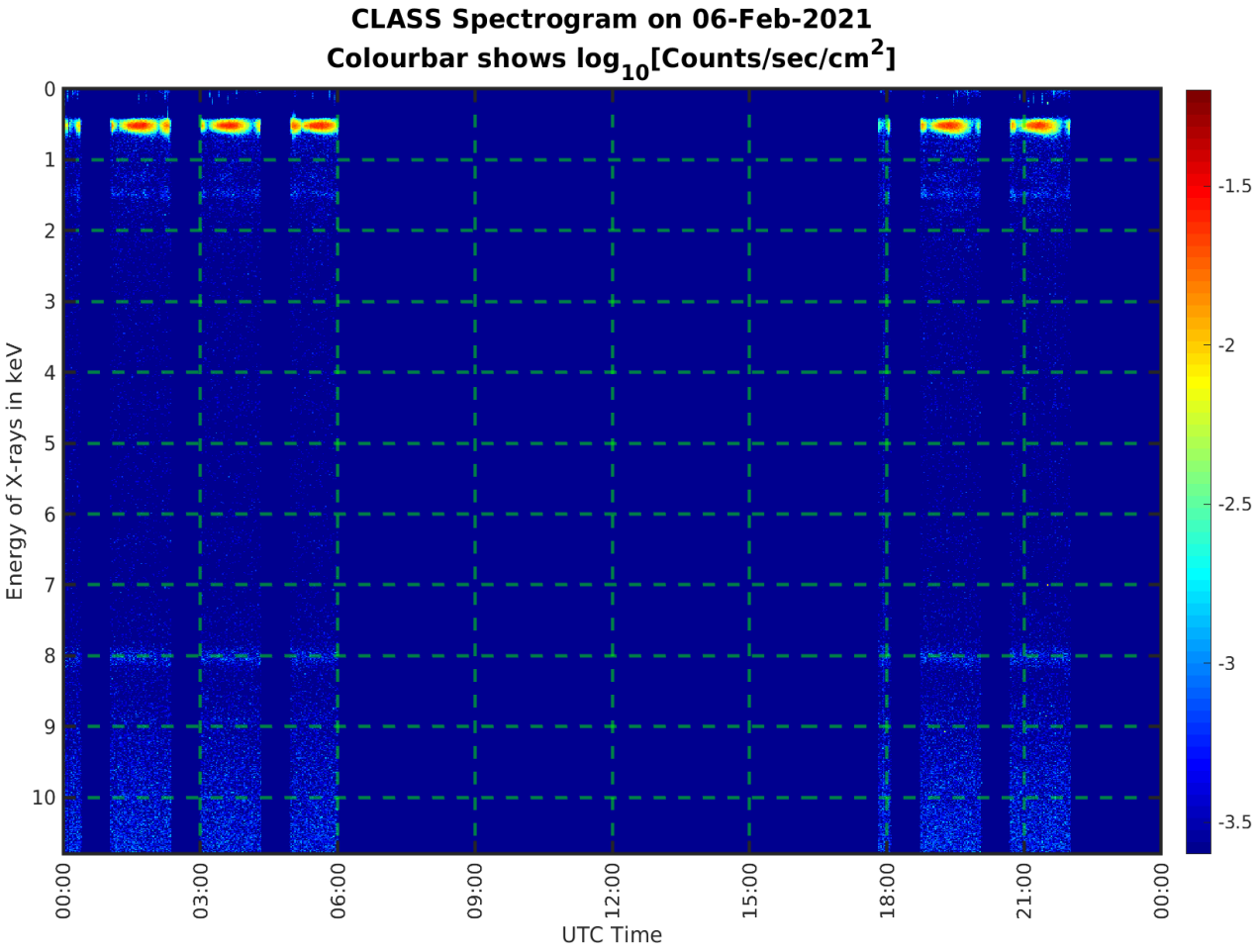
-3.5


CLASS Spectrogram on 06-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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-2.5
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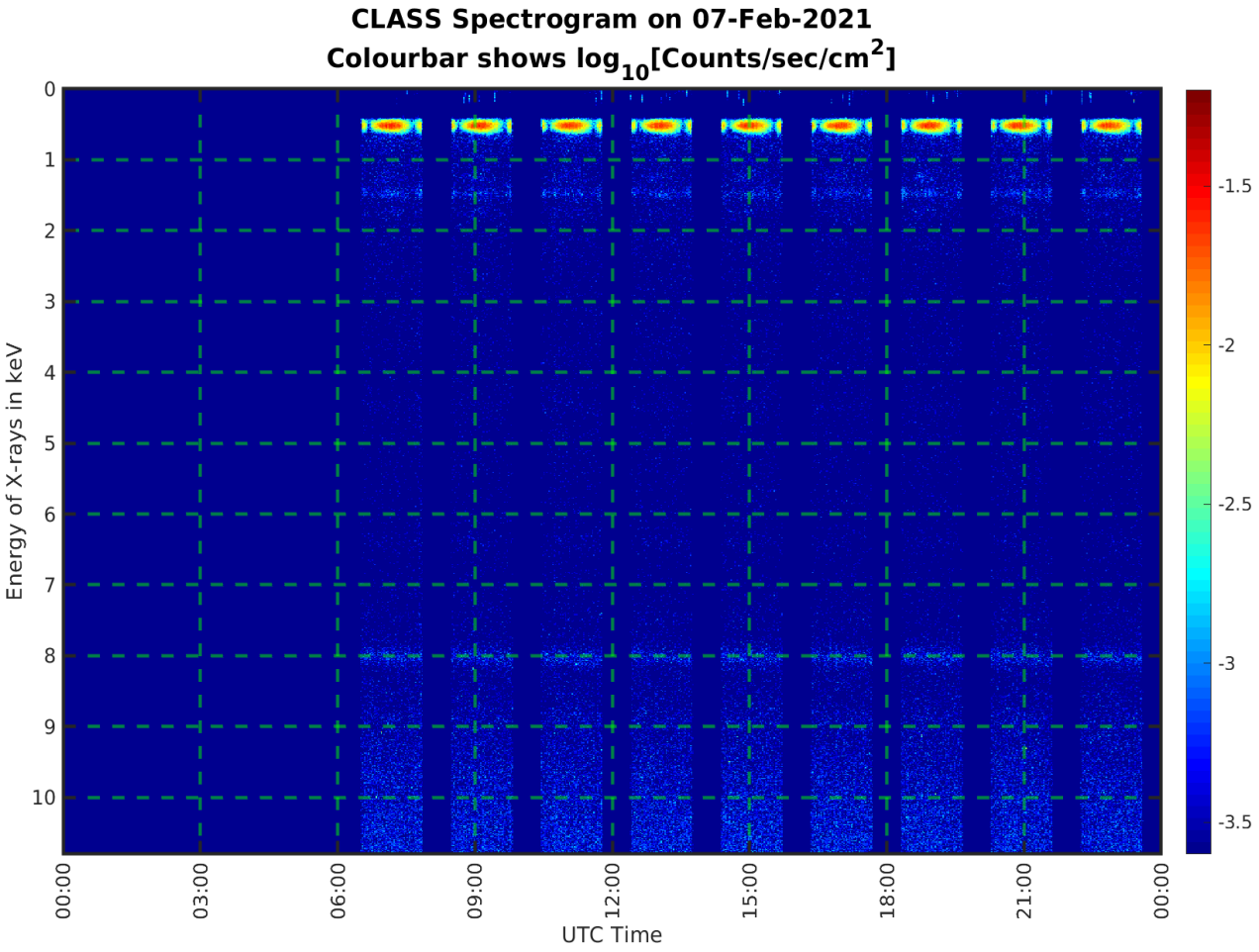
UTC Time


CLASS Spectrogram on 07-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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03:00
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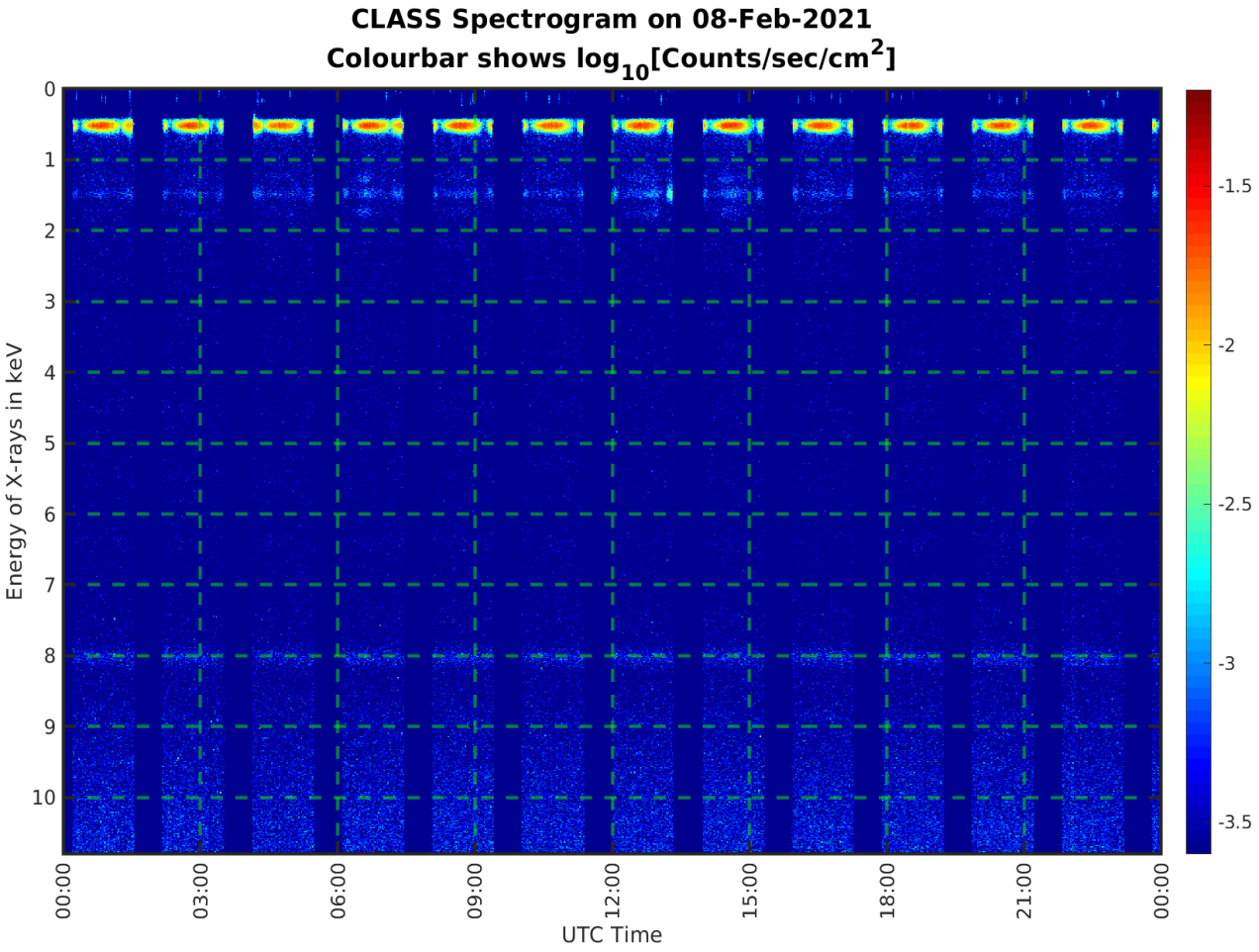
CLASS Spectrogram on 08-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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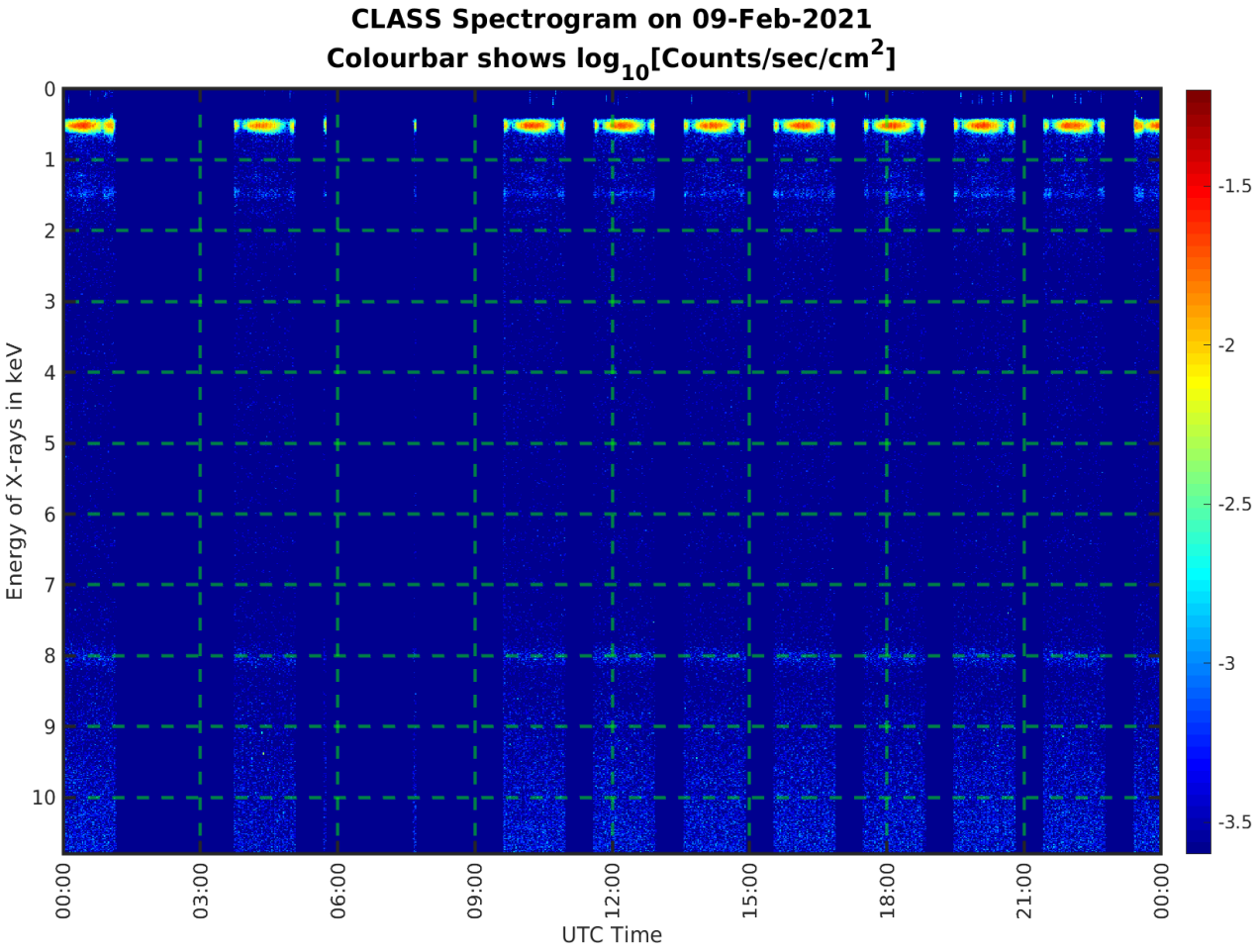
CLASS Spectrogram on 09-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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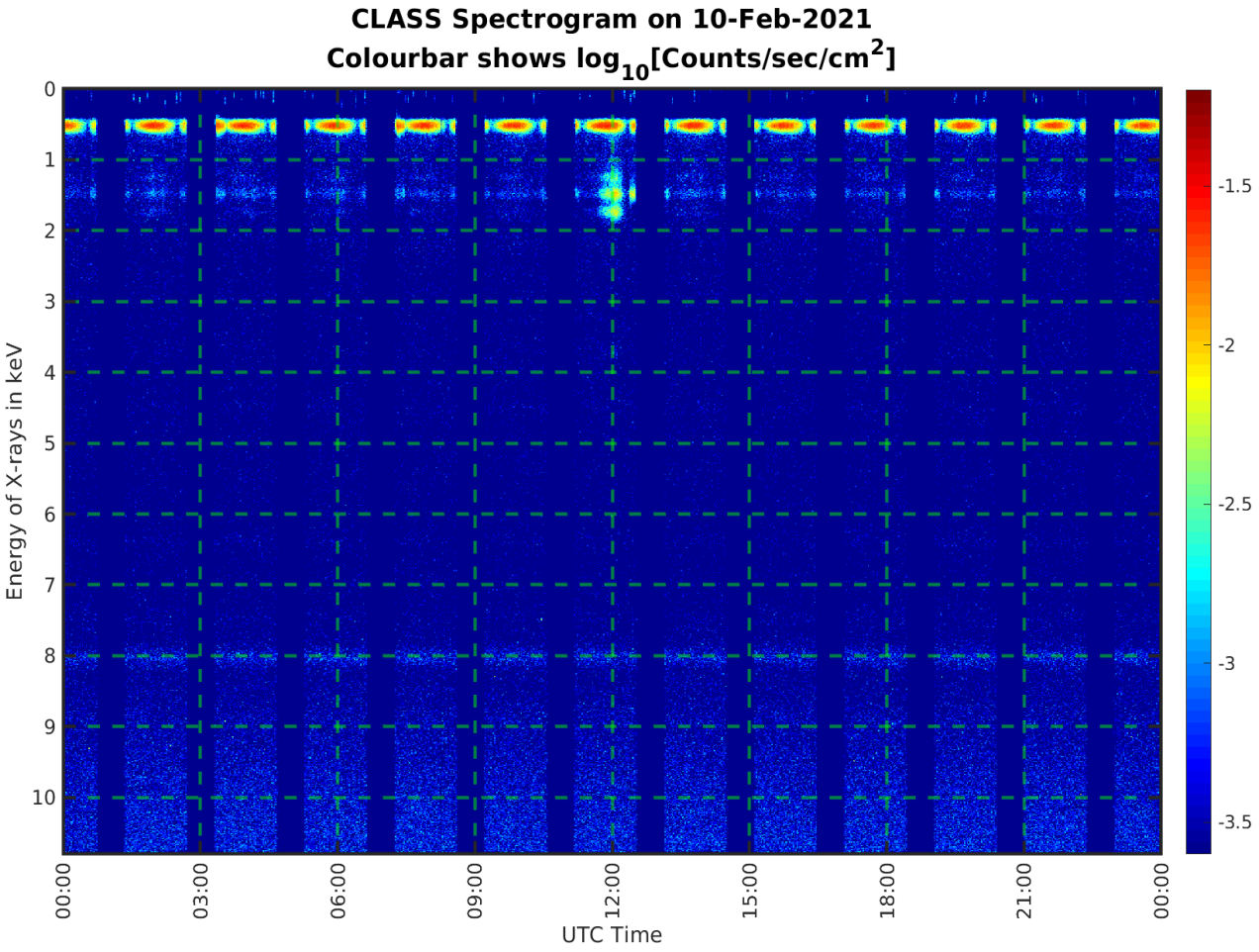
CLASS Spectrogram on 10-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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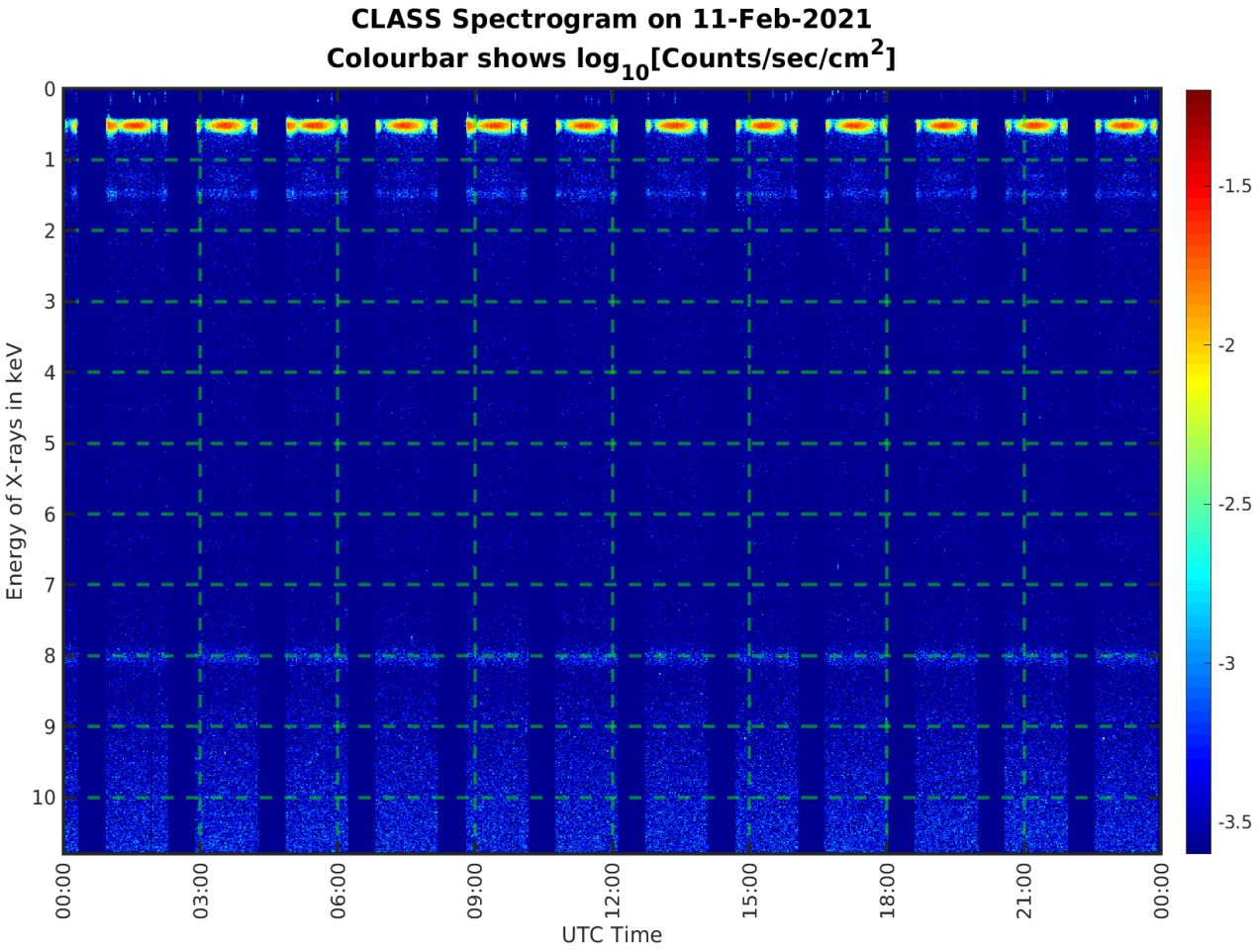
UTC Time


CLASS Spectrogram on 11-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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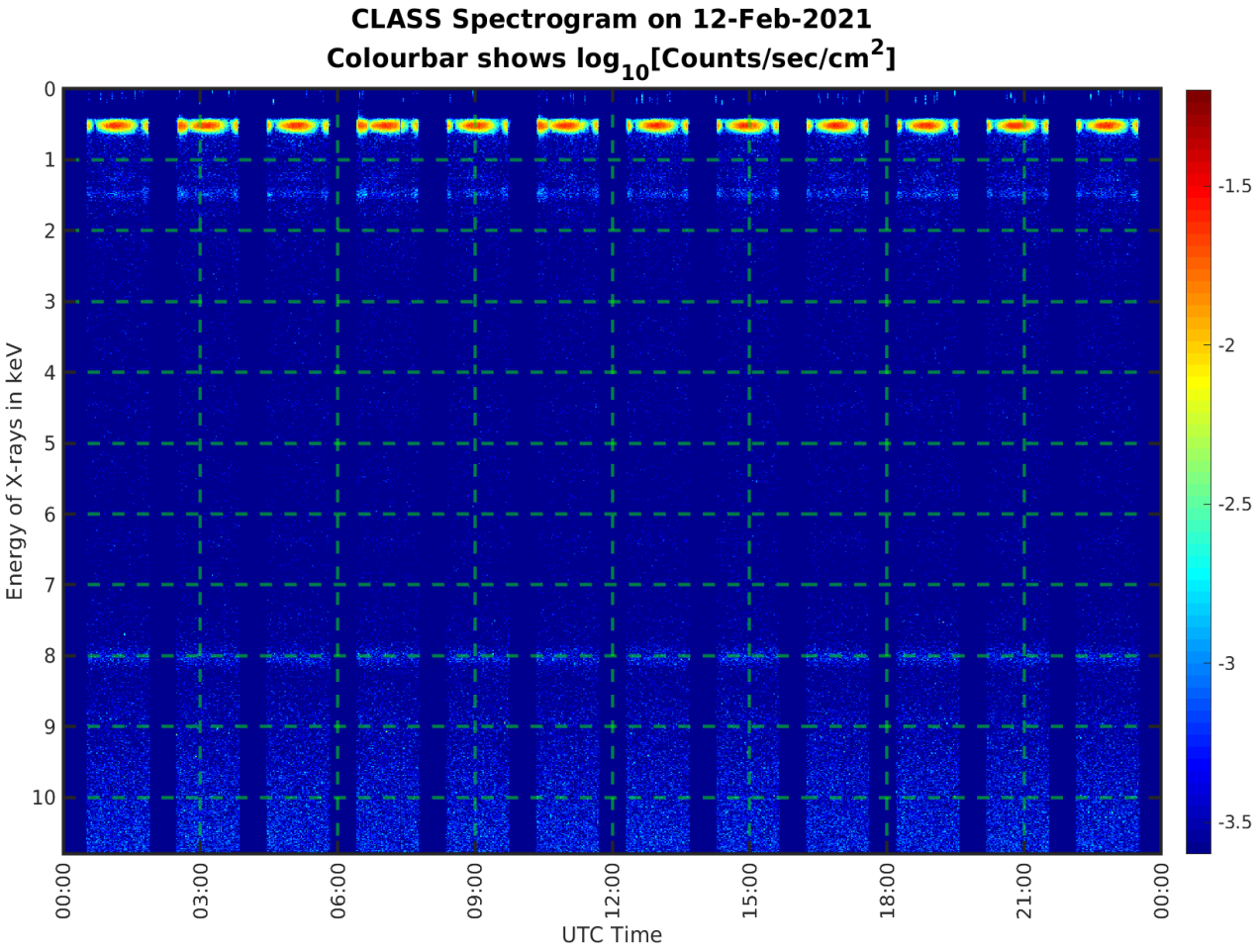
UTC Time


CLASS Spectrogram on 12-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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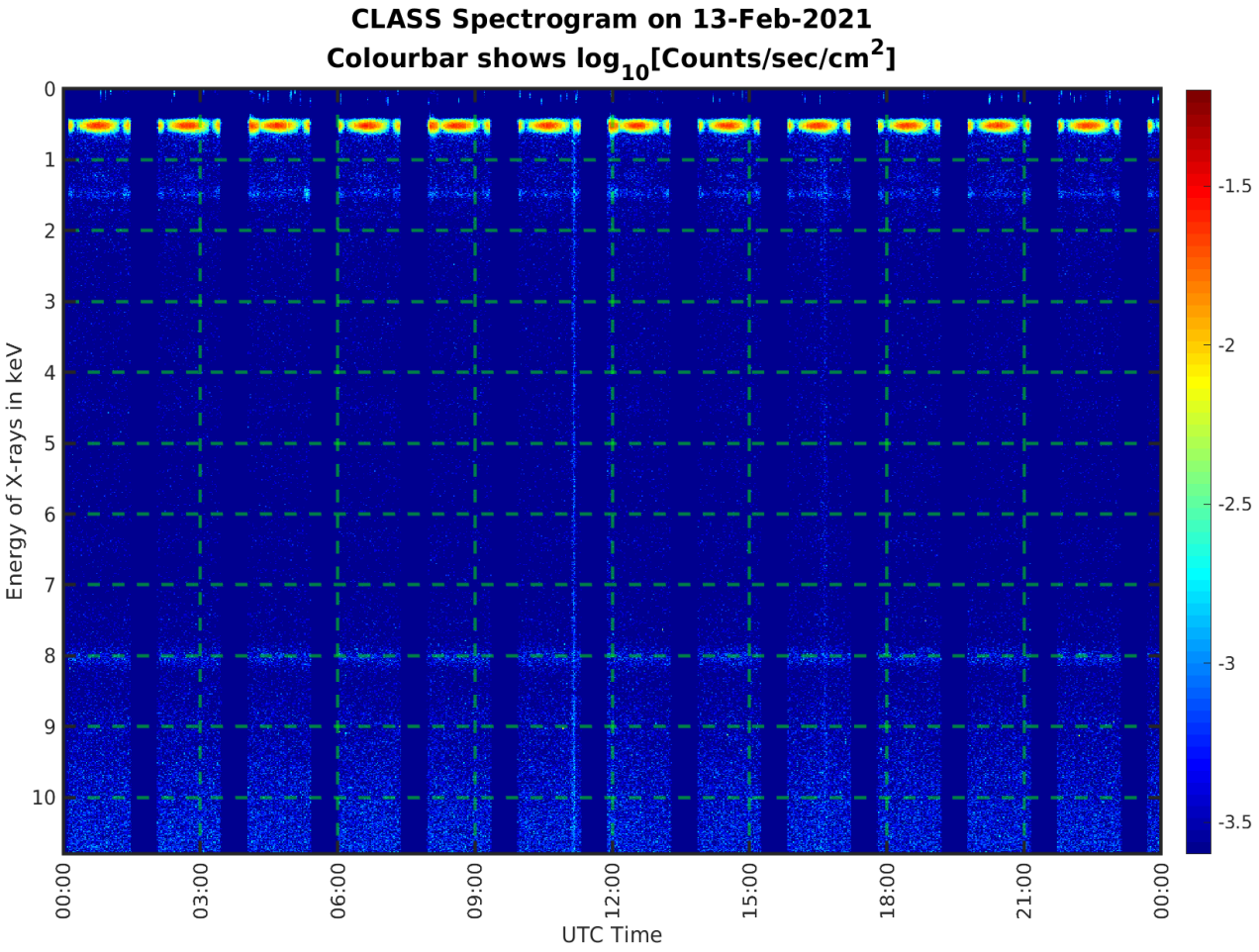
UTC Time


CLASS Spectrogram on 13-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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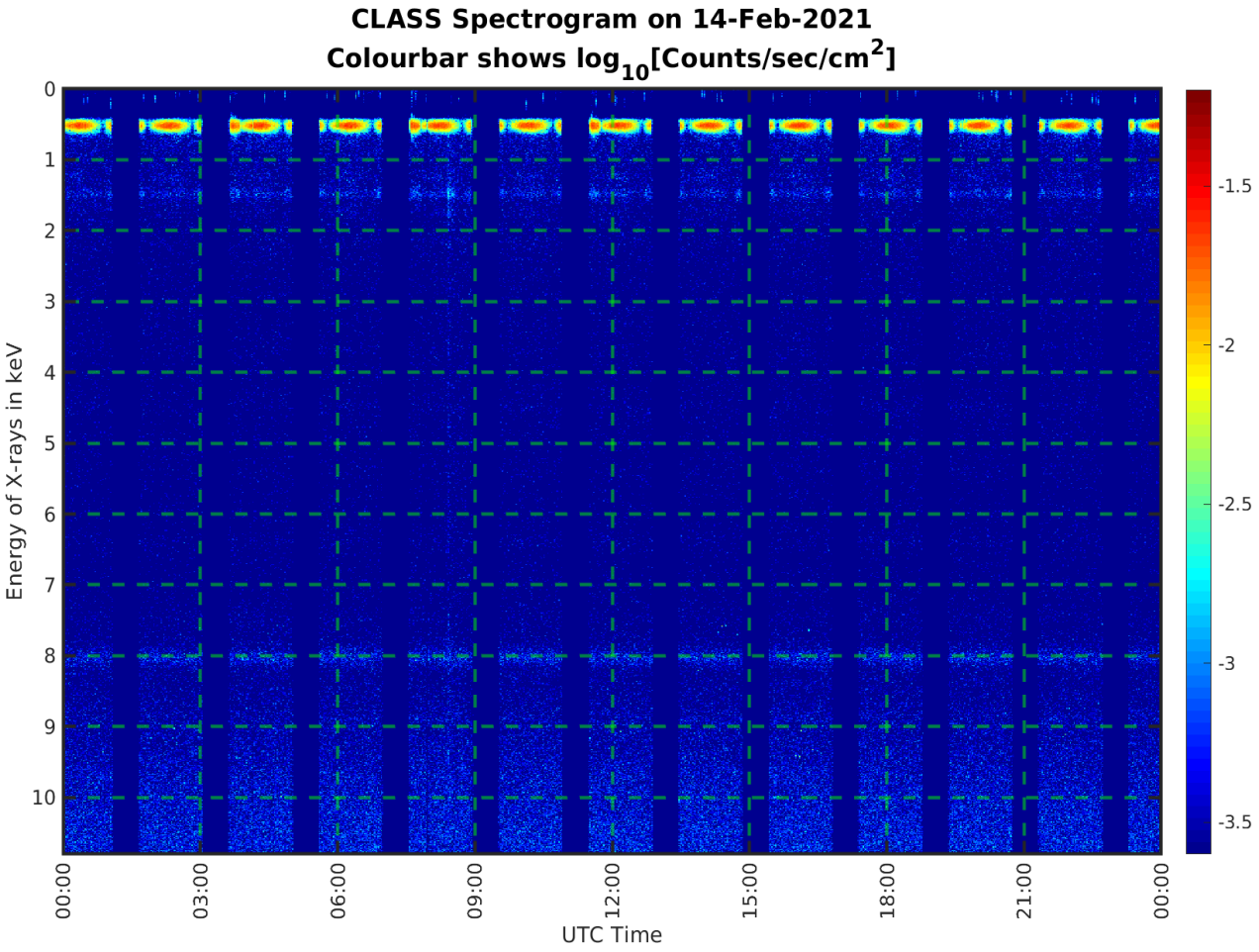
UTC Time


CLASS Spectrogram on 14-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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03:00
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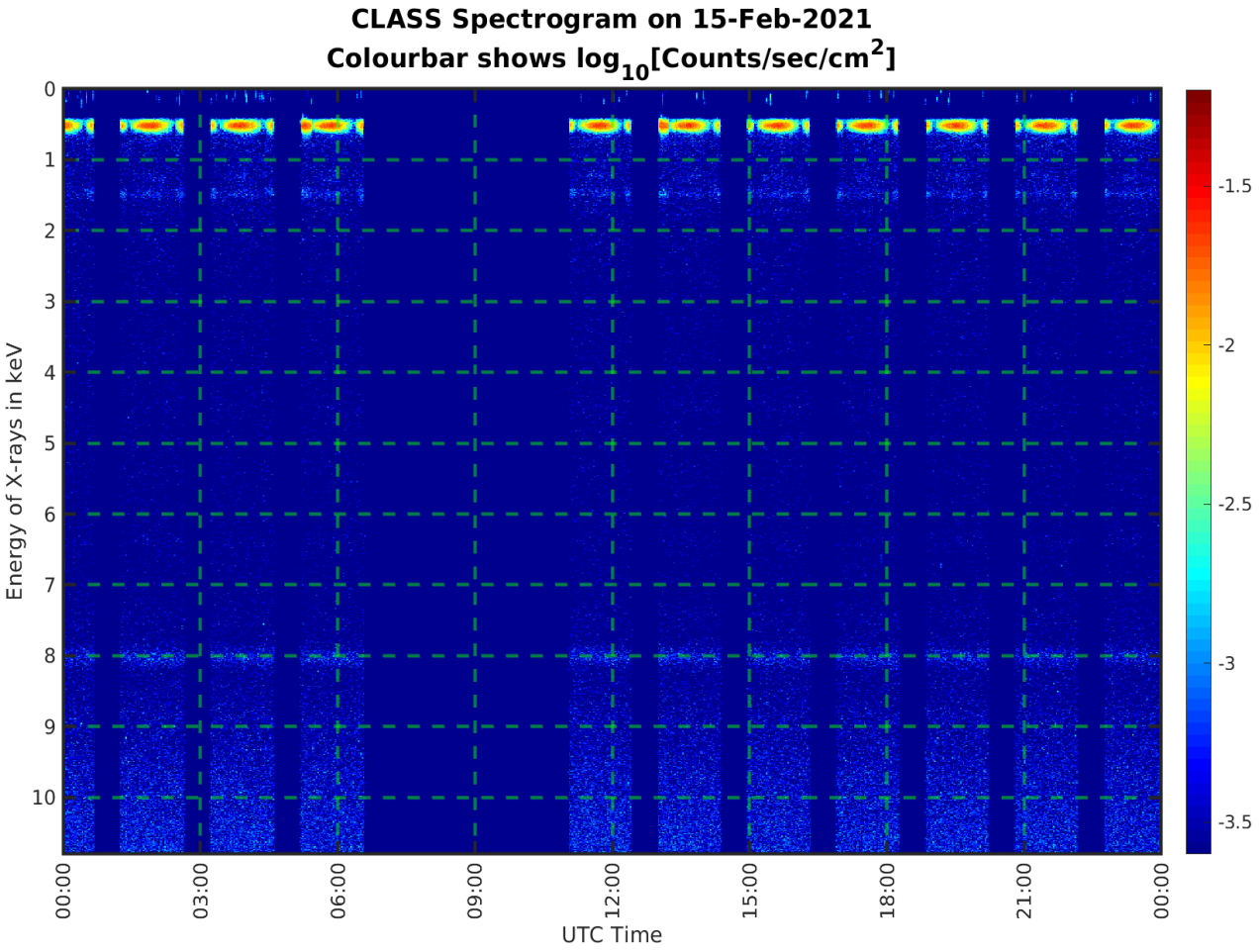
CLASS Spectrogram on 15-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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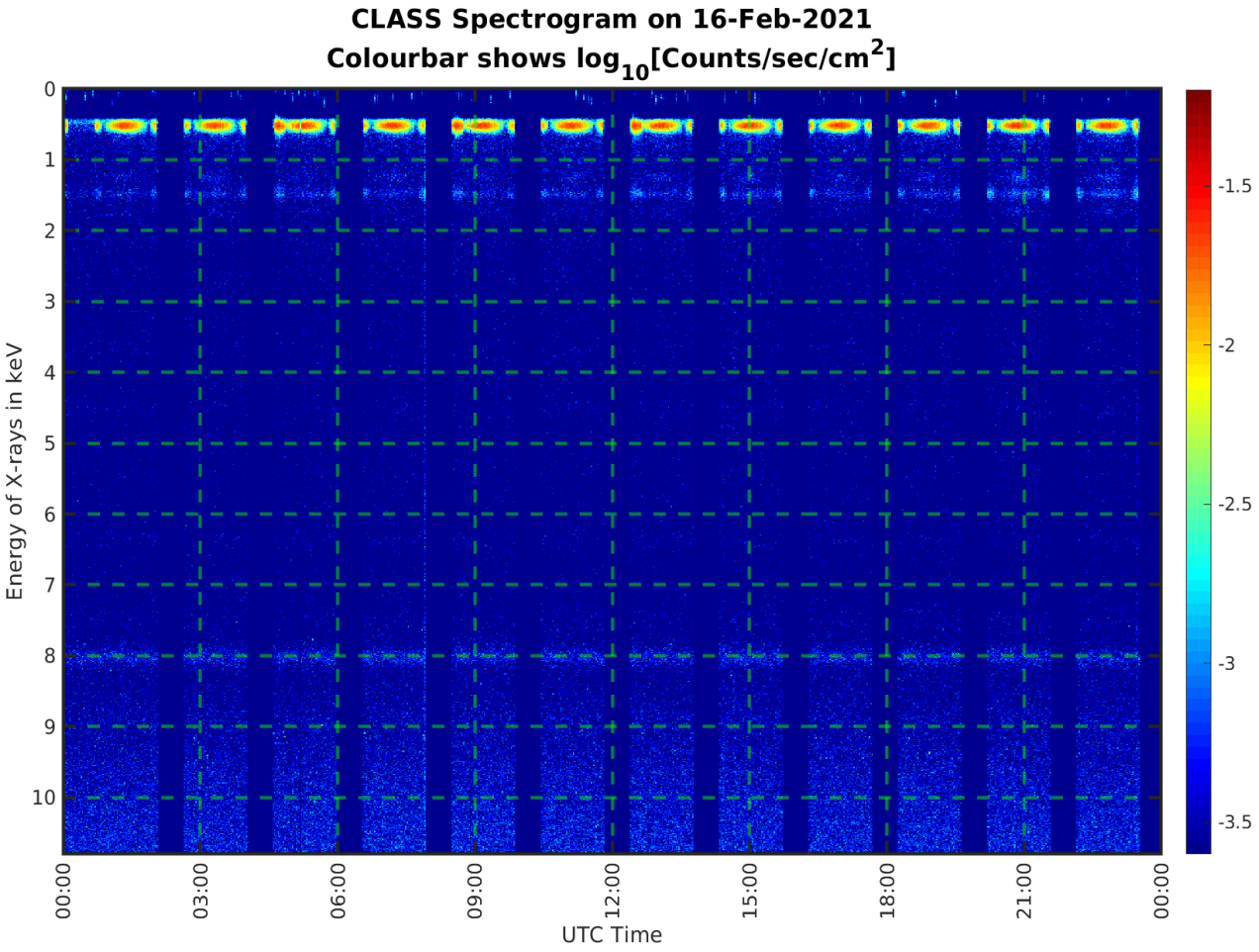
CLASS Spectrogram on 16-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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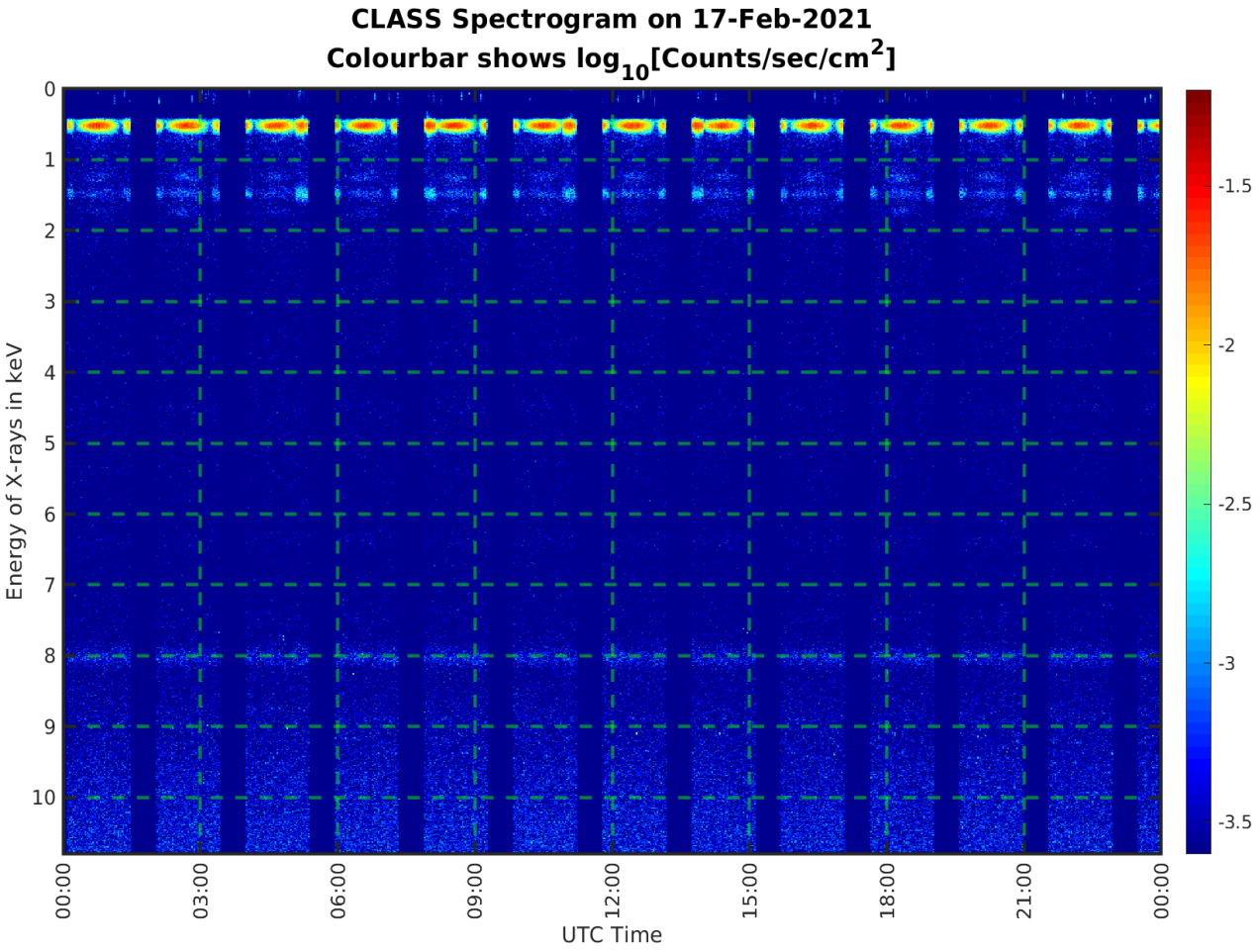
CLASS Spectrogram on 17-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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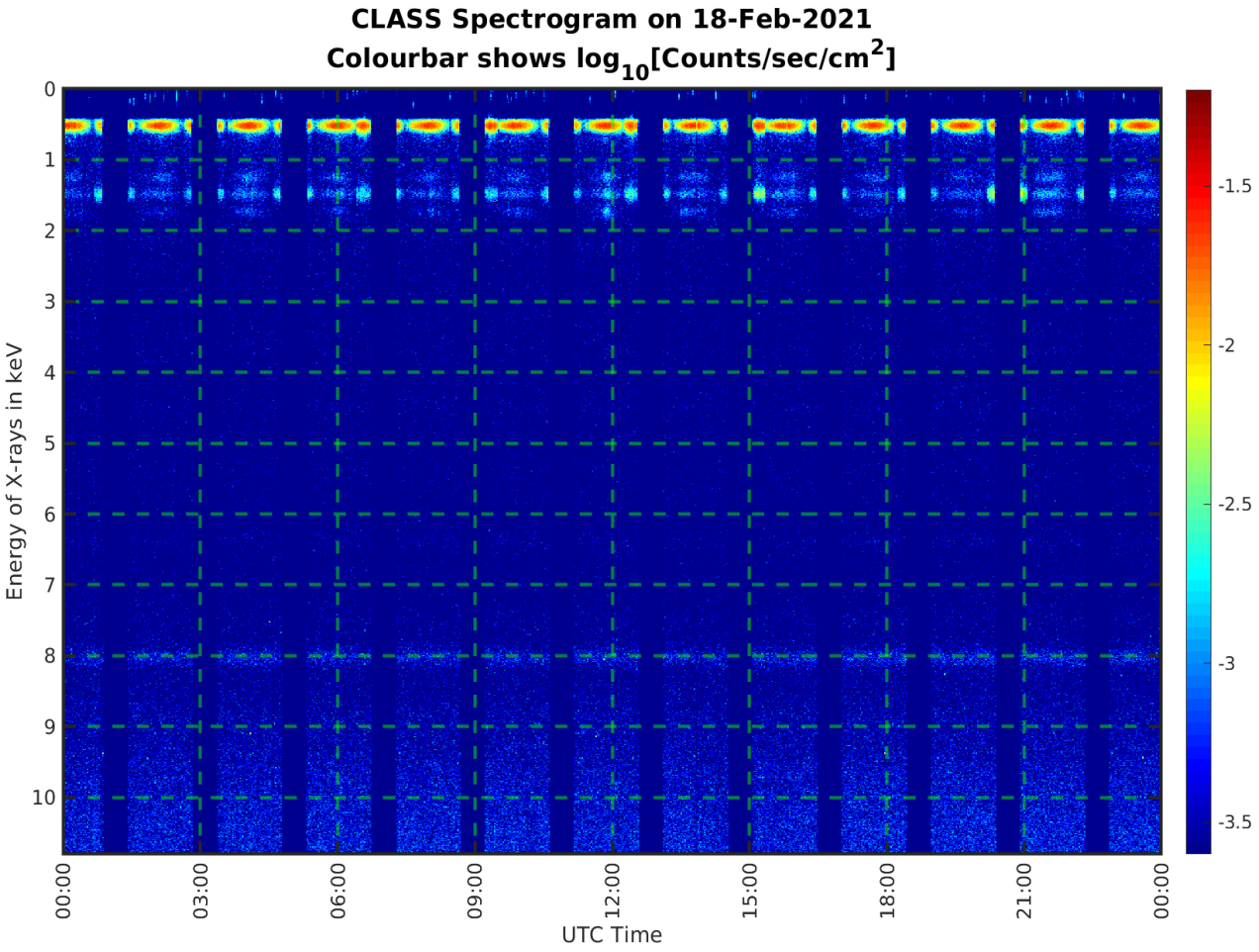
UTC Time


CLASS Spectrogram on 18-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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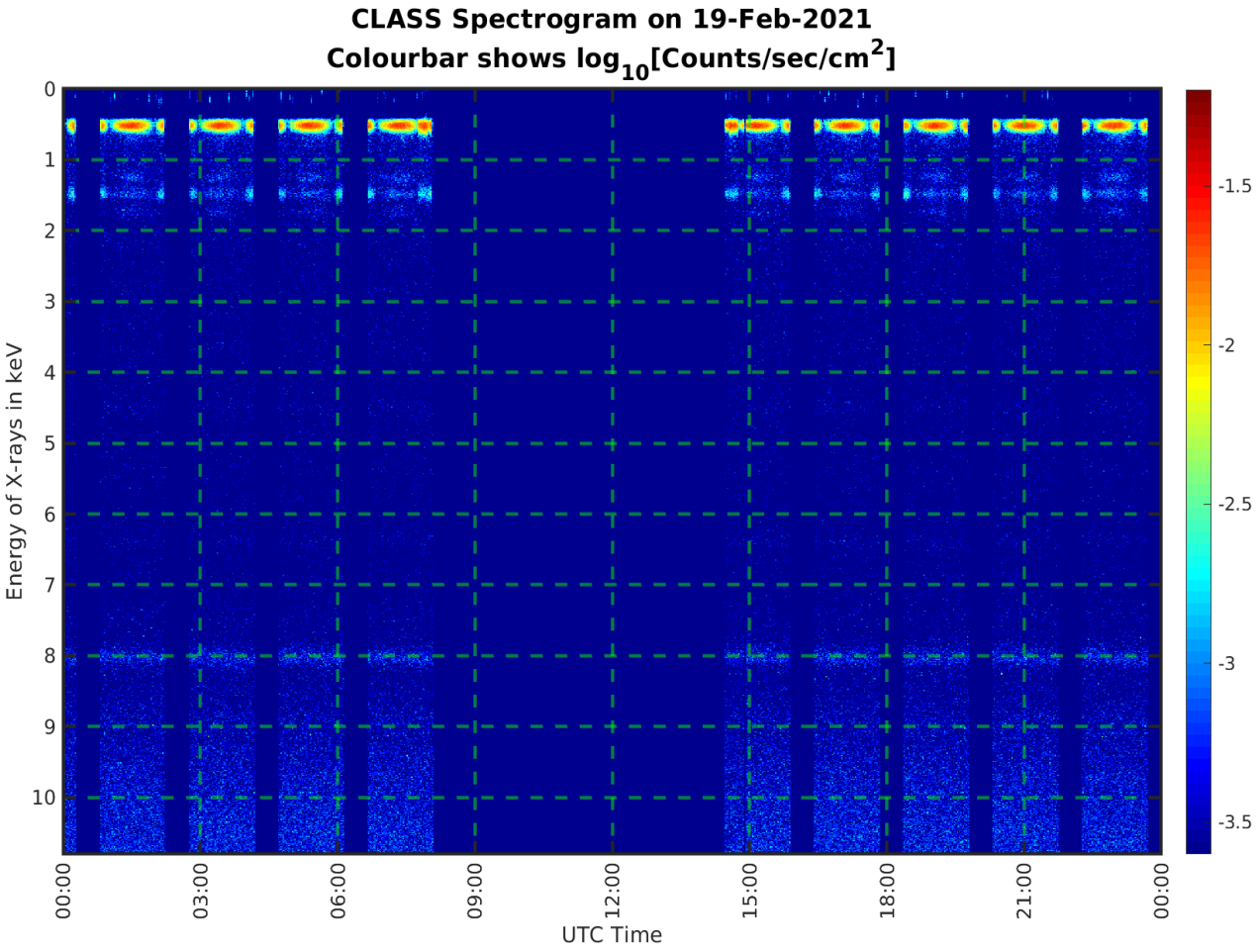
UTC Time


CLASS Spectrogram on 19-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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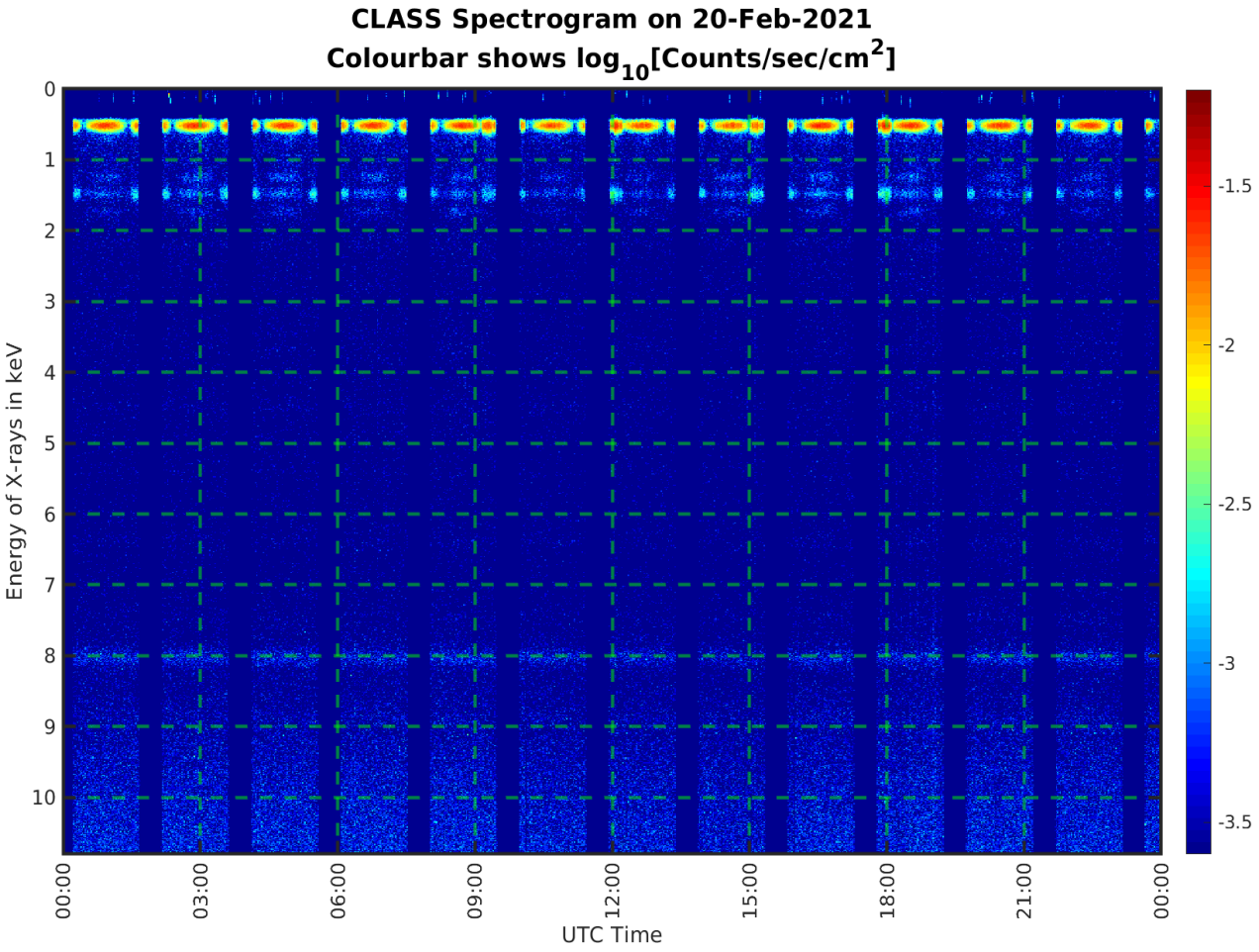
CLASS Spectrogram on 20-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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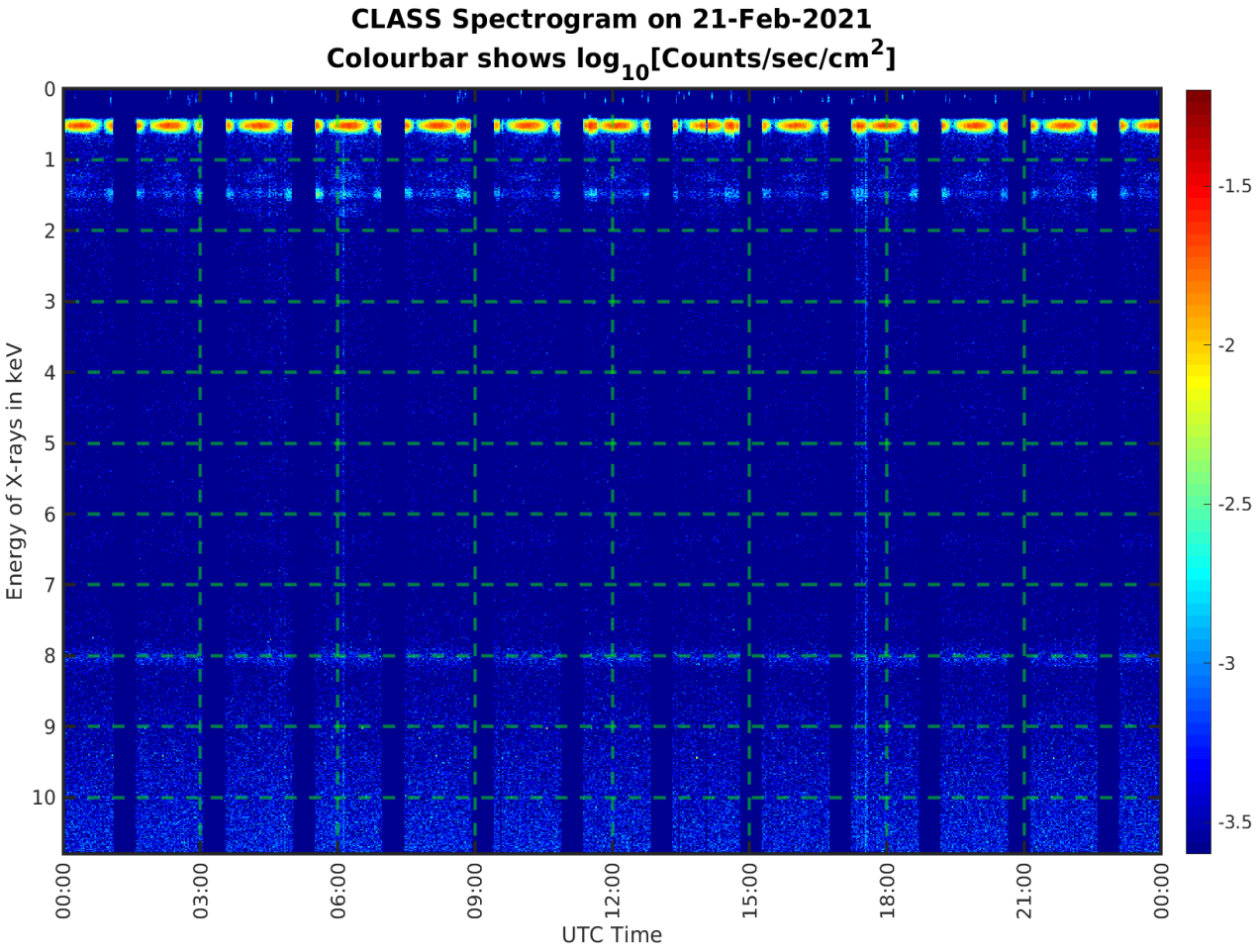
CLASS Spectrogram on 21-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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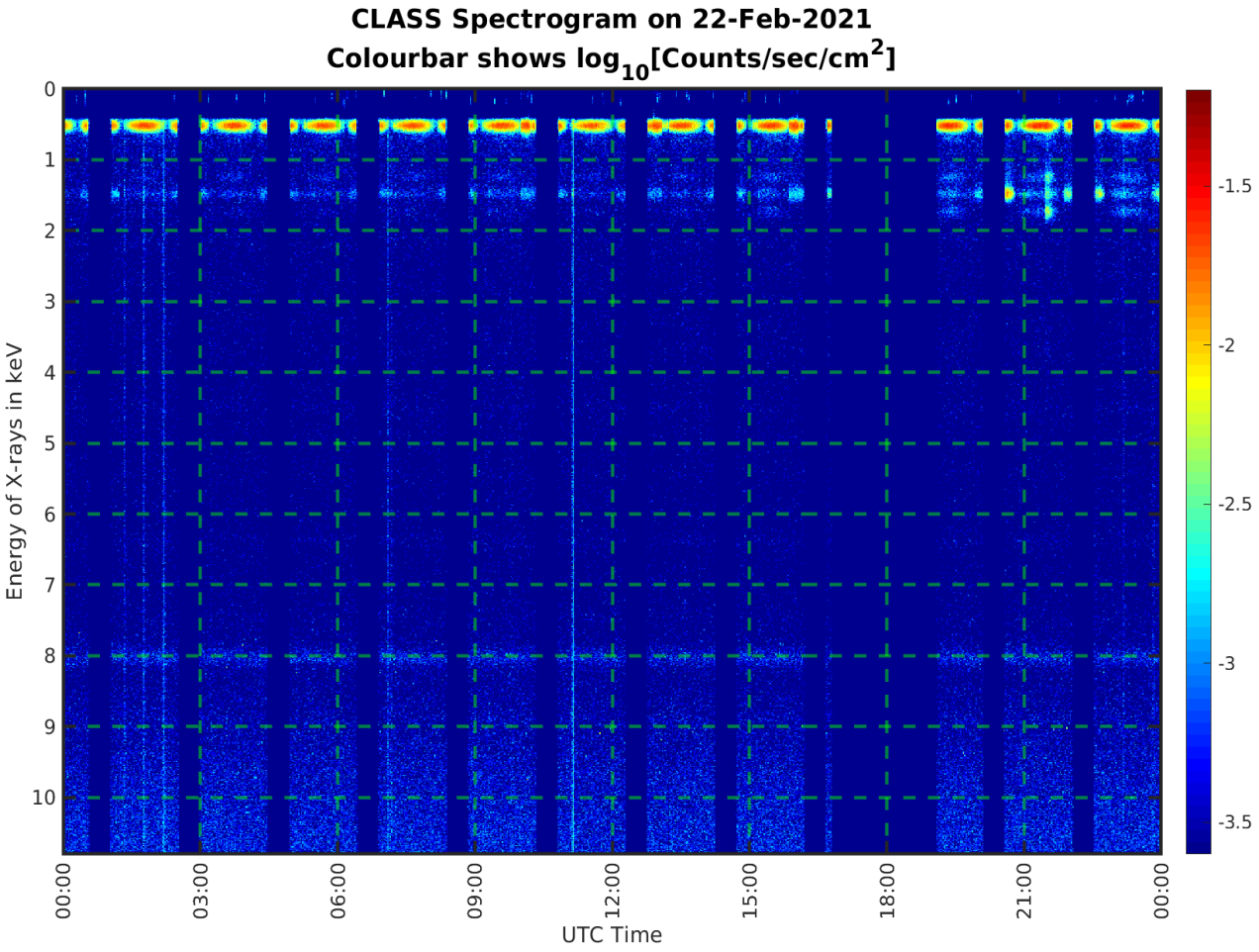
CLASS Spectrogram on 22-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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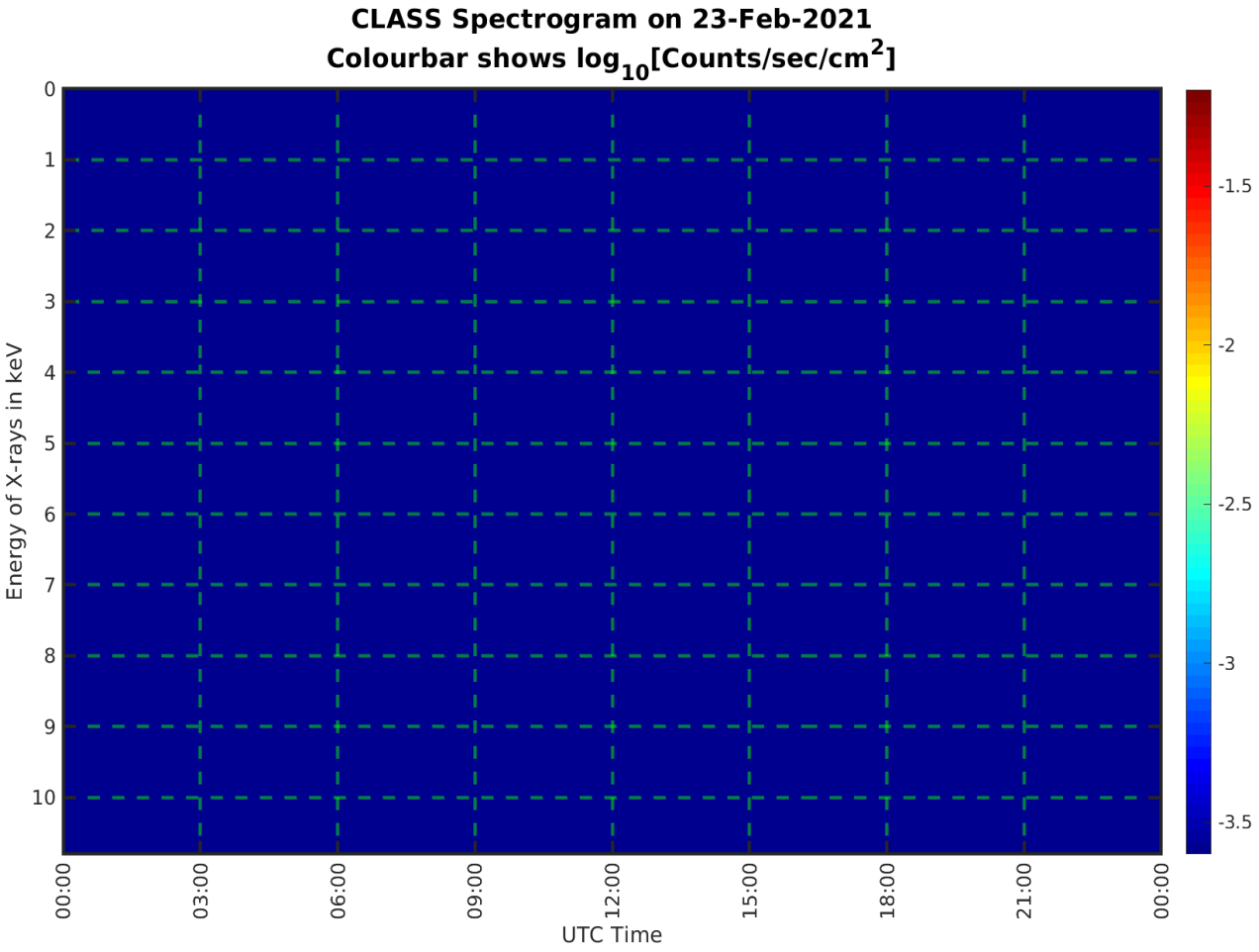
CLASS Spectrogram on 23-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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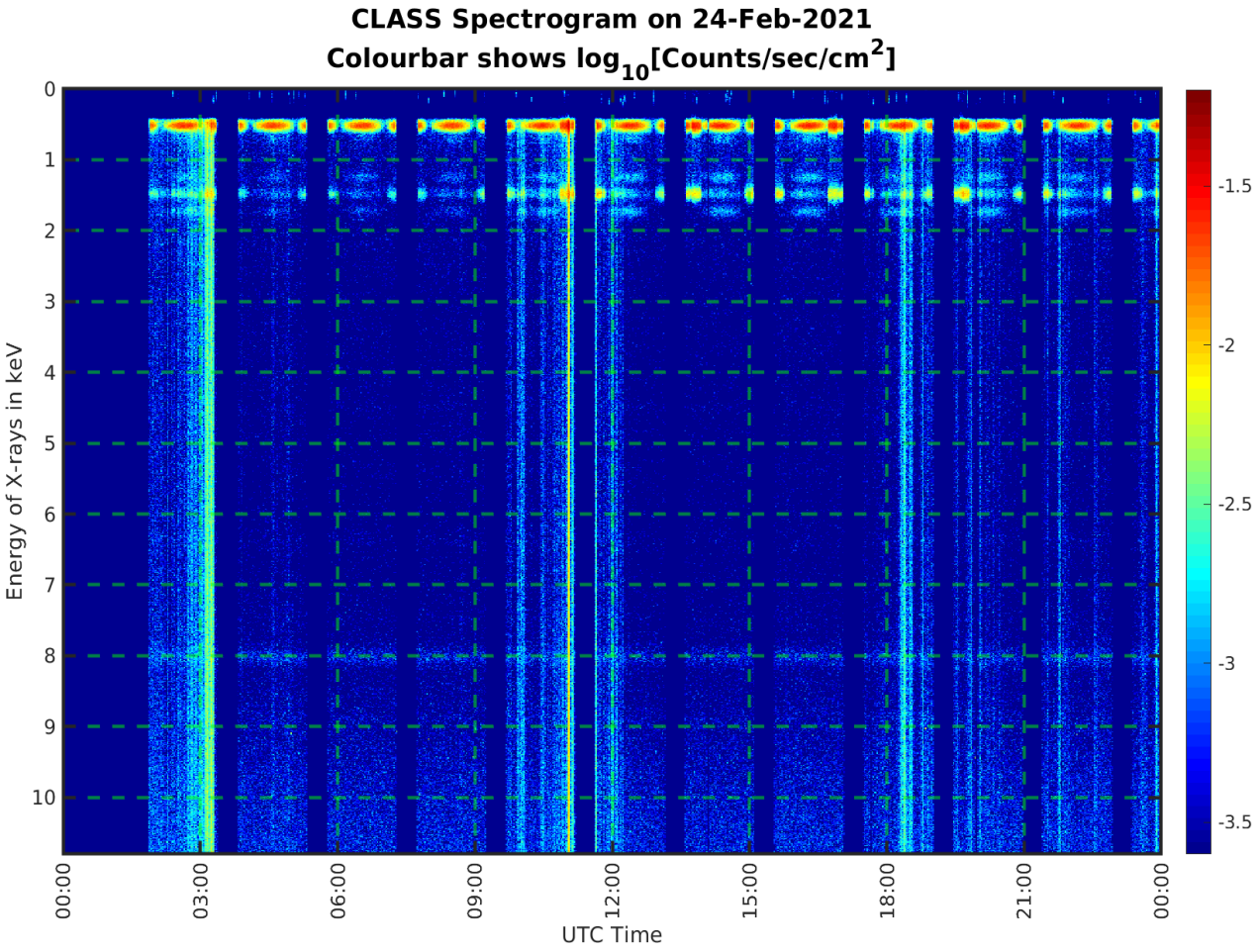
CLASS Spectrogram on 24-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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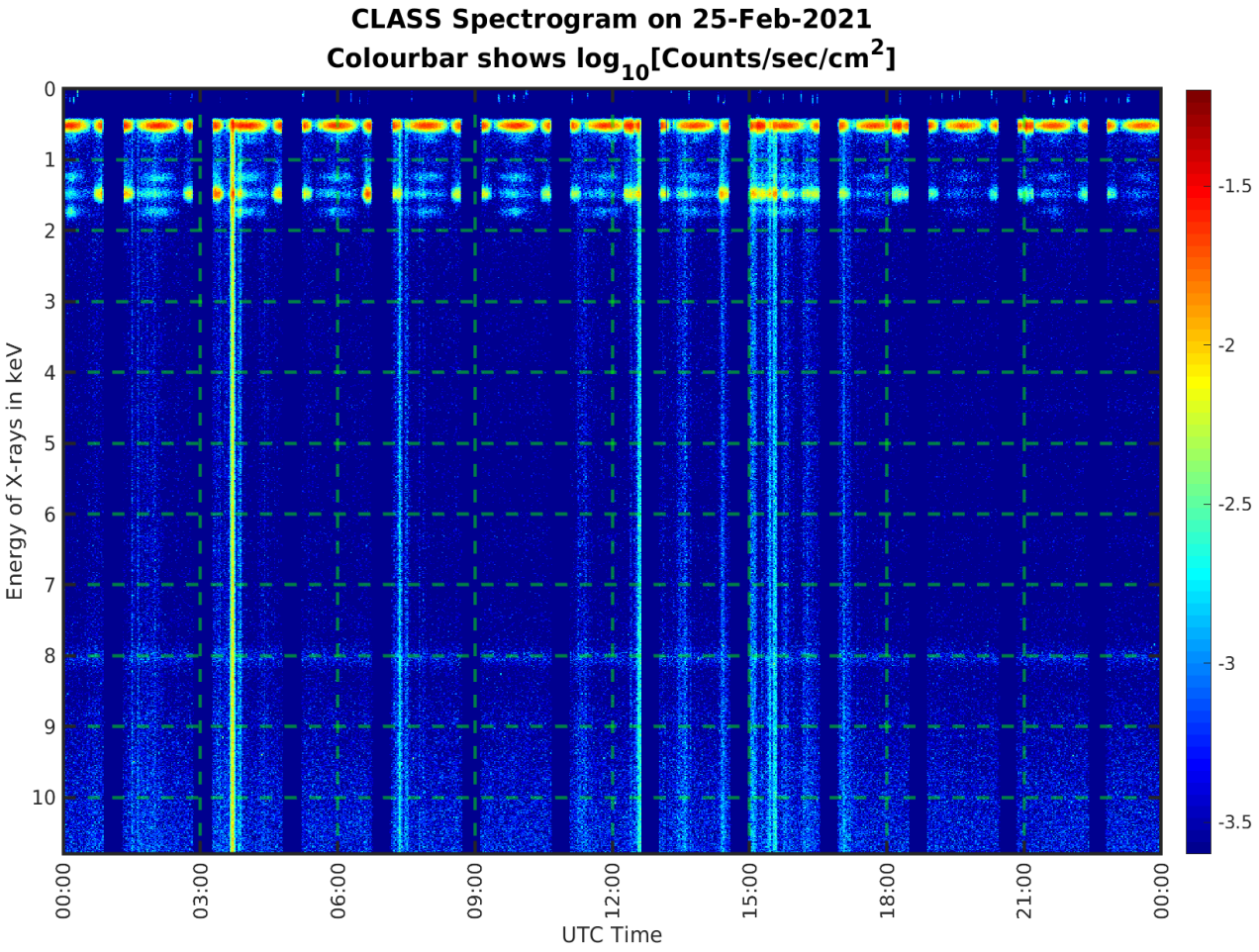
CLASS Spectrogram on 25-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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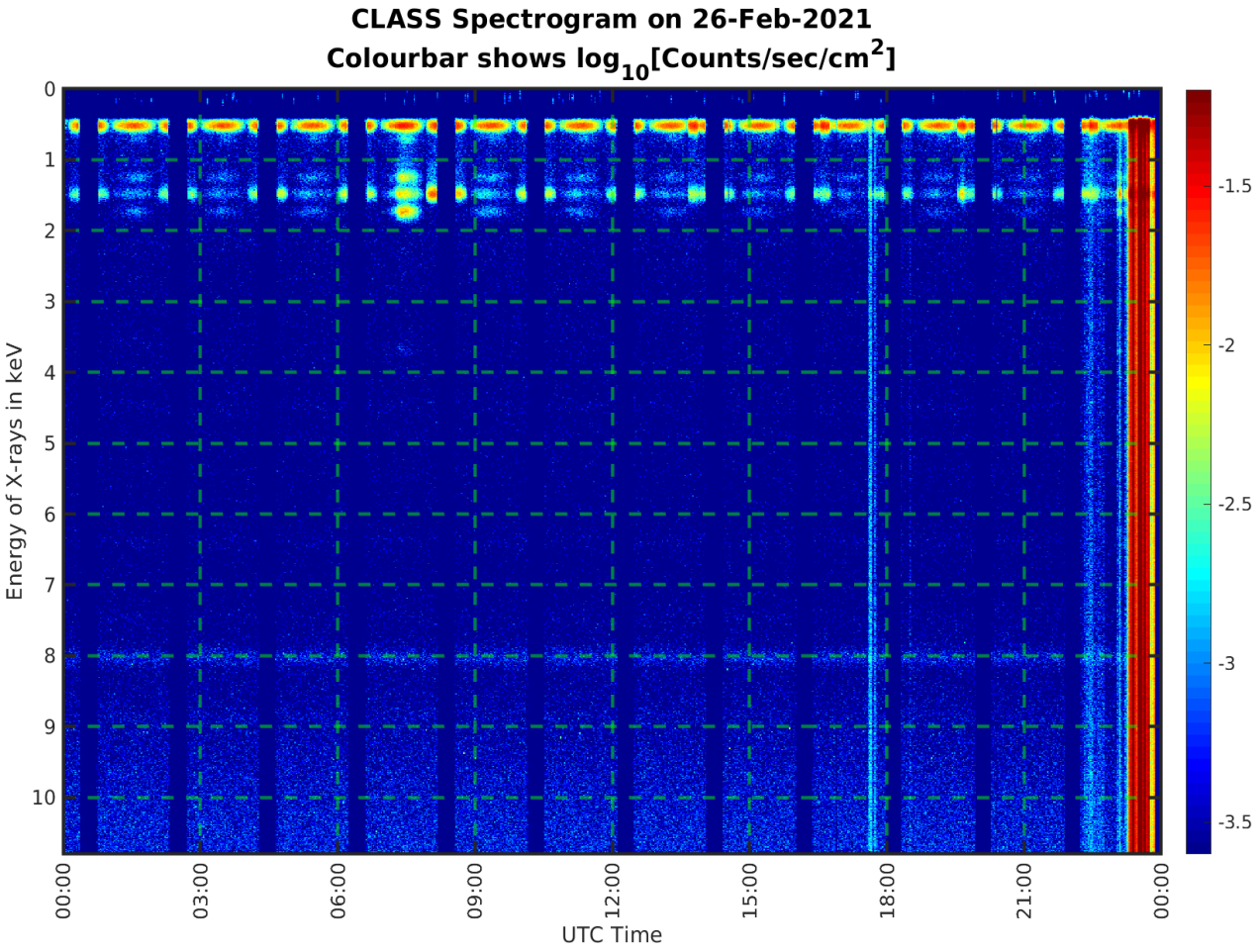
CLASS Spectrogram on 26-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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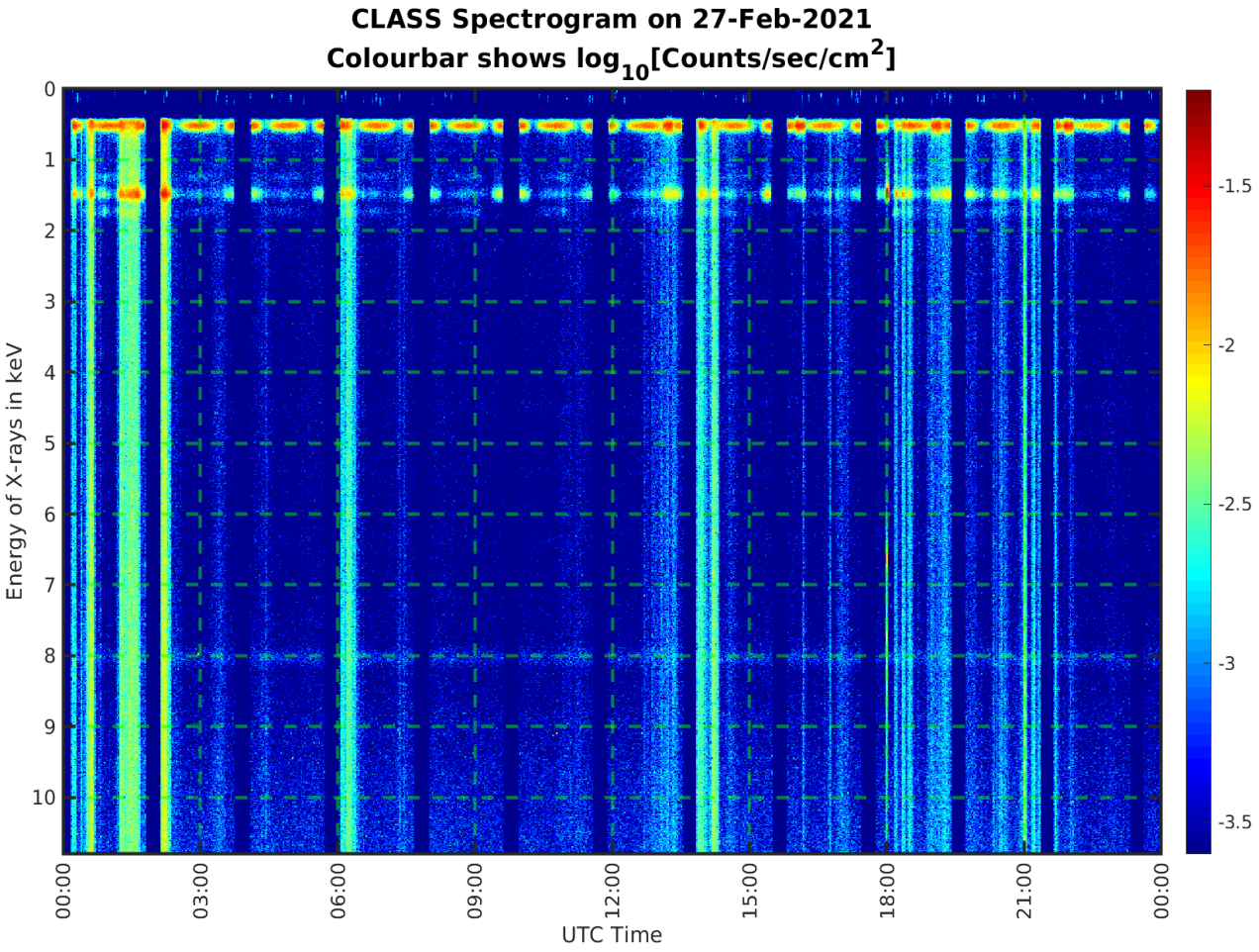
CLASS Spectrogram on 27-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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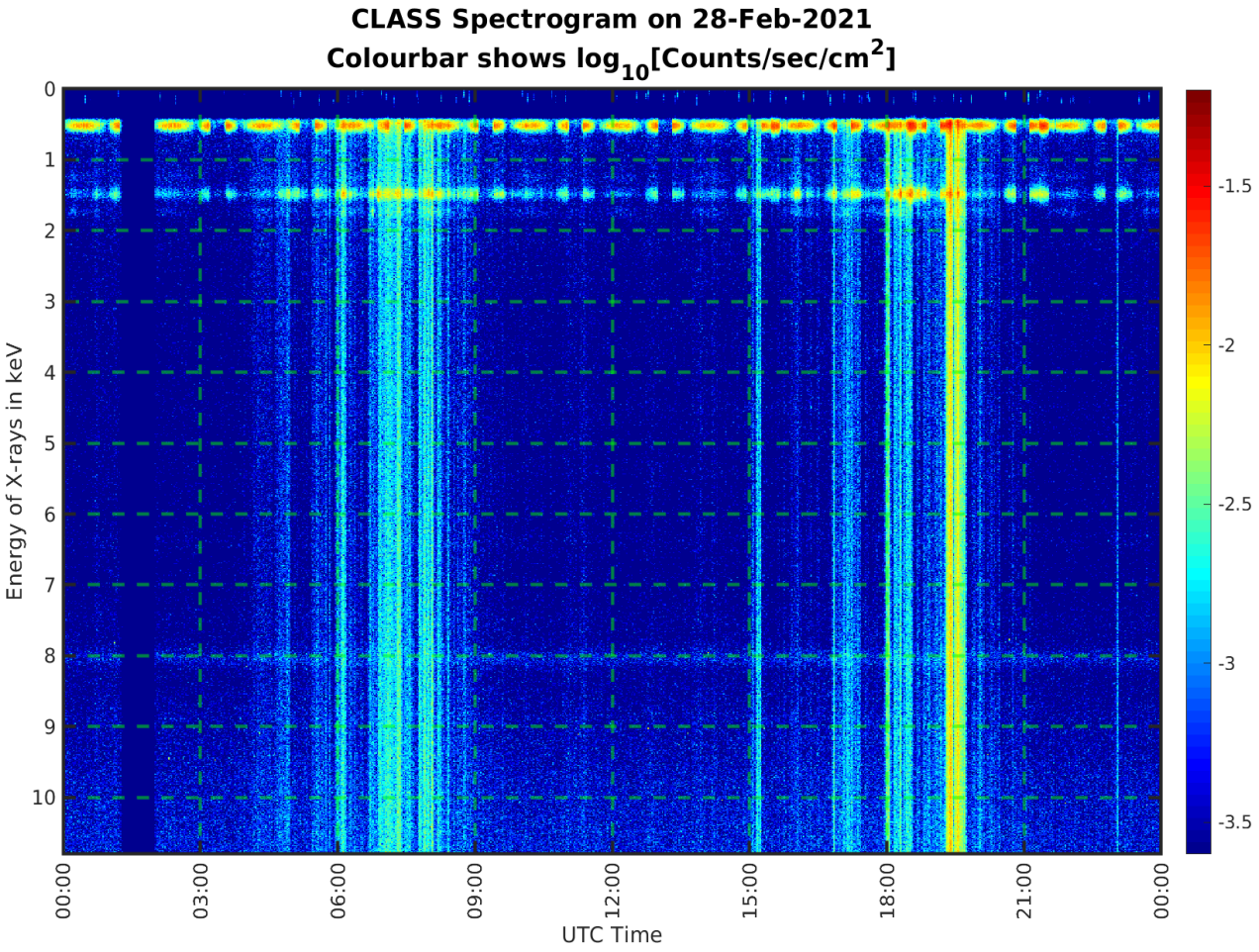
UTC Time


CLASS Spectrogram on 28-Feb-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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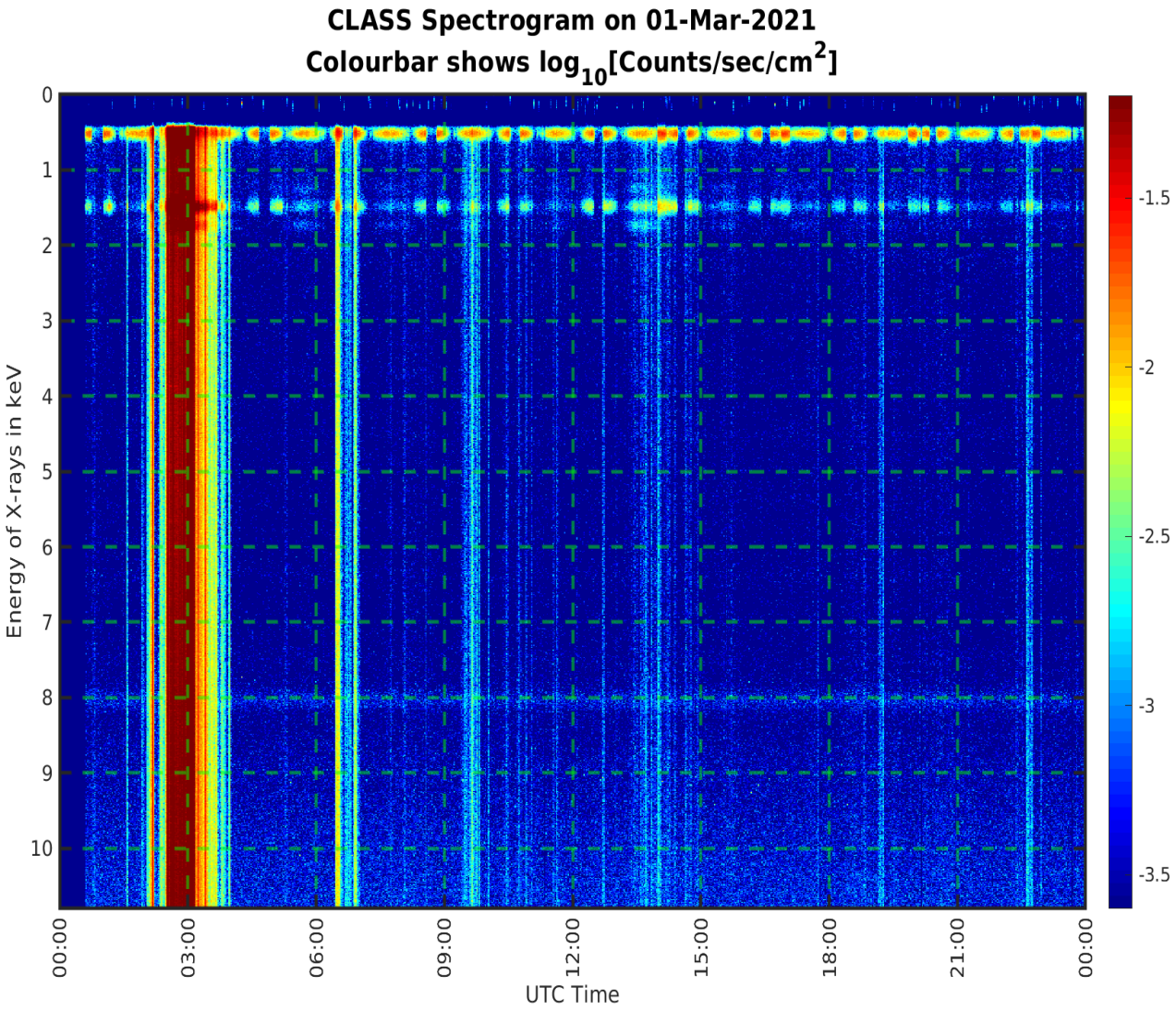
UTC Time


CLASS Spectrogram on 01-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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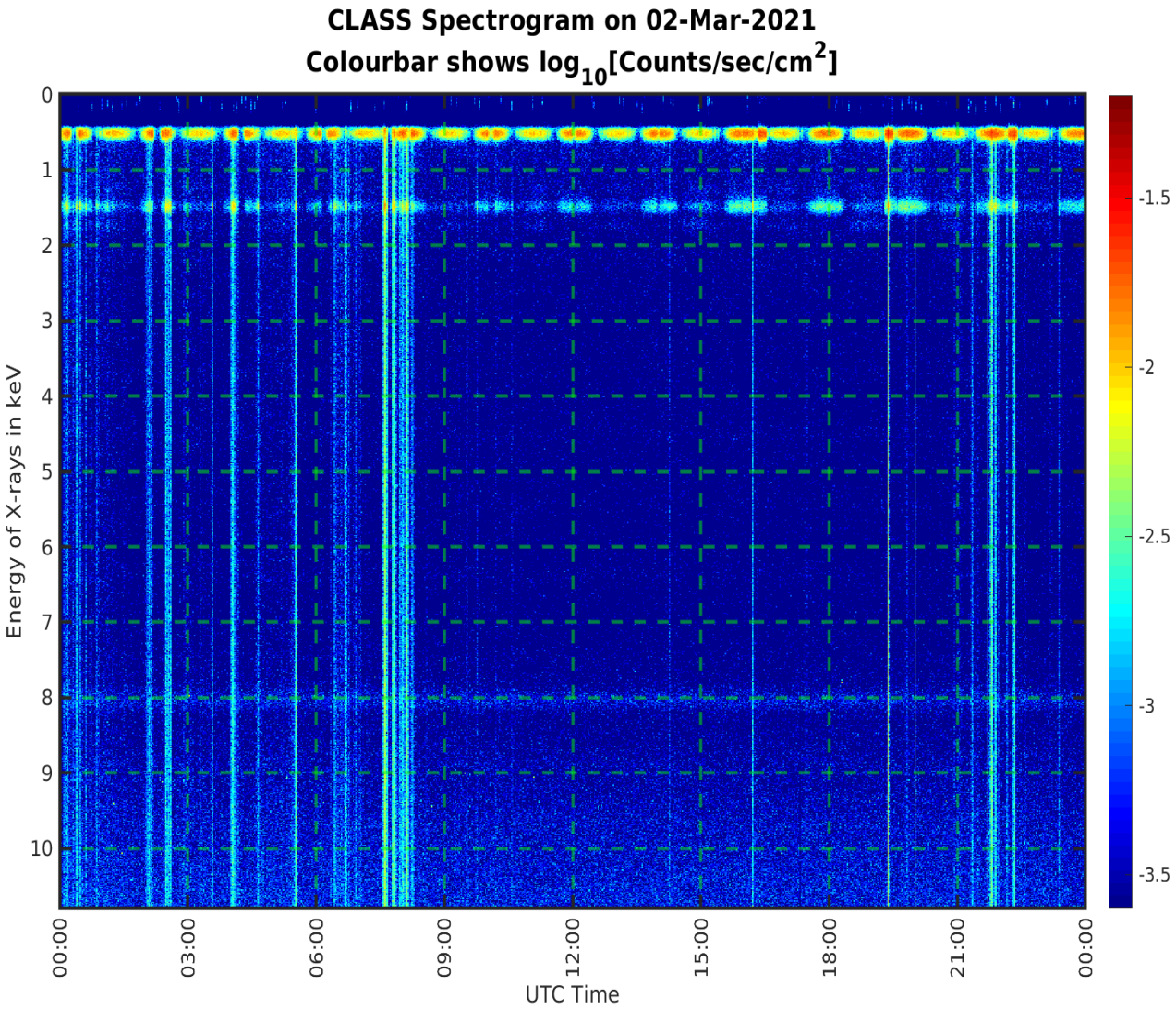
CLASS Spectrogram on 02-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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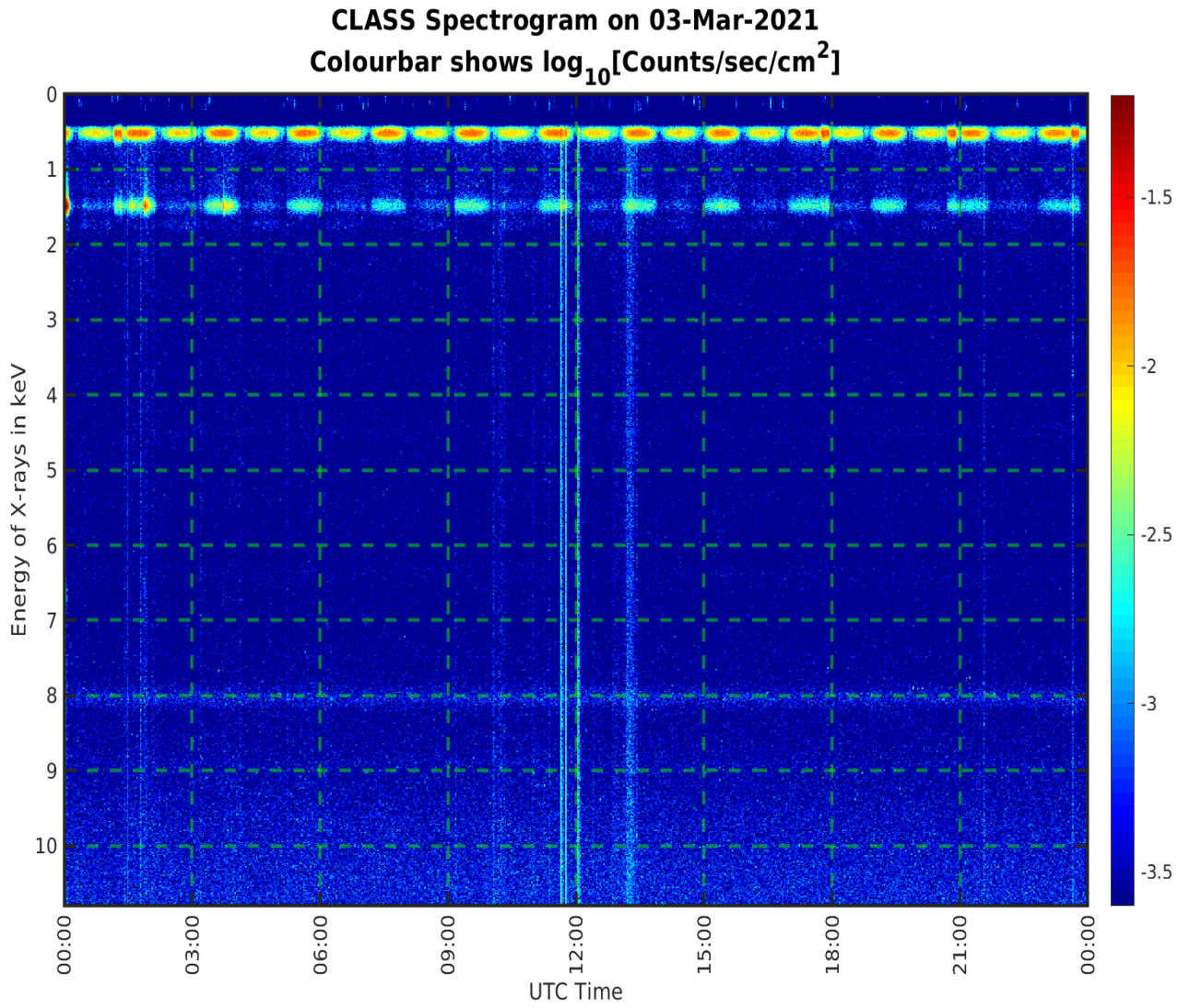
UTC Time


CLASS Spectrogram on 03-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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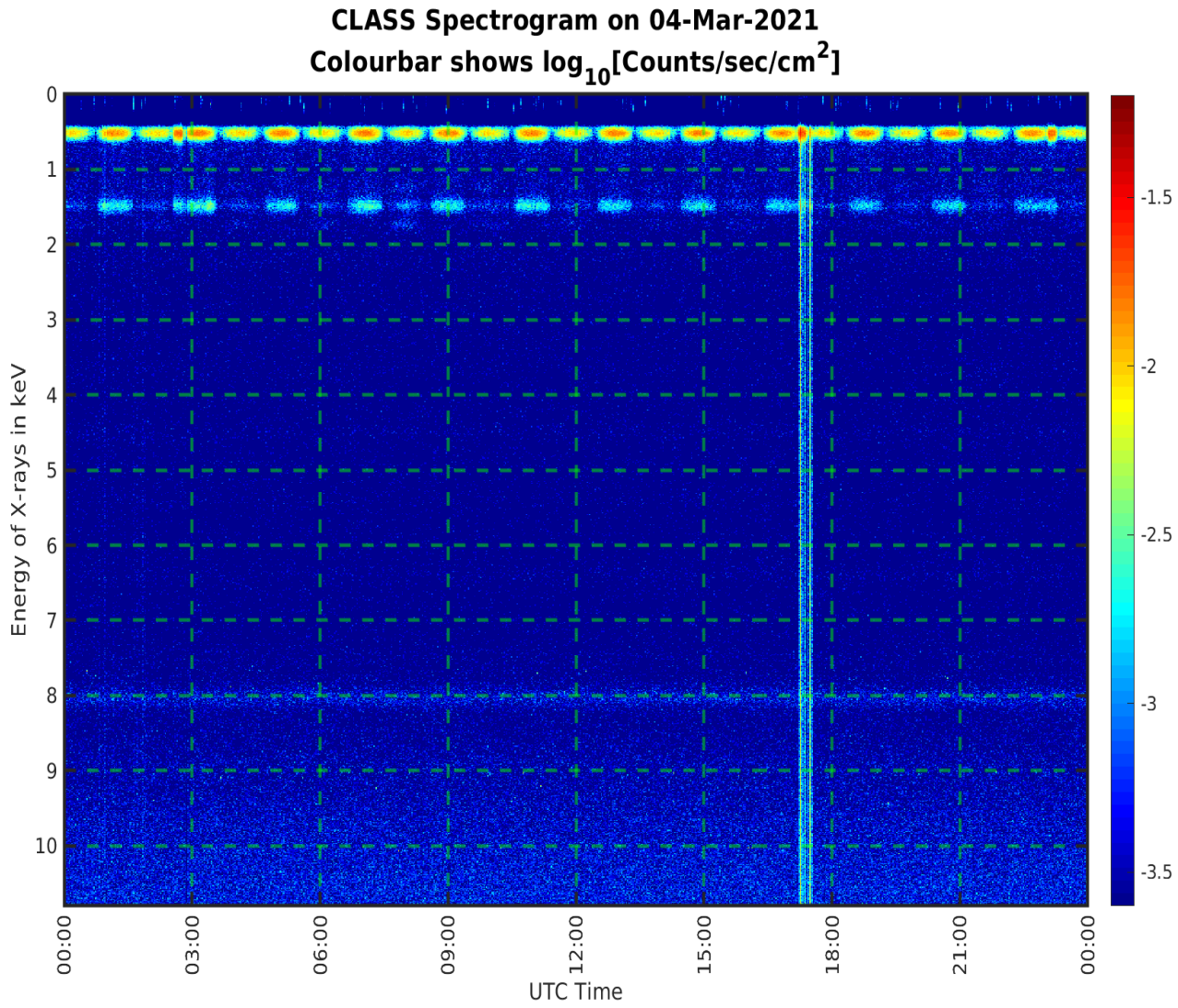
UTC Time


CLASS Spectrogram on 04-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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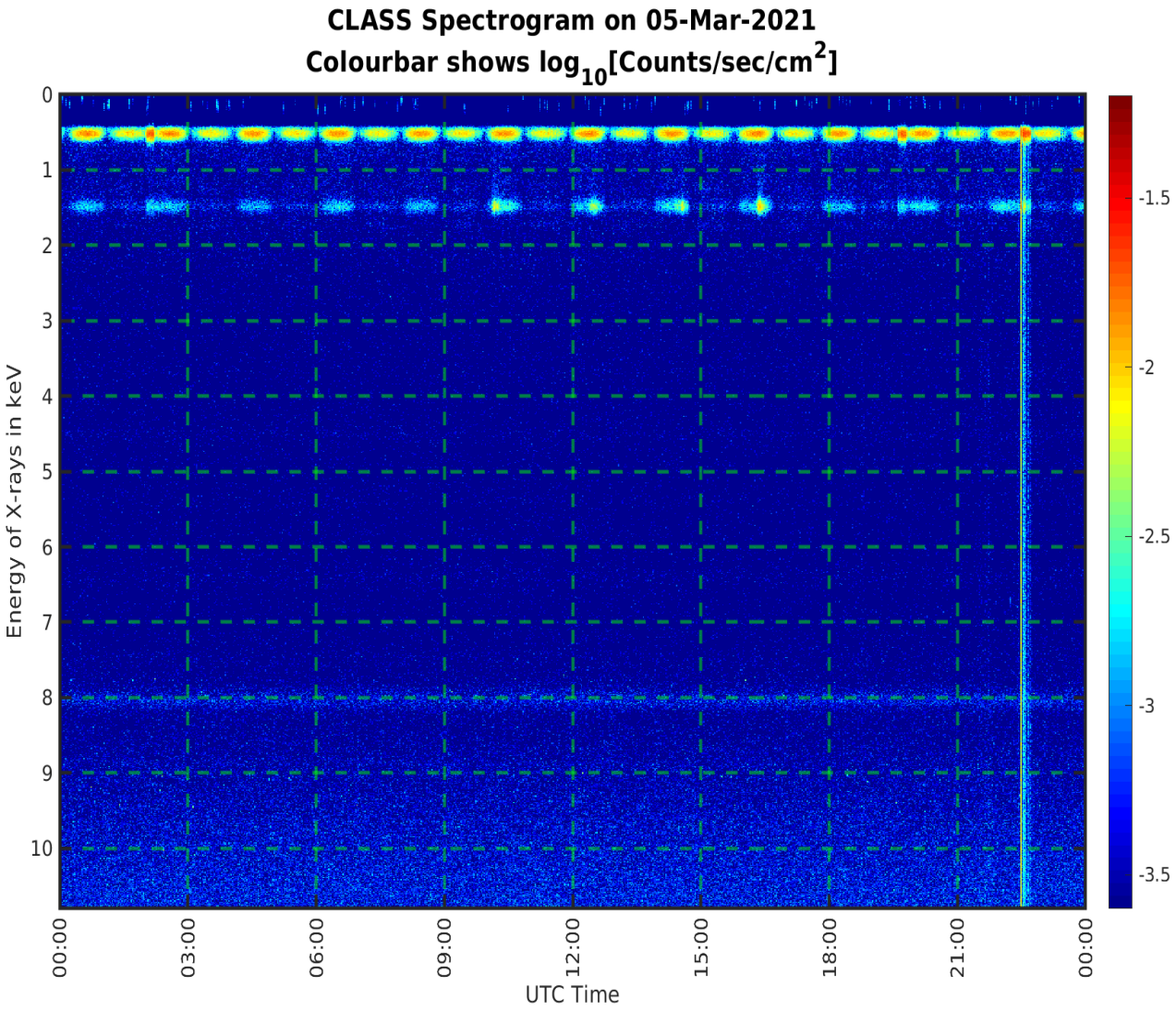
CLASS Spectrogram on 05-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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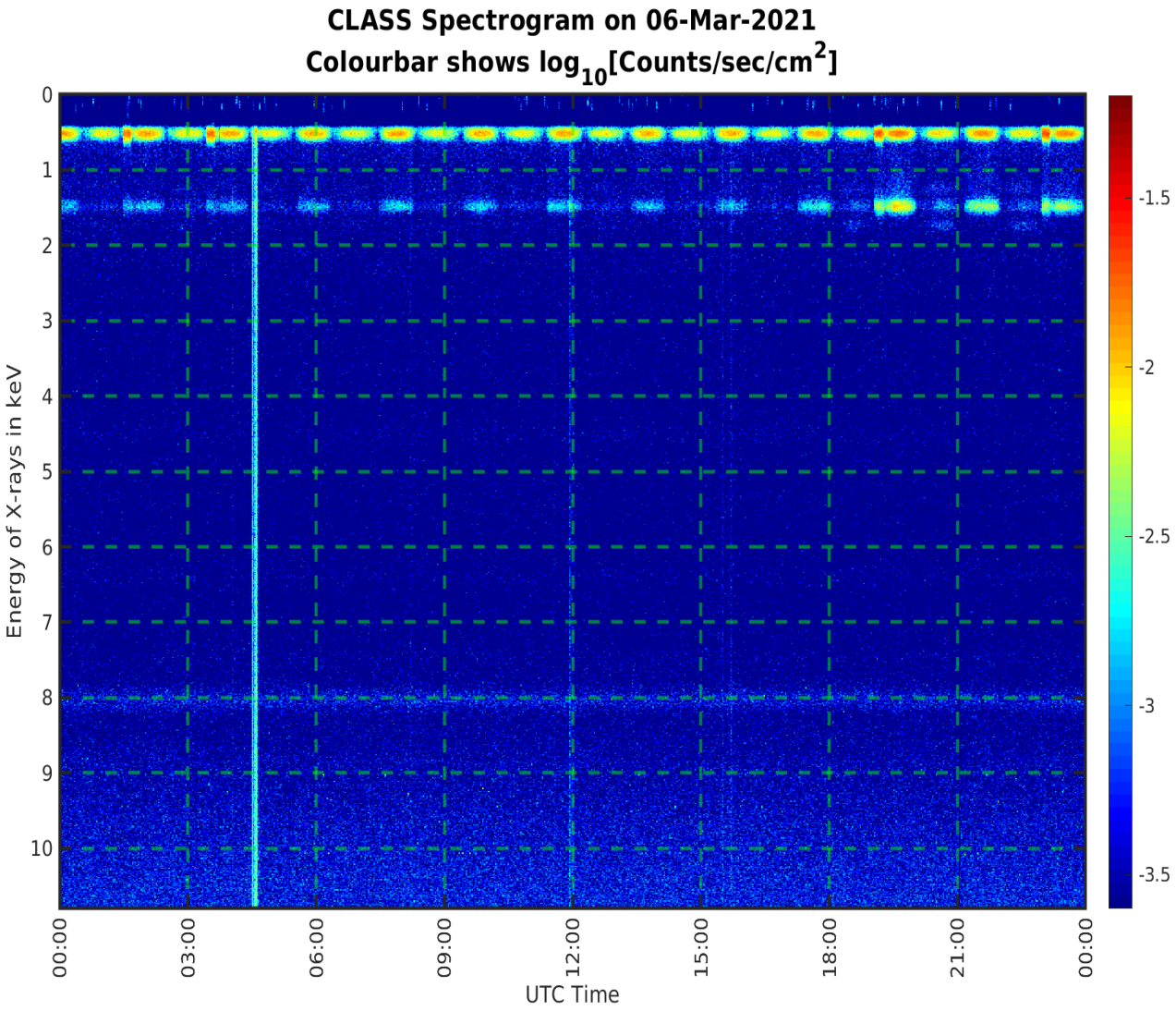
UTC Time


CLASS Spectrogram on 06-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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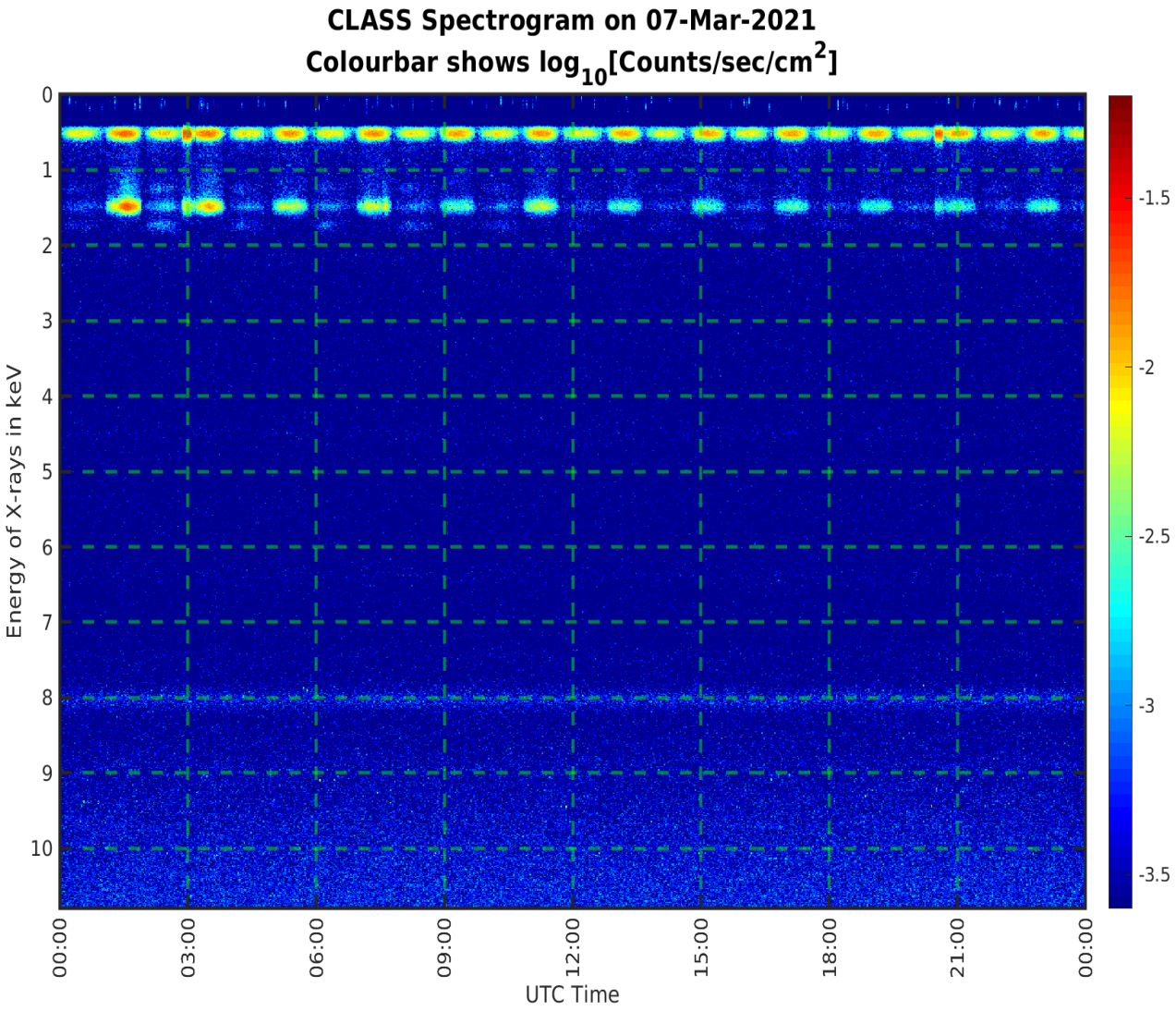
UTC Time


CLASS Spectrogram on 07-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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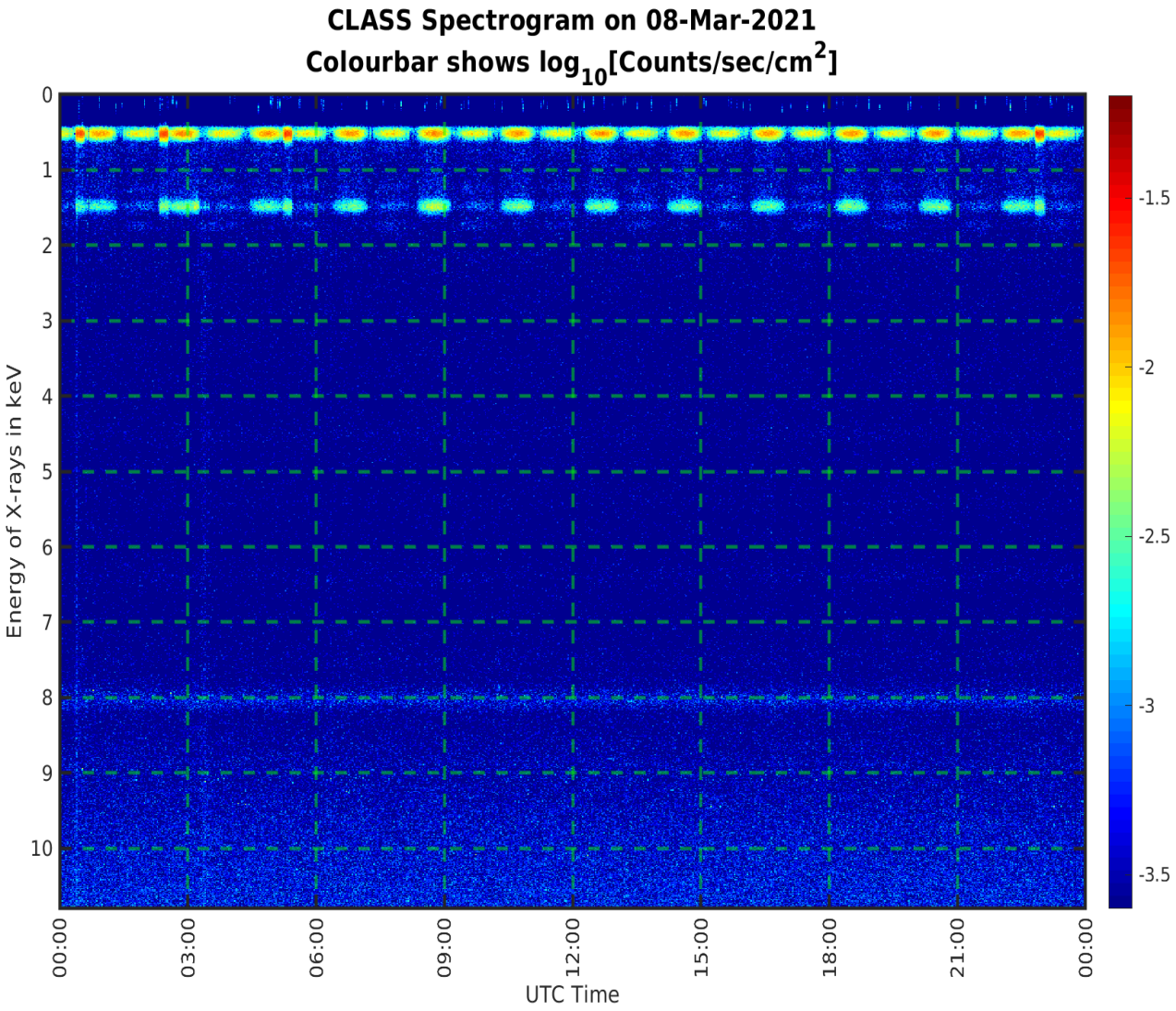
CLASS Spectrogram on 08-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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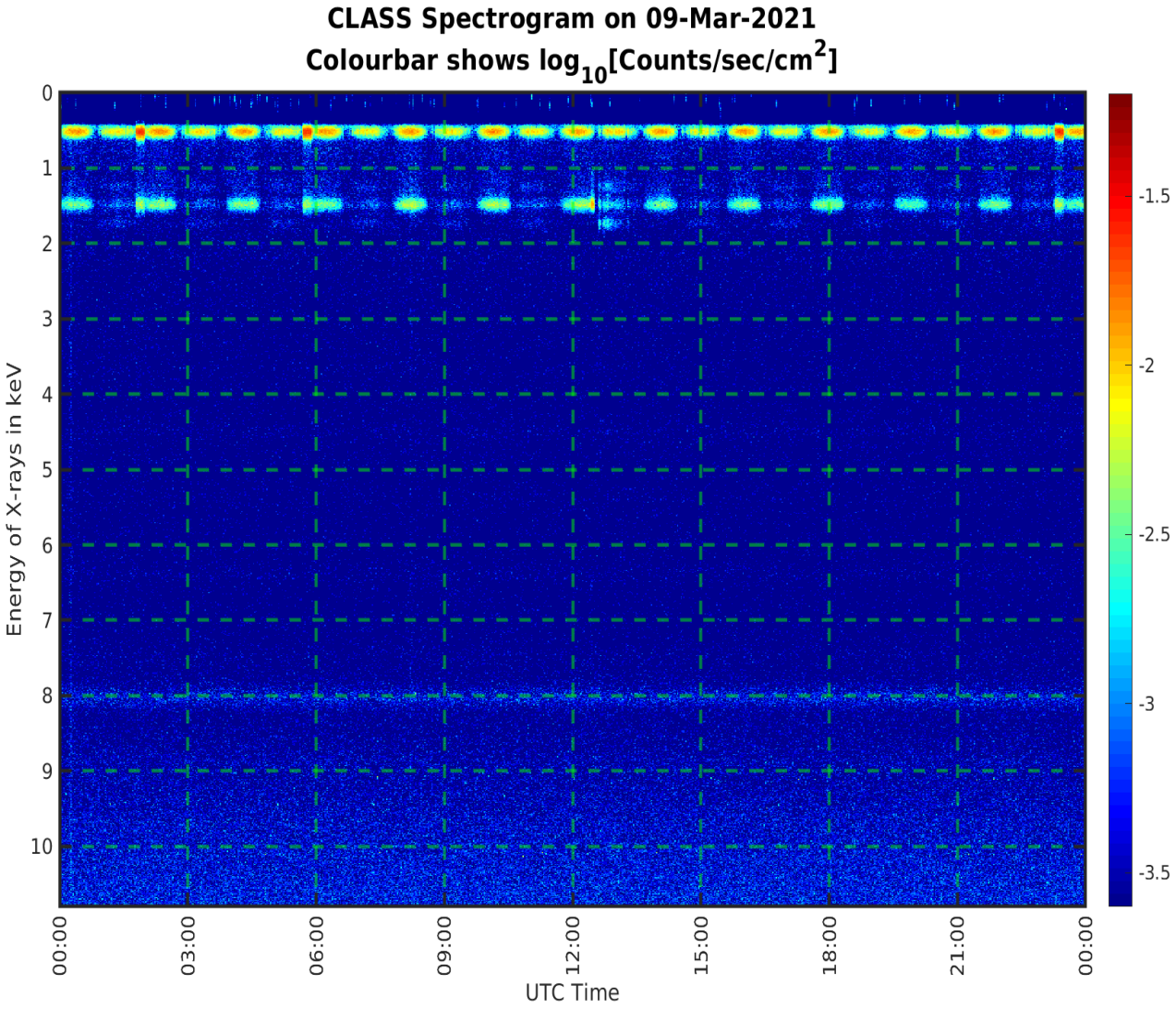
CLASS Spectrogram on 09-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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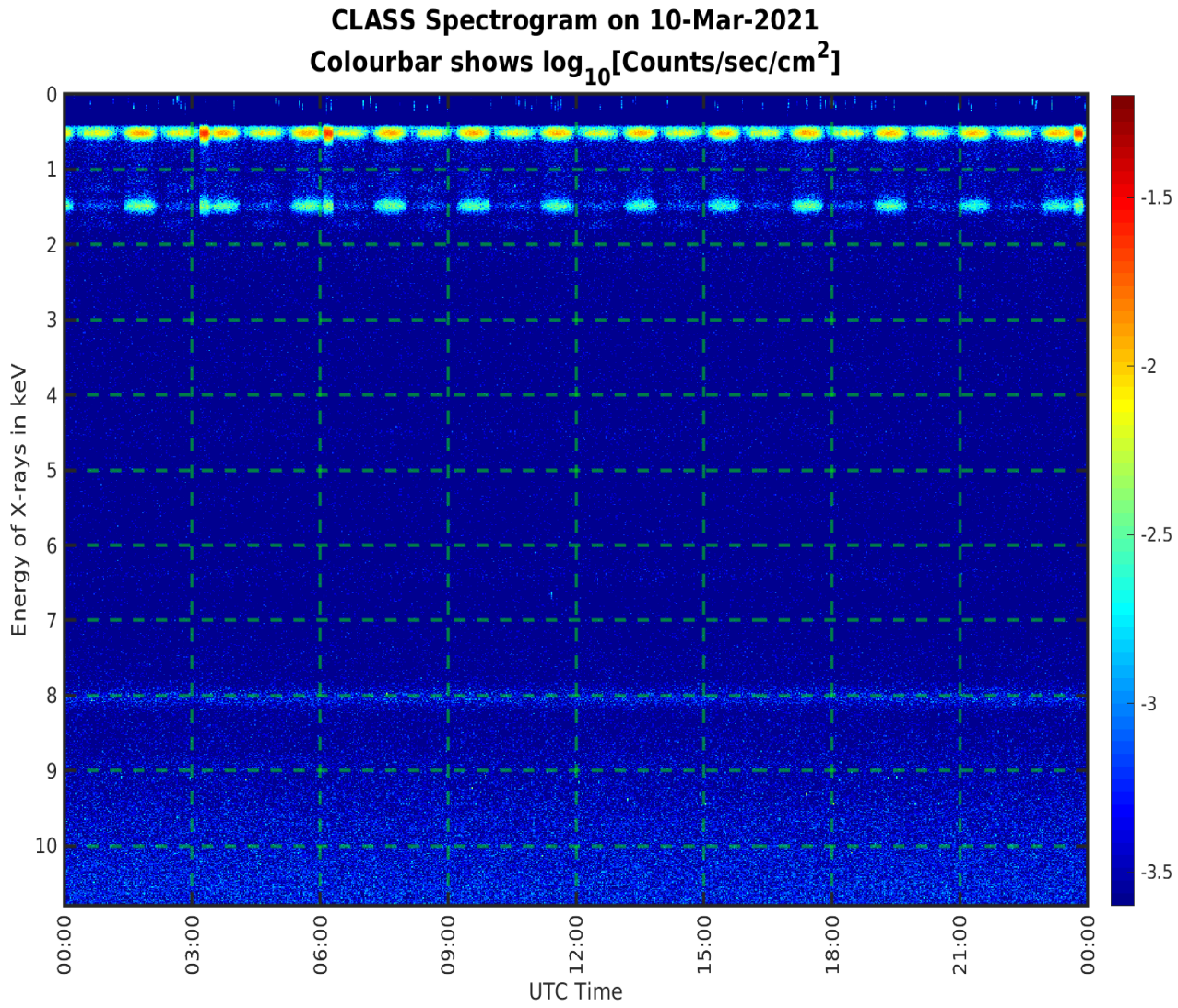
UTC Time


CLASS Spectrogram on 10-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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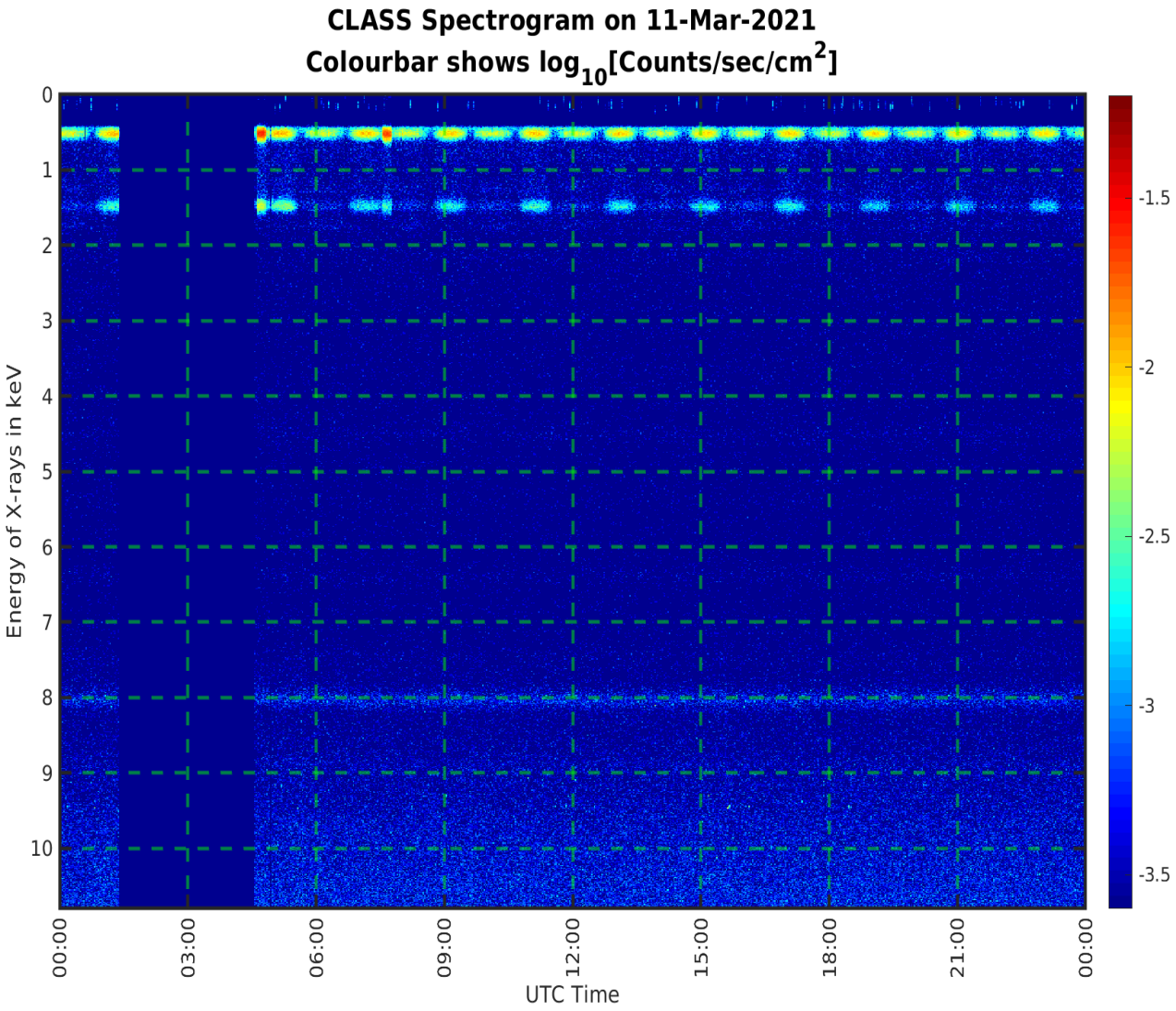
UTC Time


CLASS Spectrogram on 11-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
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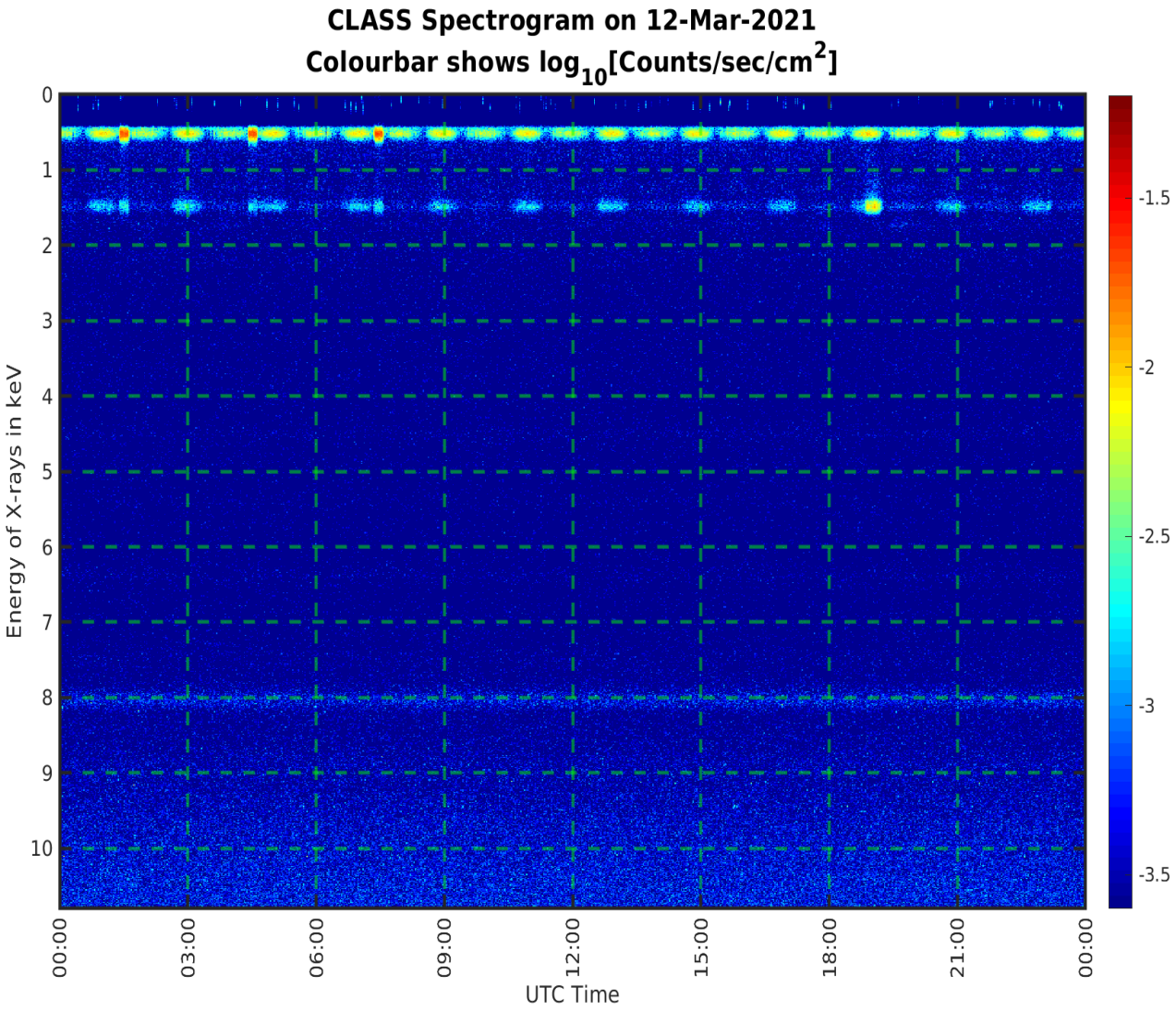
UTC Time


CLASS Spectrogram on 12-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
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-1.5
-2
-2.5
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-3.5
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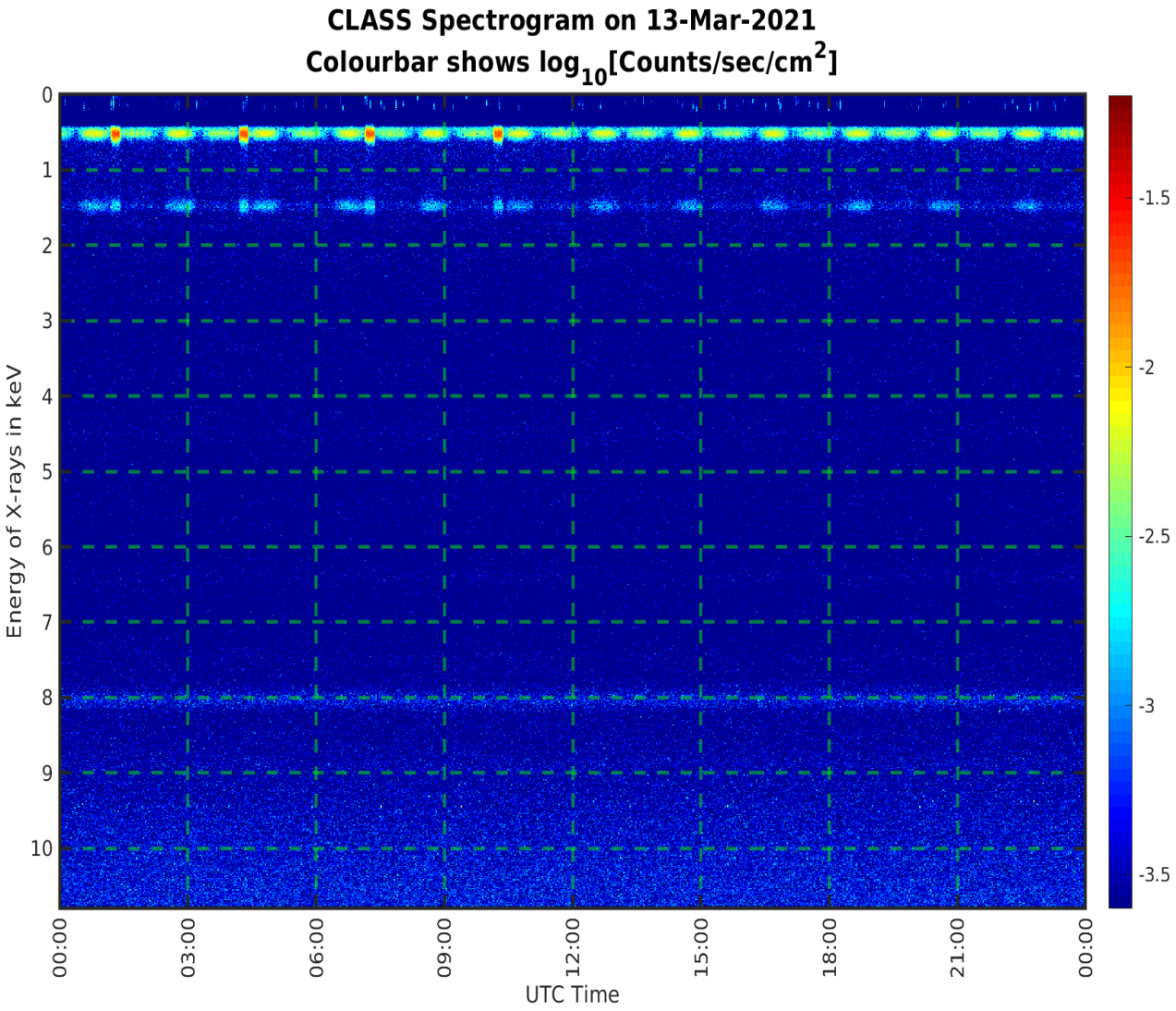
UTC Time


CLASS Spectrogram on 13-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
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-1.5
-2
-2.5
-3
-3.5
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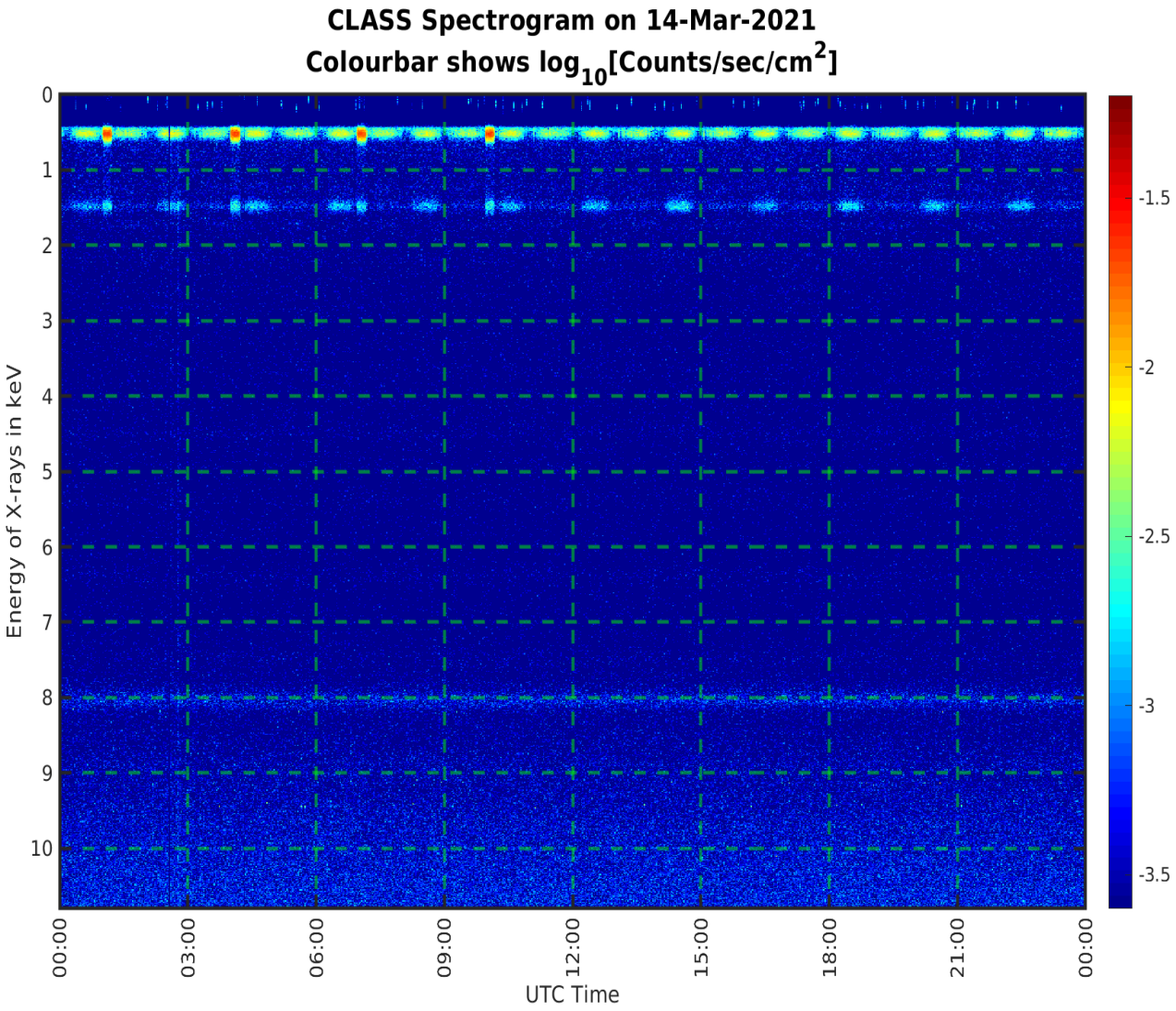
UTC Time


CLASS Spectrogram on 14-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
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-1.5
-2
-2.5
-3
-3.5
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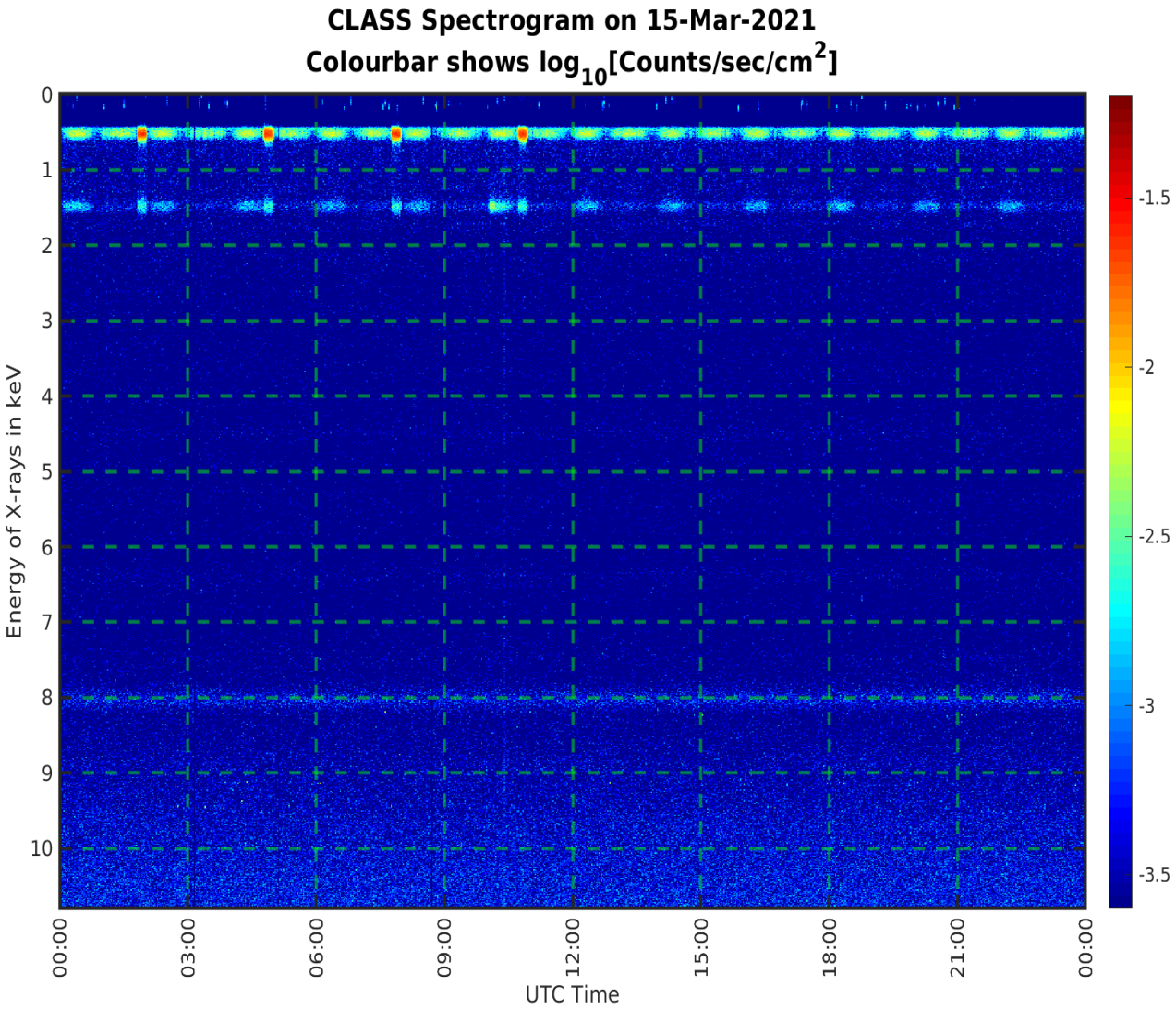
UTC Time


CLASS Spectrogram on 15-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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4
5
6
7
8
9
10
-1.5
-2
-2.5
-3
-3.5
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18:00
21:00
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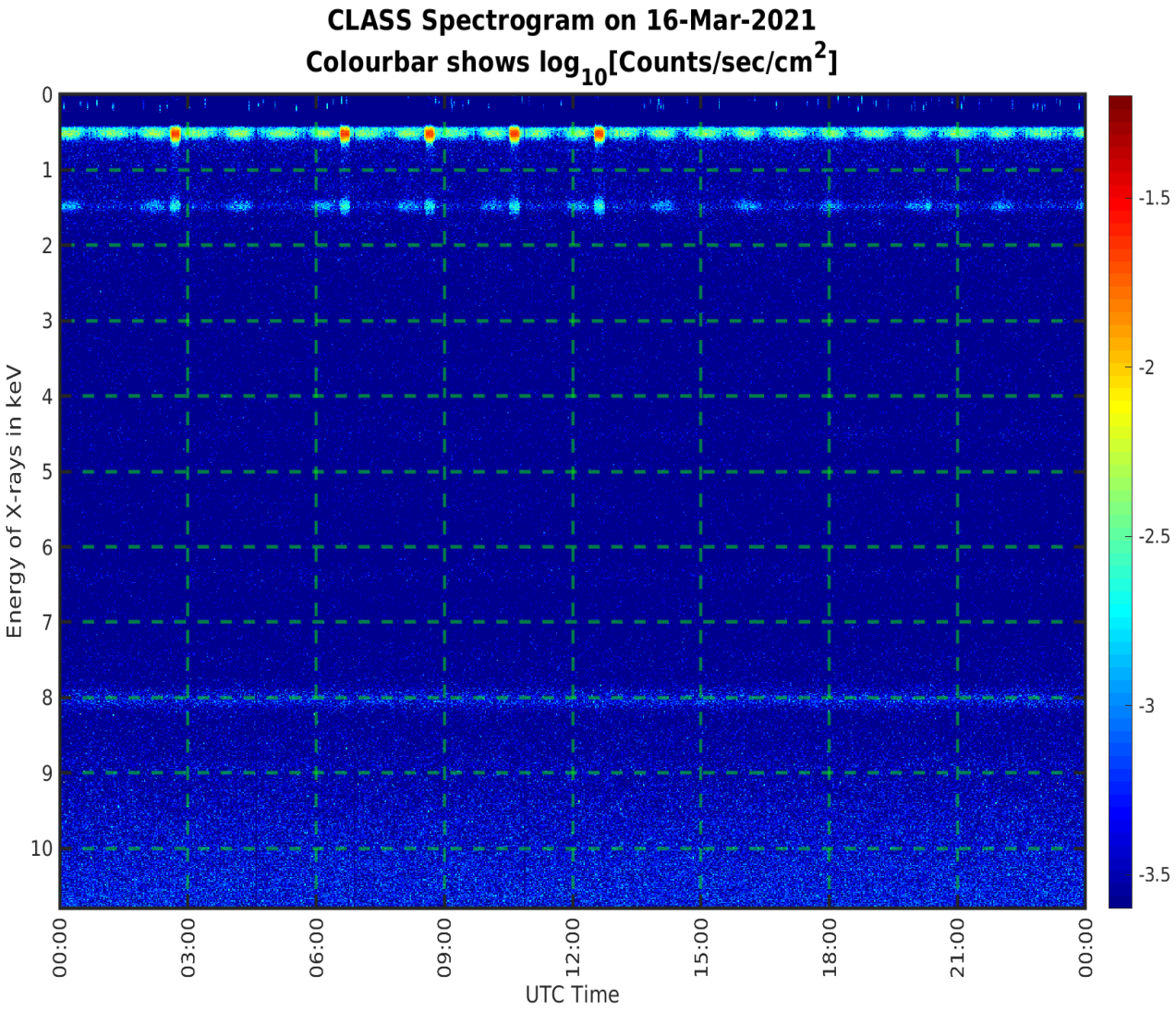
UTC Time


CLASS Spectrogram on 16-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
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-1.5
-2
-2.5
-3
-3.5
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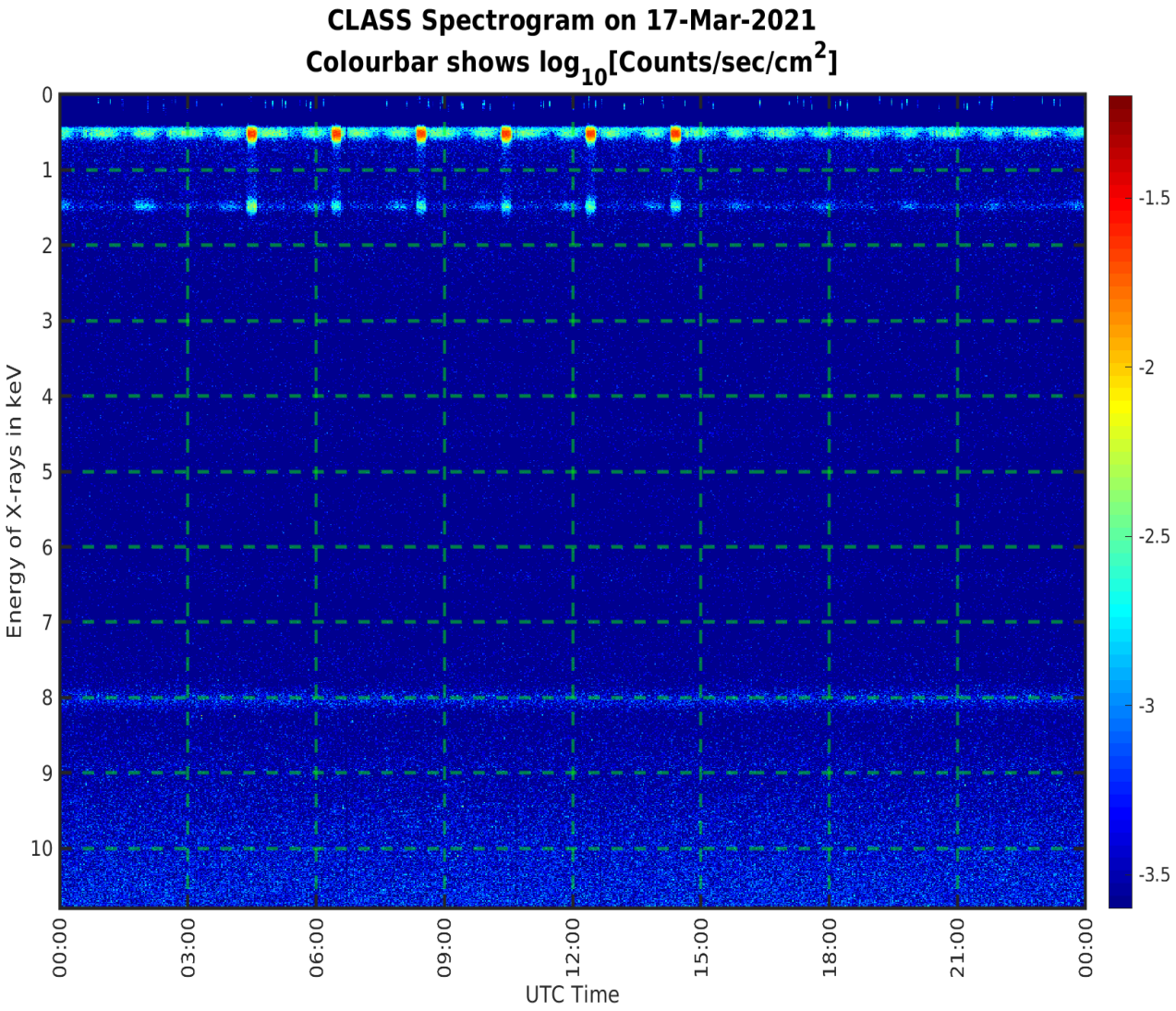
UTC Time


CLASS Spectrogram on 17-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
-2
-2.5
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-3.5
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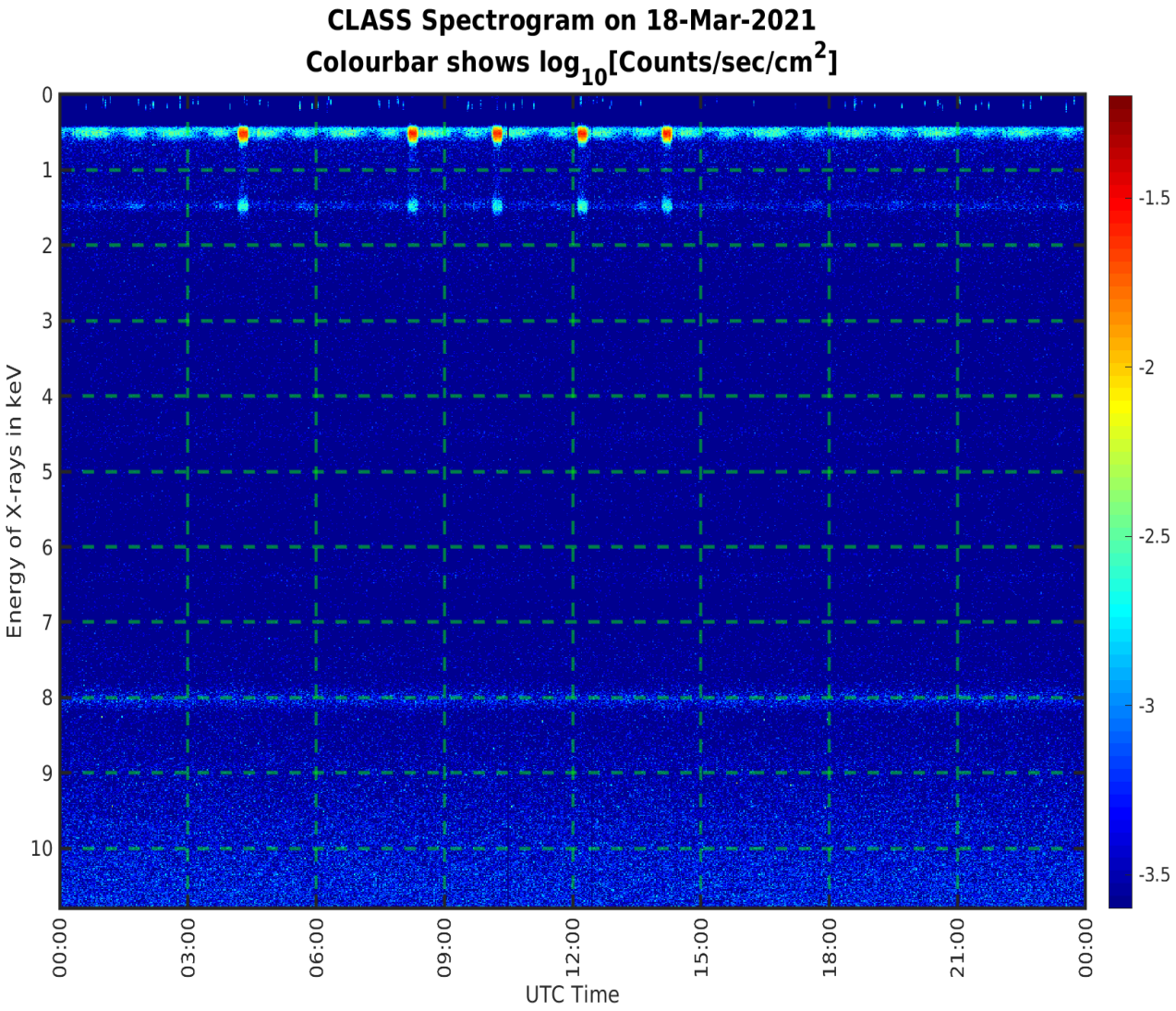
UTC Time


CLASS Spectrogram on 18-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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-1.5
-2
-2.5
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-3.5
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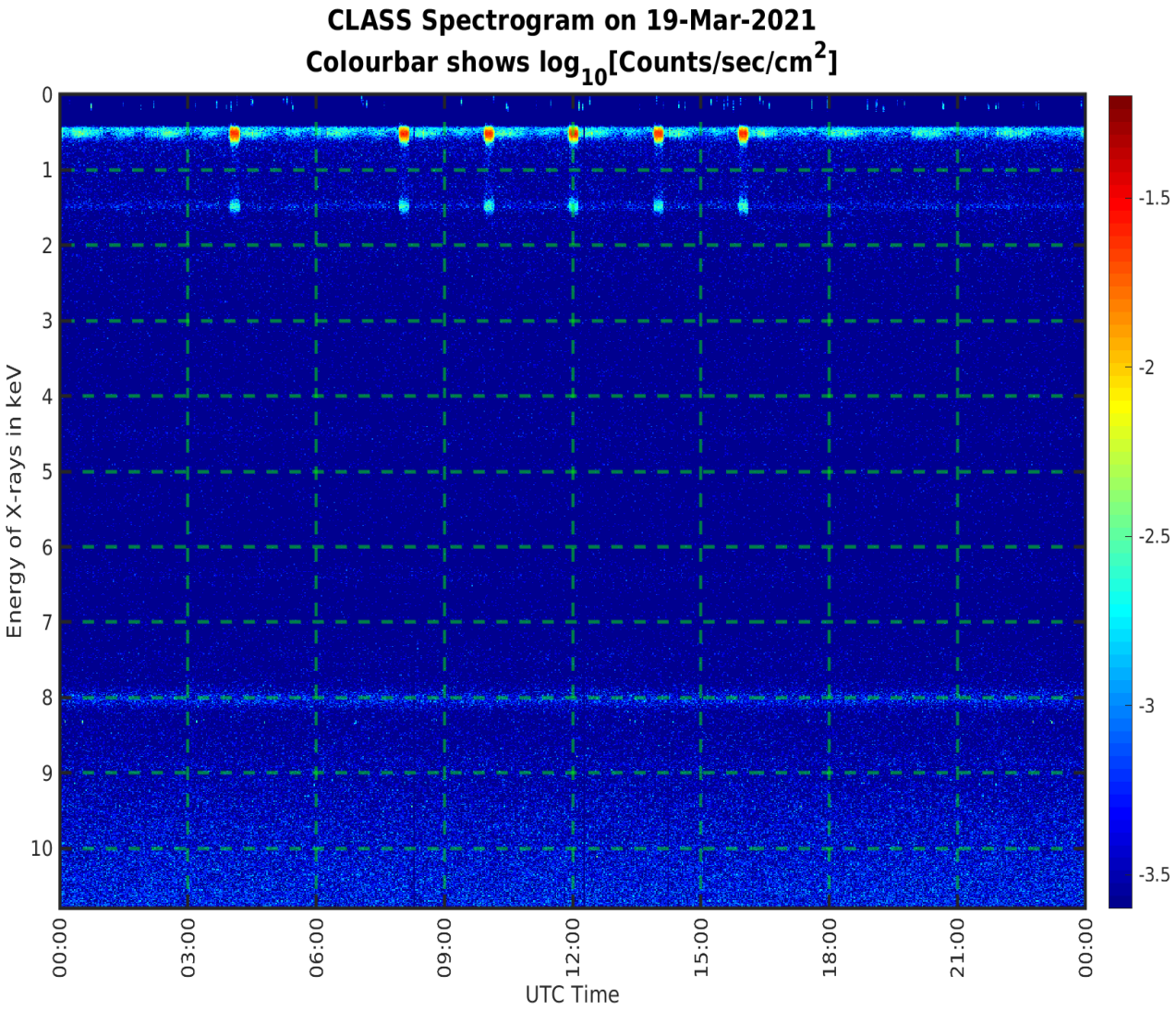
UTC Time


CLASS Spectrogram on 19-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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-2.5
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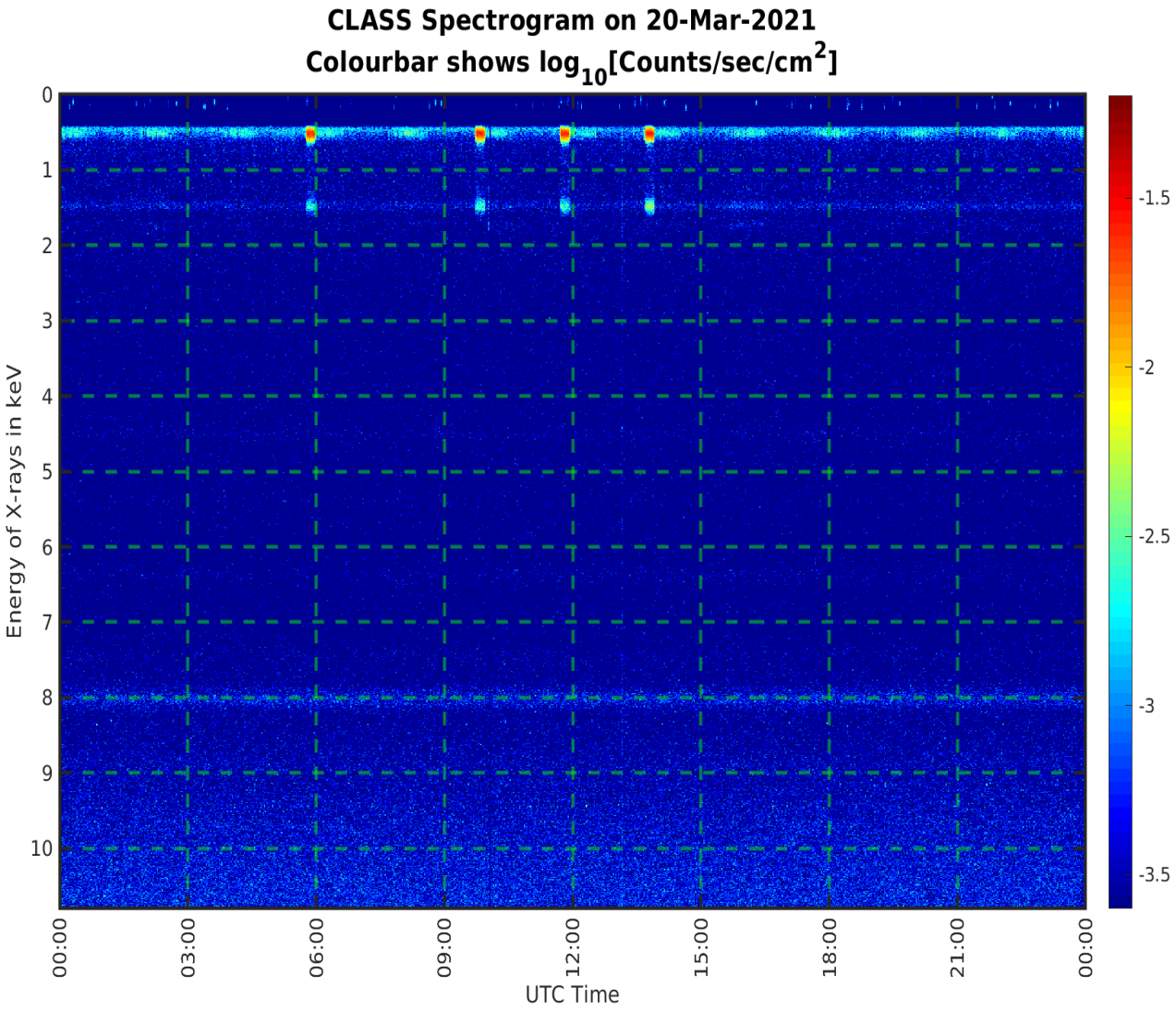
UTC Time


CLASS Spectrogram on 20-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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-1.5
-2
-2.5
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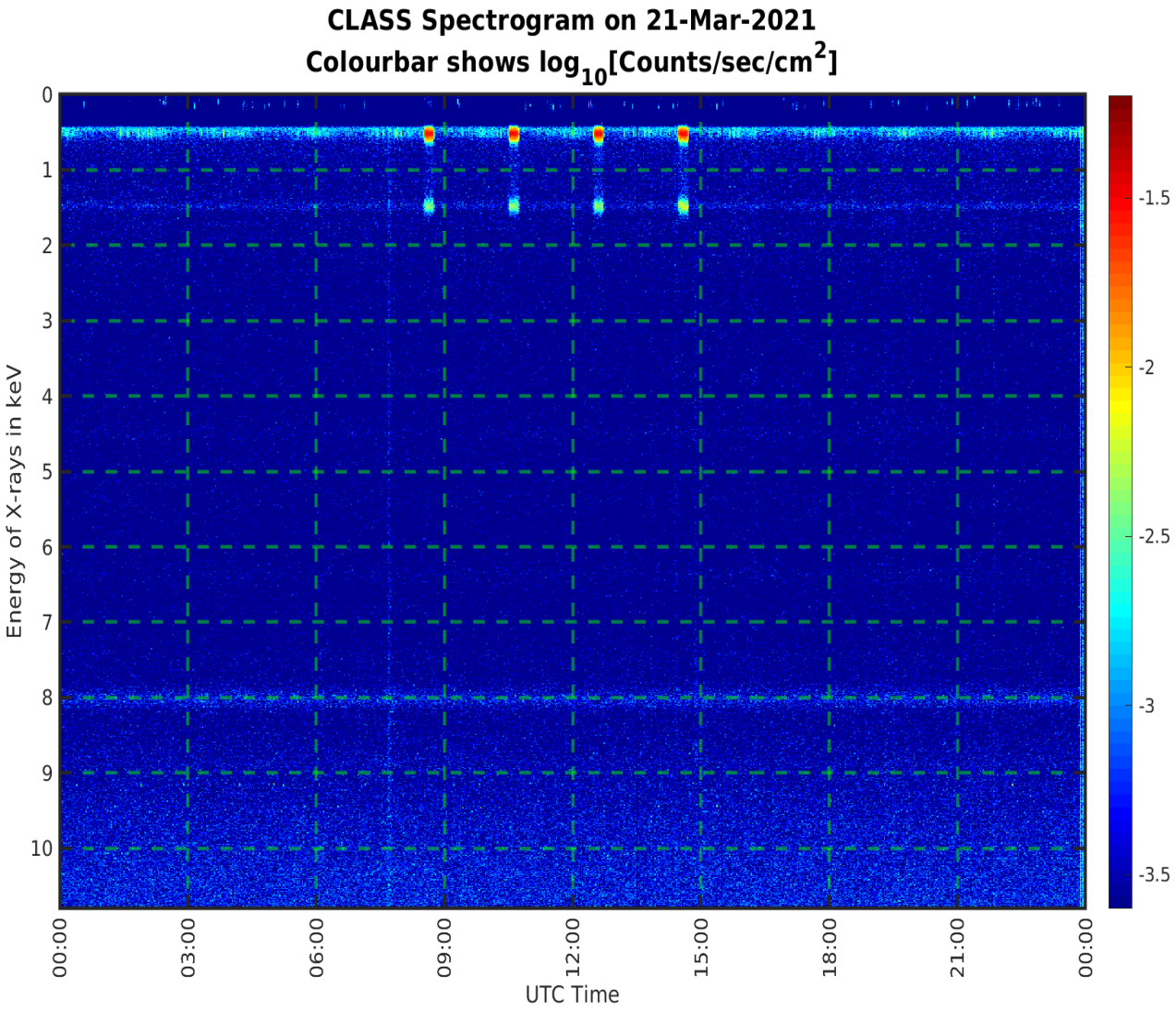
UTC Time


CLASS Spectrogram on 21-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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-1.5
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-2.5
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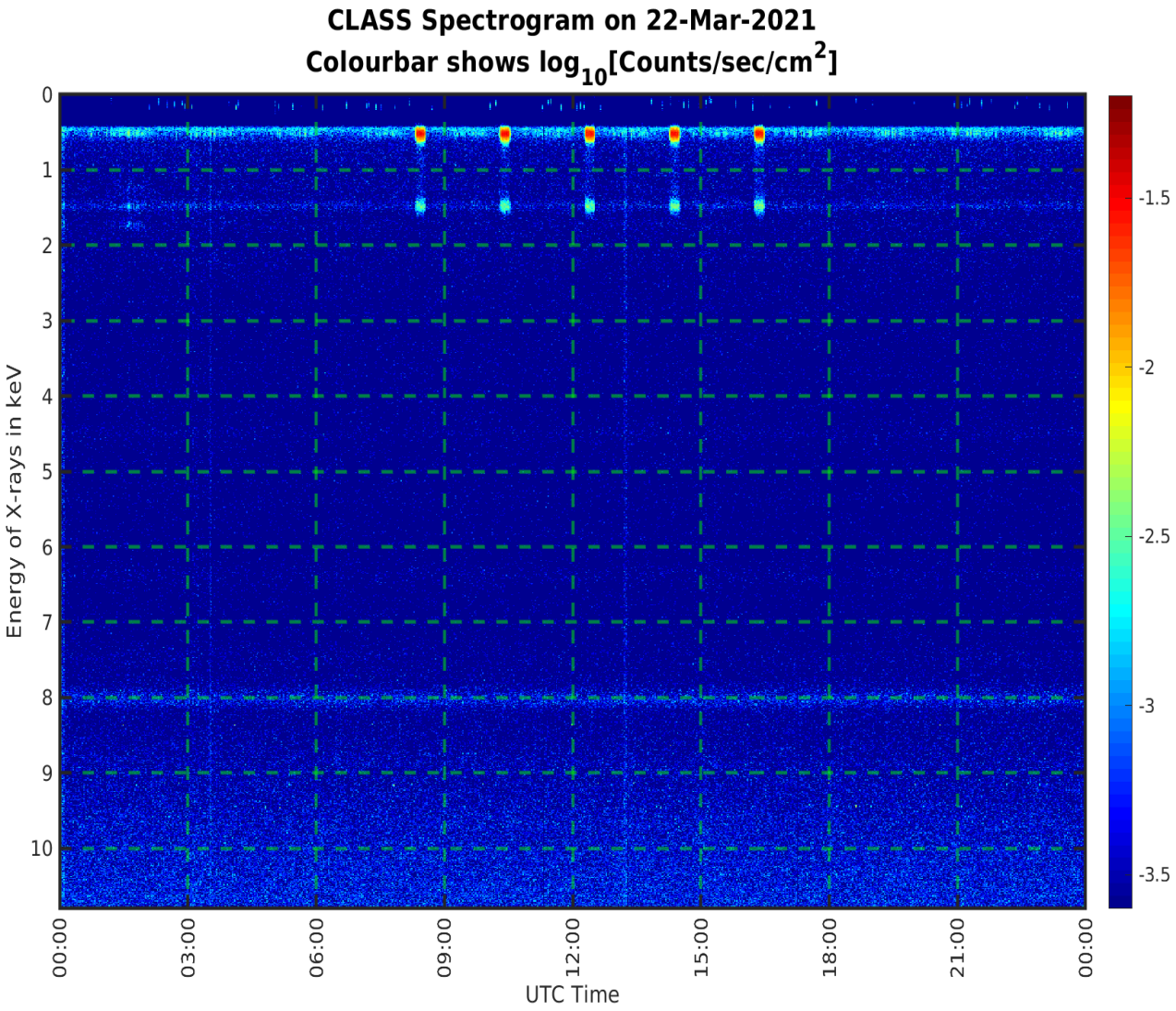
UTC Time


CLASS Spectrogram on 22-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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-2.5
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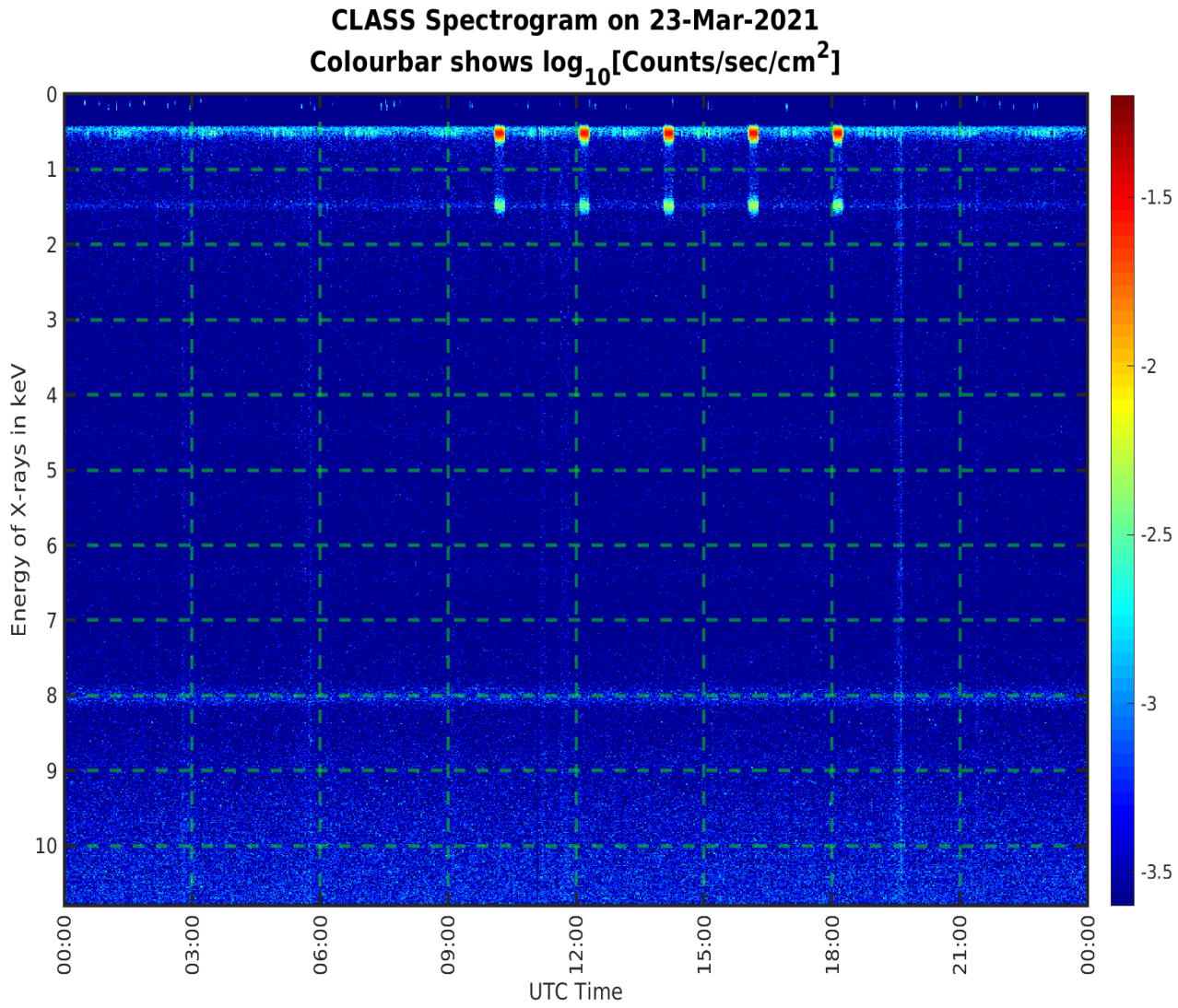
UTC Time


CLASS Spectrogram on 23-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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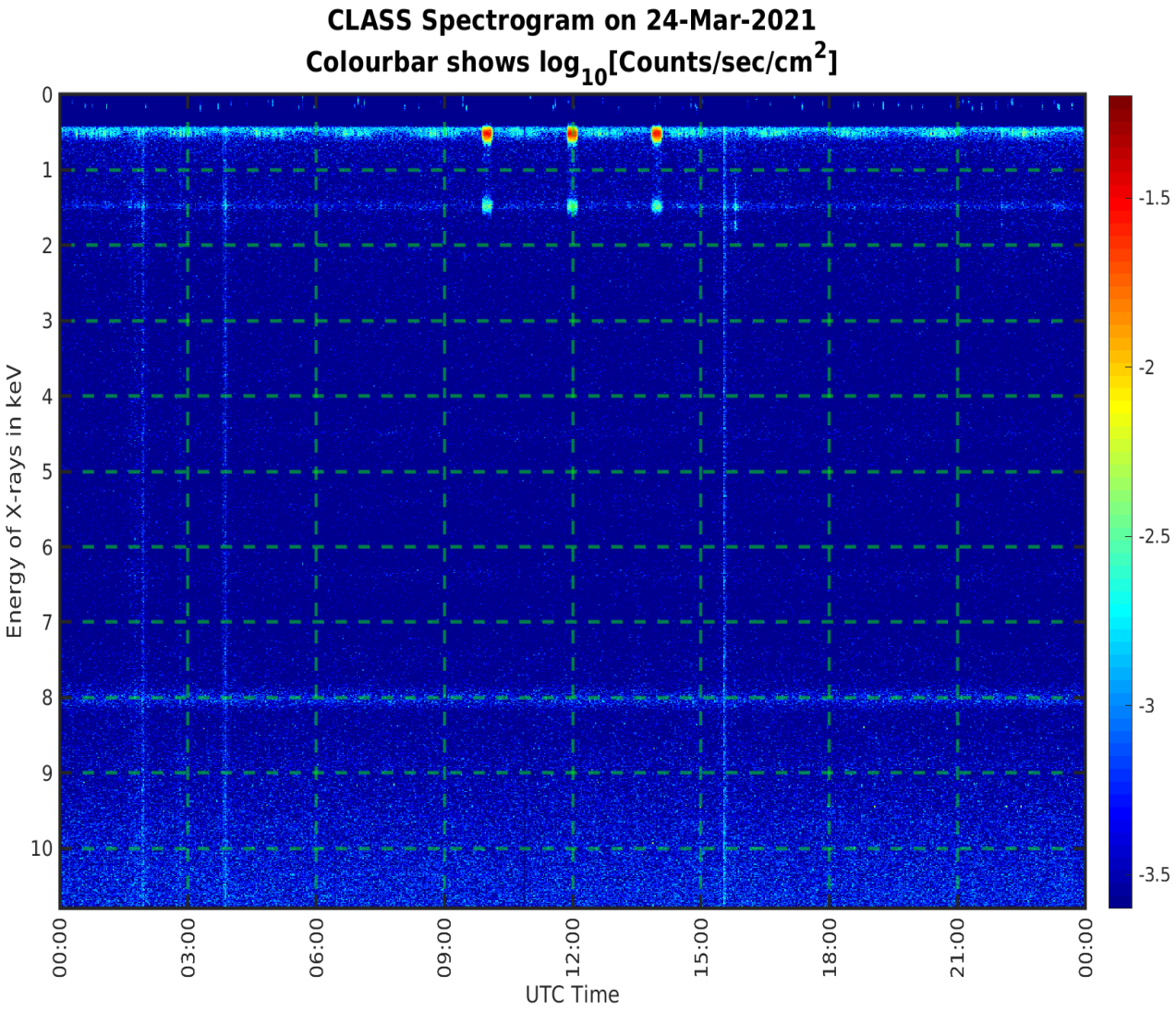
UTC Time


CLASS Spectrogram on 24-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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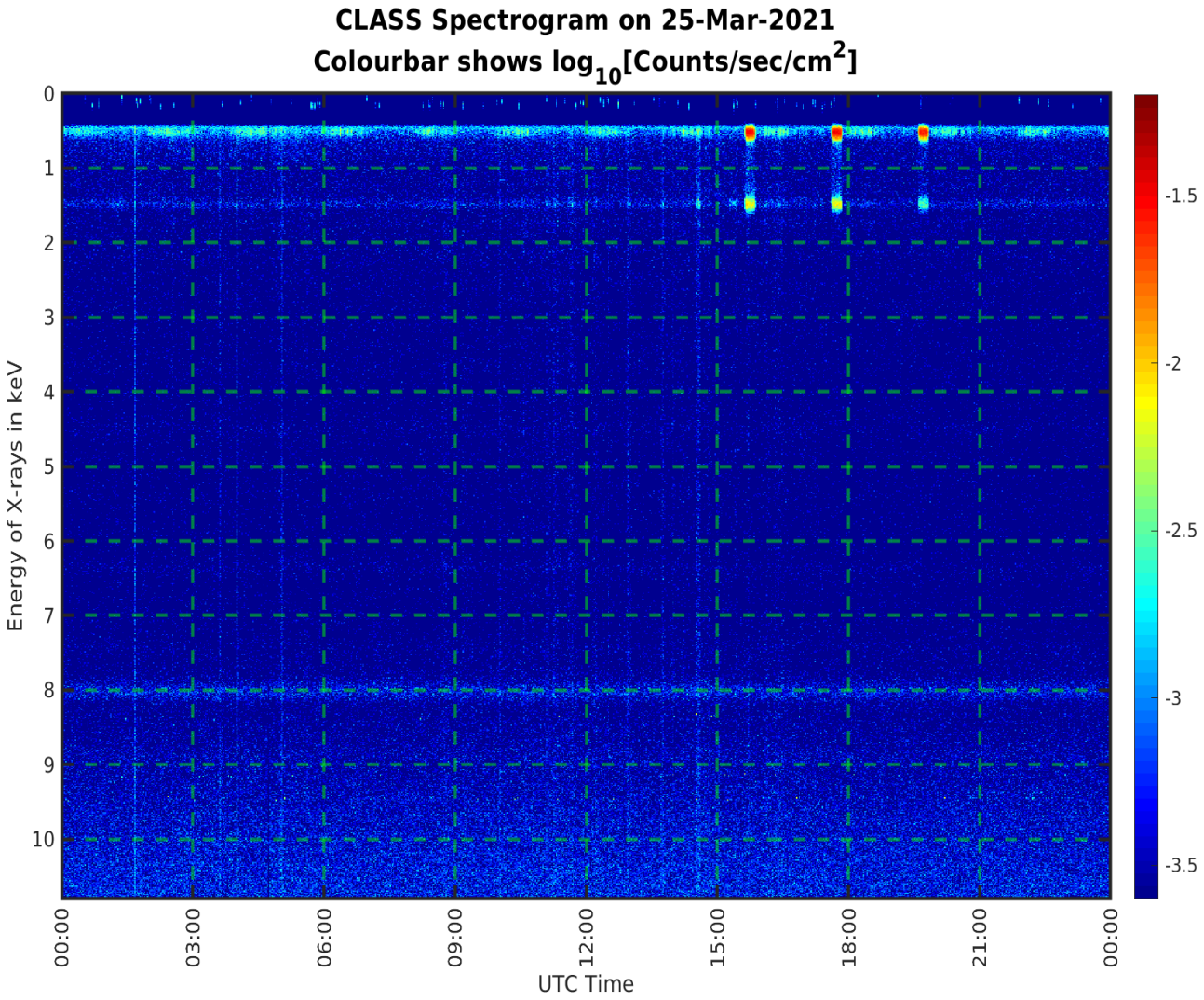
UTC Time


CLASS Spectrogram on 25-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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-3.5
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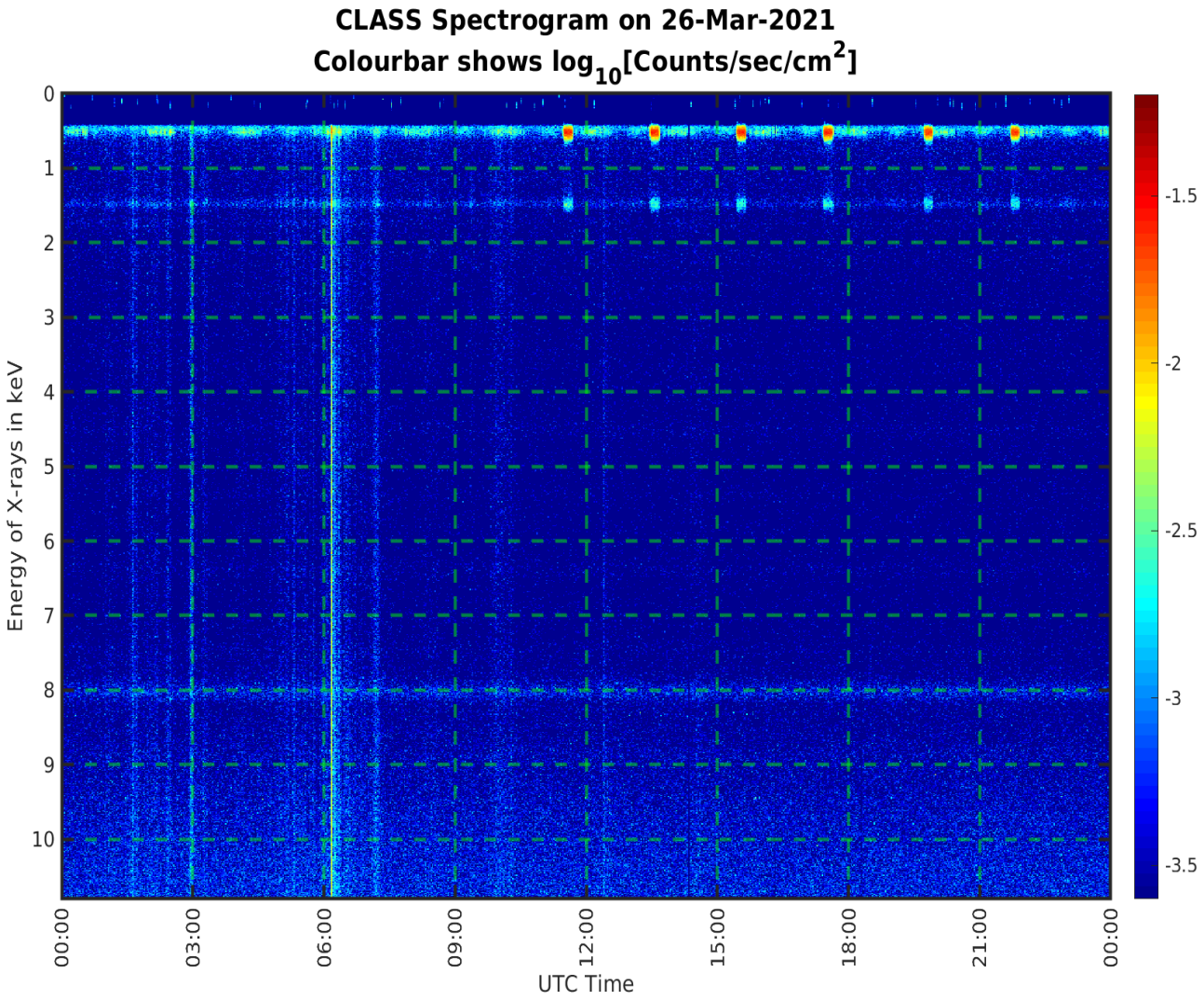
UTC Time


CLASS Spectrogram on 26-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
7
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03:00
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09:00
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UTC Time
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-2.5
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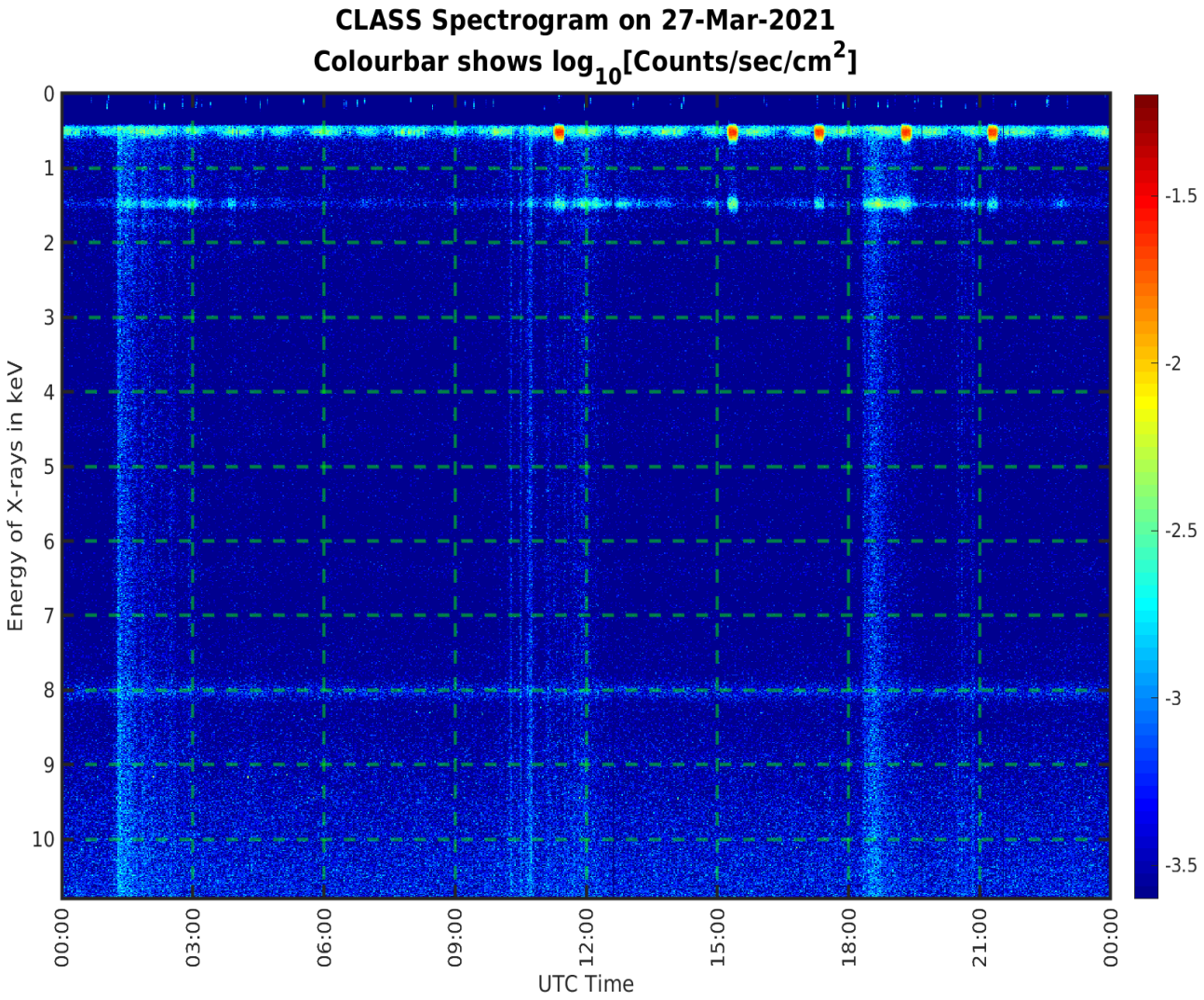
-3.5


CLASS Spectrogram on 27-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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-1.5
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-2.5
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-3.5
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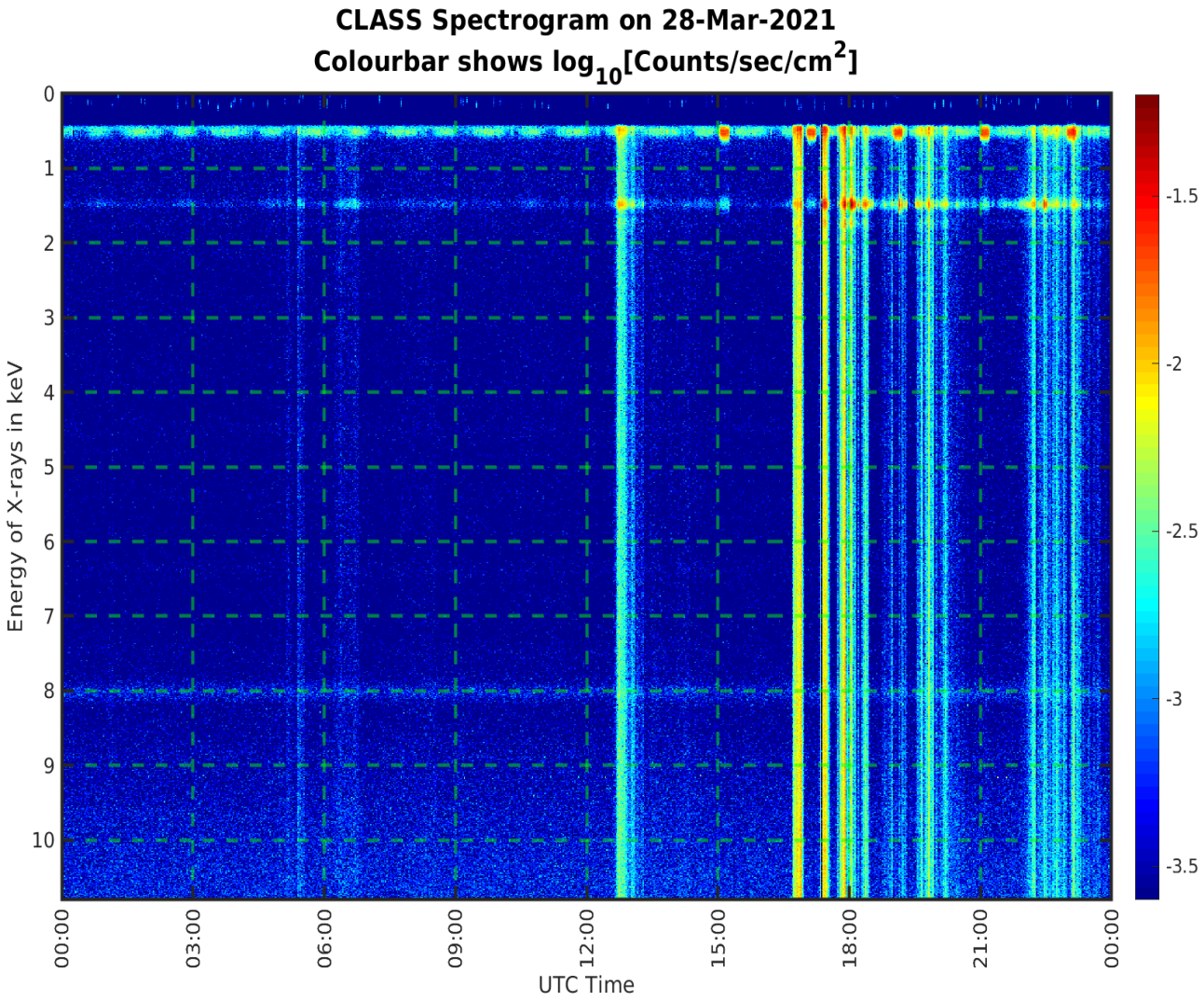
UTC Time


CLASS Spectrogram on 28-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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-2.5
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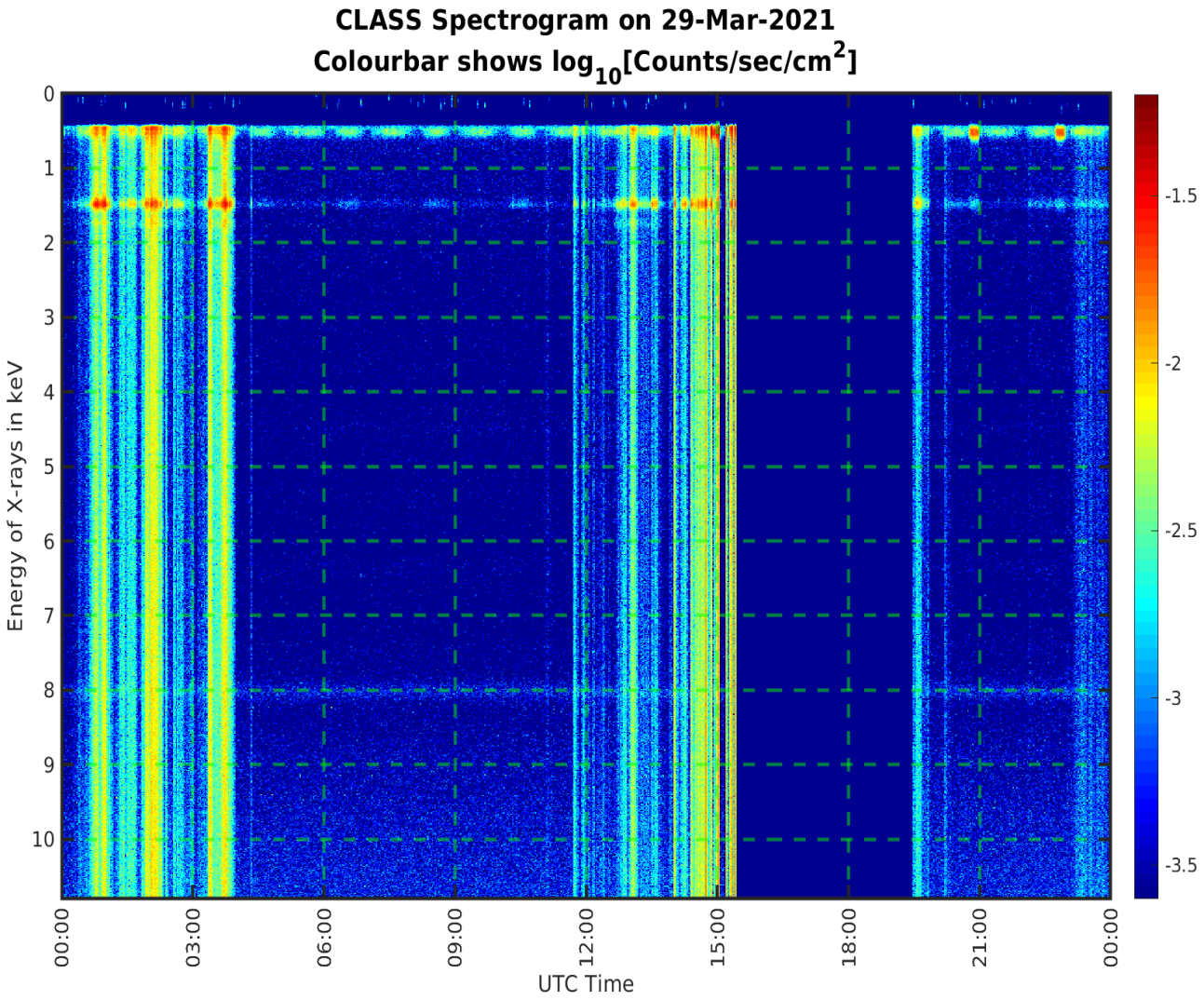
UTC Time


CLASS Spectrogram on 29-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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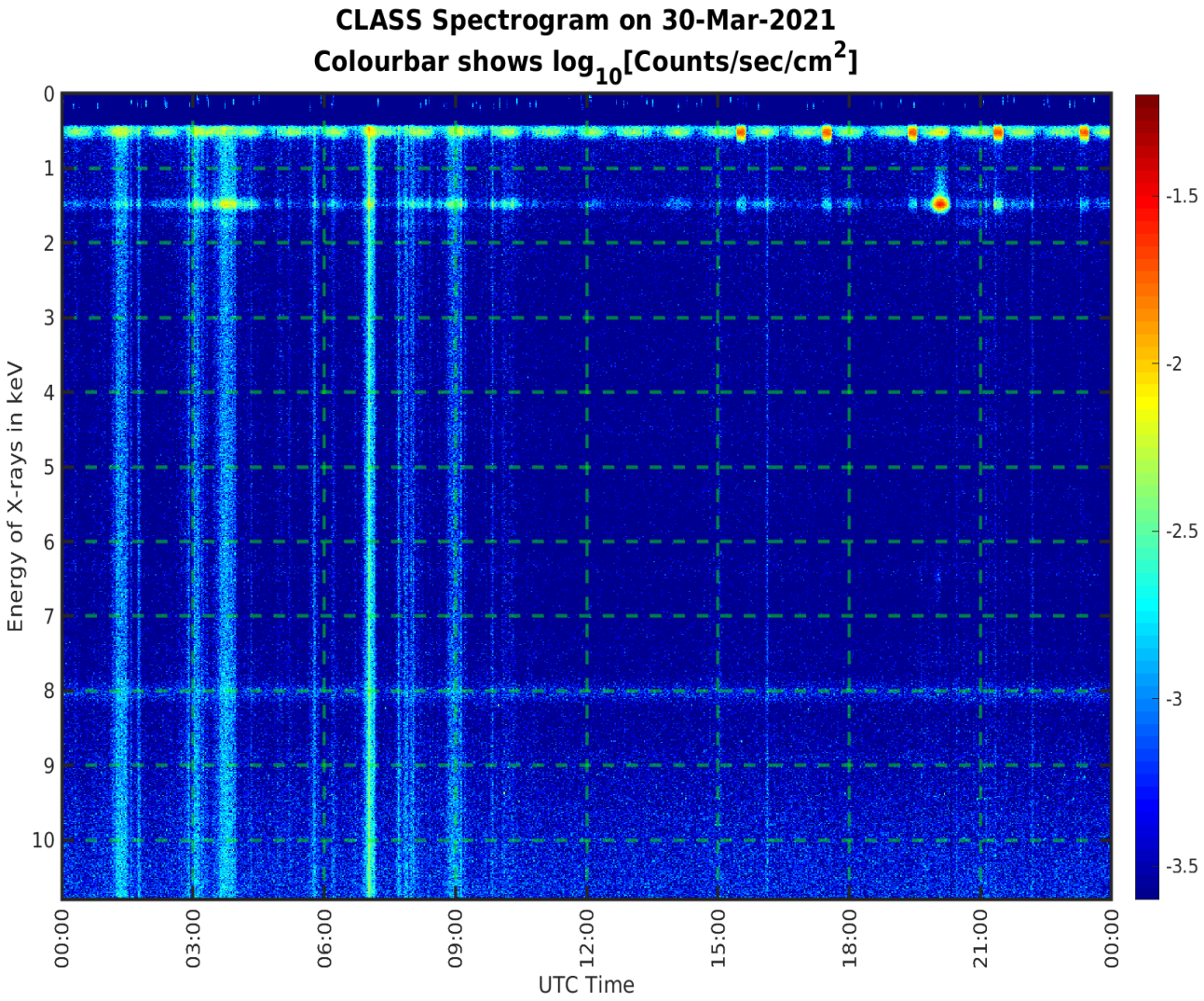
UTC Time


CLASS Spectrogram on 30-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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-1.5
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-2.5
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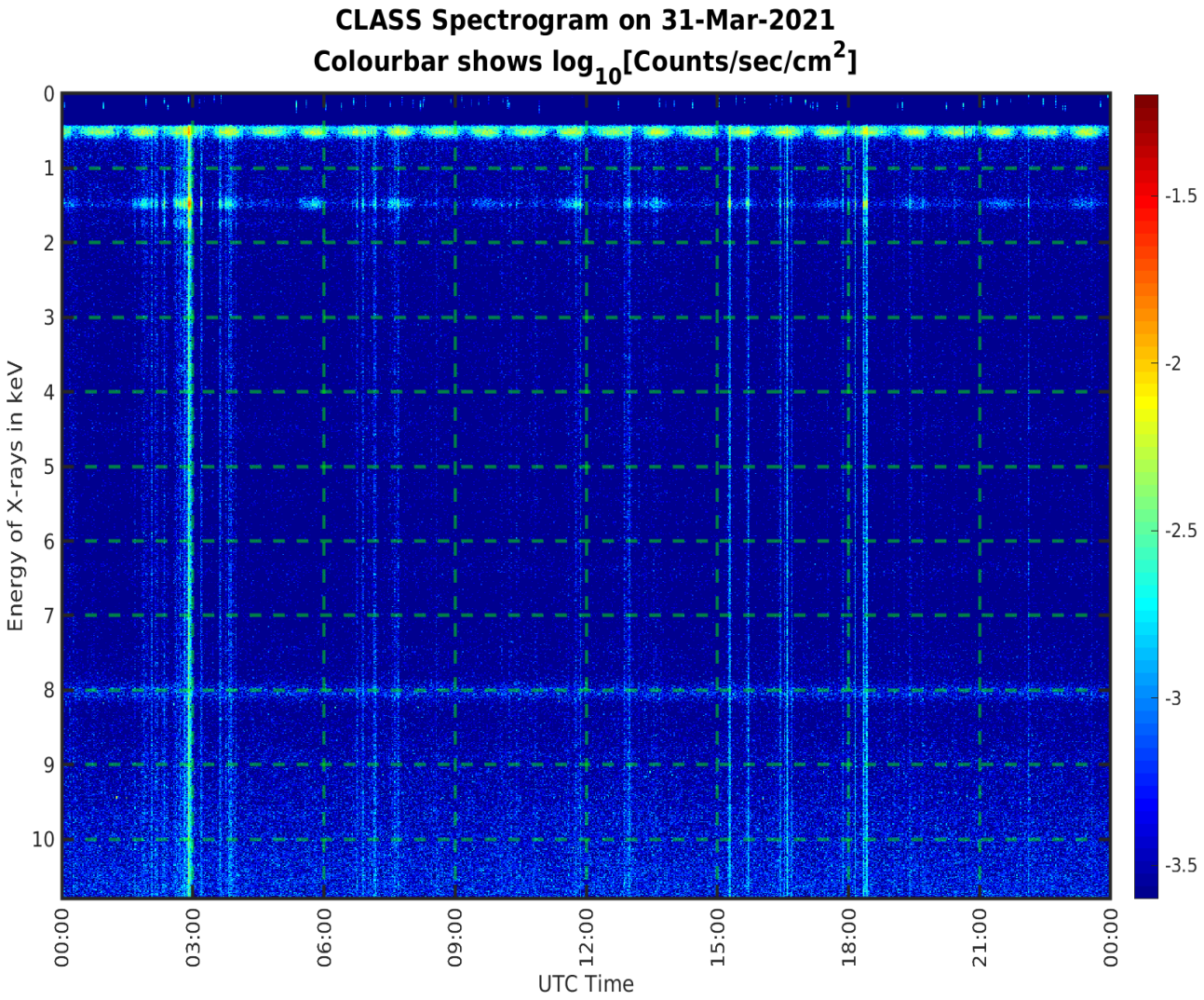
UTC Time


CLASS Spectrogram on 31-Mar-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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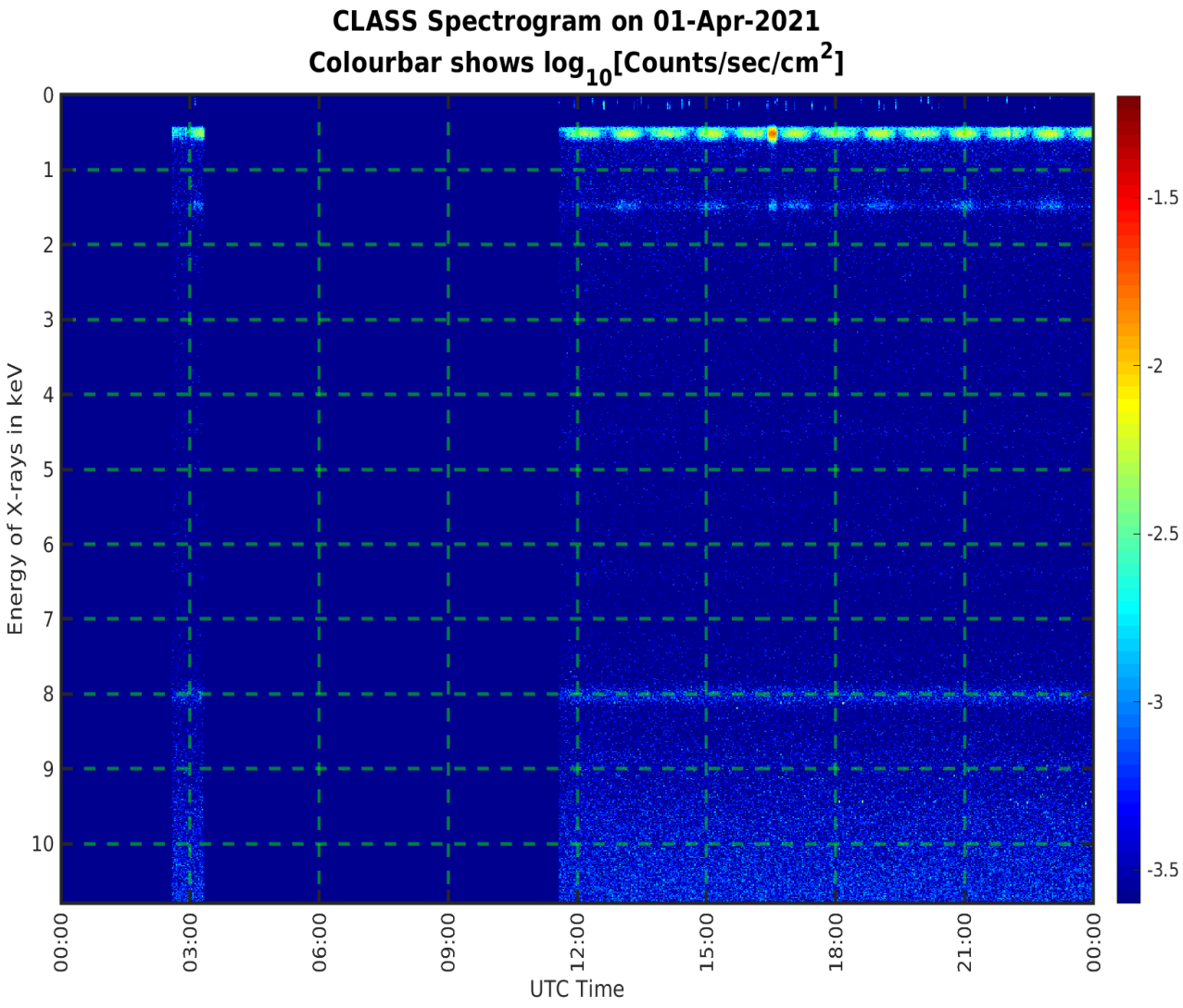
UTC Time


CLASS Spectrogram on 01-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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03:00
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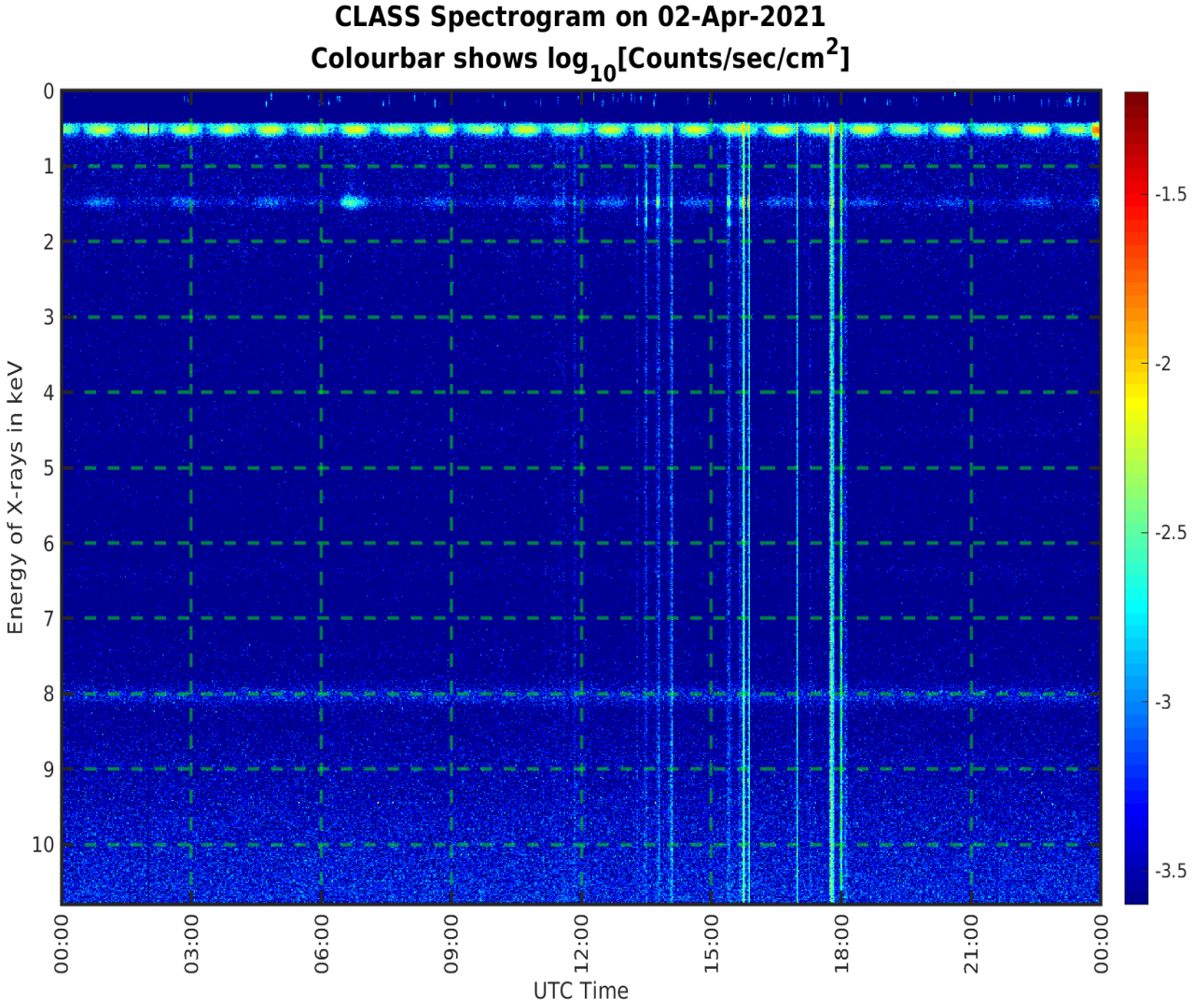
-3.5


CLASS Spectrogram on 02-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
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-1.5
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-2.5
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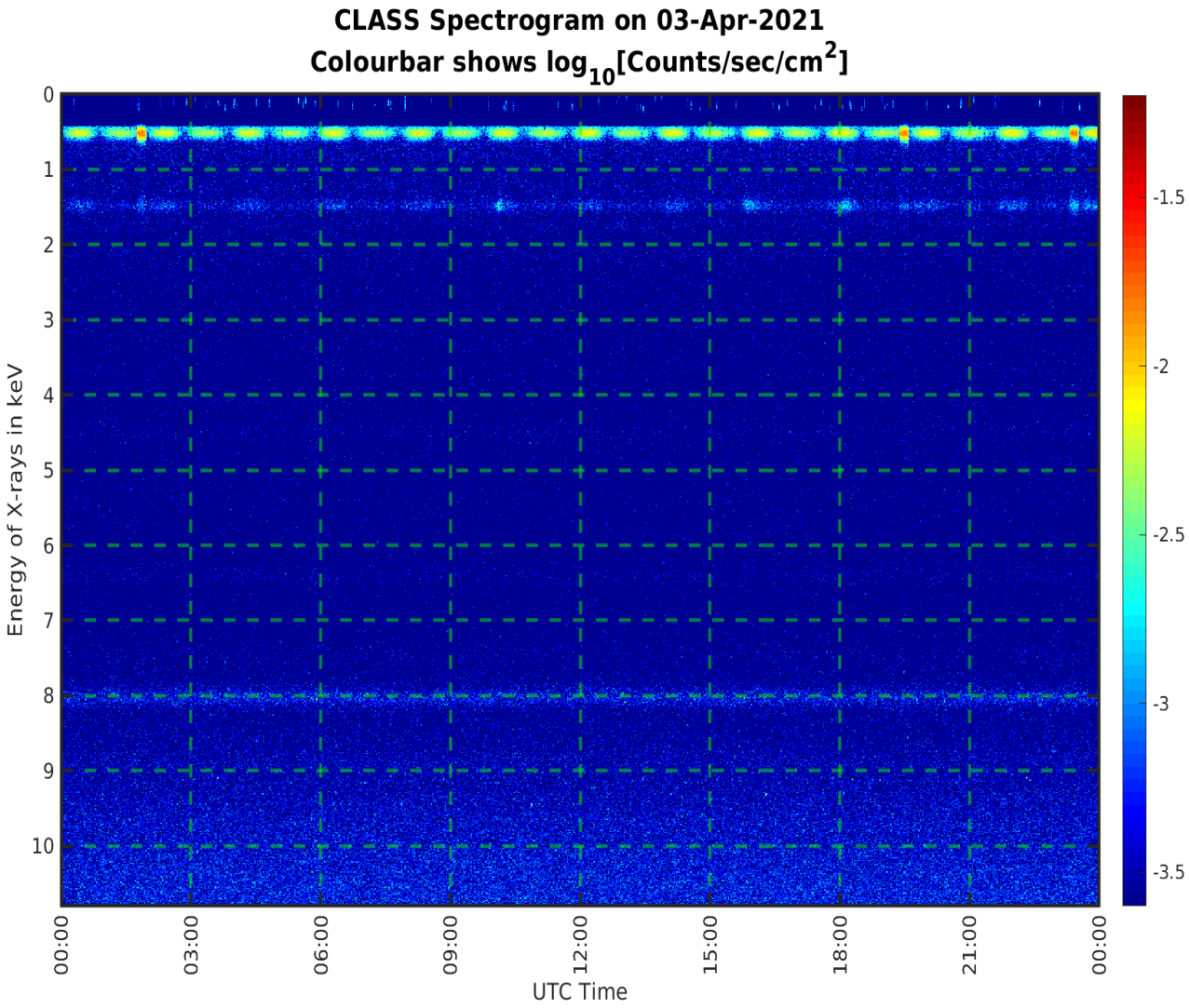
UTC Time


CLASS Spectrogram on 03-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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-1.5
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-2.5
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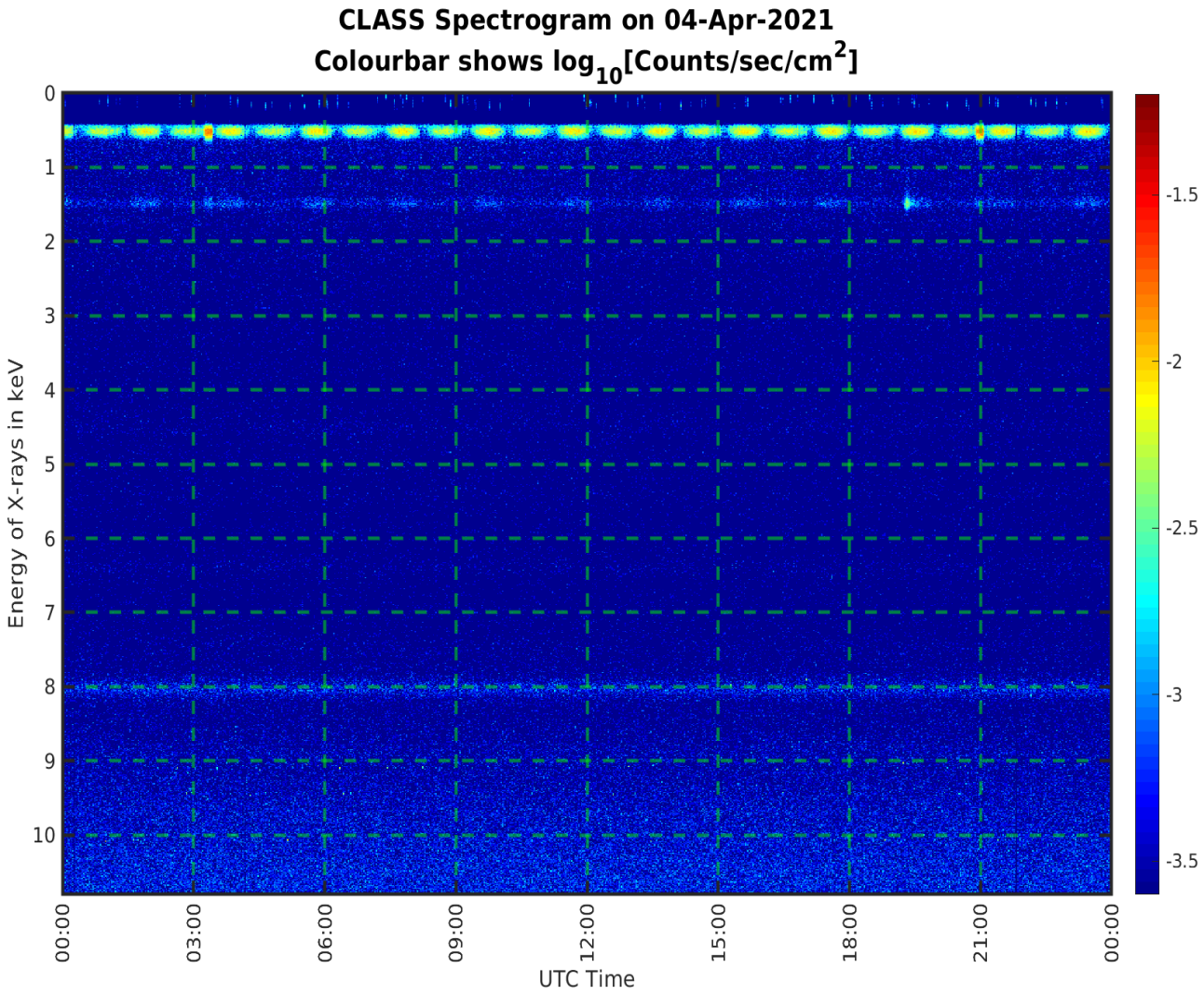
UTC Time


CLASS Spectrogram on 04-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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03:00
06:00
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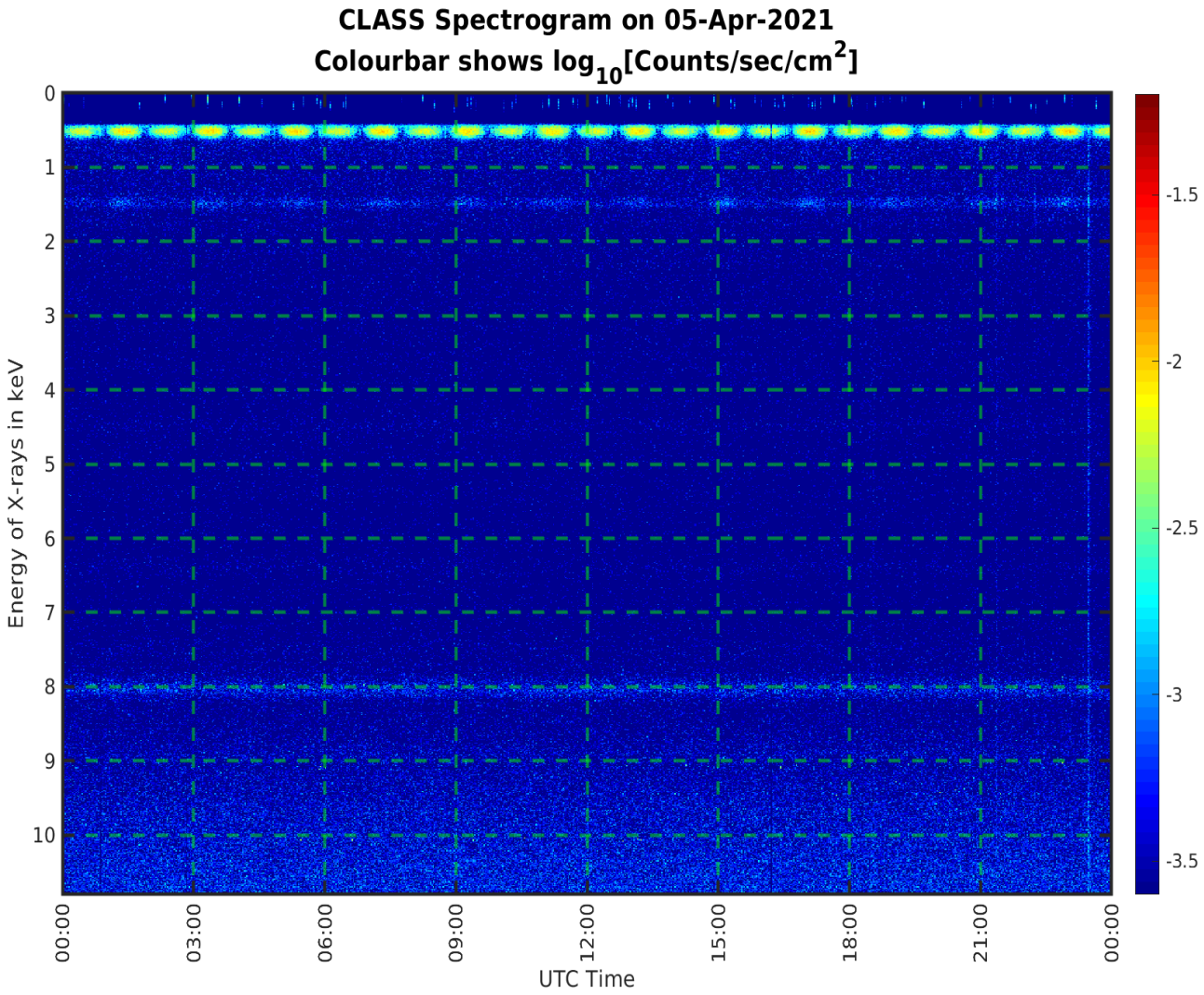
-3.5


CLASS Spectrogram on 05-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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03:00
06:00
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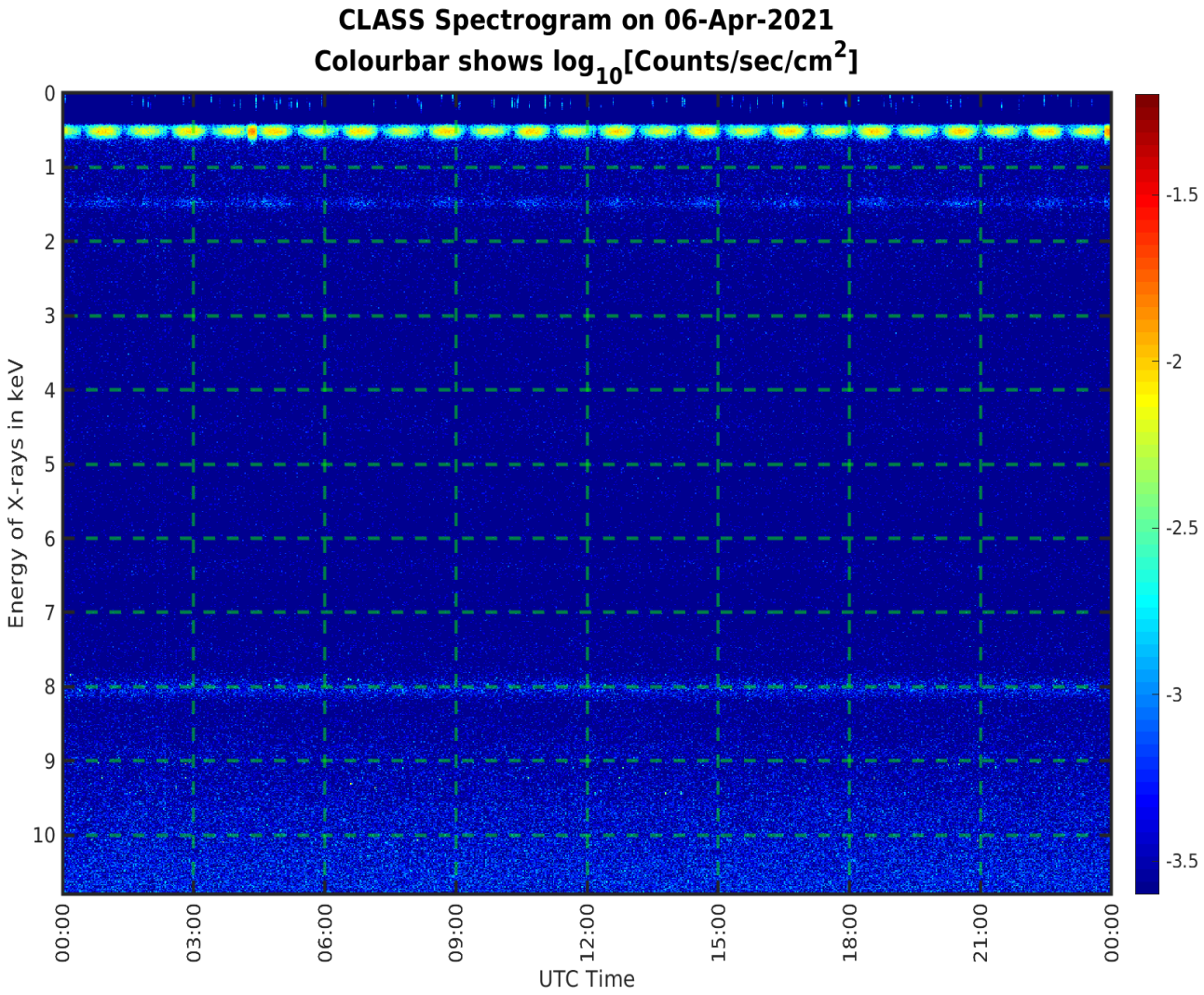
-3.5


CLASS Spectrogram on 06-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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03:00
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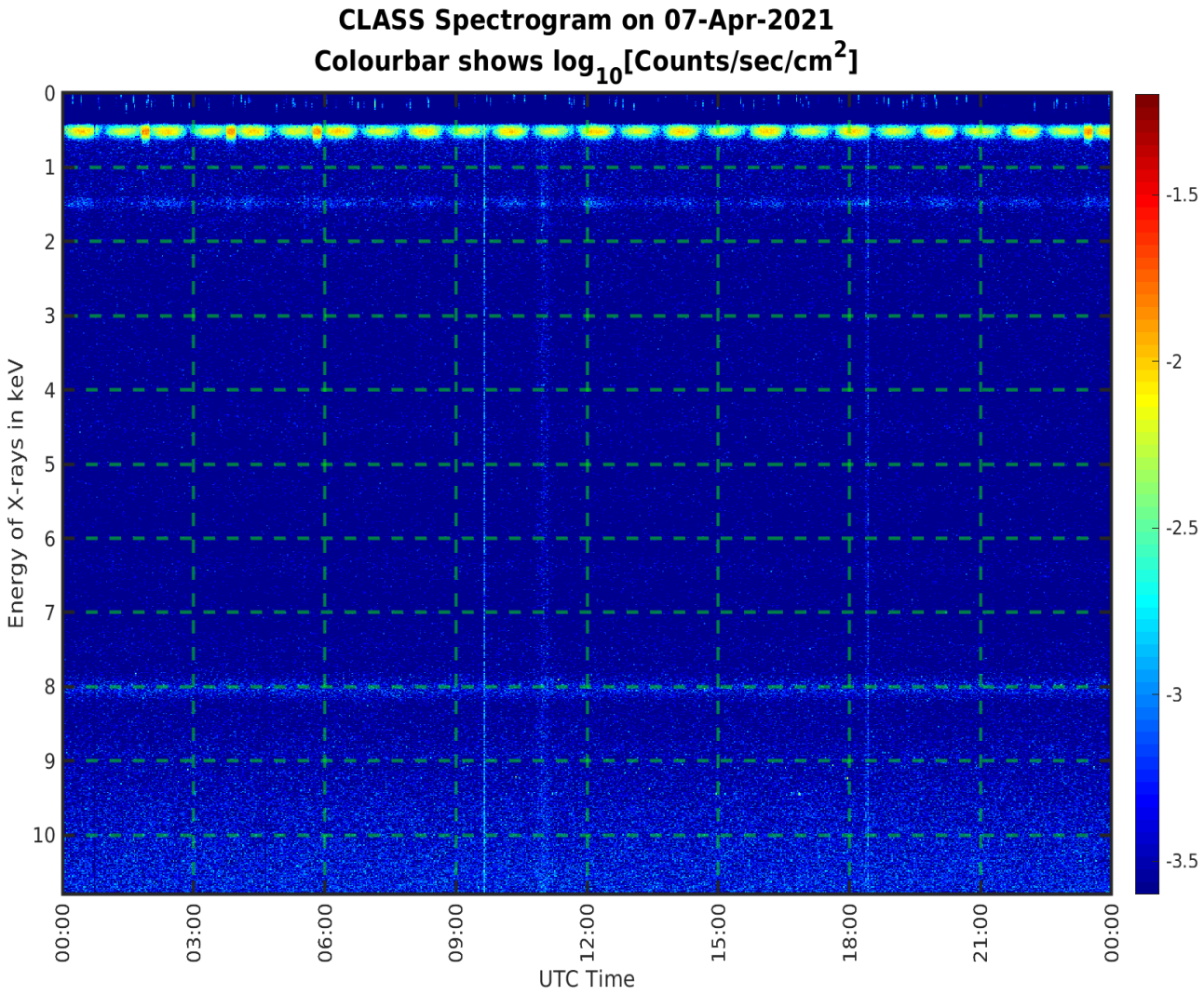
CLASS Spectrogram on 07-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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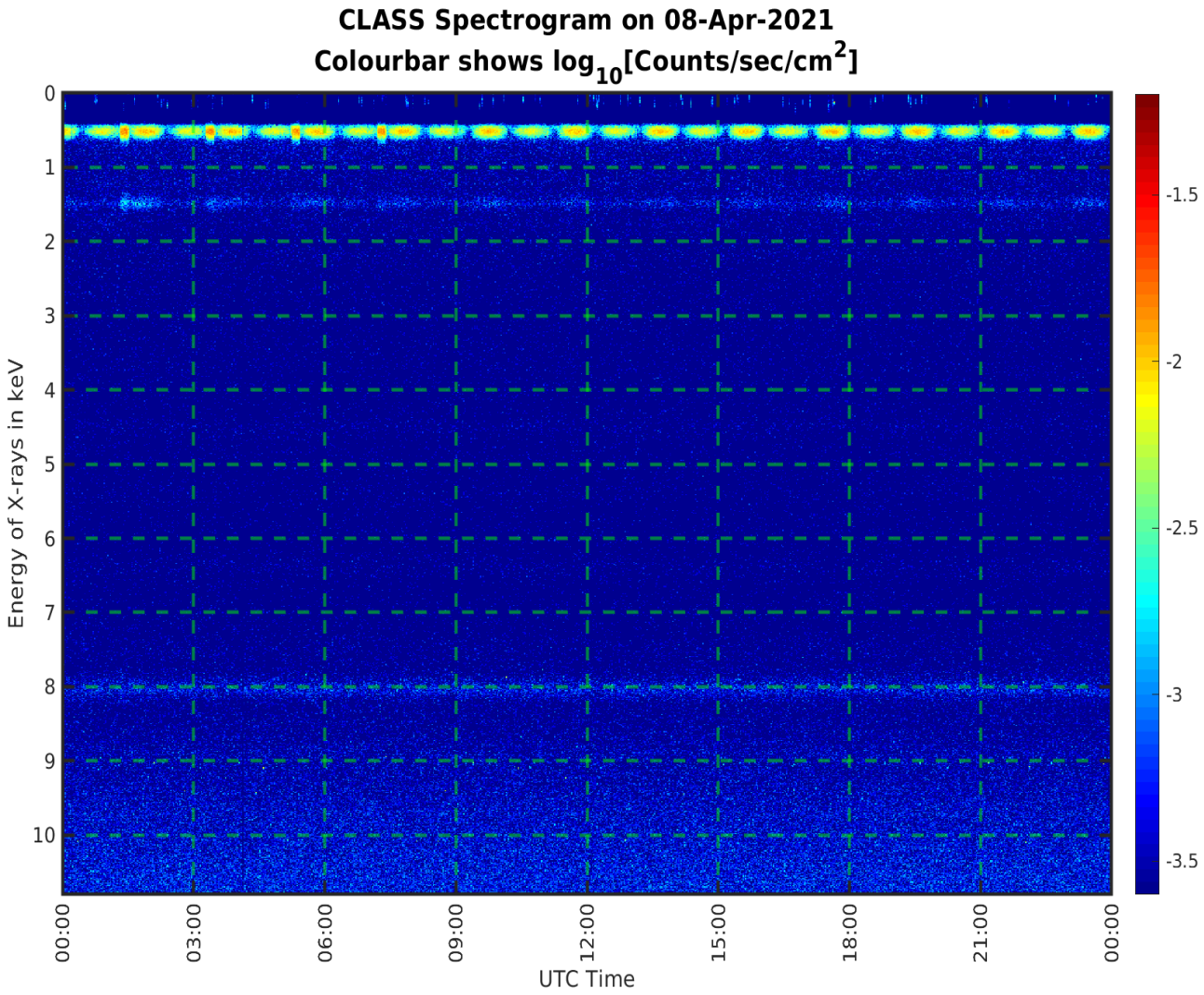
CLASS Spectrogram on 08-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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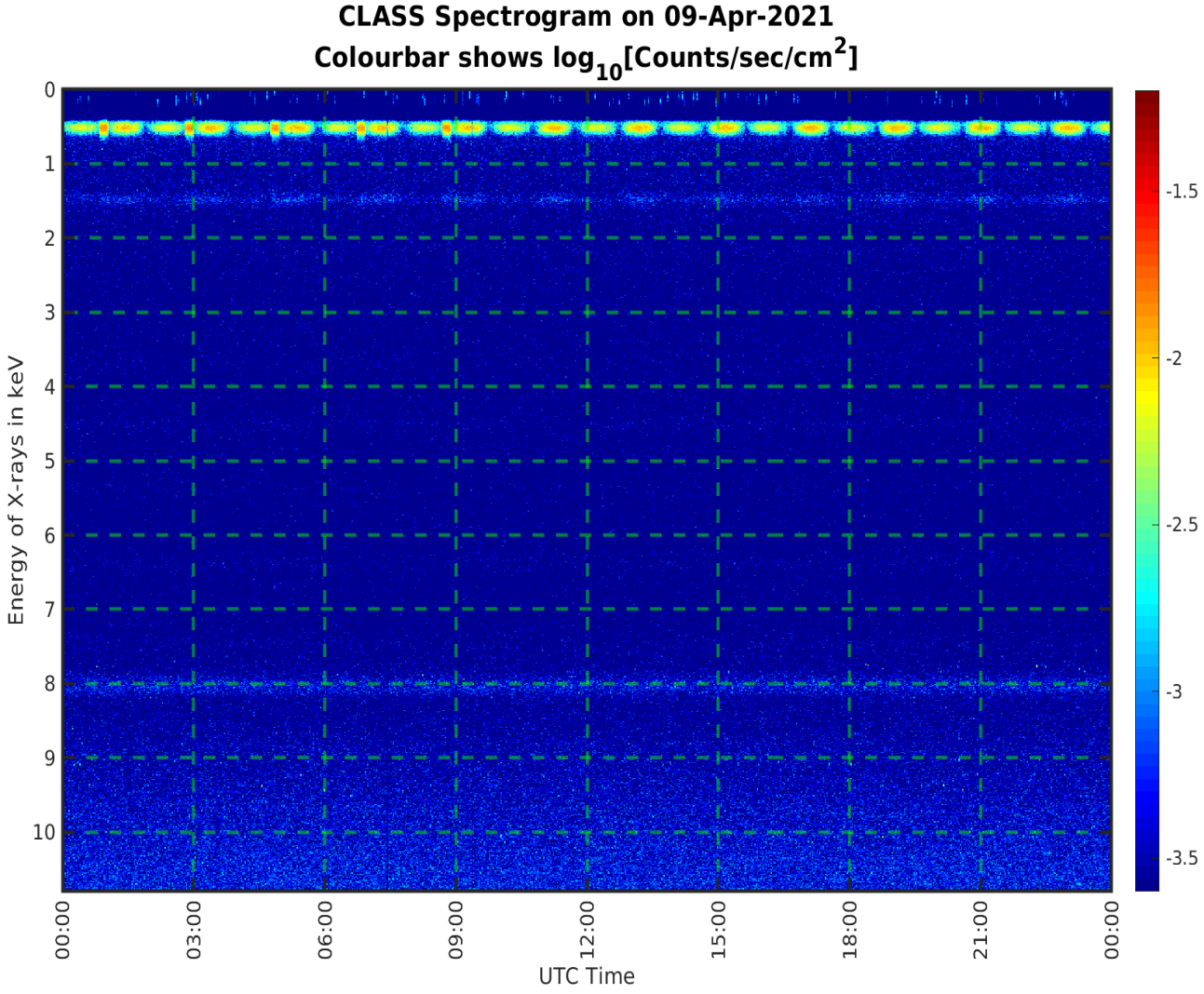
UTC Time


CLASS Spectrogram on 09-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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21:00
00:00
UTC Time
-1.5
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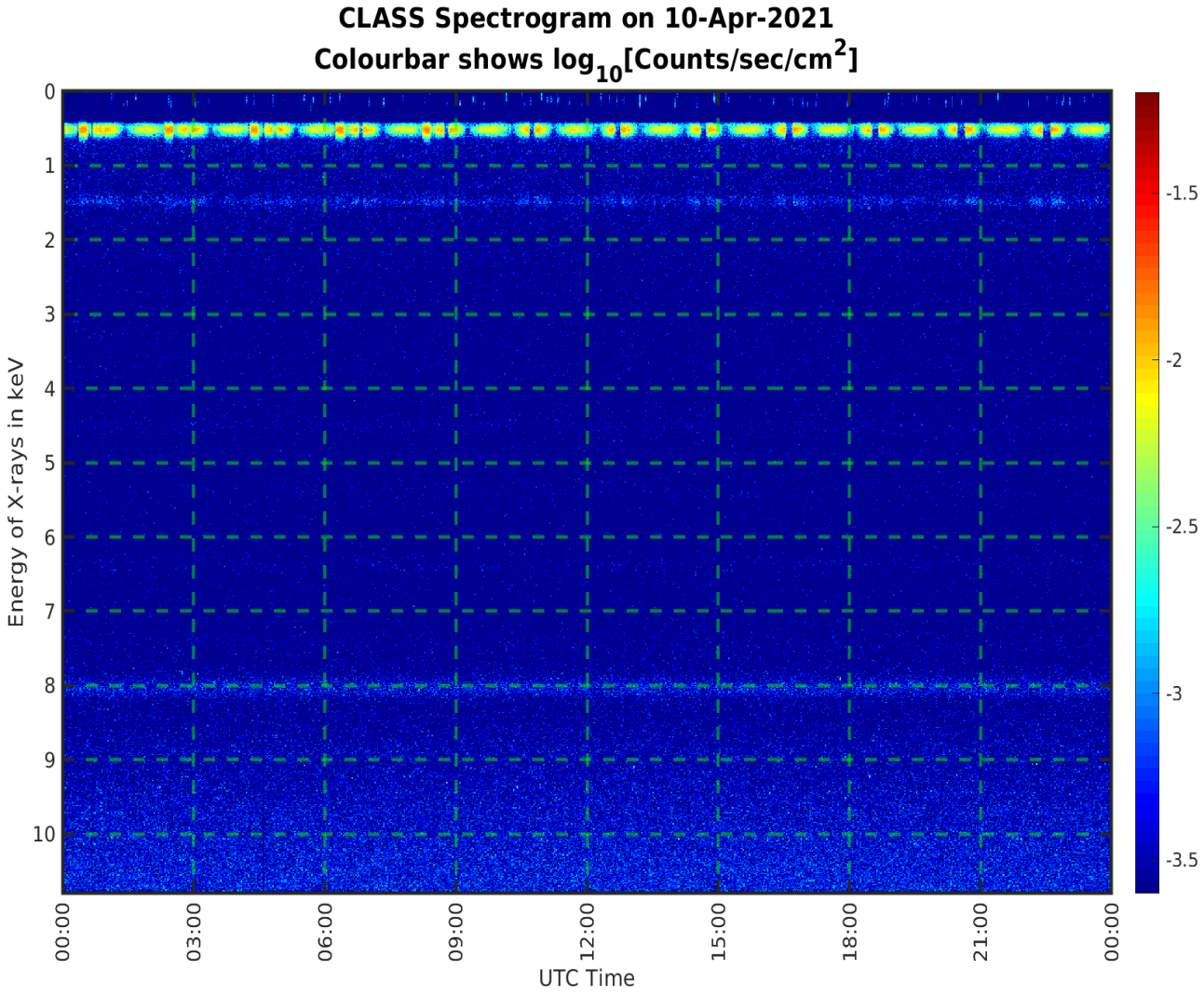
-2.5
-3
-3.5


CLASS Spectrogram on 10-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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5
6
7
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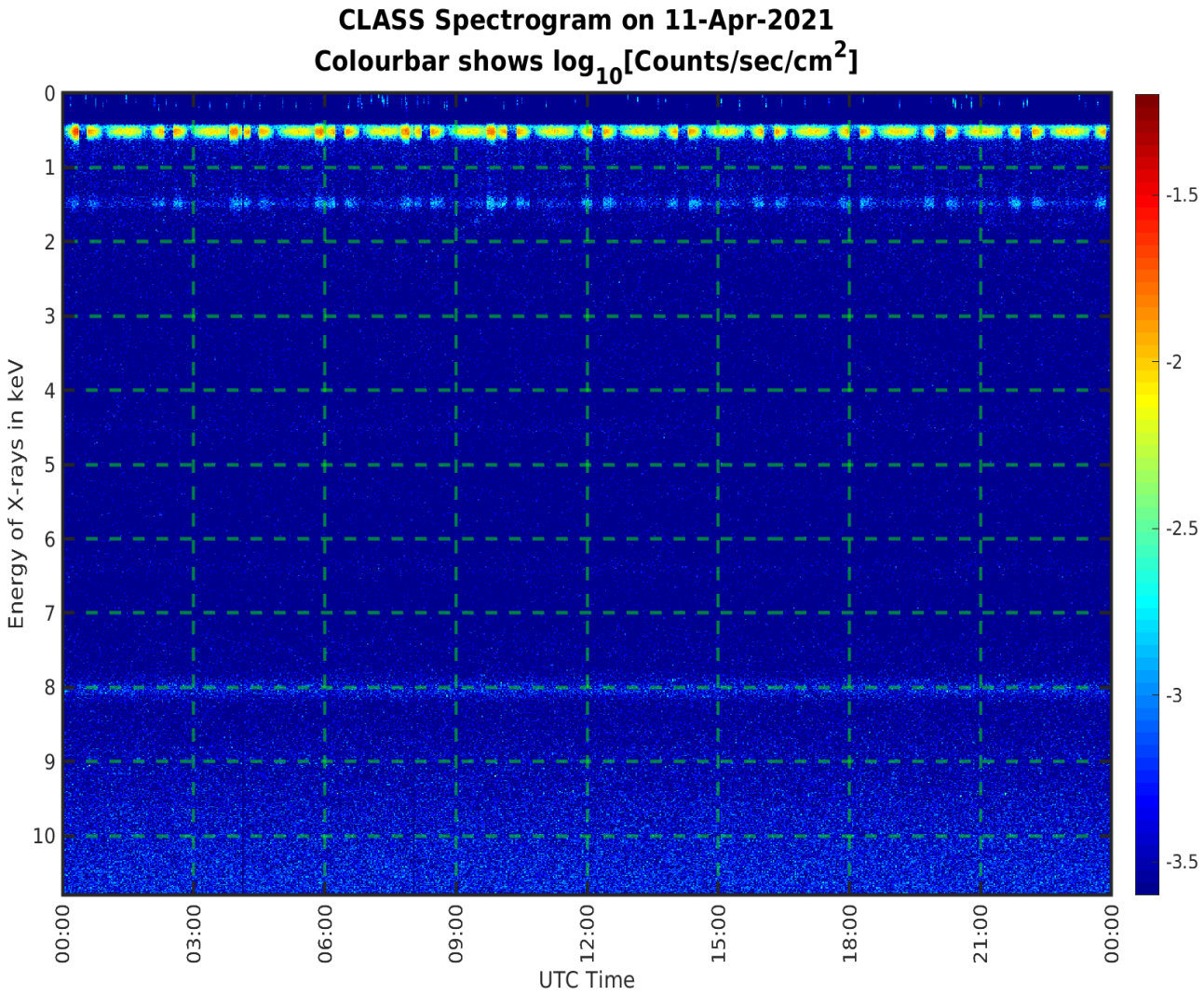
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
UTC Time
-1.5
-2
-2.5
-3
-3.5


CLASS Spectrogram on 11-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
00:00
03:00
06:00
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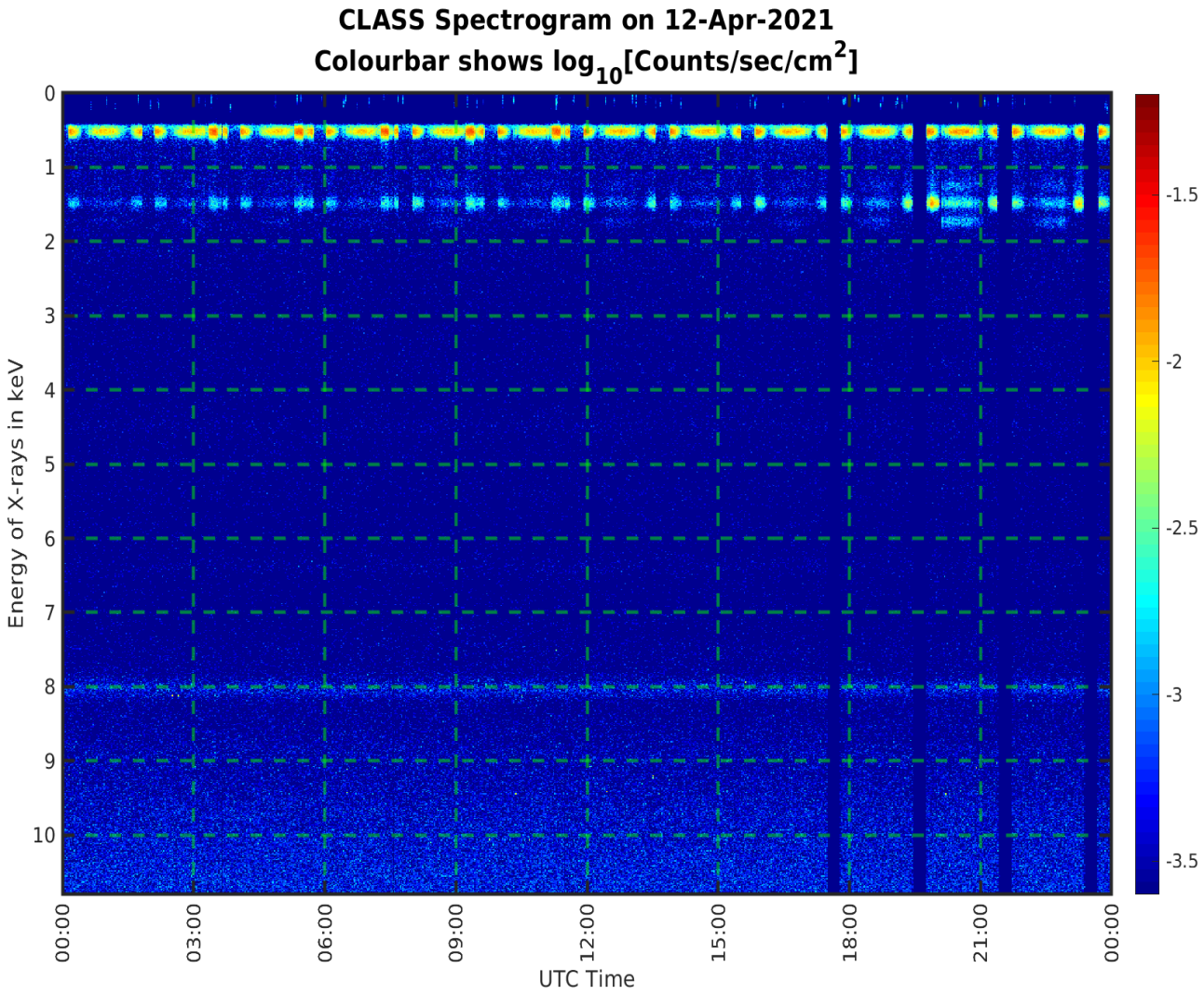
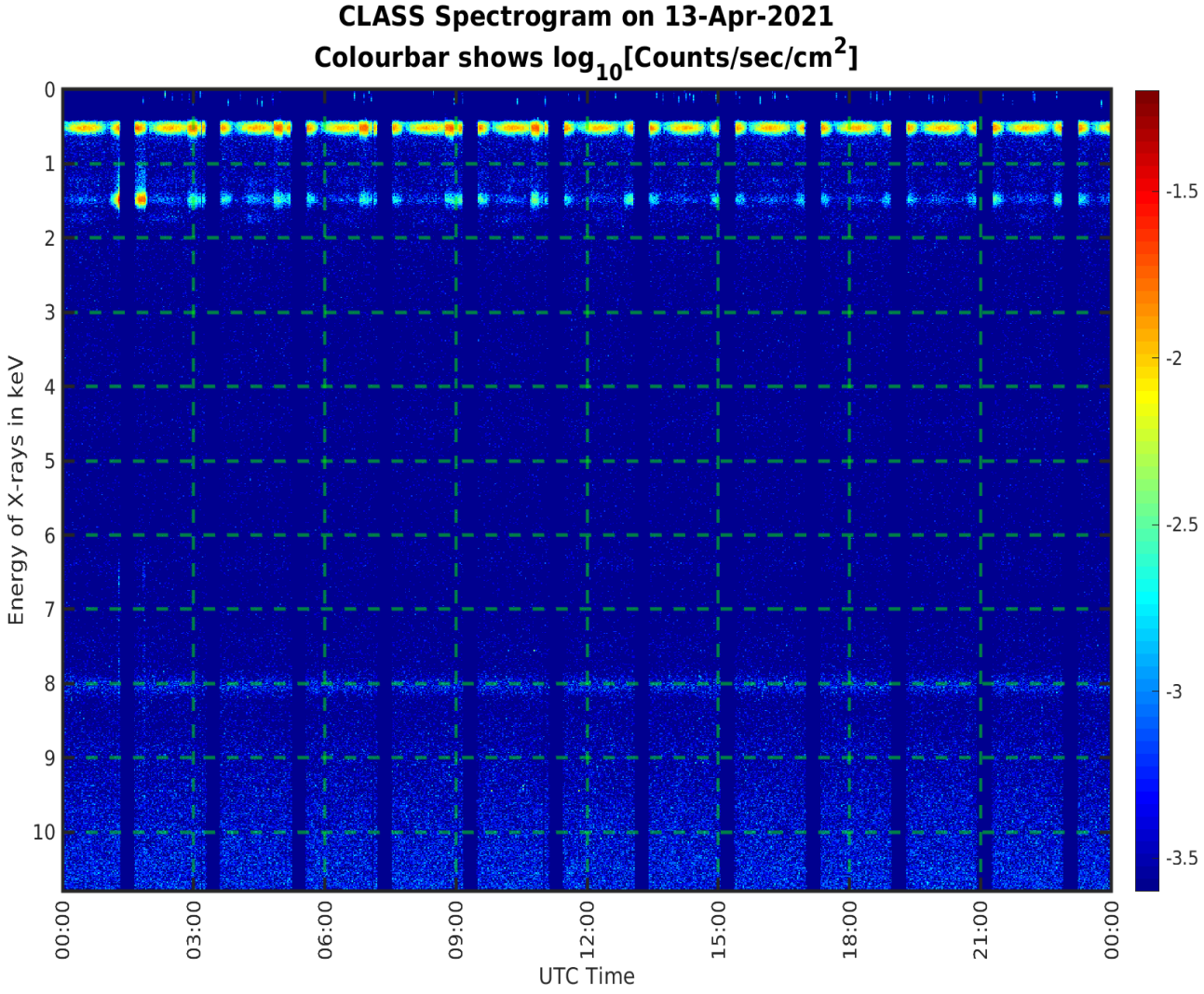
-2.5
-3
-3.5


CLASS Spectrogram on 12-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
5
6
7
8
9
10
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
UTC Time
-1.5
-2
-2.5
-3
-3.5


CLASS Spectrogram on 13-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
3
4
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6
7
8
9
10
00:00
03:00
06:00
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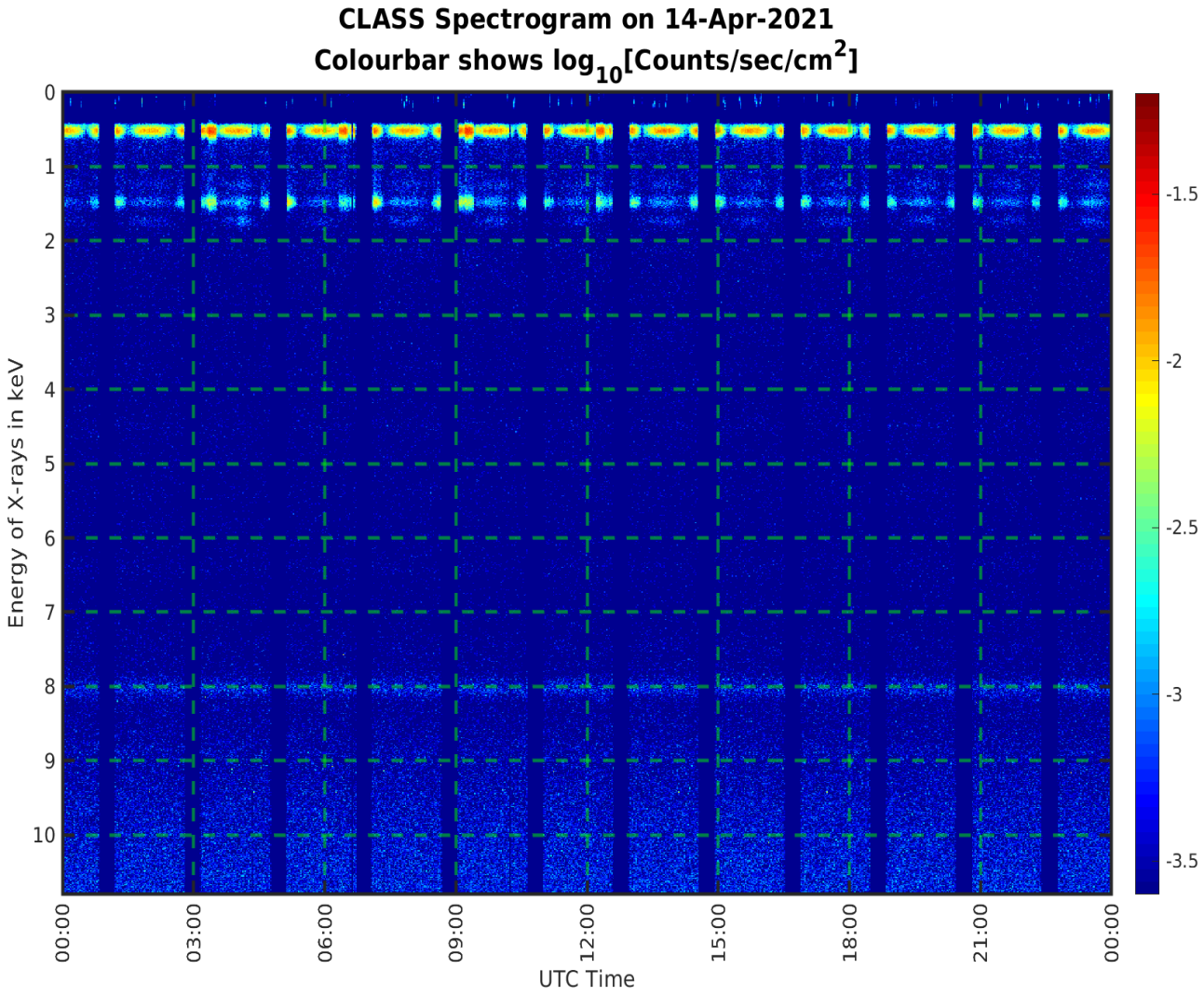
-2.5
-3
-3.5


CLASS Spectrogram on 14-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
7
8
9
10
-1.5
-2
-2.5
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-3.5
00:00
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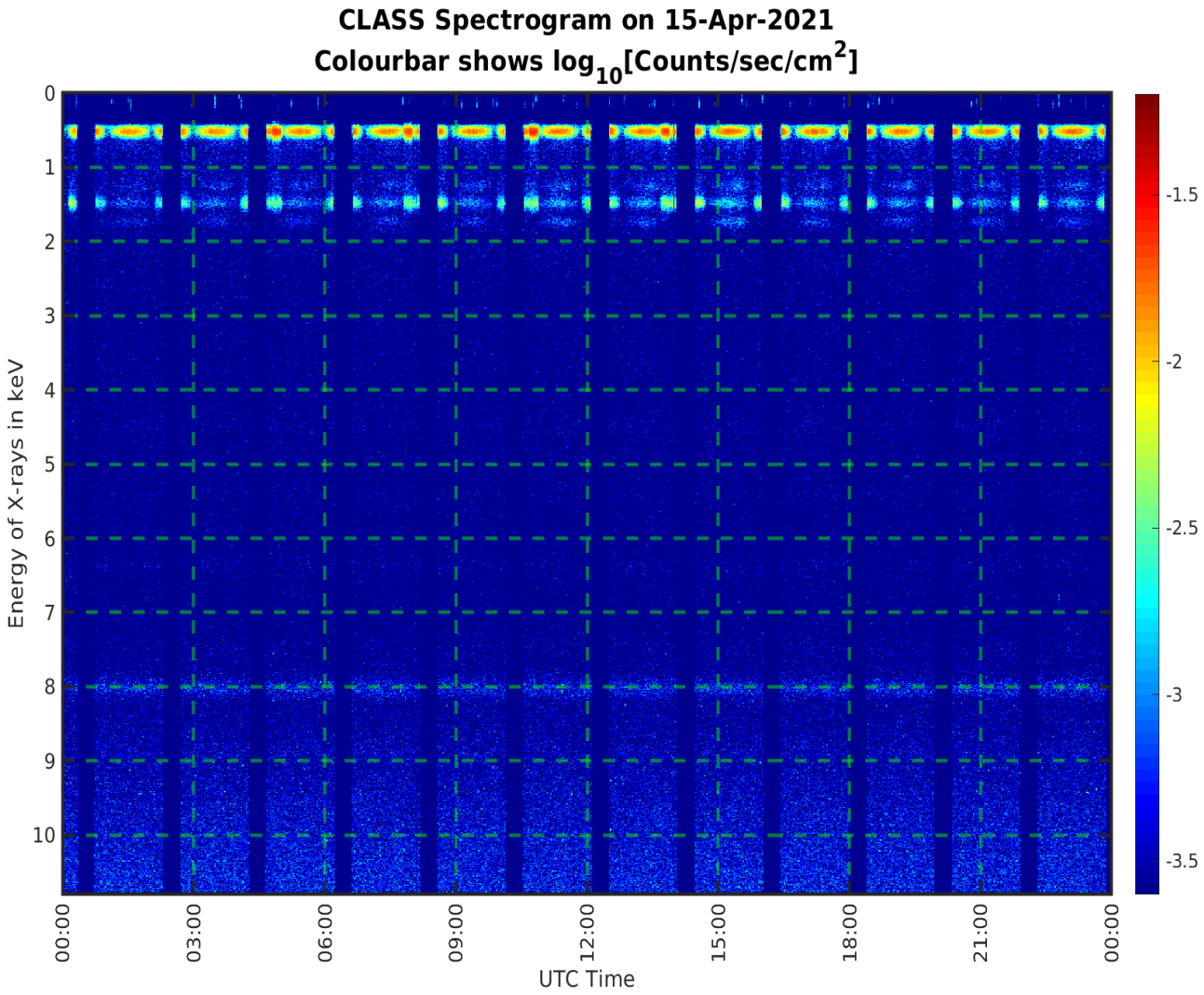
UTC Time


CLASS Spectrogram on 15-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
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-1.5
-2
-2.5
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-3.5
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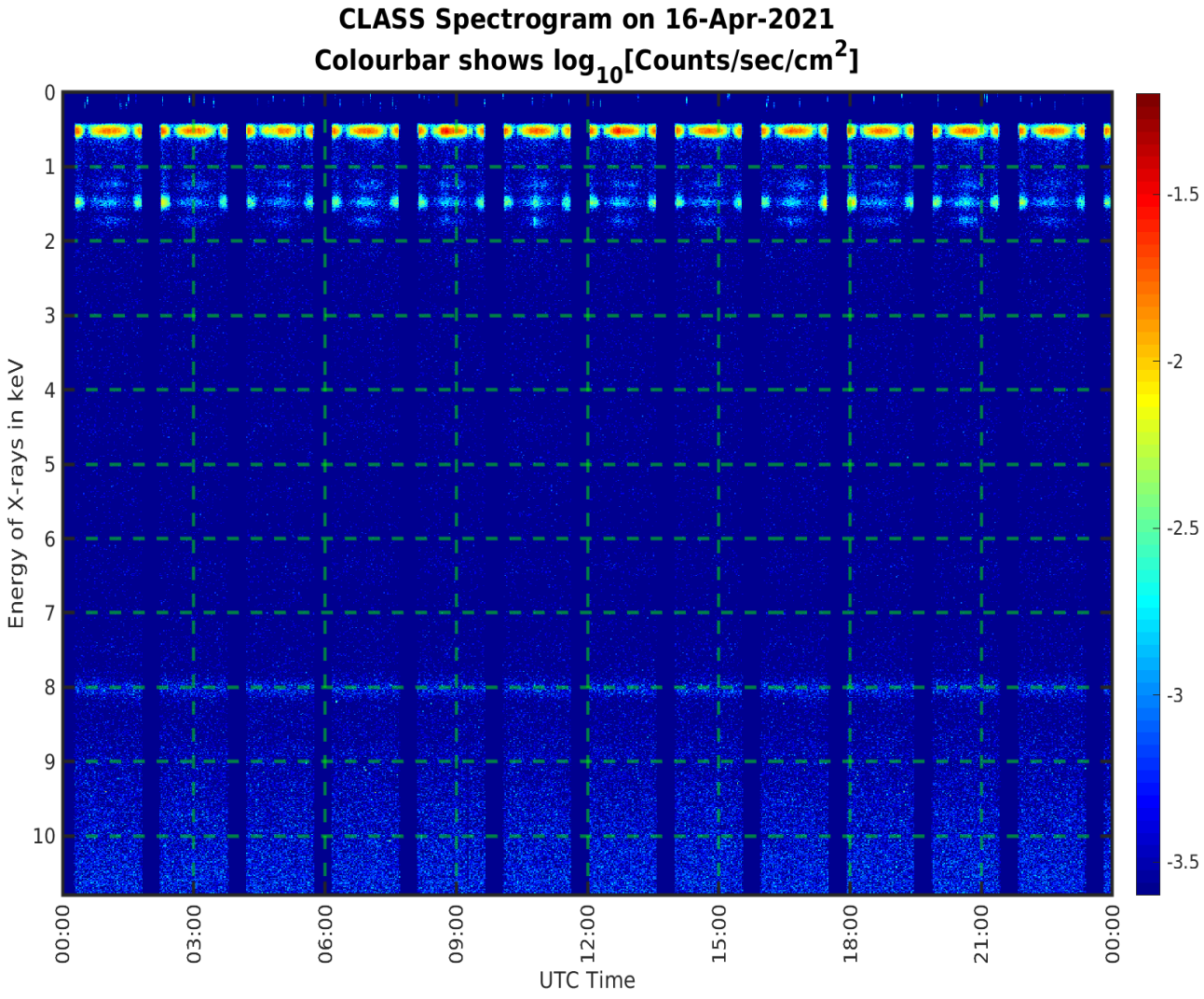
UTC Time


CLASS Spectrogram on 16-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
2
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6
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8
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10
-1.5
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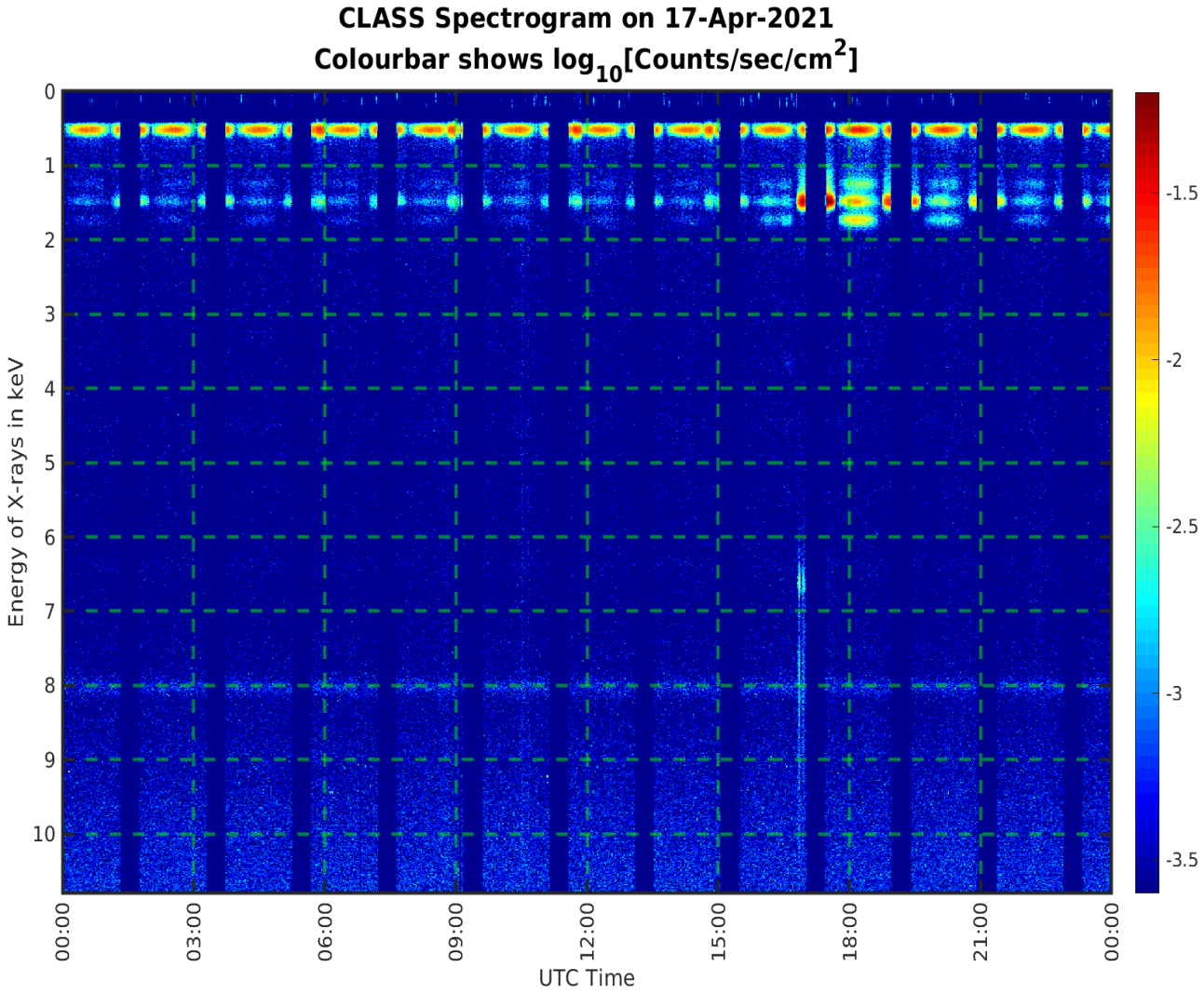
UTC Time


CLASS Spectrogram on 17-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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03:00
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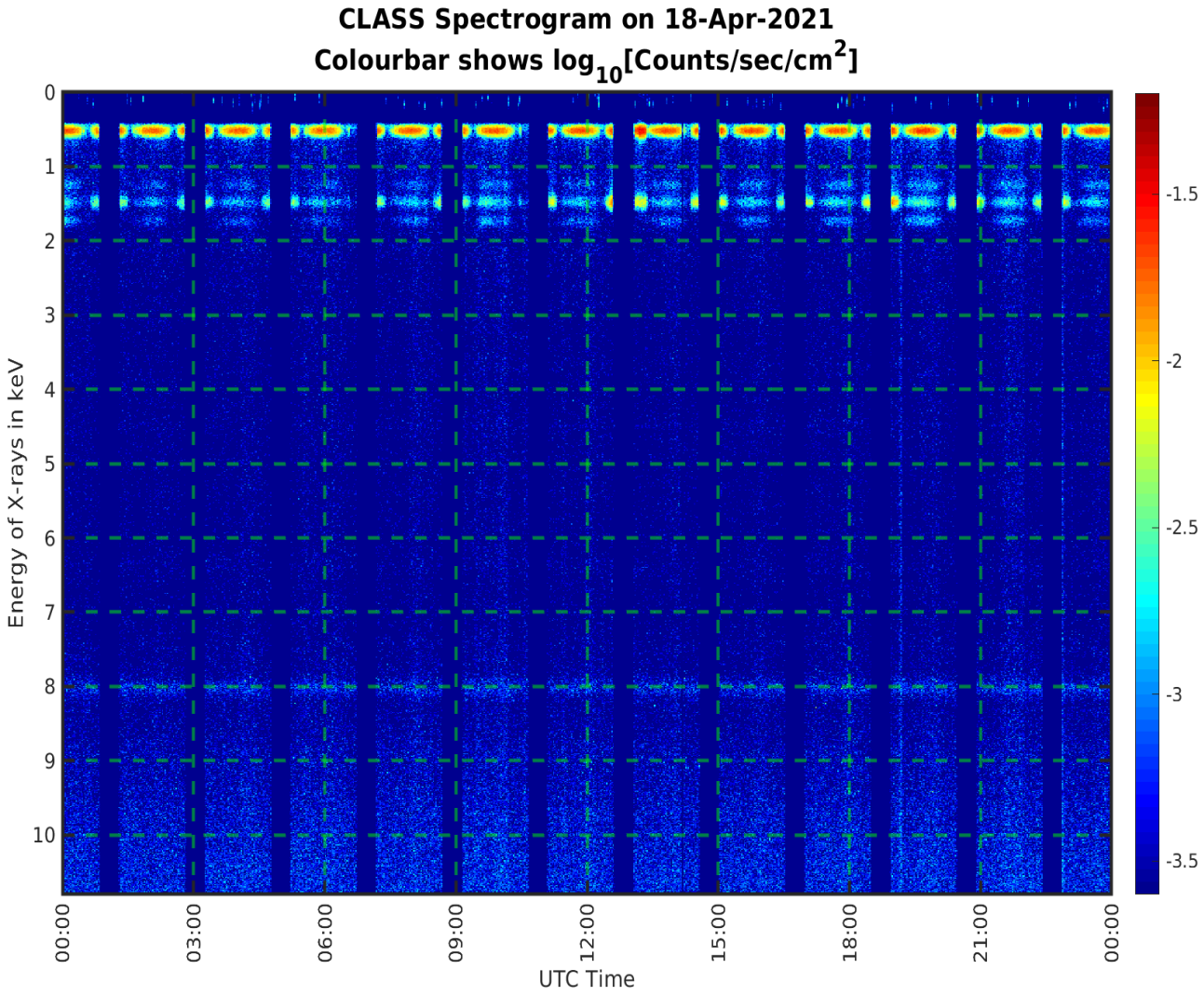
CLASS Spectrogram on 18-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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6
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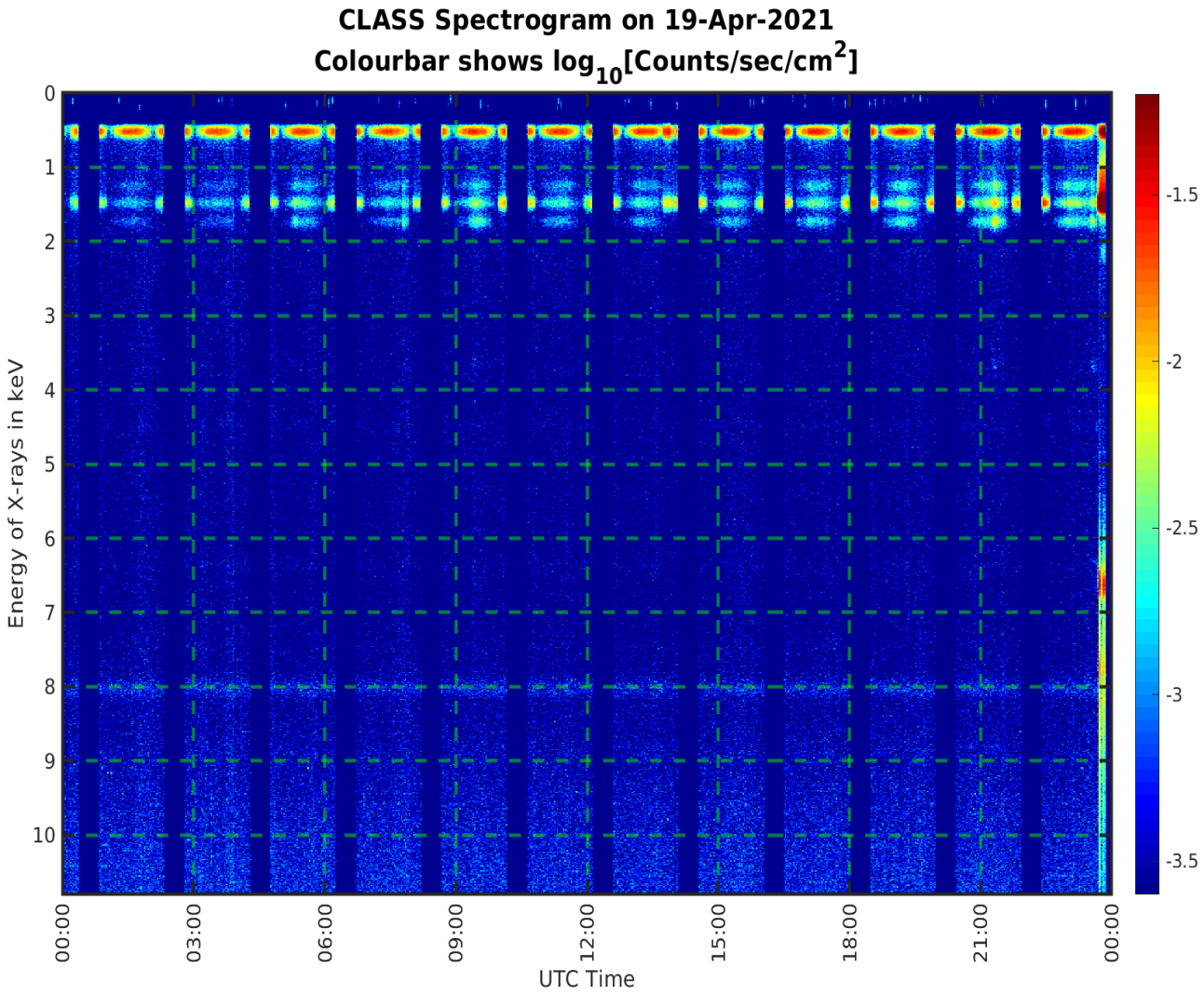
CLASS Spectrogram on 19-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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00:00
03:00
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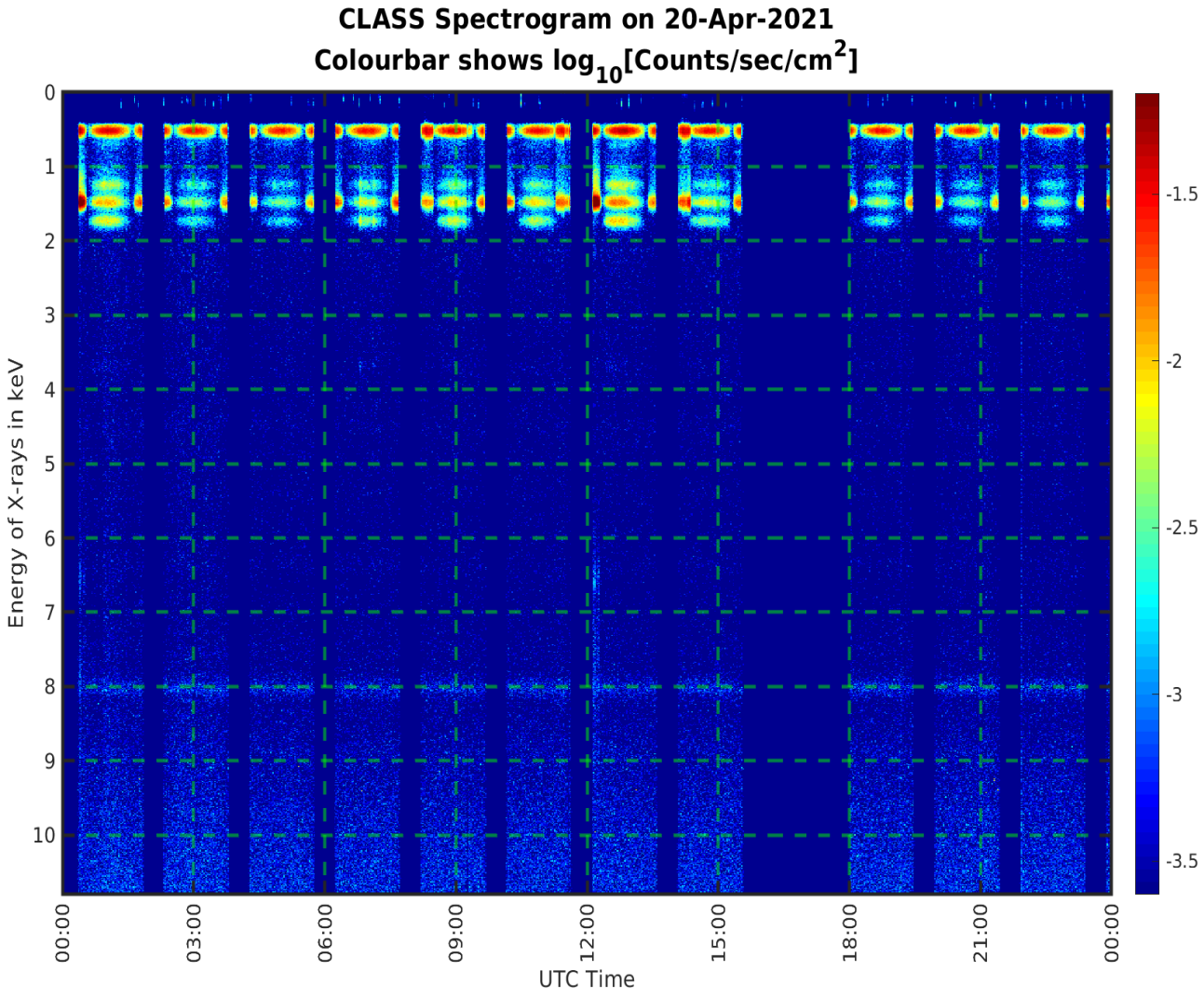
CLASS Spectrogram on 20-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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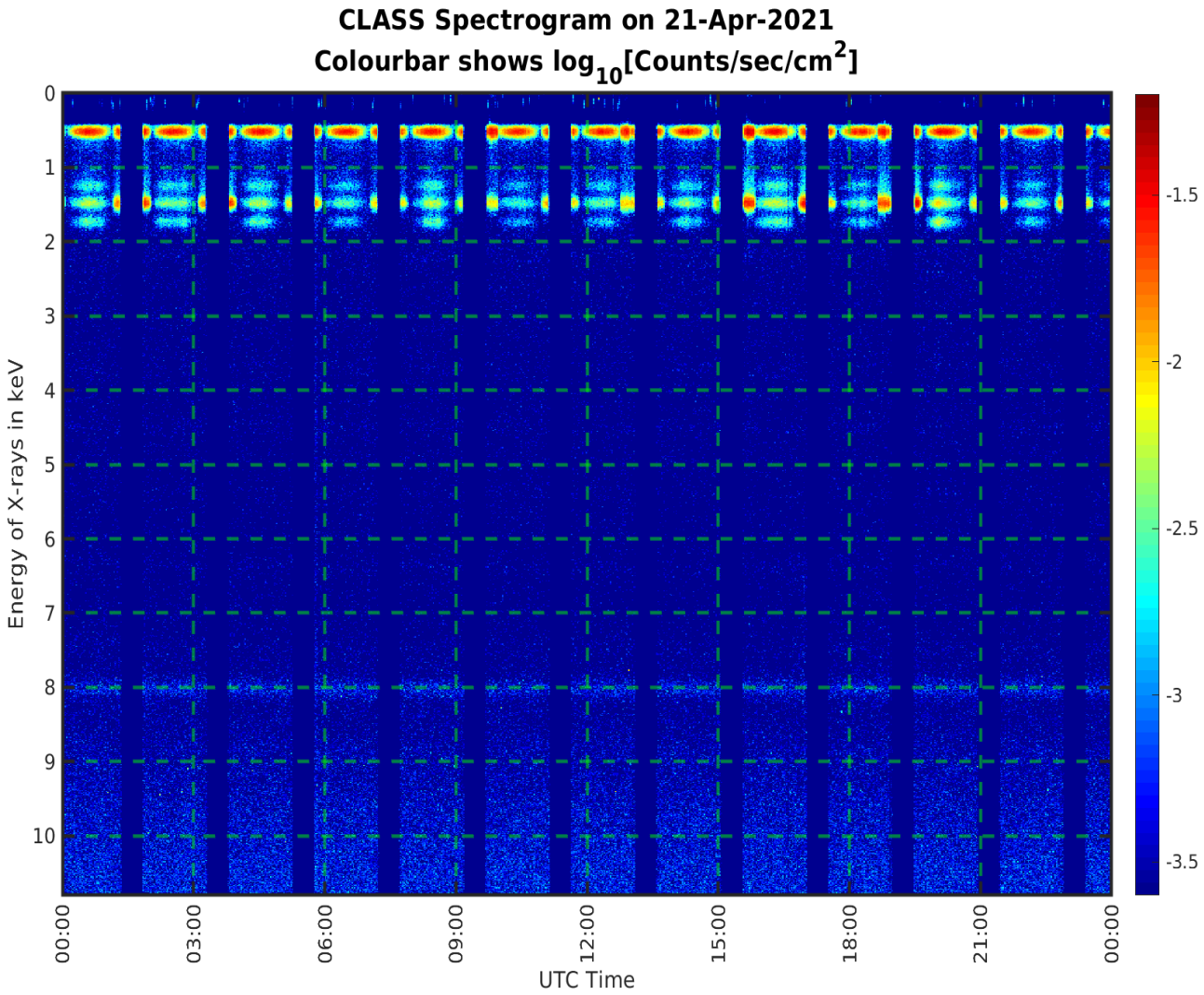
CLASS Spectrogram on 21-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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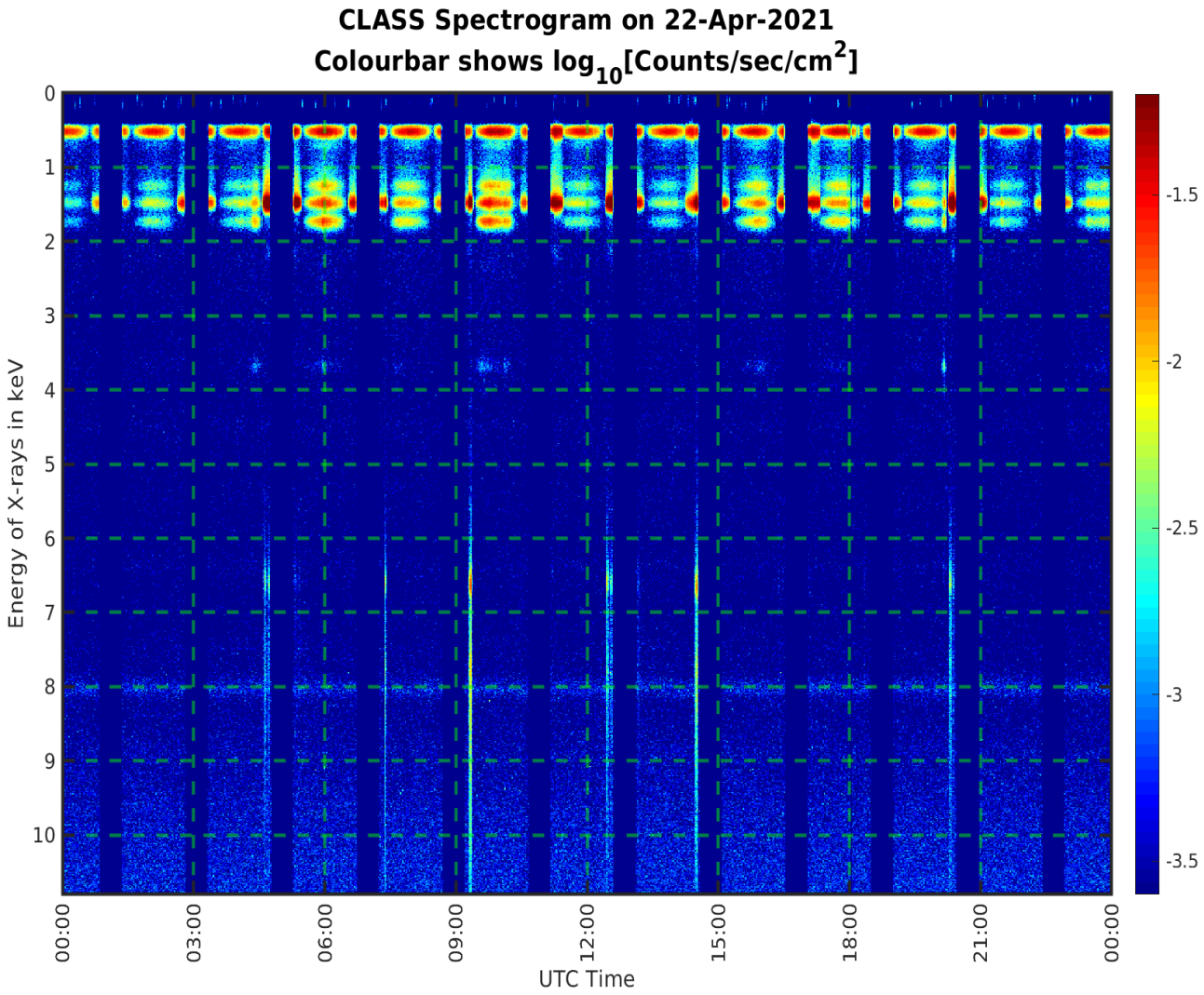
CLASS Spectrogram on 22-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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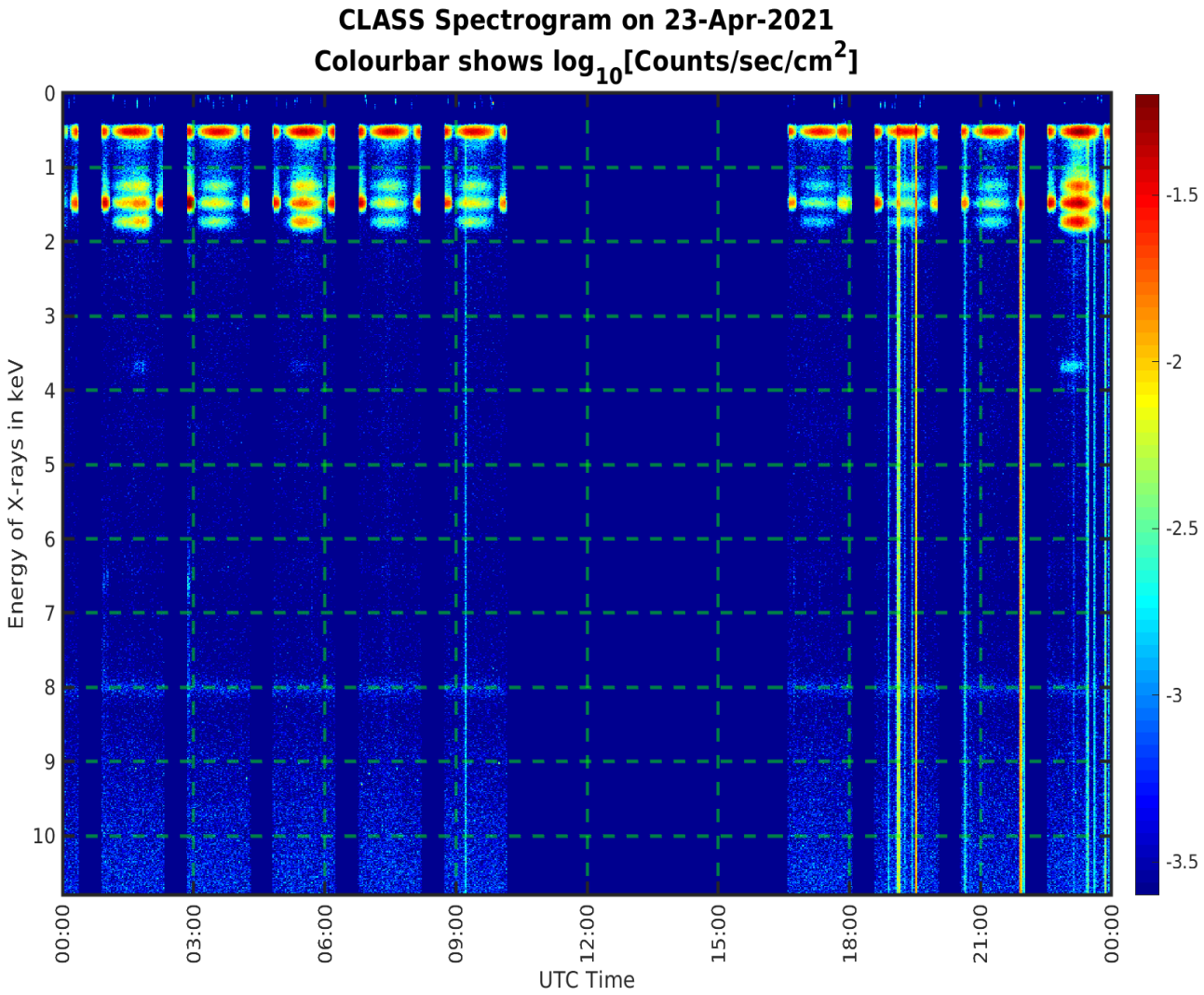
-3.5


CLASS Spectrogram on 23-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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UTC Time
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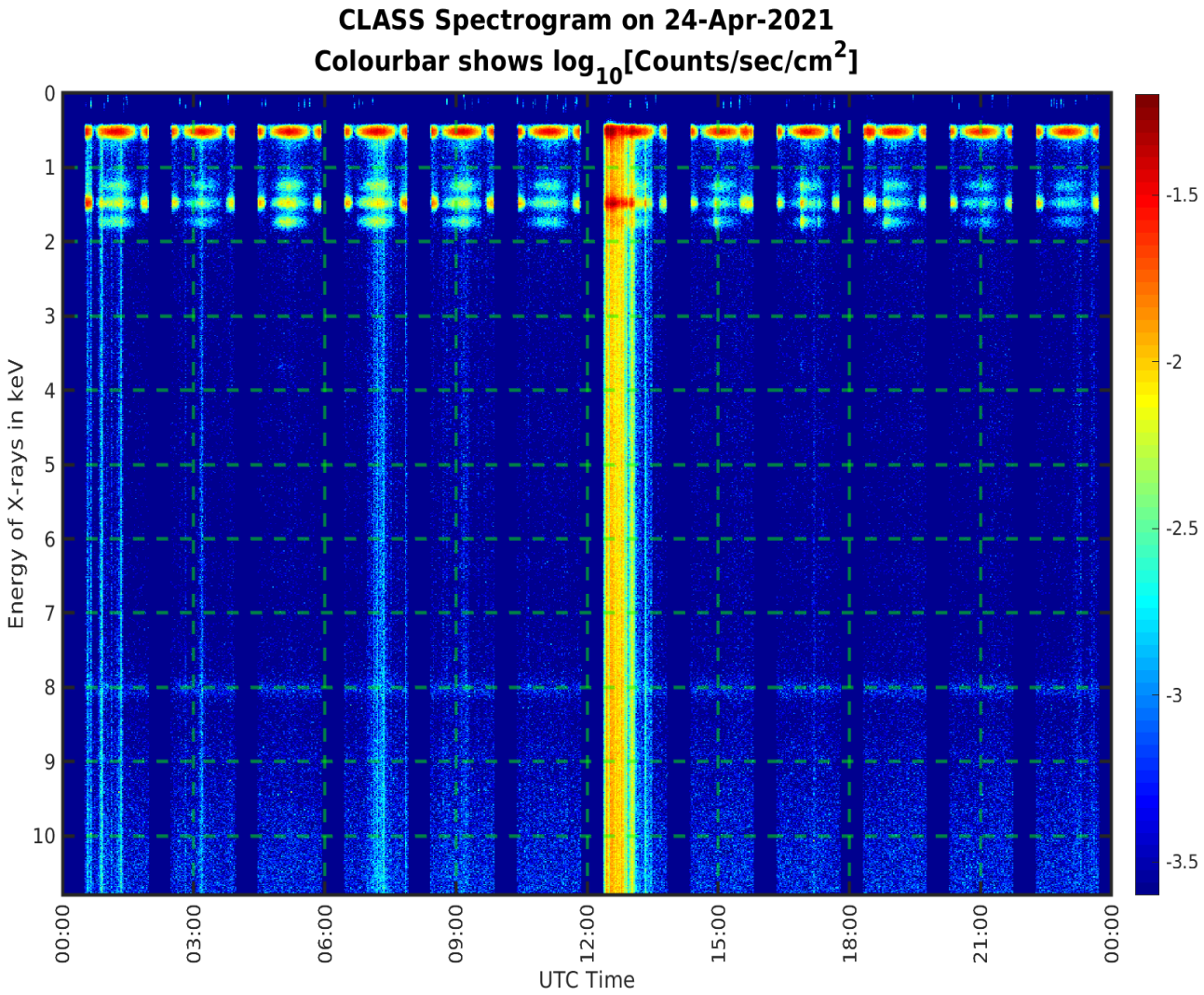
CLASS Spectrogram on 24-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
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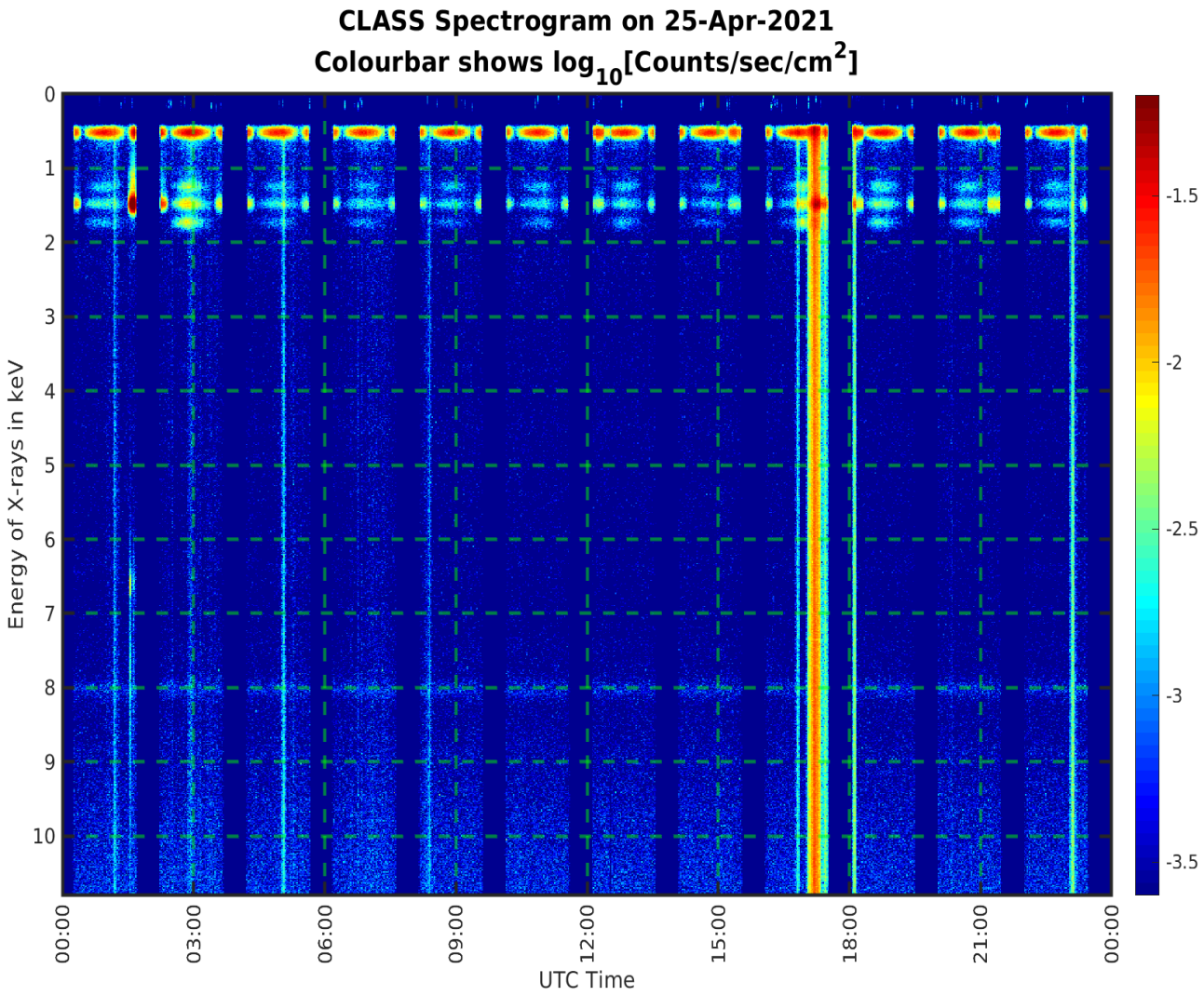
CLASS Spectrogram on 25-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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UTC Time
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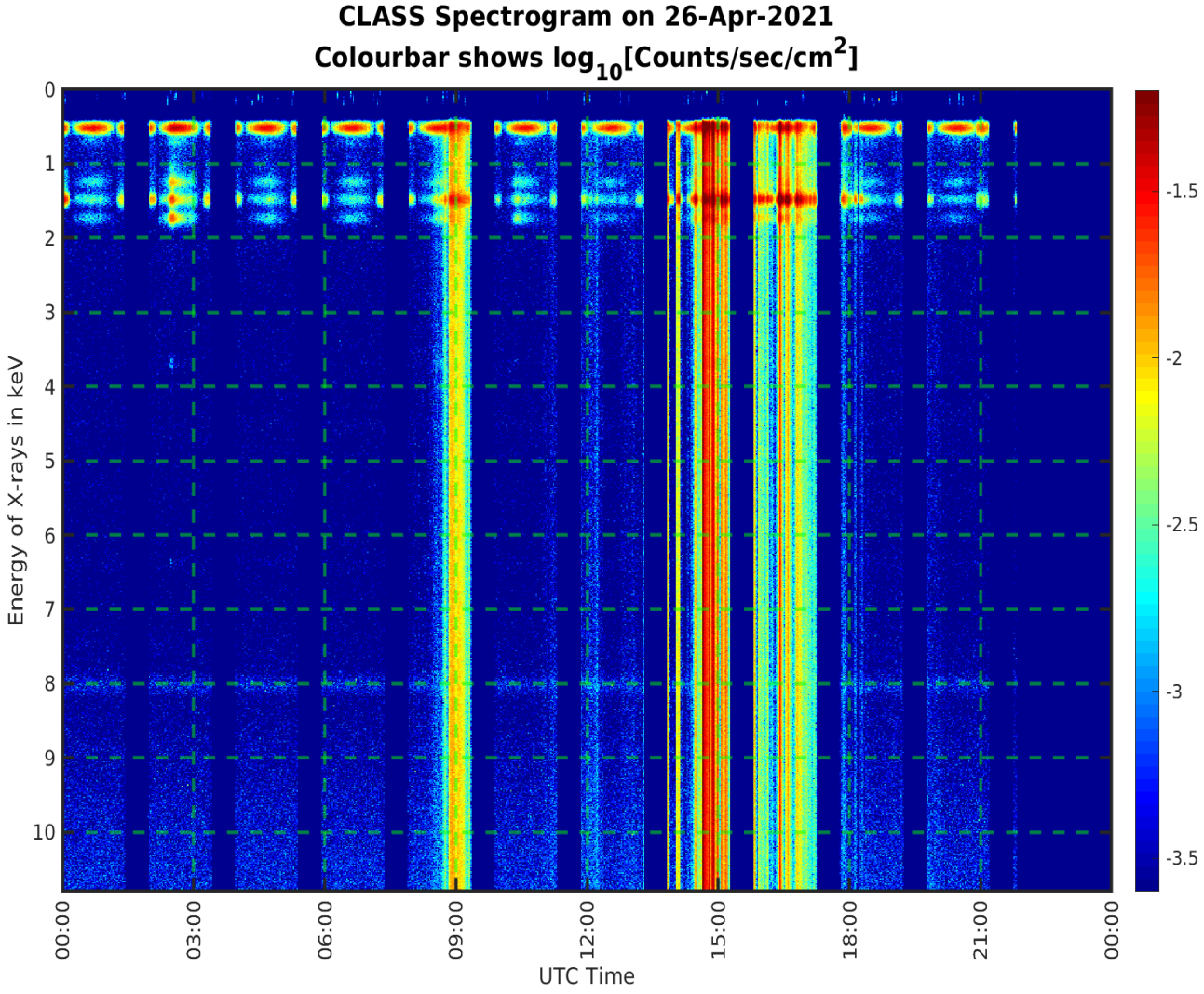
-3.5


CLASS Spectrogram on 26-Apr-2021
Colourbar shows log10[Counts/sec/cm2]
Energy of X-rays in keV
0
1
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03:00
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UTC Time
-1.5
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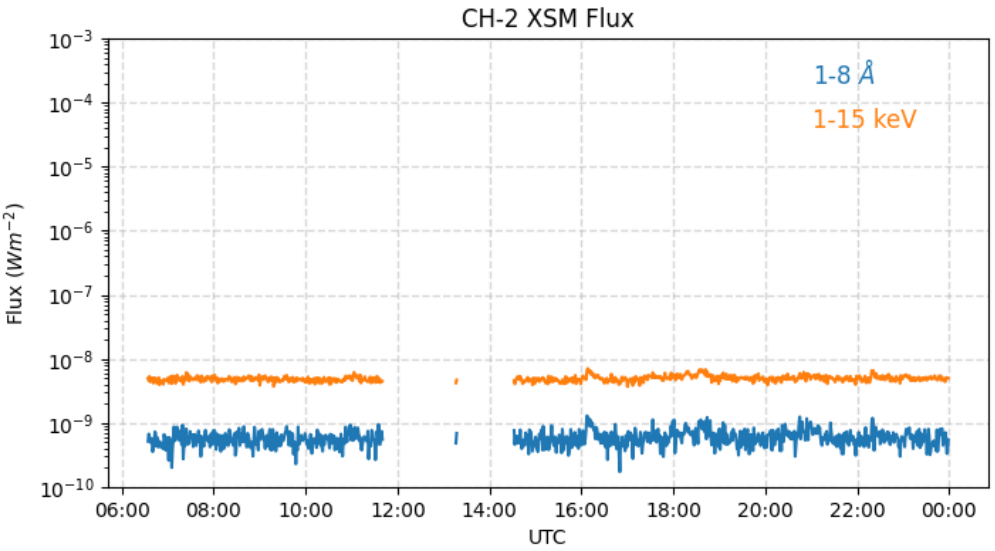
-3.5

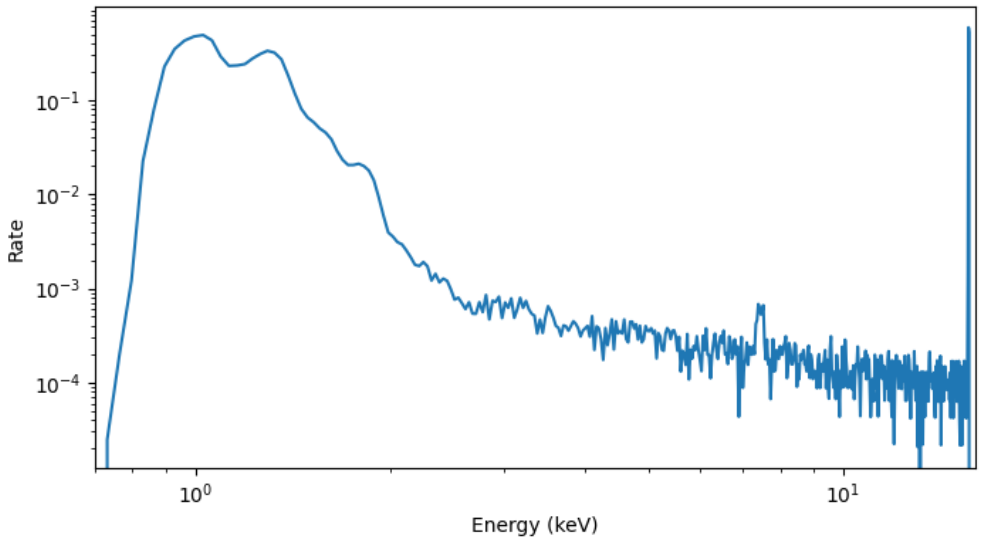


Annexure-2

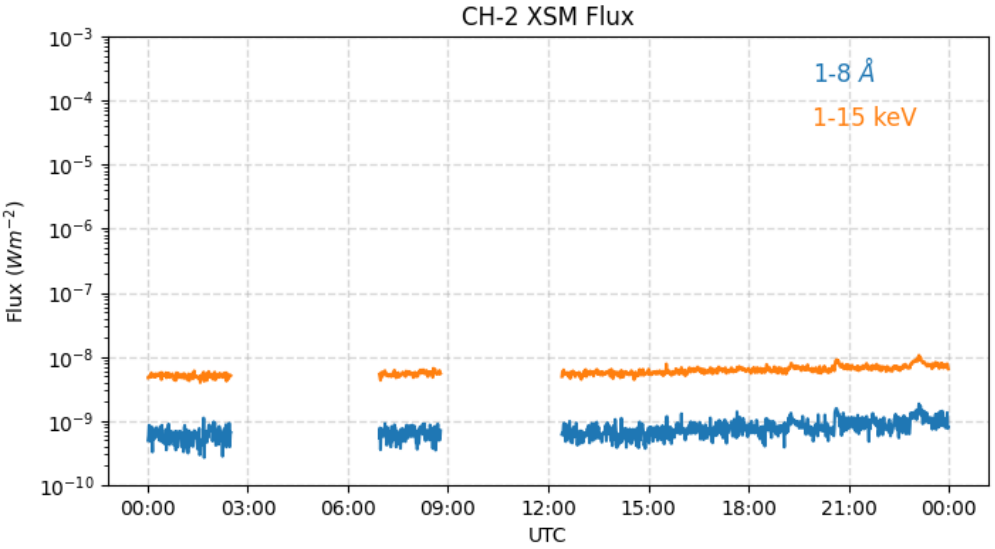
Data Products of
Solar X-ray Monitor (XSM)

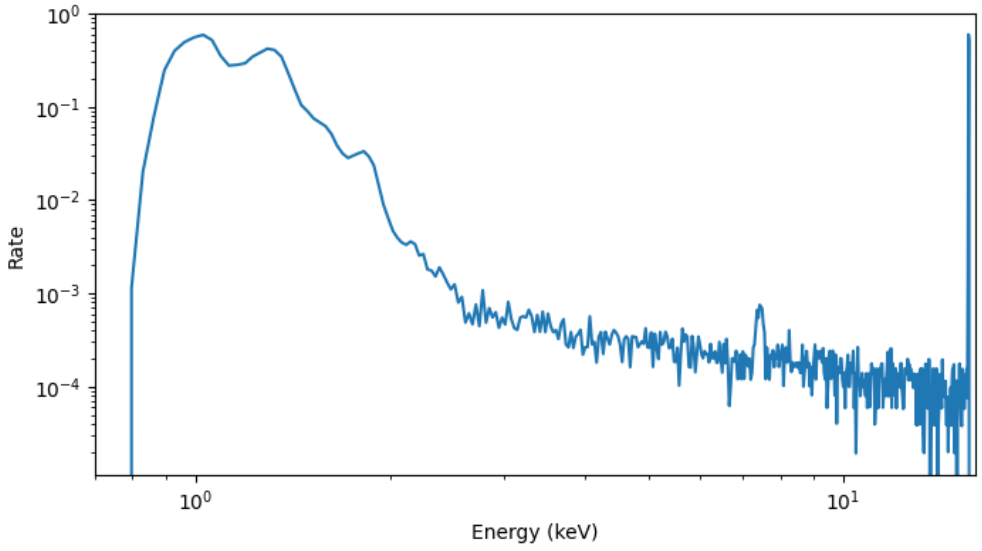
Date: 2019-09-12



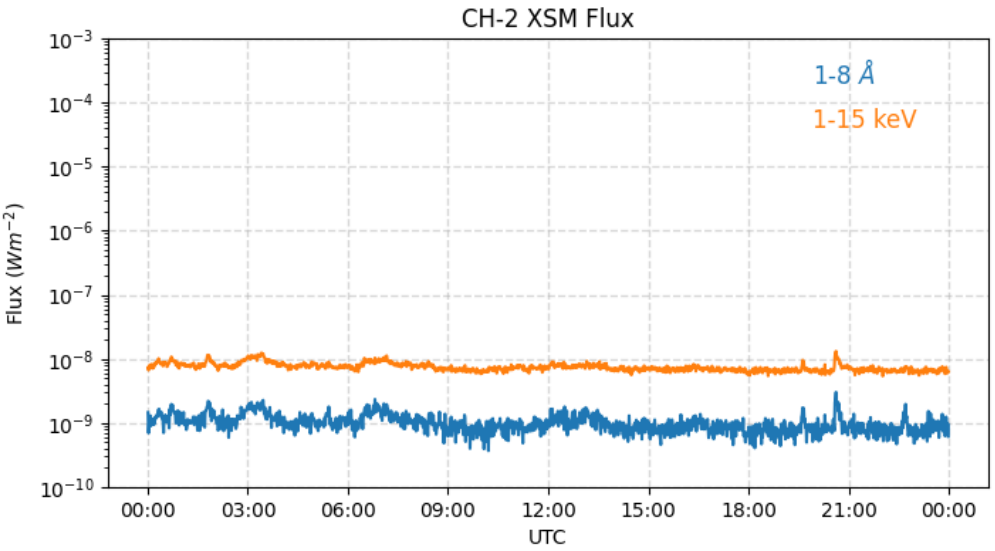


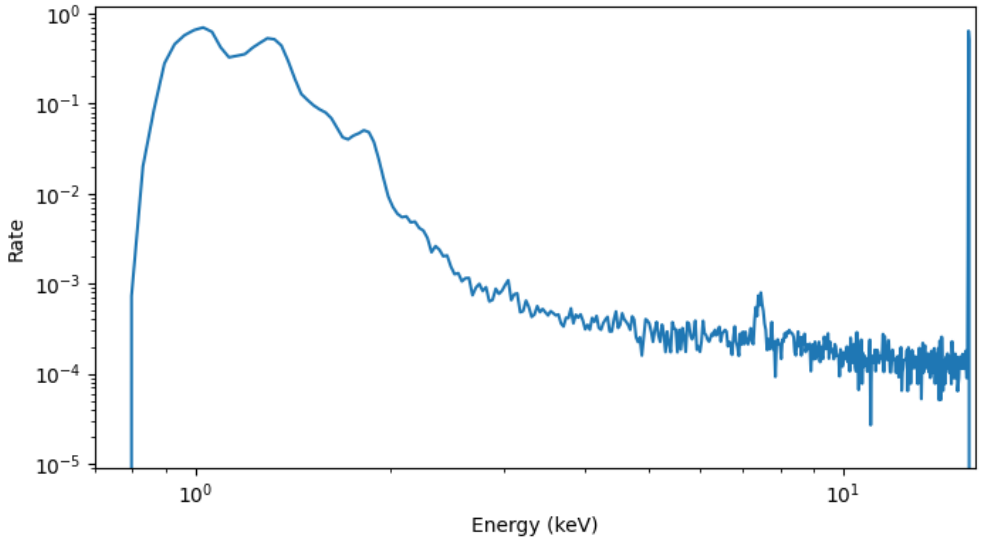
Date: 2019-09-13





Date: 2019-09-14





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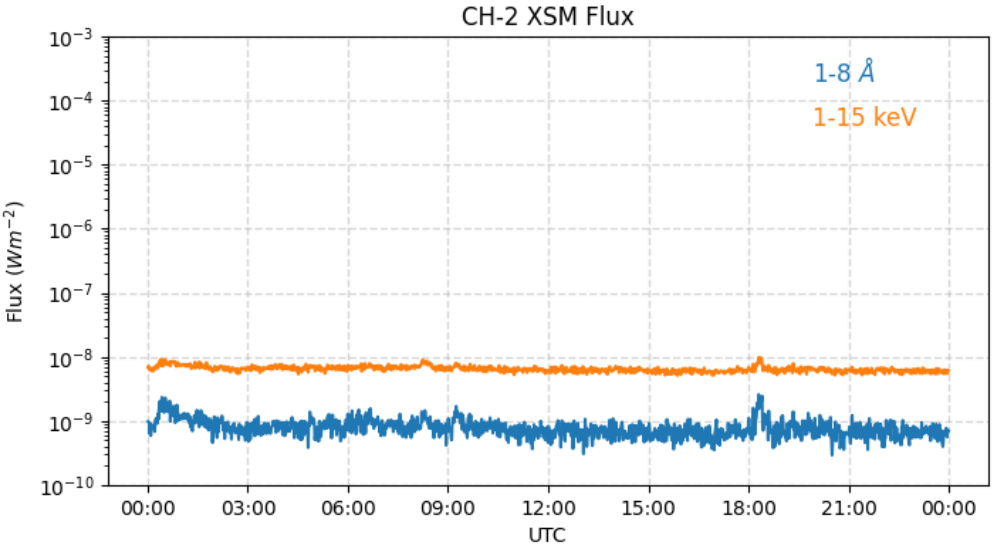
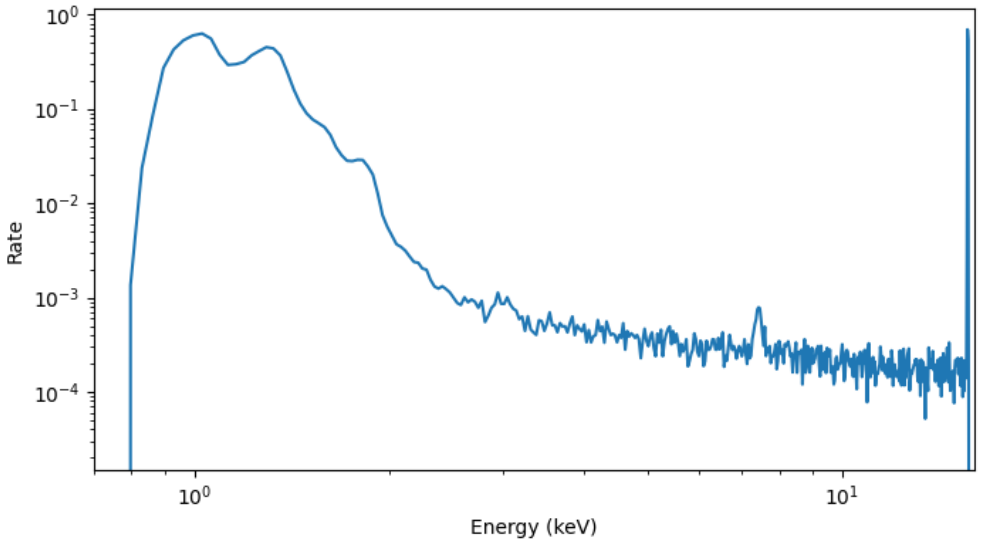
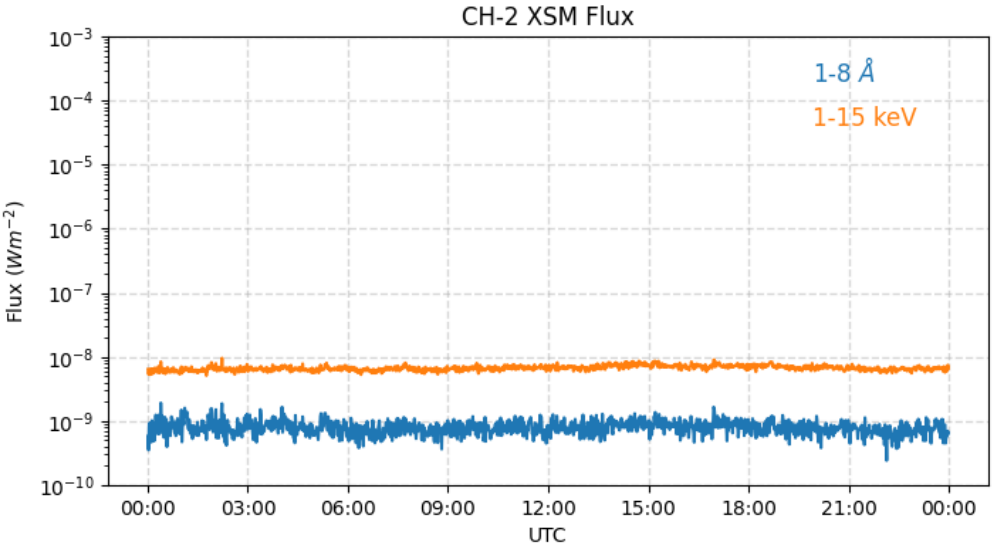
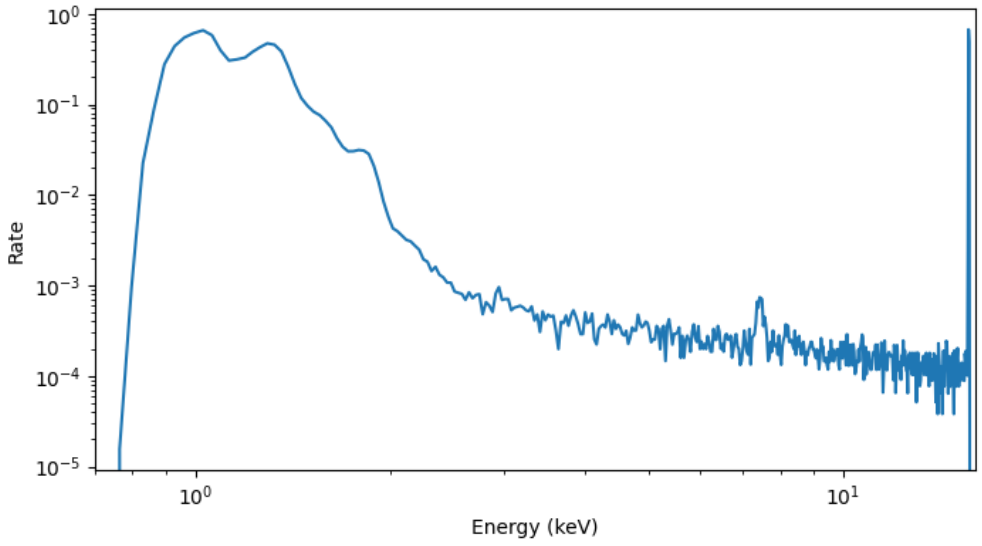




Date: 2019-09-16





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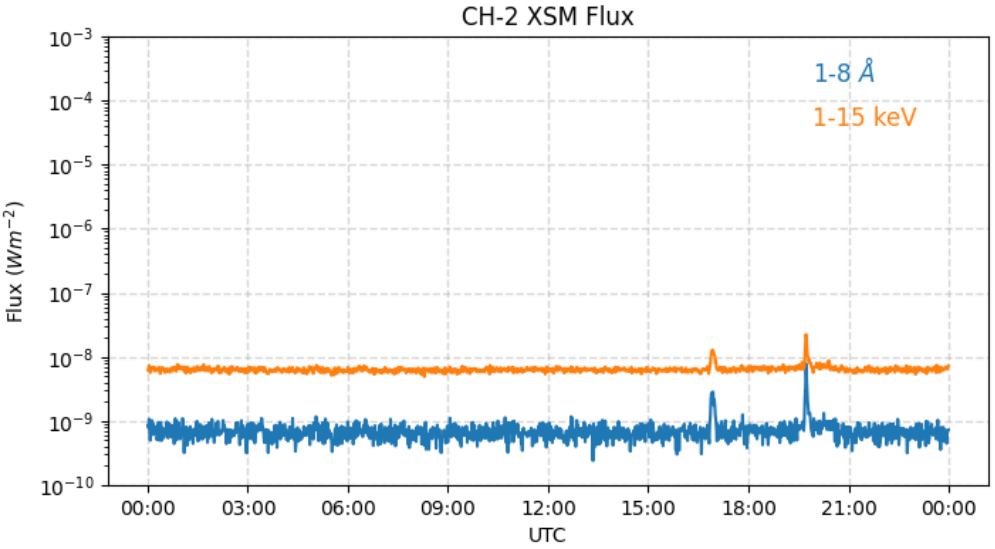

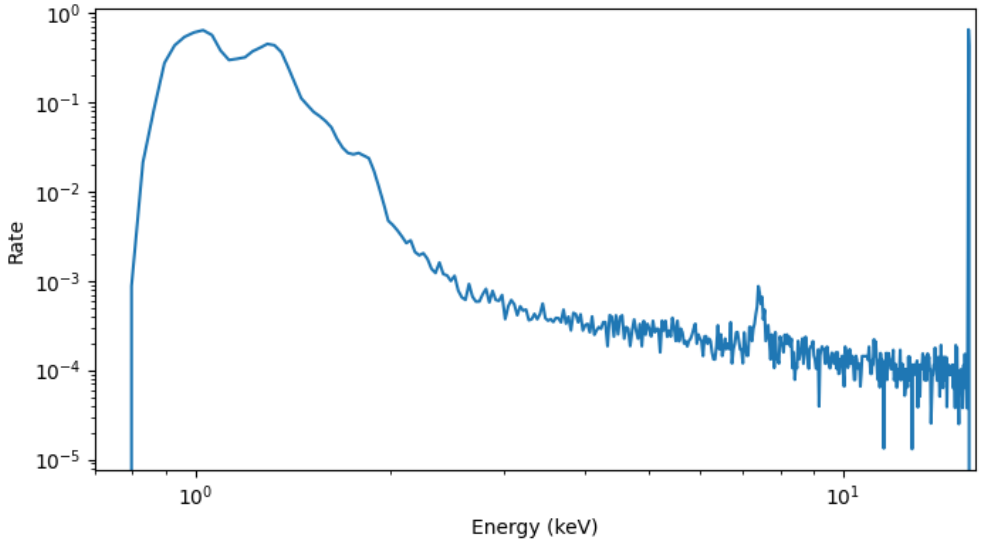

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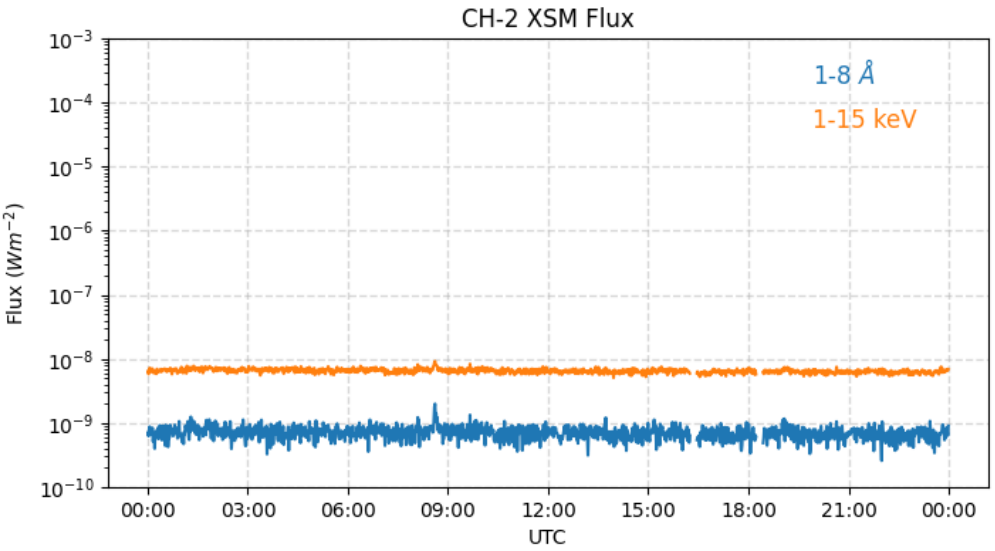
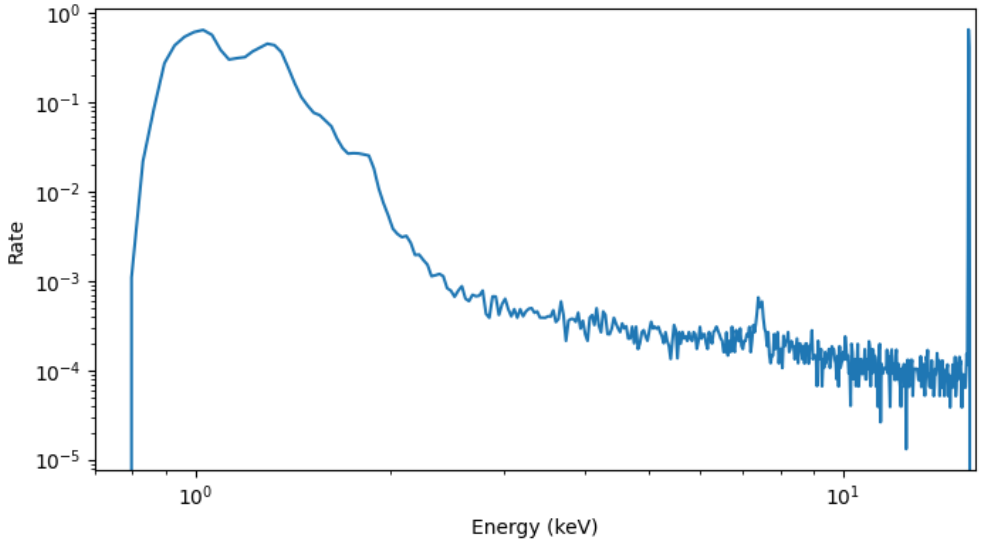
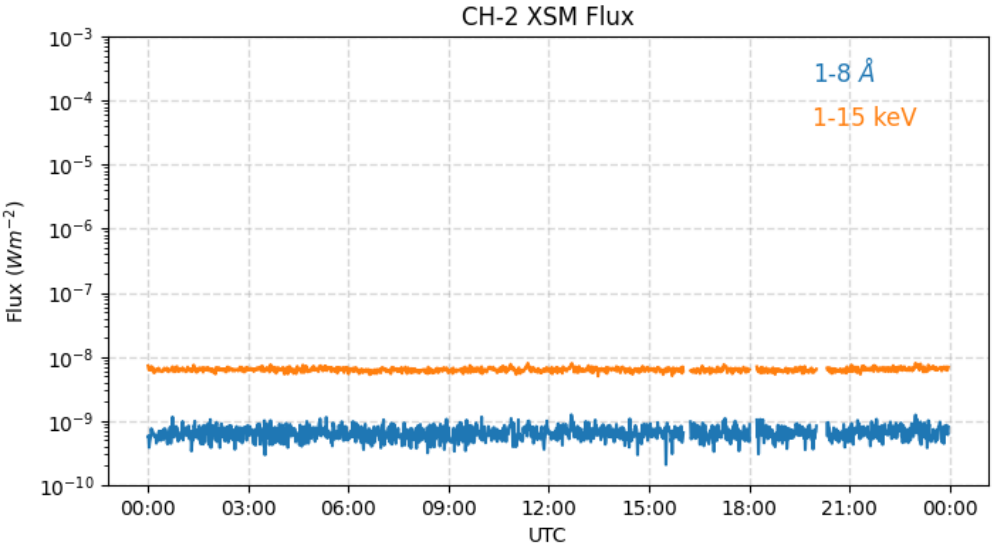
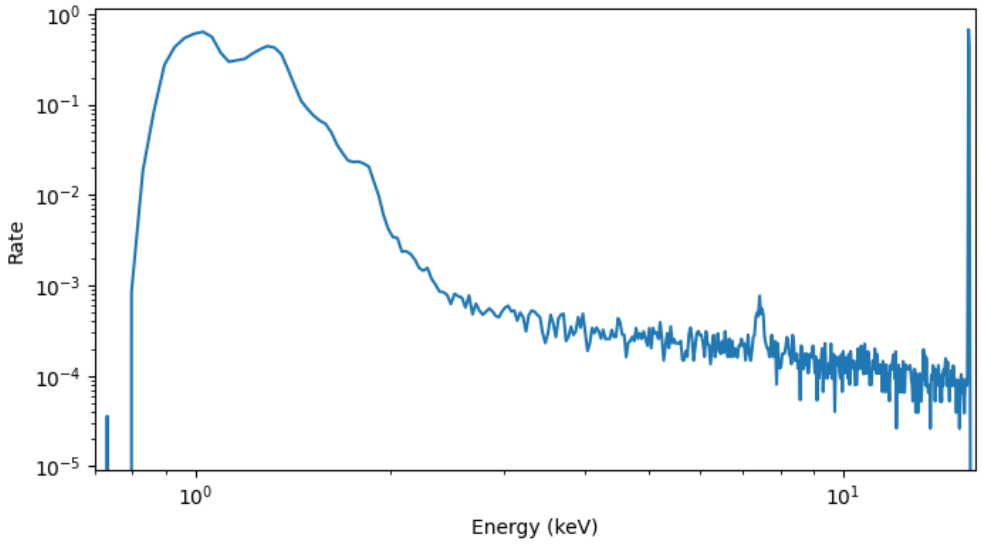


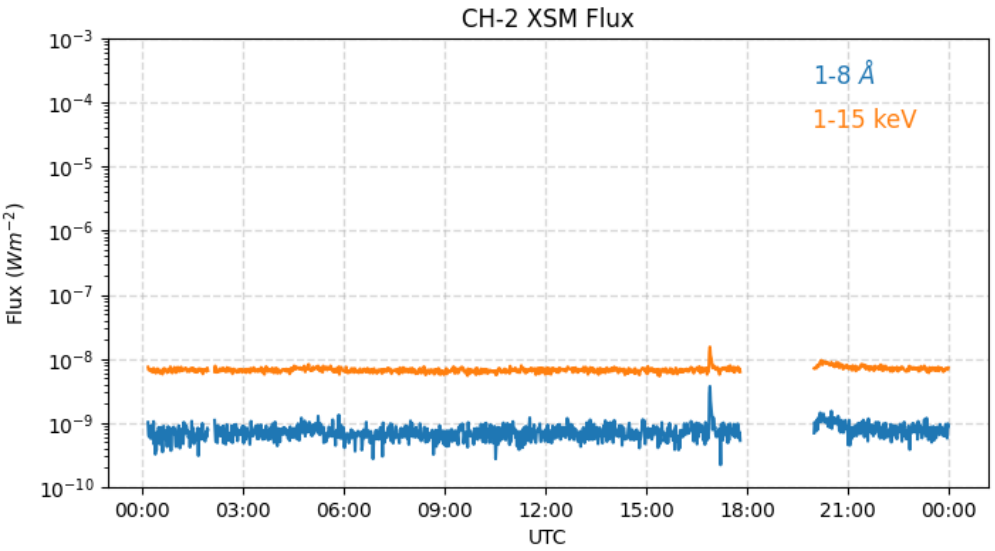


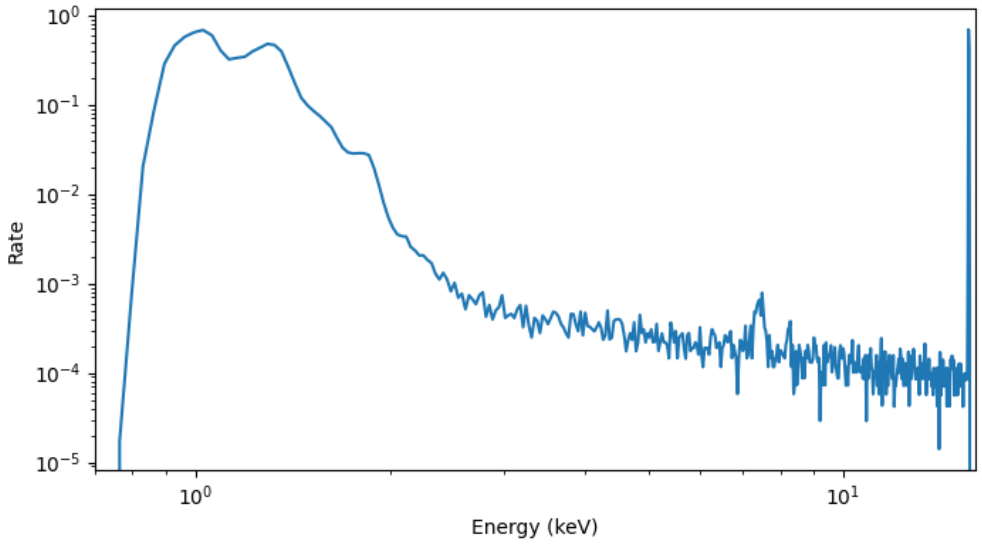
Date: 2019-09-19





Date: 2019-09-20





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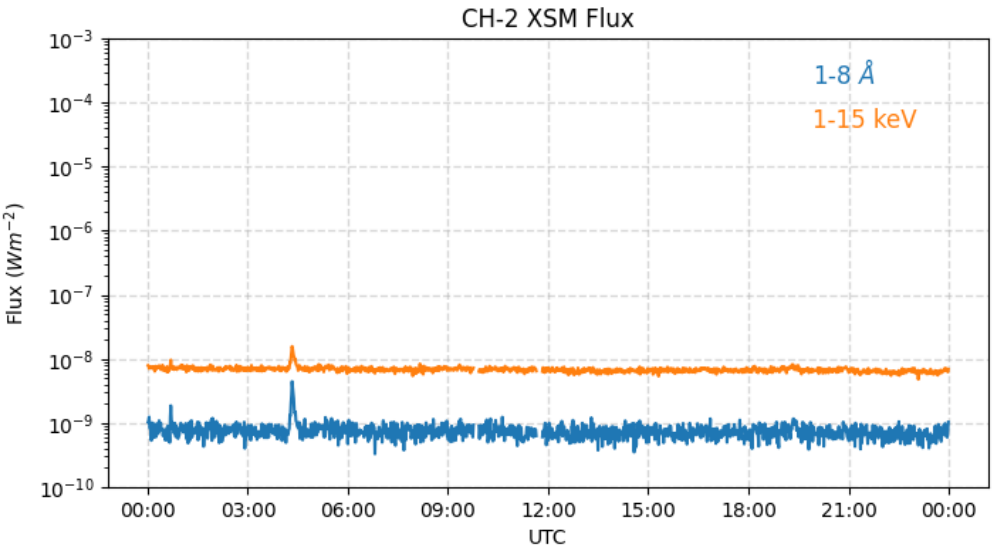

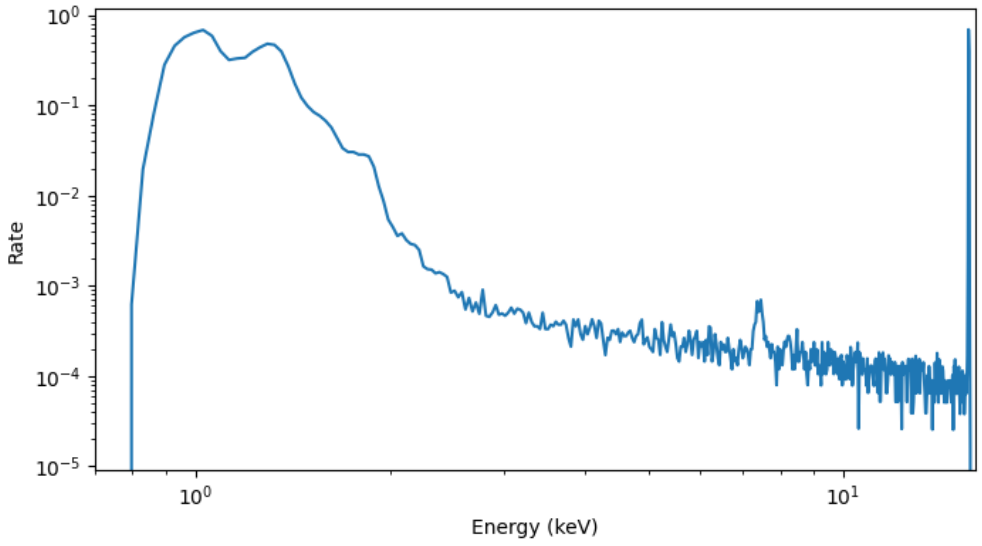

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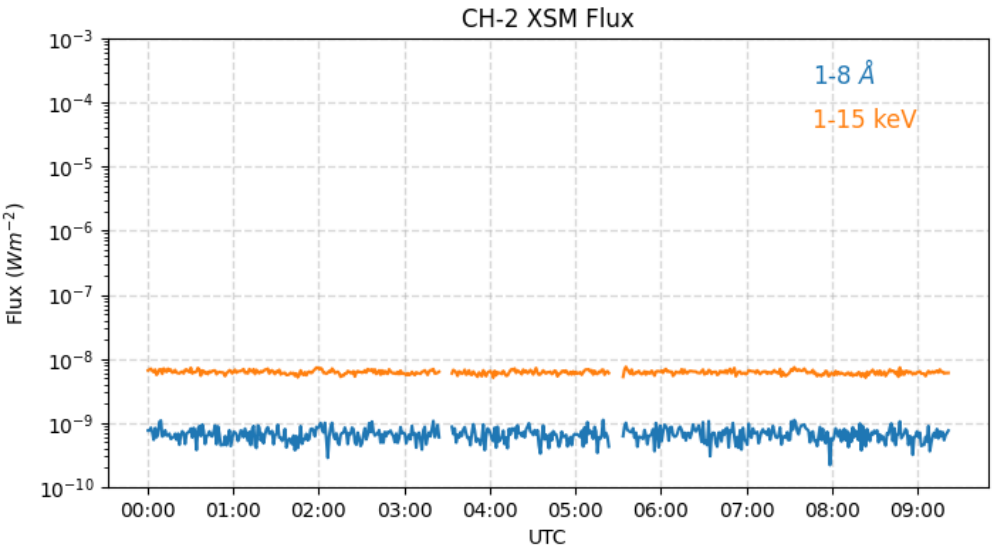
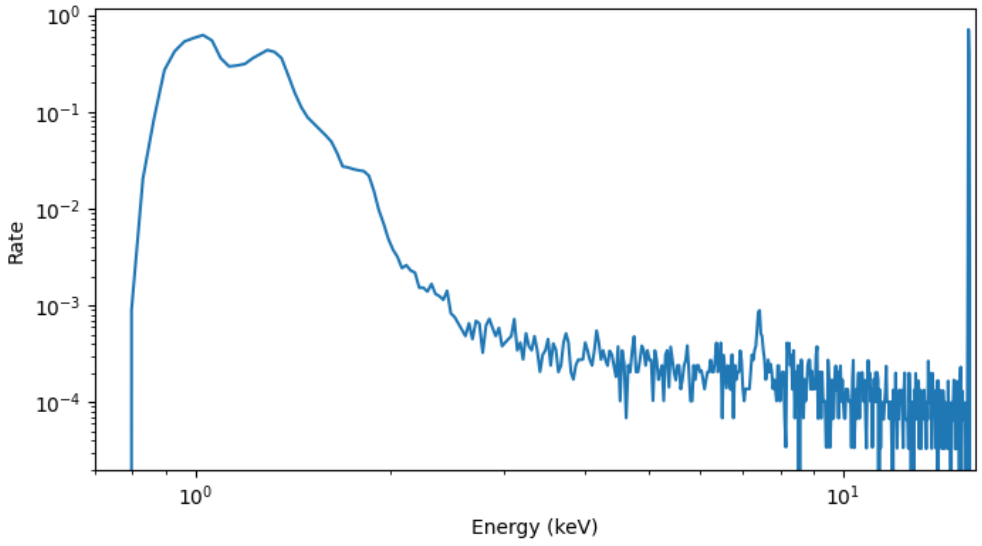
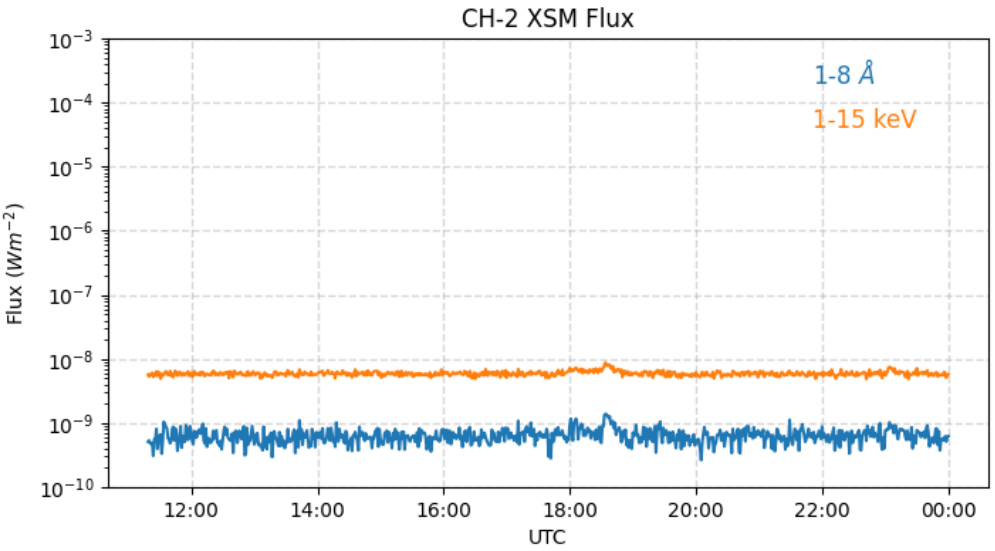
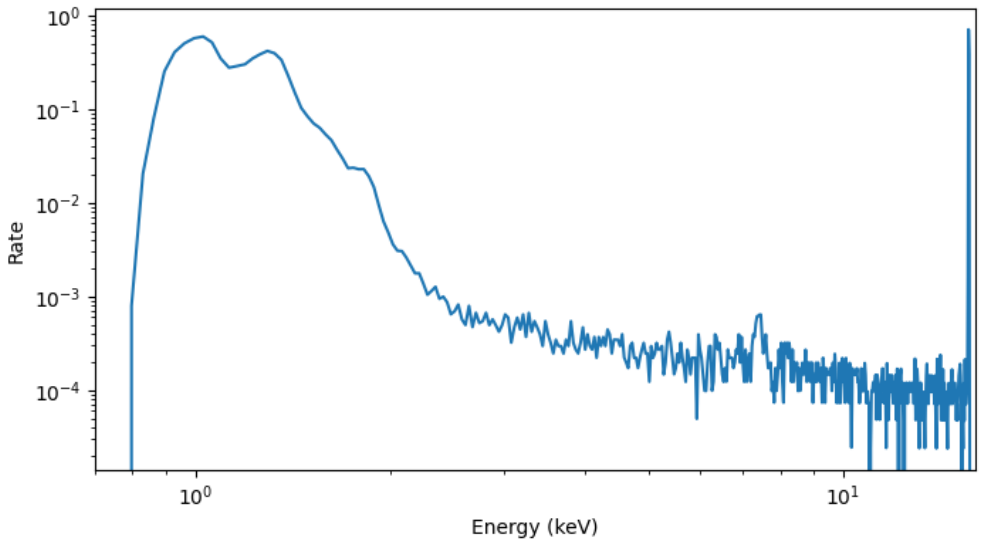




Date: 2019-09-23





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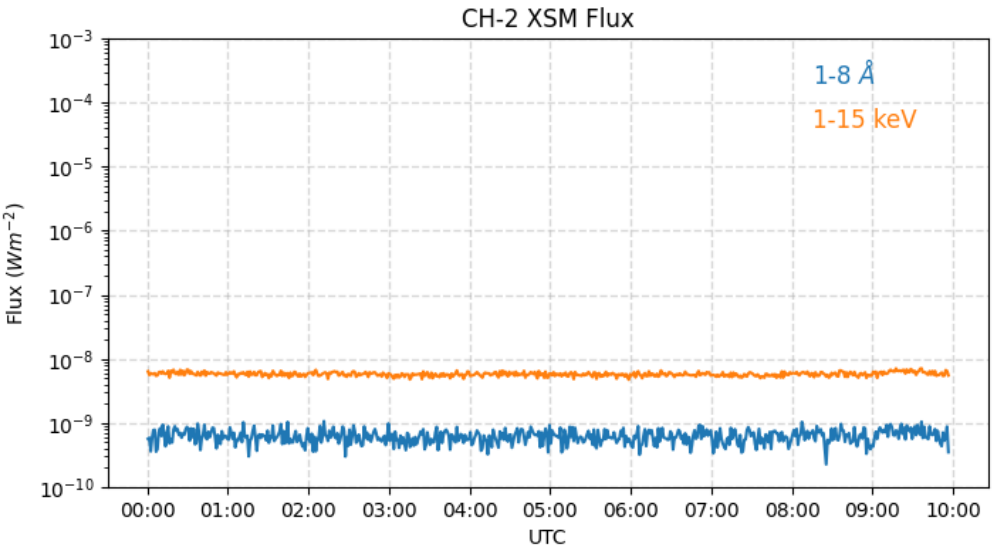

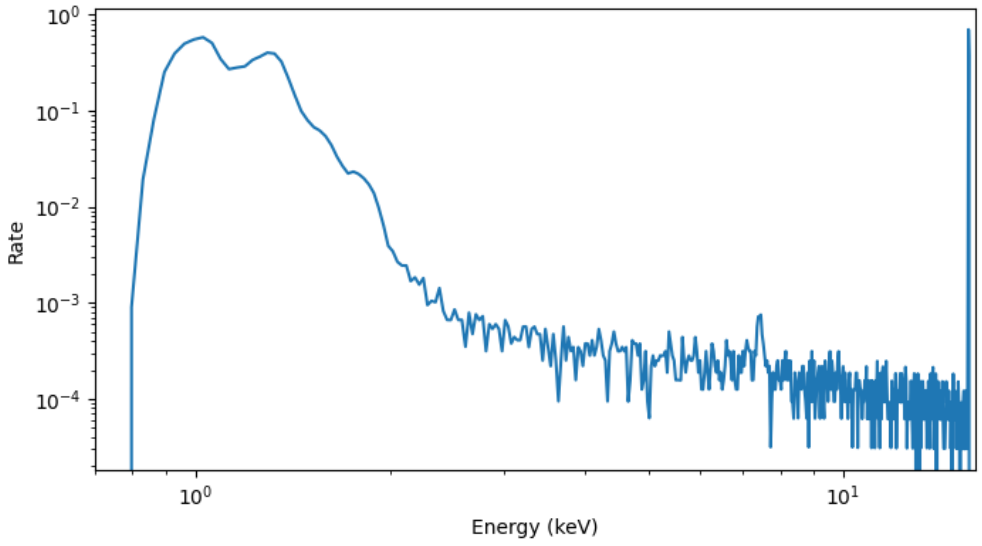

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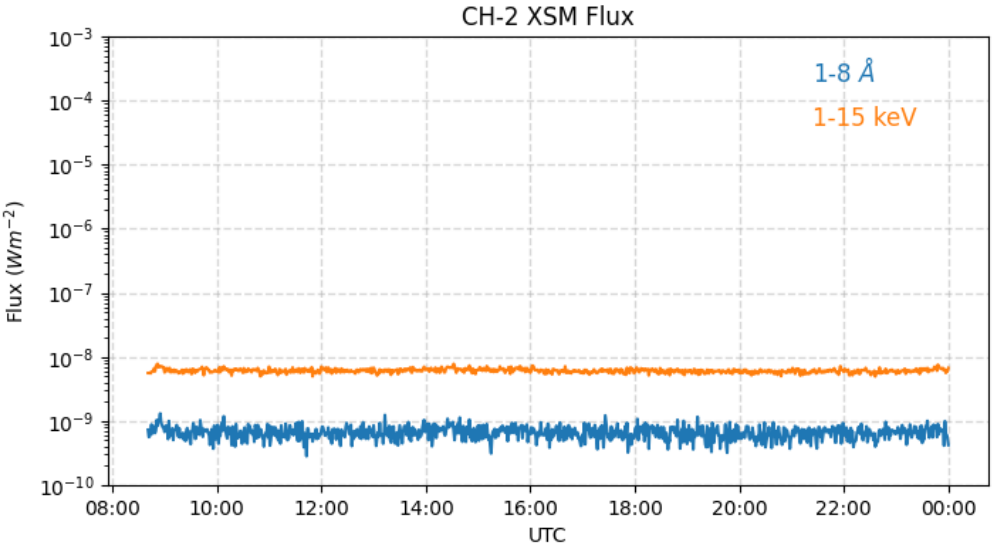

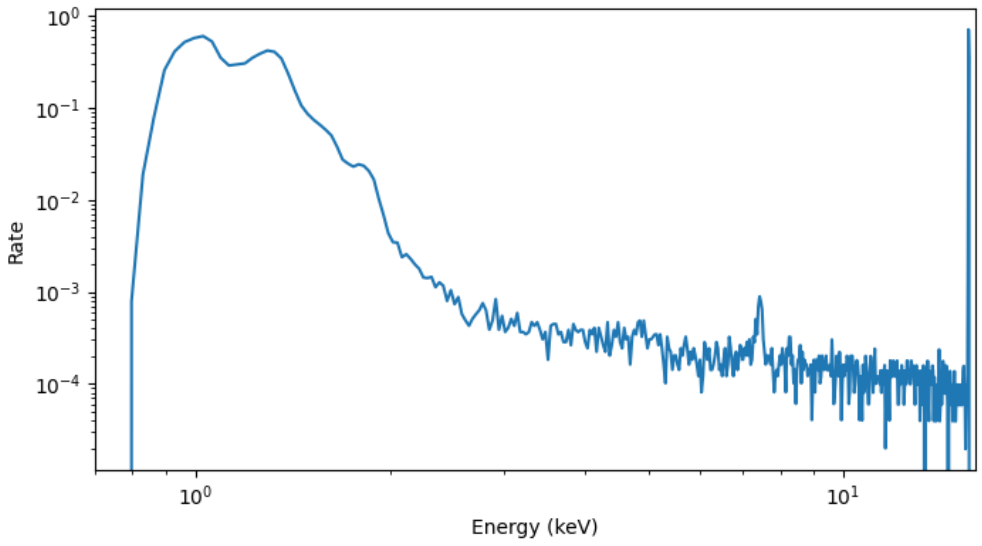

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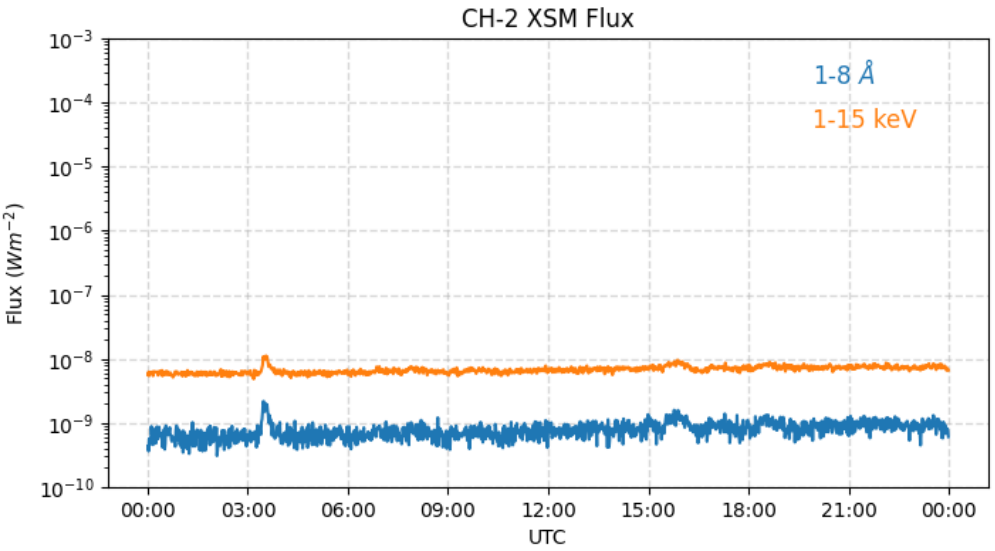

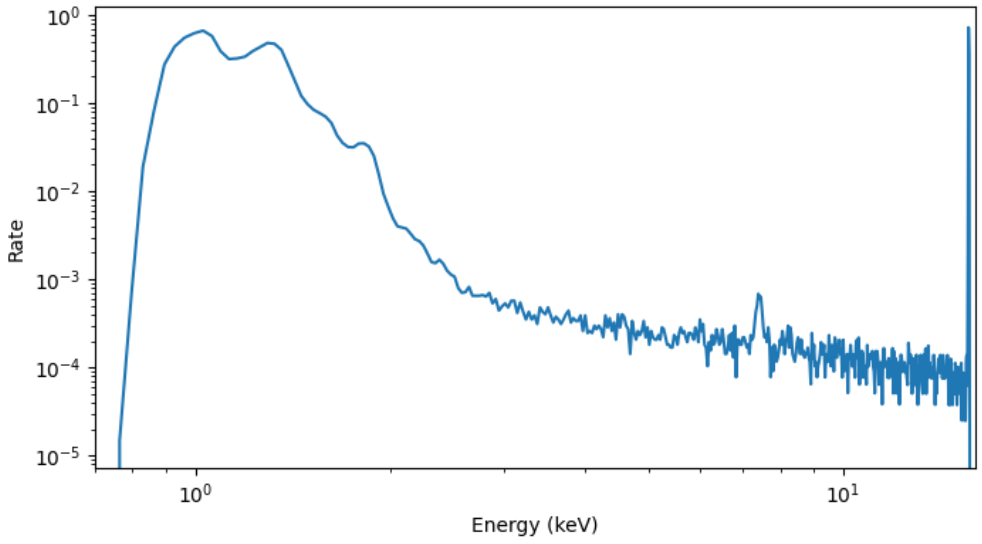

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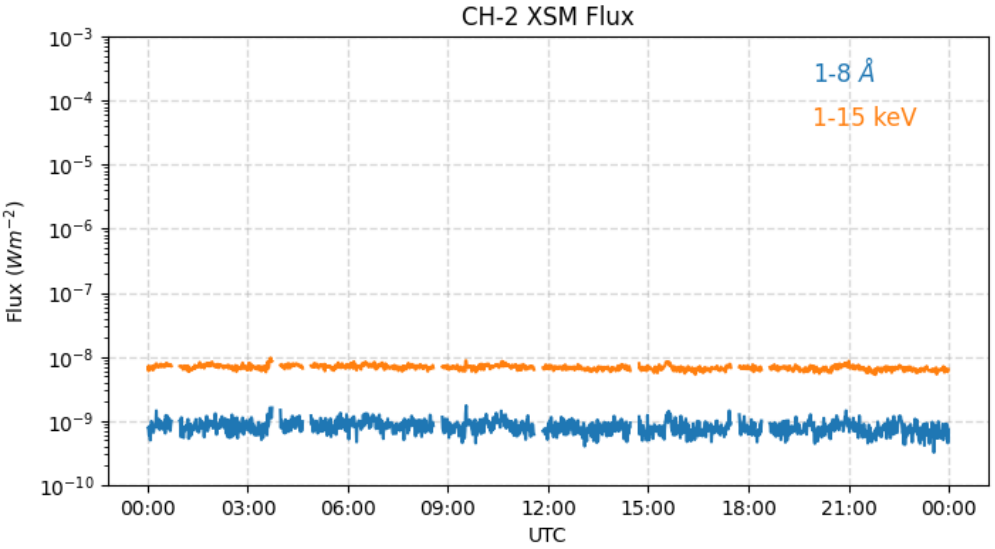

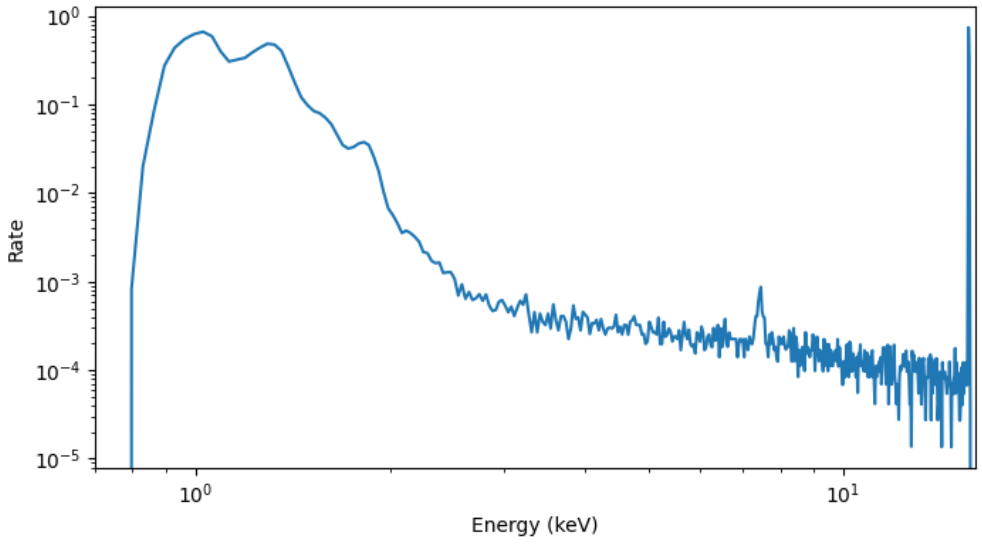

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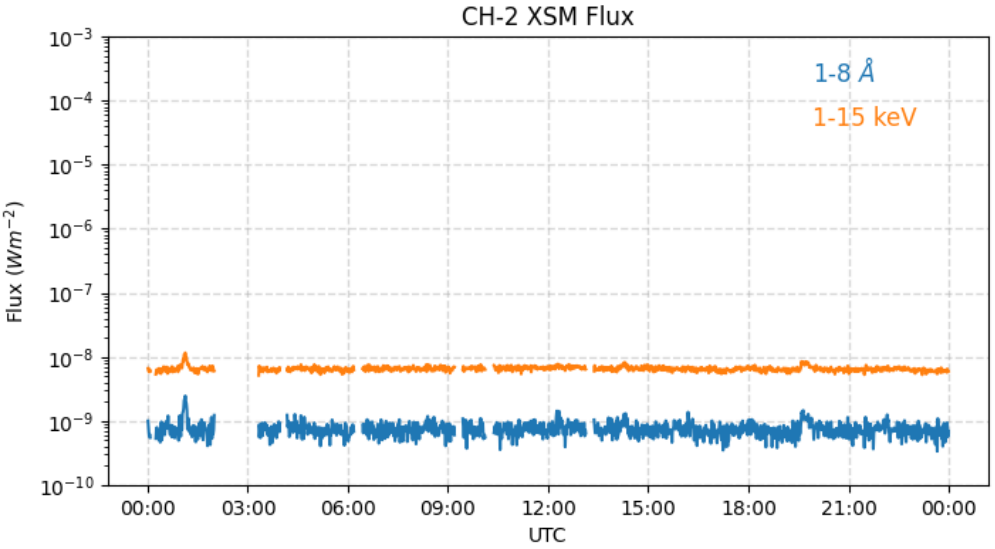

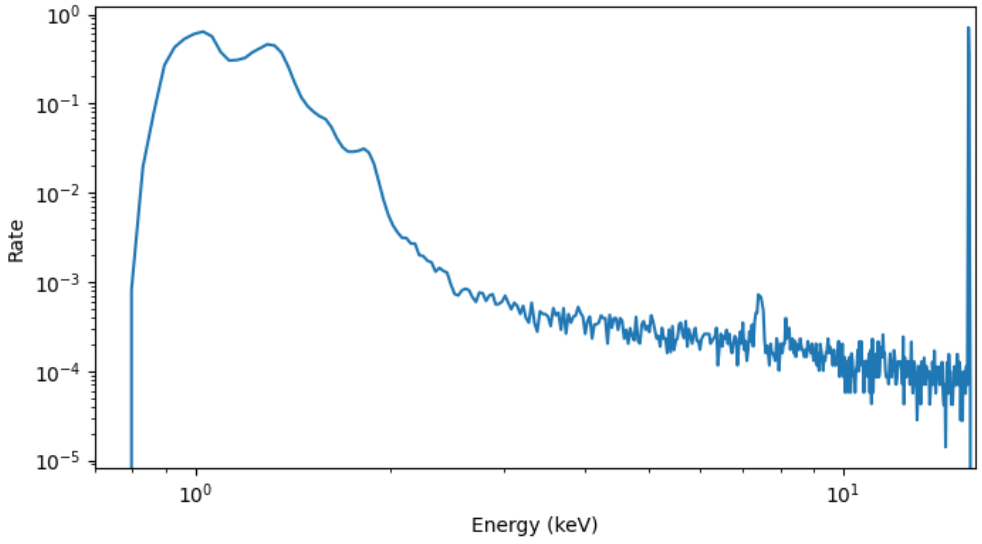

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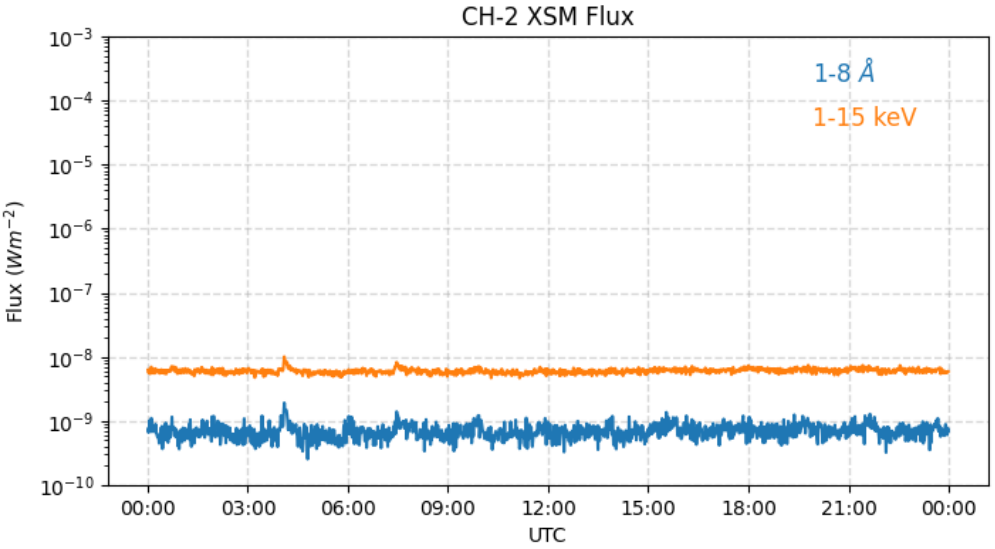

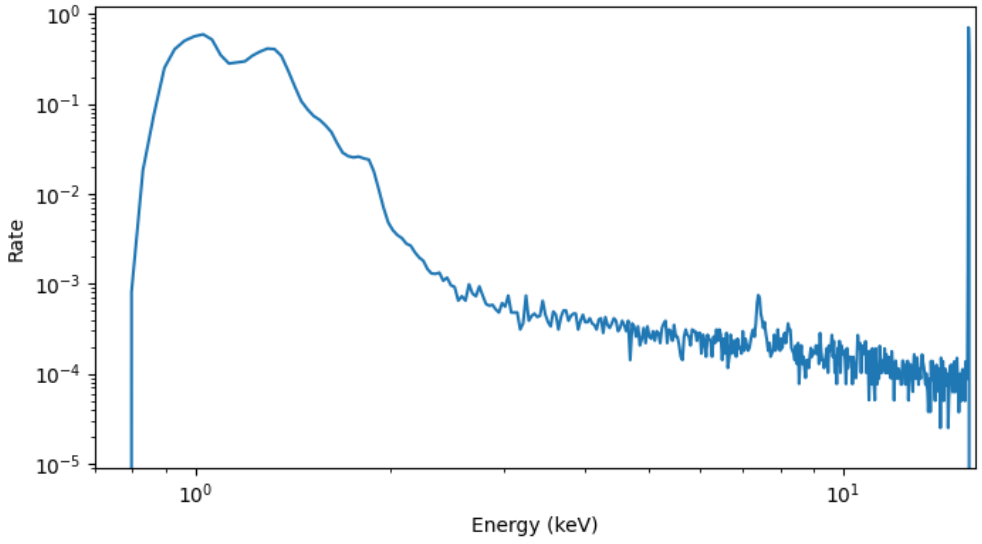

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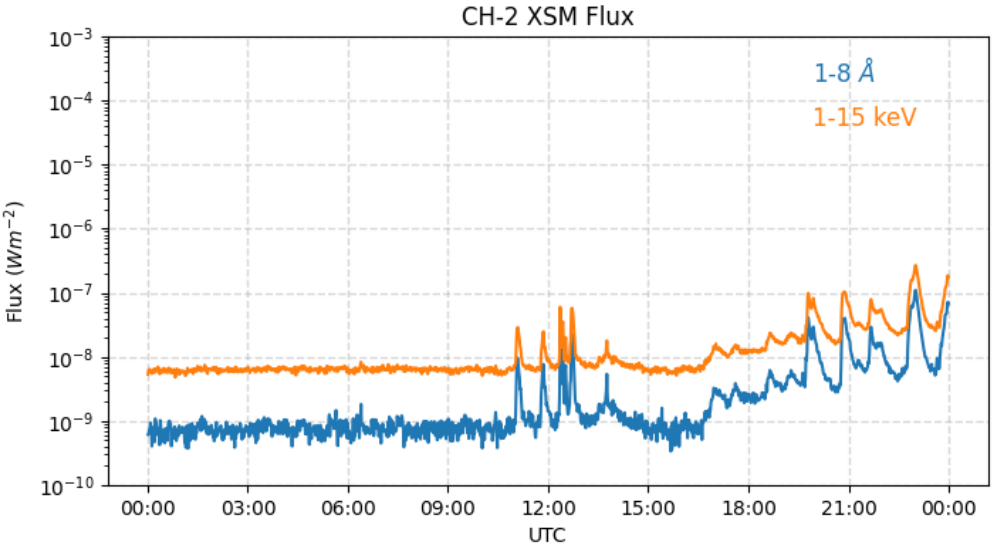

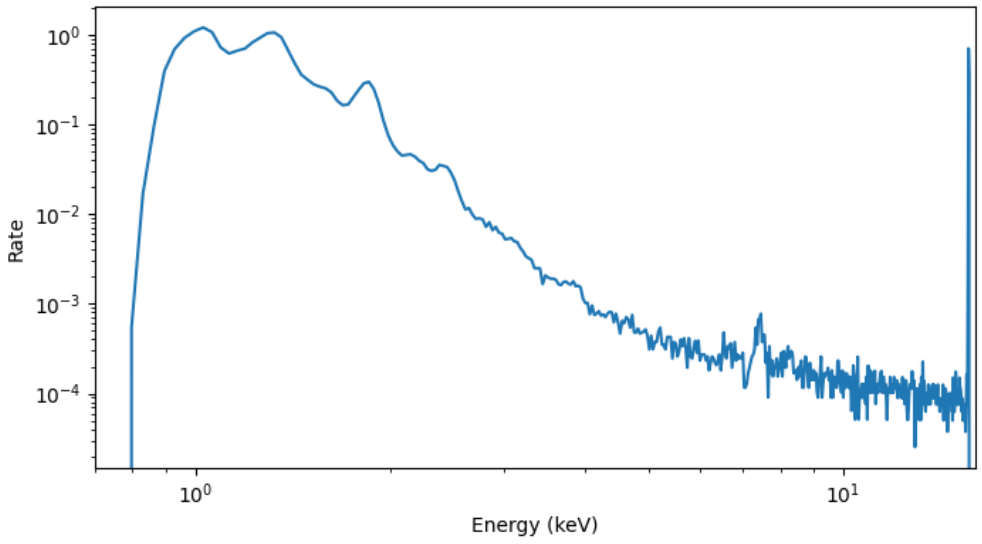

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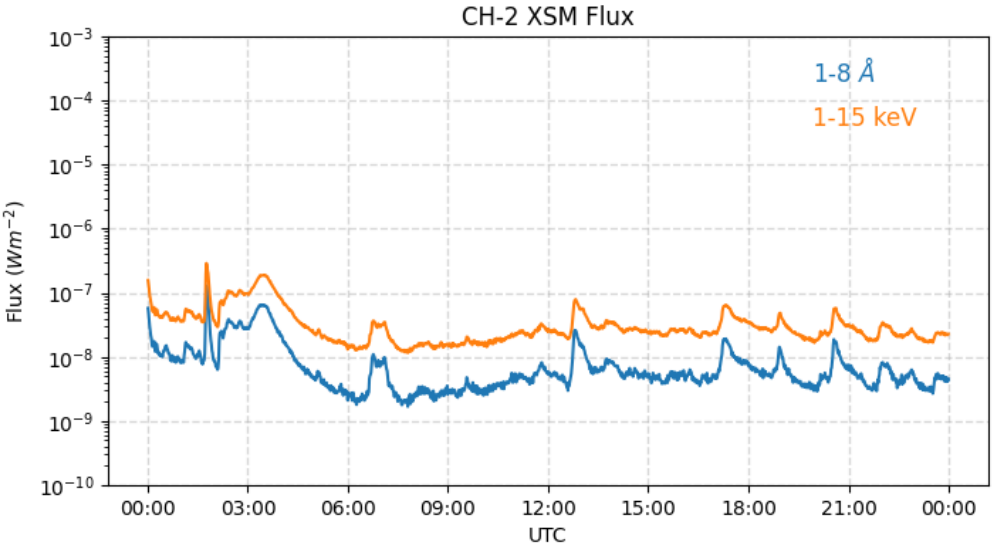

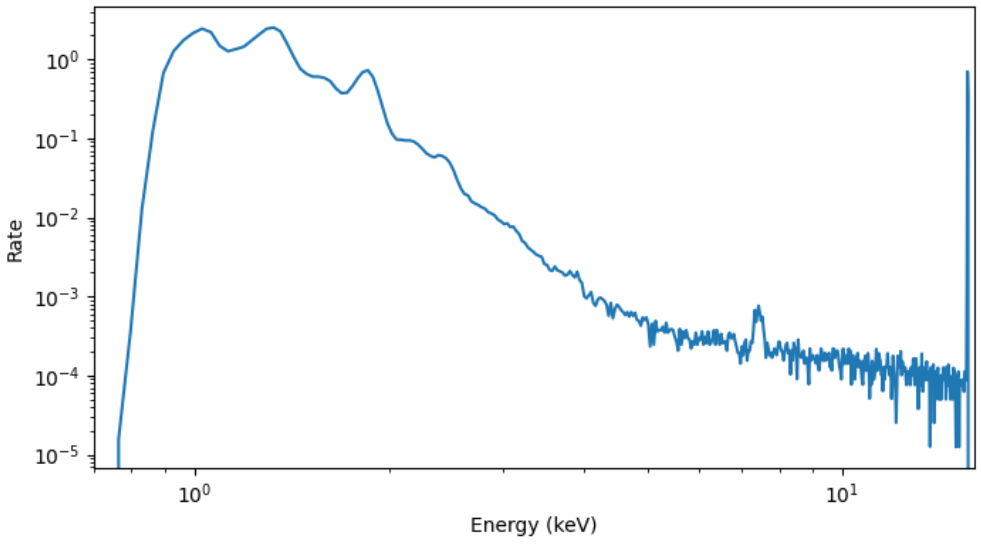

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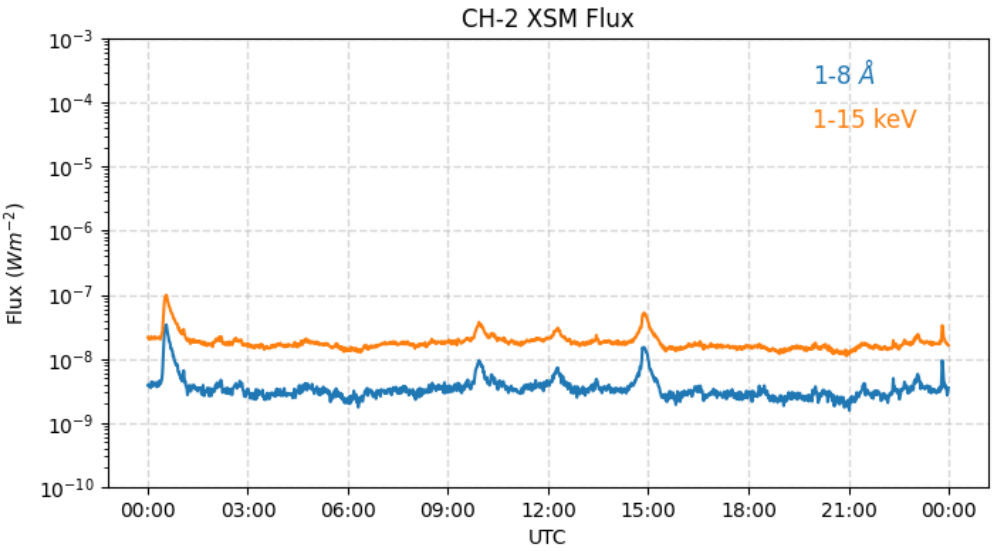

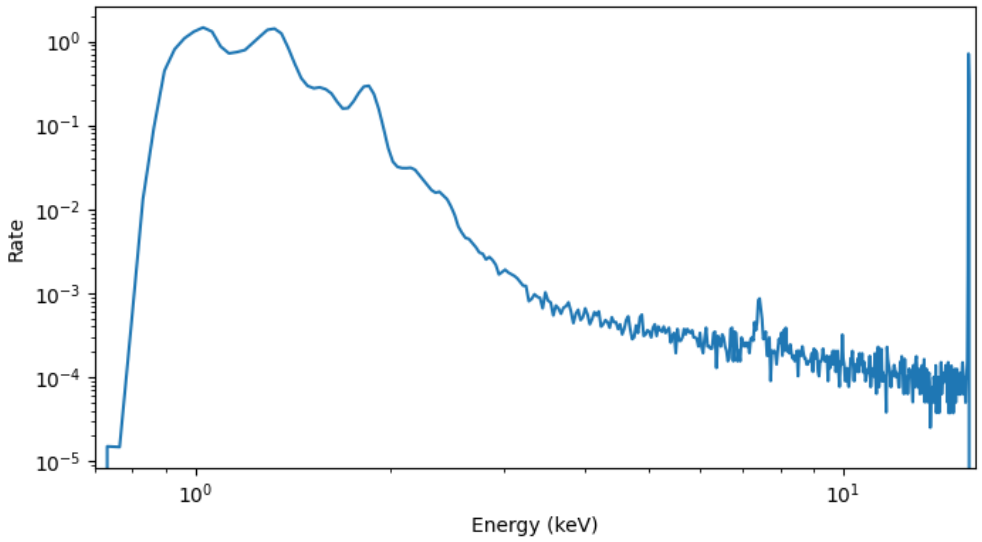

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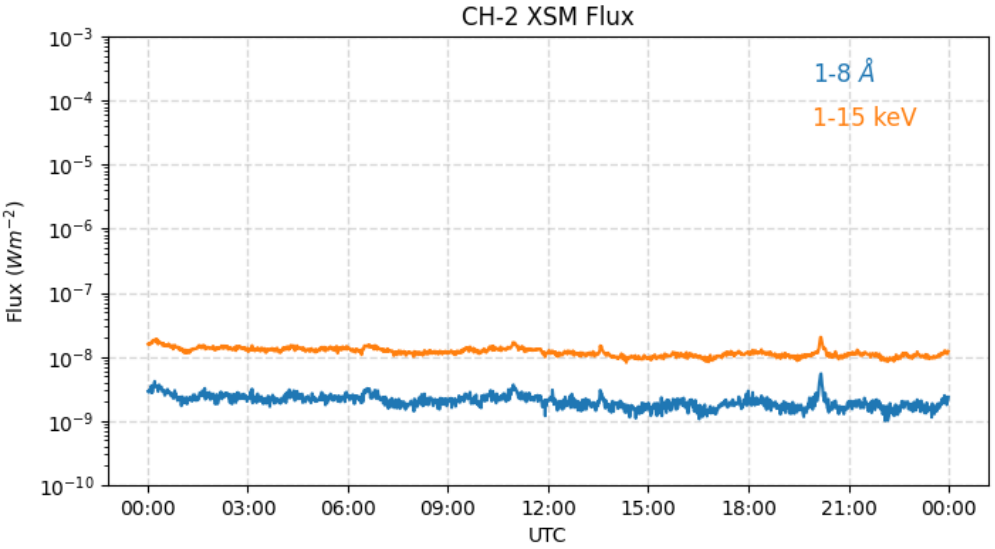

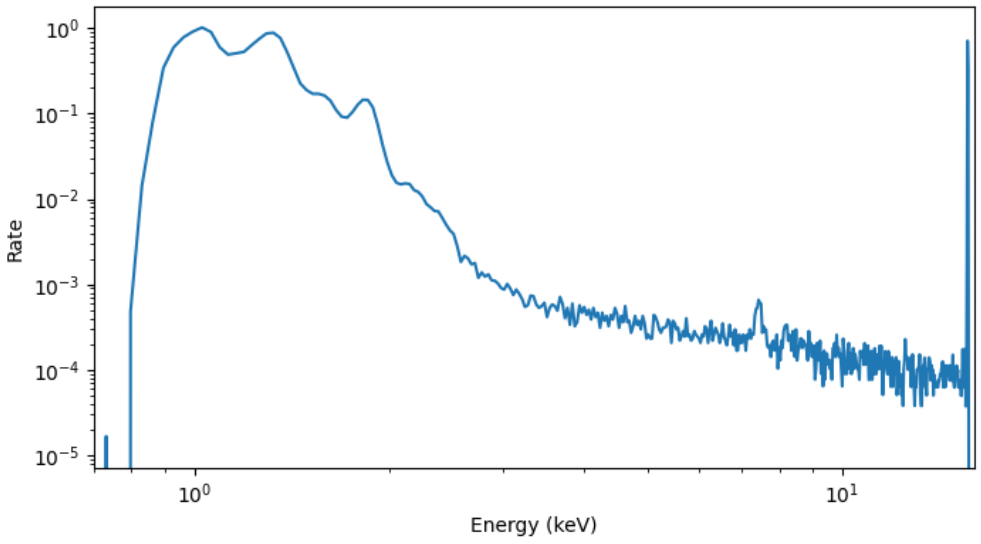

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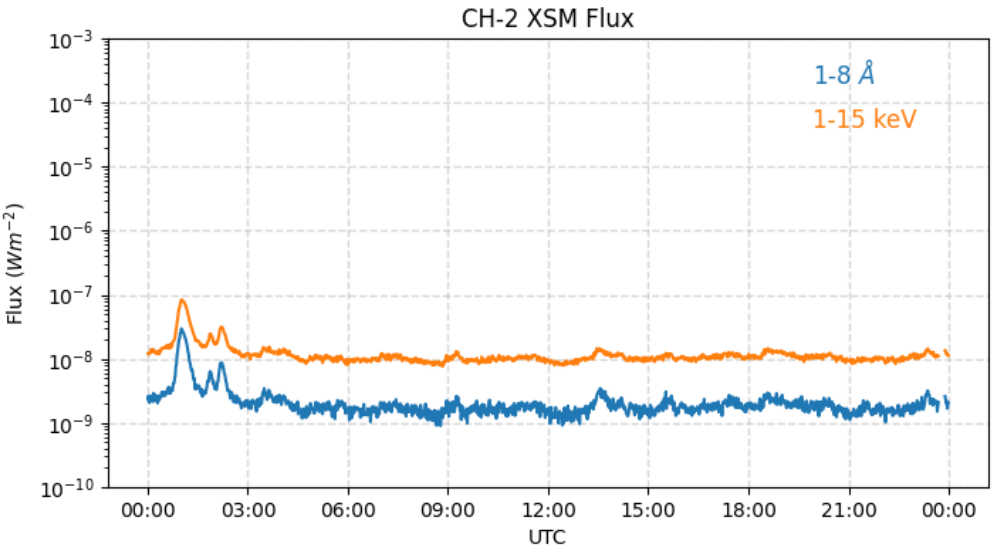

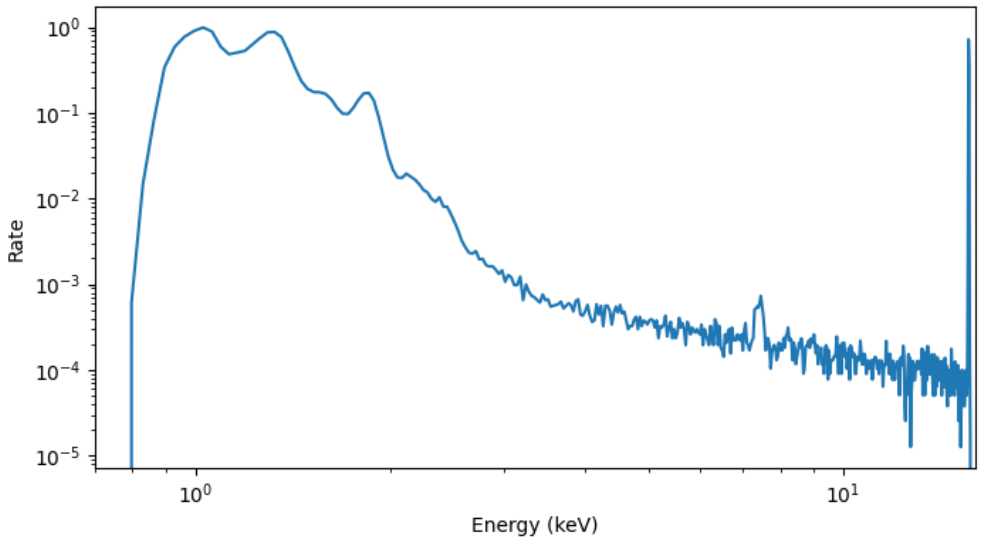

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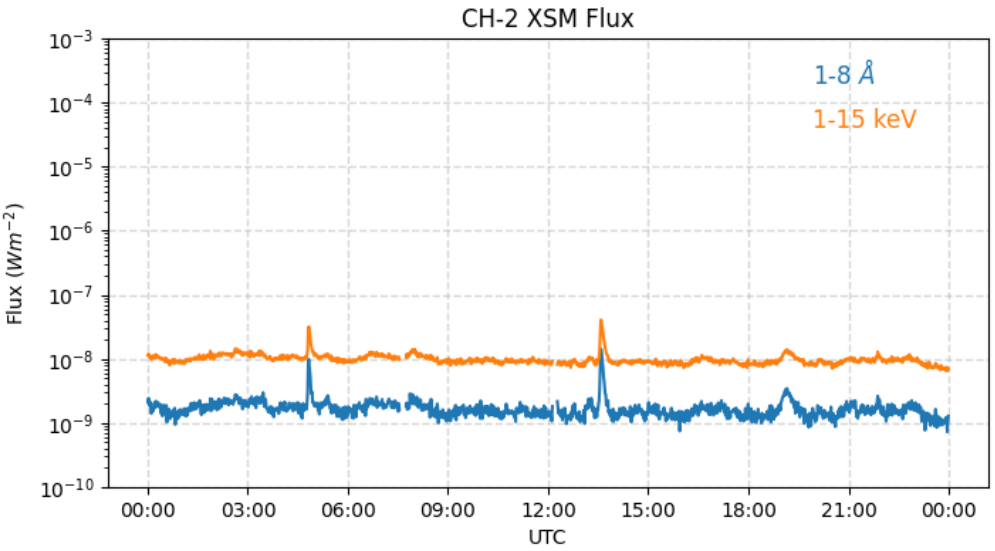

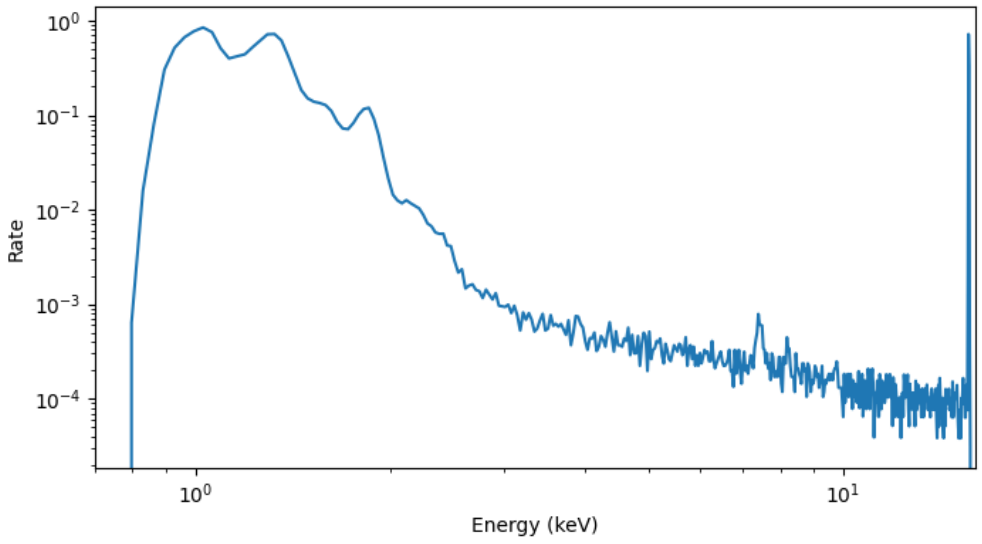

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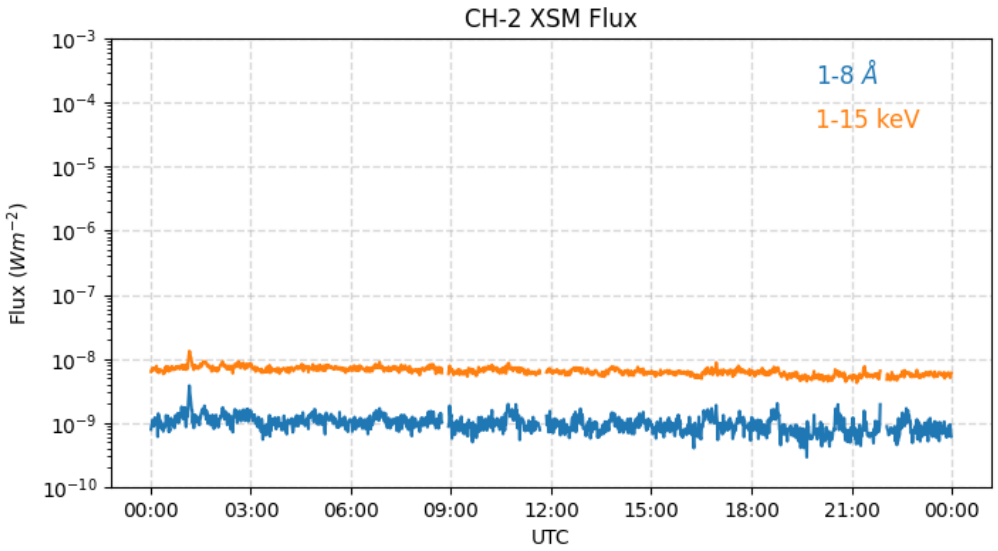

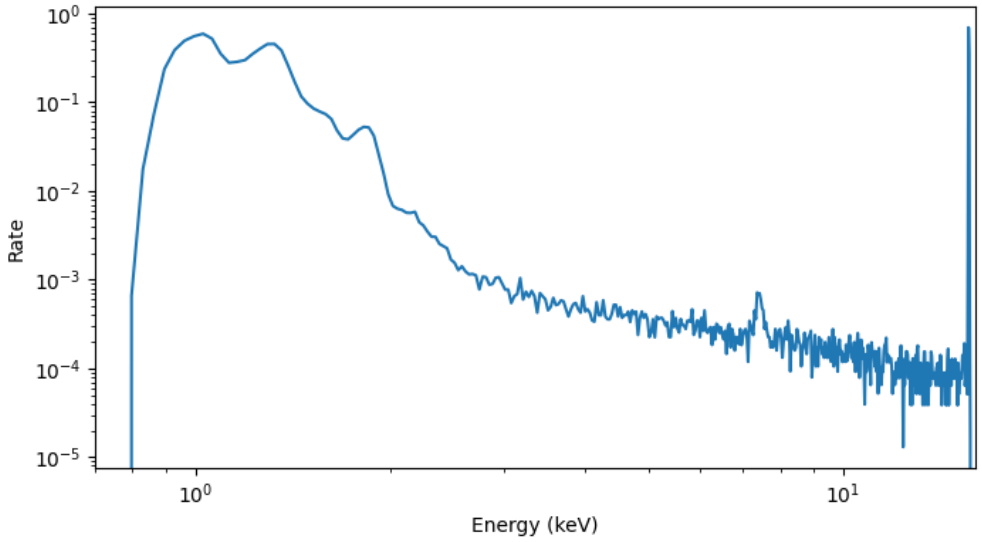

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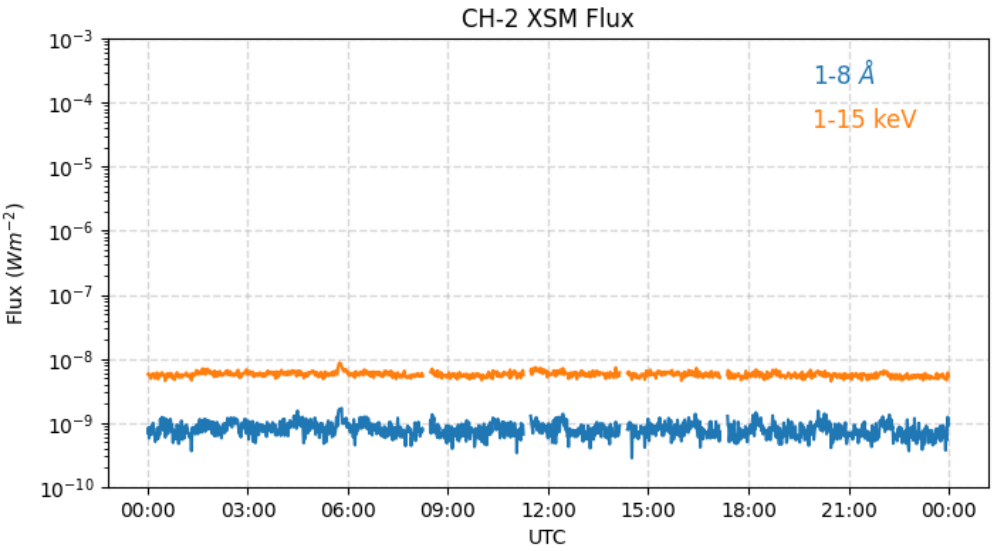

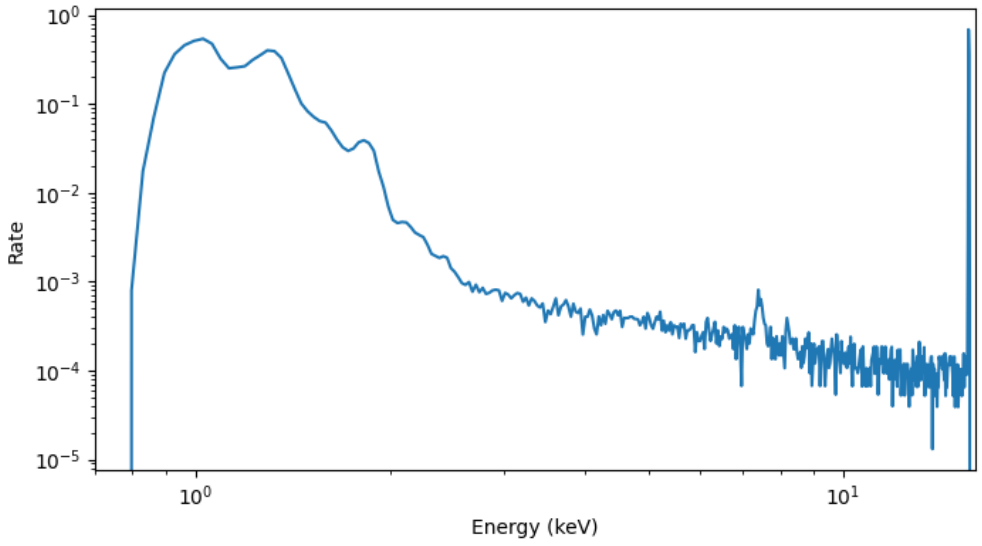

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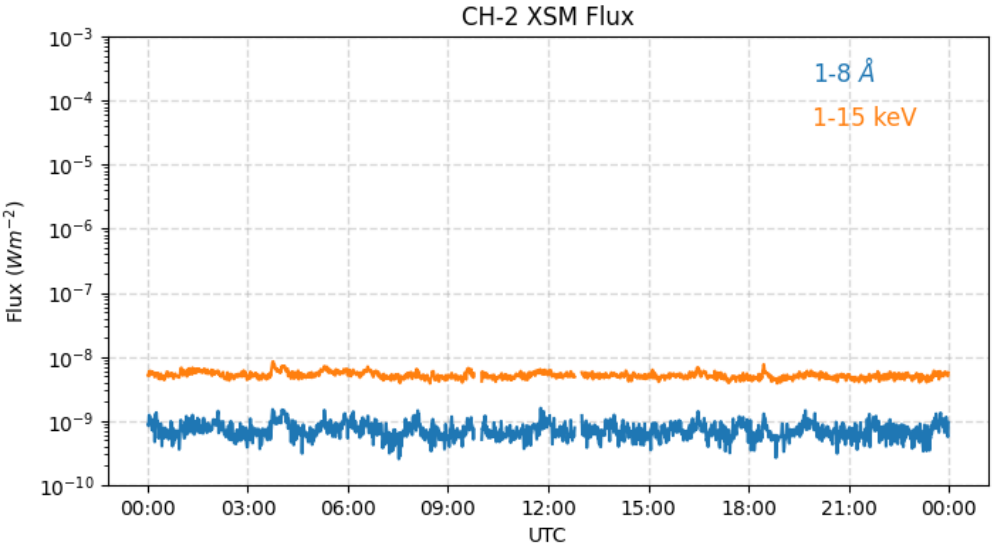

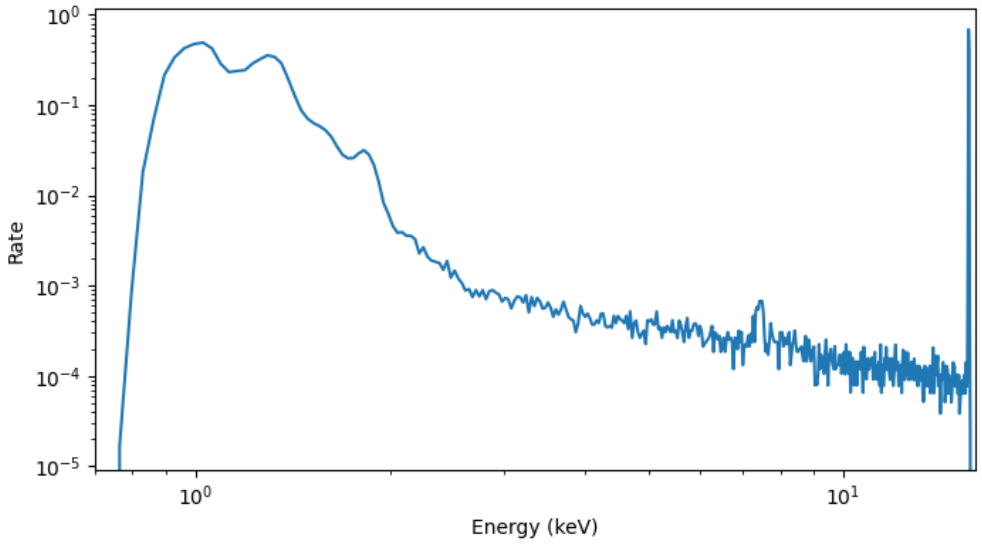

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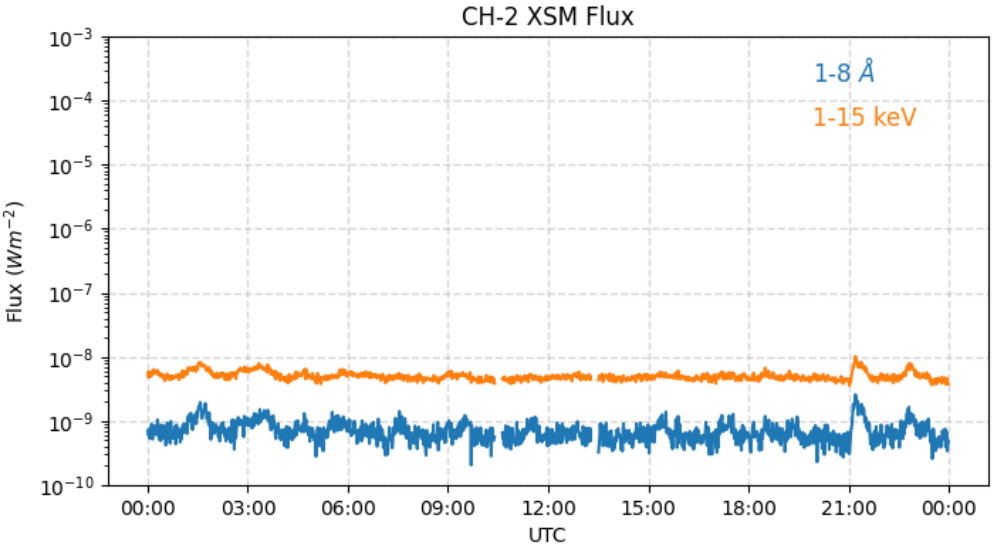

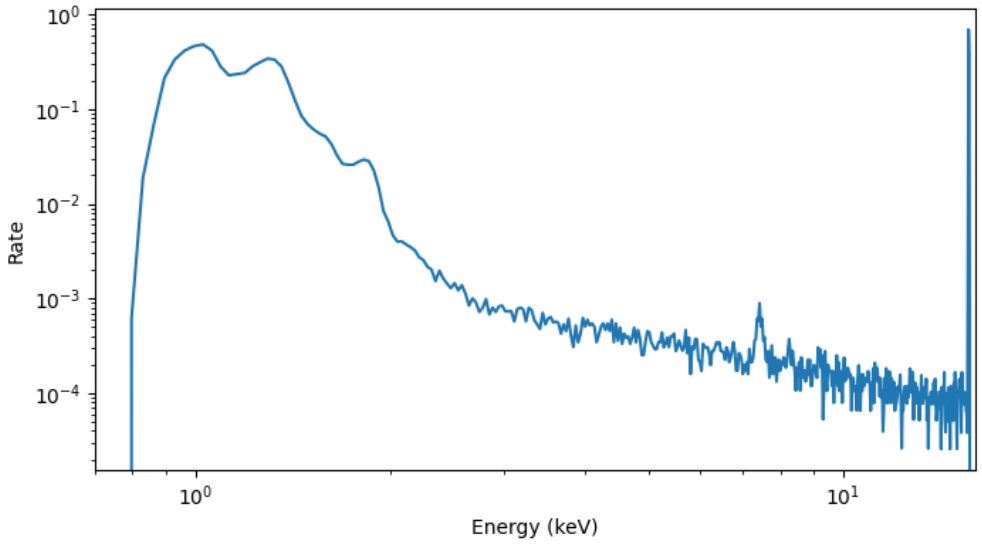

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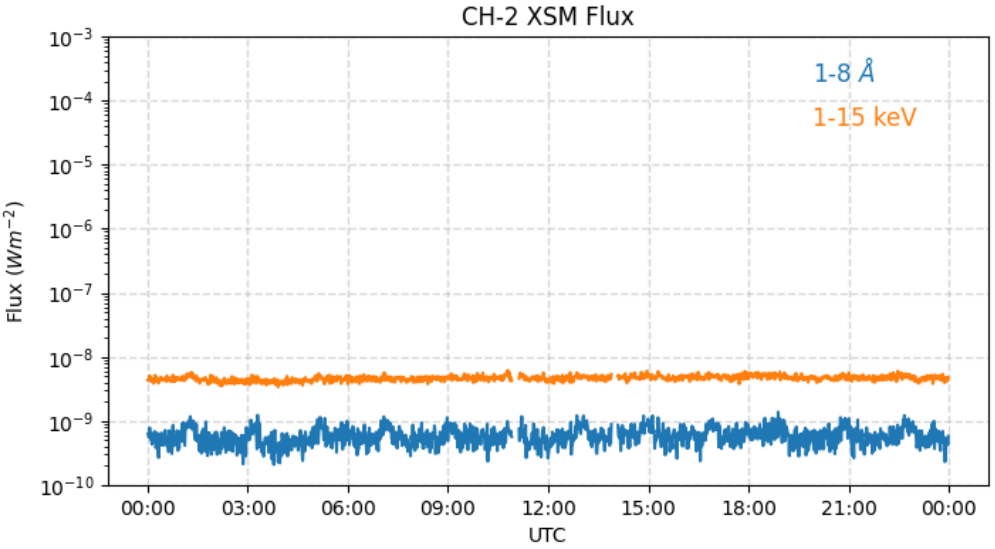

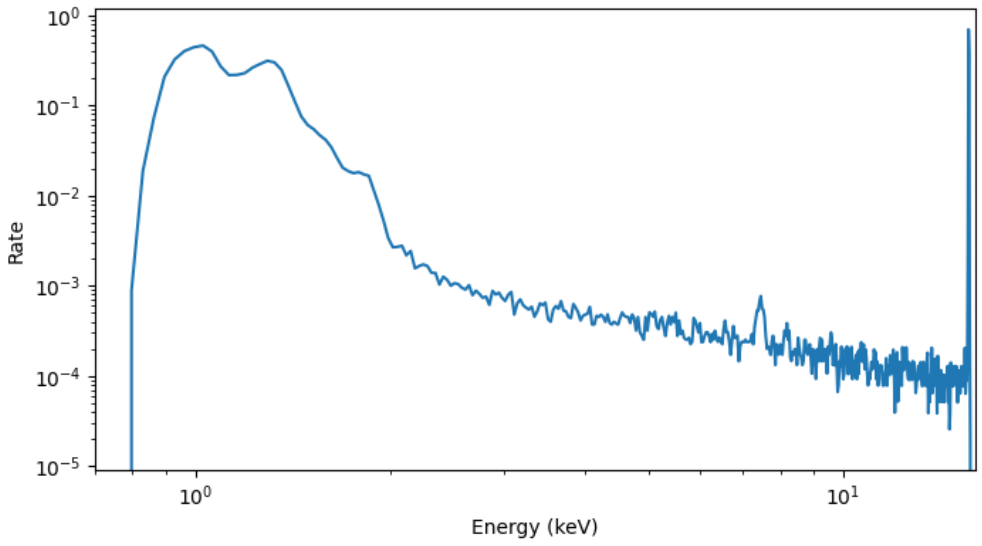

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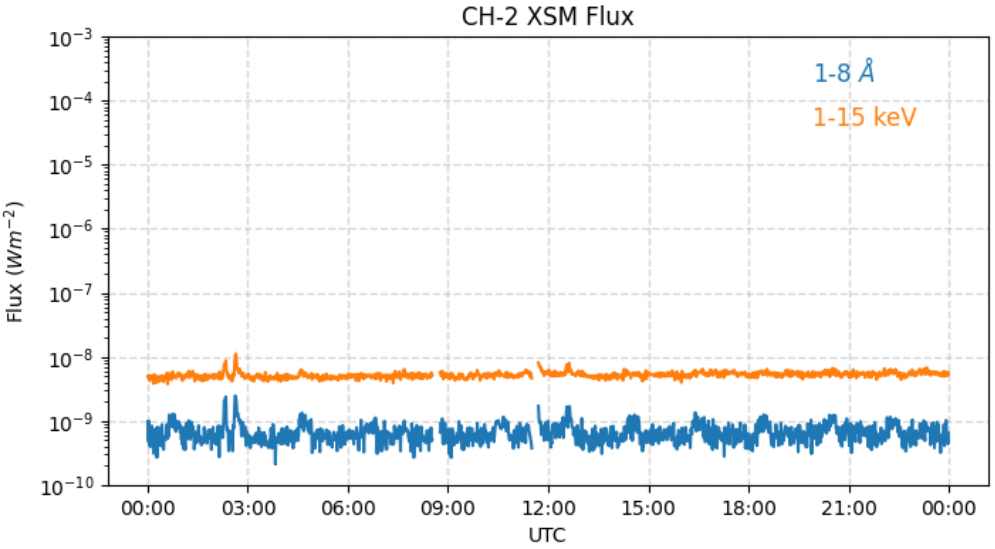

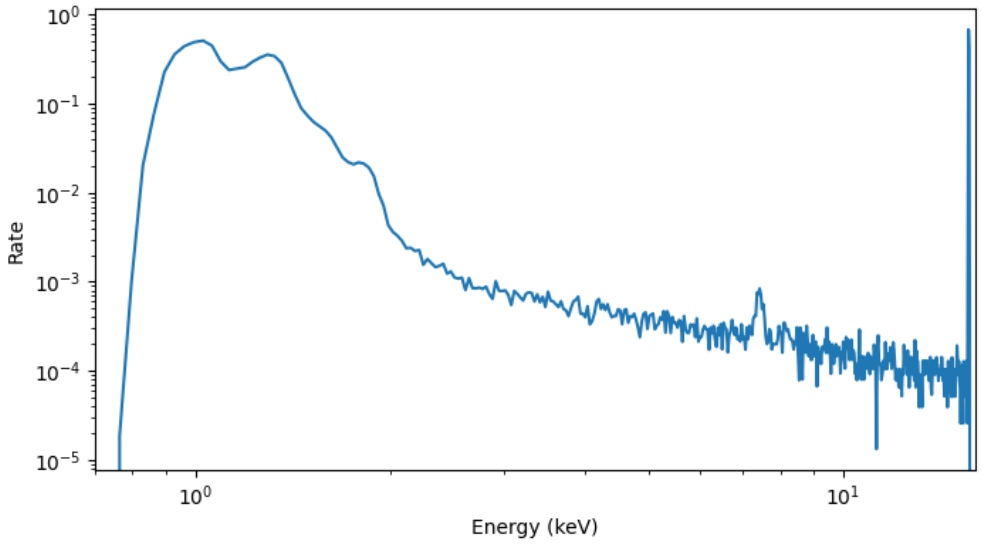

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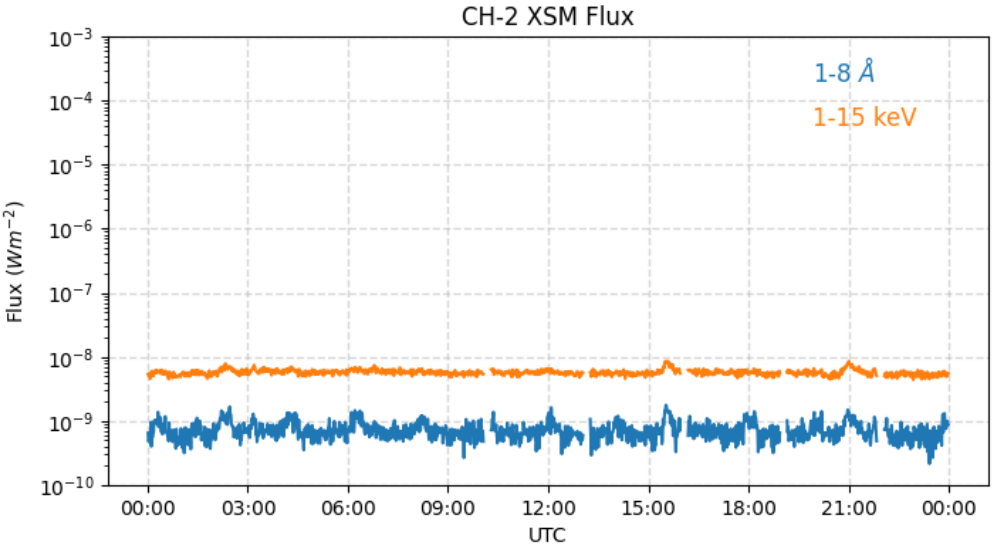

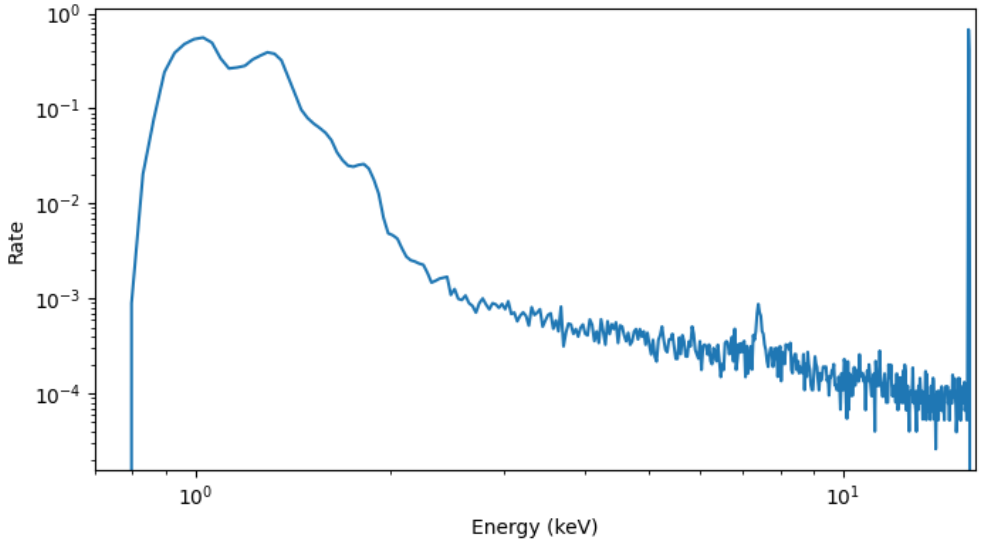

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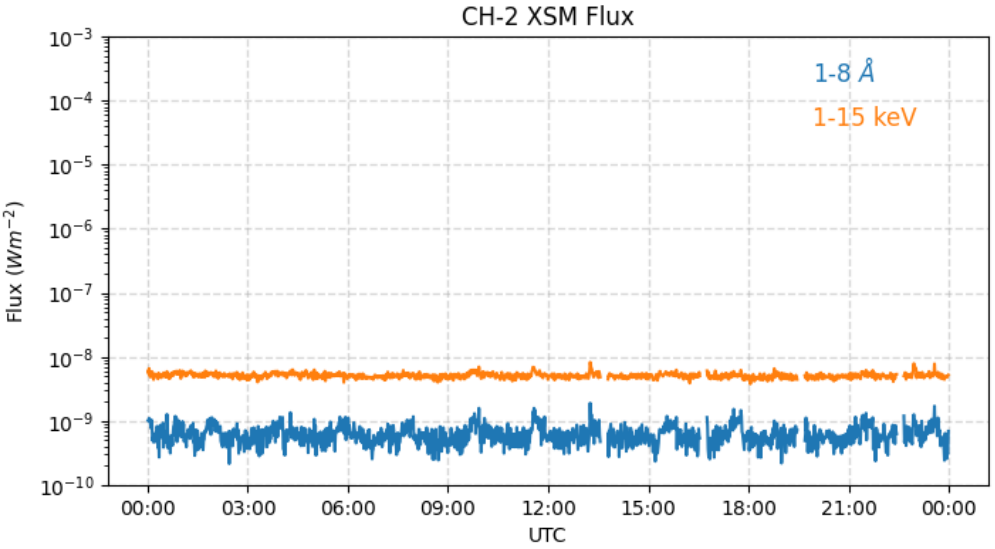

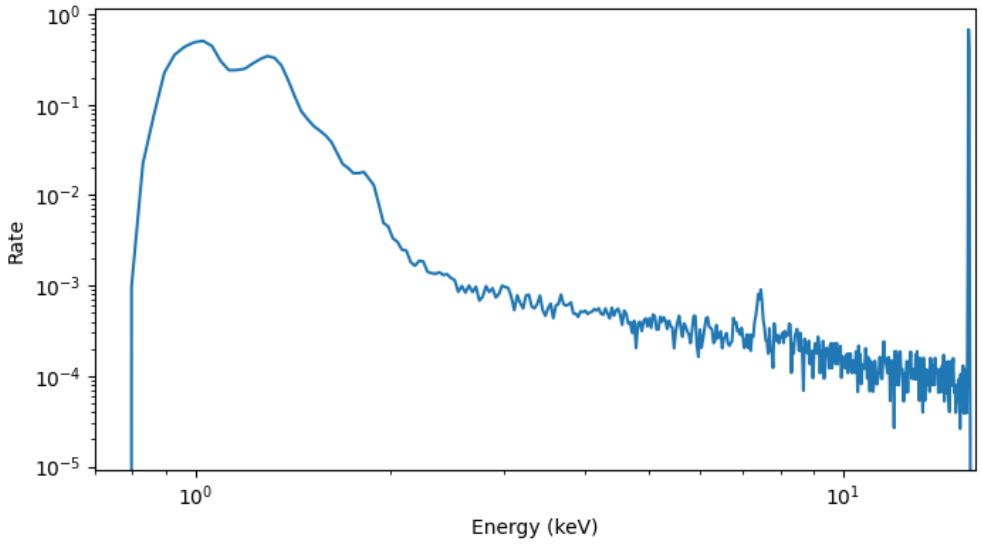

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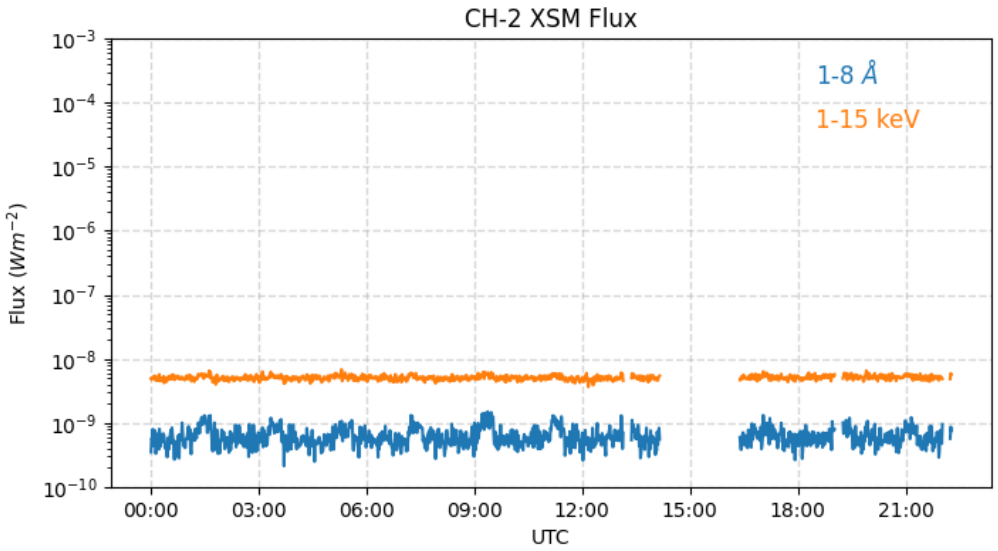

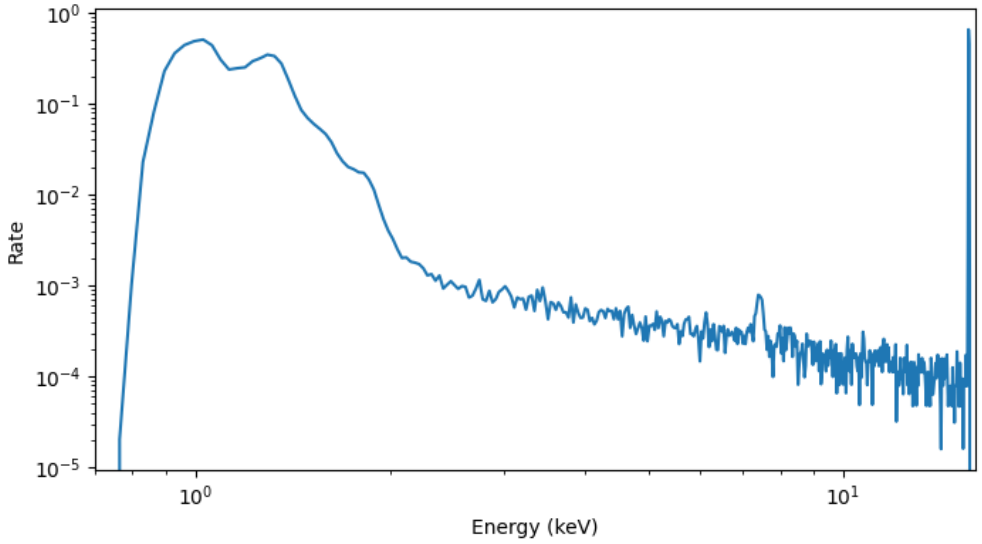

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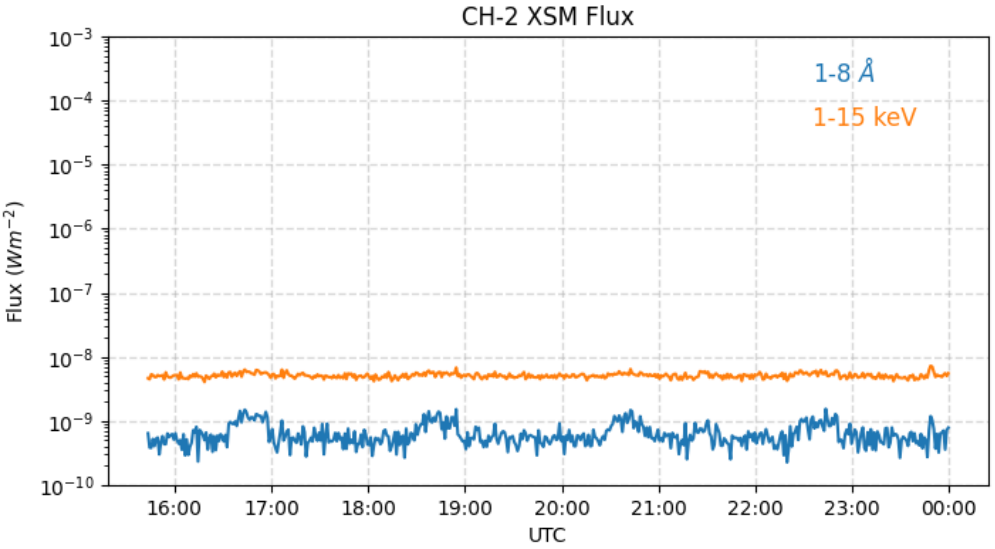

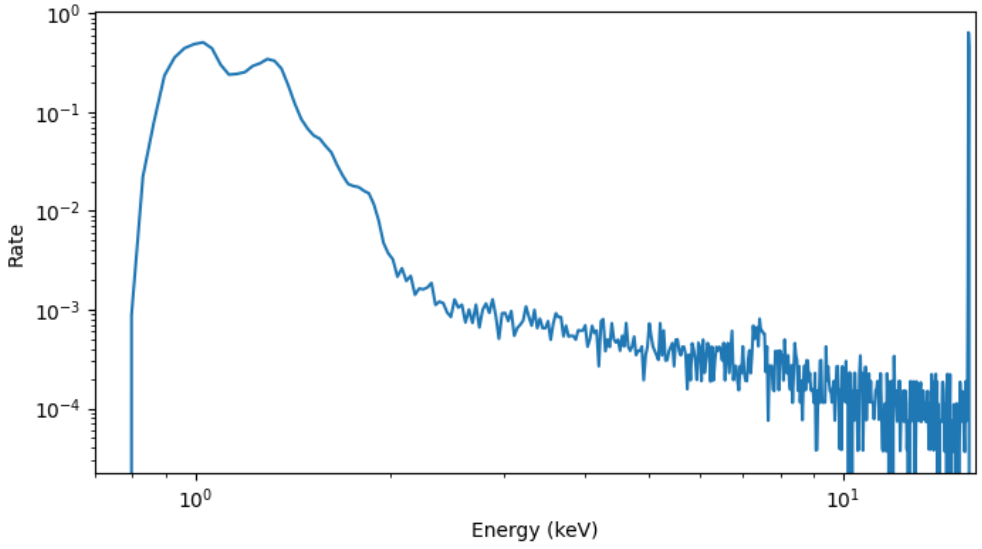

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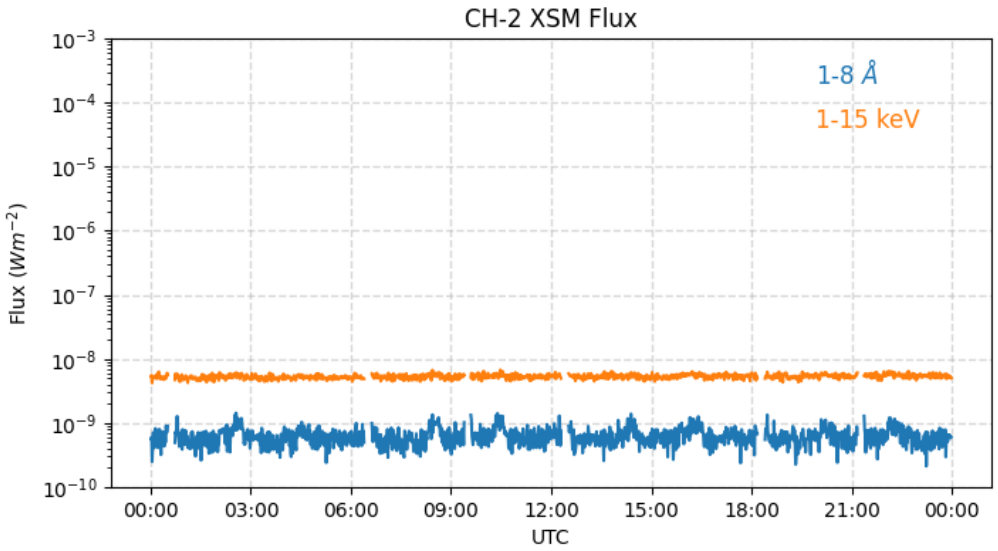

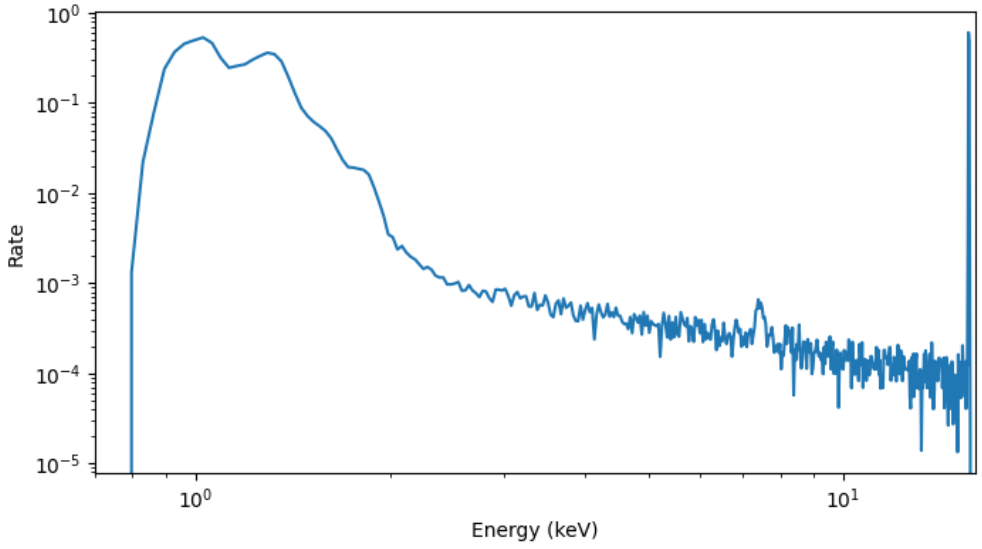

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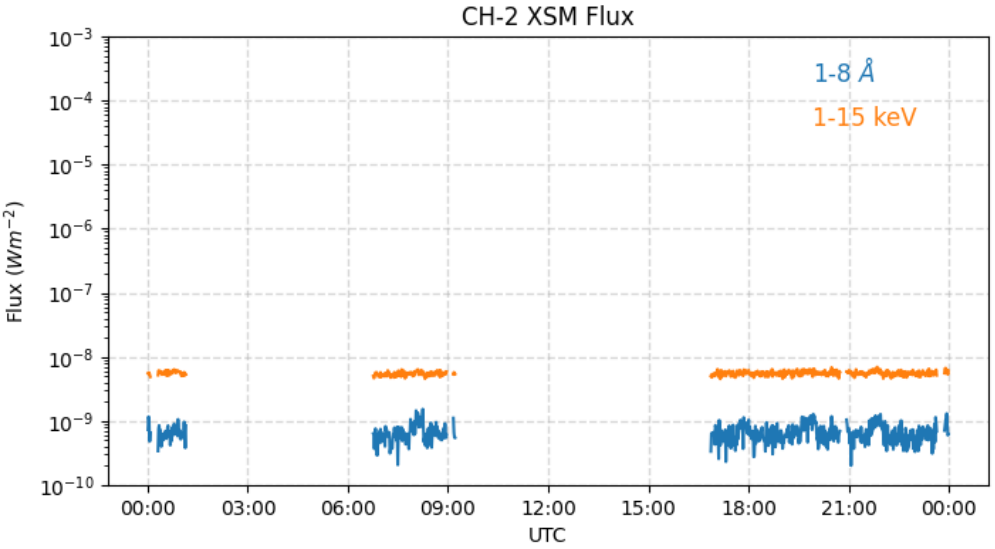

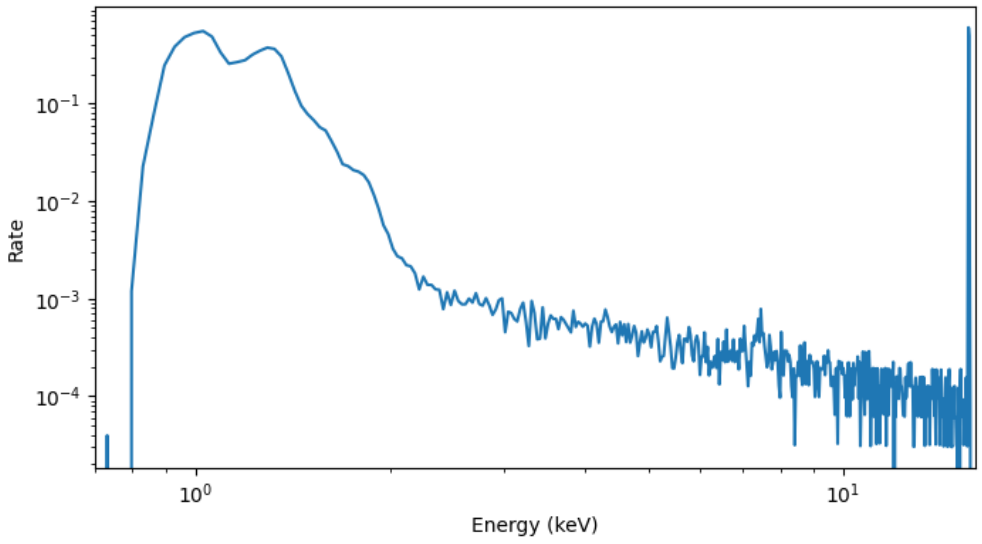

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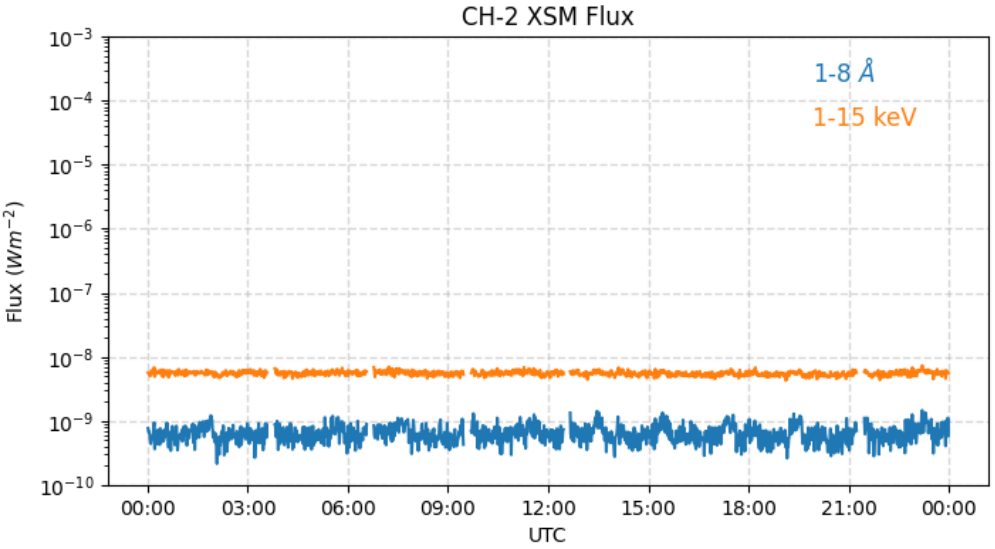

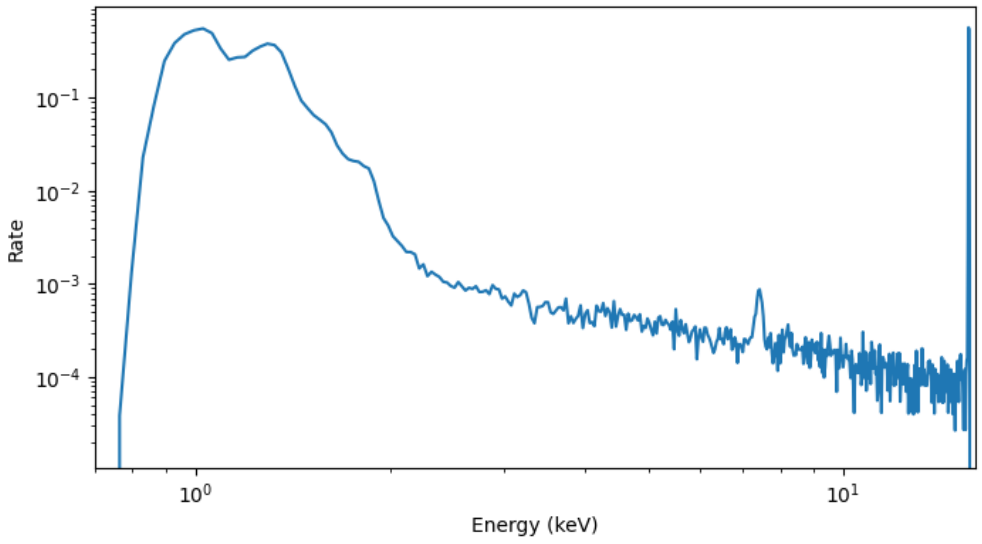

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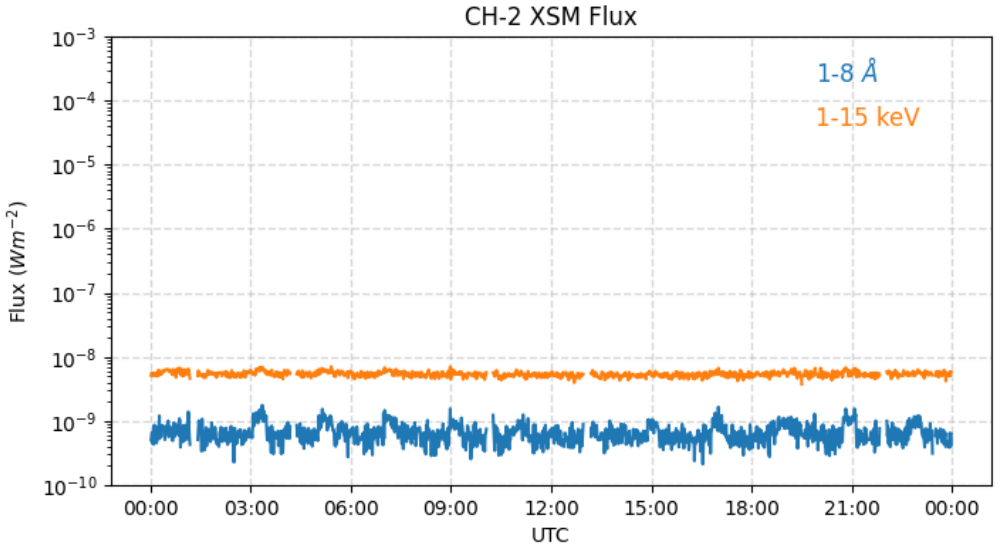

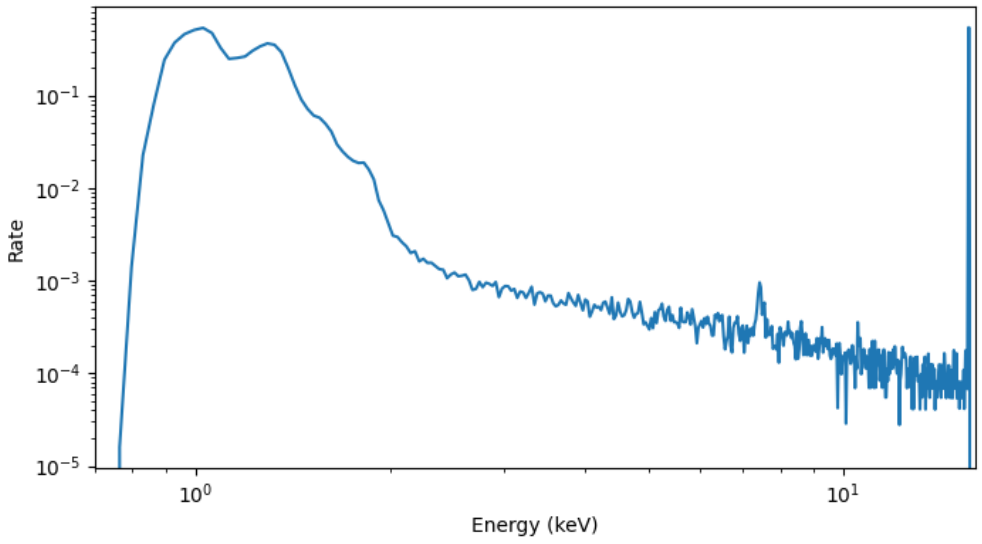

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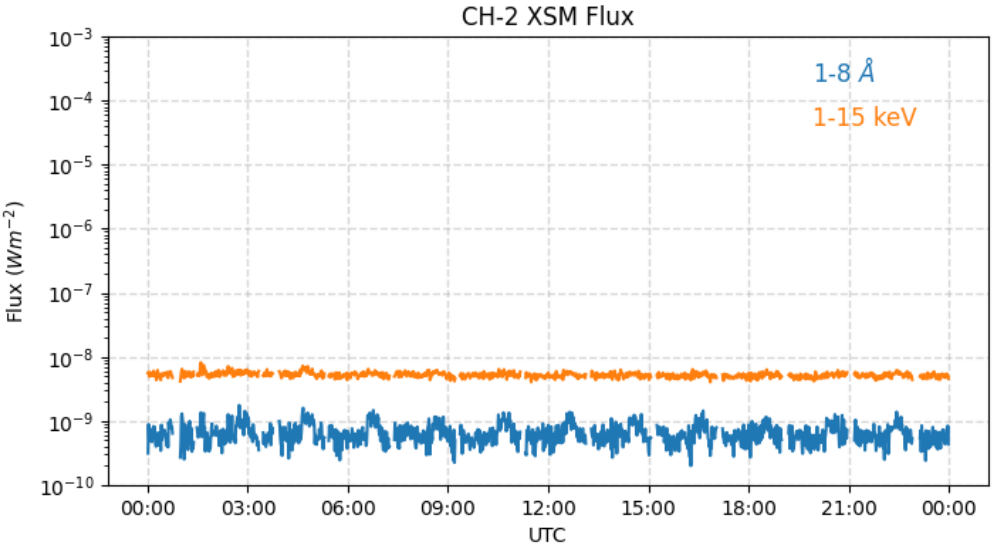
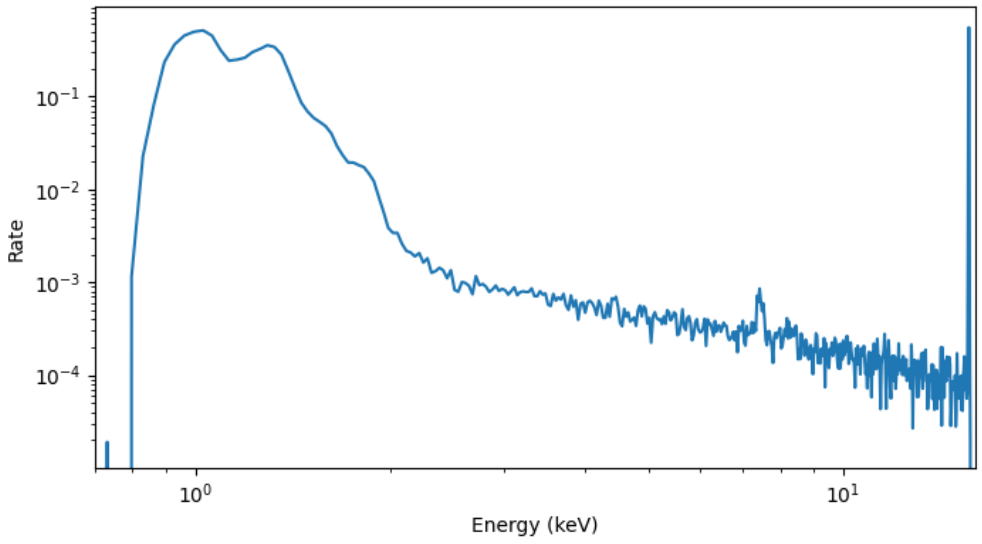
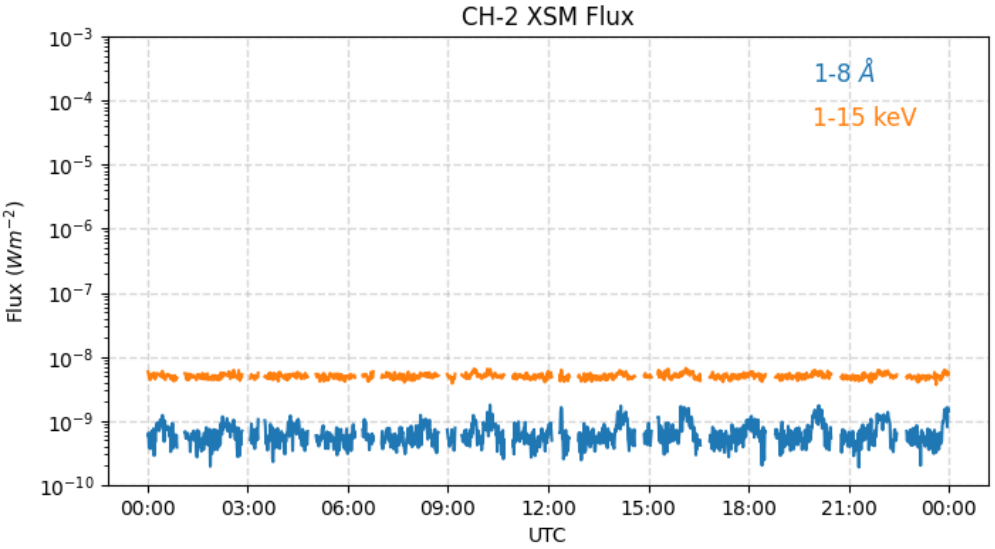
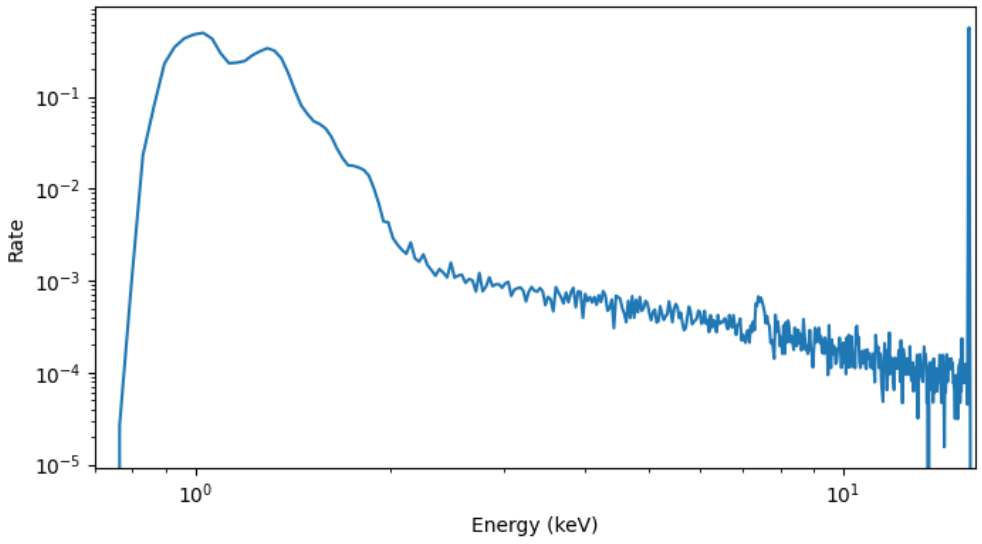


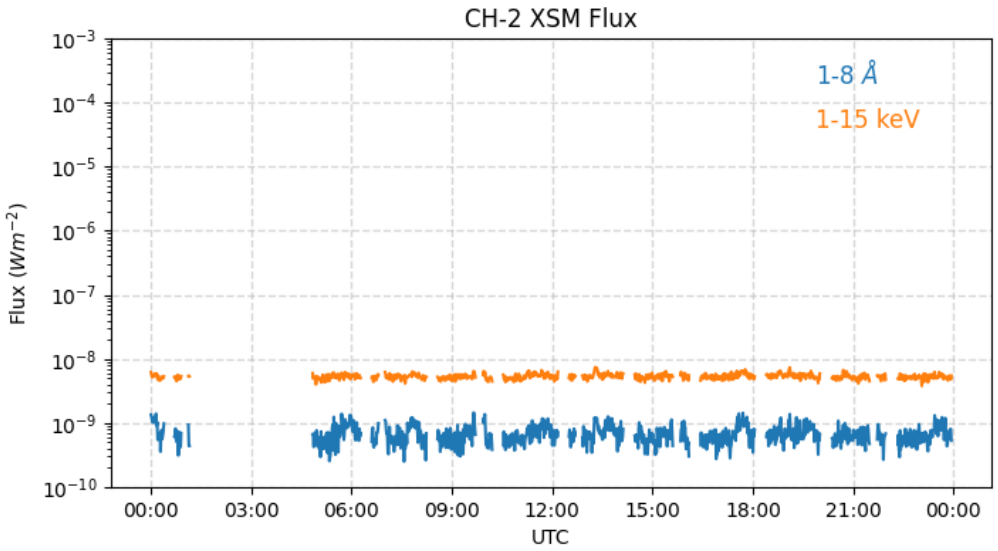


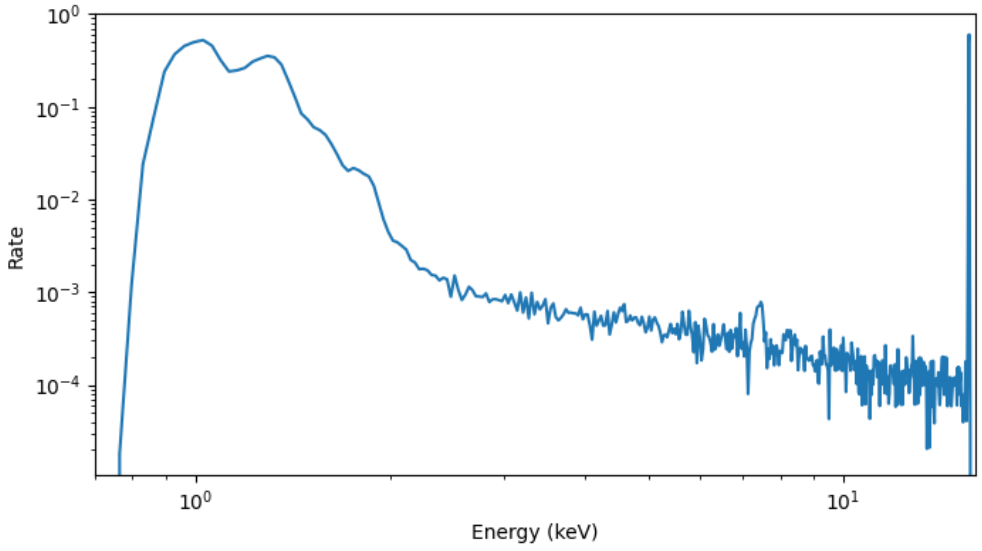
Date: 2019-10-21





Date: 2019-10-22





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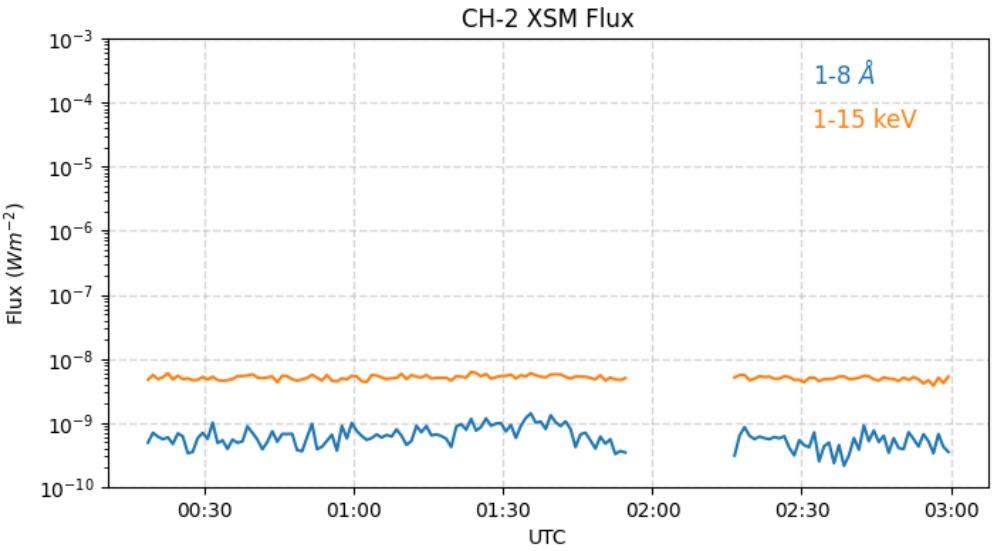

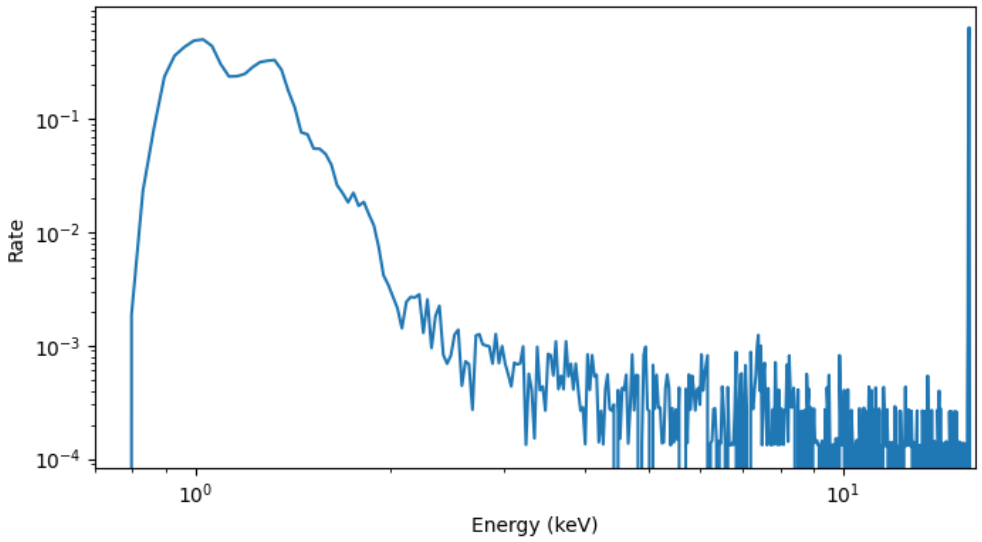

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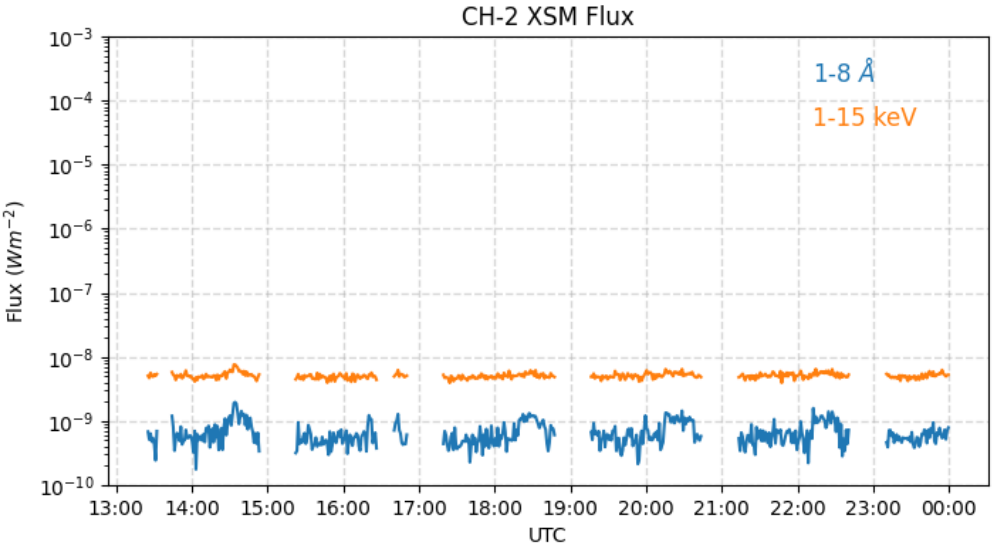

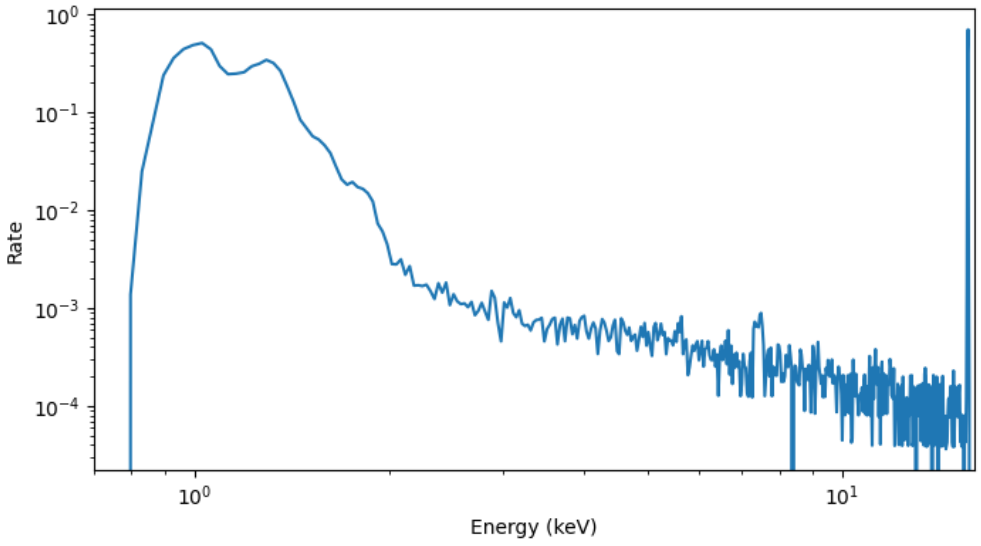

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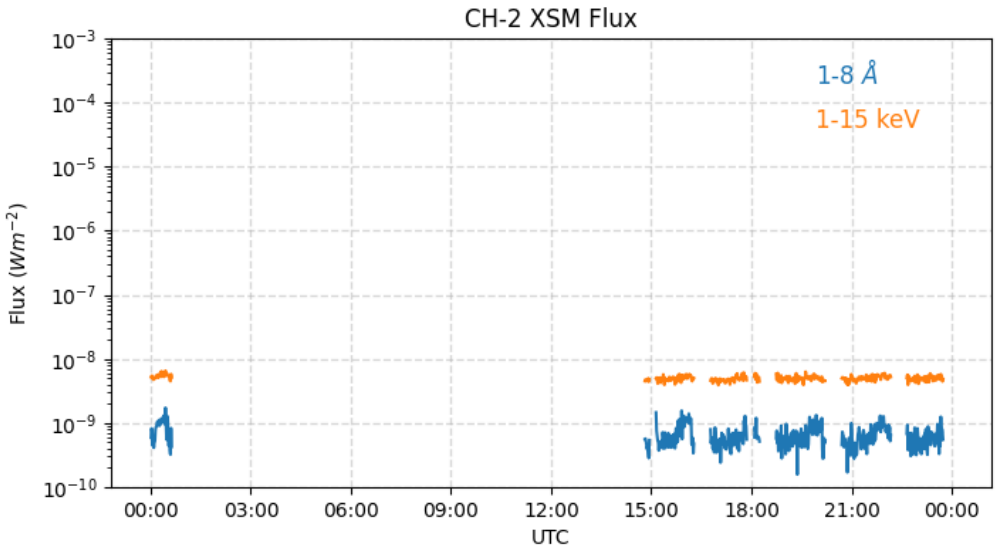

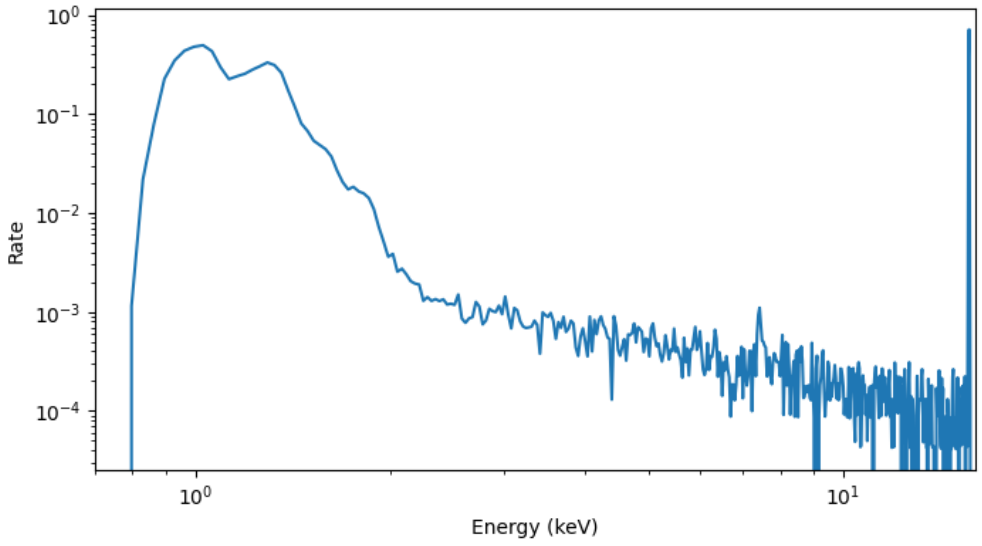

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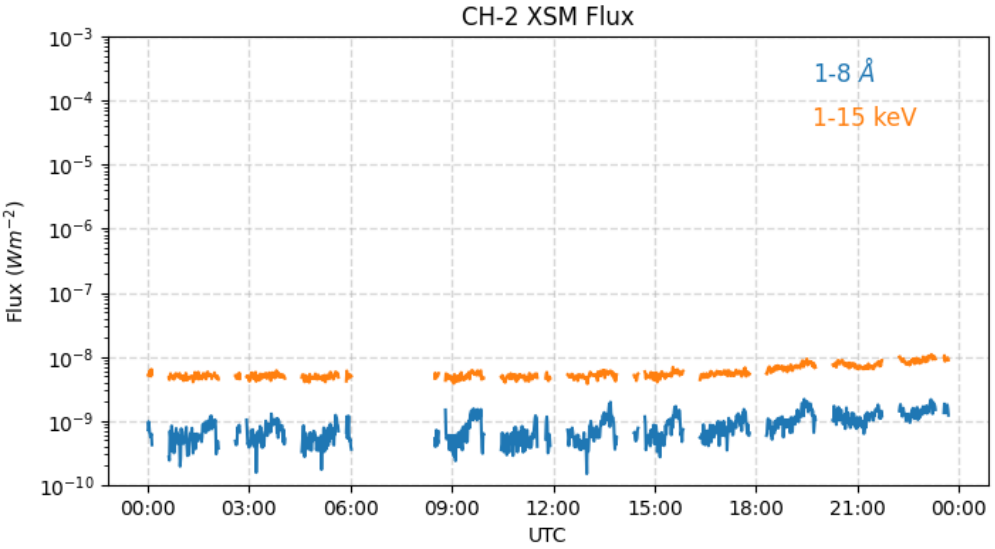

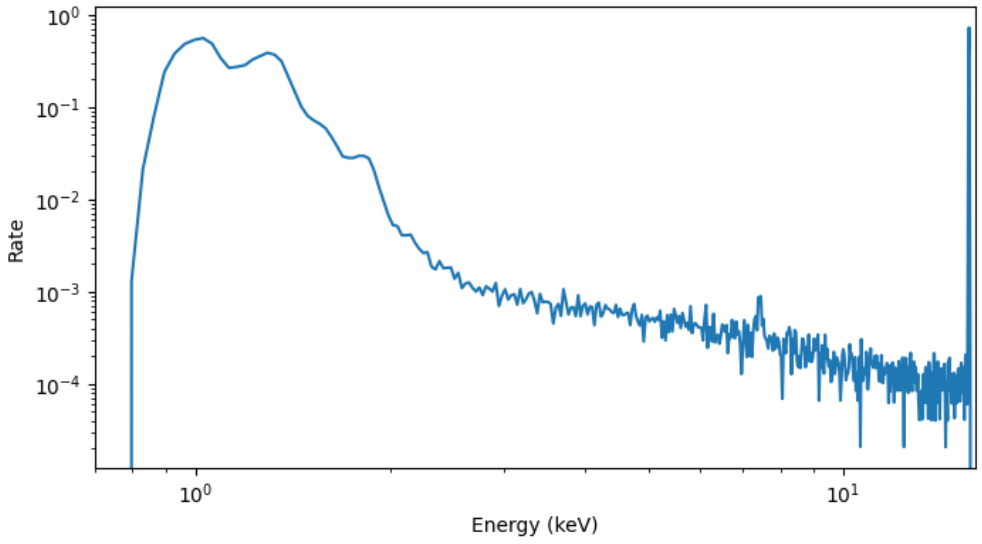

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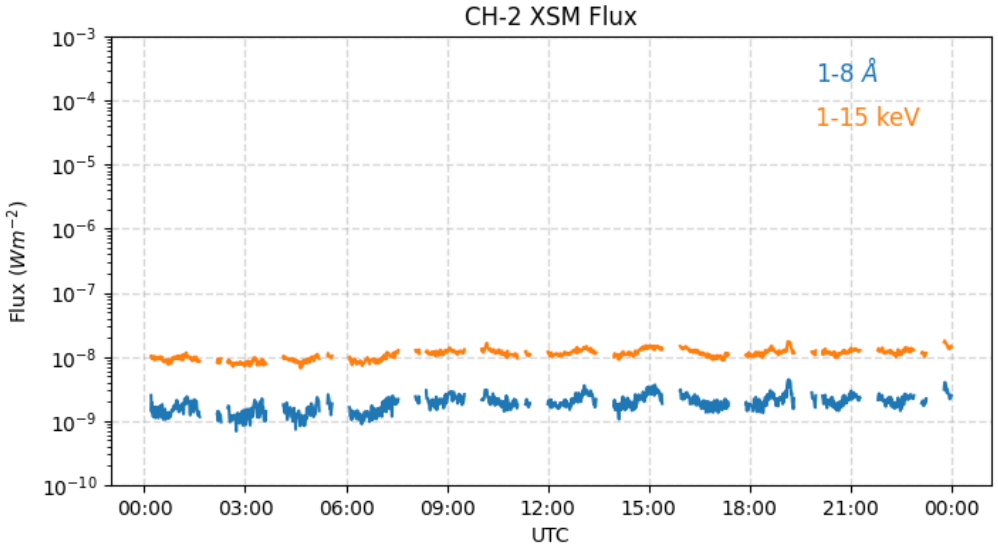

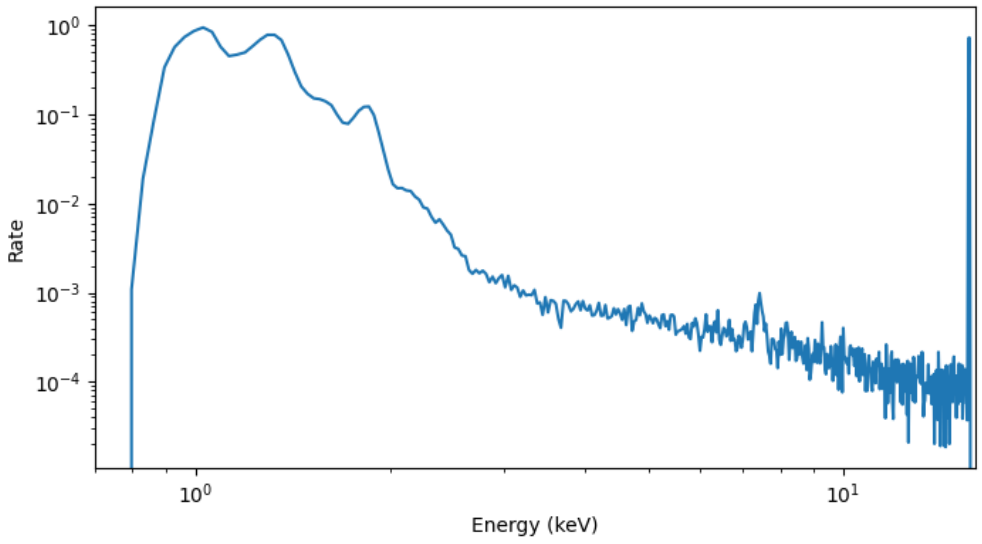

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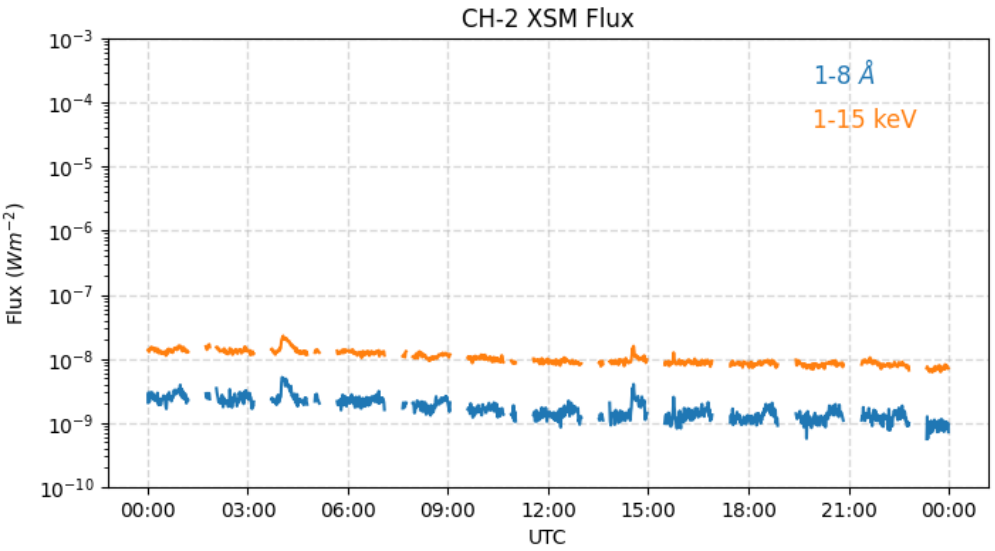

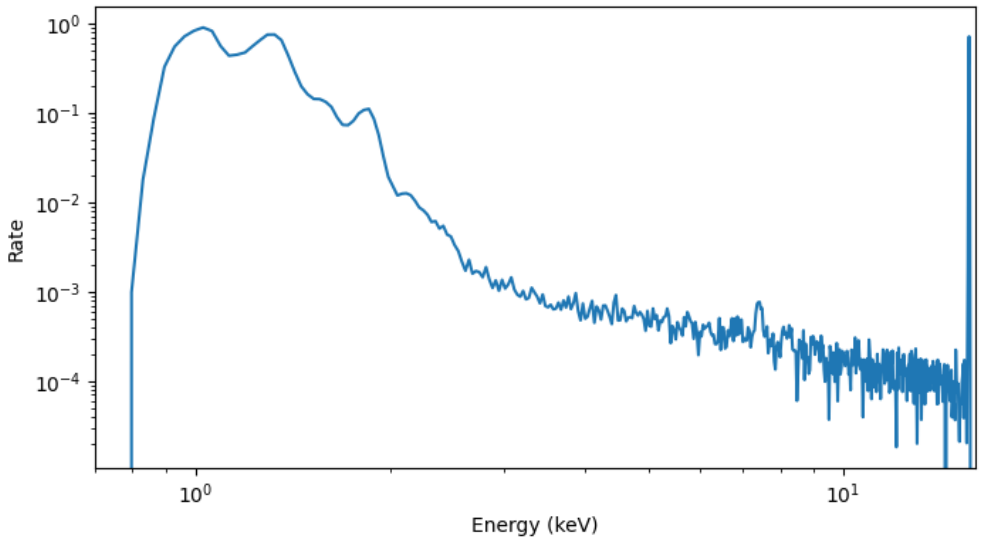

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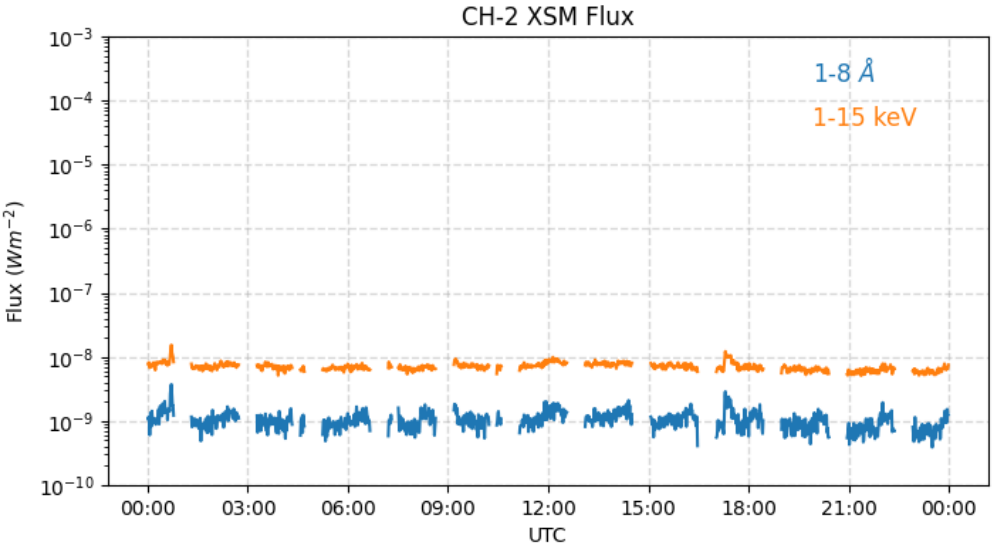

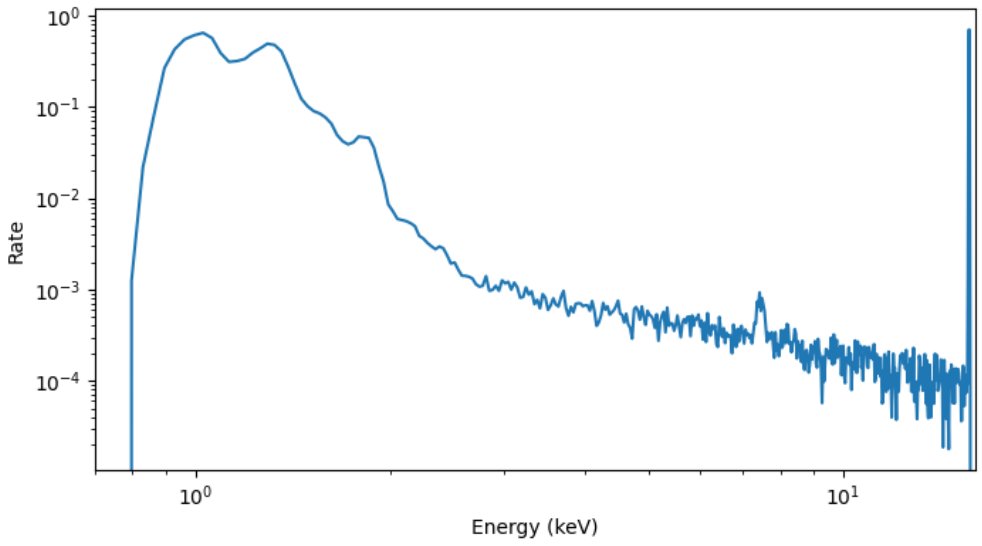

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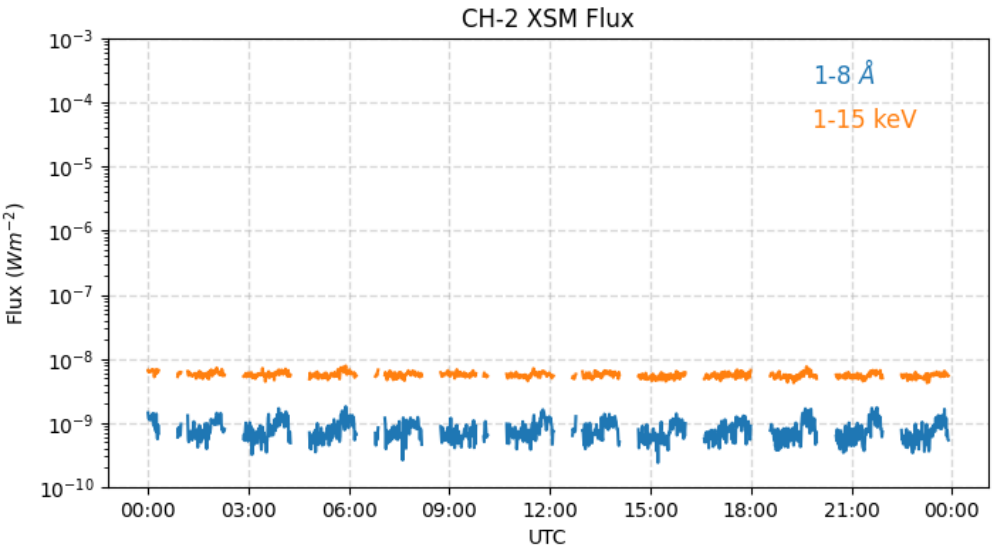

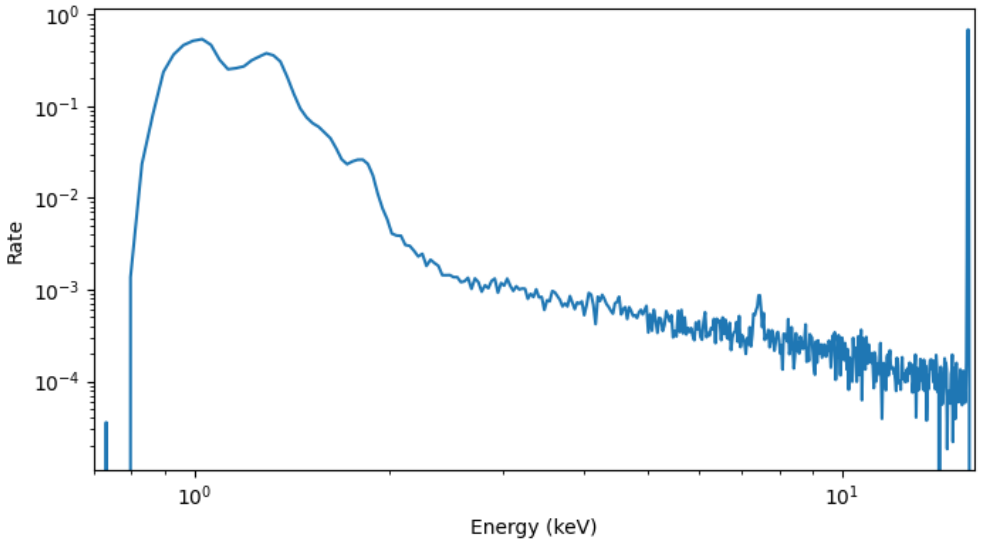

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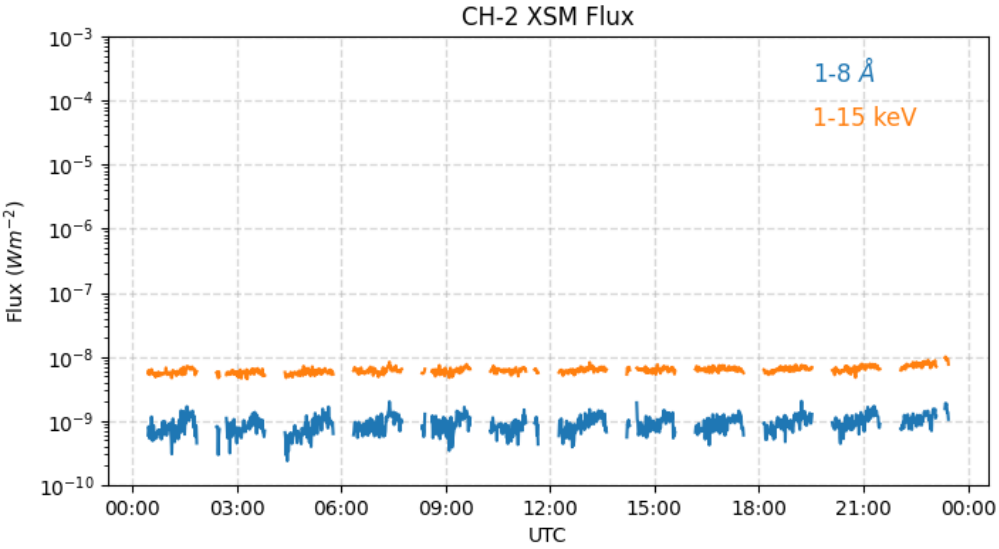
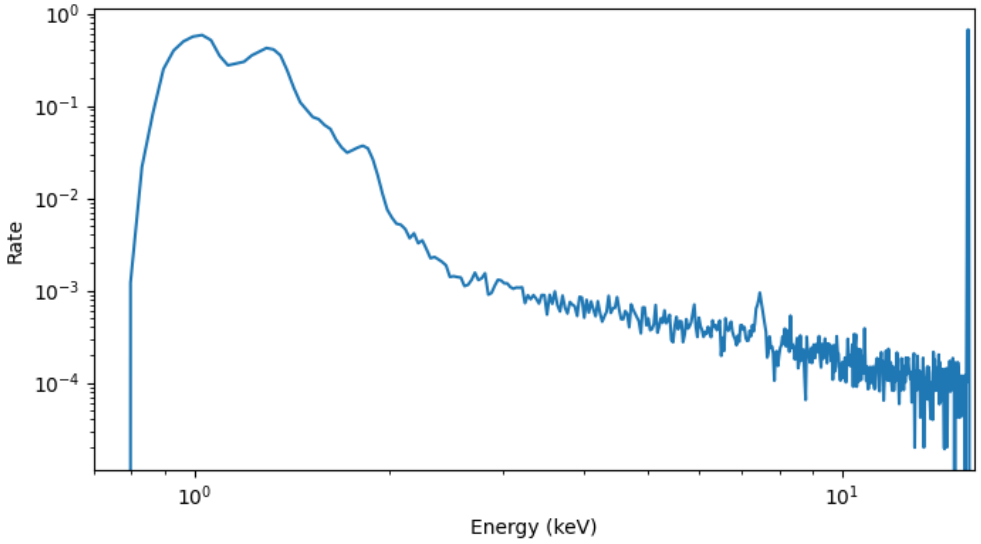
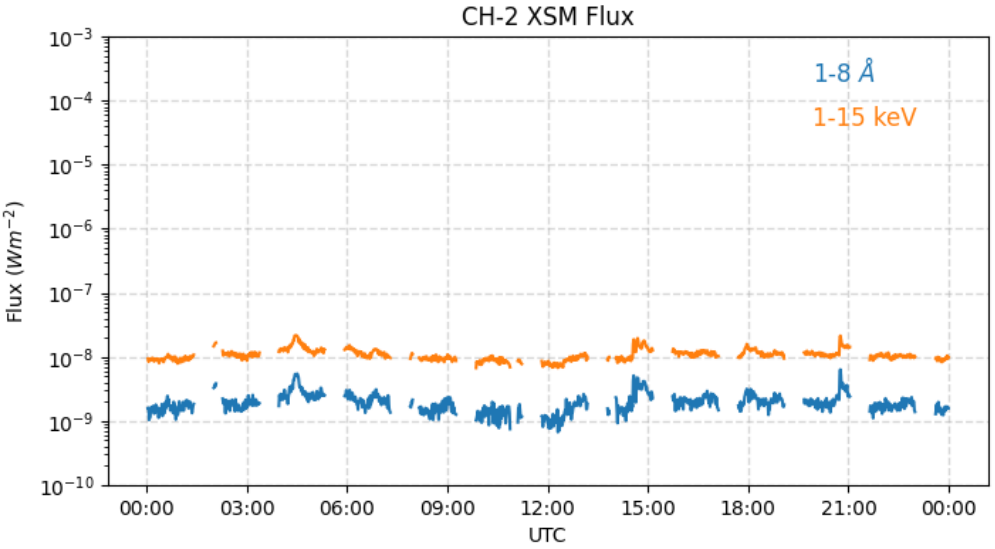
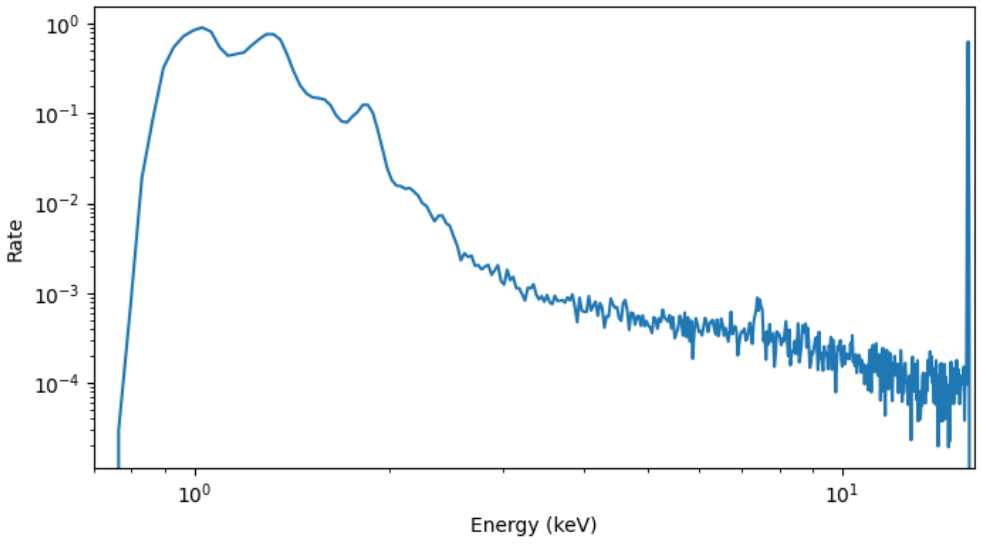


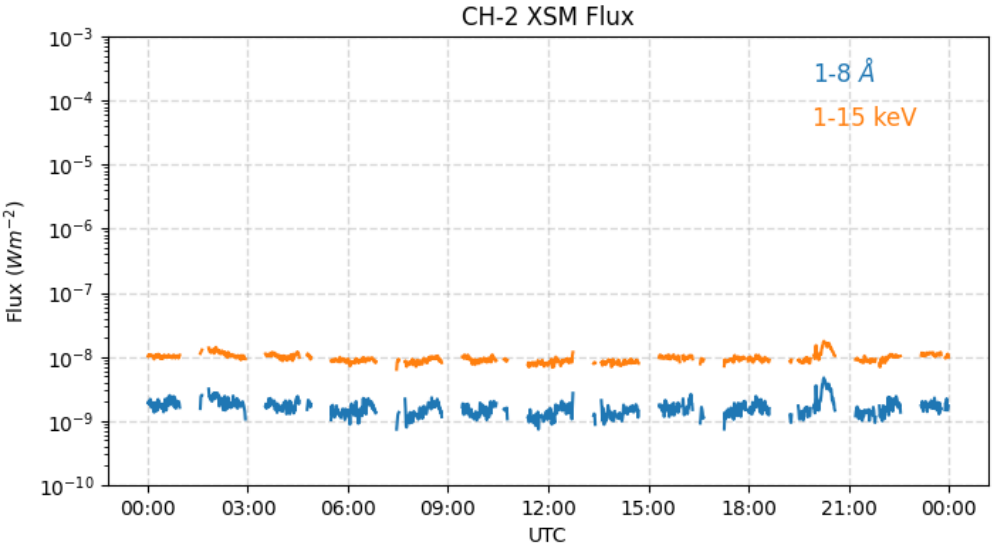


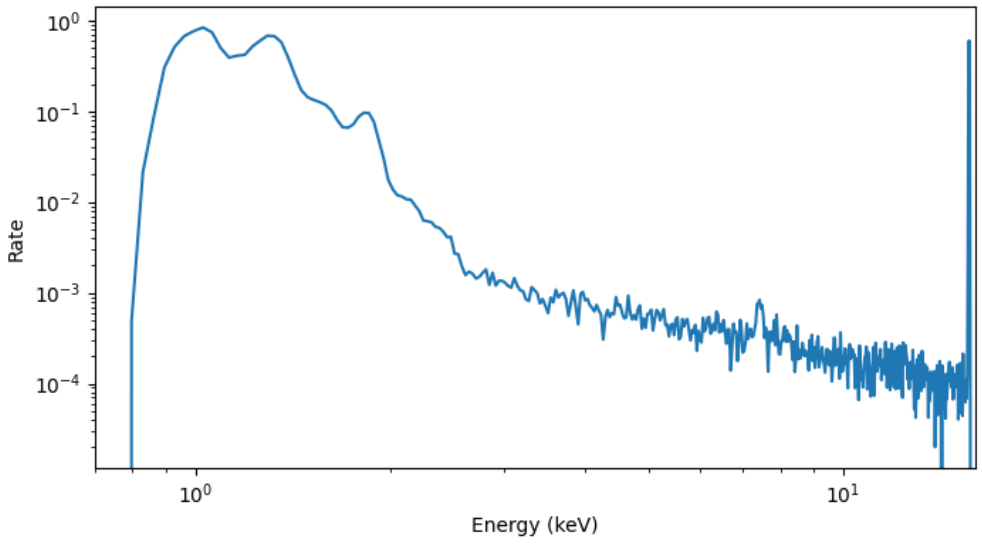
Date: 2019-11-01





Date: 2019-11-02





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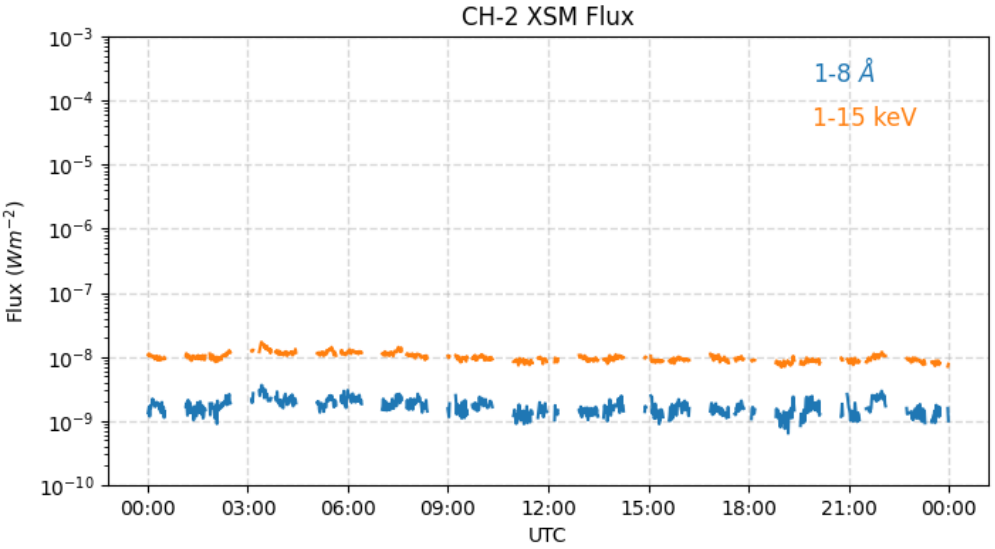

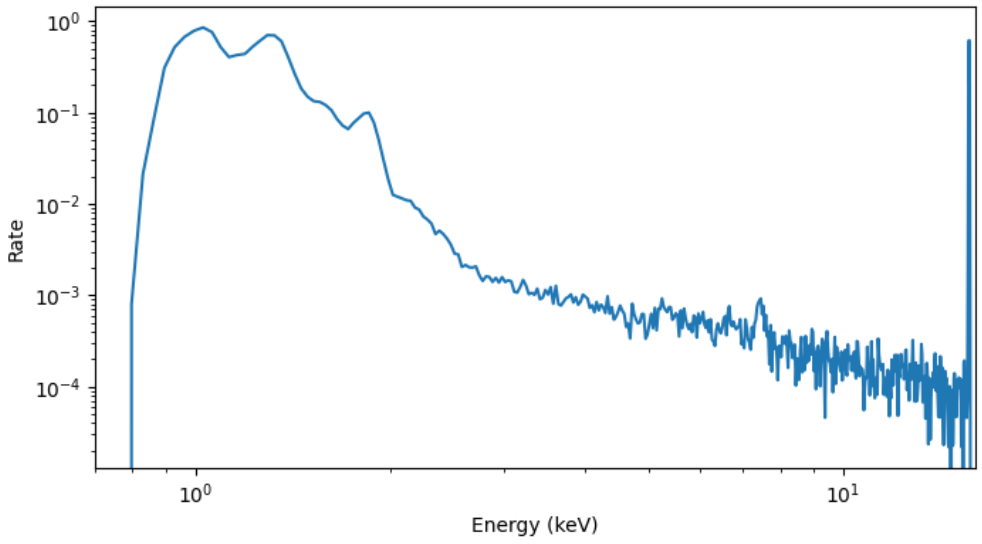

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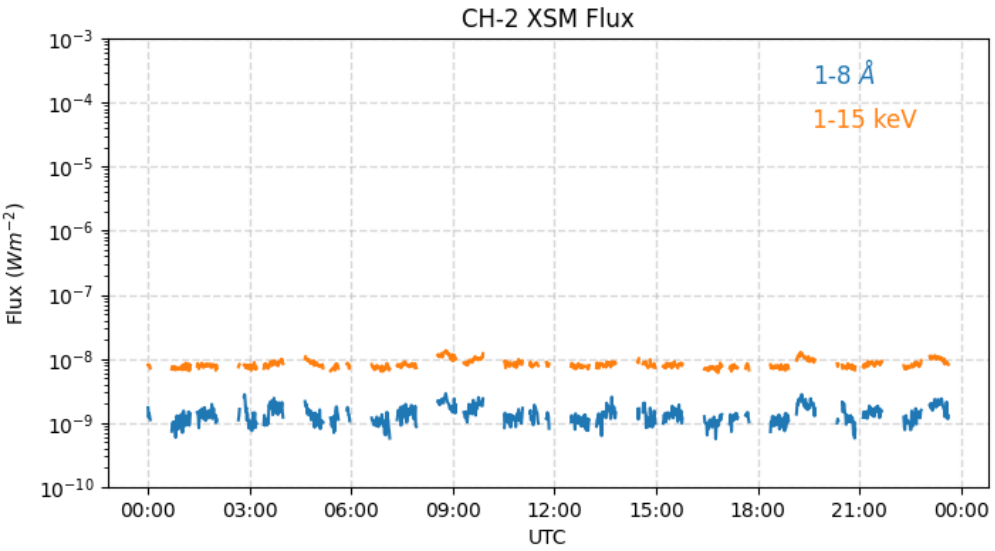

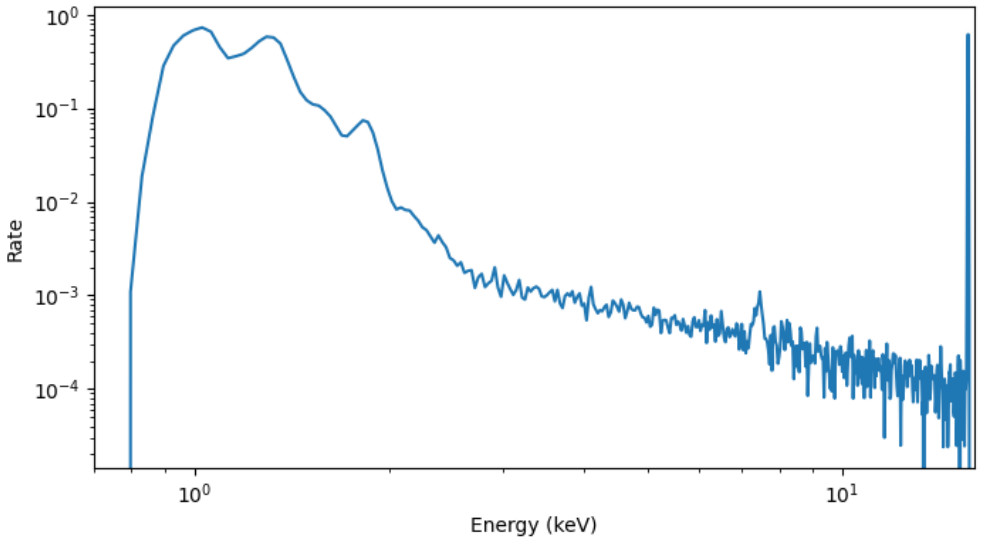

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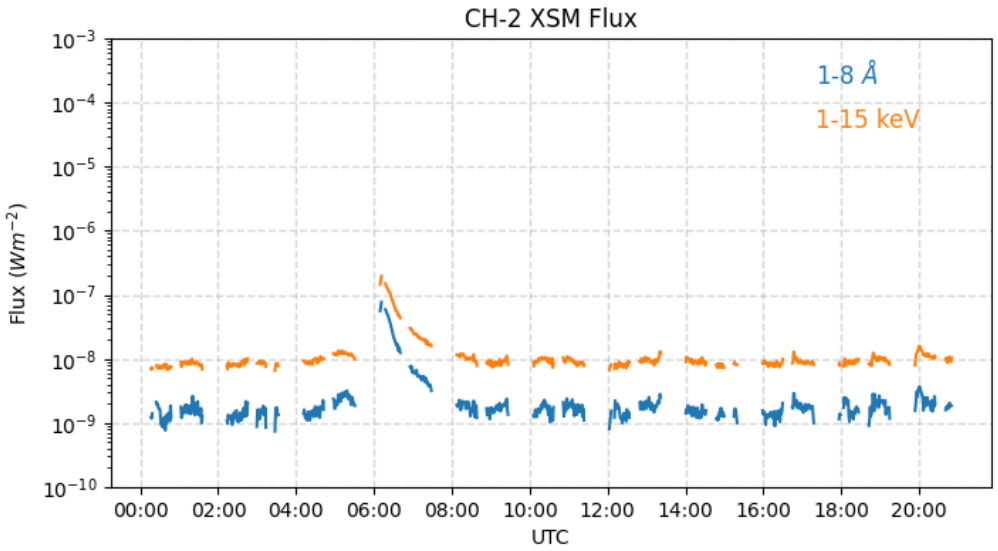

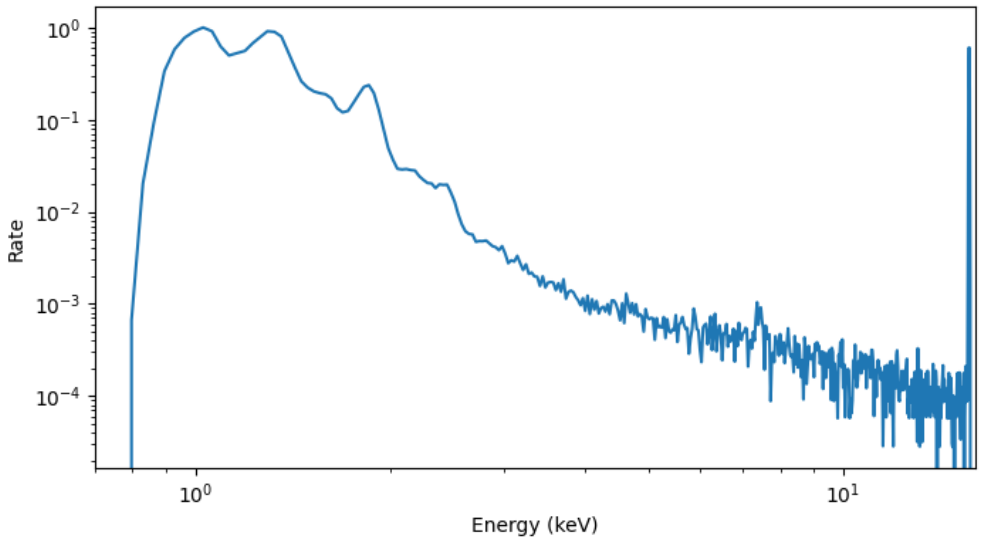

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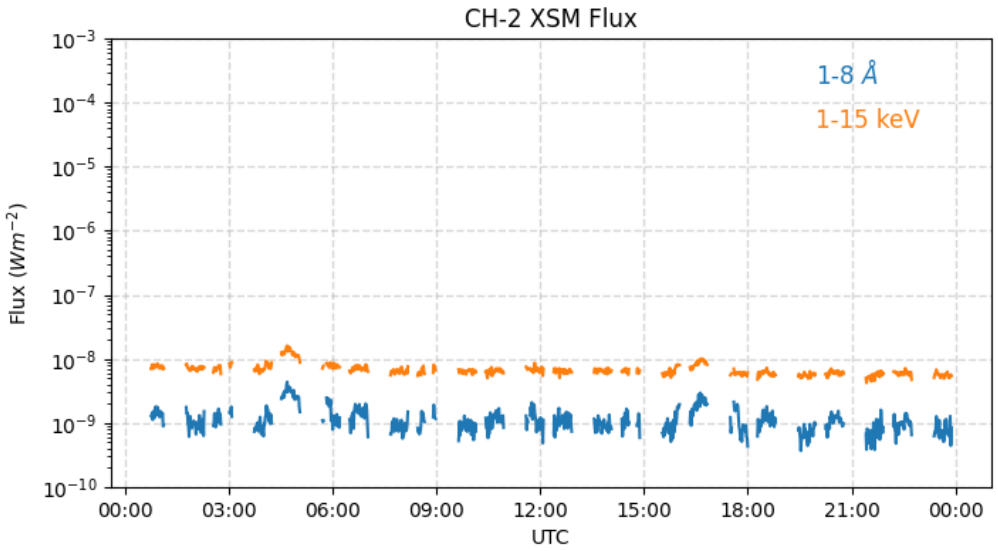

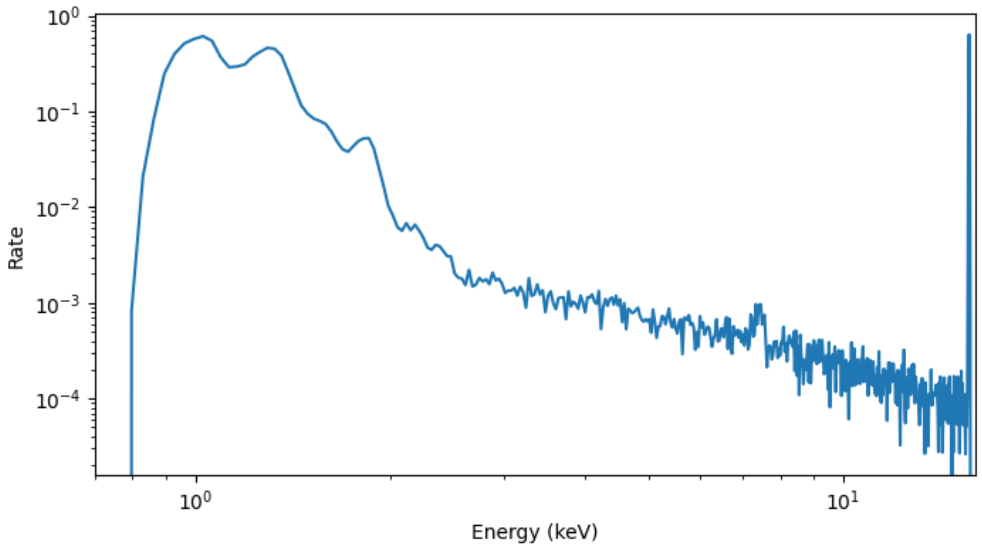

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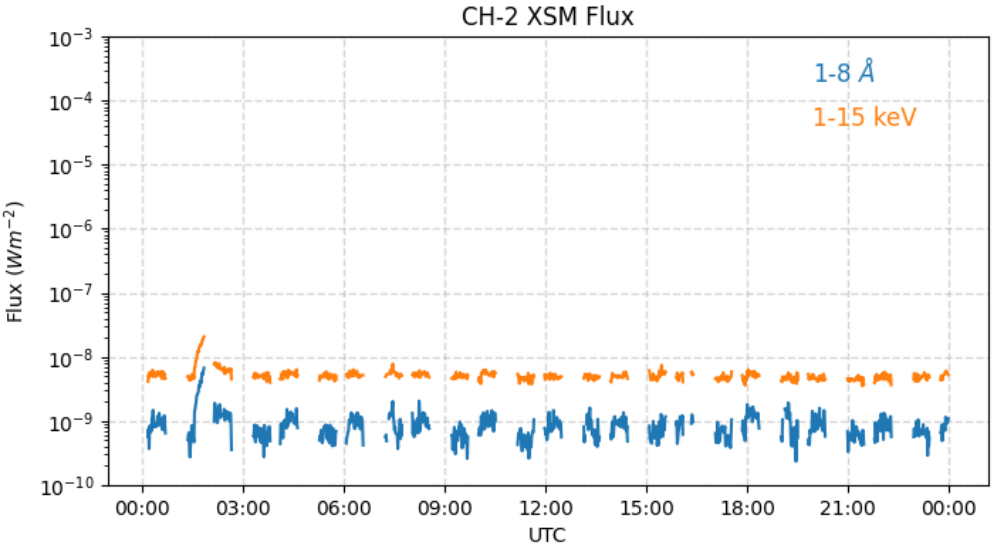

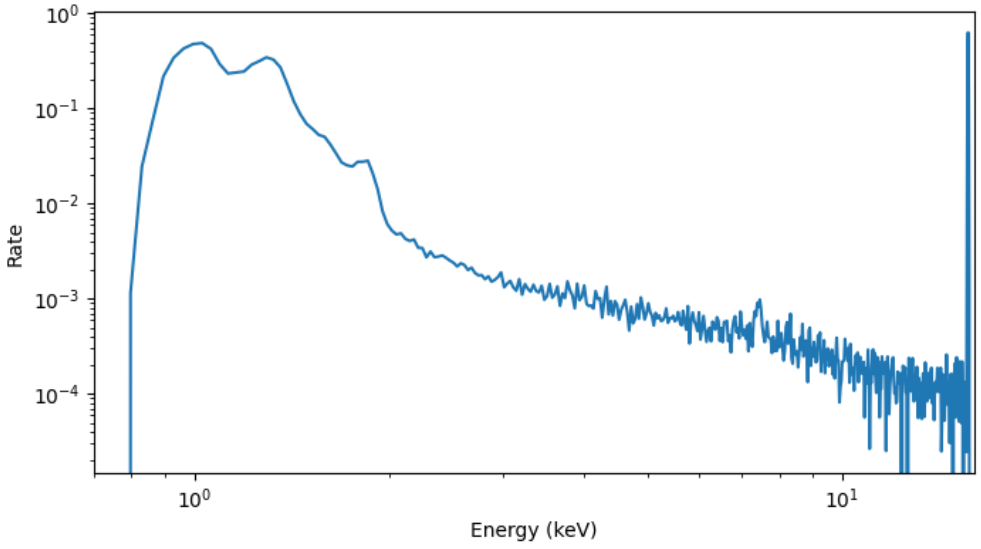

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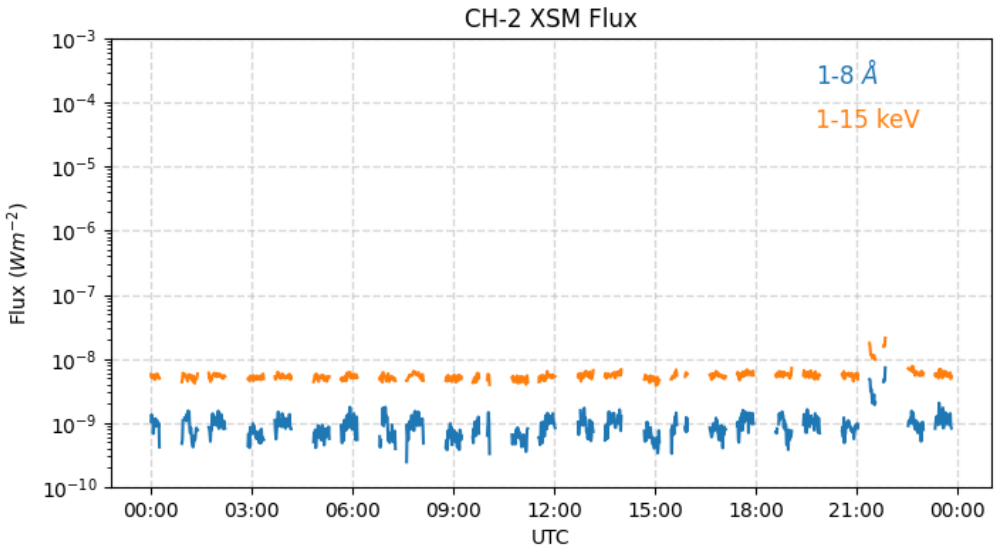

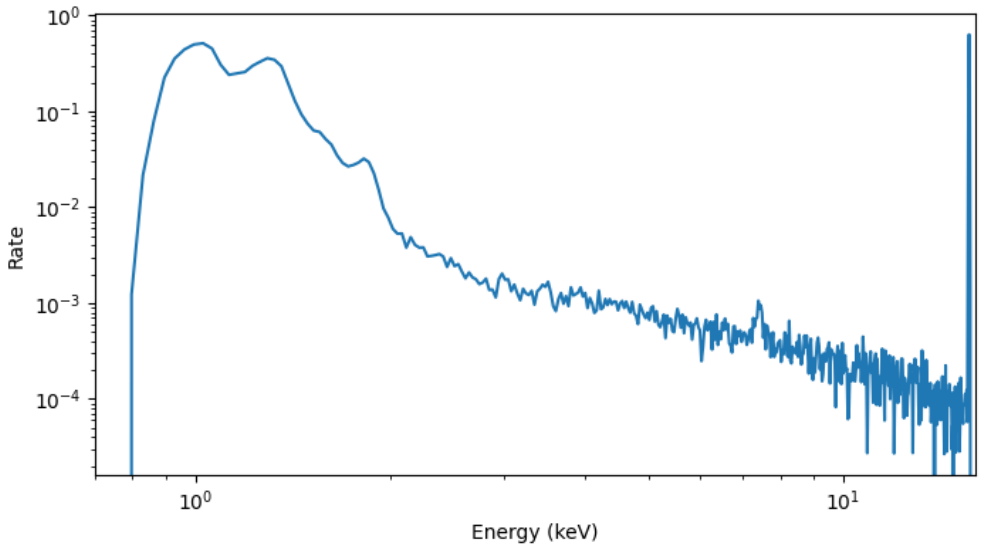

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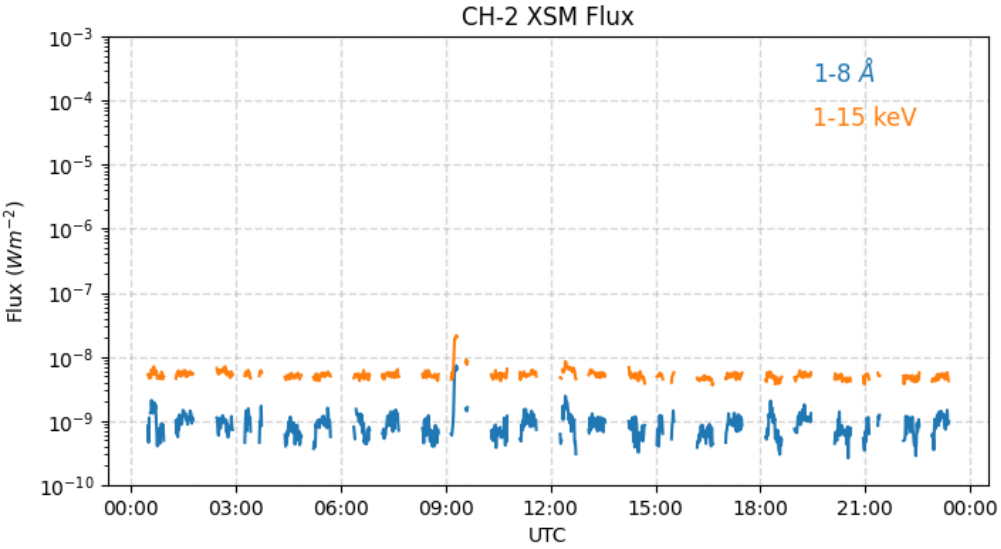

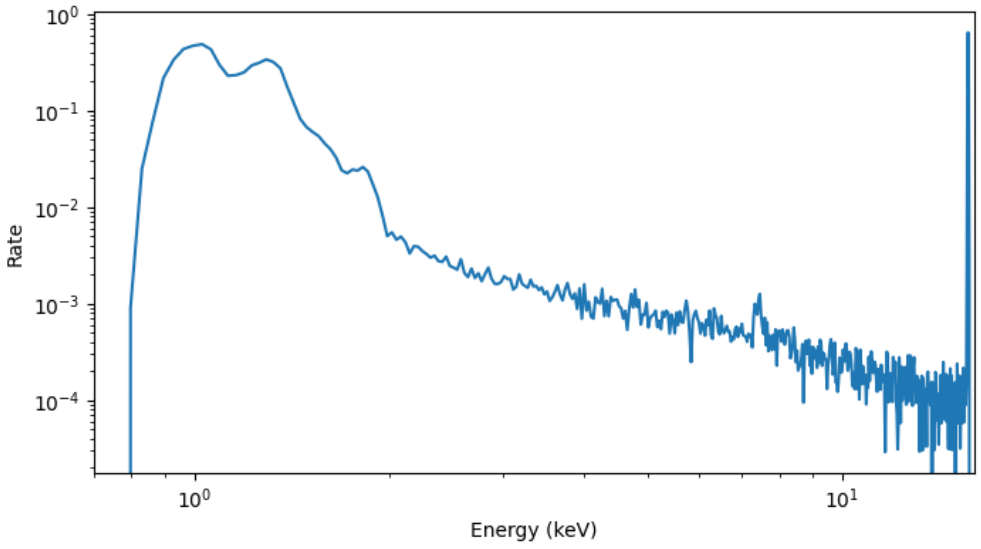

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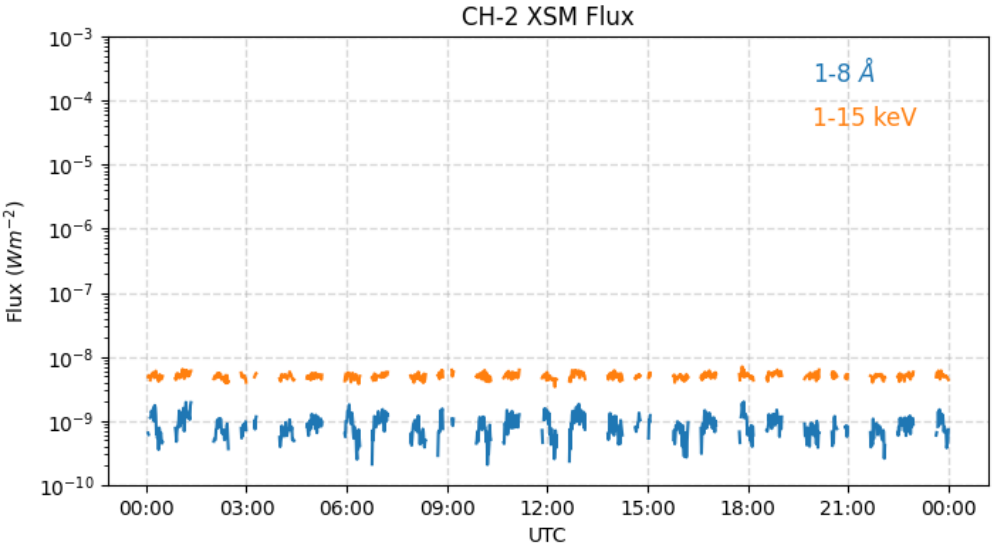

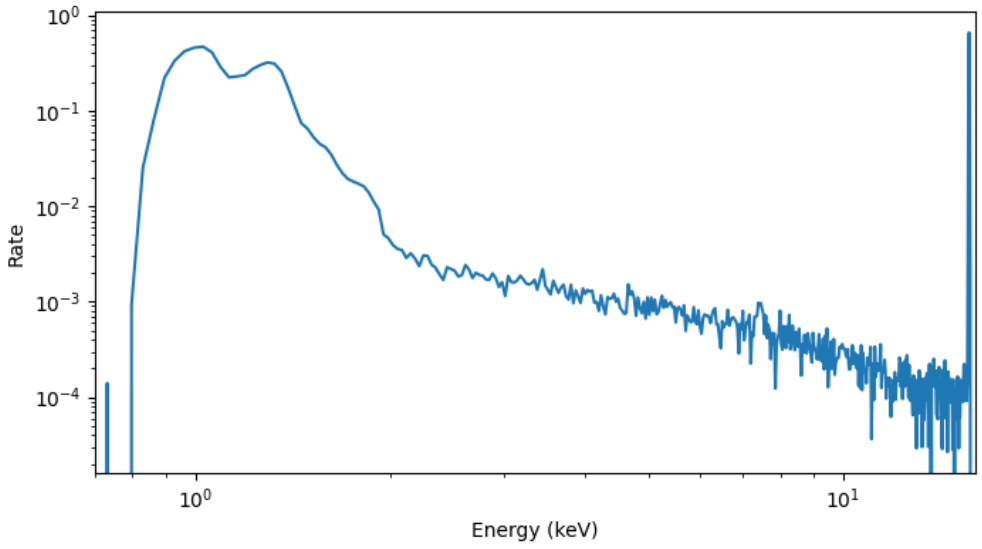

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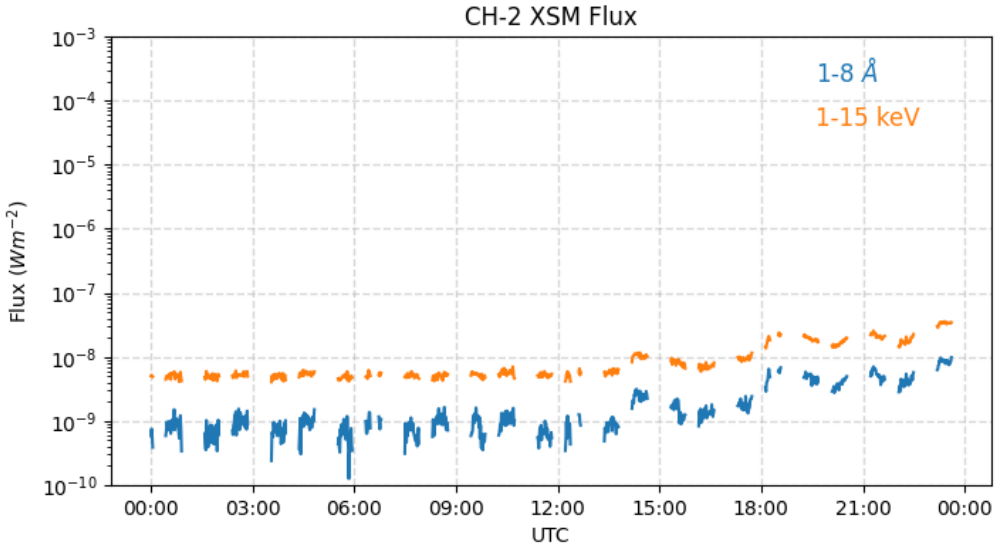

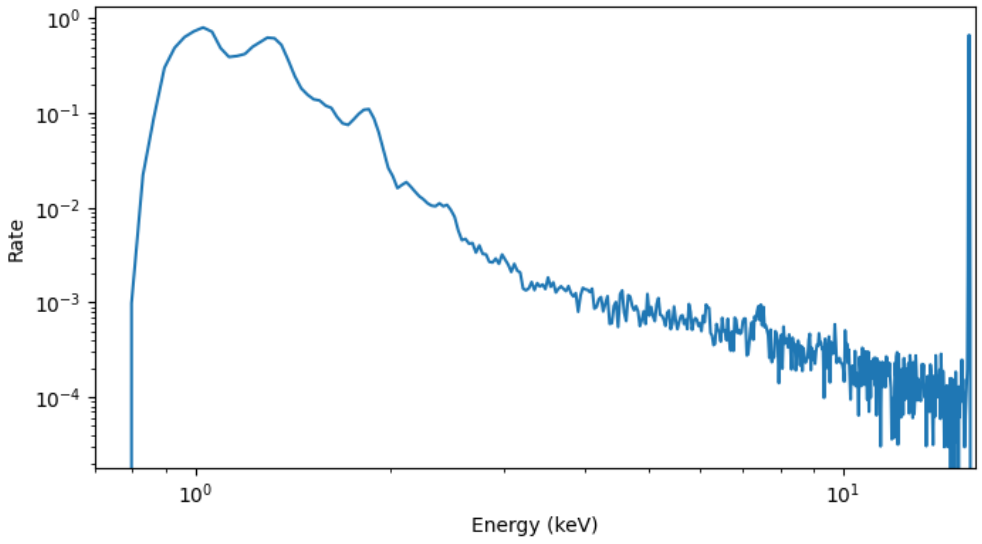

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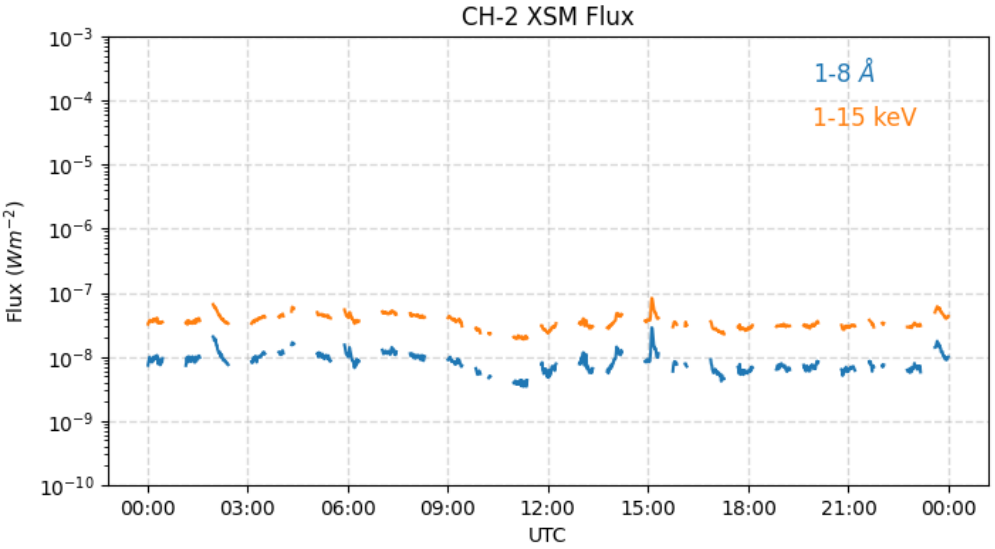

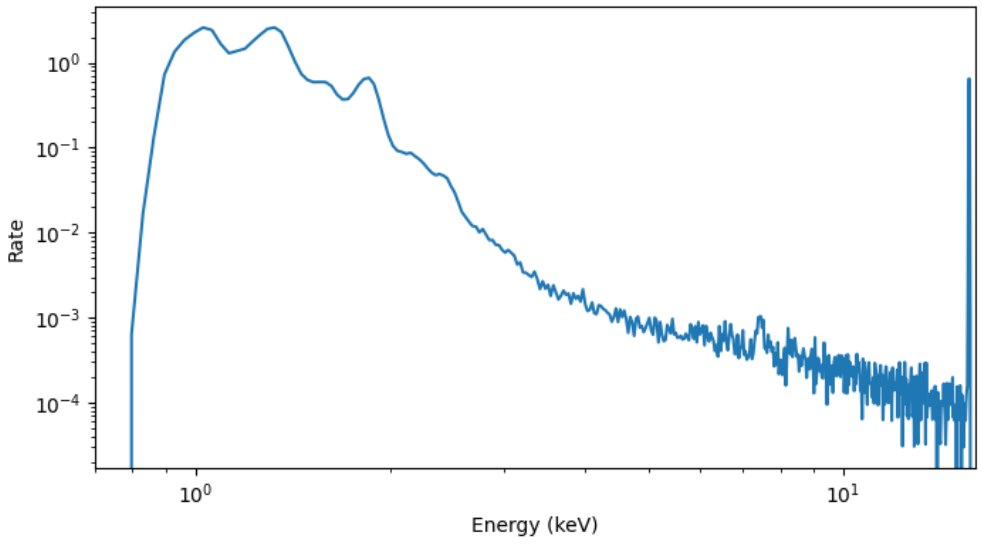

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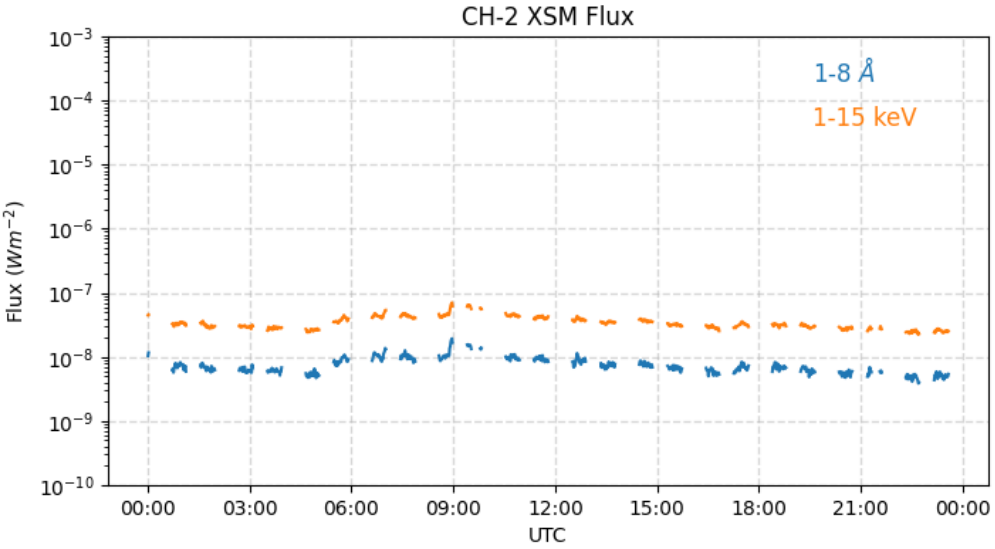
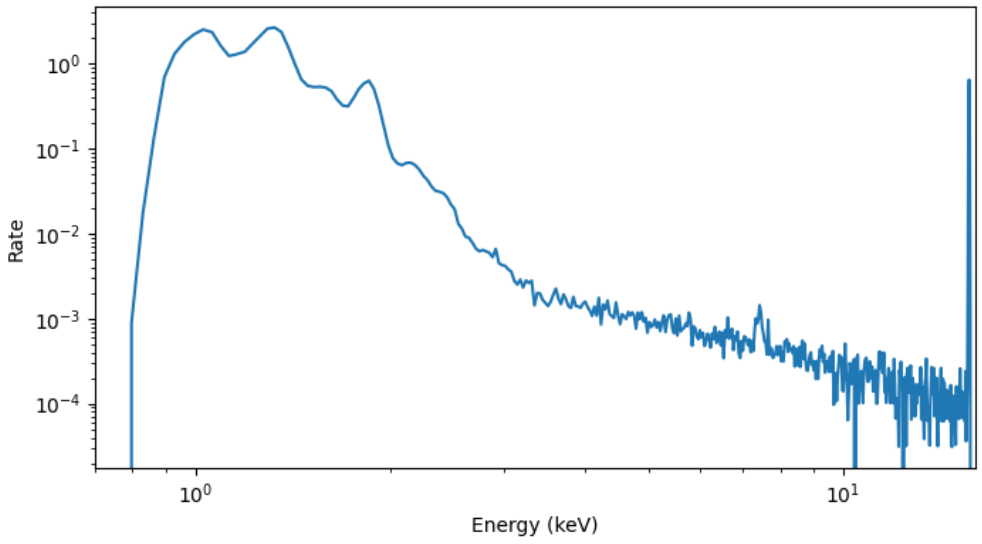
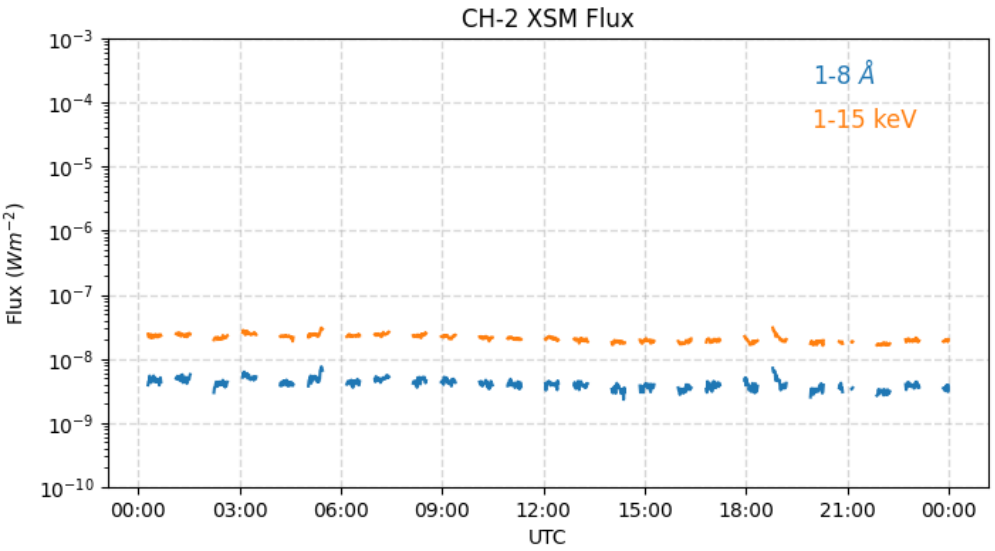
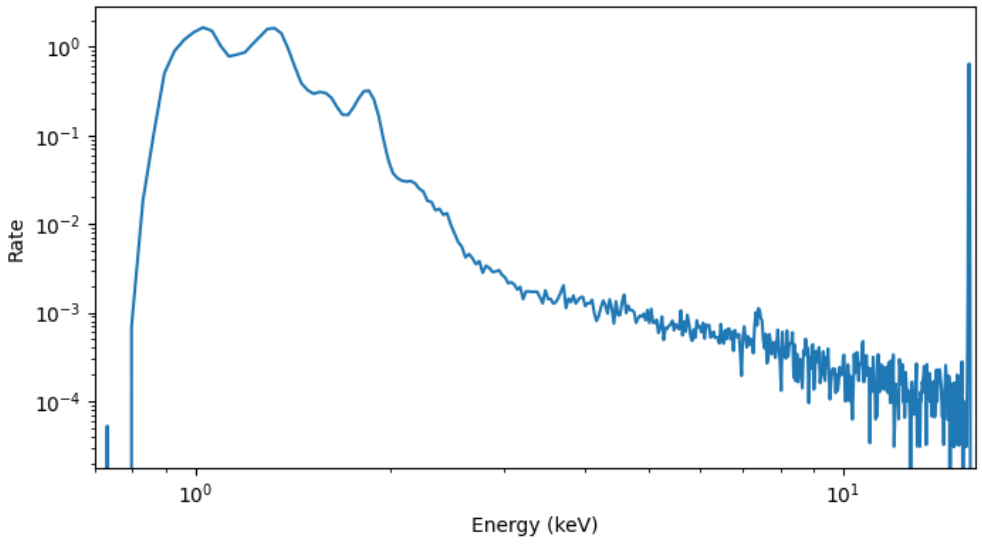




Date: 2019-11-14





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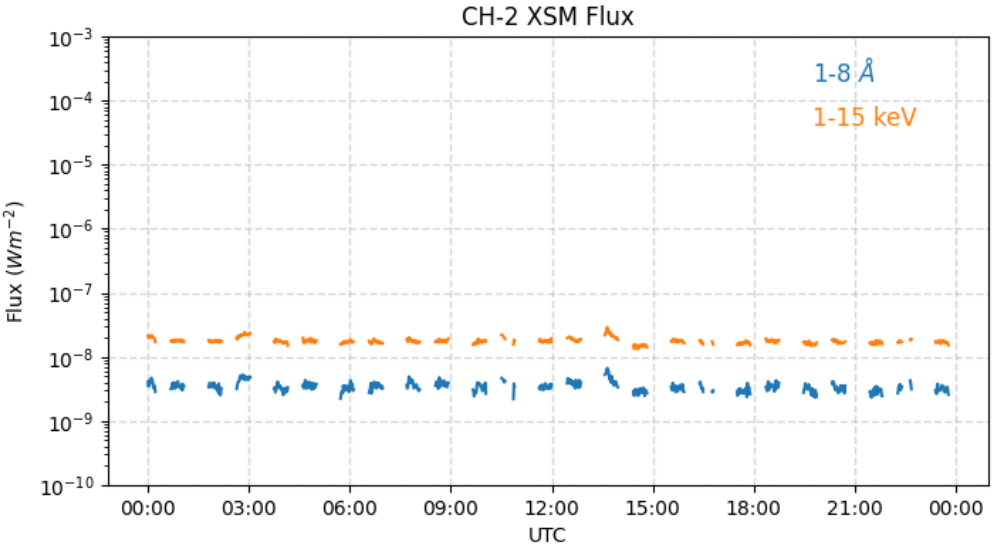

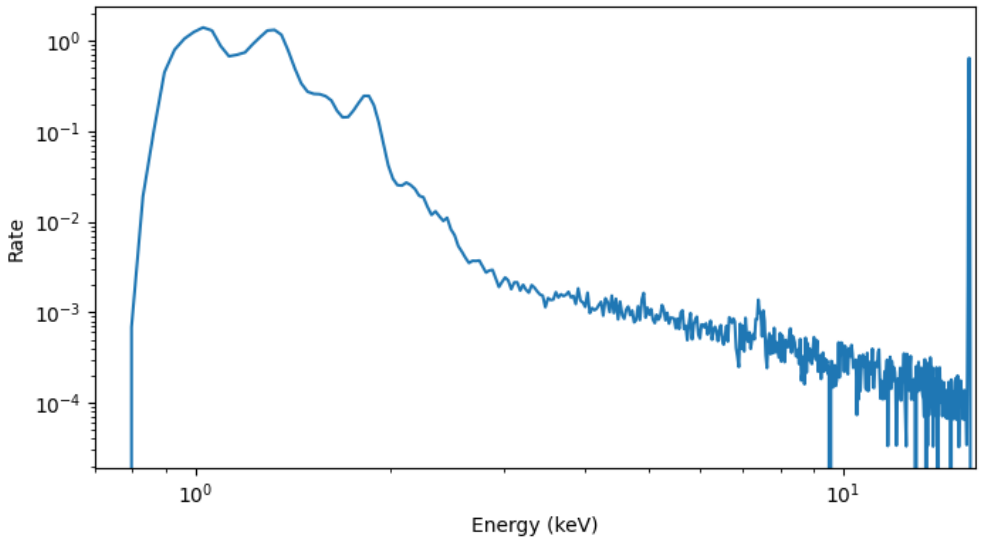

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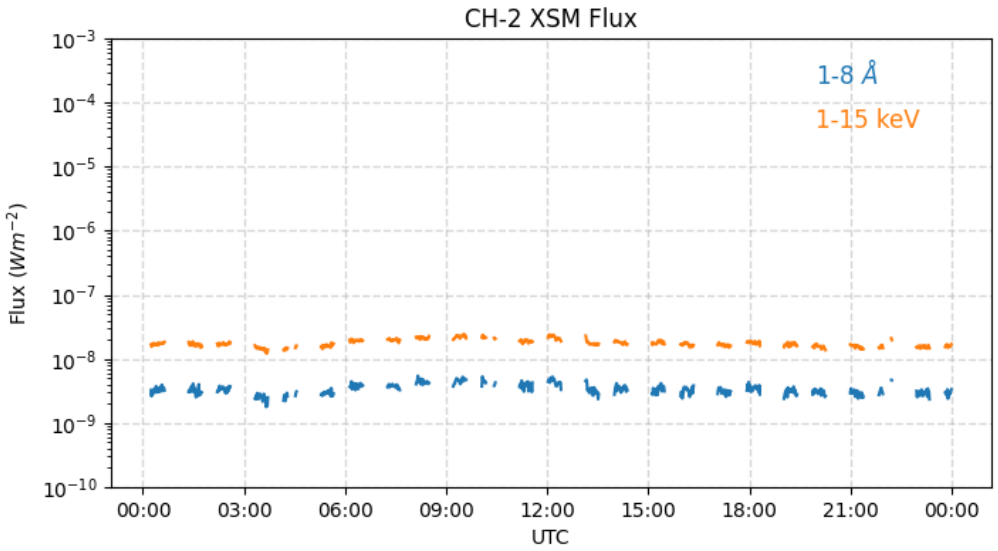
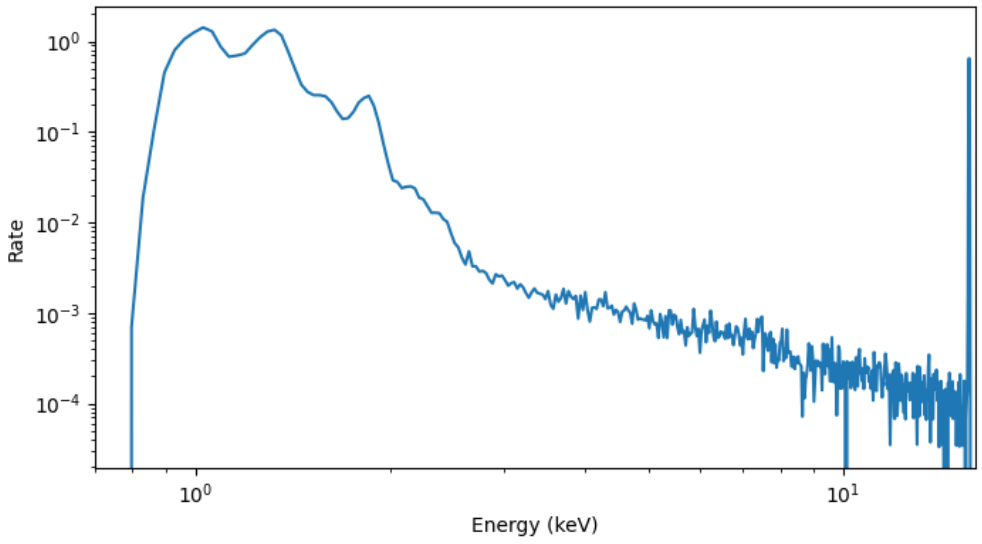
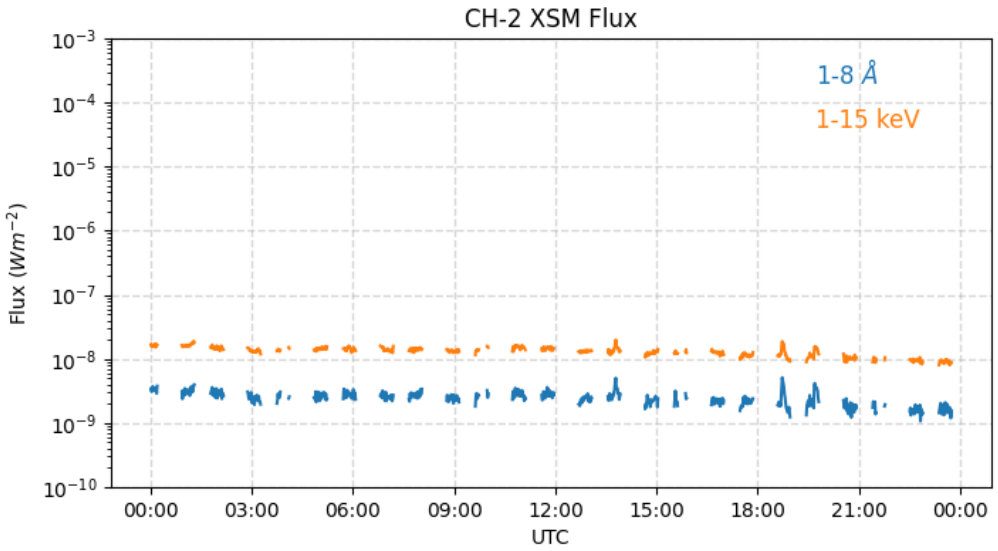
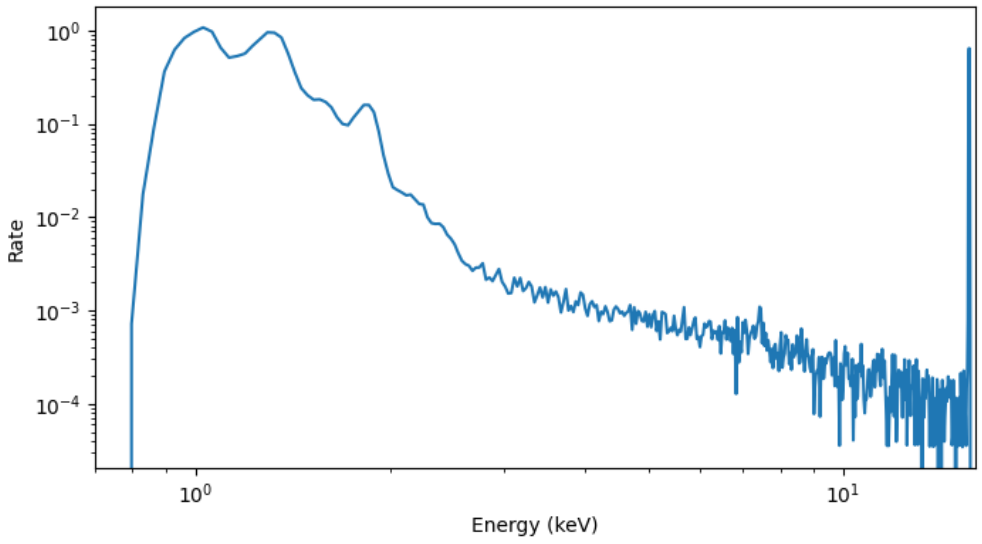


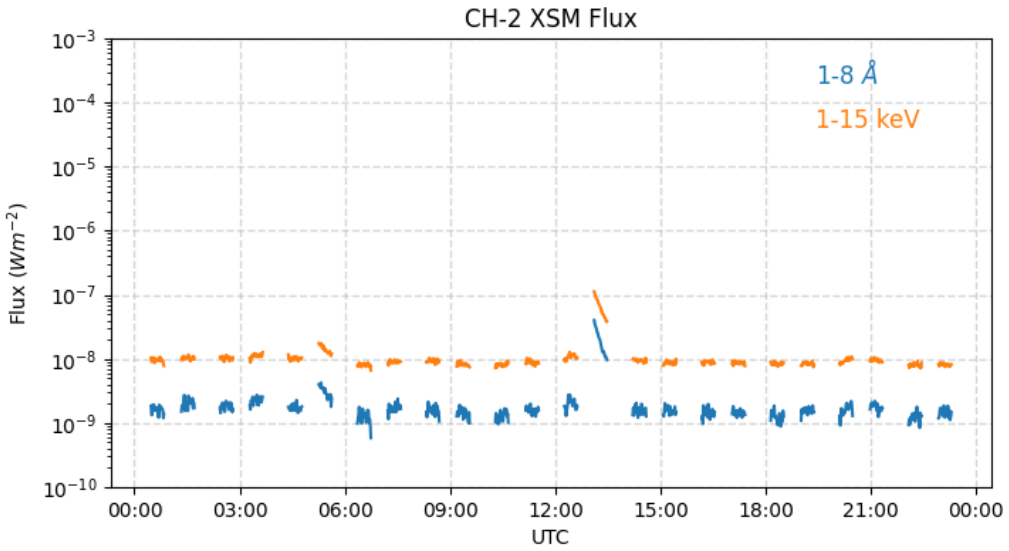


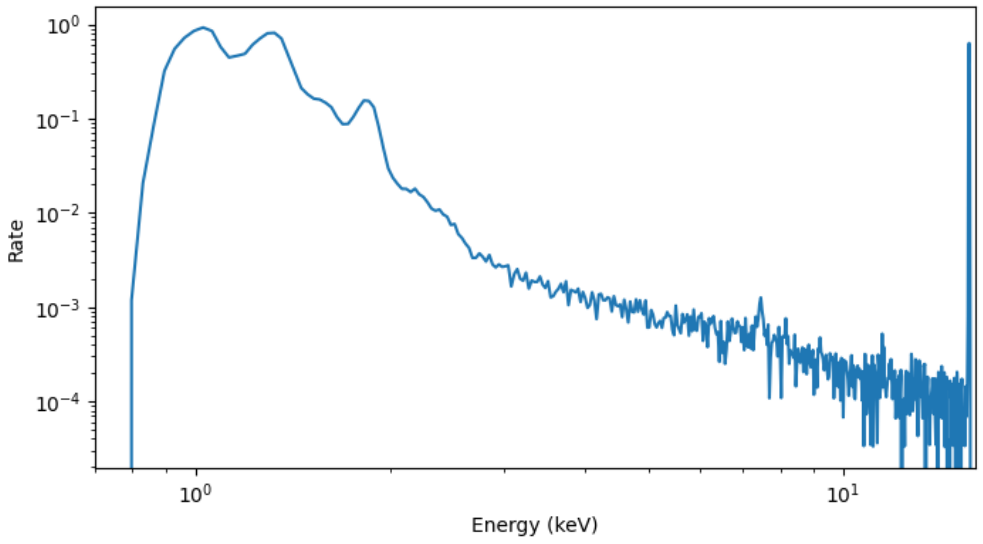
Date: 2019-11-17





Date: 2019-11-18





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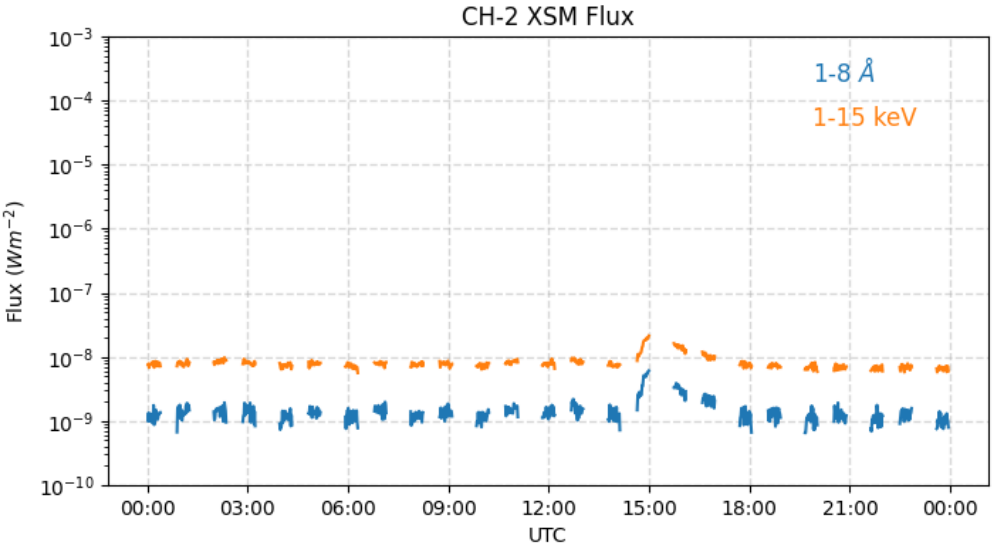

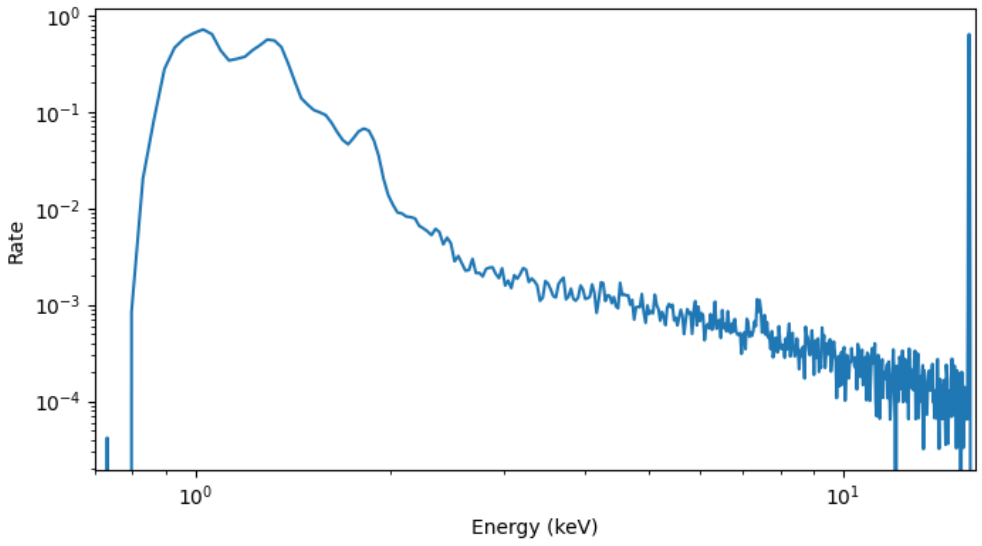

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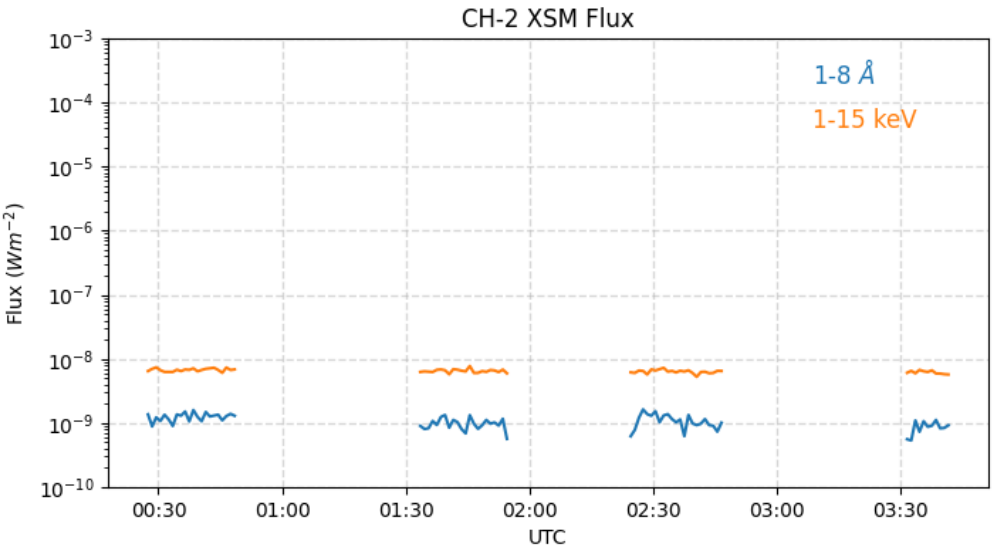

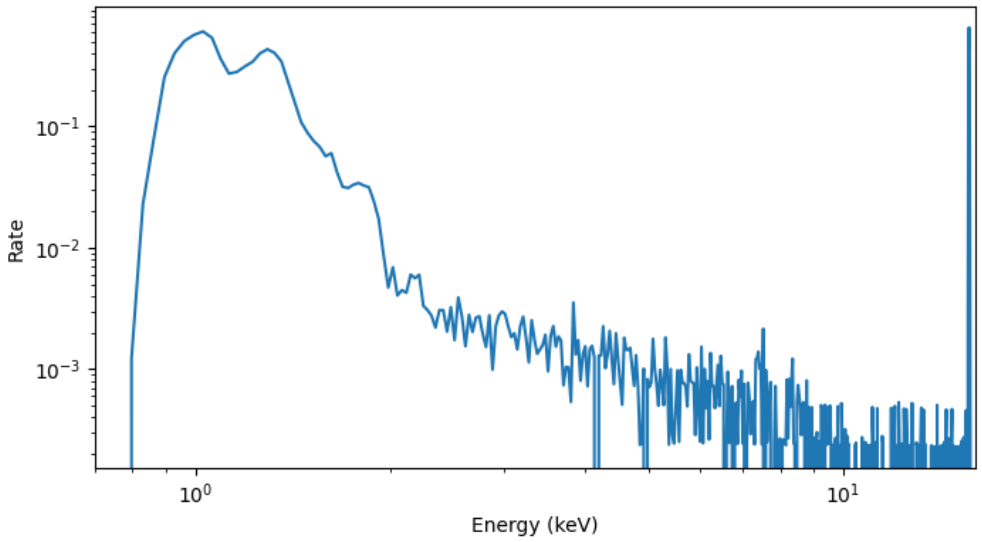

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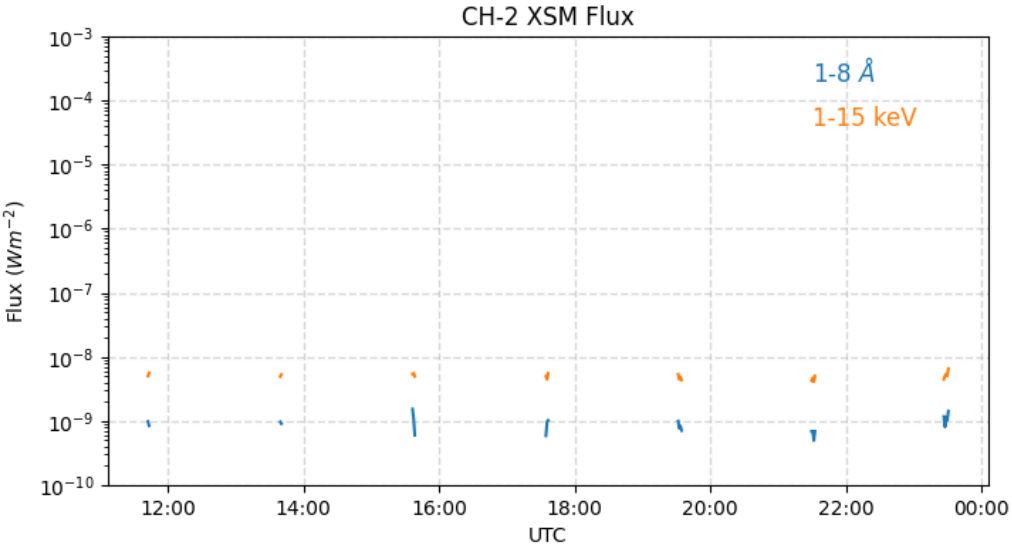

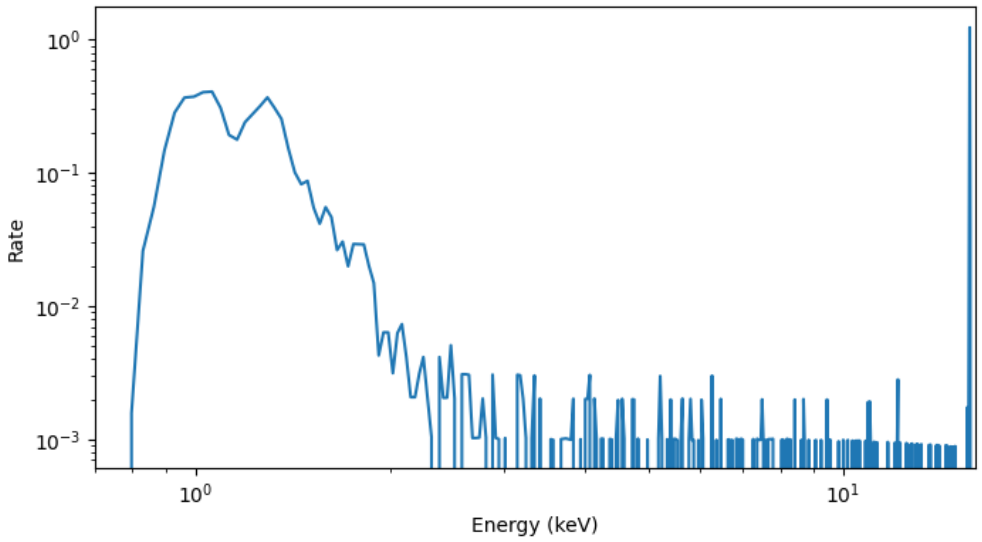

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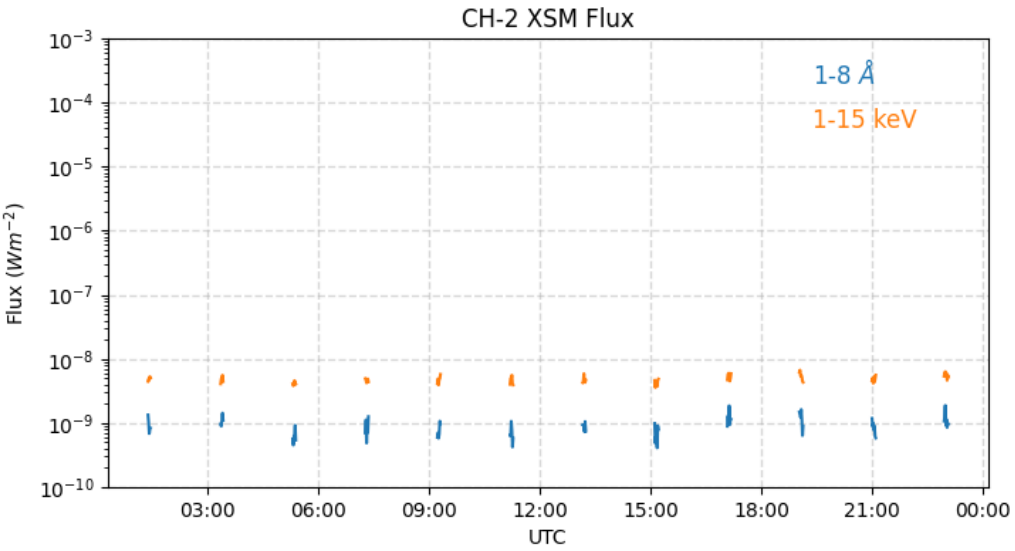

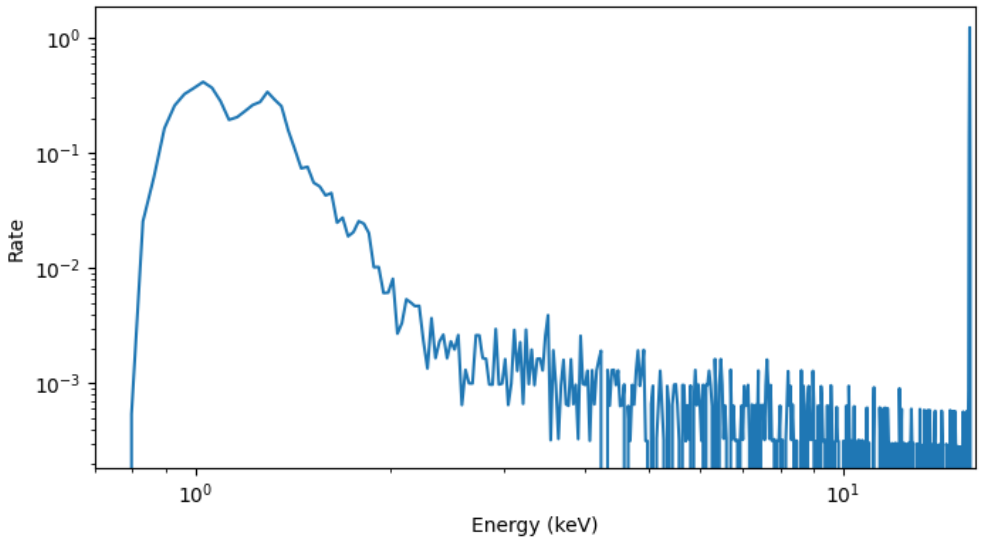

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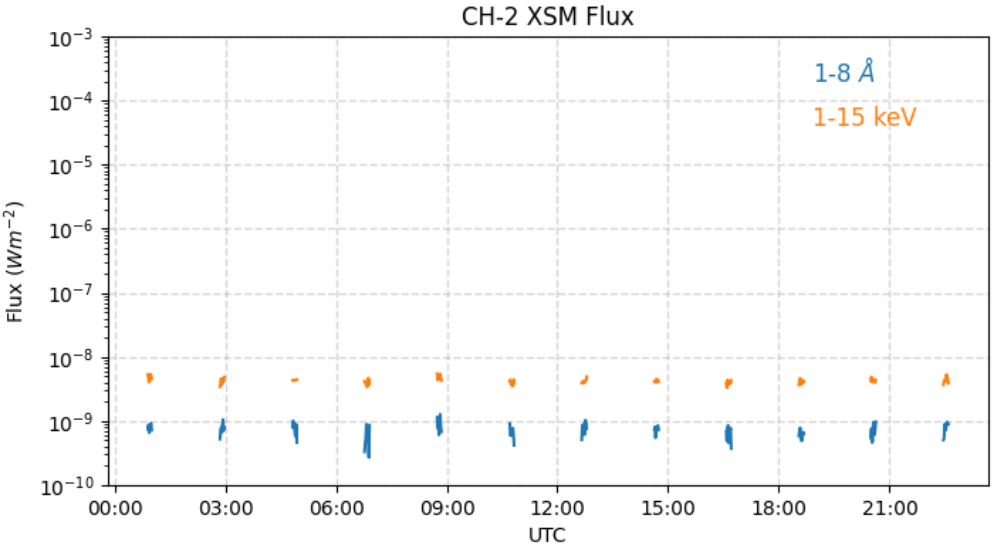

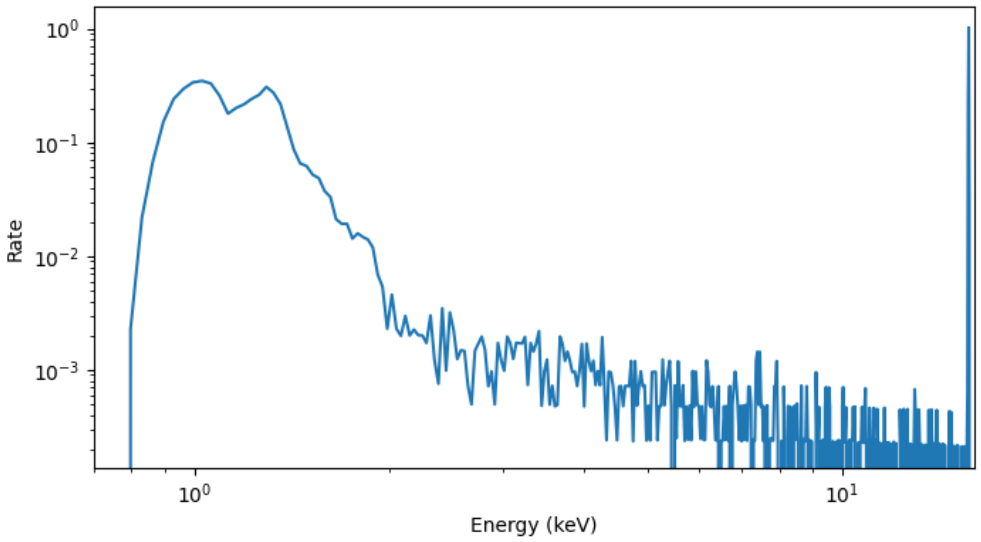

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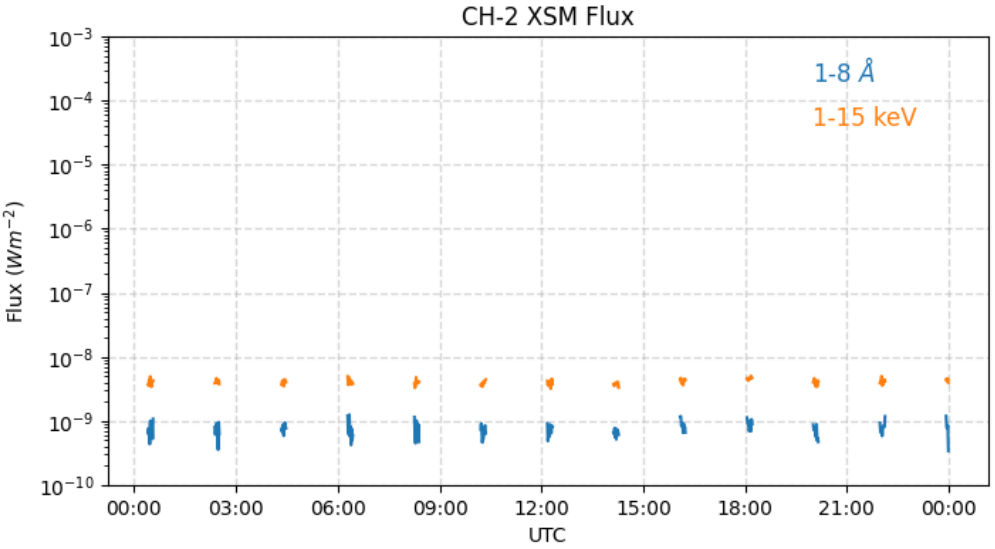

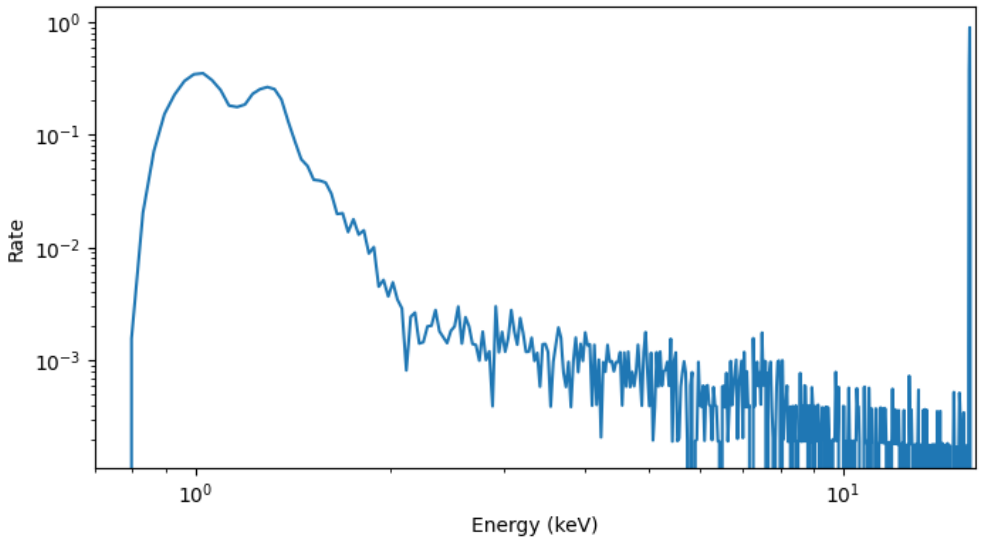

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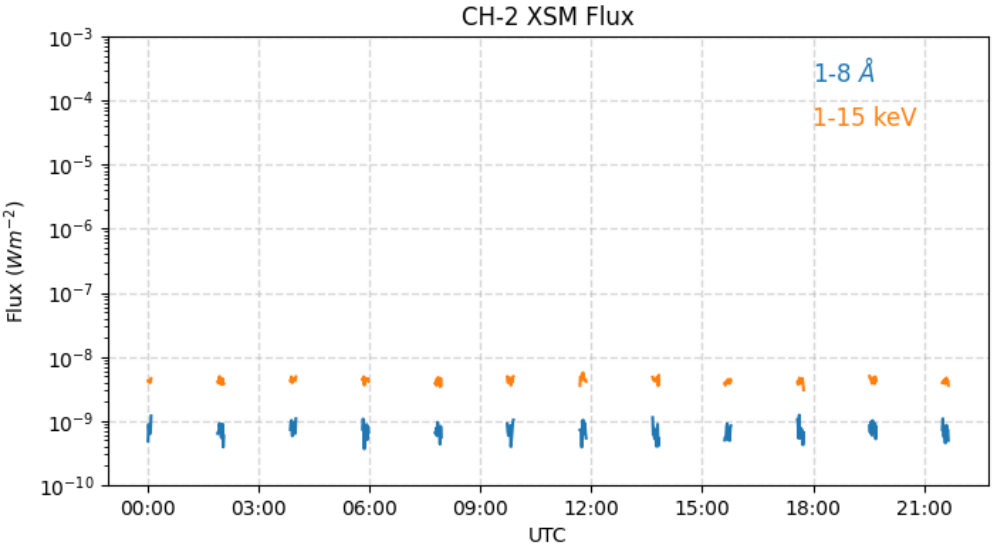

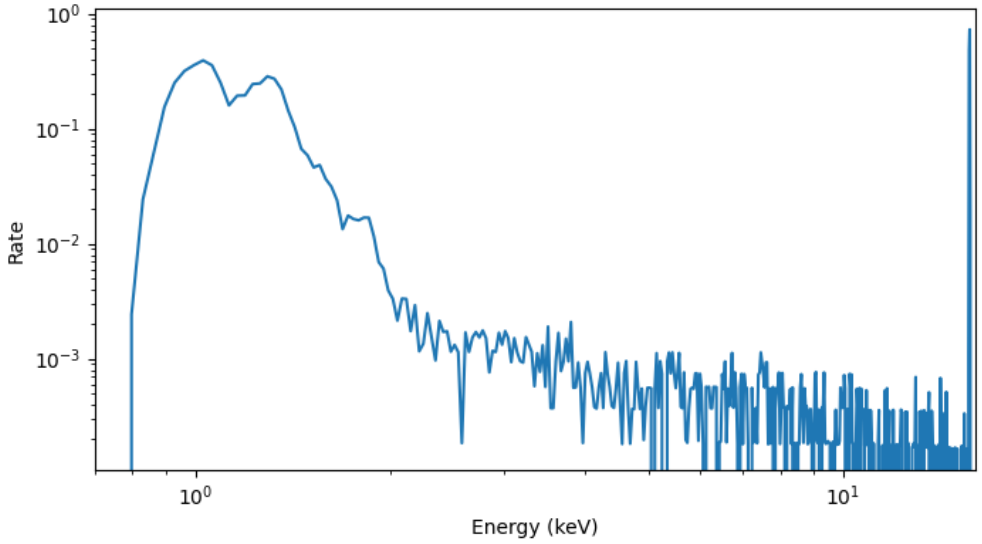

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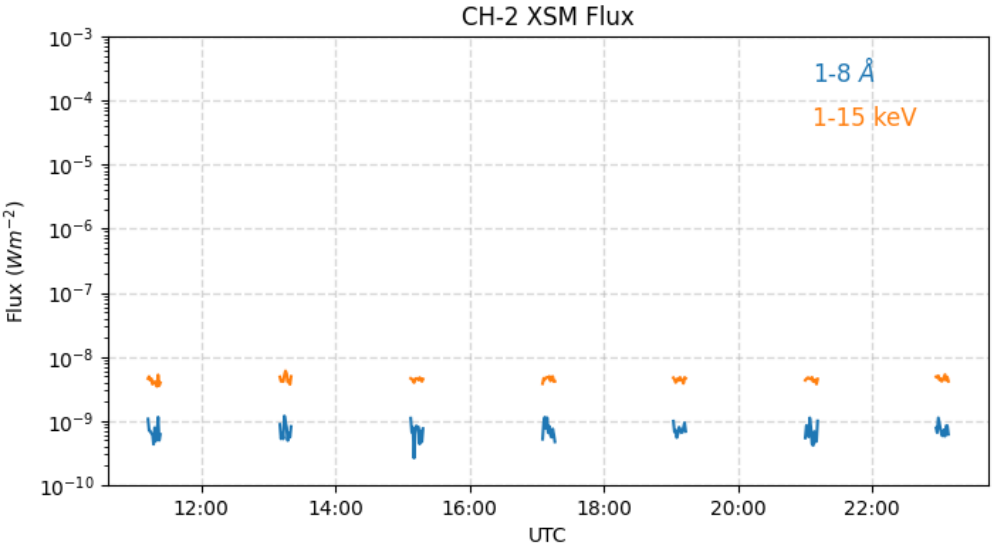

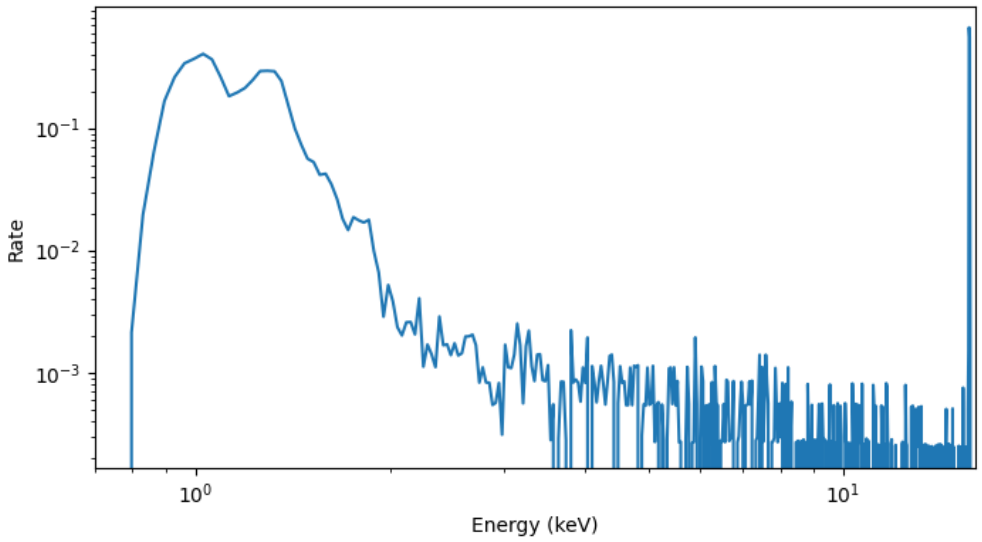

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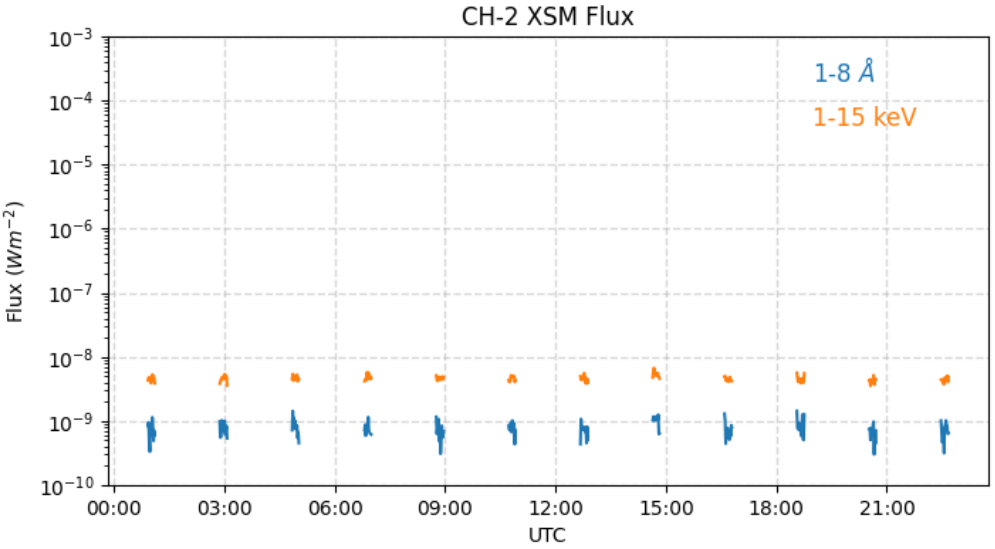

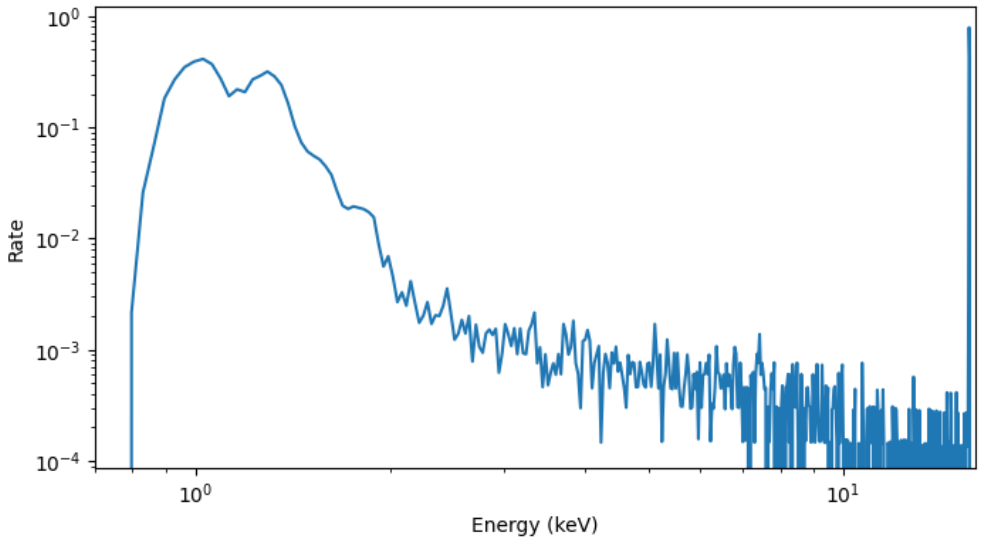

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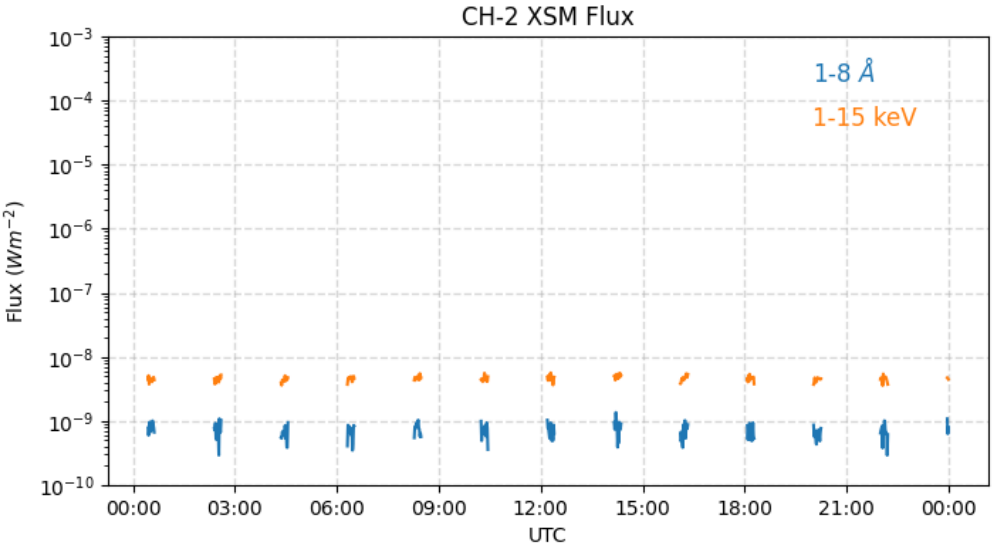
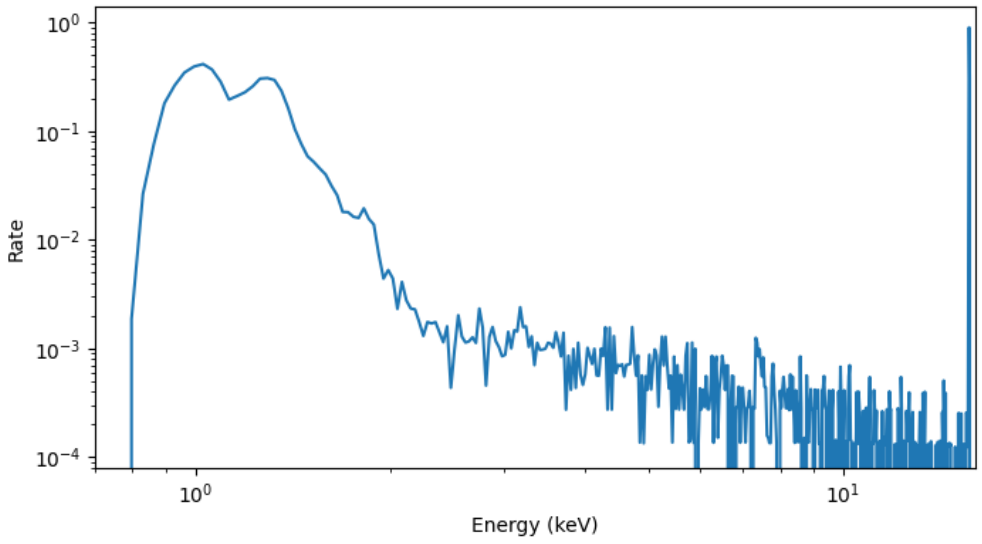
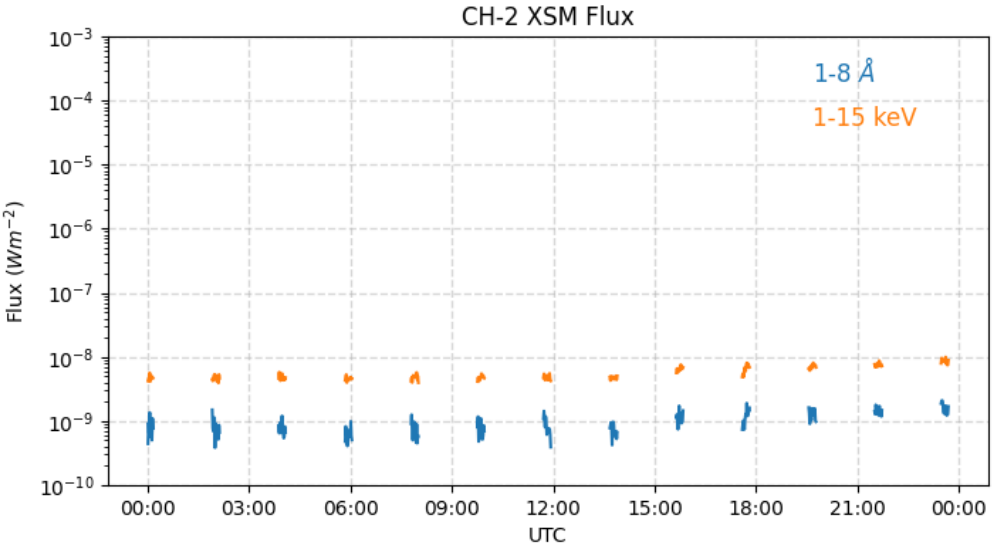
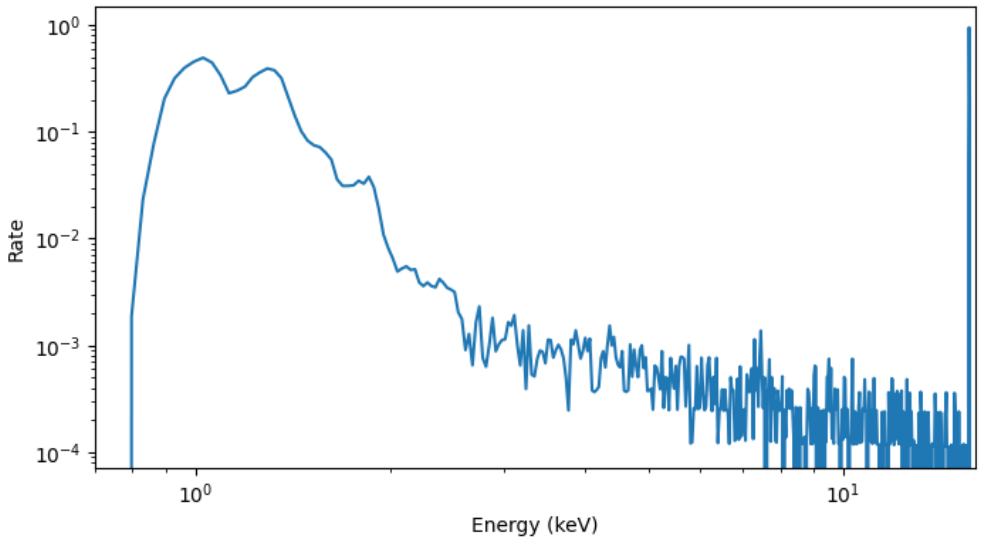


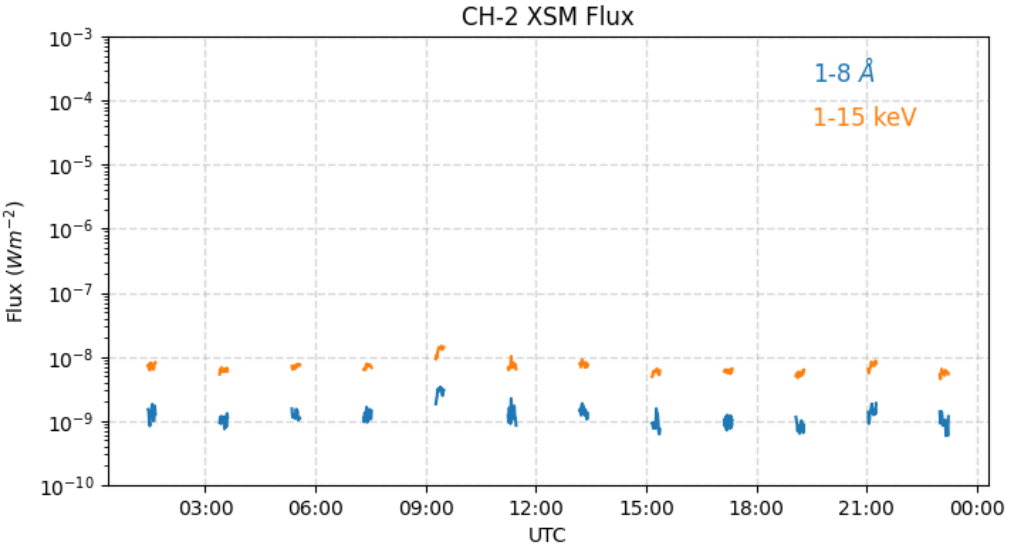


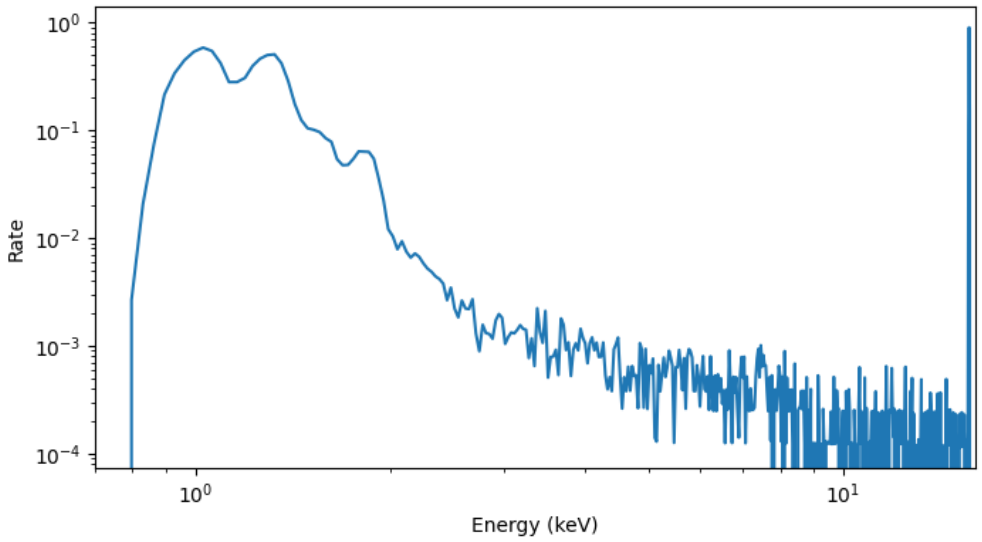
Date: 2019-12-18





Date: 2019-12-19





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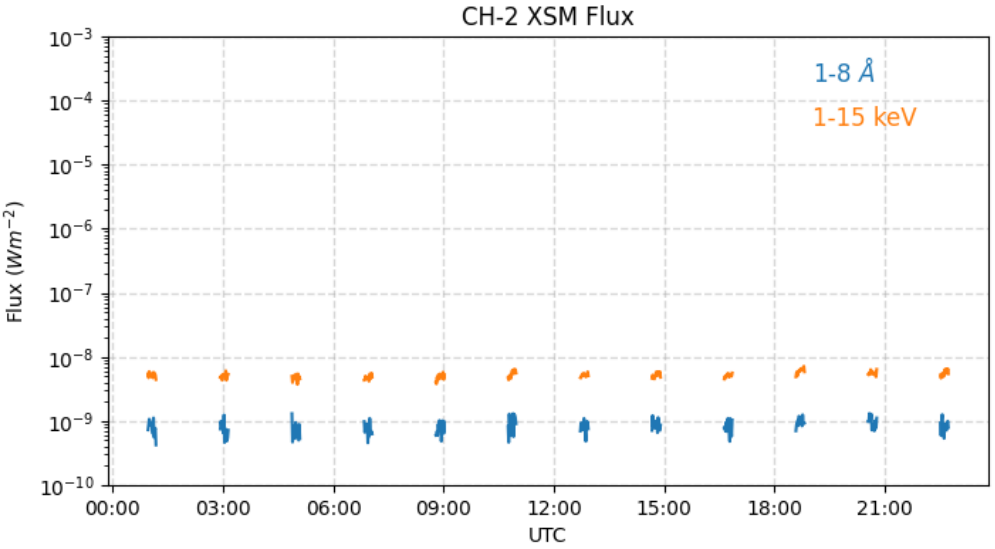

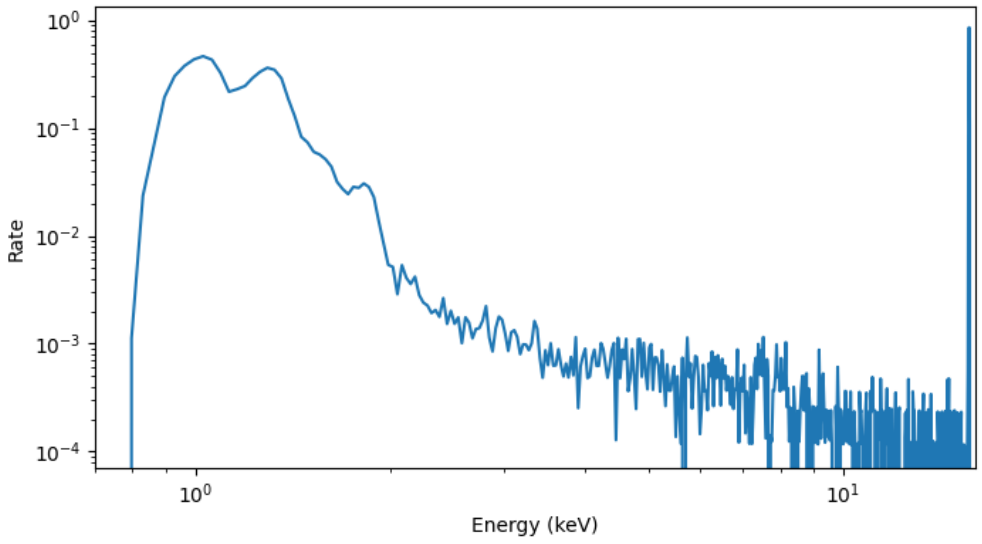

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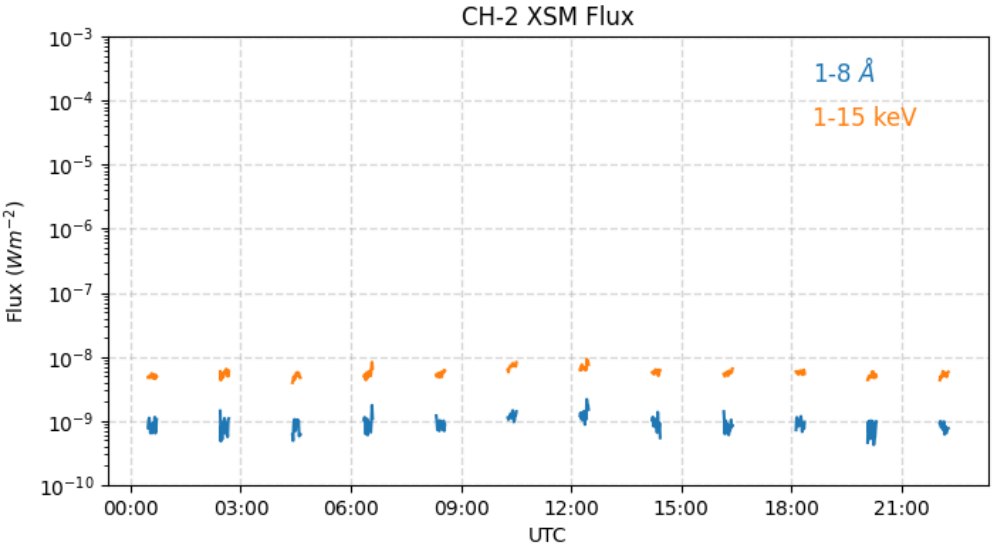

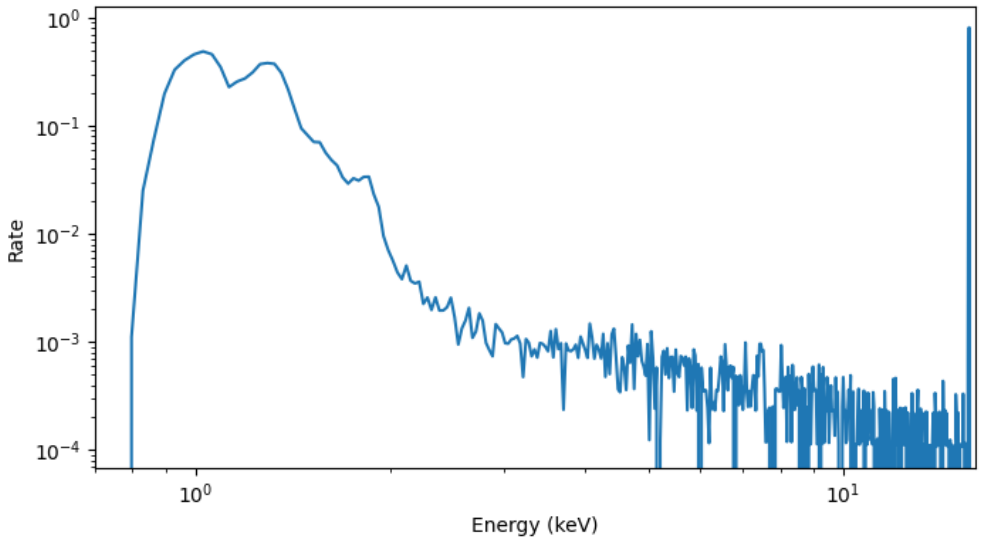

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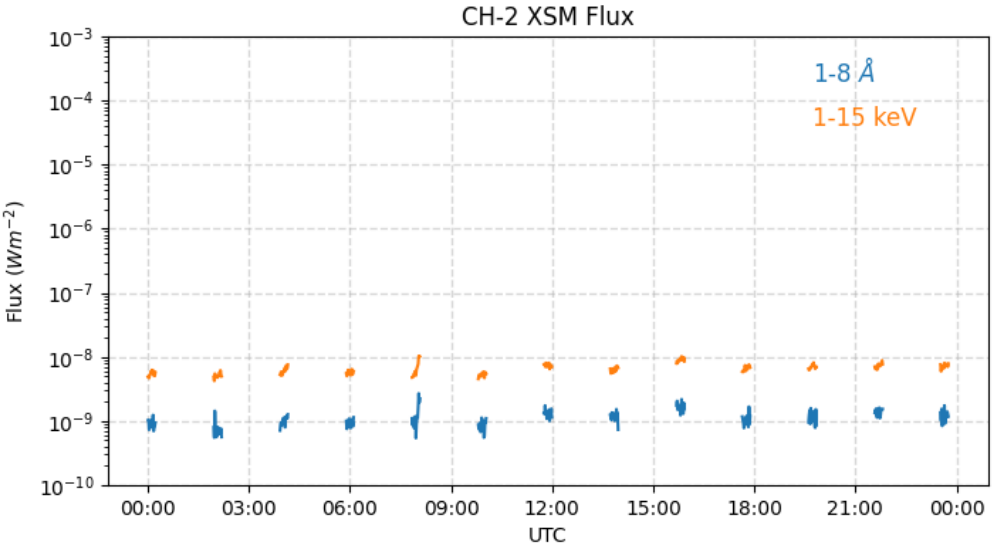

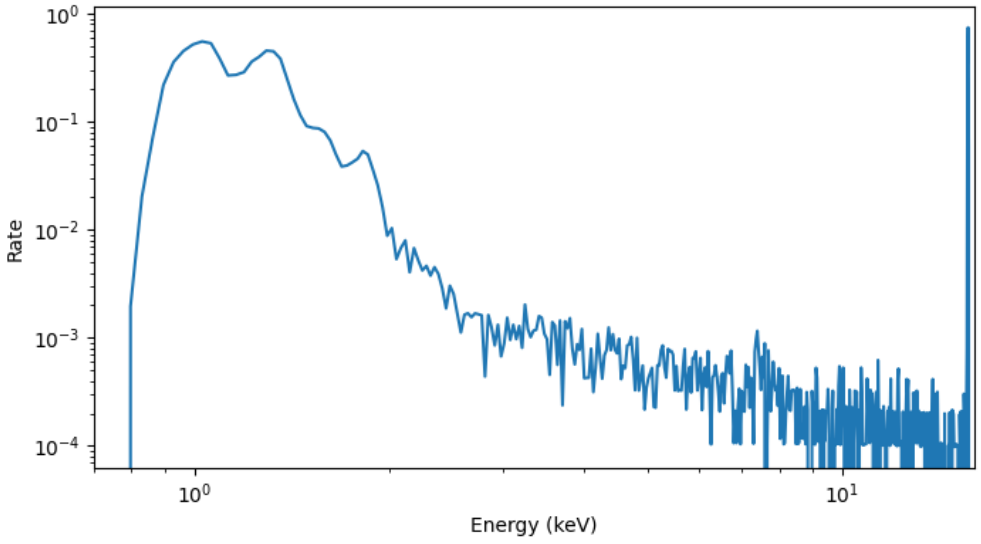

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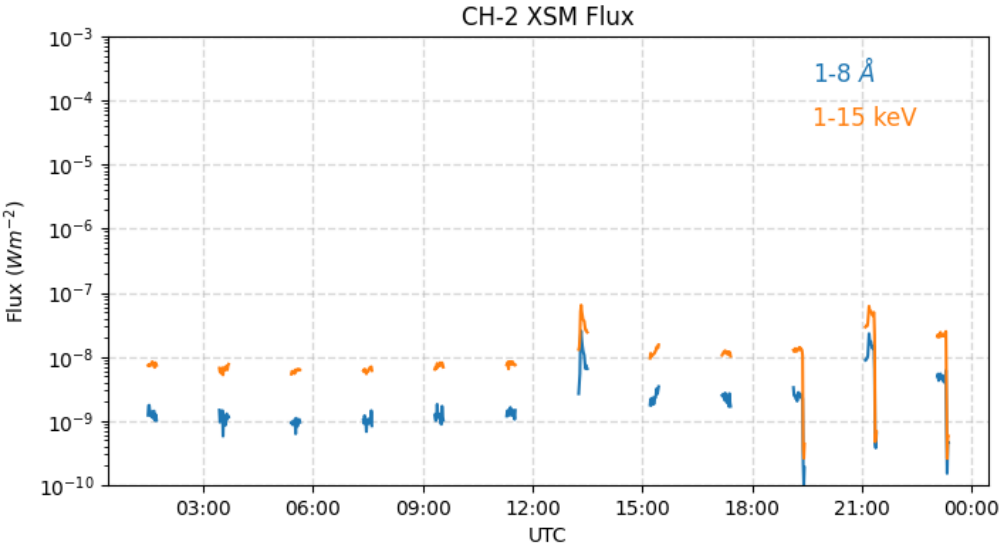

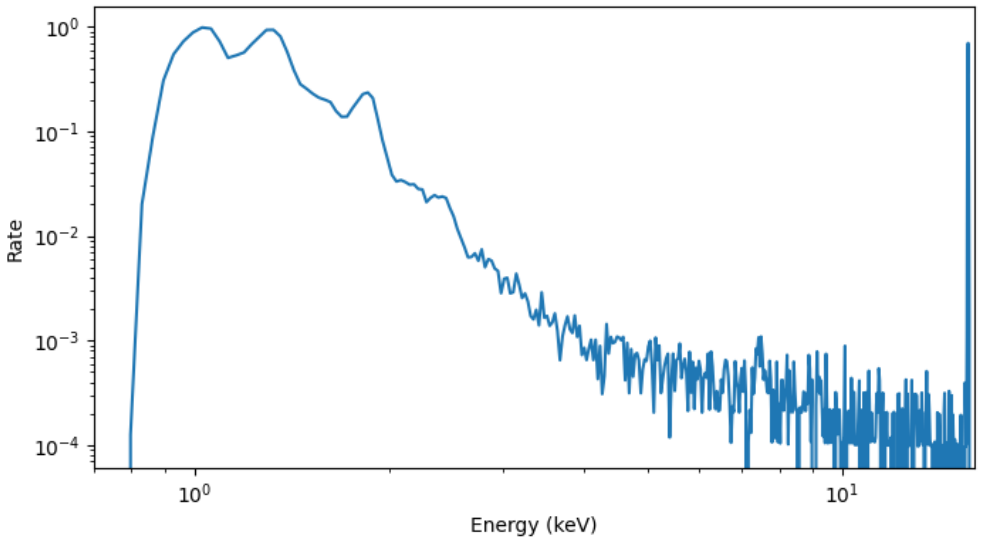

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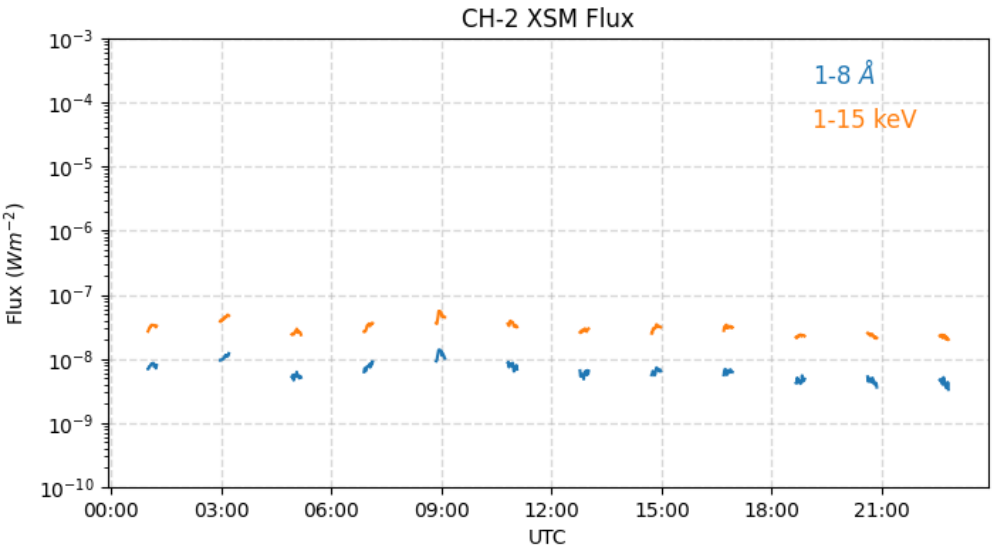

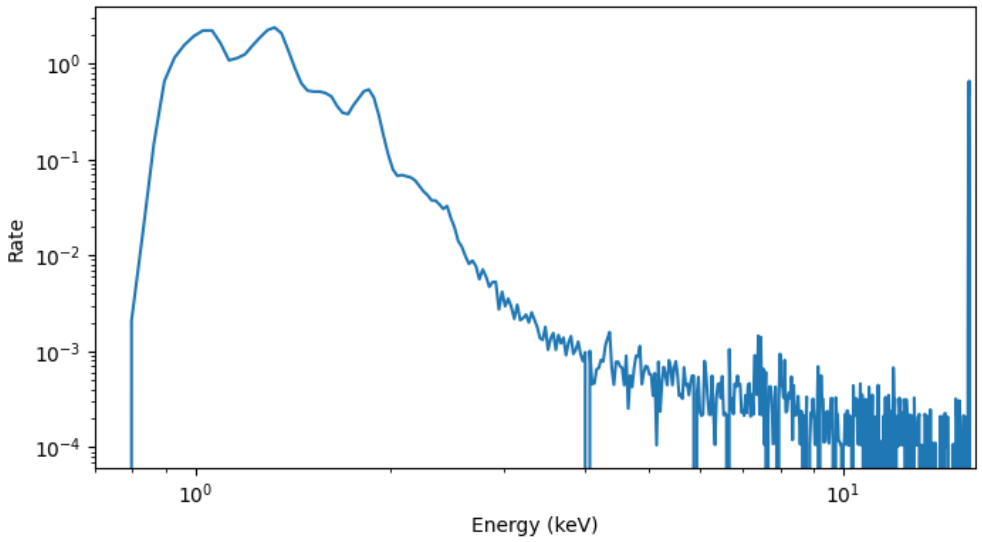

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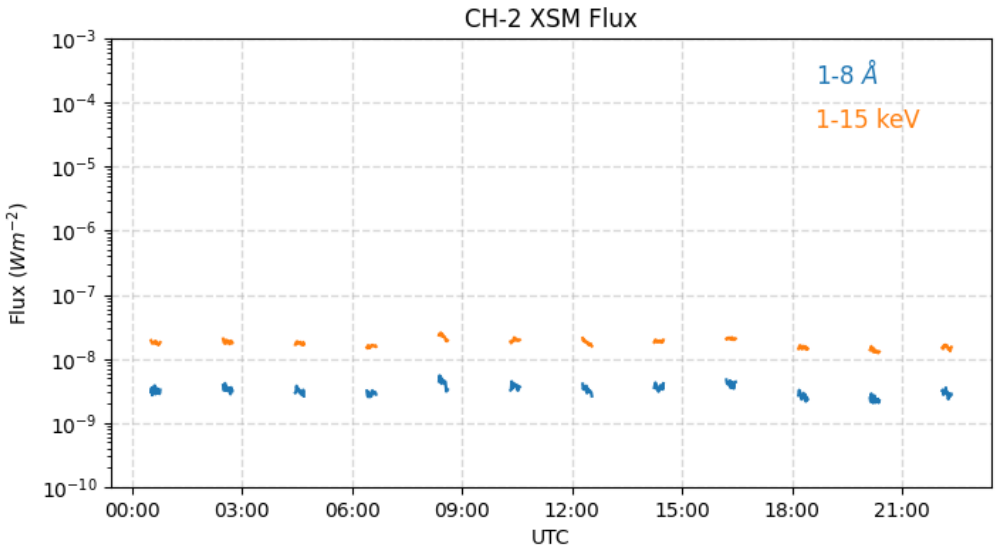

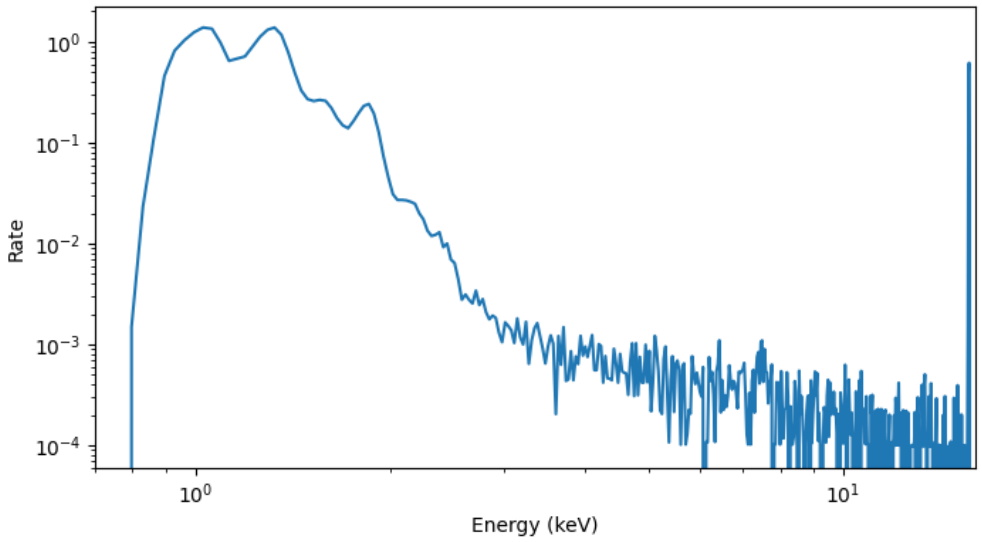

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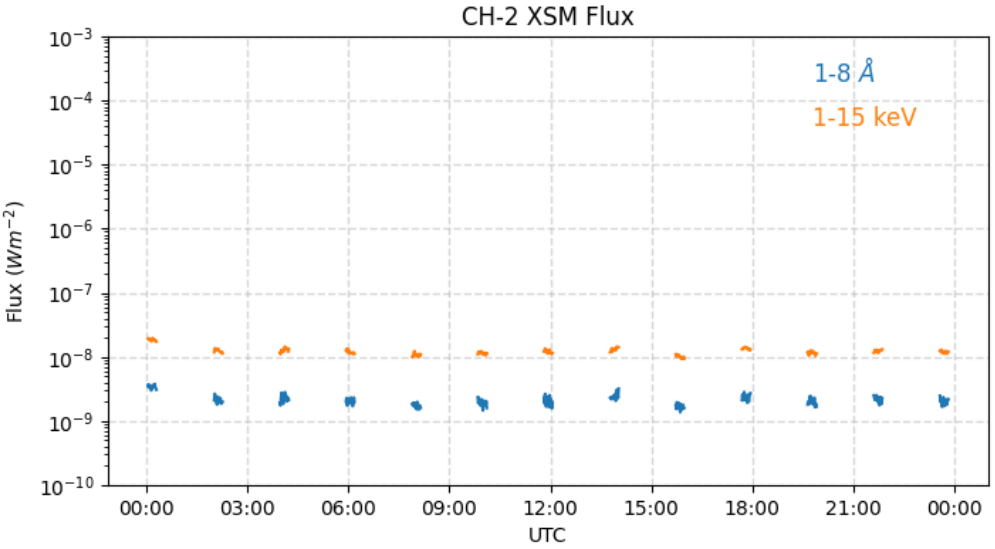

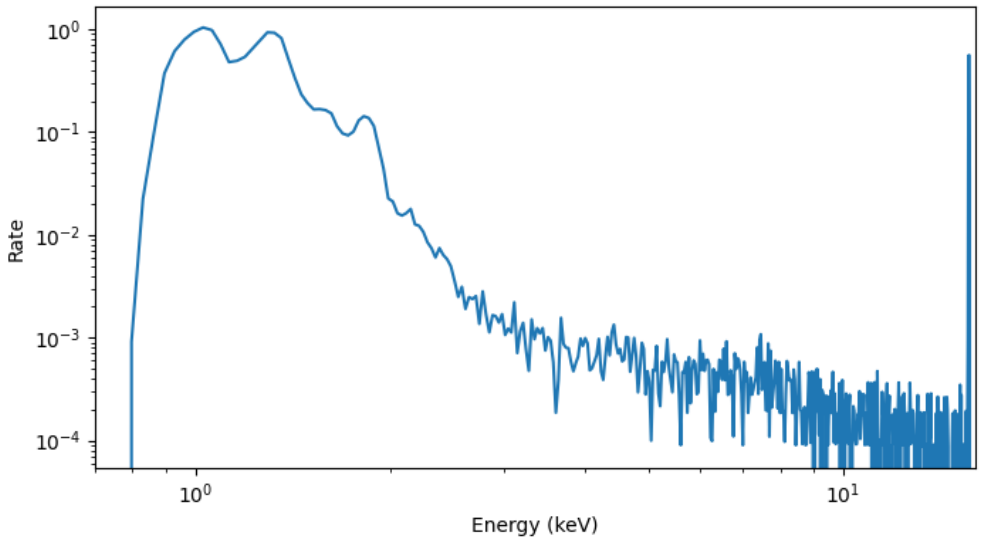

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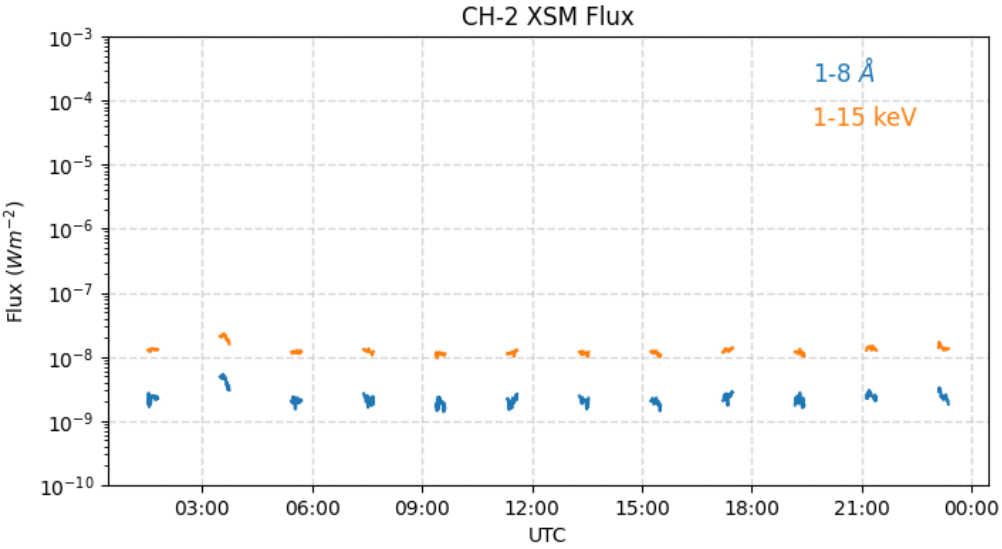

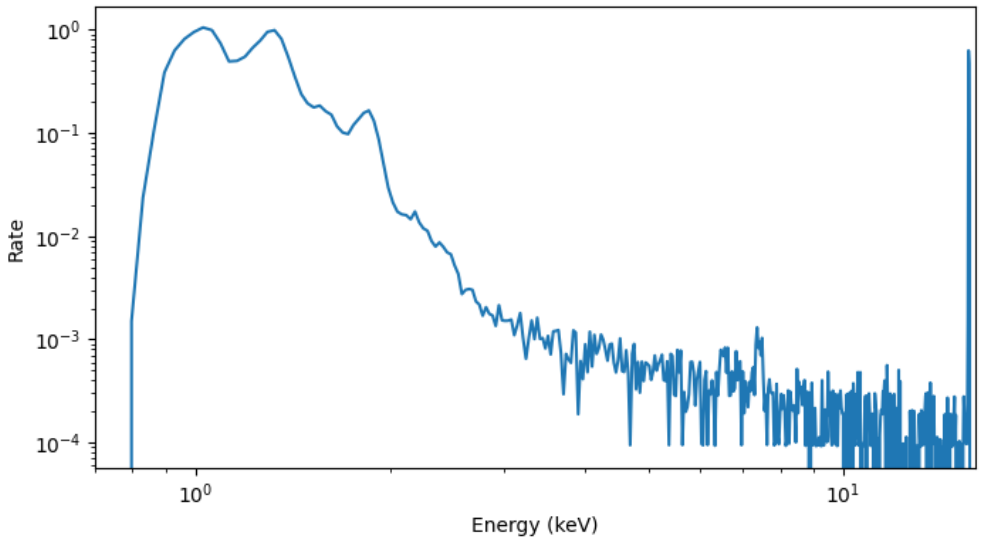

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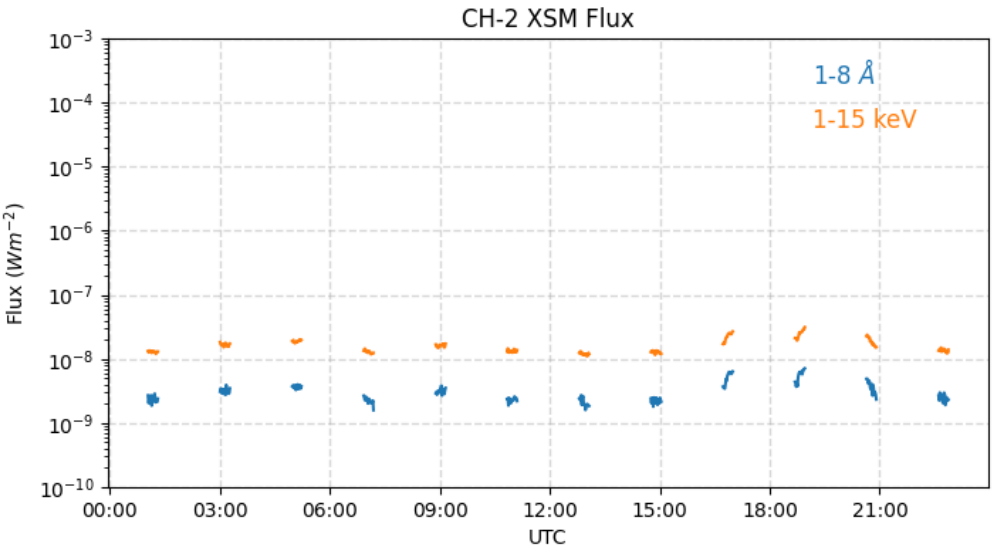

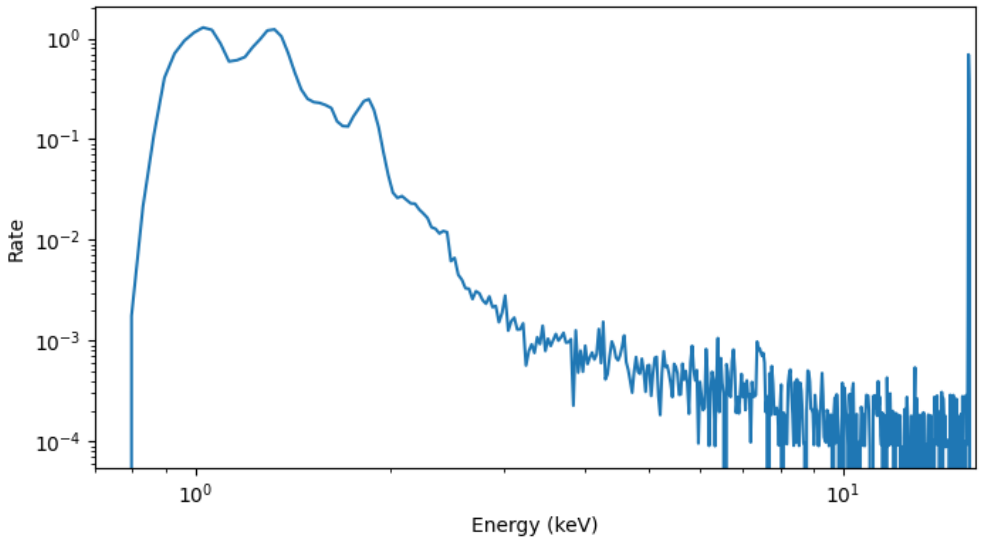

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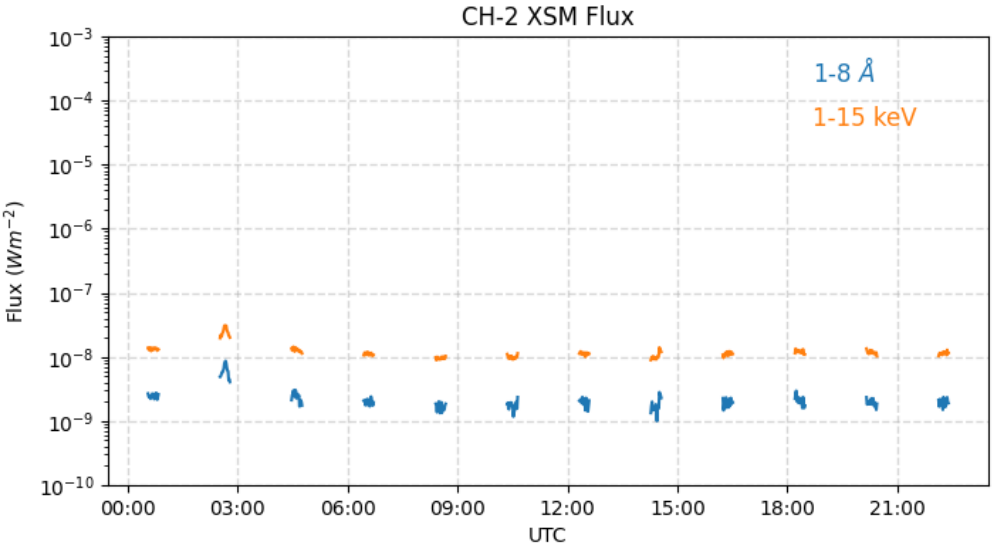

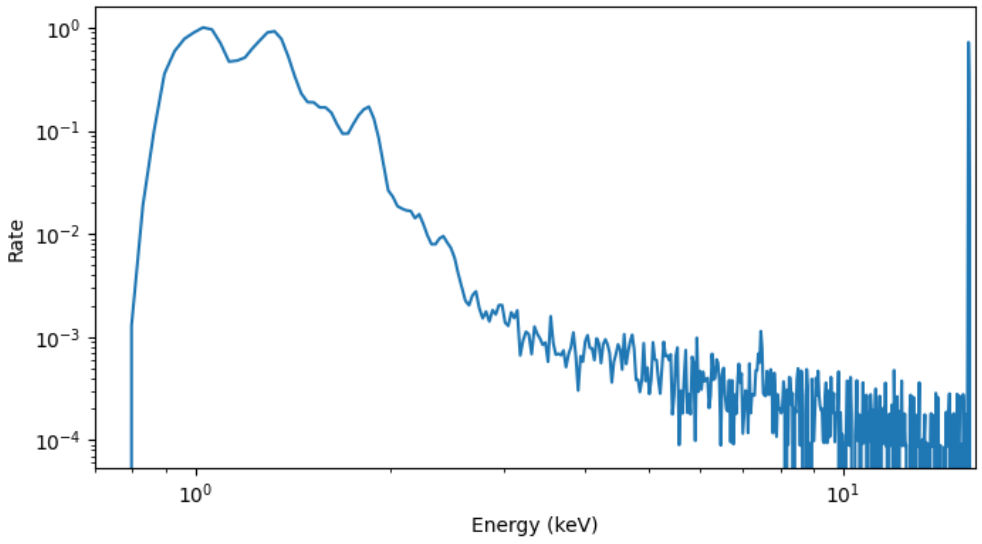

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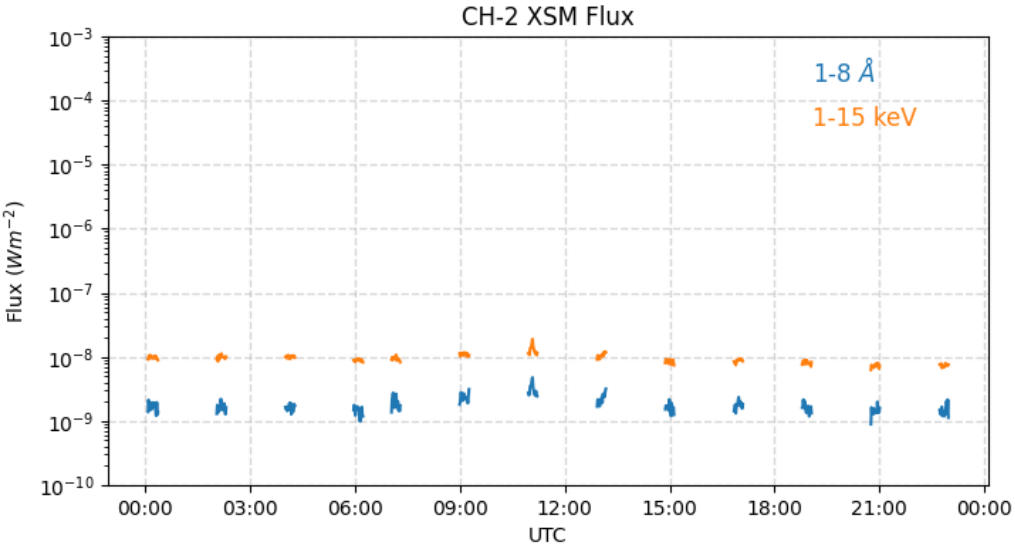

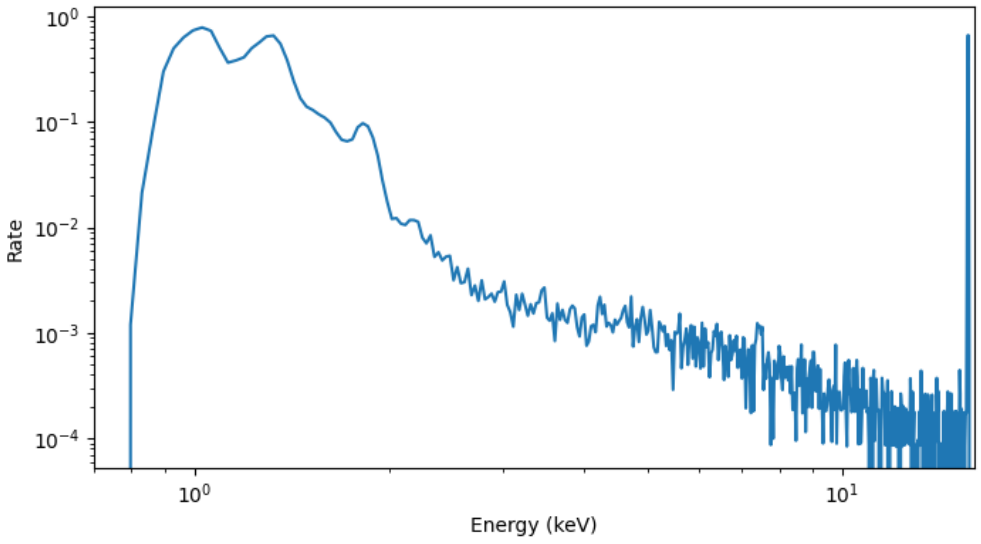

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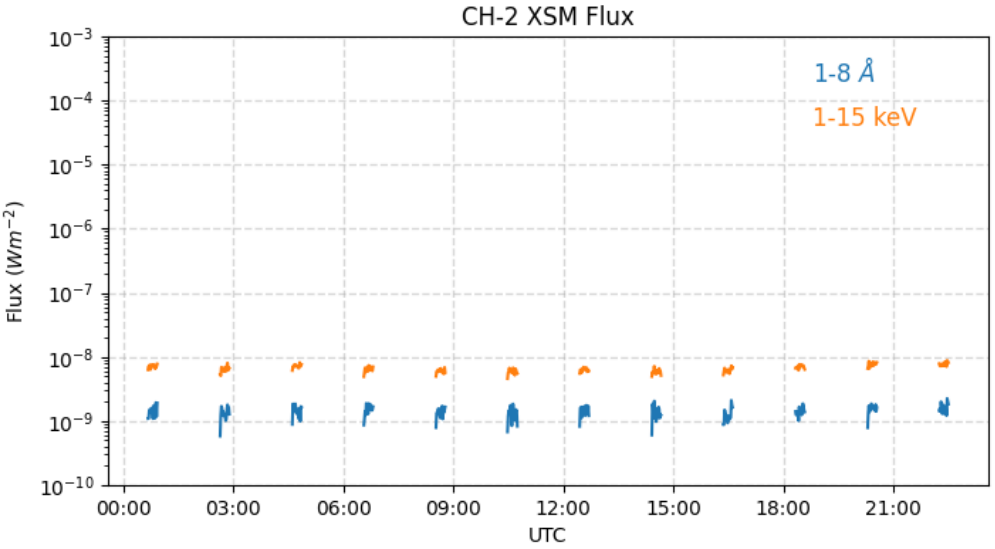

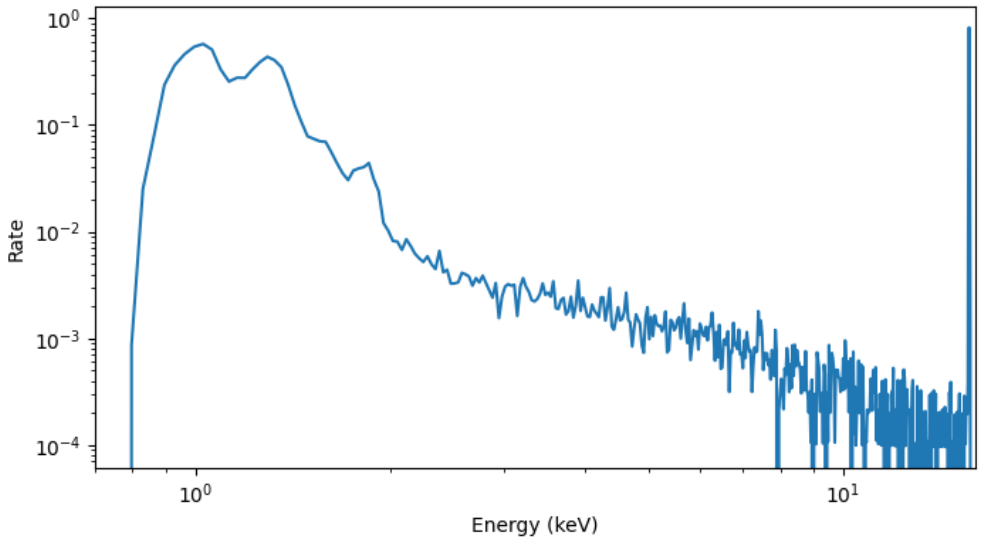

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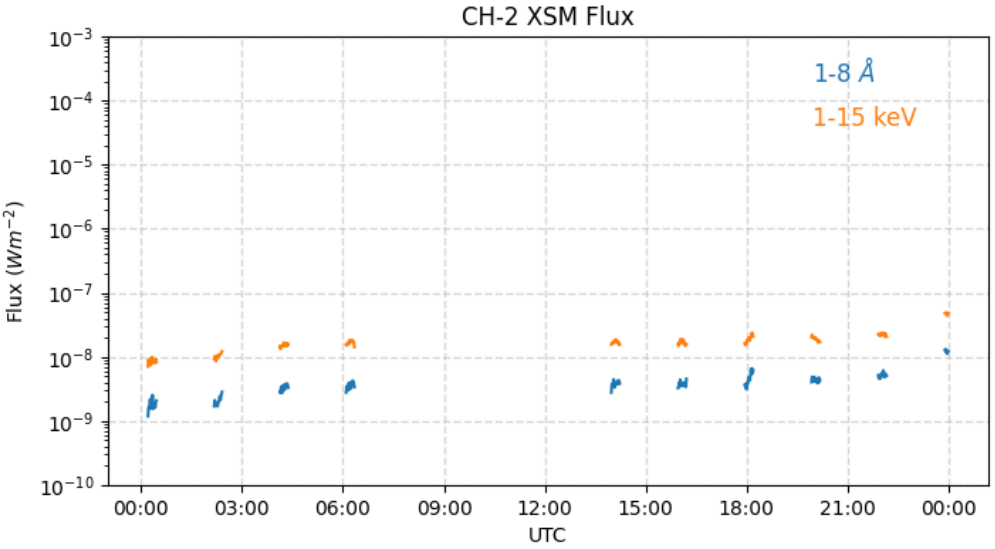

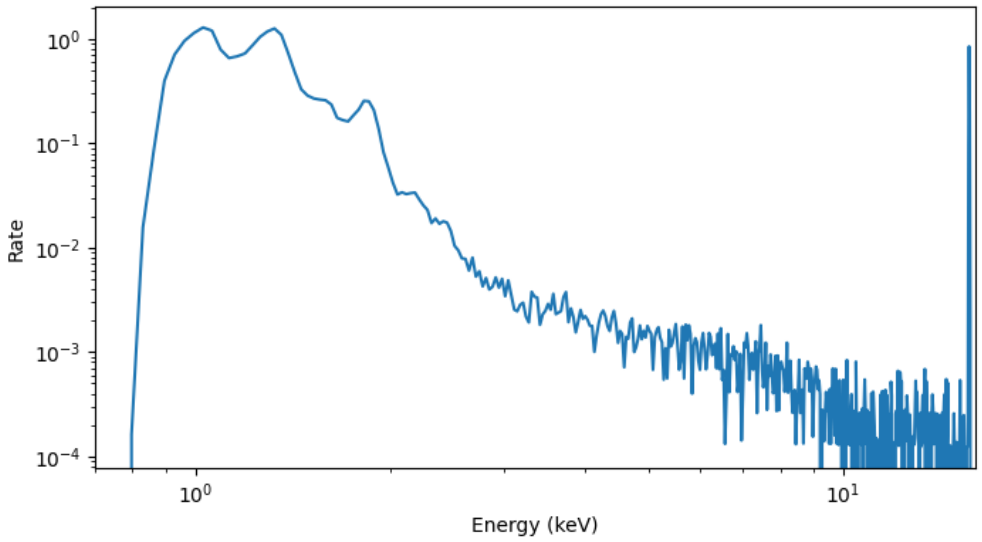

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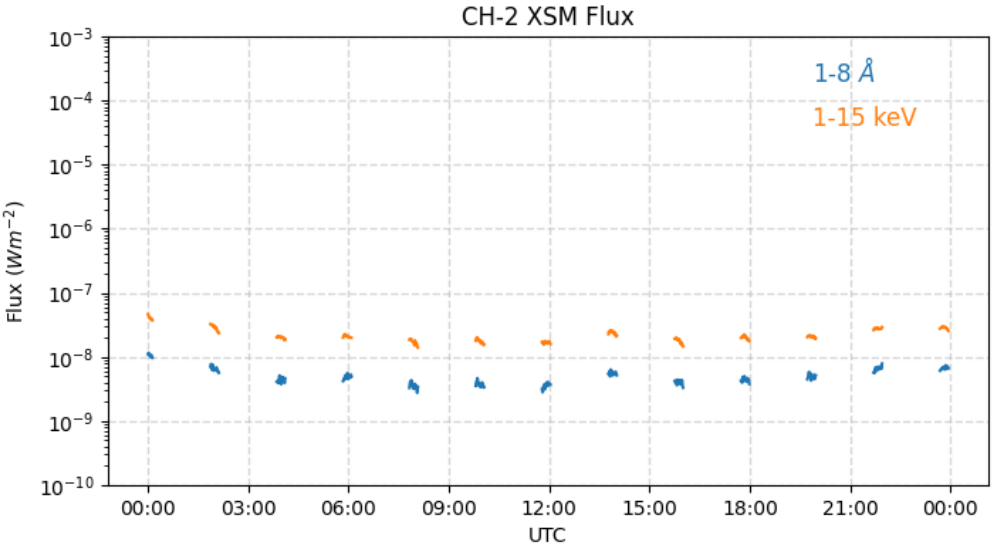

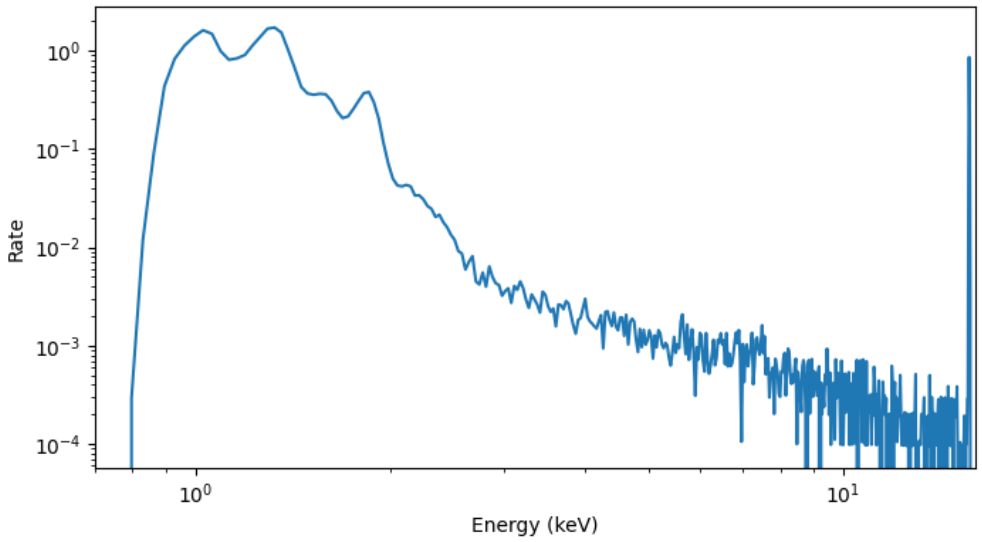

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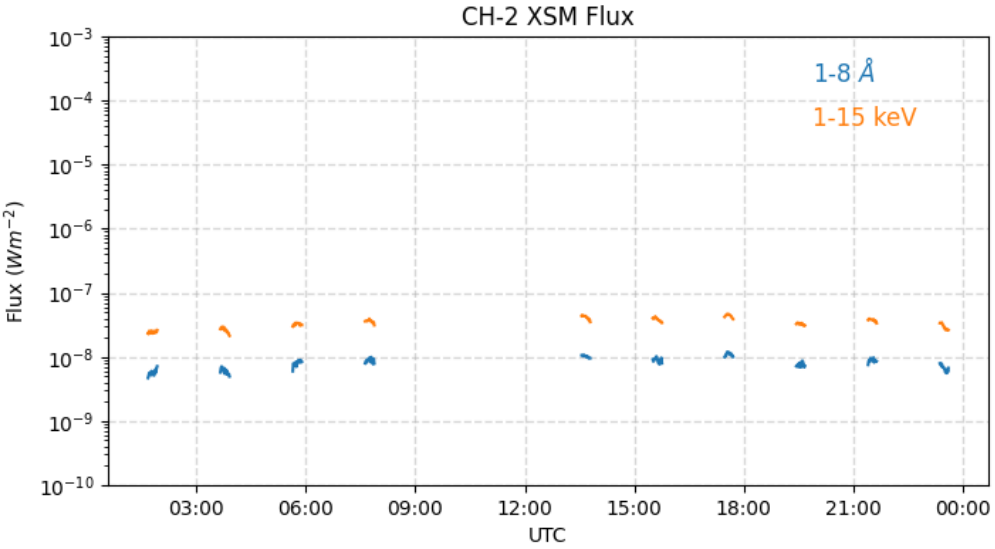
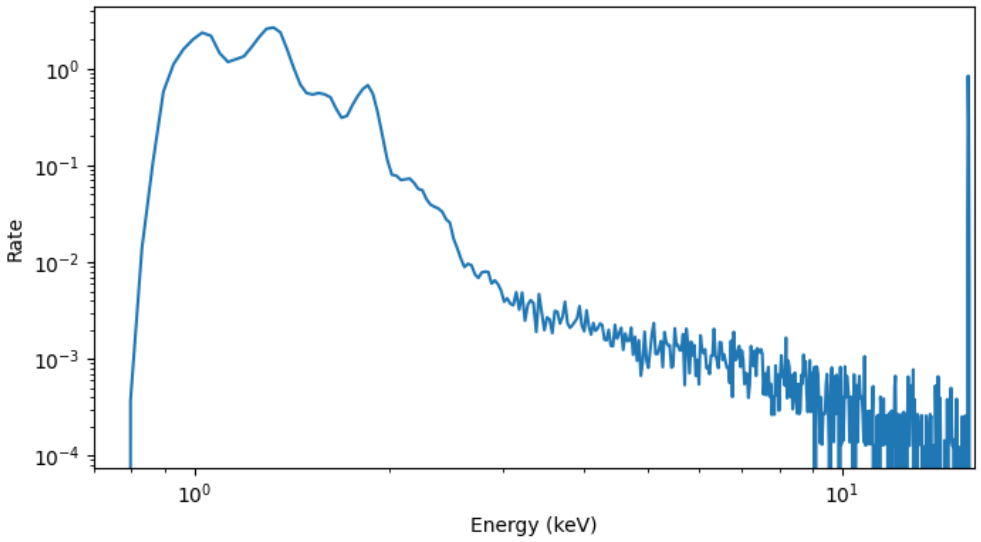
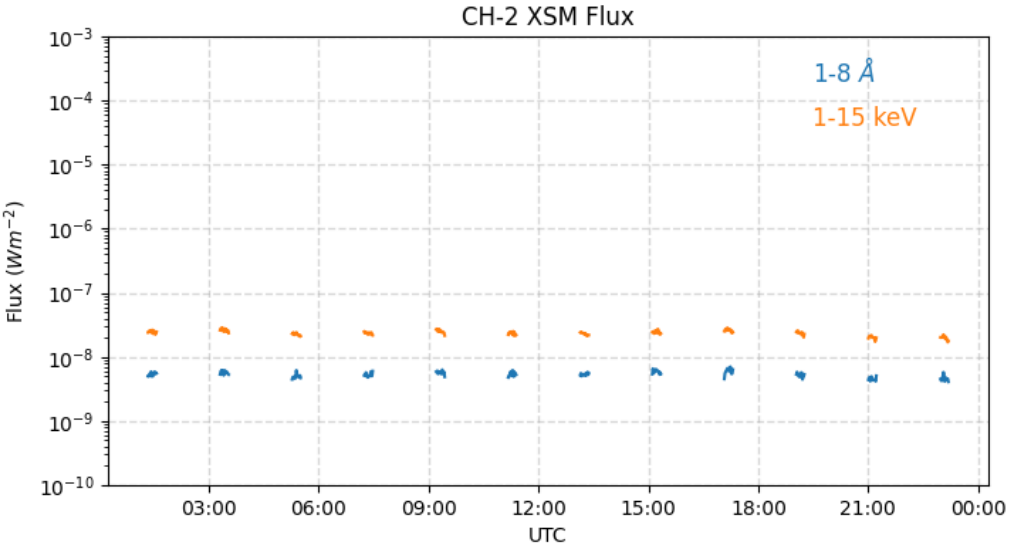
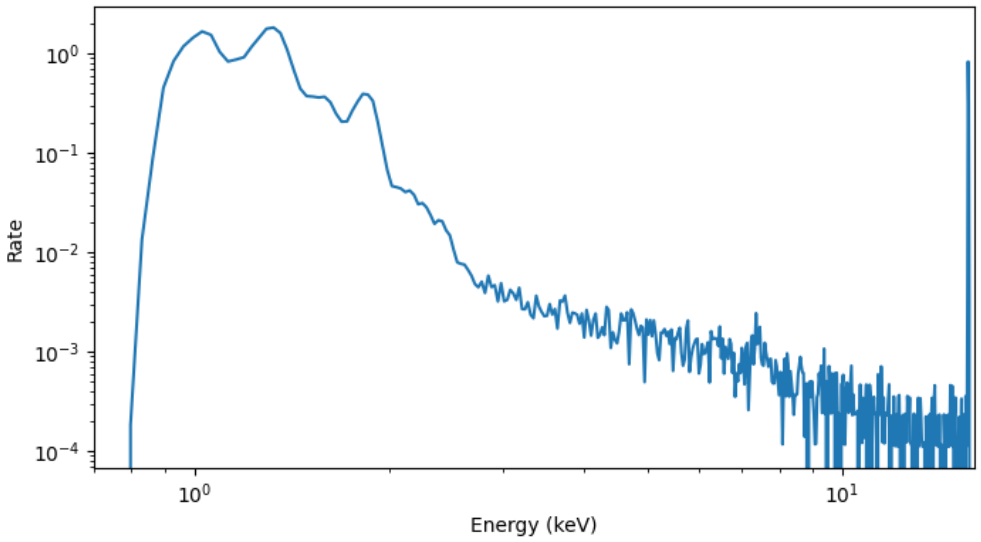




Date: 2020-01-04





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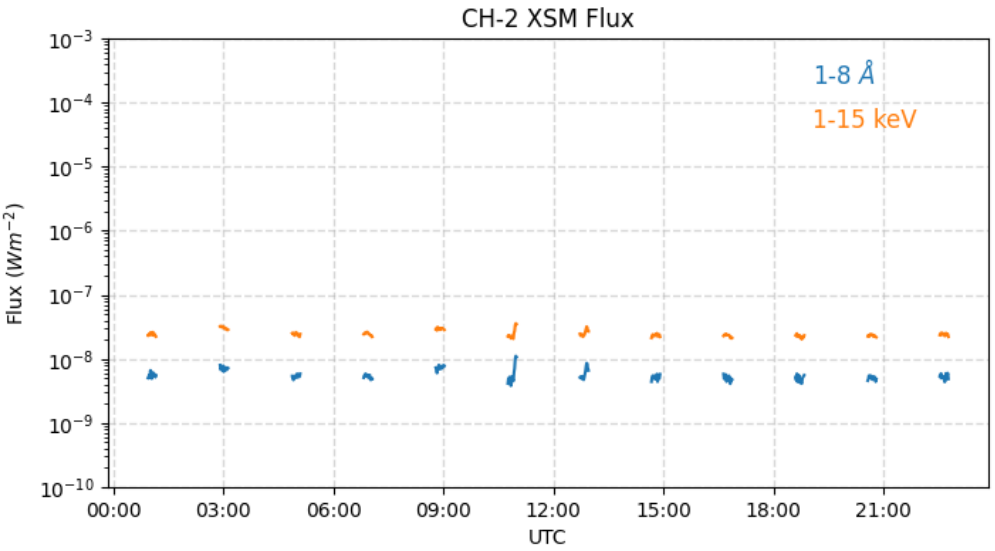

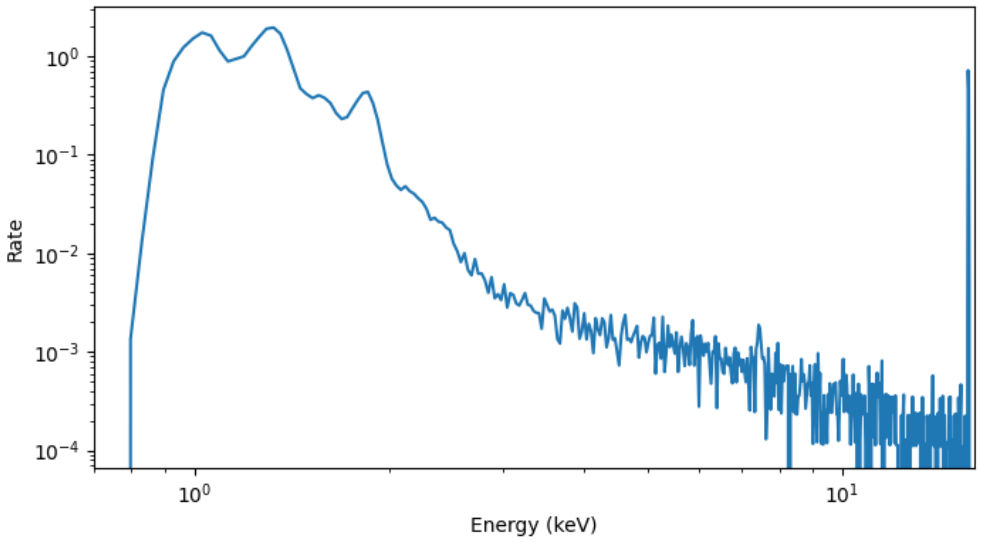

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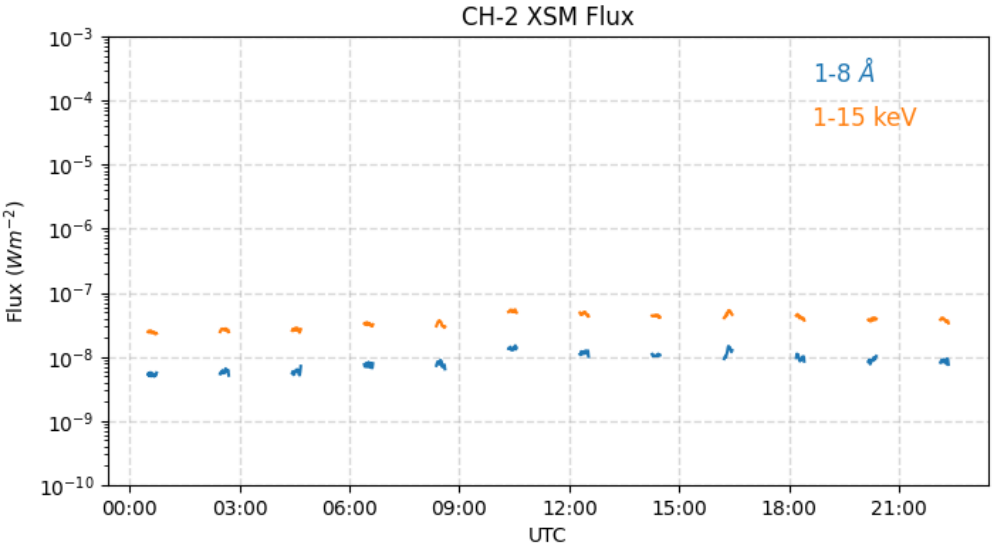

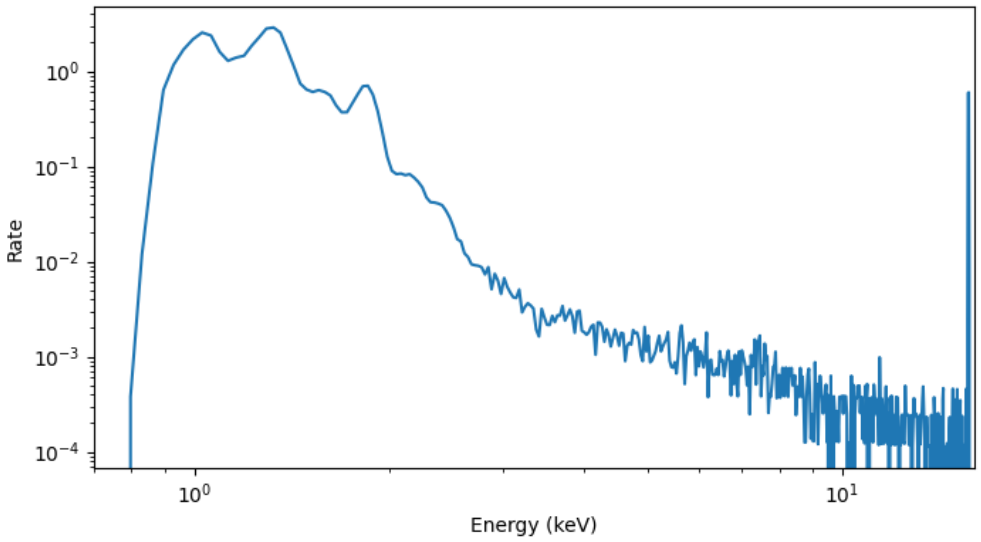

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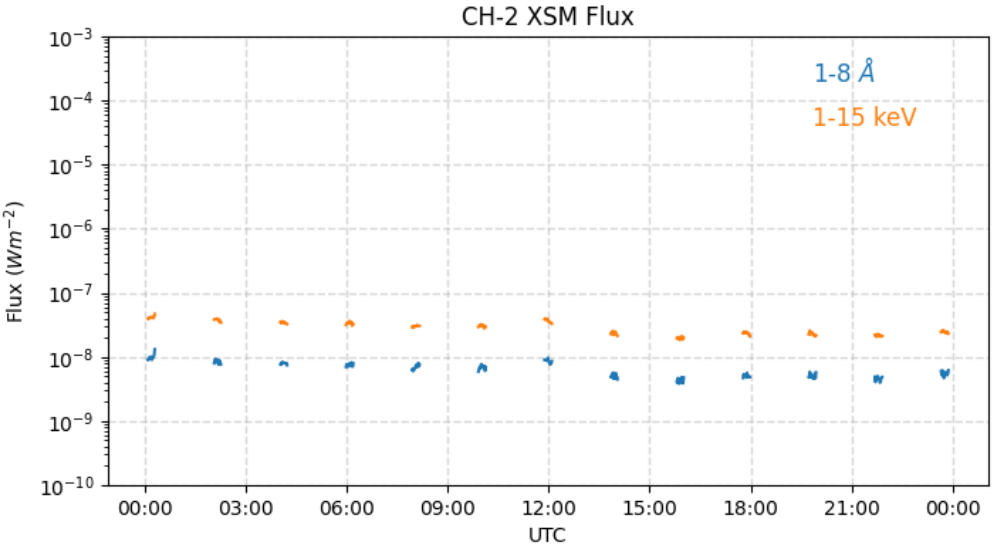

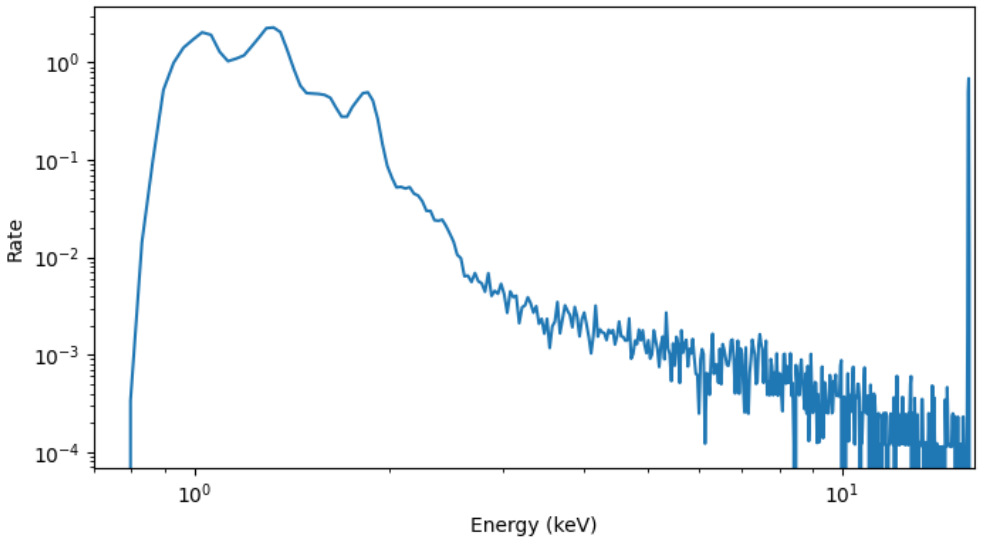

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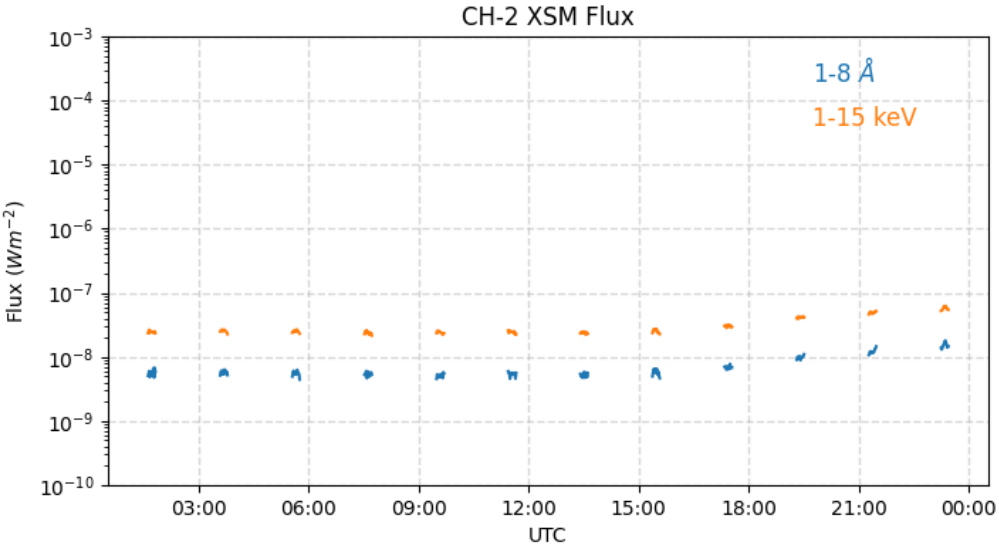

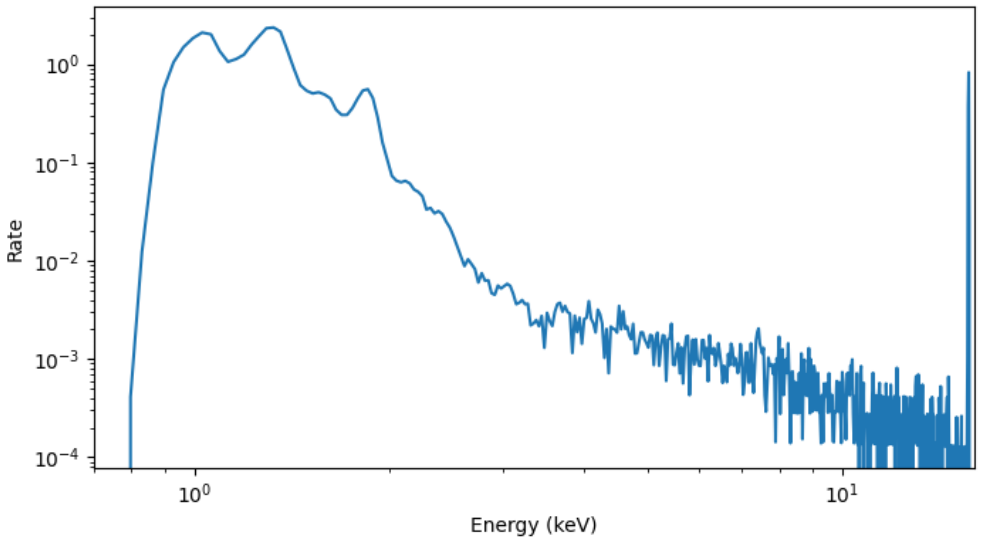

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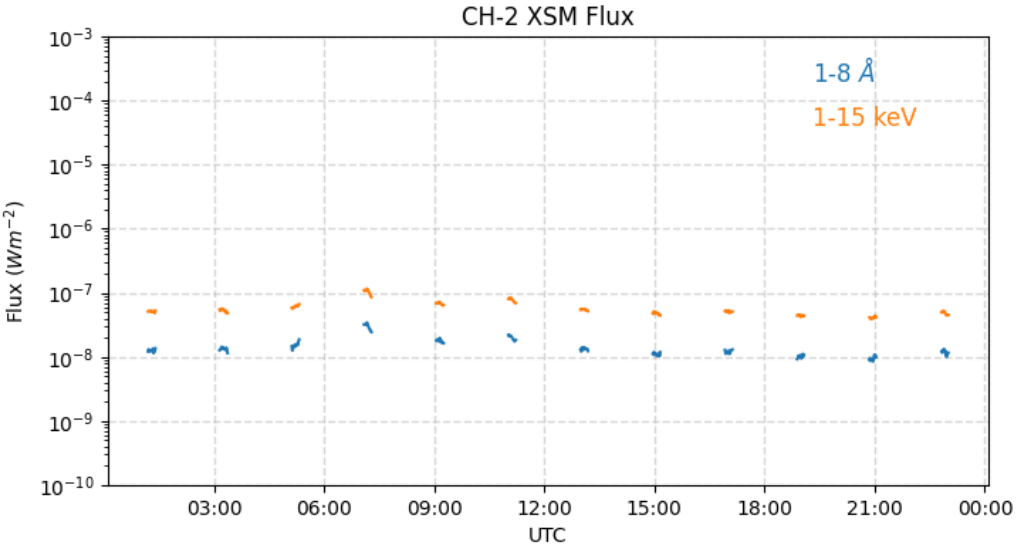

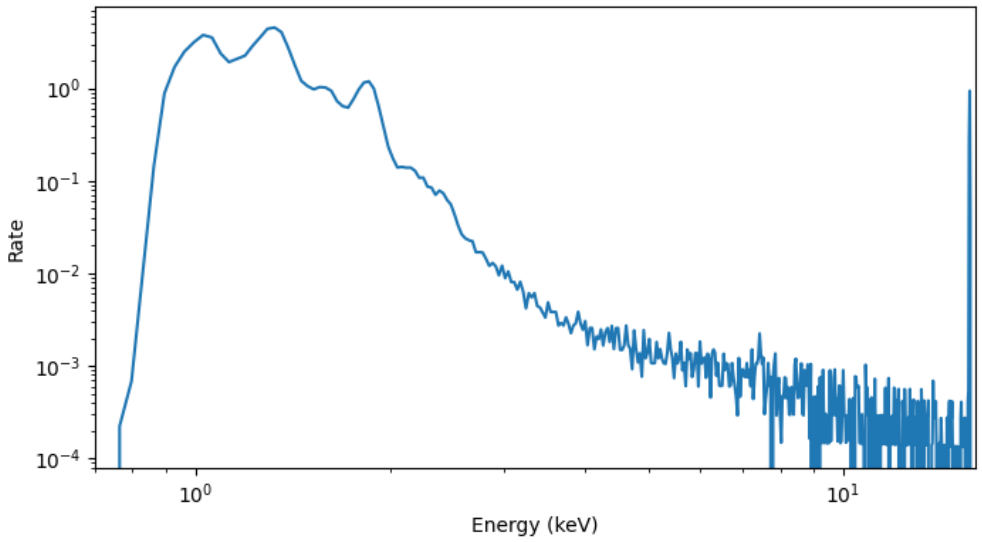

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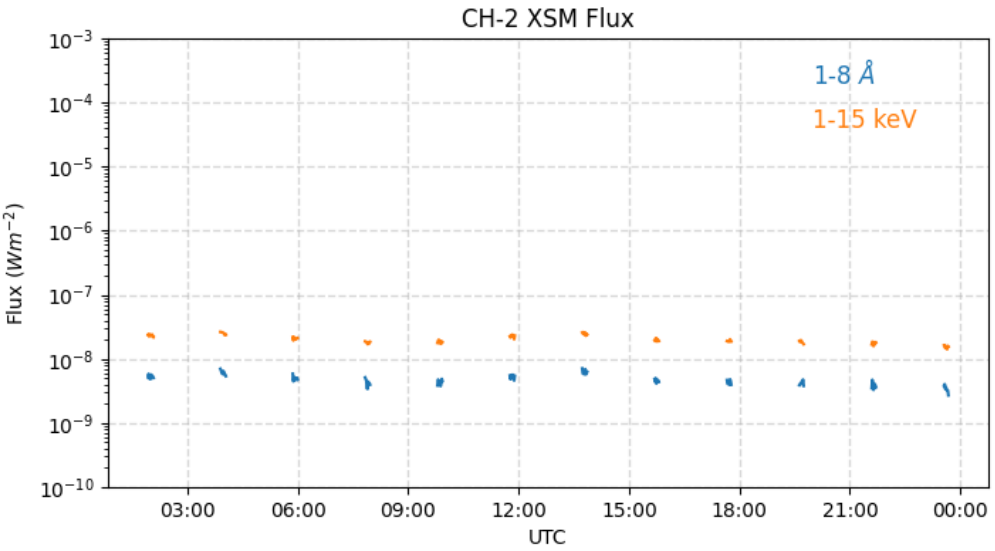

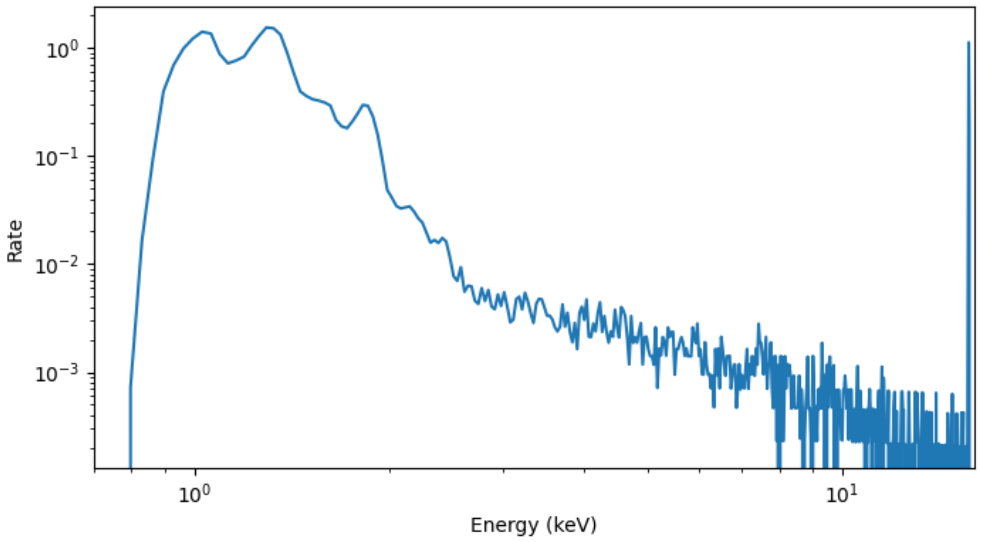

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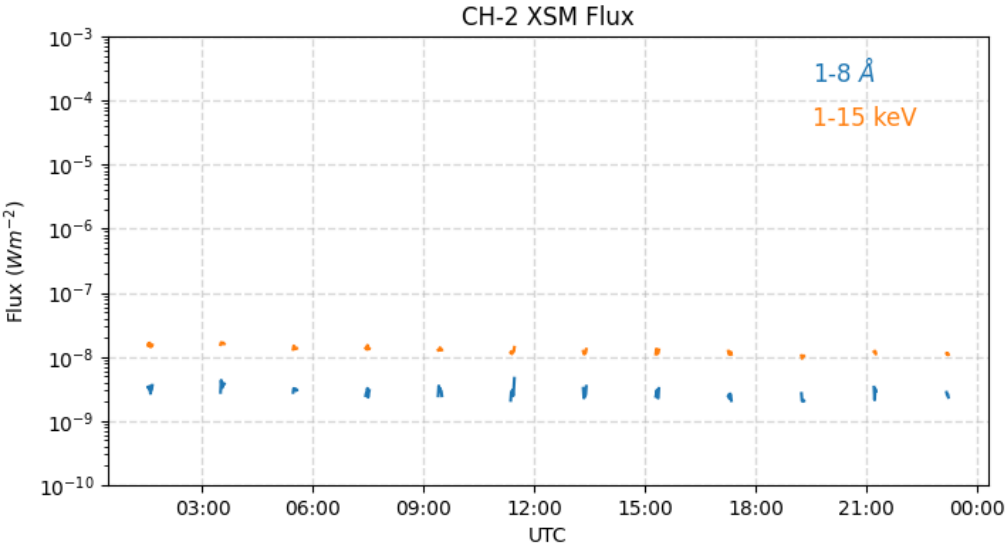

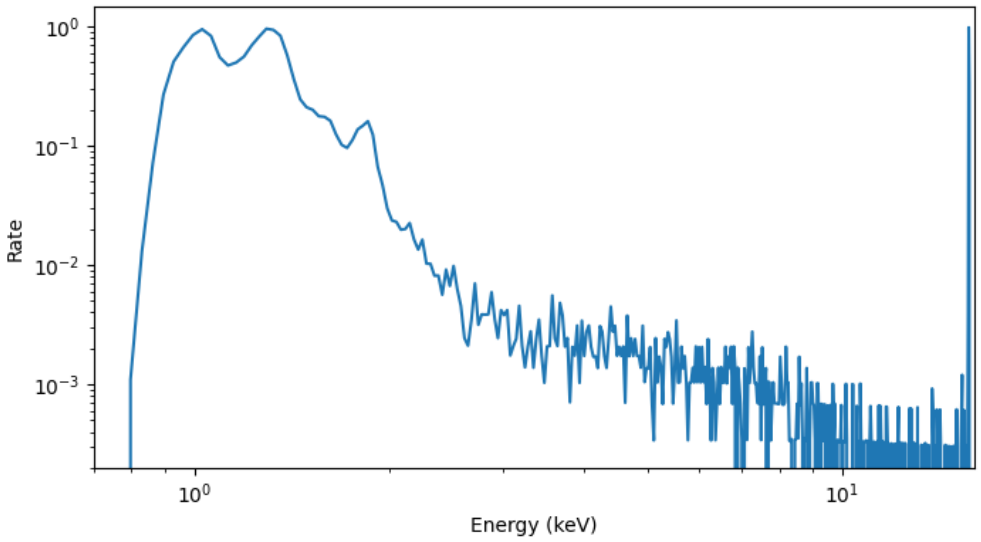

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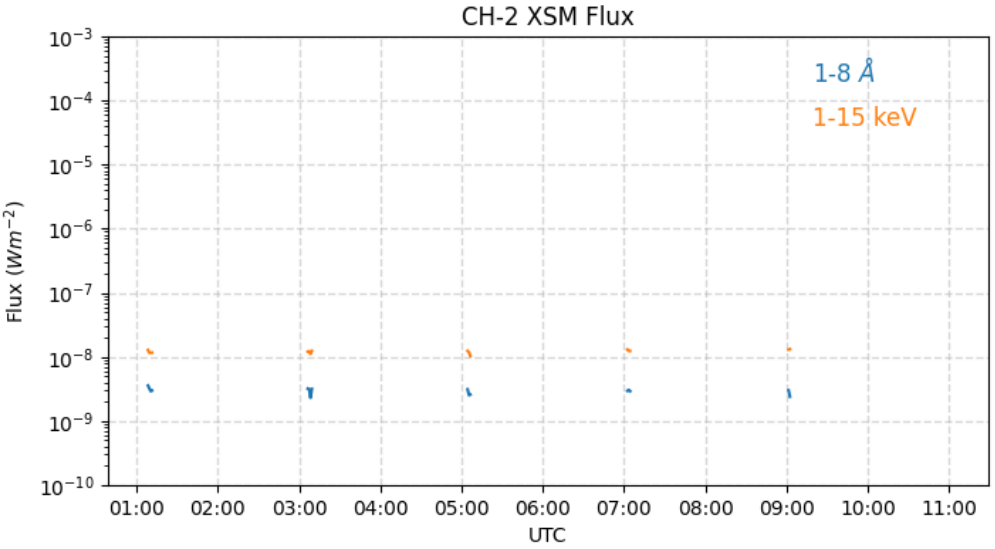

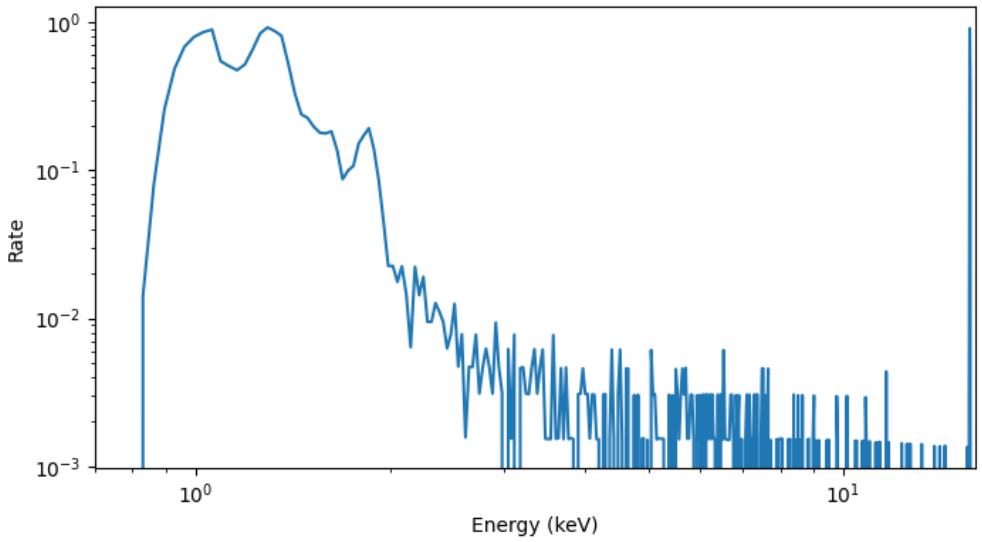

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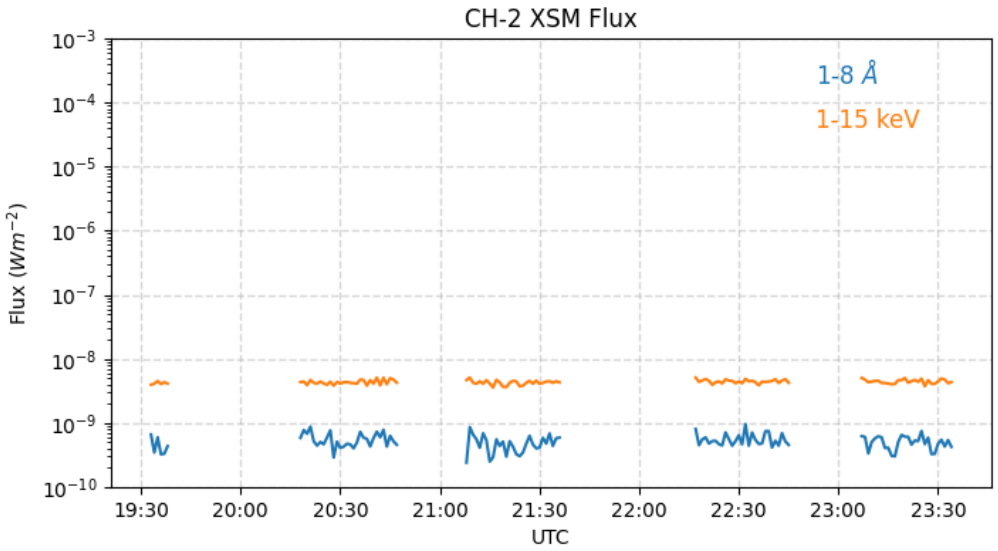

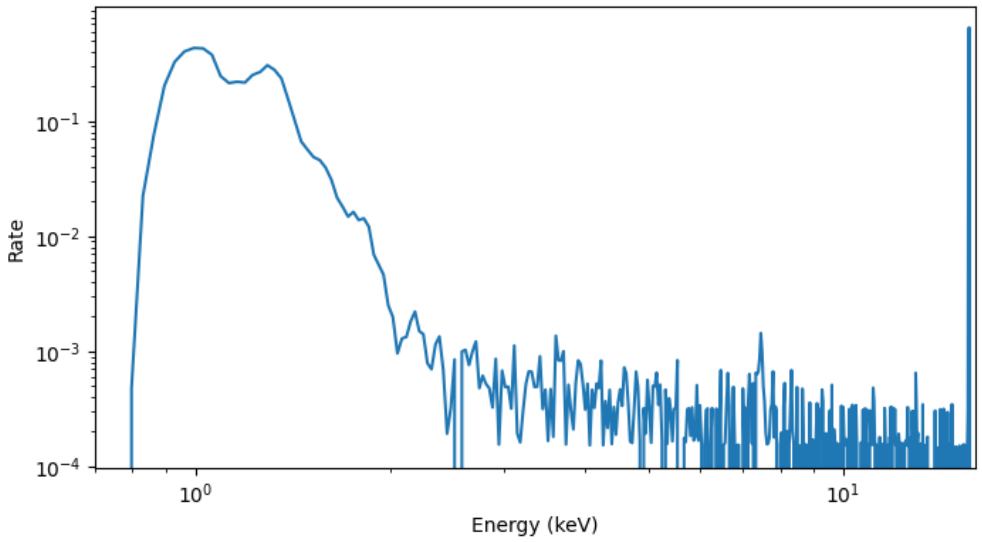

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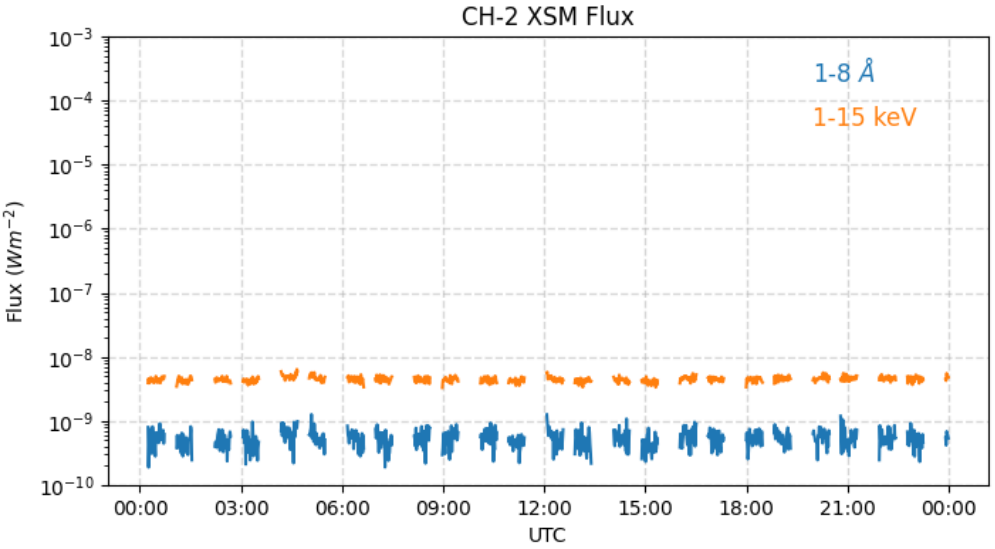

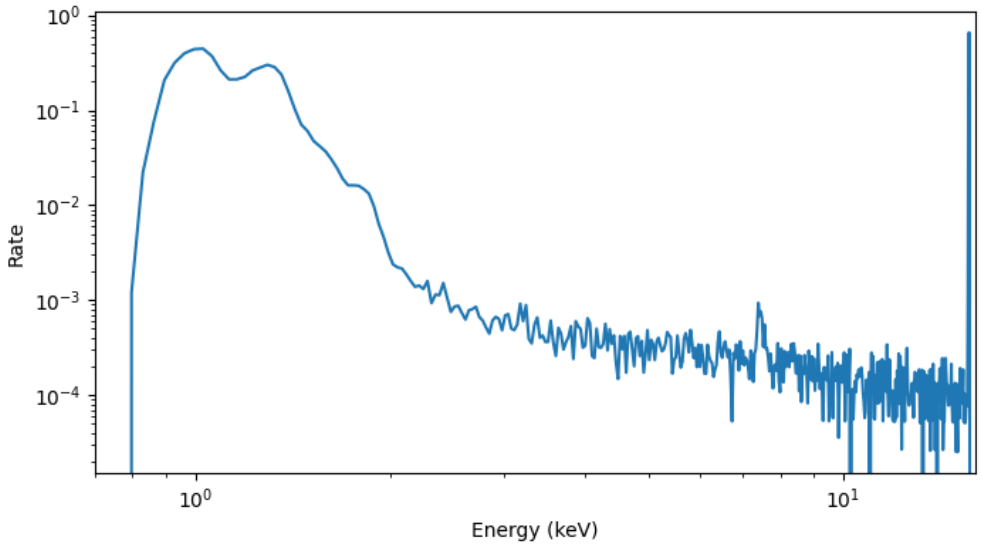

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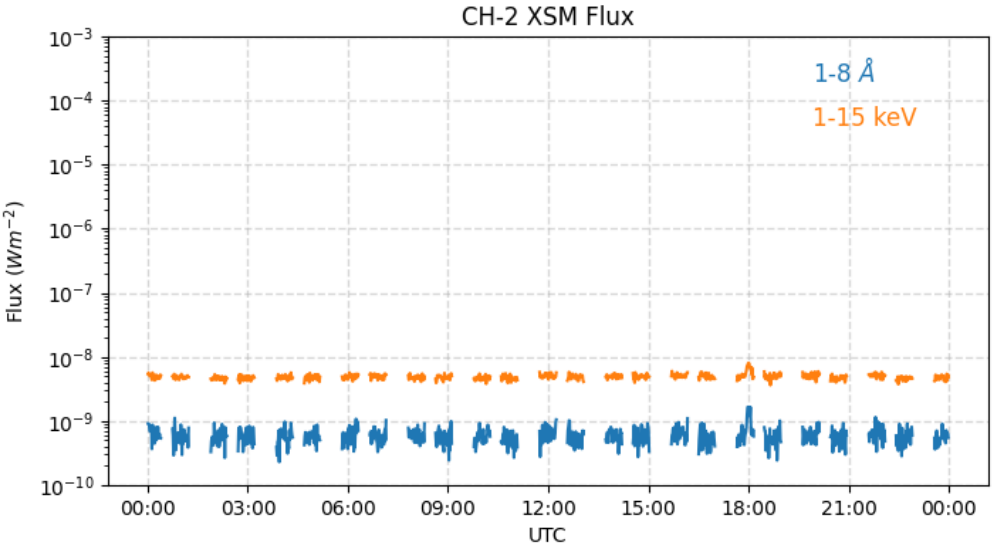

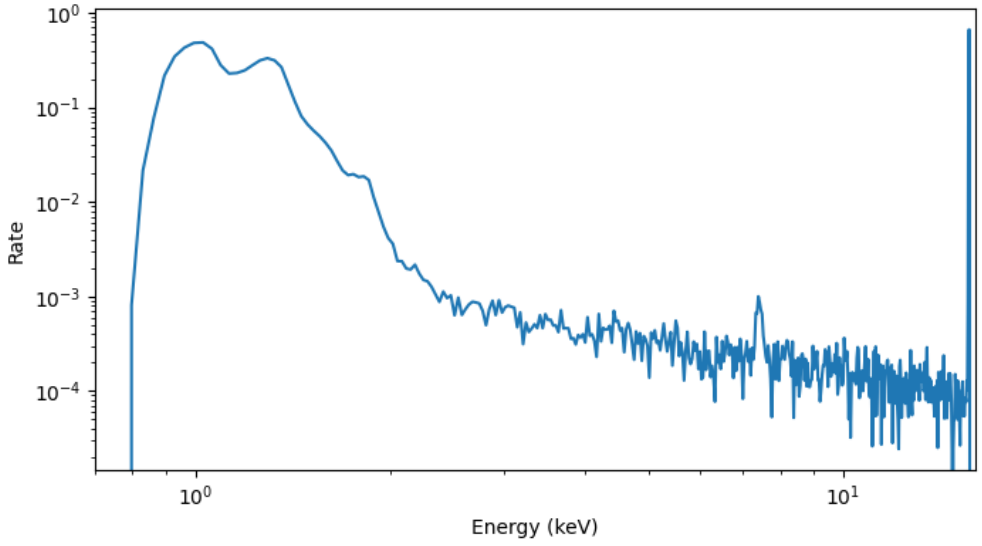

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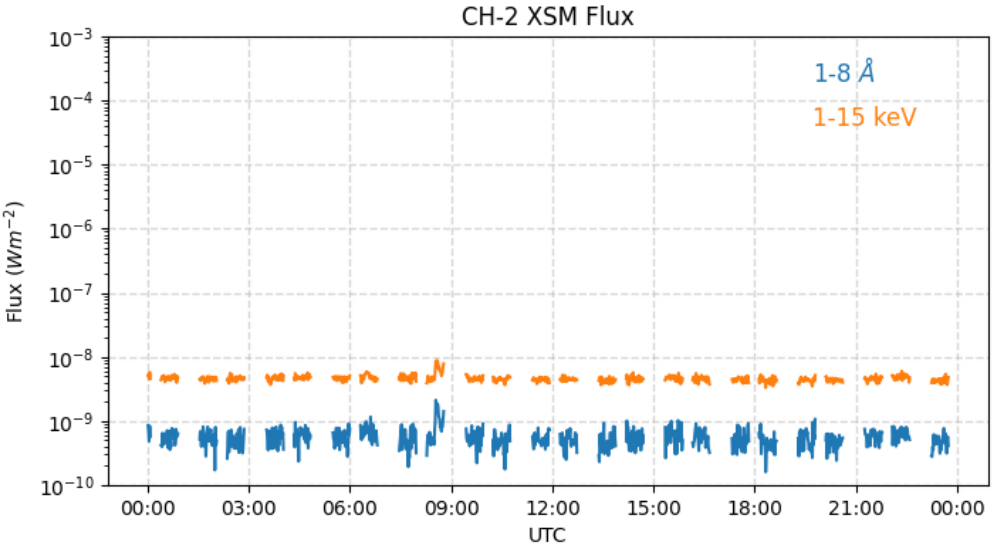

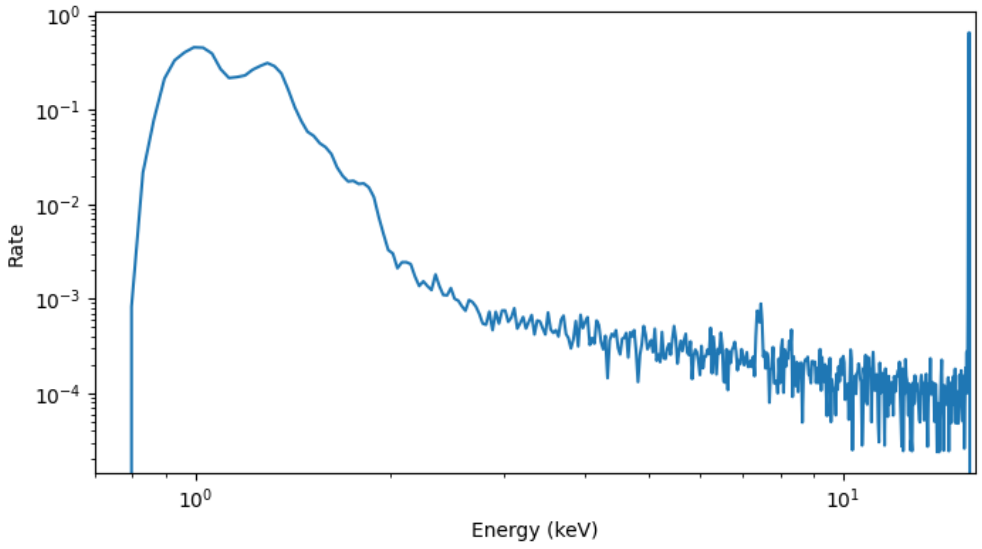

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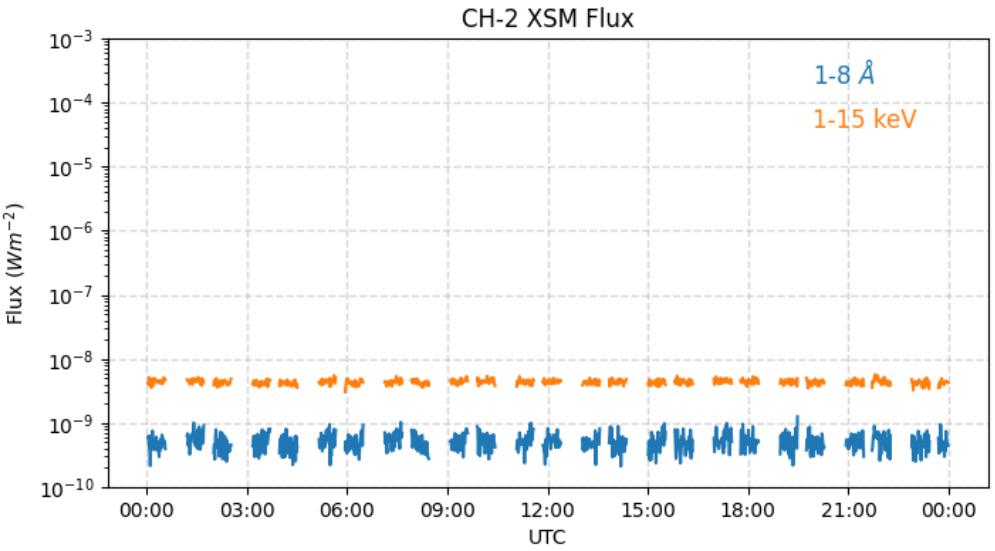

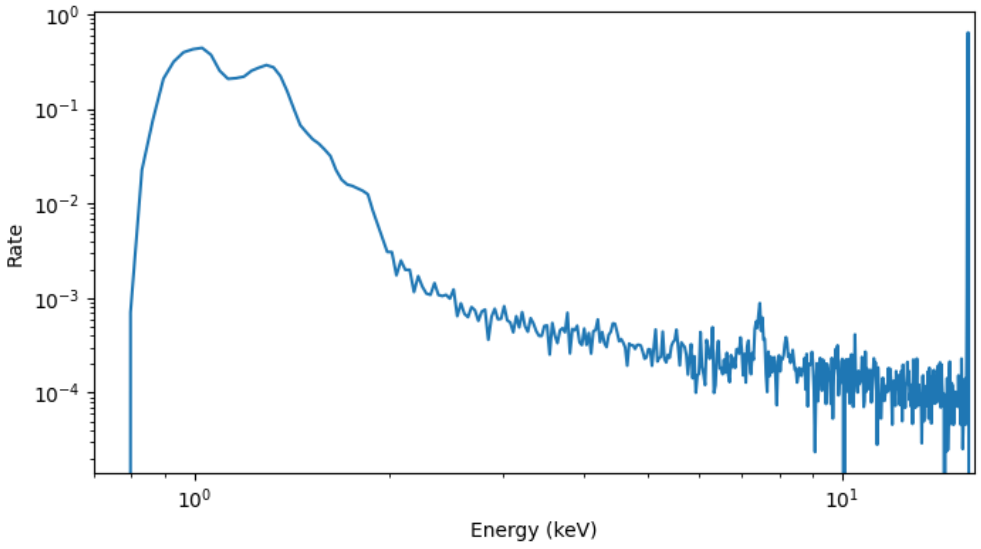

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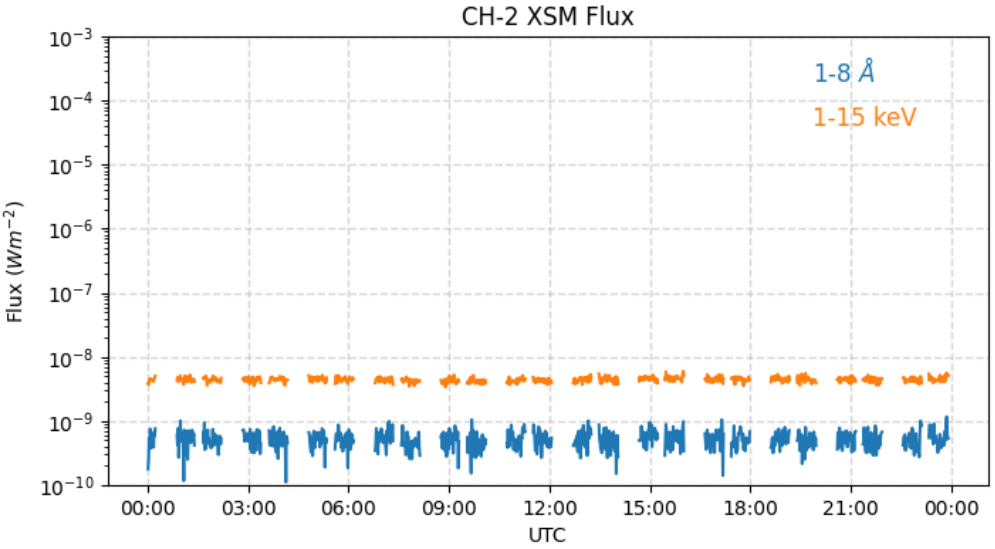

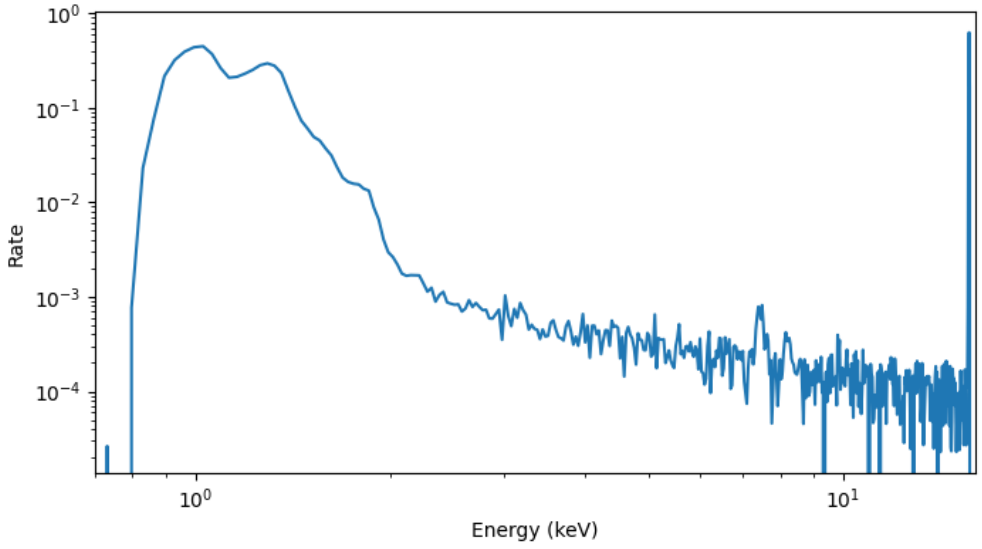

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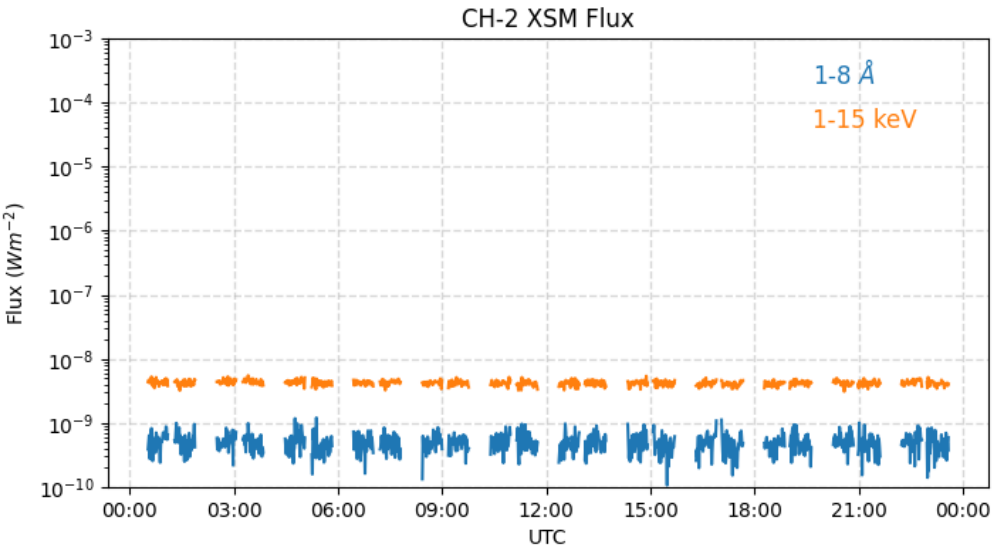

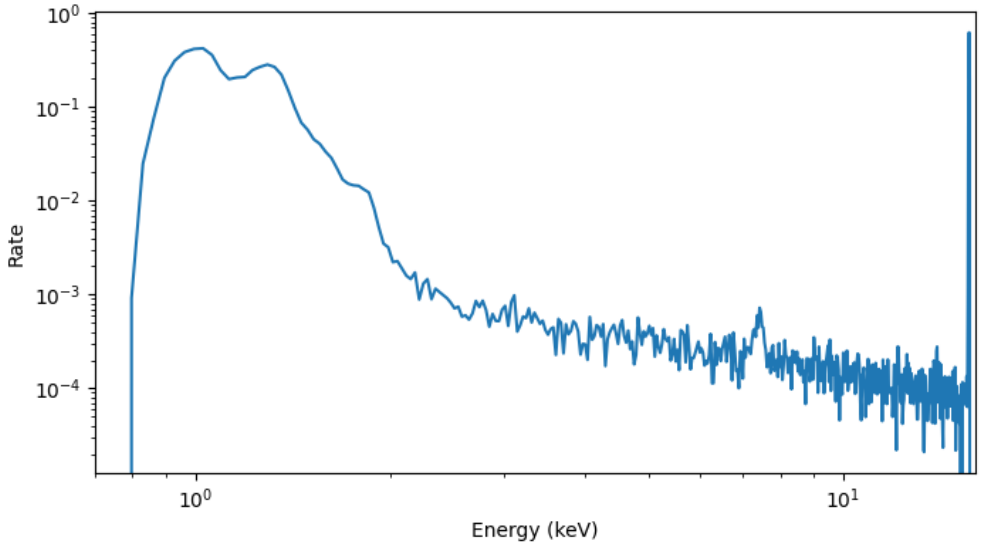

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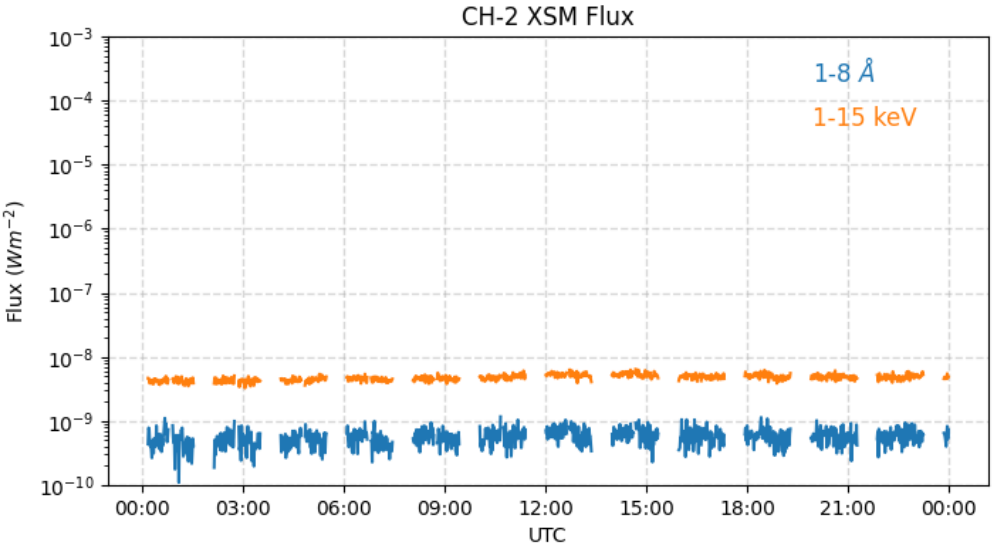

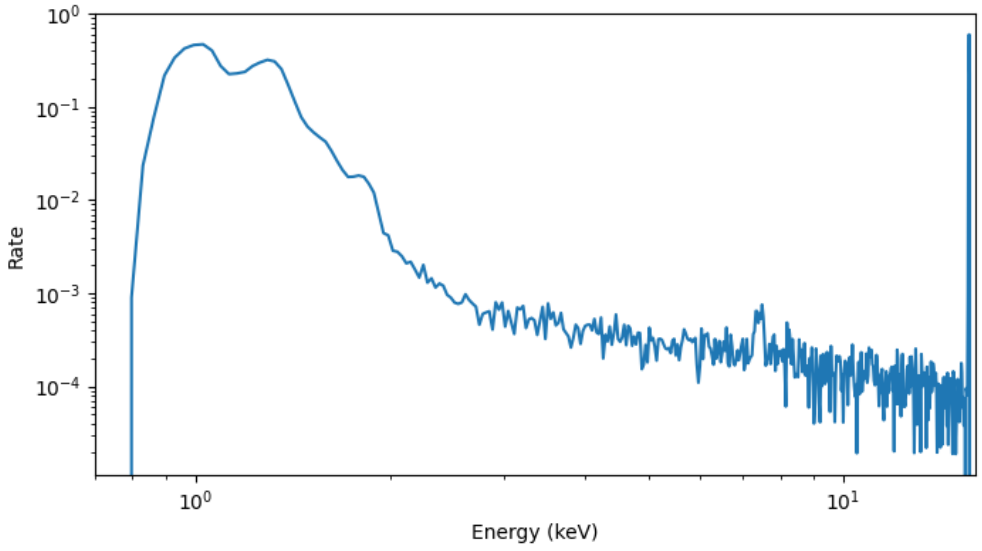

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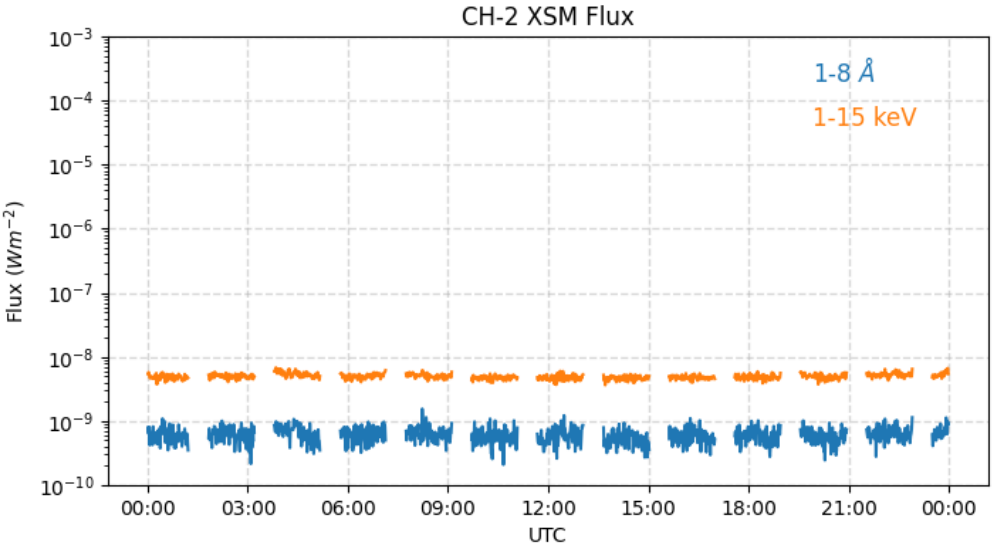

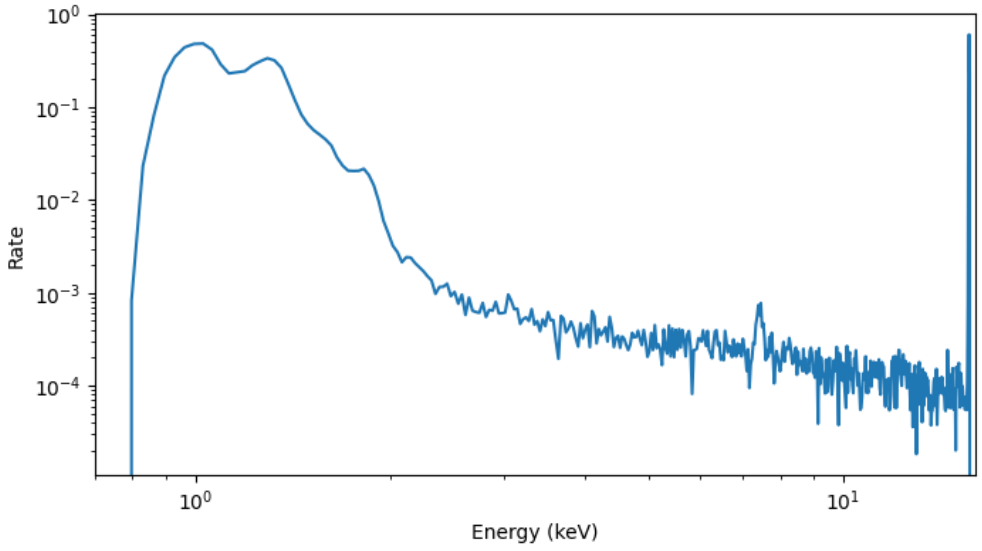

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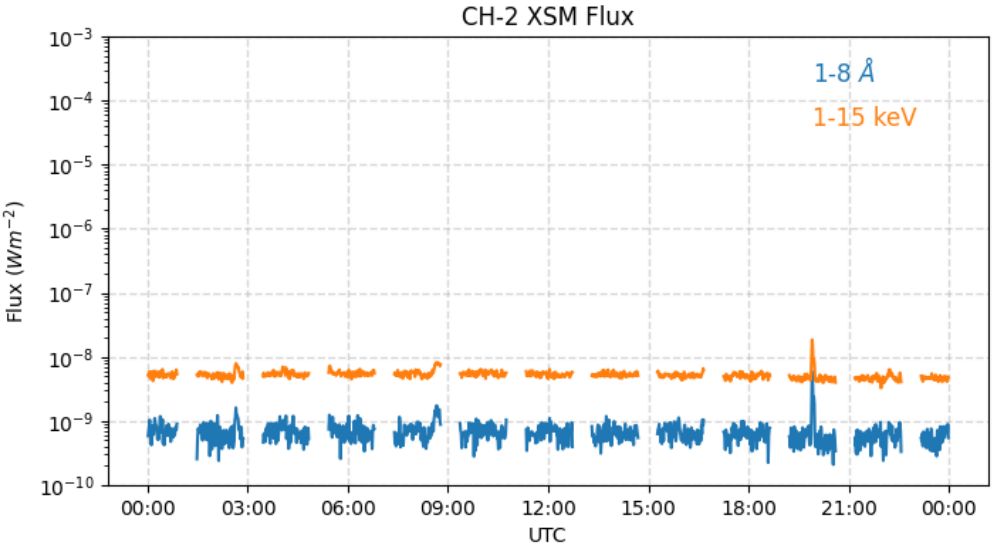

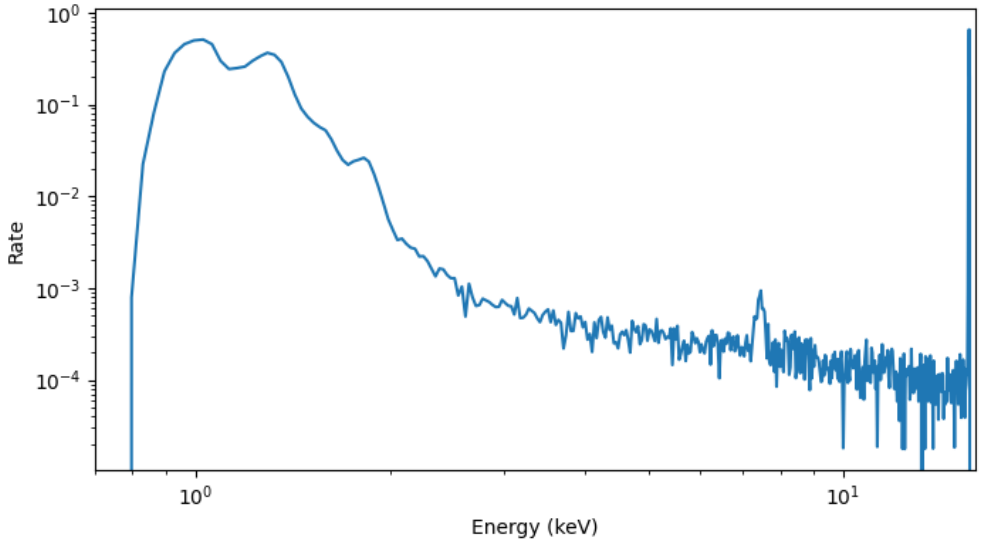

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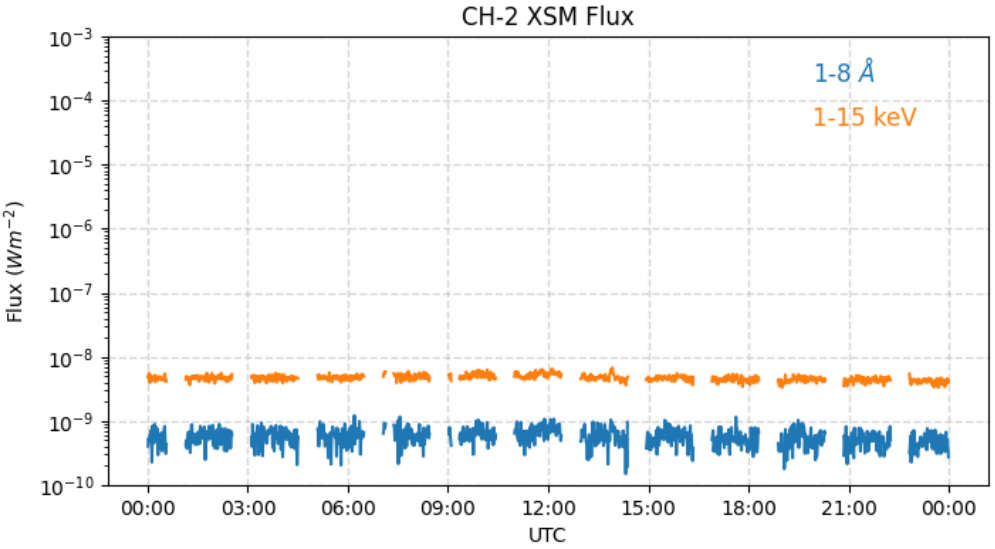

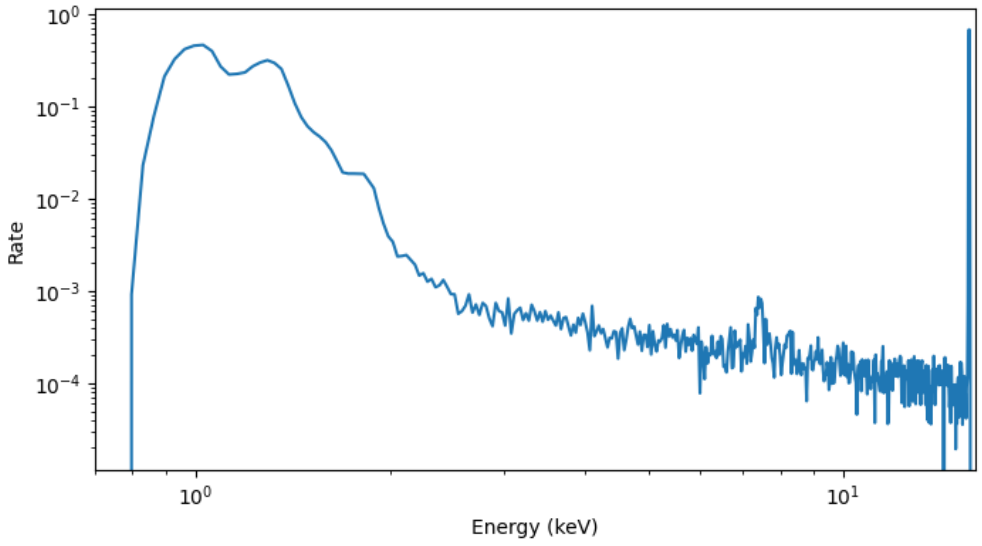

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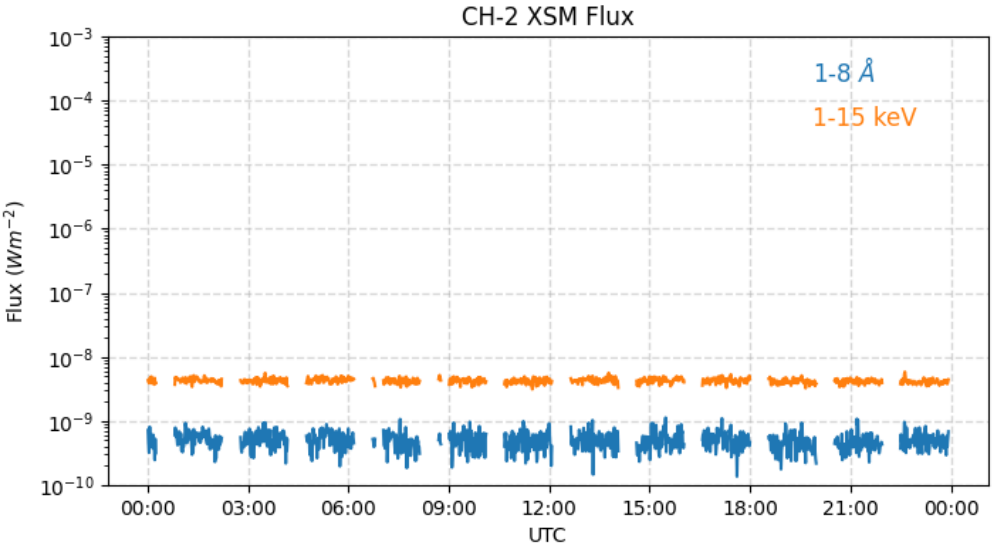

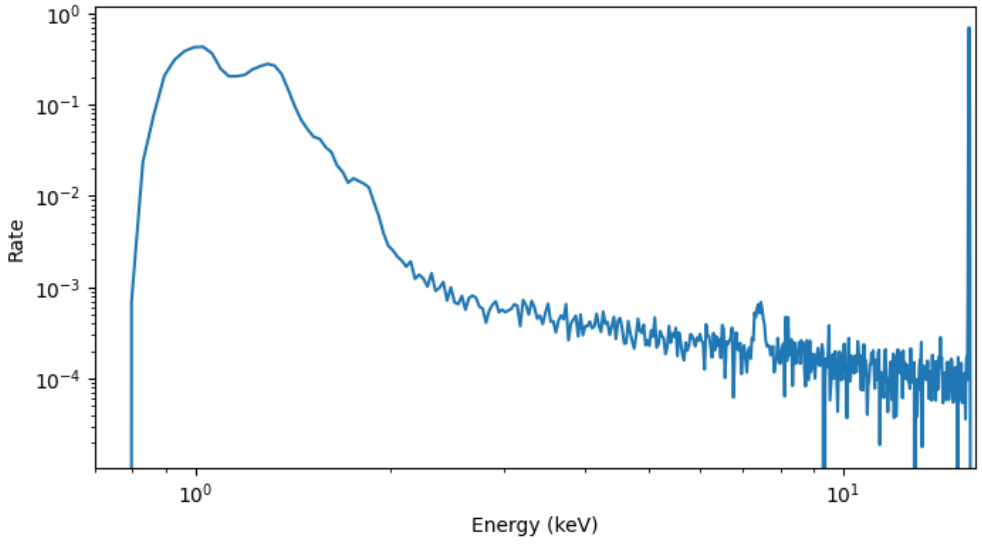

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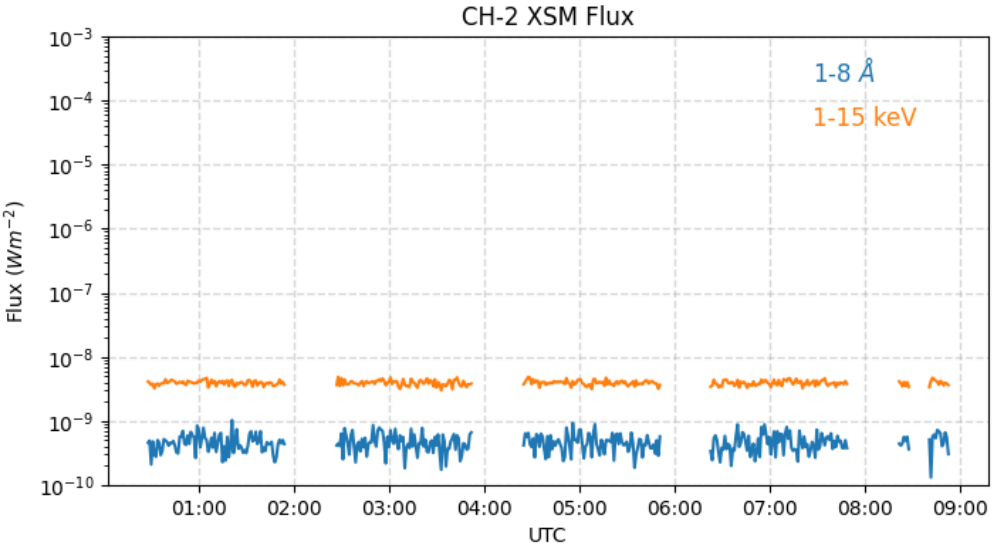

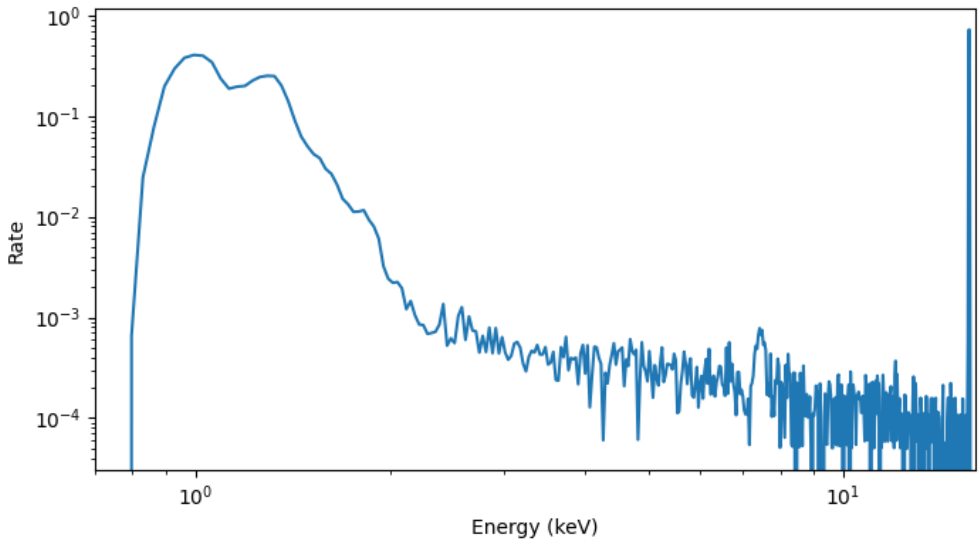

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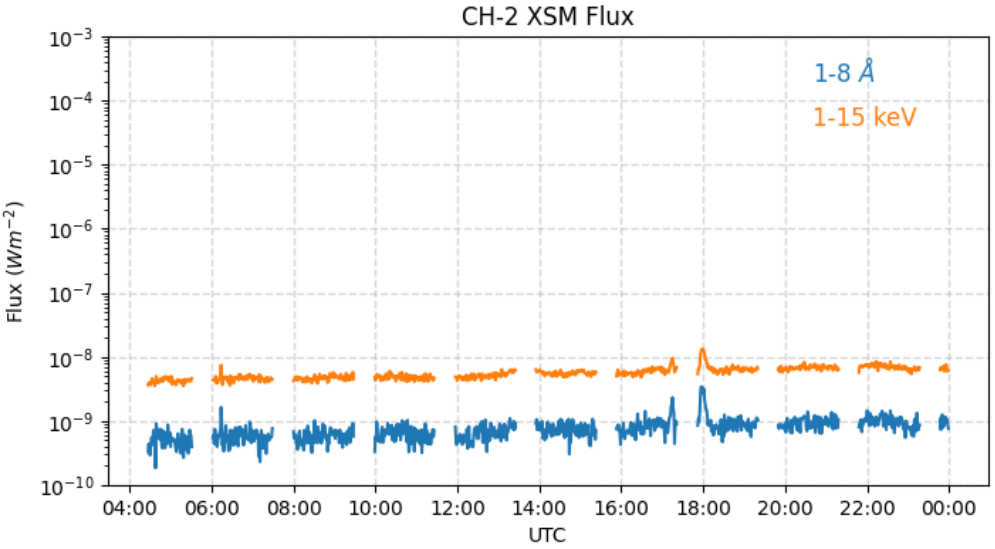

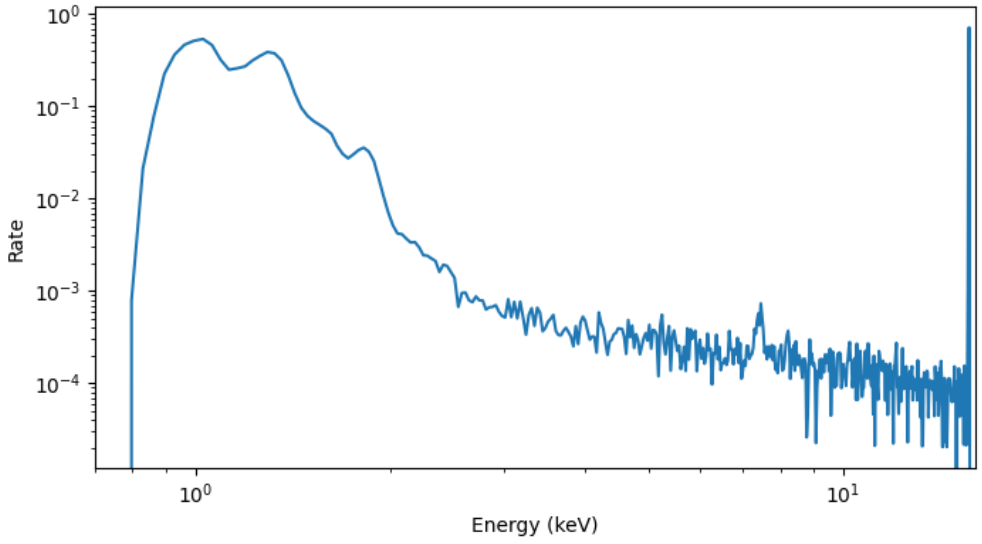

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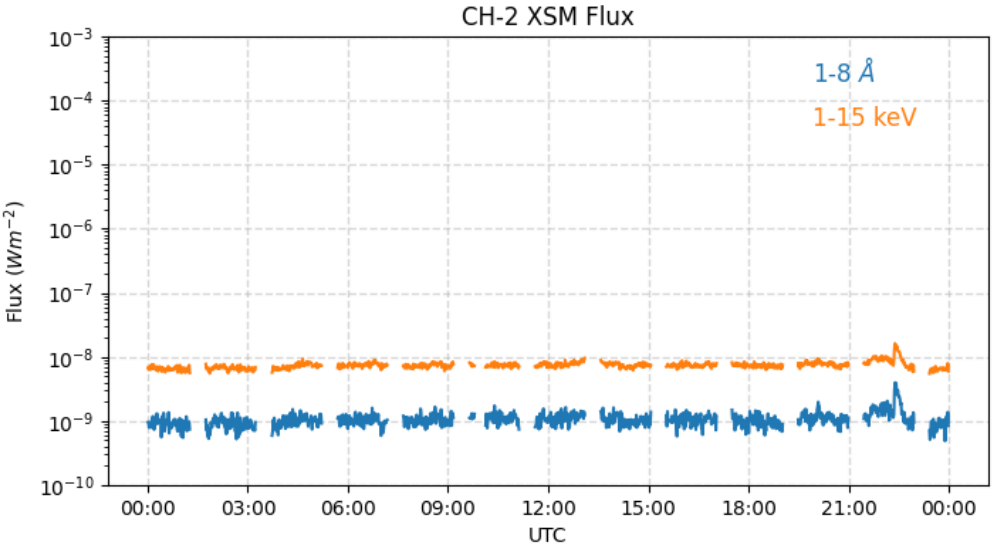

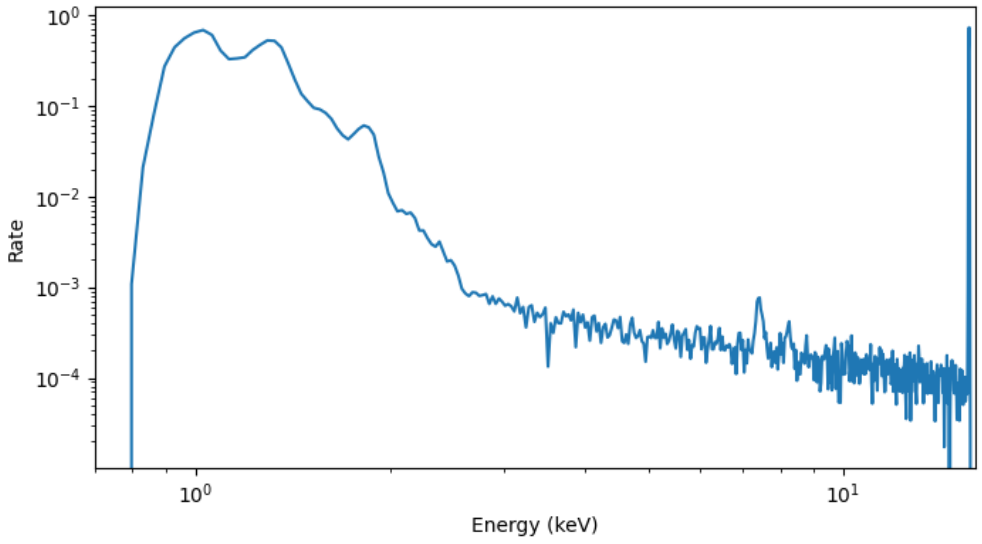

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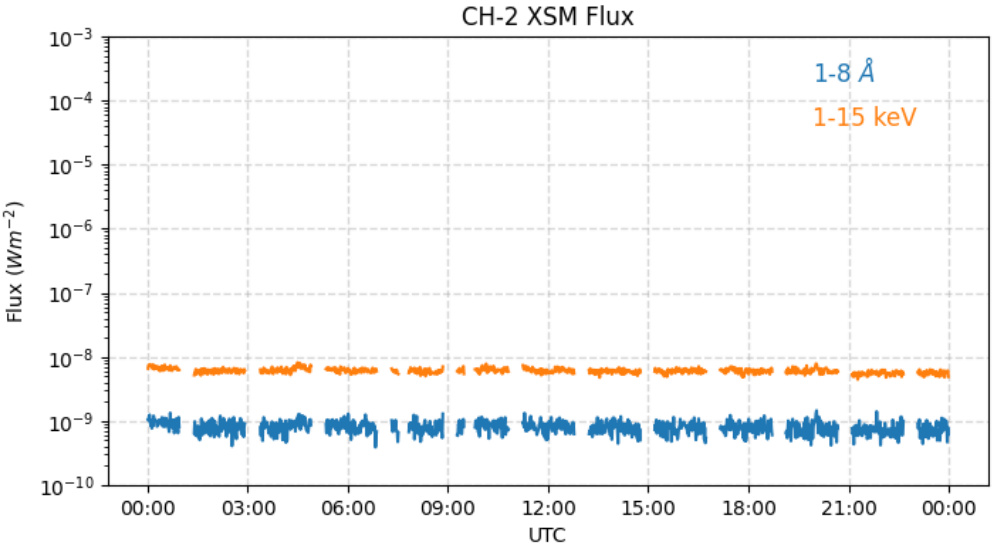

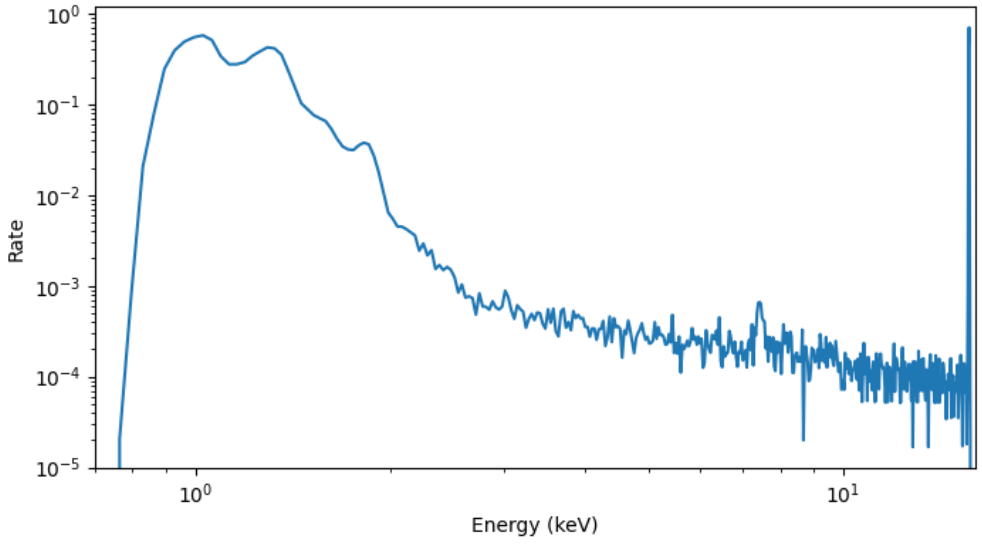

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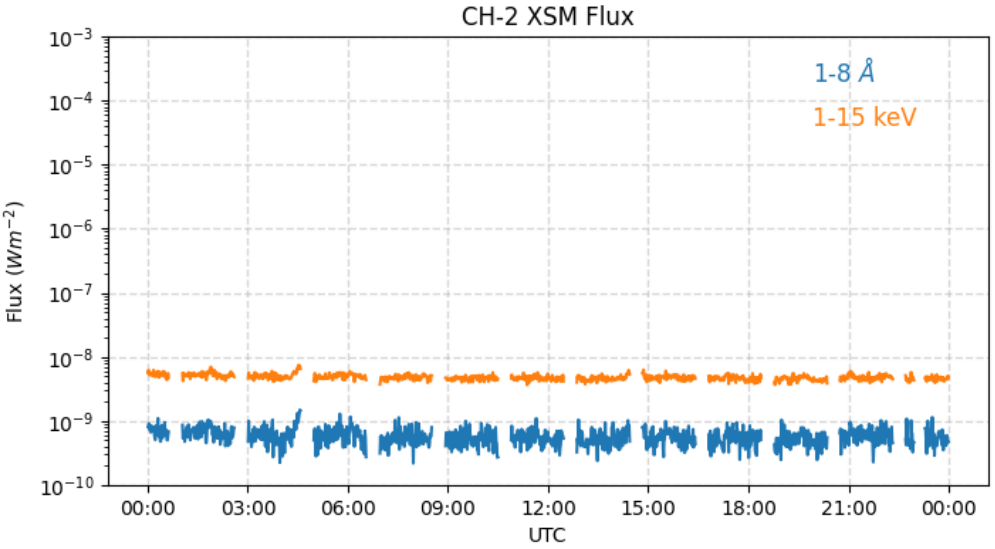

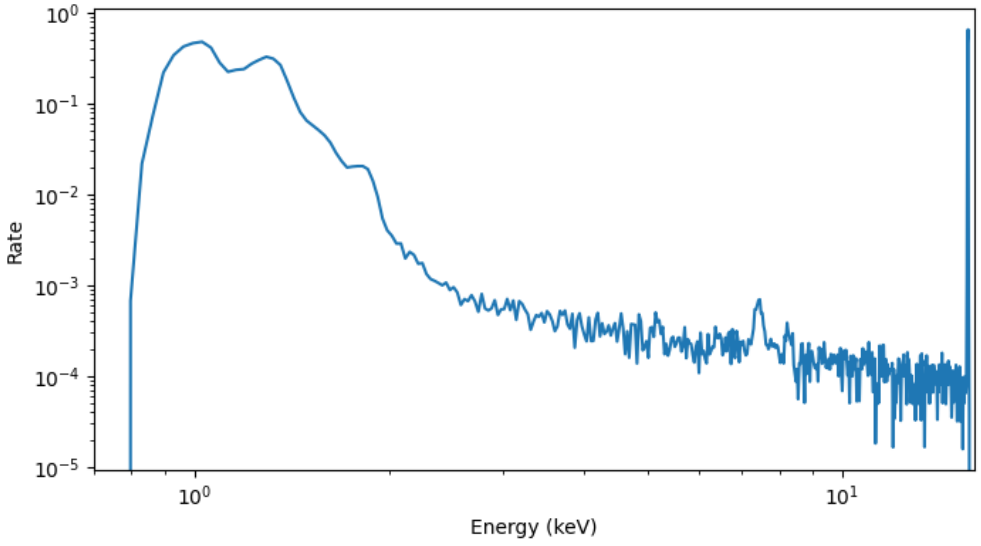

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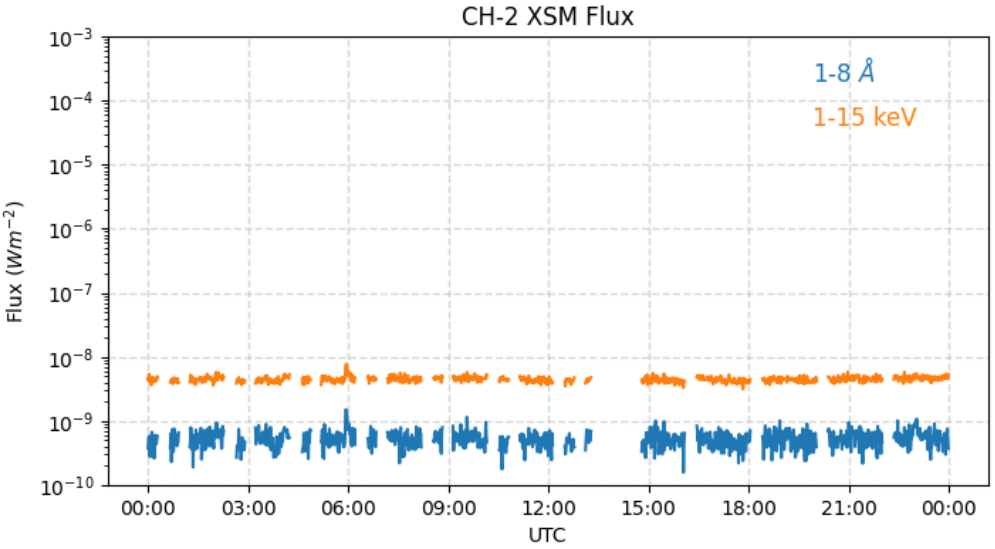

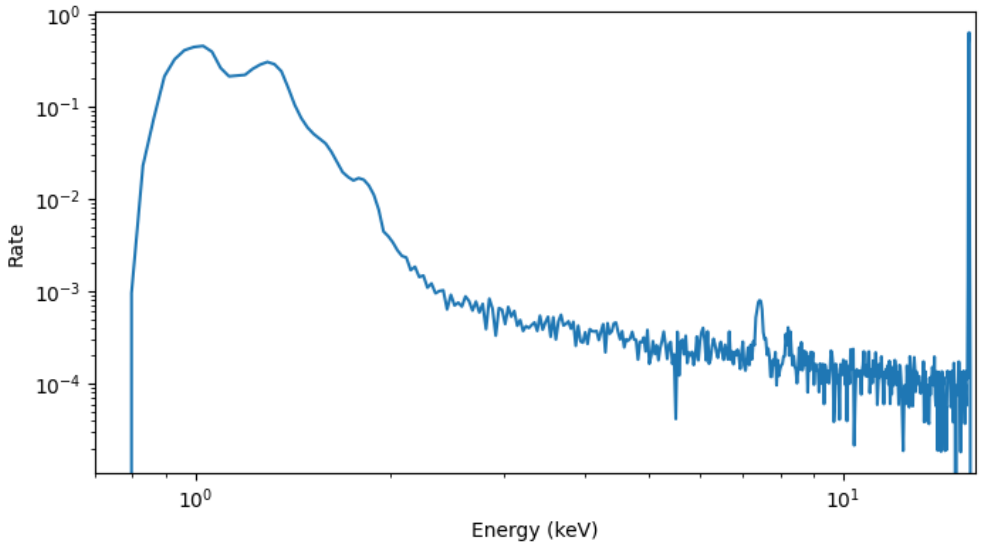

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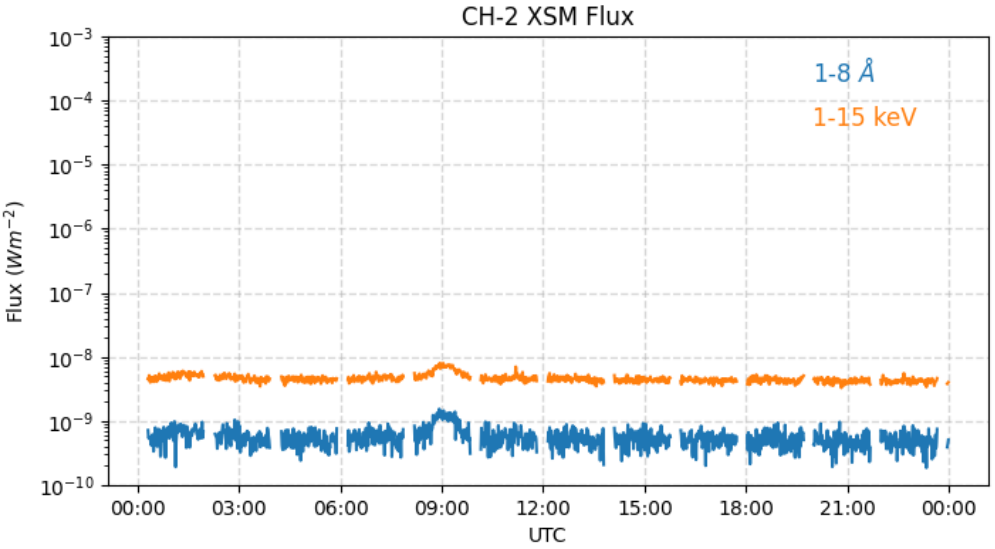
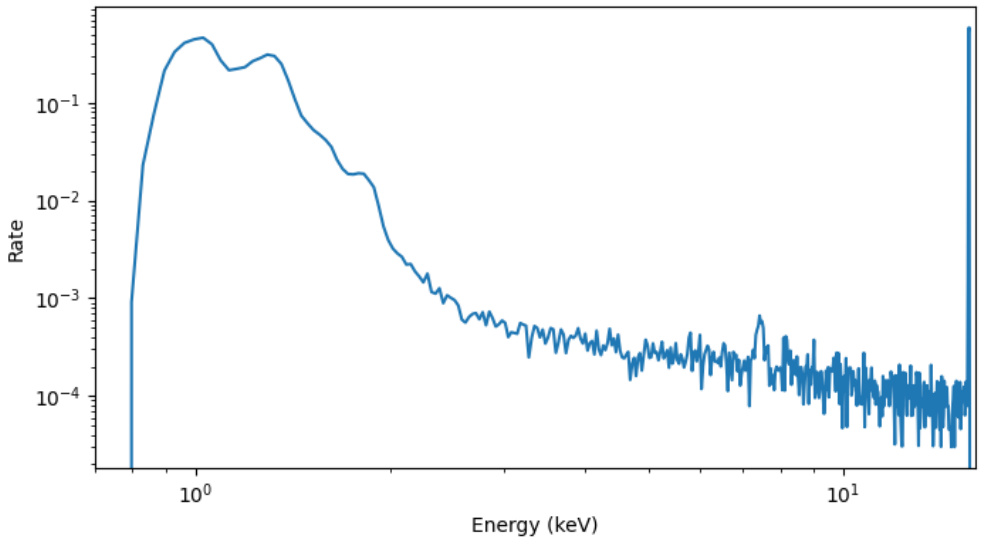
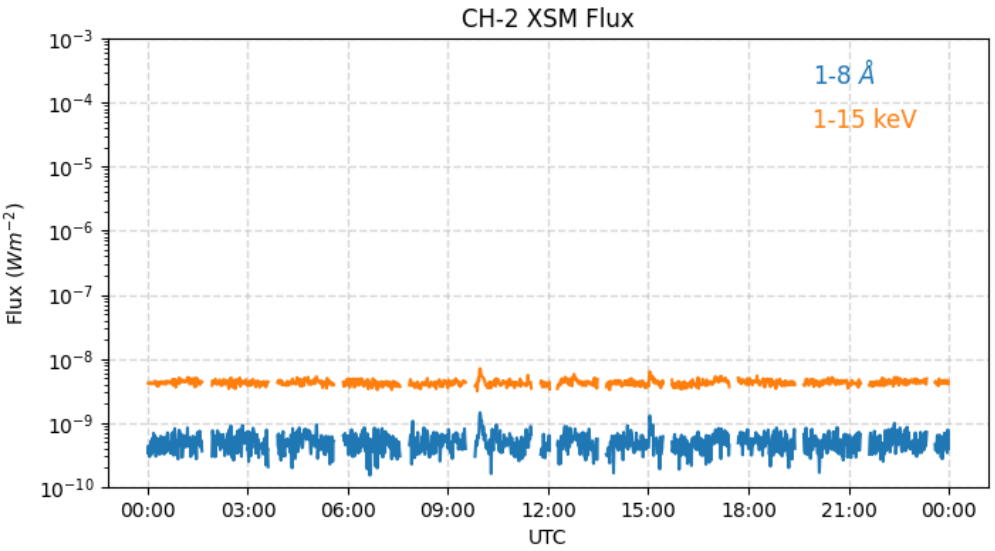
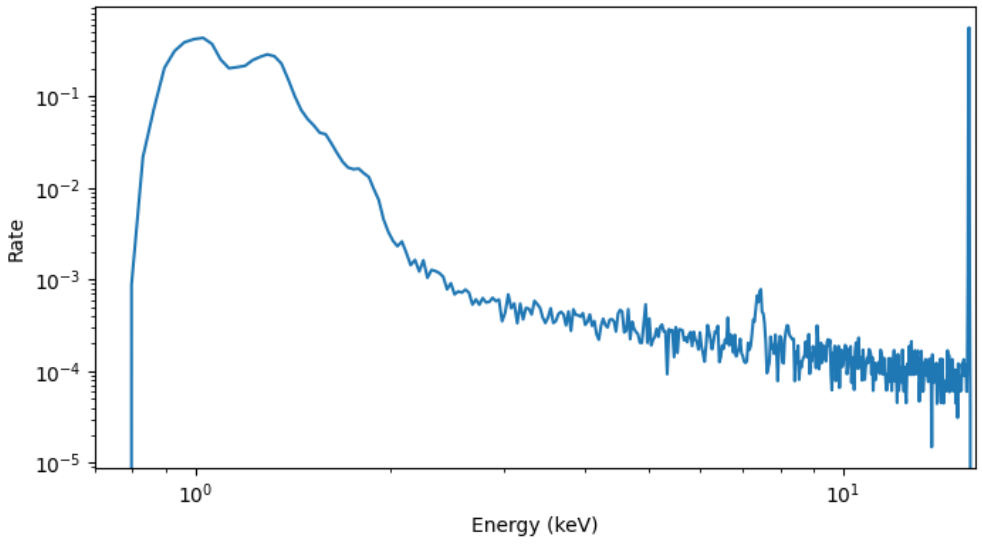




Date: 2020-03-04





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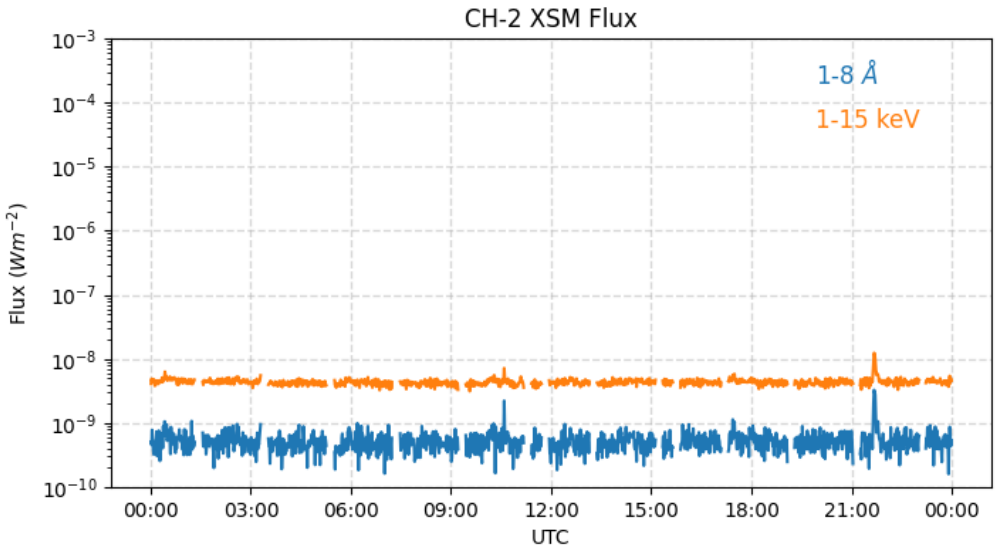

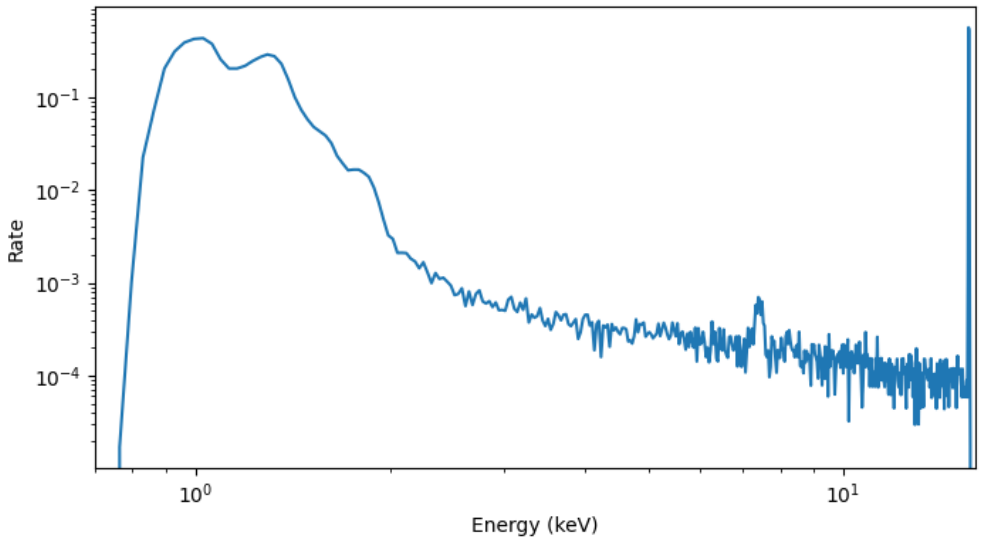

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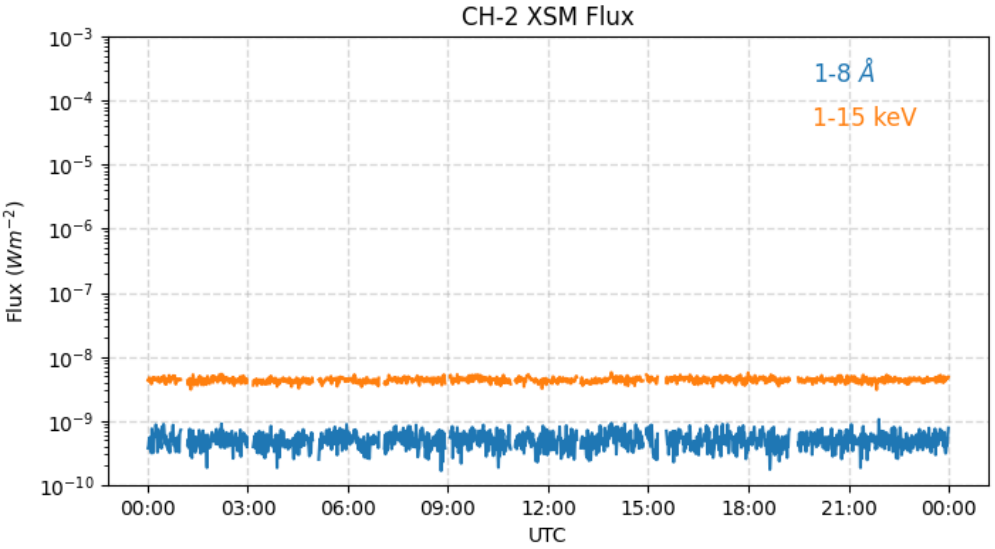

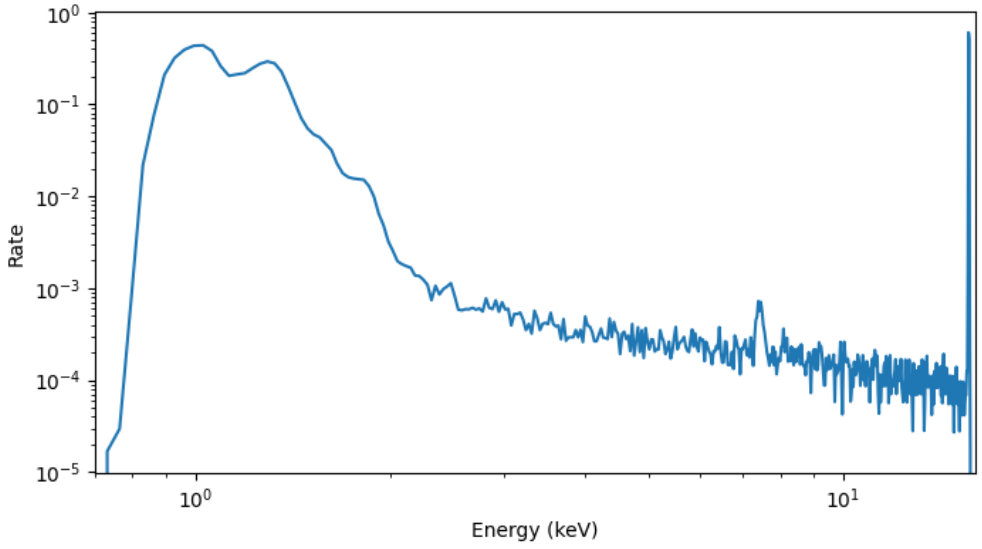

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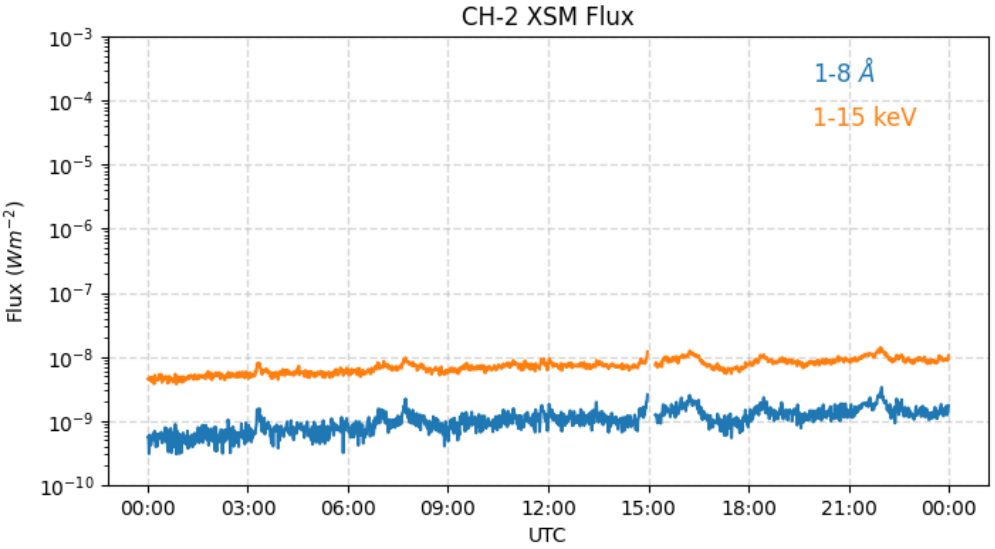

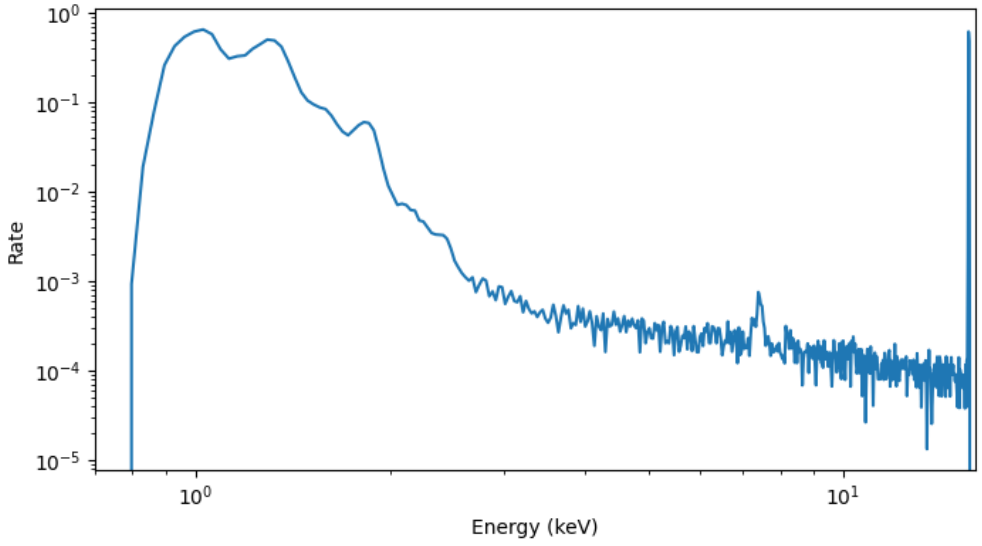

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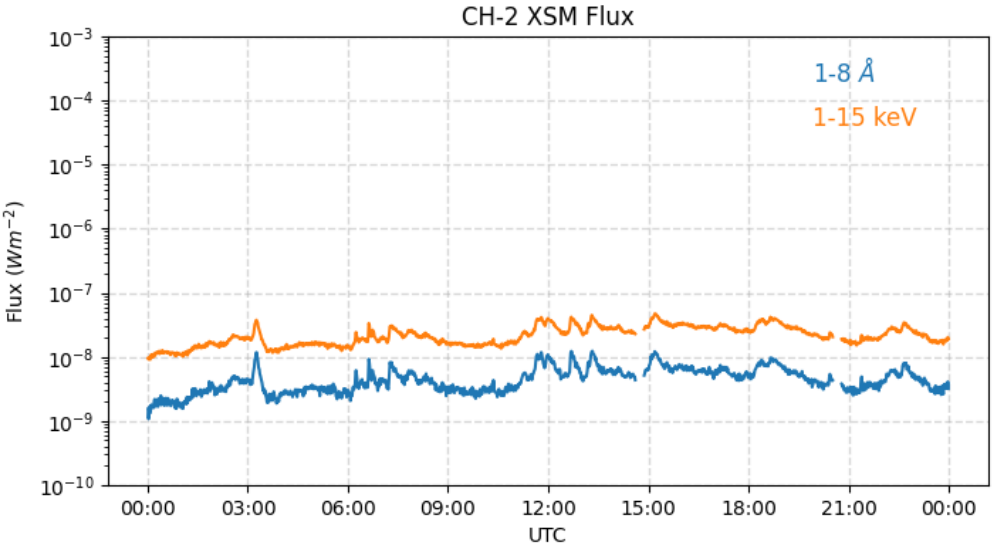

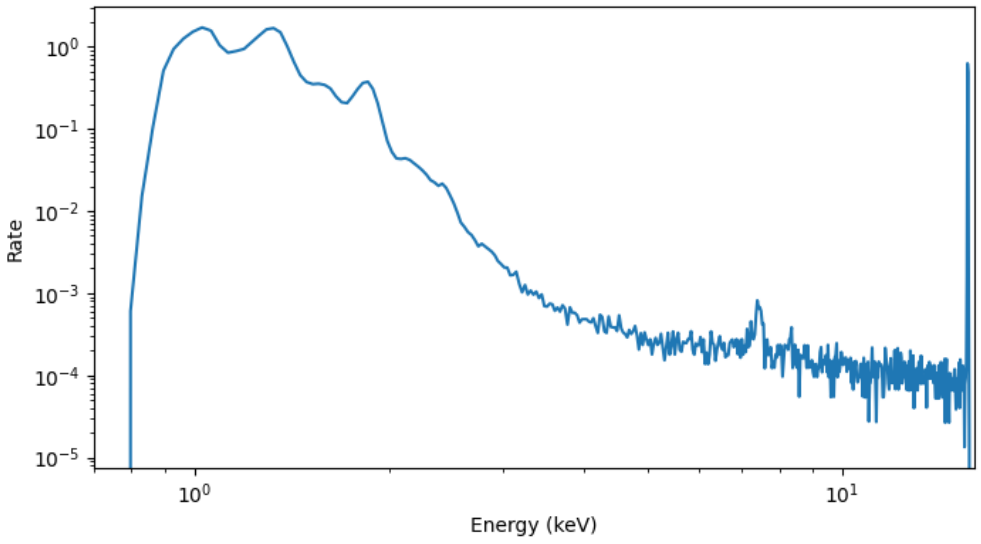

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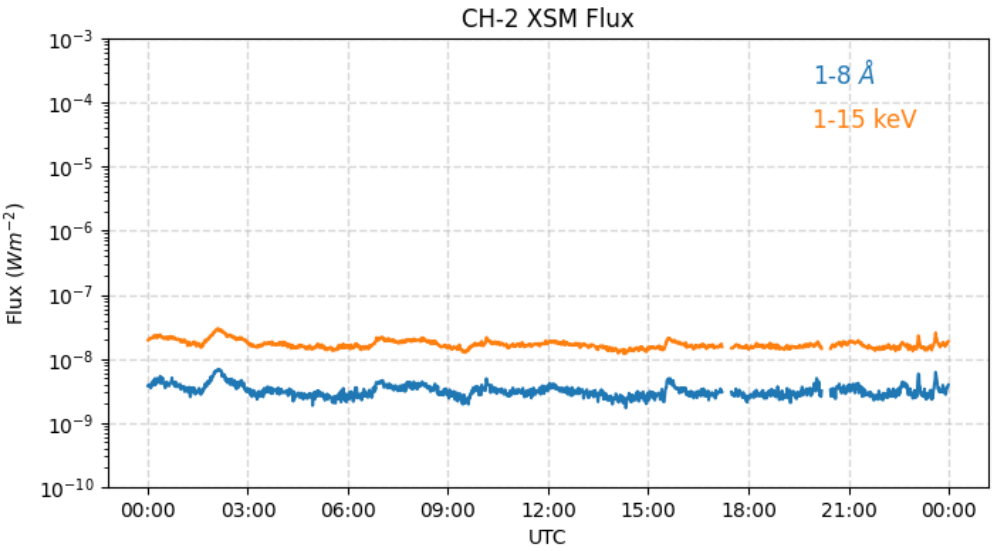

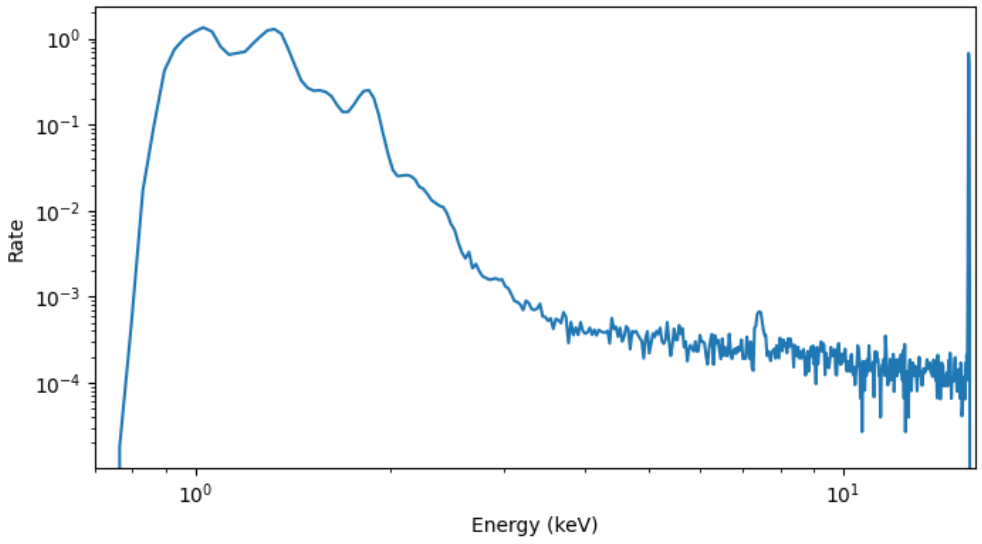

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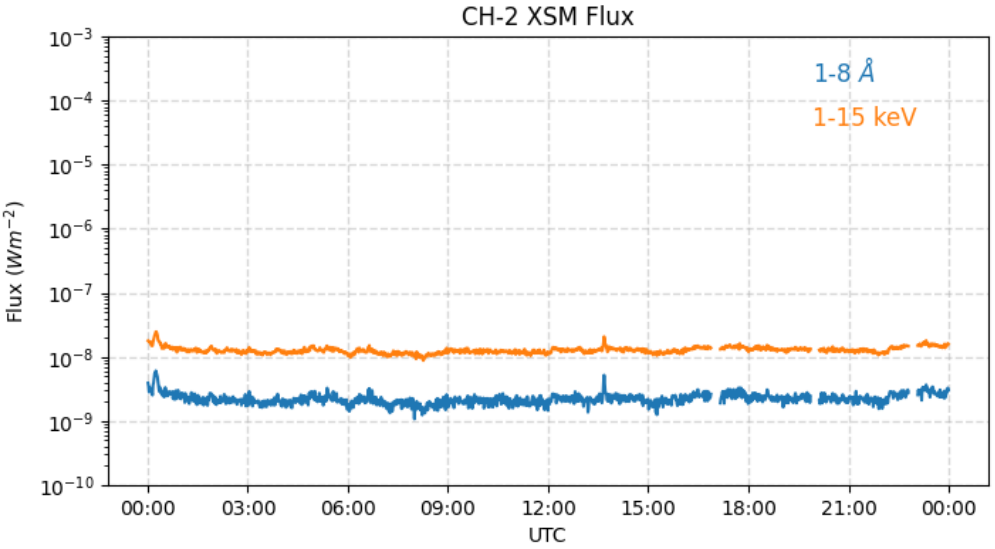

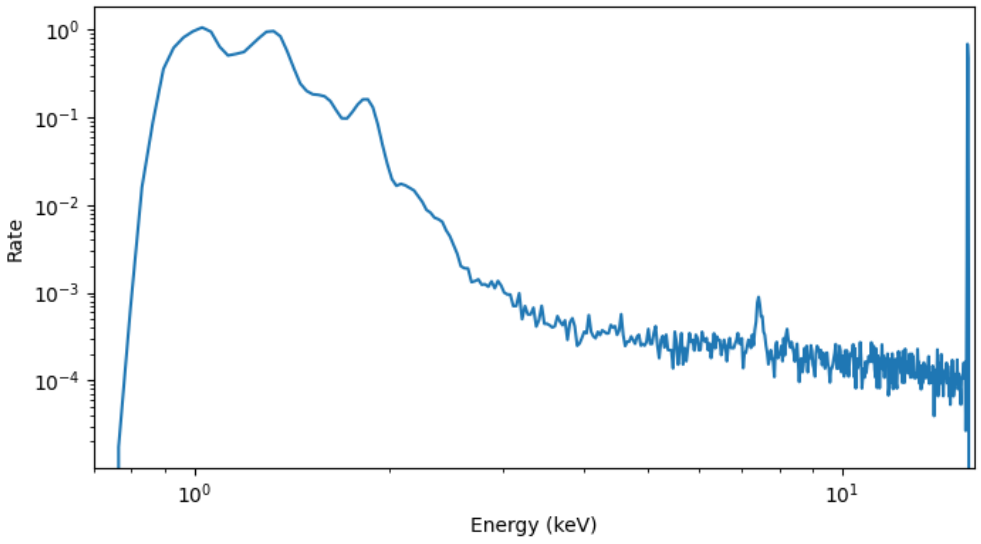

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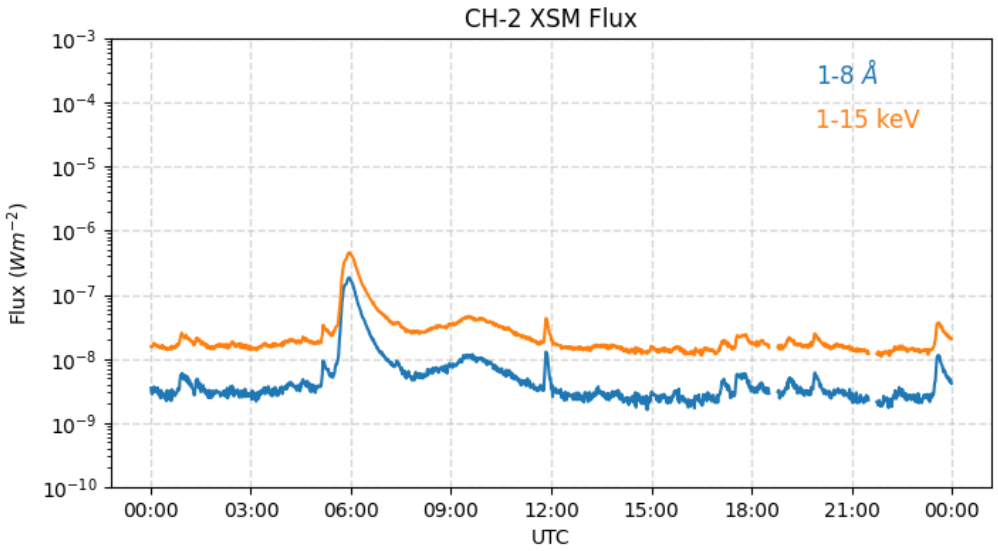

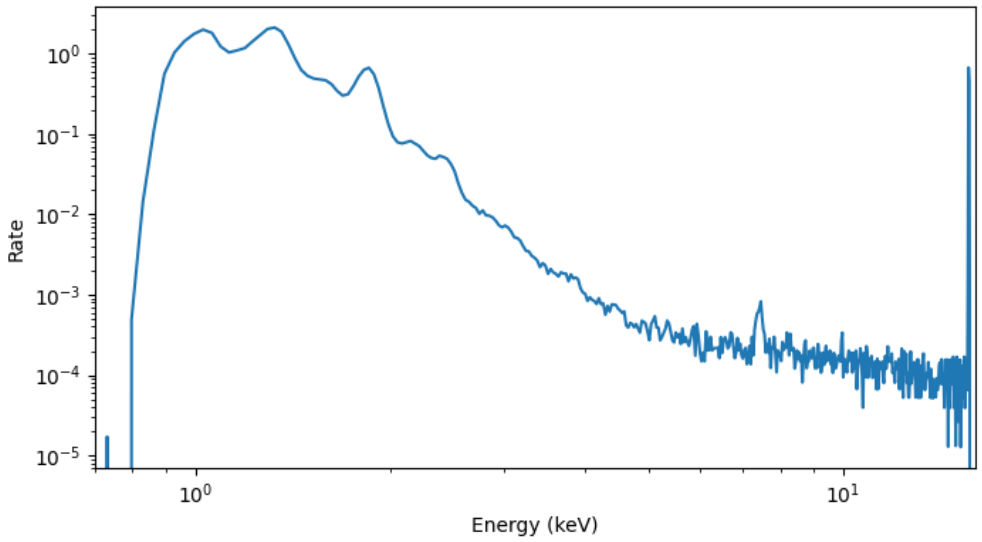

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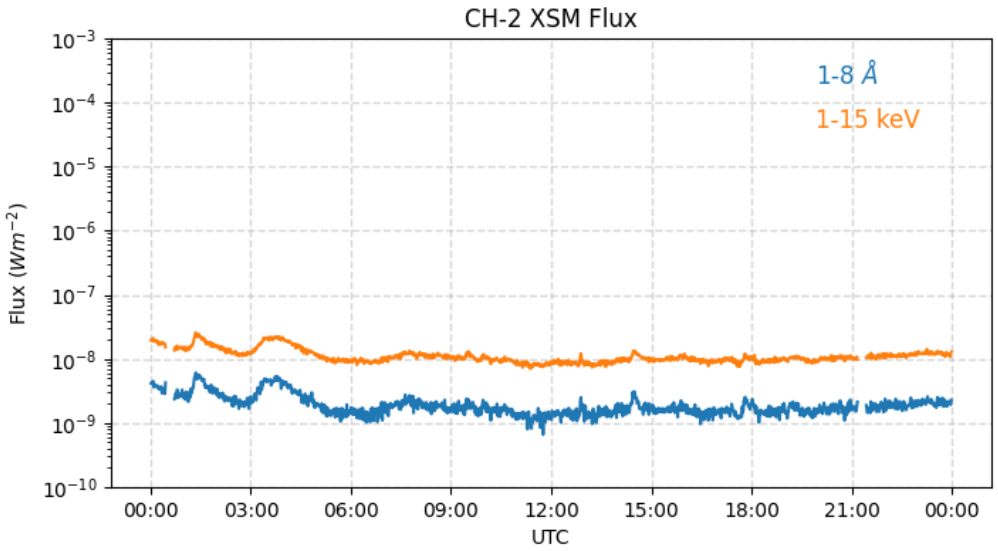

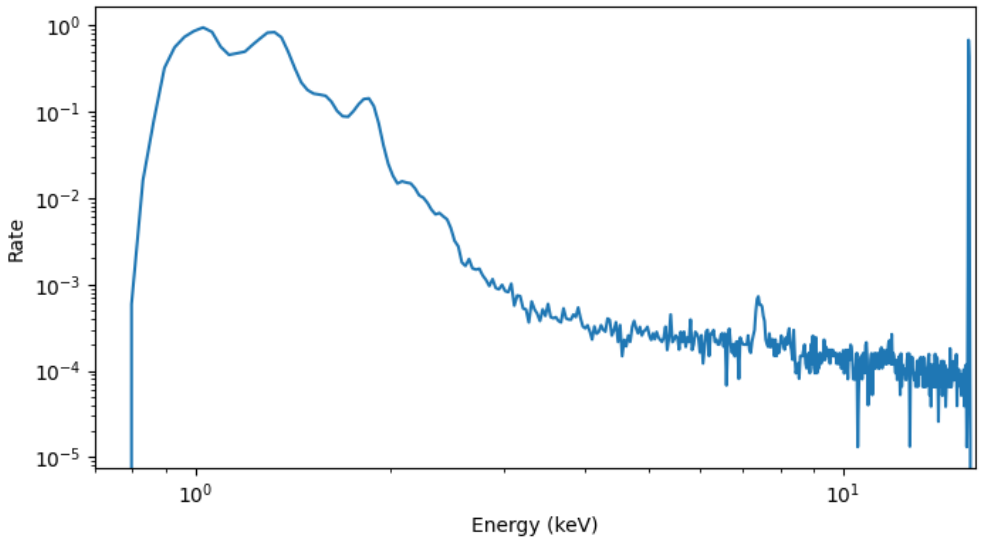

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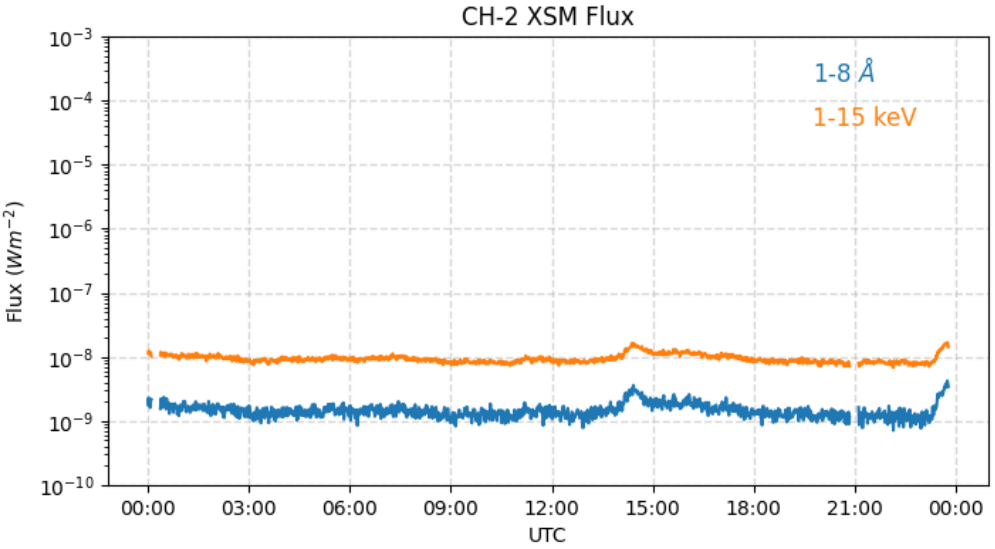

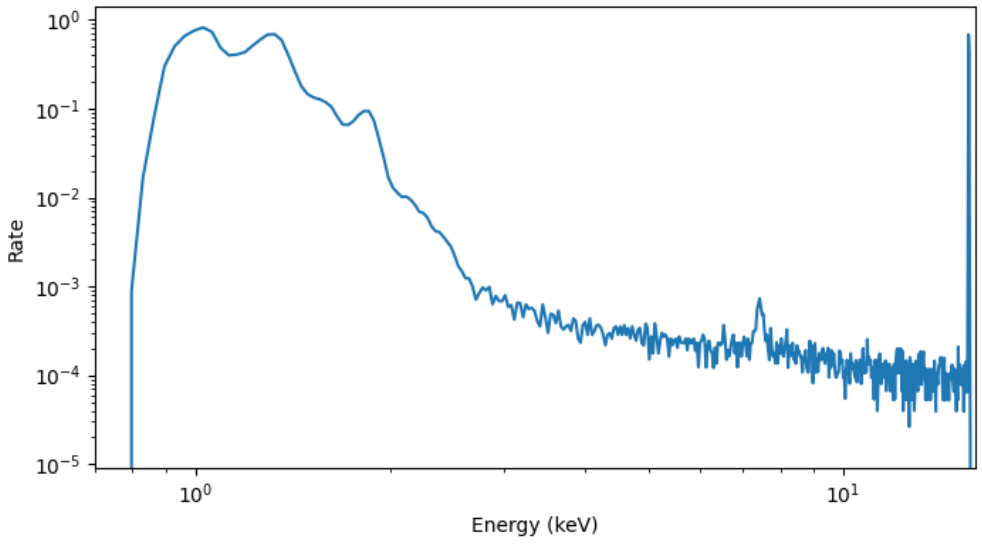

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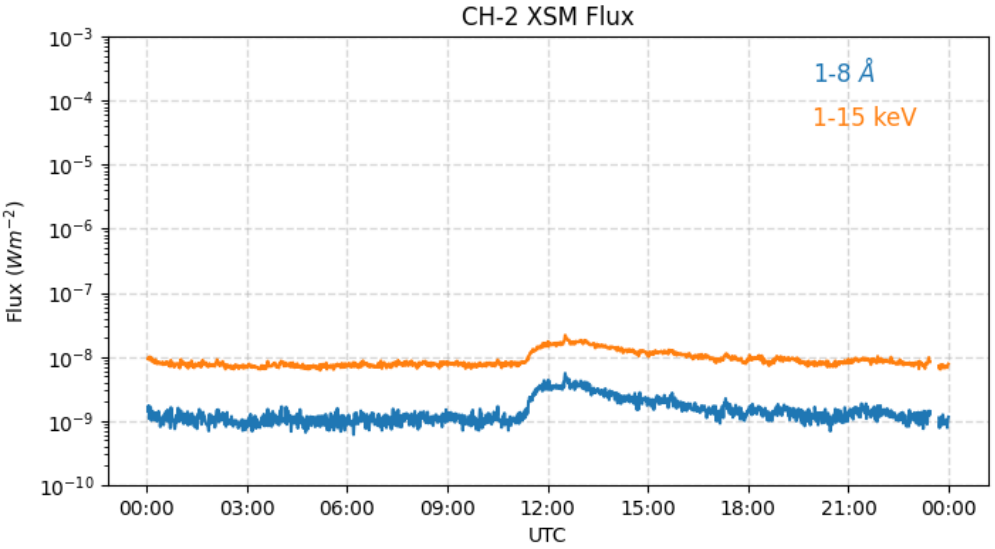

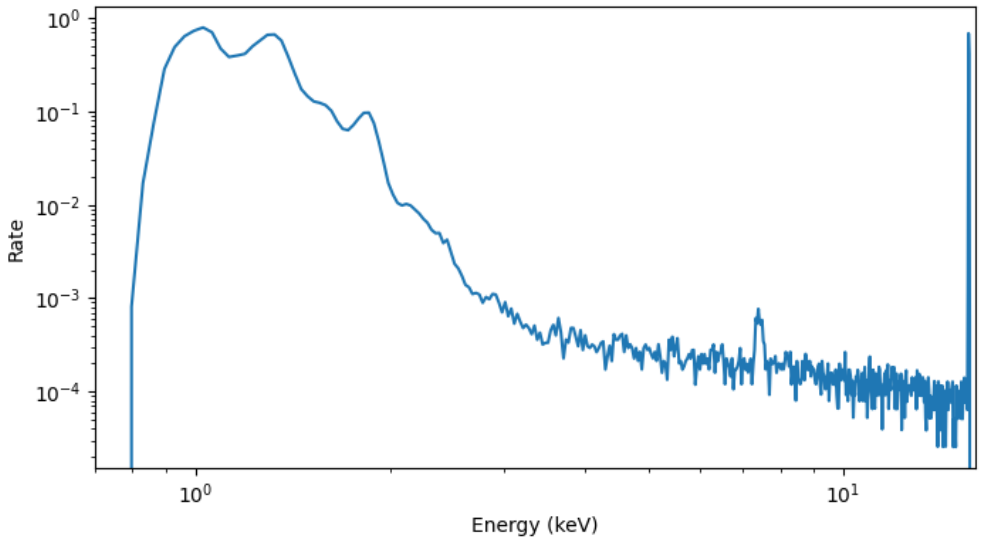

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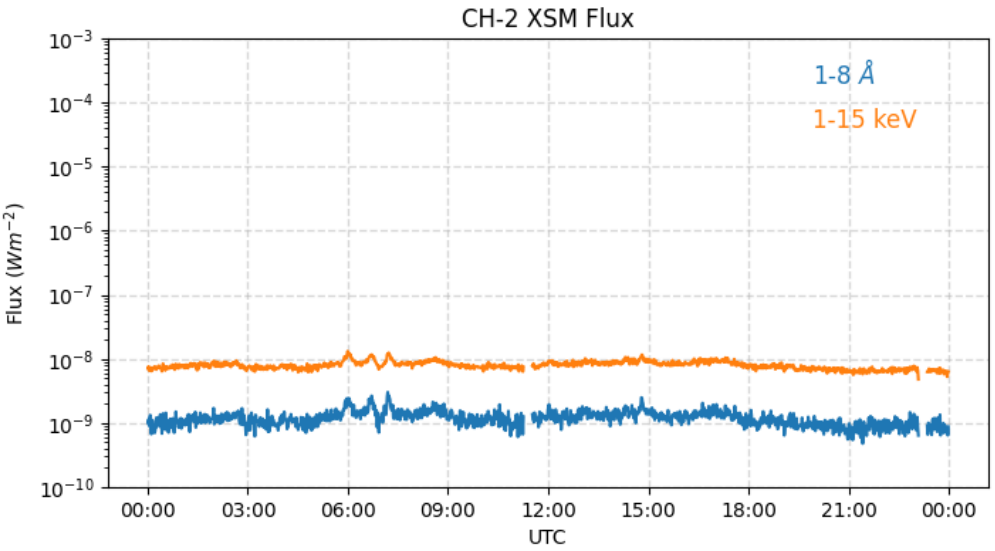

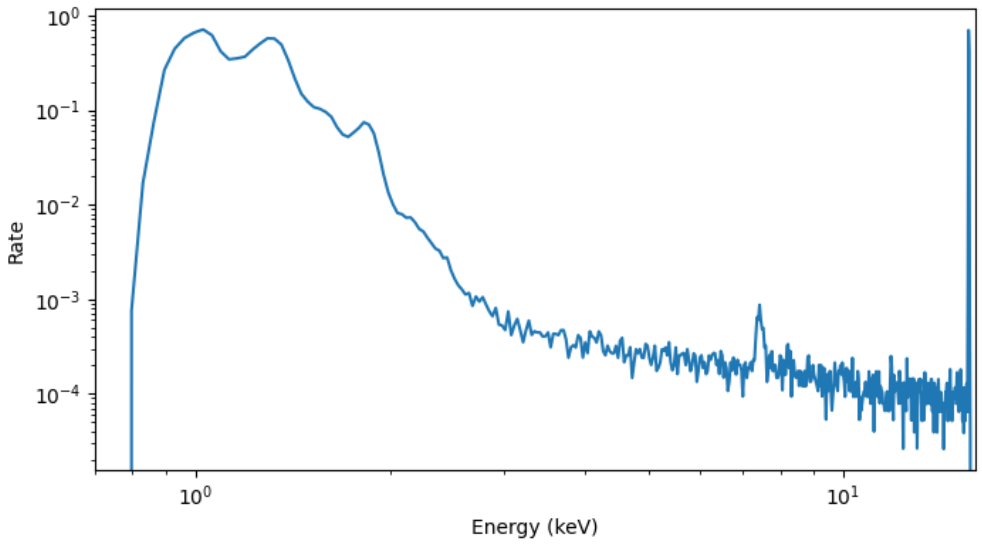

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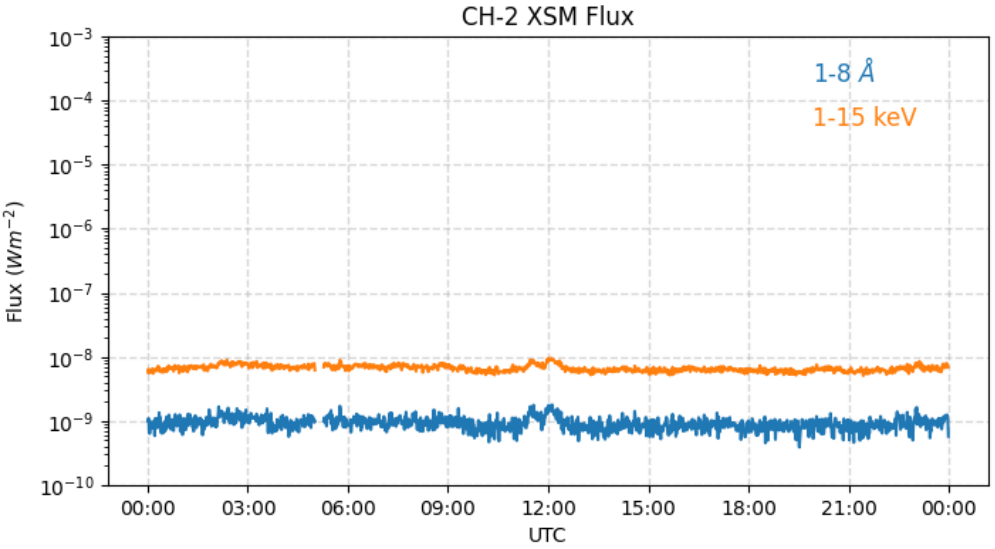

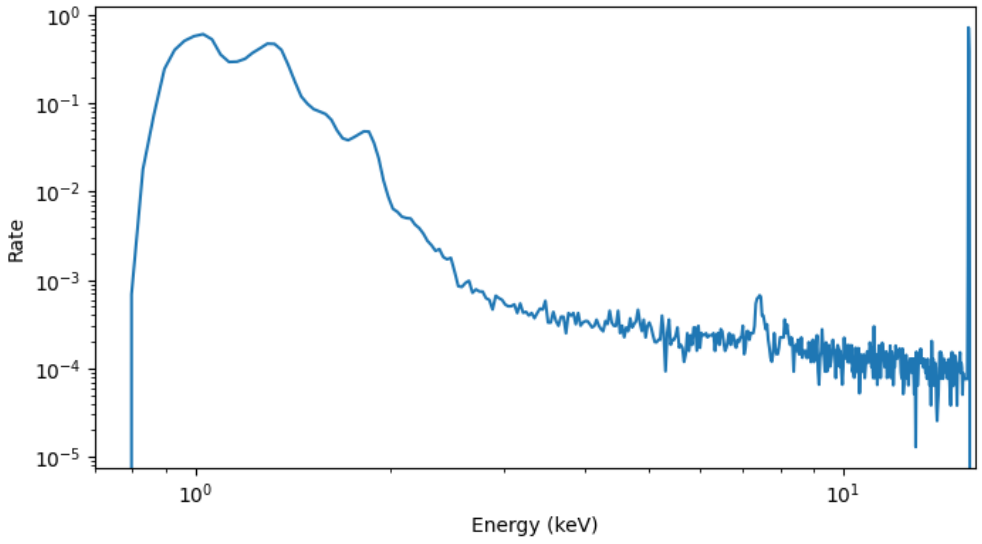

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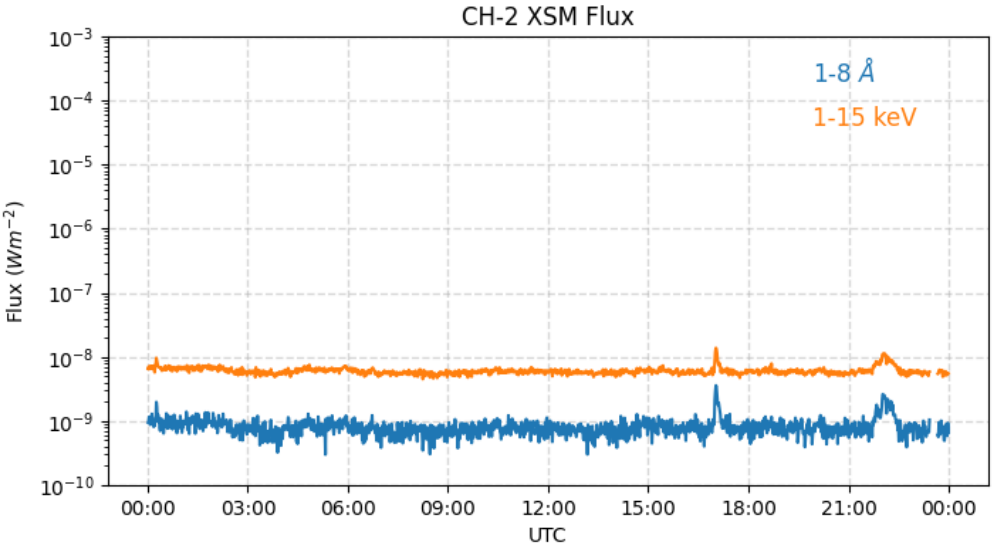

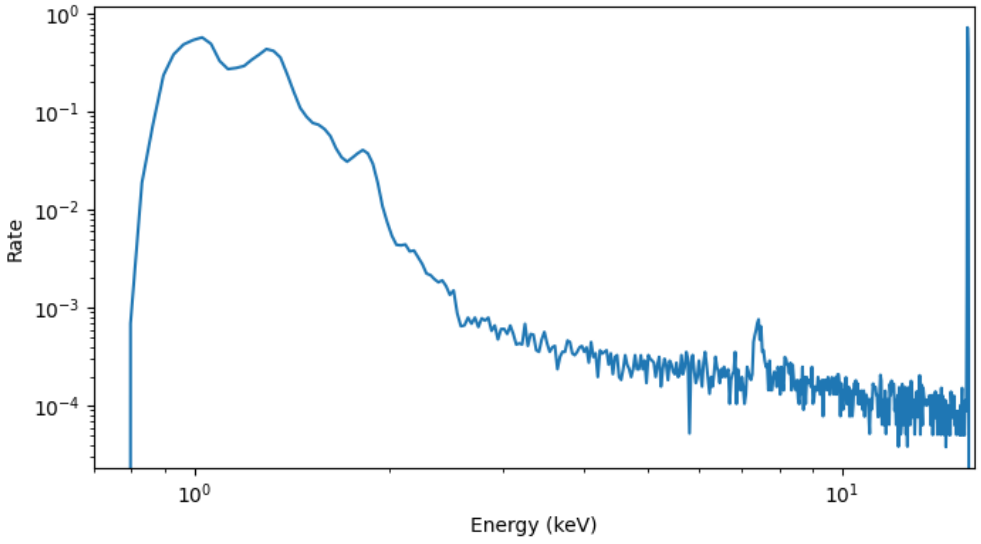

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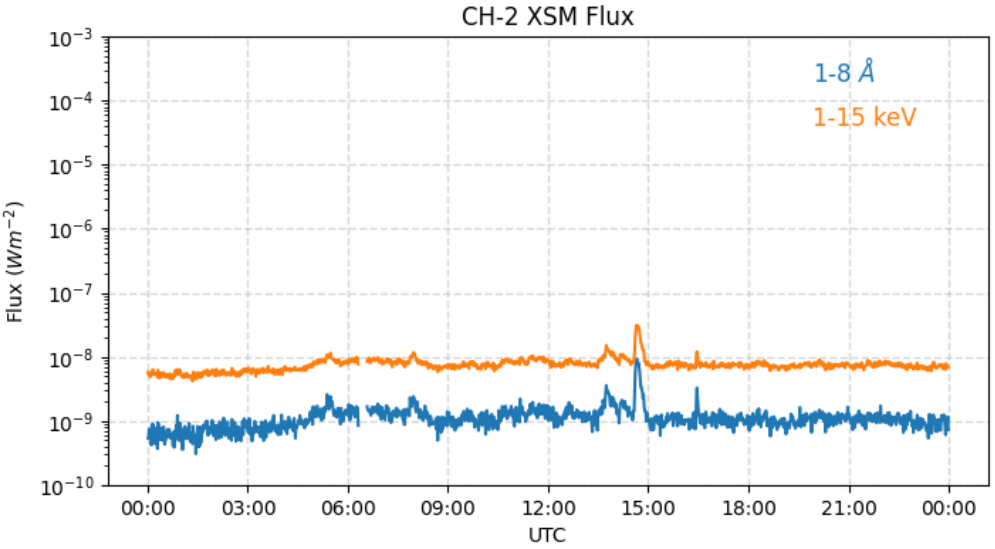

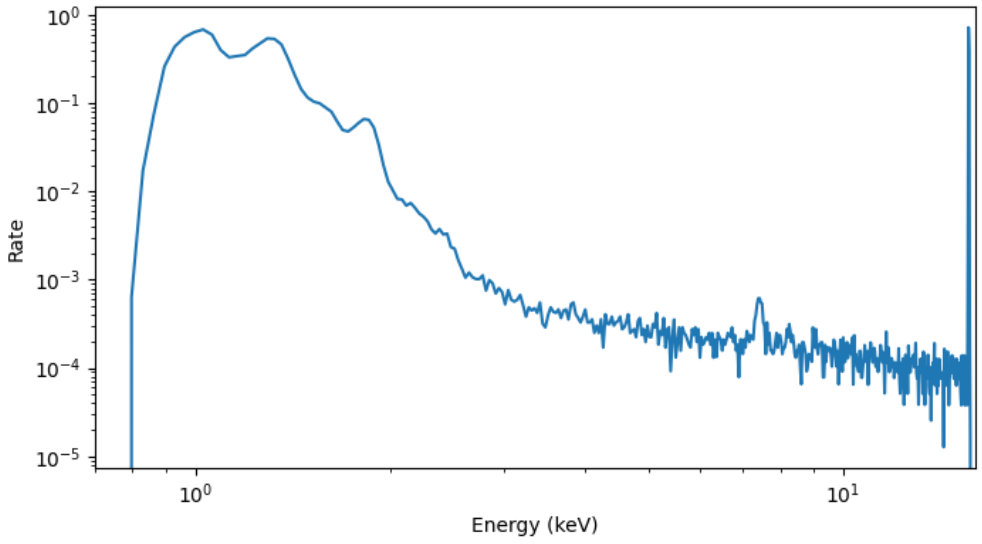

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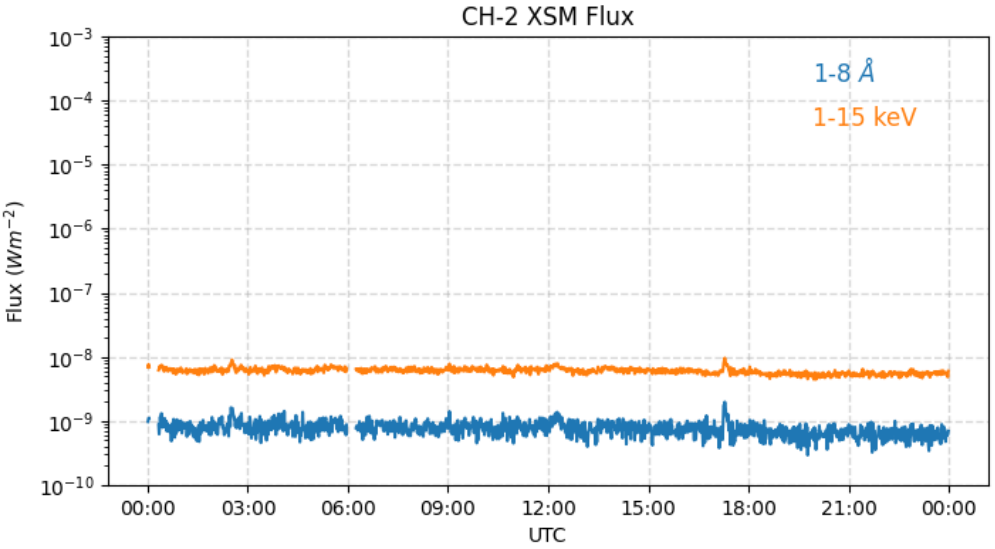

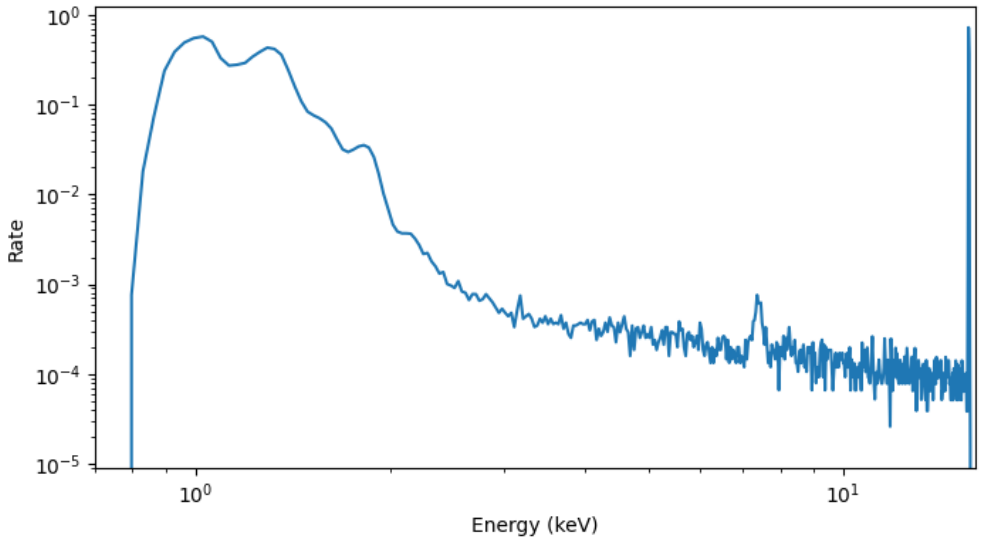

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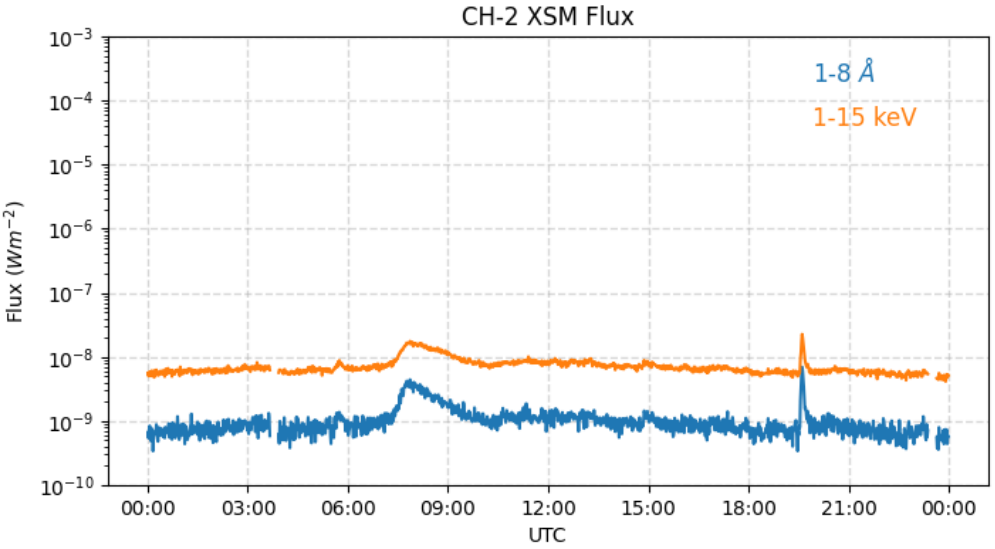

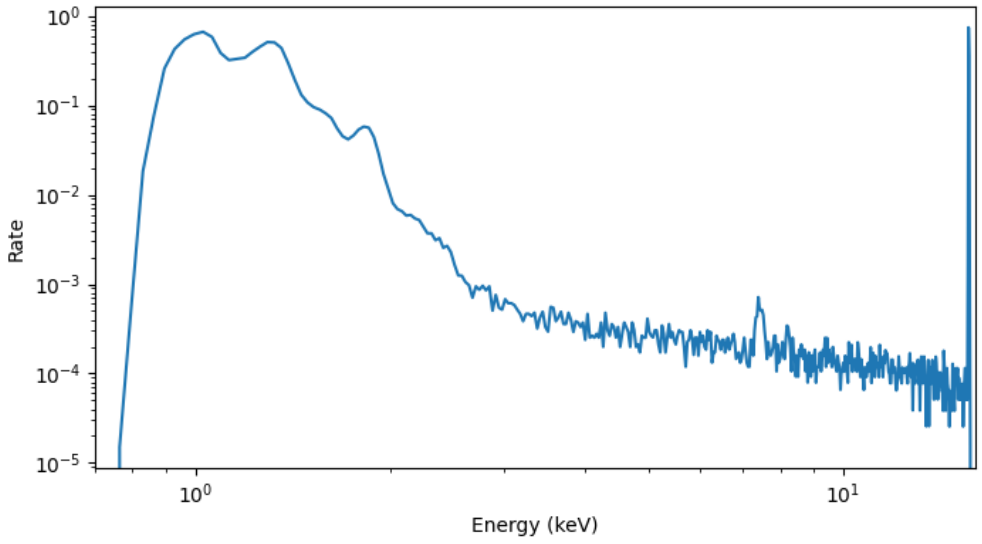

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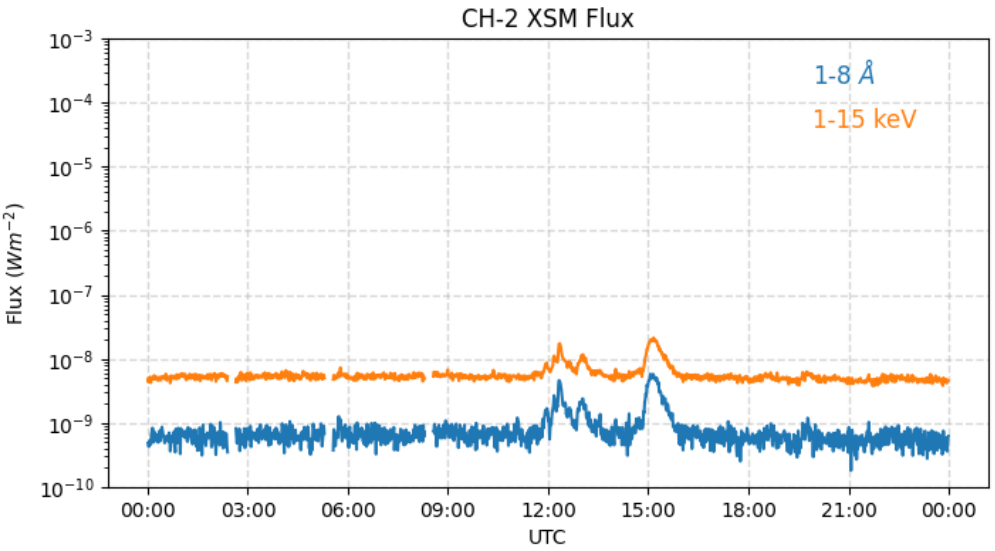

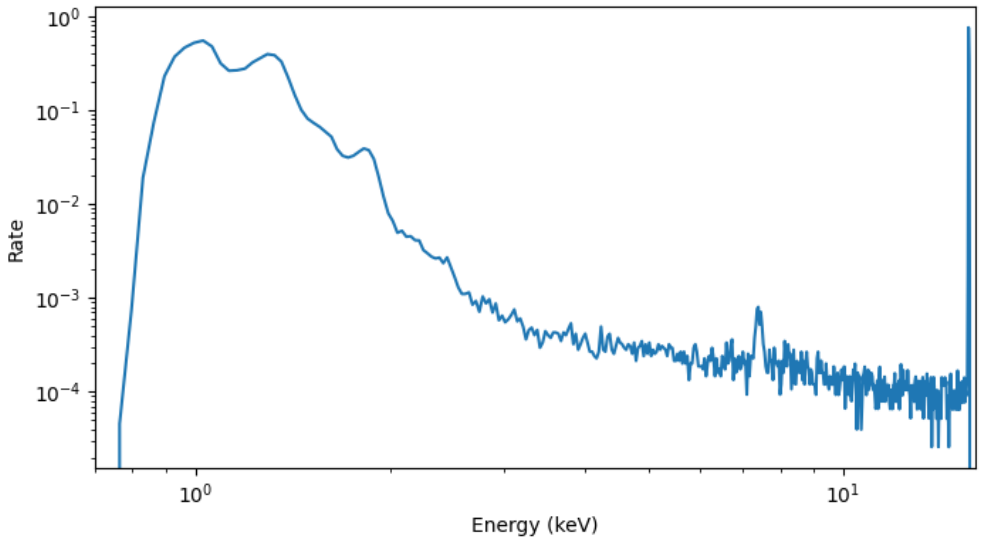

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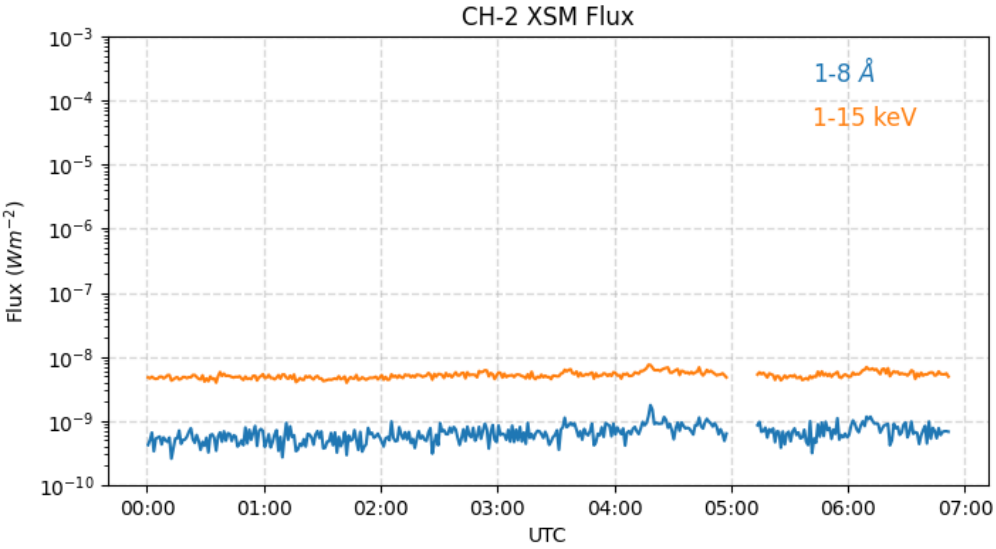

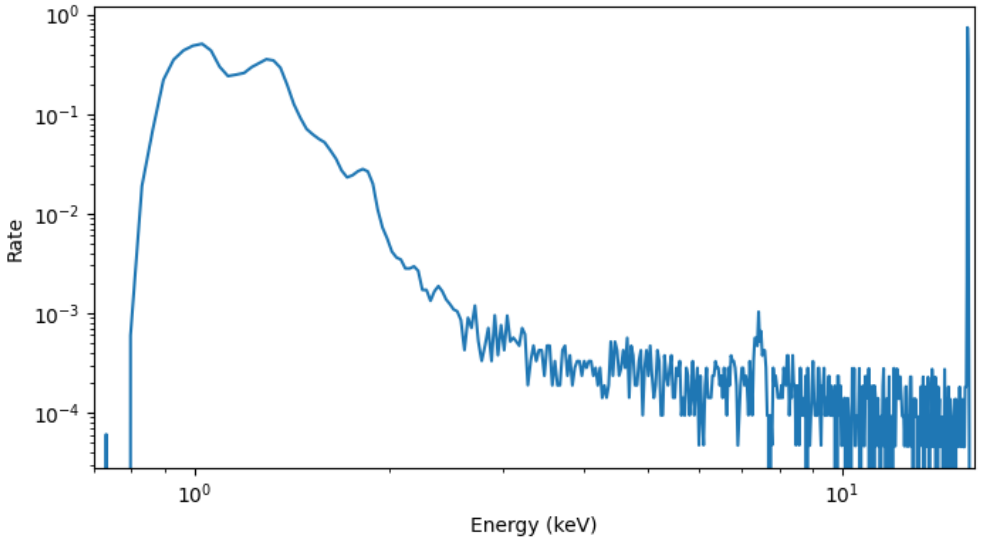

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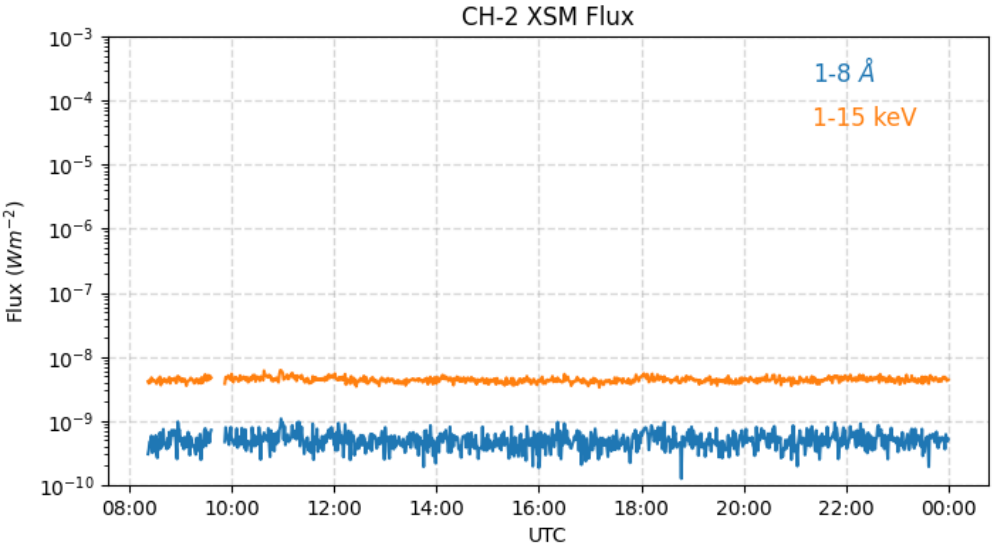

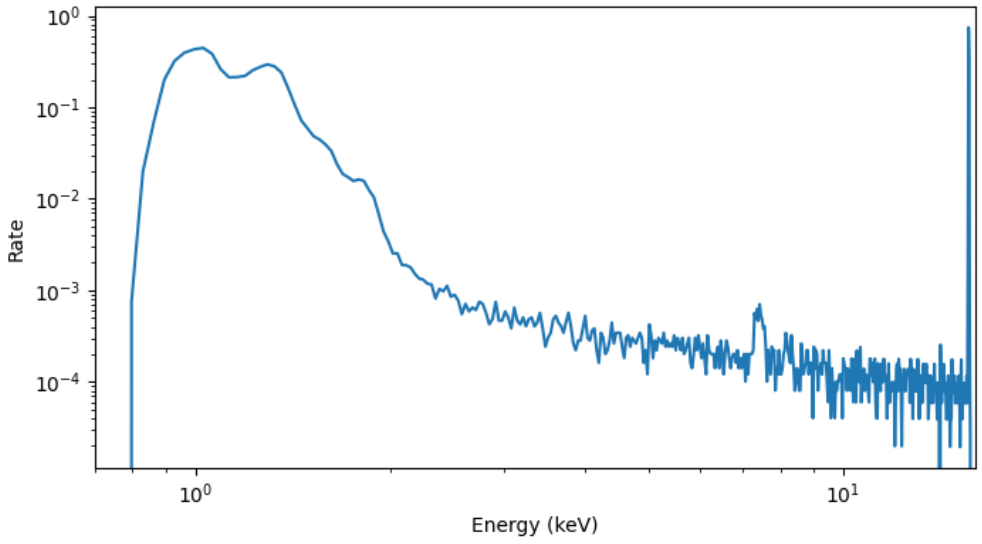

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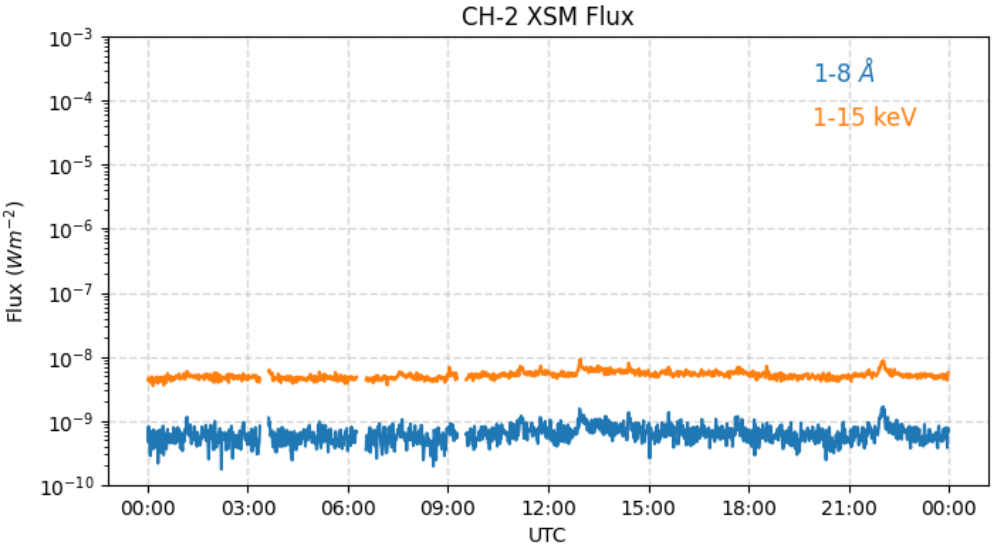

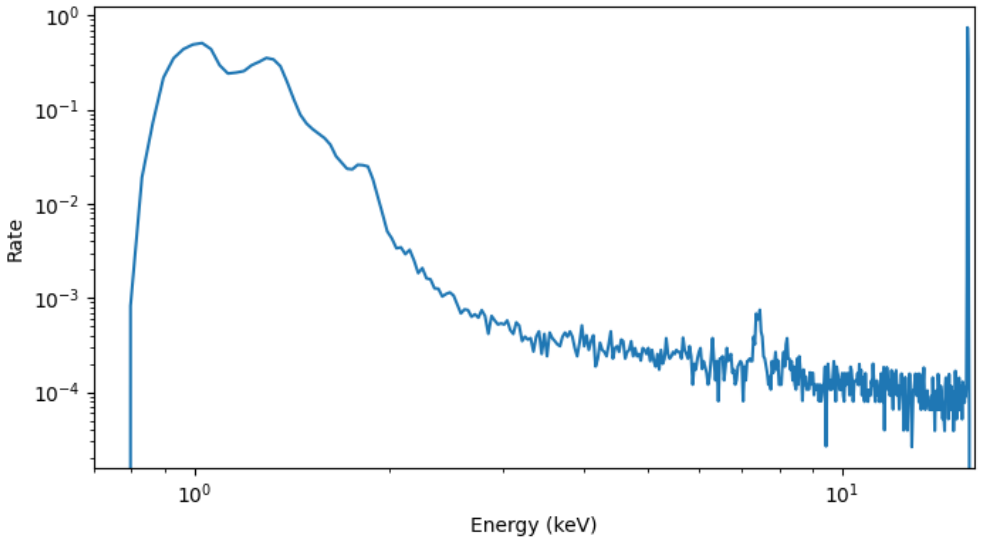

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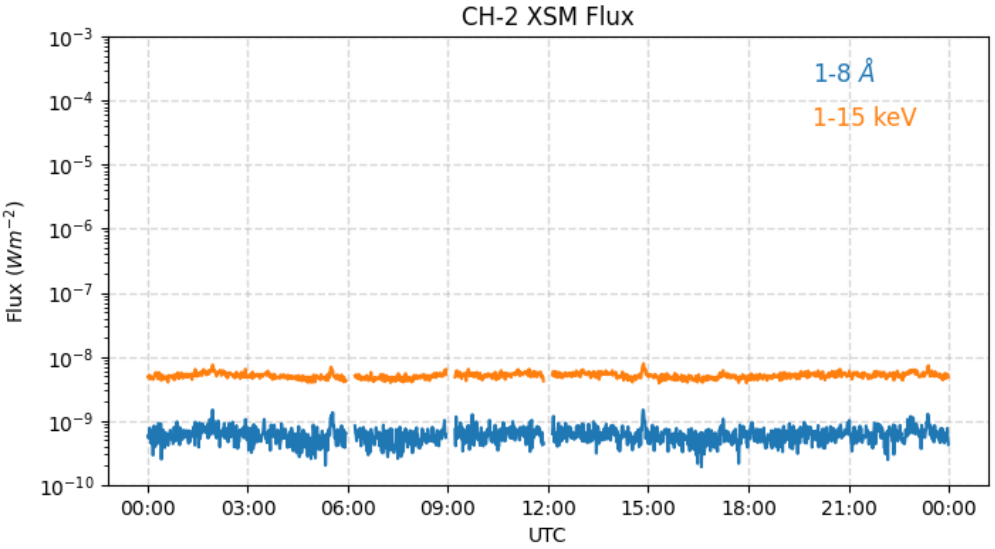

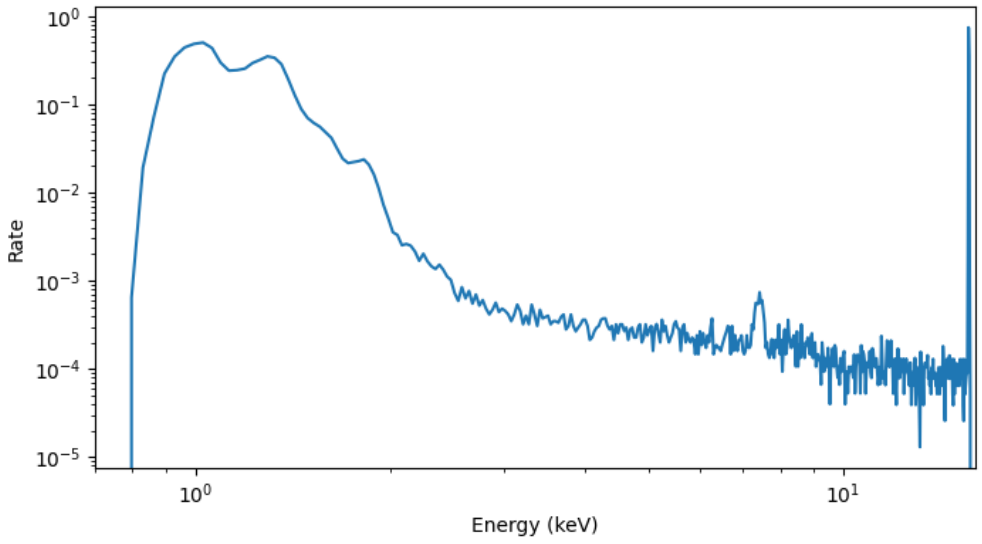

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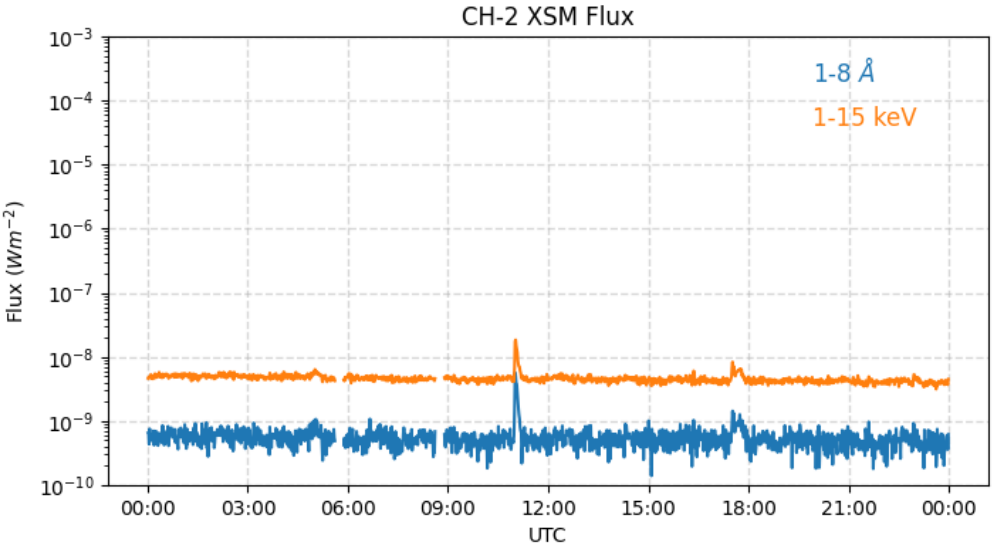

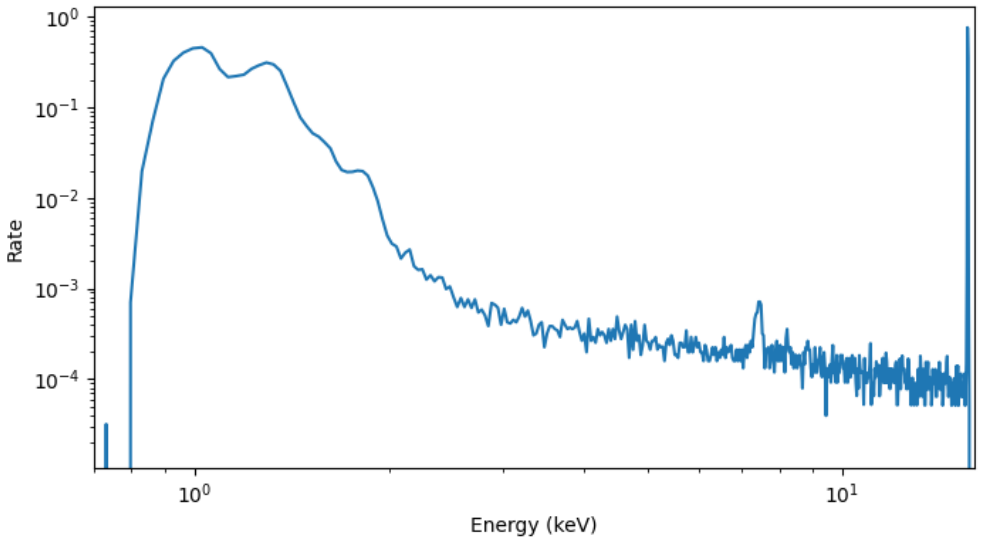

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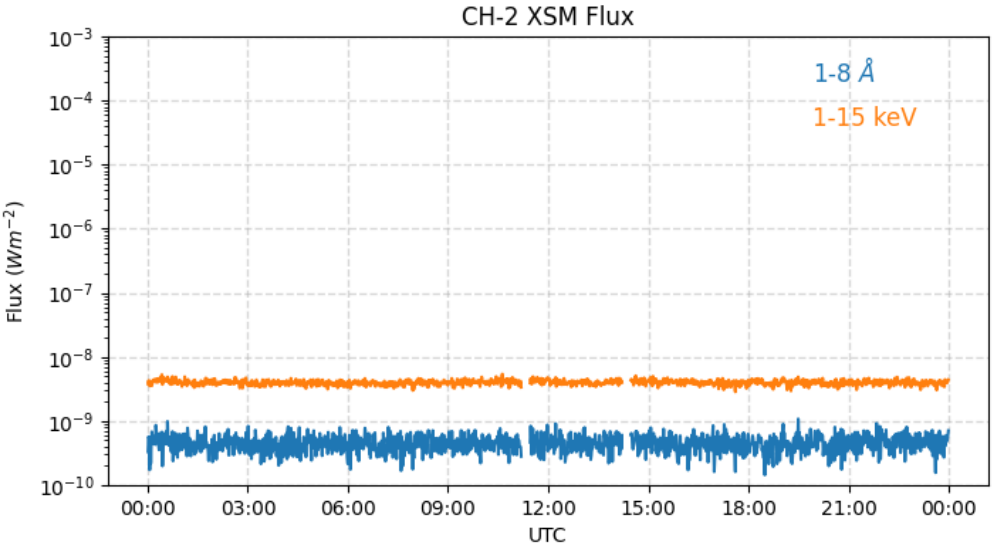

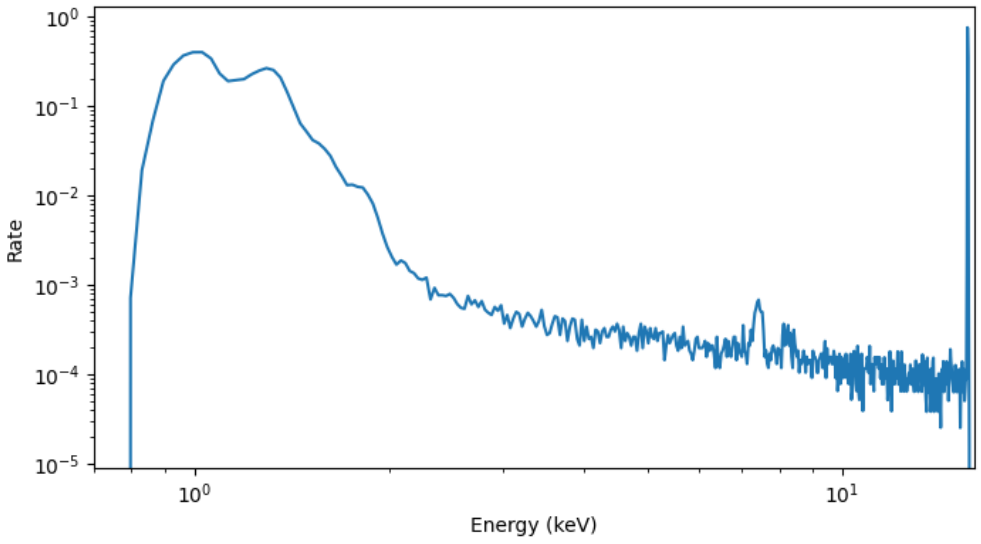

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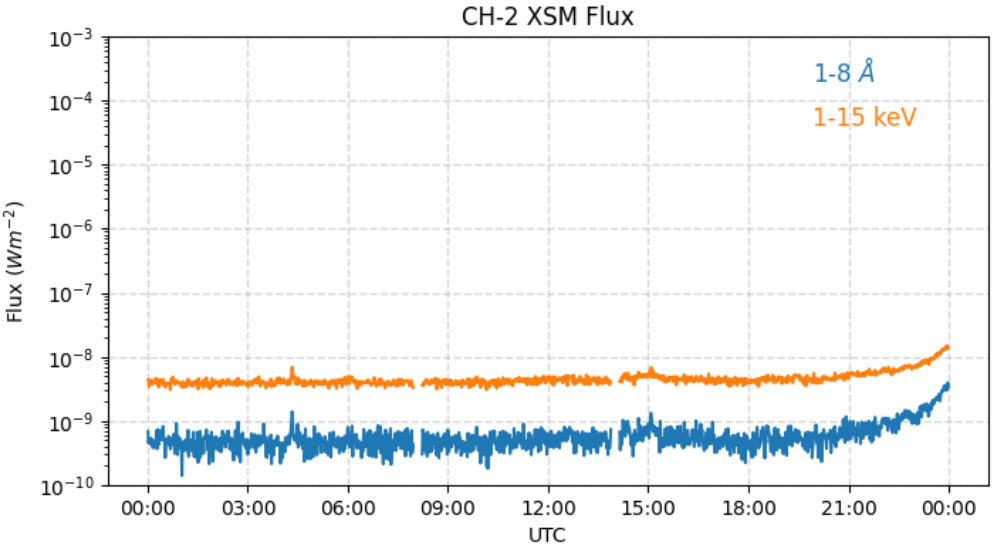

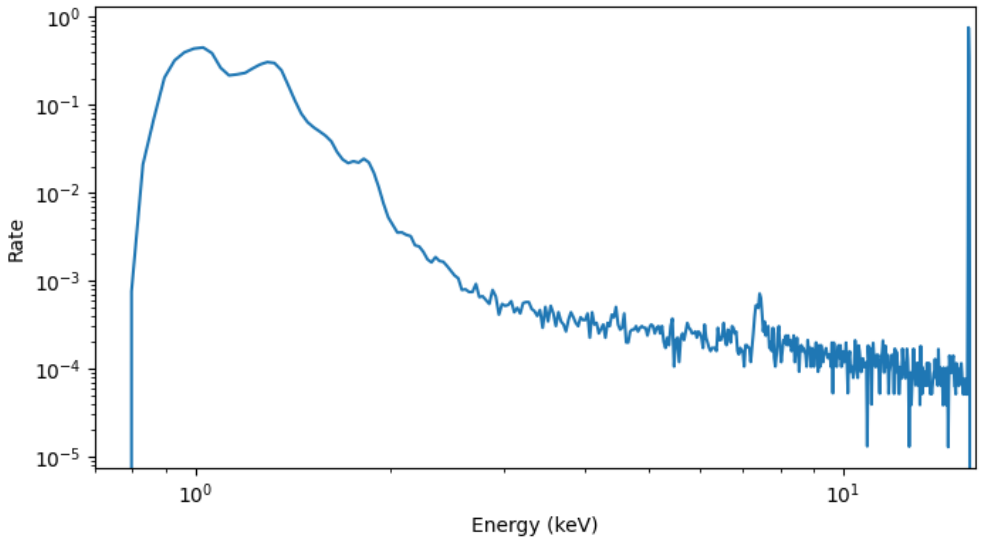

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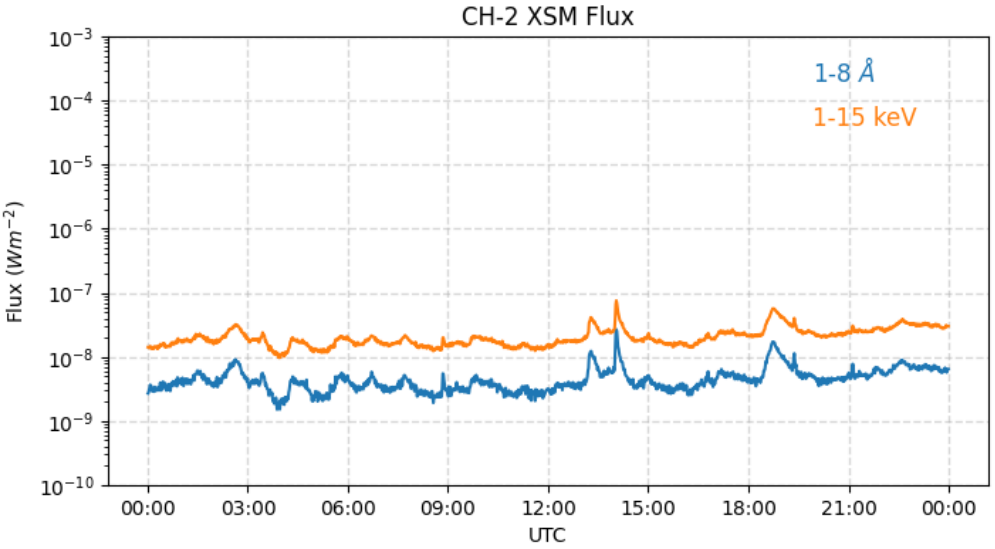

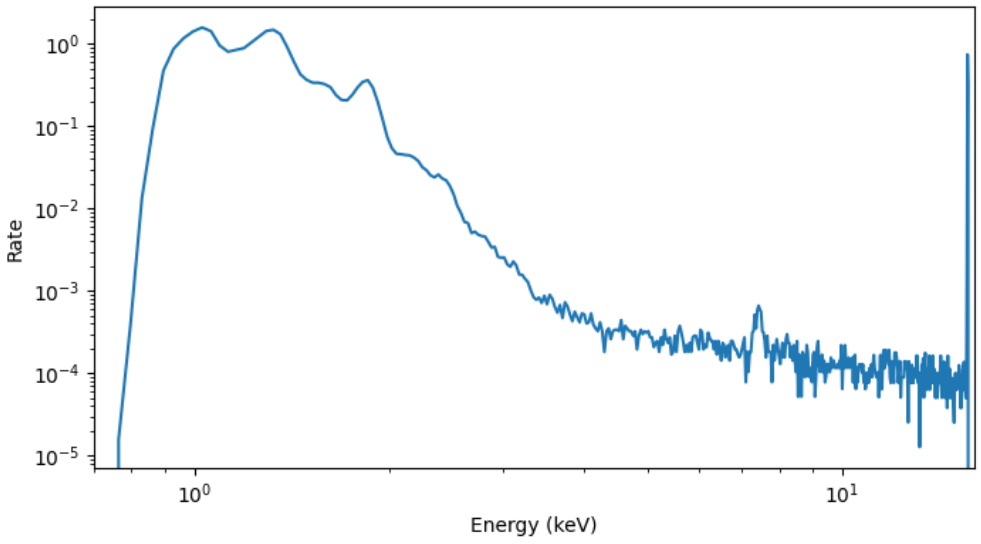

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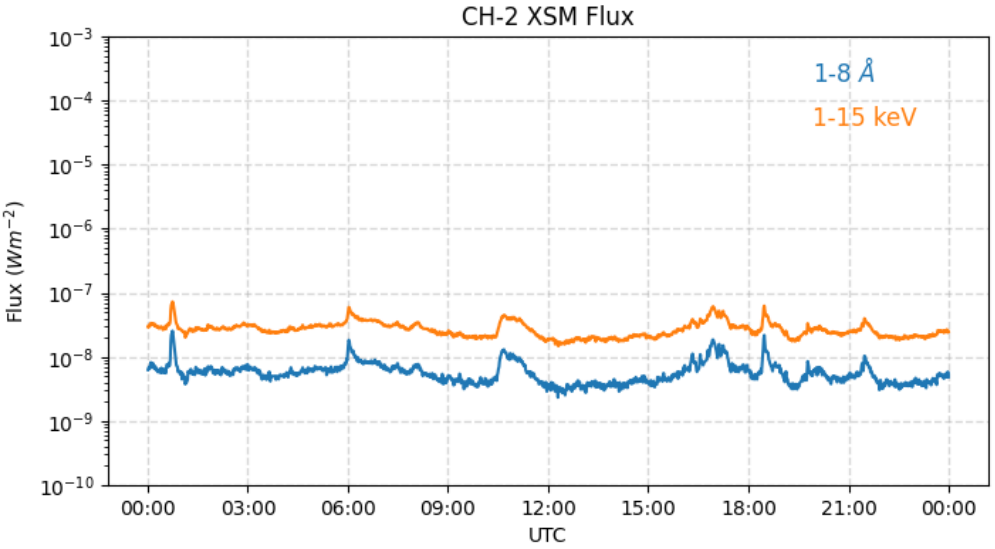

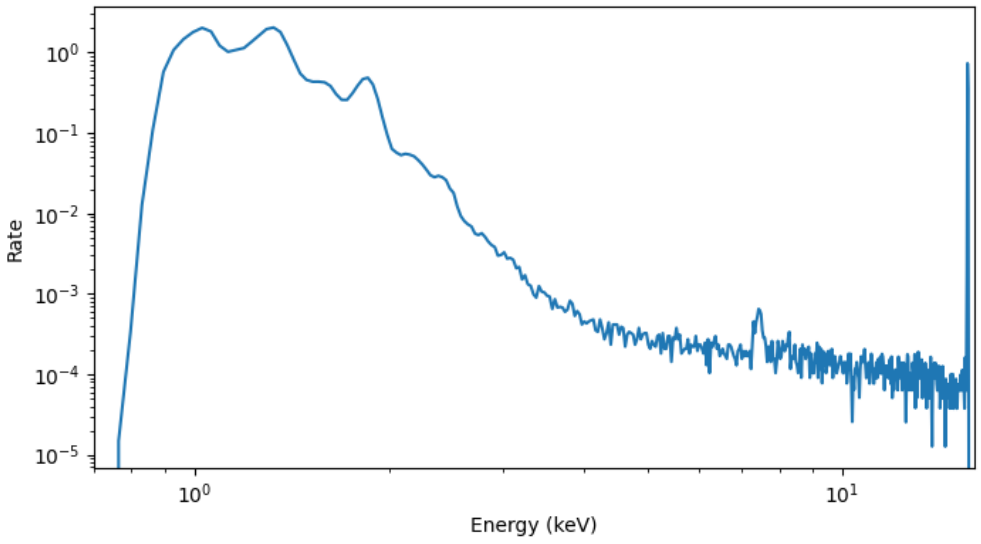

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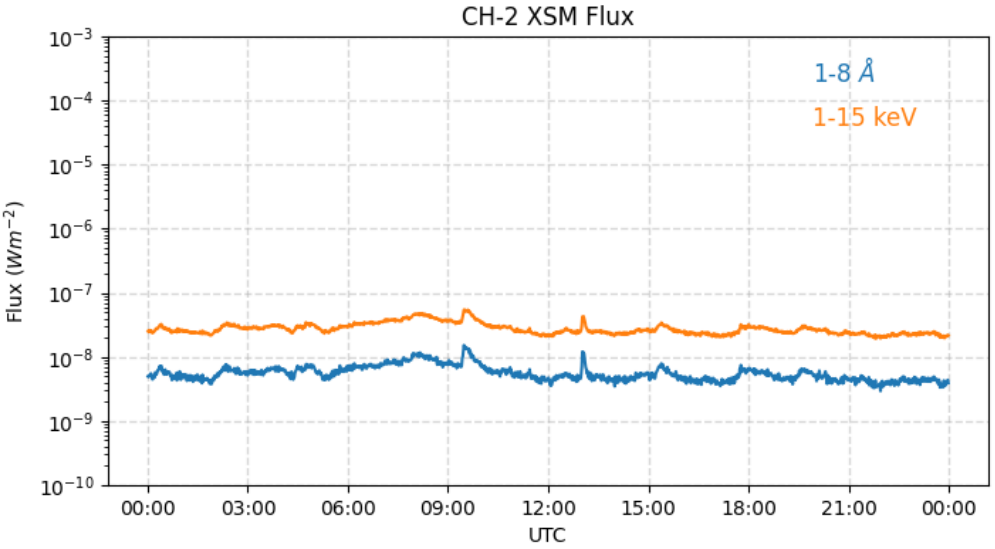
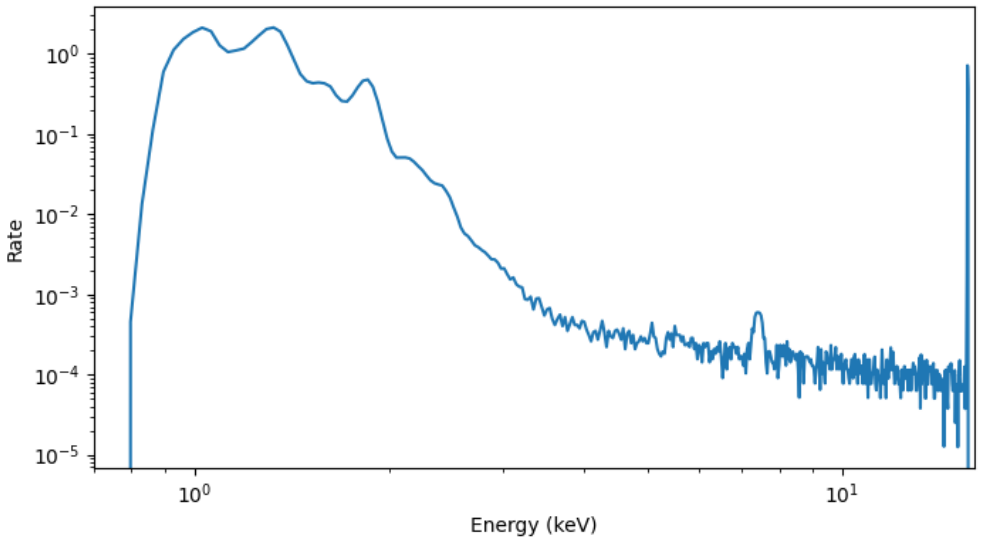
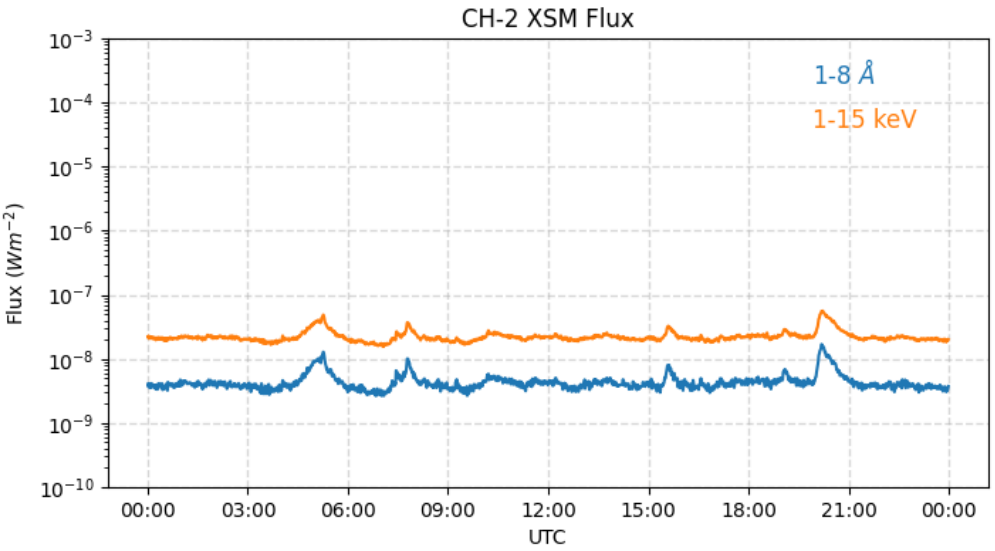
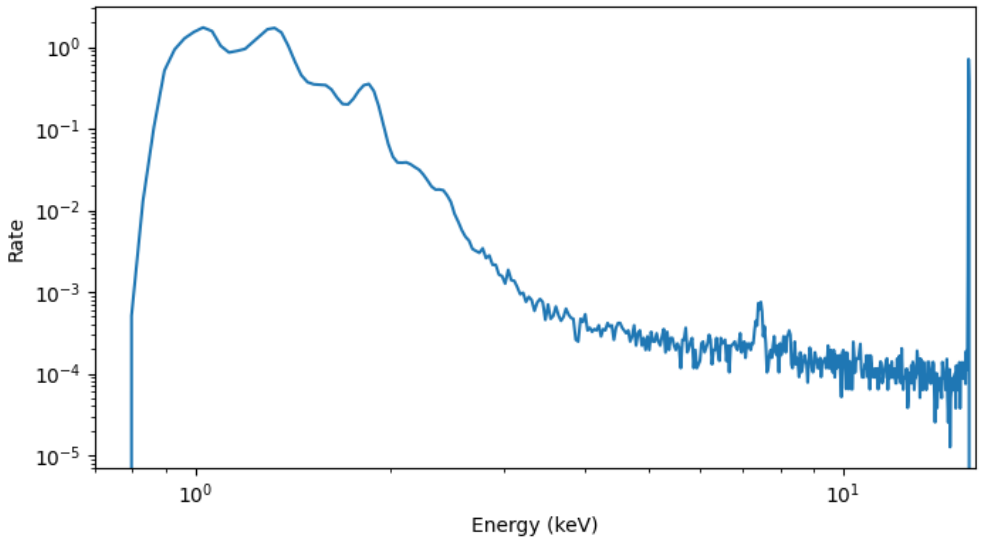




Date: 2020-04-01





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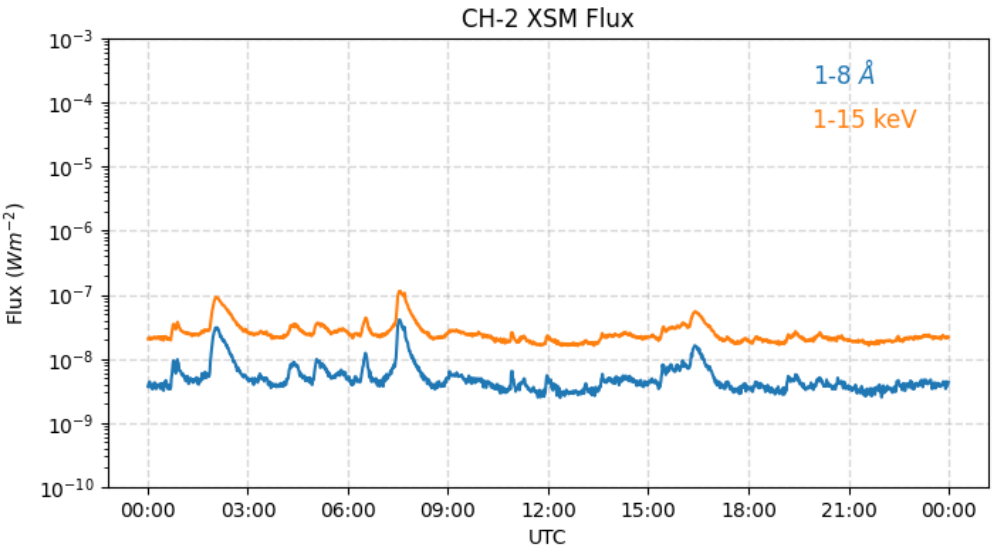

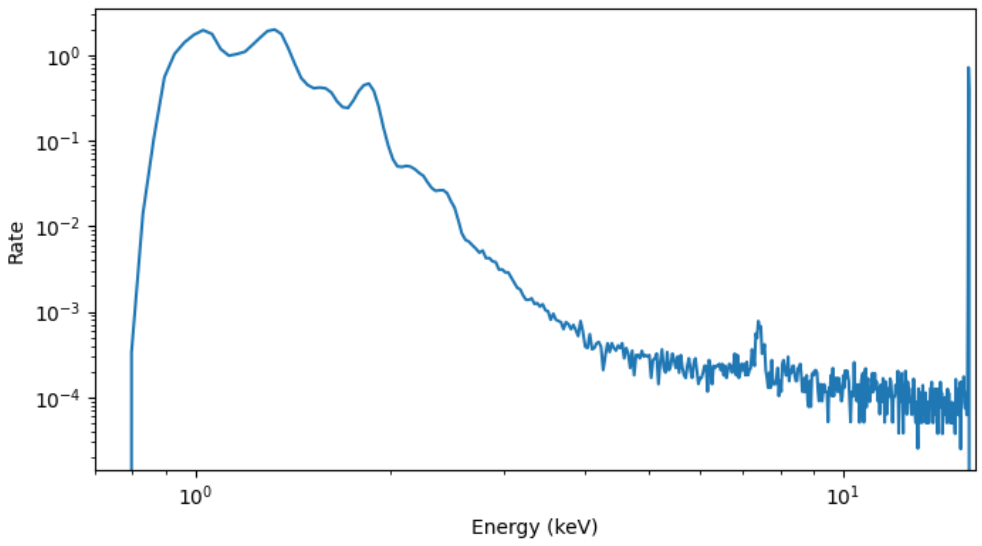

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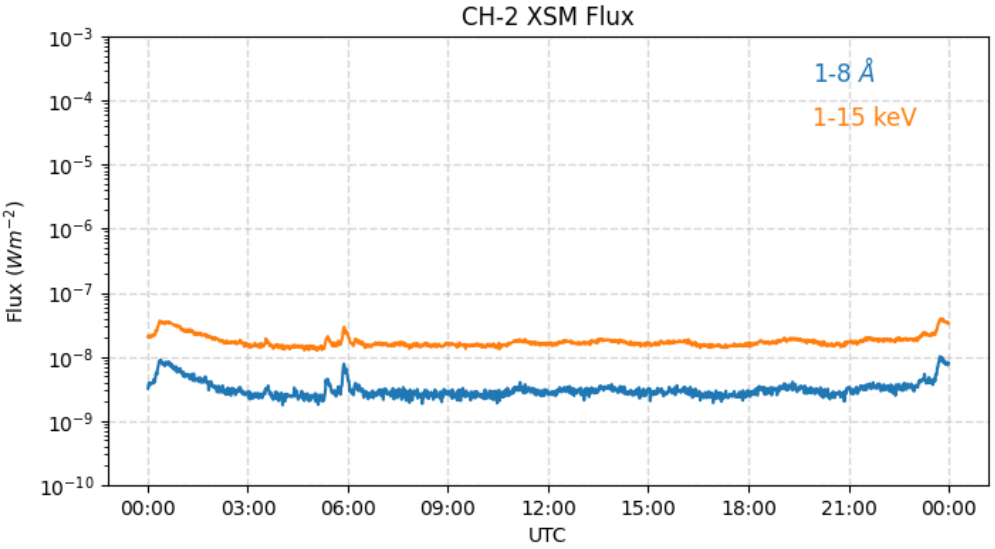

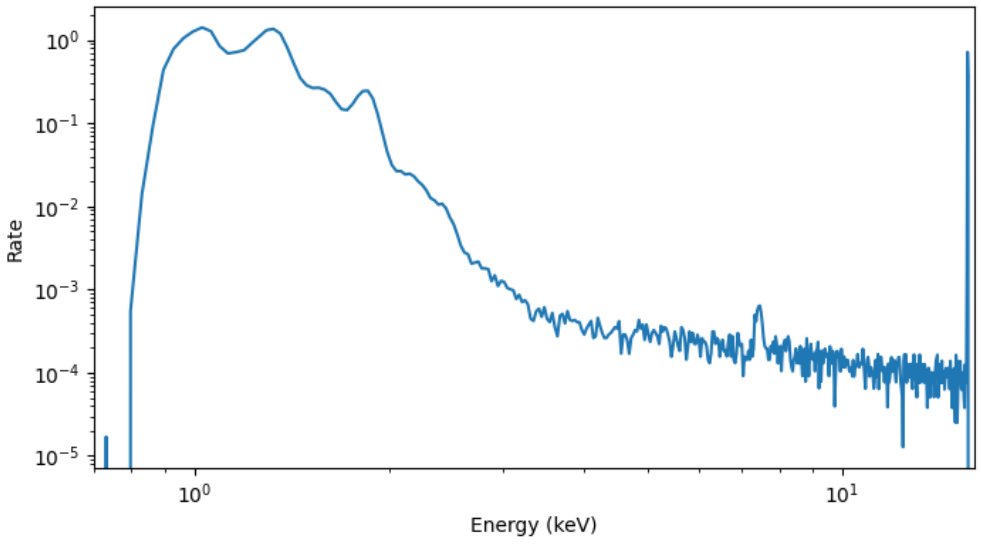

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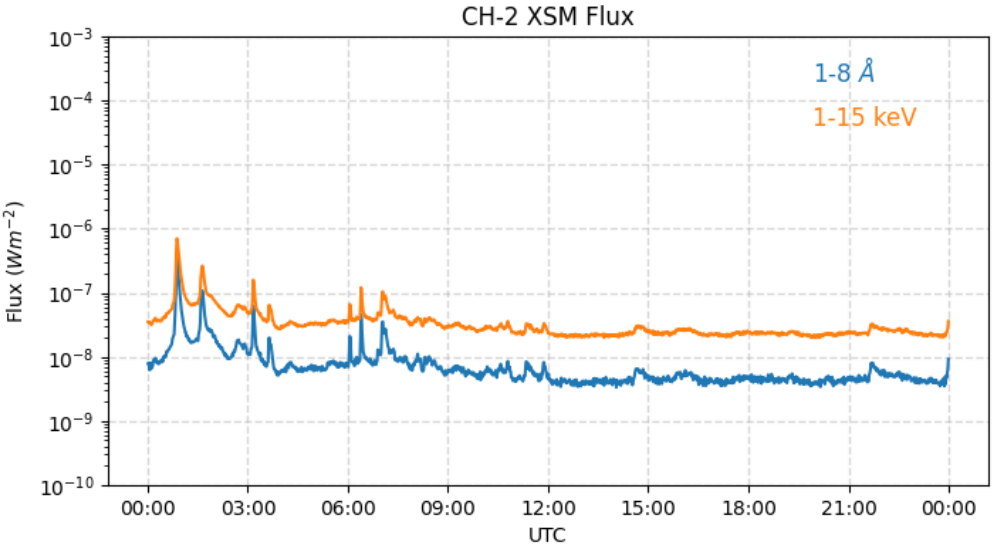

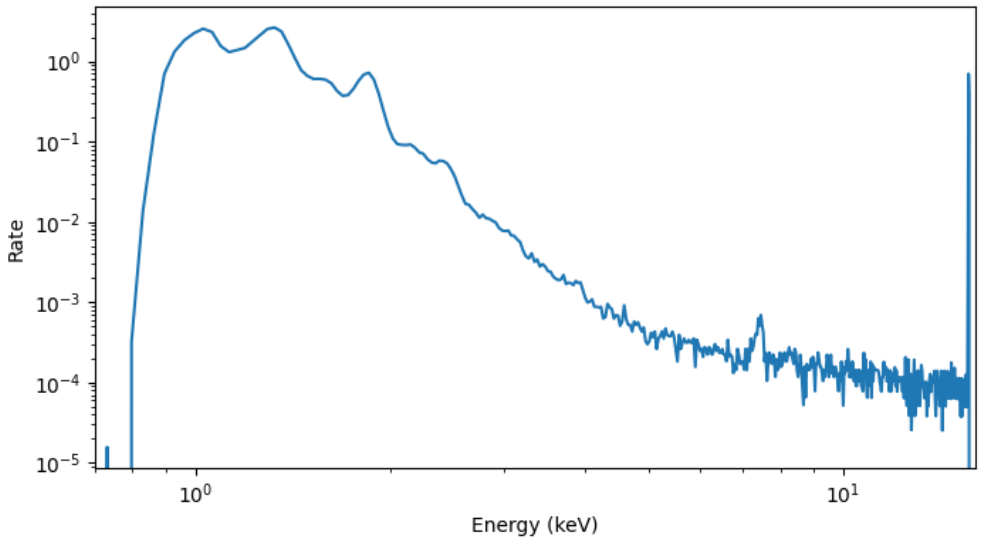

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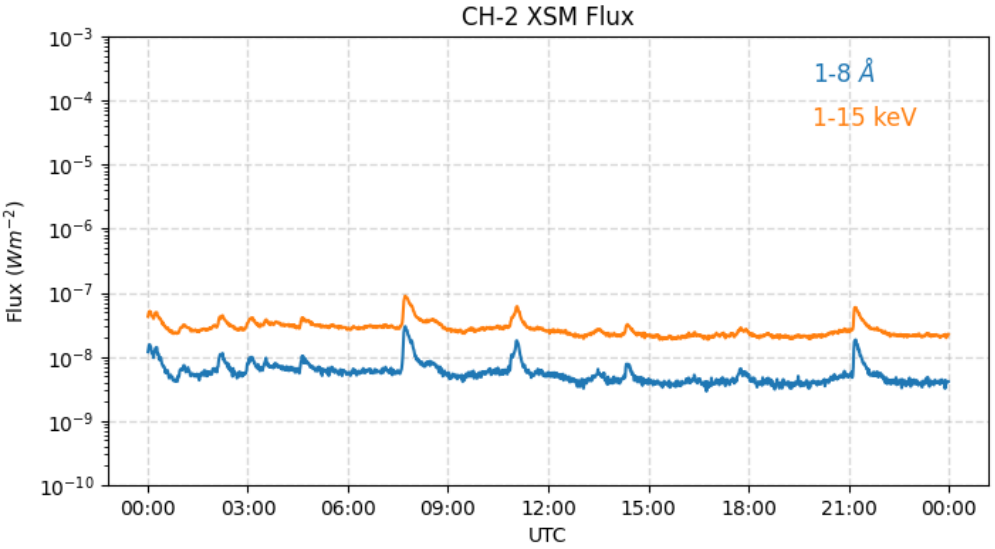

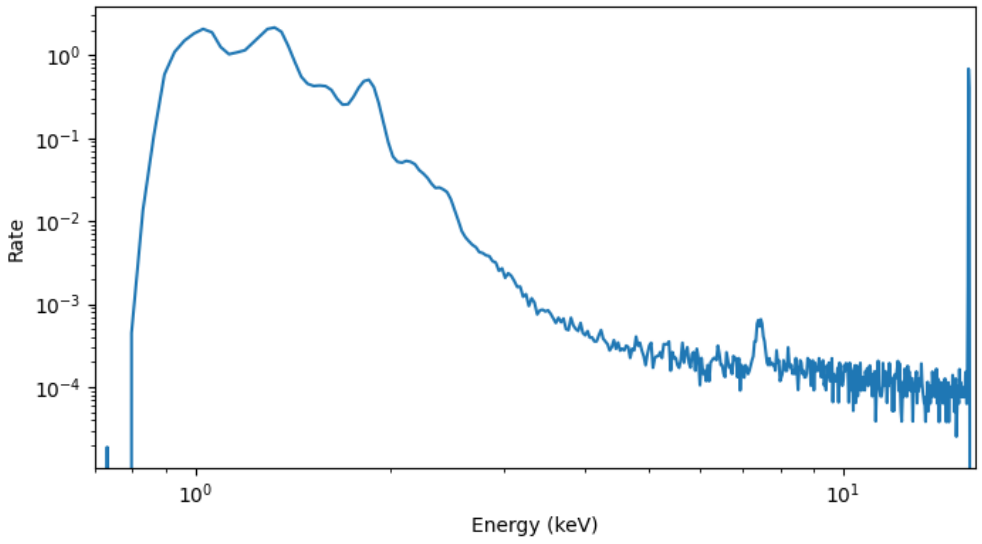

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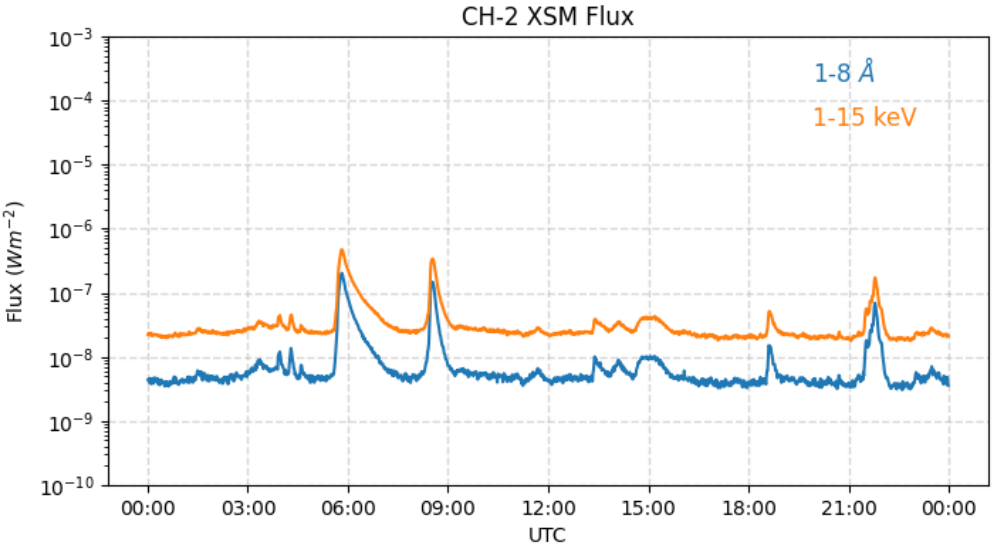

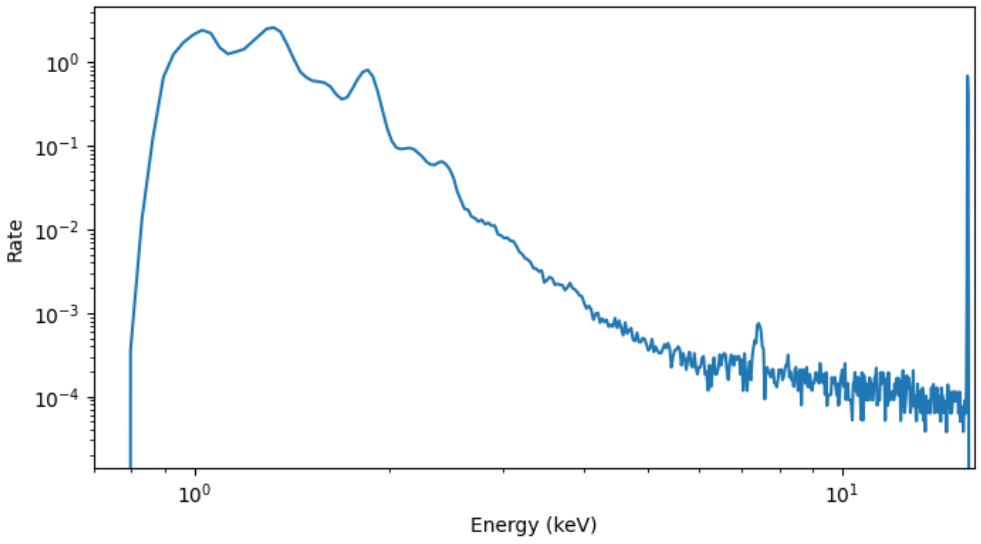

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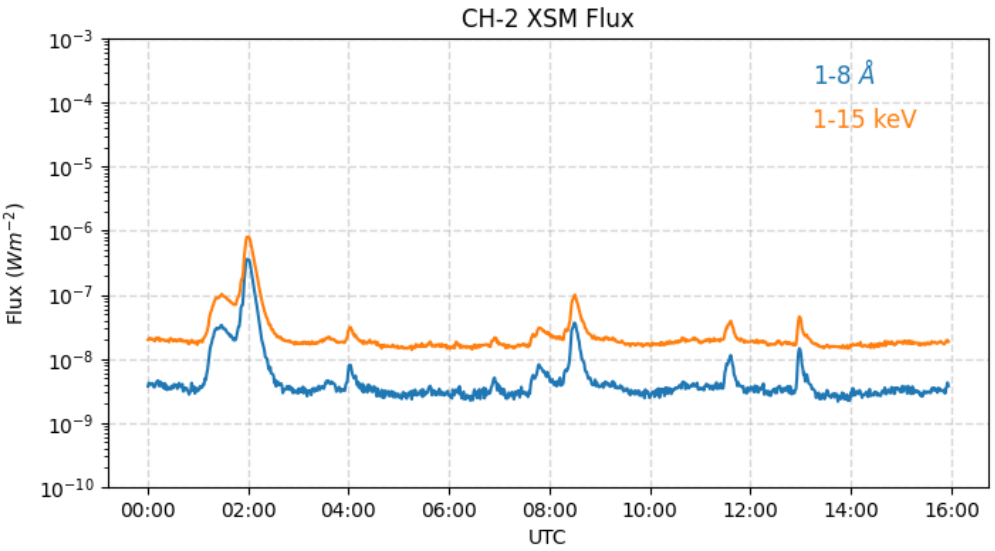

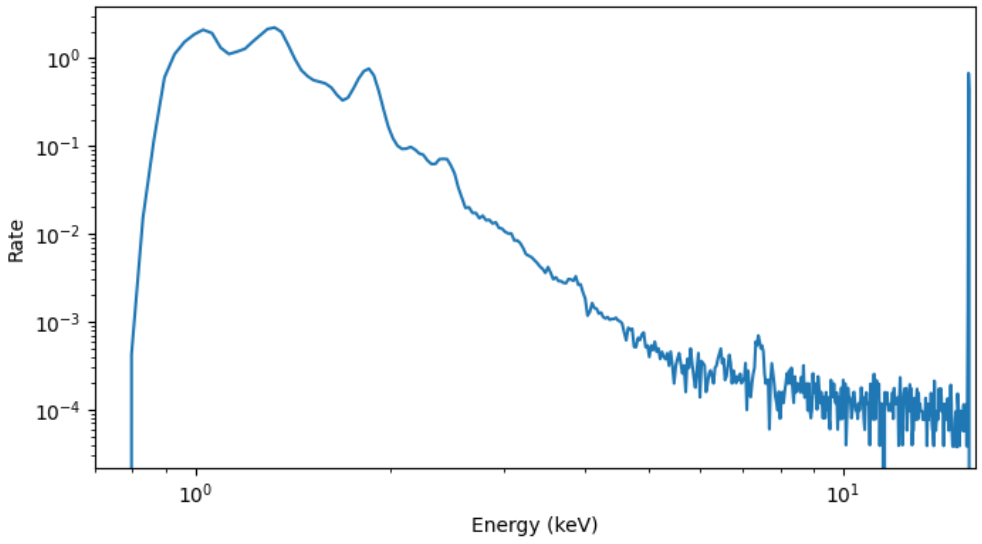

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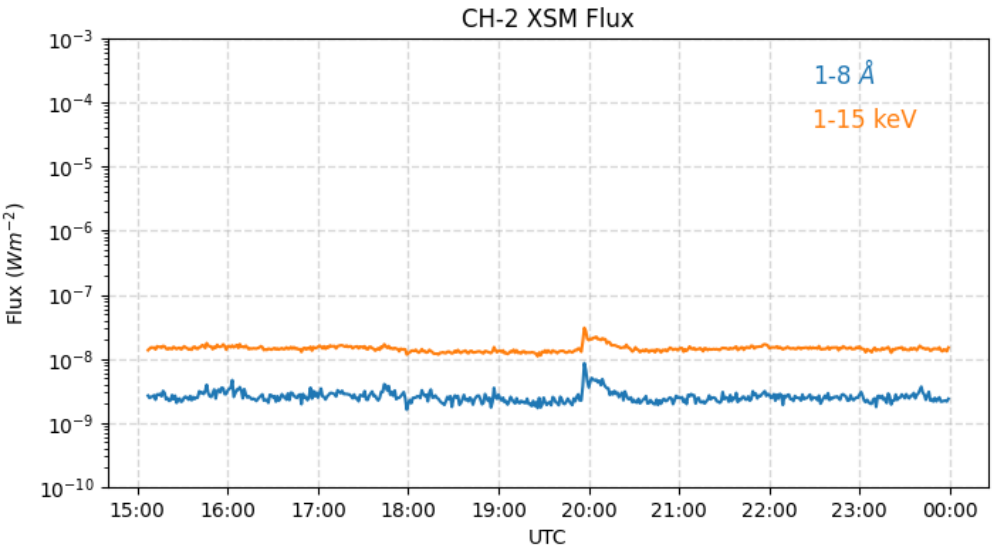

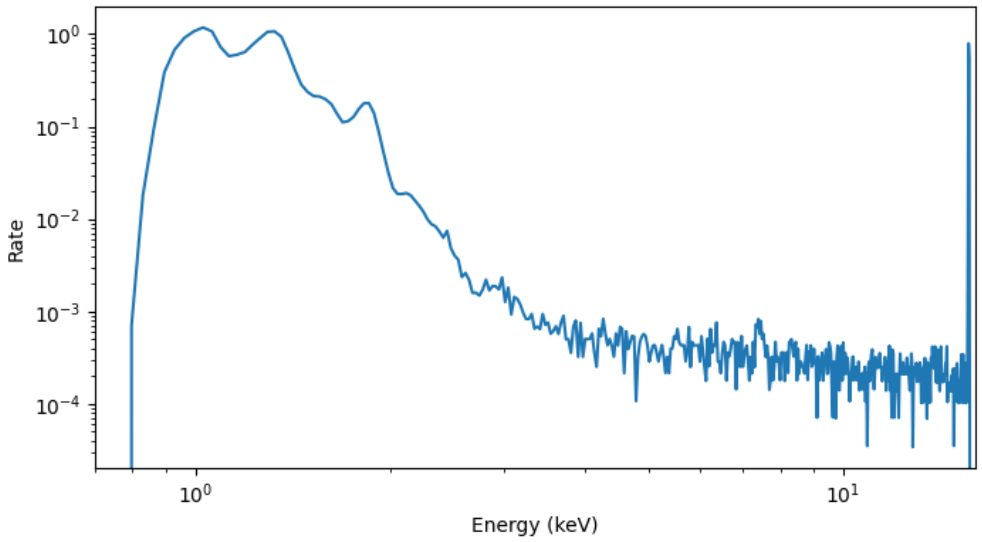

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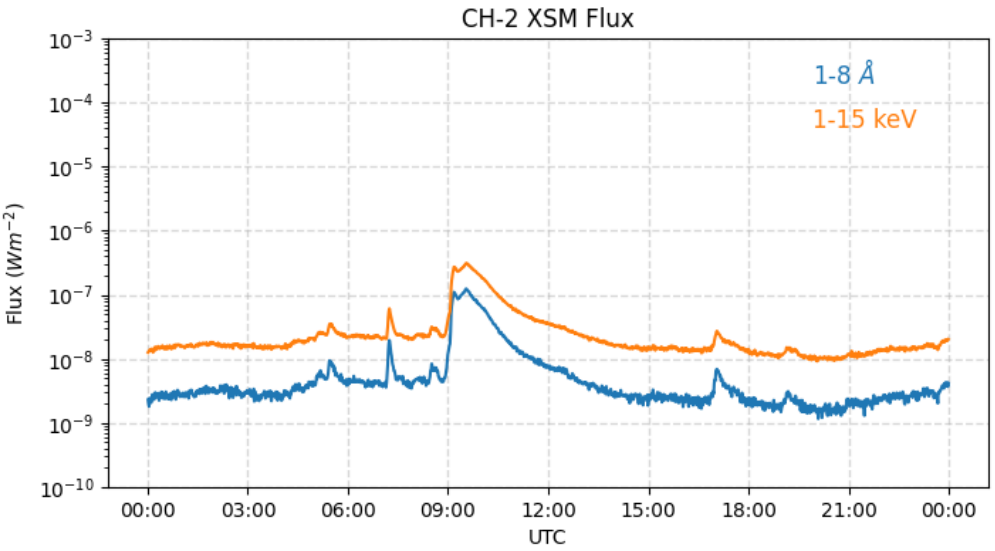

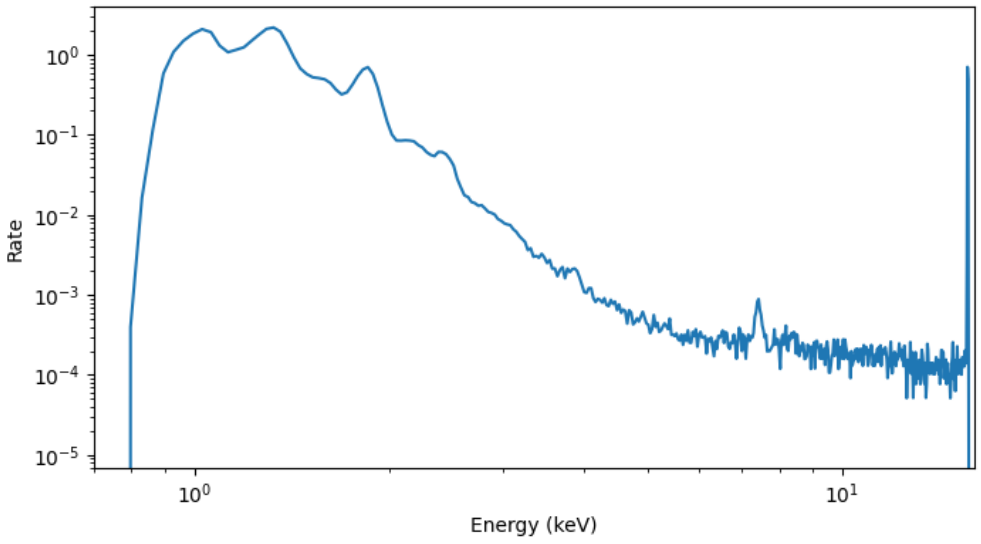

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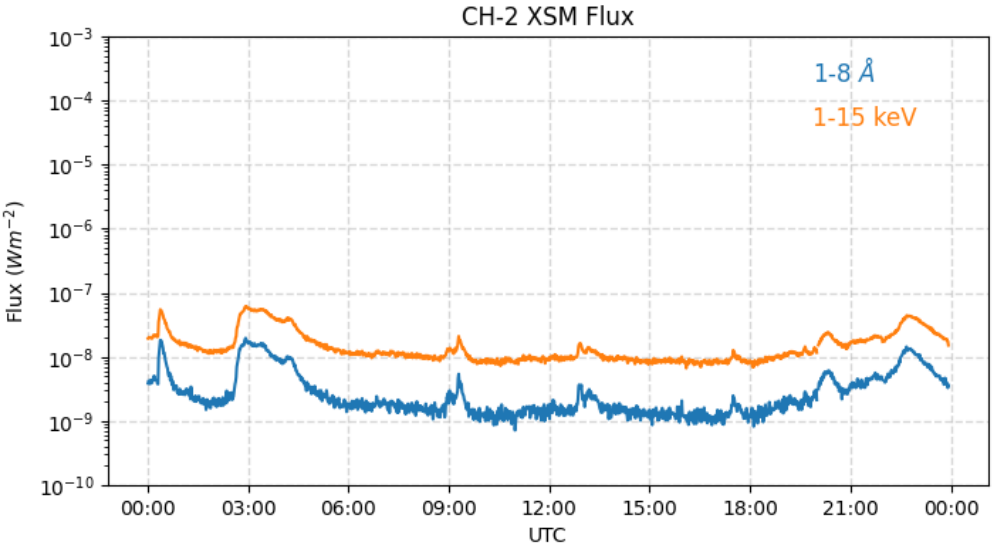

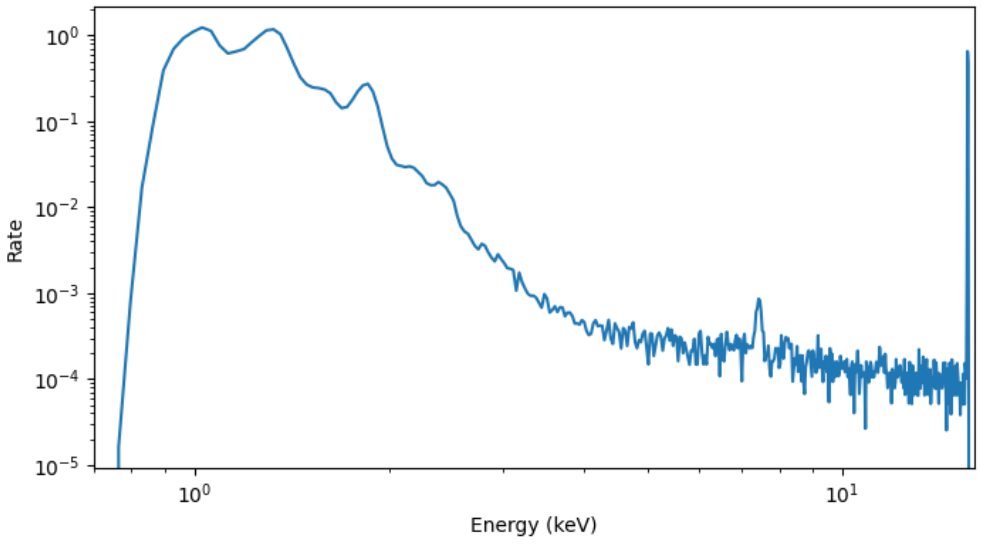

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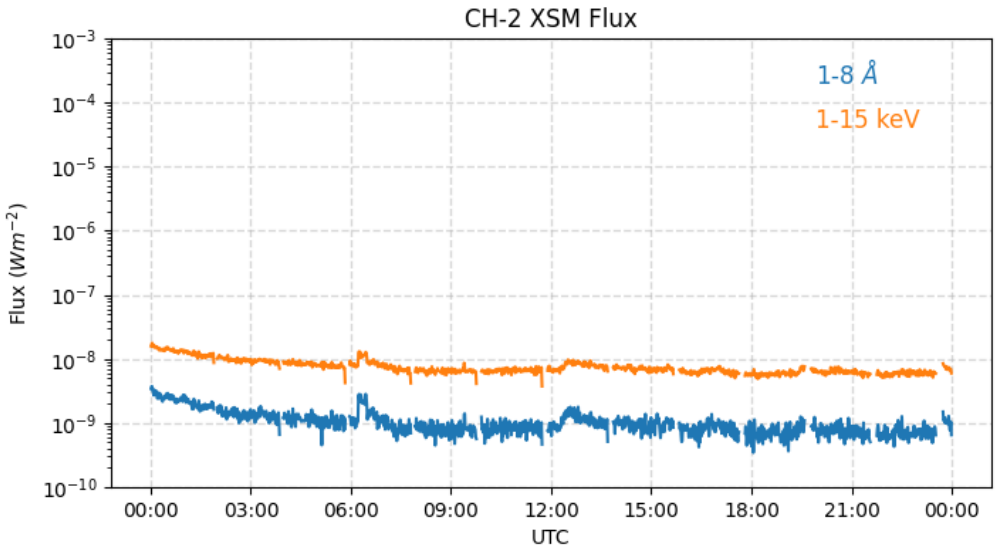

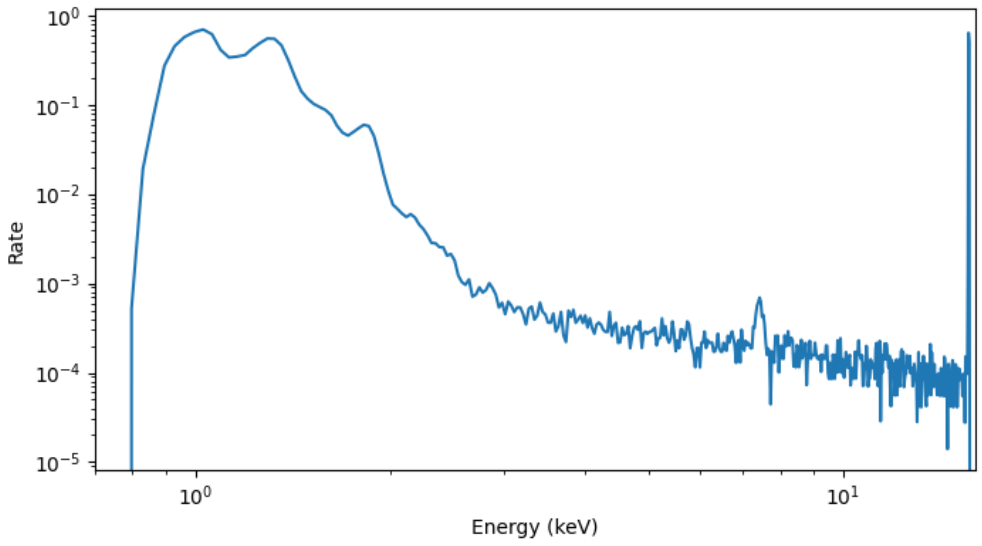

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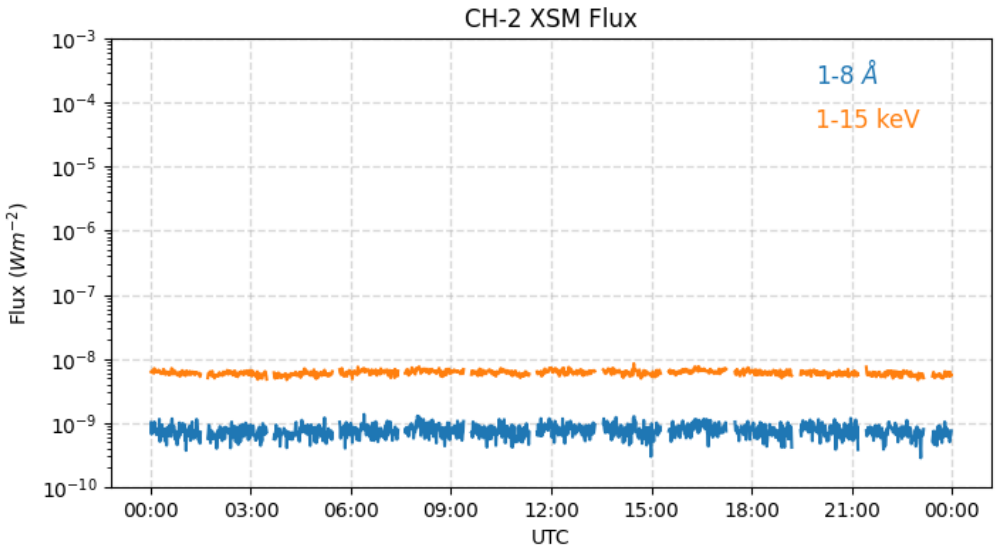

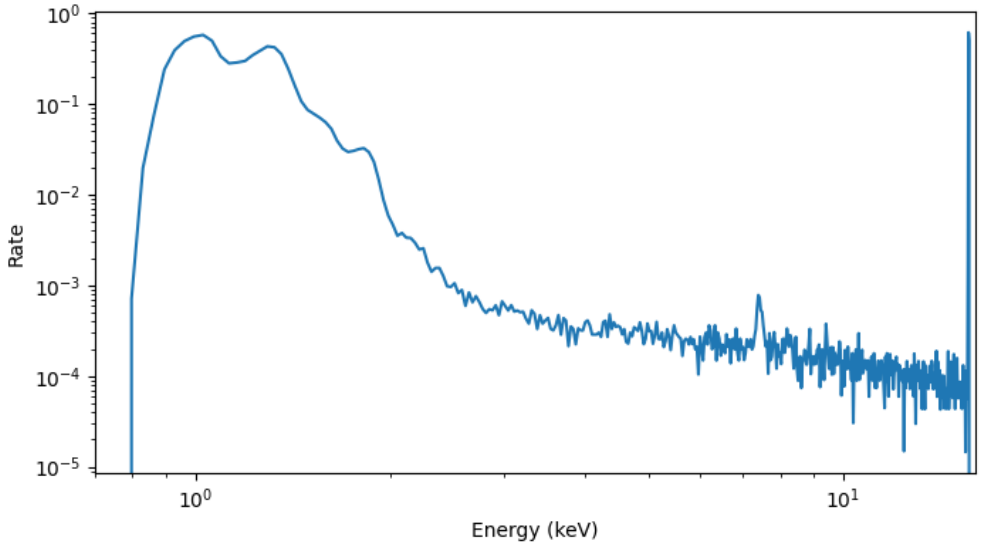

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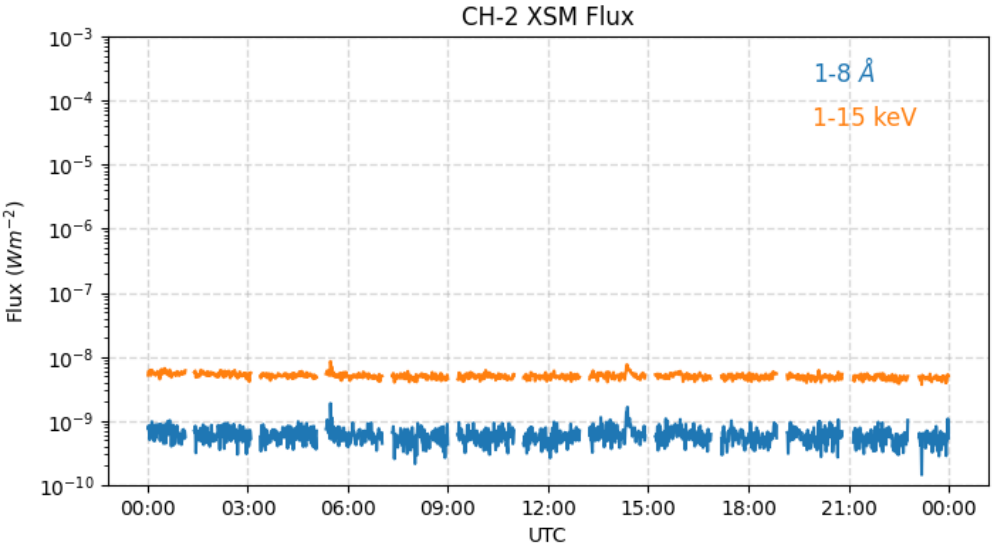

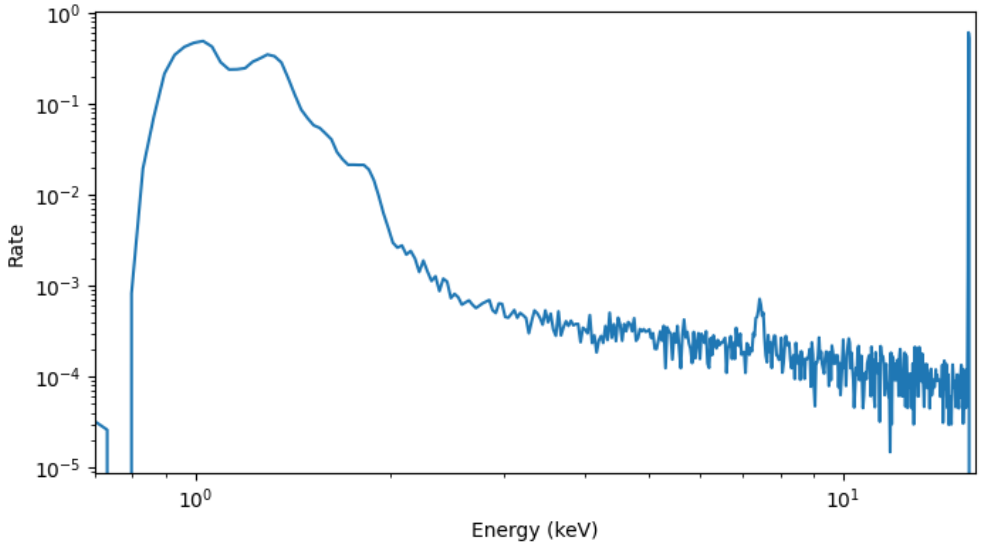

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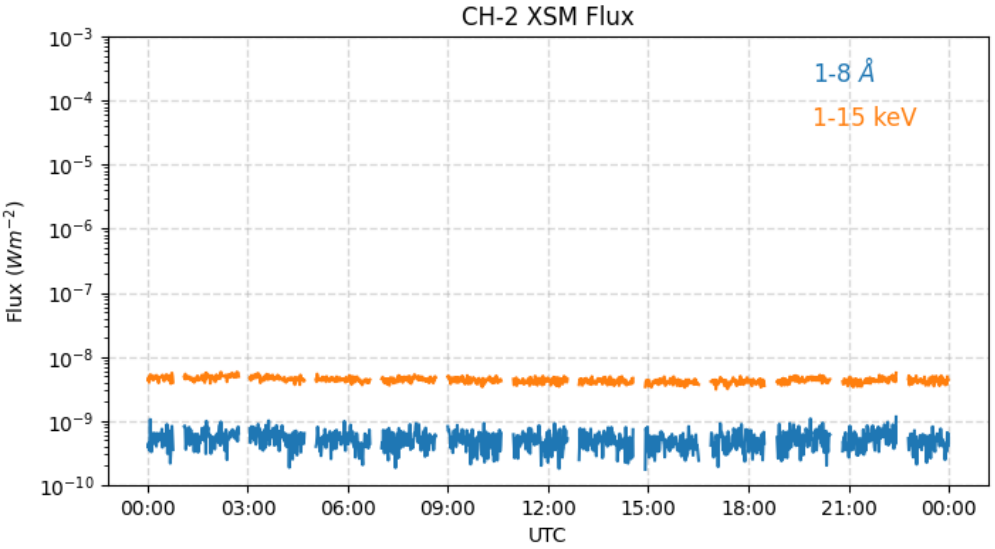

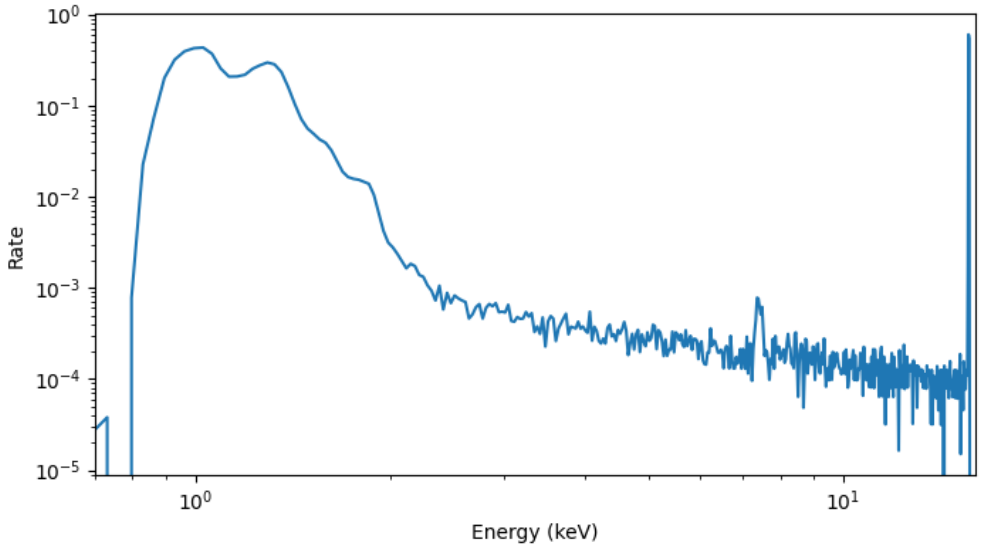

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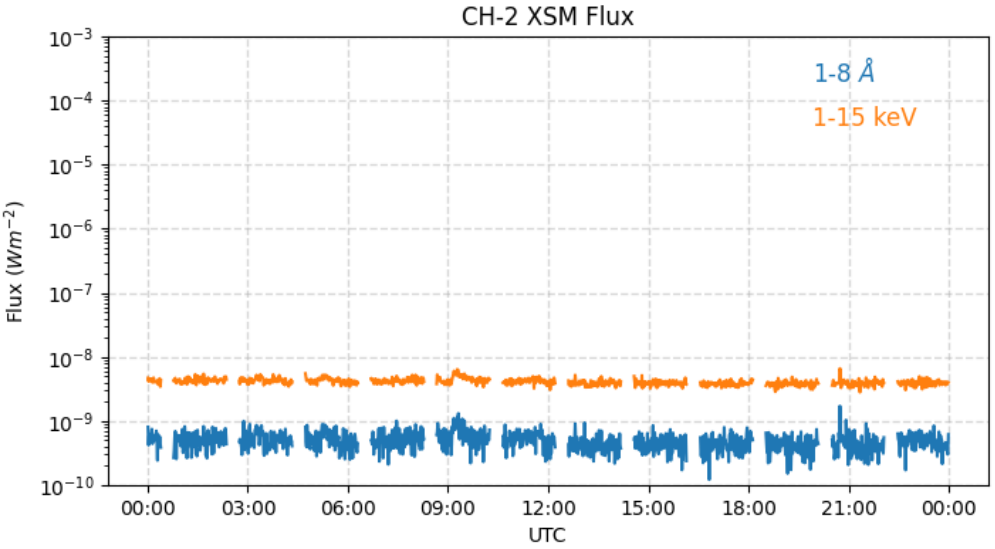

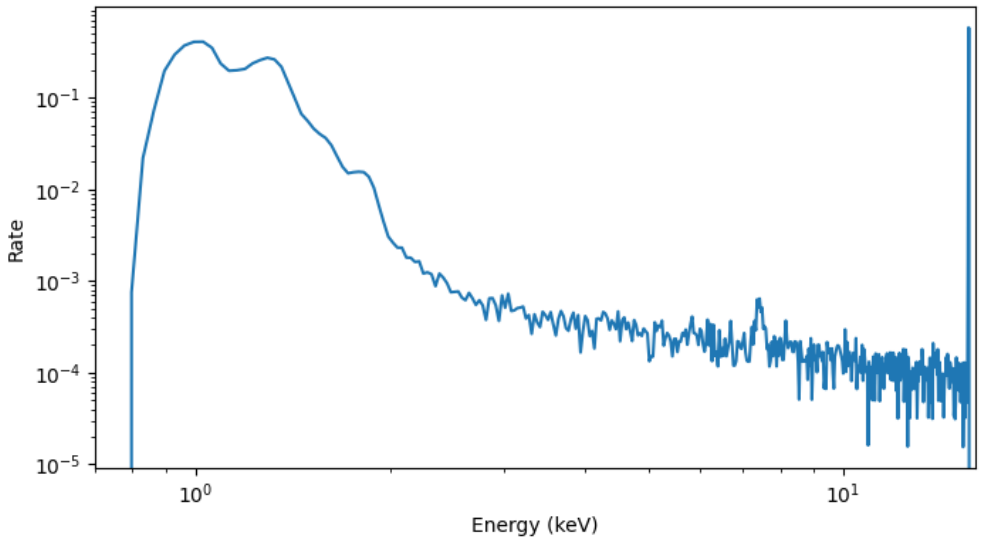

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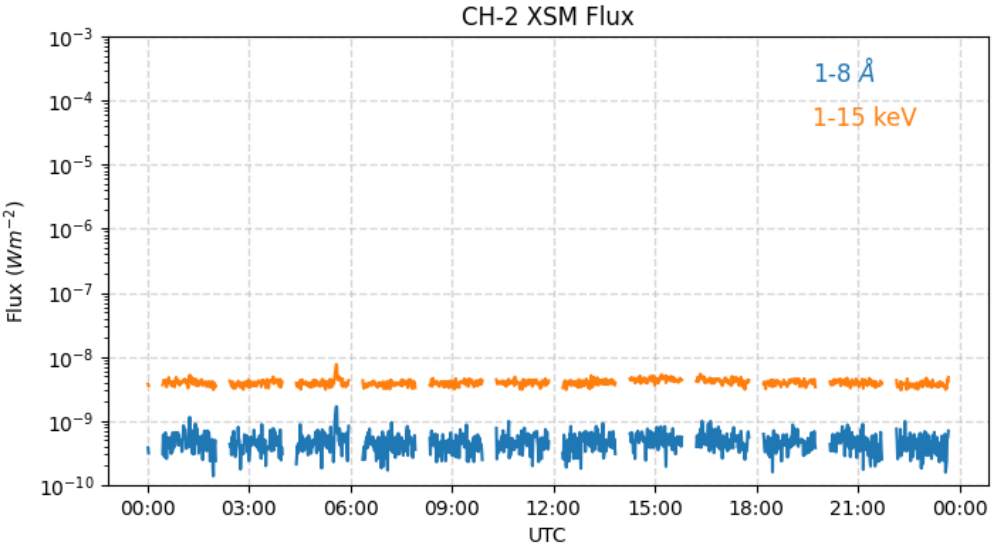

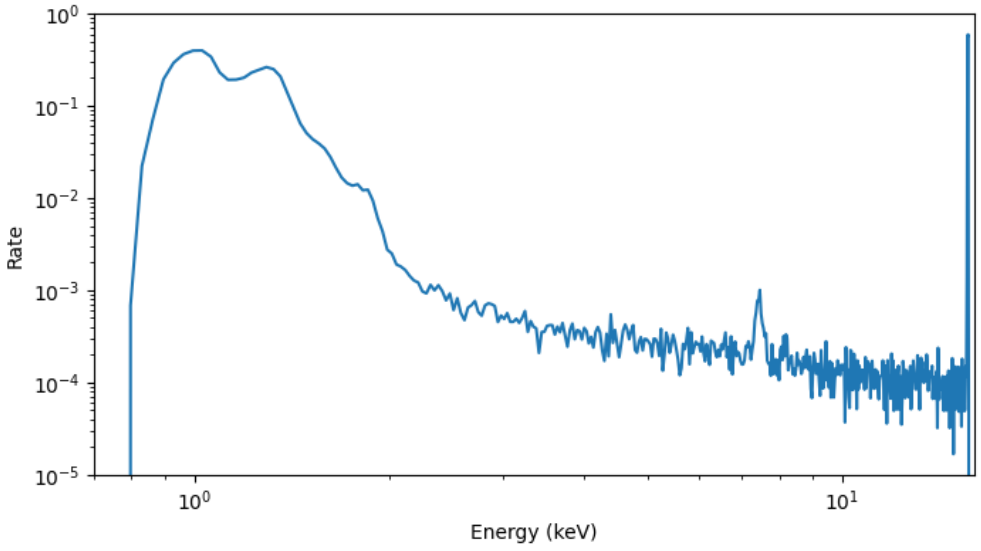

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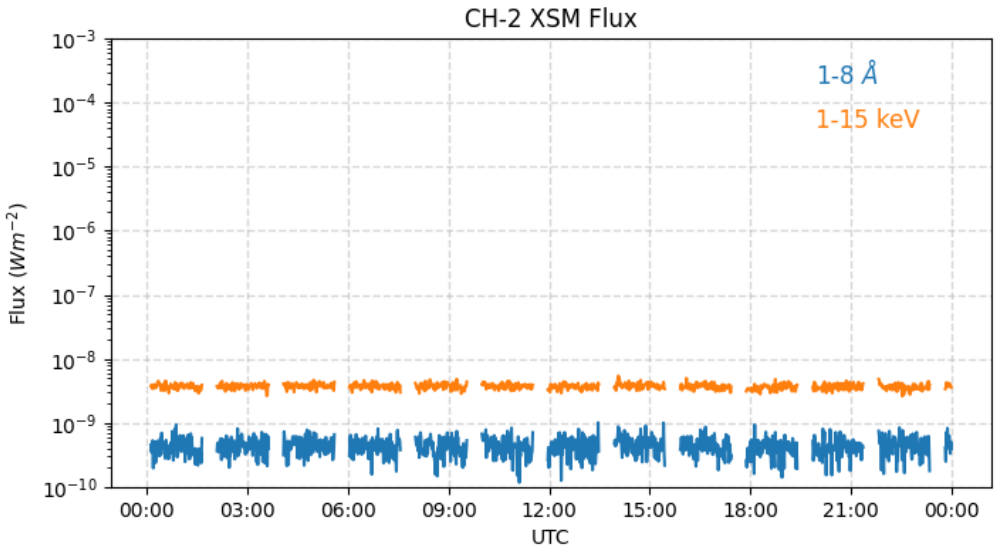

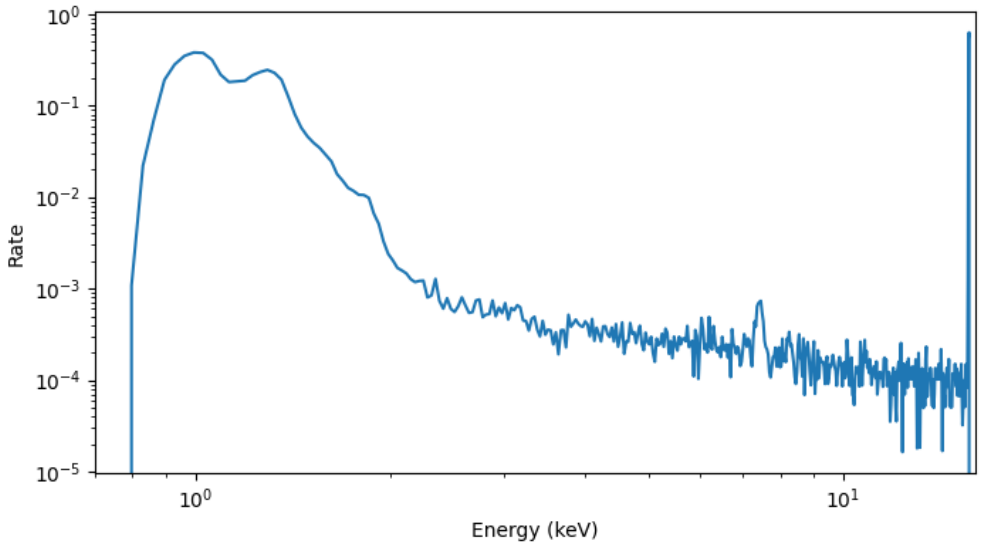

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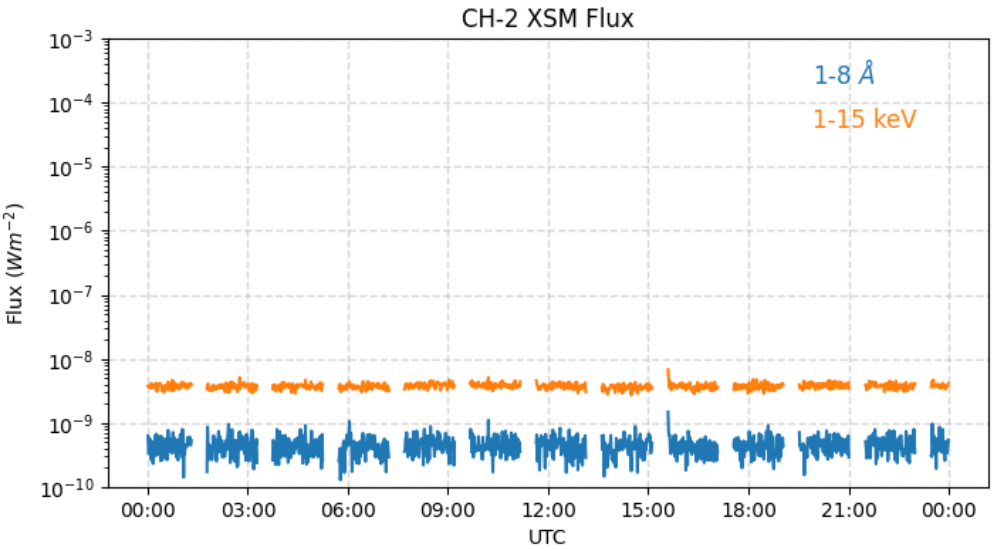

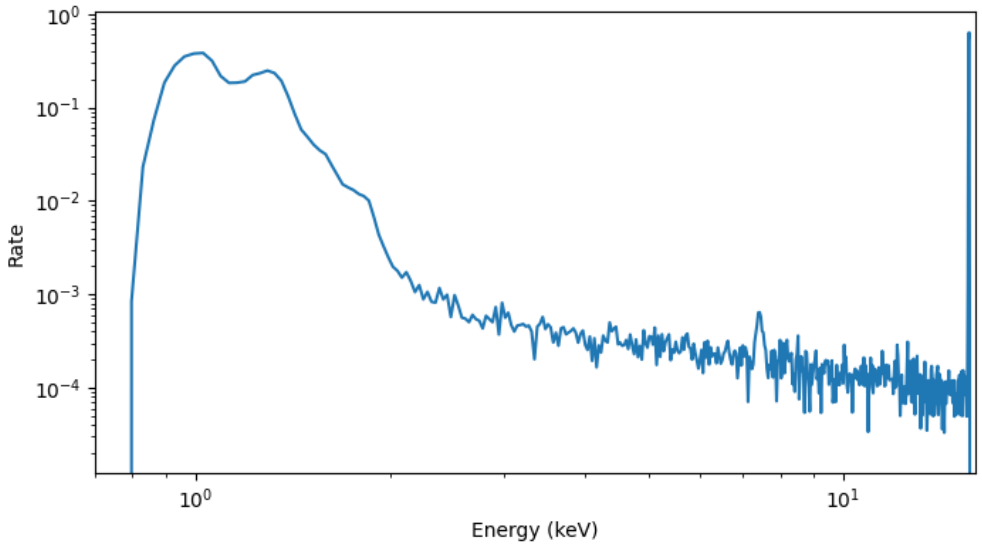

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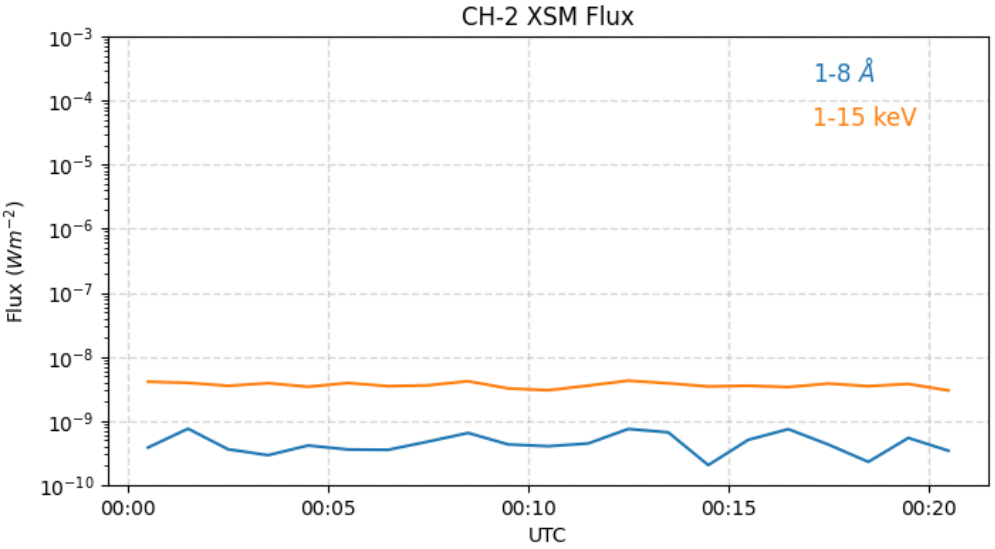

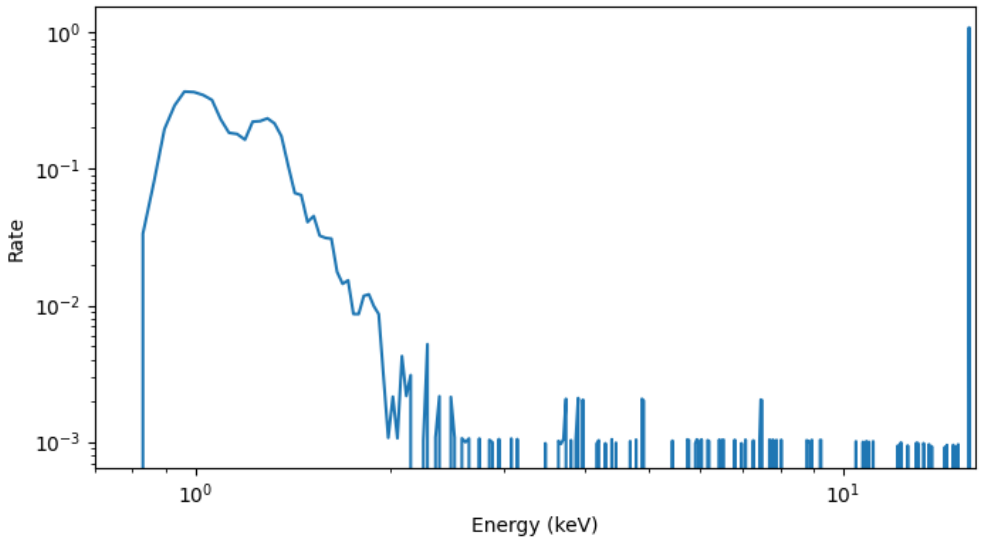

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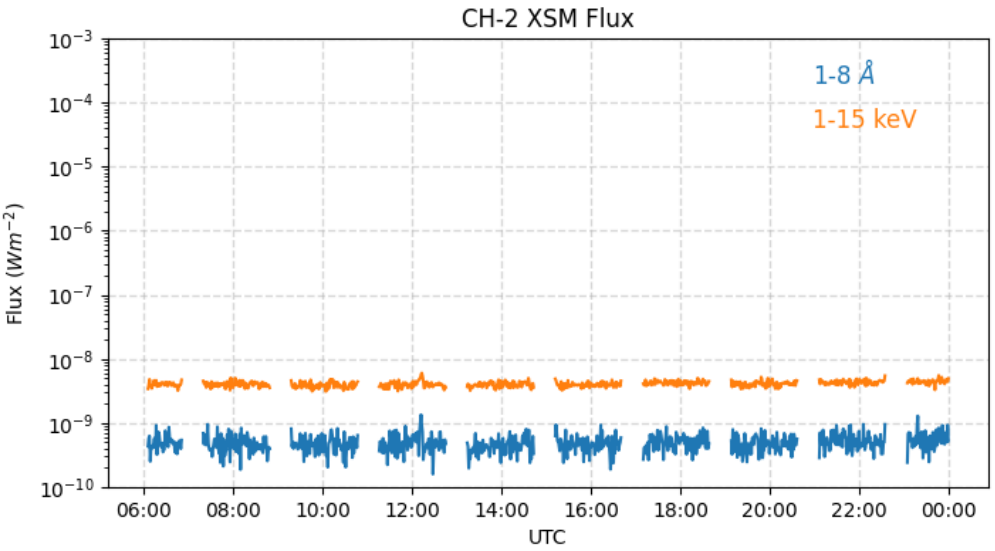

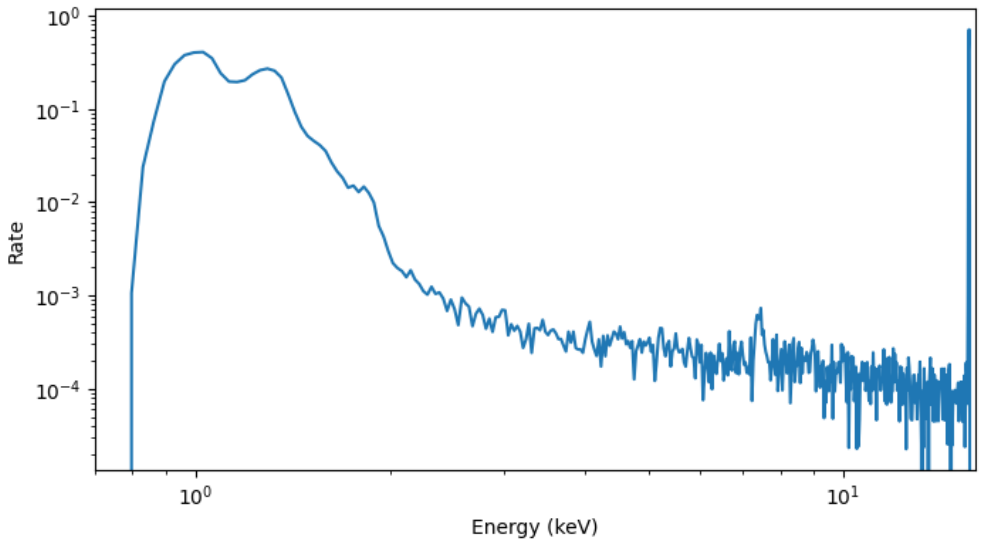

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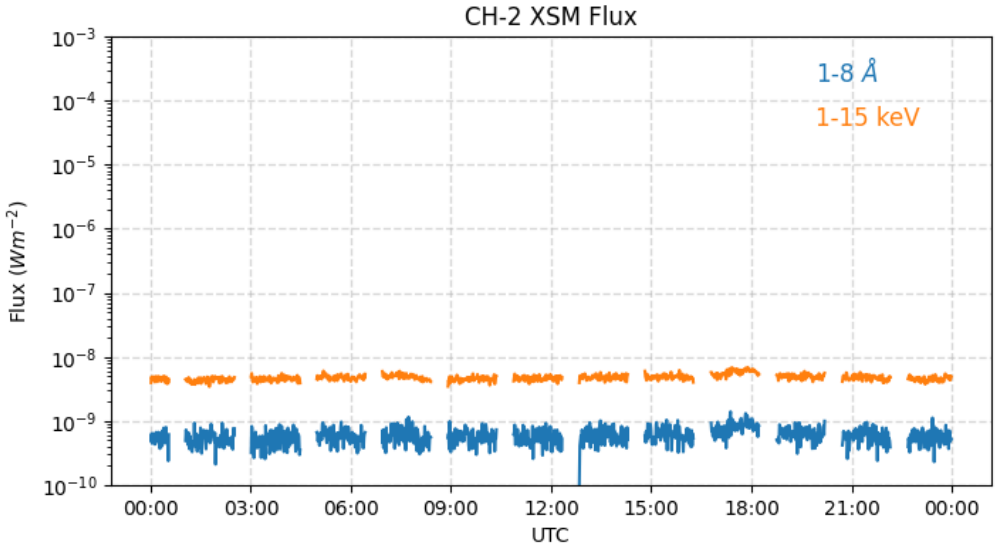

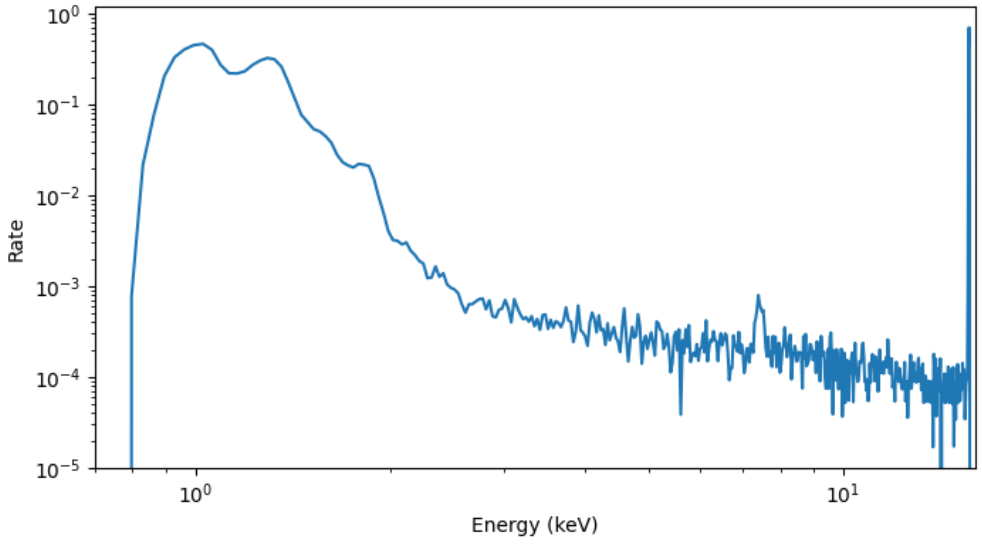

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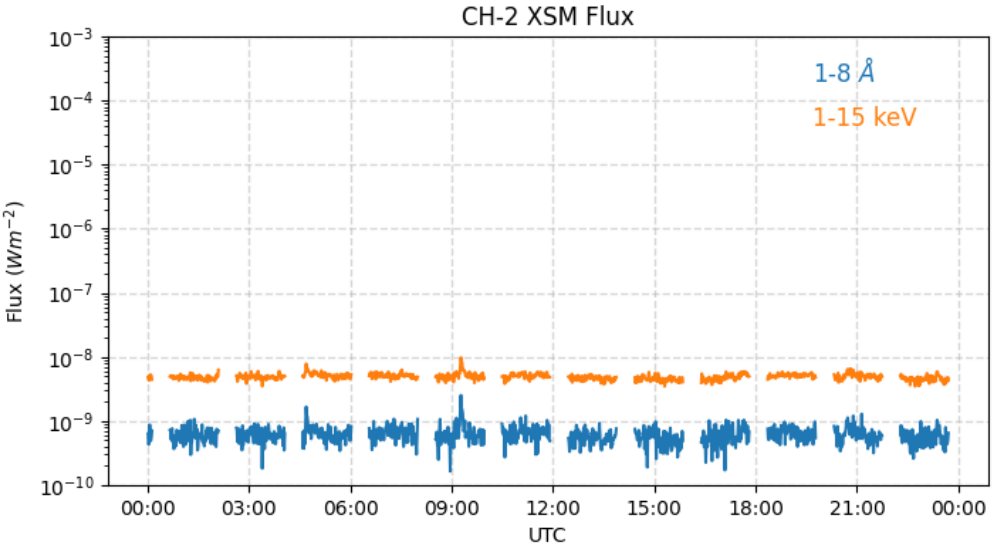

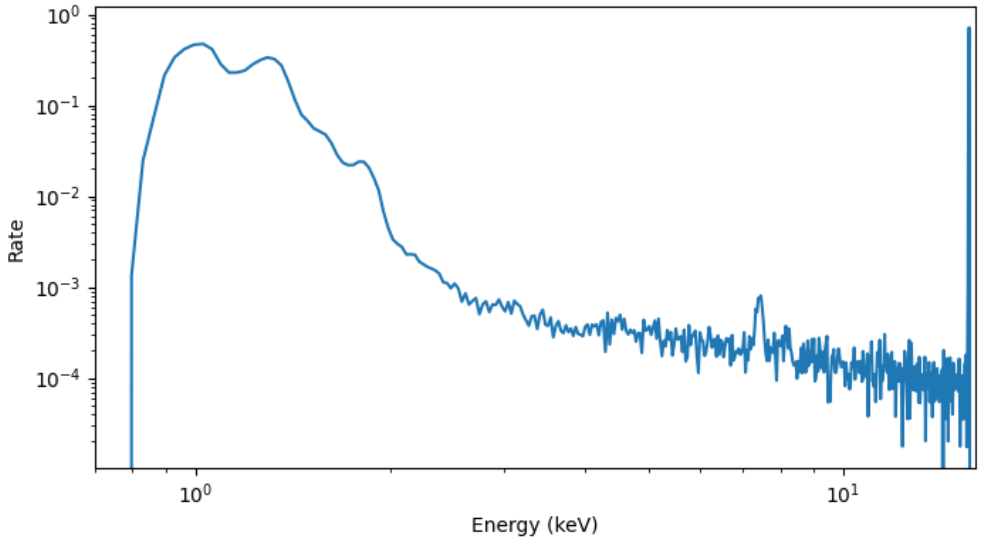

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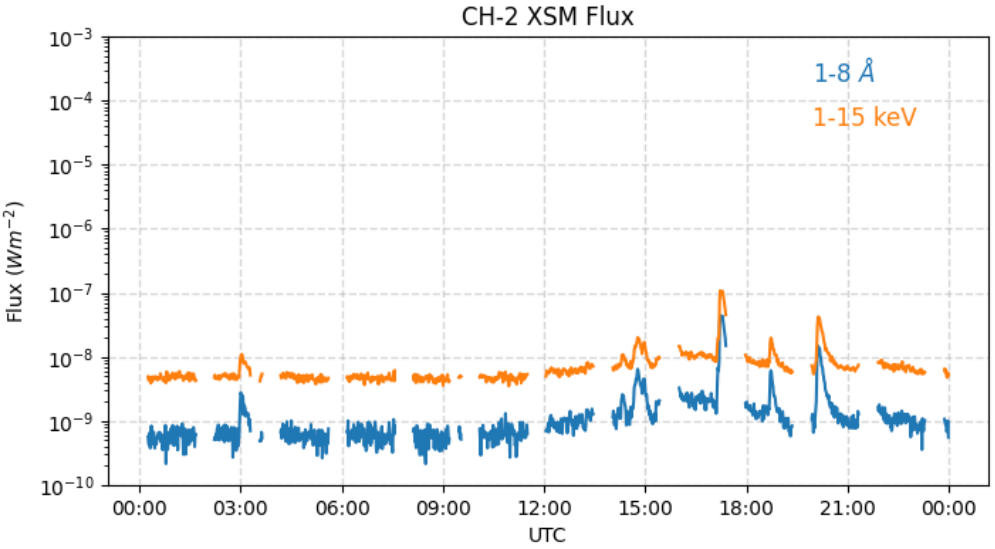

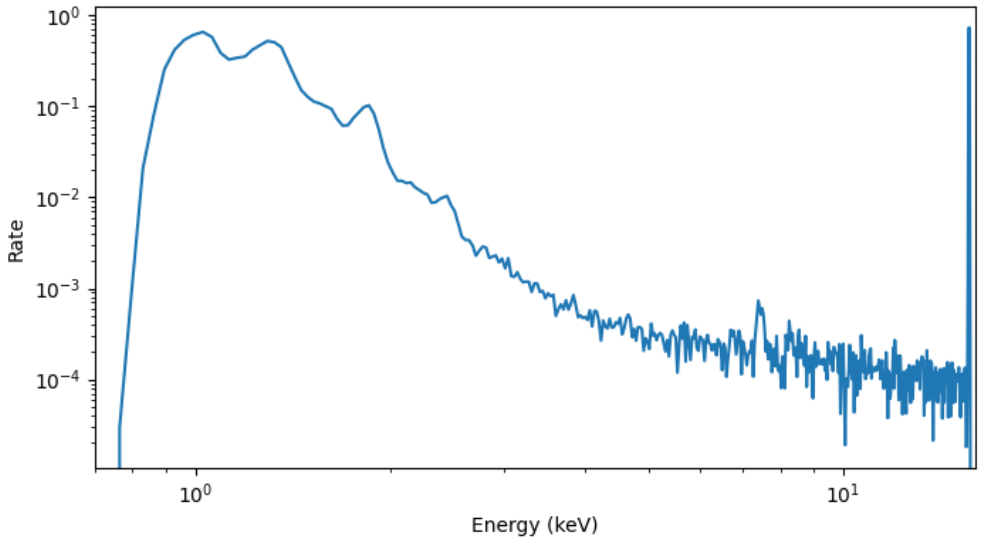

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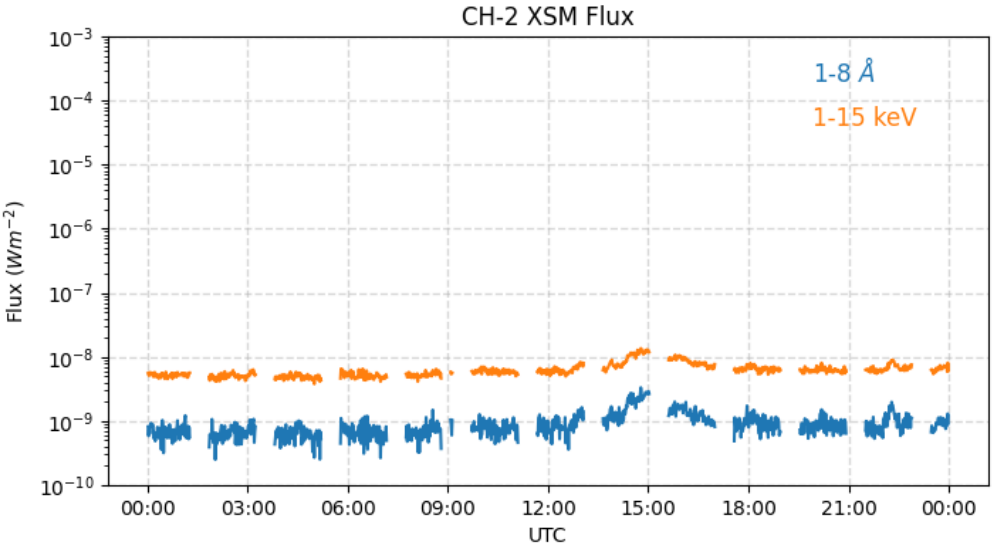

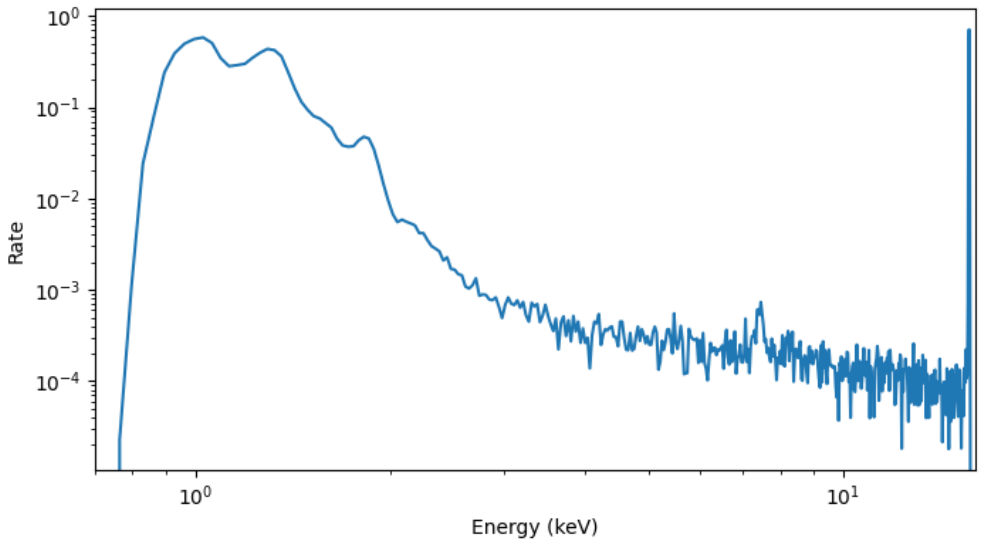

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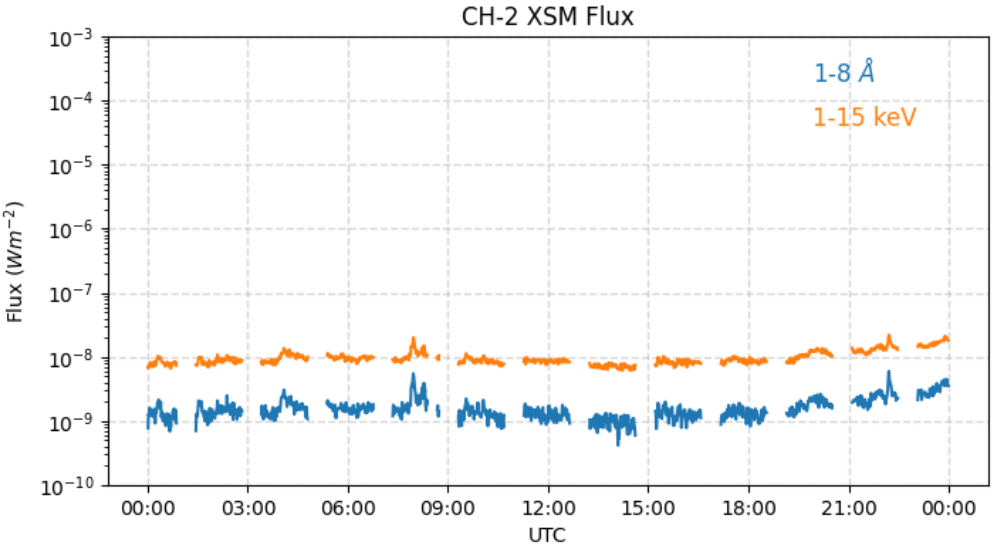

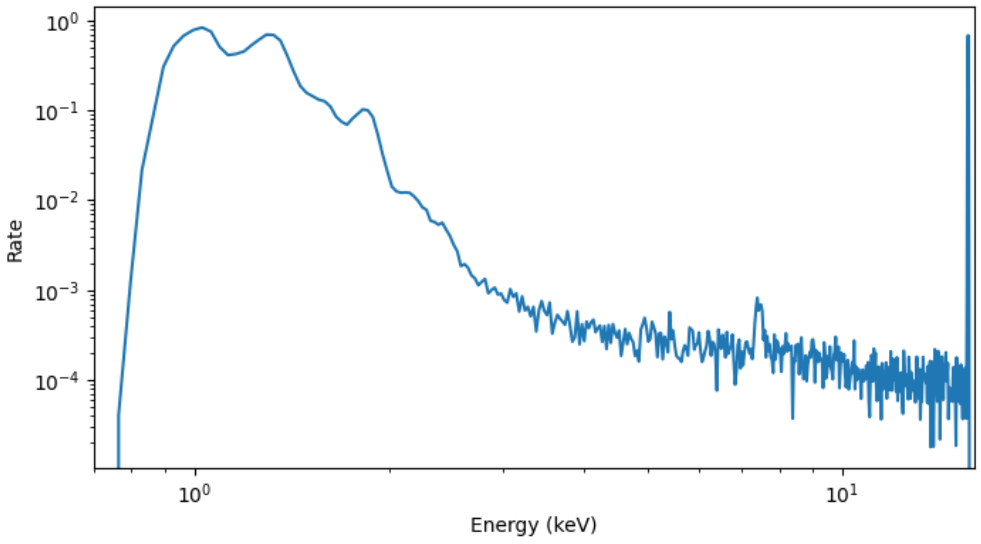

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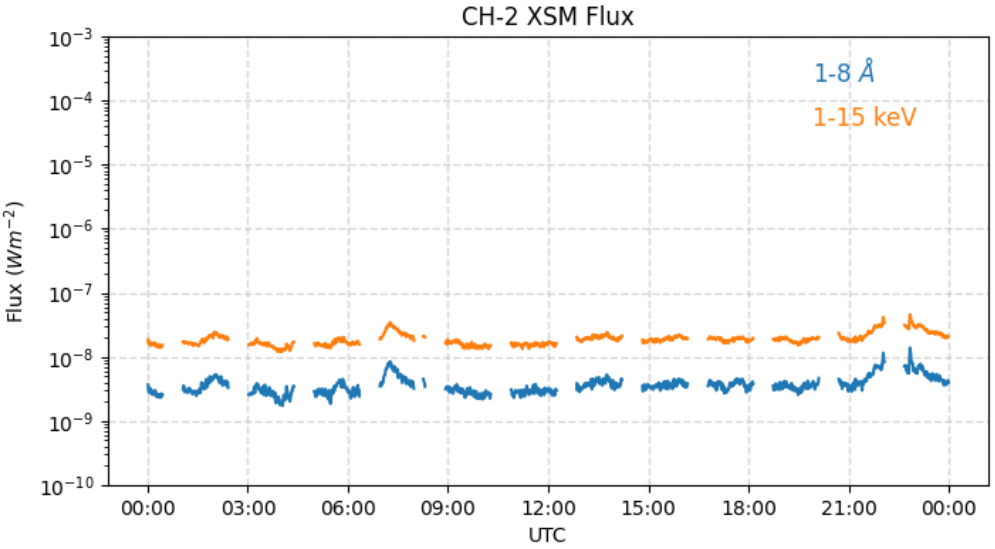

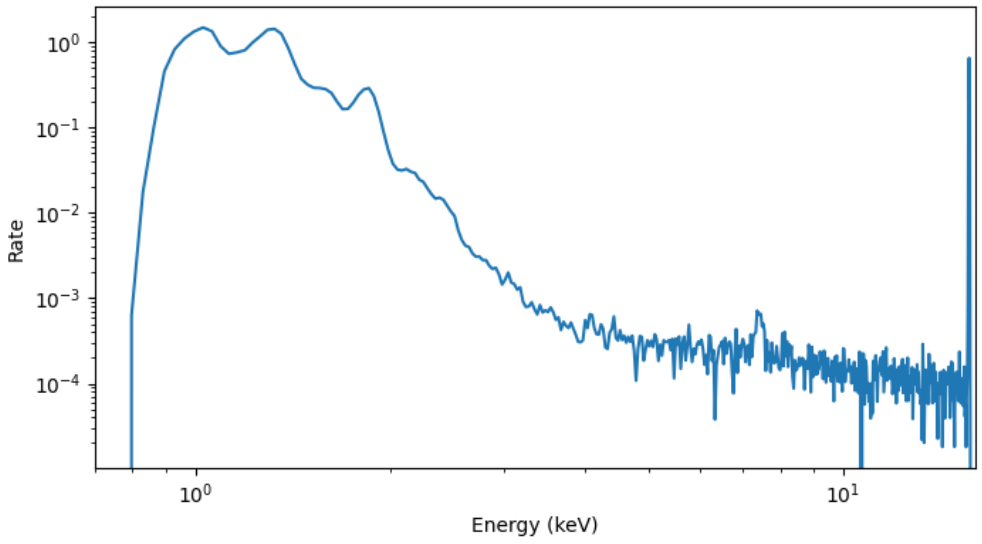

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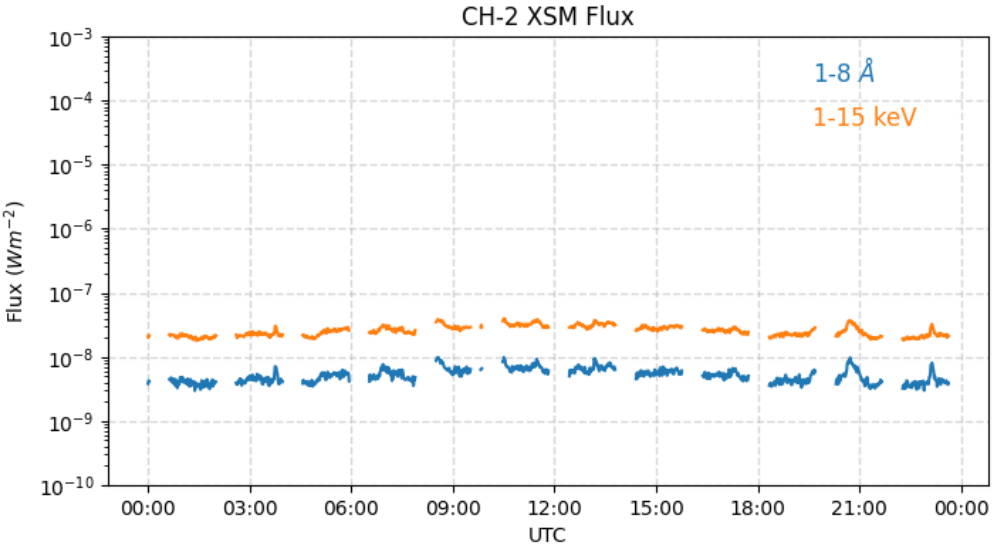

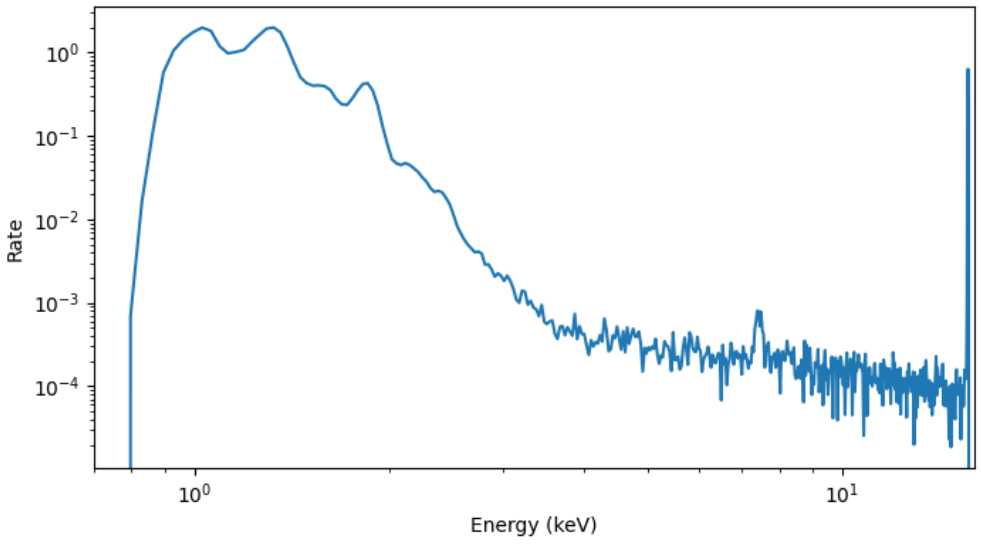

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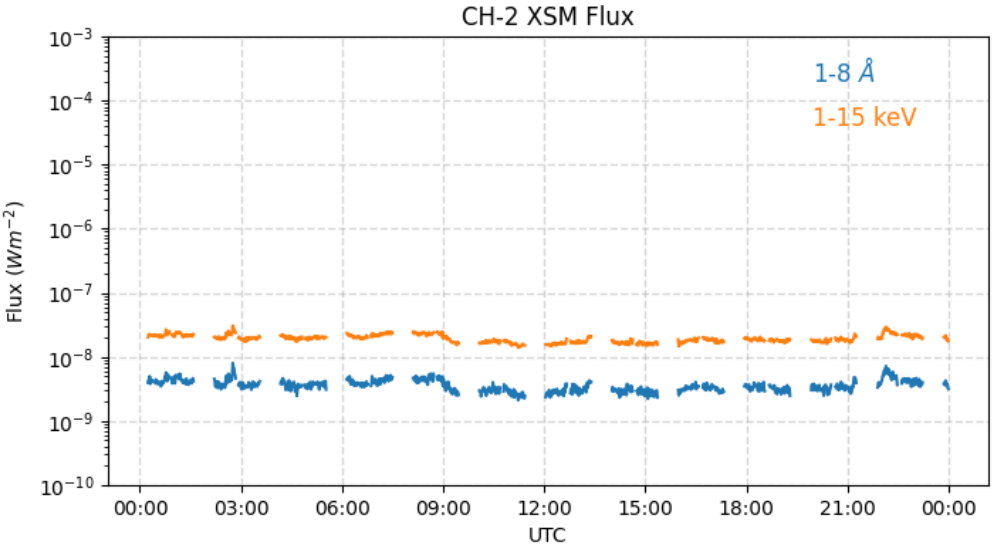
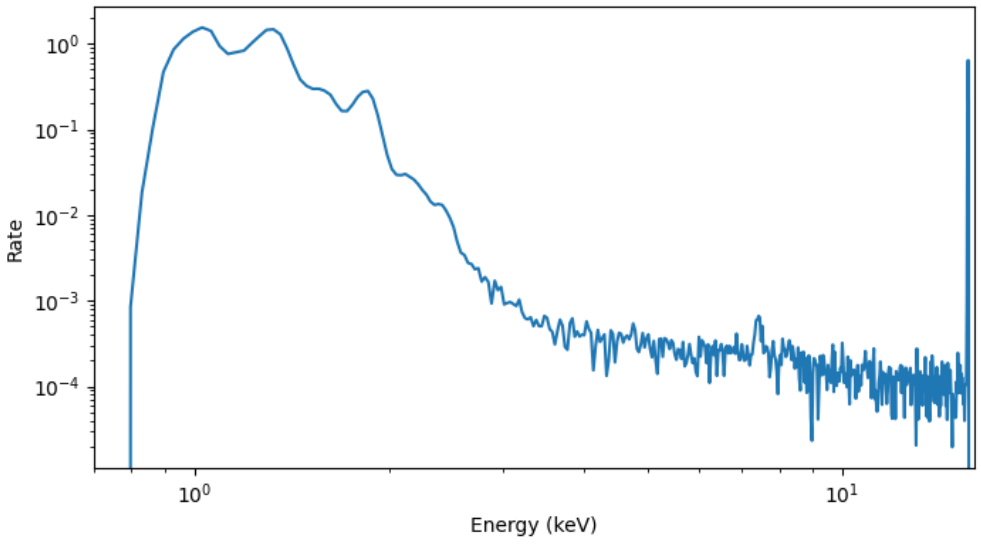
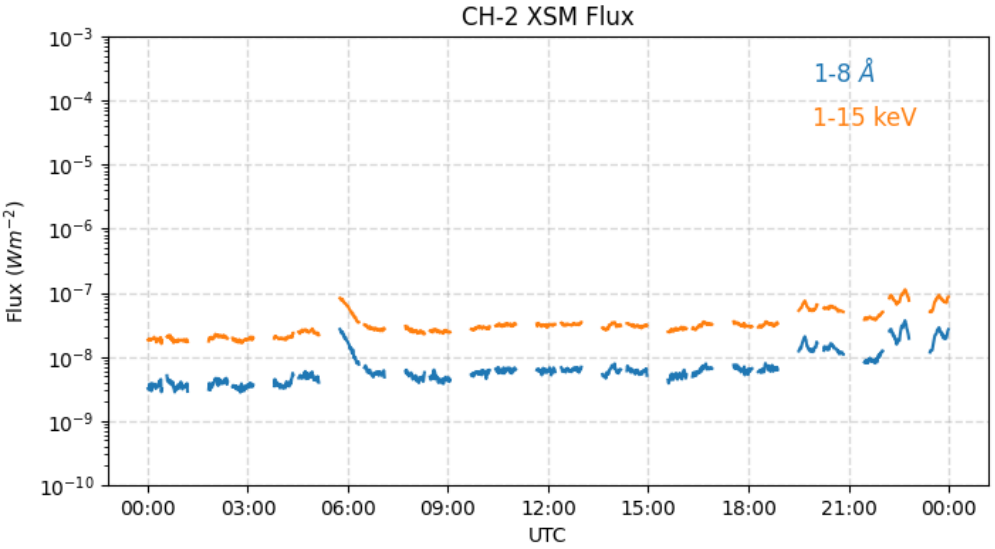
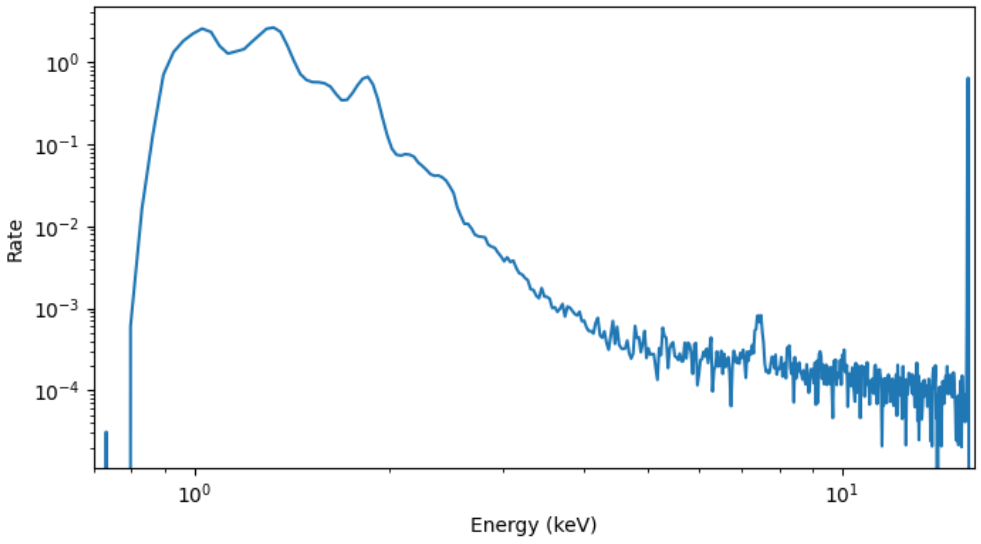




Date: 2020-04-29





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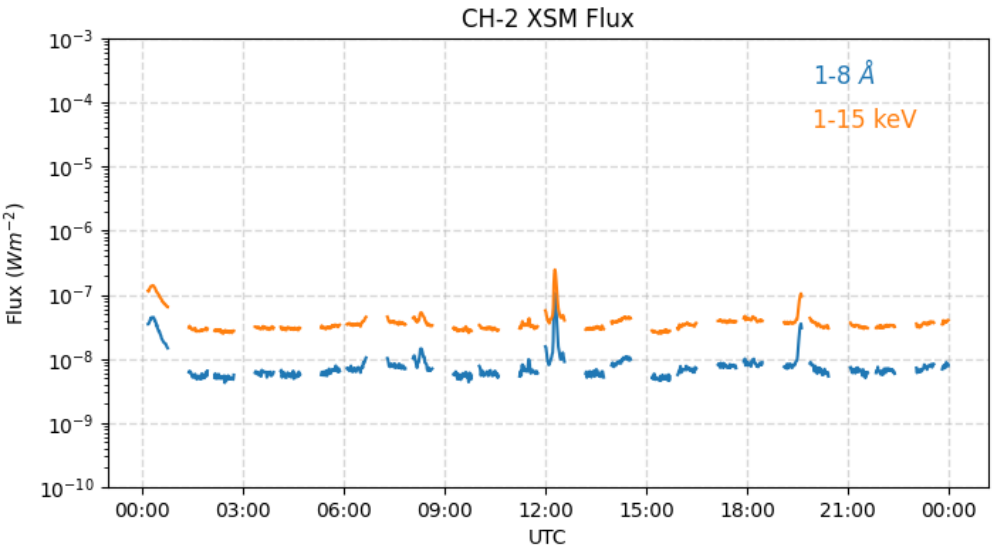
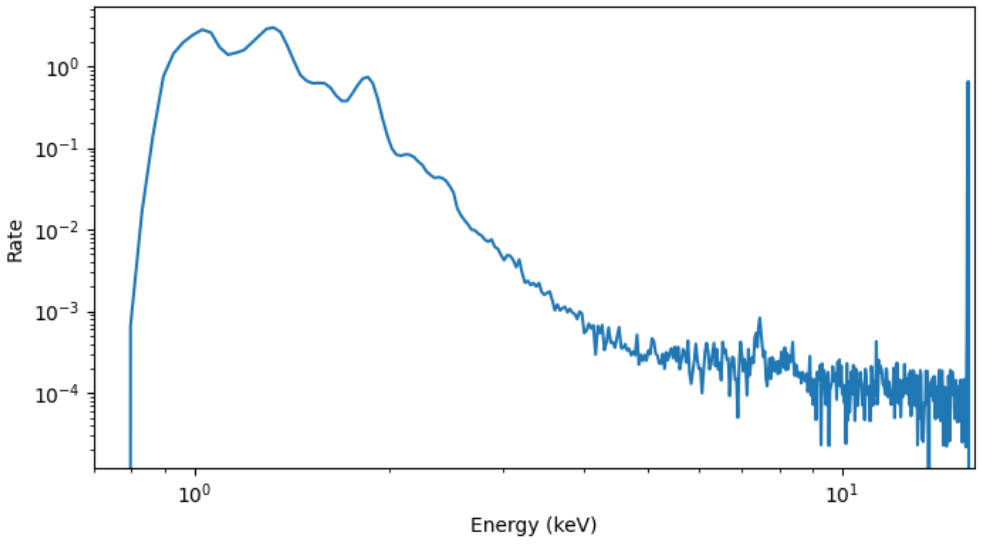
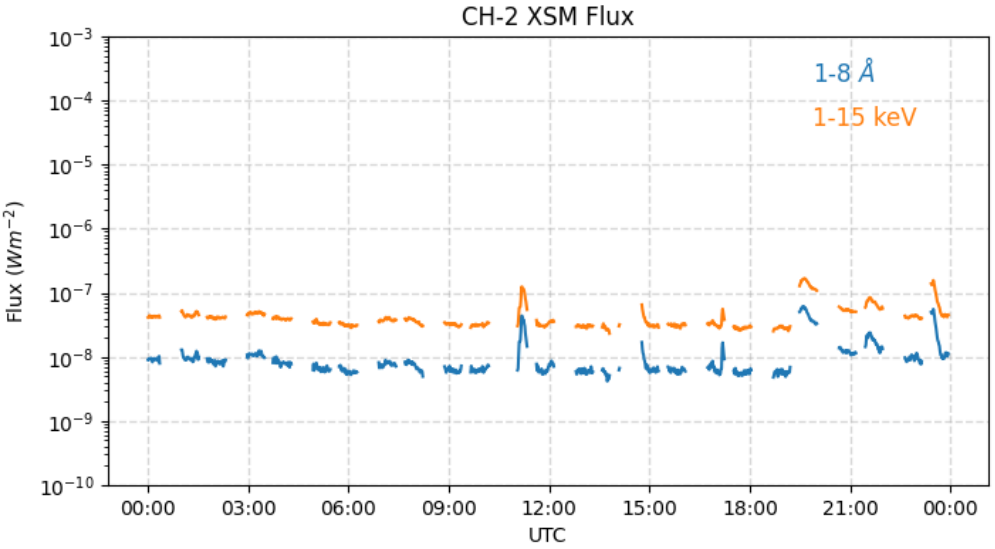
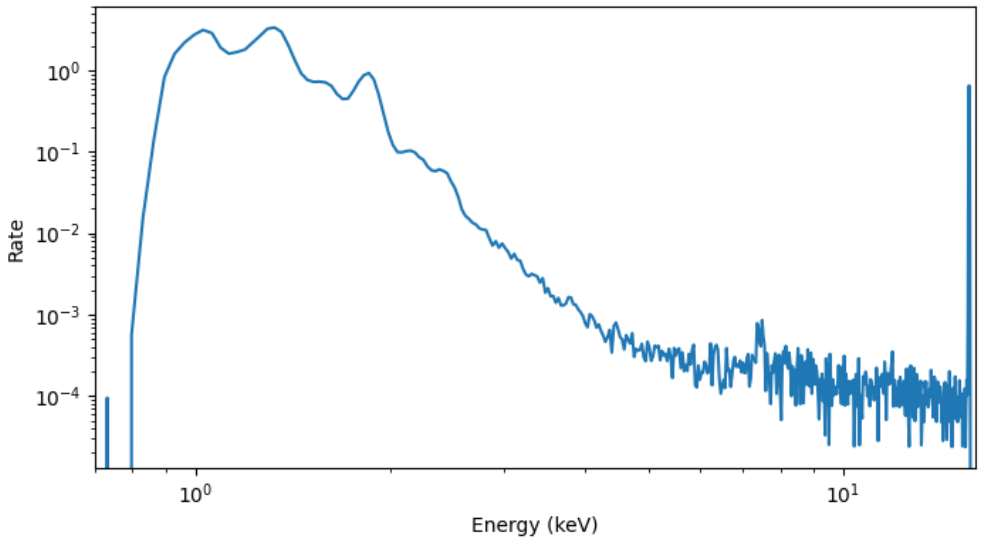




Date: 2020-05-01





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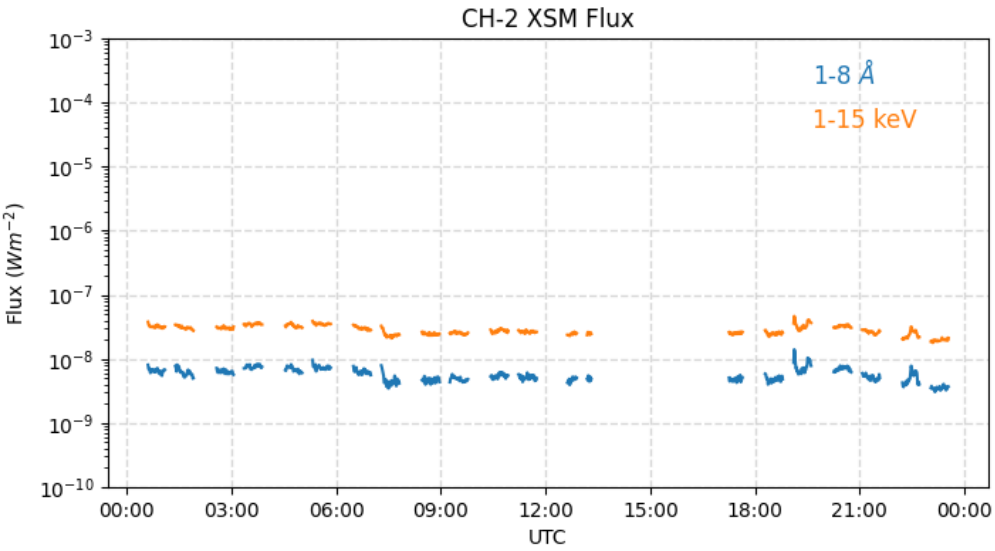

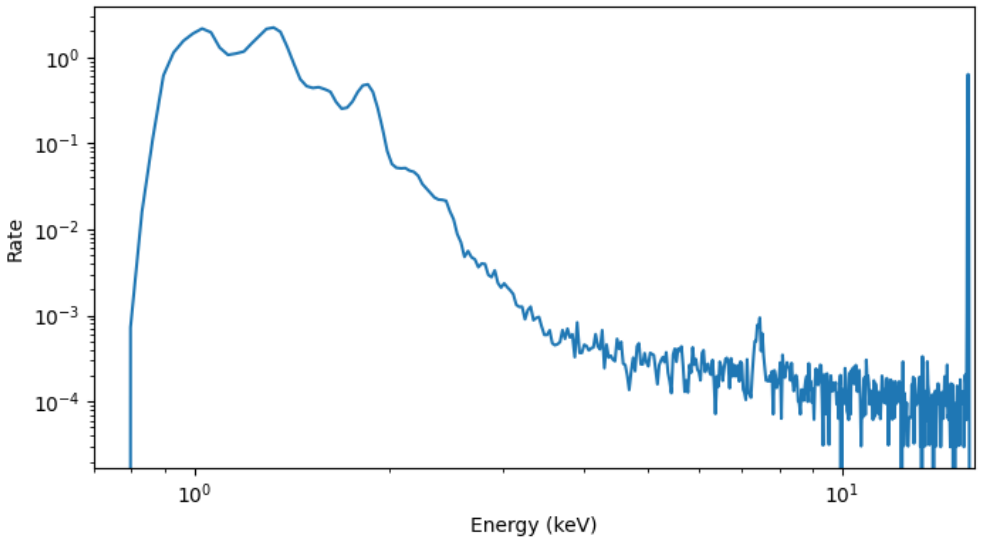

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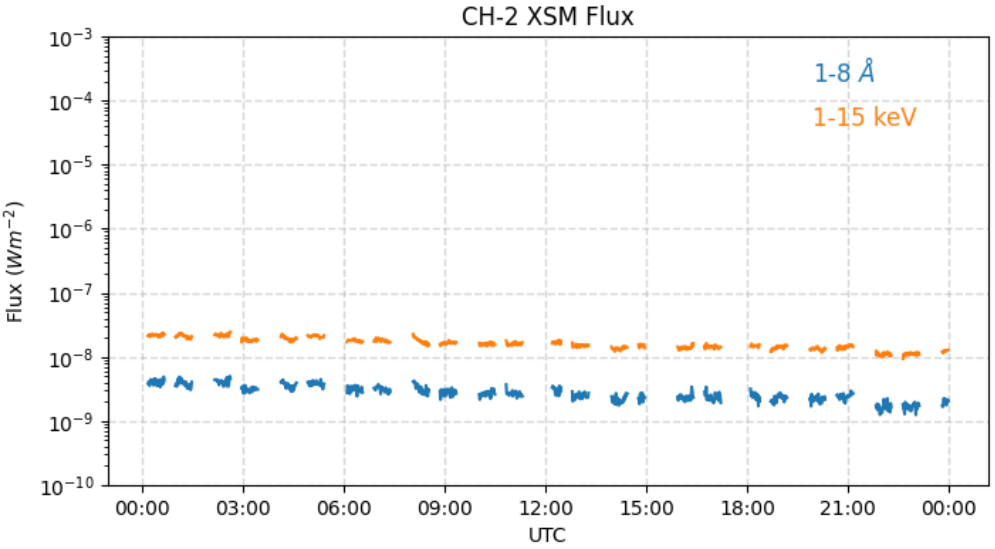

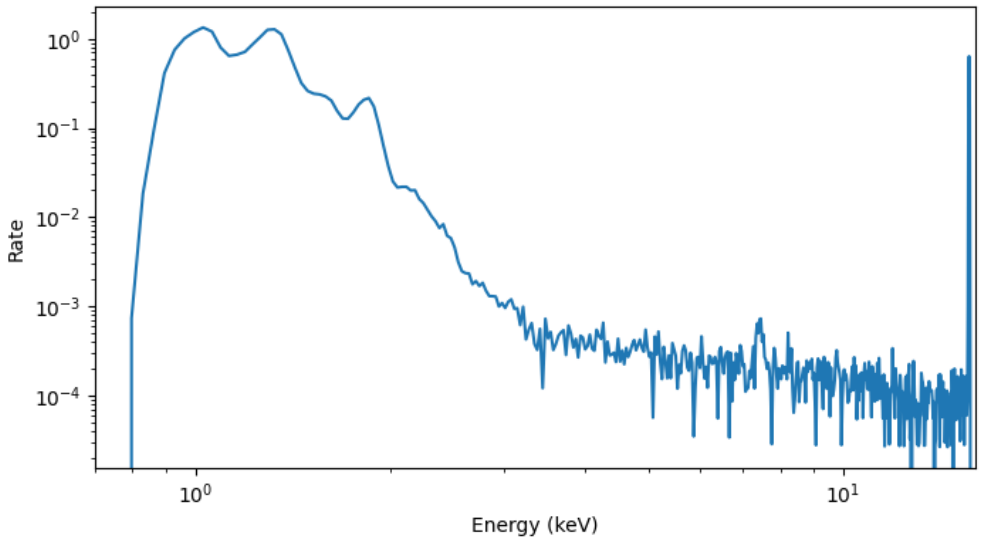

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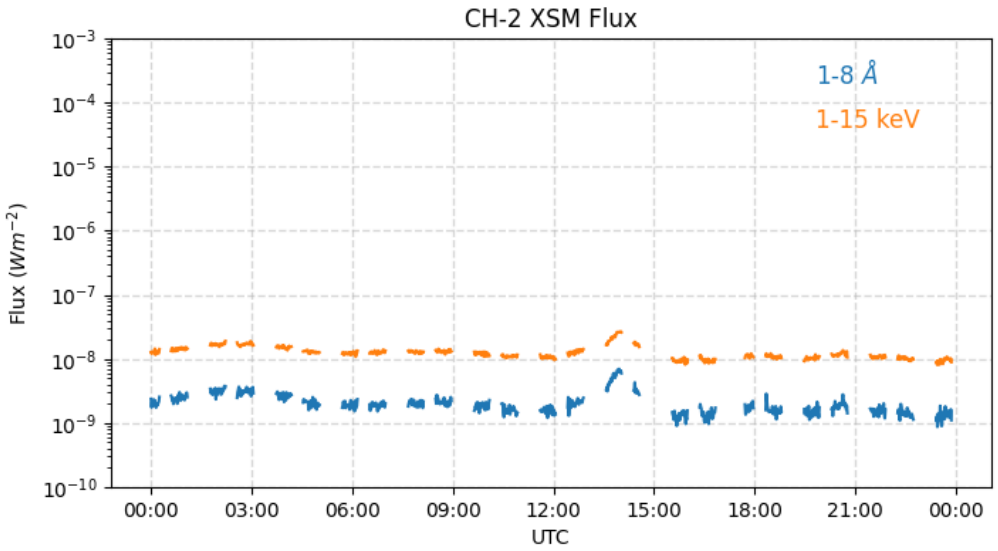

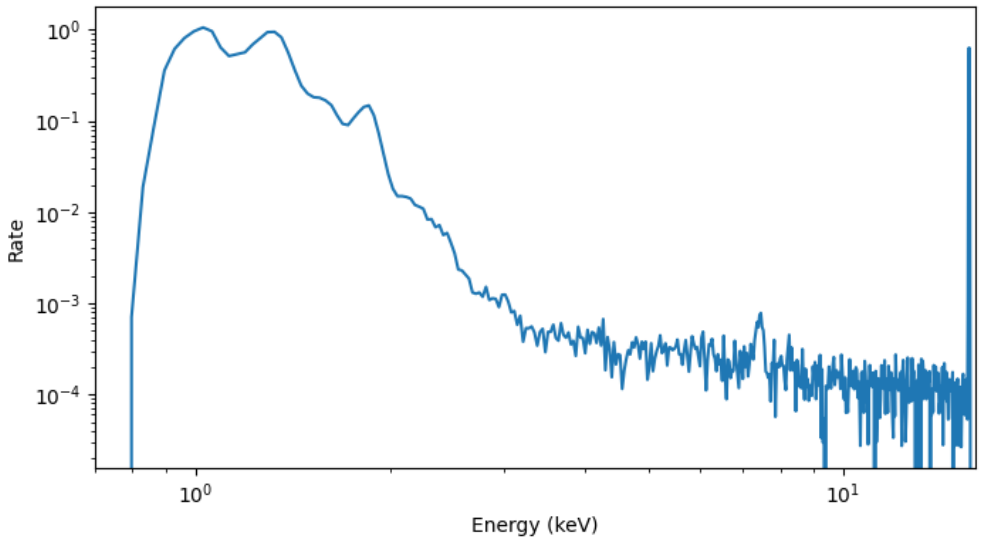

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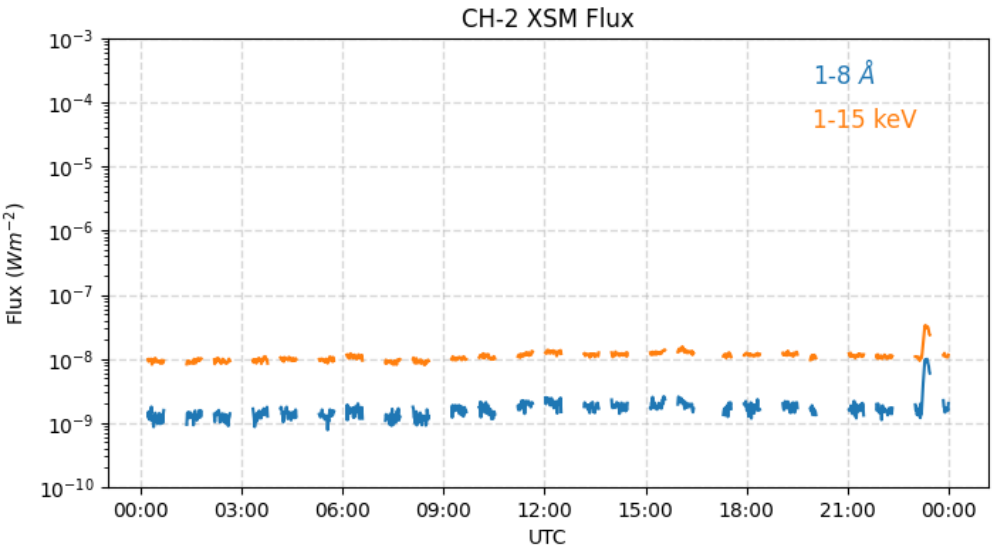

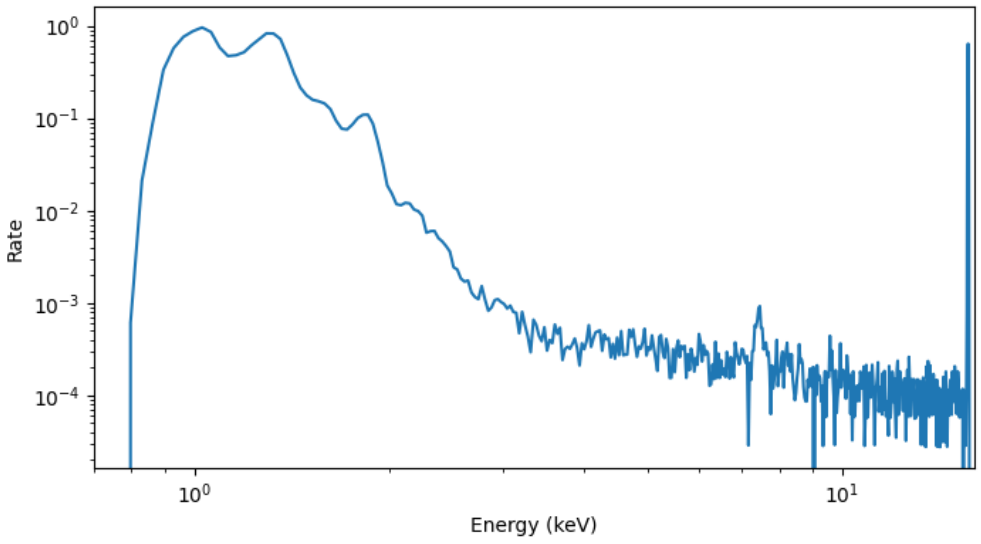

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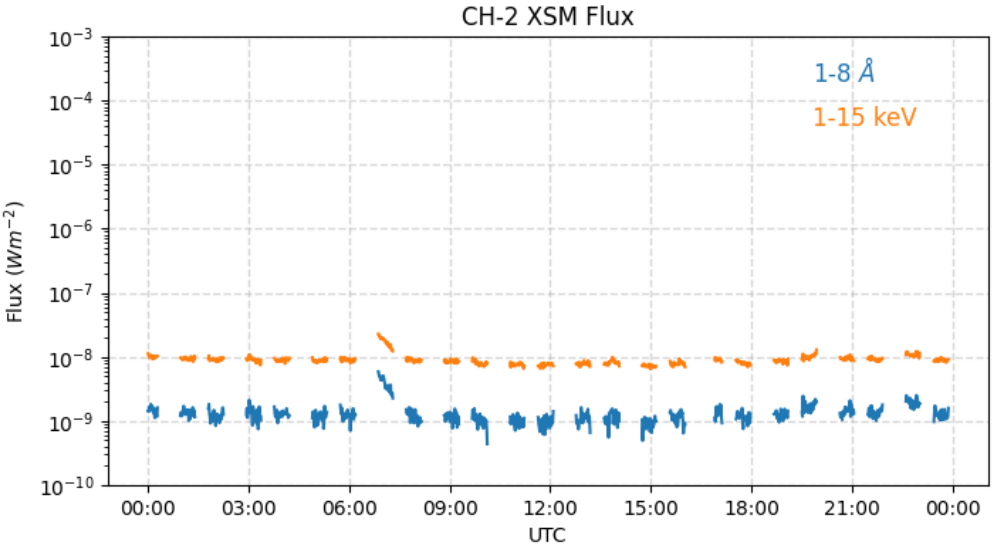

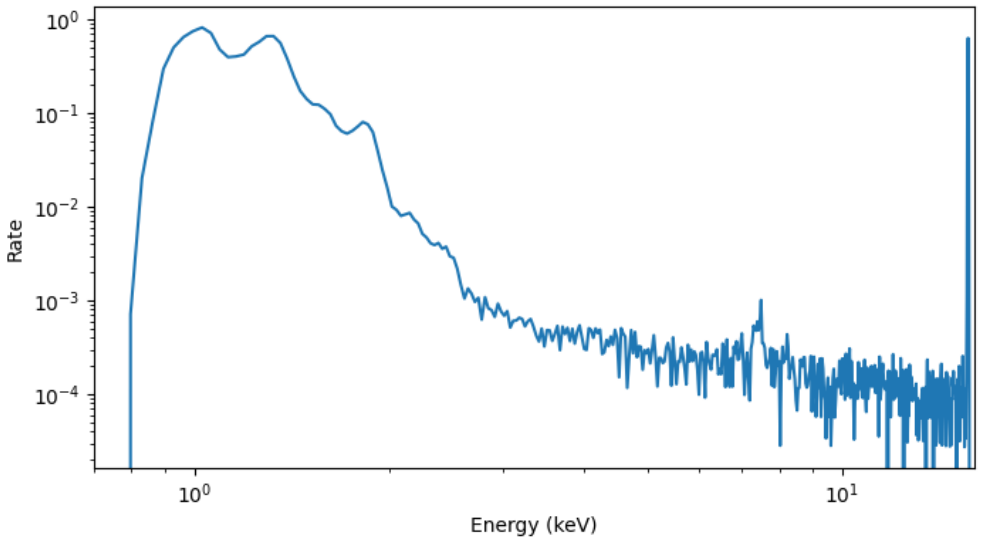

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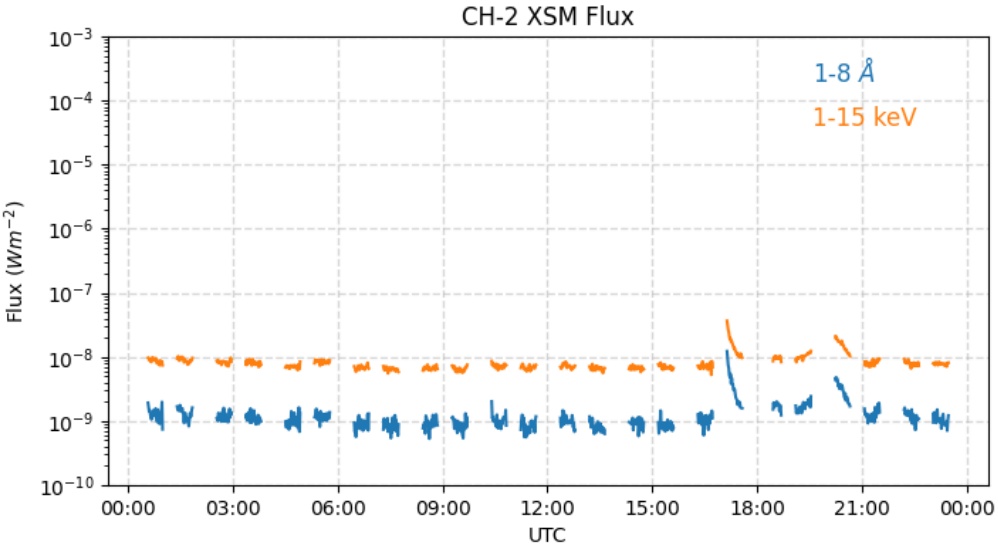

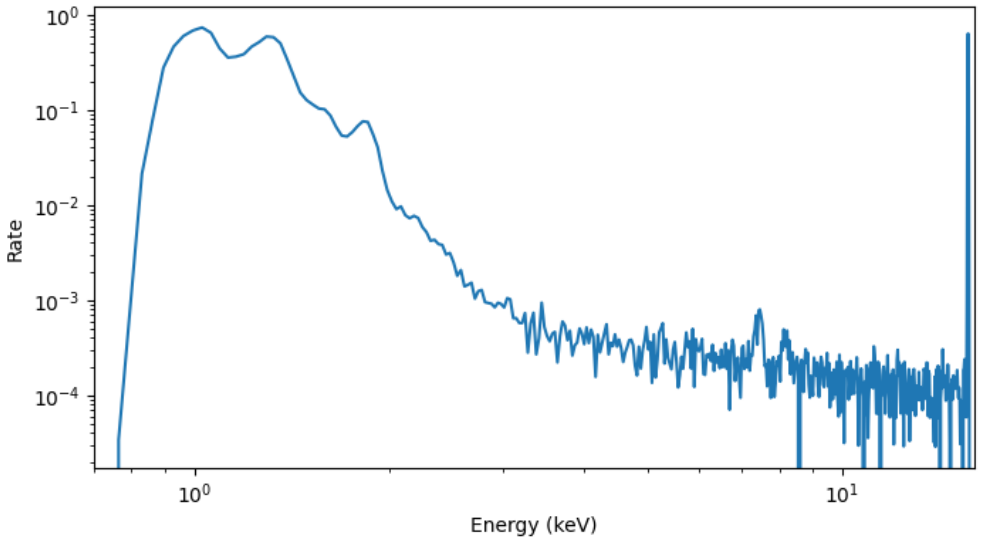

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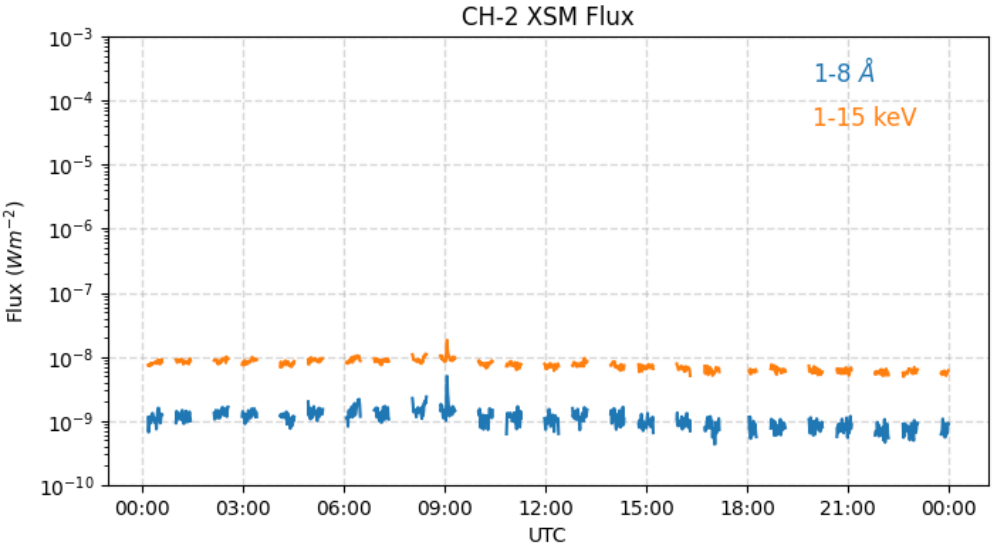

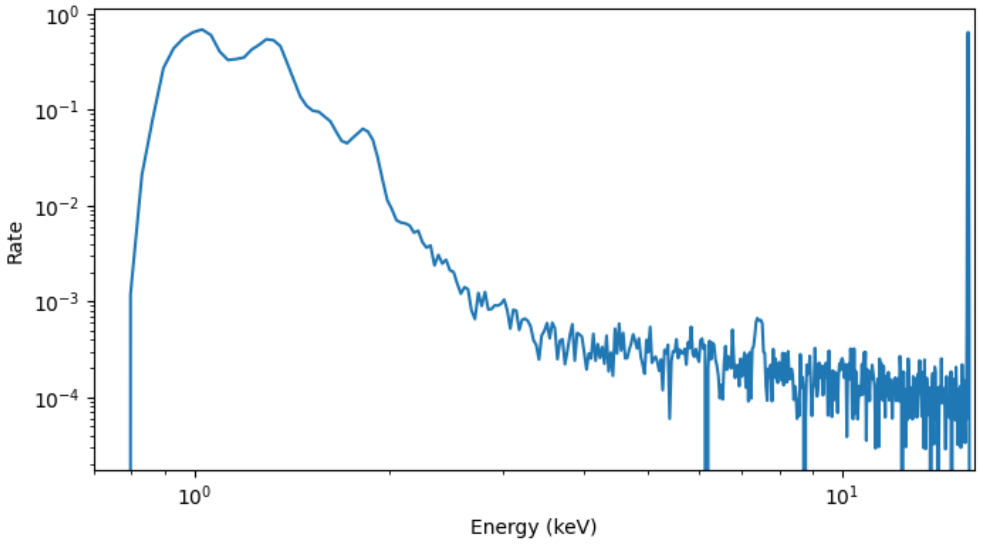

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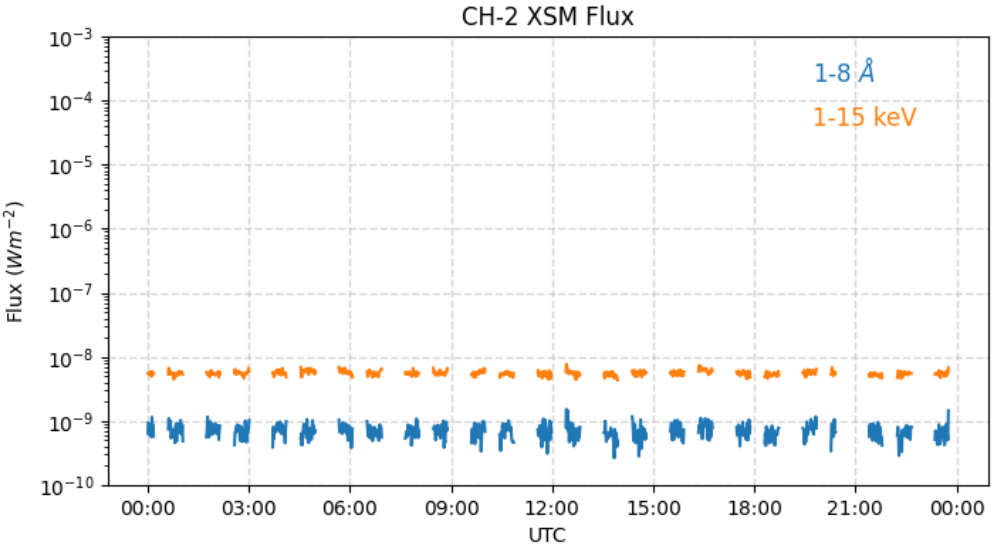

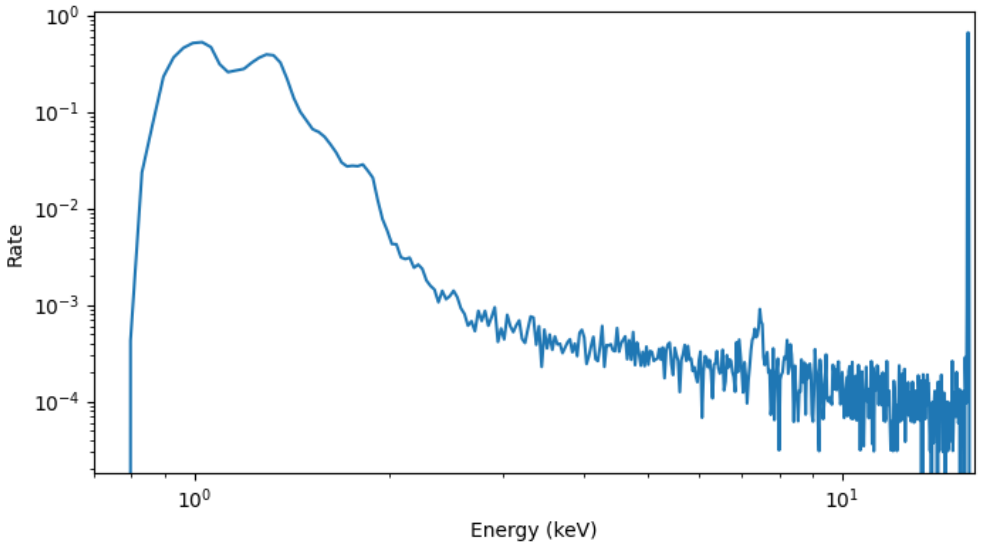

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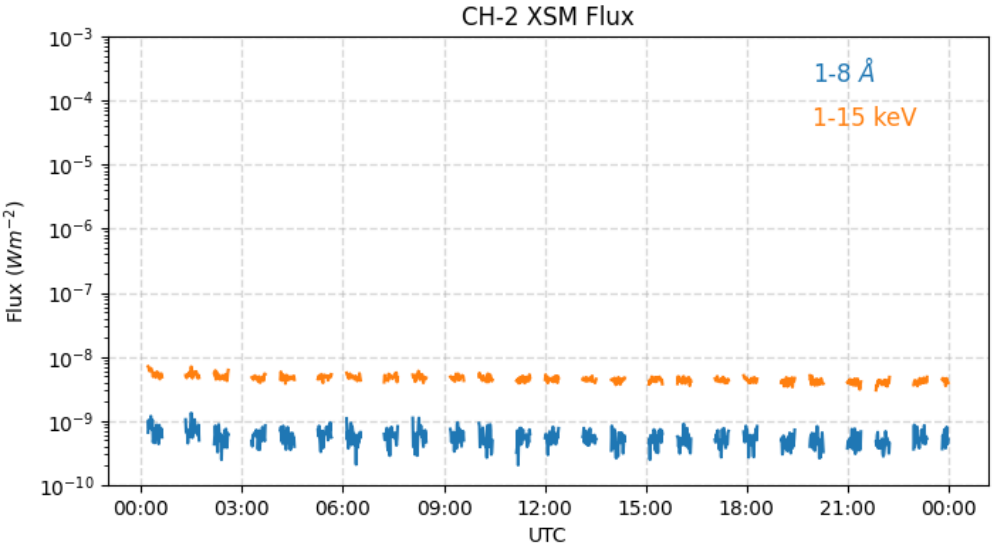
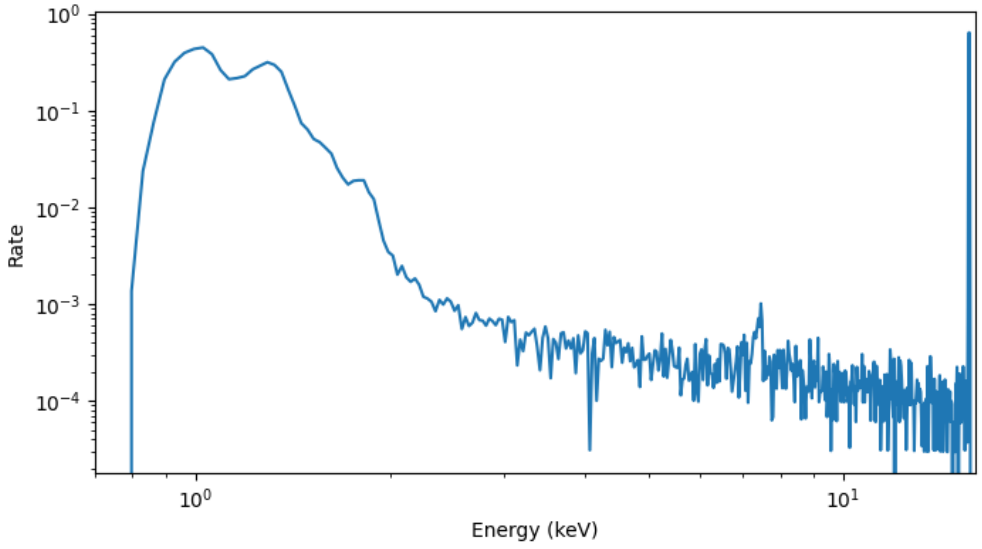
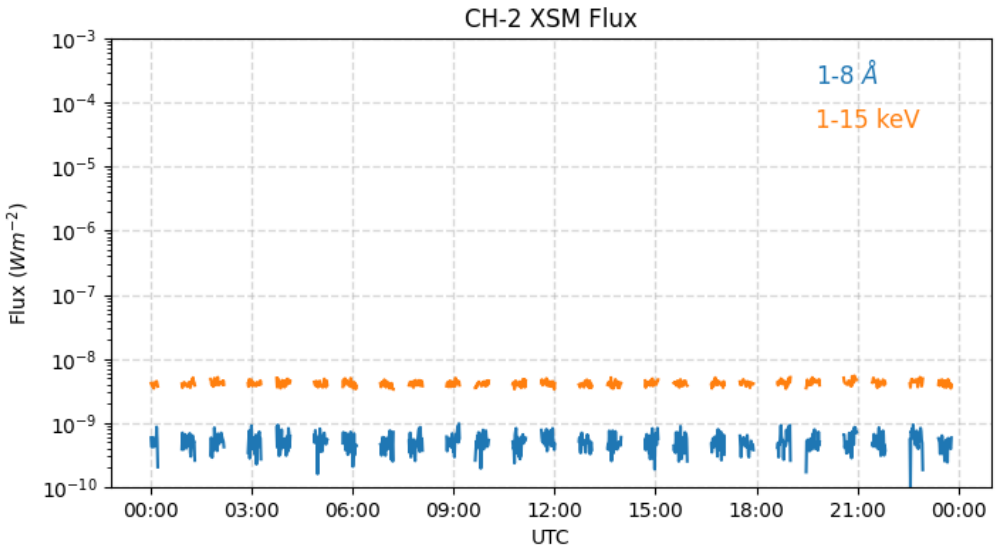
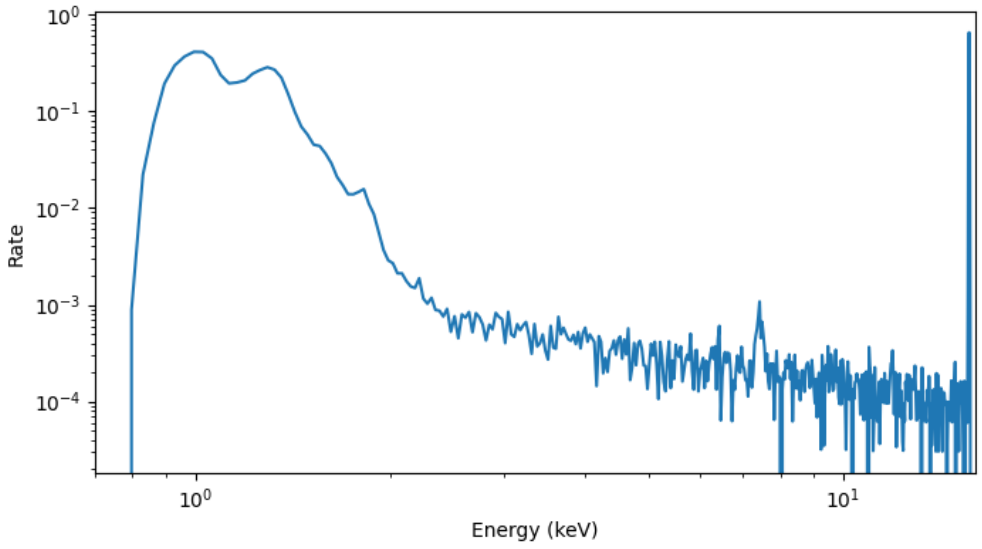




Date: 2020-05-11





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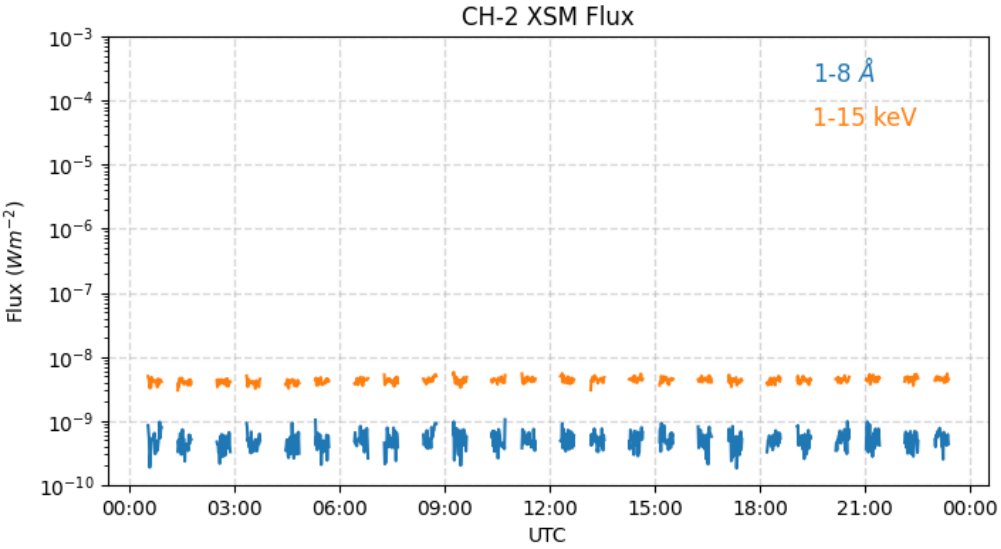

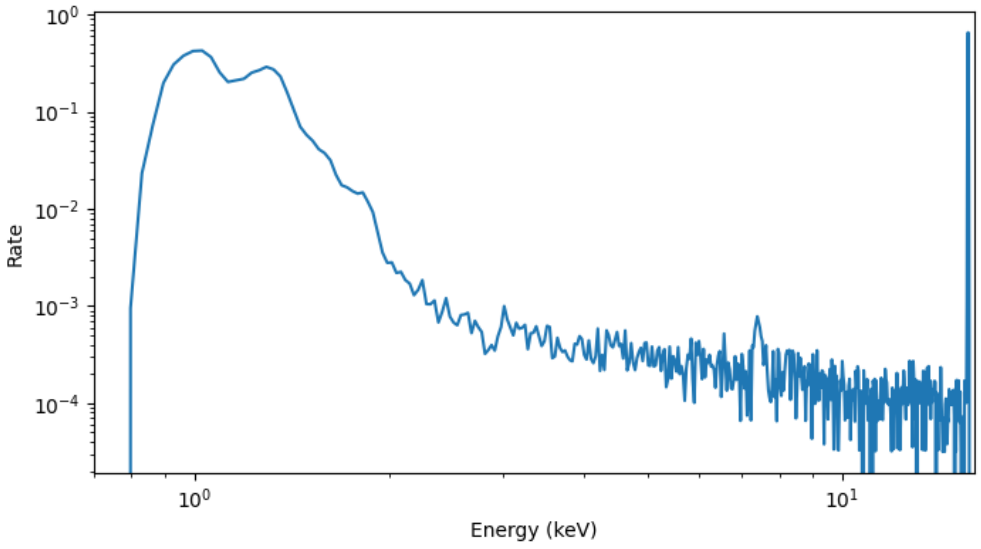

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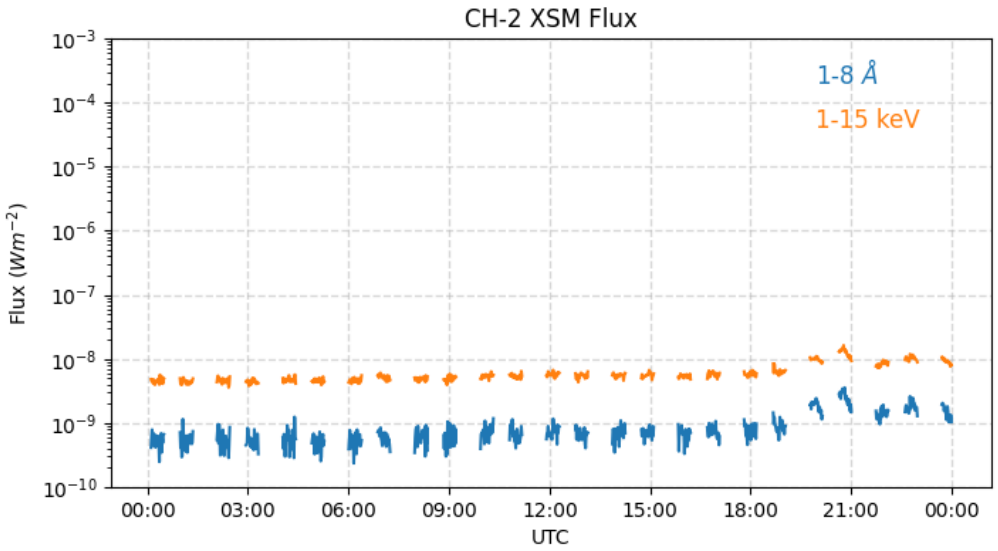

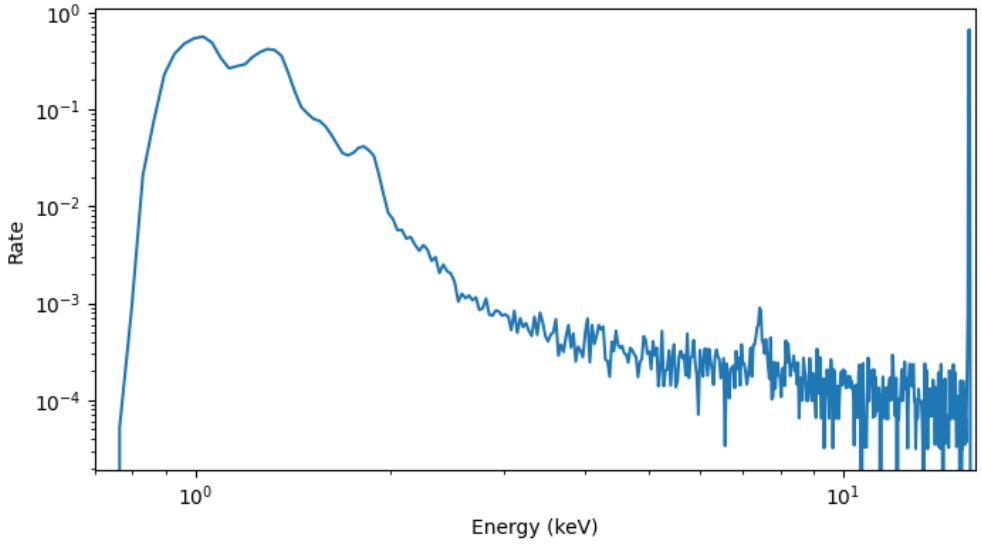

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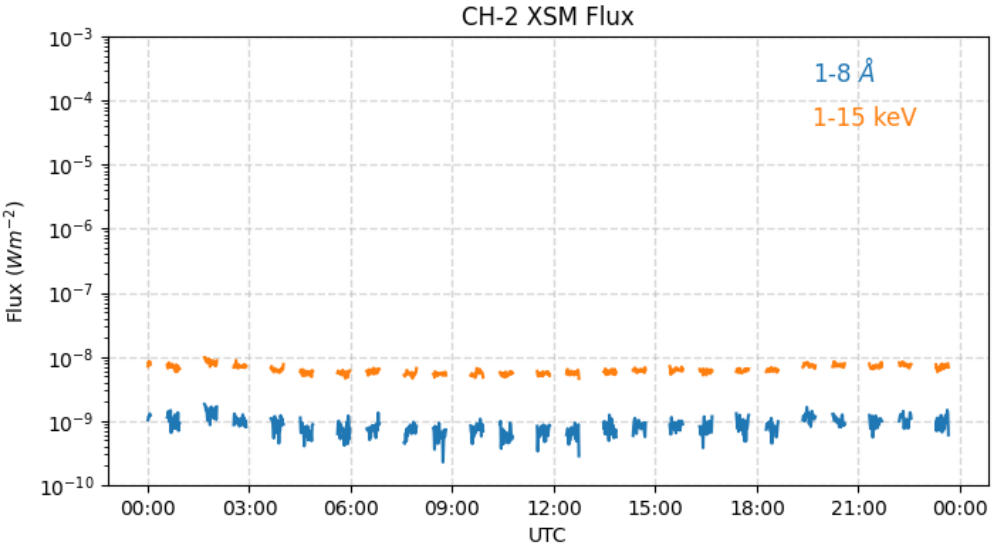

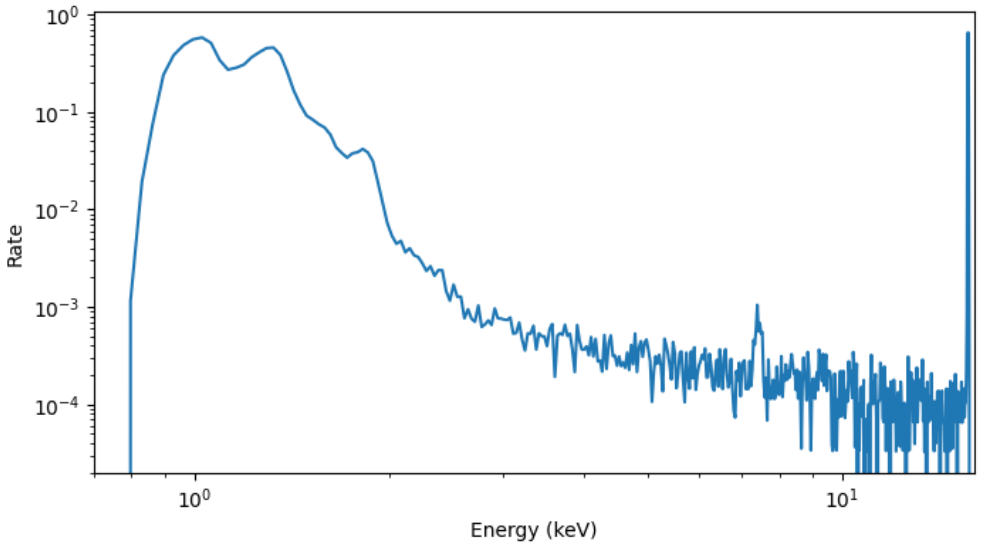

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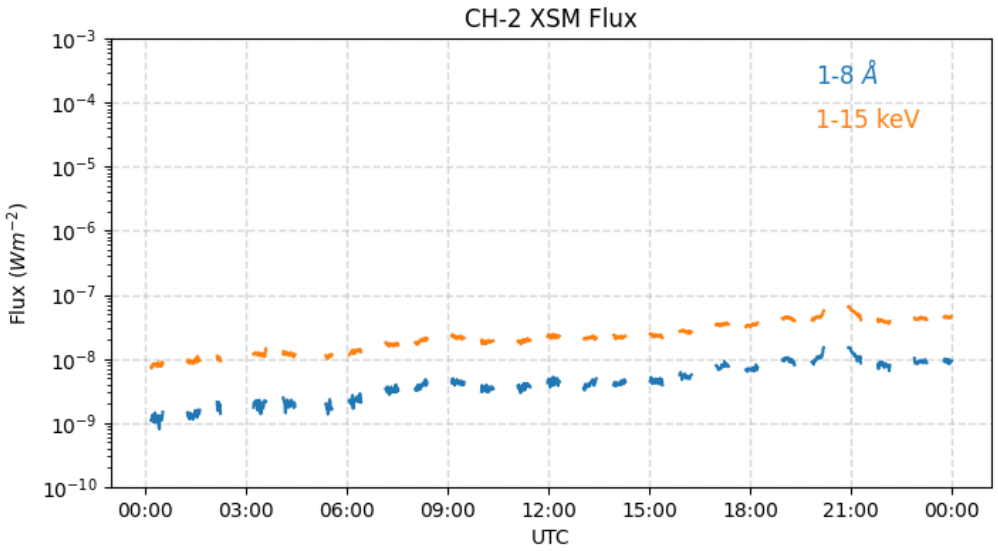

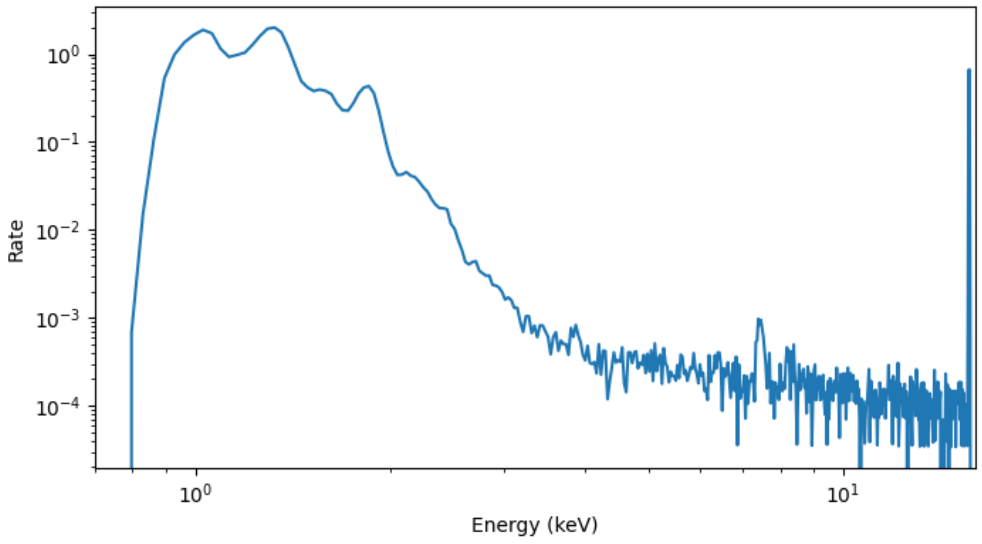

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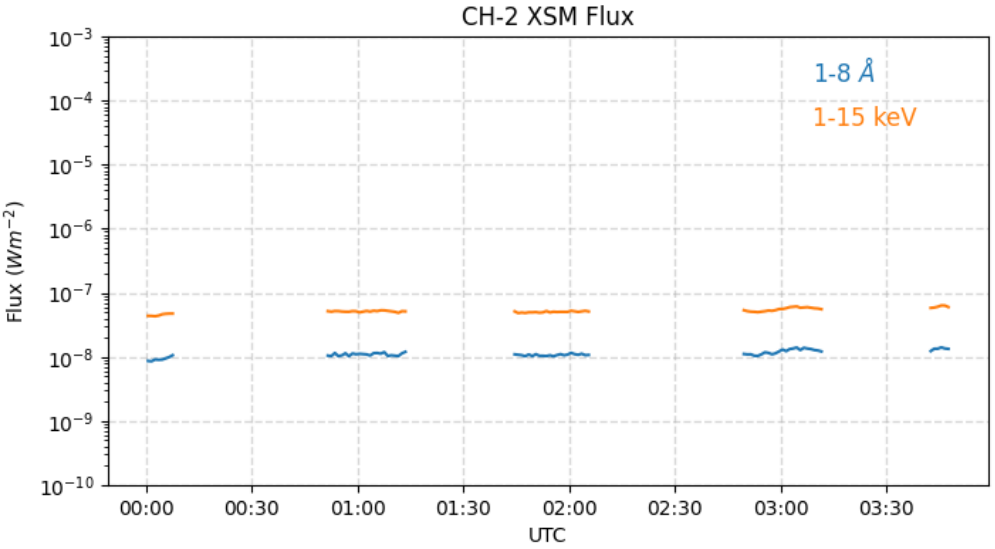

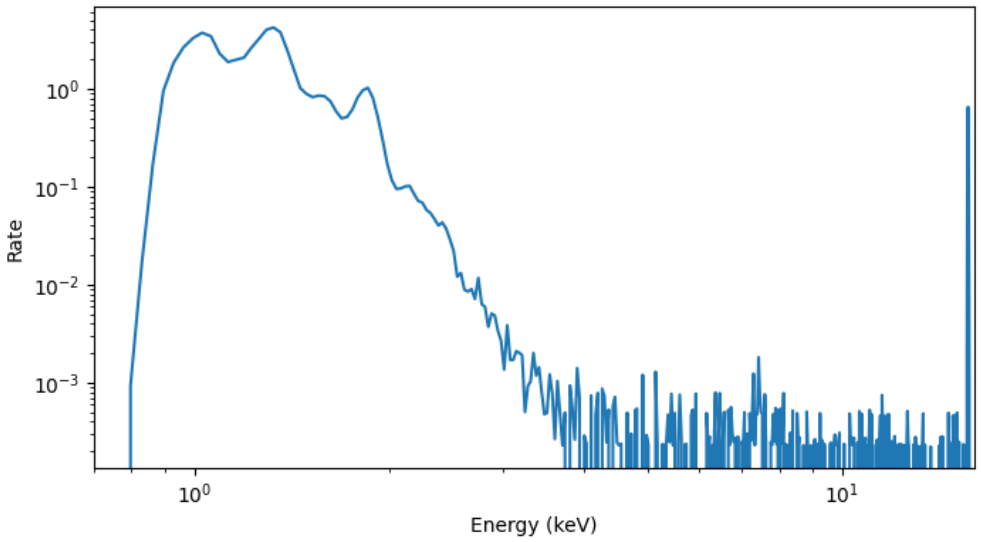

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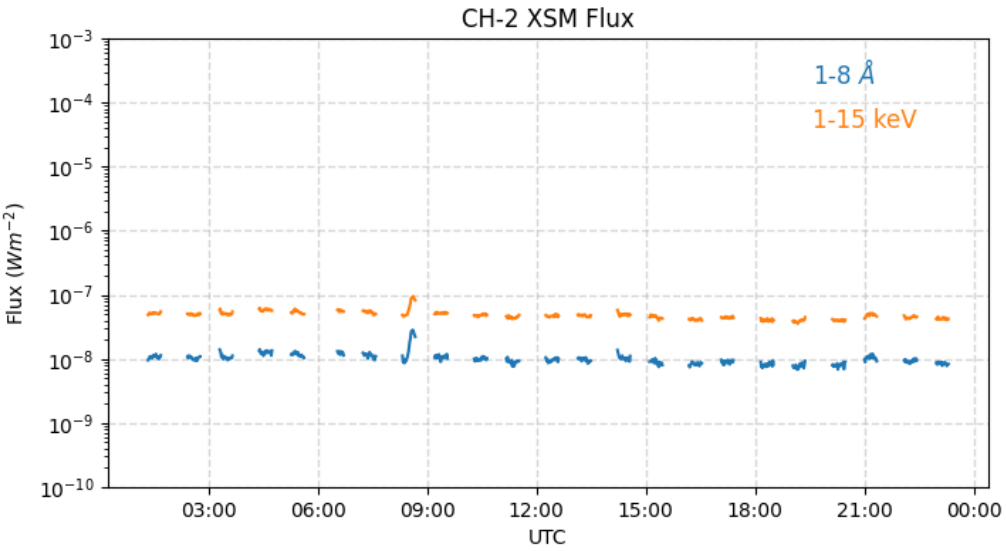

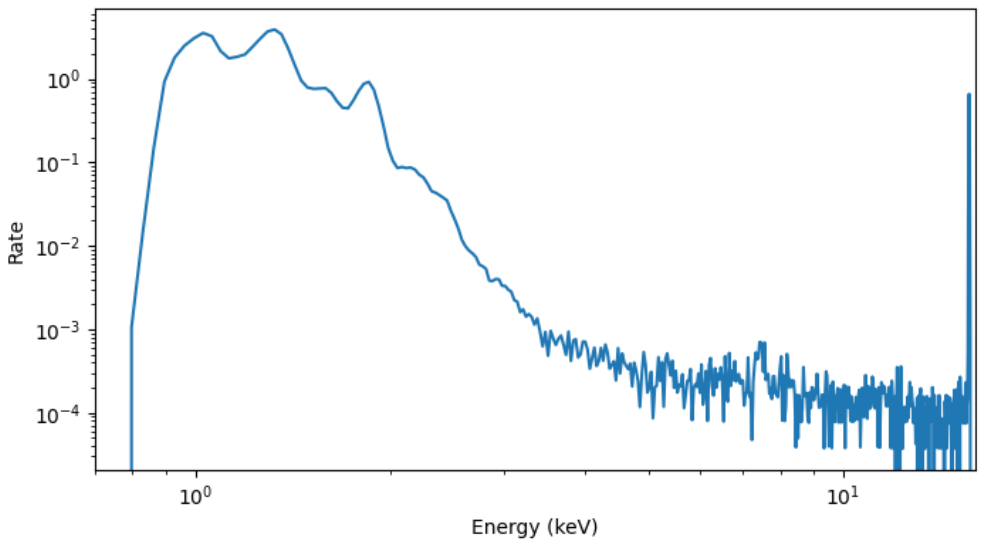

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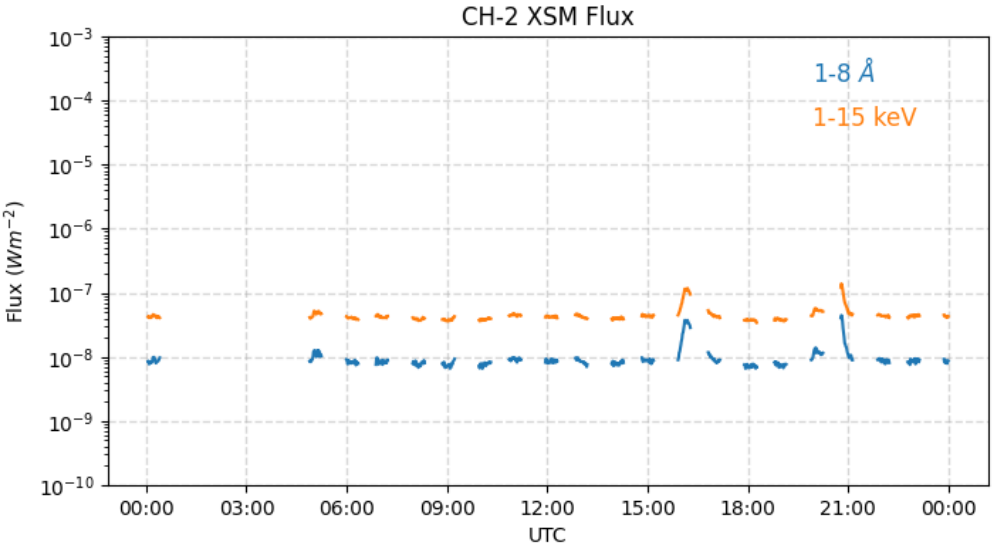

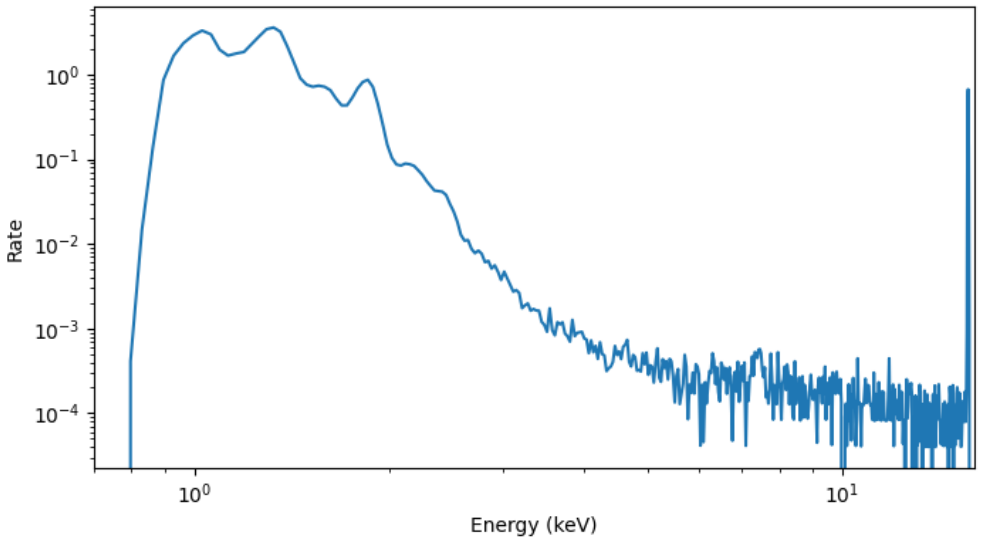

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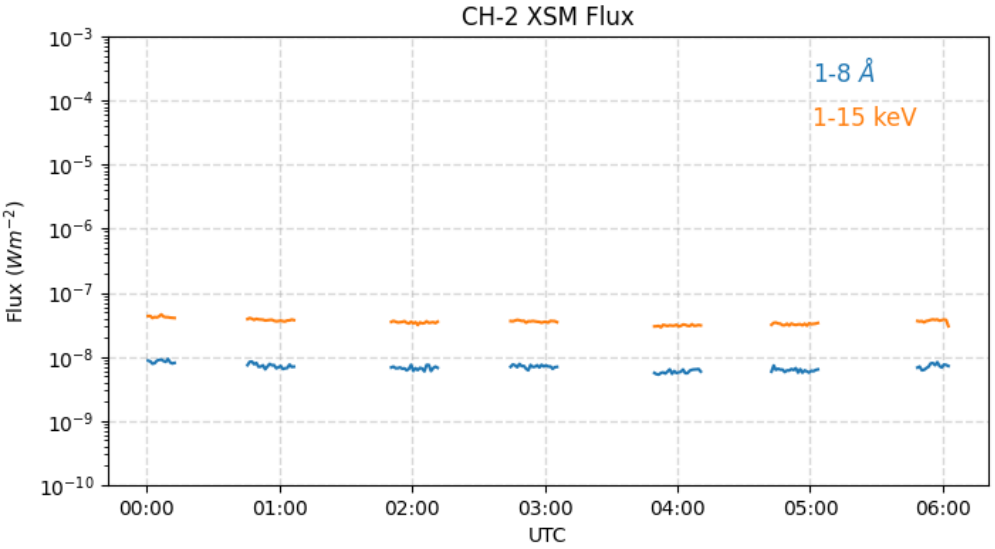

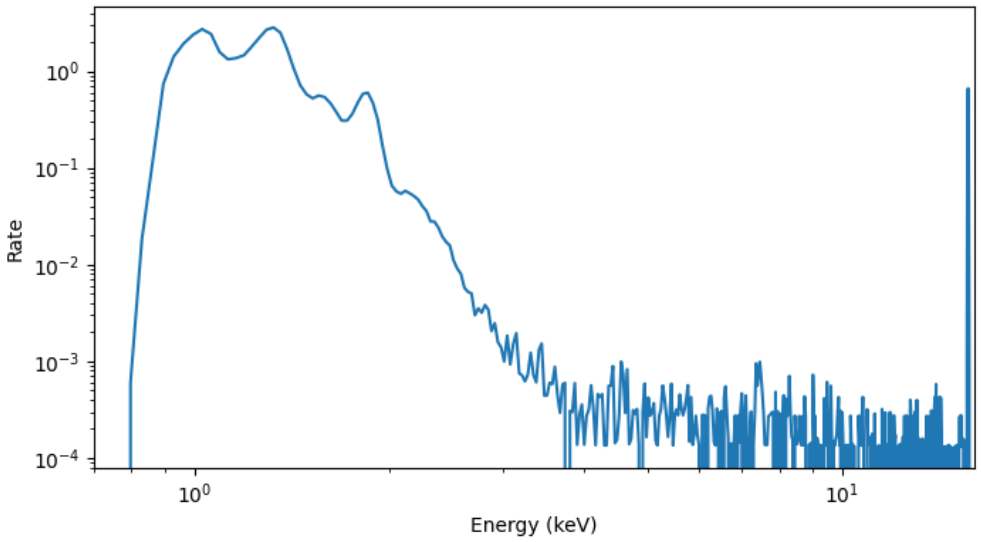

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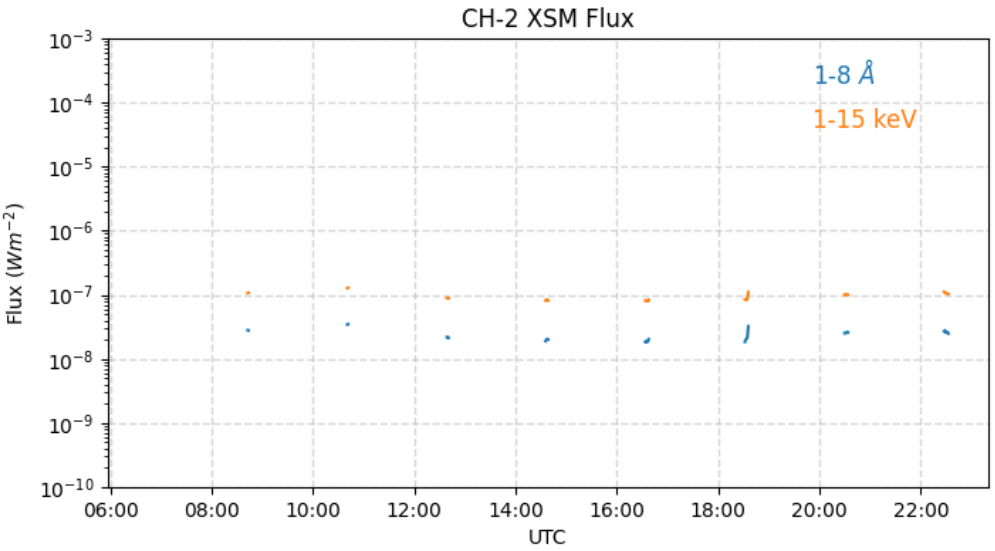

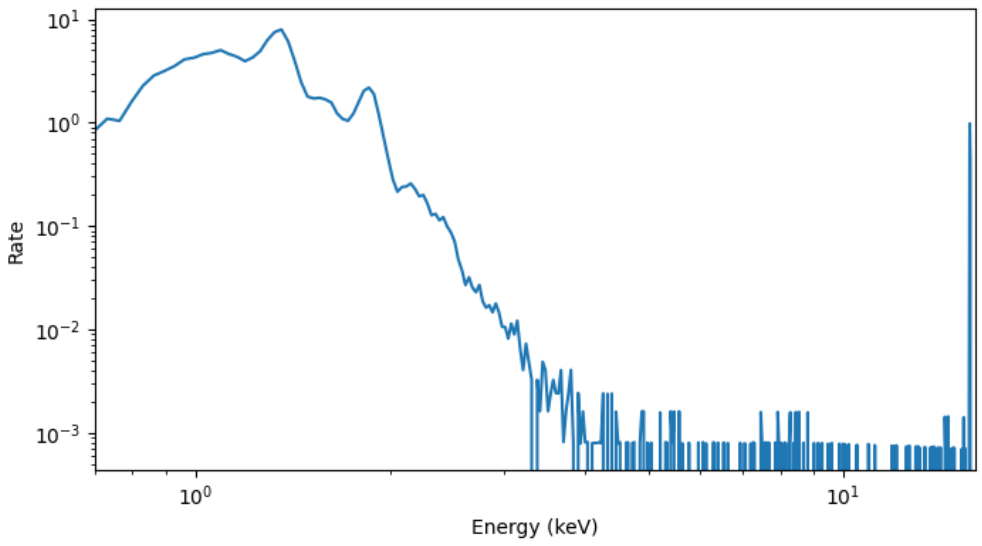

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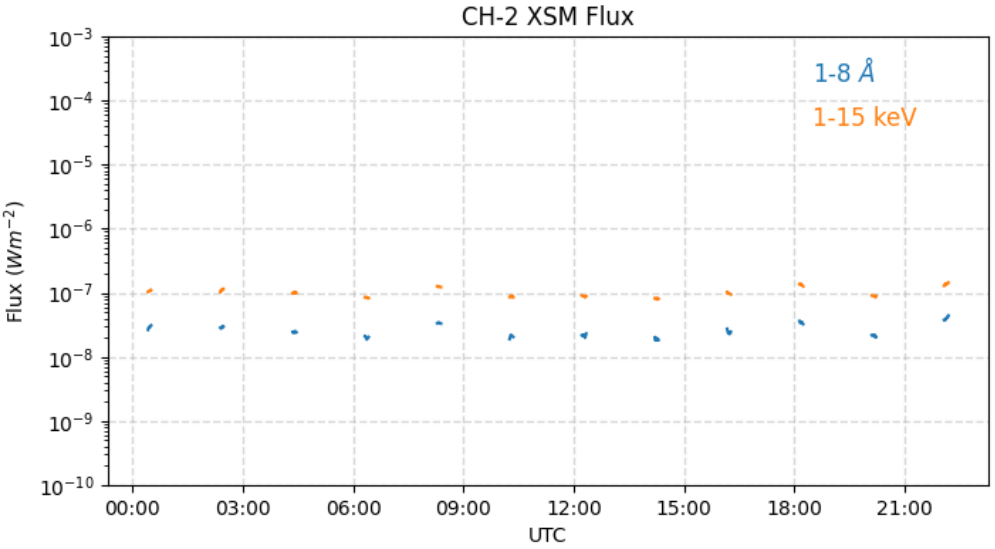

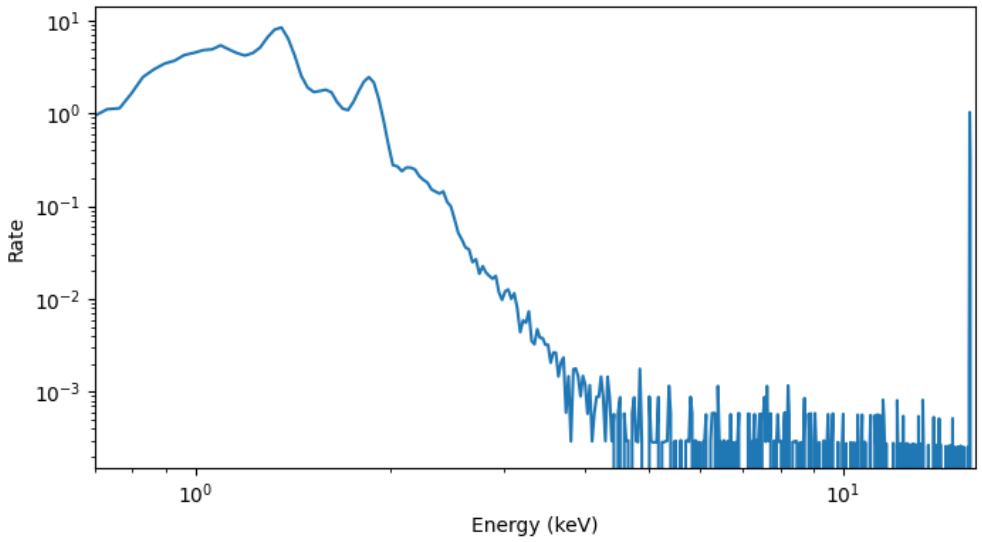

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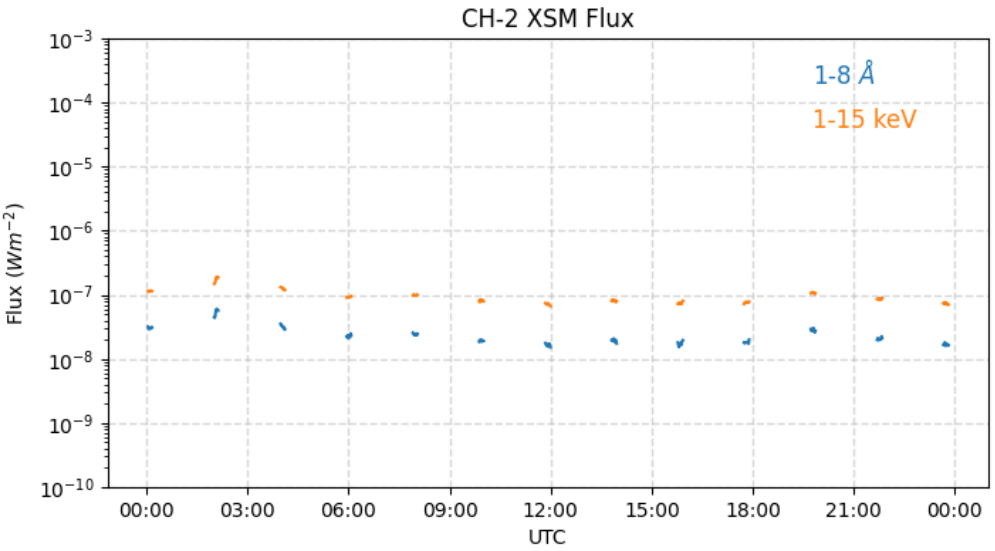

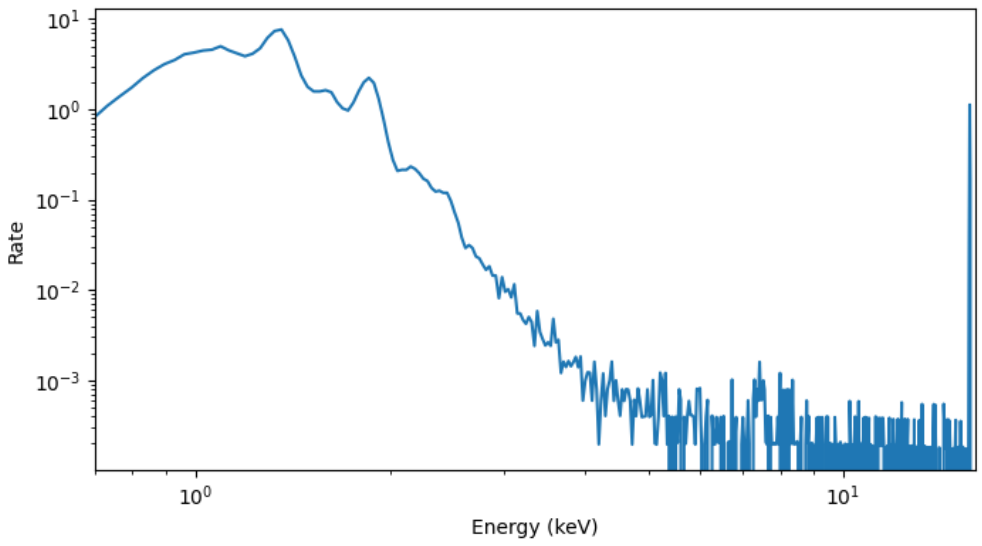

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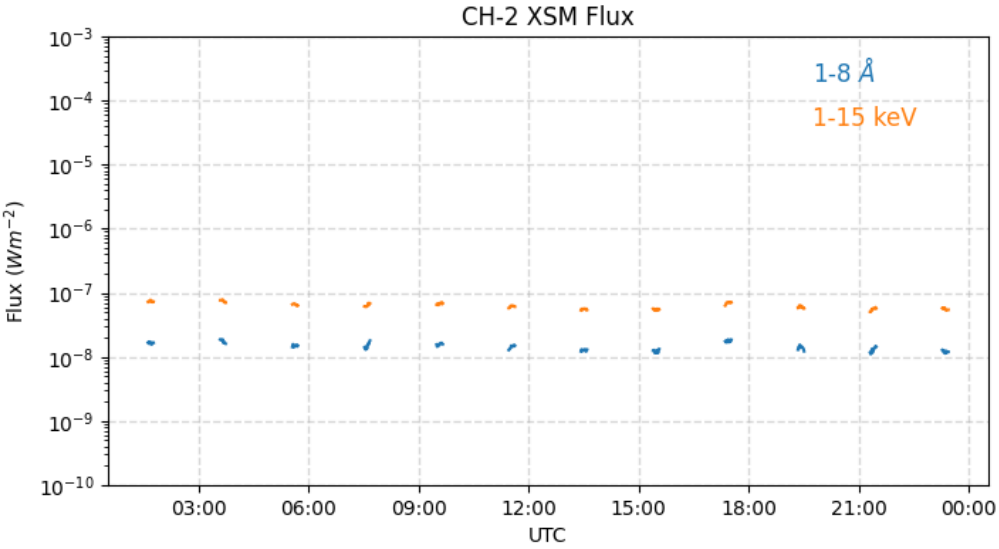
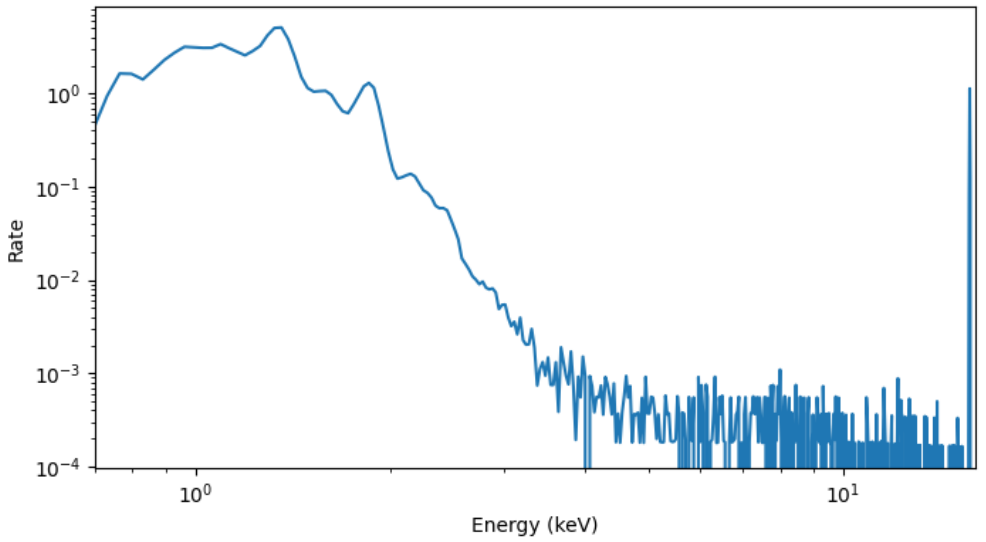
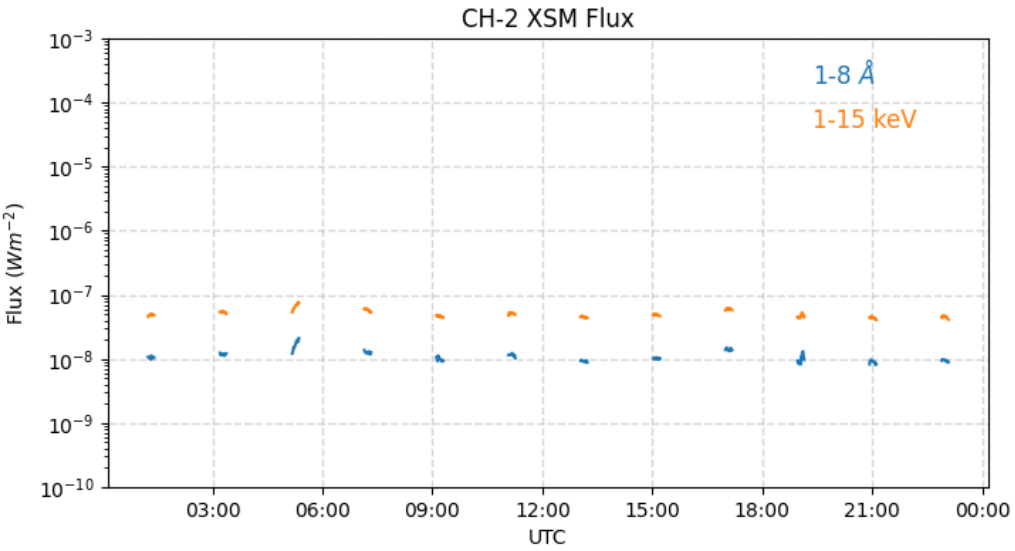
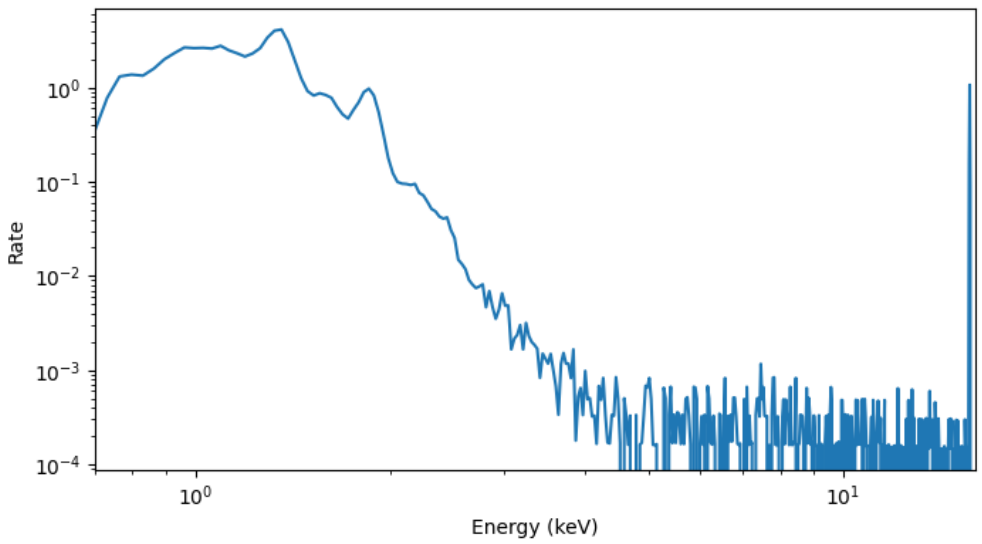




Date: 2020-06-11





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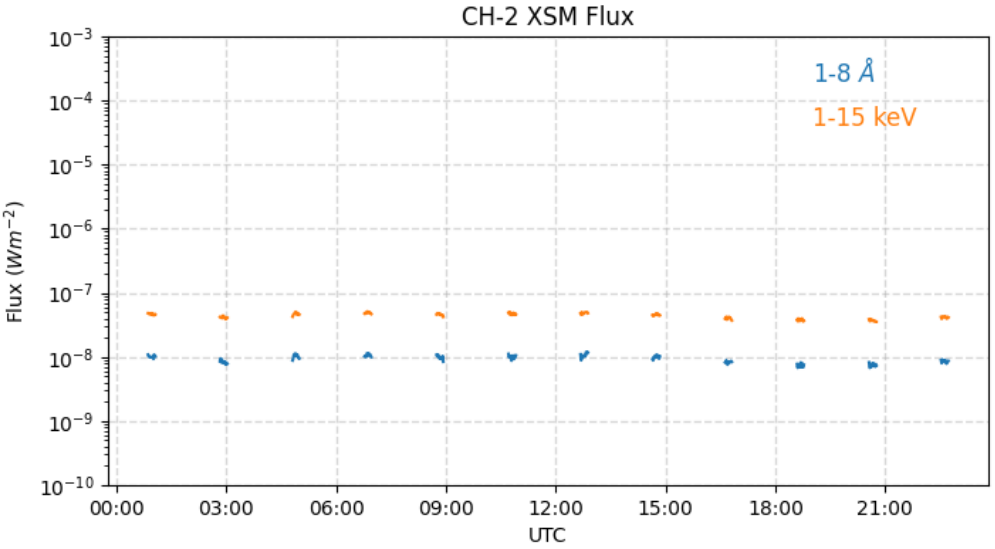

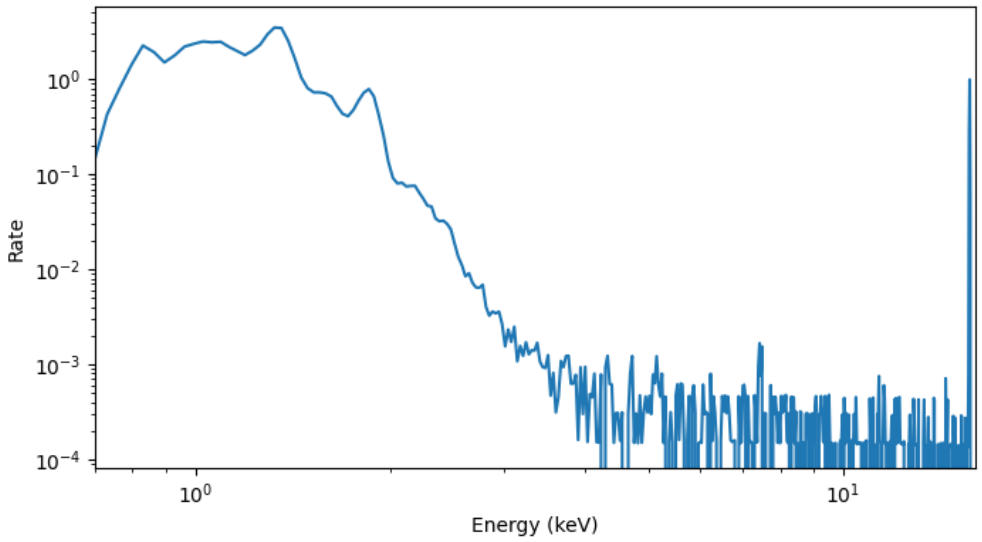

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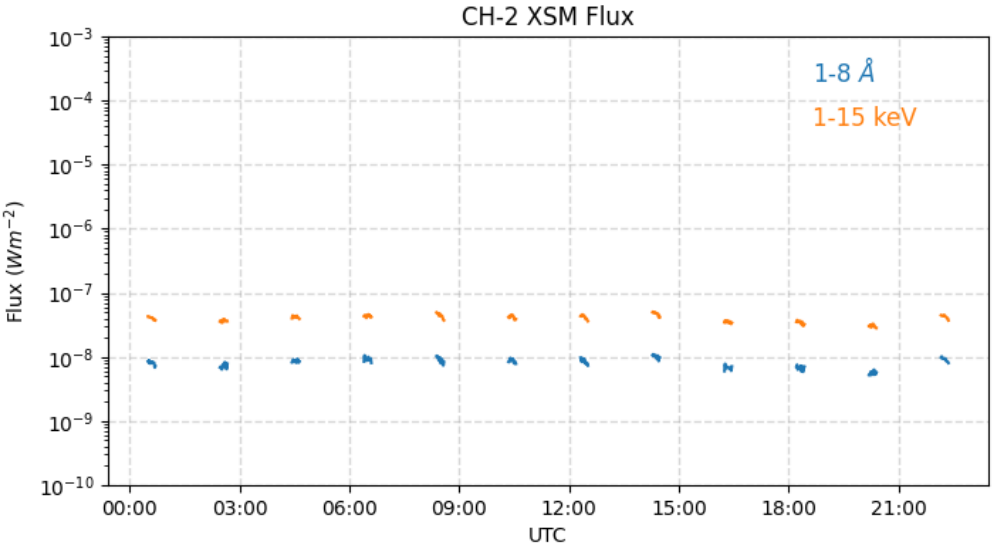
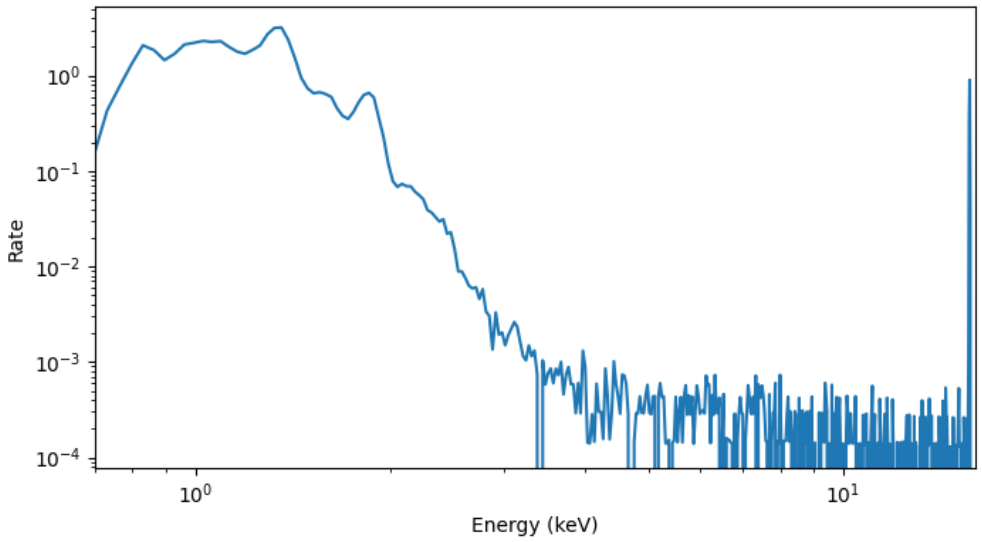
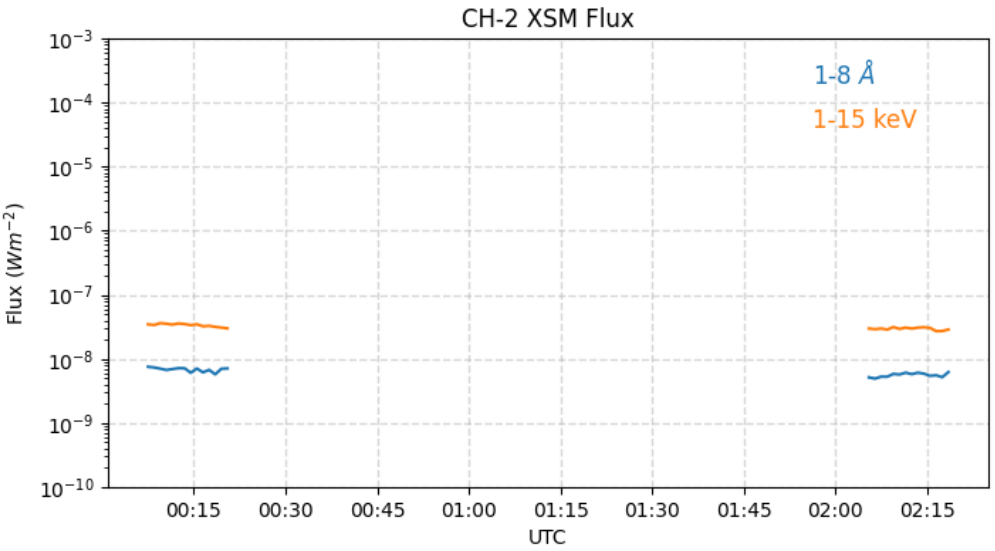
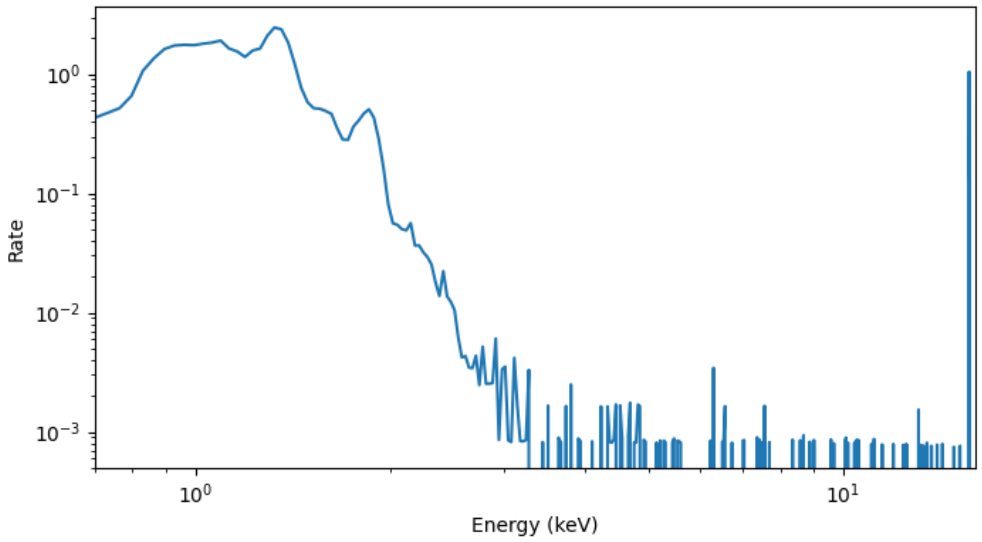




Date: 2020-06-14





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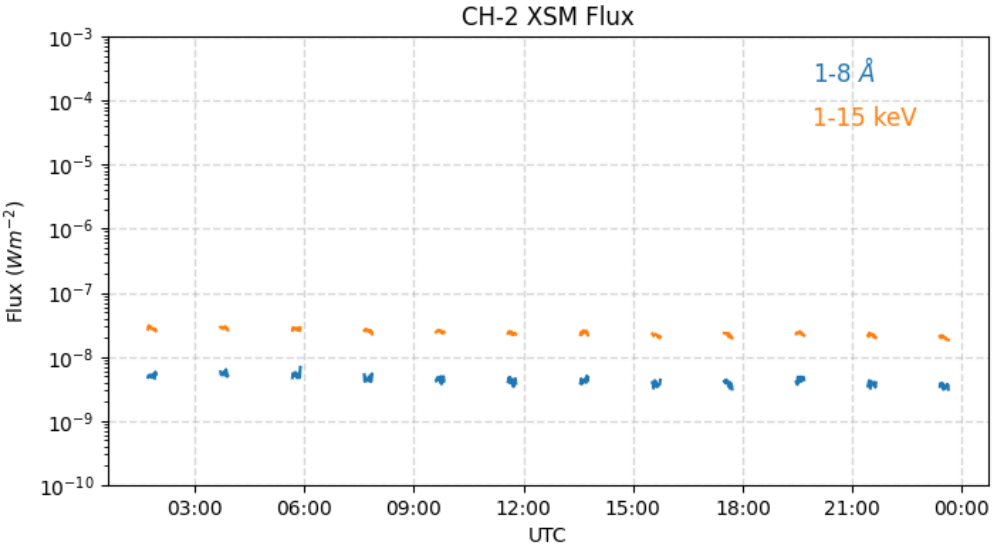

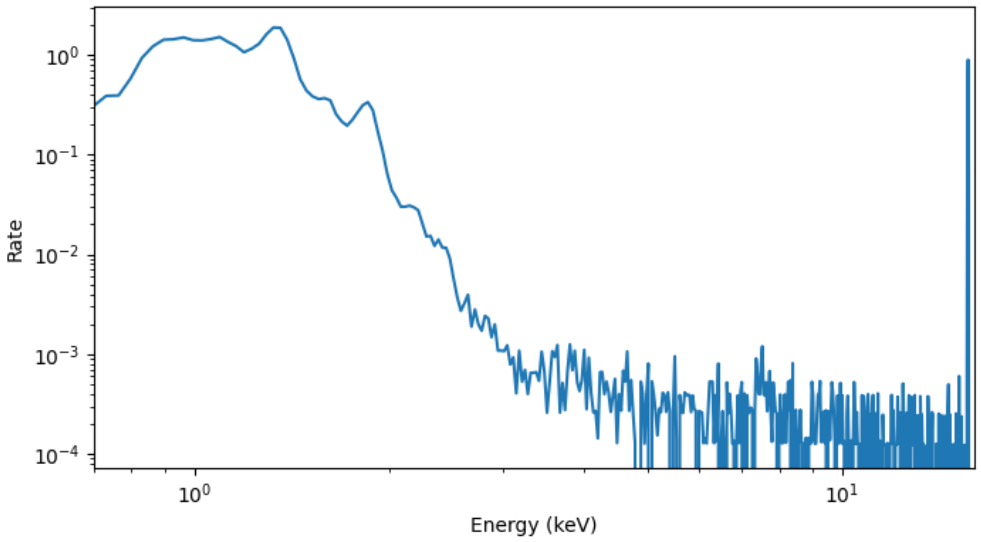

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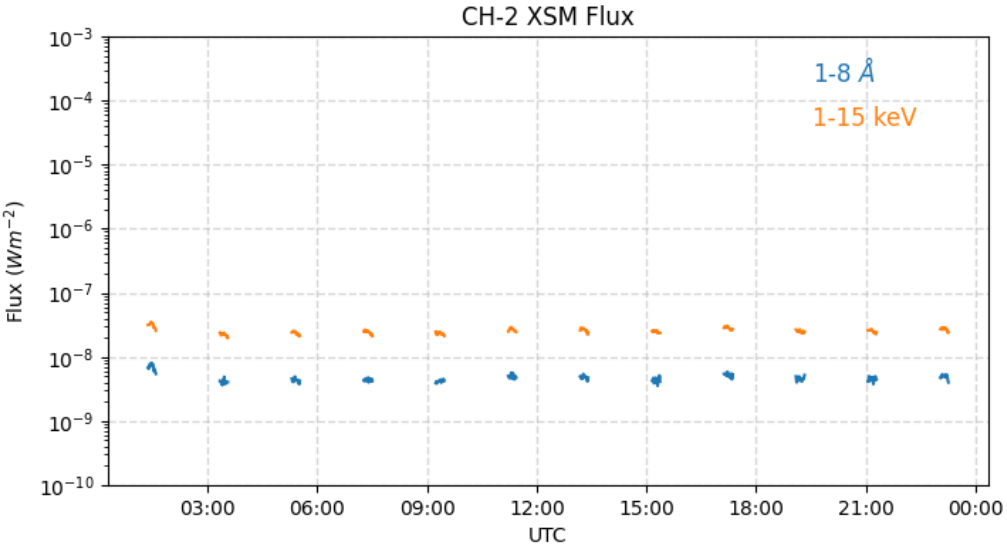

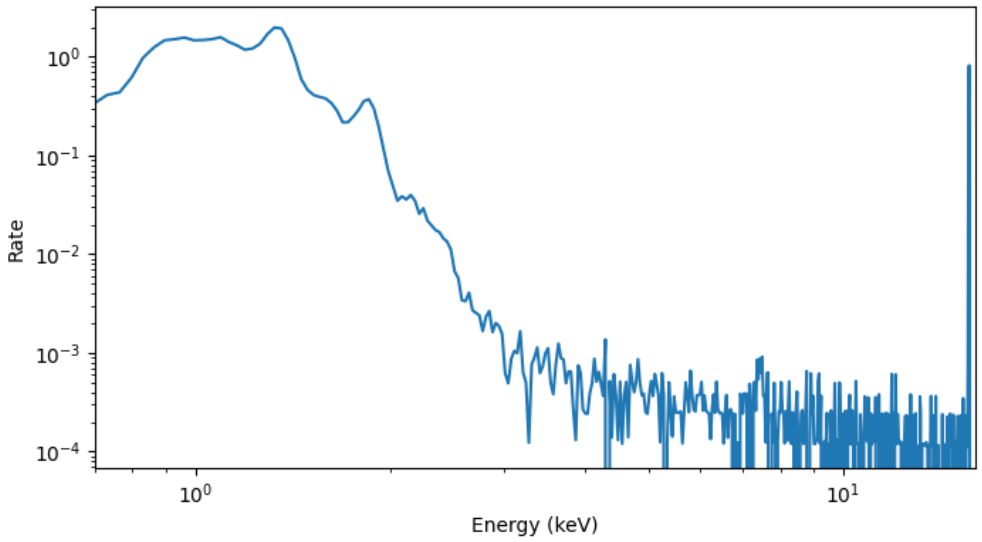

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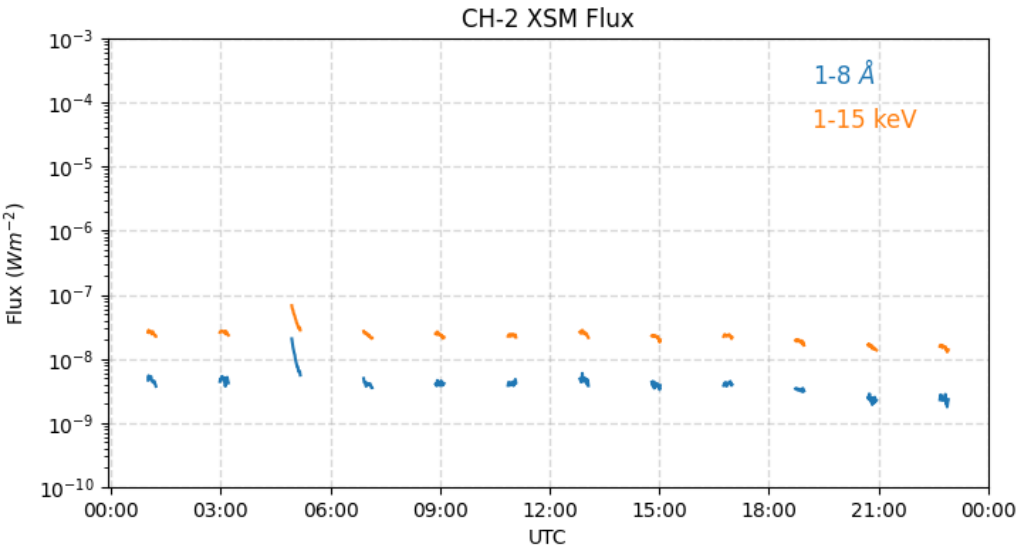

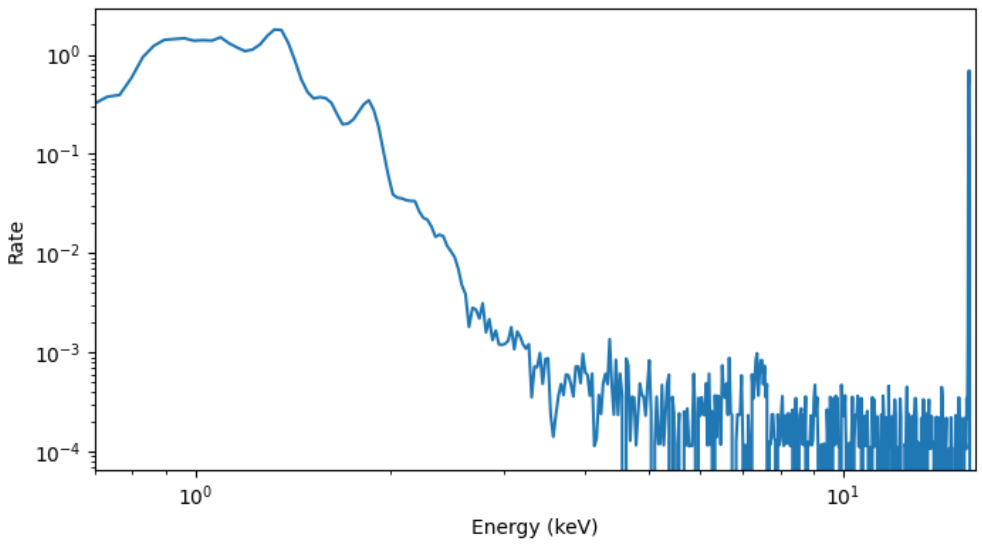

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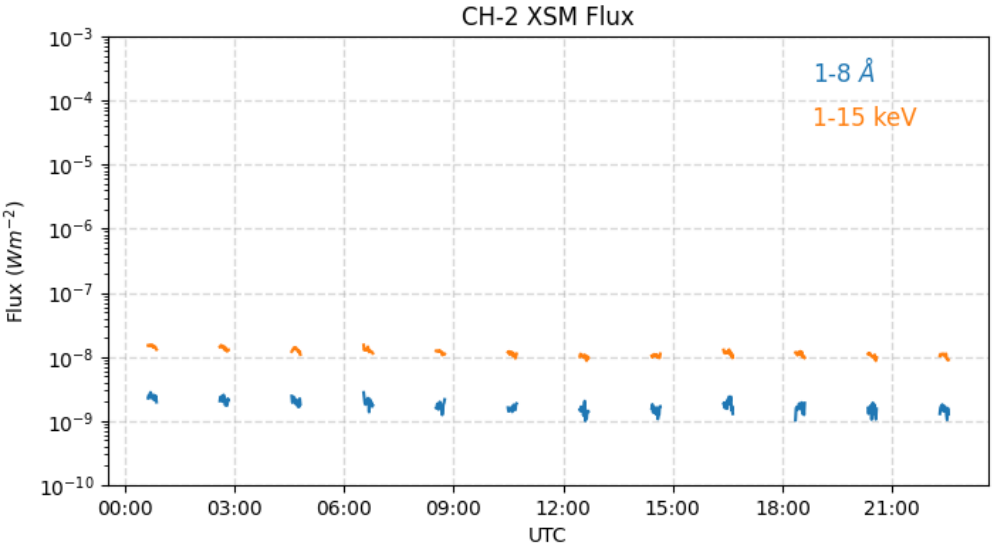

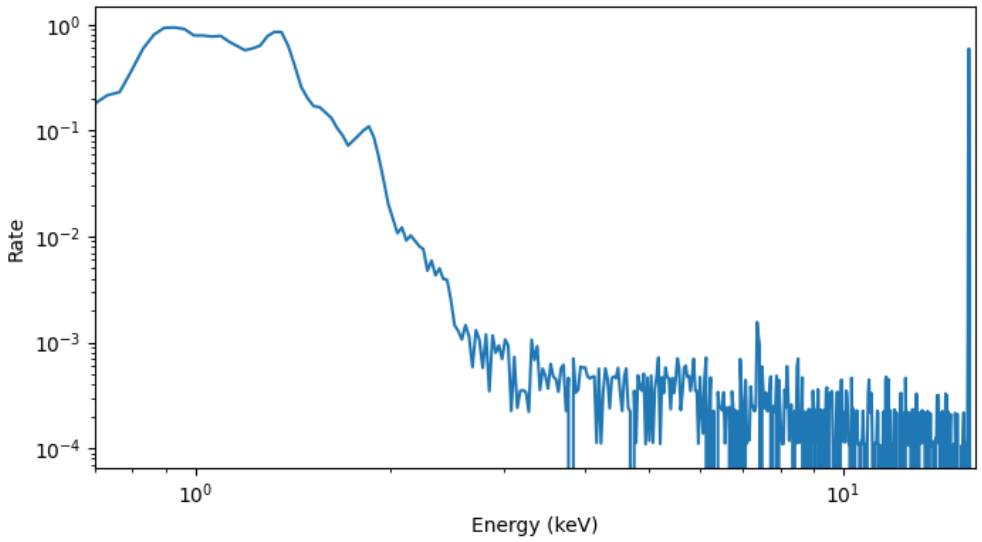

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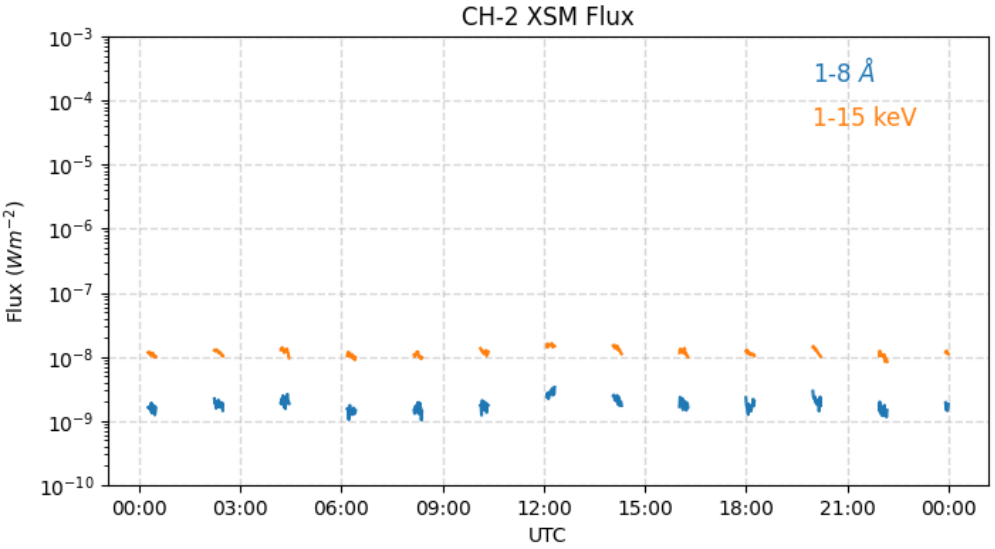

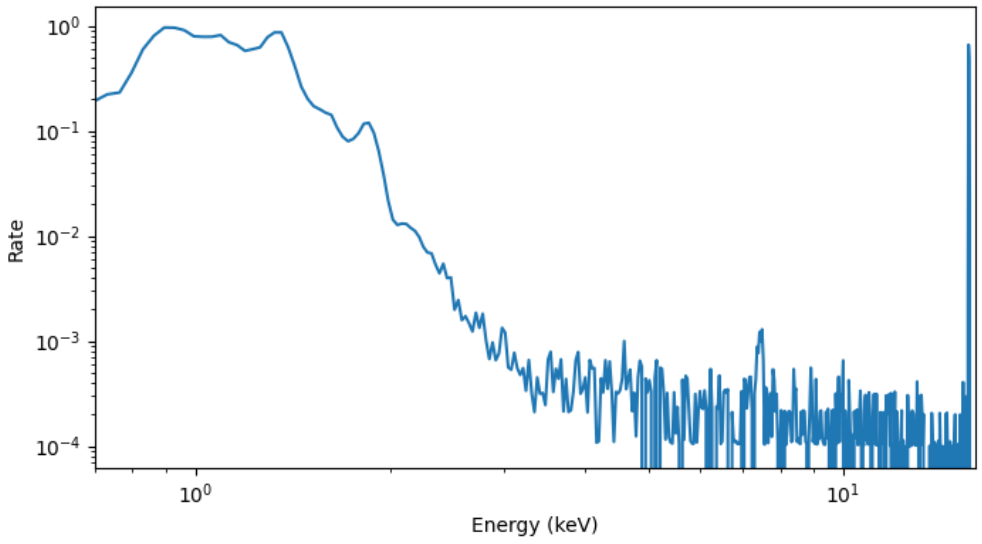

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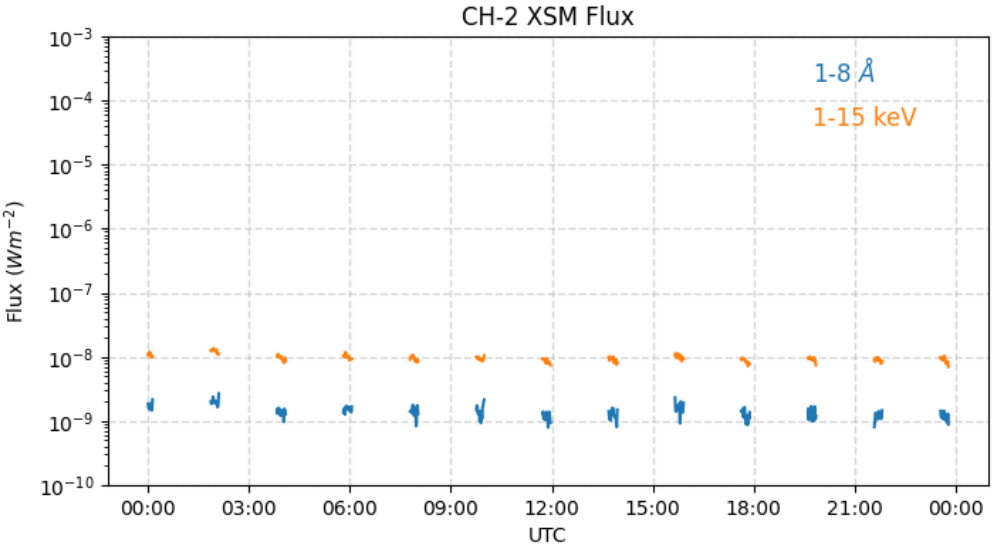

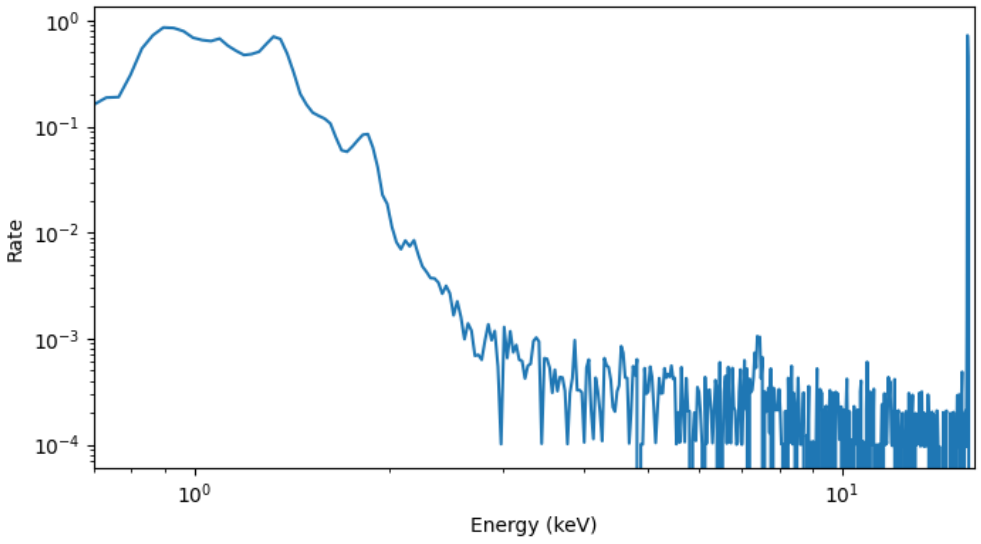

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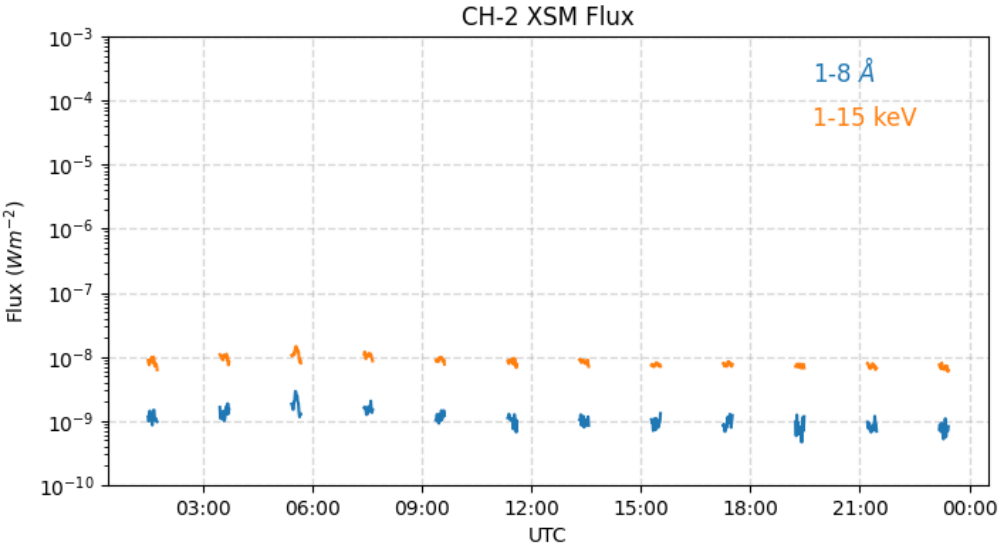

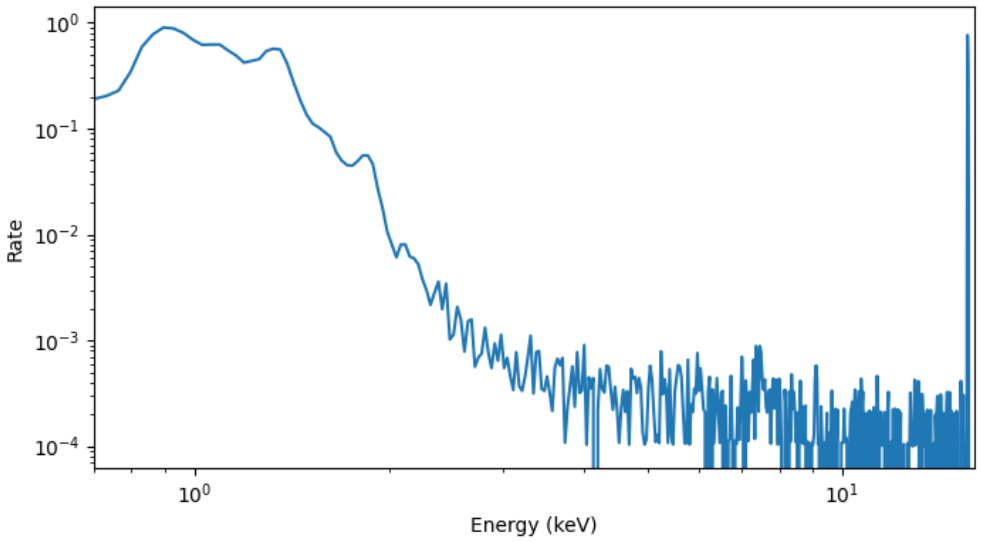

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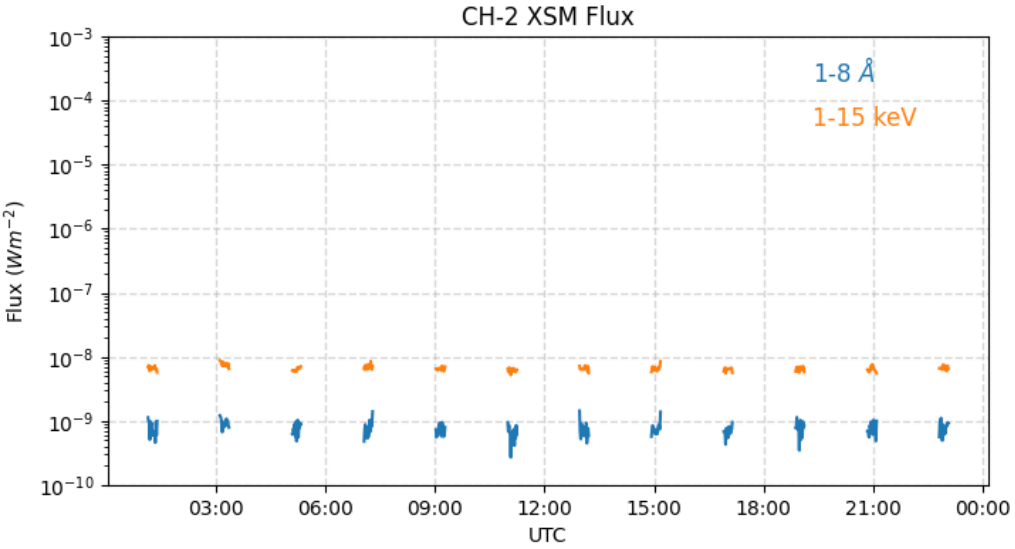

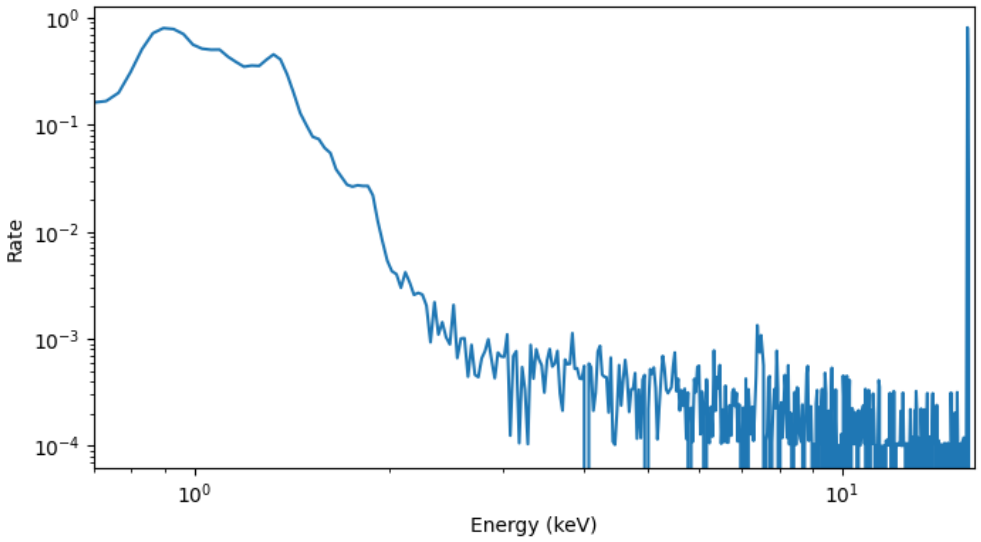

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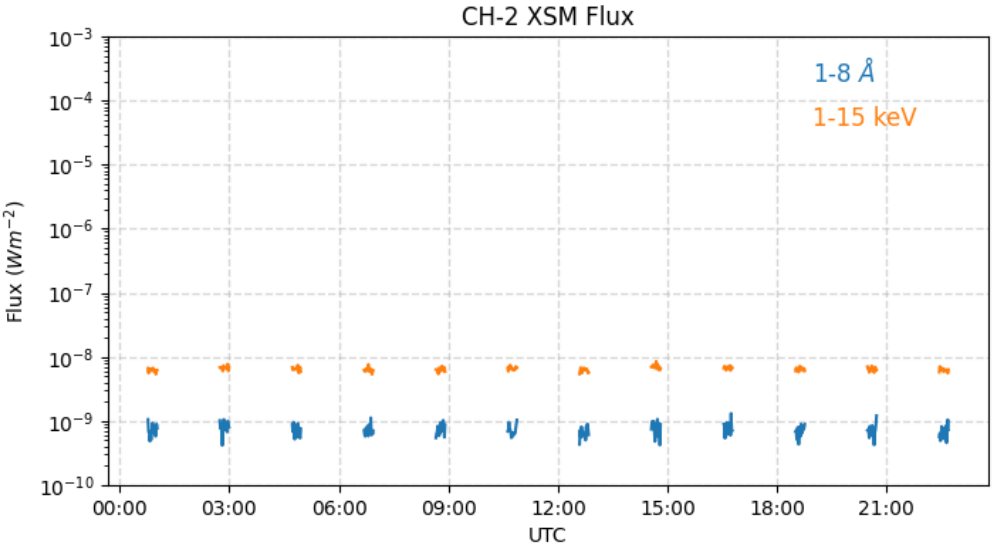

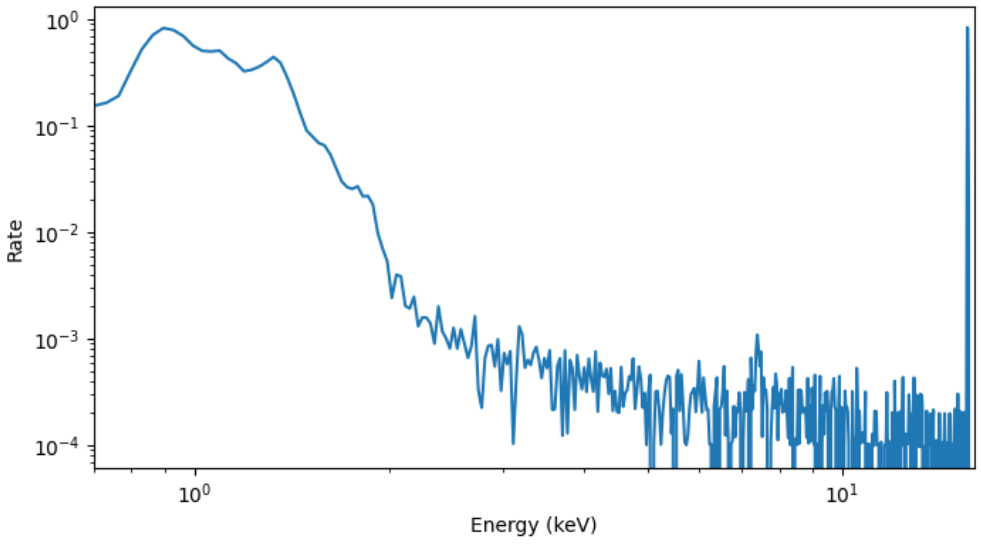

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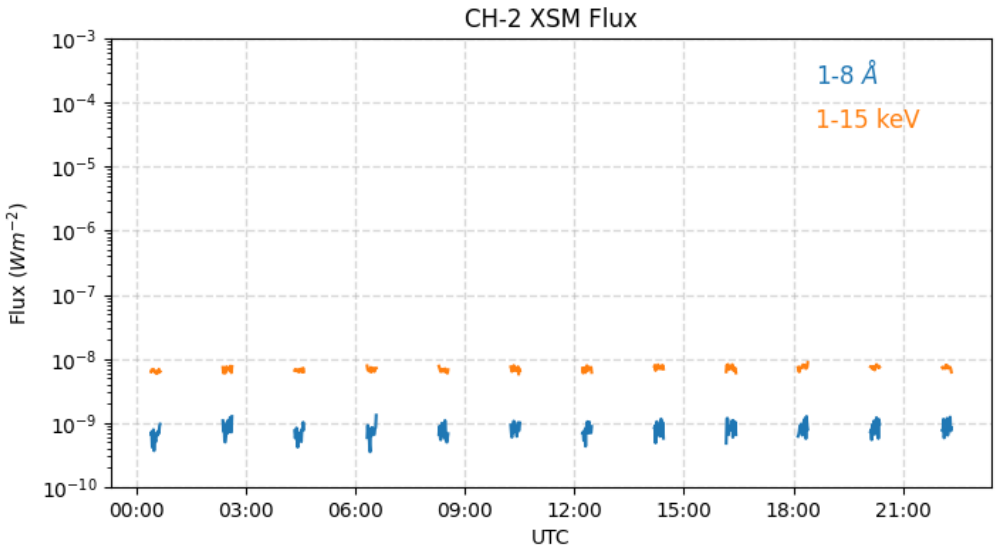

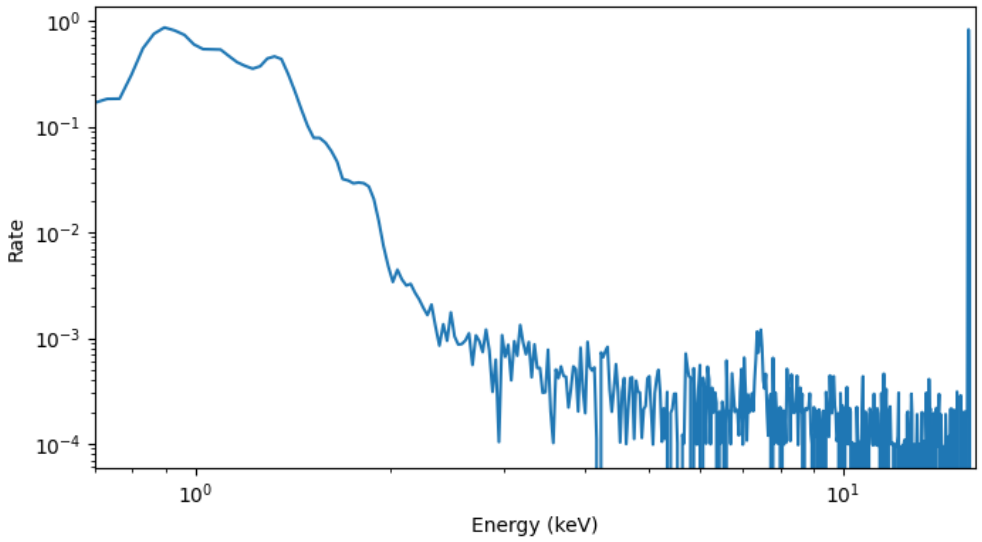

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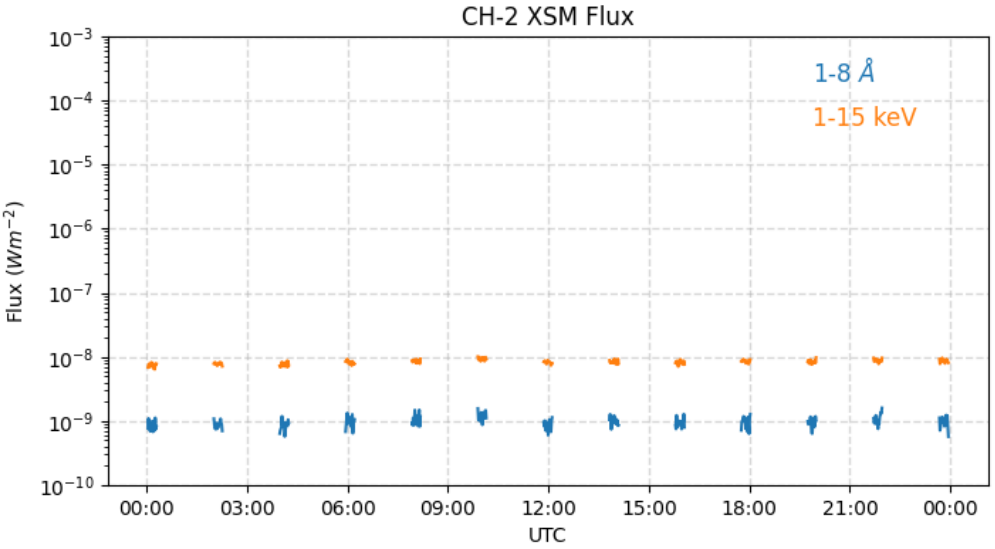

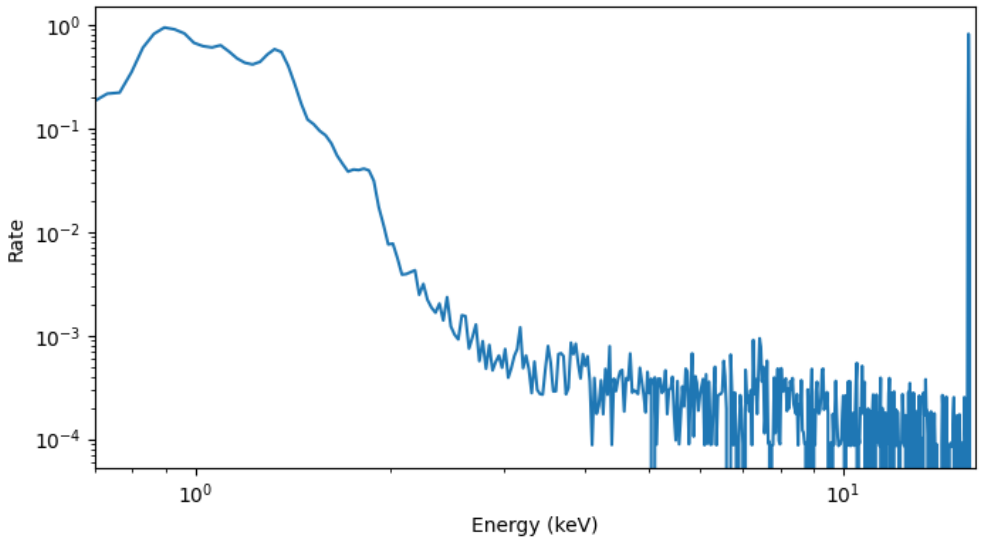

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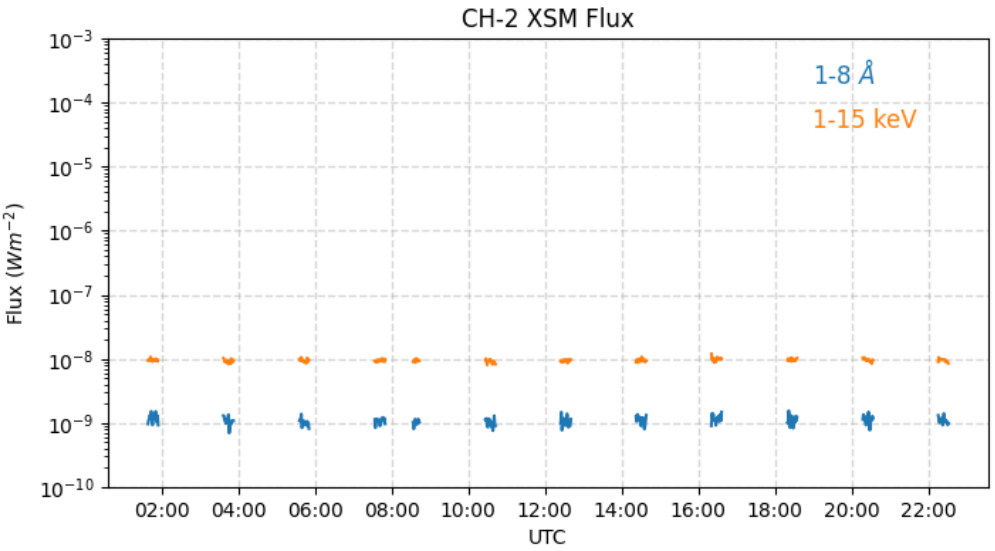

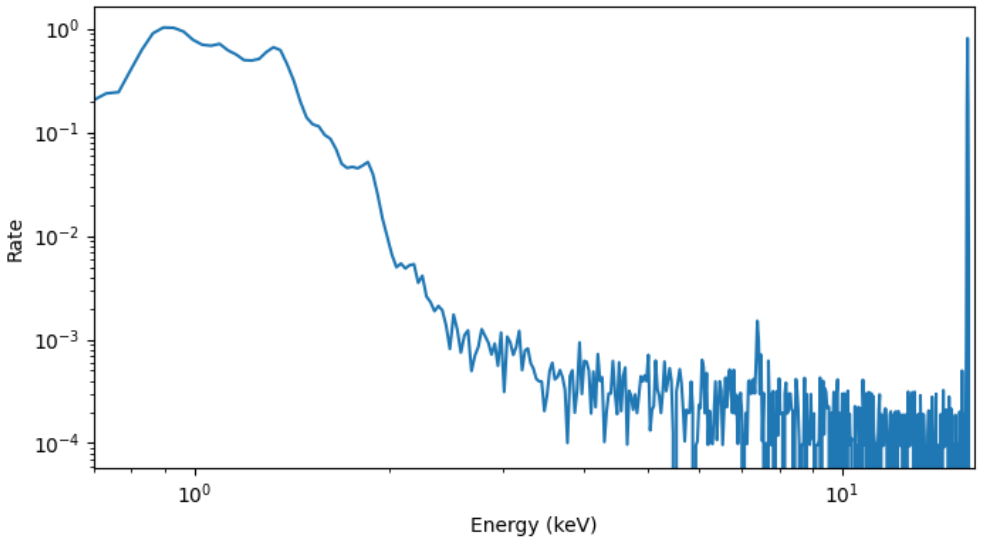

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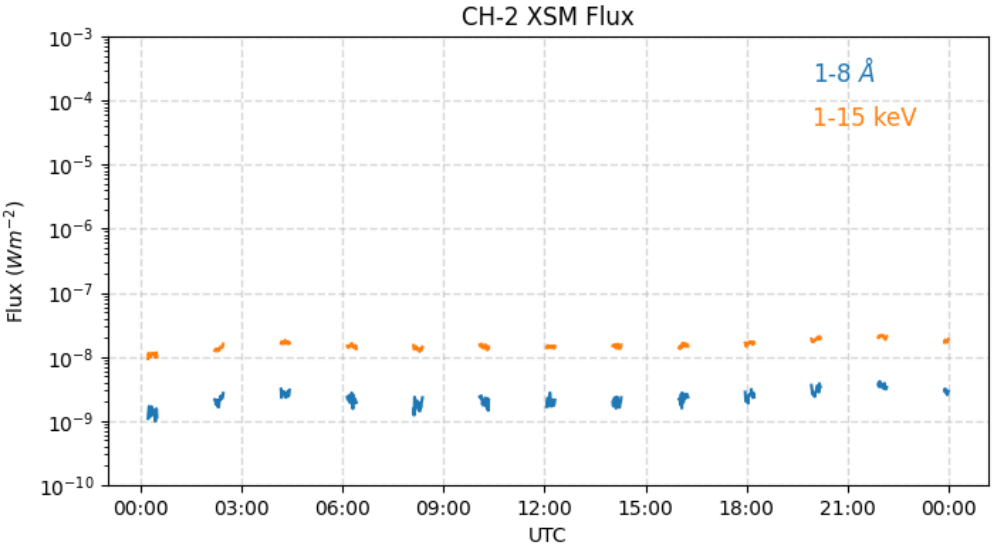

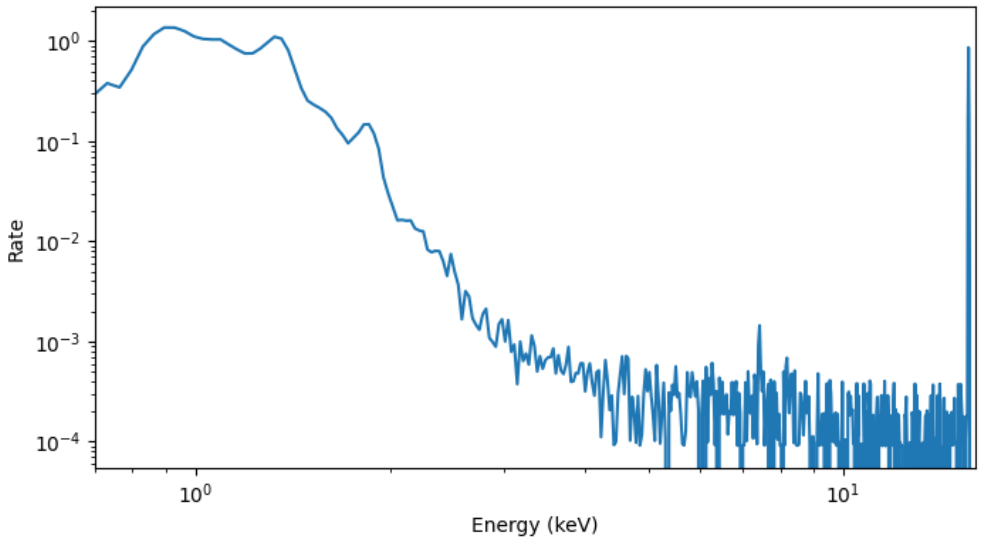

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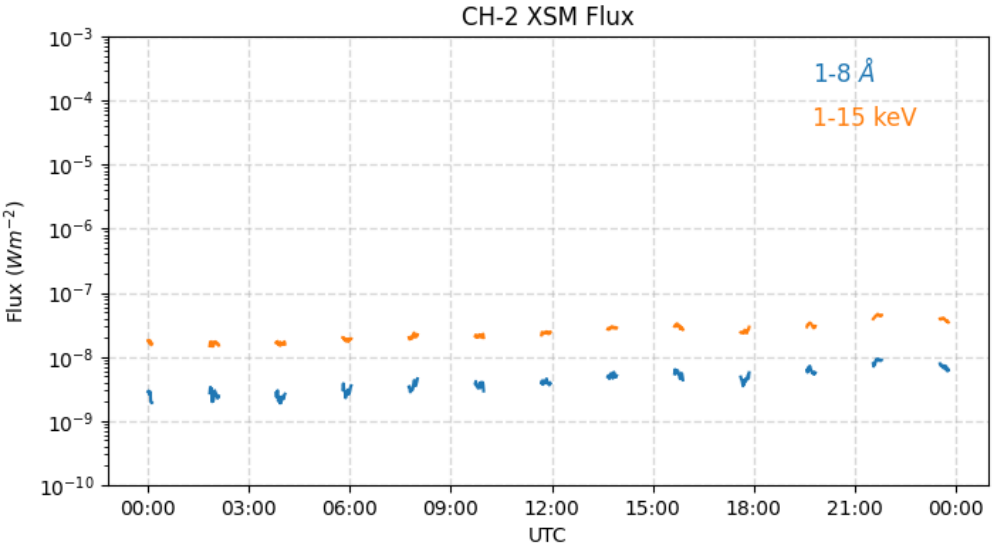

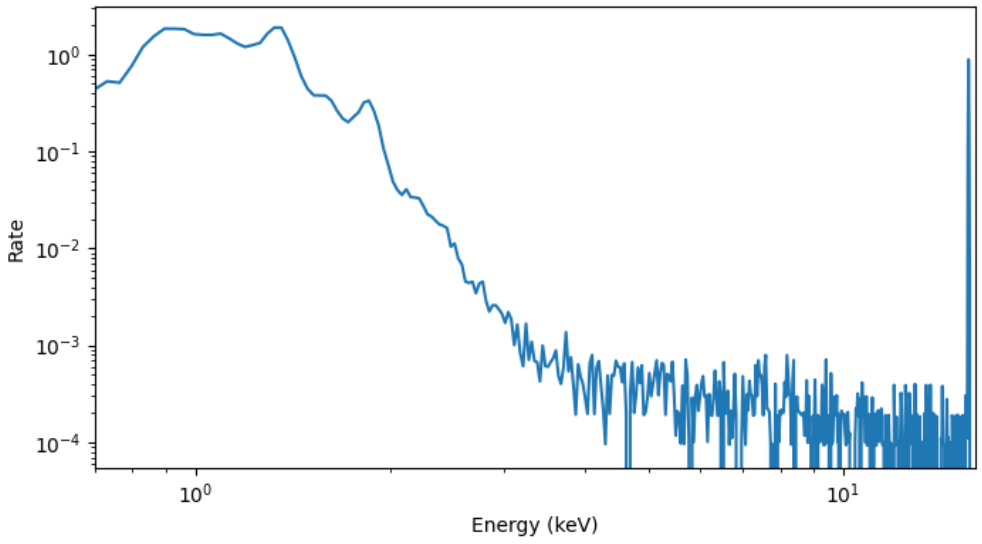

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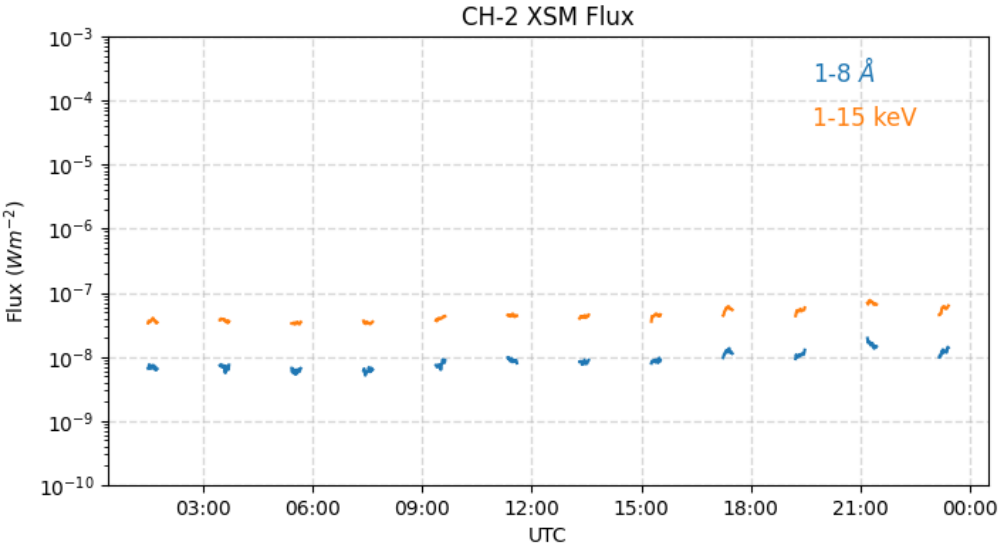

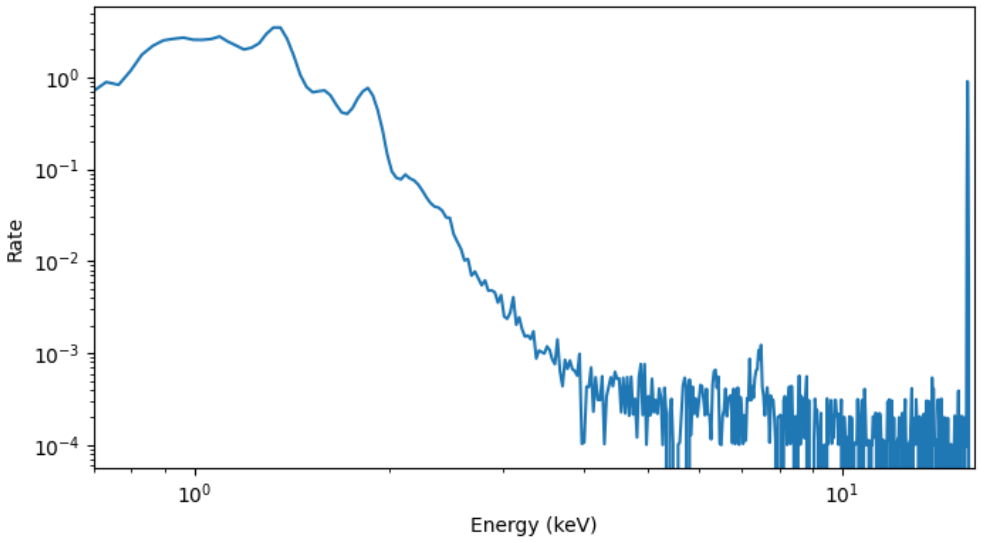

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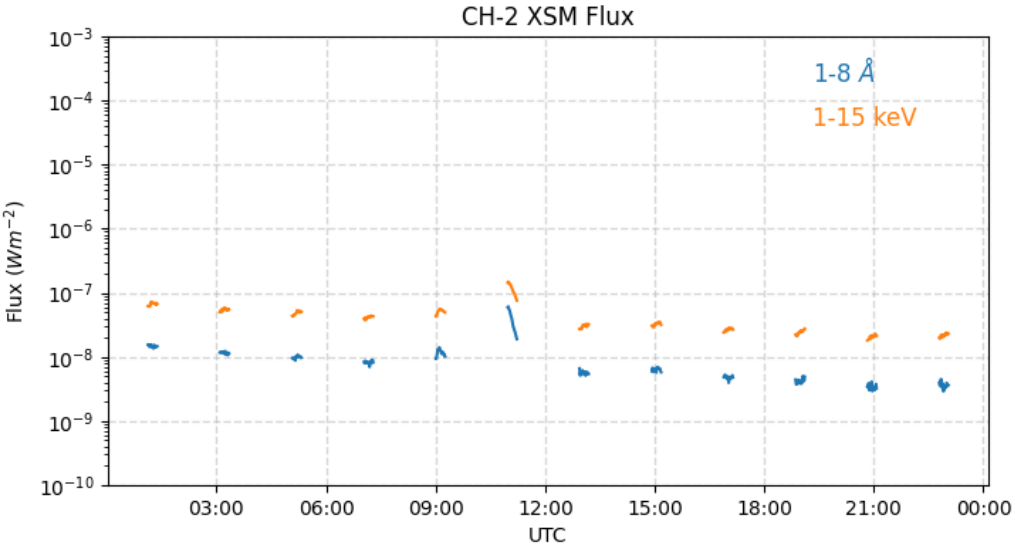

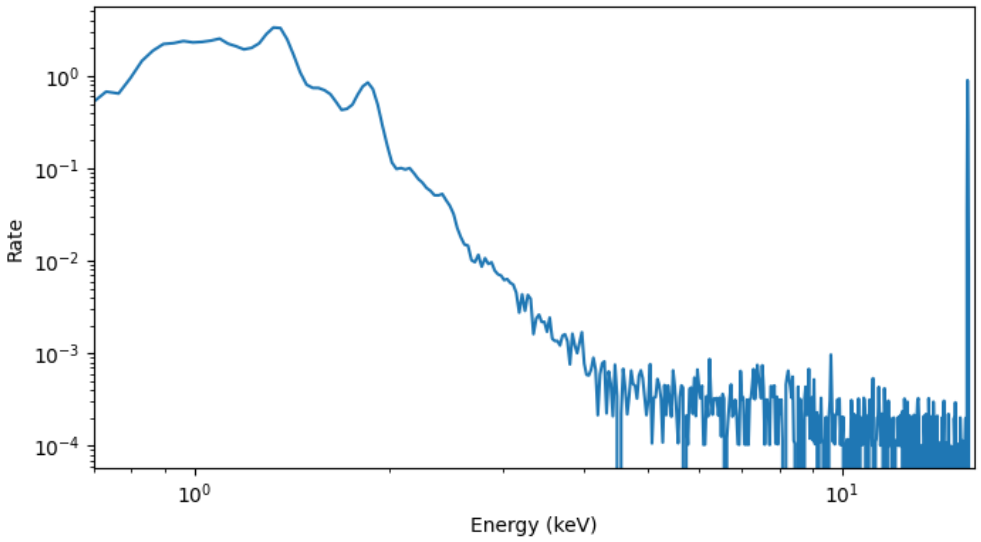

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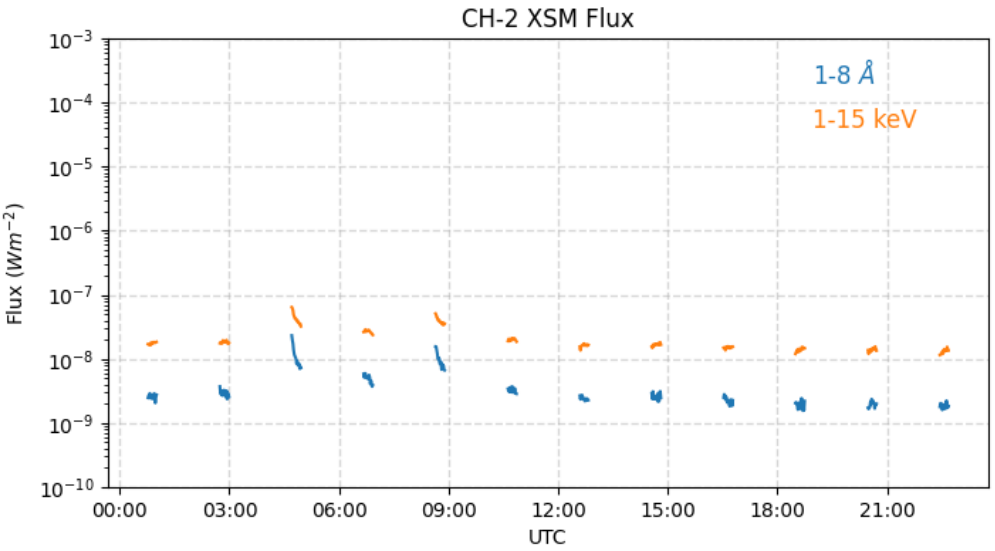

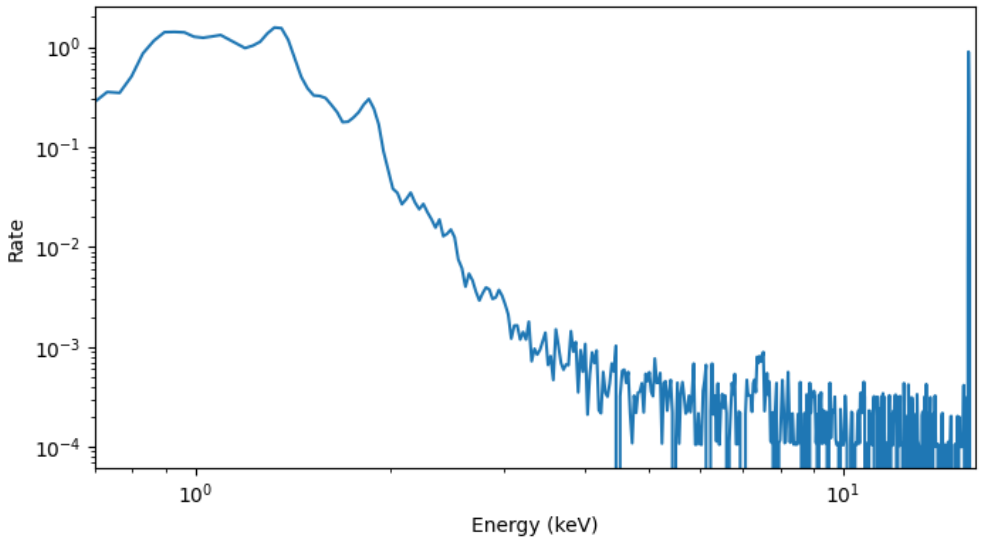

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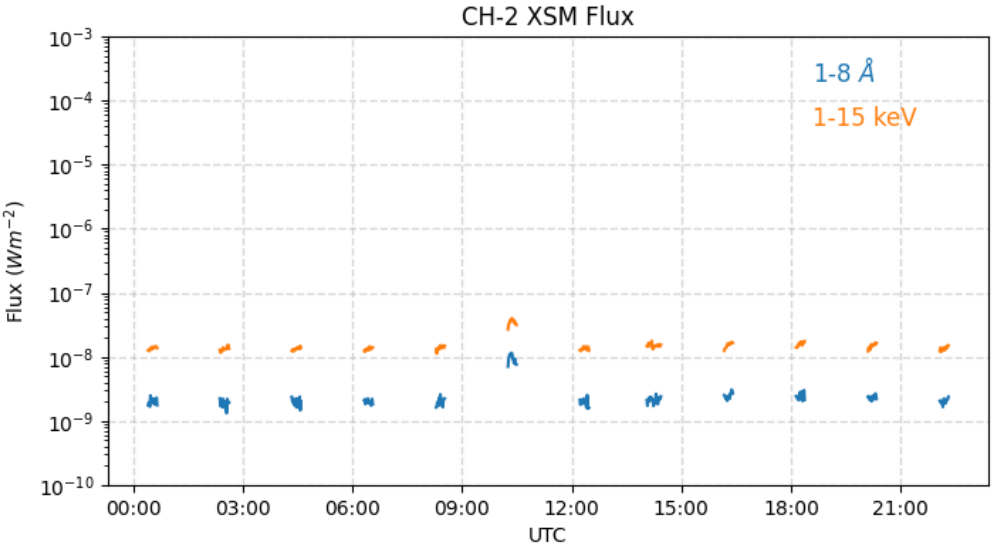

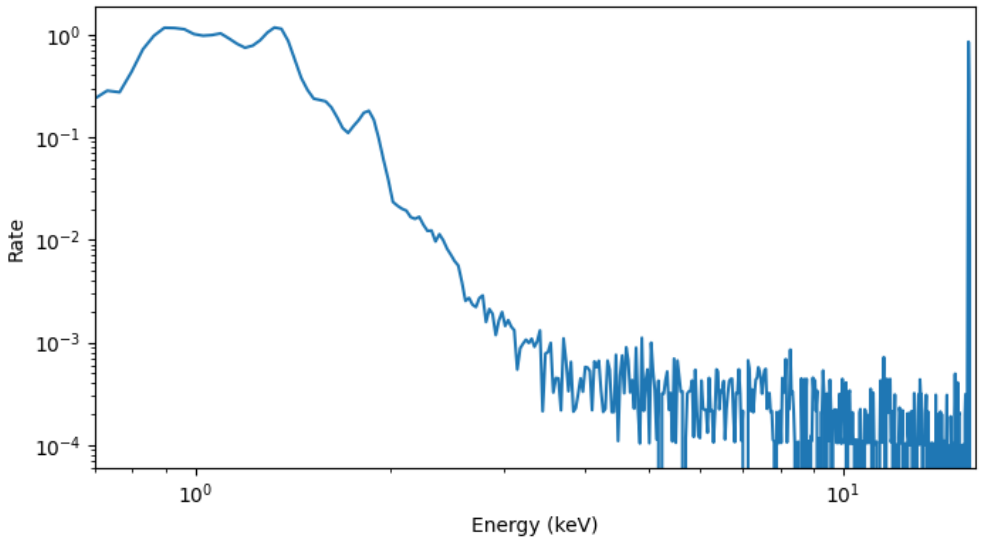

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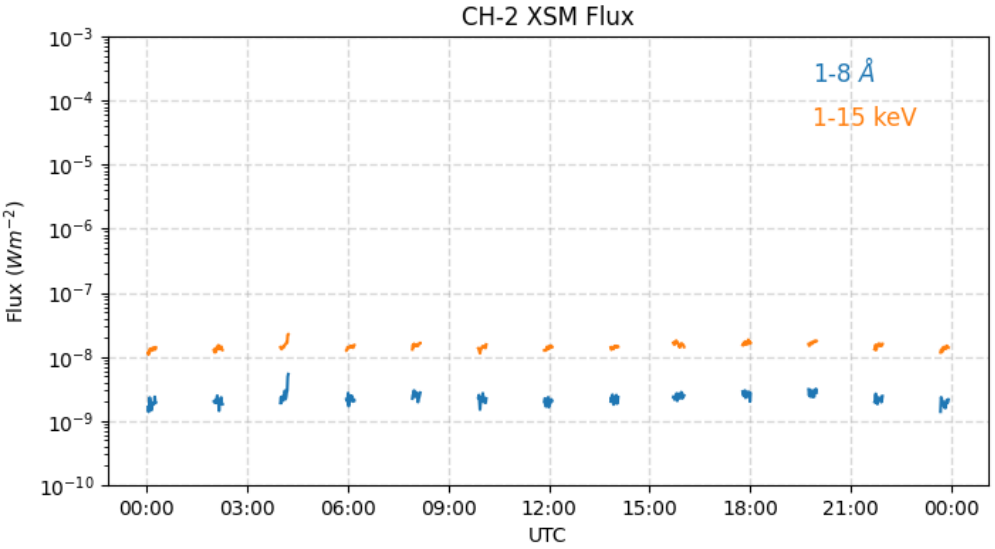

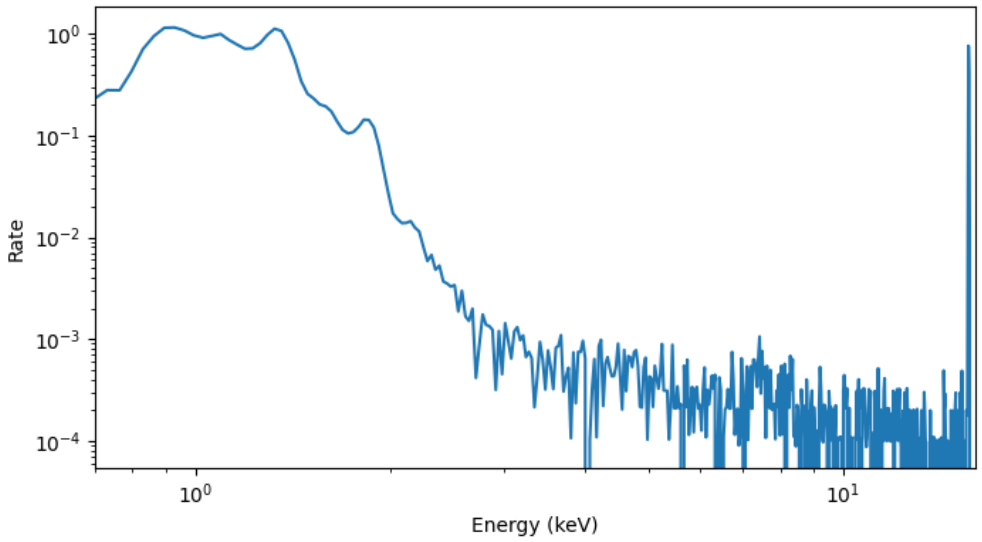

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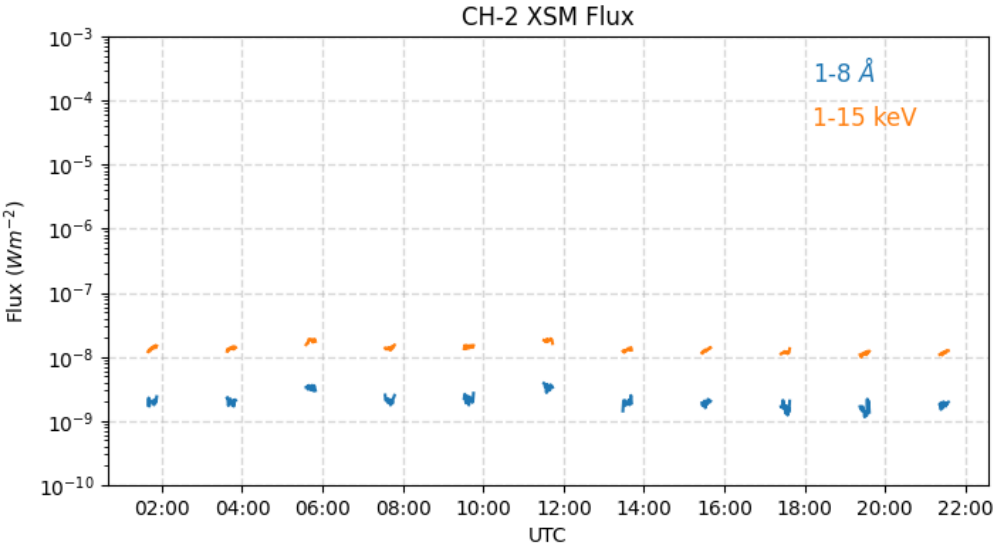

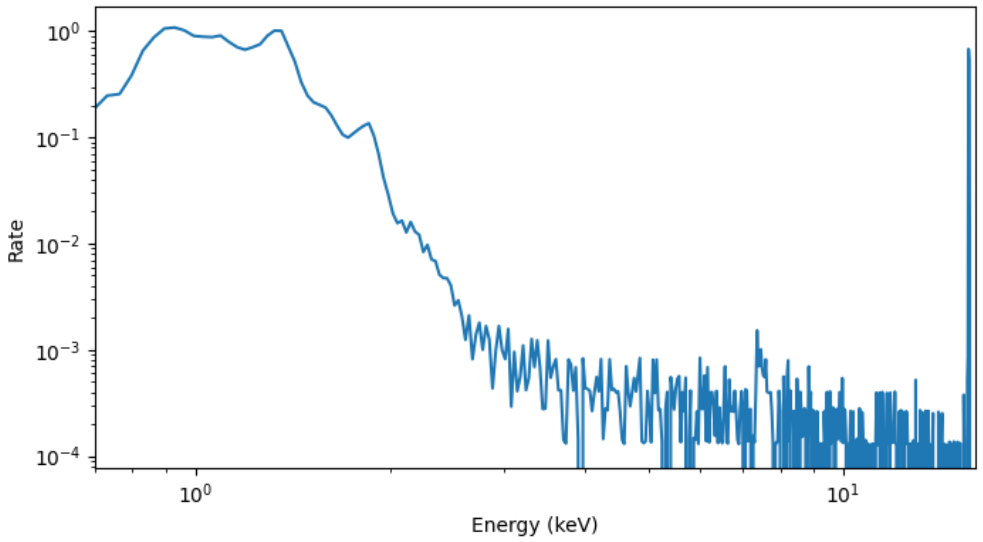

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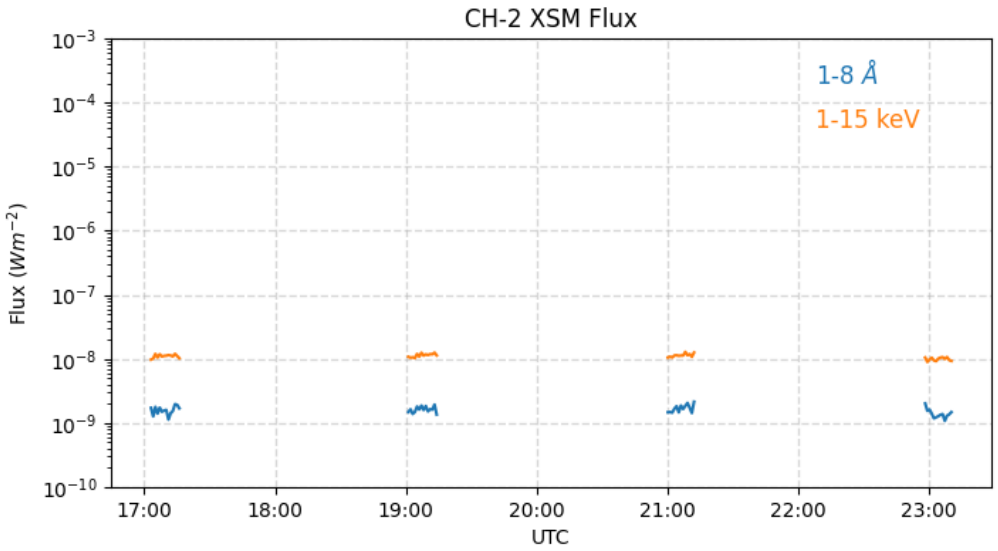

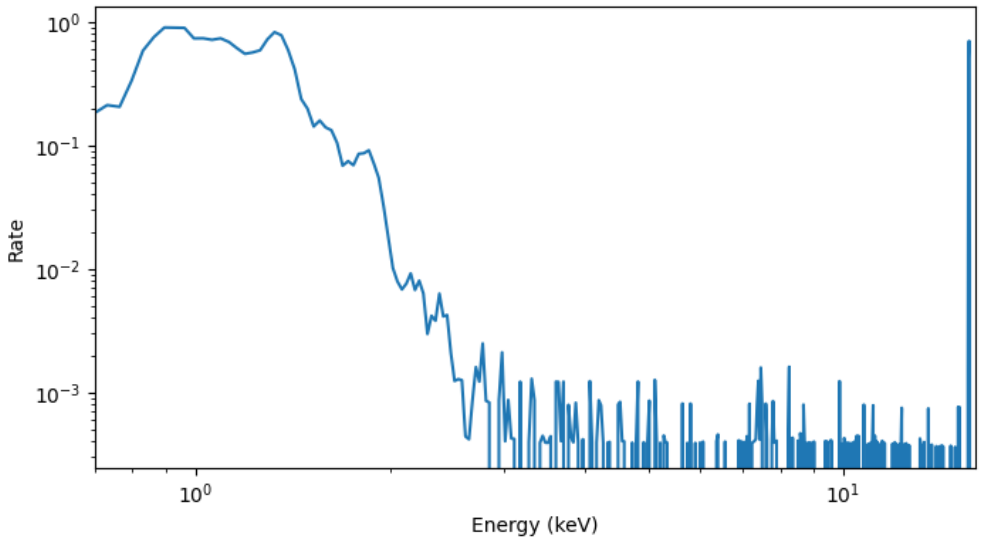

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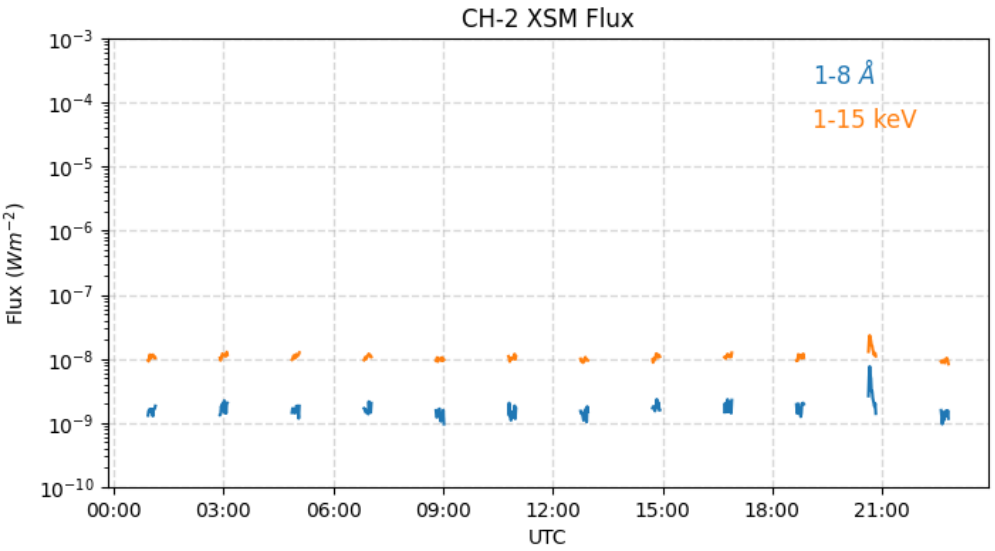

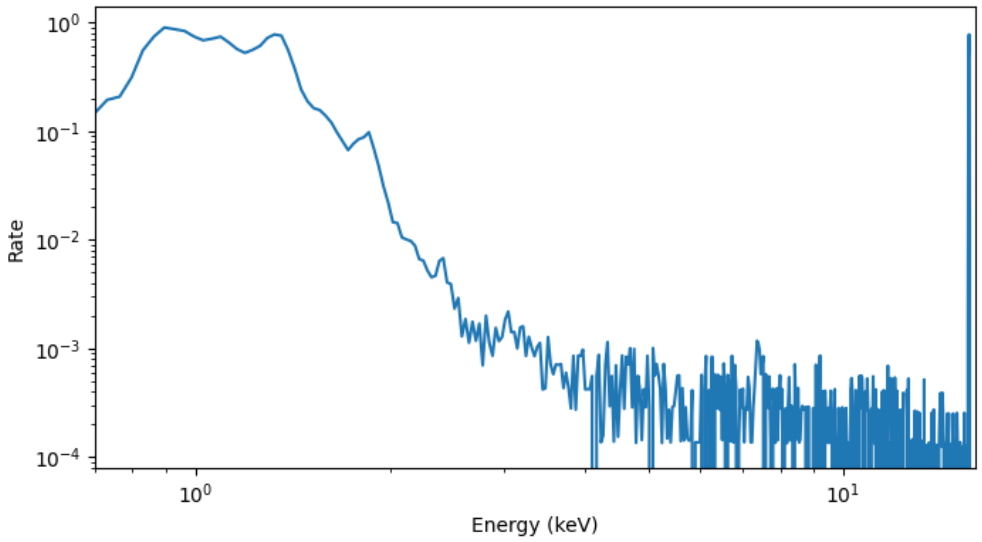

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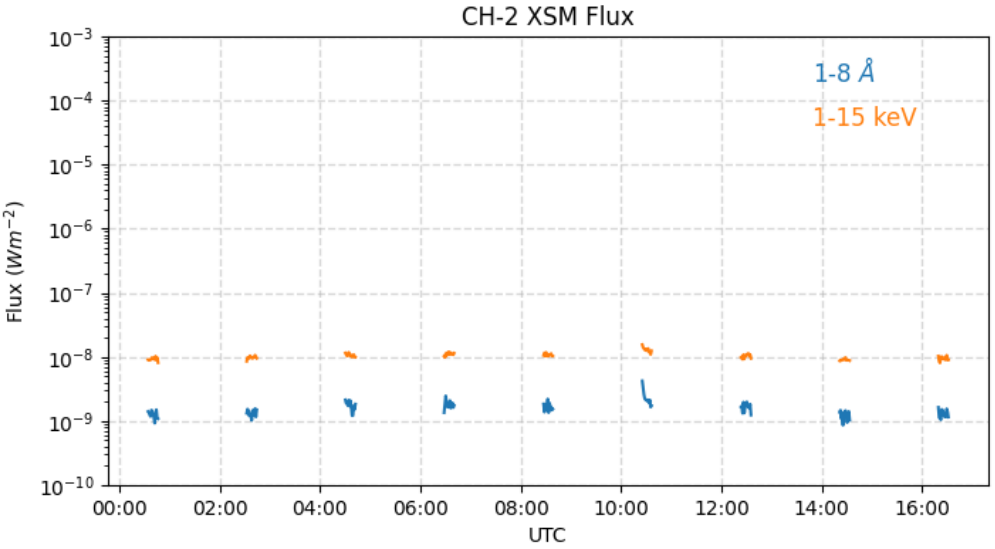

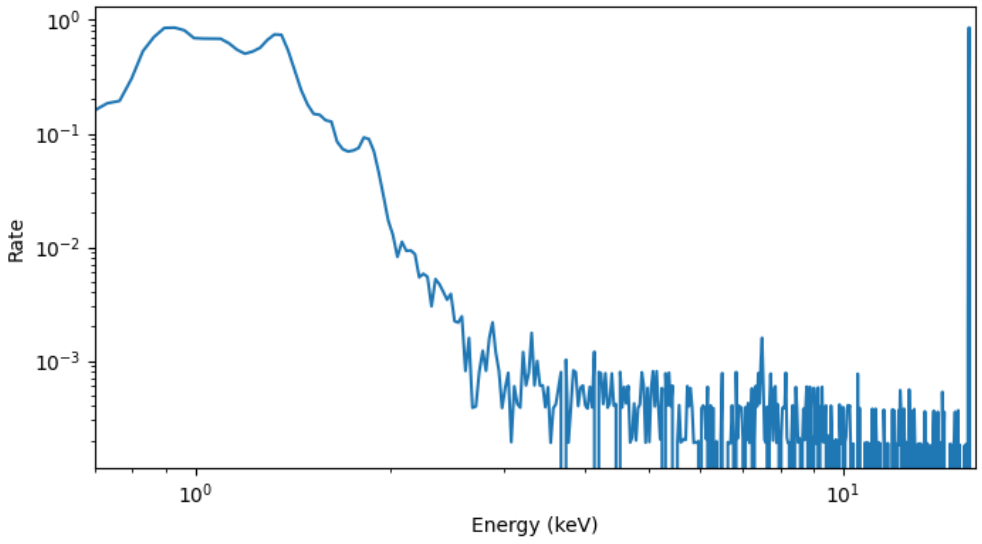

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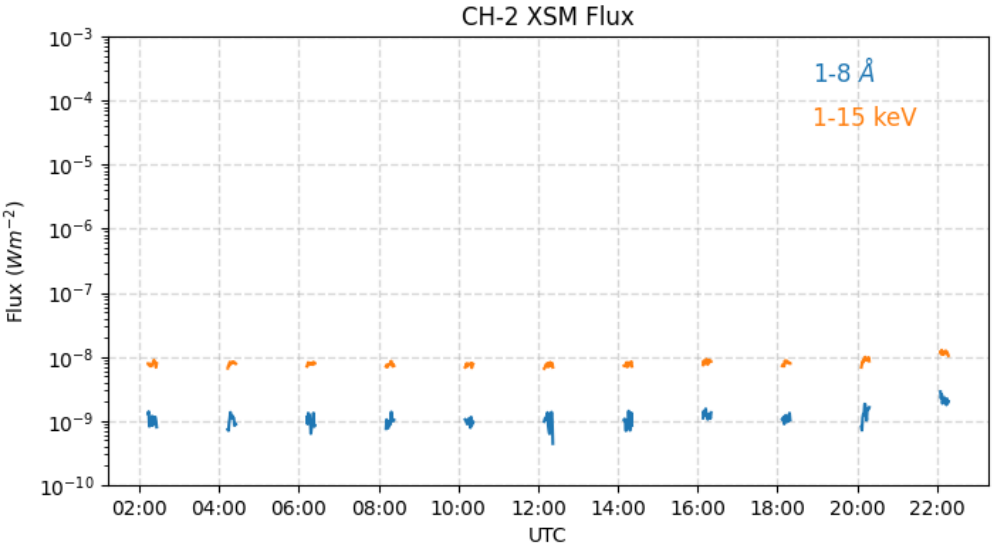

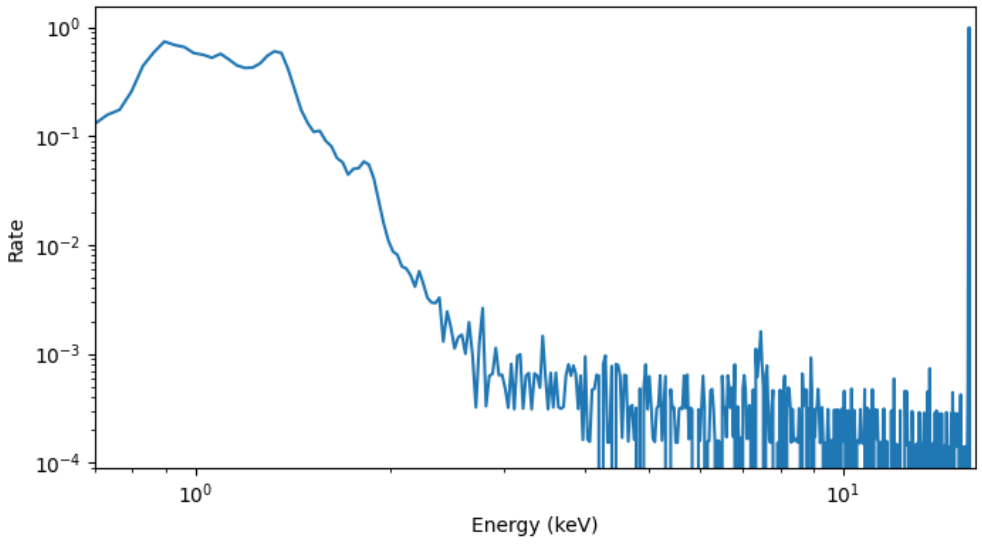

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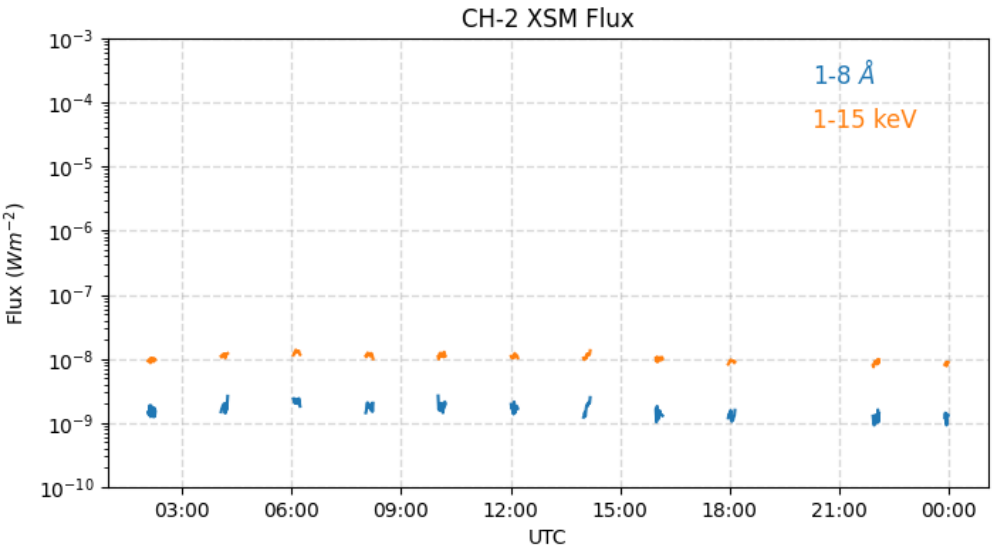

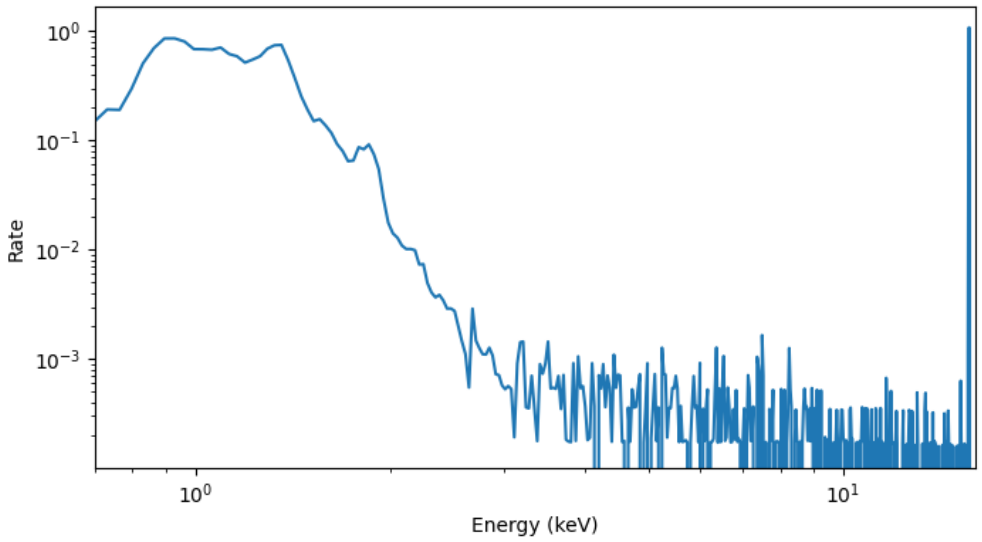

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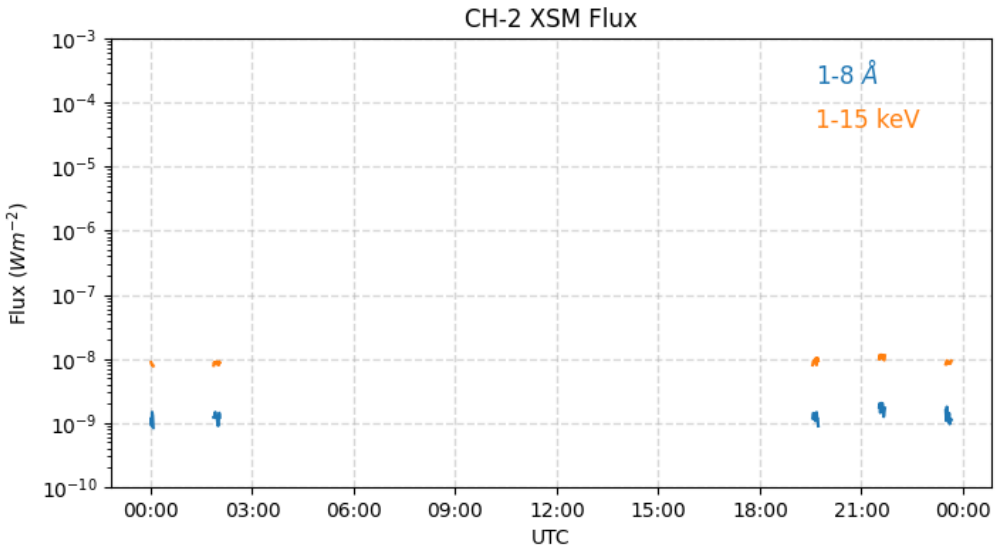

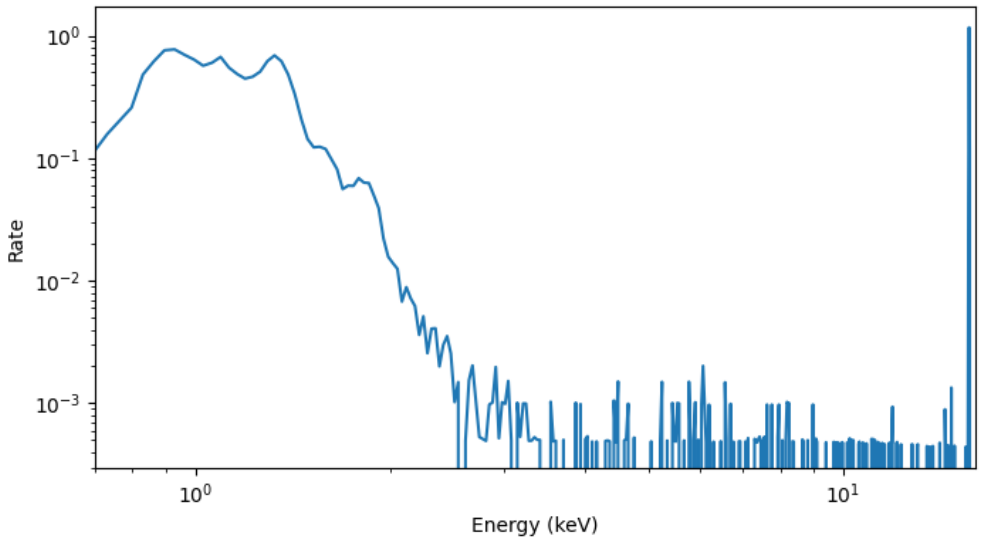

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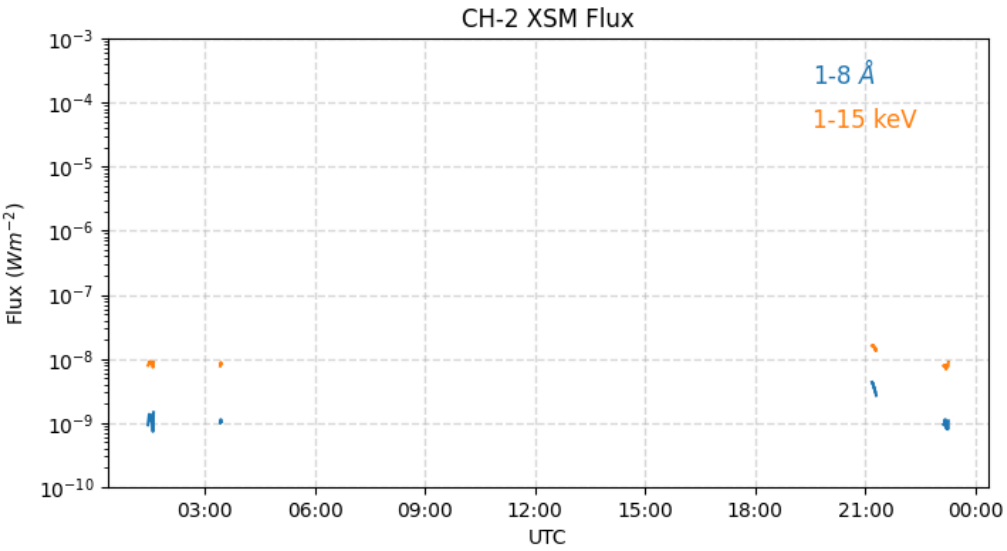
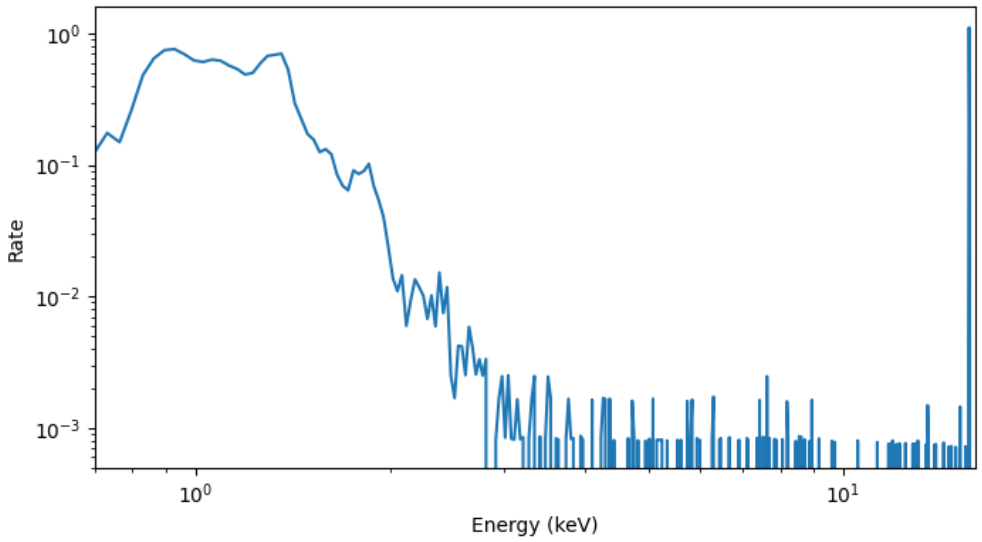
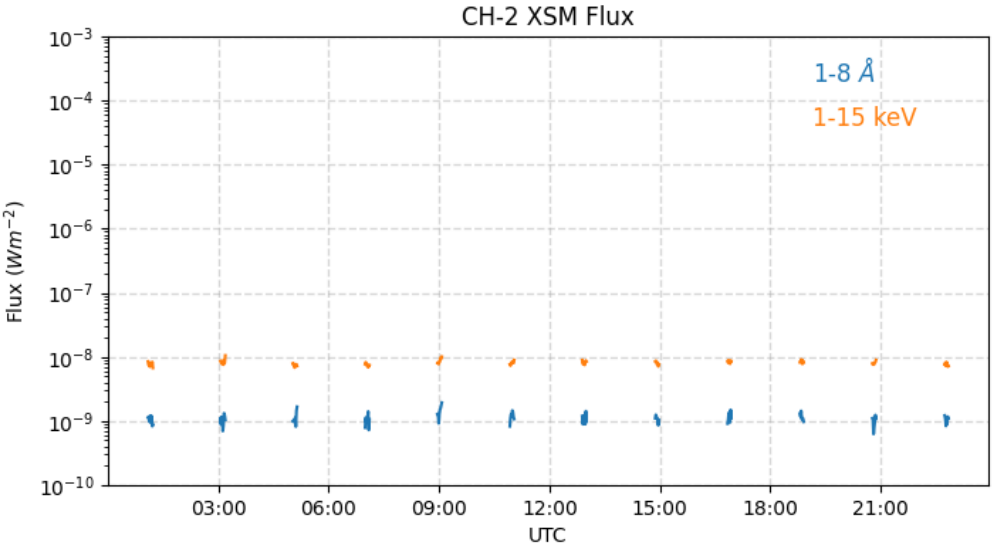
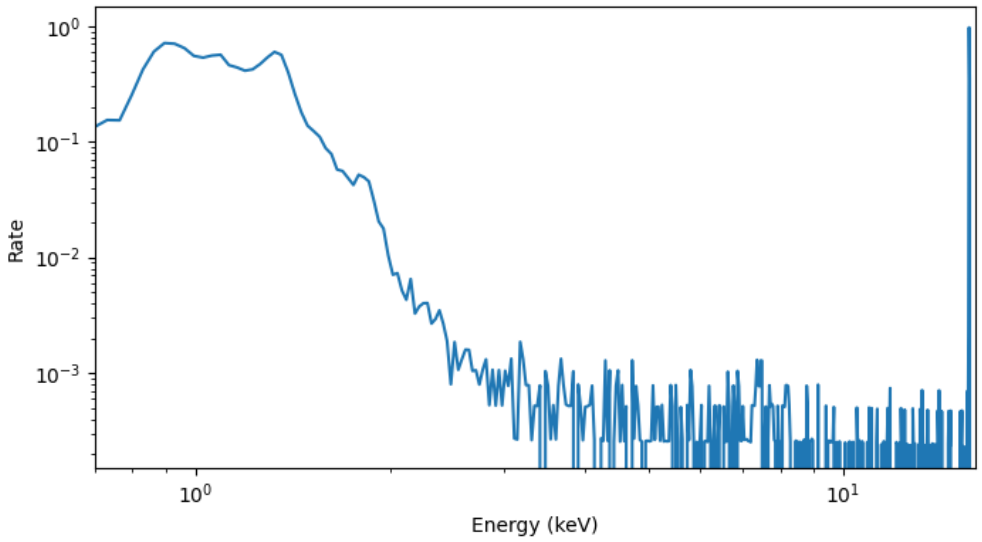


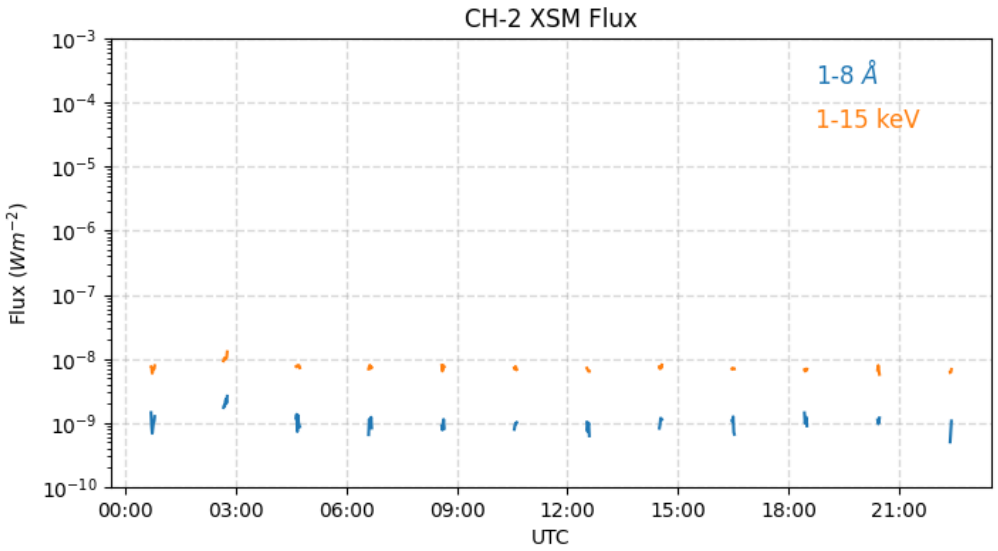


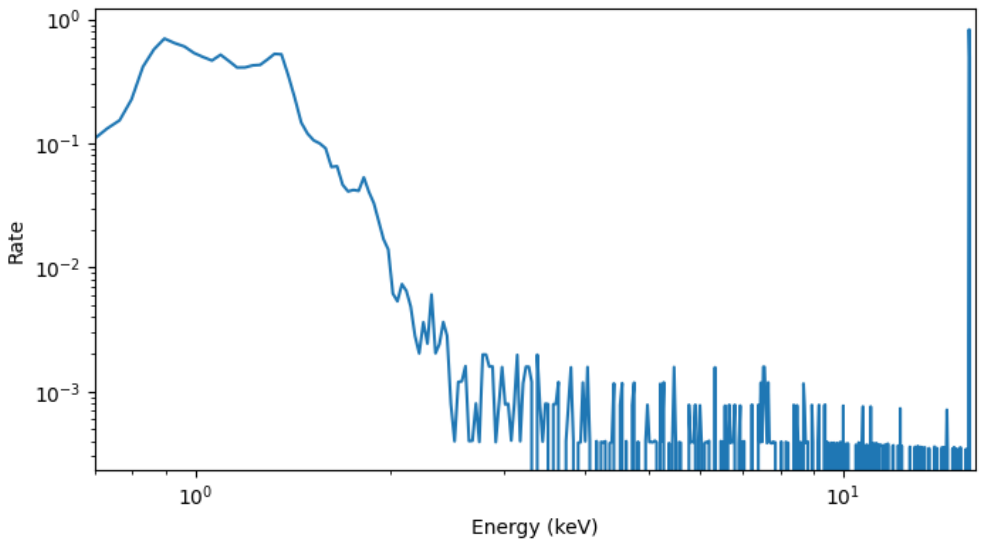
Date: 2020-07-12



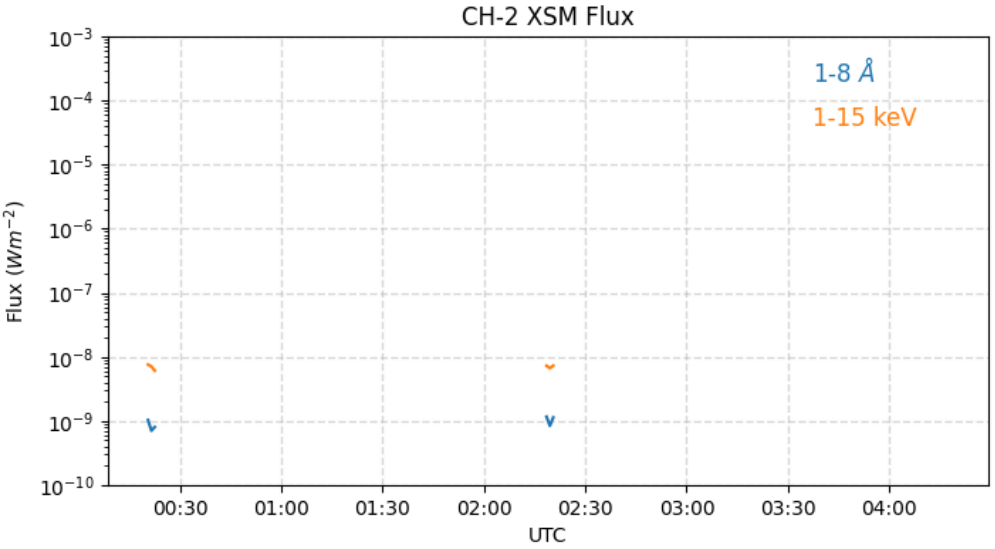


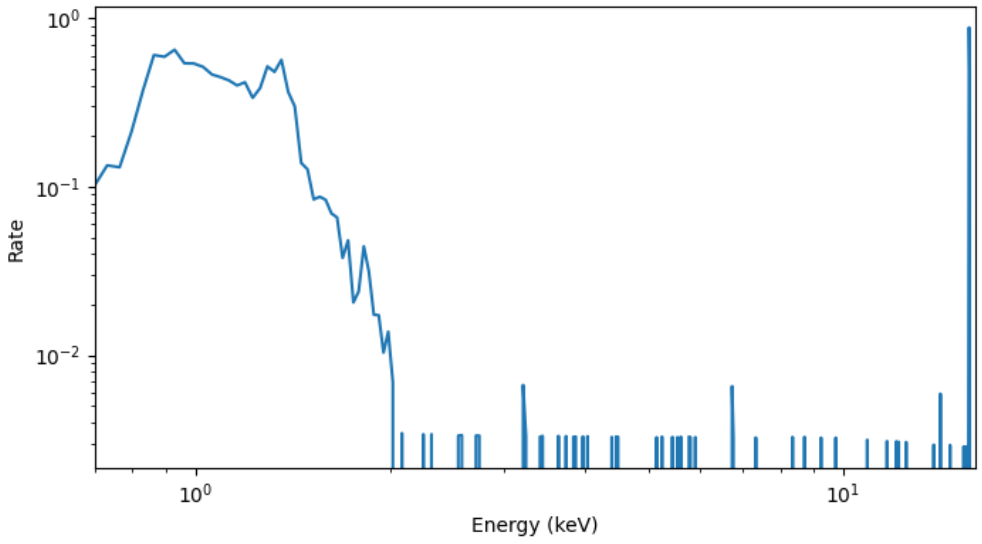
Date: 2020-07-13



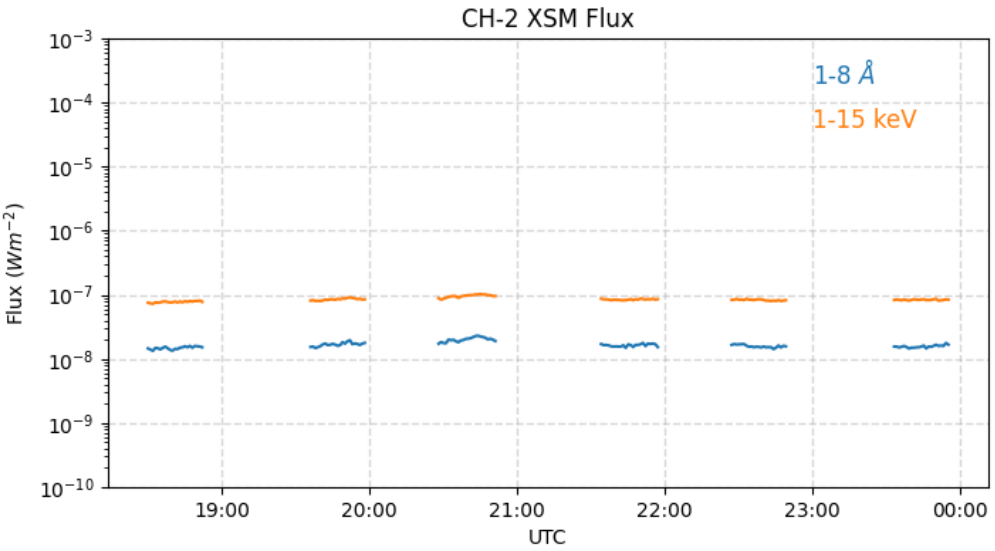


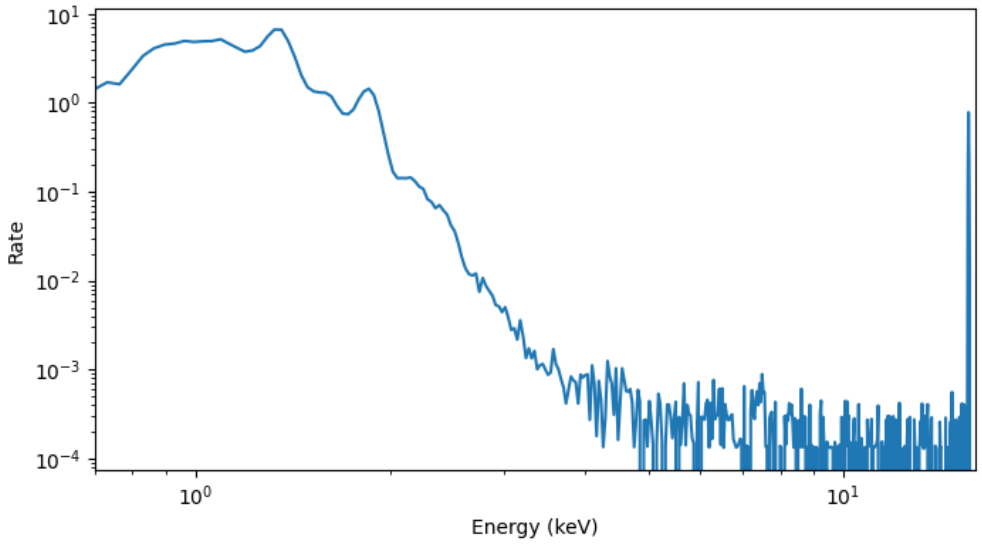
Date: 2020-07-14





Date: 2020-08-06





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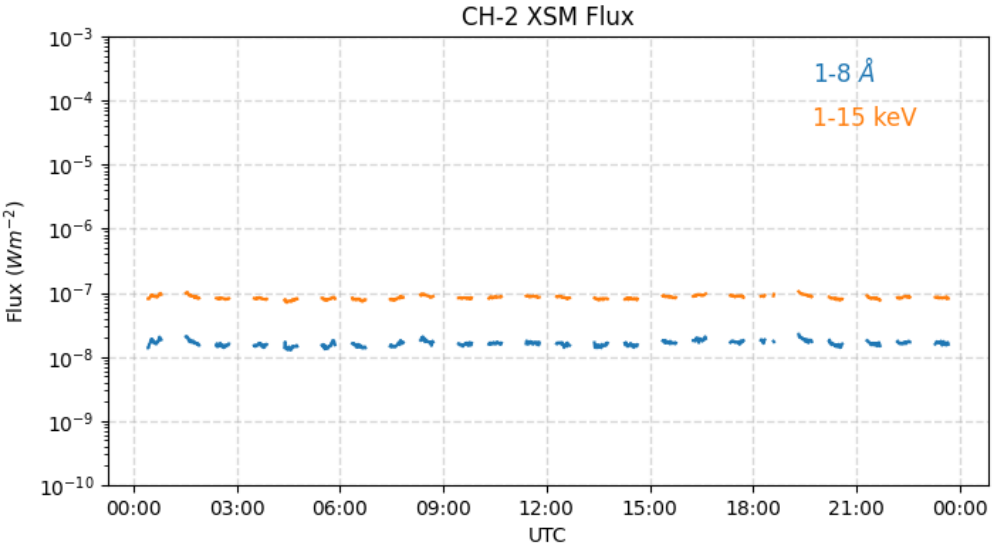
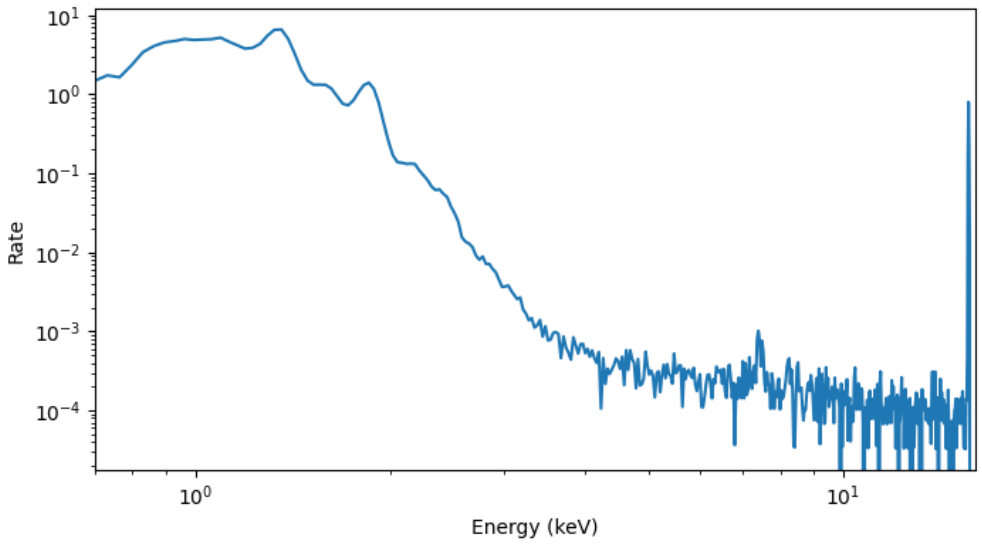
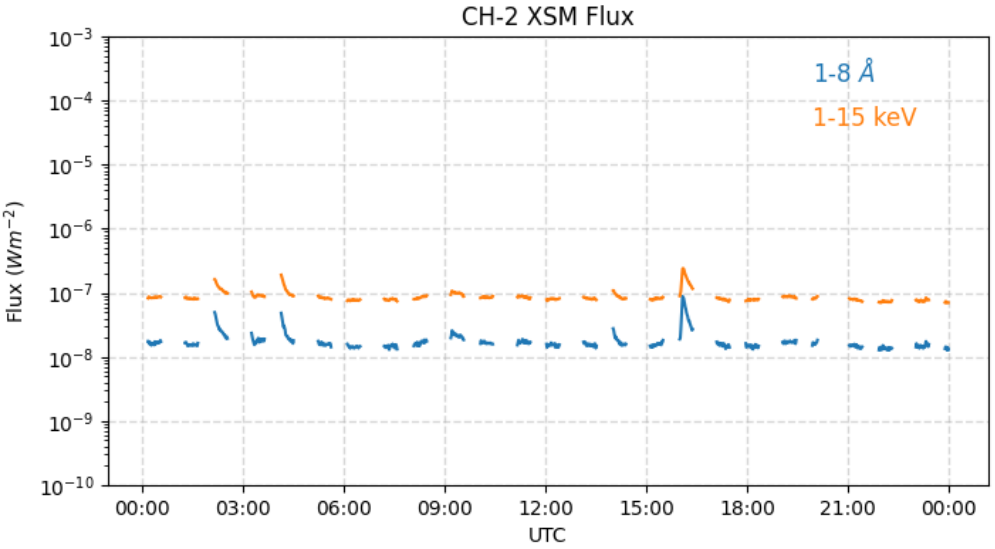
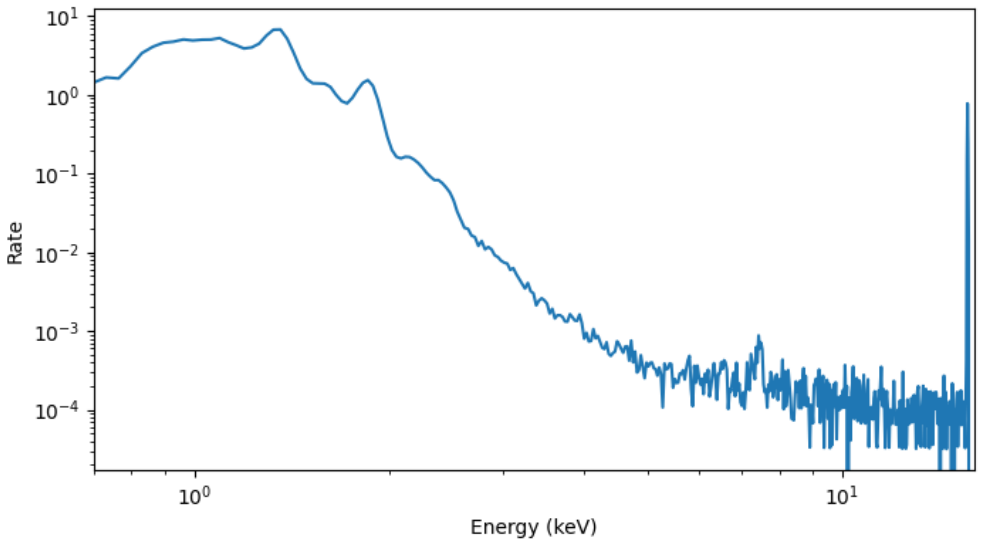




Date: 2020-08-08





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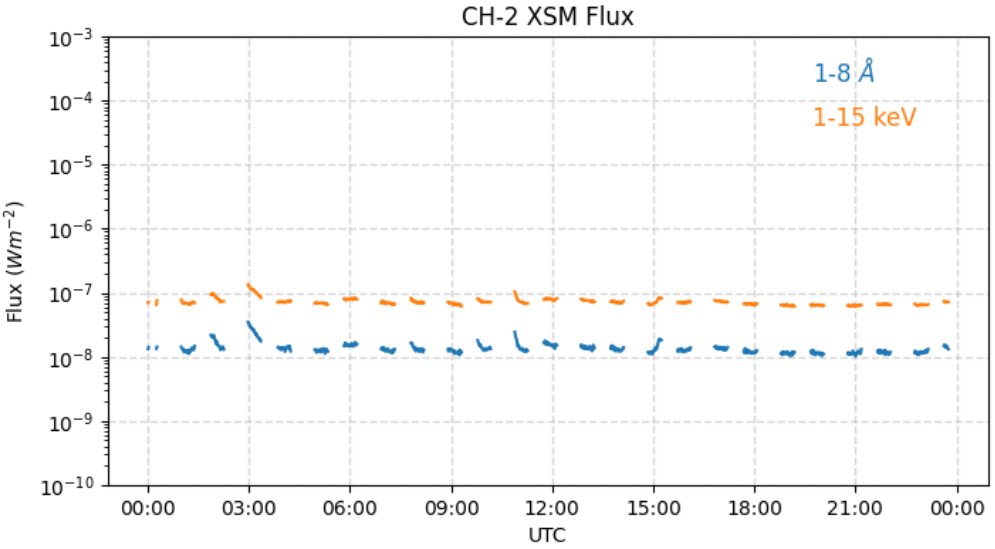

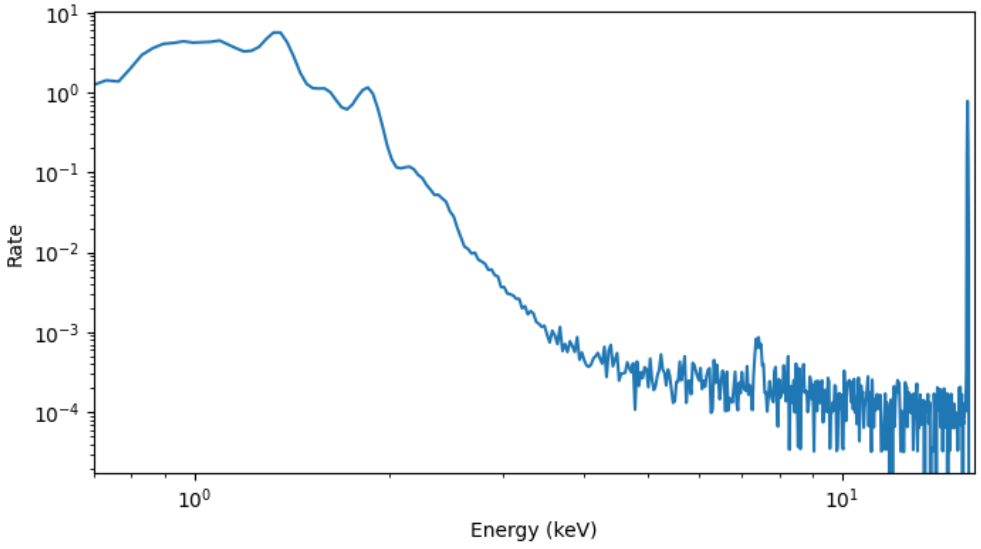

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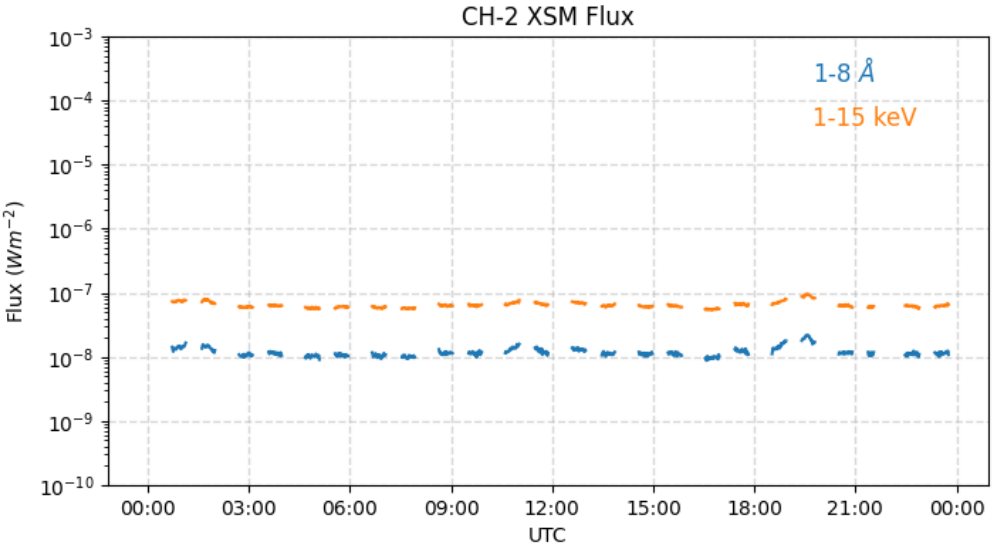

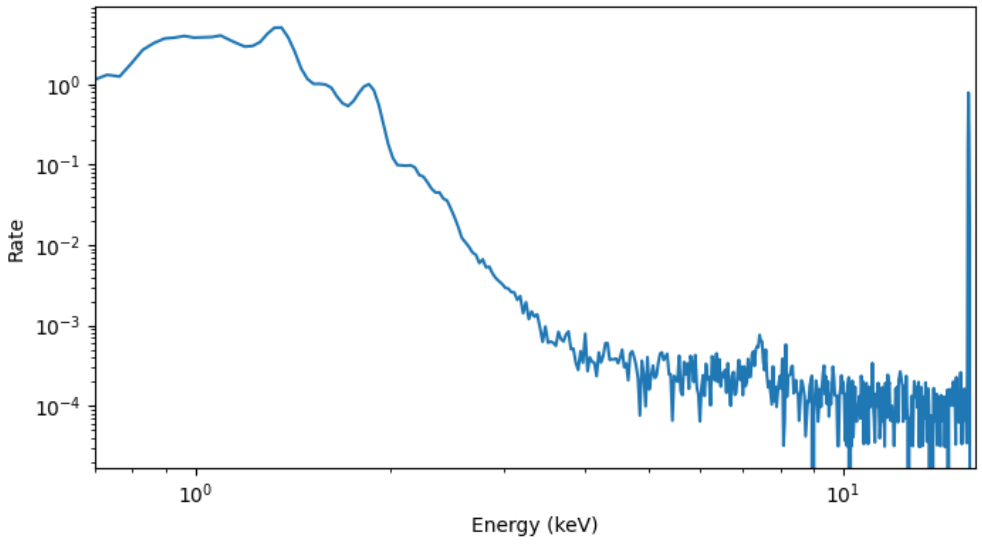

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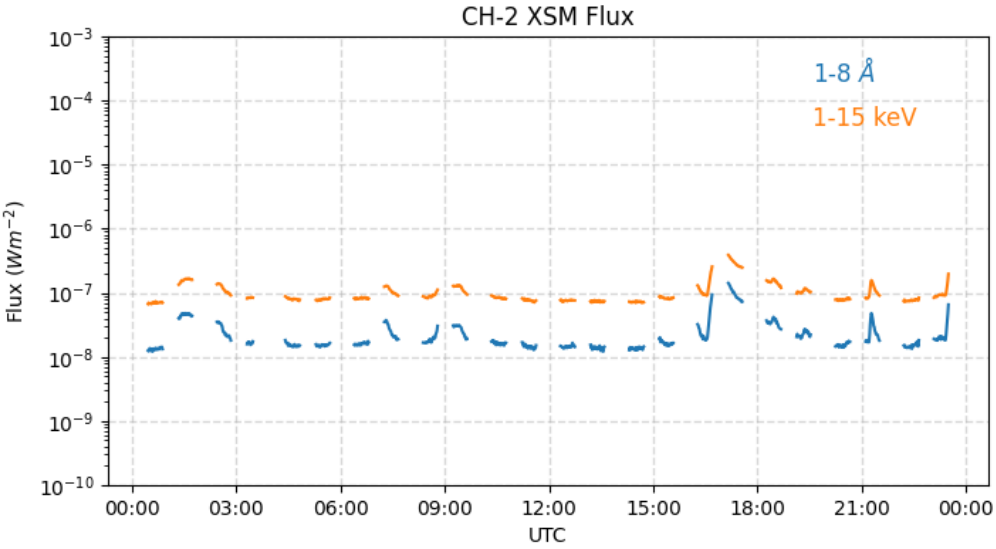
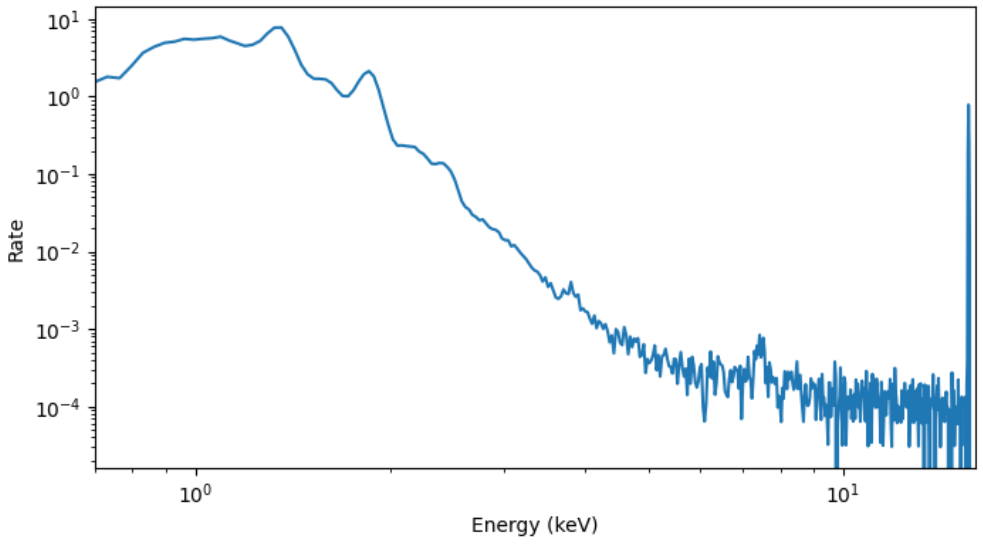
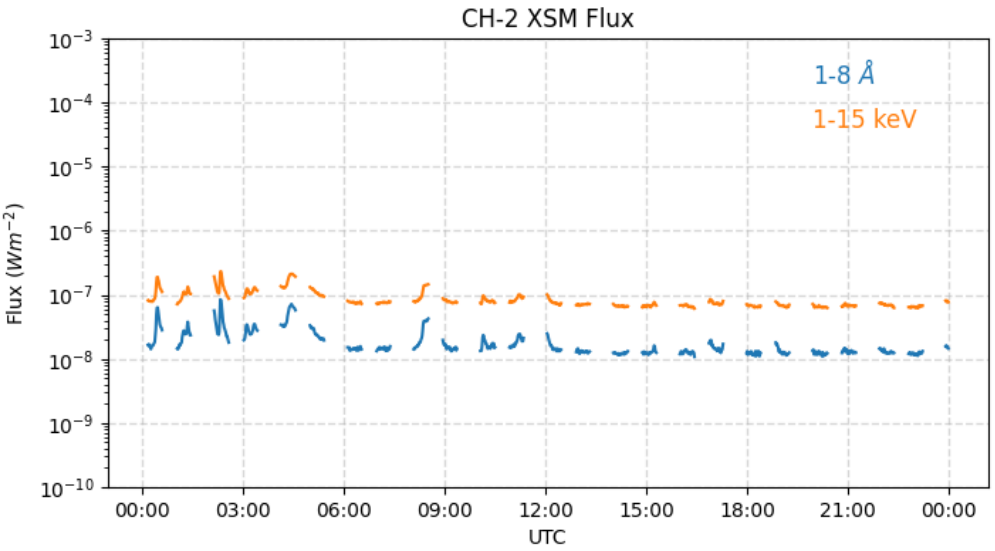
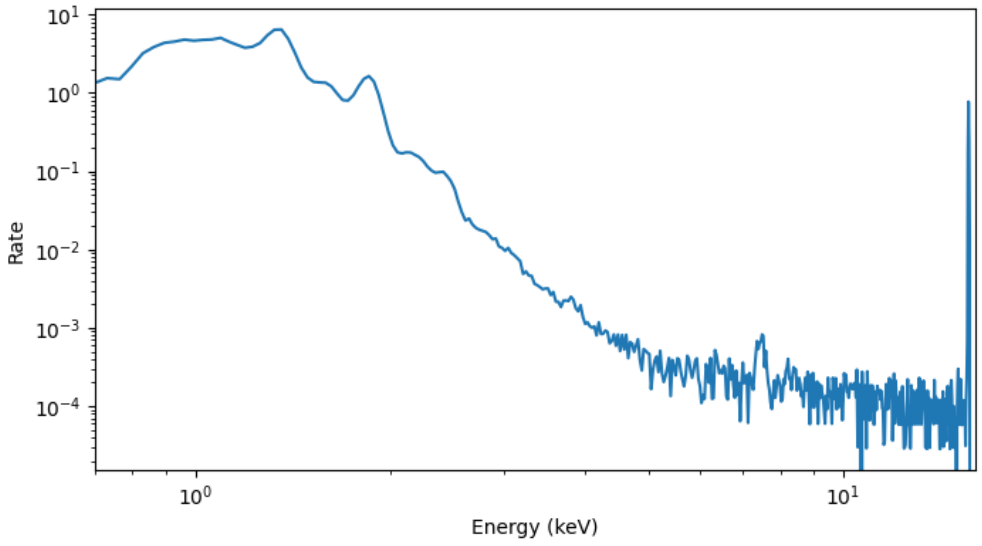




Date: 2020-08-12





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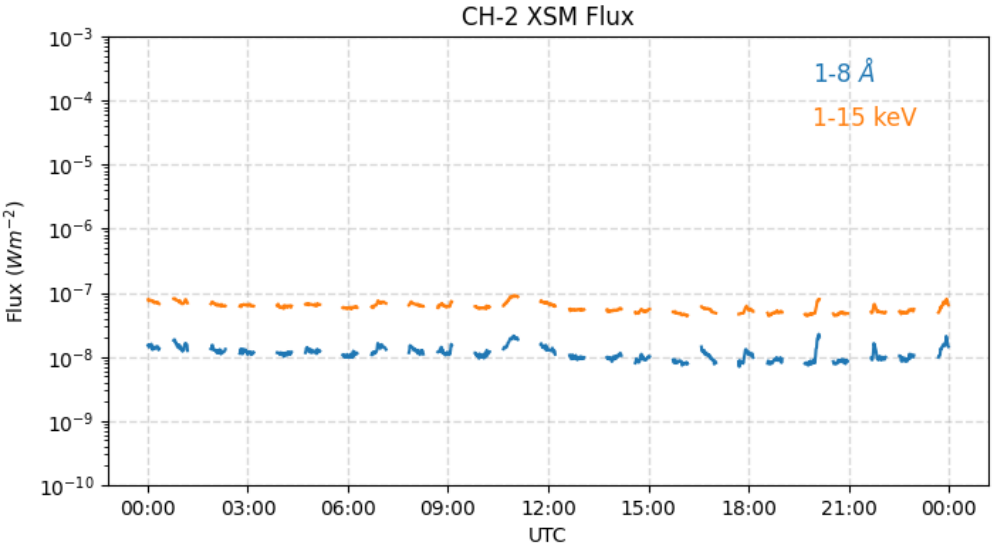
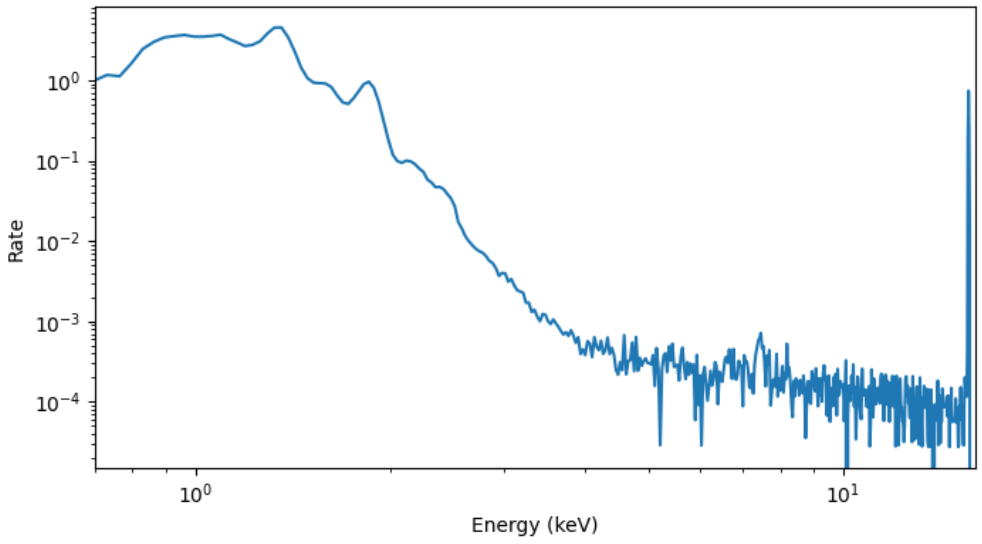
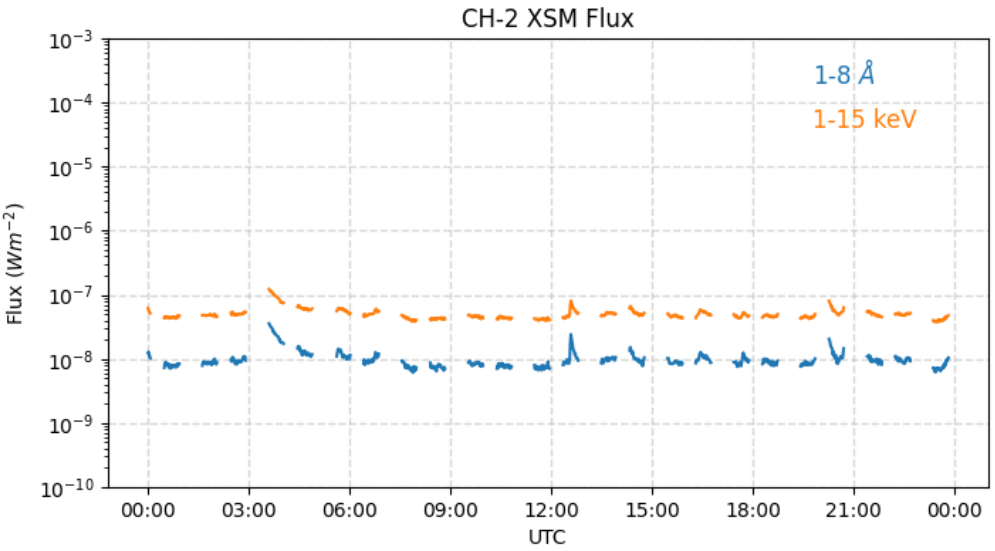
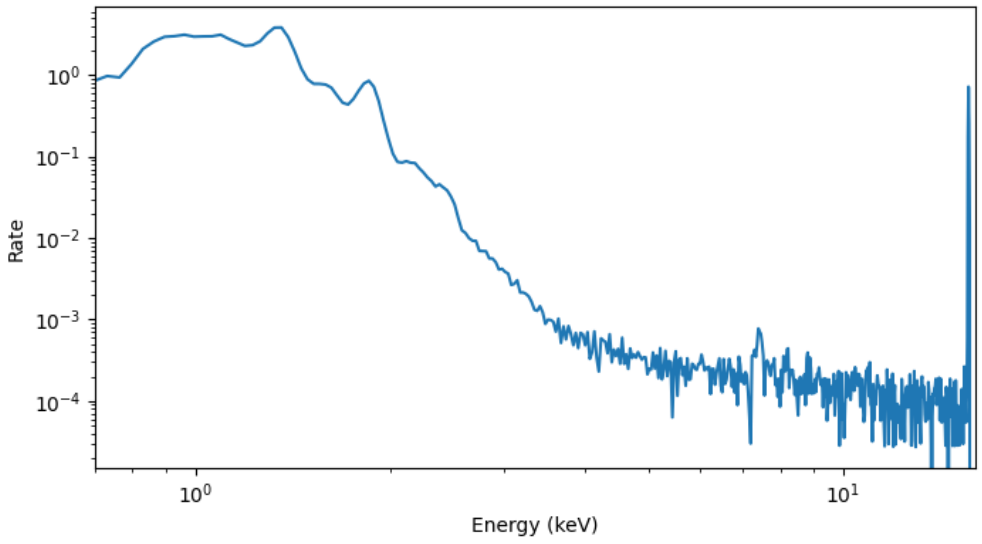




Date: 2020-08-14





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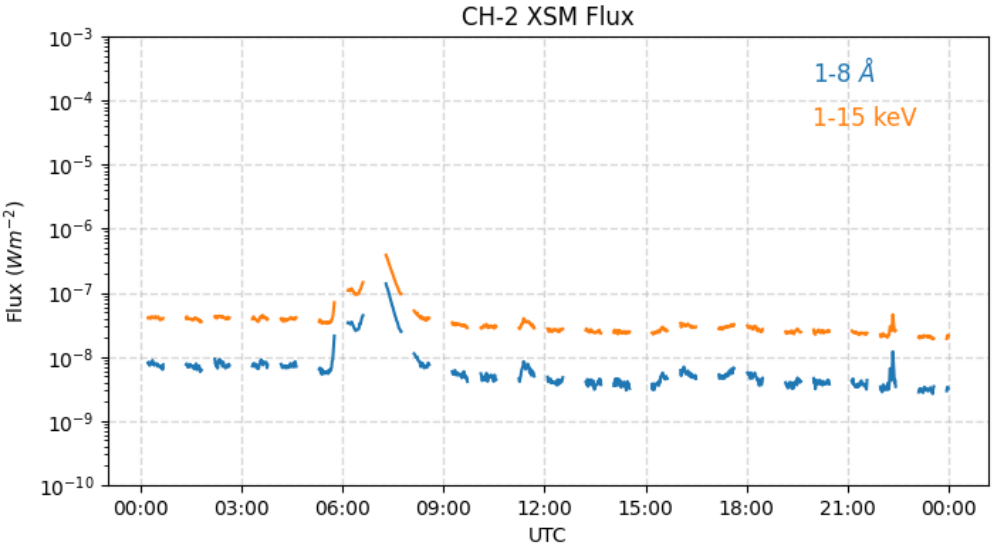

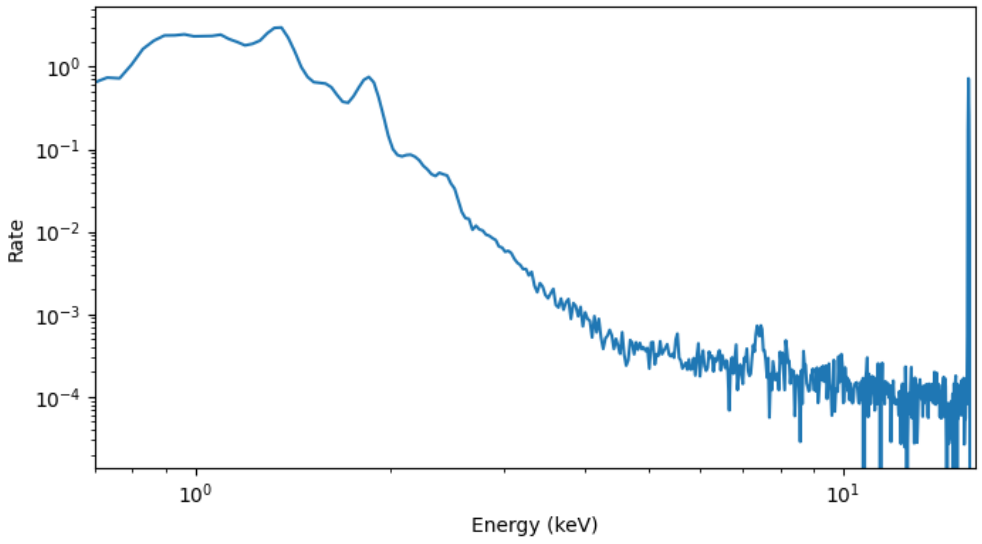

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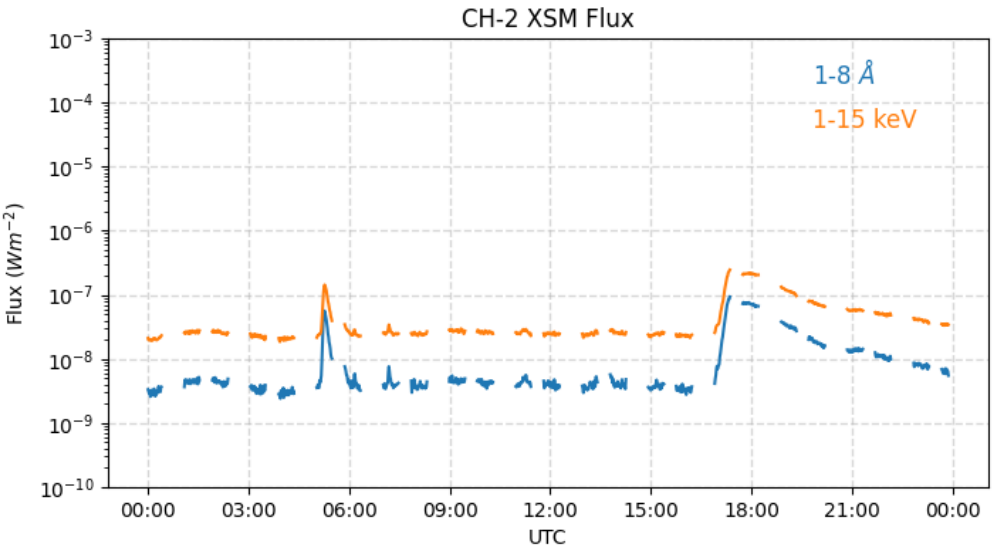

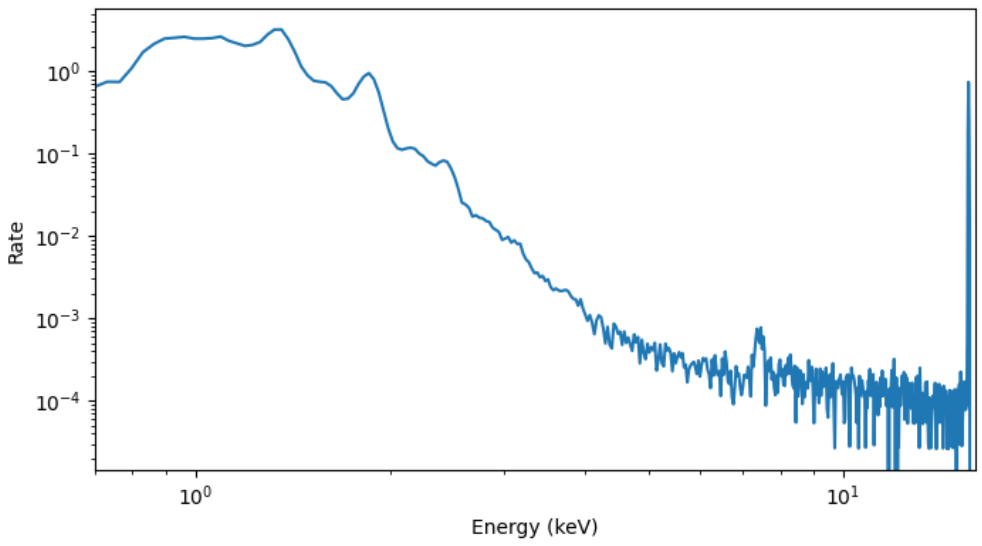

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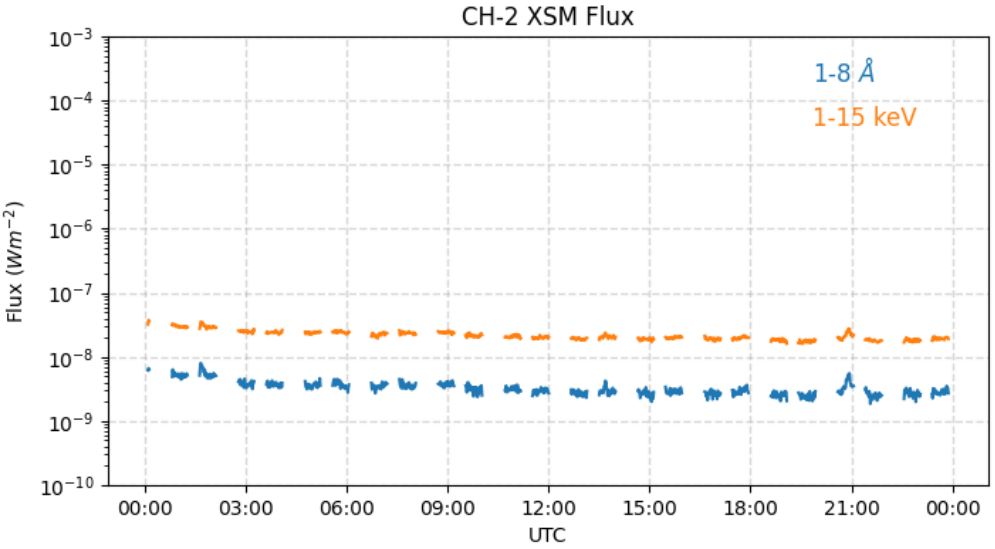

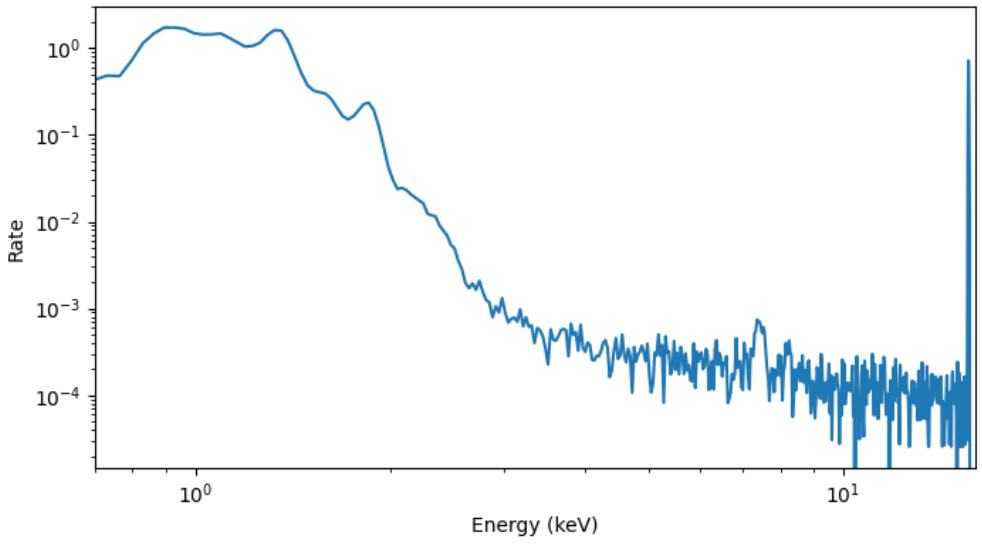

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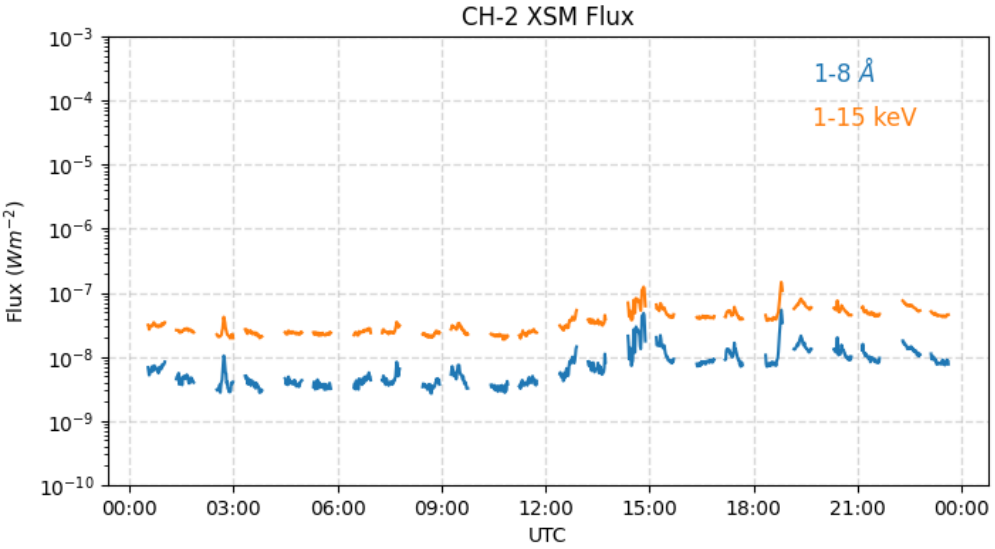

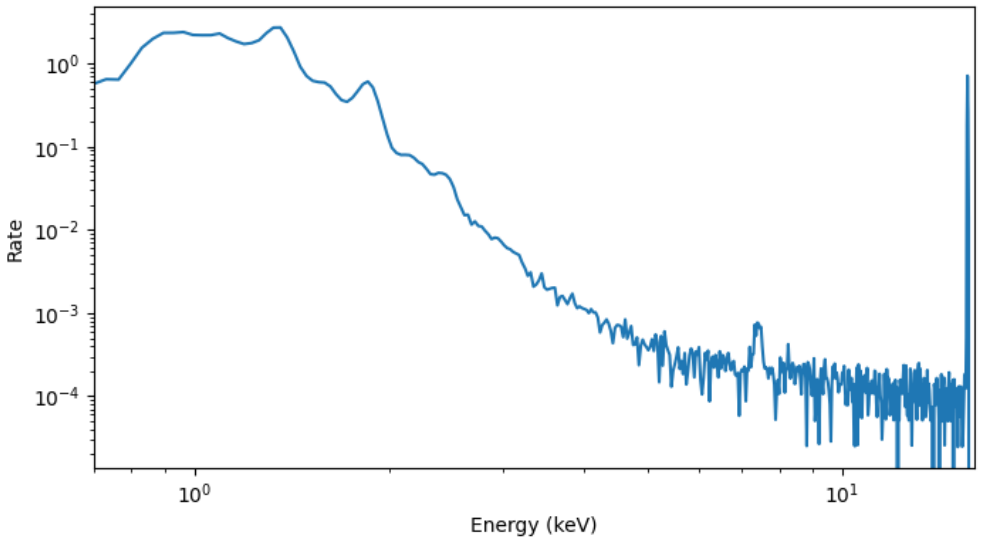

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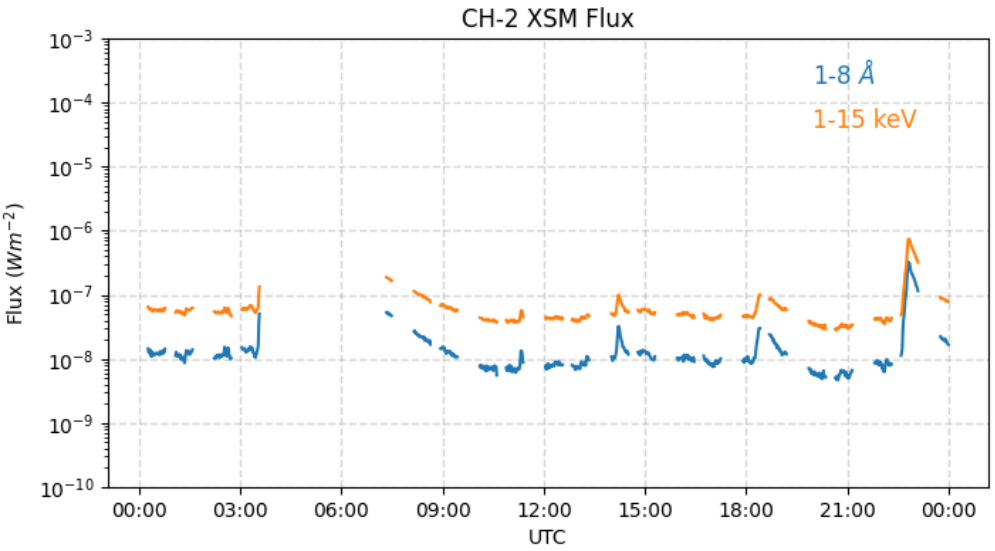

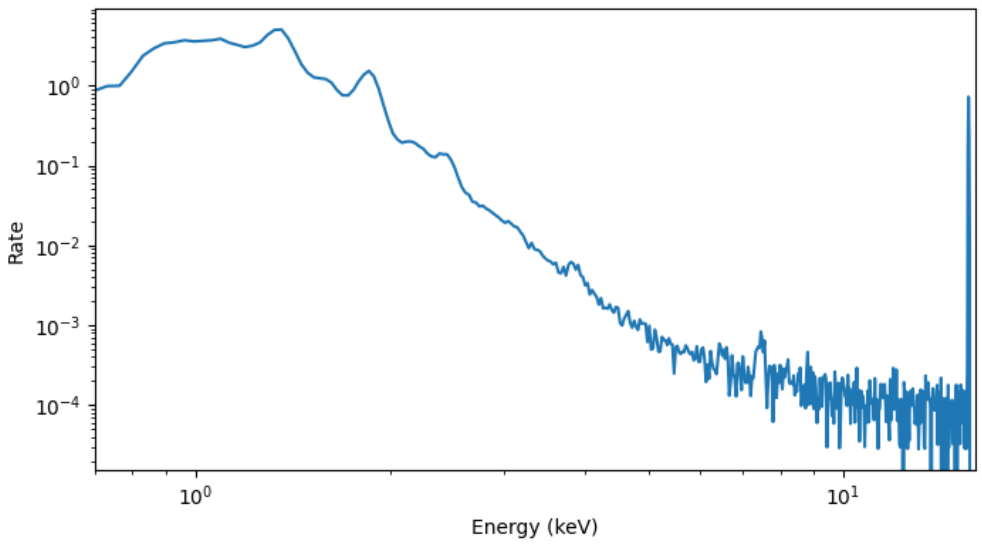

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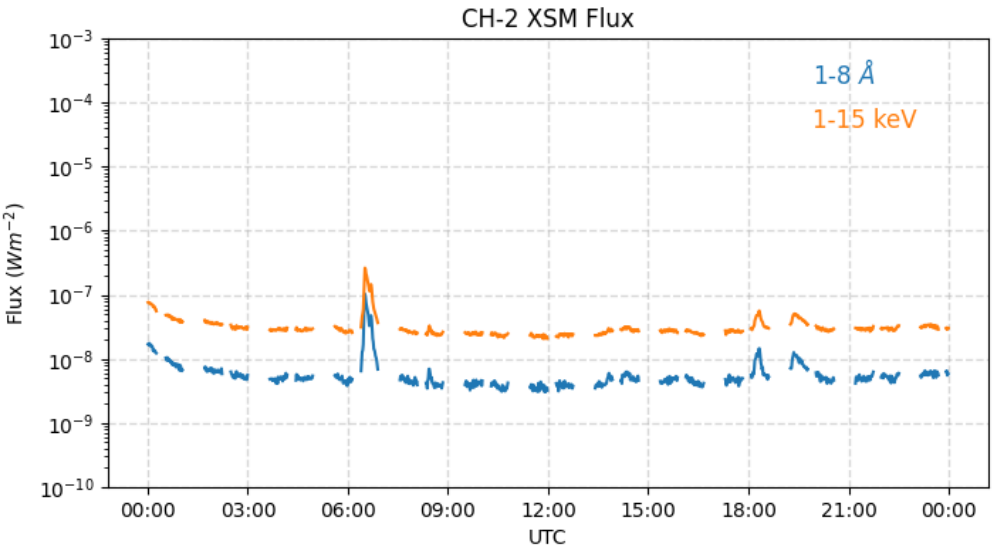

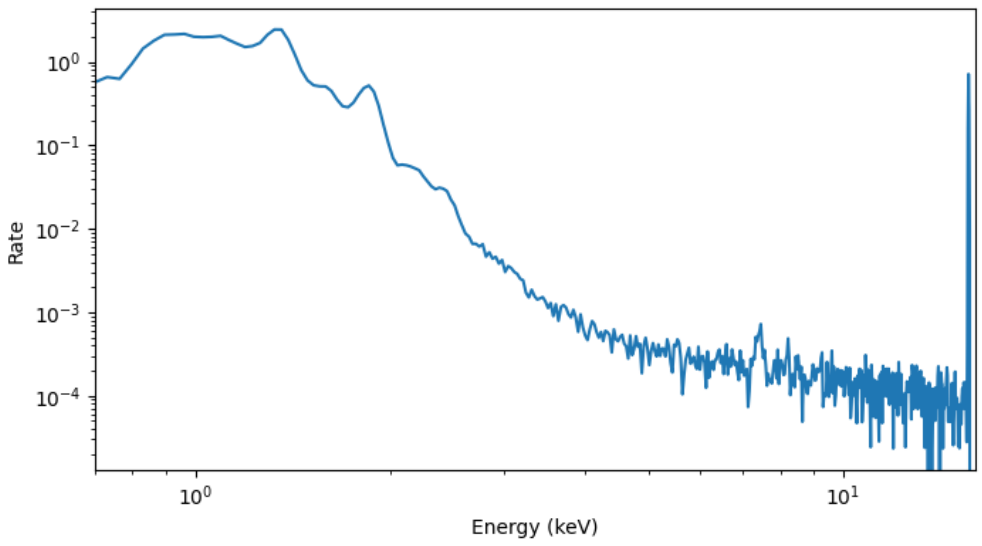

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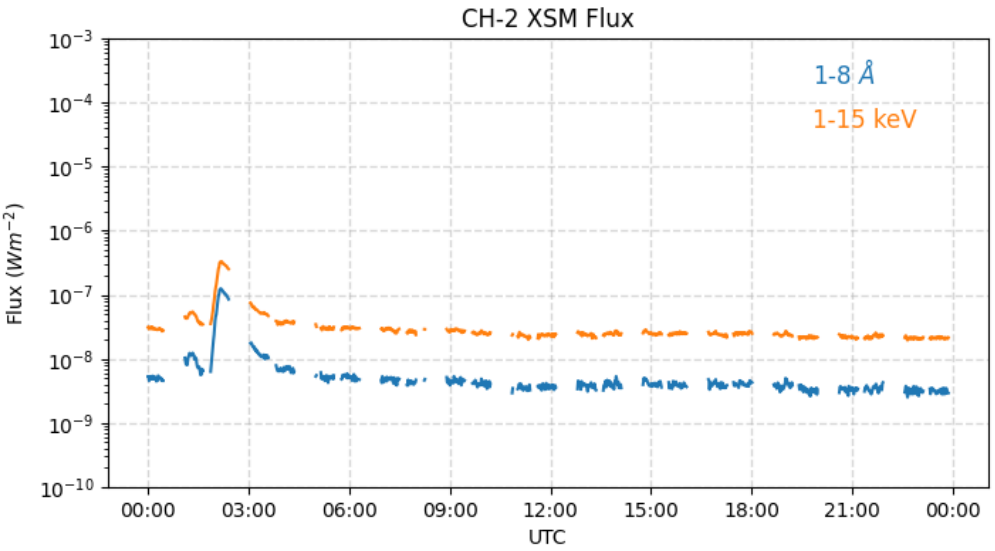
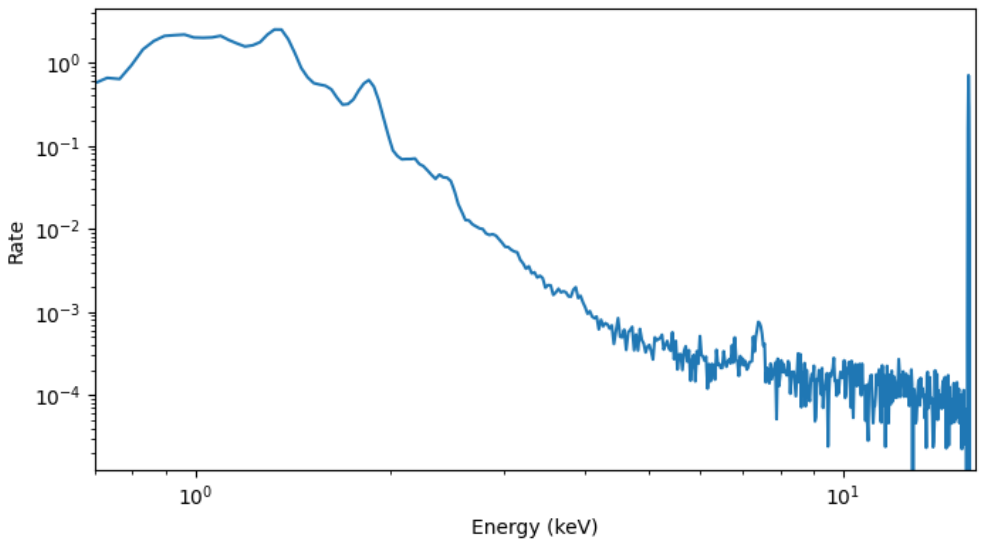
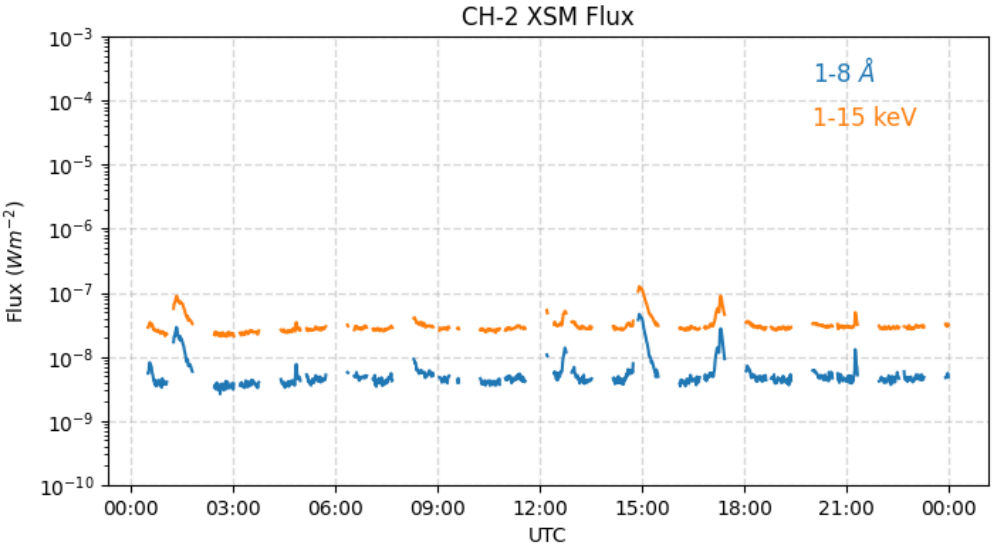
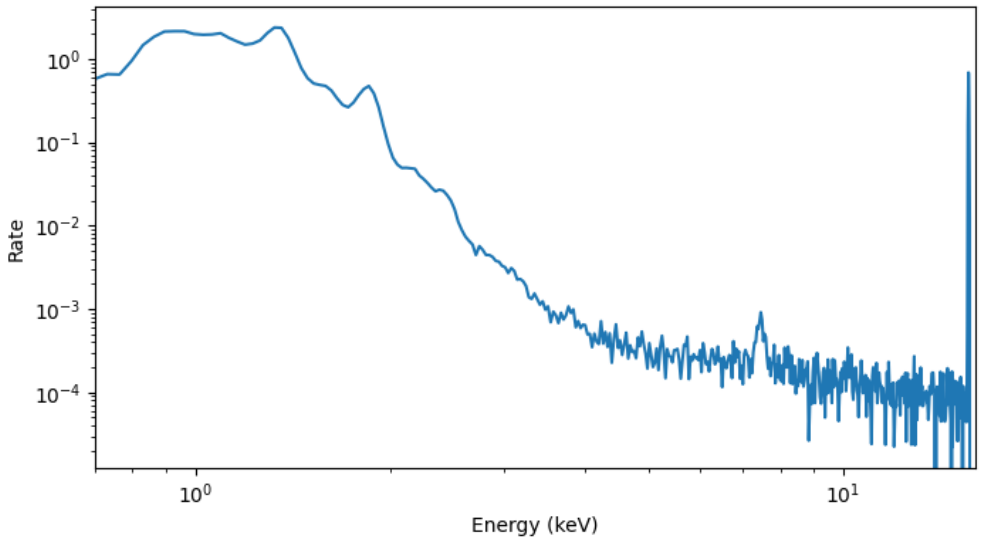




Date: 2020-08-22





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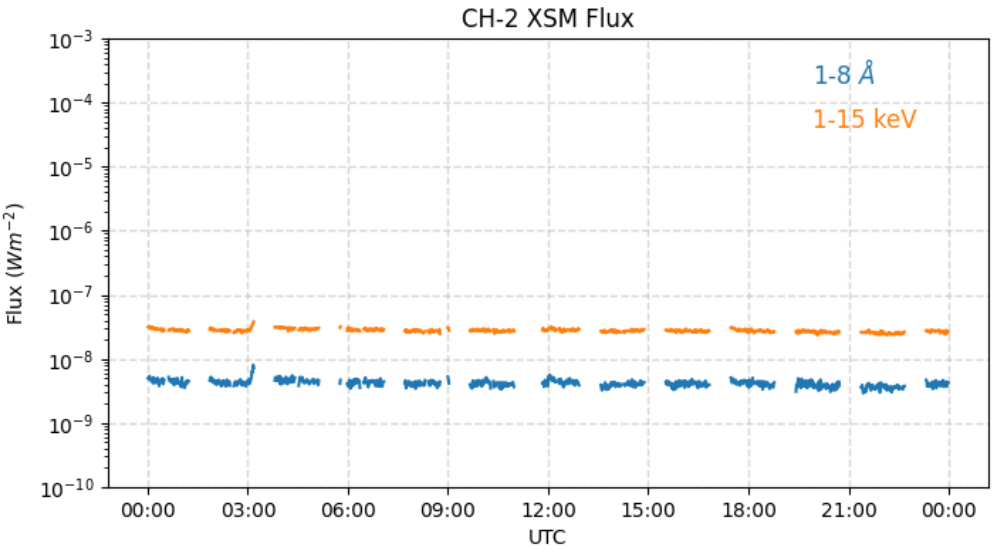

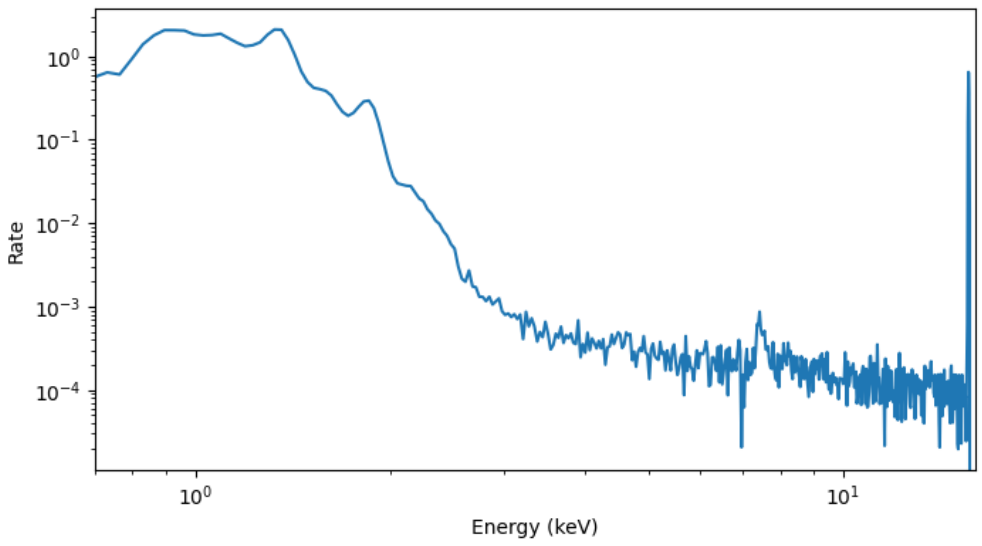

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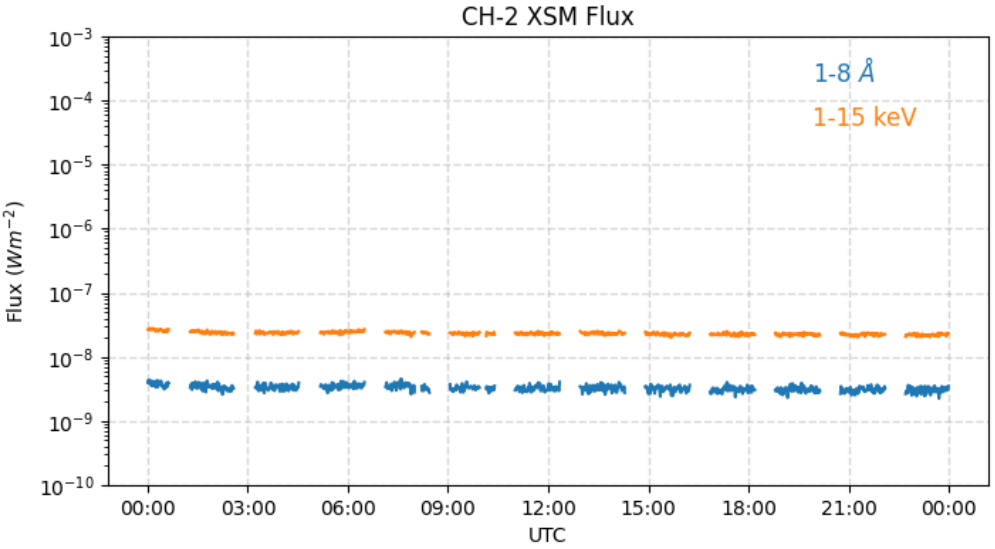

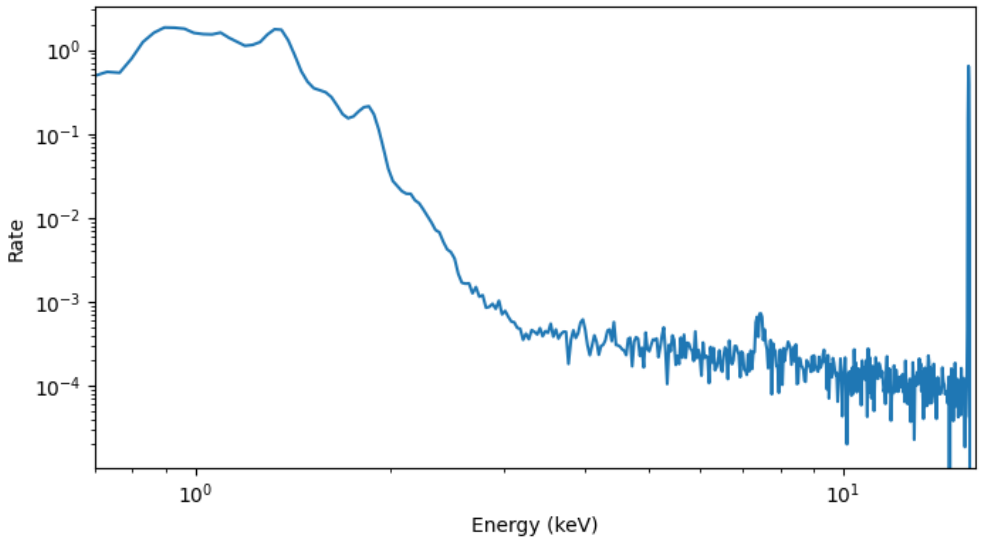

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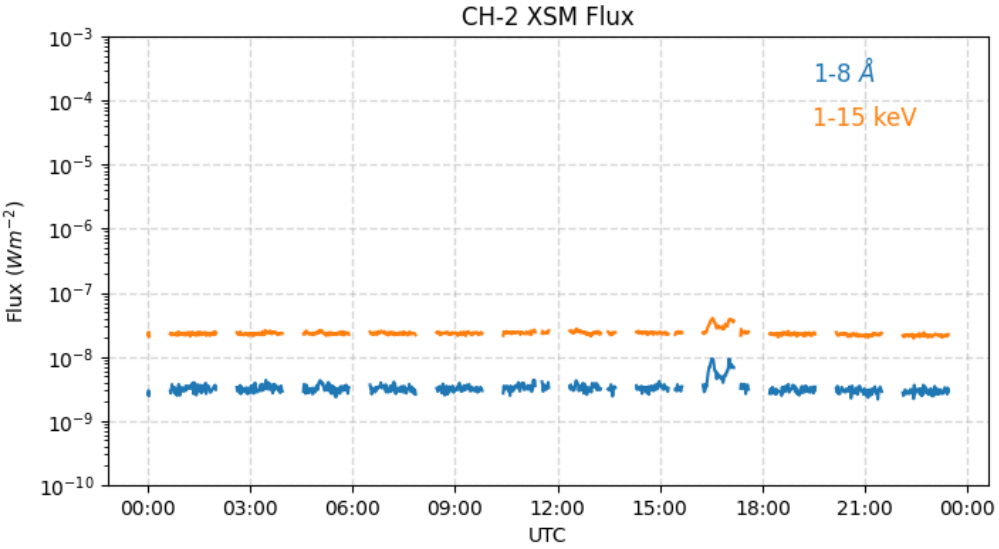

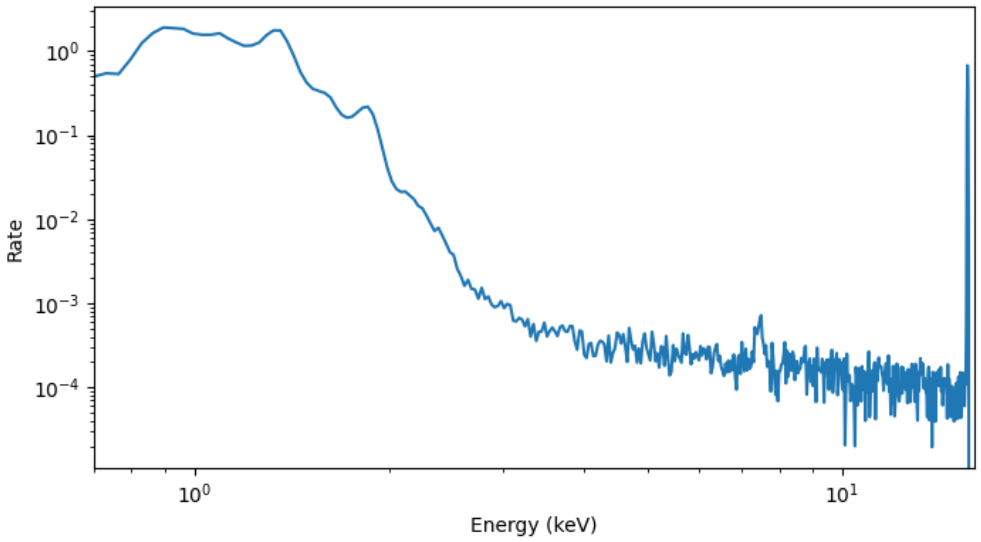

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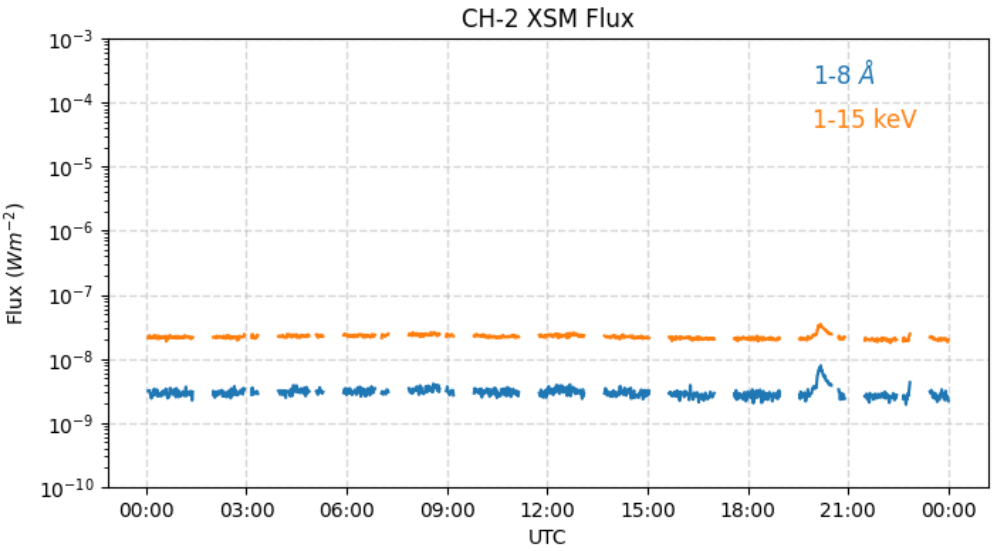

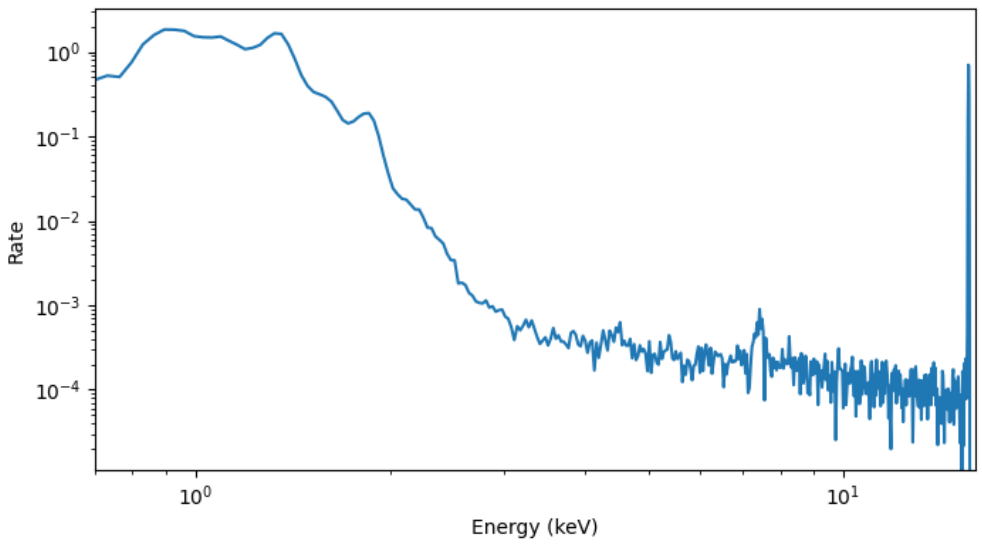

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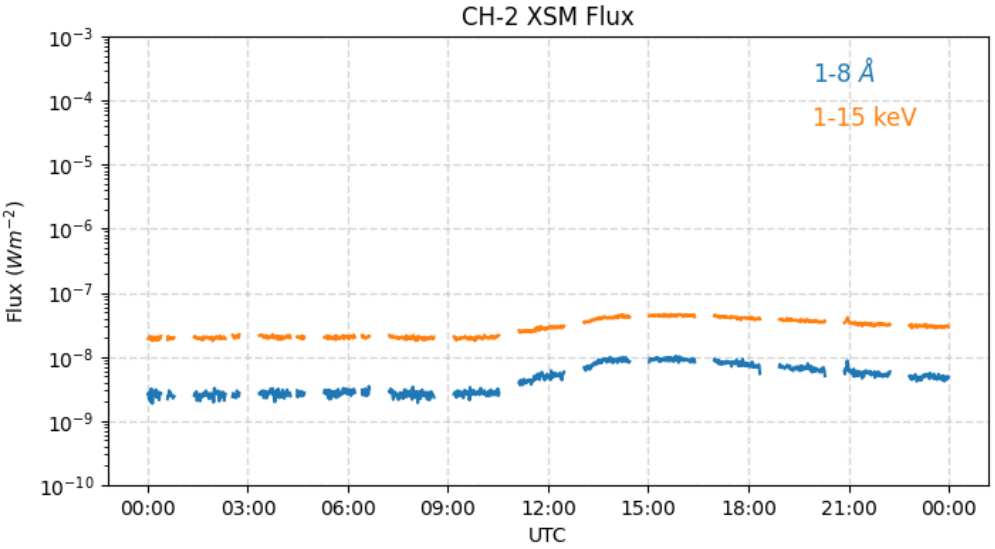

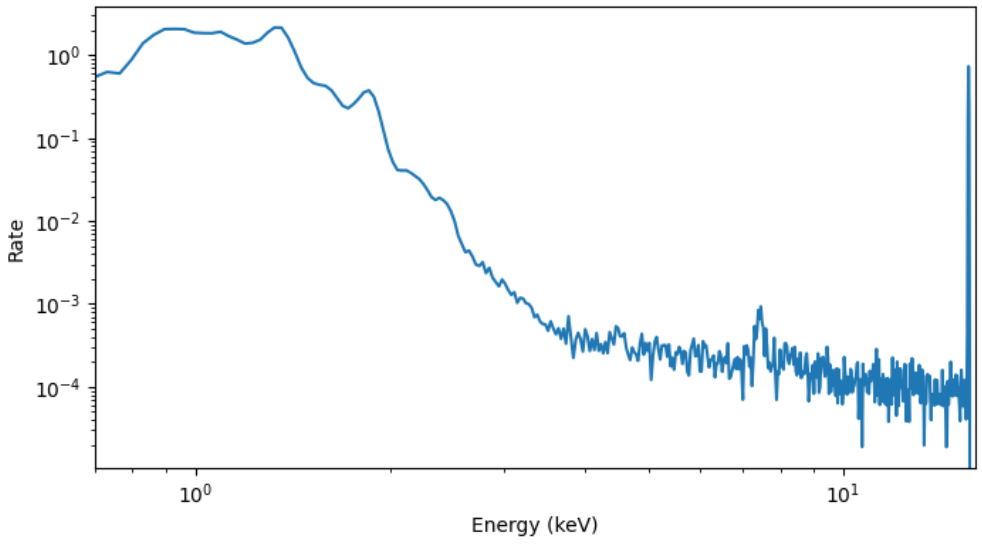

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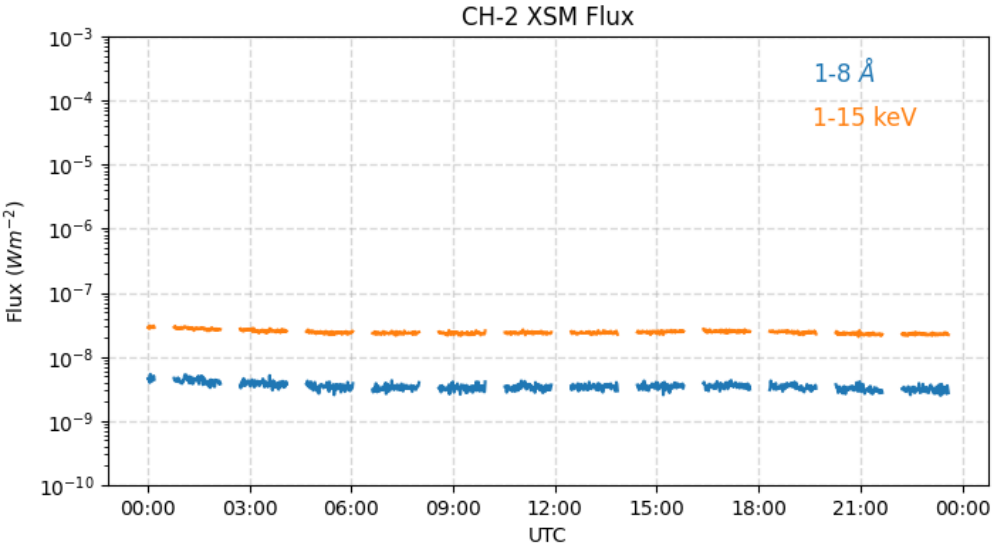

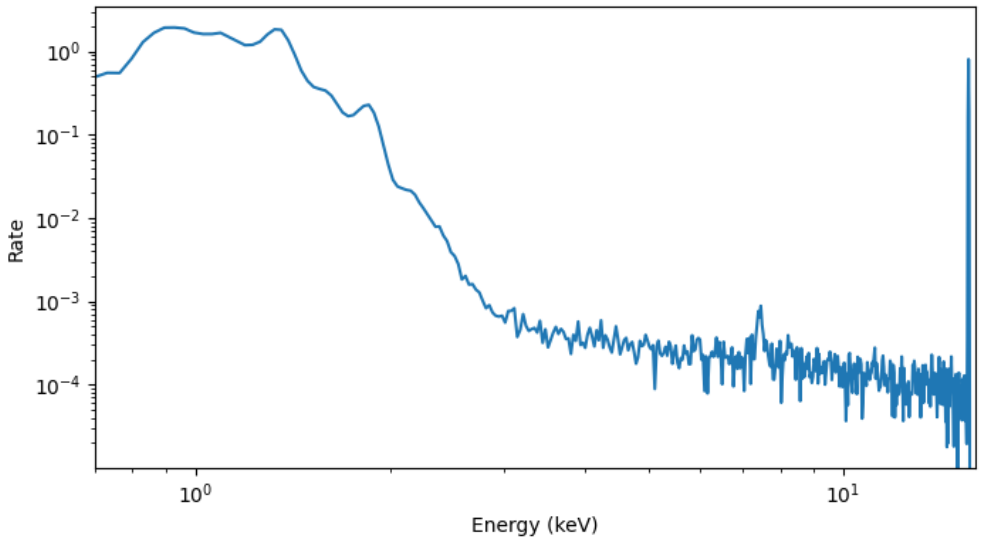

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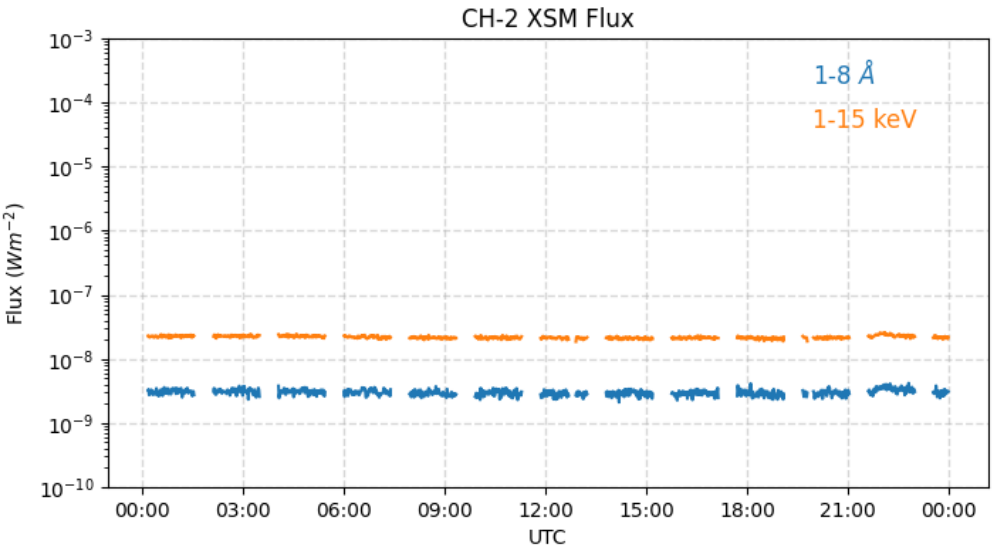
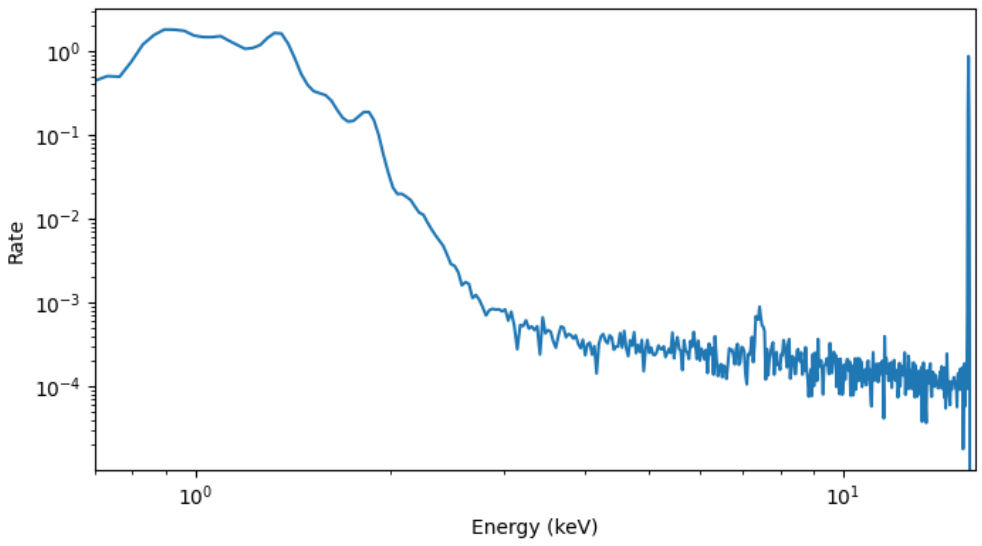
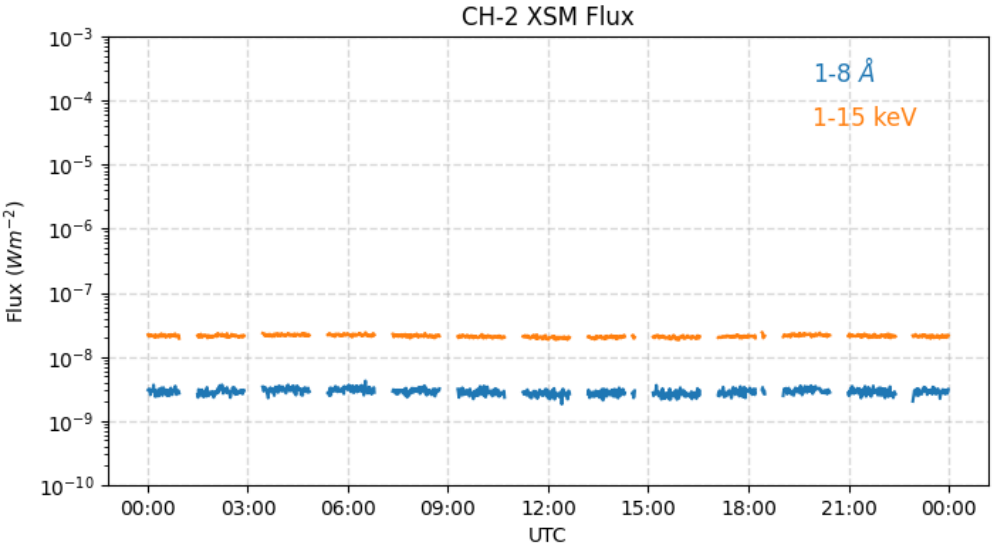
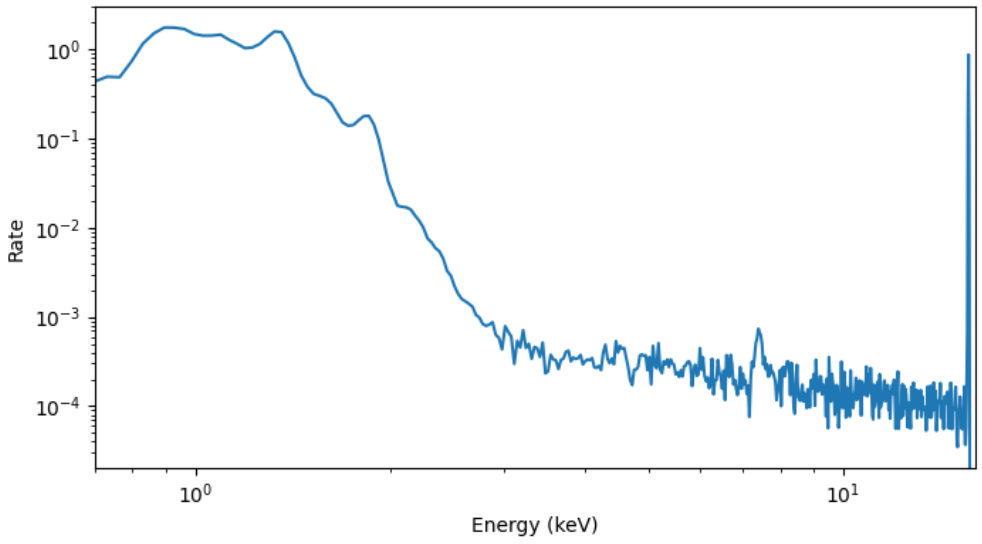


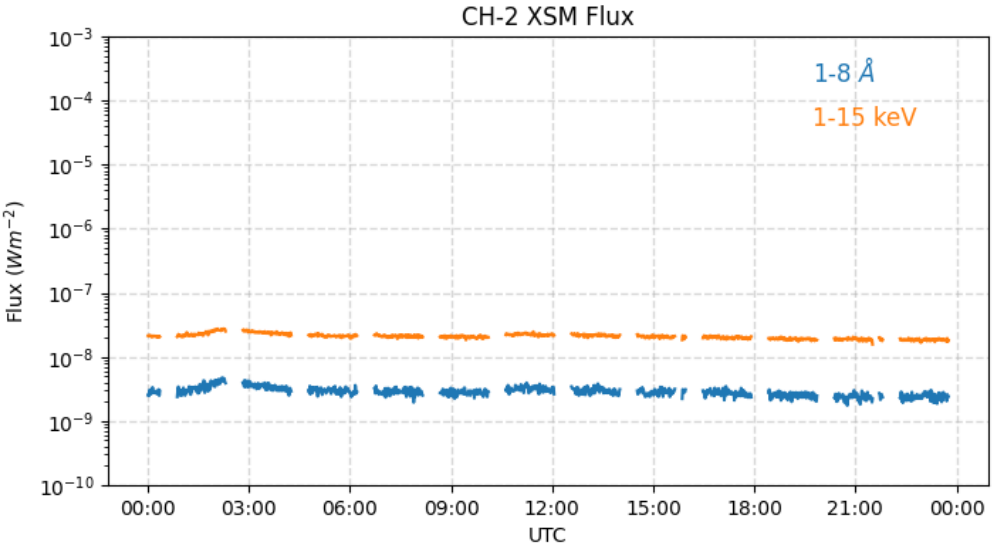


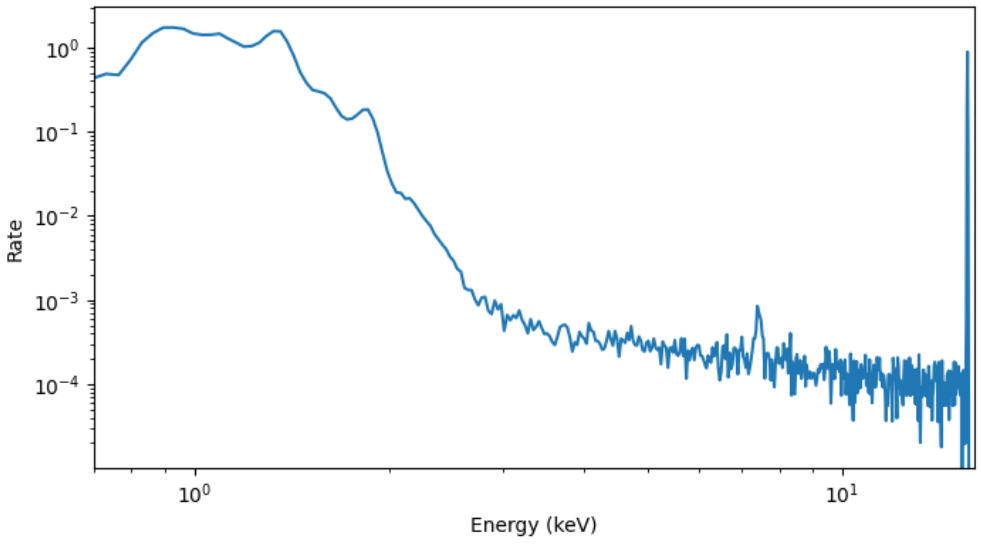
Date: 2020-08-30





Date: 2020-08-31





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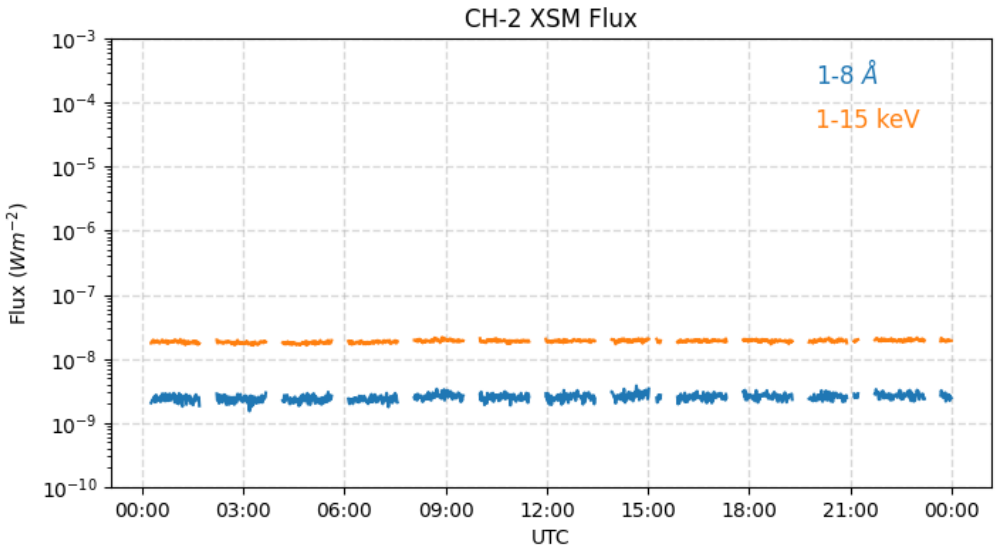
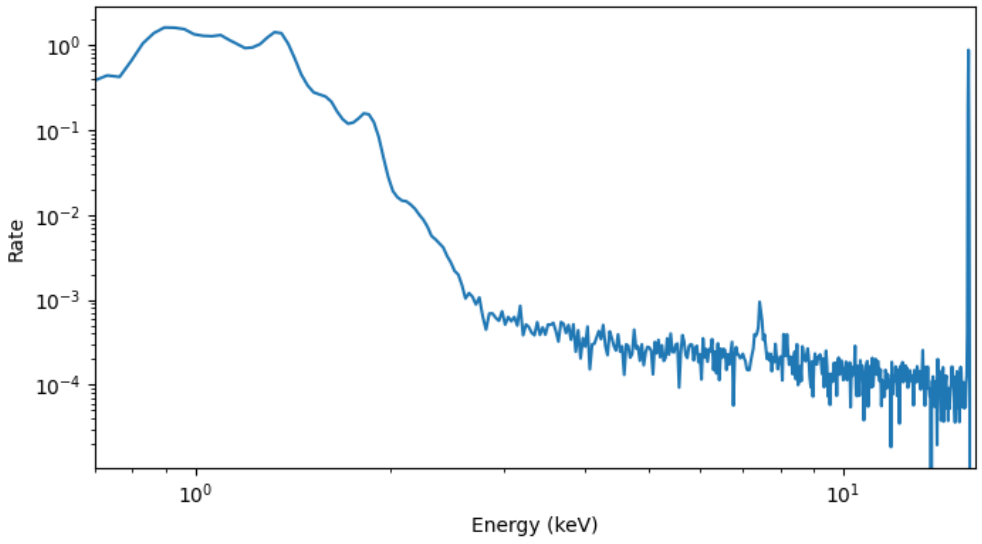
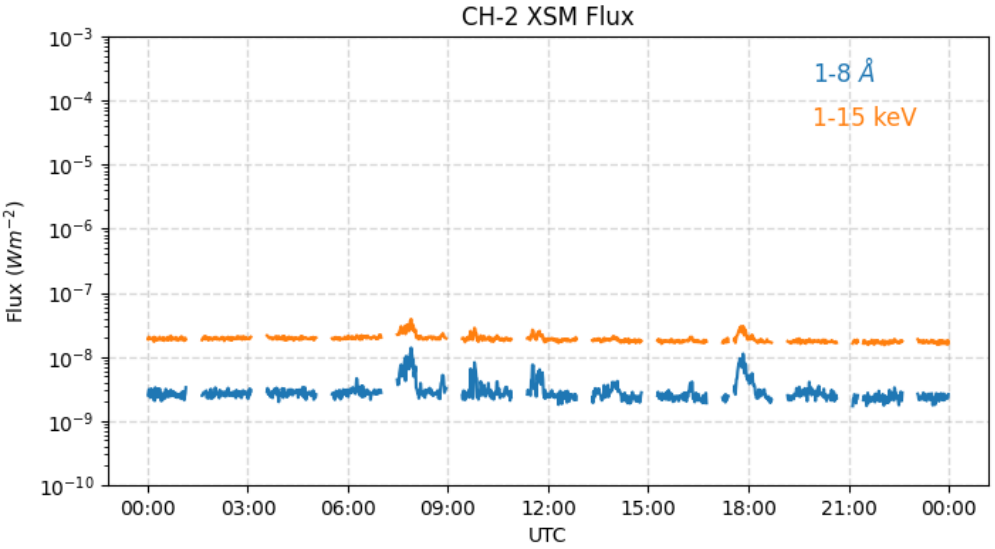
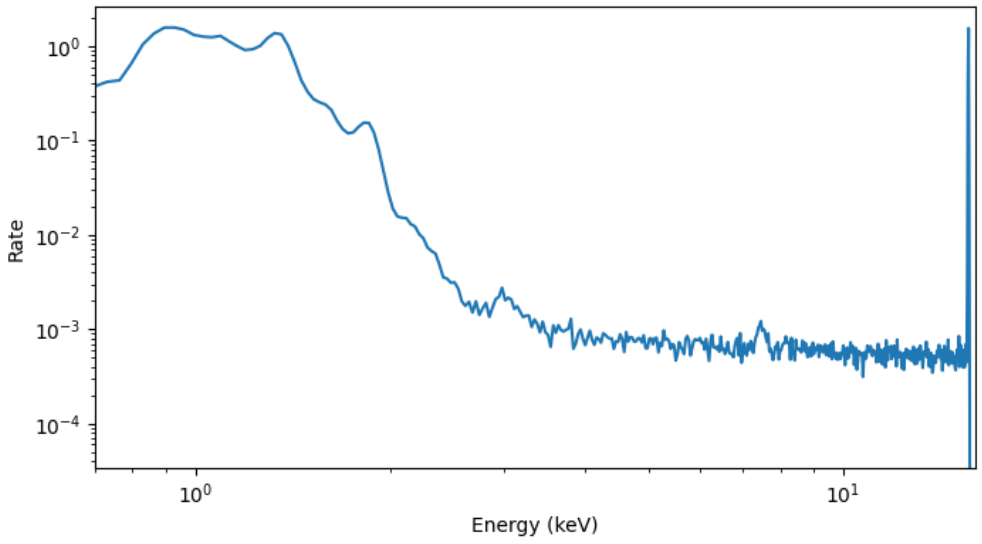




Date: 2020-09-02





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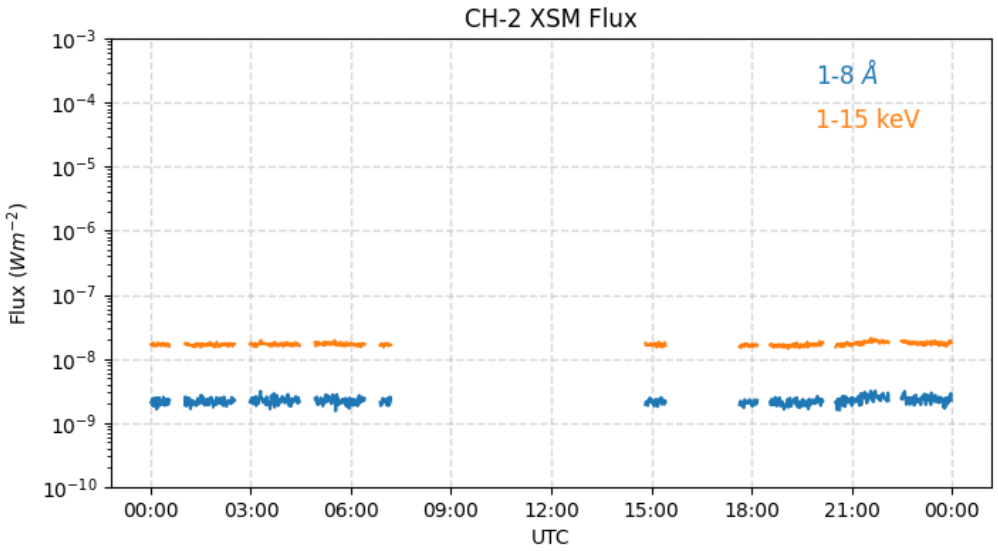

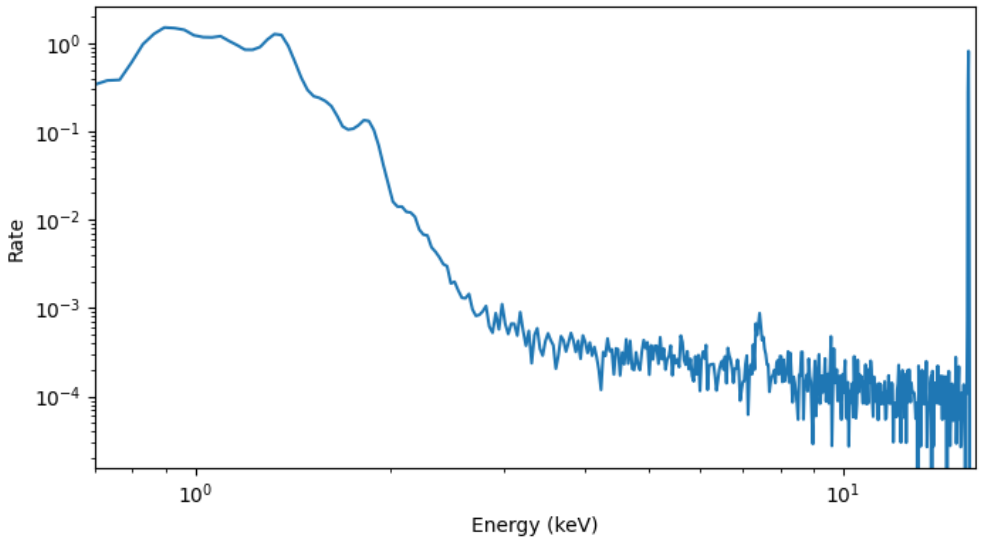

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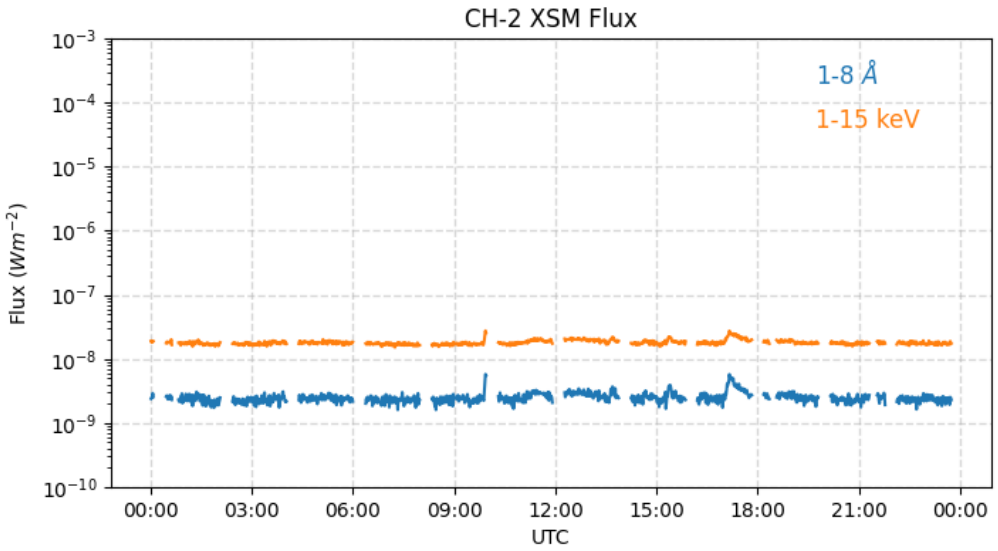

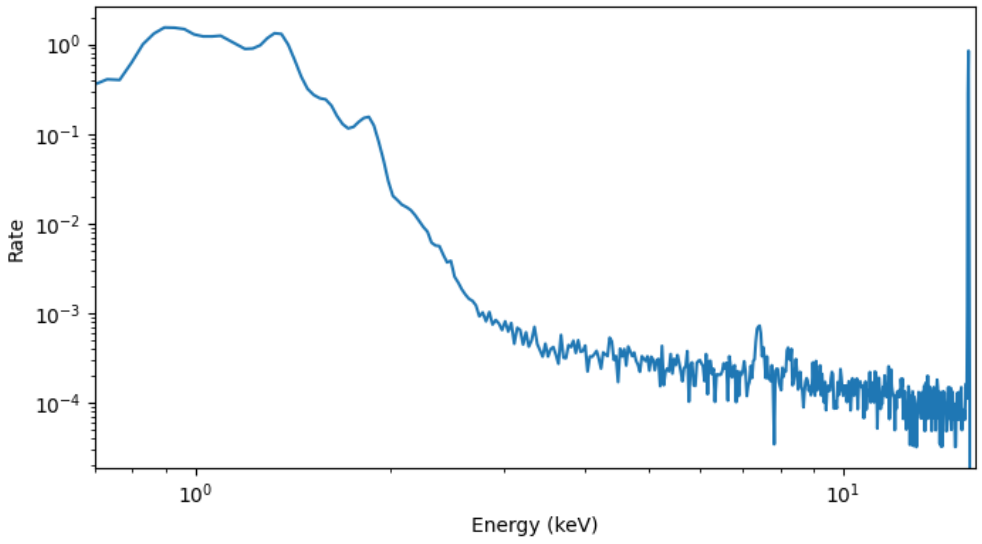

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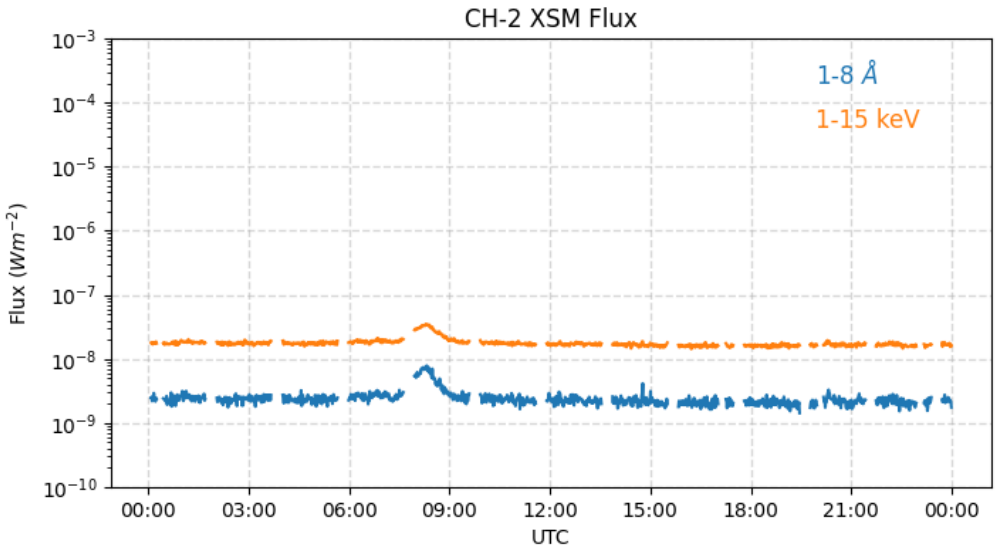

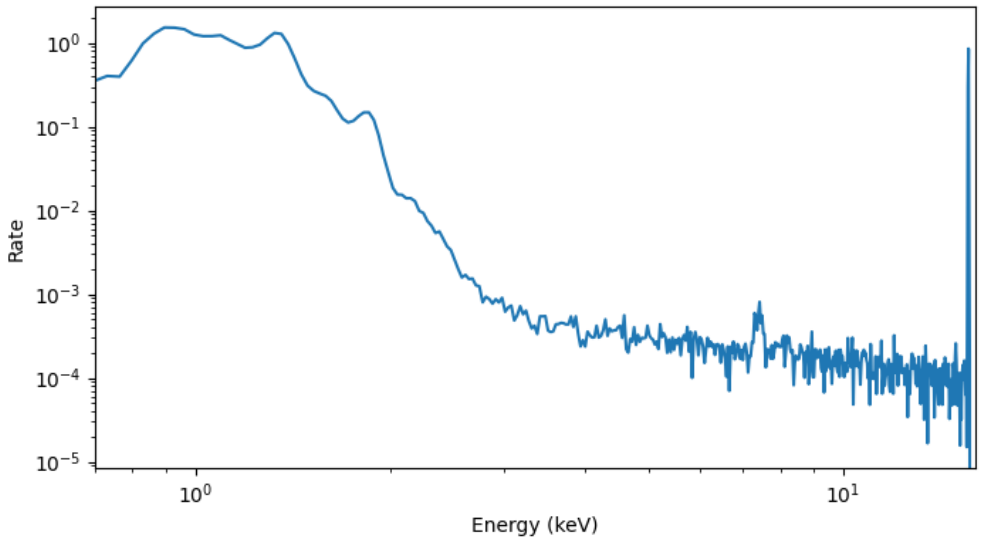

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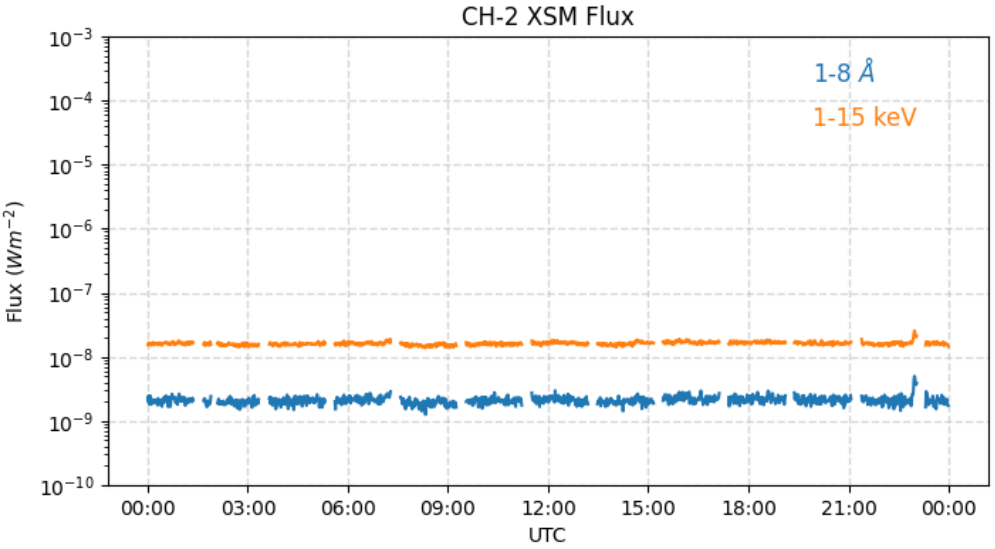

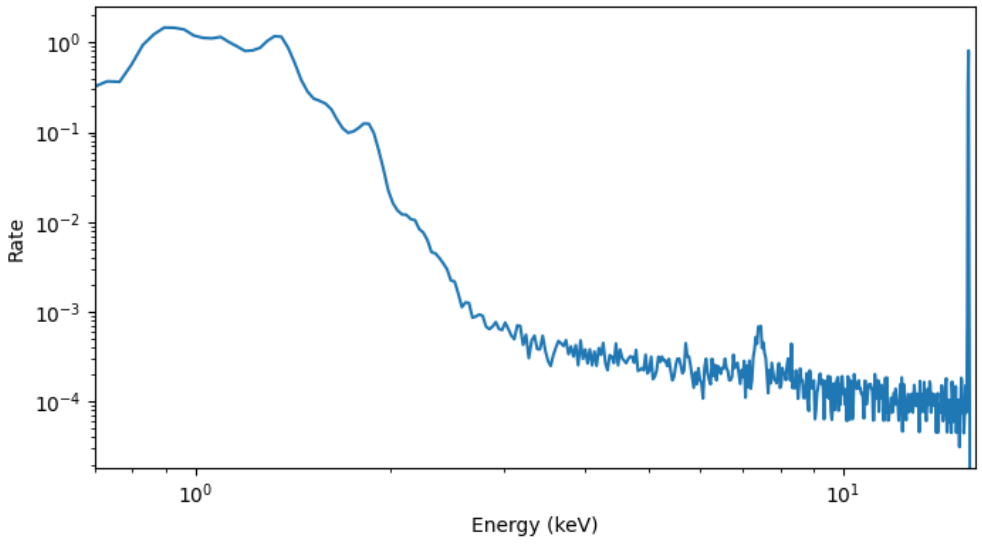

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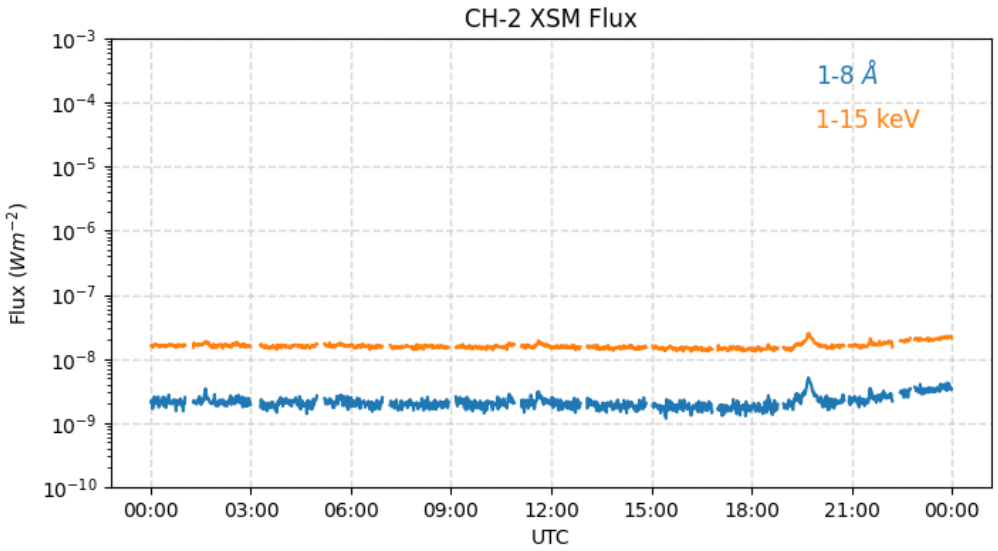

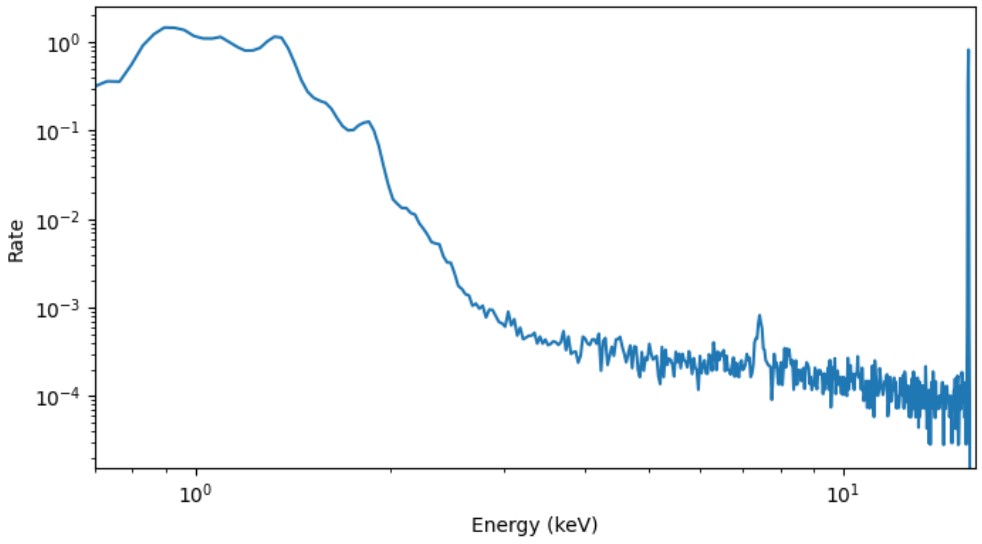

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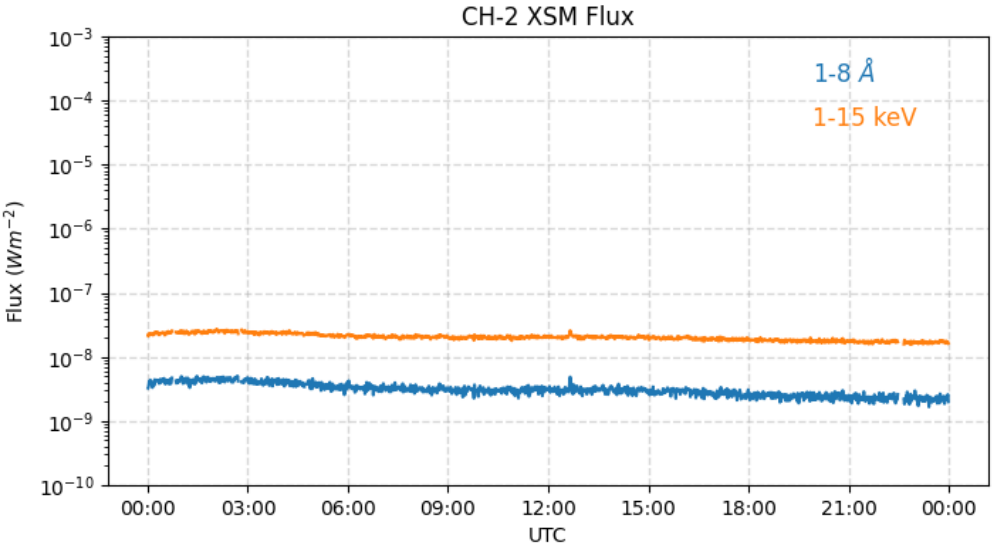

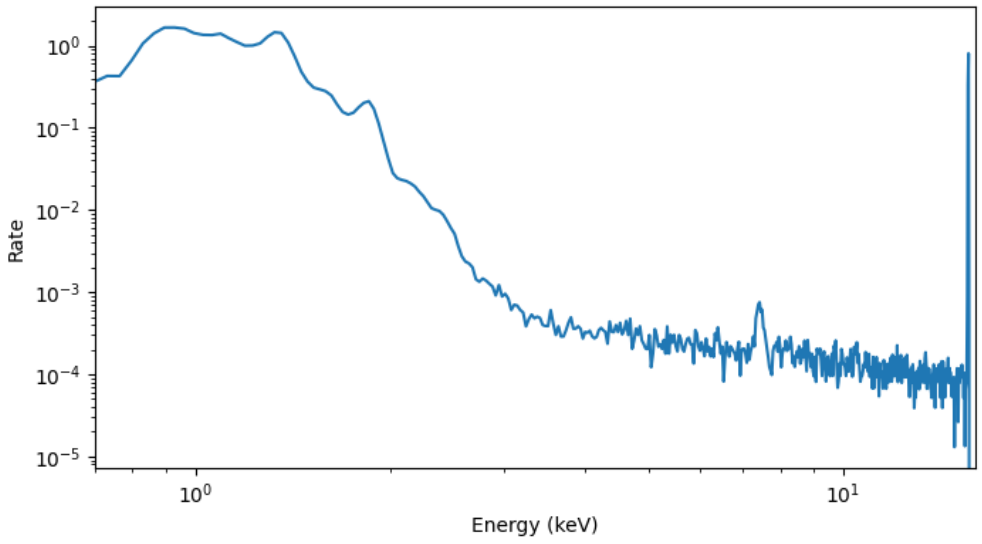

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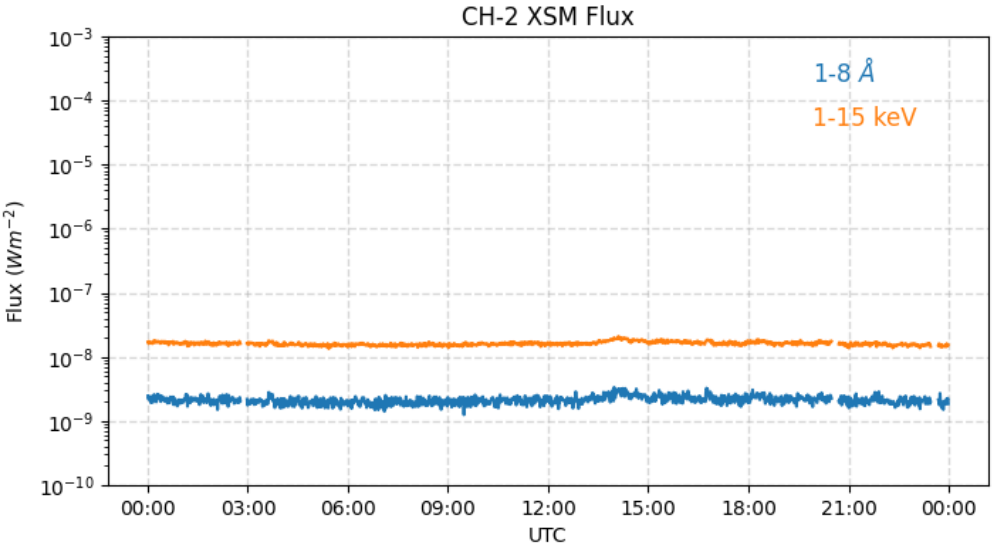

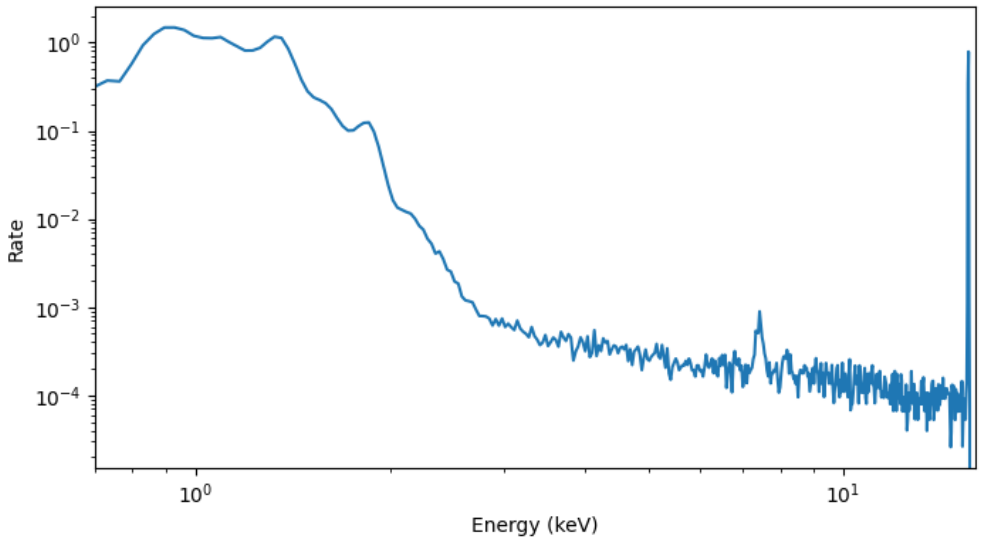

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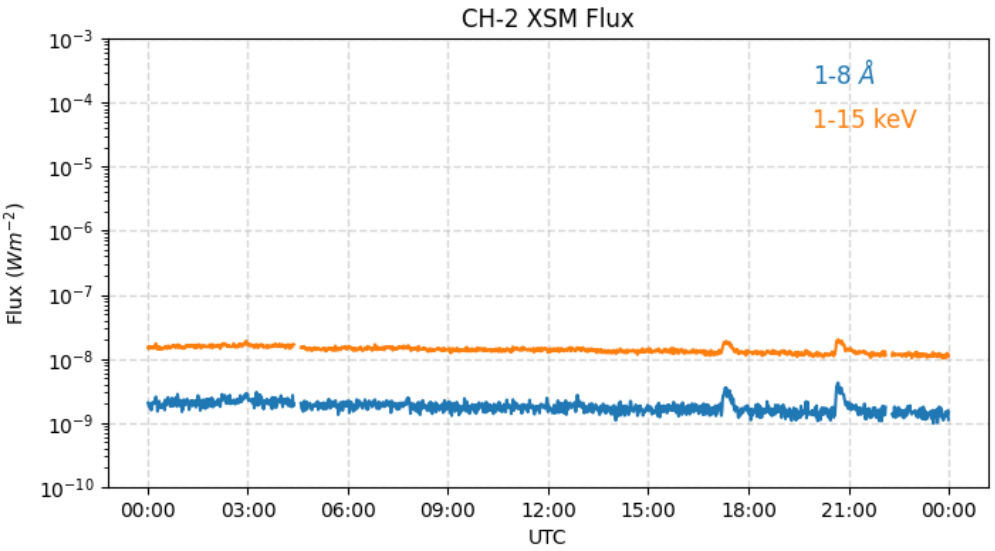

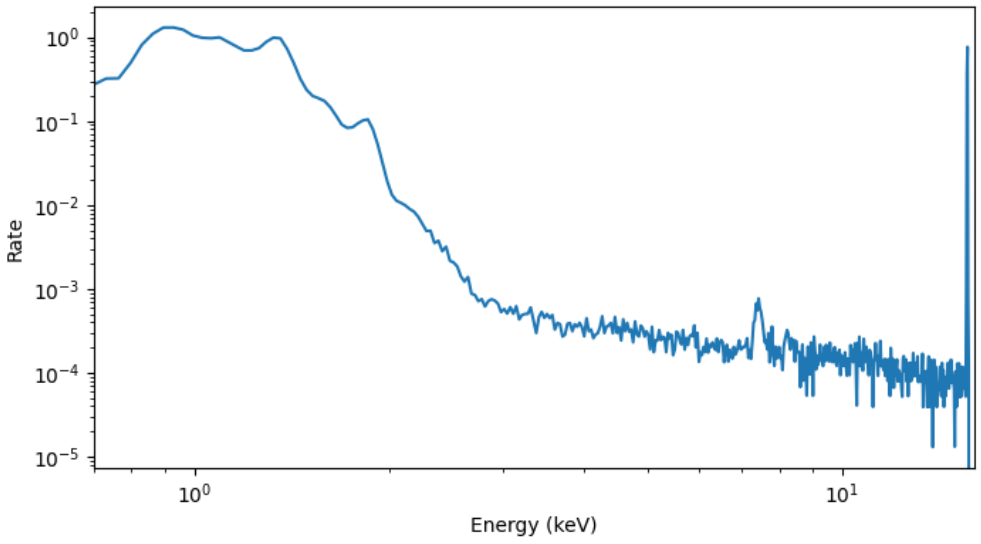

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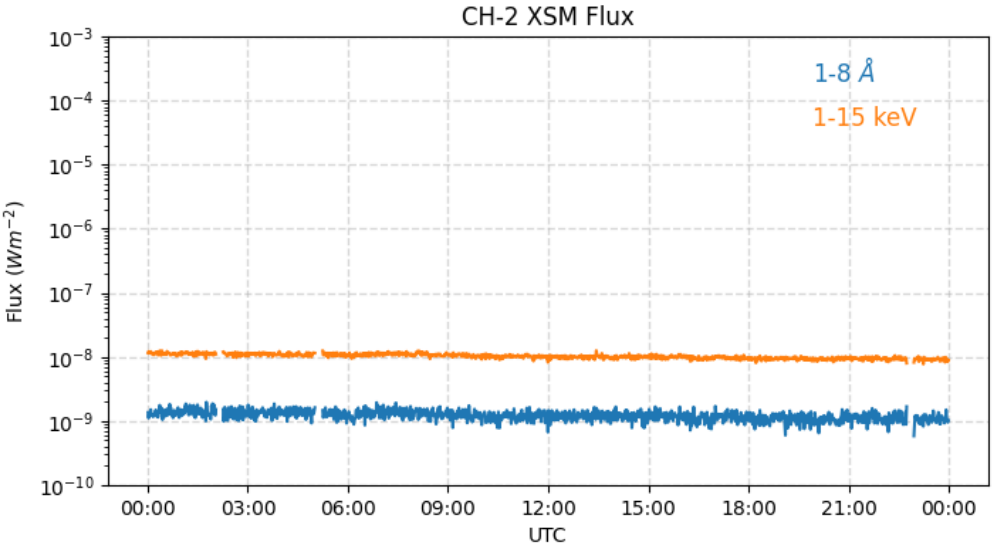

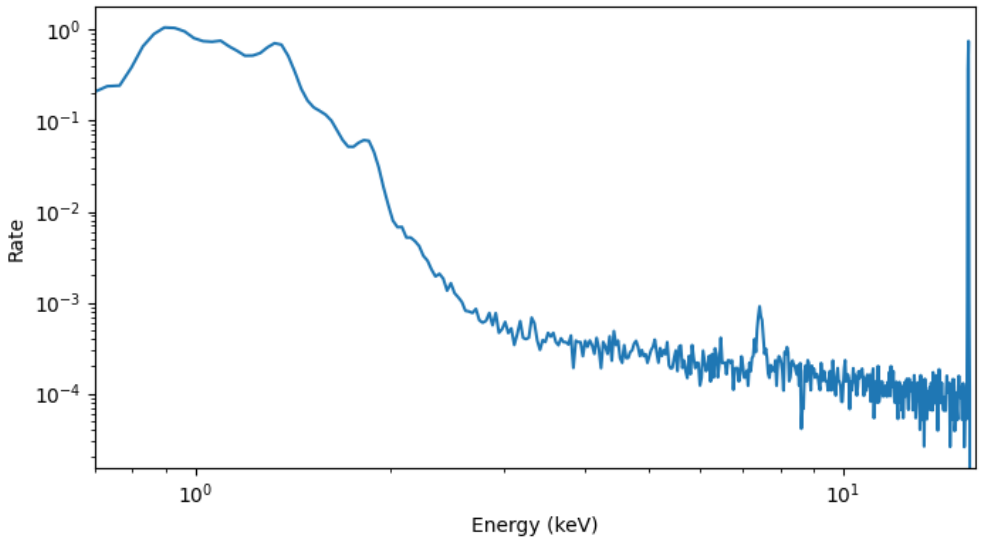

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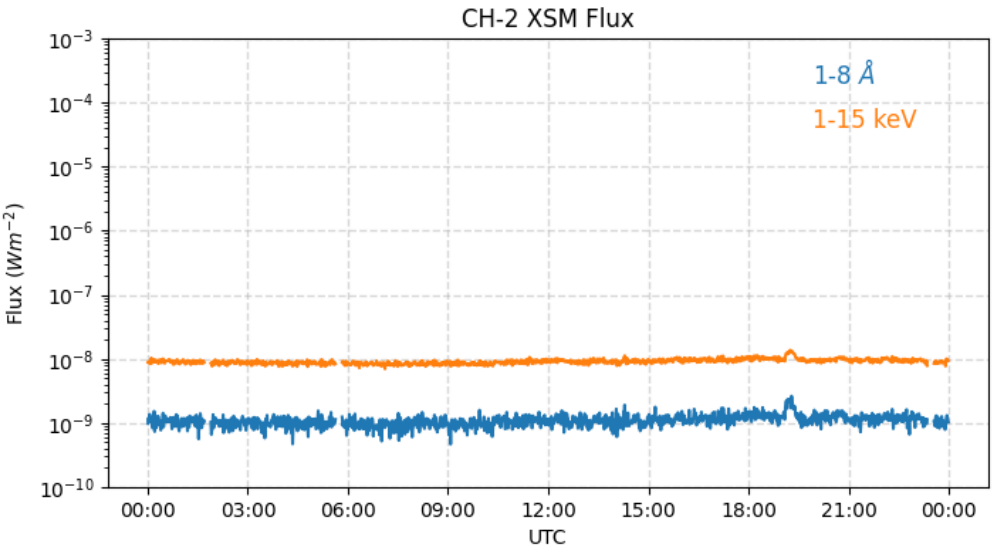

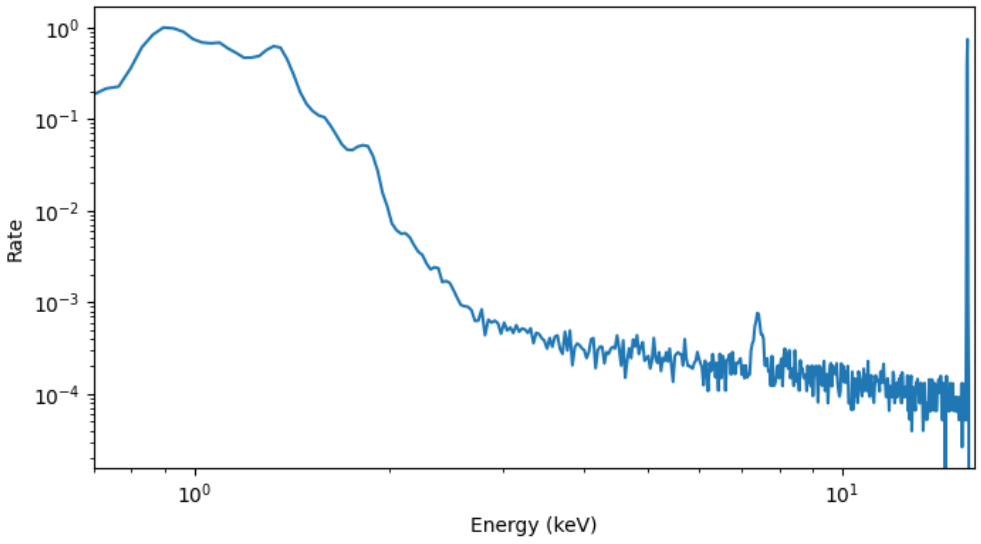

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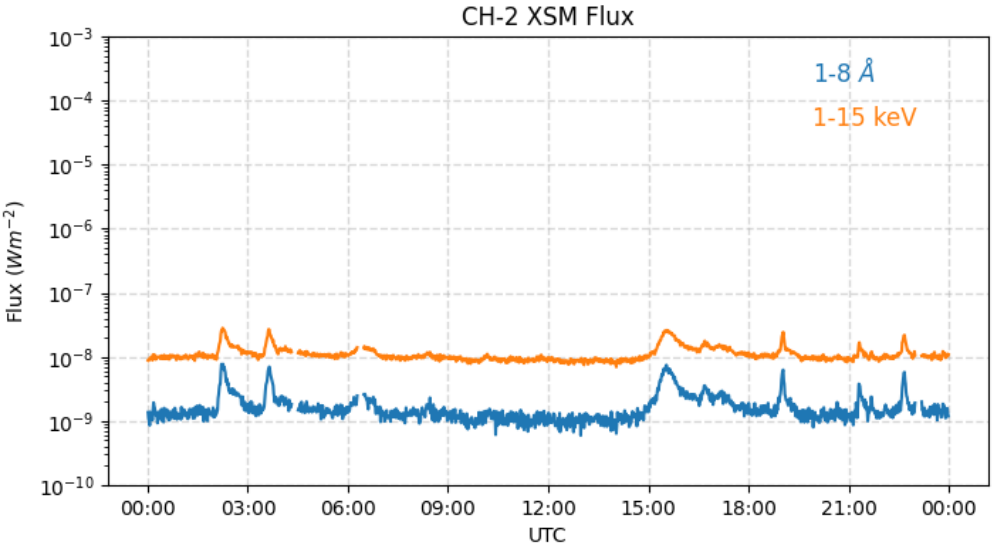

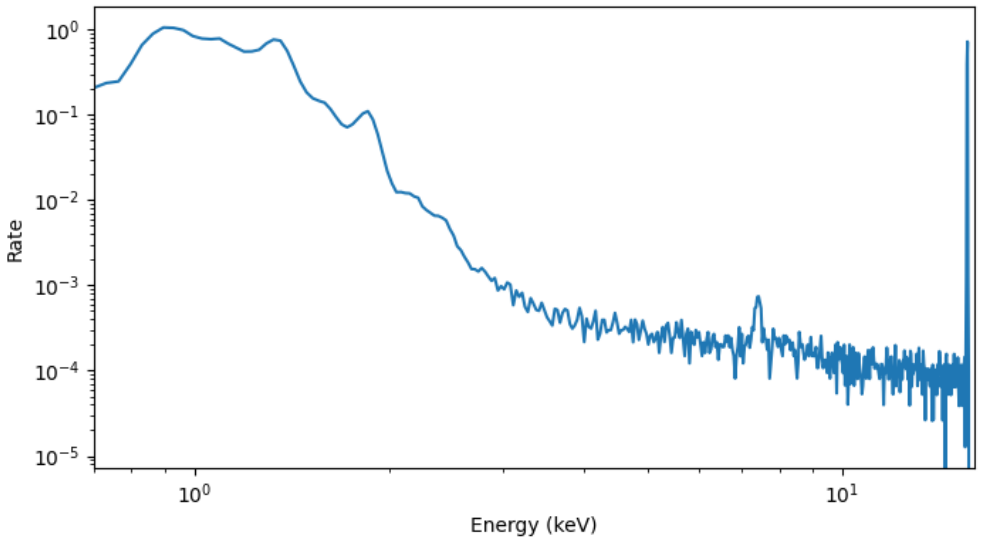

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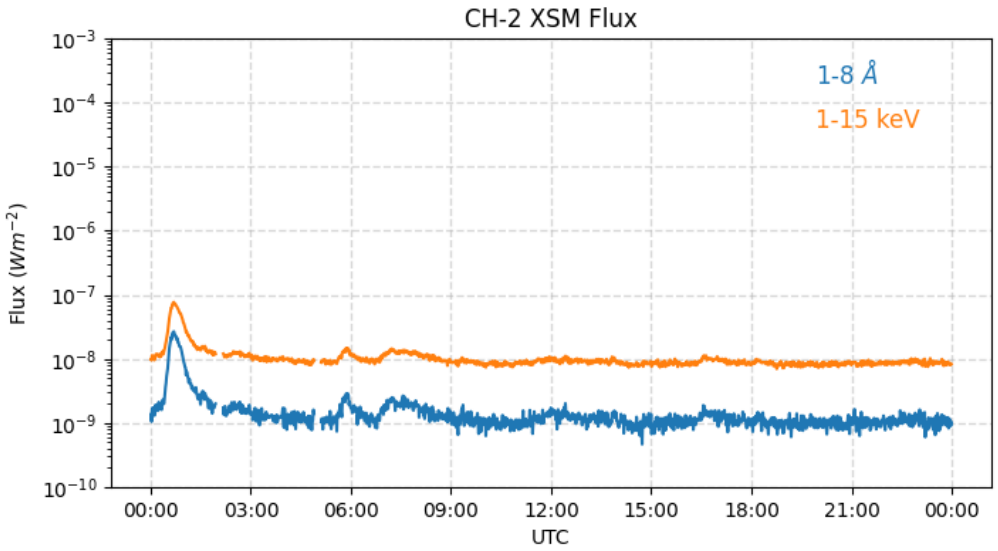

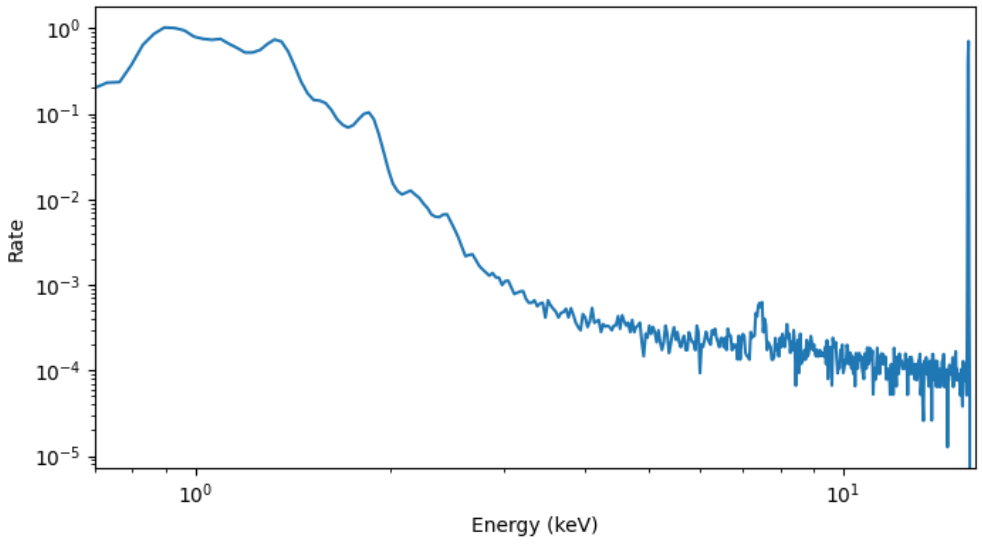

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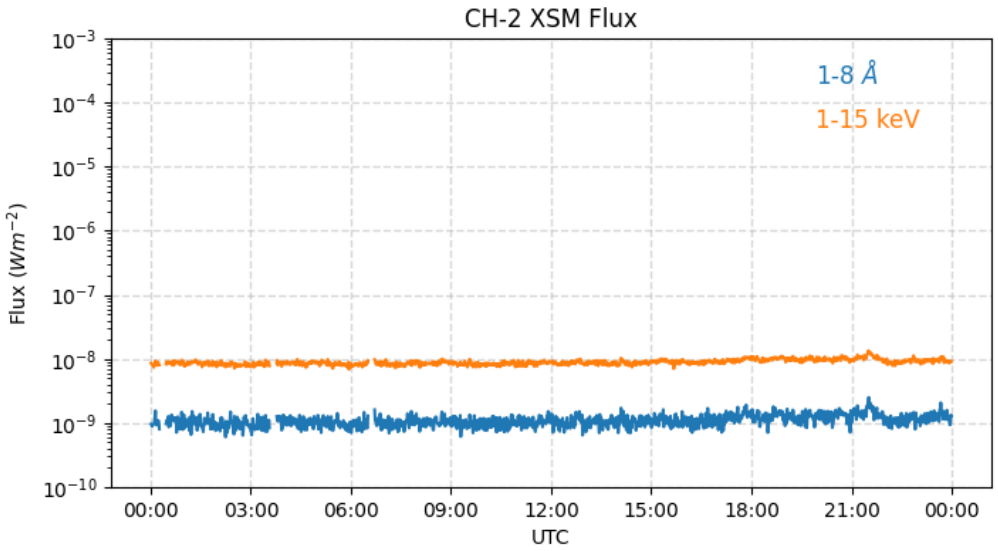

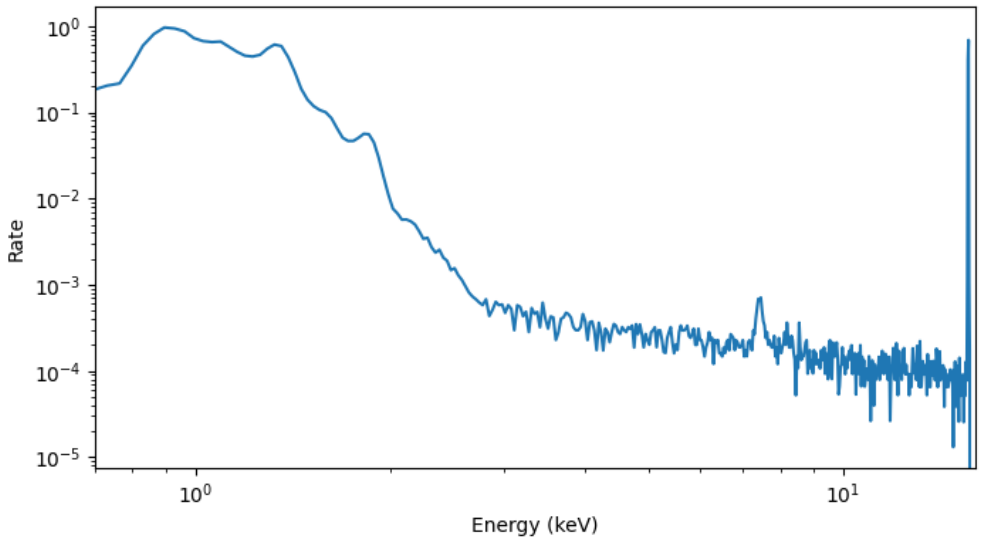

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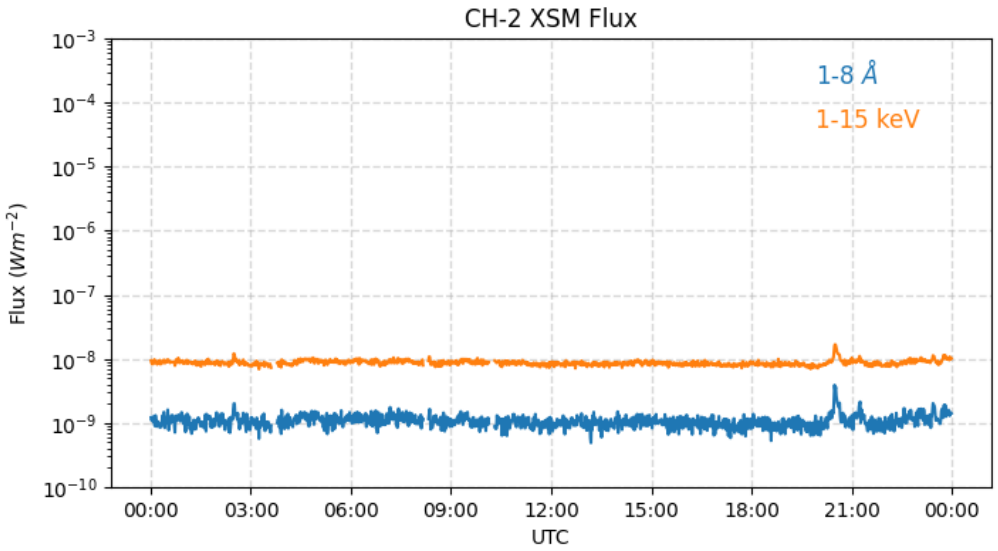

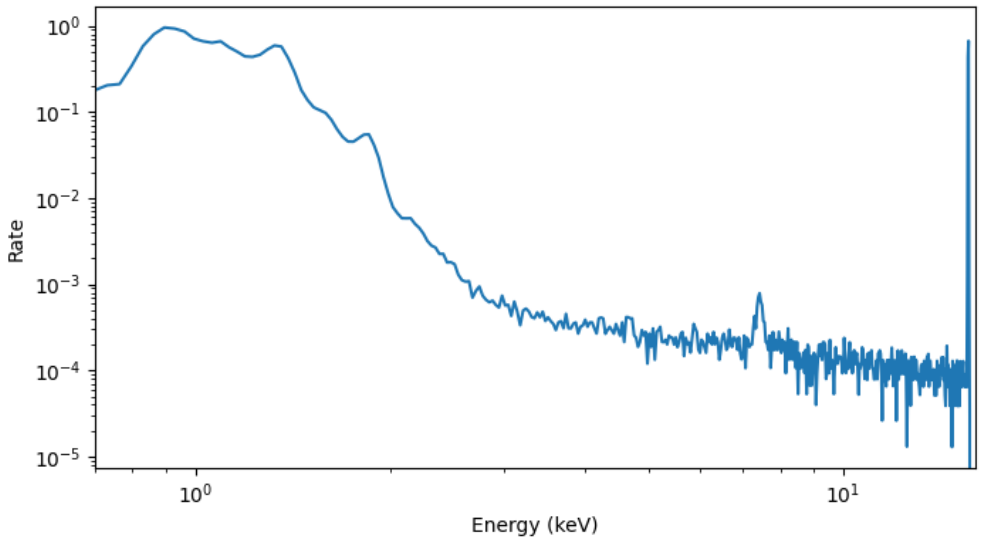

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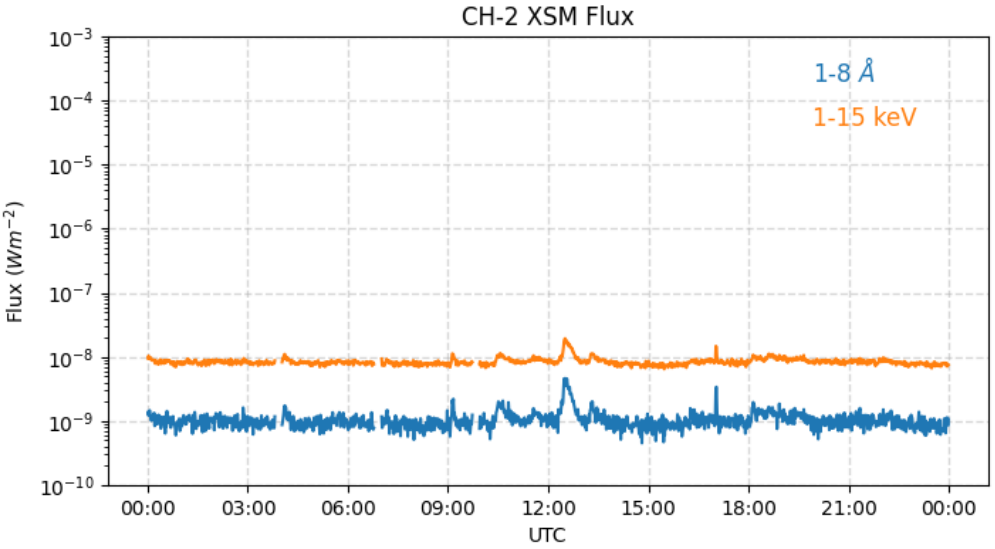

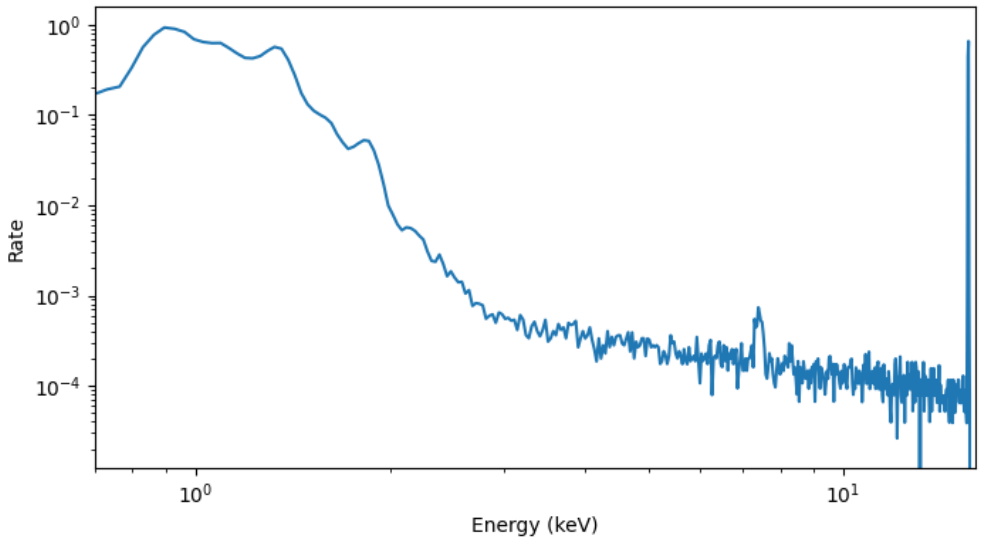

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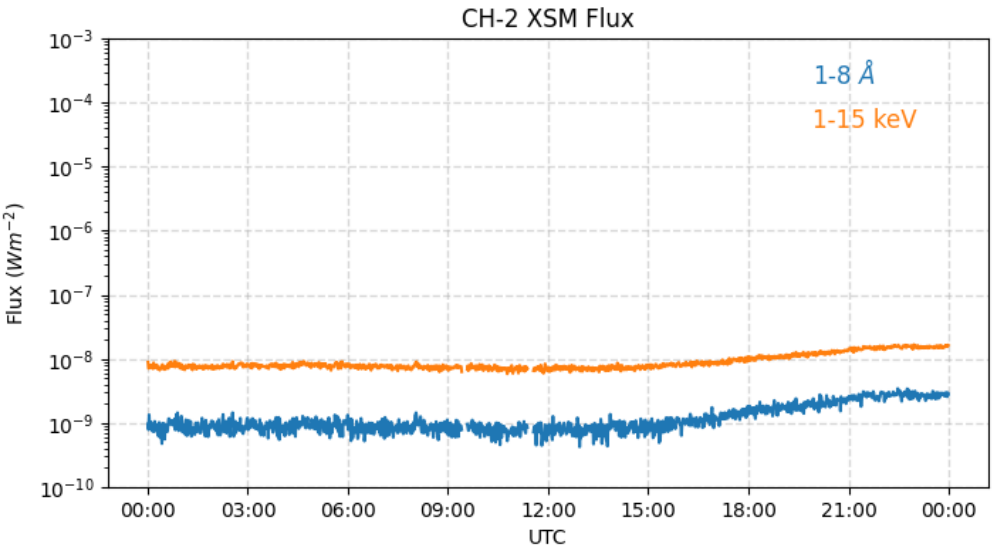

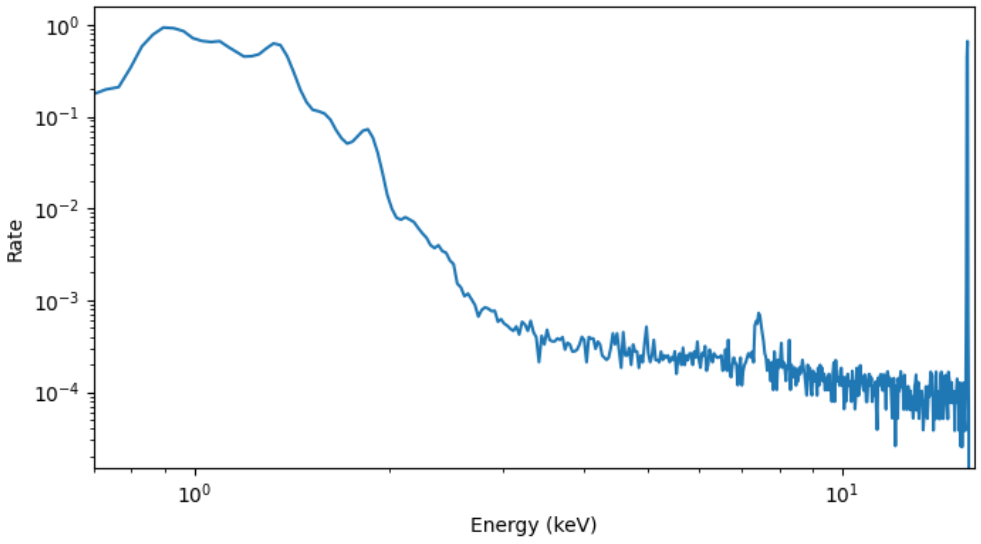

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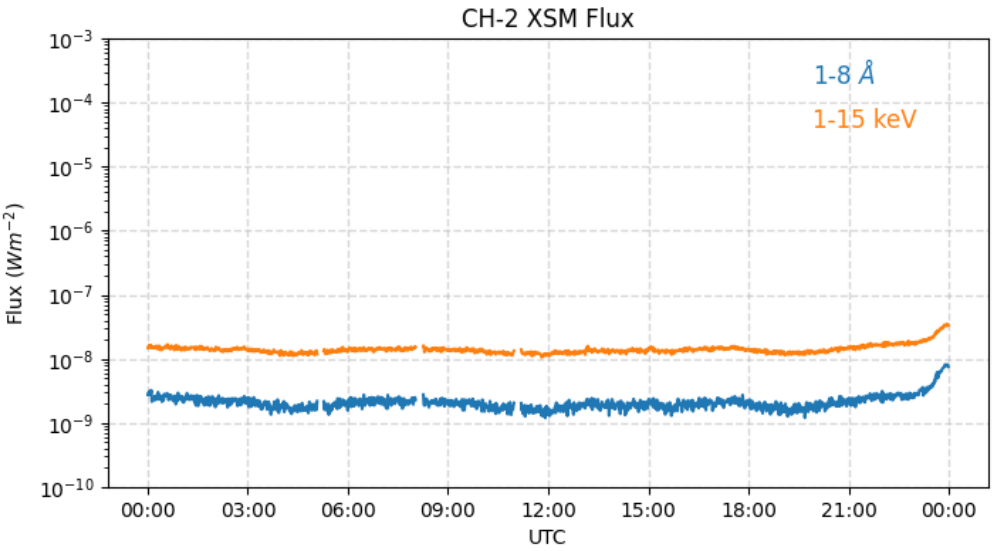

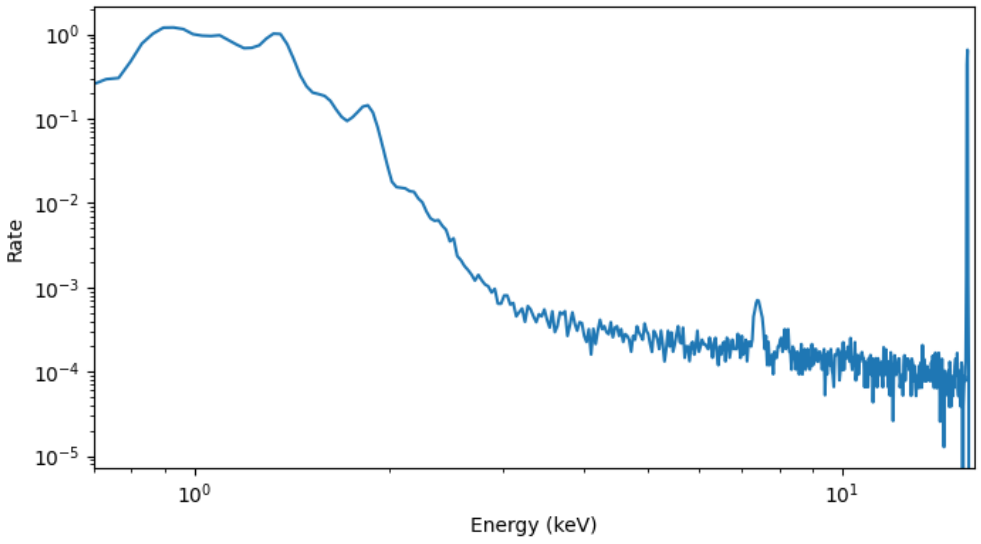

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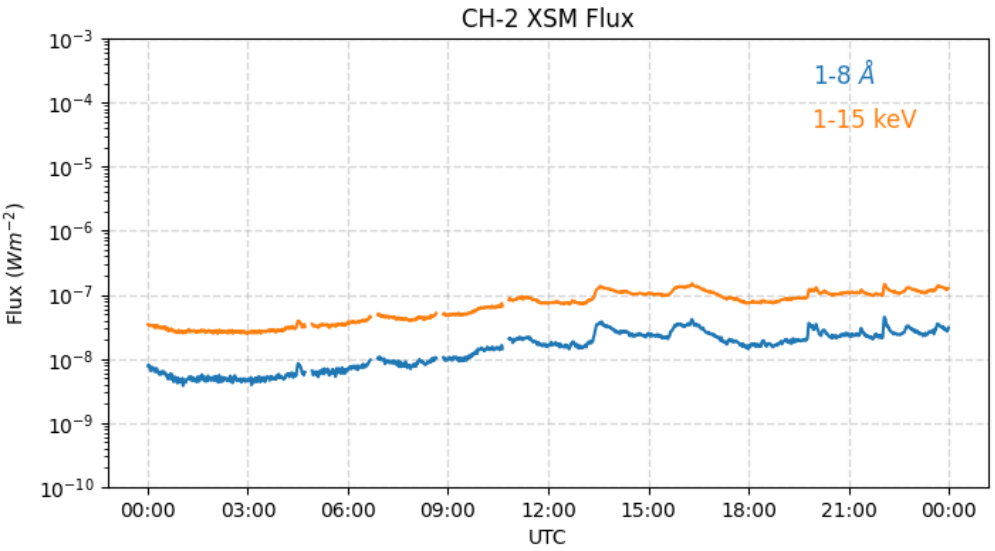

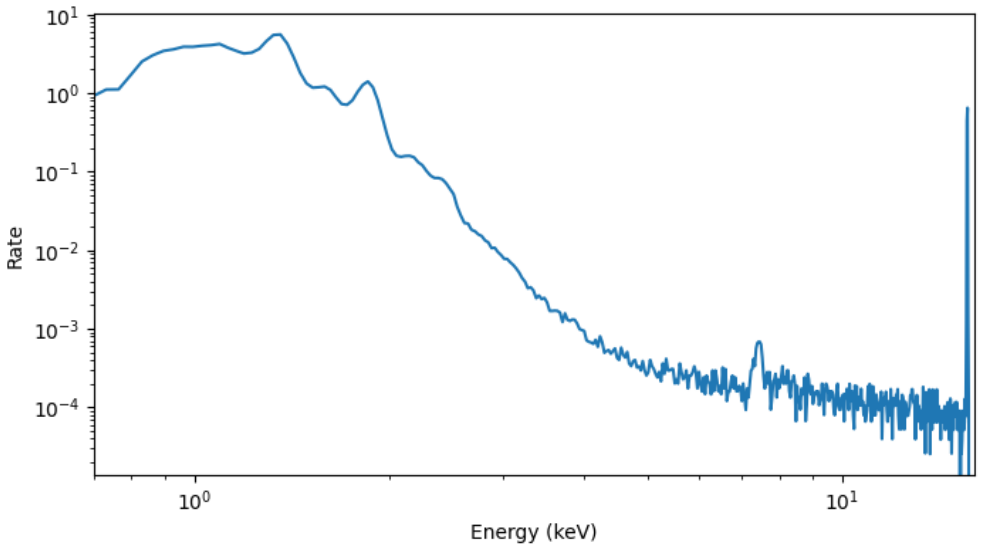

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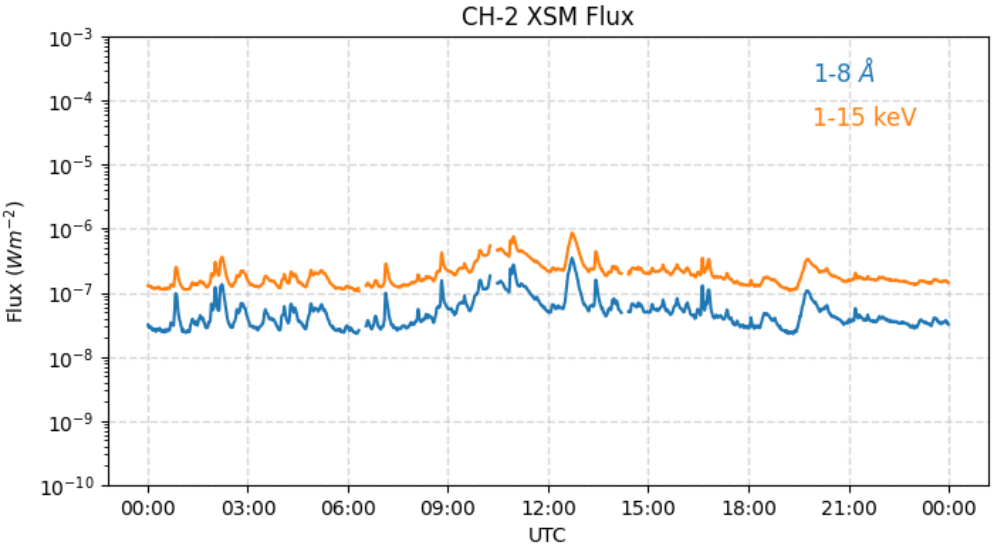

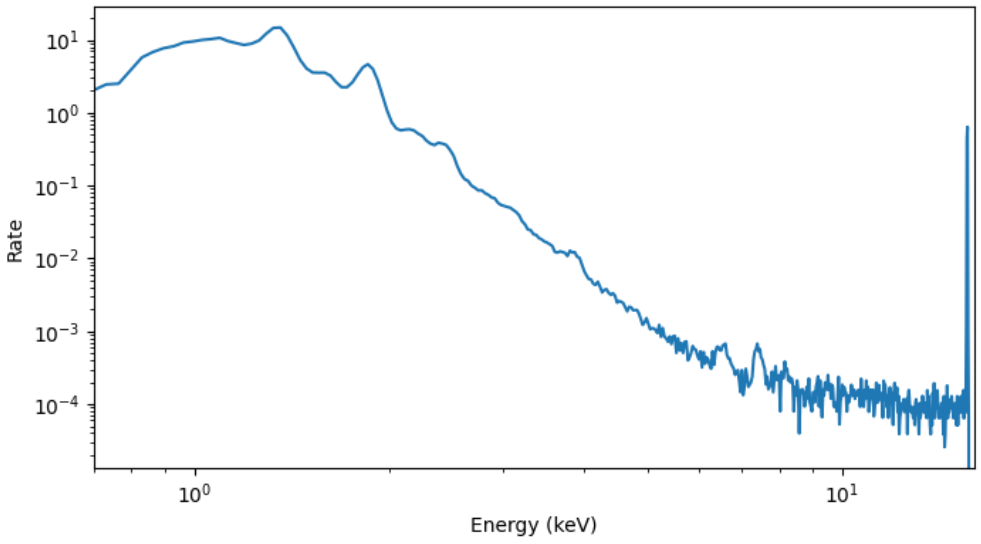

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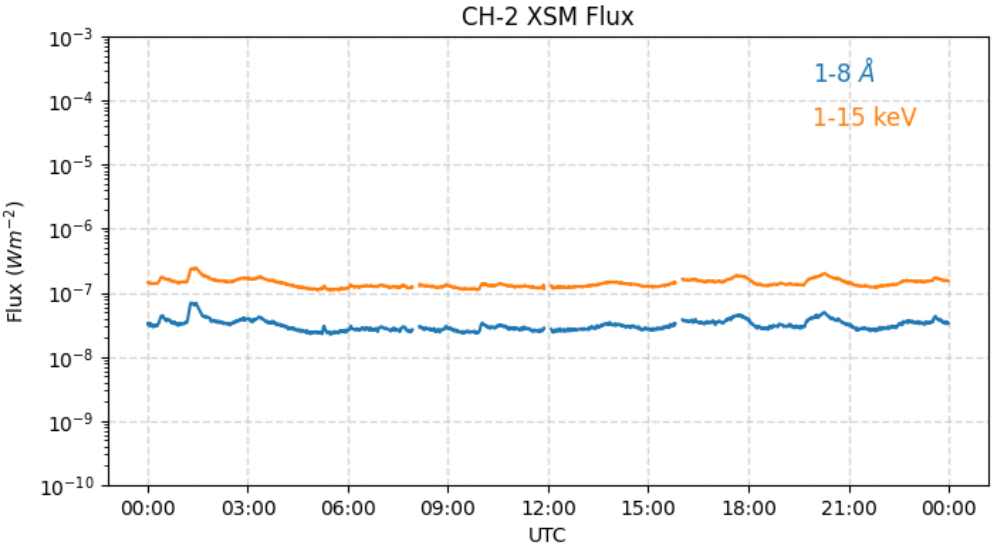

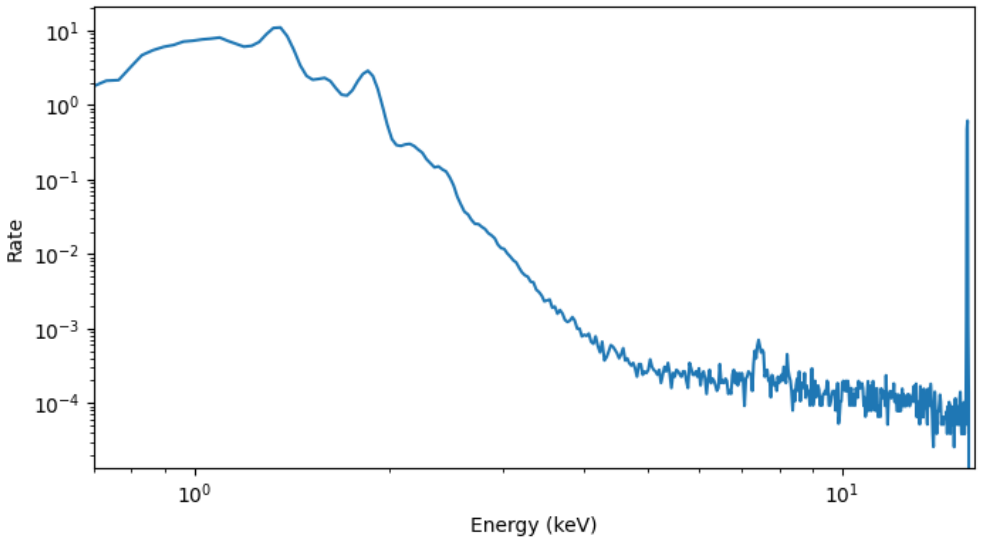

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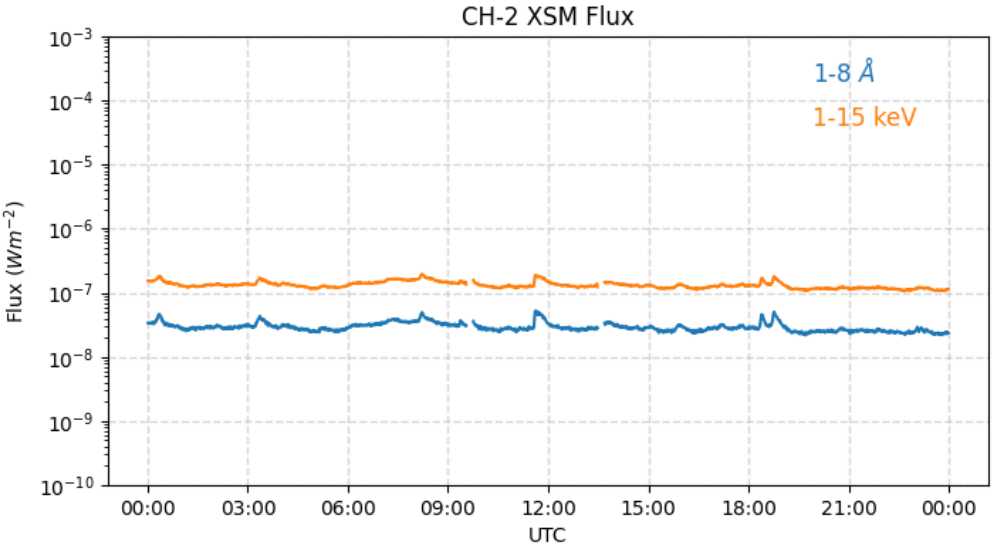

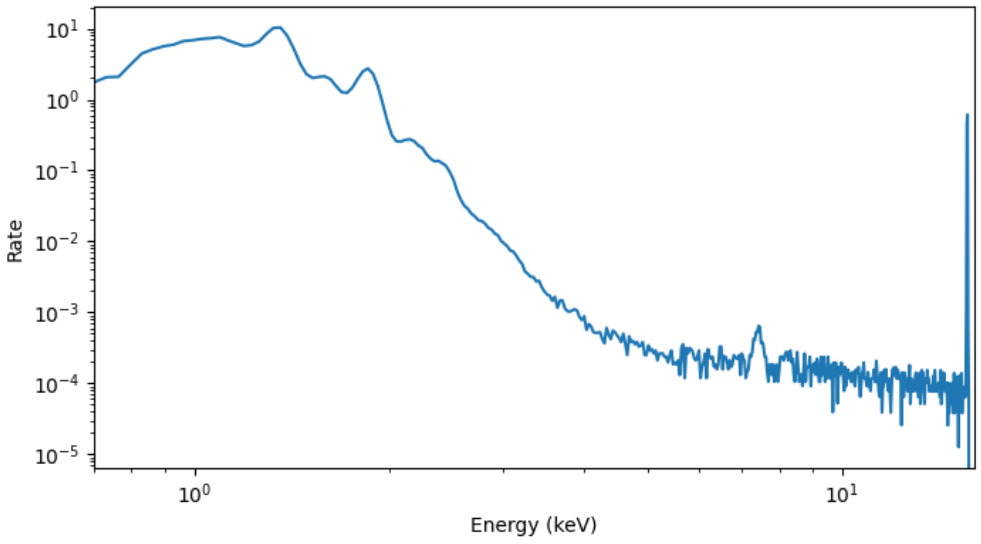

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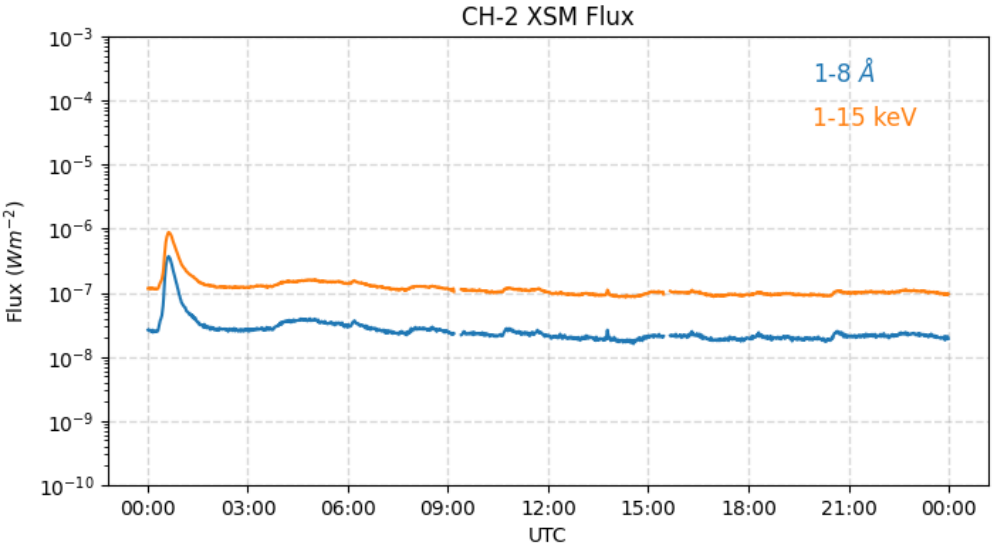

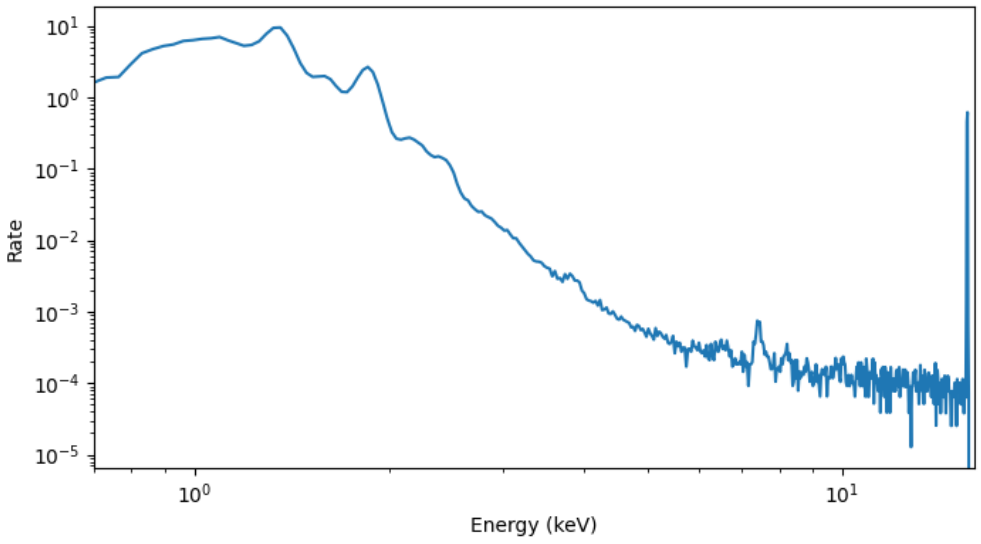

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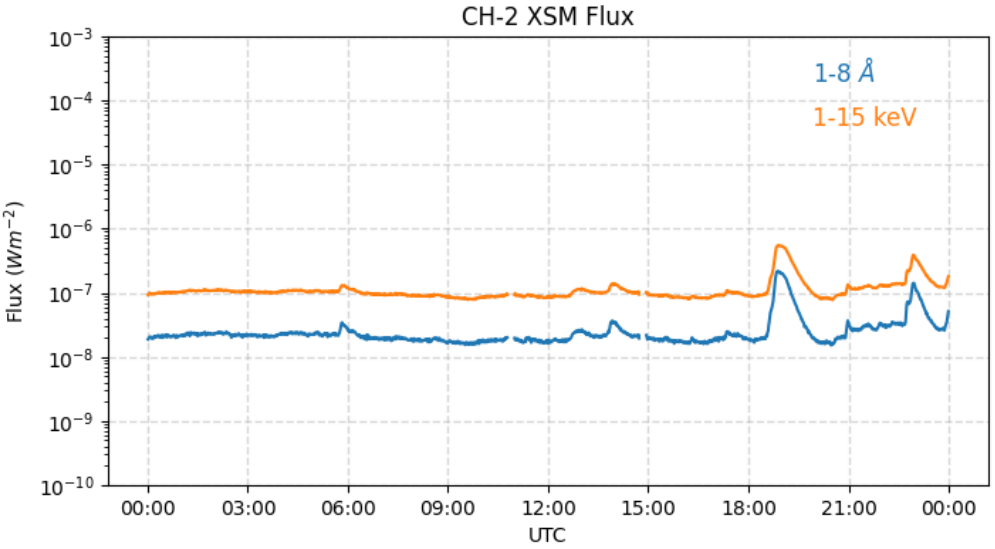

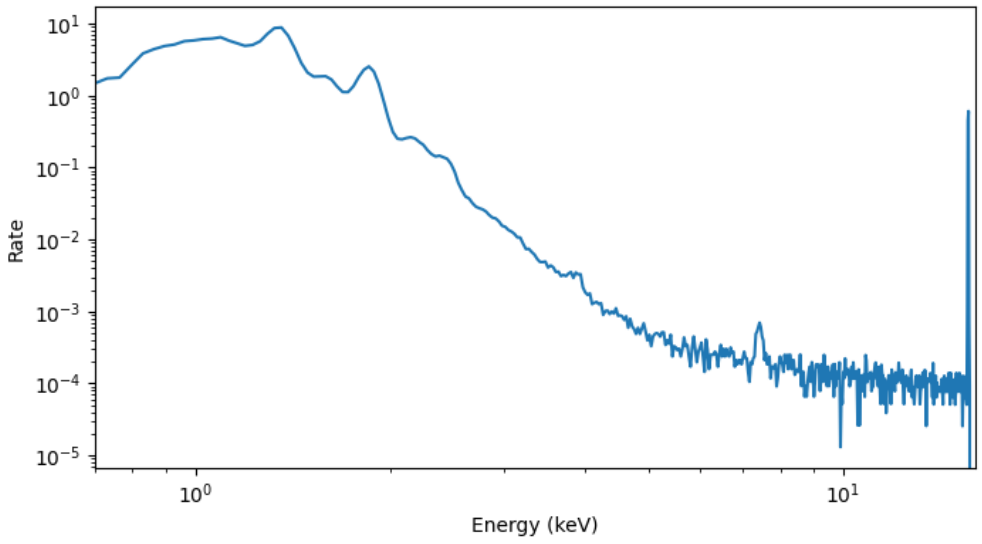

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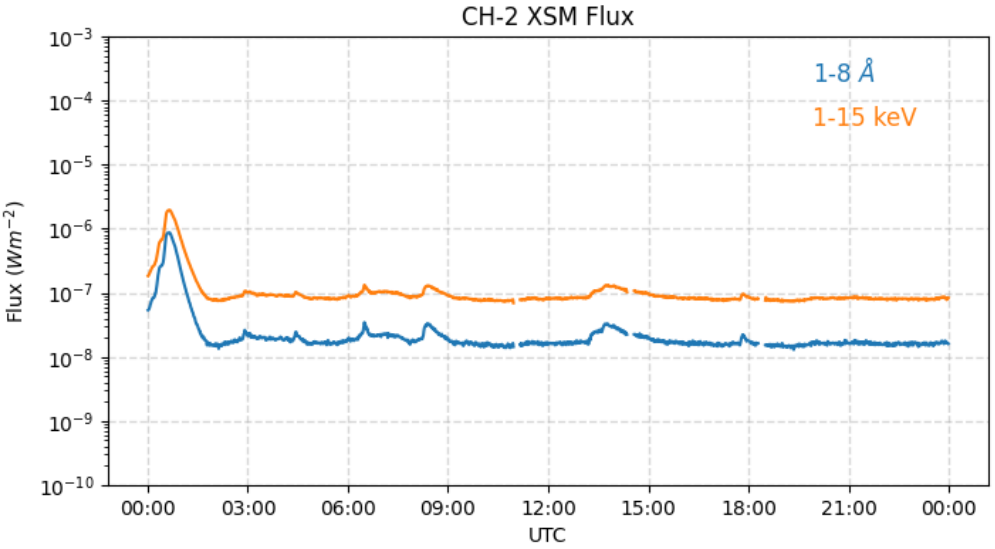

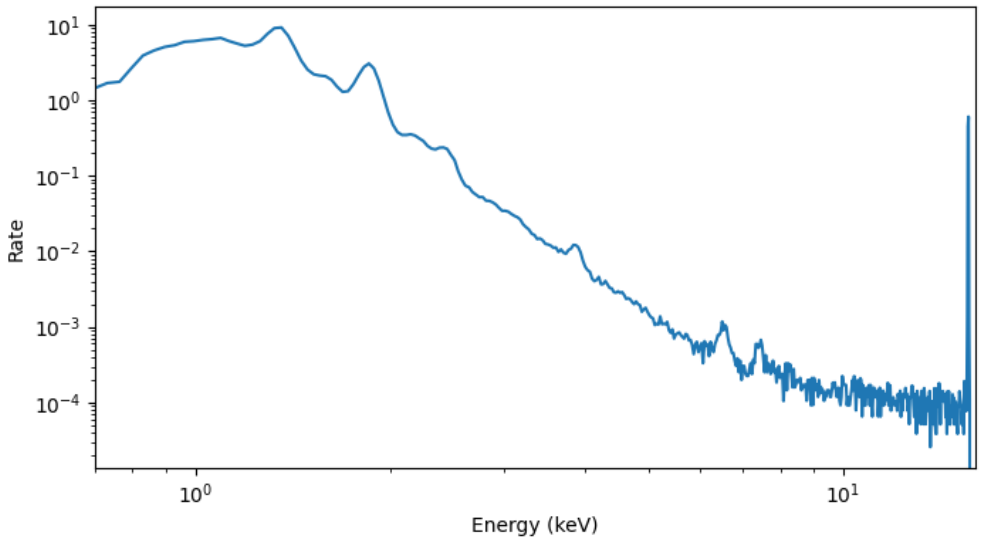

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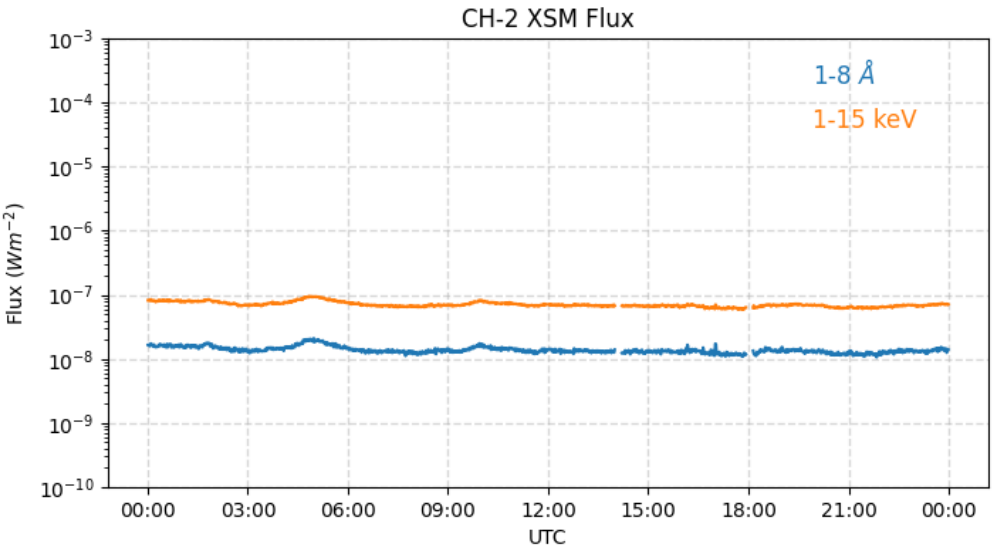
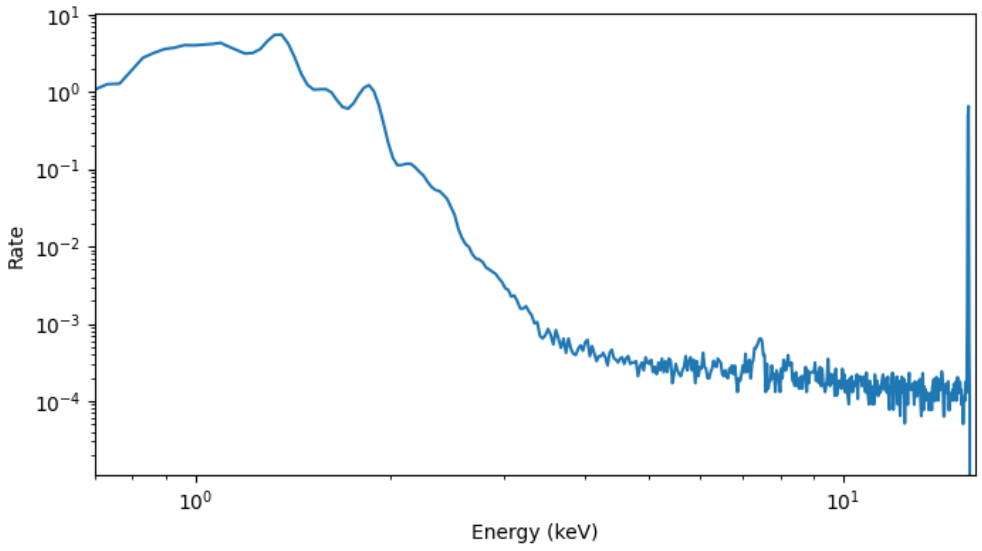
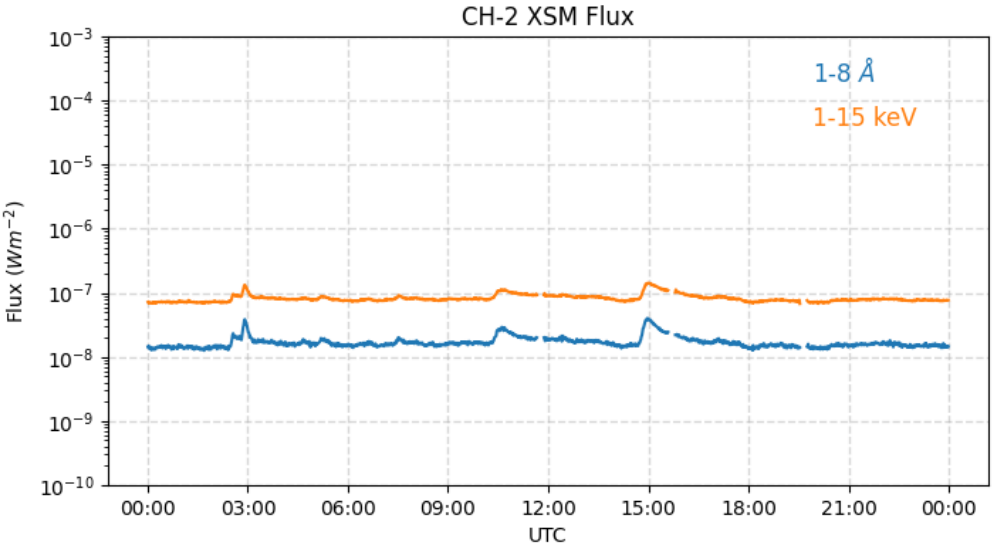
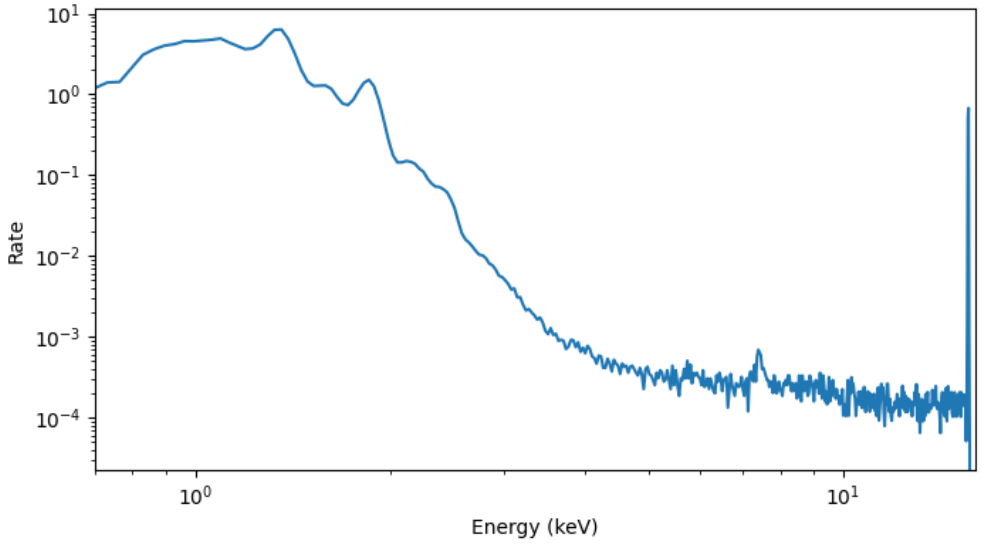




Date: 2020-09-28





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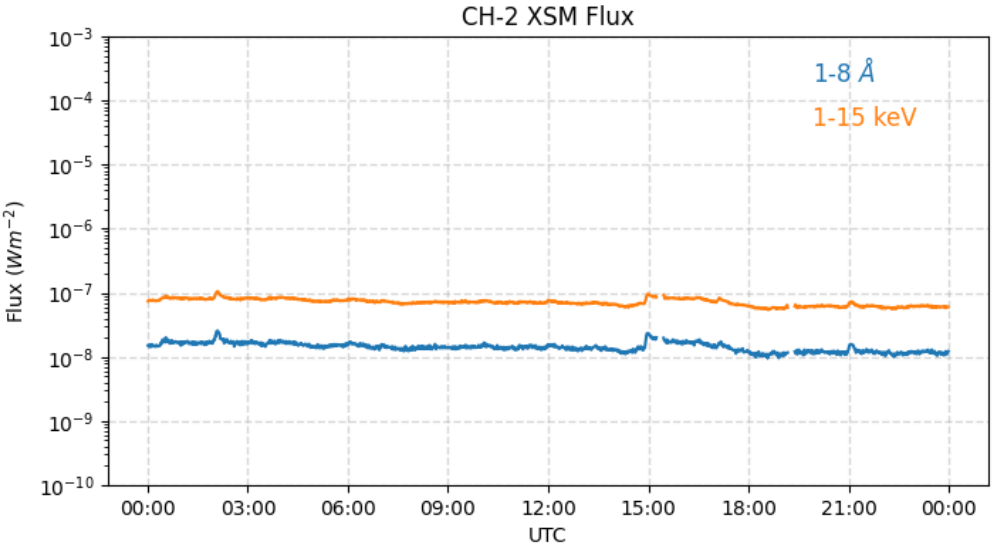

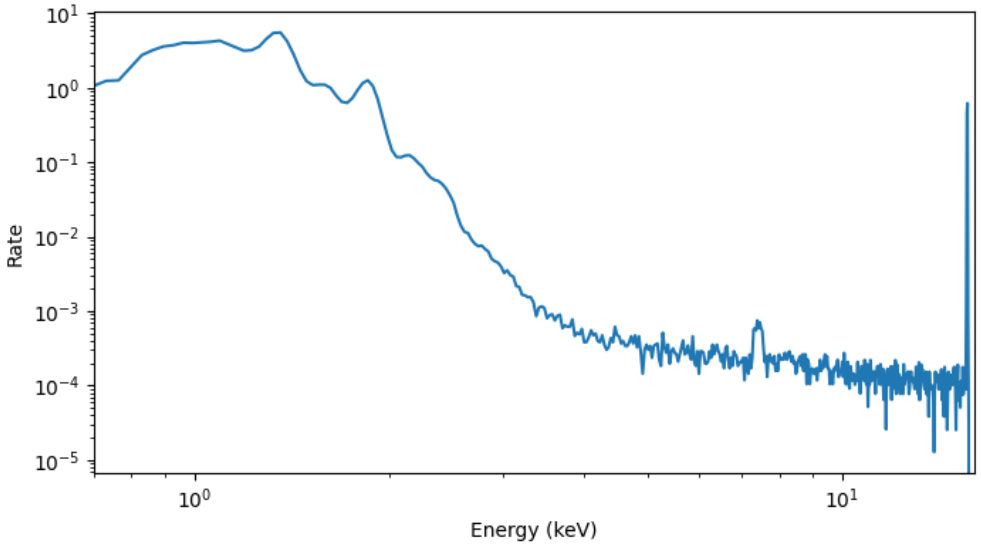

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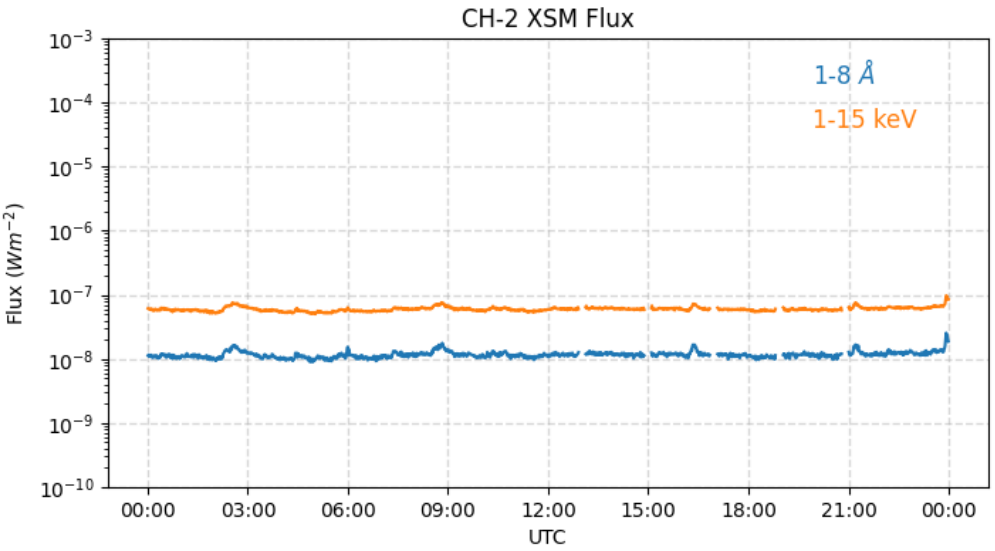

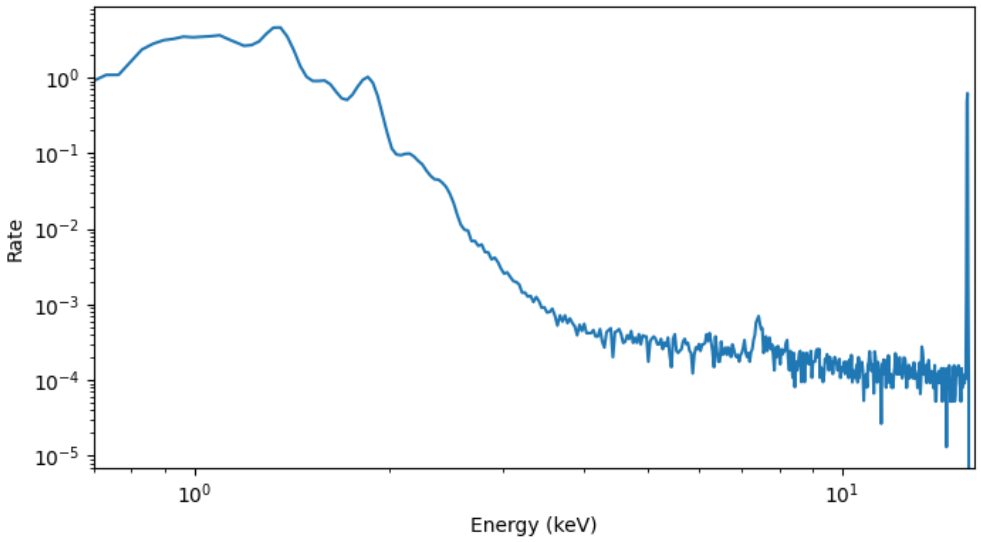

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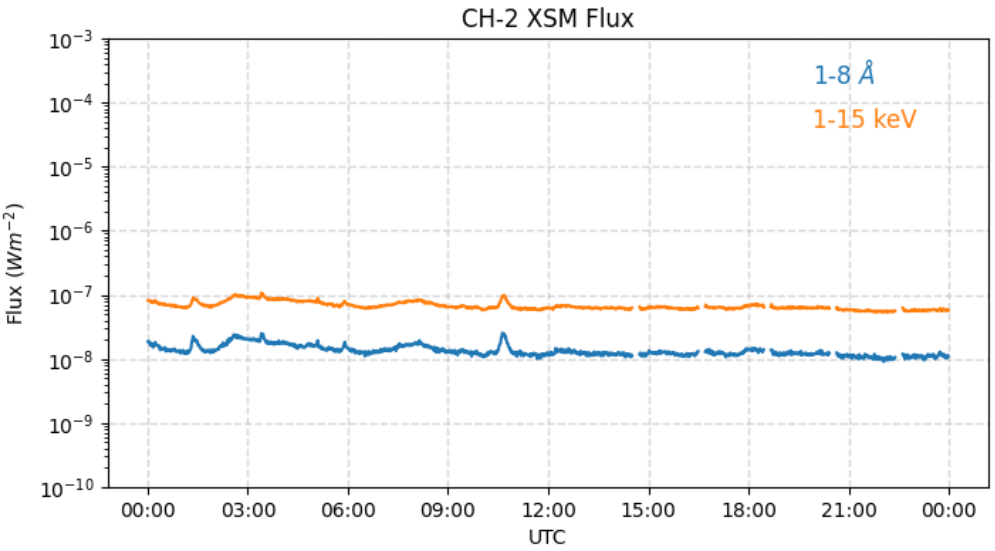

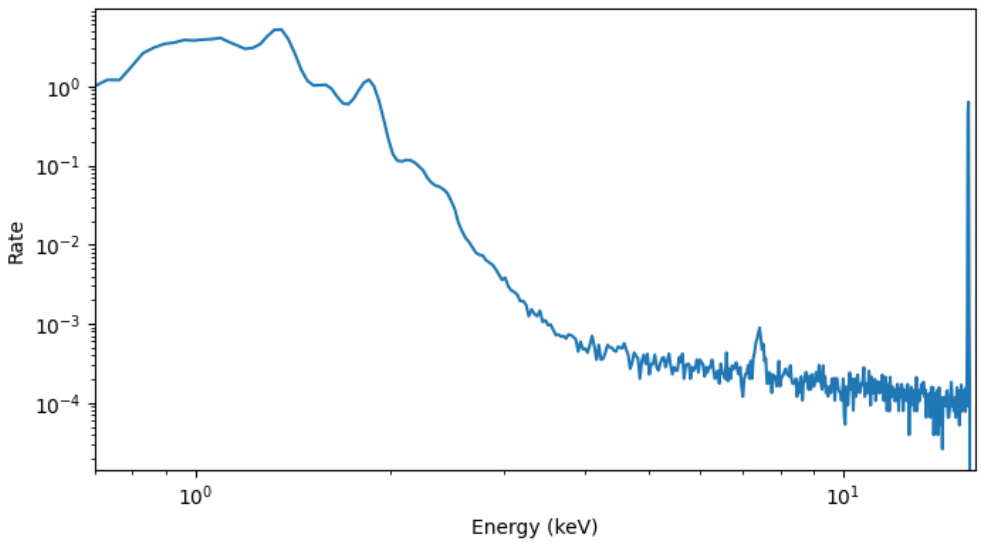

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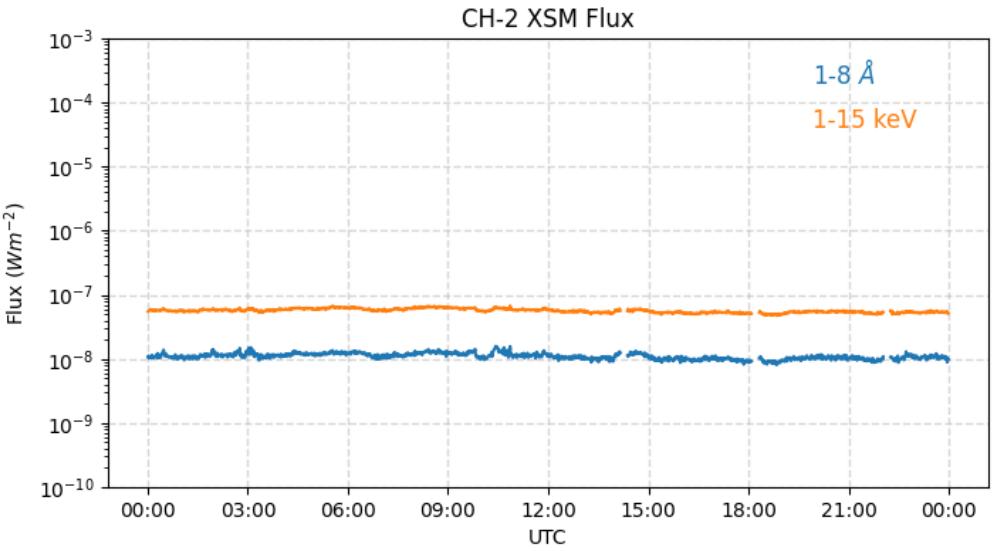

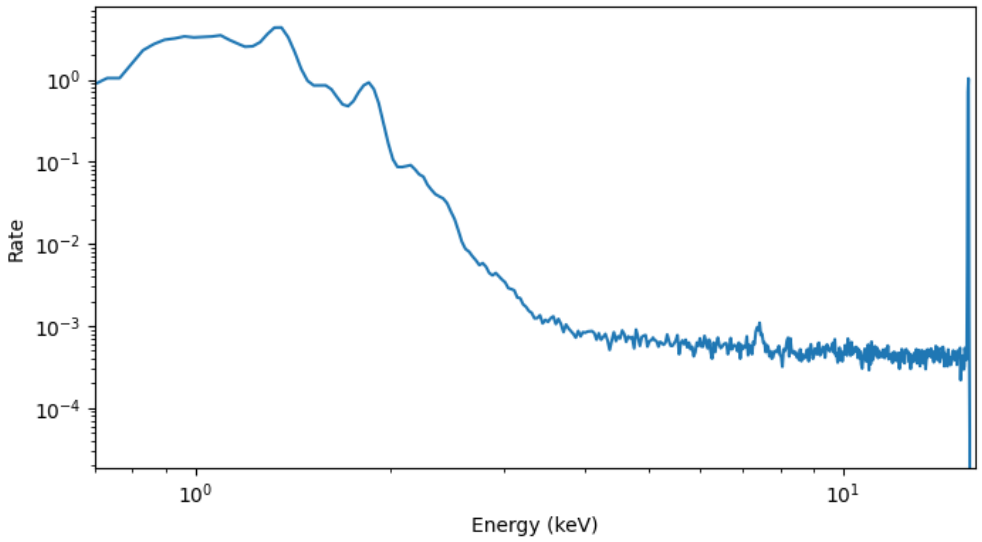

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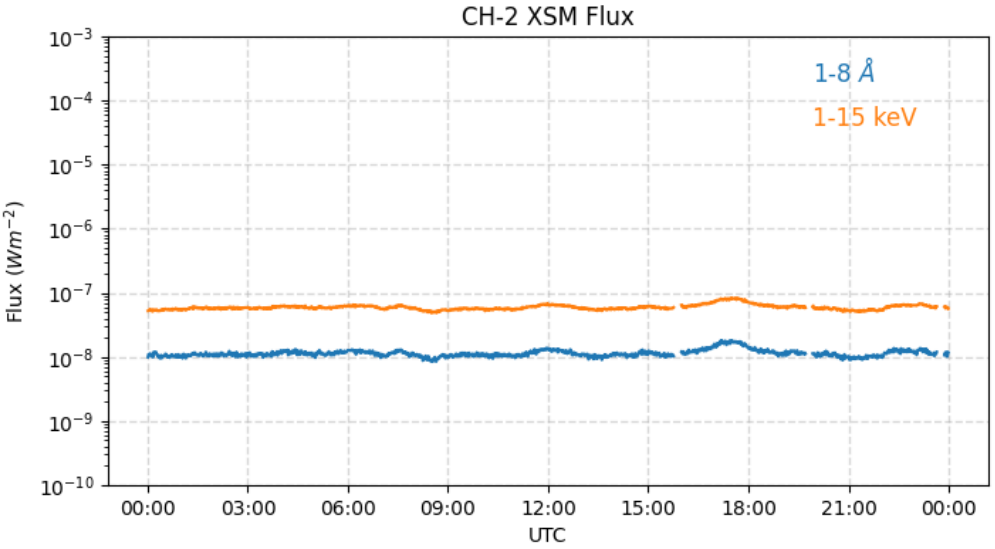

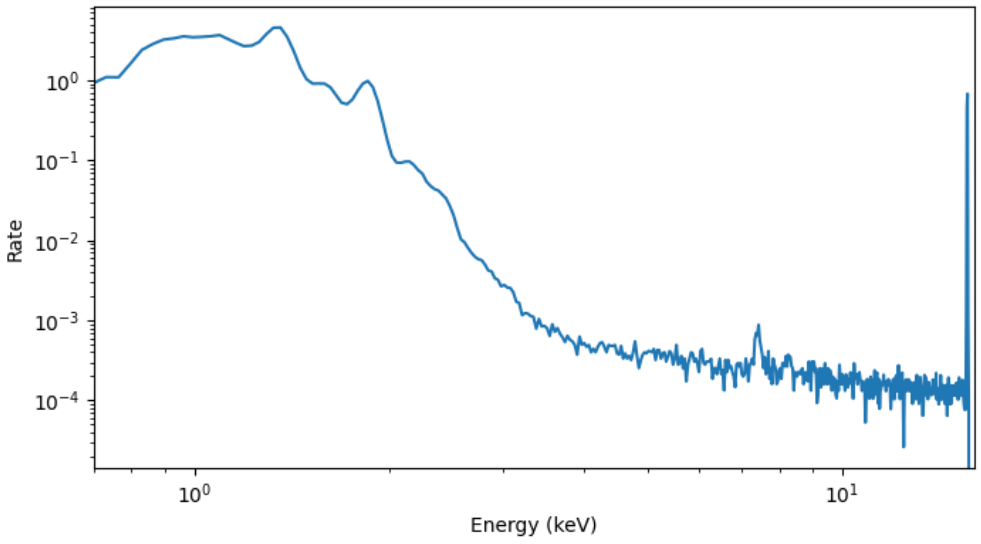

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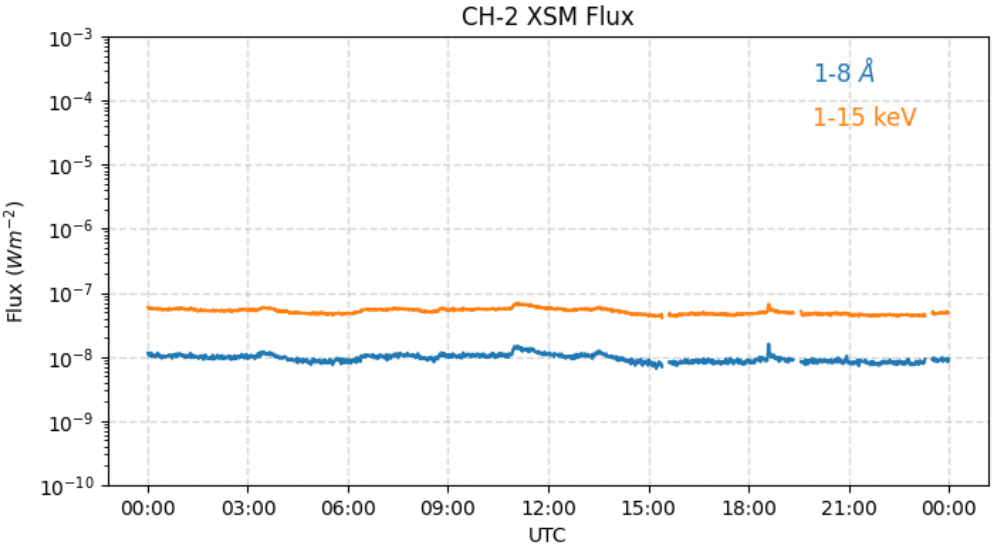

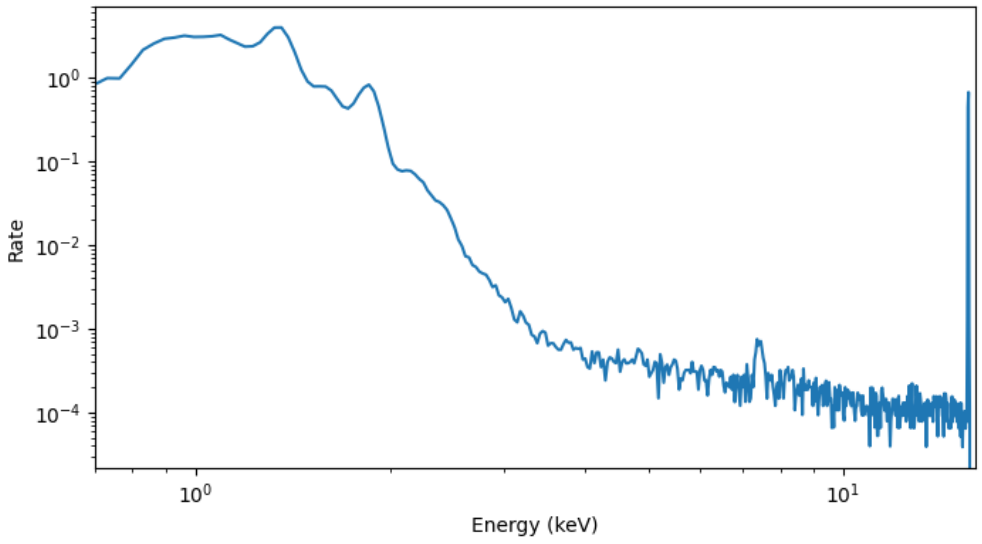

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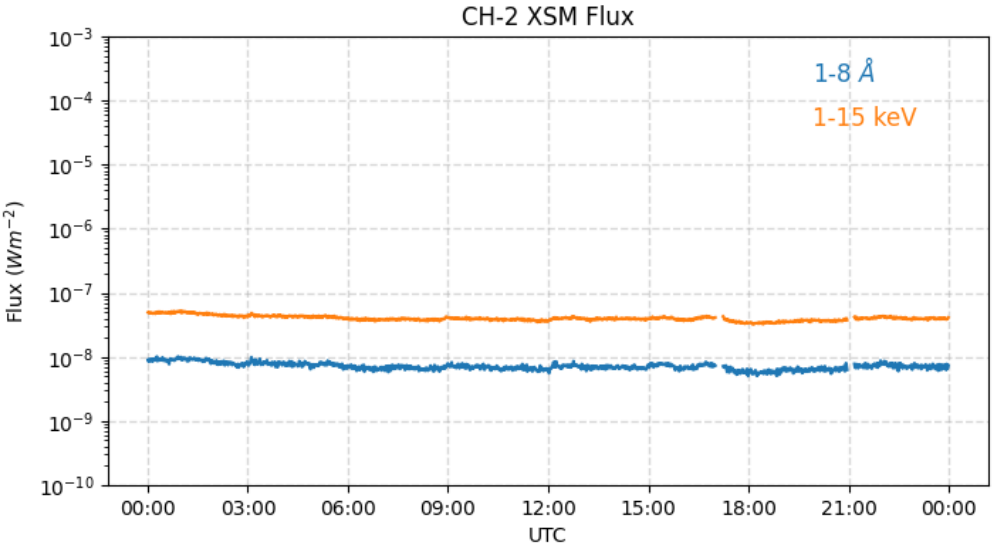

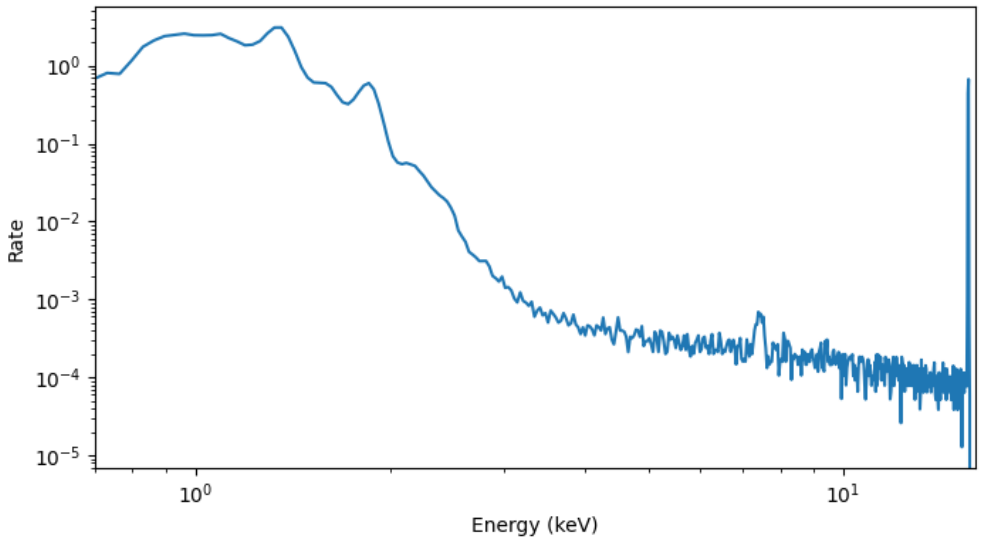

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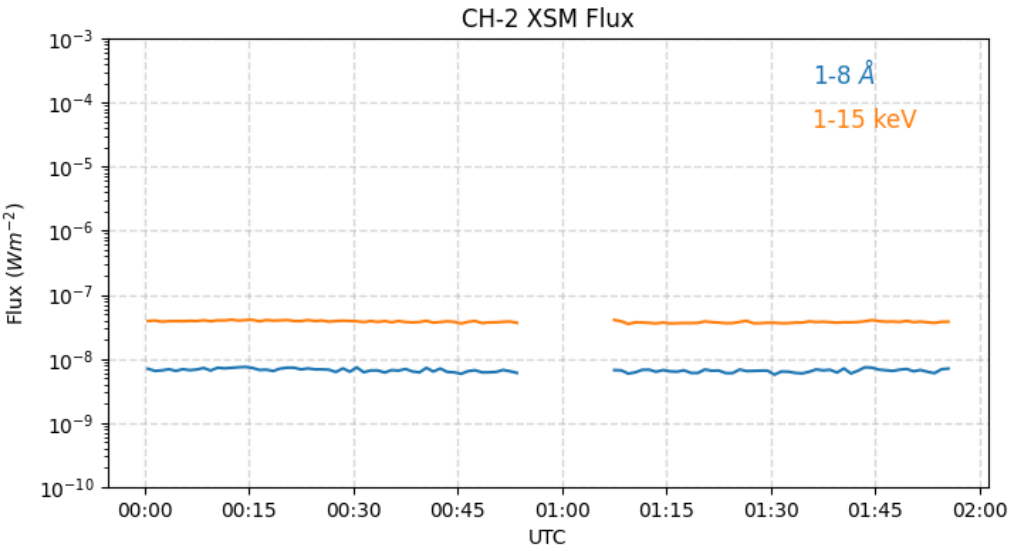

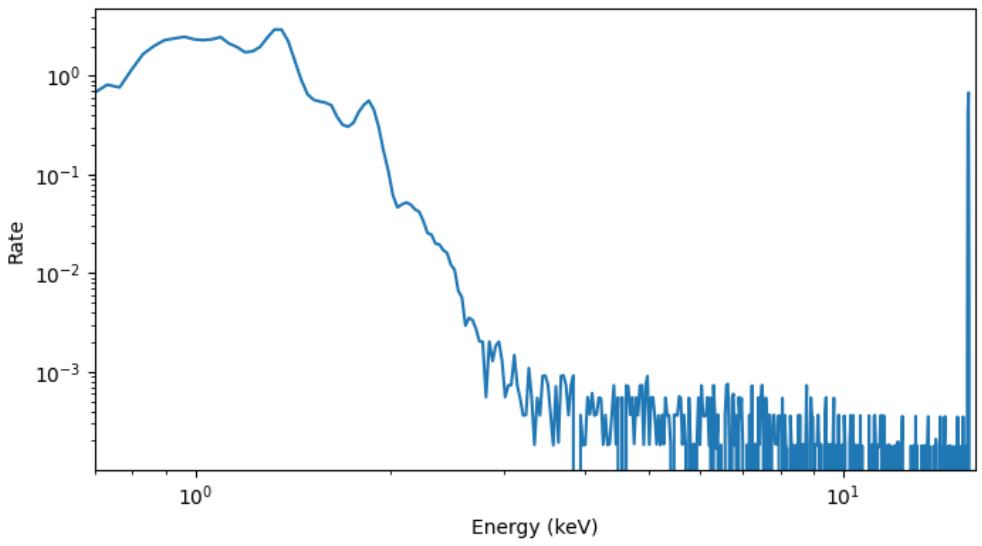

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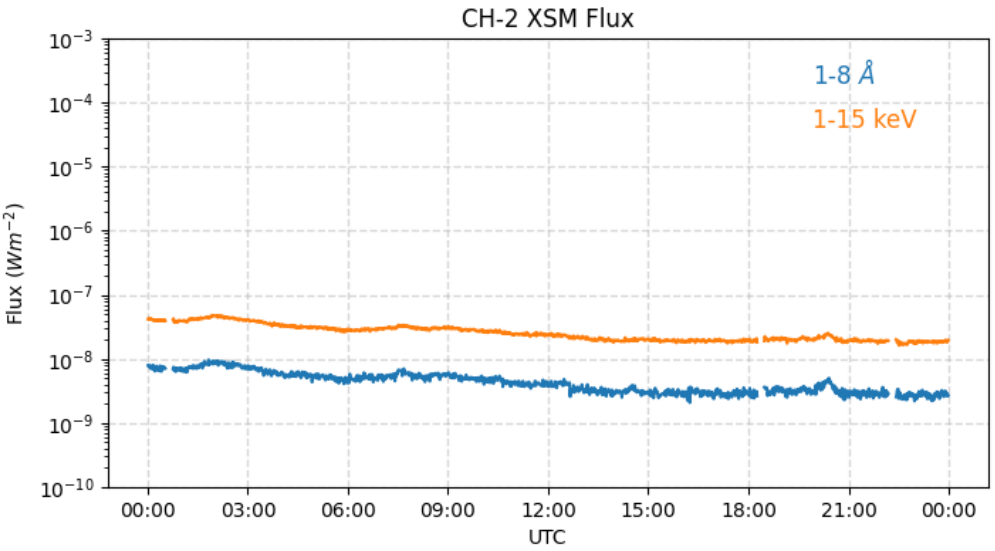

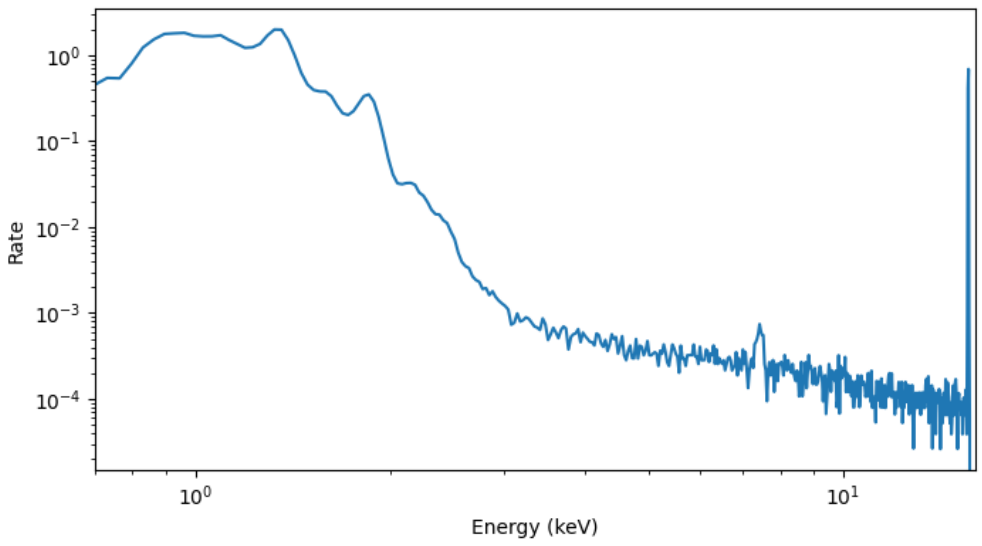

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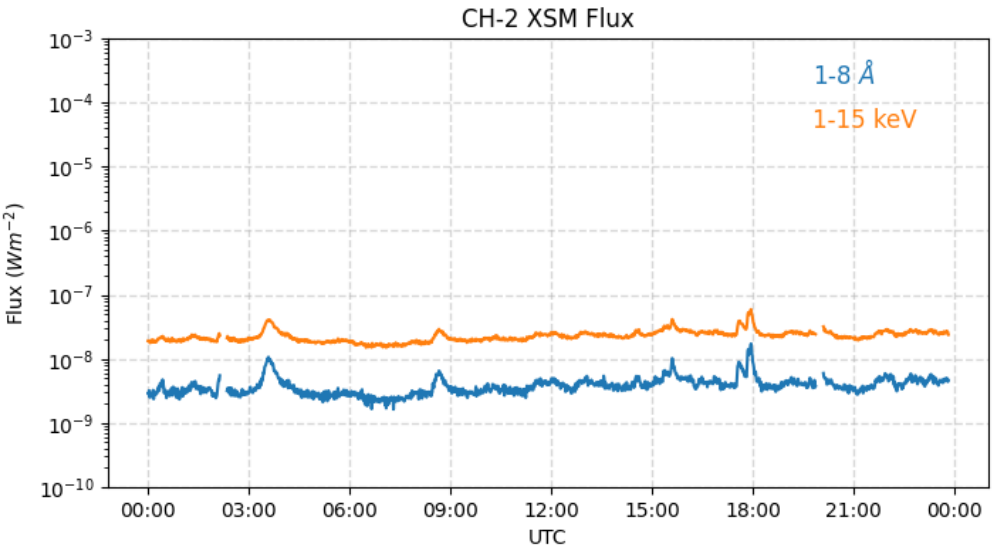

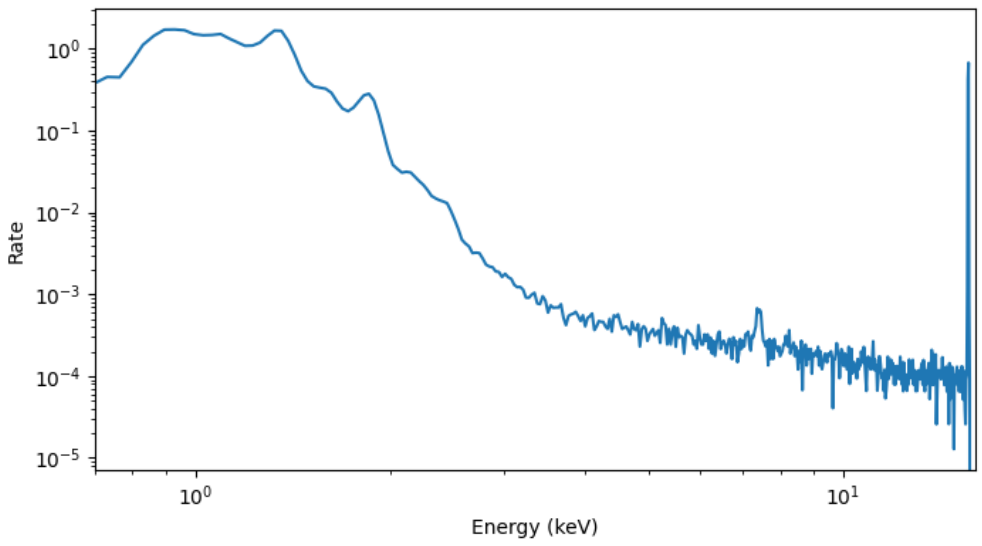

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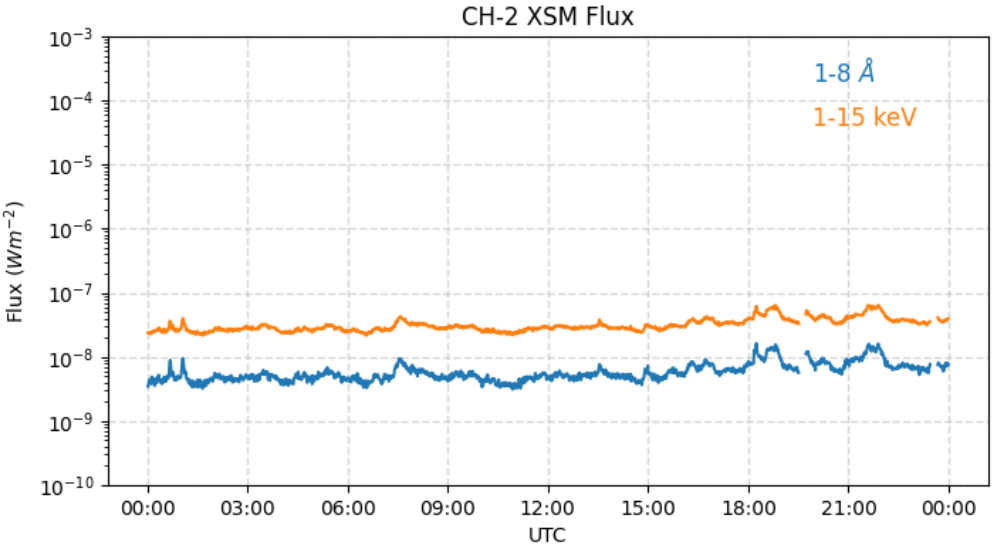

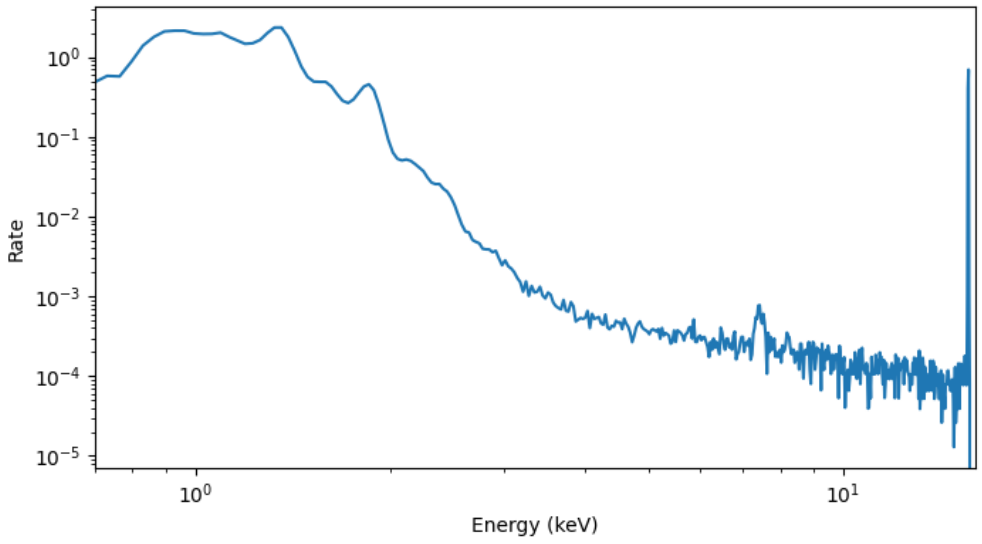

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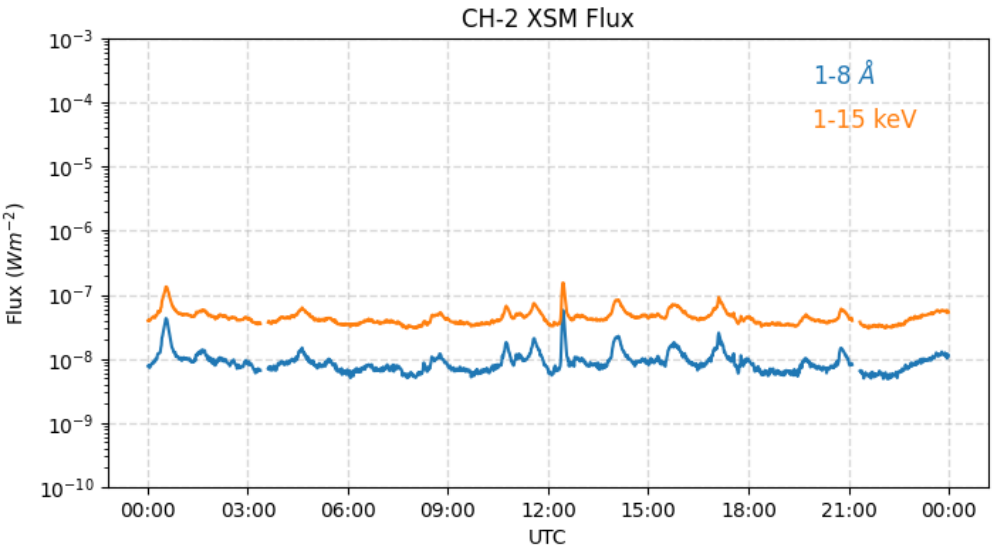

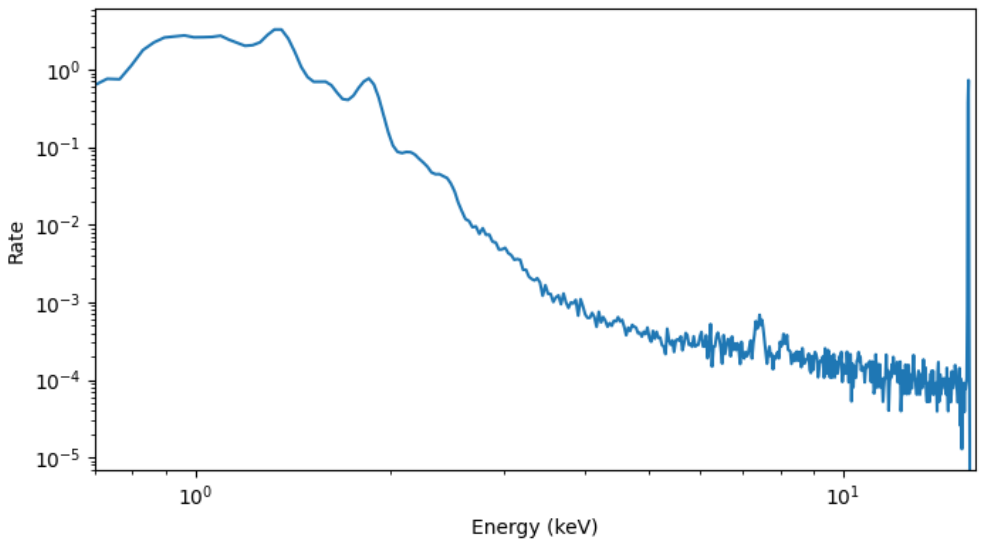

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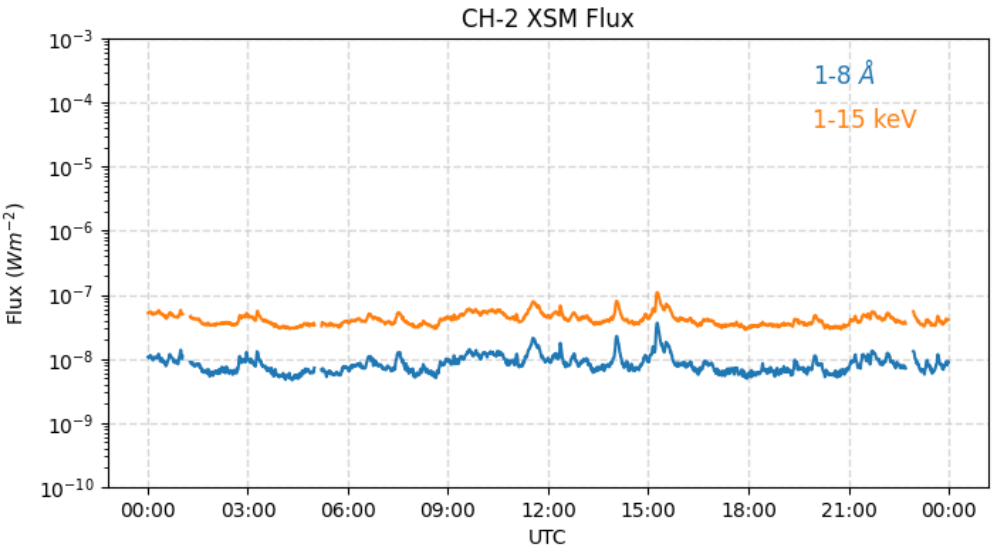

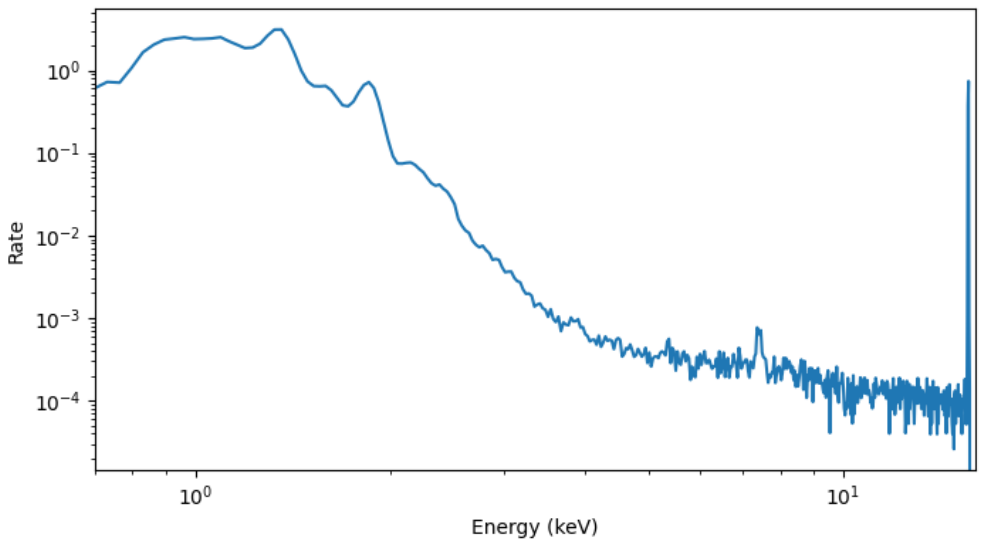

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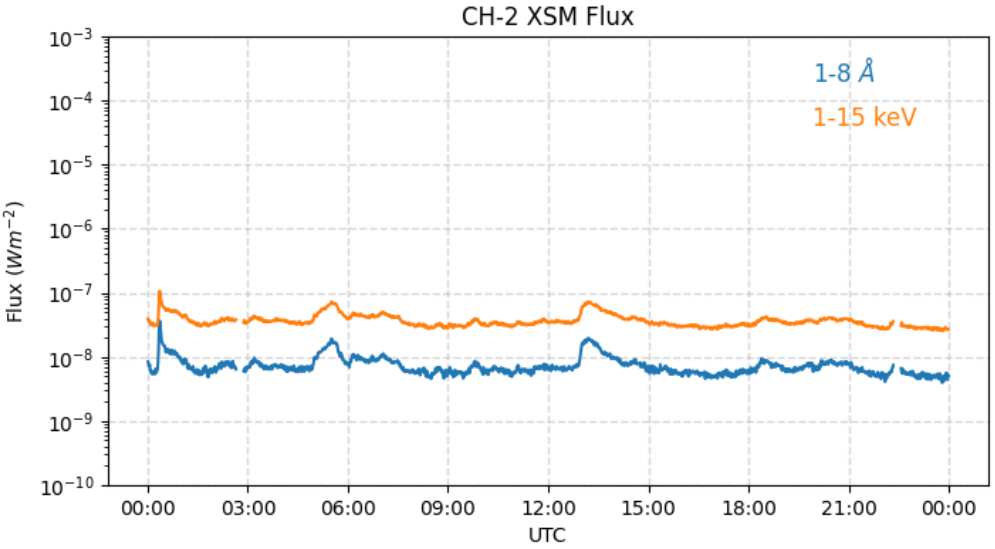

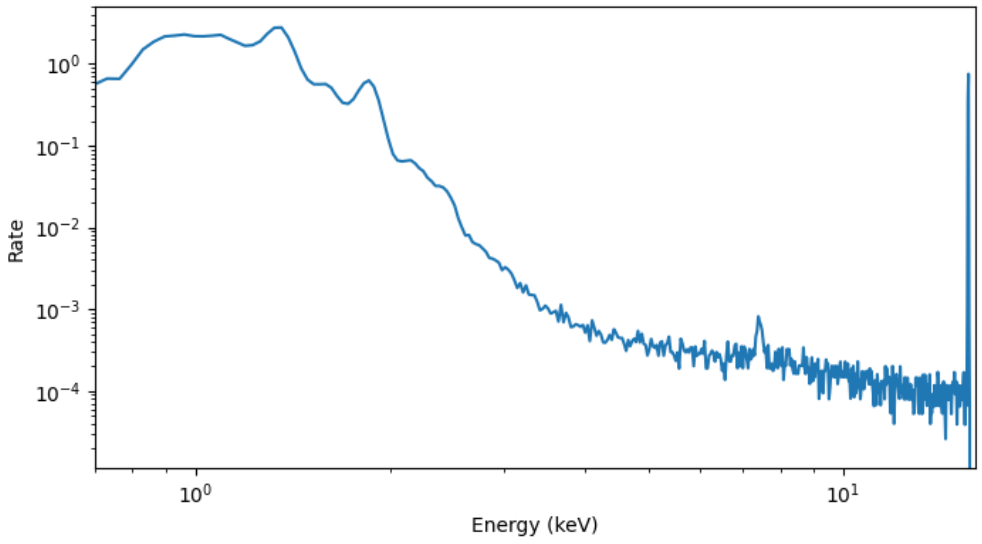

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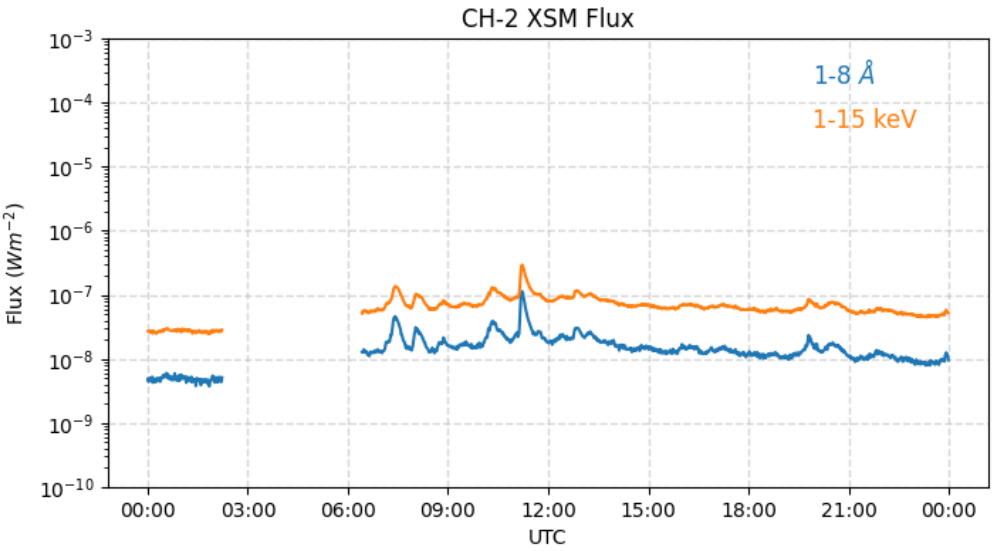

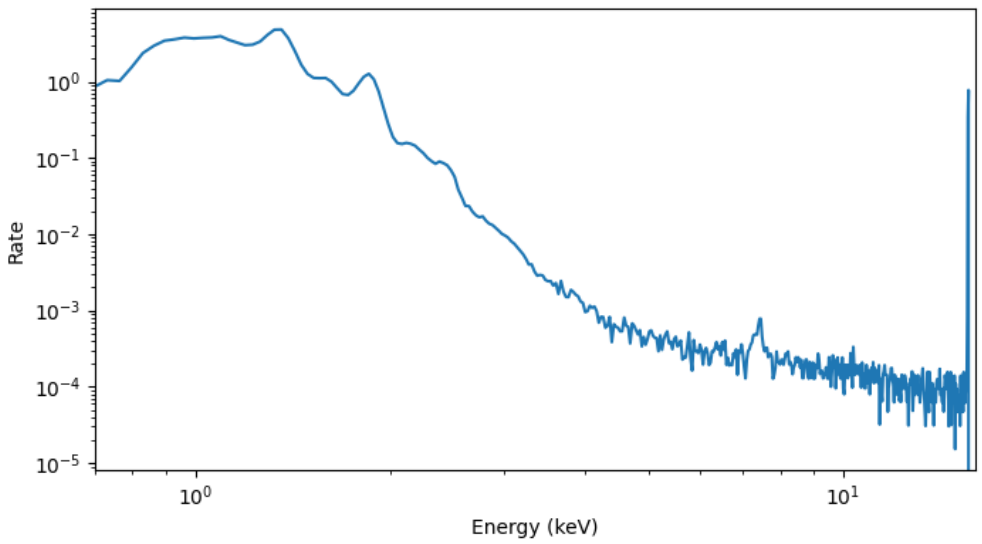

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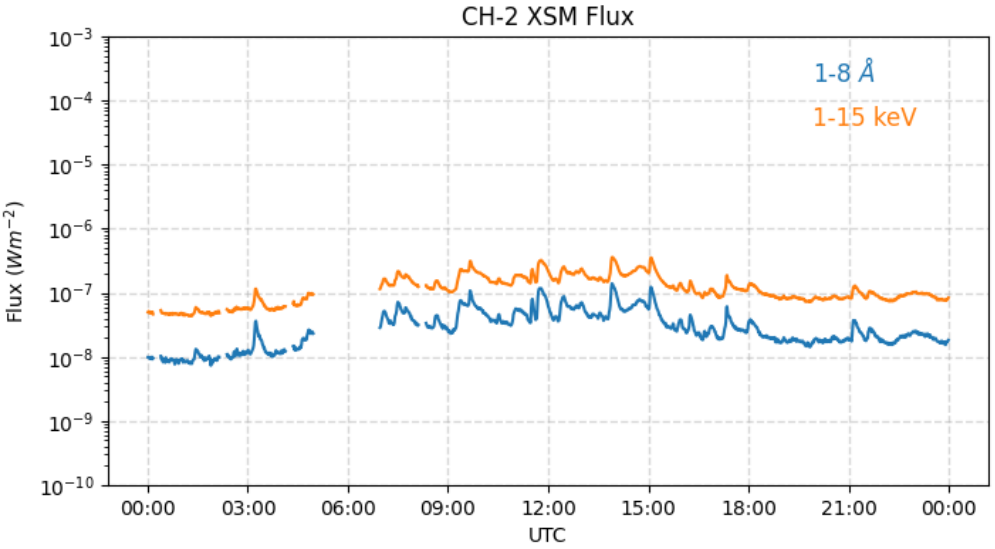

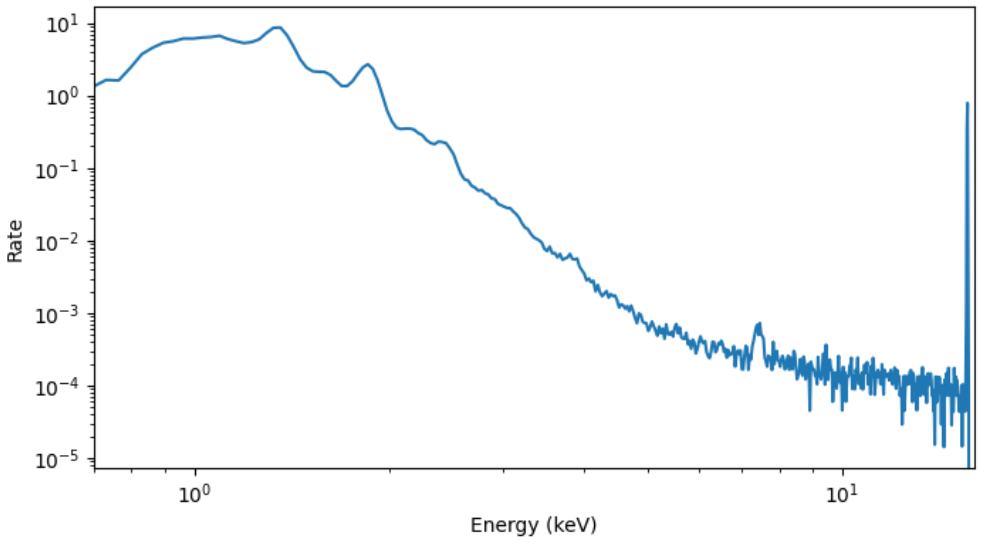

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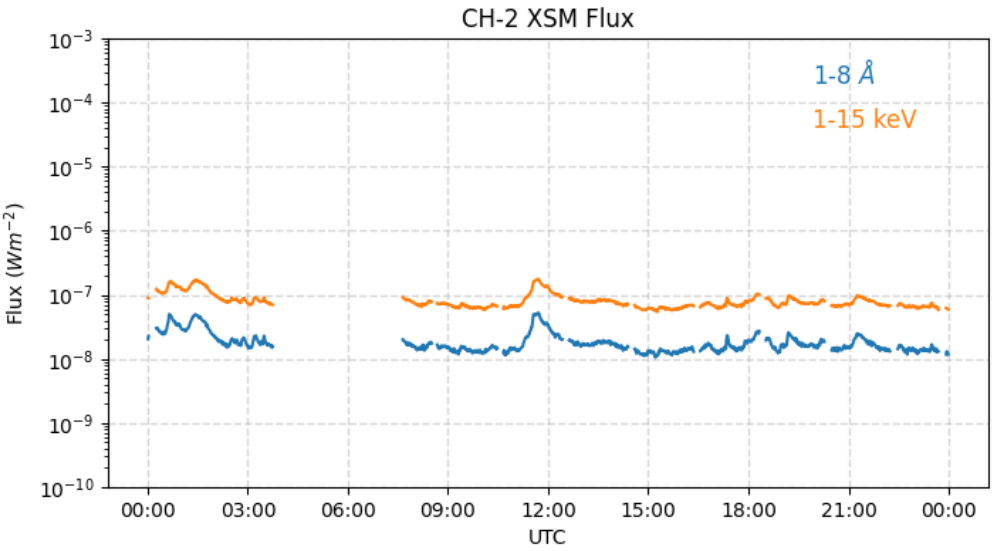

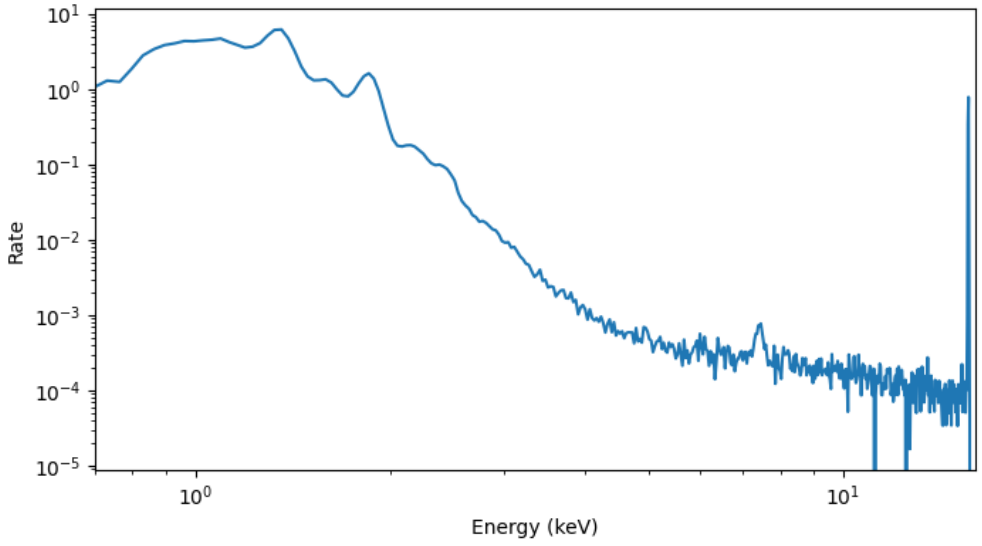

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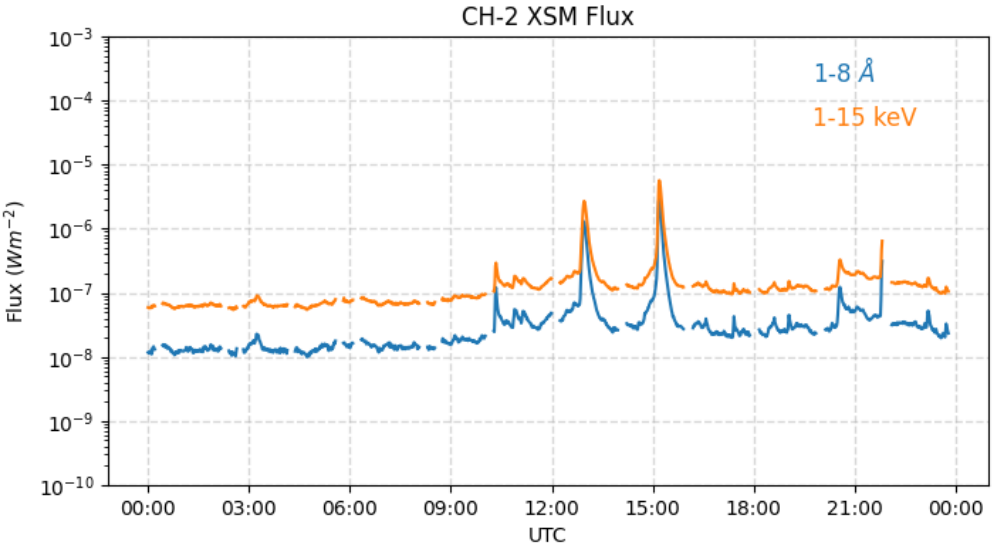

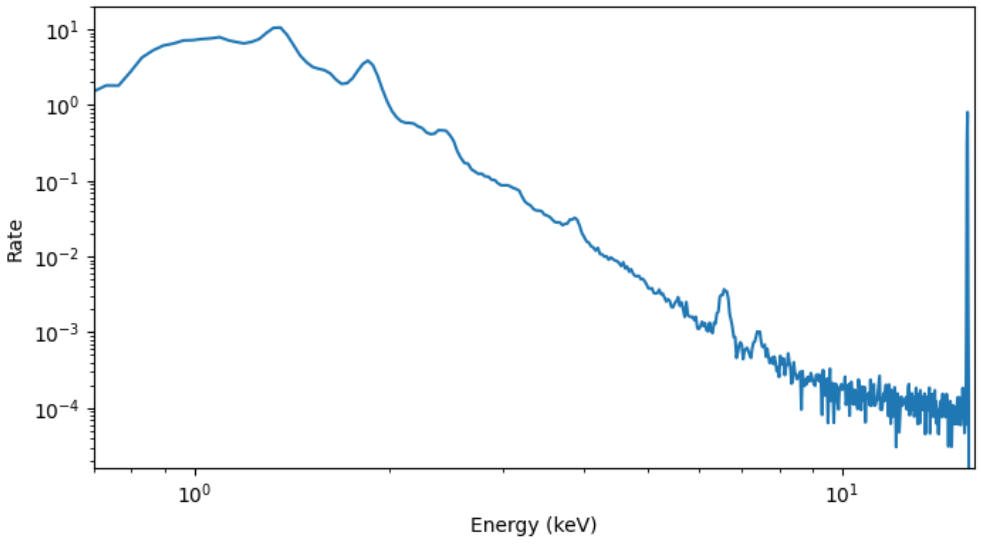

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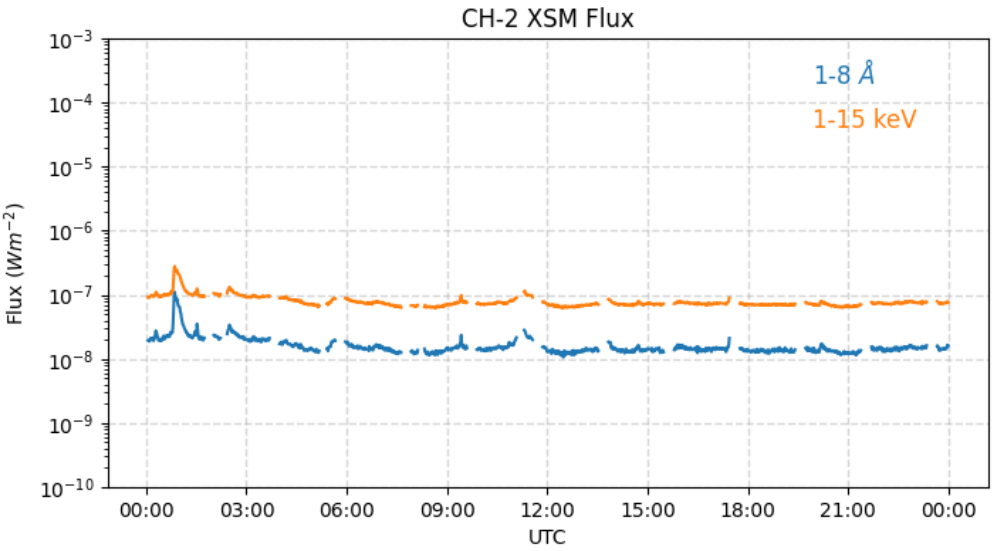

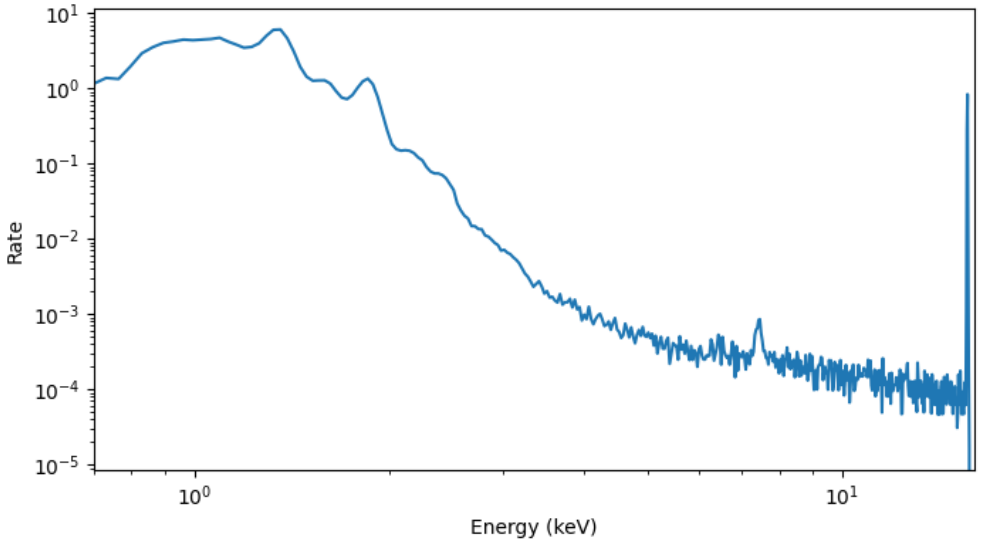

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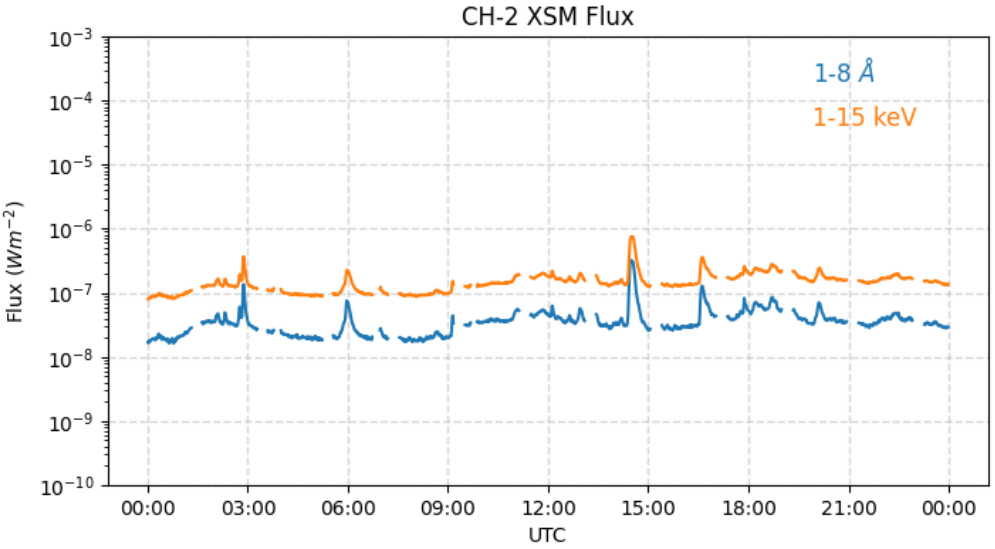

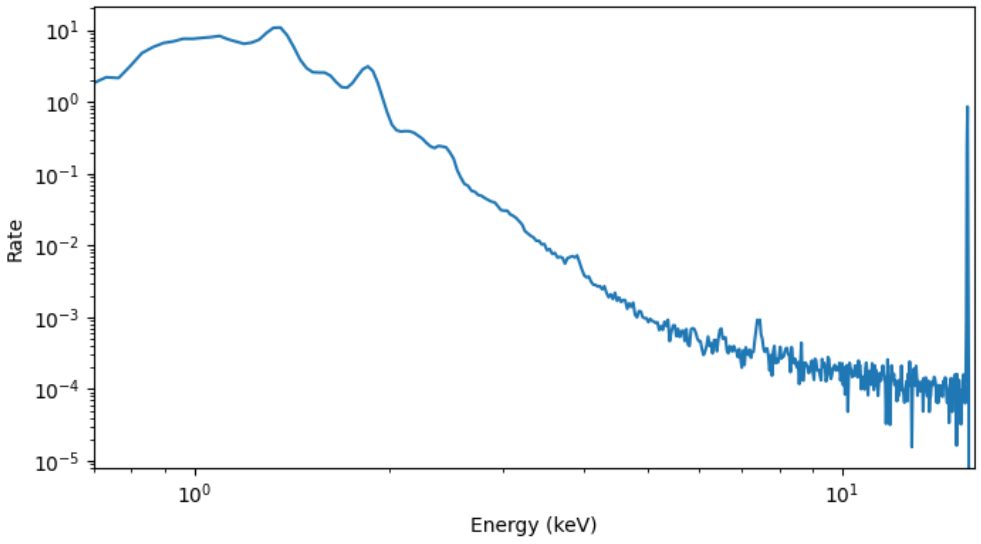

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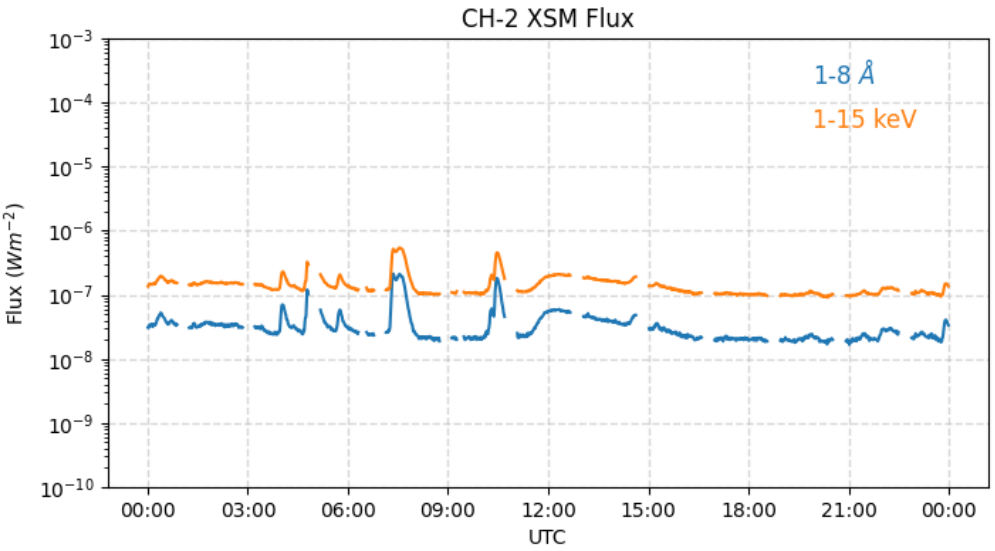

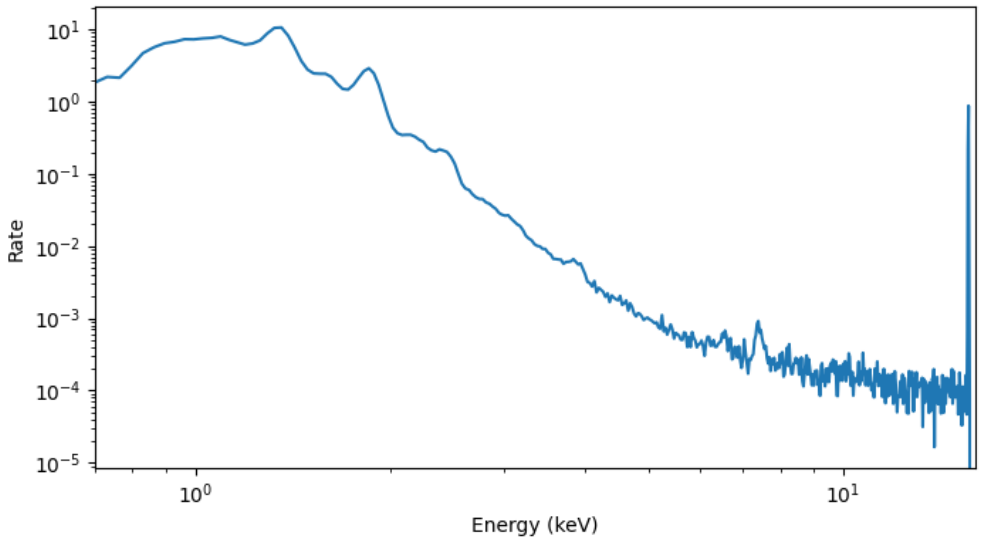

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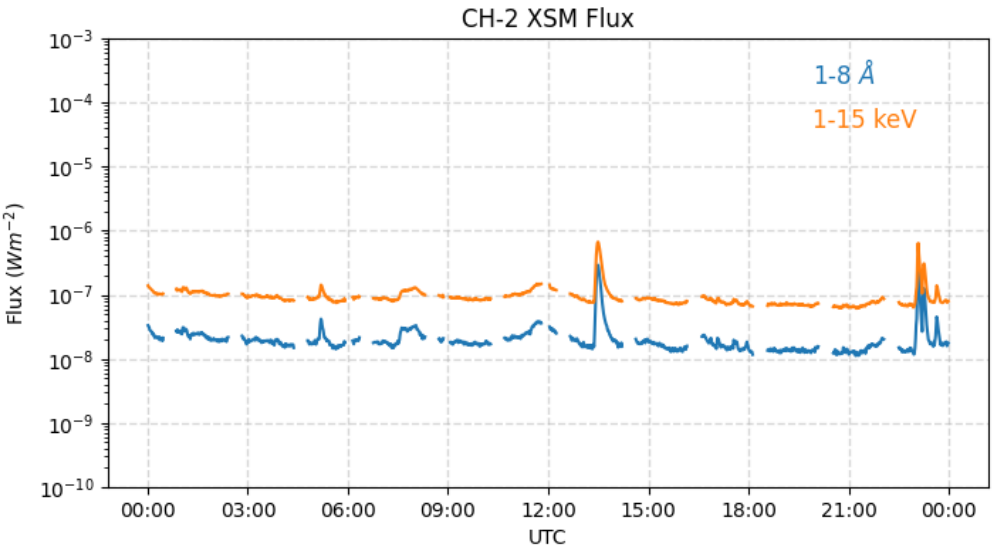

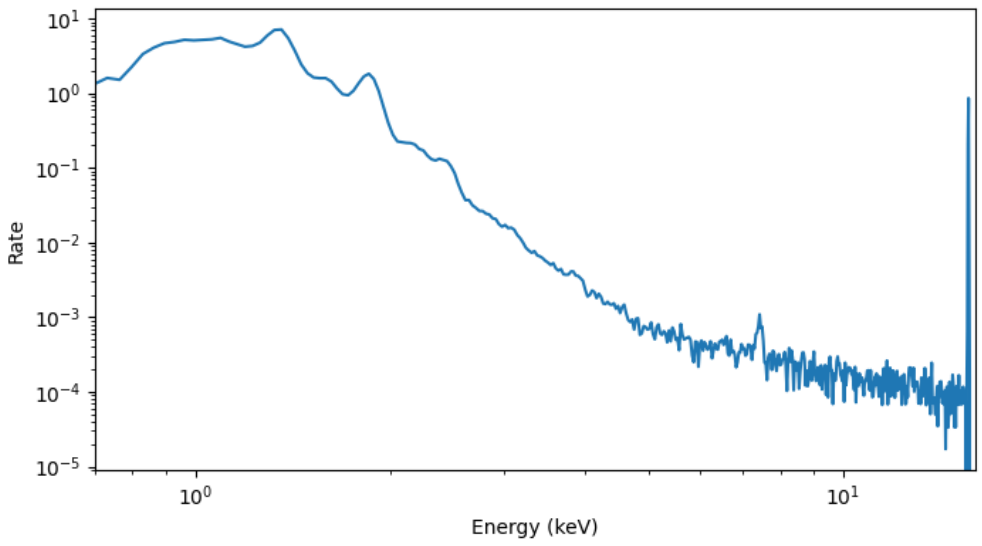

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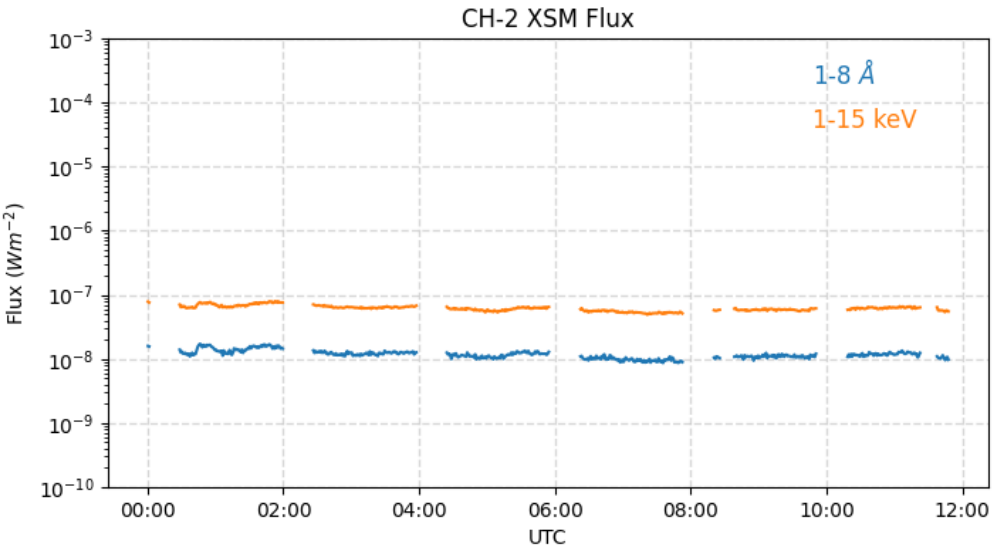

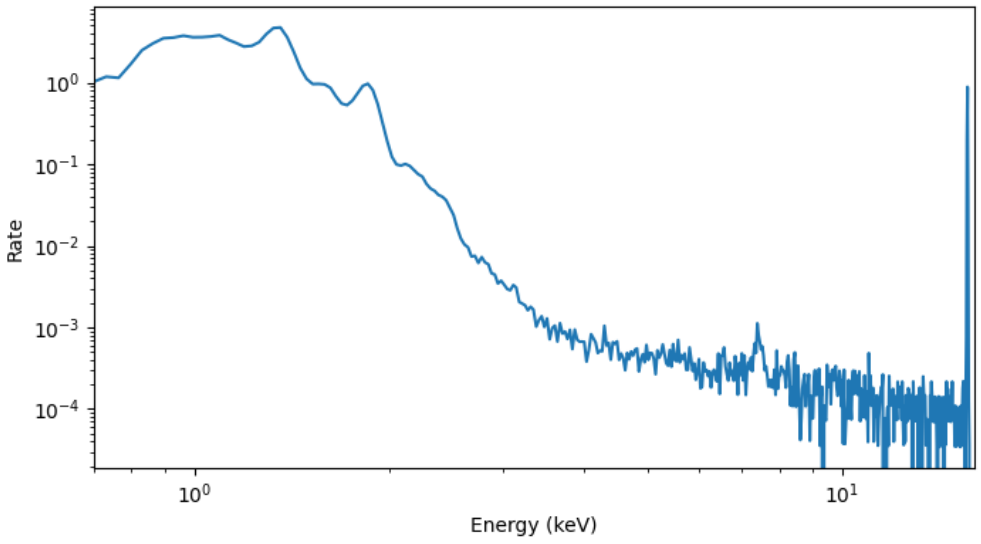

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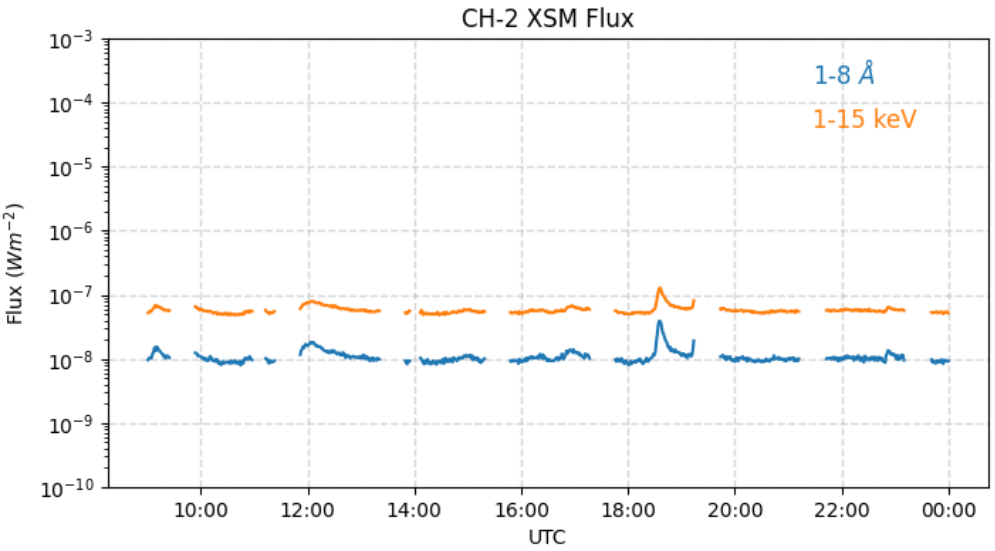

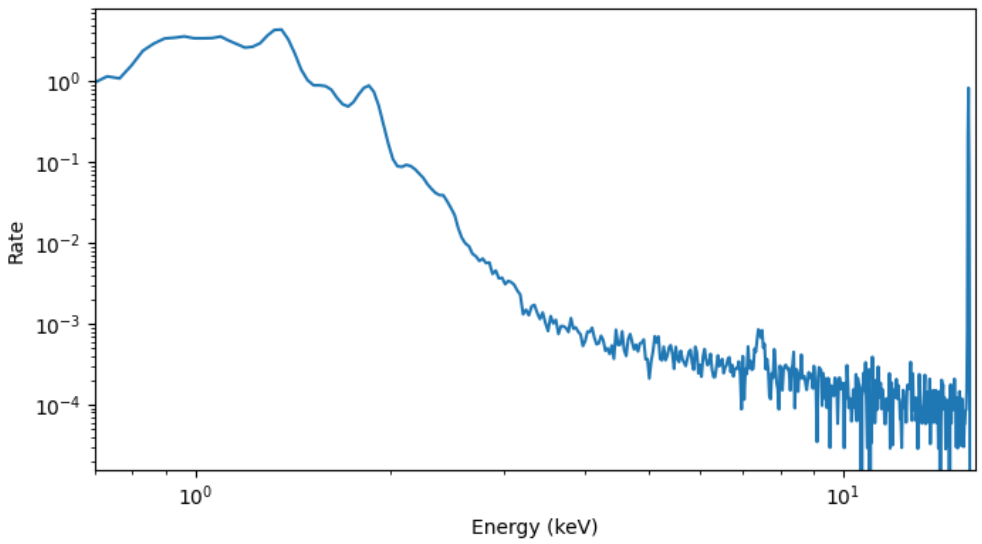

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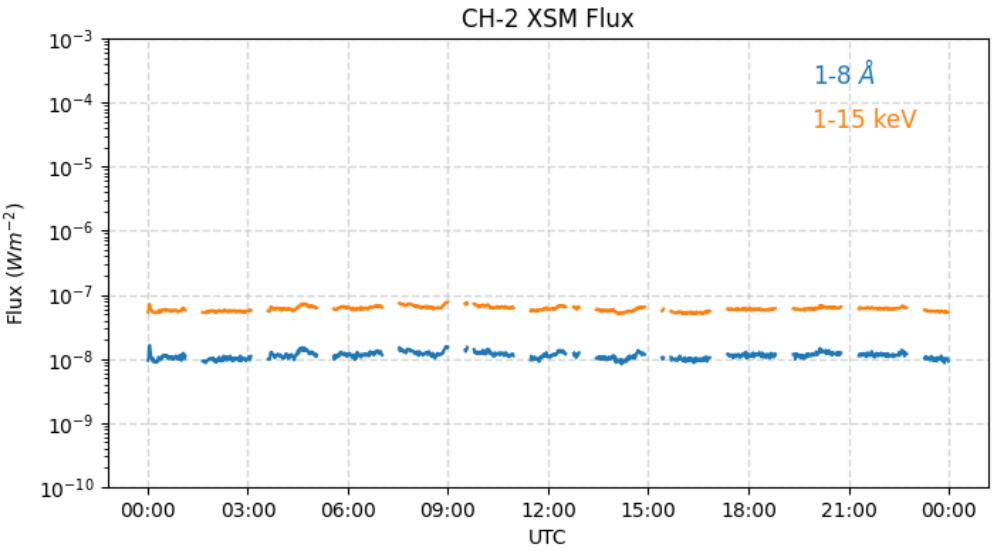

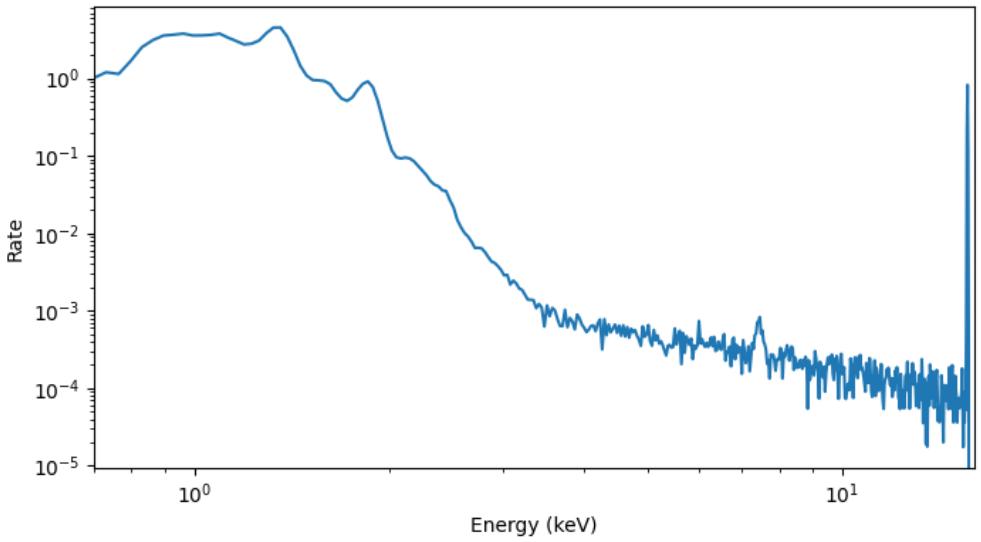

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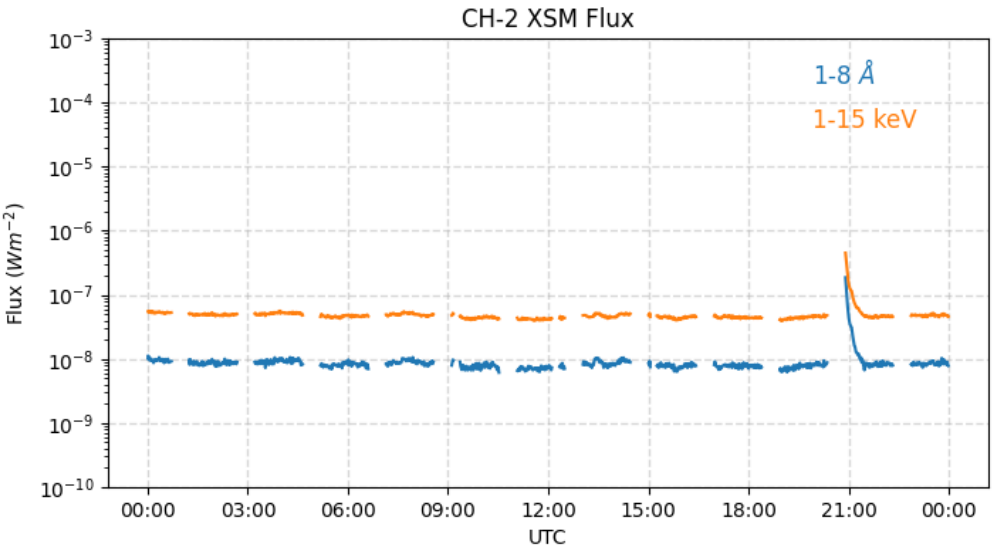

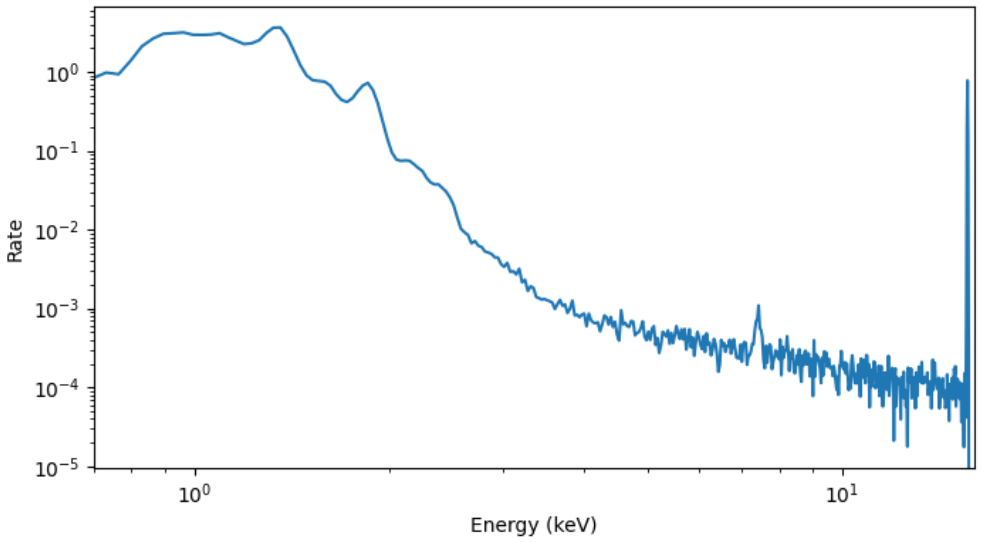

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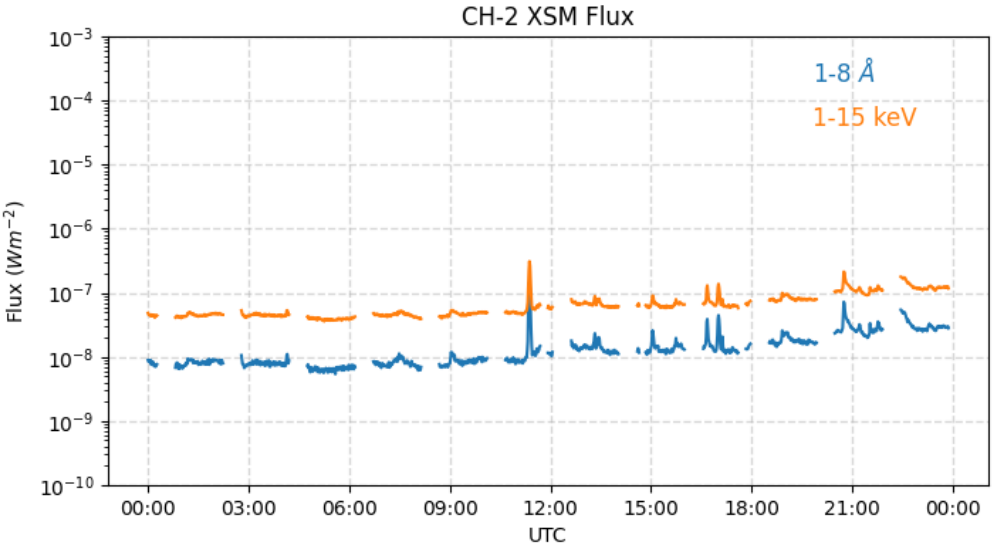
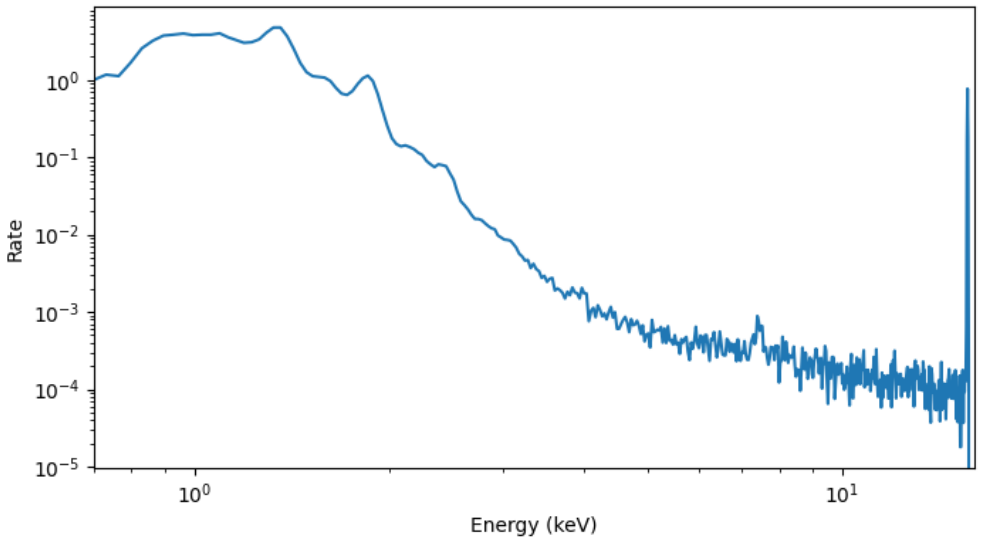
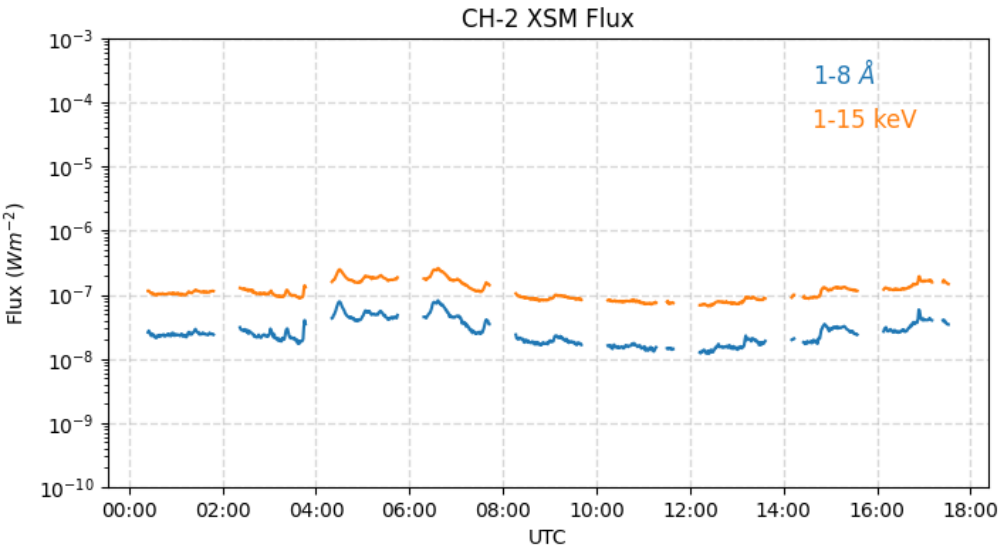
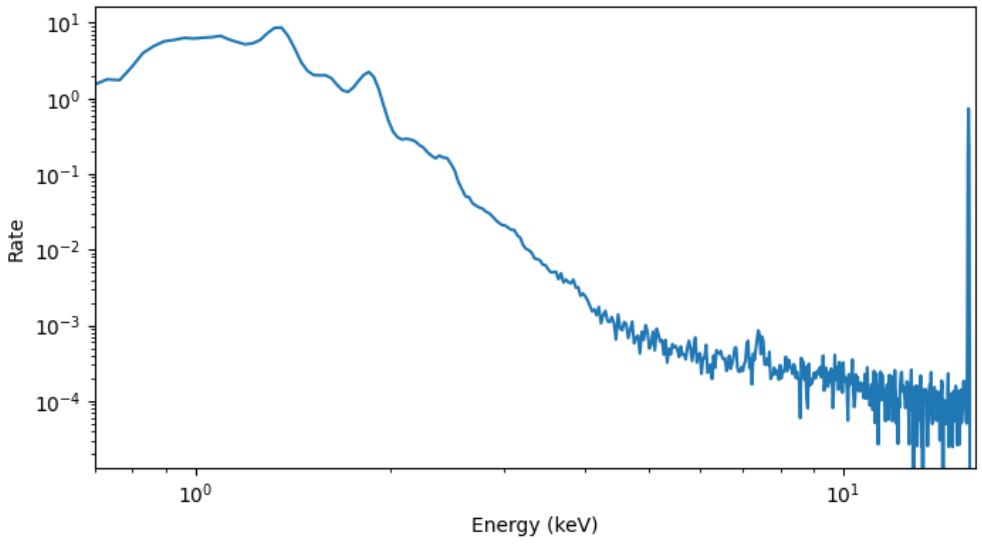


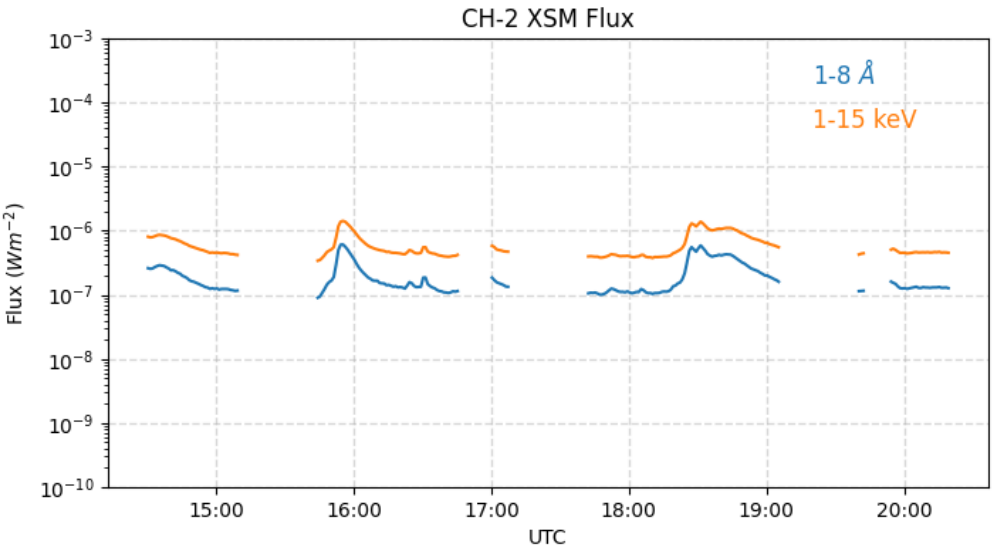


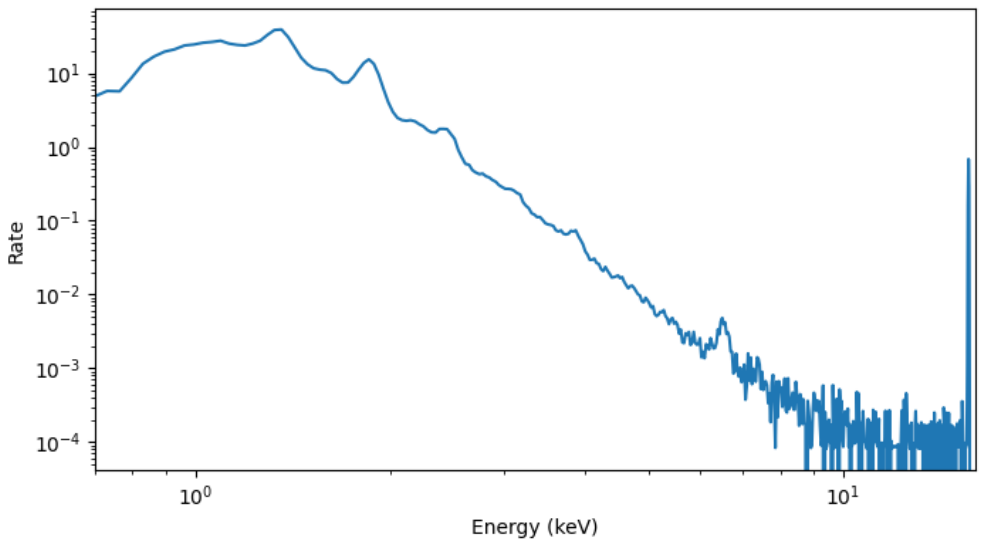
Date: 2020-10-26





Date: 2020-10-27





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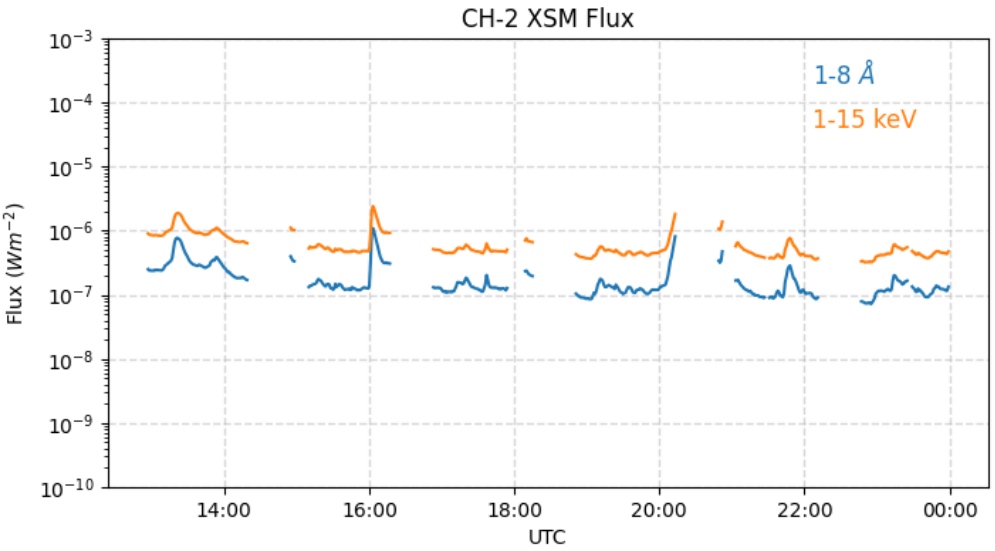

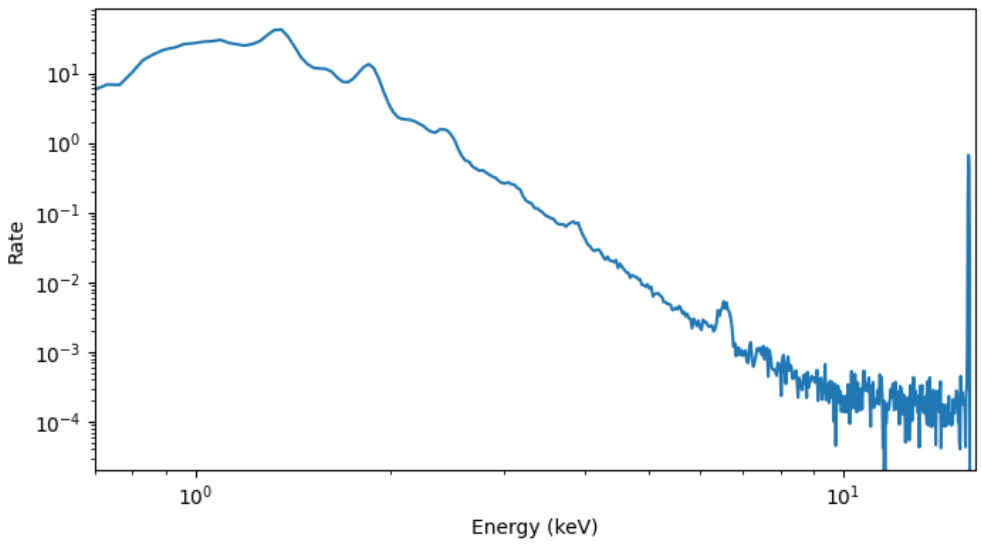

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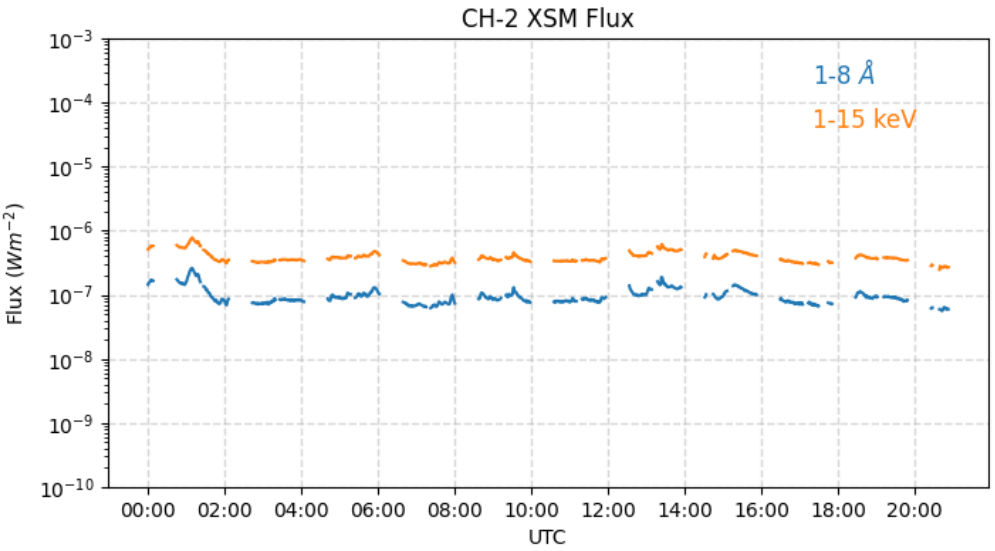

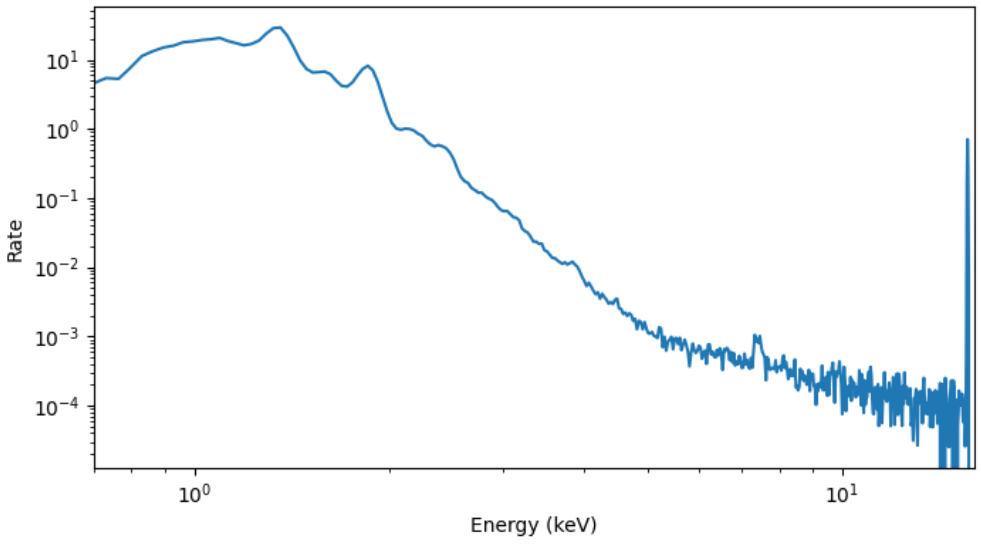

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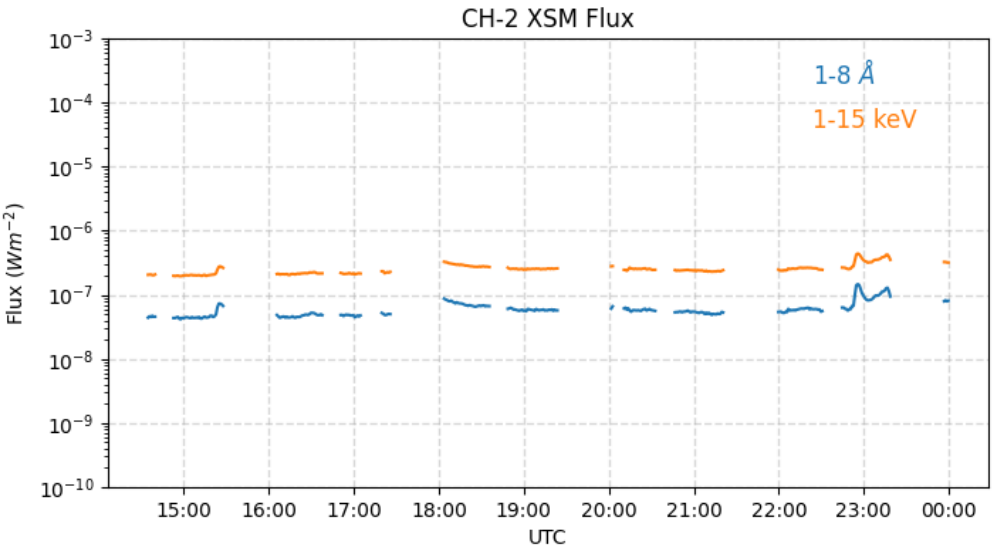

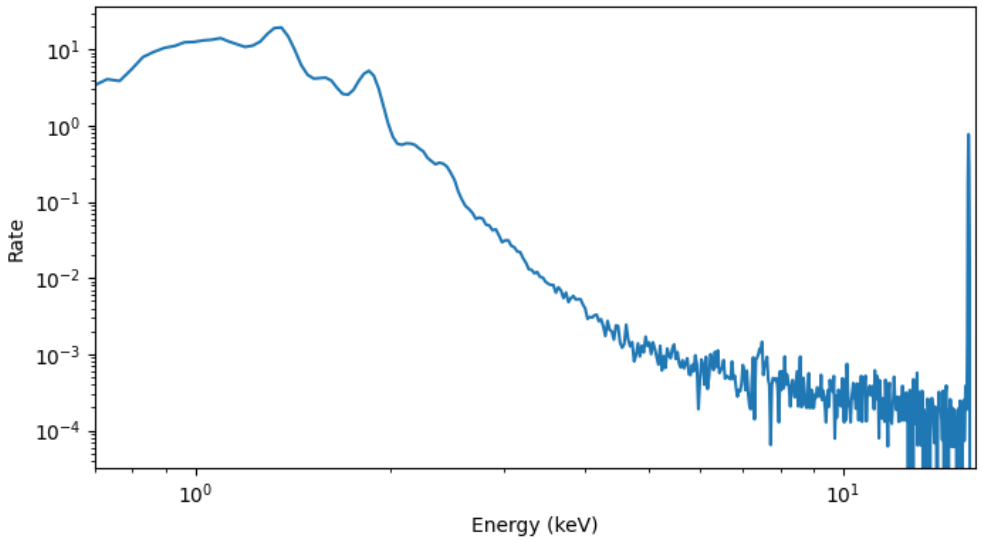

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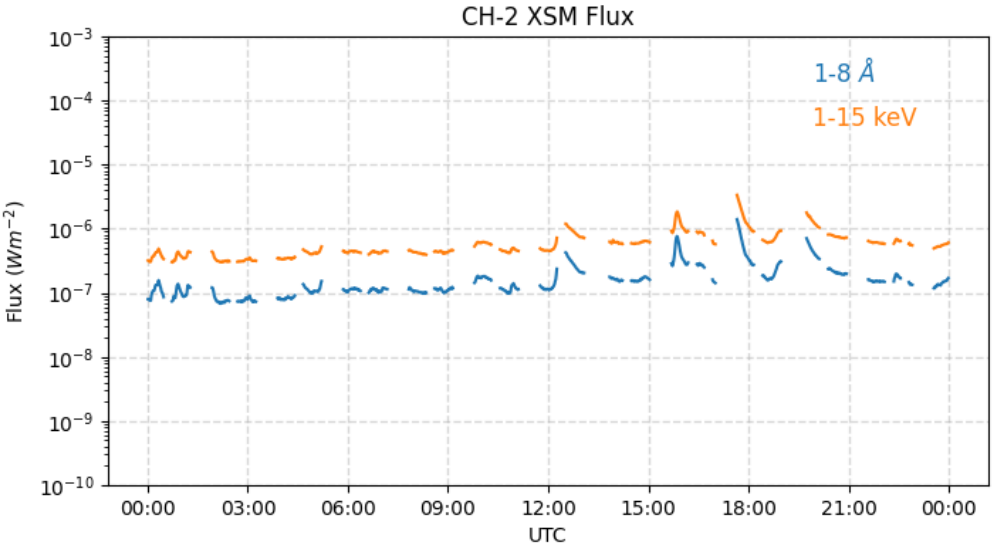

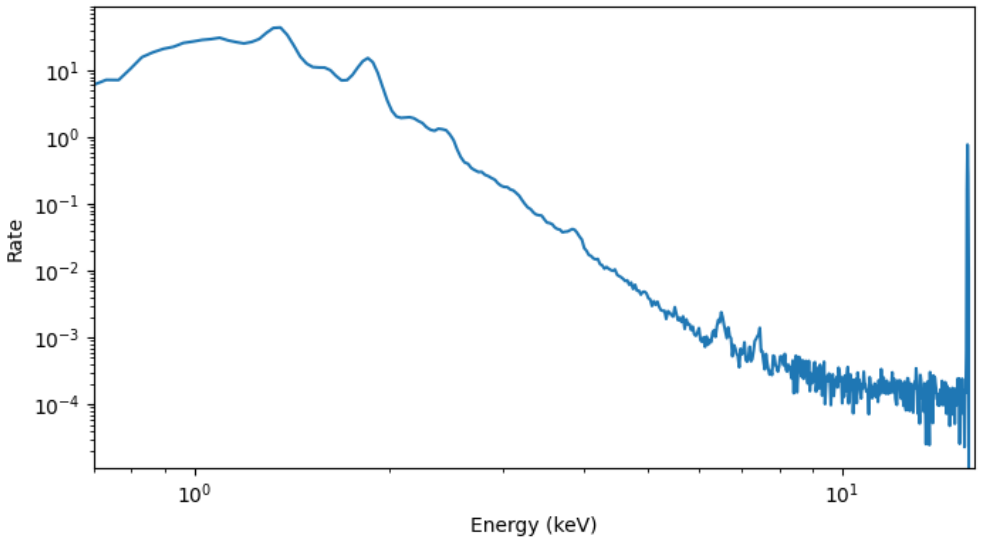

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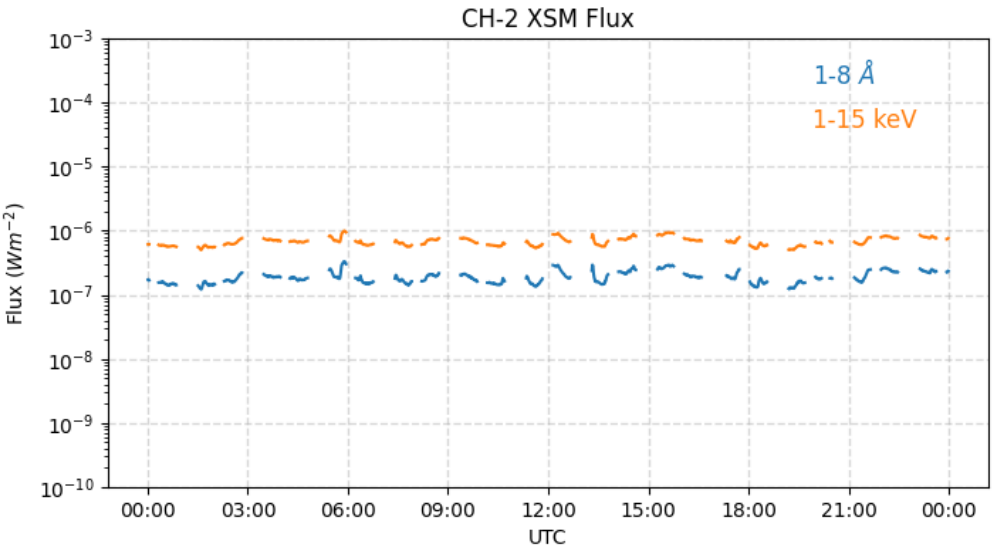

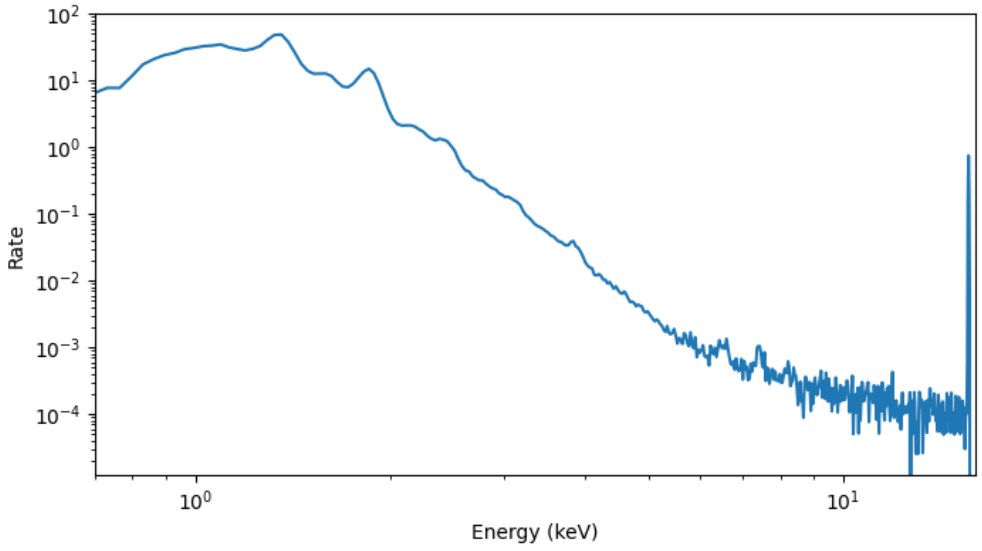

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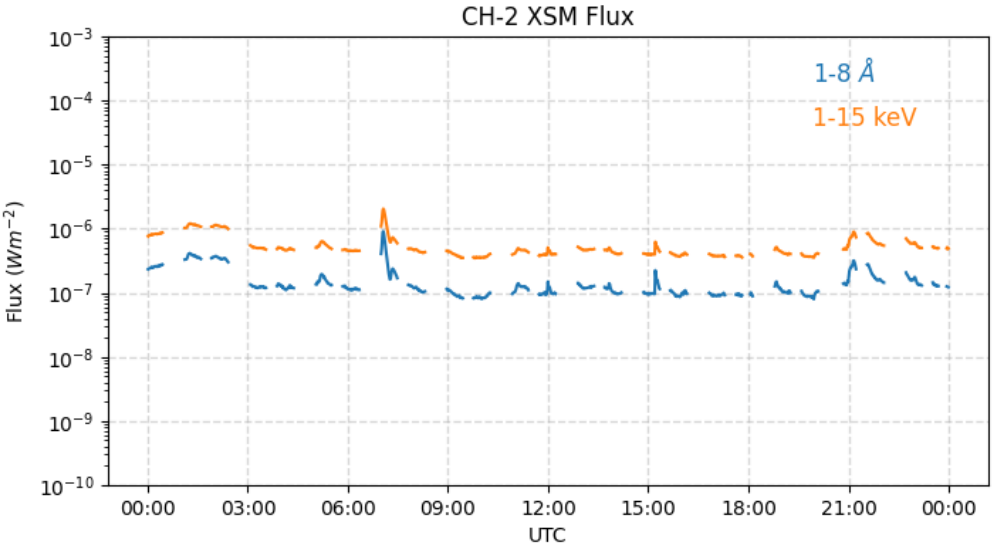

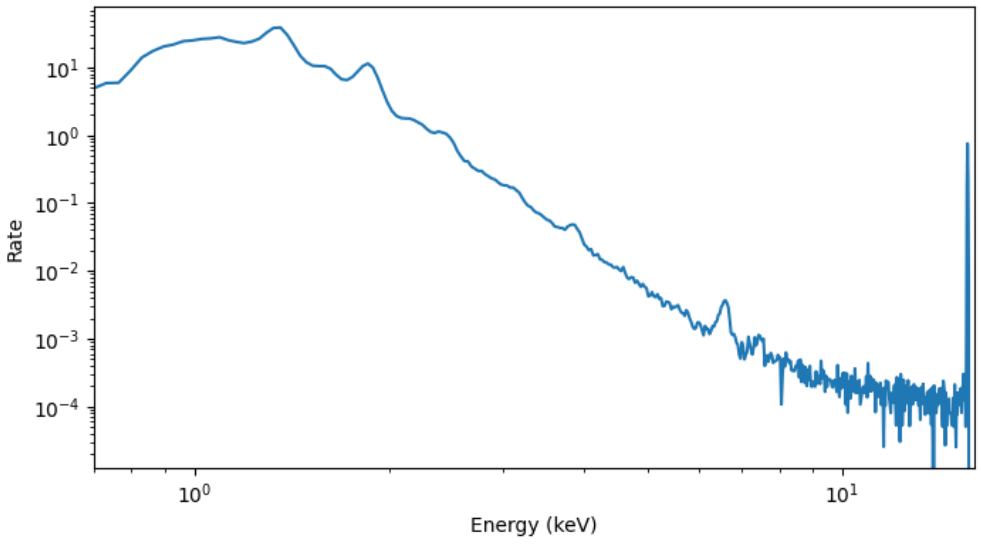

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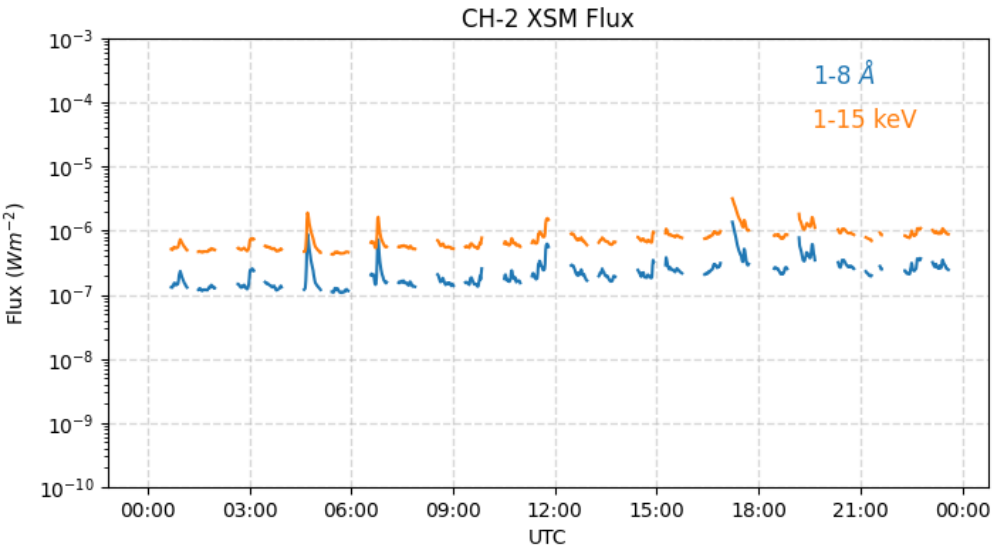

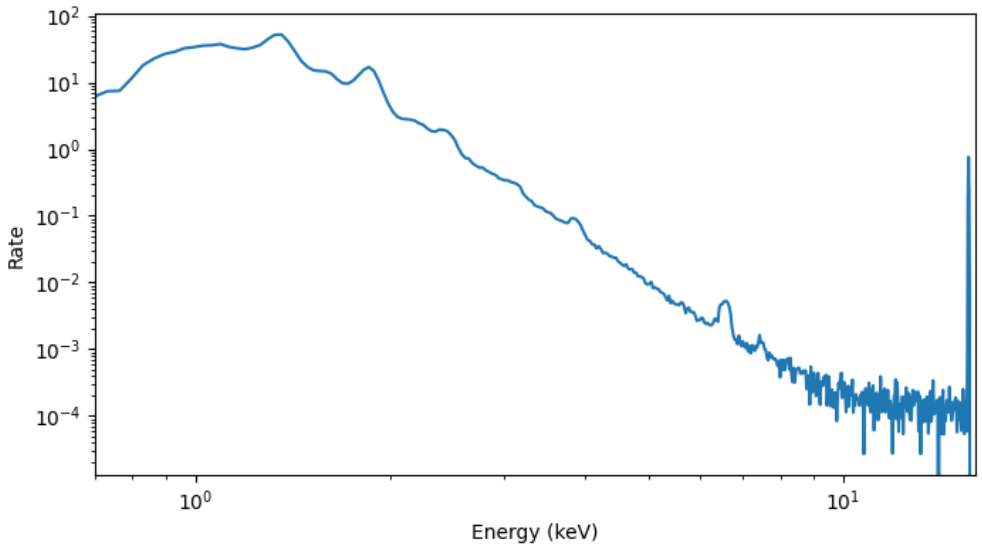

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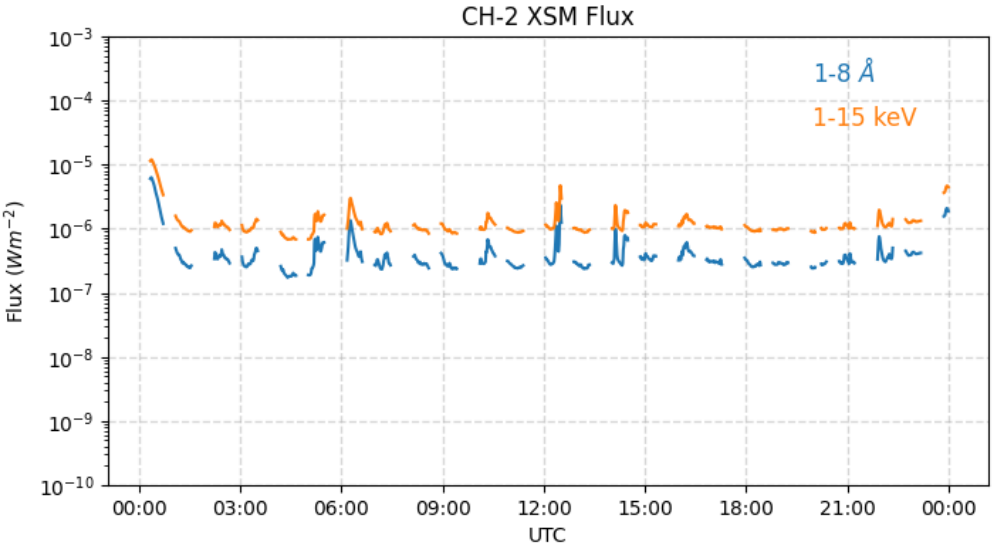

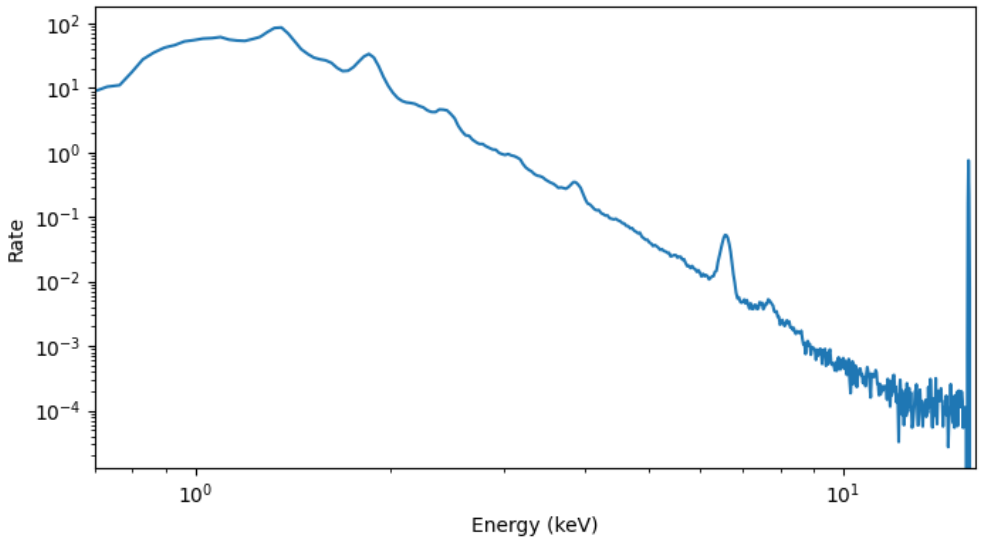

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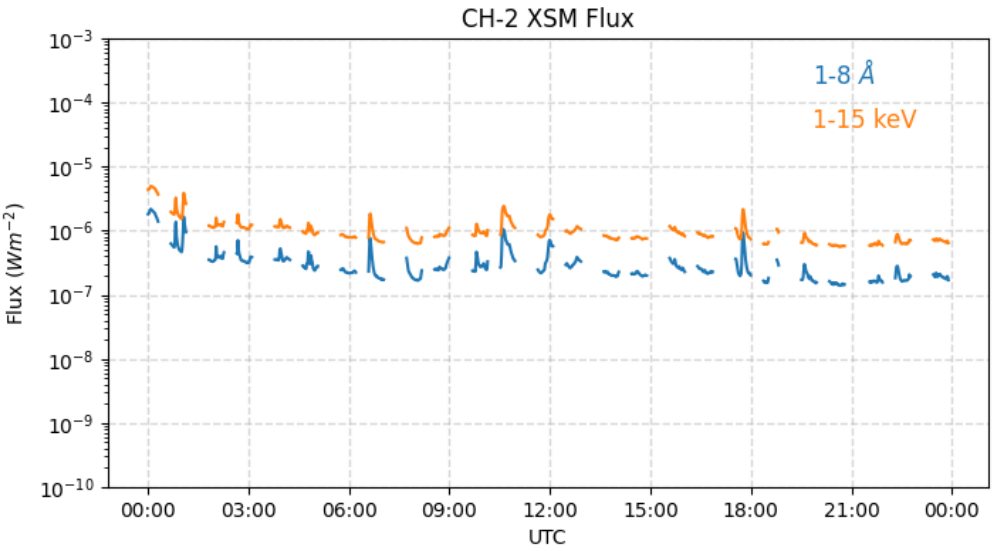

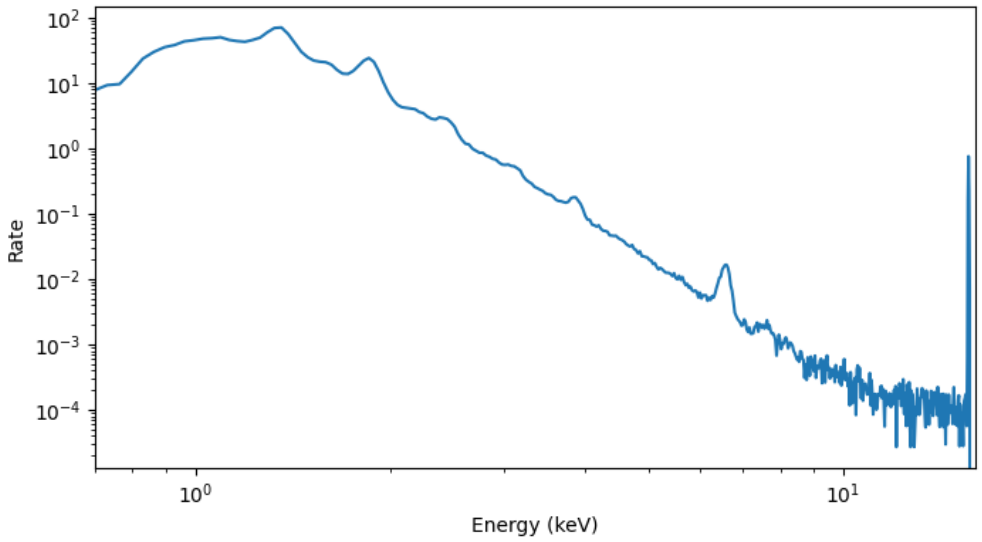

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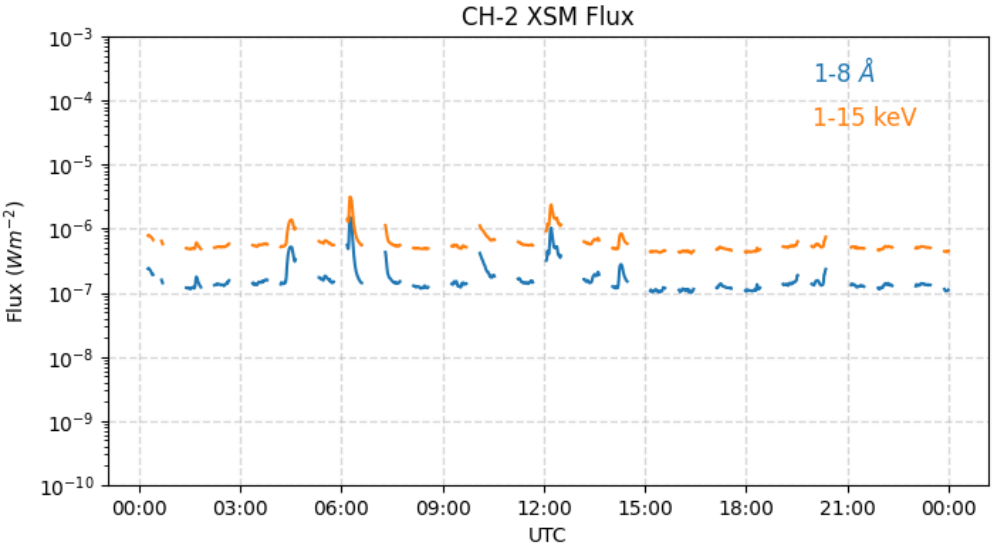

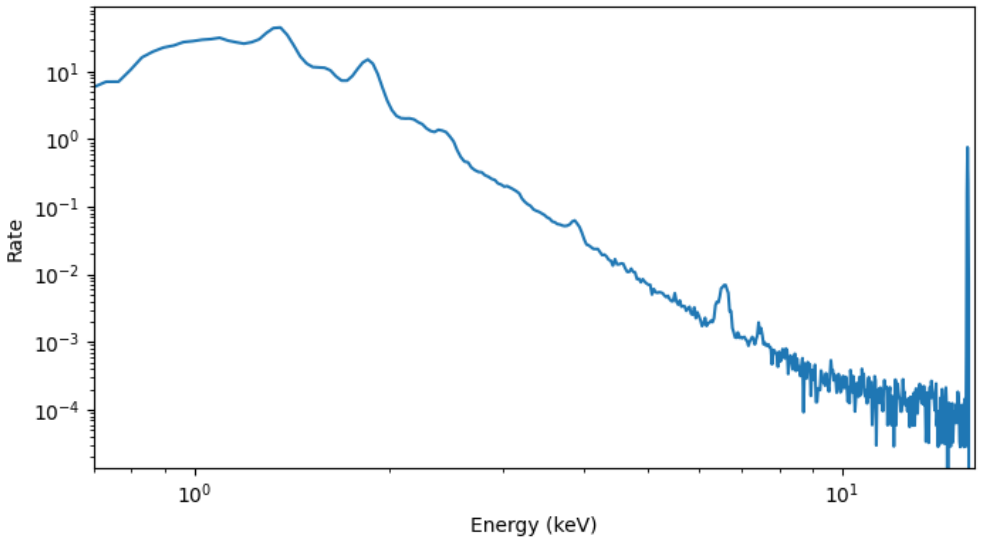

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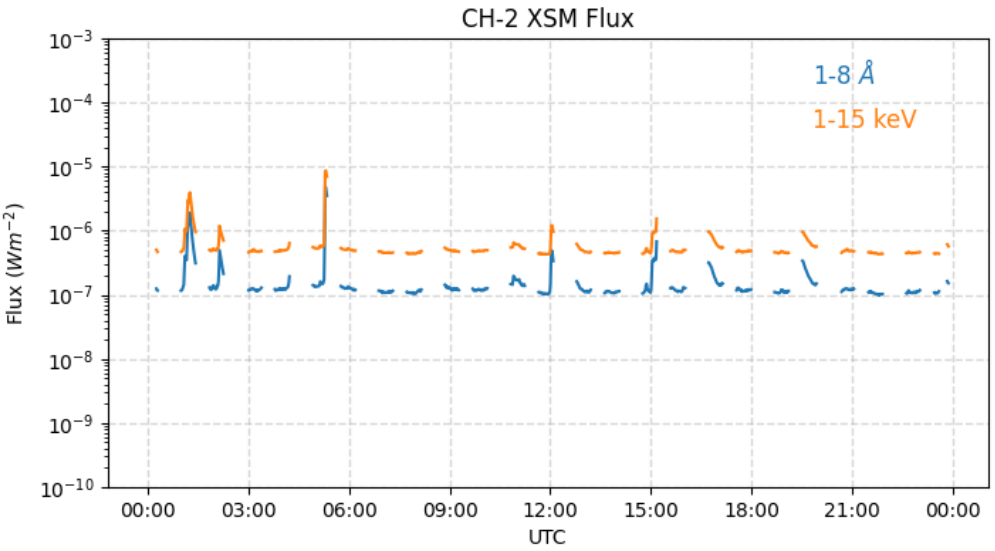

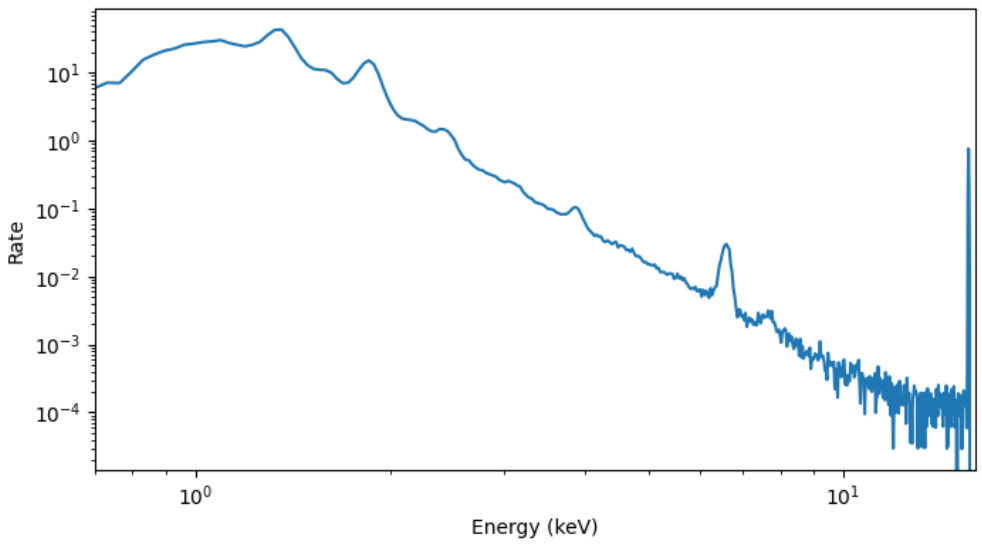

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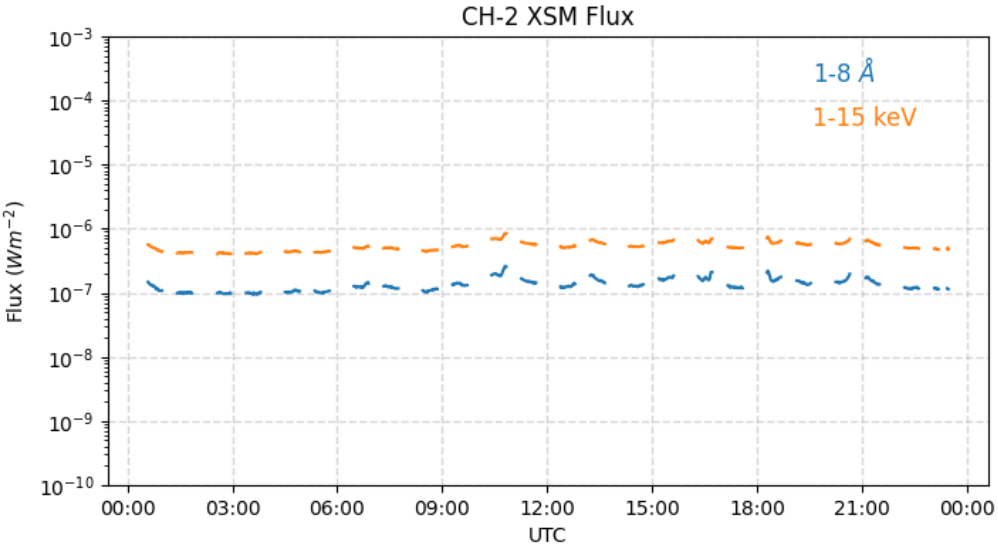

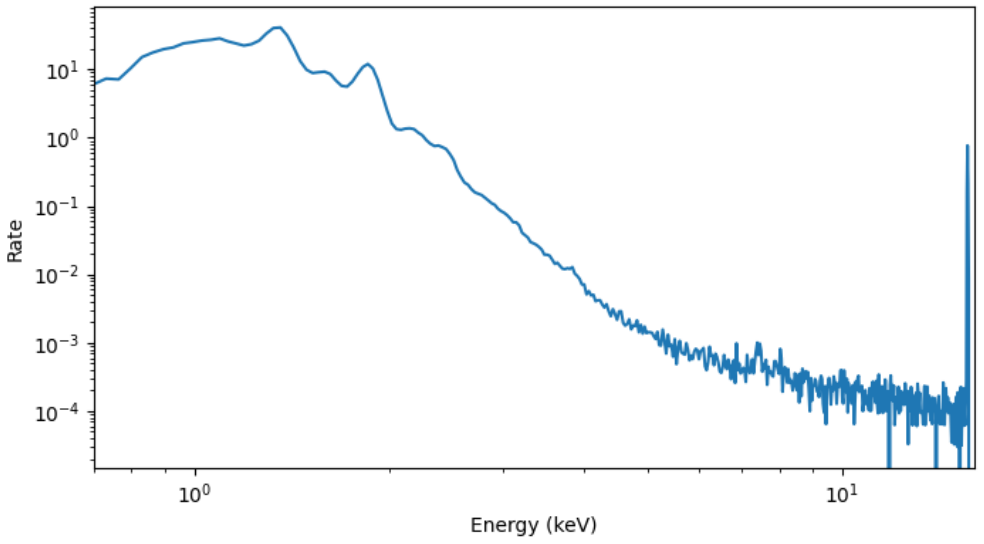

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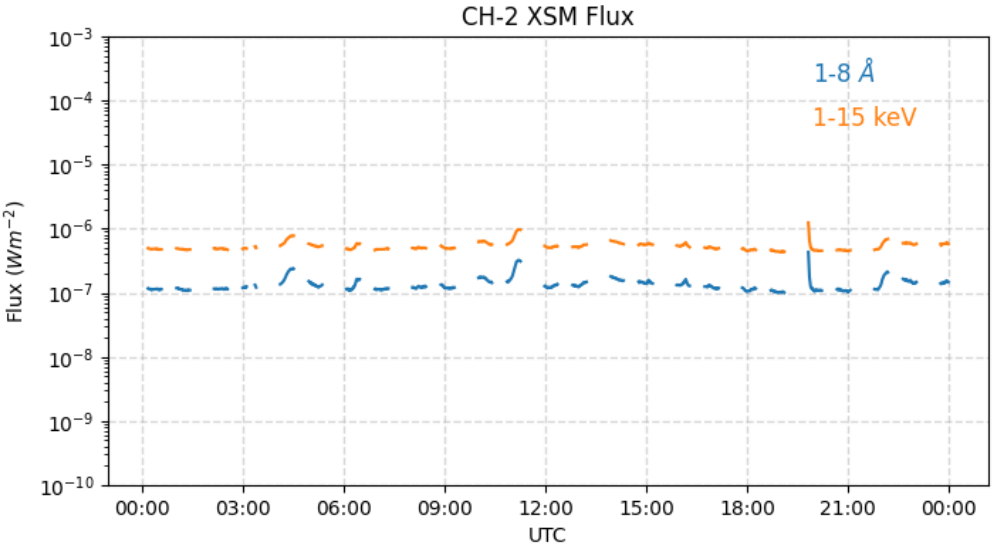

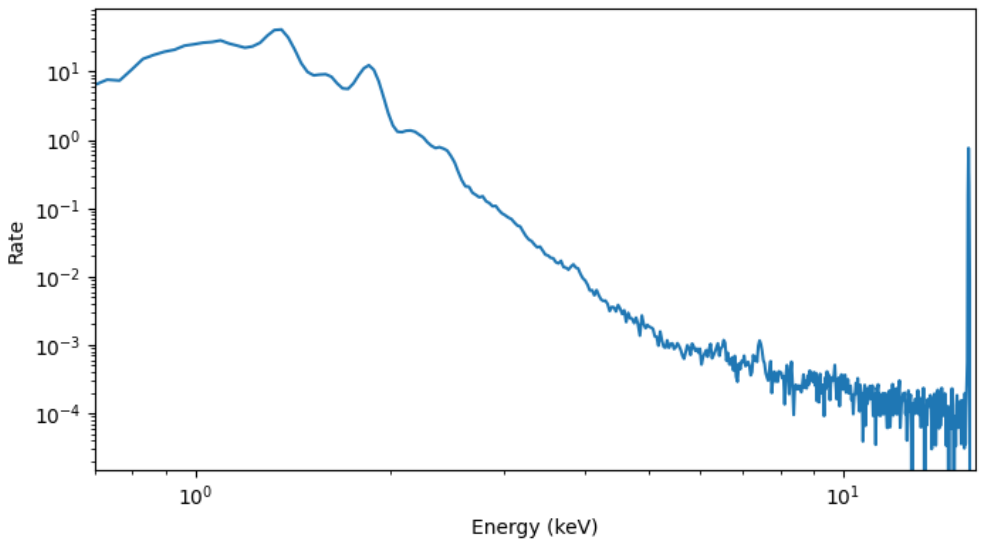

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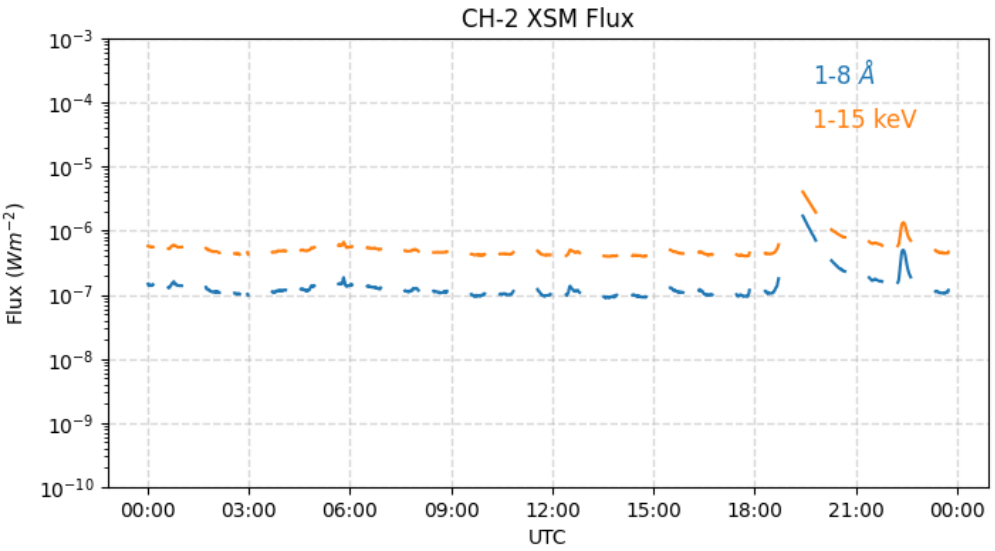

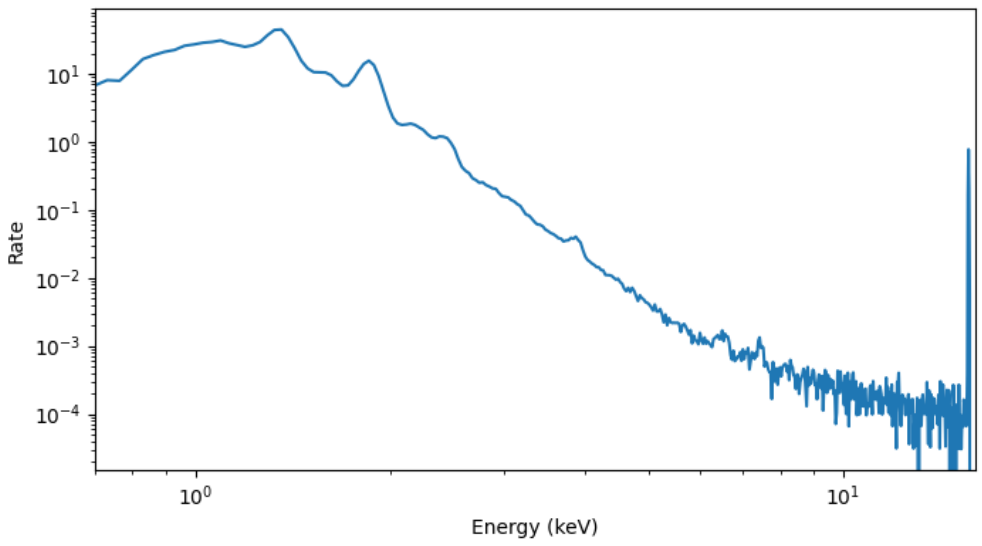

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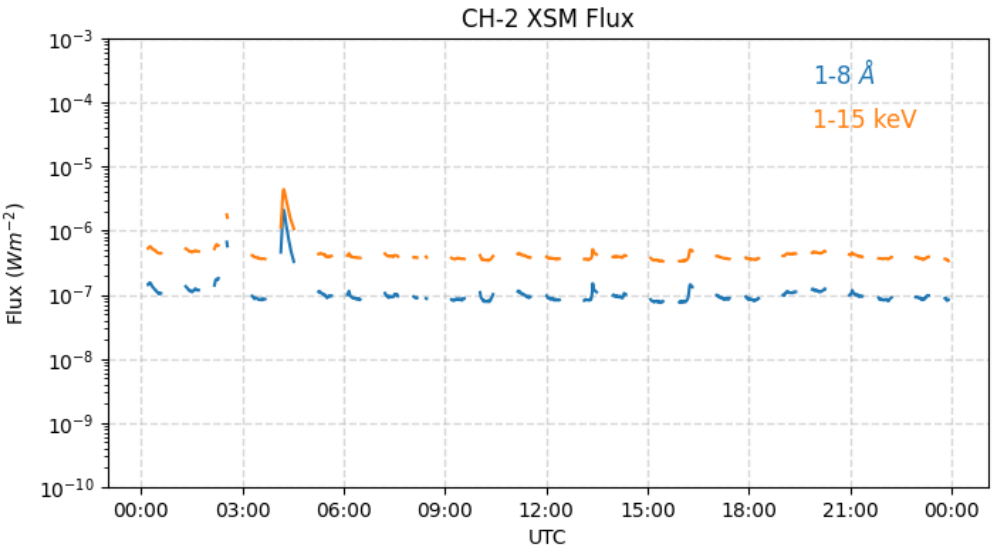

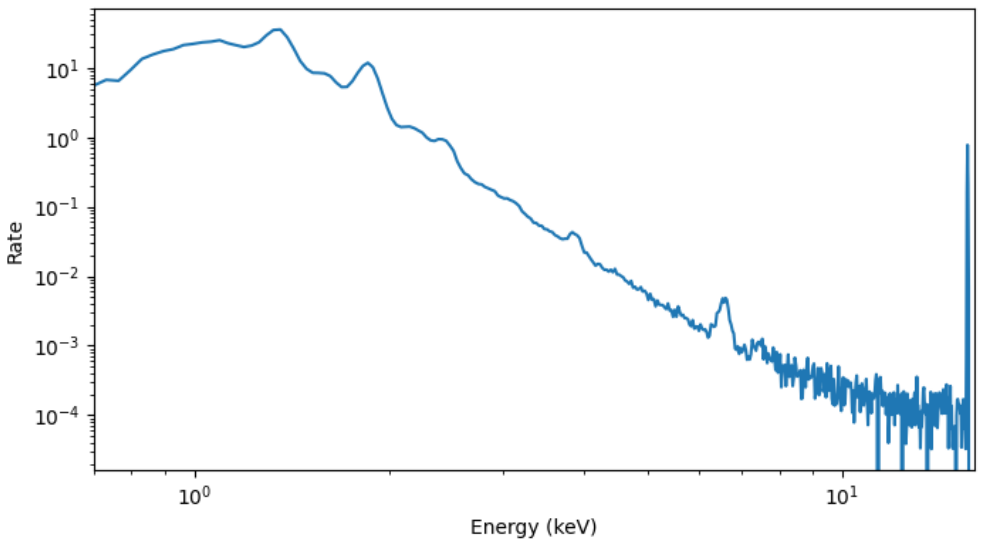

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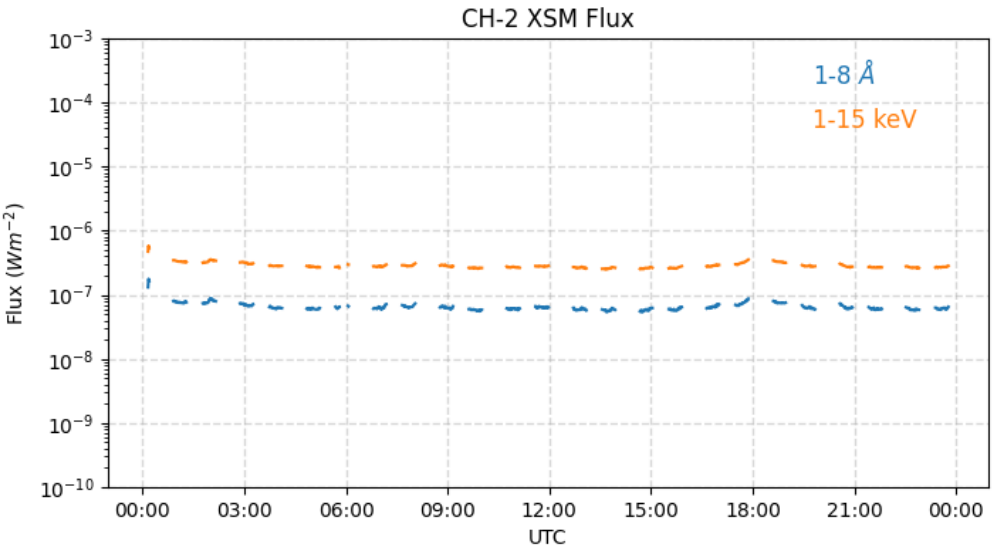

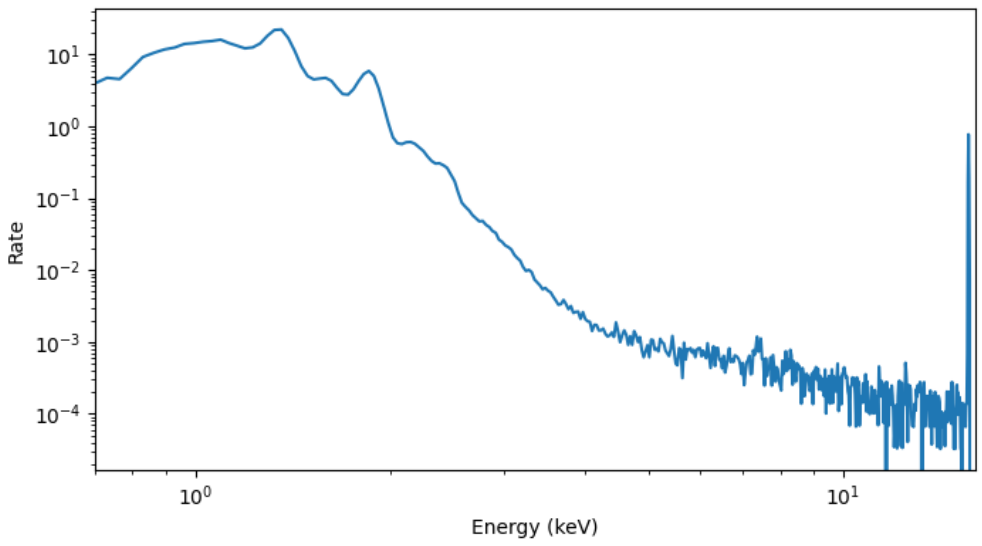

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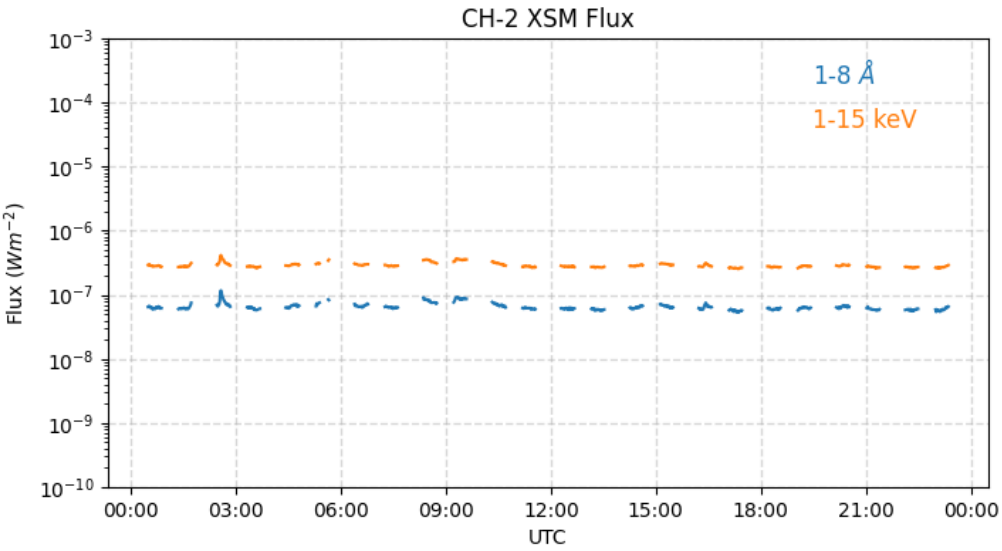

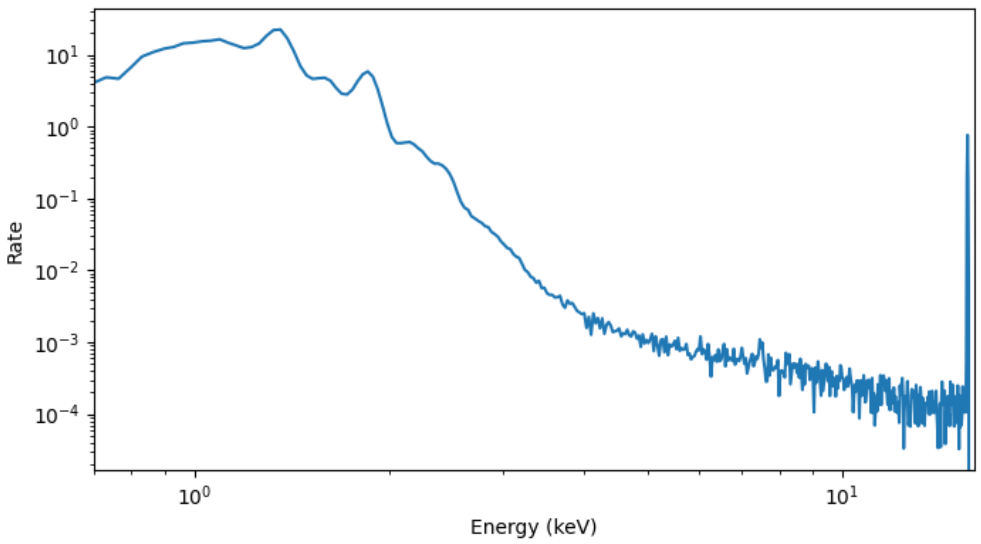

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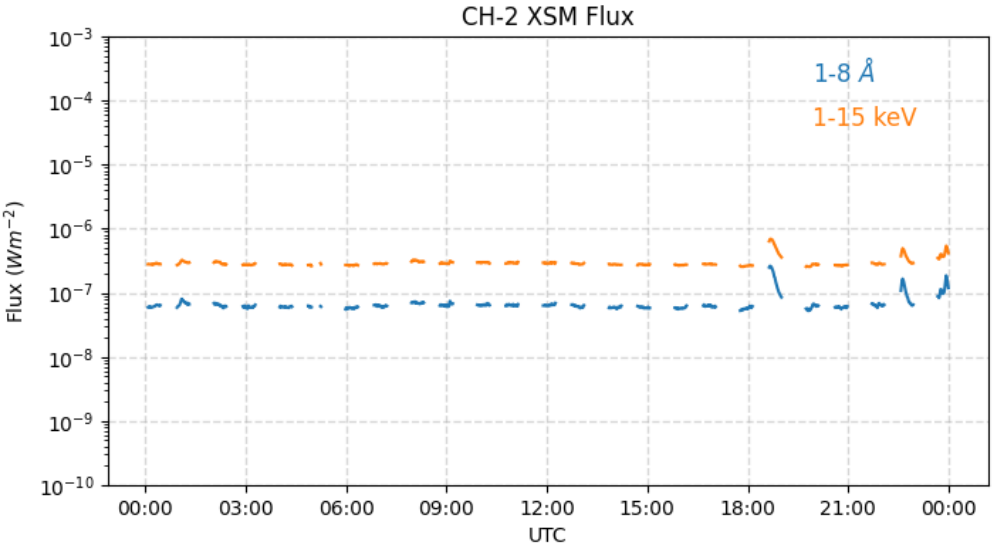

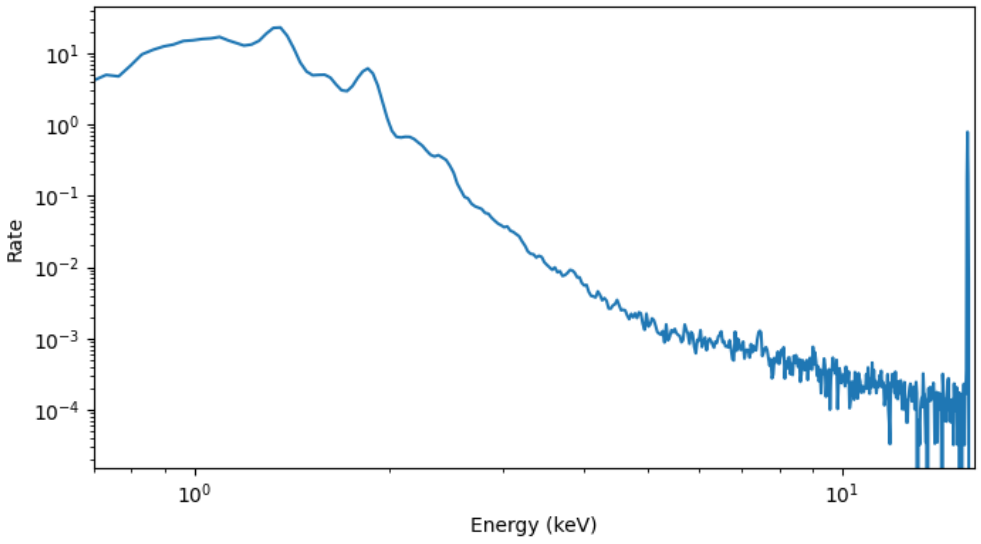

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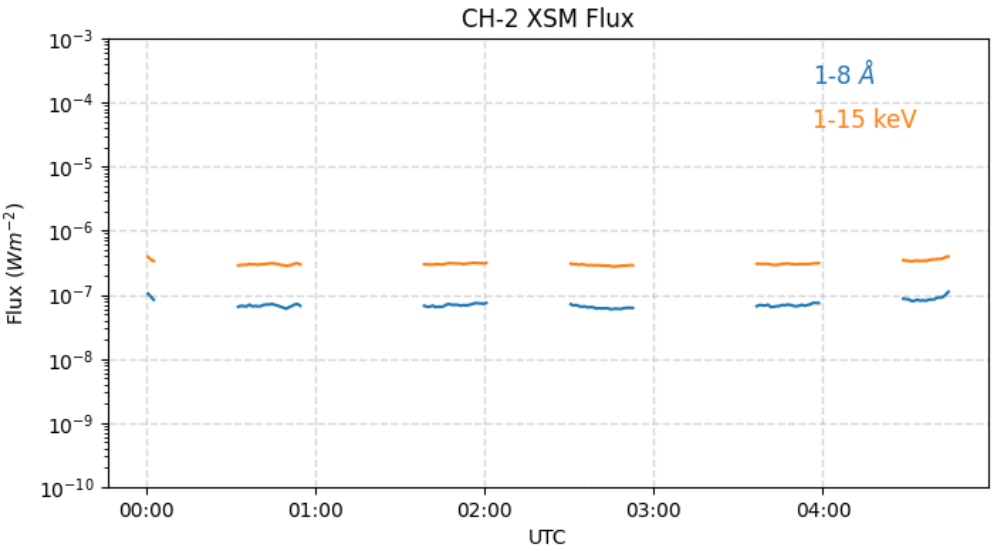

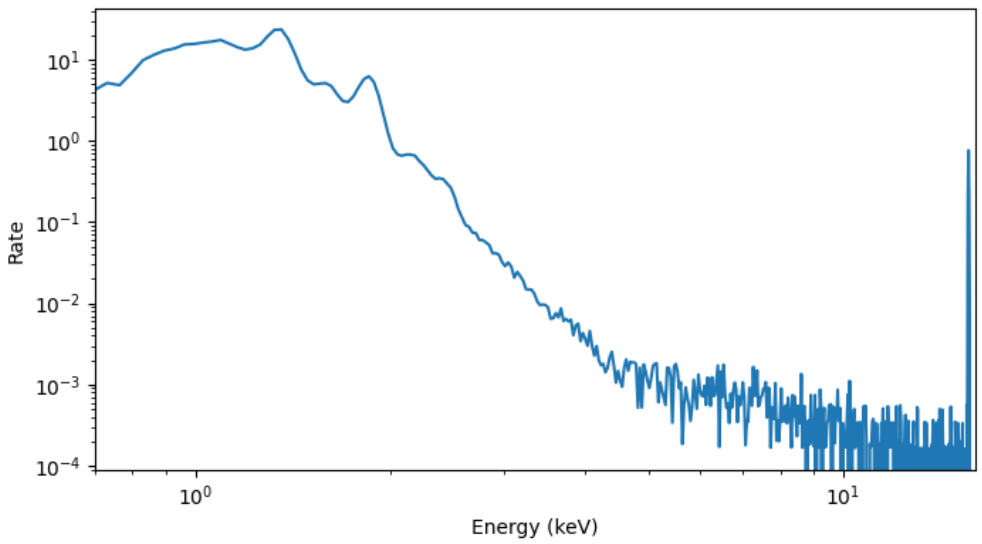

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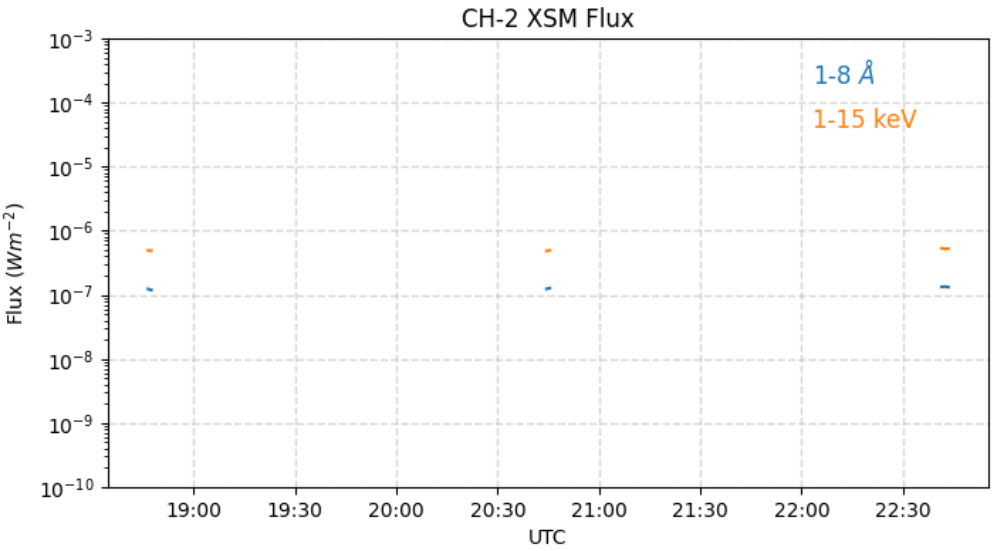

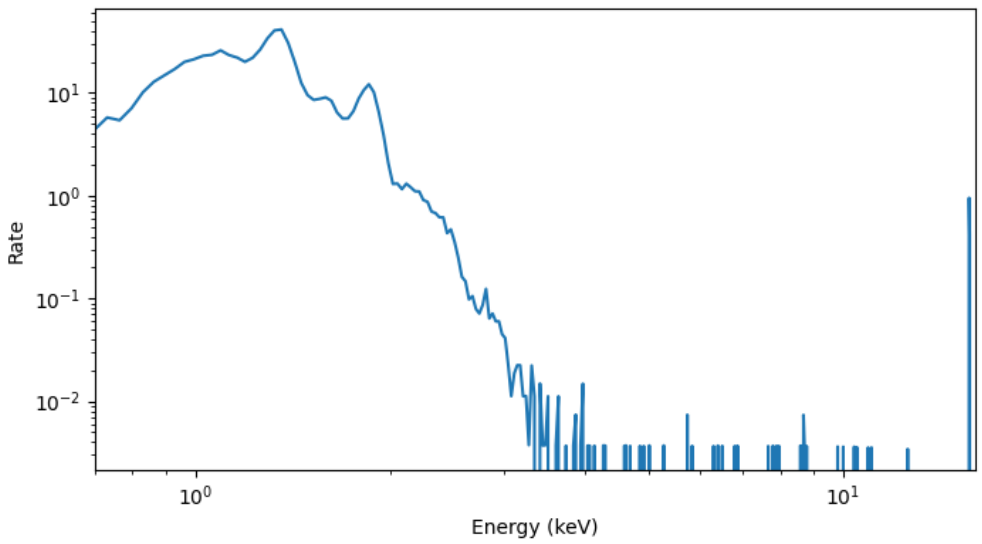

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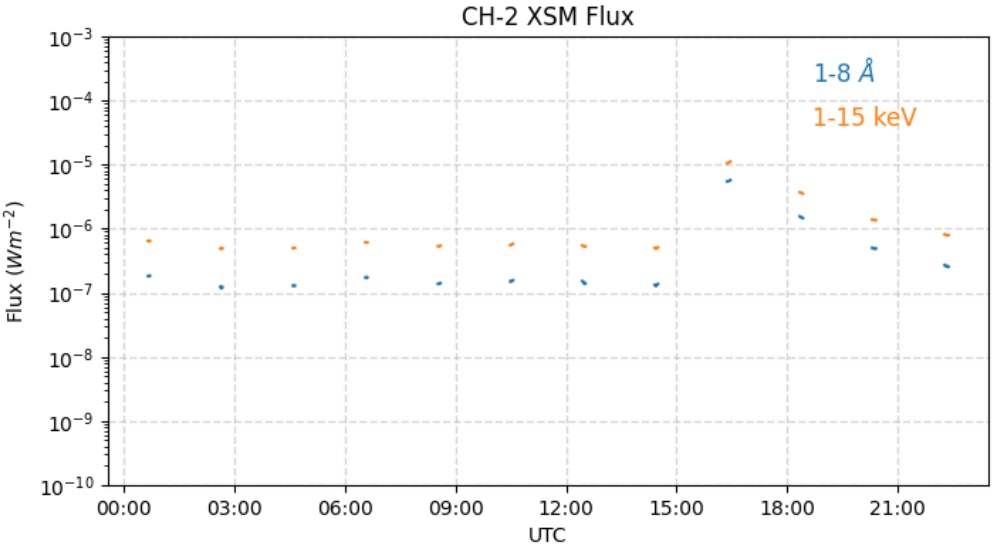

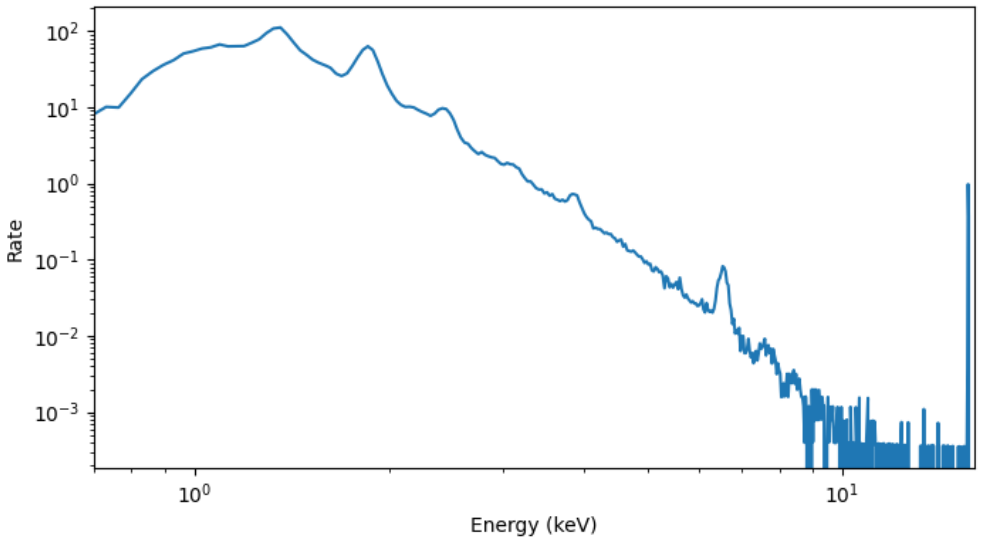

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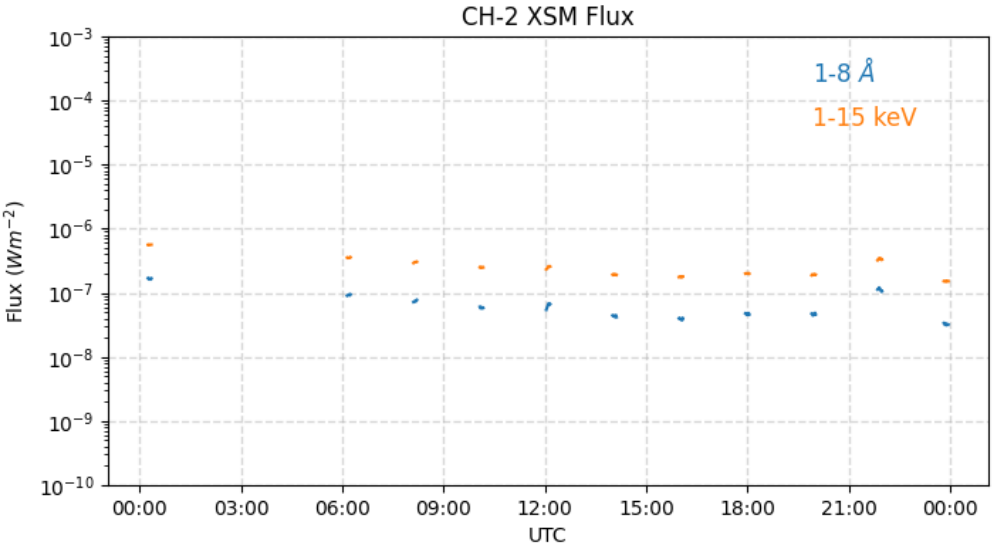

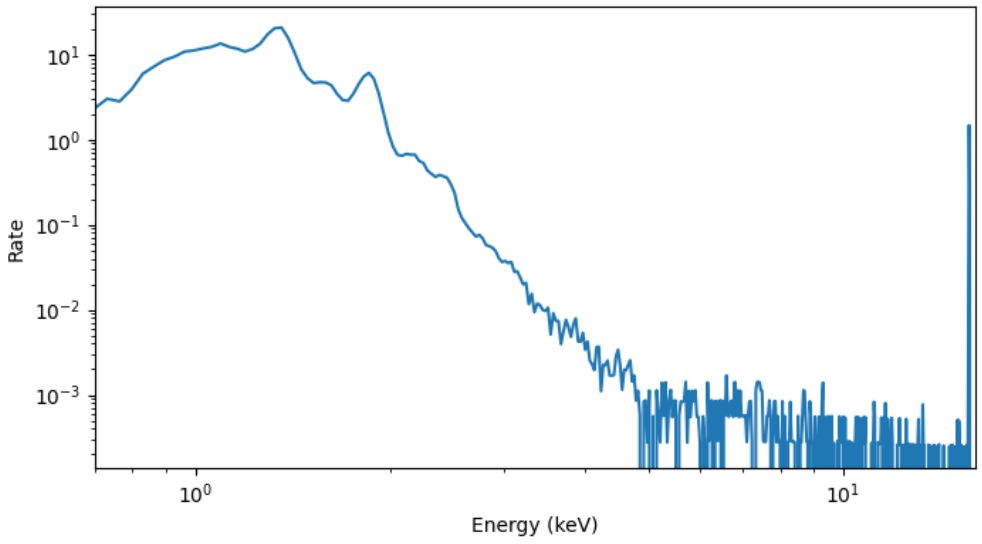

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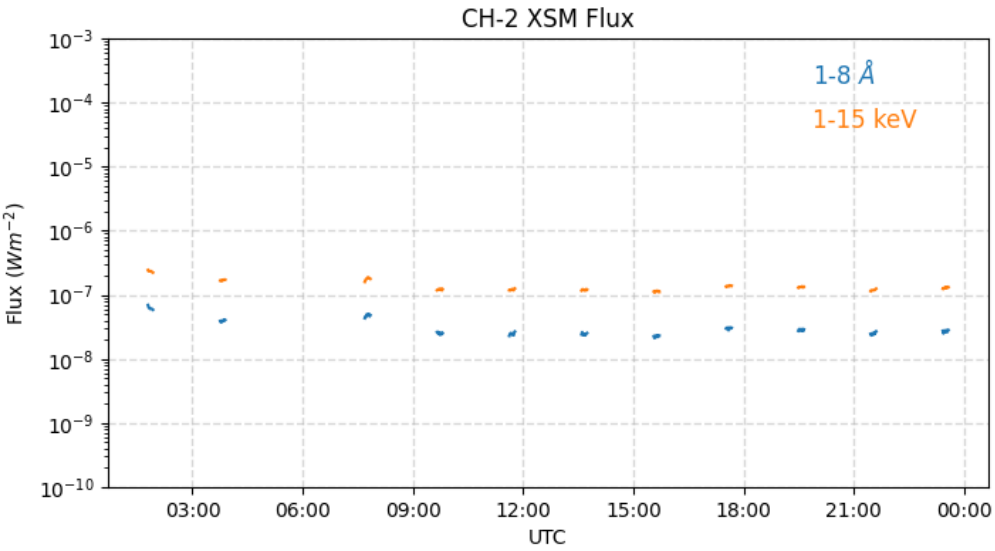

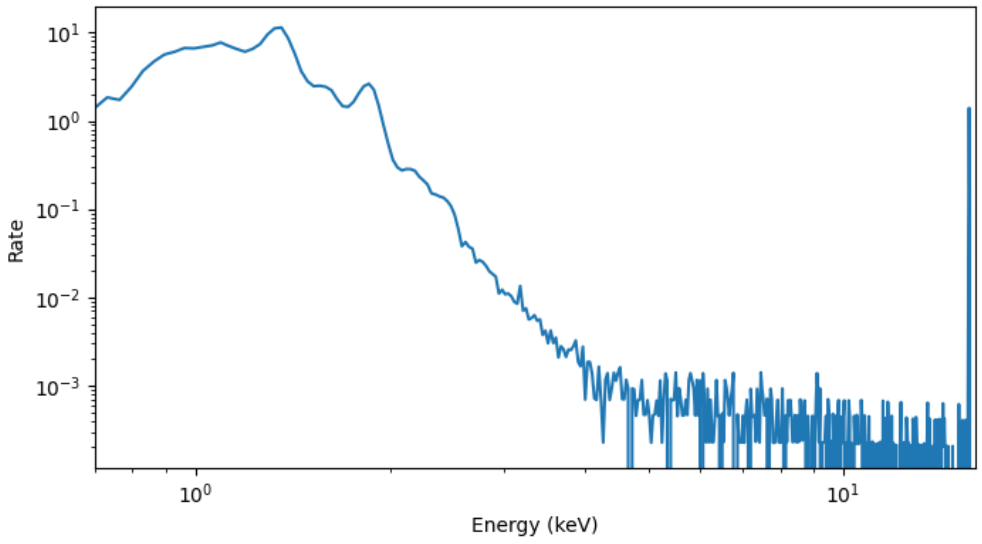

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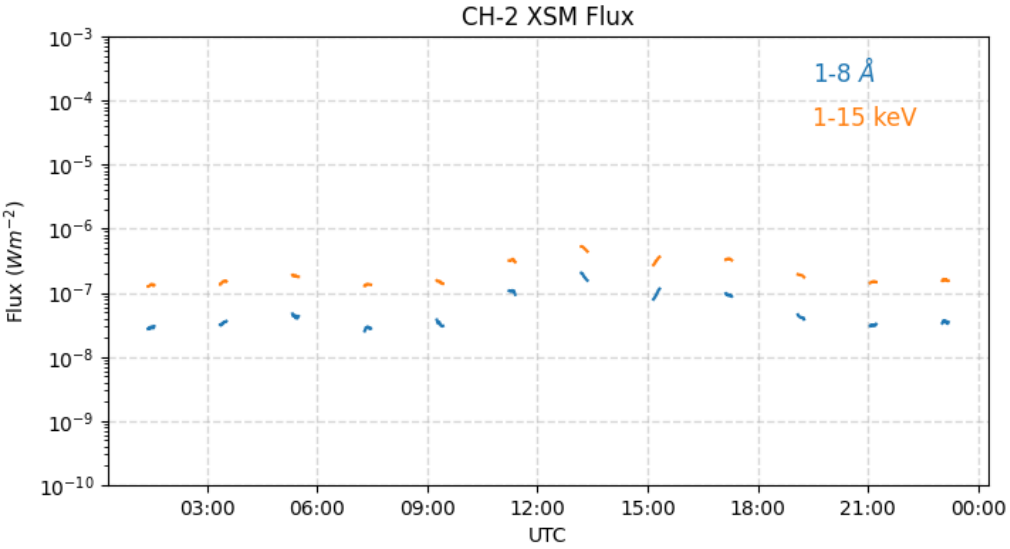

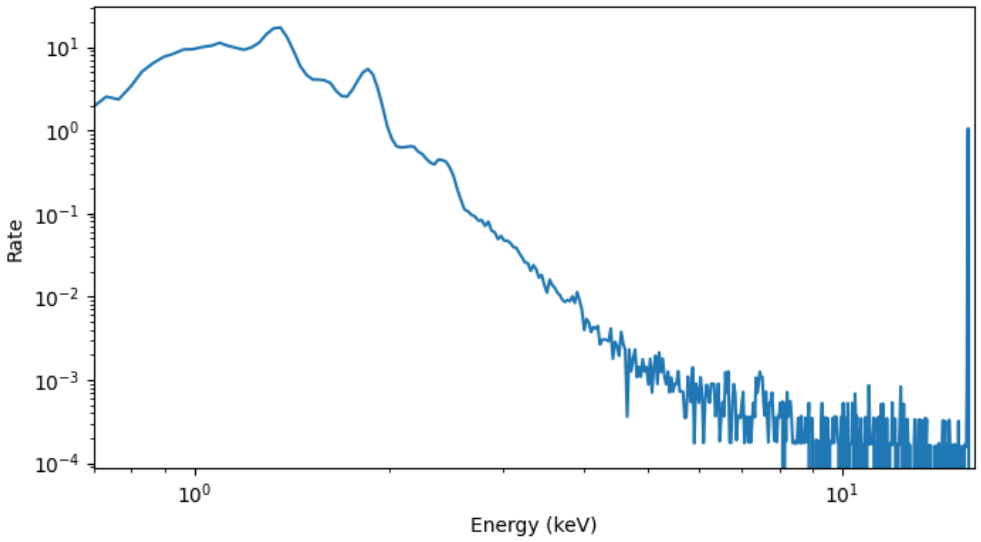

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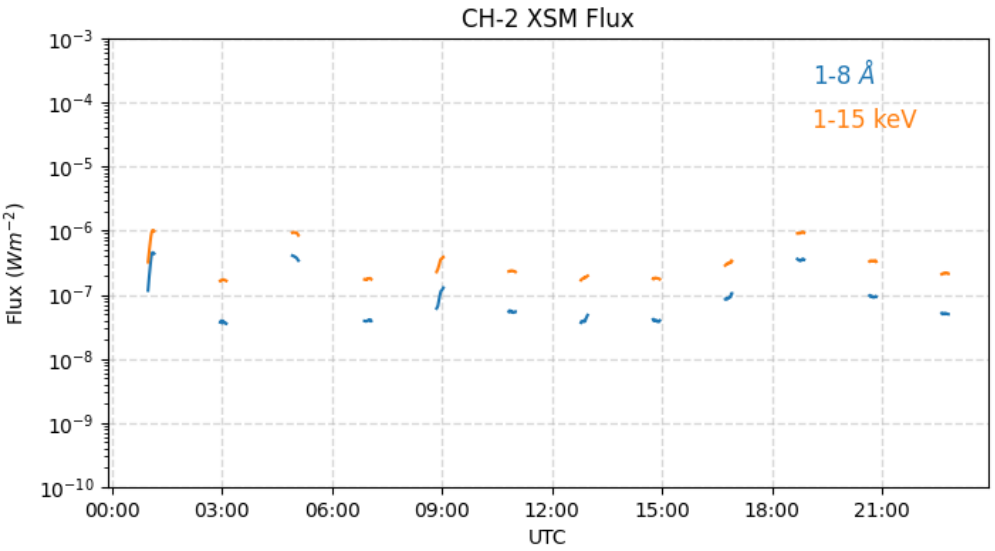

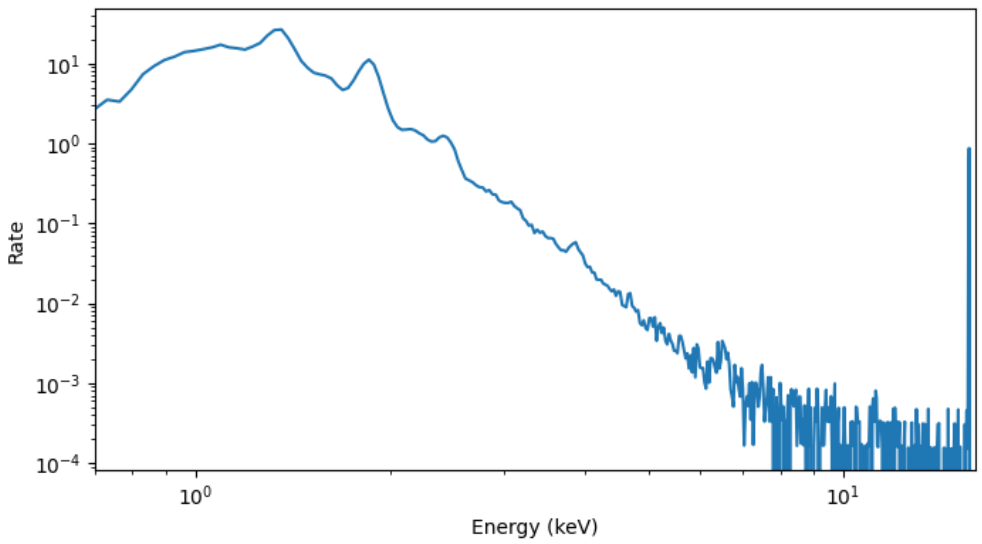

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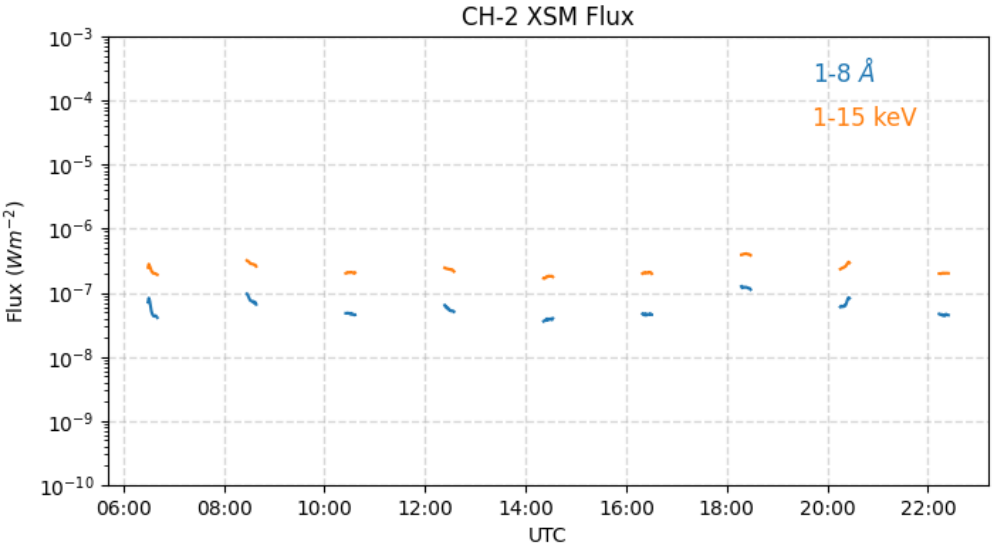

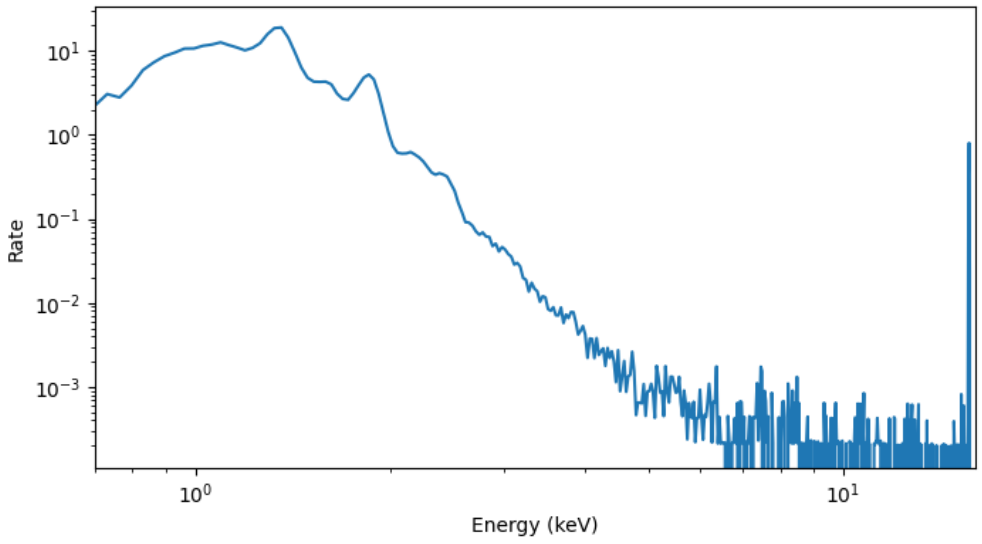

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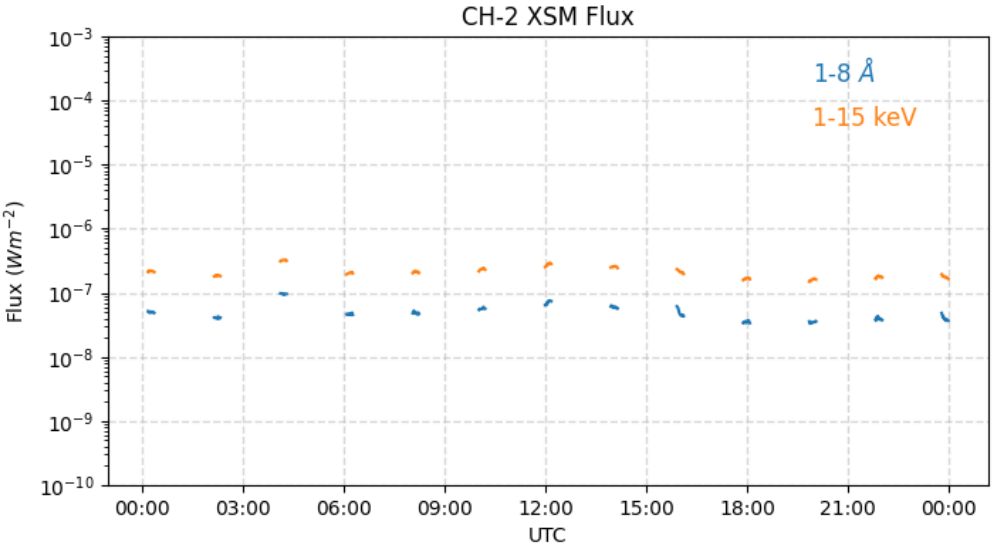

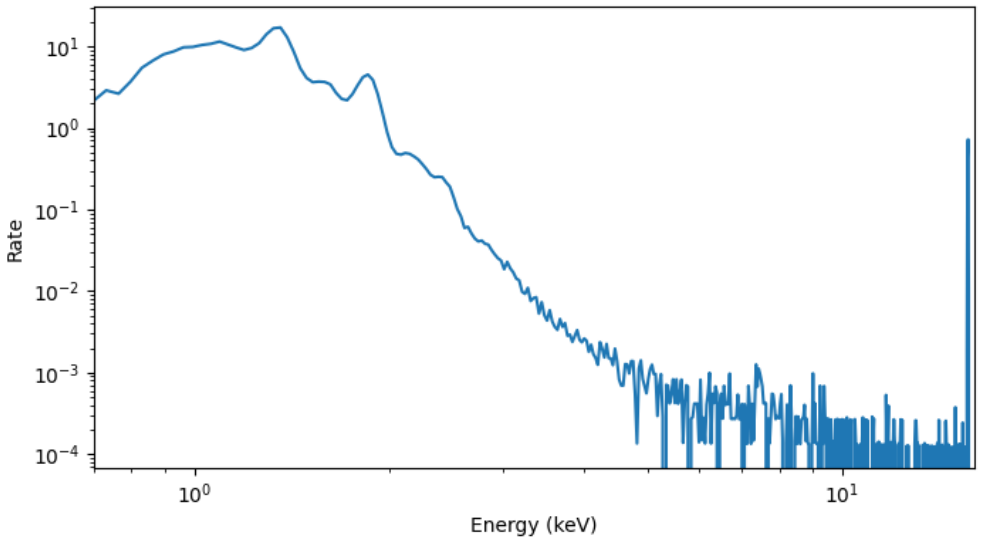

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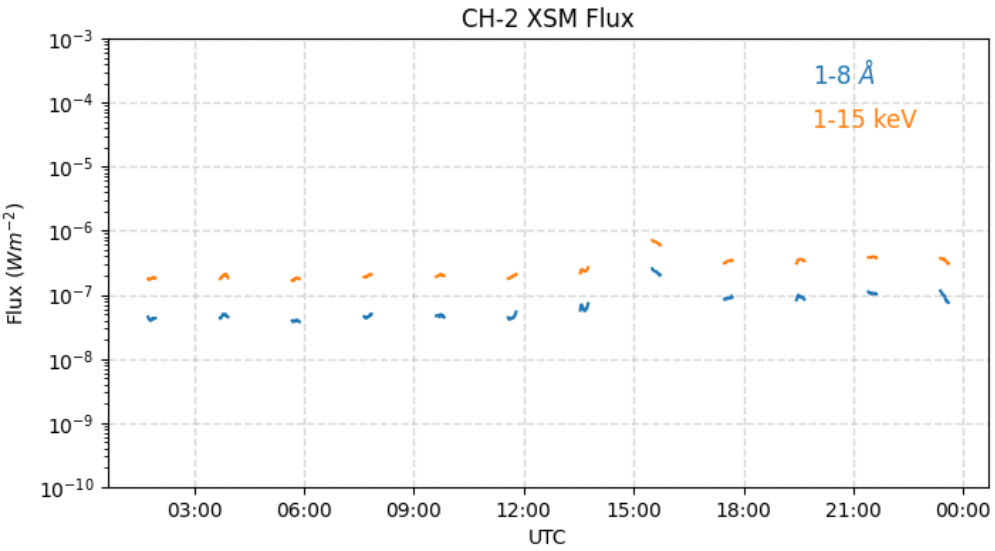

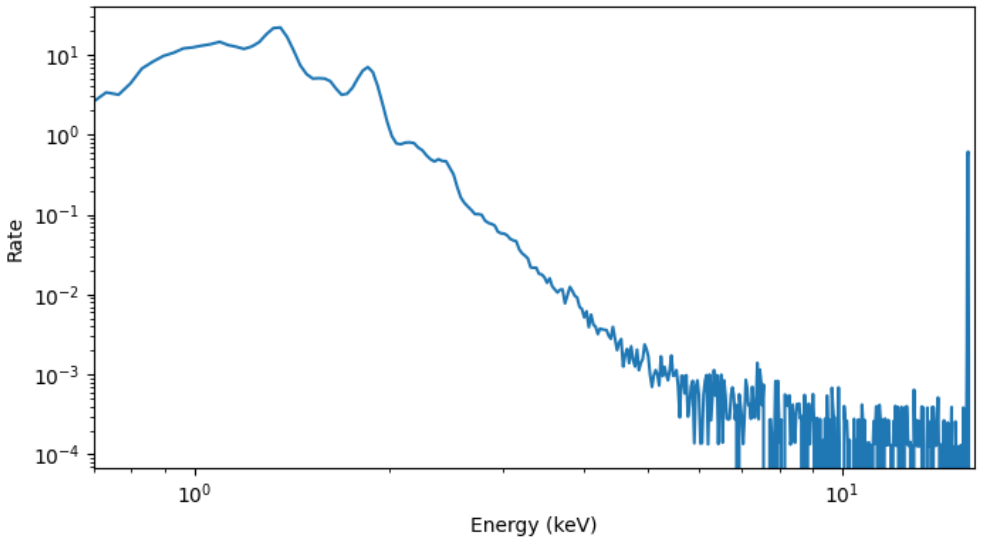

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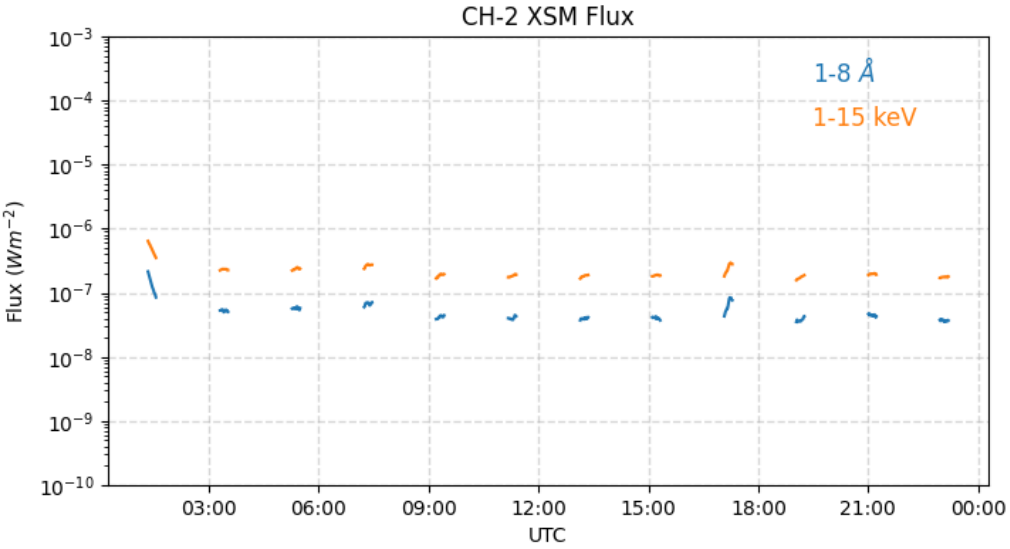

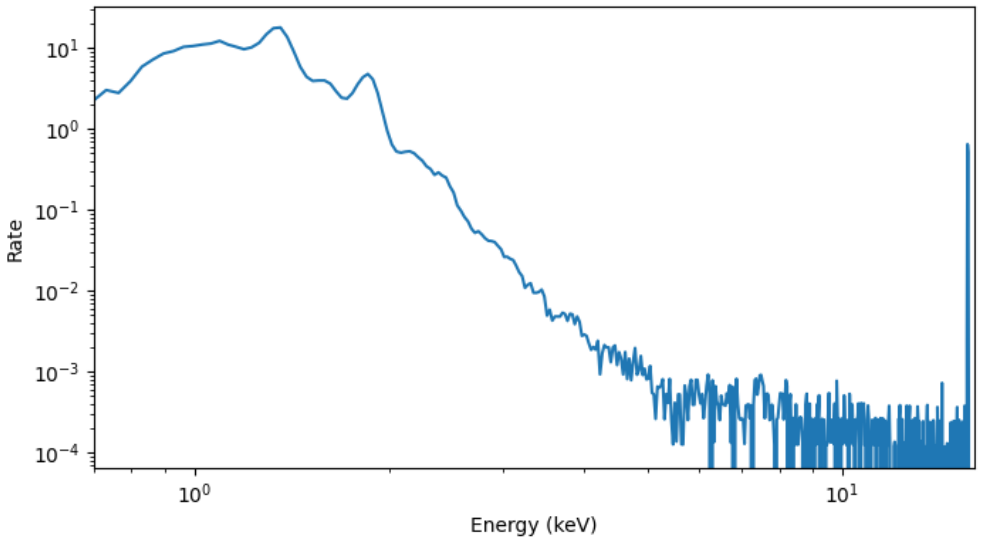

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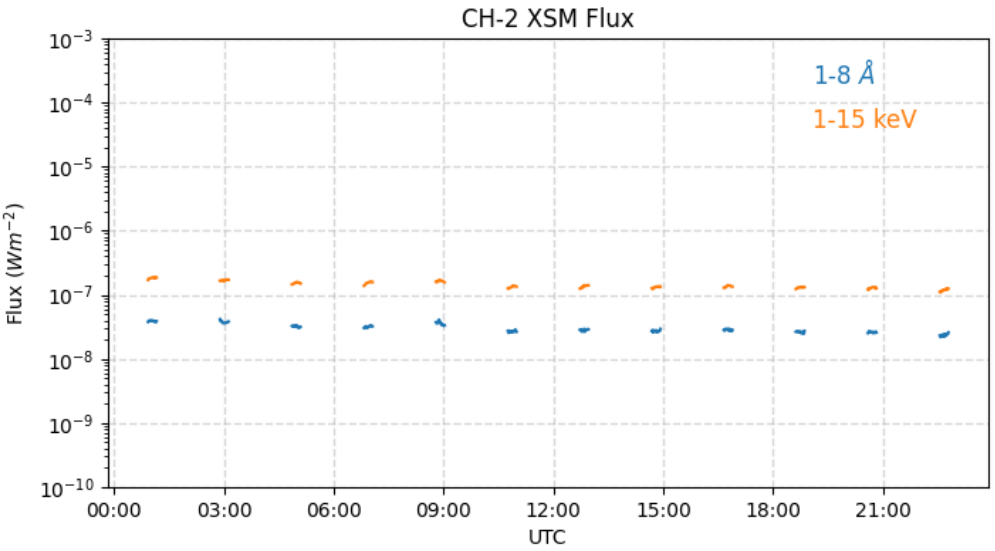

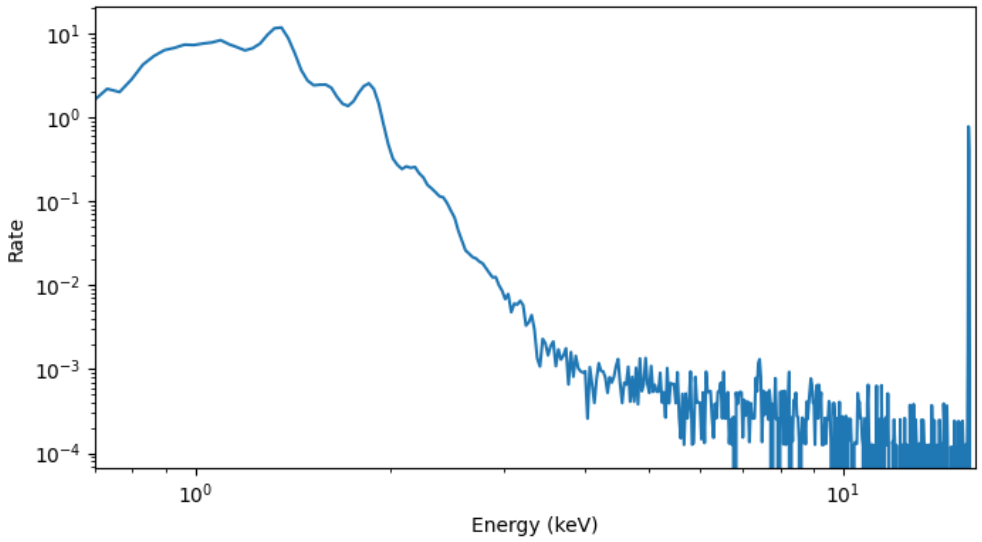

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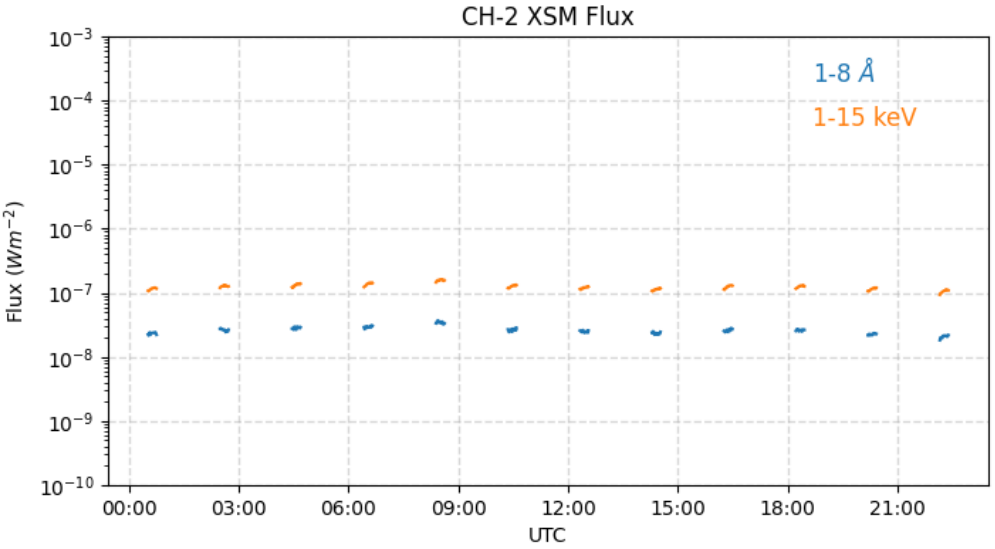

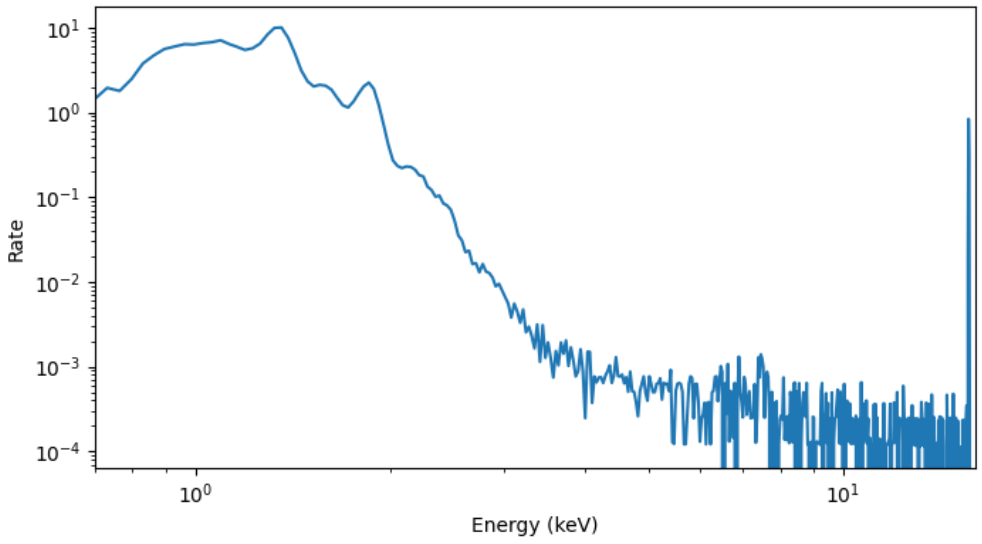

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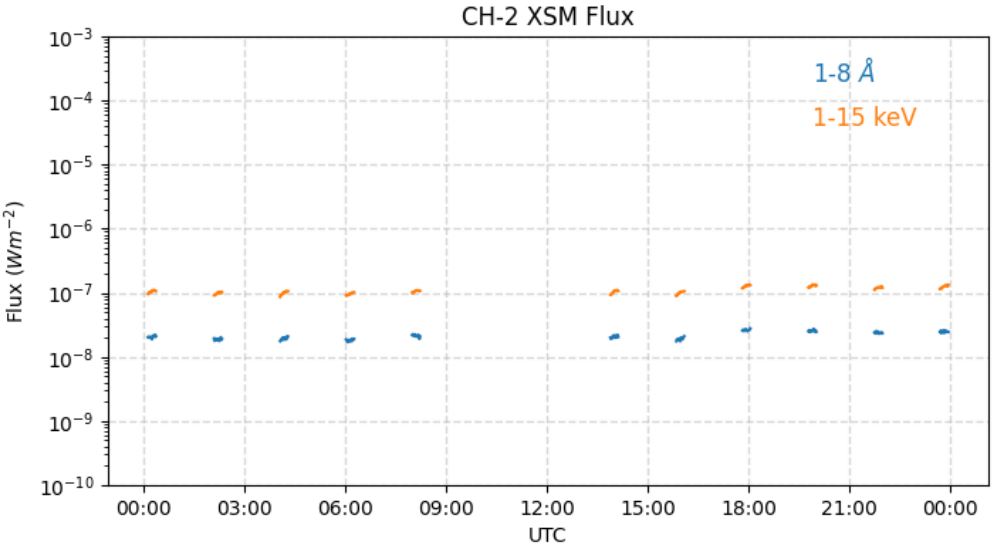

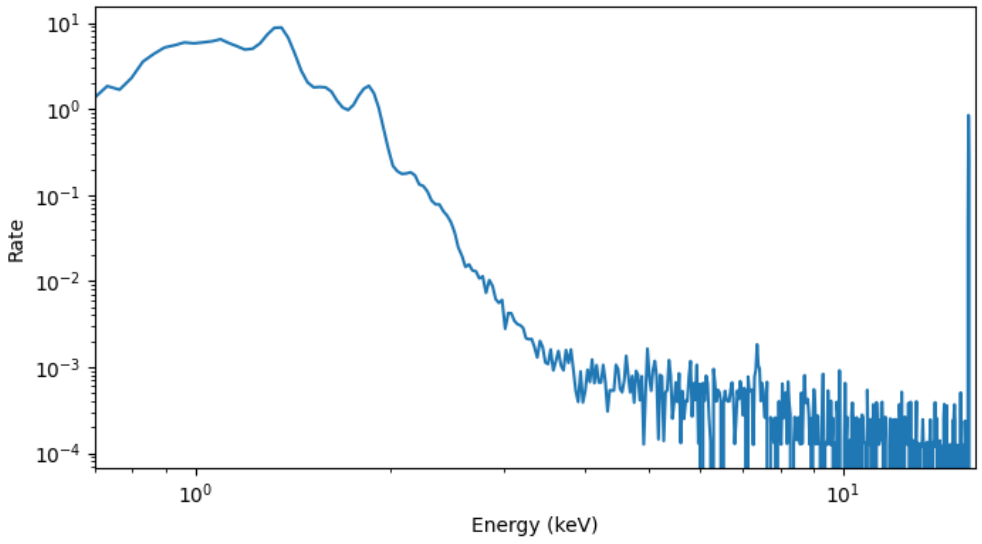

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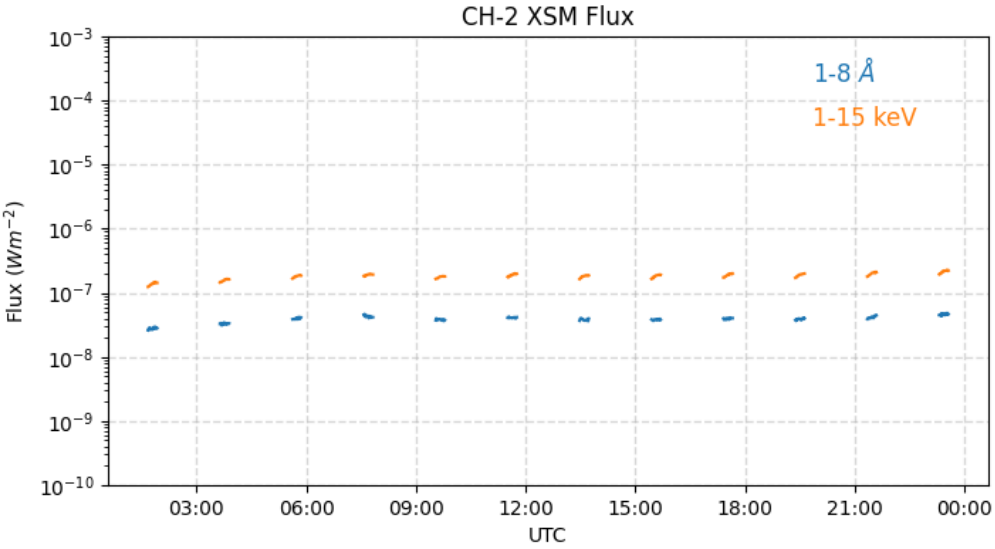

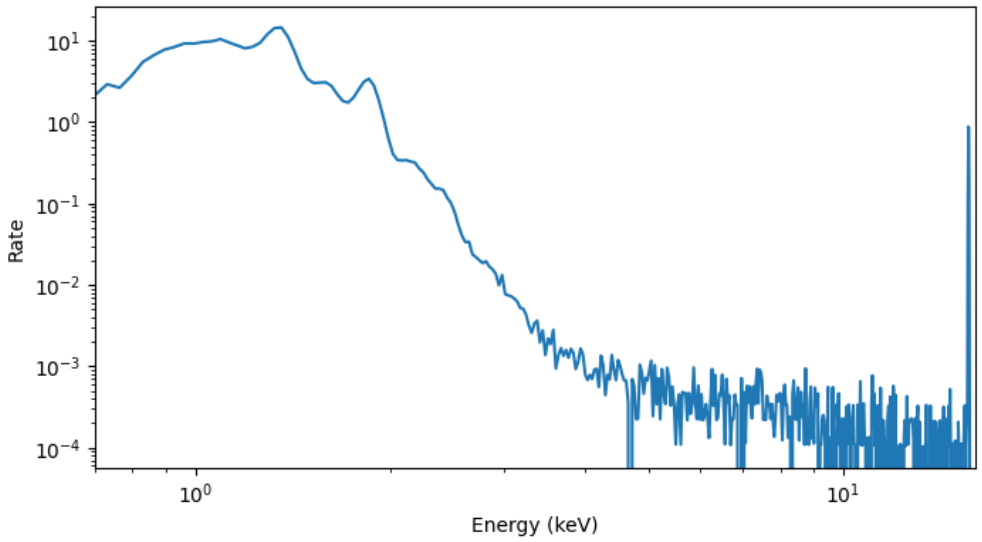

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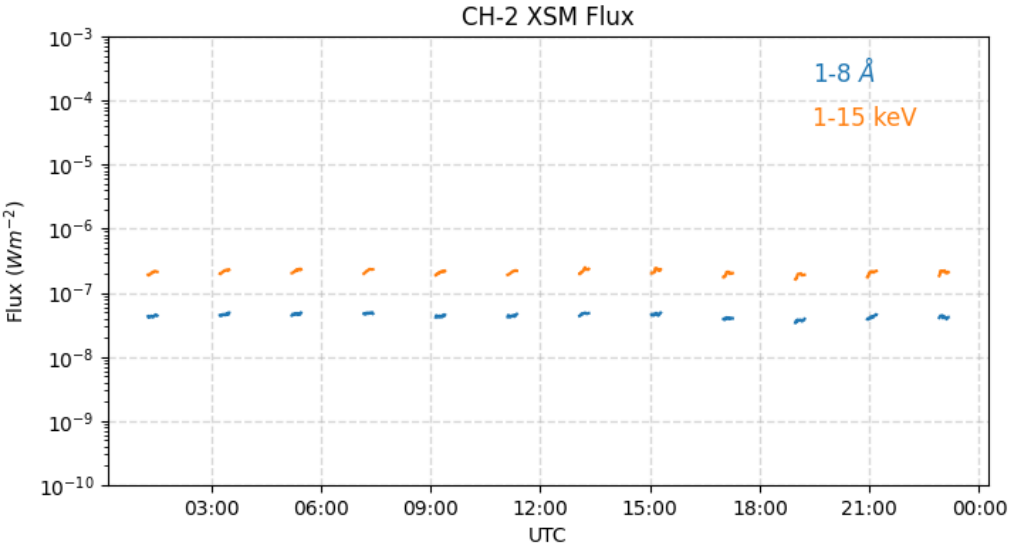

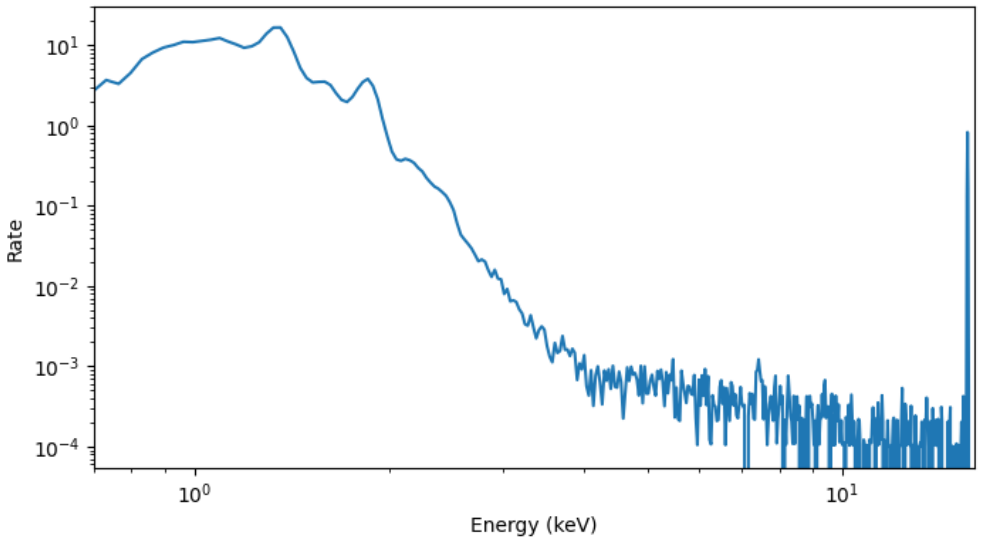

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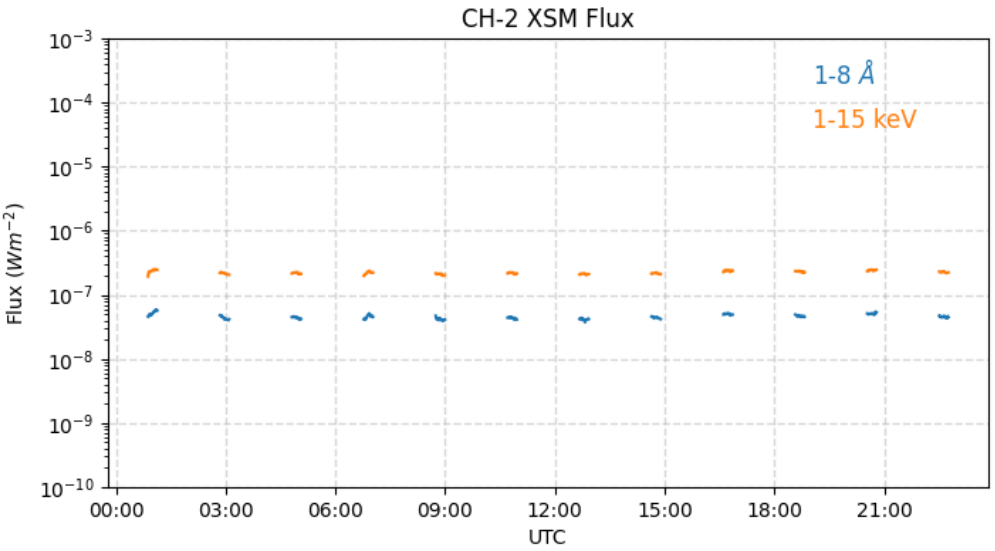

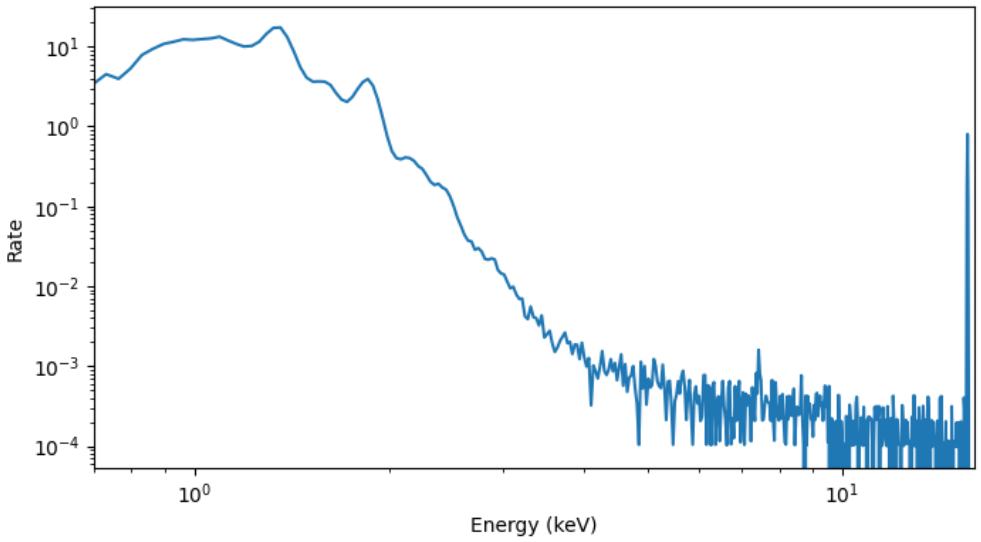

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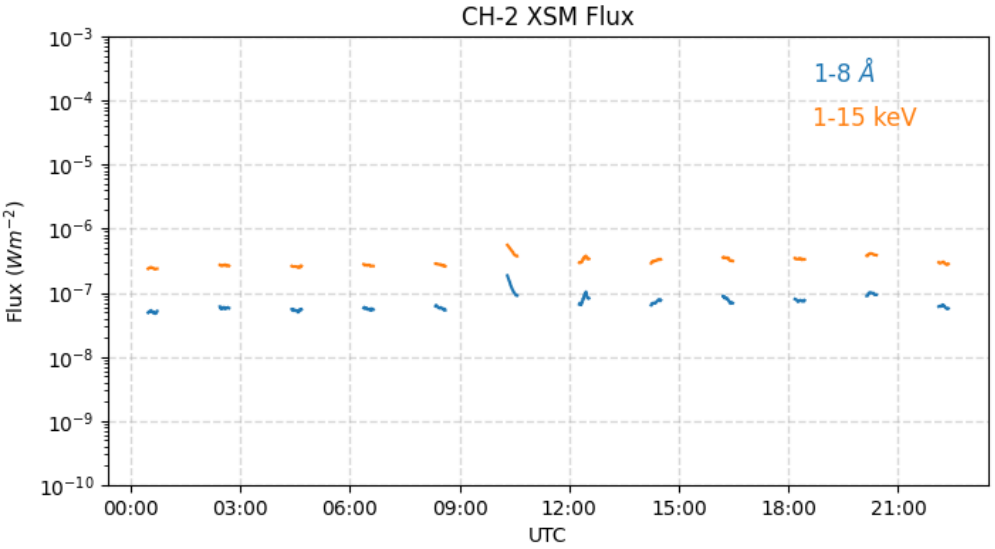

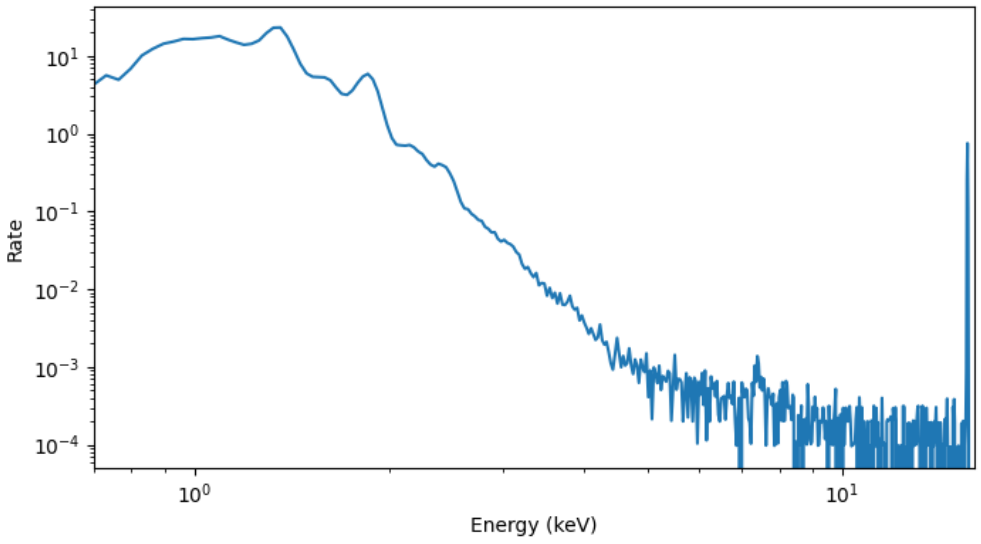

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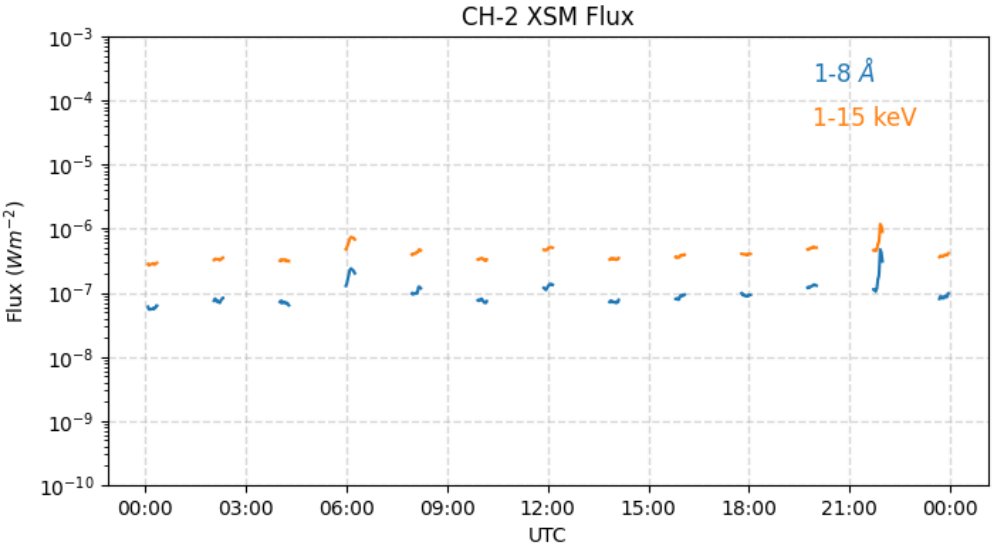

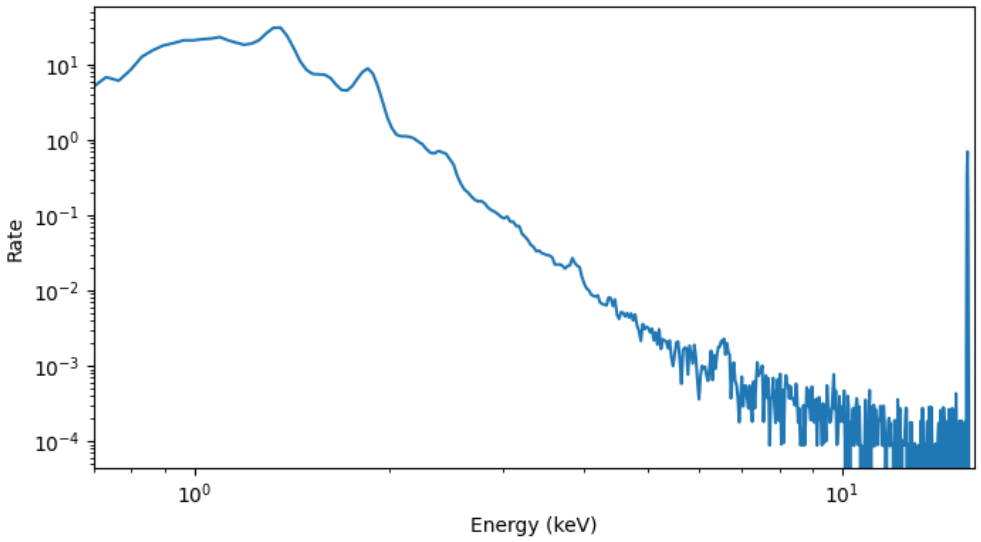

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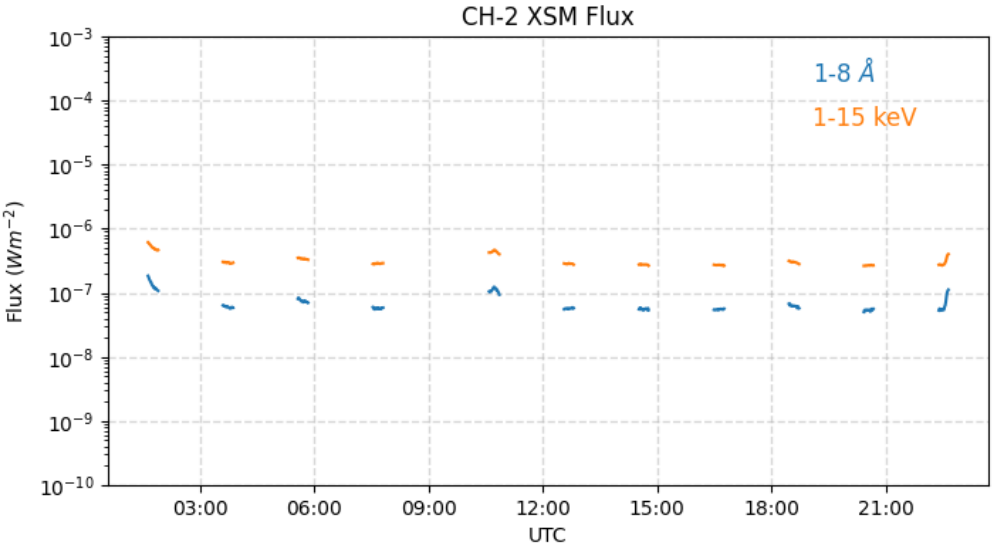

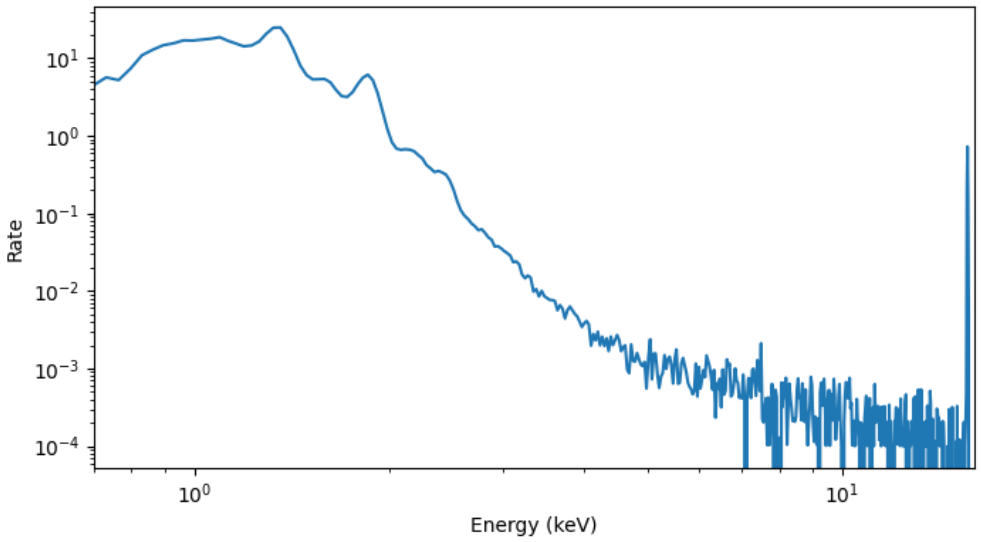

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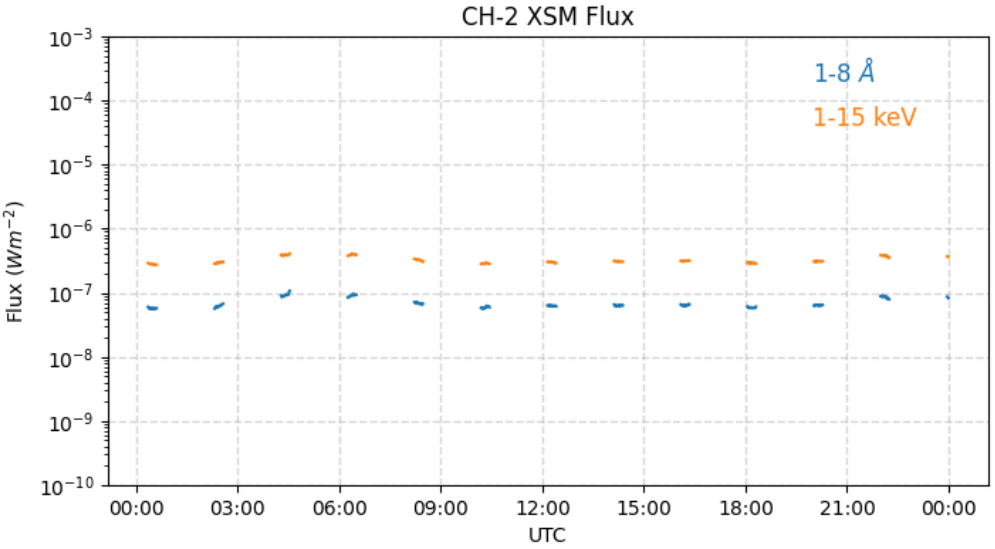

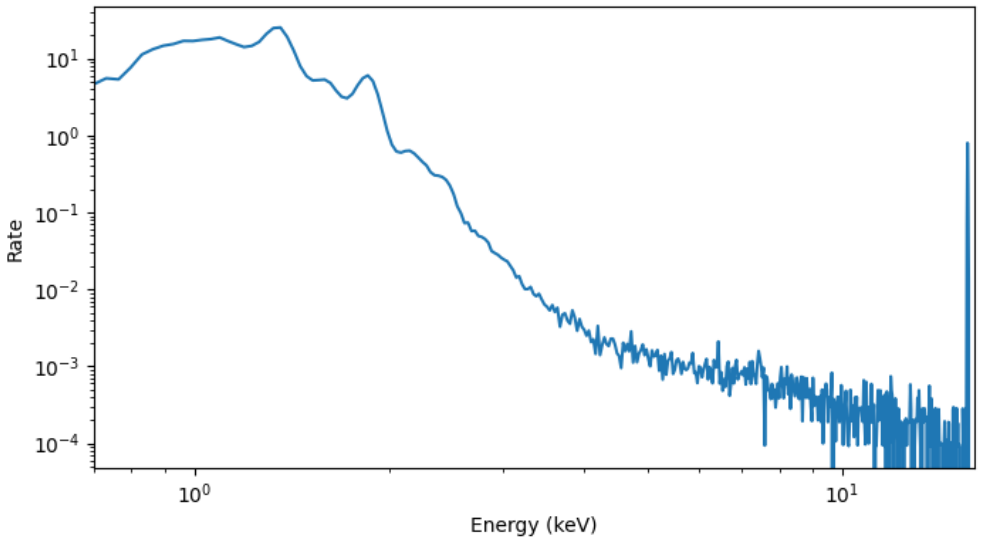

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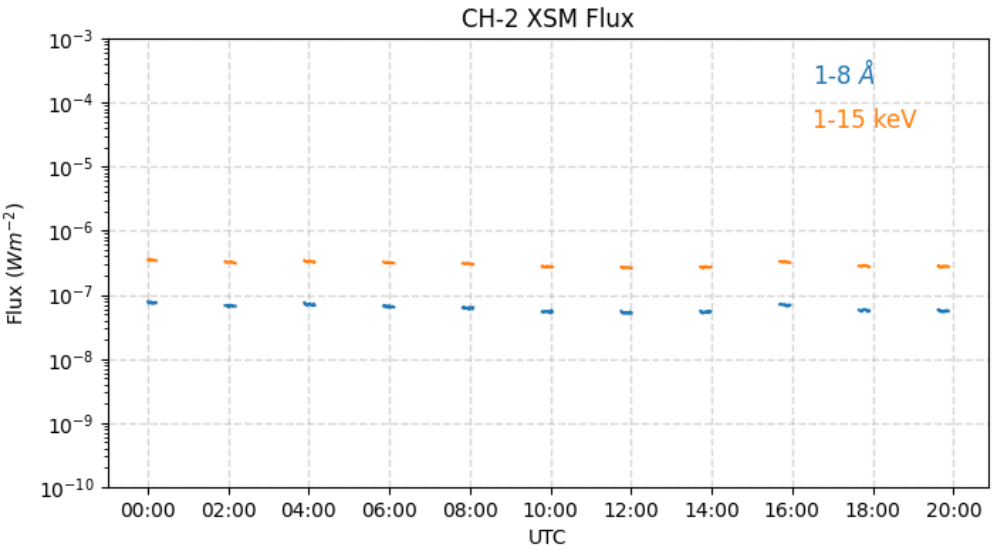

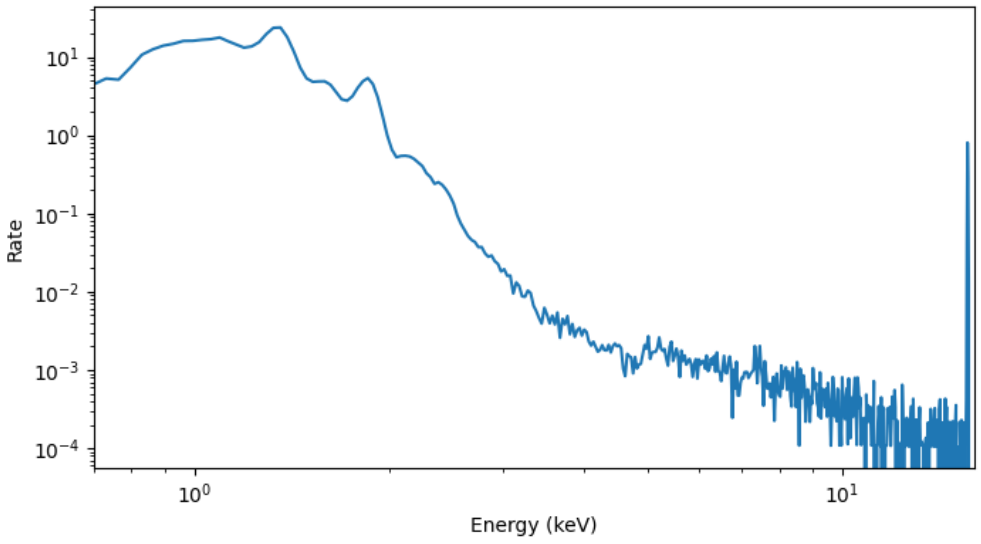

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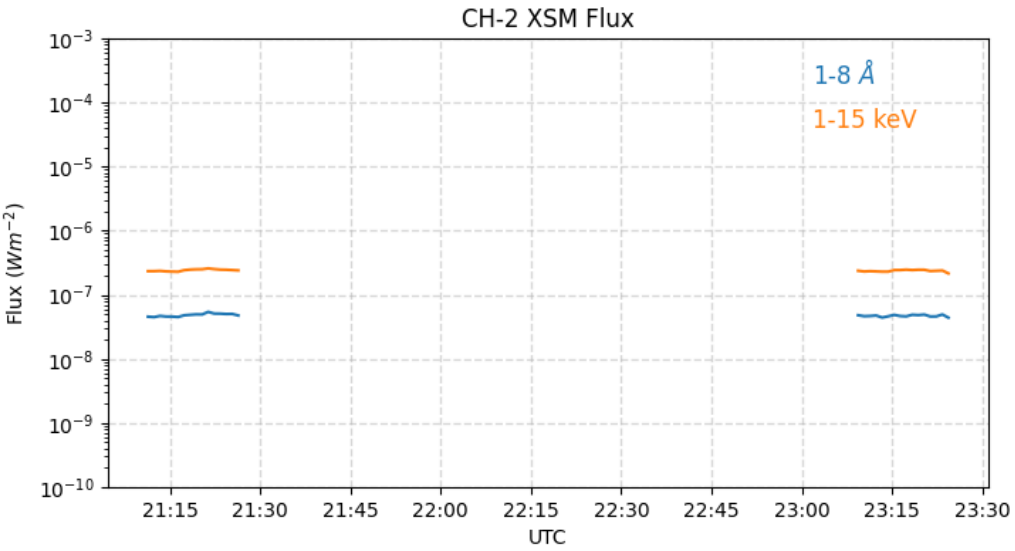

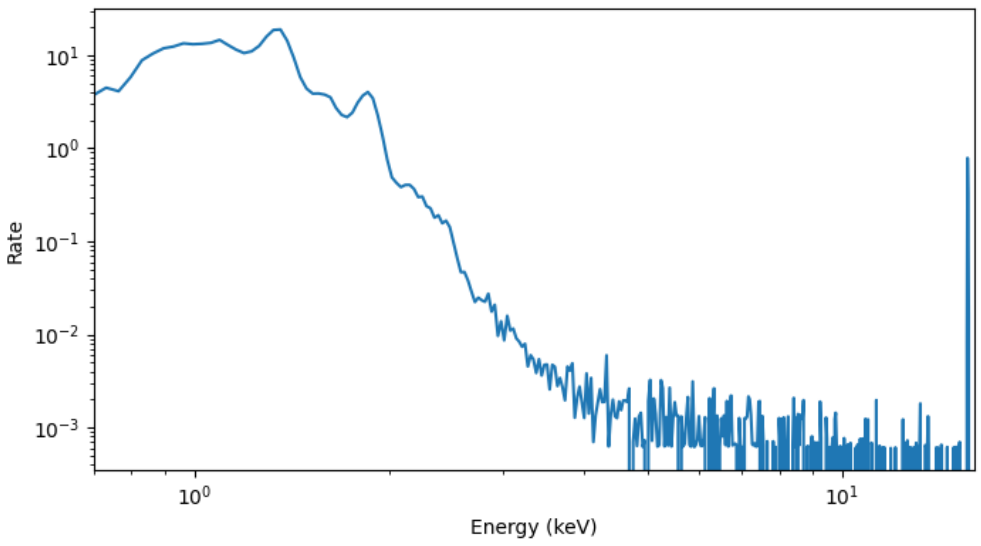

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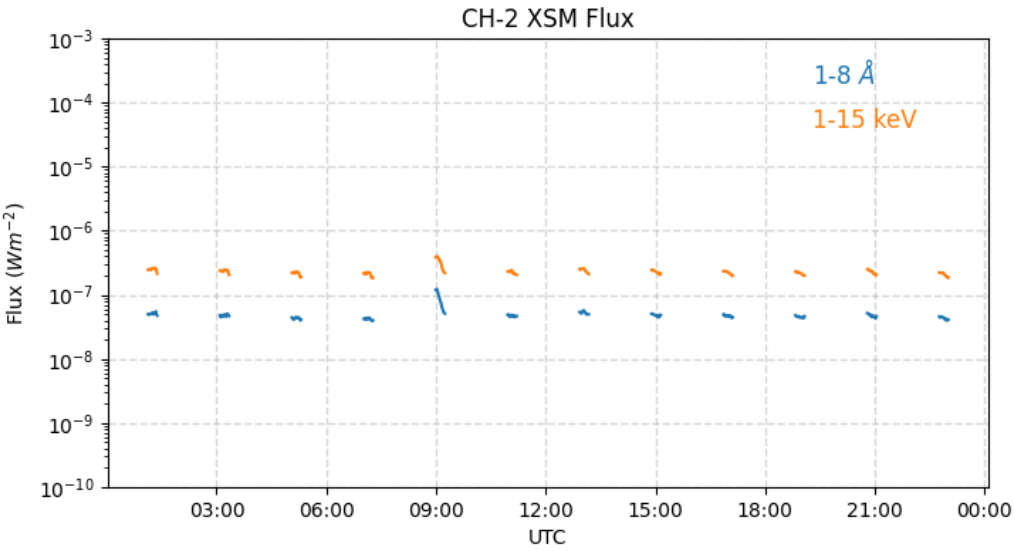

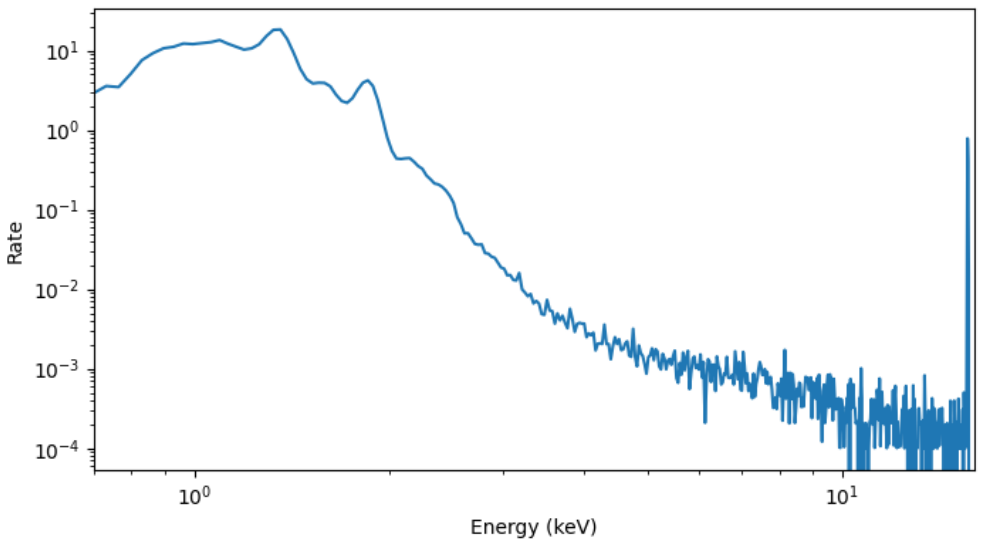

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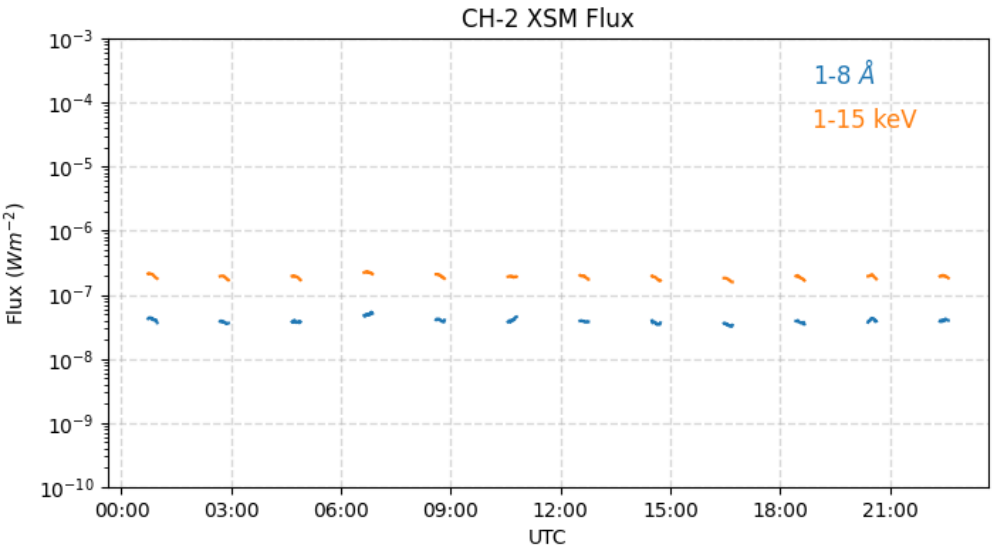

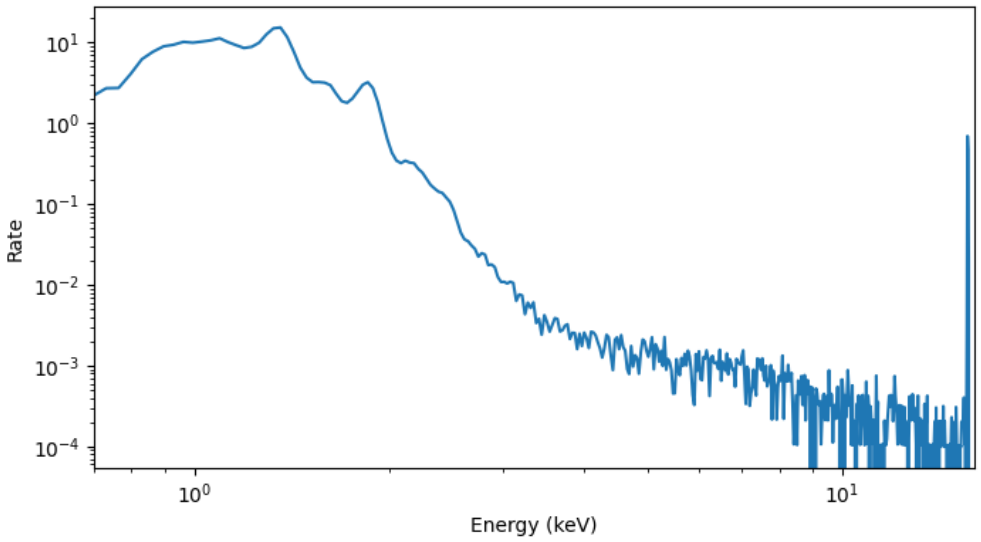

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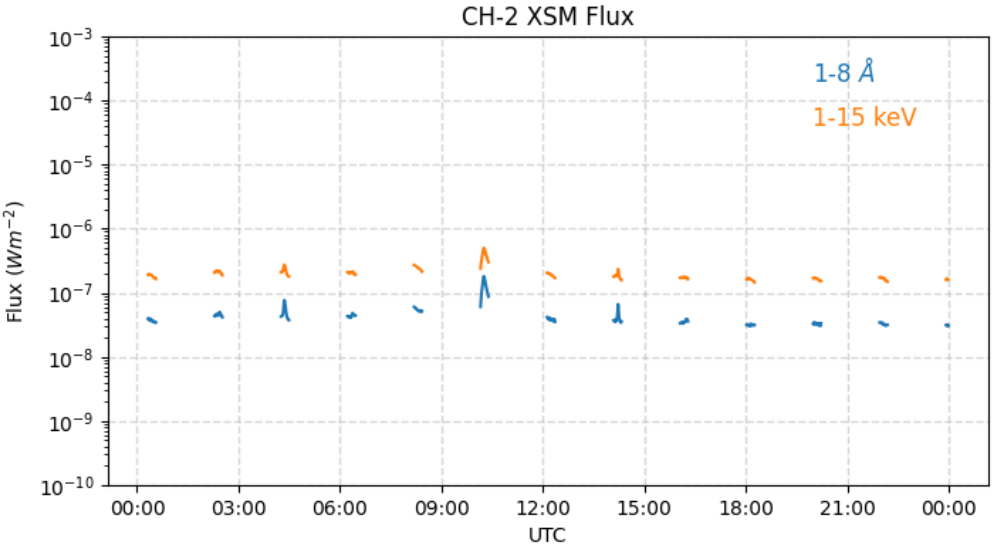

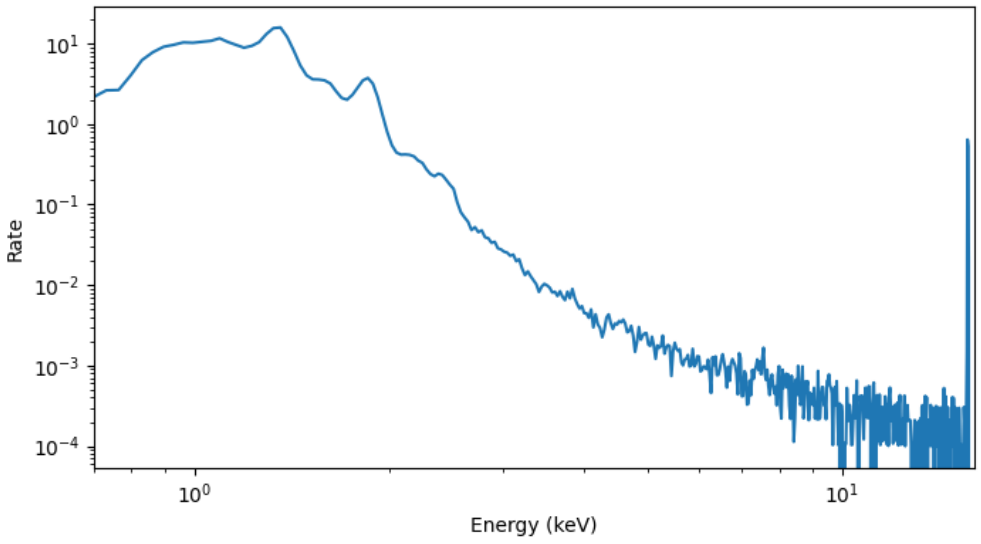

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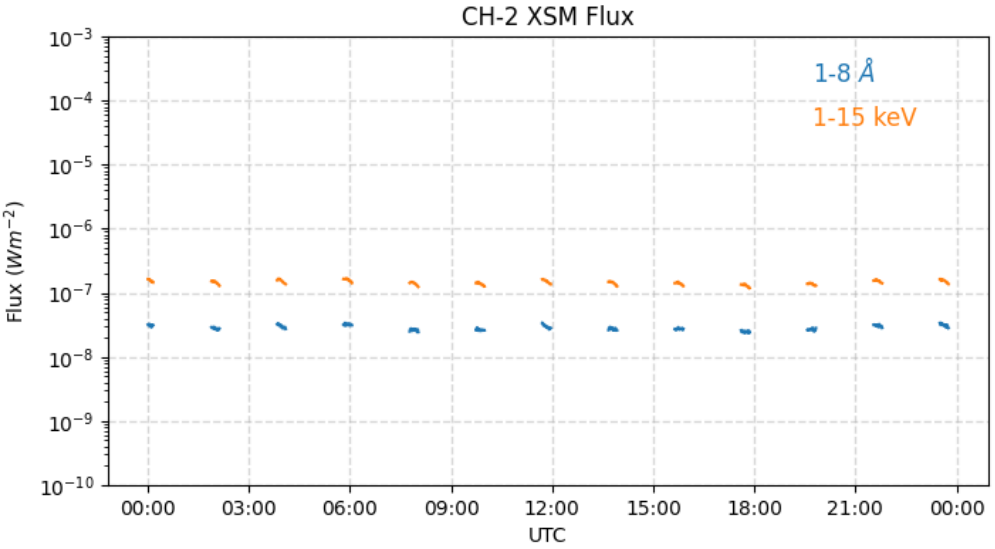

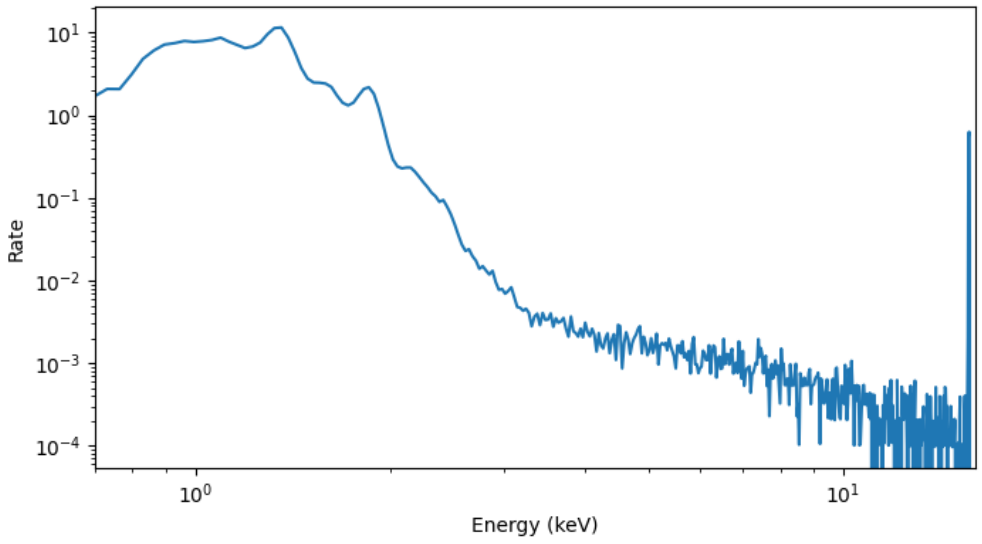

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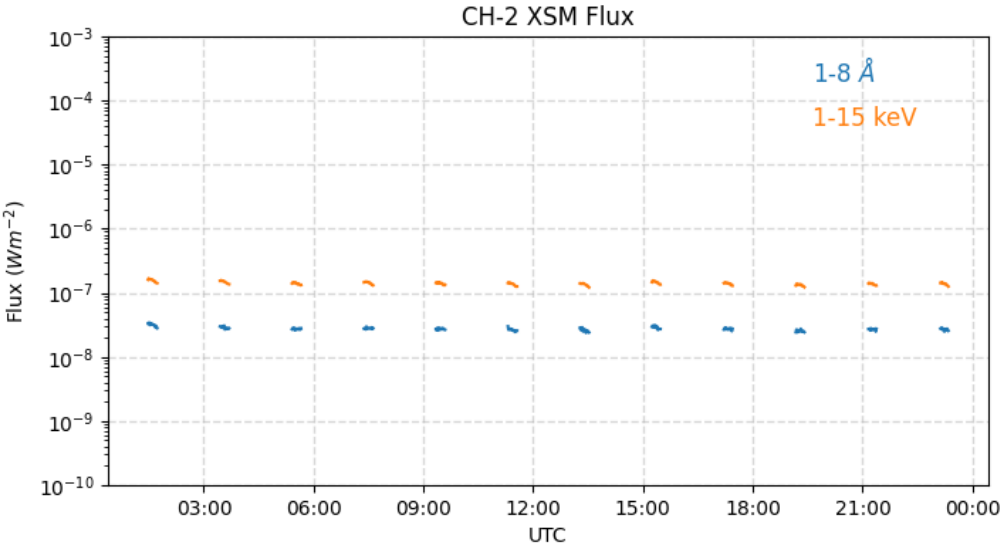

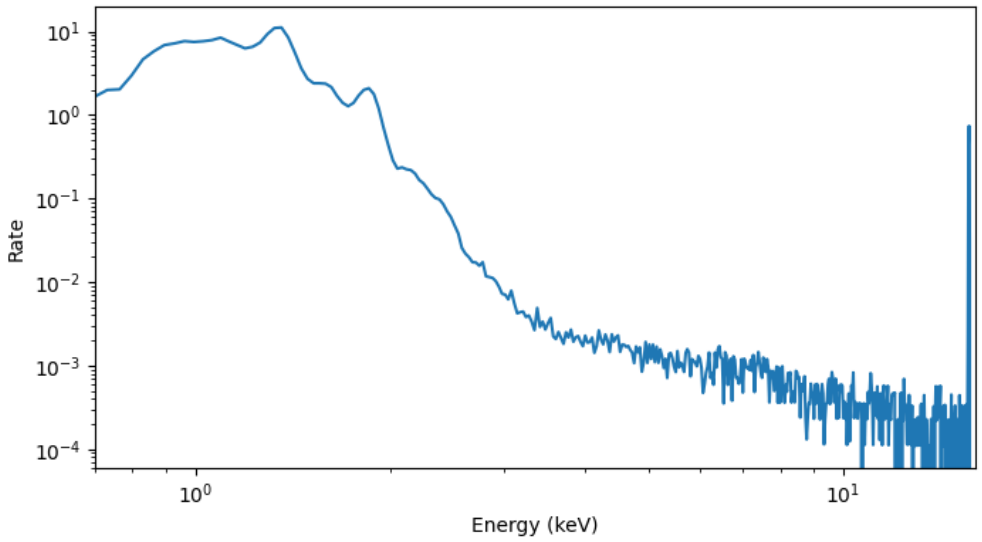

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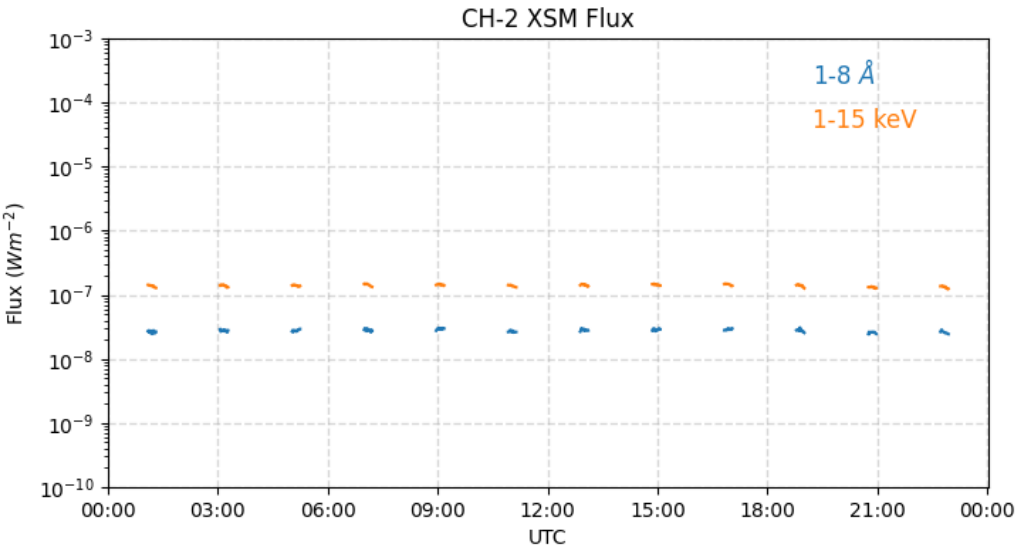

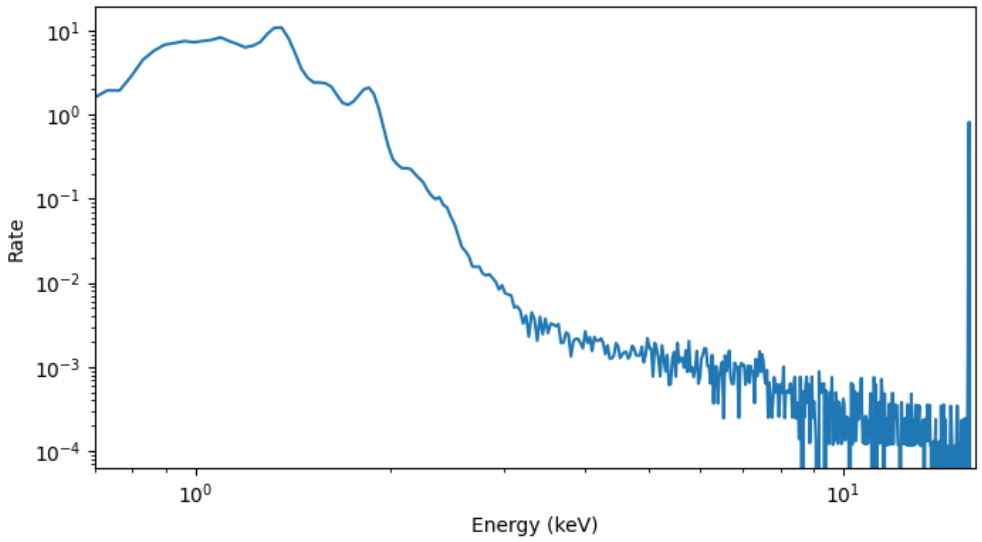

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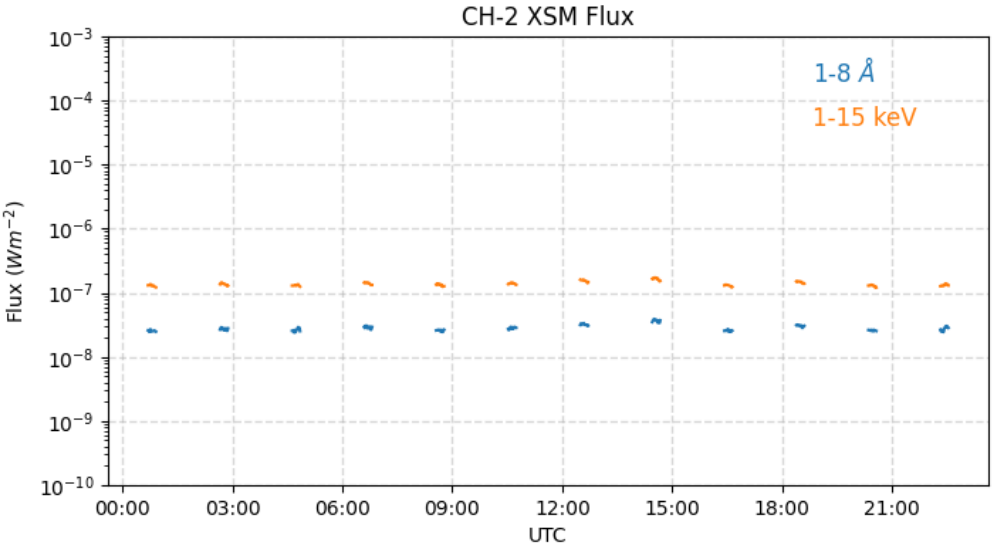

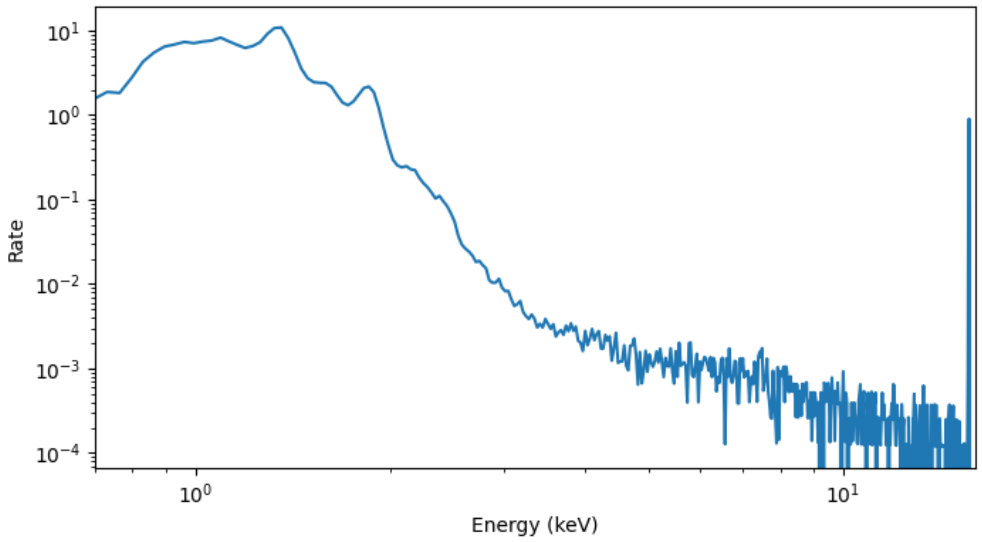

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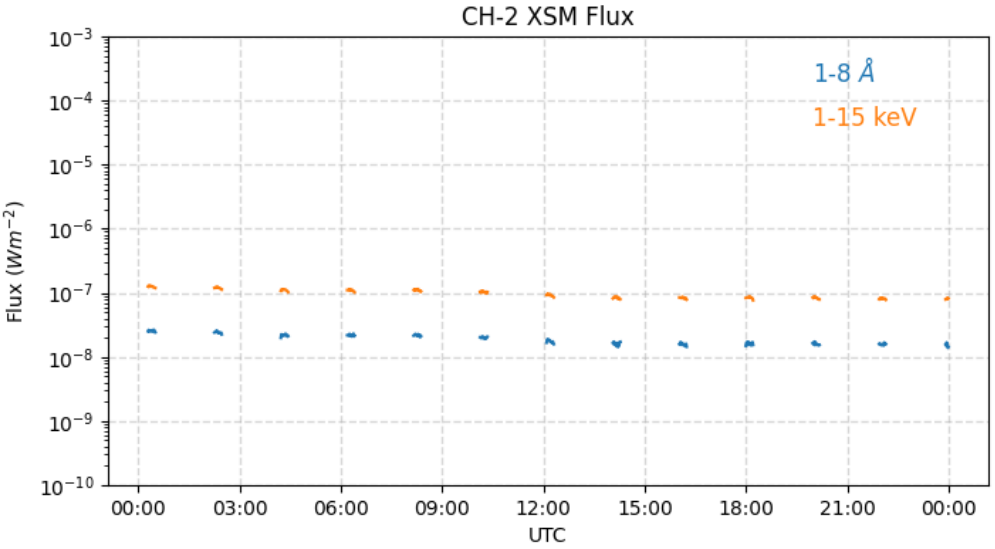

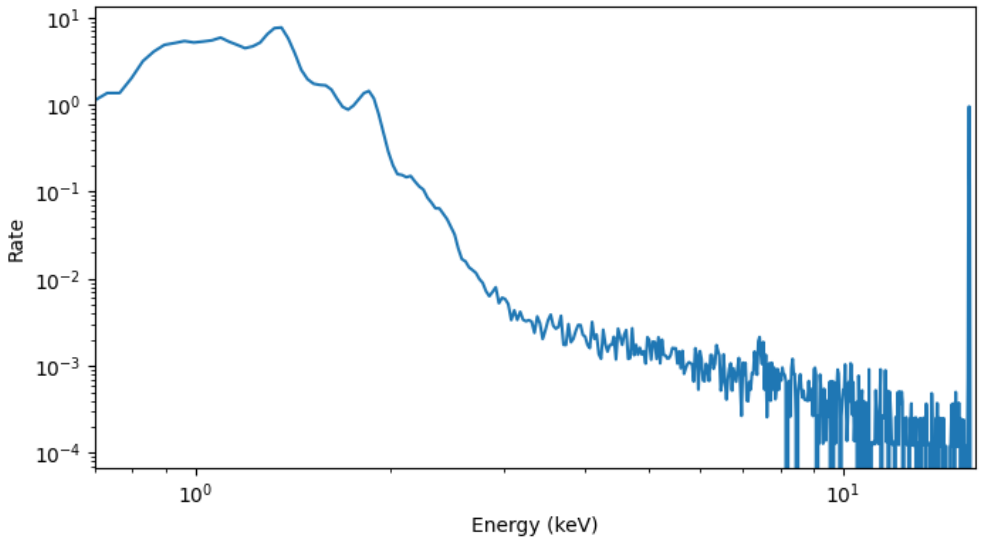

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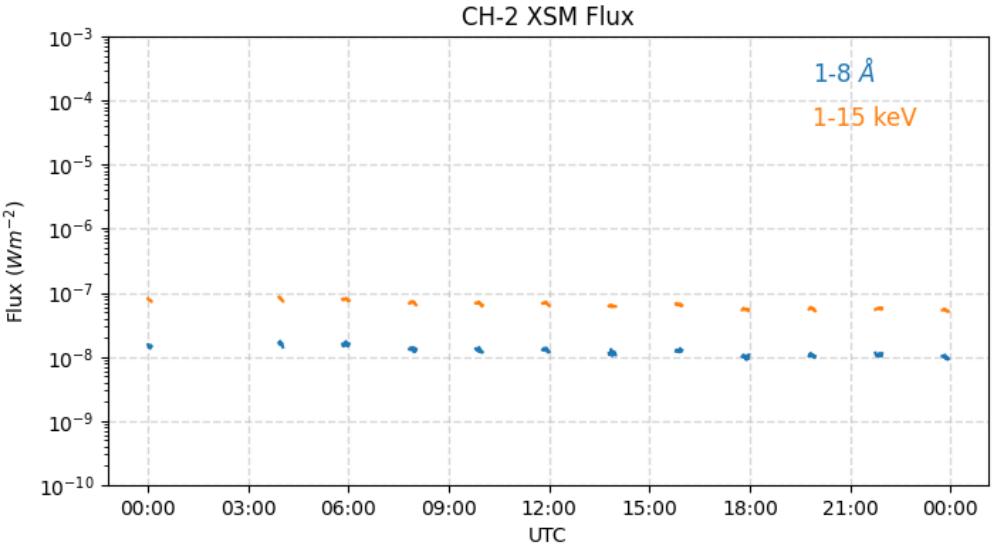

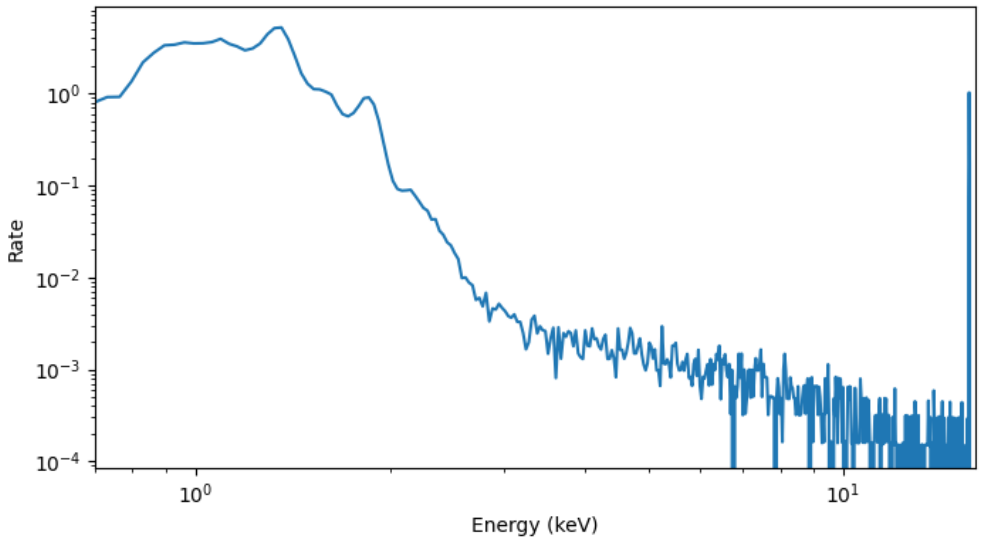

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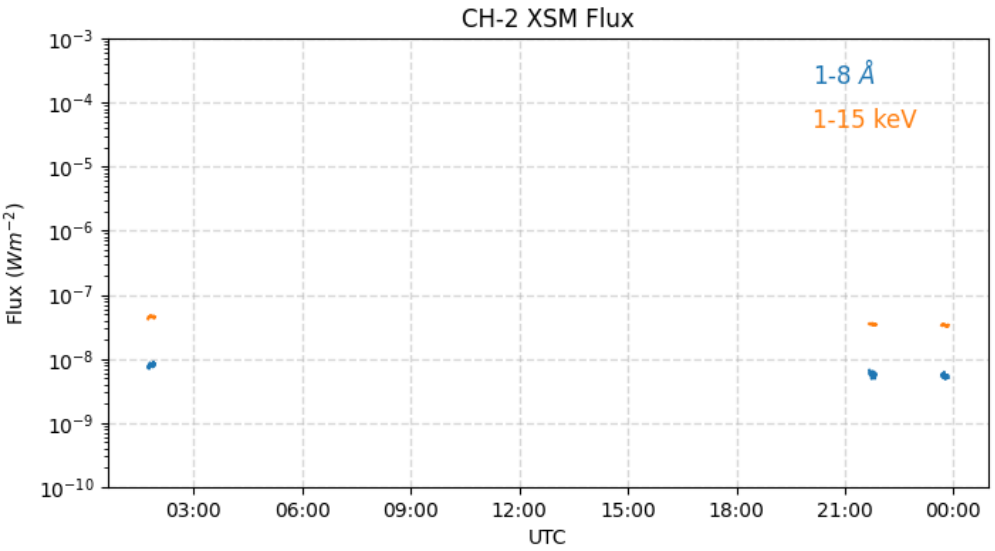

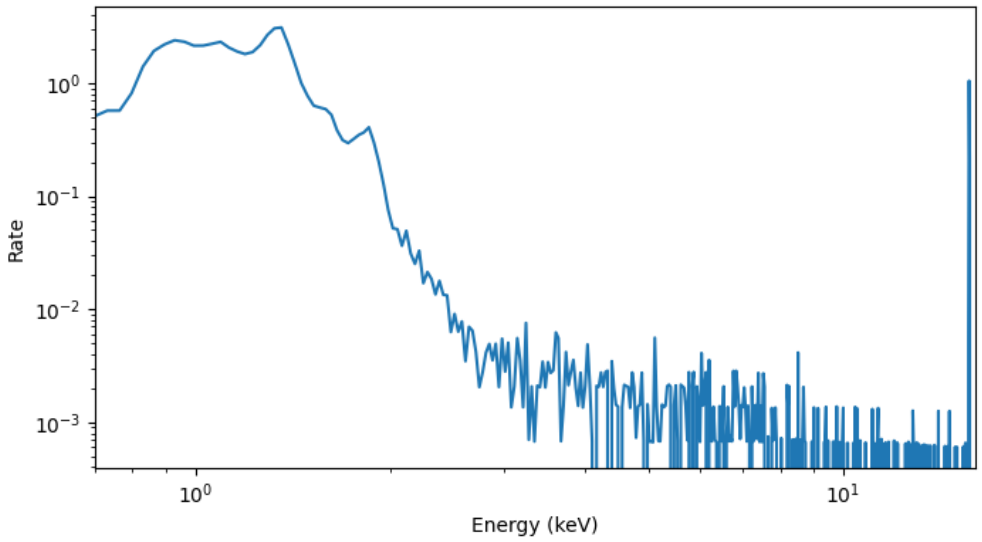

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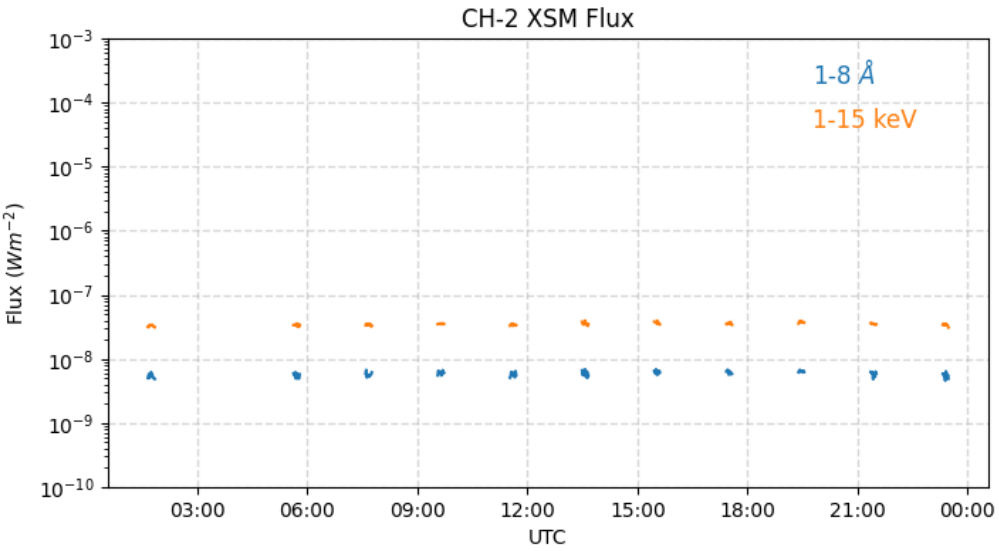

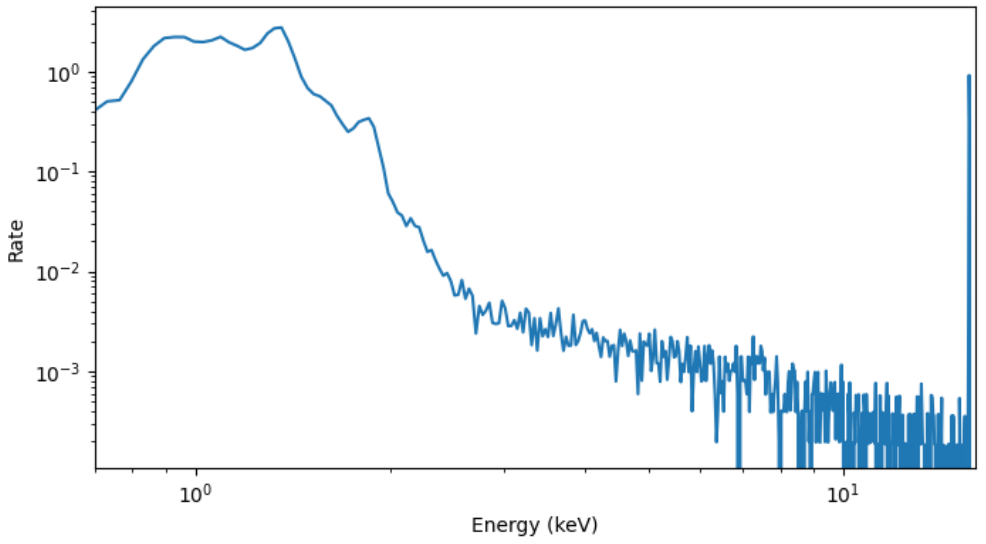

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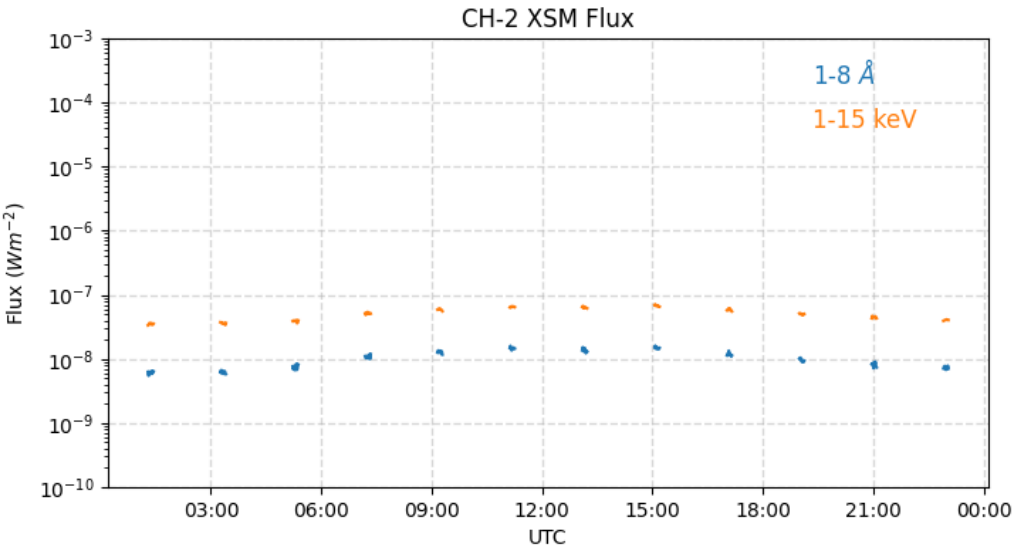

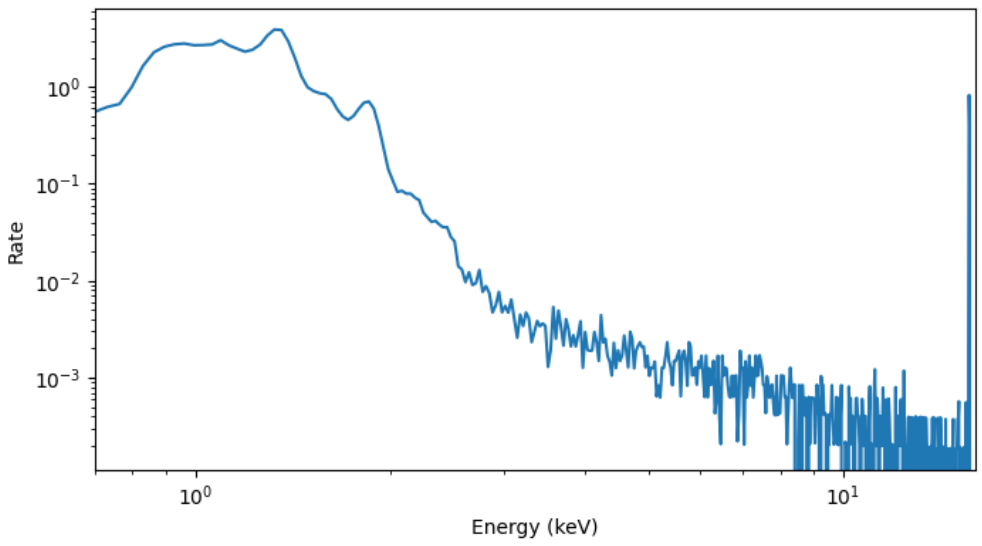

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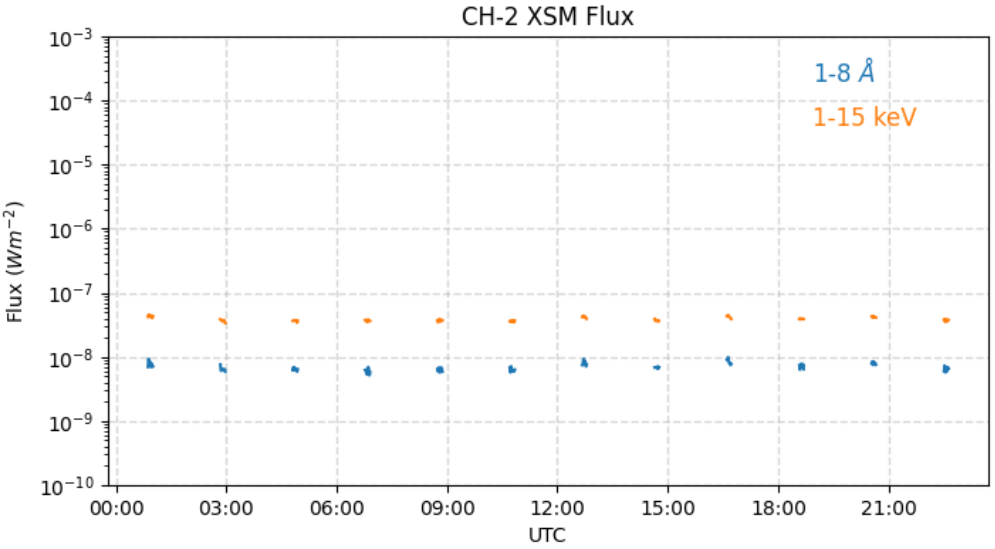

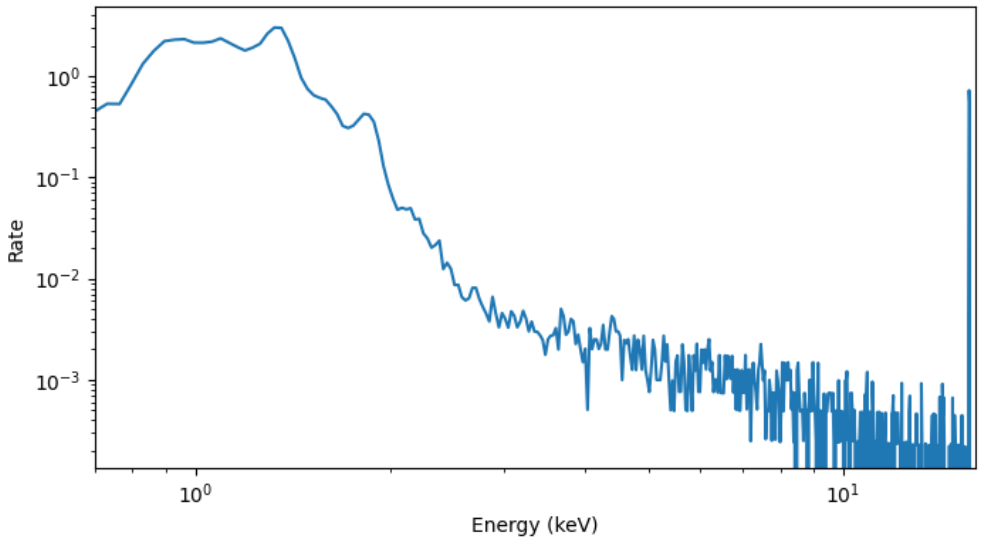

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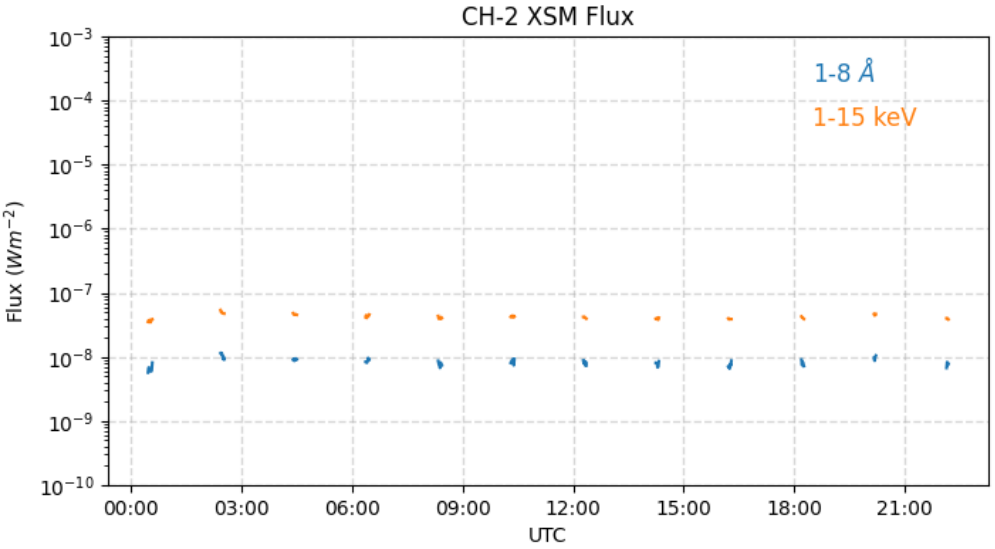

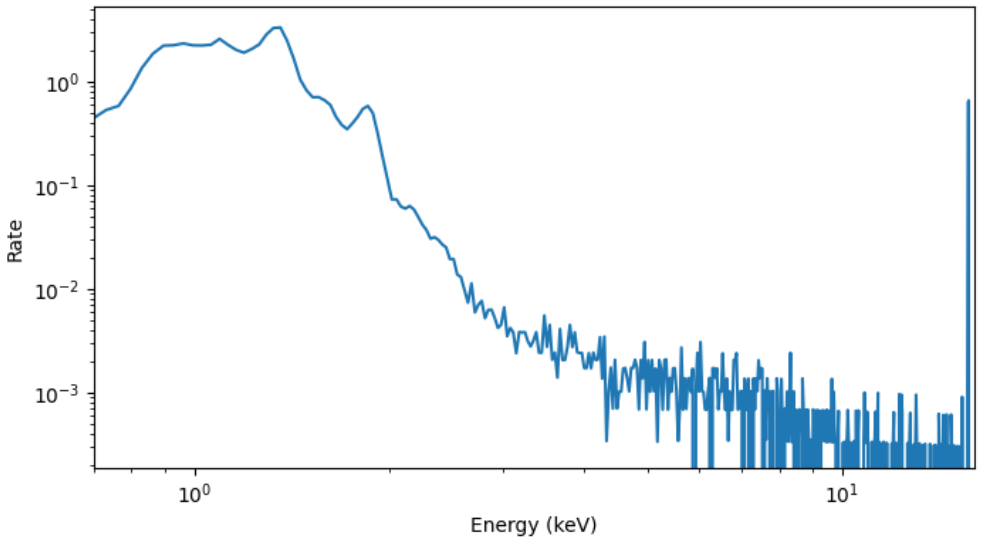

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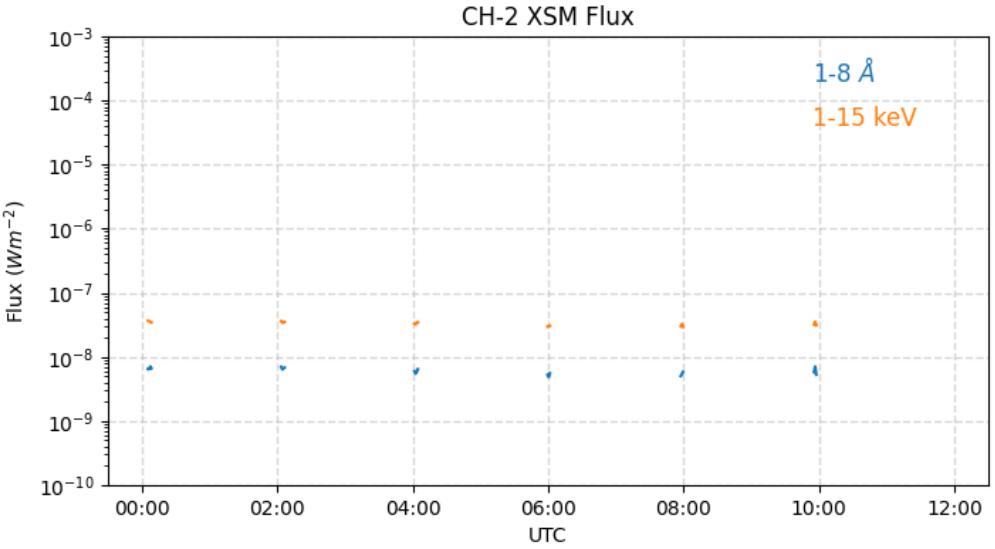

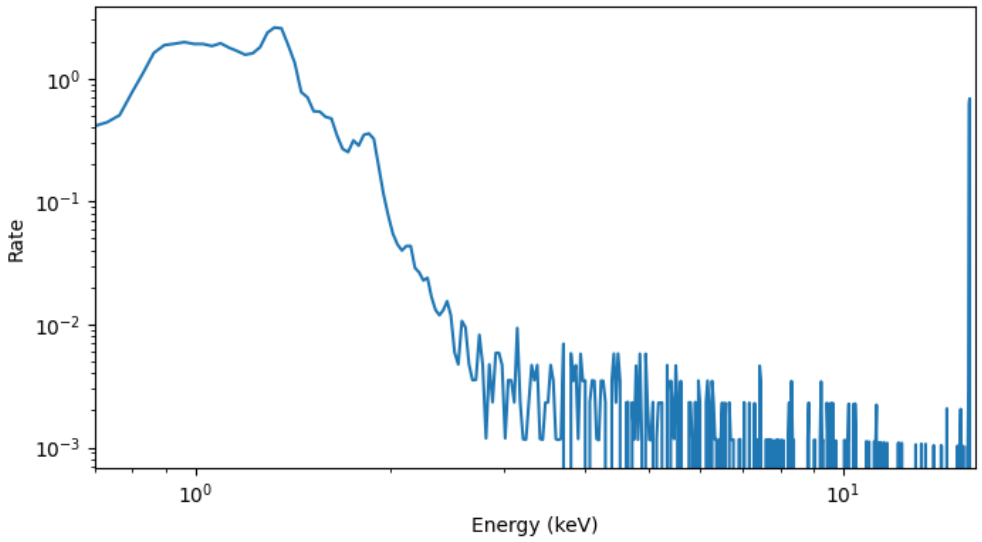

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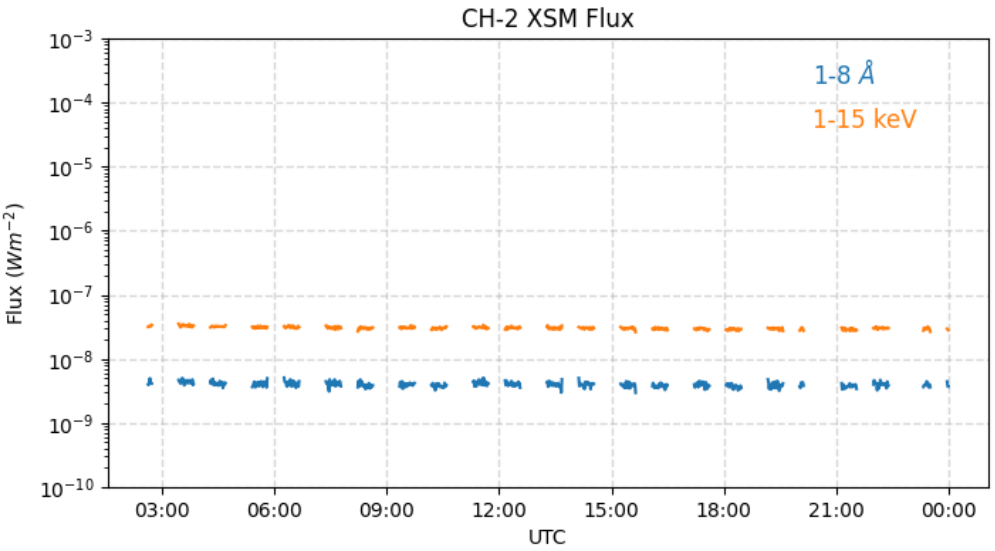

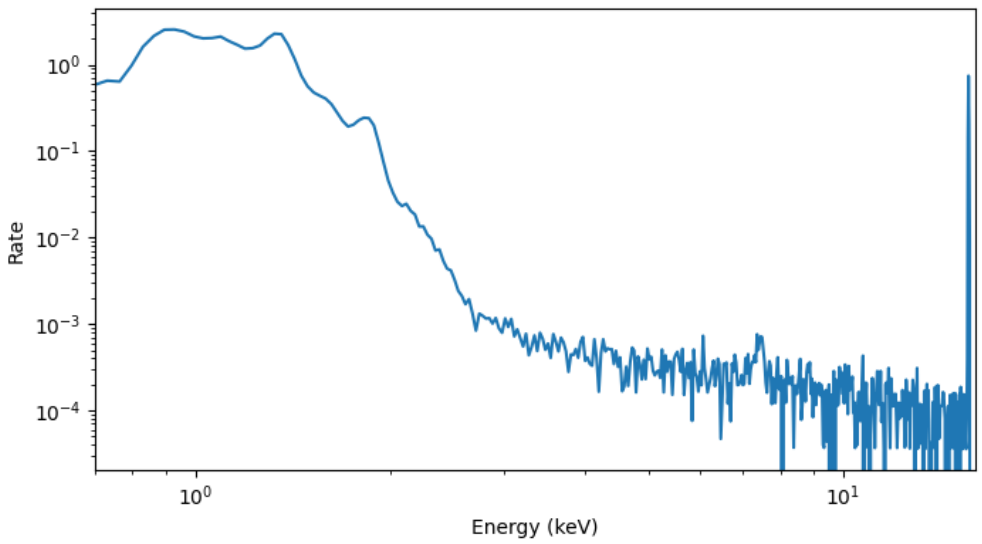

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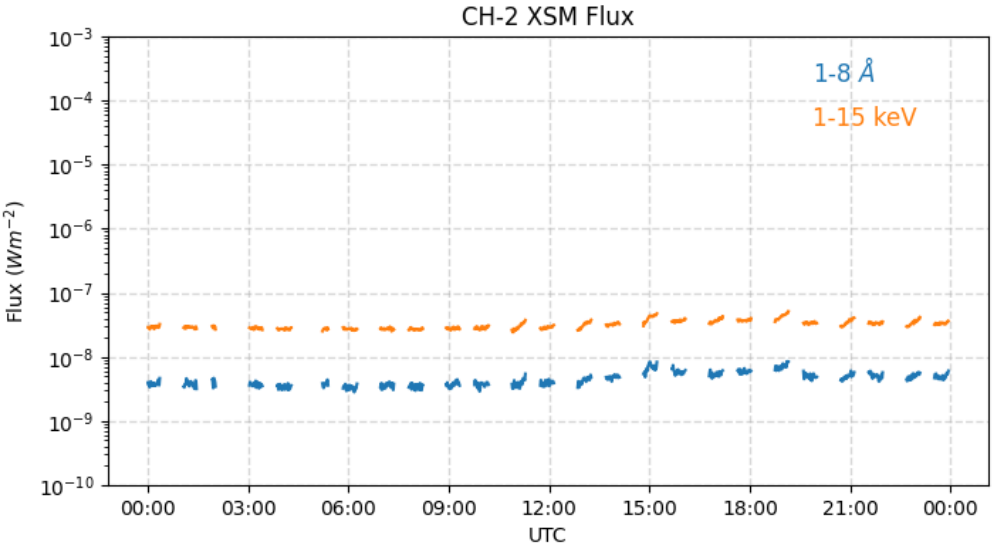

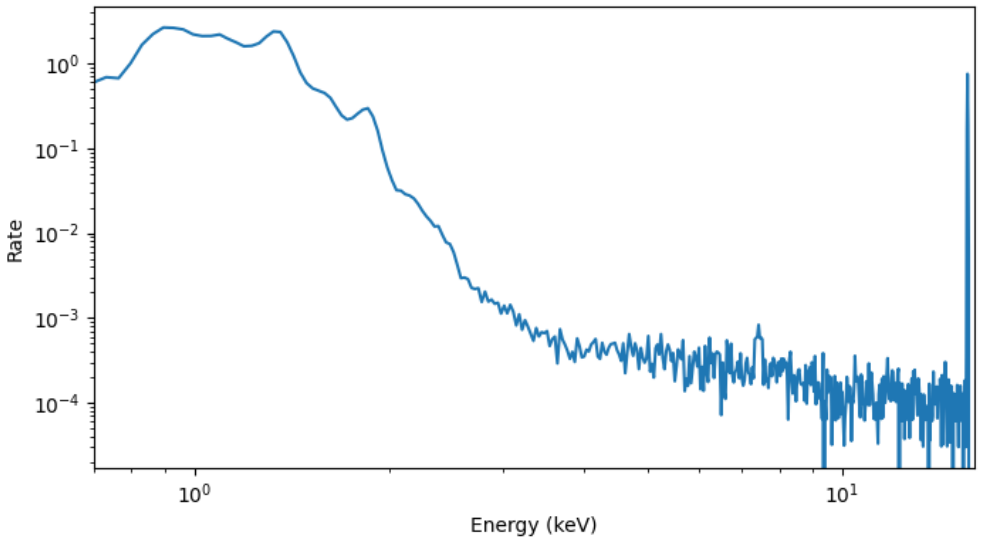

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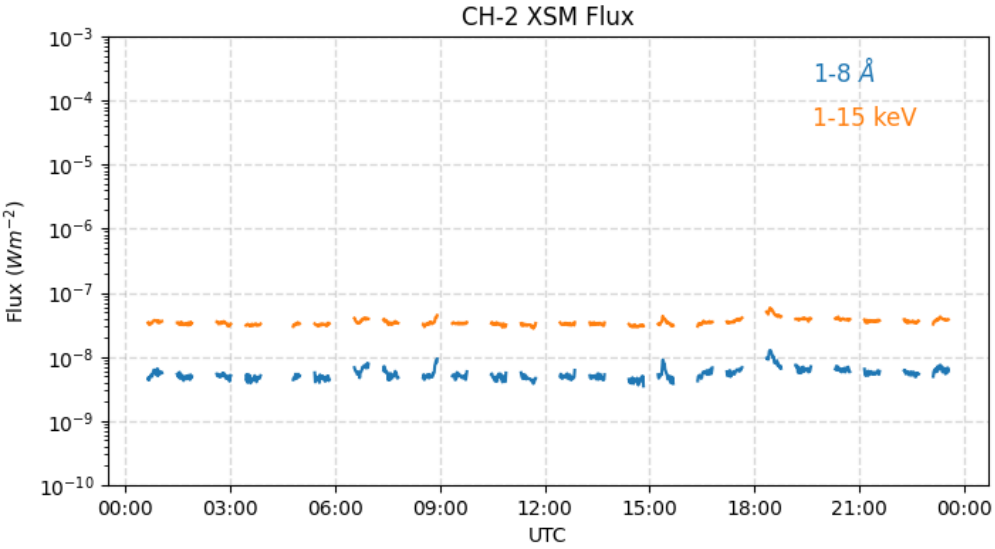

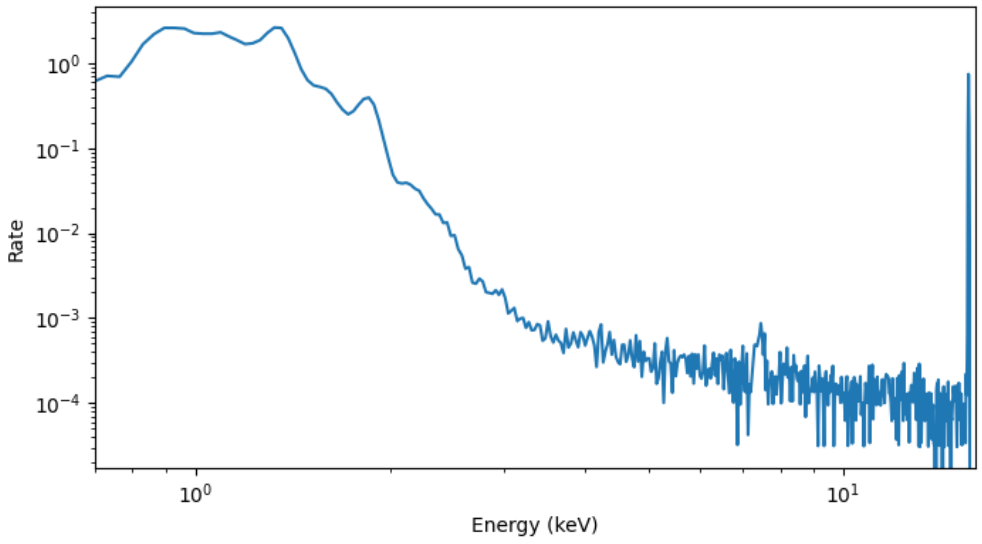

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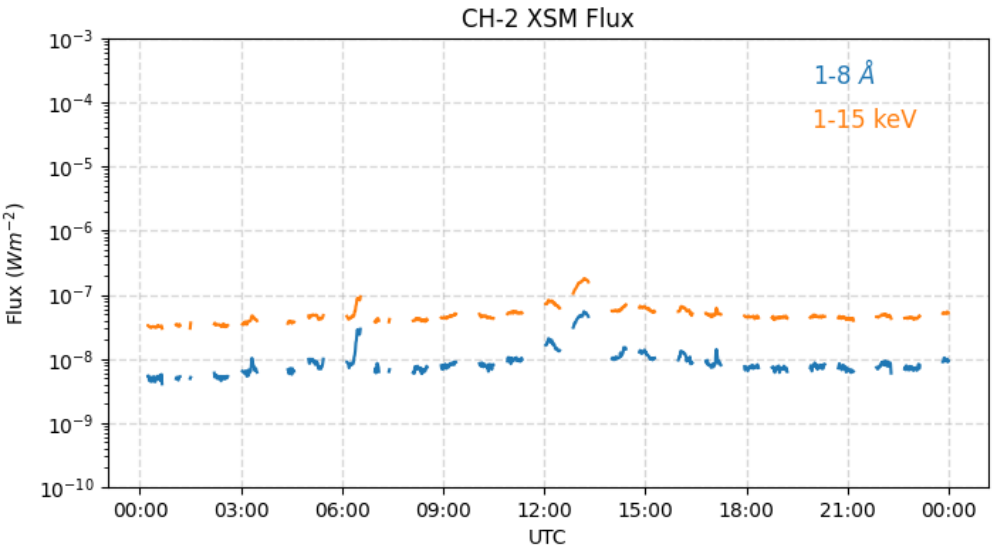

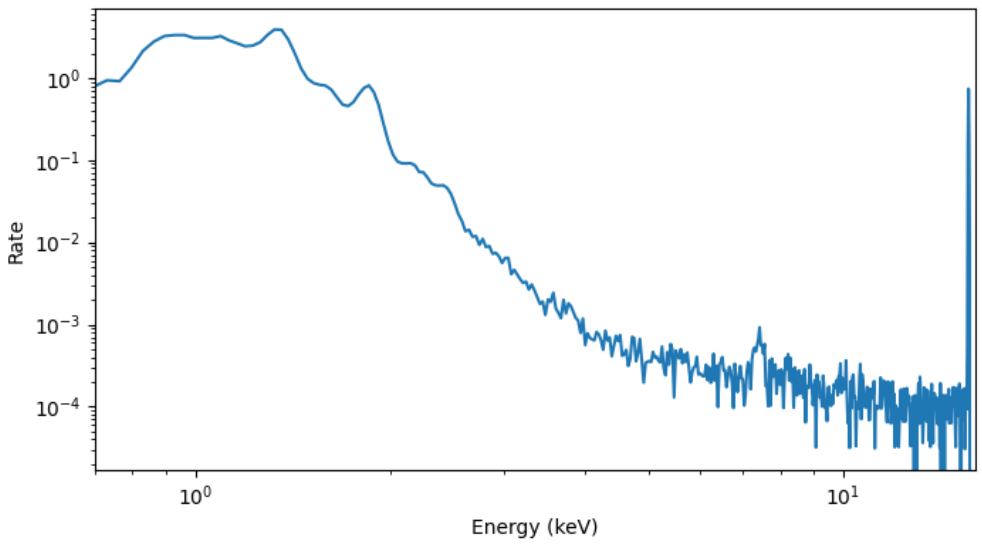

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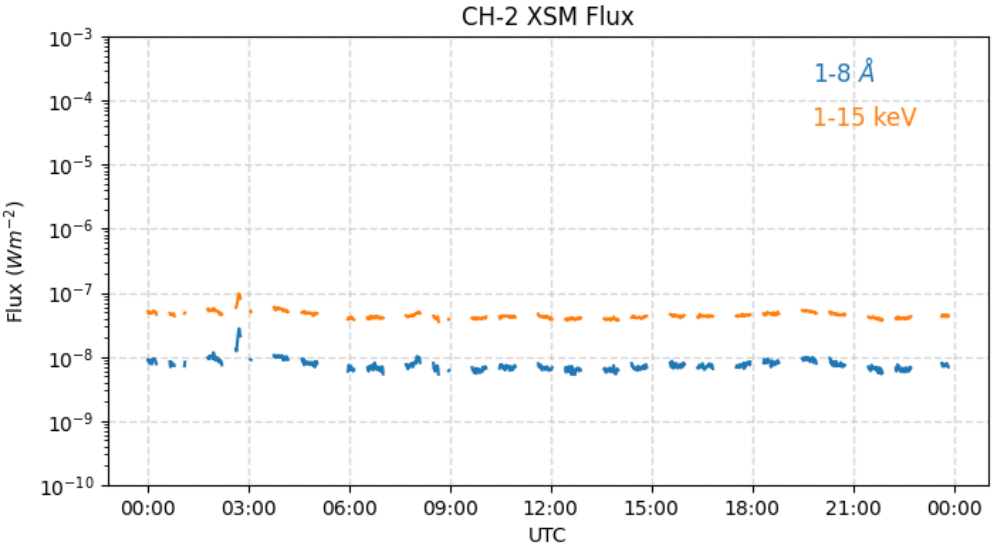

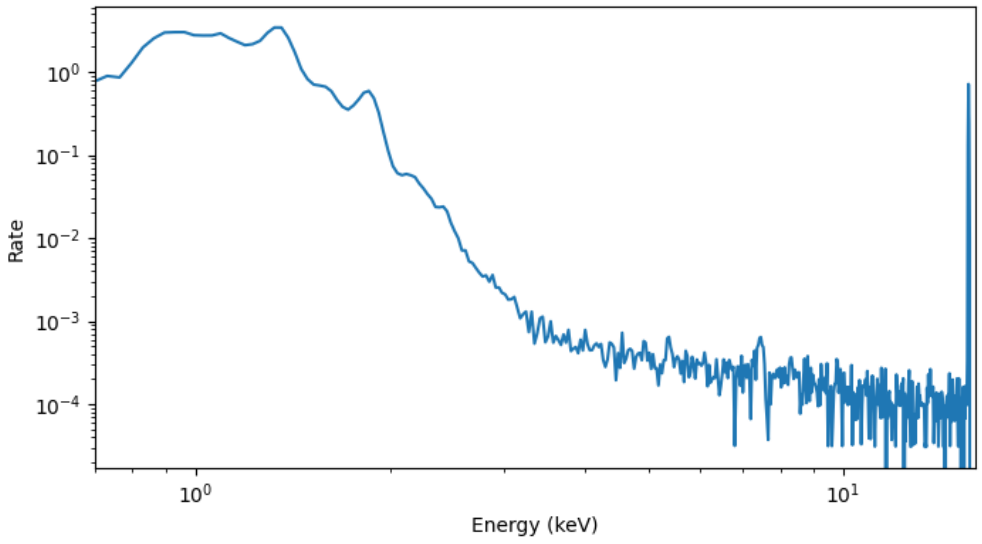

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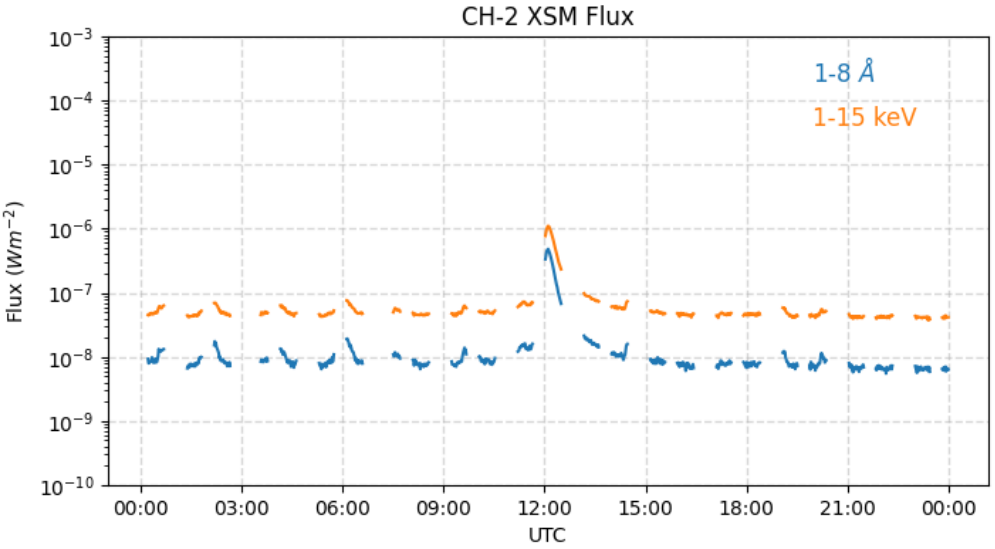

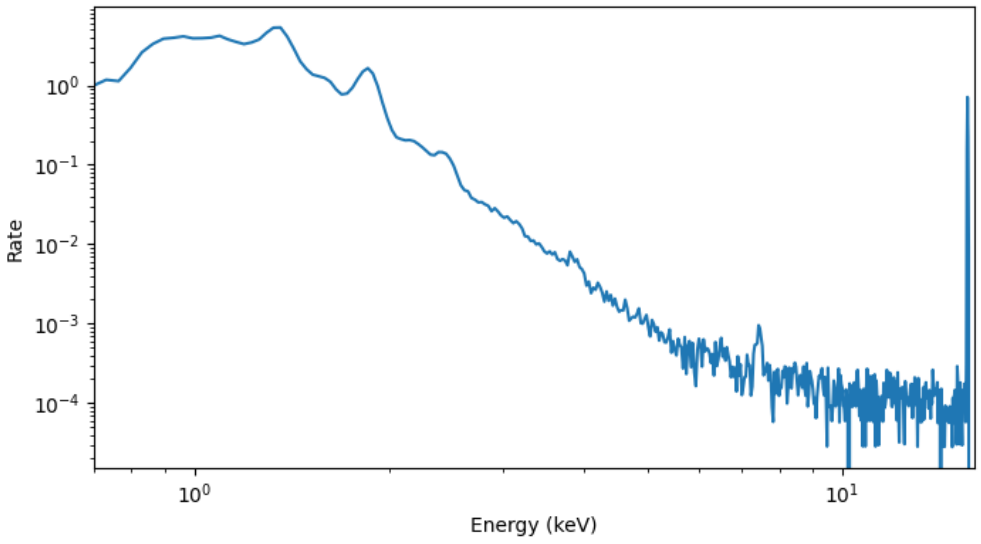

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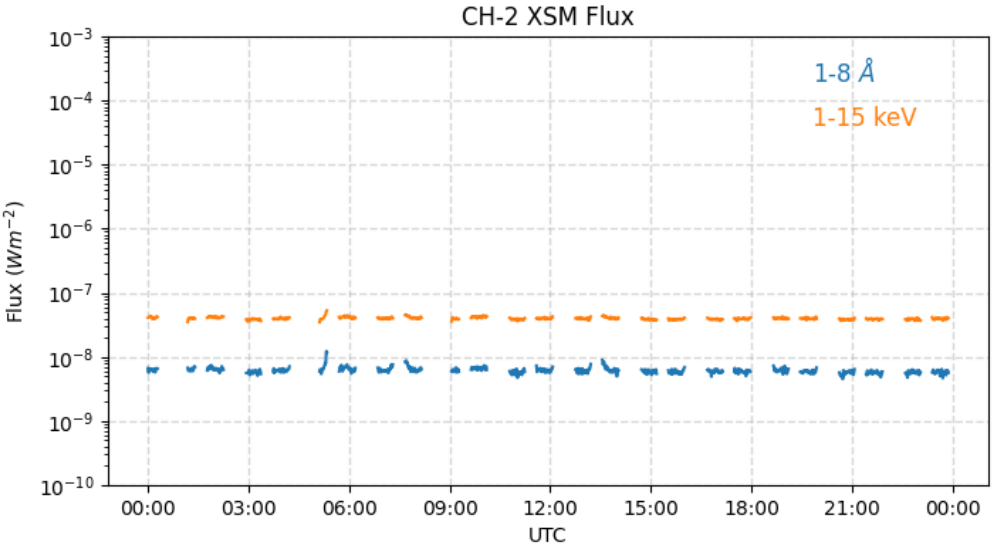

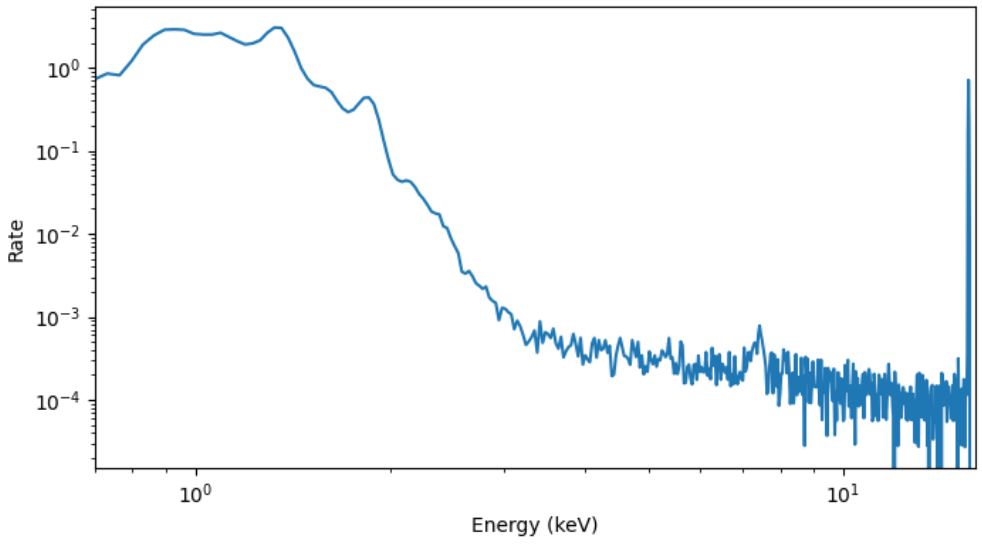

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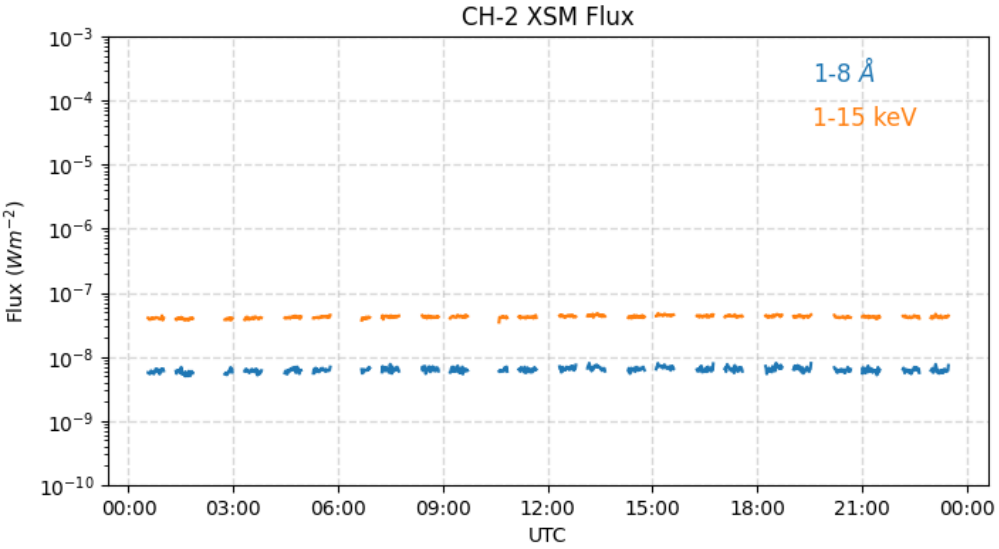

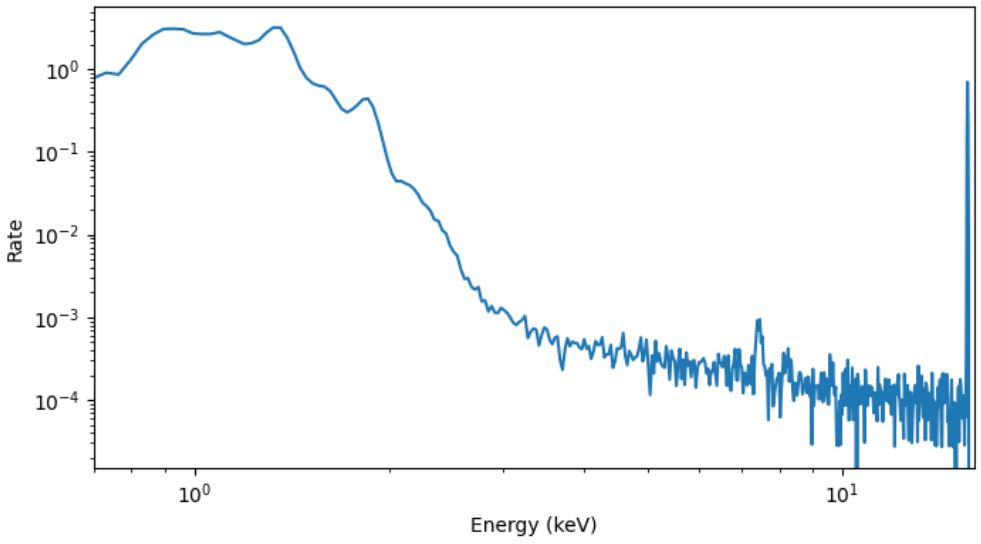

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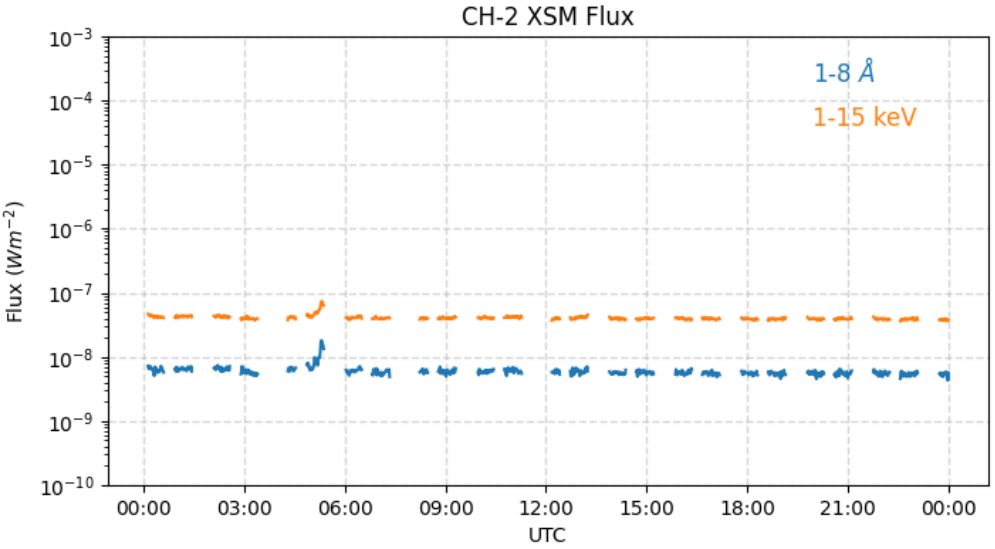

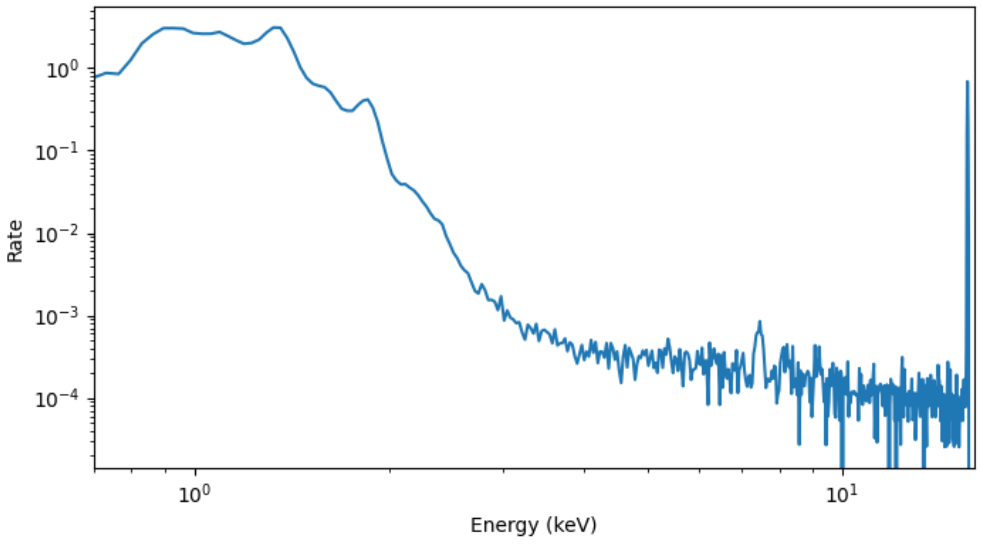

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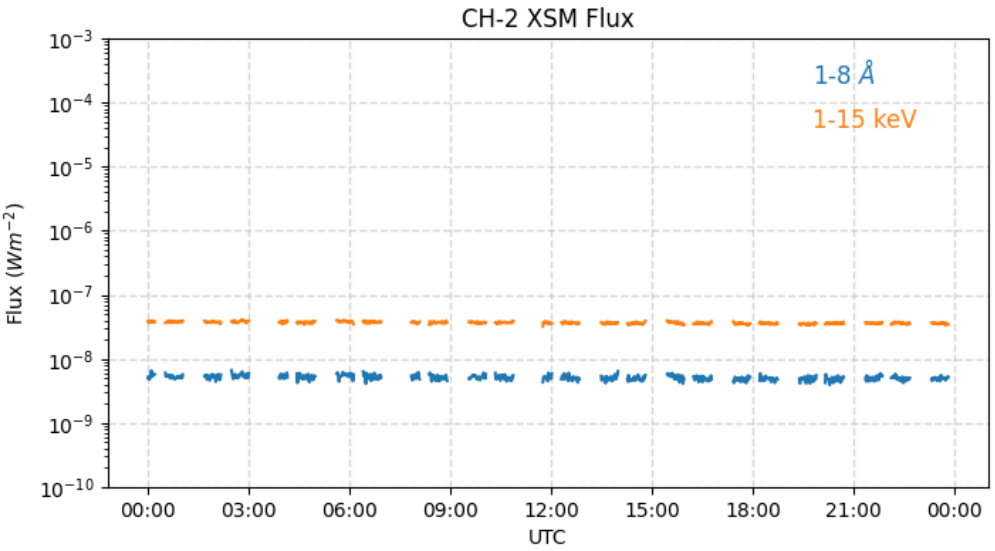

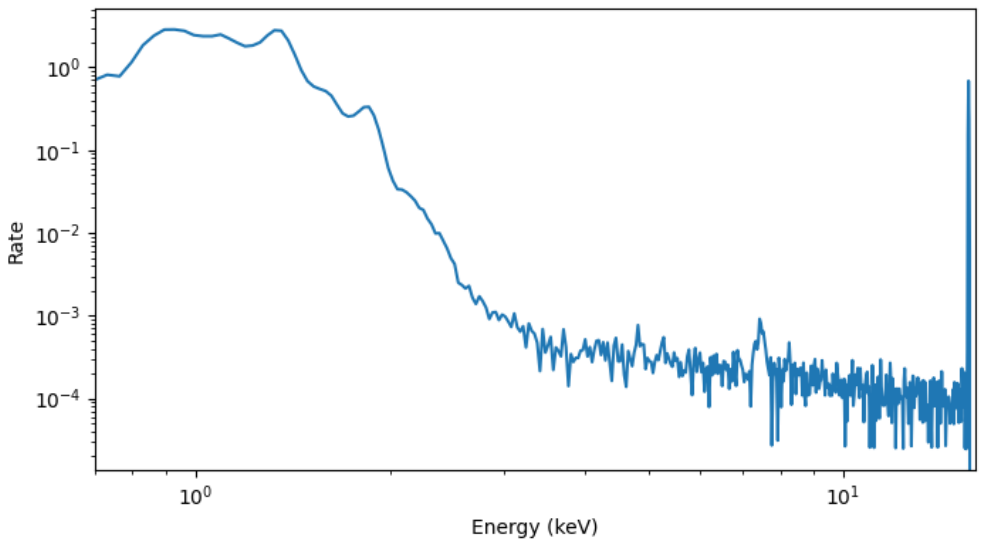

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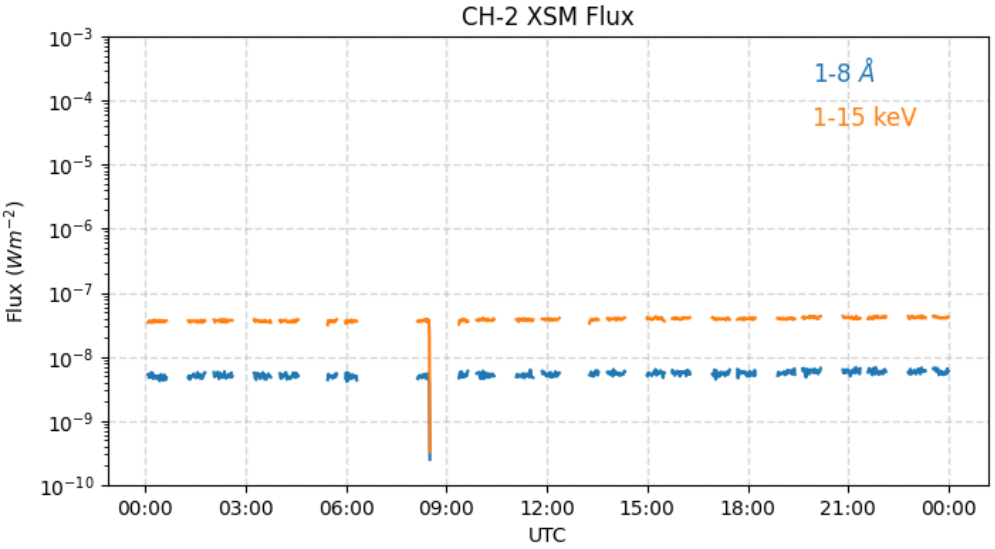

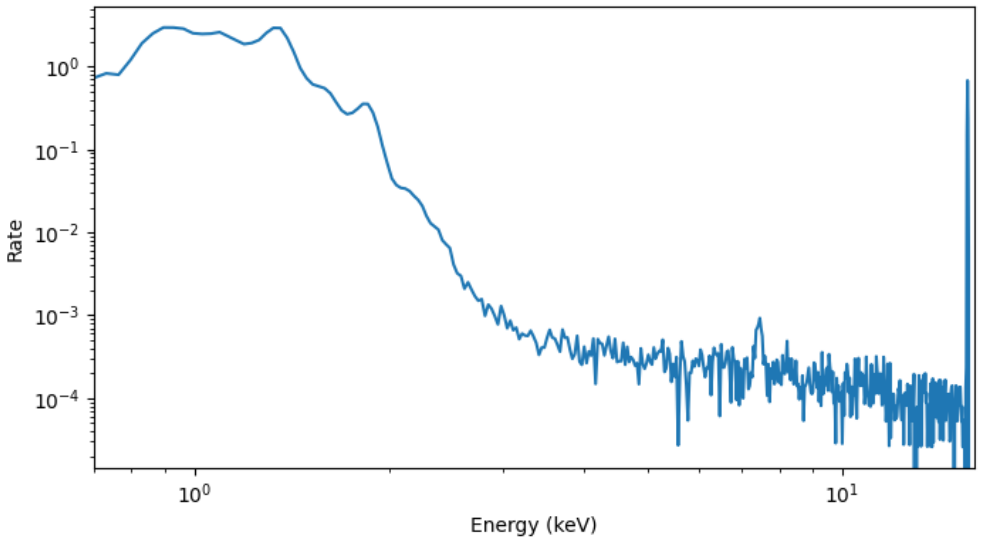

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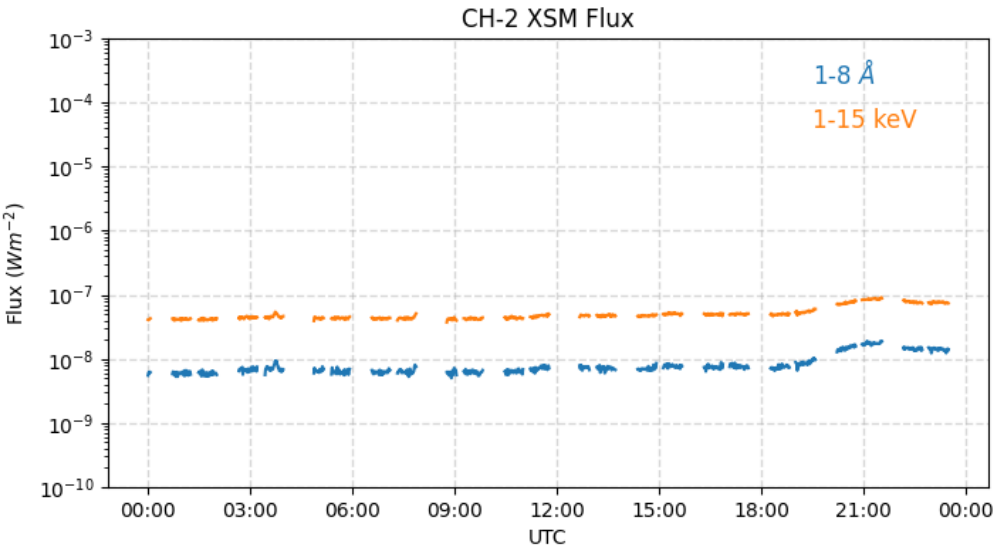

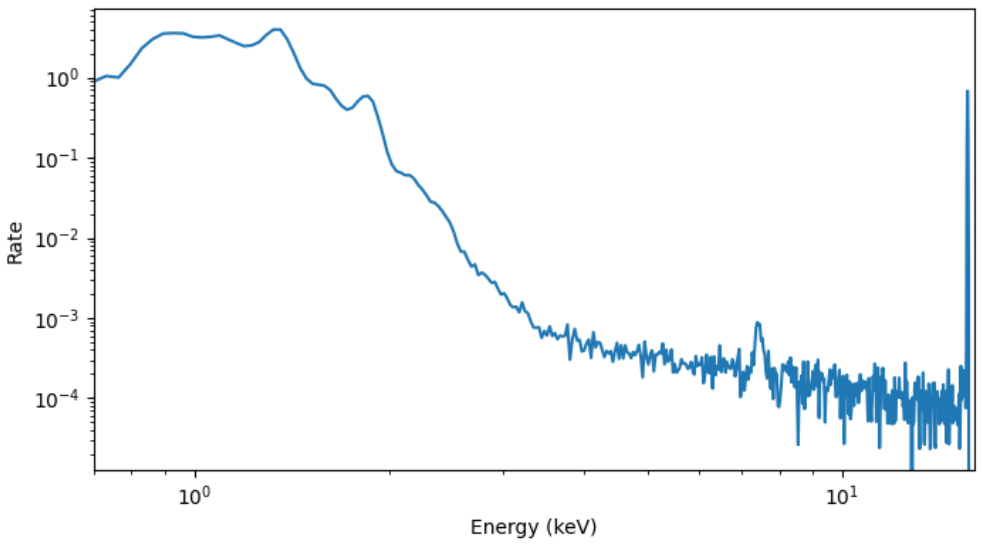

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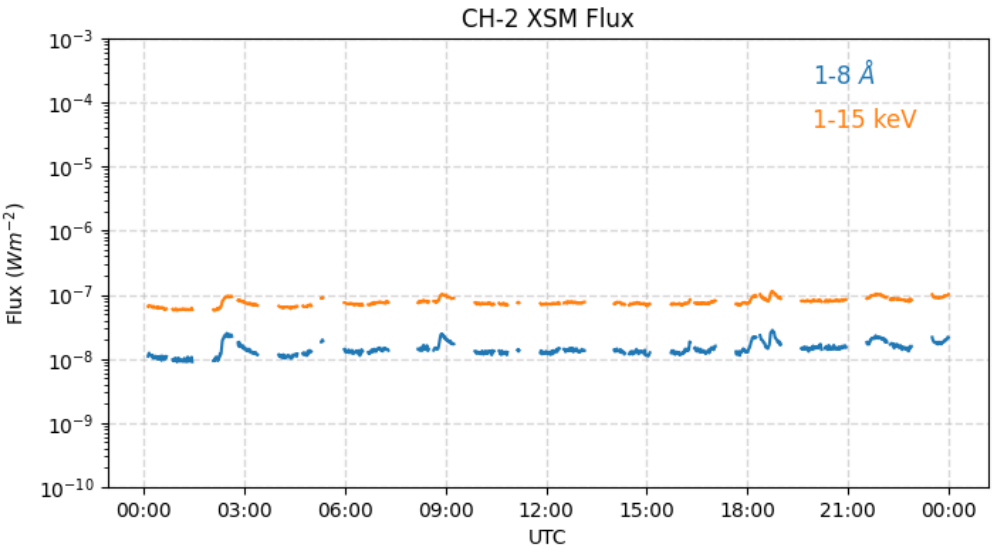

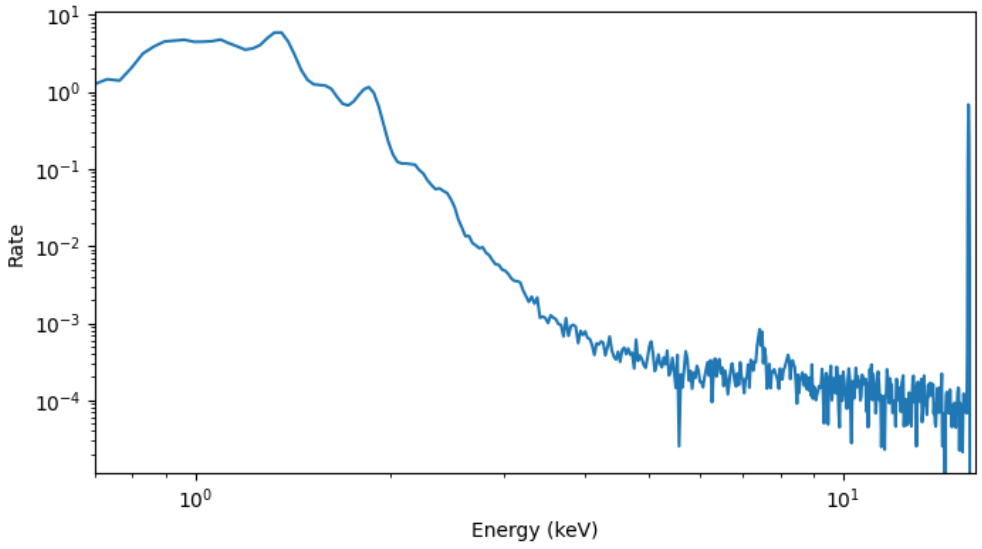

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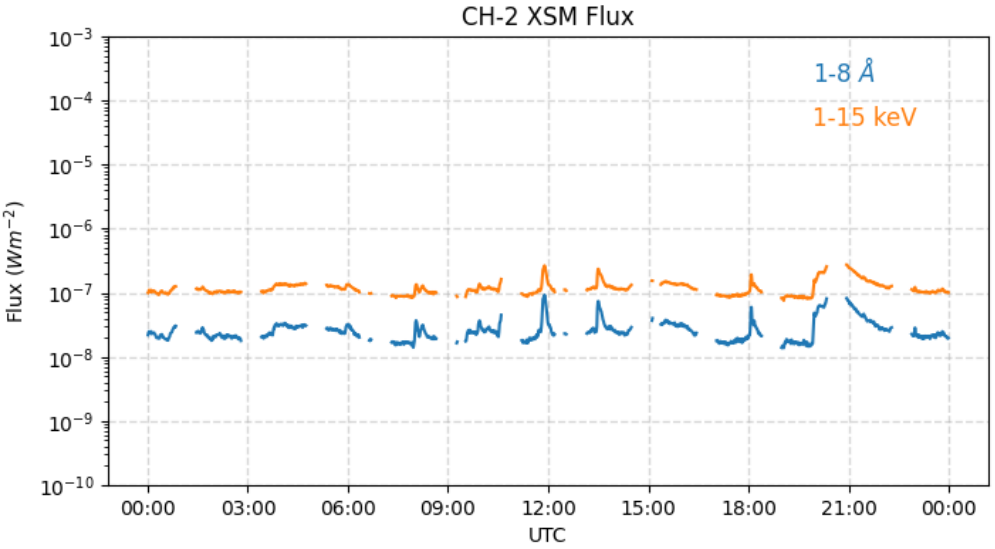

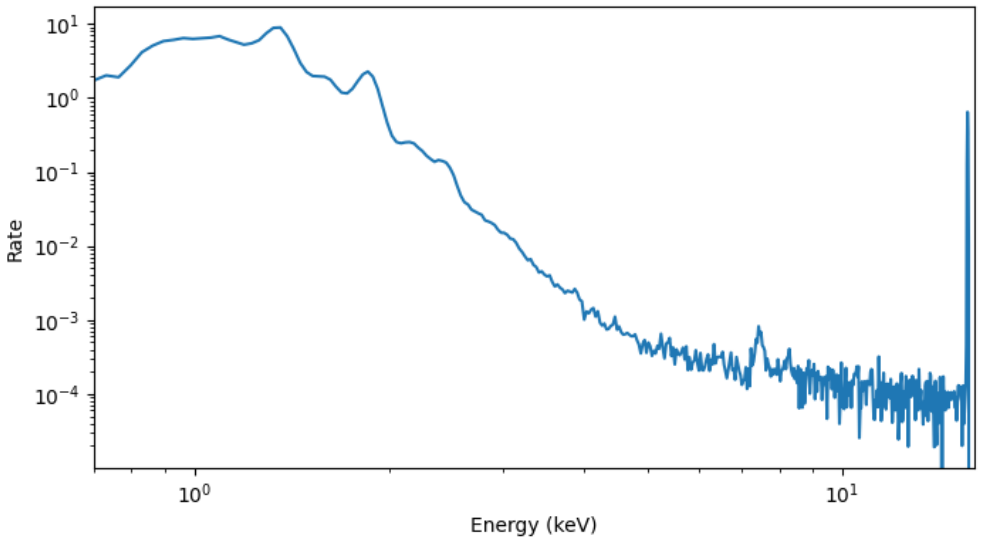

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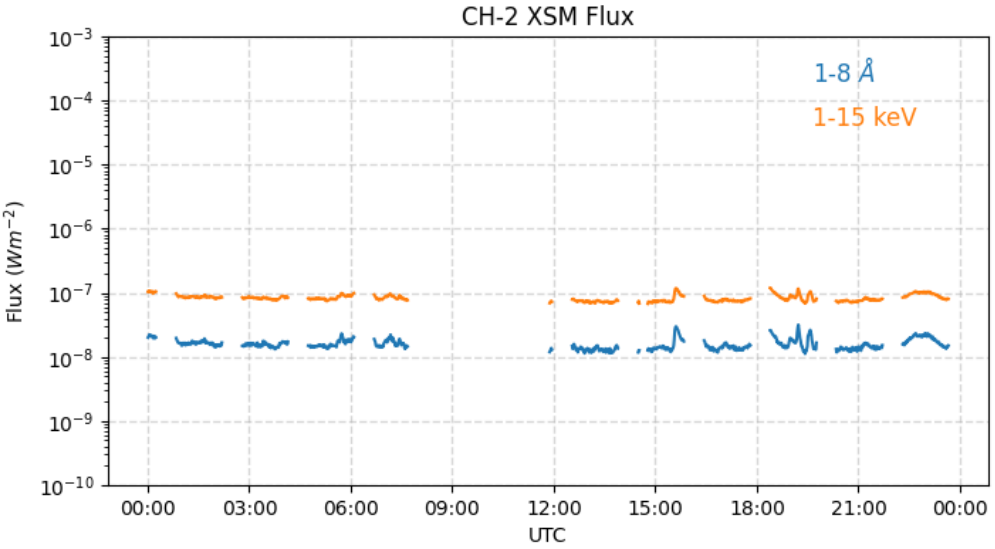

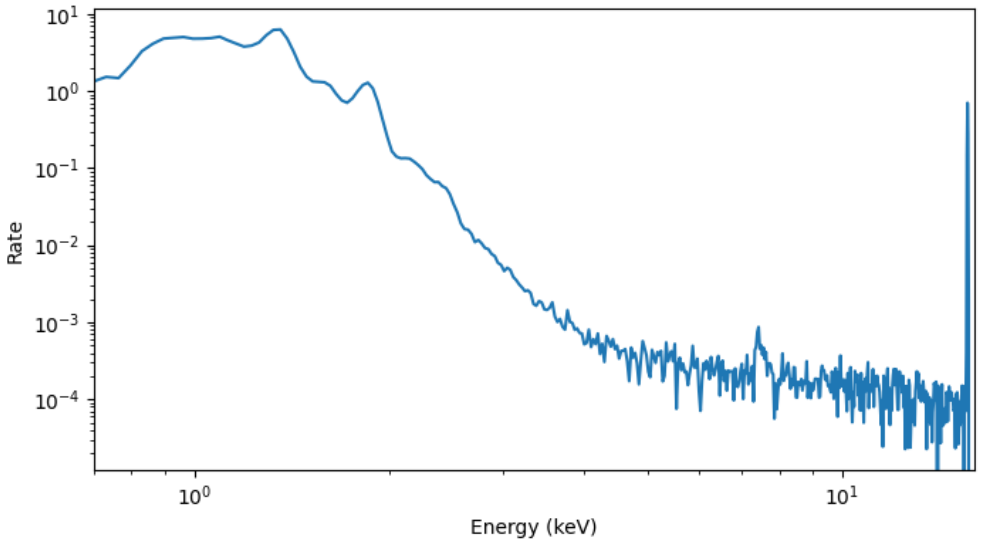

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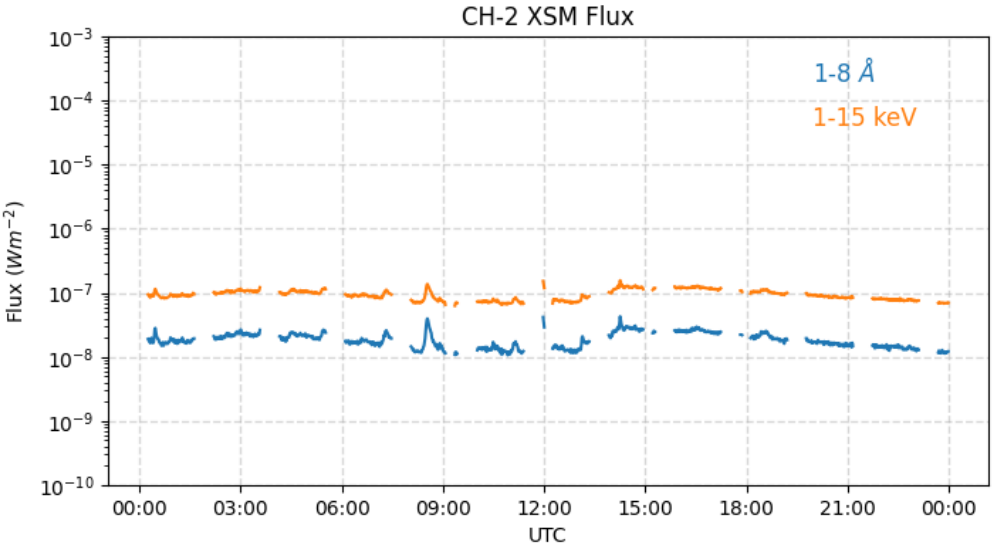

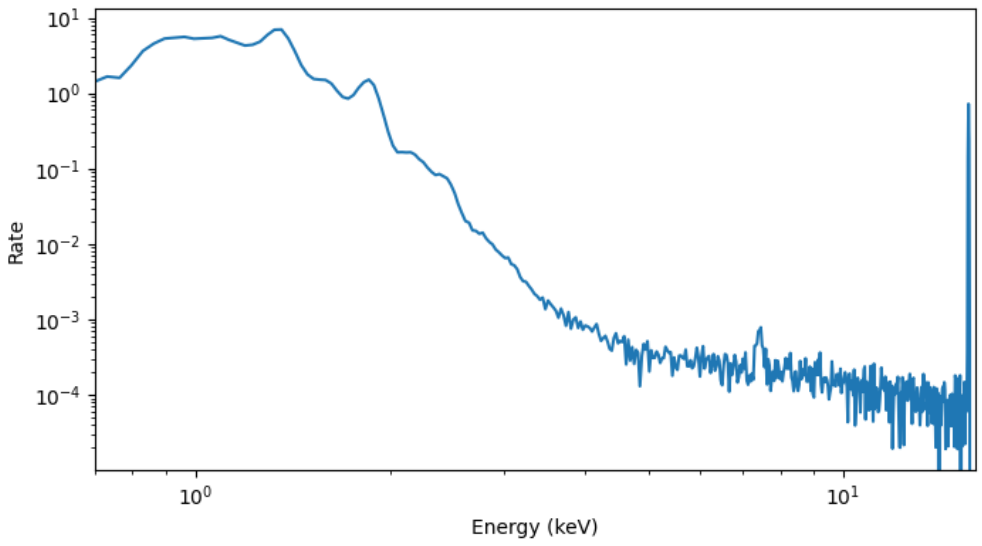

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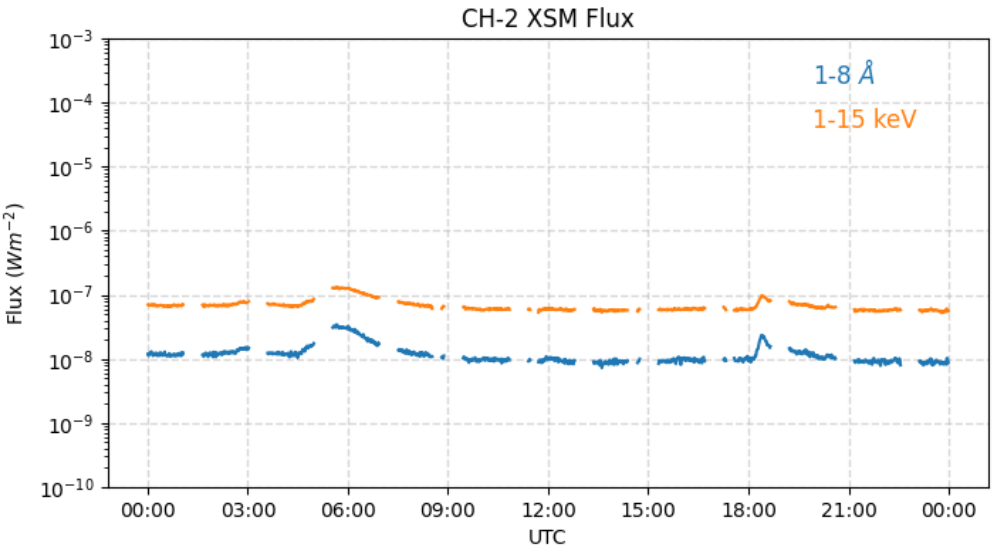

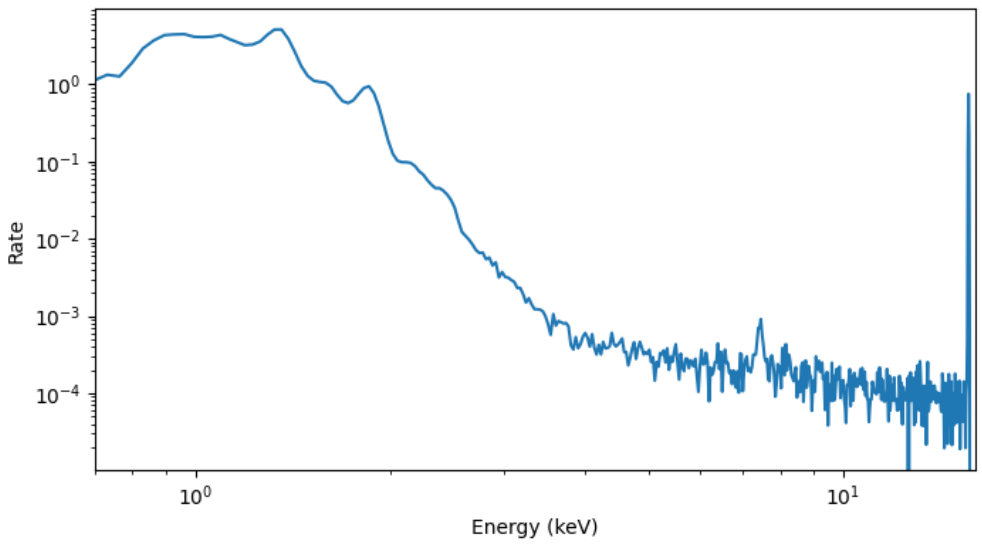

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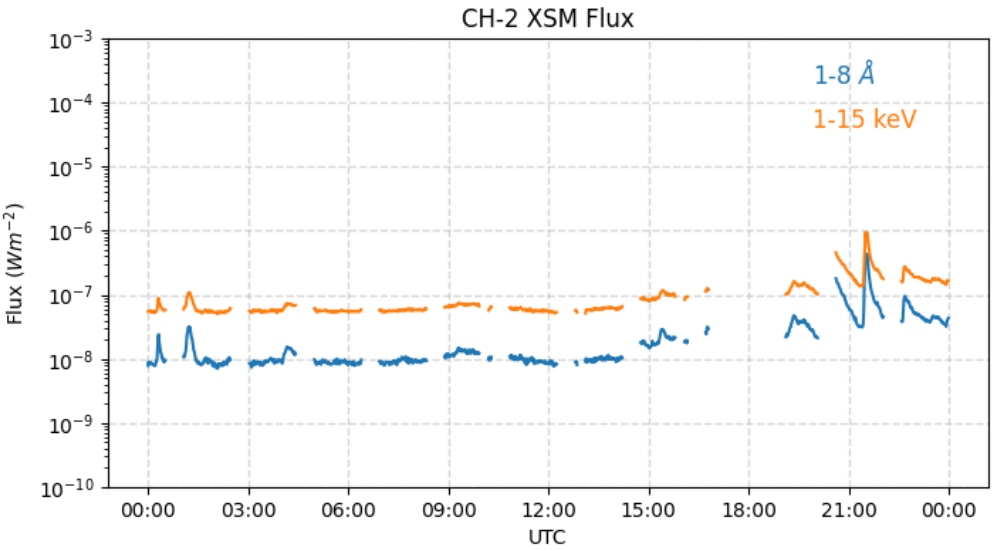

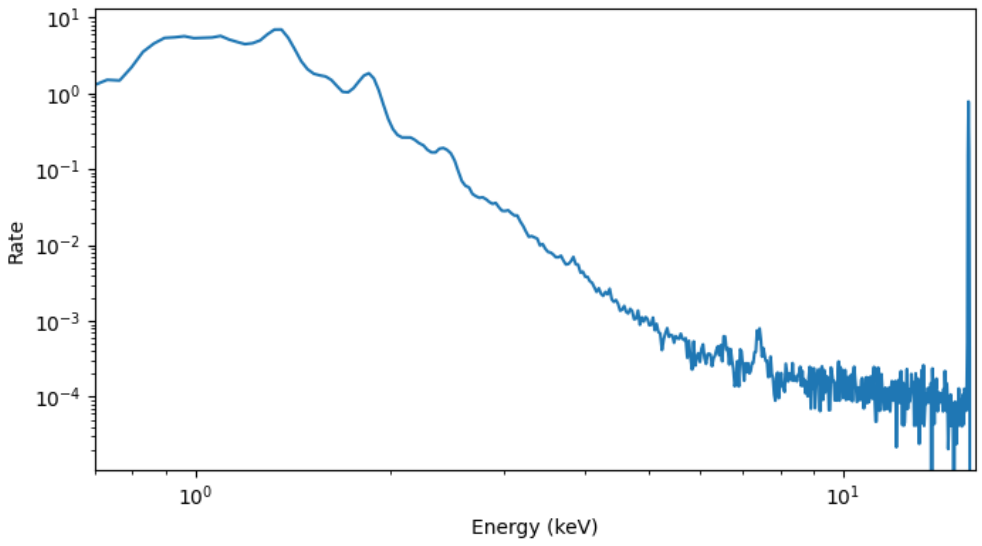

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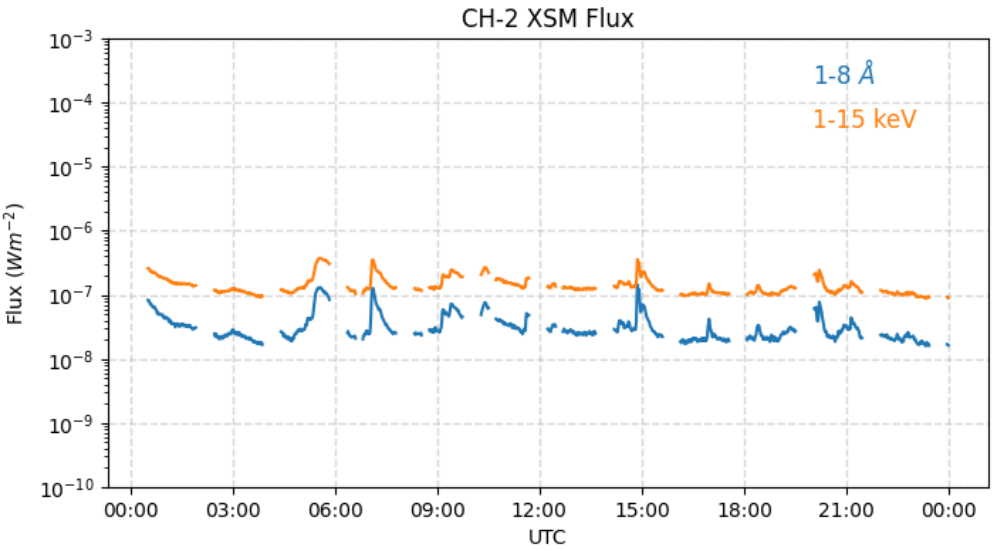

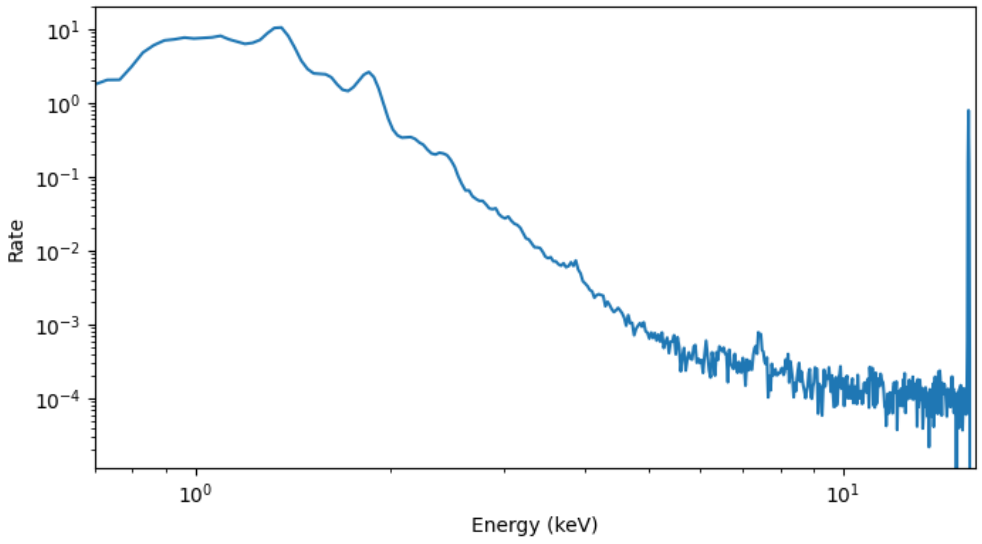

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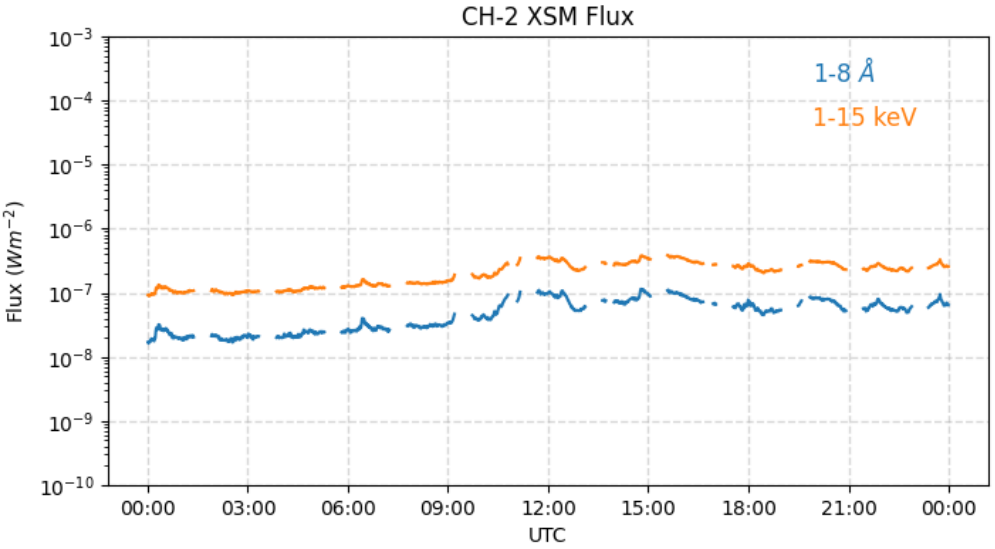

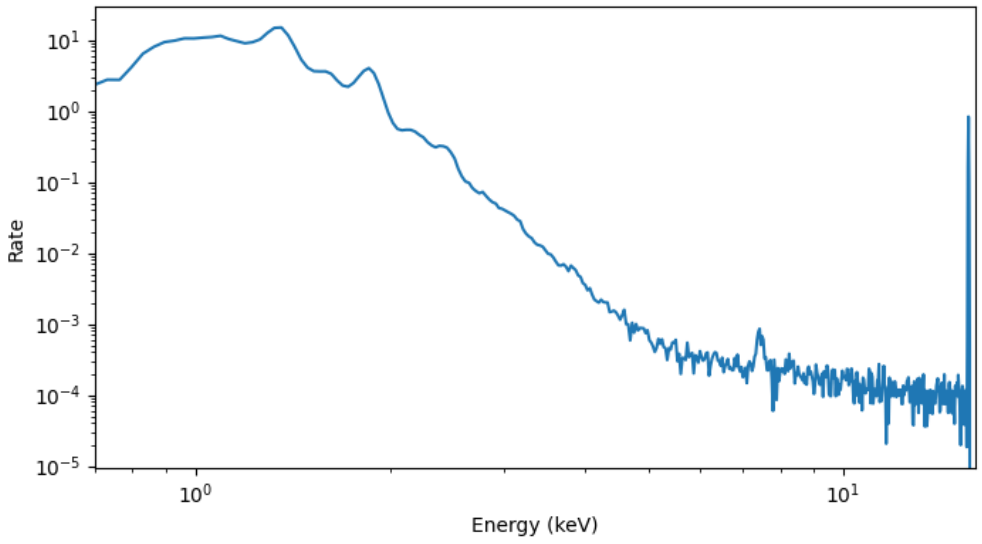

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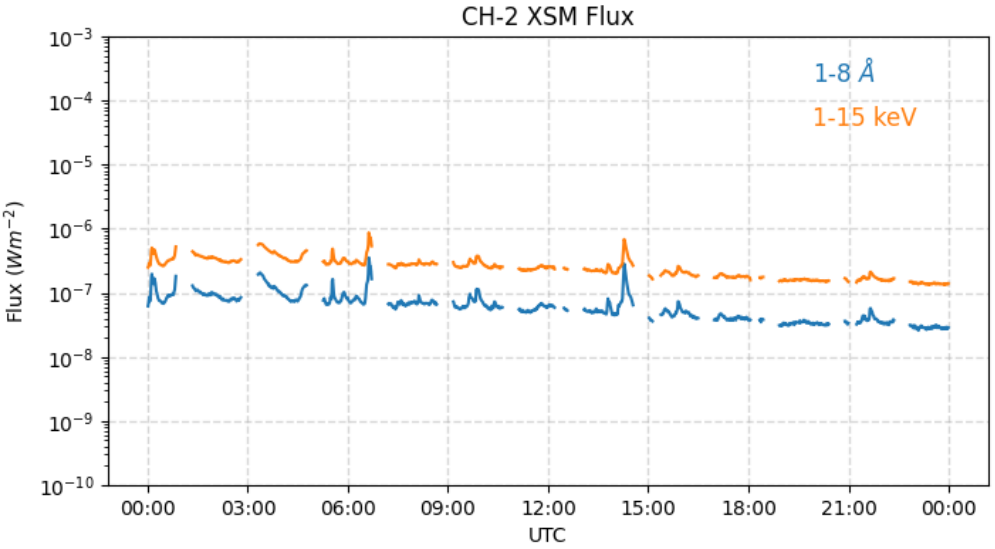

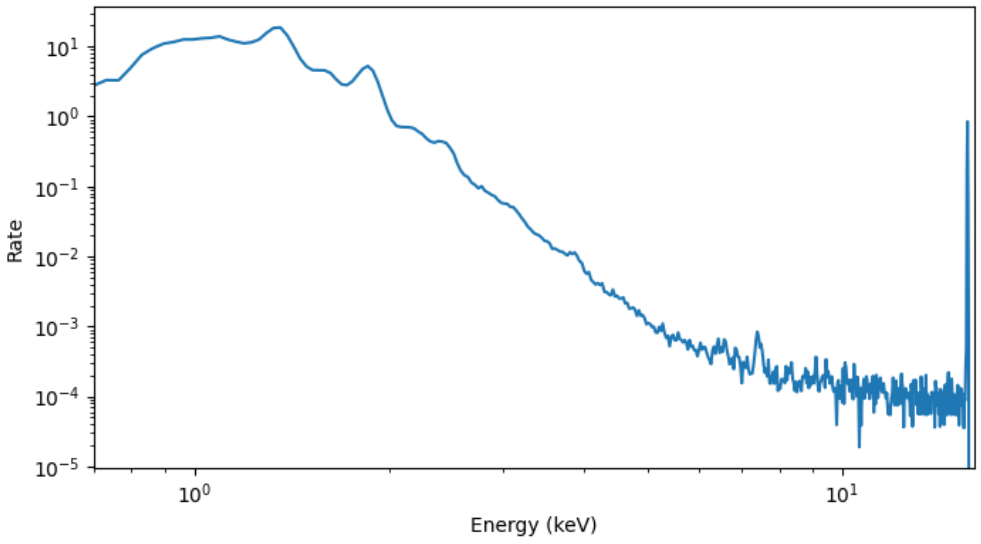

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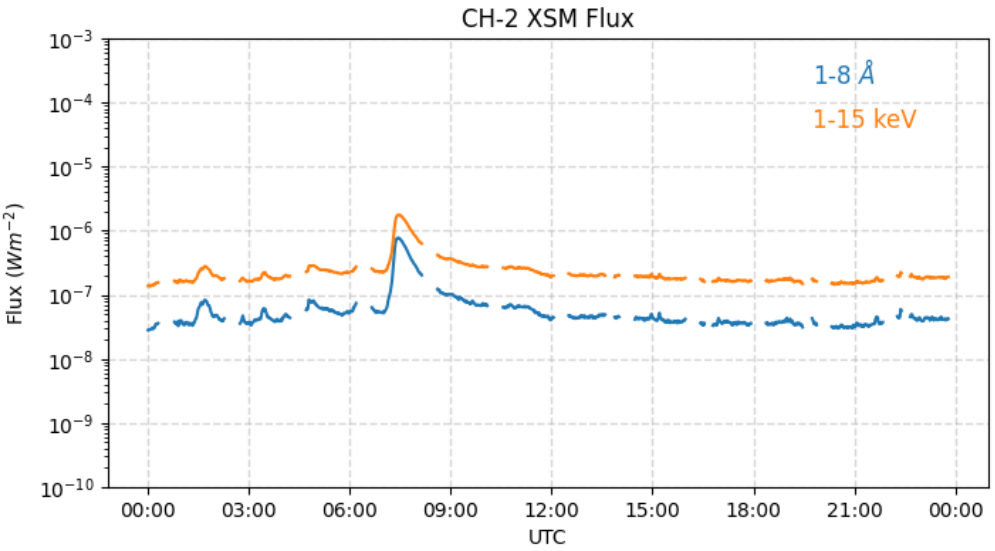

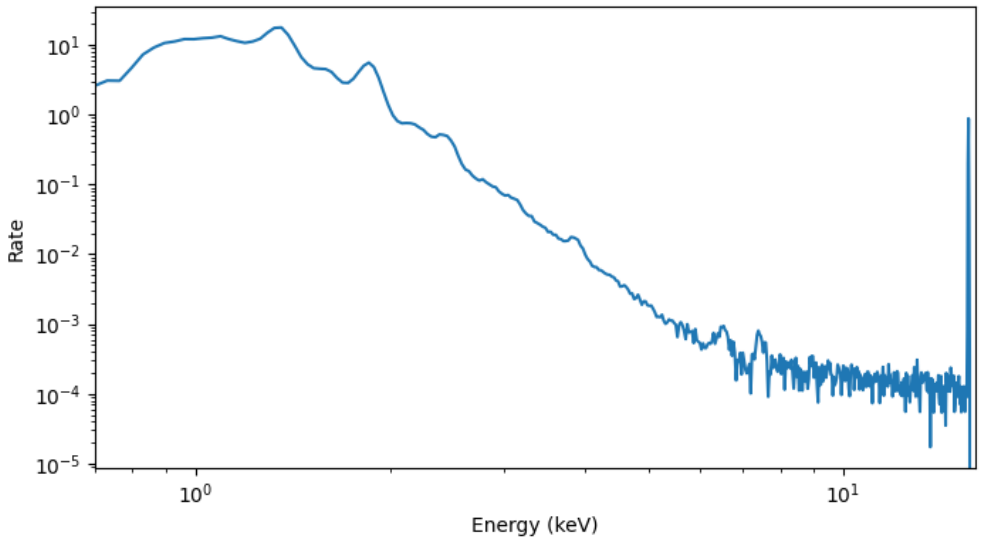

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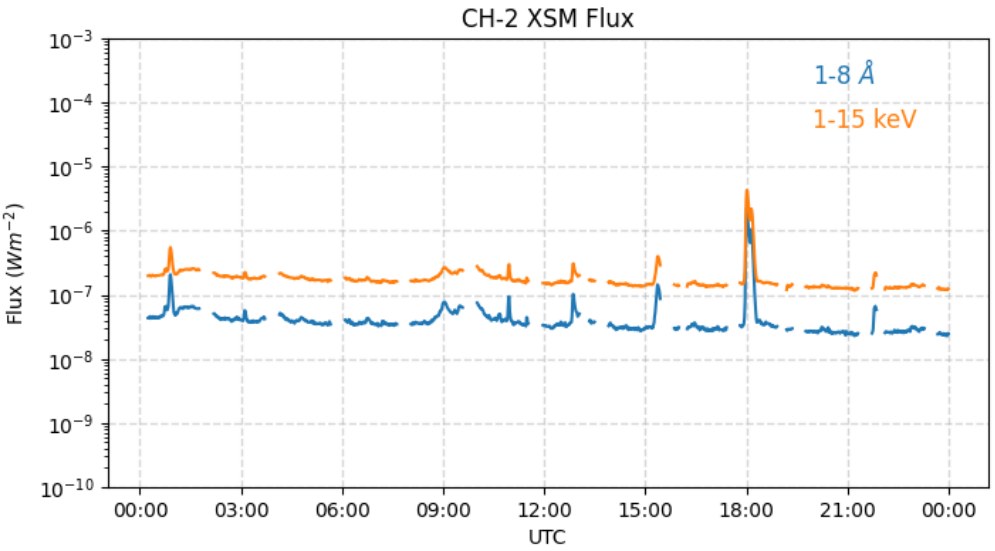

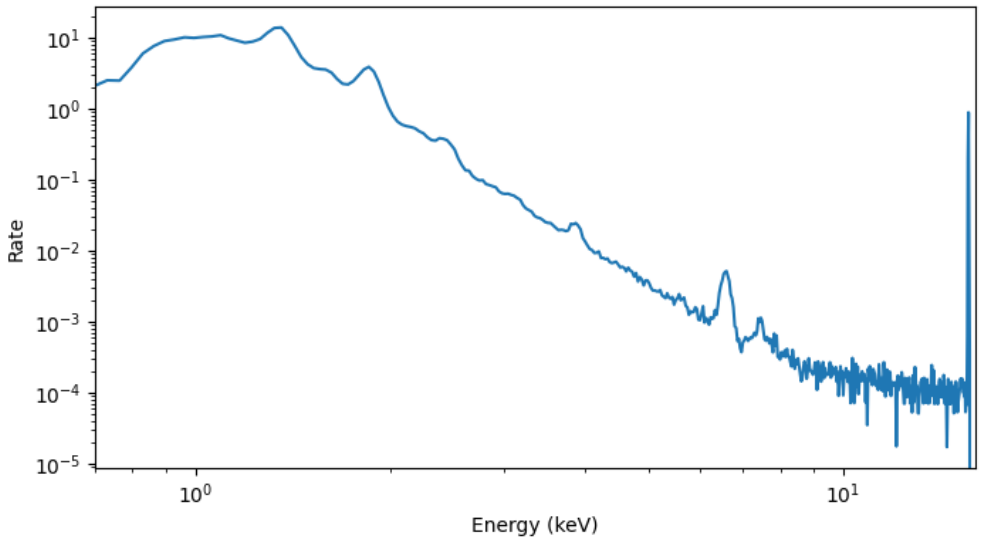

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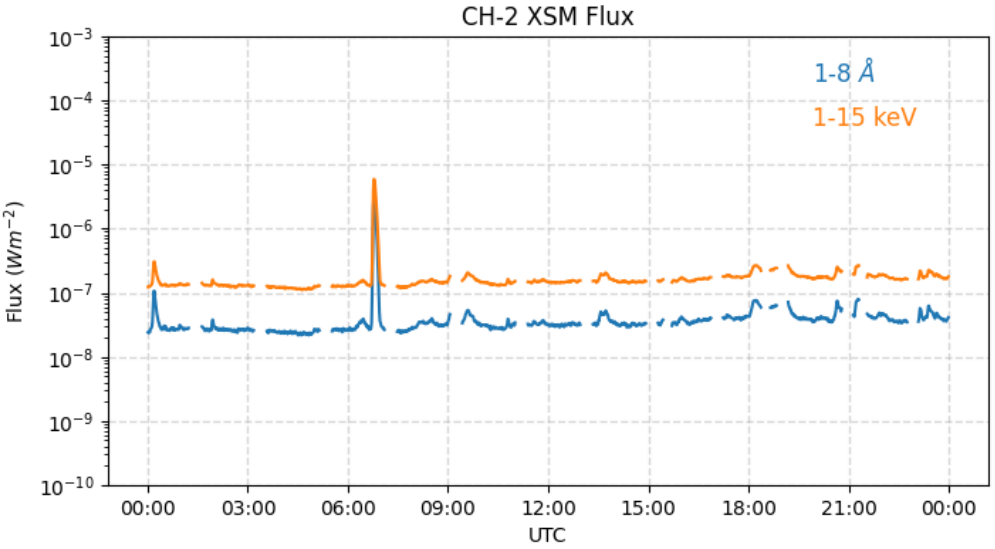

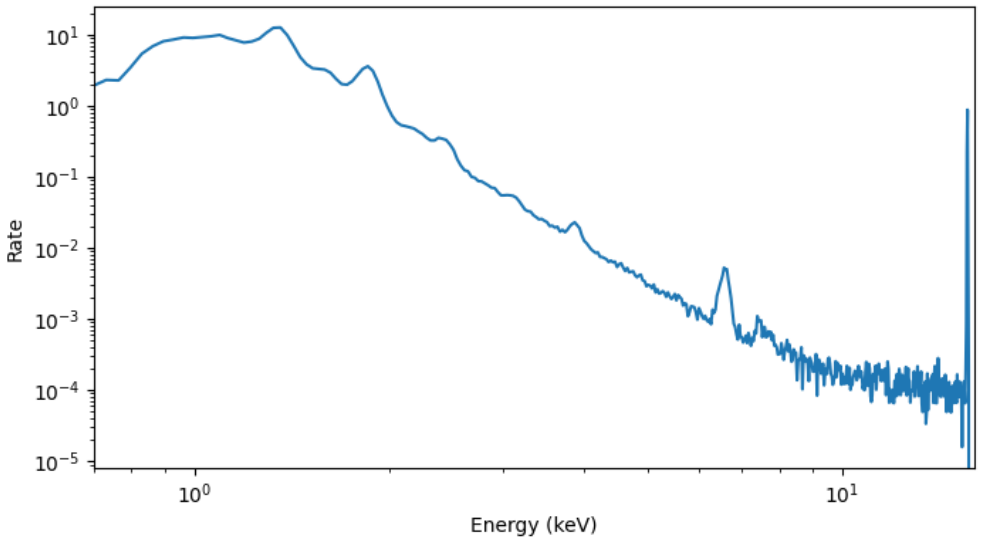

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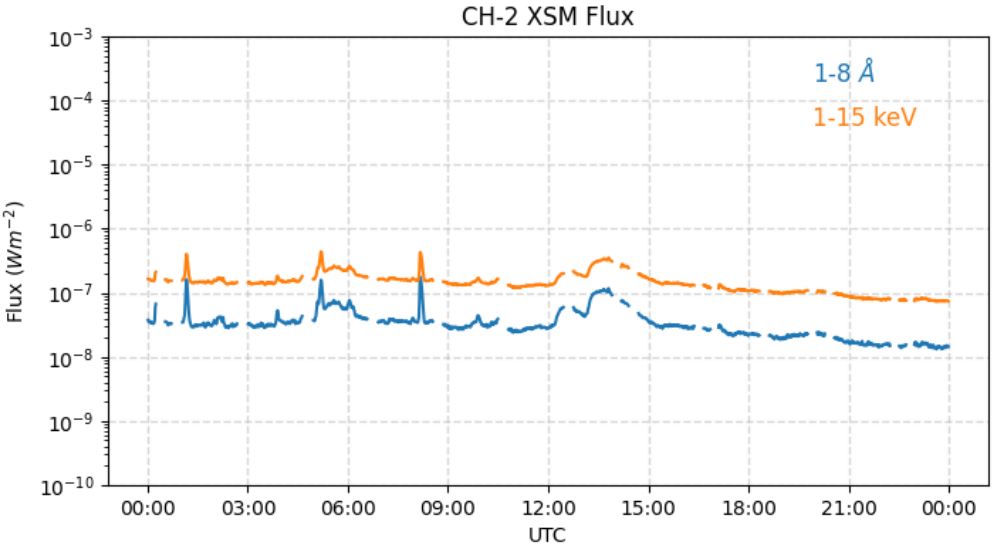

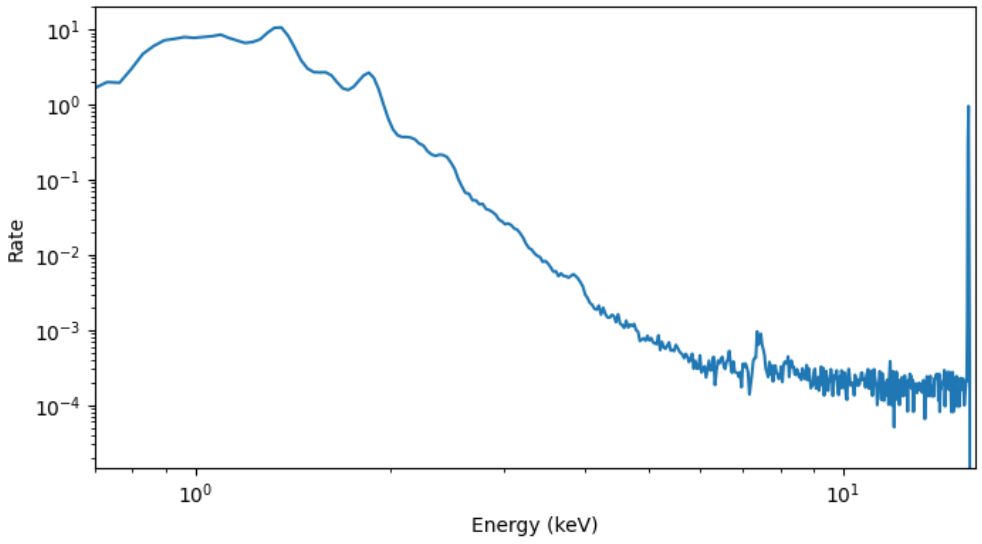

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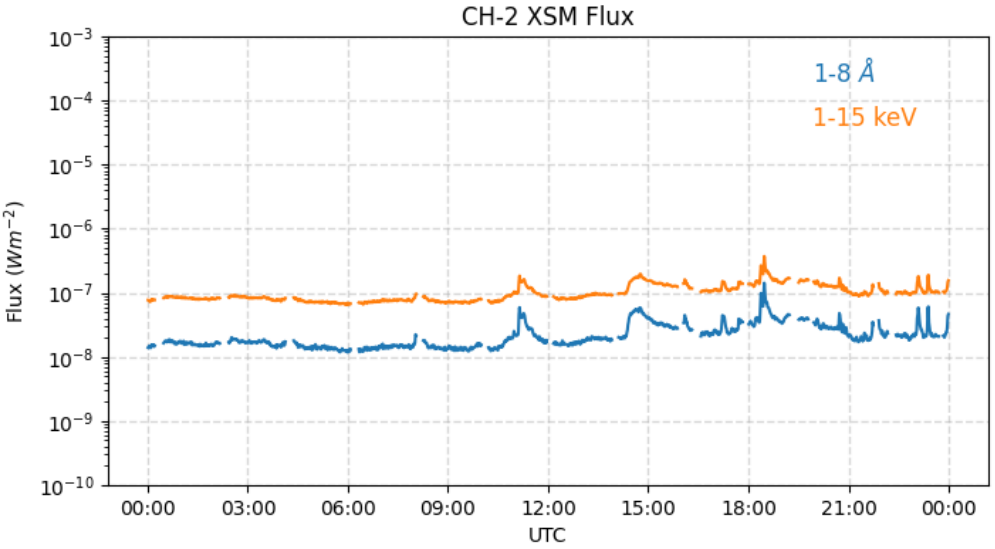

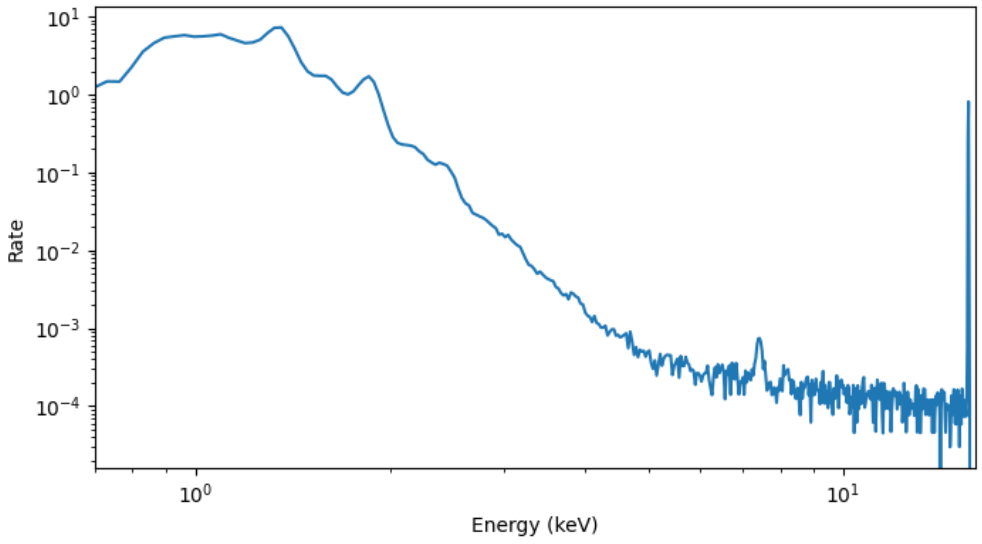

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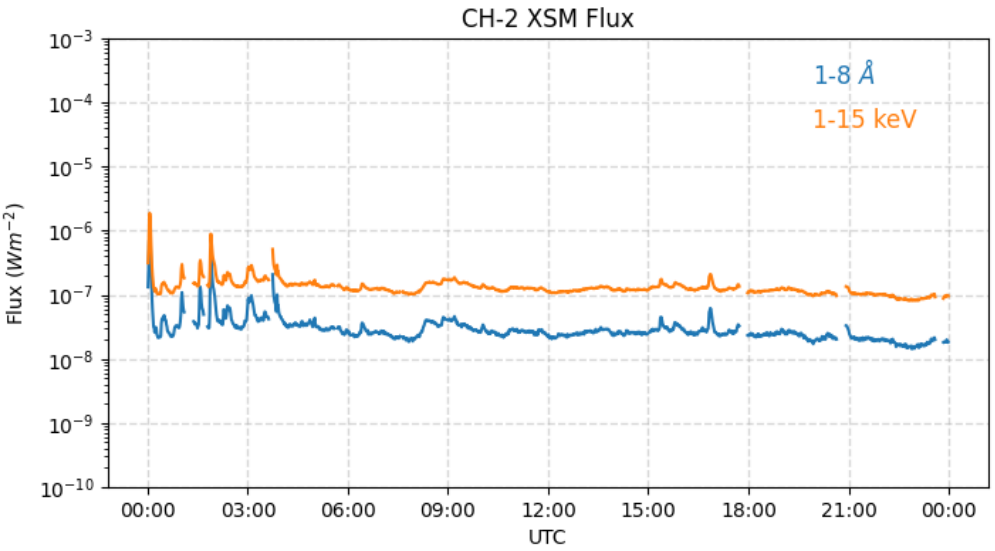

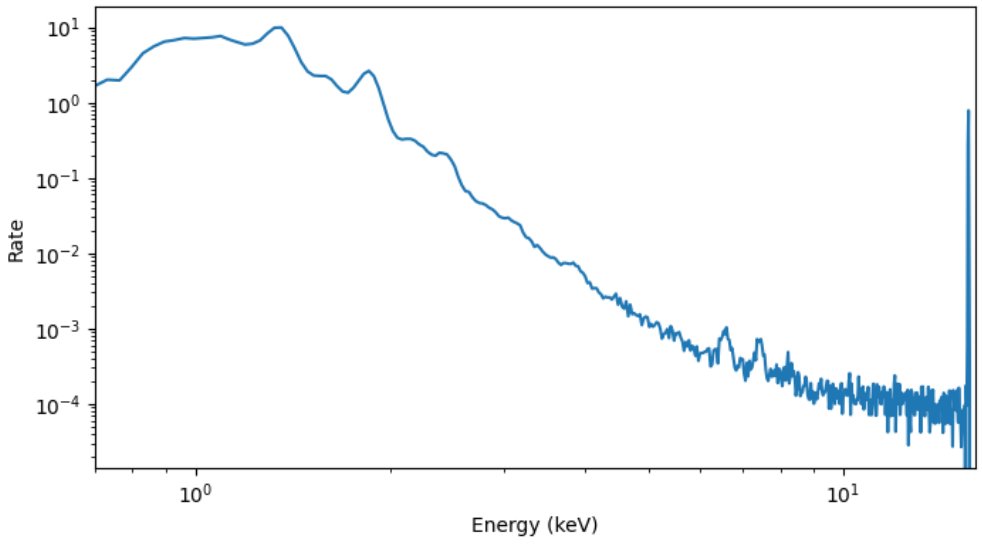

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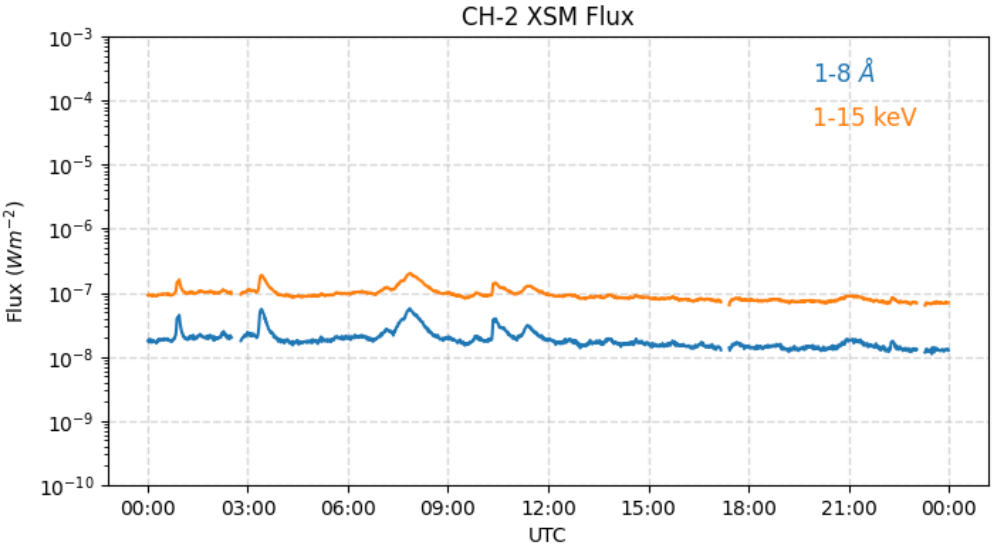

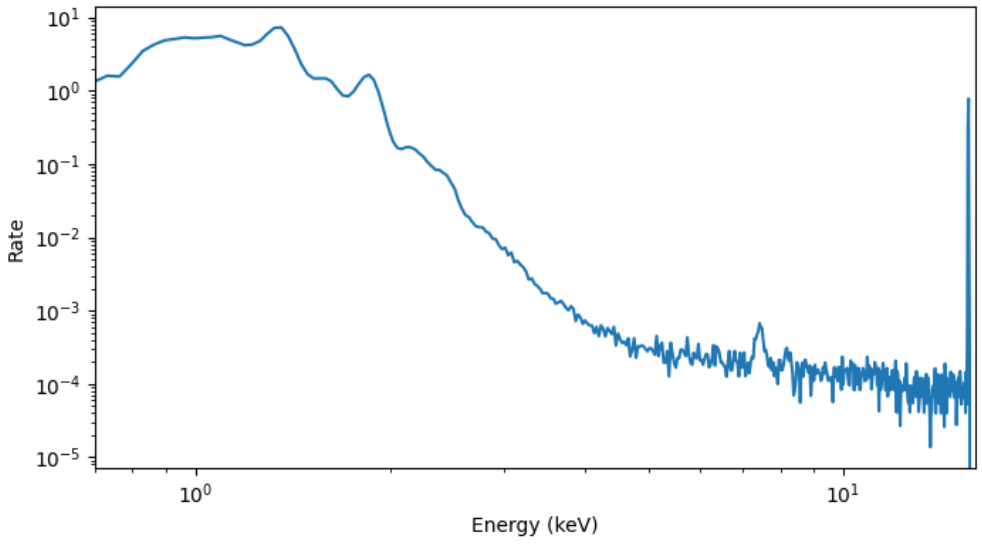

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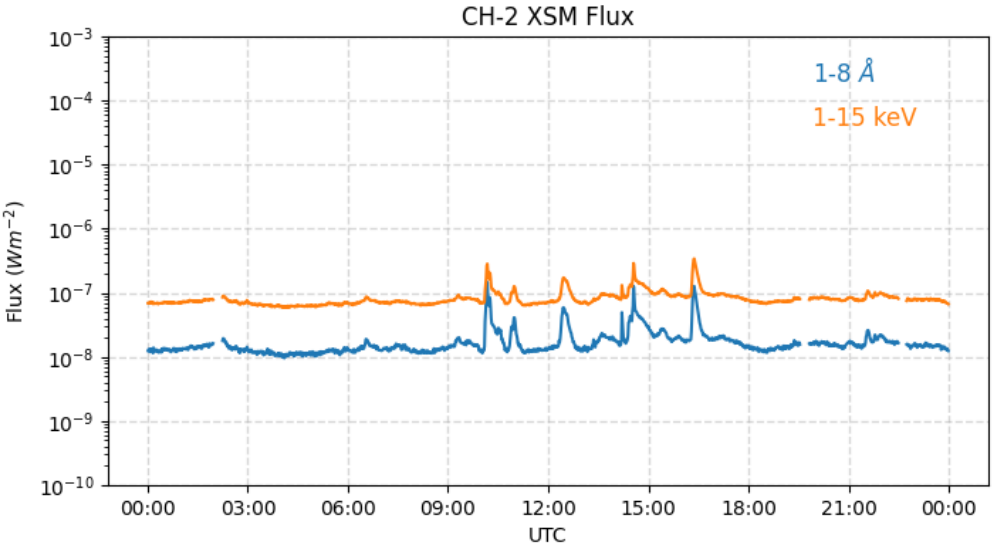

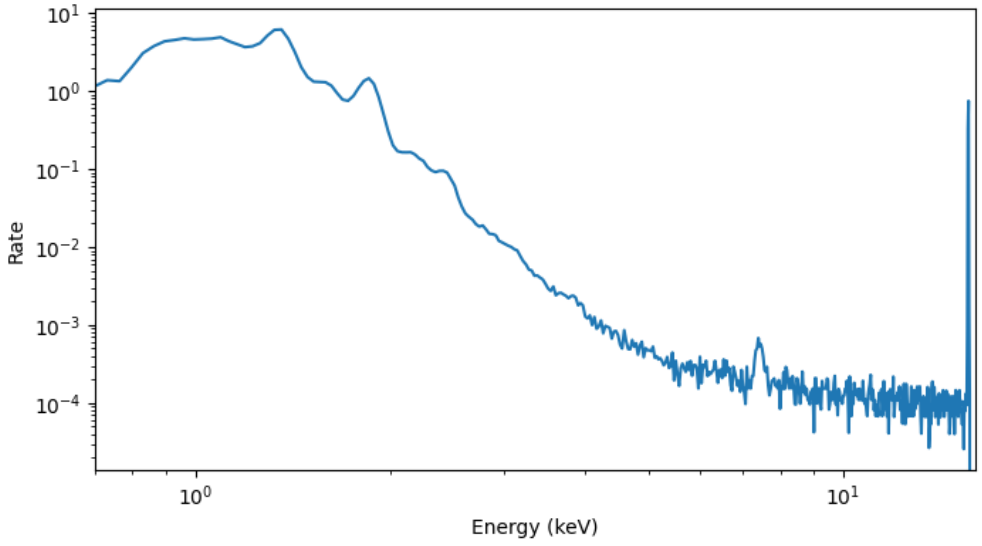

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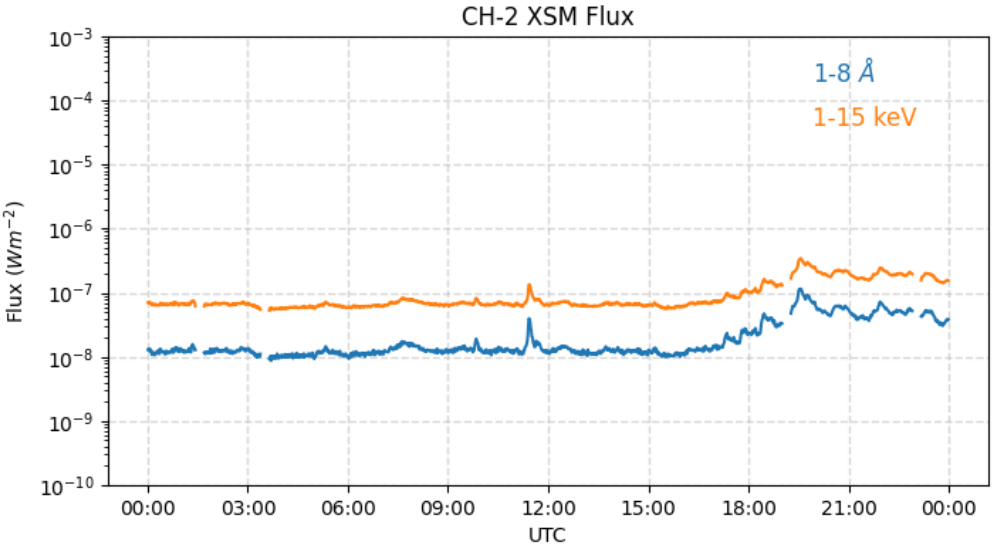

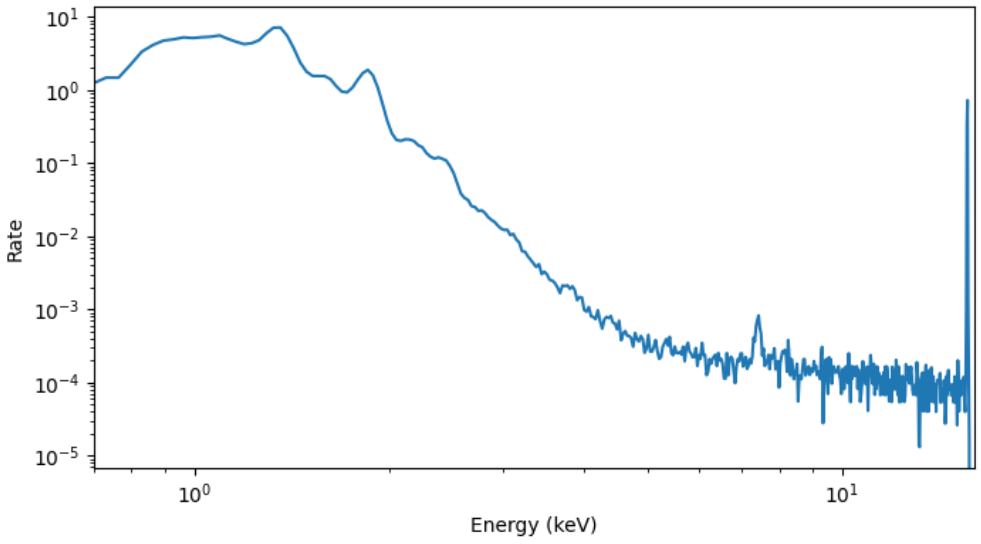

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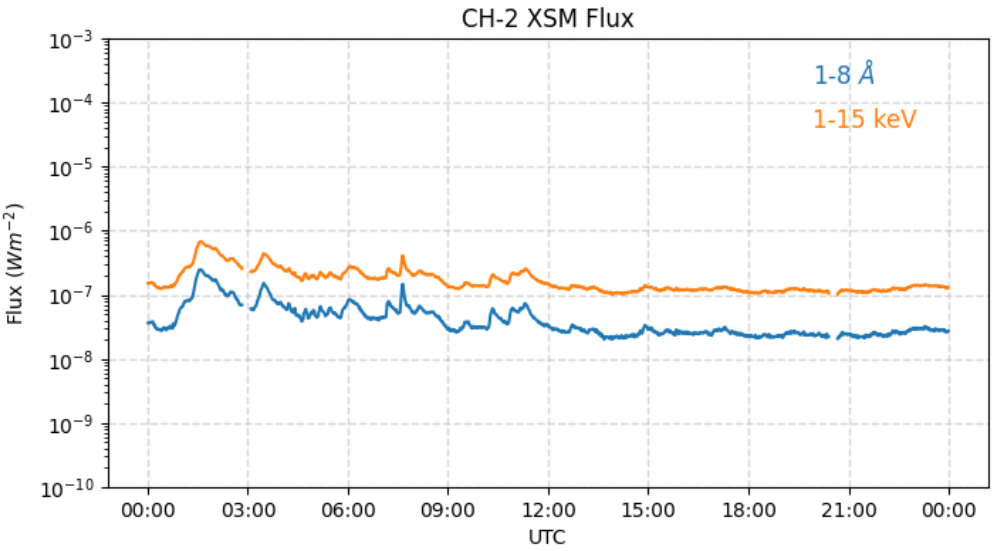

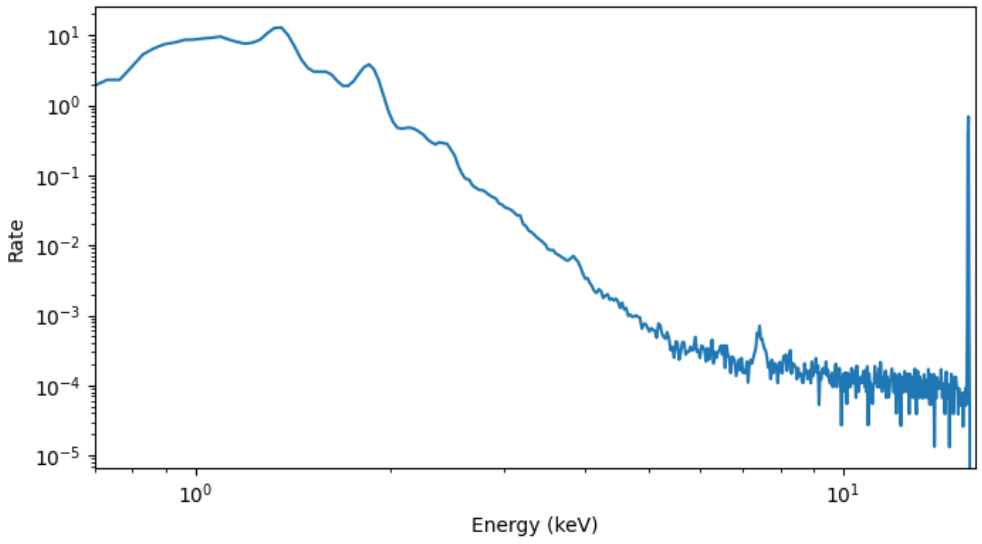

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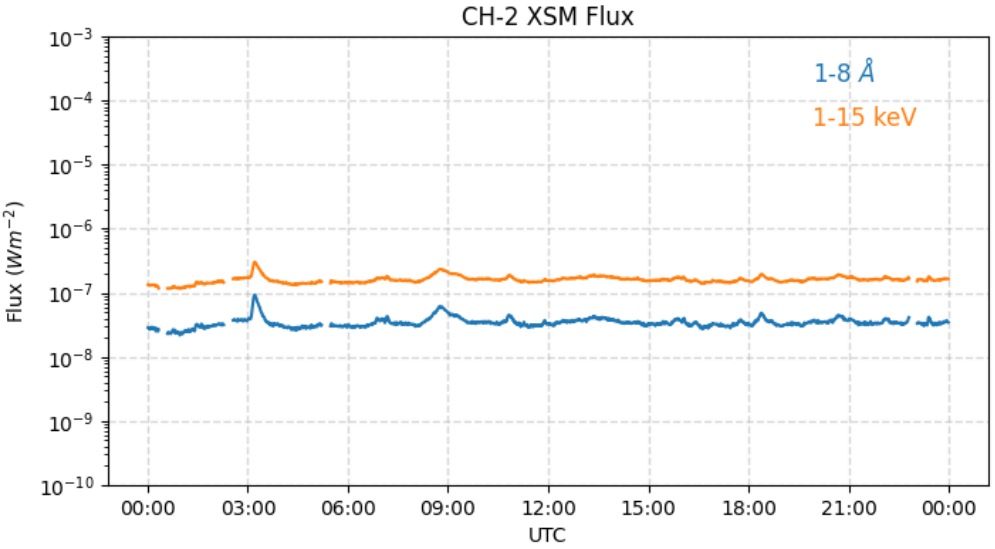

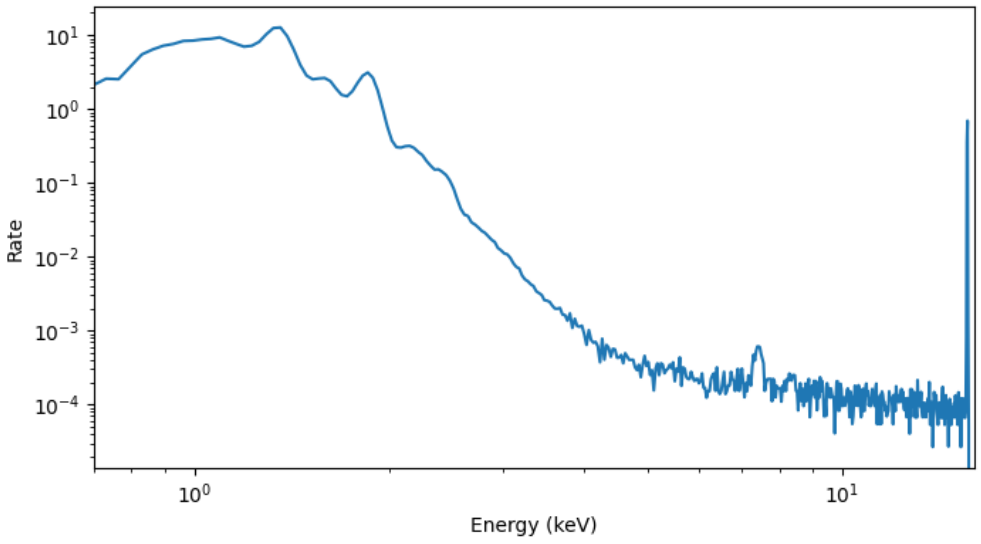

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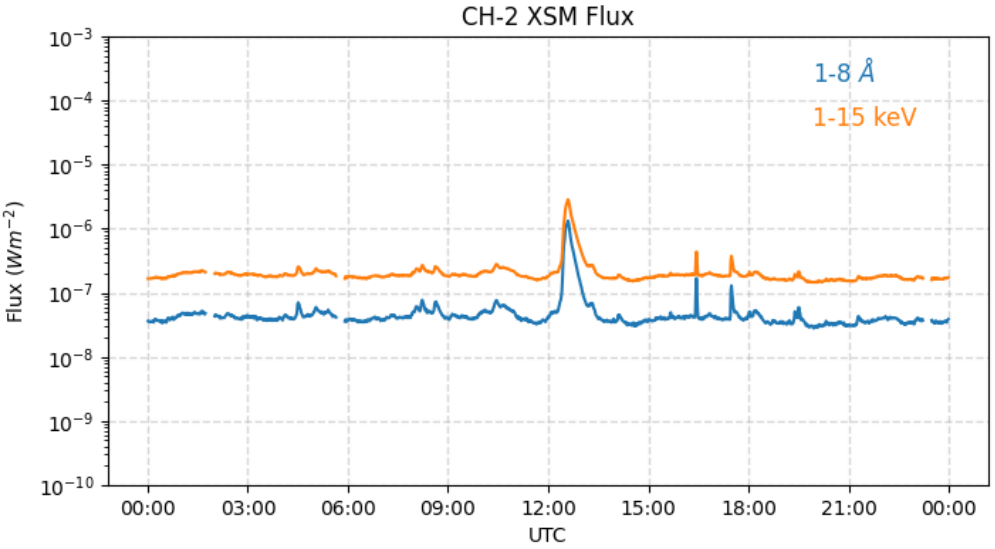

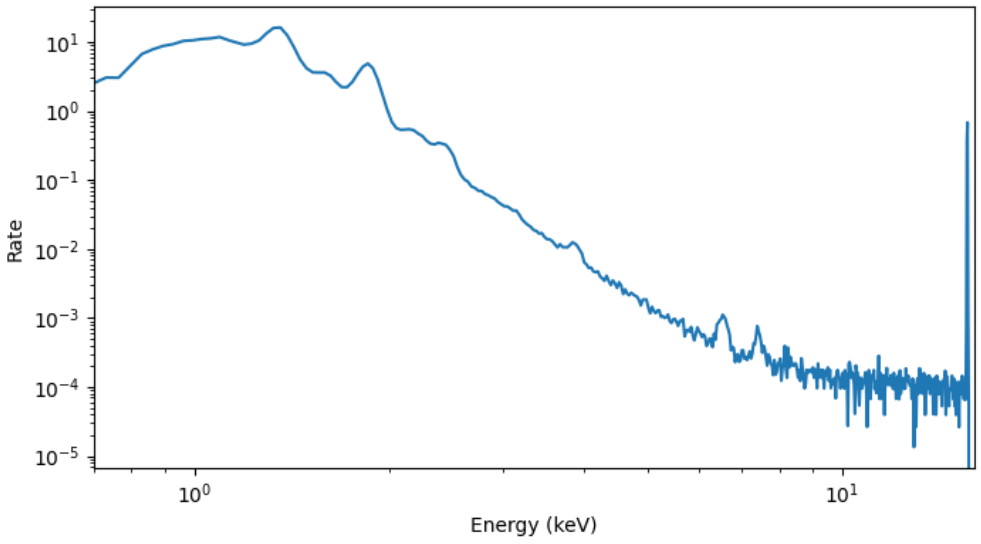

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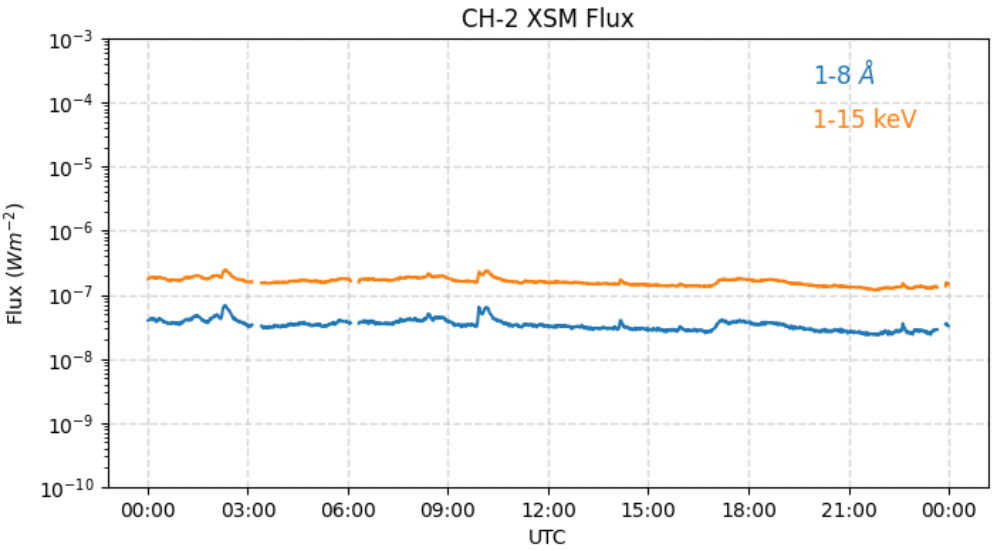

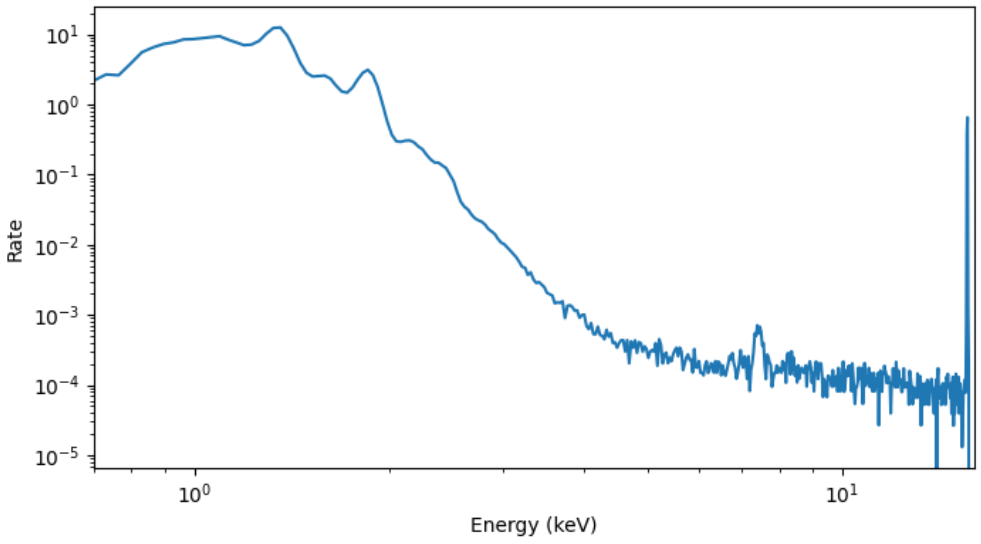

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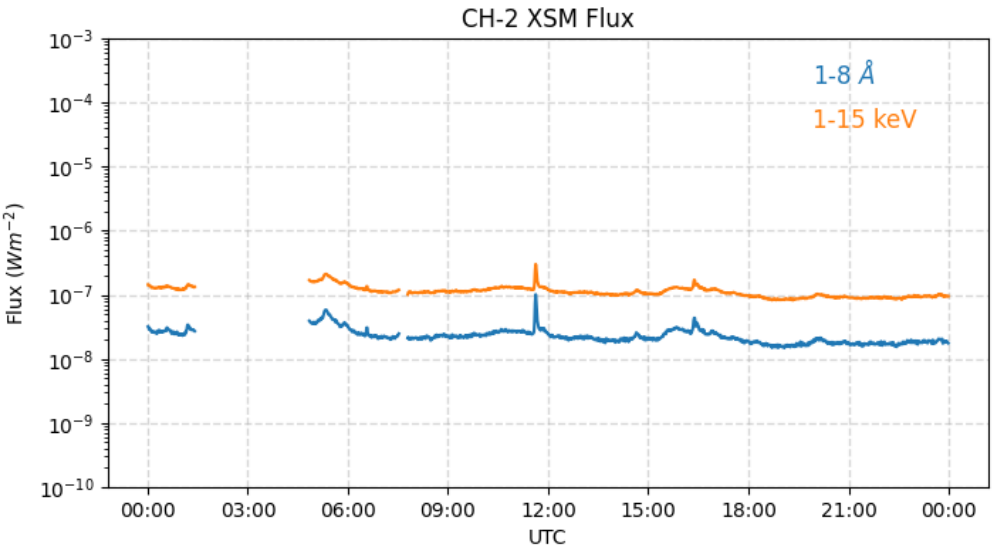

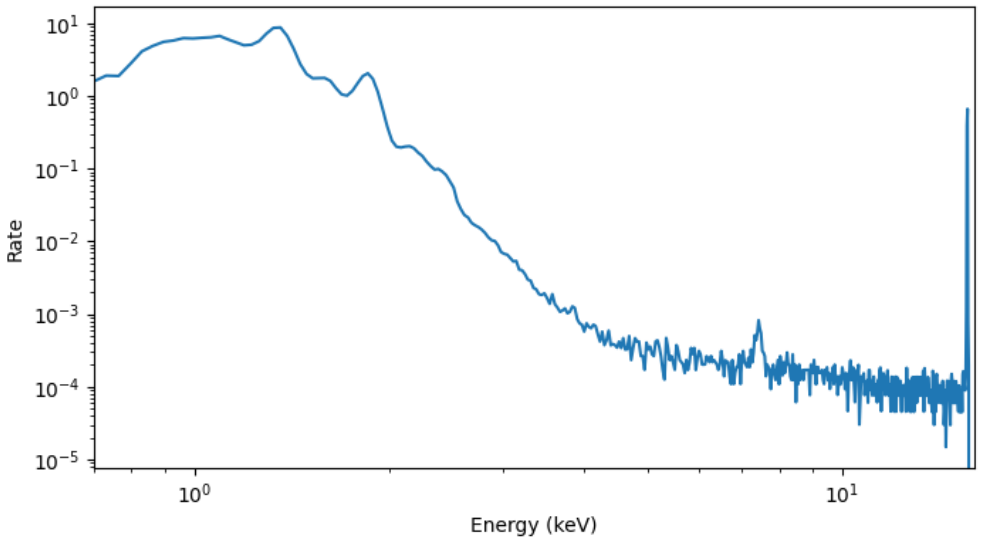

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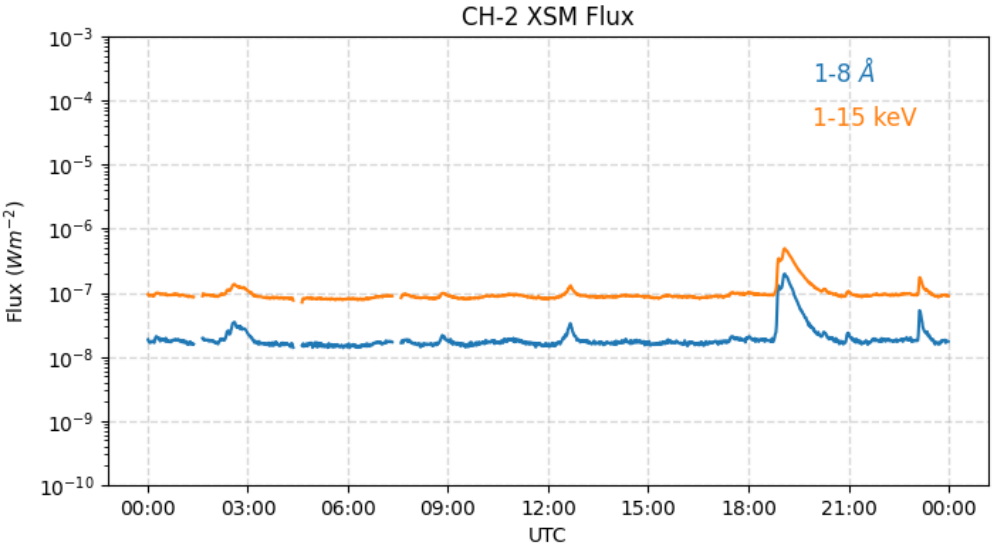

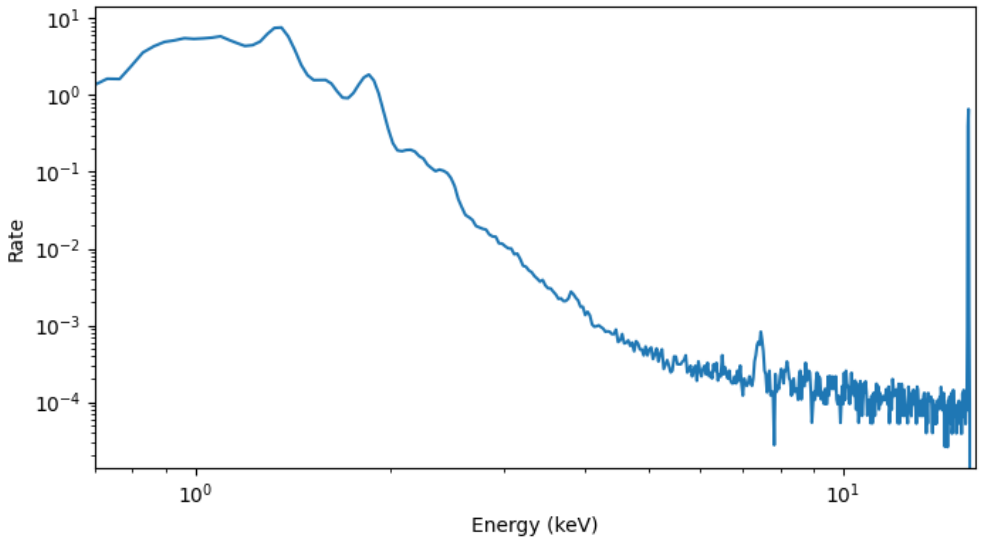

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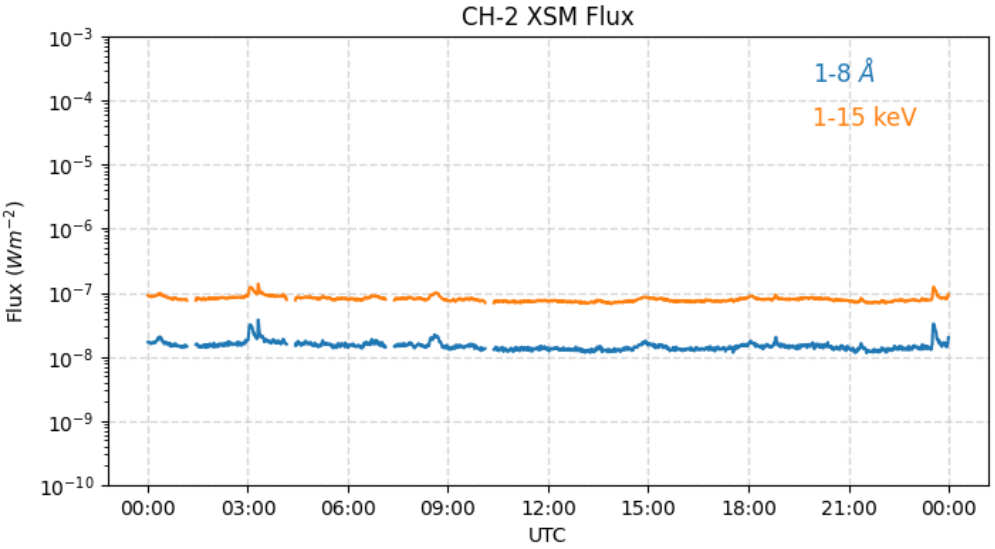

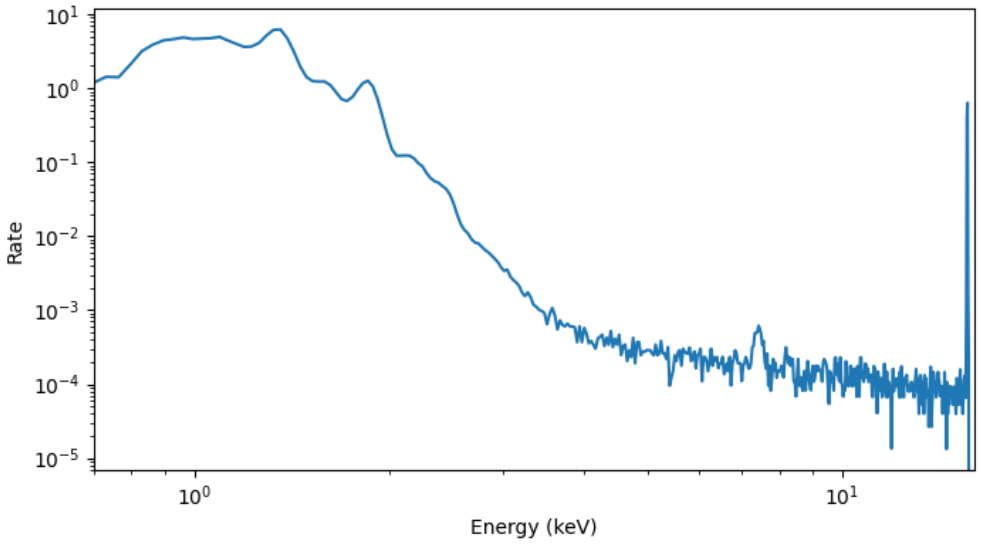

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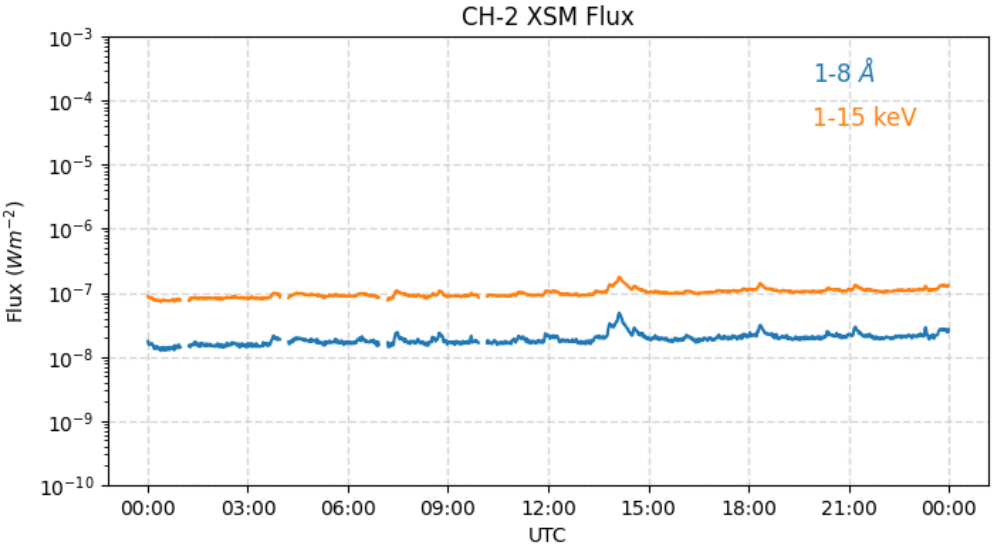

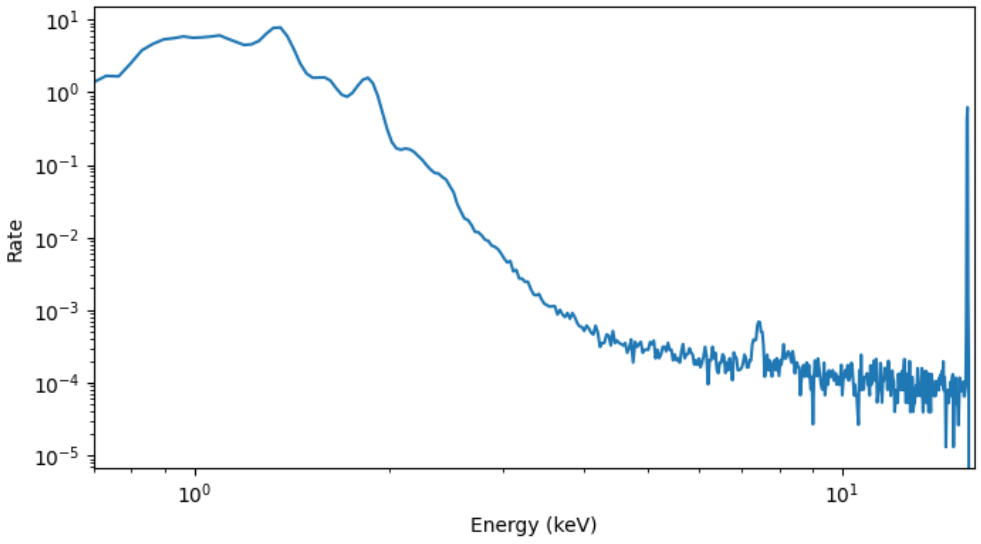

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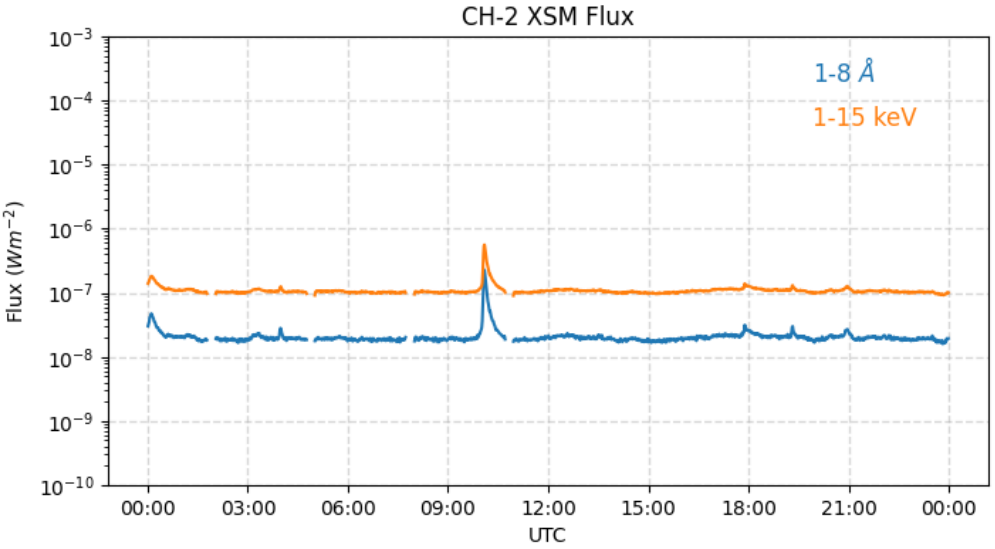

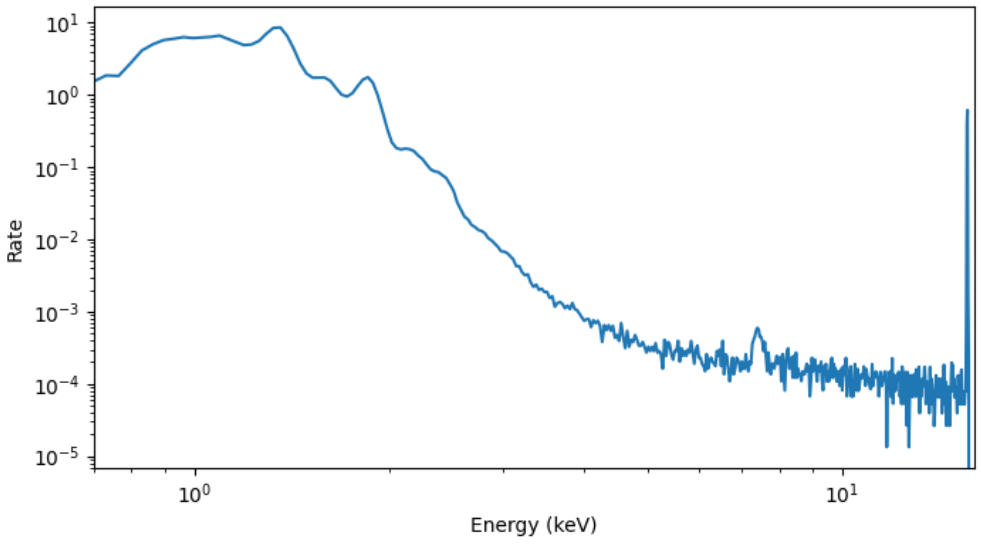

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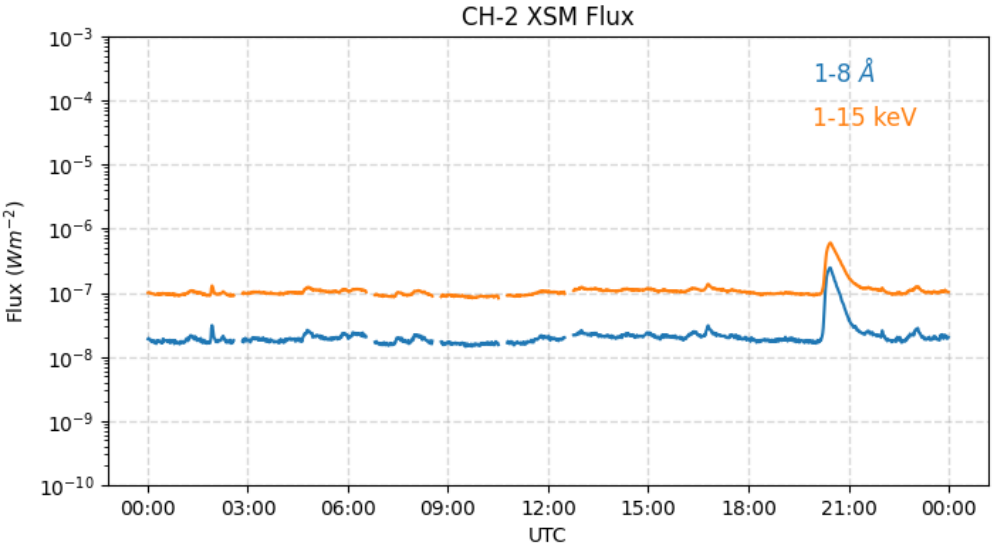

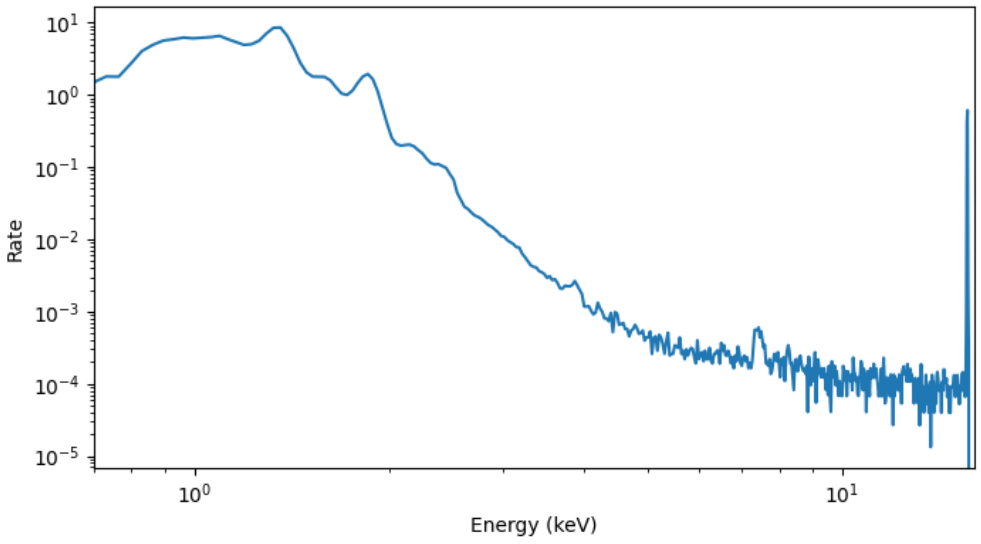

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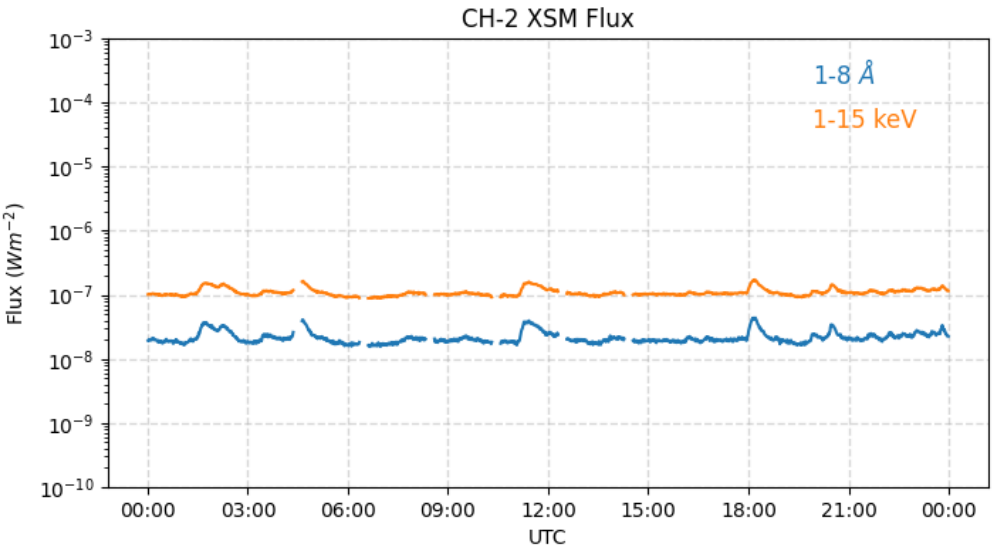

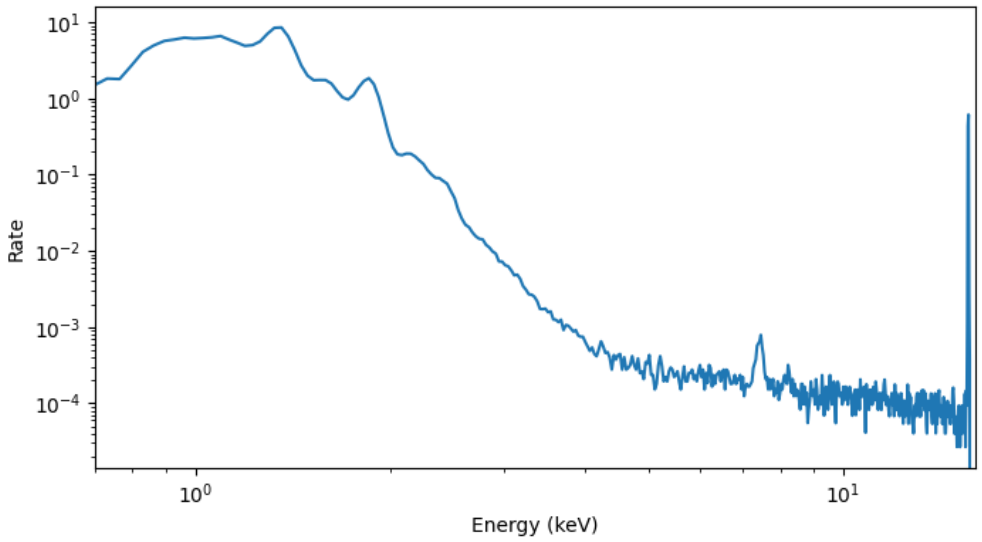

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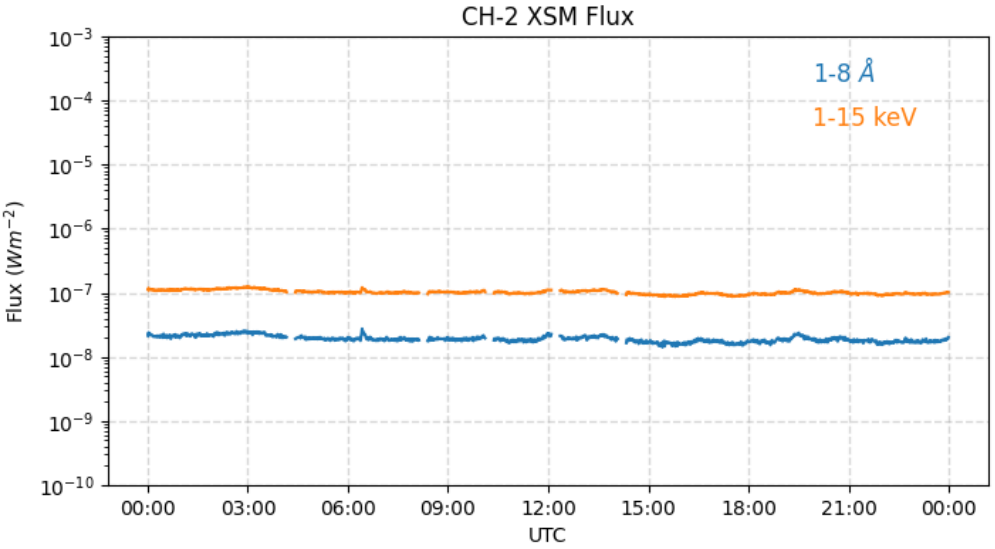

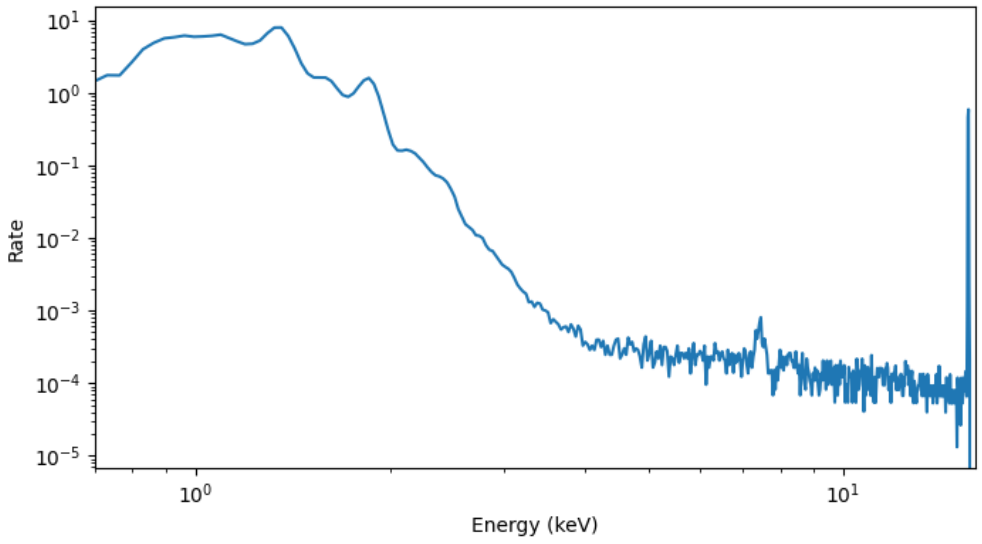

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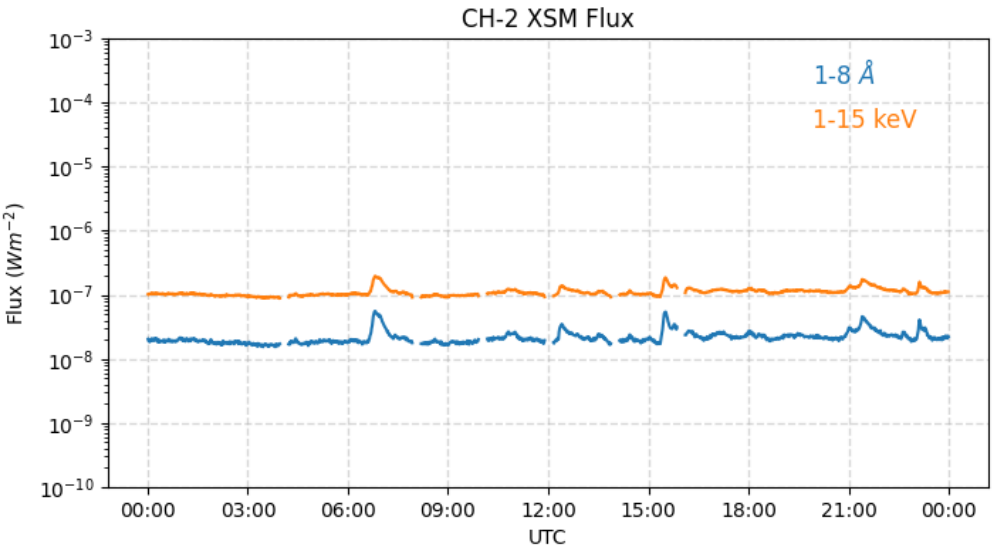

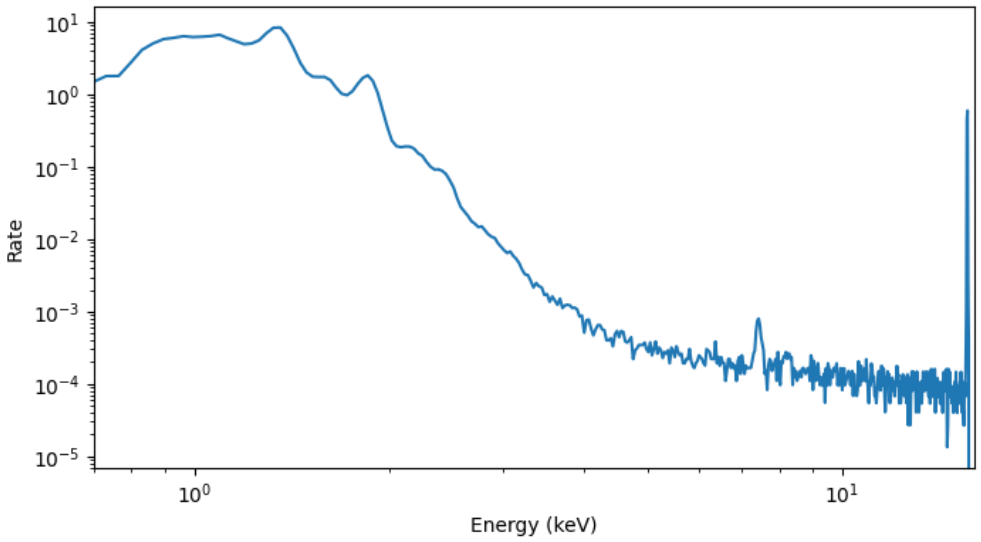

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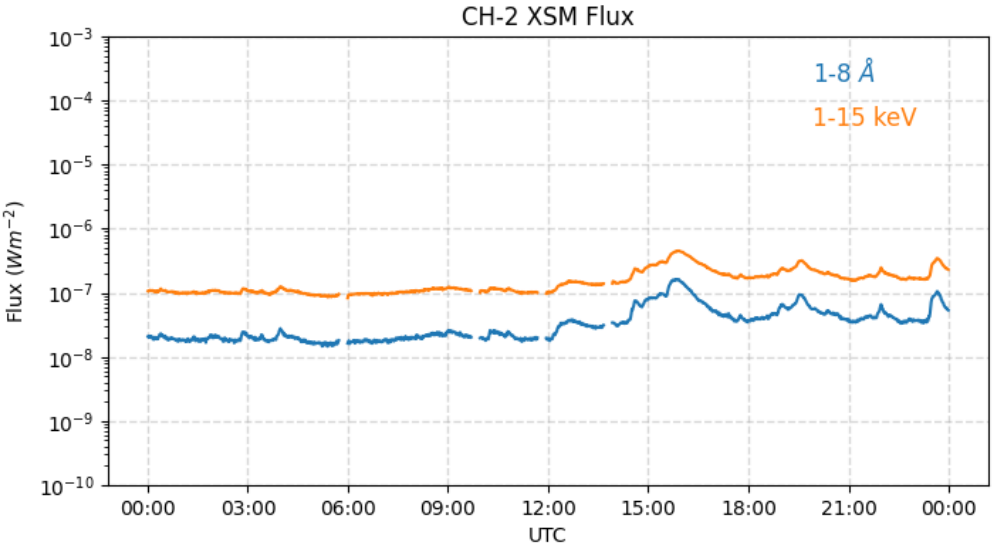

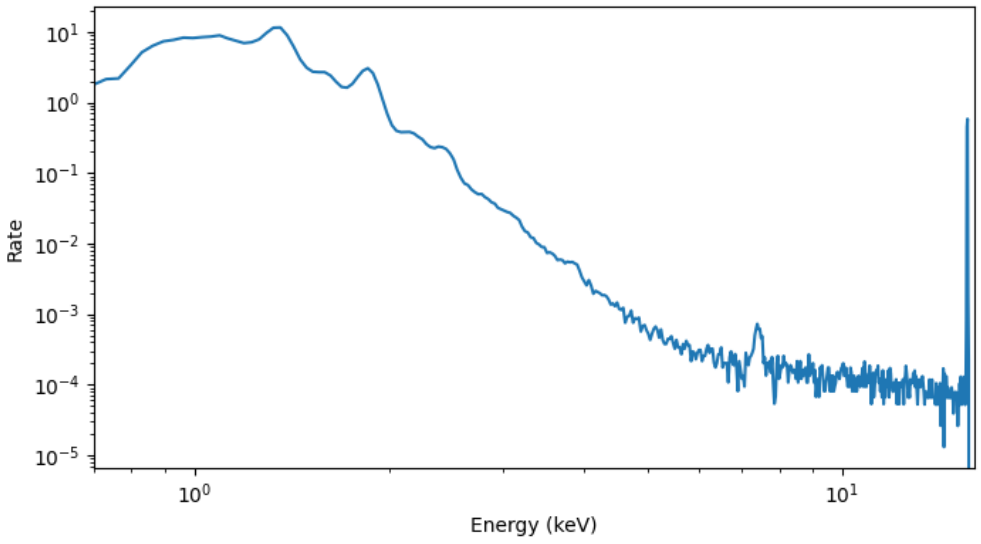

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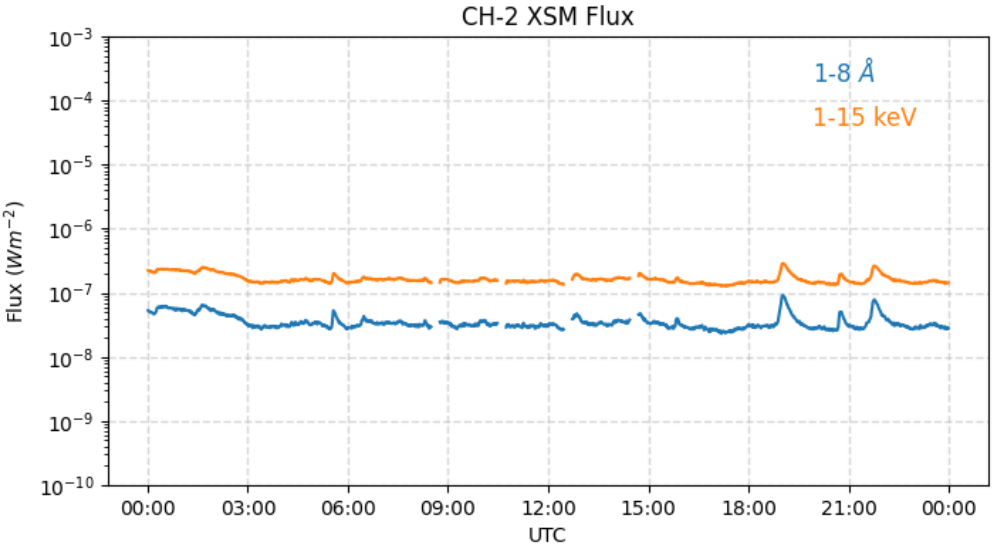

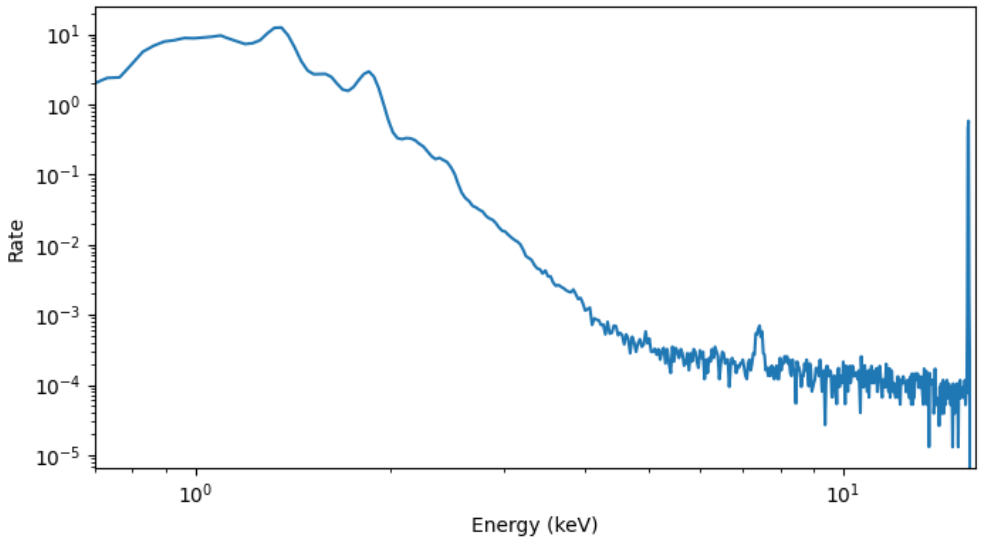

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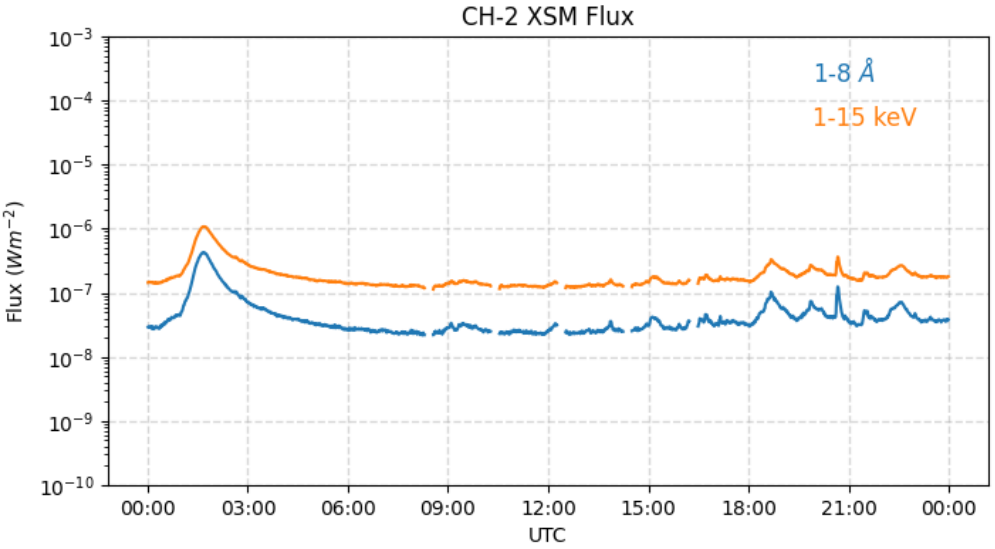

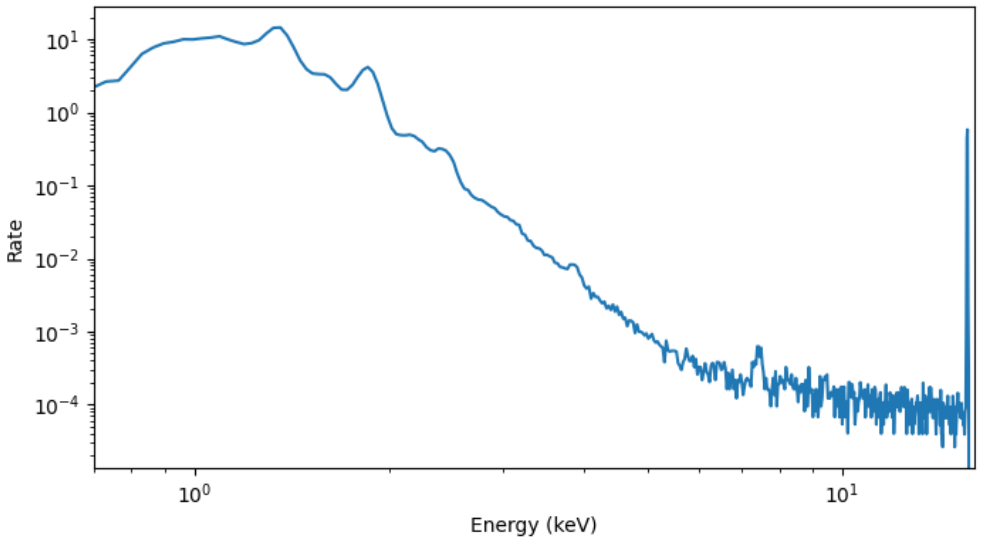

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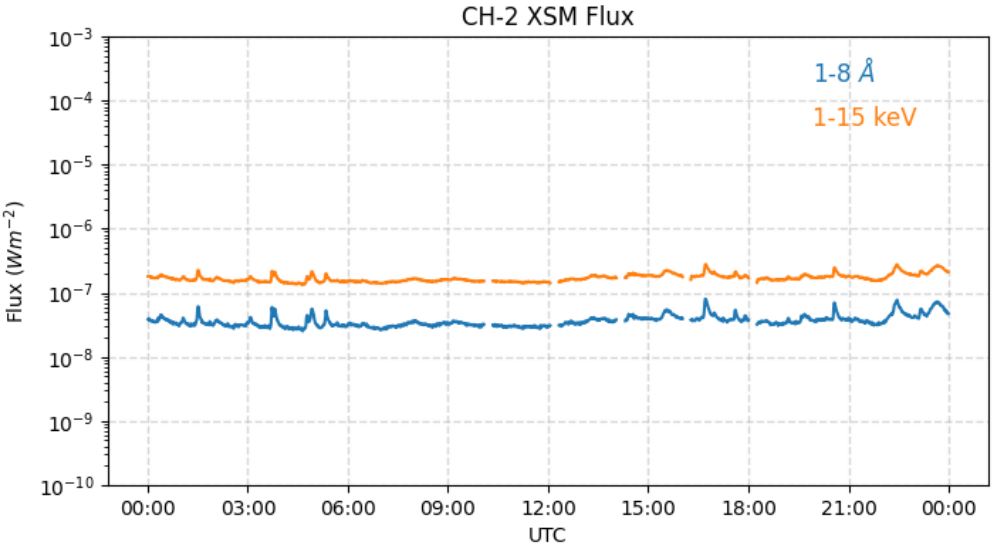

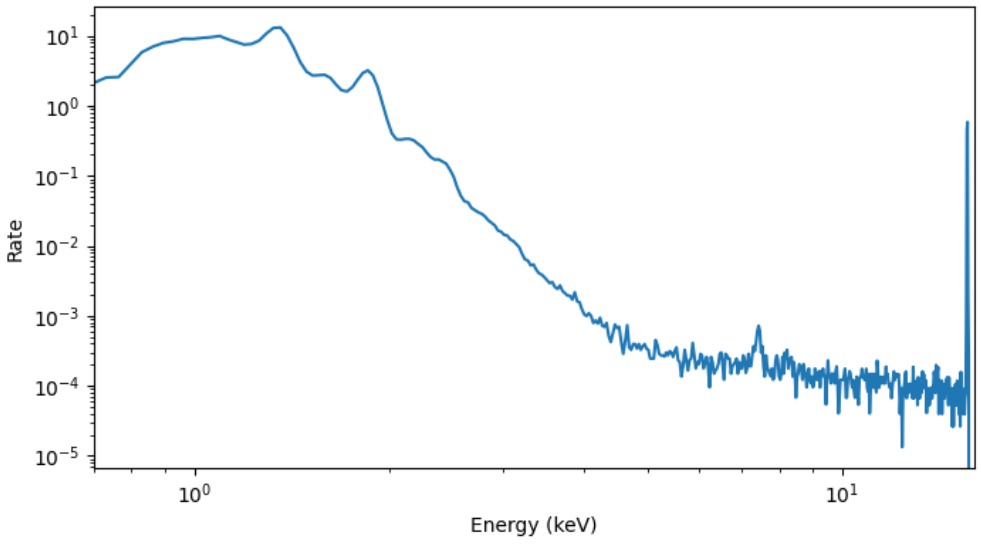

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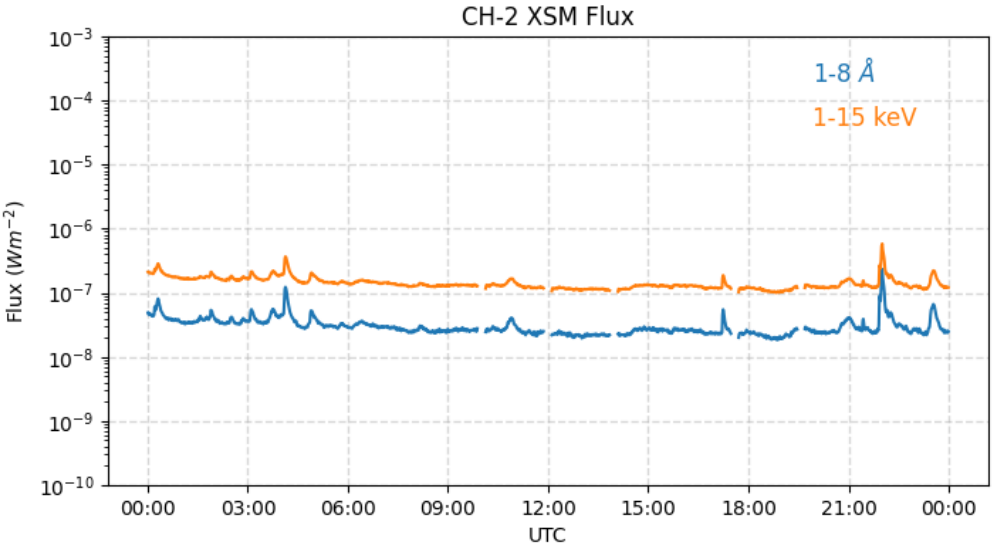

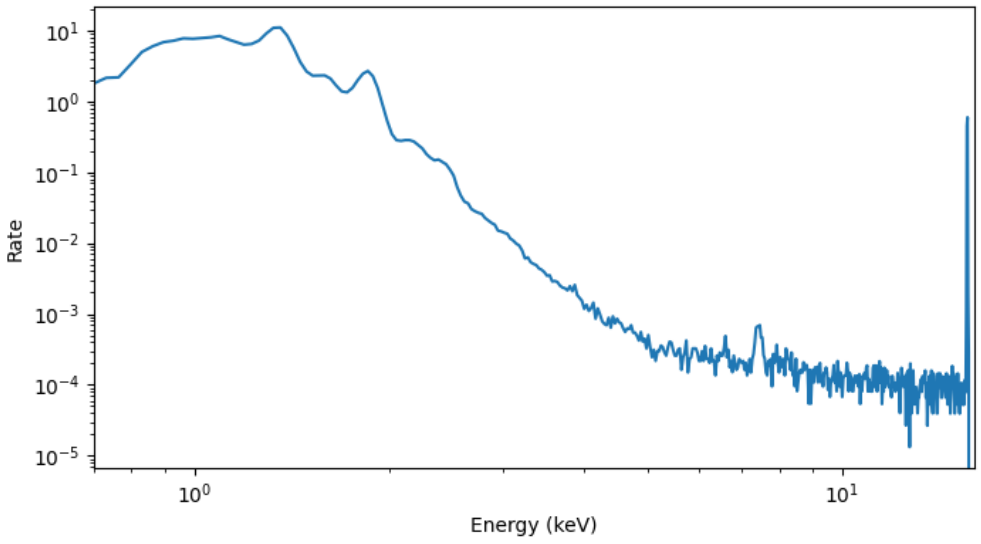

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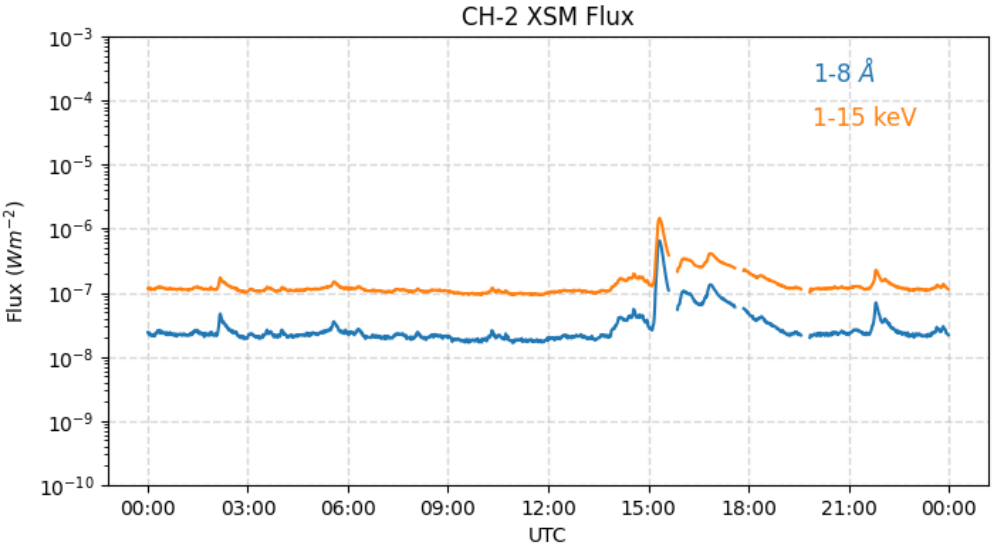

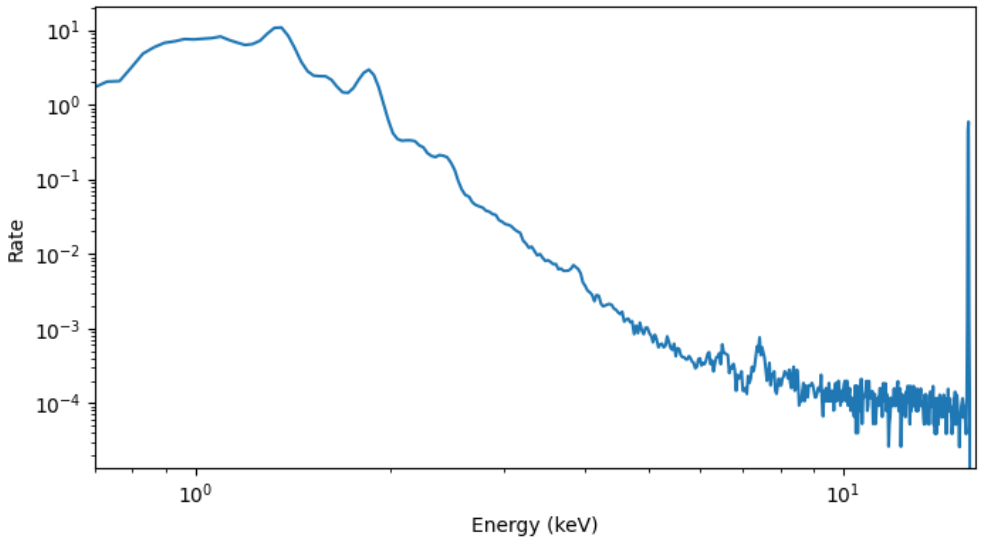

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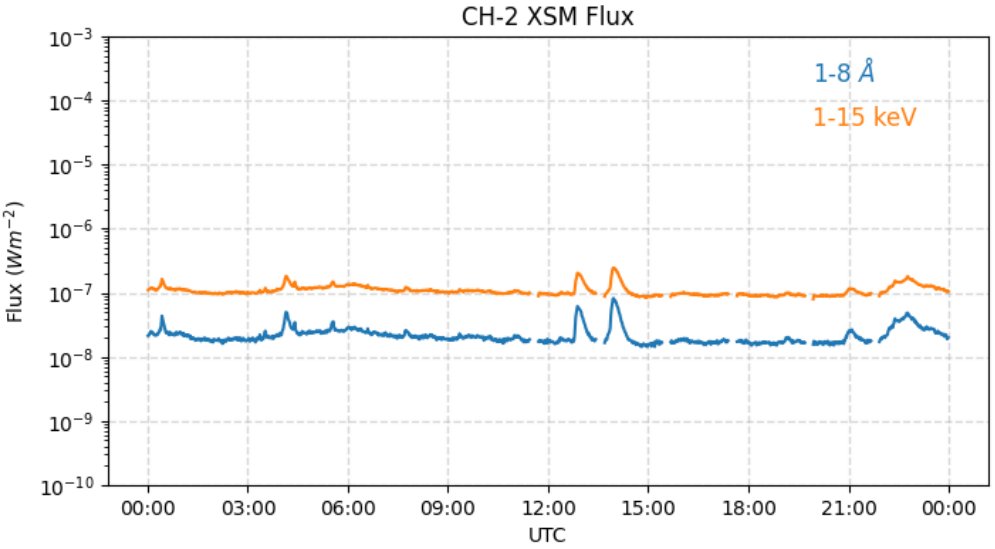

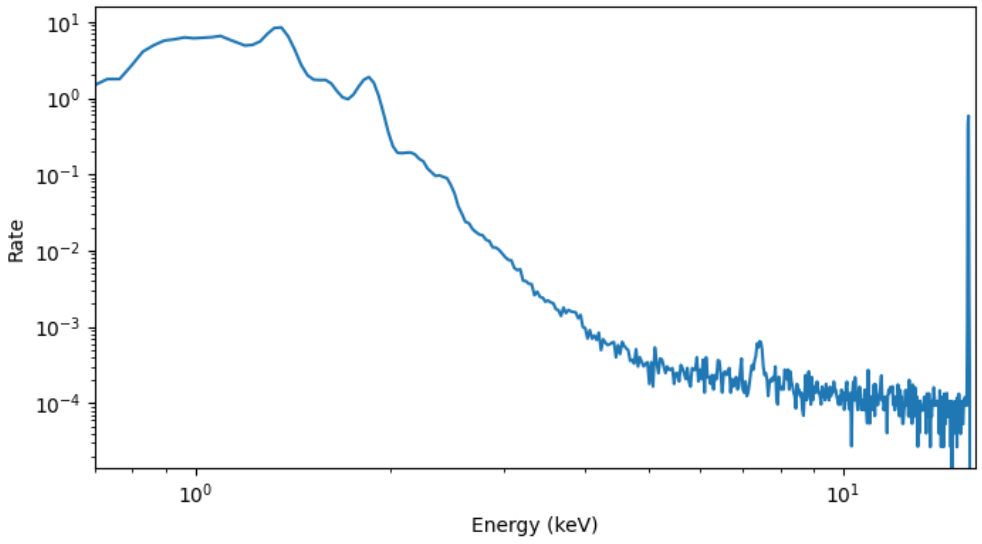

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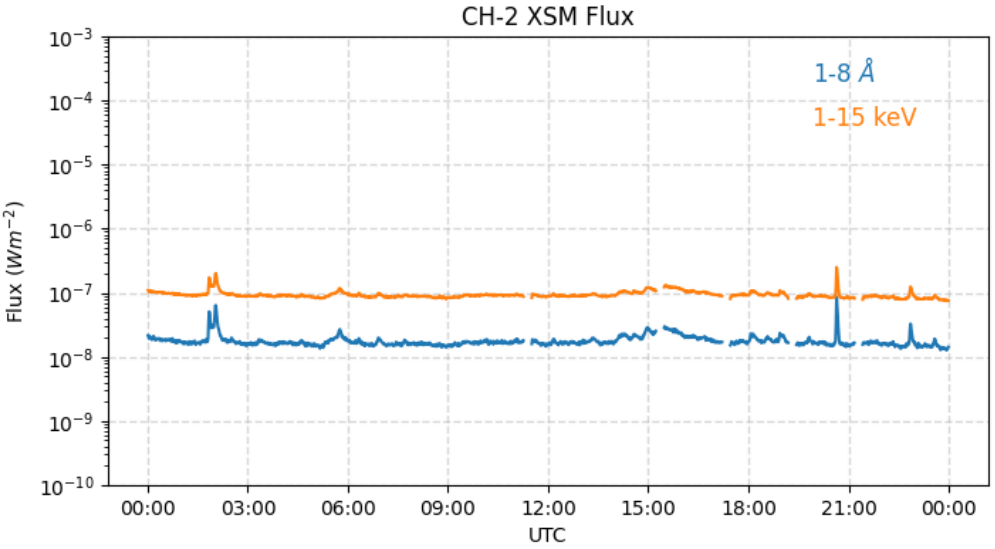

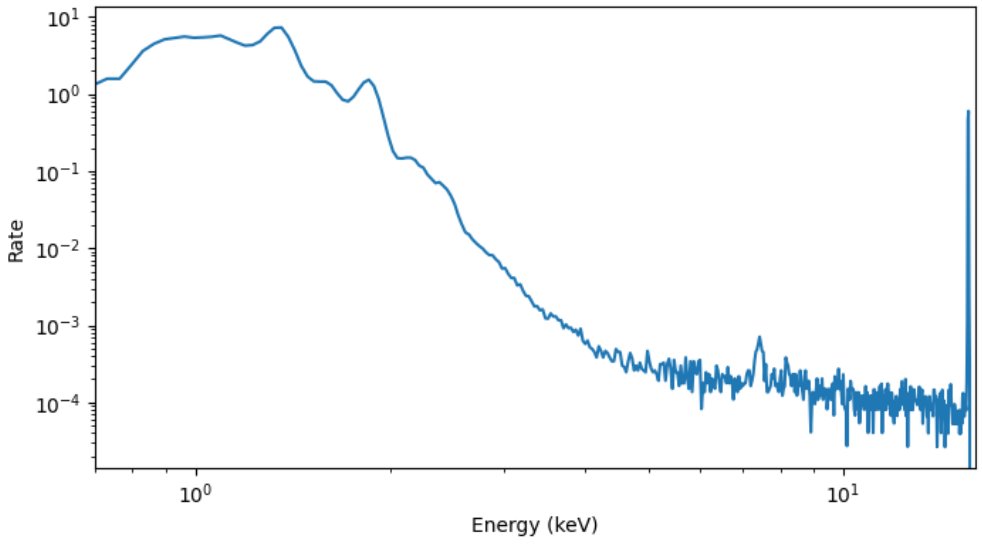

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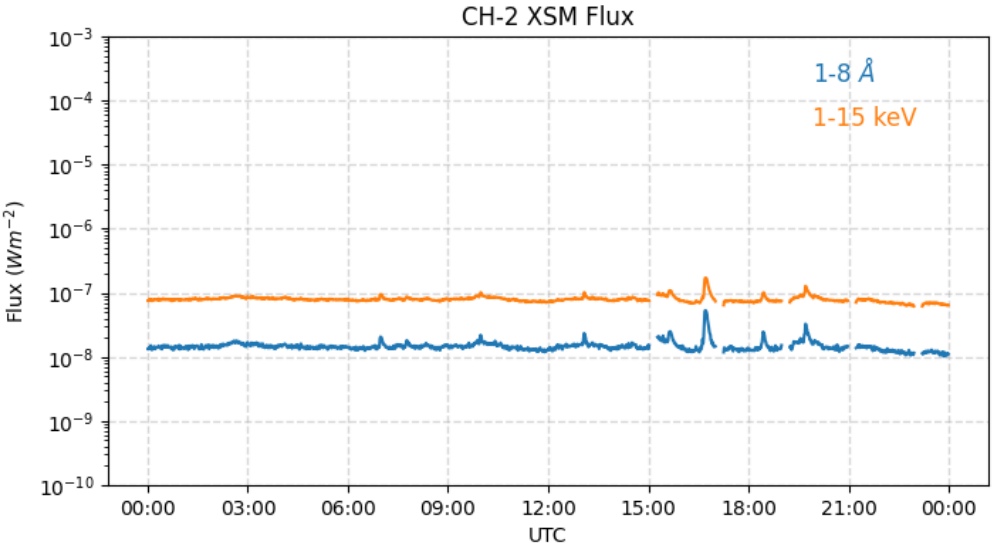

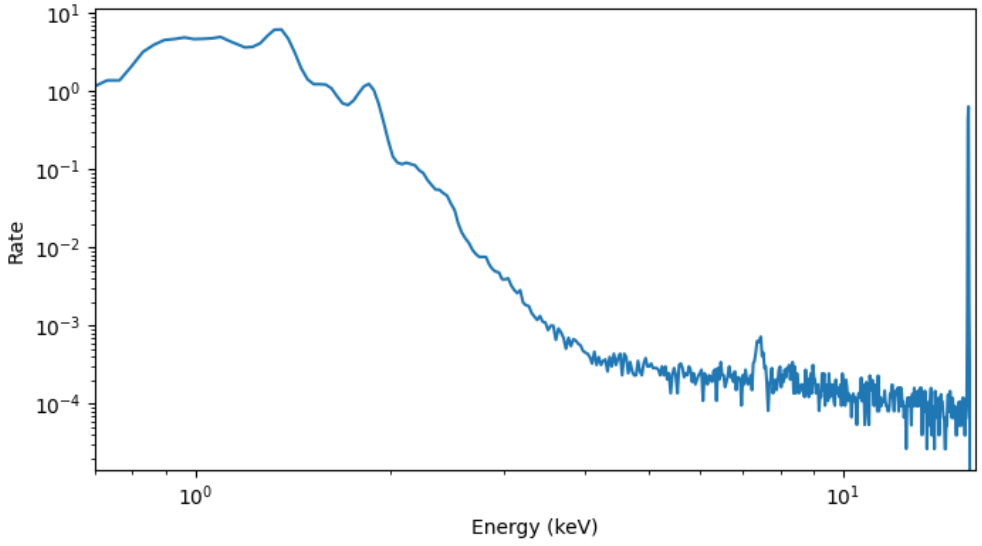

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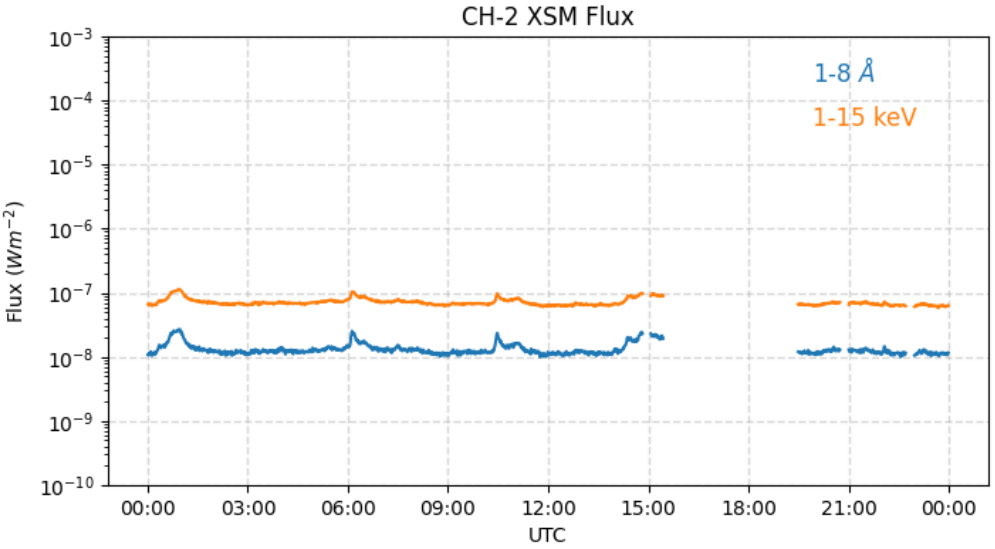

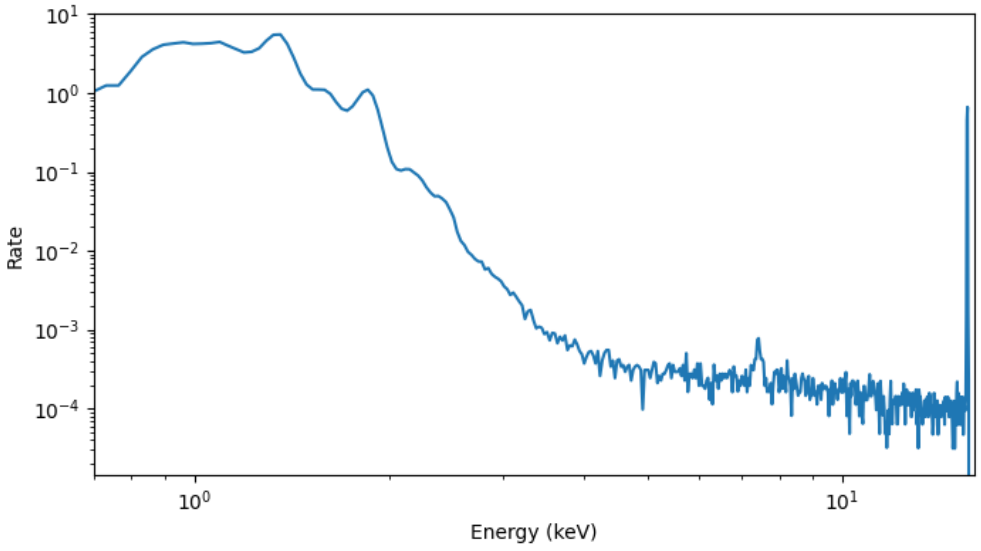

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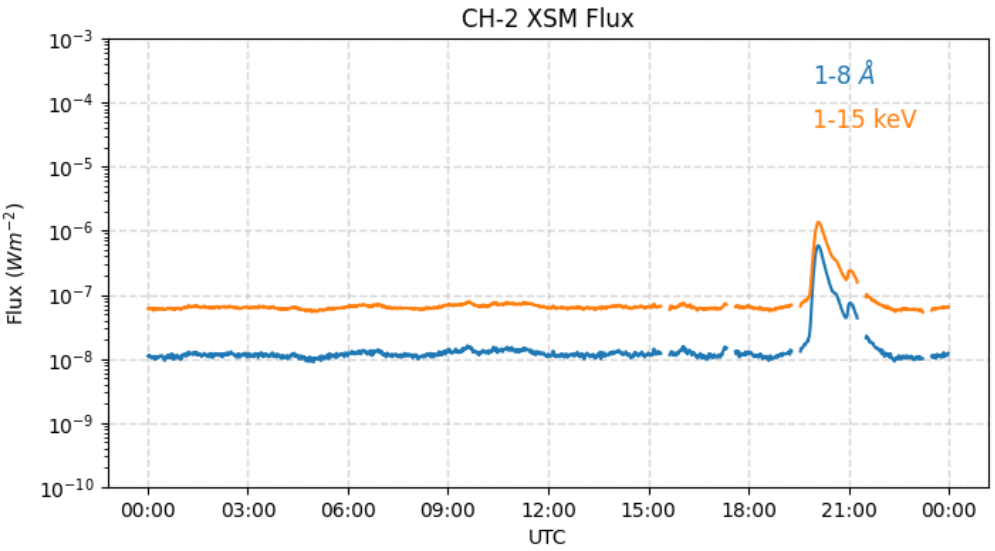
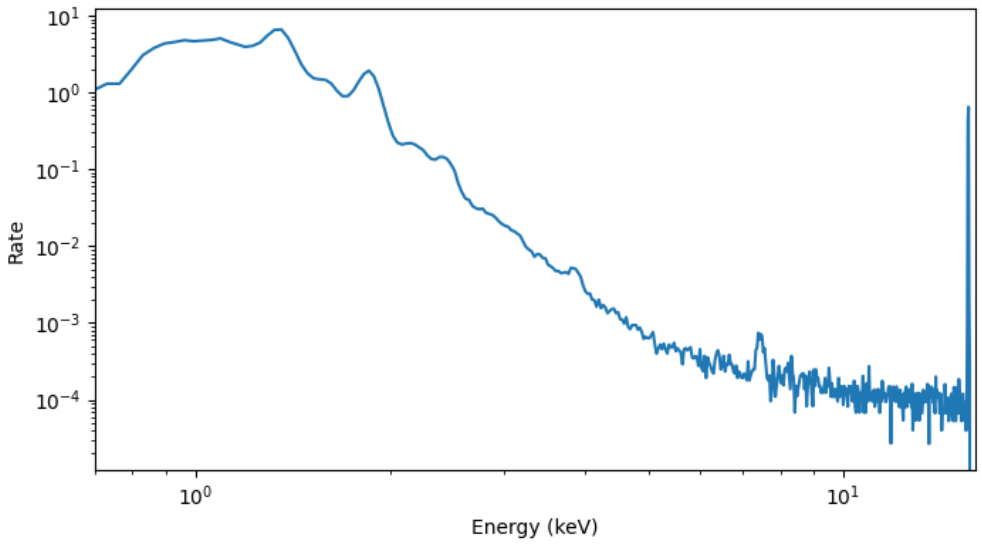
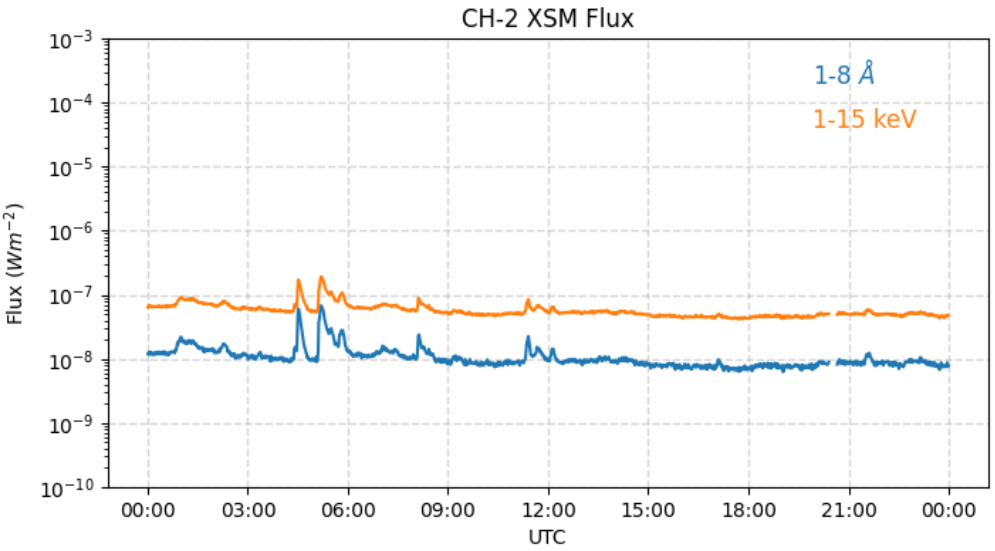
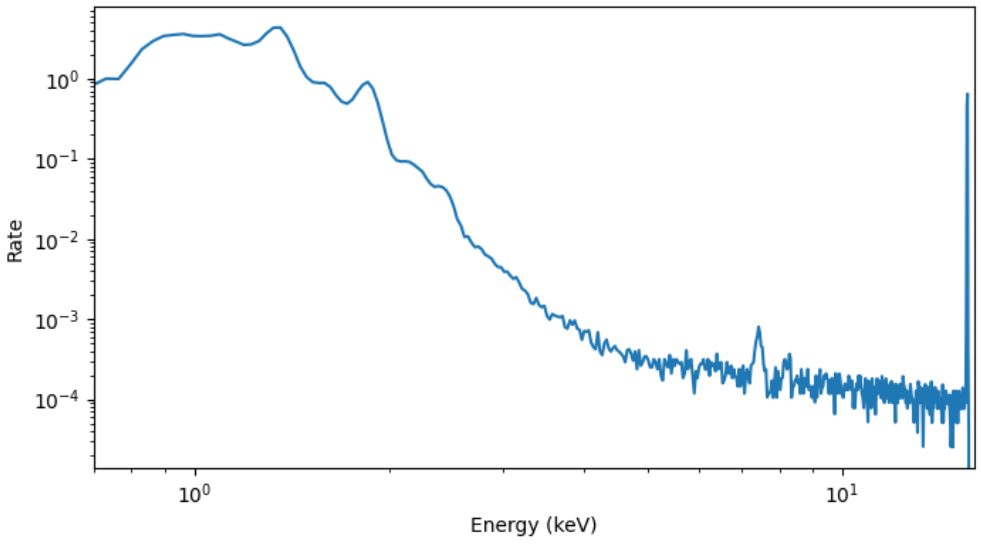


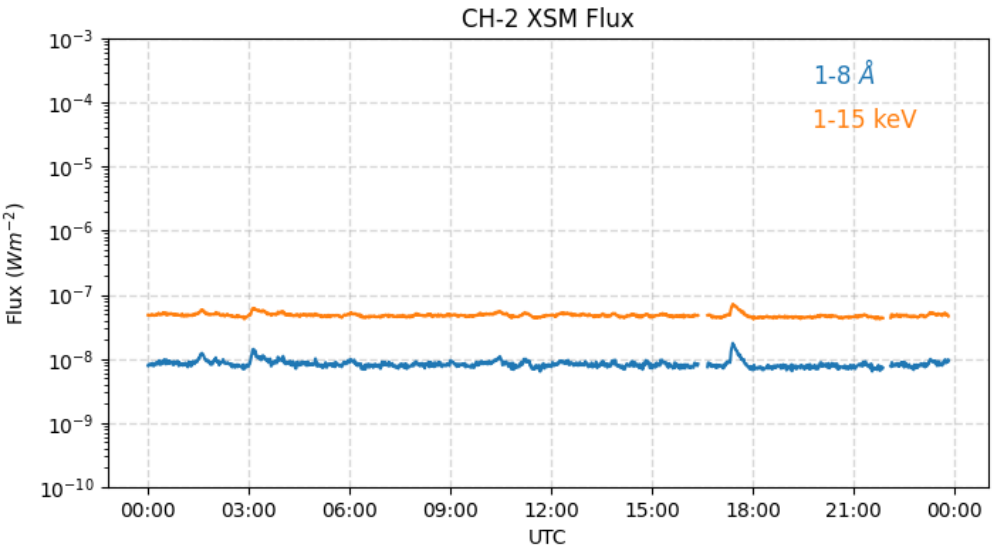


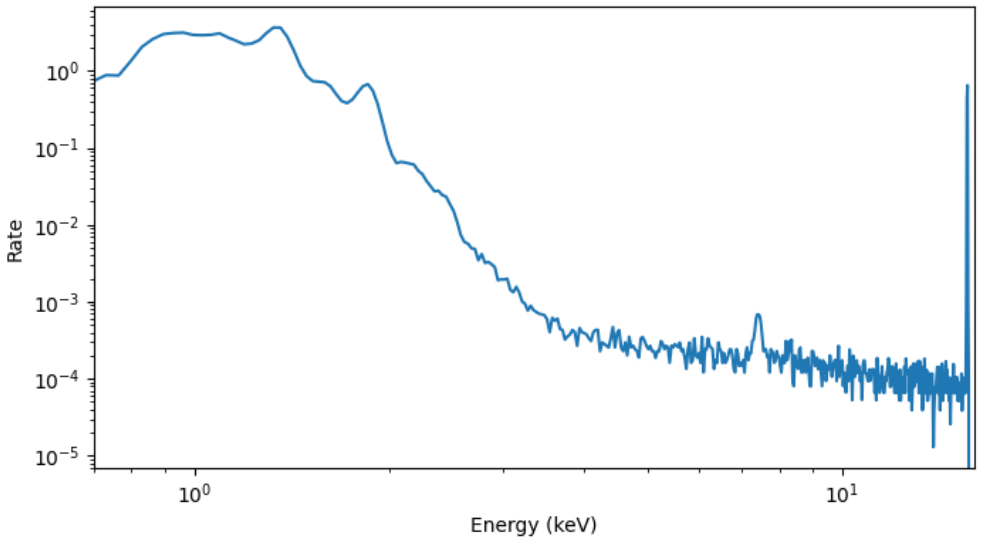
Date: 2021-03-31



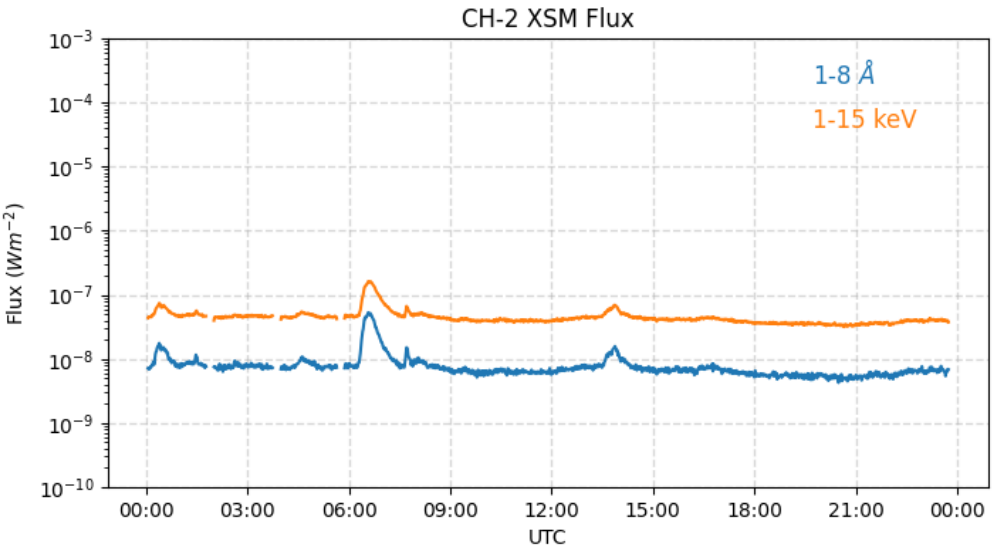


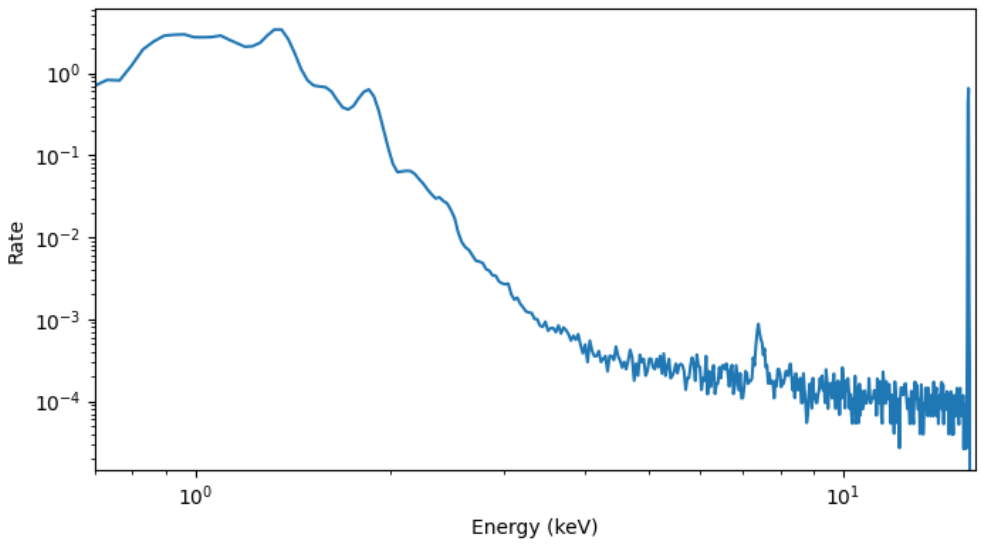
Date: 2021-04-01





Date: 2021-04-02





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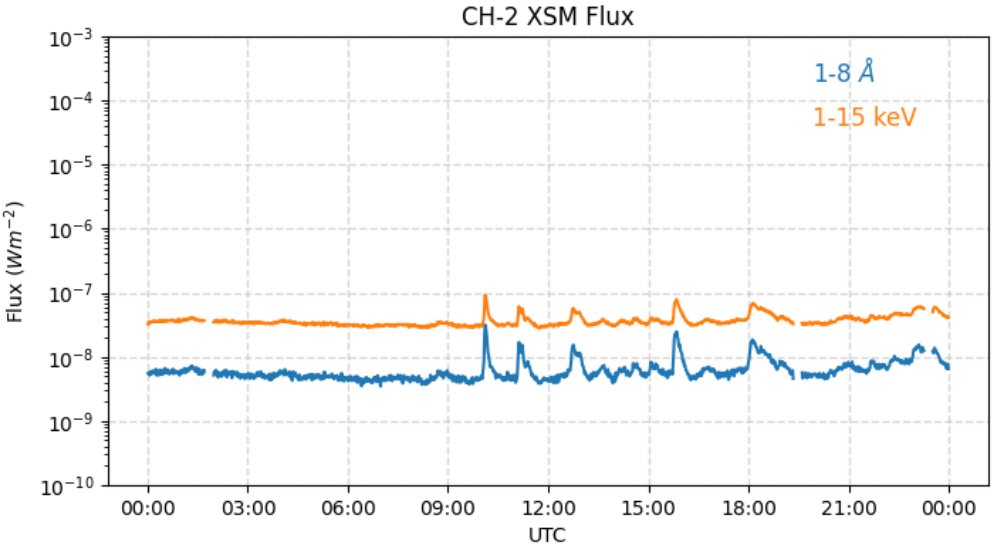

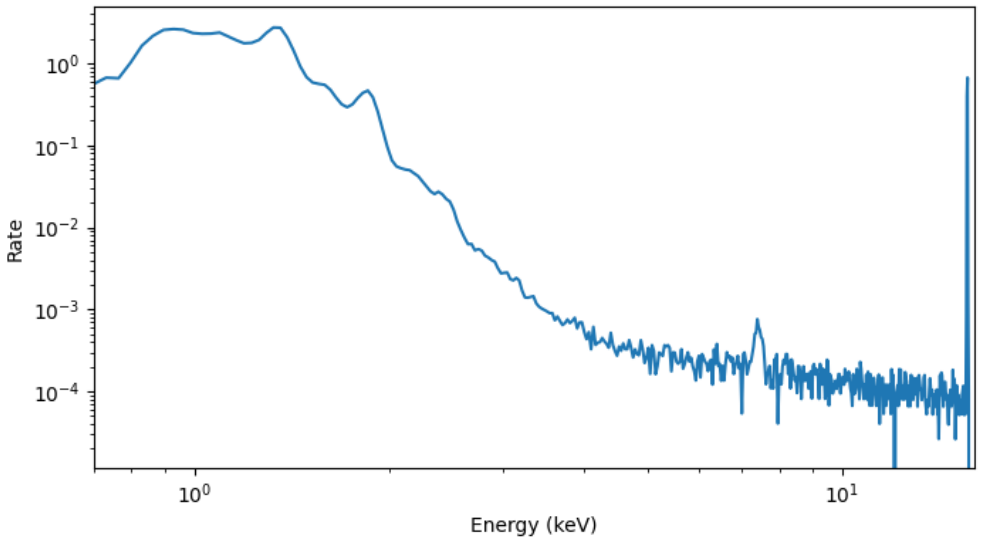

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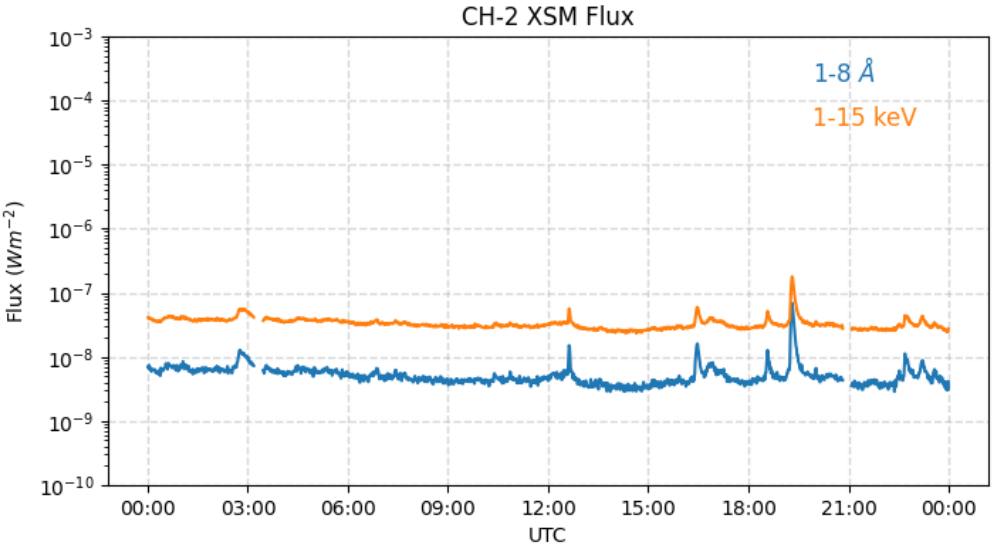

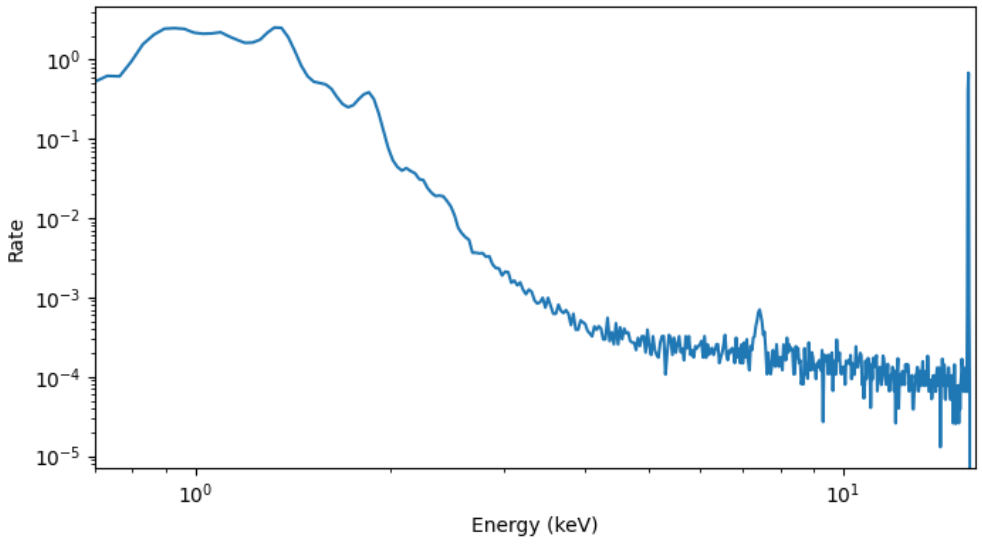

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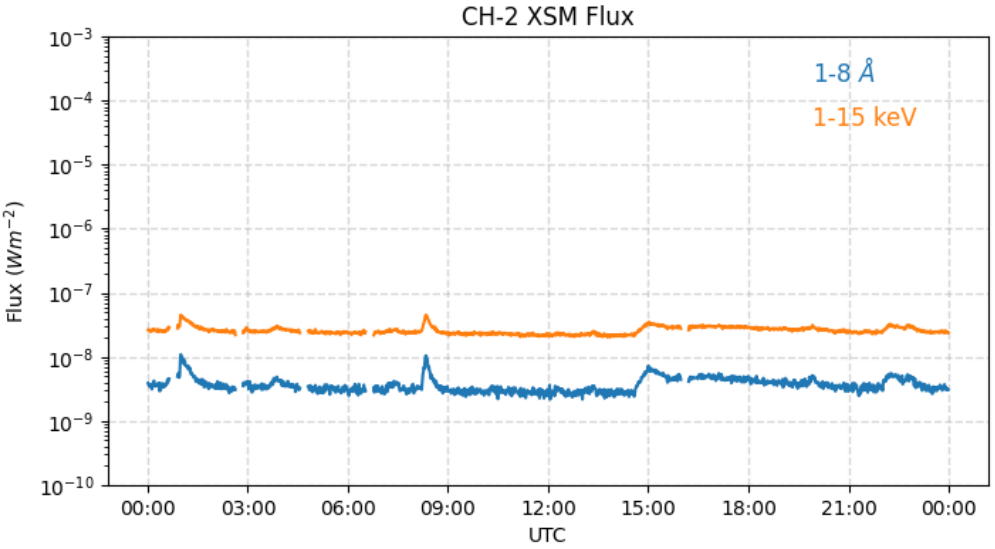

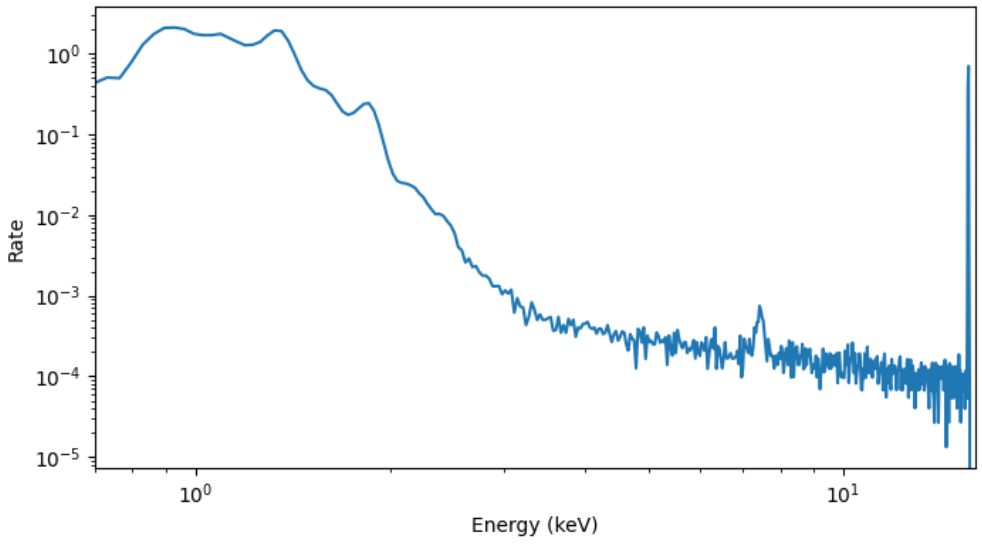

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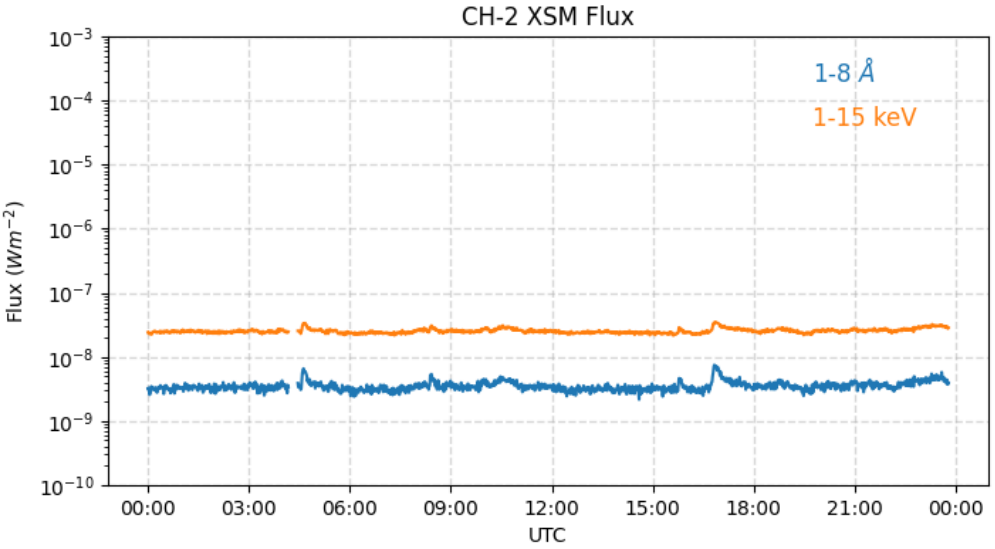

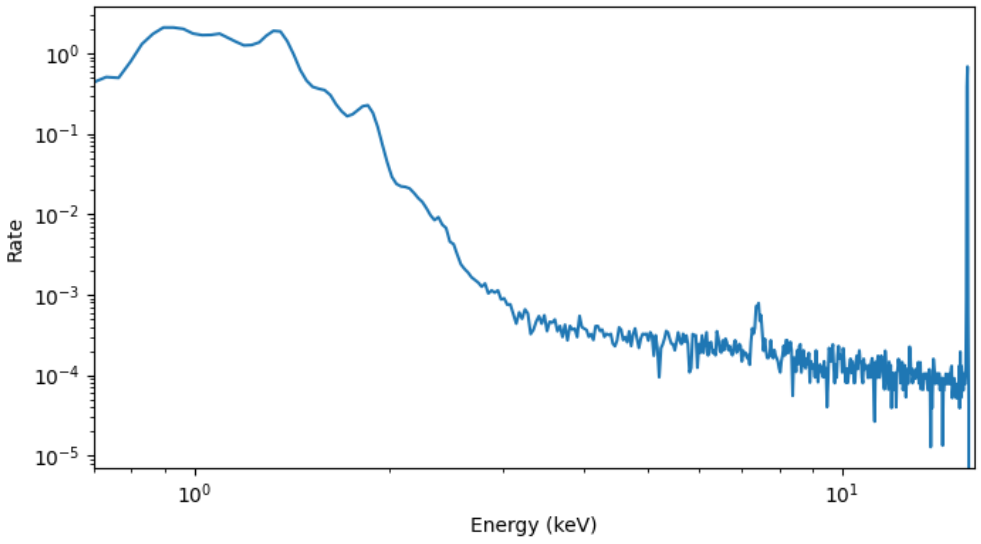

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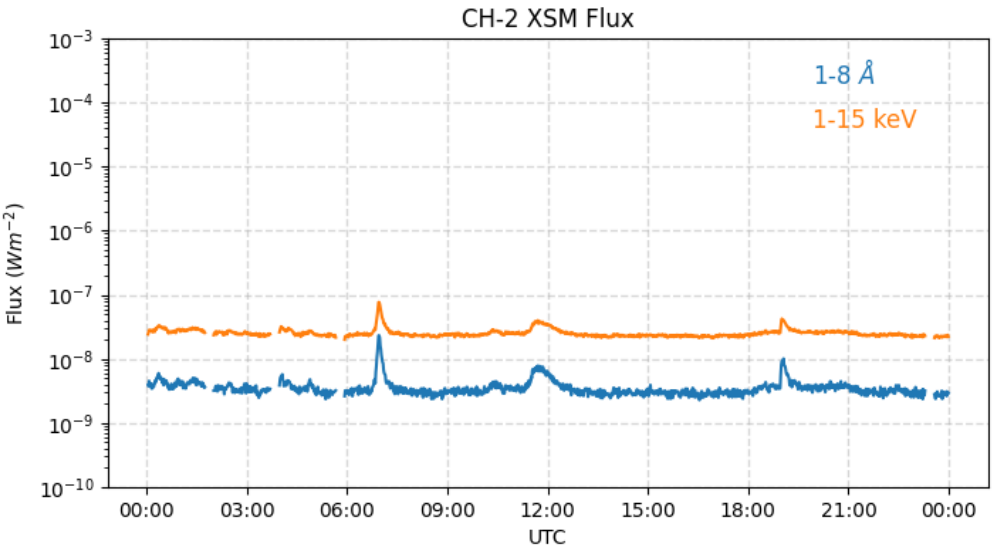

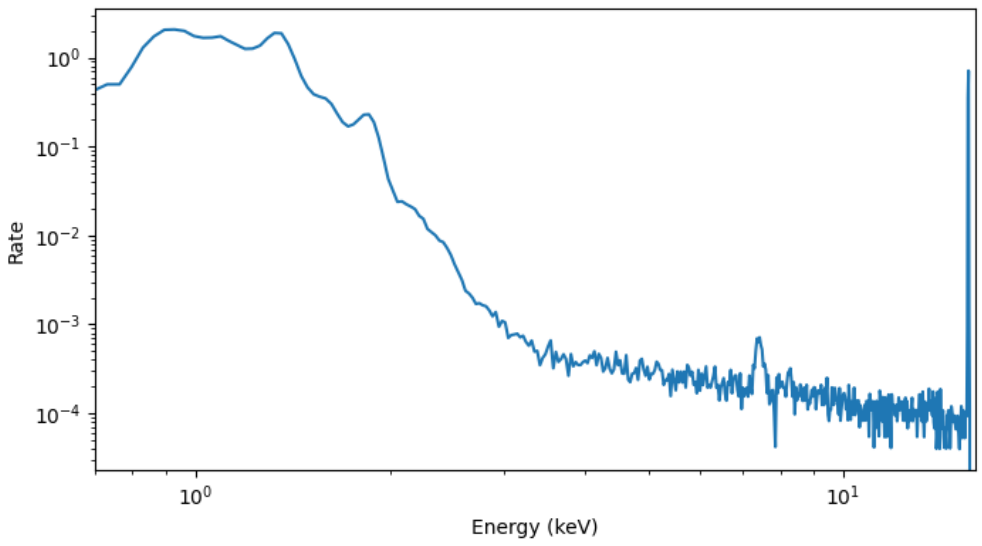

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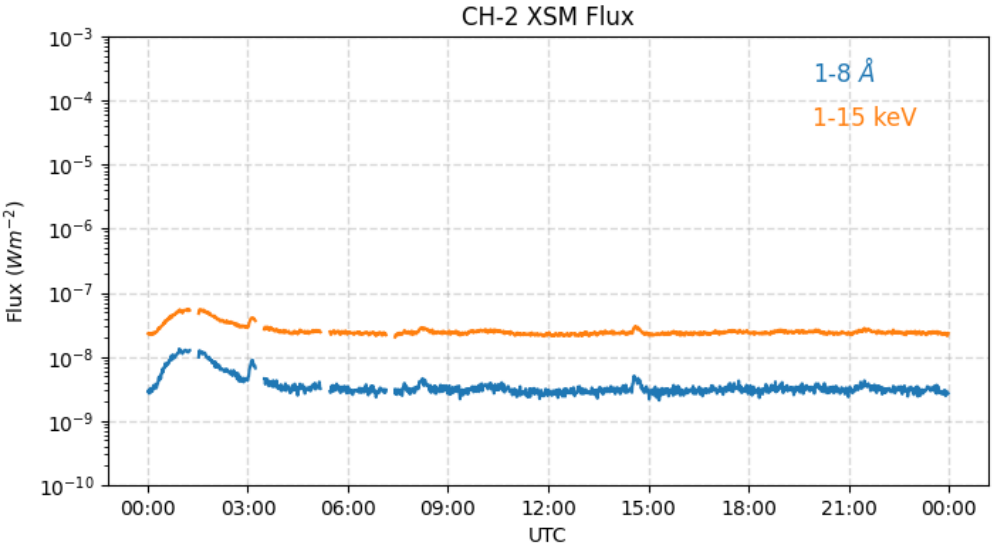

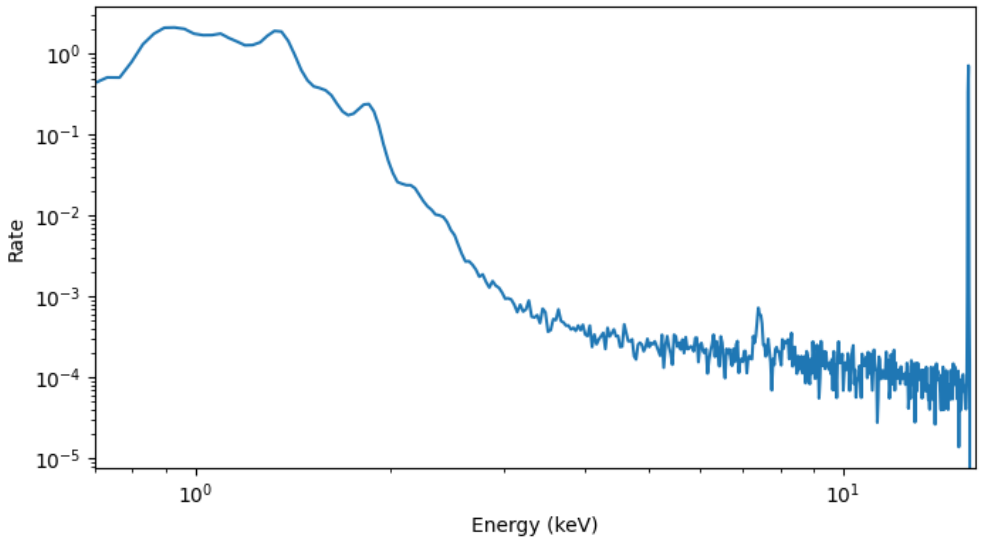

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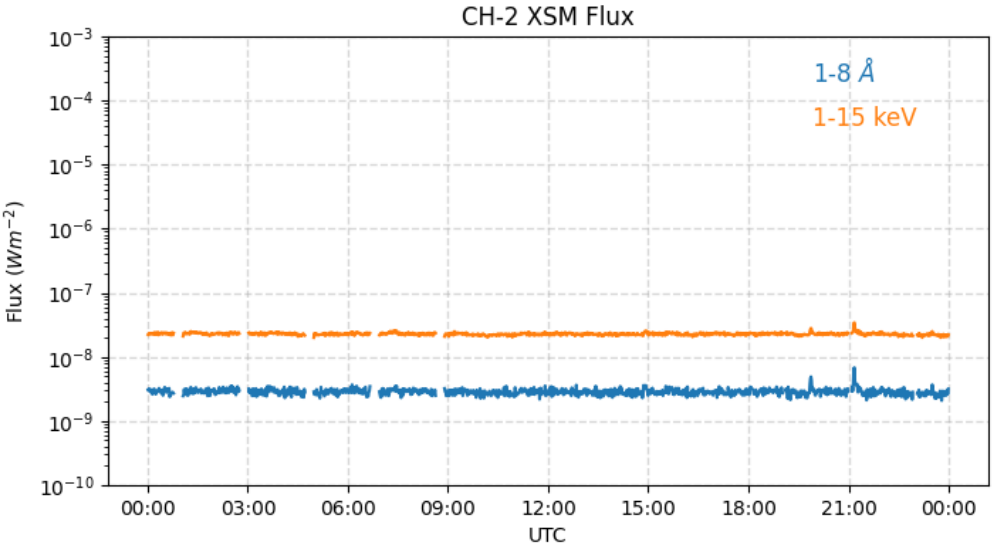

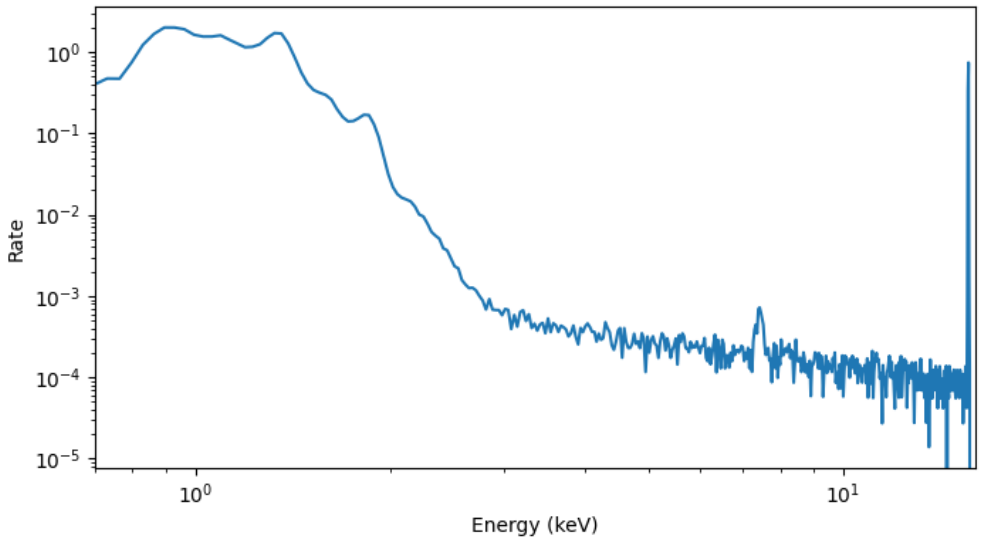

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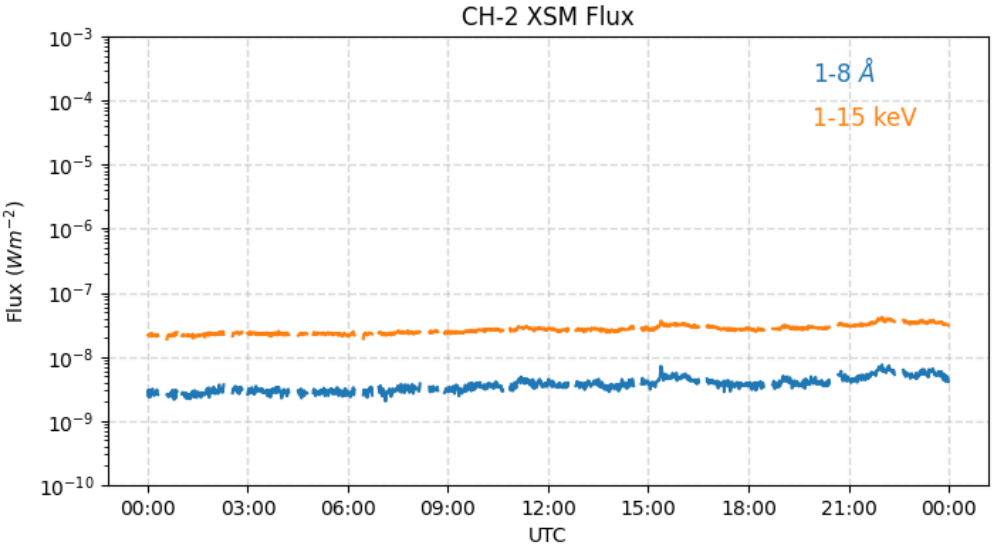

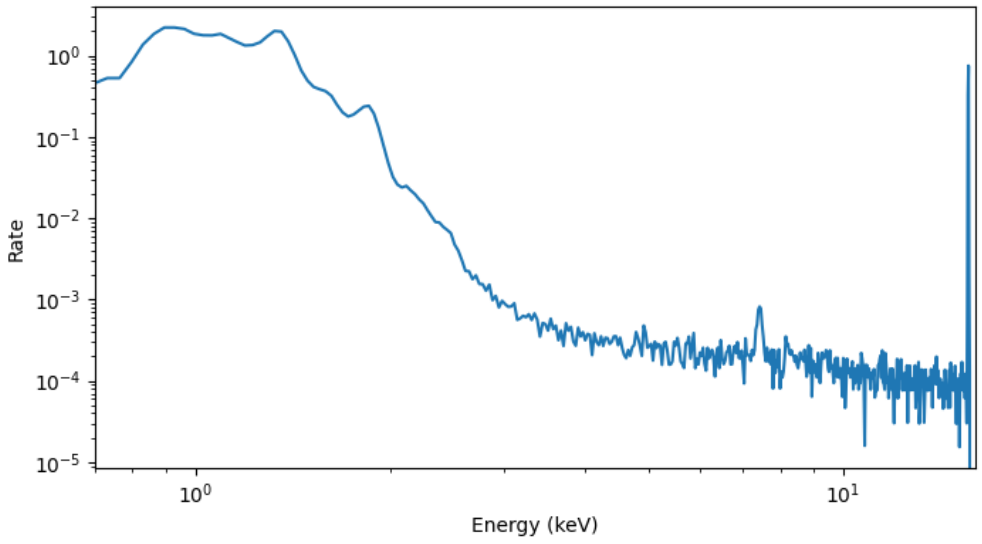

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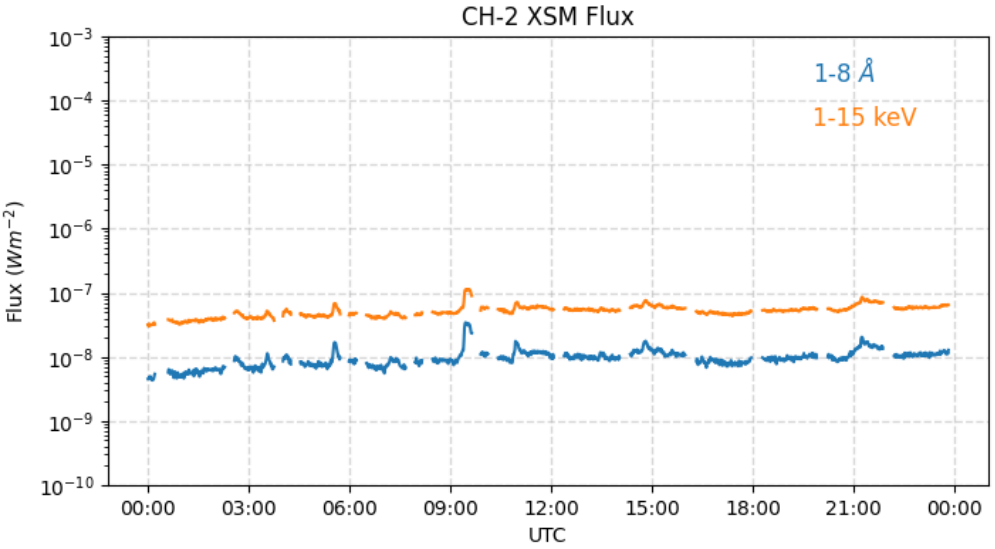

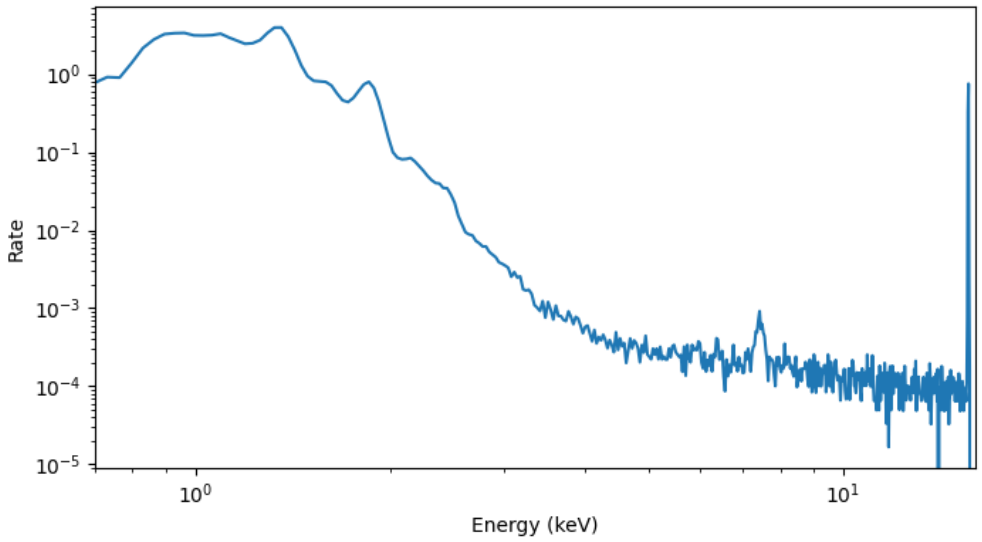

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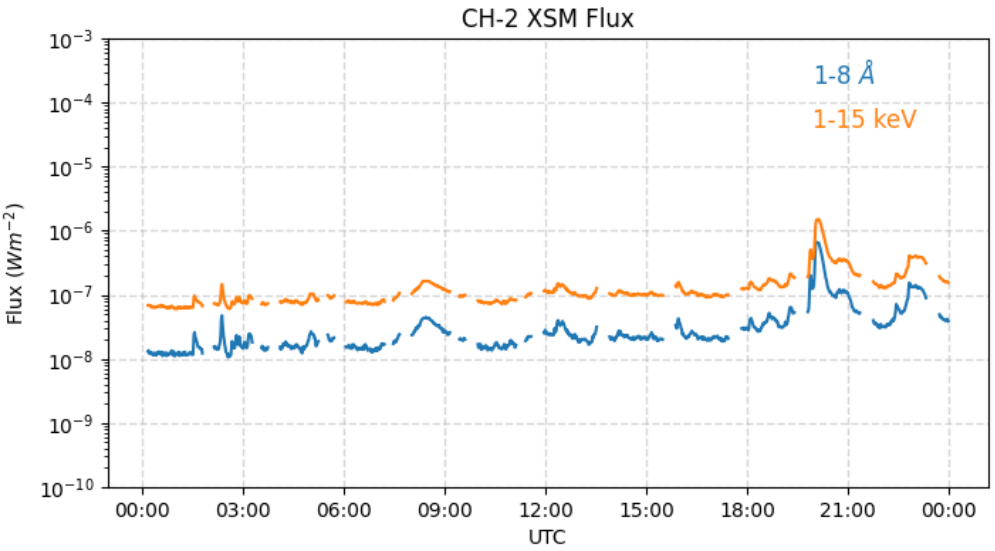

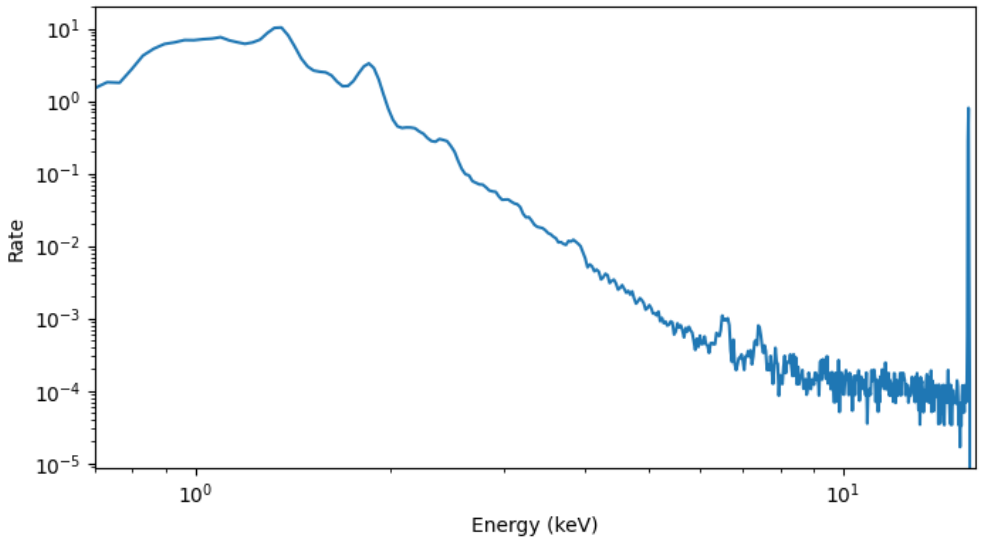

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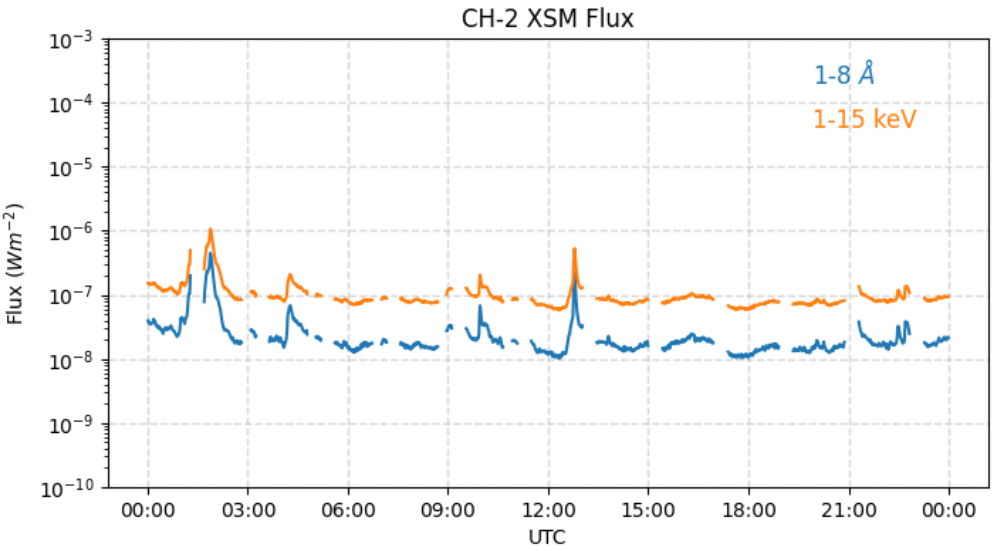

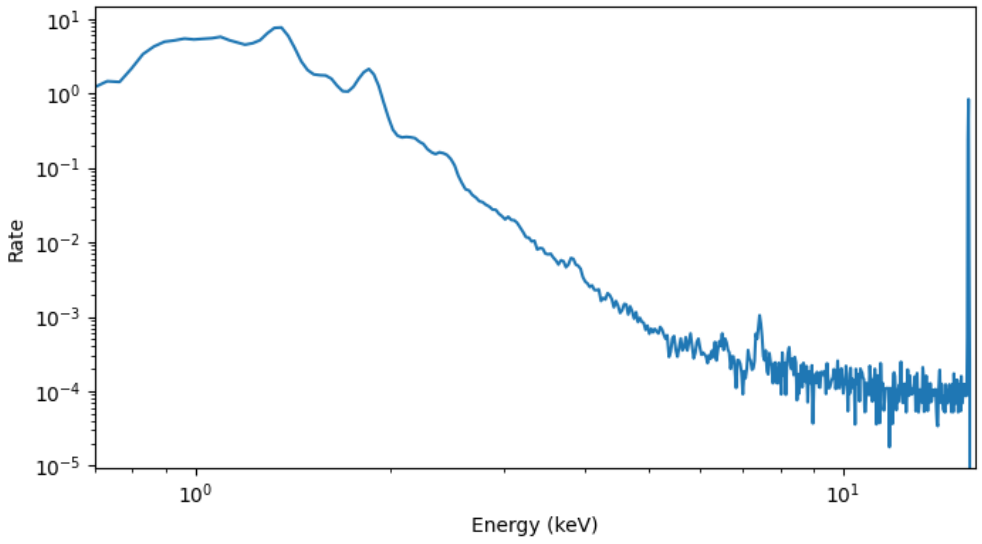

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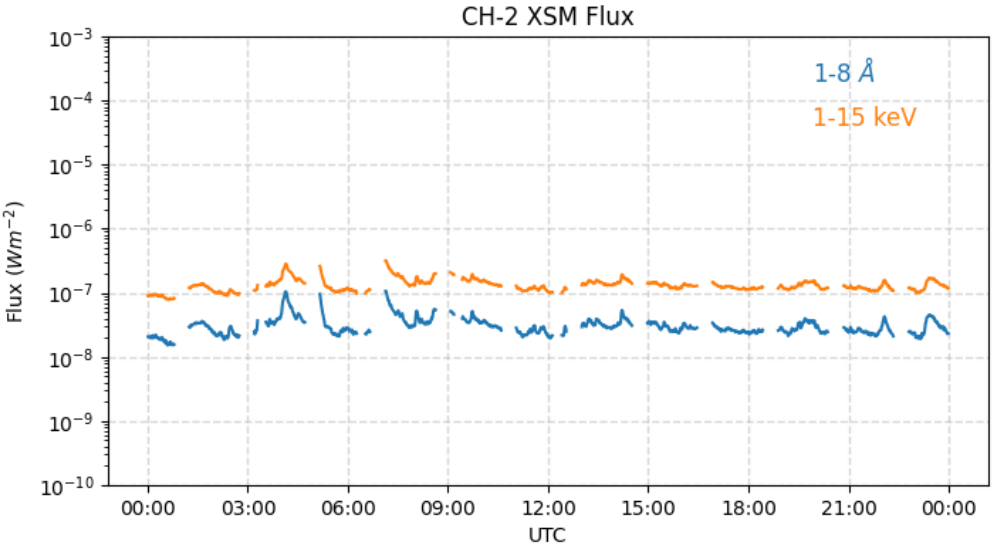

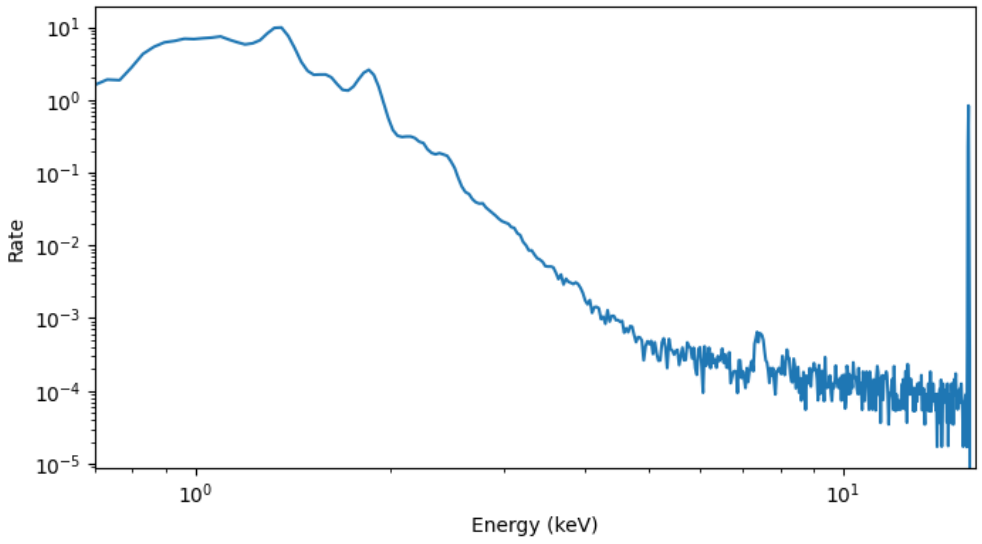

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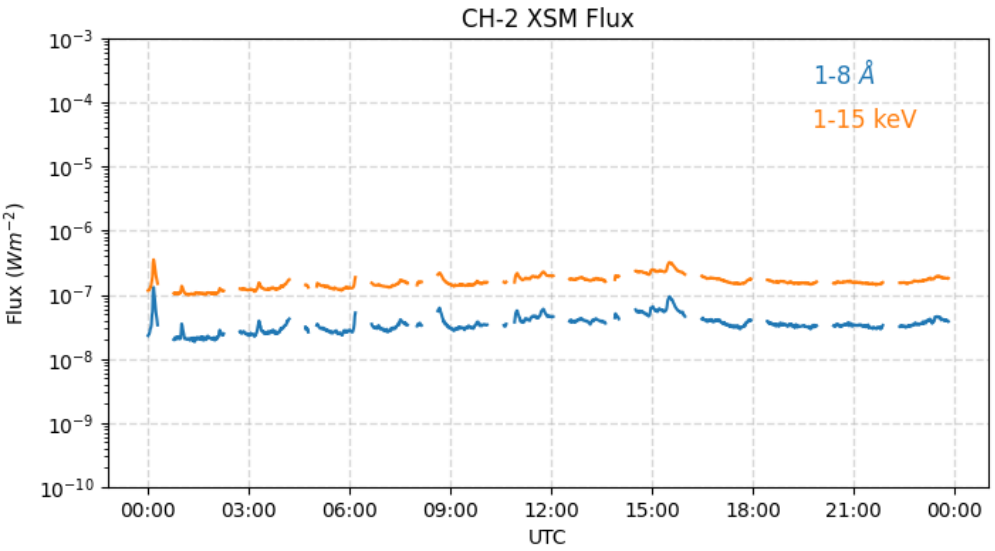

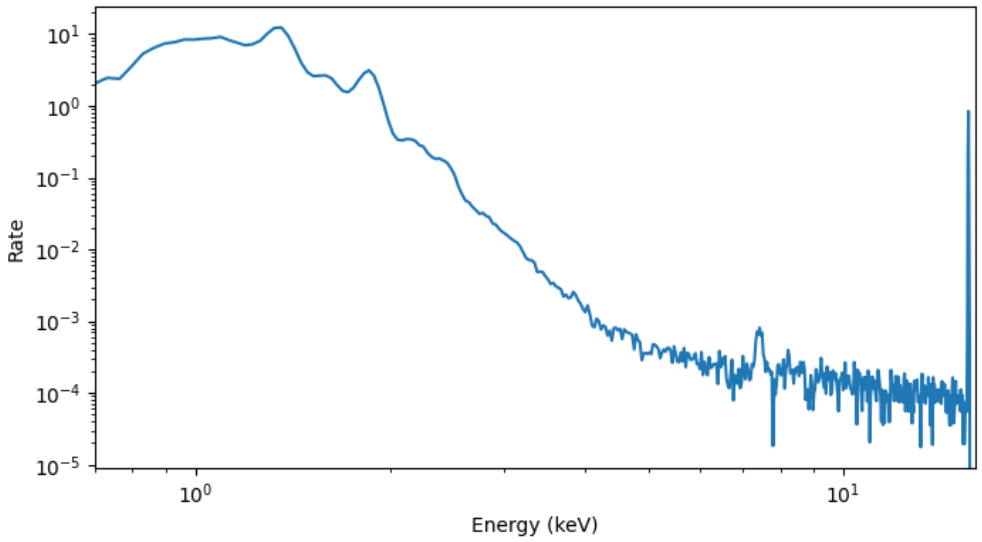

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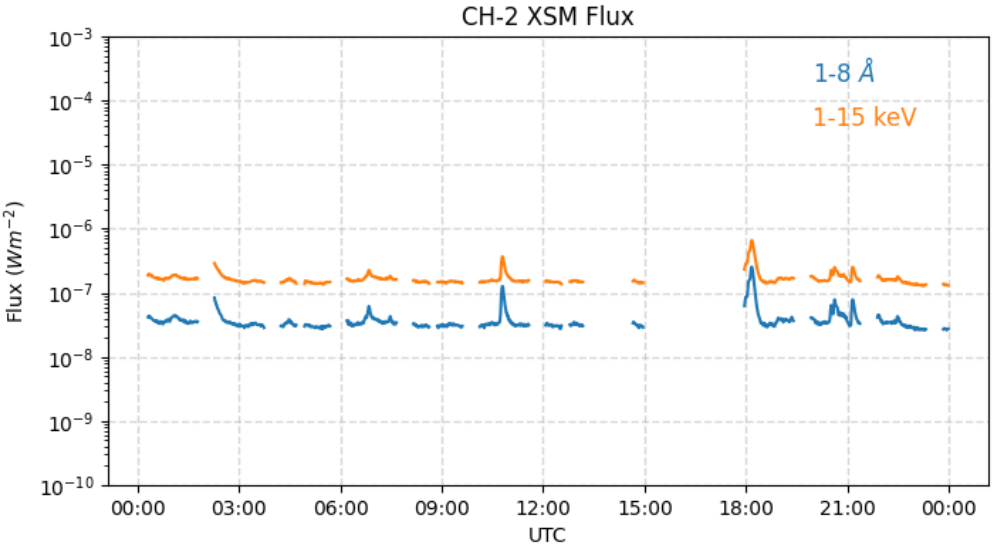

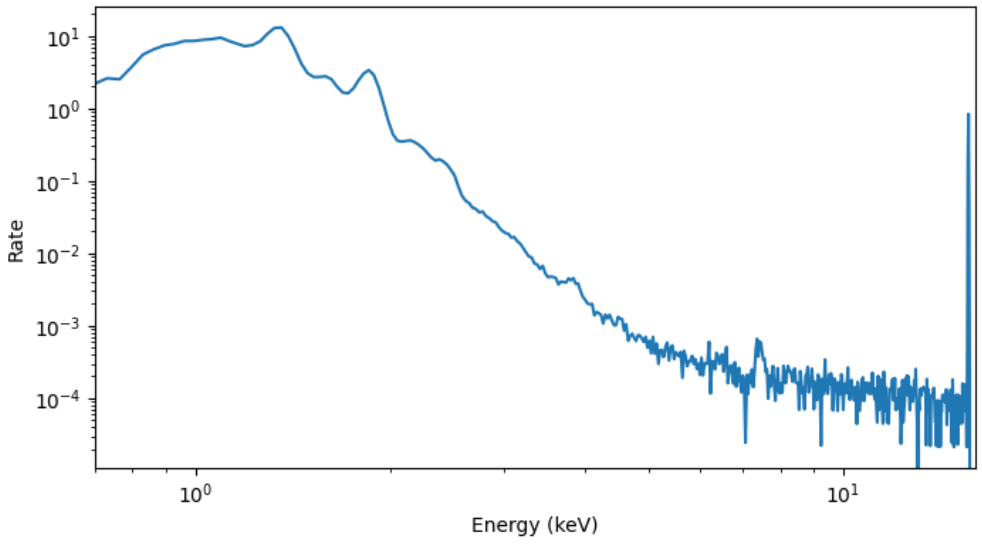

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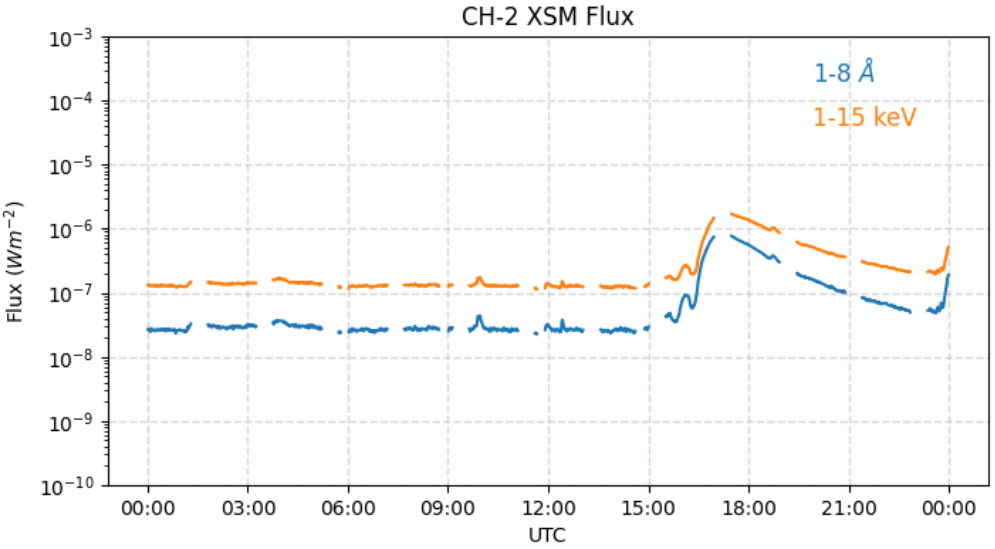

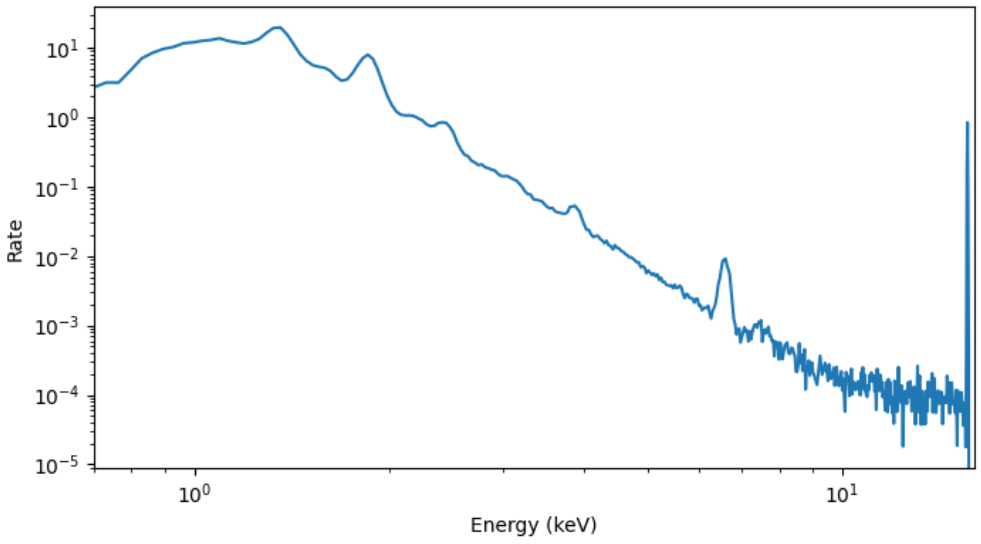

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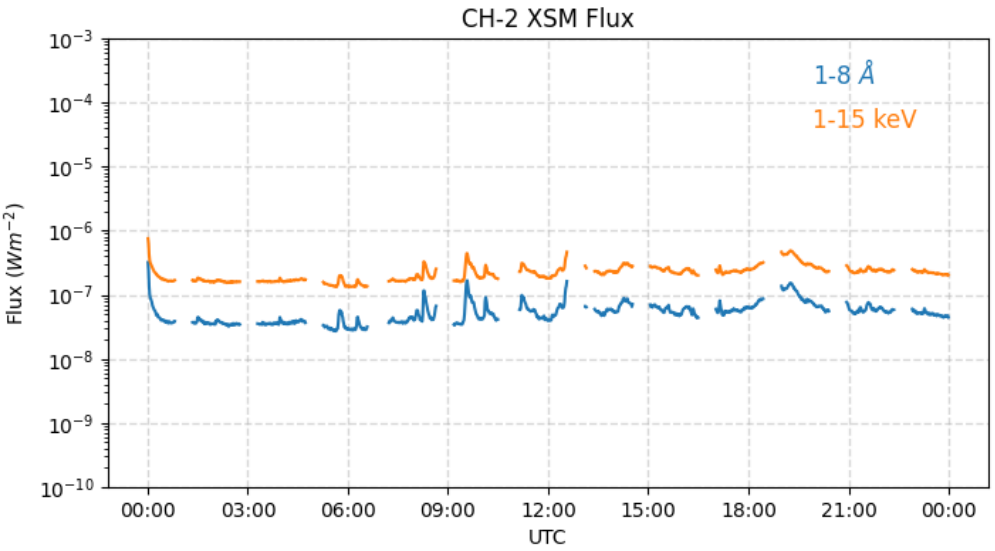

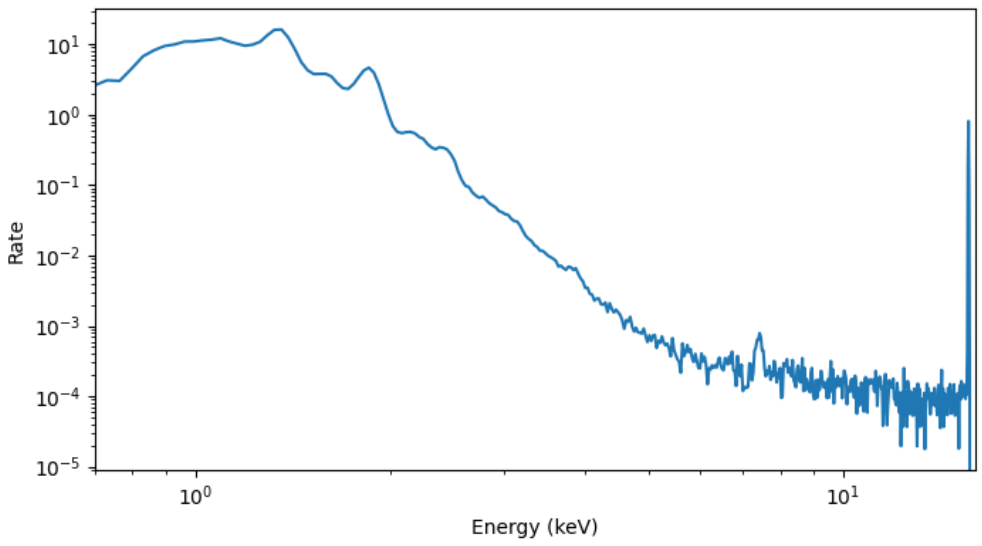

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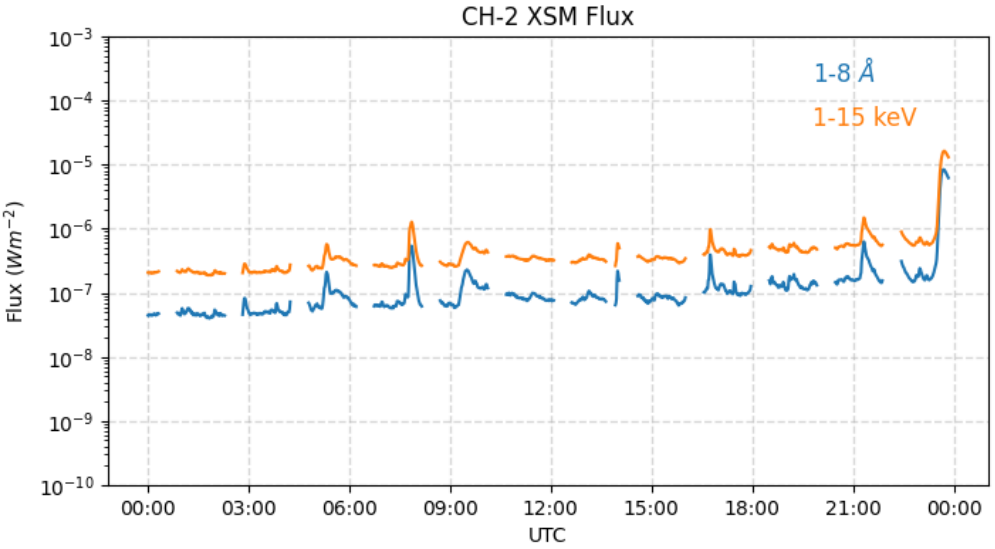

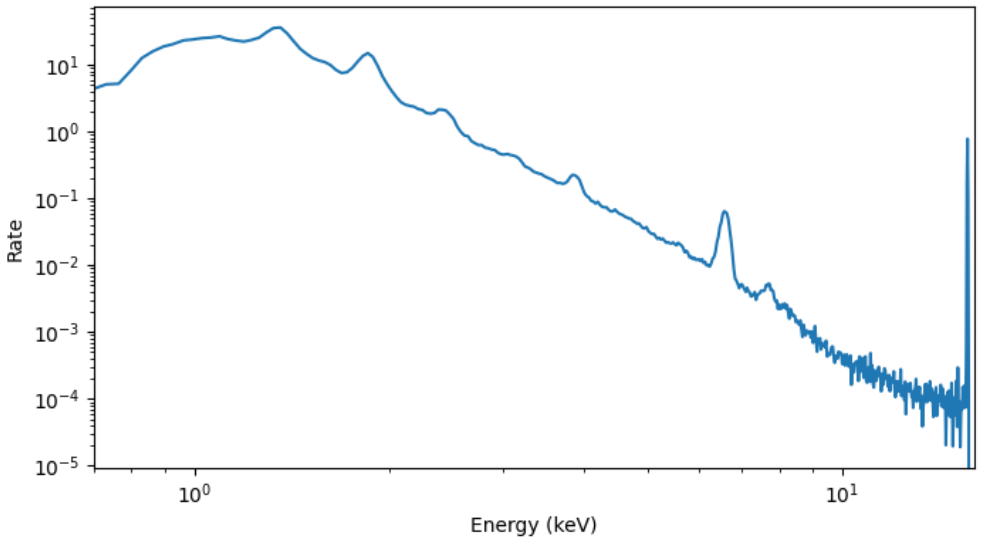

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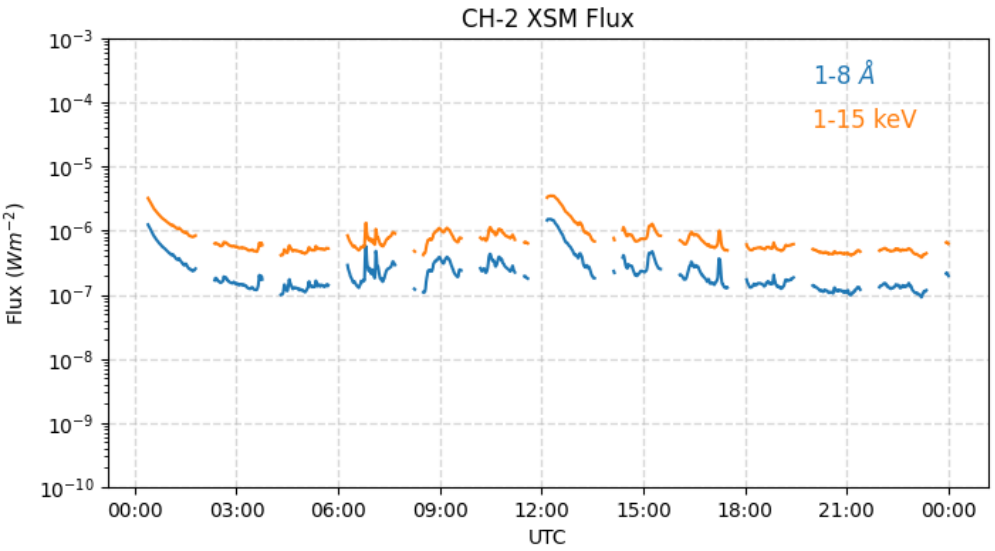

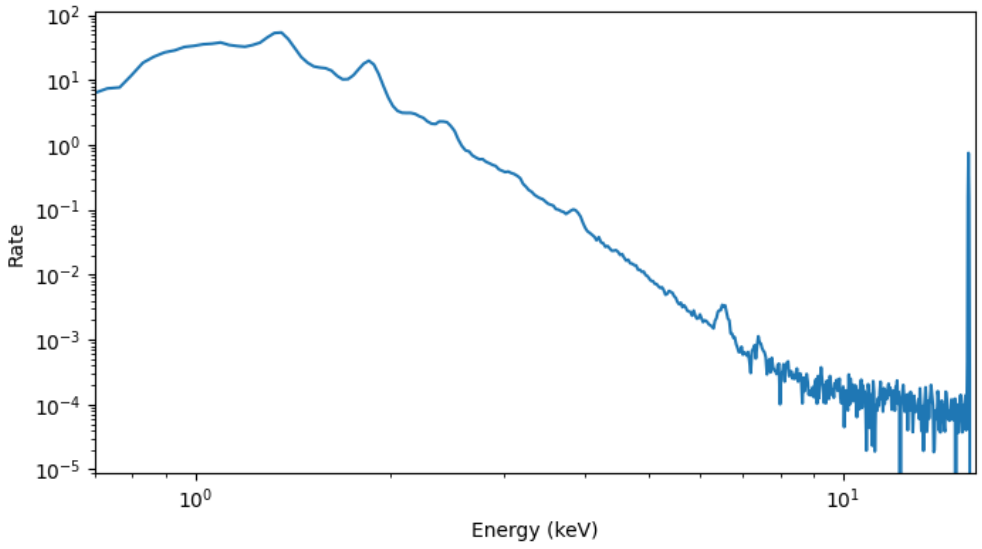

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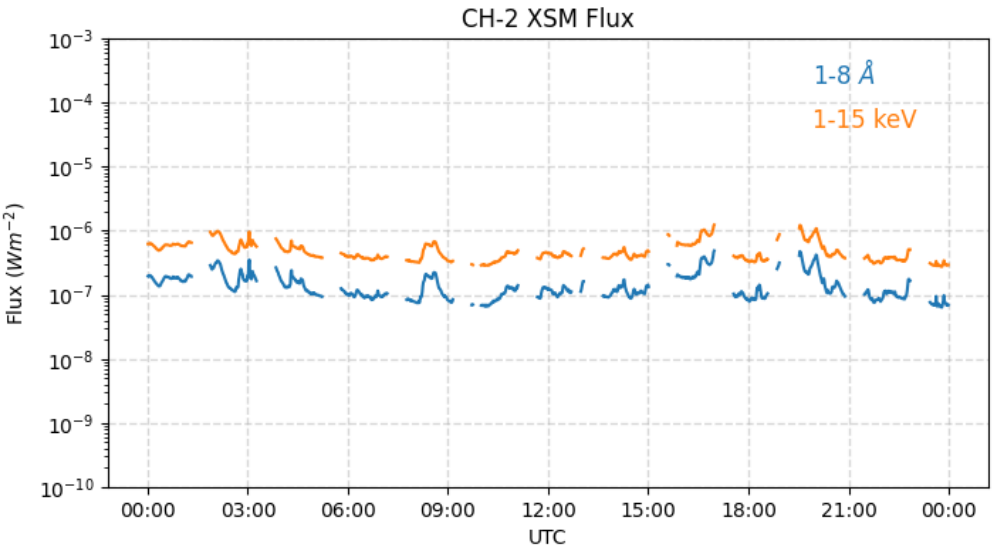

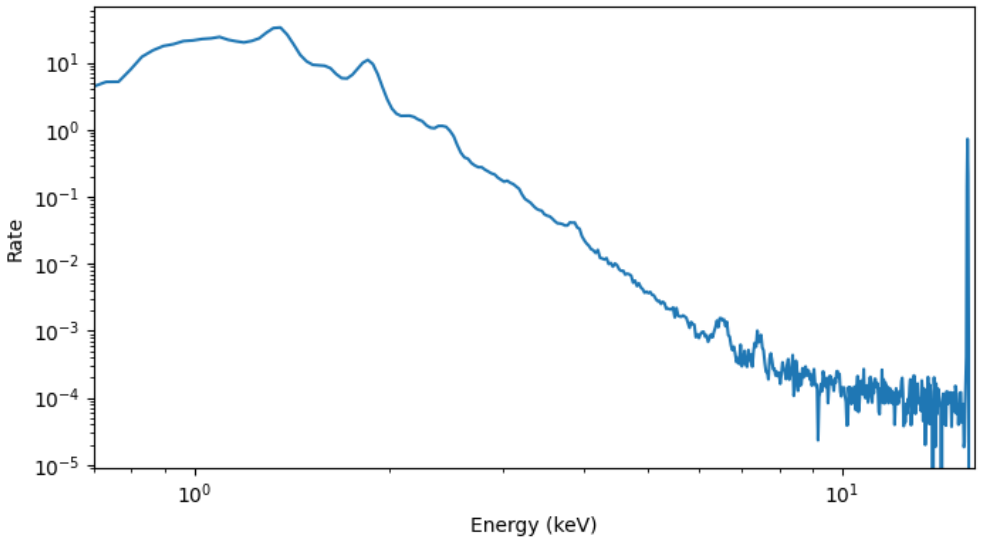

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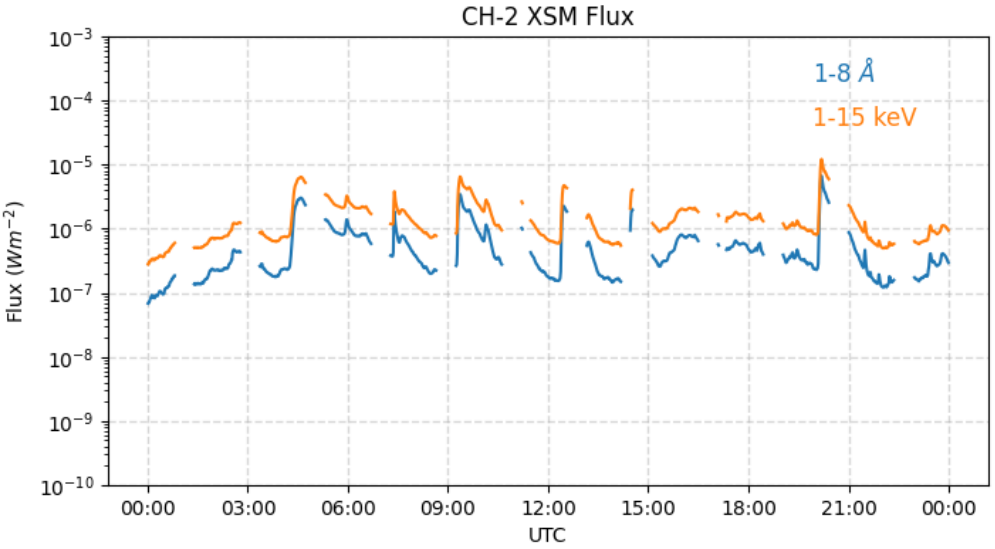

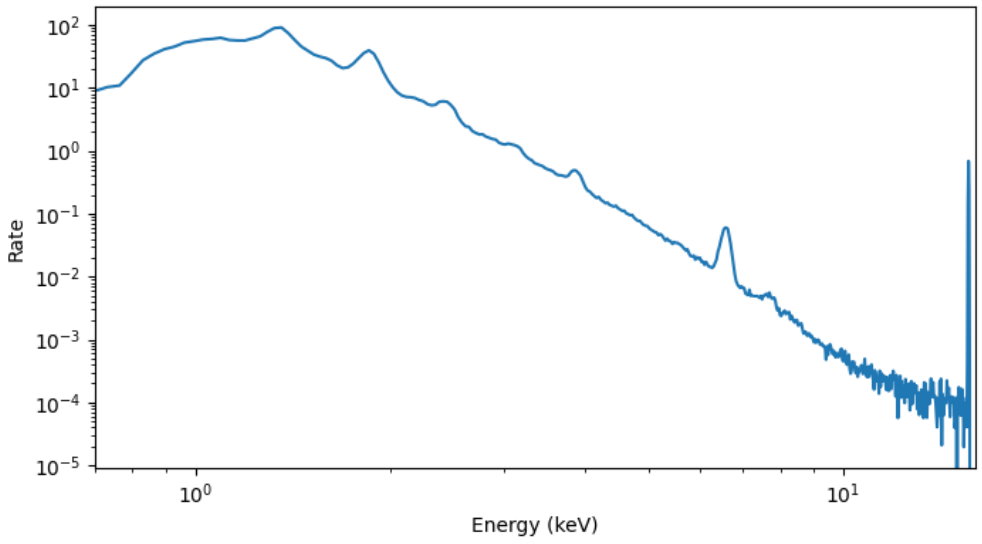

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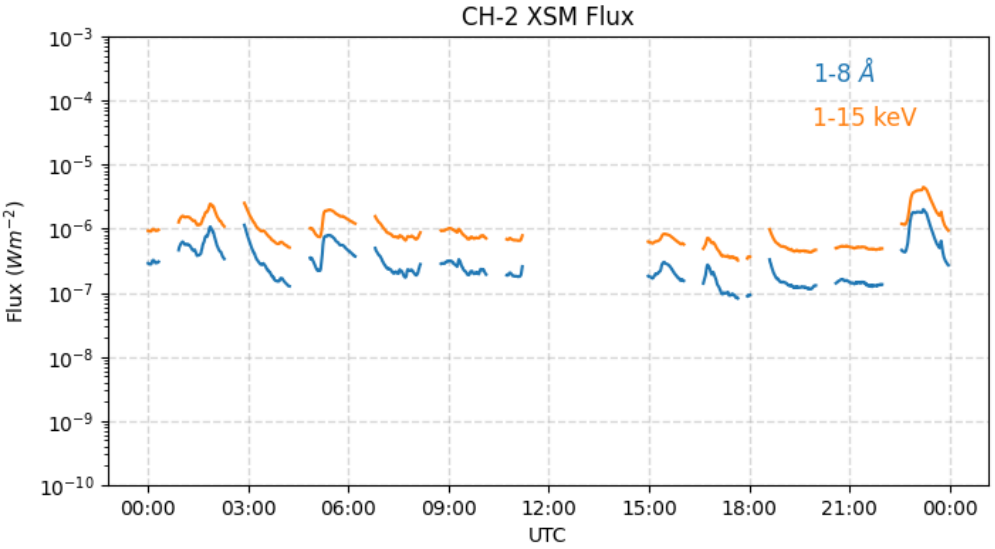

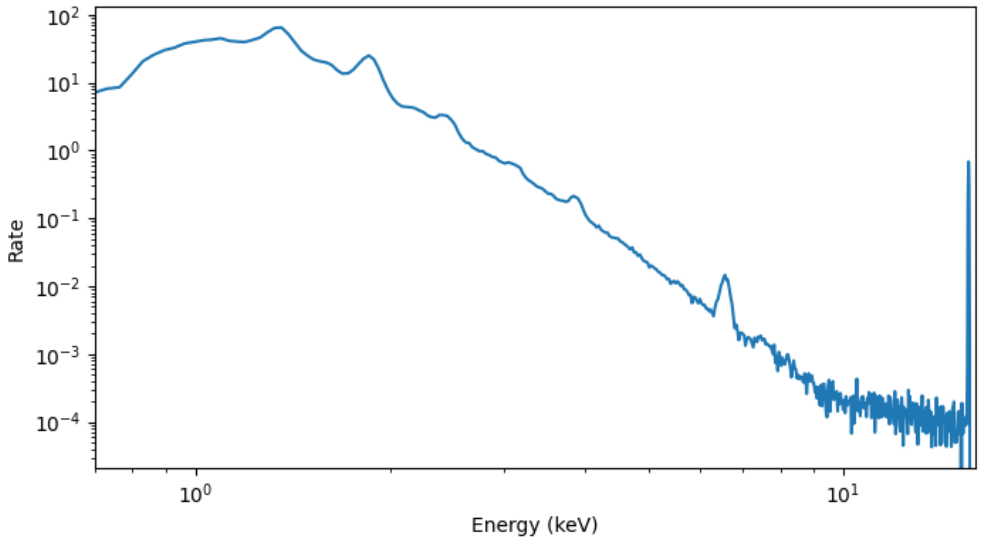

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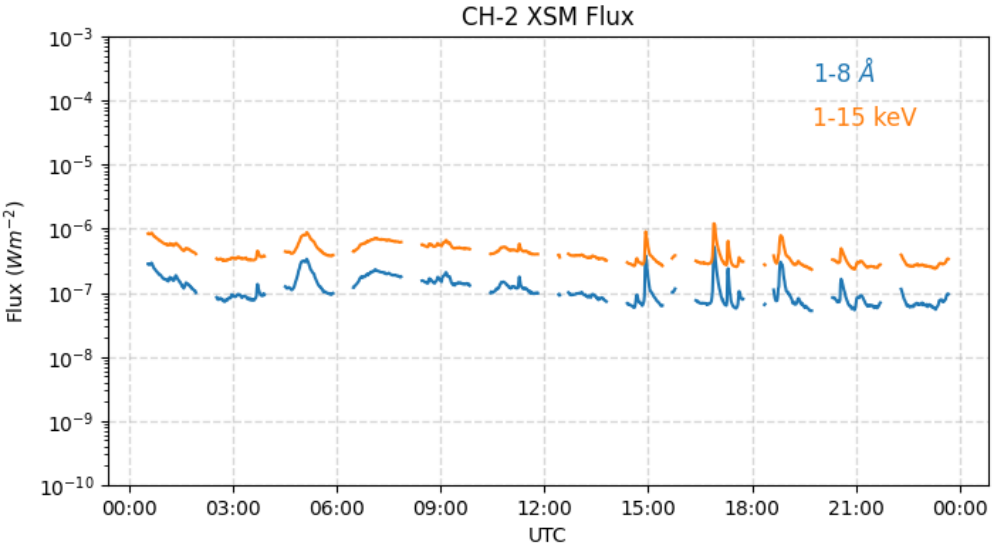

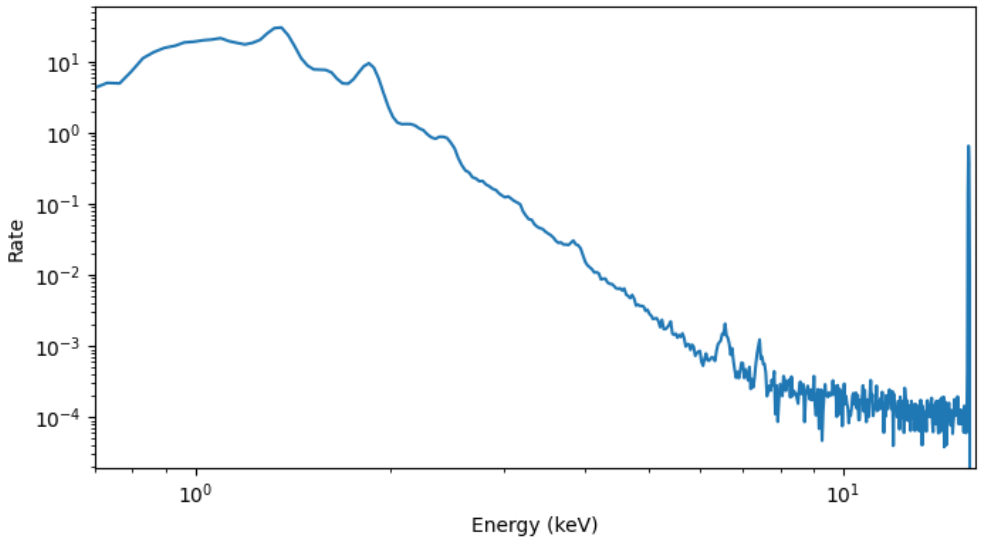

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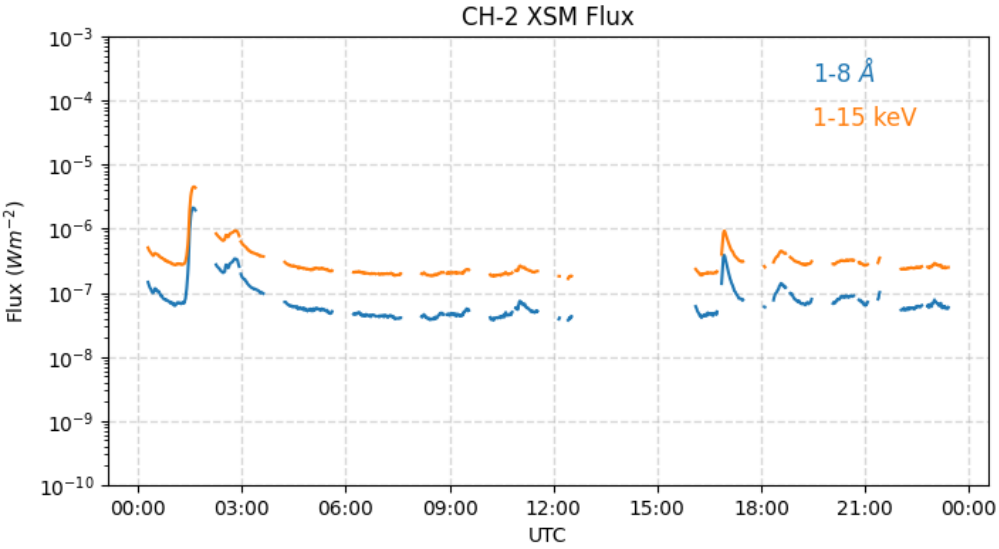

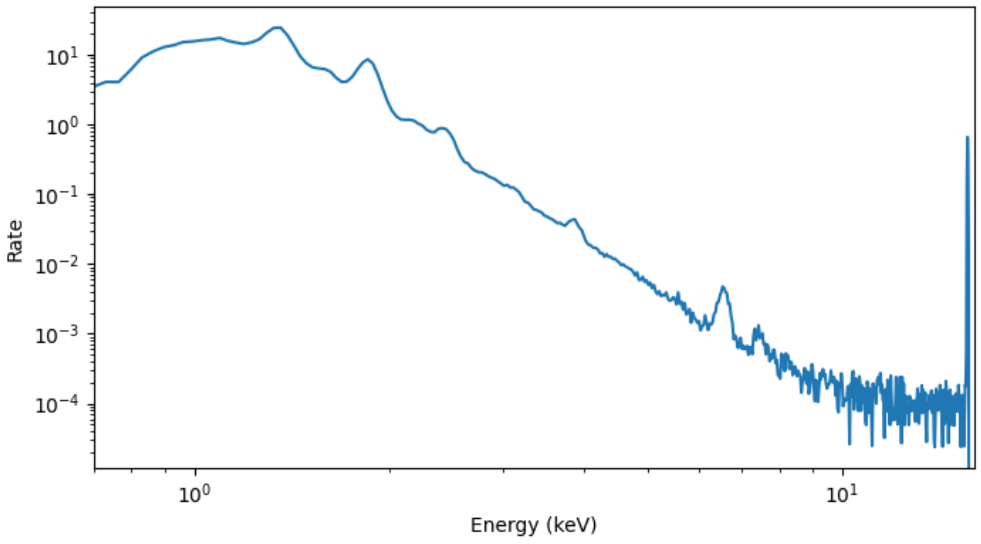

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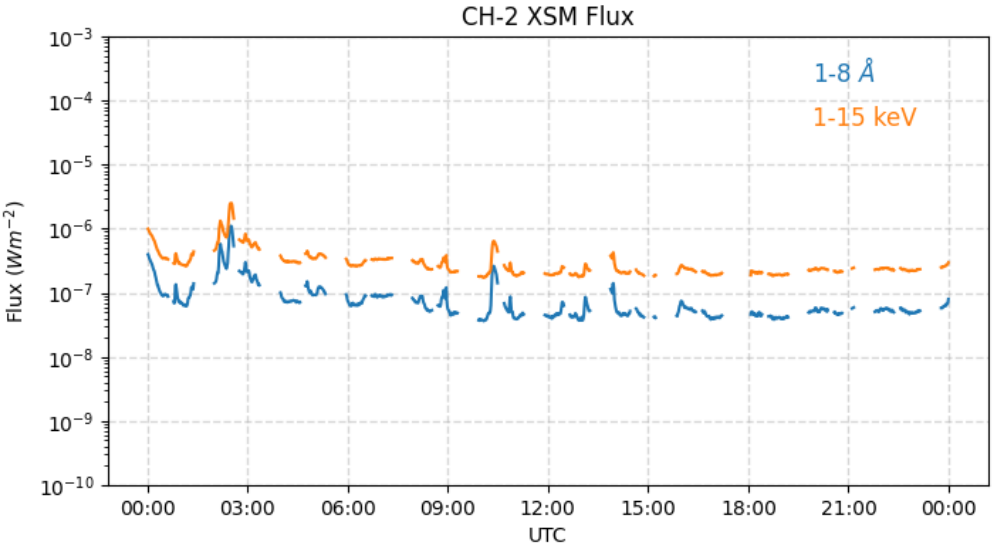

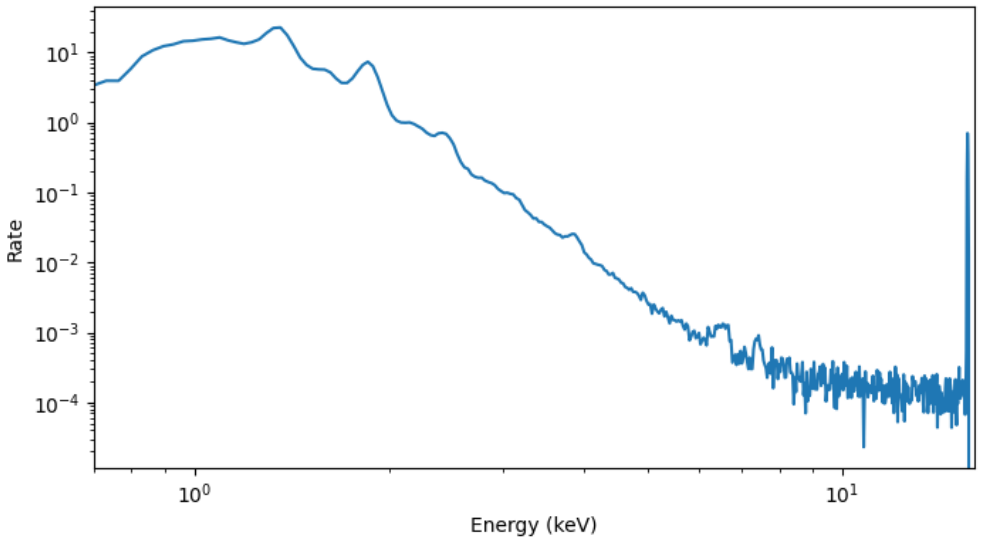

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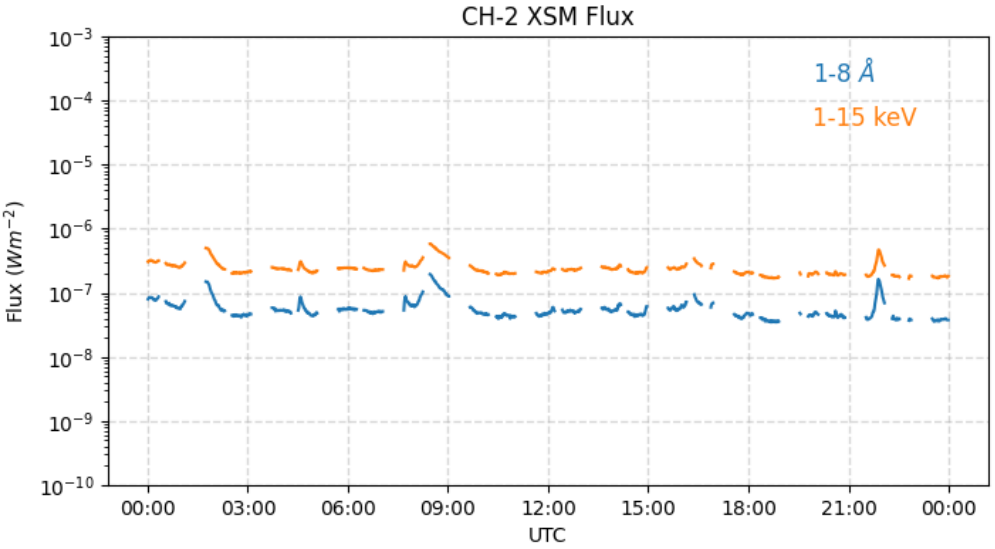
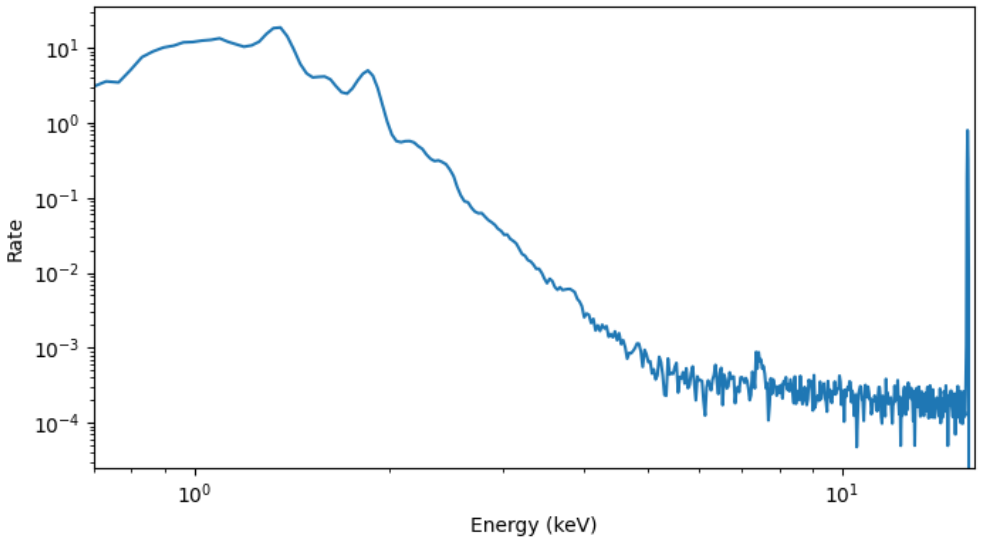
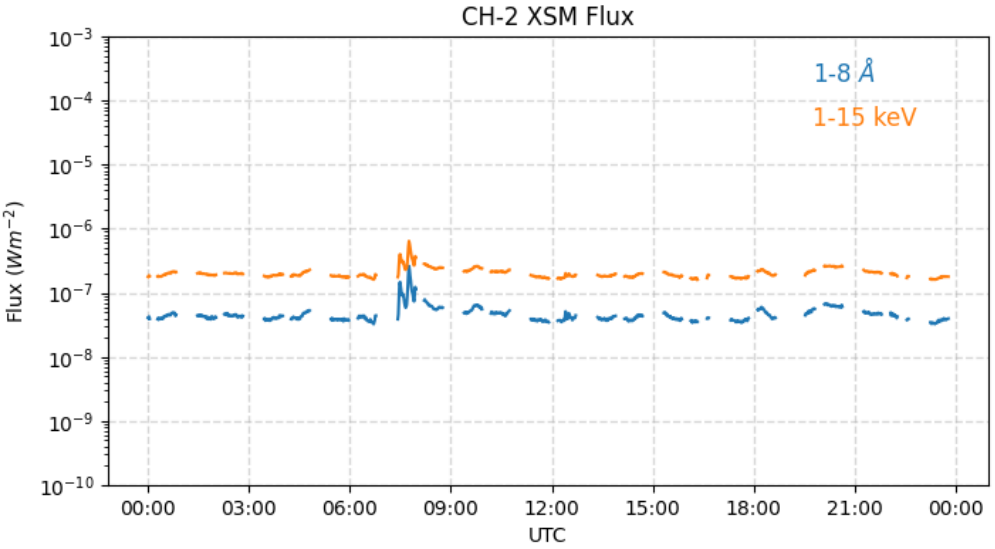
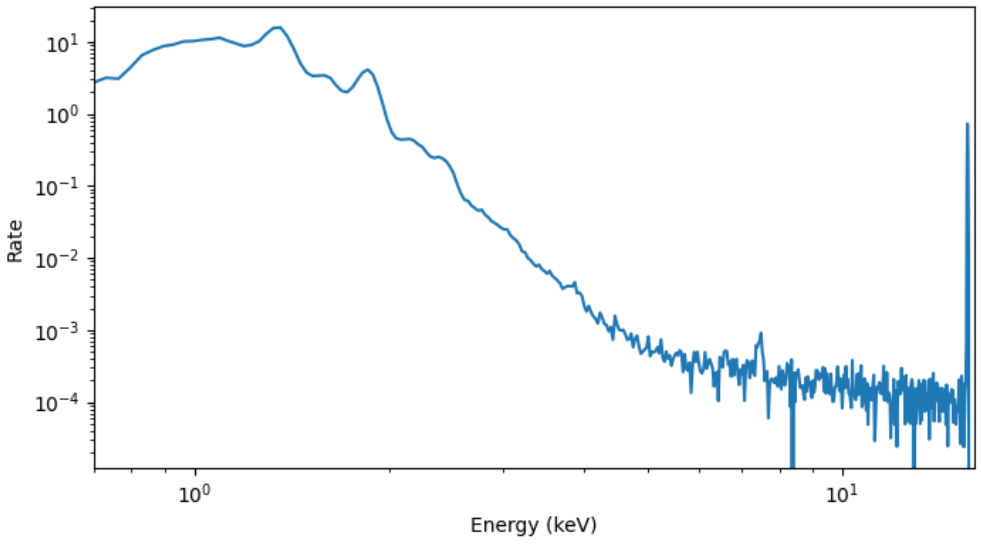




Date: 2021-04-28





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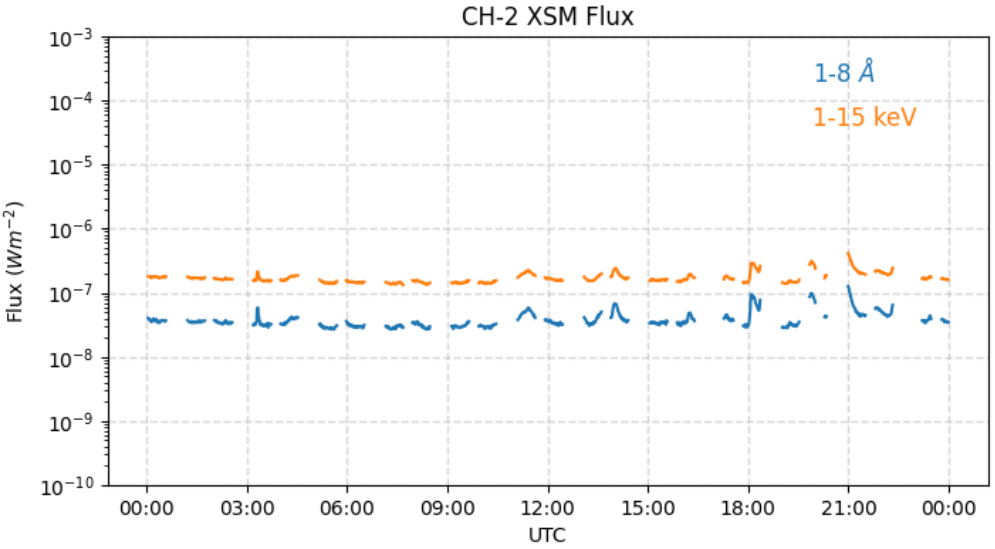

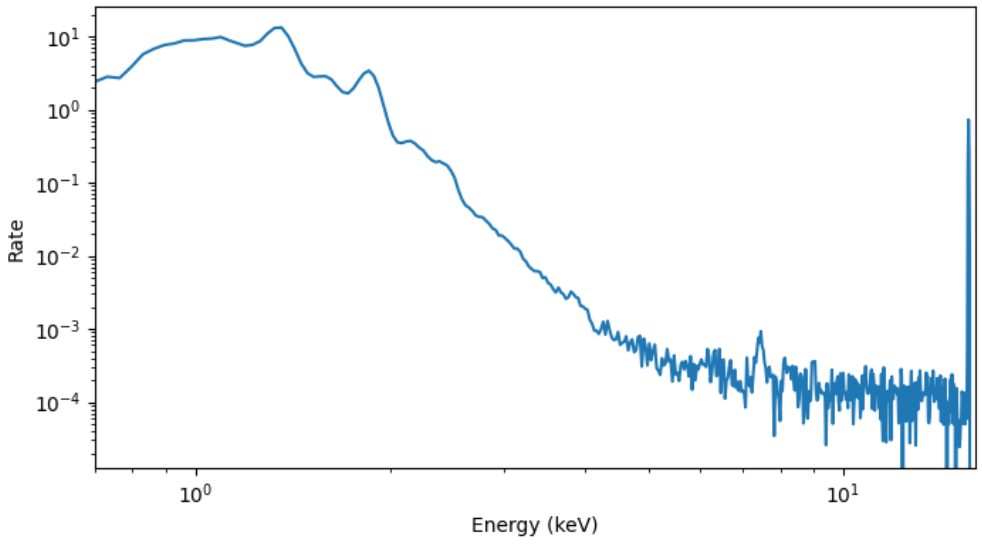

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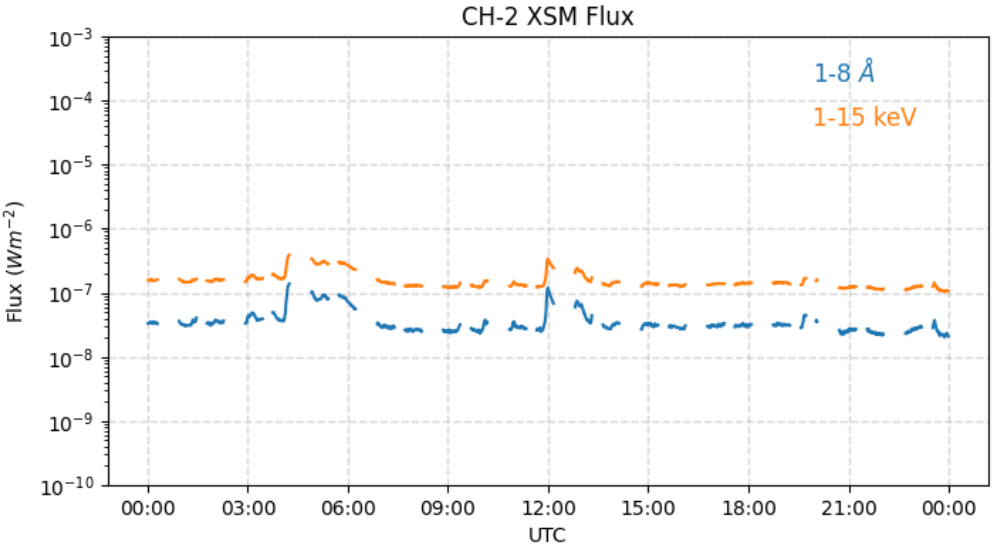
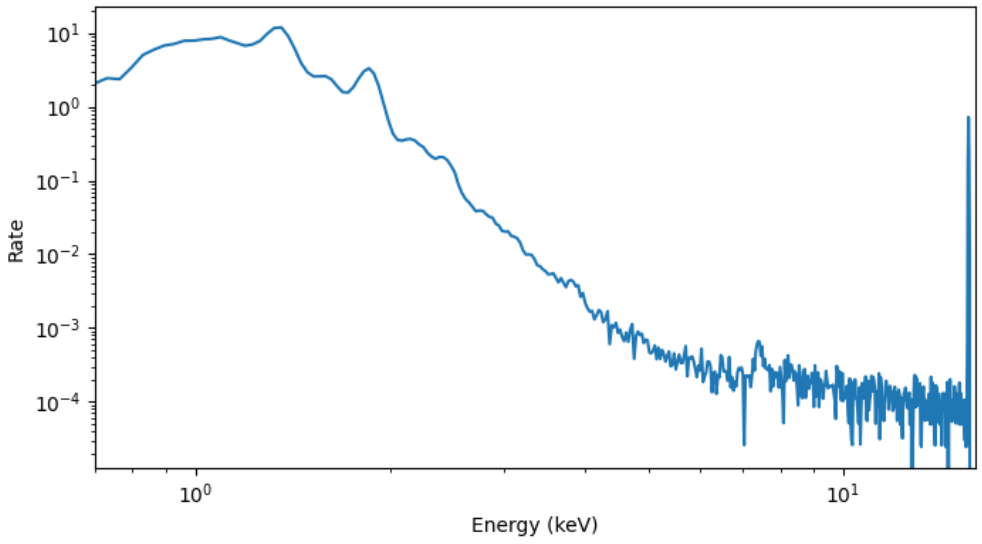
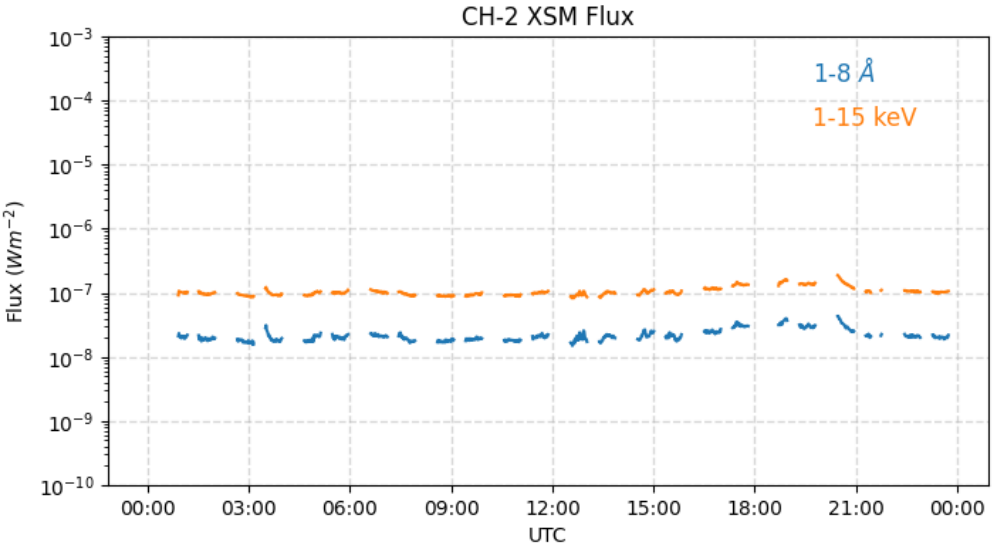
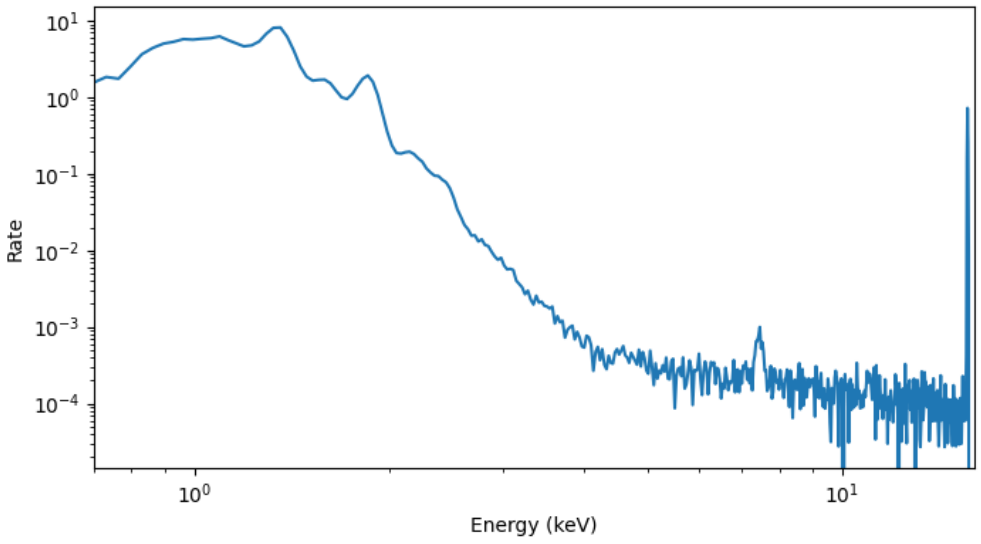


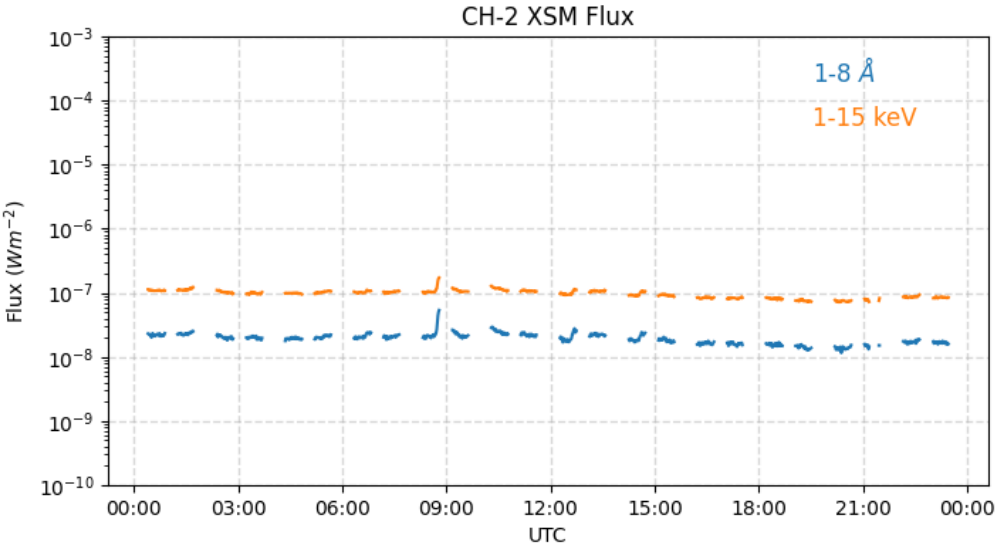


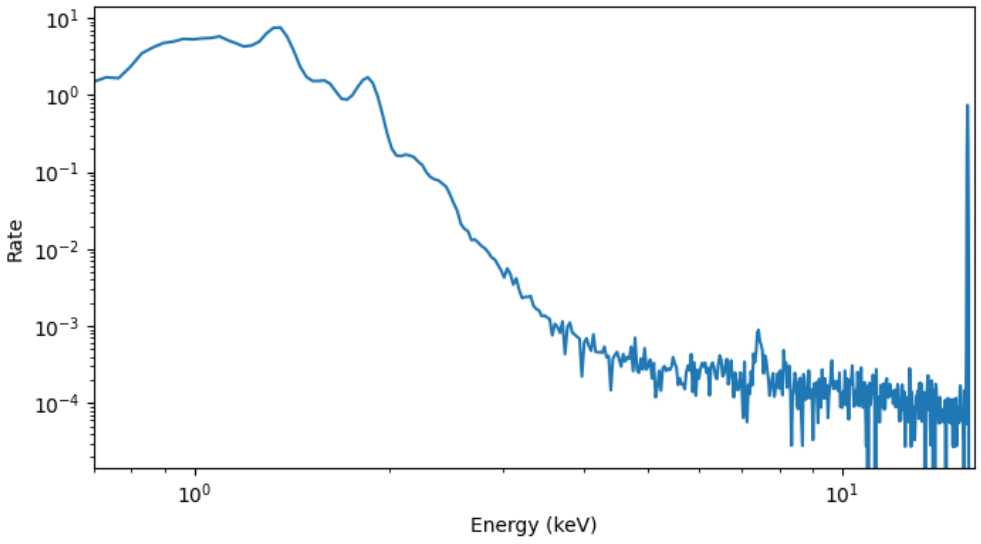
Date: 2021-05-01





Date: 2021-05-02





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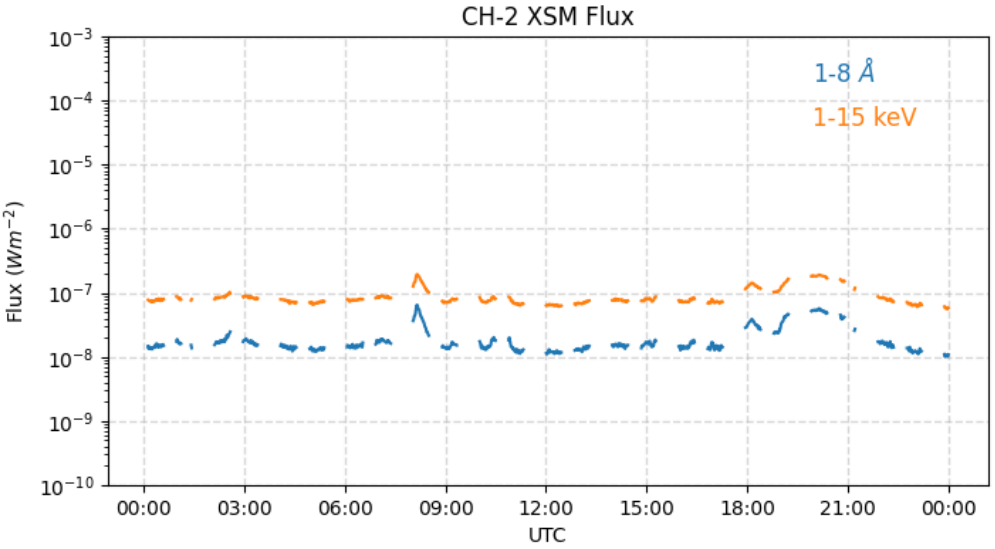

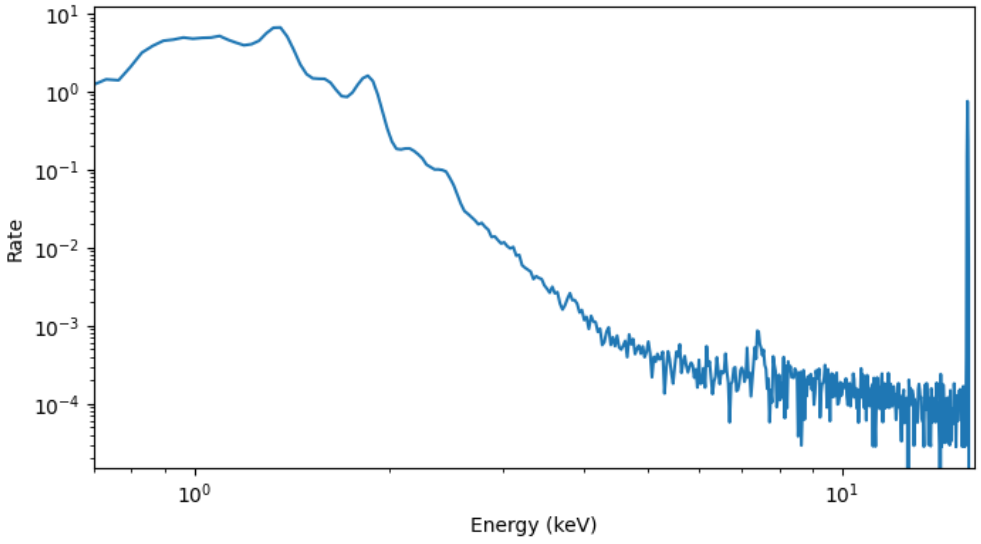

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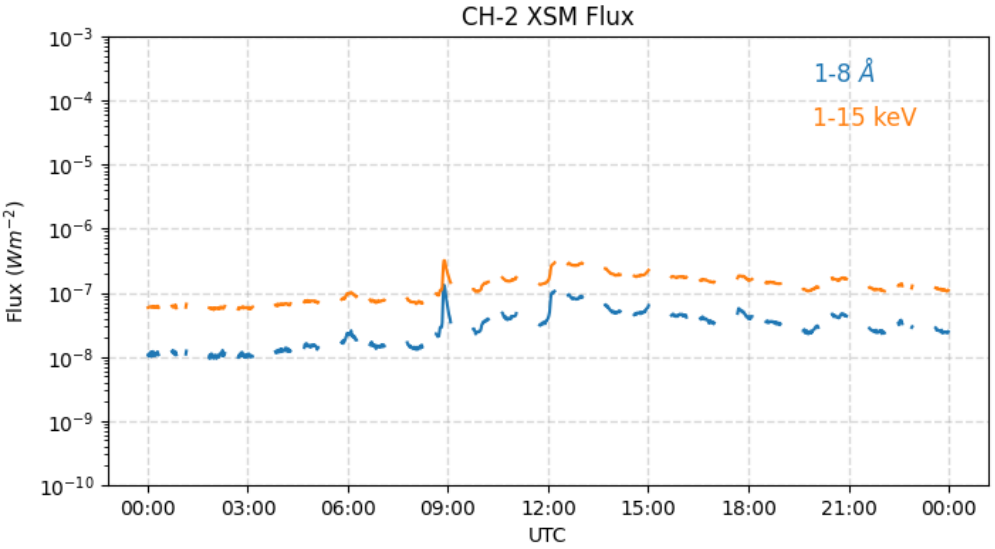

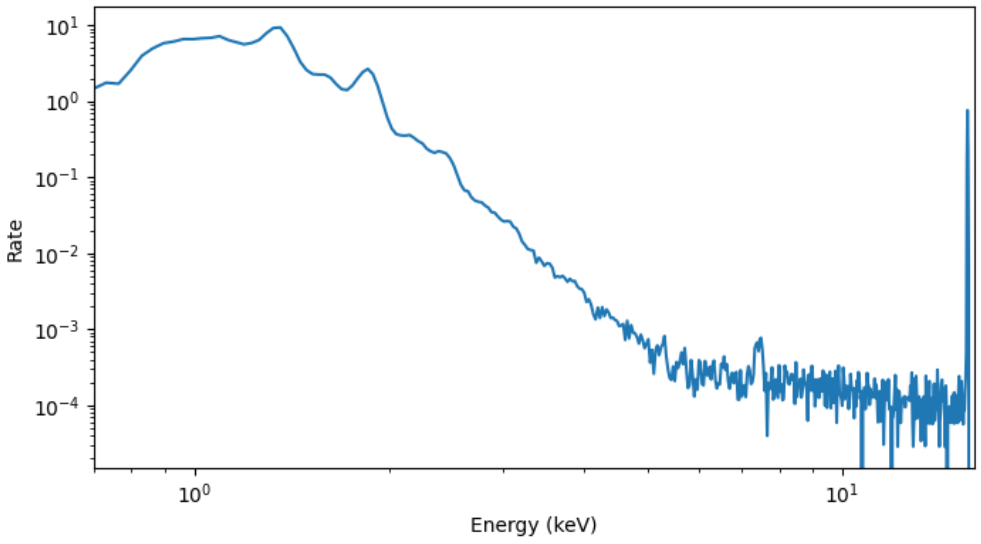

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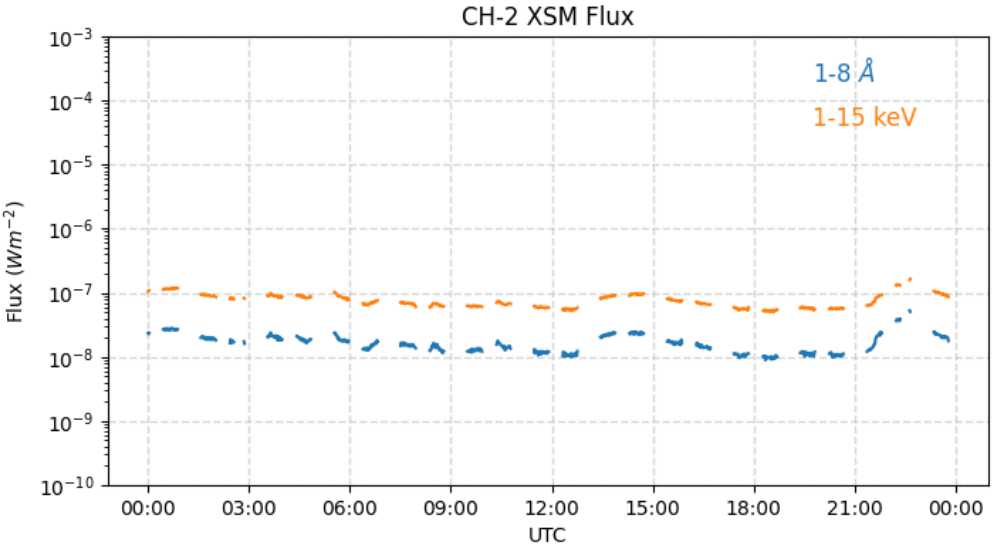
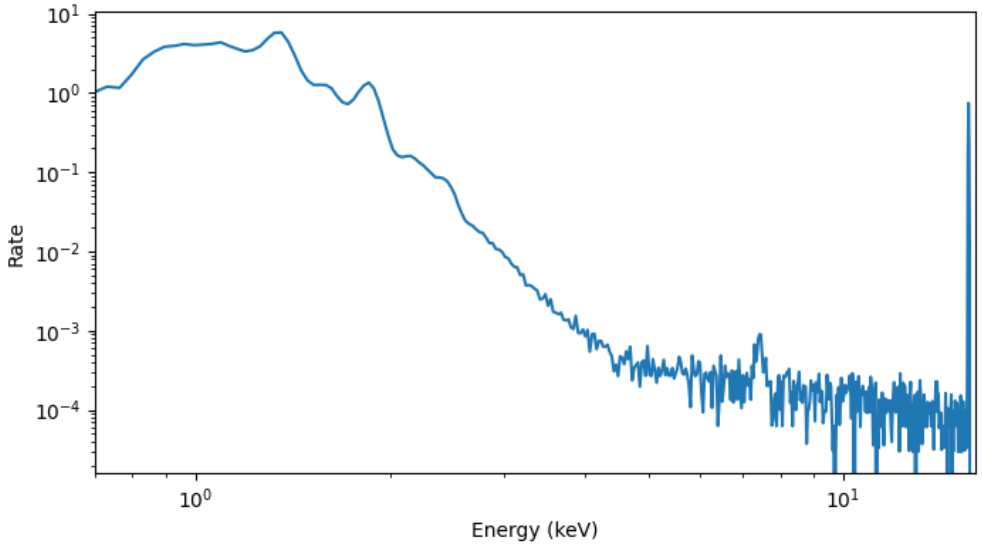
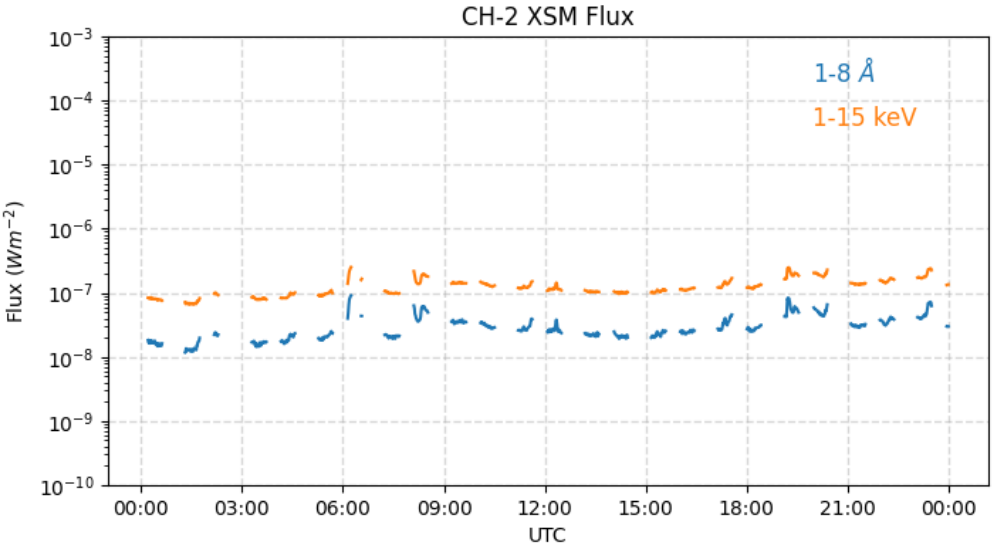
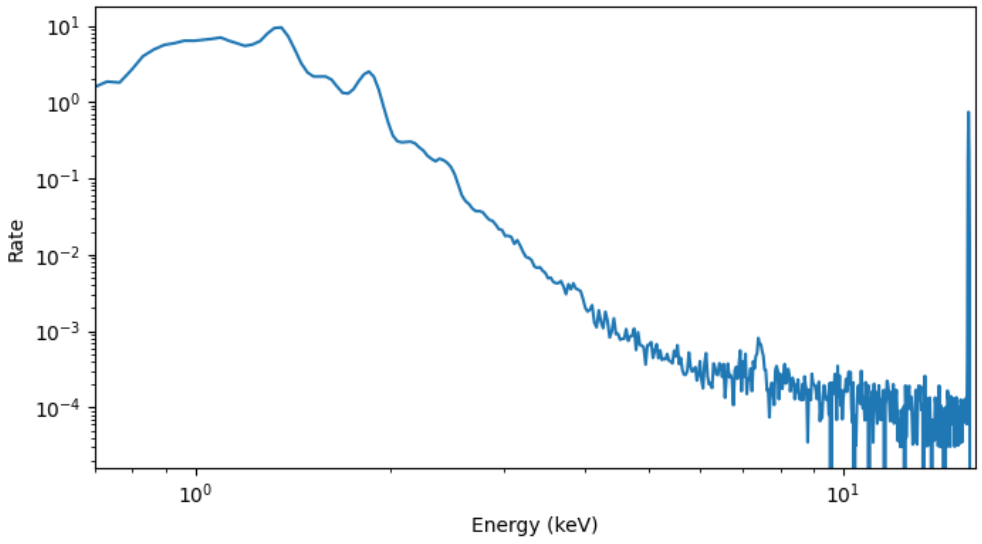


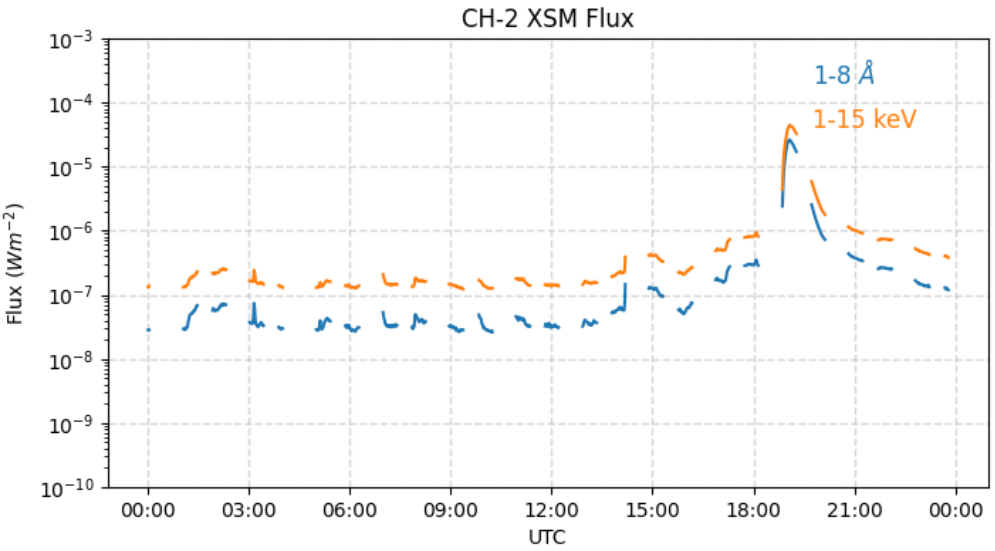


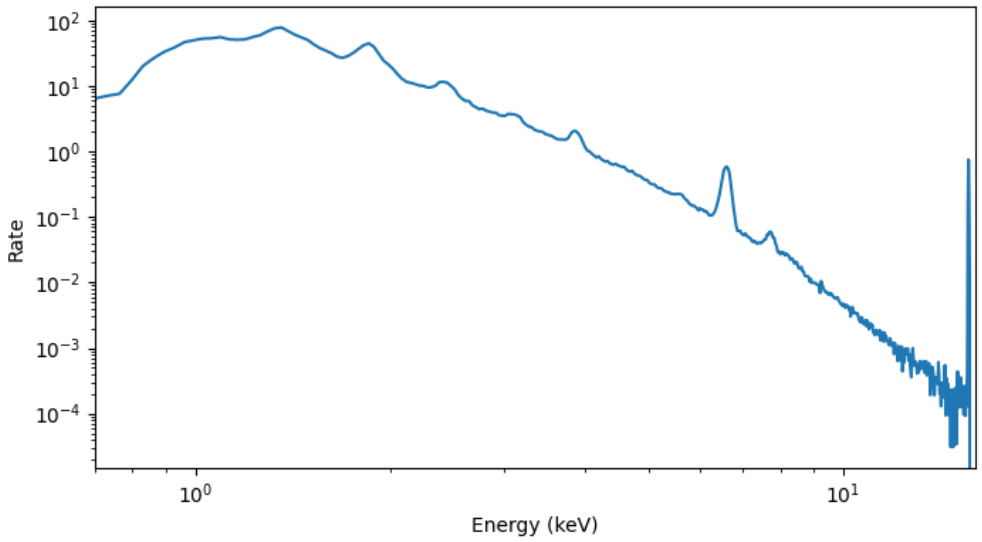
Date: 2021-05-06





Date: 2021-05-07





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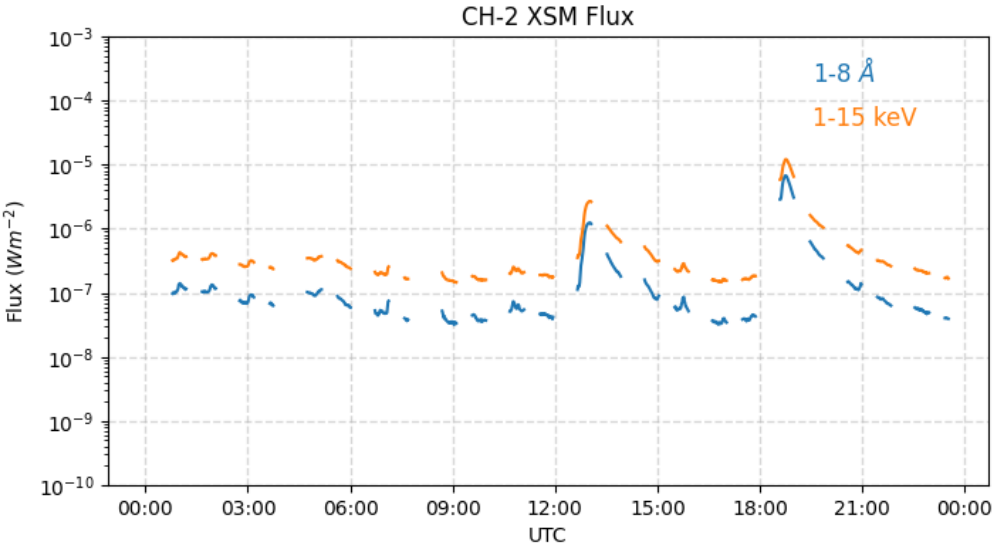

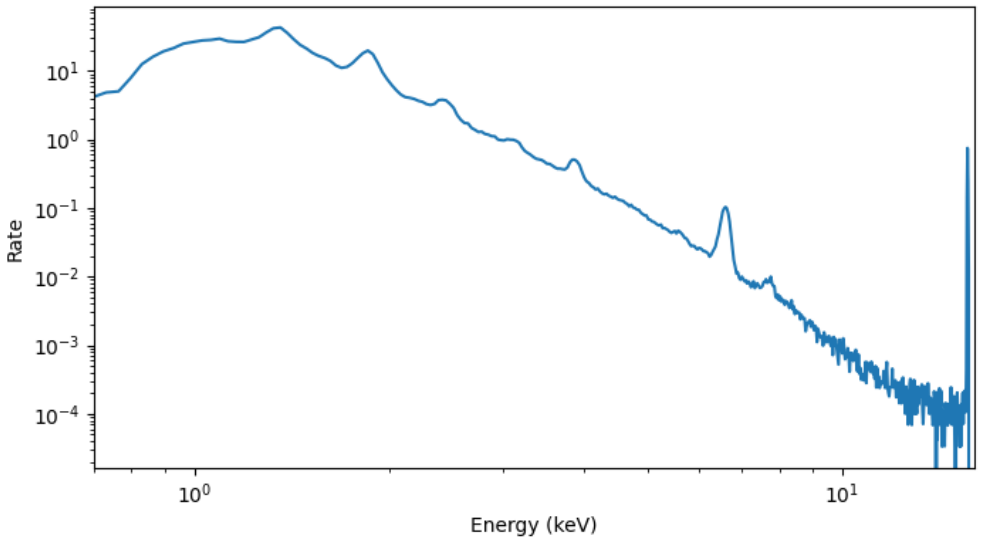

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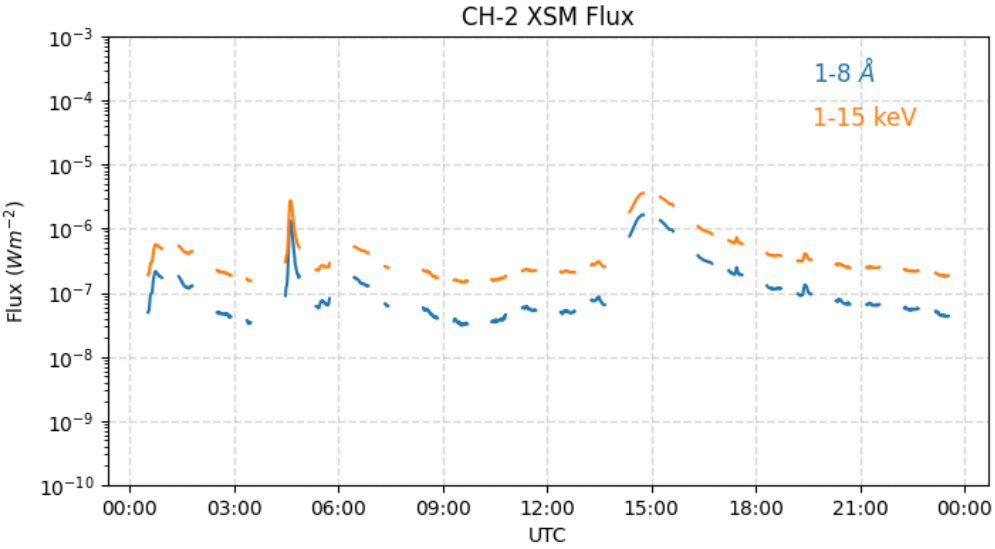
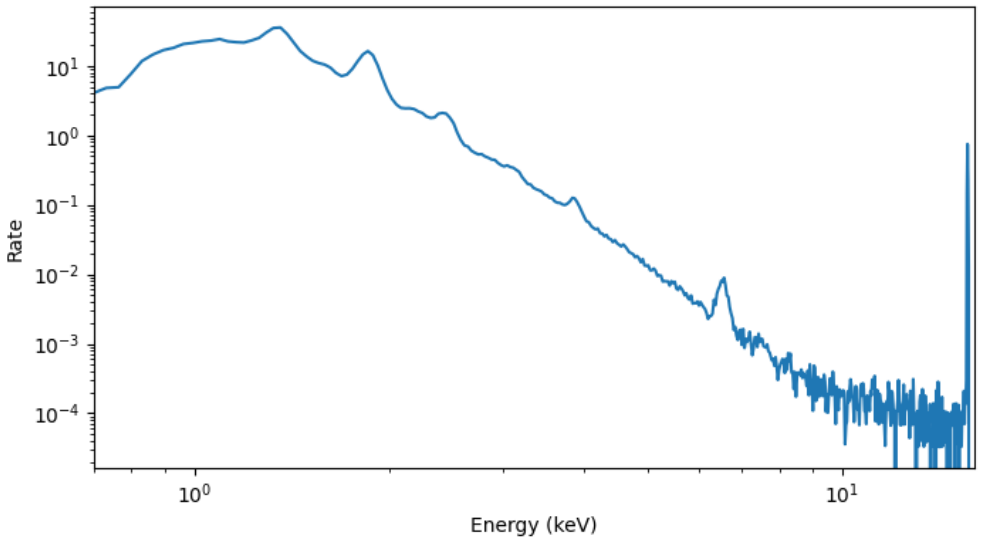
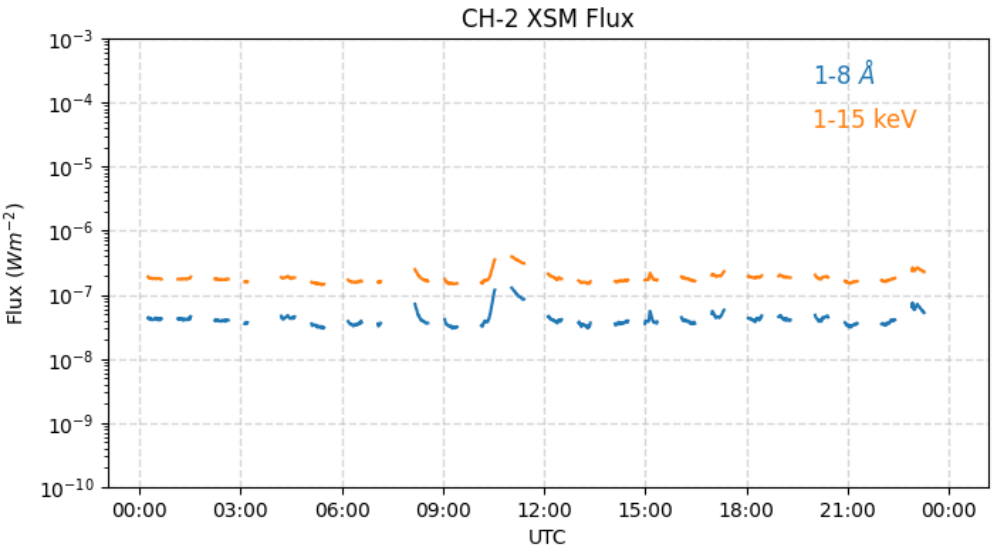
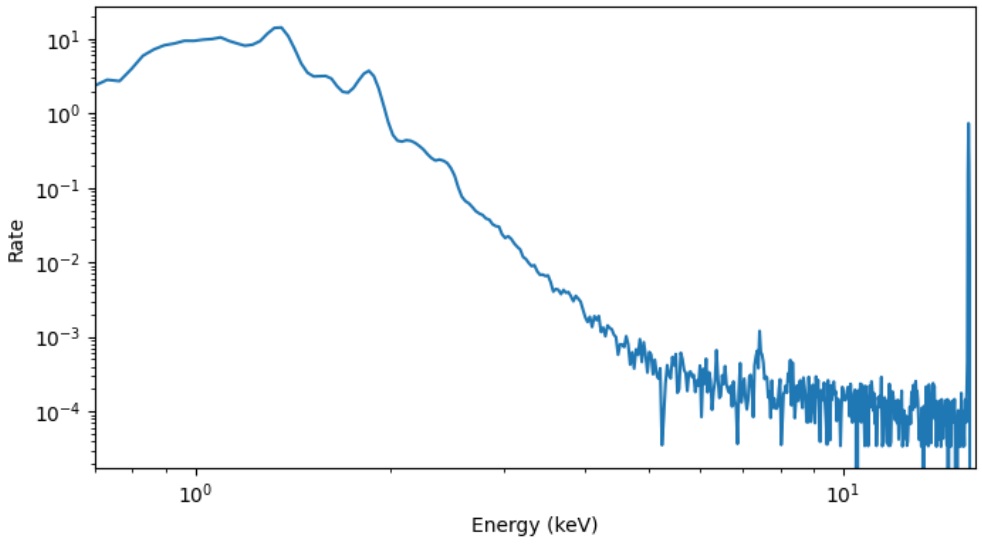


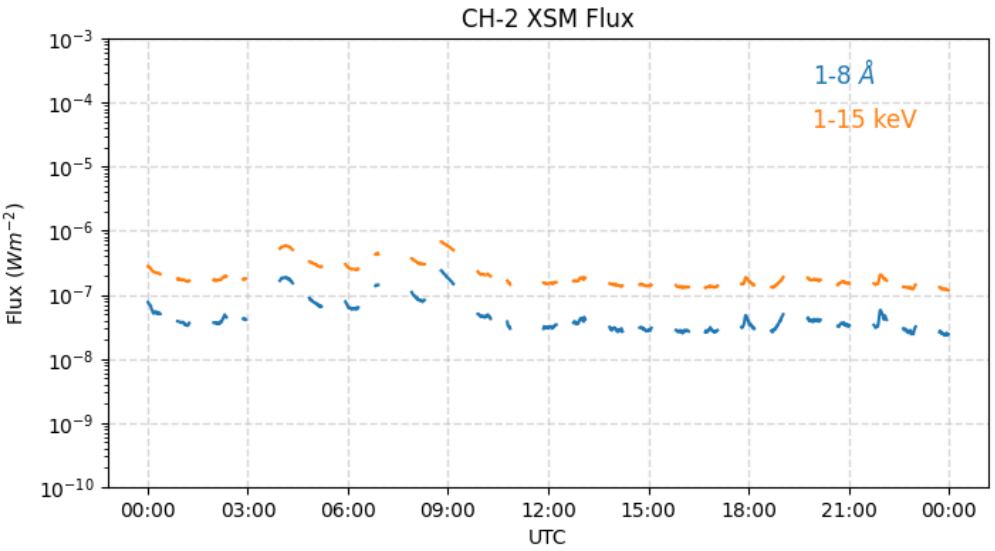


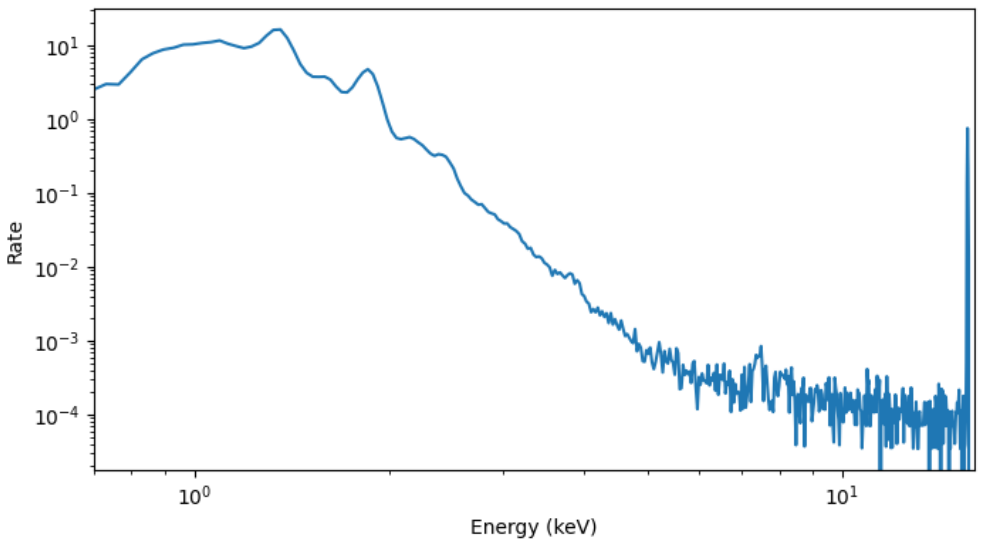
Date: 2021-05-10



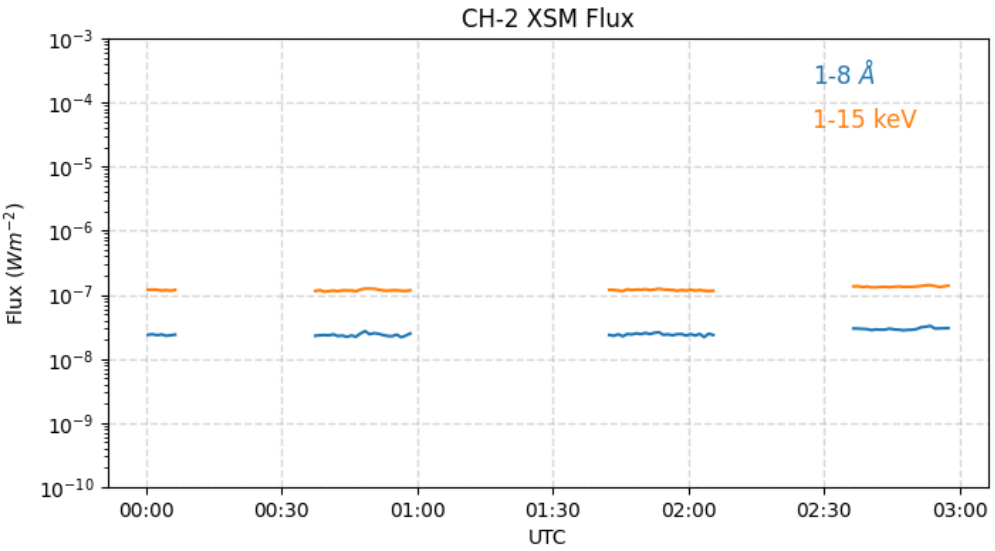


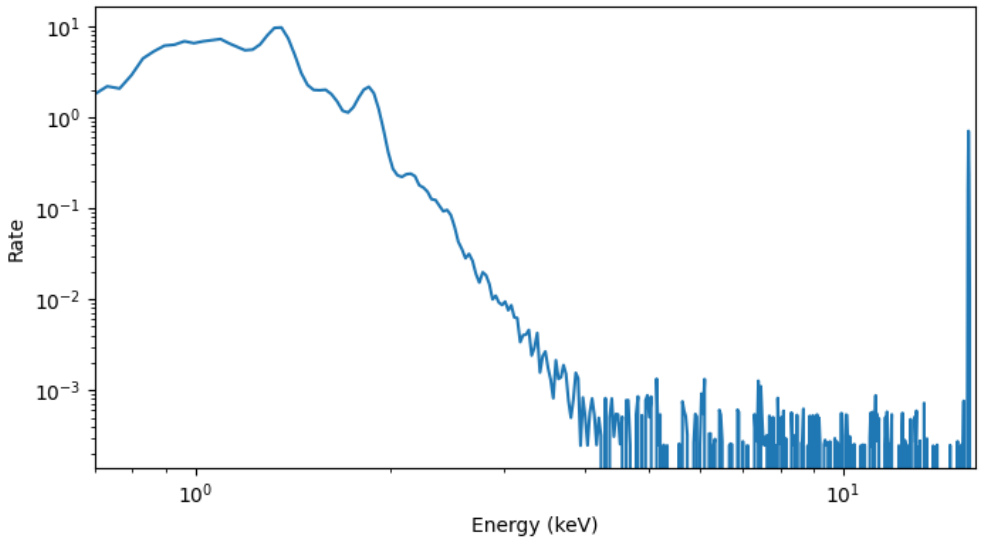
Date: 2021-05-11



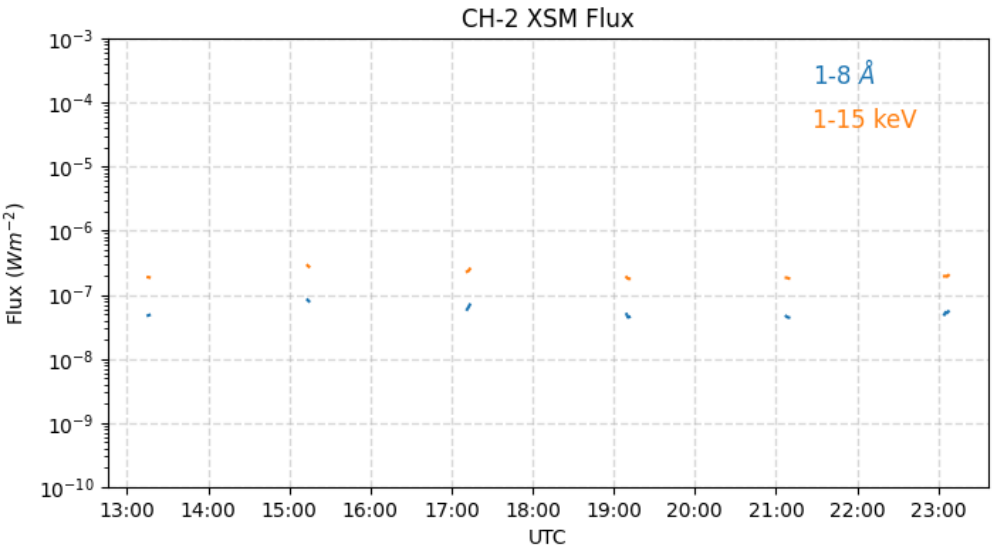


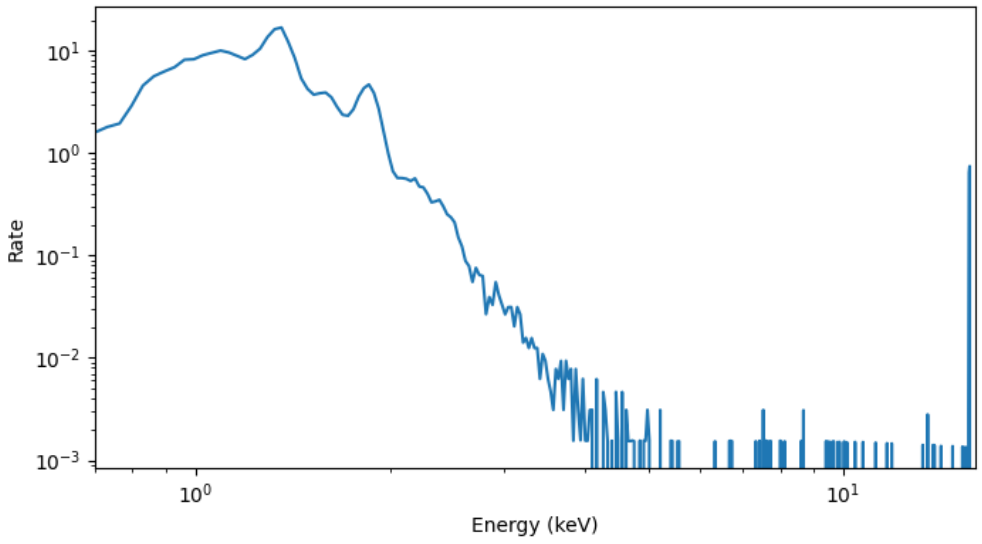
Date: 2021-05-12





Date: 2021-06-04





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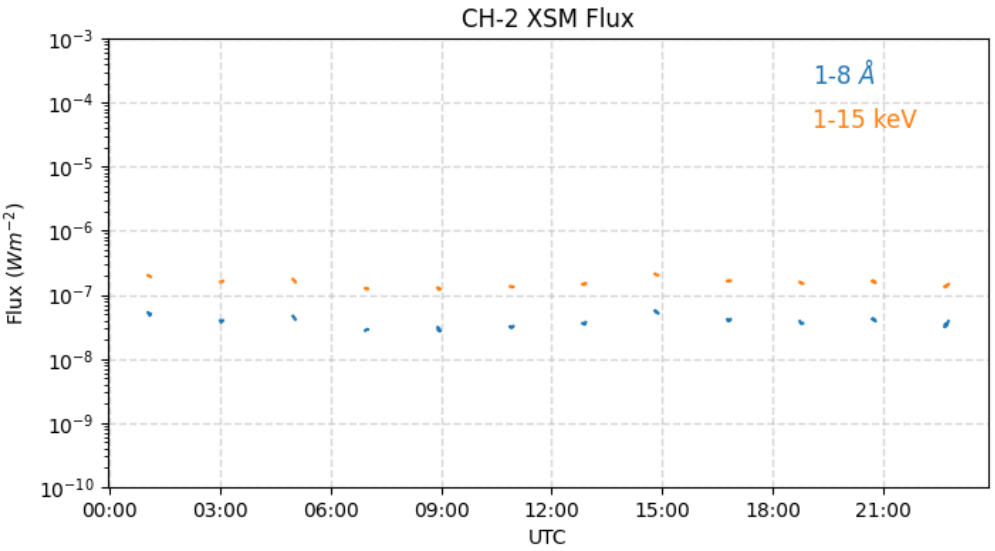
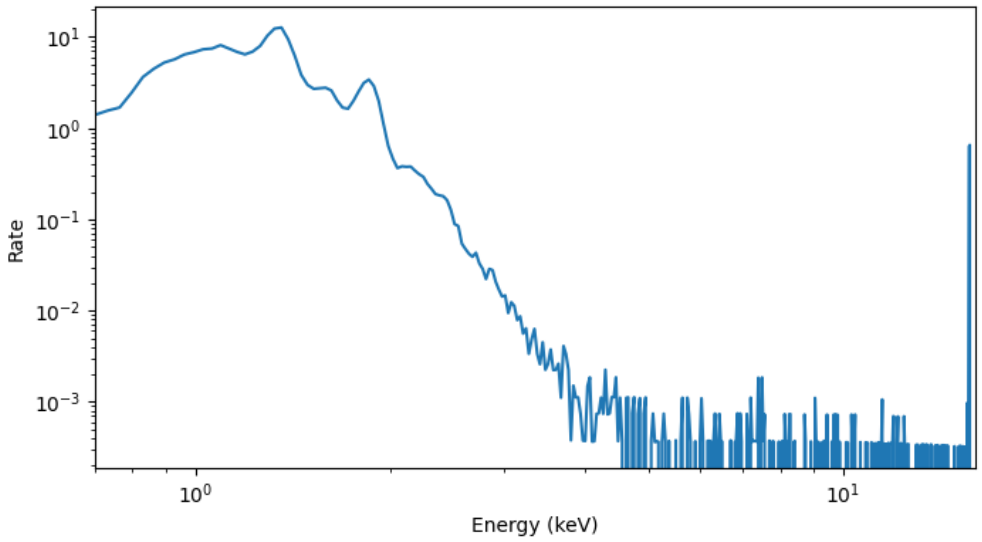
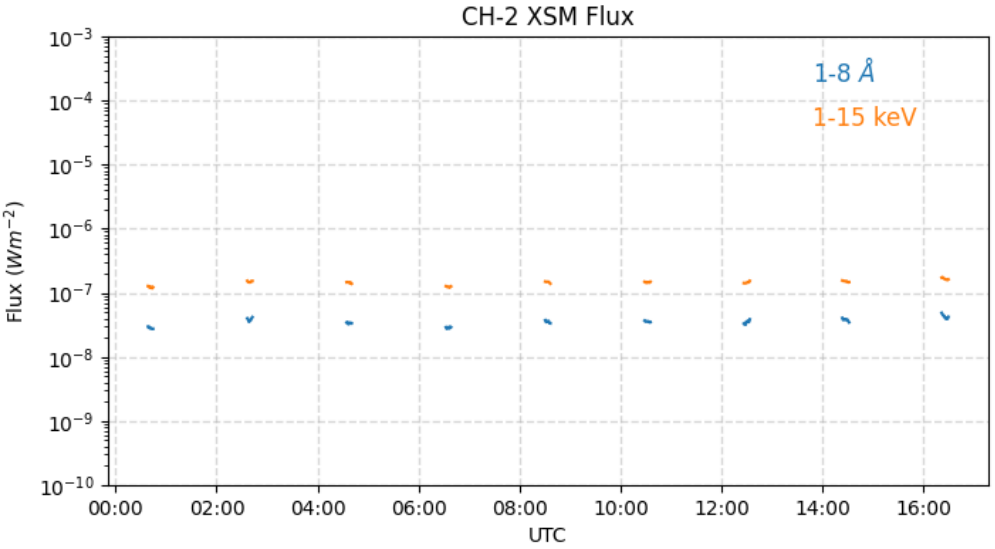
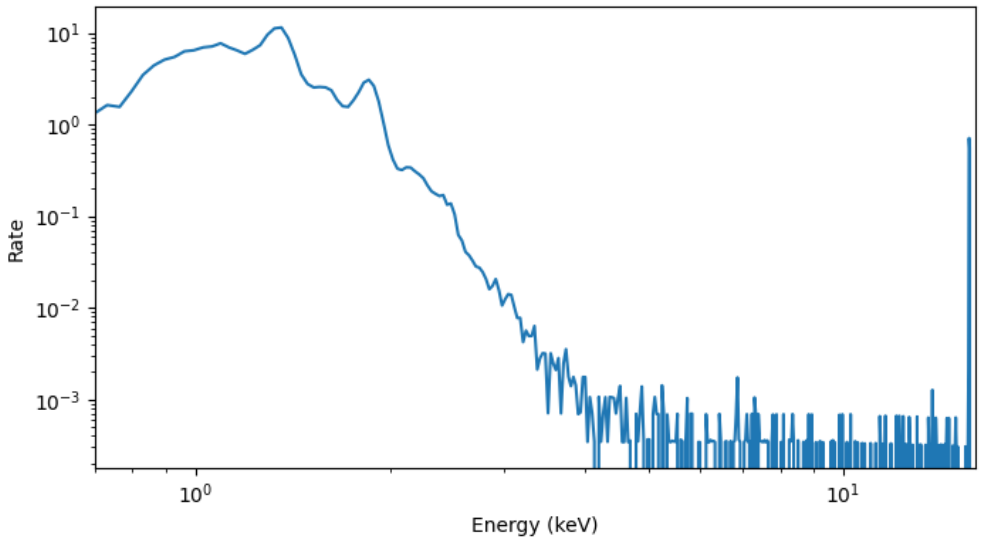




Date: 2021-06-06





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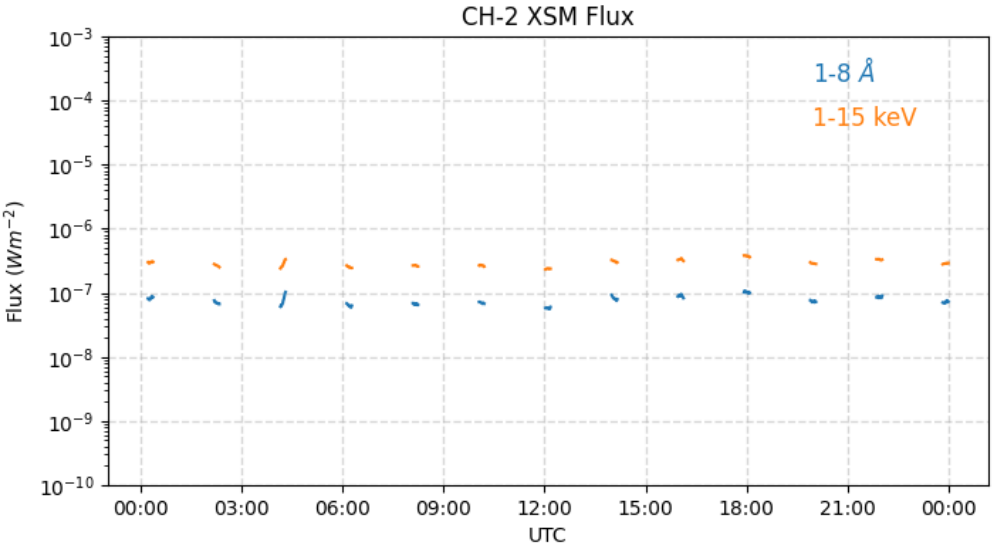

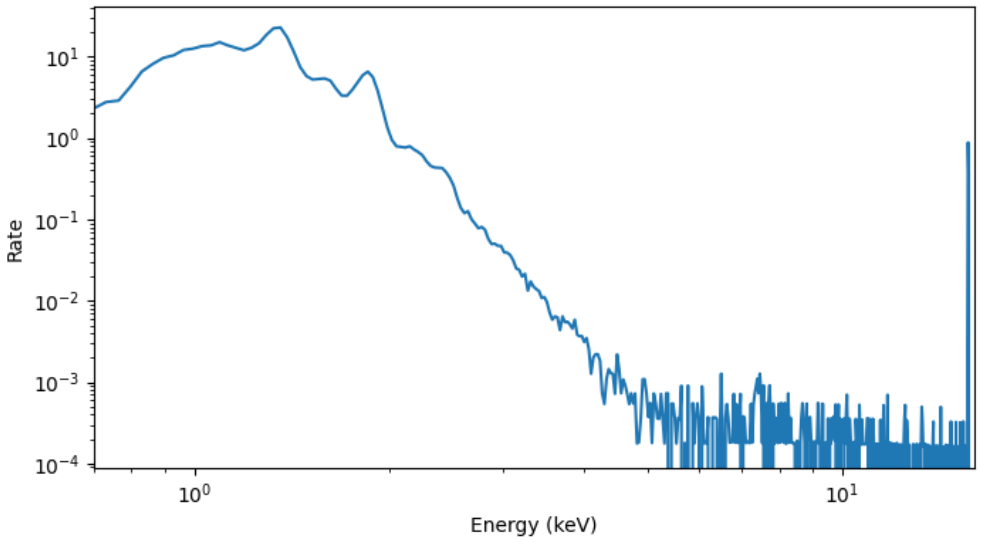

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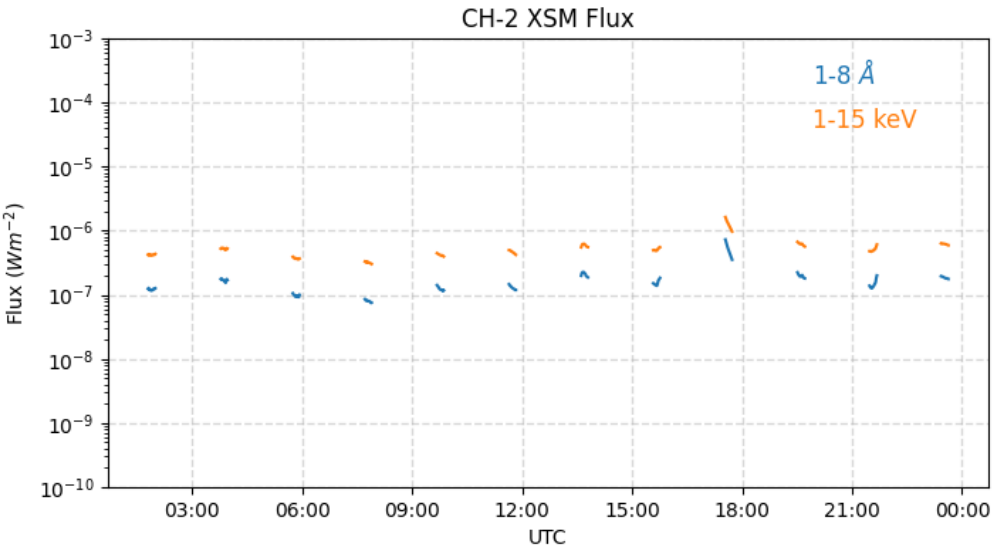

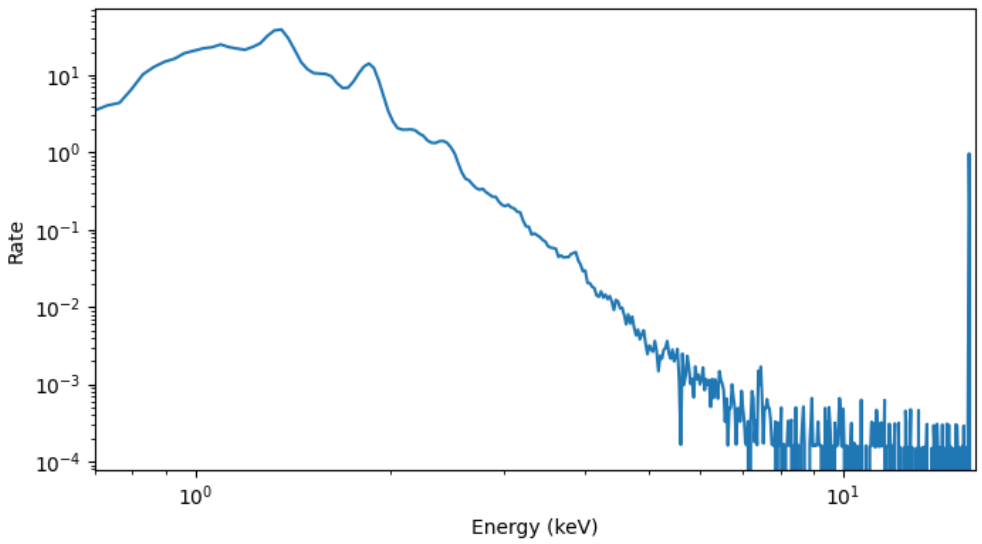

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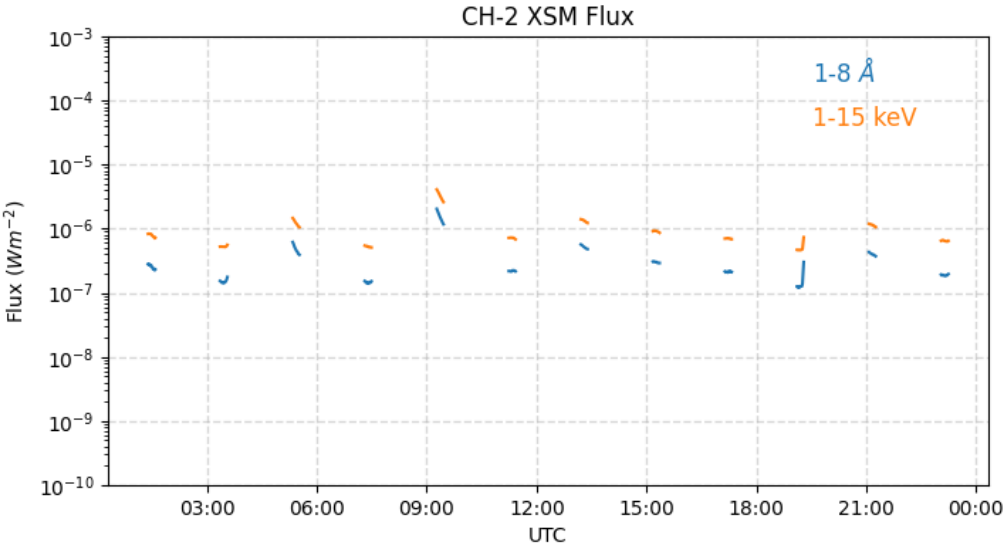

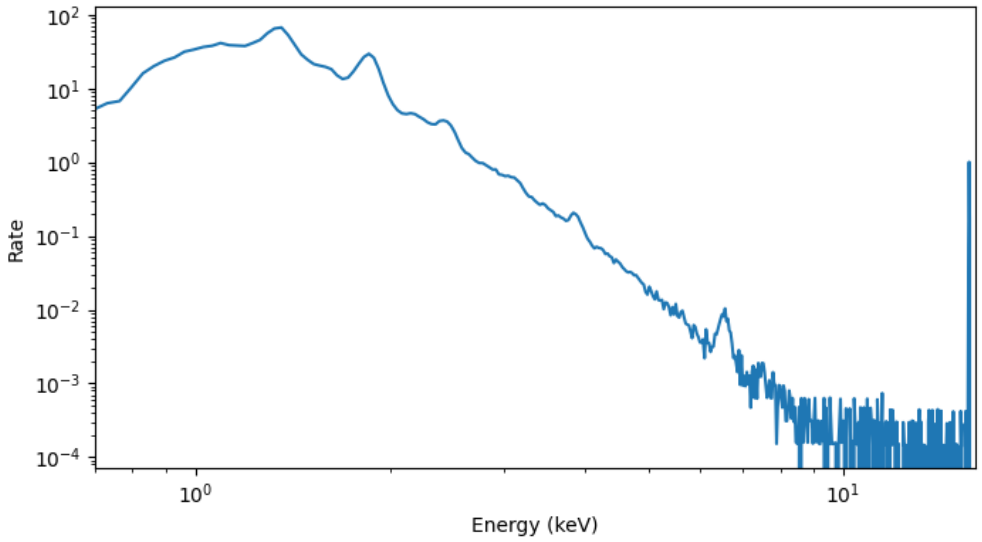

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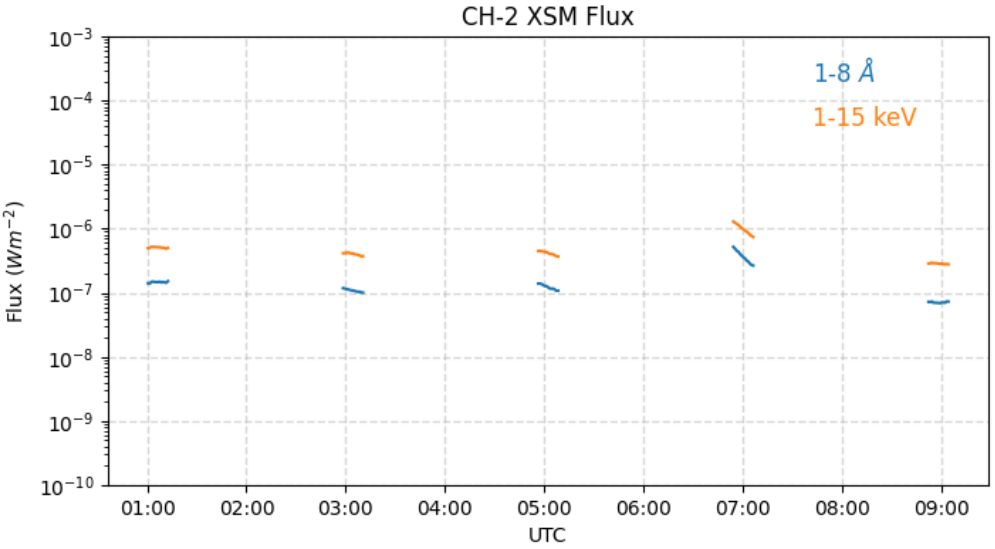
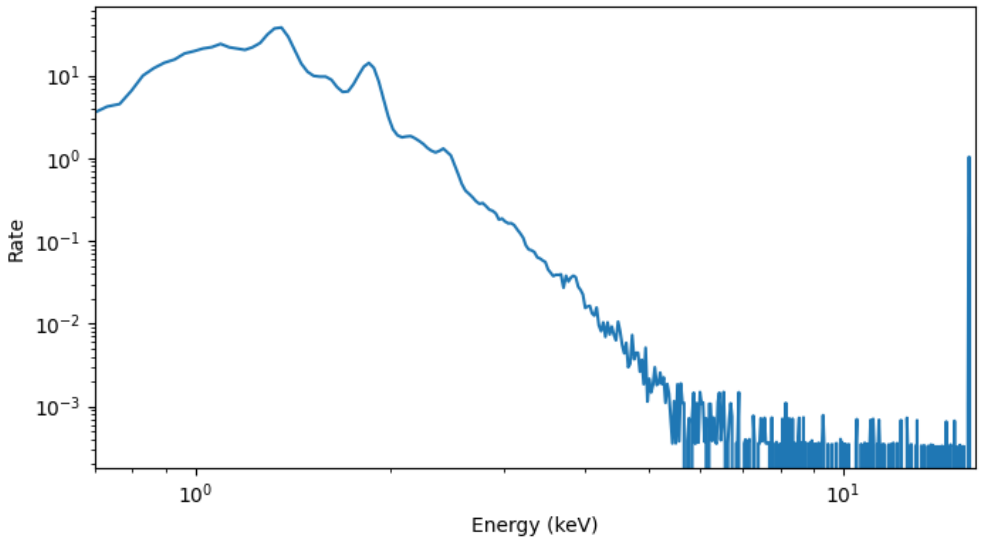
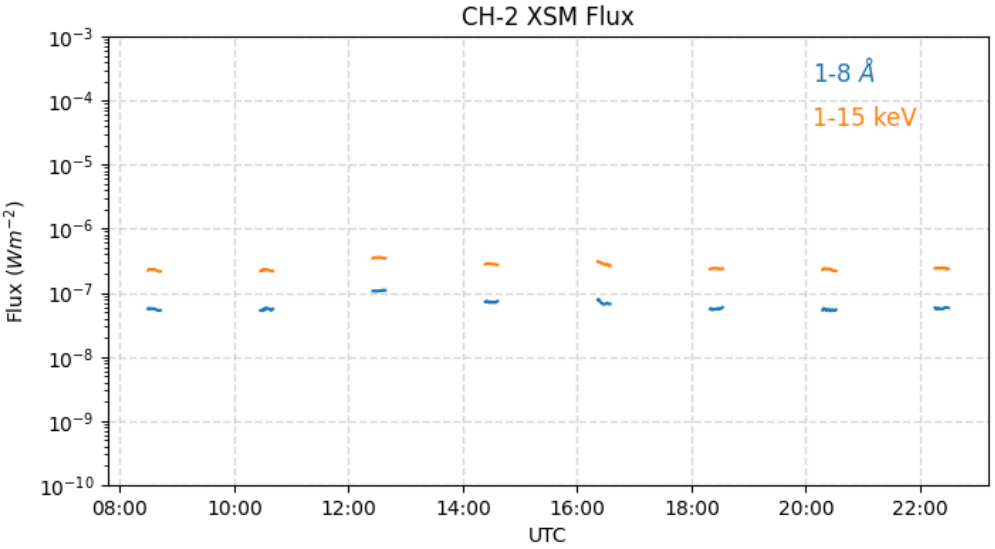
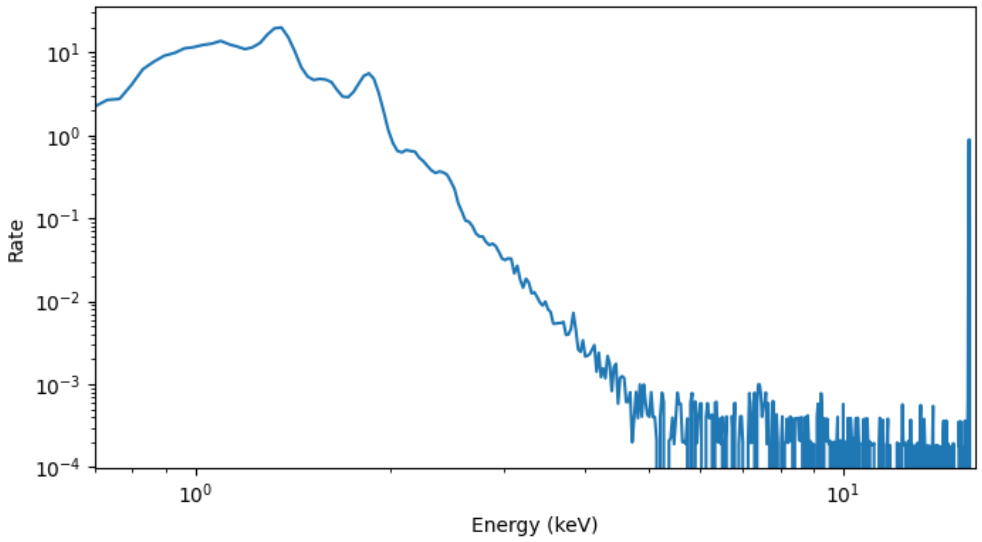


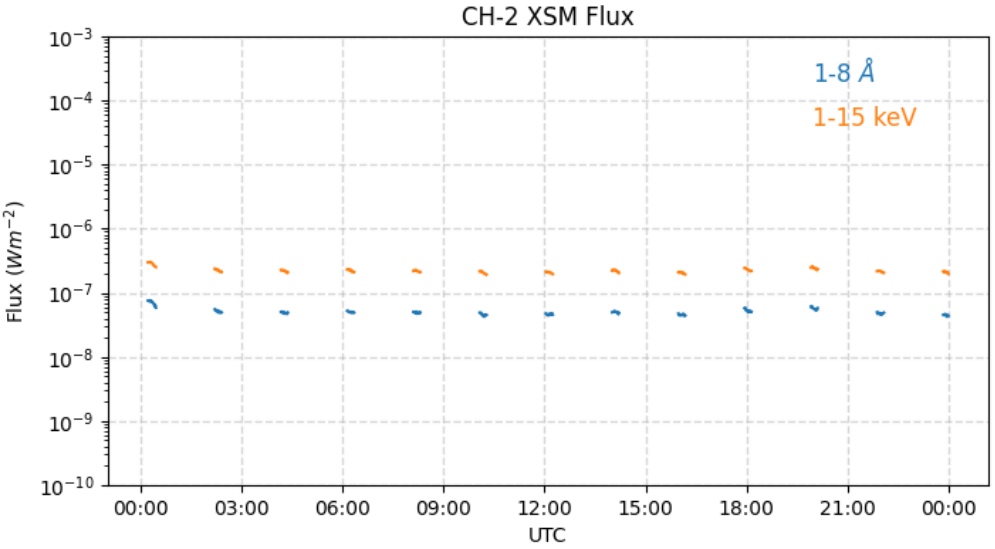


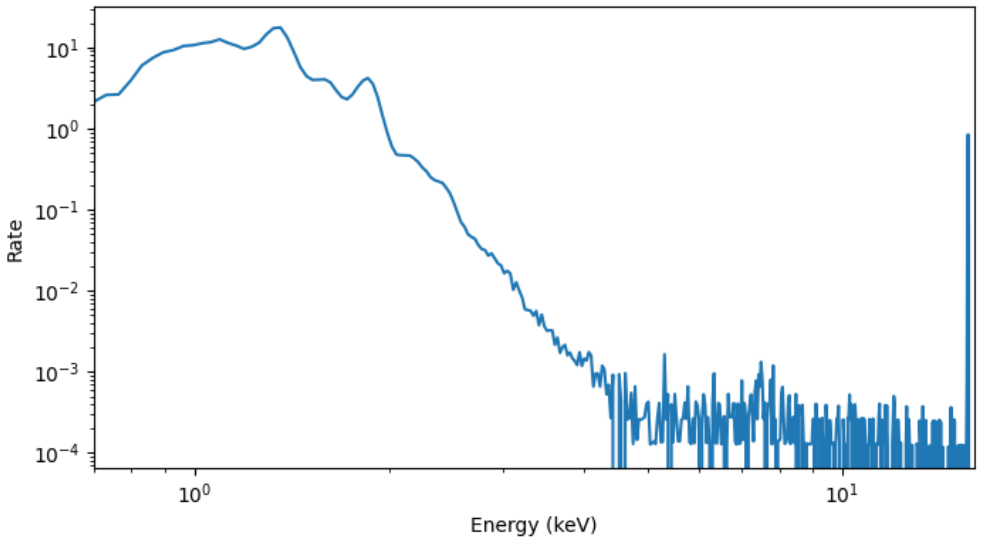
Date: 2021-06-11



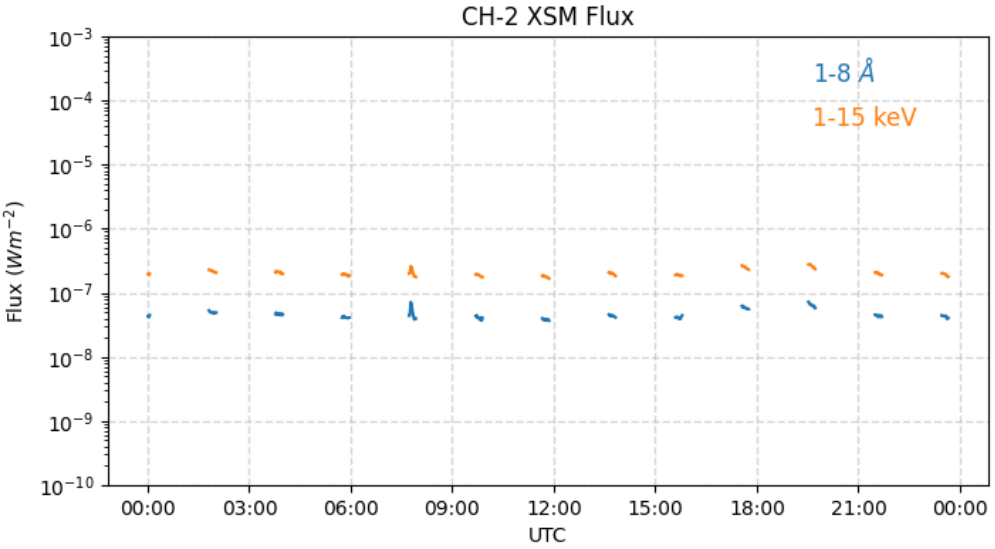


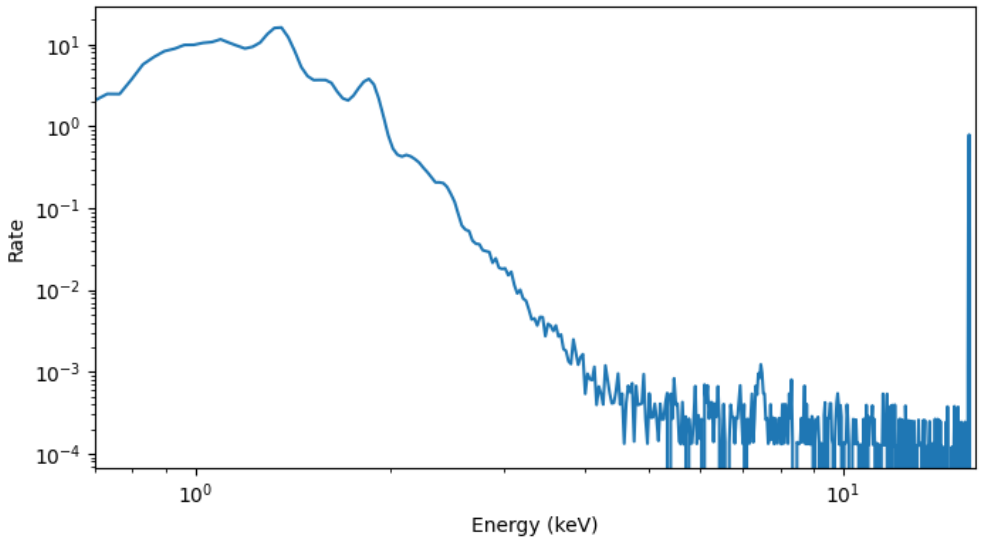
Date: 2021-06-12



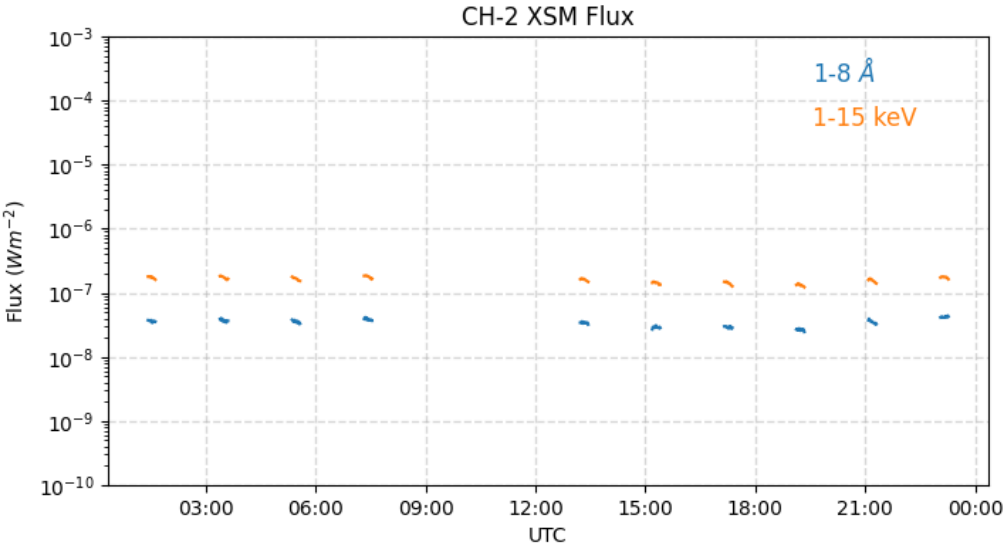


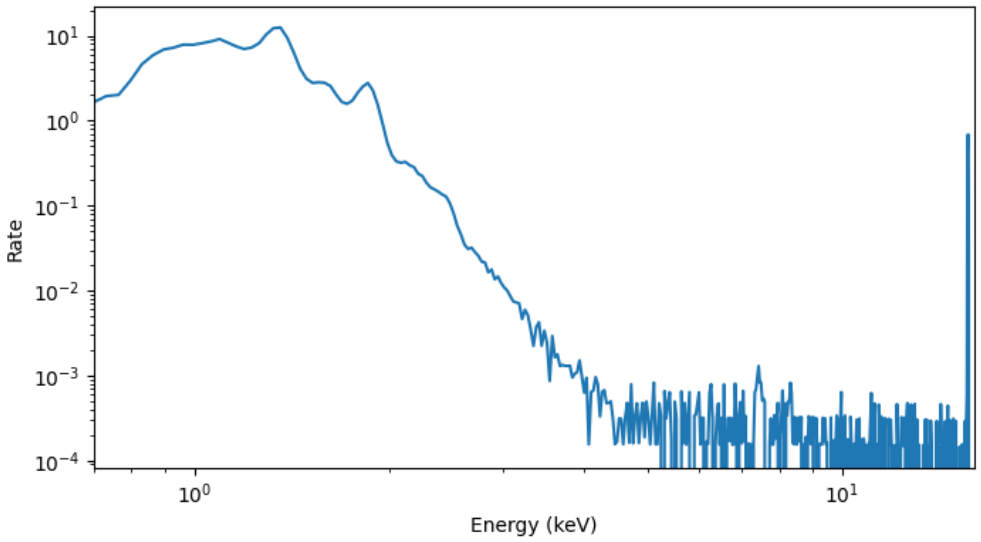
Date: 2021-06-13





Date: 2021-06-14





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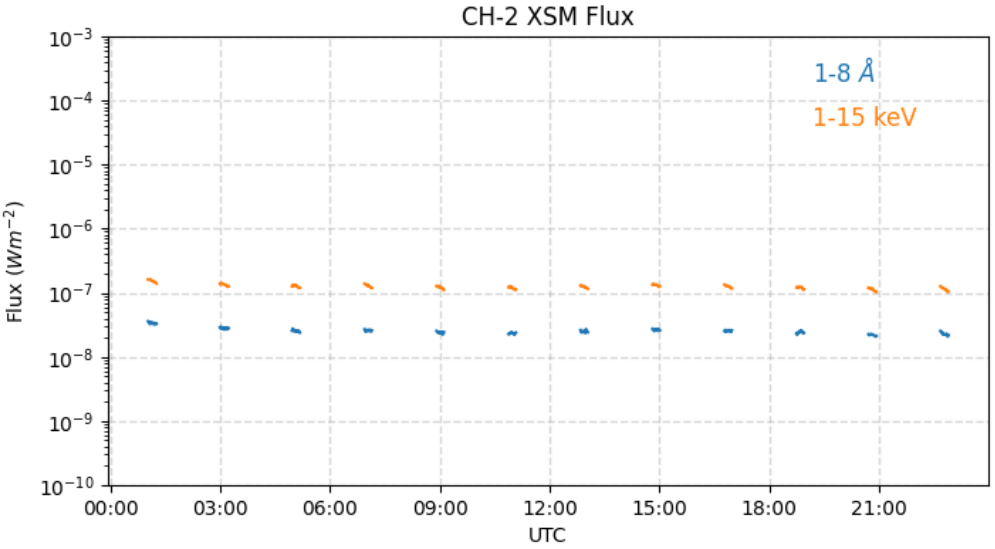
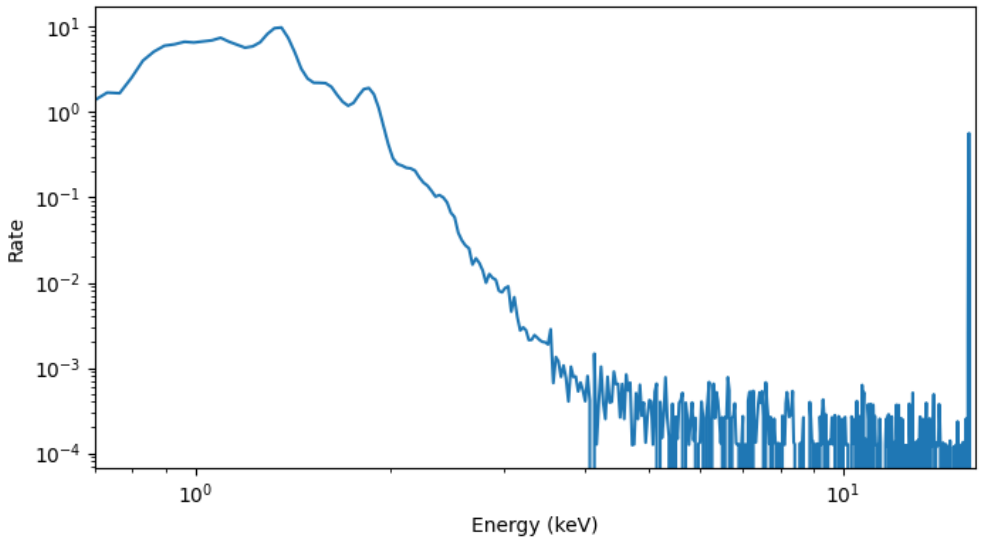
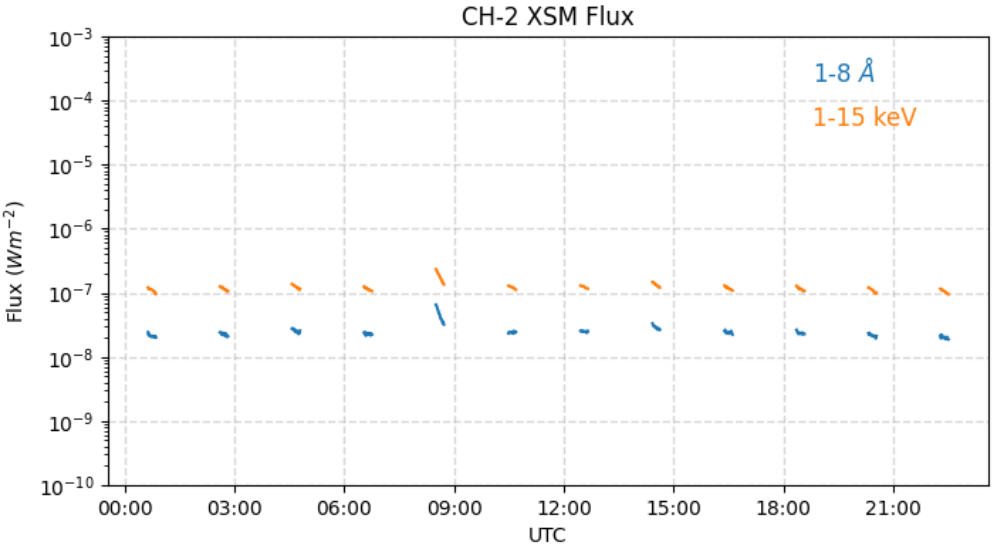
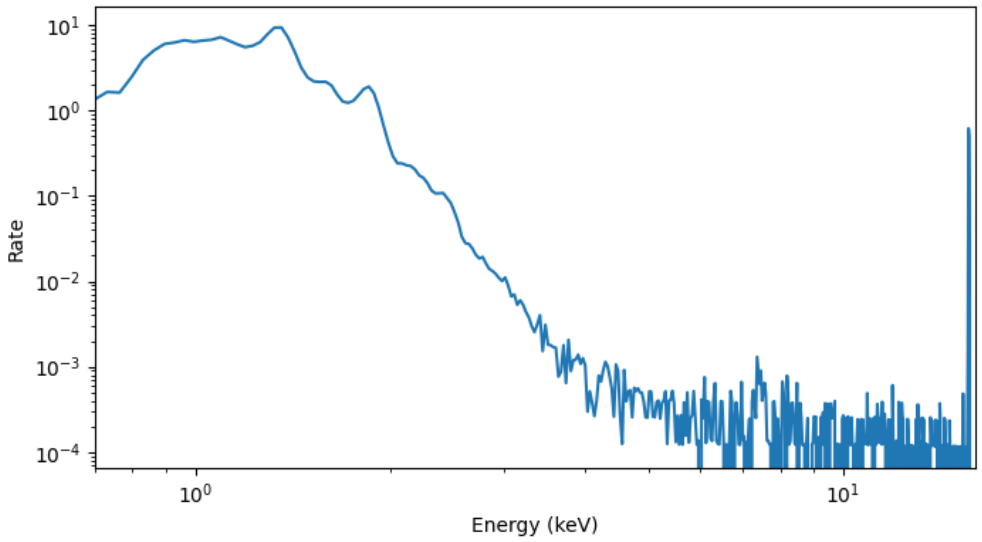


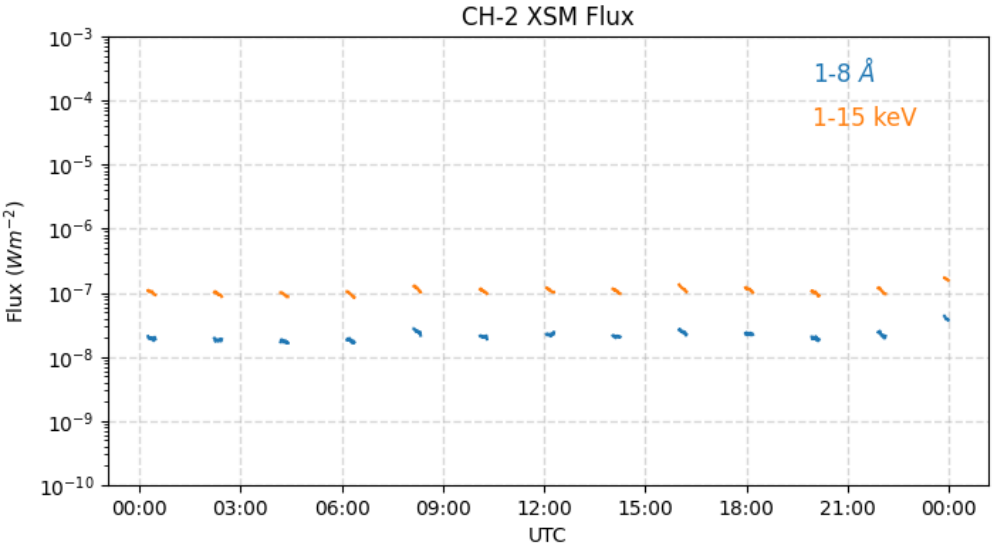


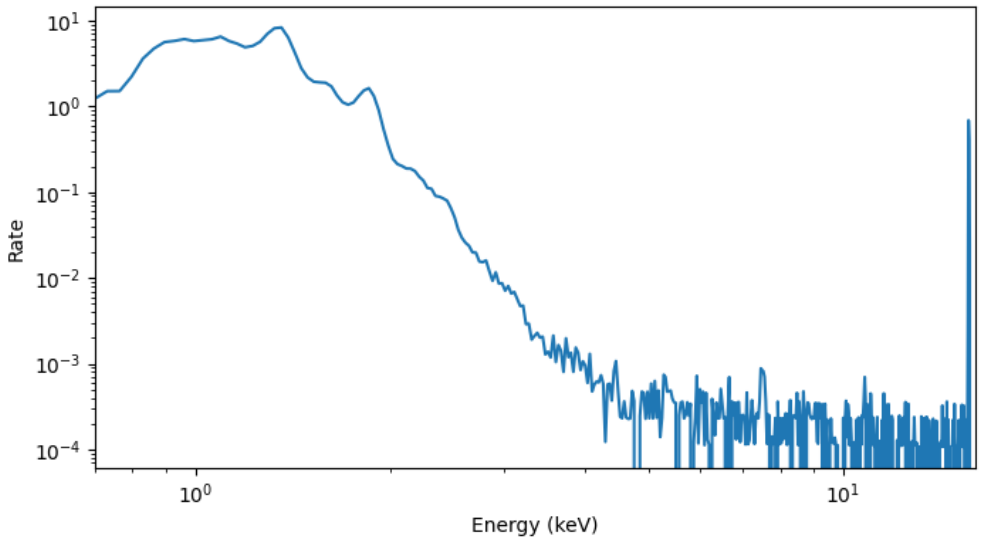
Date: 2021-06-16





Date: 2021-06-17





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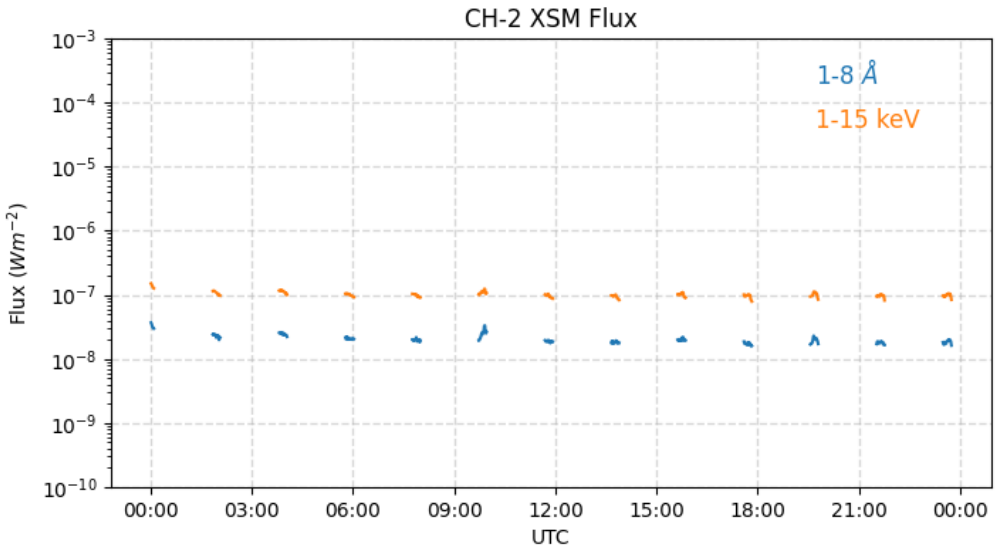

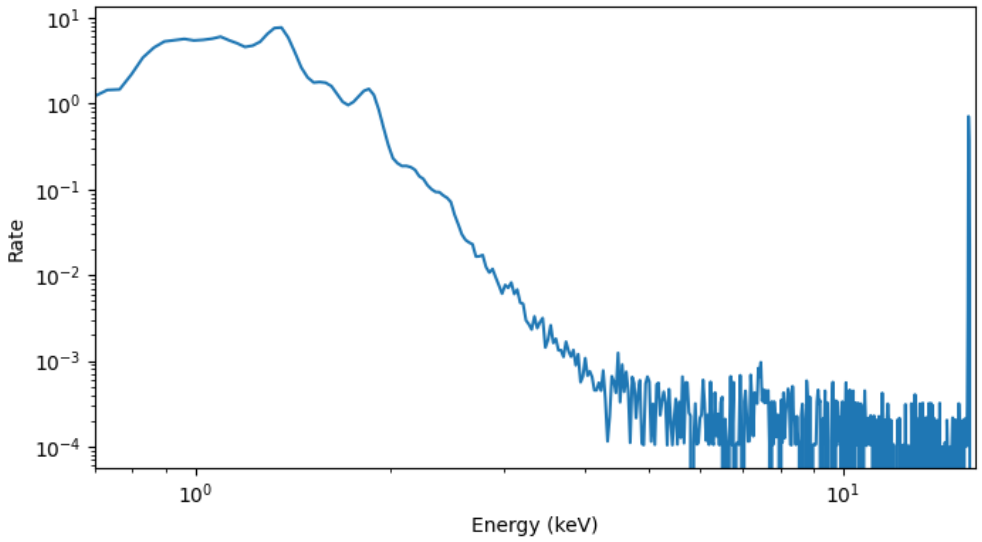

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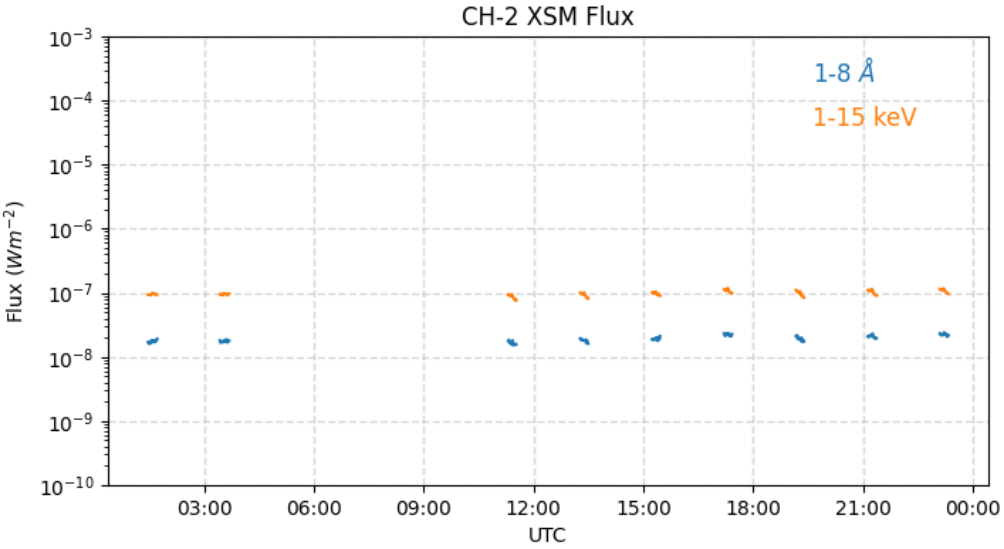

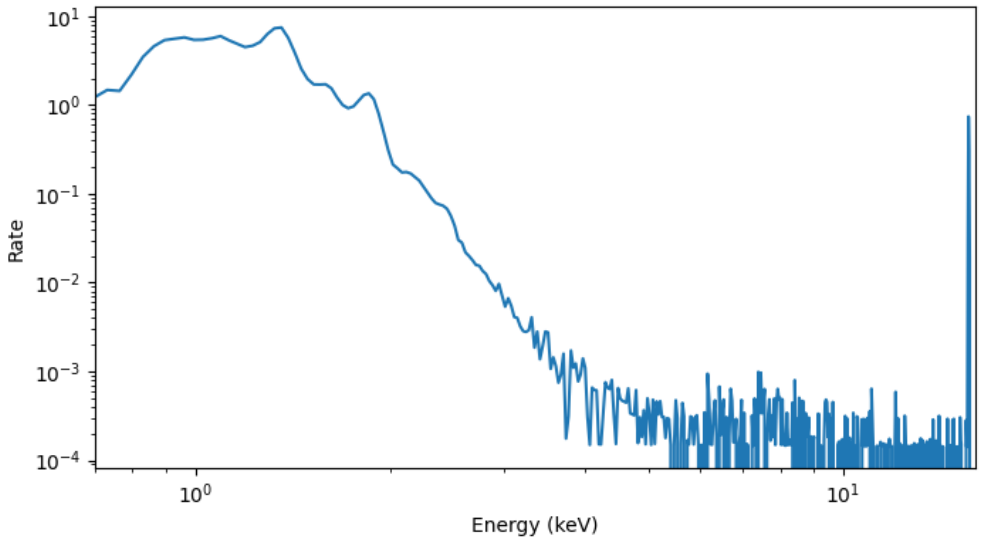

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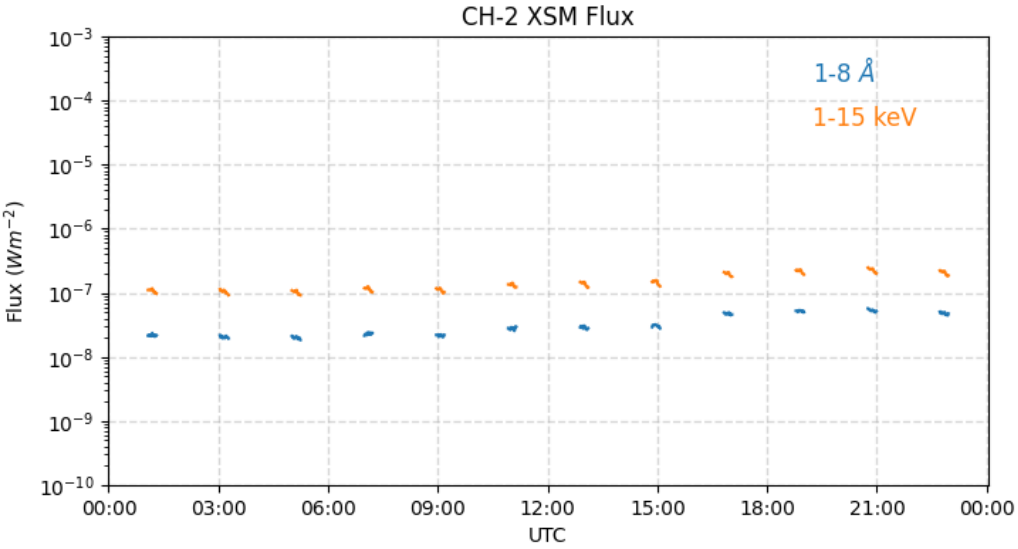

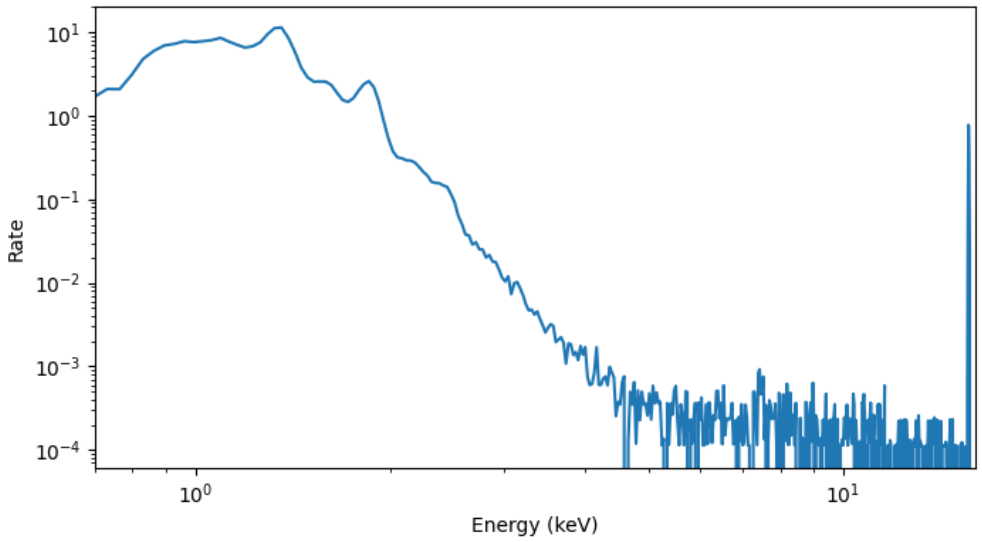

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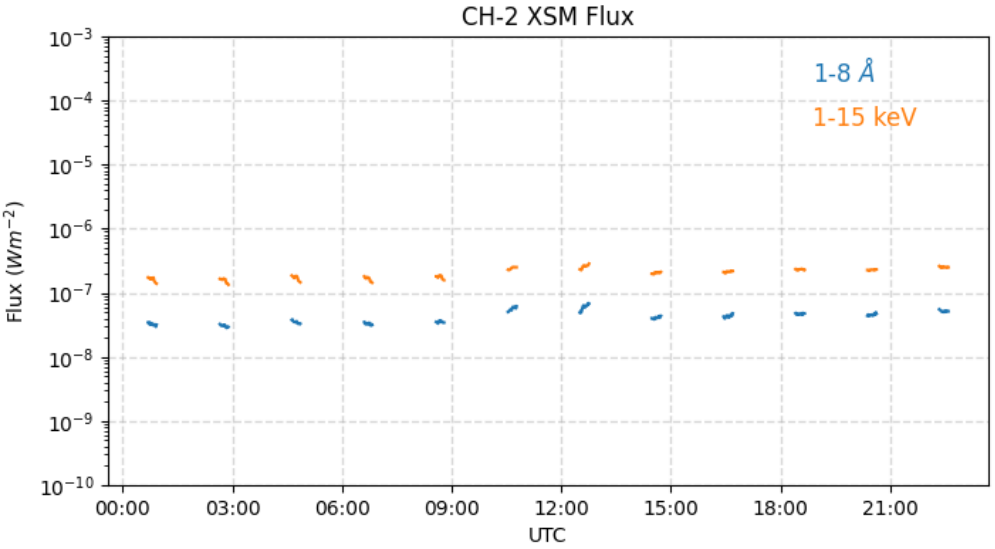

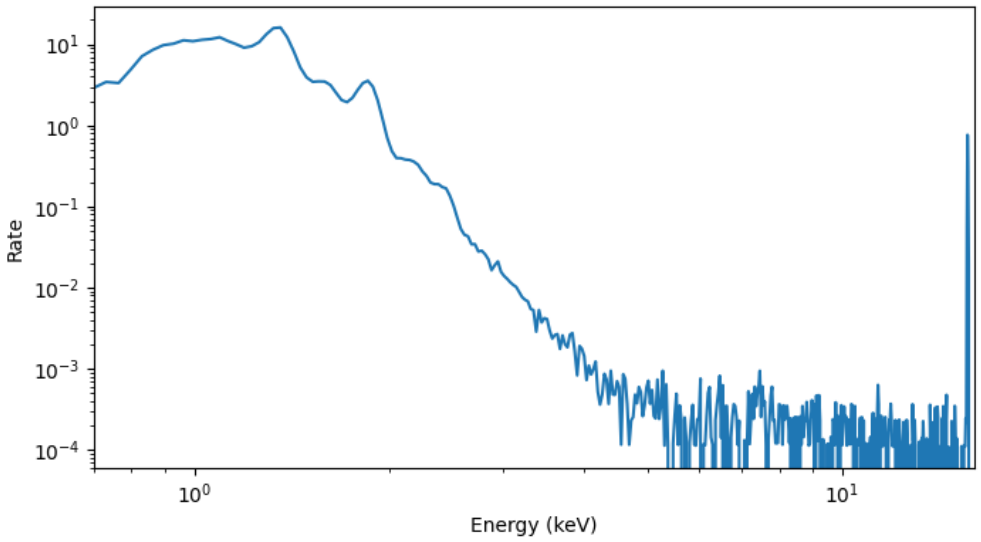

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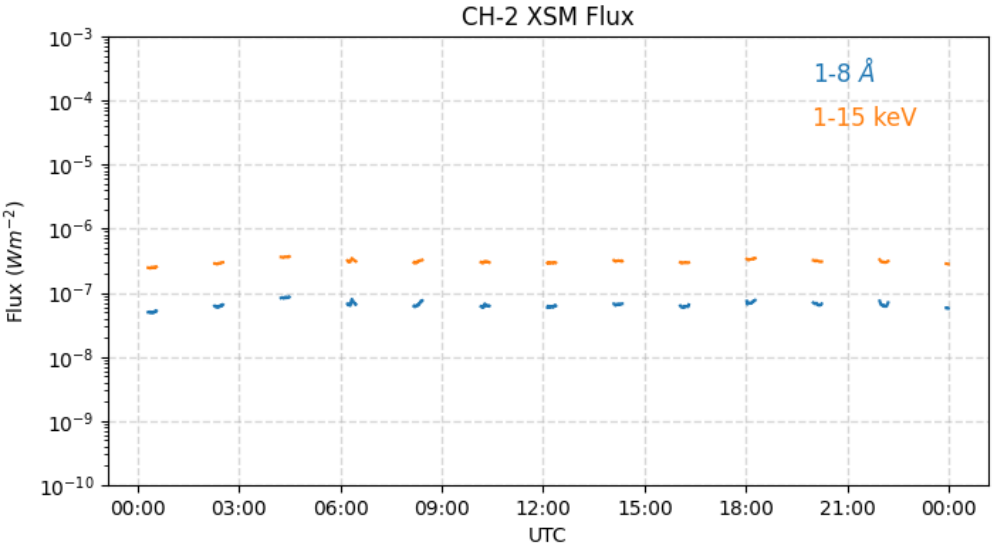

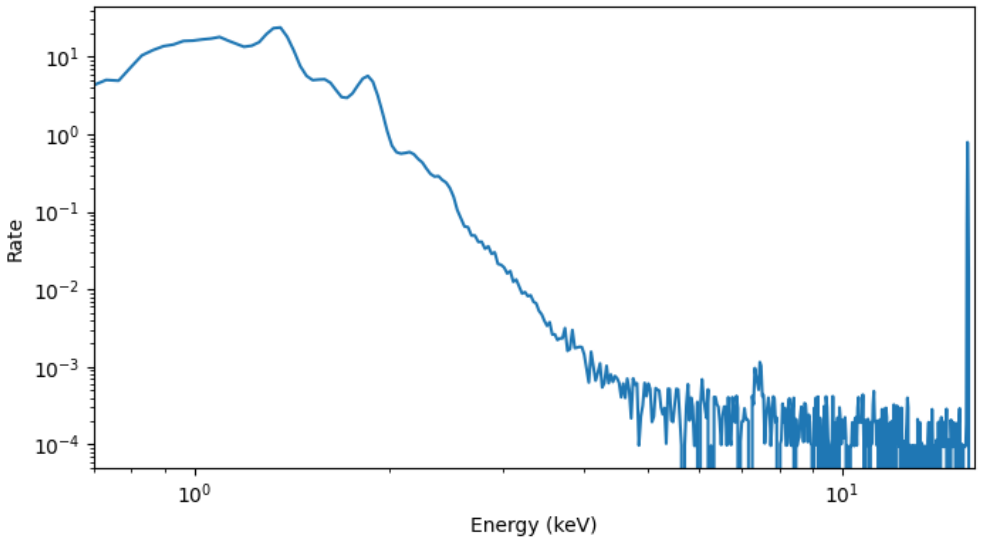

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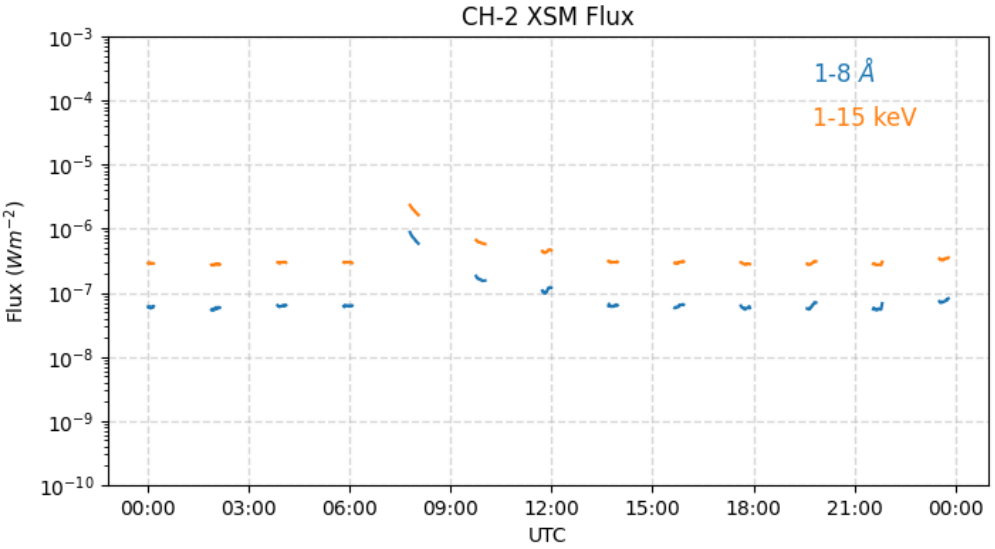
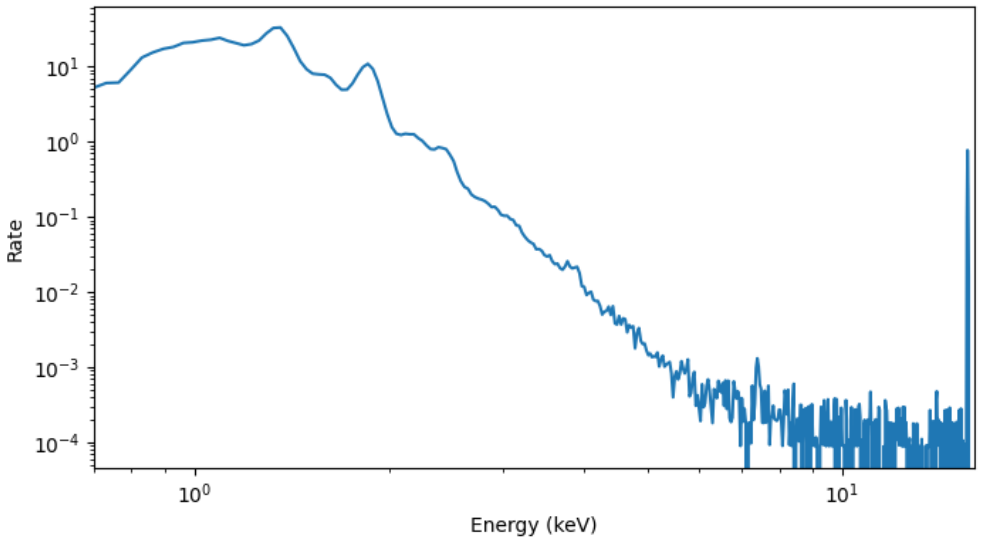




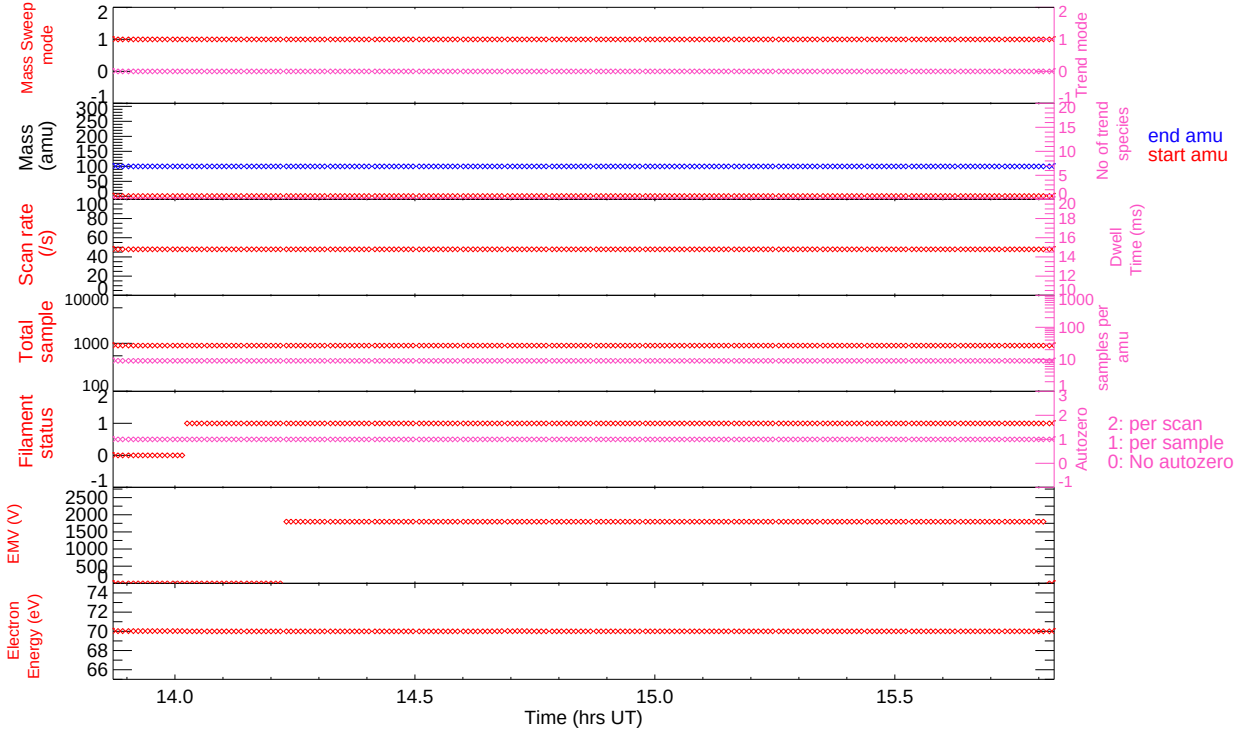


Annexure-3

Data Products of CHandra's Atmospheric Composition Explorer-2 (CHACE-2)

CHACE2 Operating parameters

2019-09-11 13:52:16 TO 2019-09-11 15:49:55

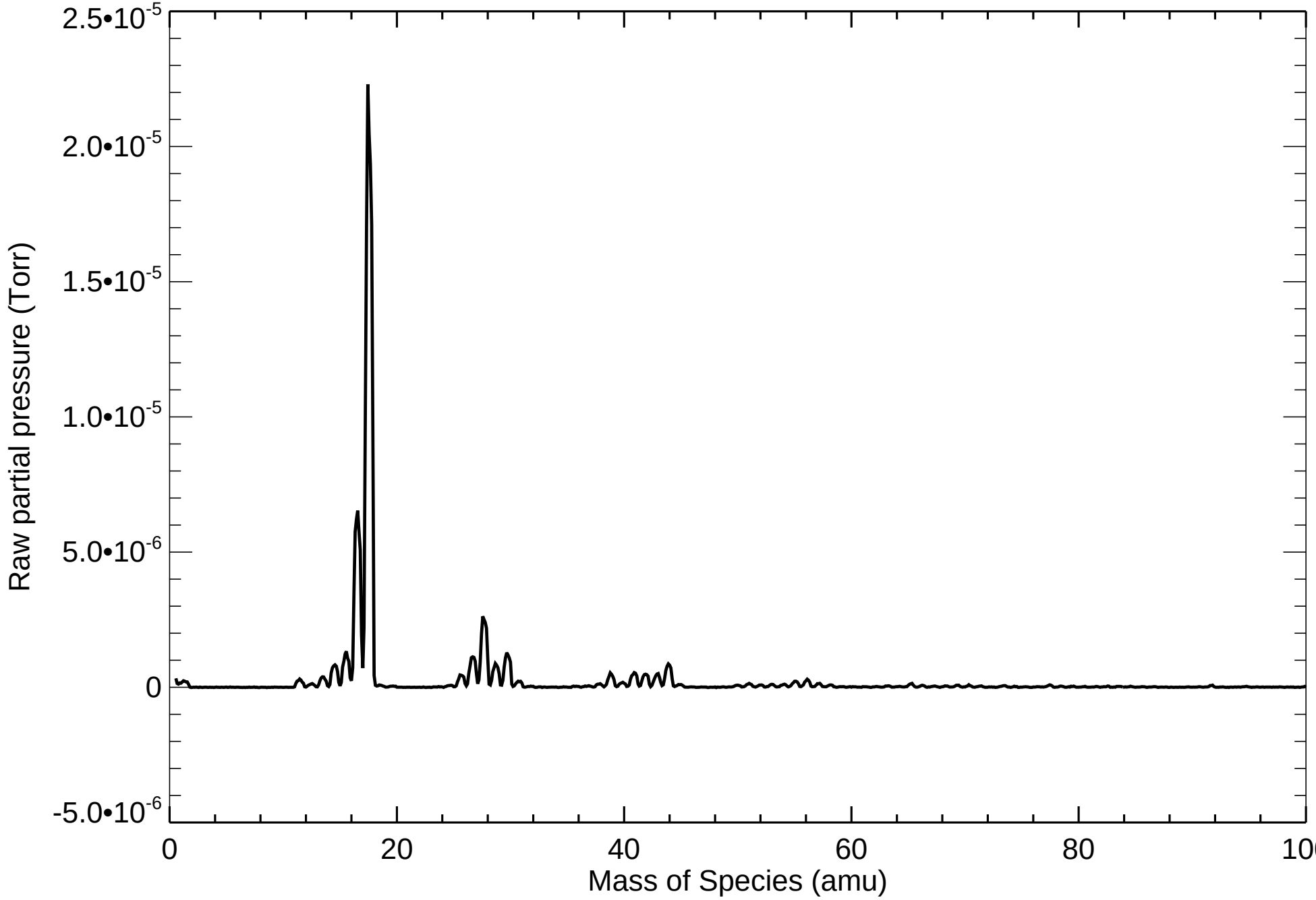


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:13:56:059 UT SWEEP: 0036 Filament: ON

Altitude (km): 113.01 Roll Angle (deg): 91.41

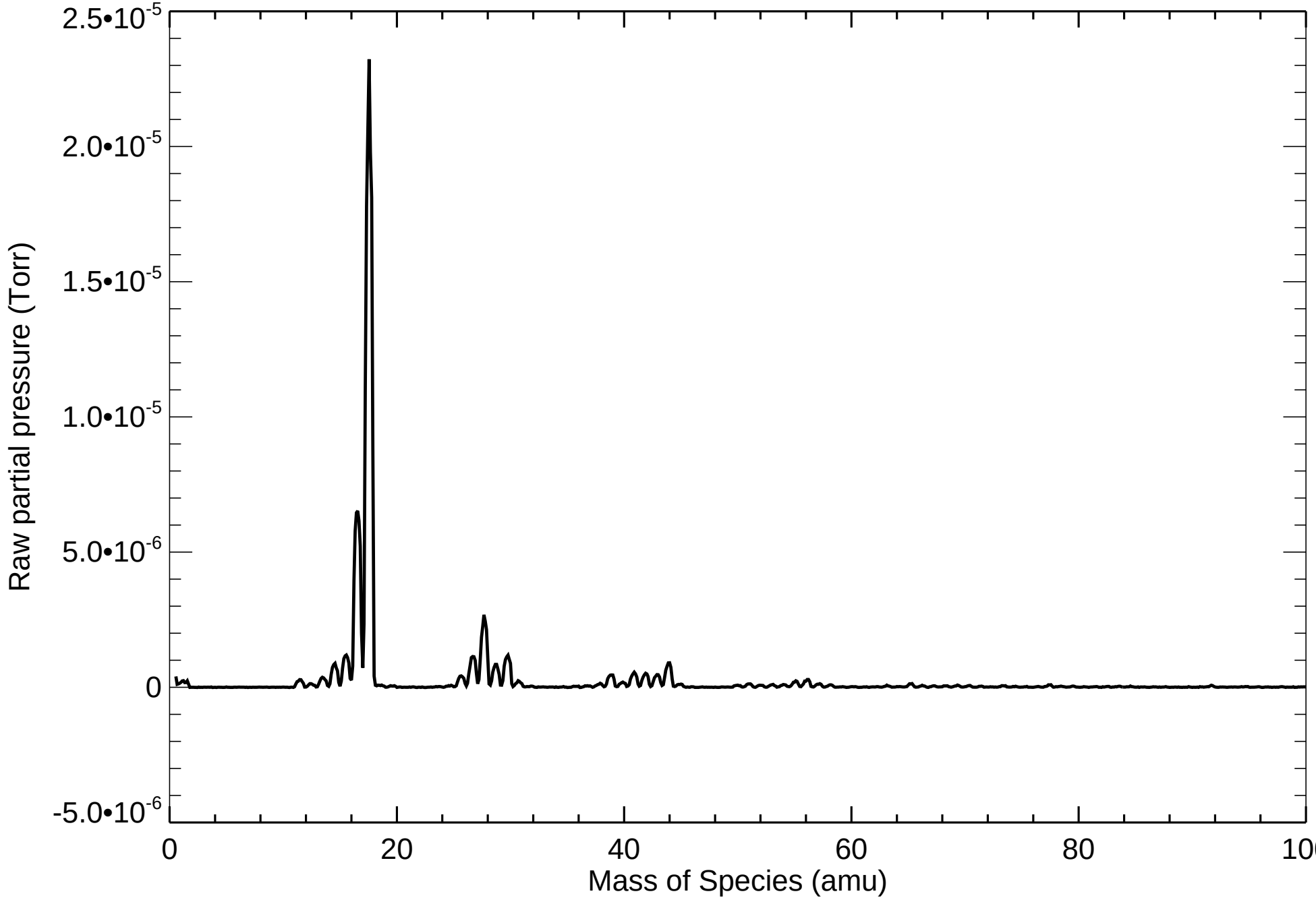


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:14:30:000 UT SWEEP: 0037 Filament: ON

Altitude (km): 114.02 Roll Angle (deg): 90.84

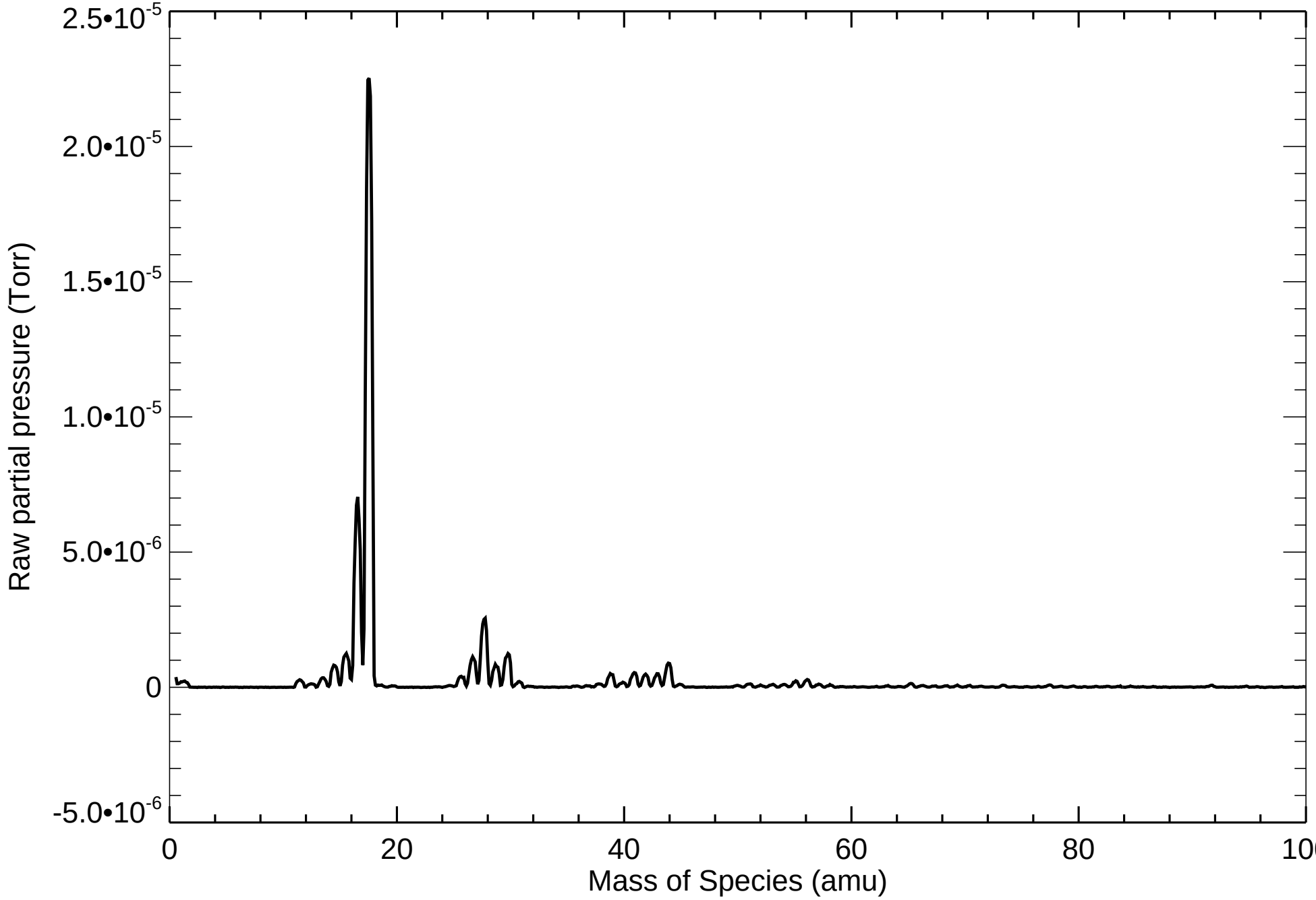


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:15:07:031 UT SWEEP: 0038 Filament: ON

Altitude (km): 114.99 Roll Angle (deg): 90.21

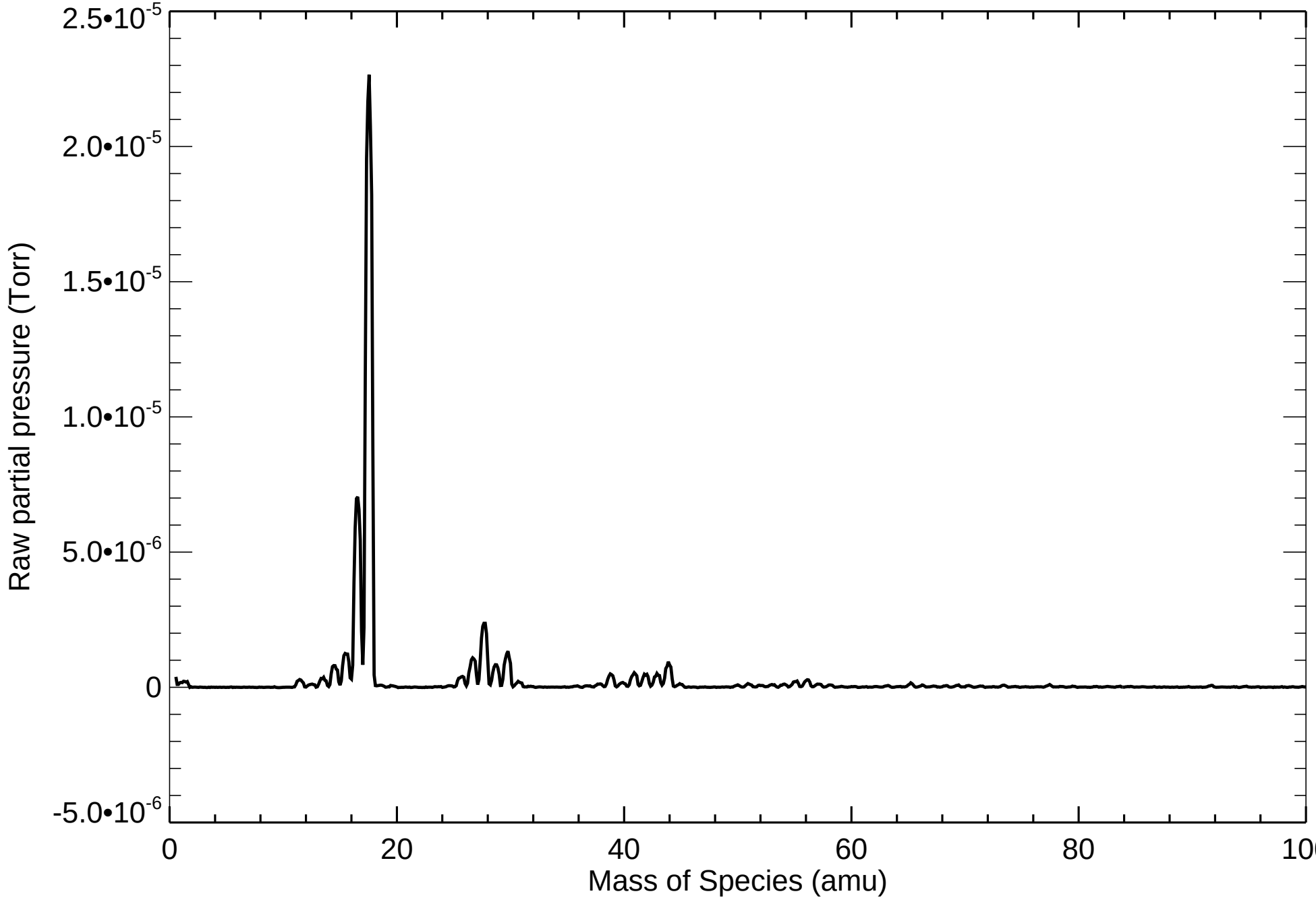


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:15:42:063 UT SWEEP: 0039 Filament: ON

Altitude (km): 115.73 Roll Angle (deg): 89.62

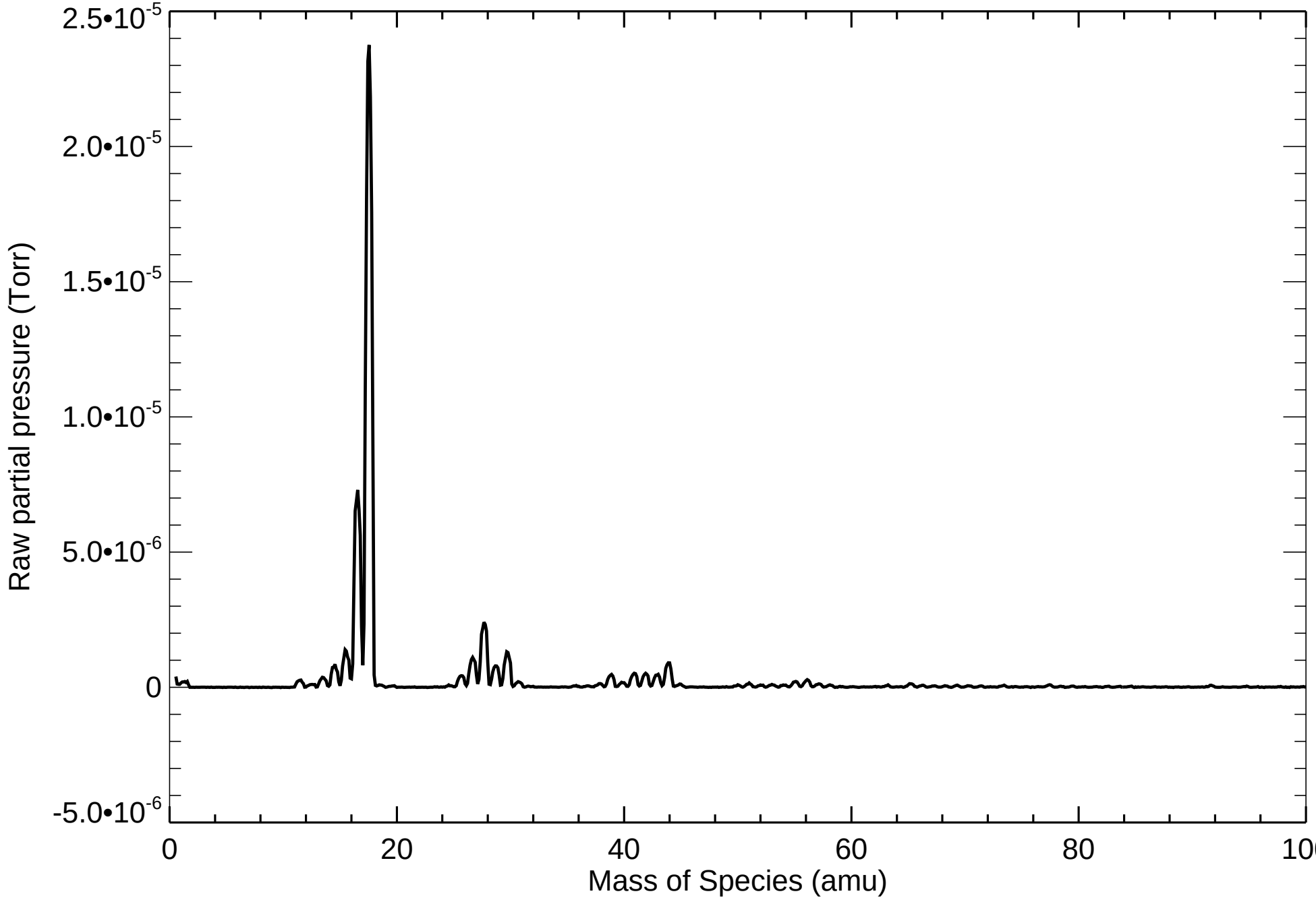


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:16:17:096 UT SWEEP: 0040 Filament: ON

Altitude (km): 116.65 Roll Angle (deg): 89.02

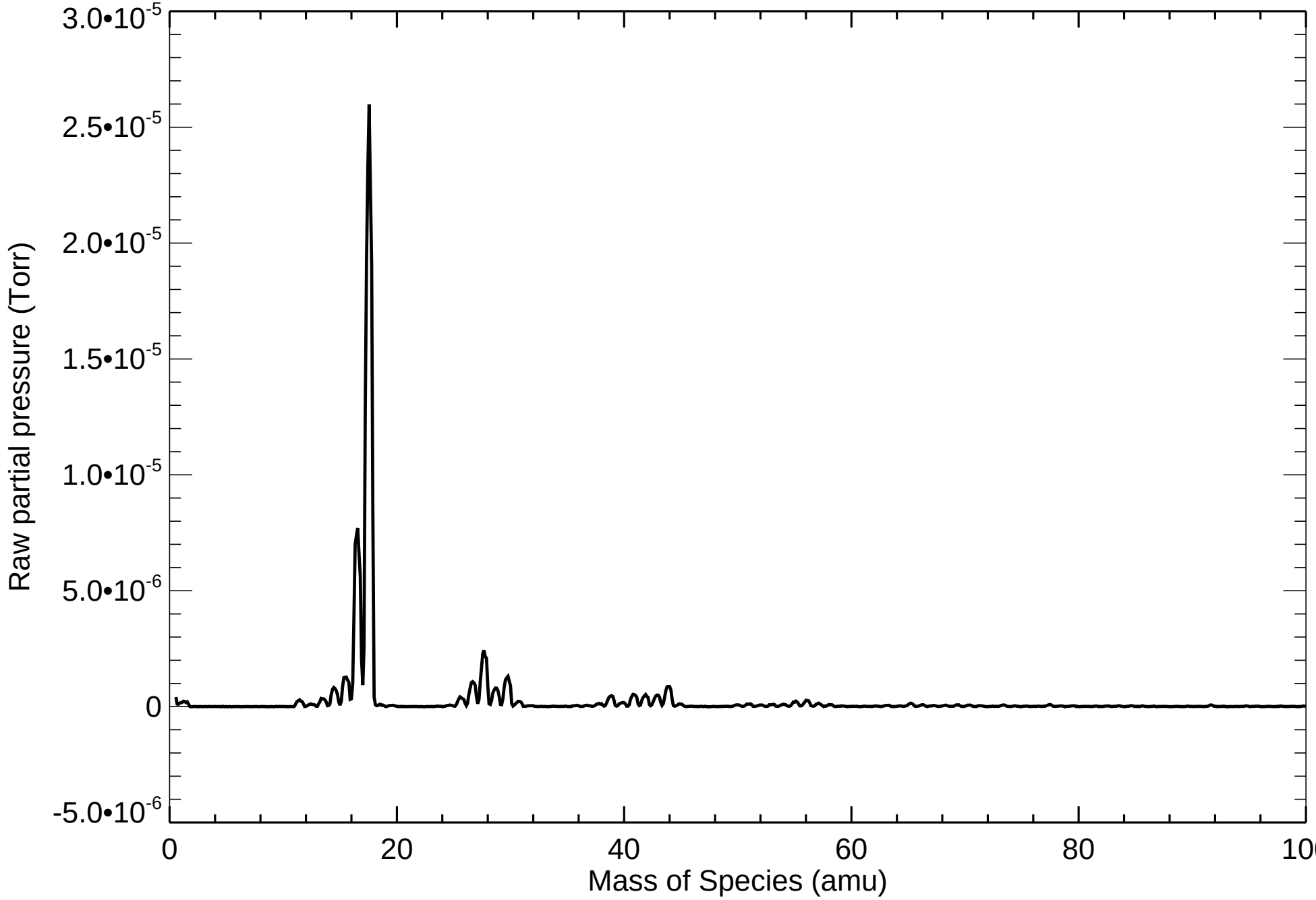


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:16:55:030 UT SWEEP: 0041 Filament: ON

Altitude (km): 117.39 Roll Angle (deg): 88.38

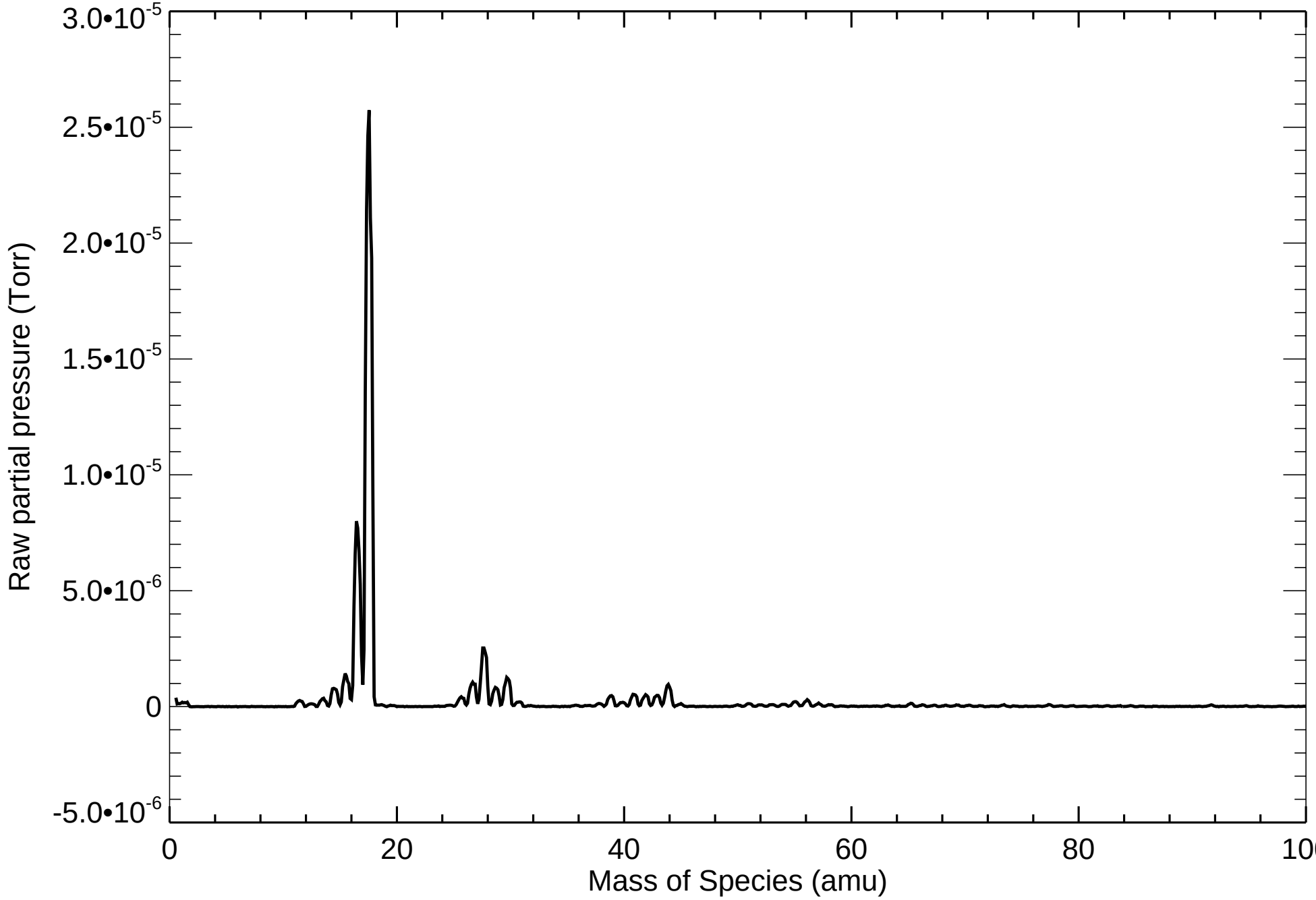


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:17:30:062 UT SWEEP: 0042 Filament: ON

Altitude (km): 118.33 Roll Angle (deg): 87.79

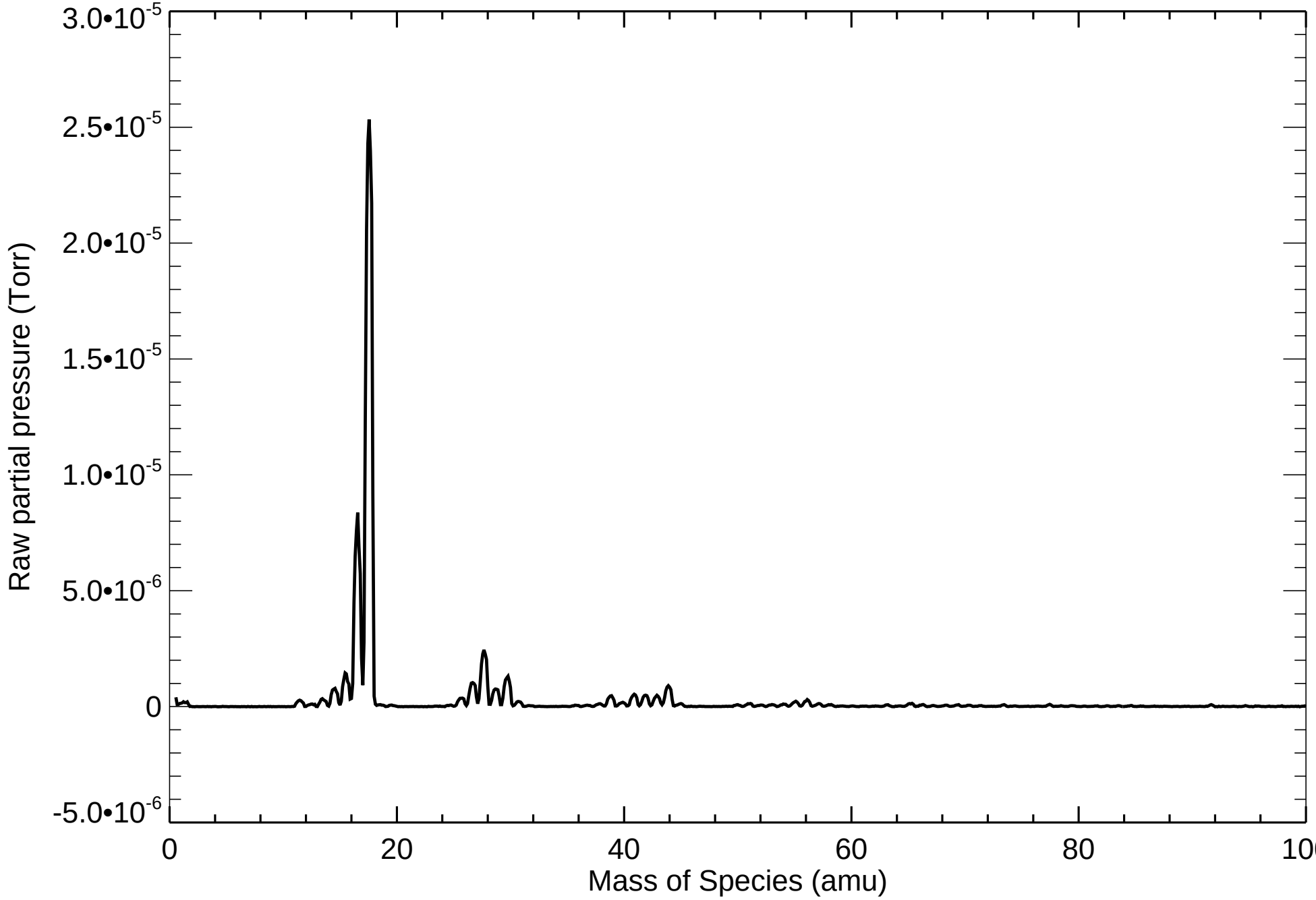


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:18:07:093 UT SWEEP: 0043 Filament: ON

Altitude (km): 119.28 Roll Angle (deg): 87.17

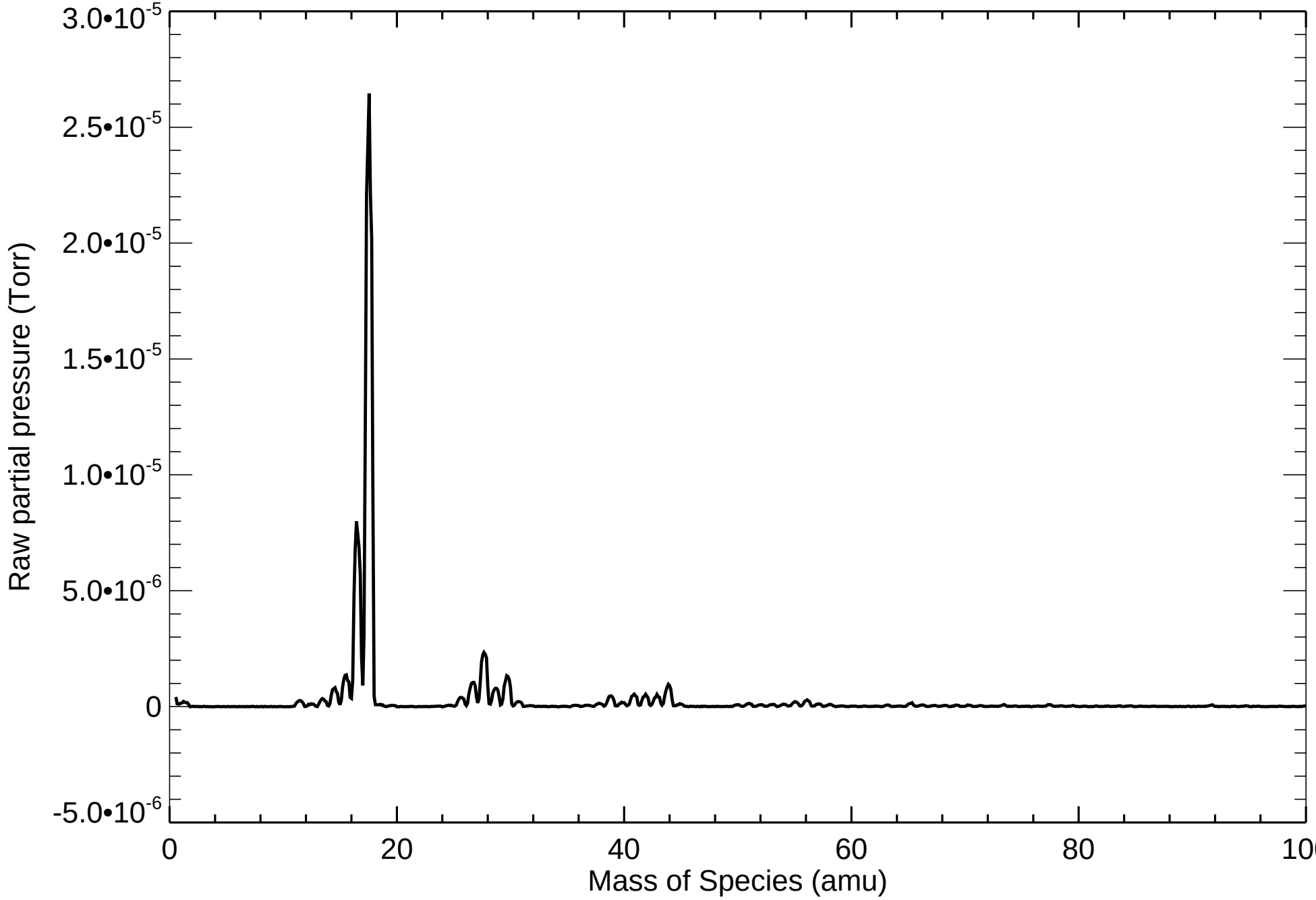


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:18:43:025 UT SWEEP: 0044 Filament: ON

Altitude (km): 119.97 Roll Angle (deg): 86.58

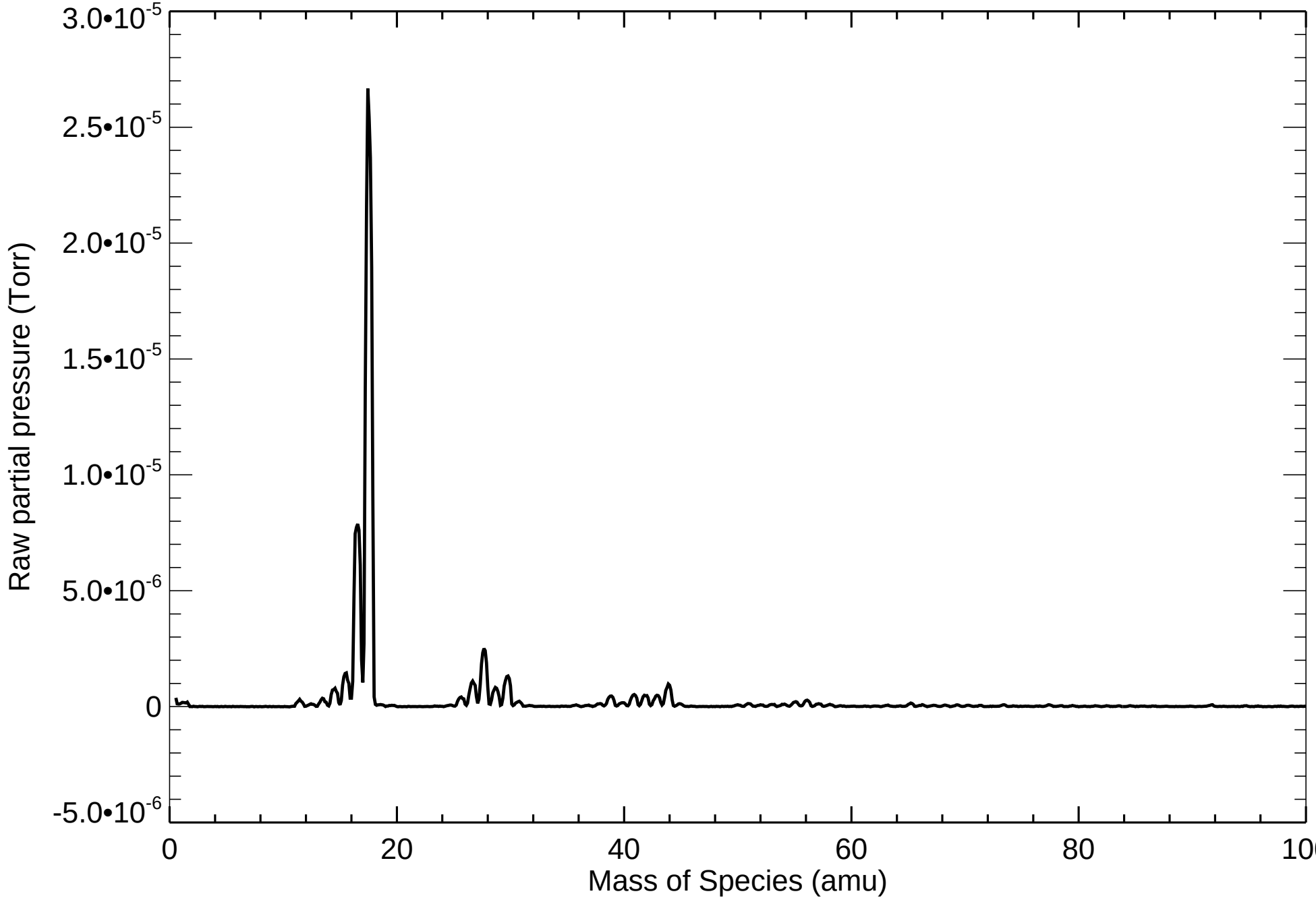


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:19:26:051 UT SWEEP: 0045 Filament: ON

Altitude (km): 120.88 Roll Angle (deg): 85.87

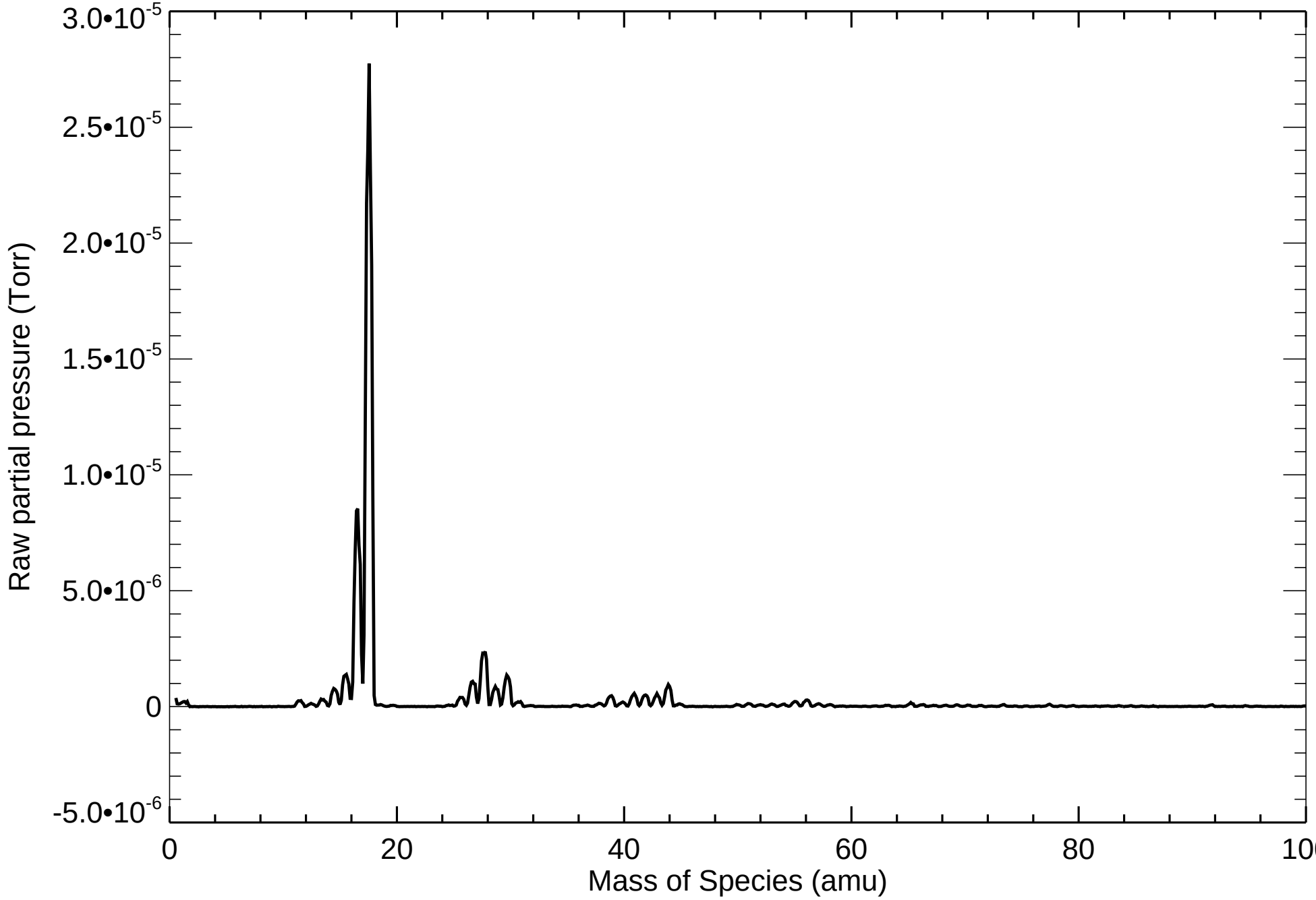


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:20:03:081 UT SWEEP: 0046 Filament: ON

Altitude (km): 121.75 Roll Angle (deg): 85.26

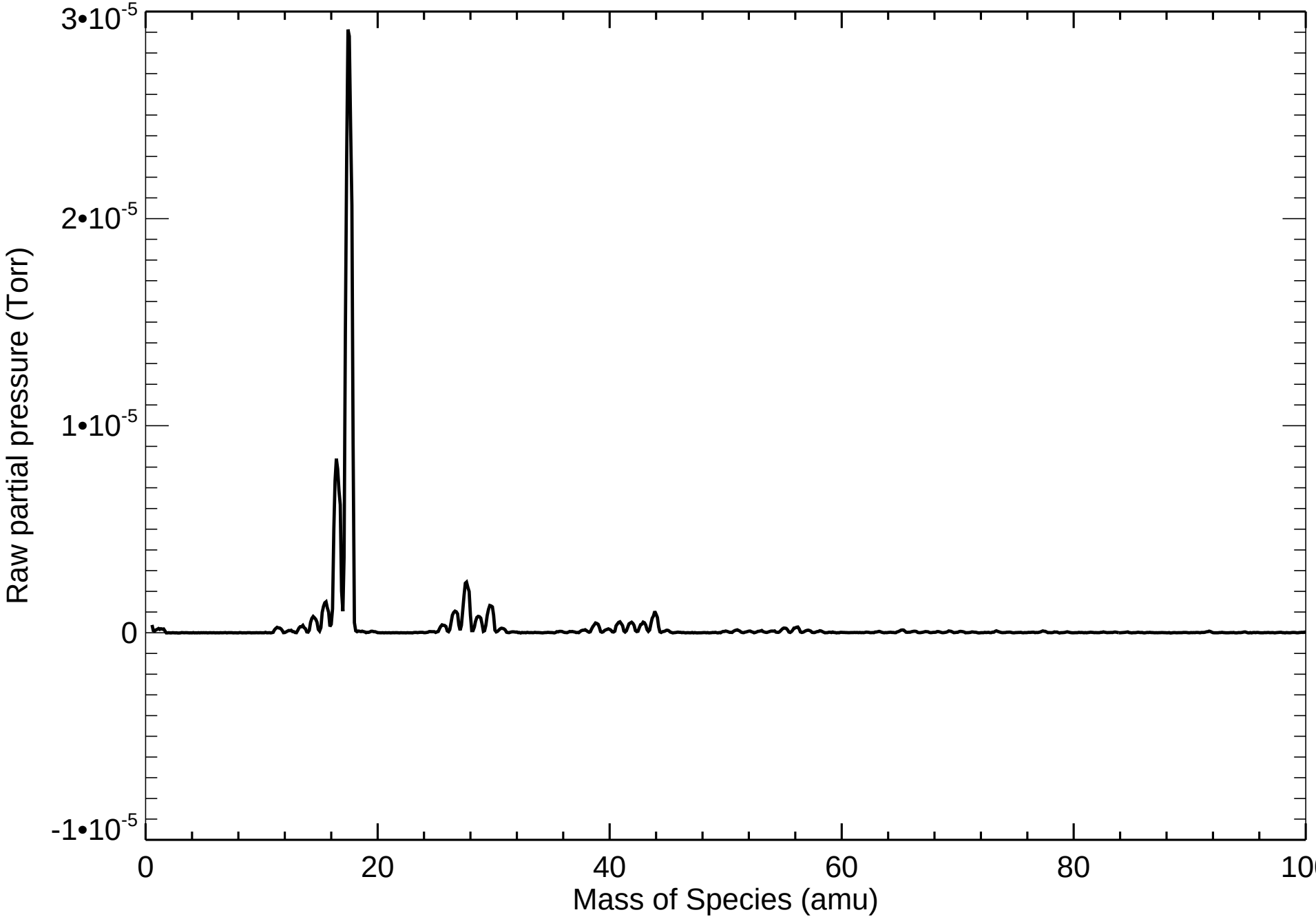


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:20:39:017 UT SWEEP: 0047 Filament: ON

Altitude (km): 122.71 Roll Angle (deg): 84.68

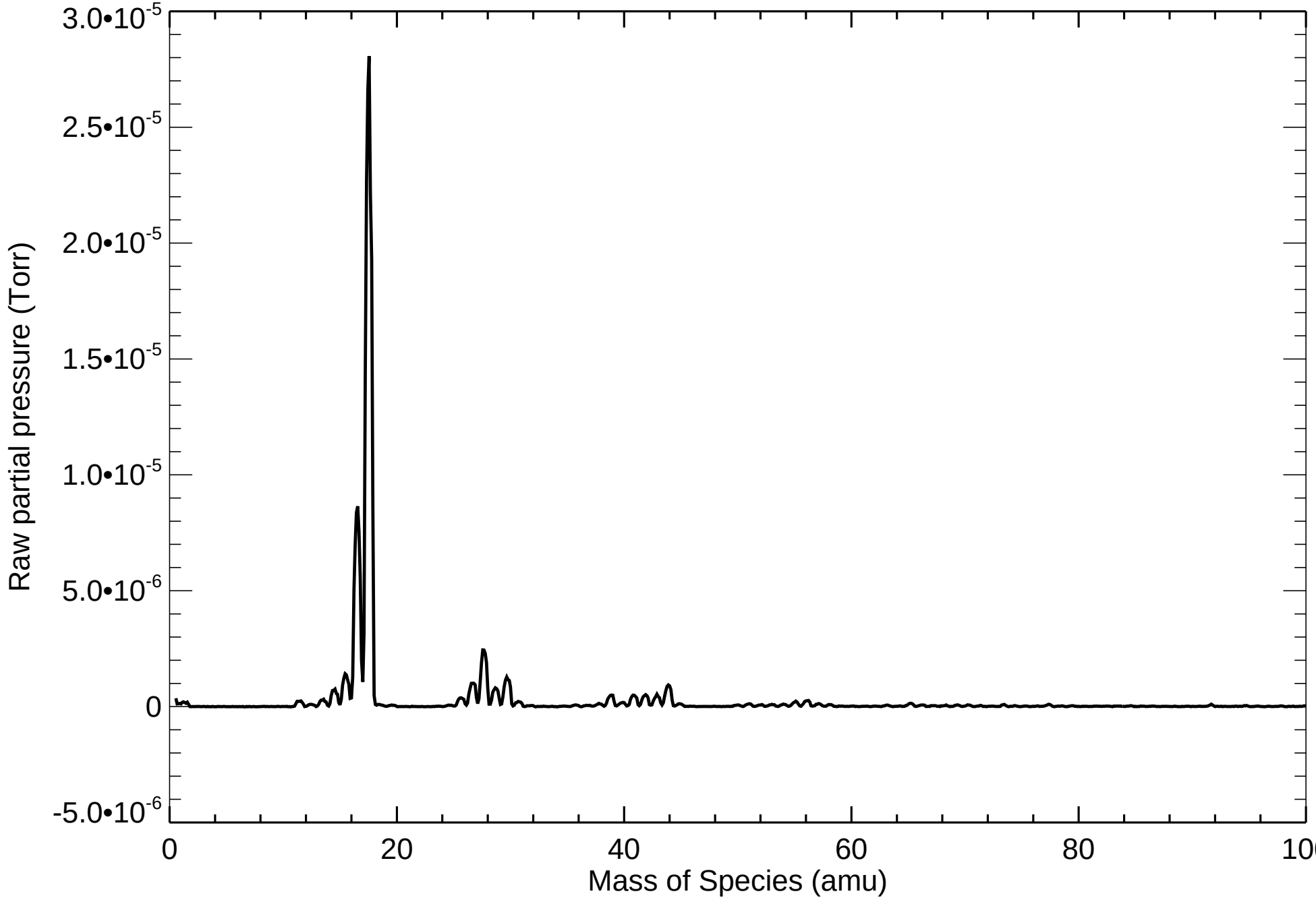


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:21:14:050 UT SWEEP: 0048 Filament: ON

Altitude (km): 123.32 Roll Angle (deg): 84.13

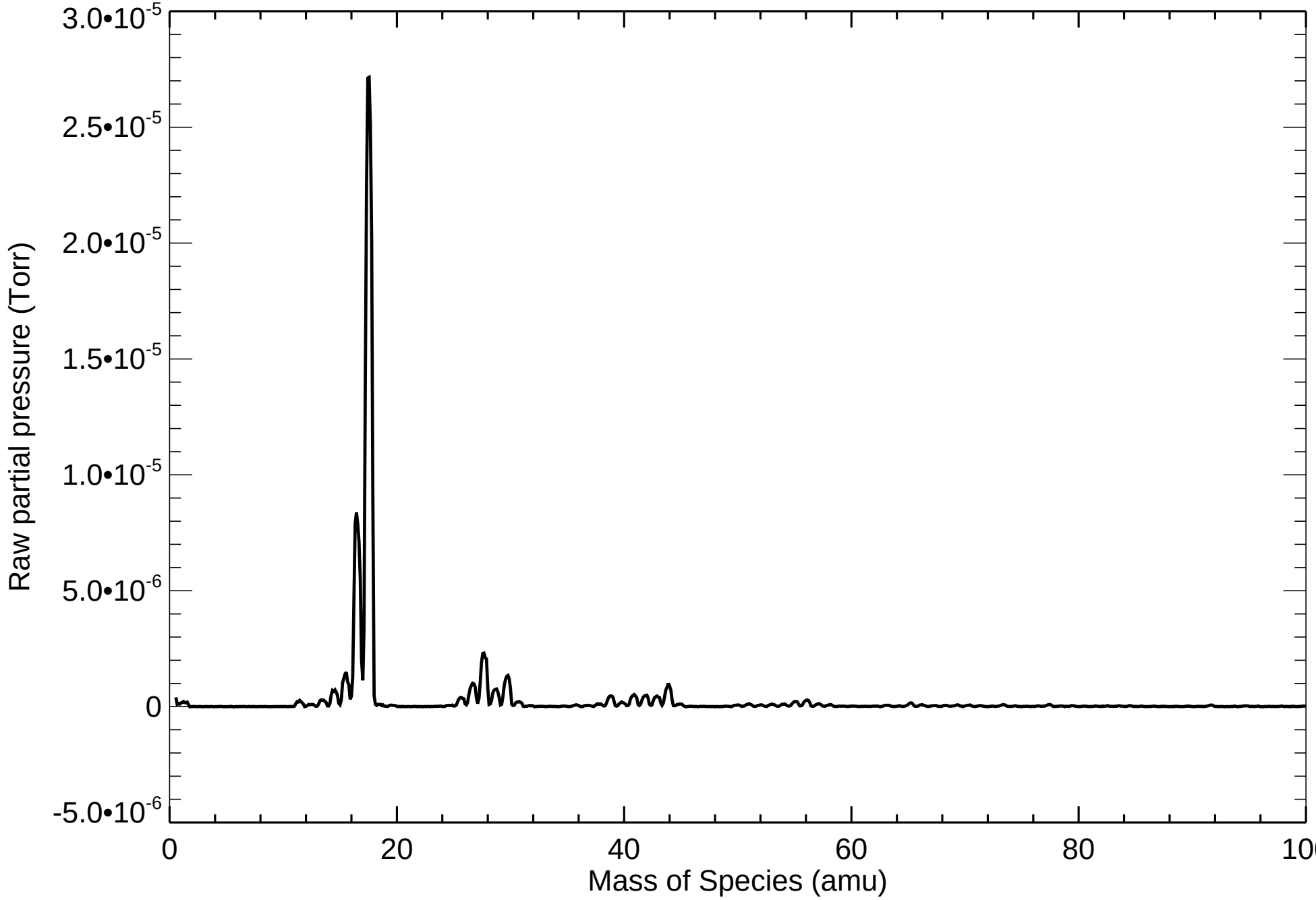


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:21:51:080 UT SWEEP: 0049 Filament: ON

Altitude (km): 124.23 Roll Angle (deg): 83.54

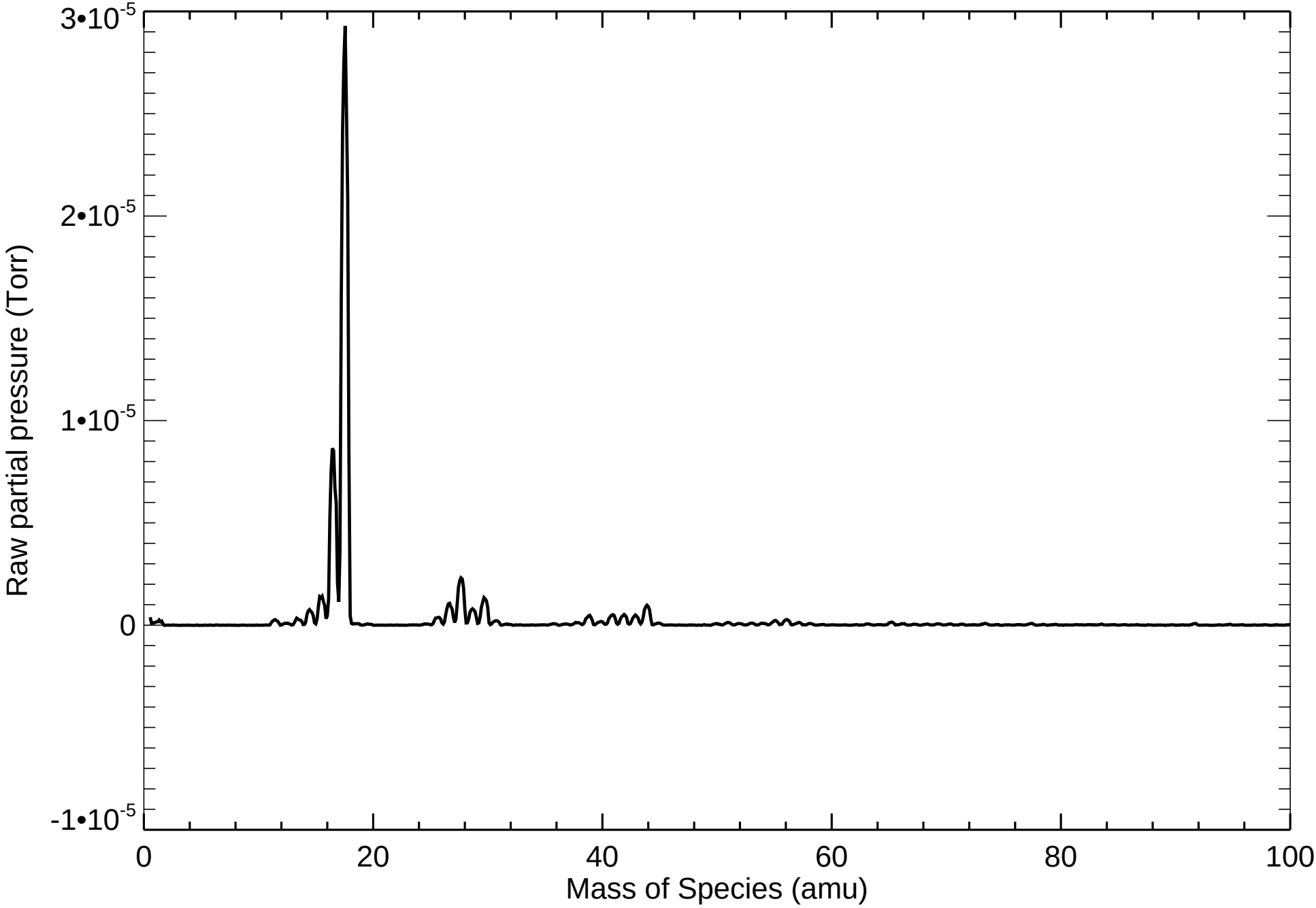


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:22:27:013 UT SWEEP: 0050 Filament: ON

Altitude (km): 125.06 Roll Angle (deg): 82.99

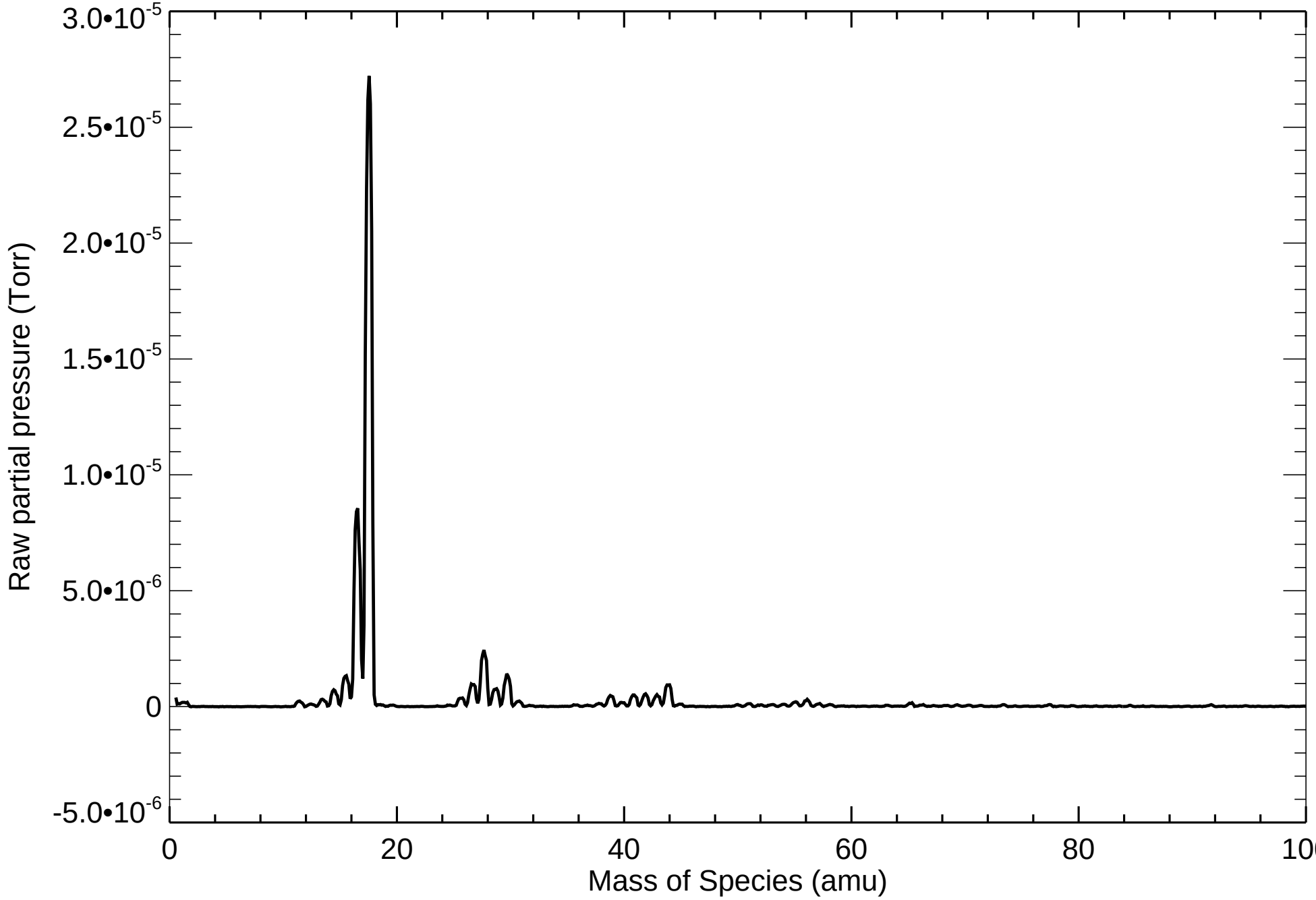


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:23:02:045 UT SWEEP: 0051 Filament: ON

Altitude (km): 125.74 Roll Angle (deg): 82.45

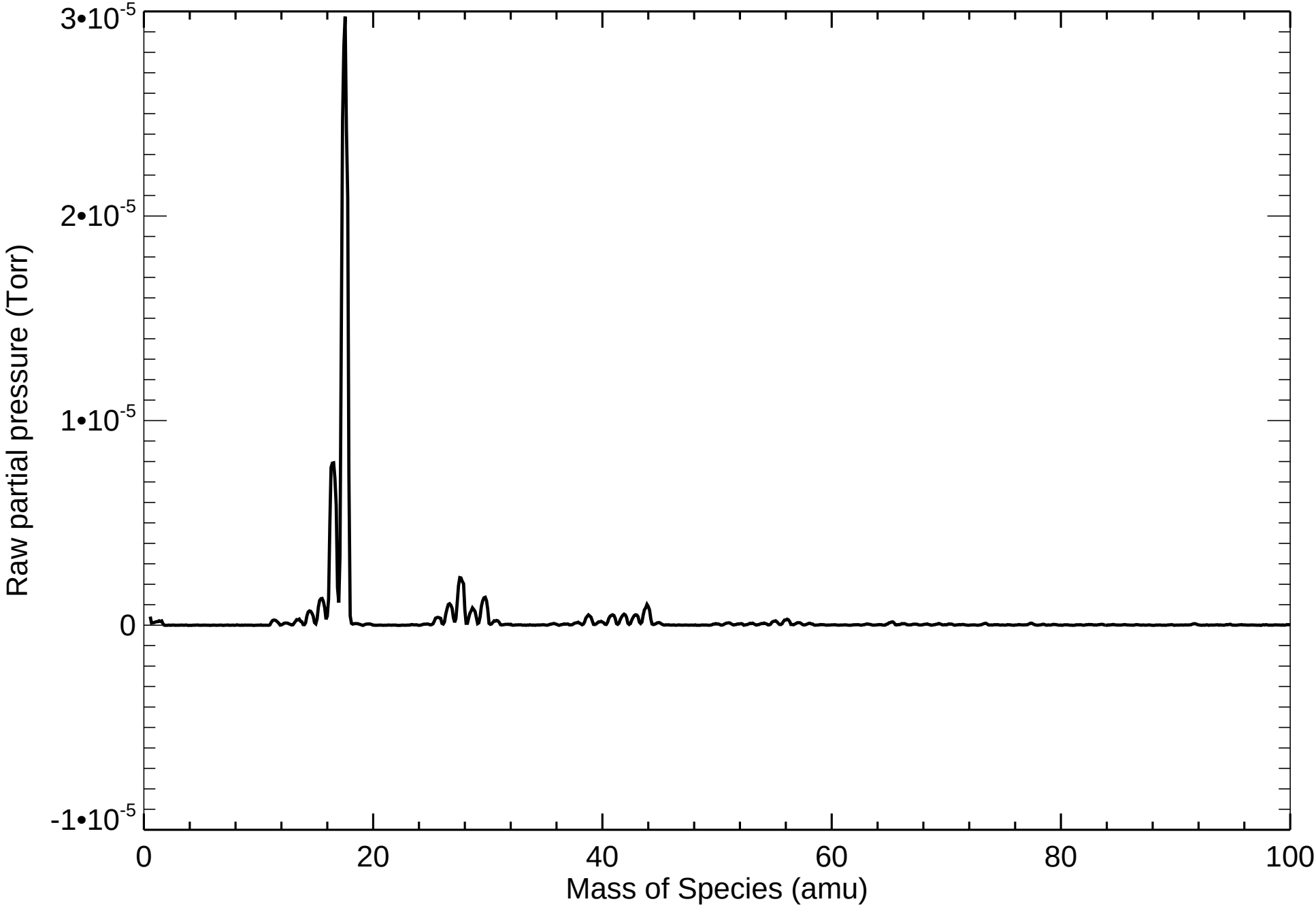


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:23:39:076 UT SWEEP: 0052 Filament: ON

Altitude (km): 126.55 Roll Angle (deg): 81.89

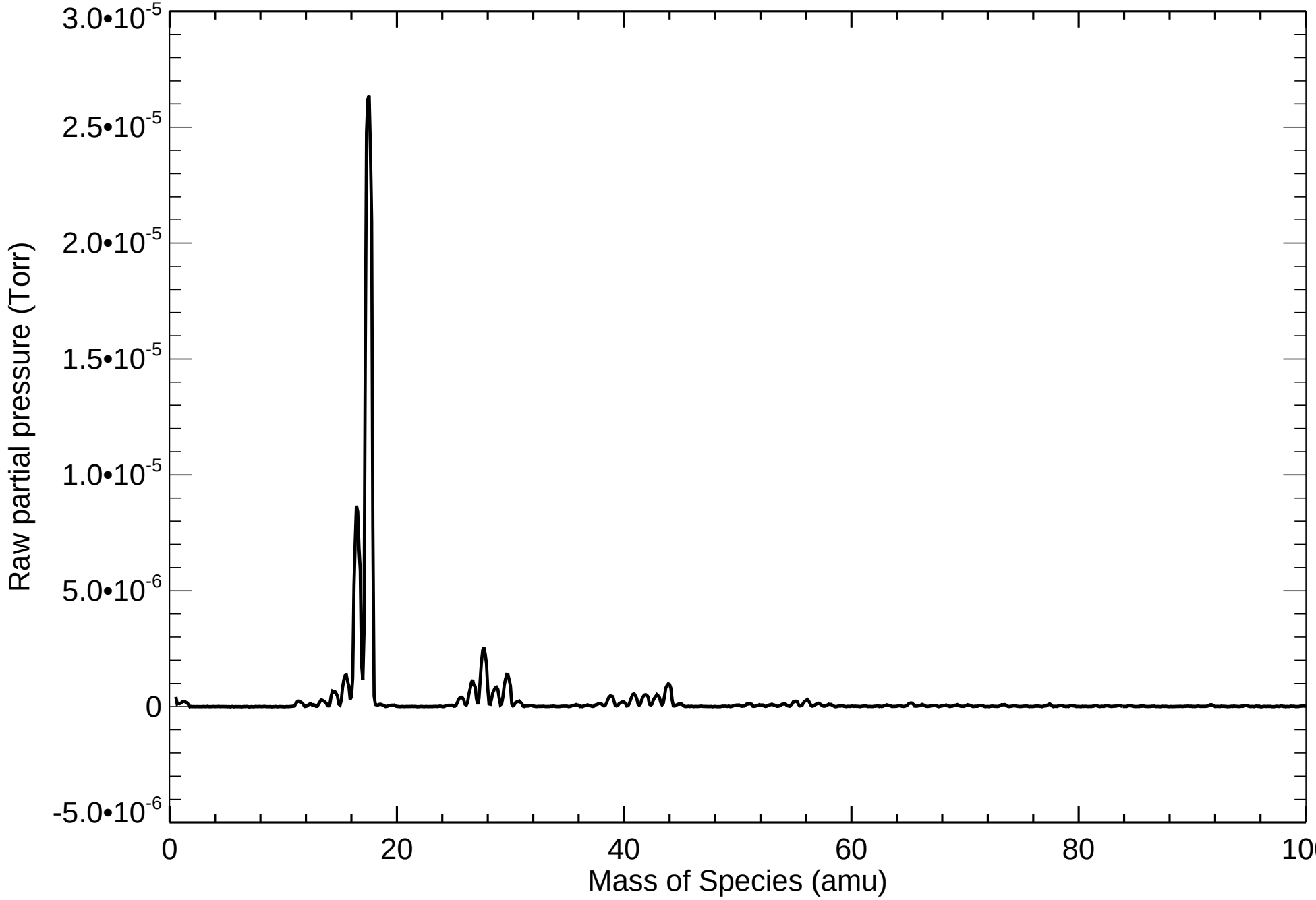


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:24:15:008 UT SWEEP: 0053 Filament: ON

Altitude (km): 127.16 Roll Angle (deg): 81.36

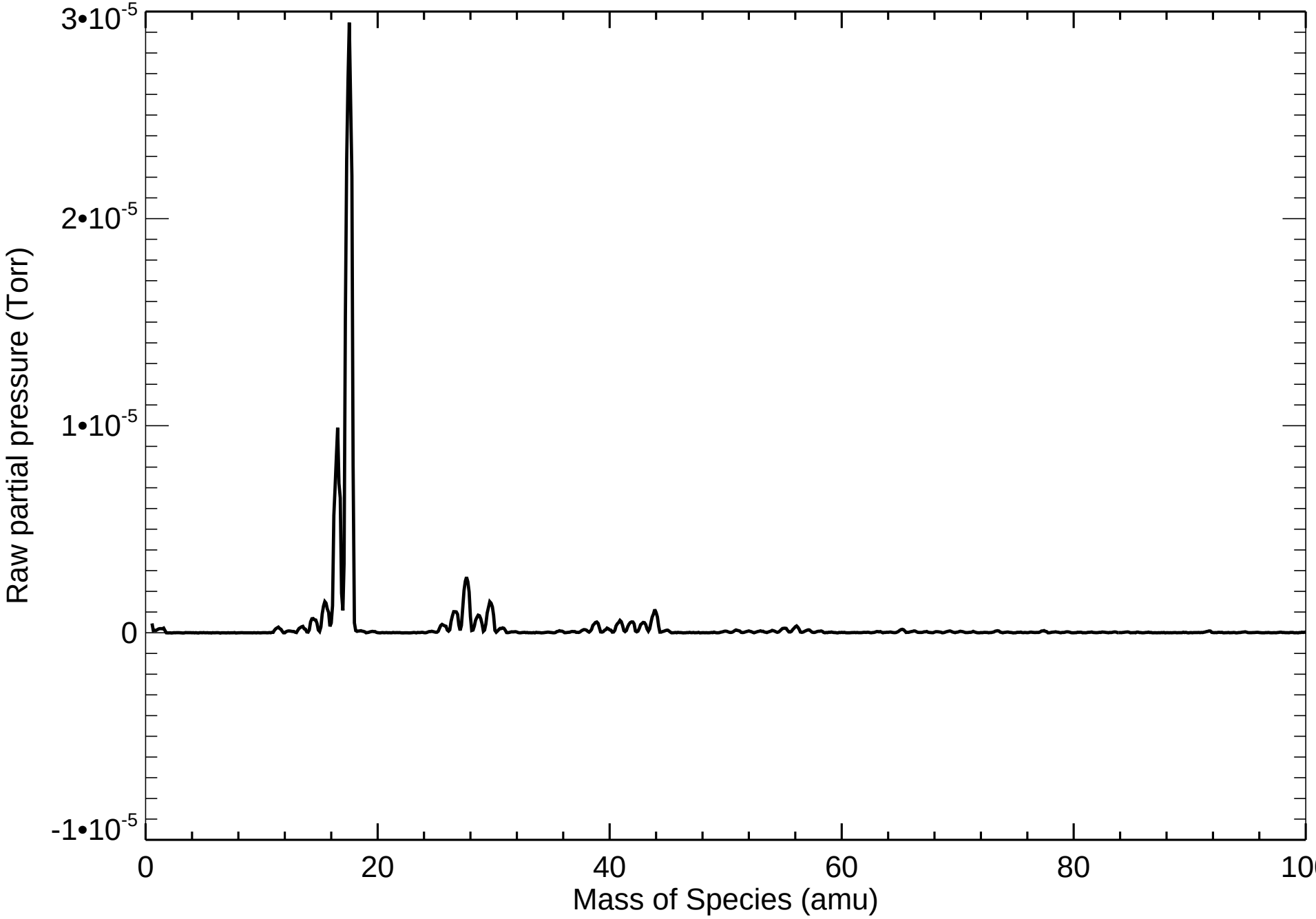


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:25:00:028 UT SWEEP: 0054 Filament: ON

Altitude (km): 128.17 Roll Angle (deg): 80.71

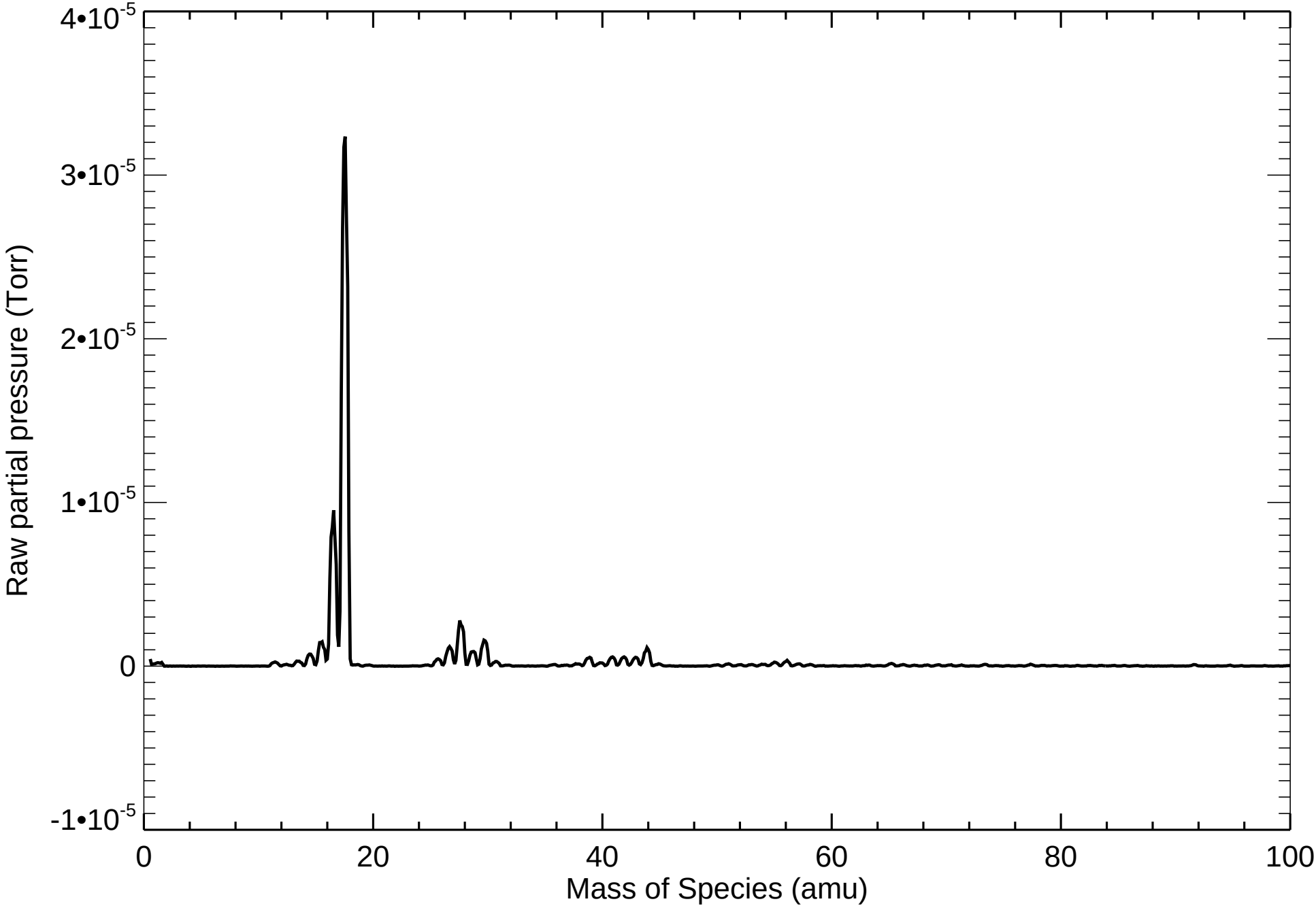


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:25:35:061 UT SWEEP: 0055 Filament: ON

Altitude (km): 128.71 Roll Angle (deg): 80.22

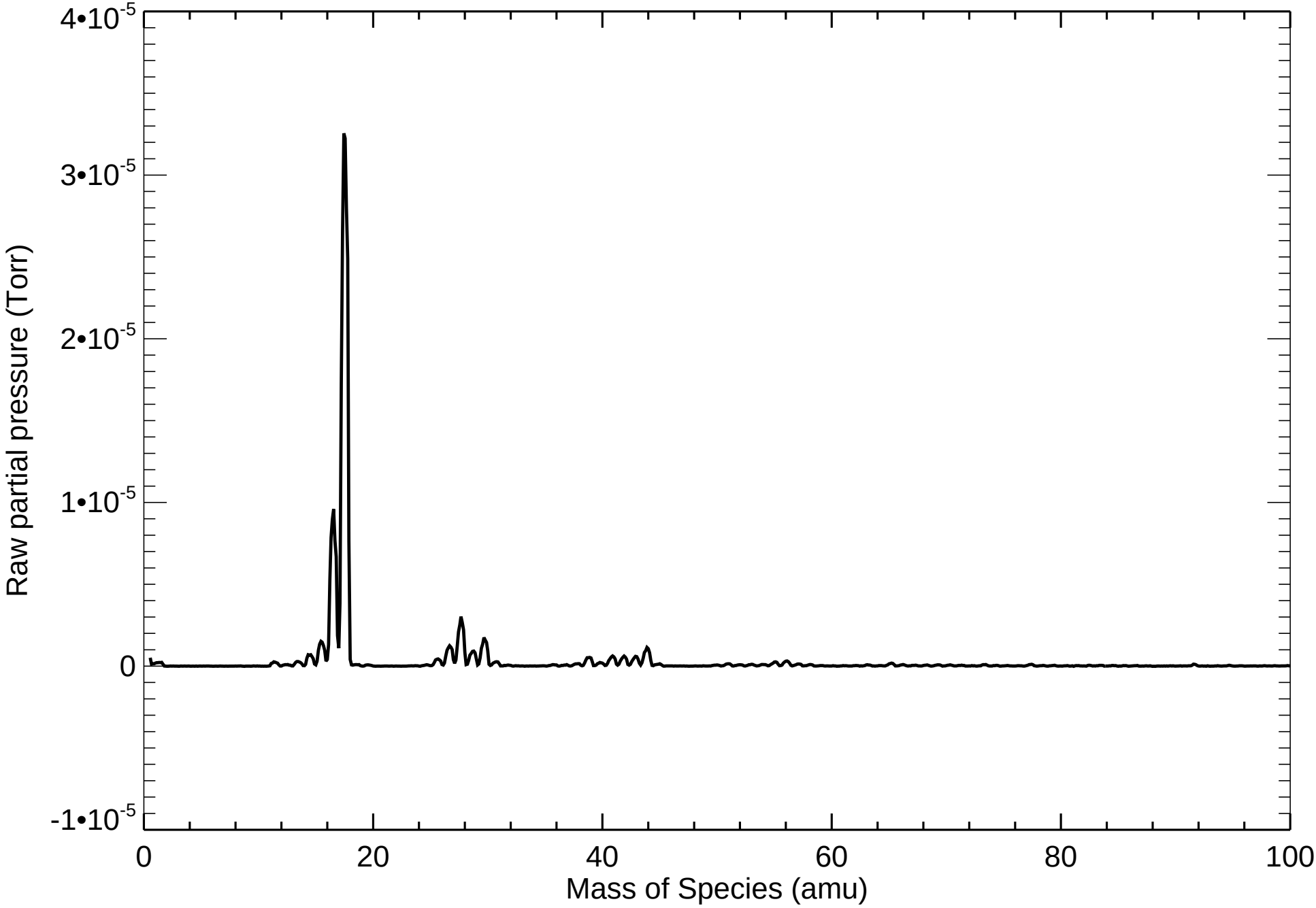


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:26:10:093 UT SWEEP: 0056 Filament: ON

Altitude (km): 129.46 Roll Angle (deg): 79.74

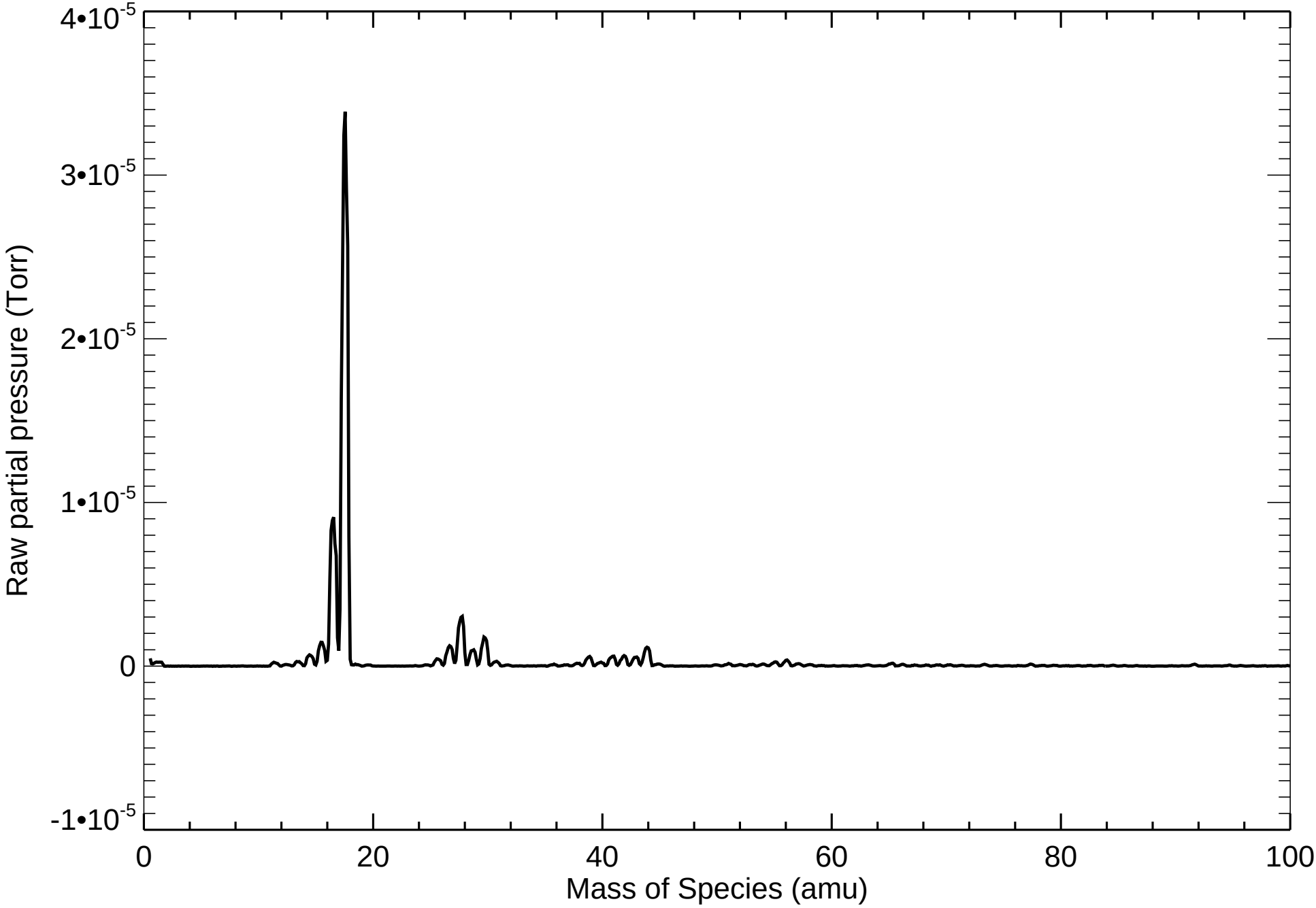


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:26:48:024 UT SWEEP: 0057 Filament: ON

Altitude (km): 130.22 Roll Angle (deg): 79.22

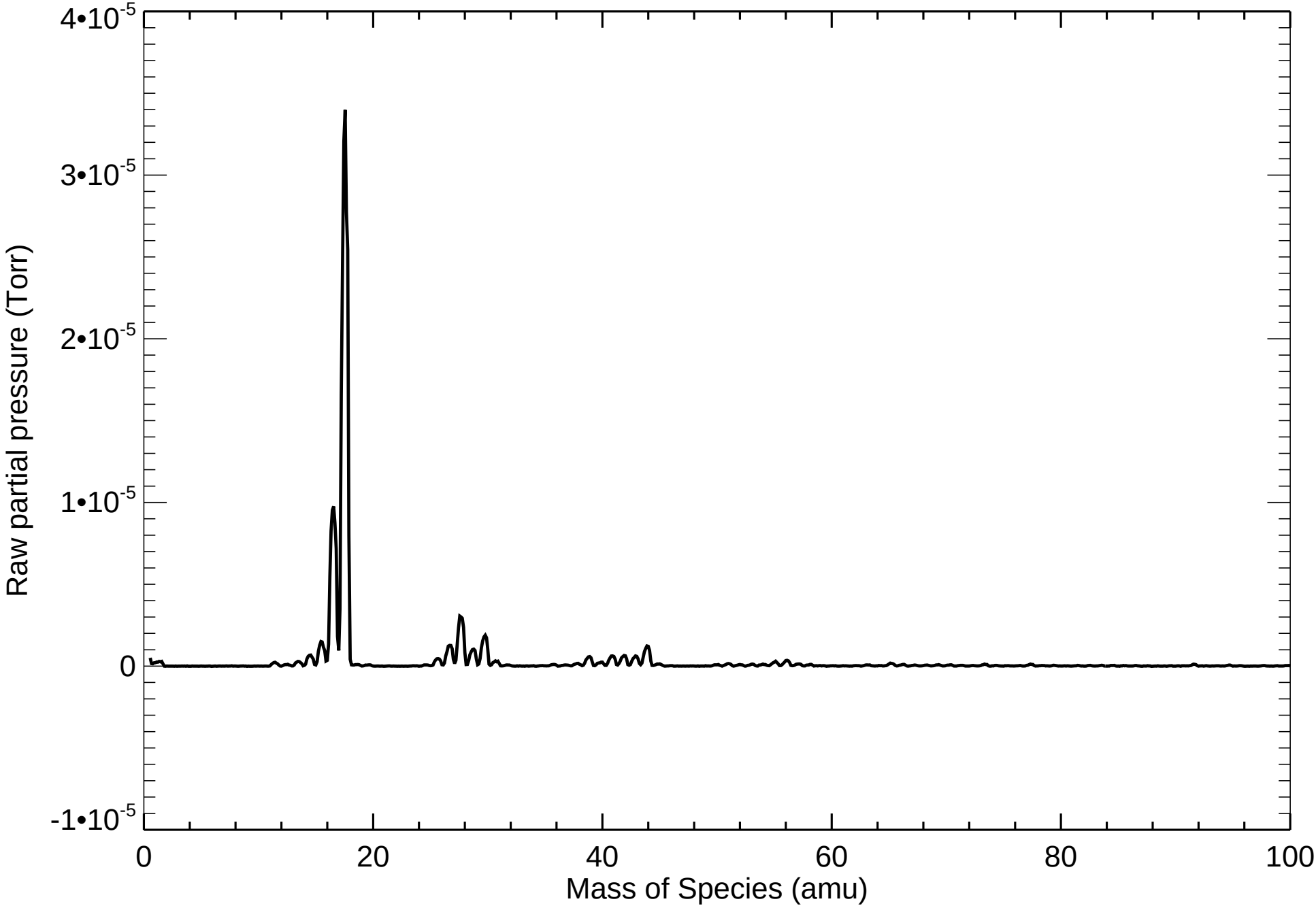


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:27:23:056 UT SWEEP: 0058 Filament: ON

Altitude (km): 130.71 Roll Angle (deg): 78.76

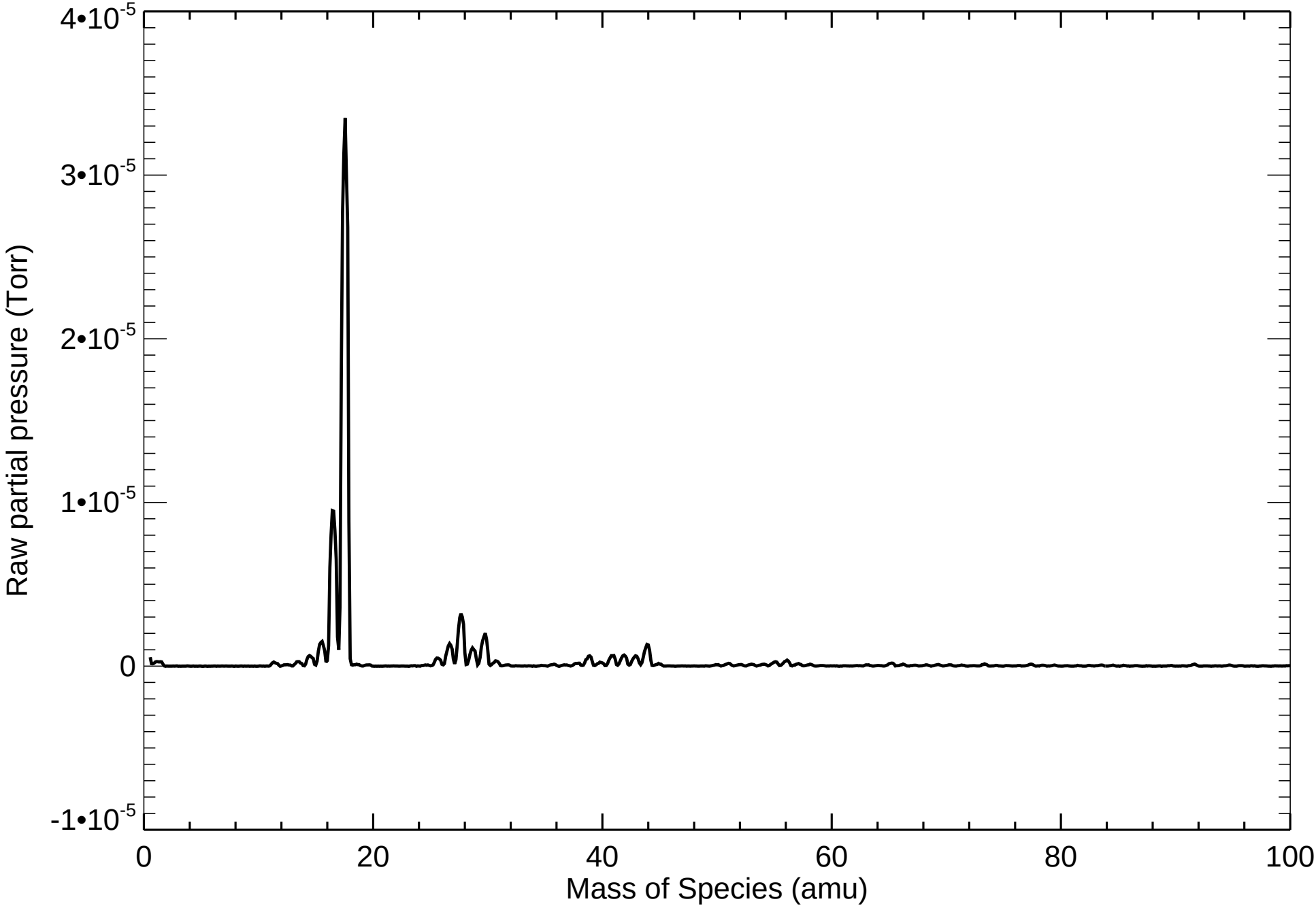


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:27:58:089 UT SWEEP: 0059 Filament: ON

Altitude (km): 131.41 Roll Angle (deg): 78.32

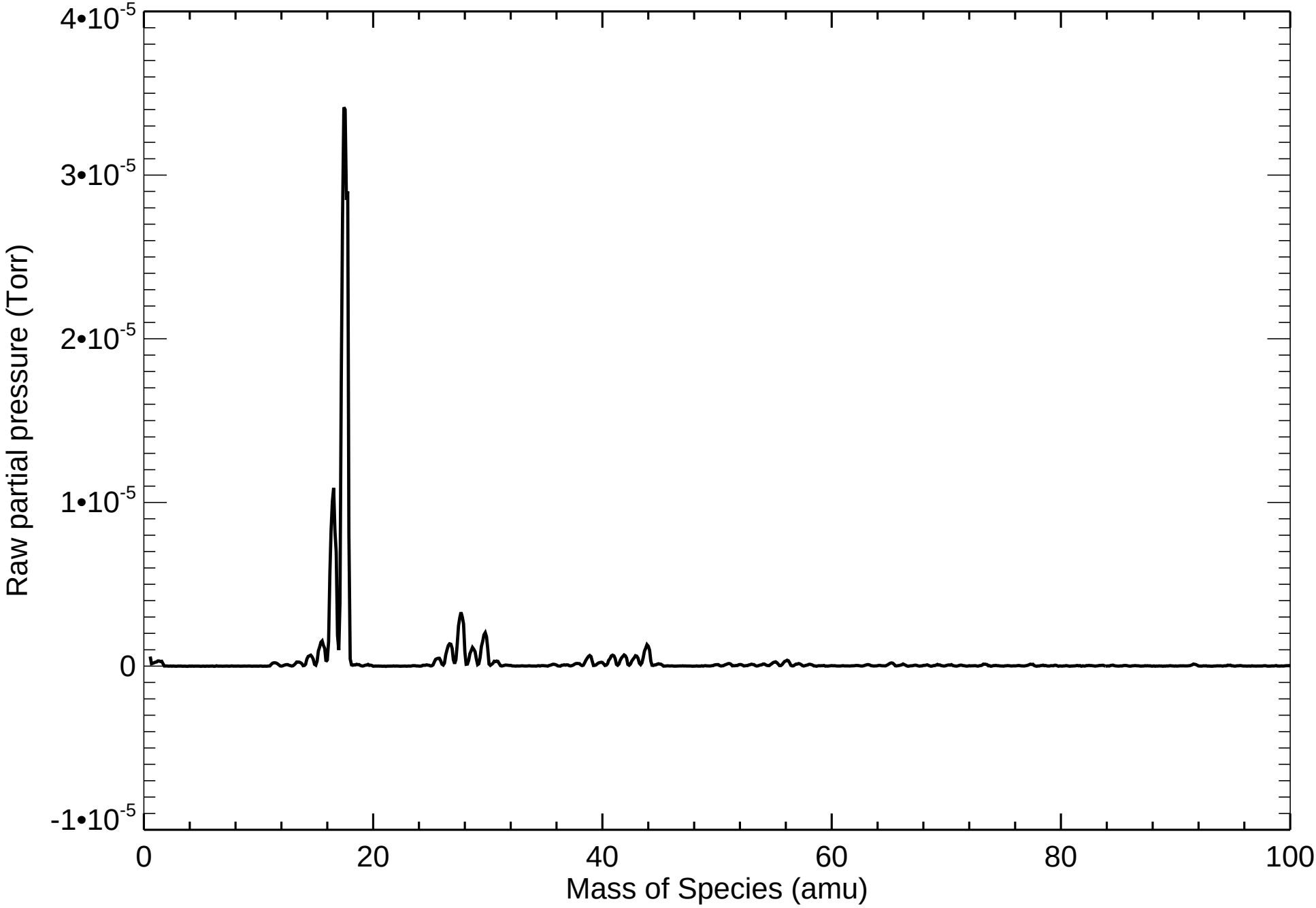


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:28:36:019 UT SWEEP: 0060 Filament: ON

Altitude (km): 131.95 Roll Angle (deg): 77.84

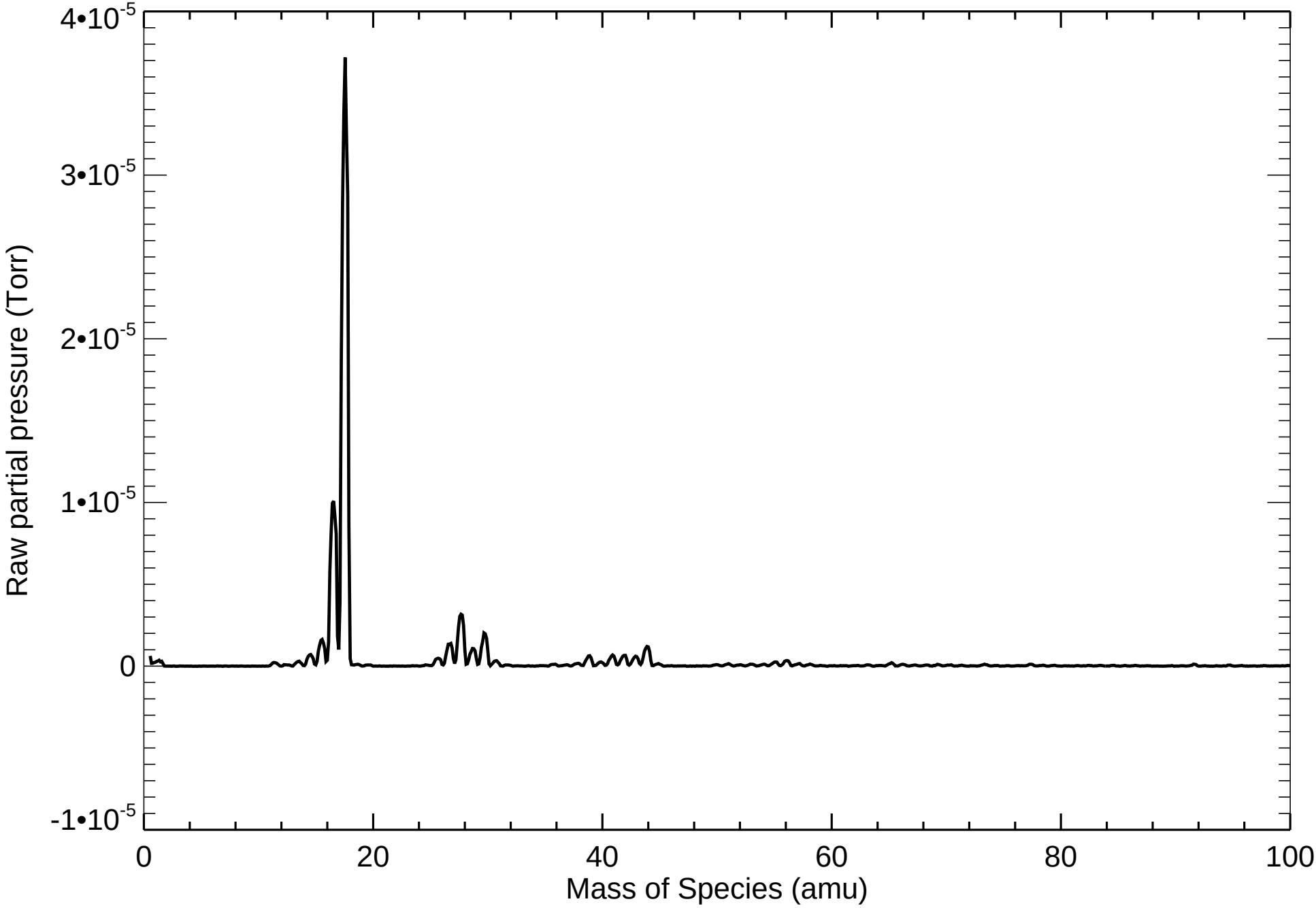


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:29:11:055 UT SWEEP: 0061 Filament: ON

Altitude (km): 132.55 Roll Angle (deg): 77.42

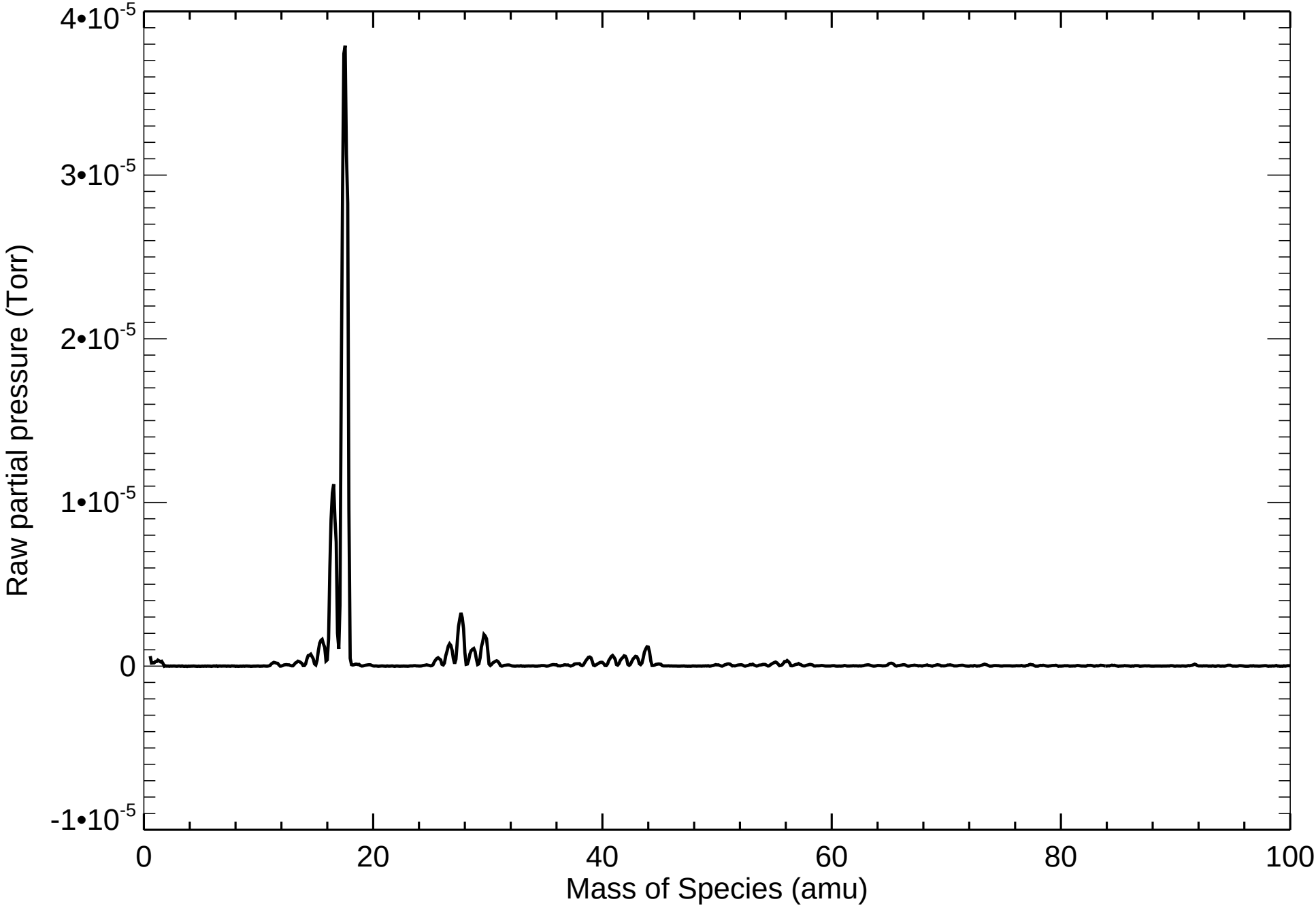


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:29:46:088 UT SWEEP: 0062 Filament: ON

Altitude (km): 133.01 Roll Angle (deg): 77.01

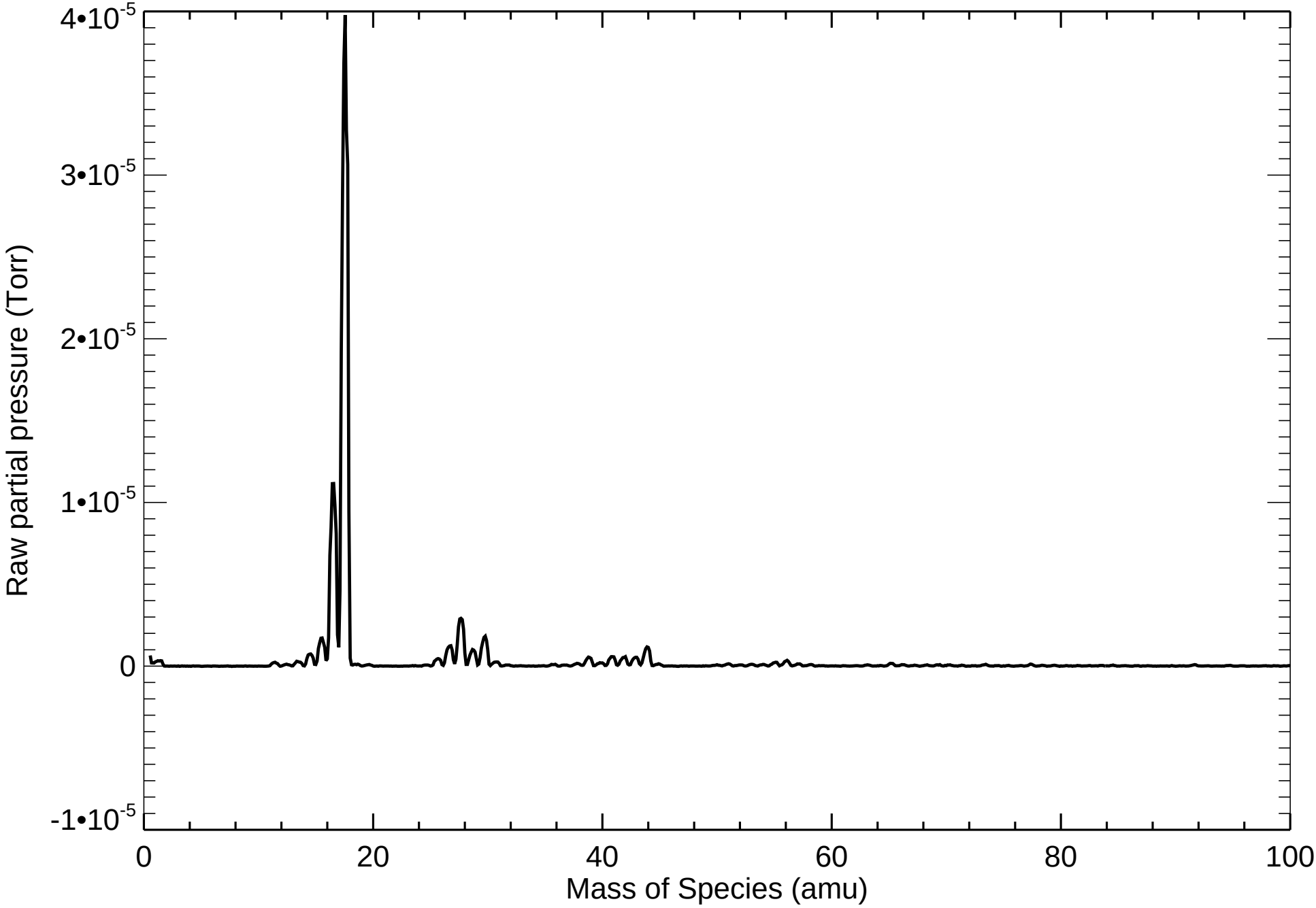


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:30:32:011 UT SWEEP: 0063 Filament: ON

Altitude (km): 133.72 Roll Angle (deg): 76.49

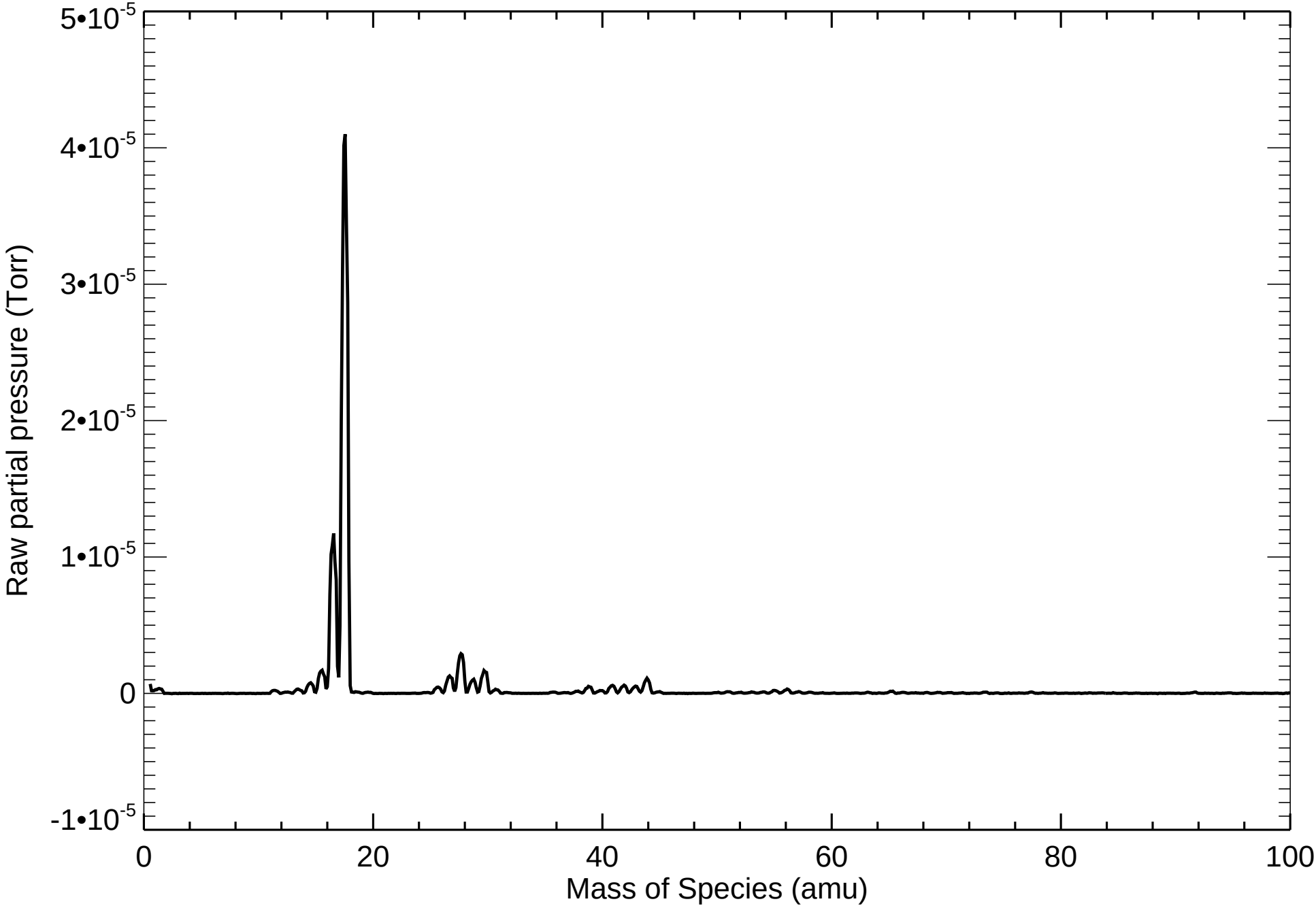


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:31:07:044 UT SWEEP: 0064 Filament: ON

Altitude (km): 134.35 Roll Angle (deg): 76.11

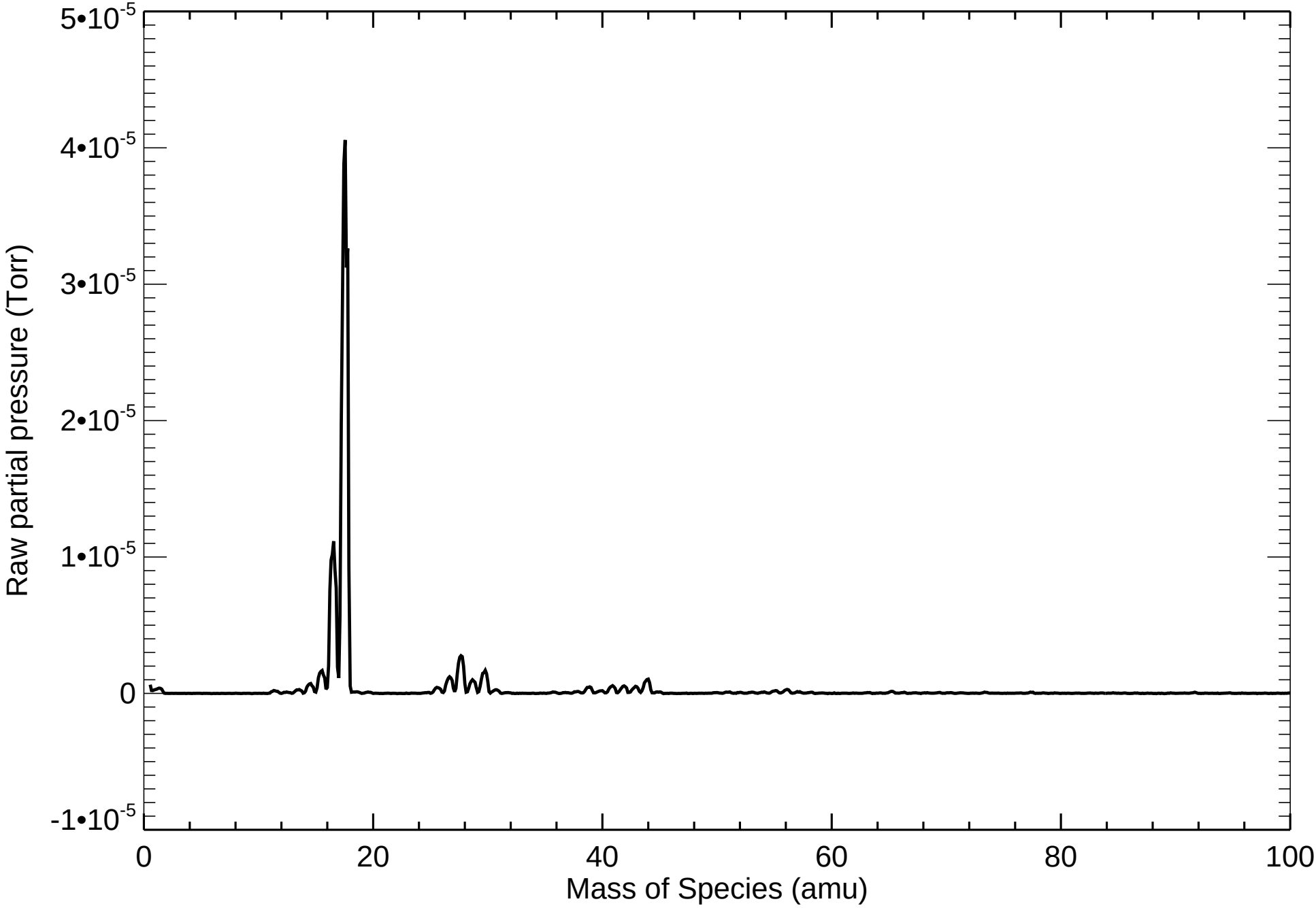


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:31:44:074 UT SWEEP: 0065 Filament: ON

Altitude (km): 134.74 Roll Angle (deg): 75.73

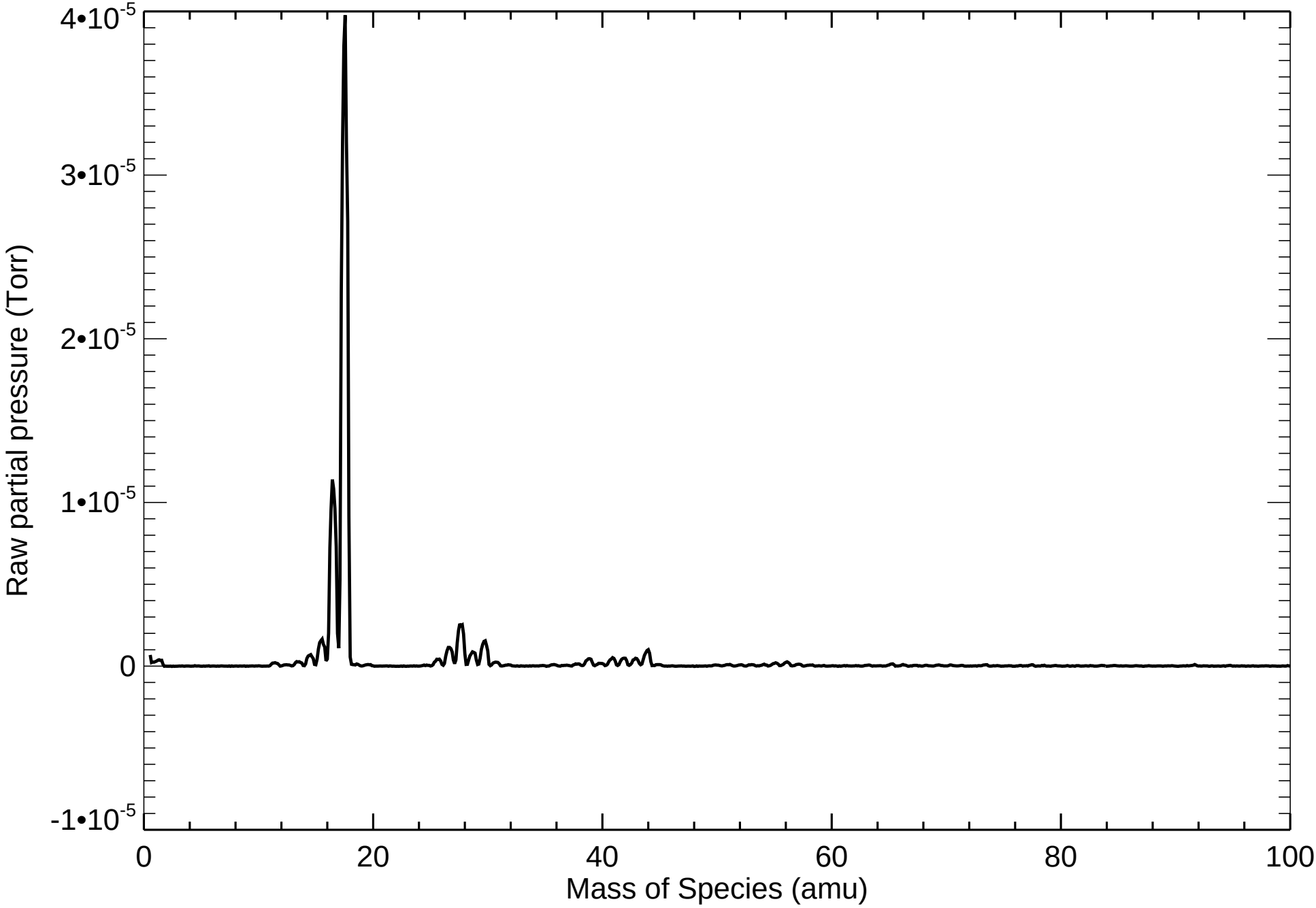


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:32:20:007 UT SWEEP: 0066 Filament: ON

Altitude (km): 135.27 Roll Angle (deg): 75.37

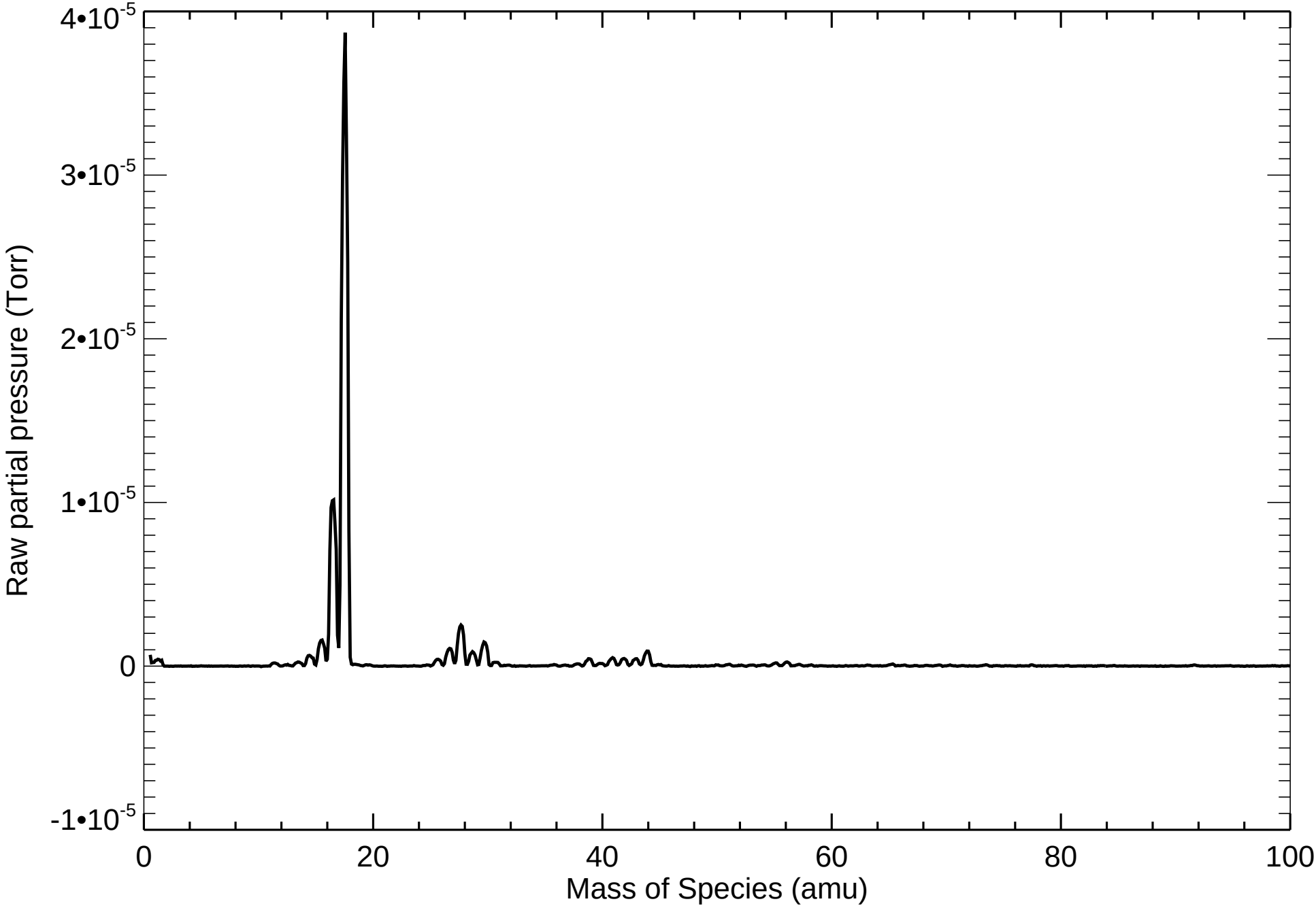


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:32:55:043 UT SWEEP: 0067 Filament: ON

Altitude (km): 135.62 Roll Angle (deg): 75.03

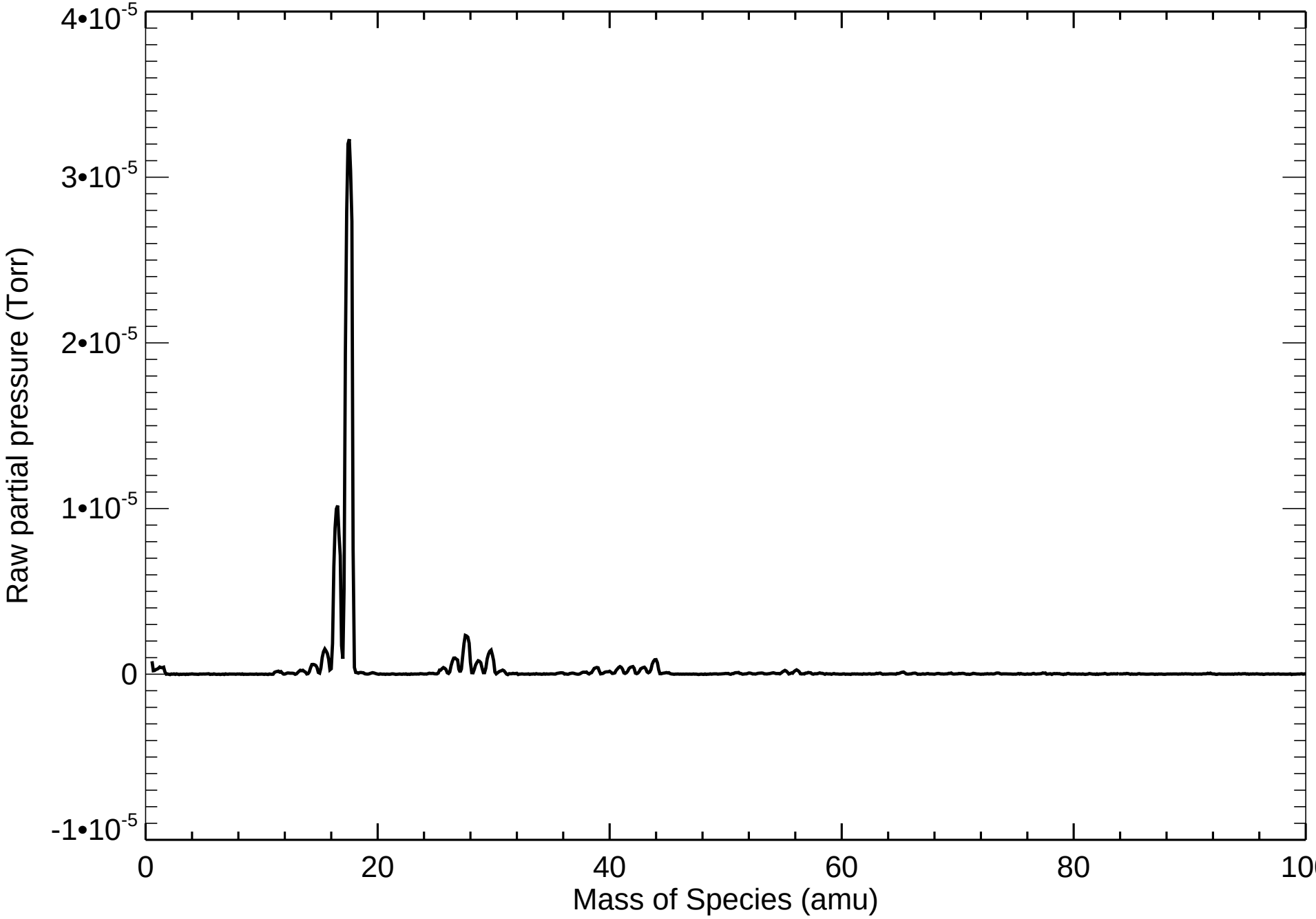


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:33:32:073 UT SWEEP: 0068 Filament: ON

Altitude (km): 136.06 Roll Angle (deg): 74.69

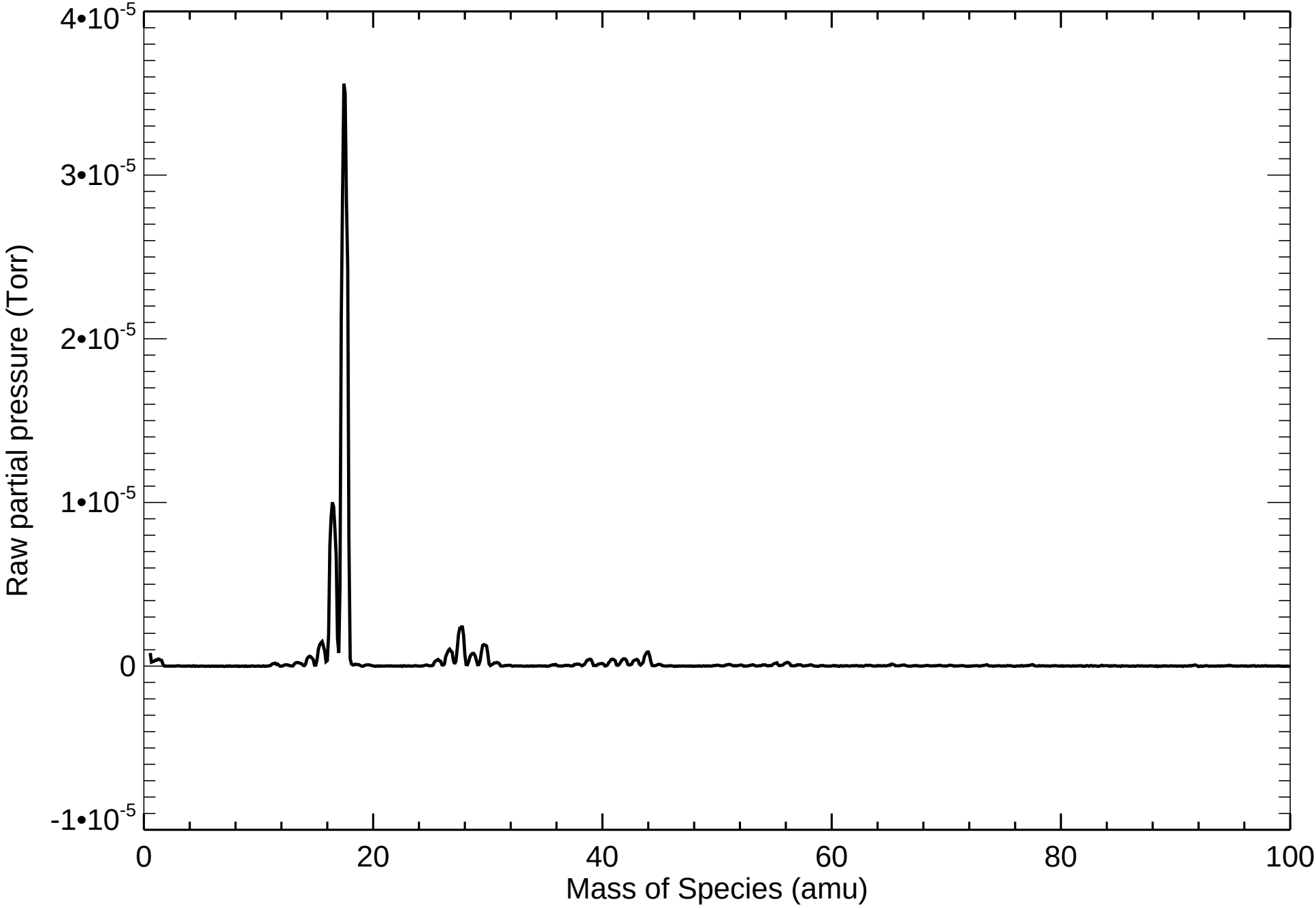


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:34:08:006 UT SWEEP: 0069 Filament: ON

Altitude (km): 136.54 Roll Angle (deg): 74.38

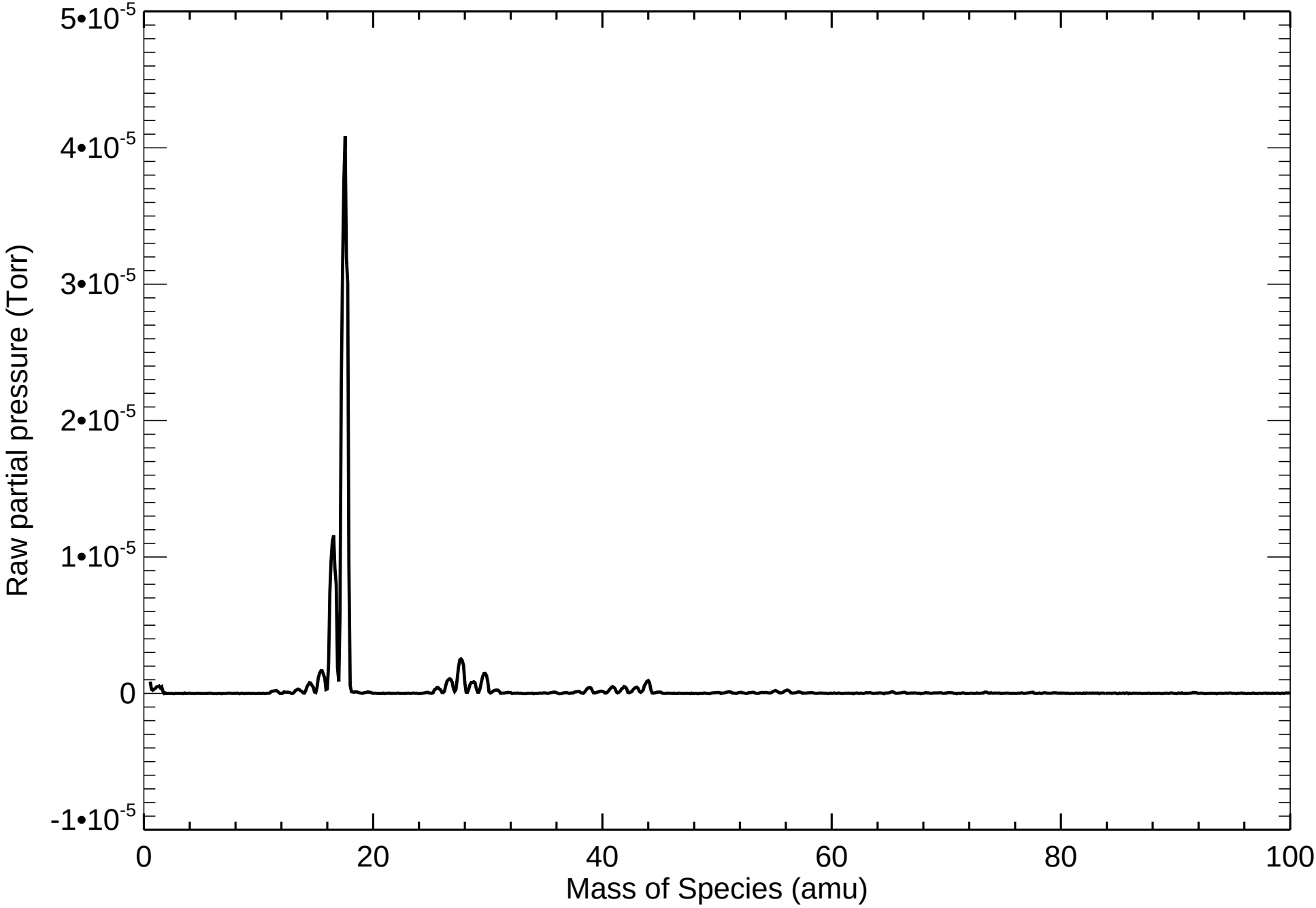


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:34:43:038 UT SWEEP: 0070 Filament: ON

Altitude (km): 136.82 Roll Angle (deg): 74.08

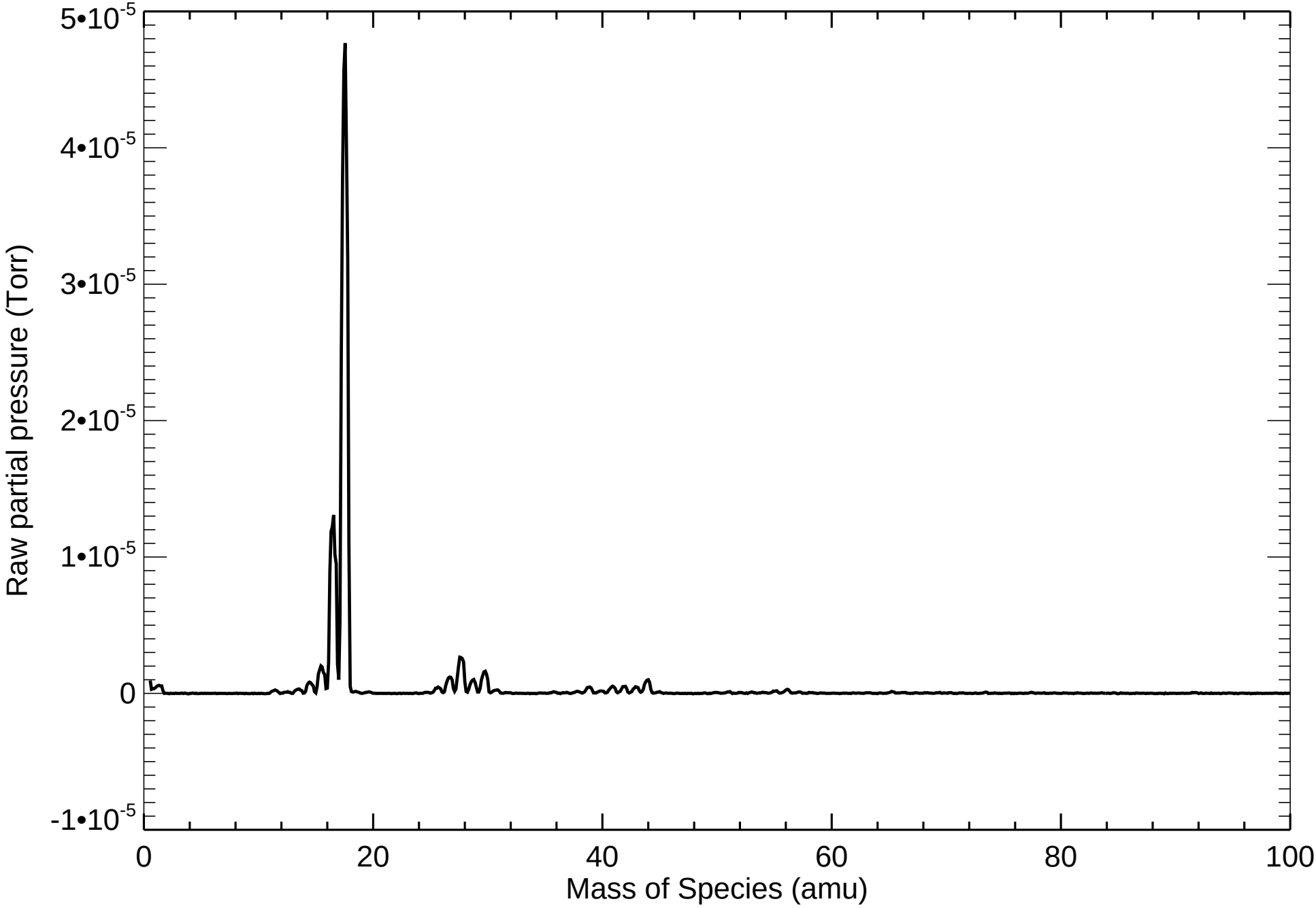


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:35:20:069 UT SWEEP: 0071 Filament: ON

Altitude (km): 137.20 Roll Angle (deg): 73.79

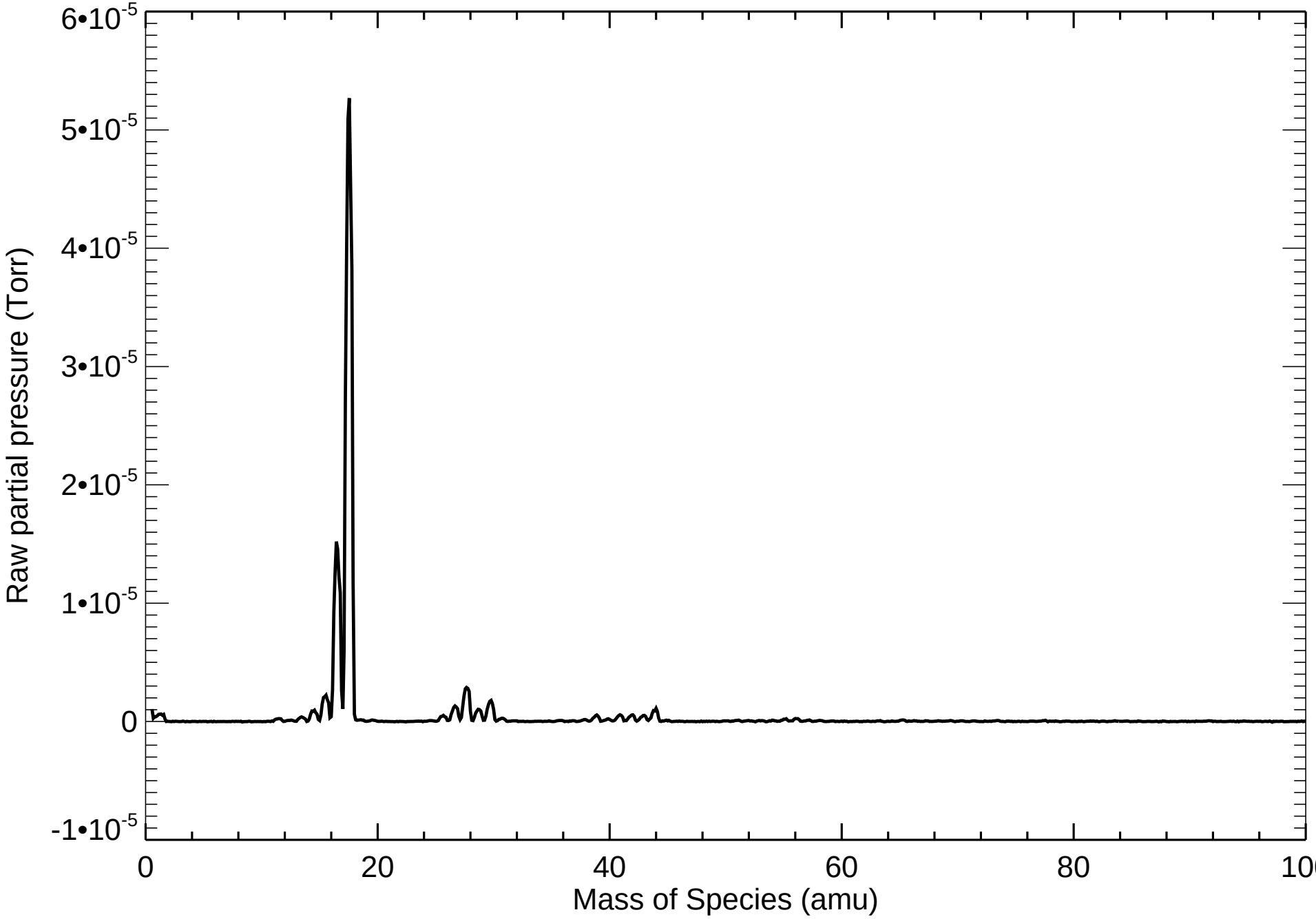


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:36:03:094 UT SWEEP: 0072 Filament: ON

Altitude (km): 137.58 Roll Angle (deg): 73.47

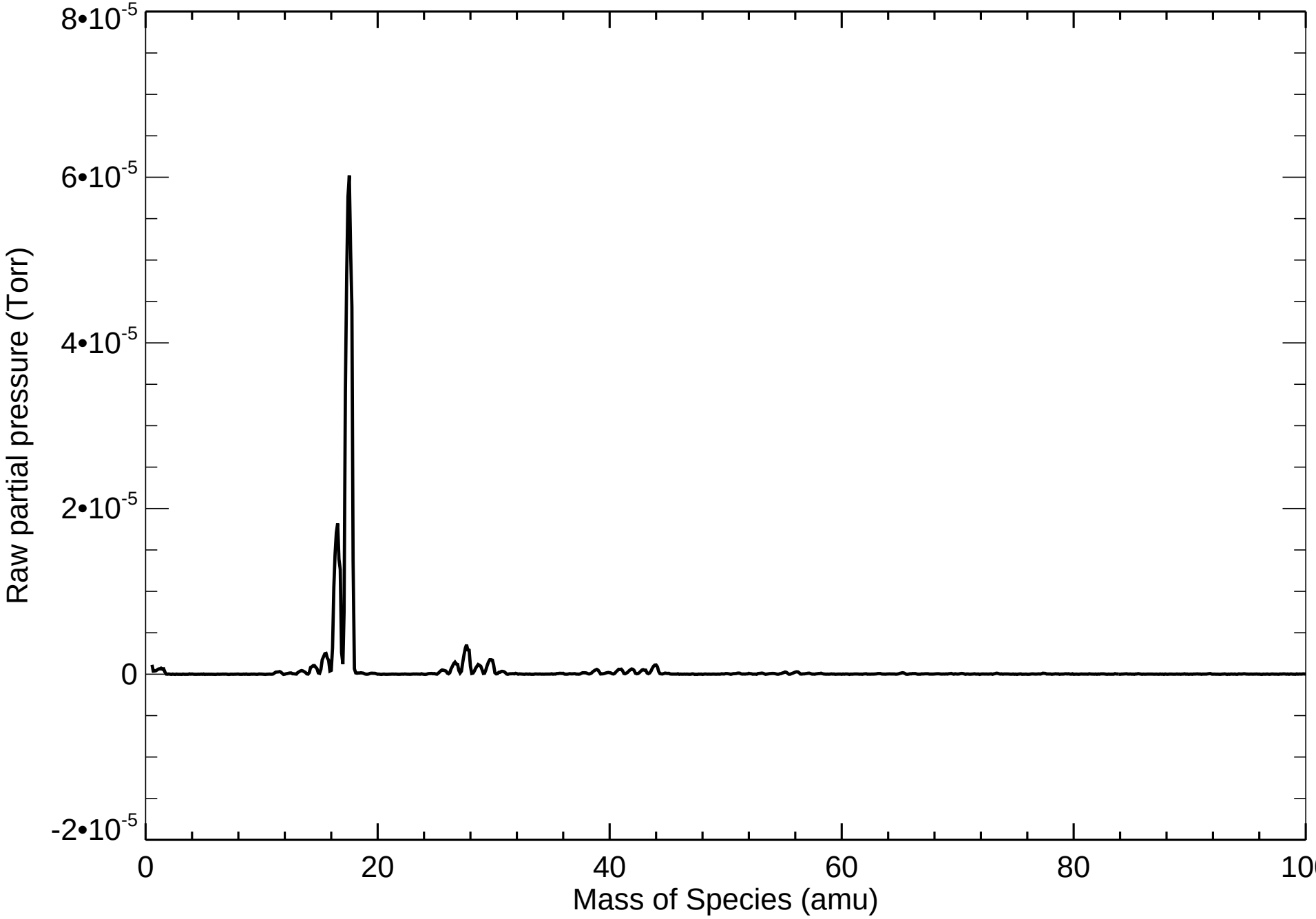


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:36:39:030 UT SWEEP: 0073 Filament: ON

Altitude (km): 137.86 Roll Angle (deg): 73.21

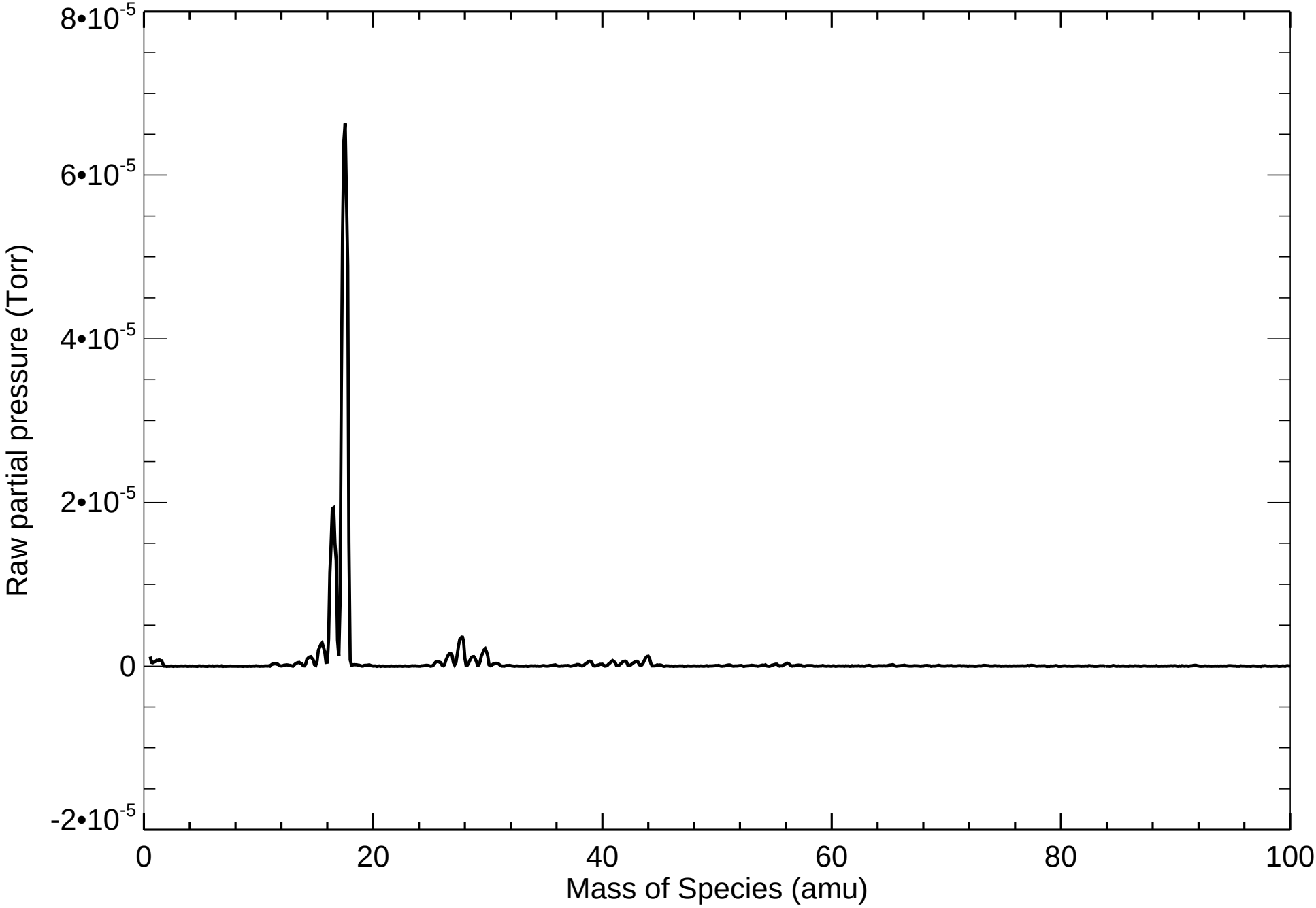


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:37:16:061 UT SWEEP: 0074 Filament: ON

Altitude (km): 138.10 Roll Angle (deg): 72.97

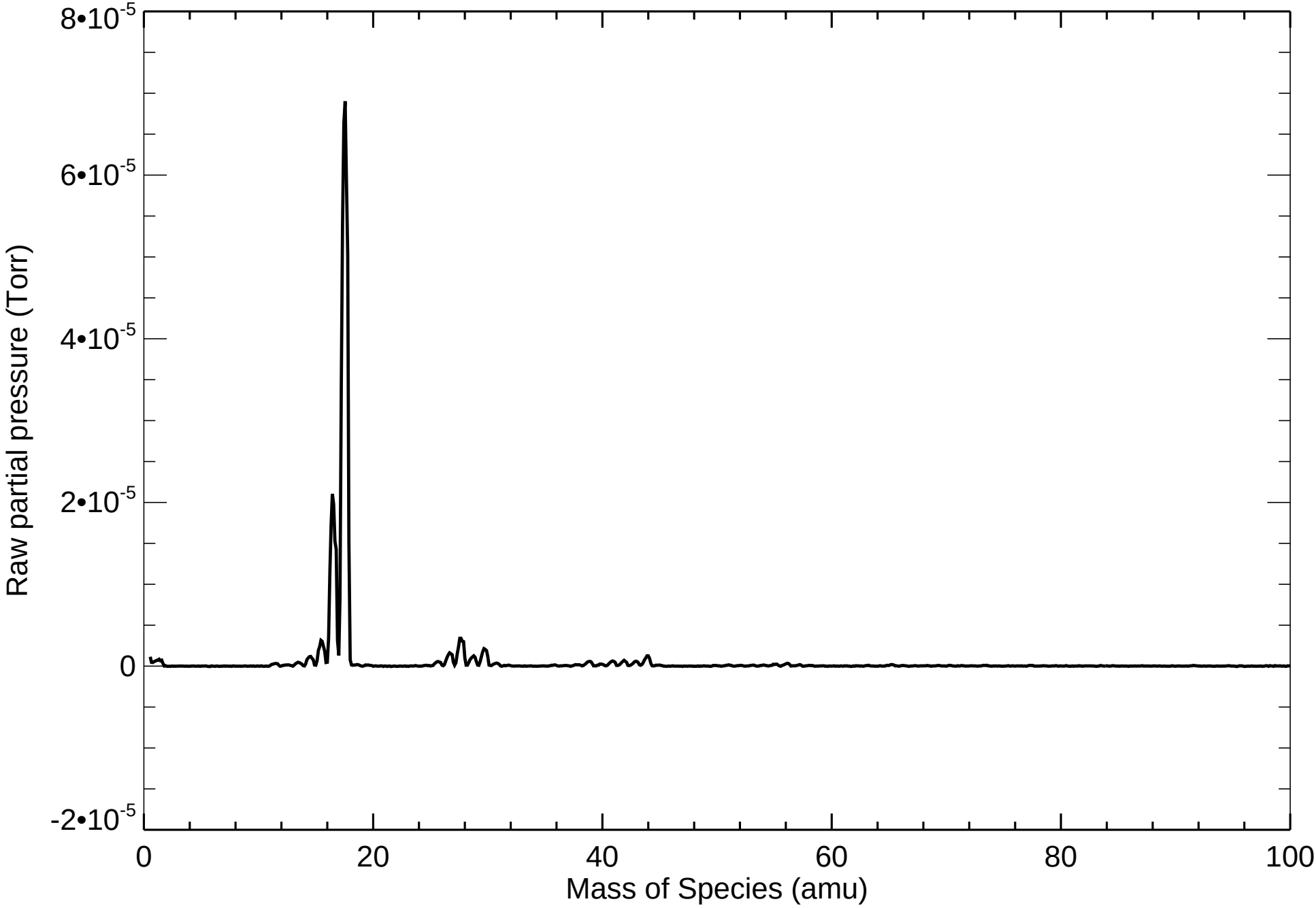


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:37:51:093 UT SWEEP: 0075 Filament: ON

Altitude (km): 138.38 Roll Angle (deg): 72.76

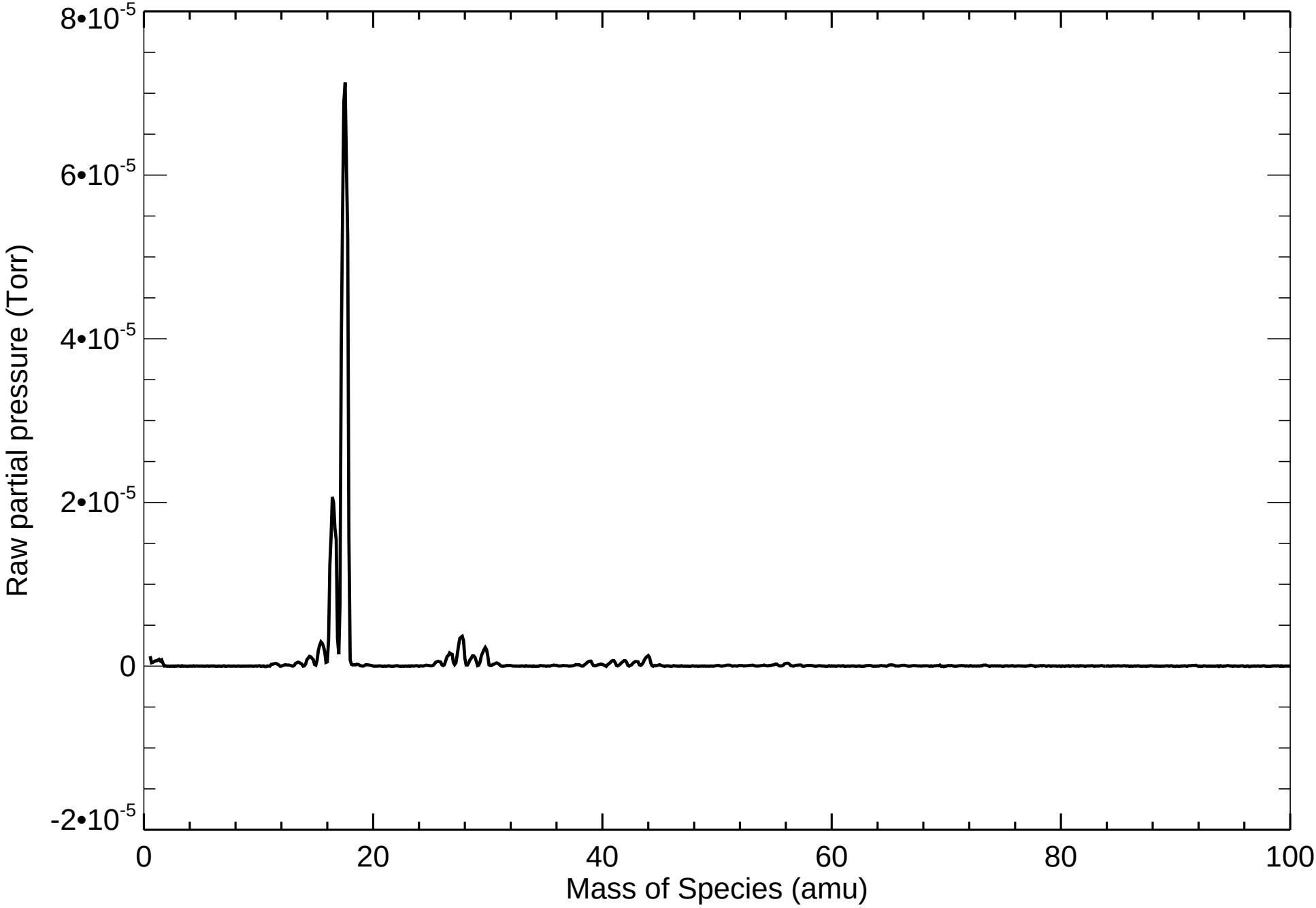


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:38:29:017 UT SWEEP: 0076 Filament: ON

Altitude (km): 138.58 Roll Angle (deg): 72.54

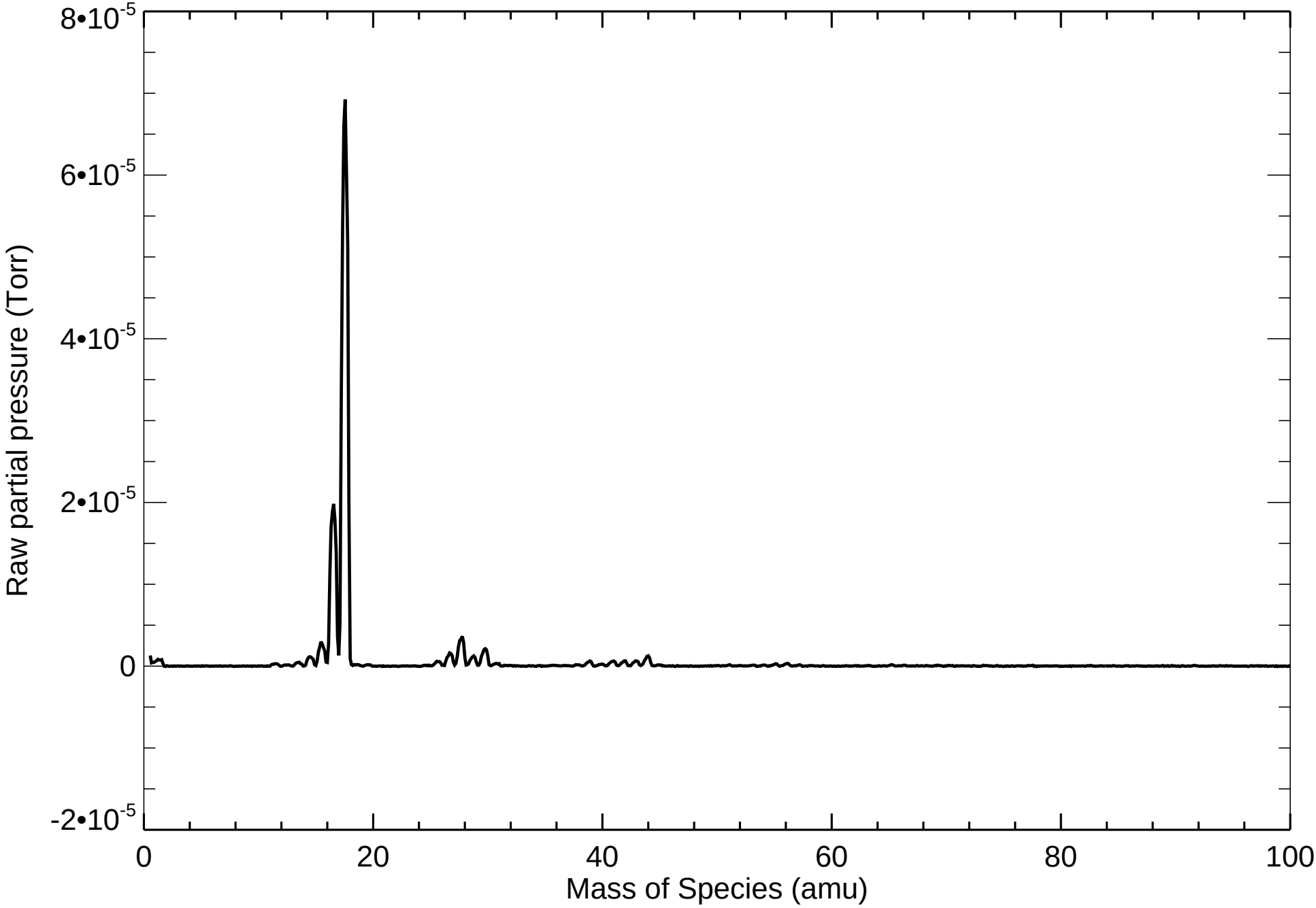


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:39:04:049 UT SWEEP: 0077 Filament: ON

Altitude (km): 138.73 Roll Angle (deg): 72.36

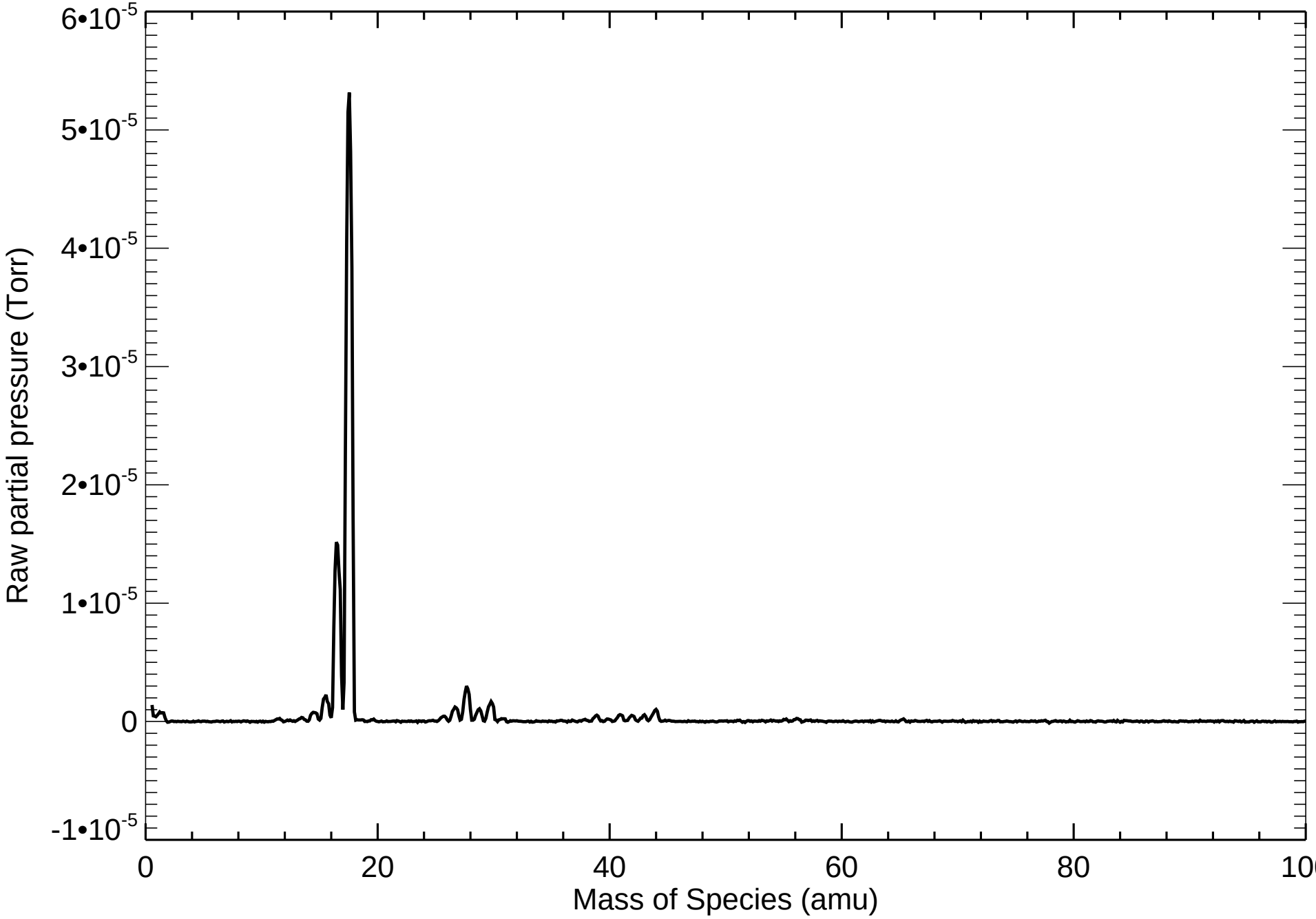


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:39:39:082 UT SWEEP: 0078 Filament: ON

Altitude (km): 138.95 Roll Angle (deg): 72.19

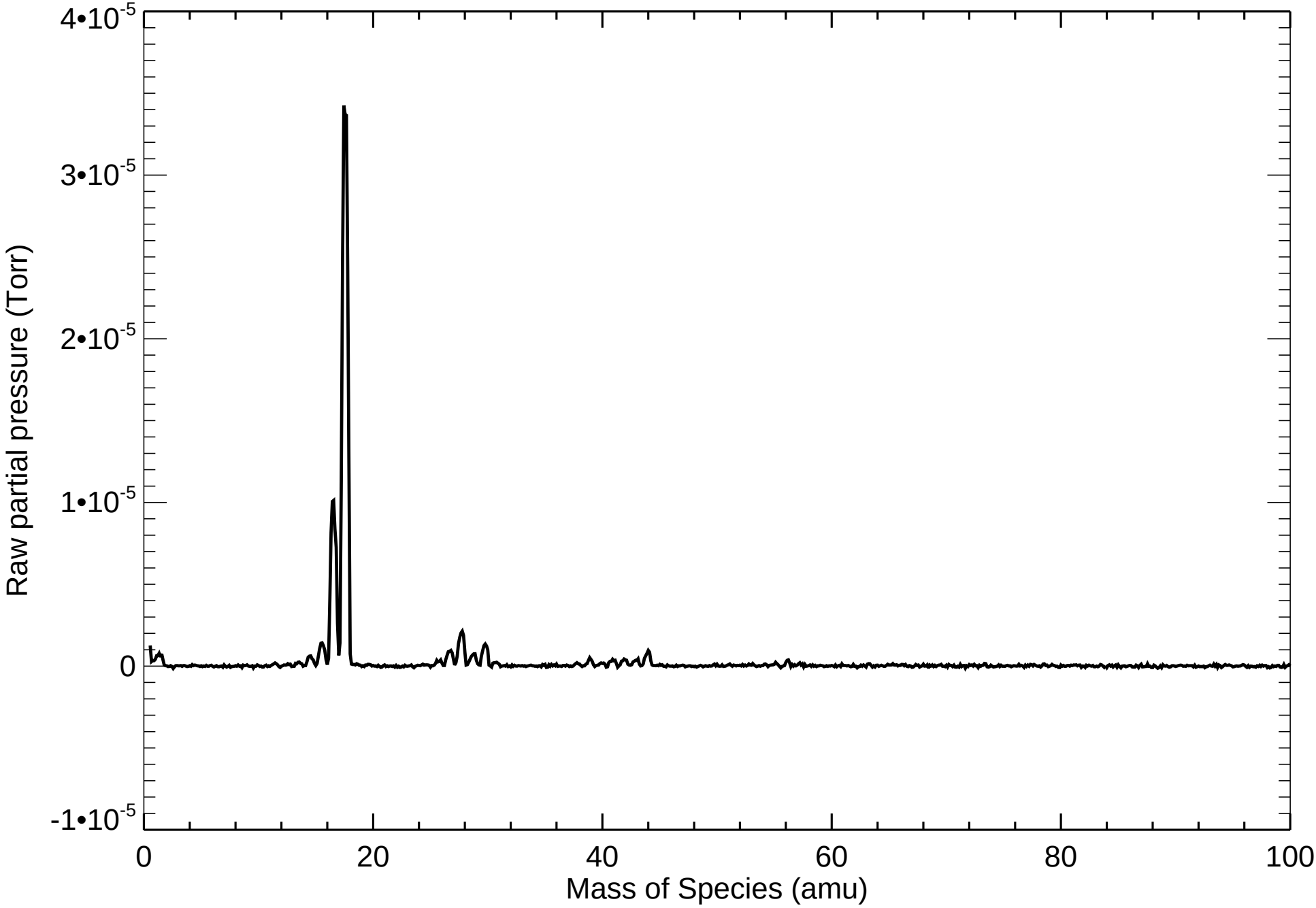


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:40:17:012 UT SWEEP: 0079 Filament: ON

Altitude (km): 139.09 Roll Angle (deg): 72.03

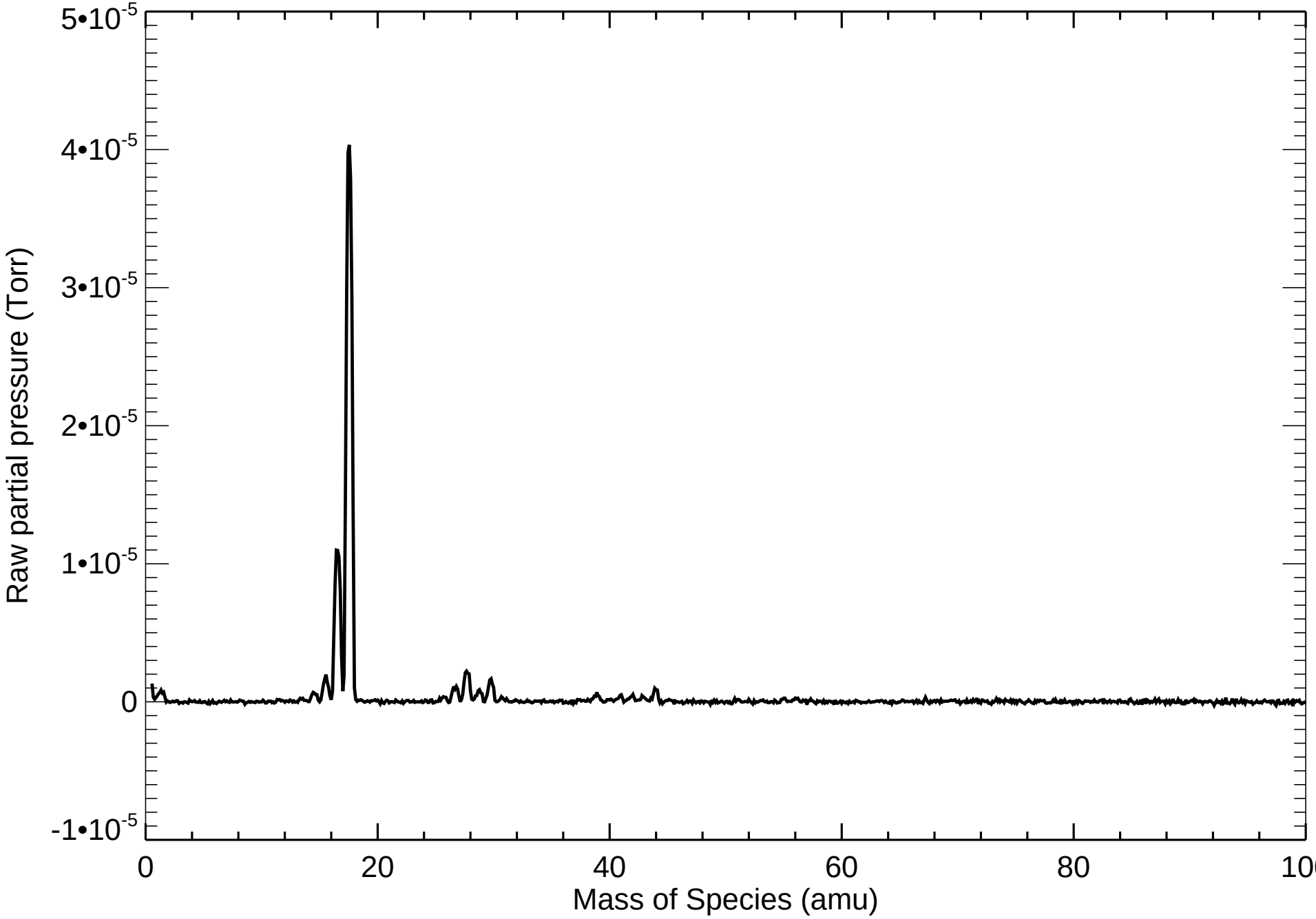


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:40:52:045 UT SWEEP: 0080 Filament: ON

Altitude (km): 139.17 Roll Angle (deg): 71.89

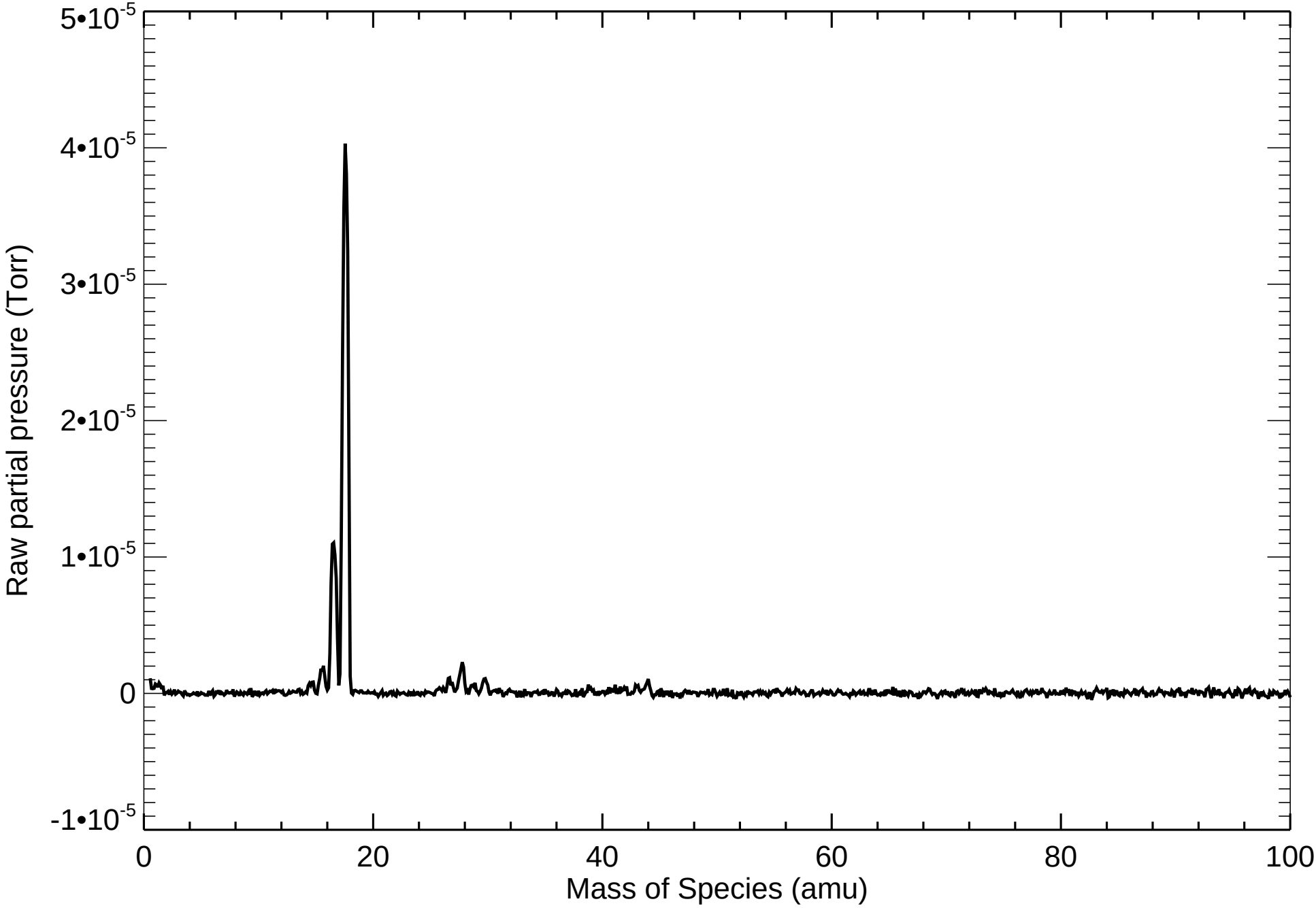


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:41:35:074 UT SWEEP: 0081 Filament: ON

Altitude (km): 139.26 Roll Angle (deg): 71.75

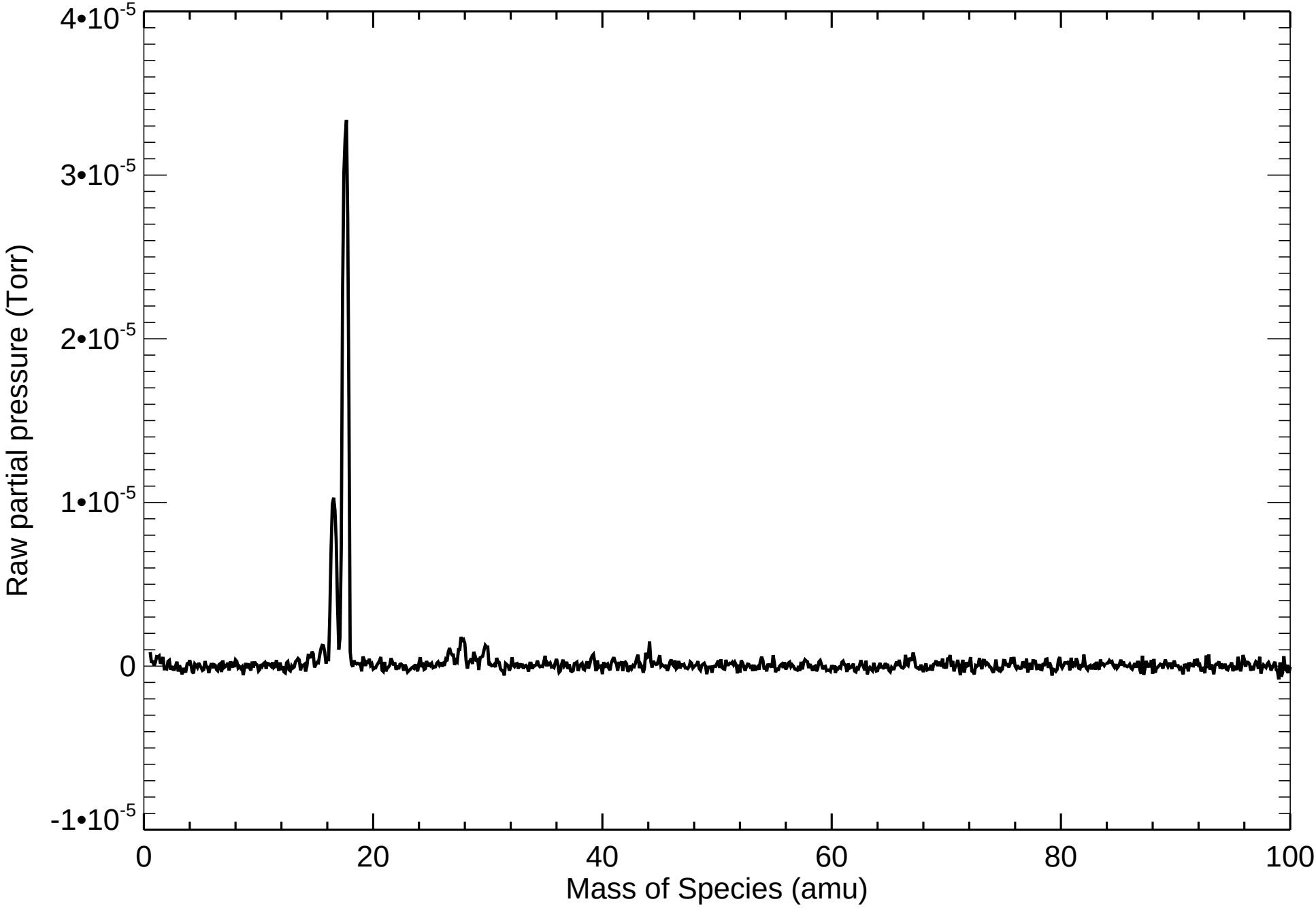


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:42:12:098 UT SWEEP: 0082 Filament: ON

Altitude (km): 139.28 Roll Angle (deg): 71.64

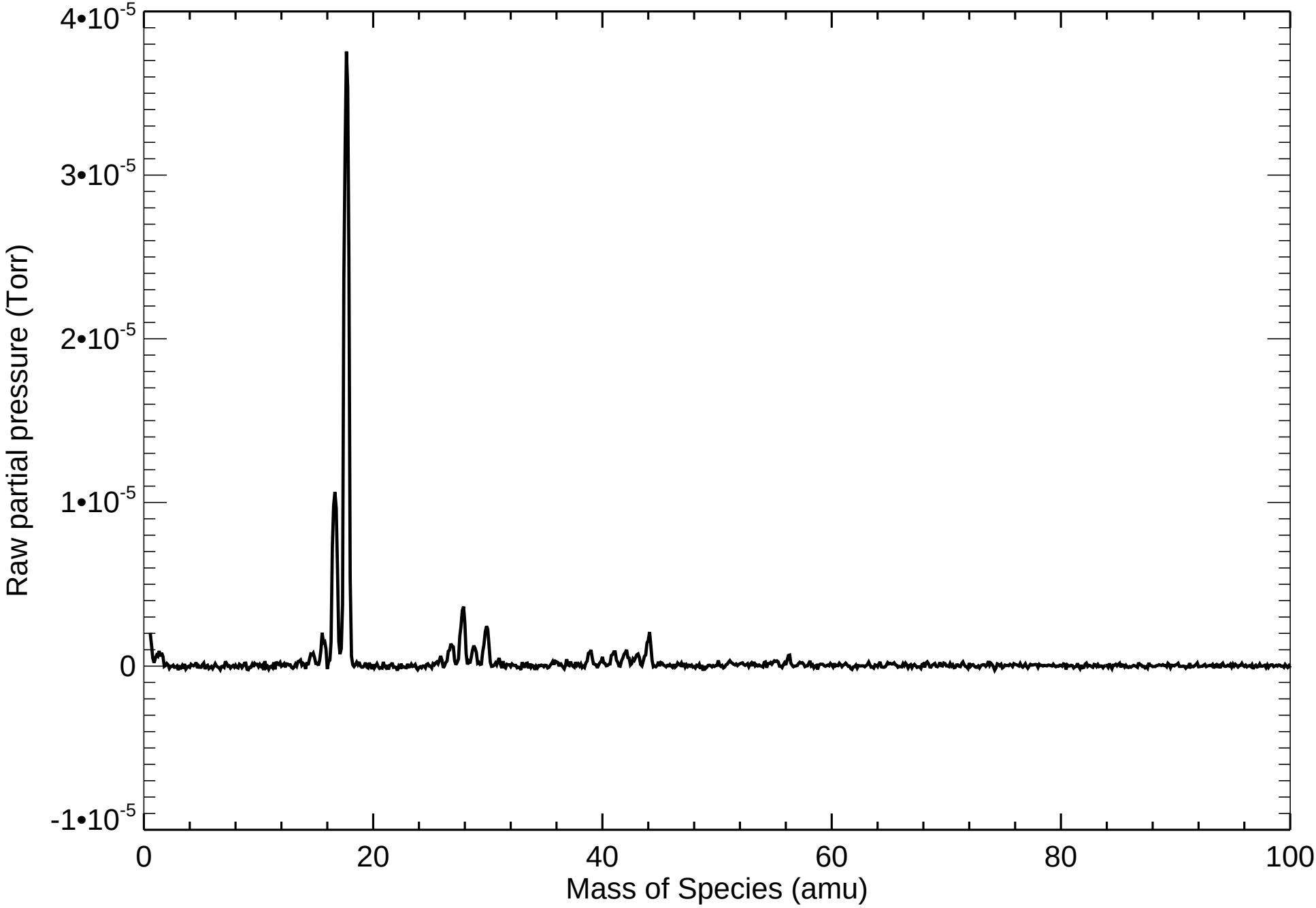


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:48:57:026 UT SWEEP: 0093 Filament: ON

Altitude (km): 137.96 Roll Angle (deg): 71.61

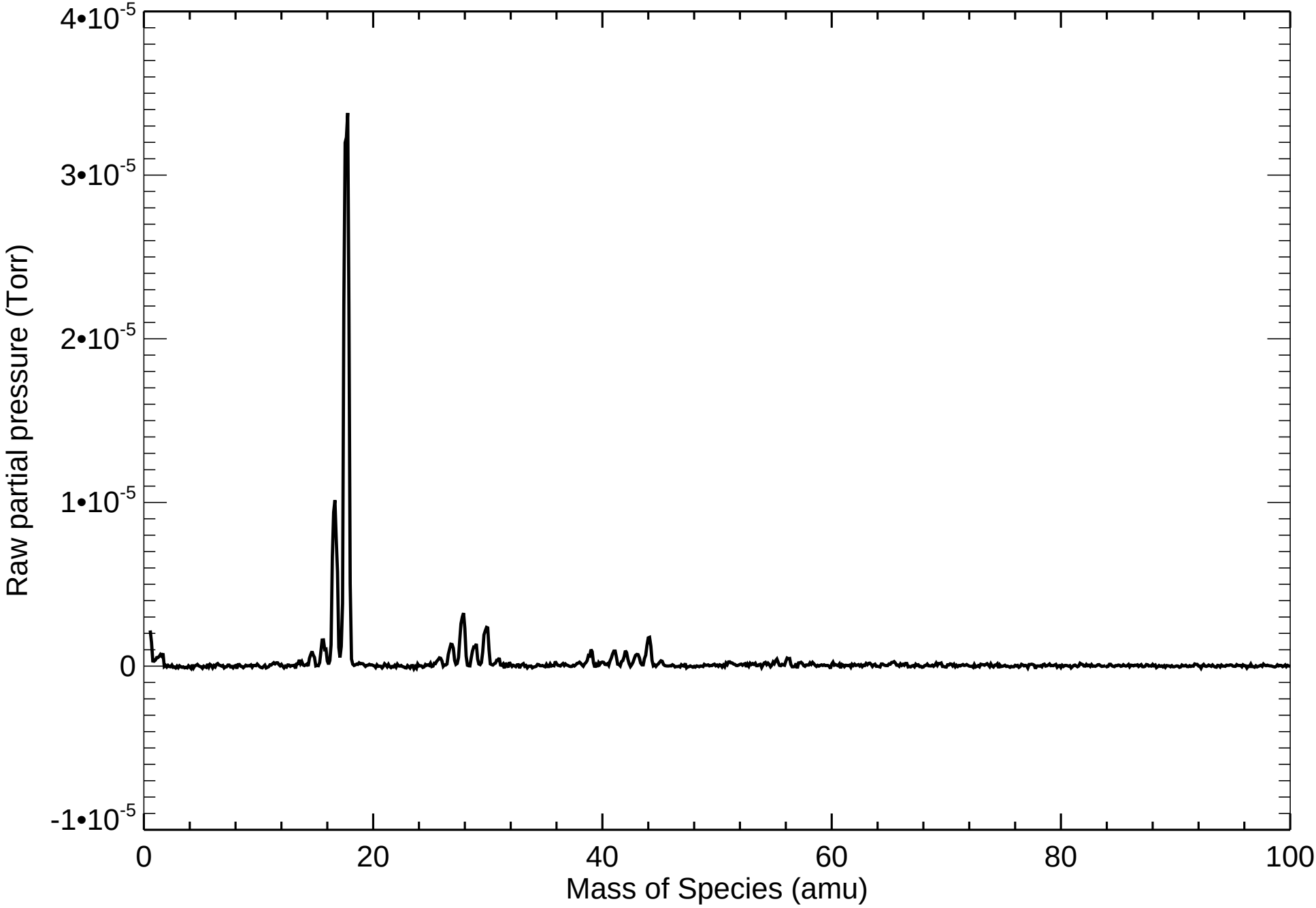


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:49:32:059 UT SWEEP: 0094 Filament: ON

Altitude (km): 137.74 Roll Angle (deg): 71.70

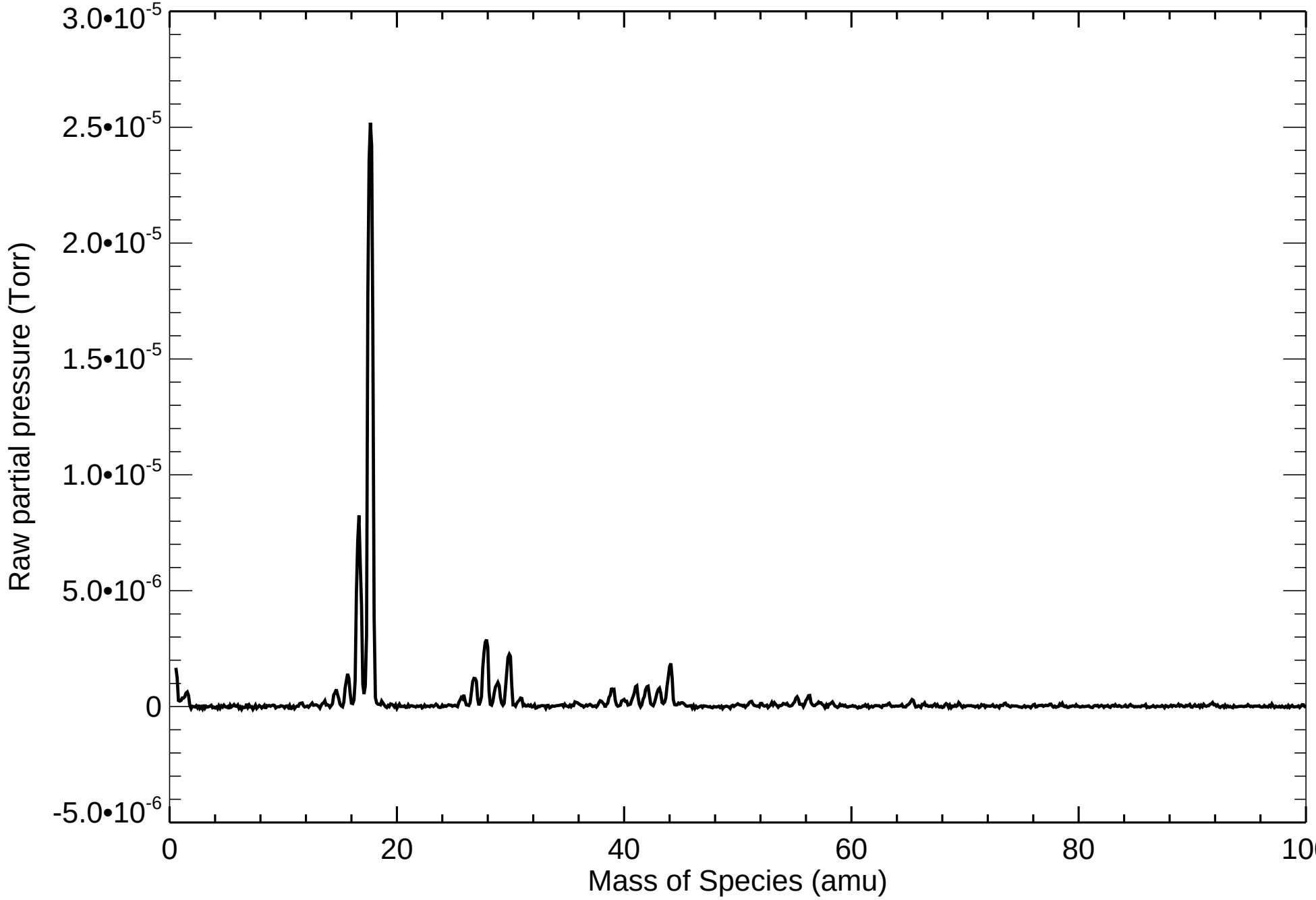


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:50:07:091 UT SWEEP: 0095 Filament: ON

Altitude (km): 137.42 Roll Angle (deg): 71.82

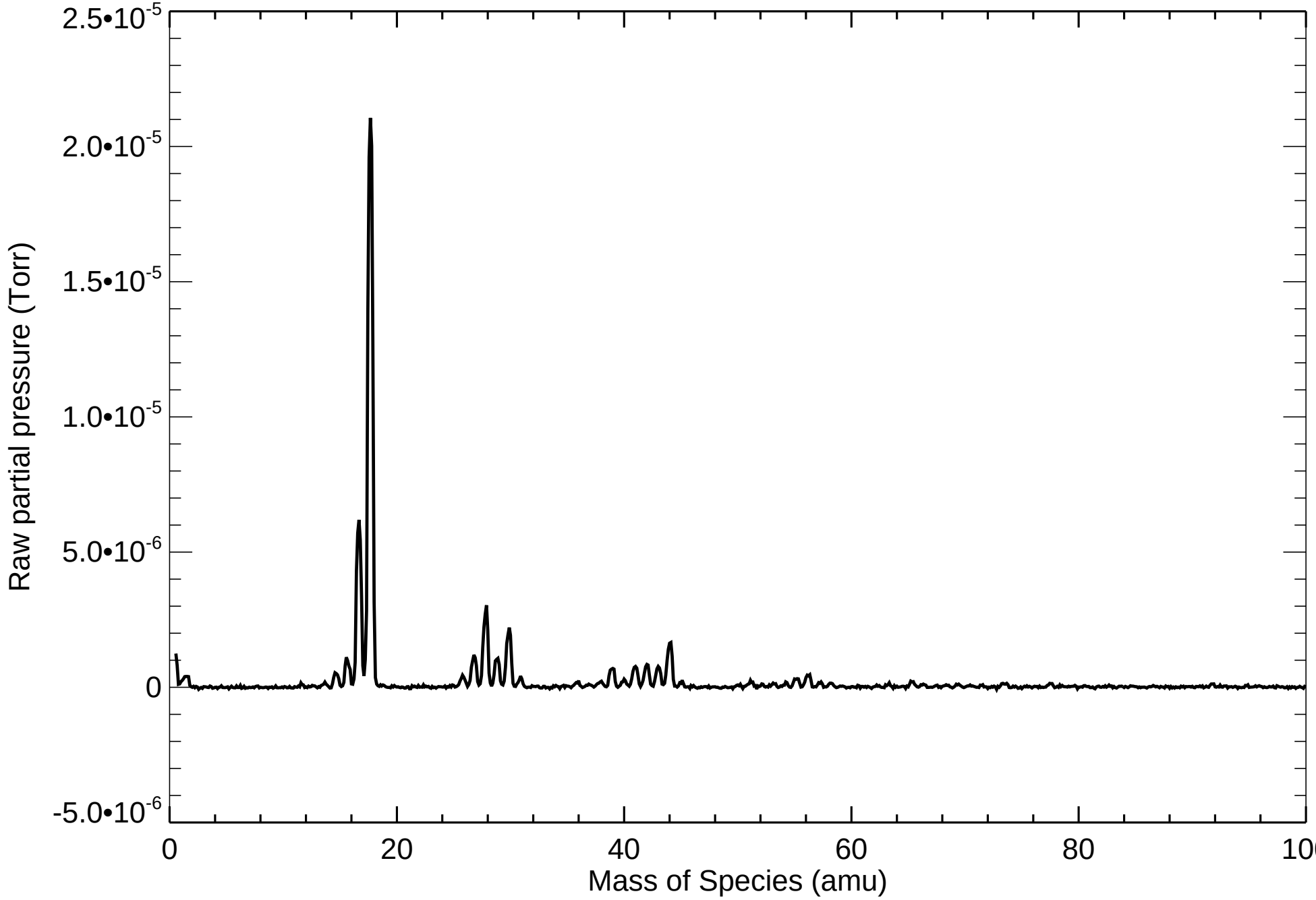


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:50:45:018 UT SWEEP: 0096 Filament: ON

Altitude (km): 137.18 Roll Angle (deg): 71.95

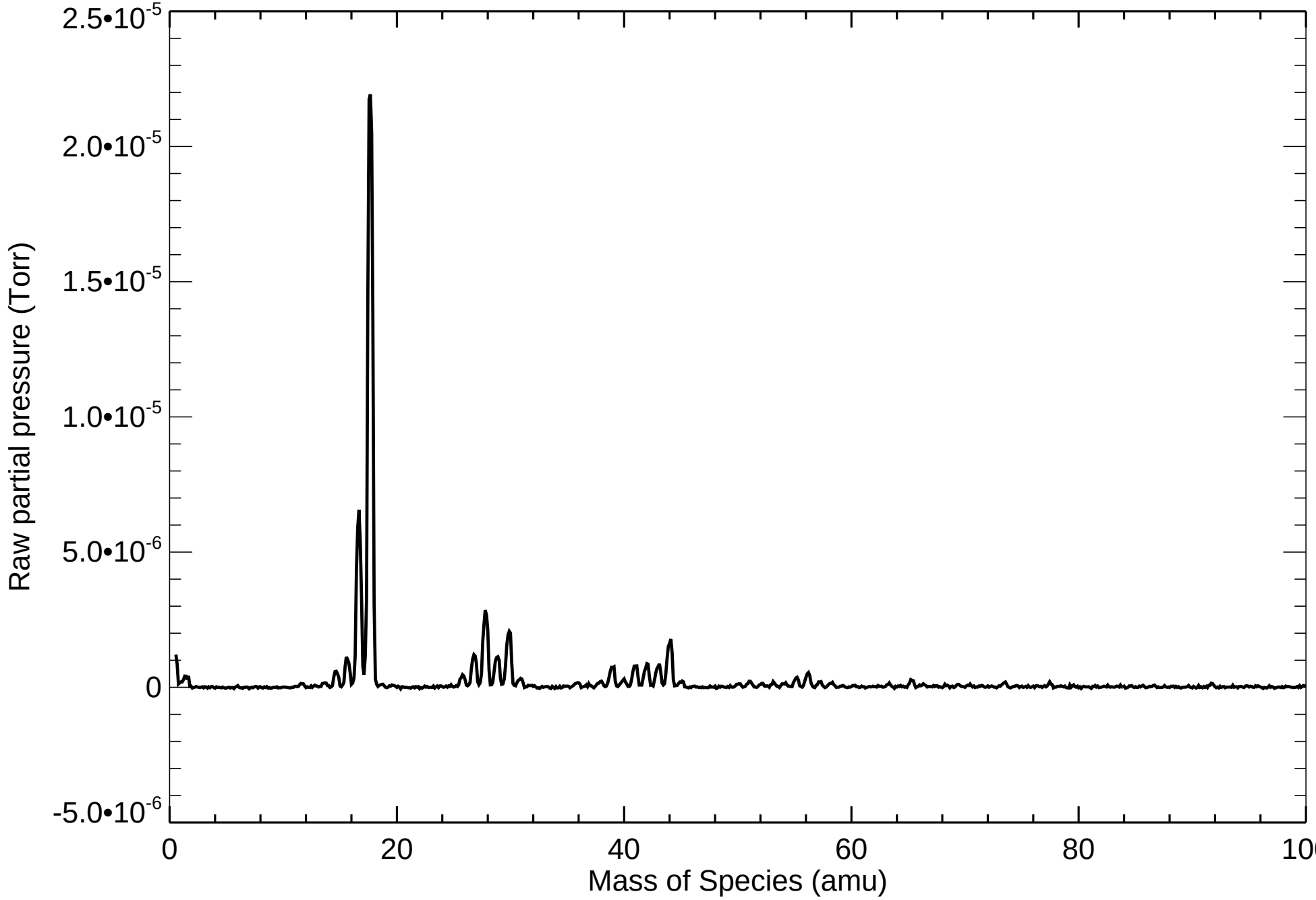


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:51:20:051 UT SWEEP: 0097 Filament: ON

Altitude (km): 136.80 Roll Angle (deg): 72.10

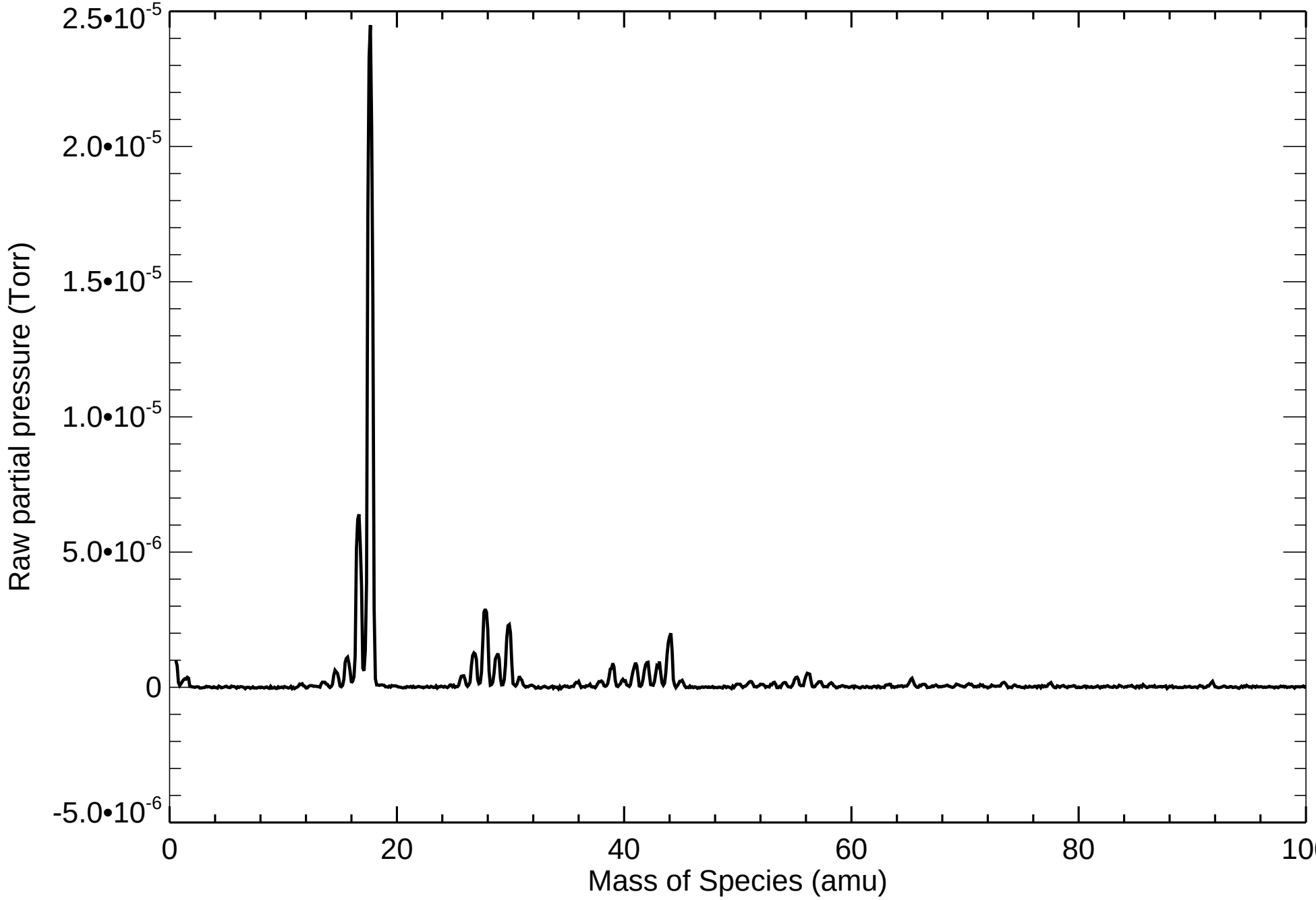


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:51:57:082 UT SWEEP: 0098 Filament: ON

Altitude (km): 136.39 Roll Angle (deg): 72.26

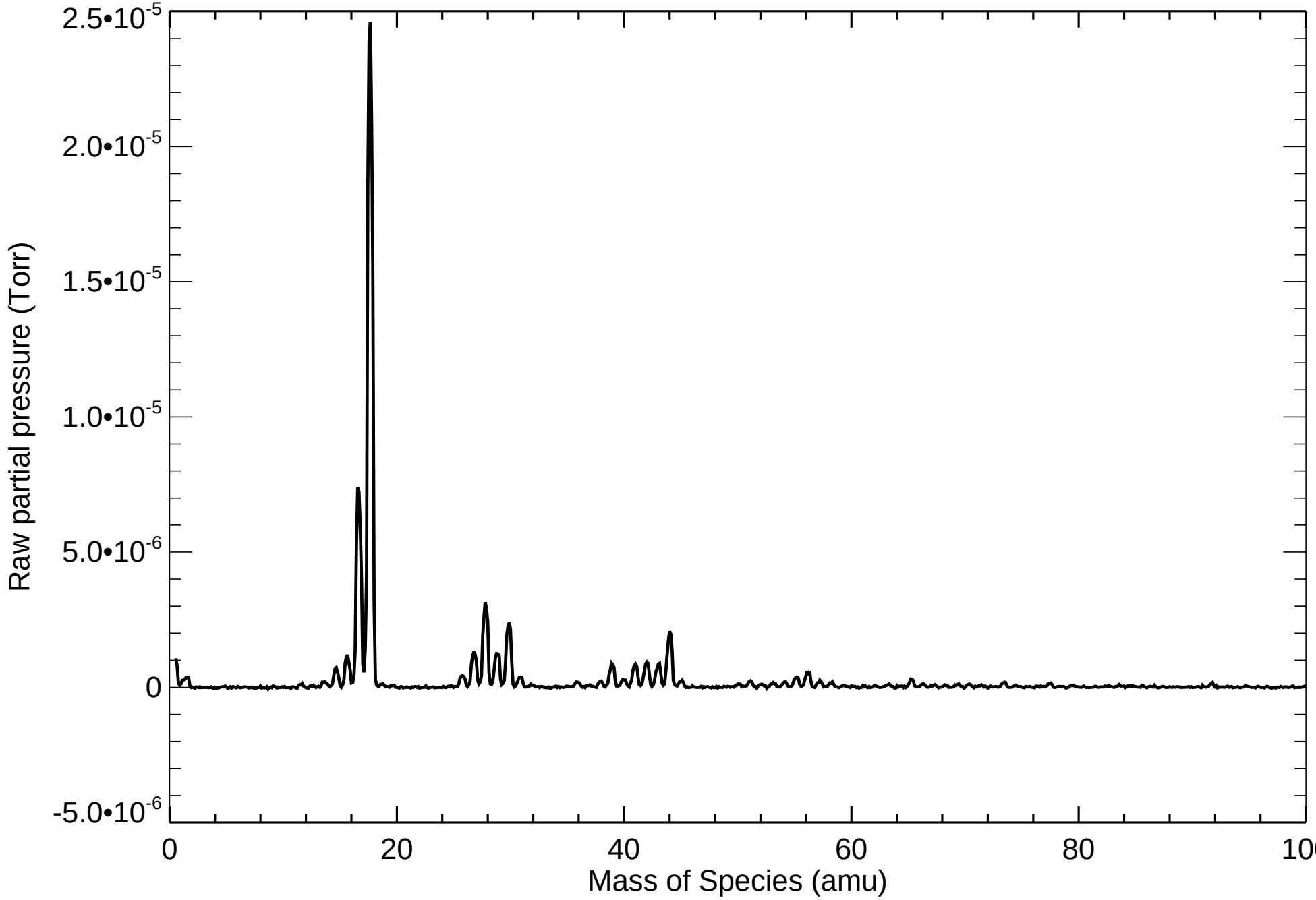


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:52:41:006 UT SWEEP: 0099 Filament: ON

Altitude (km): 135.95 Roll Angle (deg): 72.48

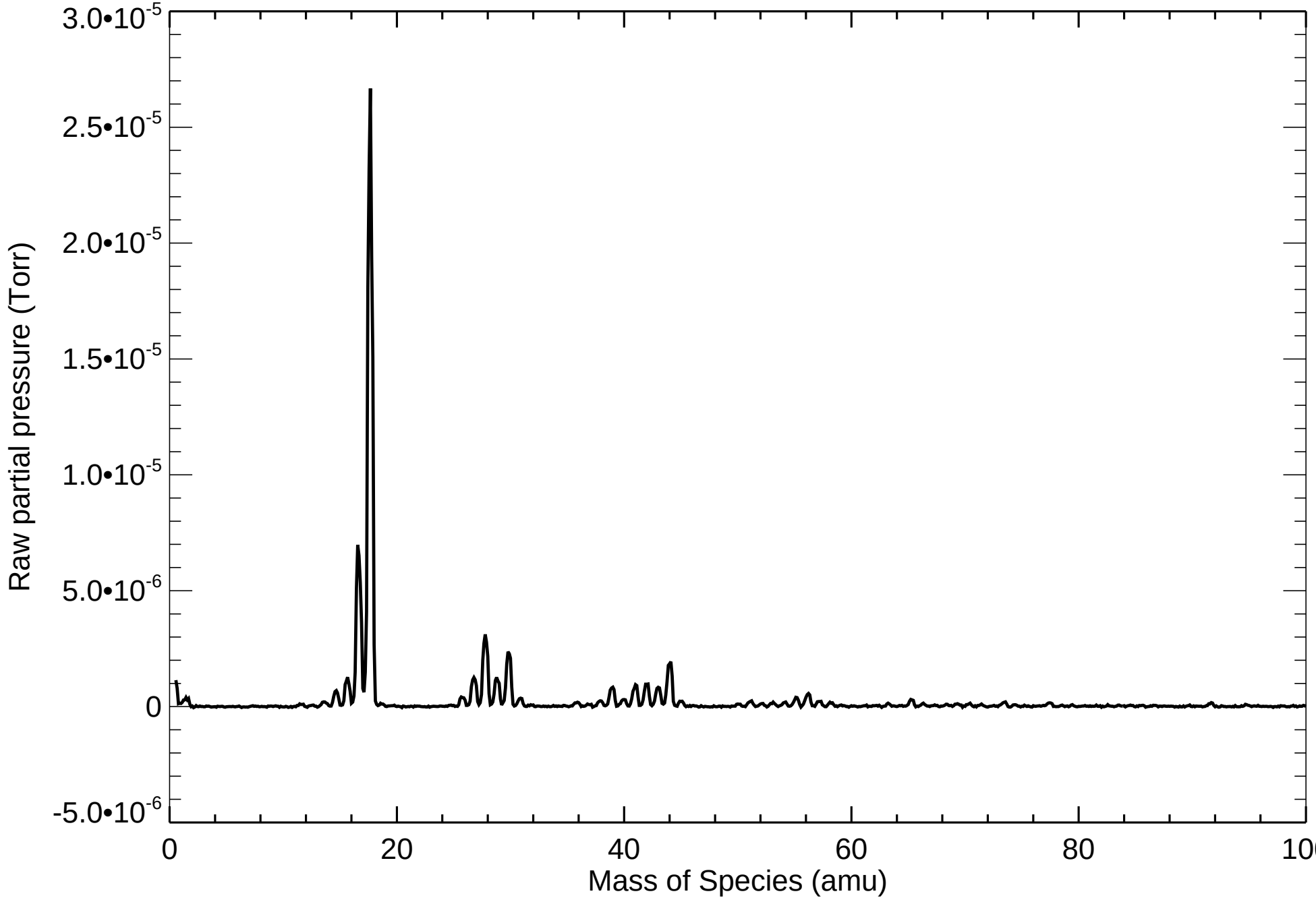


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:53:16:039 UT SWEEP: 0100 Filament: ON

Altitude (km): 135.60 Roll Angle (deg): 72.67

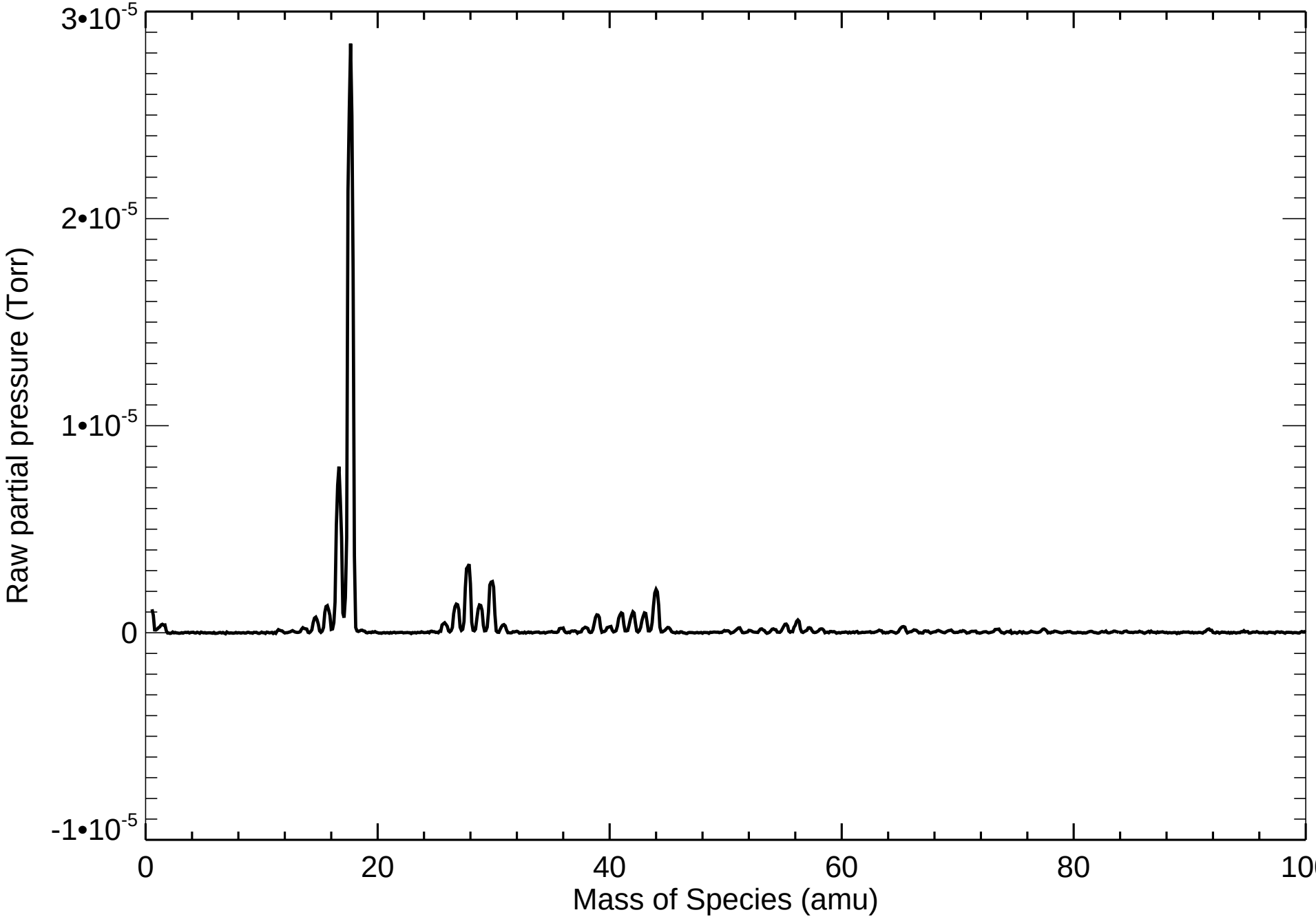


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:53:53:070 UT SWEEP: 0101 Filament: ON

Altitude (km): 135.10 Roll Angle (deg): 72.90

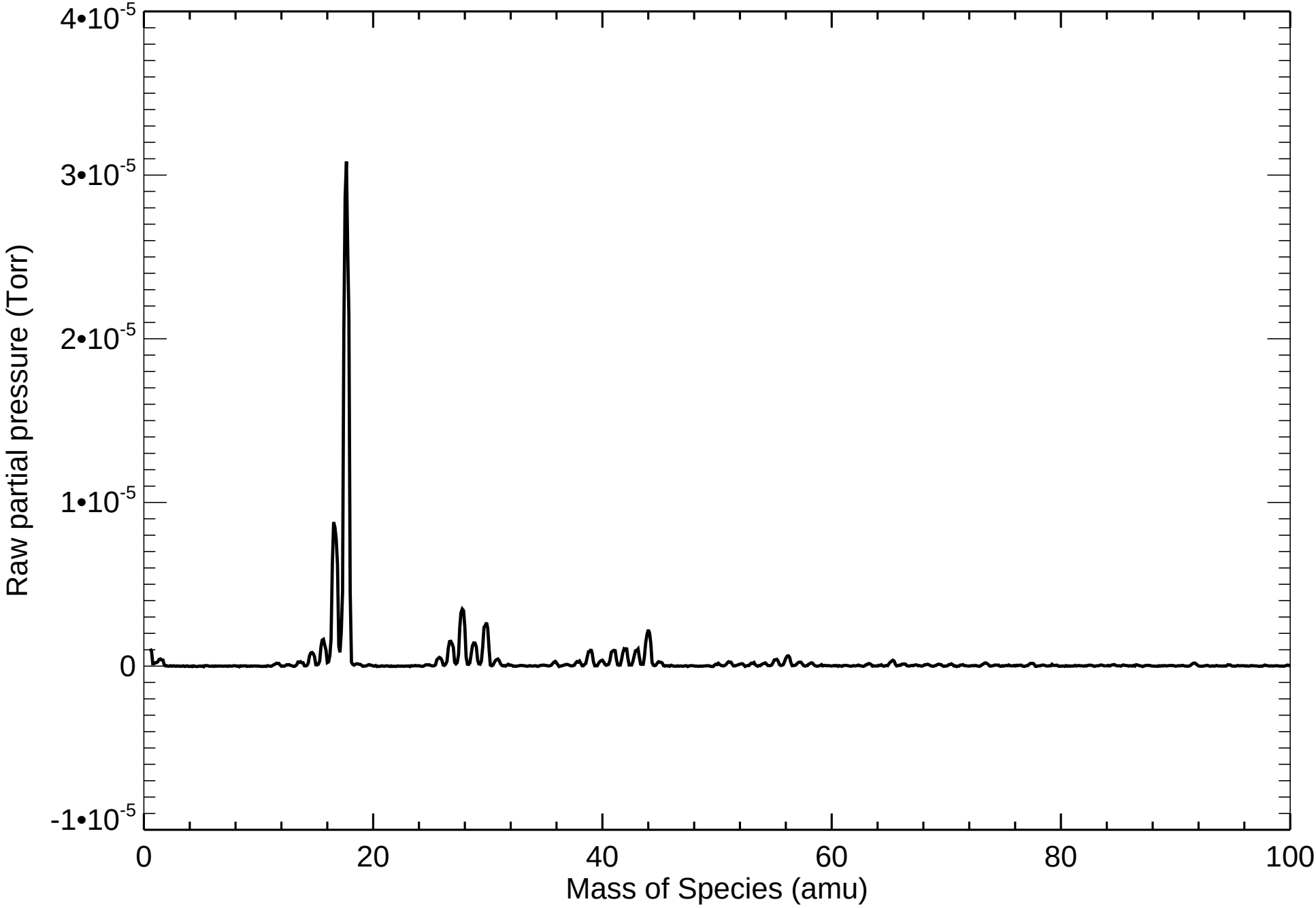


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:54:29:005 UT SWEEP: 0102 Filament: ON

Altitude (km): 134.49 Roll Angle (deg): 73.13

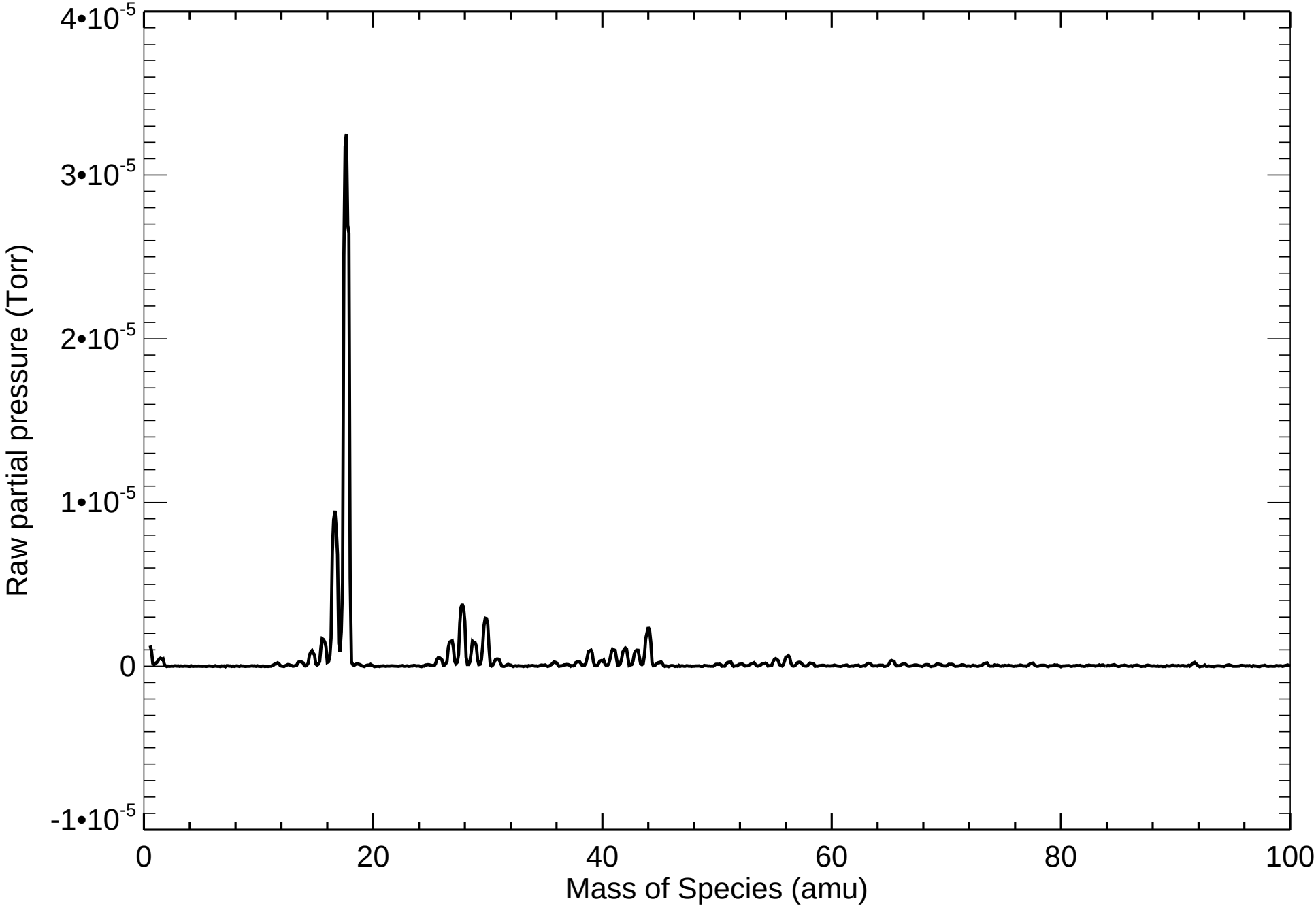


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:55:04:038 UT SWEEP: 0103 Filament: ON

Altitude (km): 134.08 Roll Angle (deg): 73.37

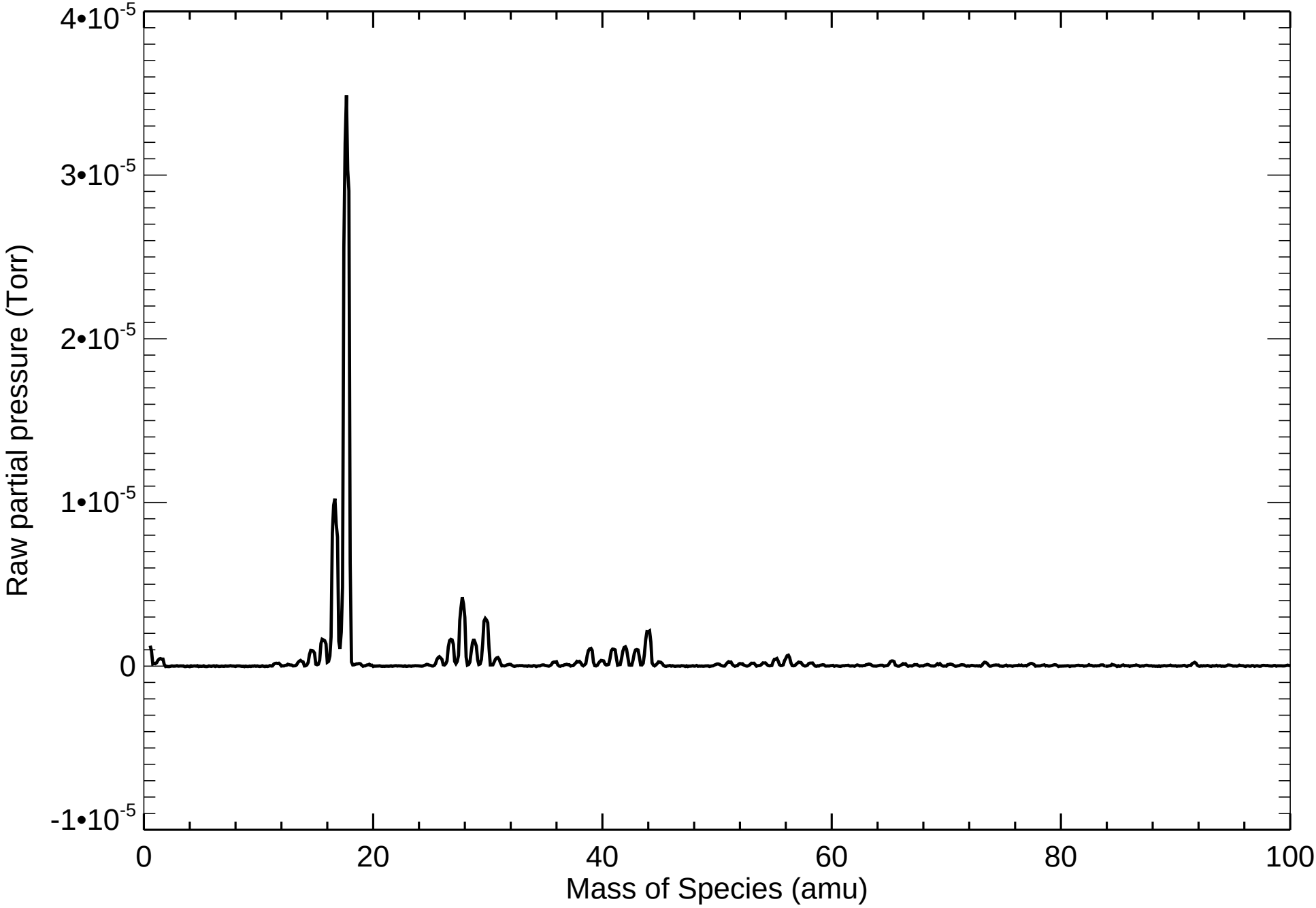


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:55:41:069 UT SWEEP: 0104 Filament: ON

Altitude (km): 133.53 Roll Angle (deg): 73.64

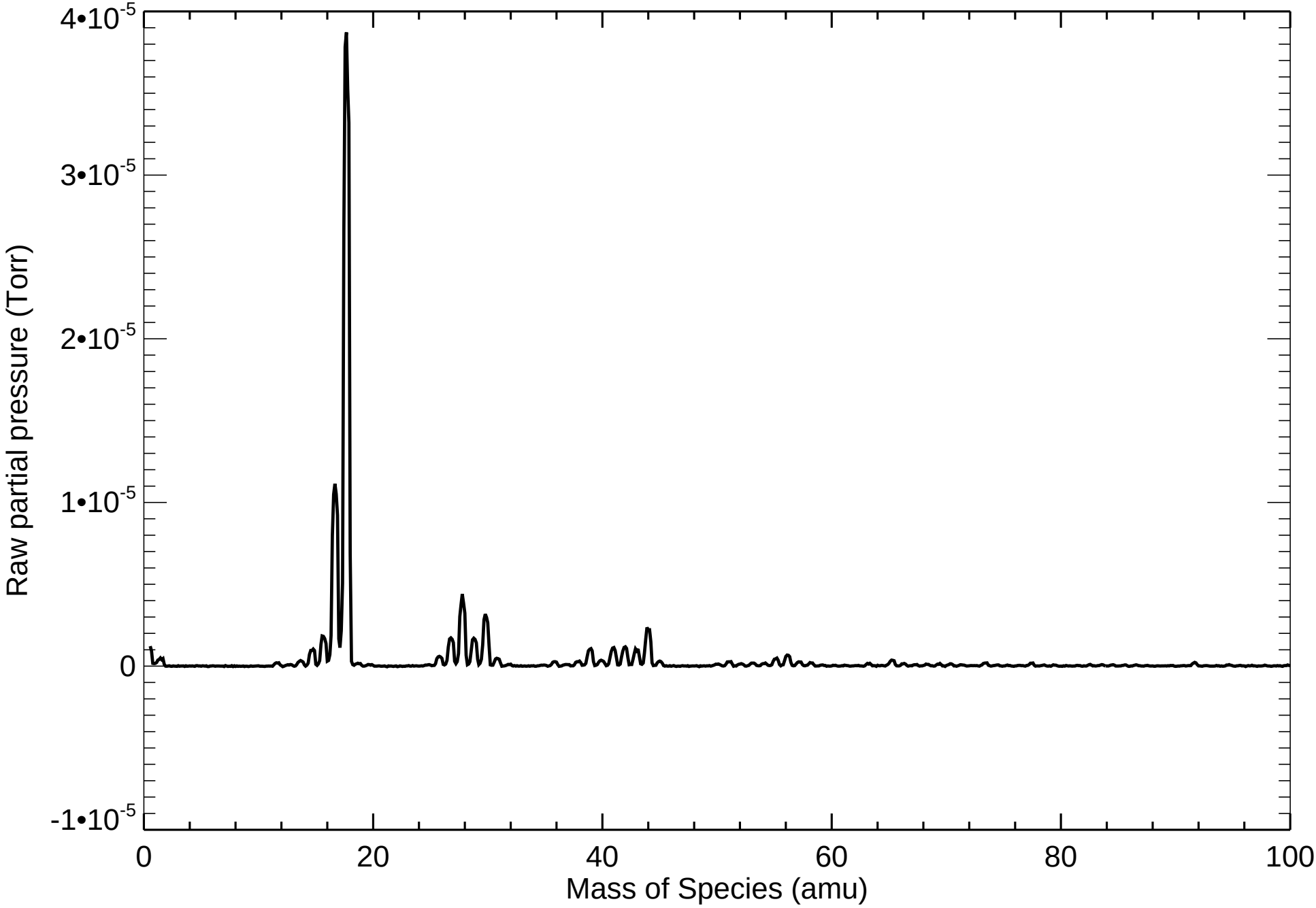


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:56:17:001 UT SWEEP: 0105 Filament: ON

Altitude (km): 132.89 Roll Angle (deg): 73.92

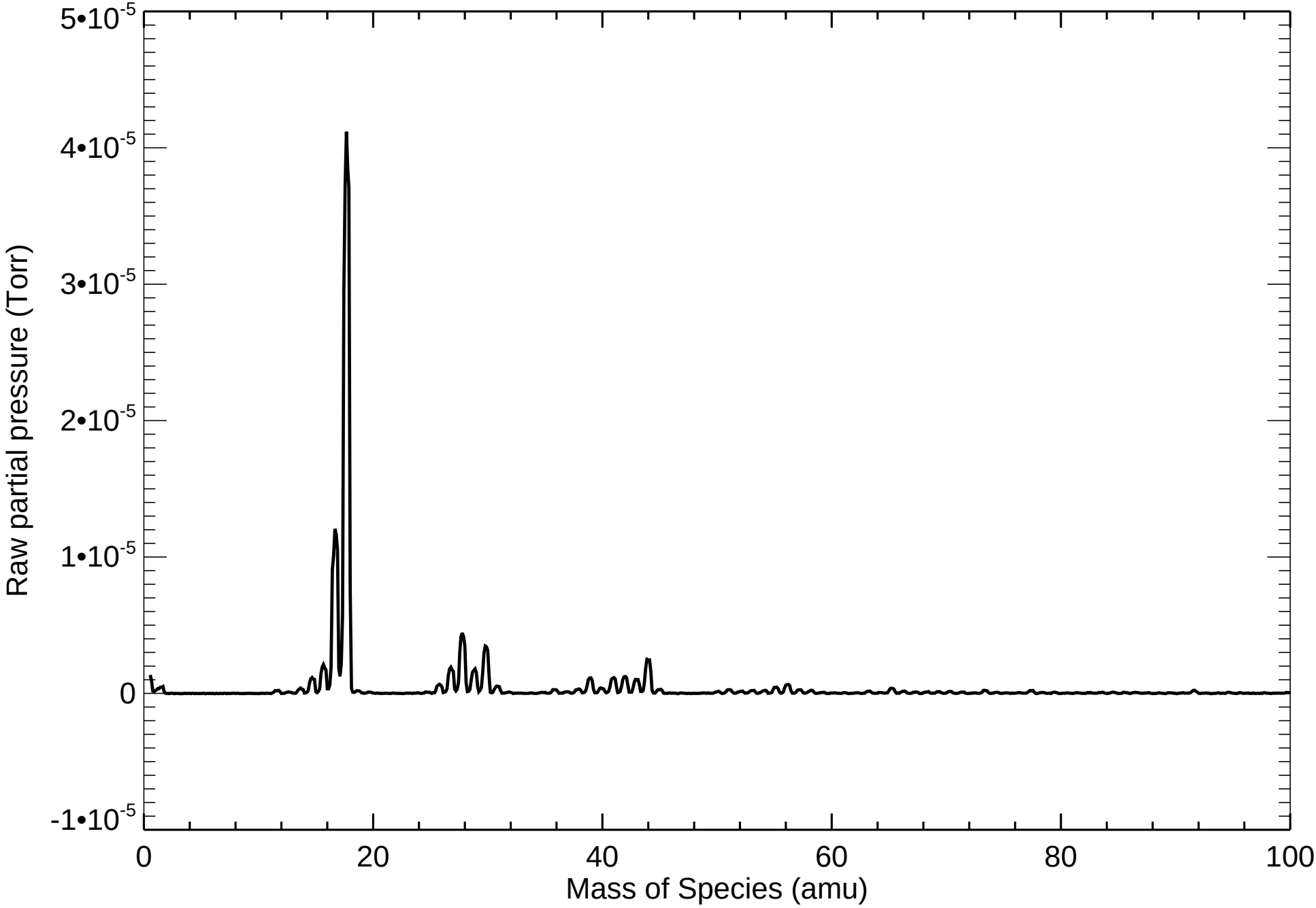


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:56:52:027 UT SWEEP: 0106 Filament: ON

Altitude (km): 132.43 Roll Angle (deg): 74.20

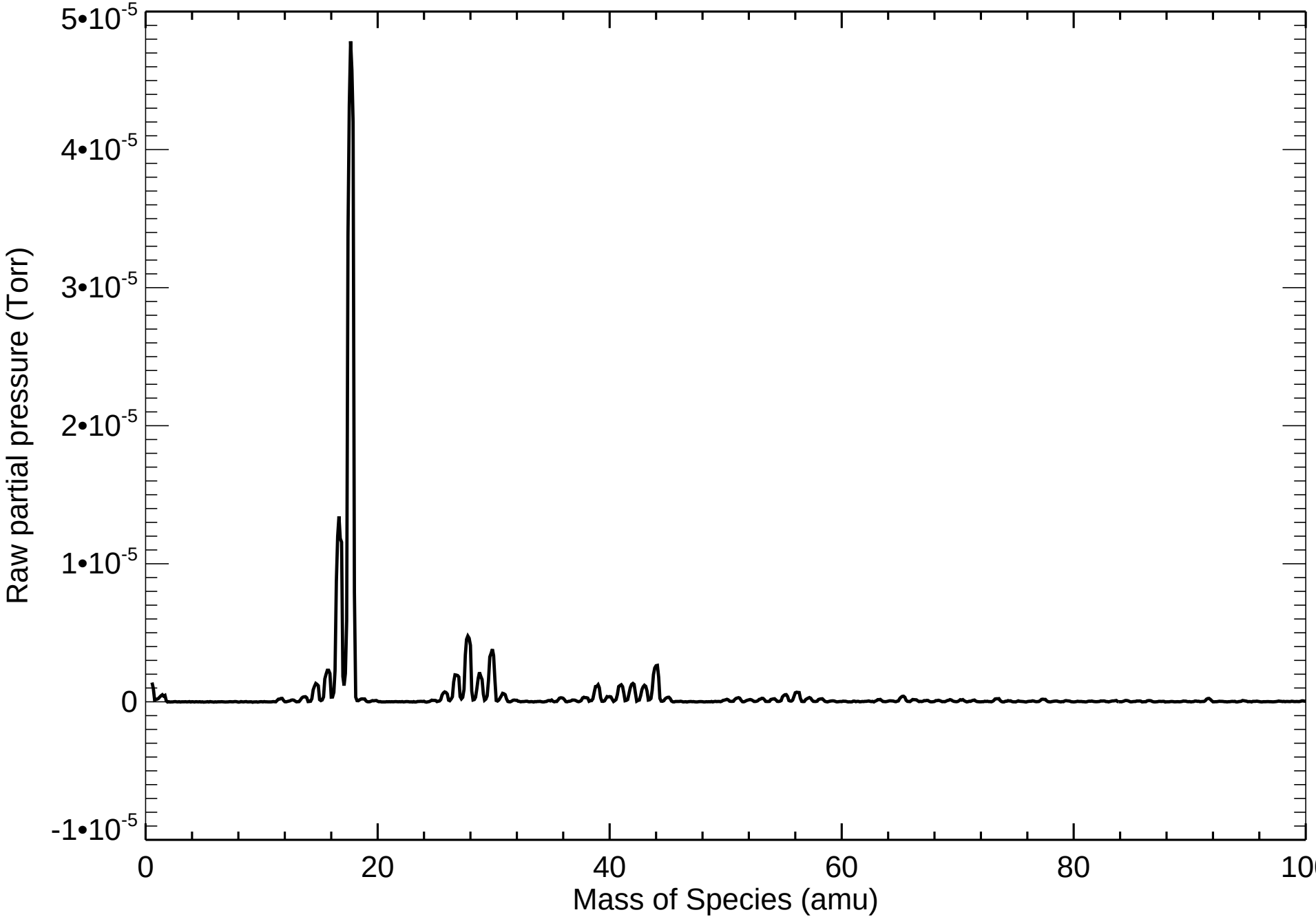


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:57:29:047 UT SWEEP: 0107 Filament: ON

Altitude (km): 131.84 Roll Angle (deg): 74.52

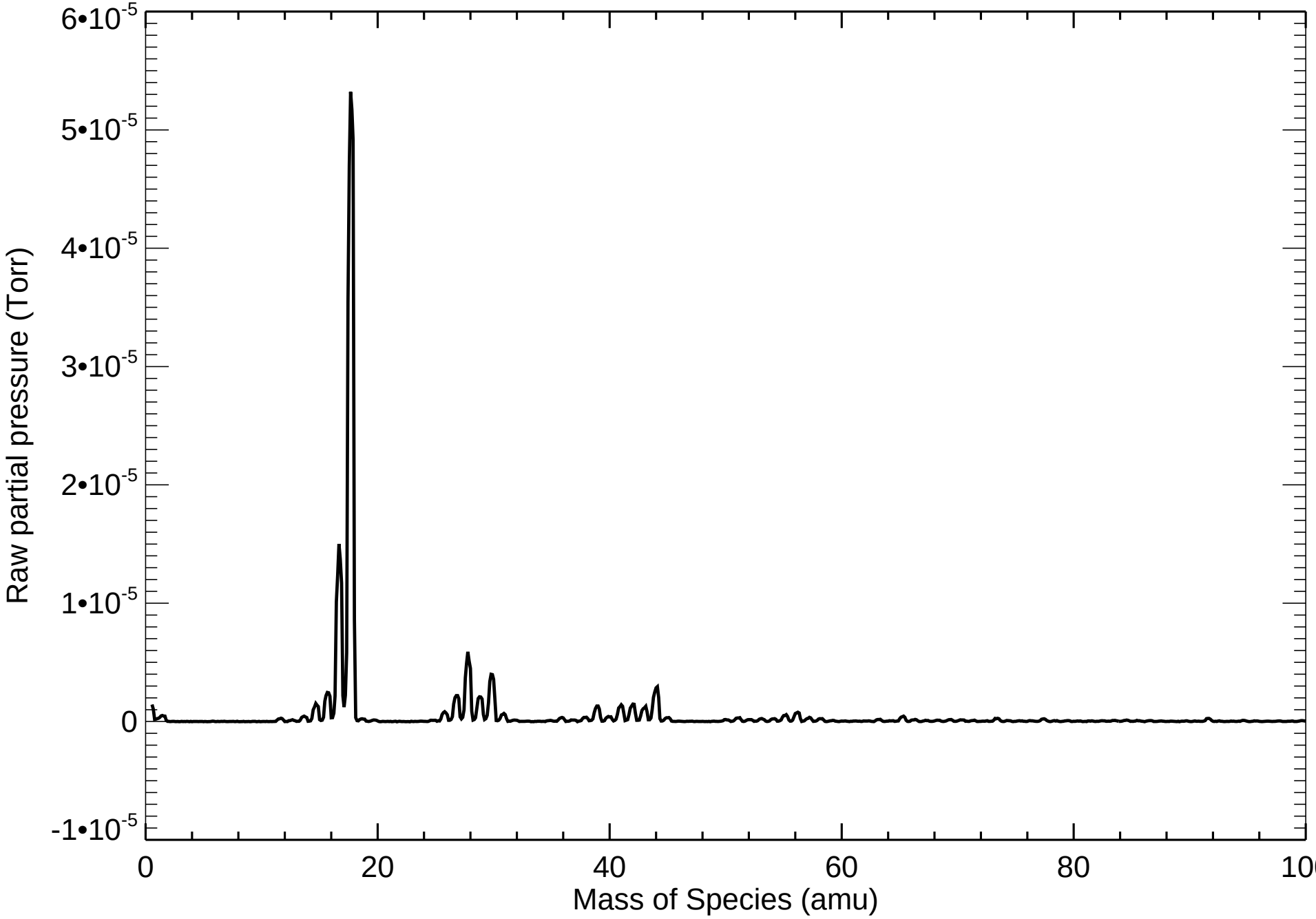


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:58:06:078 UT SWEEP: 0108 Filament: ON

Altitude (km): 131.27 Roll Angle (deg): 74.86

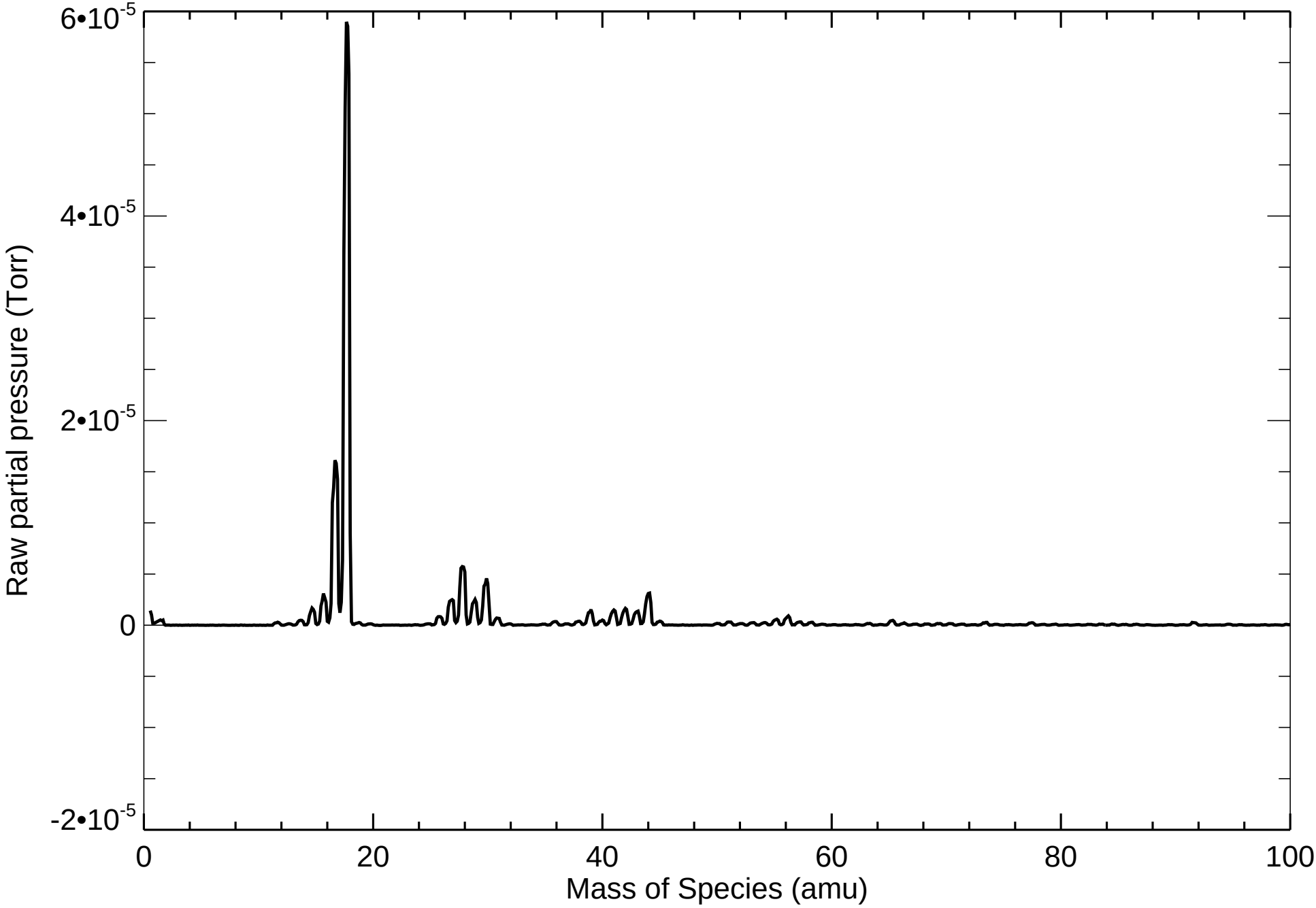


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:58:50:017 UT SWEEP: 0109 Filament: ON

Altitude (km): 130.44 Roll Angle (deg): 75.27

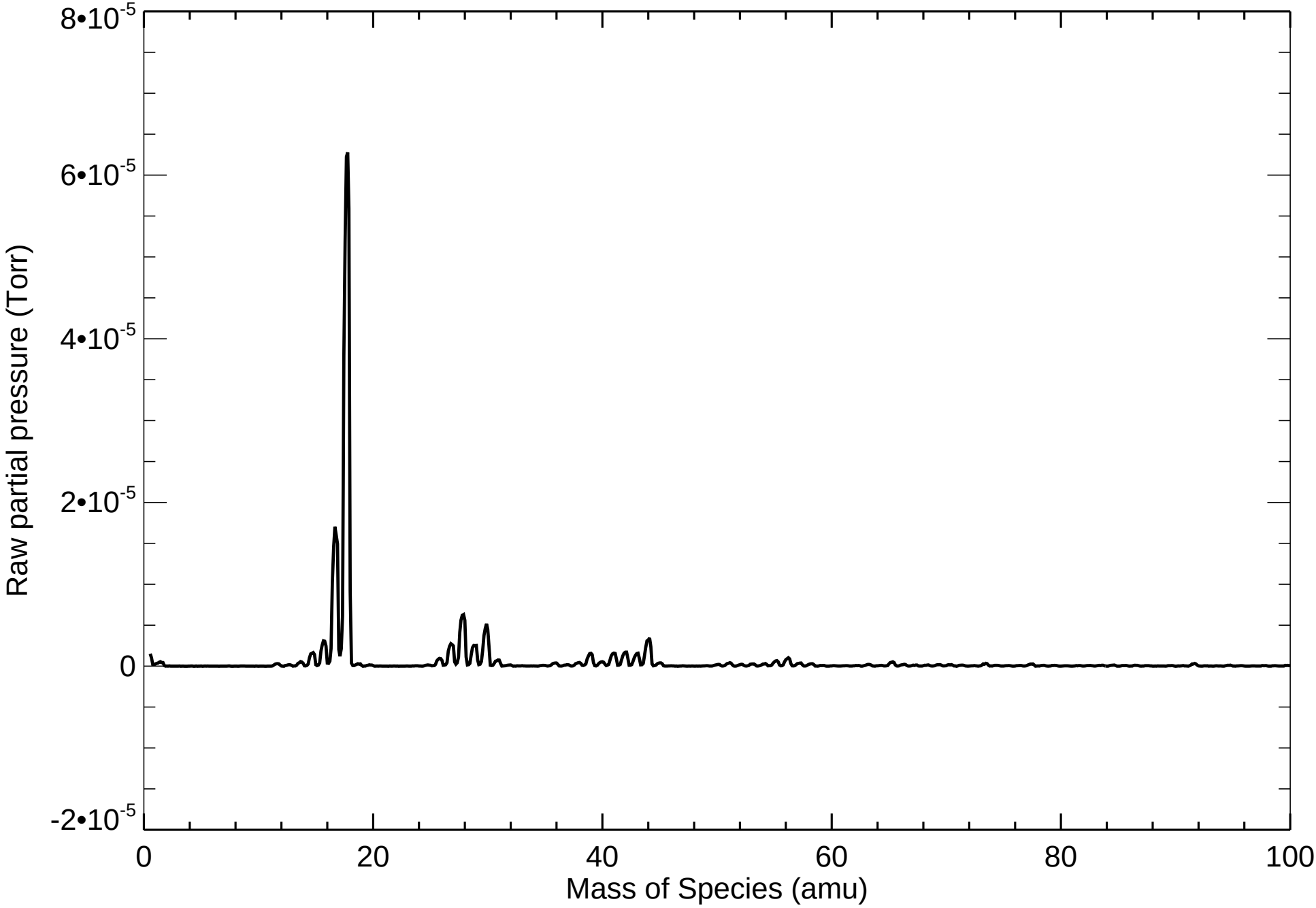


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 14:59:25:049 UT SWEEP: 0110 Filament: ON

Altitude (km): 129.93 Roll Angle (deg): 75.62

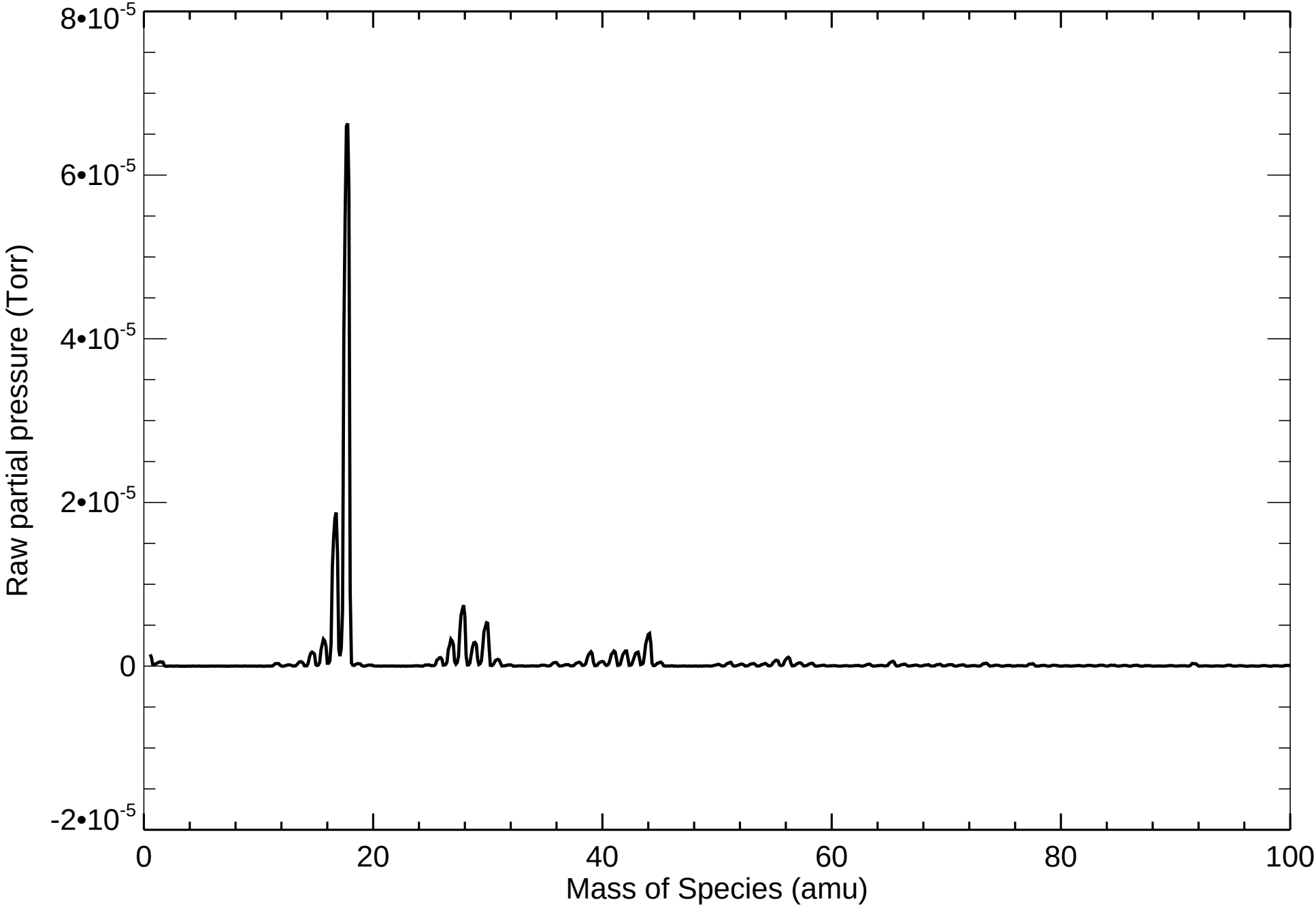


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:00:00:082 UT SWEEP: 0111 Filament: ON

Altitude (km): 129.21 Roll Angle (deg): 75.99

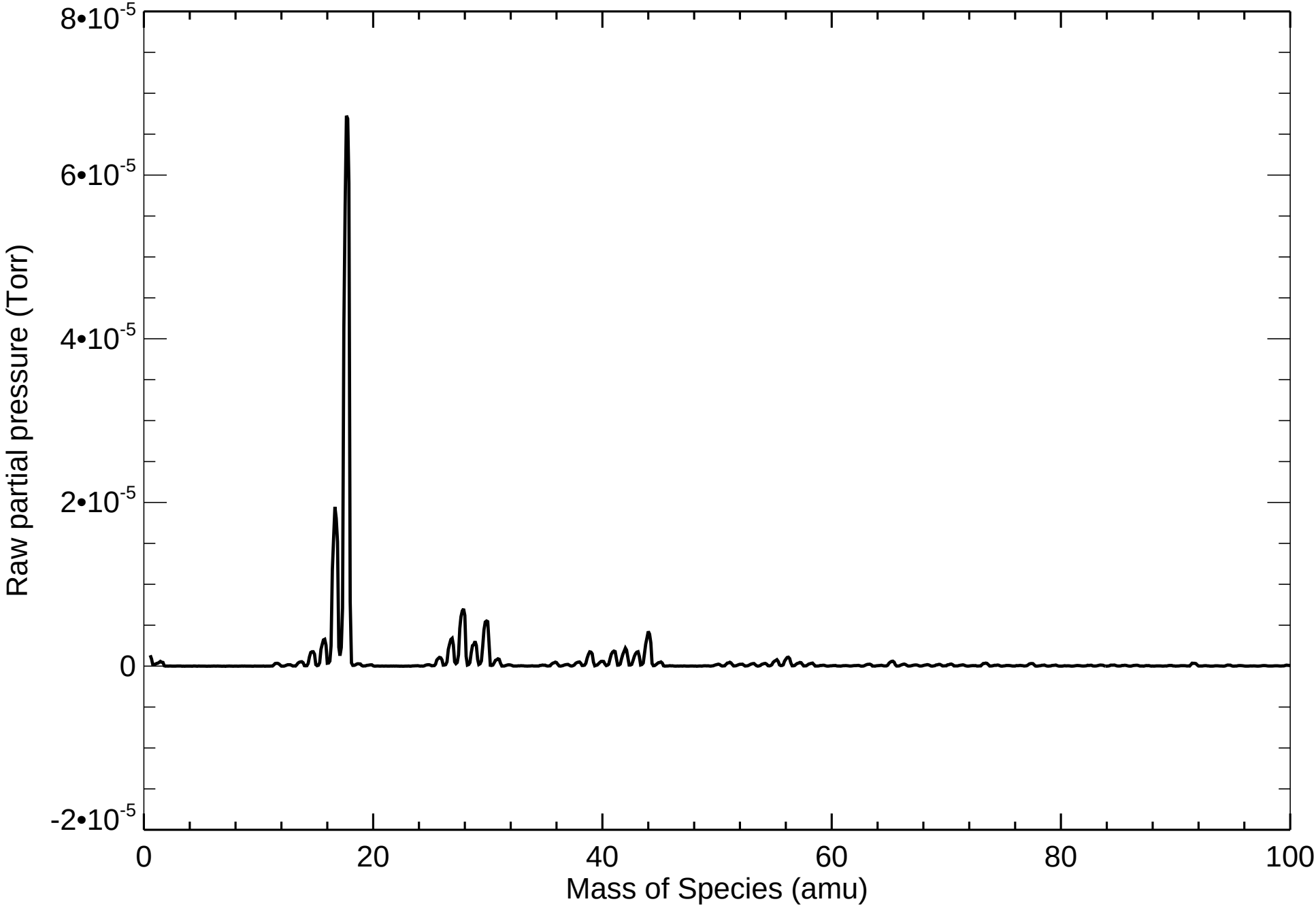


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:00:38:012 UT SWEEP: 0112 Filament: ON

Altitude (km): 128.44 Roll Angle (deg): 76.39

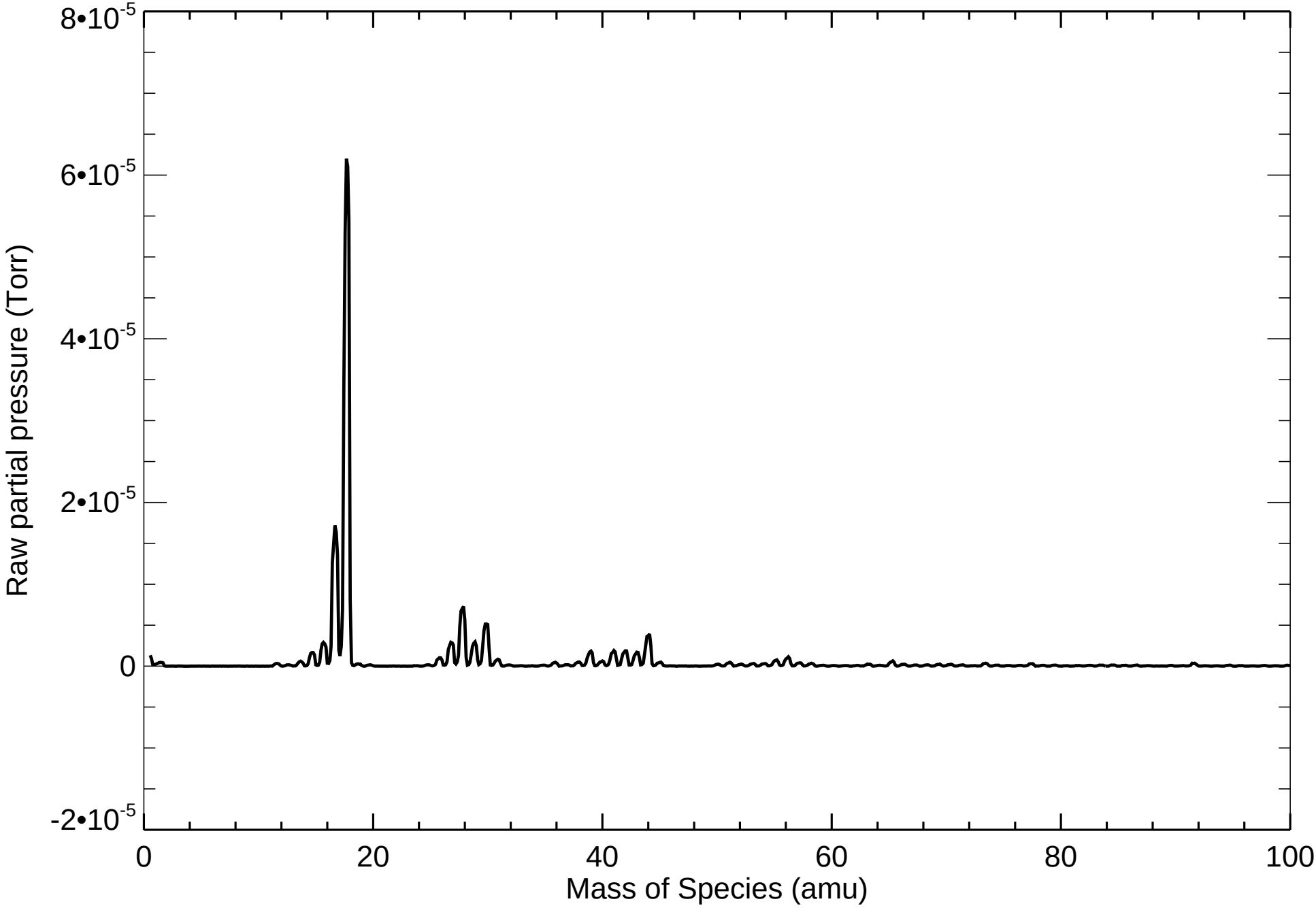


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:01:13:035 UT SWEEP: 0113 Filament: ON

Altitude (km): 127.86 Roll Angle (deg): 76.79

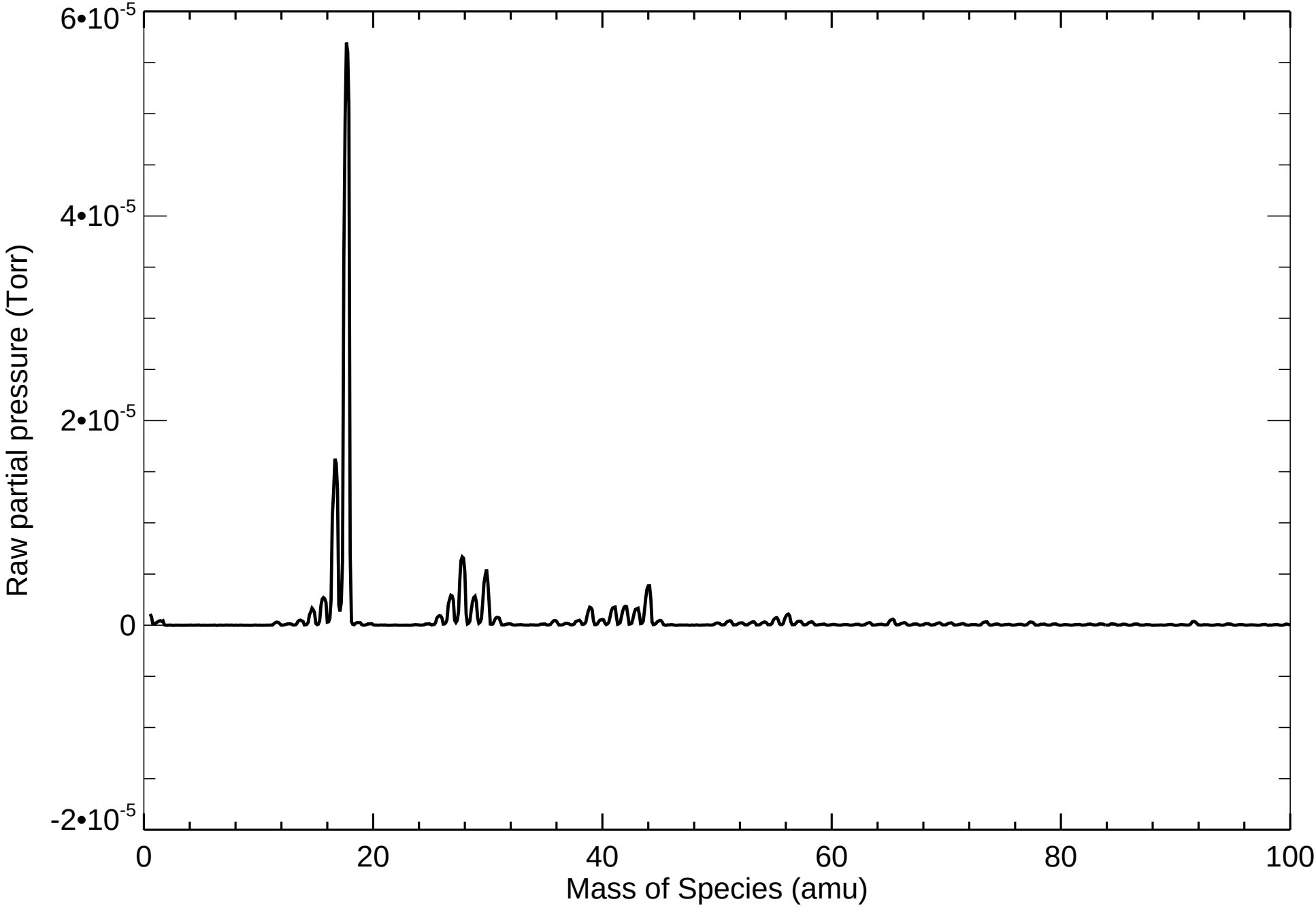


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:01:50:065 UT SWEEP: 0114 Filament: ON

Altitude (km): 127.00 Roll Angle (deg): 77.21

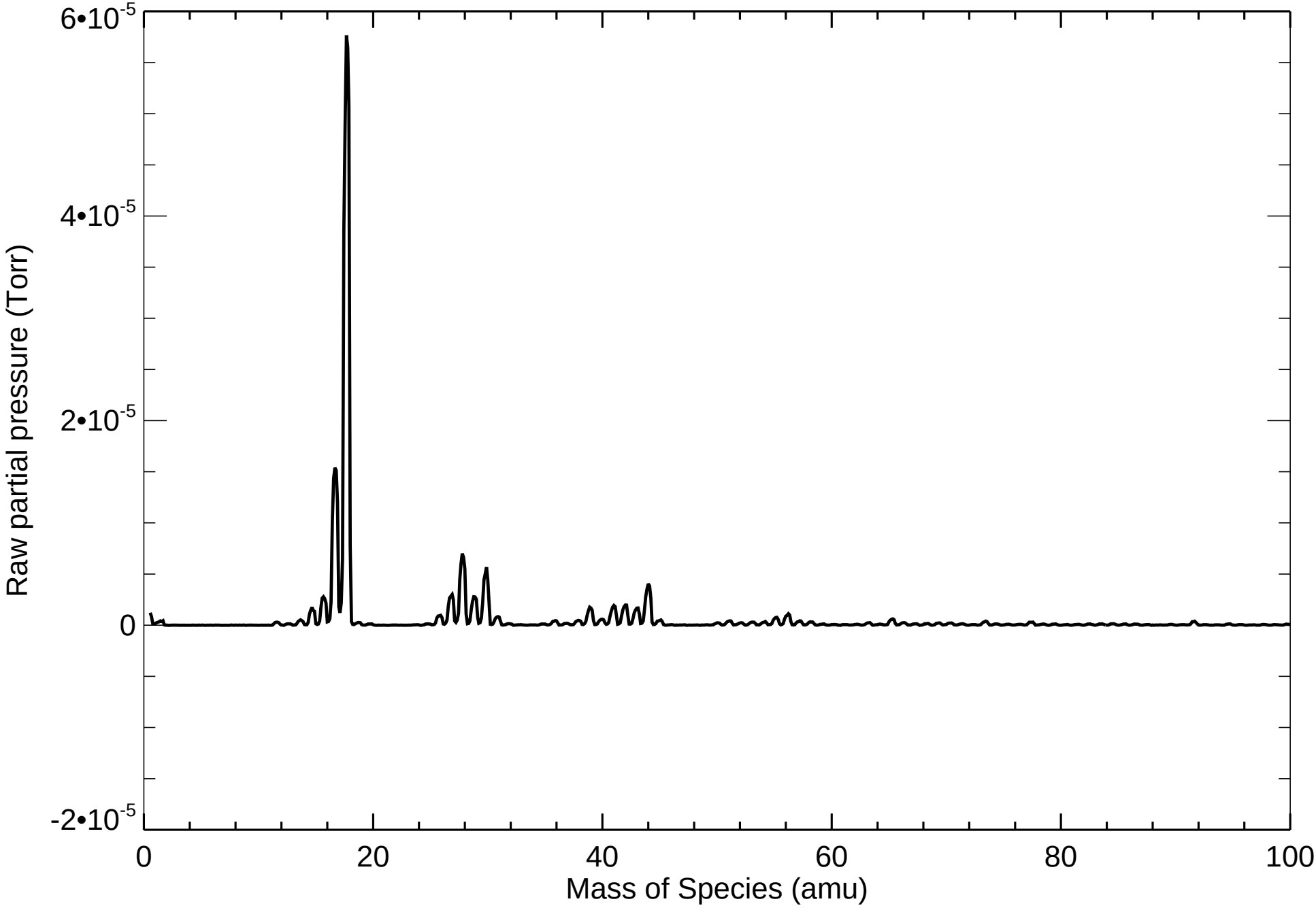


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:02:27:089 UT SWEEP: 0115 Filament: ON

Altitude (km): 126.21 Roll Angle (deg): 77.65

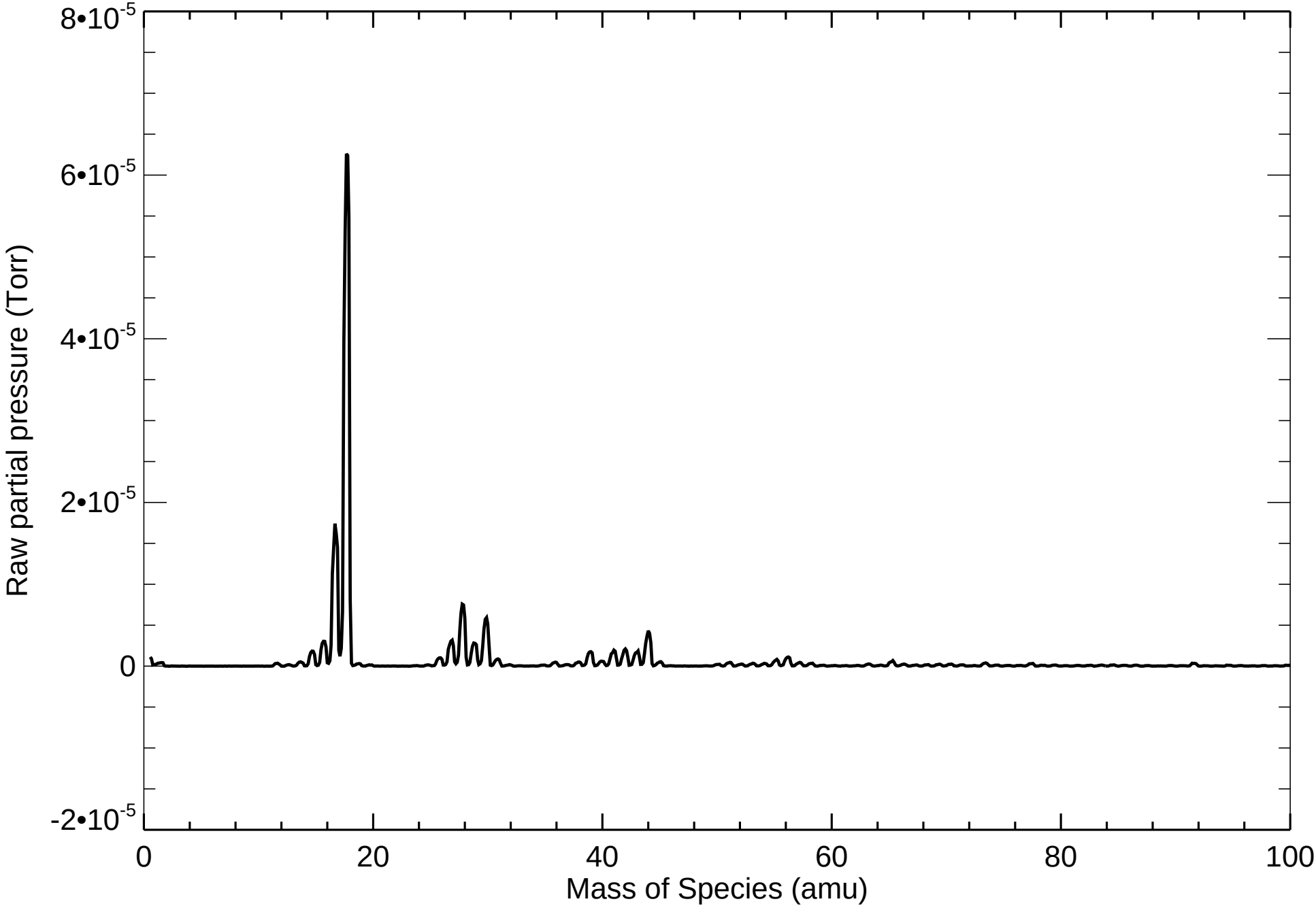


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:03:05:020 UT SWEEP: 0116 Filament: ON

Altitude (km): 125.63 Roll Angle (deg): 78.12

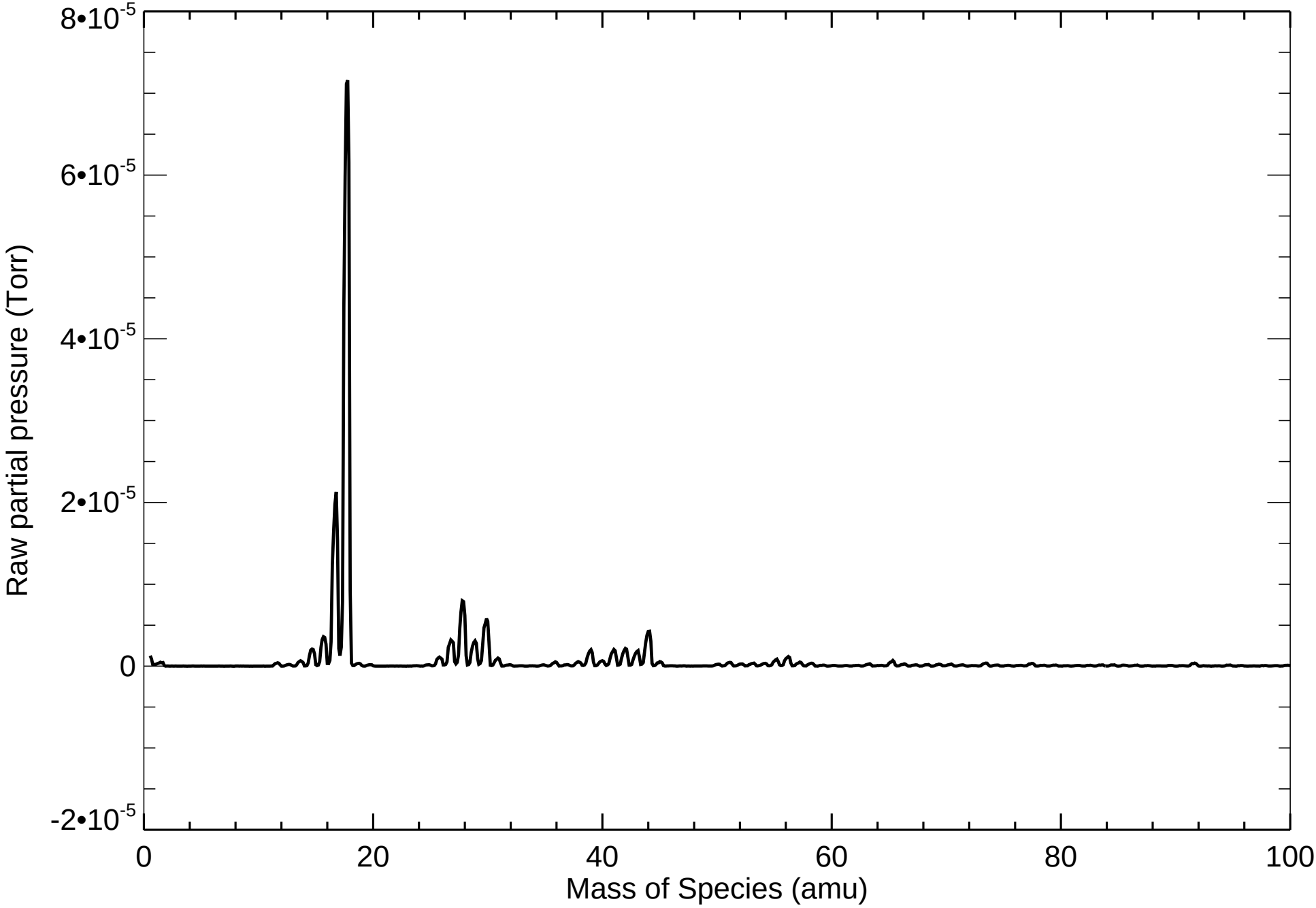


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:03:41:003 UT SWEEP: 0117 Filament: ON

Altitude (km): 124.74 Roll Angle (deg): 78.58

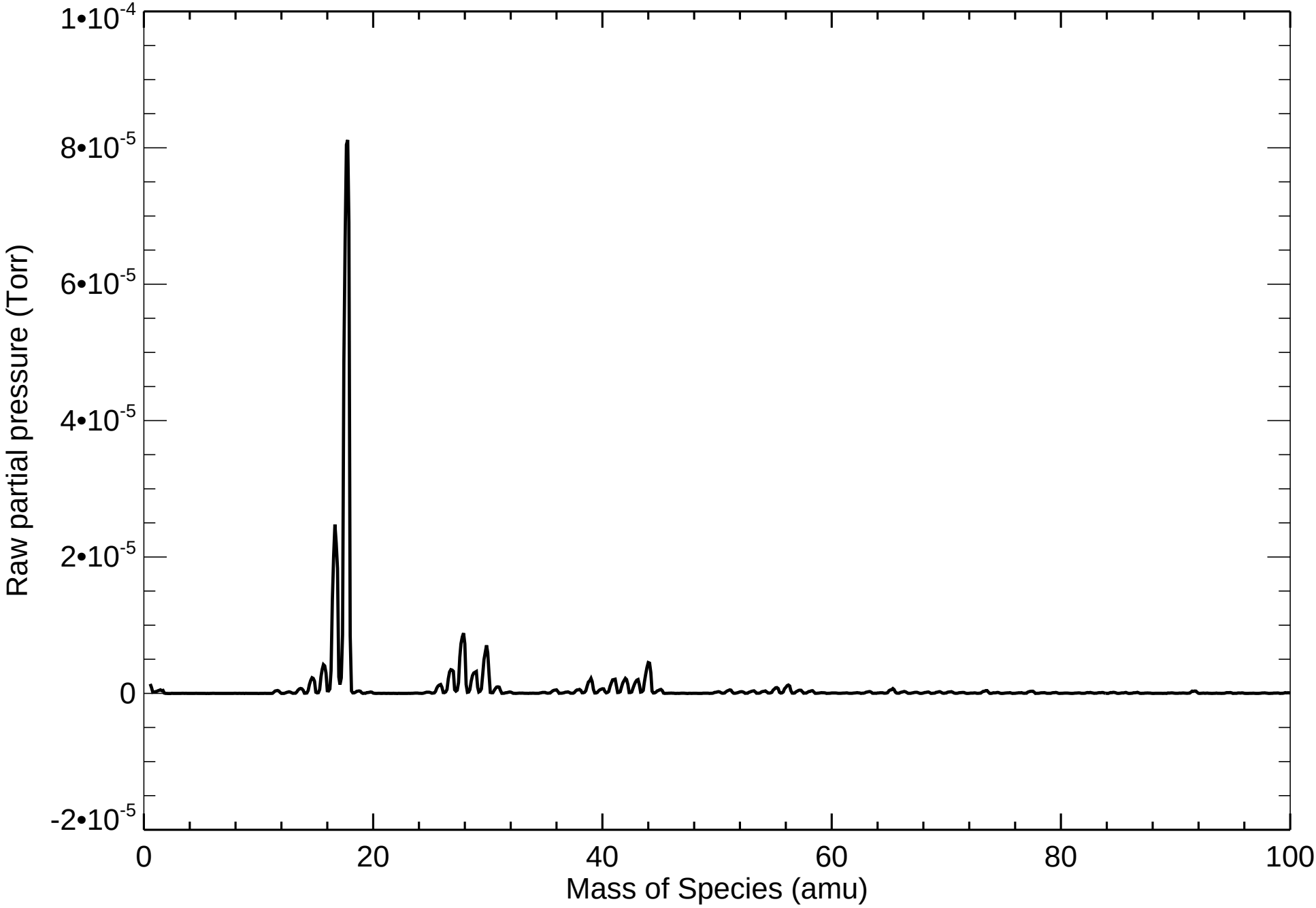


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:04:21:999 UT SWEEP: 0118 Filament: ON

Altitude (km): 123.95 Roll Angle (deg): 79.12

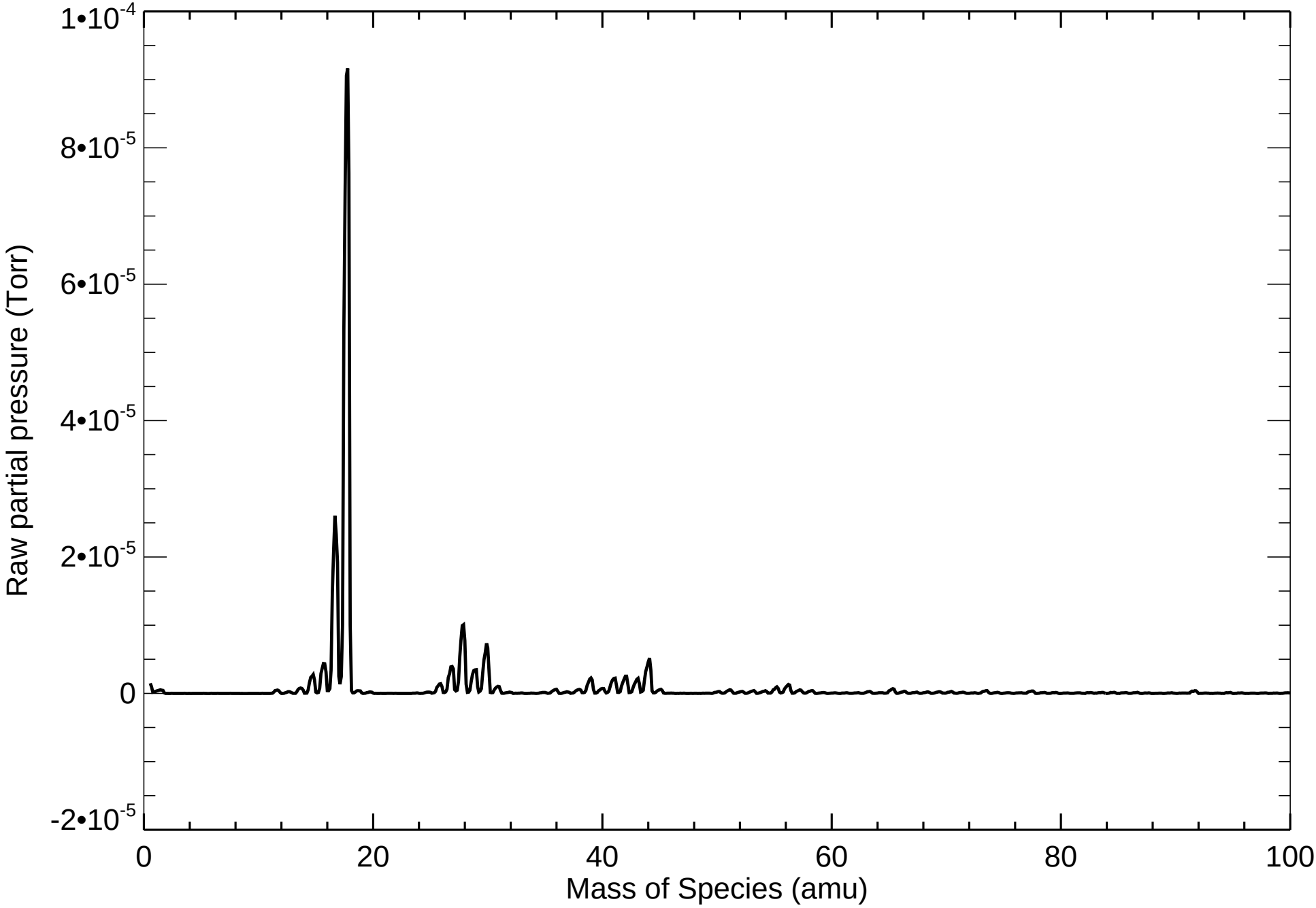


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:04:57:022 UT SWEEP: 0119 Filament: ON

Altitude (km): 123.04 Roll Angle (deg): 79.59

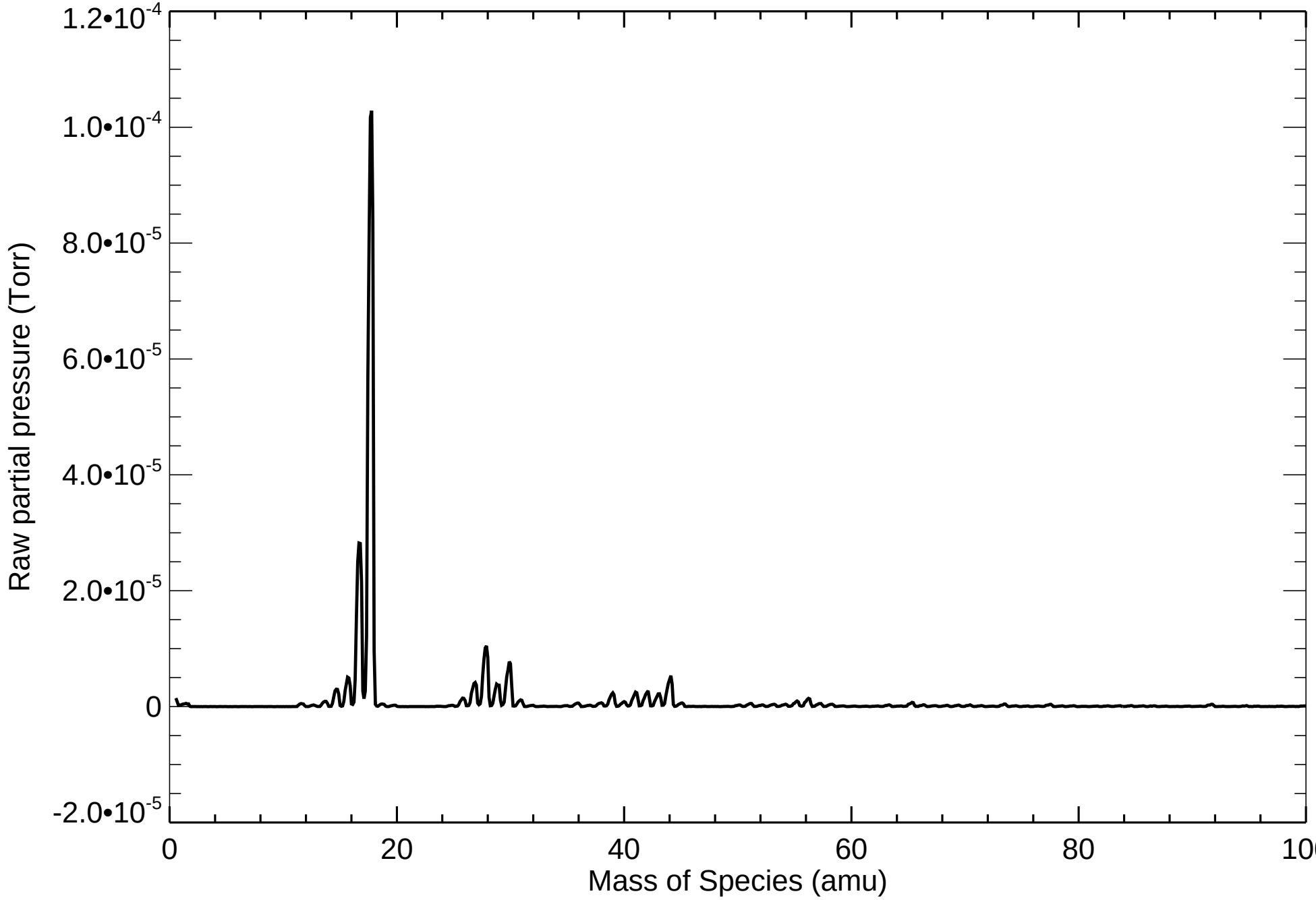


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:05:34:046 UT SWEEP: 0120 Filament: ON

Altitude (km): 122.36 Roll Angle (deg): 80.10

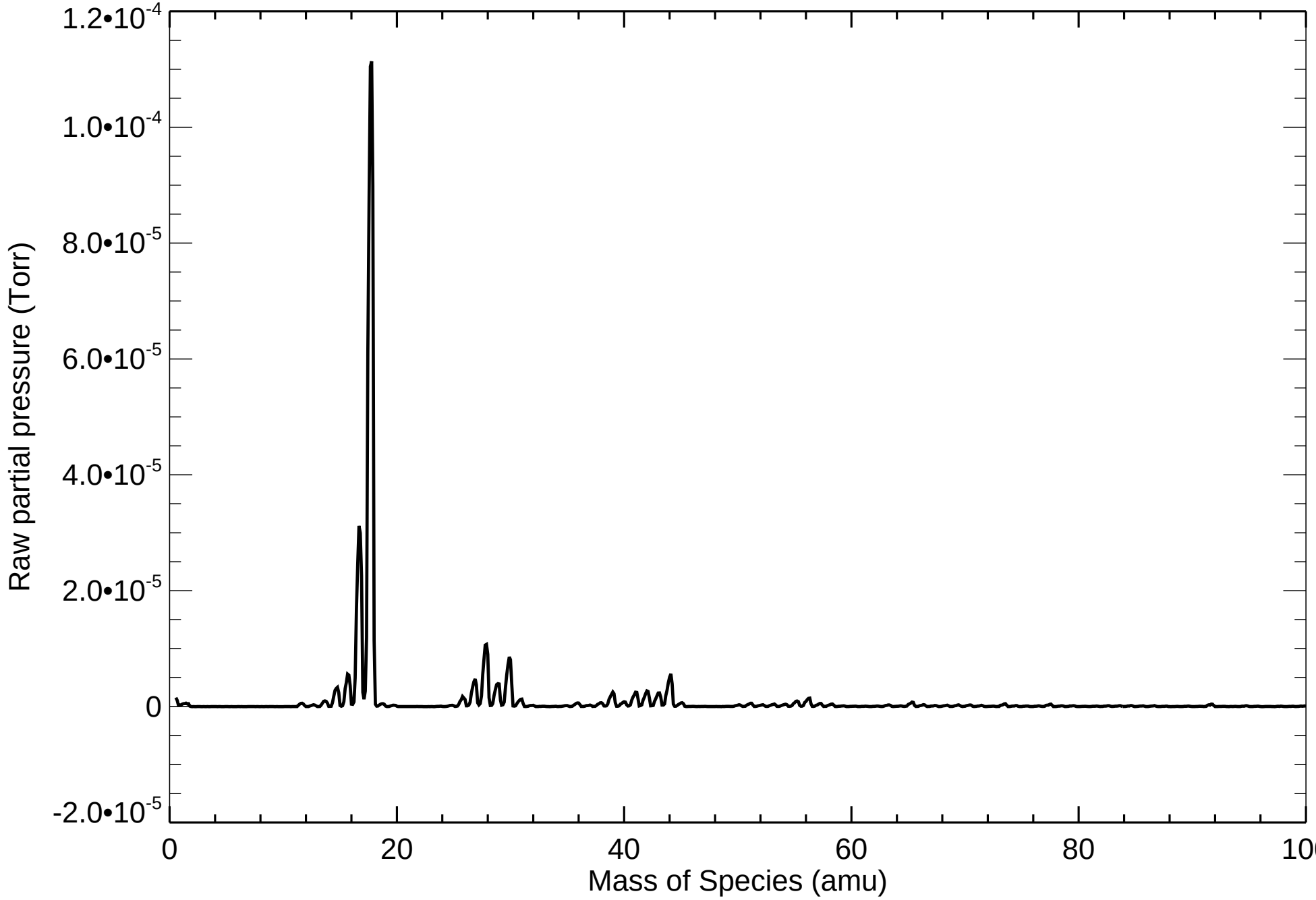


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:06:11:076 UT SWEEP: 0121 Filament: ON

Altitude (km): 121.49 Roll Angle (deg): 80.62

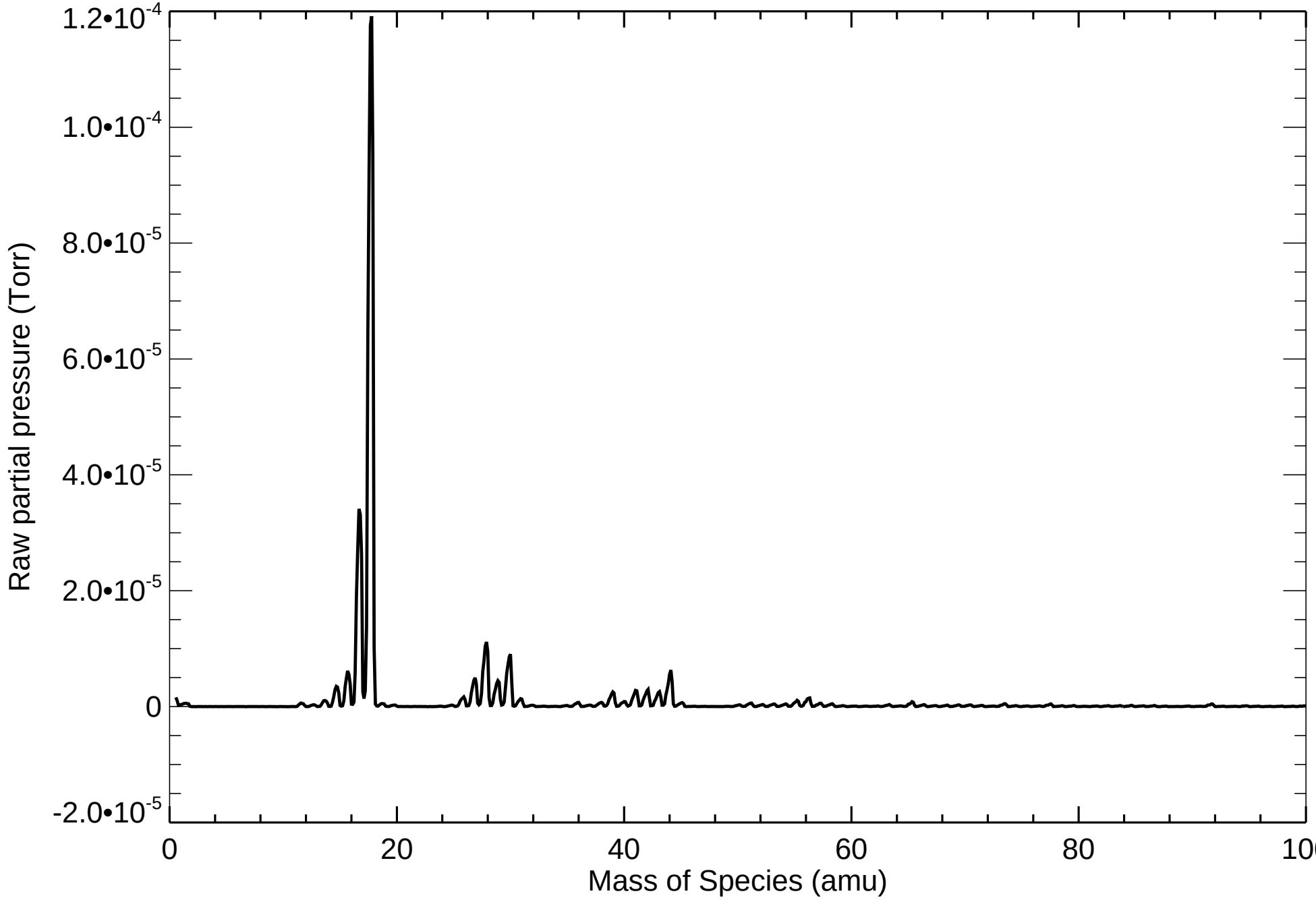


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:06:49:007 UT SWEEP: 0122 Filament: ON

Altitude (km): 120.57 Roll Angle (deg): 81.17

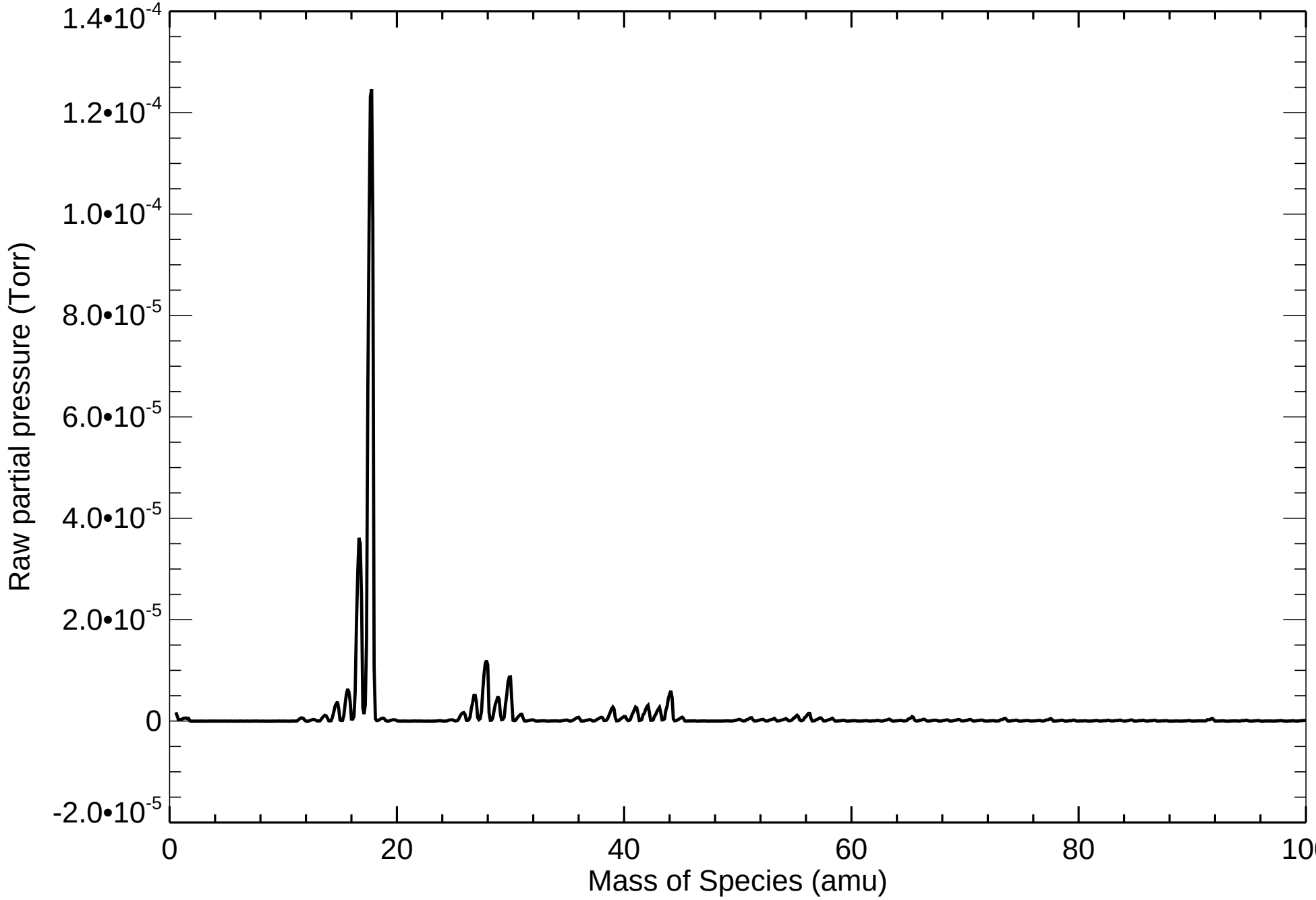


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:07:24:091 UT SWEEP: 0123 Filament: ON

Altitude (km): 119.85 Roll Angle (deg): 81.68

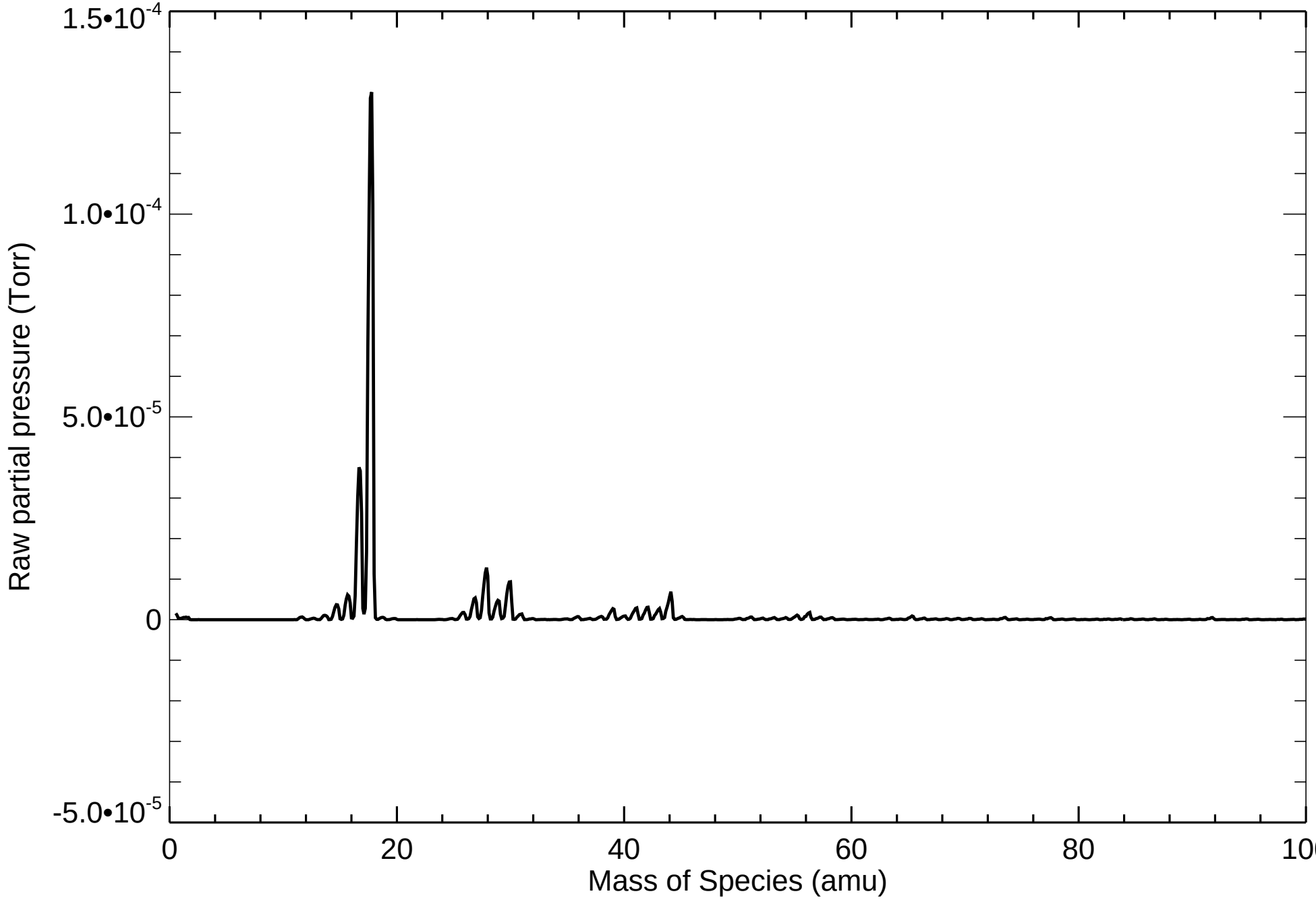


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:08:00:016 UT SWEEP: 0124 Filament: ON

Altitude (km): 118.94 Roll Angle (deg): 82.22

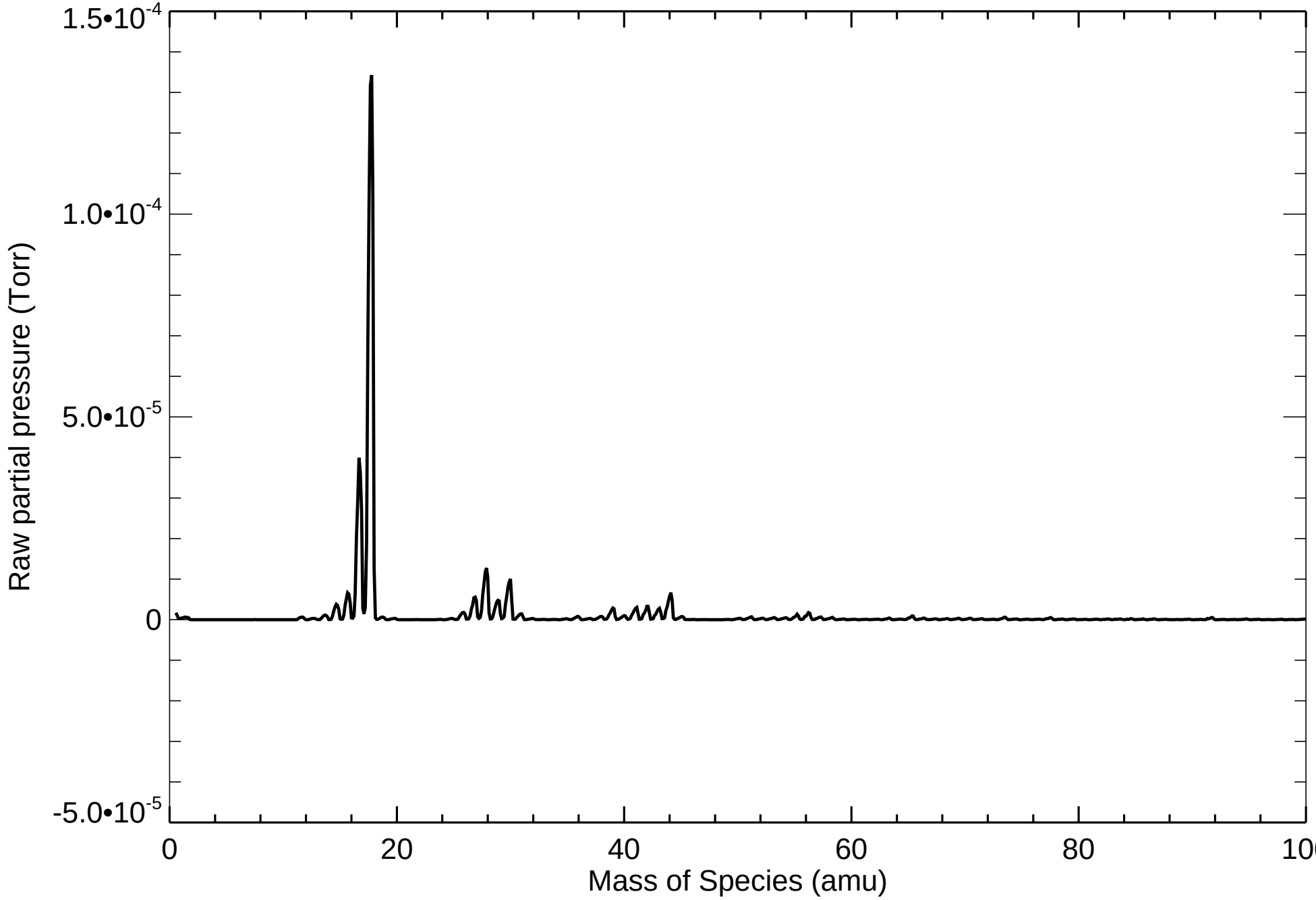


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:08:37:050 UT SWEEP: 0125 Filament: ON

Altitude (km): 118.00 Roll Angle (deg): 82.79

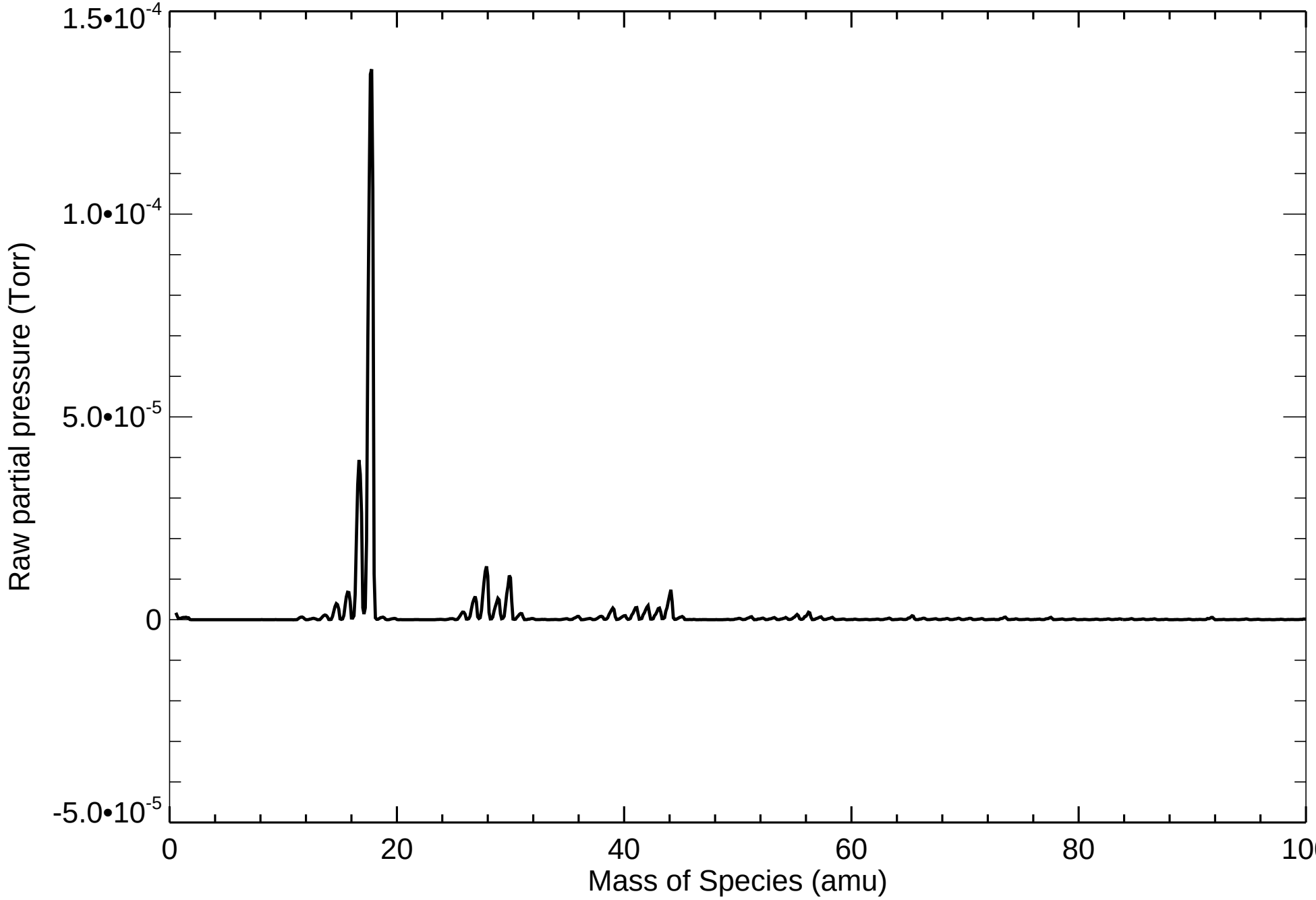


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:09:12:083 UT SWEEP: 0126 Filament: ON

Altitude (km): 117.31 Roll Angle (deg): 83.33

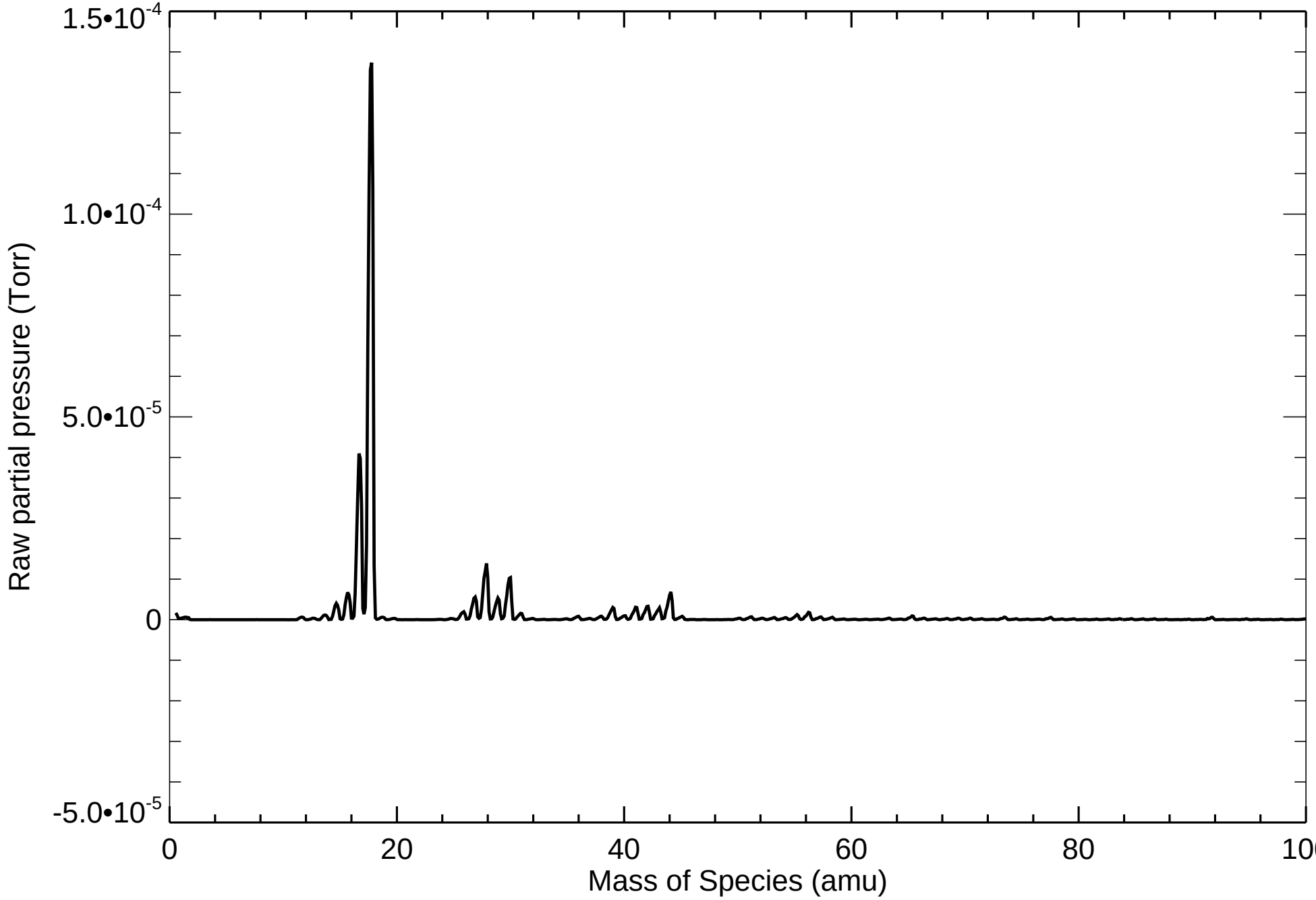


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:09:55:064 UT SWEEP: 0127 Filament: ON

Altitude (km): 116.35 Roll Angle (deg): 84.01

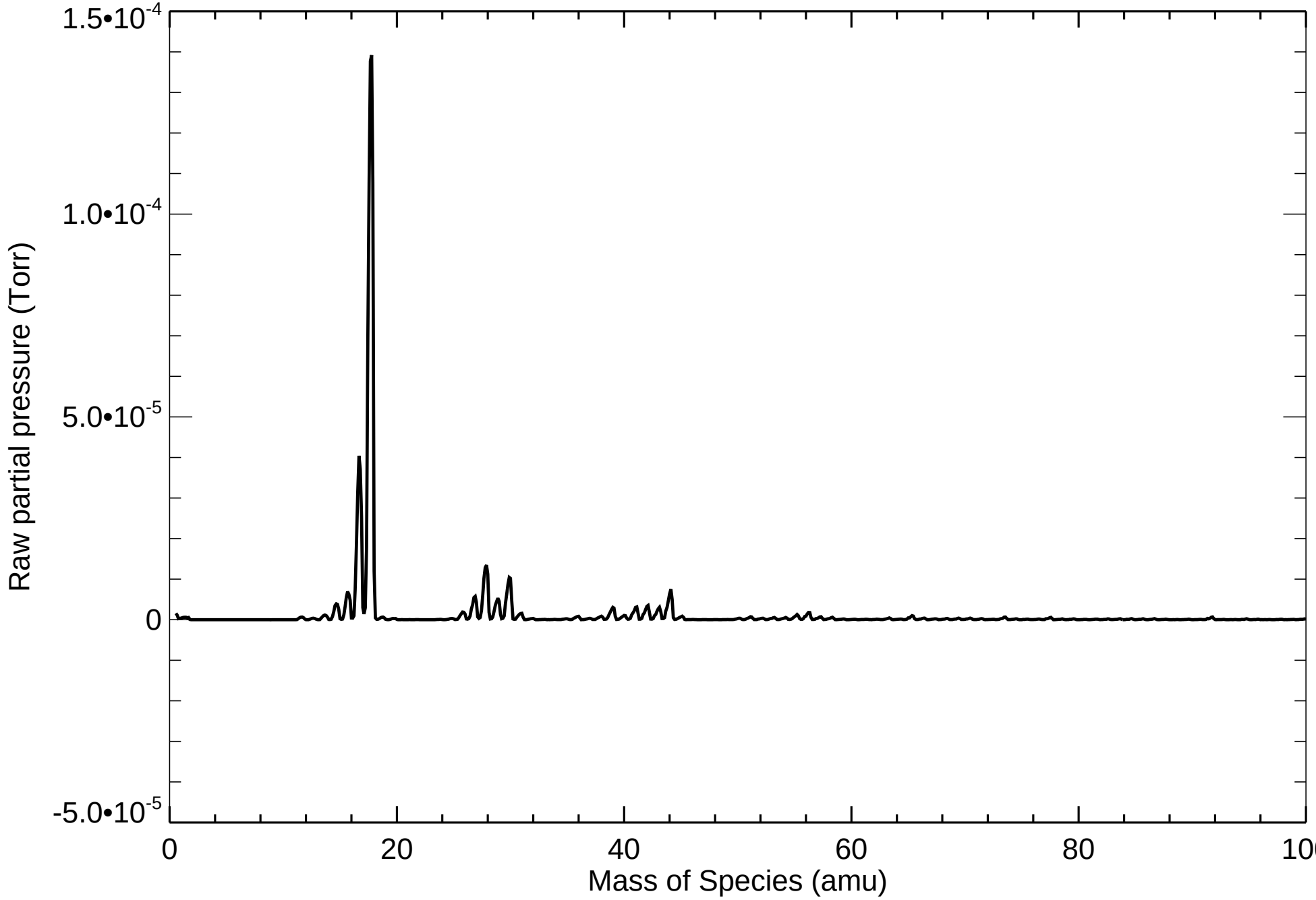


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:10:32:088 UT SWEEP: 0128 Filament: ON

Altitude (km): 115.39 Roll Angle (deg): 84.60

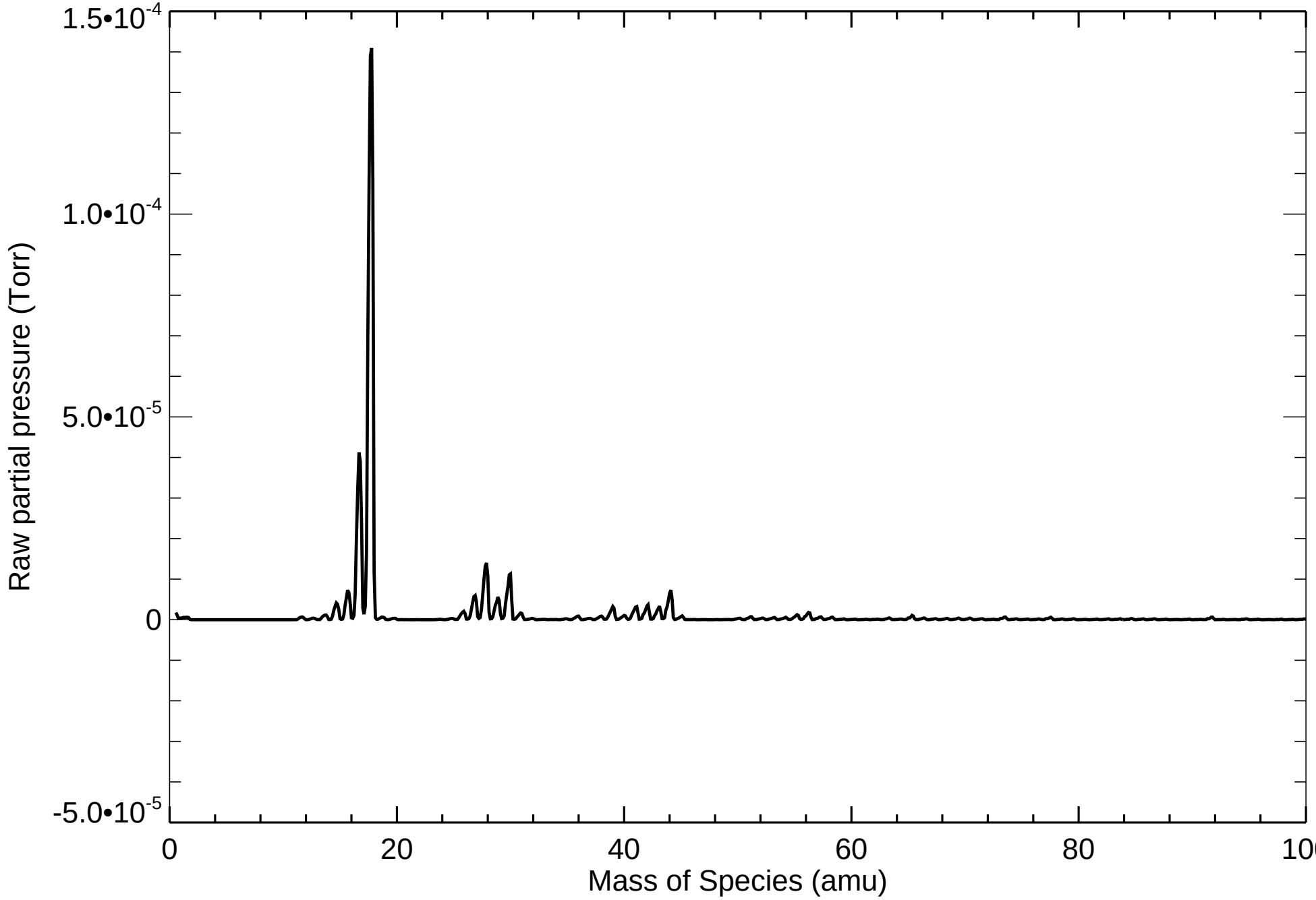


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:11:08:071 UT SWEEP: 0129 Filament: ON

Altitude (km): 114.44 Roll Angle (deg): 85.18

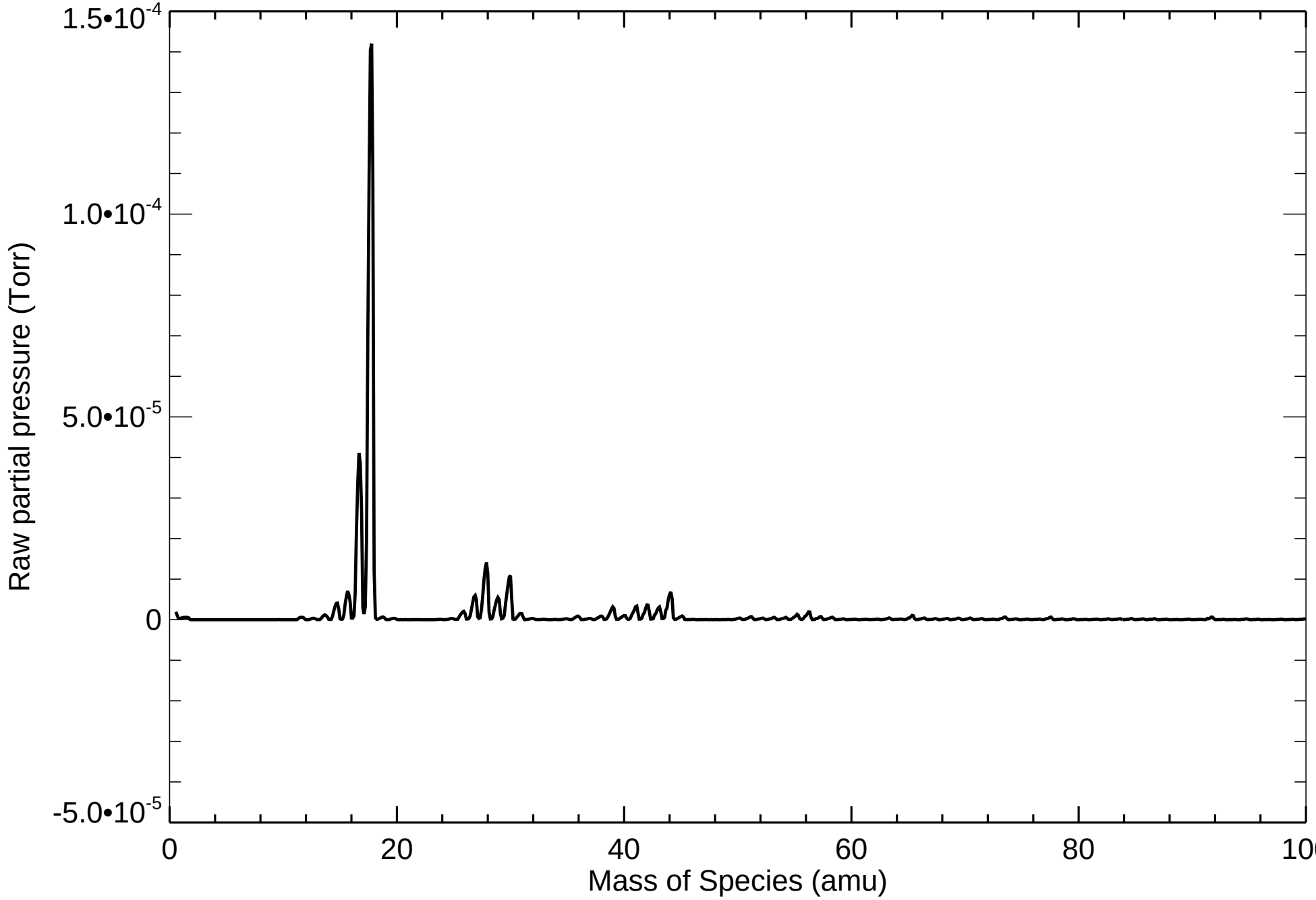


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:11:46:005 UT SWEEP: 0130 Filament: ON

Altitude (km): 113.73 Roll Angle (deg): 85.81

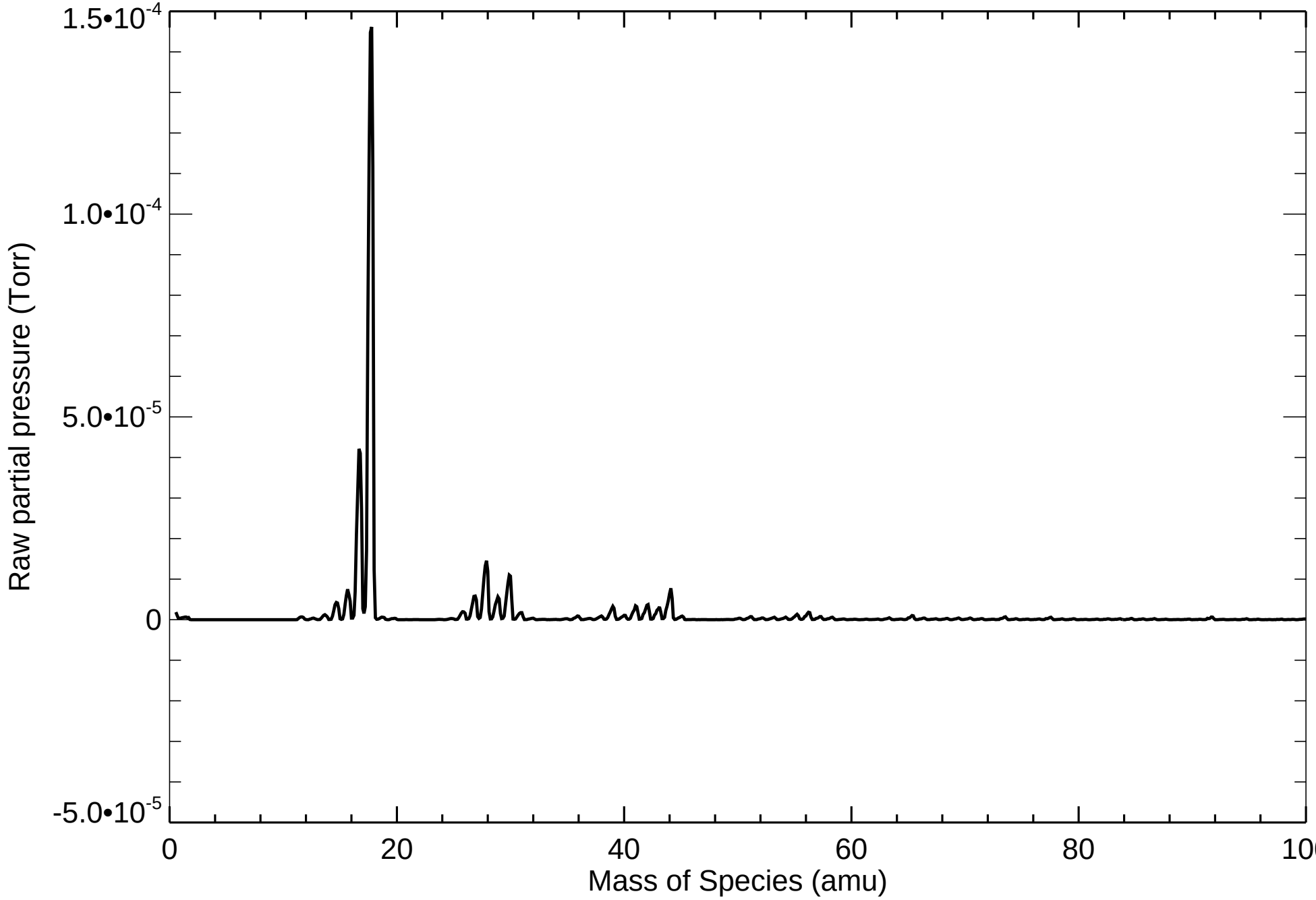


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:12:21:038 UT SWEEP: 0131 Filament: ON

Altitude (km): 112.70 Roll Angle (deg): 86.39

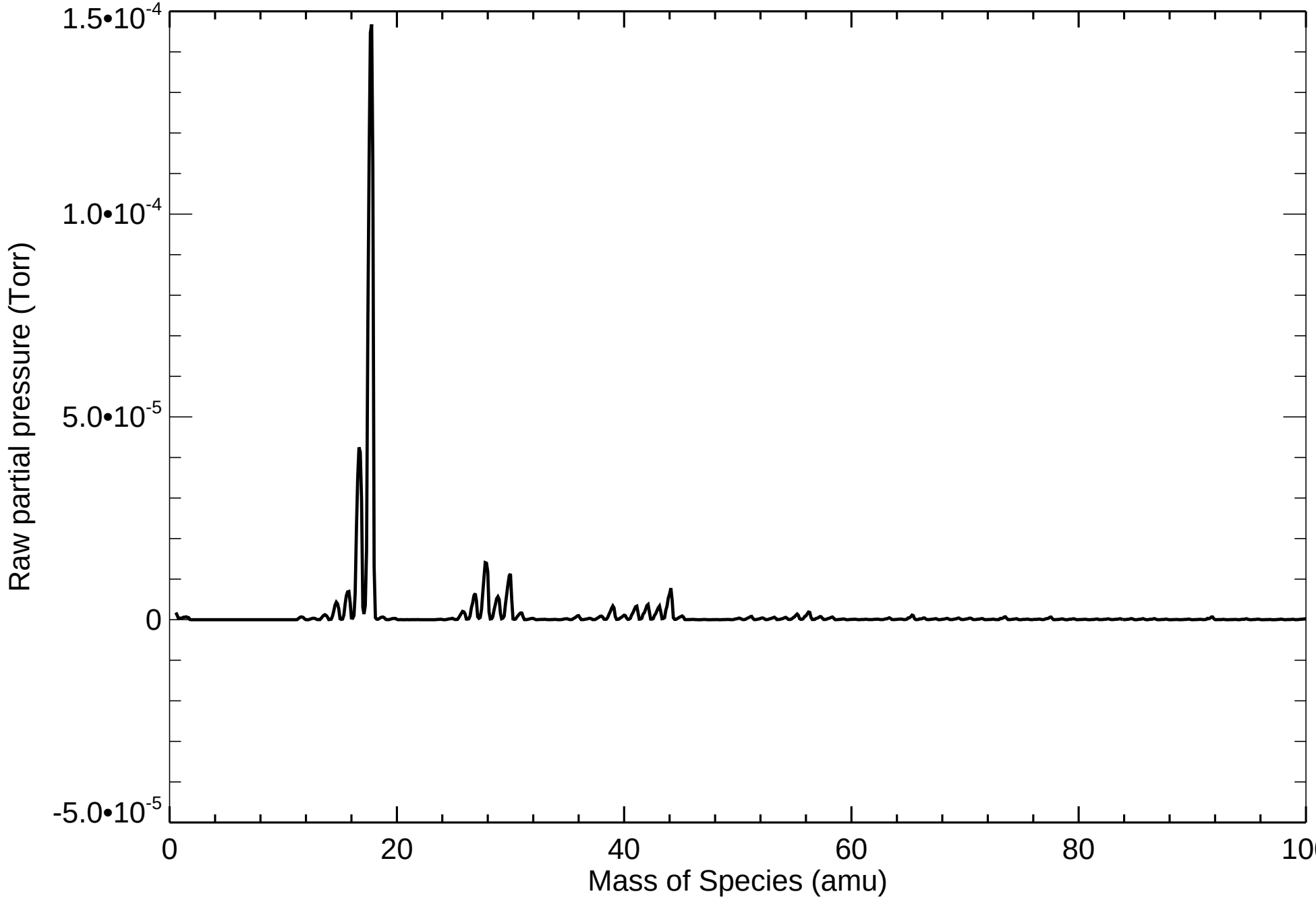


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:12:56:070 UT SWEEP: 0132 Filament: ON

Altitude (km): 111.99 Roll Angle (deg): 86.97

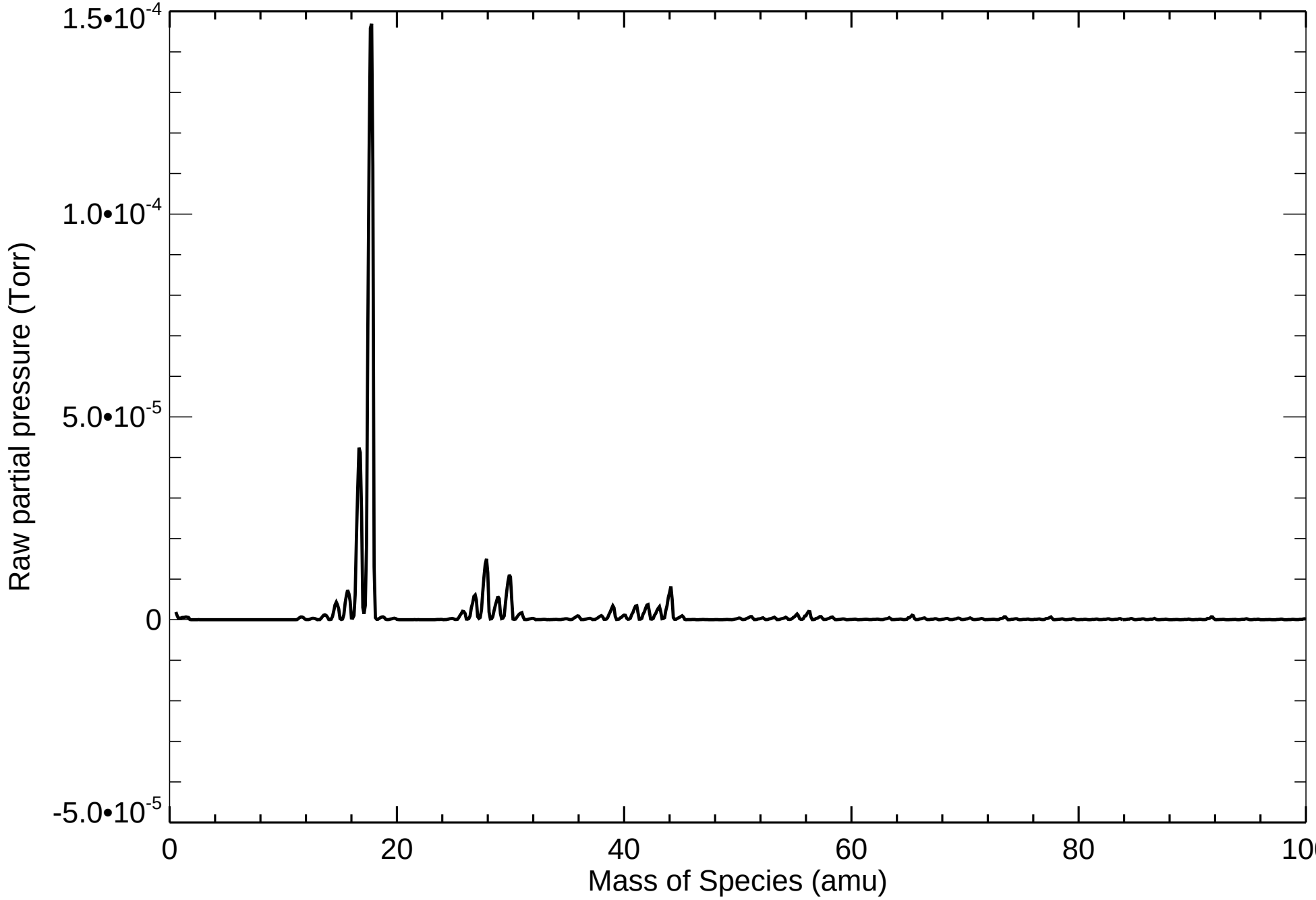


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:13:34:001 UT SWEEP: 0133 Filament: ON

Altitude (km): 111.02 Roll Angle (deg): 87.61

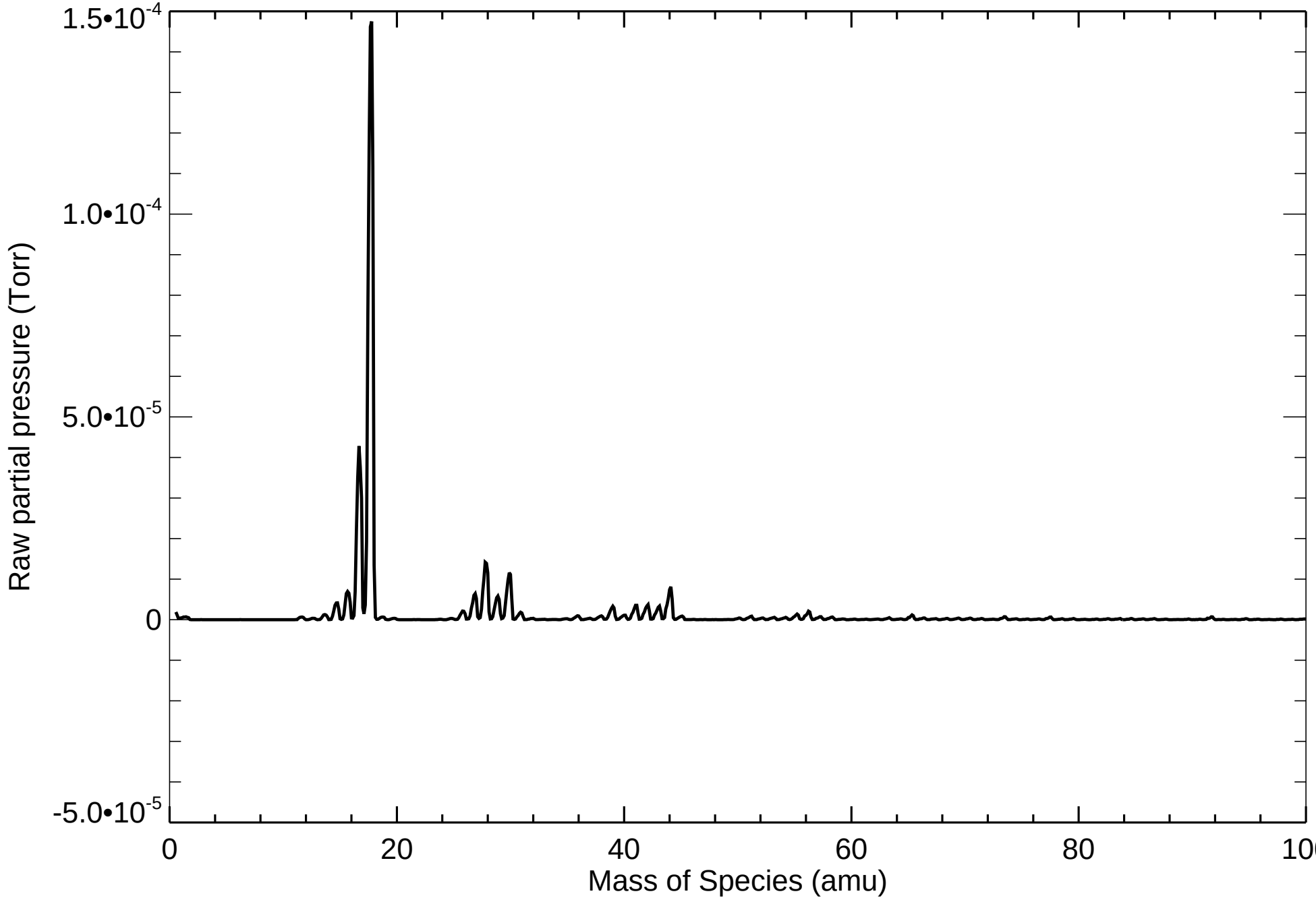


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:14:09:033 UT SWEEP: 0134 Filament: ON

Altitude (km): 110.09 Roll Angle (deg): 88.20

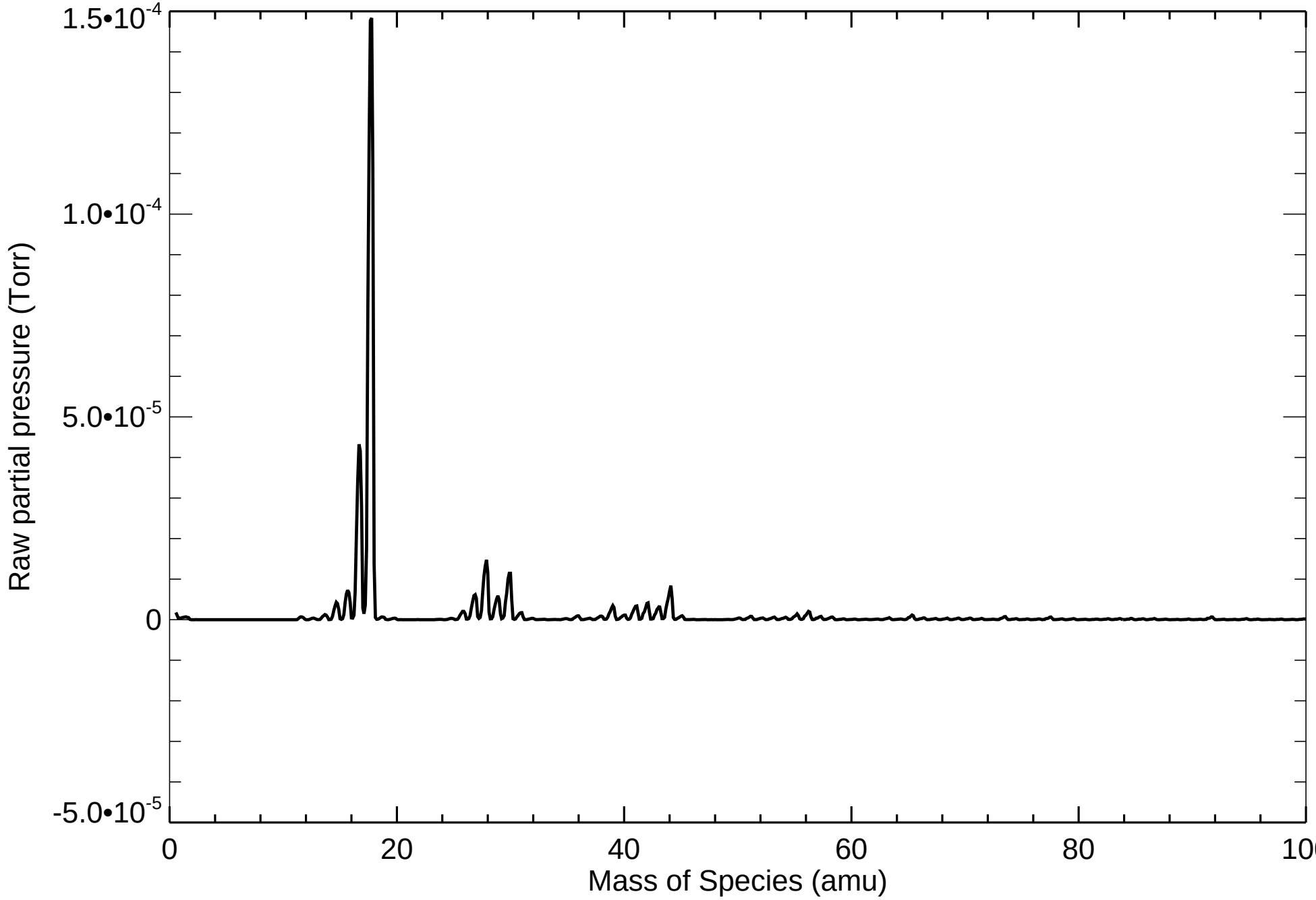


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:14:44:066 UT SWEEP: 0135 Filament: ON

Altitude (km): 109.33 Roll Angle (deg): 88.79

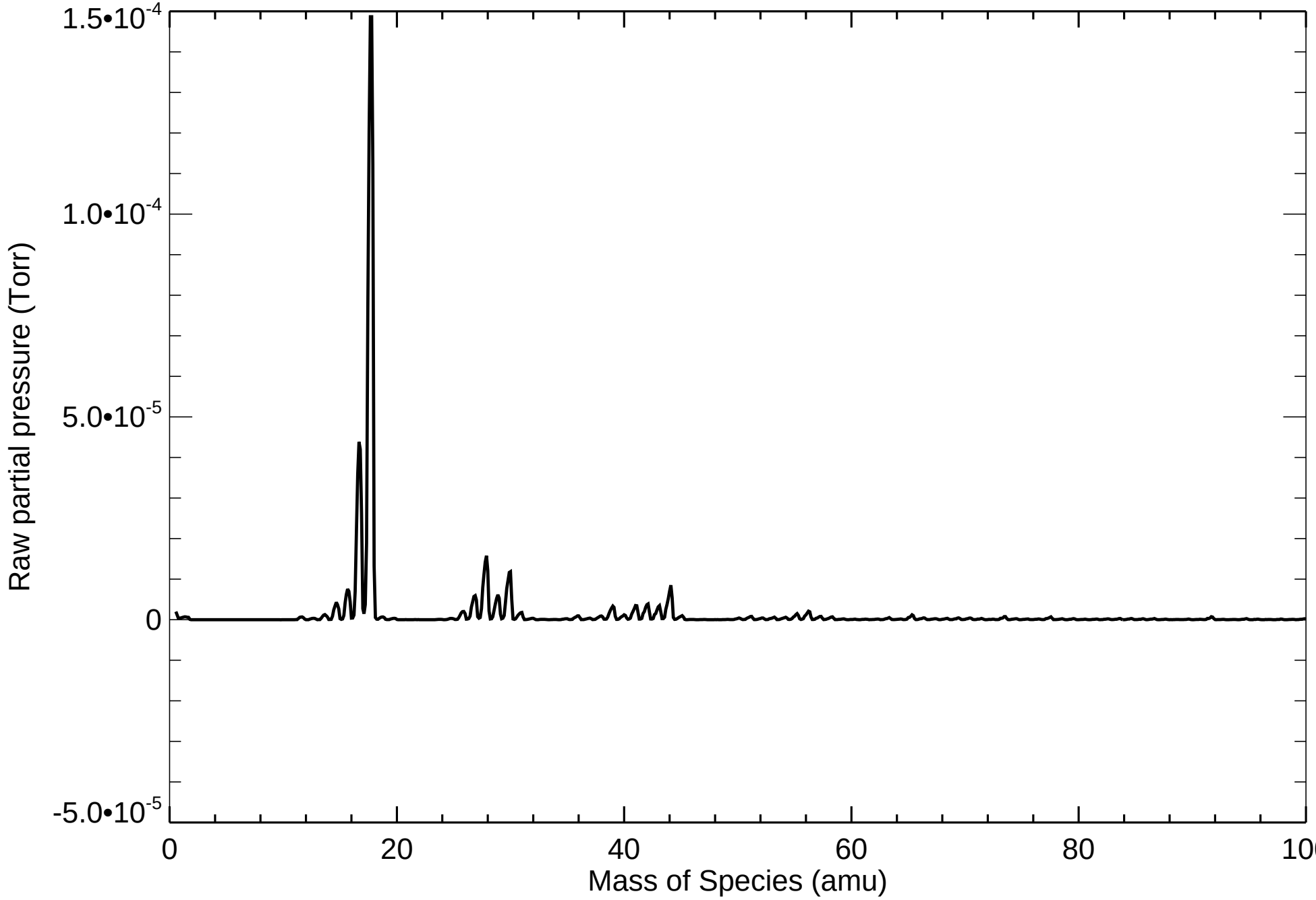


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:15:29:086 UT SWEEP: 0136 Filament: ON

Altitude (km): 108.14 Roll Angle (deg): 89.56

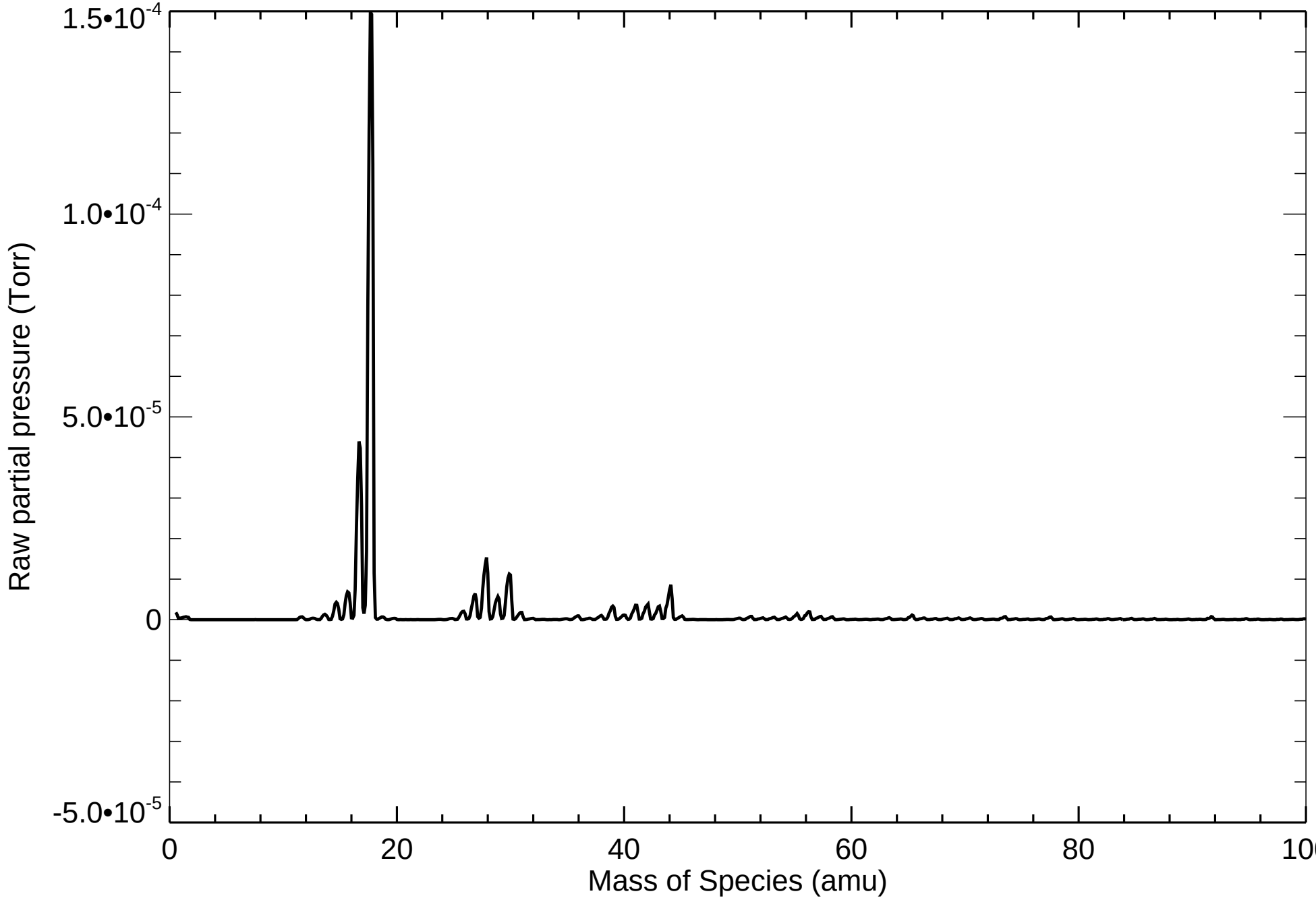


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:16:05:018 UT SWEEP: 0137 Filament: ON

Altitude (km): 107.36 Roll Angle (deg): 90.18

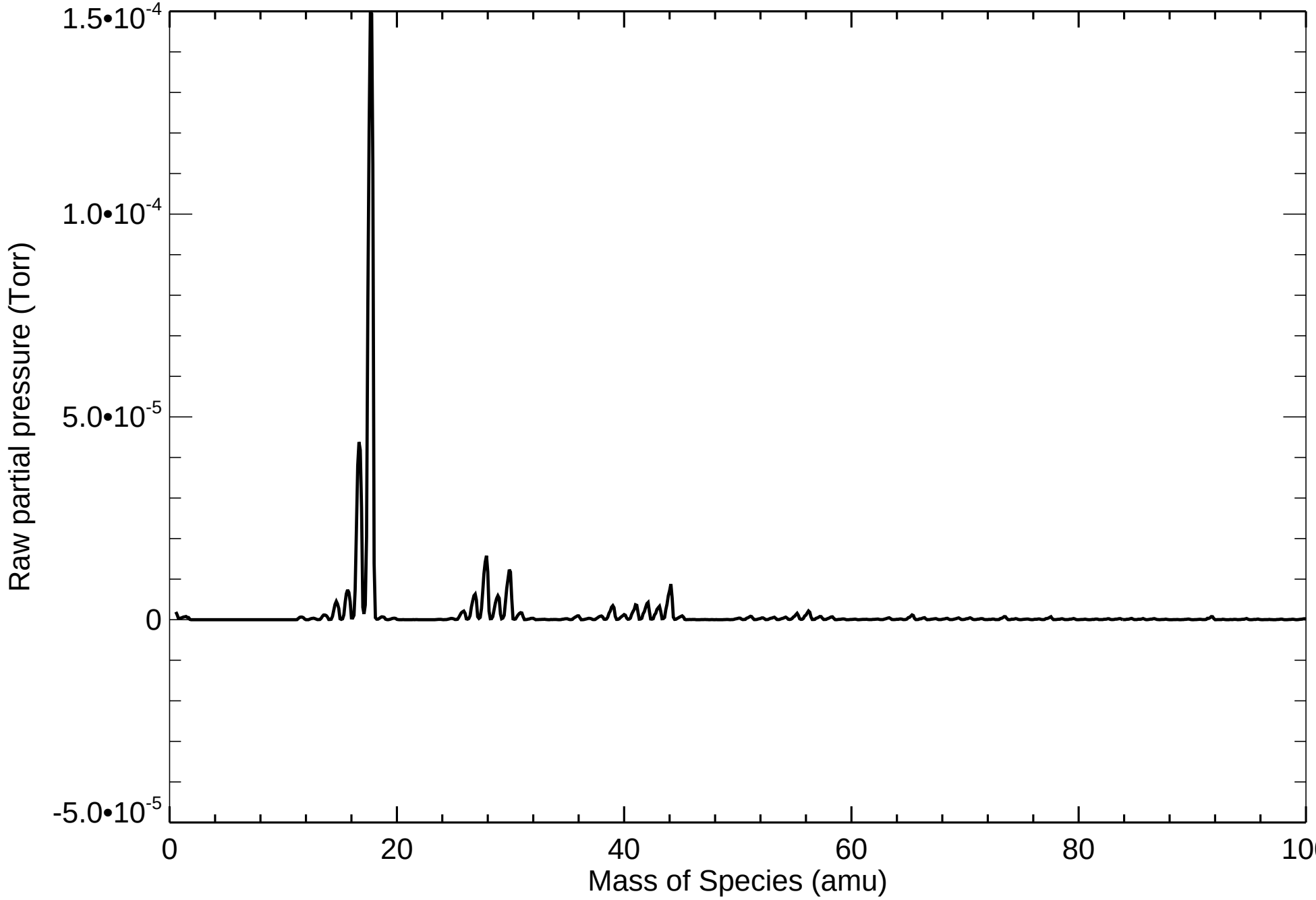


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:16:40:051 UT SWEEP: 0138 Filament: ON

Altitude (km): 106.47 Roll Angle (deg): 90.78

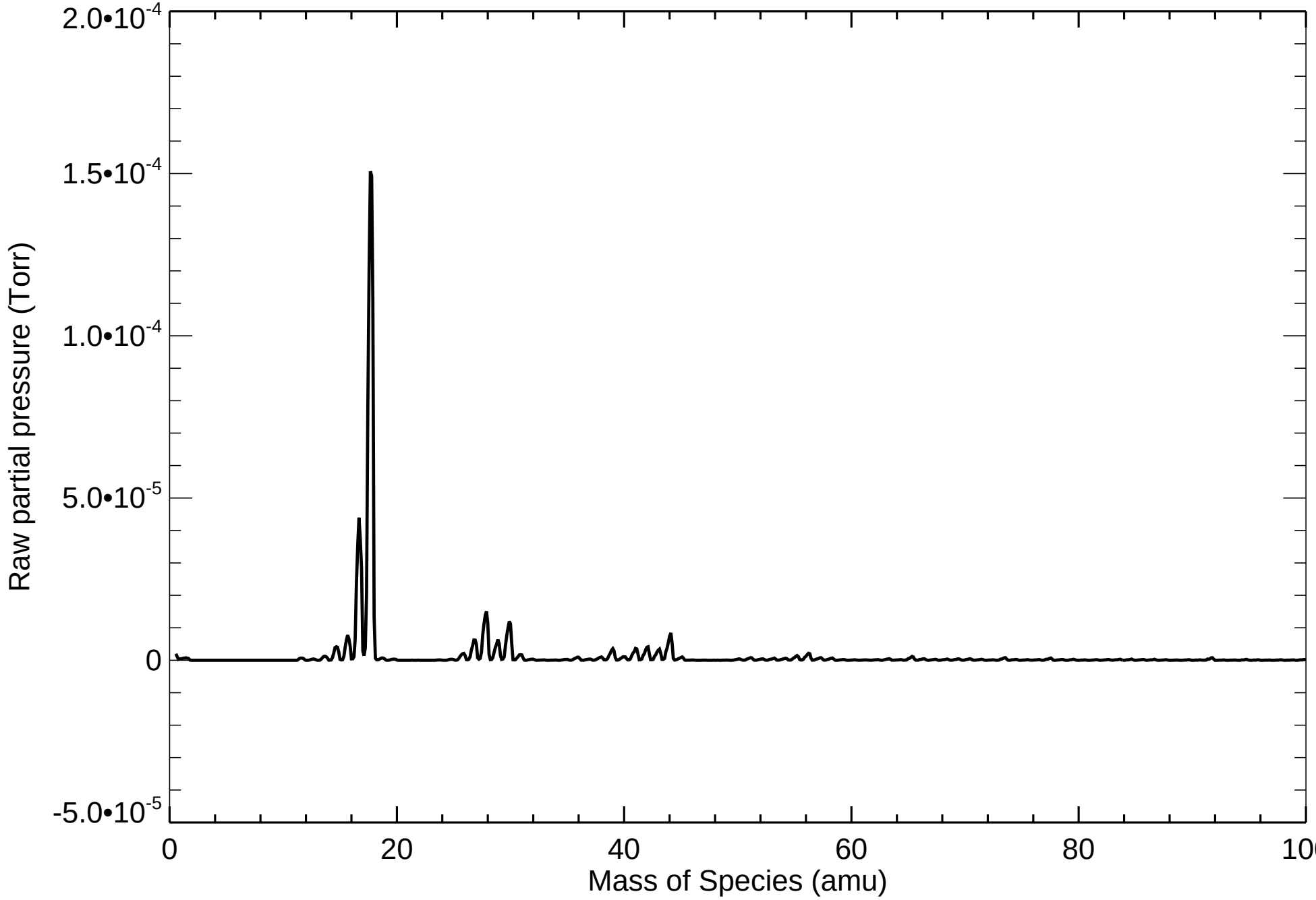


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:17:17:081 UT SWEEP: 0139 Filament: ON

Altitude (km): 105.48 Roll Angle (deg): 91.40

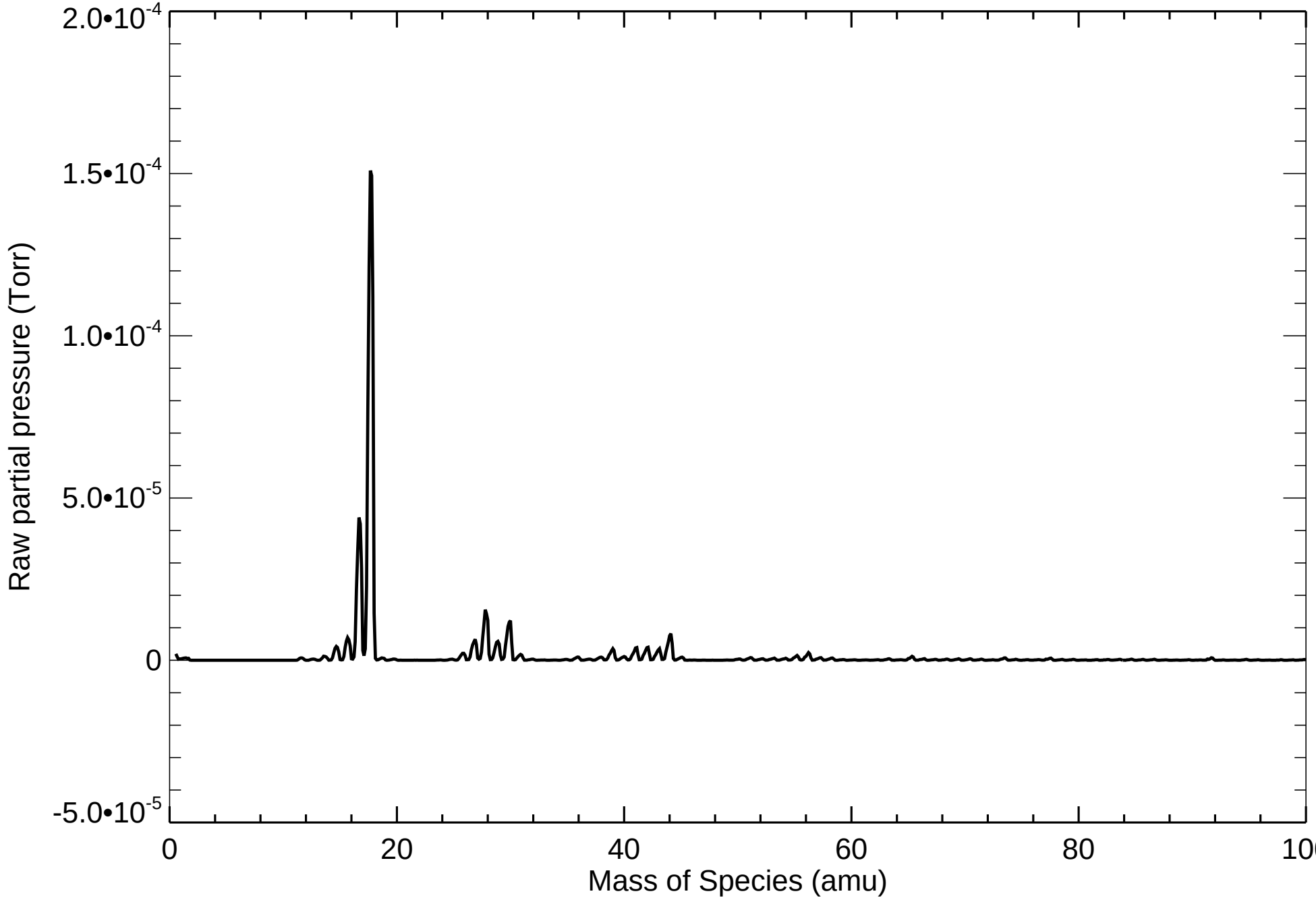


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:17:53:014 UT SWEEP: 0140 Filament: ON

Altitude (km): 104.79 Roll Angle (deg): 92.02

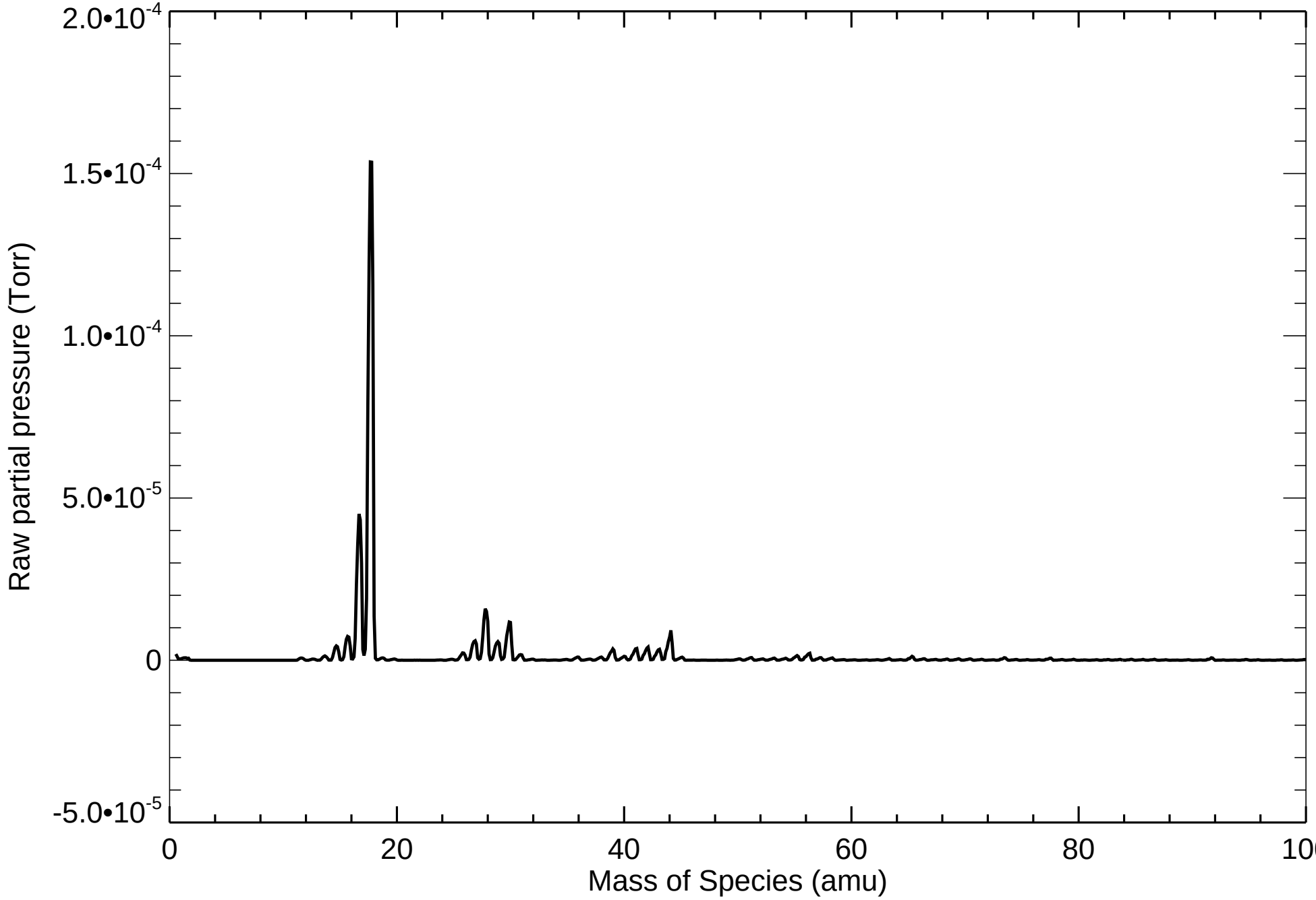


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:18:30:044 UT SWEEP: 0141 Filament: ON

Altitude (km): 103.83 Roll Angle (deg): 92.64

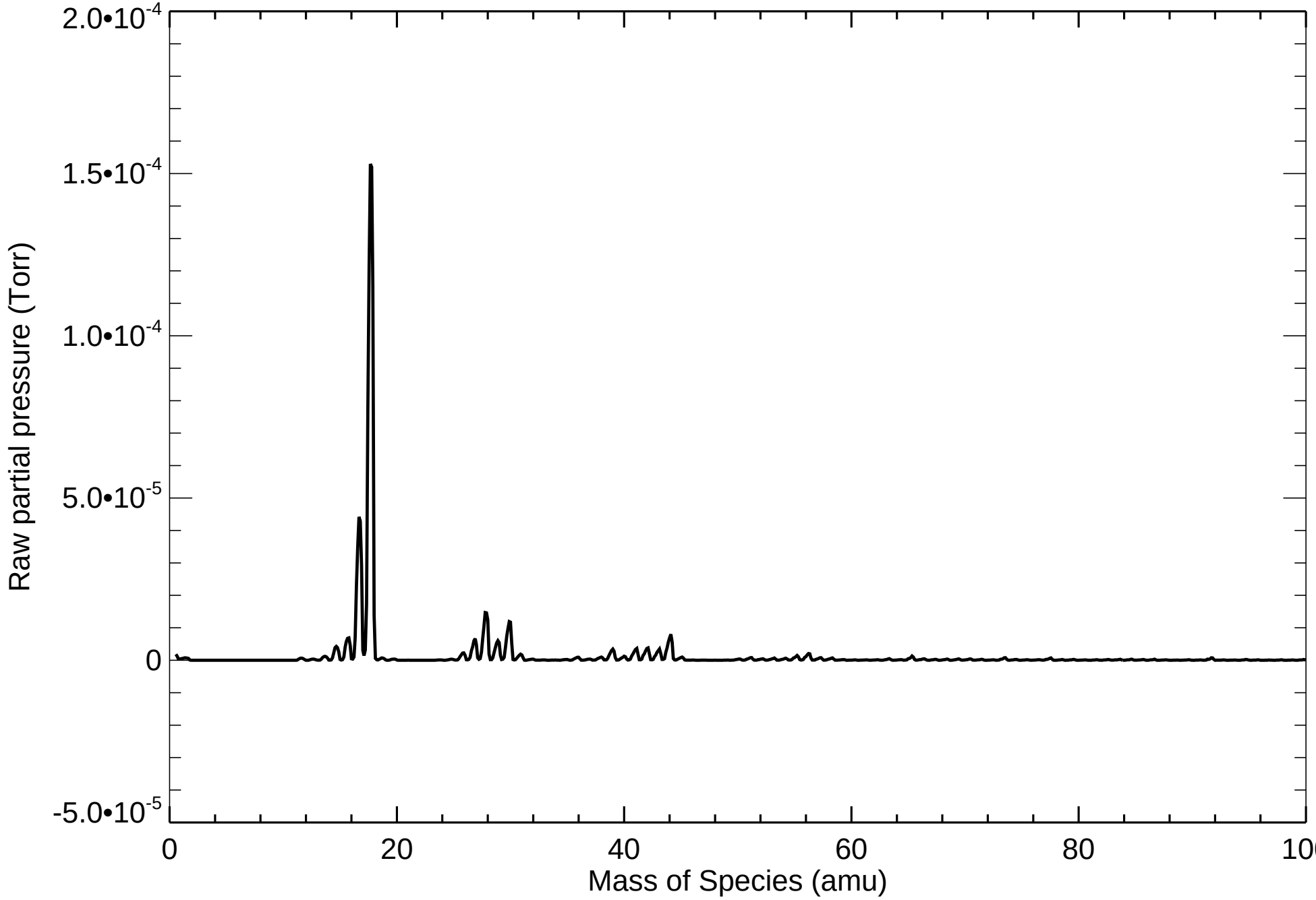


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:19:05:077 UT SWEEP: 0142 Filament: ON

Altitude (km): 103.10 Roll Angle (deg): 93.23

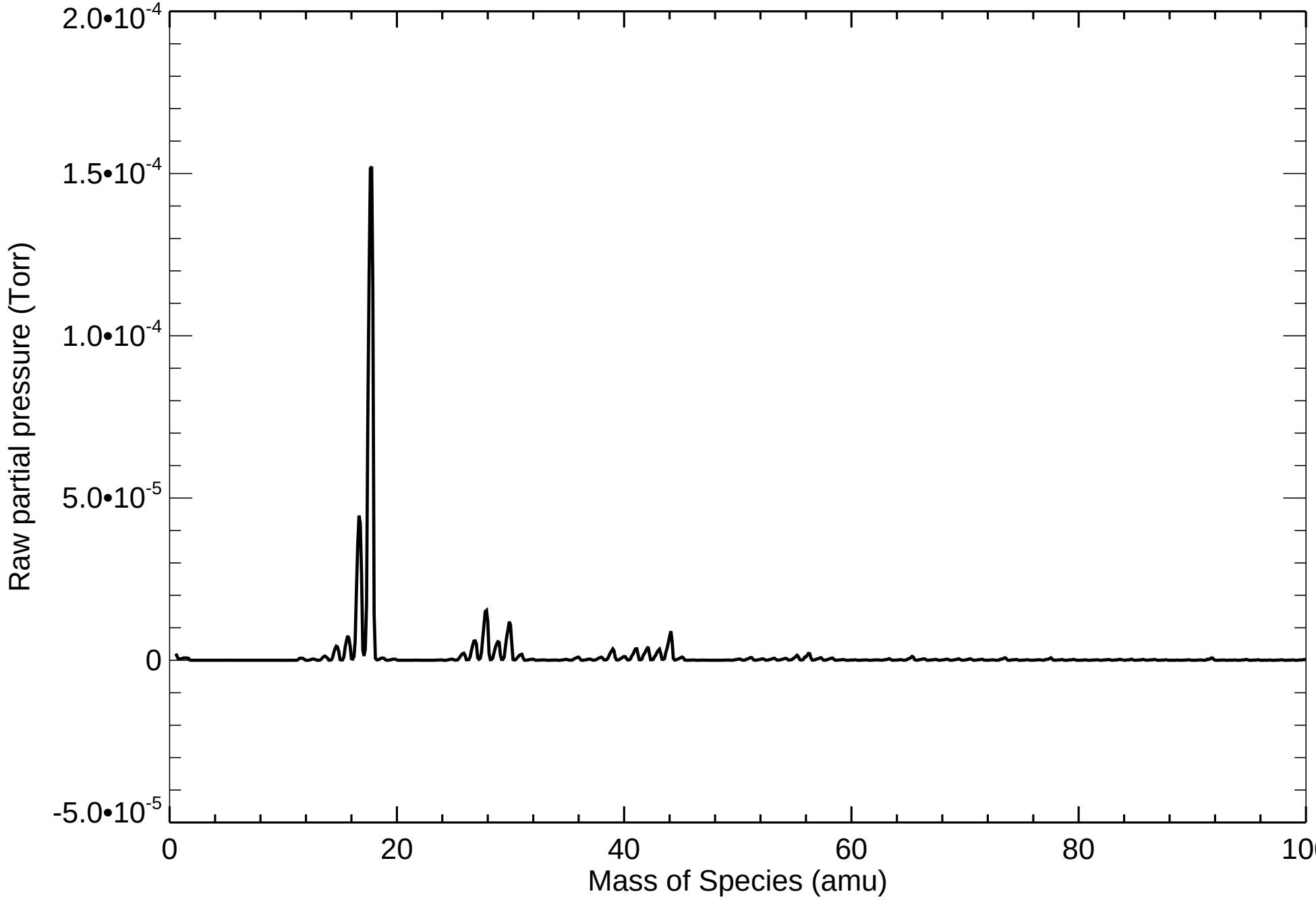


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:19:41:009 UT SWEEP: 0143 Filament: ON

Altitude (km): 102.17 Roll Angle (deg): 93.83

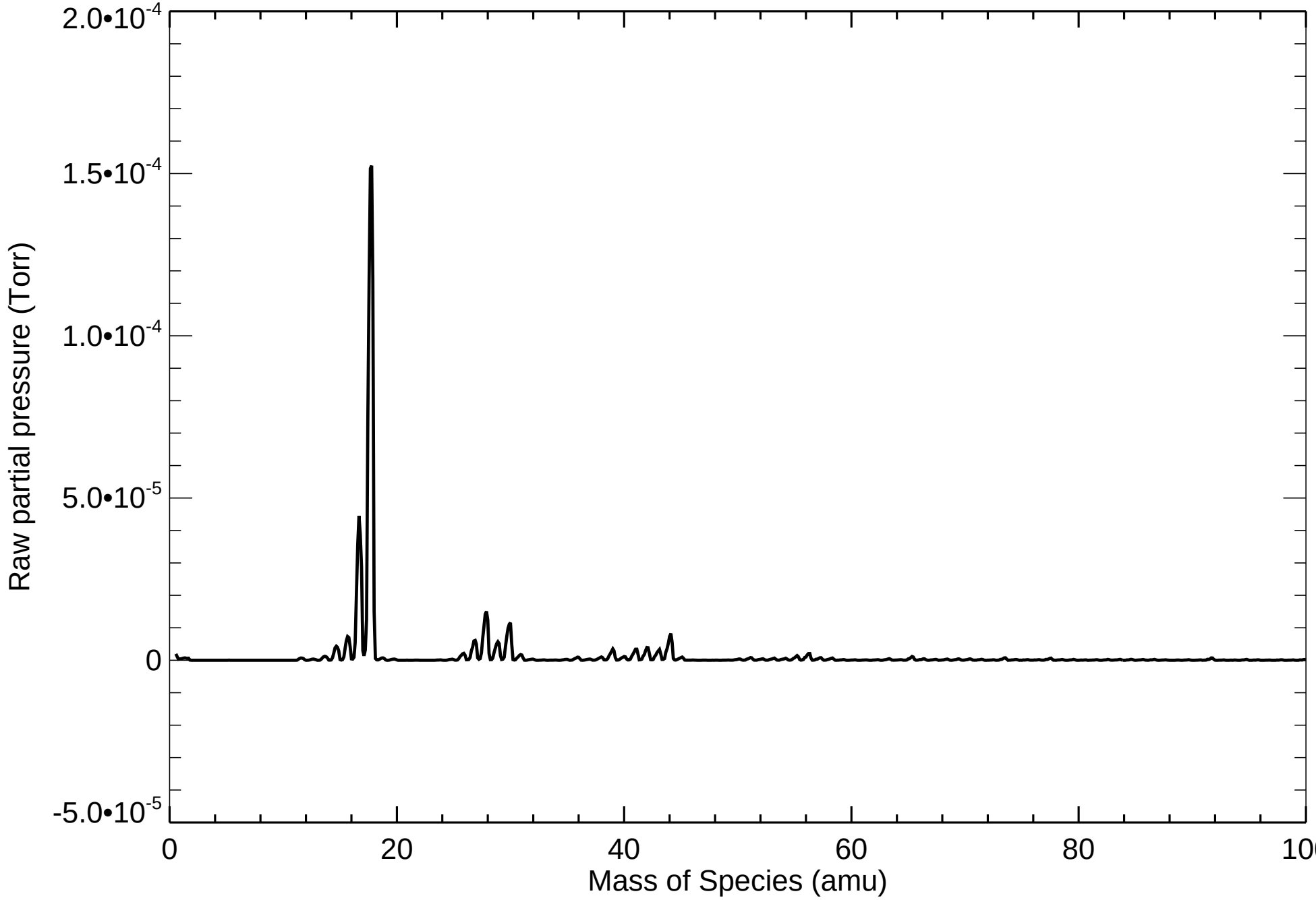


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:20:18:043 UT SWEEP: 0144 Filament: ON

Altitude (km): 101.27 Roll Angle (deg): 94.45

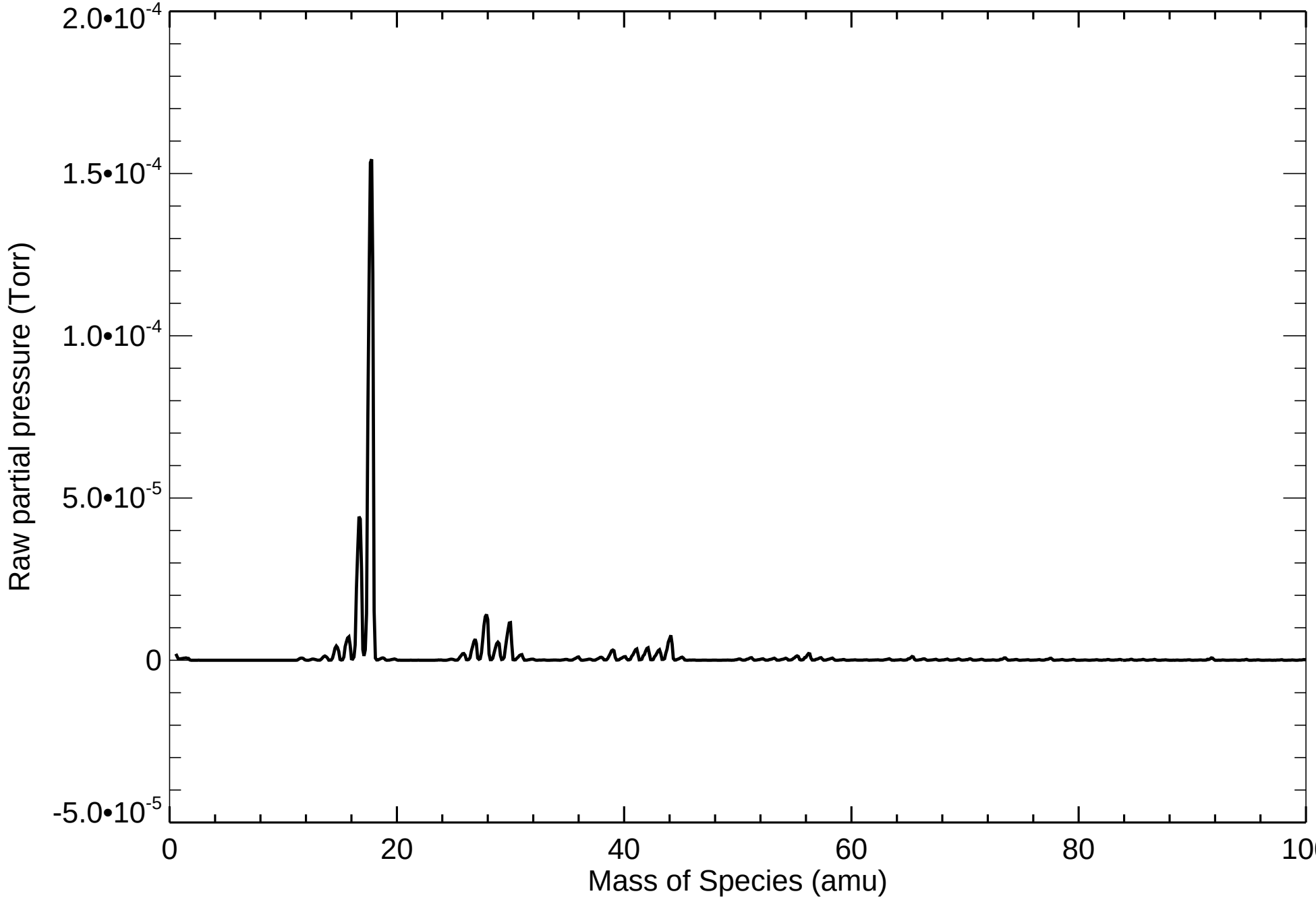


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:21:01:069 UT SWEEP: 0145 Filament: ON

Altitude (km): 100.43 Roll Angle (deg): 95.16

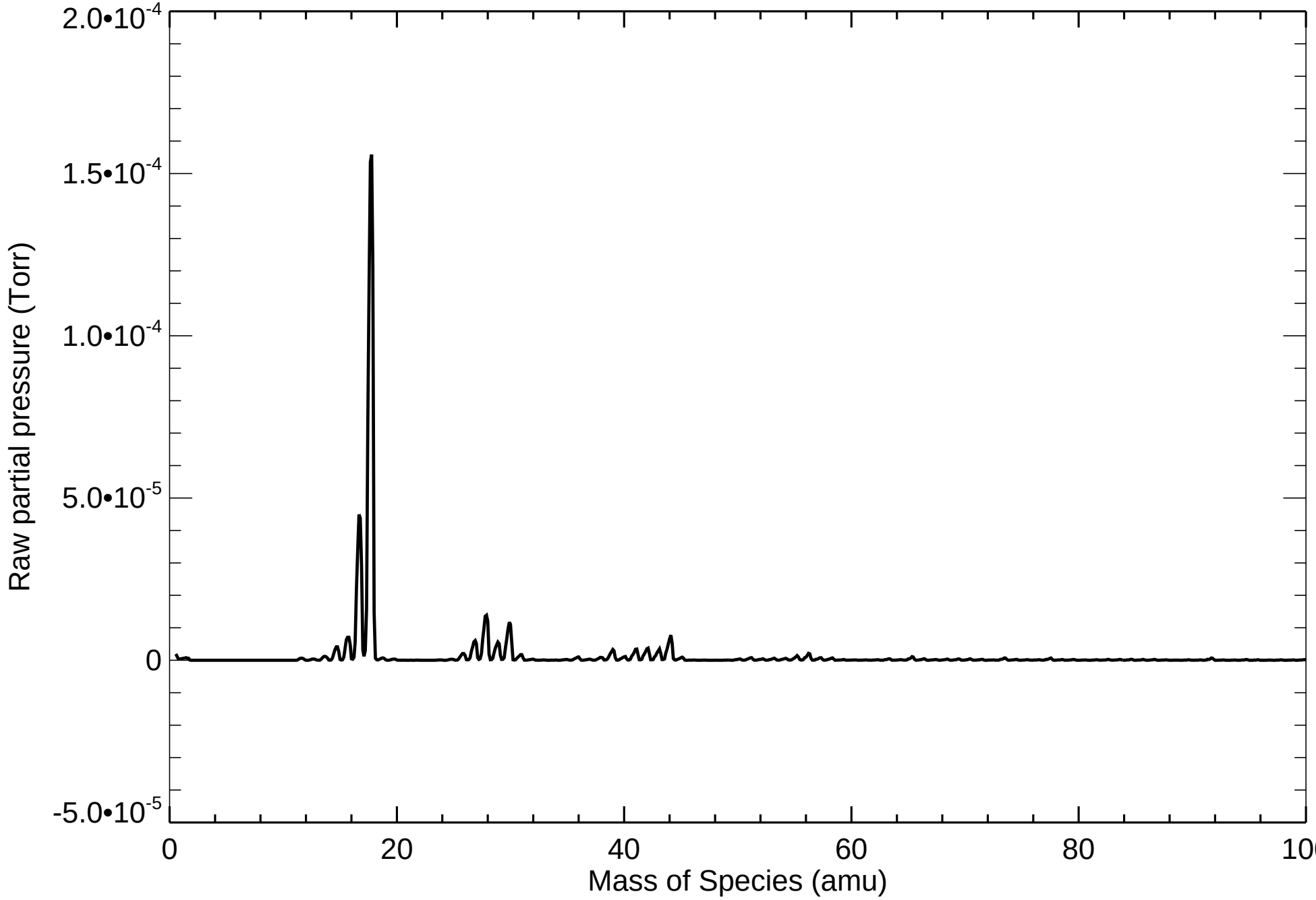


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:21:37:001 UT SWEEP: 0146 Filament: ON

Altitude (km): 99.47 Roll Angle (deg): 95.75

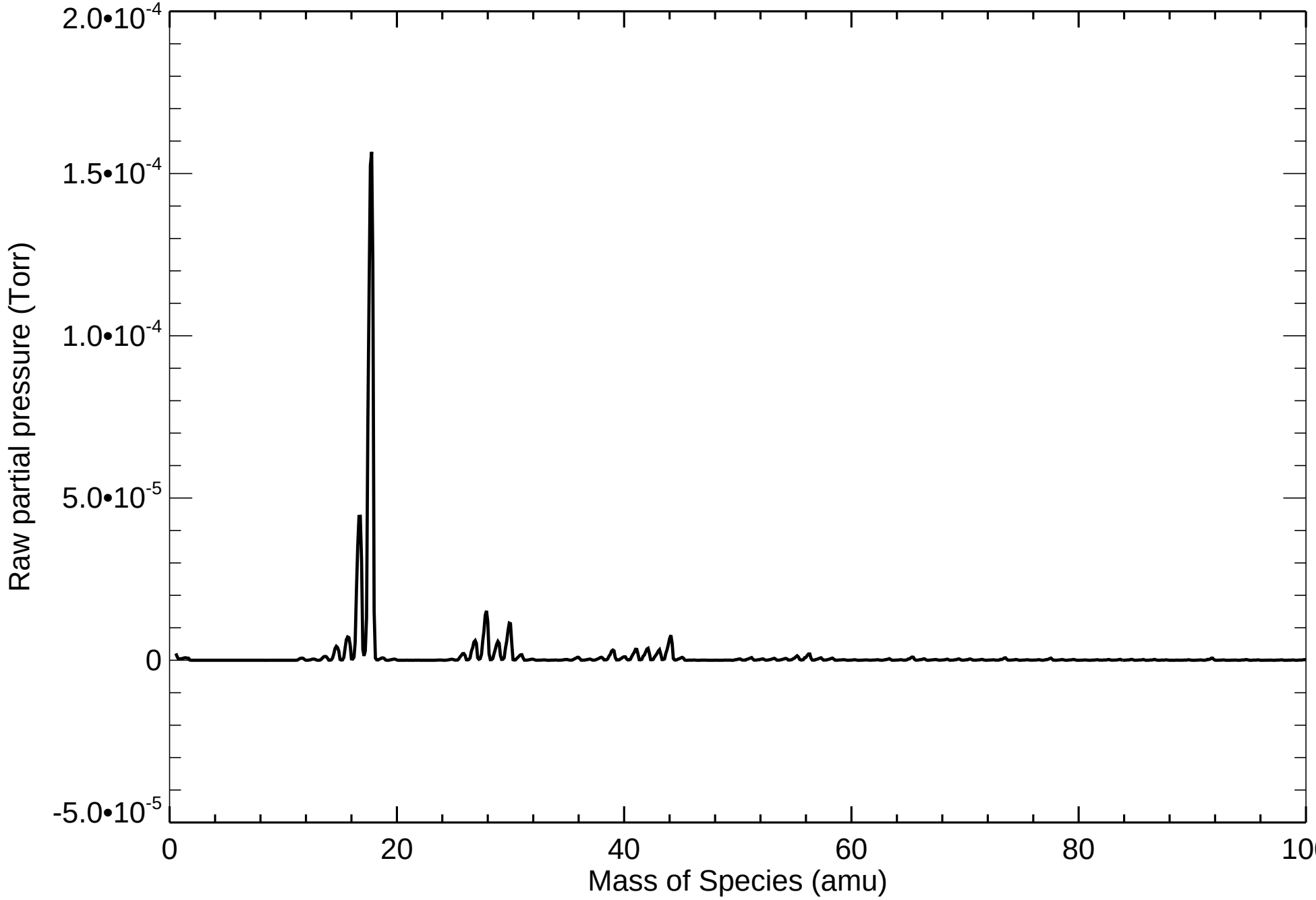


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:22:14:032 UT SWEEP: 0147 Filament: ON

Altitude (km): 98.85 Roll Angle (deg): 96.41

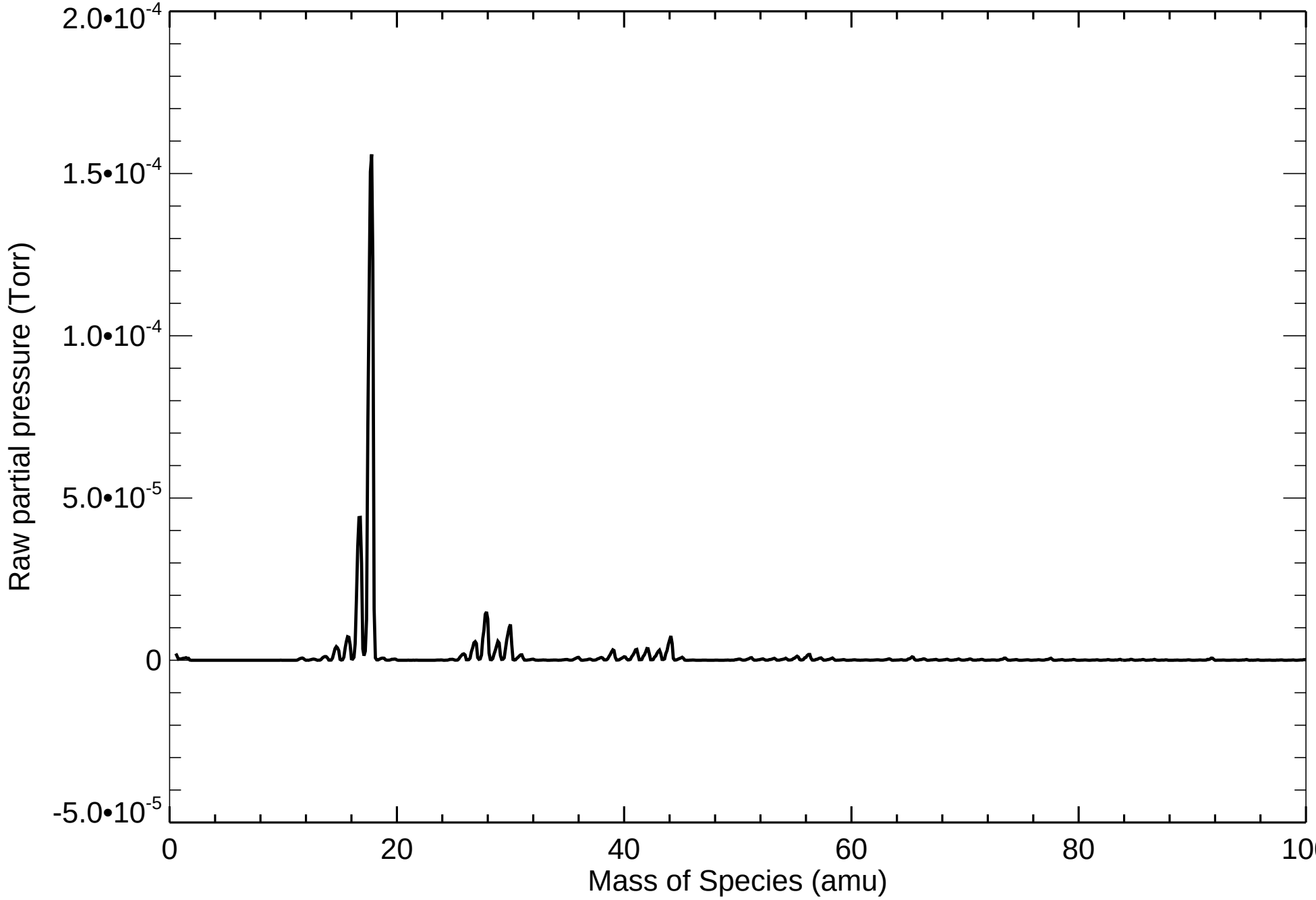


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:22:49:064 UT SWEEP: 0148 Filament: ON

Altitude (km): 98.02 Roll Angle (deg): 96.92

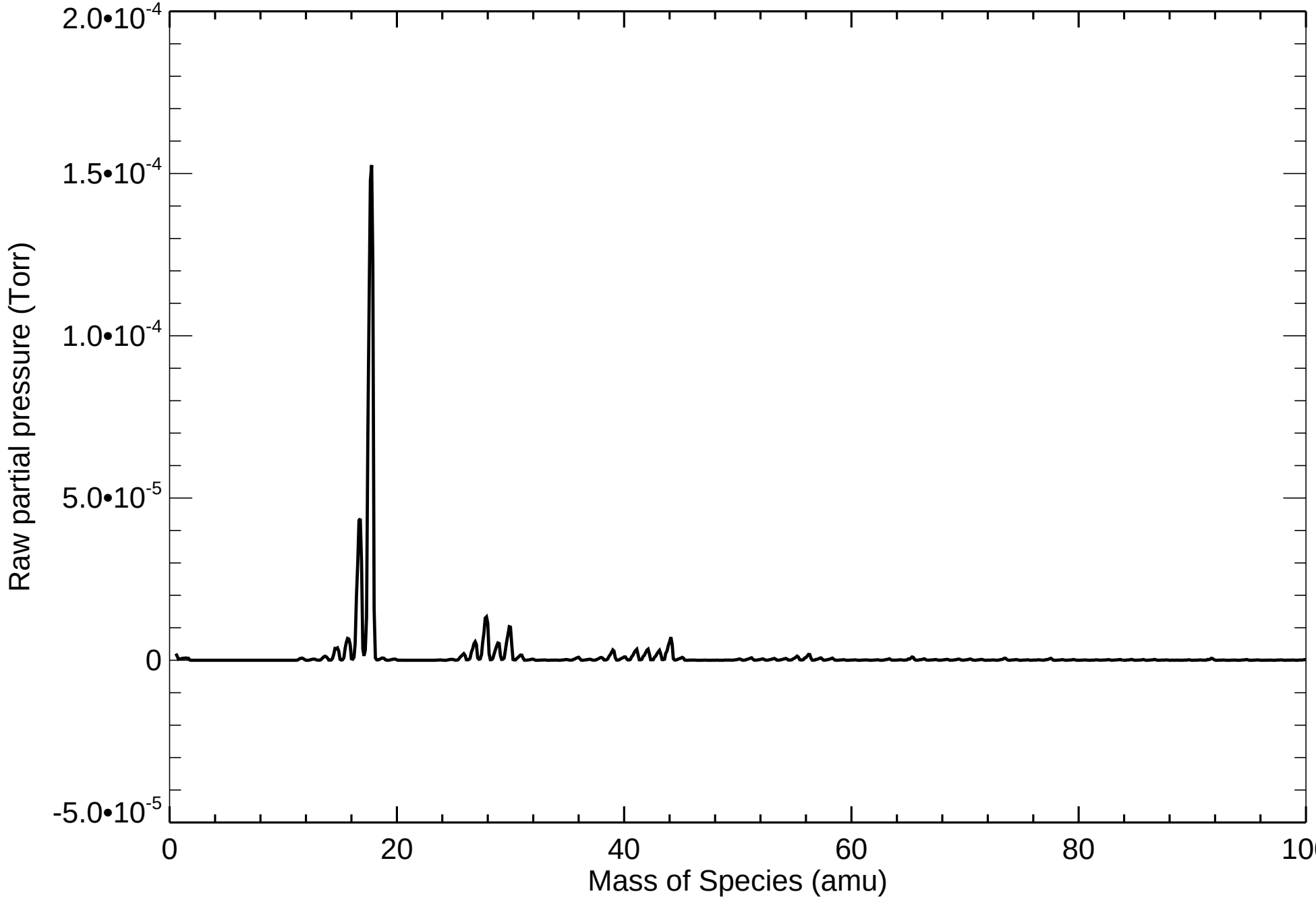


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:23:24:097 UT SWEEP: 0149 Filament: ON

Altitude (km): 97.34 Roll Angle (deg): 97.47

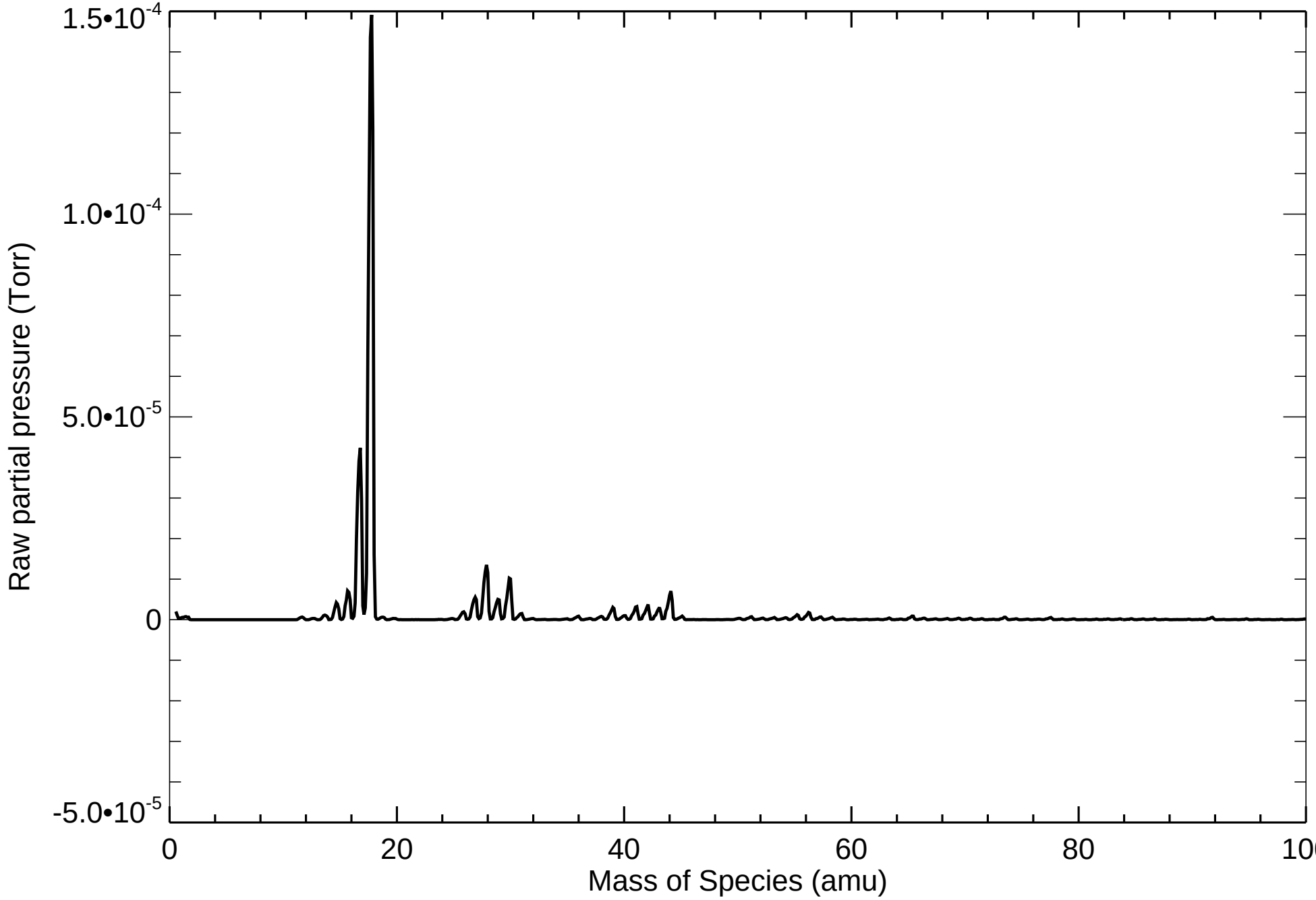


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:24:02:031 UT SWEEP: 0150 Filament: ON

Altitude (km): 96.57 Roll Angle (deg): 98.05

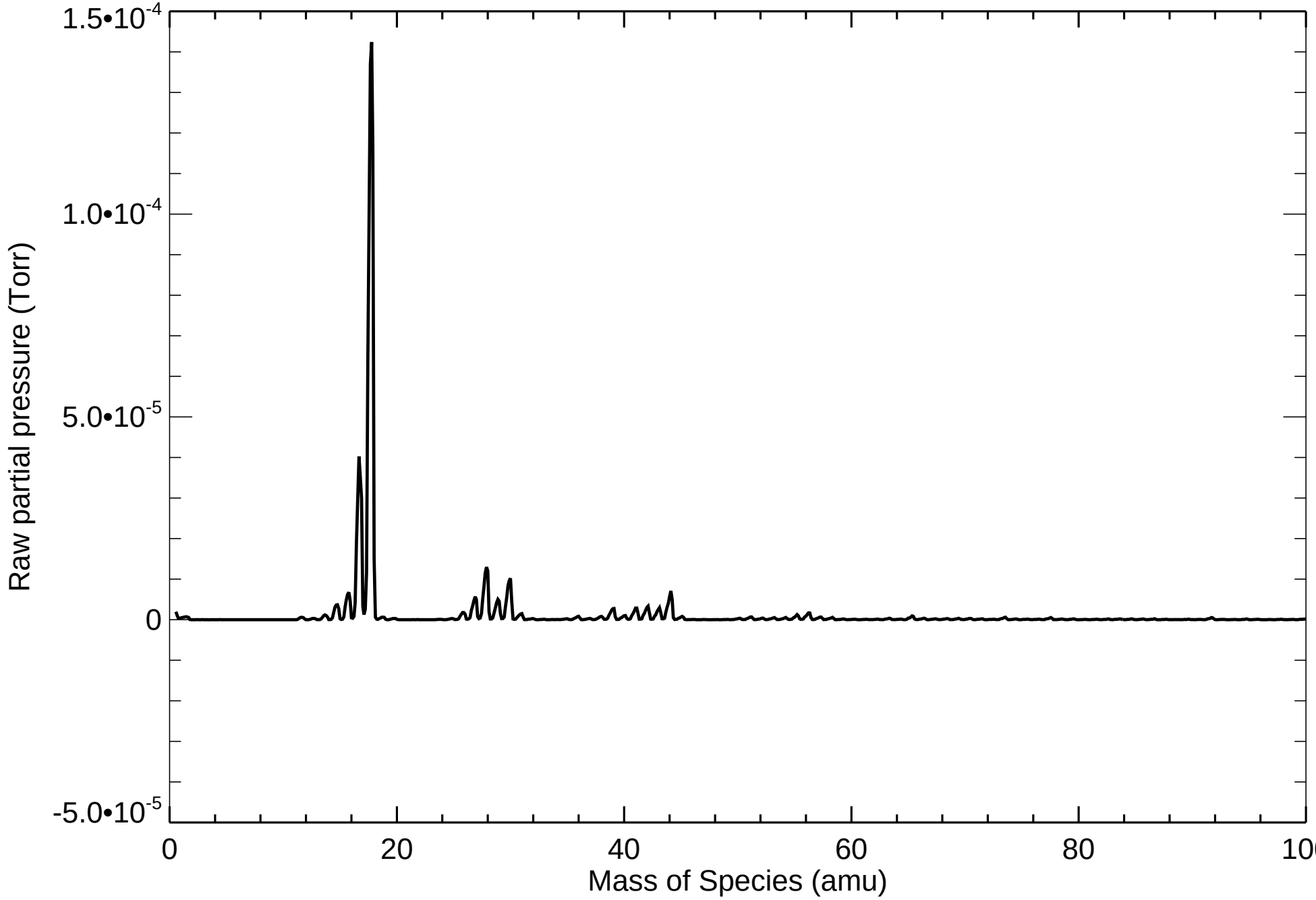


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:24:37:063 UT SWEEP: 0151 Filament: ON

Altitude (km): 95.74 Roll Angle (deg): 98.58

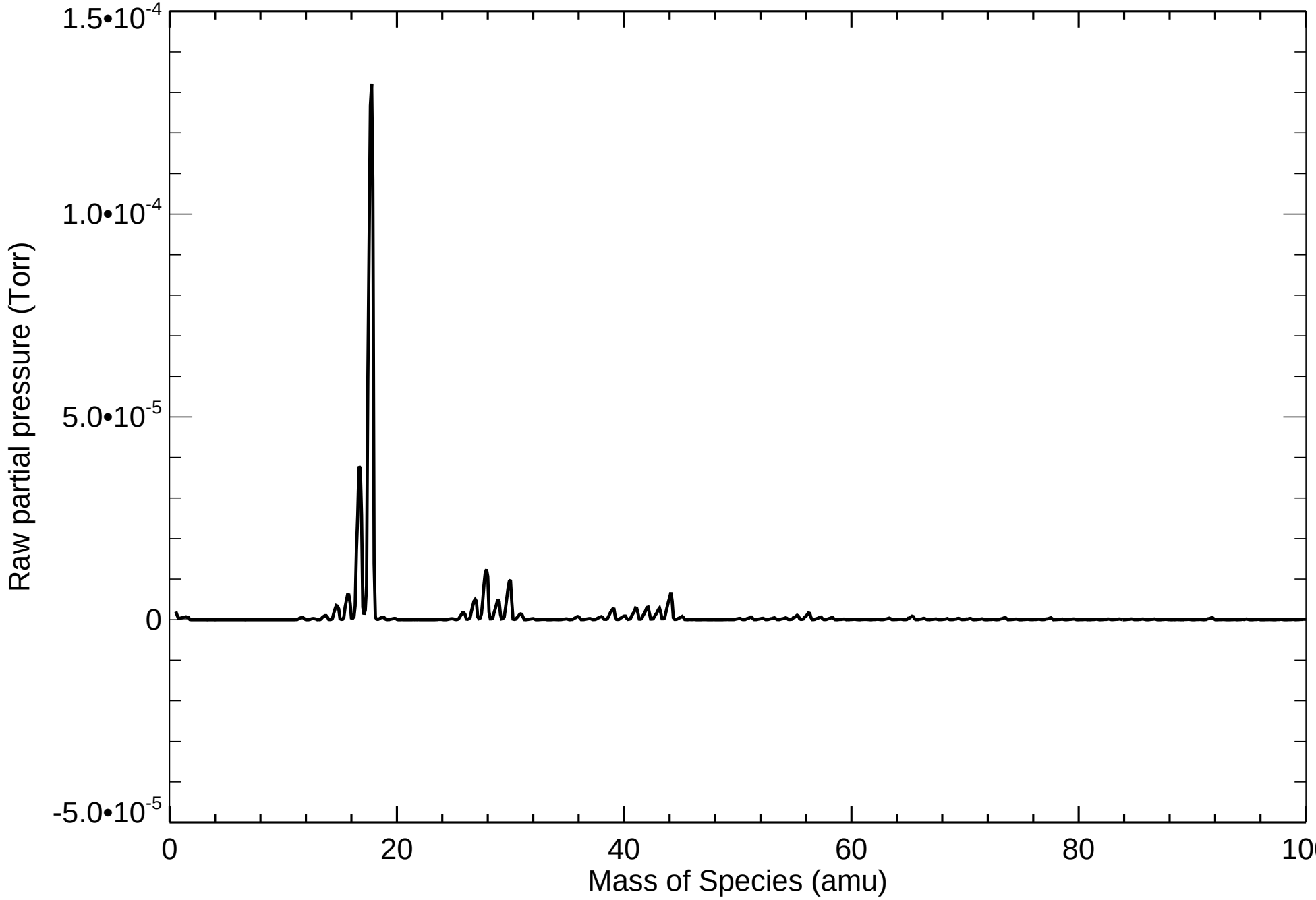


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:25:14:087 UT SWEEP: 0152 Filament: ON

Altitude (km): 95.07 Roll Angle (deg): 99.14

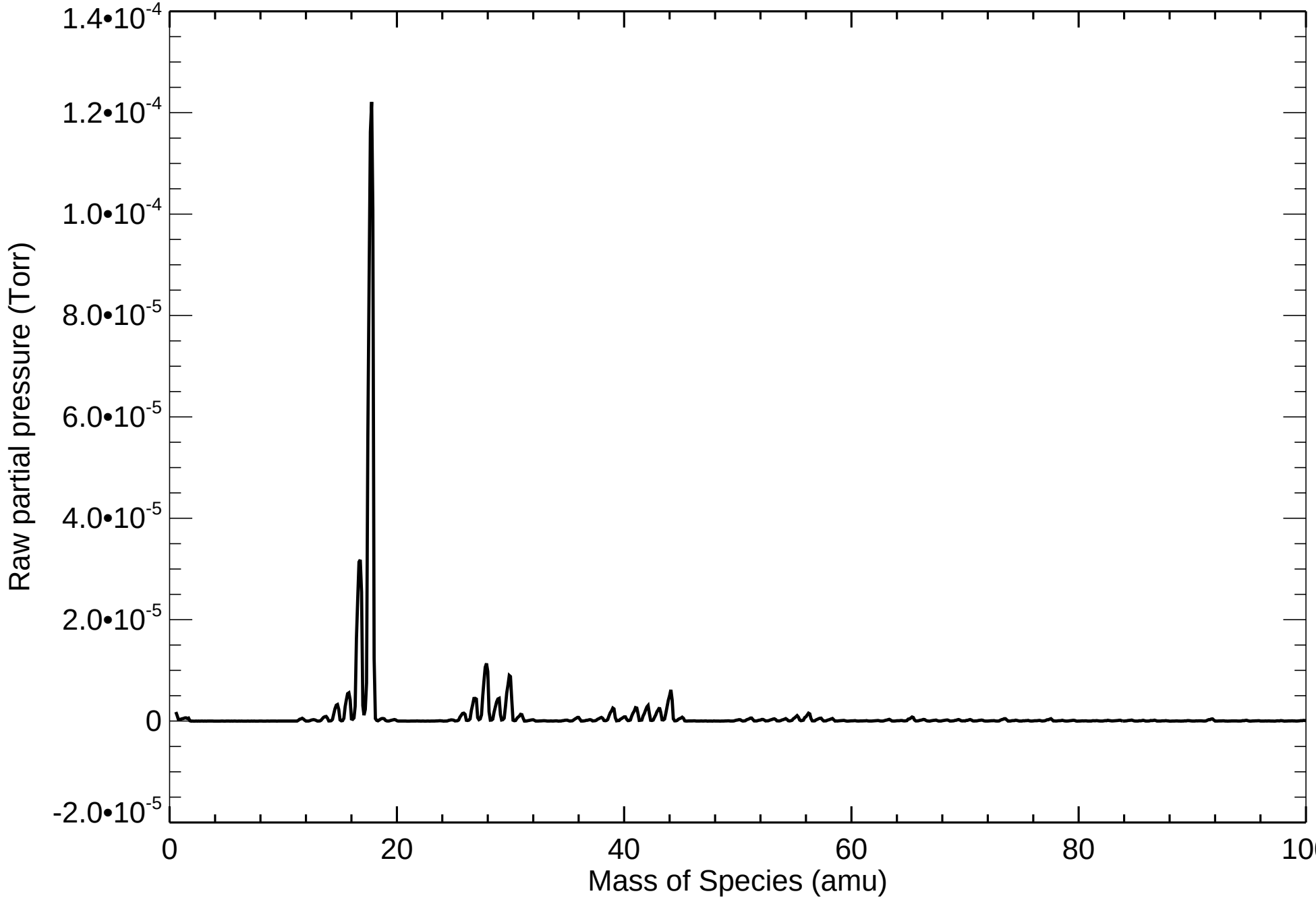


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:25:50:019 UT SWEEP: 0153 Filament: ON

Altitude (km): 94.34 Roll Angle (deg): 99.66

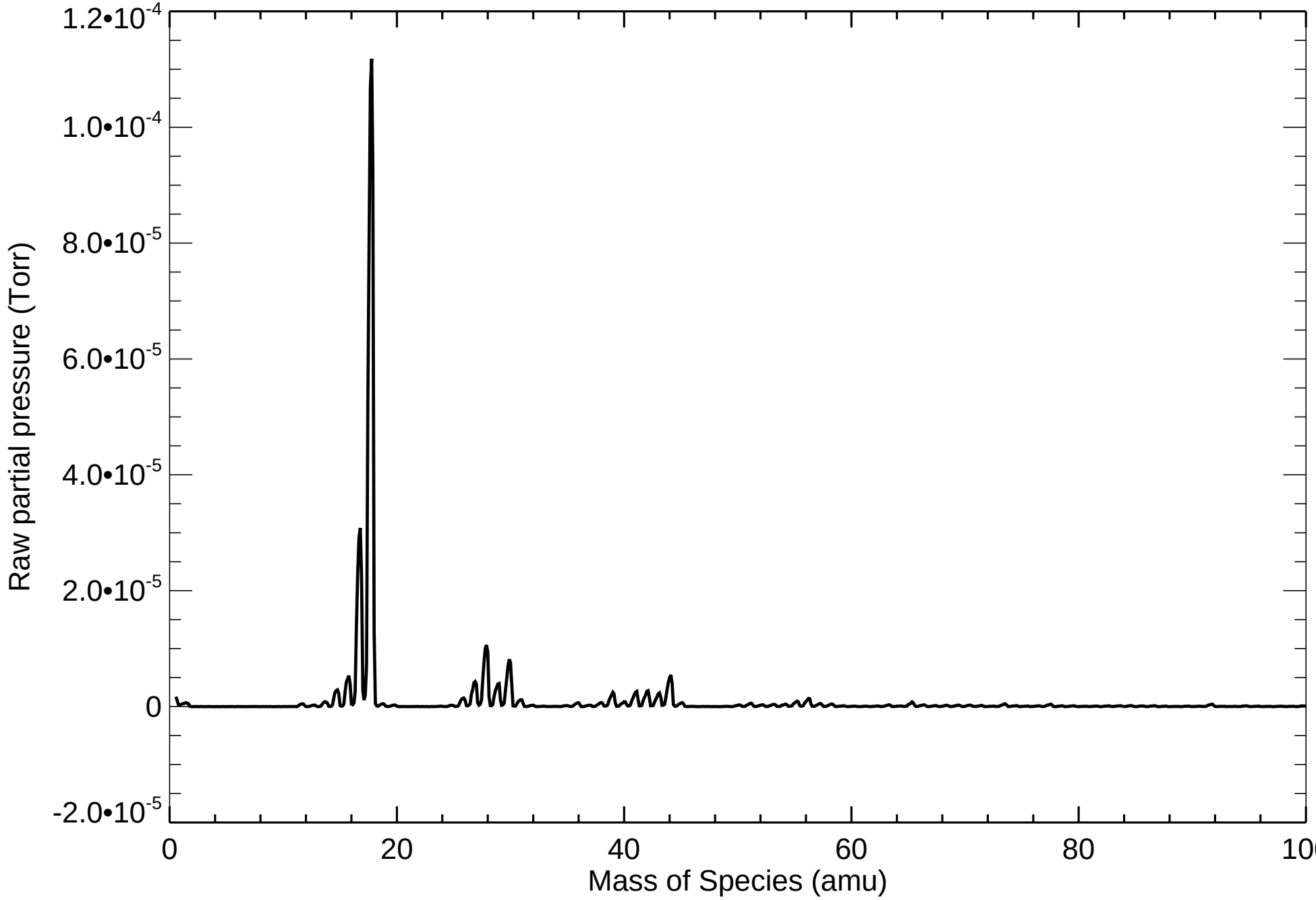


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:26:33:045 UT SWEEP: 0154 Filament: ON

Altitude (km): 93.56 Roll Angle (deg): 100.28

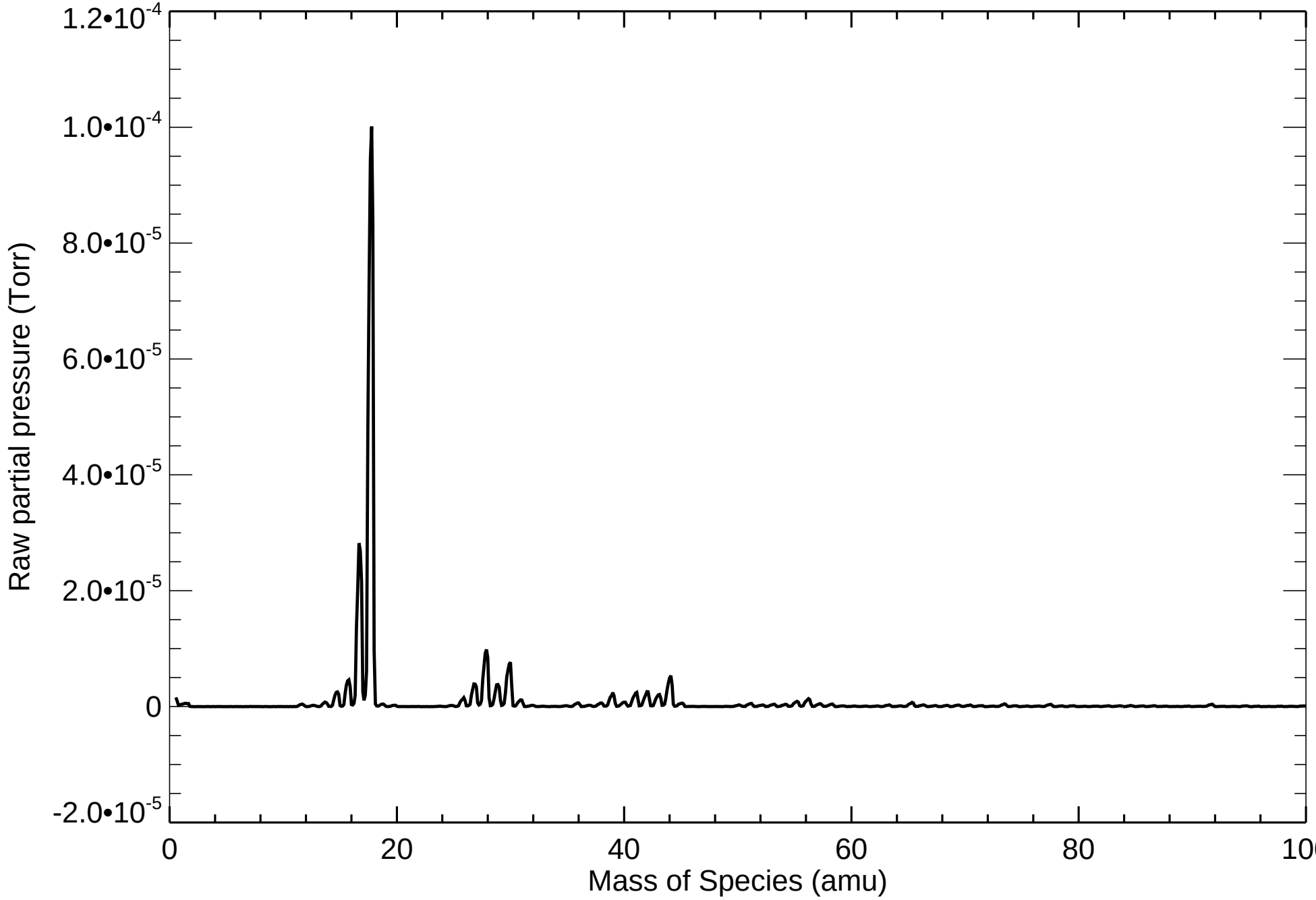


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:27:10:075 UT SWEEP: 0155 Filament: ON

Altitude (km): 92.81 Roll Angle (deg): 100.80

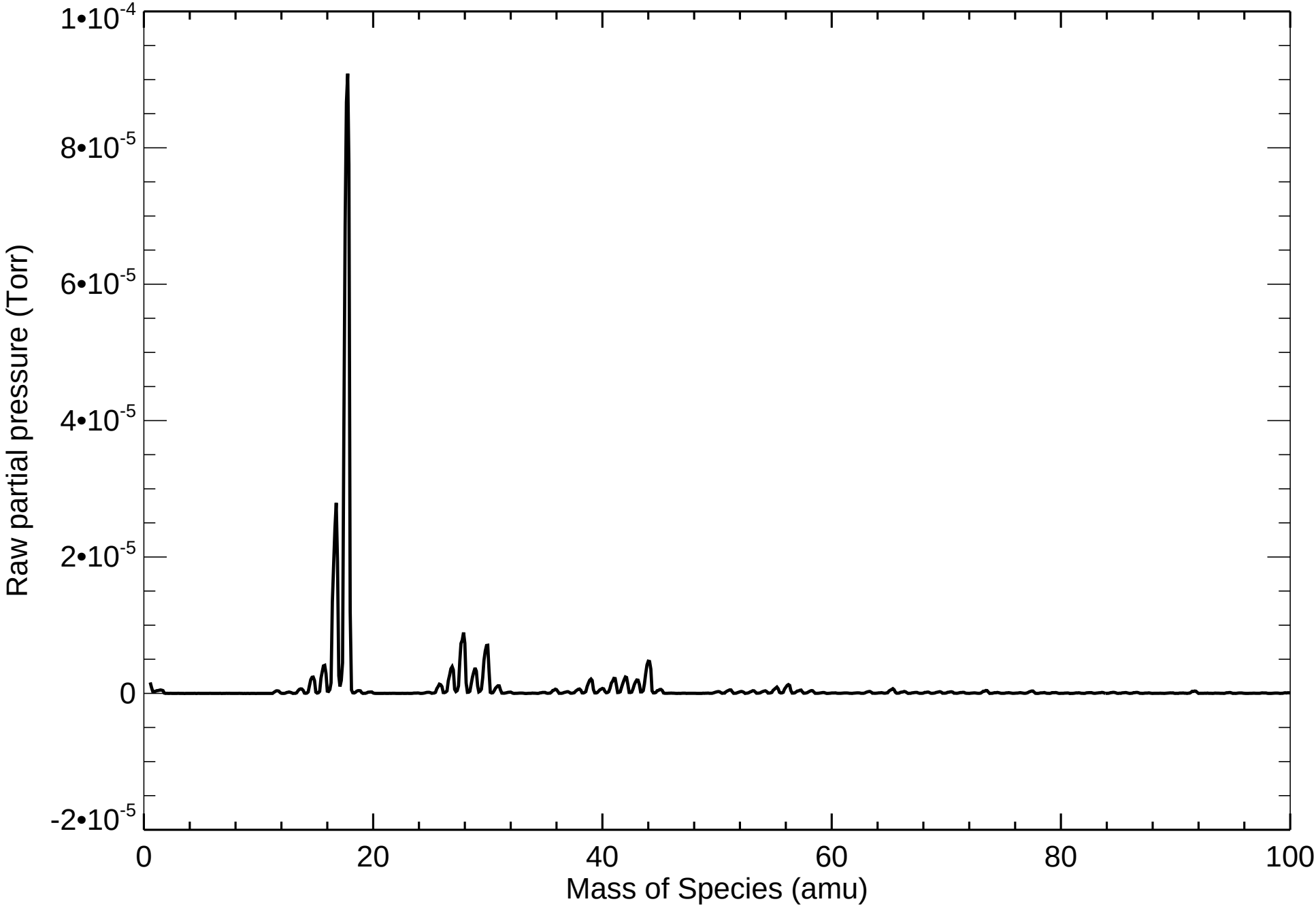


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:27:46:011 UT SWEEP: 0156 Filament: ON

Altitude (km): 92.33 Roll Angle (deg): 101.29

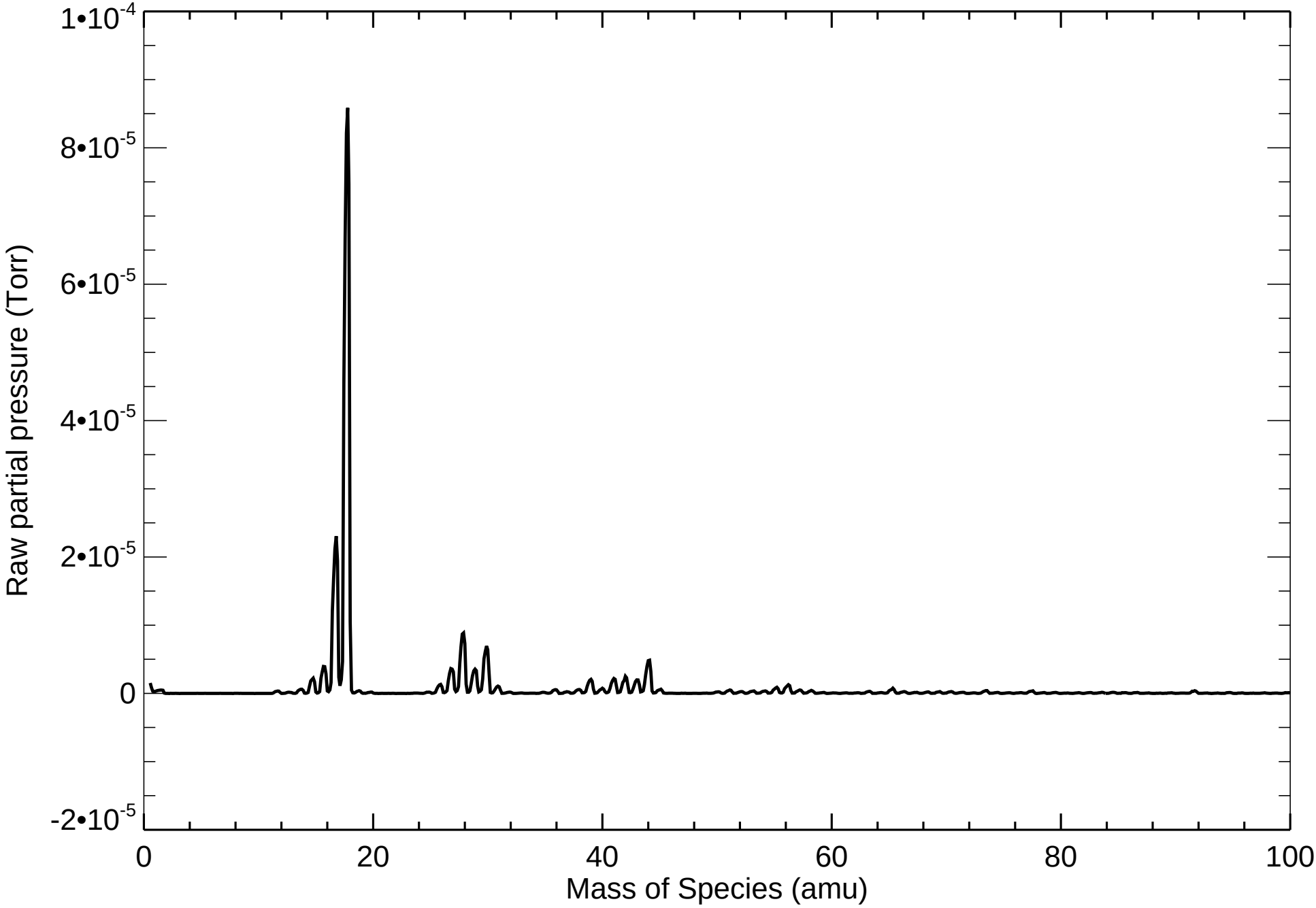


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:28:21:044 UT SWEEP: 0157 Filament: ON

Altitude (km): 91.57 Roll Angle (deg): 101.75

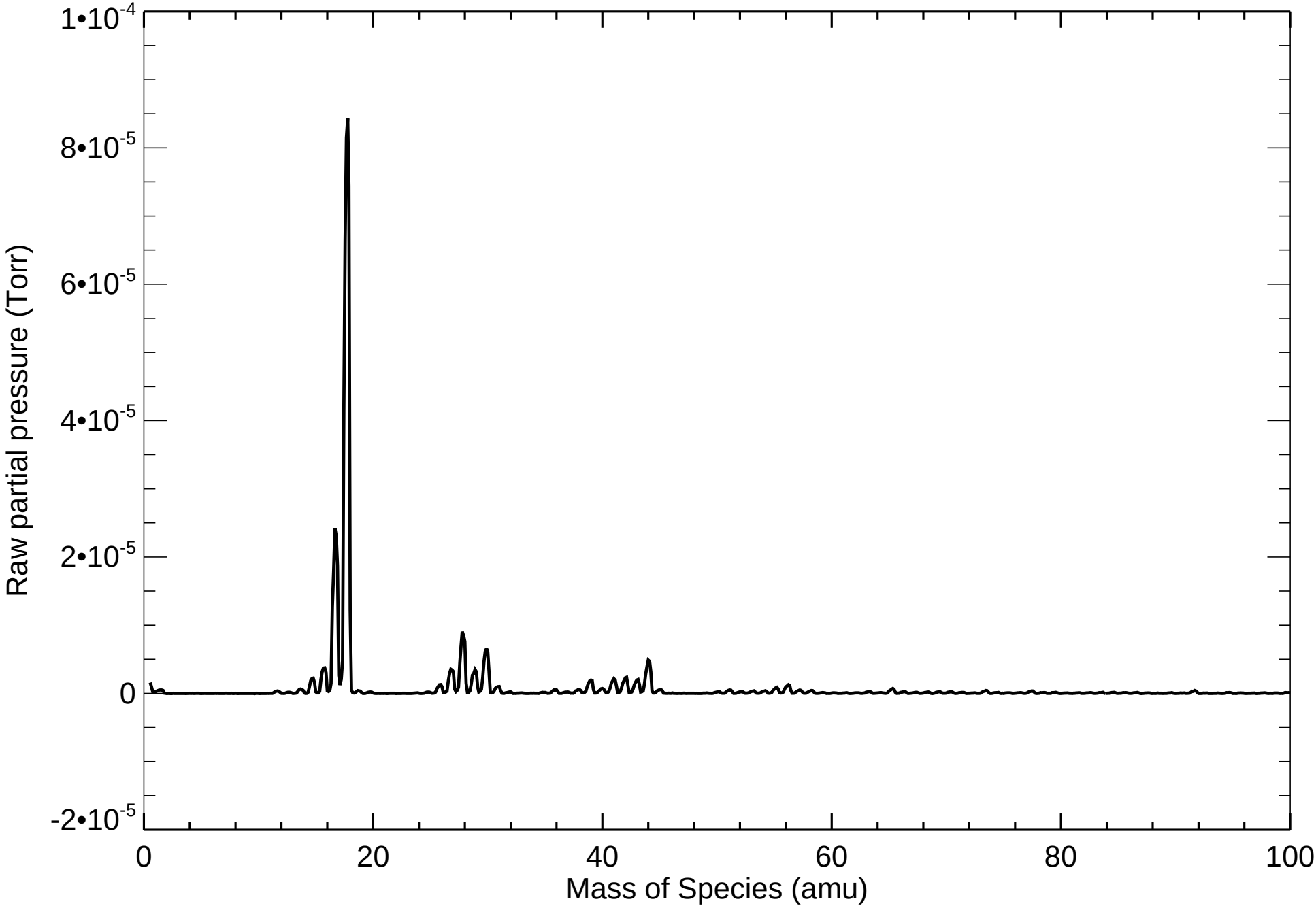


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:28:58:074 UT SWEEP: 0158 Filament: ON

Altitude (km): 90.92 Roll Angle (deg): 102.23

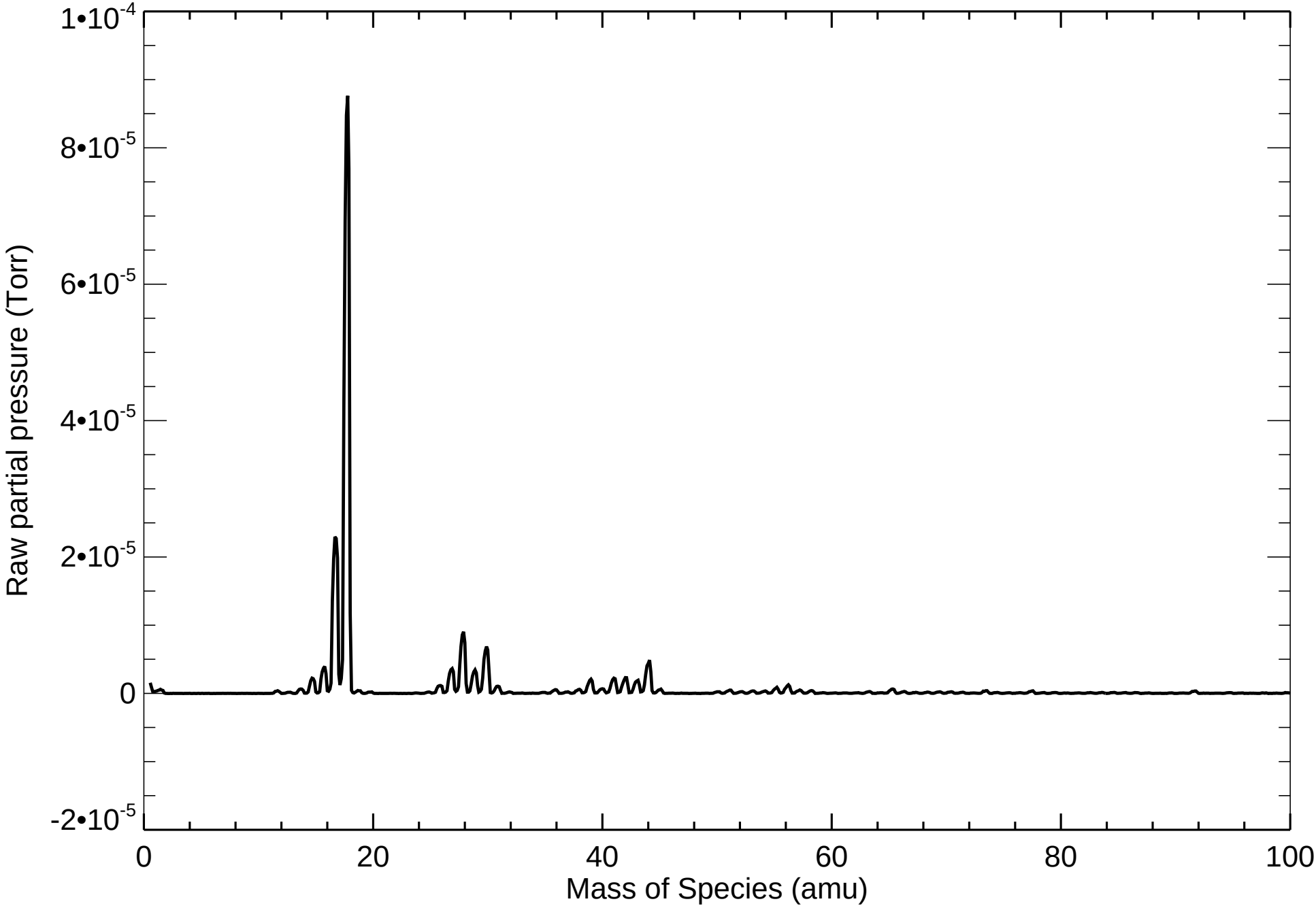


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:29:34:007 UT SWEEP: 0159 Filament: ON

Altitude (km): 90.41 Roll Angle (deg): 102.68

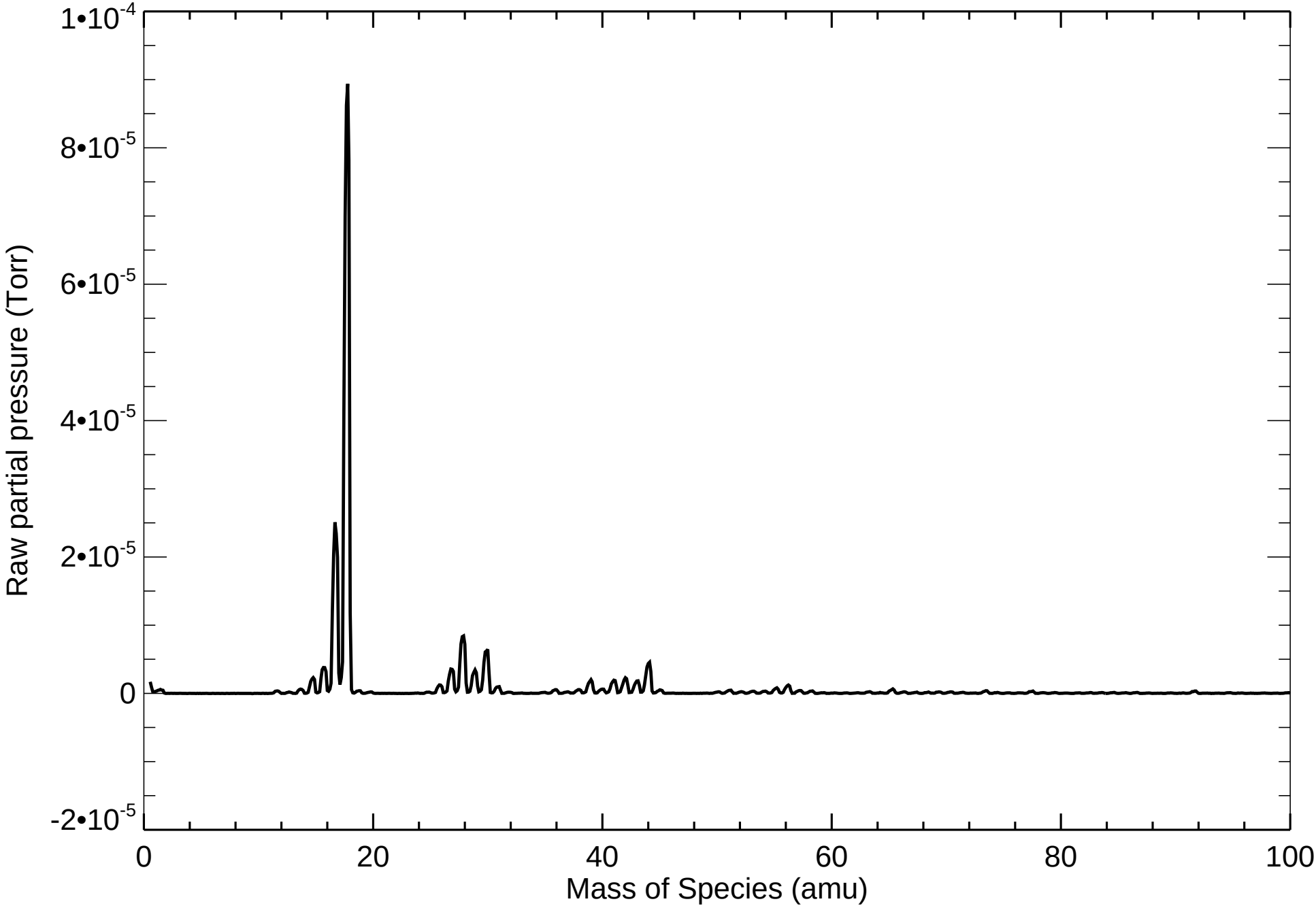


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:30:09:039 UT SWEEP: 0160 Filament: ON

Altitude (km): 89.78 Roll Angle (deg): 103.10

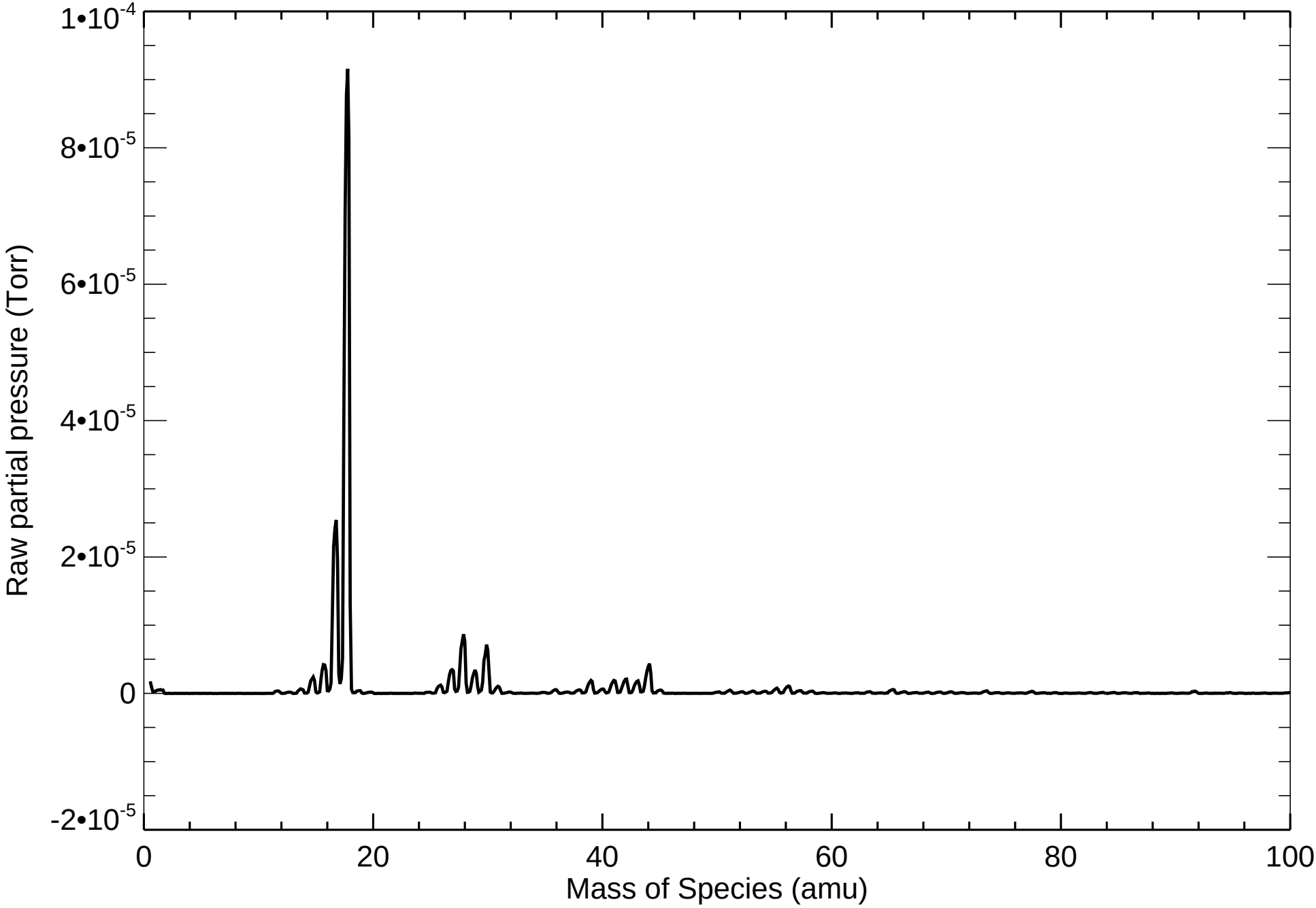


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:30:46:070 UT SWEEP: 0161 Filament: ON

Altitude (km): 89.37 Roll Angle (deg): 103.54

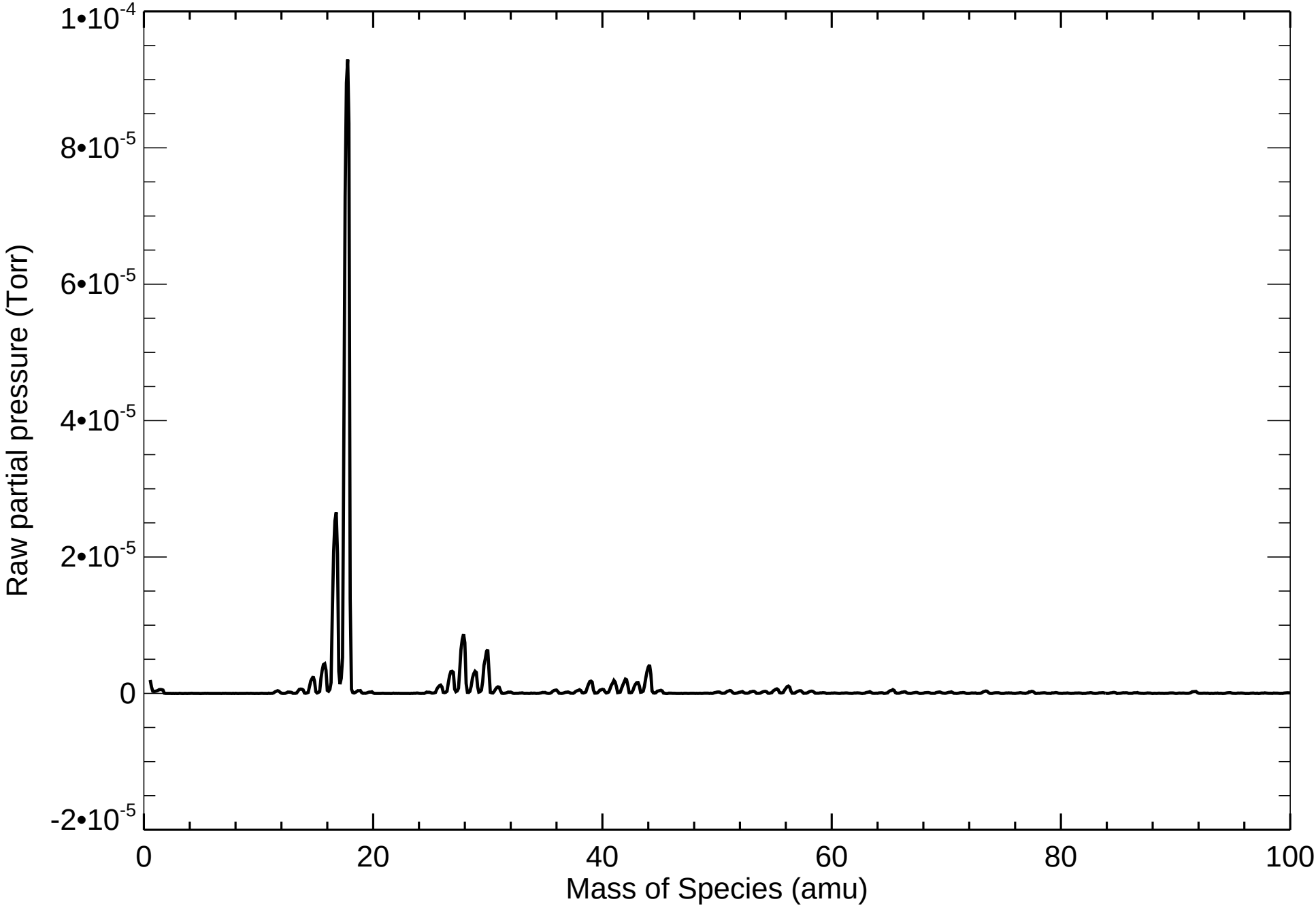


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:31:22:002 UT SWEEP: 0162 Filament: ON

Altitude (km): 88.79 Roll Angle (deg): 103.95

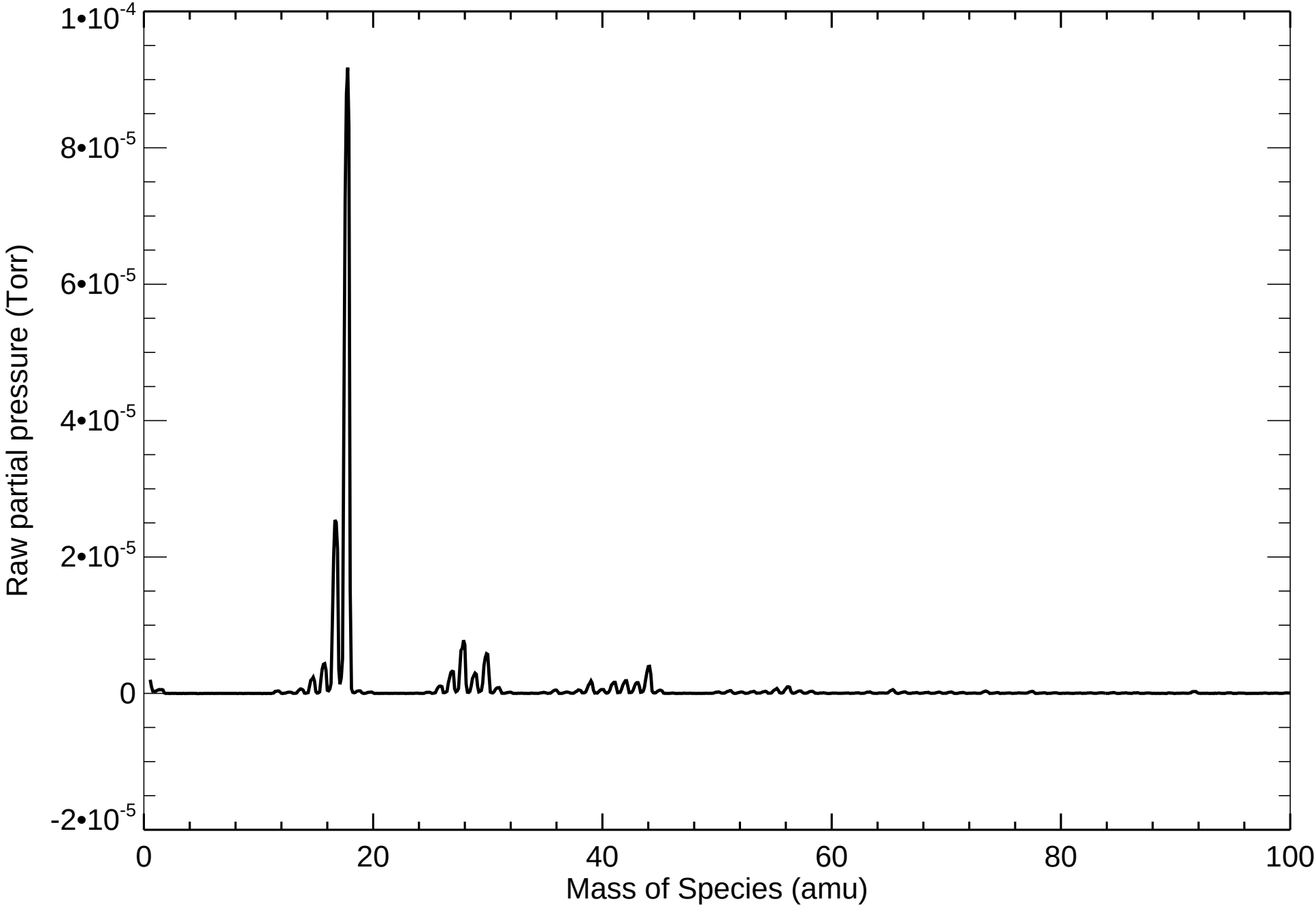


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:32:07:029 UT SWEEP: 0163 Filament: ON

Altitude (km): 88.09 Roll Angle (deg): 104.43

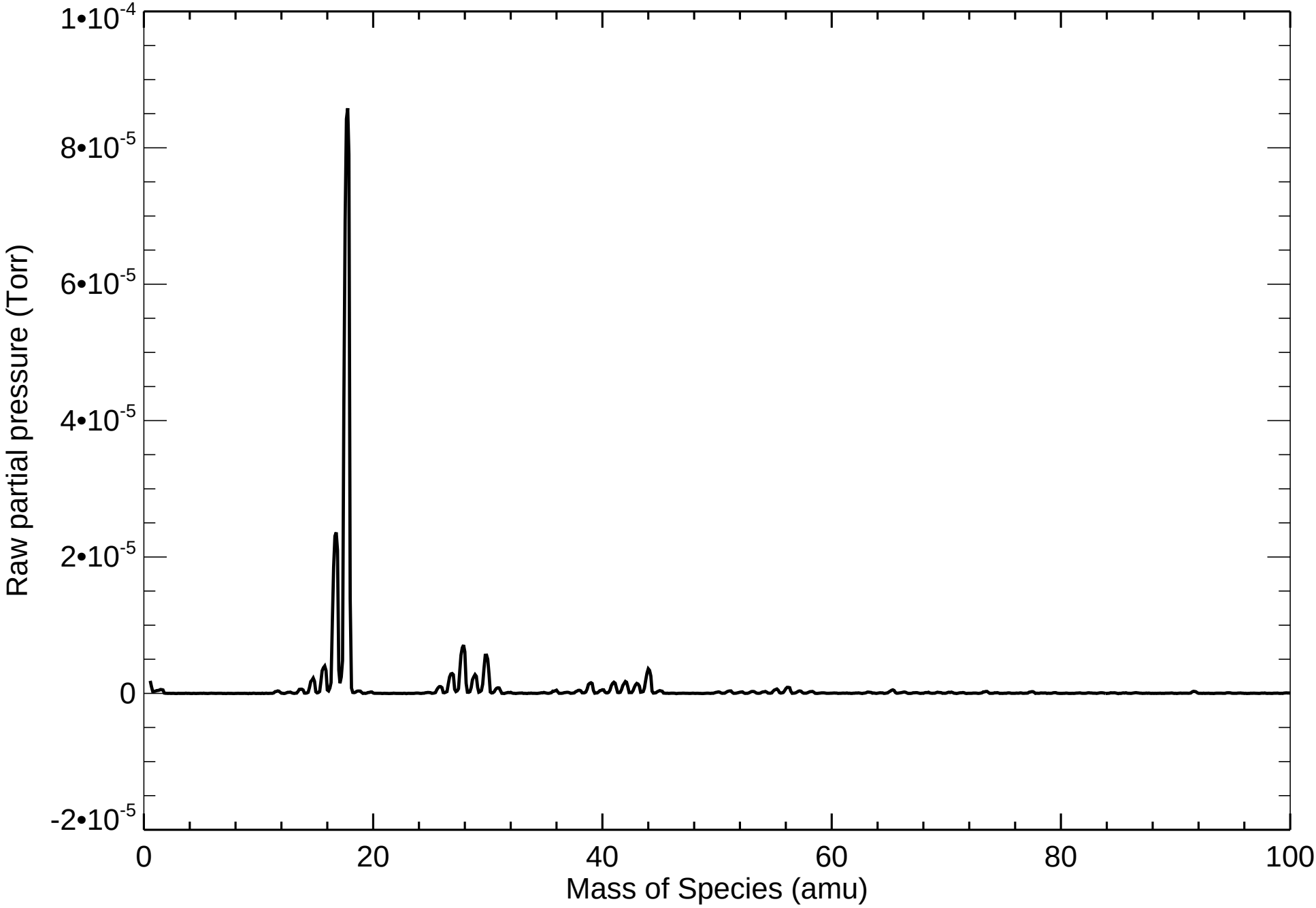


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:32:42:062 UT SWEEP: 0164 Filament: ON

Altitude (km): 87.77 Roll Angle (deg): 104.79

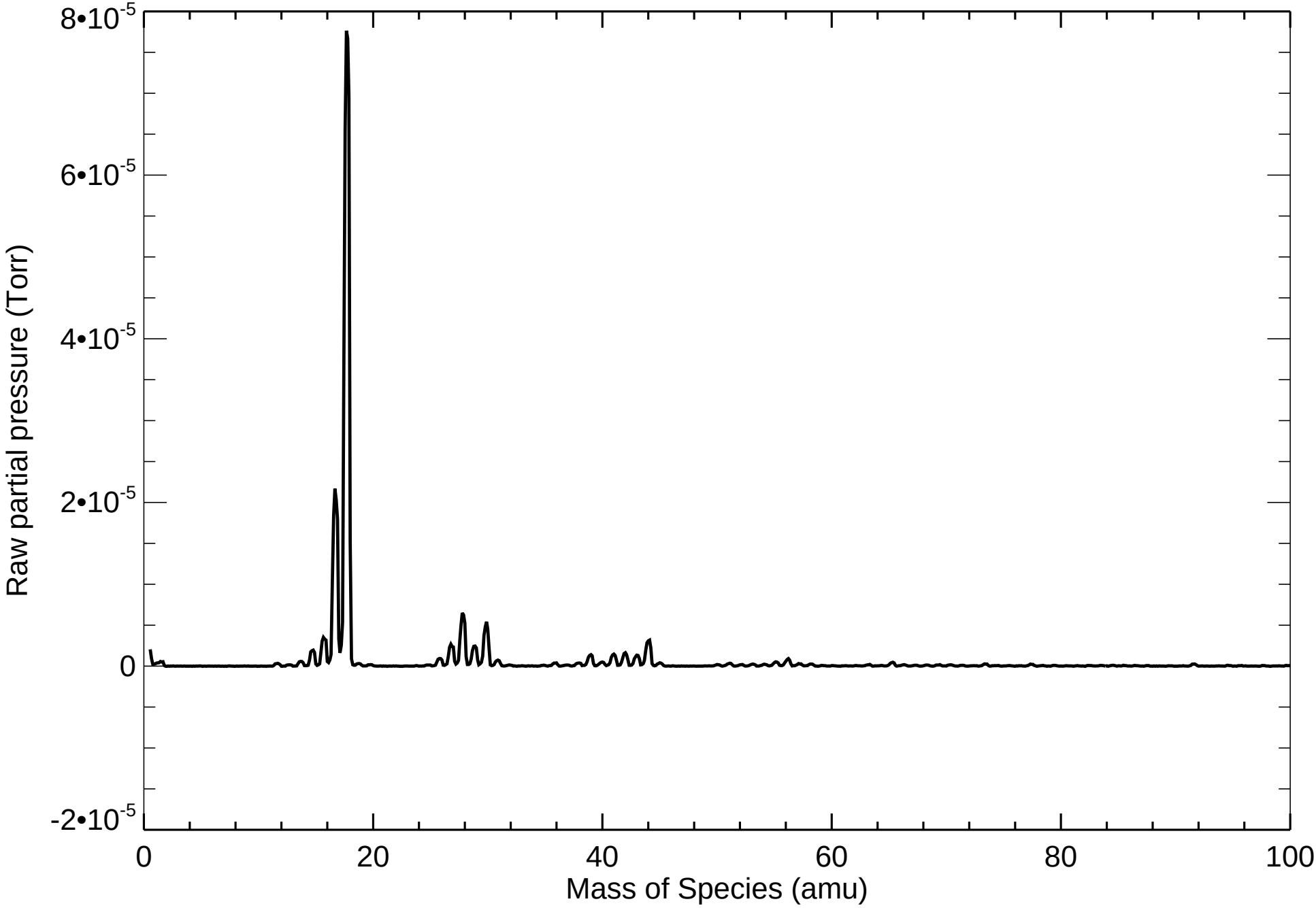


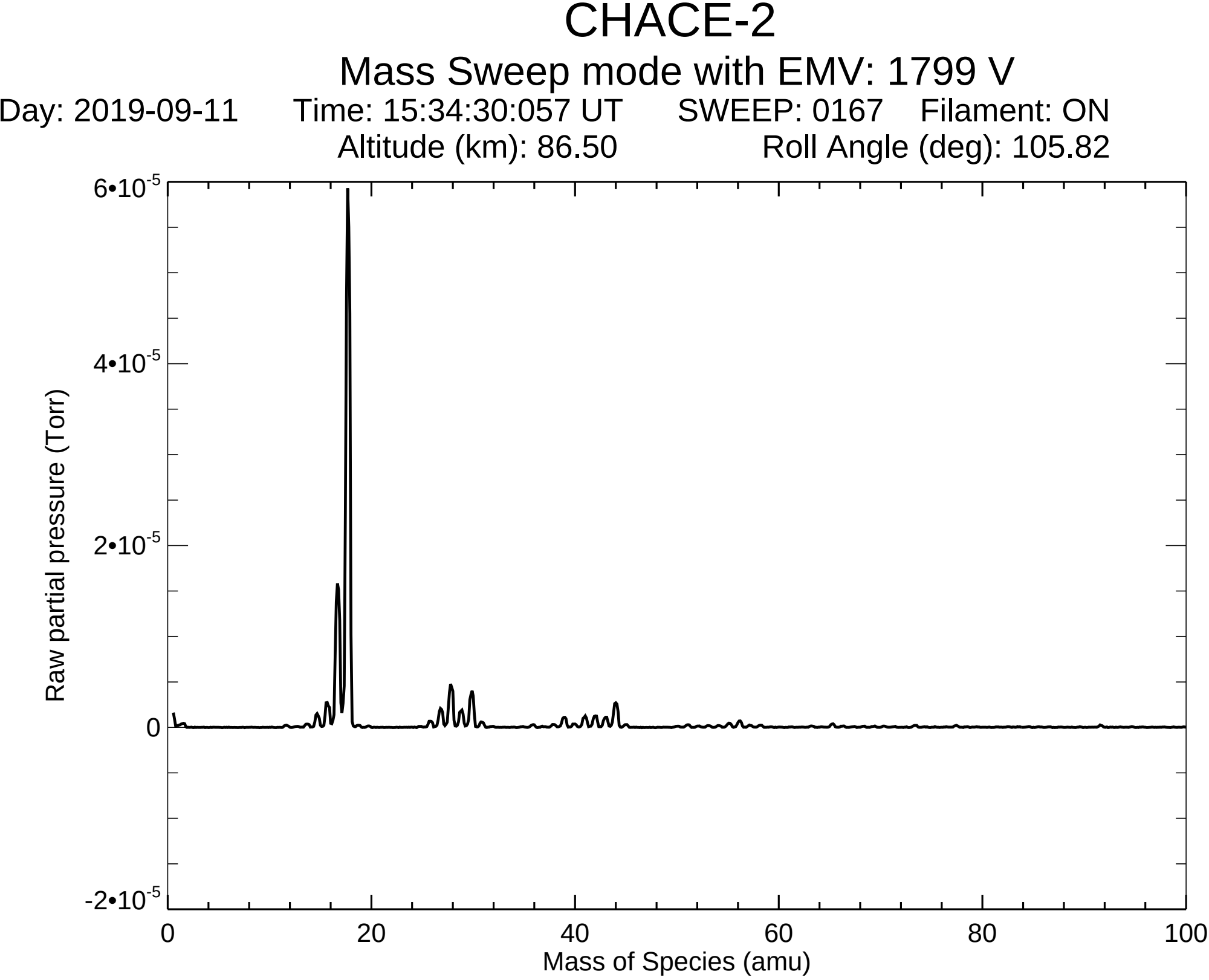
CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:33:17:094 UT SWEEP: 0165 Filament: ON

Altitude (km): 87.28 Roll Angle (deg): 105.14



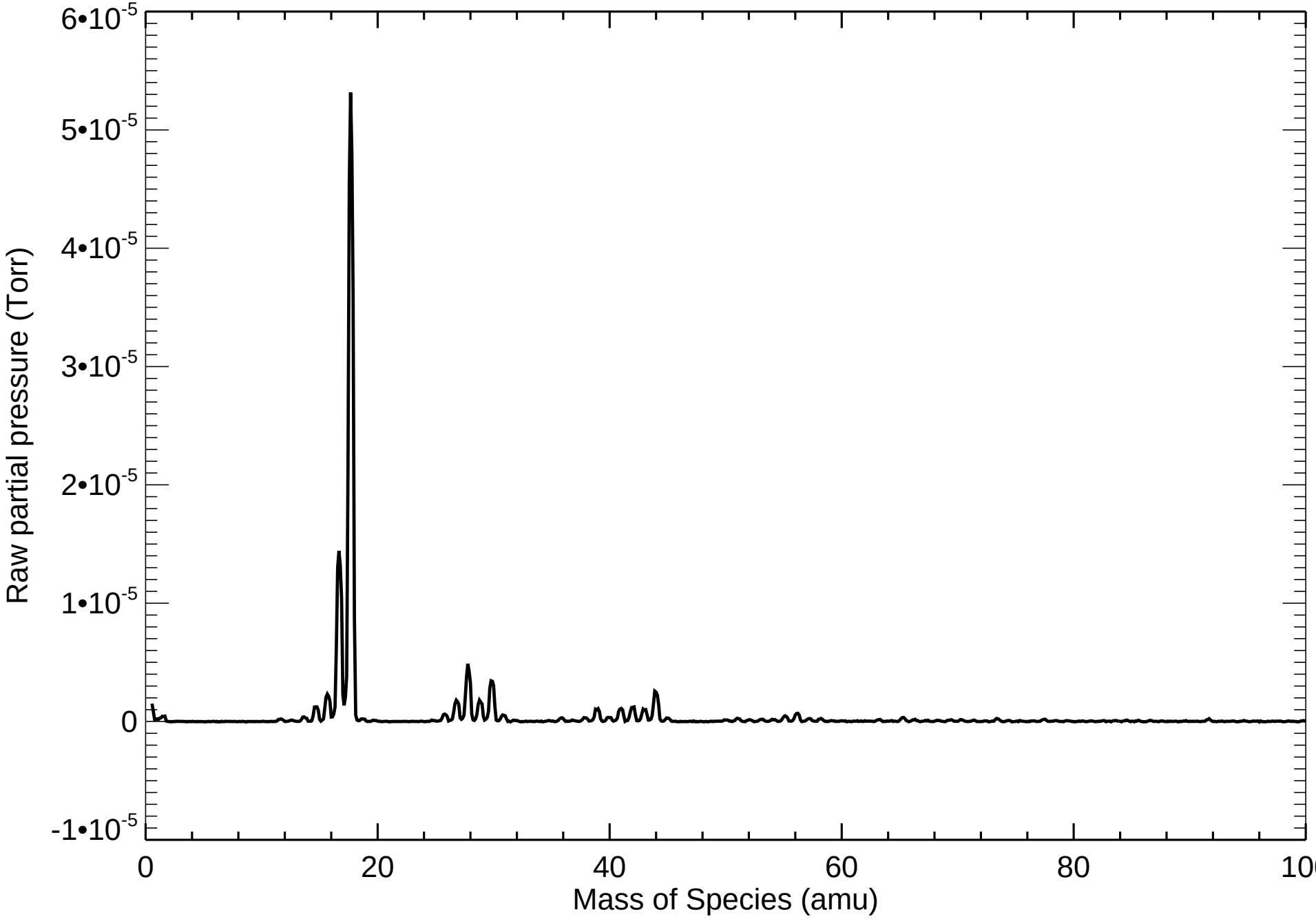

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-09-11 Time: 15:34:30:057 UT SWEEP: 0167 Filament: ON
Altitude (km): 86.50 Roll Angle (deg): 105.82
6•10-5
4•10-5
2•10-5
0
-2•10-5
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:35:05:090 UT SWEEP: 0168 Filament: ON

Altitude (km): 86.15 Roll Angle (deg): 106.11

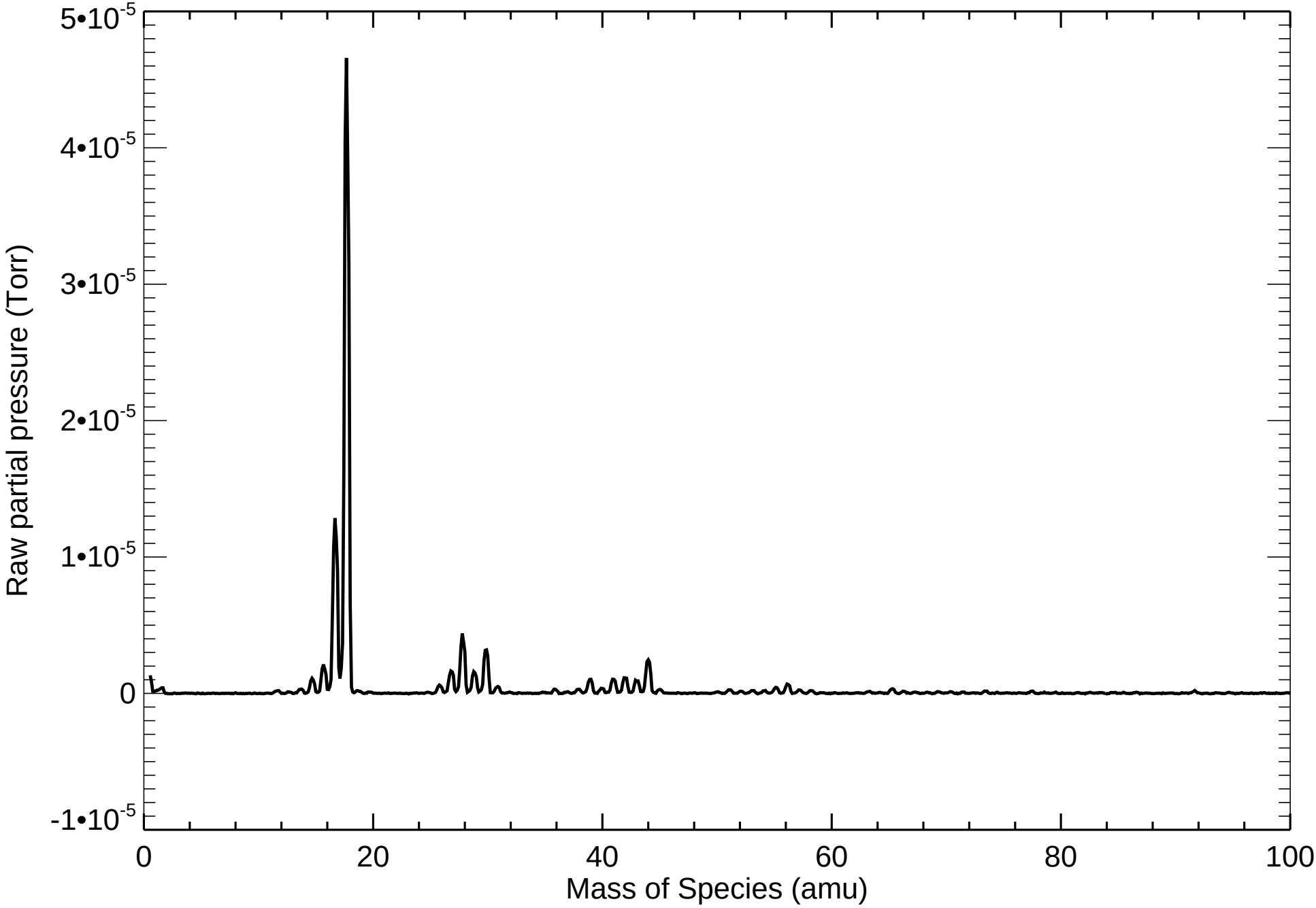


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:35:43:017 UT SWEEP: 0169 Filament: ON

Altitude (km): 85.83 Roll Angle (deg): 106.42

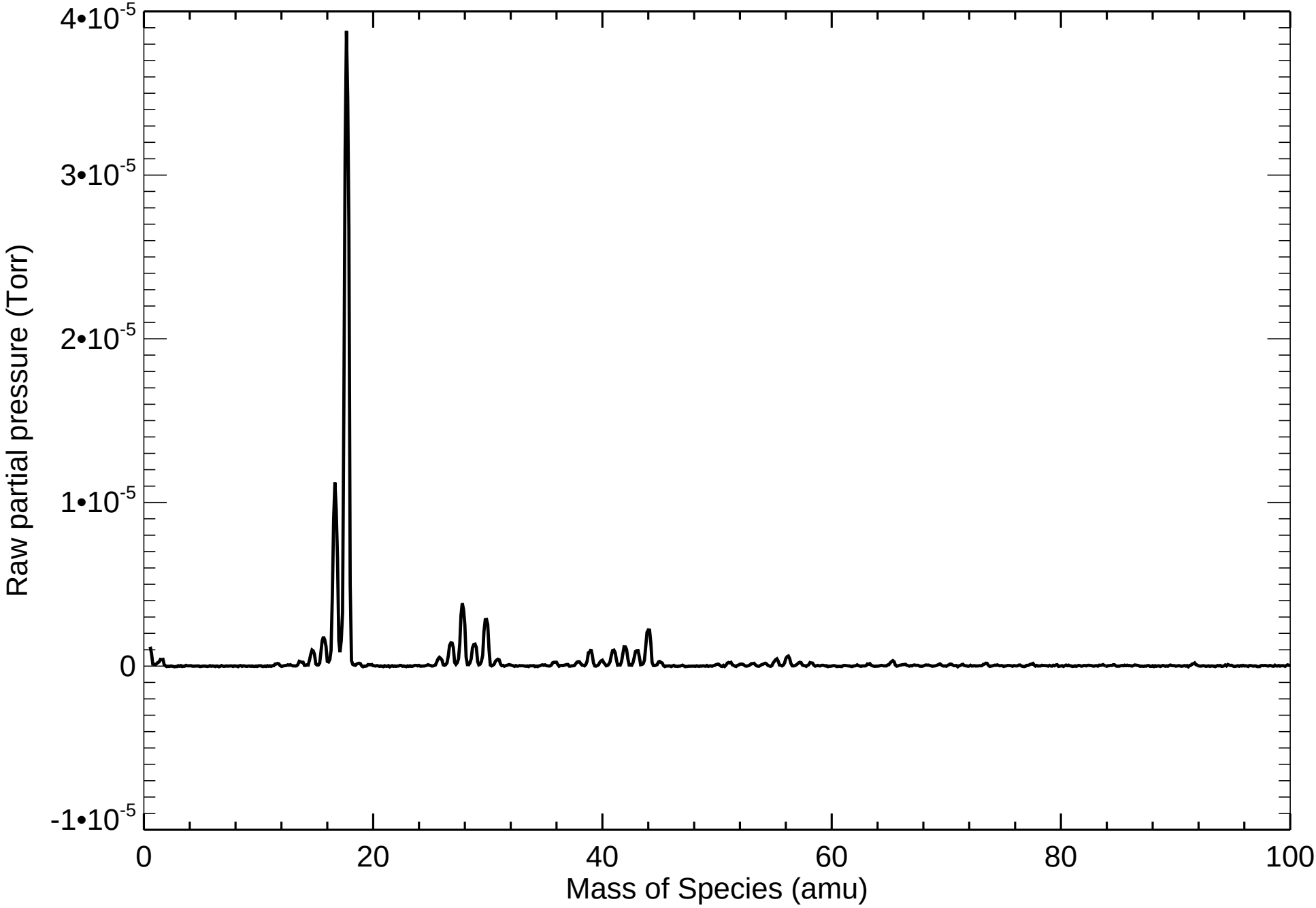


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:36:18:049 UT SWEEP: 0170 Filament: ON

Altitude (km): 85.45 Roll Angle (deg): 106.67

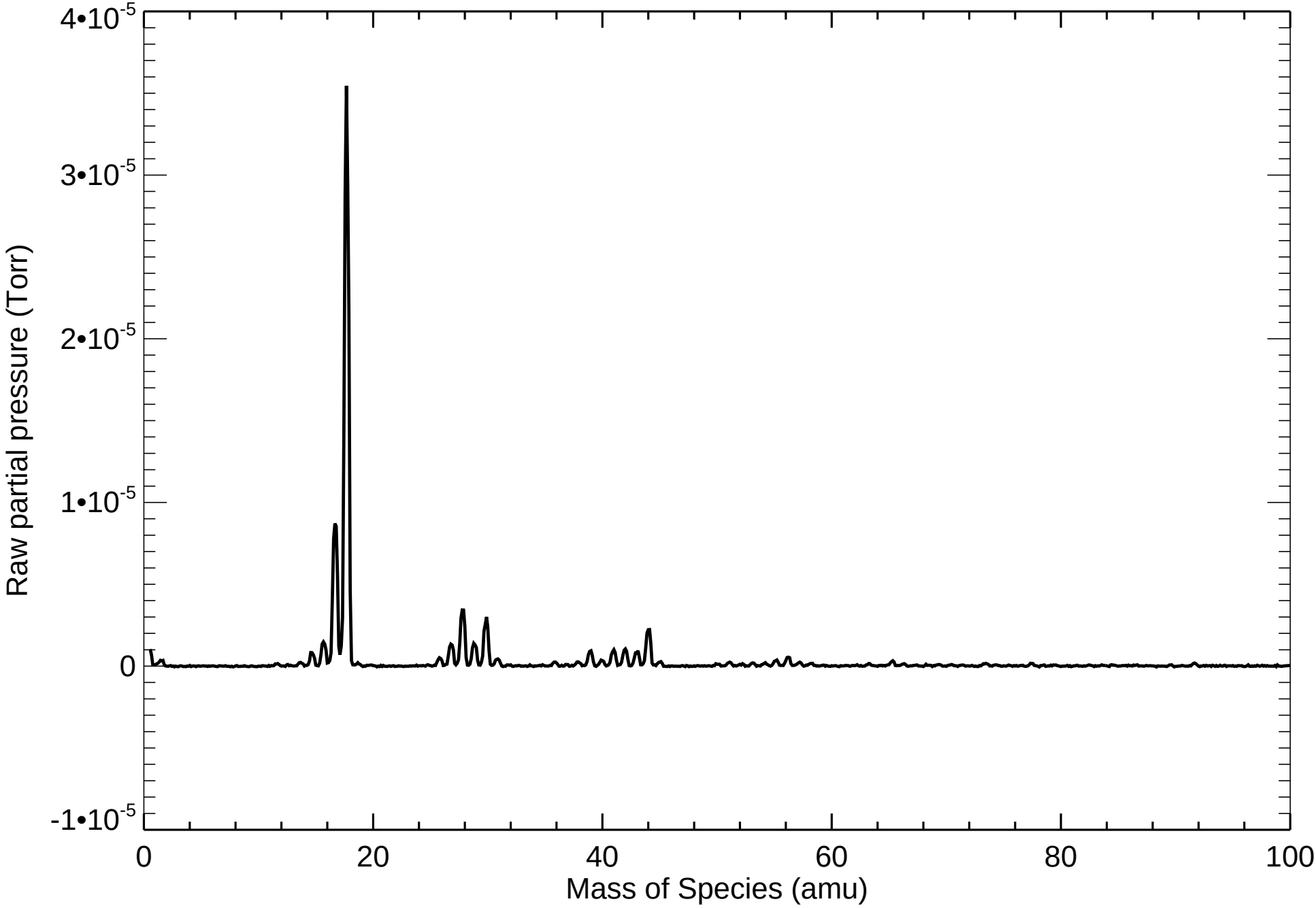


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:36:53:082 UT SWEEP: 0171 Filament: ON

Altitude (km): 85.26 Roll Angle (deg): 106.93

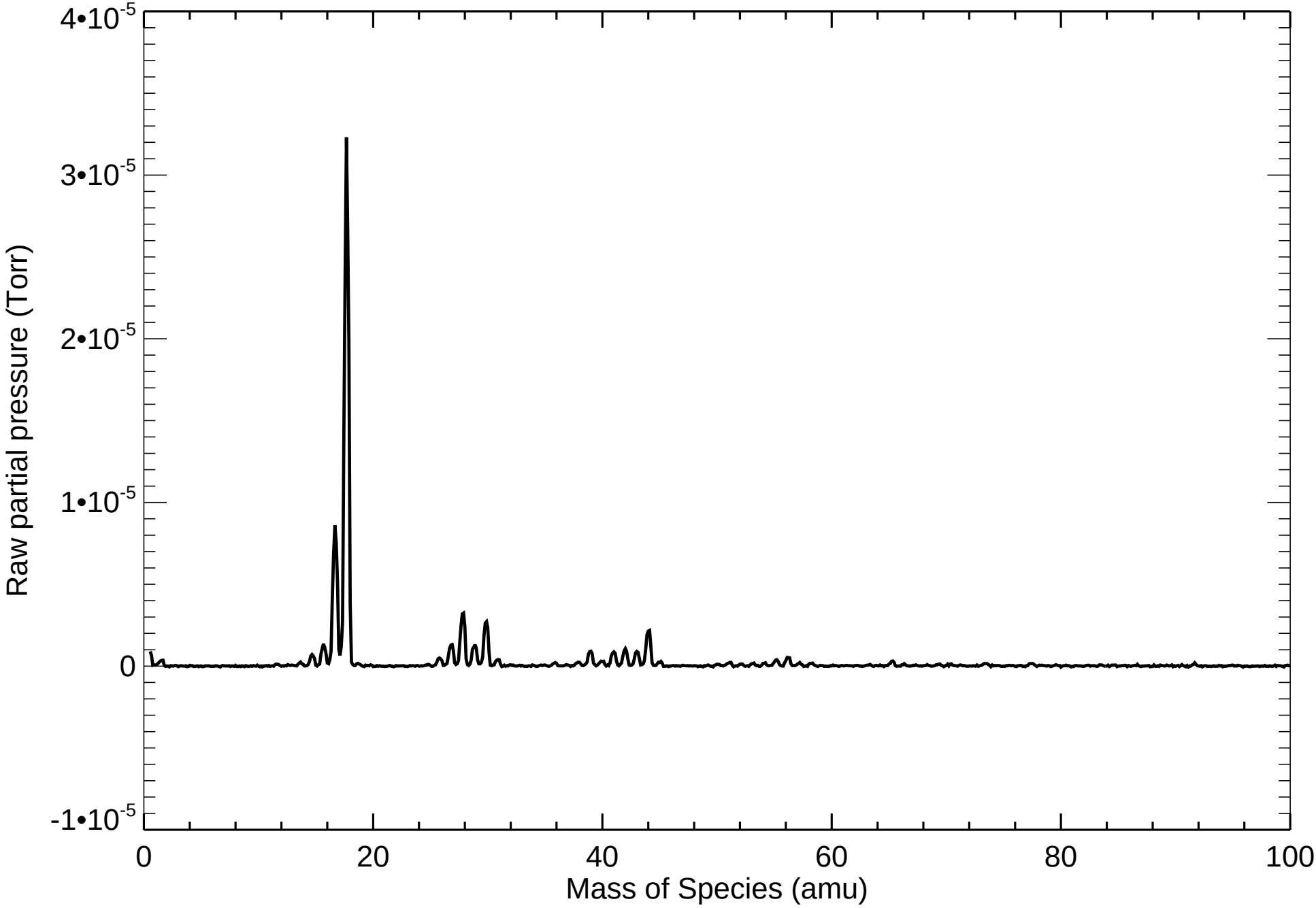


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:37:31:012 UT SWEEP: 0172 Filament: ON

Altitude (km): 84.92 Roll Angle (deg): 107.17

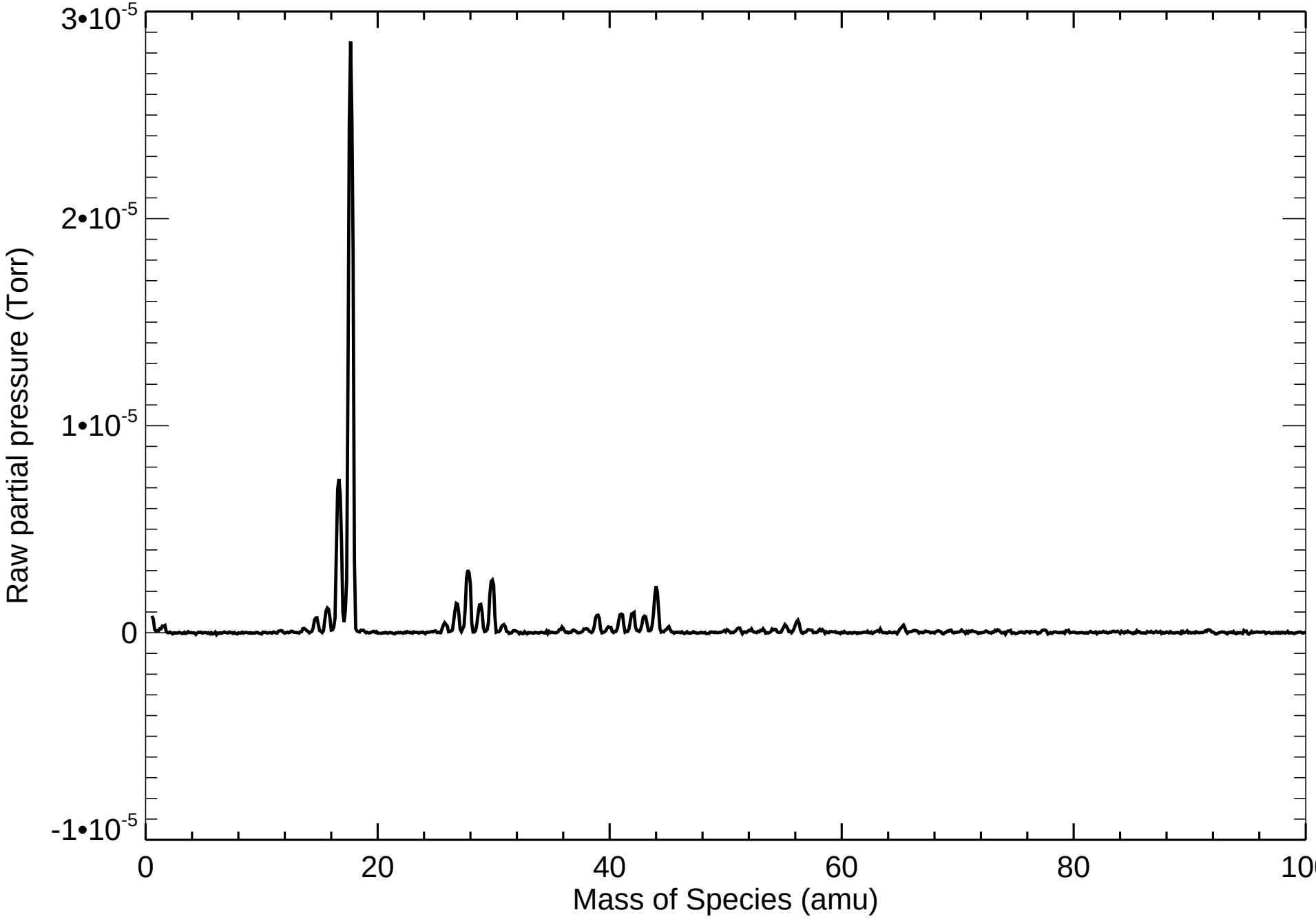


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:38:14:038 UT SWEEP: 0173 Filament: ON

Altitude (km): 84.72 Roll Angle (deg): 107.43

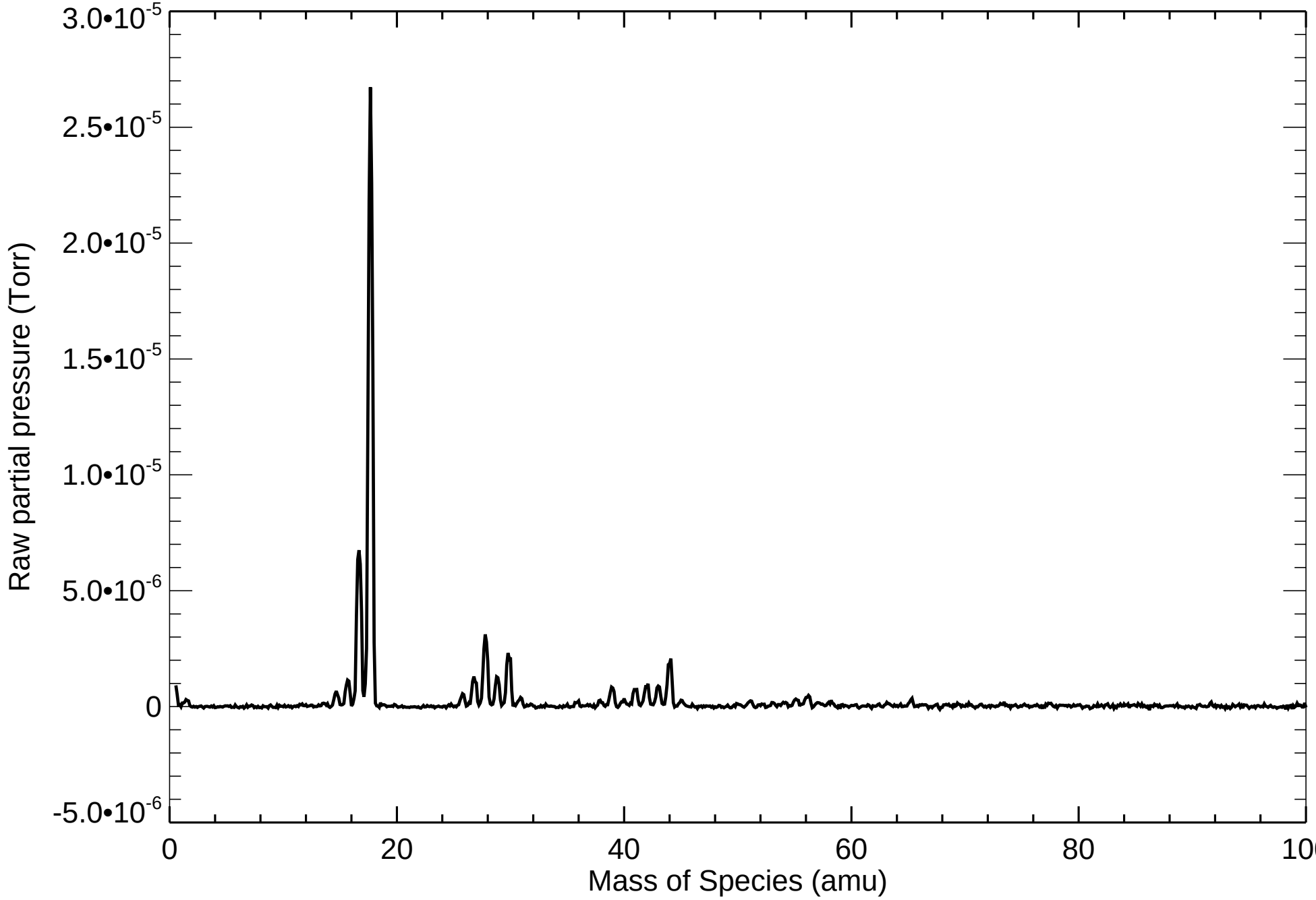


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:38:51:068 UT SWEEP: 0174 Filament: ON

Altitude (km): 84.49 Roll Angle (deg): 107.64

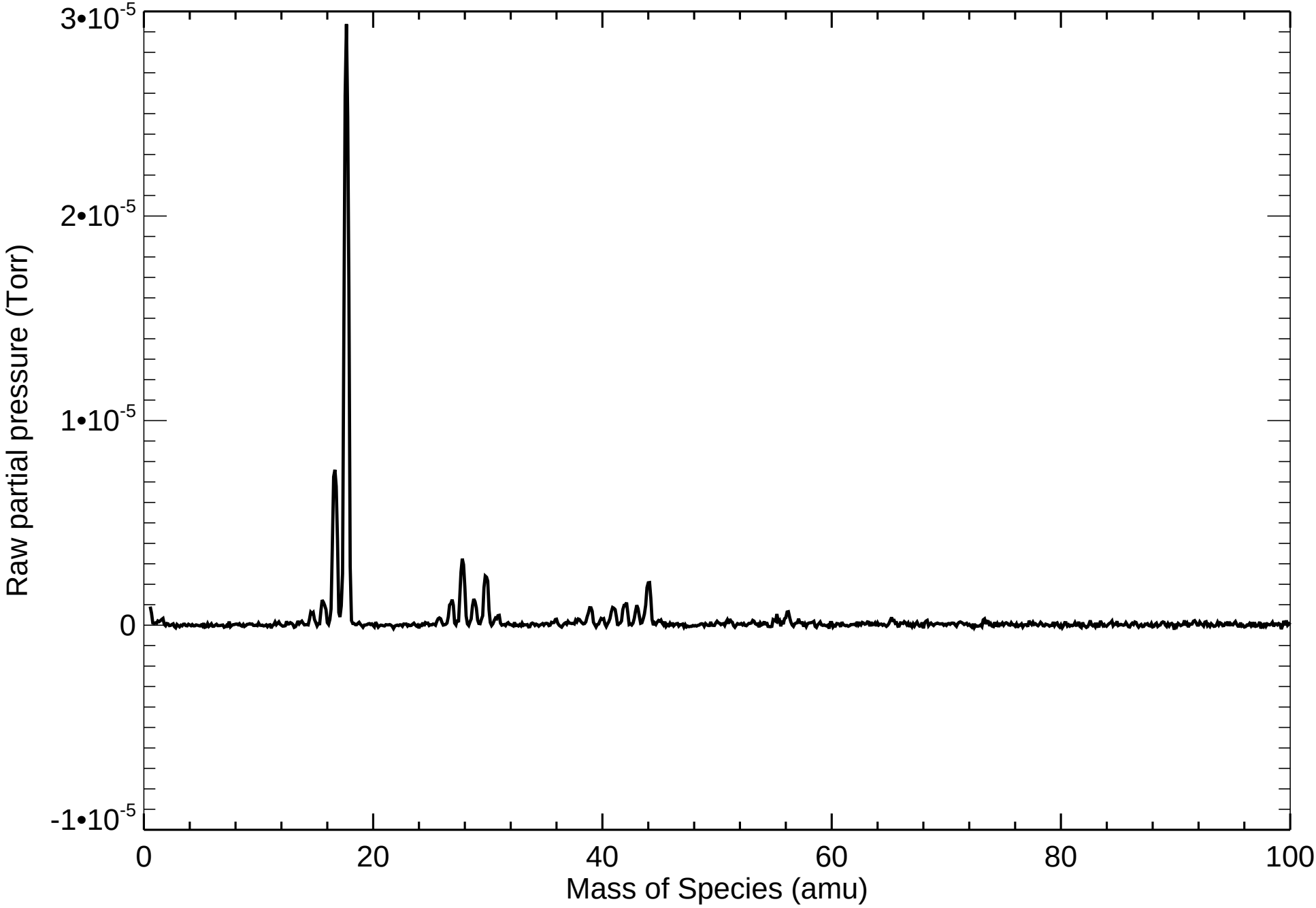


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:39:27:004 UT SWEEP: 0175 Filament: ON

Altitude (km): 84.33 Roll Angle (deg): 107.82

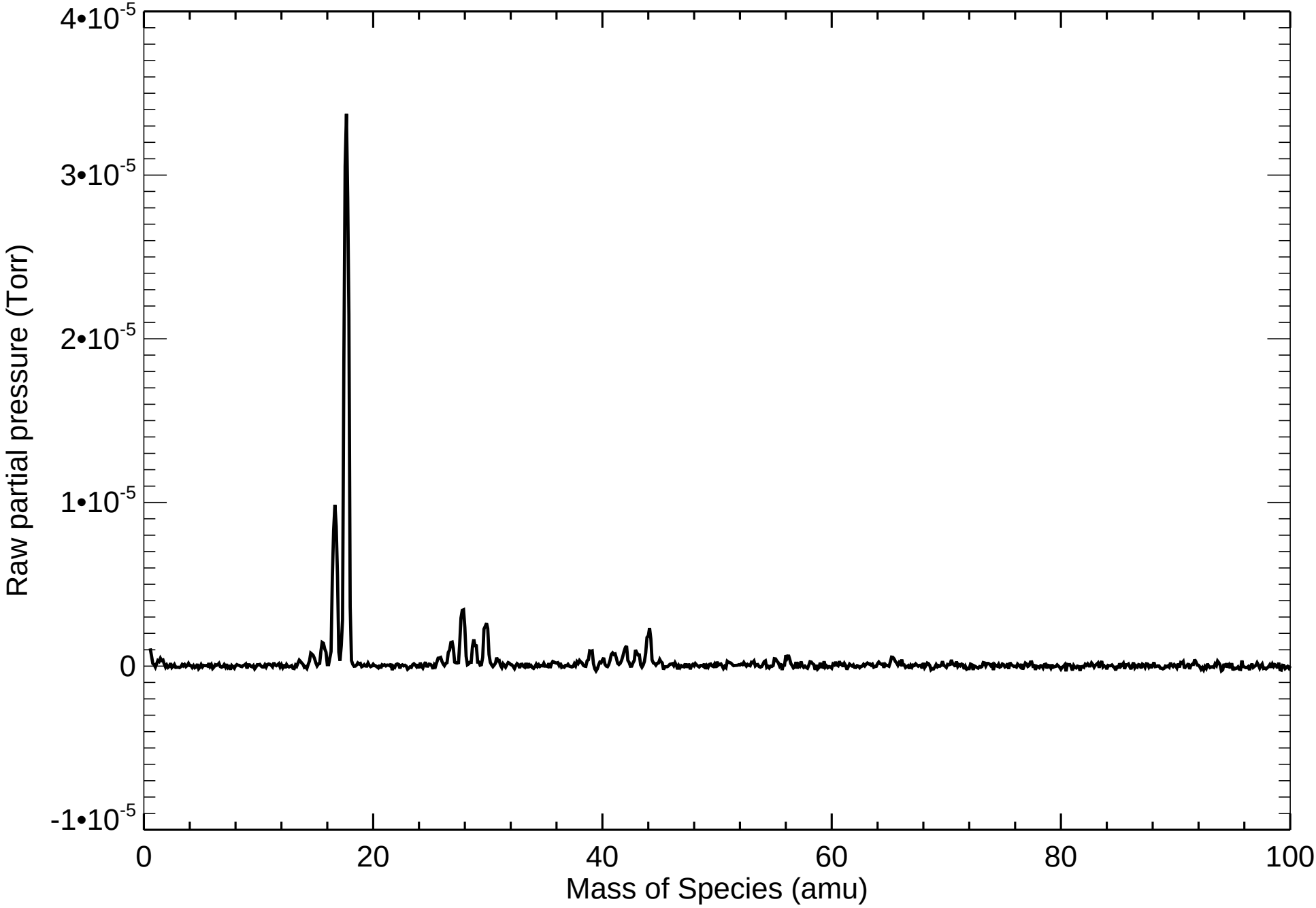


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:40:02:037 UT SWEEP: 0176 Filament: ON

Altitude (km): 84.16 Roll Angle (deg): 107.97

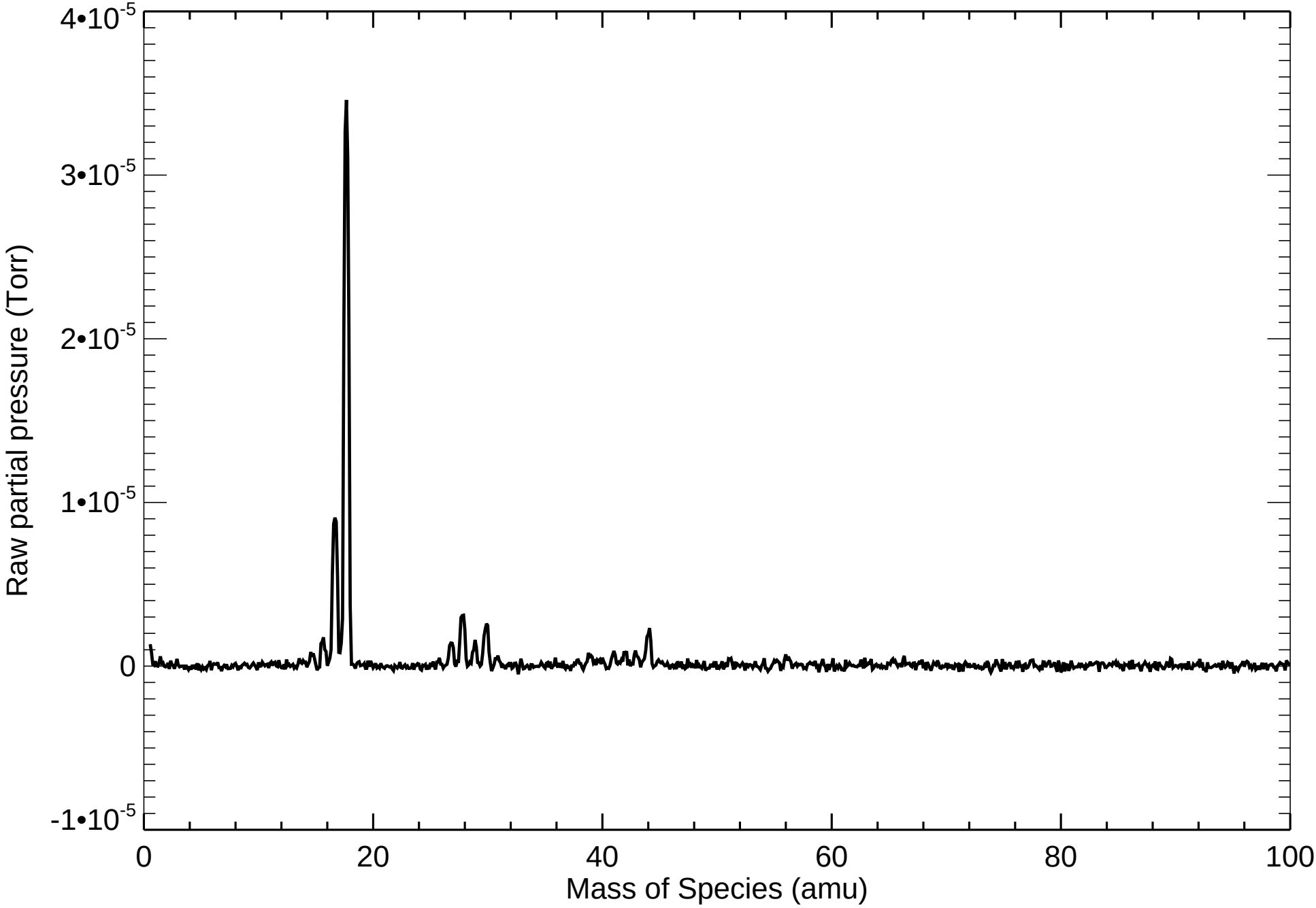


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:40:39:067 UT SWEEP: 0177 Filament: ON

Altitude (km): 84.09 Roll Angle (deg): 108.13

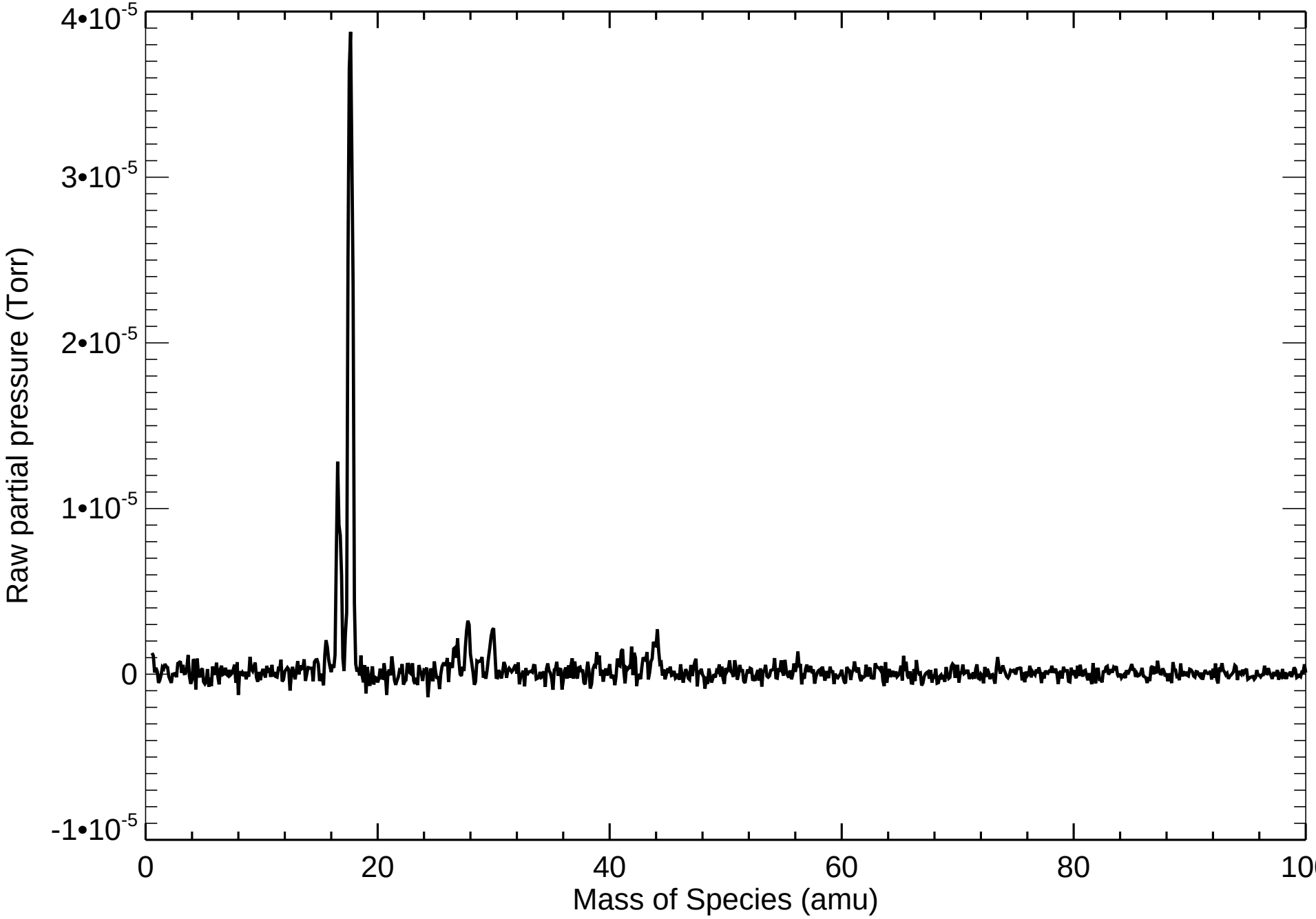


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:44:58:067 UT SWEEP: 0184 Filament: ON

Altitude (km): 84.21 Roll Angle (deg): 108.60

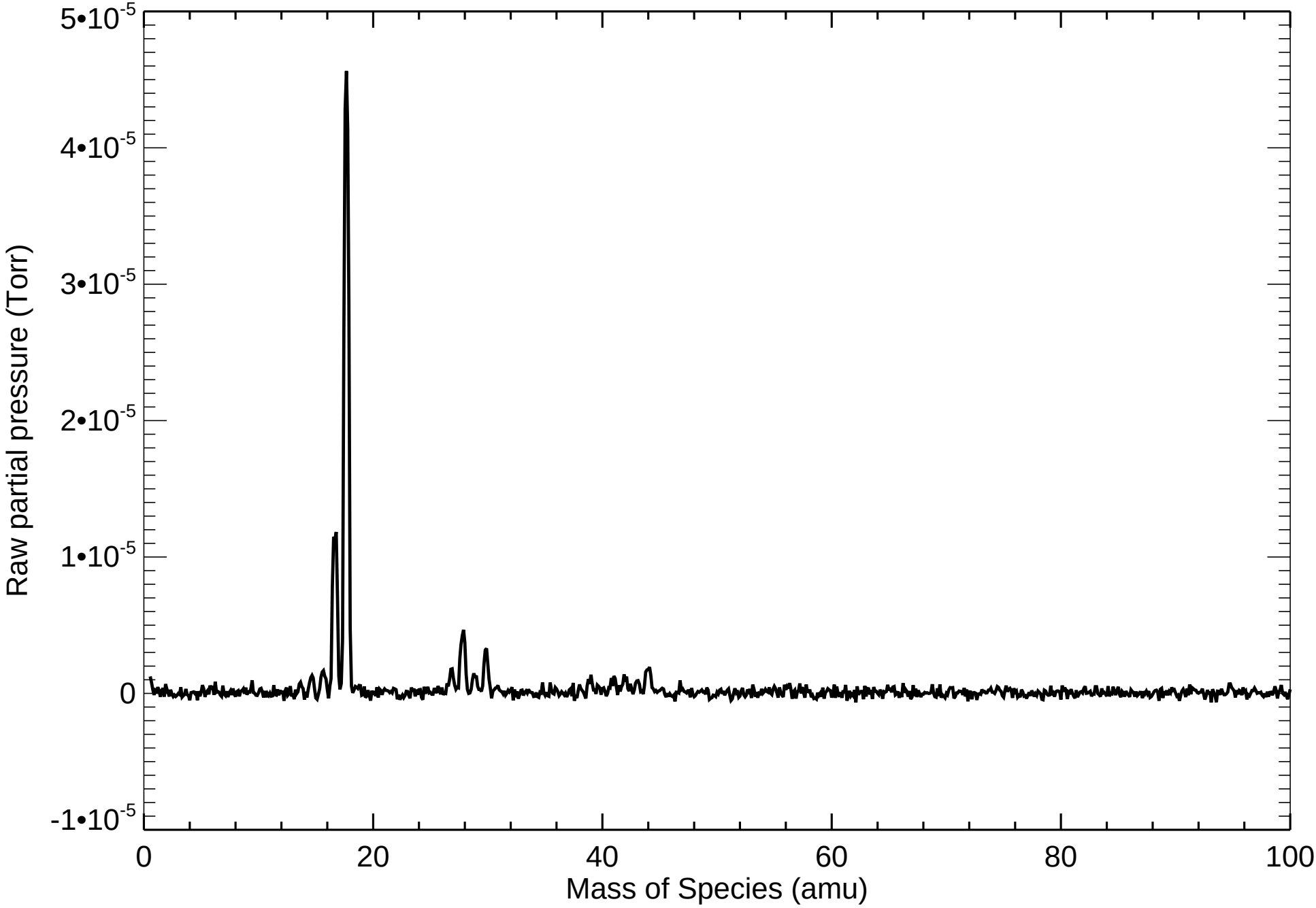


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:45:35:097 UT SWEEP: 0185 Filament: ON

Altitude (km): 84.34 Roll Angle (deg): 108.60

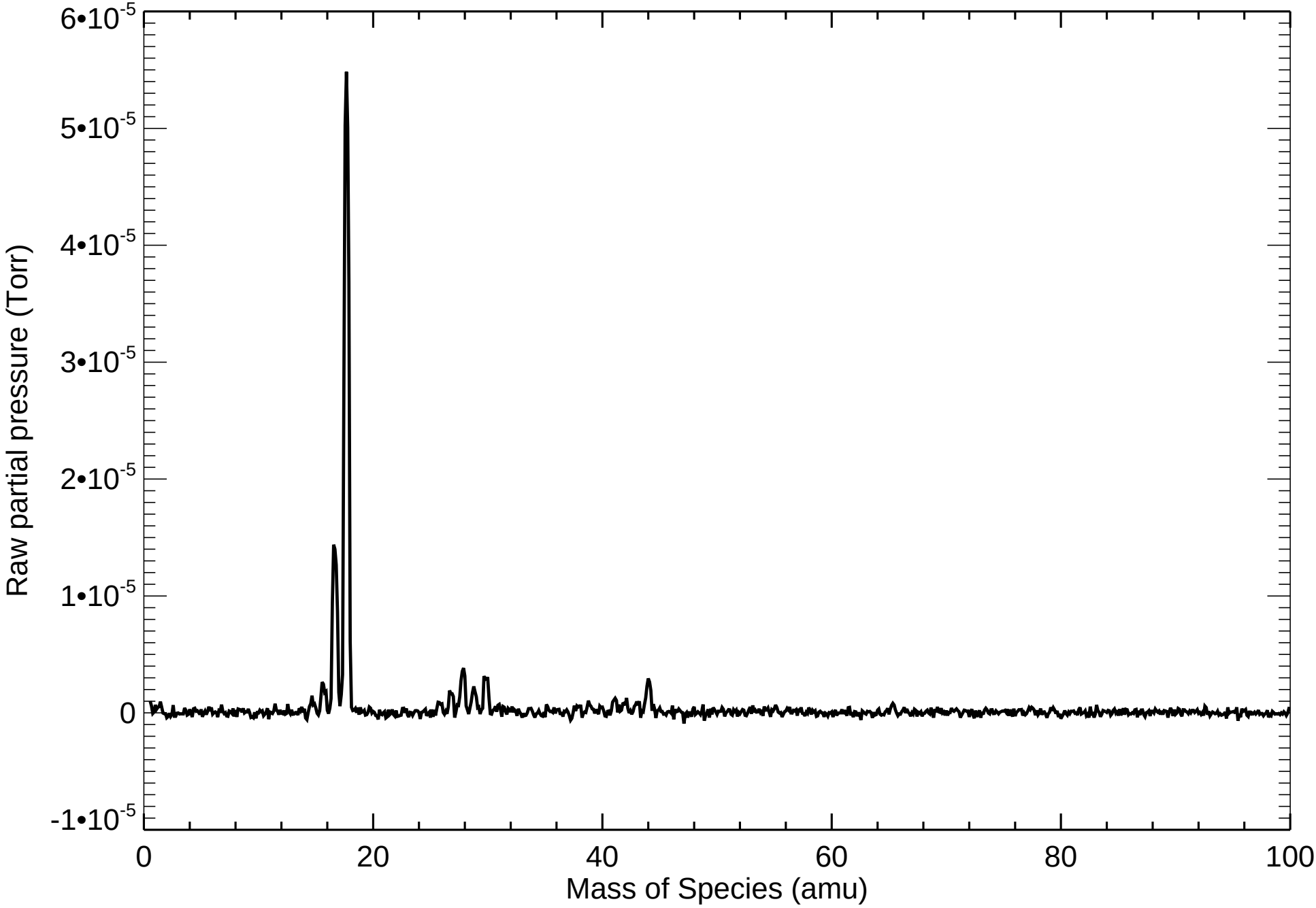


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:46:11:033 UT SWEEP: 0186 Filament: ON

Altitude (km): 84.51 Roll Angle (deg): 108.57

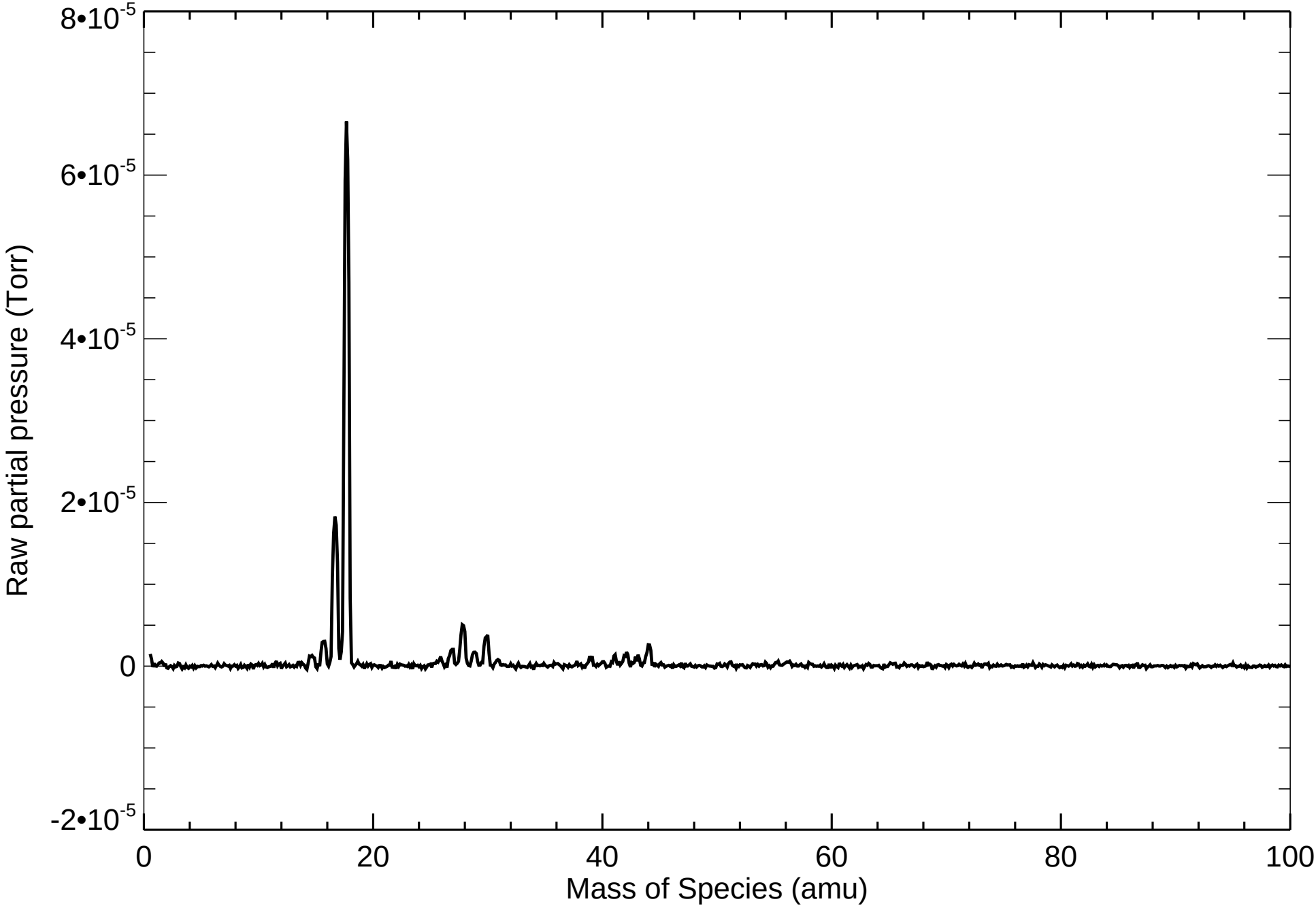


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:46:46:066 UT SWEEP: 0187 Filament: ON

Altitude (km): 84.60 Roll Angle (deg): 108.52

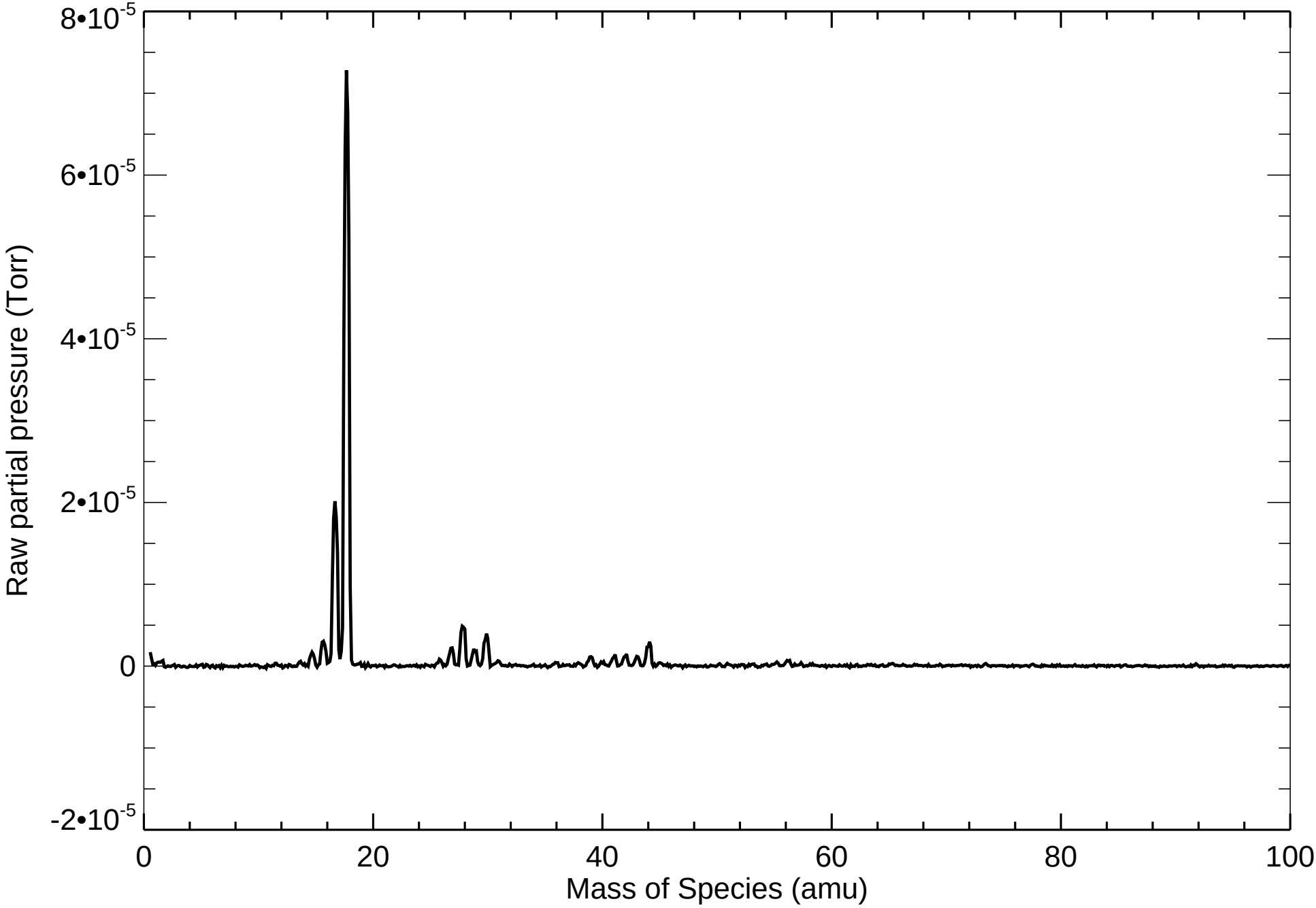


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:47:23:090 UT SWEEP: 0188 Filament: ON

Altitude (km): 84.84 Roll Angle (deg): 108.46

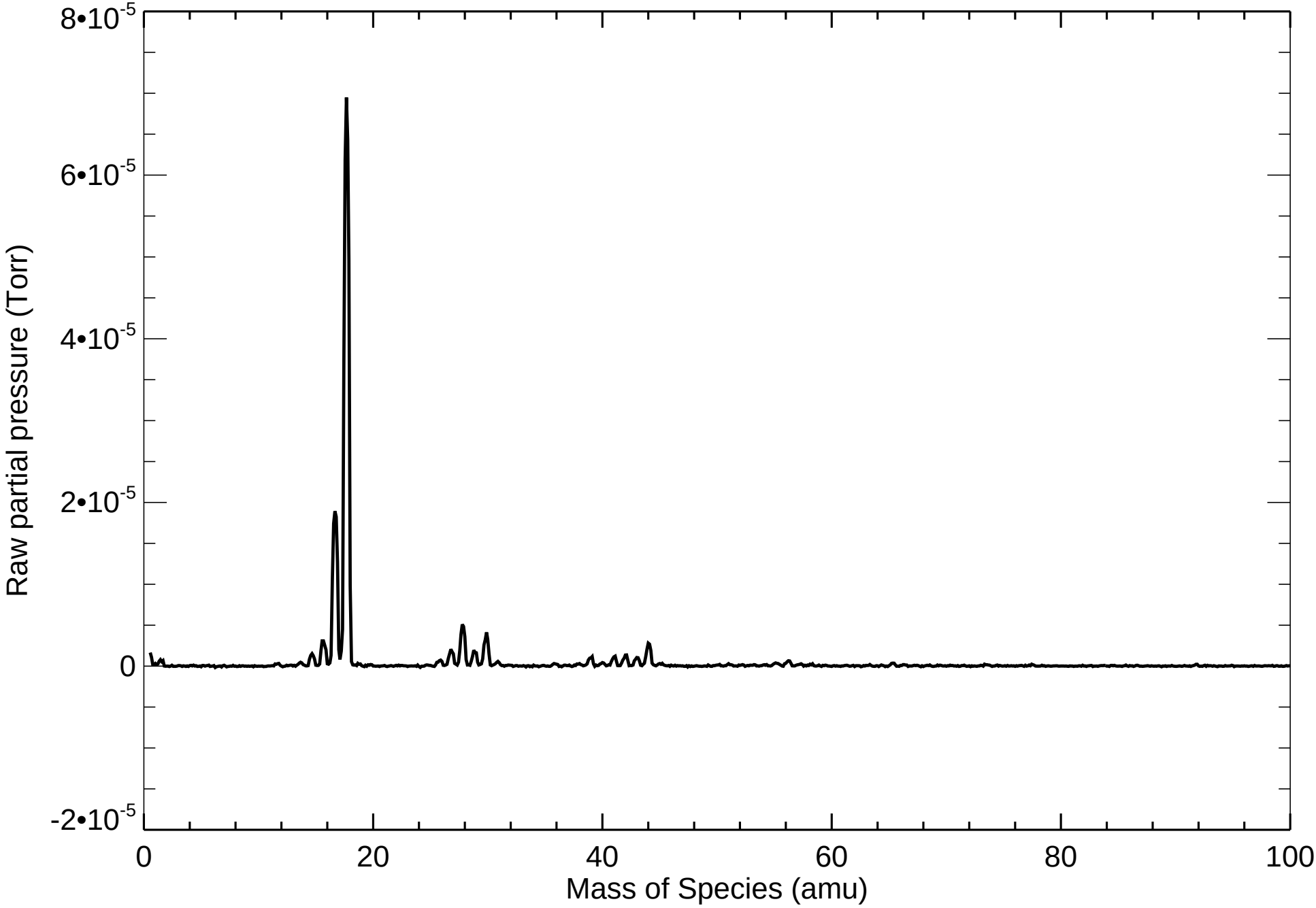


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:47:59:022 UT SWEEP: 0189 Filament: ON

Altitude (km): 85.12 Roll Angle (deg): 108.38

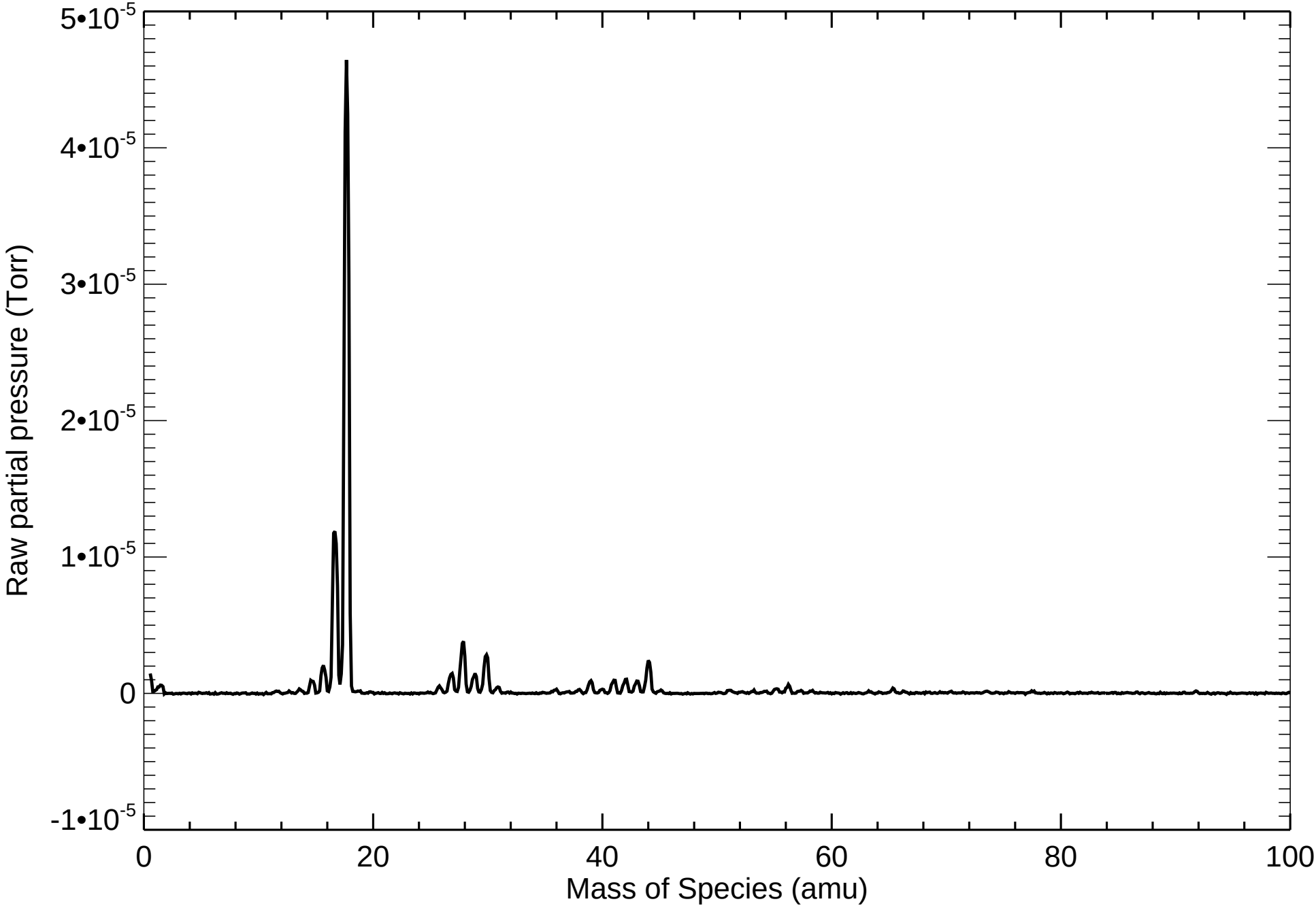


CHACE-2

Mass Sweep mode with EMV: 1799 V

Day: 2019-09-11 Time: 15:48:34:054 UT SWEEP: 0190 Filament: ON

Altitude (km): 85.36 Roll Angle (deg): 108.28

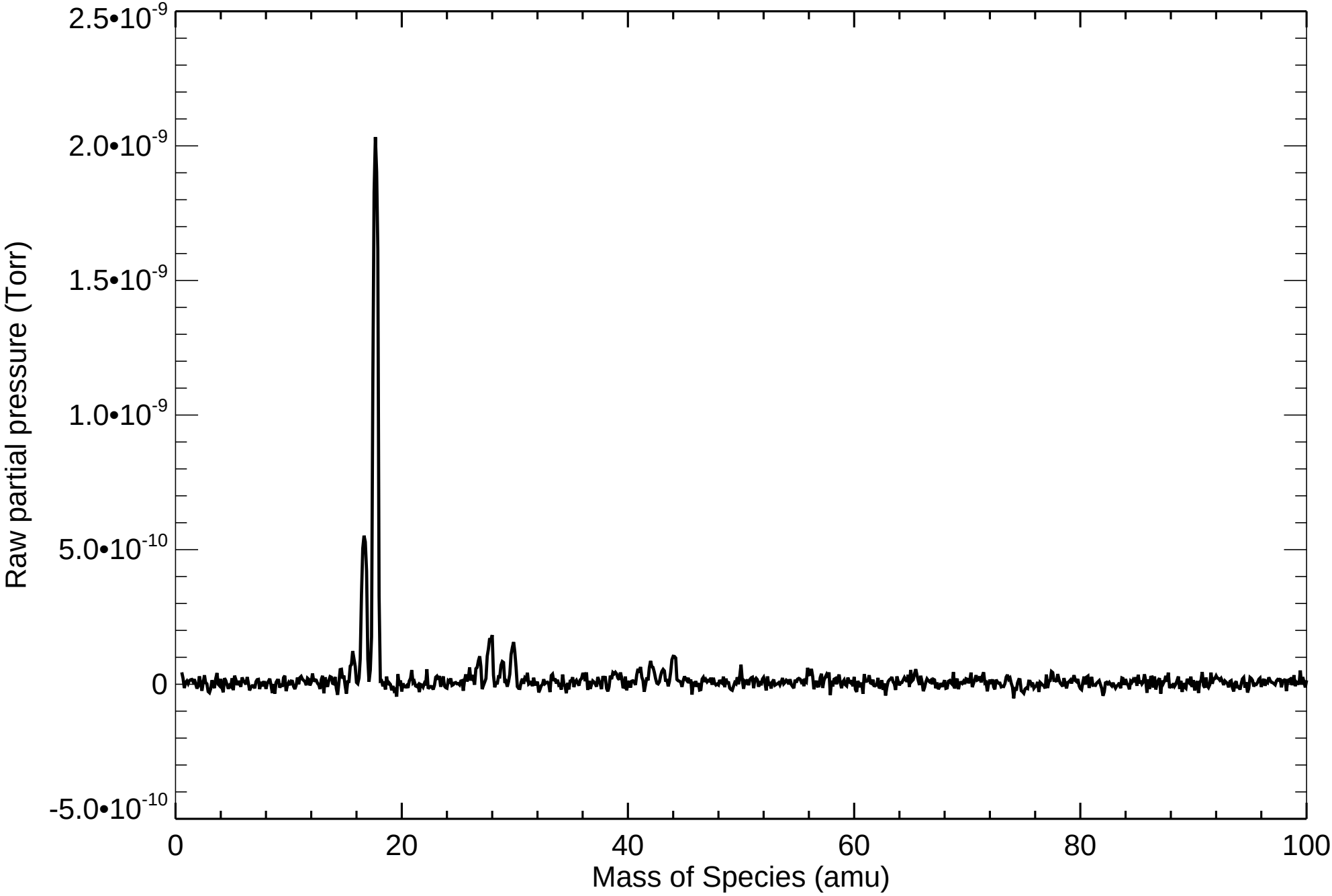


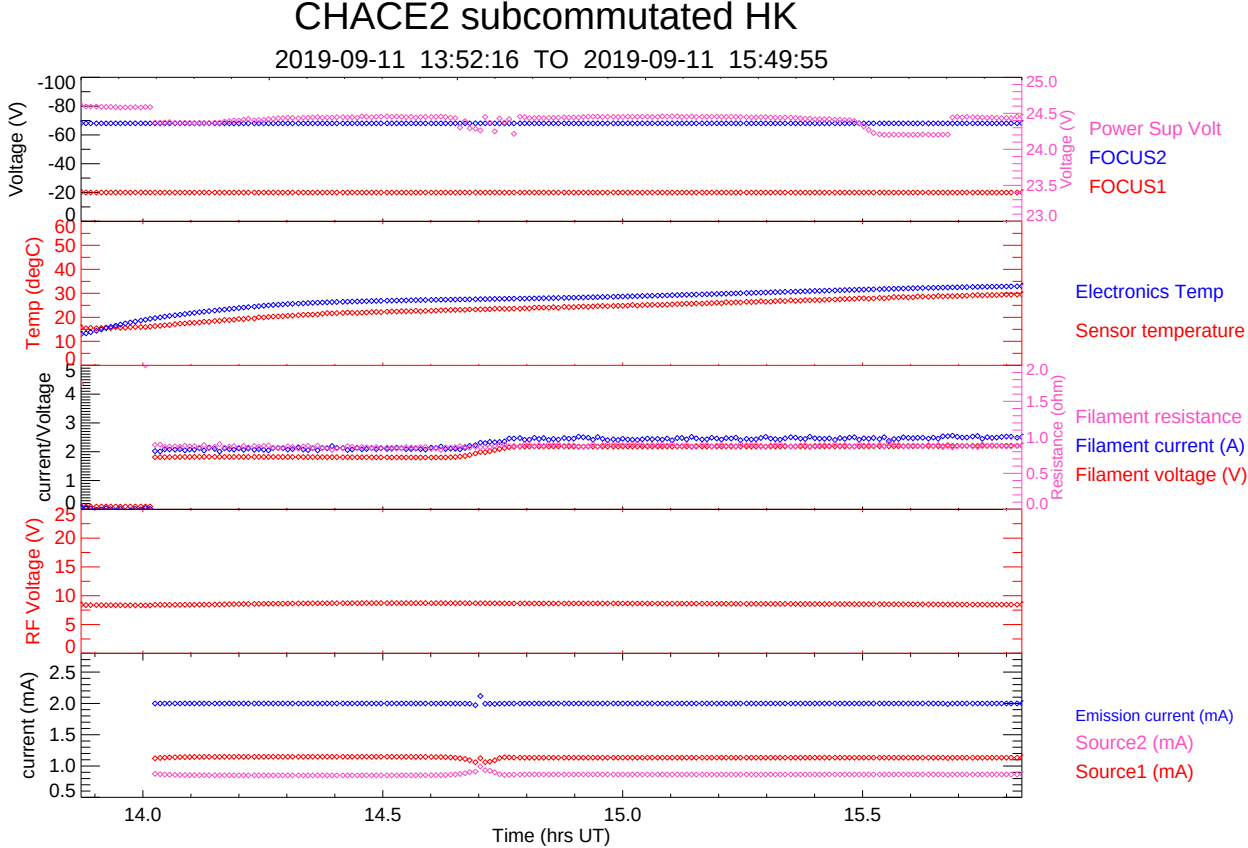
CHACE-2

Mass Sweep mode with FC detector

Day: 2019-09-11 Time: 15:49:55:006 UT SWEEP: 0192 Filament: ON

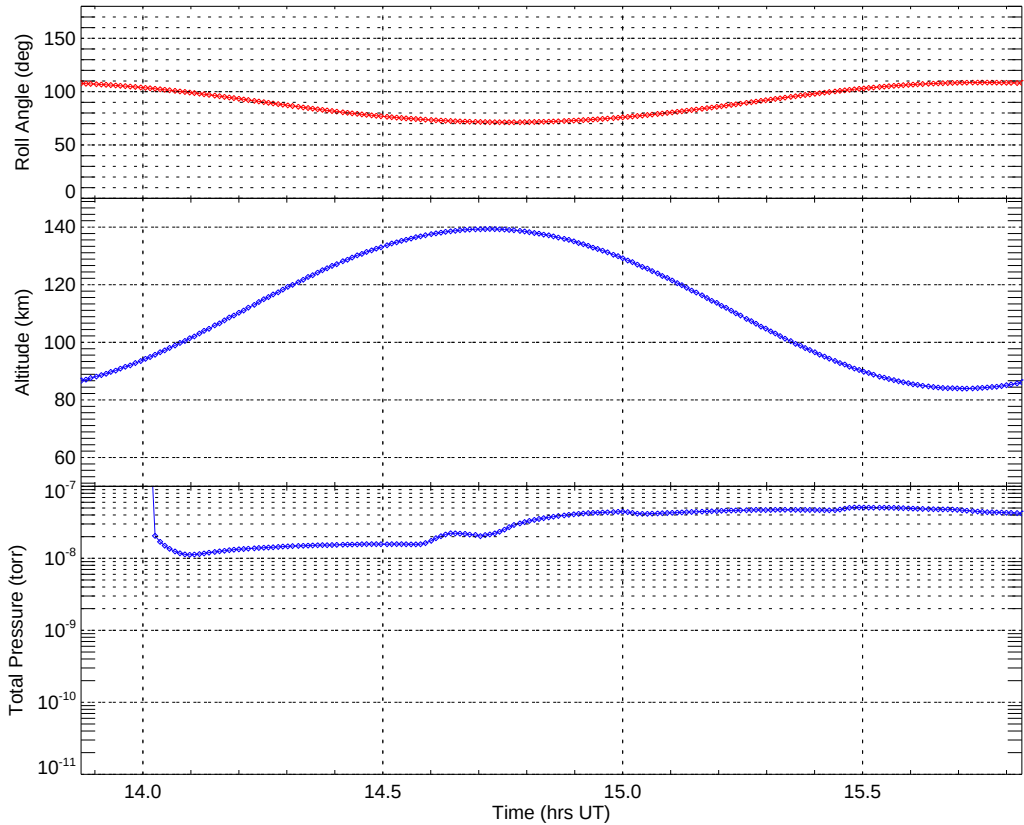
Altitude (km): 86.07 Roll Angle (deg): 107.99

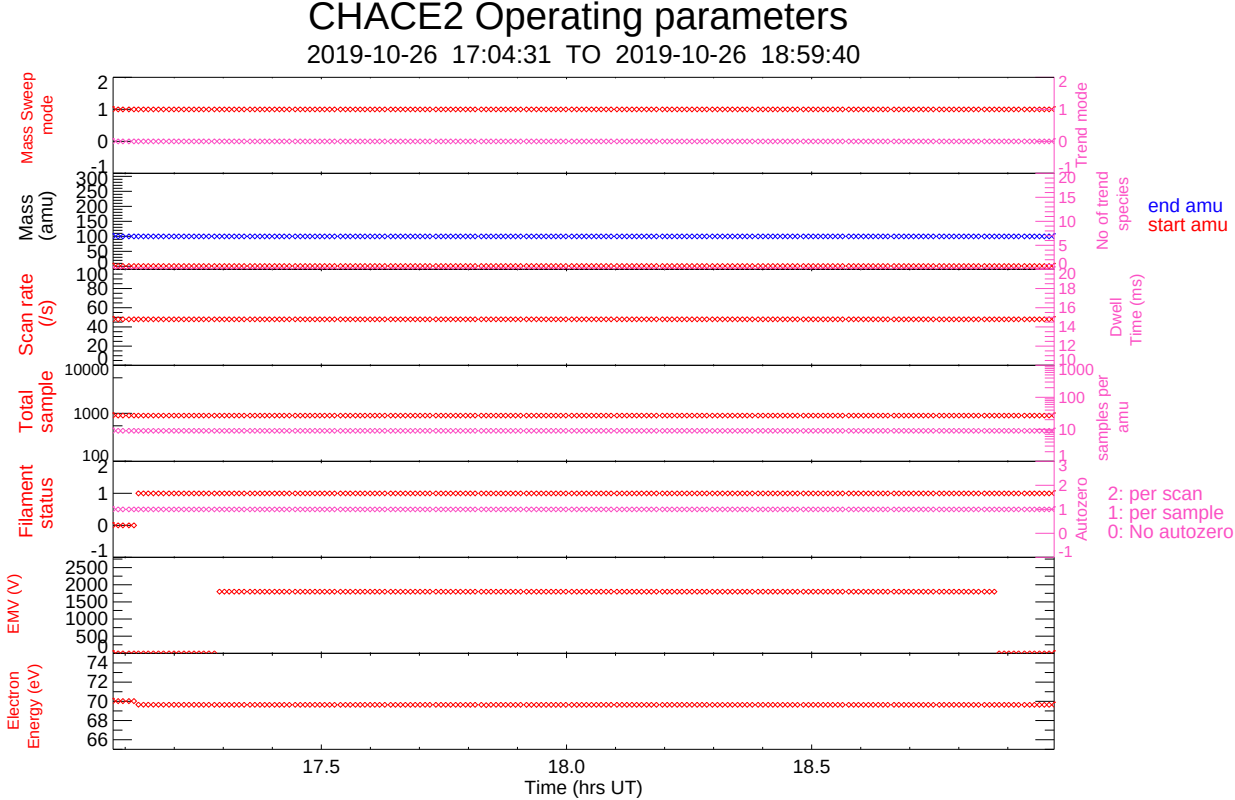


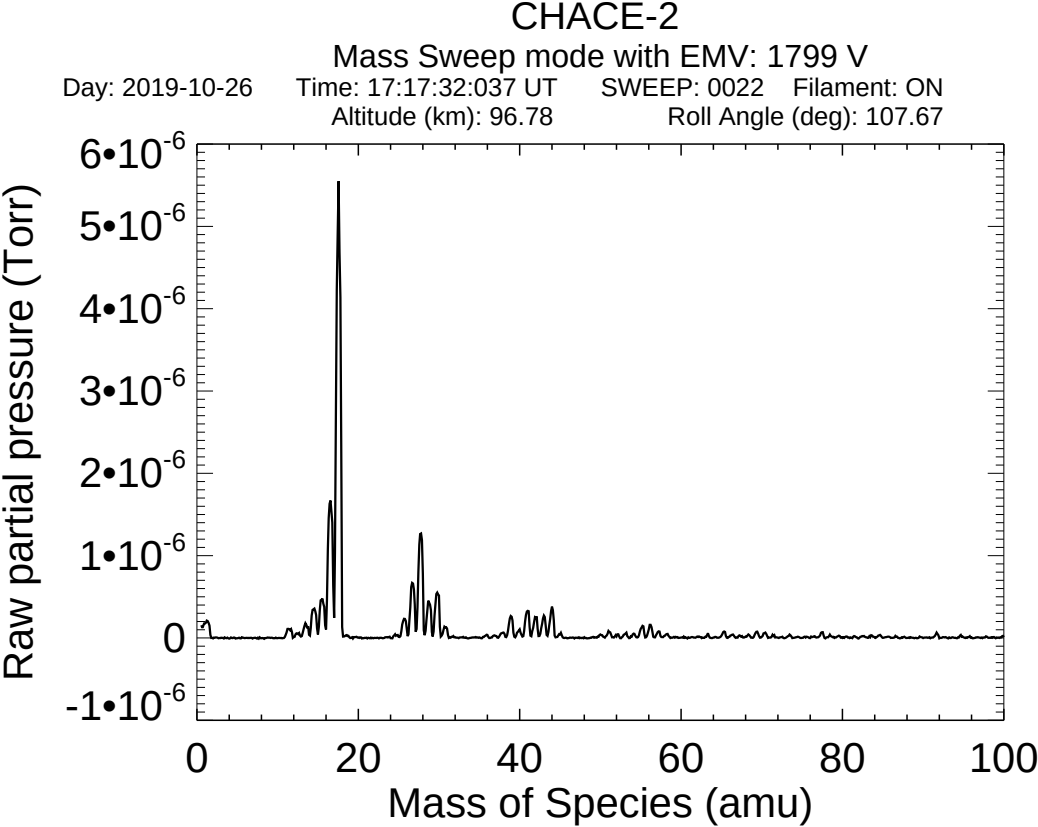

CHACE2 subcommutated HK
2019-09-11 13:52:16 TO 2019-09-11 15:49:55
Voltage (V)
Power Sup Volt
FOCUS2
FOCUS1
Temp (degC)
Electronics Temp
Sensor temperature
current/Voltage
Resistance (ohm)
Filament resistance
Filament current (A)
Filament voltage (V)
RF Voltage (V)
current (mA)
Emission current (mA)
Source2 (mA)
Source1 (mA)
Time (hrs UT)

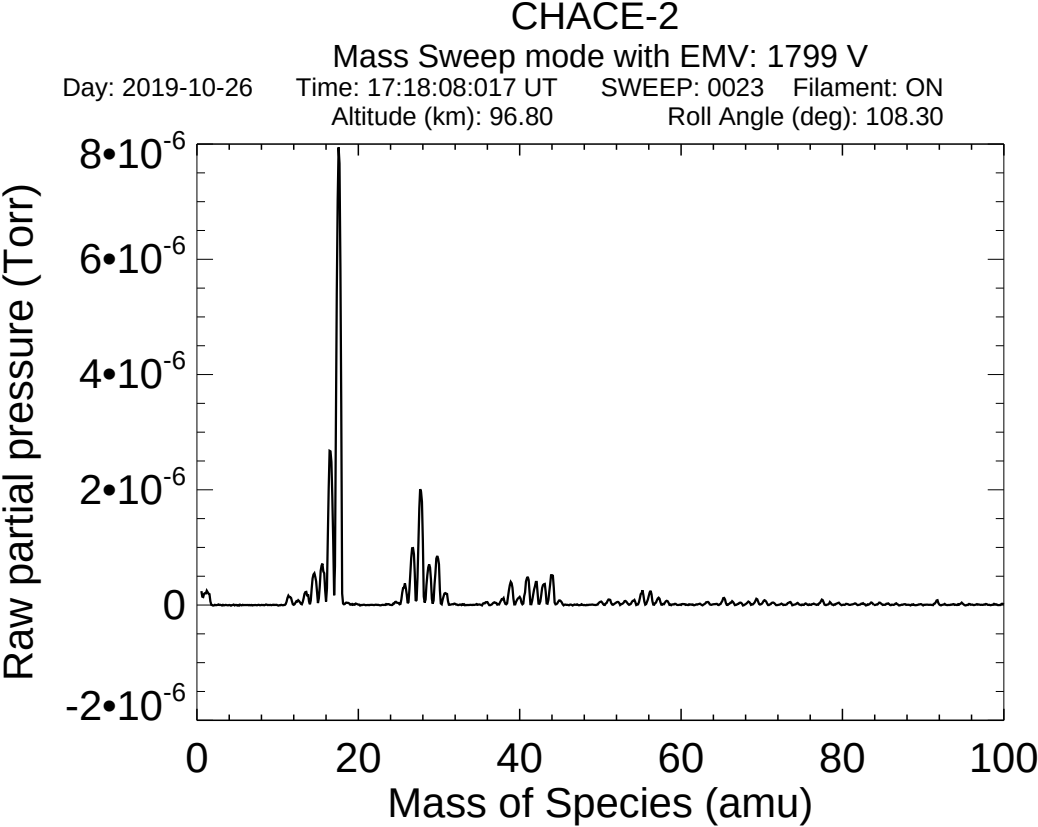
CHACE2: 2019-09-11 13:52:16 UT TO 2019-09-11 15:49:55 UT

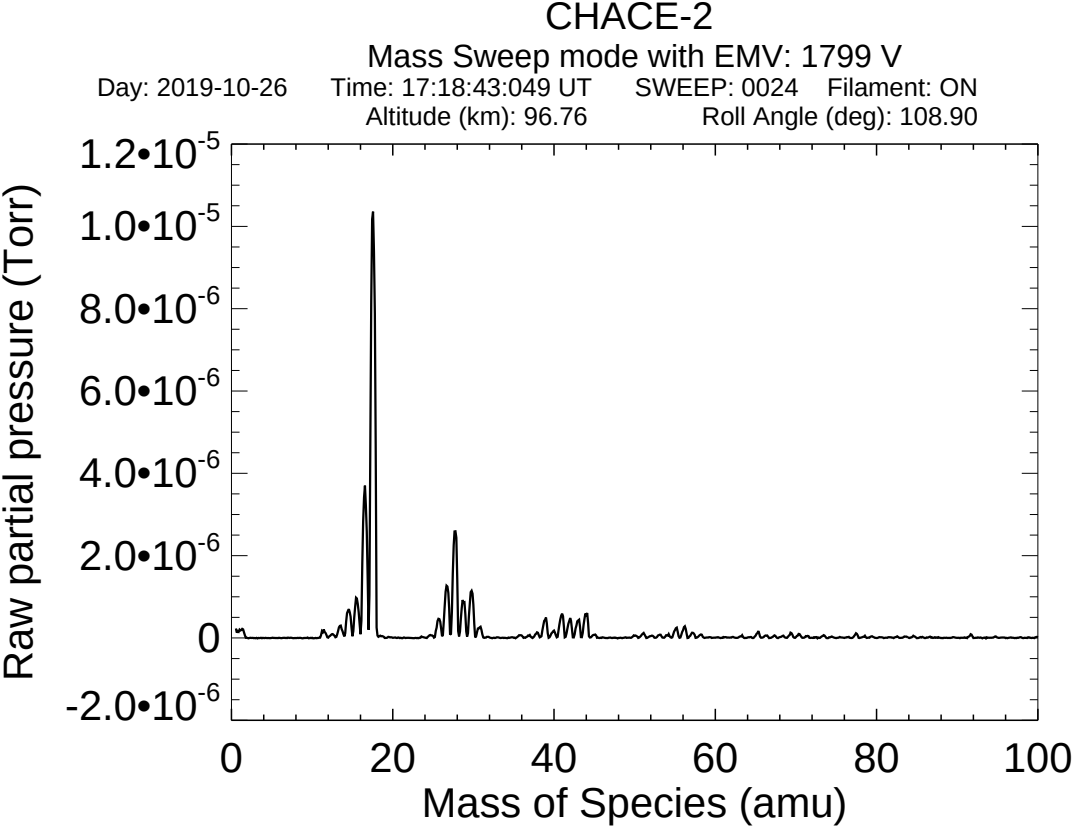
No ECLIPSE

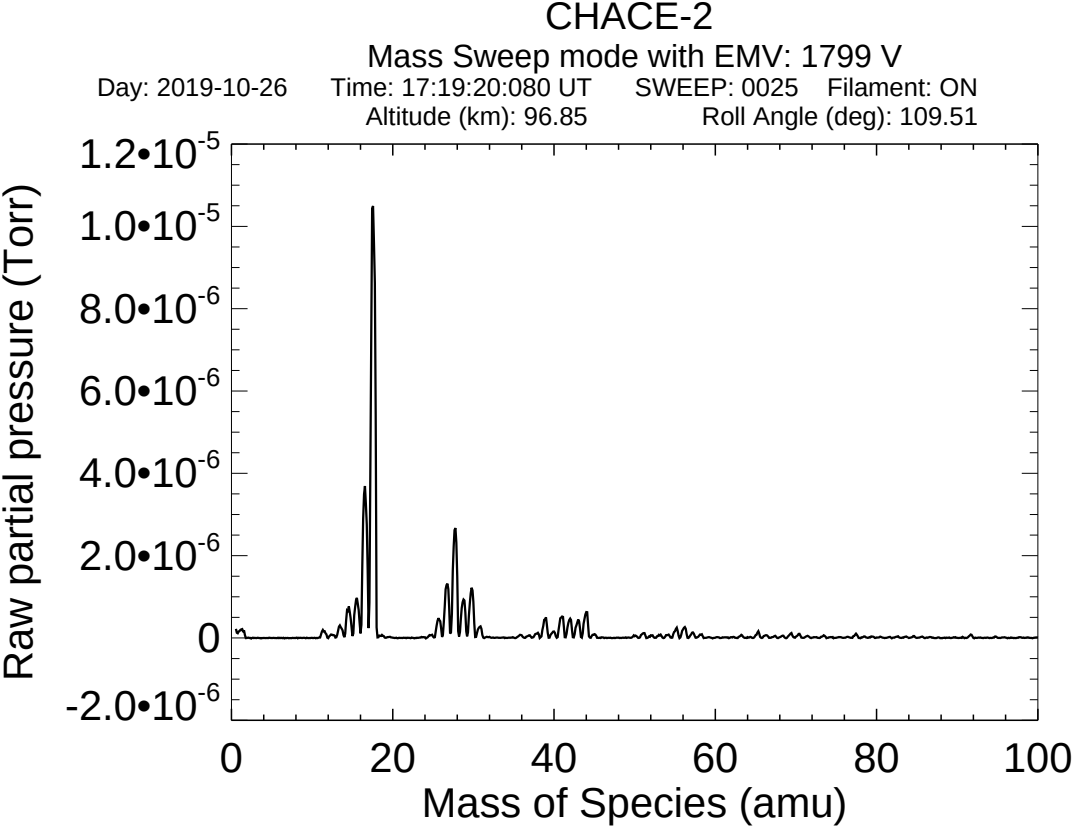


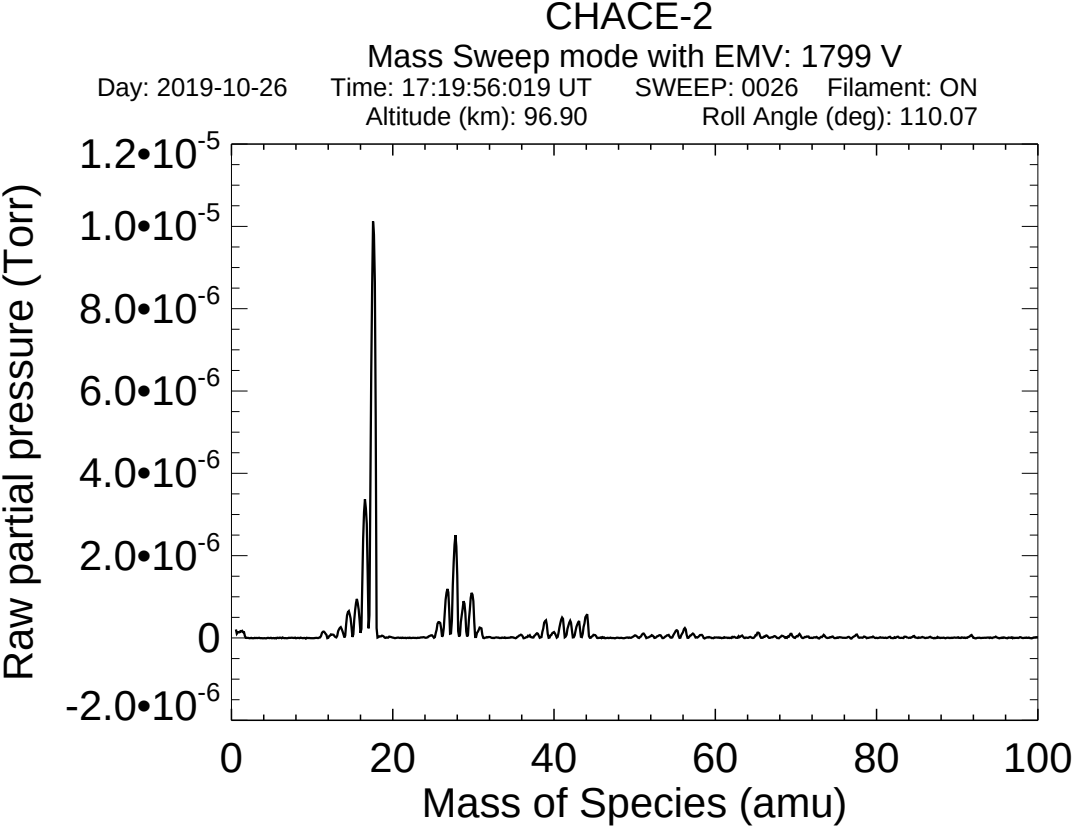

CHACE2 Operating parameters
2019-10-26 17:04:31 TO 2019-10-26 18:59:40
Mass Sweep mode
Trend mode
Mass (amu)
No of trend species
end amu
start amu
Scan rate (/s)
Dwell Time (ms)
Total sample
samples per amu
Filament status
Autozero
2: per scan
1: per sample
0: No autozero
EMV (V)
Electron Energy (eV)
17.5
18.0
18.5
Time (hrs UT)

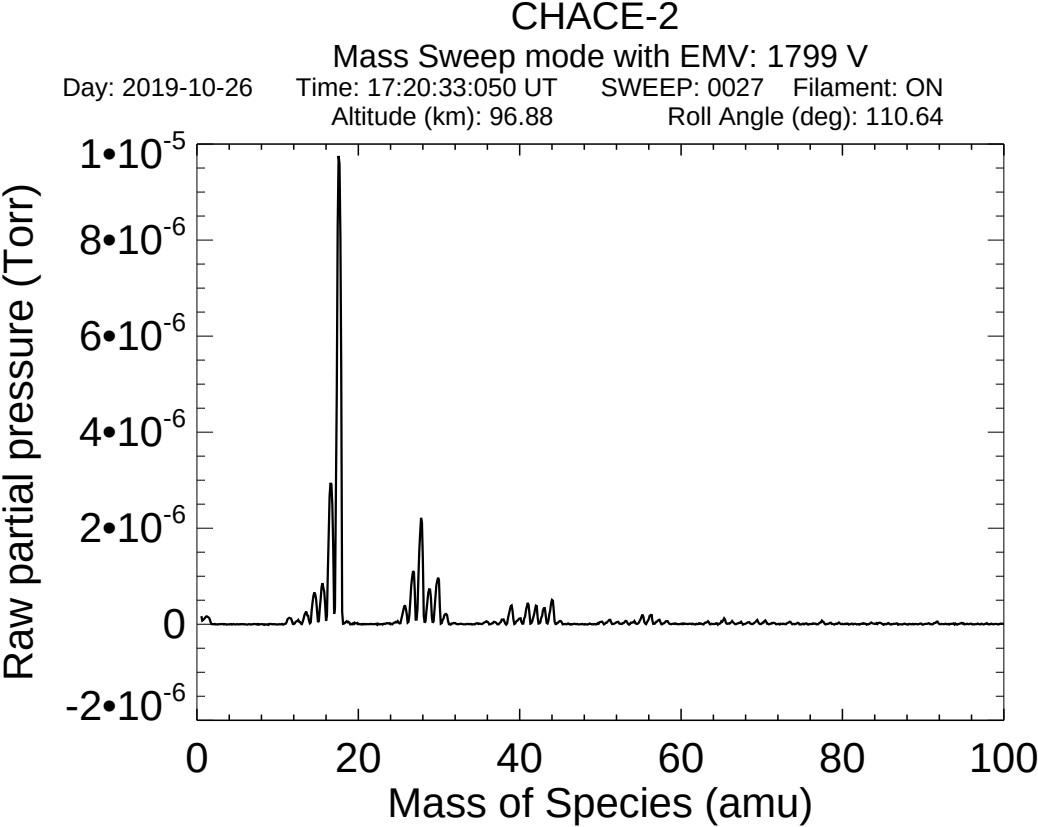

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:17:32:037 UT
SWEEP: 0022
Filament: ON
Altitude (km): 96.78
Roll Angle (deg): 107.67
Raw partial pressure (Torr)
6•10-6
5•10-6
4•10-6
3•10-6
2•10-6
1•10-6
0
-1•10-6
0
20
40
60
80
100
Mass of Species (amu)

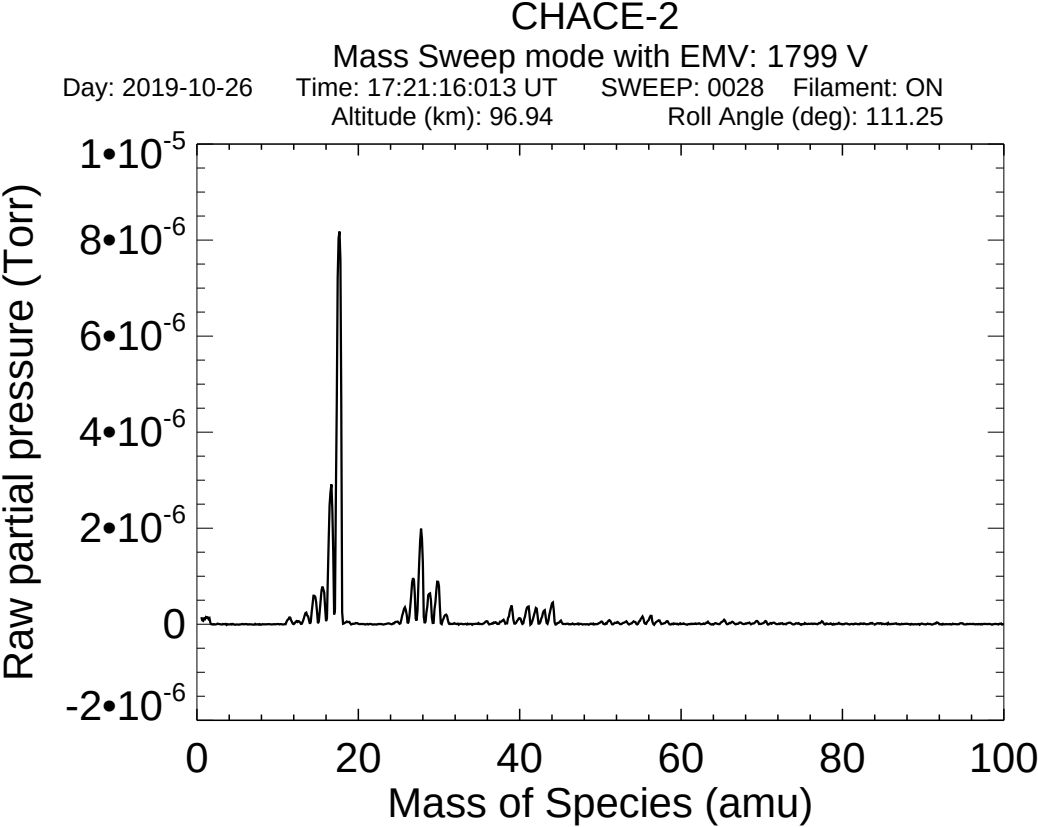

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:18:08:017 UT
SWEEP: 0023
Filament: ON
Altitude (km): 96.80
Roll Angle (deg): 108.30
8•10-6
6•10-6
4•10-6
2•10-6
0
-2•10-6
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

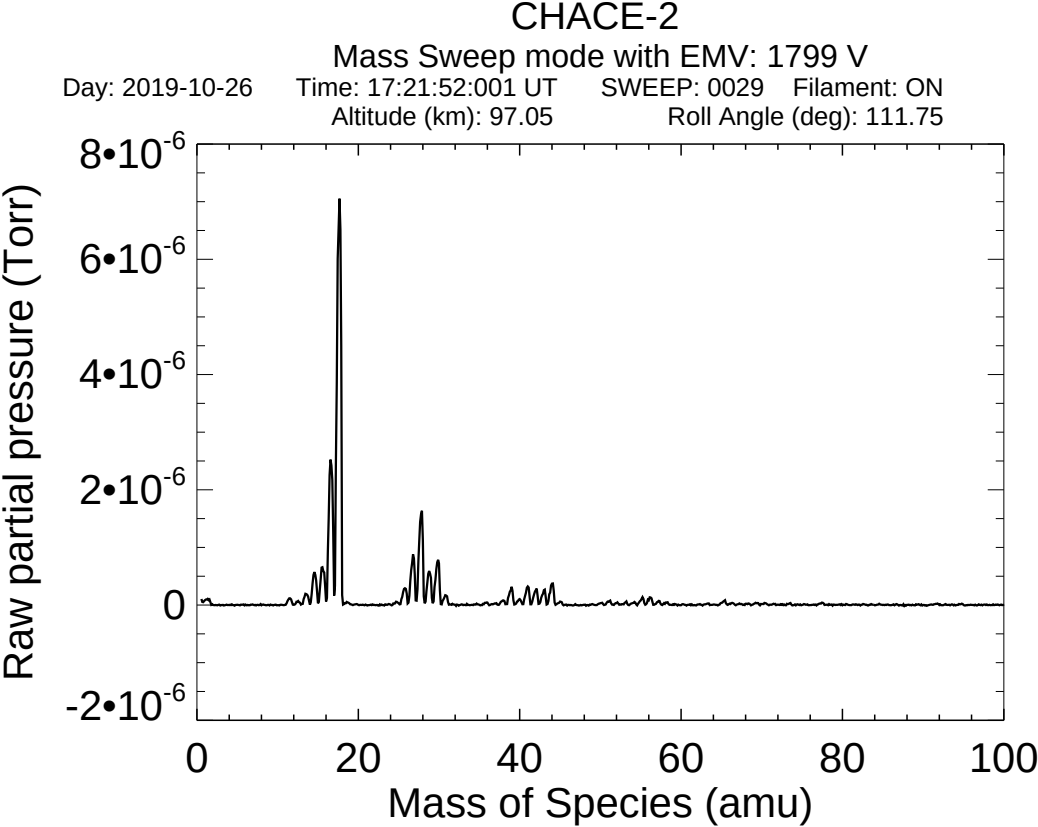

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:18:43:049 UT SWEEP: 0024 Filament: ON
Altitude (km): 96.76 Roll Angle (deg): 108.90
Raw partial pressure (Torr)
1.2•10-5
1.0•10-5
8.0•10-6
6.0•10-6
4.0•10-6
2.0•10-6
0
-2.0•10-6
0
20
40
60
80
100
Mass of Species (amu)

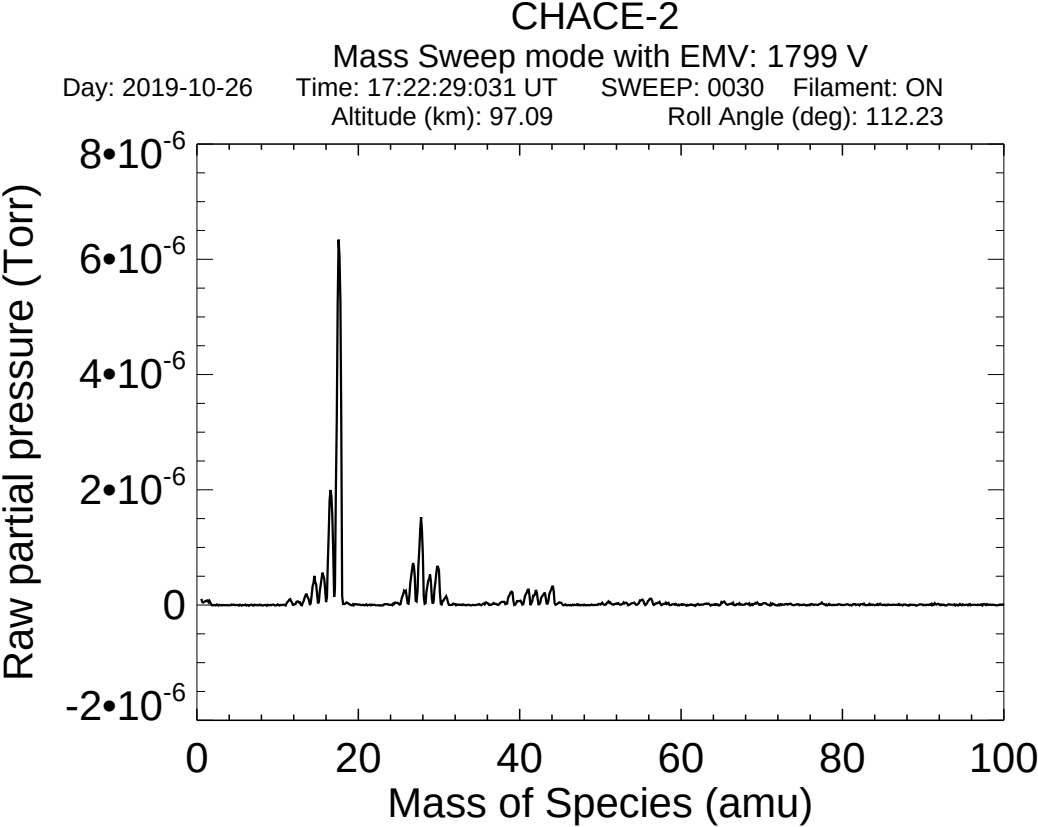

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:19:20:080 UT SWEEP: 0025 Filament: ON
Altitude (km): 96.85 Roll Angle (deg): 109.51
Raw partial pressure (Torr)
1.2•10-5
1.0•10-5
8.0•10-6
6.0•10-6
4.0•10-6
2.0•10-6
0
-2.0•10-6
0
20
40
60
80
100
Mass of Species (amu)

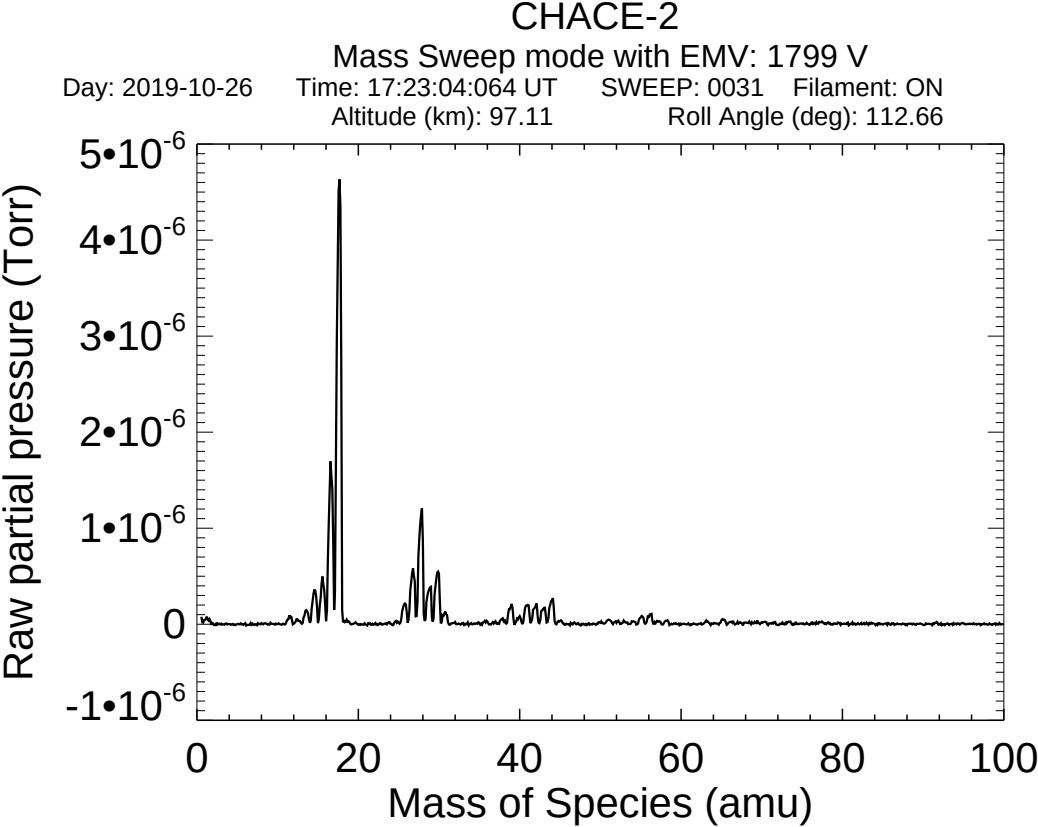

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:19:56:019 UT SWEEP: 0026 Filament: ON
Altitude (km): 96.90 Roll Angle (deg): 110.07
Raw partial pressure (Torr)
1.2•10-5
1.0•10-5
8.0•10-6
6.0•10-6
4.0•10-6
2.0•10-6
0
-2.0•10-6
0
20
40
60
80
100
Mass of Species (amu)

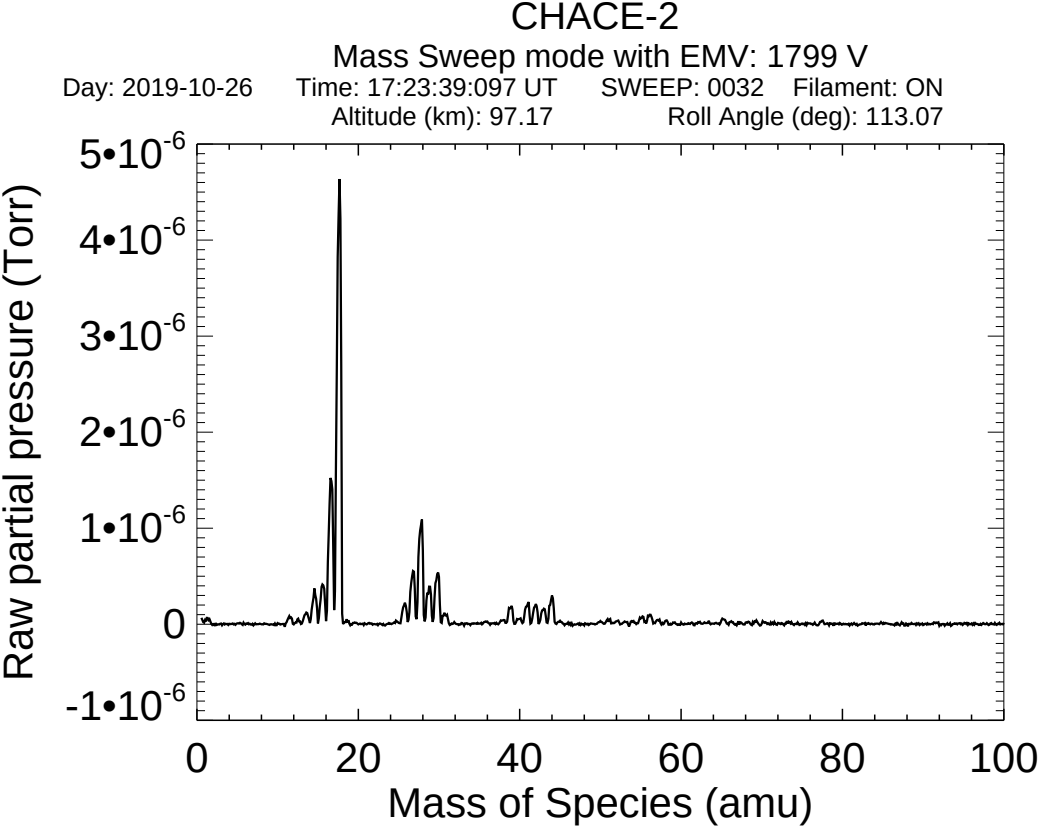

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:20:33:050 UT SWEEP: 0027 Filament: ON
Altitude (km): 96.88 Roll Angle (deg): 110.64
Raw partial pressure (Torr)
1•10-5
8•10-6
6•10-6
4•10-6
2•10-6
0
-2•10-6
0
20
40
60
80
100
Mass of Species (amu)

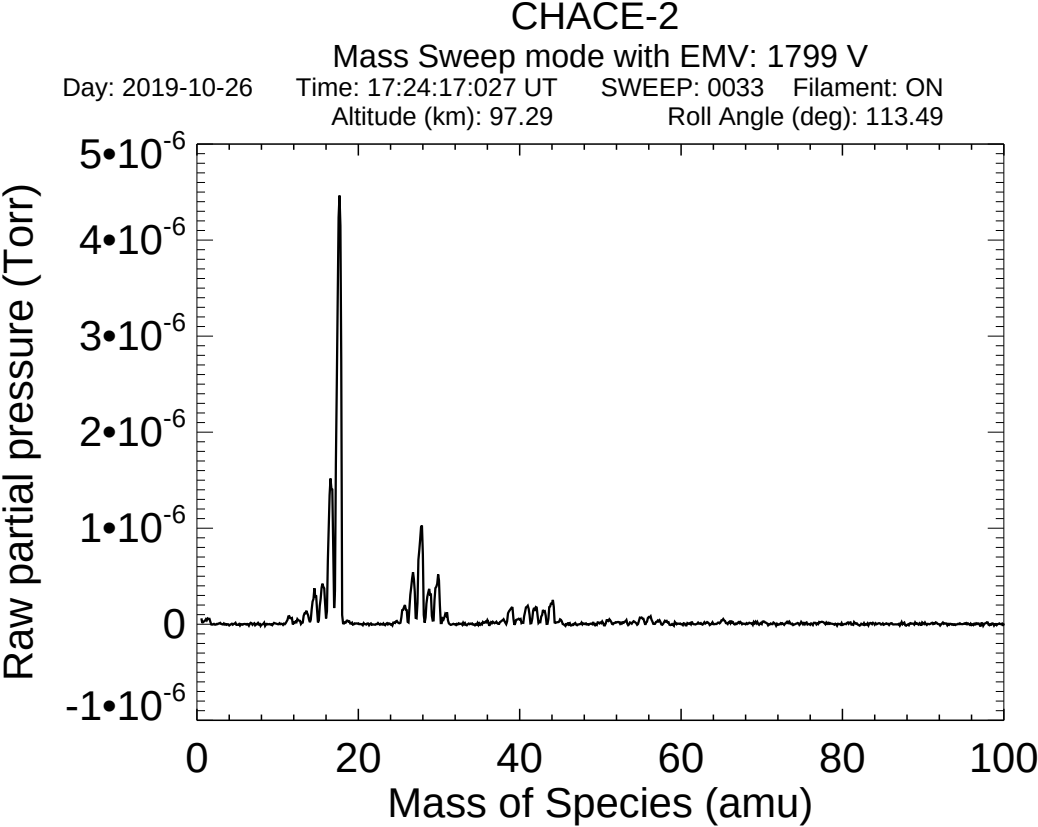

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:21:16:013 UT SWEEP: 0028 Filament: ON
Altitude (km): 96.94 Roll Angle (deg): 111.25
Raw partial pressure (Torr)
1•10-5
8•10-6
6•10-6
4•10-6
2•10-6
0
-2•10-6
0
20
40
60
80
100
Mass of Species (amu)

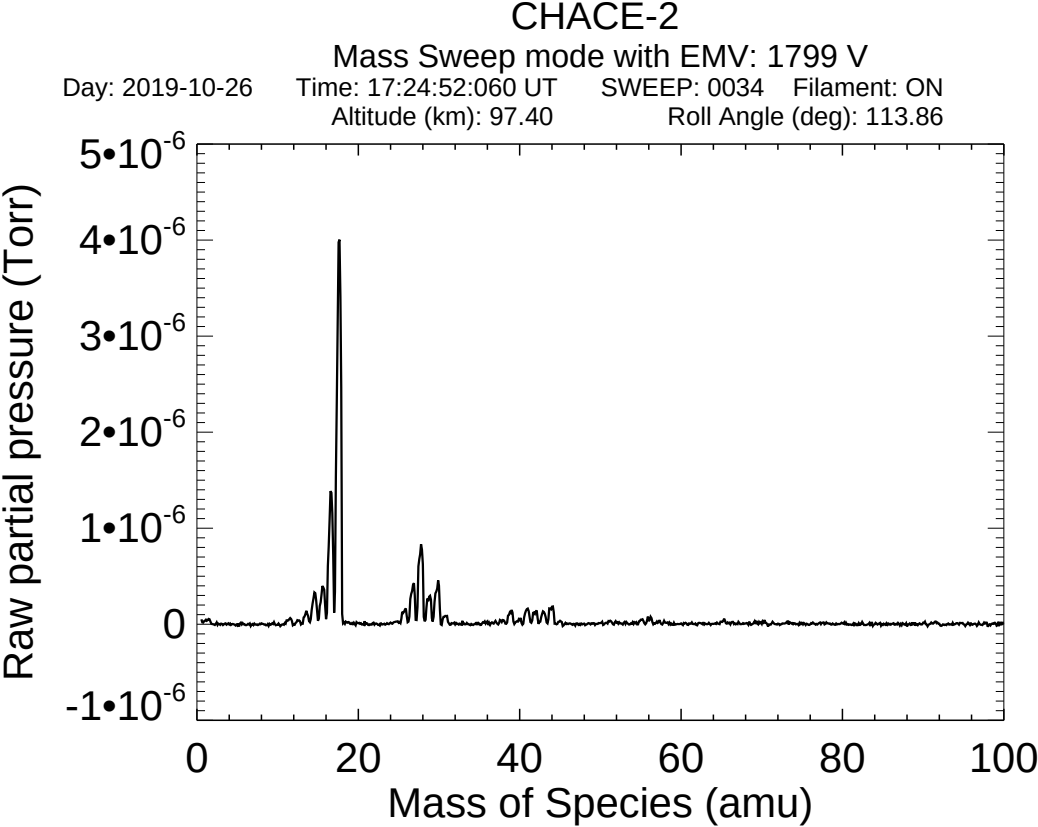

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:21:52:001 UT
SWEEP: 0029
Filament: ON
Altitude (km): 97.05
Roll Angle (deg): 111.75
8•10-6
6•10-6
4•10-6
2•10-6
0
-2•10-6
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

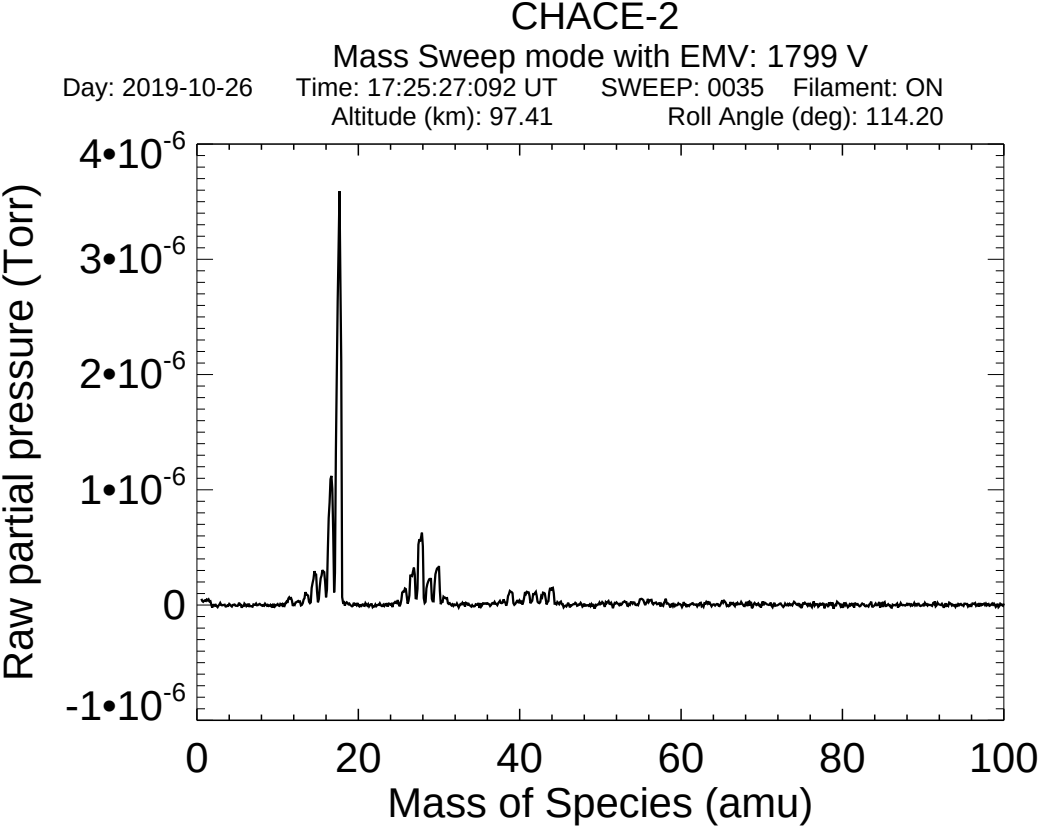

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:22:29:031 UT
SWEEP: 0030
Filament: ON
Altitude (km): 97.09
Roll Angle (deg): 112.23
Raw partial pressure (Torr)
8•10-6
6•10-6
4•10-6
2•10-6
0
-2•10-6
0
20
40
60
80
100
Mass of Species (amu)

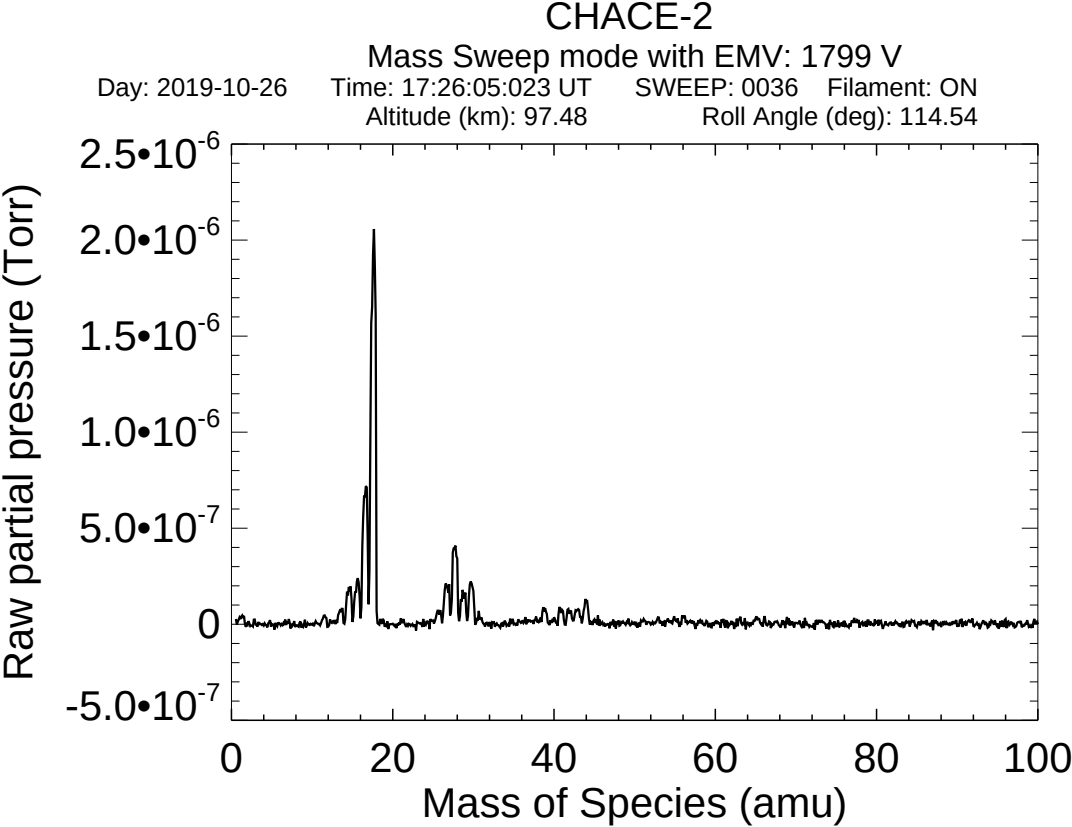

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:23:04:064 UT
SWEEP: 0031
Filament: ON
Altitude (km): 97.11
Roll Angle (deg): 112.66
Raw partial pressure (Torr)
5•10-6
4•10-6
3•10-6
2•10-6
1•10-6
0
-1•10-6
0
20
40
60
80
100
Mass of Species (amu)

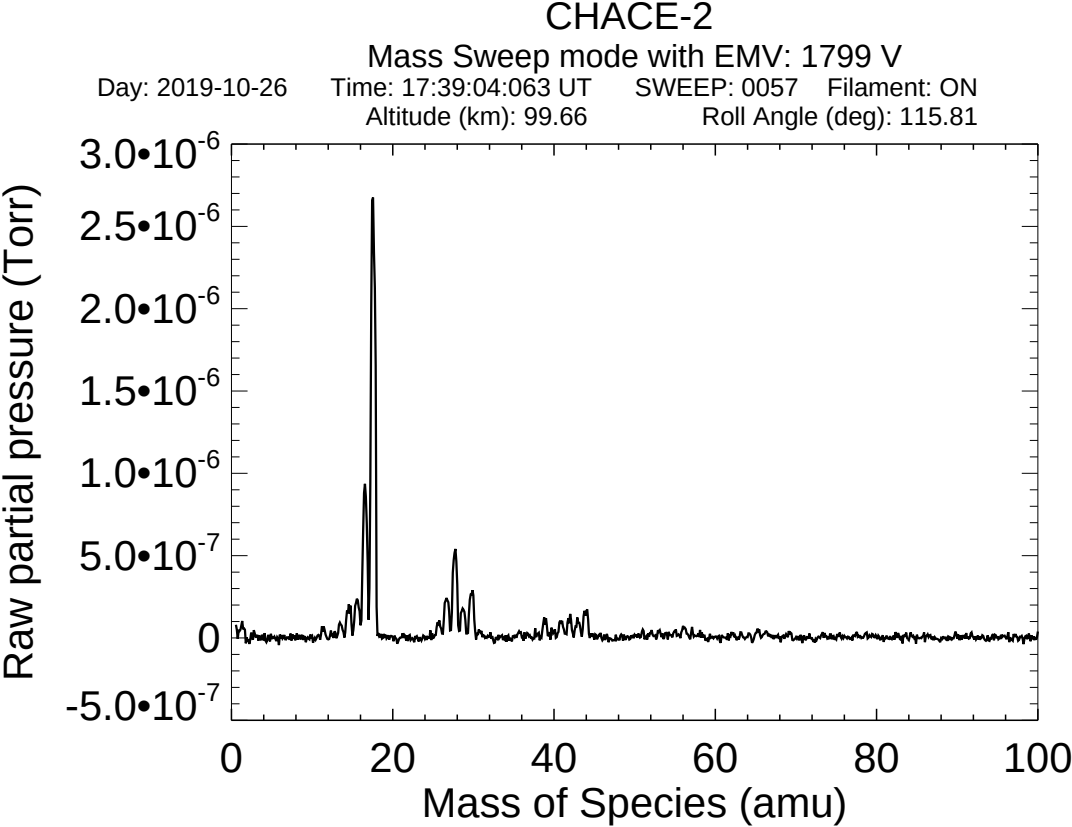

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:23:39:097 UT
SWEEP: 0032
Filament: ON
Altitude (km): 97.17
Roll Angle (deg): 113.07
Raw partial pressure (Torr)
5•10-6
4•10-6
3•10-6
2•10-6
1•10-6
0
-1•10-6
0
20
40
60
80
100
Mass of Species (amu)

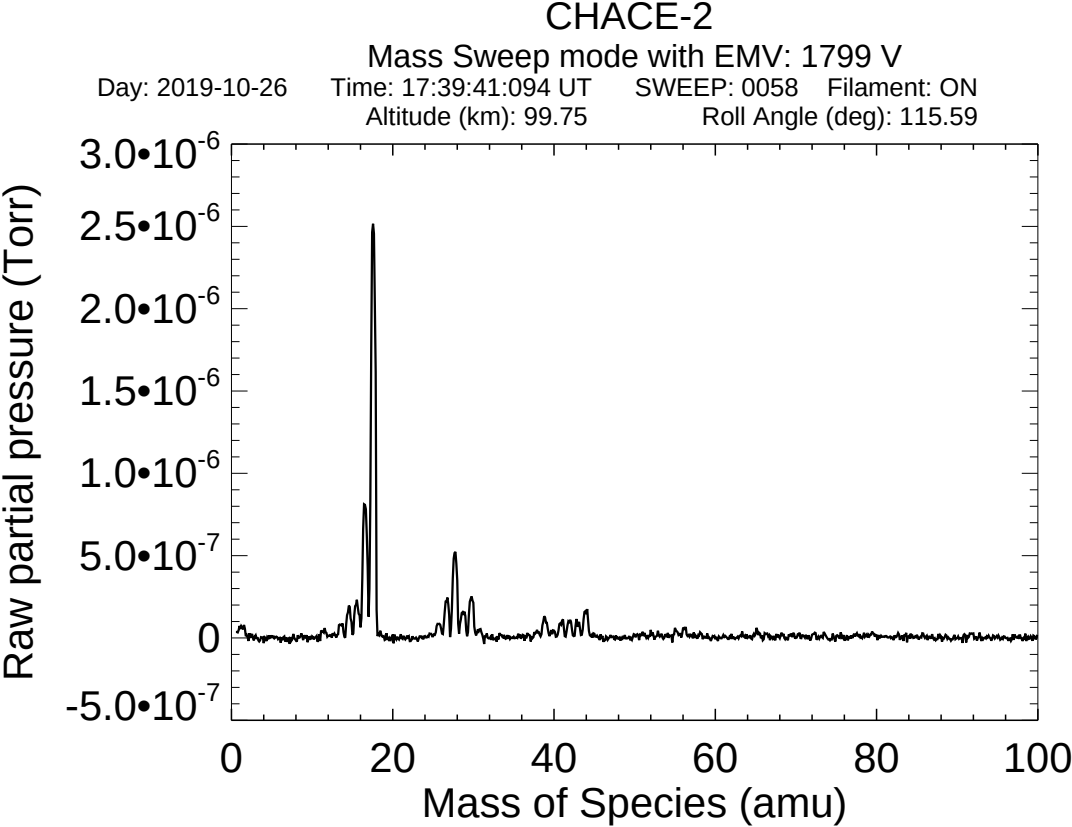

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:24:17:027 UT
SWEEP: 0033
Filament: ON
Altitude (km): 97.29
Roll Angle (deg): 113.49
Raw partial pressure (Torr)
5•10-6
4•10-6
3•10-6
2•10-6
1•10-6
0
-1•10-6
0
20
40
60
80
100
Mass of Species (amu)

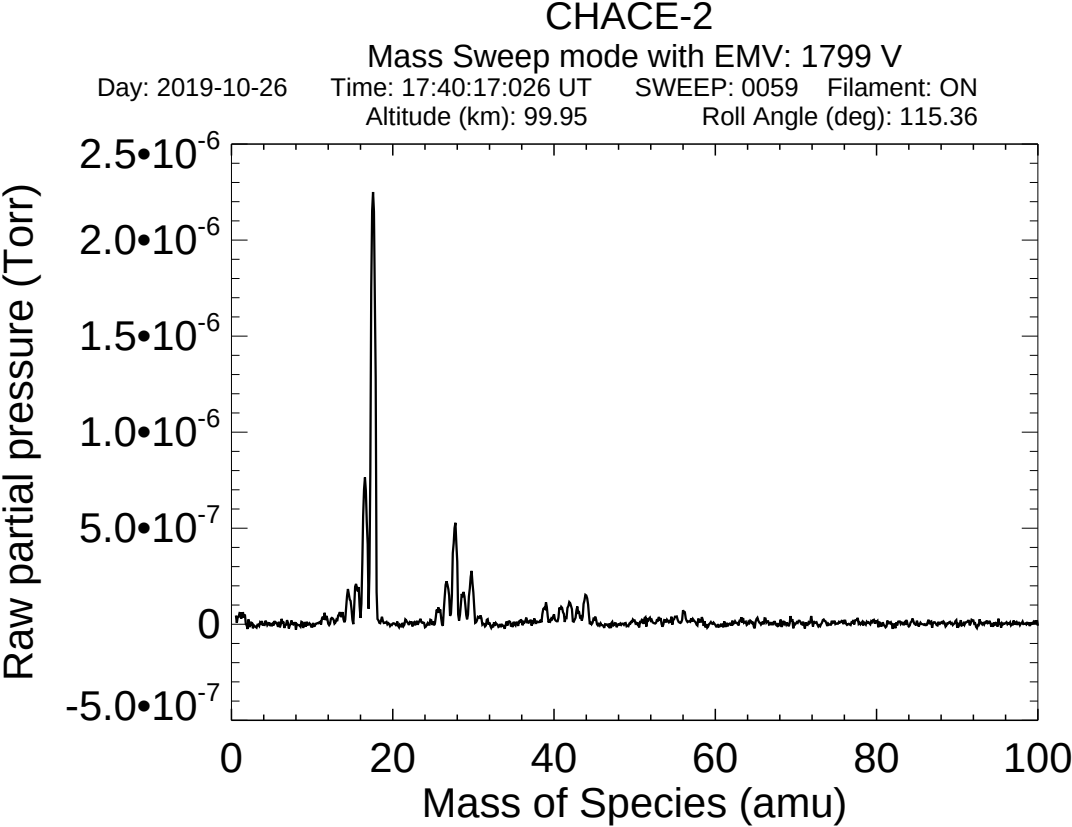

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:24:52:060 UT
SWEEP: 0034
Filament: ON
Altitude (km): 97.40
Roll Angle (deg): 113.86
Raw partial pressure (Torr)
5•10-6
4•10-6
3•10-6
2•10-6
1•10-6
0
-1•10-6
0
20
40
60
80
100
Mass of Species (amu)

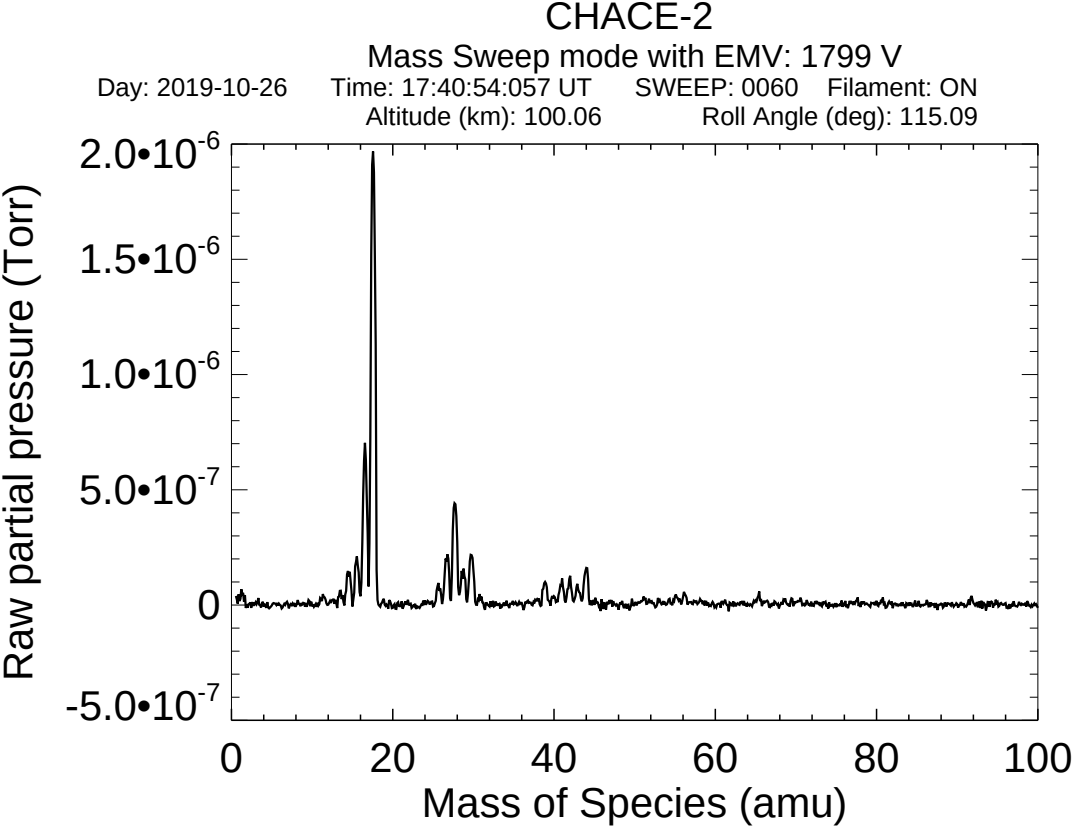

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:25:27:092 UT
SWEEP: 0035
Filament: ON
Altitude (km): 97.41
Roll Angle (deg): 114.20
Raw partial pressure (Torr)
4•10-6
3•10-6
2•10-6
1•10-6
0
-1•10-6
0
20
40
60
80
100
Mass of Species (amu)

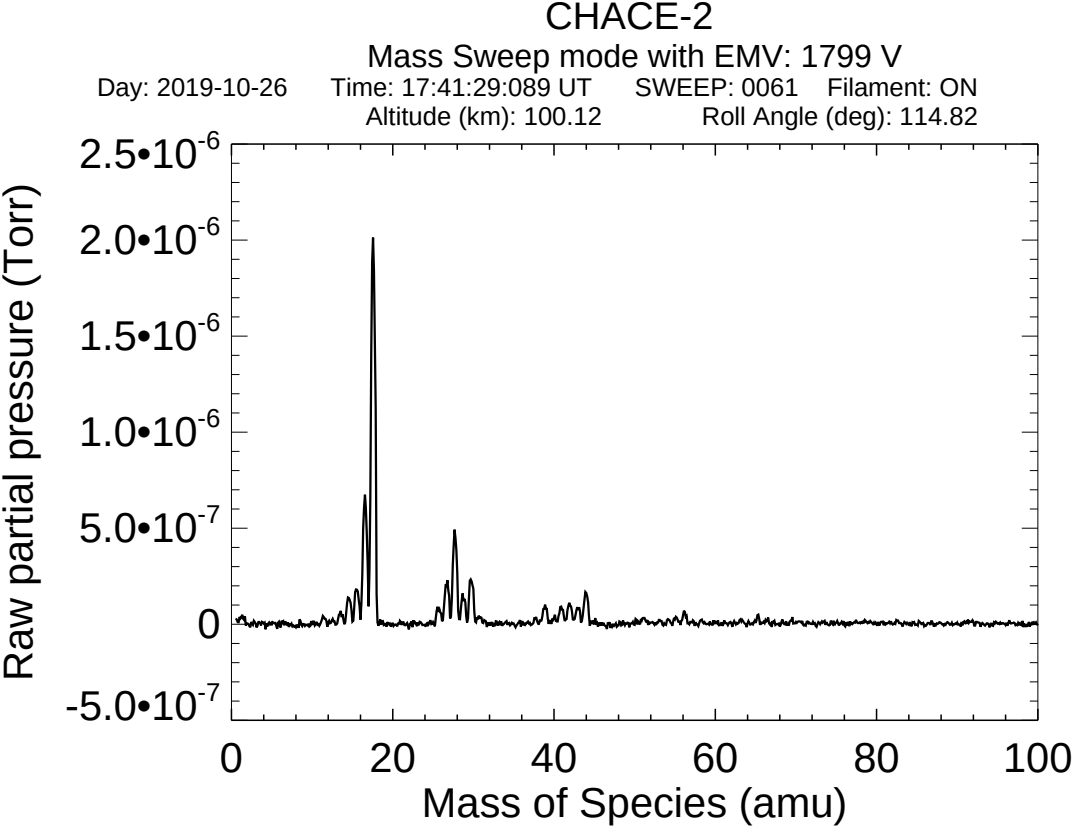

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:26:05:023 UT SWEEP: 0036 Filament: ON
Altitude (km): 97.48 Roll Angle (deg): 114.54
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

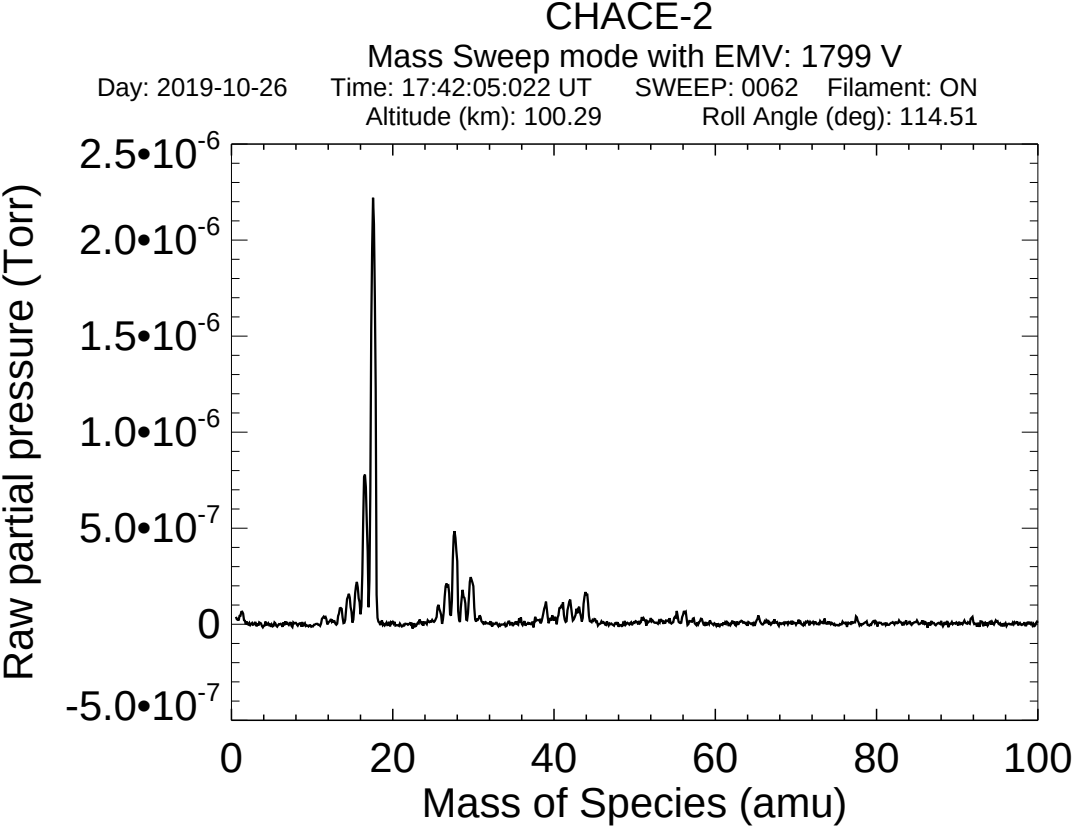

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:39:04:063 UT SWEEP: 0057 Filament: ON
Altitude (km): 99.66 Roll Angle (deg): 115.81
Raw partial pressure (Torr)
3.0•10-6
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

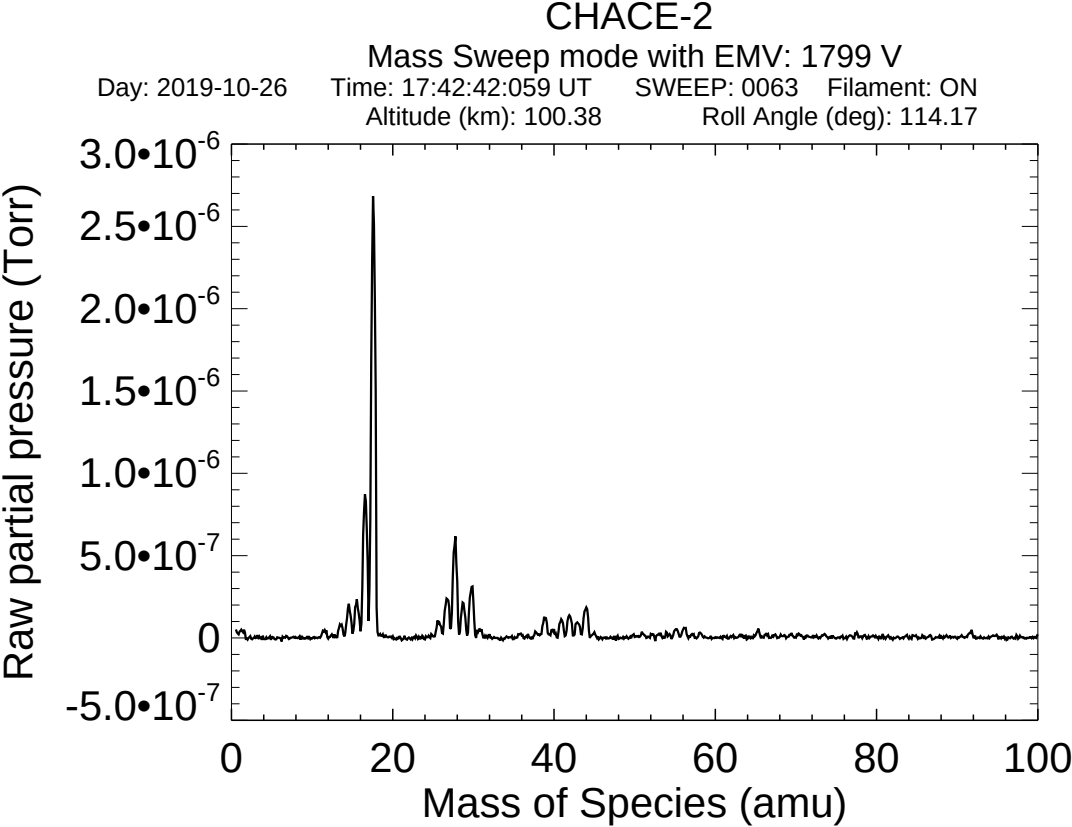

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:39:41:094 UT SWEEP: 0058 Filament: ON
Altitude (km): 99.75 Roll Angle (deg): 115.59
Raw partial pressure (Torr)
3.0•10-6
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

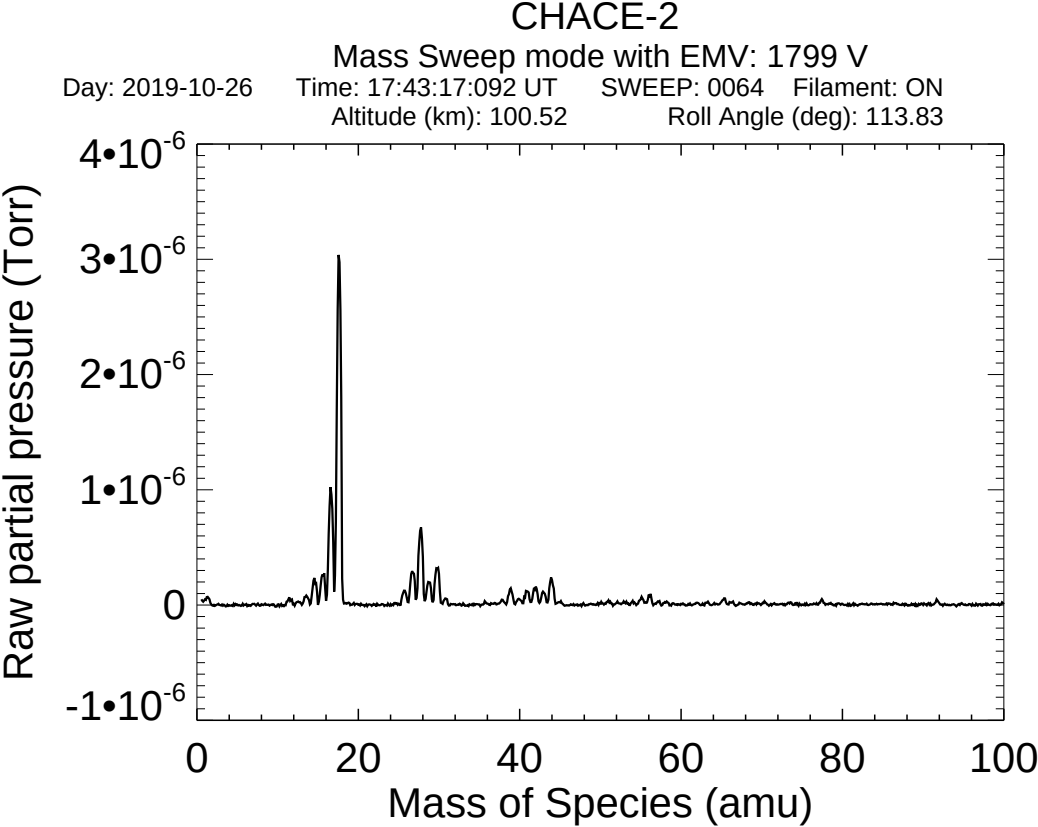

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:40:17:026 UT
SWEEP: 0059
Filament: ON
Altitude (km): 99.95
Roll Angle (deg): 115.36
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

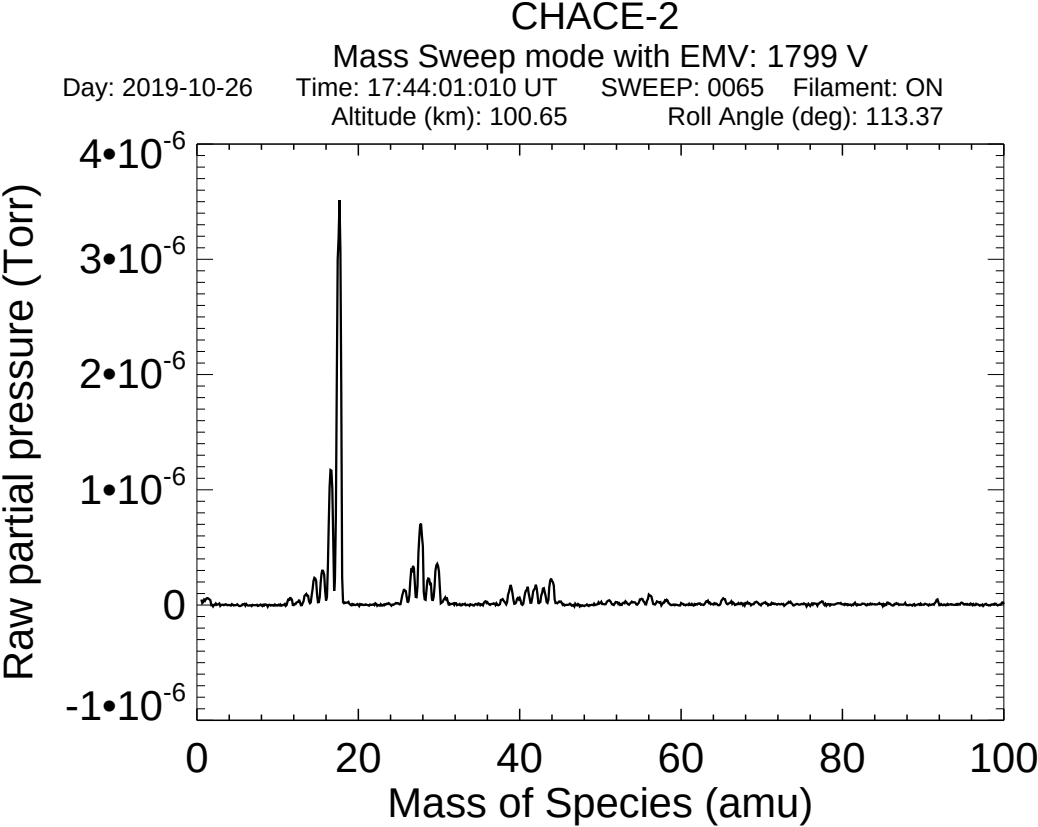

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:40:54:057 UT
SWEEP: 0060
Filament: ON
Altitude (km): 100.06
Roll Angle (deg): 115.09
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

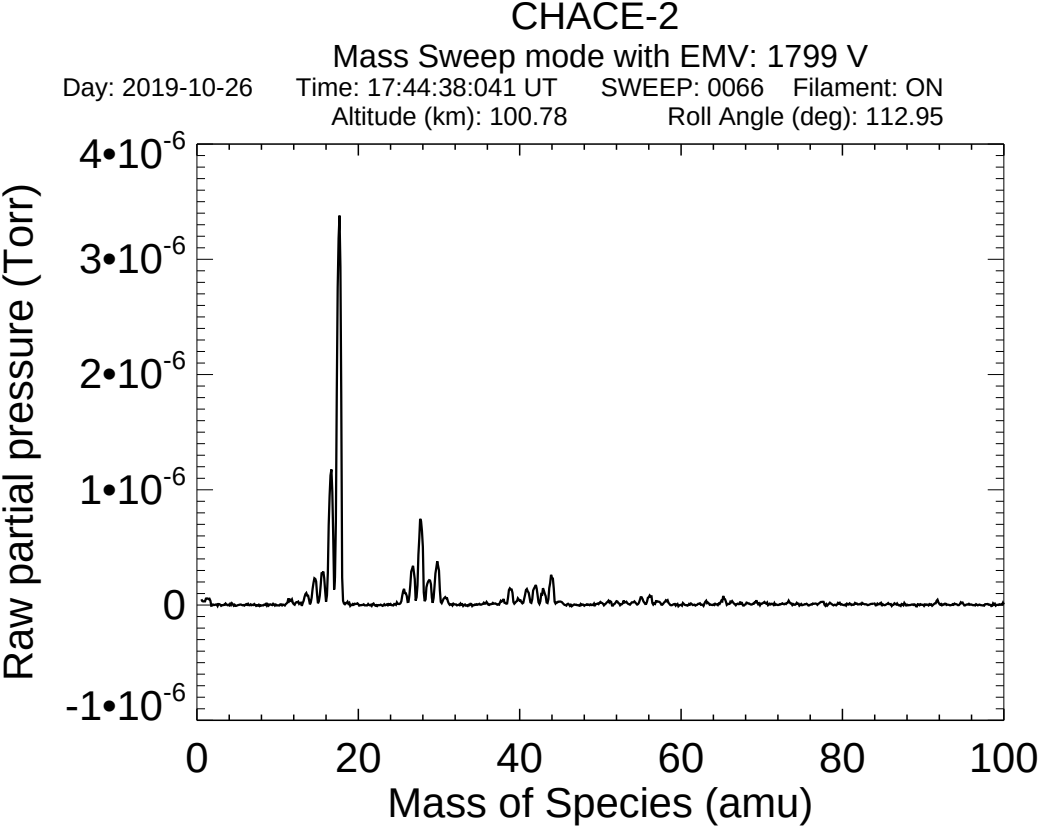

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:41:29:089 UT
SWEEP: 0061
Filament: ON
Altitude (km): 100.12
Roll Angle (deg): 114.82
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

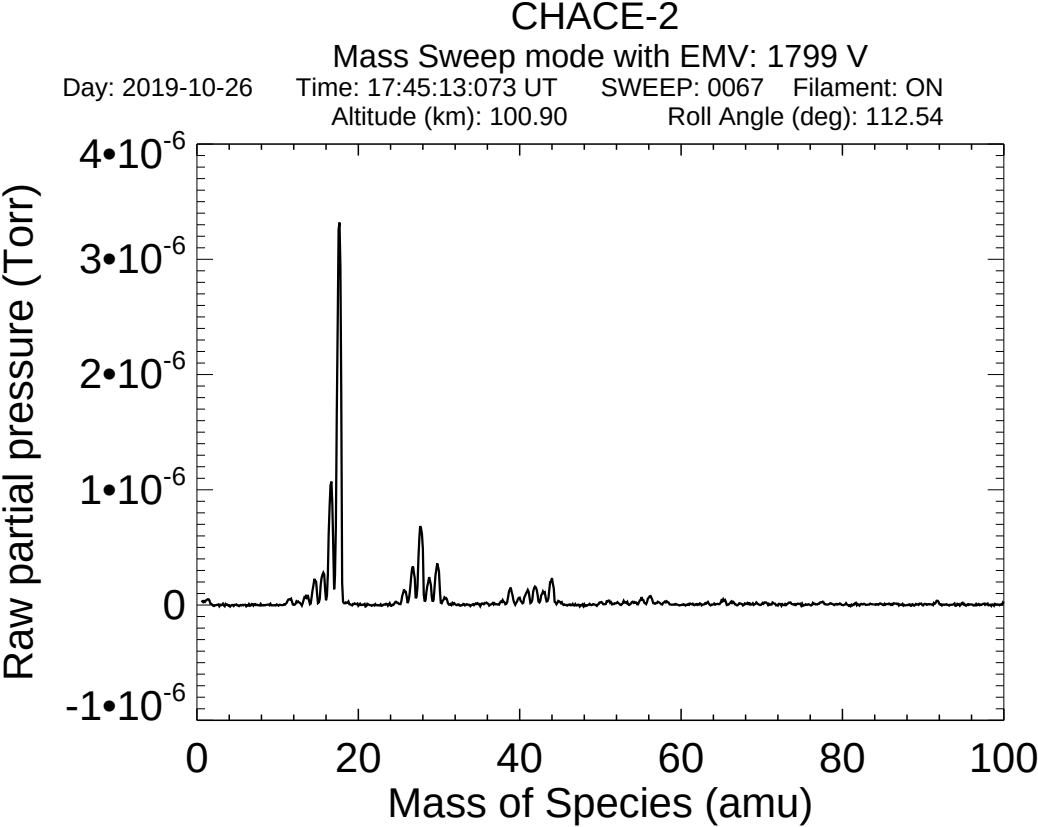

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:42:05:022 UT SWEEP: 0062 Filament: ON
Altitude (km): 100.29 Roll Angle (deg): 114.51
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

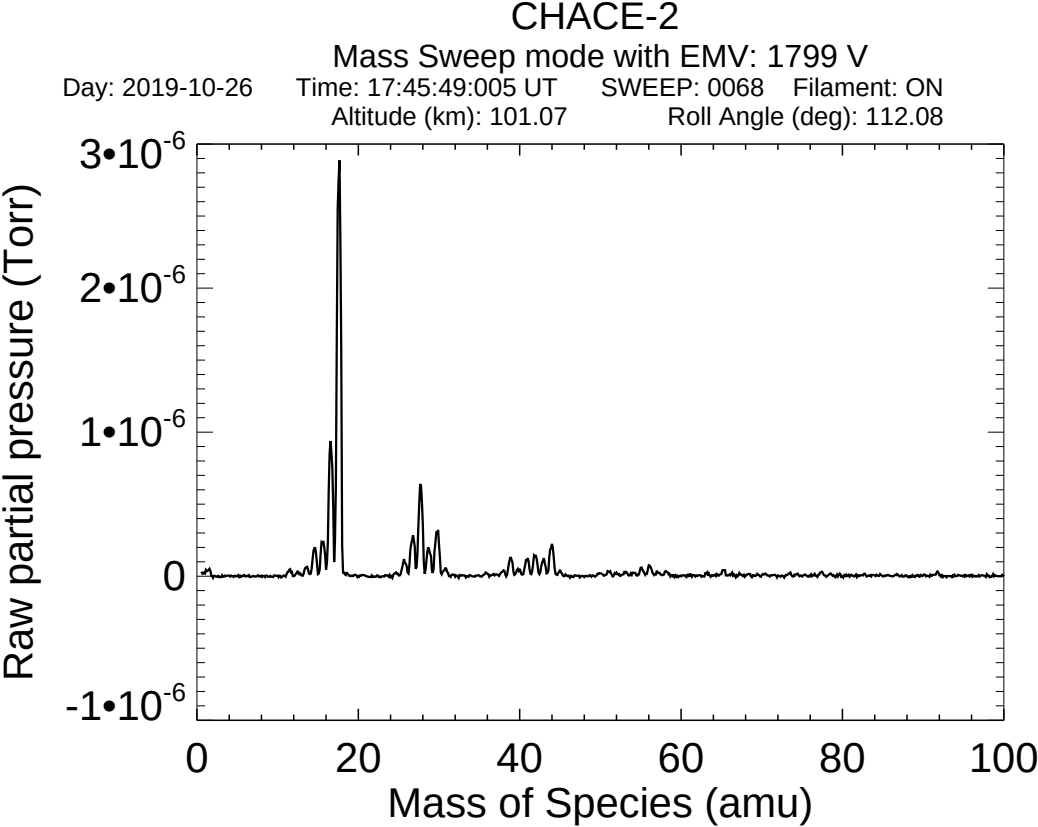

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:42:42:059 UT SWEEP: 0063 Filament: ON
Altitude (km): 100.38 Roll Angle (deg): 114.17
Raw partial pressure (Torr)
3.0•10-6
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

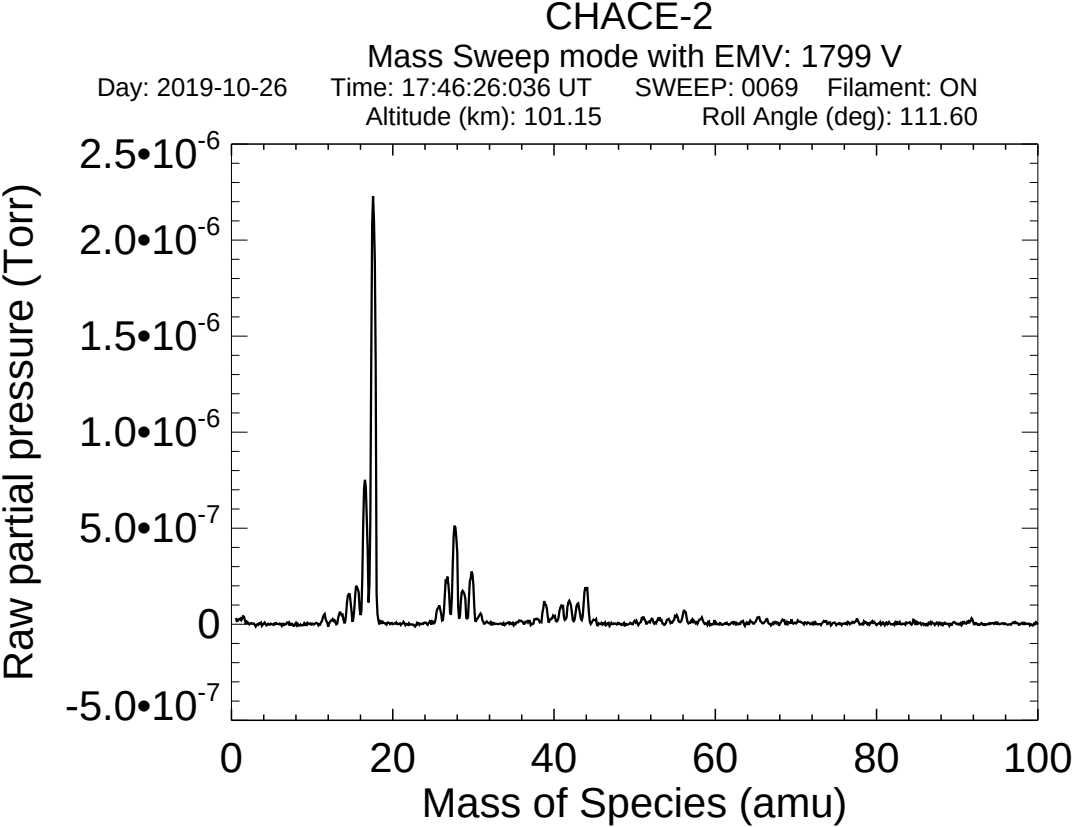

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:43:17:092 UT SWEEP: 0064 Filament: ON
Altitude (km): 100.52 Roll Angle (deg): 113.83
Raw partial pressure (Torr)
4•10-6
3•10-6
2•10-6
1•10-6
0
-1•10-6
0
20
40
60
80
100
Mass of Species (amu)

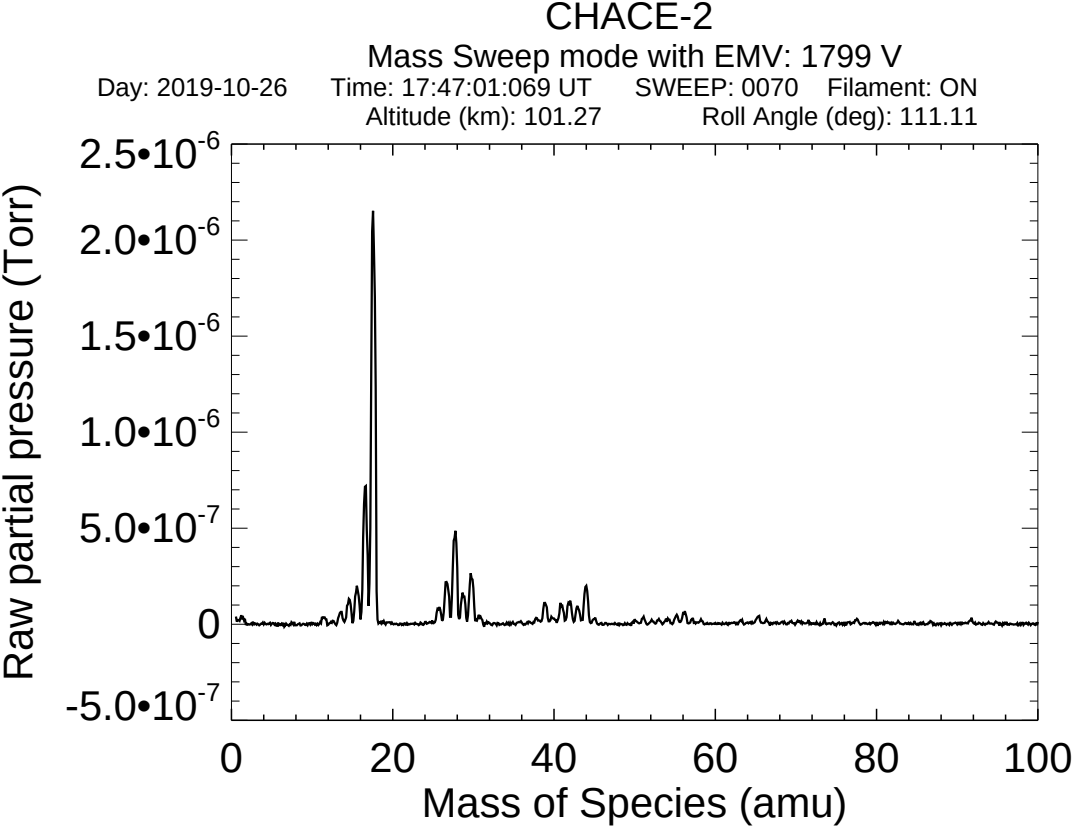

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:44:01:010 UT SWEEP: 0065 Filament: ON
Altitude (km): 100.65 Roll Angle (deg): 113.37
Raw partial pressure (Torr)
4•10-6
3•10-6
2•10-6
1•10-6
0
-1•10-6
0
20
40
60
80
100
Mass of Species (amu)

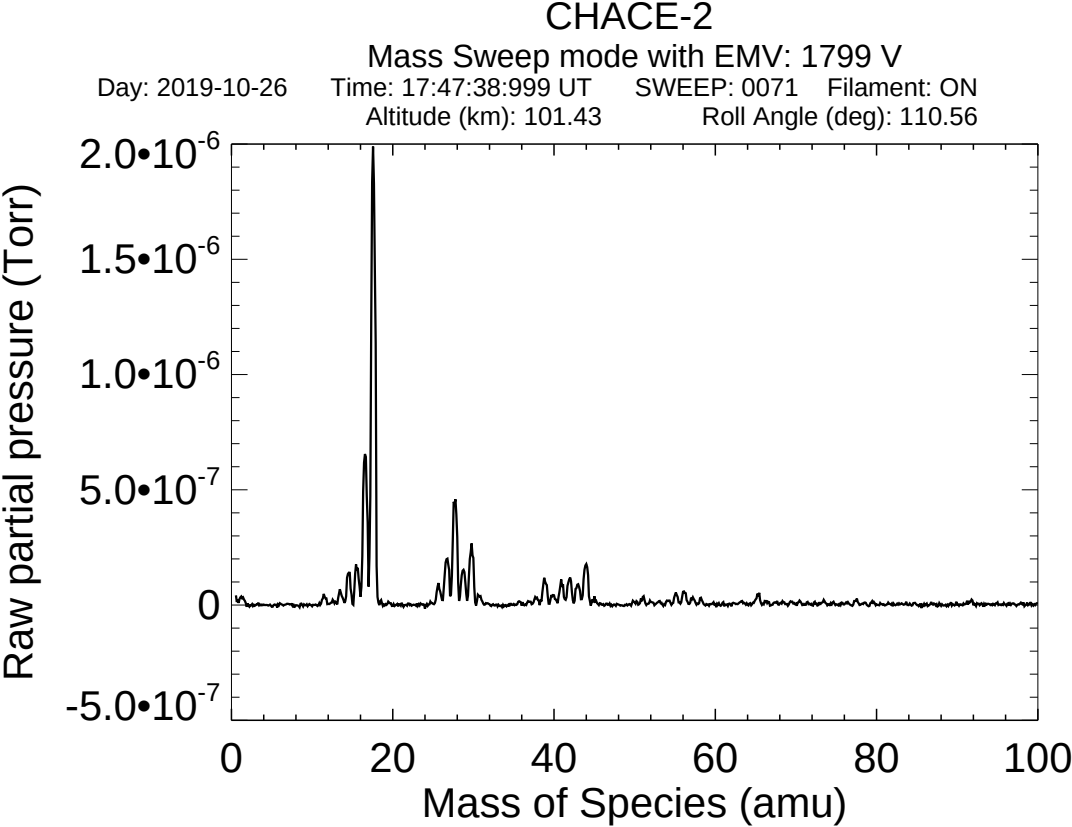

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:44:38:041 UT SWEEP: 0066 Filament: ON
Altitude (km): 100.78 Roll Angle (deg): 112.95
4•10-6
3•10-6
2•10-6
1•10-6
0
-1•10-6
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

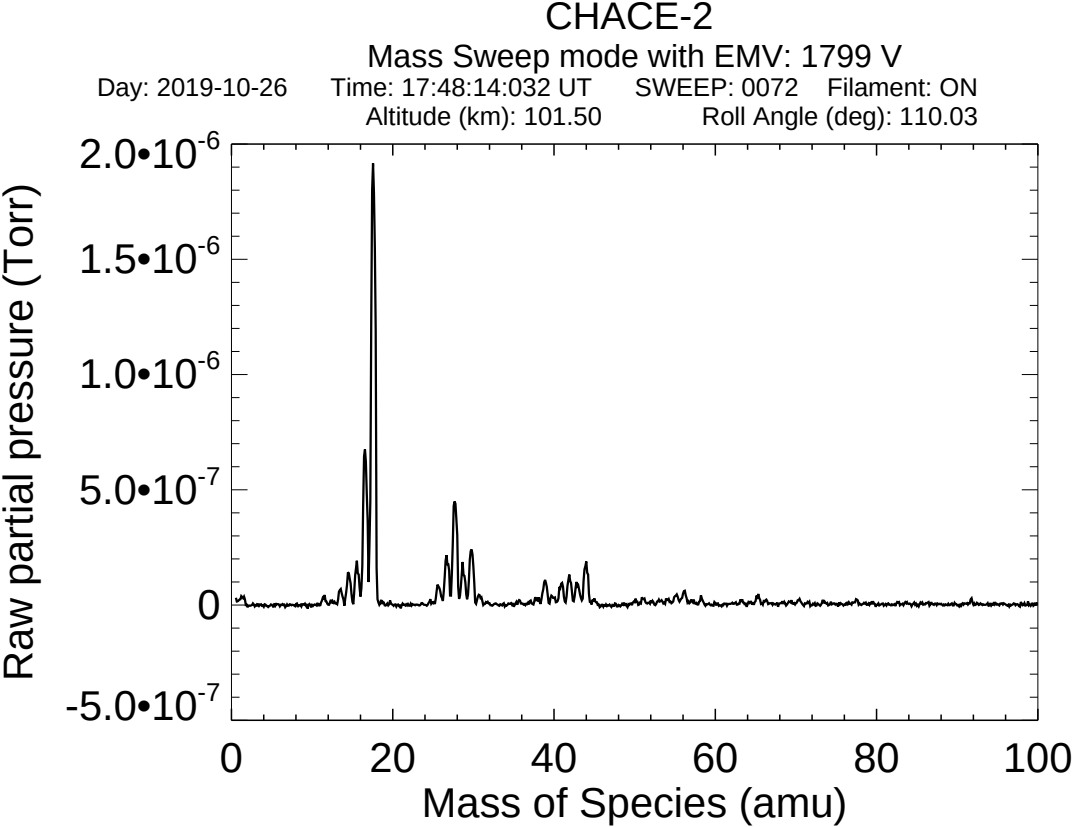

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:45:13:073 UT
SWEEP: 0067
Filament: ON
Altitude (km): 100.90
Roll Angle (deg): 112.54
Raw partial pressure (Torr)
4•10-6
3•10-6
2•10-6
1•10-6
0
-1•10-6
0
20
40
60
80
100
Mass of Species (amu)

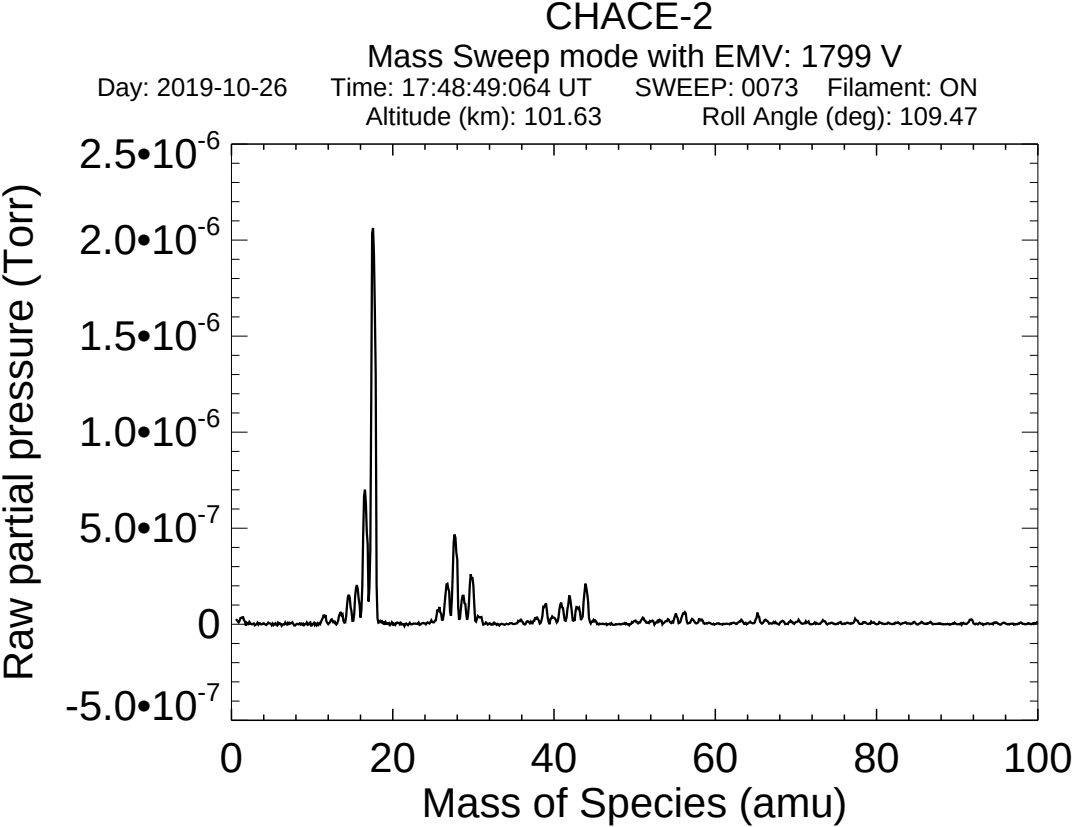

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:45:49:005 UT SWEEP: 0068 Filament: ON
Altitude (km): 101.07 Roll Angle (deg): 112.08
3•10-6
2•10-6
1•10-6
0
-1•10-6
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

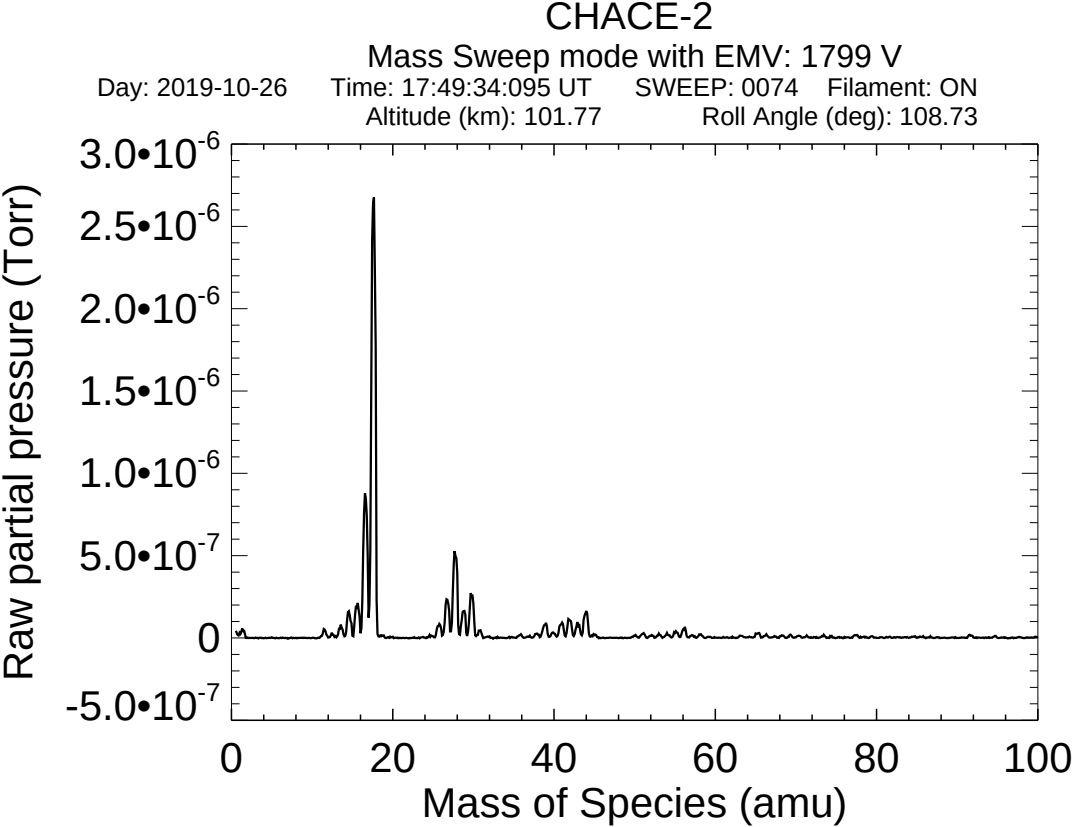

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:46:26:036 UT SWEEP: 0069 Filament: ON
Altitude (km): 101.15 Roll Angle (deg): 111.60
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

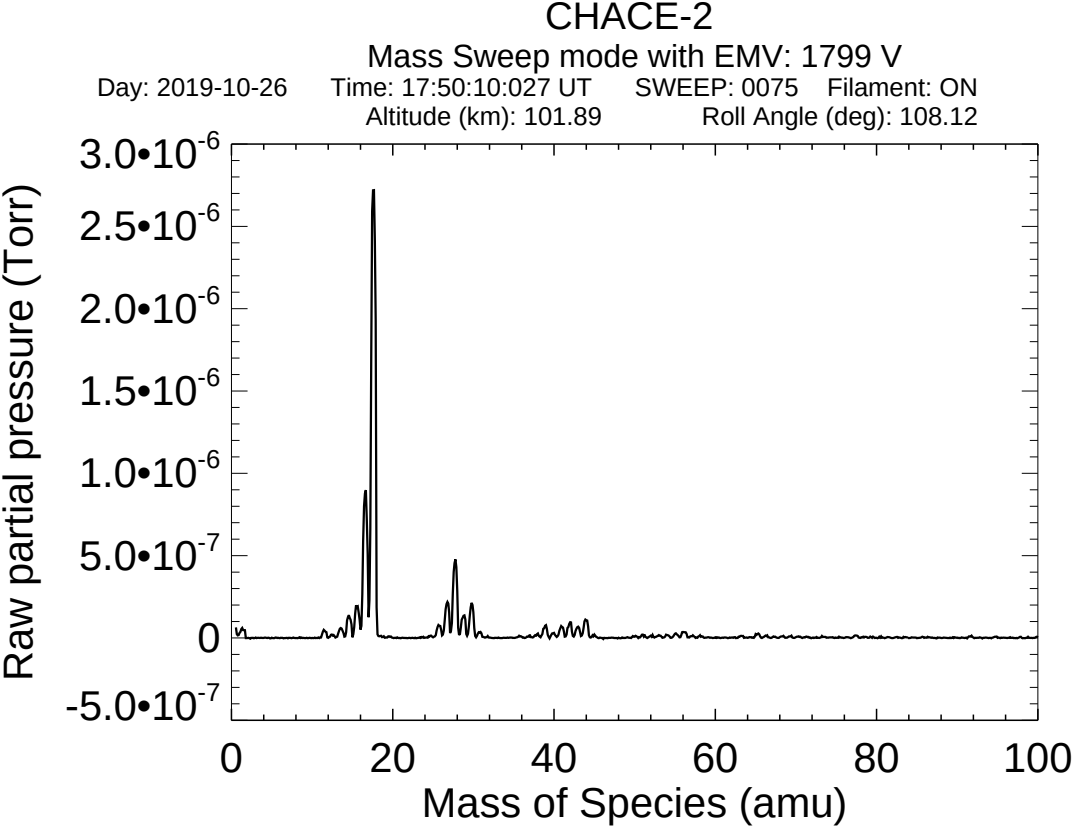

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:47:01:069 UT SWEEP: 0070 Filament: ON
Altitude (km): 101.27 Roll Angle (deg): 111.11
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

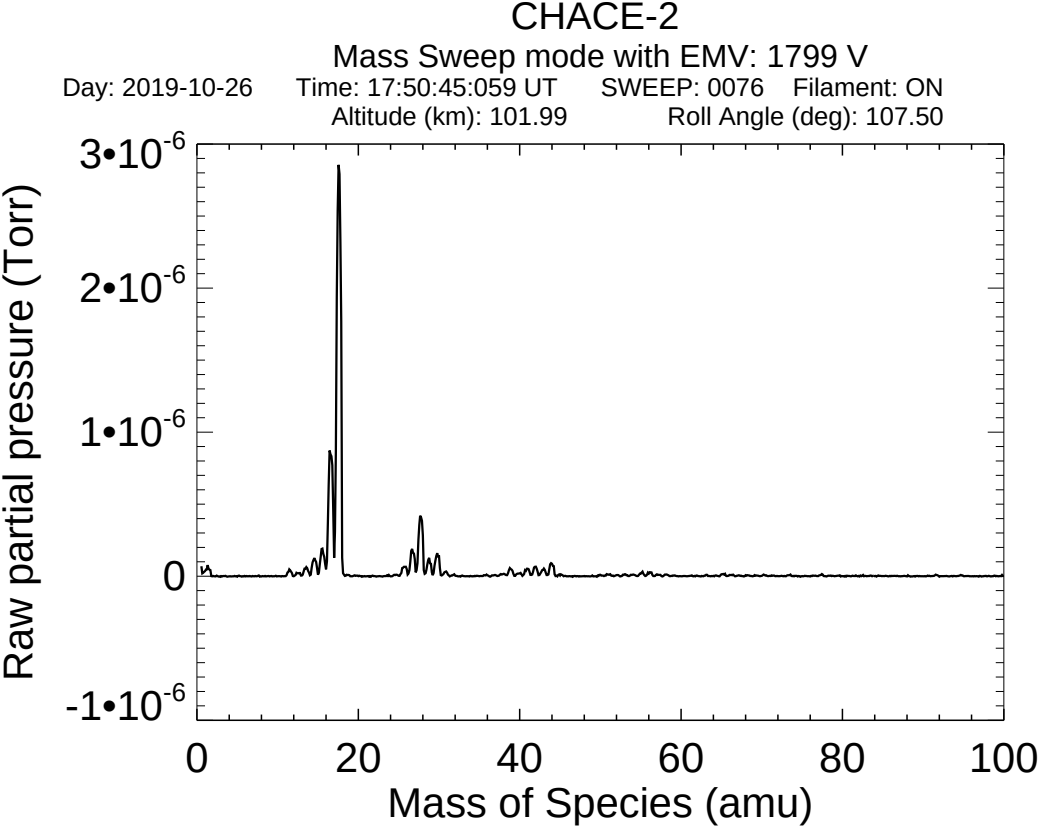

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:47:38:999 UT
SWEEP: 0071
Filament: ON
Altitude (km): 101.43
Roll Angle (deg): 110.56
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

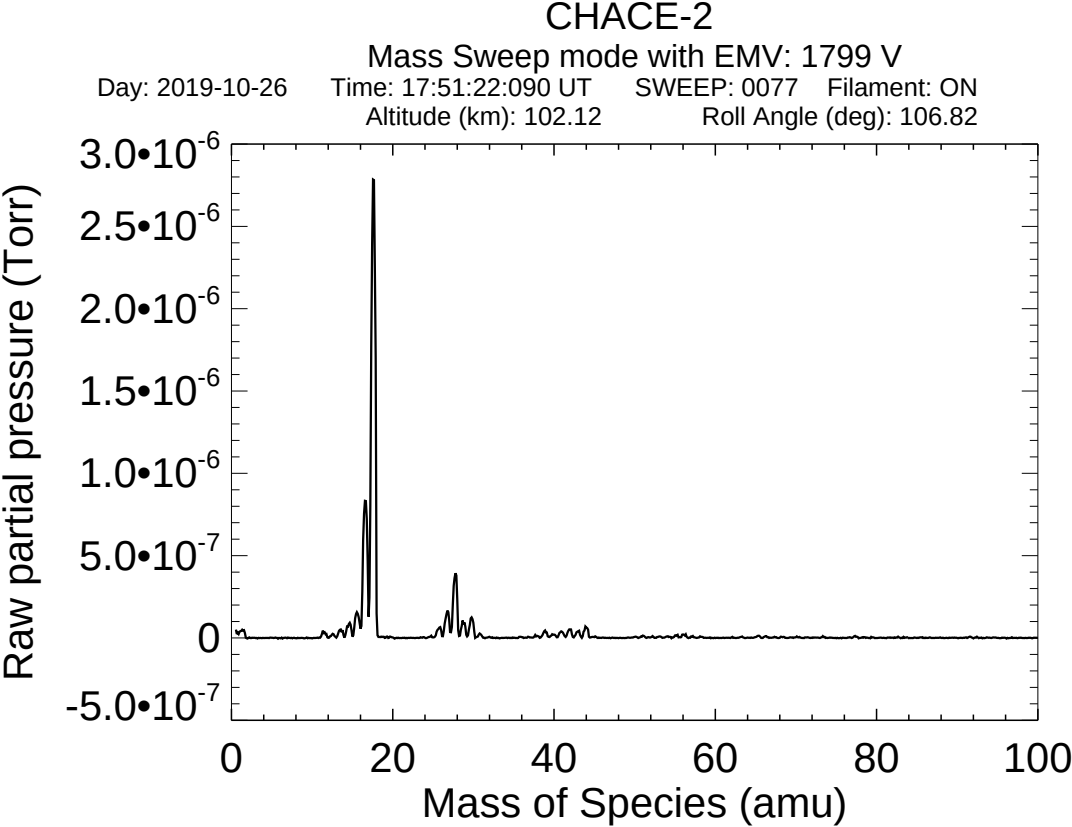

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:48:14:032 UT SWEEP: 0072 Filament: ON
Altitude (km): 101.50 Roll Angle (deg): 110.03
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

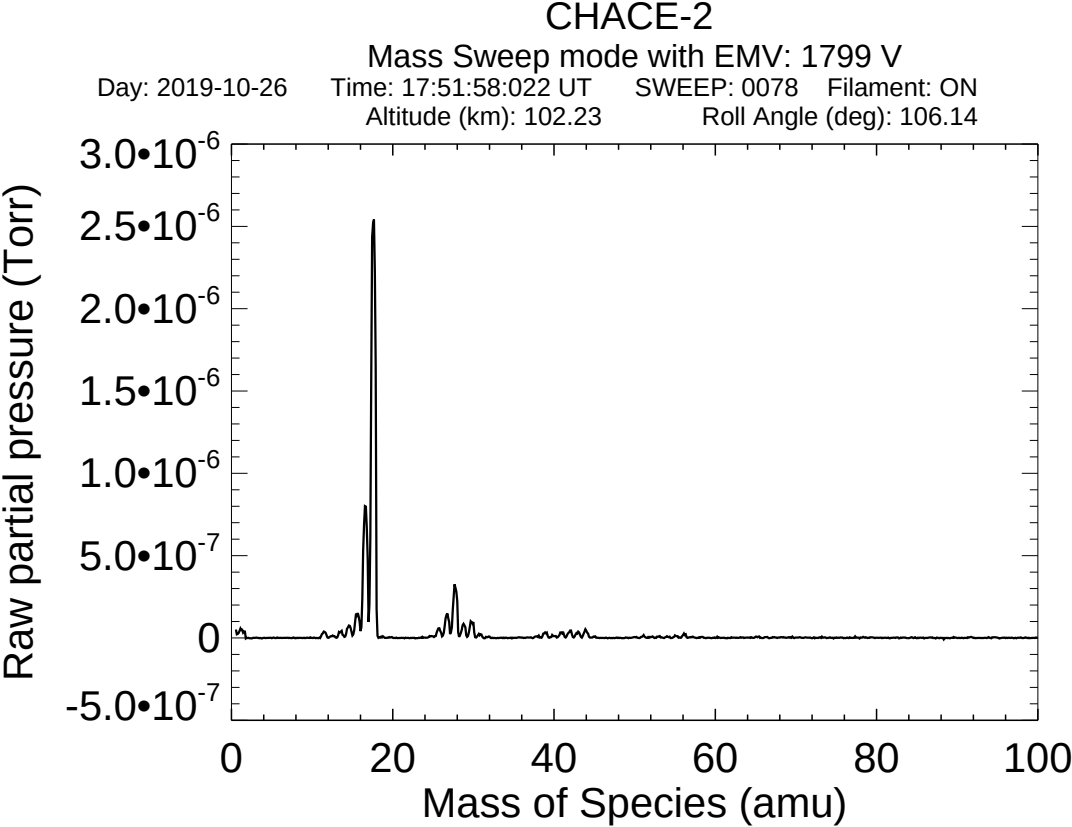

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:48:49:064 UT SWEEP: 0073 Filament: ON
Altitude (km): 101.63 Roll Angle (deg): 109.47
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

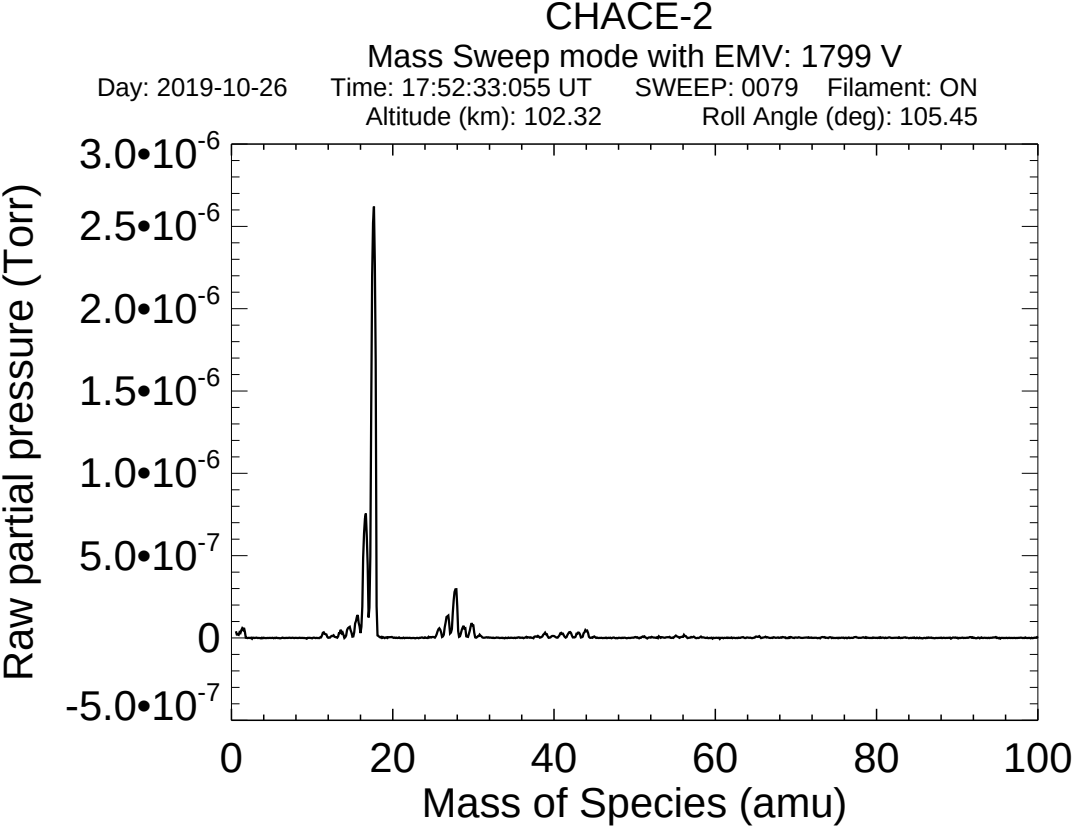

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:49:34:095 UT
SWEEP: 0074
Filament: ON
Altitude (km): 101.77
Roll Angle (deg): 108.73
Raw partial pressure (Torr)
3.0•10-6
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

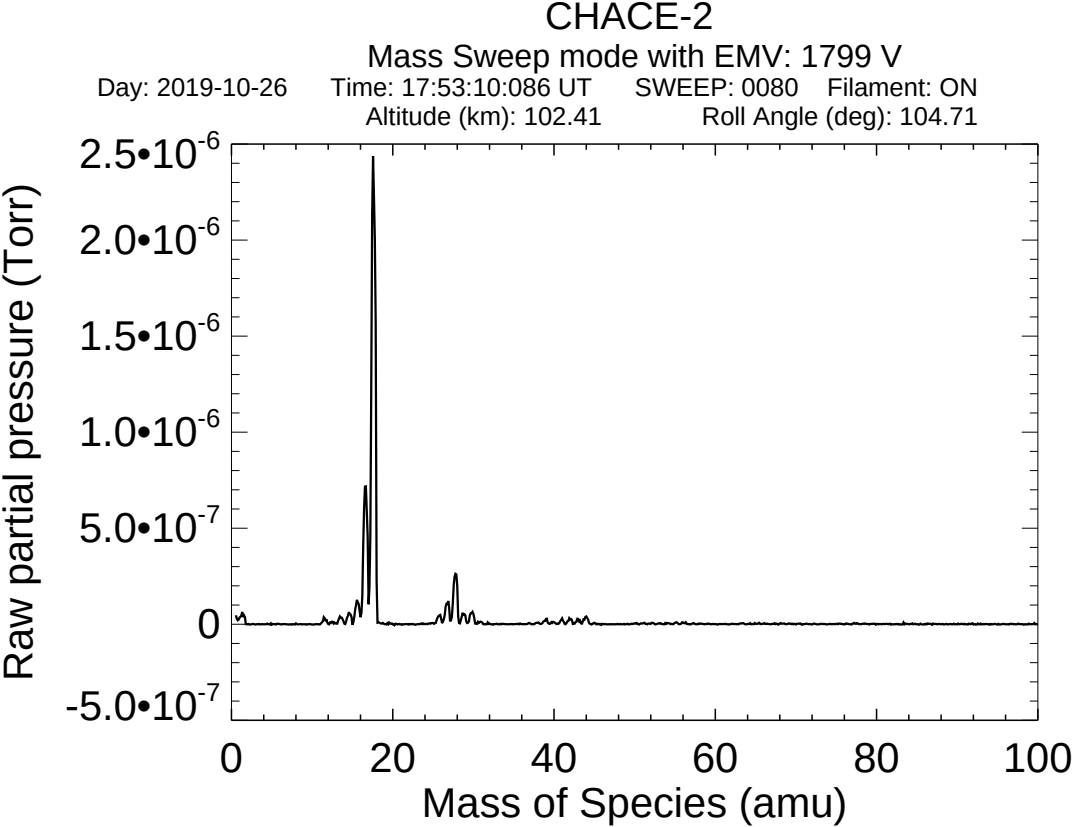

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:50:10:027 UT
SWEEP: 0075
Filament: ON
Altitude (km): 101.89
Roll Angle (deg): 108.12
Raw partial pressure (Torr)
3.0•10-6
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

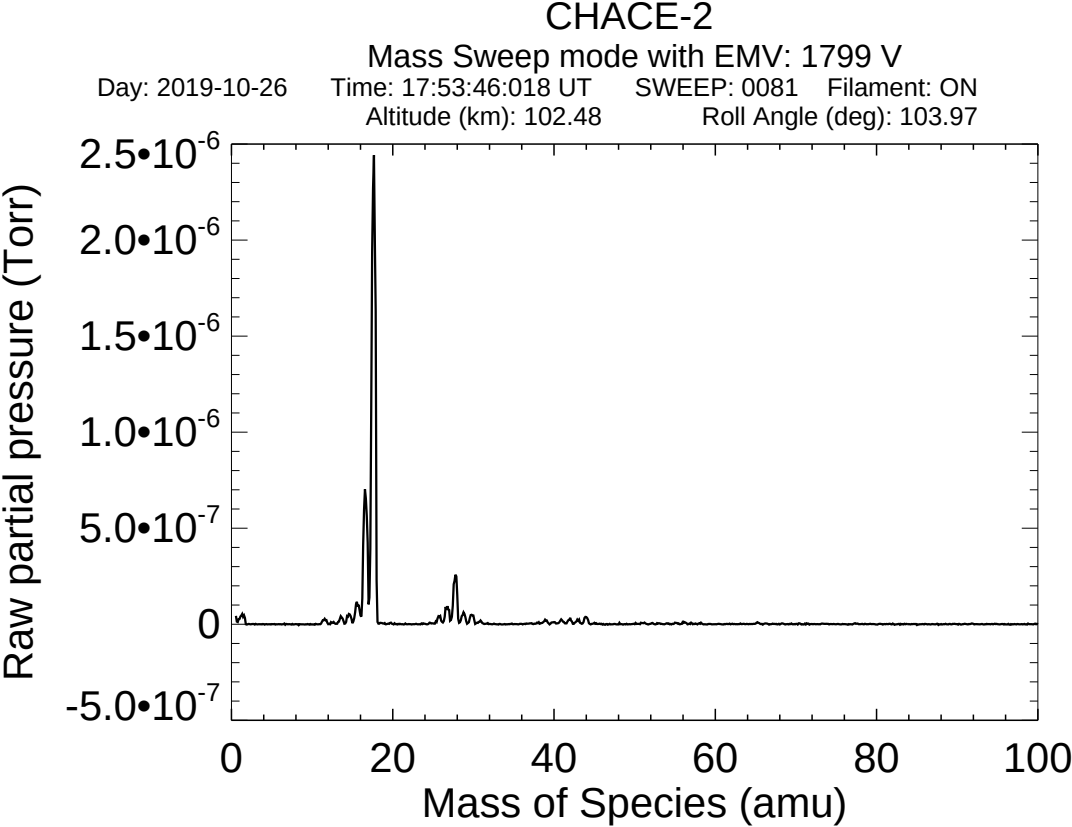

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:50:45:059 UT SWEEP: 0076 Filament: ON
Altitude (km): 101.99 Roll Angle (deg): 107.50
3•10-6
2•10-6
1•10-6
0
-1•10-6
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

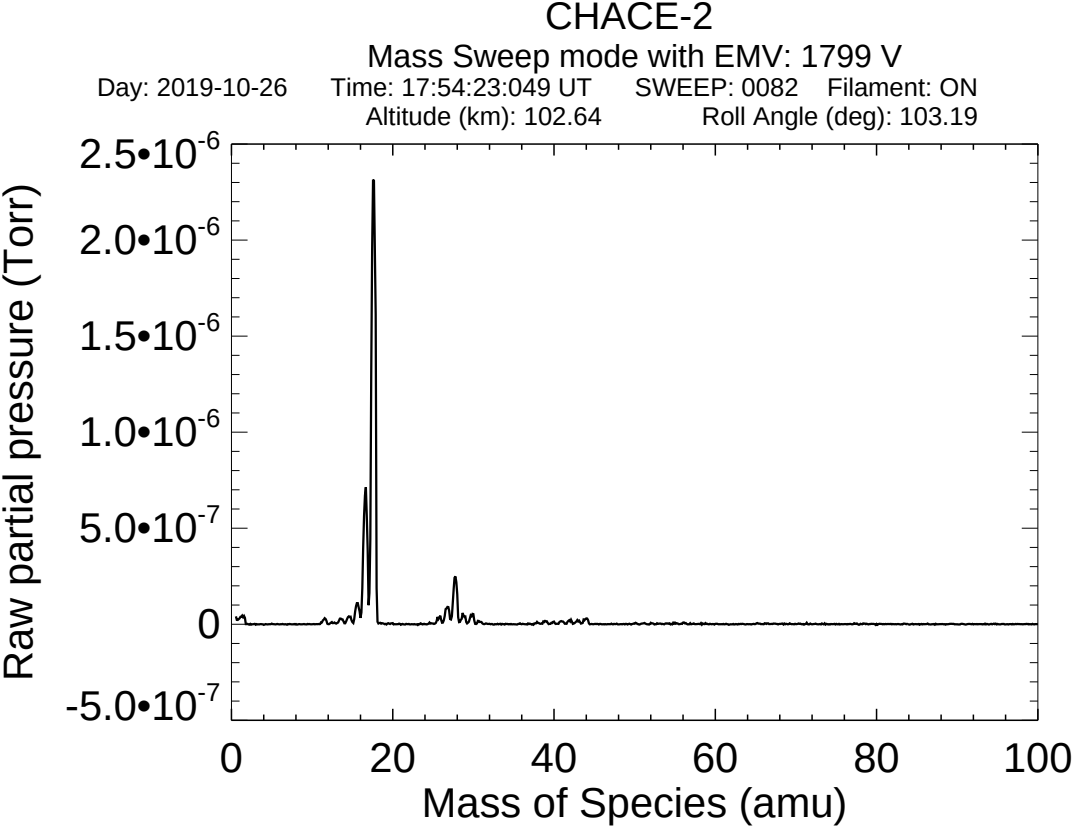

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:51:22:090 UT
SWEEP: 0077
Filament: ON
Altitude (km): 102.12
Roll Angle (deg): 106.82
Raw partial pressure (Torr)
3.0•10-6
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

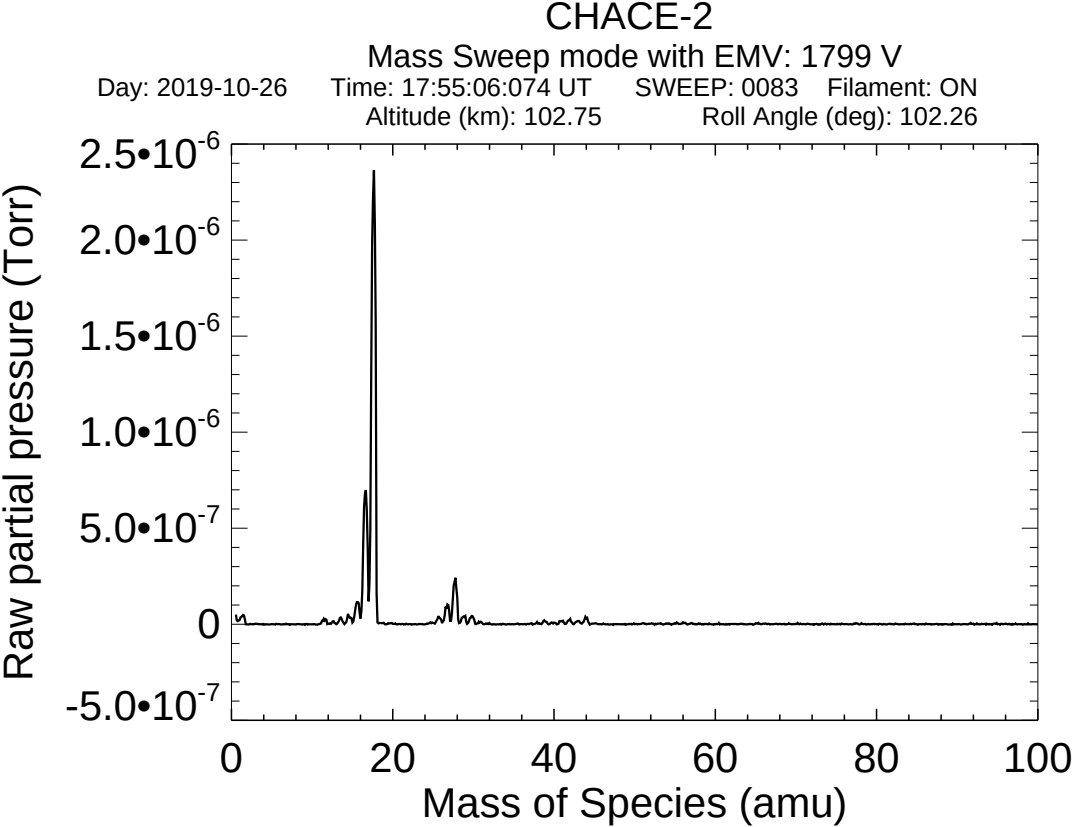

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:51:58:022 UT
SWEEP: 0078
Filament: ON
Altitude (km): 102.23
Roll Angle (deg): 106.14
Raw partial pressure (Torr)
3.0•10-6
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

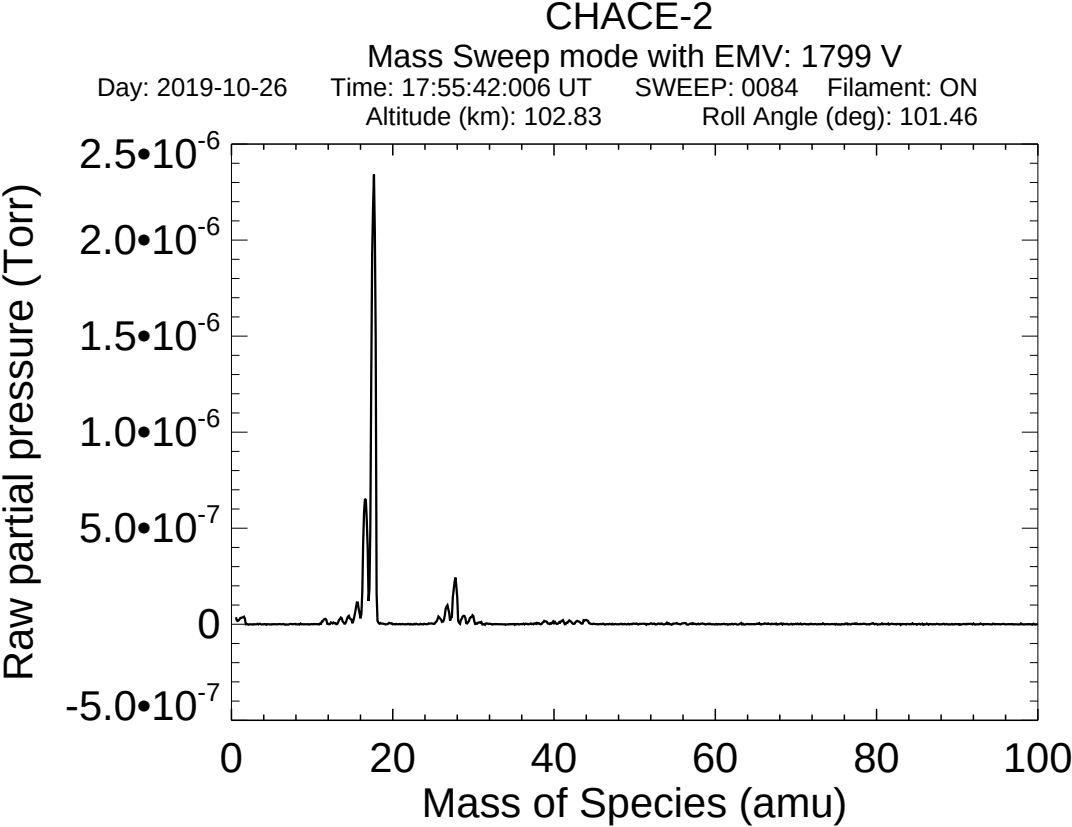

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:52:33:055 UT SWEEP: 0079 Filament: ON
Altitude (km): 102.32 Roll Angle (deg): 105.45
Raw partial pressure (Torr)
3.0•10-6
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

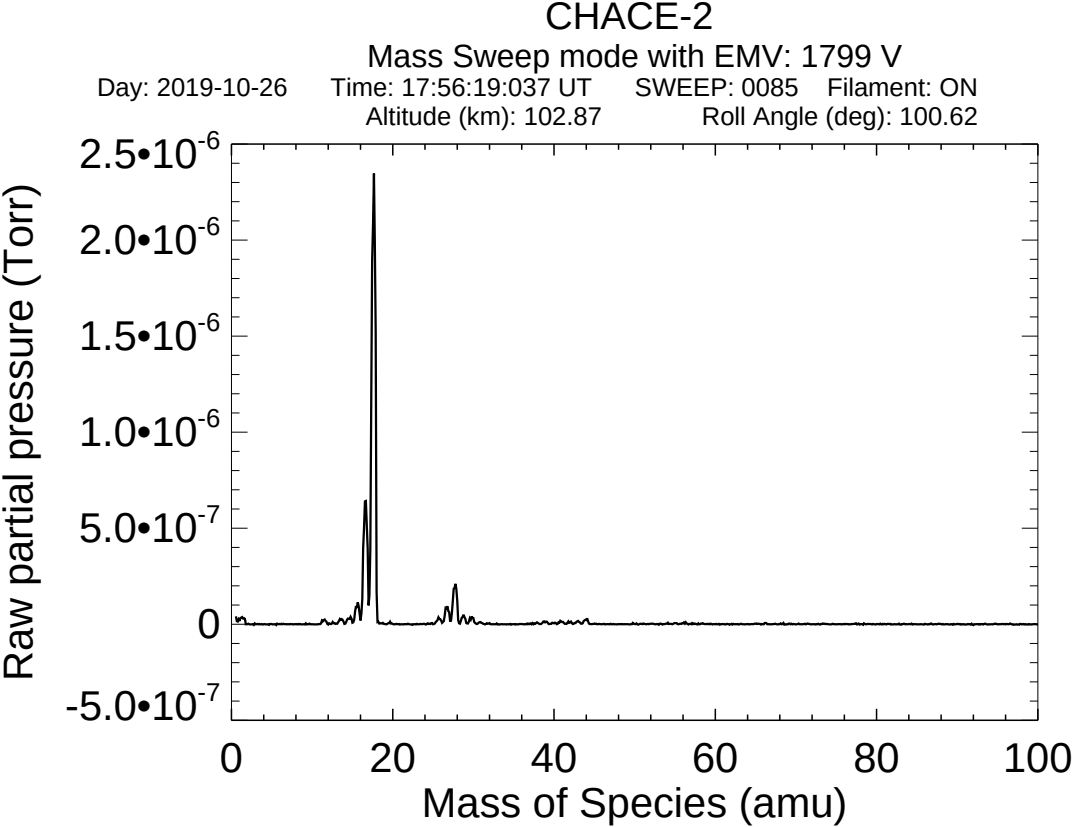

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:53:10:086 UT
SWEEP: 0080
Filament: ON
Altitude (km): 102.41
Roll Angle (deg): 104.71
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

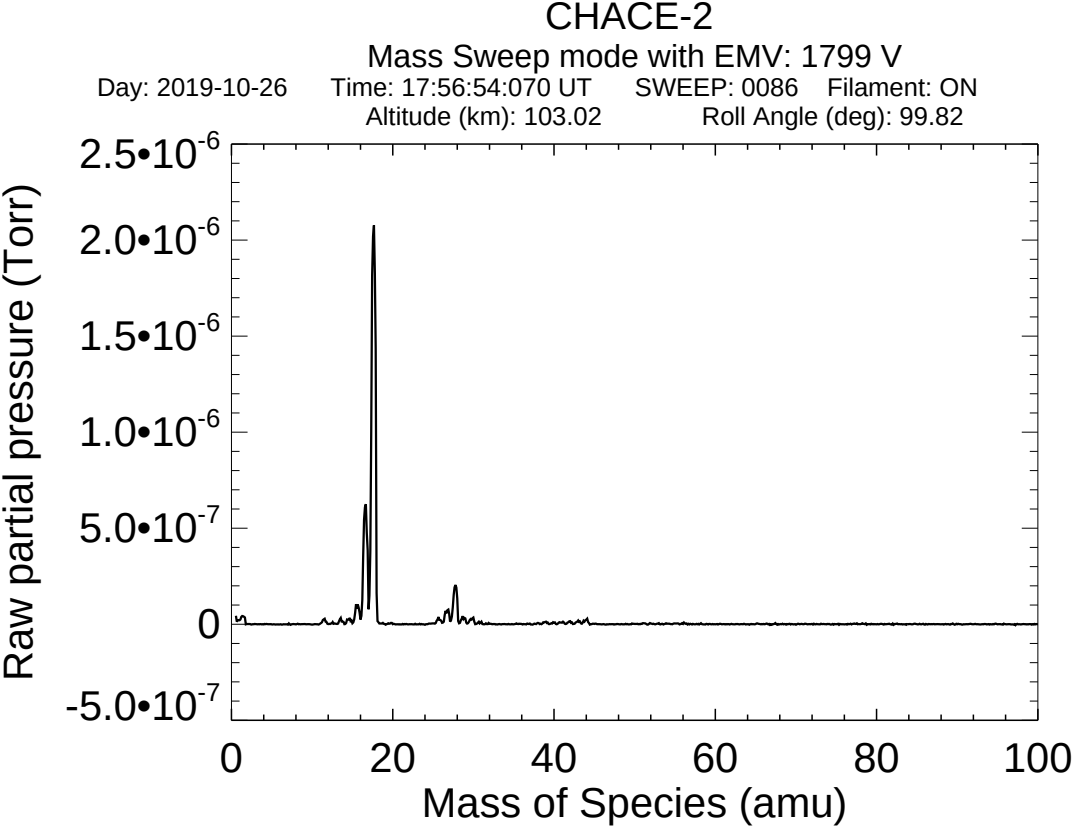

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:53:46:018 UT
SWEEP: 0081
Filament: ON
Altitude (km): 102.48
Roll Angle (deg): 103.97
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

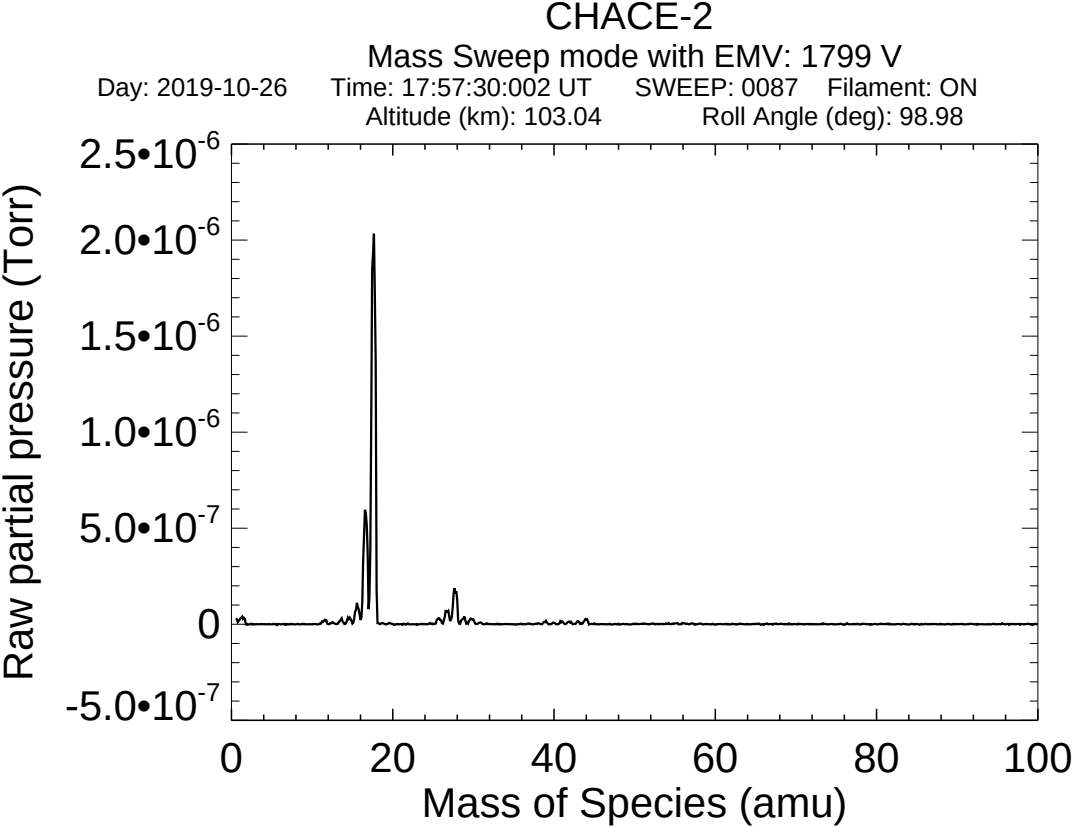

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:54:23:049 UT SWEEP: 0082 Filament: ON
Altitude (km): 102.64 Roll Angle (deg): 103.19
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

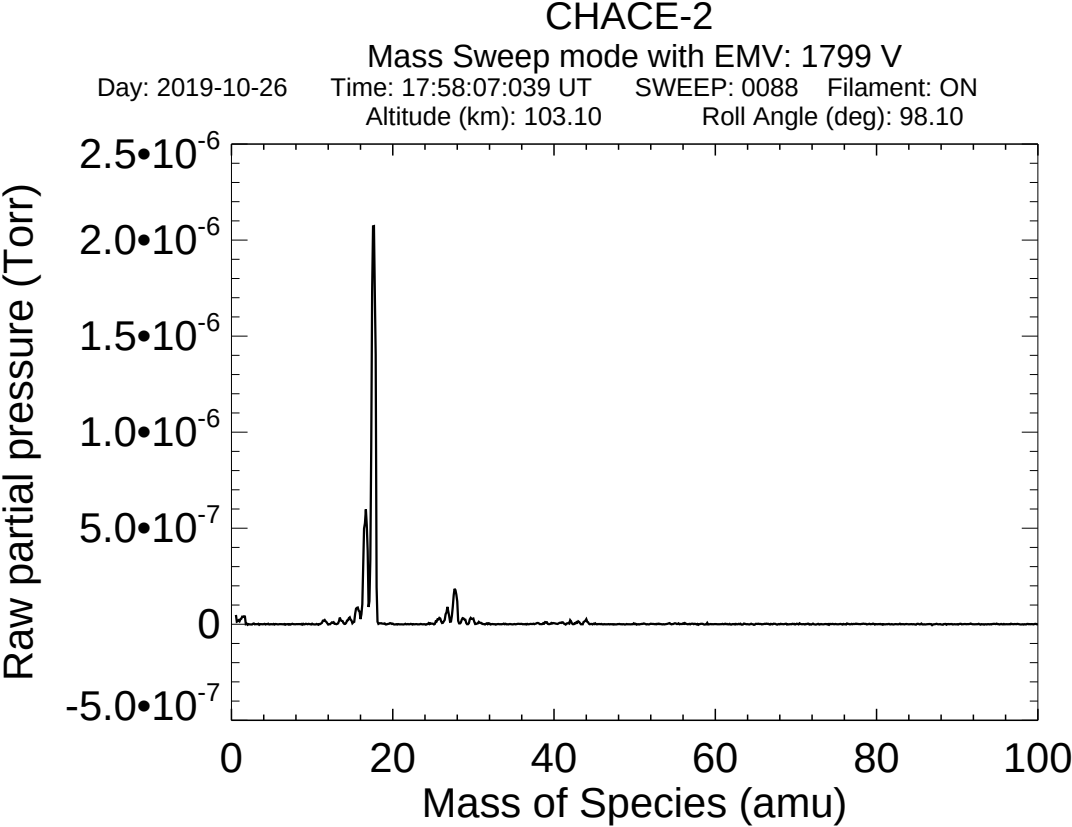

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:55:06:074 UT
SWEEP: 0083
Filament: ON
Altitude (km): 102.75
Roll Angle (deg): 102.26
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

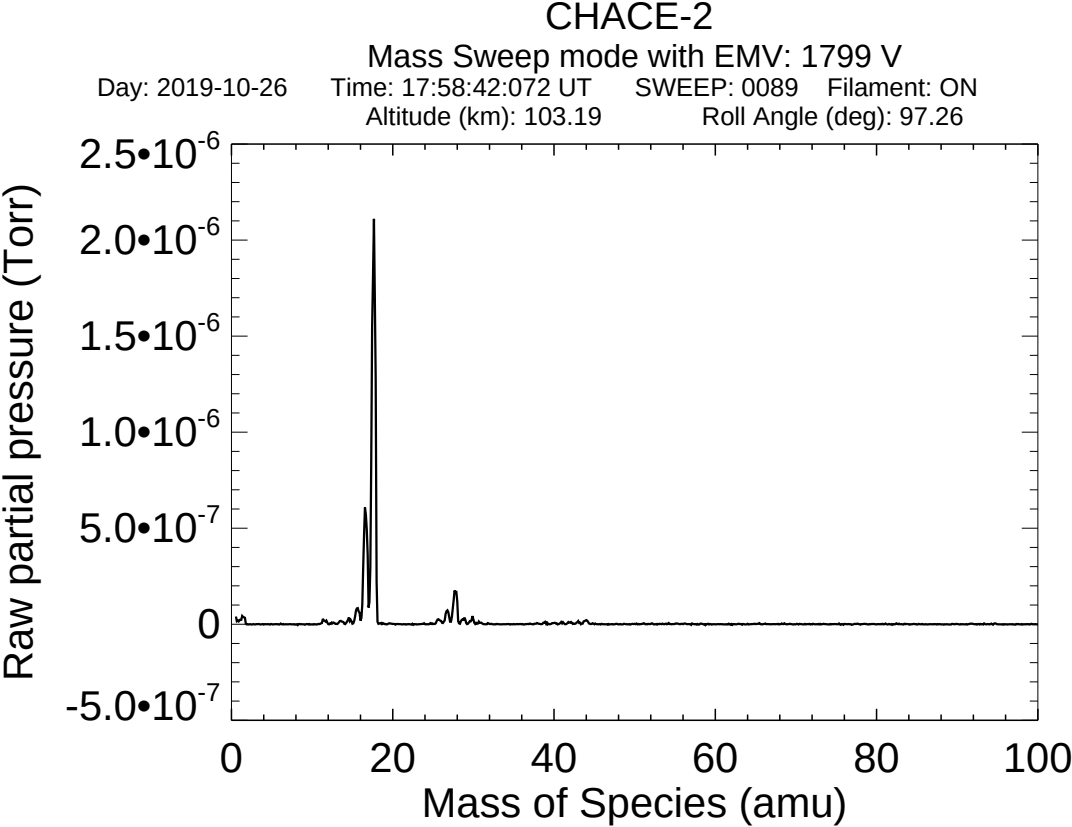

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:55:42:006 UT
SWEEP: 0084
Filament: ON
Altitude (km): 102.83
Roll Angle (deg): 101.46
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

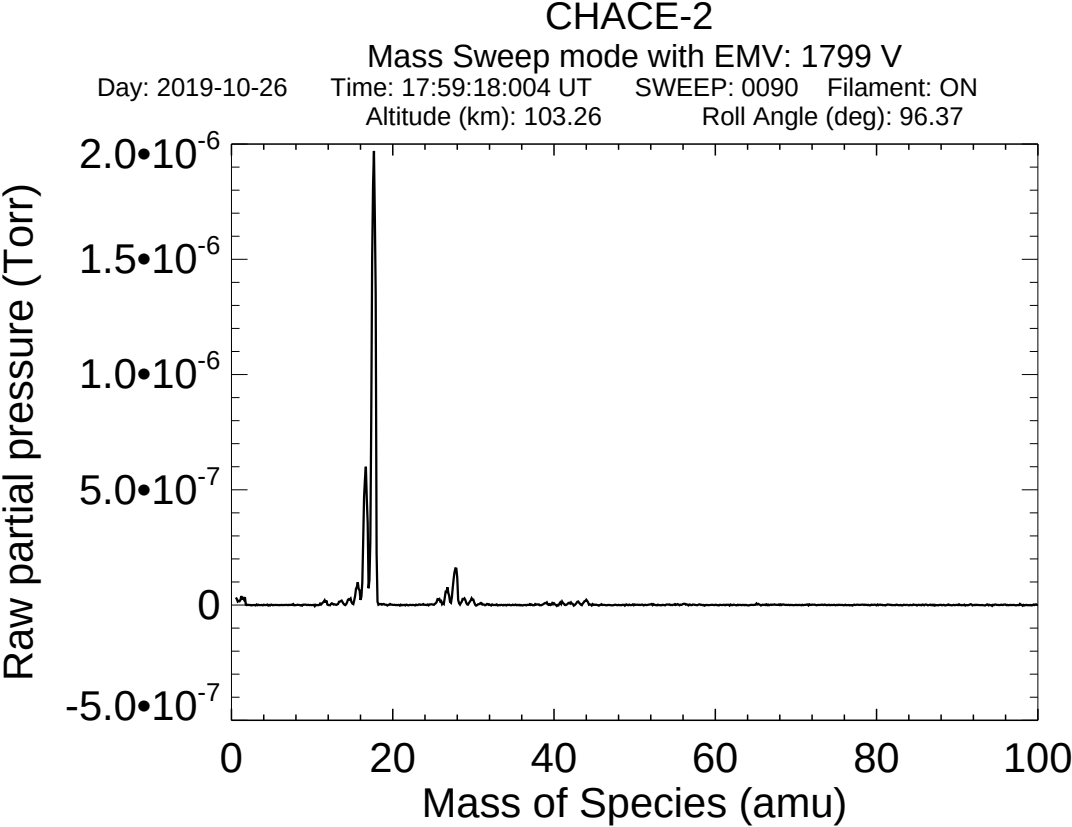

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:56:19:037 UT
SWEEP: 0085
Filament: ON
Altitude (km): 102.87
Roll Angle (deg): 100.62
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

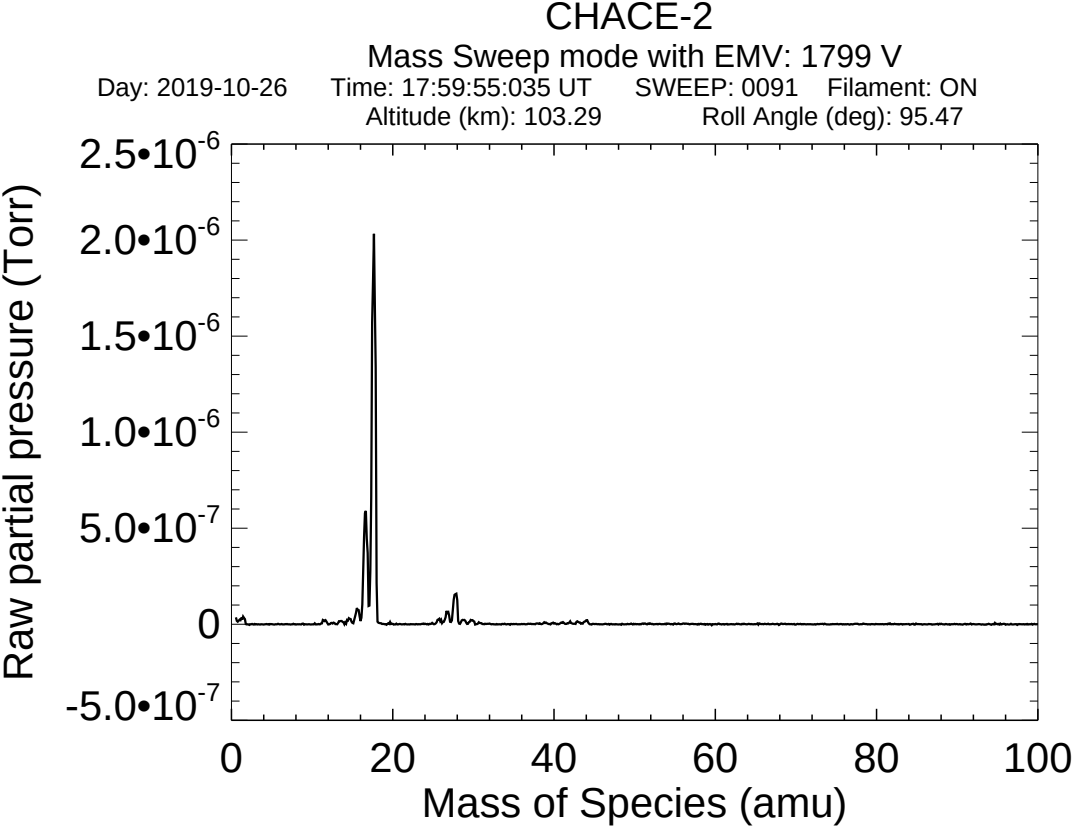

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:56:54:070 UT
SWEEP: 0086
Filament: ON
Altitude (km): 103.02
Roll Angle (deg): 99.82
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

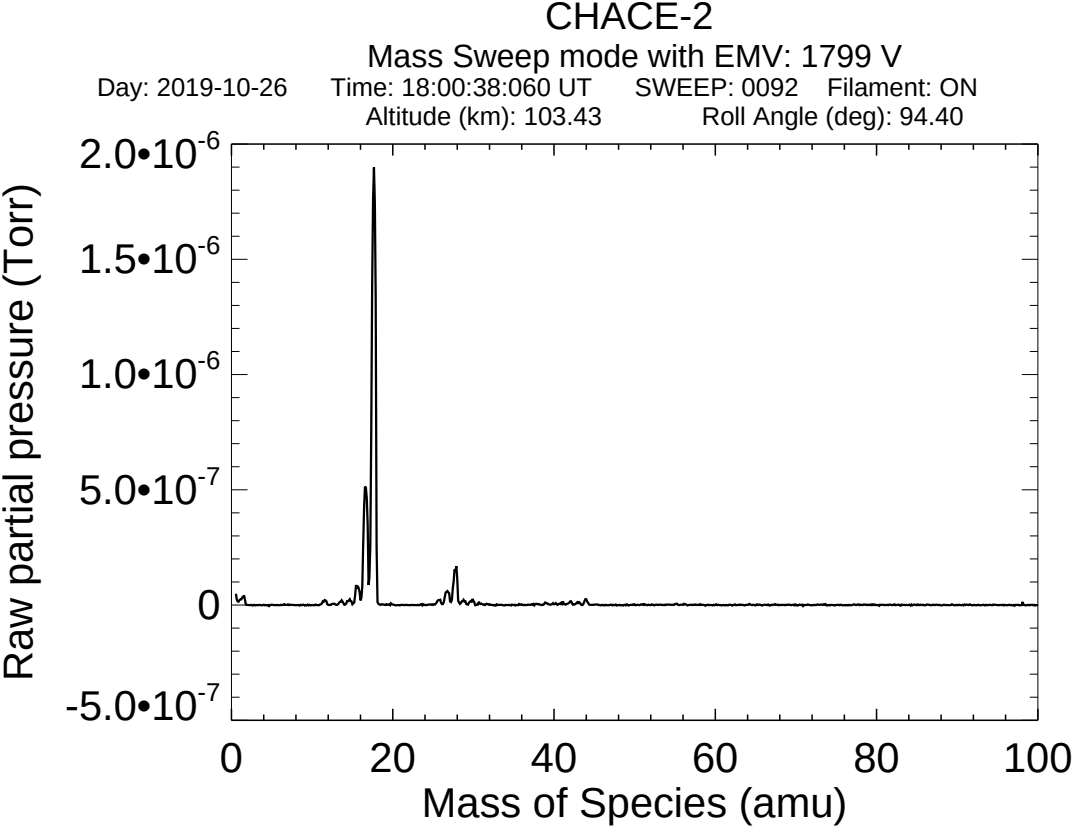

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:57:30:002 UT SWEEP: 0087 Filament: ON
Altitude (km): 103.04 Roll Angle (deg): 98.98
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

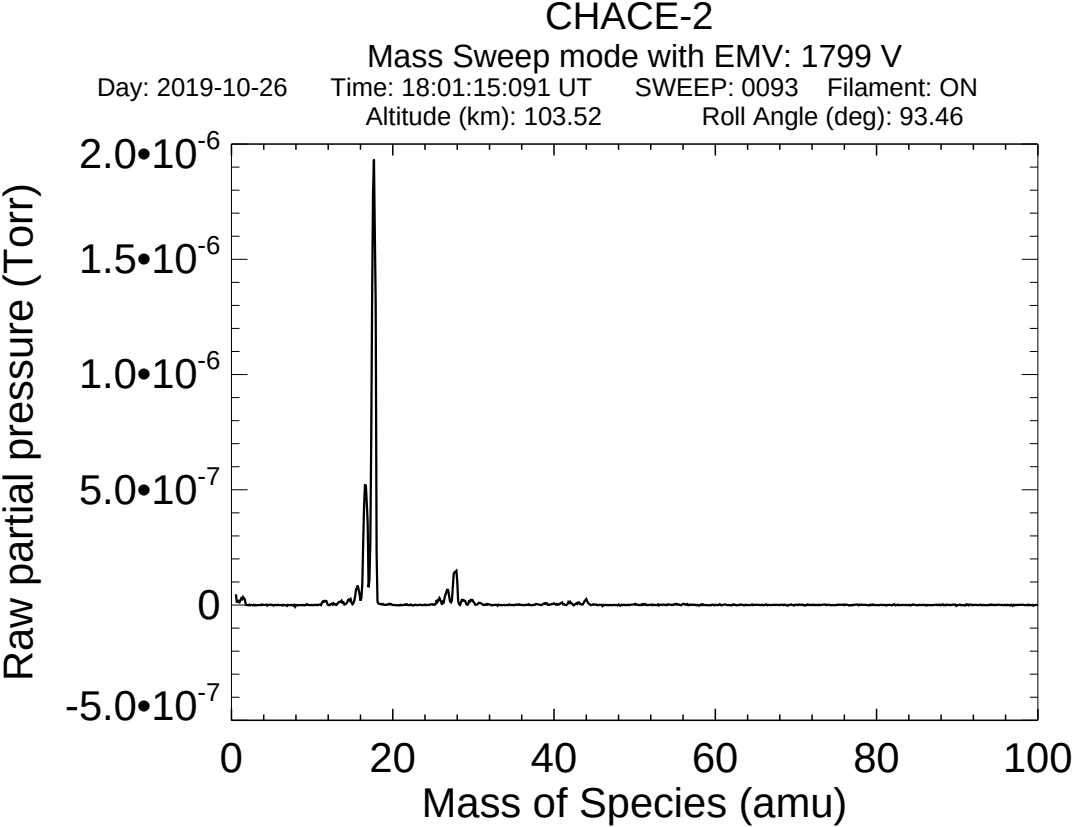

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:58:07:039 UT
SWEEP: 0088
Filament: ON
Altitude (km): 103.10
Roll Angle (deg): 98.10
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

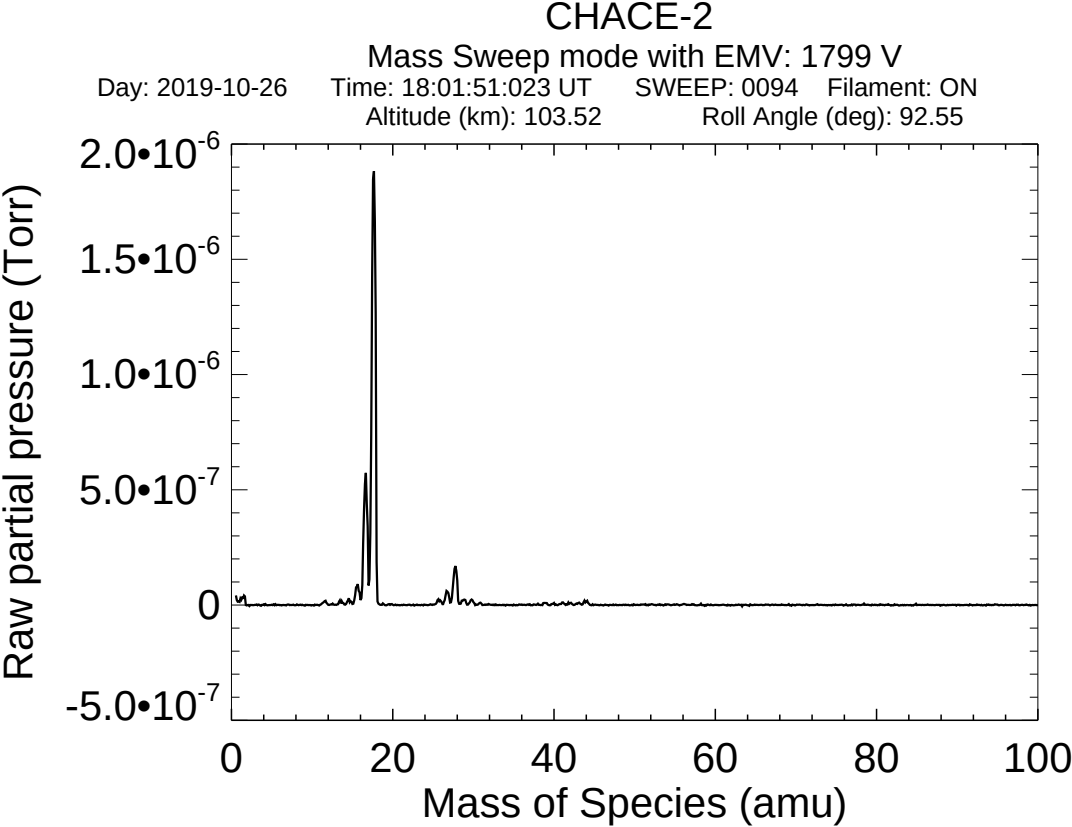

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 17:58:42:072 UT SWEEP: 0089 Filament: ON
Altitude (km): 103.19 Roll Angle (deg): 97.26
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

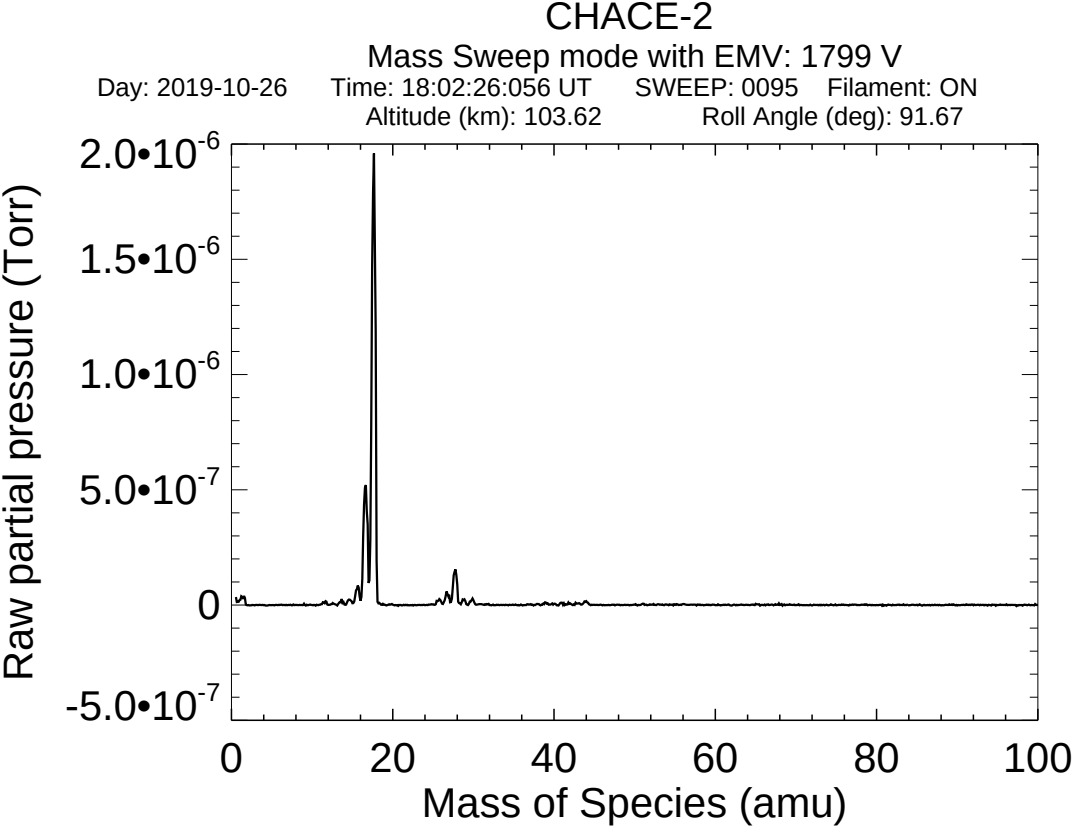

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:59:18:004 UT
SWEEP: 0090
Filament: ON
Altitude (km): 103.26
Roll Angle (deg): 96.37
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

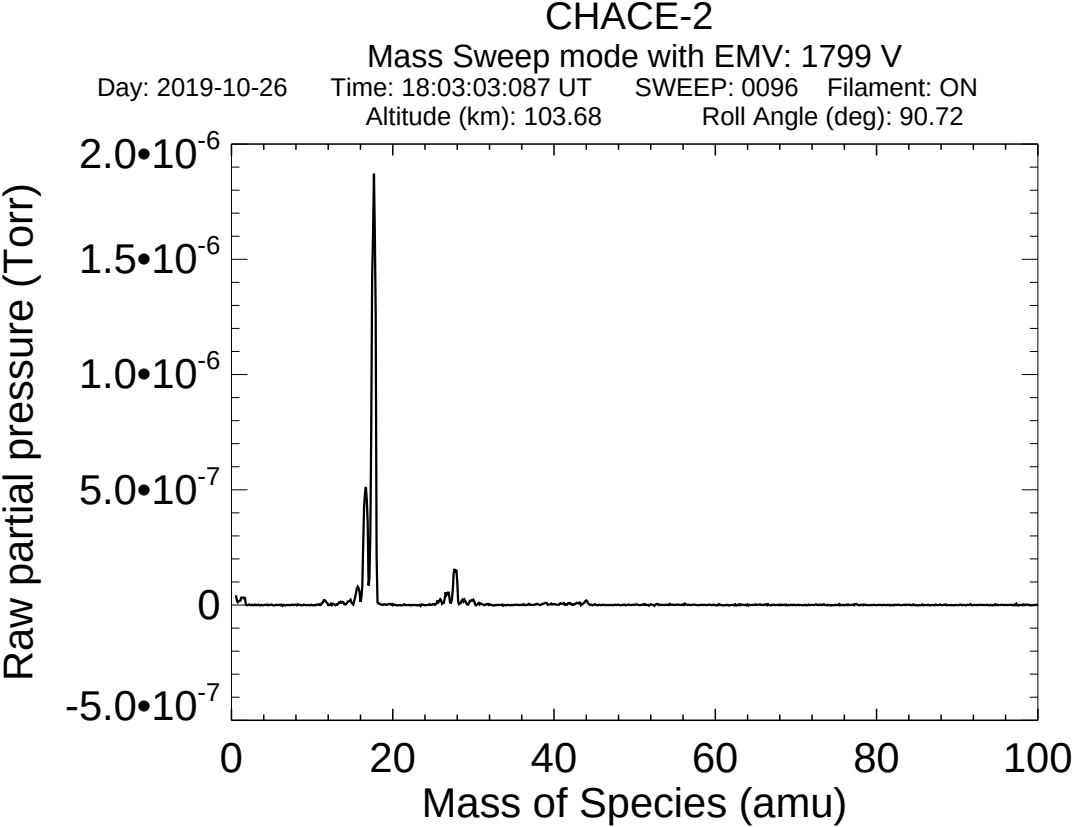

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 17:59:55:035 UT
SWEEP: 0091
Filament: ON
Altitude (km): 103.29
Roll Angle (deg): 95.47
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

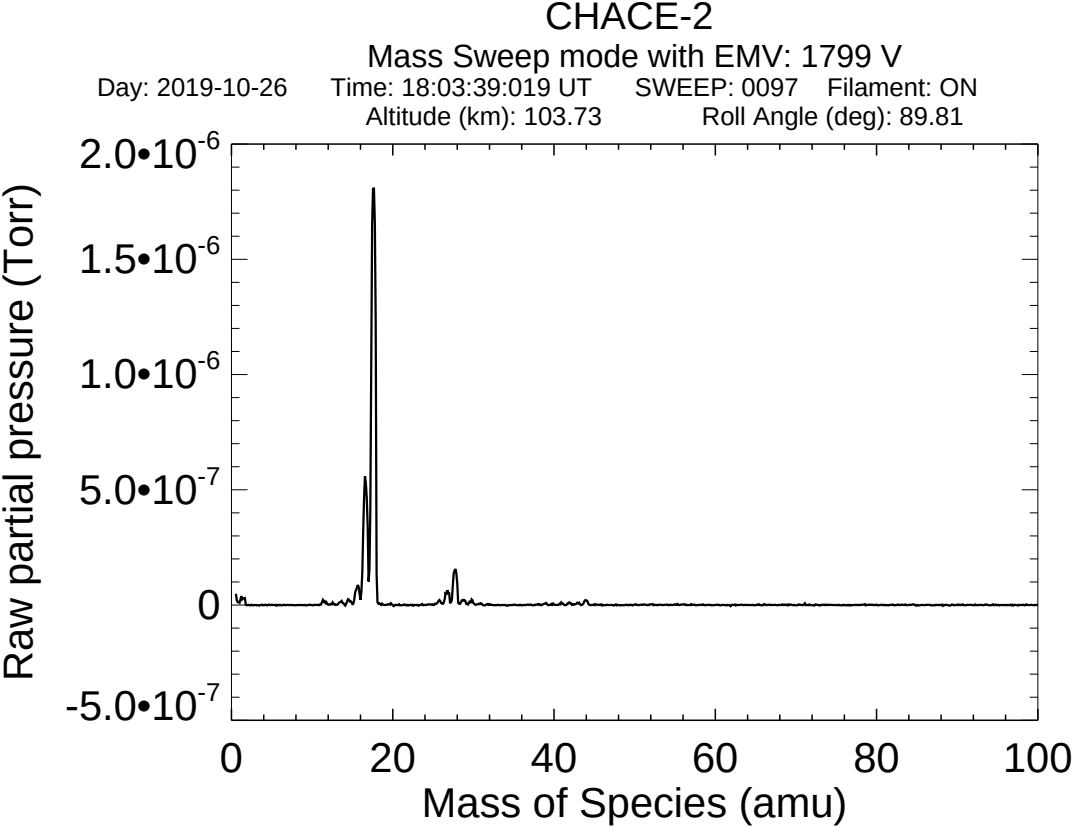

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:00:38:060 UT SWEEP: 0092 Filament: ON
Altitude (km): 103.43 Roll Angle (deg): 94.40
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

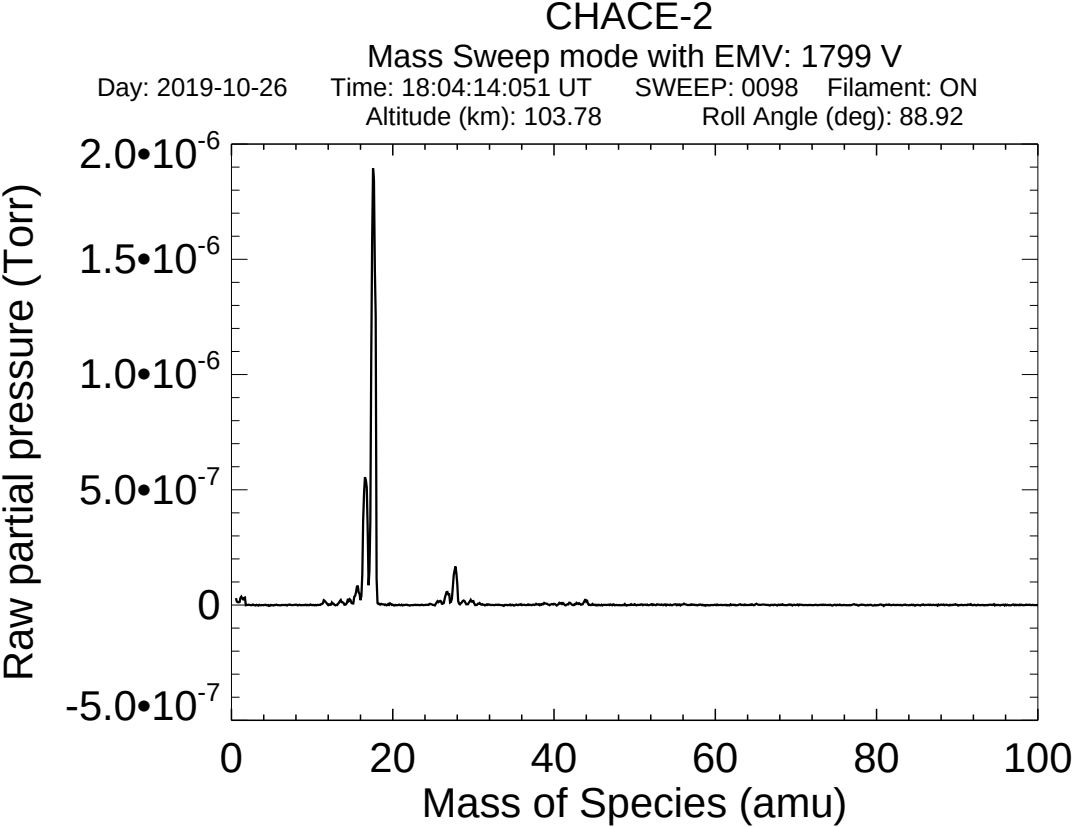

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:01:15:091 UT SWEEP: 0093 Filament: ON
Altitude (km): 103.52 Roll Angle (deg): 93.46
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

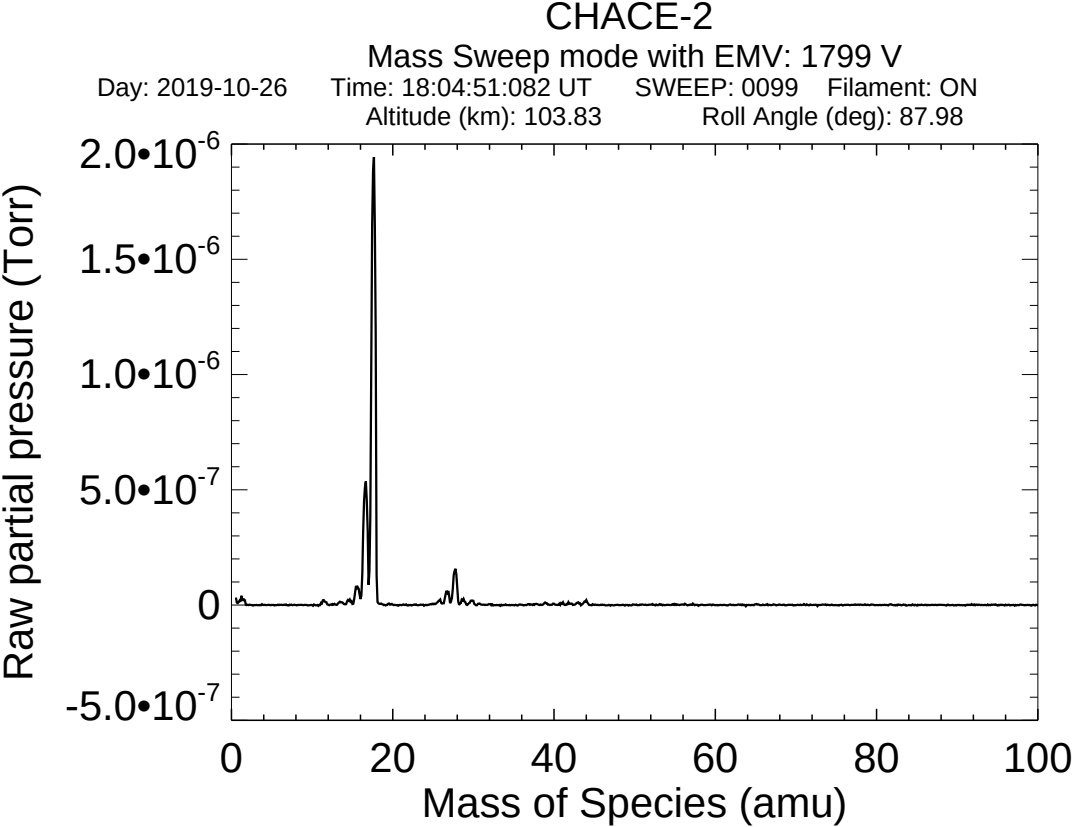

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:01:51:023 UT SWEEP: 0094 Filament: ON
Altitude (km): 103.52 Roll Angle (deg): 92.55
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

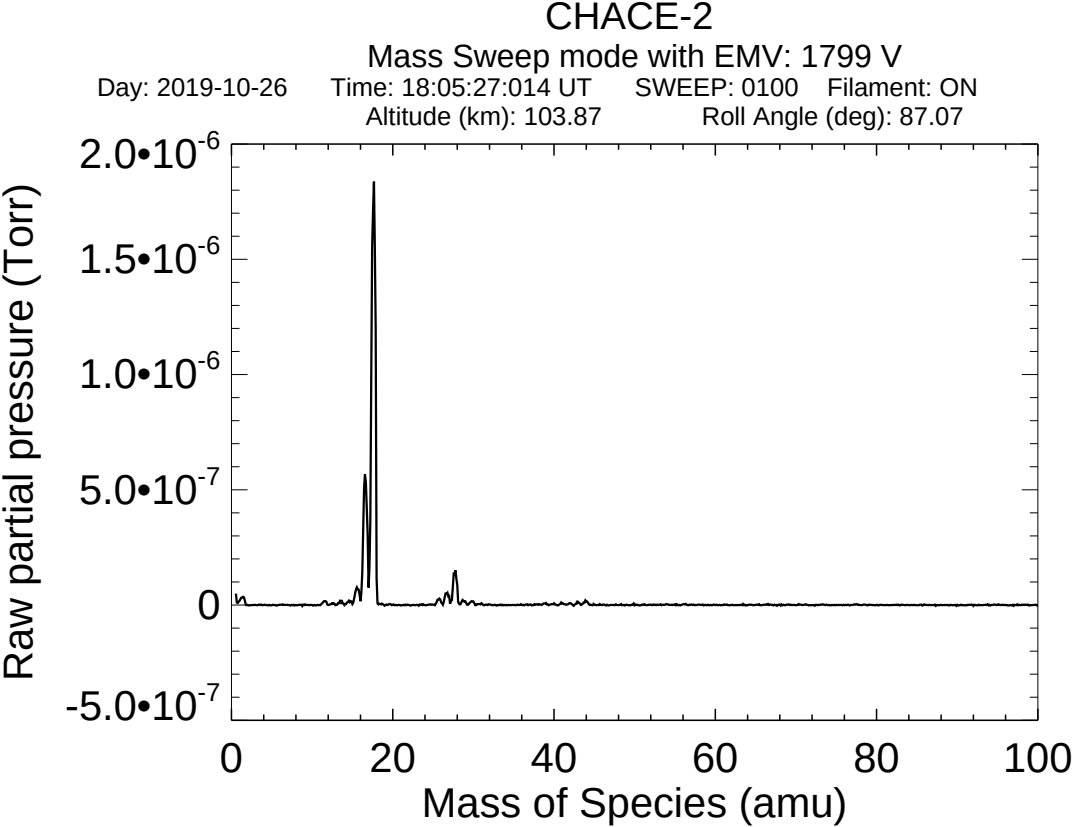

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:02:26:056 UT SWEEP: 0095 Filament: ON
Altitude (km): 103.62 Roll Angle (deg): 91.67
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

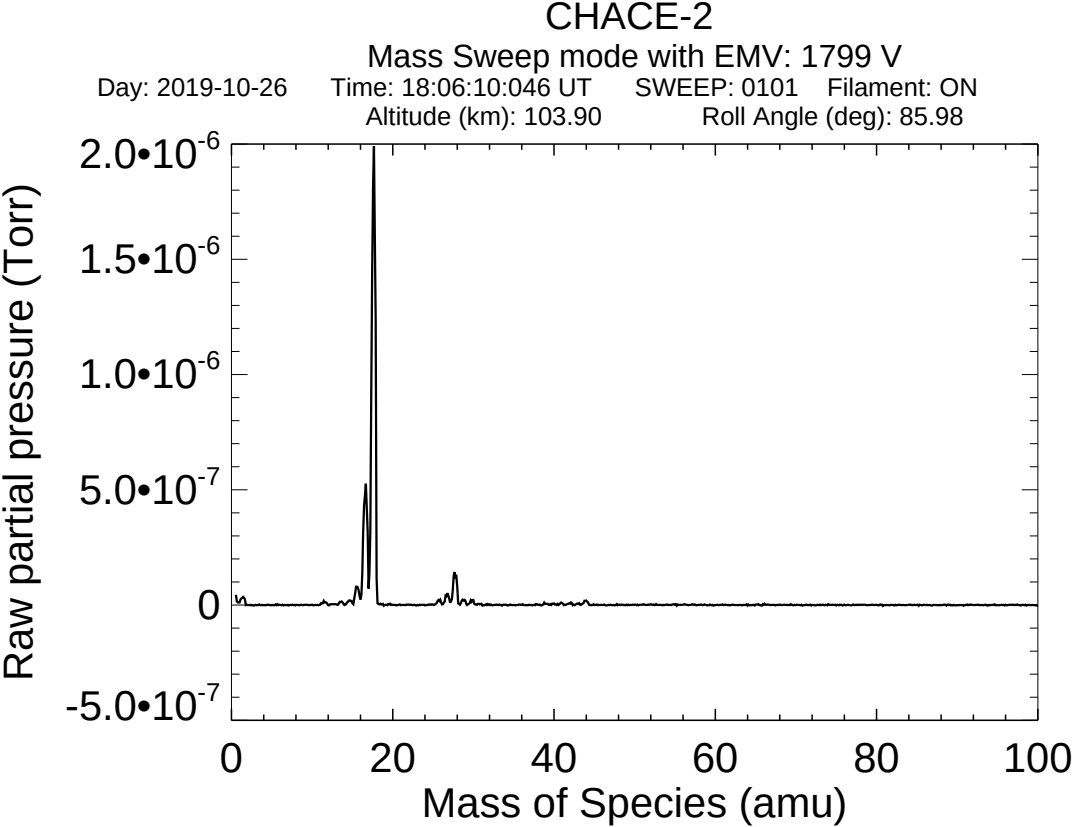

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 18:03:03:087 UT
SWEEP: 0096
Filament: ON
Altitude (km): 103.68
Roll Angle (deg): 90.72
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

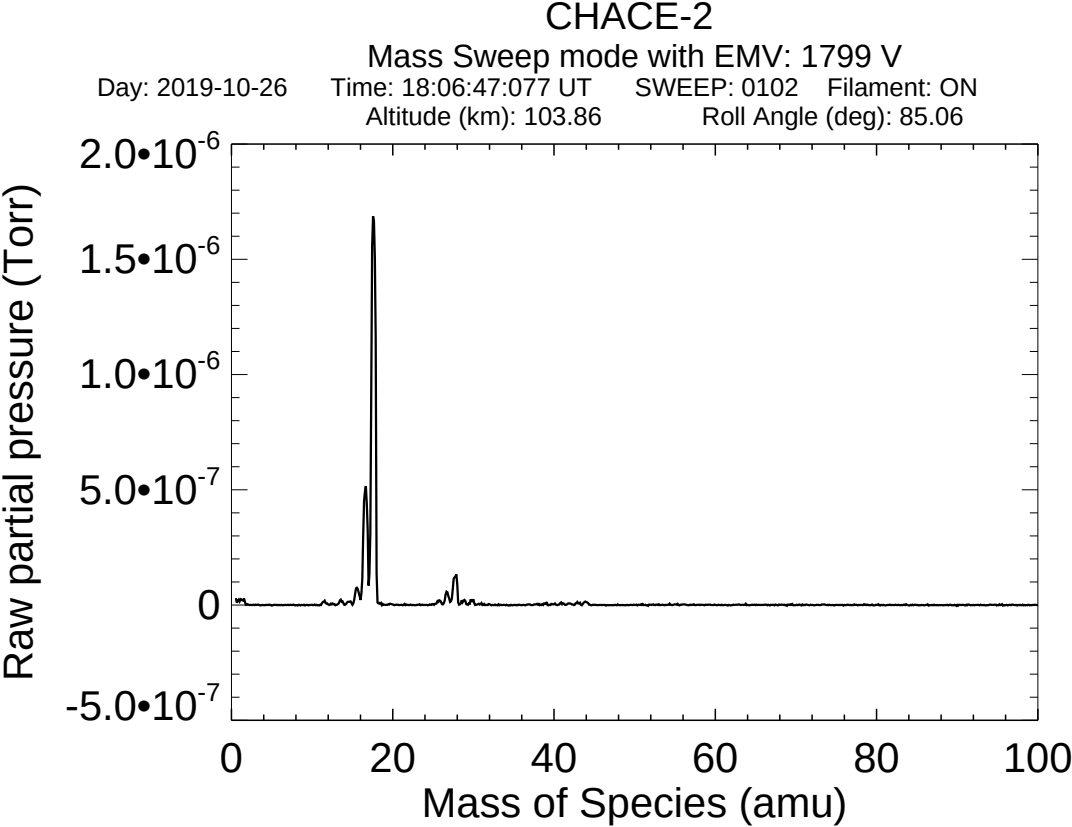

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 18:03:39:019 UT
SWEEP: 0097
Filament: ON
Altitude (km): 103.73
Roll Angle (deg): 89.81
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

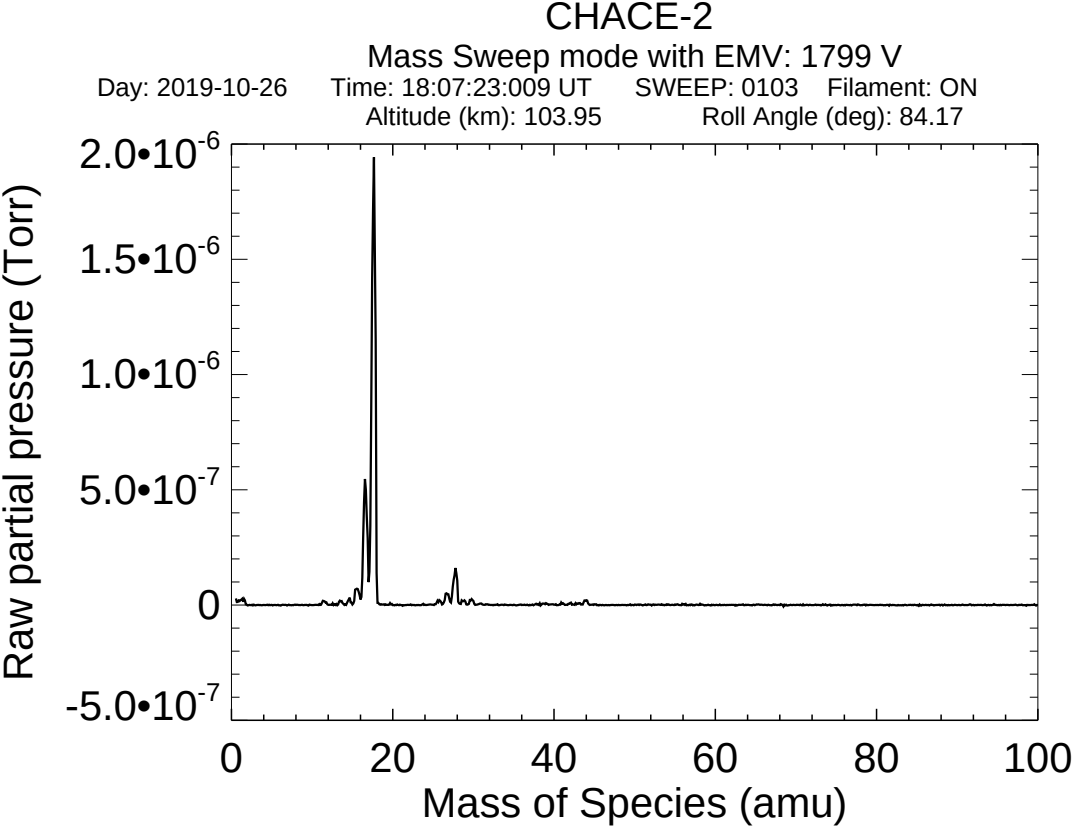

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:04:14:051 UT SWEEP: 0098 Filament: ON
Altitude (km): 103.78 Roll Angle (deg): 88.92
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

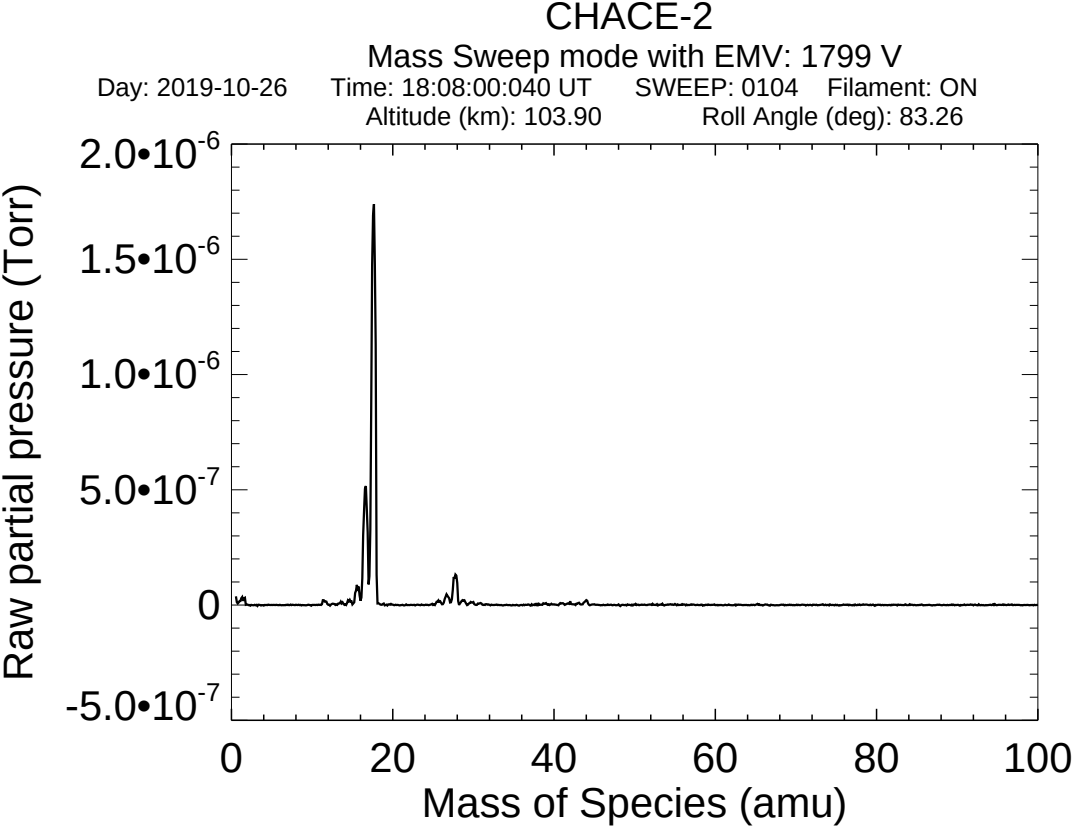

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:04:51:082 UT SWEEP: 0099 Filament: ON
Altitude (km): 103.83 Roll Angle (deg): 87.98
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

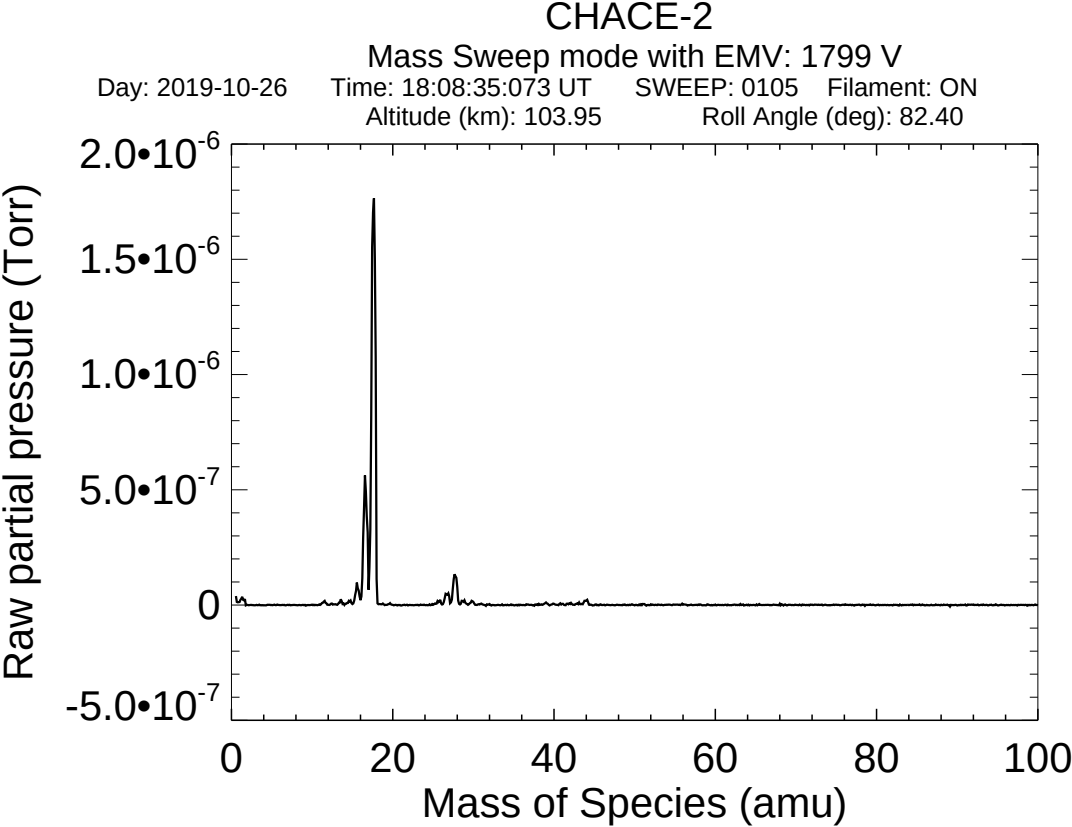

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 18:05:27:014 UT
SWEEP: 0100
Filament: ON
Altitude (km): 103.87
Roll Angle (deg): 87.07
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

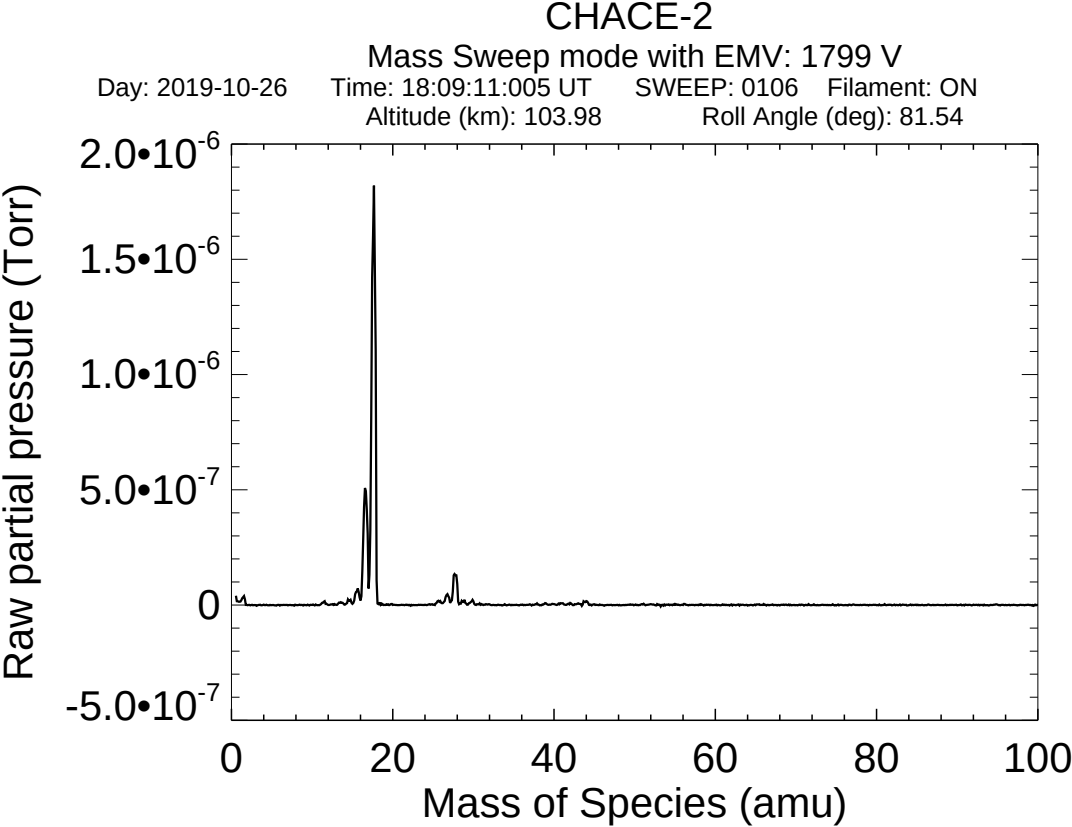

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:06:10:046 UT SWEEP: 0101 Filament: ON
Altitude (km): 103.90 Roll Angle (deg): 85.98
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

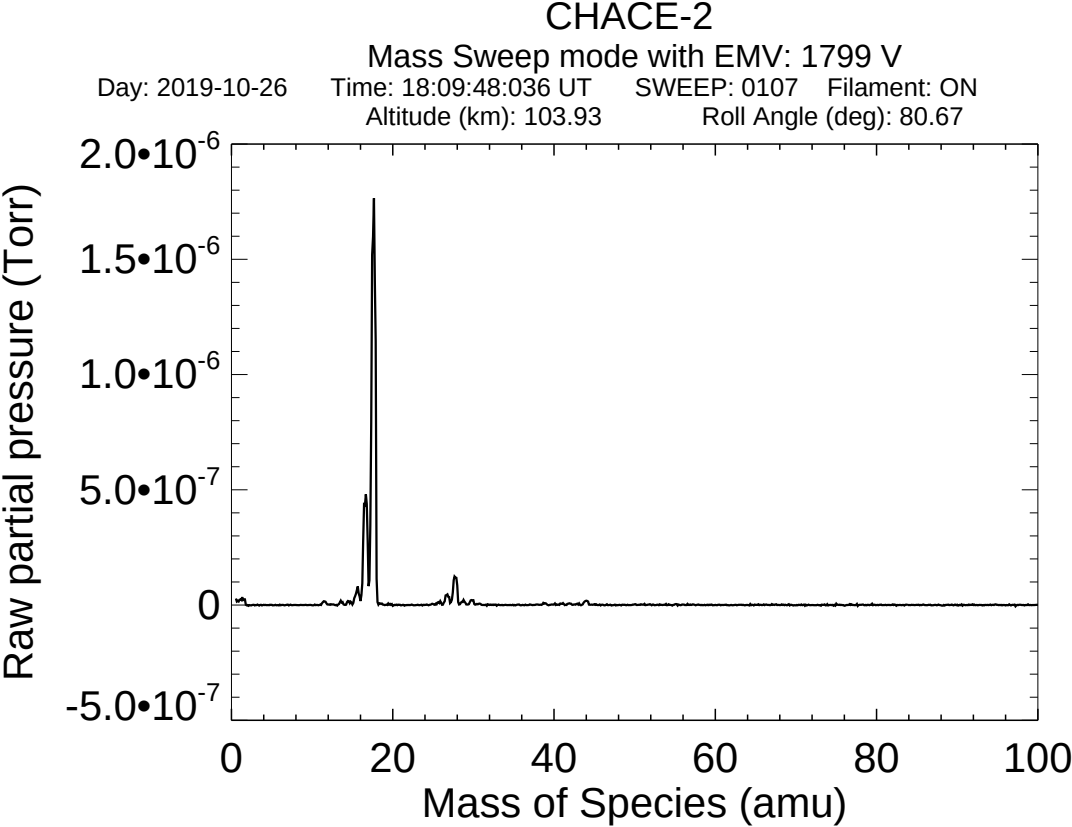

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:06:47:077 UT SWEEP: 0102 Filament: ON
Altitude (km): 103.86 Roll Angle (deg): 85.06
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

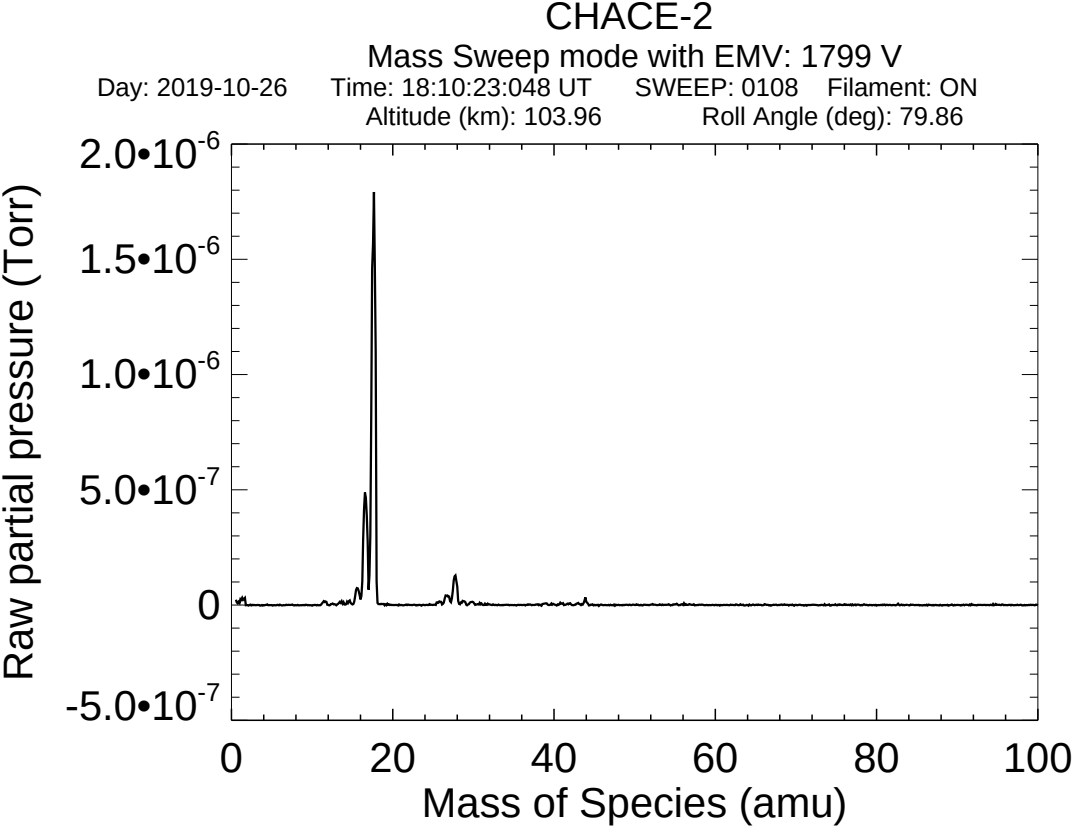

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:07:23:009 UT SWEEP: 0103 Filament: ON
Altitude (km): 103.95 Roll Angle (deg): 84.17
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

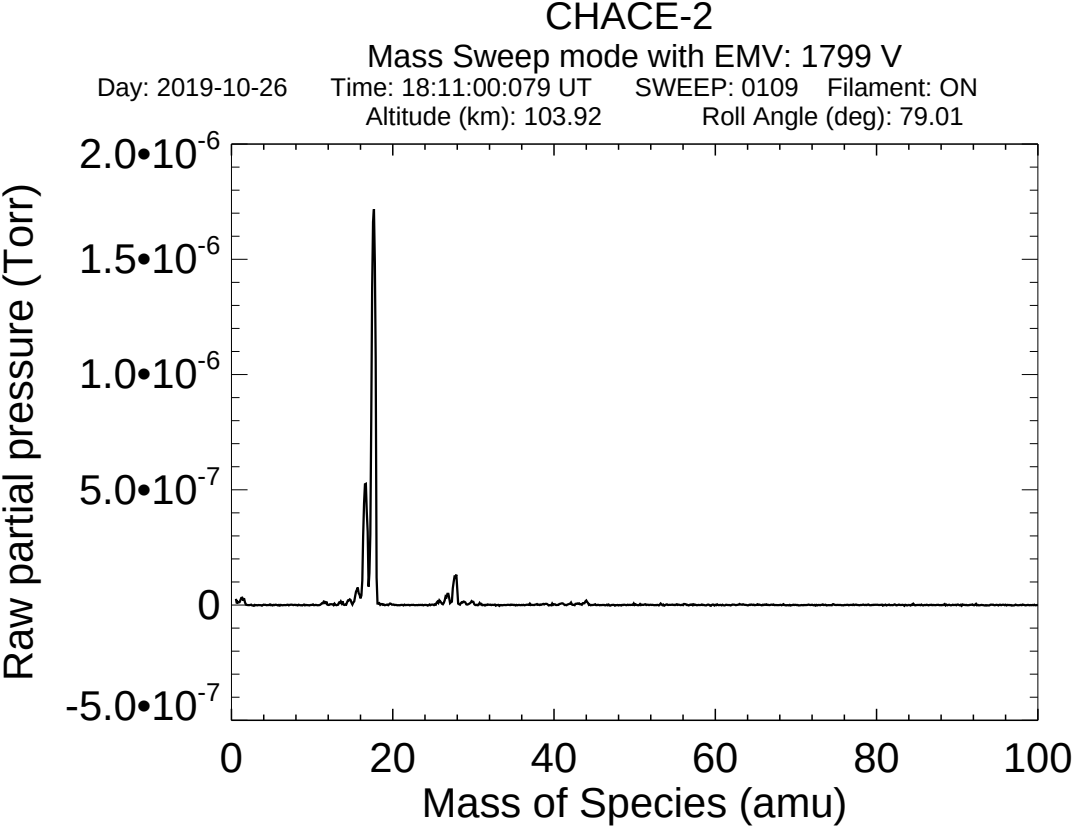

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:08:00:040 UT SWEEP: 0104 Filament: ON
Altitude (km): 103.90 Roll Angle (deg): 83.26
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

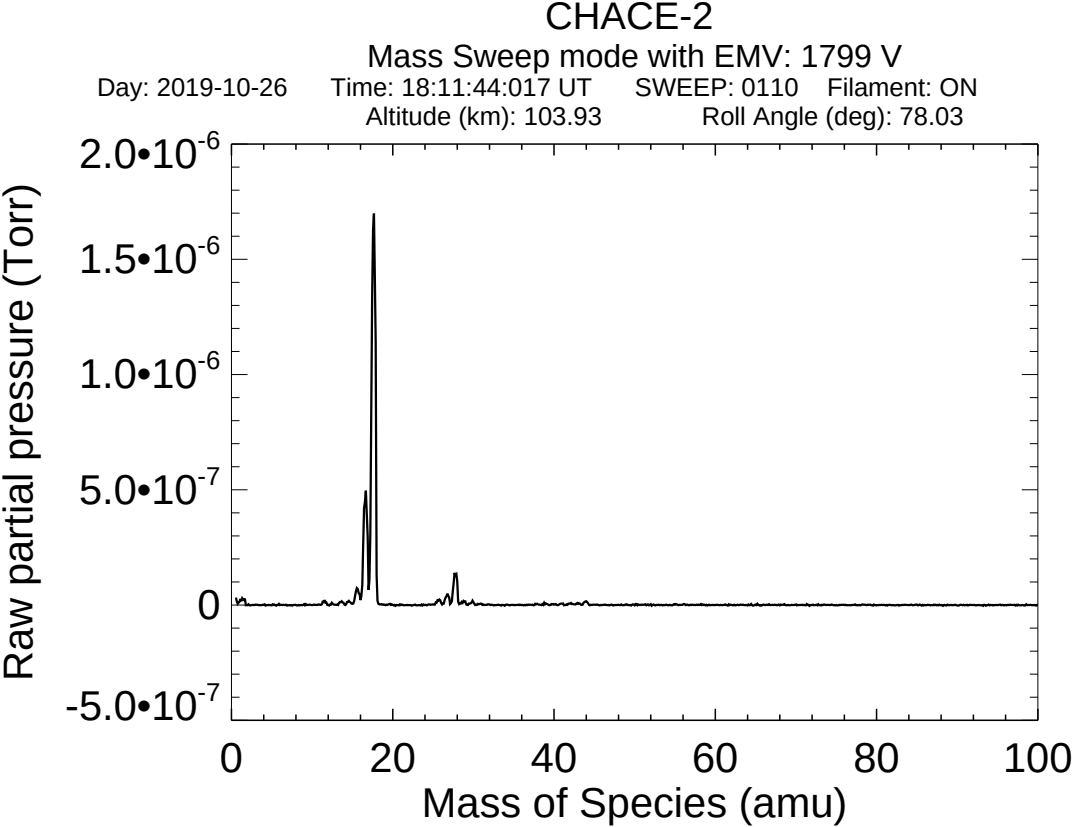

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:08:35:073 UT SWEEP: 0105 Filament: ON
Altitude (km): 103.95 Roll Angle (deg): 82.40
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

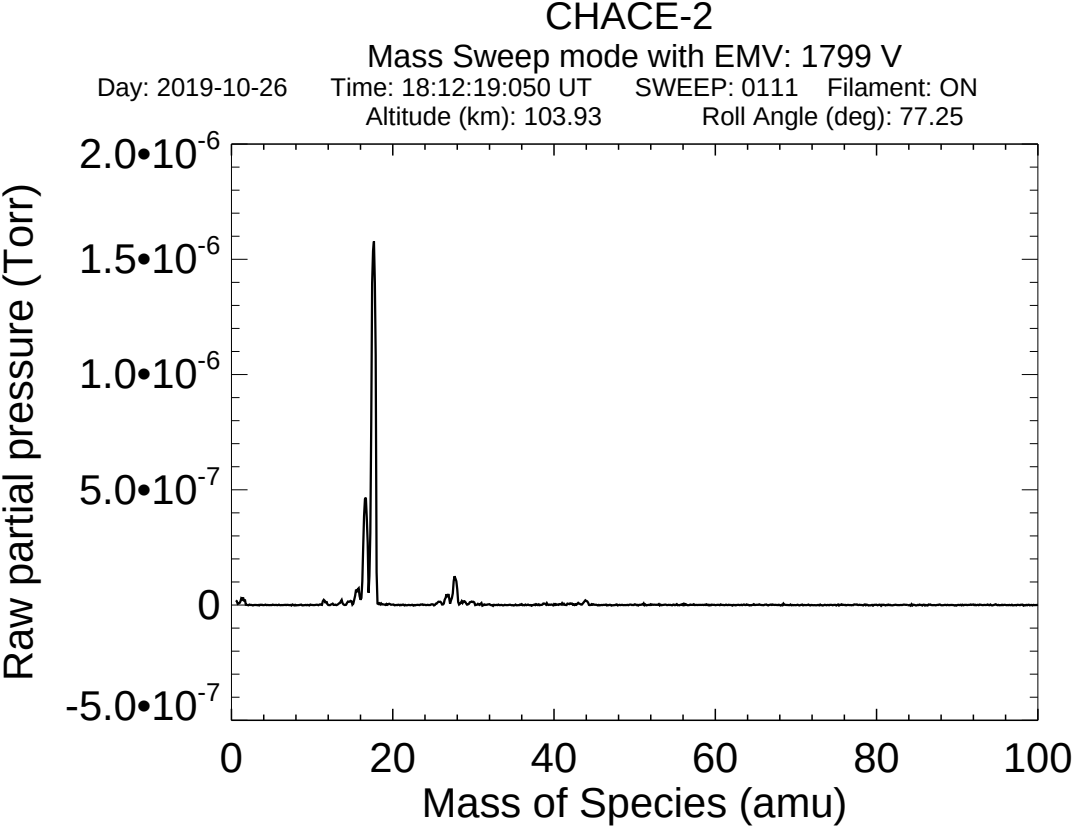

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:09:11:005 UT SWEEP: 0106 Filament: ON
Altitude (km): 103.98 Roll Angle (deg): 81.54
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

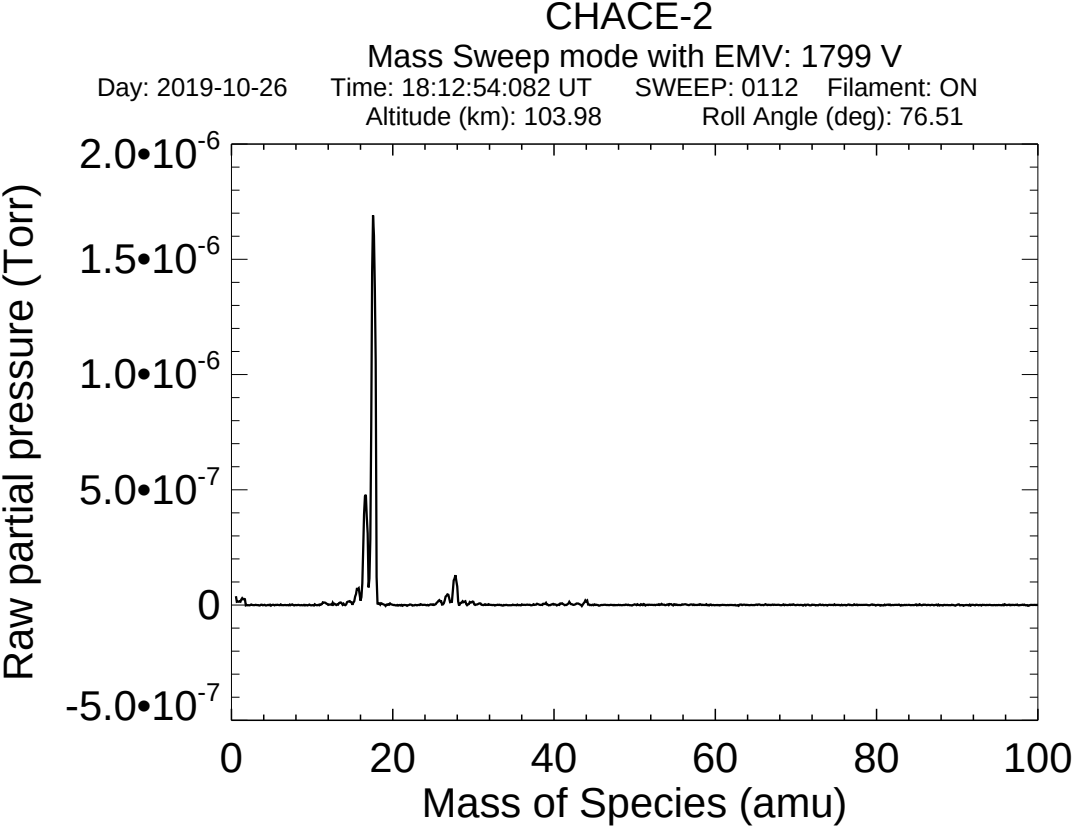

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:09:48:036 UT SWEEP: 0107 Filament: ON
Altitude (km): 103.93 Roll Angle (deg): 80.67
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

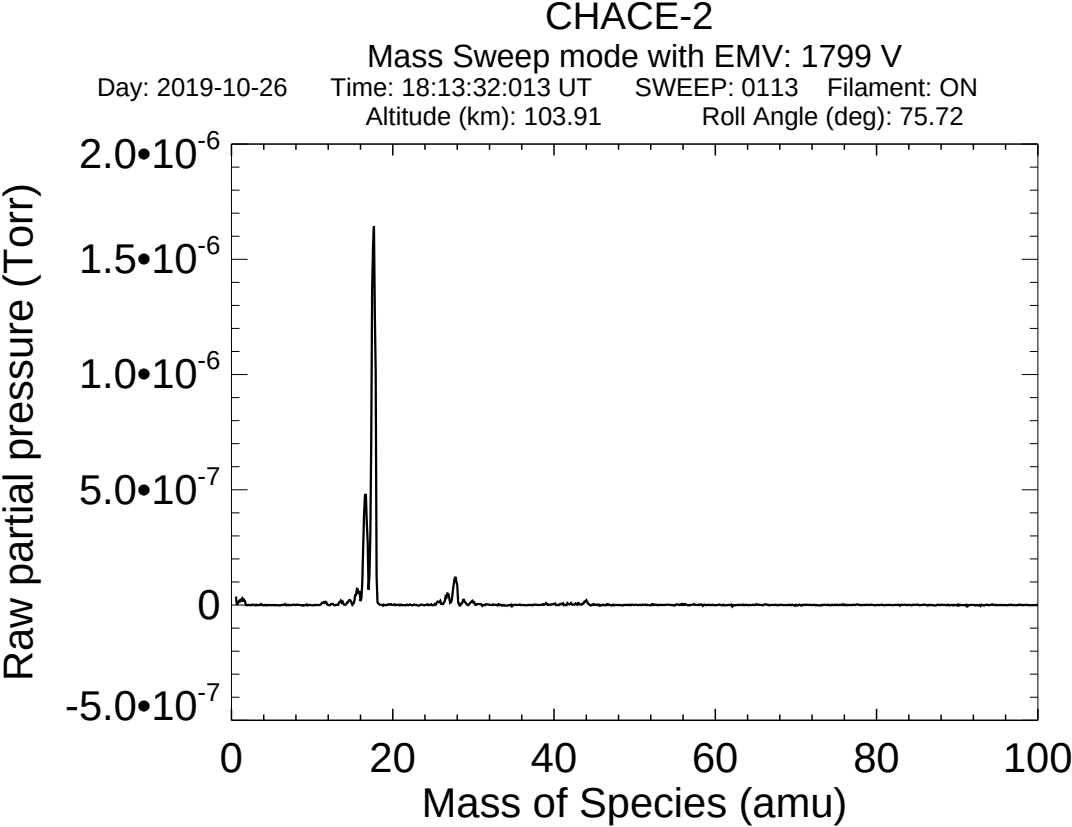

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:10:23:048 UT SWEEP: 0108 Filament: ON
Altitude (km): 103.96 Roll Angle (deg): 79.86
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

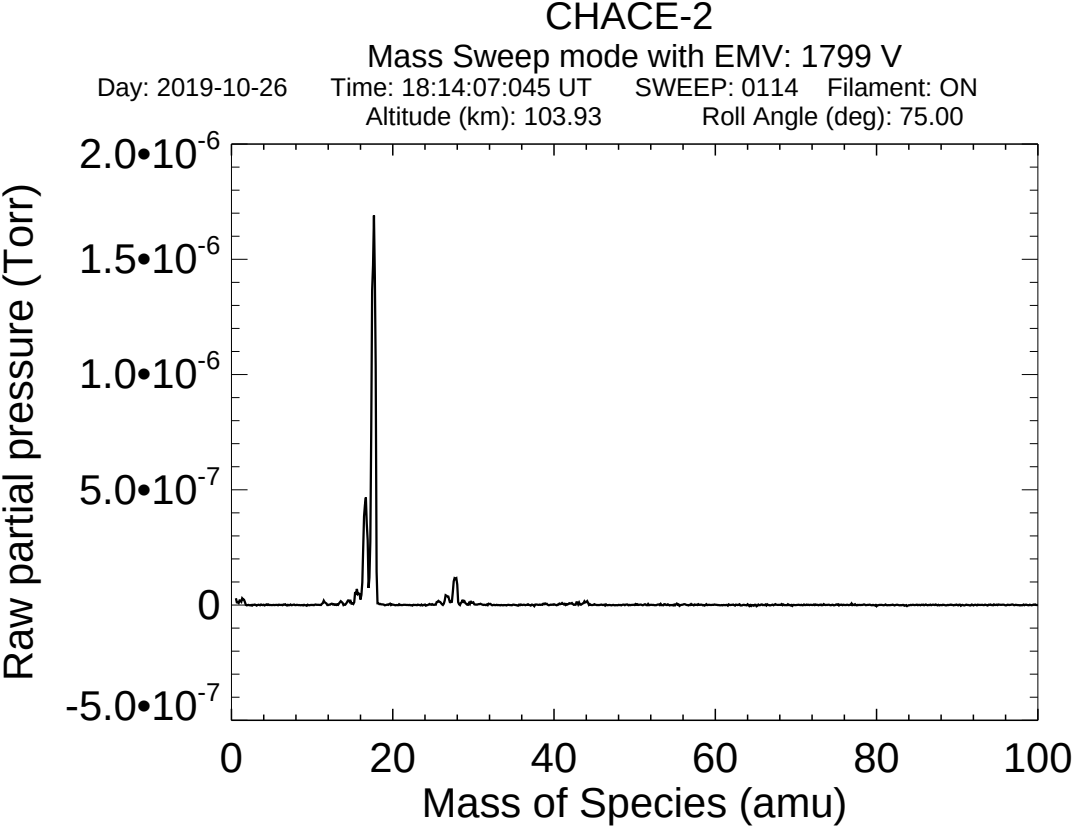

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:11:00:079 UT SWEEP: 0109 Filament: ON
Altitude (km): 103.92 Roll Angle (deg): 79.01
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

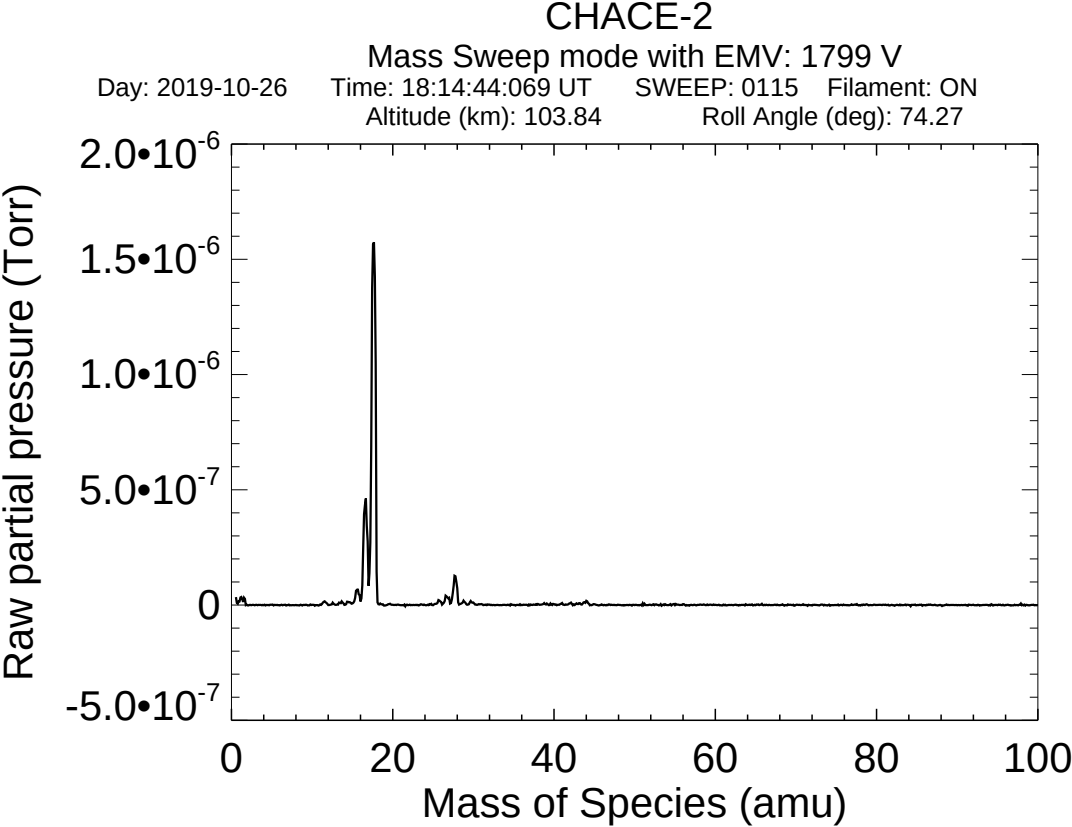

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:11:44:017 UT SWEEP: 0110 Filament: ON
Altitude (km): 103.93 Roll Angle (deg): 78.03
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

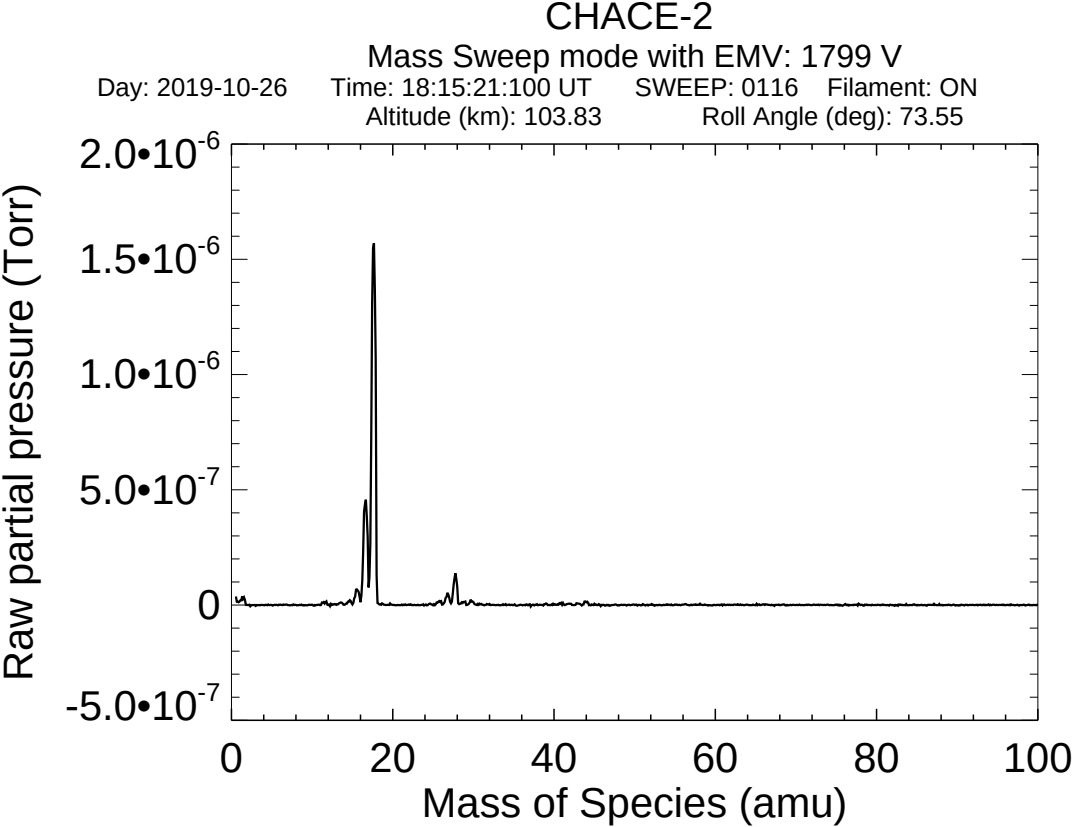

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:12:19:050 UT SWEEP: 0111 Filament: ON
Altitude (km): 103.93 Roll Angle (deg): 77.25
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

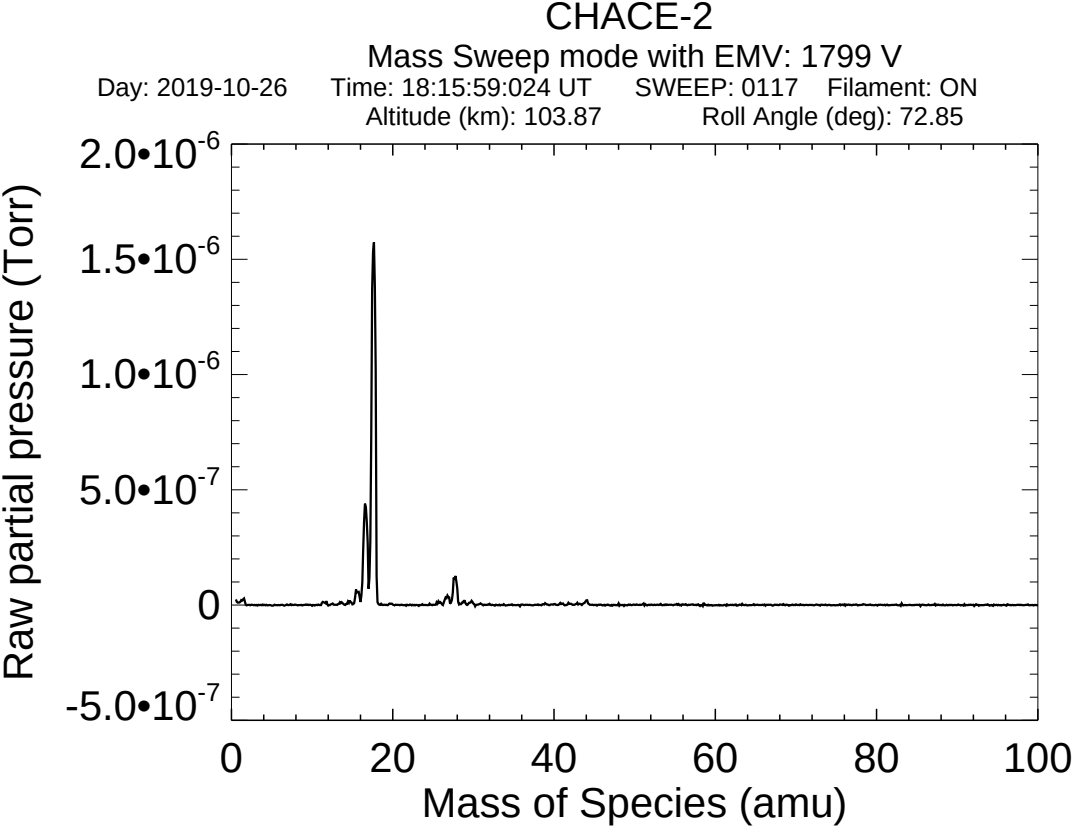

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:12:54:082 UT SWEEP: 0112 Filament: ON
Altitude (km): 103.98 Roll Angle (deg): 76.51
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

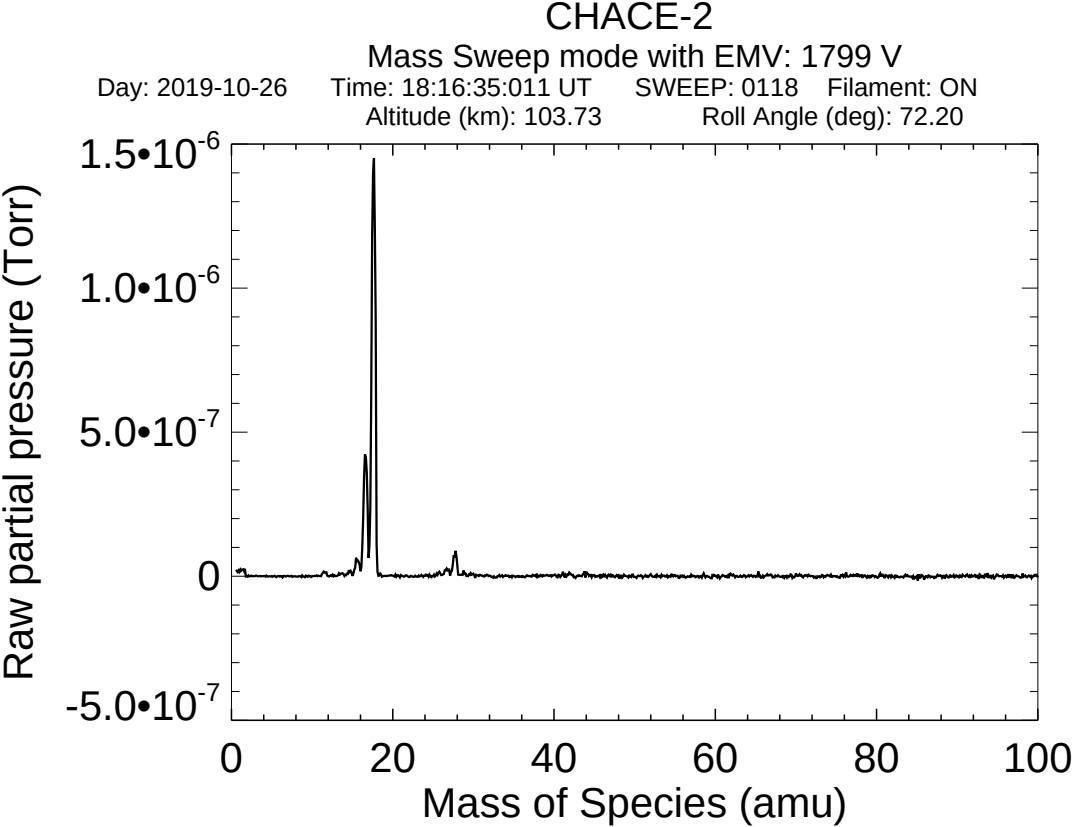

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:13:32:013 UT SWEEP: 0113 Filament: ON
Altitude (km): 103.91 Roll Angle (deg): 75.72
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

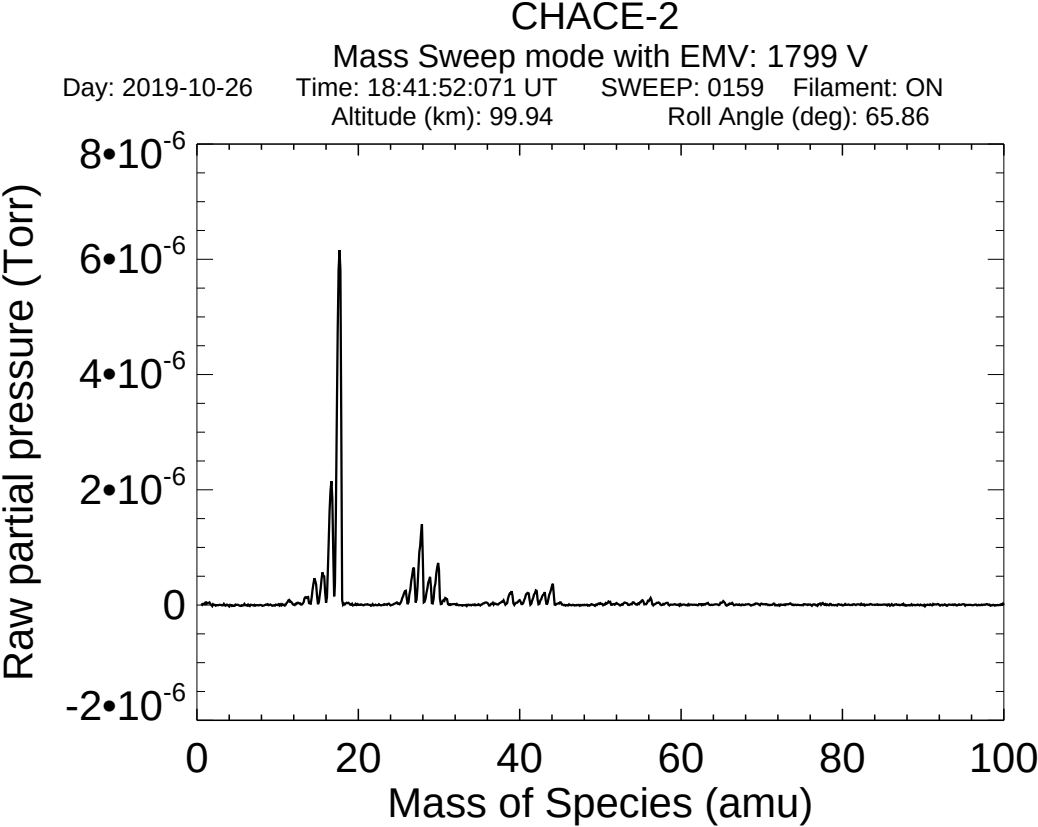

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:14:07:045 UT SWEEP: 0114 Filament: ON
Altitude (km): 103.93 Roll Angle (deg): 75.00
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

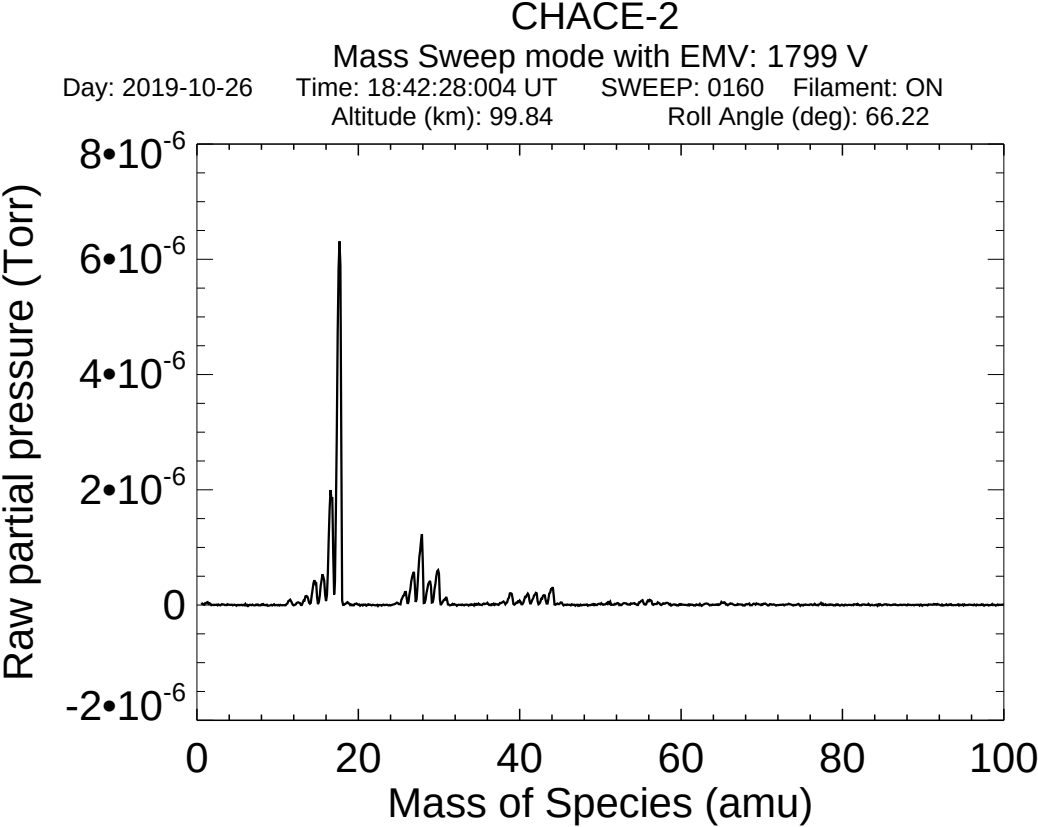

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:14:44:069 UT SWEEP: 0115 Filament: ON
Altitude (km): 103.84 Roll Angle (deg): 74.27
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

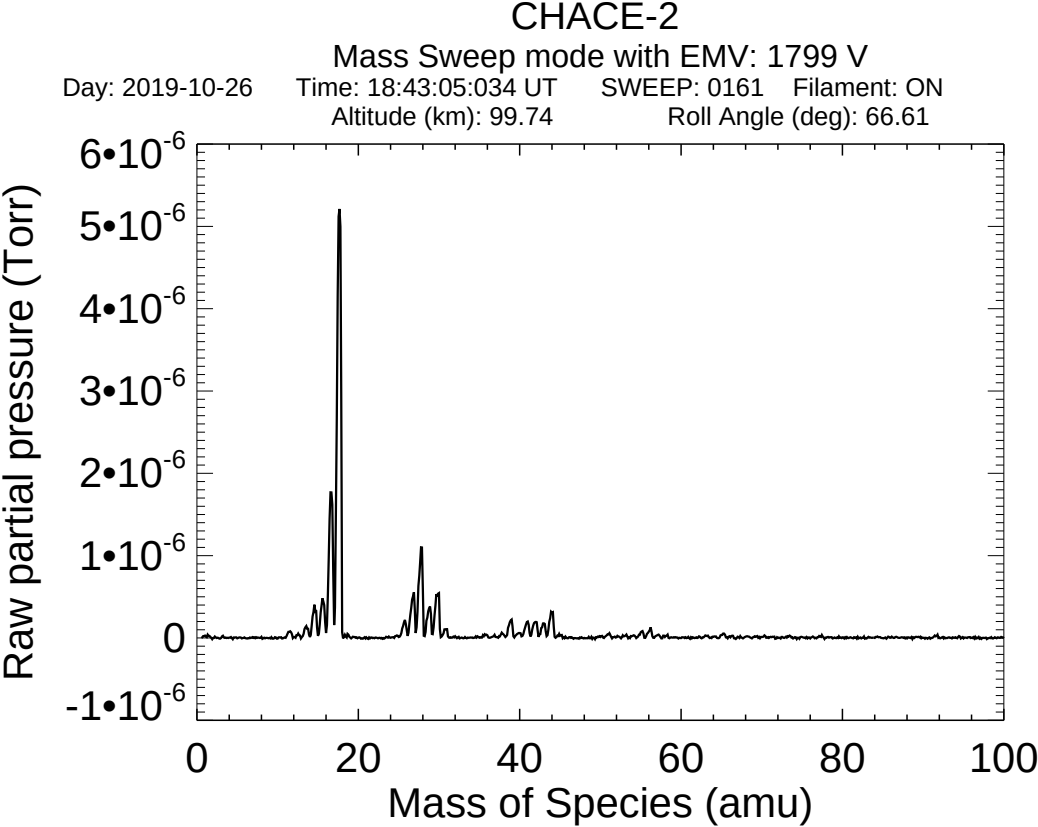

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:15:21:100 UT SWEEP: 0116 Filament: ON
Altitude (km): 103.83 Roll Angle (deg): 73.55
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

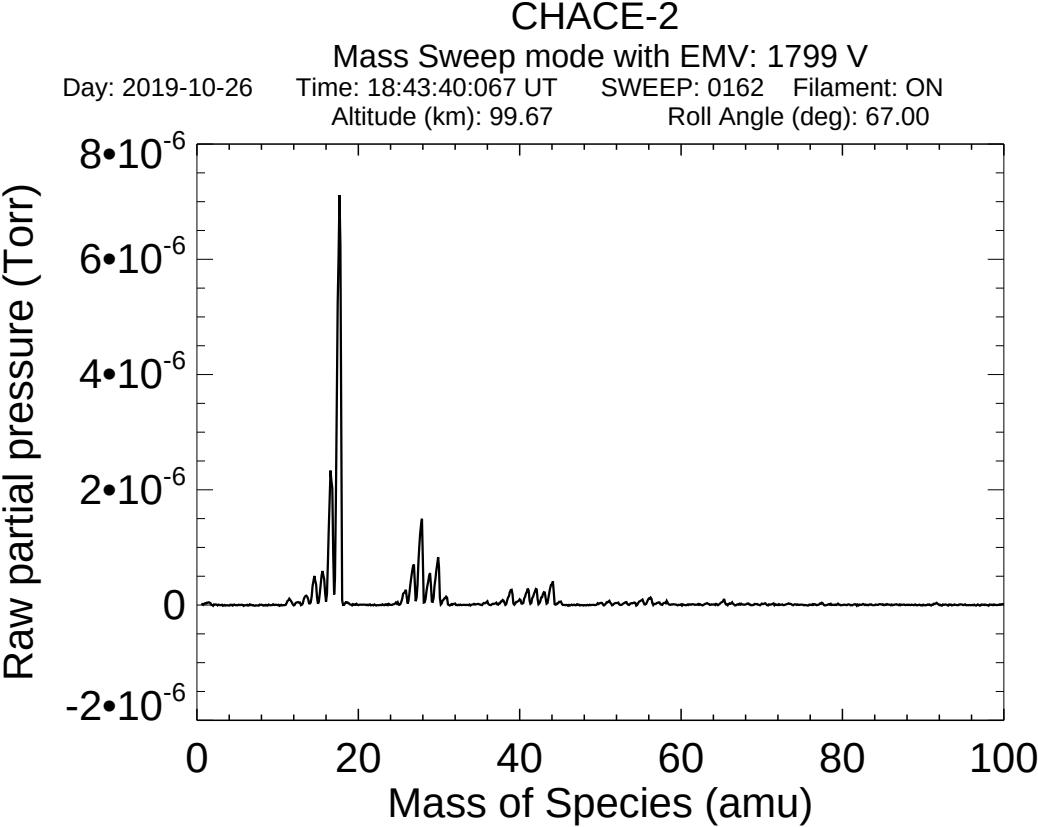

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:15:59:024 UT SWEEP: 0117 Filament: ON
Altitude (km): 103.87 Roll Angle (deg): 72.85
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

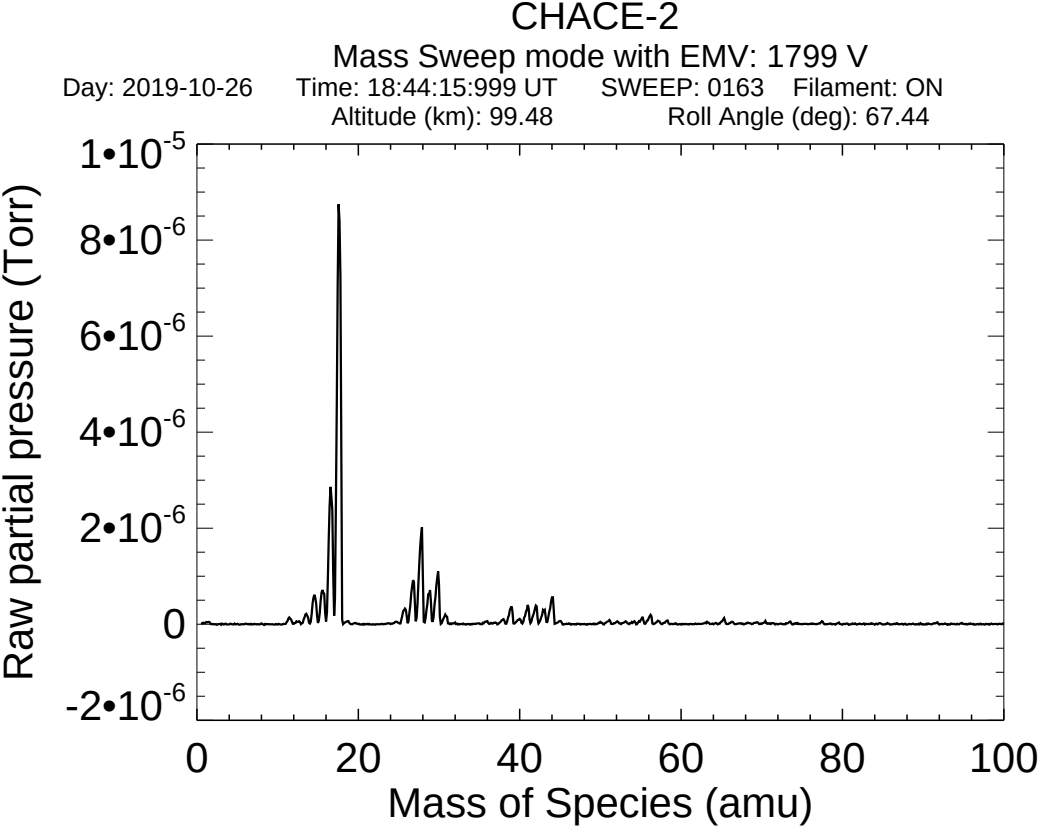

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:16:35:011 UT SWEEP: 0118 Filament: ON
Altitude (km): 103.73 Roll Angle (deg): 72.20
Raw partial pressure (Torr)
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

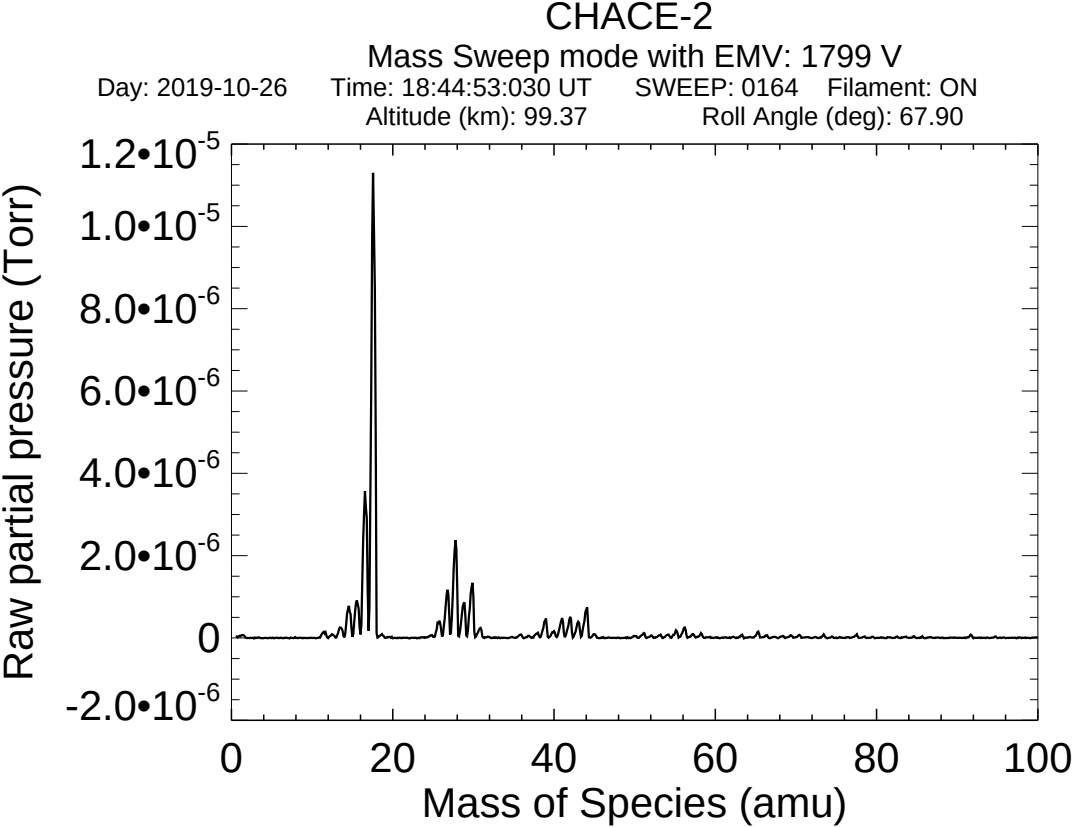

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 18:41:52:071 UT
SWEEP: 0159
Filament: ON
Altitude (km): 99.94
Roll Angle (deg): 65.86
Raw partial pressure (Torr)
8•10-6
6•10-6
4•10-6
2•10-6
0
-2•10-6
0
20
40
60
80
100
Mass of Species (amu)

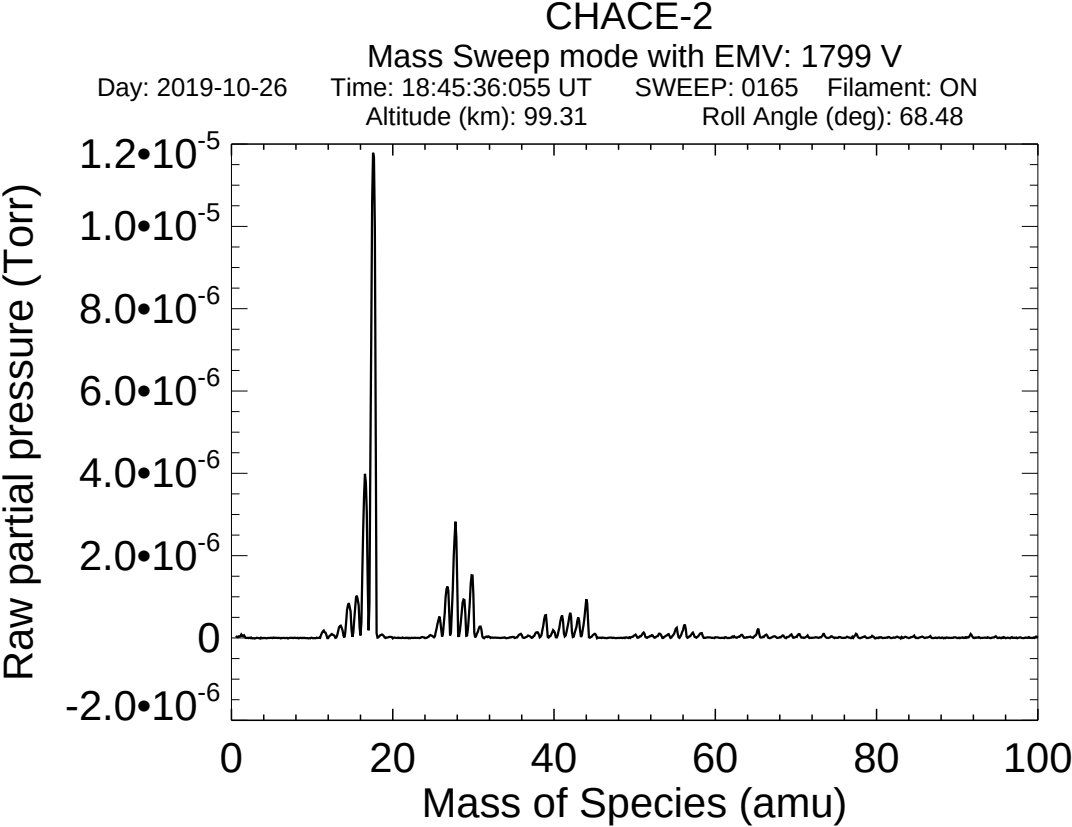

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 18:42:28:004 UT
SWEEP: 0160
Filament: ON
Altitude (km): 99.84
Roll Angle (deg): 66.22
8•10-6
6•10-6
4•10-6
2•10-6
0
-2•10-6
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

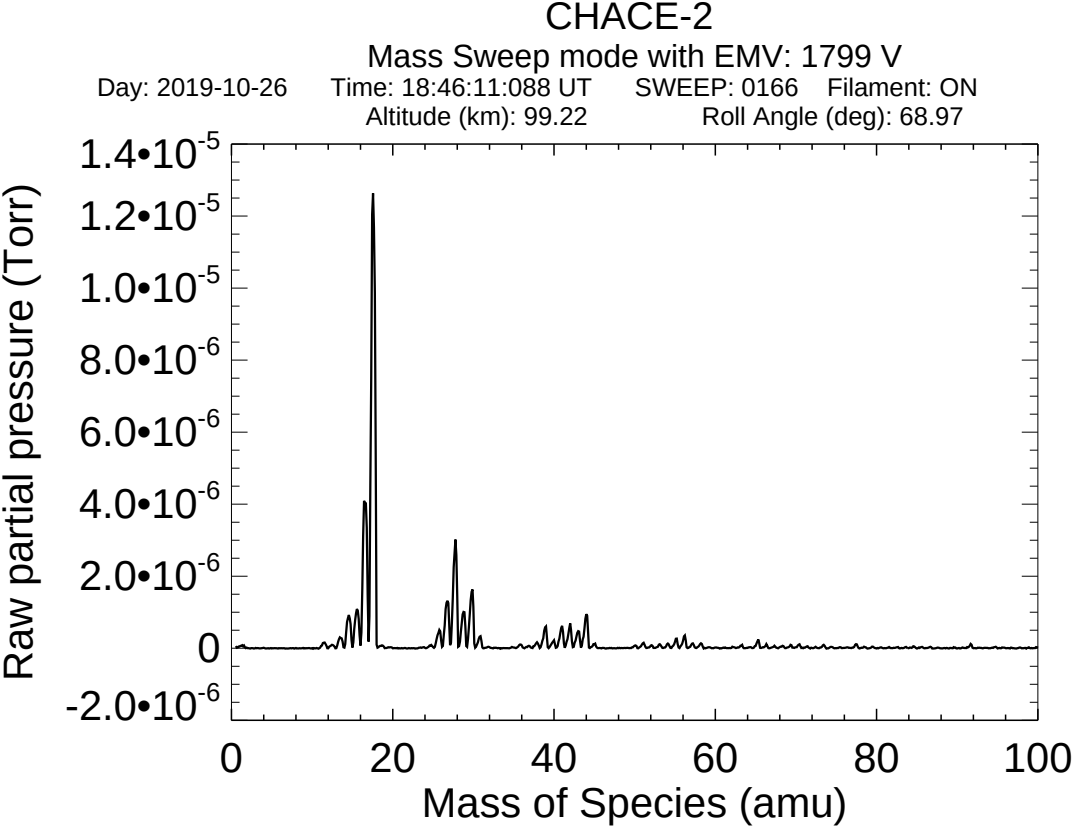

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 18:43:05:034 UT
SWEEP: 0161
Filament: ON
Altitude (km): 99.74
Roll Angle (deg): 66.61
Raw partial pressure (Torr)
6•10-6
5•10-6
4•10-6
3•10-6
2•10-6
1•10-6
0
-1•10-6
0
20
40
60
80
100
Mass of Species (amu)

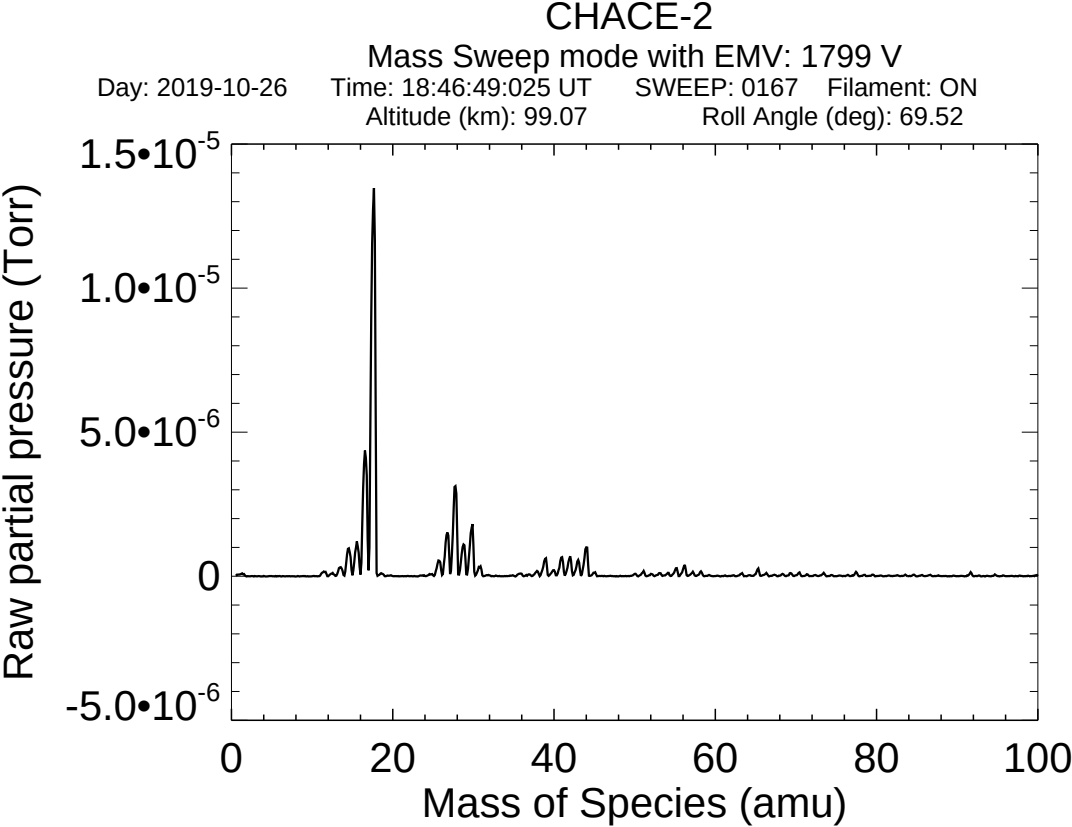

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 18:43:40:067 UT
SWEEP: 0162
Filament: ON
Altitude (km): 99.67
Roll Angle (deg): 67.00
8•10-6
6•10-6
4•10-6
2•10-6
0
-2•10-6
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

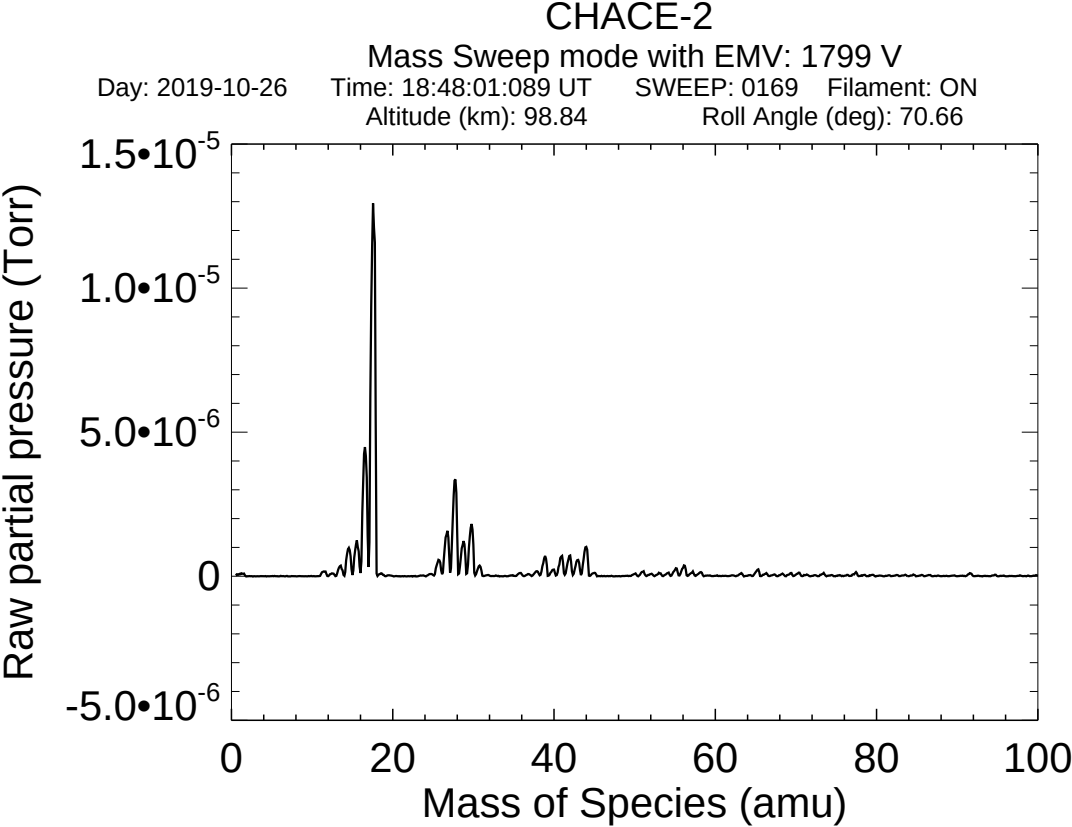

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:44:15:999 UT SWEEP: 0163 Filament: ON
Altitude (km): 99.48 Roll Angle (deg): 67.44
Raw partial pressure (Torr)
1•10-5
8•10-6
6•10-6
4•10-6
2•10-6
0
-2•10-6
0
20
40
60
80
100
Mass of Species (amu)

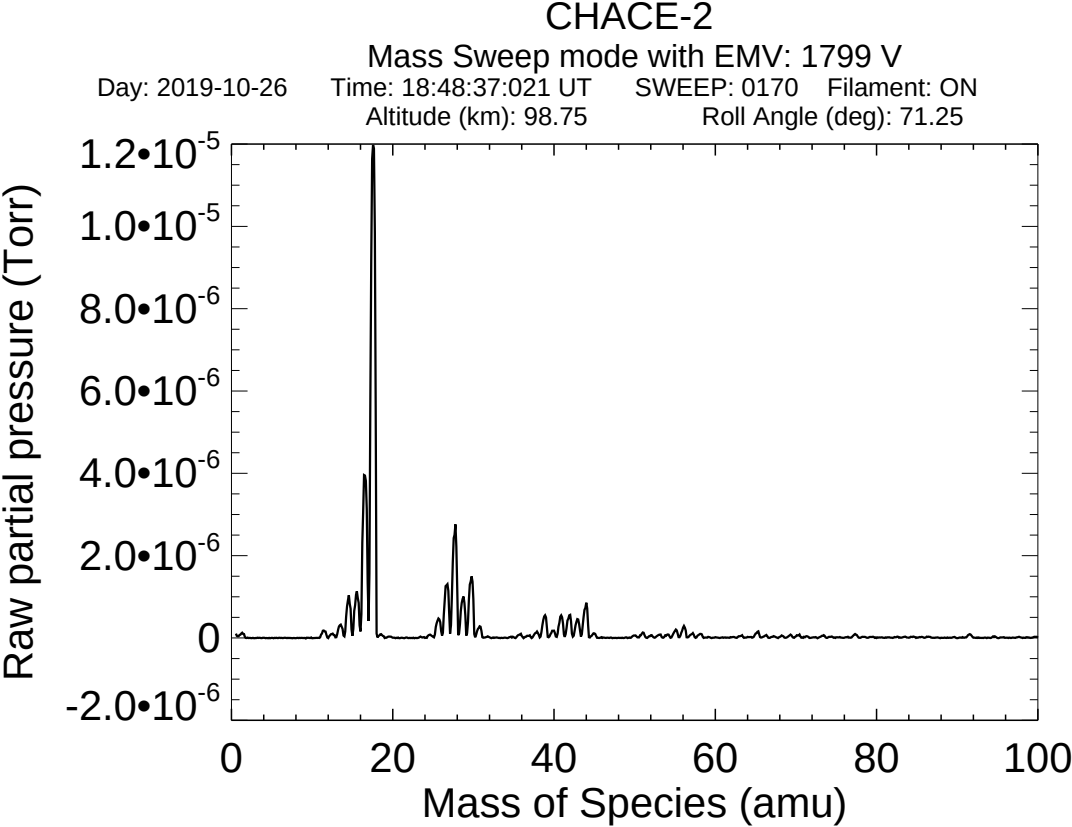

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:44:53:030 UT SWEEP: 0164 Filament: ON
Altitude (km): 99.37 Roll Angle (deg): 67.90
Raw partial pressure (Torr)
1.2•10-5
1.0•10-5
8.0•10-6
6.0•10-6
4.0•10-6
2.0•10-6
0
-2.0•10-6
0
20
40
60
80
100
Mass of Species (amu)

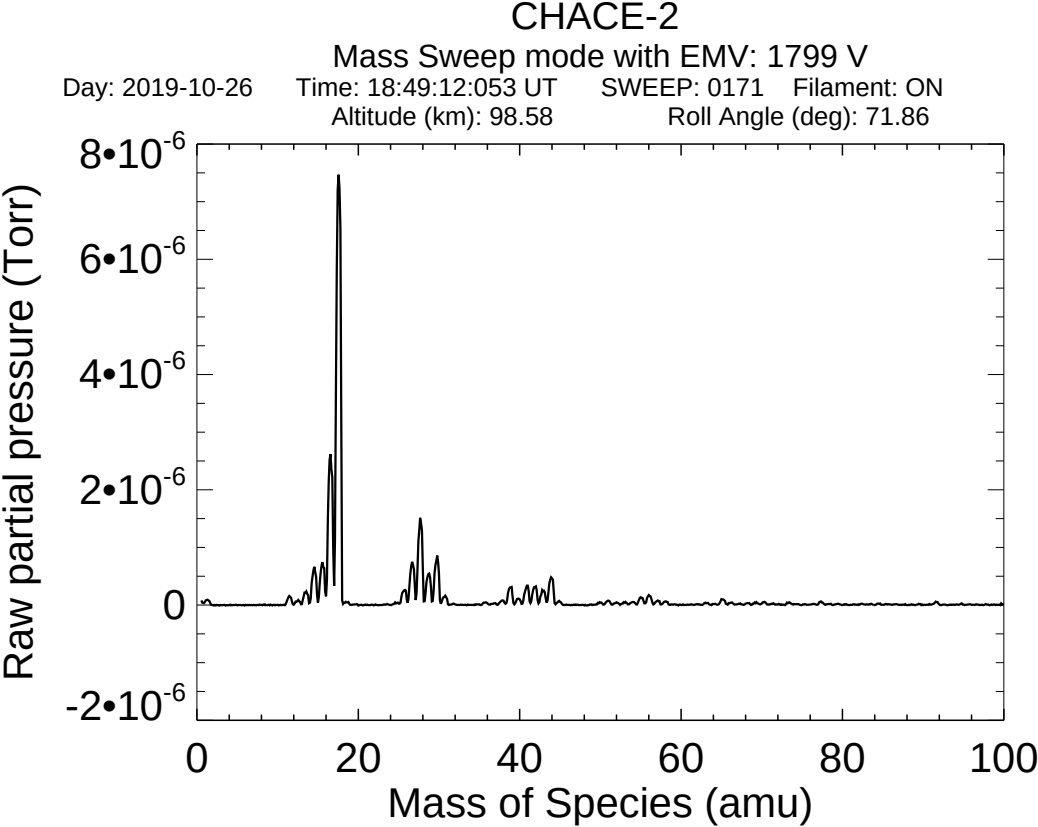

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 18:45:36:055 UT
SWEEP: 0165
Filament: ON
Altitude (km): 99.31
Roll Angle (deg): 68.48
Raw partial pressure (Torr)
1.2•10-5
1.0•10-5
8.0•10-6
6.0•10-6
4.0•10-6
2.0•10-6
0
-2.0•10-6
0
20
40
60
80
100
Mass of Species (amu)

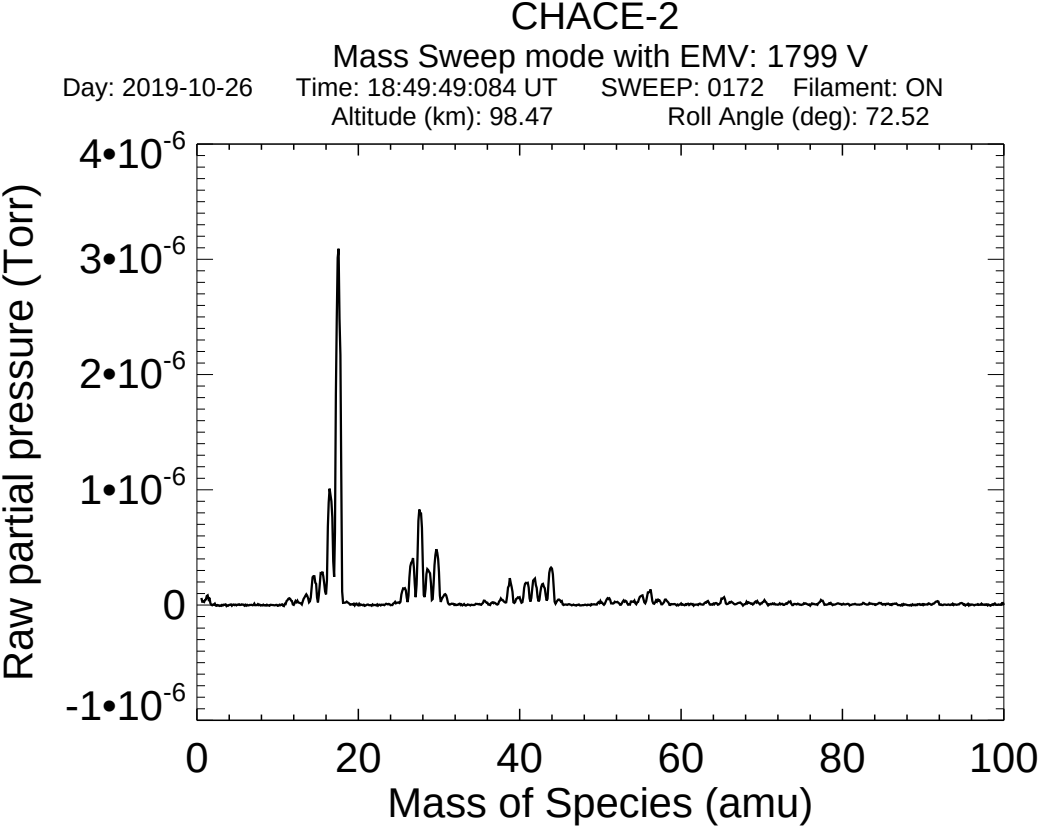

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 18:46:11:088 UT
SWEEP: 0166
Filament: ON
Altitude (km): 99.22
Roll Angle (deg): 68.97
Raw partial pressure (Torr)
1.4•10-5
1.2•10-5
1.0•10-5
8.0•10-6
6.0•10-6
4.0•10-6
2.0•10-6
0
-2.0•10-6
0
20
40
60
80
100
Mass of Species (amu)

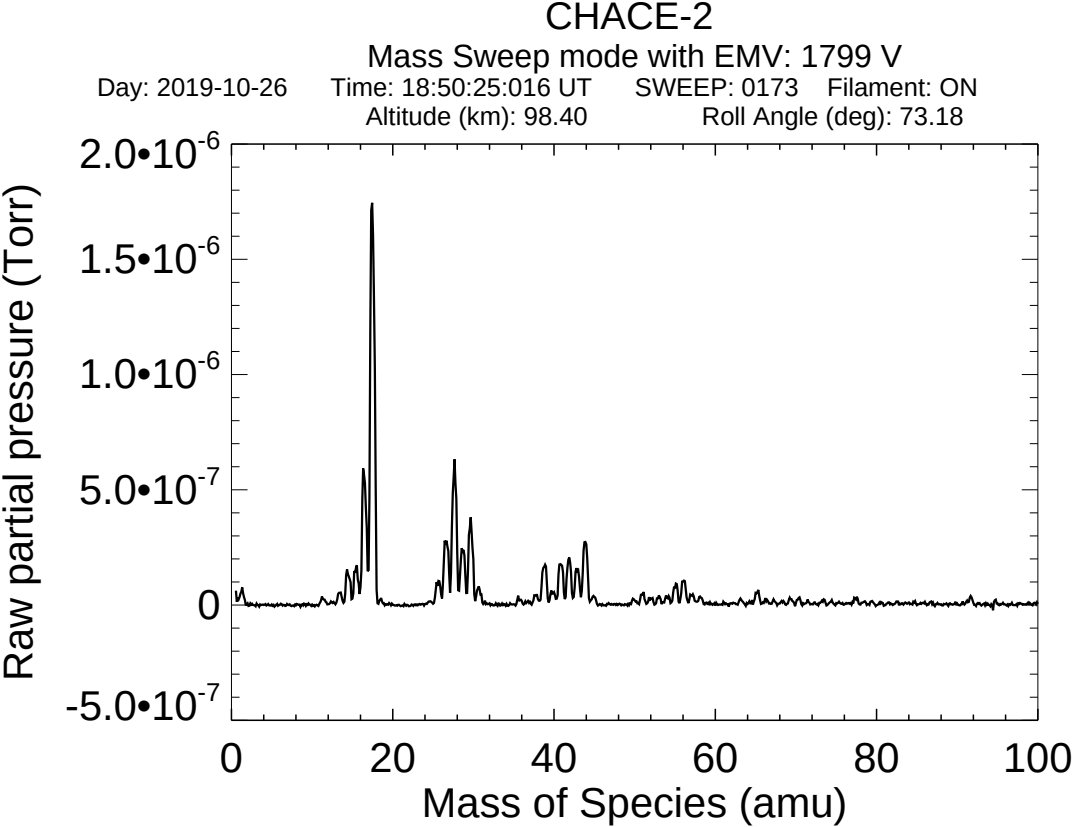

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 18:46:49:025 UT
SWEEP: 0167
Filament: ON
Altitude (km): 99.07
Roll Angle (deg): 69.52
1.5•10-5
1.0•10-5
5.0•10-6
0
-5.0•10-6
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

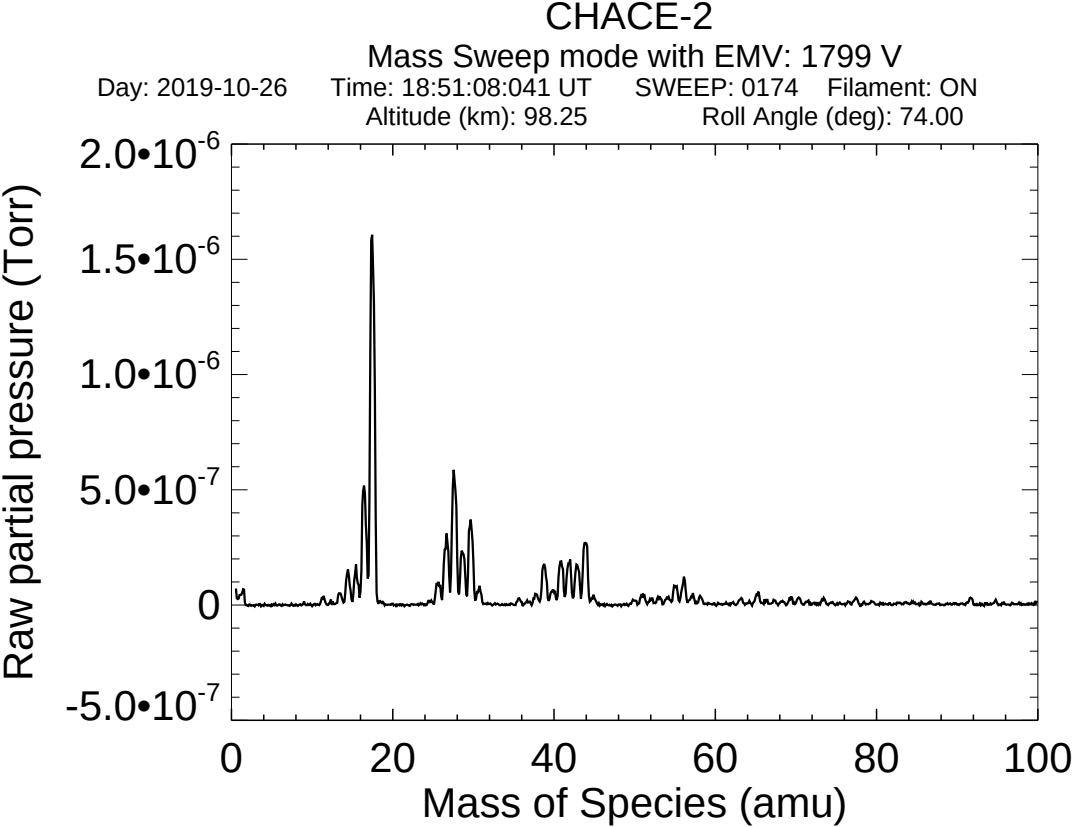

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 18:48:01:089 UT
SWEEP: 0169
Filament: ON
Altitude (km): 98.84
Roll Angle (deg): 70.66
Raw partial pressure (Torr)
1.5•10-5
1.0•10-5
5.0•10-6
0
-5.0•10-6
0
20
40
60
80
100
Mass of Species (amu)

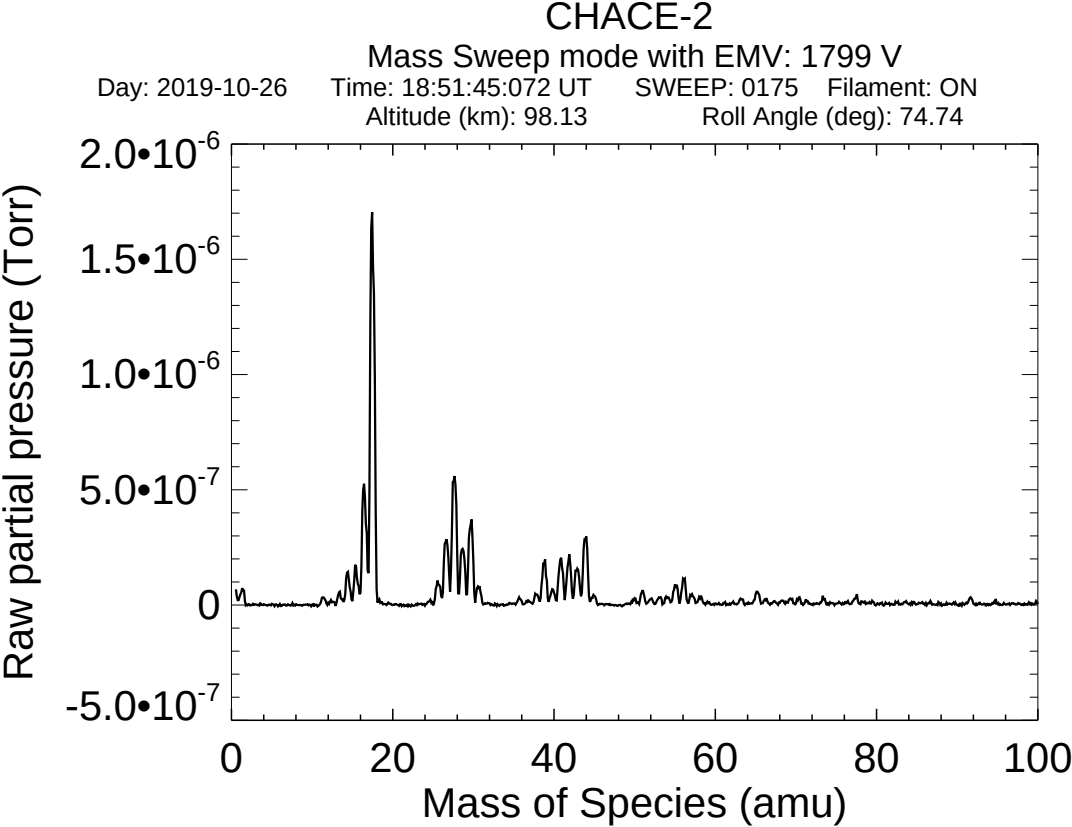

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 18:48:37:021 UT
SWEEP: 0170
Filament: ON
Altitude (km): 98.75
Roll Angle (deg): 71.25
Raw partial pressure (Torr)
1.2•10-5
1.0•10-5
8.0•10-6
6.0•10-6
4.0•10-6
2.0•10-6
0
-2.0•10-6
0
20
40
60
80
100
Mass of Species (amu)

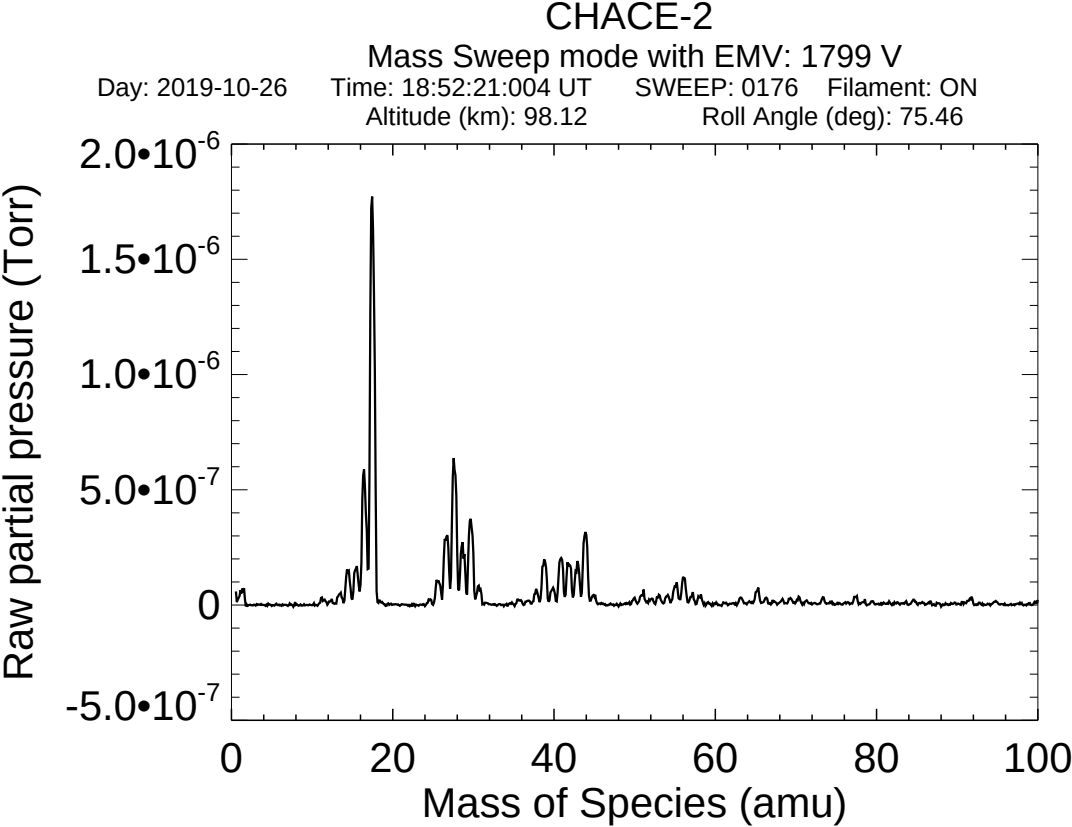

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 18:49:12:053 UT
SWEEP: 0171
Filament: ON
Altitude (km): 98.58
Roll Angle (deg): 71.86
Raw partial pressure (Torr)
8•10-6
6•10-6
4•10-6
2•10-6
0
-2•10-6
0
20
40
60
80
100
Mass of Species (amu)

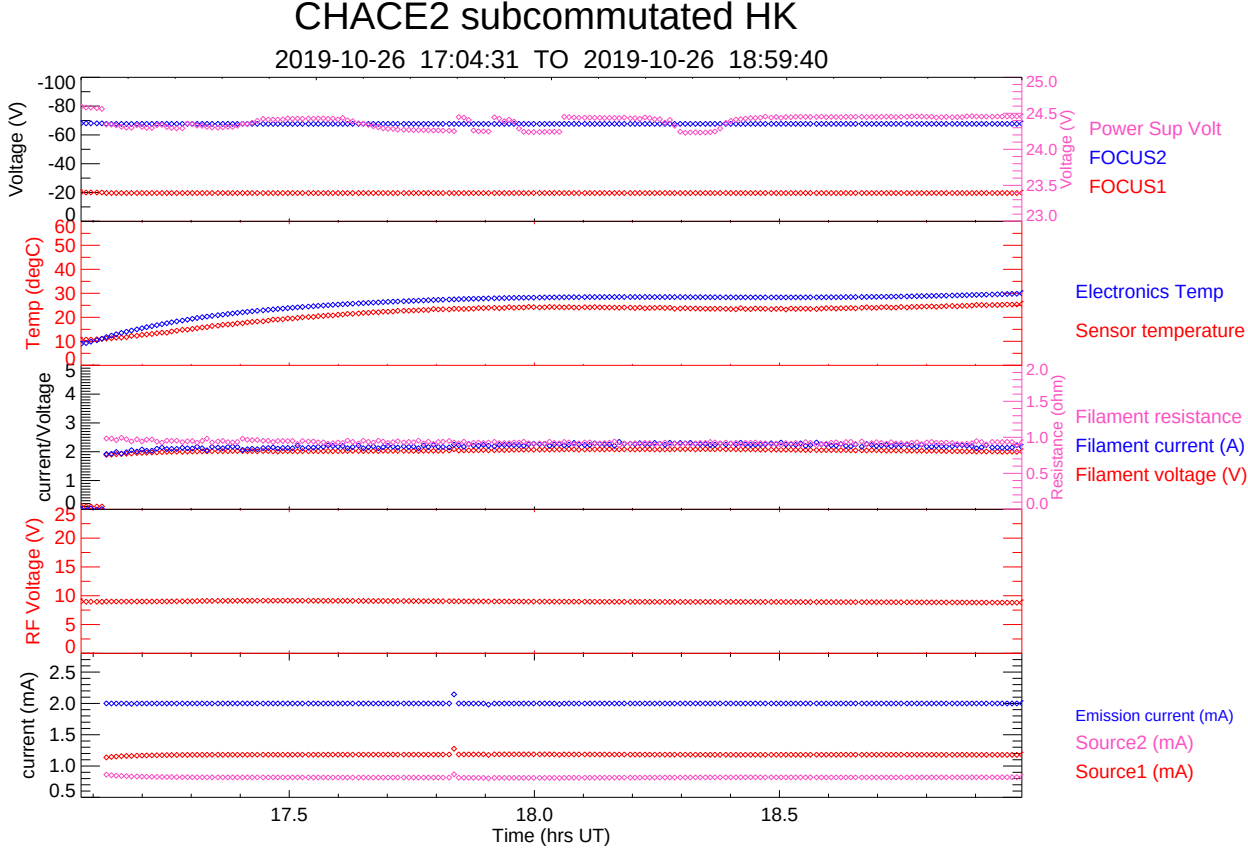

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:49:49:084 UT SWEEP: 0172 Filament: ON
Altitude (km): 98.47 Roll Angle (deg): 72.52
Raw partial pressure (Torr)
4•10-6
3•10-6
2•10-6
1•10-6
0
-1•10-6
0
20
40
60
80
100
Mass of Species (amu)


CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26
Time: 18:50:25:016 UT
SWEEP: 0173
Filament: ON
Altitude (km): 98.40
Roll Angle (deg): 73.18
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

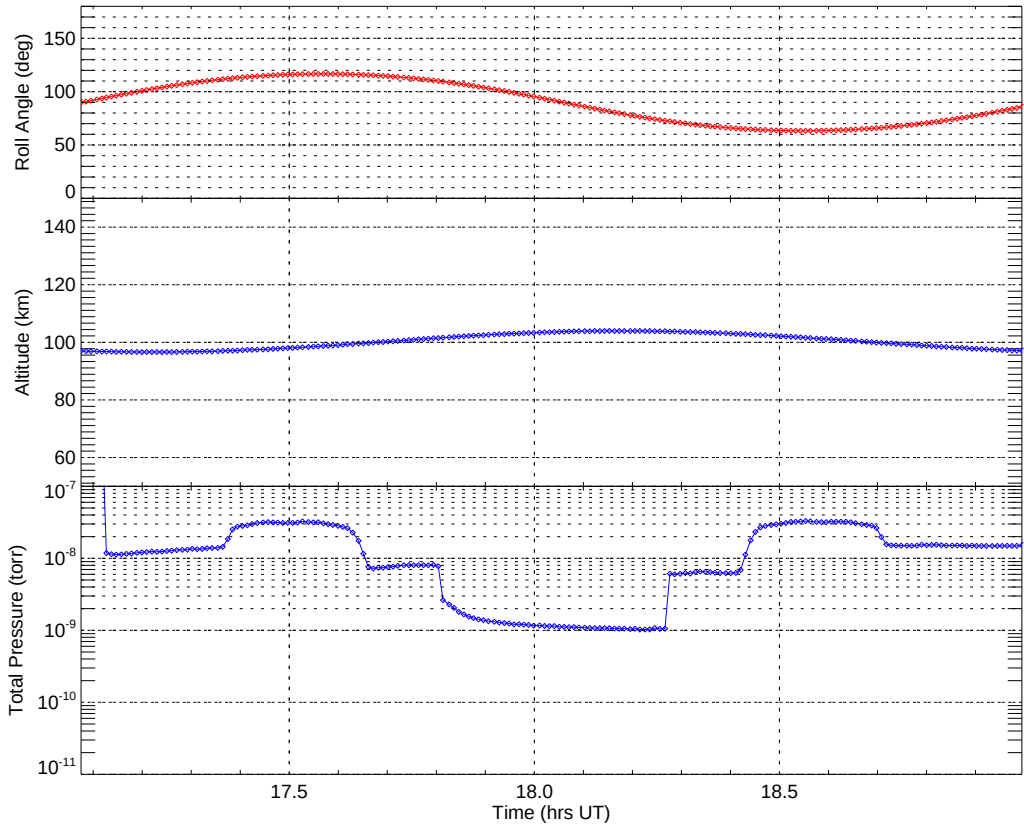

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:51:08:041 UT SWEEP: 0174 Filament: ON
Altitude (km): 98.25 Roll Angle (deg): 74.00
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)


CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:51:45:072 UT SWEEP: 0175 Filament: ON
Altitude (km): 98.13 Roll Angle (deg): 74.74
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)


CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-10-26 Time: 18:52:21:004 UT SWEEP: 0176 Filament: ON
Altitude (km): 98.12 Roll Angle (deg): 75.46
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

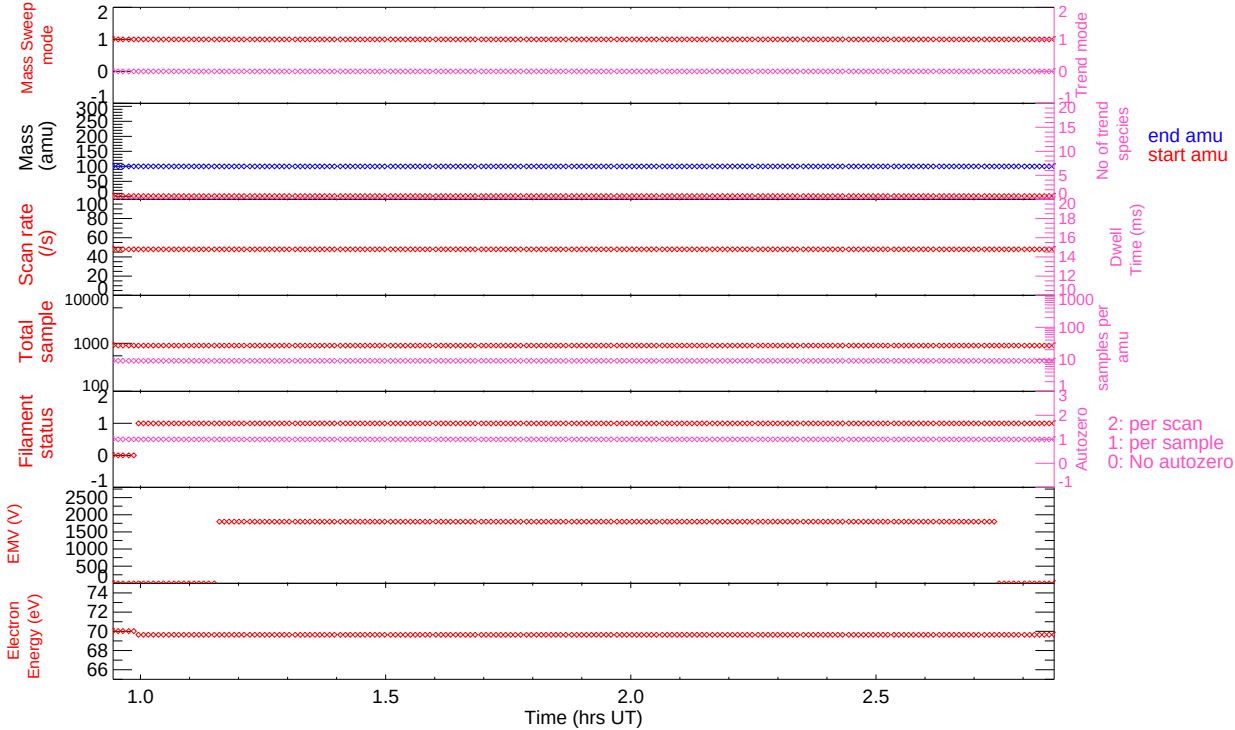

CHACE2 subcommutated HK
2019-10-26 17:04:31 TO 2019-10-26 18:59:40
Voltage (V)
Voltage (V)
Power Sup Volt
FOCUS2
FOCUS1
Temp (degC)
Electronics Temp
Sensor temperature
current/Voltage
Resistance (ohm)
Filament resistance
Filament current (A)
Filament voltage (V)
RF Voltage (V)
current (mA)
Emission current (mA)
Source2 (mA)
Source1 (mA)
Time (hrs UT)

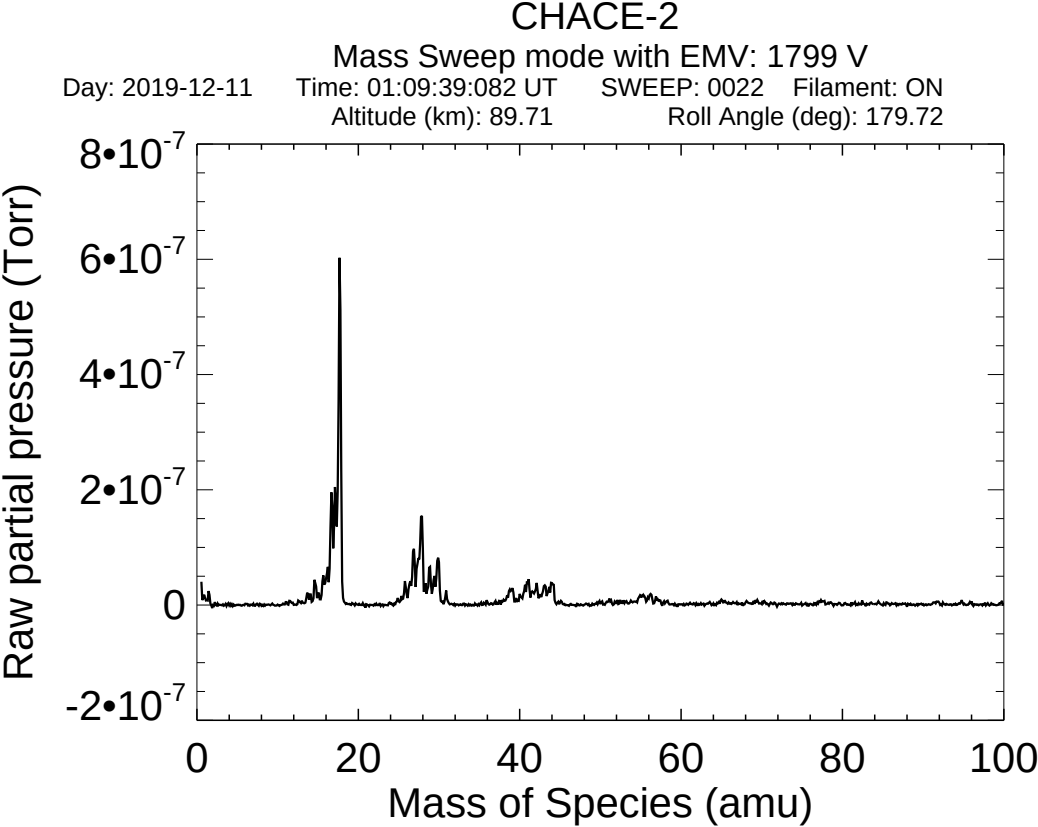
CHACE2: 2019-10-26 17:04:31 UT TO 2019-10-26 18:59:40 UT

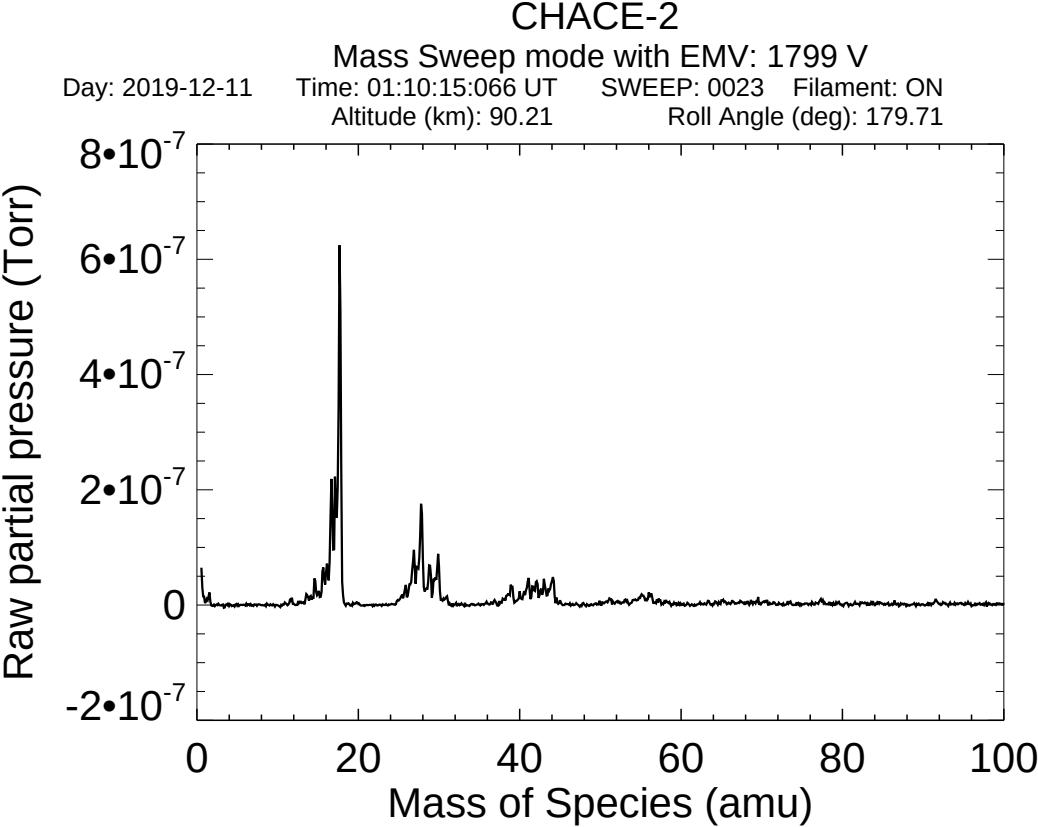


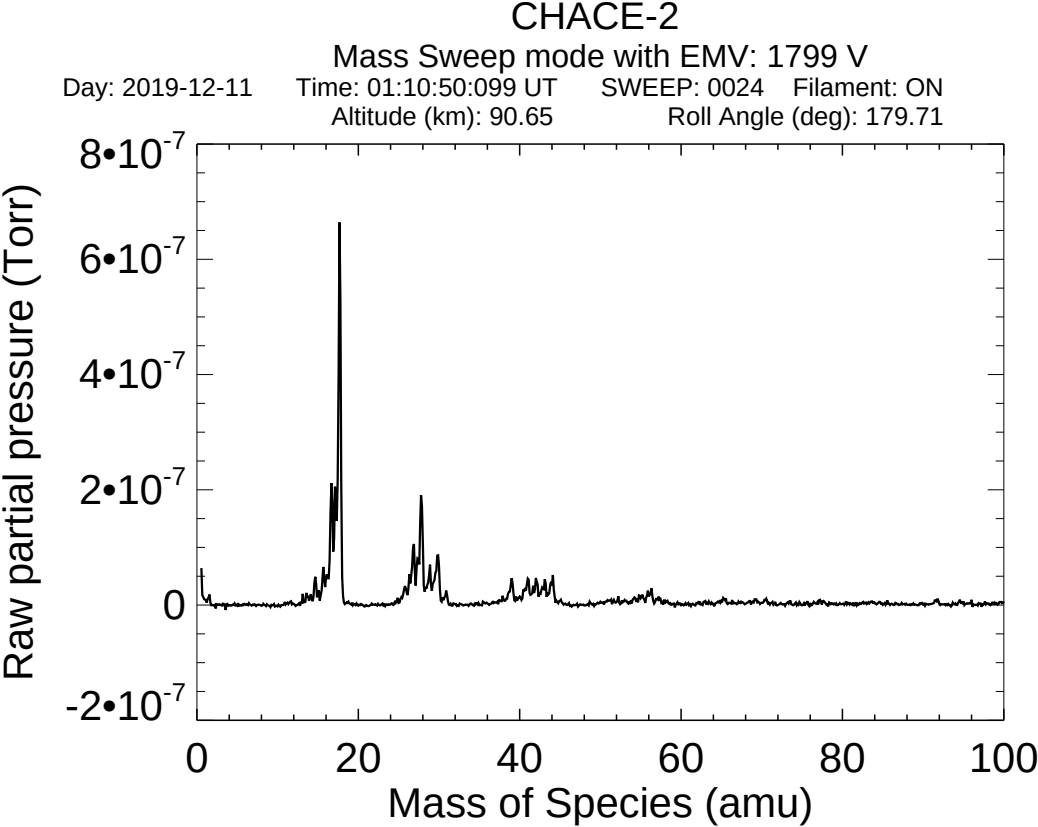
CHACE2 Operating parameters

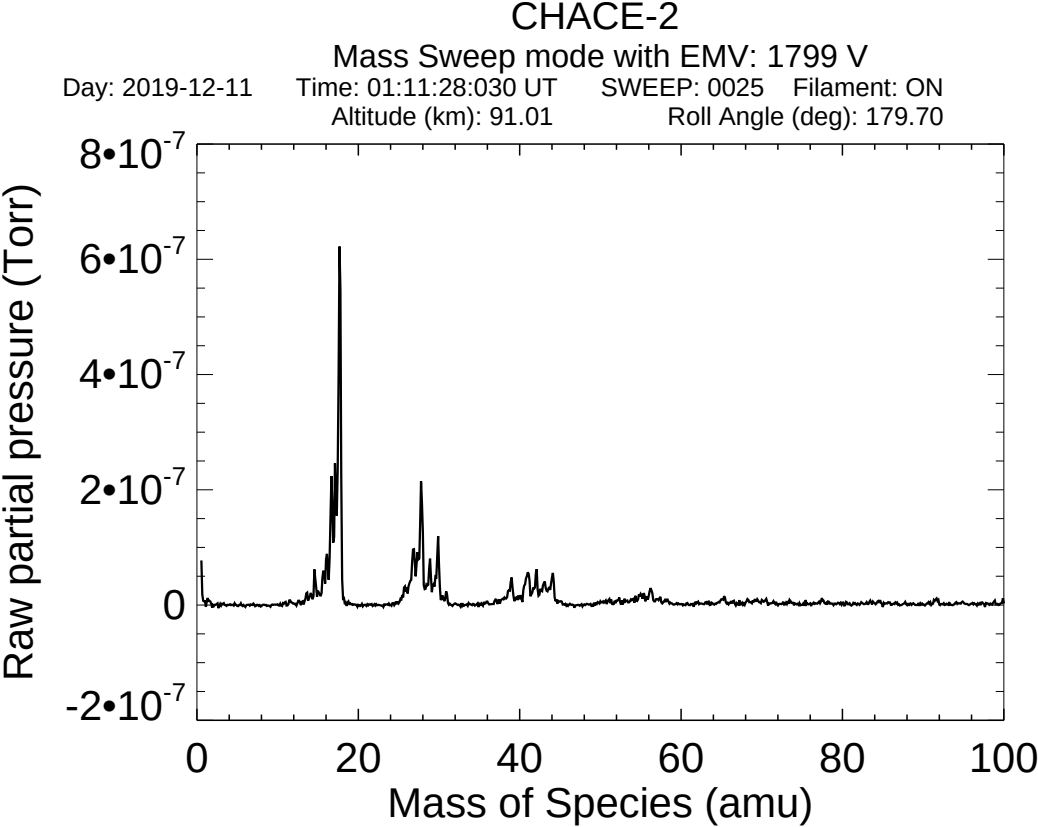
2019-12-11 00:56:39 TO 2019-12-11 02:51:48

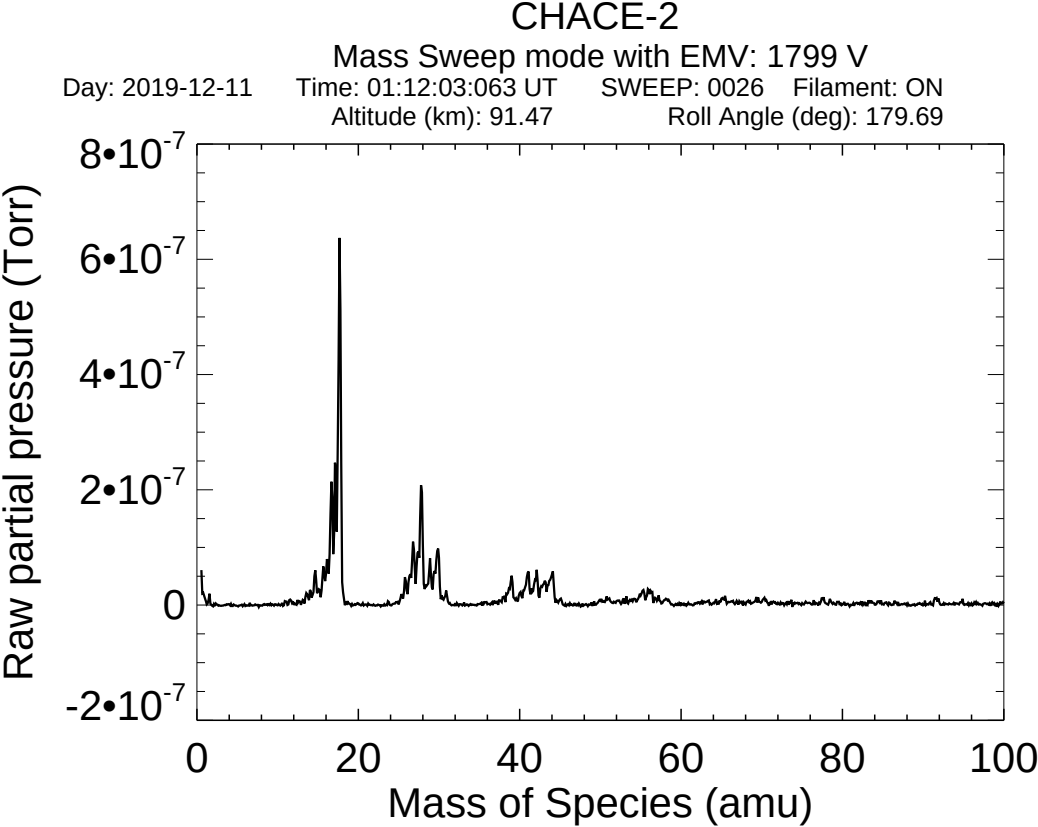


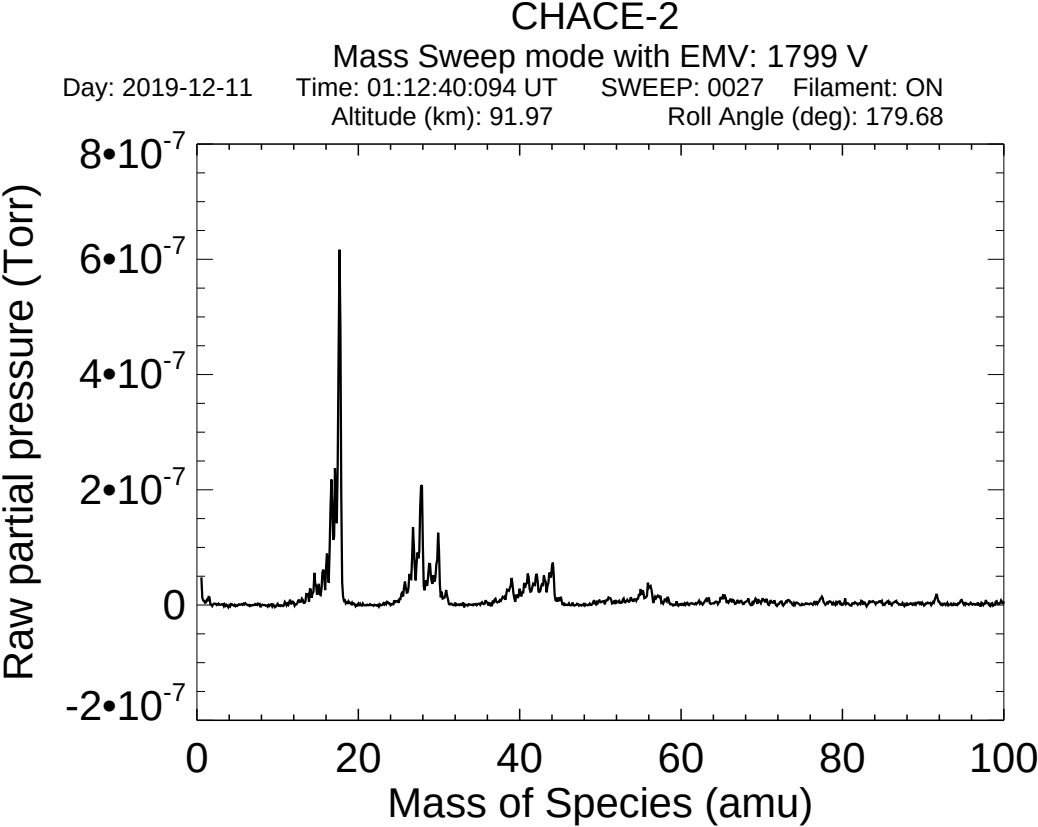

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:09:39:082 UT SWEEP: 0022 Filament: ON
Altitude (km): 89.71 Roll Angle (deg): 179.72
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

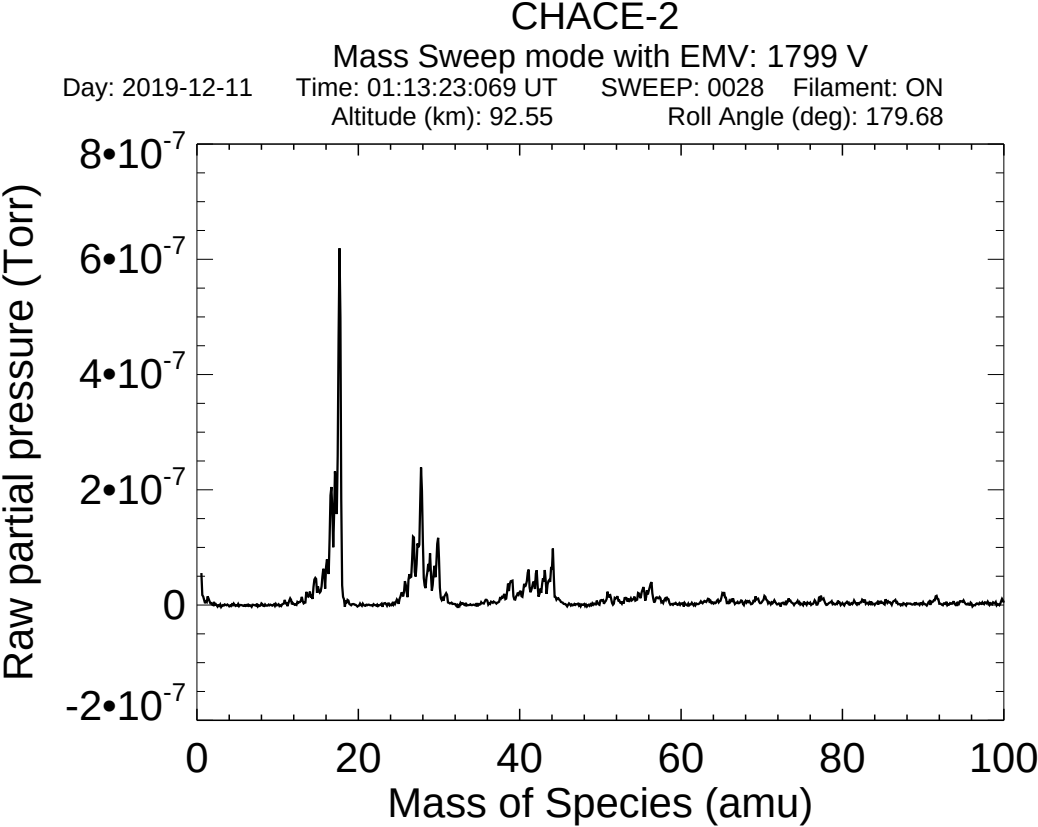

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:10:15:066 UT SWEEP: 0023 Filament: ON
Altitude (km): 90.21 Roll Angle (deg): 179.71
Raw partial pressure (Torr)
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

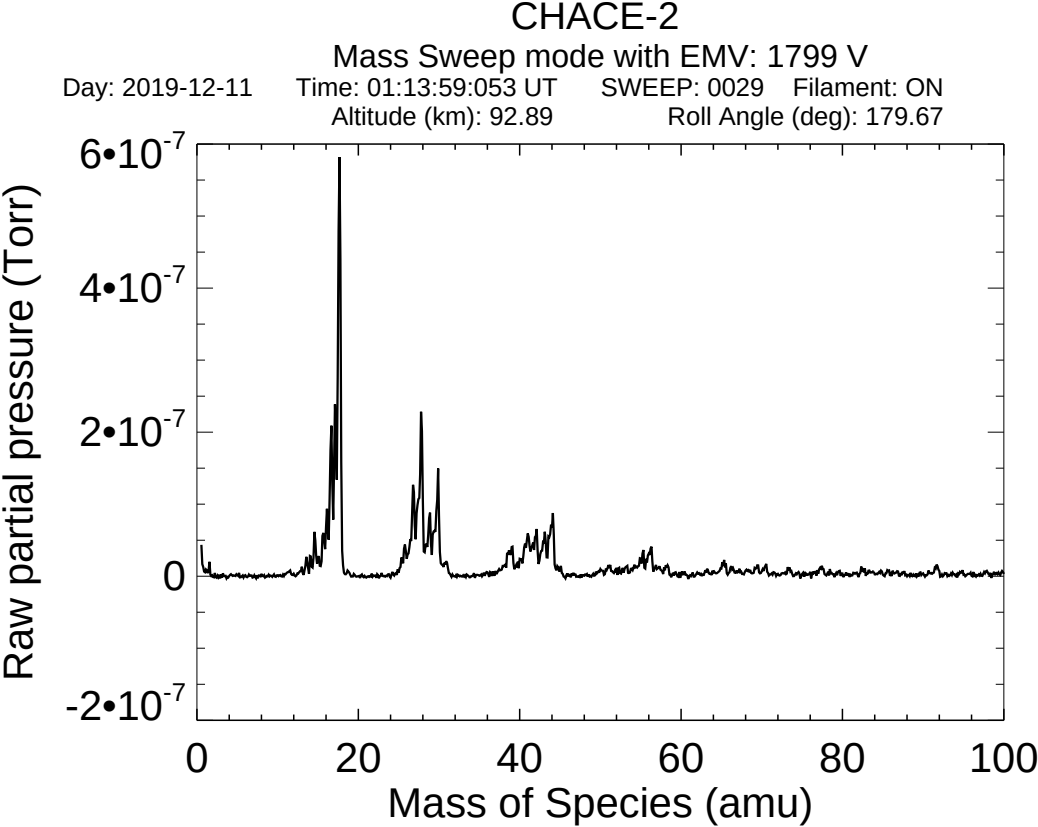

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:10:50:099 UT SWEEP: 0024 Filament: ON
Altitude (km): 90.65 Roll Angle (deg): 179.71
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

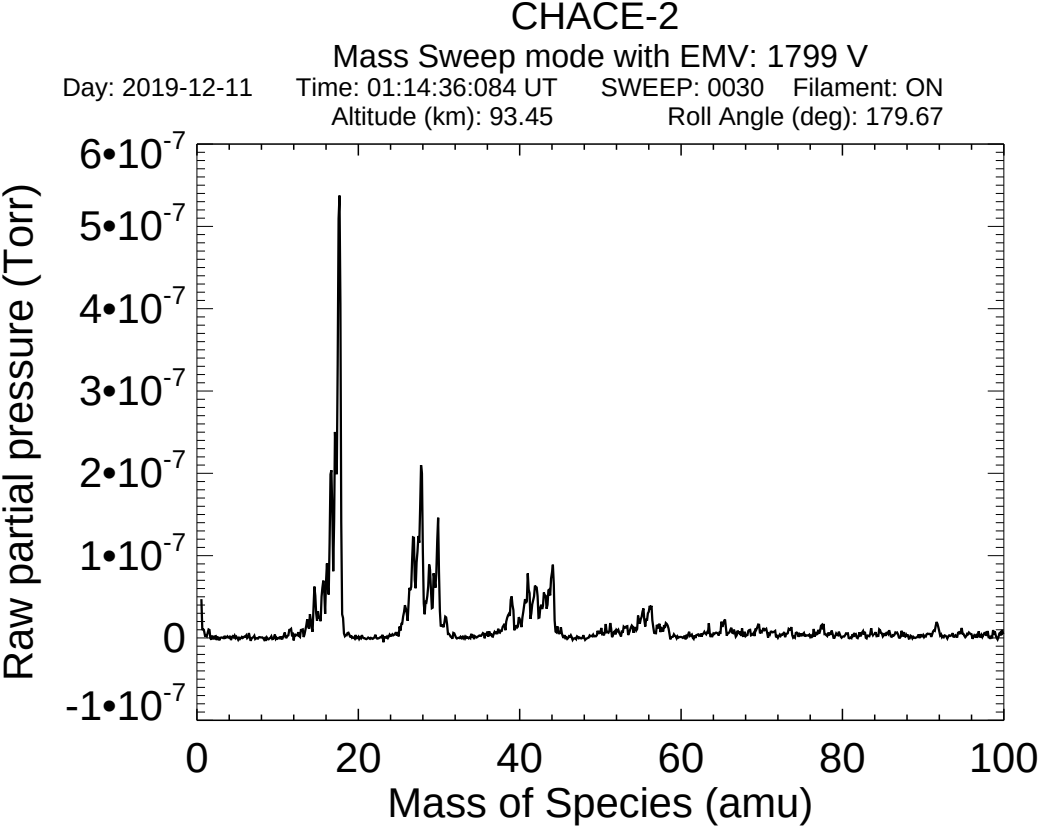

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:11:28:030 UT SWEEP: 0025 Filament: ON
Altitude (km): 91.01 Roll Angle (deg): 179.70
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

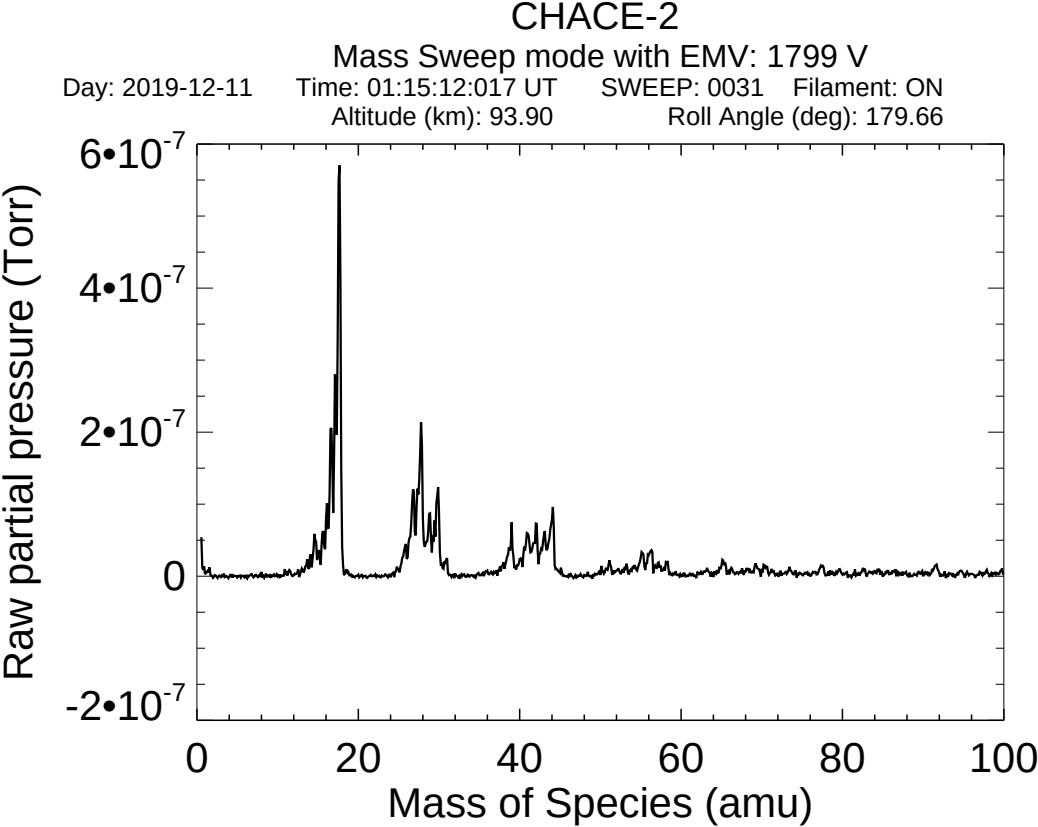

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:12:03:063 UT SWEEP: 0026 Filament: ON
Altitude (km): 91.47 Roll Angle (deg): 179.69
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

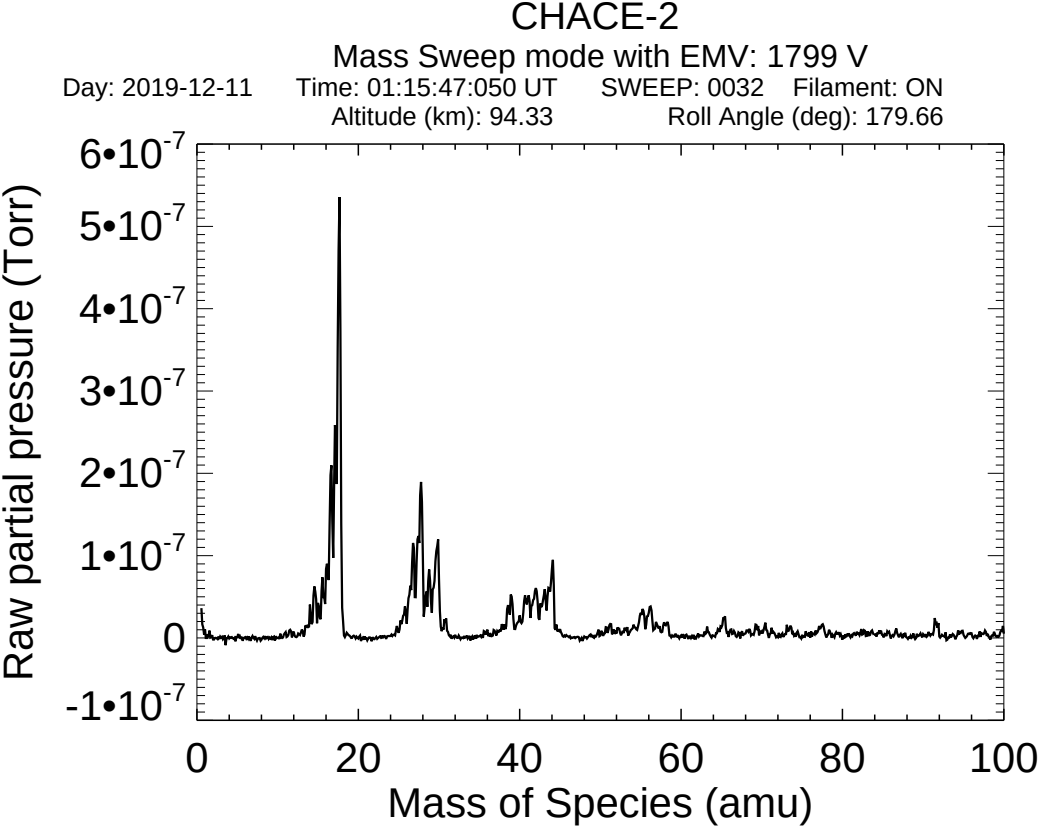

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:12:40:094 UT SWEEP: 0027 Filament: ON
Altitude (km): 91.97 Roll Angle (deg): 179.68
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

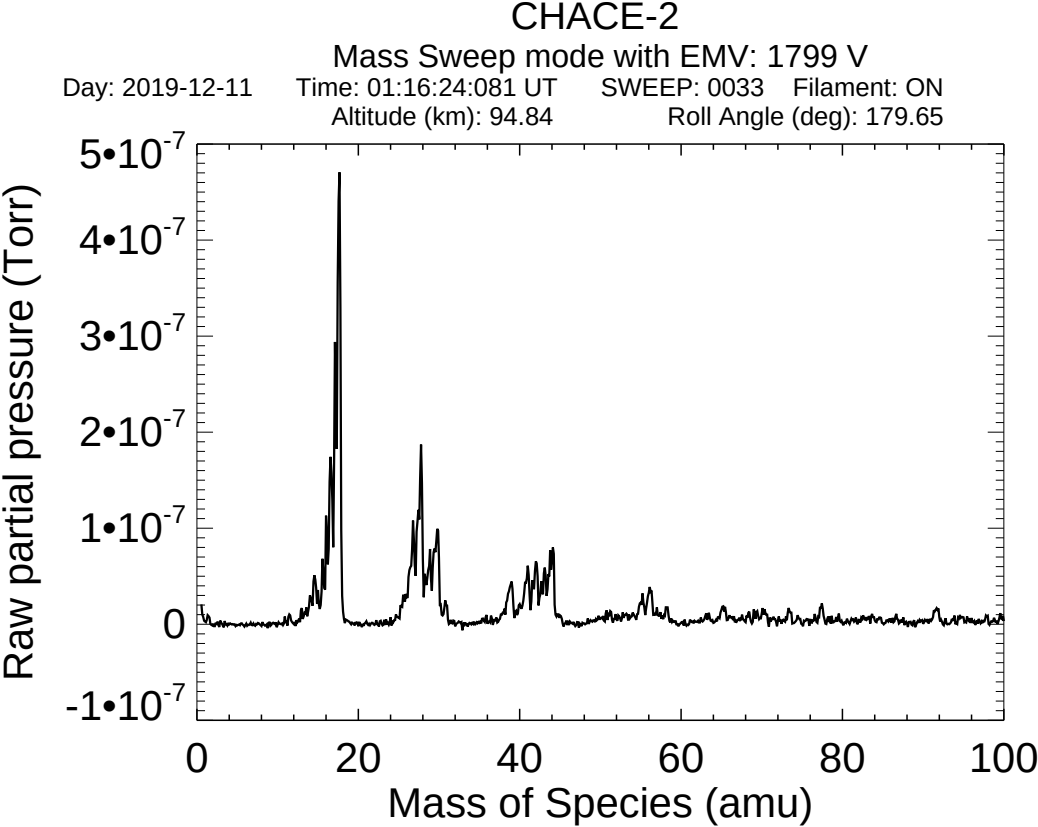

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 01:13:23:069 UT
SWEEP: 0028
Filament: ON
Altitude (km): 92.55
Roll Angle (deg): 179.68
Raw partial pressure (Torr)
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

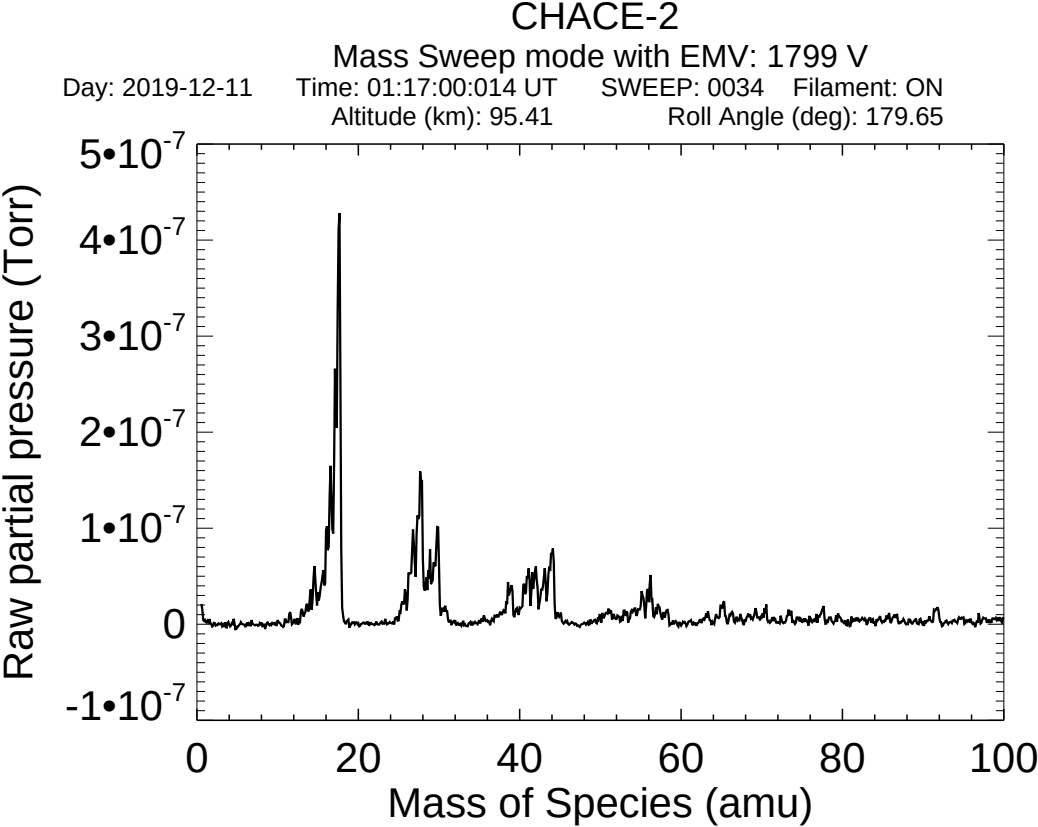

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:13:59:053 UT SWEEP: 0029 Filament: ON
Altitude (km): 92.89 Roll Angle (deg): 179.67
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

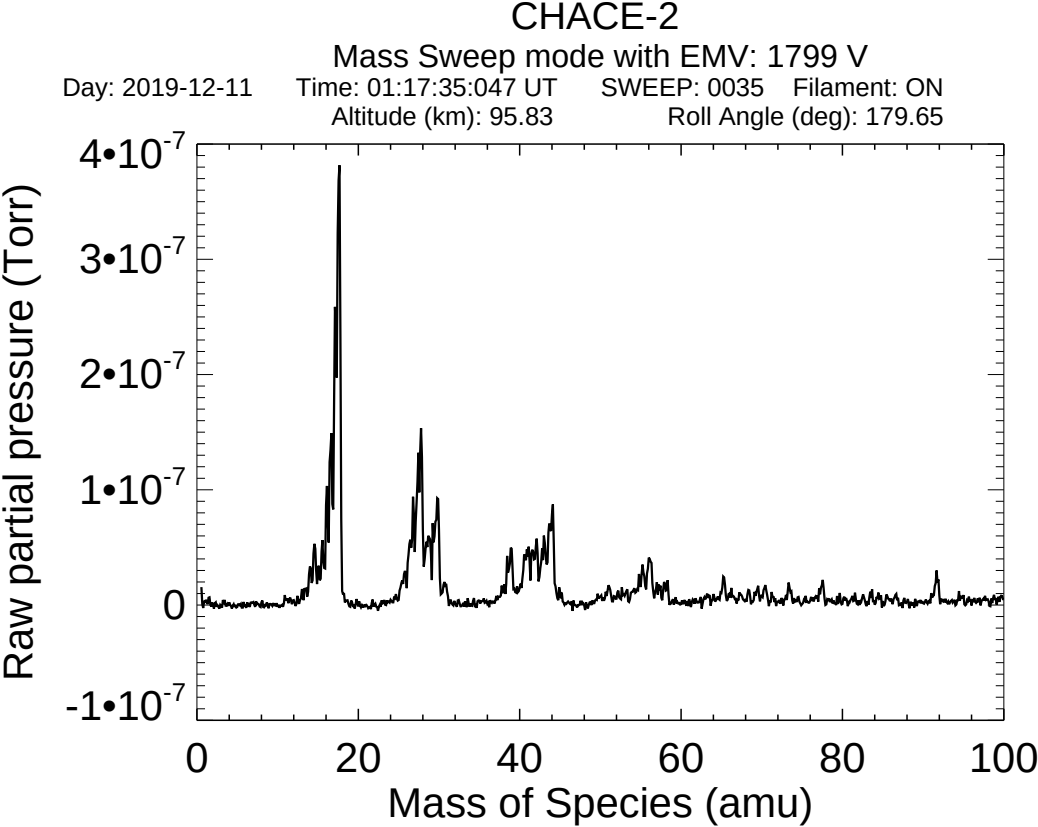

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 01:14:36:084 UT
SWEEP: 0030
Filament: ON
Altitude (km): 93.45
Roll Angle (deg): 179.67
Raw partial pressure (Torr)
6•10-7
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

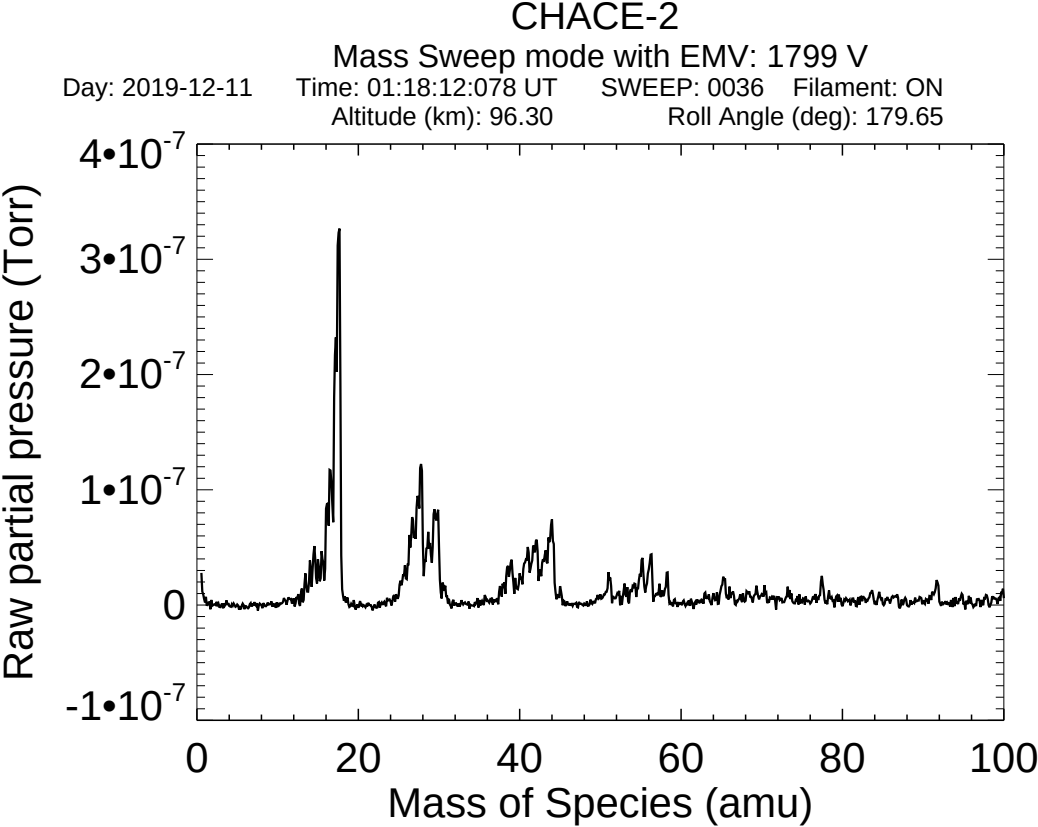

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 01:15:12:017 UT
SWEEP: 0031
Filament: ON
Altitude (km): 93.90
Roll Angle (deg): 179.66
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

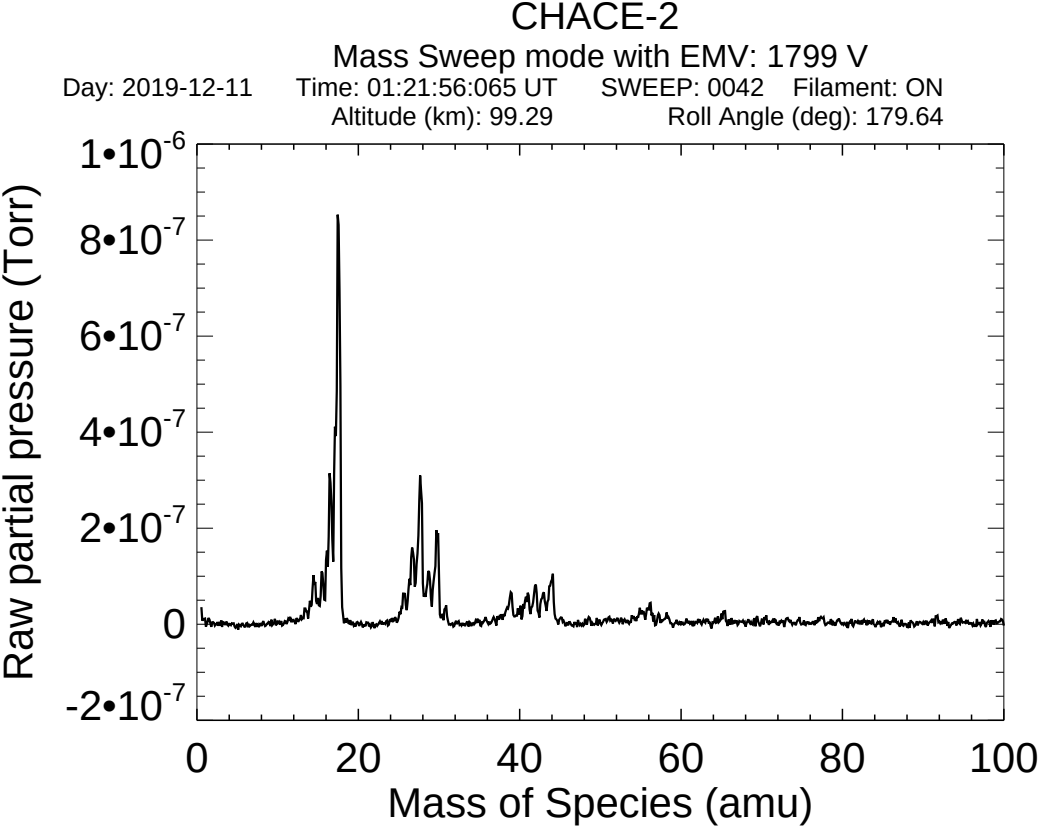

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 01:15:47:050 UT
SWEEP: 0032
Filament: ON
Altitude (km): 94.33
Roll Angle (deg): 179.66
Raw partial pressure (Torr)
6•10-7
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

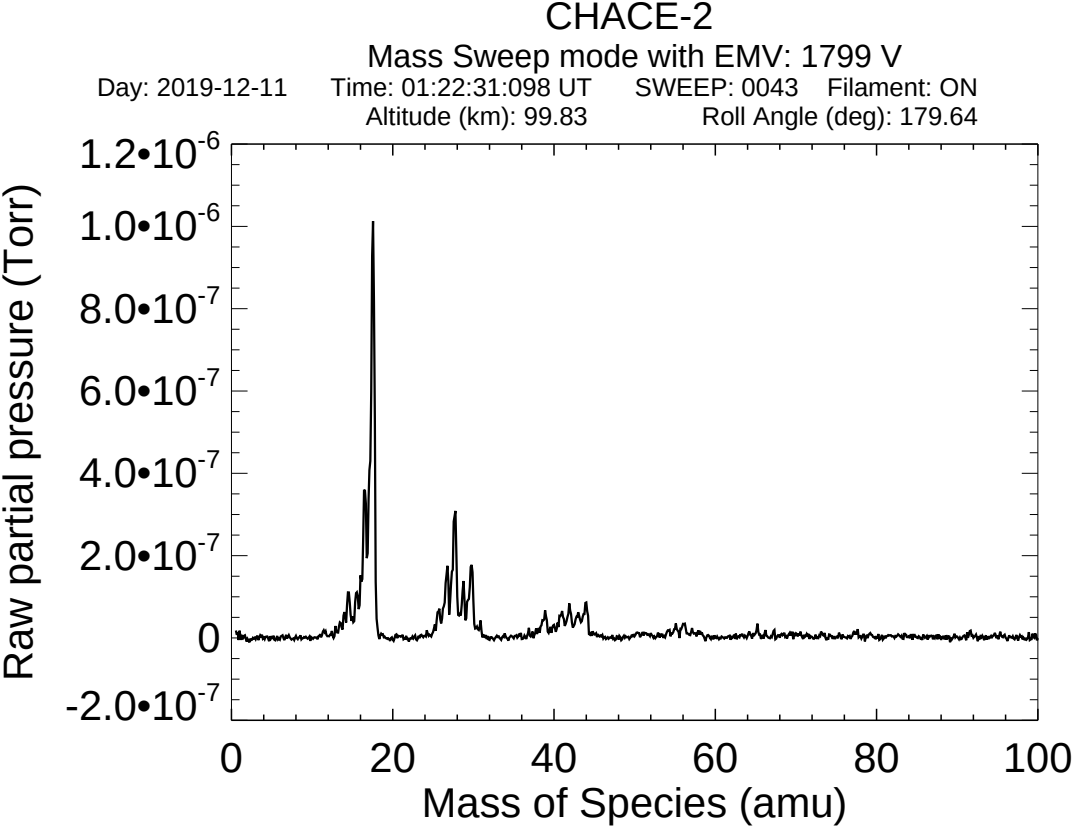

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:16:24:081 UT SWEEP: 0033 Filament: ON
Altitude (km): 94.84 Roll Angle (deg): 179.65
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

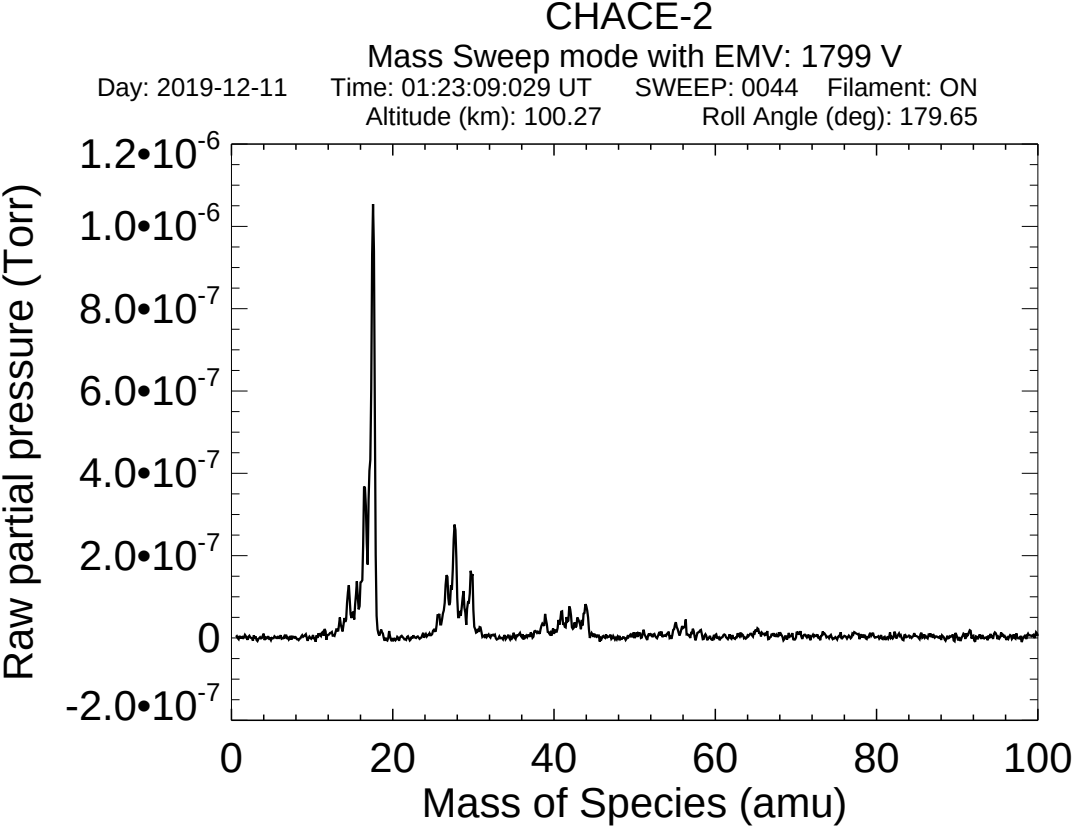

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 01:17:00:014 UT
SWEEP: 0034
Filament: ON
Altitude (km): 95.41
Roll Angle (deg): 179.65
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

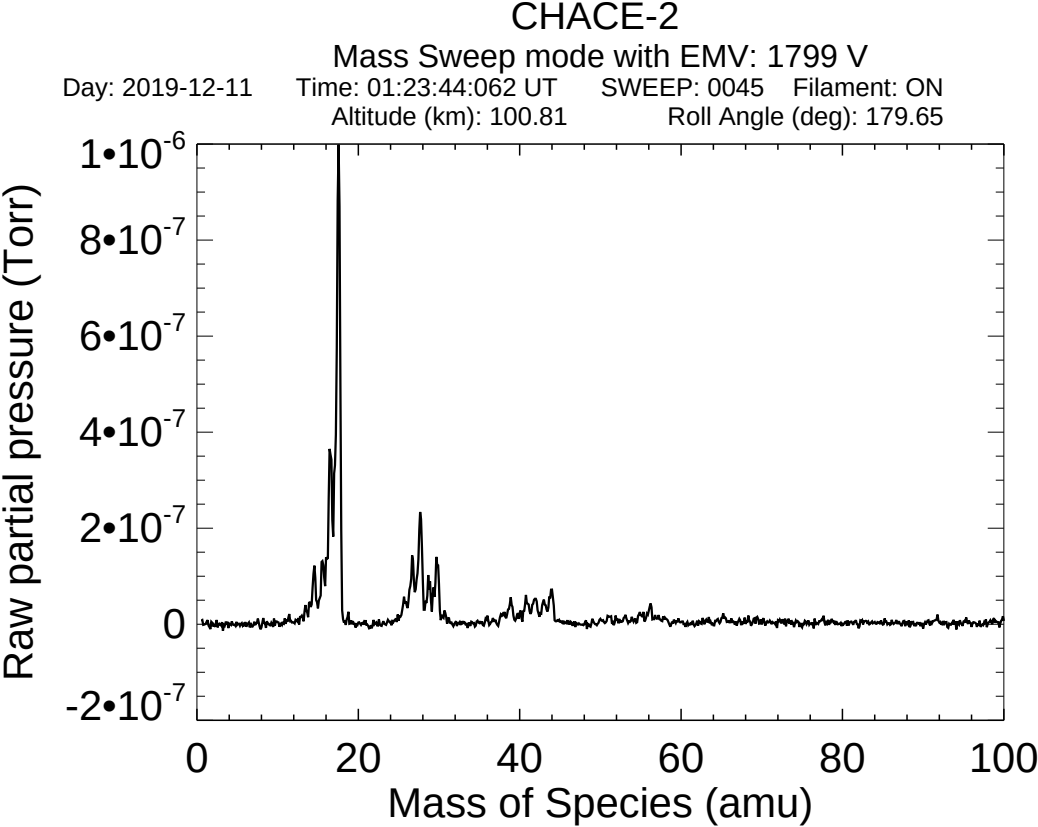

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:17:35:047 UT SWEEP: 0035 Filament: ON
Altitude (km): 95.83 Roll Angle (deg): 179.65
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

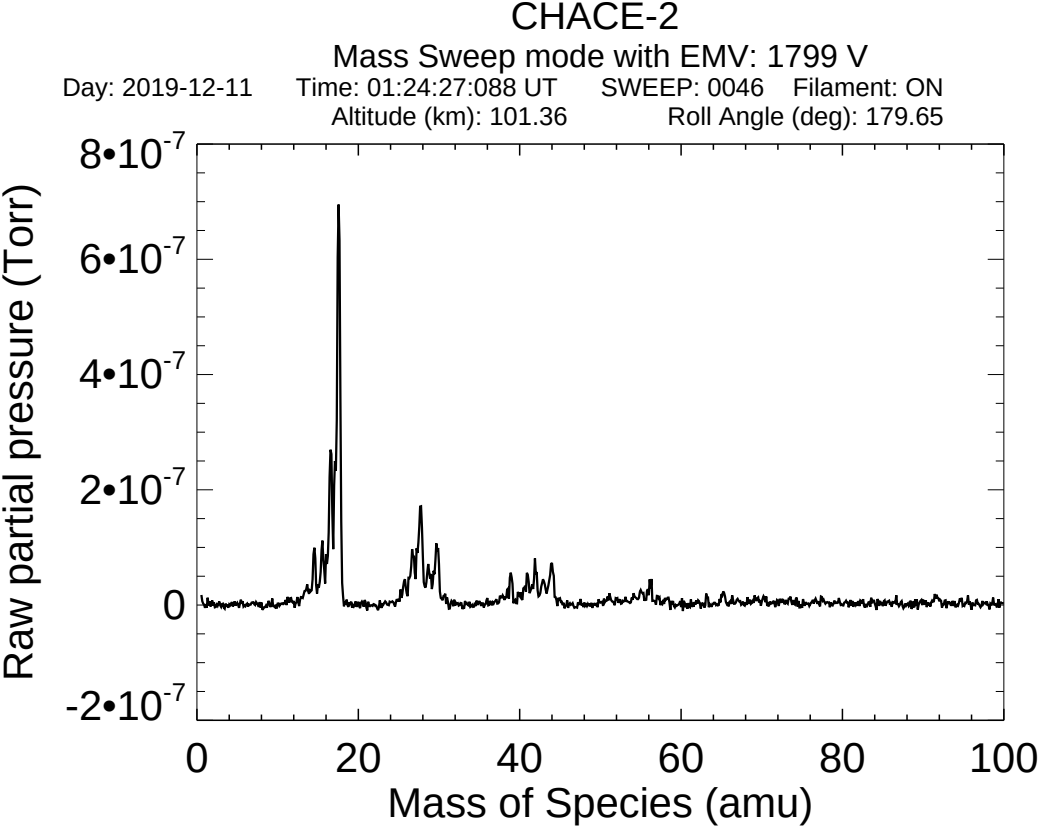

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 01:18:12:078 UT
SWEEP: 0036
Filament: ON
Altitude (km): 96.30
Roll Angle (deg): 179.65
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

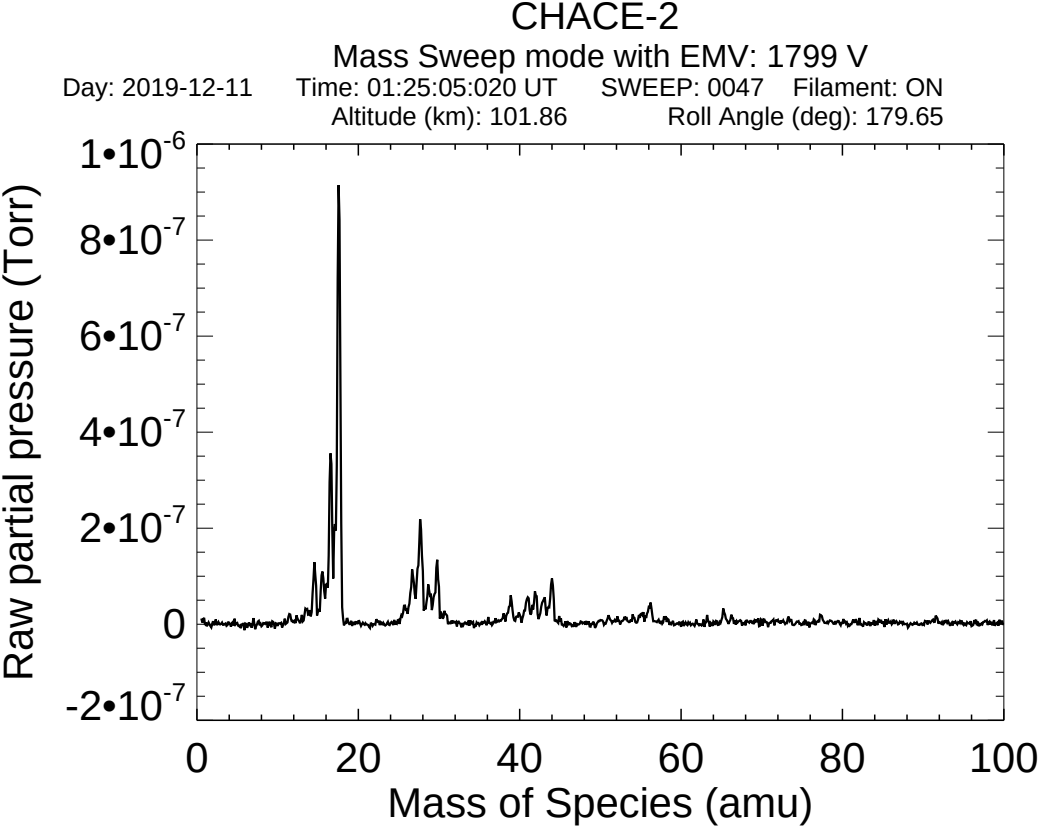

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 01:21:56:065 UT
SWEEP: 0042
Filament: ON
Altitude (km): 99.29
Roll Angle (deg): 179.64
Raw partial pressure (Torr)
1•10-6
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

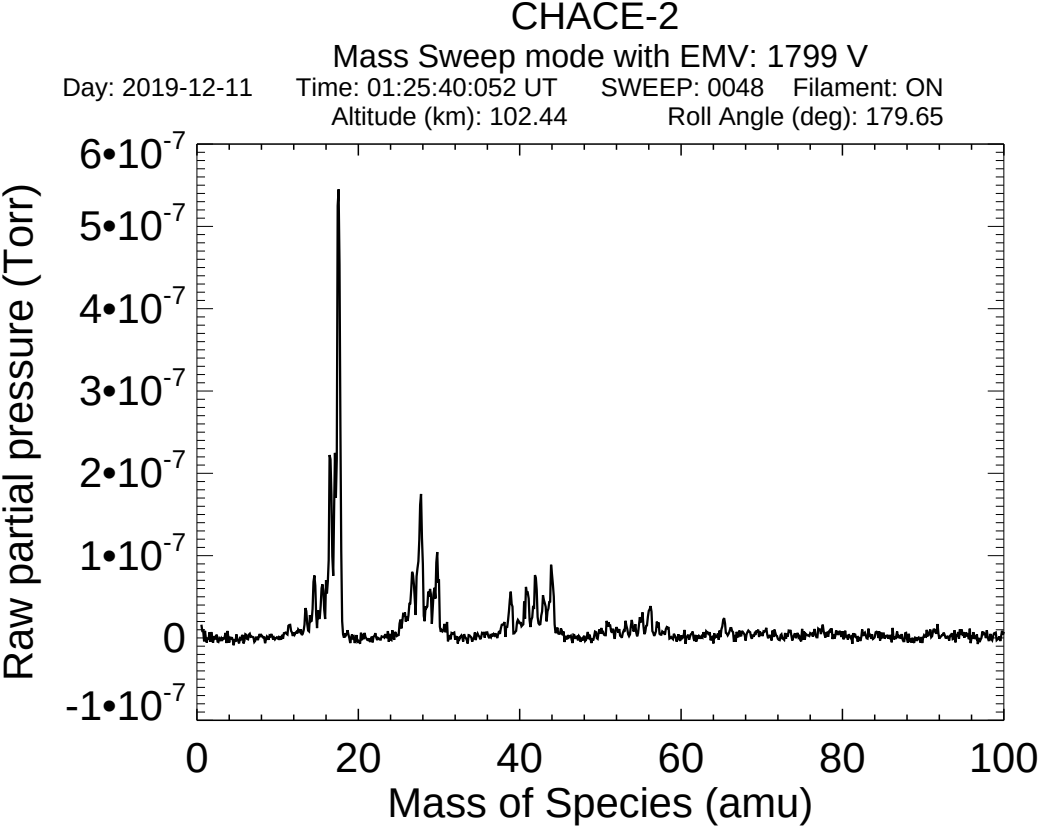

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:22:31:098 UT SWEEP: 0043 Filament: ON
Altitude (km): 99.83 Roll Angle (deg): 179.64
Raw partial pressure (Torr)
1.2•10-6
1.0•10-6
8.0•10-7
6.0•10-7
4.0•10-7
2.0•10-7
0
-2.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

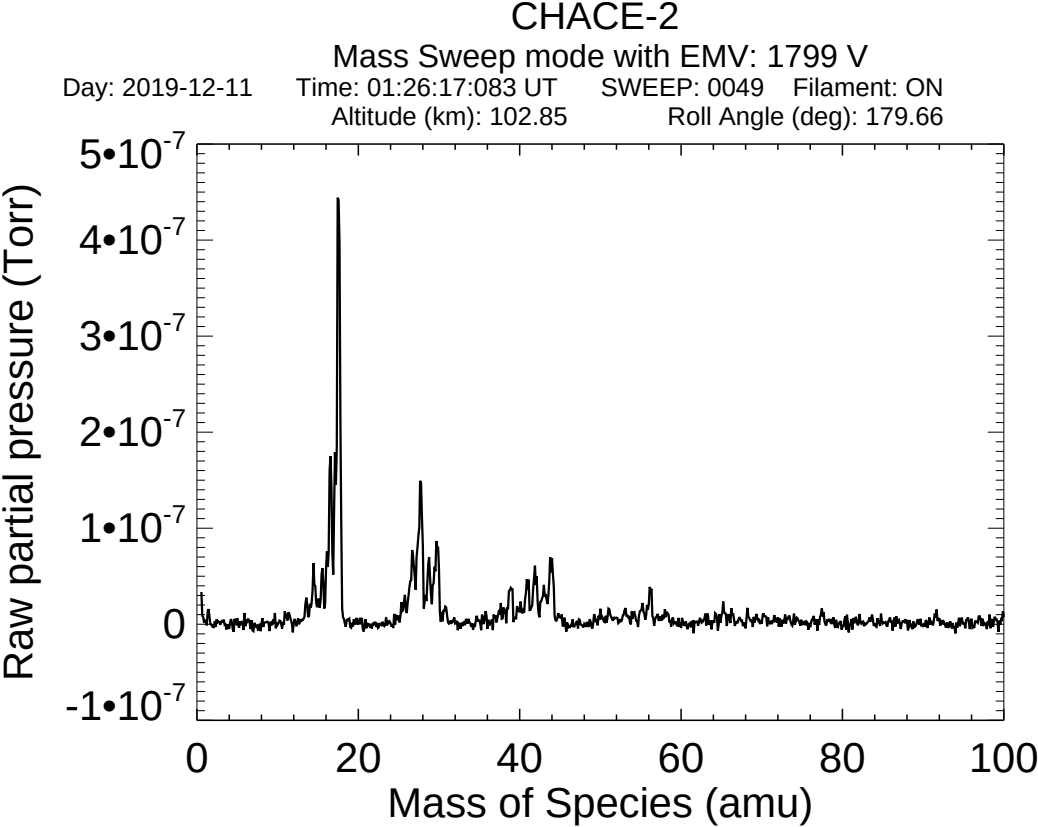

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:23:09:029 UT SWEEP: 0044 Filament: ON
Altitude (km): 100.27 Roll Angle (deg): 179.65
Raw partial pressure (Torr)
1.2•10-6
1.0•10-6
8.0•10-7
6.0•10-7
4.0•10-7
2.0•10-7
0
-2.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

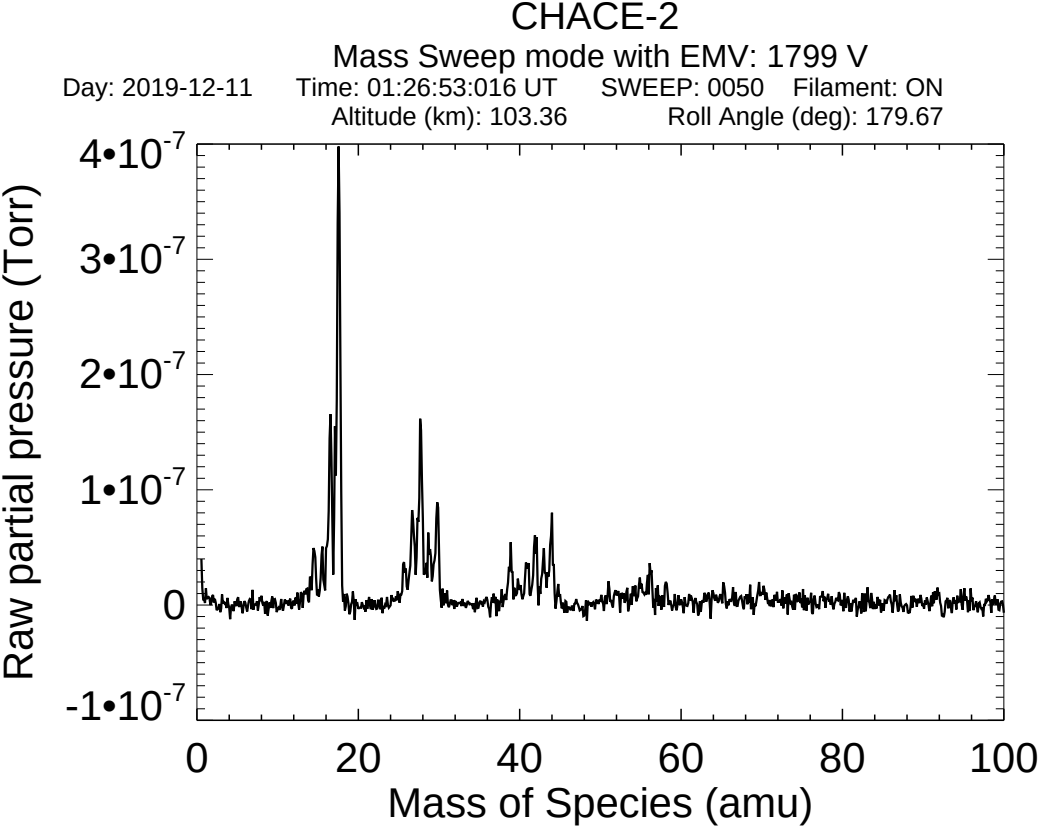

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:23:44:062 UT SWEEP: 0045 Filament: ON
Altitude (km): 100.81 Roll Angle (deg): 179.65
Raw partial pressure (Torr)
1•10-6
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

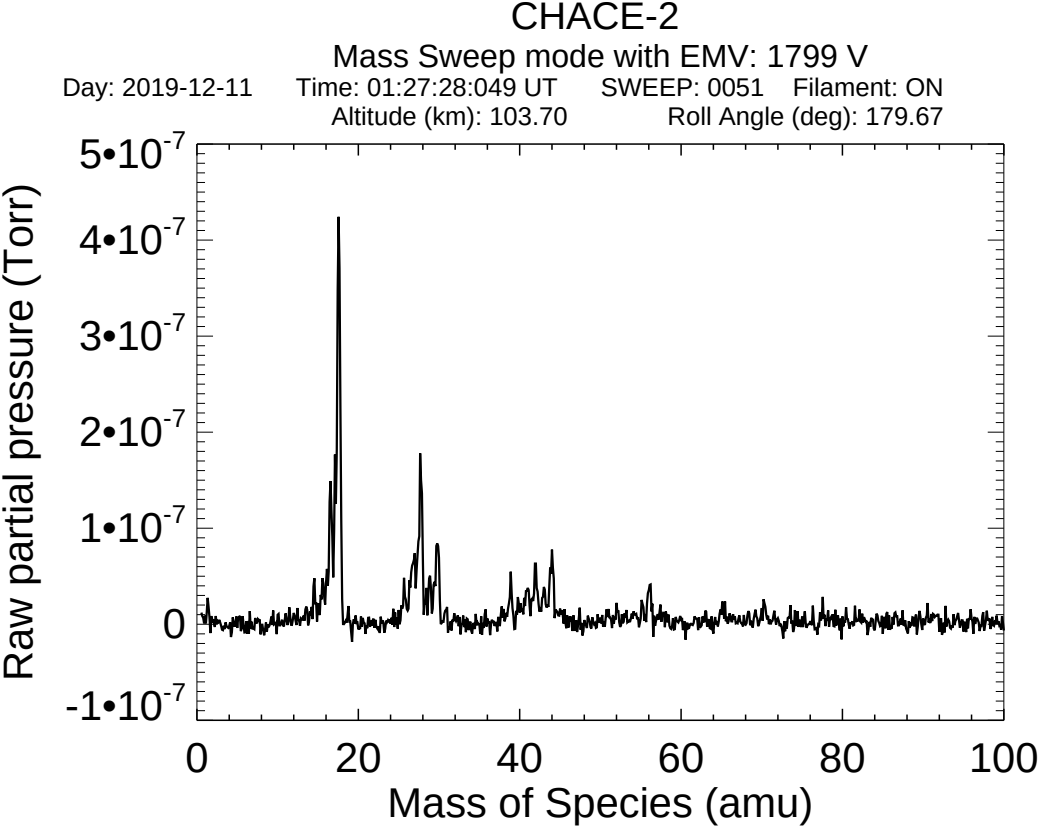

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:24:27:088 UT SWEEP: 0046 Filament: ON
Altitude (km): 101.36 Roll Angle (deg): 179.65
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

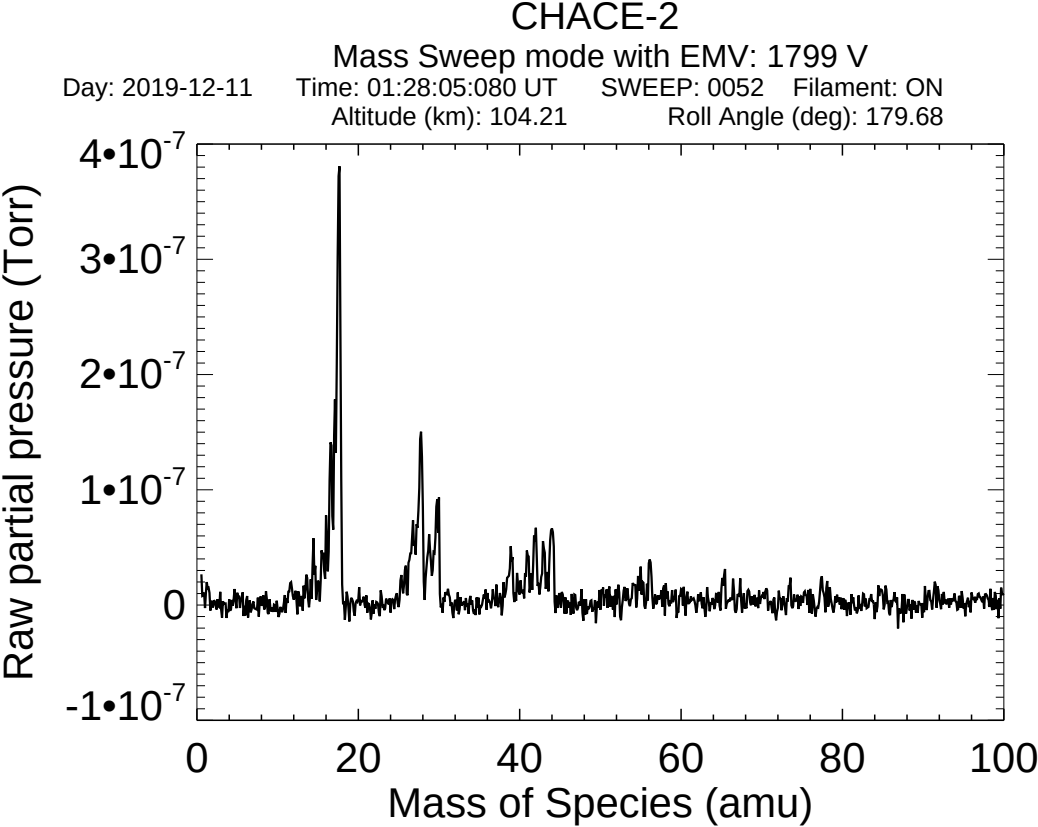

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 01:25:05:020 UT
SWEEP: 0047
Filament: ON
Altitude (km): 101.86
Roll Angle (deg): 179.65
Raw partial pressure (Torr)
1•10-6
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

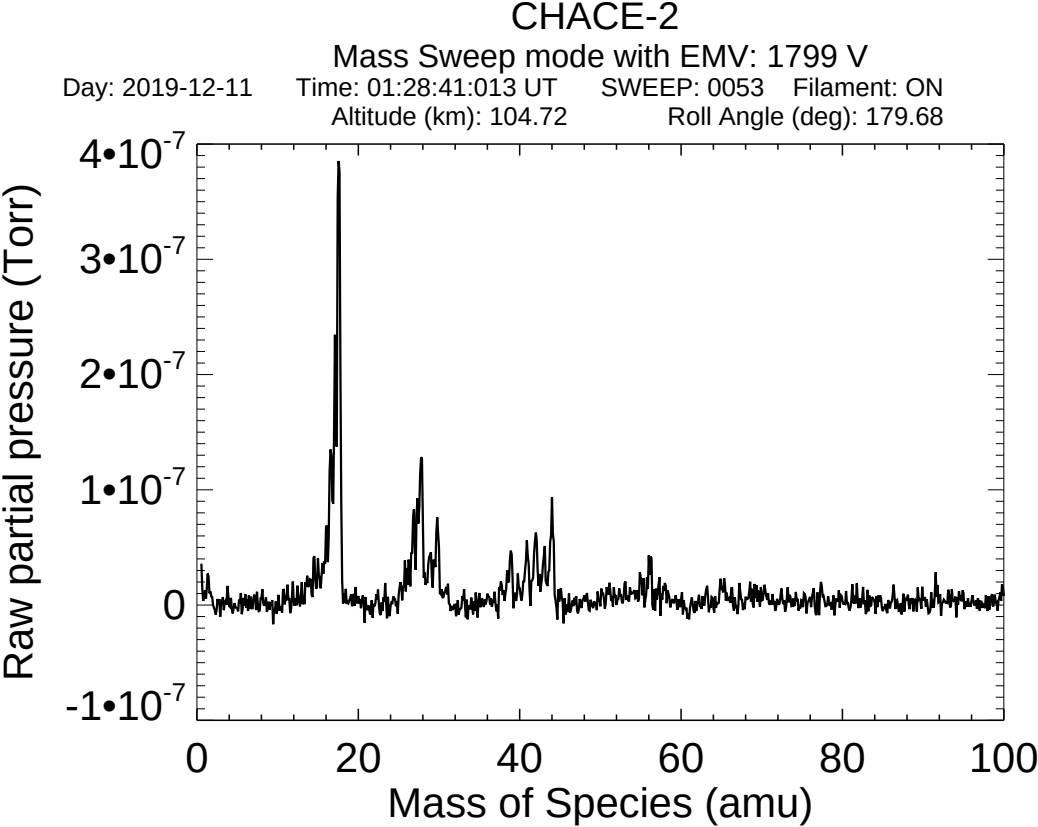

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:25:40:052 UT SWEEP: 0048 Filament: ON
Altitude (km): 102.44 Roll Angle (deg): 179.65
Raw partial pressure (Torr)
6•10-7
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

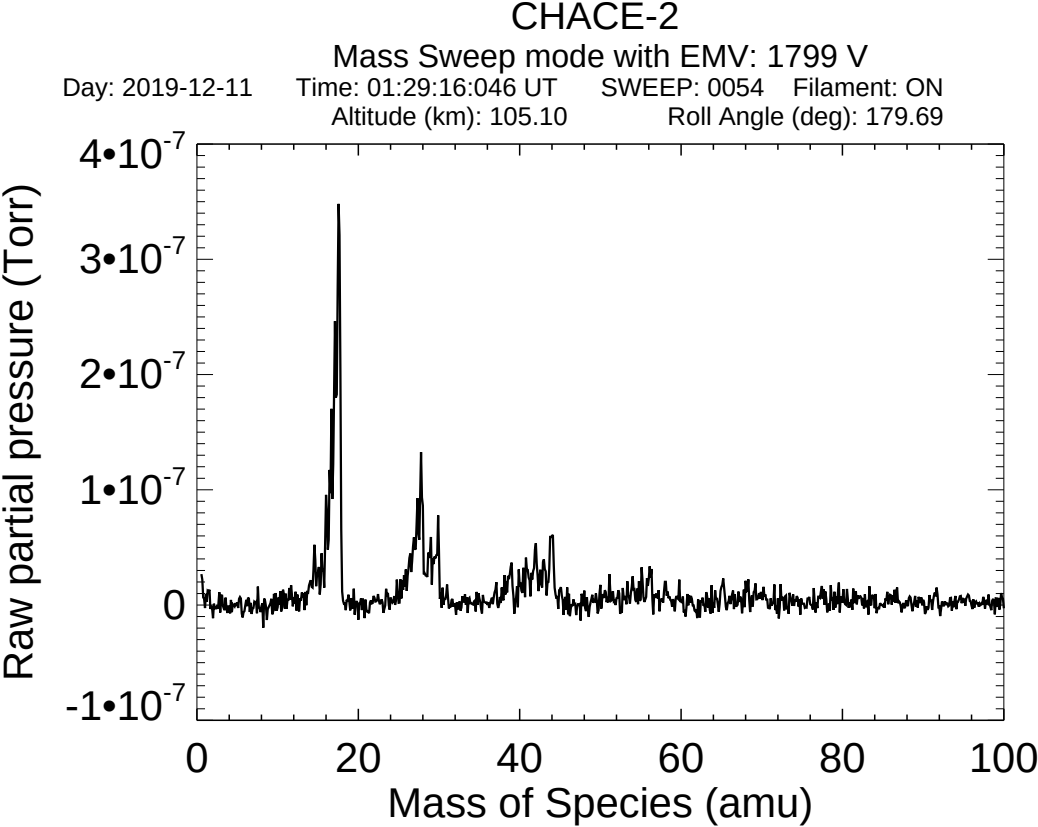

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:26:17:083 UT SWEEP: 0049 Filament: ON
Altitude (km): 102.85 Roll Angle (deg): 179.66
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

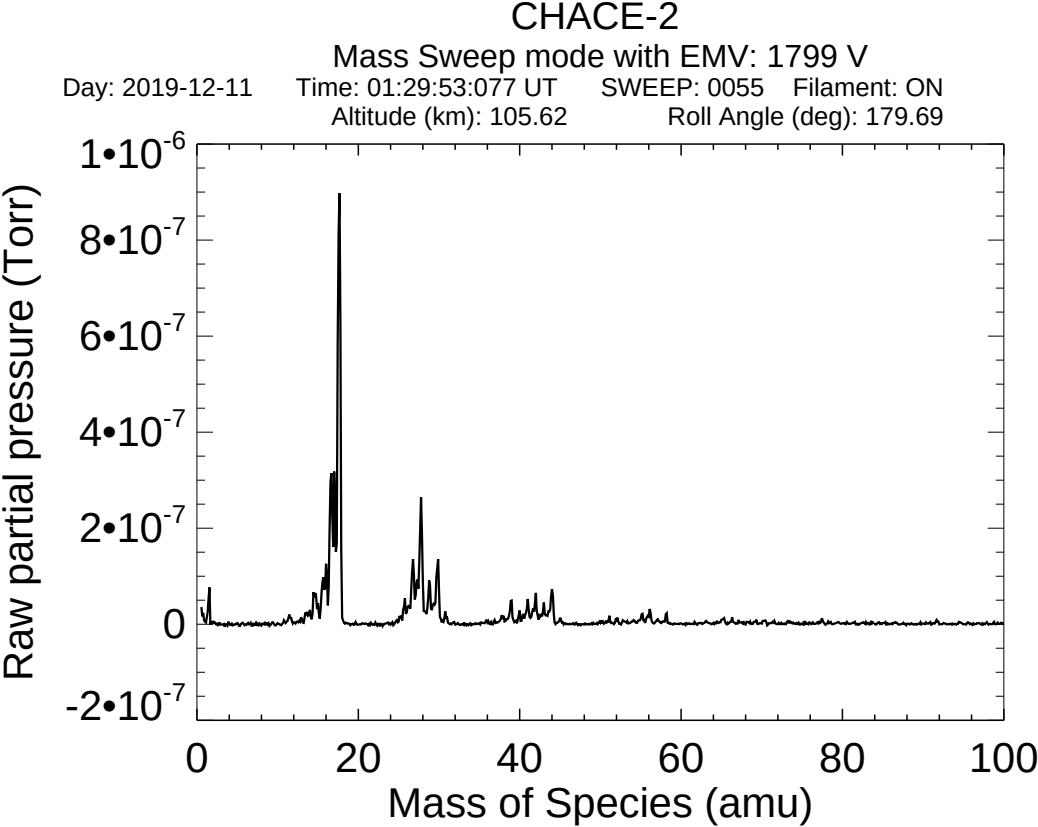

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:26:53:016 UT SWEEP: 0050 Filament: ON
Altitude (km): 103.36 Roll Angle (deg): 179.67
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

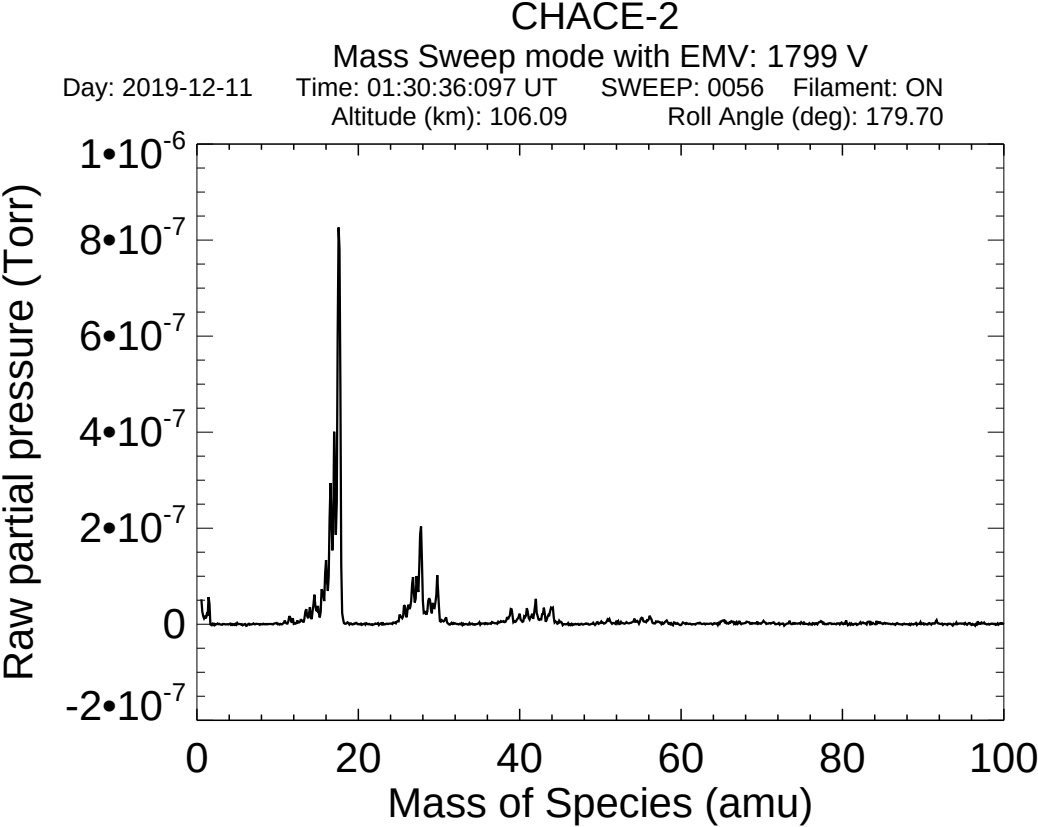

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:27:28:049 UT SWEEP: 0051 Filament: ON
Altitude (km): 103.70 Roll Angle (deg): 179.67
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

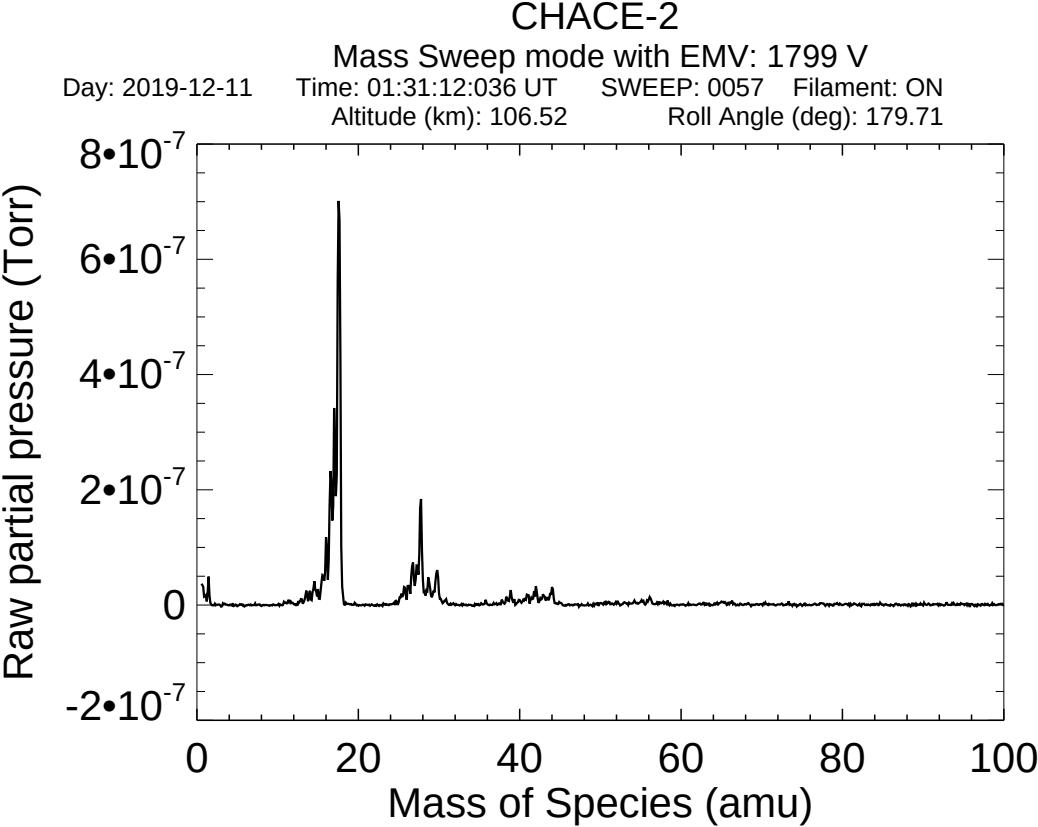

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 01:28:05:080 UT
SWEEP: 0052
Filament: ON
Altitude (km): 104.21
Roll Angle (deg): 179.68
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

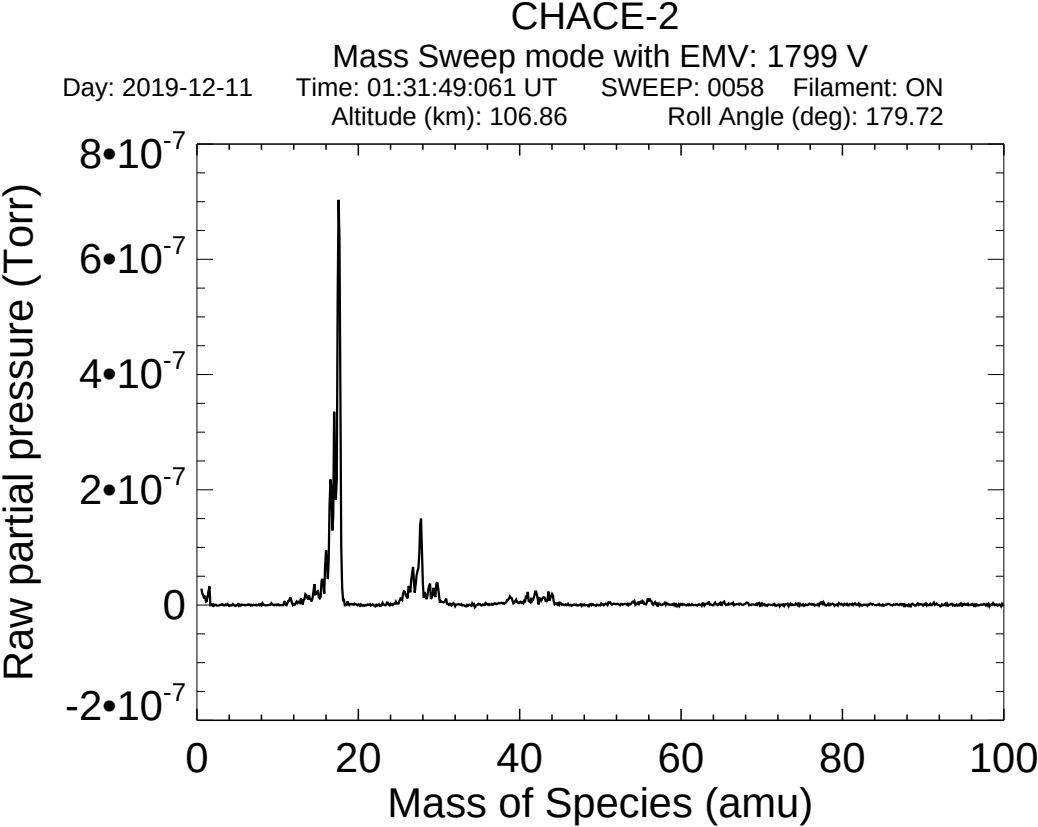

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:28:41:013 UT SWEEP: 0053 Filament: ON
Altitude (km): 104.72 Roll Angle (deg): 179.68
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

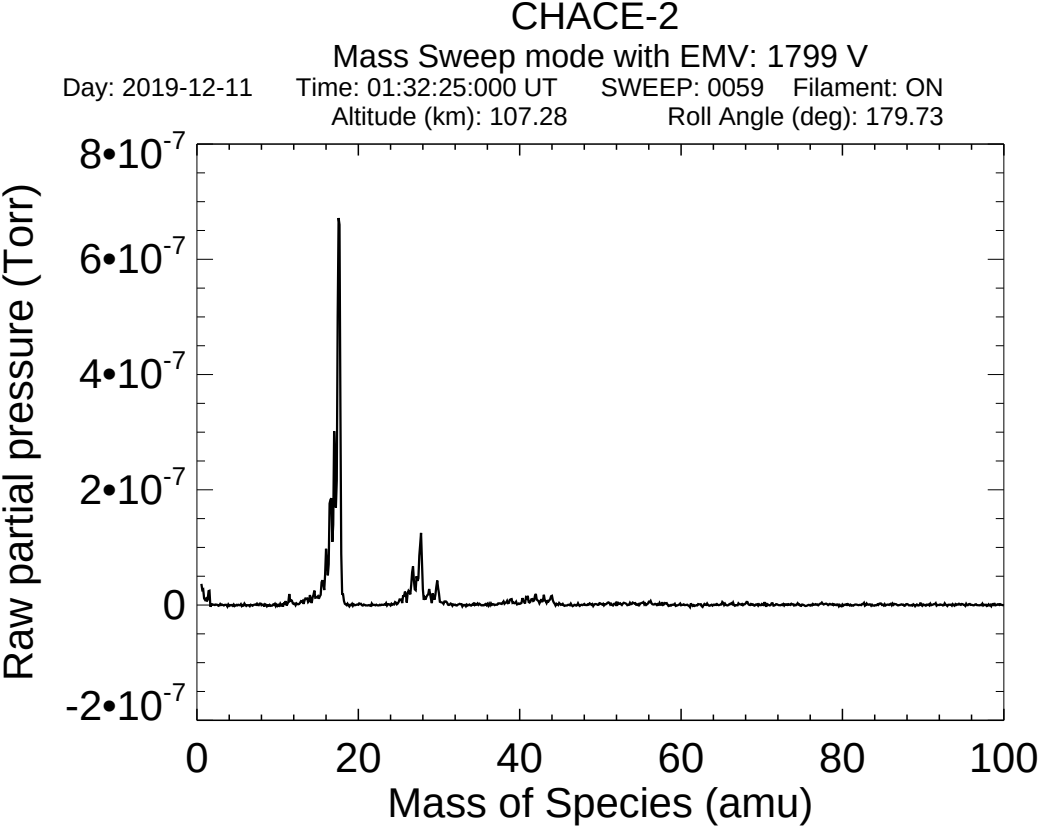

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:29:16:046 UT SWEEP: 0054 Filament: ON
Altitude (km): 105.10 Roll Angle (deg): 179.69
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

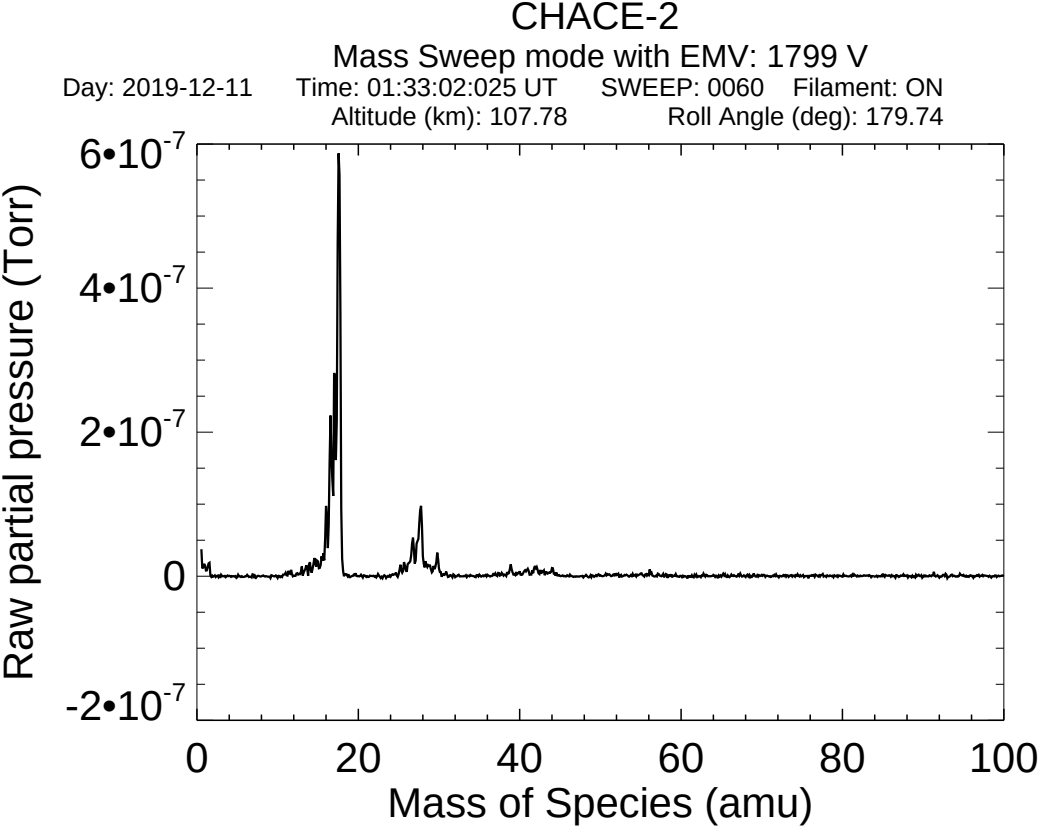

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:29:53:077 UT SWEEP: 0055 Filament: ON
Altitude (km): 105.62 Roll Angle (deg): 179.69
Raw partial pressure (Torr)
1•10-6
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

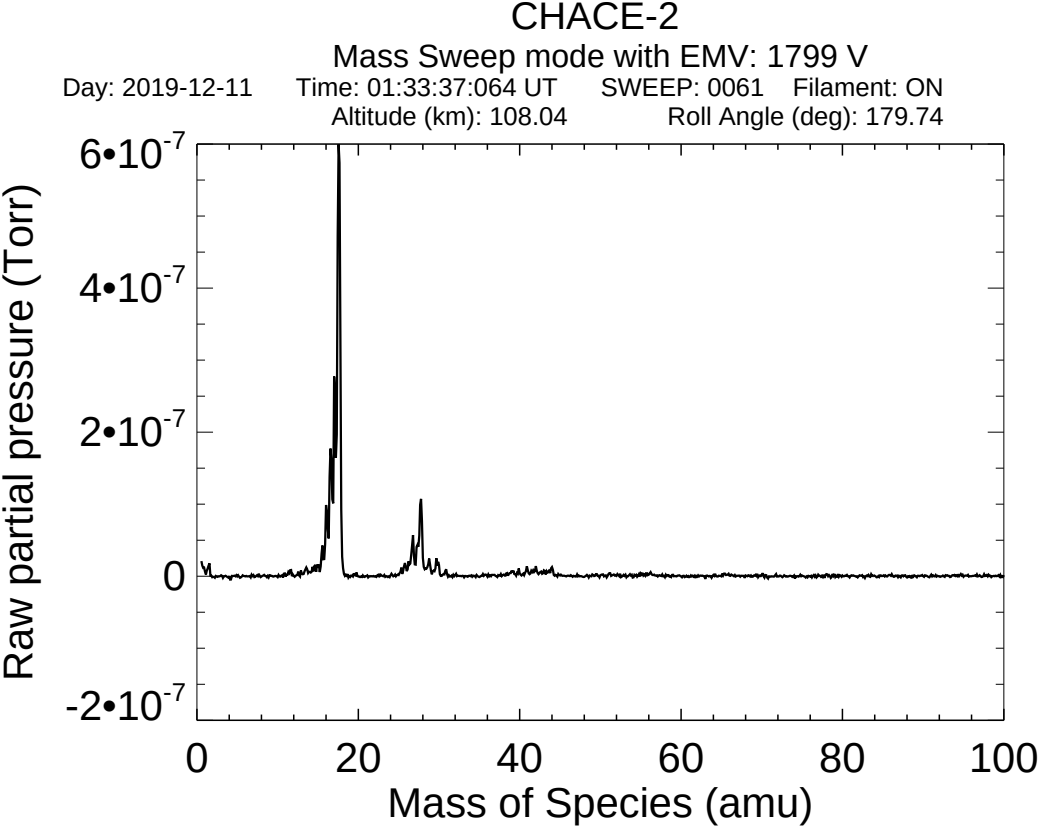

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:30:36:097 UT SWEEP: 0056 Filament: ON
Altitude (km): 106.09 Roll Angle (deg): 179.70
Raw partial pressure (Torr)
1•10-6
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

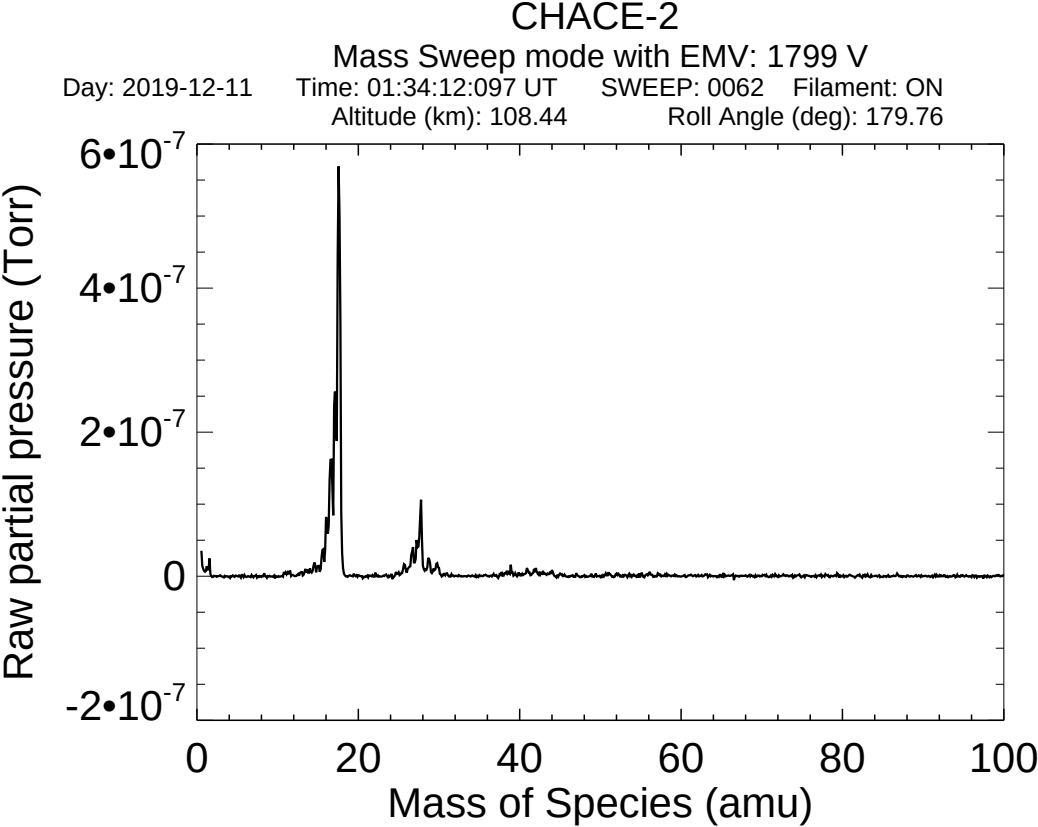

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:31:12:036 UT SWEEP: 0057 Filament: ON
Altitude (km): 106.52 Roll Angle (deg): 179.71
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

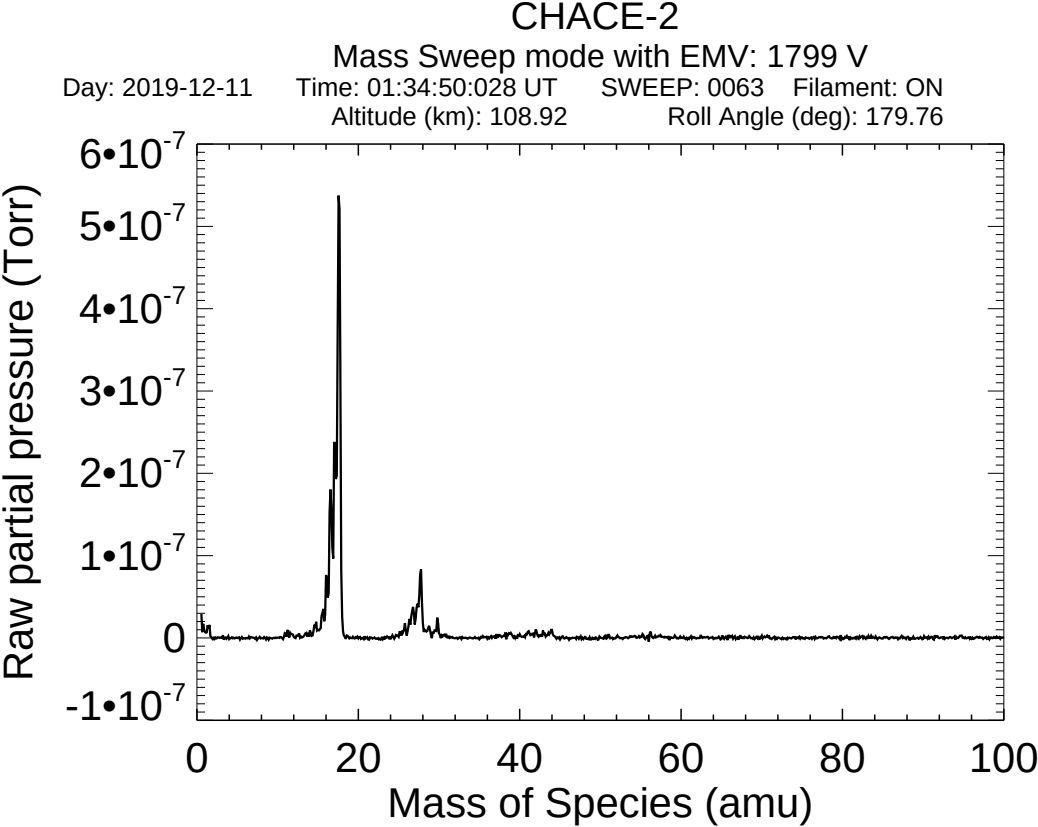

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:31:49:061 UT SWEEP: 0058 Filament: ON
Altitude (km): 106.86 Roll Angle (deg): 179.72
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

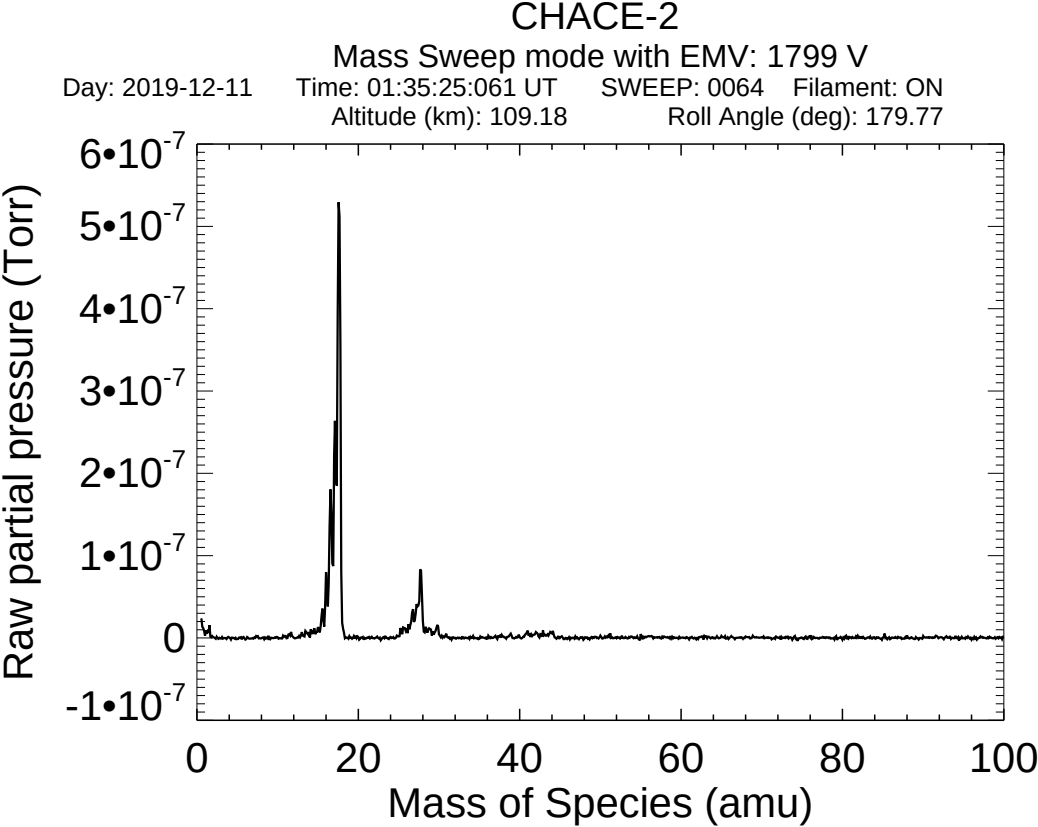

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:32:25:000 UT SWEEP: 0059 Filament: ON
Altitude (km): 107.28 Roll Angle (deg): 179.73
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

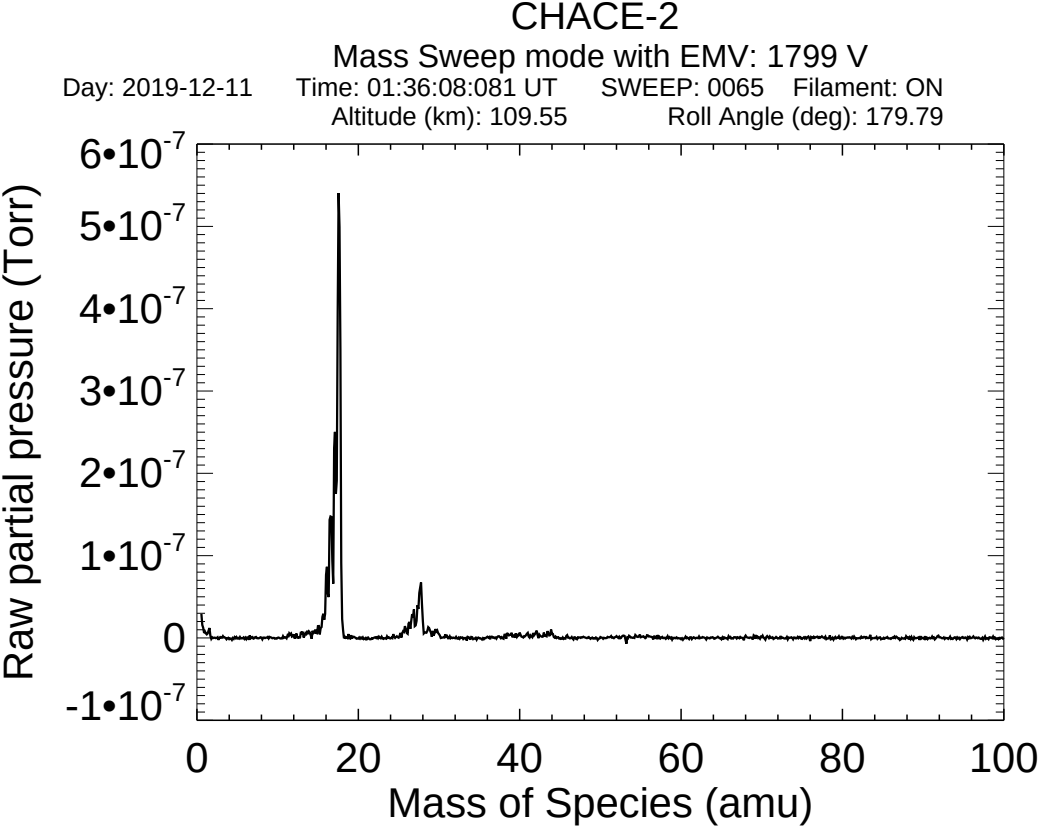

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:33:02:025 UT SWEEP: 0060 Filament: ON
Altitude (km): 107.78 Roll Angle (deg): 179.74
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

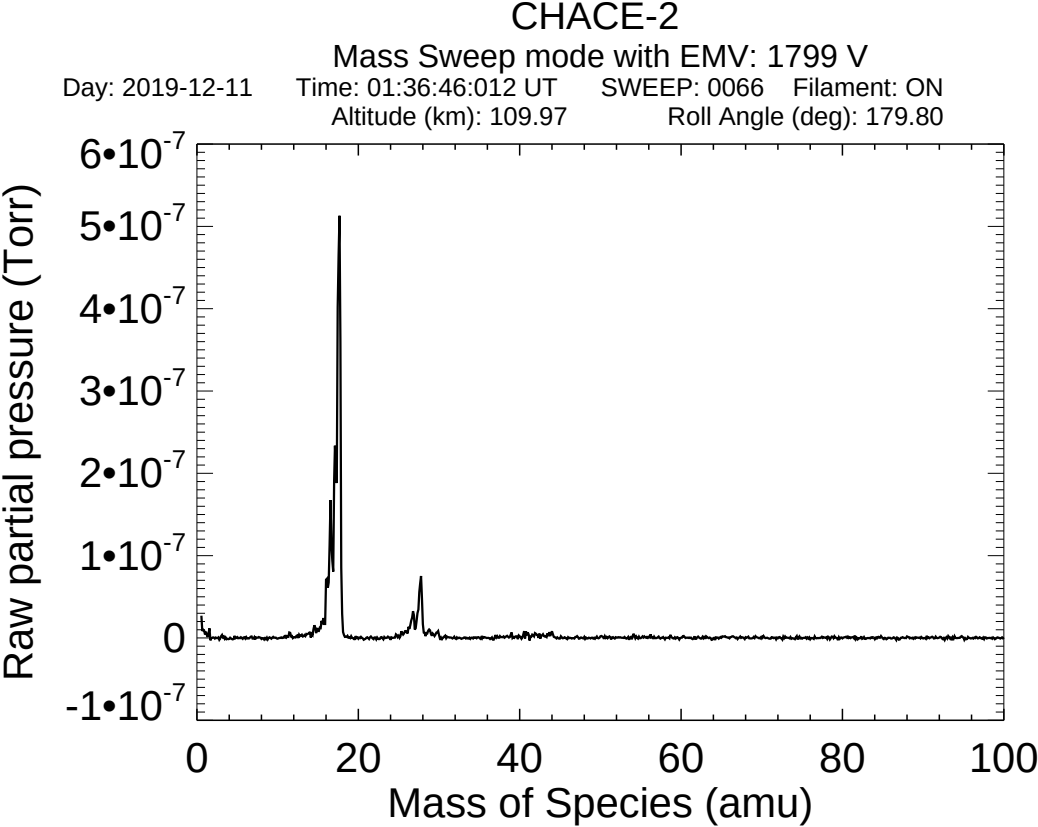

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:33:37:064 UT SWEEP: 0061 Filament: ON
Altitude (km): 108.04 Roll Angle (deg): 179.74
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

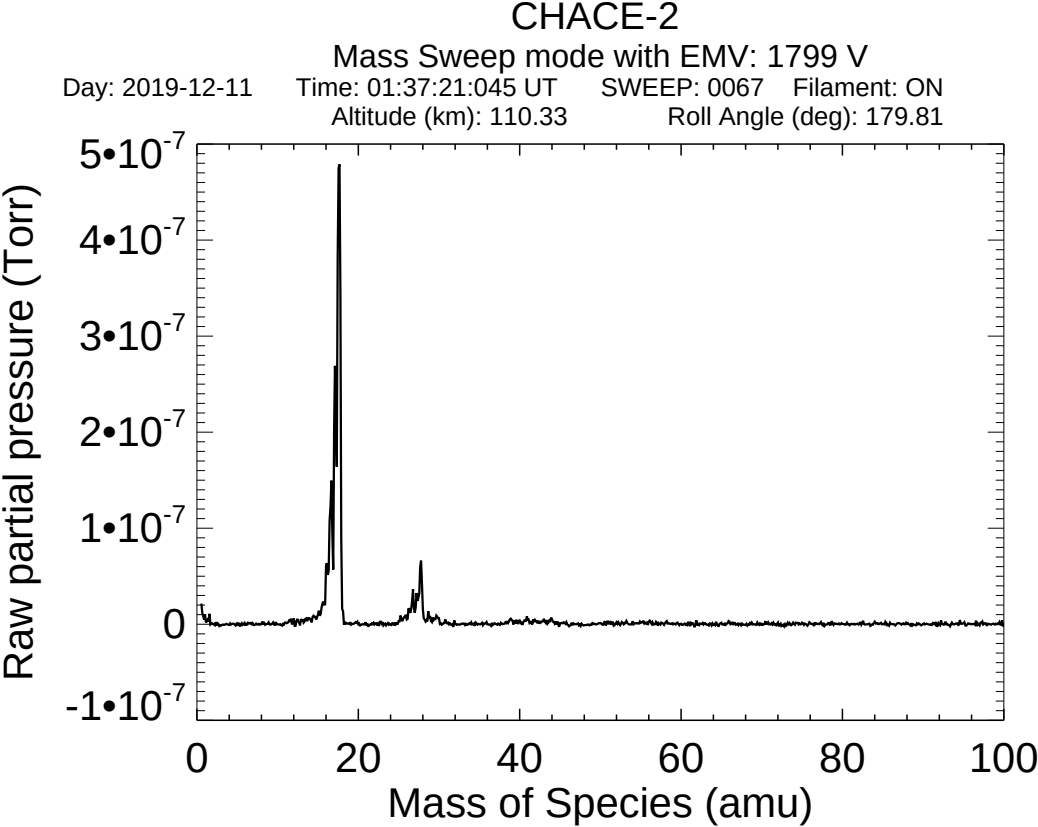

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:34:12:097 UT SWEEP: 0062 Filament: ON
Altitude (km): 108.44 Roll Angle (deg): 179.76
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

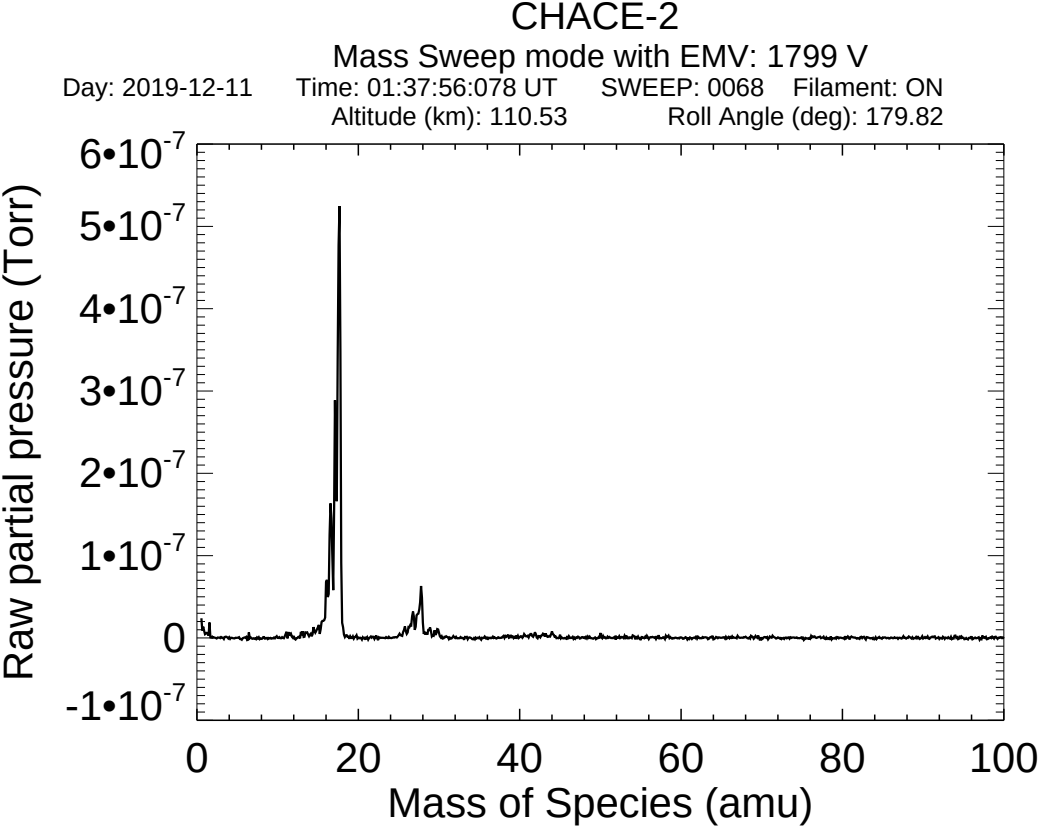

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:34:50:028 UT SWEEP: 0063 Filament: ON
Altitude (km): 108.92 Roll Angle (deg): 179.76
Raw partial pressure (Torr)
6•10-7
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

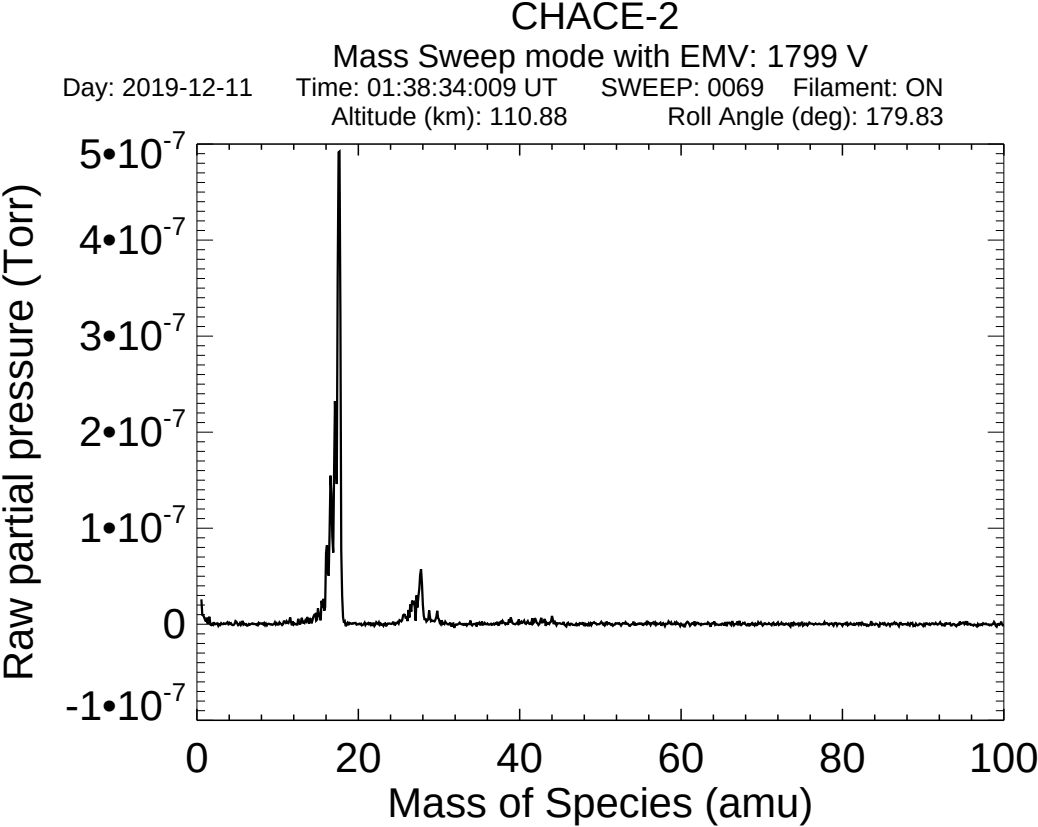

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:35:25:061 UT SWEEP: 0064 Filament: ON
Altitude (km): 109.18 Roll Angle (deg): 179.77
Raw partial pressure (Torr)
6•10-7
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

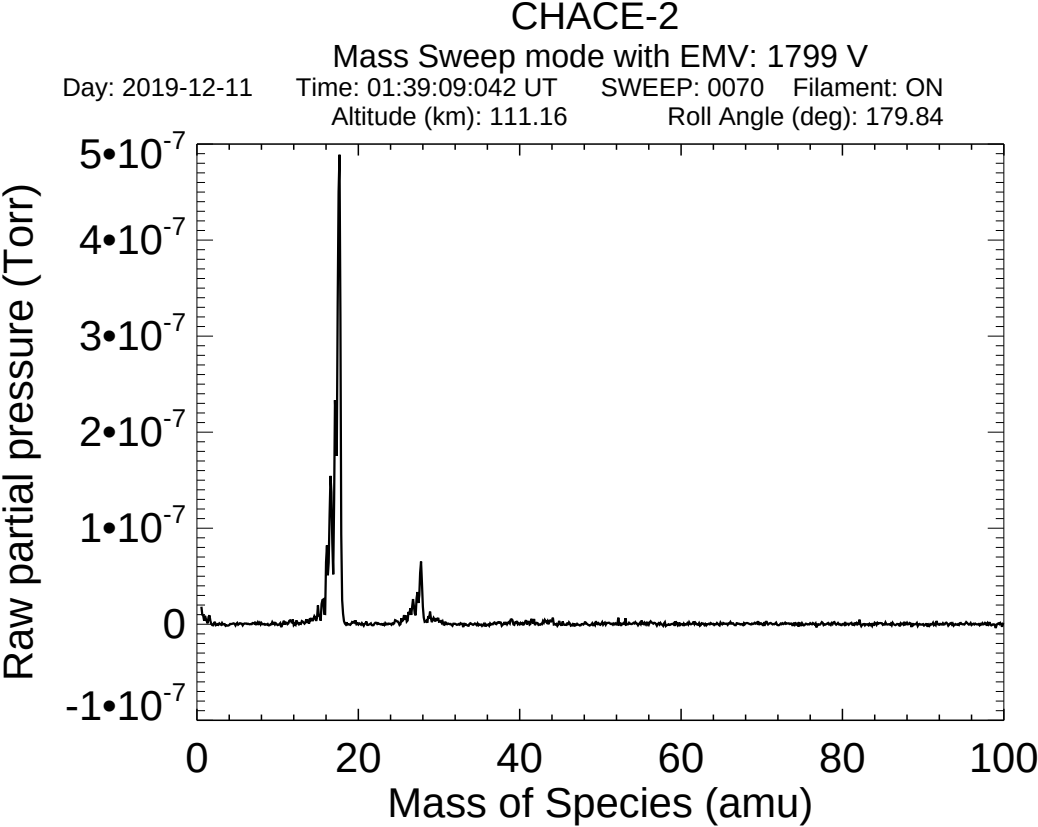

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:36:08:081 UT SWEEP: 0065 Filament: ON
Altitude (km): 109.55 Roll Angle (deg): 179.79
Raw partial pressure (Torr)
6•10-7
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

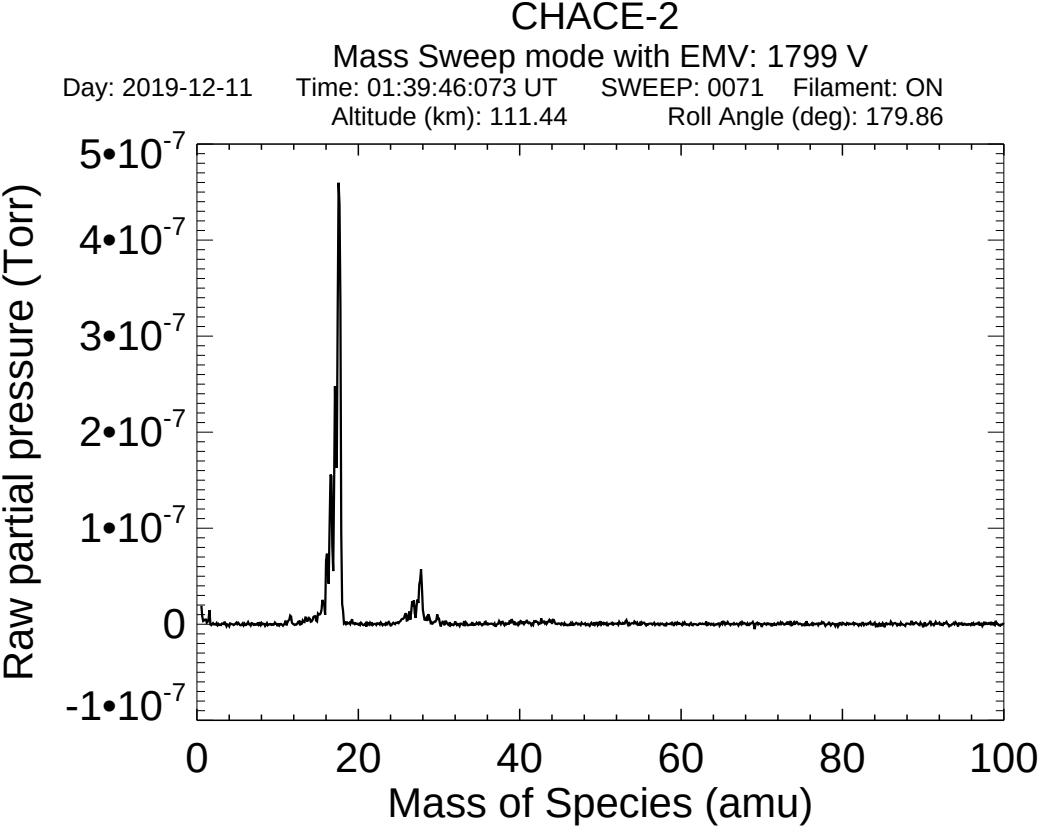

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:36:46:012 UT SWEEP: 0066 Filament: ON
Altitude (km): 109.97 Roll Angle (deg): 179.80
Raw partial pressure (Torr)
6•10-7
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

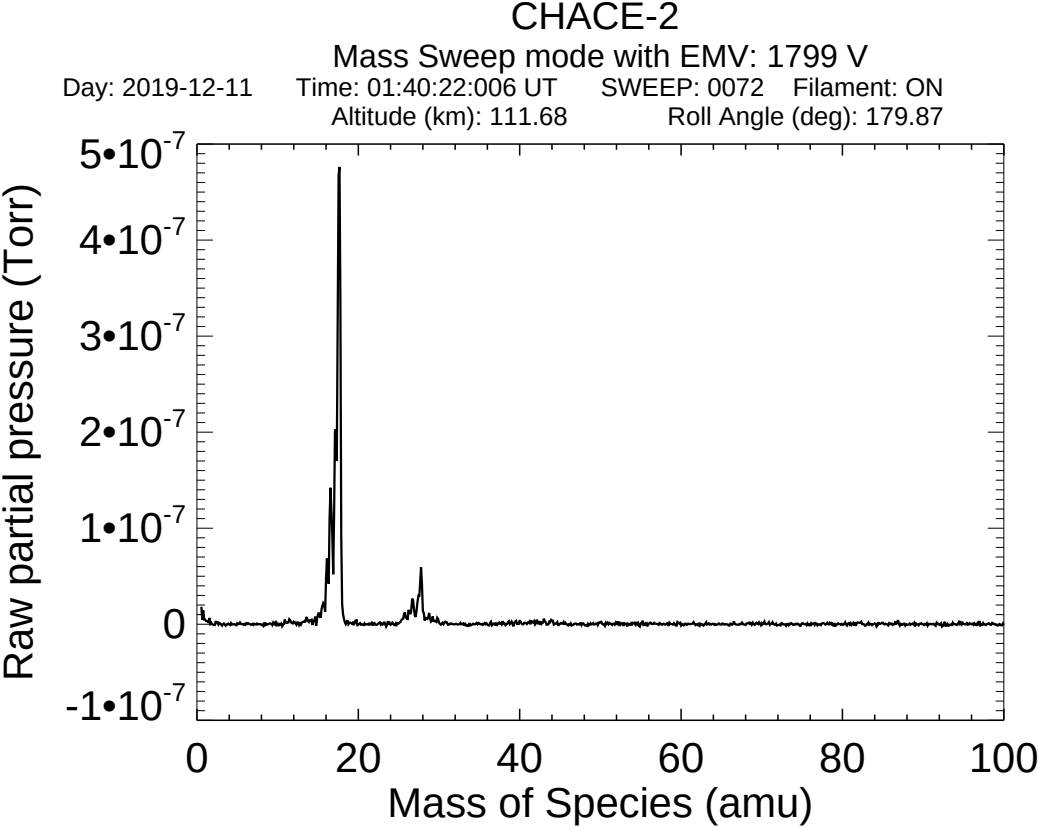

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:37:21:045 UT SWEEP: 0067 Filament: ON
Altitude (km): 110.33 Roll Angle (deg): 179.81
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

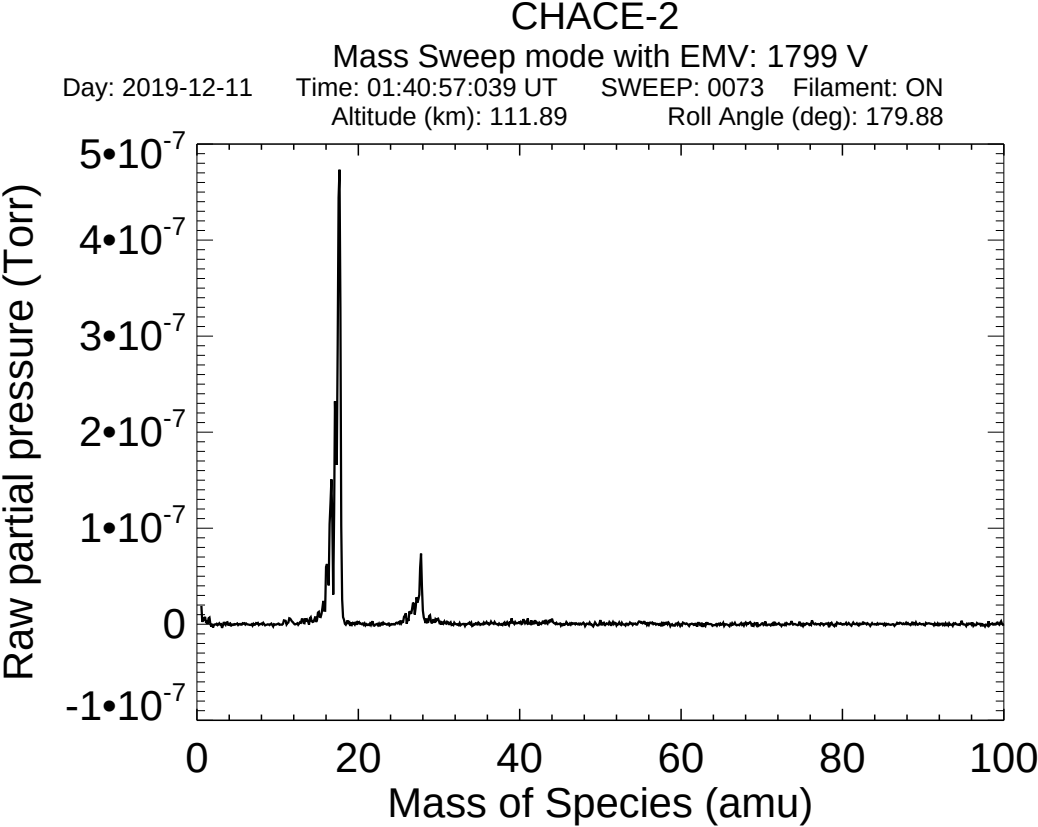

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:37:56:078 UT SWEEP: 0068 Filament: ON
Altitude (km): 110.53 Roll Angle (deg): 179.82
Raw partial pressure (Torr)
6•10-7
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

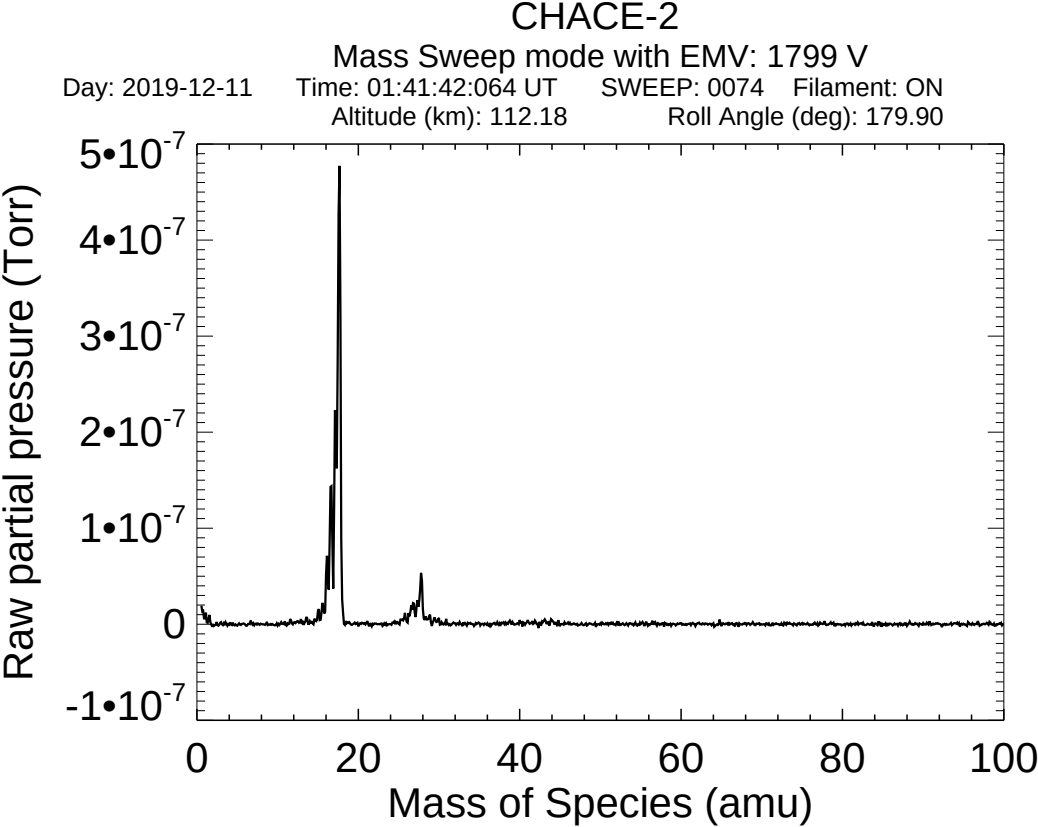

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:38:34:009 UT SWEEP: 0069 Filament: ON
Altitude (km): 110.88 Roll Angle (deg): 179.83
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

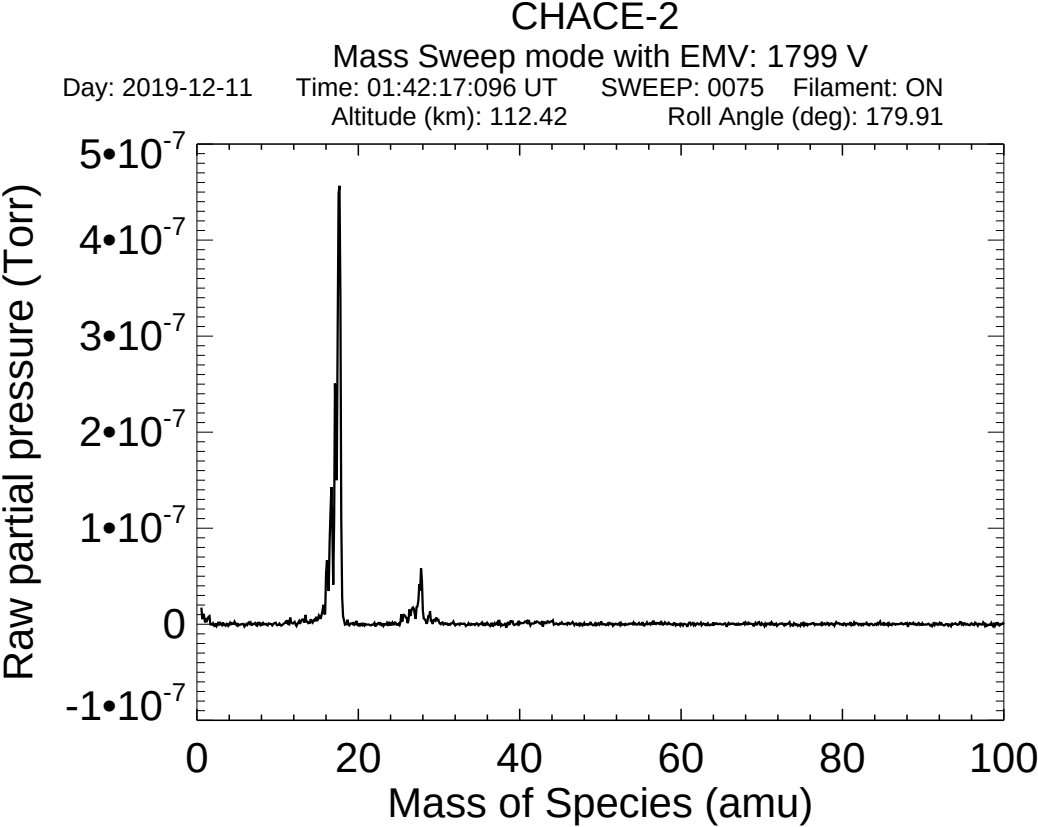

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:39:09:042 UT SWEEP: 0070 Filament: ON
Altitude (km): 111.16 Roll Angle (deg): 179.84
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

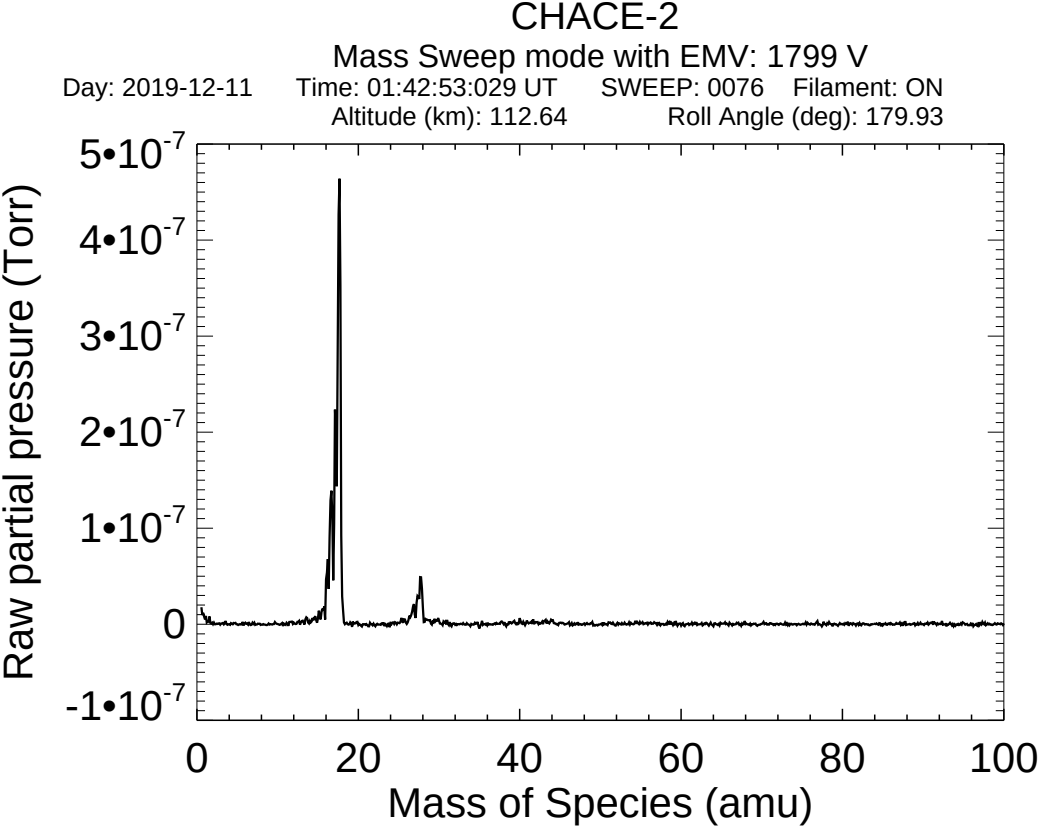

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:39:46:073 UT SWEEP: 0071 Filament: ON
Altitude (km): 111.44 Roll Angle (deg): 179.86
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

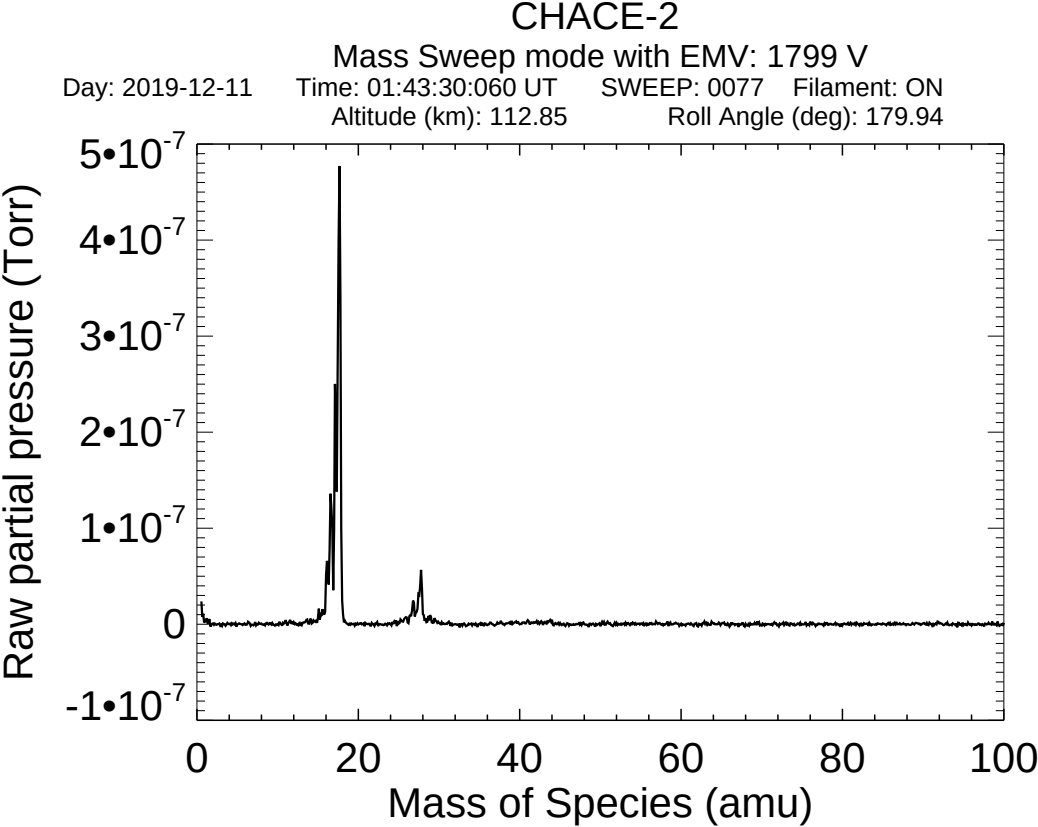

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:40:22:006 UT SWEEP: 0072 Filament: ON
Altitude (km): 111.68 Roll Angle (deg): 179.87
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

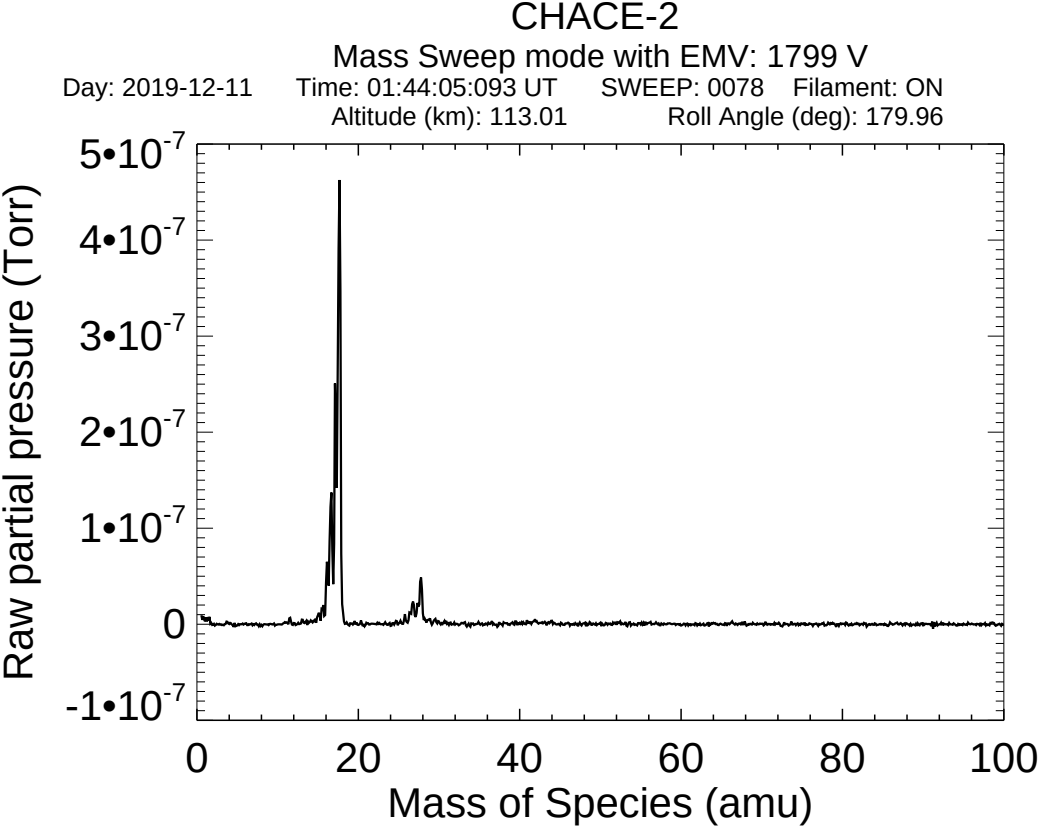

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:40:57:039 UT SWEEP: 0073 Filament: ON
Altitude (km): 111.89 Roll Angle (deg): 179.88
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

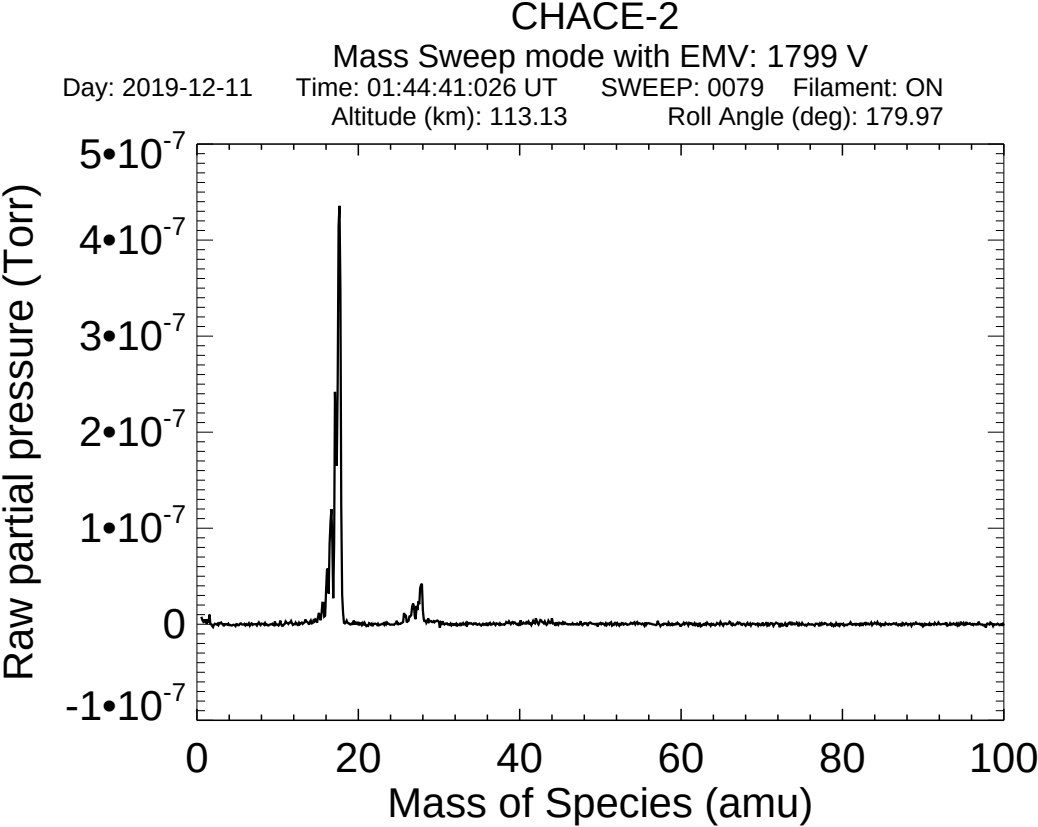

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:41:42:064 UT SWEEP: 0074 Filament: ON
Altitude (km): 112.18 Roll Angle (deg): 179.90
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

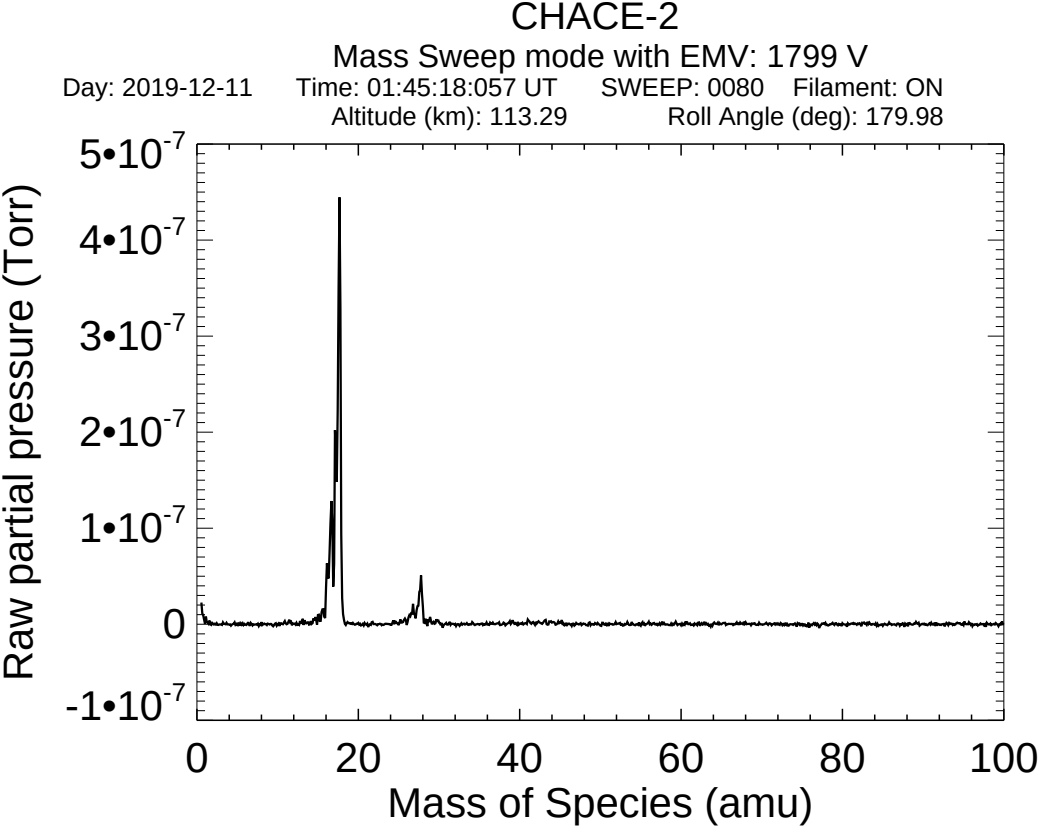

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:42:17:096 UT SWEEP: 0075 Filament: ON
Altitude (km): 112.42 Roll Angle (deg): 179.91
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

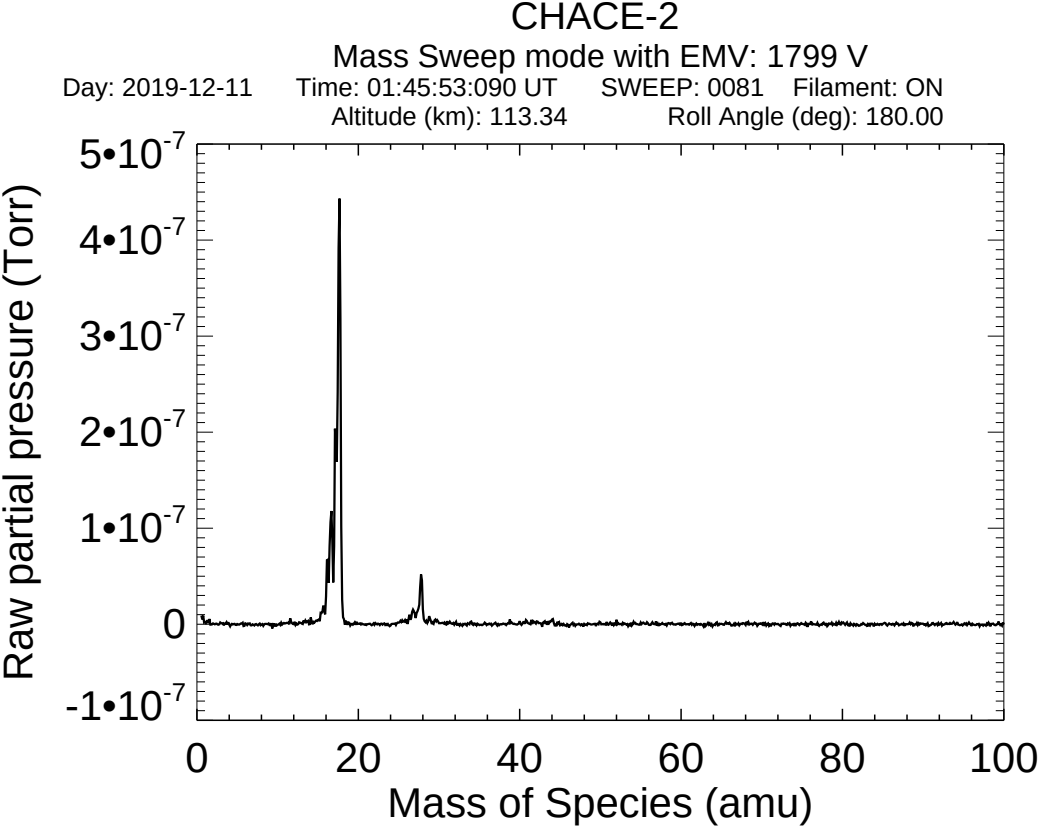

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:42:53:029 UT SWEEP: 0076 Filament: ON
Altitude (km): 112.64 Roll Angle (deg): 179.93
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

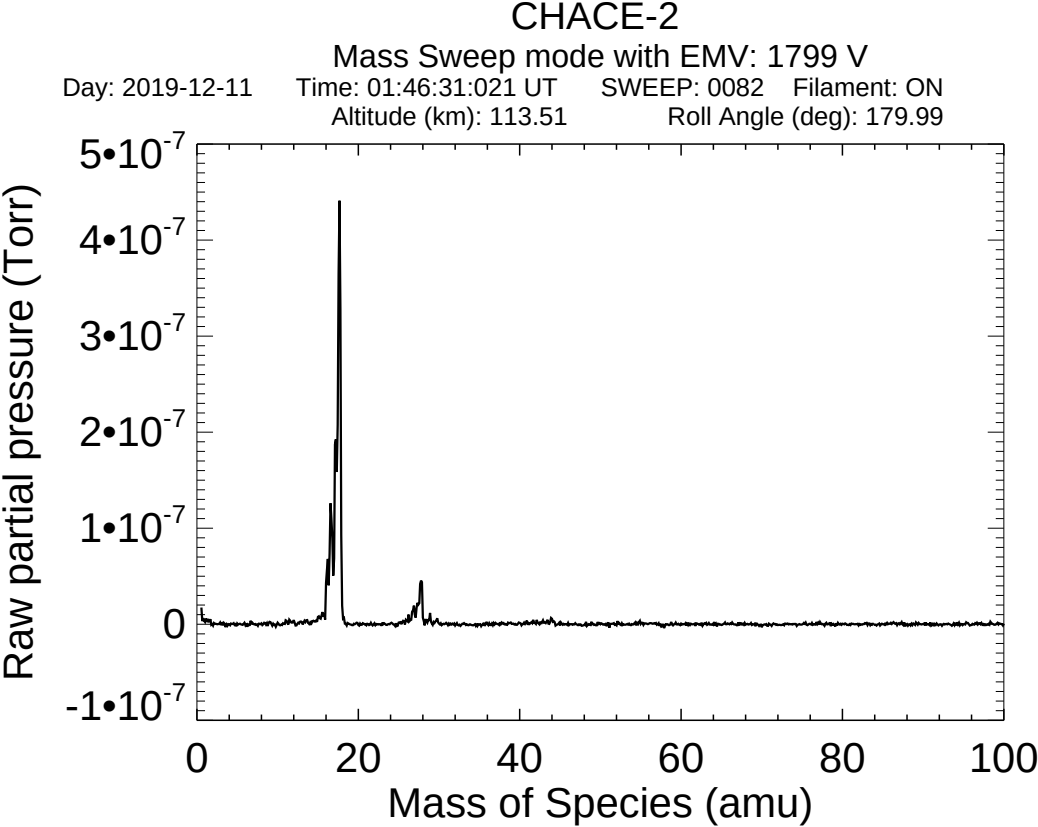

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:43:30:060 UT SWEEP: 0077 Filament: ON
Altitude (km): 112.85 Roll Angle (deg): 179.94
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

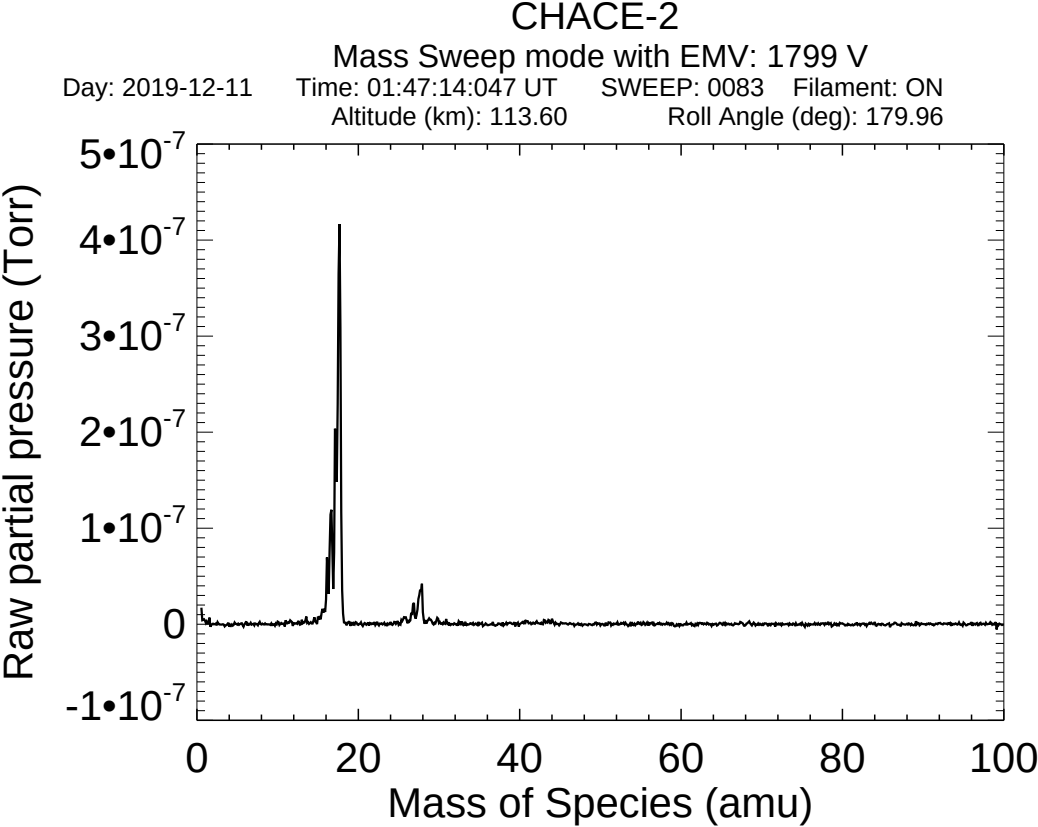

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:44:05:093 UT SWEEP: 0078 Filament: ON
Altitude (km): 113.01 Roll Angle (deg): 179.96
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

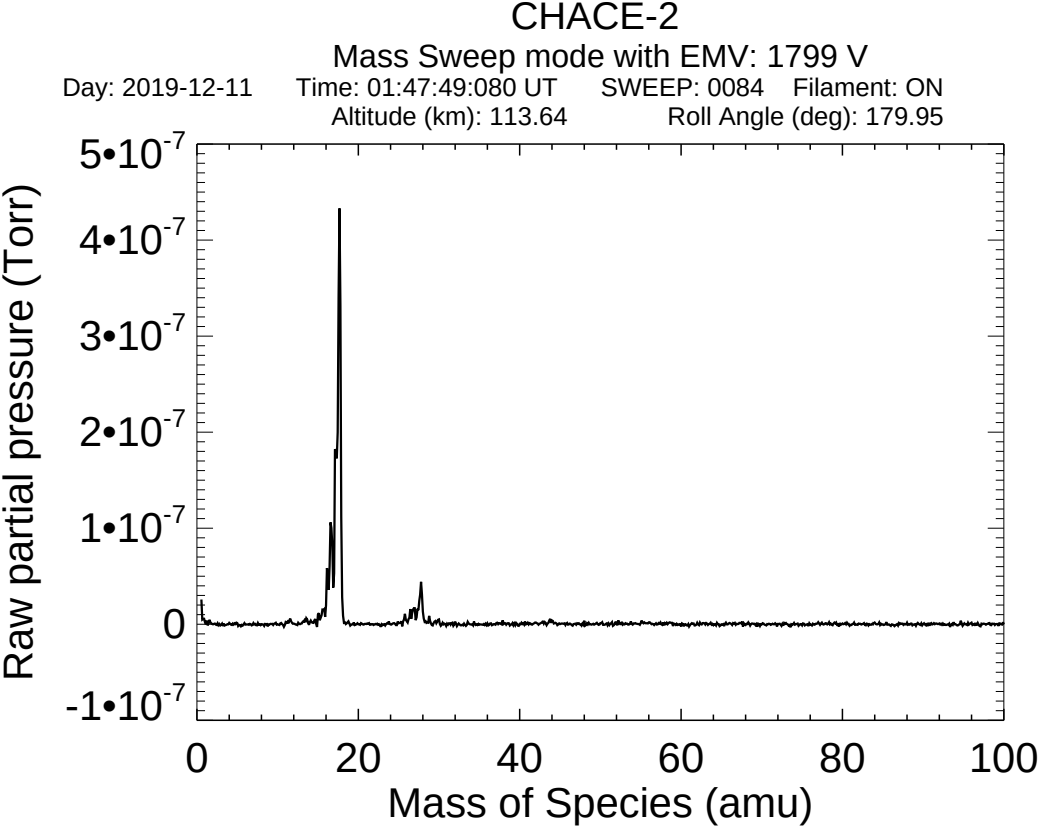

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:44:41:026 UT SWEEP: 0079 Filament: ON
Altitude (km): 113.13 Roll Angle (deg): 179.97
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

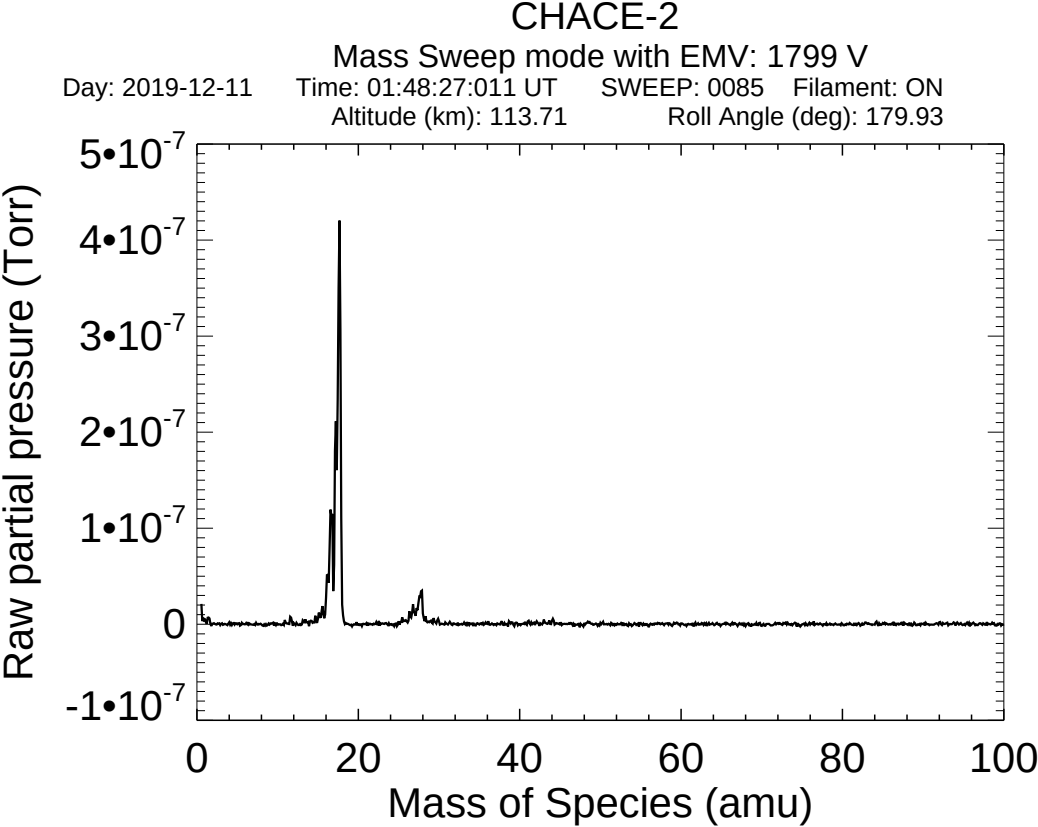

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:45:18:057 UT SWEEP: 0080 Filament: ON
Altitude (km): 113.29 Roll Angle (deg): 179.98
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

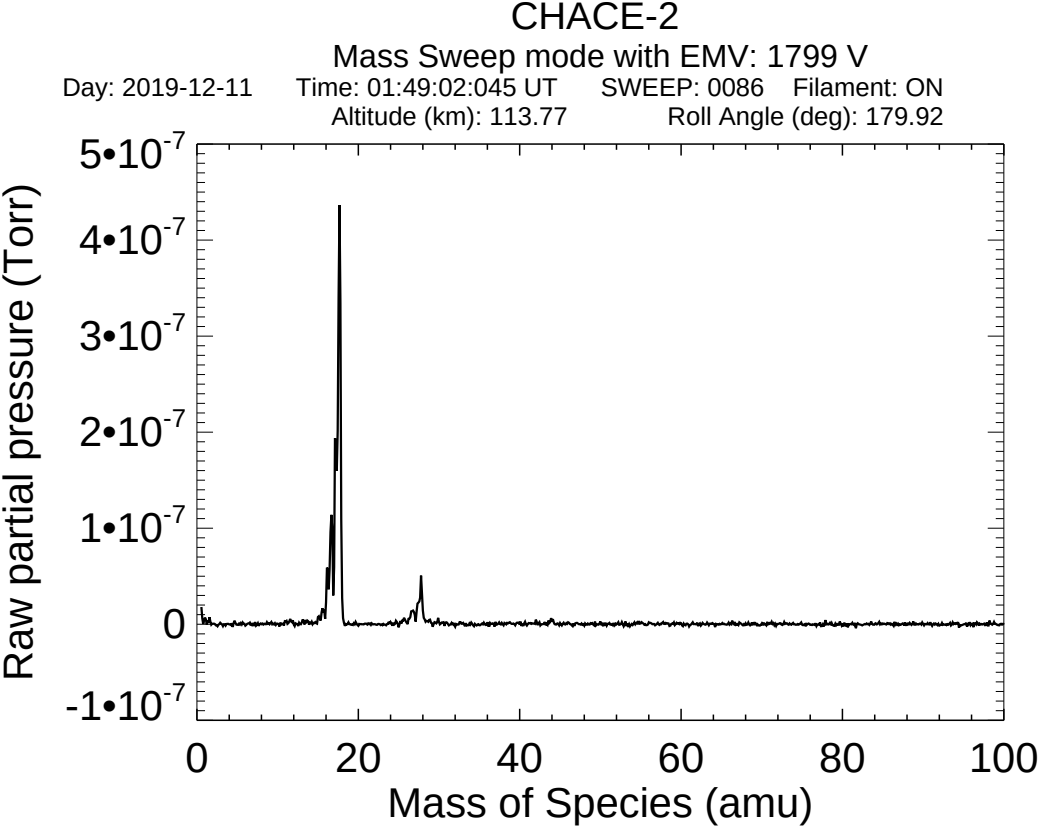

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:45:53:090 UT SWEEP: 0081 Filament: ON
Altitude (km): 113.34 Roll Angle (deg): 180.00
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

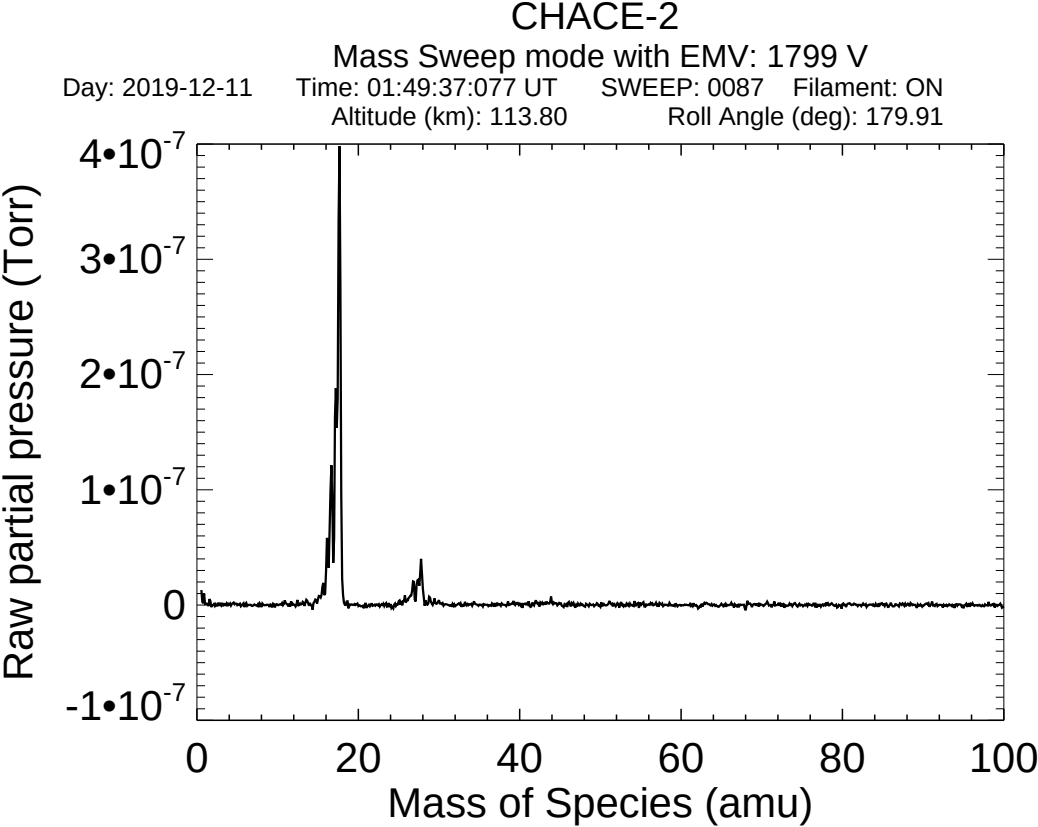

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:46:31:021 UT SWEEP: 0082 Filament: ON
Altitude (km): 113.51 Roll Angle (deg): 179.99
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

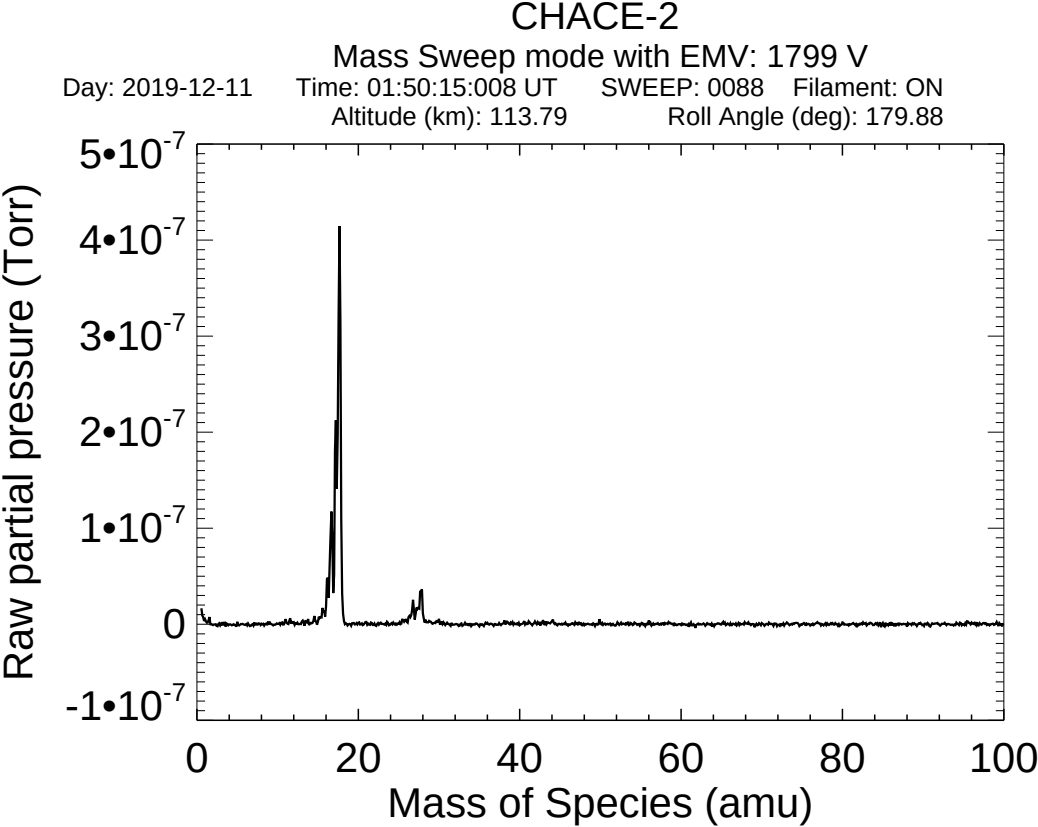

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:47:14:047 UT SWEEP: 0083 Filament: ON
Altitude (km): 113.60 Roll Angle (deg): 179.96
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

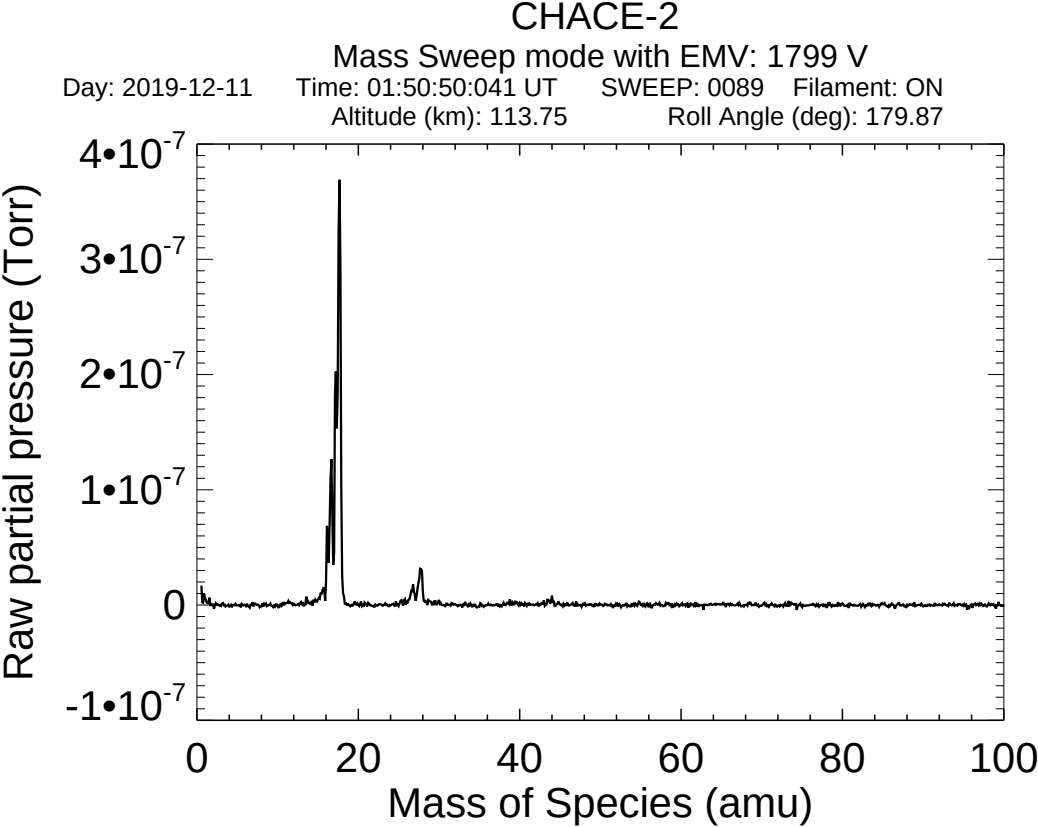

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:47:49:080 UT SWEEP: 0084 Filament: ON
Altitude (km): 113.64 Roll Angle (deg): 179.95
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

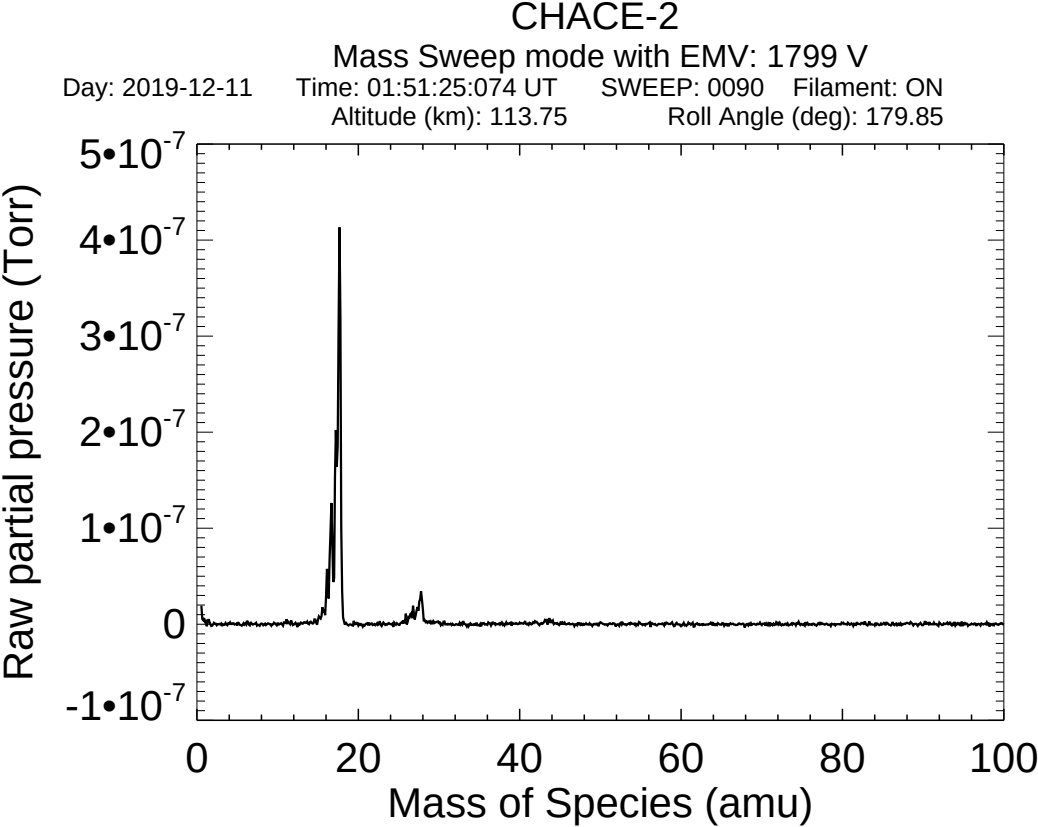

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:48:27:011 UT SWEEP: 0085 Filament: ON
Altitude (km): 113.71 Roll Angle (deg): 179.93
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

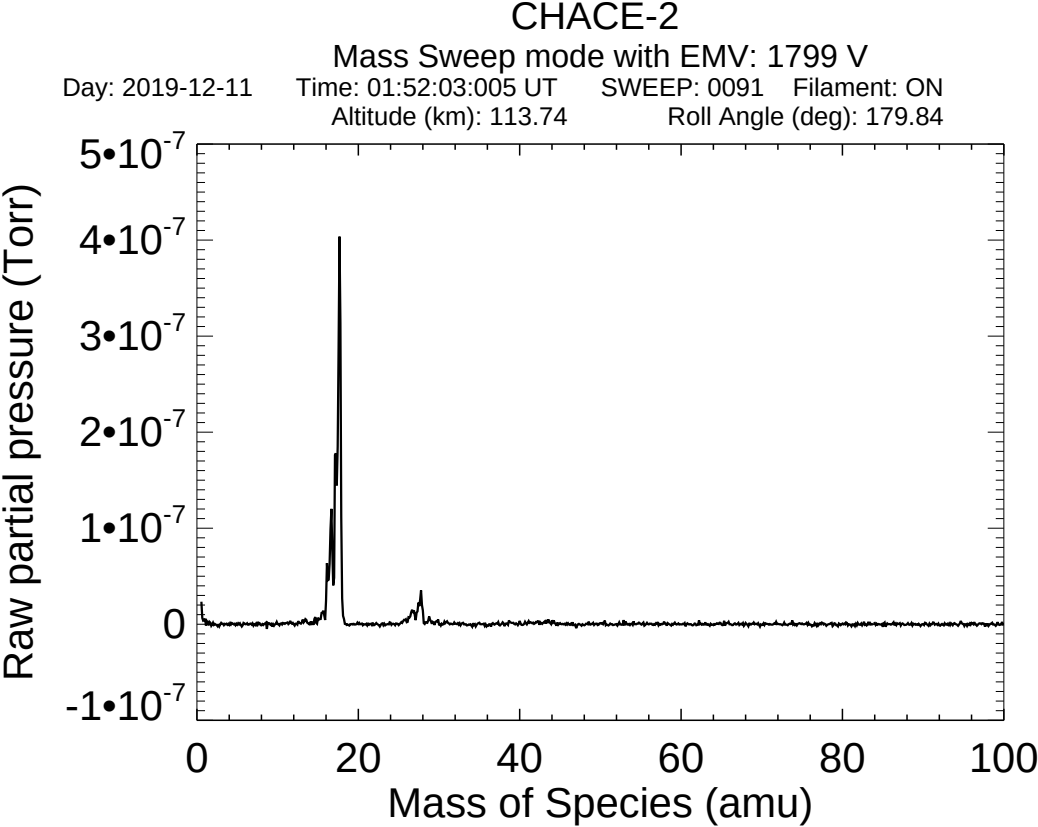

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:49:02:045 UT SWEEP: 0086 Filament: ON
Altitude (km): 113.77 Roll Angle (deg): 179.92
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

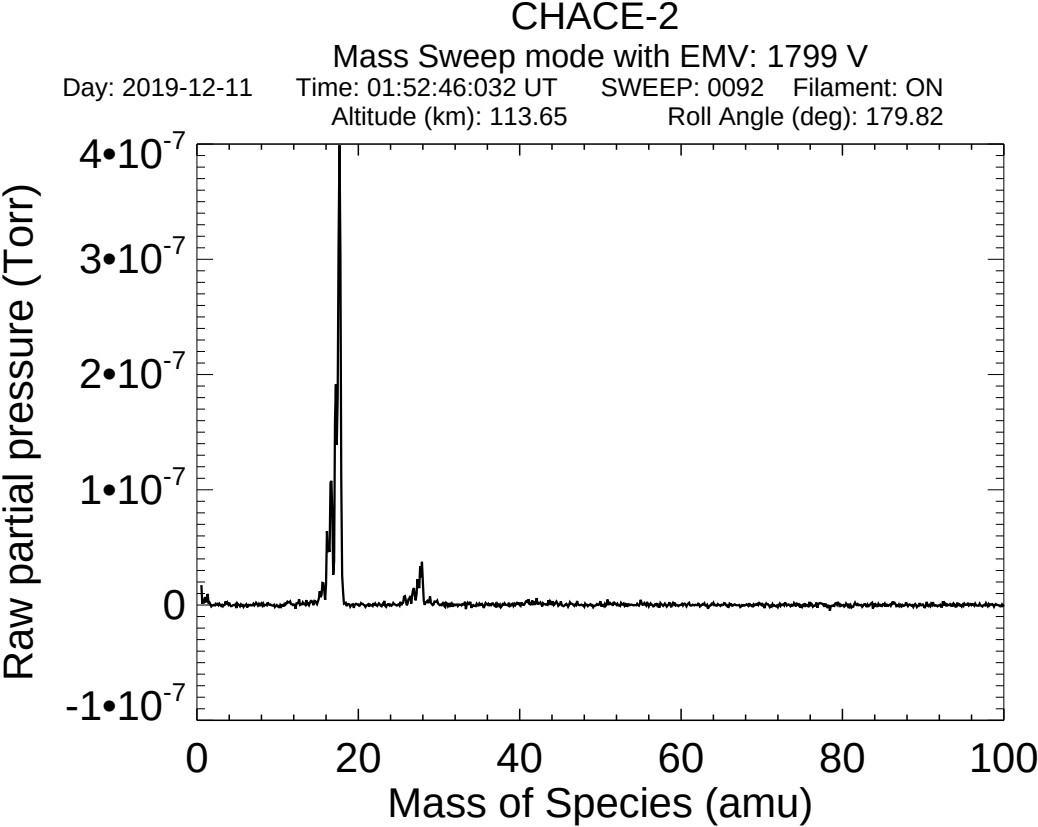

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:49:37:077 UT SWEEP: 0087 Filament: ON
Altitude (km): 113.80 Roll Angle (deg): 179.91
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

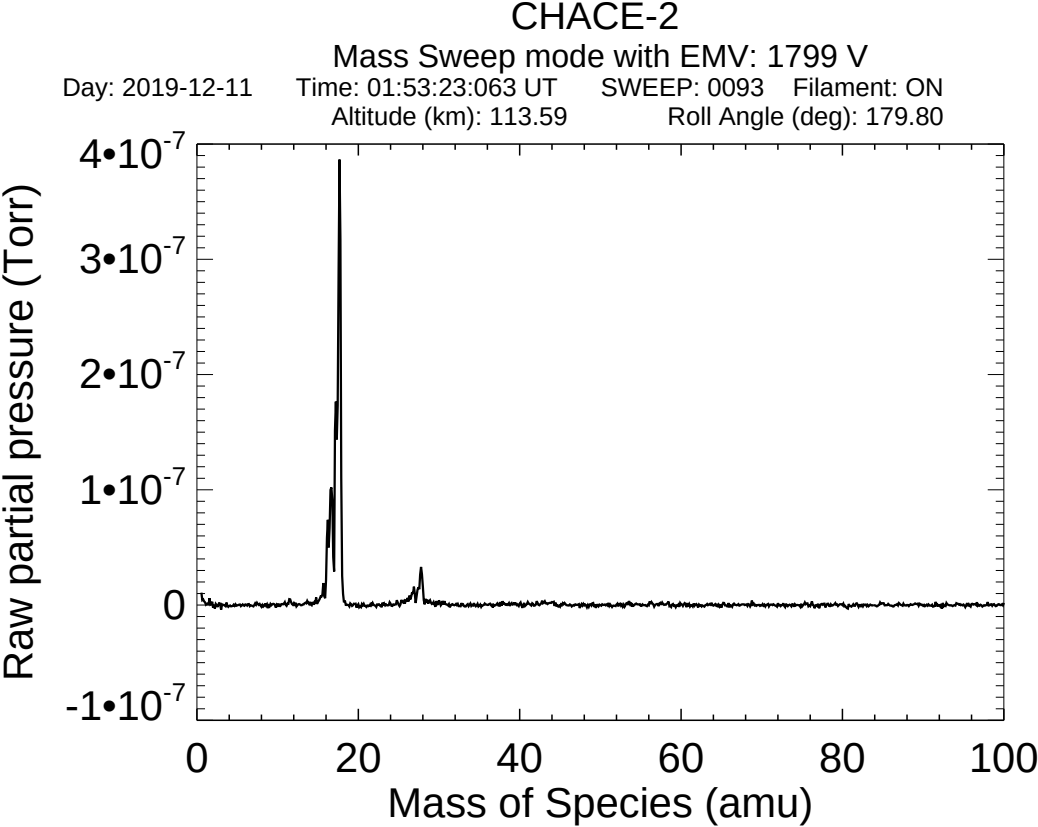

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:50:15:008 UT SWEEP: 0088 Filament: ON
Altitude (km): 113.79 Roll Angle (deg): 179.88
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

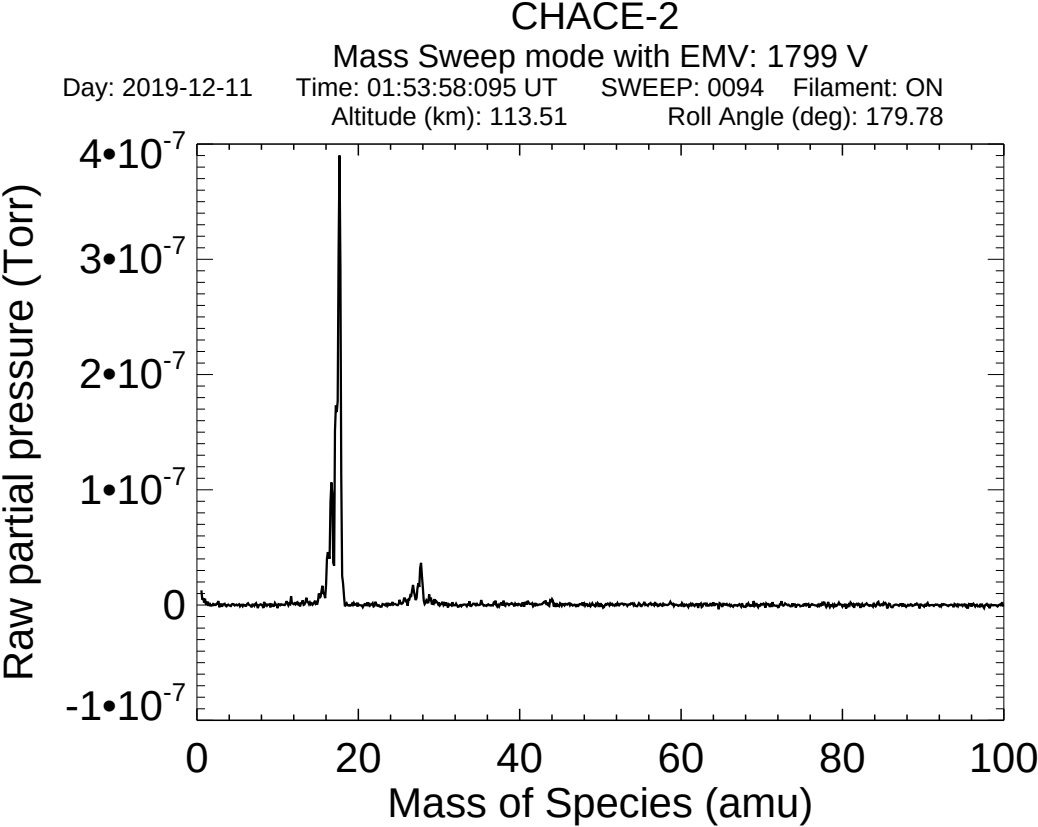

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:50:50:041 UT SWEEP: 0089 Filament: ON
Altitude (km): 113.75 Roll Angle (deg): 179.87
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

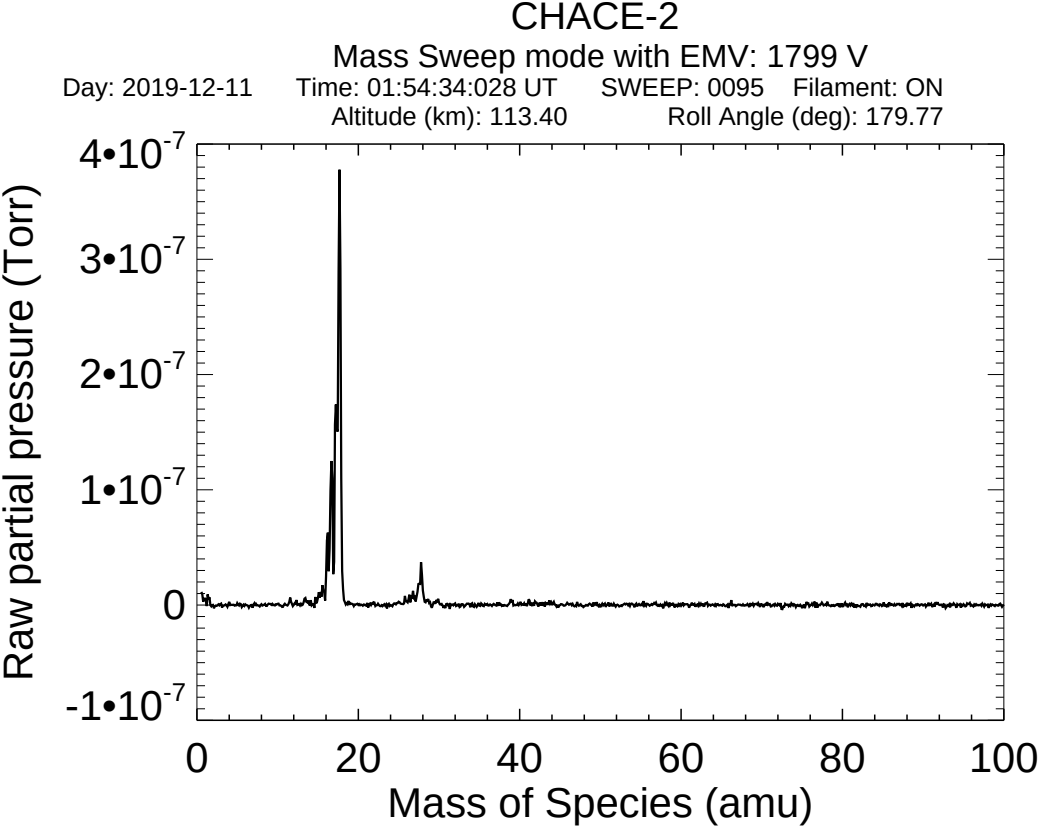

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:51:25:074 UT SWEEP: 0090 Filament: ON
Altitude (km): 113.75 Roll Angle (deg): 179.85
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

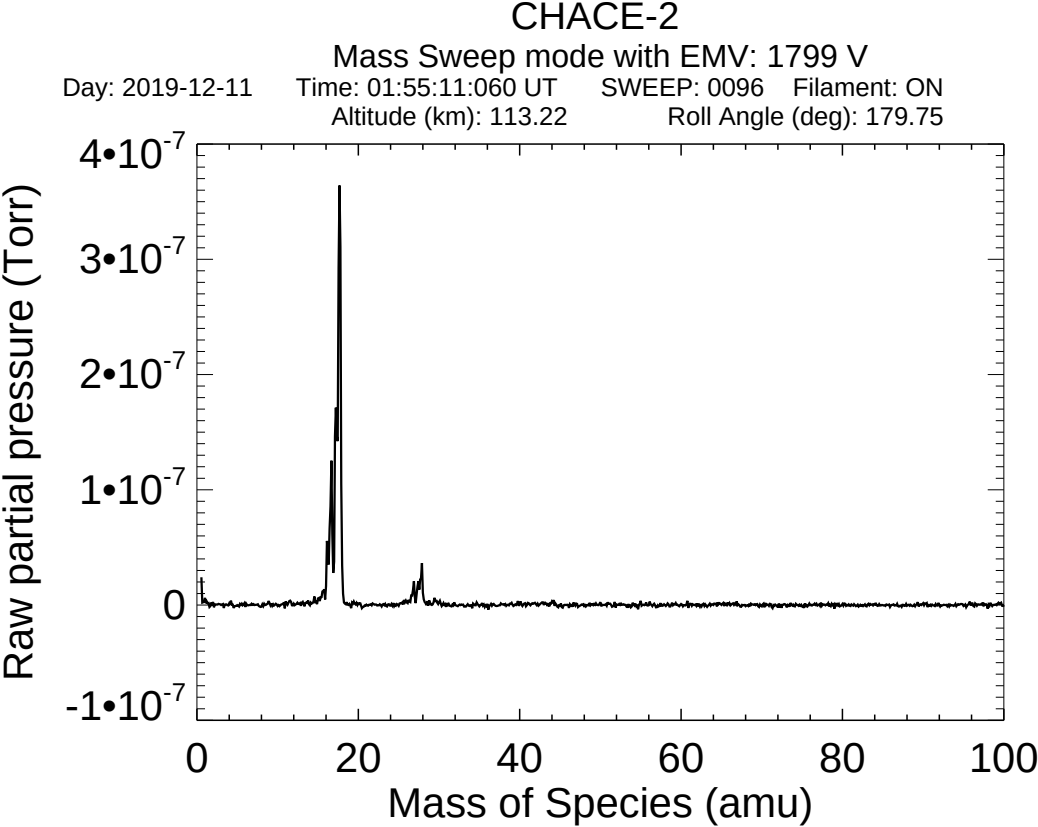

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:52:03:005 UT SWEEP: 0091 Filament: ON
Altitude (km): 113.74 Roll Angle (deg): 179.84
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

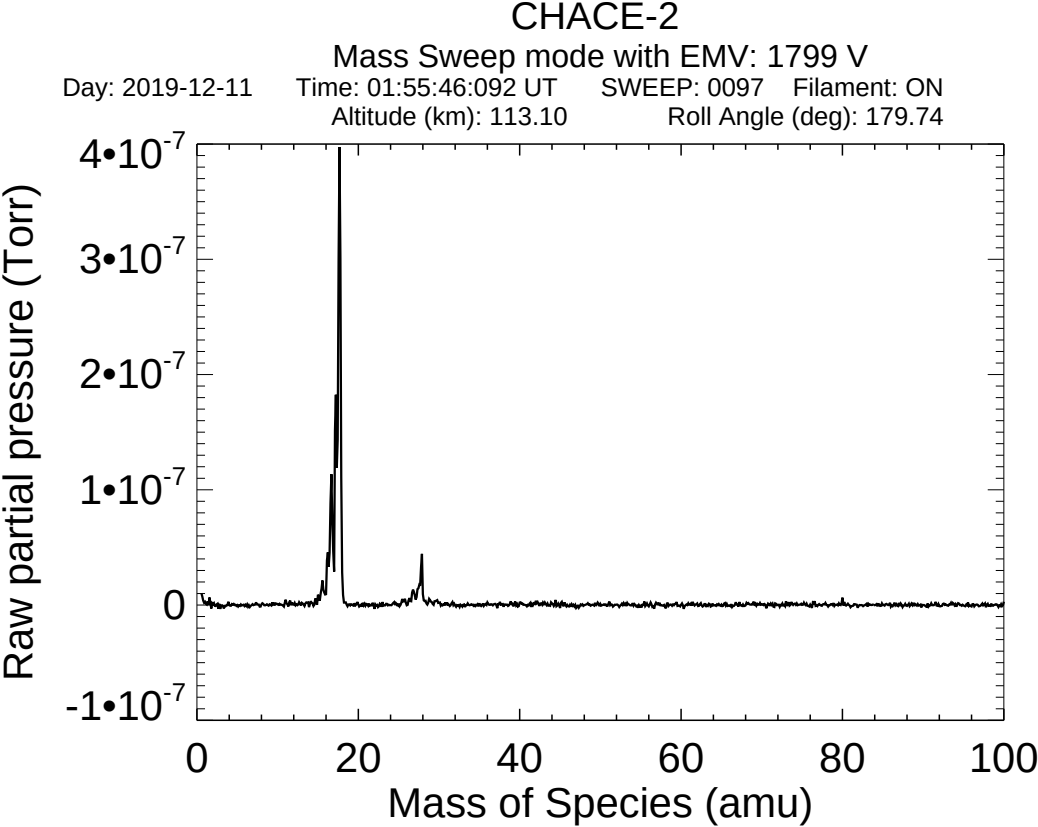

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:52:46:032 UT SWEEP: 0092 Filament: ON
Altitude (km): 113.65 Roll Angle (deg): 179.82
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

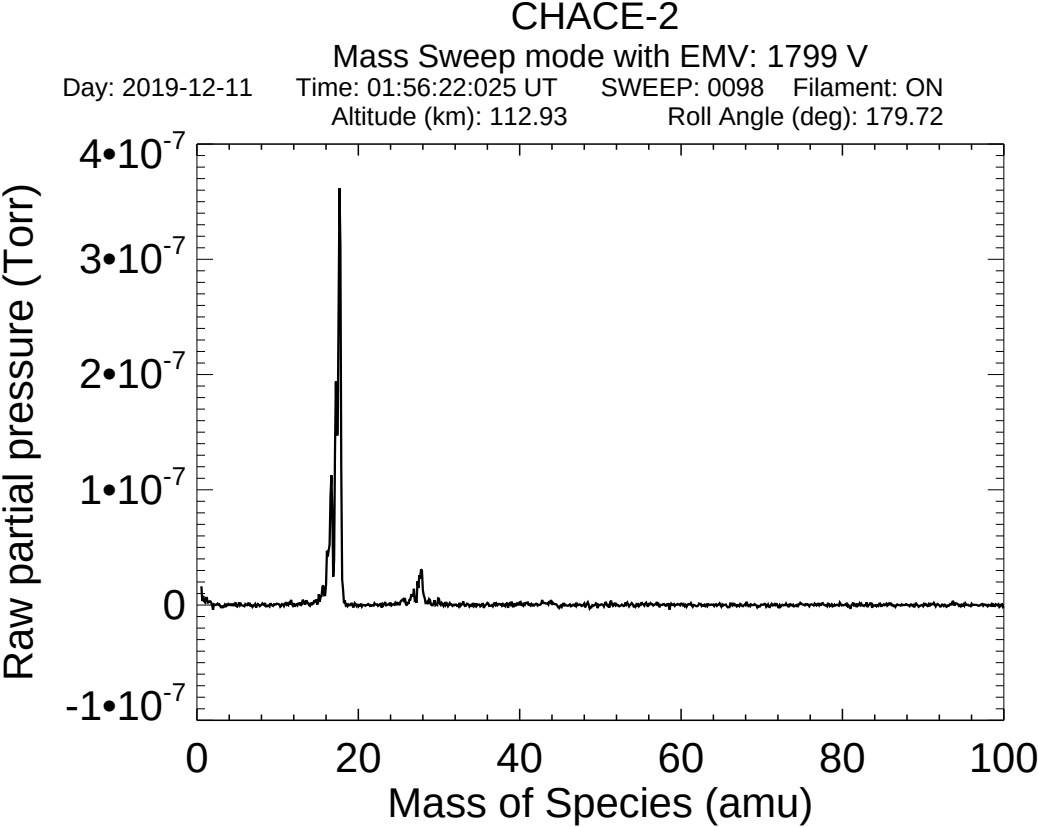

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:53:23:063 UT SWEEP: 0093 Filament: ON
Altitude (km): 113.59 Roll Angle (deg): 179.80
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

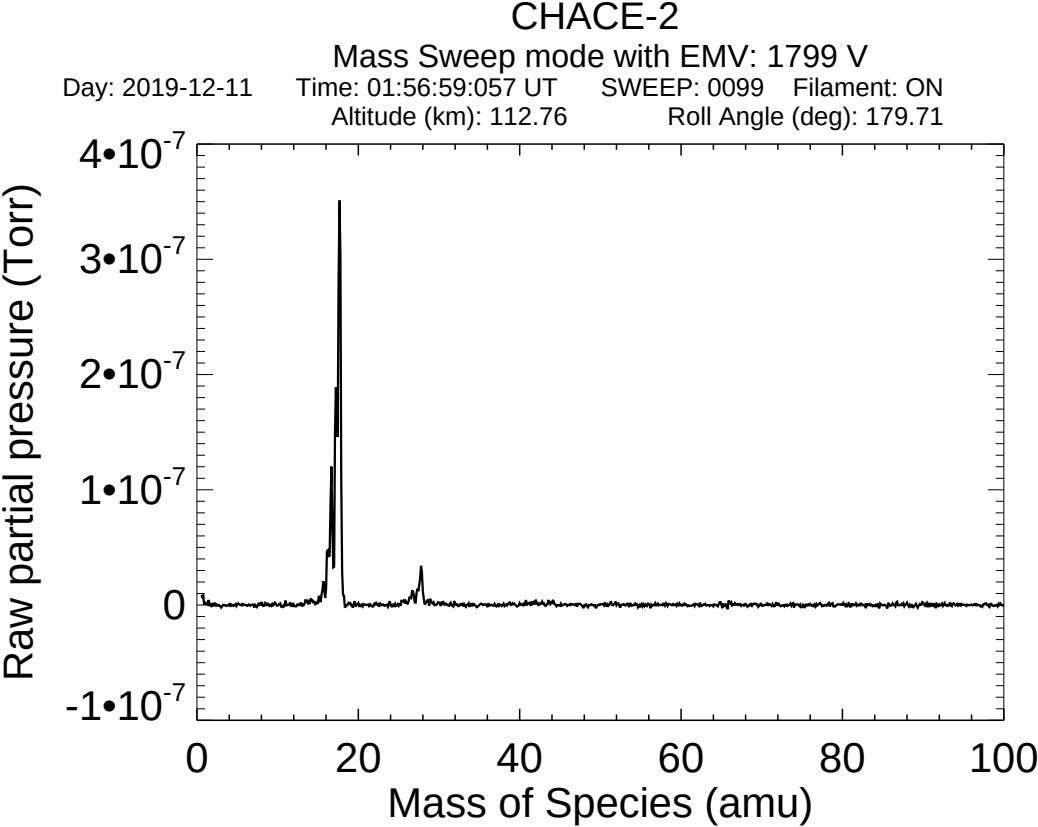

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:53:58:095 UT SWEEP: 0094 Filament: ON
Altitude (km): 113.51 Roll Angle (deg): 179.78
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

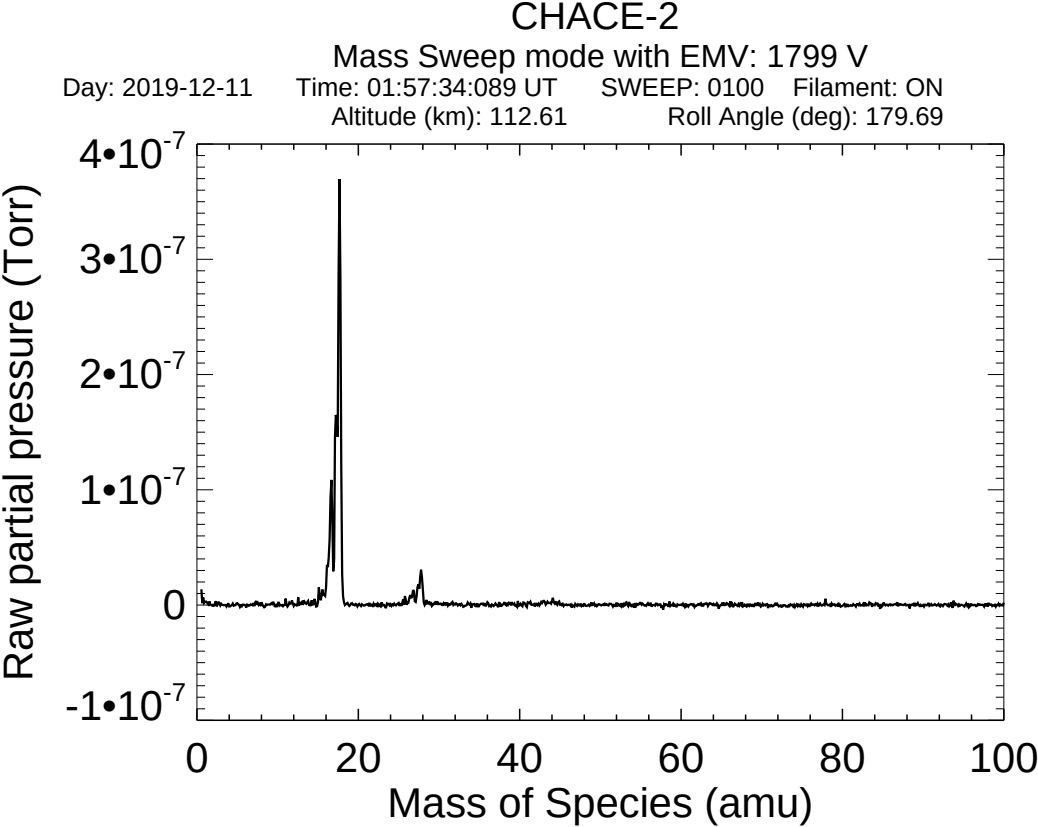

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:54:34:028 UT SWEEP: 0095 Filament: ON
Altitude (km): 113.40 Roll Angle (deg): 179.77
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

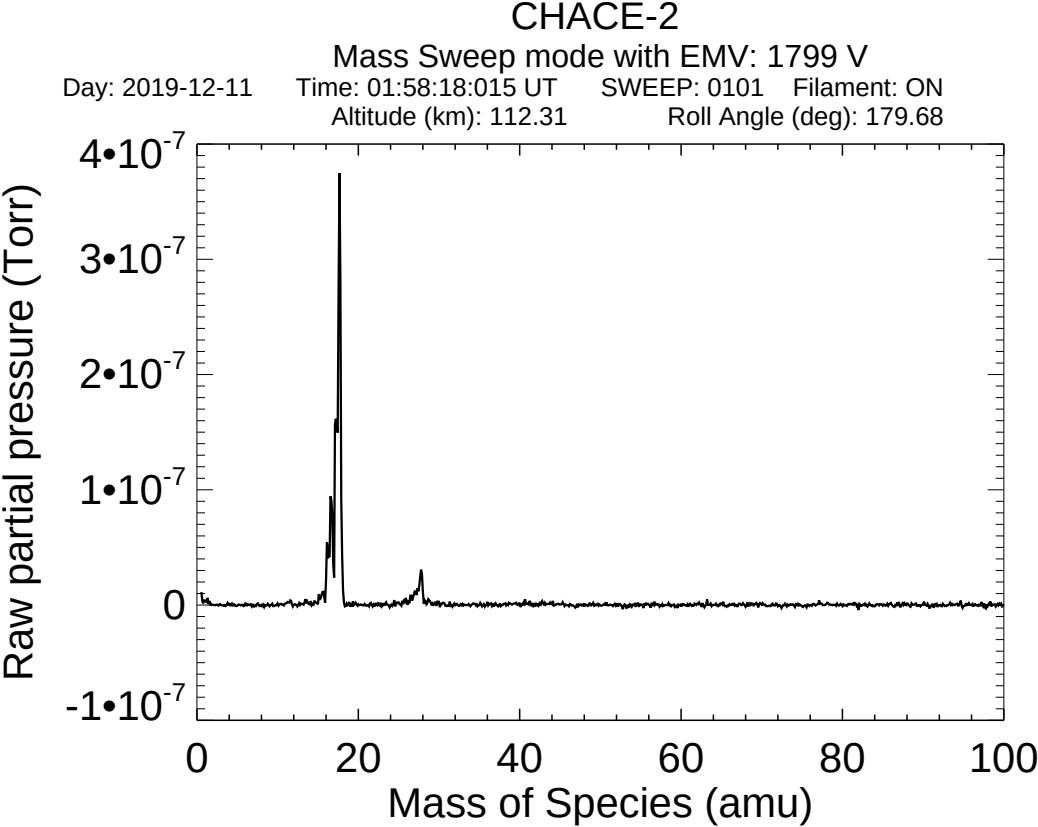

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:55:11:060 UT SWEEP: 0096 Filament: ON
Altitude (km): 113.22 Roll Angle (deg): 179.75
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

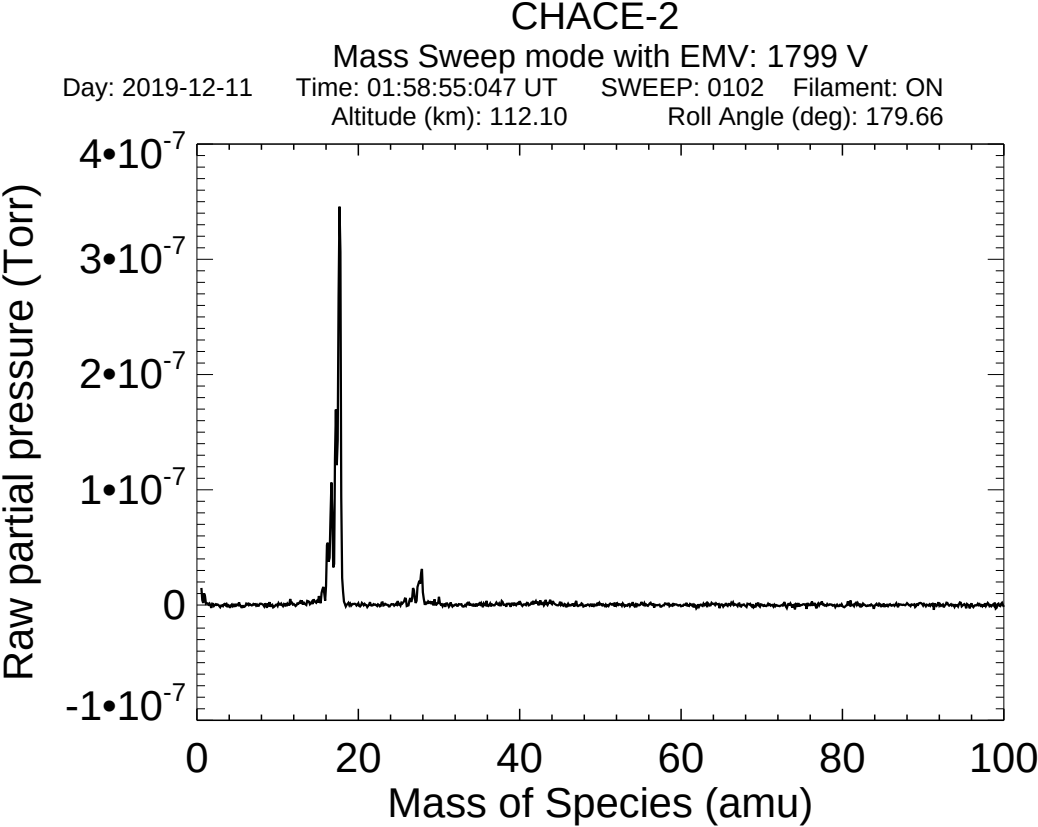

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:55:46:092 UT SWEEP: 0097 Filament: ON
Altitude (km): 113.10 Roll Angle (deg): 179.74
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

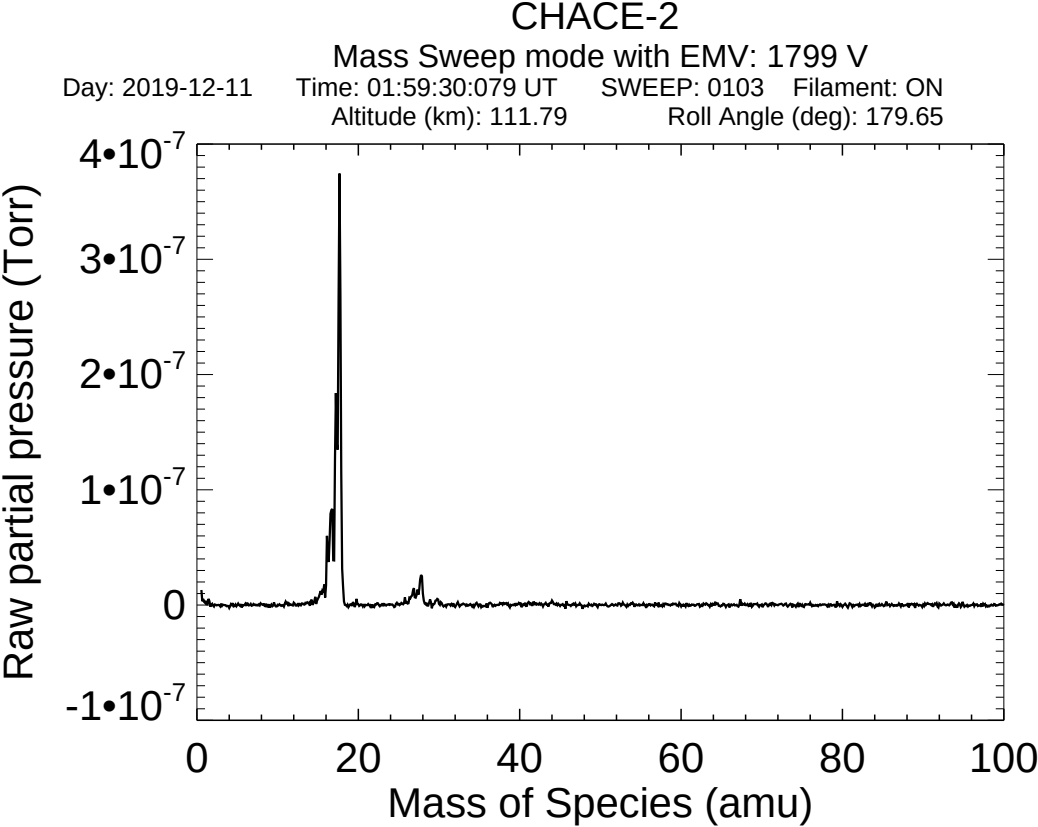

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:56:22:025 UT SWEEP: 0098 Filament: ON
Altitude (km): 112.93 Roll Angle (deg): 179.72
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

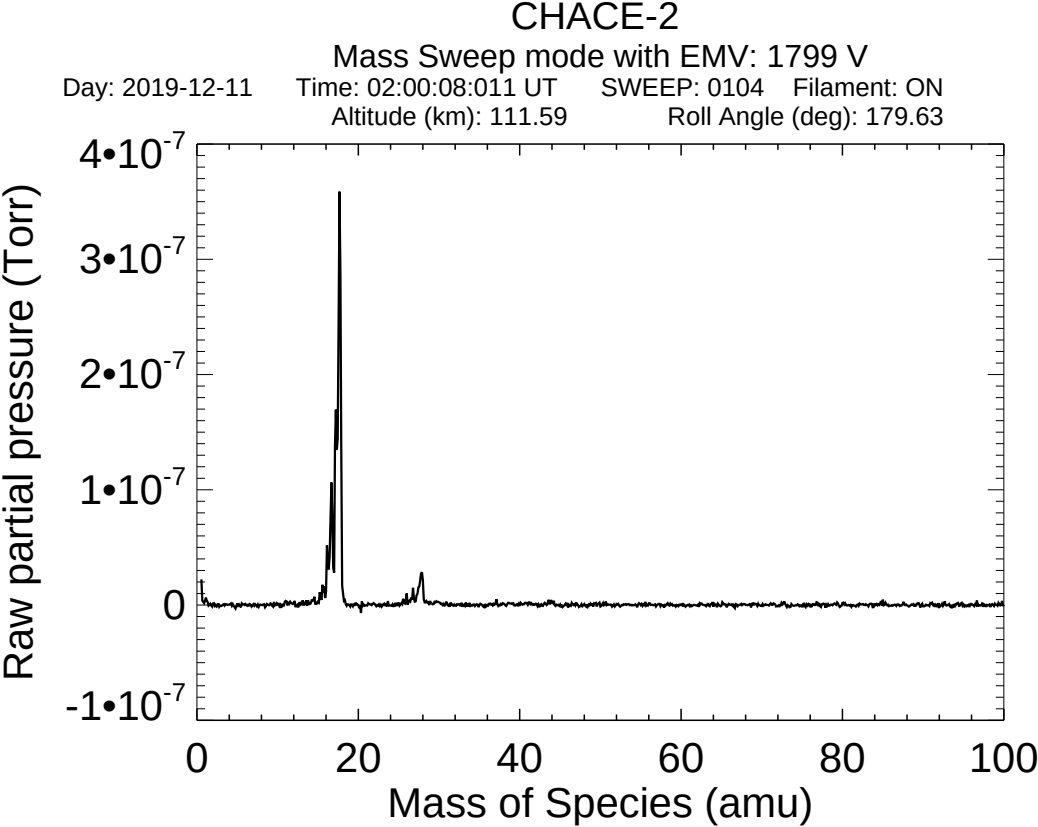

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:56:59:057 UT SWEEP: 0099 Filament: ON
Altitude (km): 112.76 Roll Angle (deg): 179.71
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

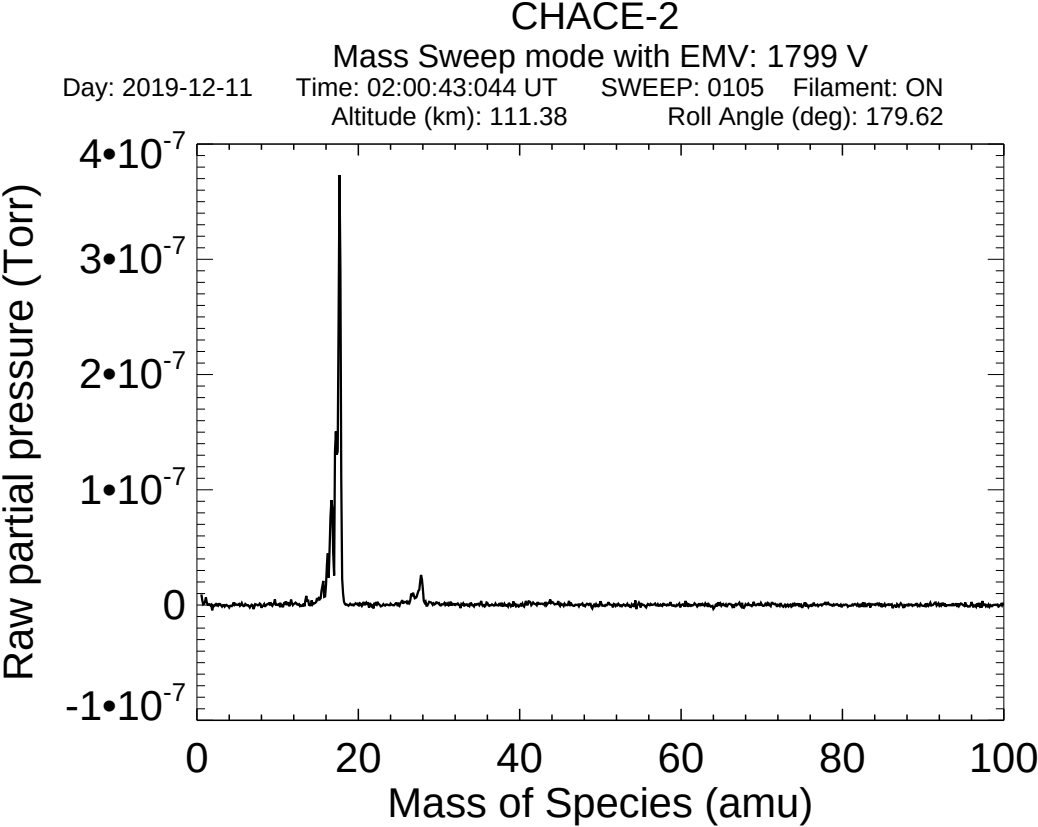

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:57:34:089 UT SWEEP: 0100 Filament: ON
Altitude (km): 112.61 Roll Angle (deg): 179.69
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

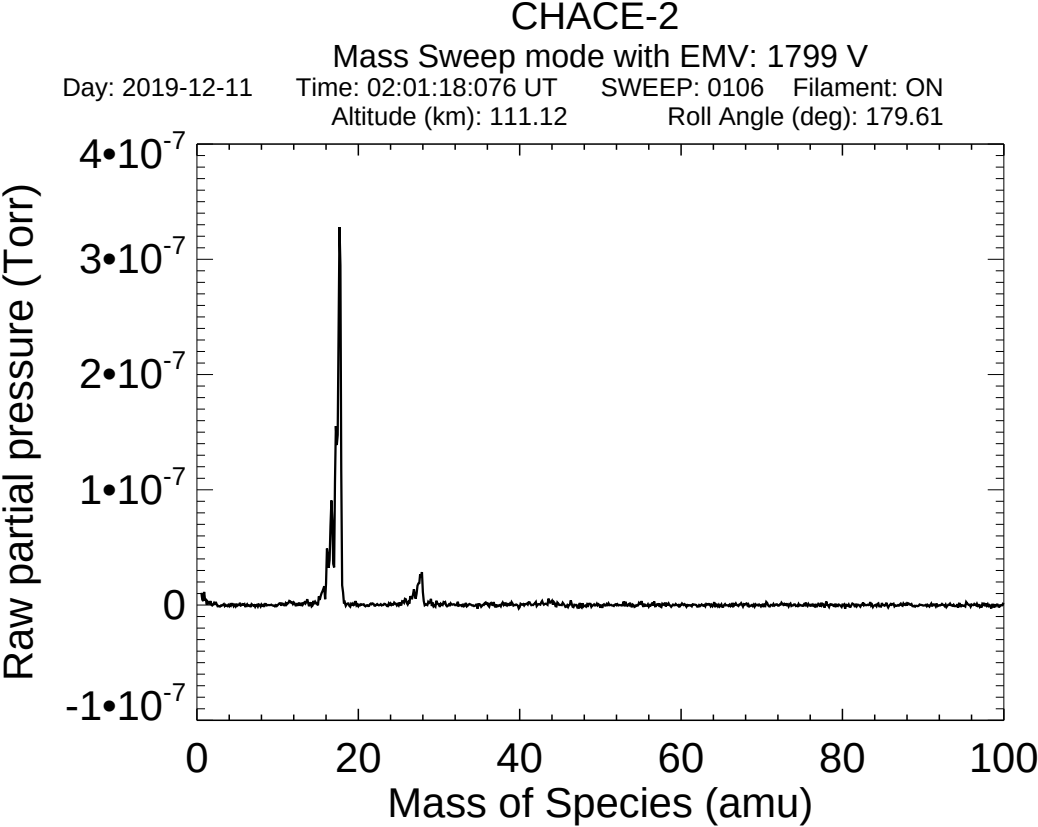

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:58:18:015 UT SWEEP: 0101 Filament: ON
Altitude (km): 112.31 Roll Angle (deg): 179.68
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

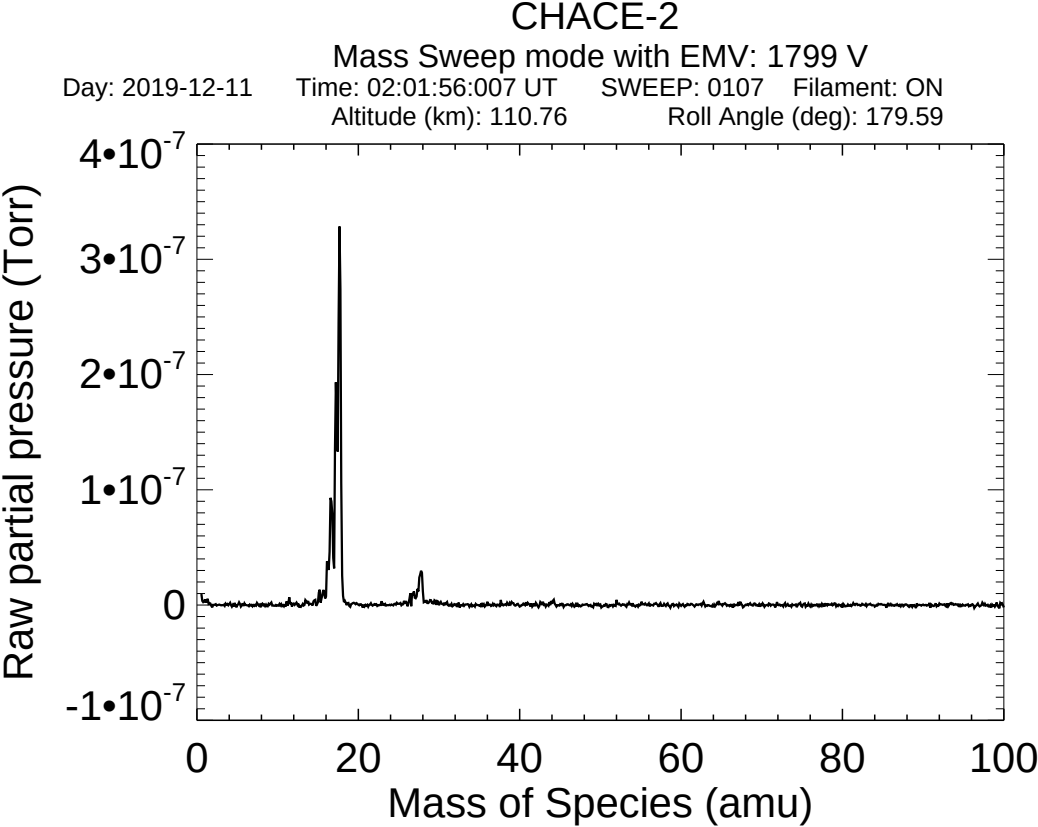

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:58:55:047 UT SWEEP: 0102 Filament: ON
Altitude (km): 112.10 Roll Angle (deg): 179.66
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

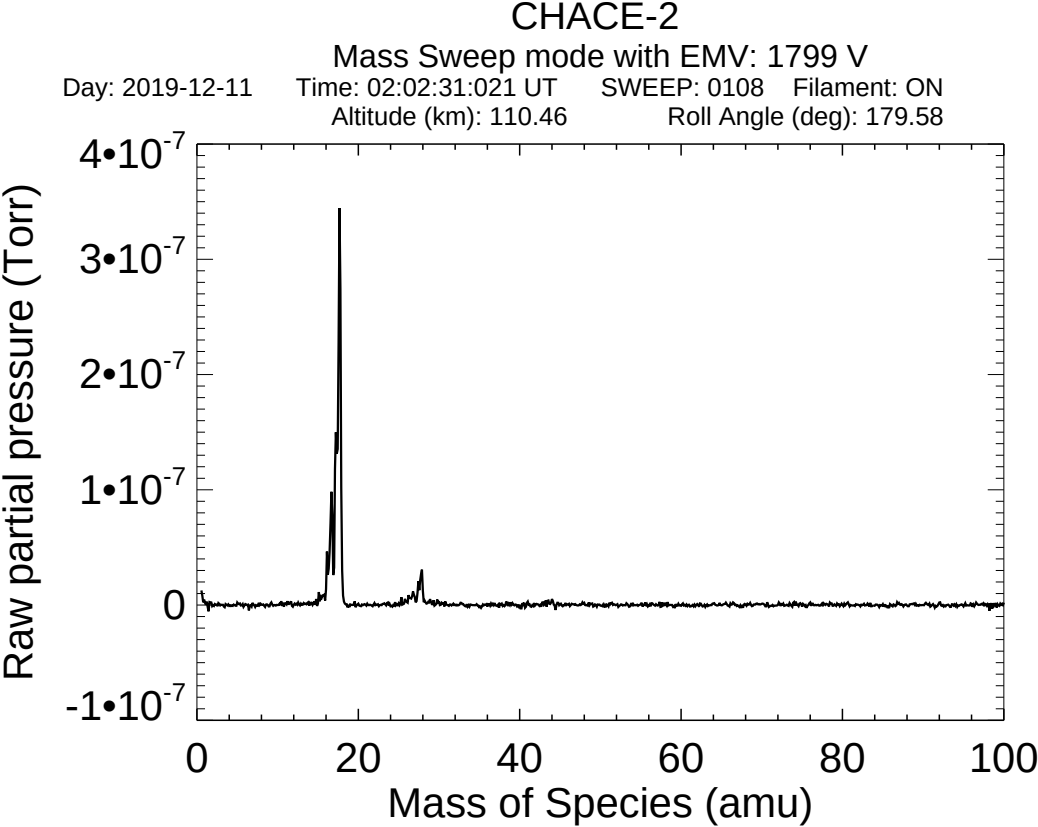

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 01:59:30:079 UT SWEEP: 0103 Filament: ON
Altitude (km): 111.79 Roll Angle (deg): 179.65
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

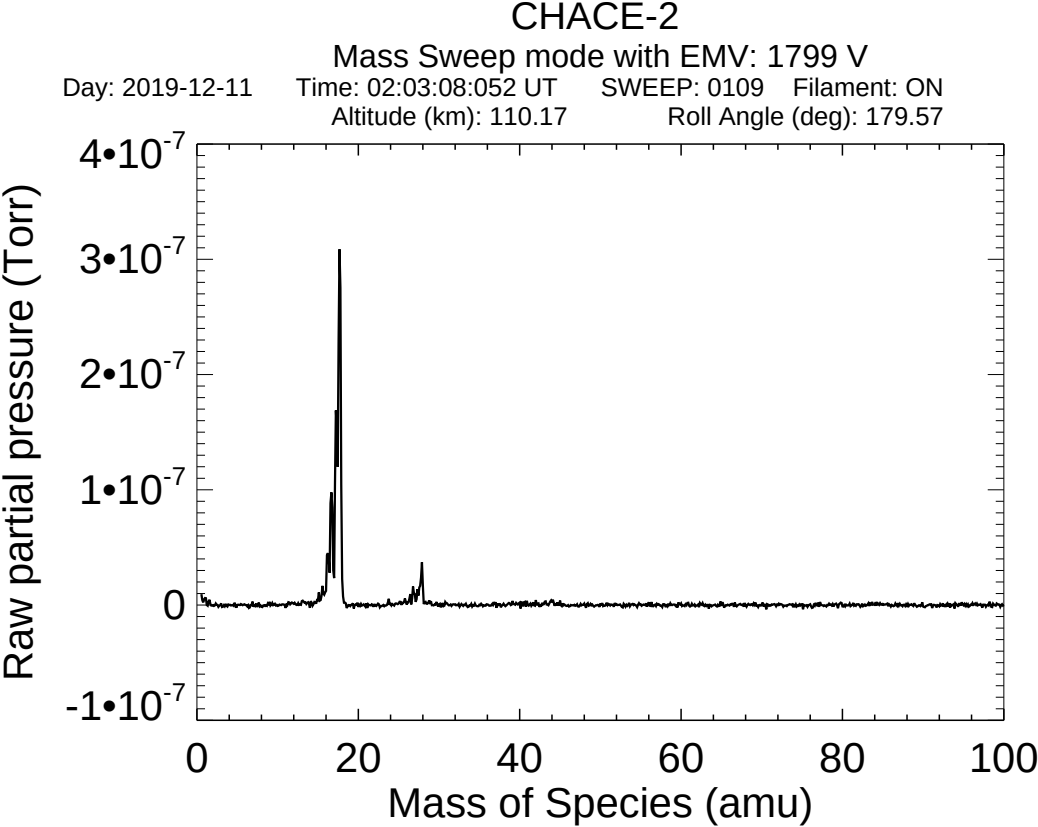

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:00:08:011 UT SWEEP: 0104 Filament: ON
Altitude (km): 111.59 Roll Angle (deg): 179.63
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

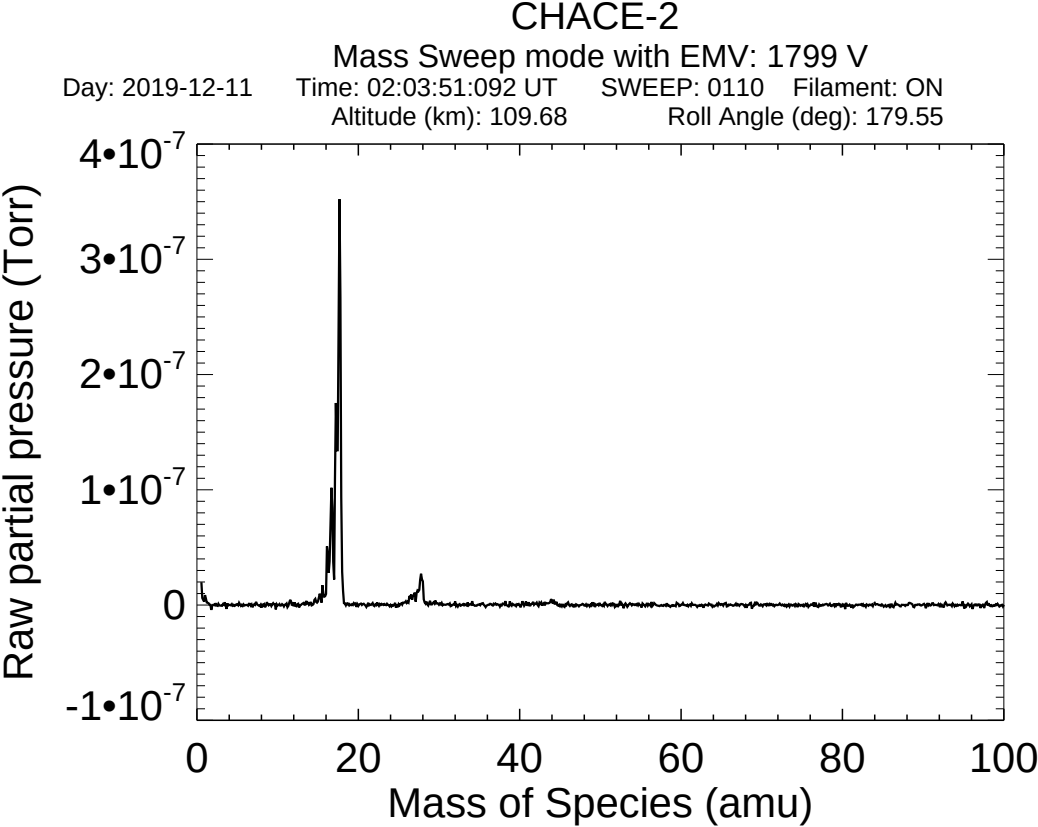

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:00:43:044 UT SWEEP: 0105 Filament: ON
Altitude (km): 111.38 Roll Angle (deg): 179.62
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

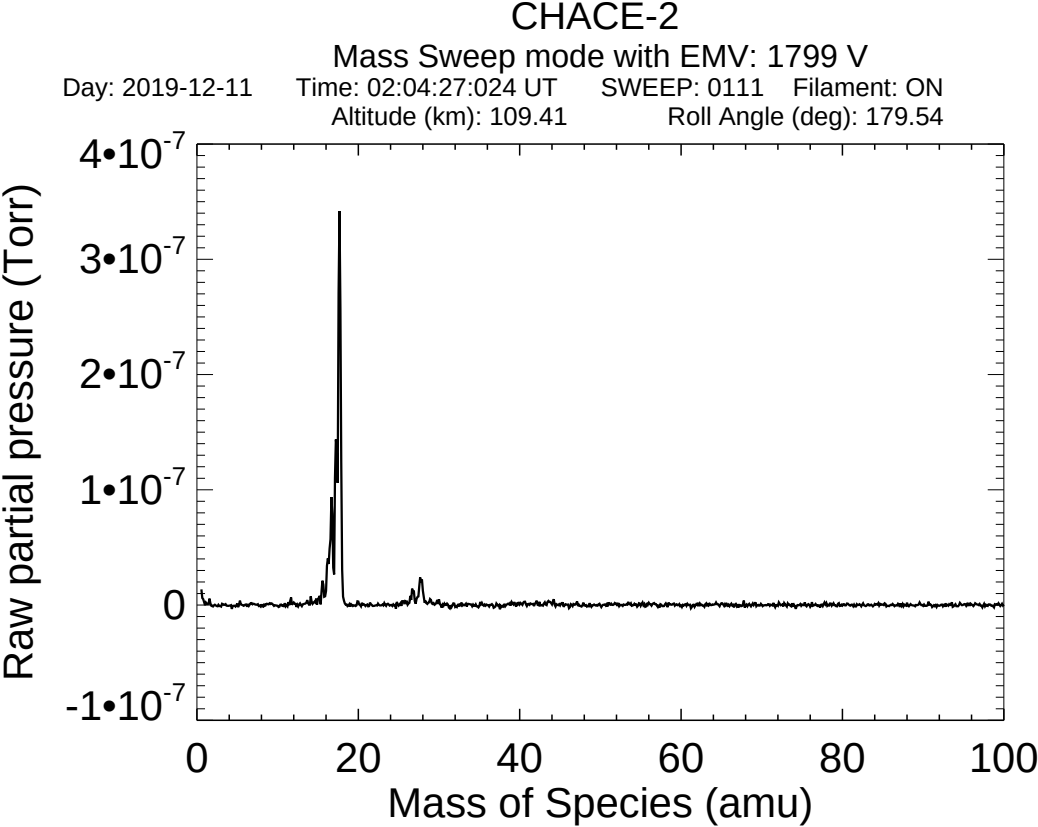

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:01:18:076 UT SWEEP: 0106 Filament: ON
Altitude (km): 111.12 Roll Angle (deg): 179.61
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

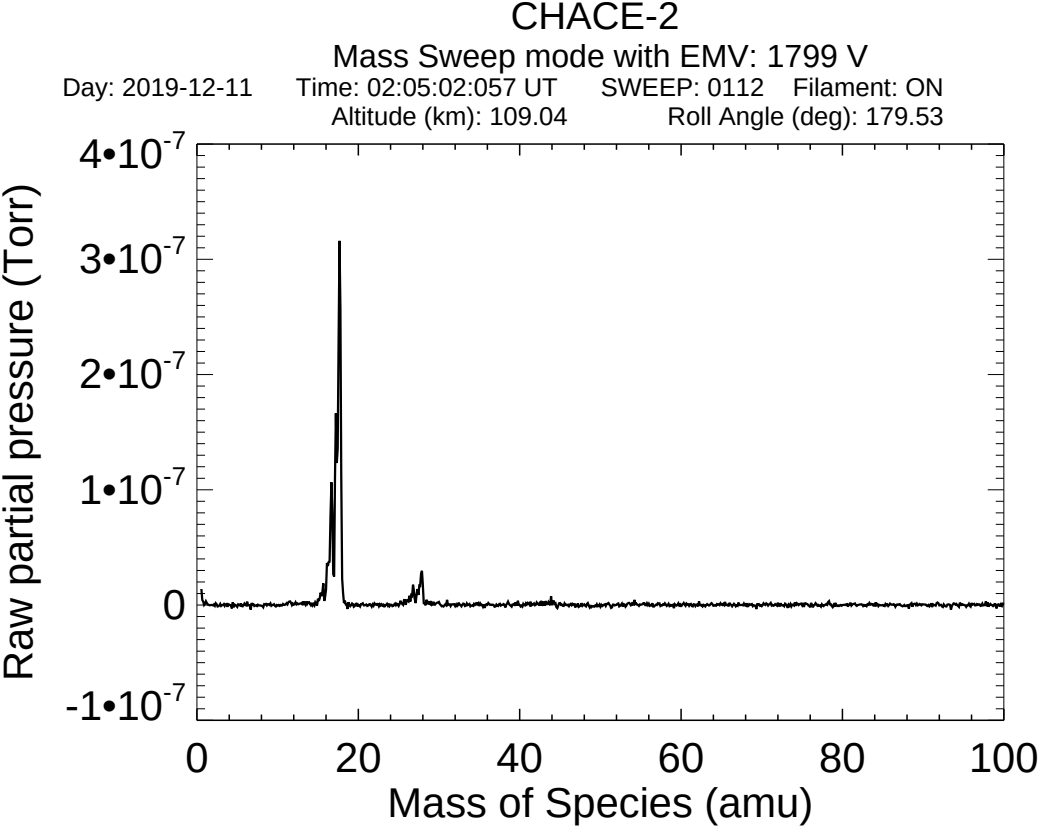

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:01:56:007 UT SWEEP: 0107 Filament: ON
Altitude (km): 110.76 Roll Angle (deg): 179.59
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

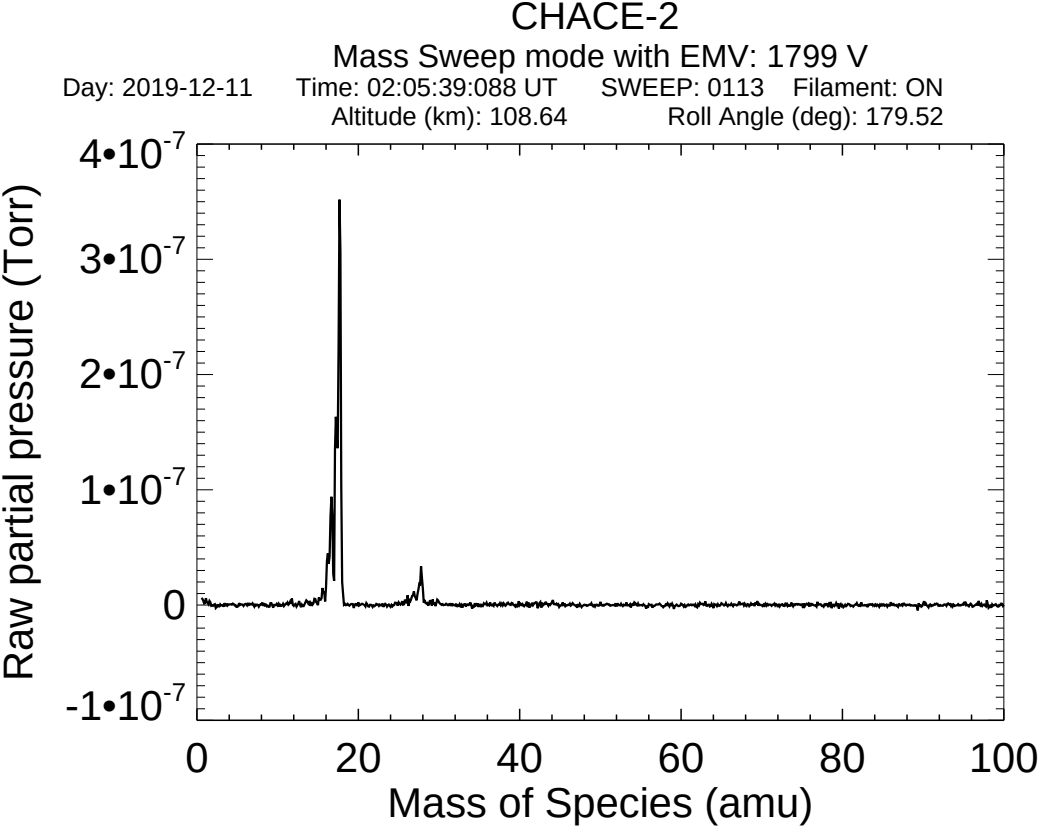

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:02:31:021 UT SWEEP: 0108 Filament: ON
Altitude (km): 110.46 Roll Angle (deg): 179.58
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

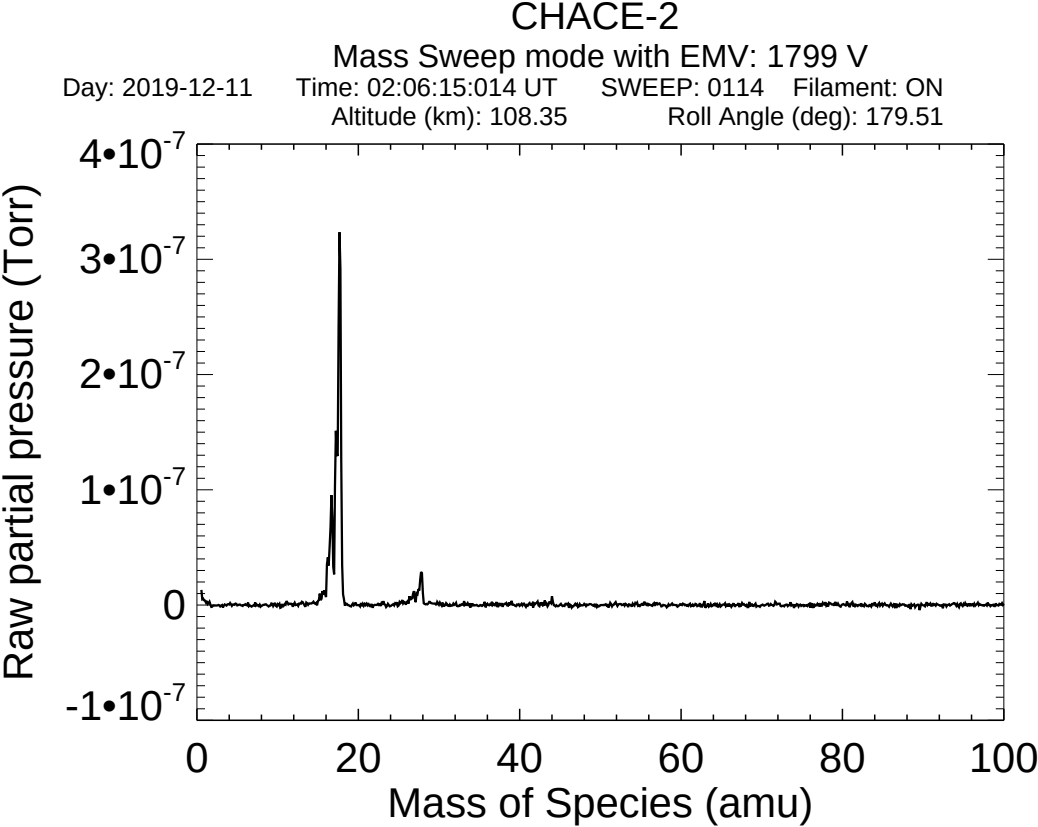

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:03:08:052 UT SWEEP: 0109 Filament: ON
Altitude (km): 110.17 Roll Angle (deg): 179.57
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

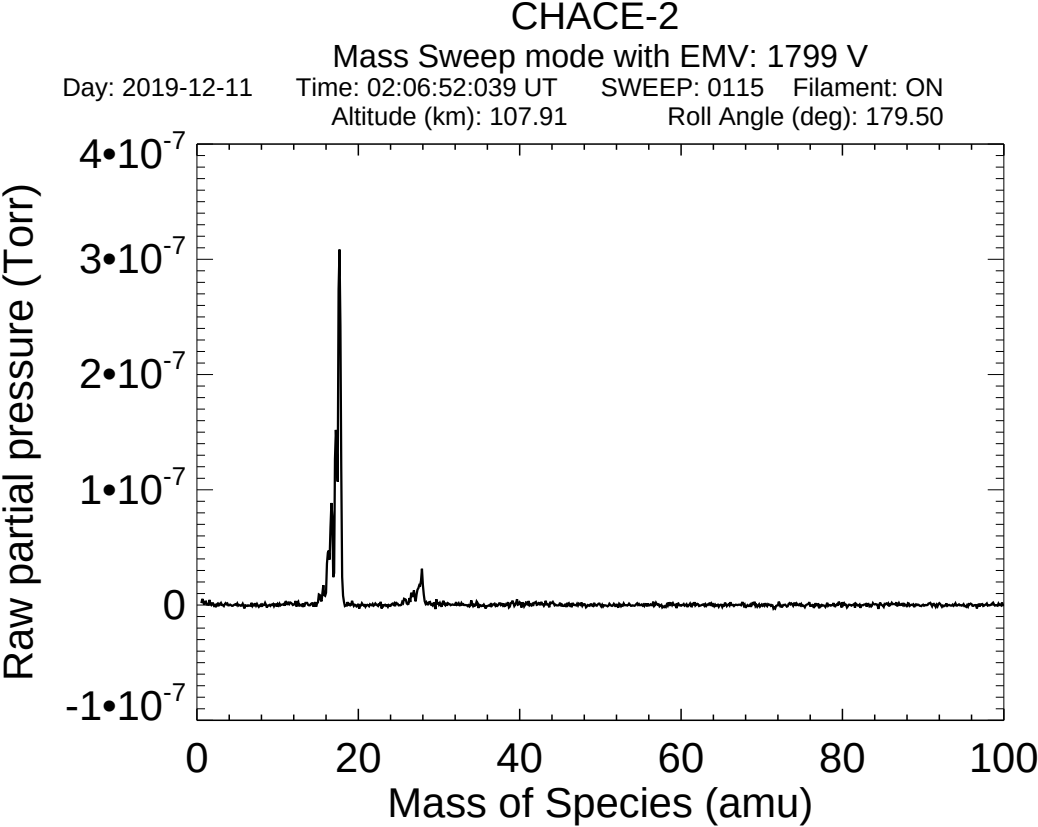

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:03:51:092 UT SWEEP: 0110 Filament: ON
Altitude (km): 109.68 Roll Angle (deg): 179.55
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

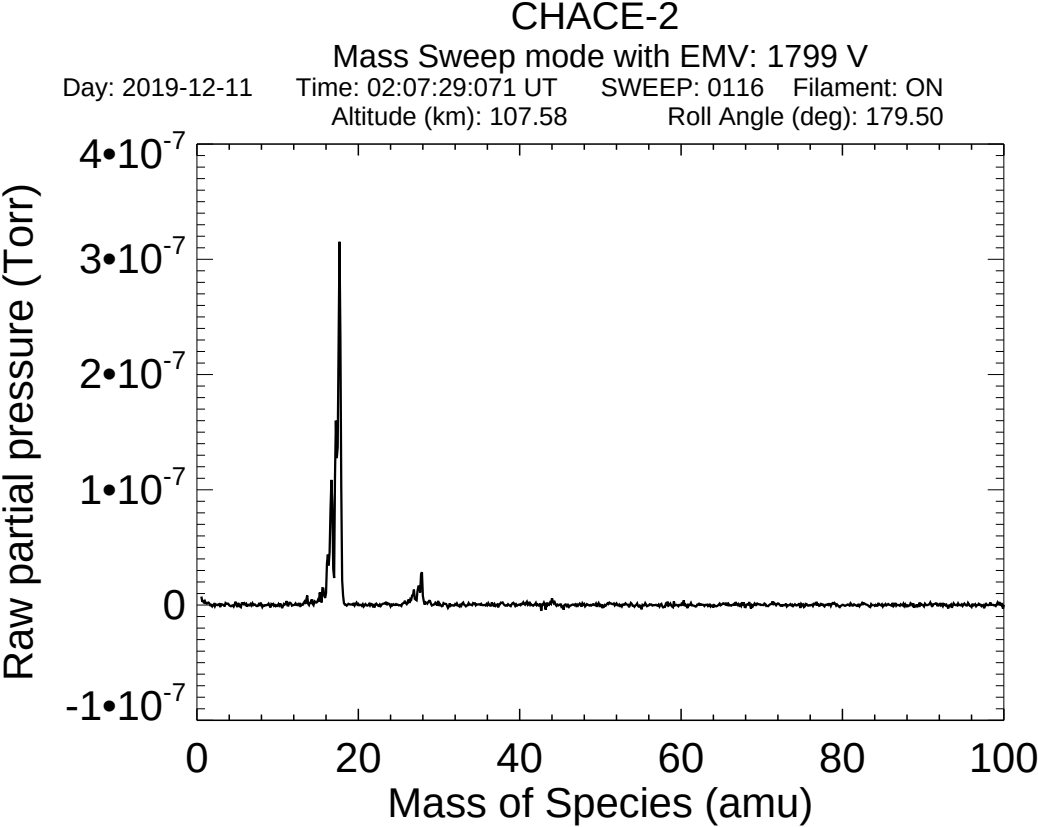

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:04:27:024 UT SWEEP: 0111 Filament: ON
Altitude (km): 109.41 Roll Angle (deg): 179.54
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

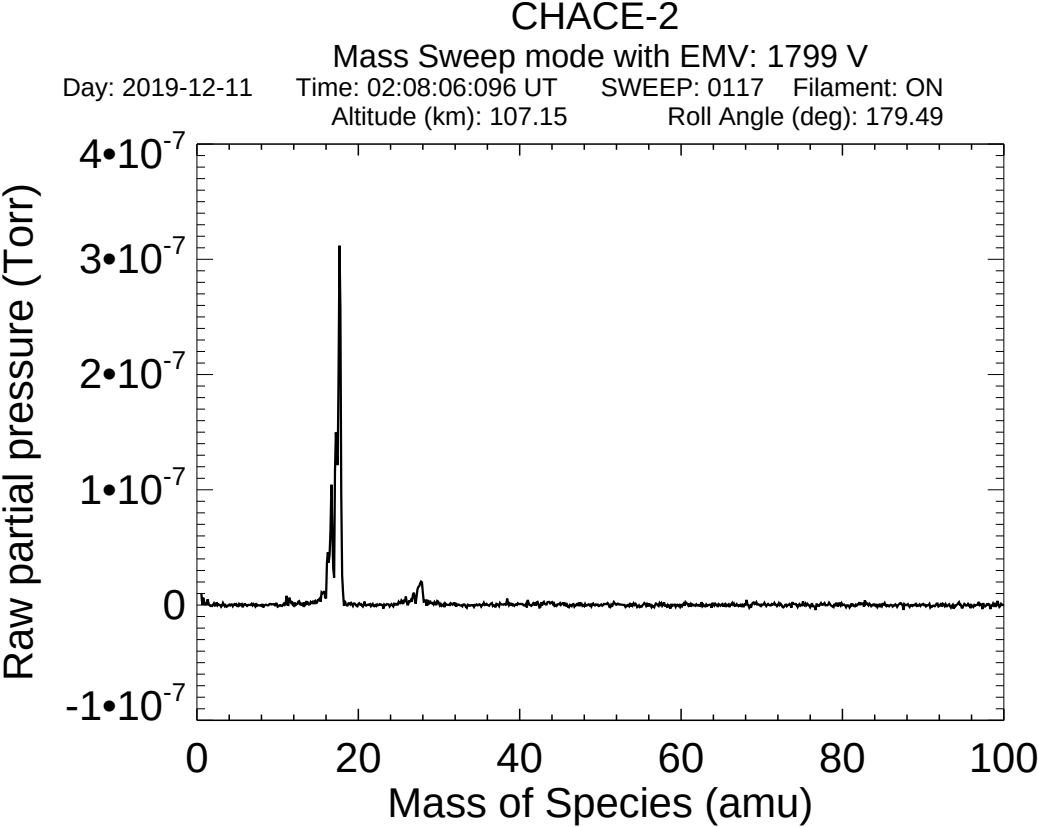

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:05:02:057 UT SWEEP: 0112 Filament: ON
Altitude (km): 109.04 Roll Angle (deg): 179.53
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

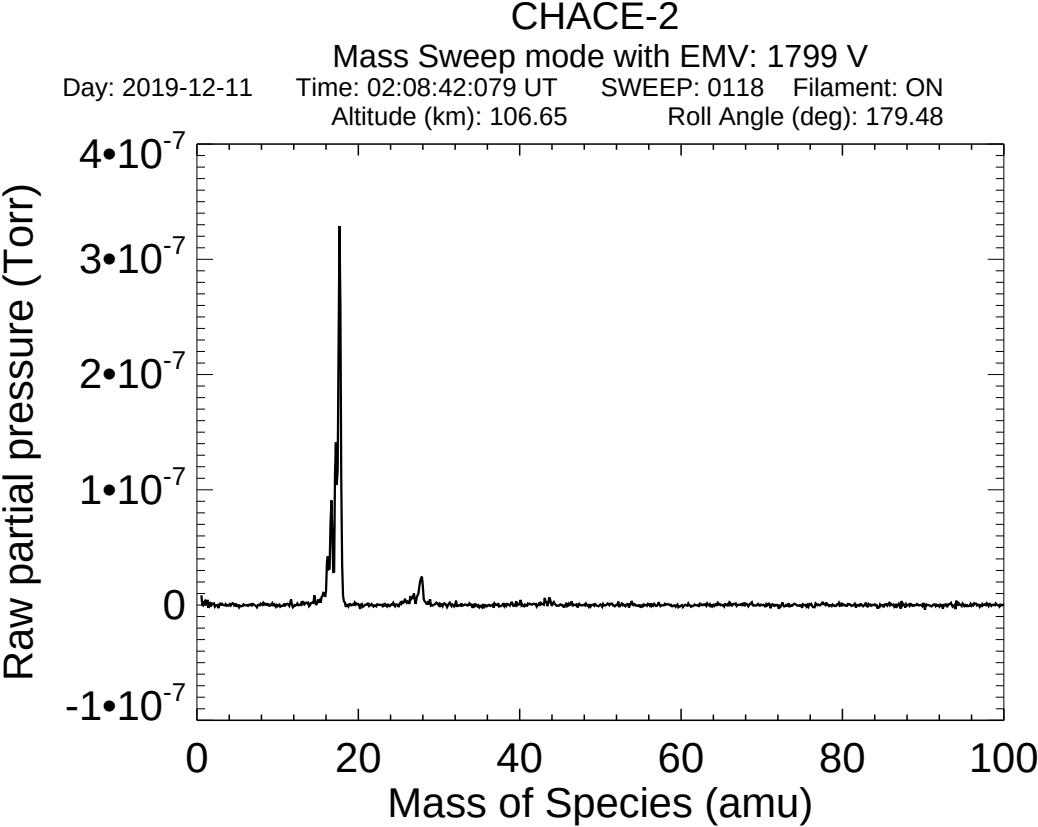

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:05:39:088 UT SWEEP: 0113 Filament: ON
Altitude (km): 108.64 Roll Angle (deg): 179.52
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

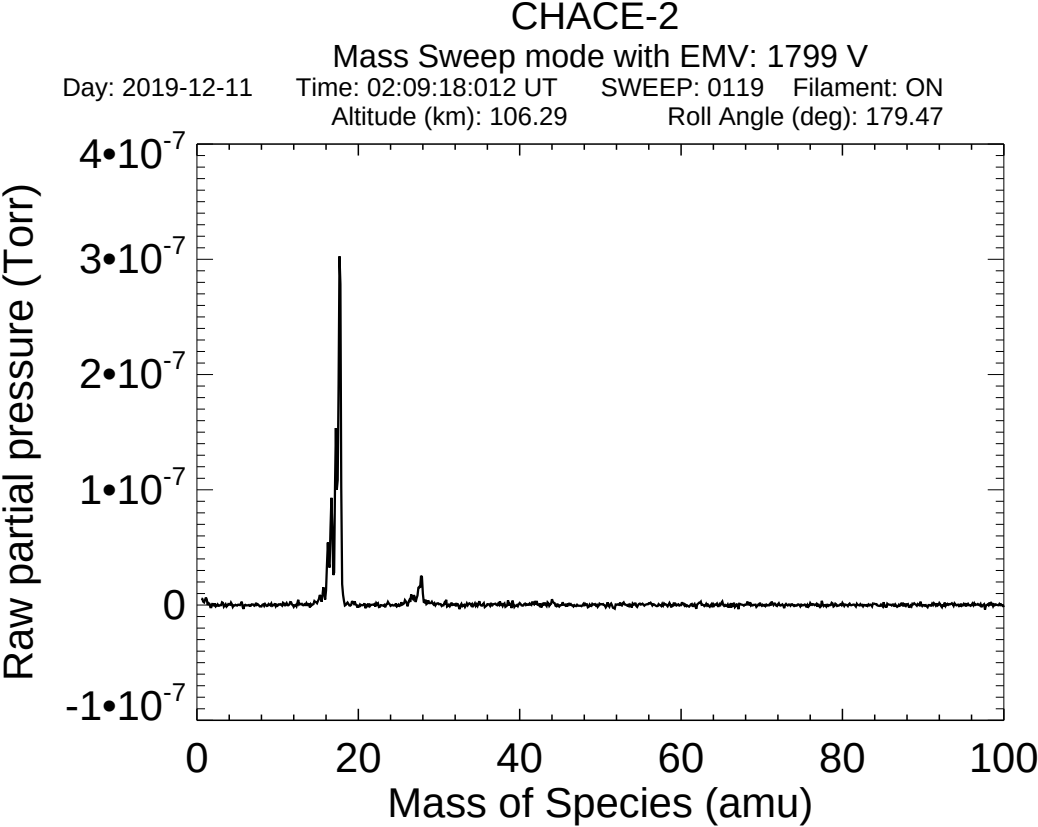

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:06:15:014 UT SWEEP: 0114 Filament: ON
Altitude (km): 108.35 Roll Angle (deg): 179.51
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

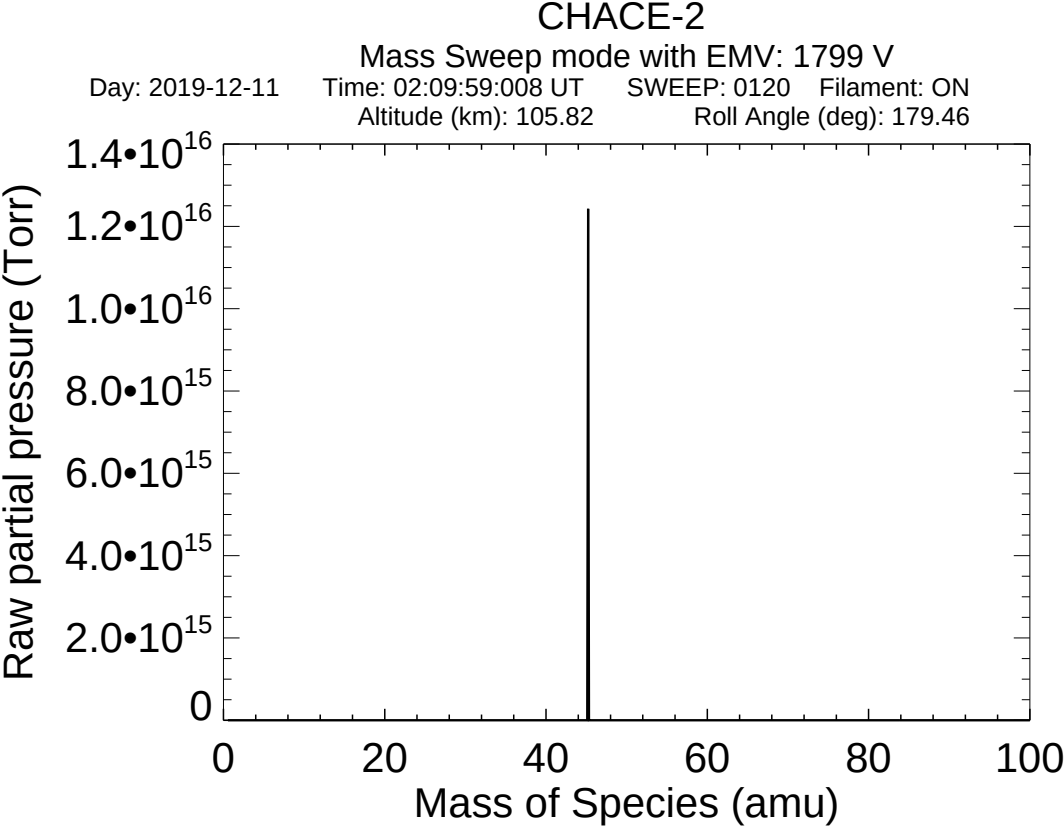

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:06:52:039 UT SWEEP: 0115 Filament: ON
Altitude (km): 107.91 Roll Angle (deg): 179.50
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

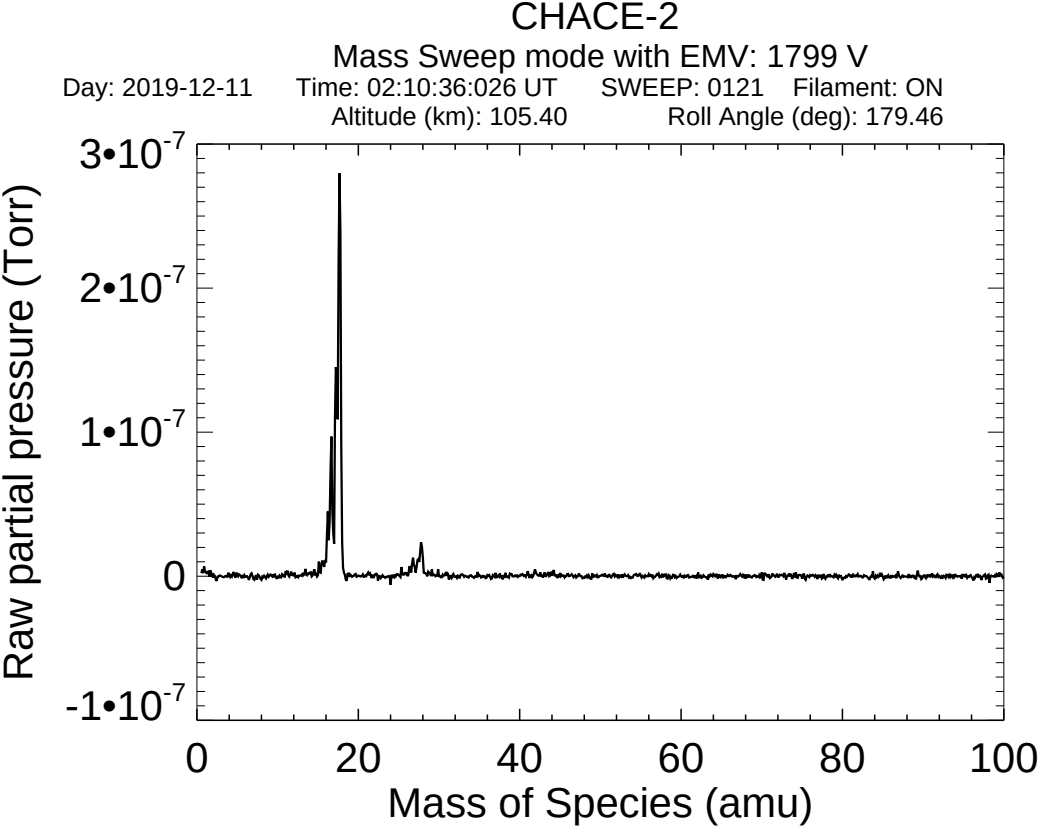

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:07:29:071 UT SWEEP: 0116 Filament: ON
Altitude (km): 107.58 Roll Angle (deg): 179.50
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

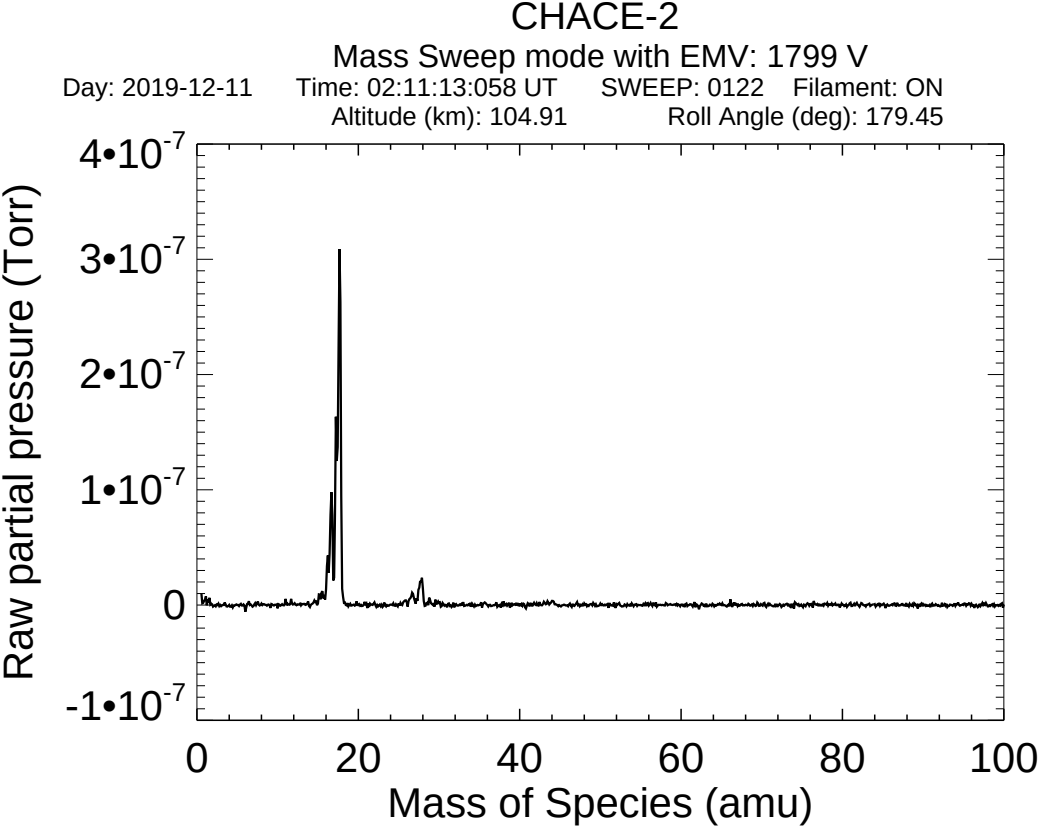

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:08:06:096 UT SWEEP: 0117 Filament: ON
Altitude (km): 107.15 Roll Angle (deg): 179.49
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

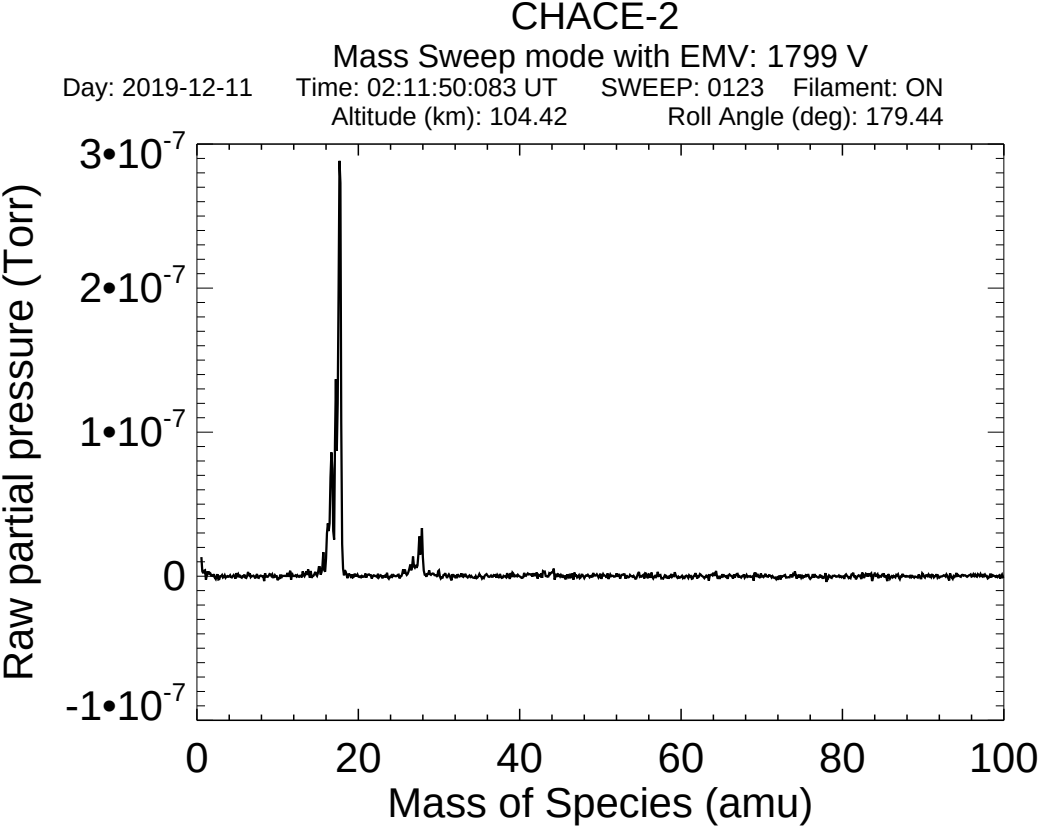

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:08:42:079 UT
SWEEP: 0118
Filament: ON
Altitude (km): 106.65
Roll Angle (deg): 179.48
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

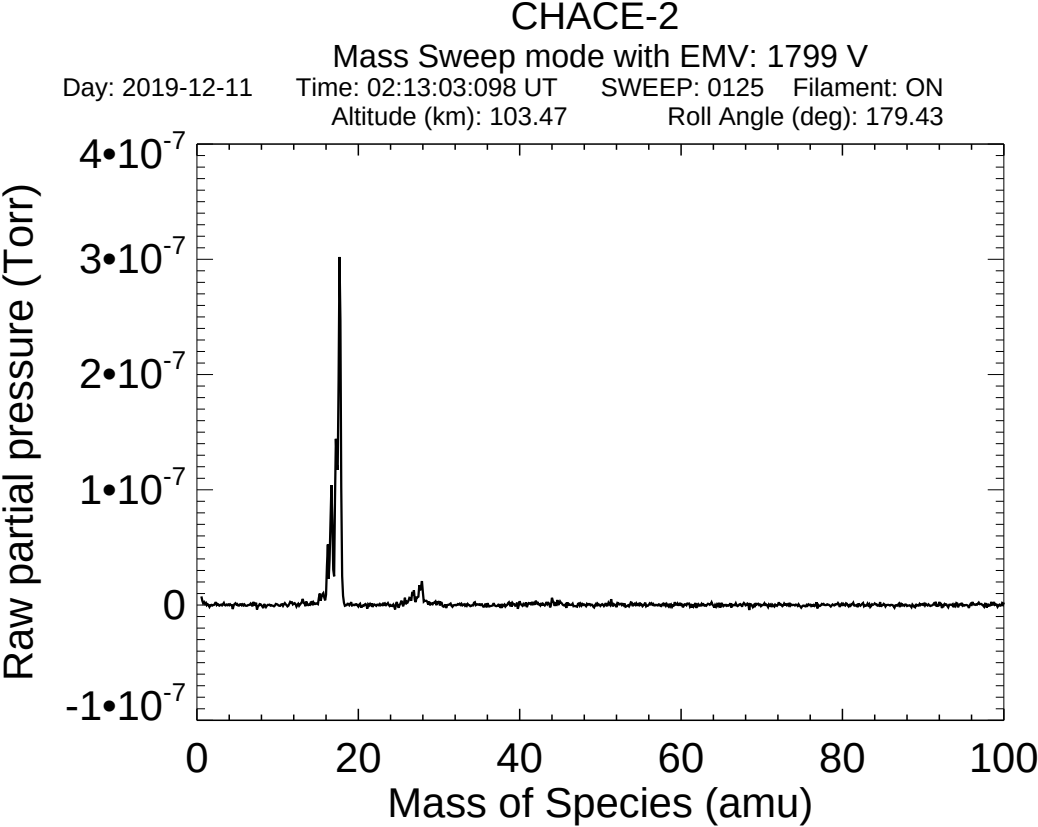

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:09:18:012 UT SWEEP: 0119 Filament: ON
Altitude (km): 106.29 Roll Angle (deg): 179.47
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

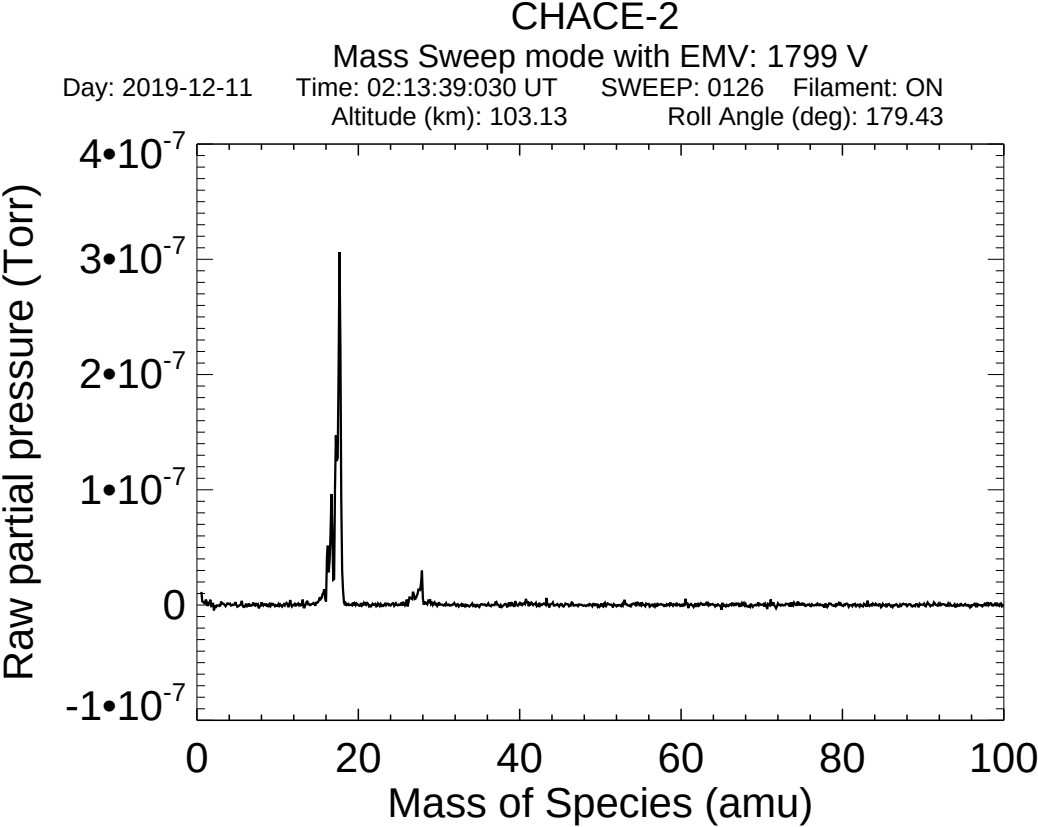

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:09:59:008 UT SWEEP: 0120 Filament: ON
Altitude (km): 105.82 Roll Angle (deg): 179.46
Raw partial pressure (Torr)
1.4•10^16
1.2•10^16
1.0•10^16
8.0•10^15
6.0•10^15
4.0•10^15
2.0•10^15
0
0
20
40
60
80
100
Mass of Species (amu)

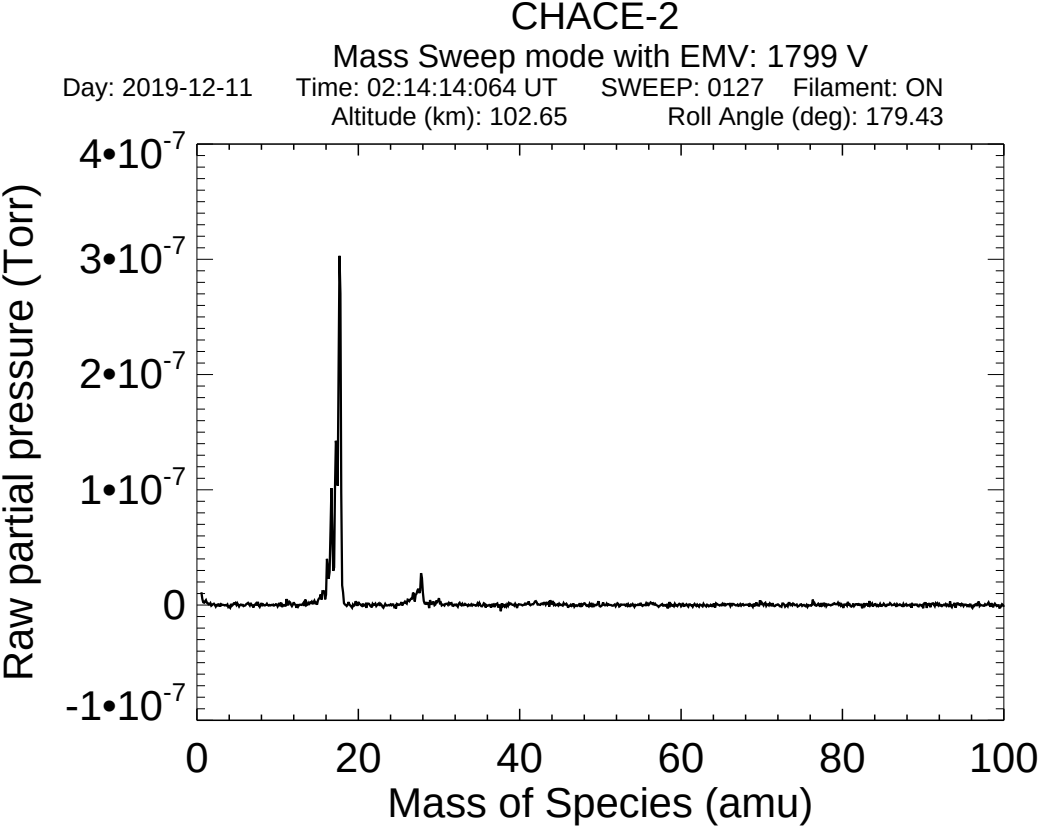

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:10:36:026 UT SWEEP: 0121 Filament: ON
Altitude (km): 105.40 Roll Angle (deg): 179.46
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

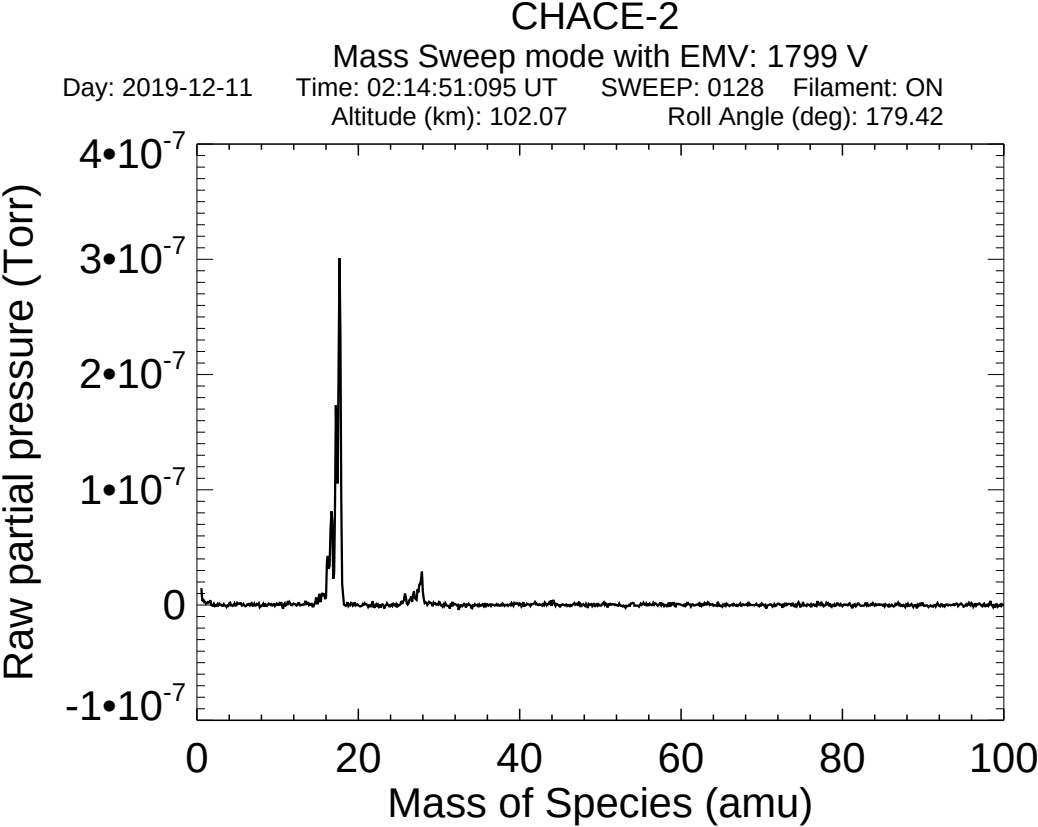

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:11:13:058 UT SWEEP: 0122 Filament: ON
Altitude (km): 104.91 Roll Angle (deg): 179.45
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

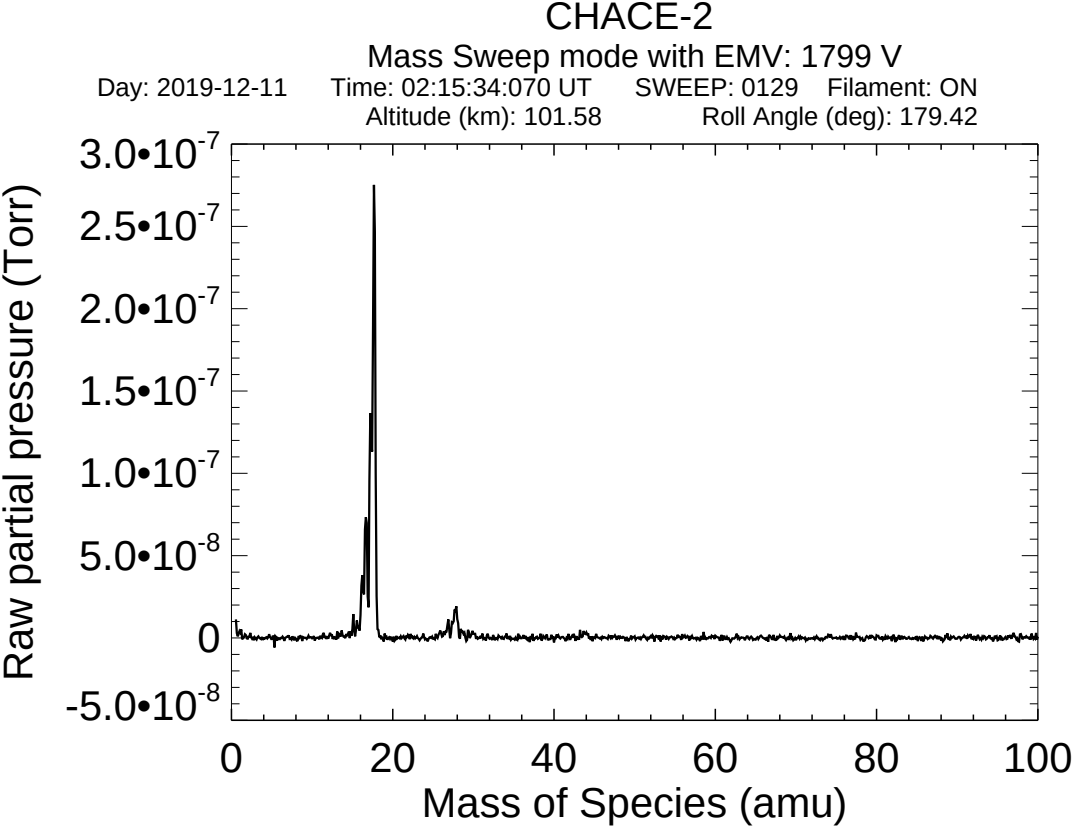

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:11:50:083 UT SWEEP: 0123 Filament: ON
Altitude (km): 104.42 Roll Angle (deg): 179.44
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

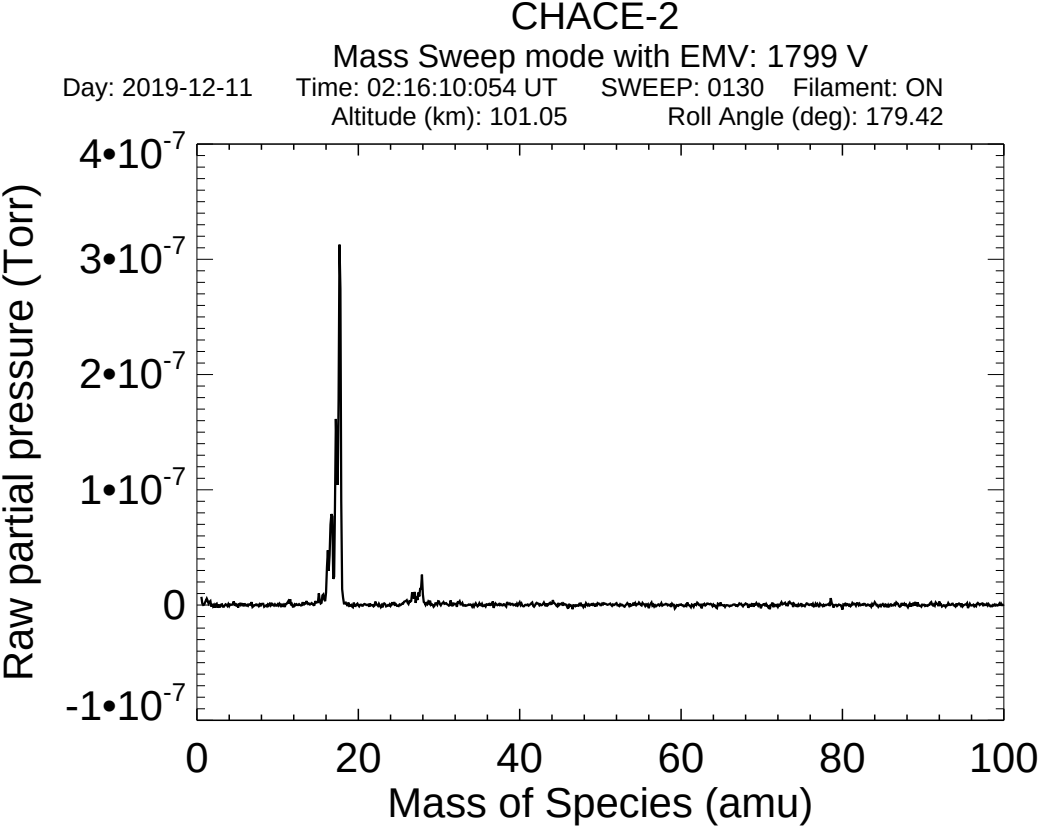

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:13:03:098 UT SWEEP: 0125 Filament: ON
Altitude (km): 103.47 Roll Angle (deg): 179.43
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

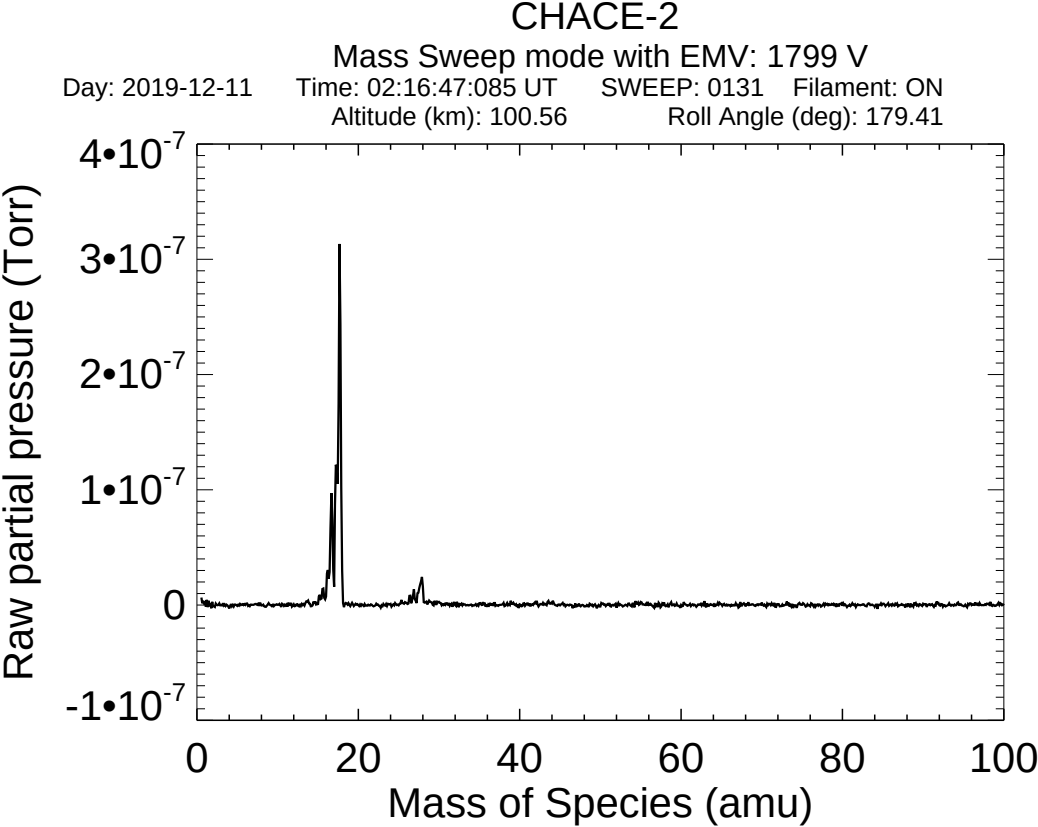

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:13:39:030 UT SWEEP: 0126 Filament: ON
Altitude (km): 103.13 Roll Angle (deg): 179.43
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

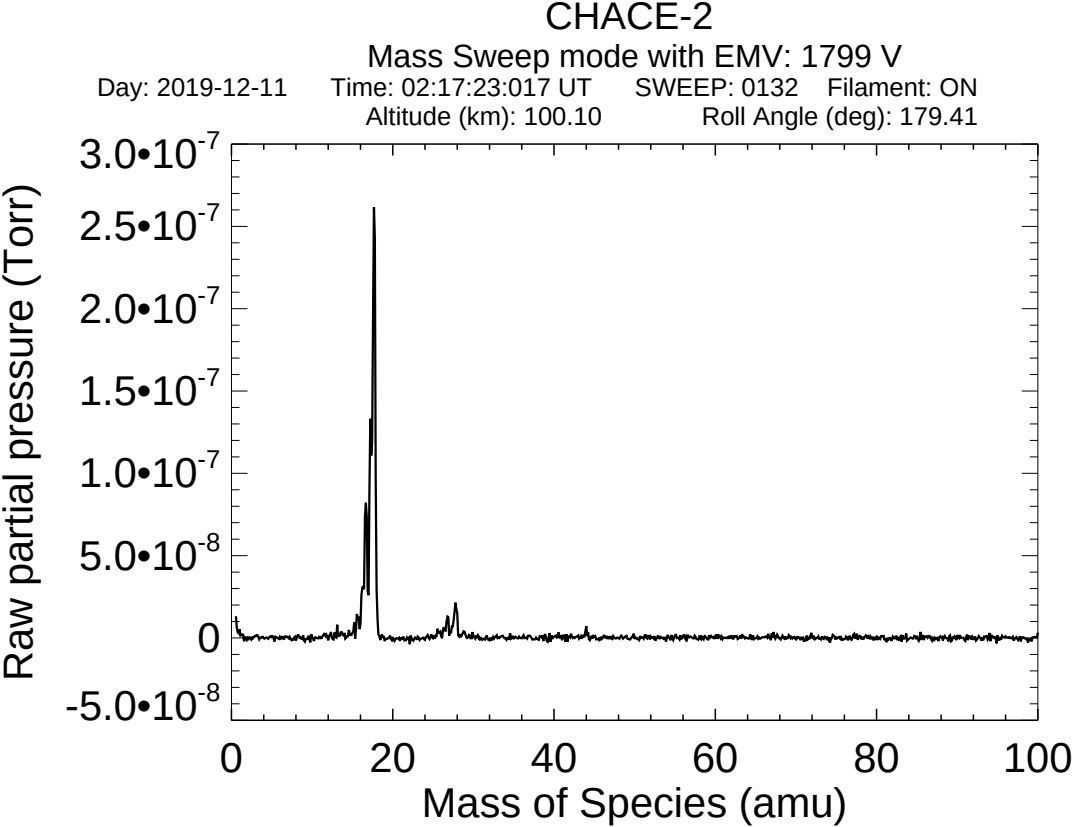

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:14:14:064 UT SWEEP: 0127 Filament: ON
Altitude (km): 102.65 Roll Angle (deg): 179.43
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

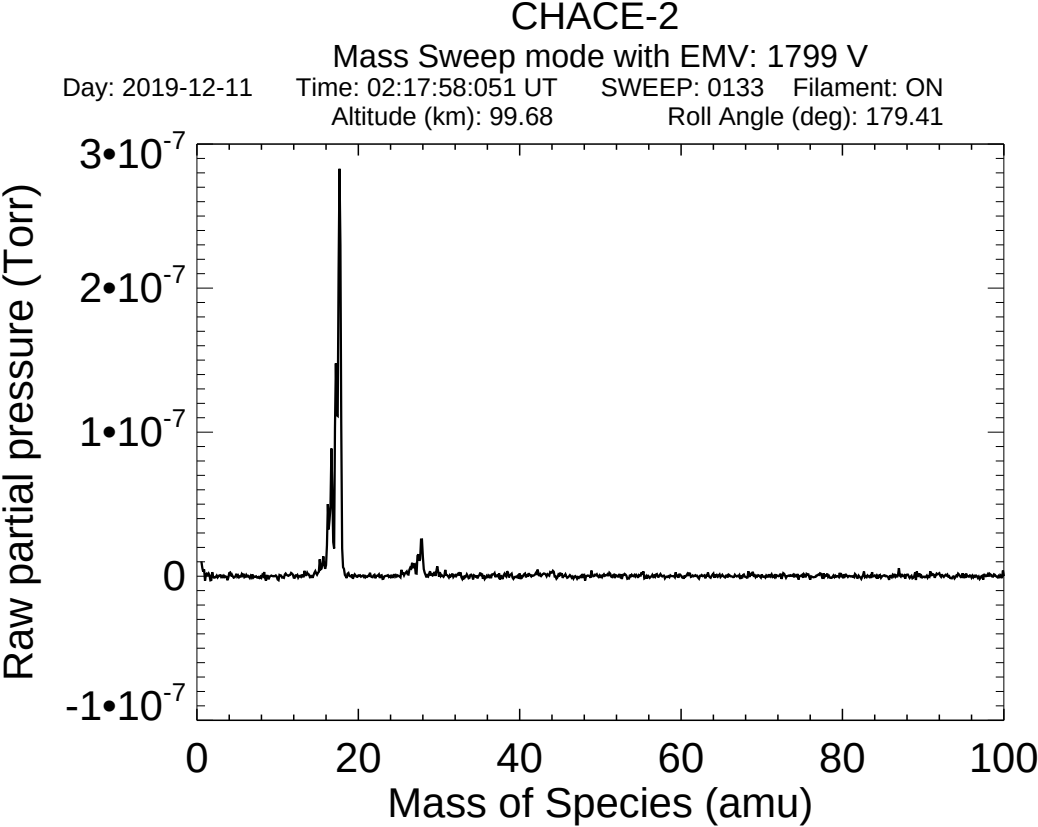

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:14:51:095 UT SWEEP: 0128 Filament: ON
Altitude (km): 102.07 Roll Angle (deg): 179.42
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

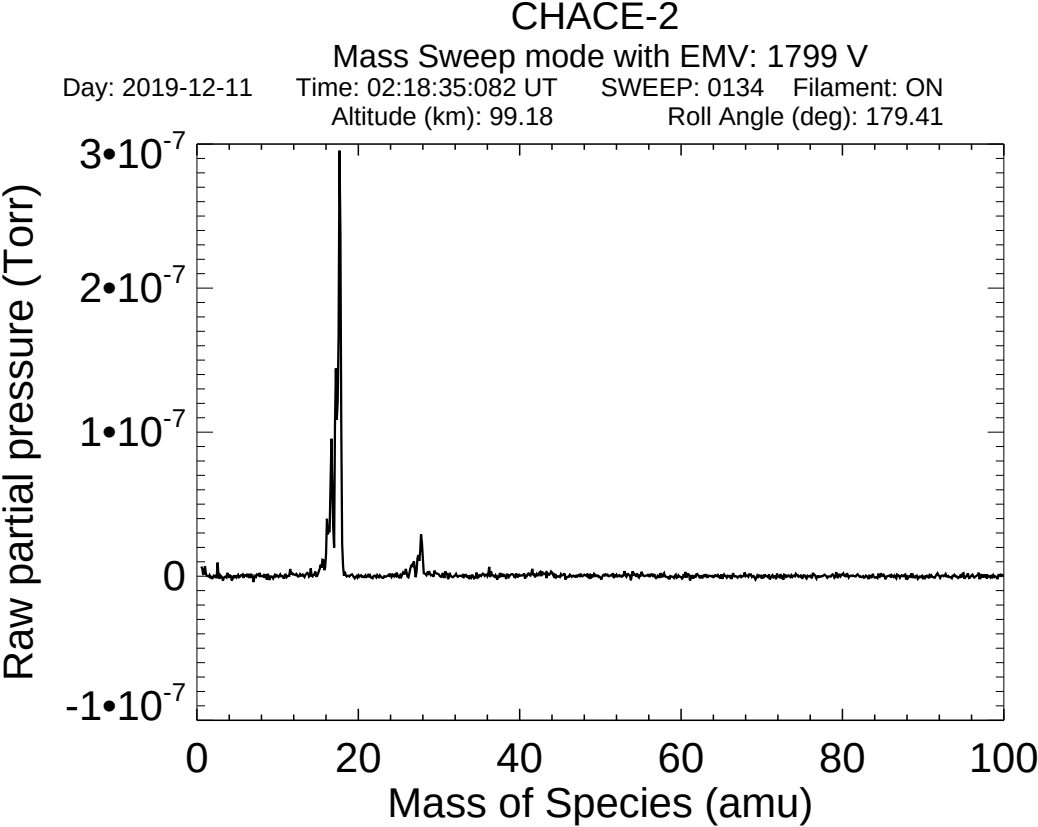

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:15:34:070 UT SWEEP: 0129 Filament: ON
Altitude (km): 101.58 Roll Angle (deg): 179.42
Raw partial pressure (Torr)
3.0•10-7
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

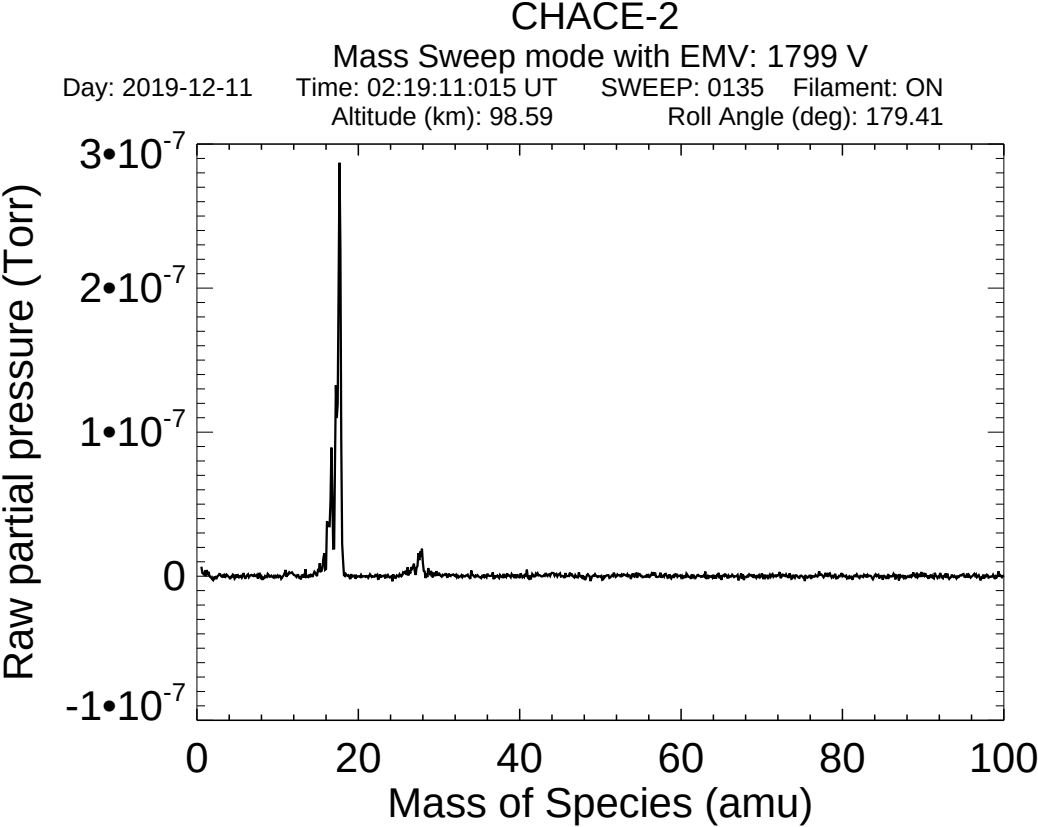

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:16:10:054 UT SWEEP: 0130 Filament: ON
Altitude (km): 101.05 Roll Angle (deg): 179.42
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

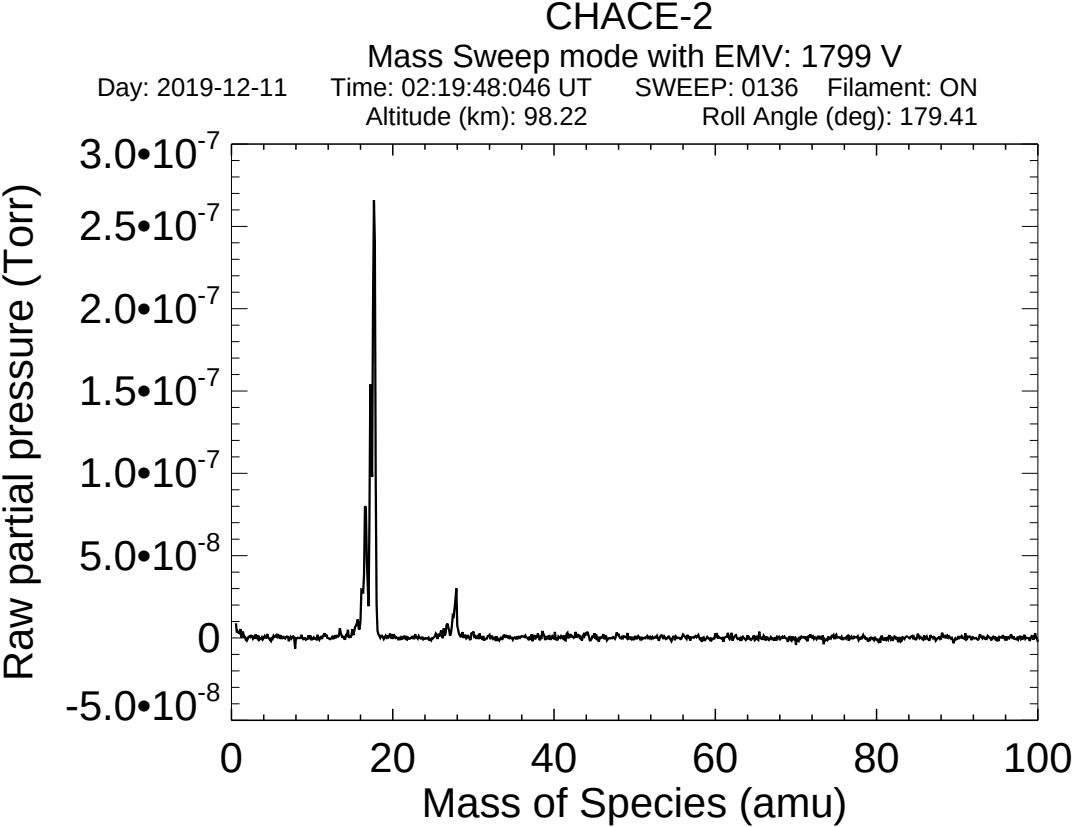

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:16:47:085 UT SWEEP: 0131 Filament: ON
Altitude (km): 100.56 Roll Angle (deg): 179.41
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

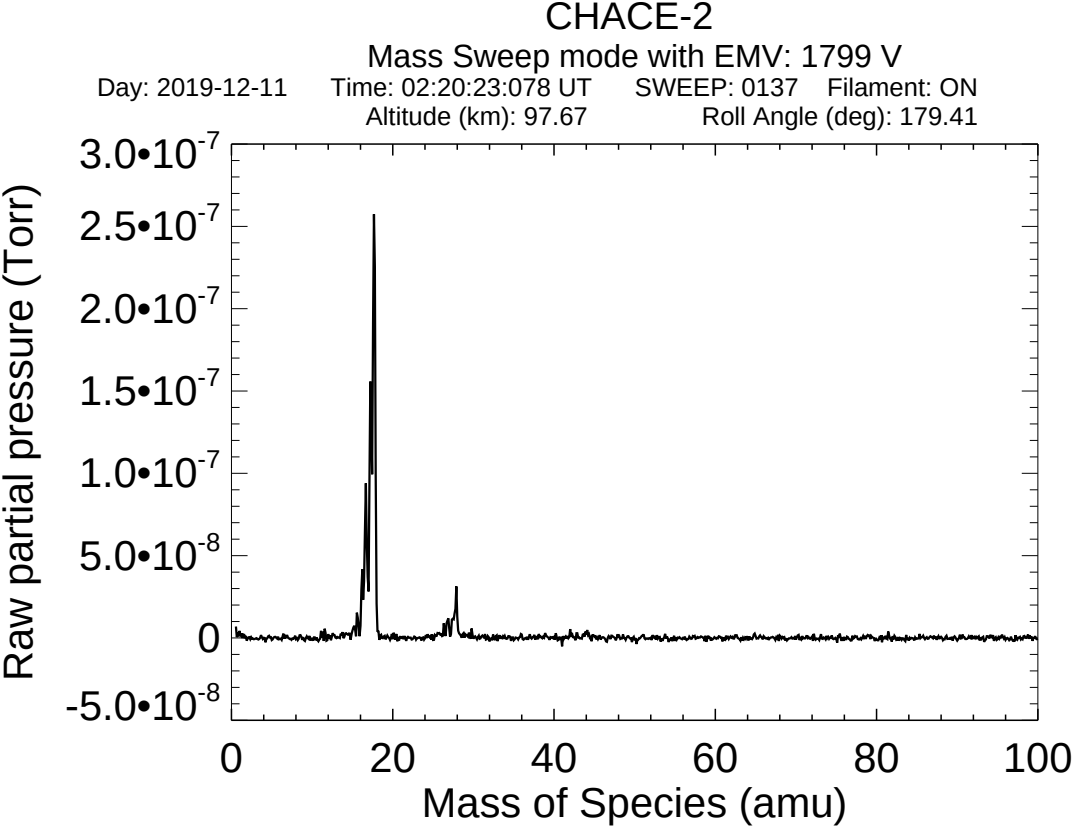

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:17:23:017 UT SWEEP: 0132 Filament: ON
Altitude (km): 100.10 Roll Angle (deg): 179.41
Raw partial pressure (Torr)
3.0•10-7
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

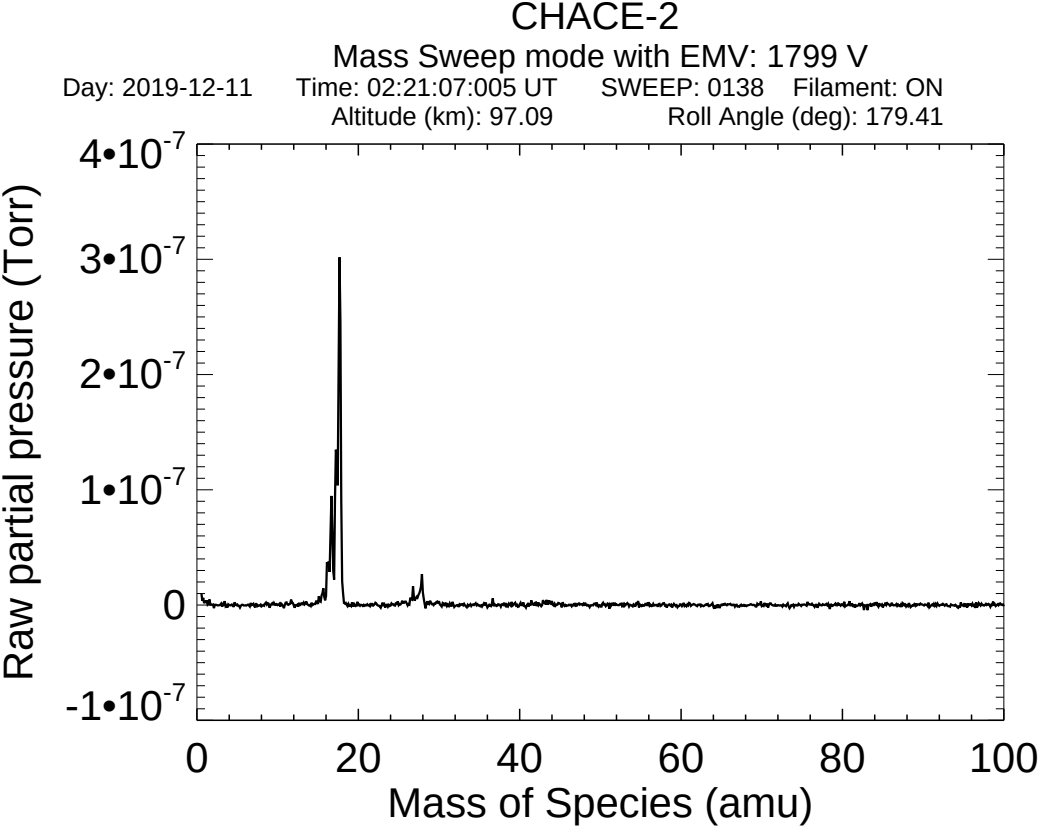

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:17:58:051 UT SWEEP: 0133 Filament: ON
Altitude (km): 99.68 Roll Angle (deg): 179.41
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

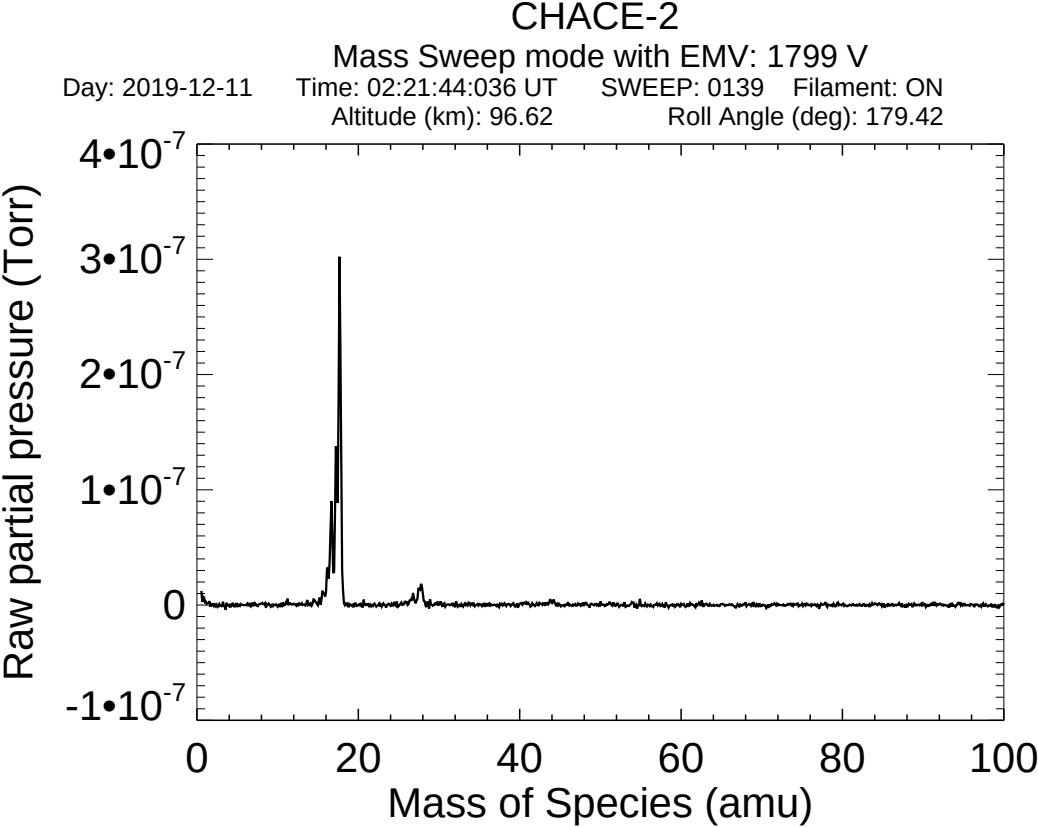

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:18:35:082 UT SWEEP: 0134 Filament: ON
Altitude (km): 99.18 Roll Angle (deg): 179.41
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

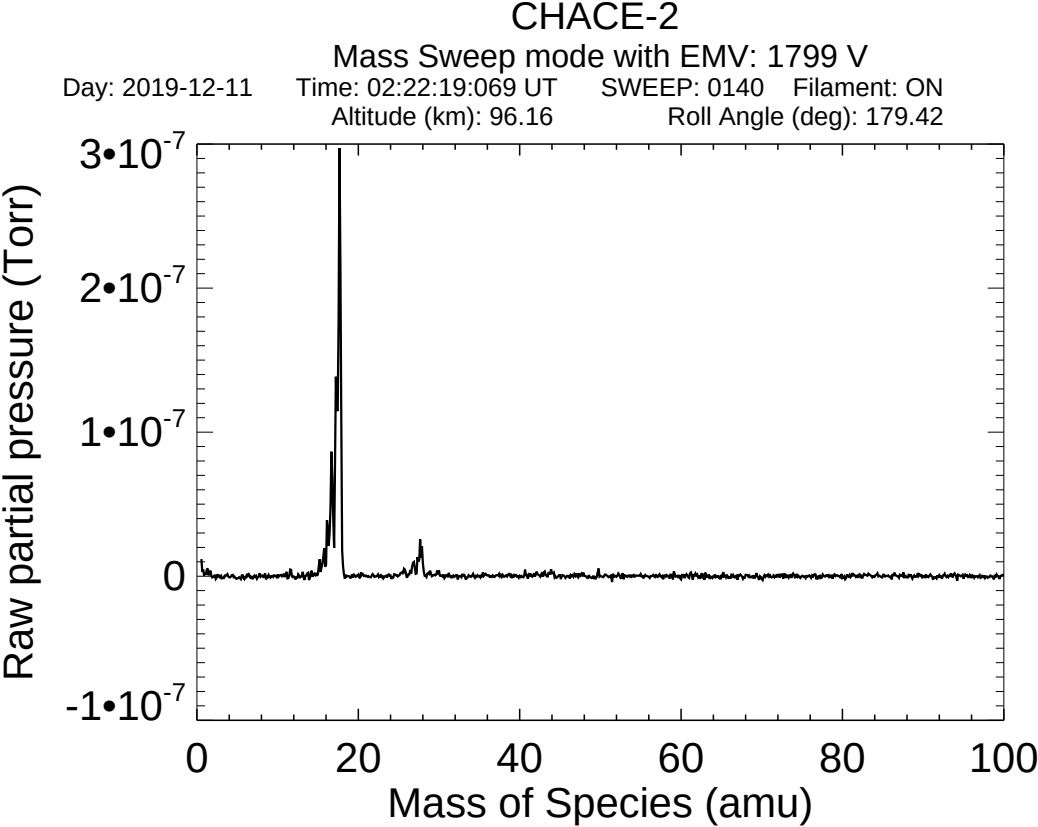

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:19:11:015 UT
SWEEP: 0135
Filament: ON
Altitude (km): 98.59
Roll Angle (deg): 179.41
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

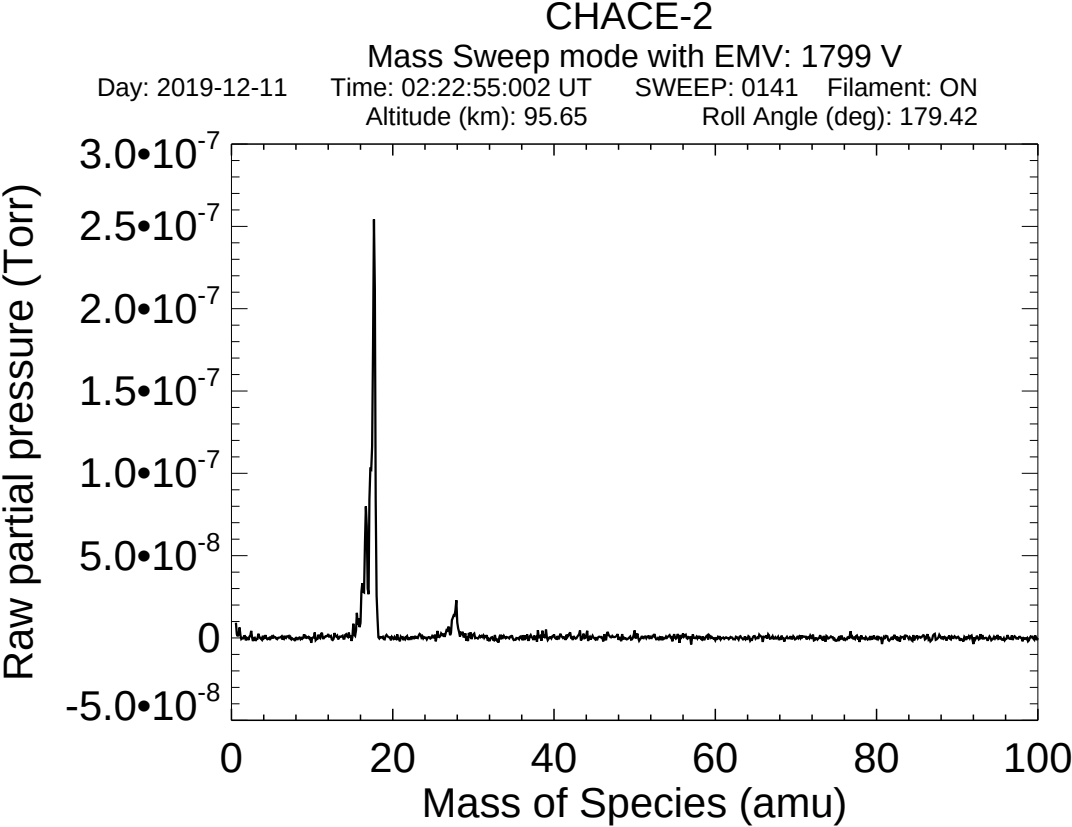

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:19:48:046 UT SWEEP: 0136 Filament: ON
Altitude (km): 98.22 Roll Angle (deg): 179.41
Raw partial pressure (Torr)
3.0•10-7
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

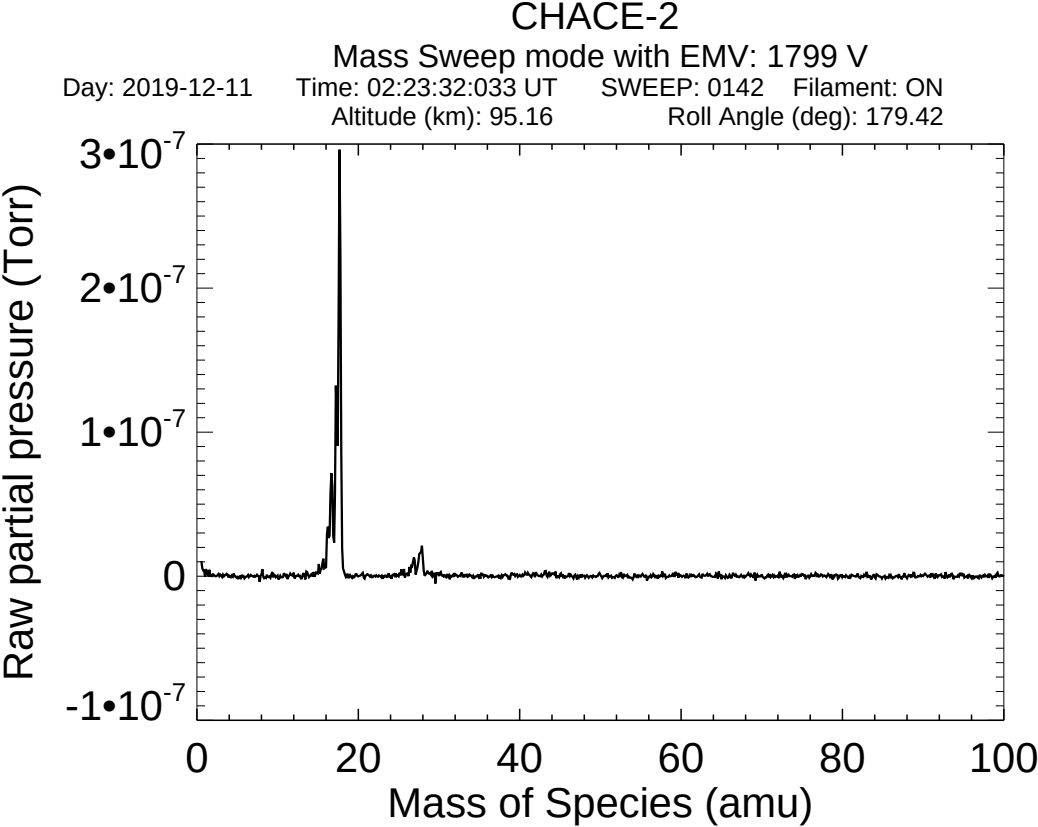

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:20:23:078 UT SWEEP: 0137 Filament: ON
Altitude (km): 97.67 Roll Angle (deg): 179.41
Raw partial pressure (Torr)
3.0•10-7
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

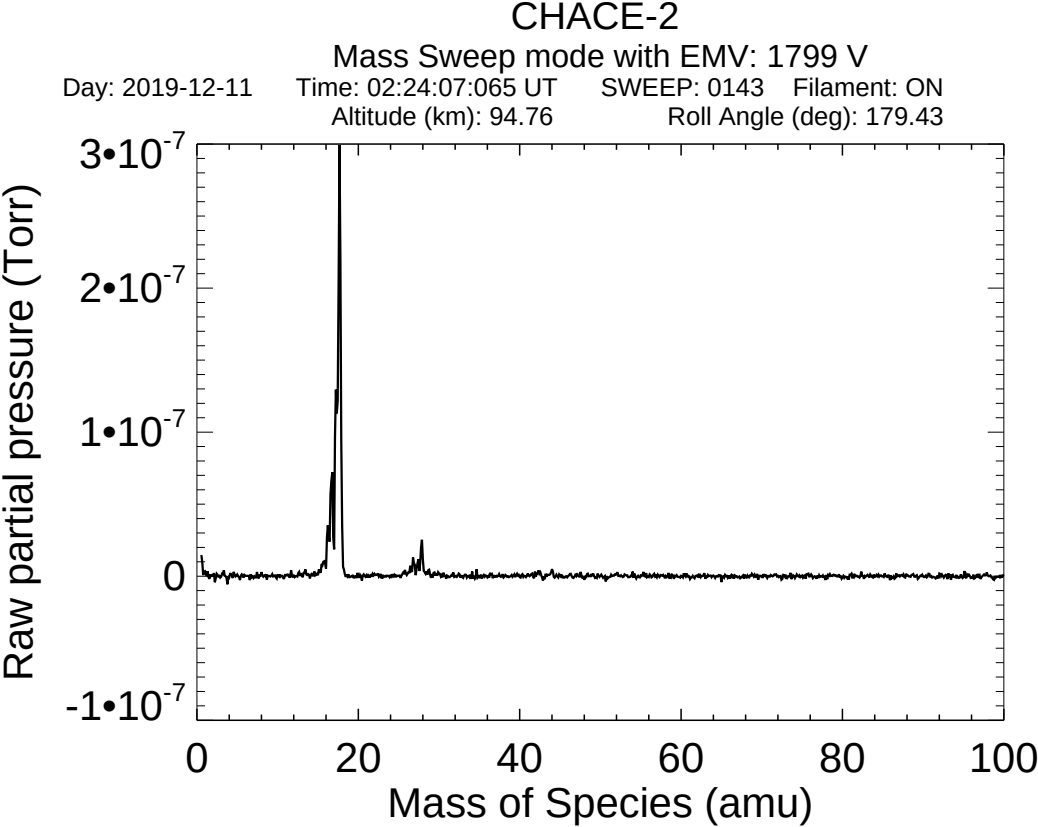

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:21:07:005 UT SWEEP: 0138 Filament: ON
Altitude (km): 97.09 Roll Angle (deg): 179.41
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

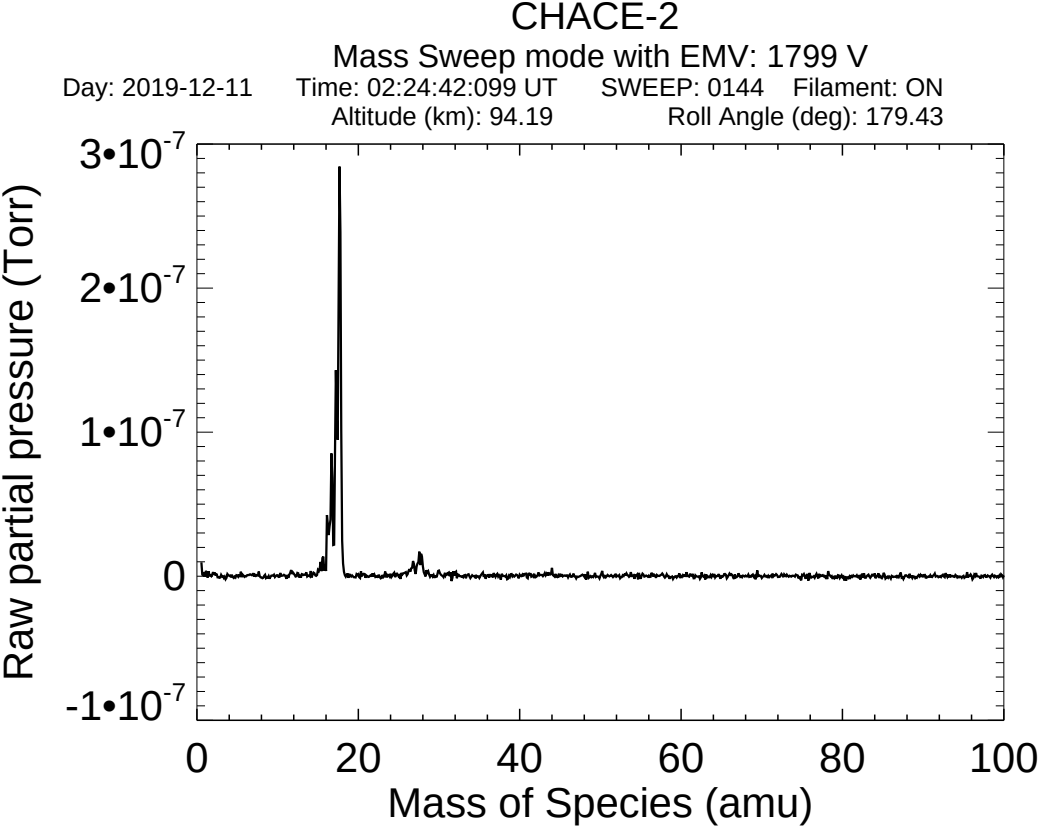

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:21:44:036 UT
SWEEP: 0139
Filament: ON
Altitude (km): 96.62
Roll Angle (deg): 179.42
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

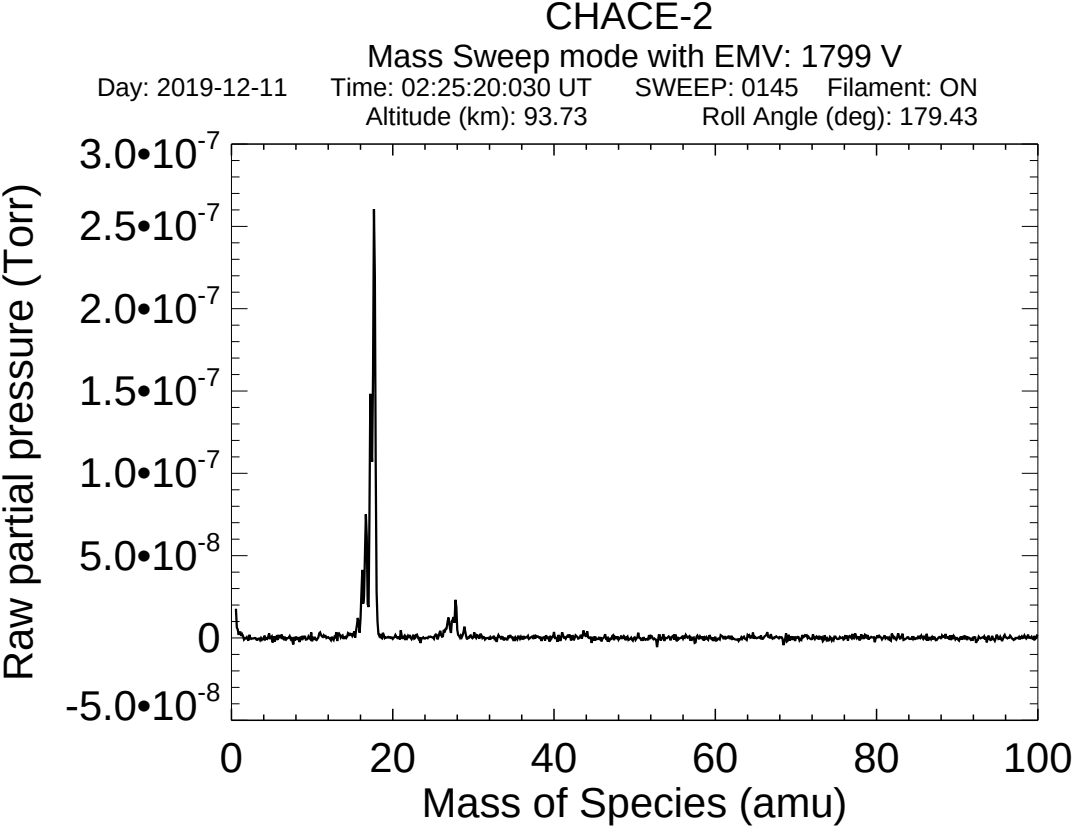

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:22:19:069 UT
SWEEP: 0140
Filament: ON
Altitude (km): 96.16
Roll Angle (deg): 179.42
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

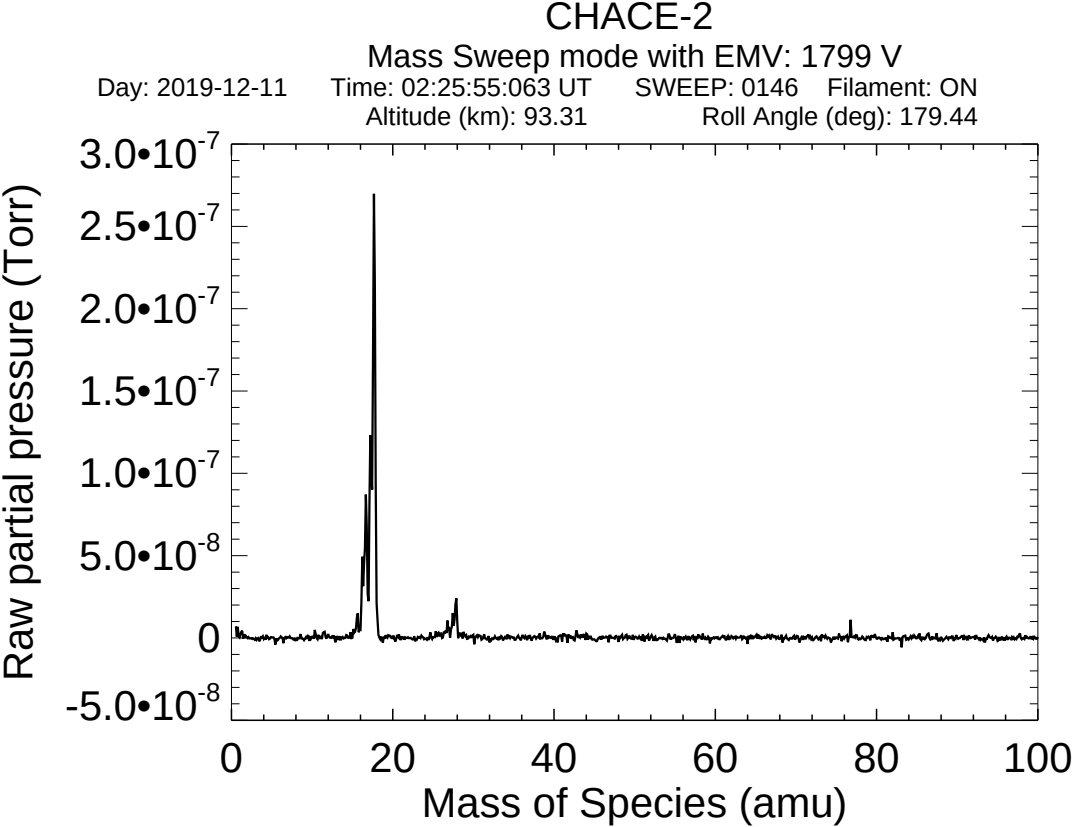

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:22:55:002 UT SWEEP: 0141 Filament: ON
Altitude (km): 95.65 Roll Angle (deg): 179.42
Raw partial pressure (Torr)
3.0•10-7
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

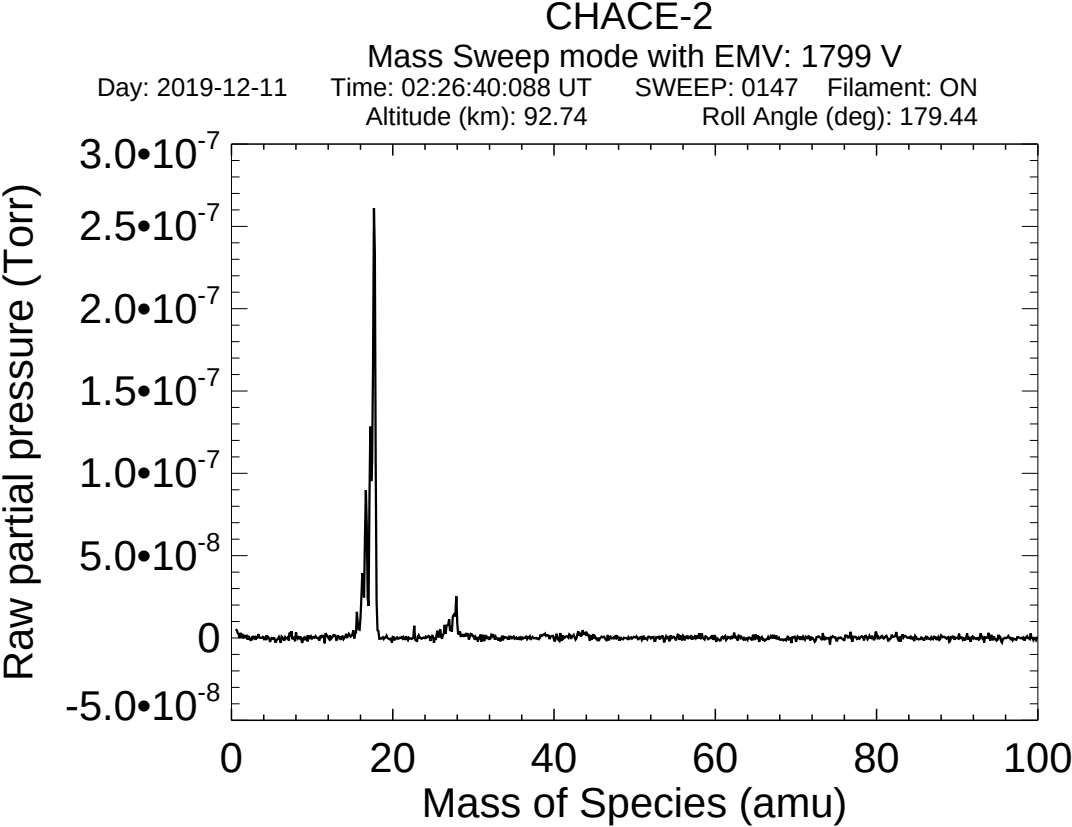

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:23:32:033 UT
SWEEP: 0142
Filament: ON
Altitude (km): 95.16
Roll Angle (deg): 179.42
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

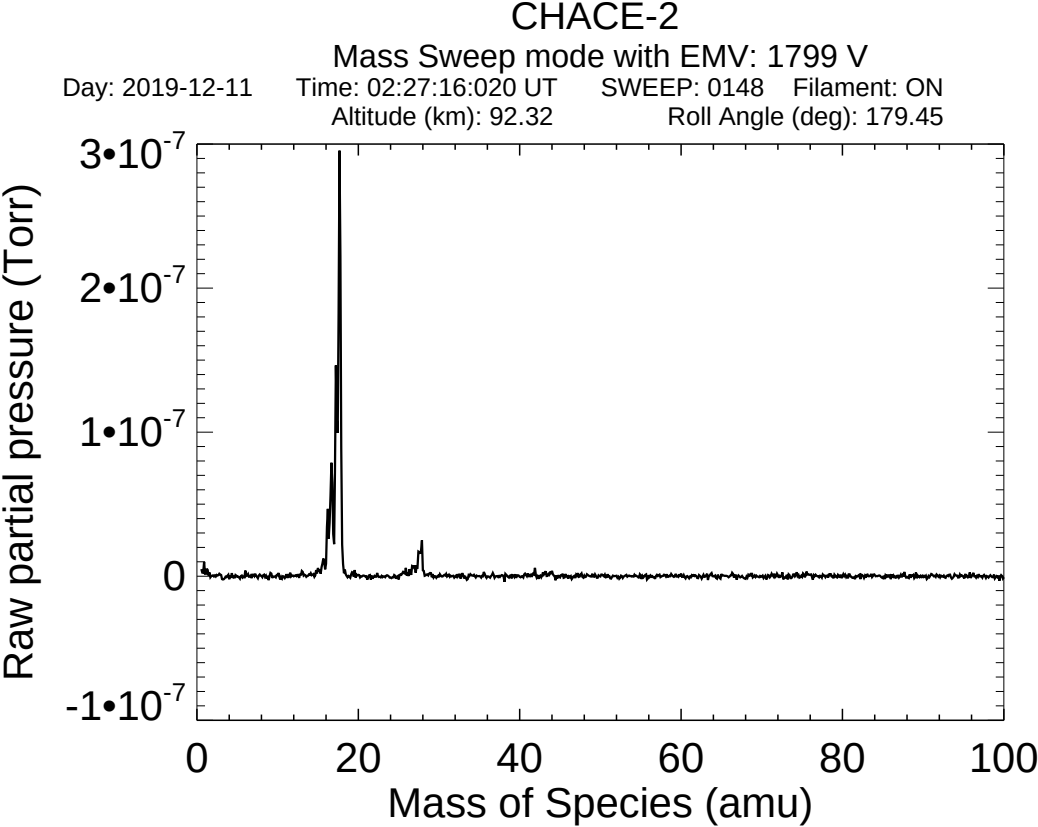

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:24:07:065 UT
SWEEP: 0143
Filament: ON
Altitude (km): 94.76
Roll Angle (deg): 179.43
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

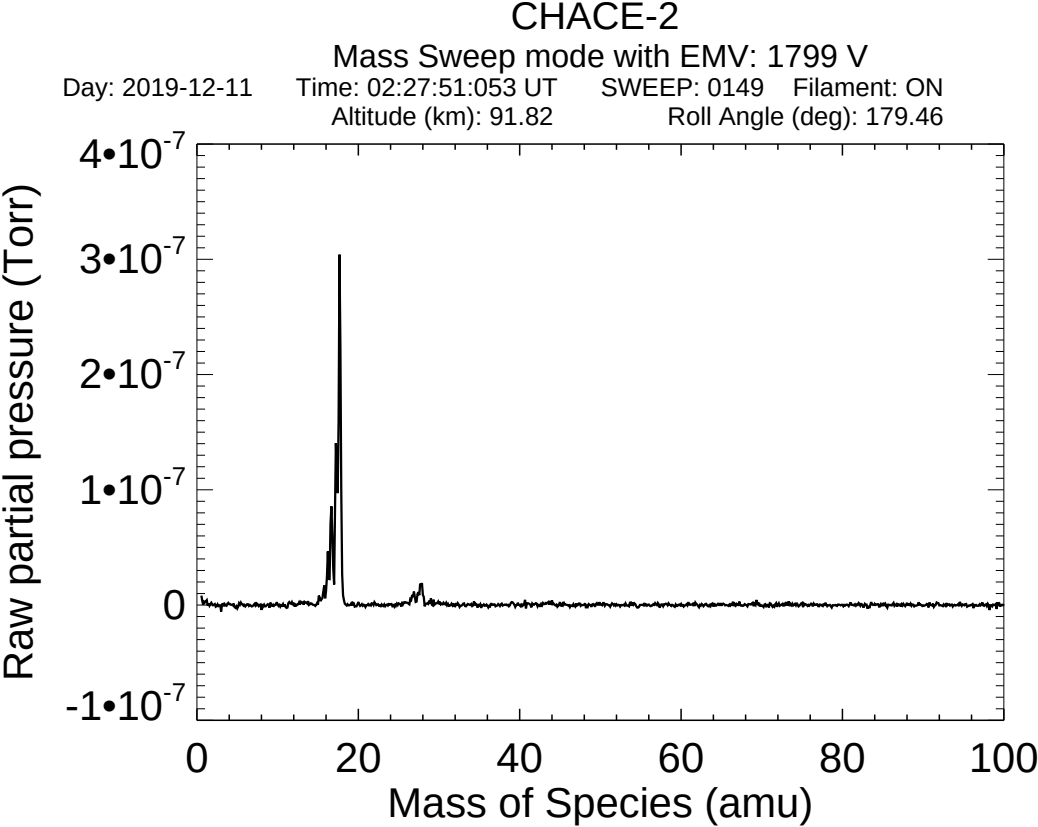

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:24:42:099 UT
SWEEP: 0144
Filament: ON
Altitude (km): 94.19
Roll Angle (deg): 179.43
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

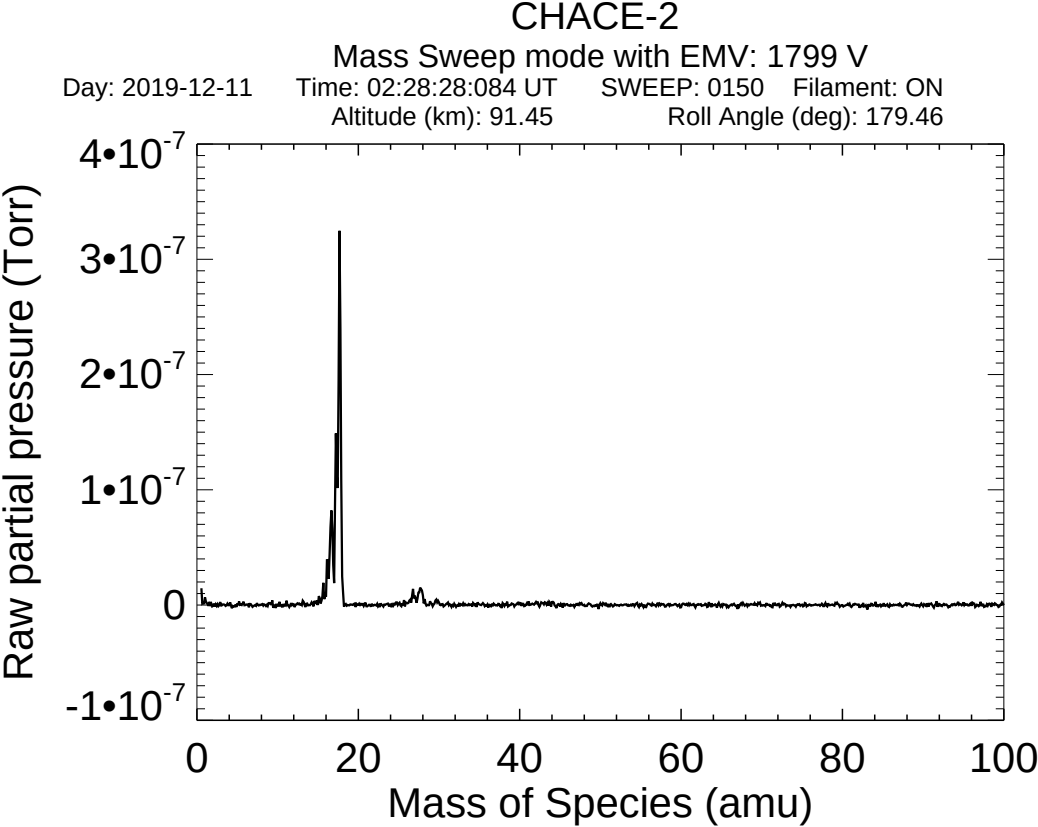

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:25:20:030 UT SWEEP: 0145 Filament: ON
Altitude (km): 93.73 Roll Angle (deg): 179.43
Raw partial pressure (Torr)
3.0•10-7
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

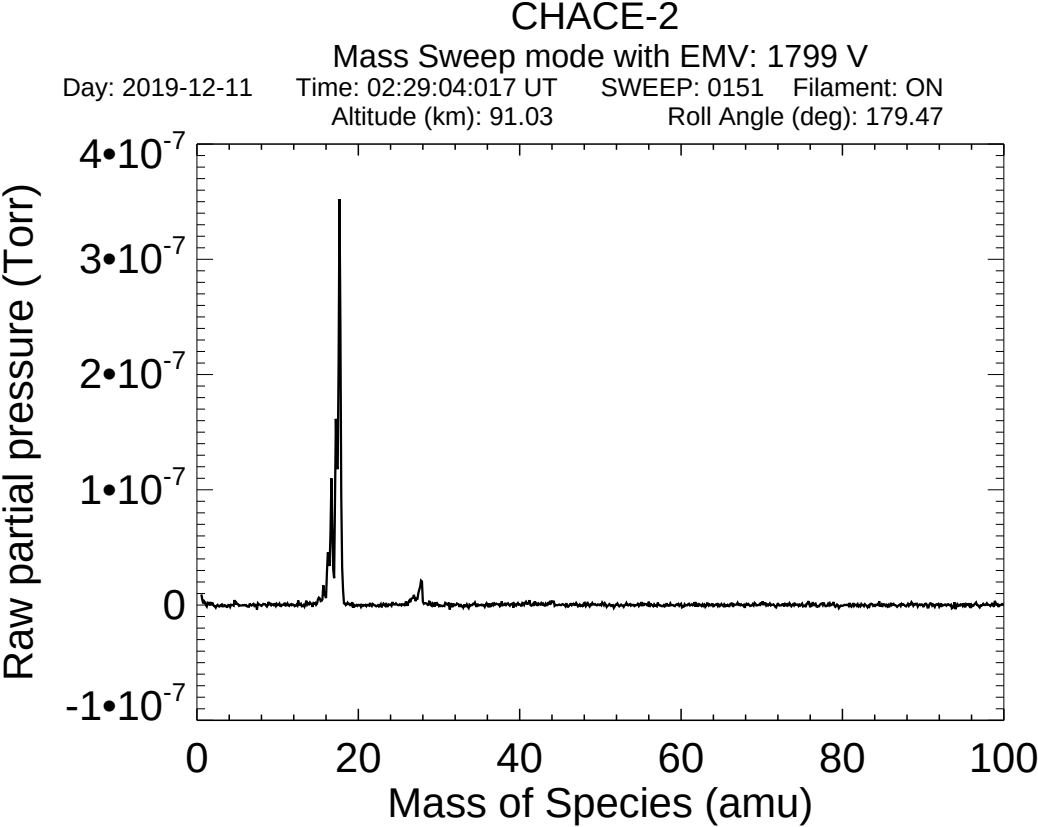

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:25:55:063 UT SWEEP: 0146 Filament: ON
Altitude (km): 93.31 Roll Angle (deg): 179.44
Raw partial pressure (Torr)
3.0•10-7
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

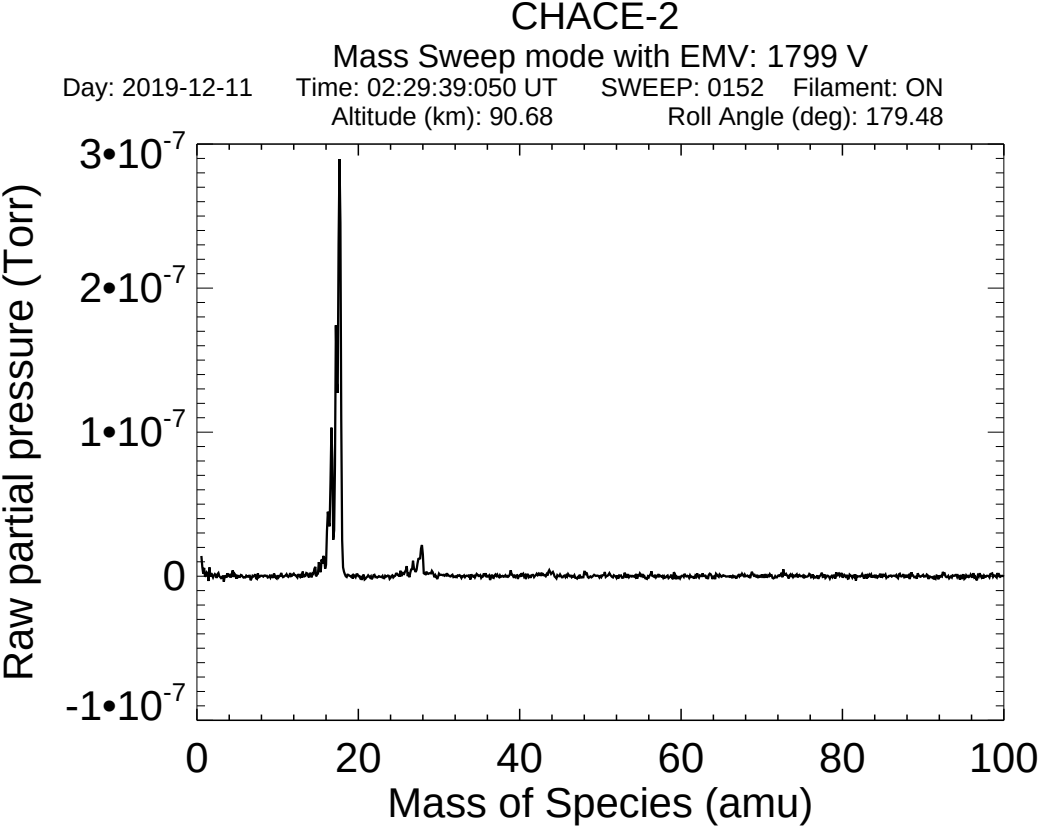

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:26:40:088 UT SWEEP: 0147 Filament: ON
Altitude (km): 92.74 Roll Angle (deg): 179.44
Raw partial pressure (Torr)
3.0•10-7
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

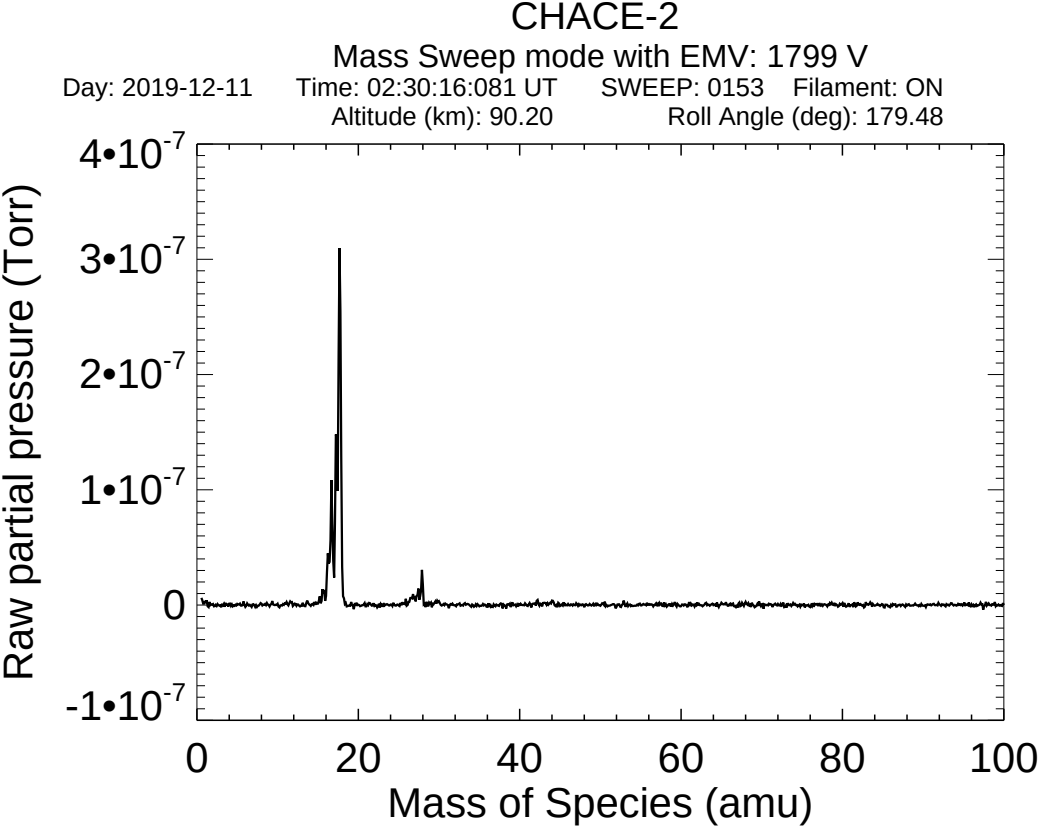

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:27:16:020 UT
SWEEP: 0148
Filament: ON
Altitude (km): 92.32
Roll Angle (deg): 179.45
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

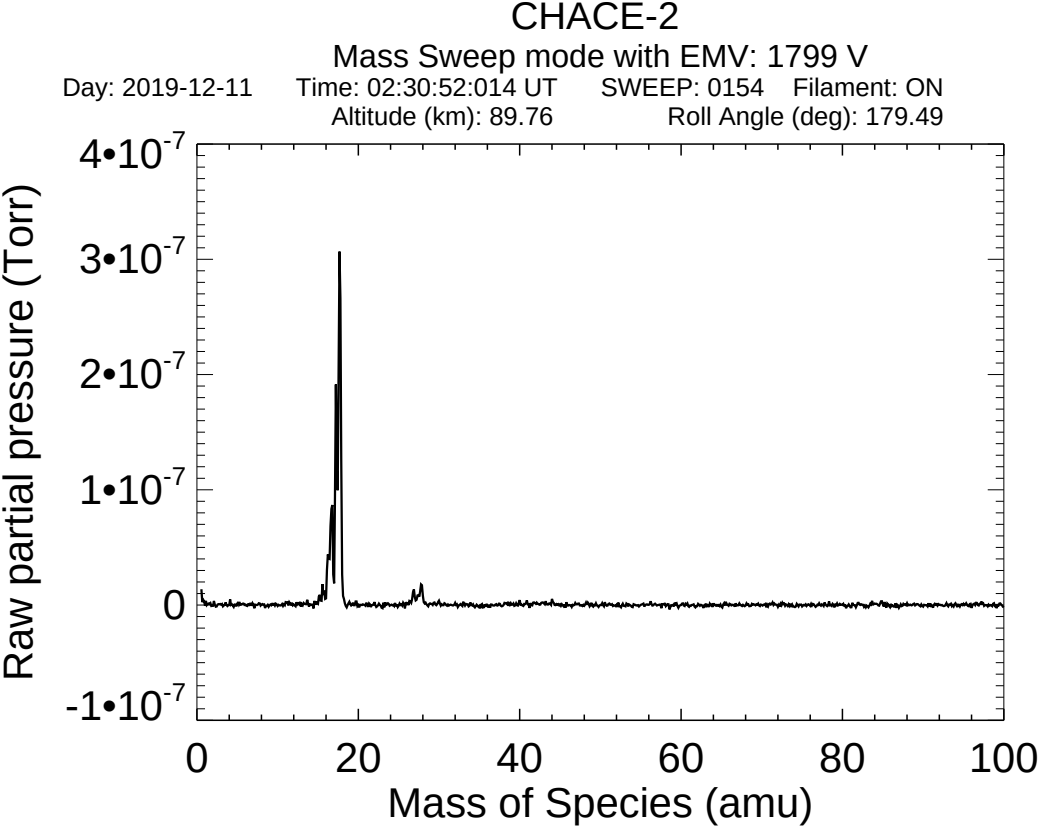

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:27:51:053 UT
SWEEP: 0149
Filament: ON
Altitude (km): 91.82
Roll Angle (deg): 179.46
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

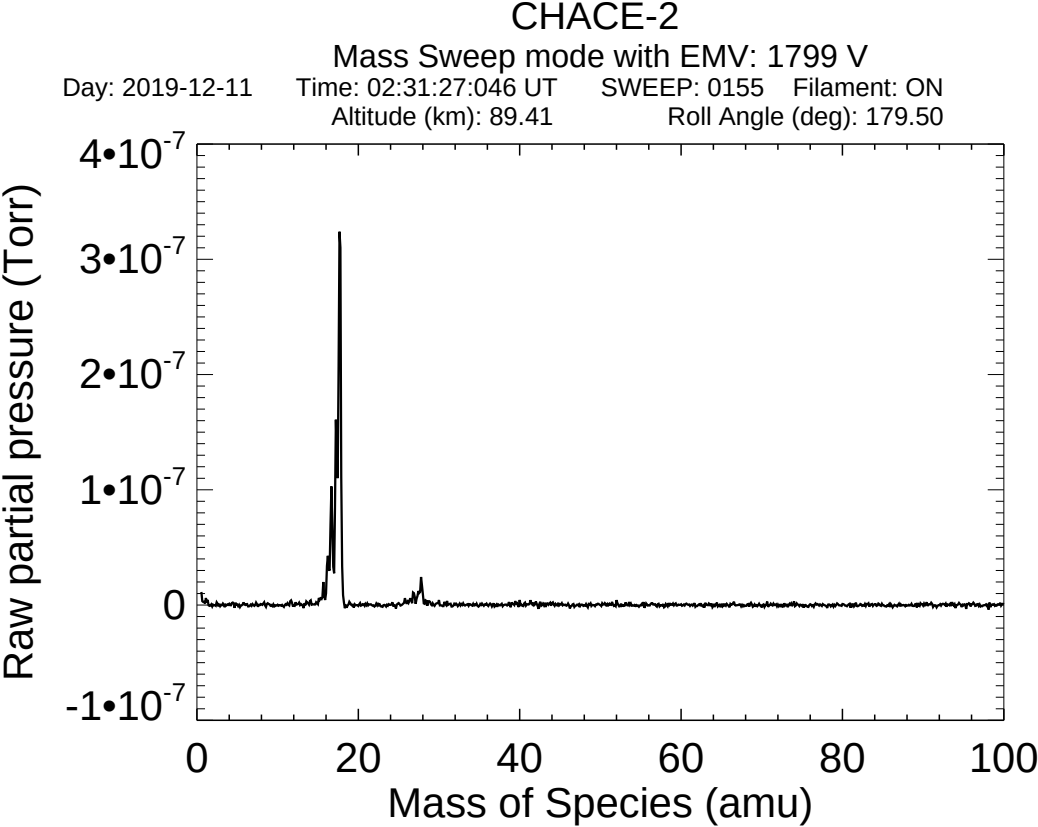

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:28:28:084 UT
SWEEP: 0150
Filament: ON
Altitude (km): 91.45
Roll Angle (deg): 179.46
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

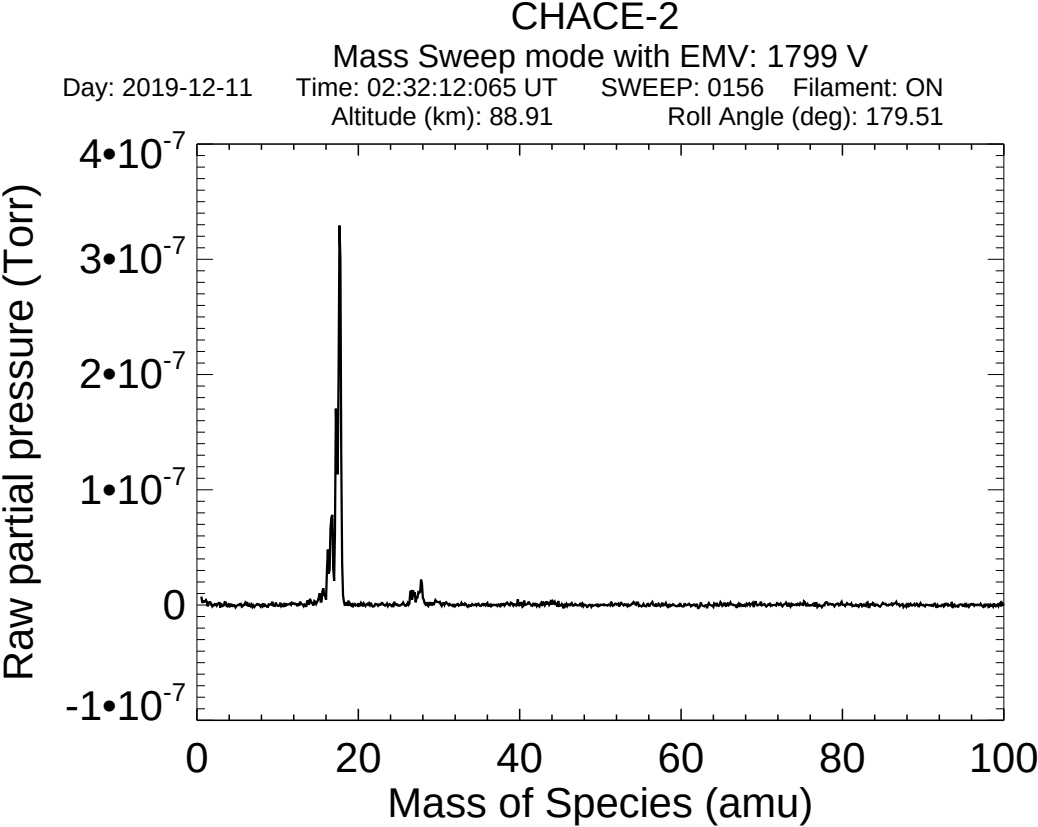

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:29:04:017 UT SWEEP: 0151 Filament: ON
Altitude (km): 91.03 Roll Angle (deg): 179.47
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

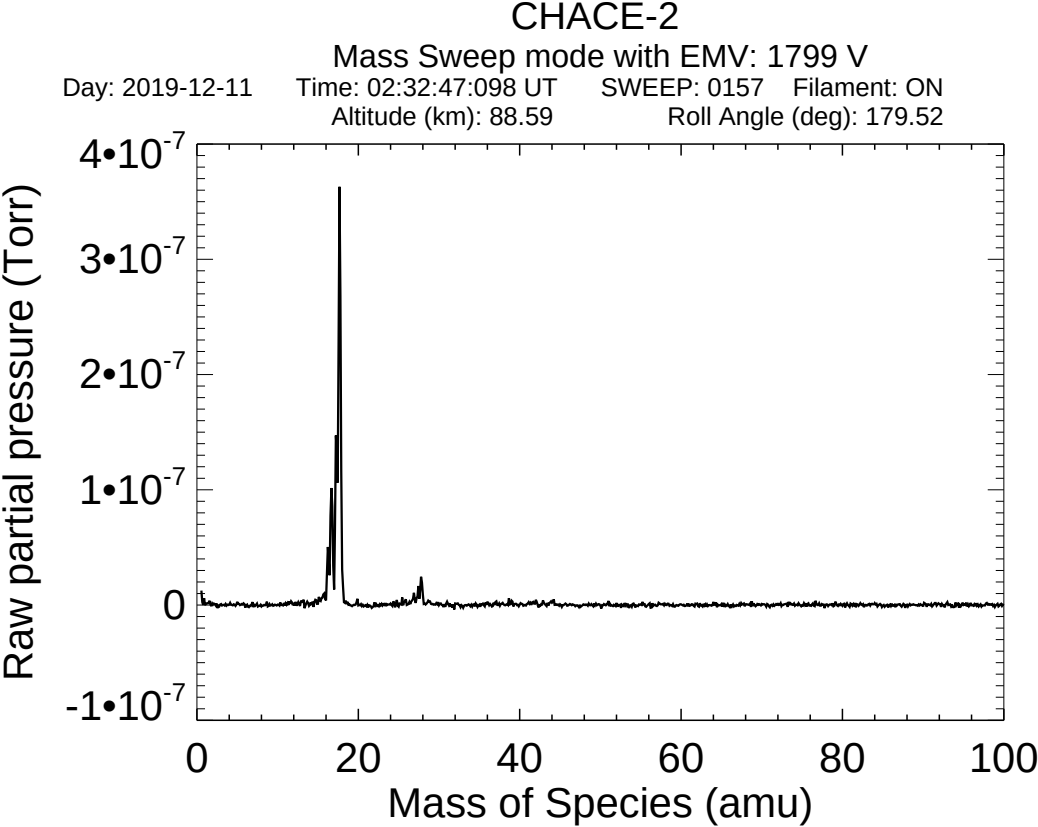

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:29:39:050 UT
SWEEP: 0152
Filament: ON
Altitude (km): 90.68
Roll Angle (deg): 179.48
Raw partial pressure (Torr)
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

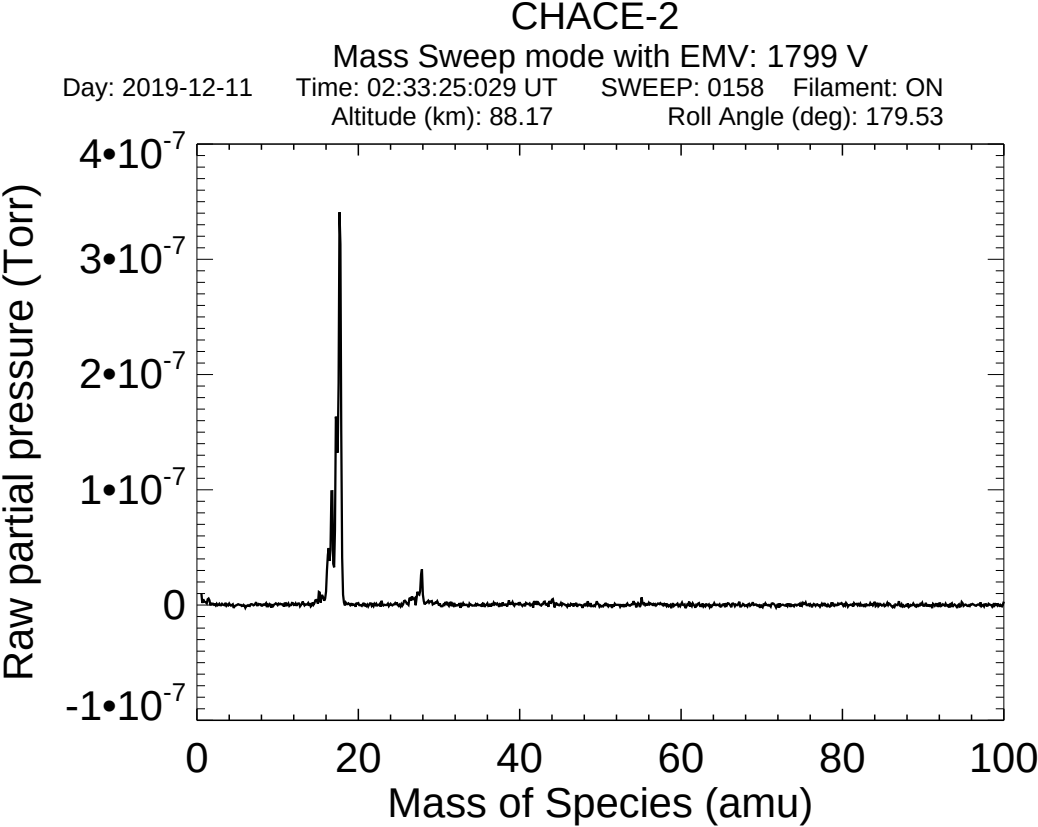

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:30:16:081 UT SWEEP: 0153 Filament: ON
Altitude (km): 90.20 Roll Angle (deg): 179.48
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

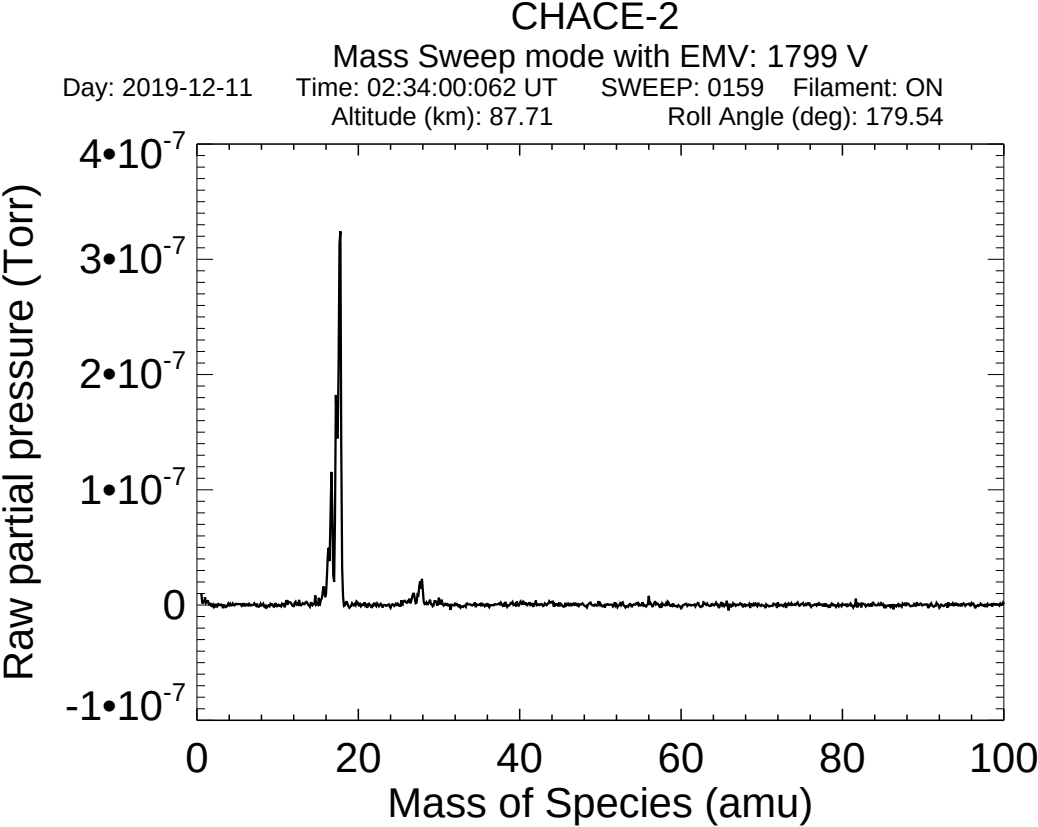

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:30:52:014 UT
SWEEP: 0154
Filament: ON
Altitude (km): 89.76
Roll Angle (deg): 179.49
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

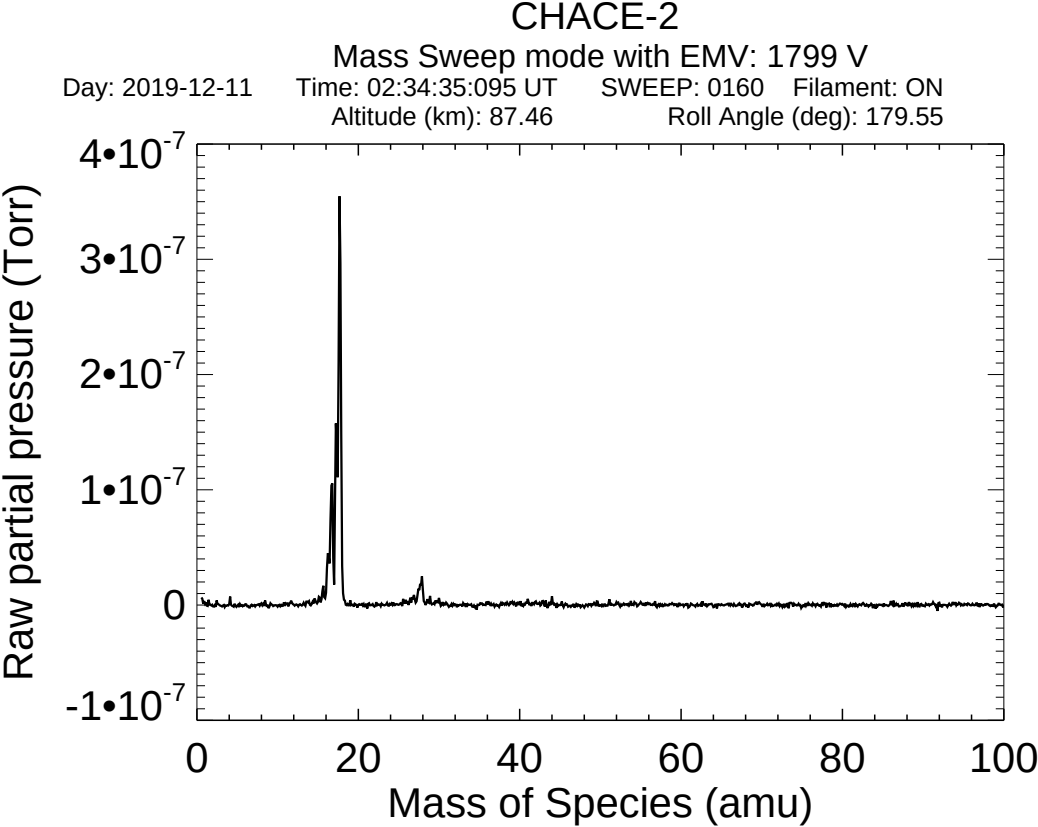

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:31:27:046 UT SWEEP: 0155 Filament: ON
Altitude (km): 89.41 Roll Angle (deg): 179.50
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

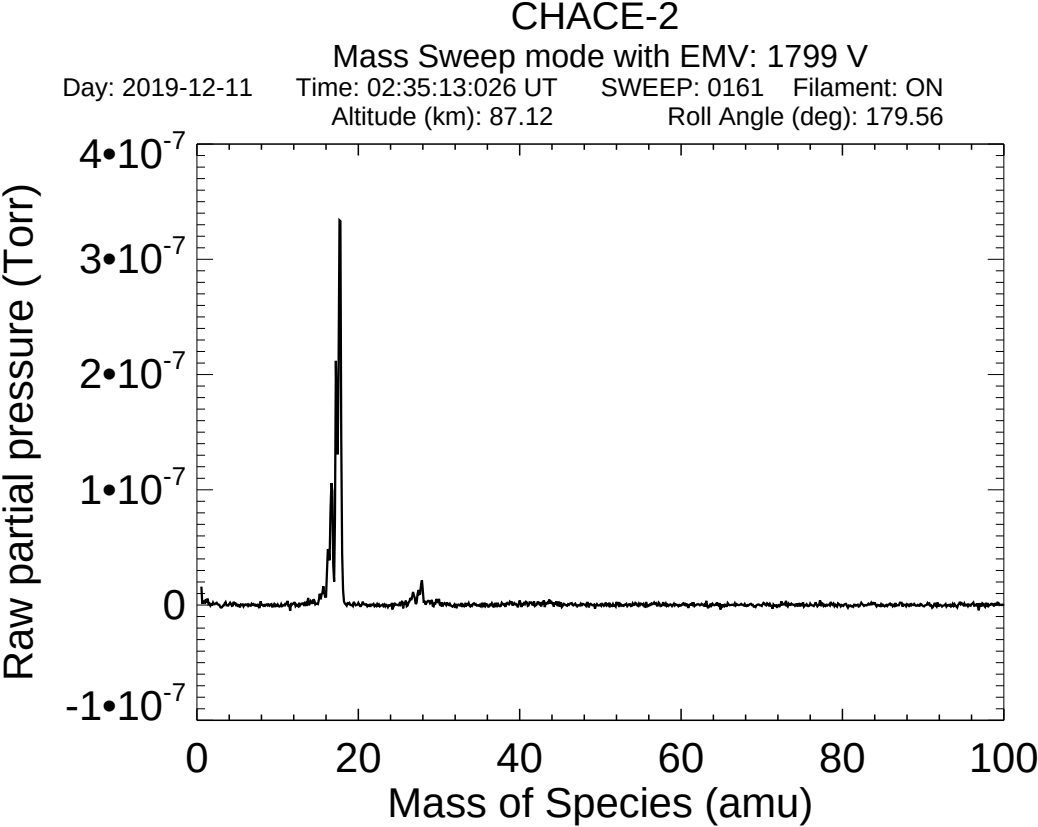

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:32:12:065 UT SWEEP: 0156 Filament: ON
Altitude (km): 88.91 Roll Angle (deg): 179.51
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

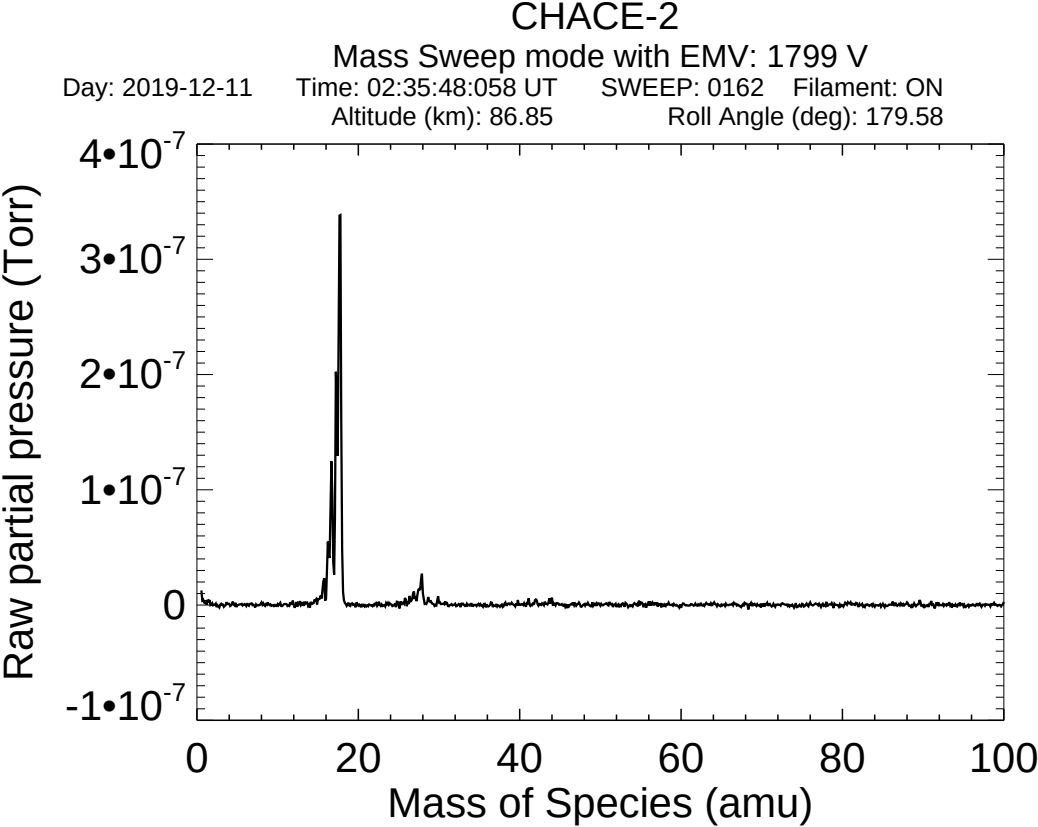

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:32:47:098 UT SWEEP: 0157 Filament: ON
Altitude (km): 88.59 Roll Angle (deg): 179.52
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

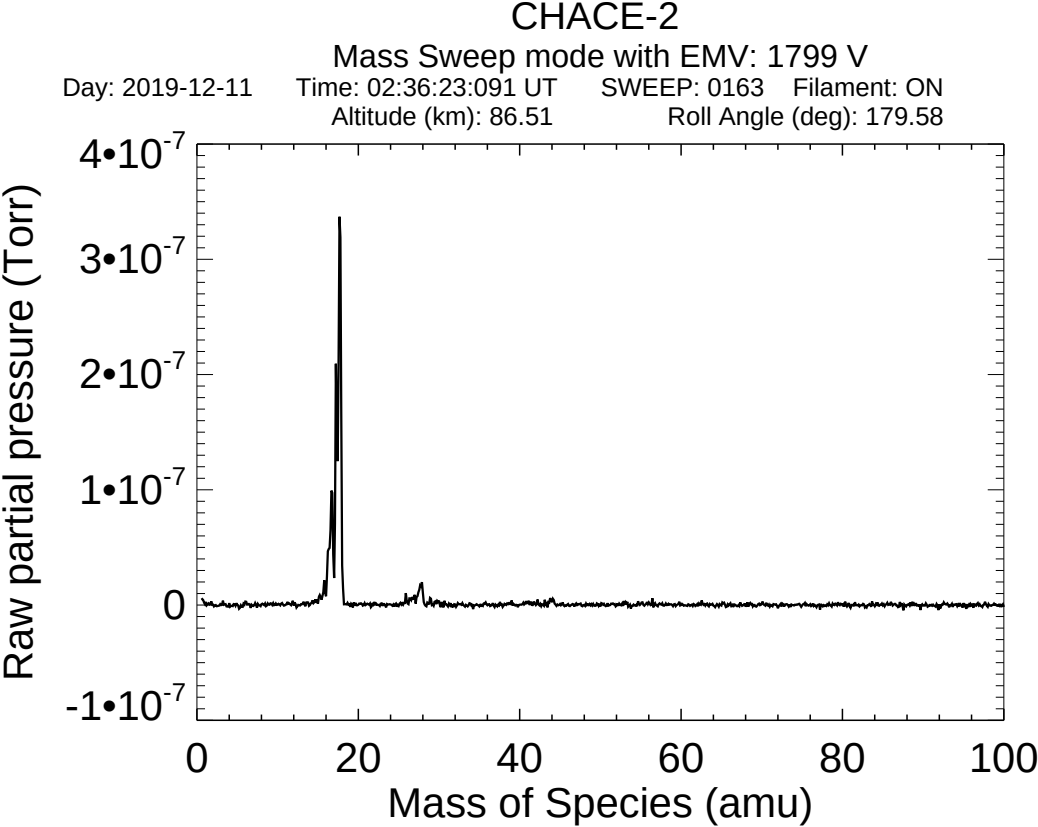

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:33:25:029 UT
SWEEP: 0158
Filament: ON
Altitude (km): 88.17
Roll Angle (deg): 179.53
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

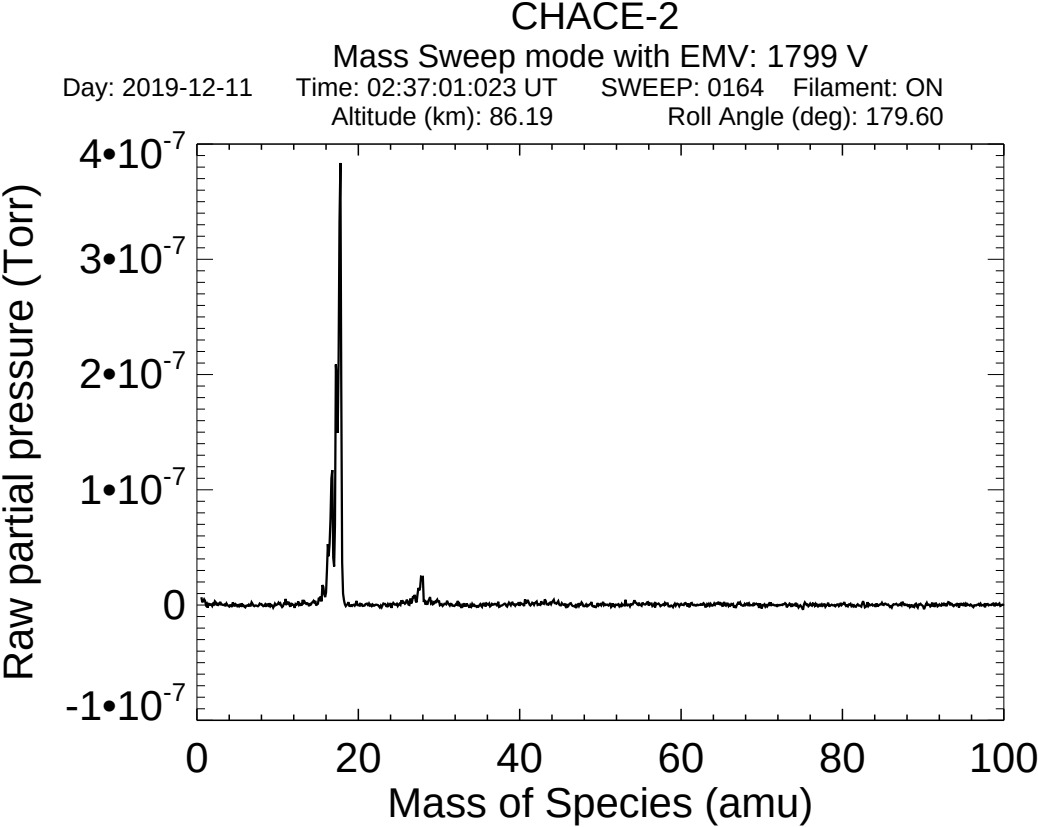

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:34:00:062 UT SWEEP: 0159 Filament: ON
Altitude (km): 87.71 Roll Angle (deg): 179.54
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

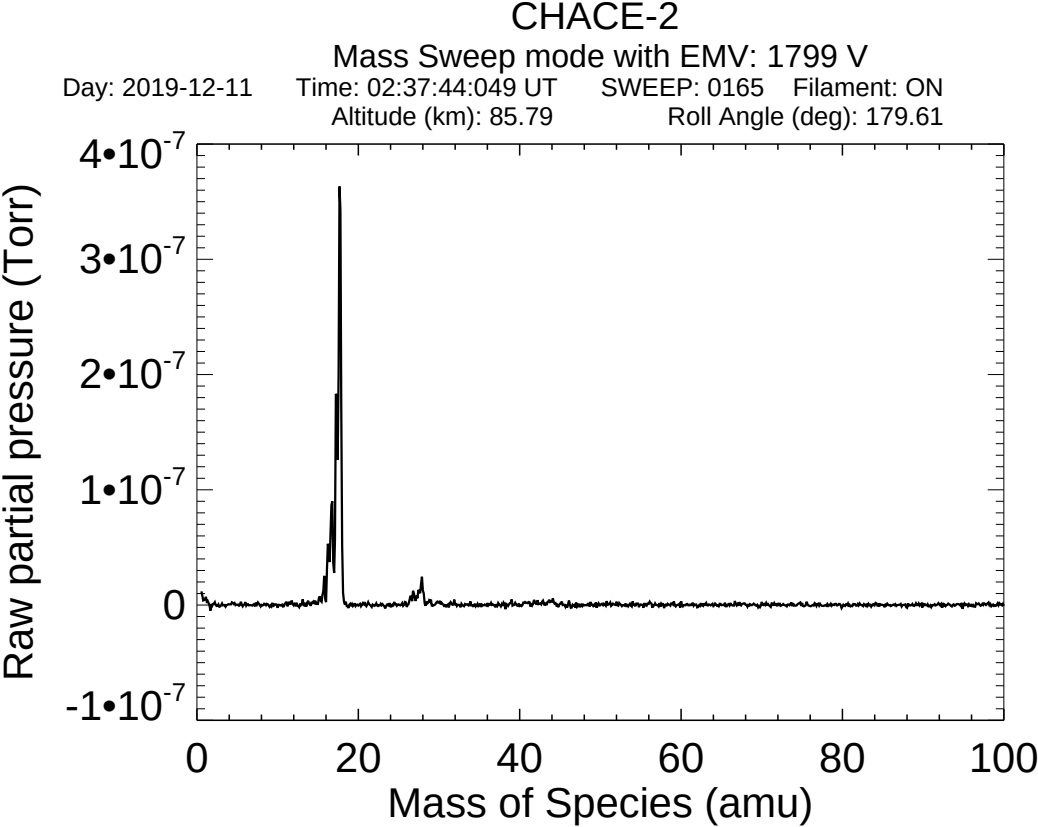

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:34:35:095 UT
SWEEP: 0160
Filament: ON
Altitude (km): 87.46
Roll Angle (deg): 179.55
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

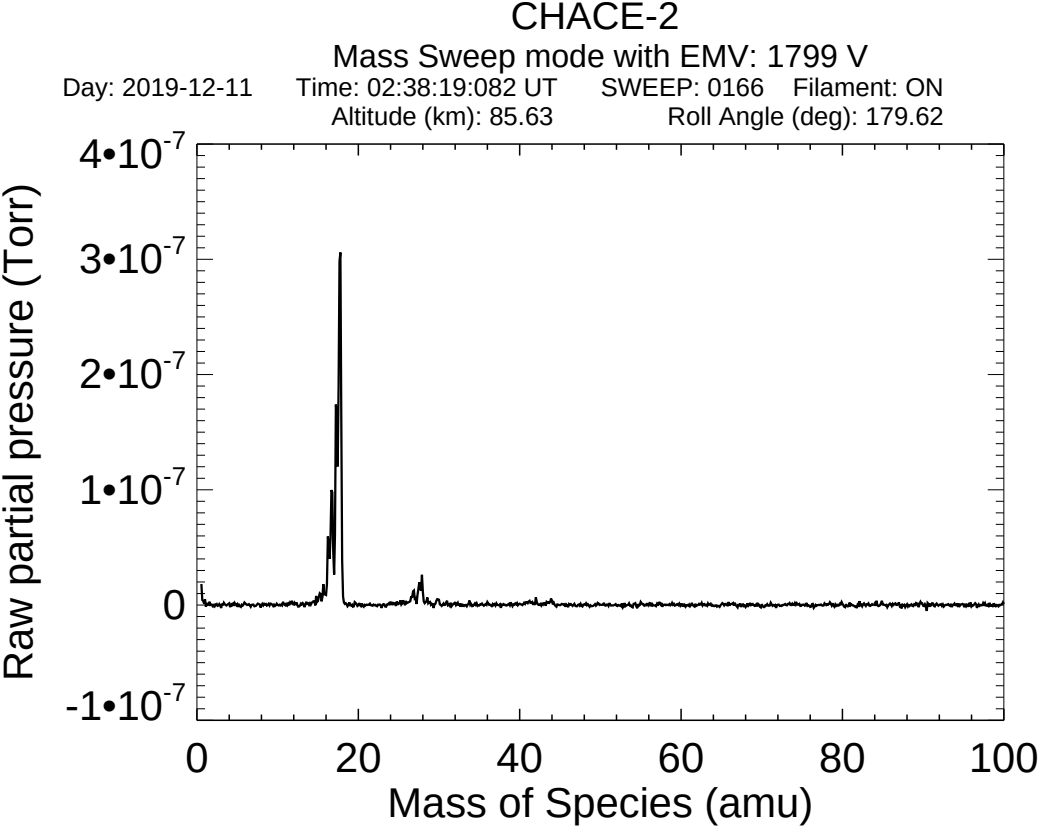

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:35:13:026 UT SWEEP: 0161 Filament: ON
Altitude (km): 87.12 Roll Angle (deg): 179.56
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

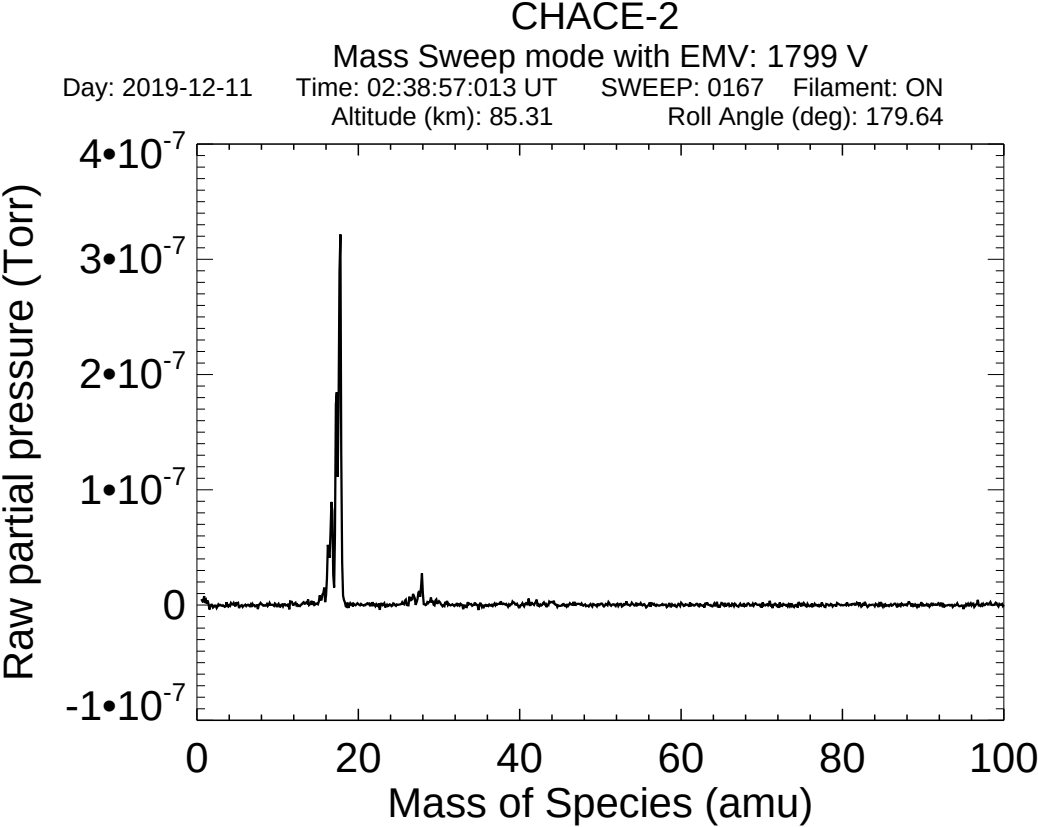

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:35:48:058 UT
SWEEP: 0162
Filament: ON
Altitude (km): 86.85
Roll Angle (deg): 179.58
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

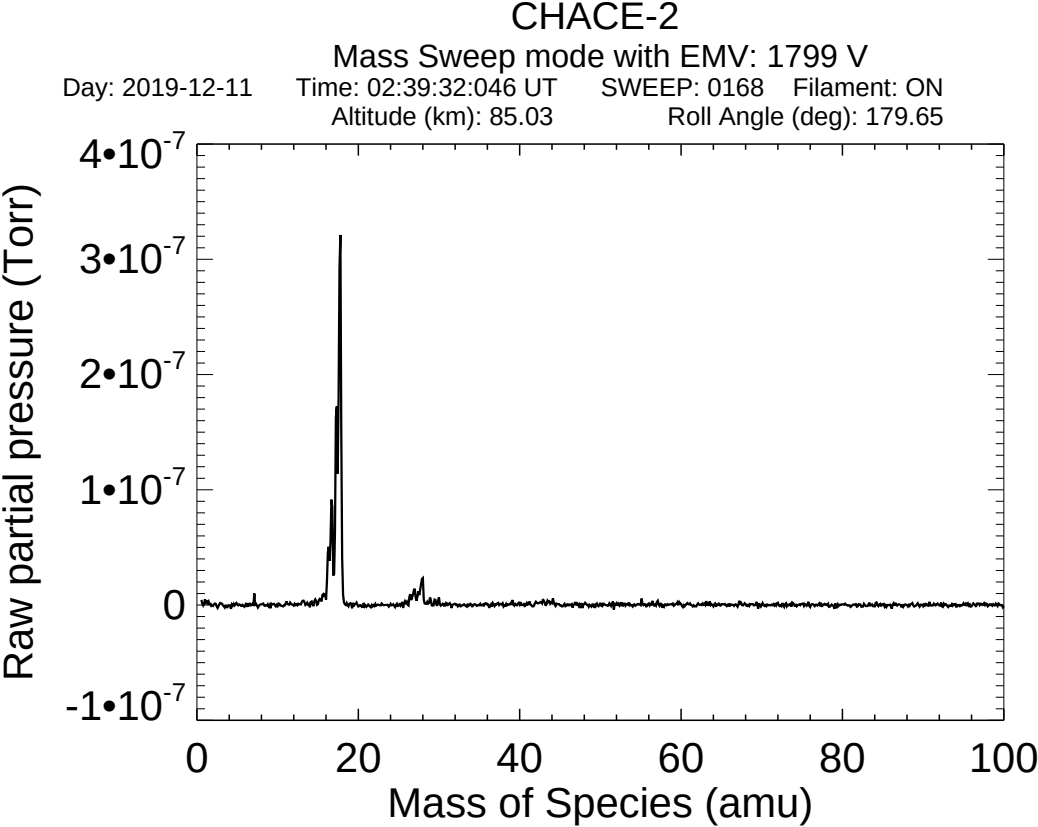

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:36:23:091 UT SWEEP: 0163 Filament: ON
Altitude (km): 86.51 Roll Angle (deg): 179.58
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

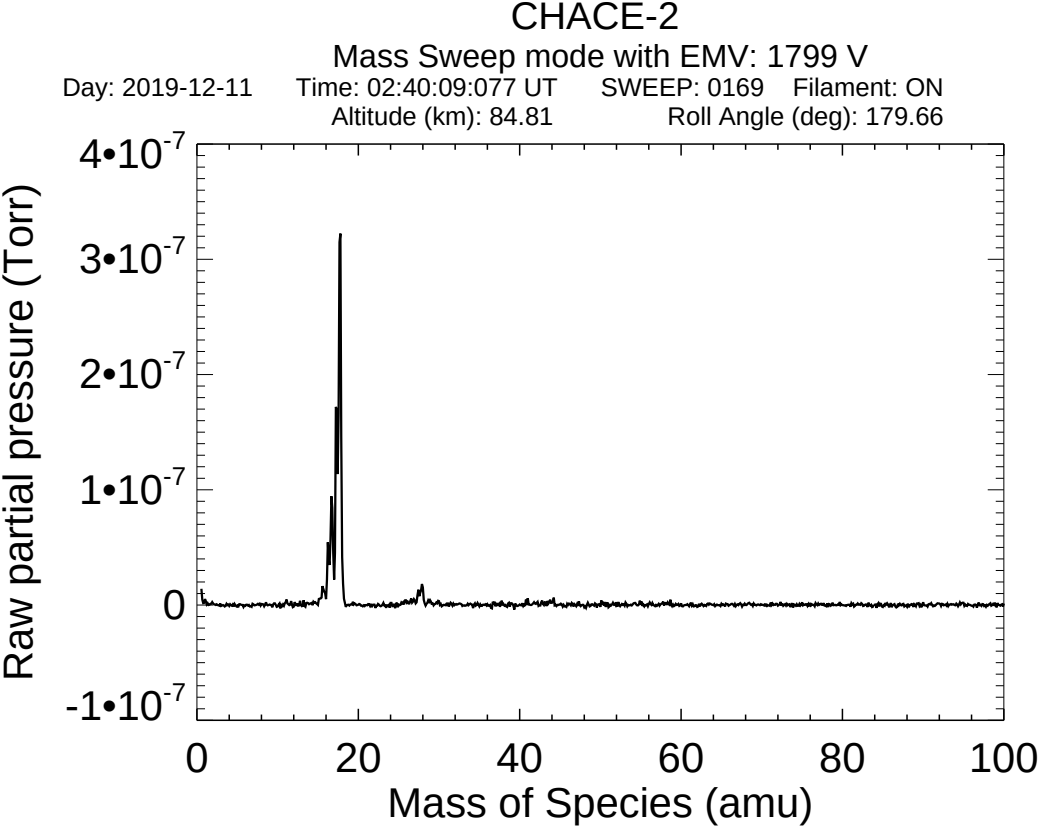

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:37:01:023 UT SWEEP: 0164 Filament: ON
Altitude (km): 86.19 Roll Angle (deg): 179.60
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

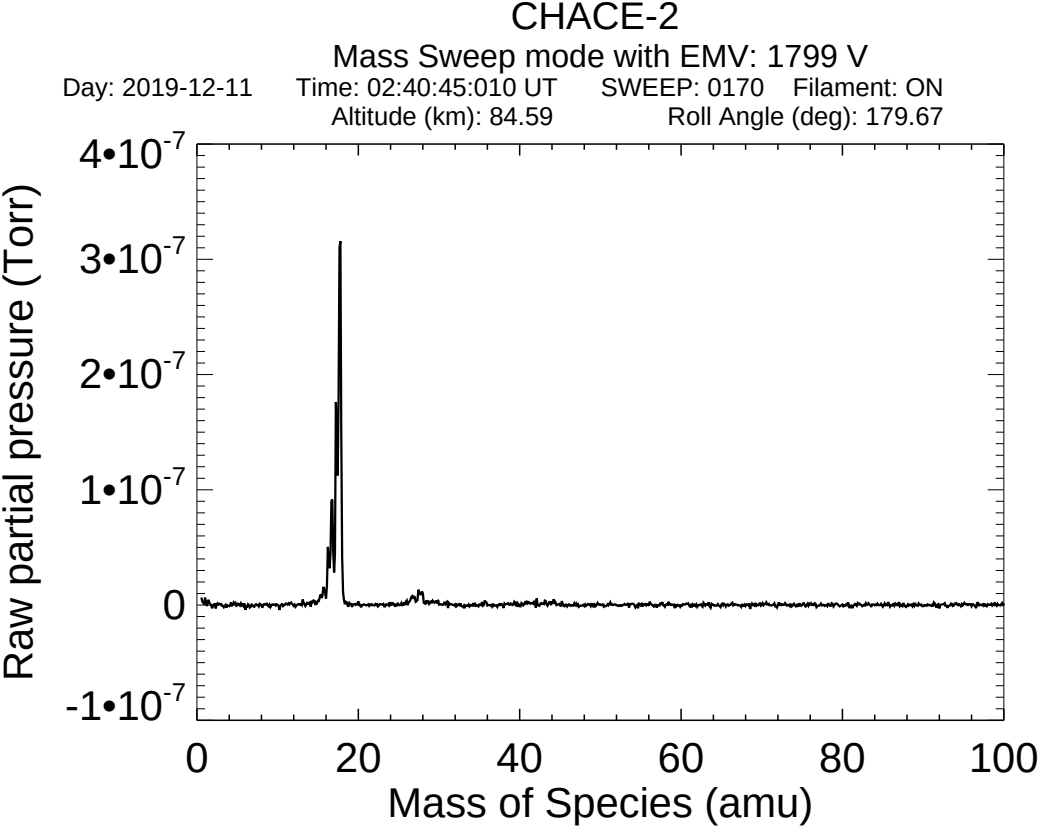

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:37:44:049 UT SWEEP: 0165 Filament: ON
Altitude (km): 85.79 Roll Angle (deg): 179.61
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

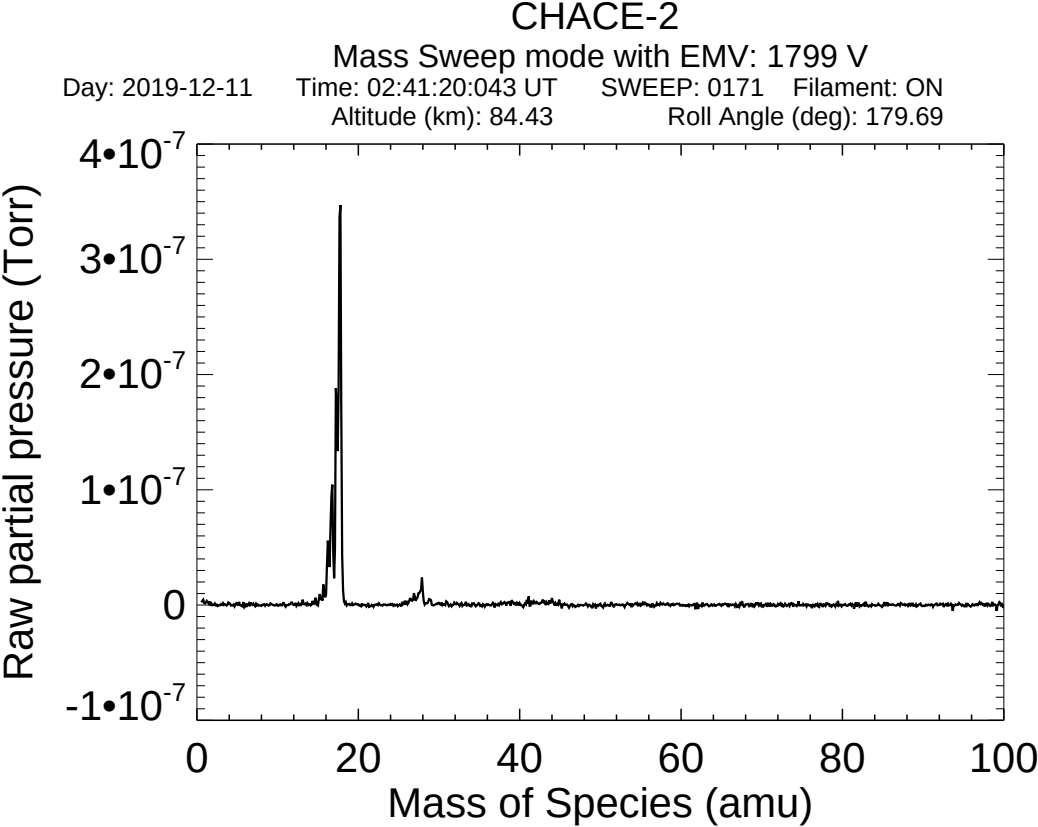

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:38:19:082 UT SWEEP: 0166 Filament: ON
Altitude (km): 85.63 Roll Angle (deg): 179.62
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

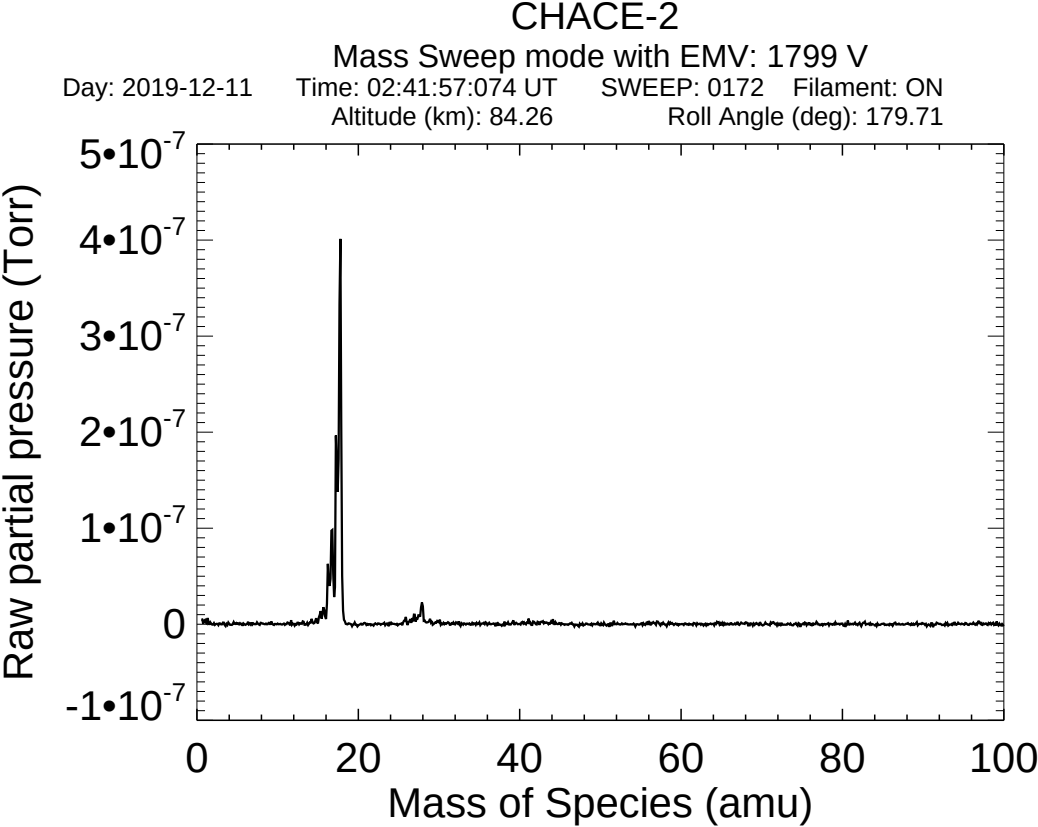

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:38:57:013 UT
SWEEP: 0167
Filament: ON
Altitude (km): 85.31
Roll Angle (deg): 179.64
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

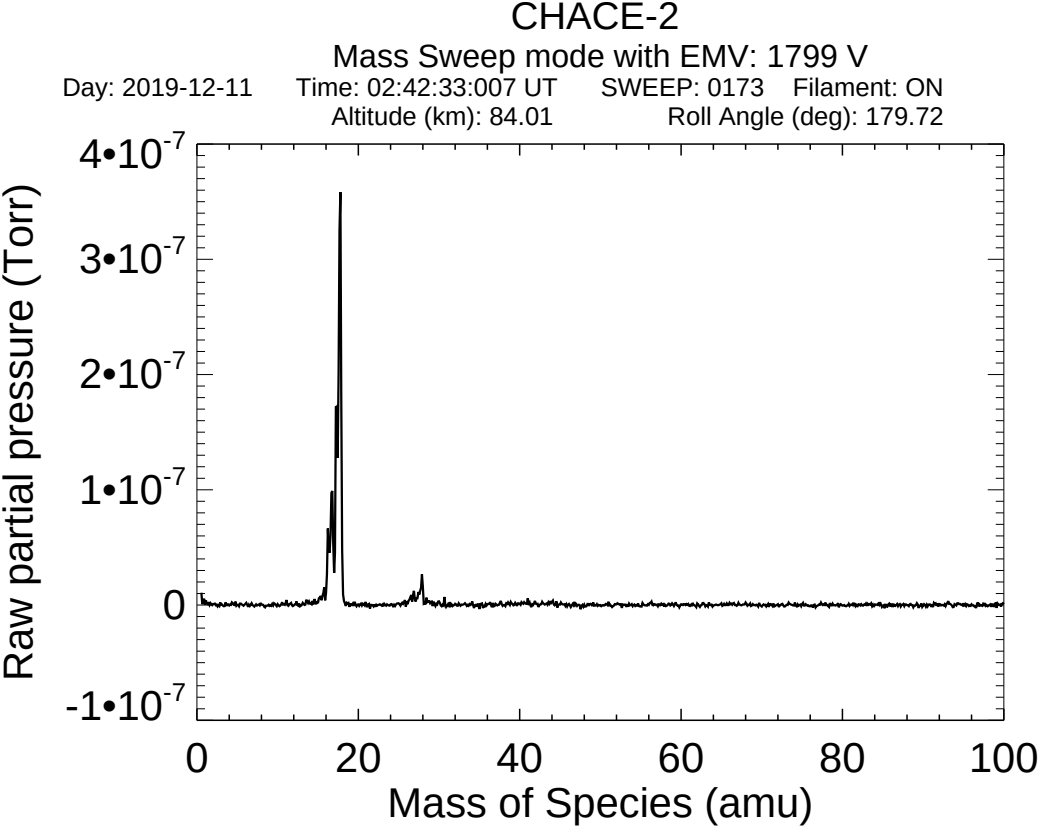

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:39:32:046 UT
SWEEP: 0168
Filament: ON
Altitude (km): 85.03
Roll Angle (deg): 179.65
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

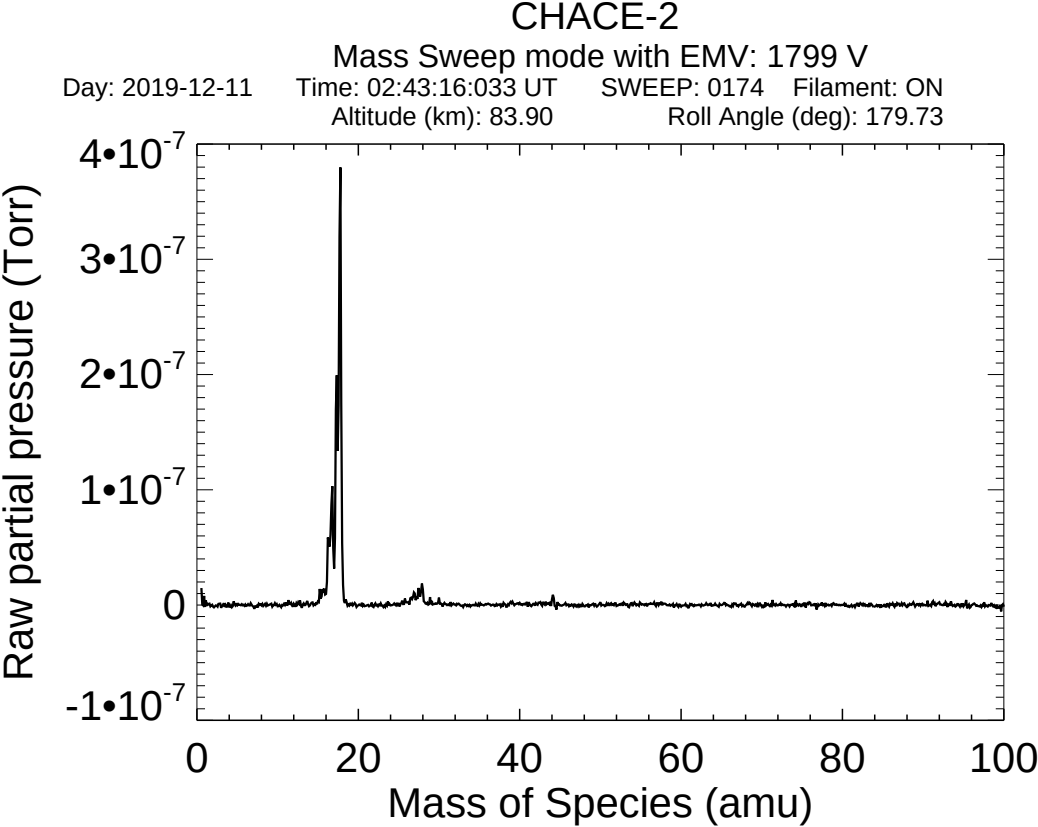

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:40:09:077 UT
SWEEP: 0169
Filament: ON
Altitude (km): 84.81
Roll Angle (deg): 179.66
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

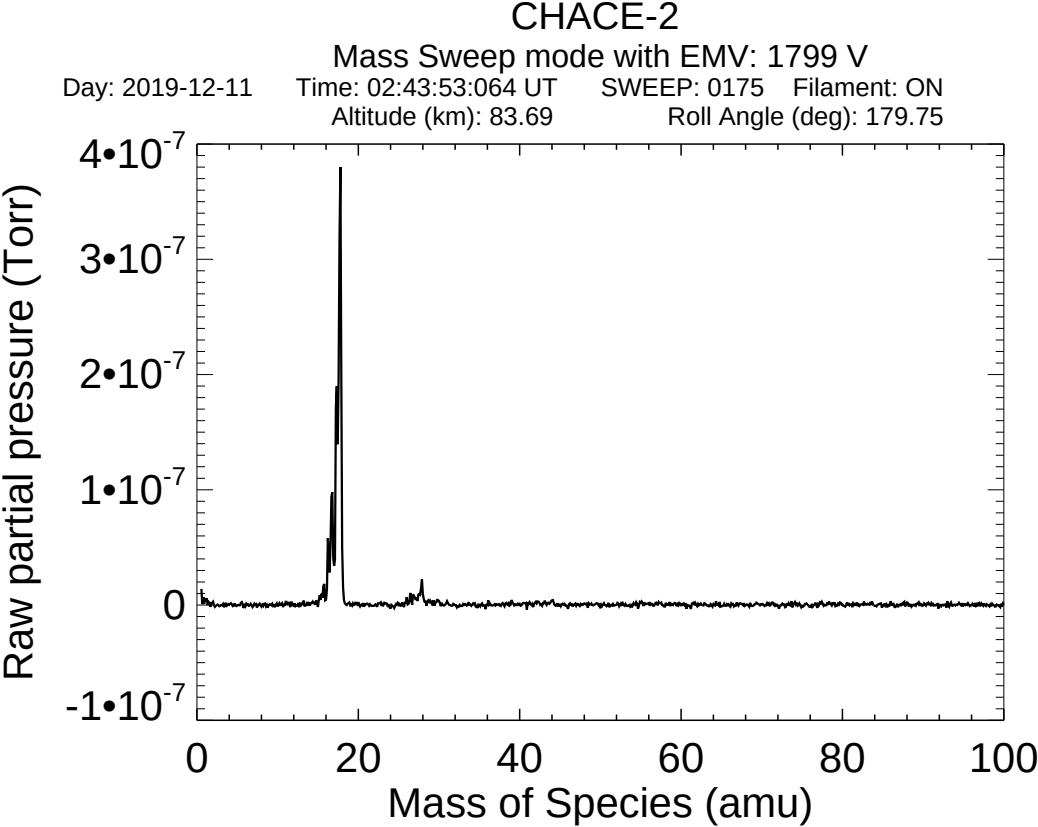

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:40:45:010 UT
SWEEP: 0170
Filament: ON
Altitude (km): 84.59
Roll Angle (deg): 179.67
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

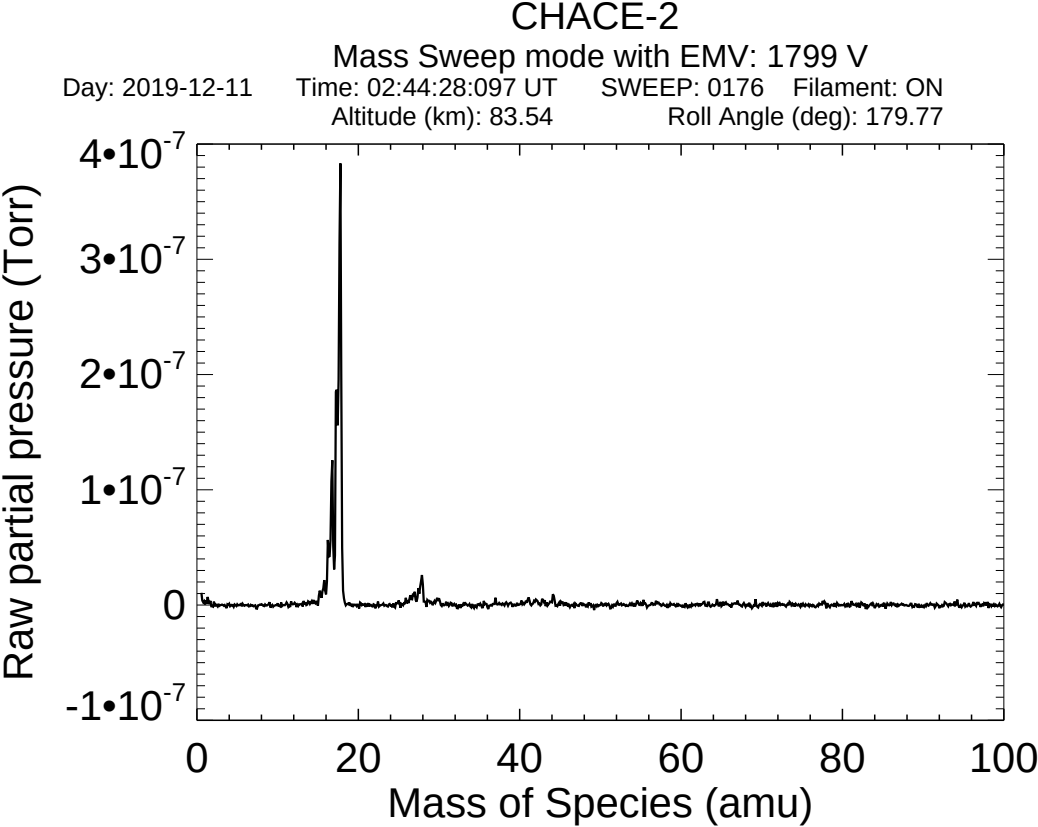

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:41:20:043 UT SWEEP: 0171 Filament: ON
Altitude (km): 84.43 Roll Angle (deg): 179.69
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

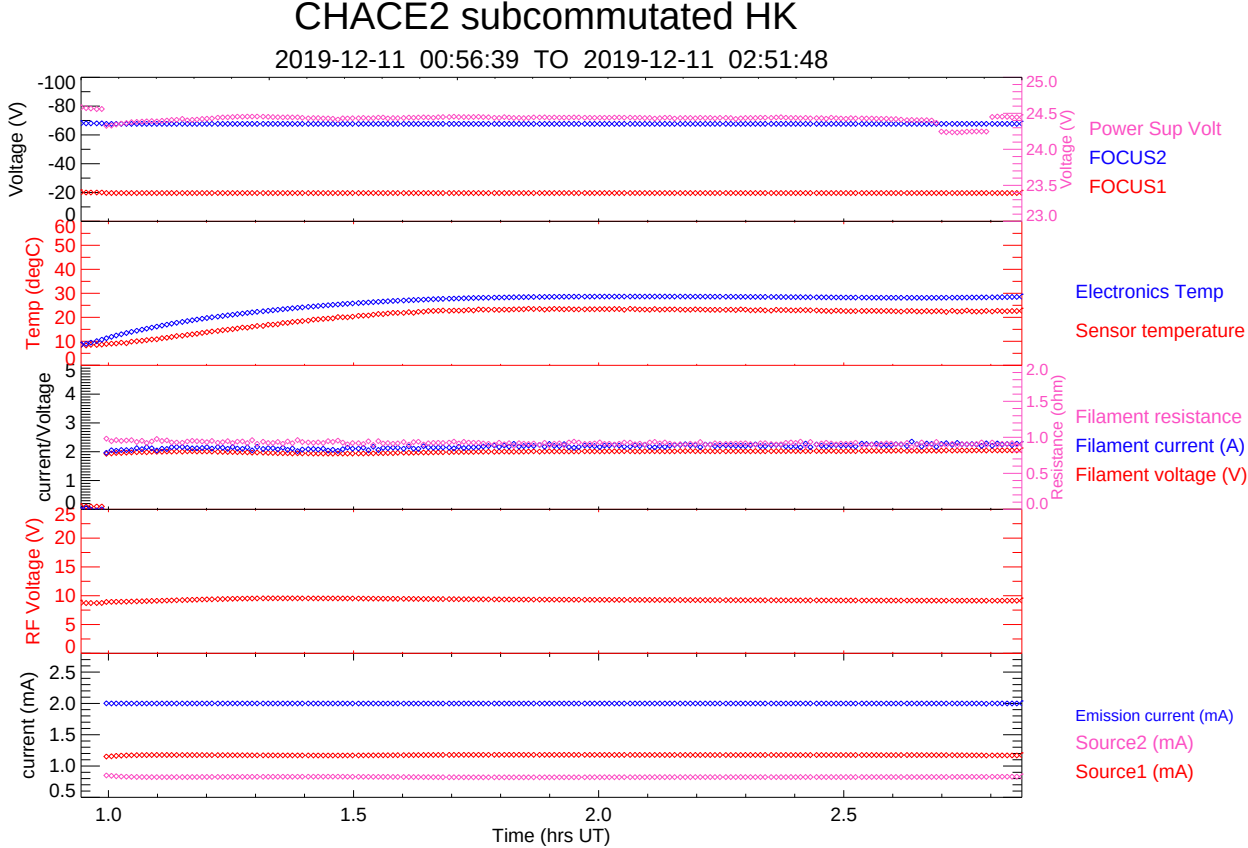

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:41:57:074 UT SWEEP: 0172 Filament: ON
Altitude (km): 84.26 Roll Angle (deg): 179.71
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)


CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:42:33:007 UT SWEEP: 0173 Filament: ON
Altitude (km): 84.01 Roll Angle (deg): 179.72
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)


CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11
Time: 02:43:16:033 UT
SWEEP: 0174
Filament: ON
Altitude (km): 83.90
Roll Angle (deg): 179.73
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

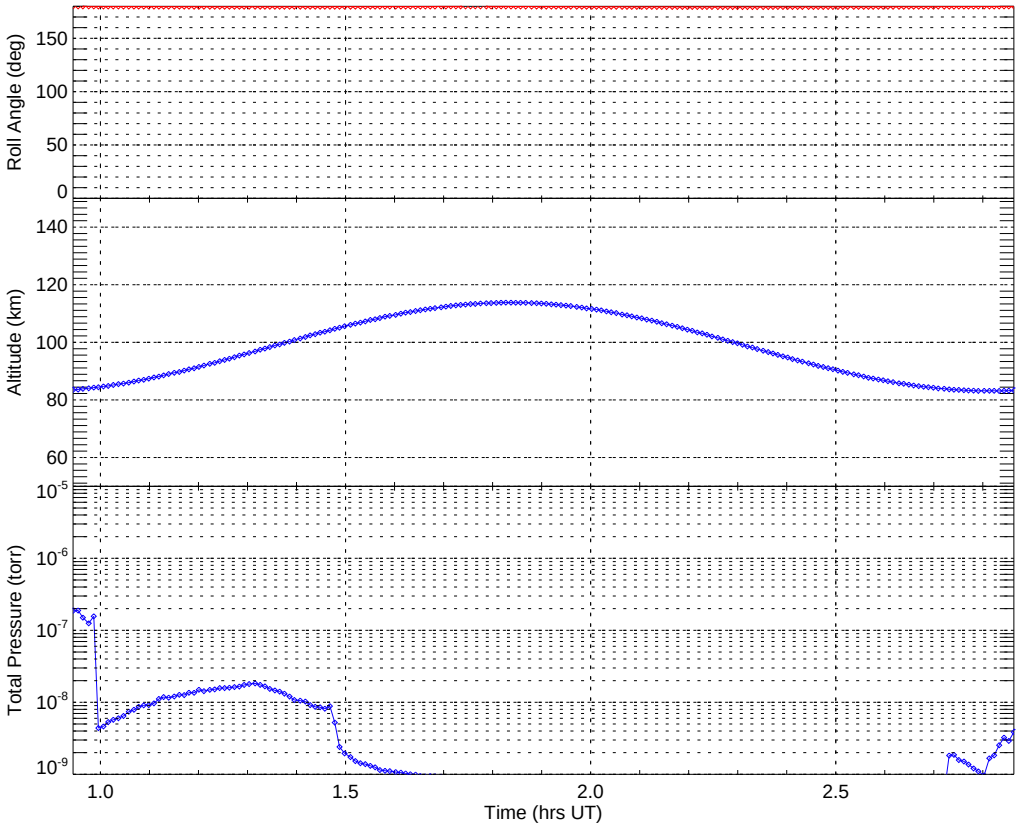

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:43:53:064 UT SWEEP: 0175 Filament: ON
Altitude (km): 83.69 Roll Angle (deg): 179.75
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

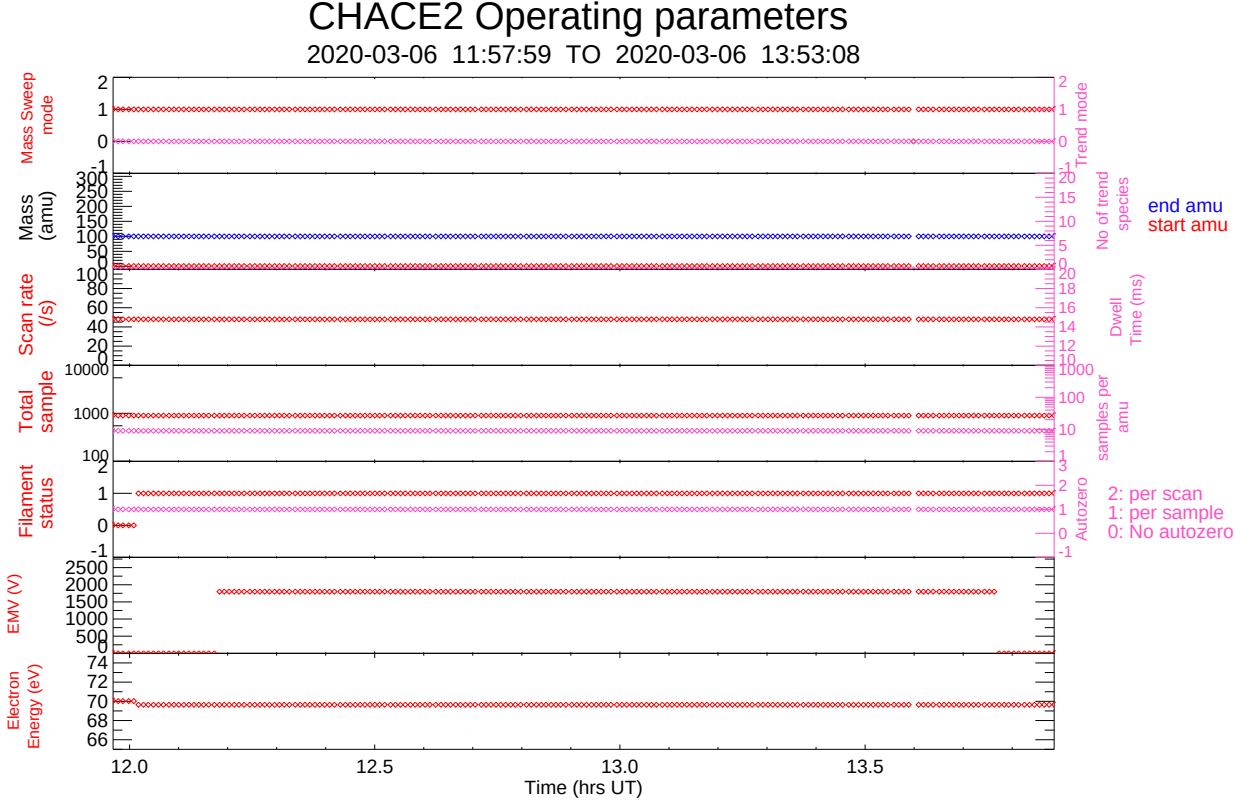

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2019-12-11 Time: 02:44:28:097 UT SWEEP: 0176 Filament: ON
Altitude (km): 83.54 Roll Angle (deg): 179.77
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

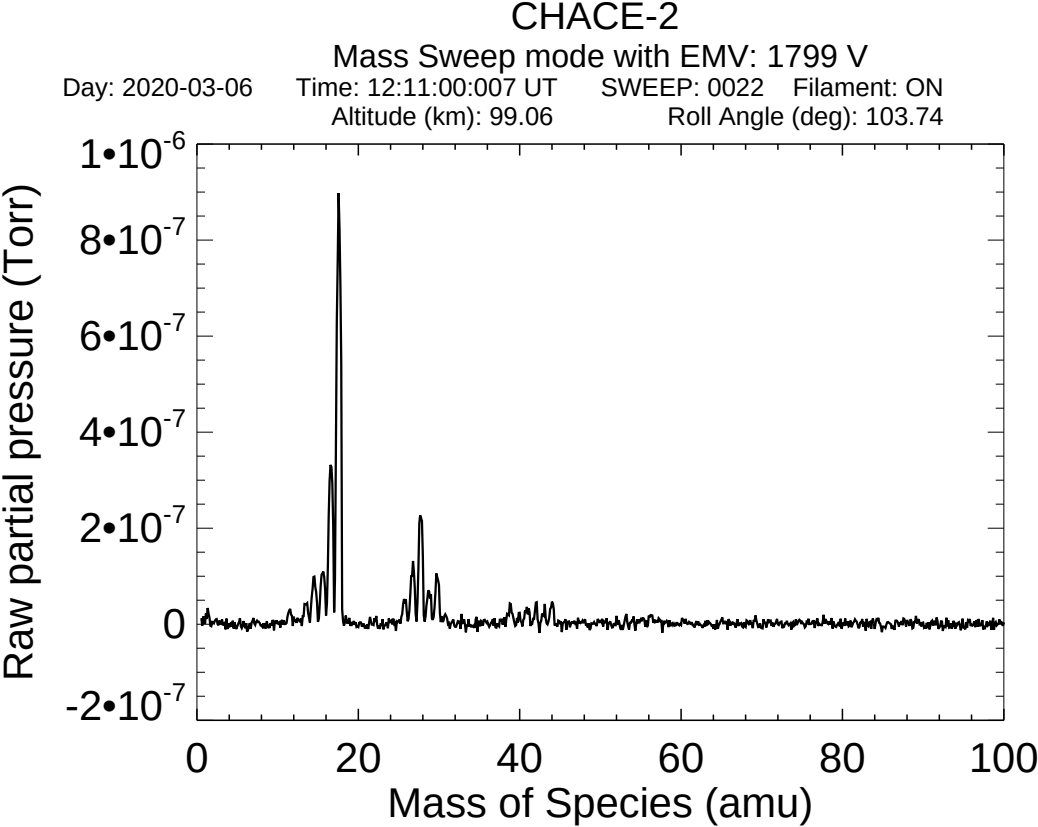

CHACE2 subcommutated HK
2019-12-11 00:56:39 TO 2019-12-11 02:51:48
Voltage (V)
Power Sup Volt
FOCUS2
FOCUS1
Temp (degC)
Electronics Temp
Sensor temperature
current/Voltage
Resistance (ohm)
Filament resistance
Filament current (A)
Filament voltage (V)
RF Voltage (V)
current (mA)
Emission current (mA)
Source2 (mA)
Source1 (mA)
Time (hrs UT)

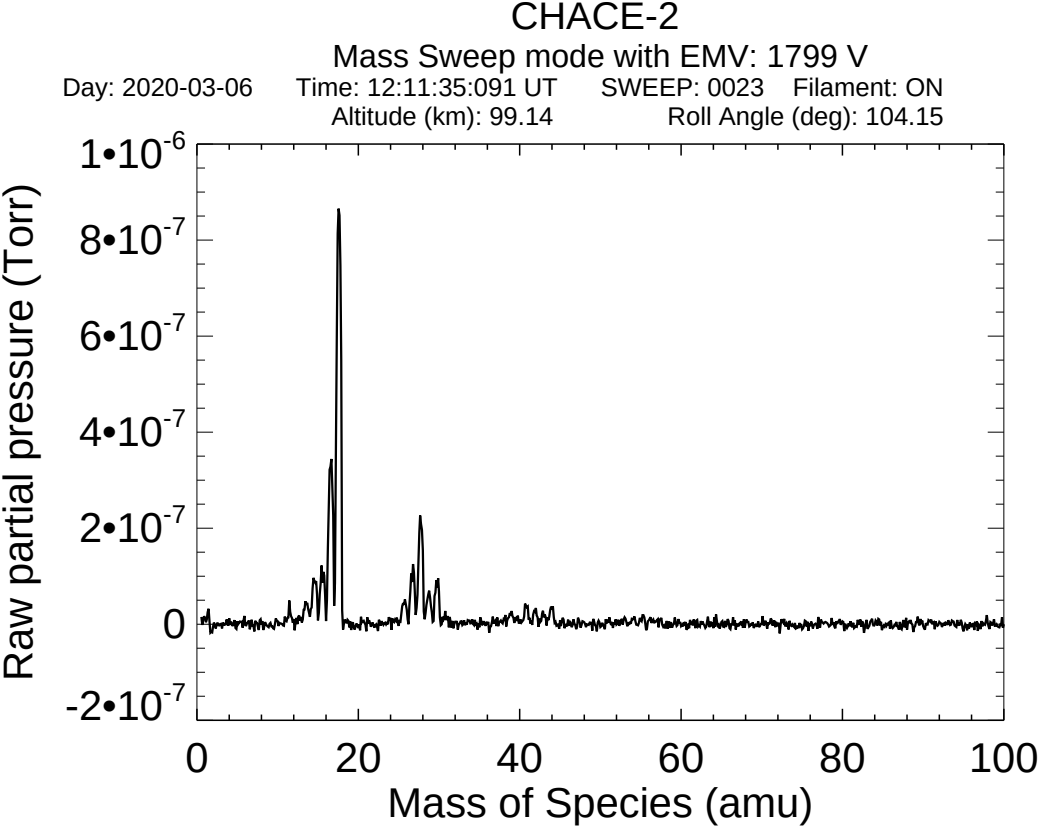
CHACE2: 2019-12-11 00:56:39 UT TO 2019-12-11 02:51:48 UT

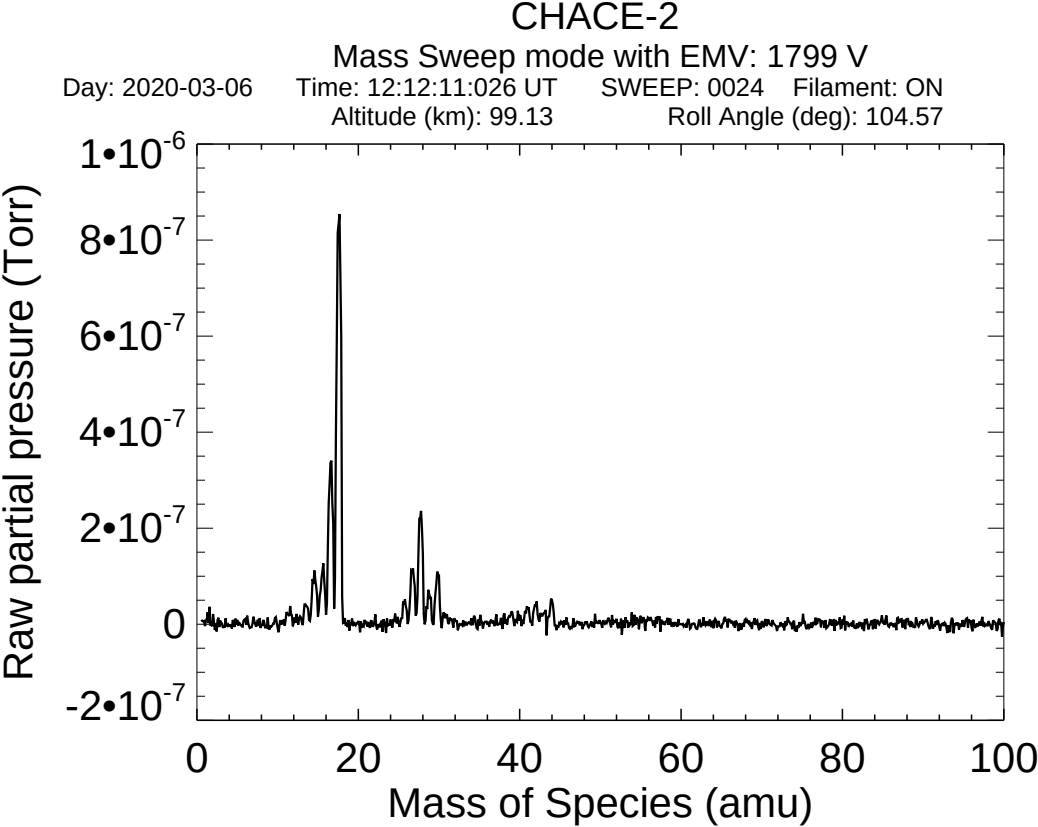
No ECLIPSE

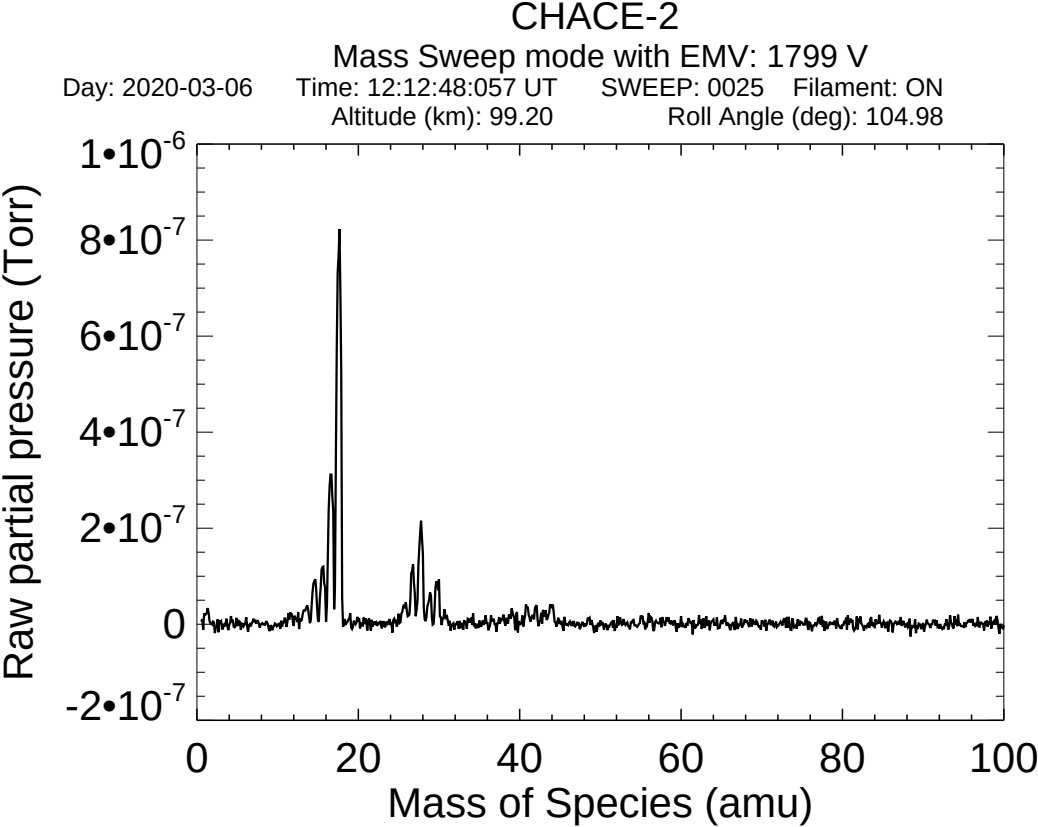


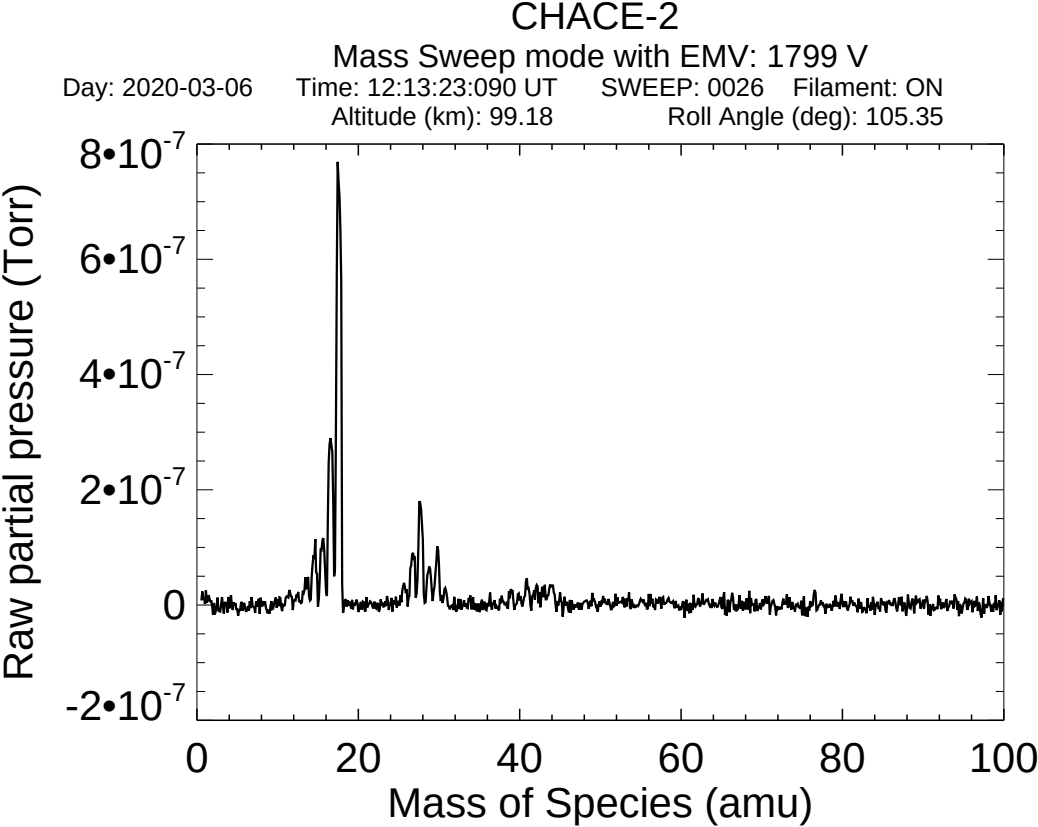

CHACE2 Operating parameters
2020-03-06 11:57:59 TO 2020-03-06 13:53:08
Mass Sweep mode
Trend mode
Mass (amu)
No of trend species
end amu
start amu
Scan rate (/s)
Dwell Time (ms)
Total sample
samples per amu
Filament status
Autozero
2: per scan
1: per sample
0: No autozero
EMV (V)
Electron Energy (eV)
12.0
12.5
13.0
13.5
Time (hrs UT)

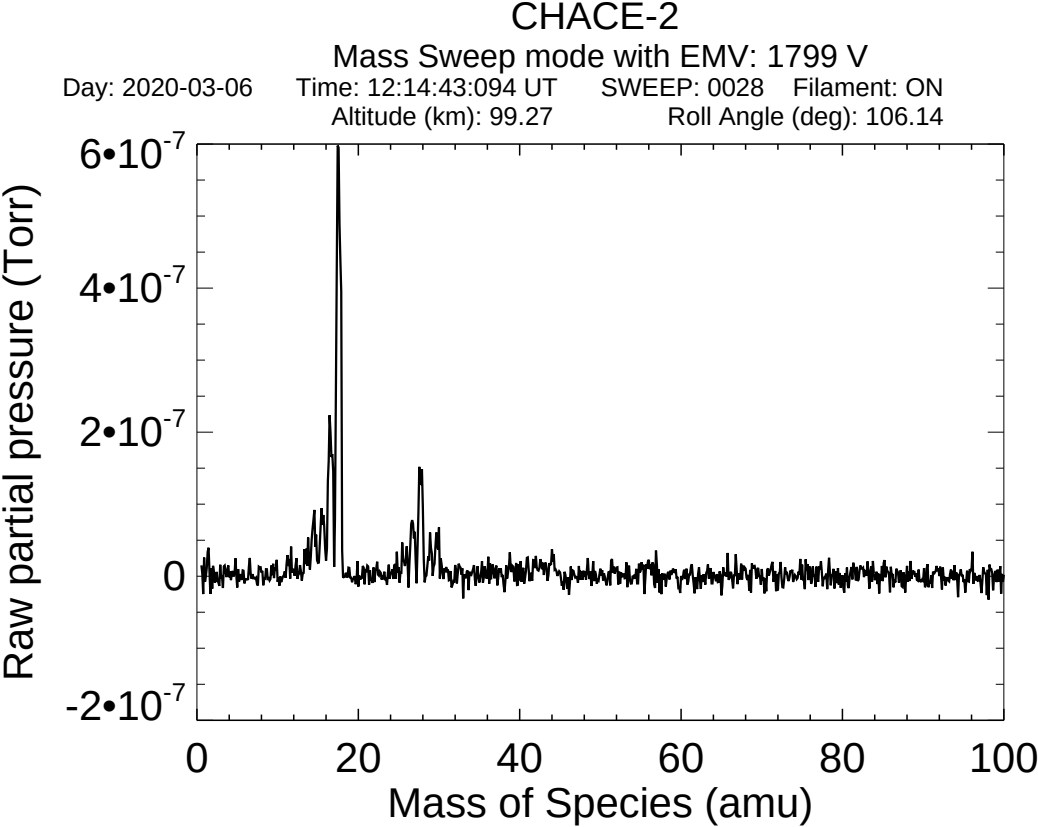

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 12:11:00:007 UT
SWEEP: 0022
Filament: ON
Altitude (km): 99.06
Roll Angle (deg): 103.74
Raw partial pressure (Torr)
1•10-6
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

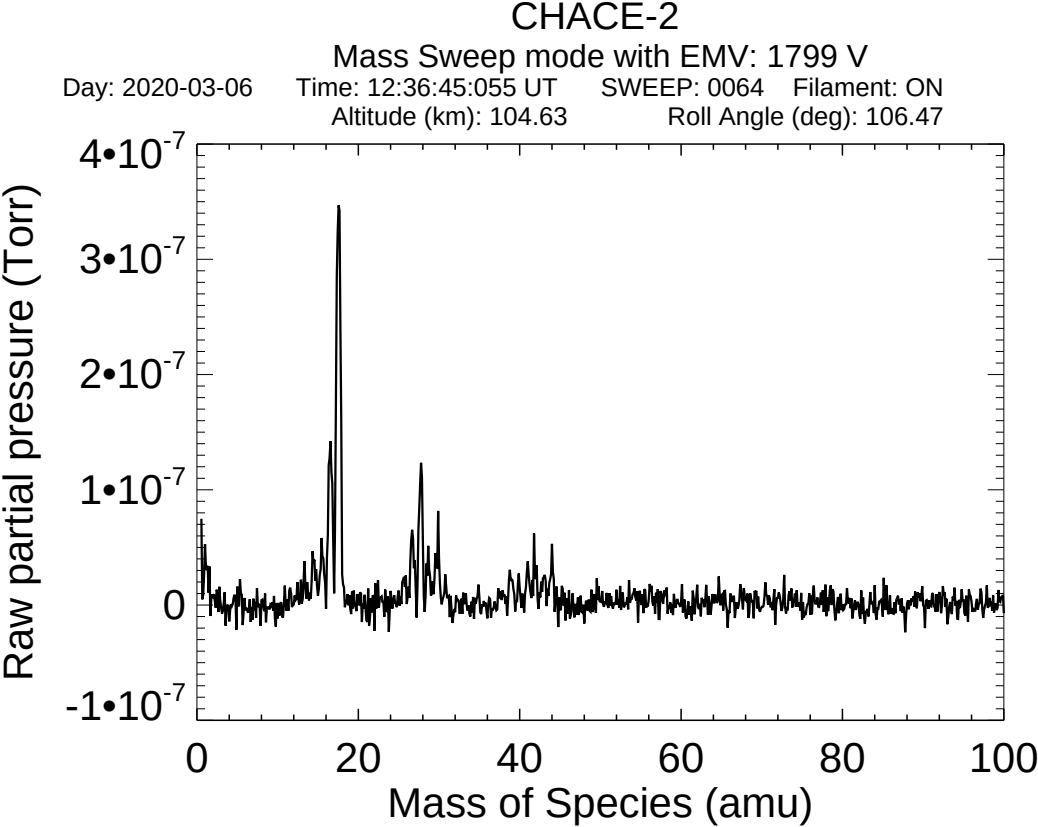

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 12:11:35:091 UT
SWEEP: 0023
Filament: ON
Altitude (km): 99.14
Roll Angle (deg): 104.15
Raw partial pressure (Torr)
1•10-6
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

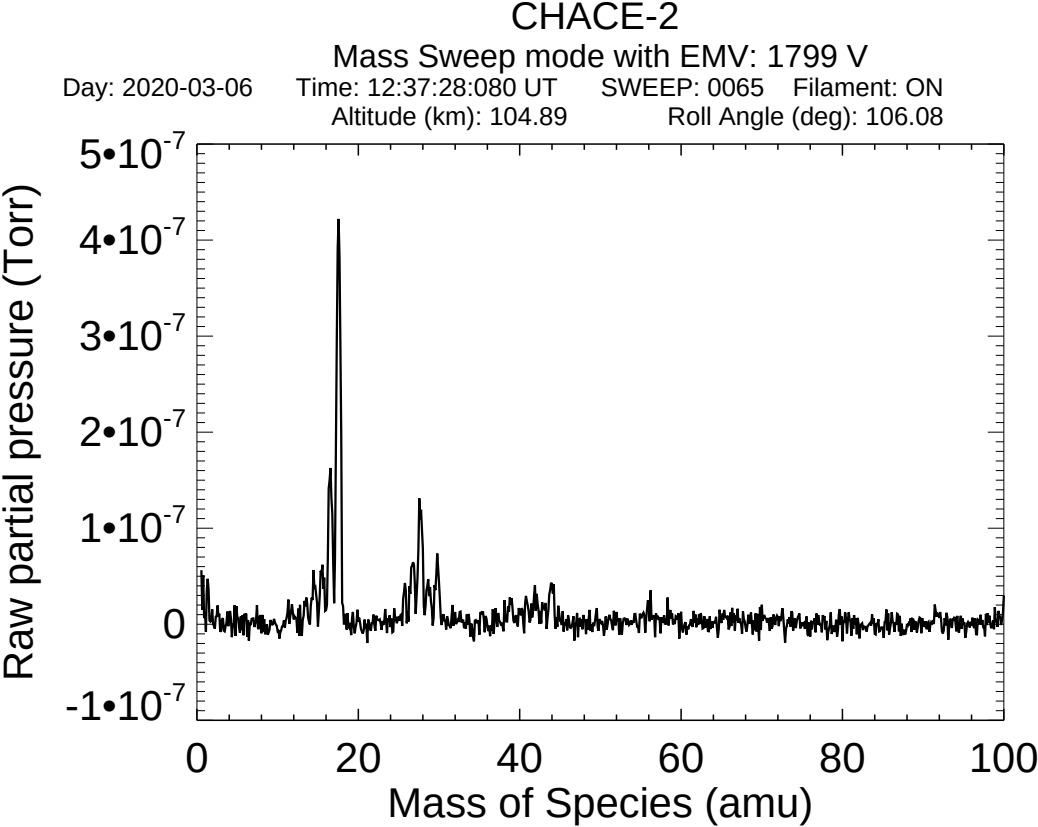

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 12:12:11:026 UT
SWEEP: 0024
Filament: ON
Altitude (km): 99.13
Roll Angle (deg): 104.57
Raw partial pressure (Torr)
1•10-6
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

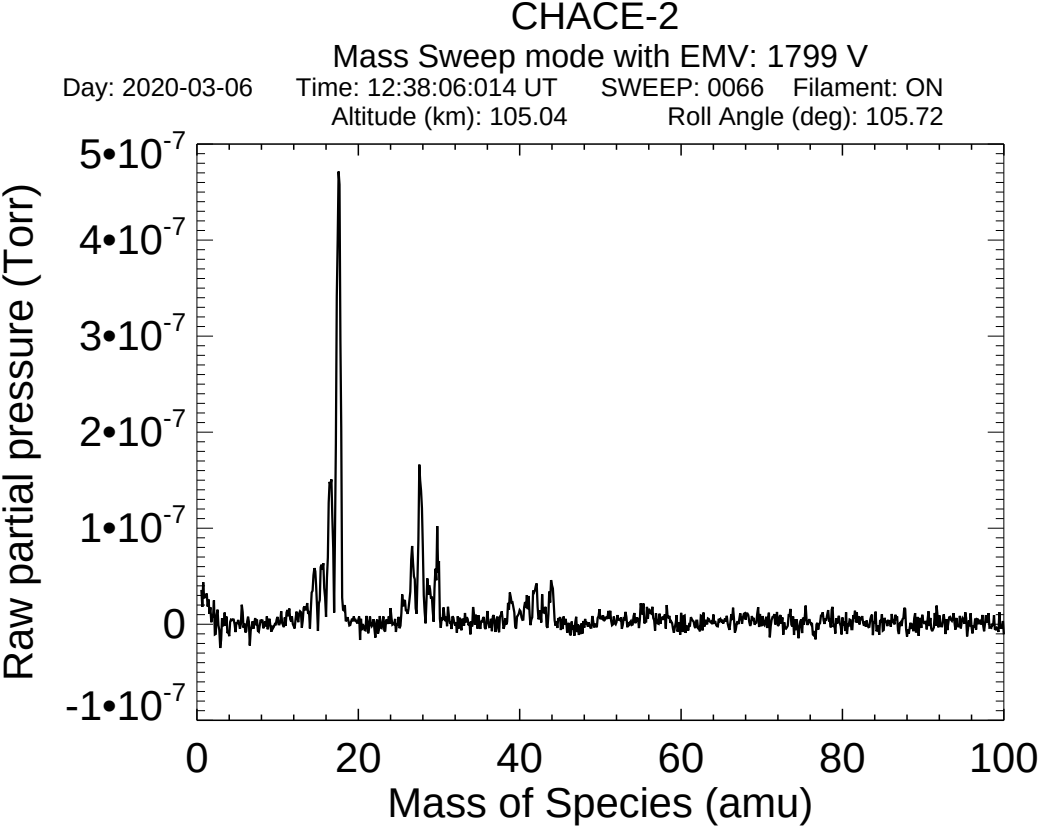

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 12:12:48:057 UT
SWEEP: 0025
Filament: ON
Altitude (km): 99.20
Roll Angle (deg): 104.98
Raw partial pressure (Torr)
1•10-6
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

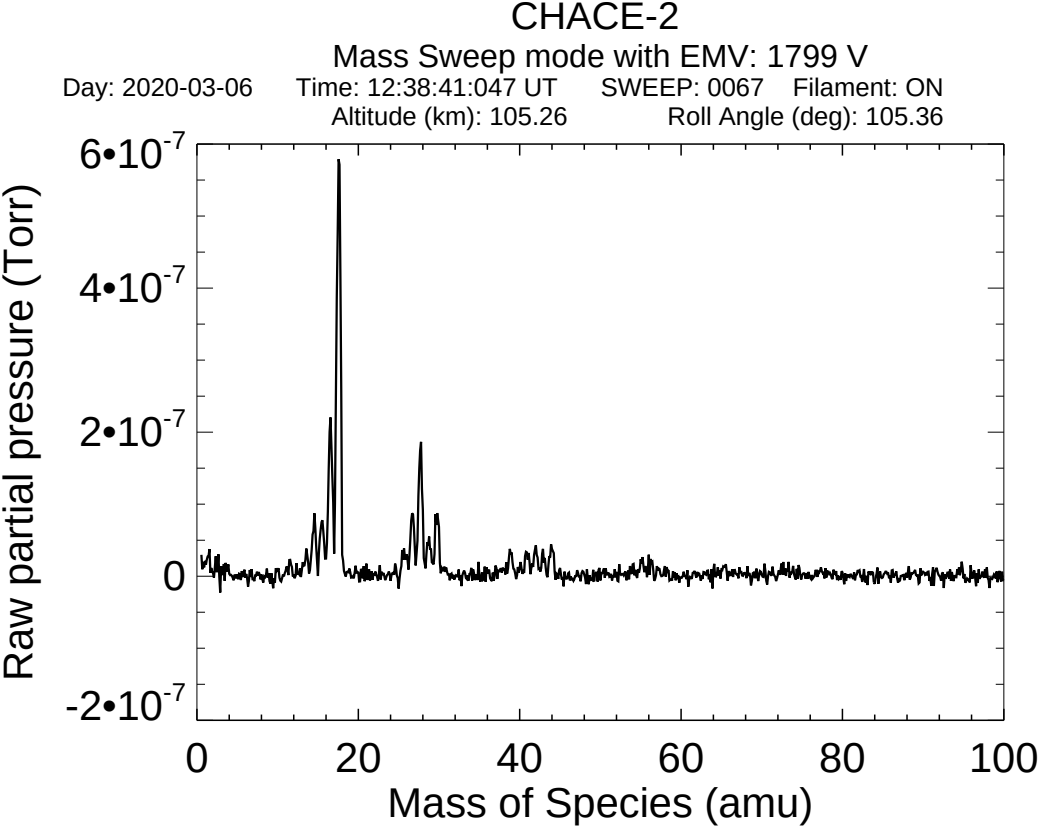

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:13:23:090 UT SWEEP: 0026 Filament: ON
Altitude (km): 99.18 Roll Angle (deg): 105.35
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

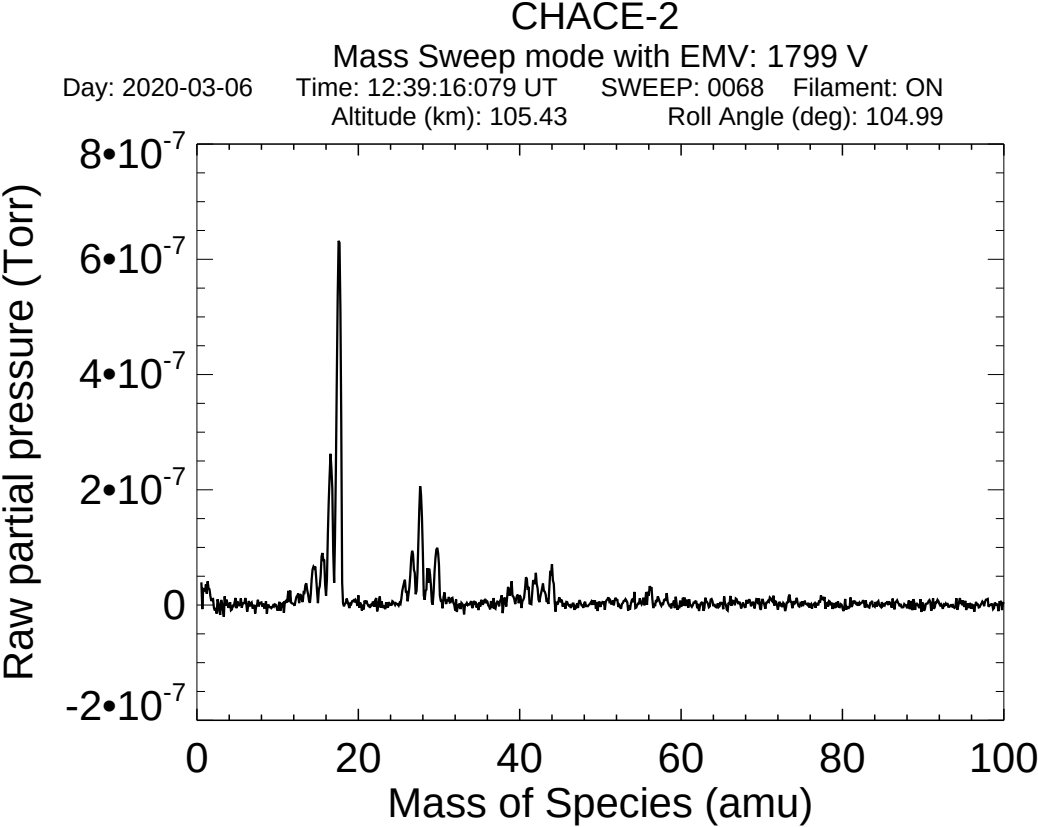

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 12:14:43:094 UT
SWEEP: 0028
Filament: ON
Altitude (km): 99.27
Roll Angle (deg): 106.14
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

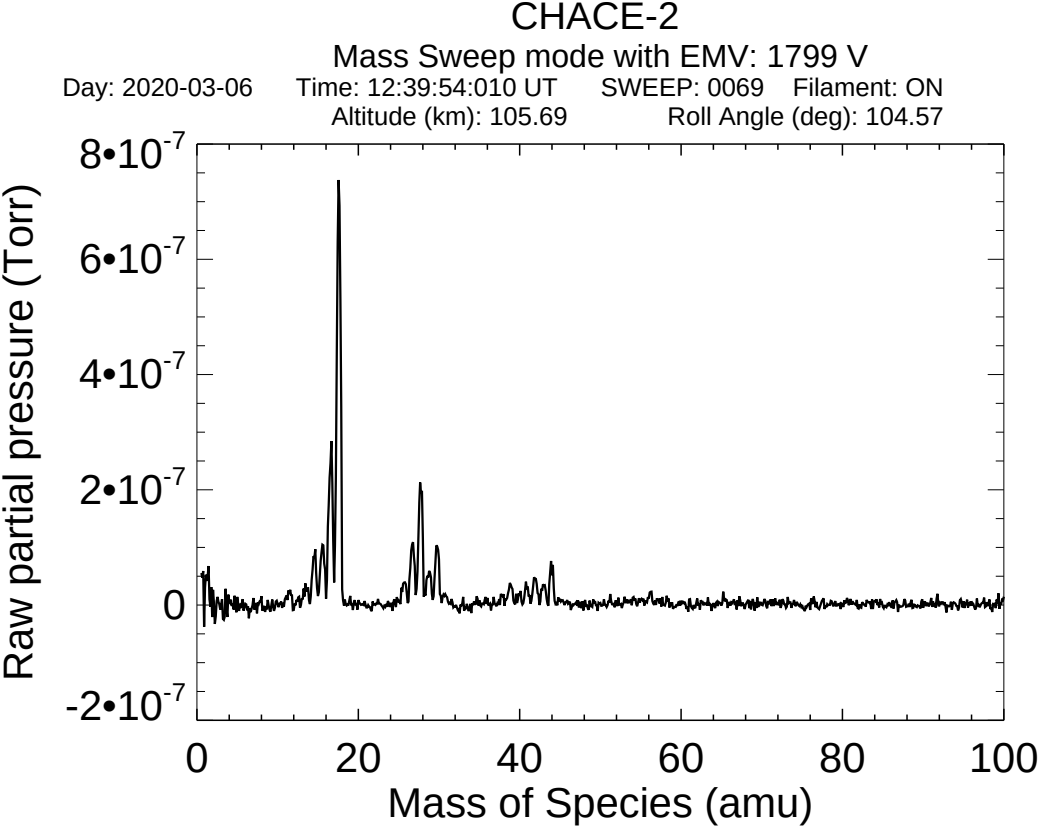

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:36:45:055 UT SWEEP: 0064 Filament: ON
Altitude (km): 104.63 Roll Angle (deg): 106.47
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

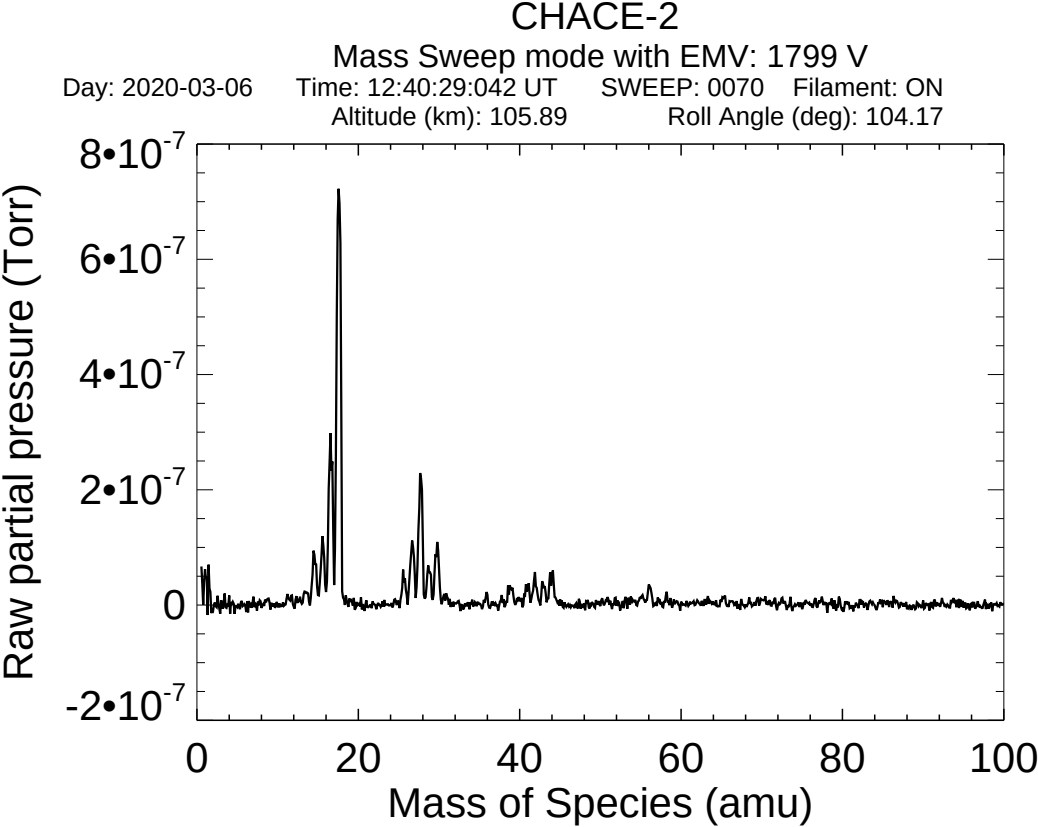

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:37:28:080 UT SWEEP: 0065 Filament: ON
Altitude (km): 104.89 Roll Angle (deg): 106.08
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

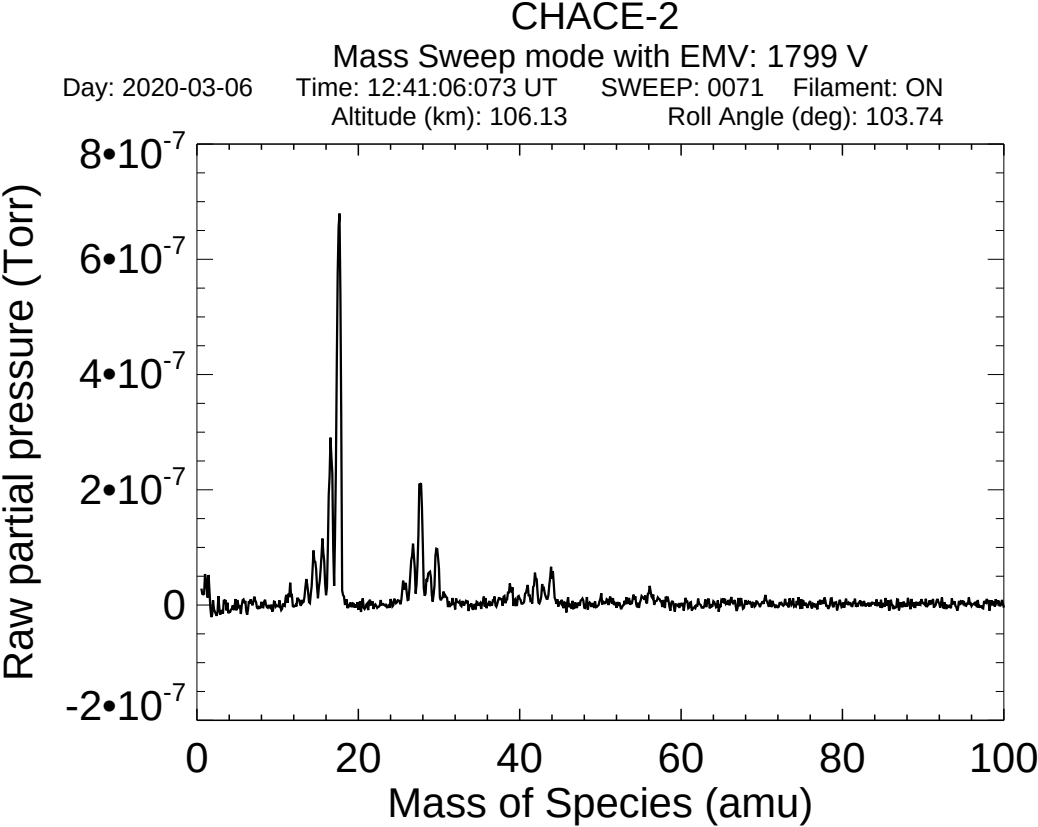

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:38:06:014 UT SWEEP: 0066 Filament: ON
Altitude (km): 105.04 Roll Angle (deg): 105.72
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

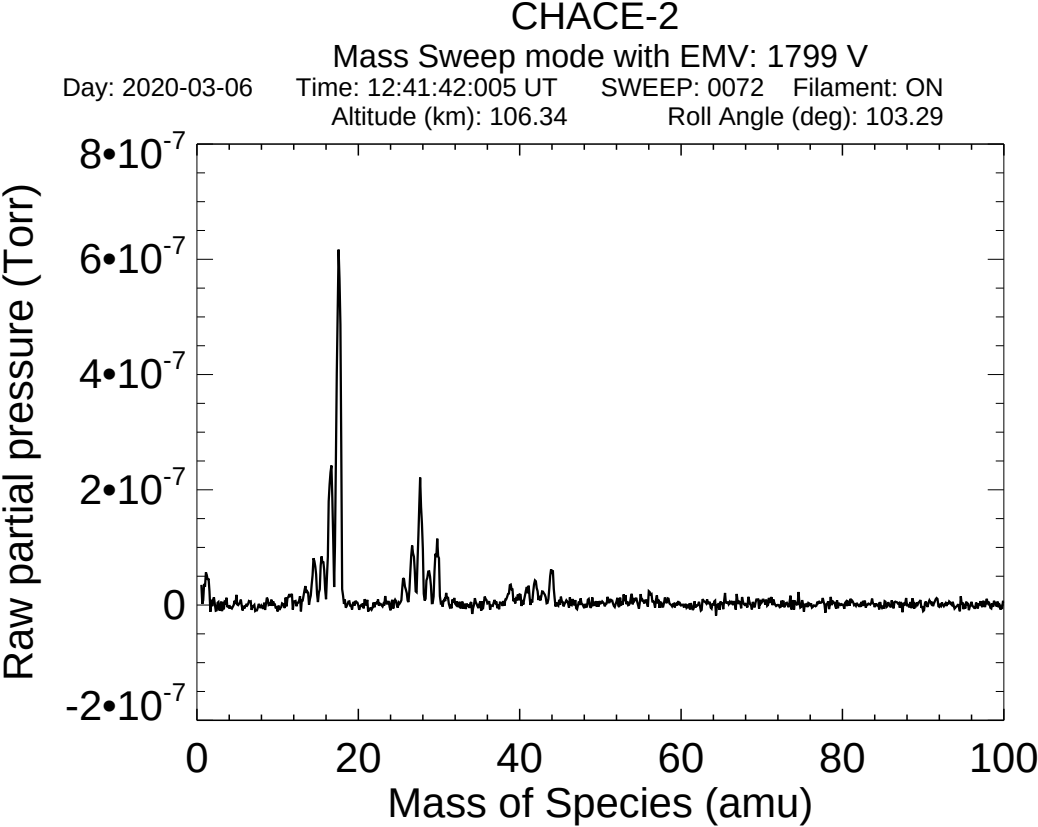

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:38:41:047 UT SWEEP: 0067 Filament: ON
Altitude (km): 105.26 Roll Angle (deg): 105.36
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

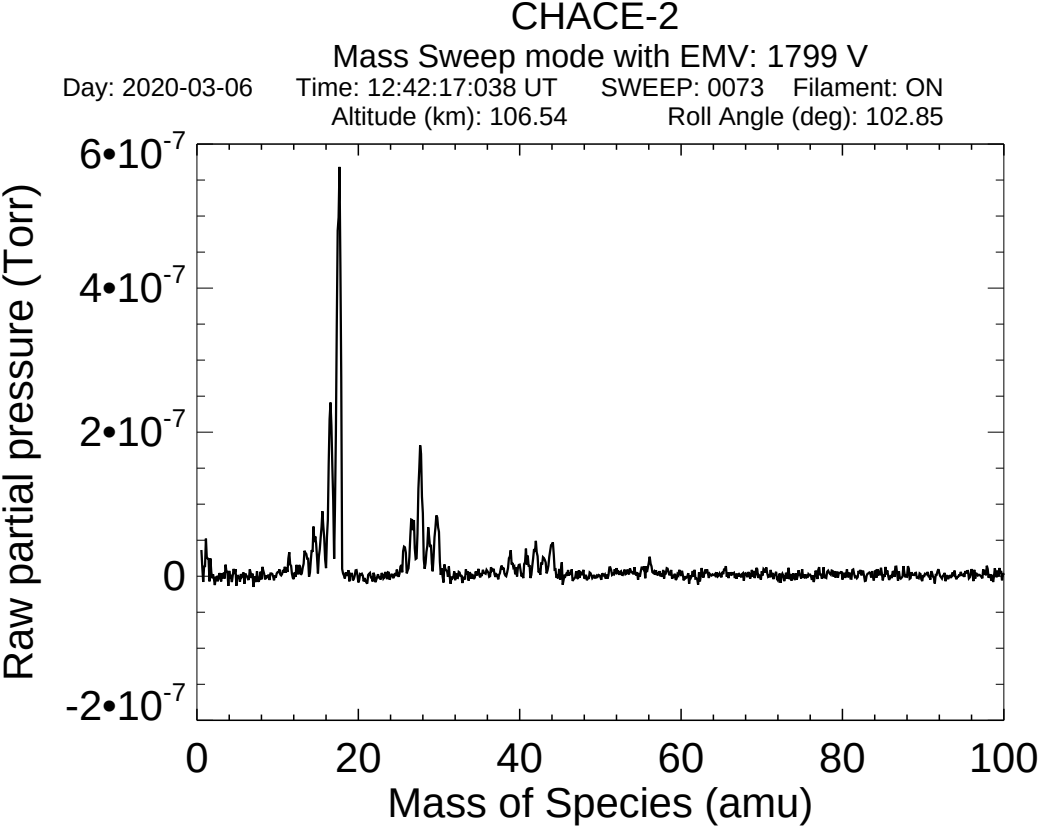

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:39:16:079 UT SWEEP: 0068 Filament: ON
Altitude (km): 105.43 Roll Angle (deg): 104.99
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

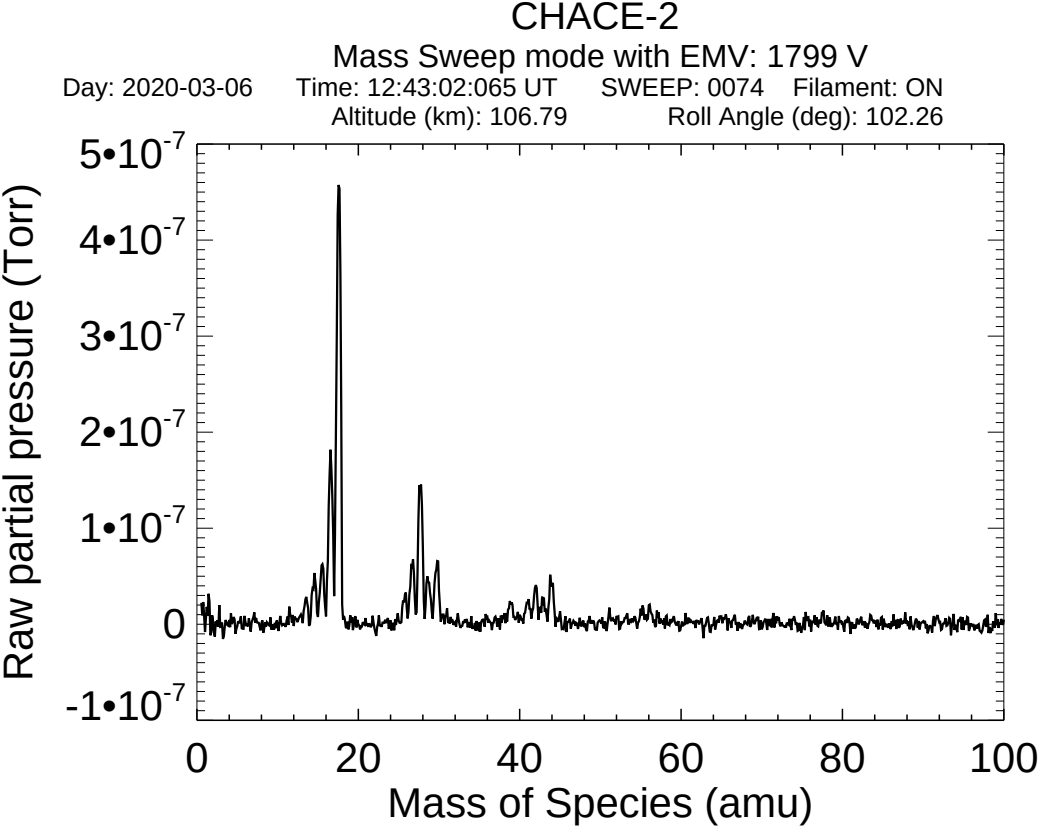

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:39:54:010 UT SWEEP: 0069 Filament: ON
Altitude (km): 105.69 Roll Angle (deg): 104.57
Raw partial pressure (Torr)
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

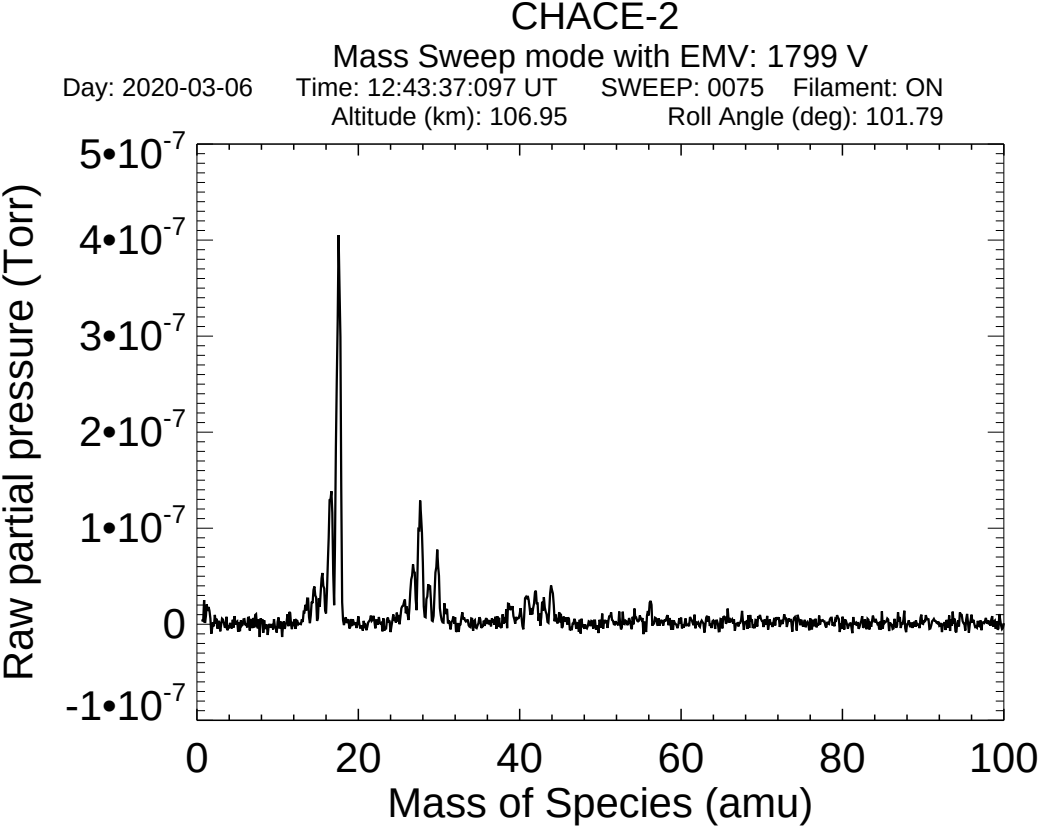

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:40:29:042 UT SWEEP: 0070 Filament: ON
Altitude (km): 105.89 Roll Angle (deg): 104.17
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

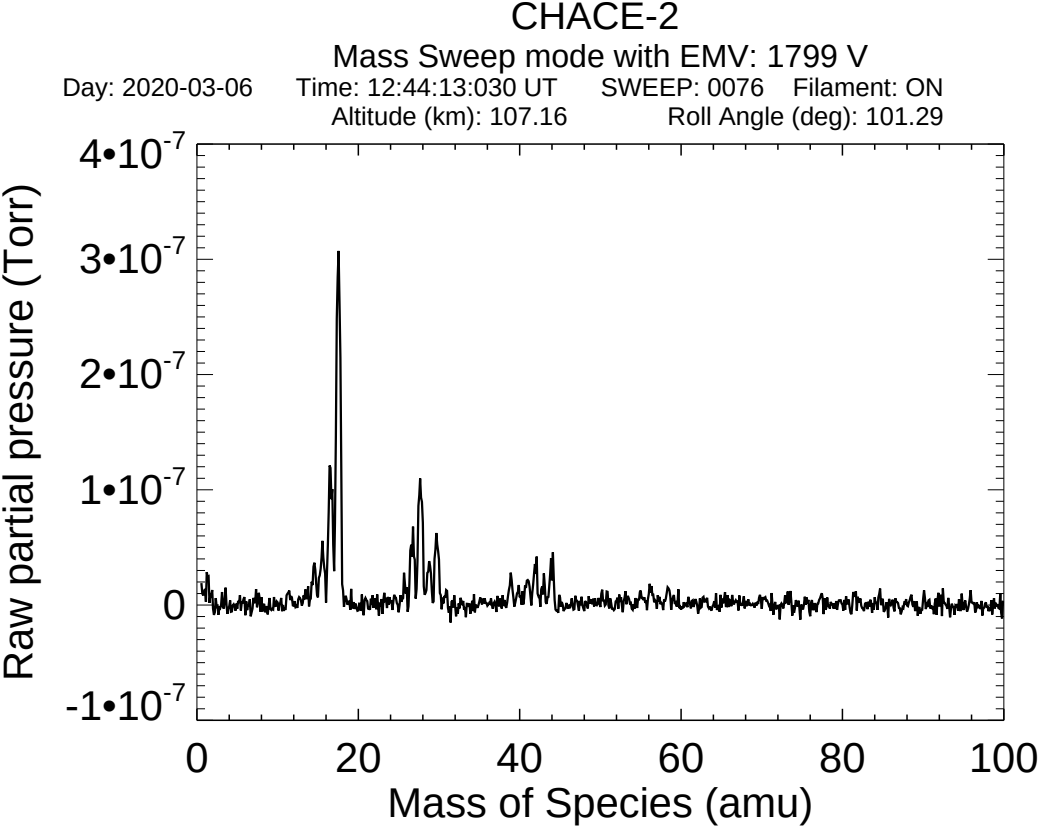

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:41:06:073 UT SWEEP: 0071 Filament: ON
Altitude (km): 106.13 Roll Angle (deg): 103.74
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

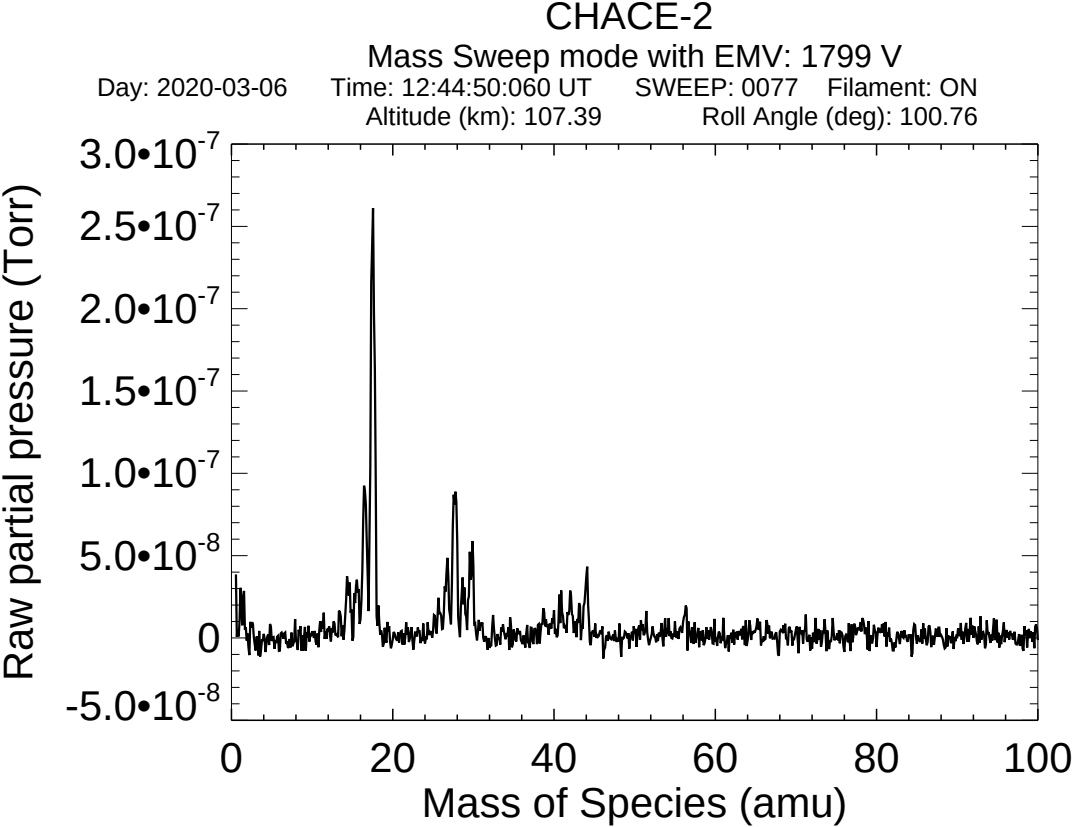

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:41:42:005 UT SWEEP: 0072 Filament: ON
Altitude (km): 106.34 Roll Angle (deg): 103.29
Raw partial pressure (Torr)
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

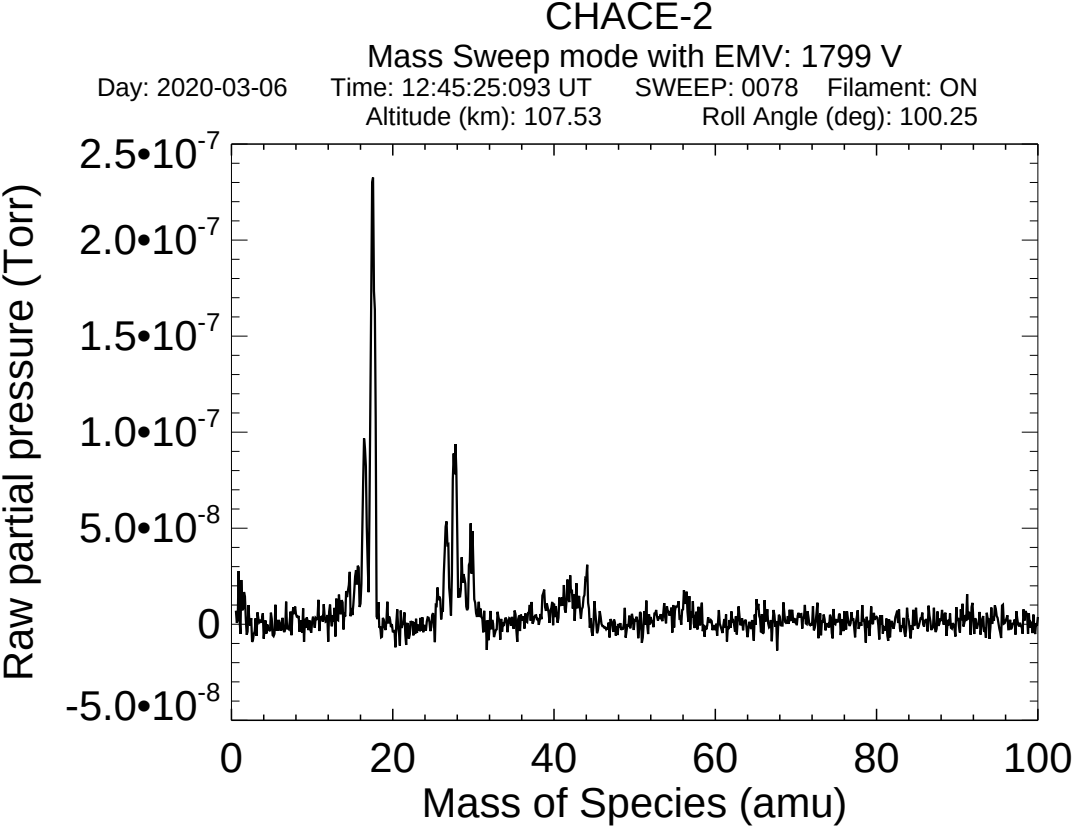

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:42:17:038 UT SWEEP: 0073 Filament: ON
Altitude (km): 106.54 Roll Angle (deg): 102.85
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

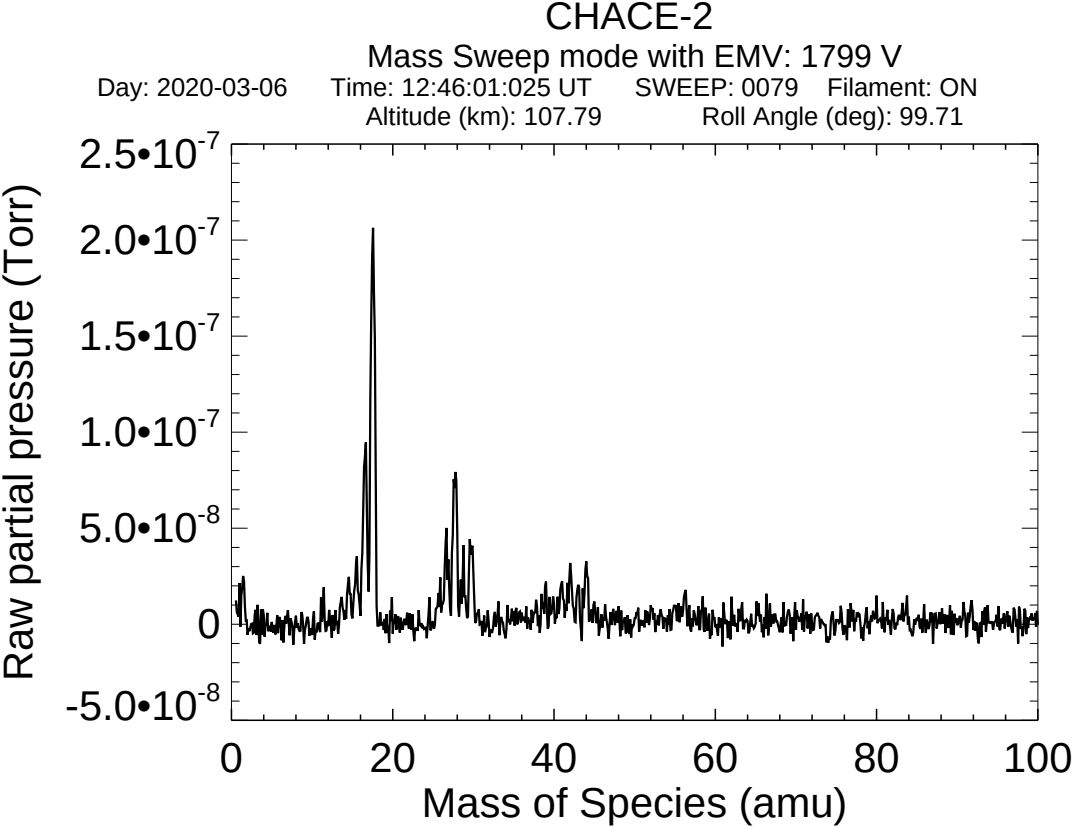

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:43:02:065 UT SWEEP: 0074 Filament: ON
Altitude (km): 106.79 Roll Angle (deg): 102.26
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

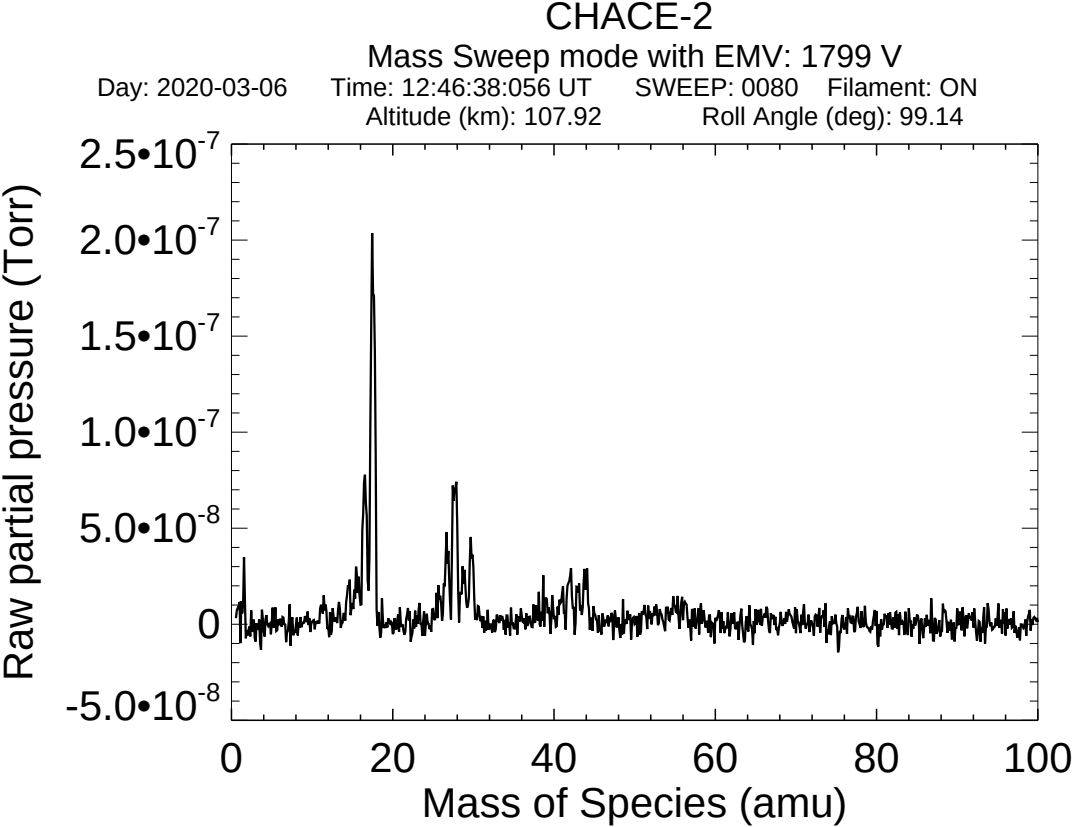

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:43:37:097 UT SWEEP: 0075 Filament: ON
Altitude (km): 106.95 Roll Angle (deg): 101.79
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

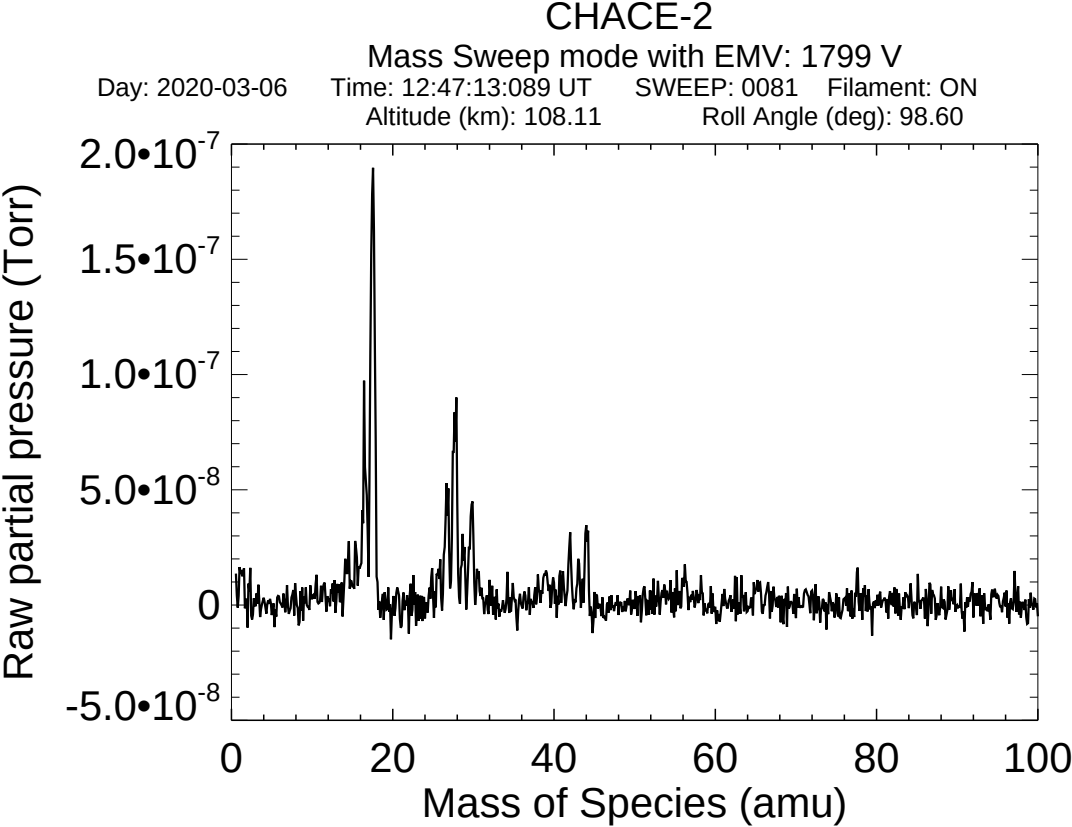

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:44:13:030 UT SWEEP: 0076 Filament: ON
Altitude (km): 107.16 Roll Angle (deg): 101.29
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

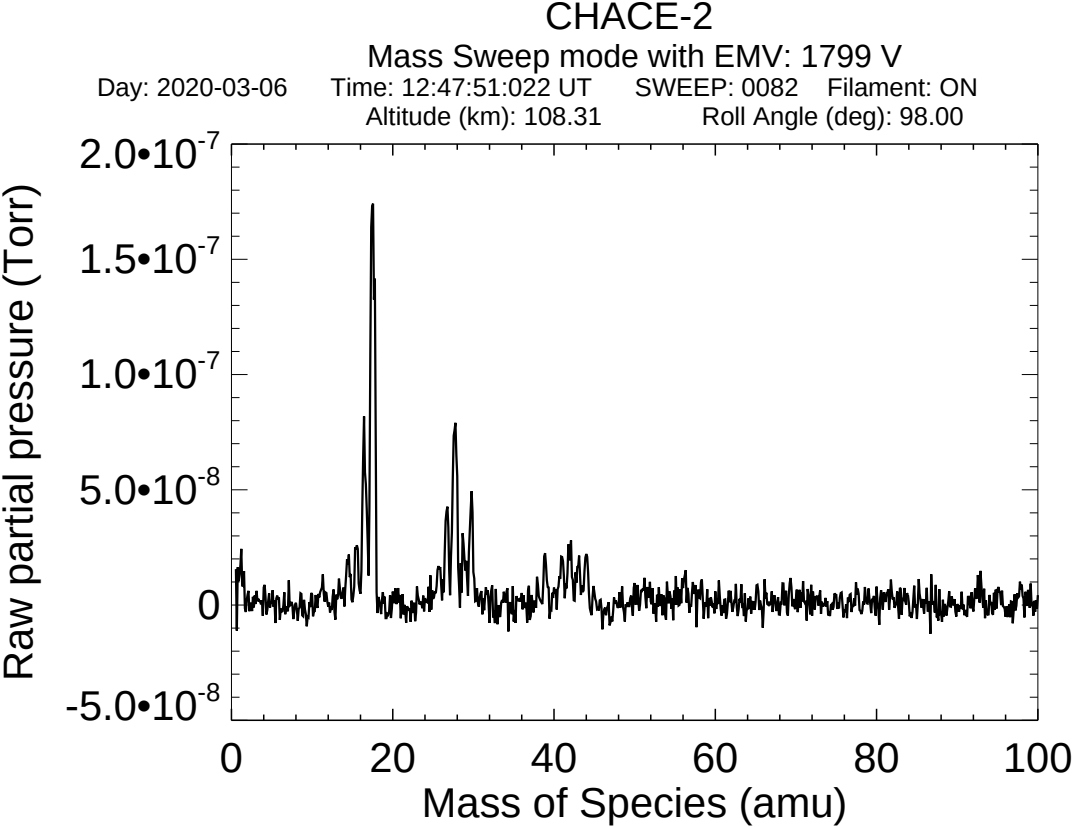

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:44:50:060 UT SWEEP: 0077 Filament: ON
Altitude (km): 107.39 Roll Angle (deg): 100.76
Raw partial pressure (Torr)
3.0•10-7
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

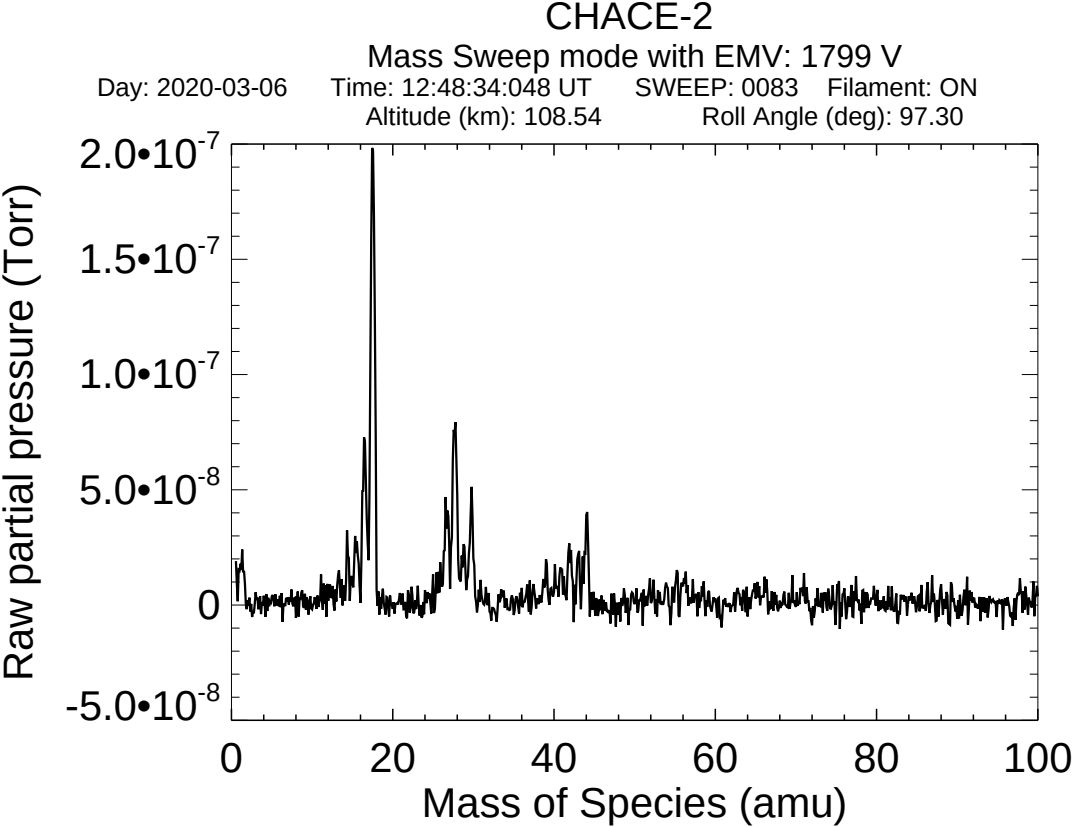

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:45:25:093 UT SWEEP: 0078 Filament: ON
Altitude (km): 107.53 Roll Angle (deg): 100.25
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

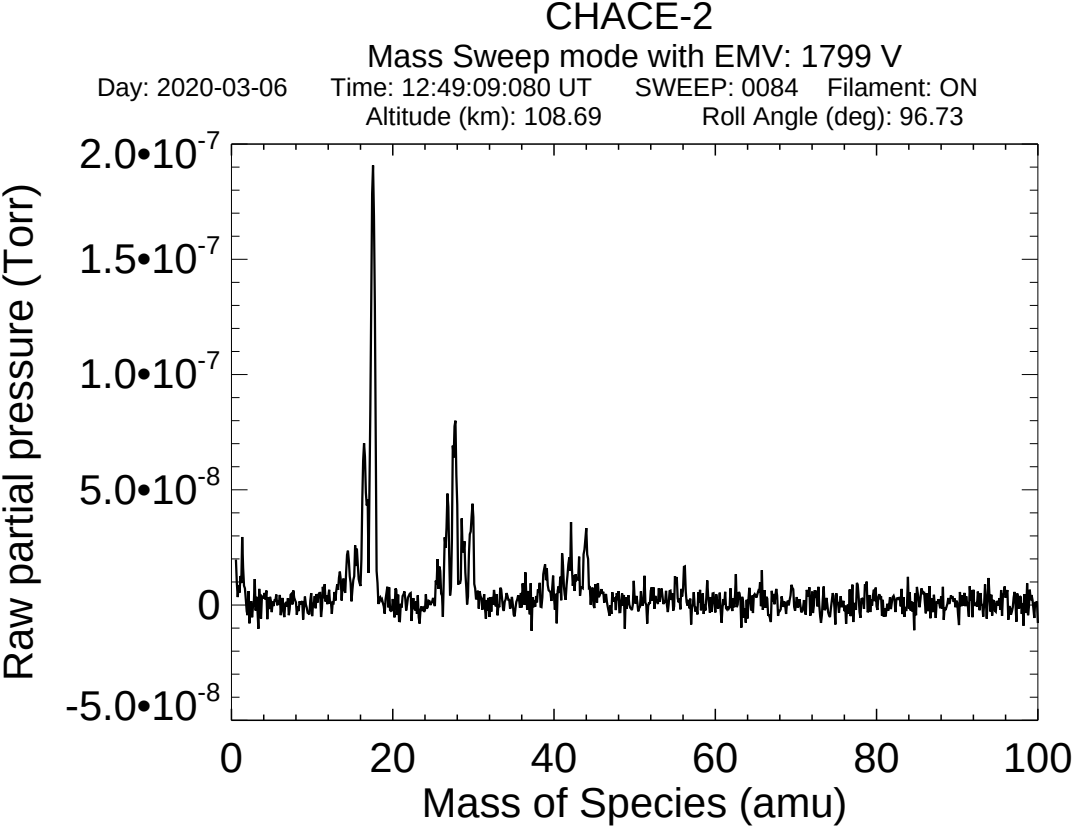

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:46:01:025 UT SWEEP: 0079 Filament: ON
Altitude (km): 107.79 Roll Angle (deg): 99.71
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

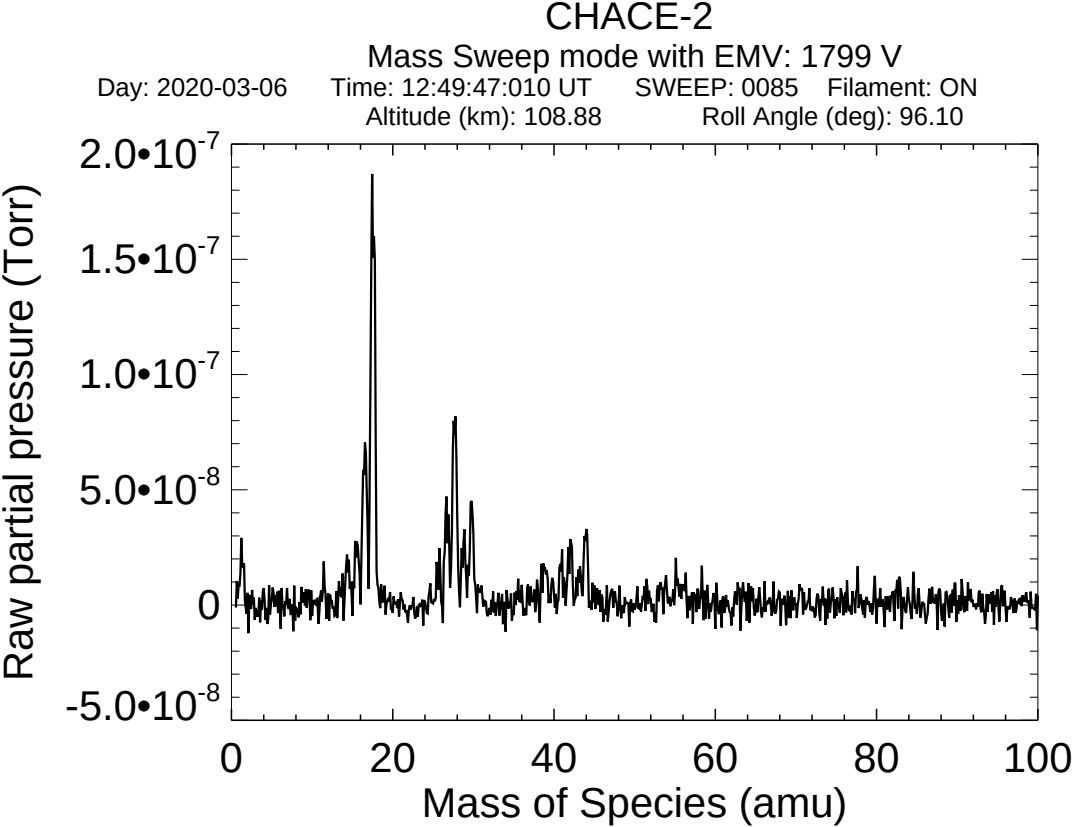

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:46:38:056 UT SWEEP: 0080 Filament: ON
Altitude (km): 107.92 Roll Angle (deg): 99.14
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

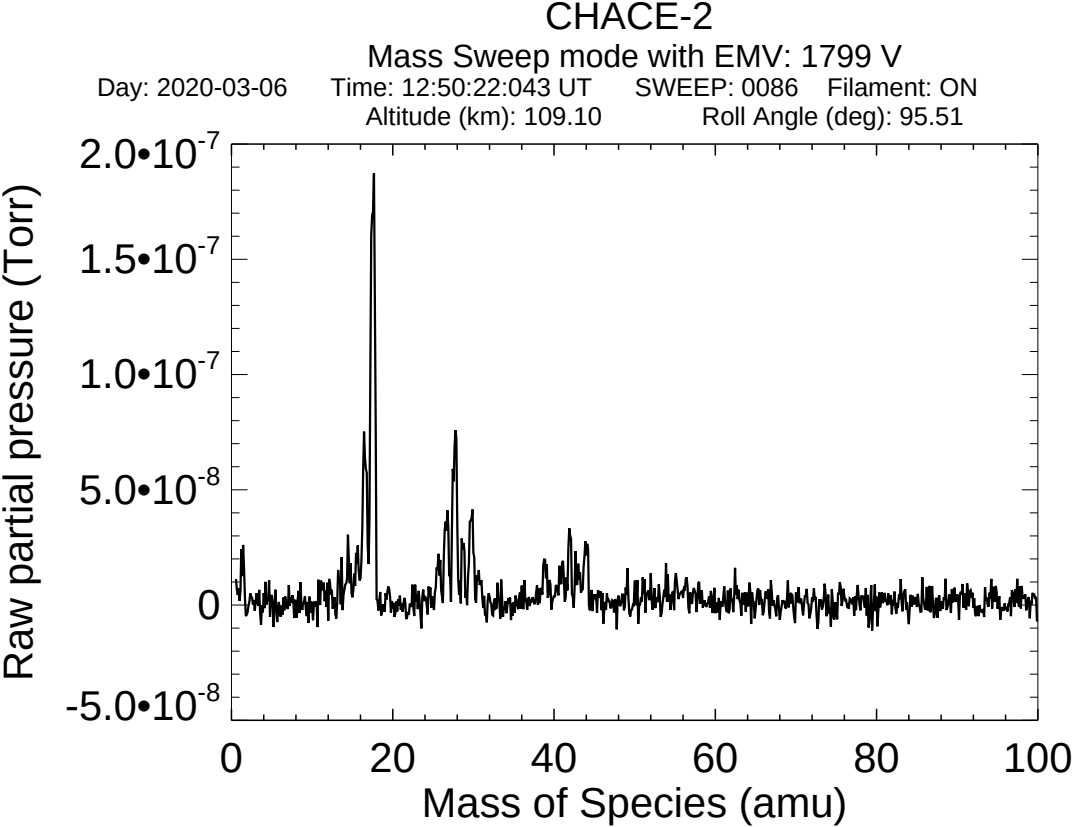

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:47:13:089 UT SWEEP: 0081 Filament: ON
Altitude (km): 108.11 Roll Angle (deg): 98.60
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

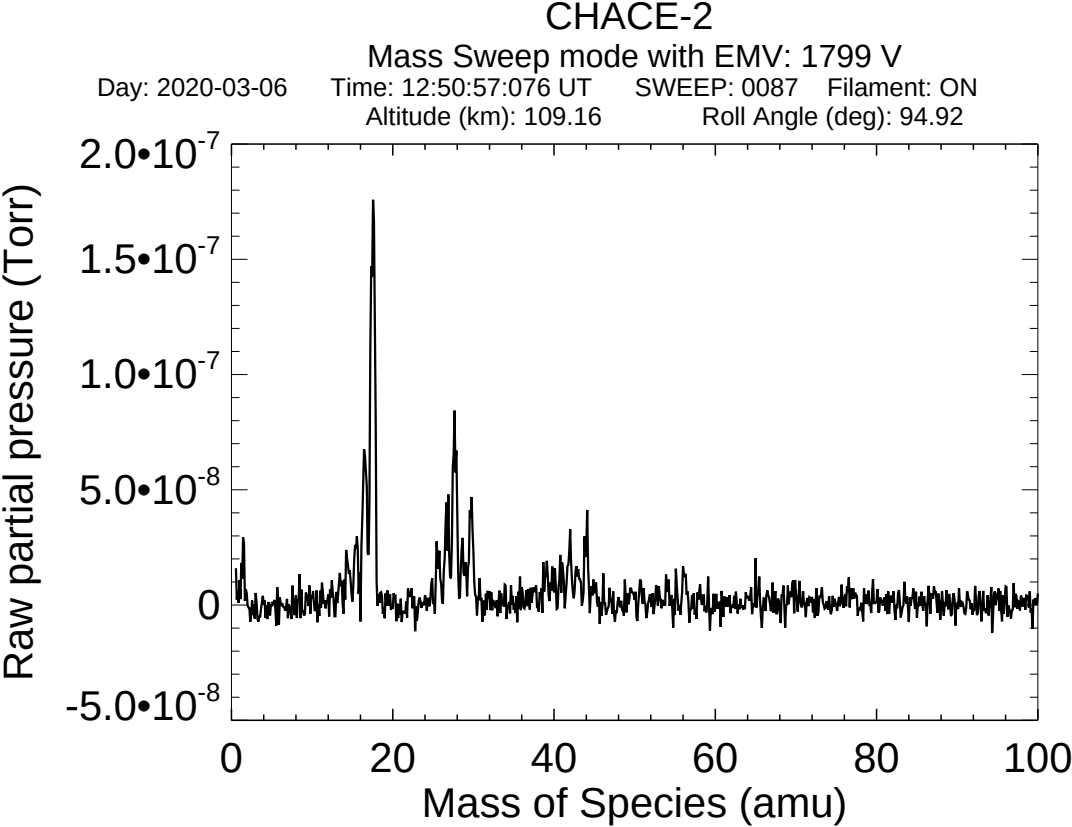

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:47:51:022 UT SWEEP: 0082 Filament: ON
Altitude (km): 108.31 Roll Angle (deg): 98.00
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

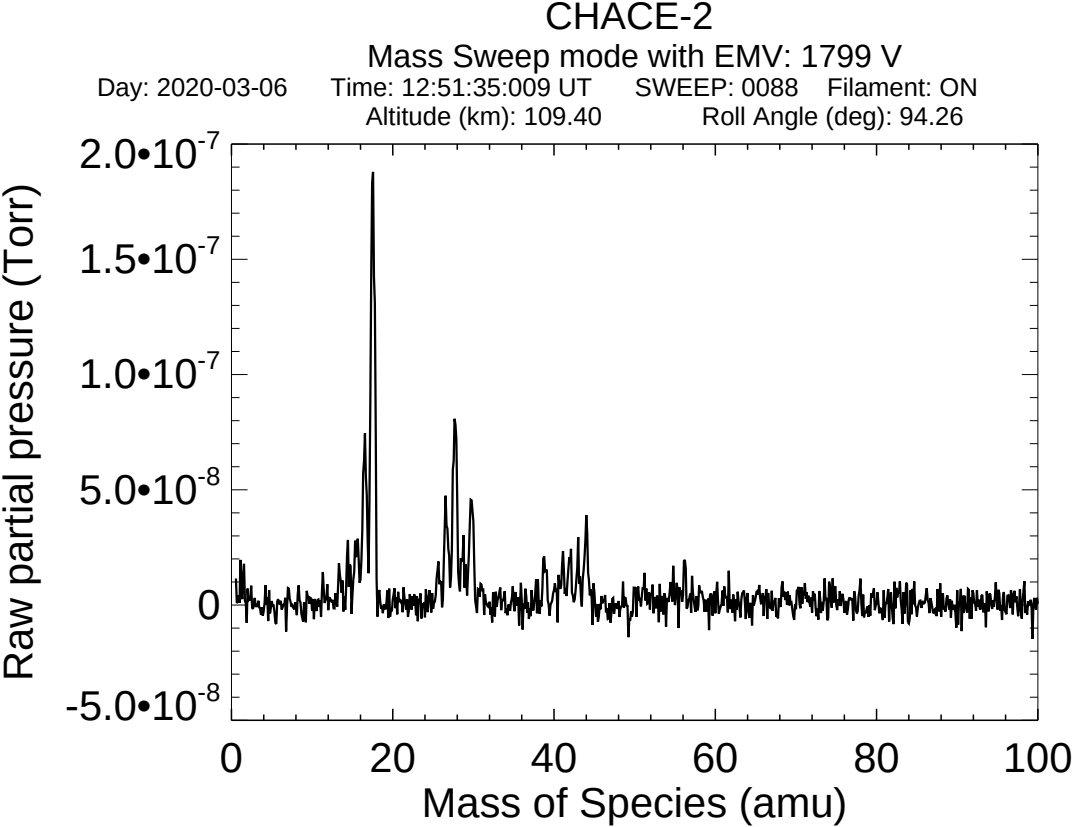

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:48:34:048 UT SWEEP: 0083 Filament: ON
Altitude (km): 108.54 Roll Angle (deg): 97.30
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

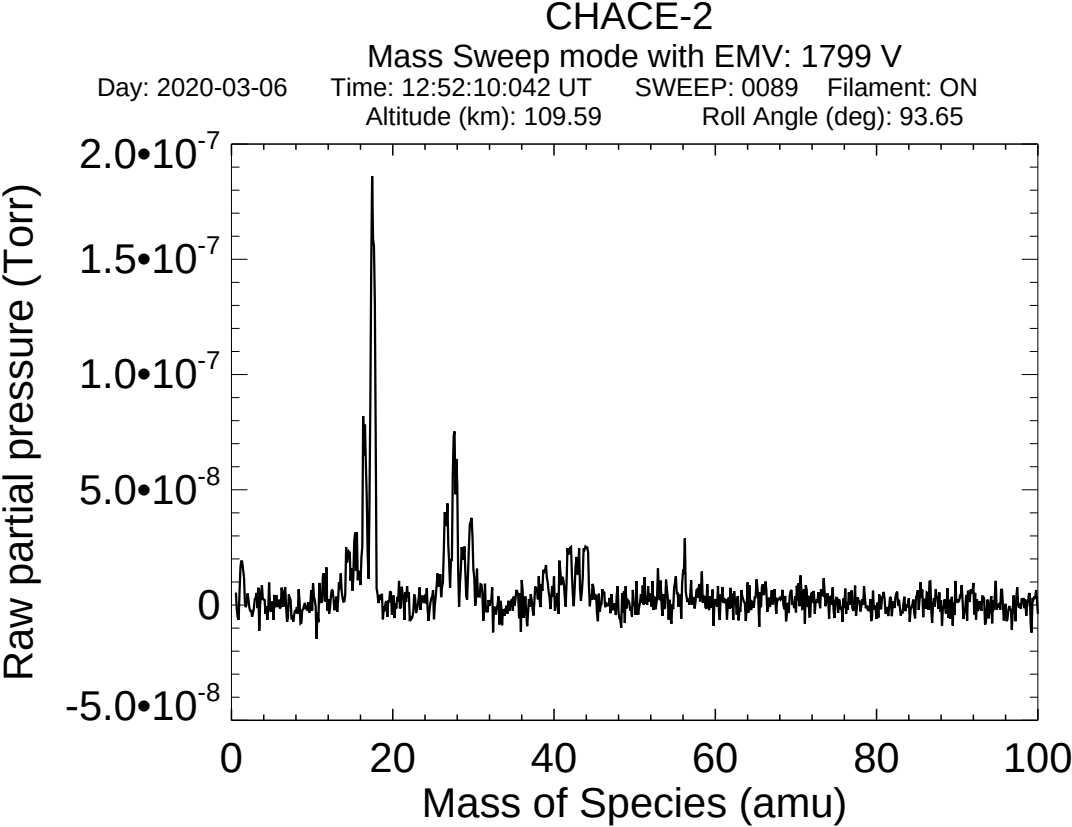

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:49:09:080 UT SWEEP: 0084 Filament: ON
Altitude (km): 108.69 Roll Angle (deg): 96.73
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

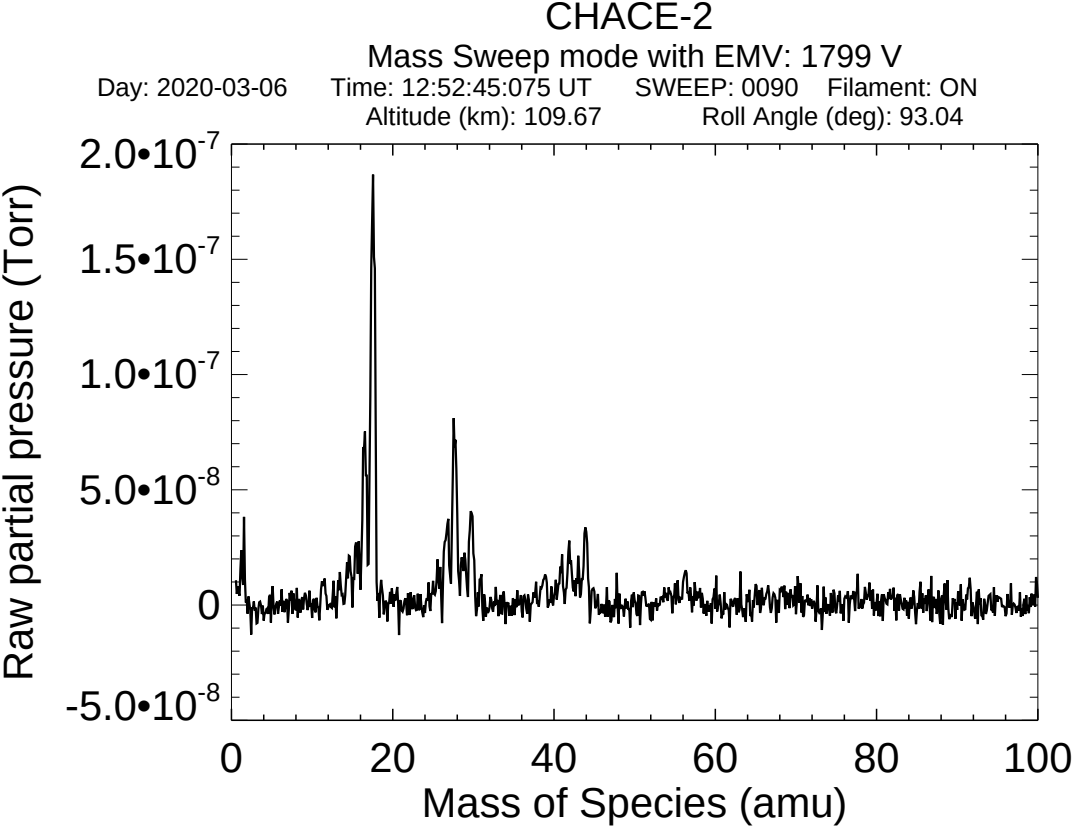

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:49:47:010 UT SWEEP: 0085 Filament: ON
Altitude (km): 108.88 Roll Angle (deg): 96.10
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

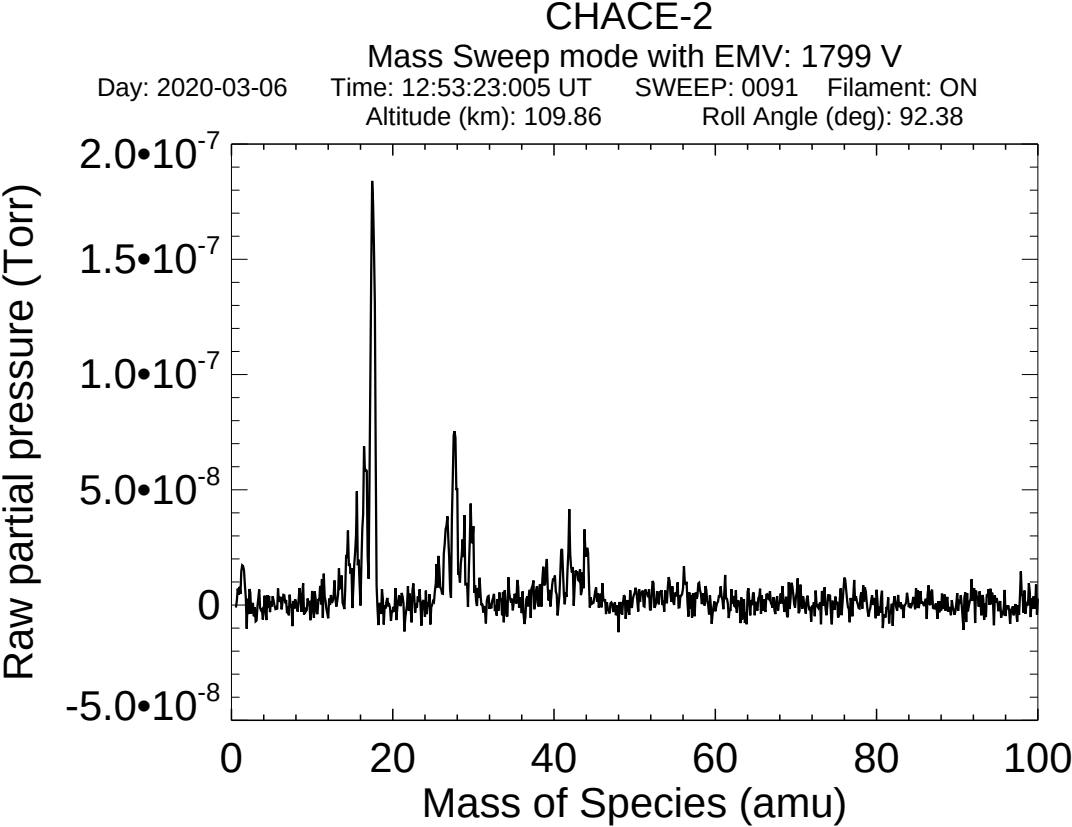

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:50:22:043 UT SWEEP: 0086 Filament: ON
Altitude (km): 109.10 Roll Angle (deg): 95.51
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

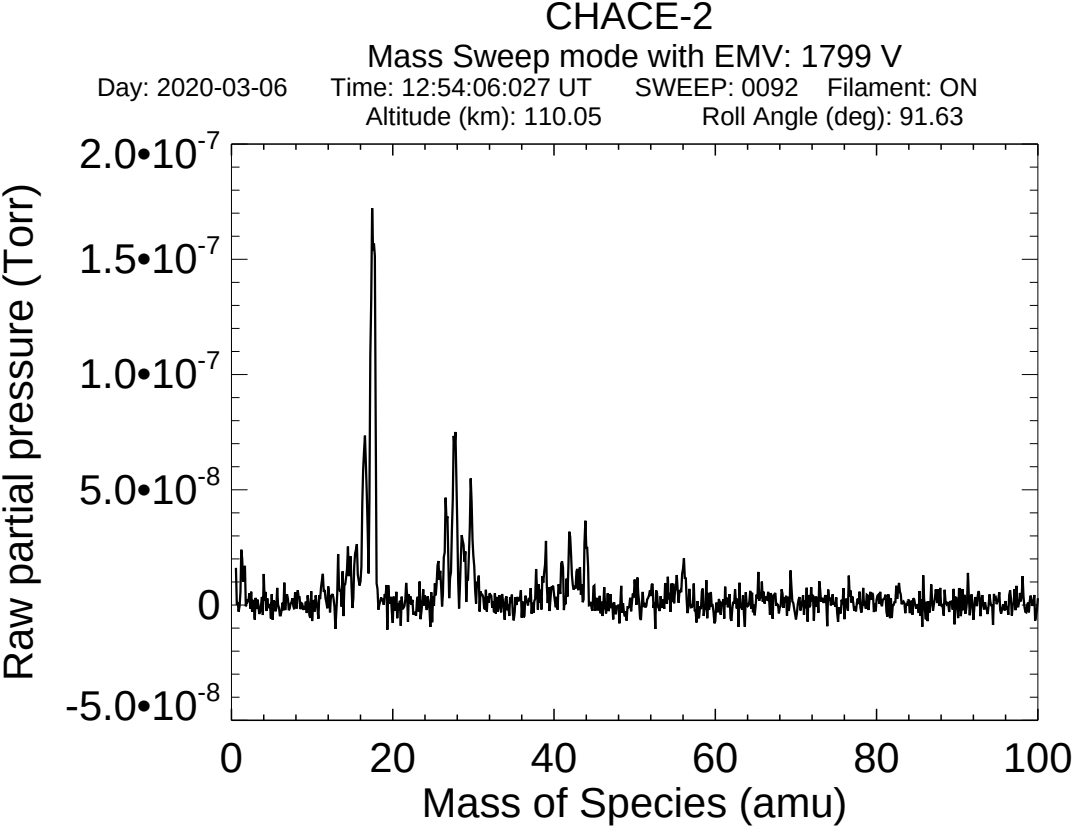

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 12:50:57:076 UT
SWEEP: 0087
Filament: ON
Altitude (km): 109.16
Roll Angle (deg): 94.92
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

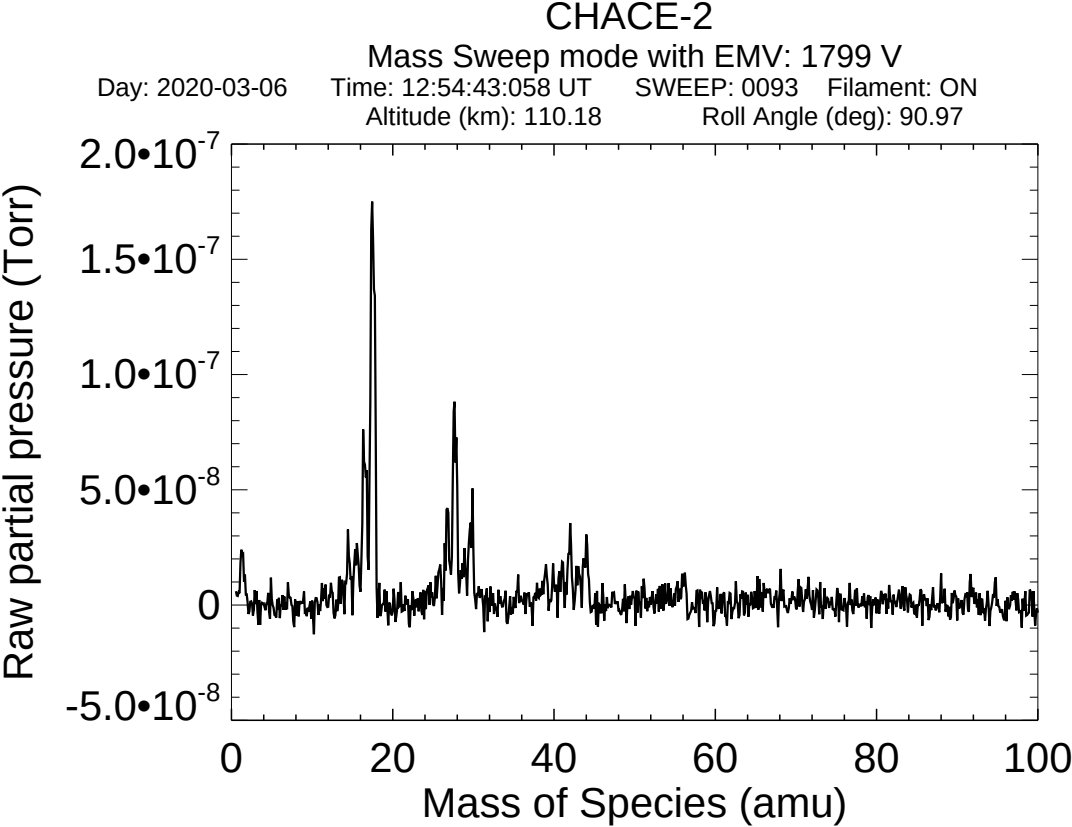

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 12:51:35:009 UT
SWEEP: 0088
Filament: ON
Altitude (km): 109.40
Roll Angle (deg): 94.26
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

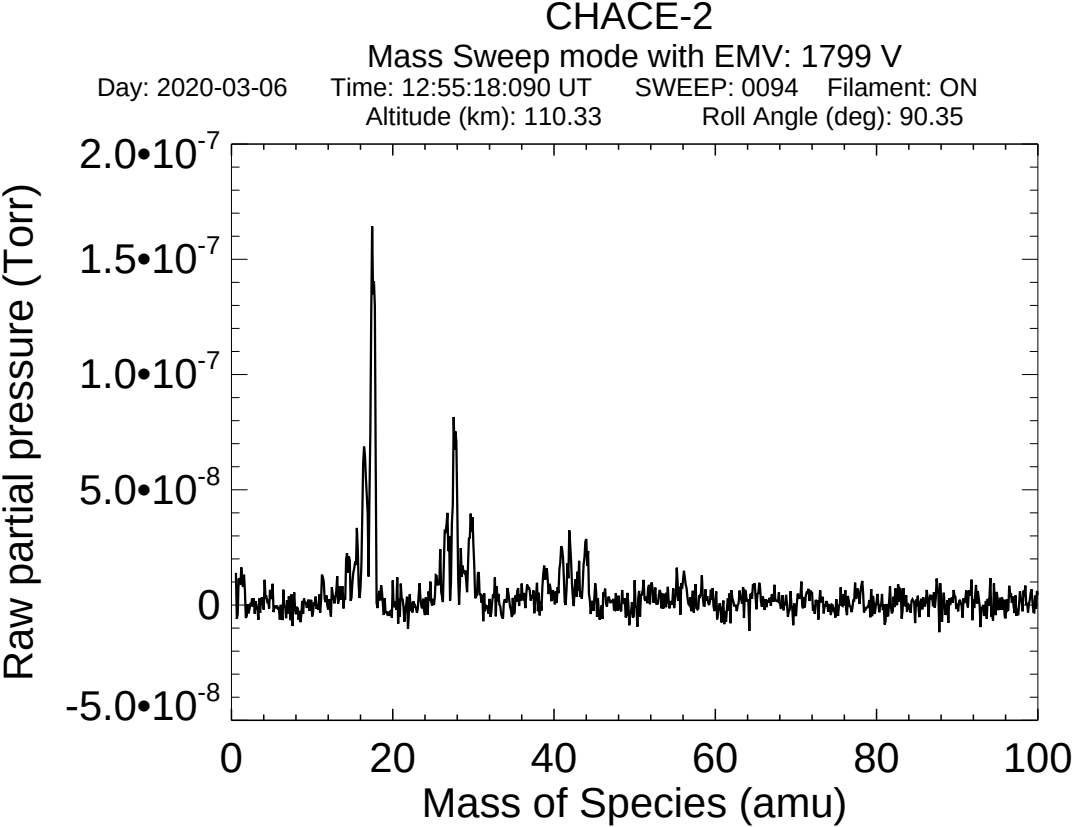

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 12:52:10:042 UT
SWEEP: 0089
Filament: ON
Altitude (km): 109.59
Roll Angle (deg): 93.65
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

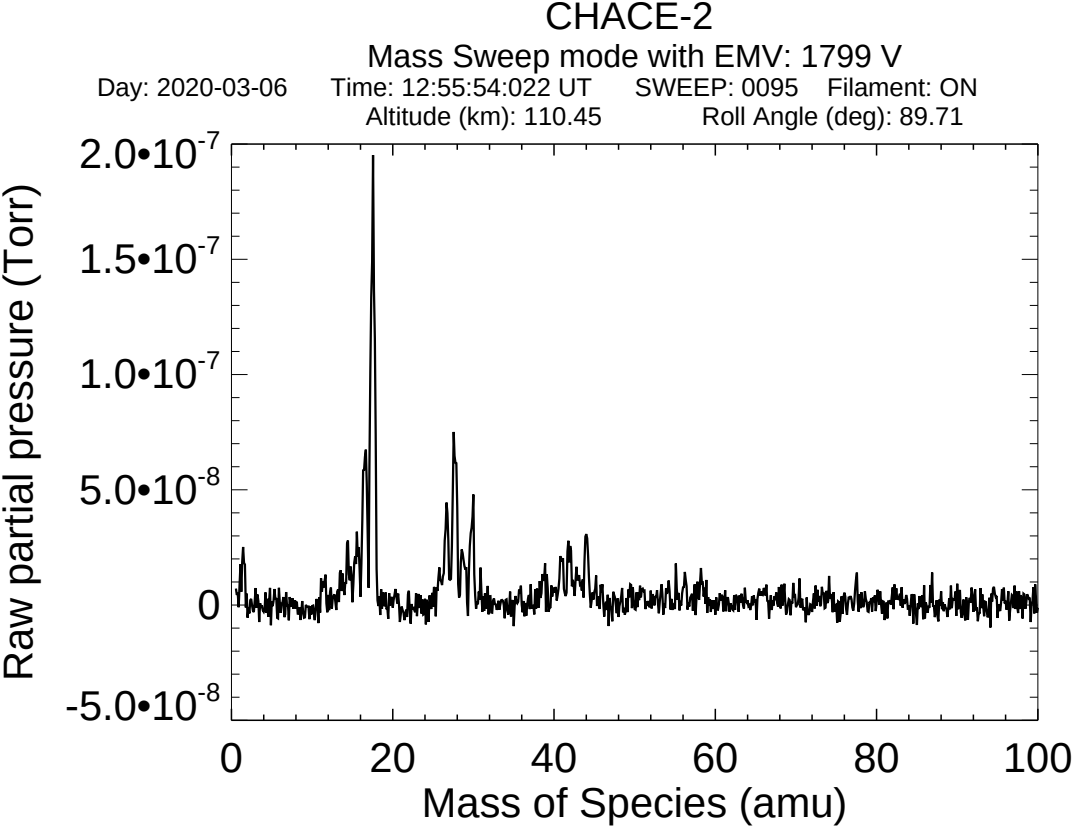

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 12:52:45:075 UT
SWEEP: 0090
Filament: ON
Altitude (km): 109.67
Roll Angle (deg): 93.04
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

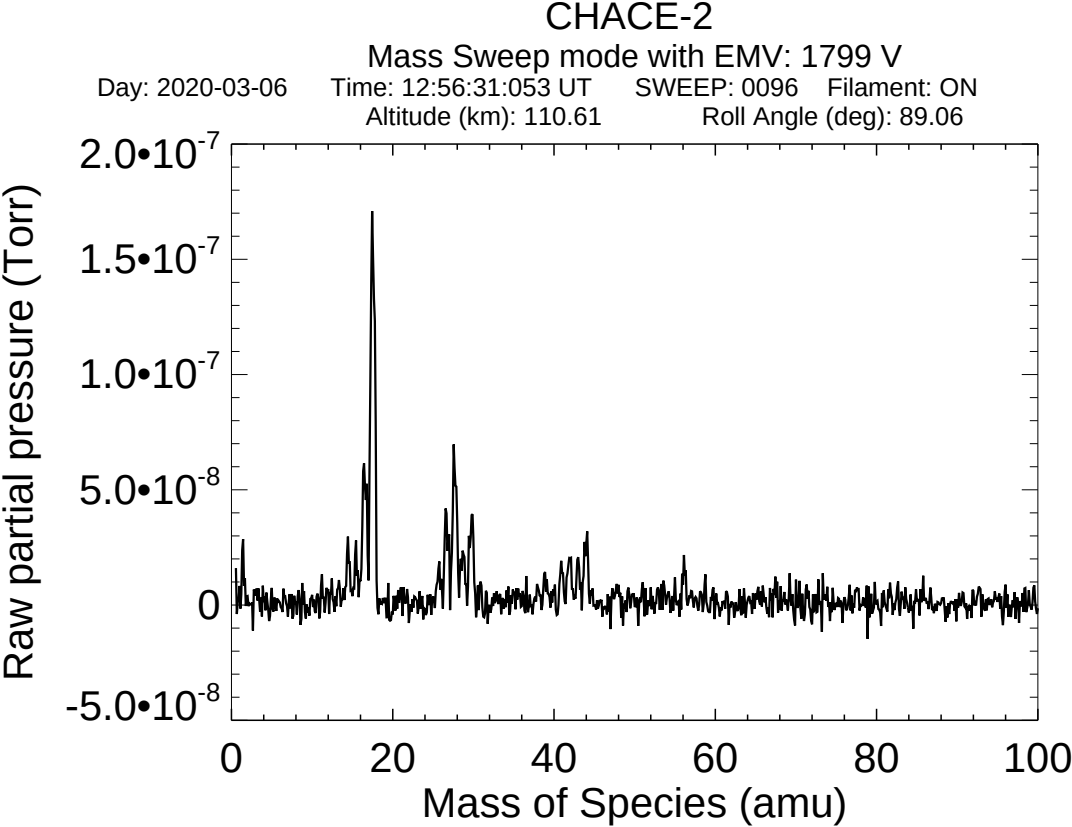

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:53:23:005 UT SWEEP: 0091 Filament: ON
Altitude (km): 109.86 Roll Angle (deg): 92.38
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

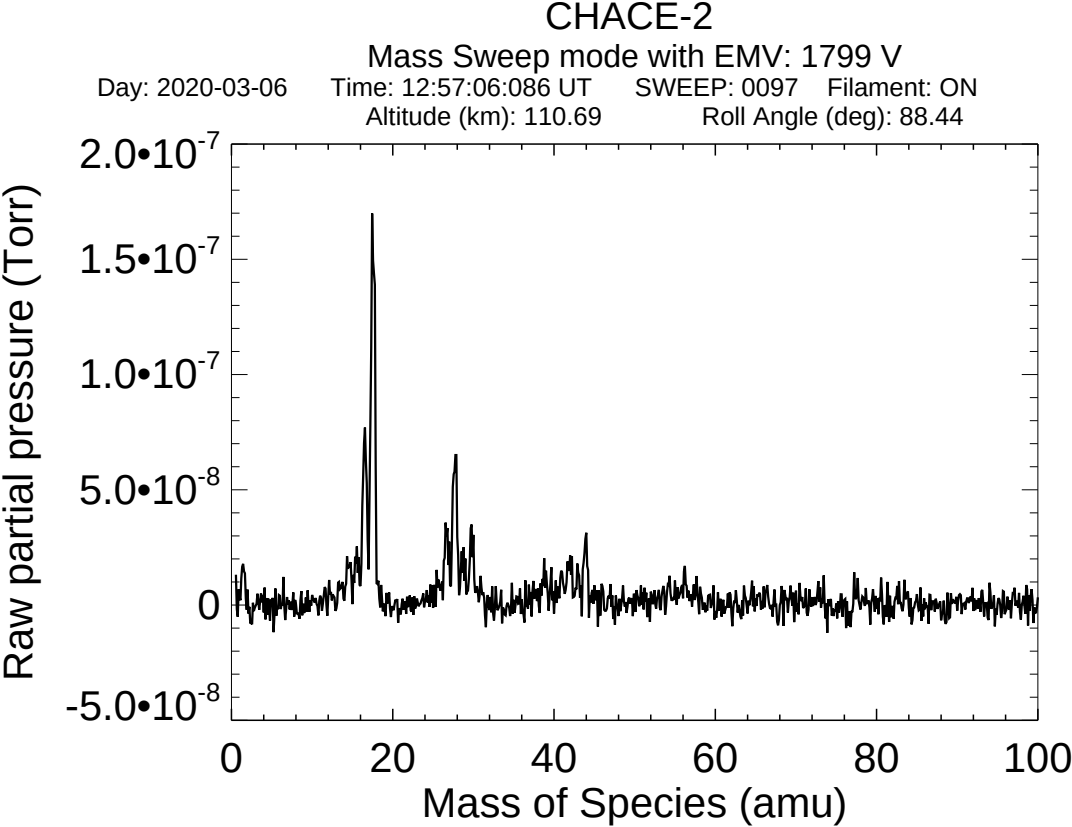

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 12:54:06:027 UT
SWEEP: 0092
Filament: ON
Altitude (km): 110.05
Roll Angle (deg): 91.63
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

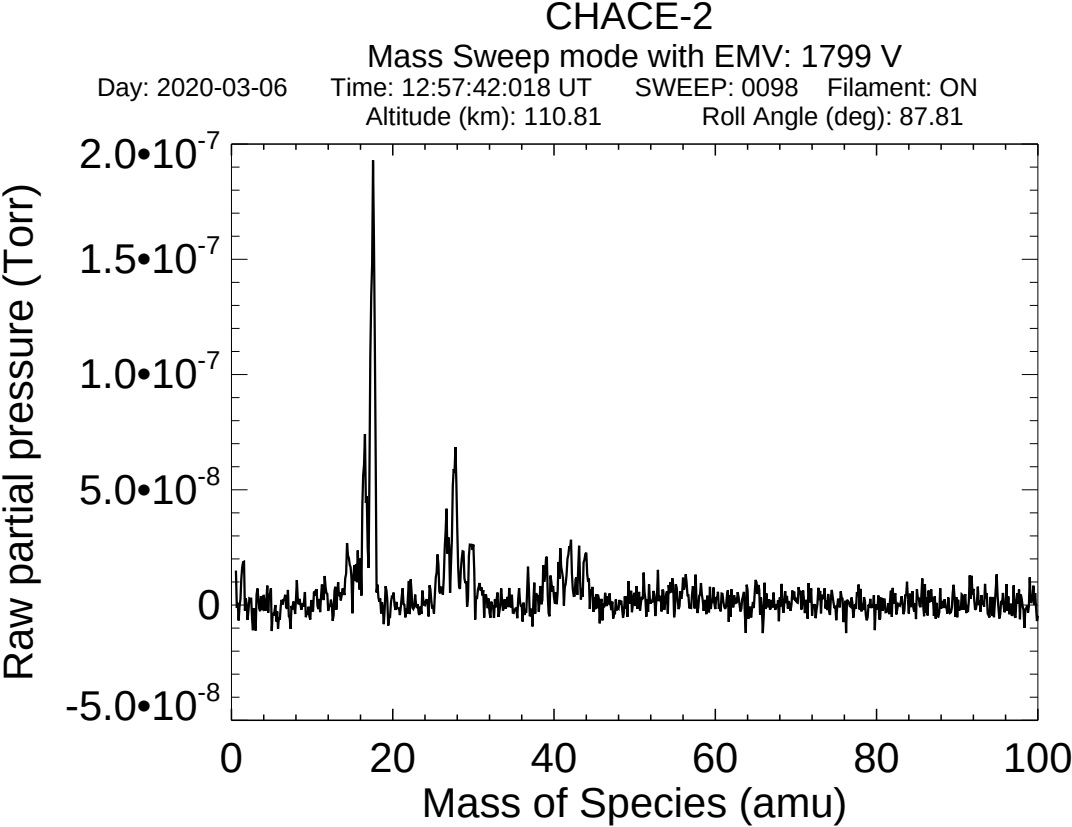

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:54:43:058 UT SWEEP: 0093 Filament: ON
Altitude (km): 110.18 Roll Angle (deg): 90.97
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

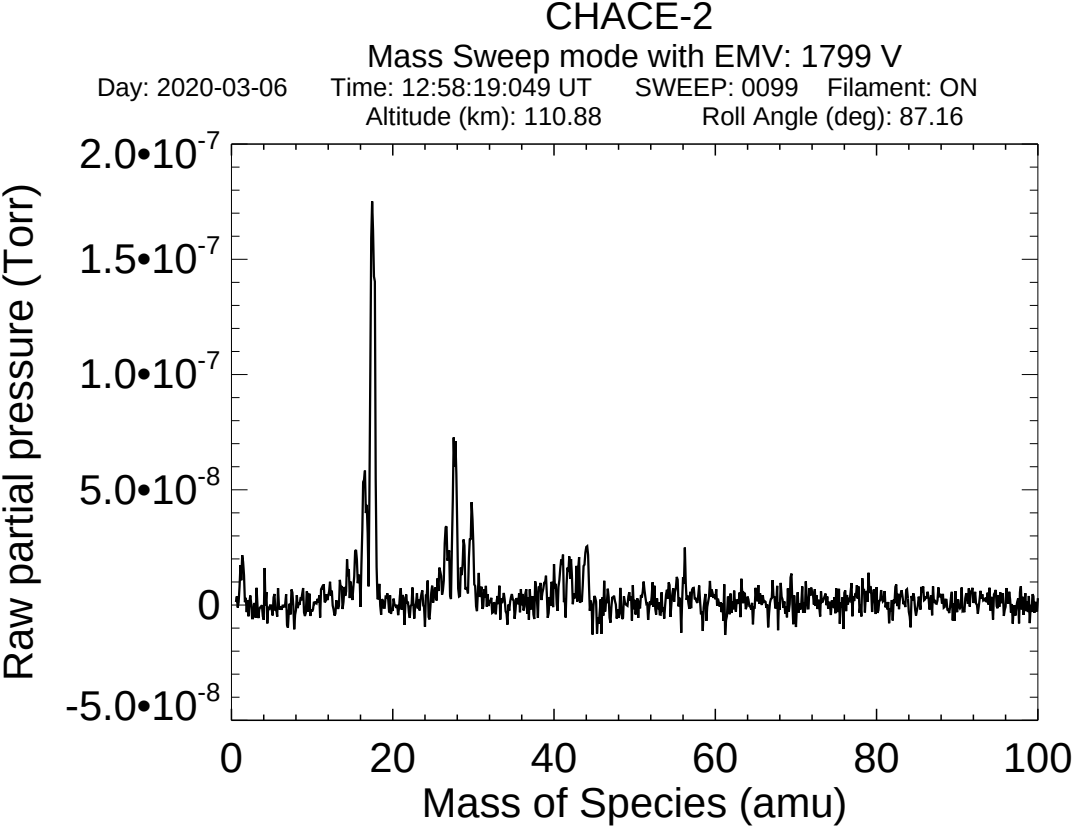

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:55:18:090 UT SWEEP: 0094 Filament: ON
Altitude (km): 110.33 Roll Angle (deg): 90.35
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

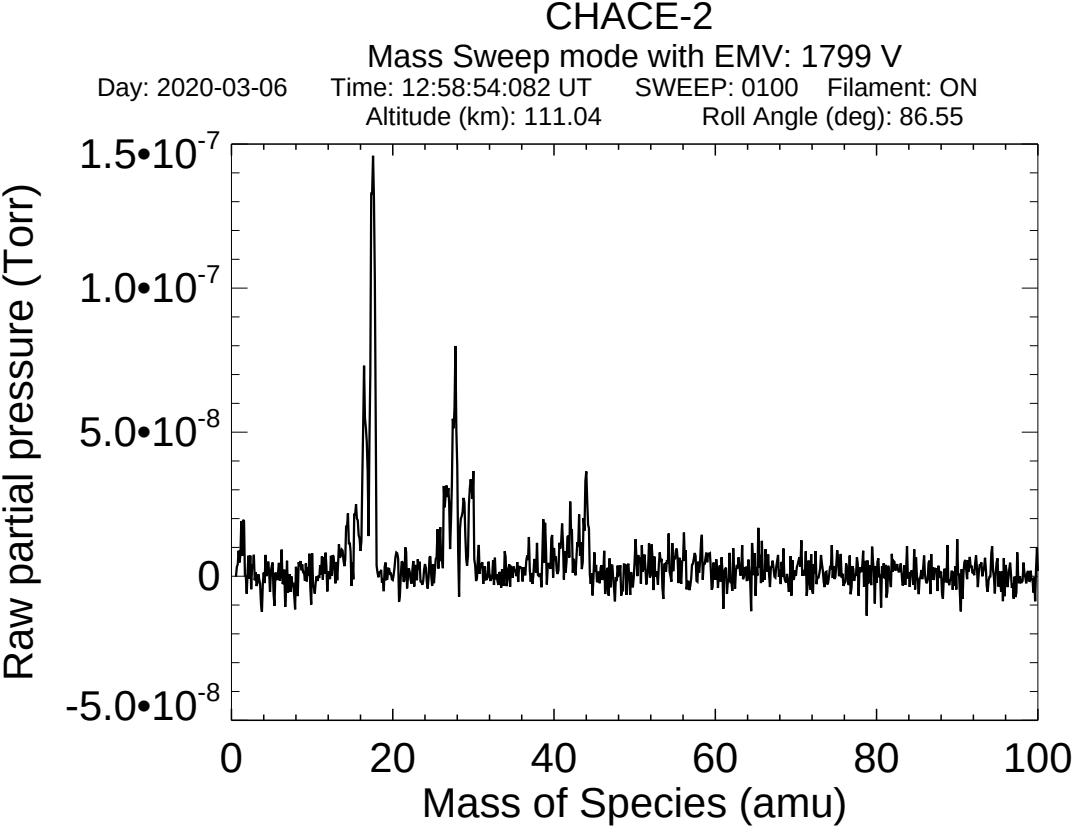

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:55:54:022 UT SWEEP: 0095 Filament: ON
Altitude (km): 110.45 Roll Angle (deg): 89.71
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

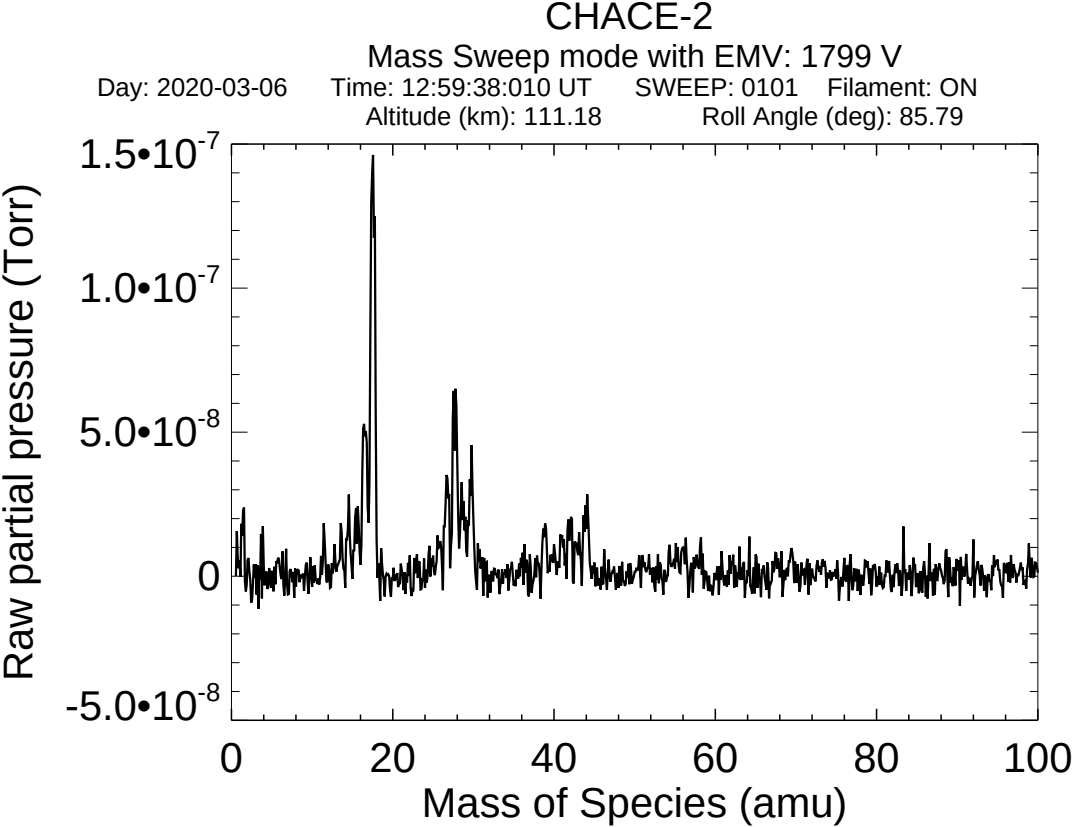

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:56:31:053 UT SWEEP: 0096 Filament: ON
Altitude (km): 110.61 Roll Angle (deg): 89.06
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

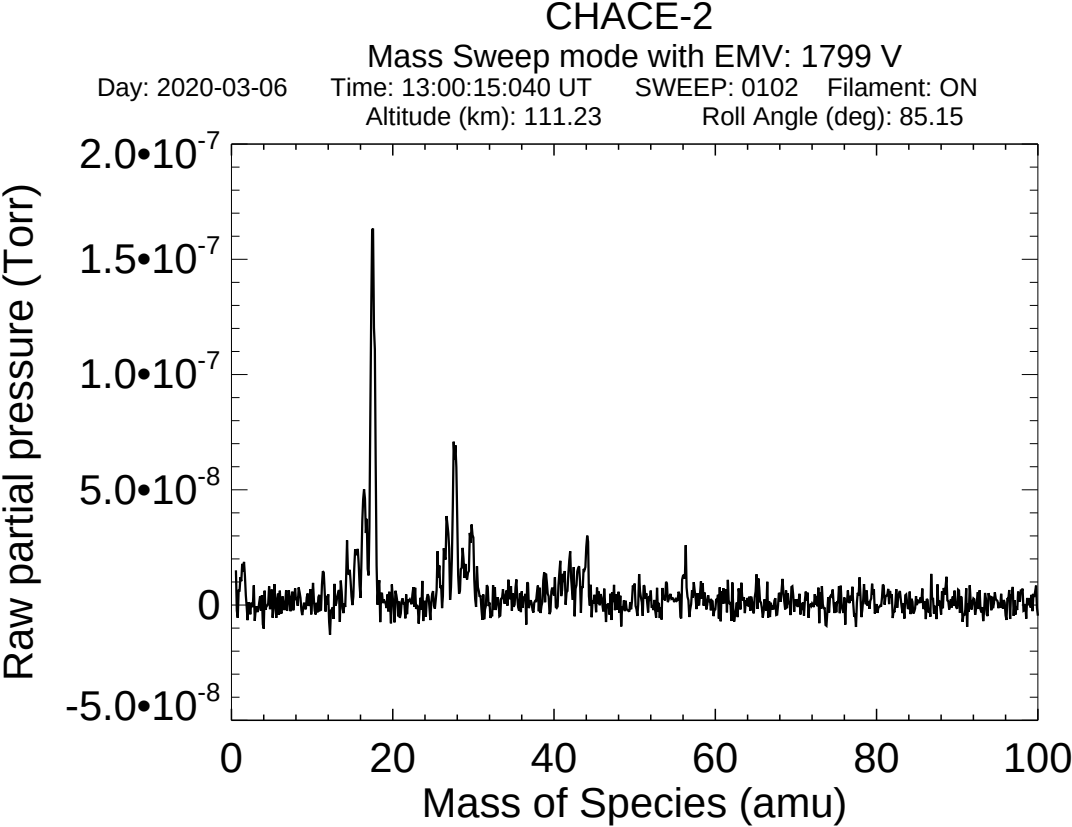

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:57:06:086 UT SWEEP: 0097 Filament: ON
Altitude (km): 110.69 Roll Angle (deg): 88.44
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

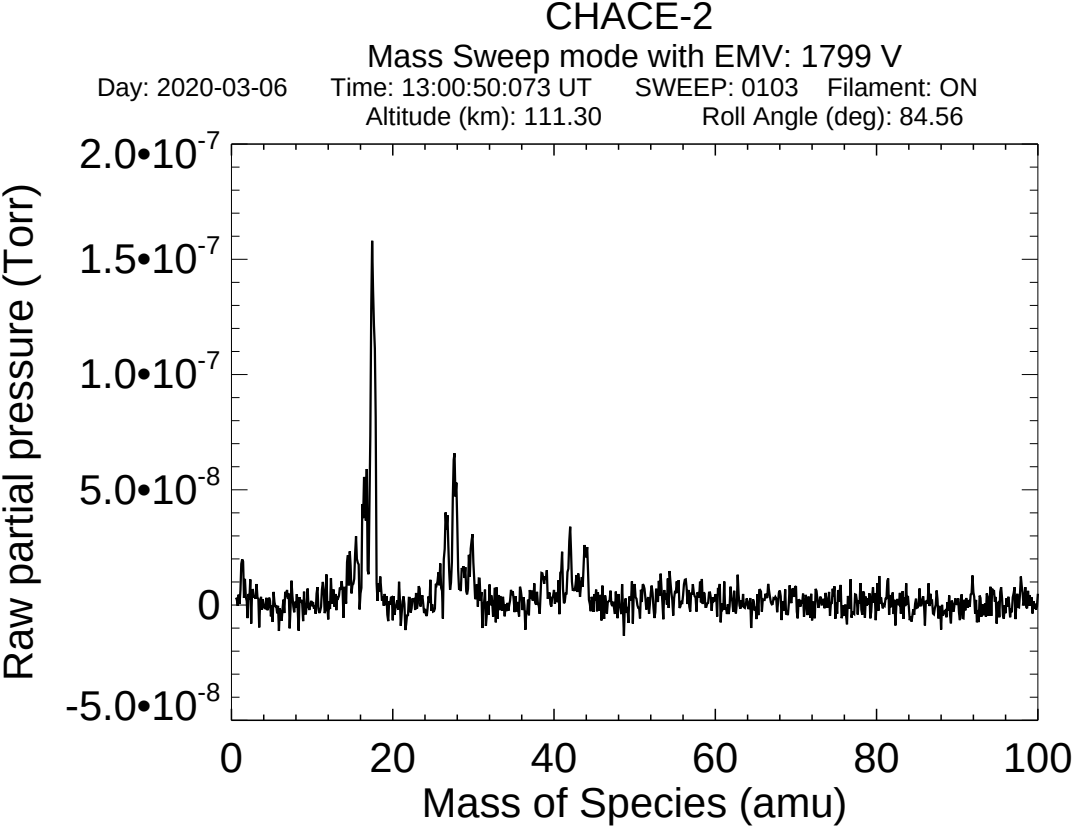

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:57:42:018 UT SWEEP: 0098 Filament: ON
Altitude (km): 110.81 Roll Angle (deg): 87.81
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

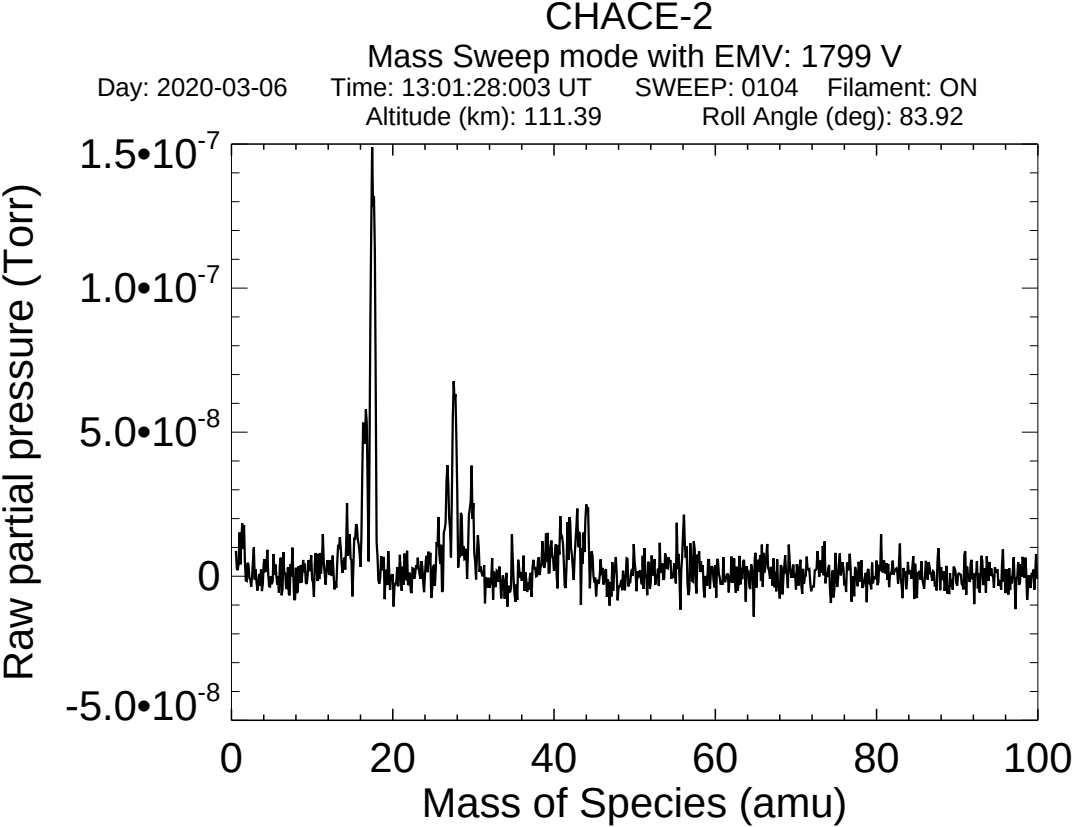

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 12:58:19:049 UT
SWEEP: 0099
Filament: ON
Altitude (km): 110.88
Roll Angle (deg): 87.16
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

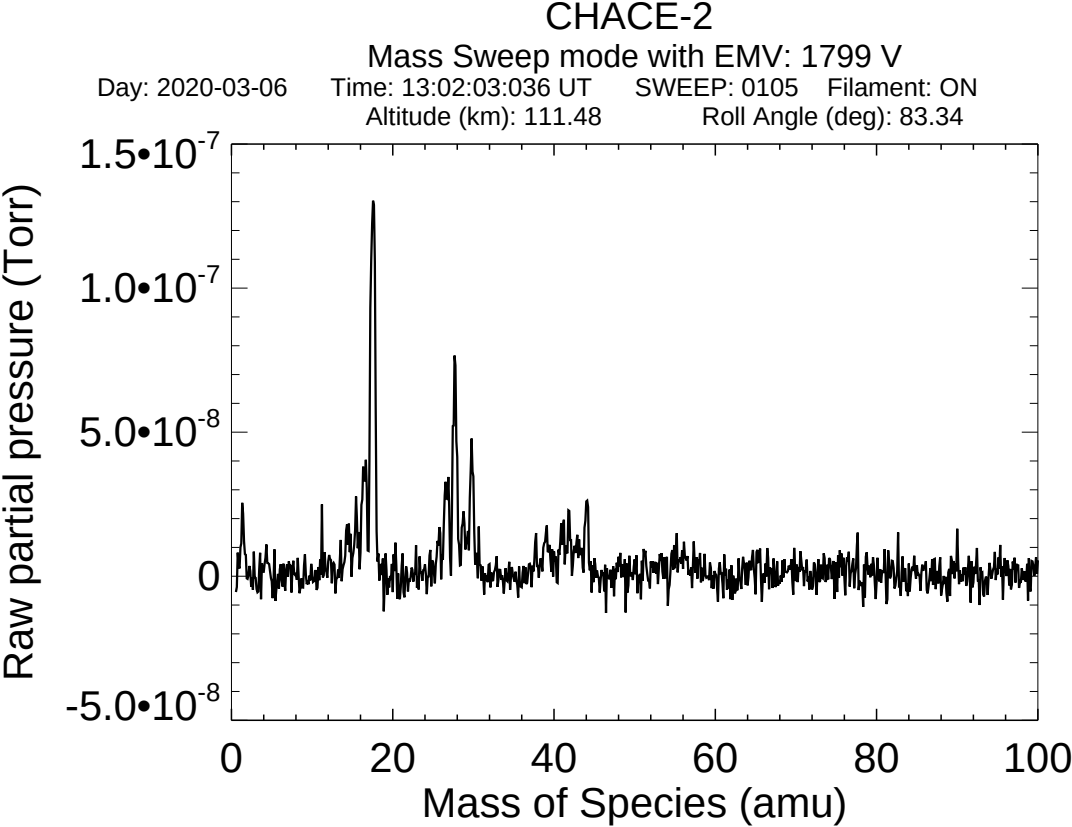

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:58:54:082 UT SWEEP: 0100 Filament: ON
Altitude (km): 111.04 Roll Angle (deg): 86.55
Raw partial pressure (Torr)
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

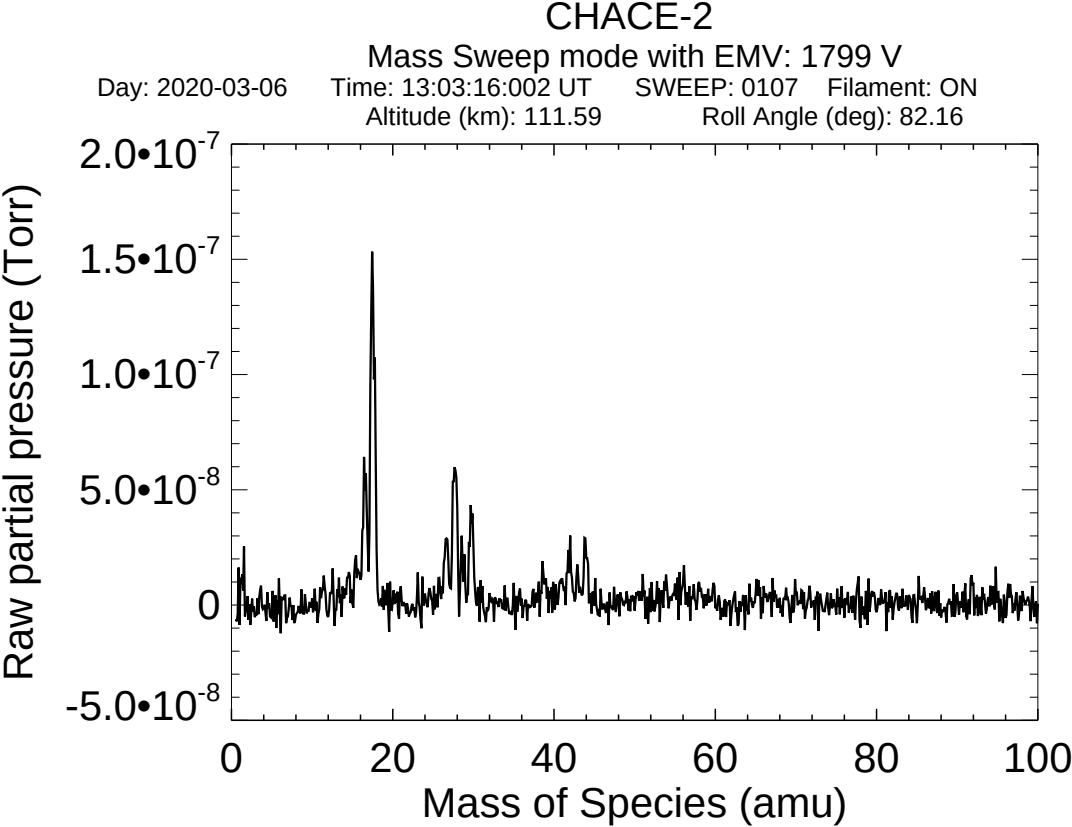

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 12:59:38:010 UT SWEEP: 0101 Filament: ON
Altitude (km): 111.18 Roll Angle (deg): 85.79
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

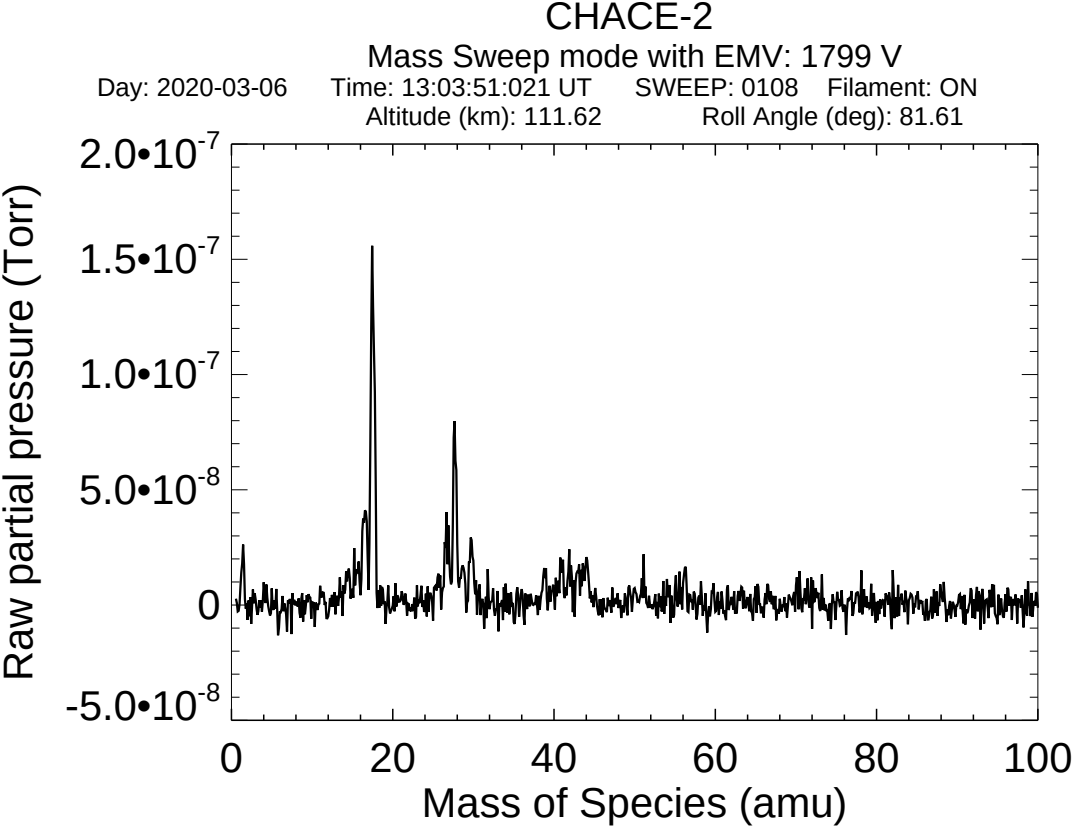

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:00:15:040 UT SWEEP: 0102 Filament: ON
Altitude (km): 111.23 Roll Angle (deg): 85.15
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

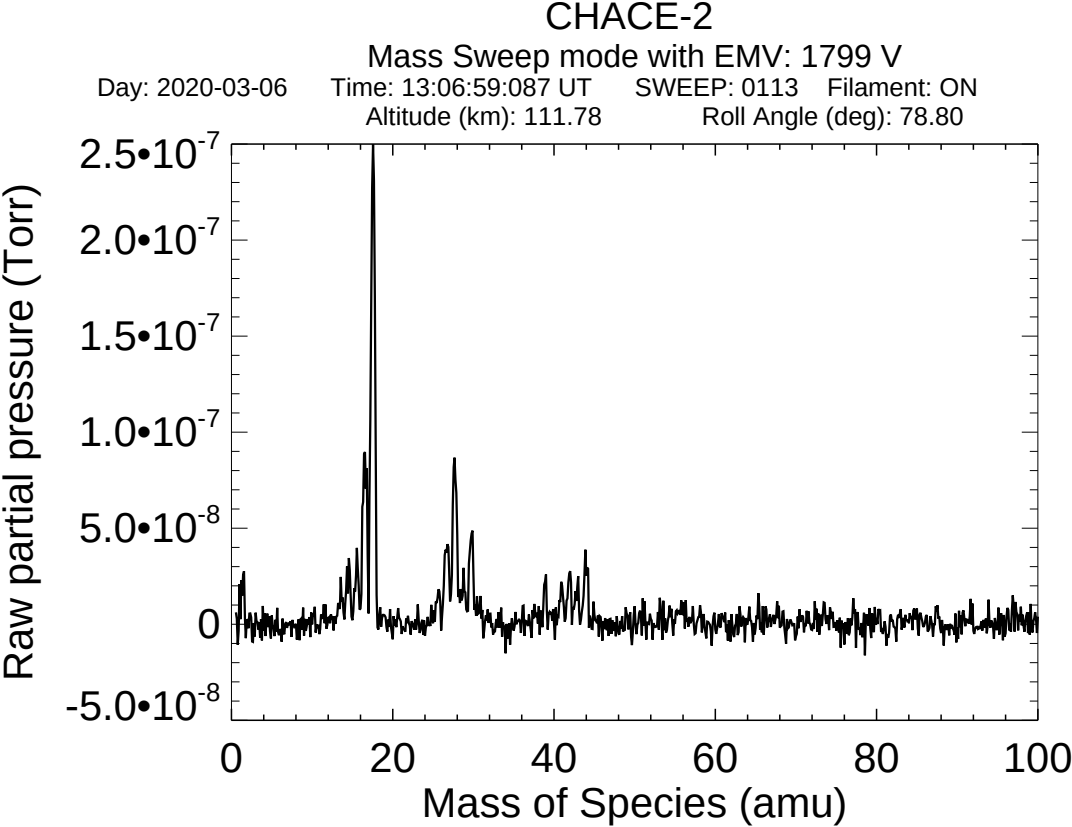

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:00:50:073 UT SWEEP: 0103 Filament: ON
Altitude (km): 111.30 Roll Angle (deg): 84.56
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

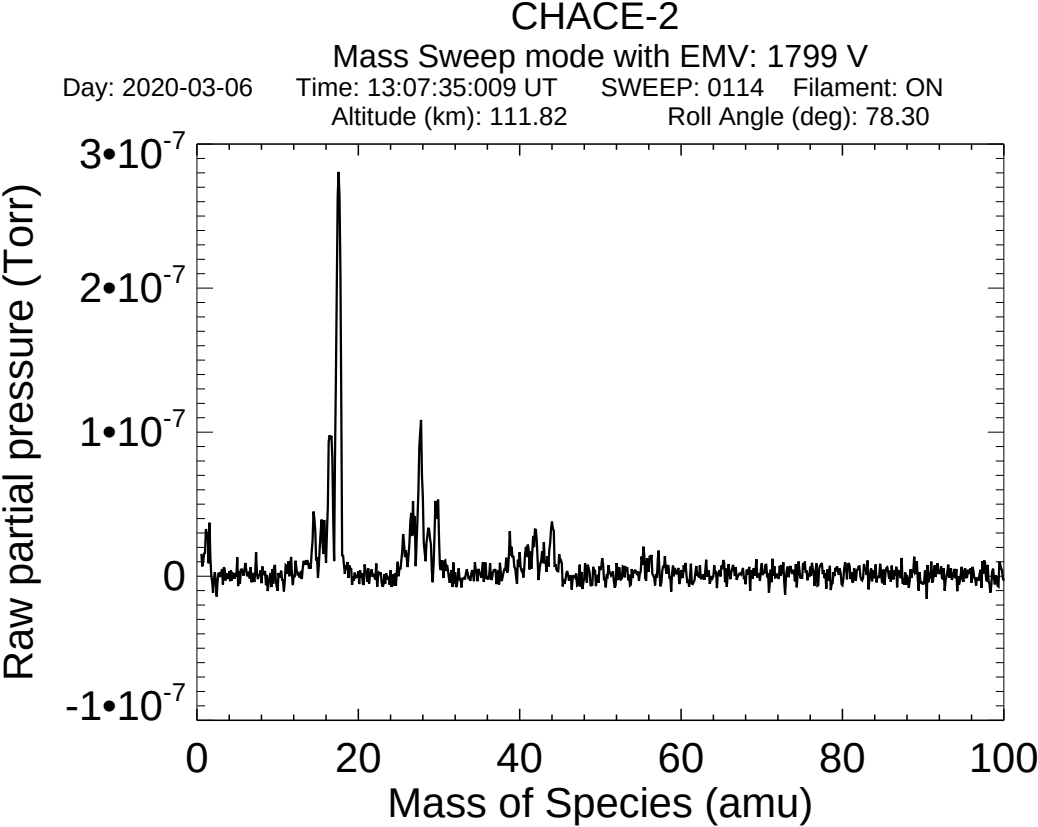

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 13:01:28:003 UT
SWEEP: 0104
Filament: ON
Altitude (km): 111.39
Roll Angle (deg): 83.92
Raw partial pressure (Torr)
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

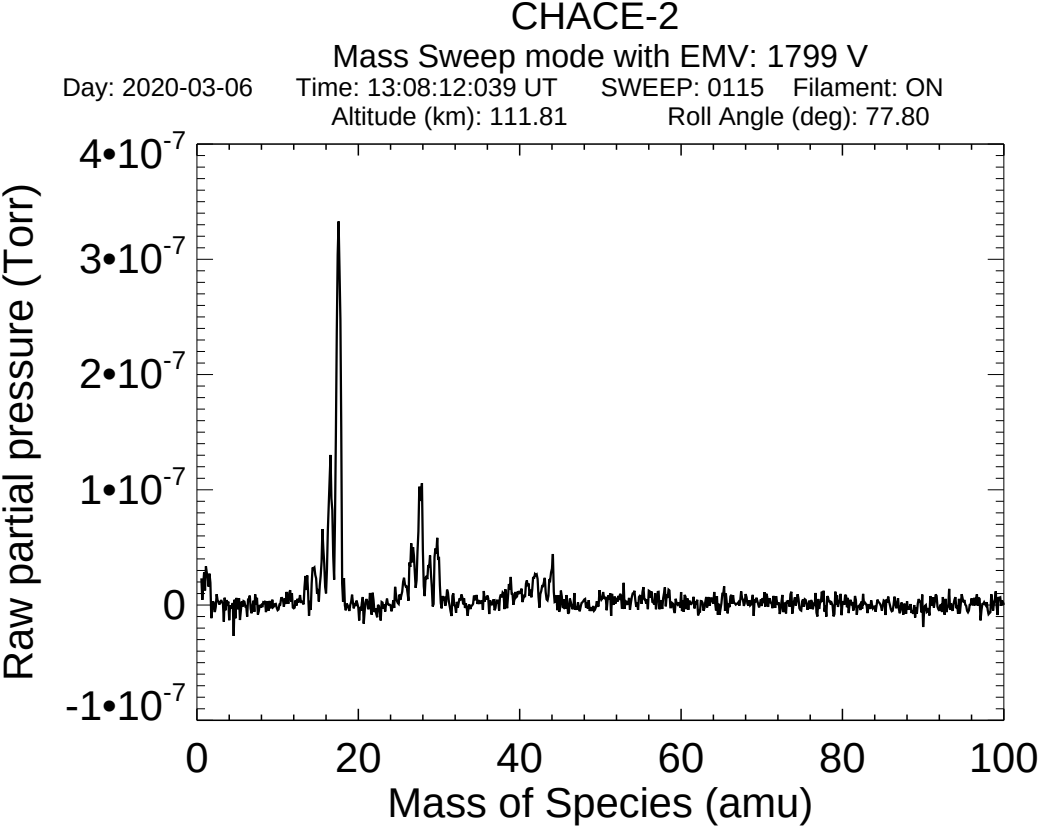

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:02:03:036 UT SWEEP: 0105 Filament: ON
Altitude (km): 111.48 Roll Angle (deg): 83.34
Raw partial pressure (Torr)
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

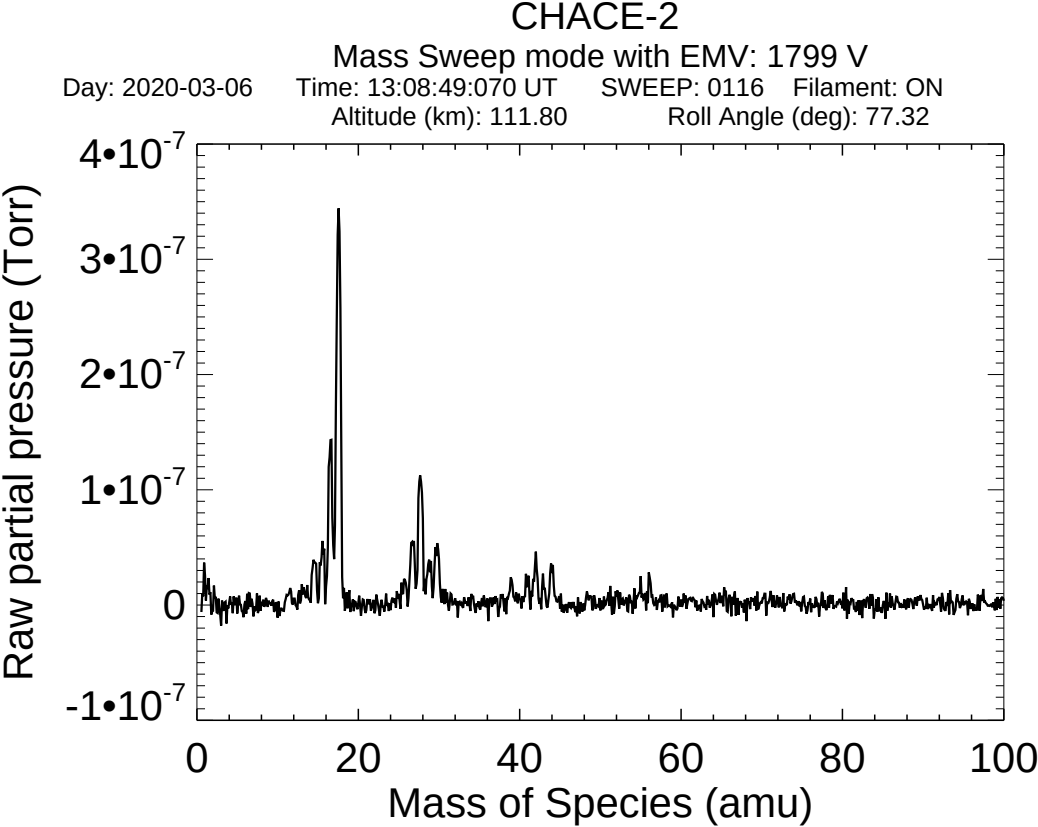

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:03:16:002 UT SWEEP: 0107 Filament: ON
Altitude (km): 111.59 Roll Angle (deg): 82.16
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

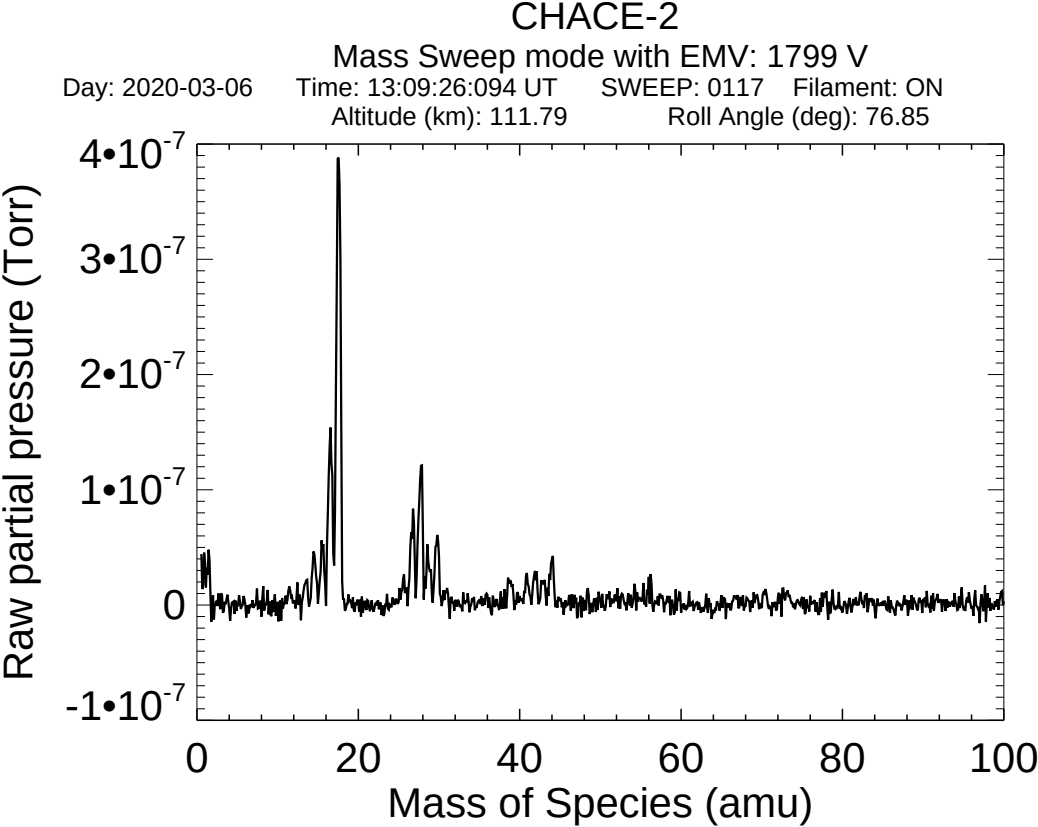

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 13:03:51:021 UT
SWEEP: 0108
Filament: ON
Altitude (km): 111.62
Roll Angle (deg): 81.61
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

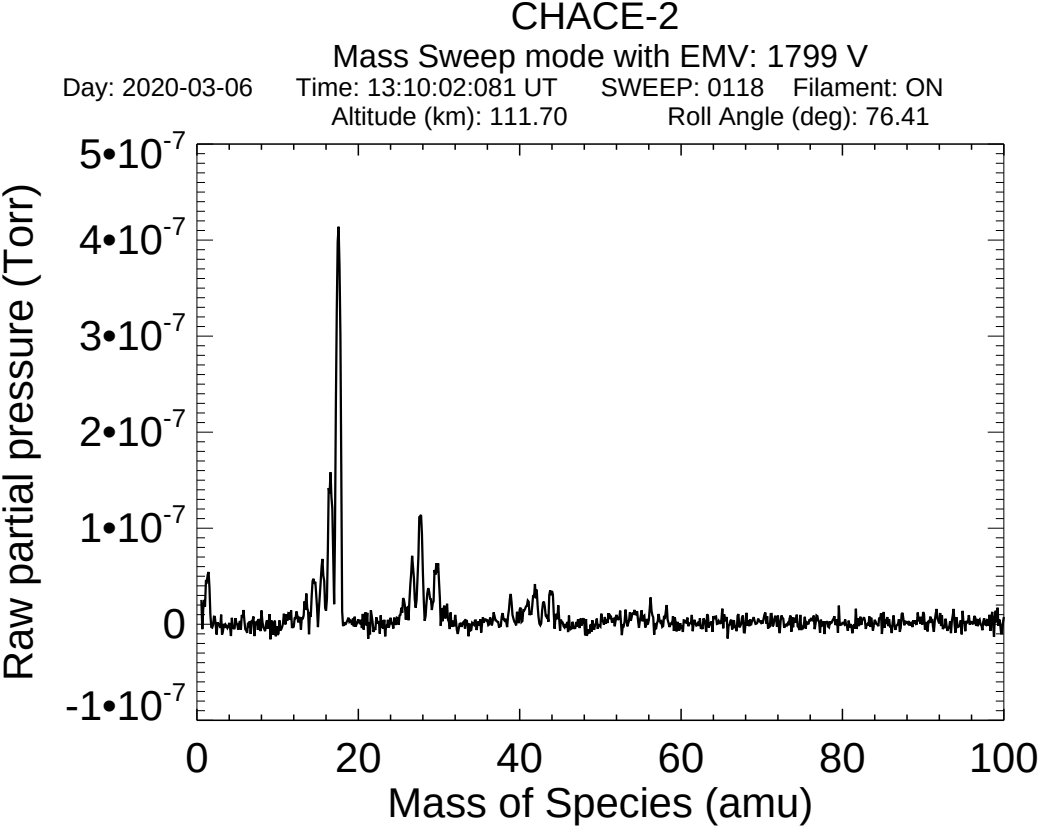

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:06:59:087 UT SWEEP: 0113 Filament: ON
Altitude (km): 111.78 Roll Angle (deg): 78.80
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

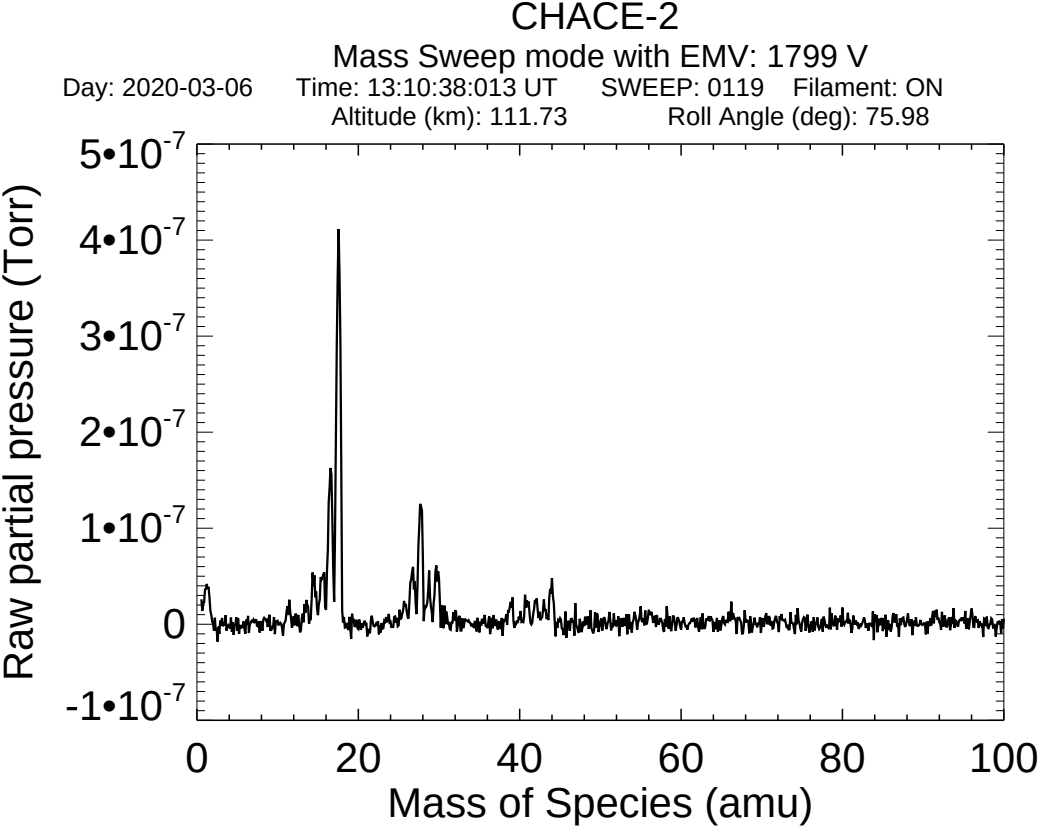

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:07:35:009 UT SWEEP: 0114 Filament: ON
Altitude (km): 111.82 Roll Angle (deg): 78.30
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

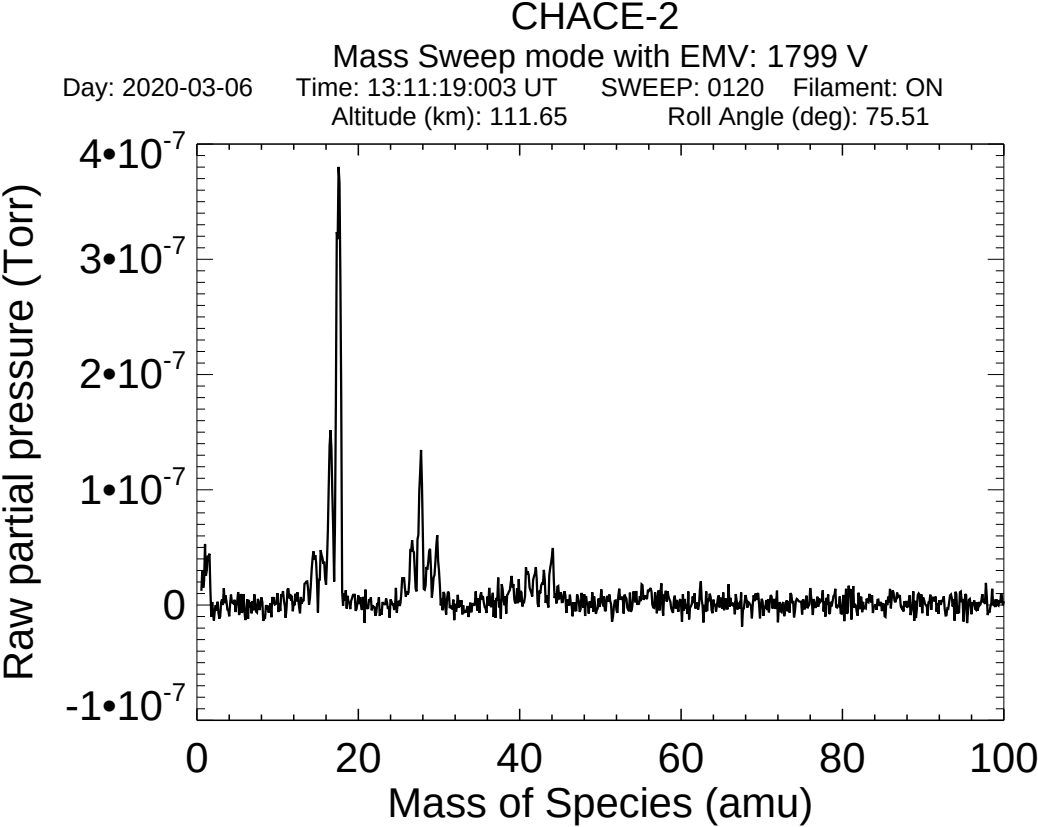

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:08:12:039 UT SWEEP: 0115 Filament: ON
Altitude (km): 111.81 Roll Angle (deg): 77.80
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

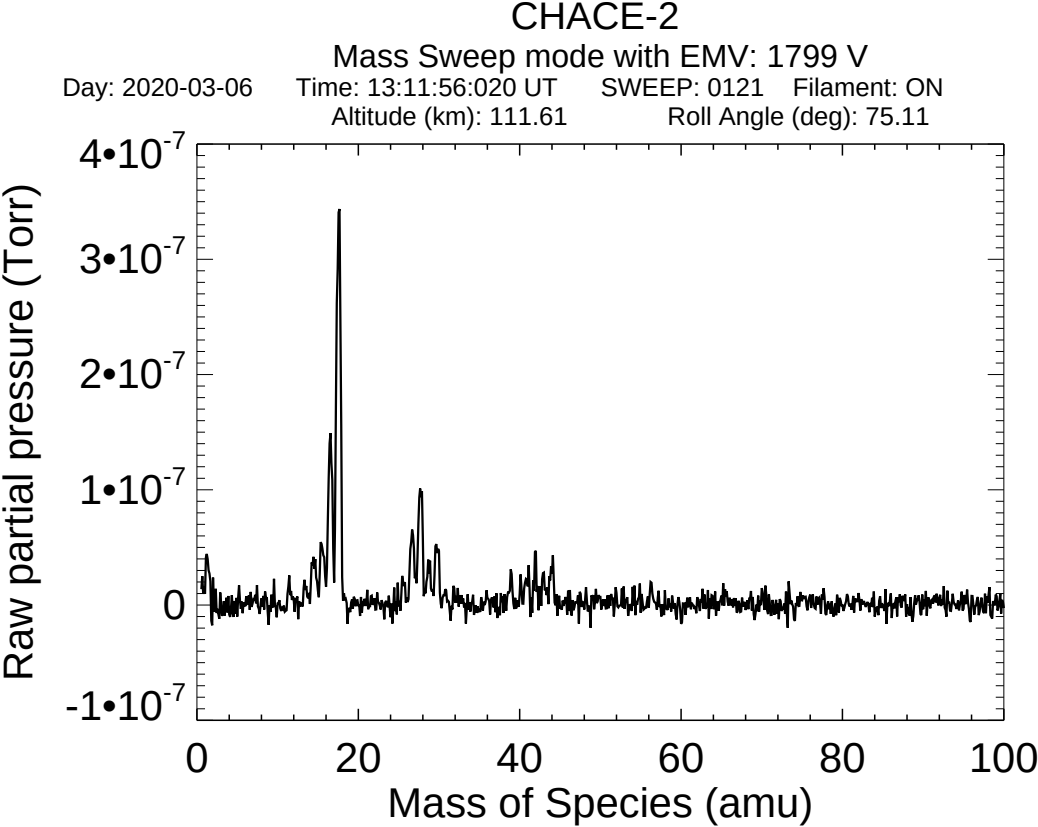

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:08:49:070 UT SWEEP: 0116 Filament: ON
Altitude (km): 111.80 Roll Angle (deg): 77.32
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

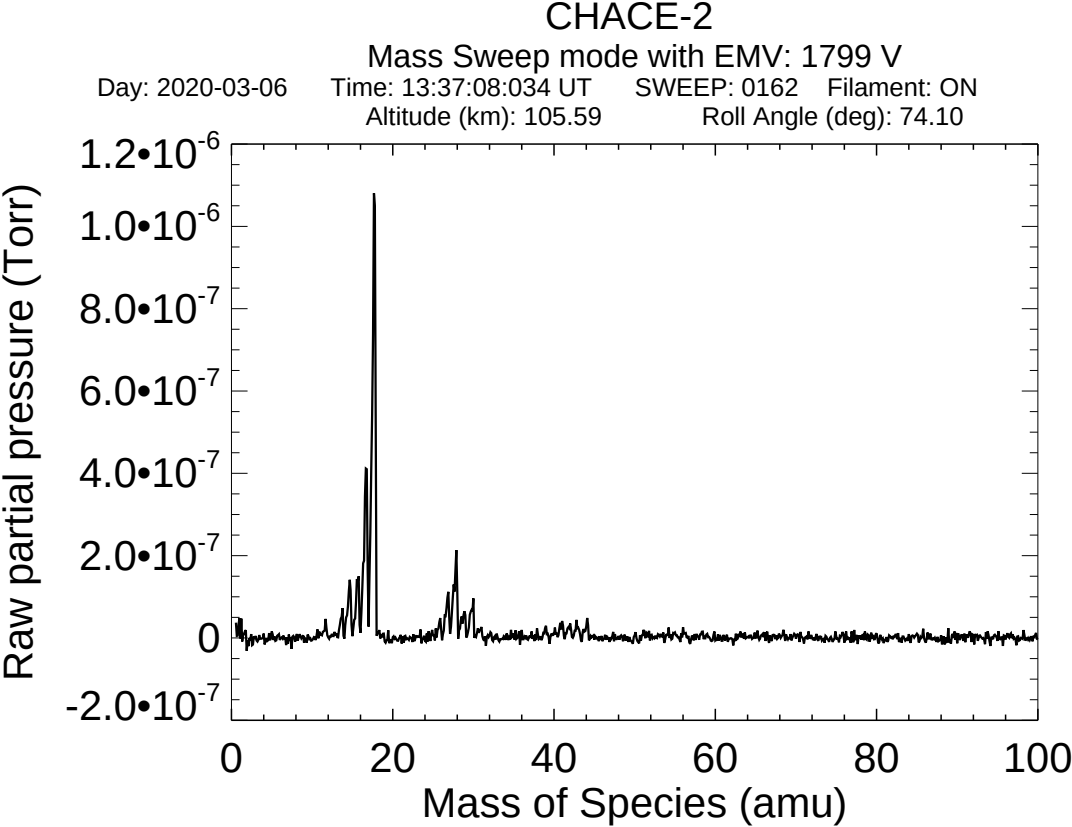

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:09:26:094 UT SWEEP: 0117 Filament: ON
Altitude (km): 111.79 Roll Angle (deg): 76.85
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

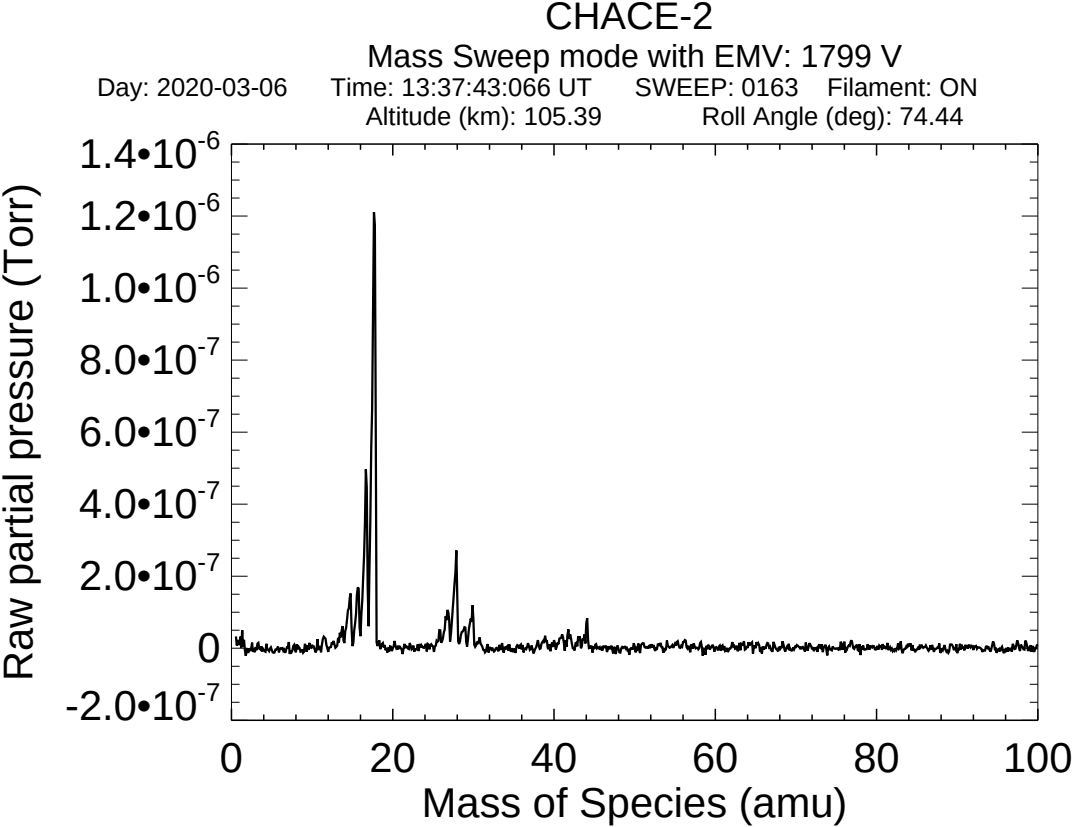

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:10:02:081 UT SWEEP: 0118 Filament: ON
Altitude (km): 111.70 Roll Angle (deg): 76.41
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

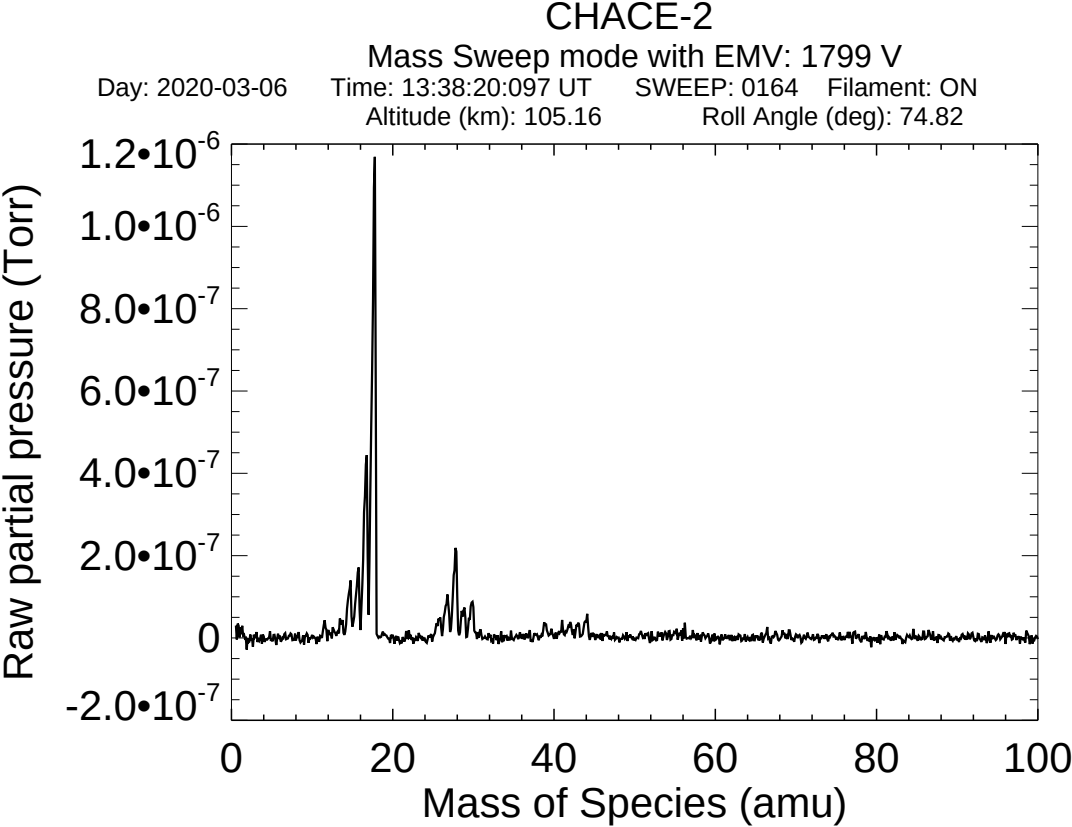

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:10:38:013 UT SWEEP: 0119 Filament: ON
Altitude (km): 111.73 Roll Angle (deg): 75.98
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

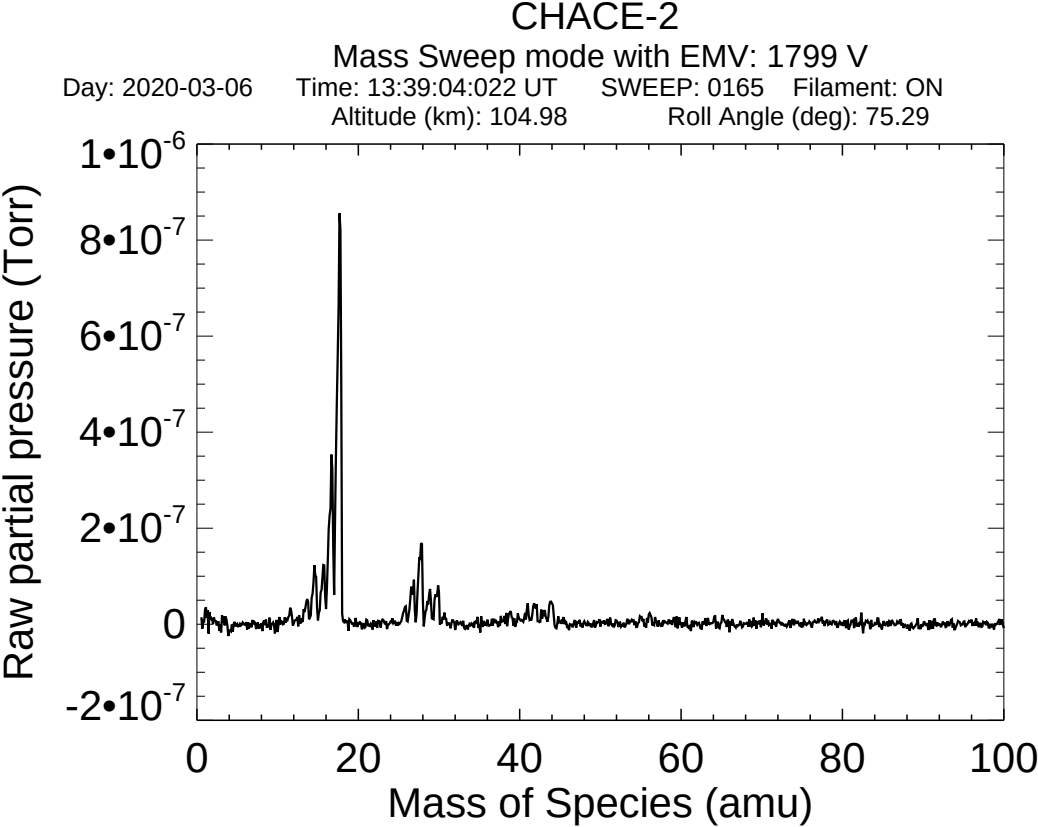

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:11:19:003 UT SWEEP: 0120 Filament: ON
Altitude (km): 111.65 Roll Angle (deg): 75.51
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

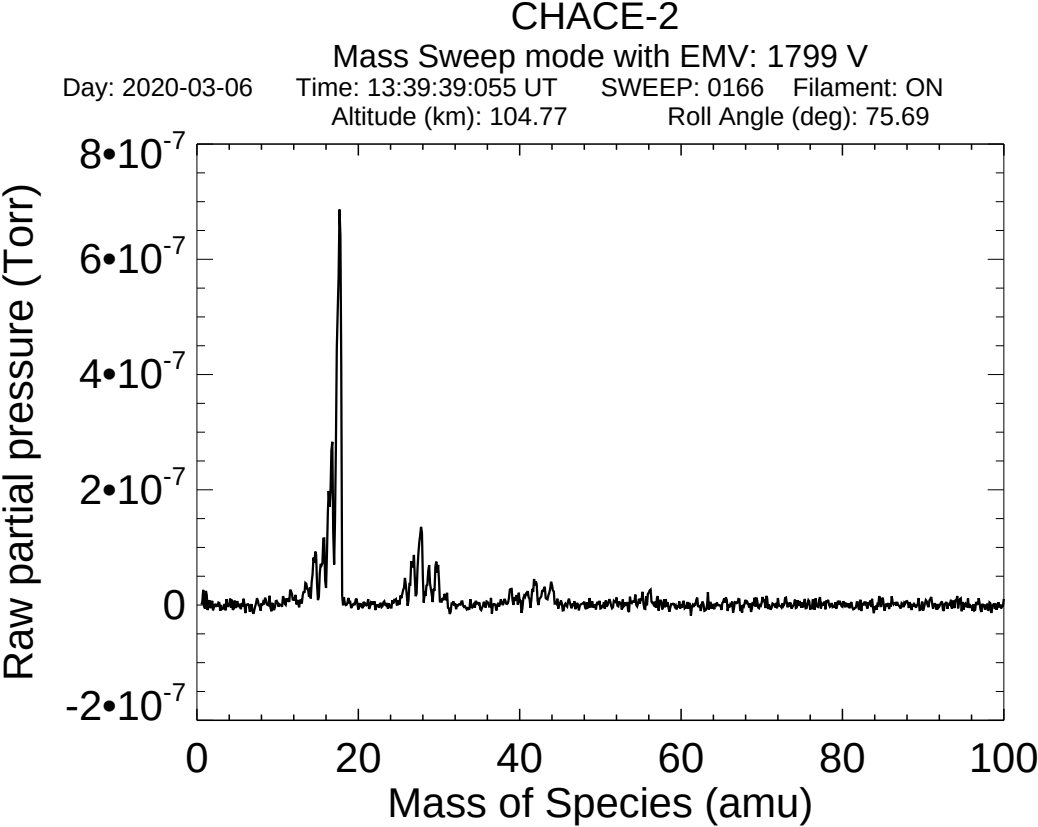

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:11:56:020 UT SWEEP: 0121 Filament: ON
Altitude (km): 111.61 Roll Angle (deg): 75.11
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

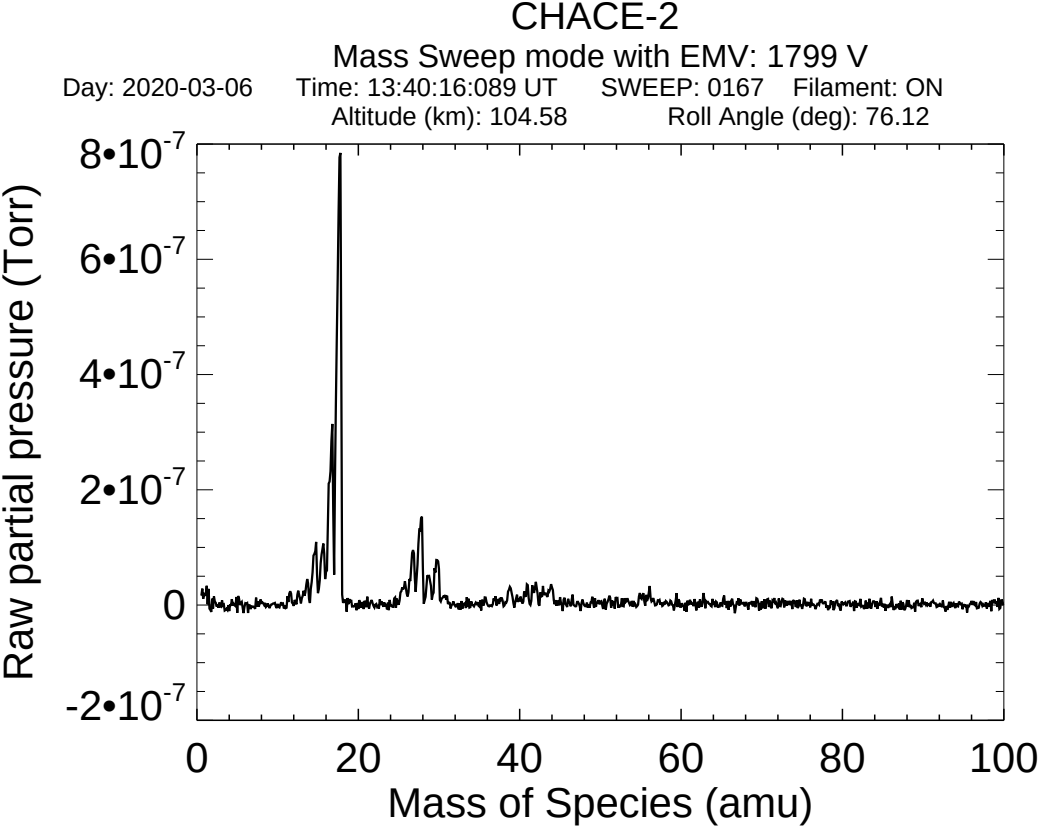

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:37:08:034 UT SWEEP: 0162 Filament: ON
Altitude (km): 105.59 Roll Angle (deg): 74.10
Raw partial pressure (Torr)
1.2•10-6
1.0•10-6
8.0•10-7
6.0•10-7
4.0•10-7
2.0•10-7
0
-2.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

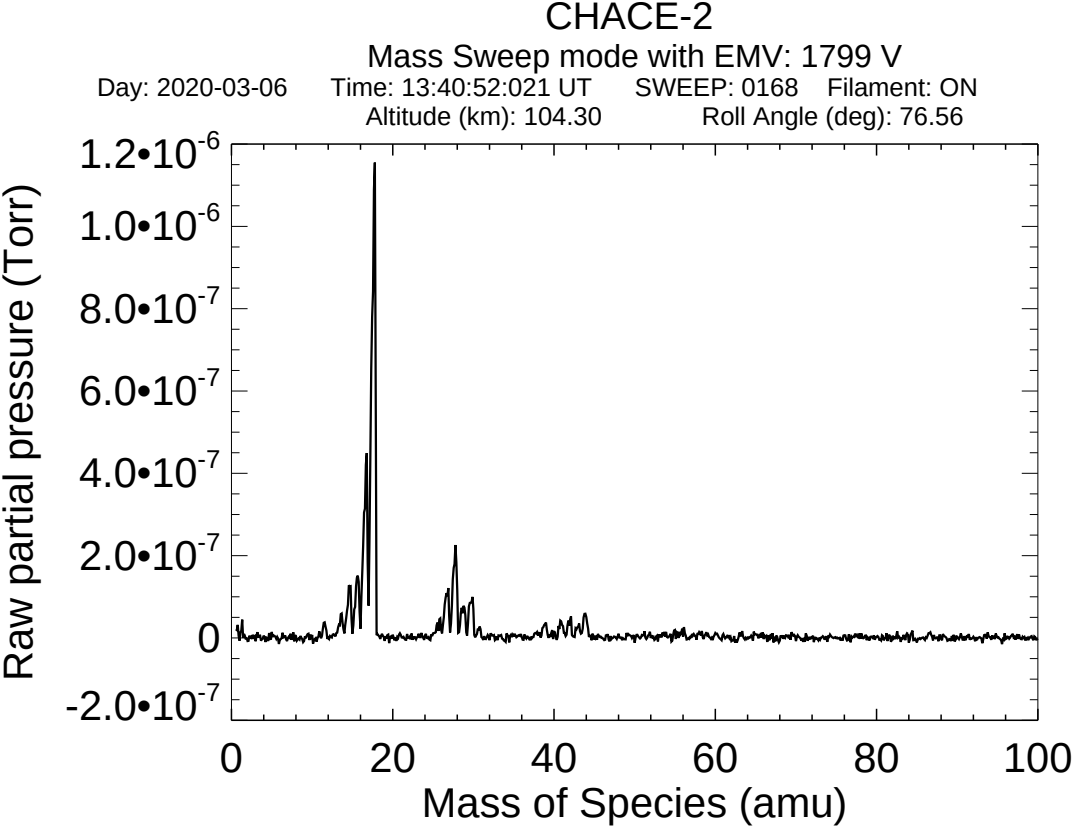

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:37:43:066 UT SWEEP: 0163 Filament: ON
Altitude (km): 105.39 Roll Angle (deg): 74.44
Raw partial pressure (Torr)
1.4•10-6
1.2•10-6
1.0•10-6
8.0•10-7
6.0•10-7
4.0•10-7
2.0•10-7
0
-2.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

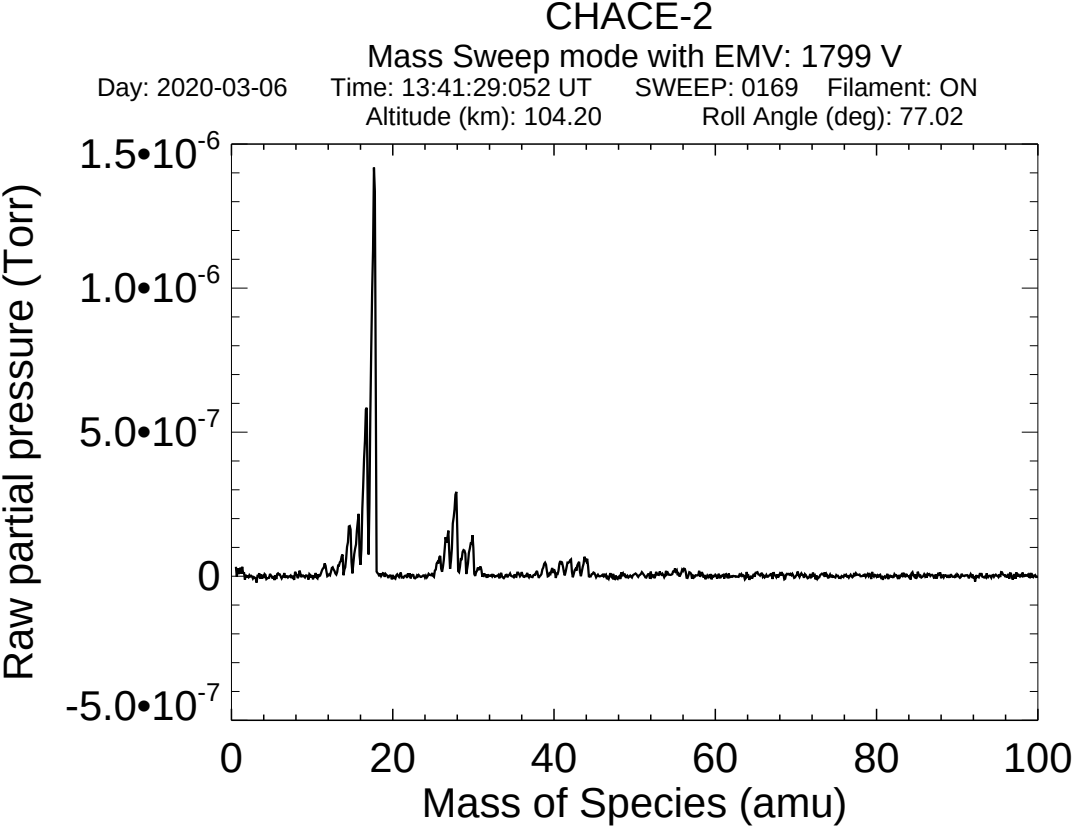

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:38:20:097 UT SWEEP: 0164 Filament: ON
Altitude (km): 105.16 Roll Angle (deg): 74.82
Raw partial pressure (Torr)
1.2•10-6
1.0•10-6
8.0•10-7
6.0•10-7
4.0•10-7
2.0•10-7
0
-2.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

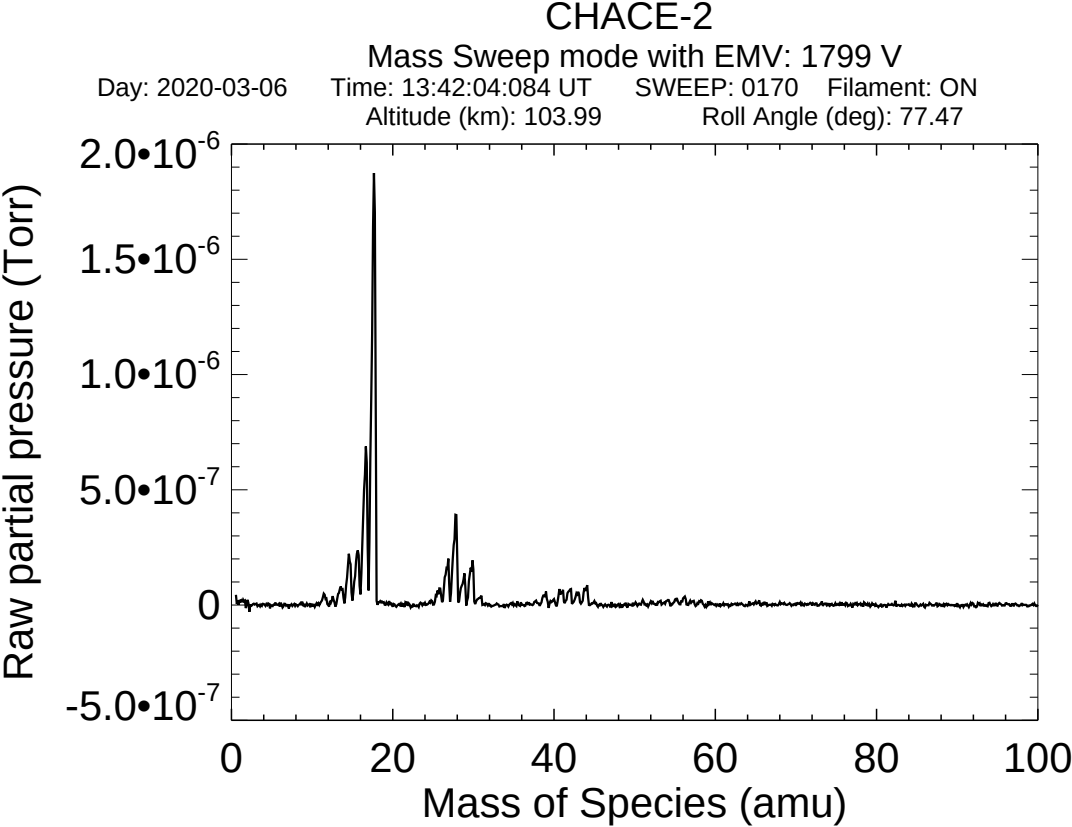

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:39:04:022 UT SWEEP: 0165 Filament: ON
Altitude (km): 104.98 Roll Angle (deg): 75.29
Raw partial pressure (Torr)
1•10-6
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

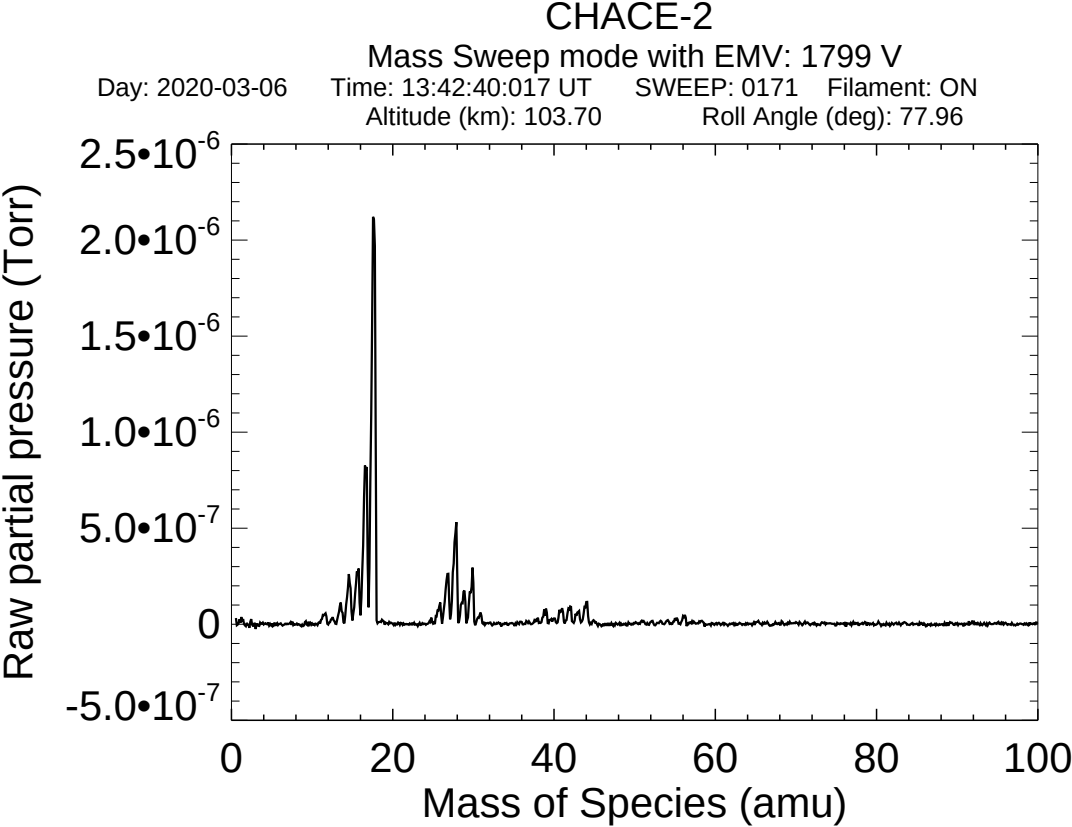

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:39:39:055 UT SWEEP: 0166 Filament: ON
Altitude (km): 104.77 Roll Angle (deg): 75.69
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

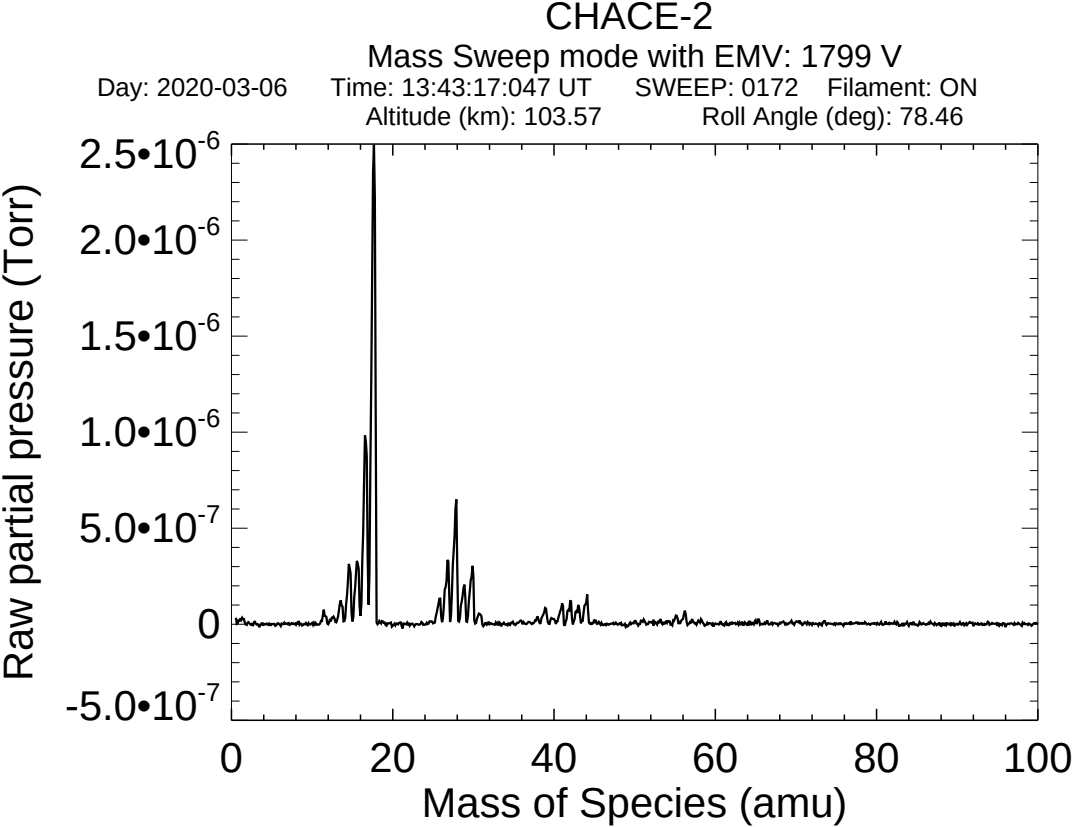

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:40:16:089 UT SWEEP: 0167 Filament: ON
Altitude (km): 104.58 Roll Angle (deg): 76.12
Raw partial pressure (Torr)
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

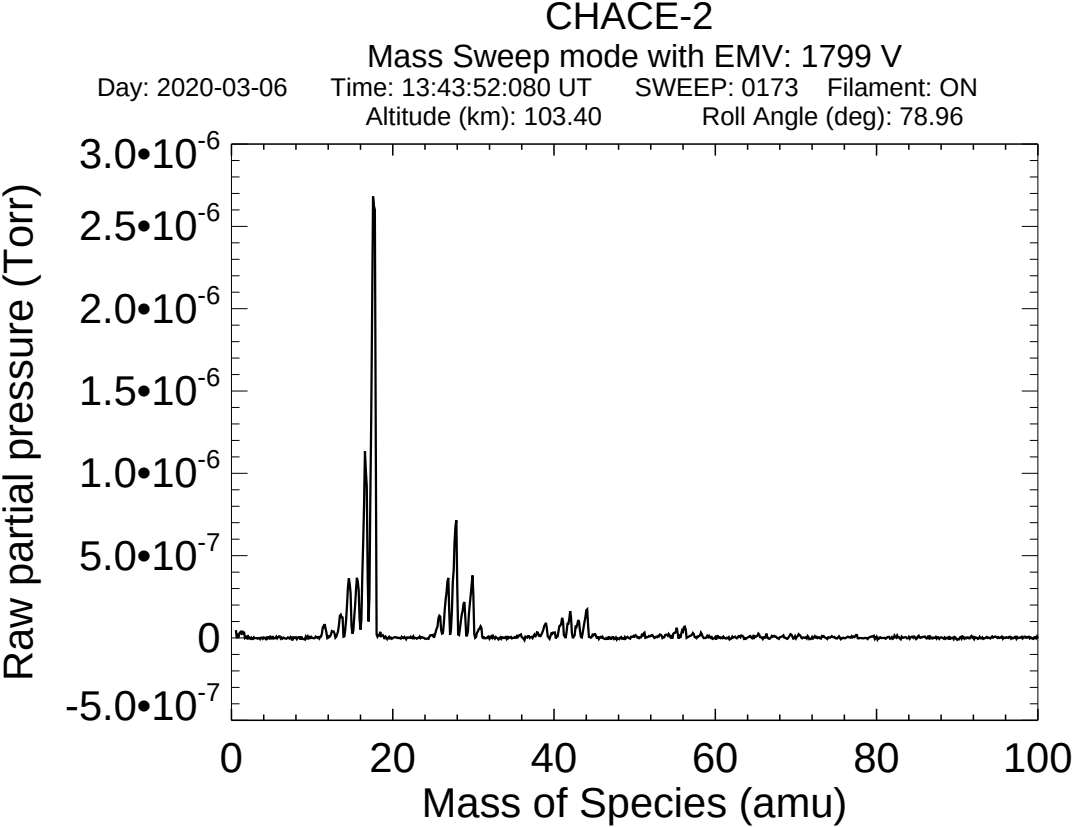

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:40:52:021 UT SWEEP: 0168 Filament: ON
Altitude (km): 104.30 Roll Angle (deg): 76.56
Raw partial pressure (Torr)
1.2•10-6
1.0•10-6
8.0•10-7
6.0•10-7
4.0•10-7
2.0•10-7
0
-2.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

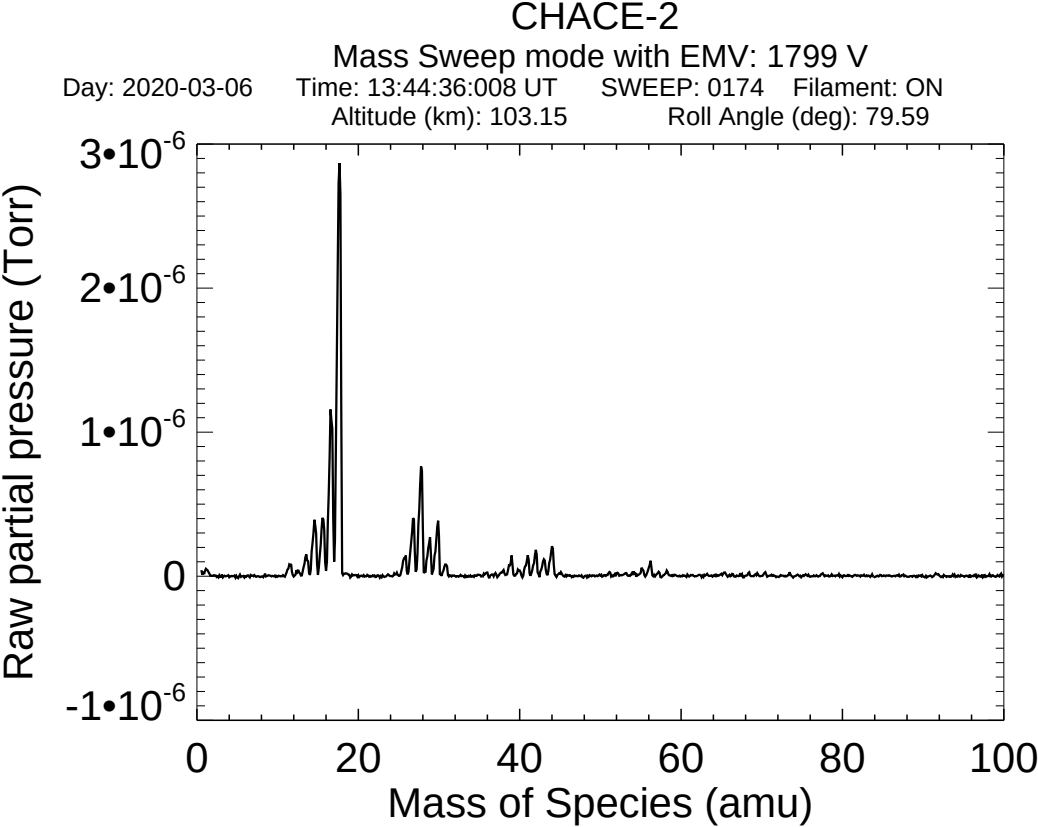

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:41:29:052 UT SWEEP: 0169 Filament: ON
Altitude (km): 104.20 Roll Angle (deg): 77.02
Raw partial pressure (Torr)
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

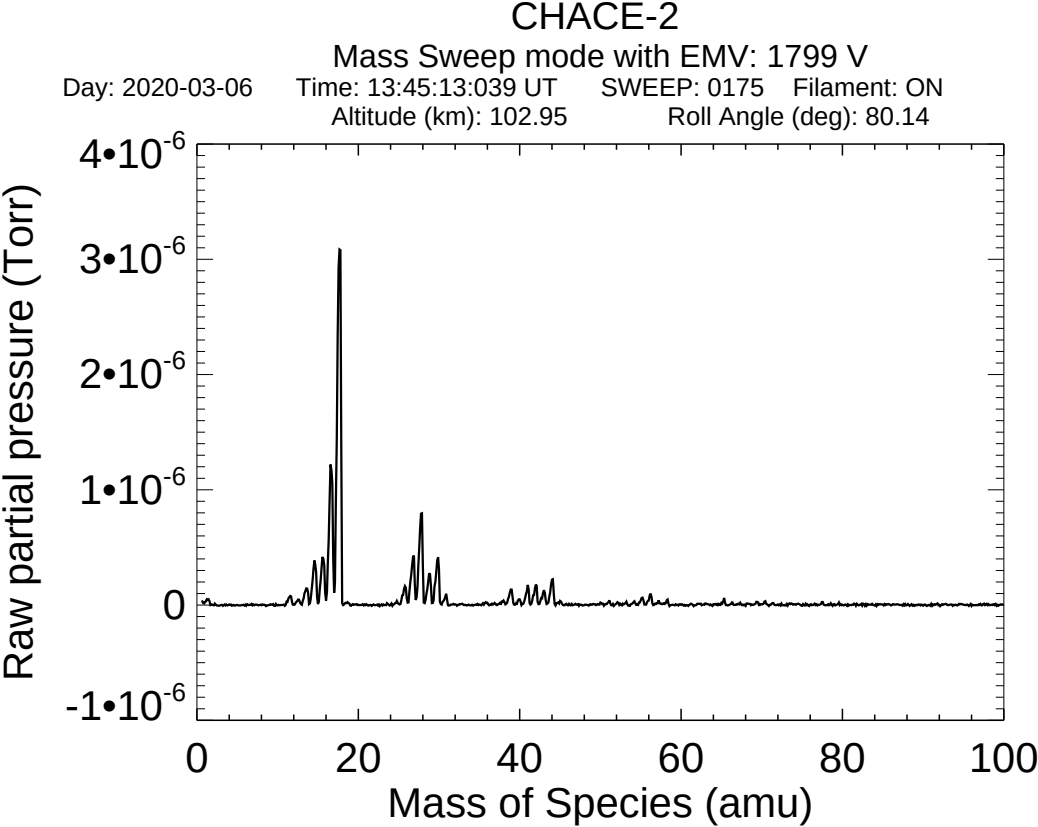

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 13:42:04:084 UT
SWEEP: 0170
Filament: ON
Altitude (km): 103.99
Roll Angle (deg): 77.47
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

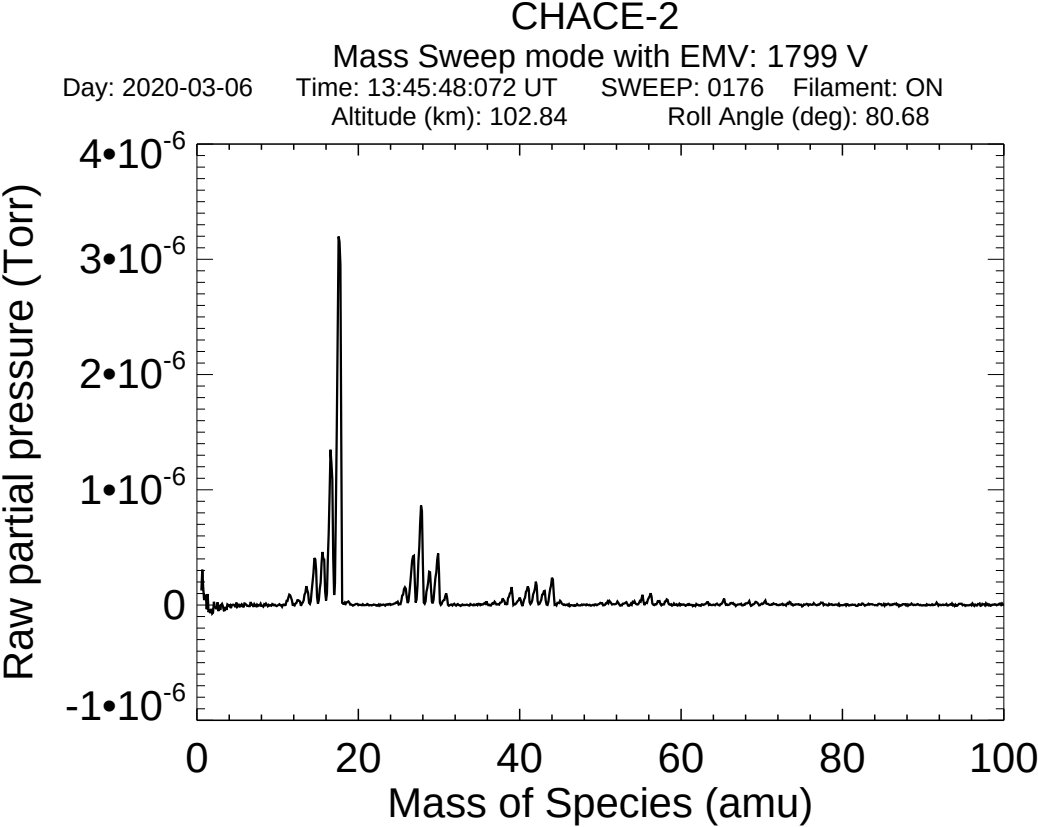

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:42:40:017 UT SWEEP: 0171 Filament: ON
Altitude (km): 103.70 Roll Angle (deg): 77.96
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

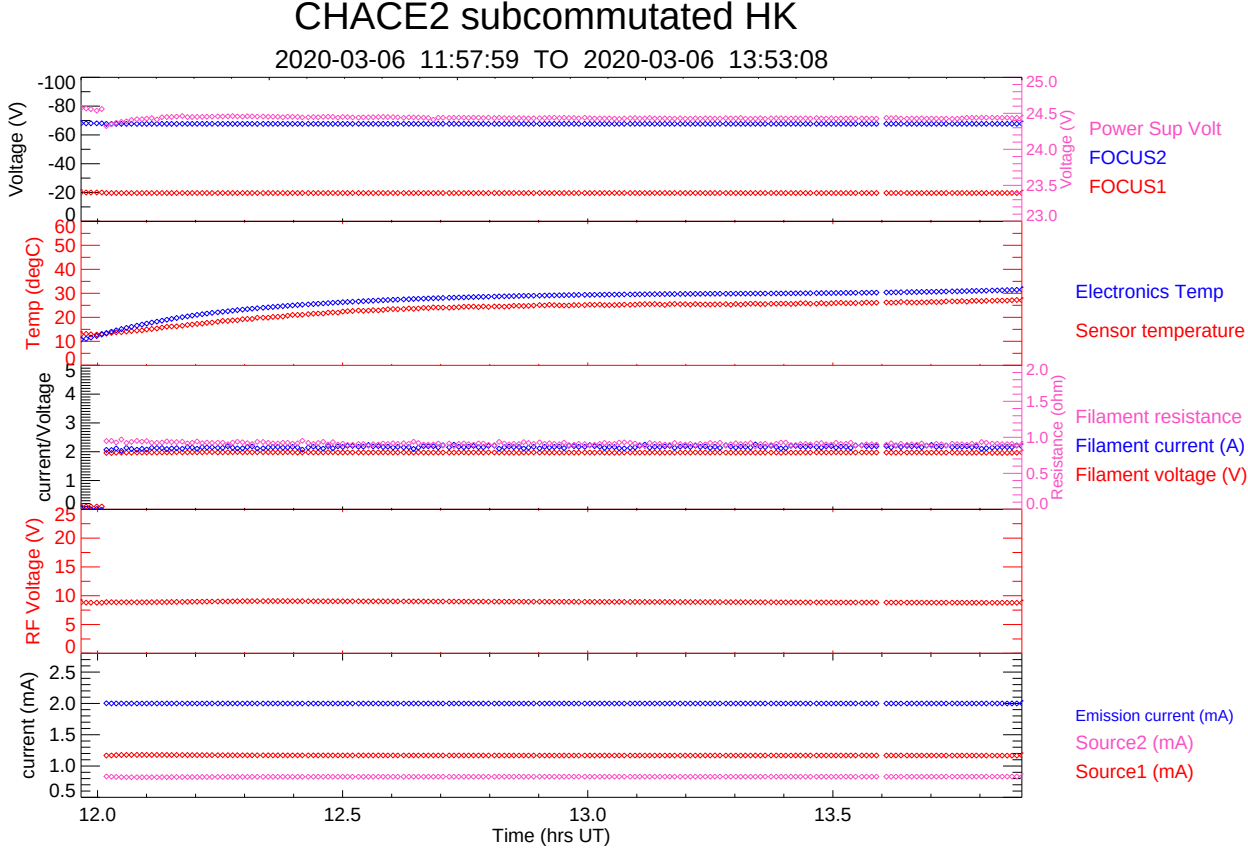

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 13:43:17:047 UT
SWEEP: 0172
Filament: ON
Altitude (km): 103.57
Roll Angle (deg): 78.46
Raw partial pressure (Torr)
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)


CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06
Time: 13:43:52:080 UT
SWEEP: 0173
Filament: ON
Altitude (km): 103.40
Roll Angle (deg): 78.96
Raw partial pressure (Torr)
3.0•10-6
2.5•10-6
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)


CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:44:36:008 UT SWEEP: 0174 Filament: ON
Altitude (km): 103.15 Roll Angle (deg): 79.59
3•10-6
2•10-6
1•10-6
0
-1•10-6
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

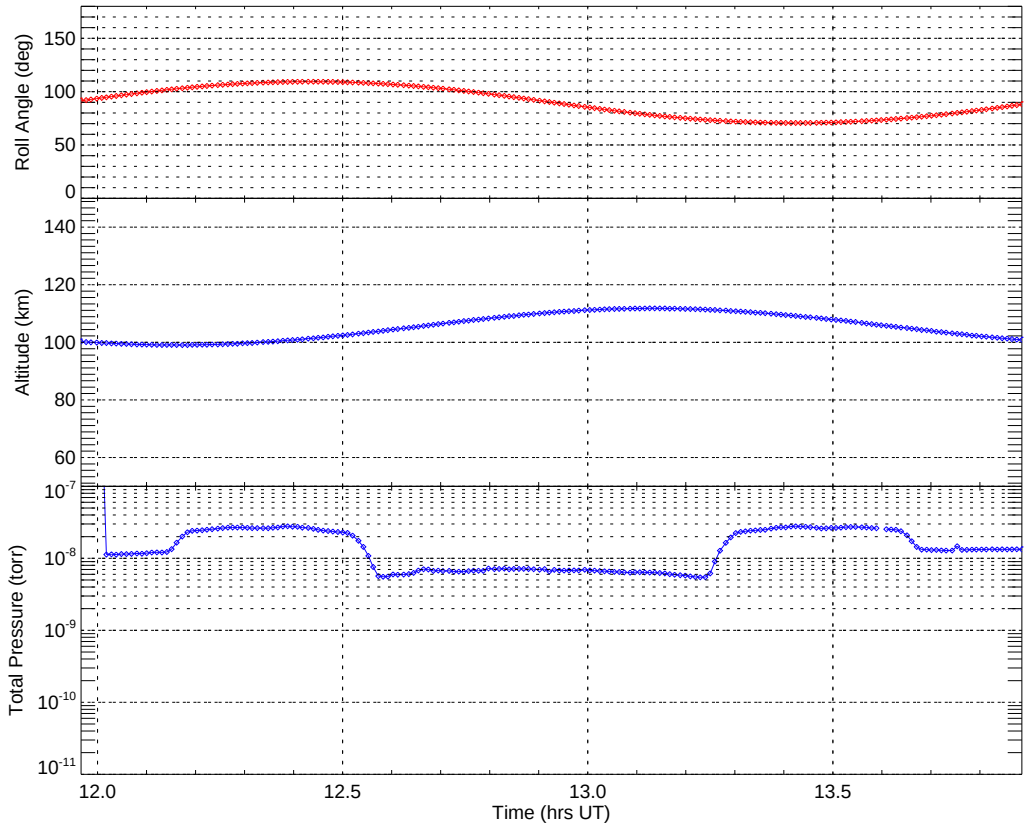

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:45:13:039 UT SWEEP: 0175 Filament: ON
Altitude (km): 102.95 Roll Angle (deg): 80.14
4•10-6
3•10-6
2•10-6
1•10-6
0
-1•10-6
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)


CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-03-06 Time: 13:45:48:072 UT SWEEP: 0176 Filament: ON
Altitude (km): 102.84 Roll Angle (deg): 80.68
4•10-6
3•10-6
2•10-6
1•10-6
0
-1•10-6
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)


CHACE2 subcommutated HK
2020-03-06 11:57:59 TO 2020-03-06 13:53:08
Voltage (V)
Voltage (V)
Power Sup Volt
FOCUS2
FOCUS1
Temp (degC)
Electronics Temp
Sensor temperature
current/Voltage
Resistance (ohm)
Filament resistance
Filament current (A)
Filament voltage (V)
RF Voltage (V)
current (mA)
Emission current (mA)
Source2 (mA)
Source1 (mA)
Time (hrs UT)

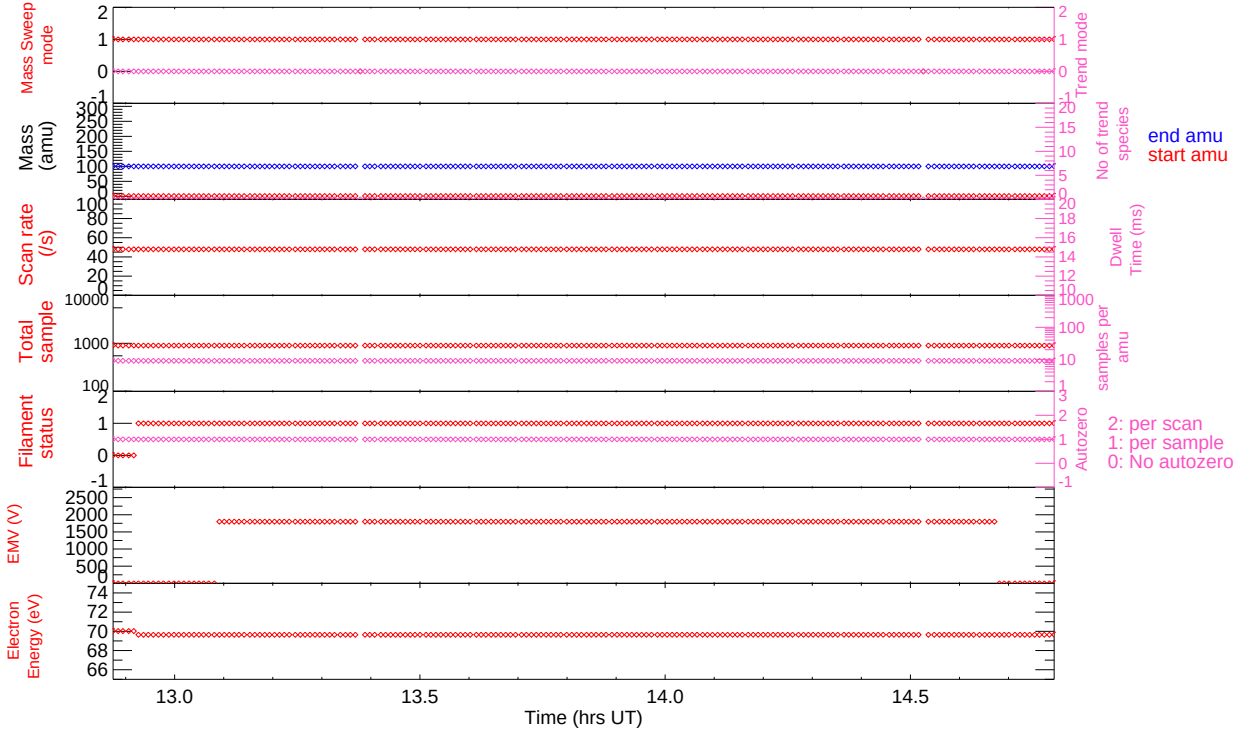
CHACE2: 2020-03-06 11:57:59 UT TO 2020-03-06 13:53:08 UT

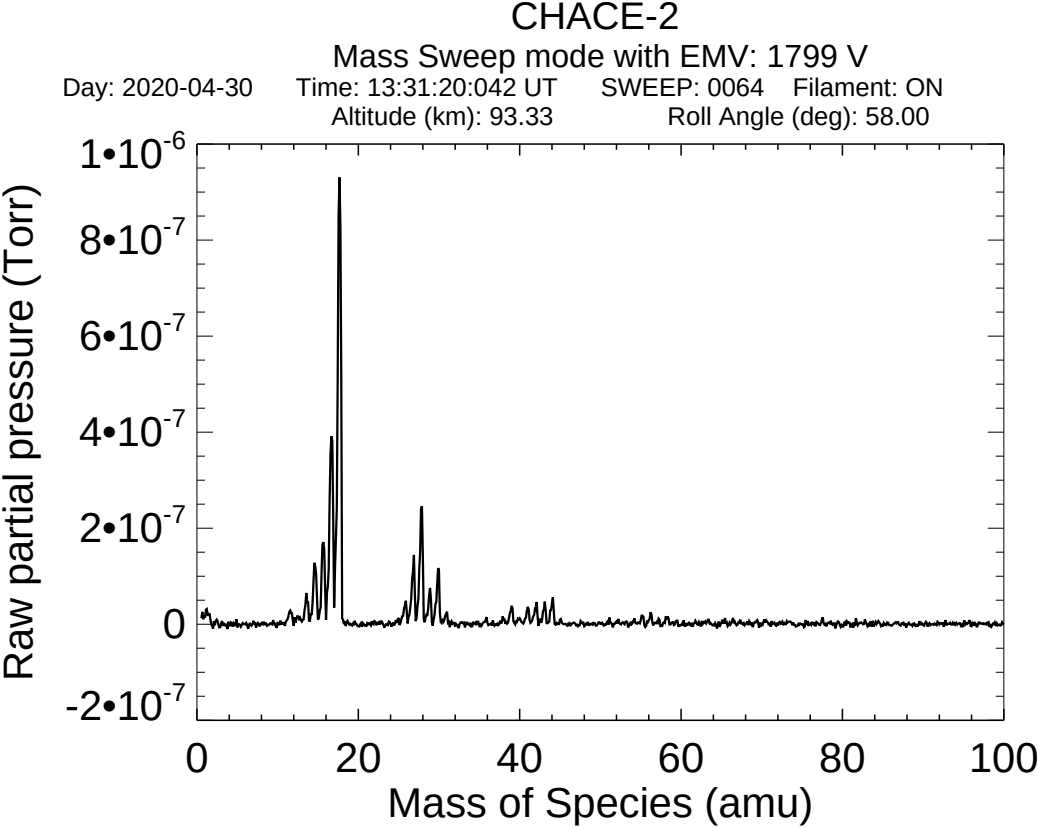
No ECLIPSE

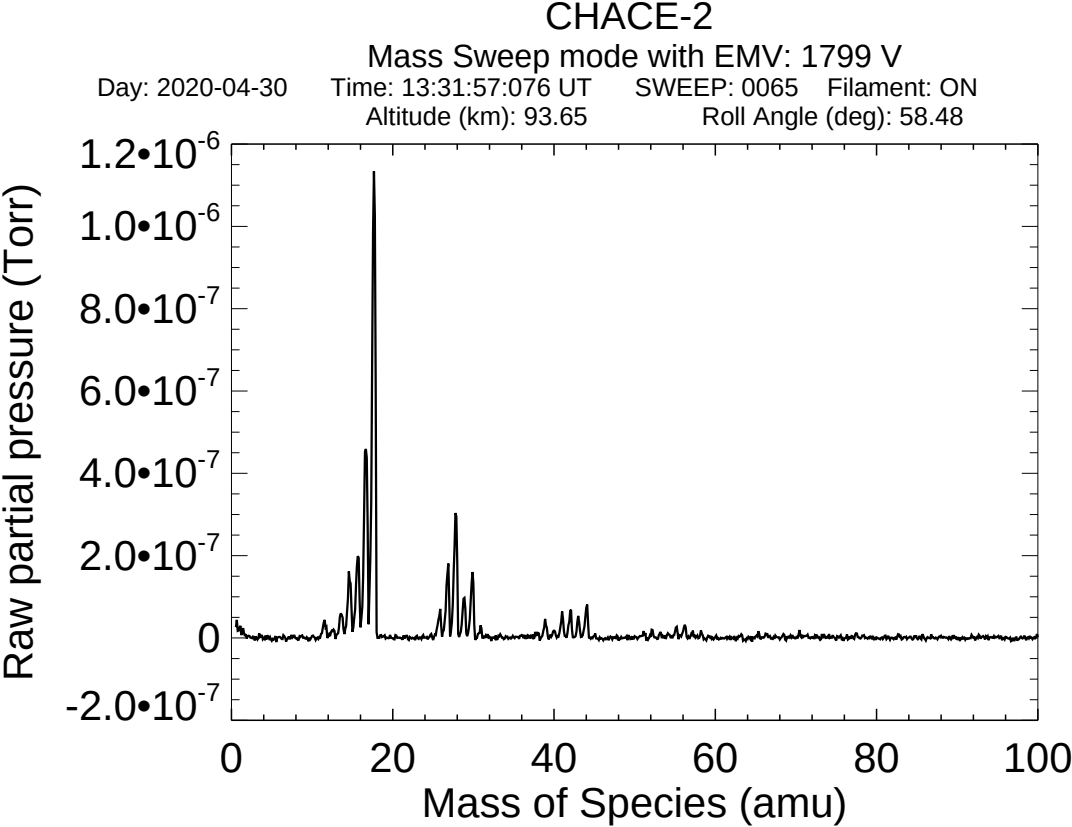


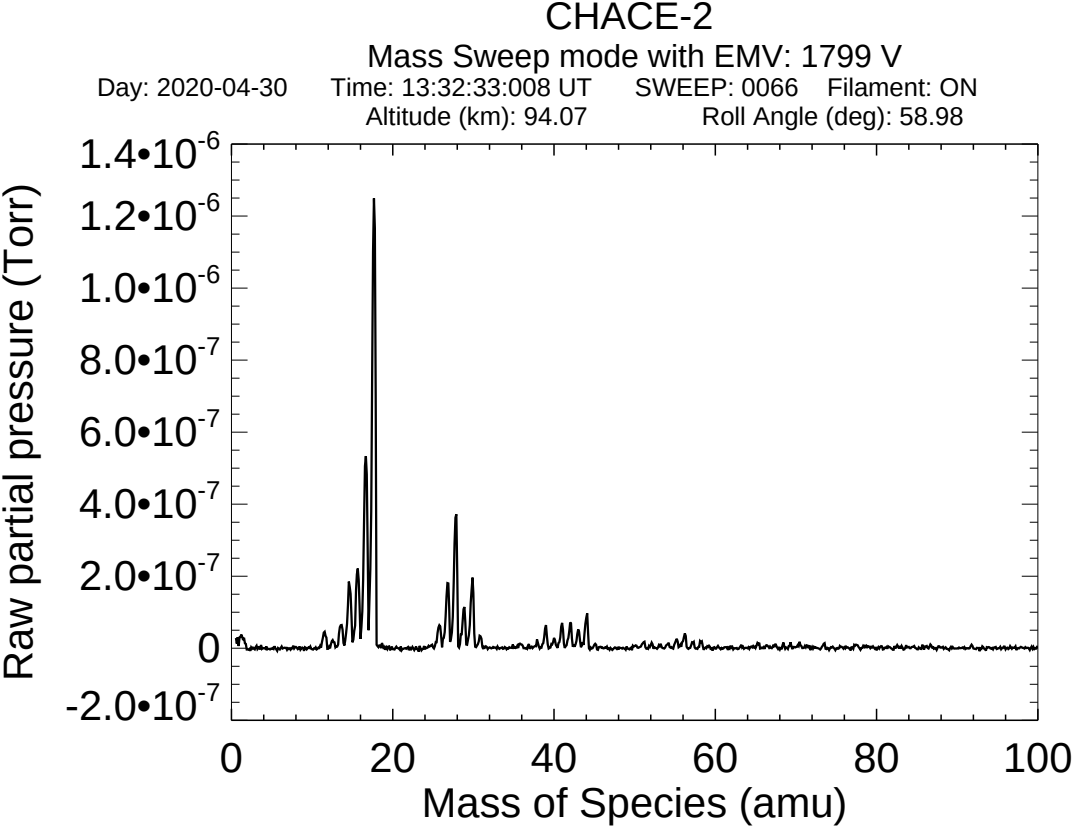
CHACE2 Operating parameters

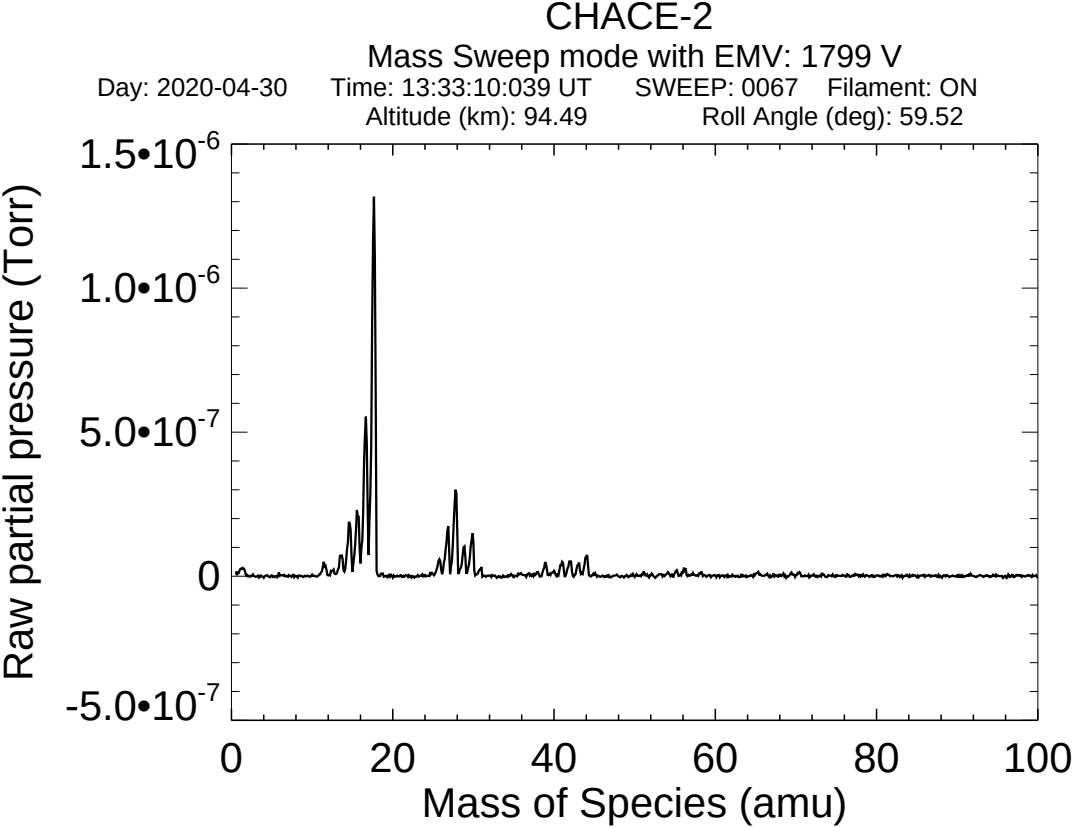
2020-04-30 12:52:28 TO 2020-04-30 14:47:35

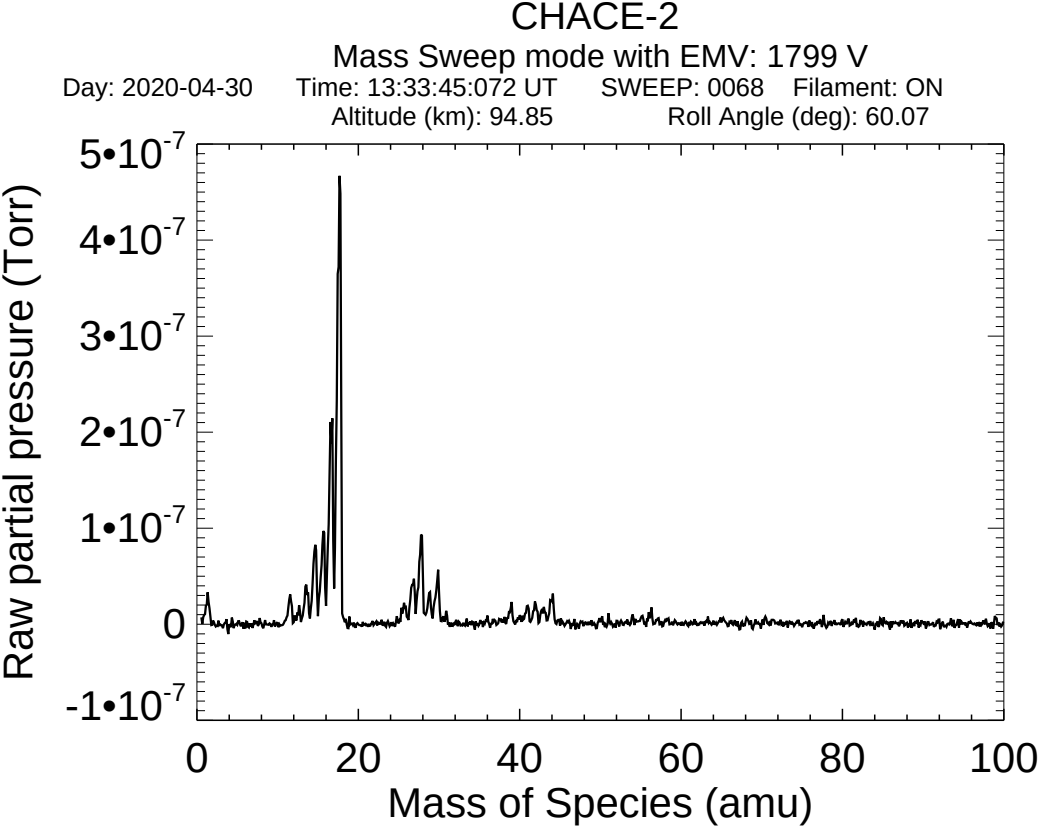


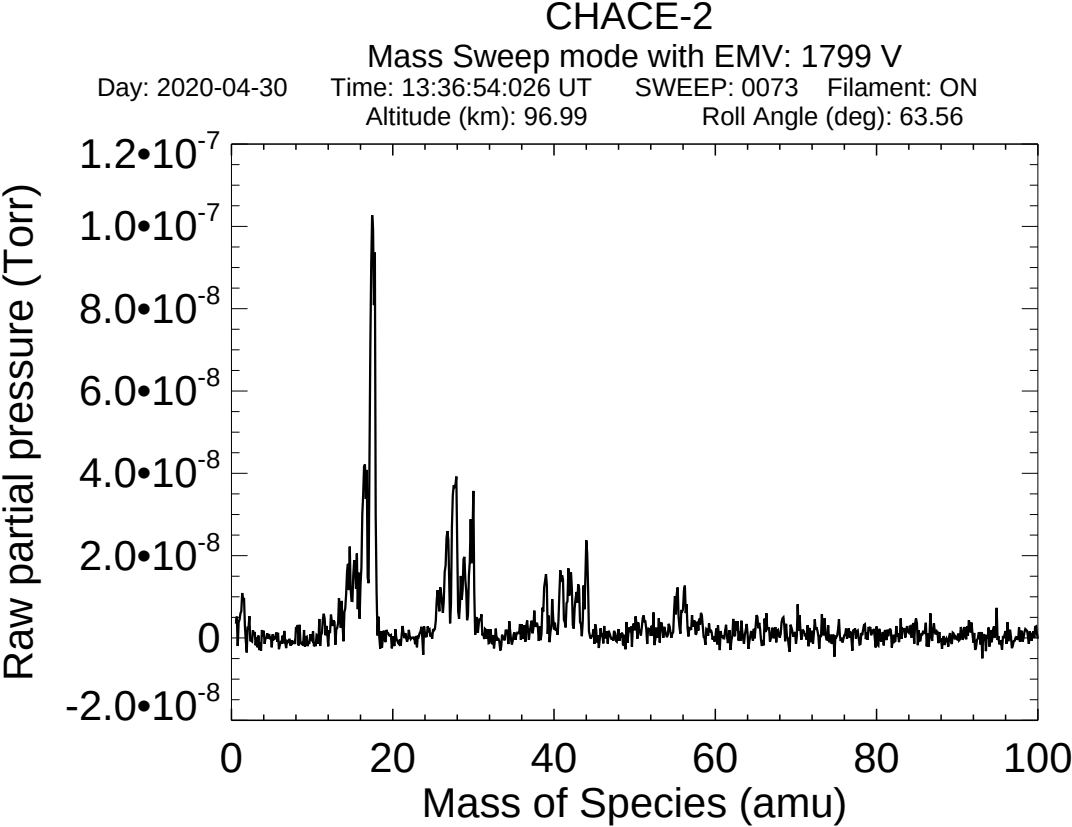

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:31:20:042 UT SWEEP: 0064 Filament: ON
Altitude (km): 93.33 Roll Angle (deg): 58.00
Raw partial pressure (Torr)
1•10-6
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

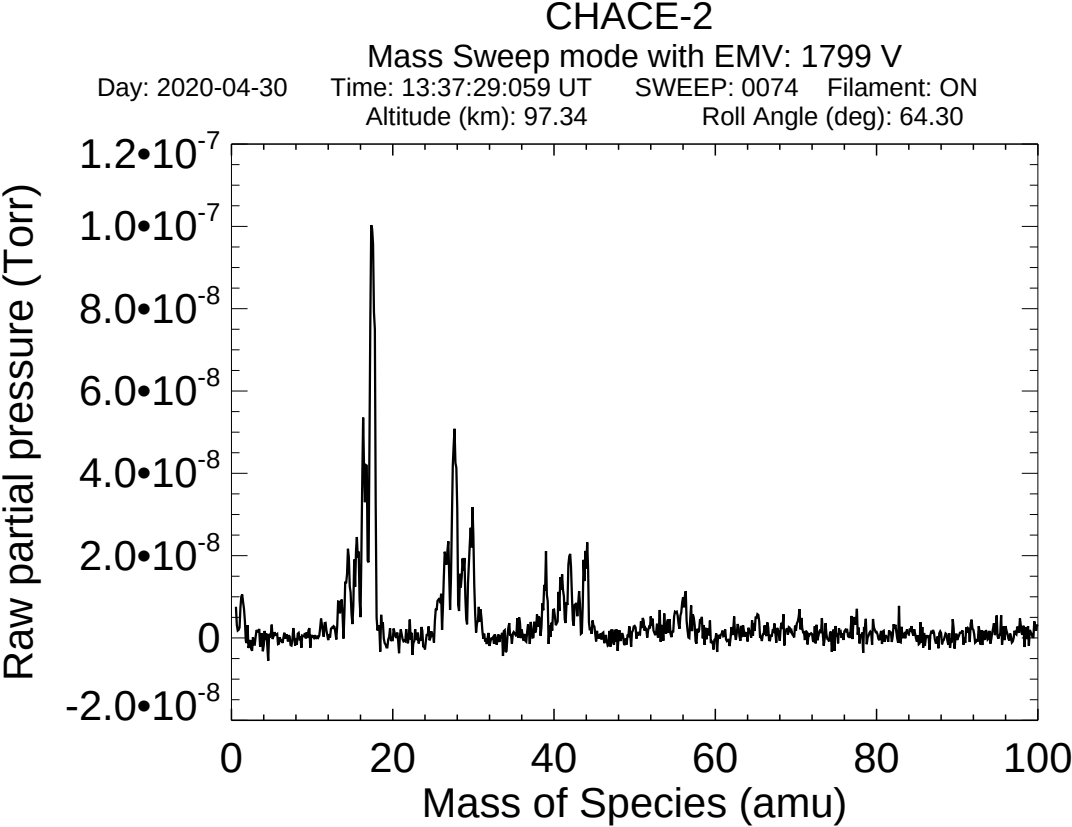

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:31:57:076 UT SWEEP: 0065 Filament: ON
Altitude (km): 93.65 Roll Angle (deg): 58.48
Raw partial pressure (Torr)
1.2•10-6
1.0•10-6
8.0•10-7
6.0•10-7
4.0•10-7
2.0•10-7
0
-2.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

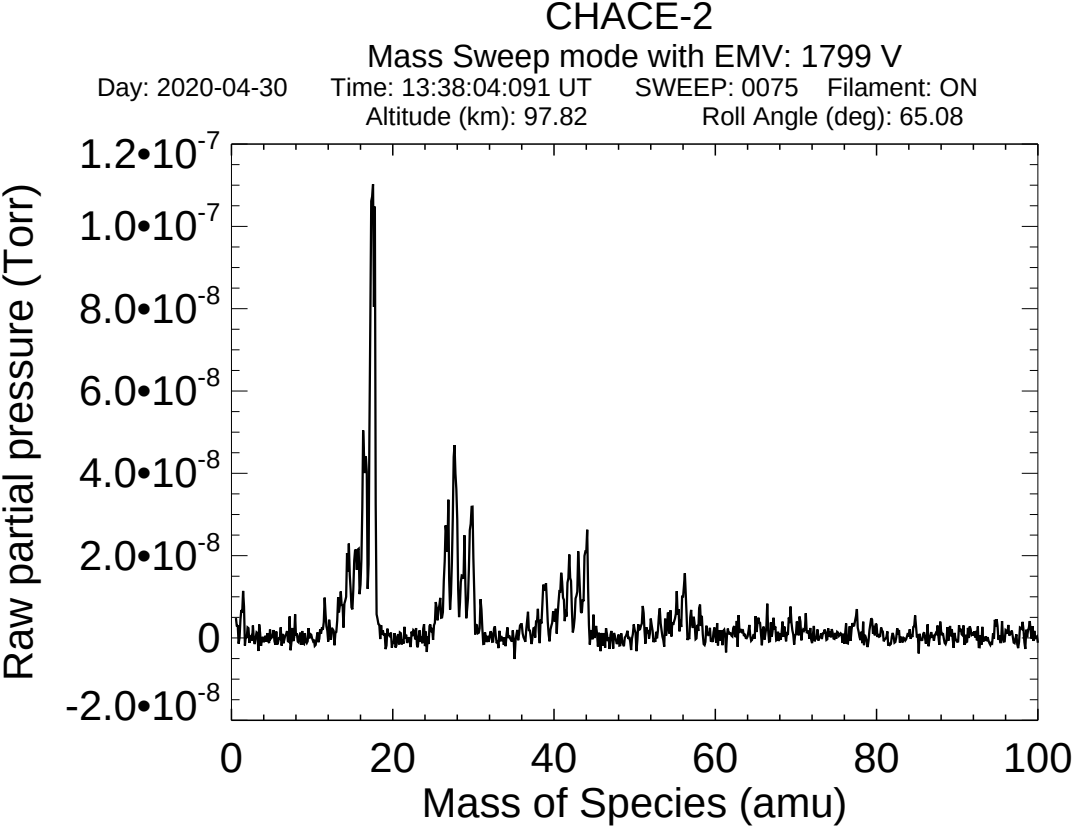

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30
Time: 13:32:33:008 UT
SWEEP: 0066
Filament: ON
Altitude (km): 94.07
Roll Angle (deg): 58.98
Raw partial pressure (Torr)
1.4•10-6
1.2•10-6
1.0•10-6
8.0•10-7
6.0•10-7
4.0•10-7
2.0•10-7
0
-2.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

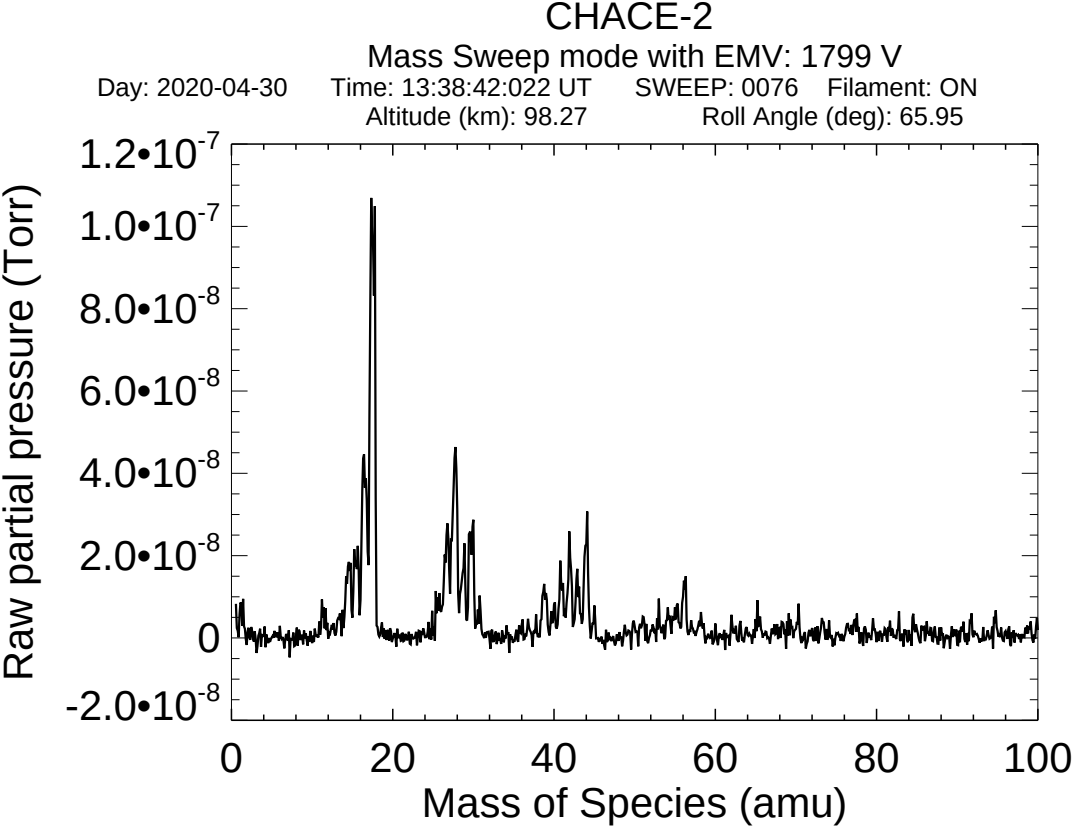

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30
Time: 13:33:10:039 UT
SWEEP: 0067
Filament: ON
Altitude (km): 94.49
Roll Angle (deg): 59.52
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

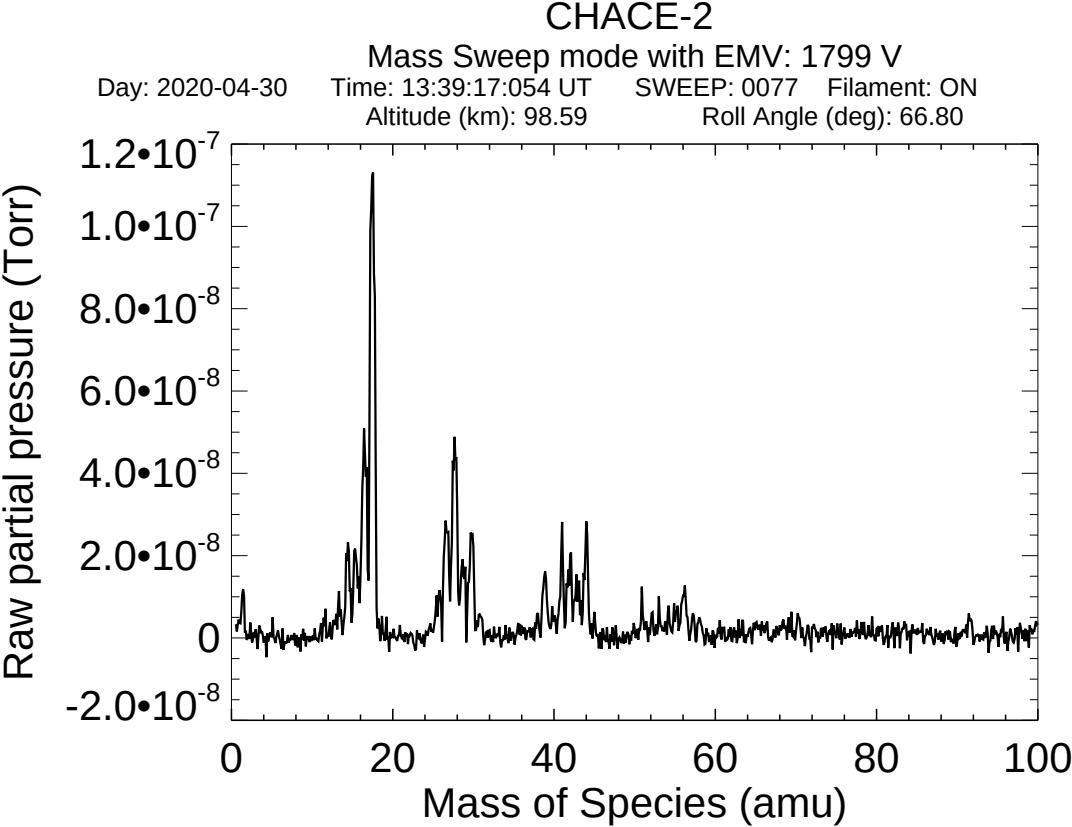

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:33:45:072 UT SWEEP: 0068 Filament: ON
Altitude (km): 94.85 Roll Angle (deg): 60.07
Raw partial pressure (Torr)
5•10-7
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

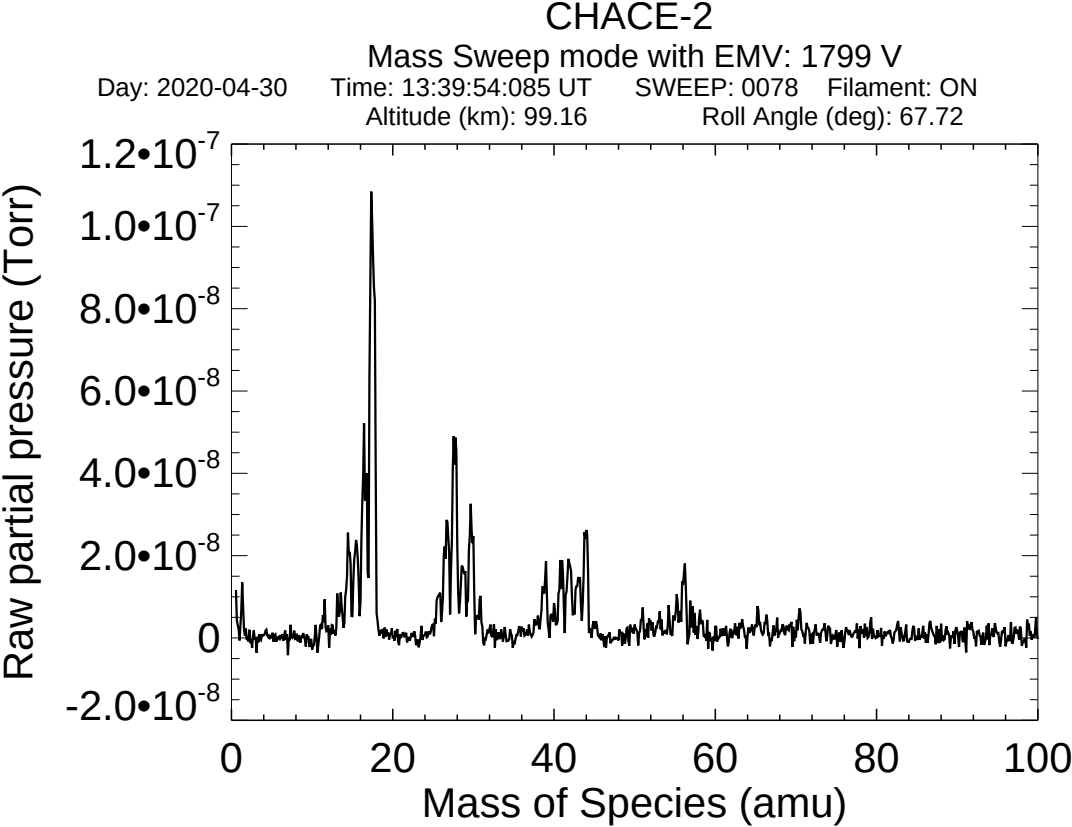

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:36:54:026 UT SWEEP: 0073 Filament: ON
Altitude (km): 96.99 Roll Angle (deg): 63.56
Raw partial pressure (Torr)
1.2•10-7
1.0•10-7
8.0•10-8
6.0•10-8
4.0•10-8
2.0•10-8
0
-2.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

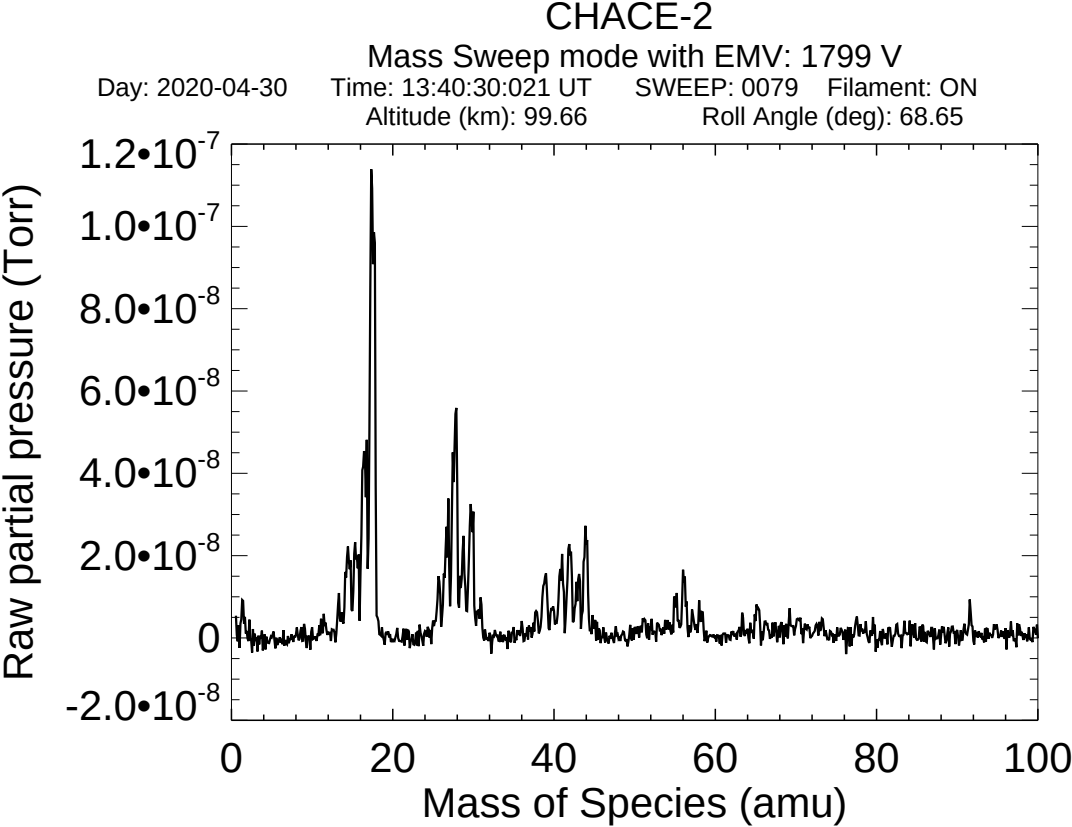

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:37:29:059 UT SWEEP: 0074 Filament: ON
Altitude (km): 97.34 Roll Angle (deg): 64.30
Raw partial pressure (Torr)
1.2•10-7
1.0•10-7
8.0•10-8
6.0•10-8
4.0•10-8
2.0•10-8
0
-2.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

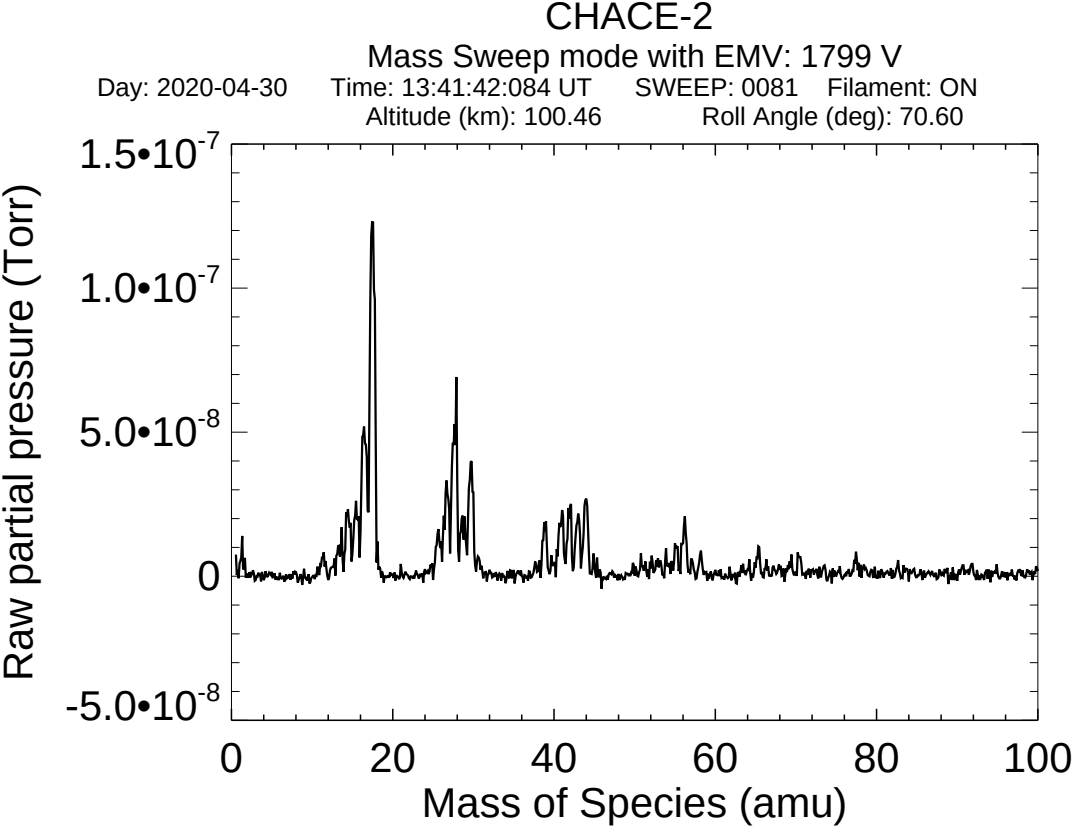

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:38:04:091 UT SWEEP: 0075 Filament: ON
Altitude (km): 97.82 Roll Angle (deg): 65.08
Raw partial pressure (Torr)
1.2•10-7
1.0•10-7
8.0•10-8
6.0•10-8
4.0•10-8
2.0•10-8
0
-2.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

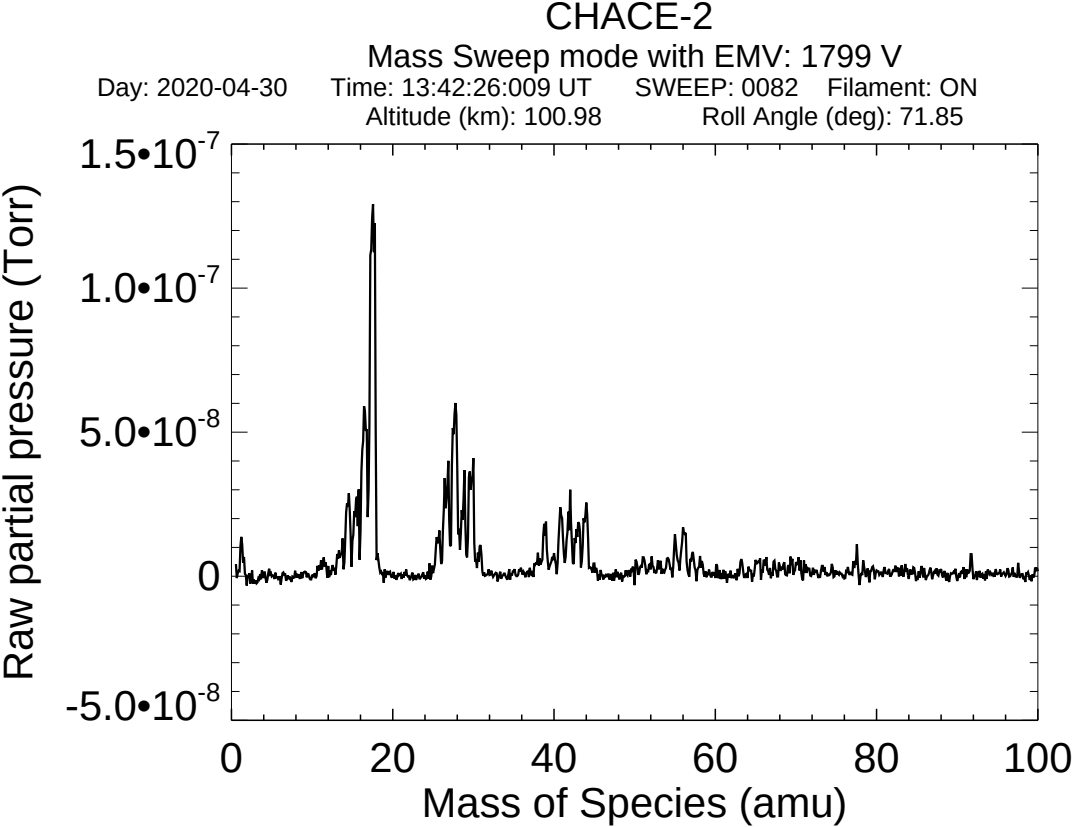

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30
Time: 13:38:42:022 UT
SWEEP: 0076
Filament: ON
Altitude (km): 98.27
Roll Angle (deg): 65.95
Raw partial pressure (Torr)
1.2•10-7
1.0•10-7
8.0•10-8
6.0•10-8
4.0•10-8
2.0•10-8
0
-2.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

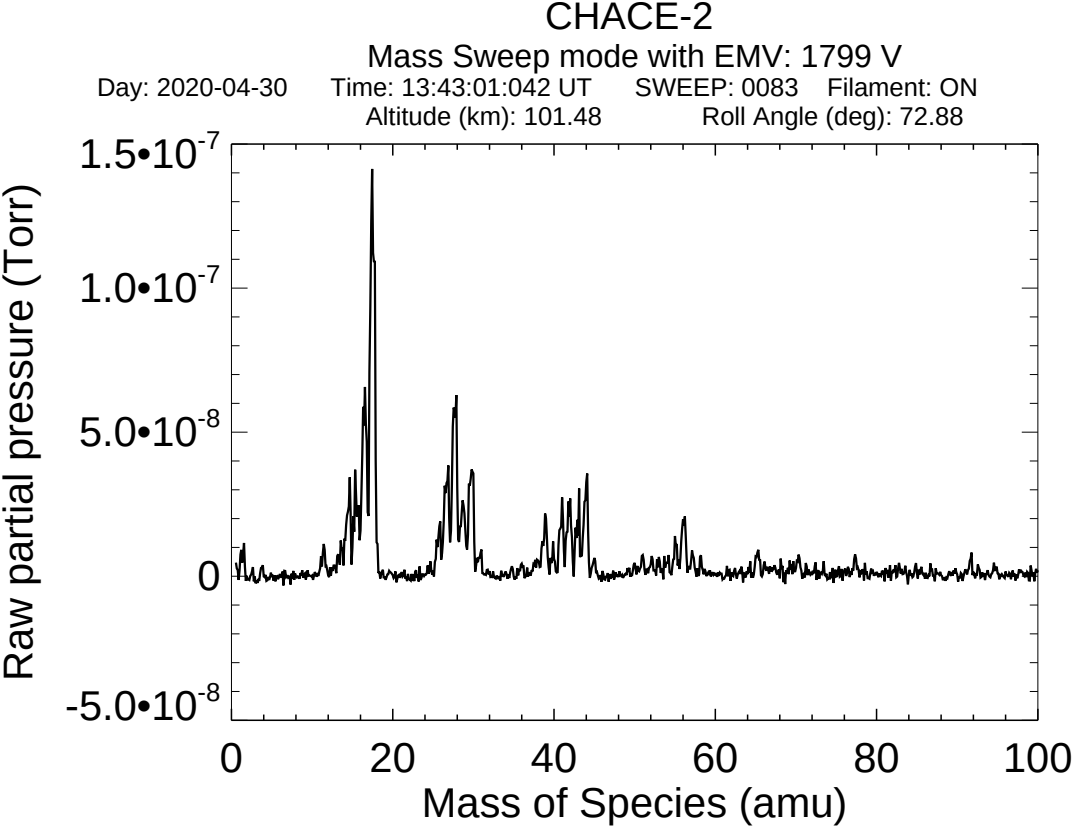

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:39:17:054 UT SWEEP: 0077 Filament: ON
Altitude (km): 98.59 Roll Angle (deg): 66.80
Raw partial pressure (Torr)
1.2•10-7
1.0•10-7
8.0•10-8
6.0•10-8
4.0•10-8
2.0•10-8
0
-2.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

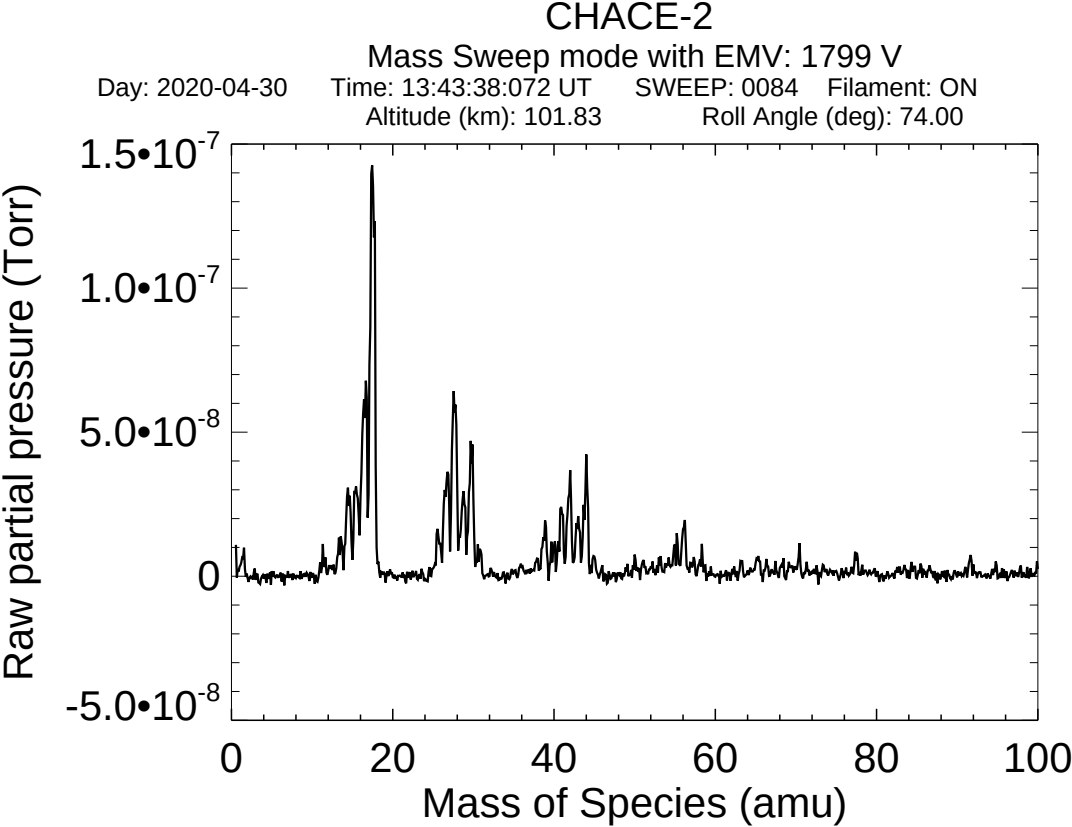

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:39:54:085 UT SWEEP: 0078 Filament: ON
Altitude (km): 99.16 Roll Angle (deg): 67.72
Raw partial pressure (Torr)
1.2•10-7
1.0•10-7
8.0•10-8
6.0•10-8
4.0•10-8
2.0•10-8
0
-2.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

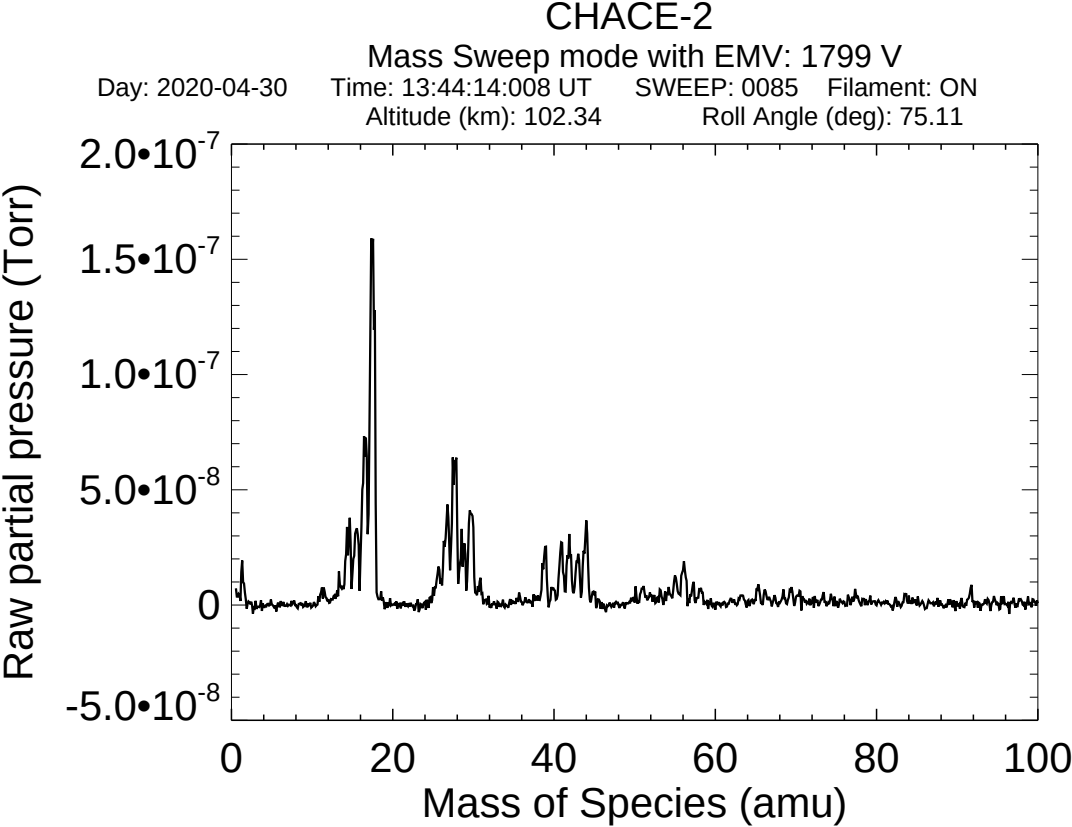

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:40:30:021 UT SWEEP: 0079 Filament: ON
Altitude (km): 99.66 Roll Angle (deg): 68.65
Raw partial pressure (Torr)
1.2•10-7
1.0•10-7
8.0•10-8
6.0•10-8
4.0•10-8
2.0•10-8
0
-2.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

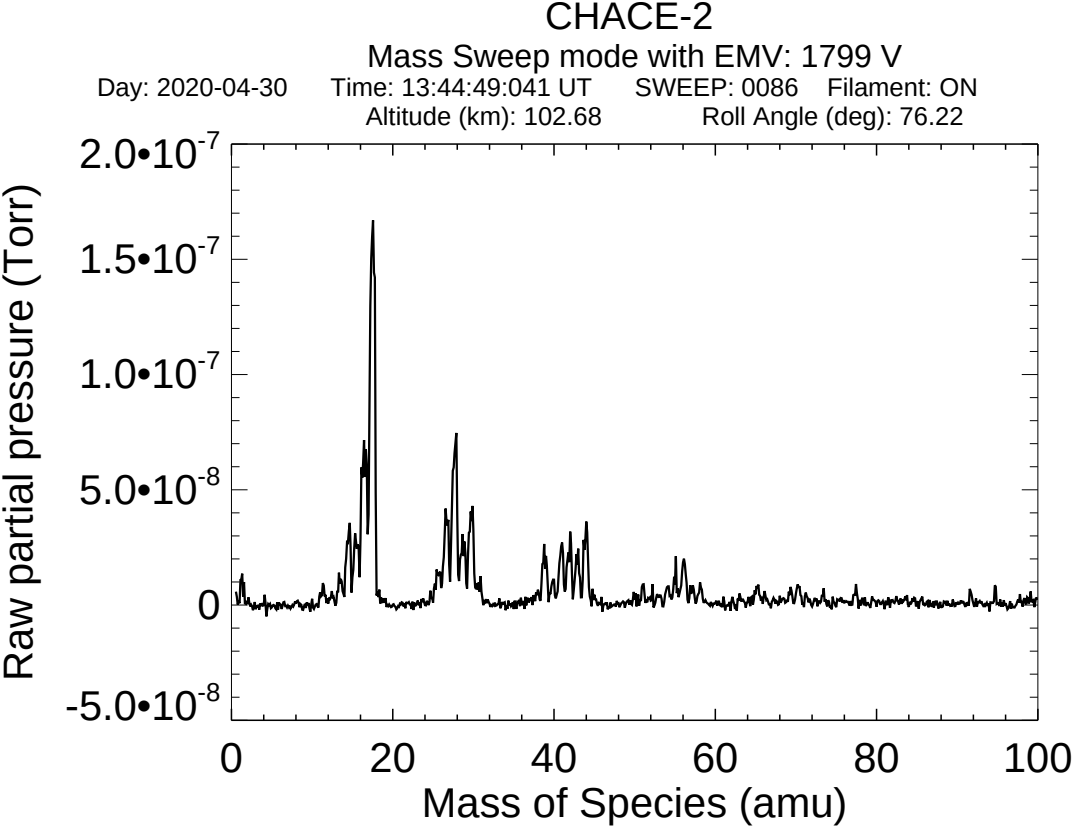

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:41:42:084 UT SWEEP: 0081 Filament: ON
Altitude (km): 100.46 Roll Angle (deg): 70.60
Raw partial pressure (Torr)
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

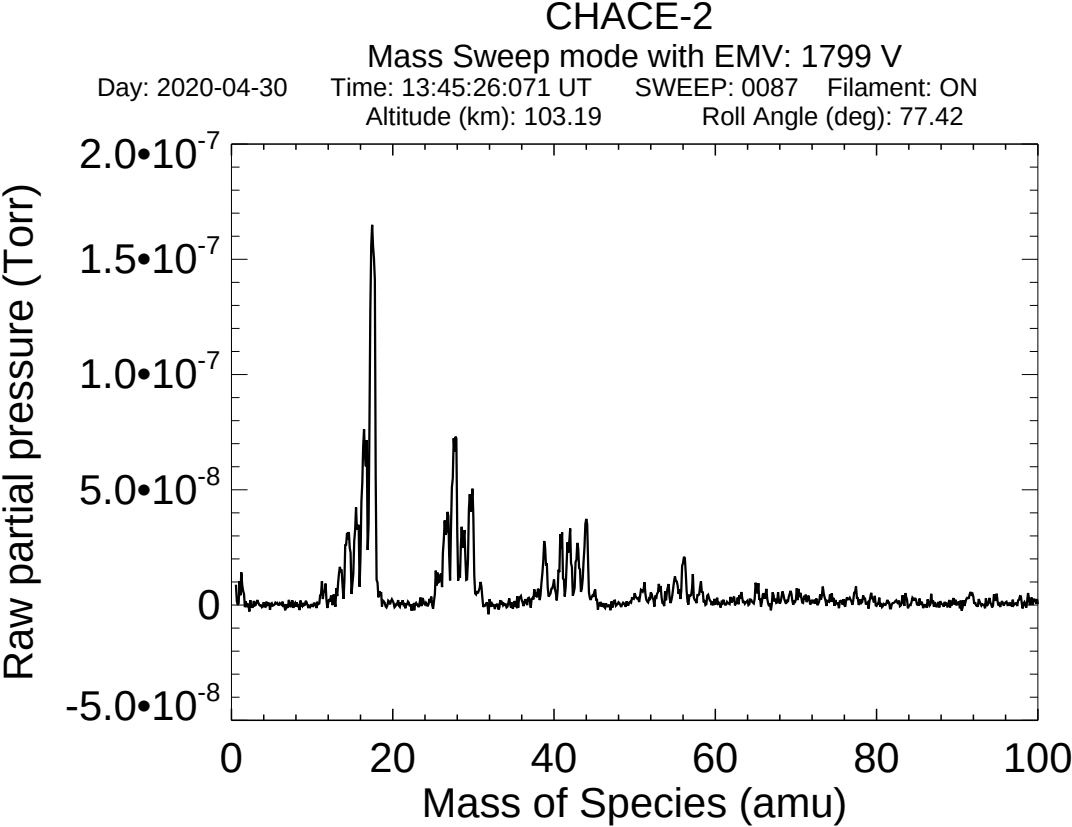

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:42:26:009 UT SWEEP: 0082 Filament: ON
Altitude (km): 100.98 Roll Angle (deg): 71.85
Raw partial pressure (Torr)
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

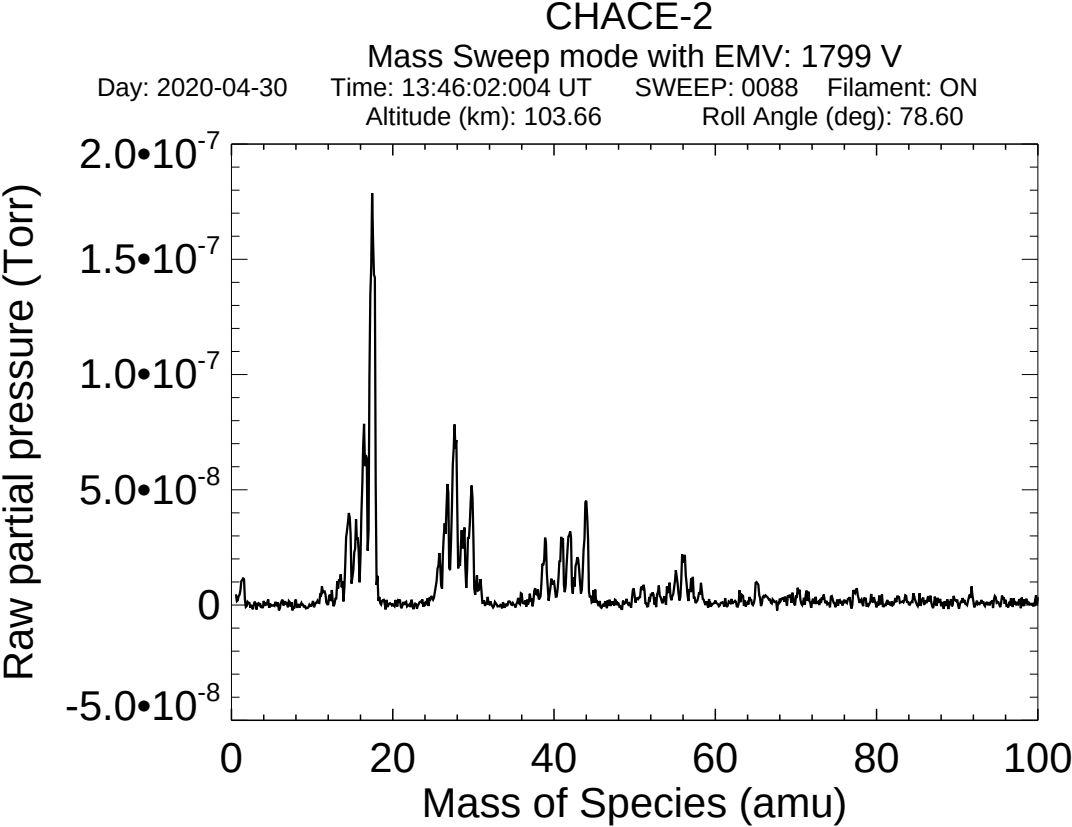

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:43:01:042 UT SWEEP: 0083 Filament: ON
Altitude (km): 101.48 Roll Angle (deg): 72.88
Raw partial pressure (Torr)
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

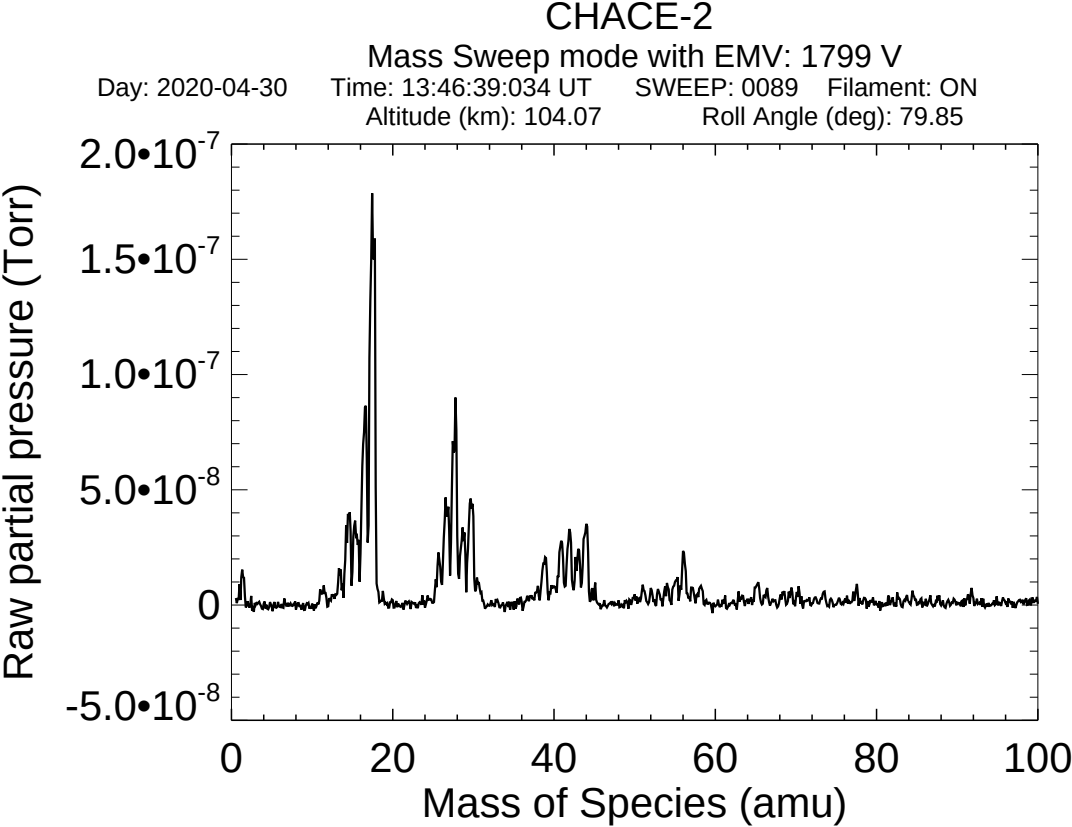

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:43:38:072 UT SWEEP: 0084 Filament: ON
Altitude (km): 101.83 Roll Angle (deg): 74.00
Raw partial pressure (Torr)
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

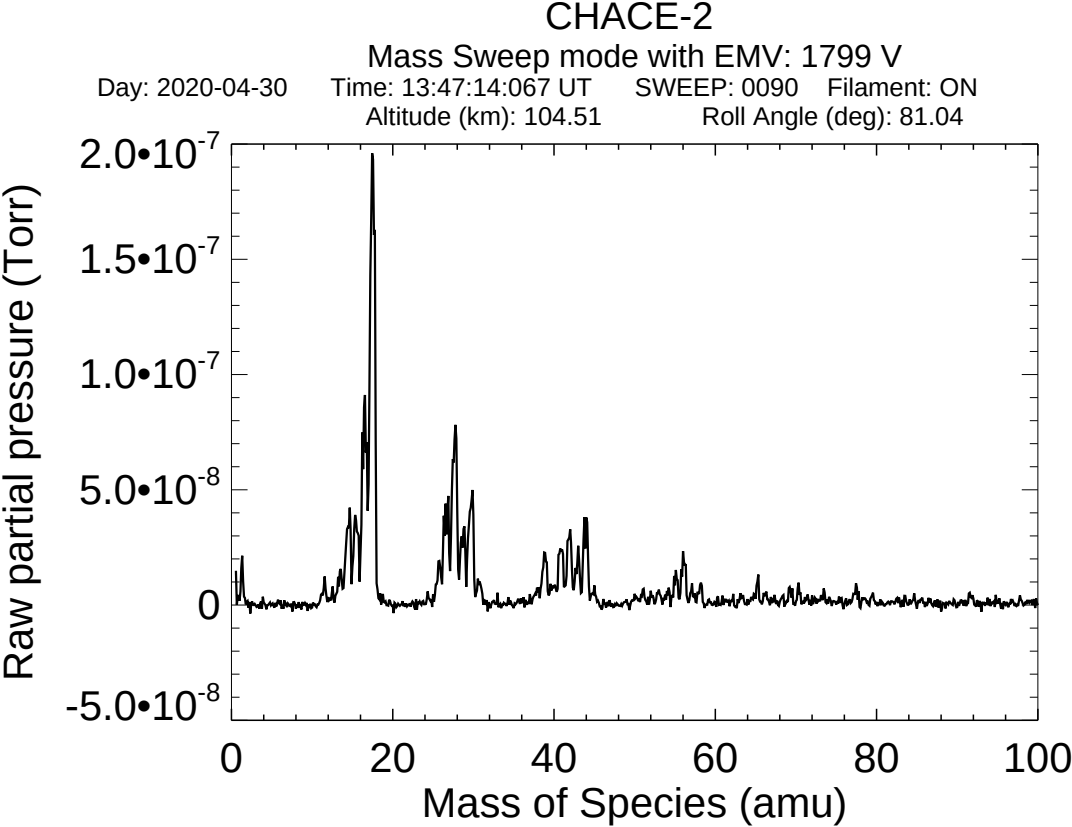

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:44:14:008 UT SWEEP: 0085 Filament: ON
Altitude (km): 102.34 Roll Angle (deg): 75.11
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

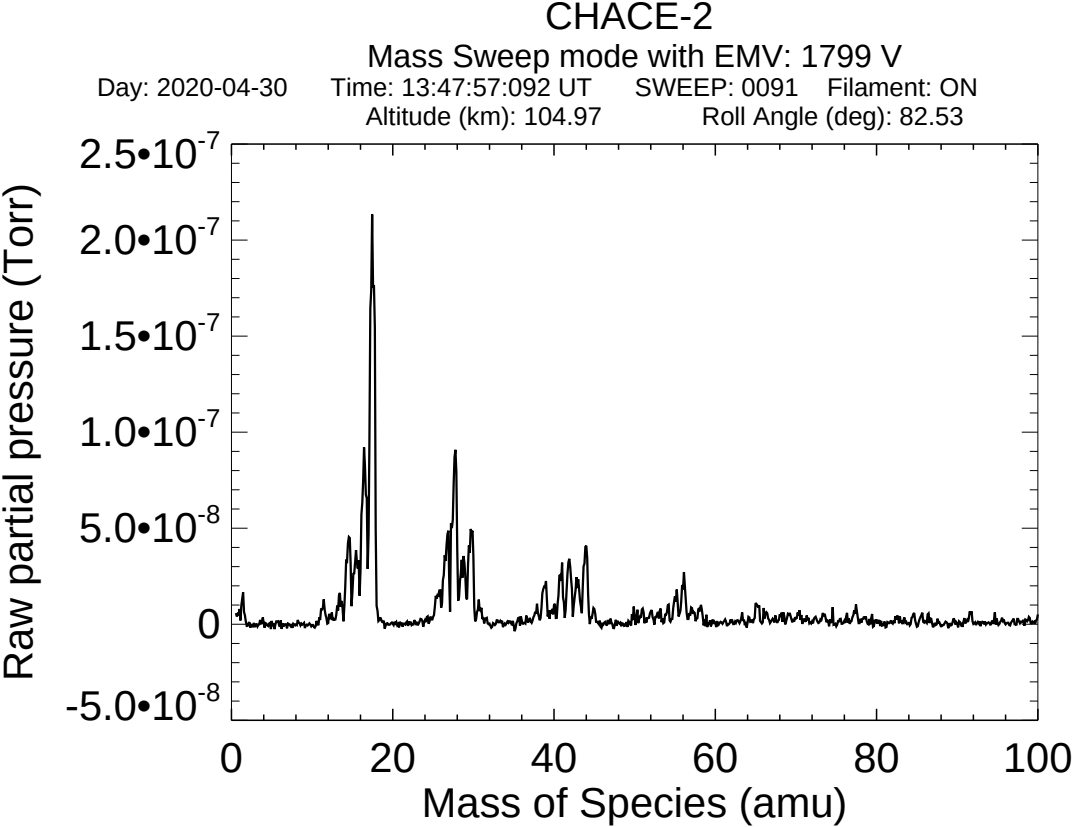

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:44:49:041 UT SWEEP: 0086 Filament: ON
Altitude (km): 102.68 Roll Angle (deg): 76.22
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

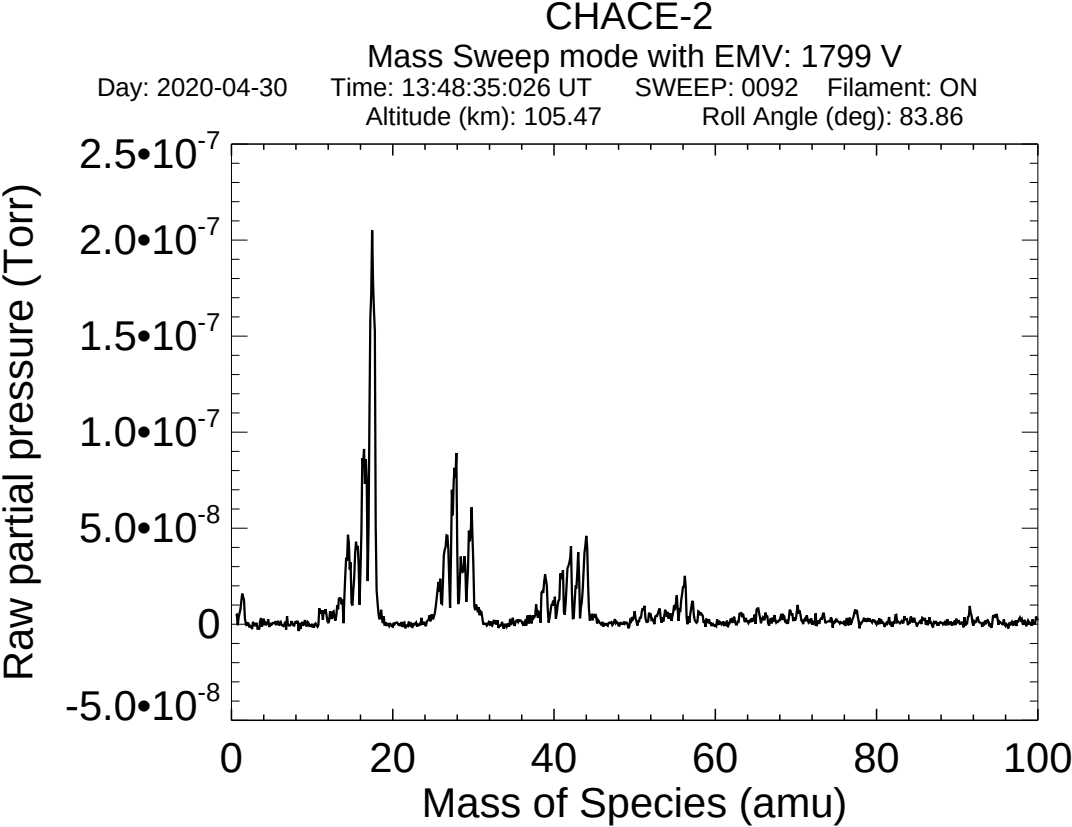

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:45:26:071 UT SWEEP: 0087 Filament: ON
Altitude (km): 103.19 Roll Angle (deg): 77.42
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

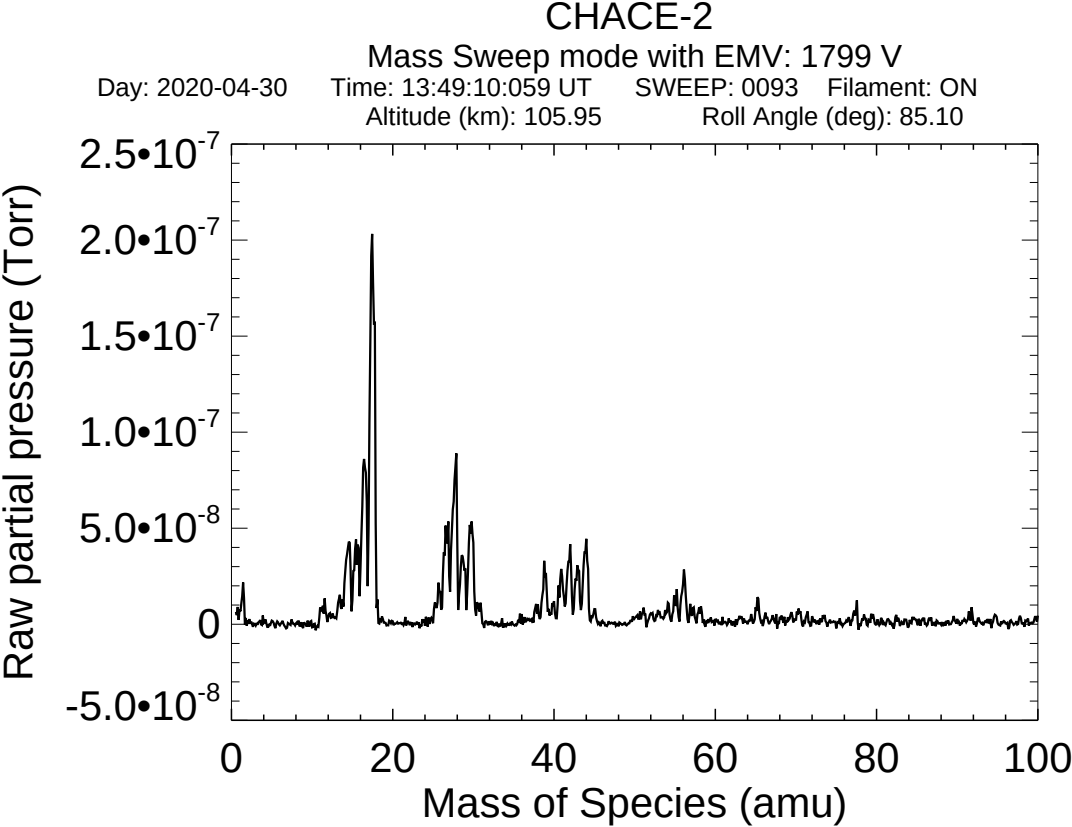

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:46:02:004 UT SWEEP: 0088 Filament: ON
Altitude (km): 103.66 Roll Angle (deg): 78.60
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

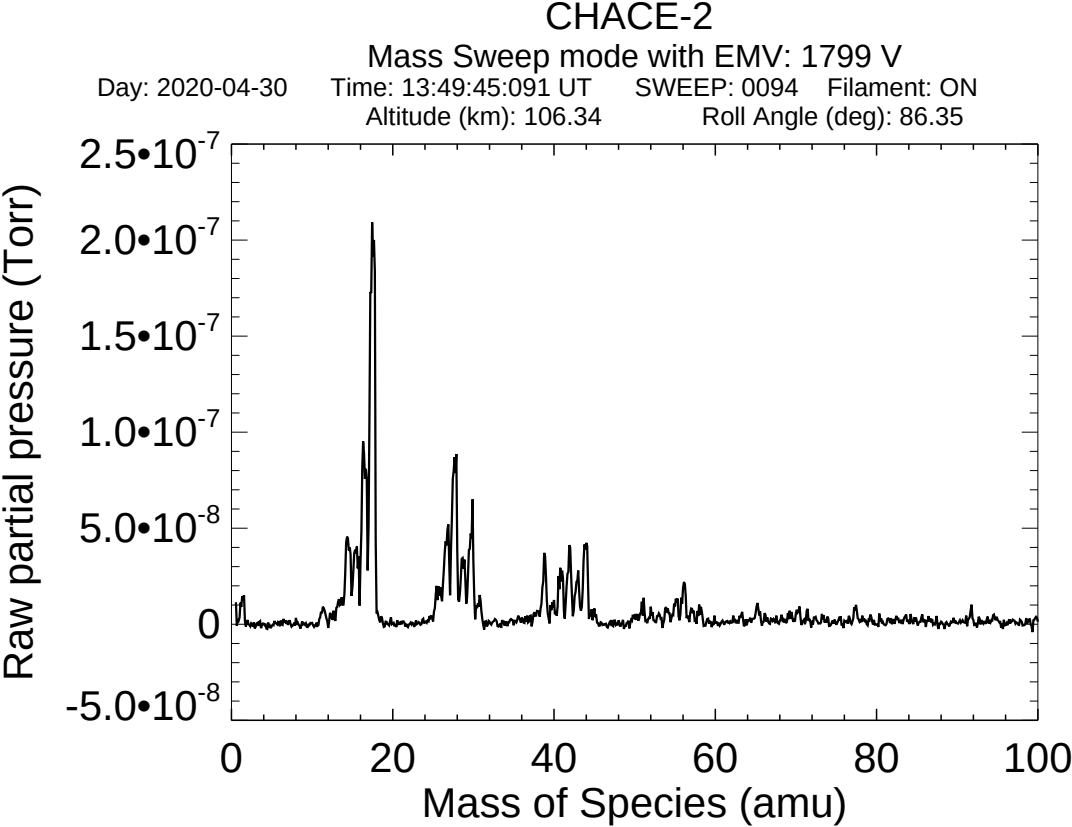

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:46:39:034 UT SWEEP: 0089 Filament: ON
Altitude (km): 104.07 Roll Angle (deg): 79.85
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

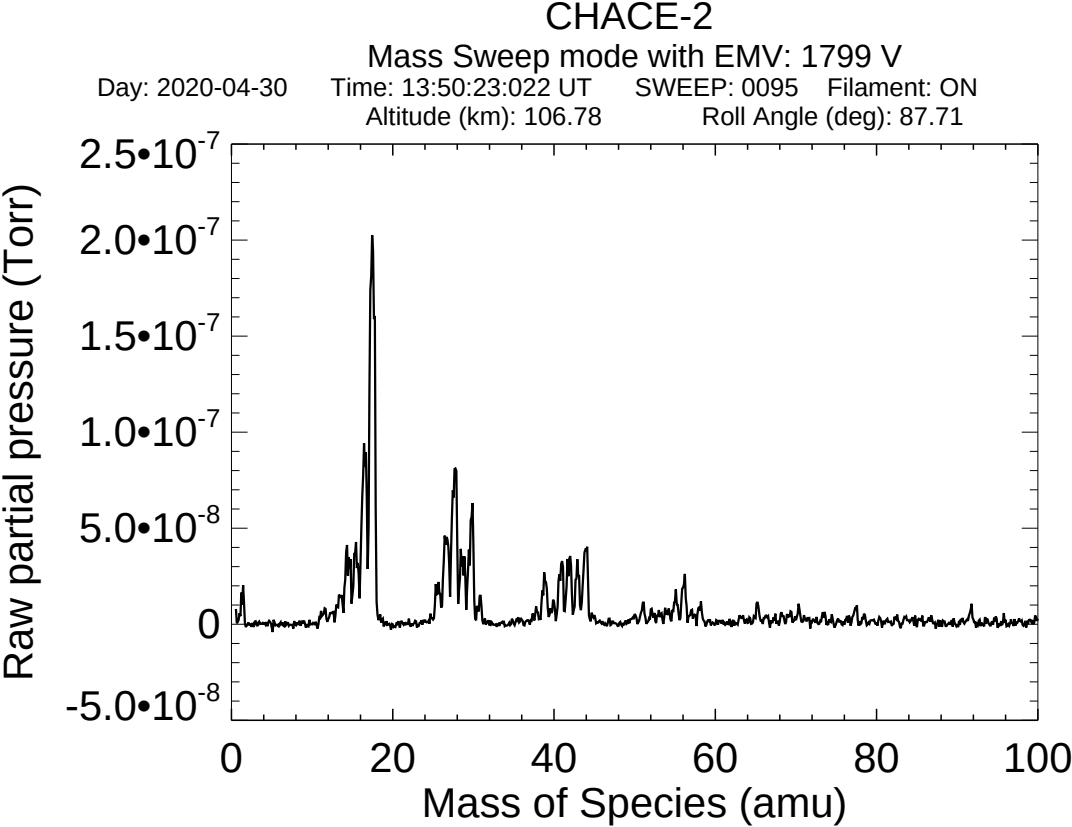

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:47:14:067 UT SWEEP: 0090 Filament: ON
Altitude (km): 104.51 Roll Angle (deg): 81.04
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

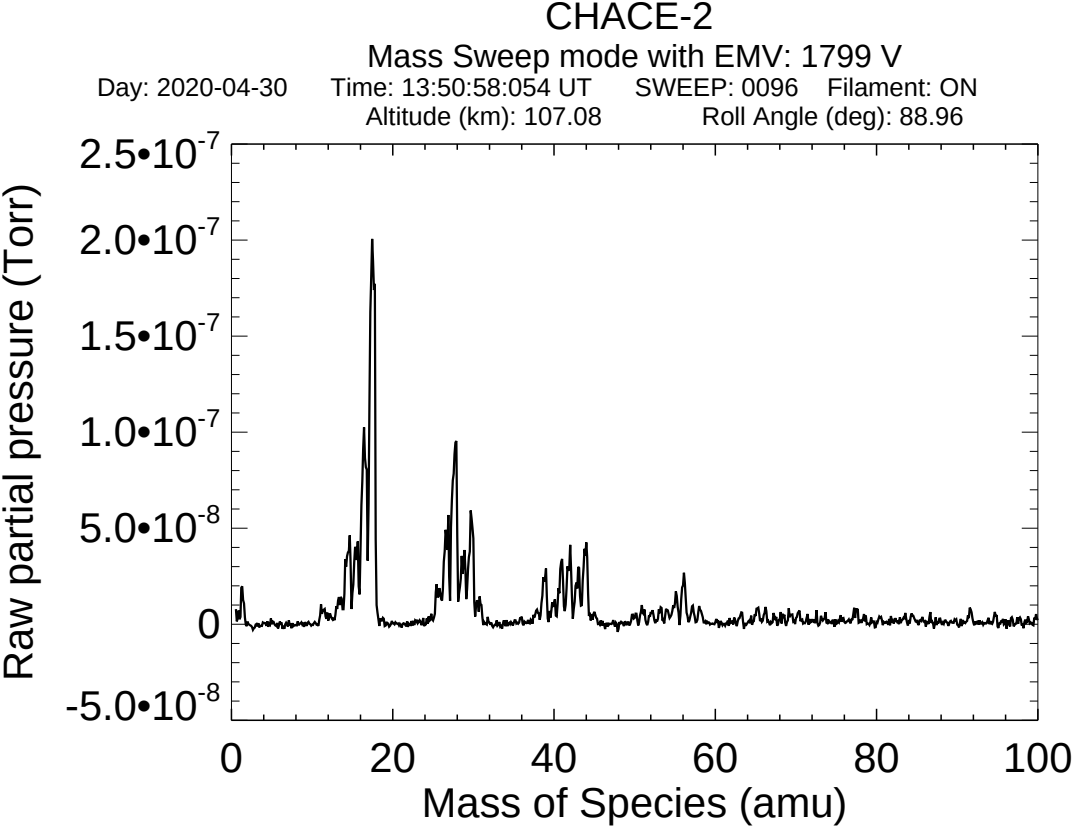

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:47:57:092 UT SWEEP: 0091 Filament: ON
Altitude (km): 104.97 Roll Angle (deg): 82.53
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

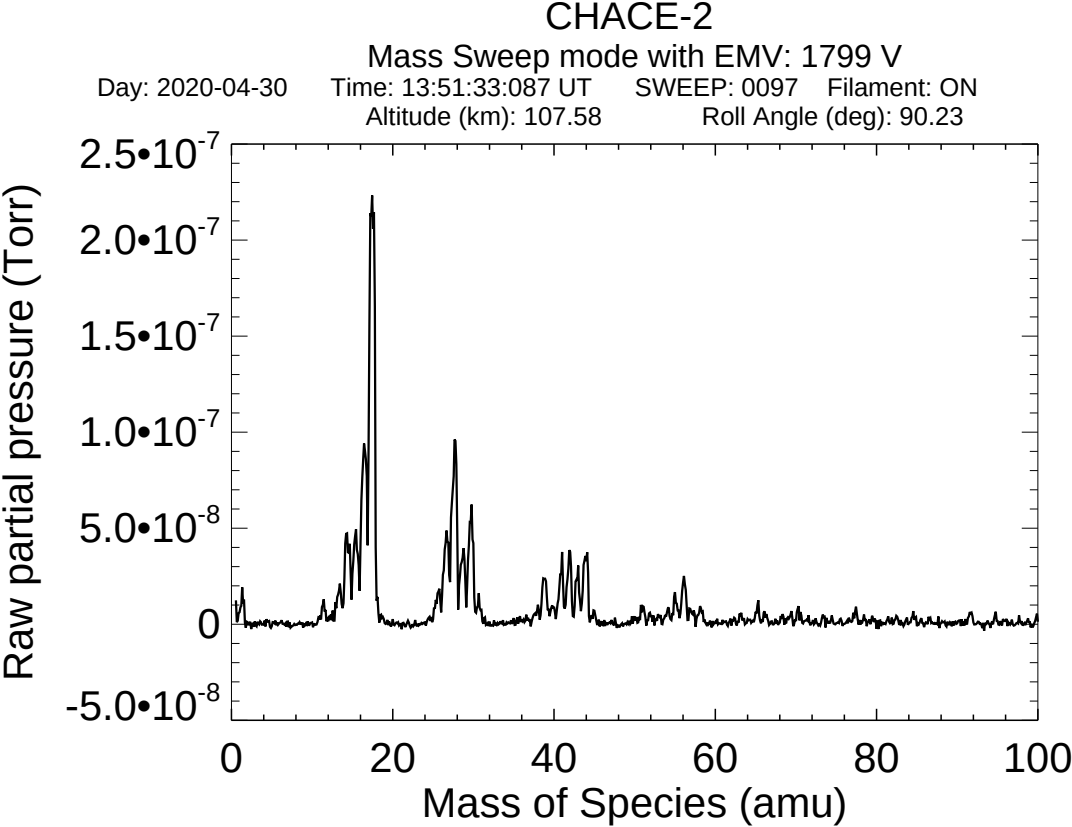

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:48:35:026 UT SWEEP: 0092 Filament: ON
Altitude (km): 105.47 Roll Angle (deg): 83.86
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

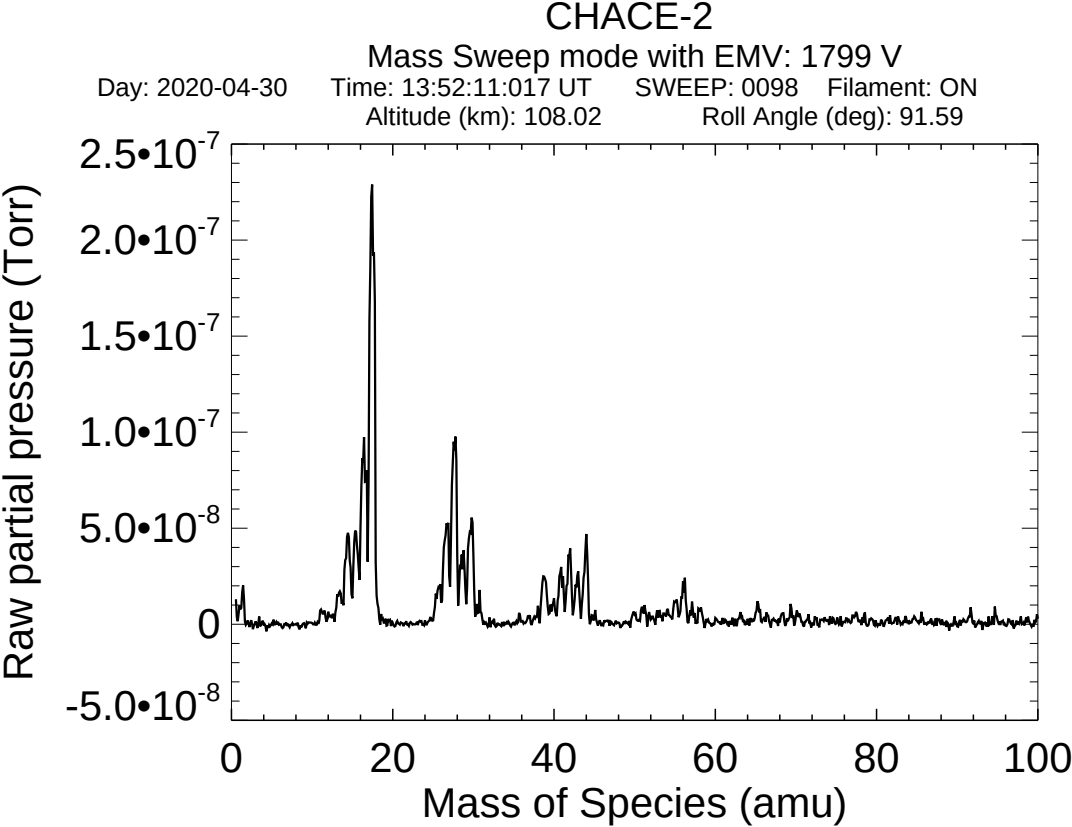

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:49:10:059 UT SWEEP: 0093 Filament: ON
Altitude (km): 105.95 Roll Angle (deg): 85.10
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

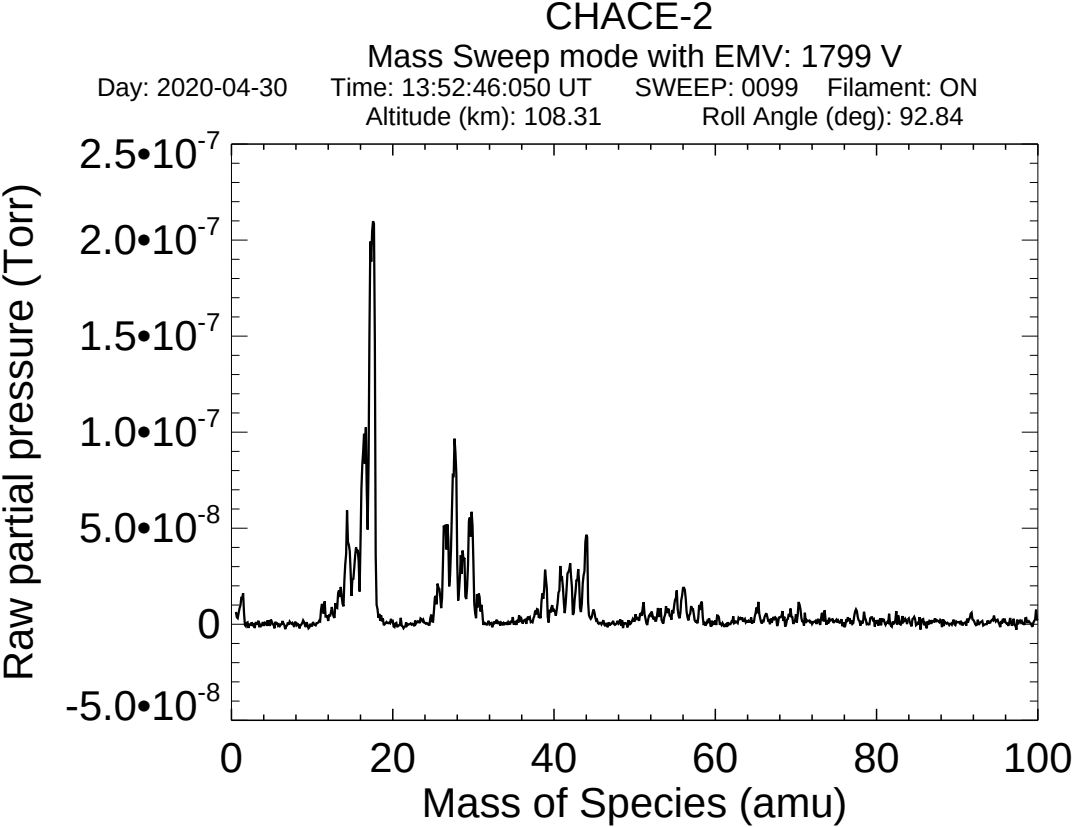

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:49:45:091 UT SWEEP: 0094 Filament: ON
Altitude (km): 106.34 Roll Angle (deg): 86.35
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

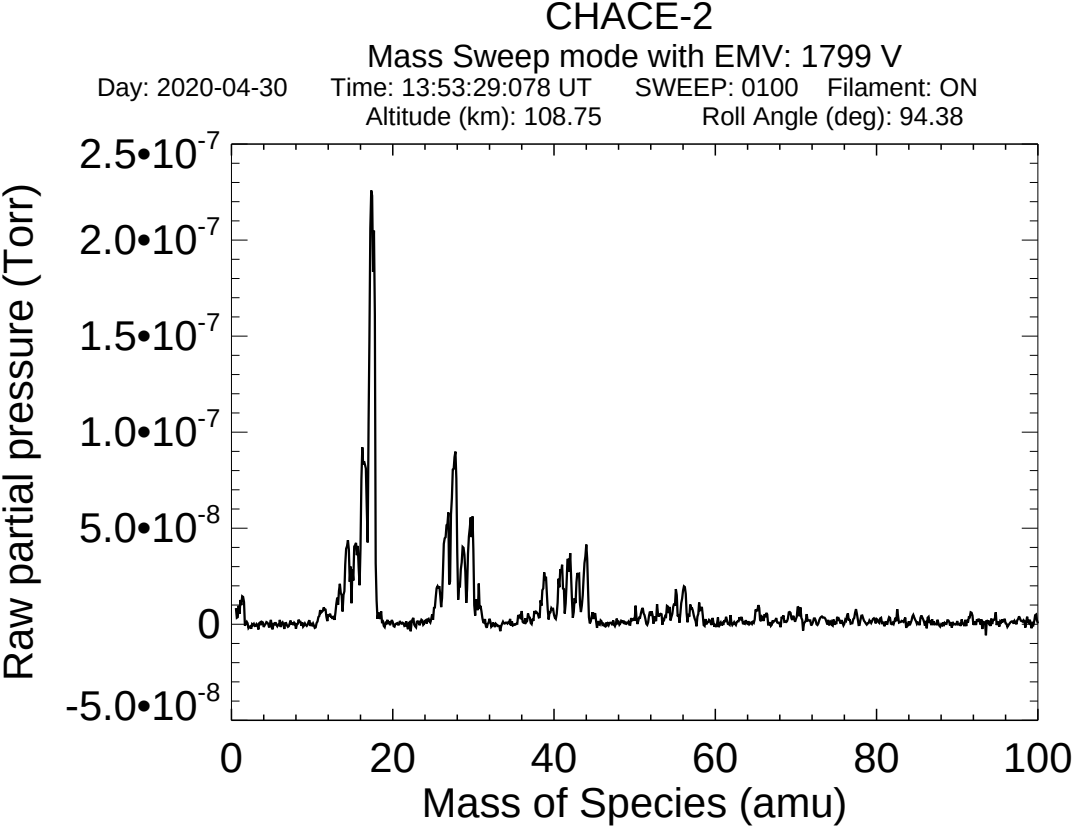

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:50:23:022 UT SWEEP: 0095 Filament: ON
Altitude (km): 106.78 Roll Angle (deg): 87.71
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

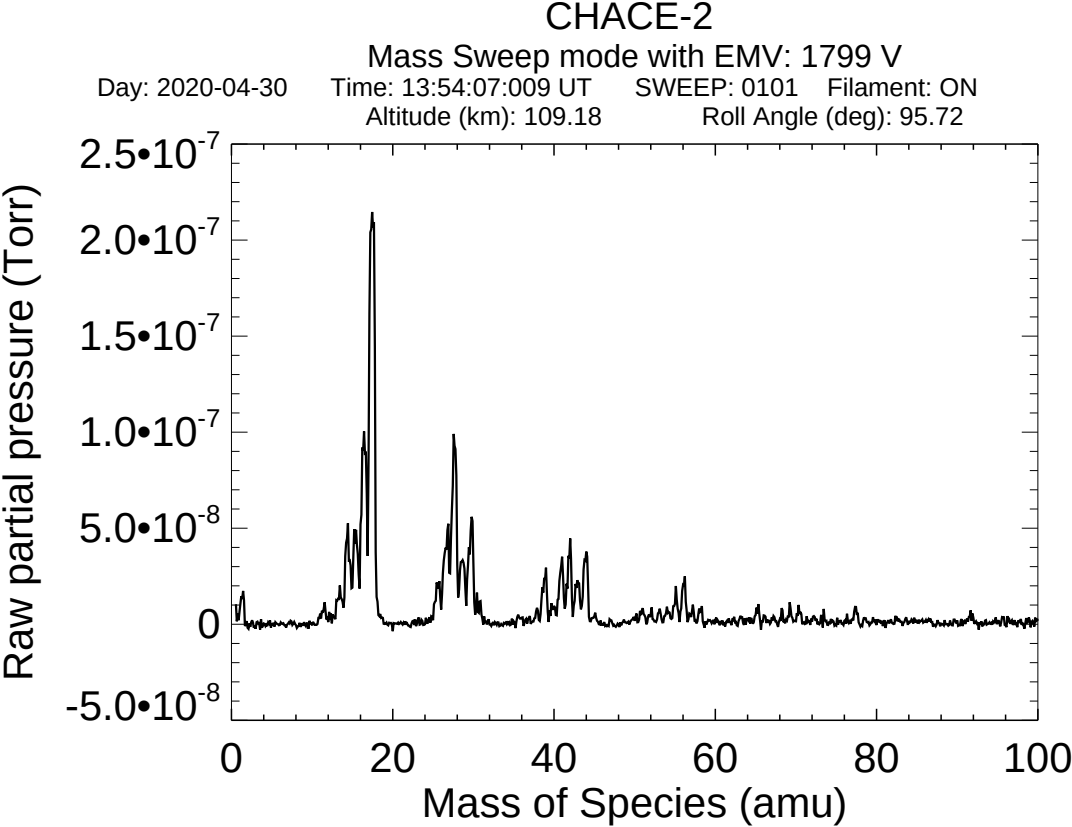

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:50:58:054 UT SWEEP: 0096 Filament: ON
Altitude (km): 107.08 Roll Angle (deg): 88.96
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

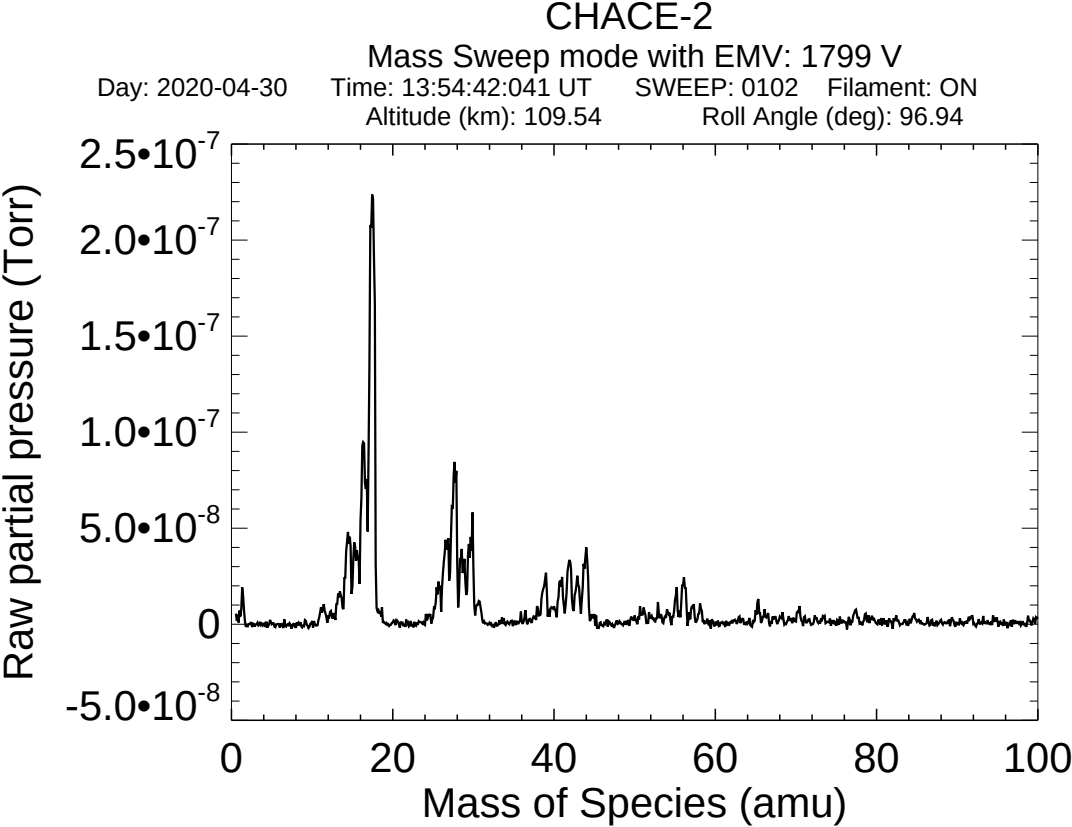

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:51:33:087 UT SWEEP: 0097 Filament: ON
Altitude (km): 107.58 Roll Angle (deg): 90.23
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

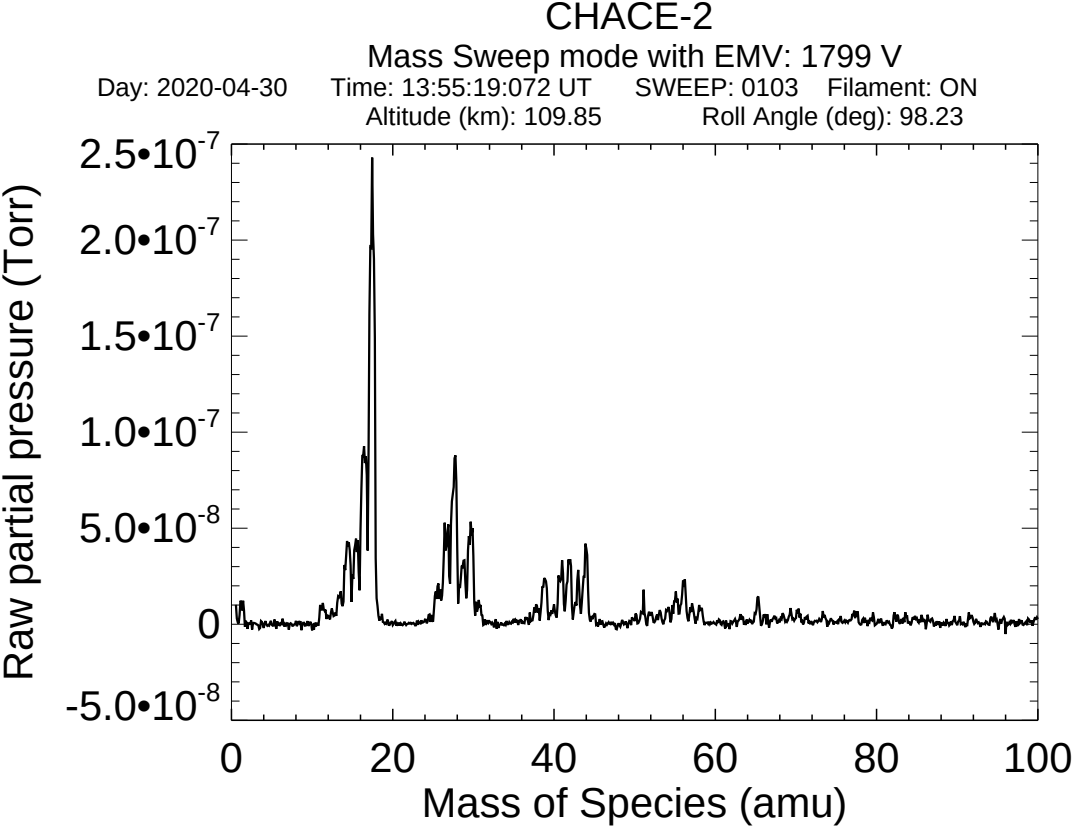

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:52:11:017 UT SWEEP: 0098 Filament: ON
Altitude (km): 108.02 Roll Angle (deg): 91.59
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

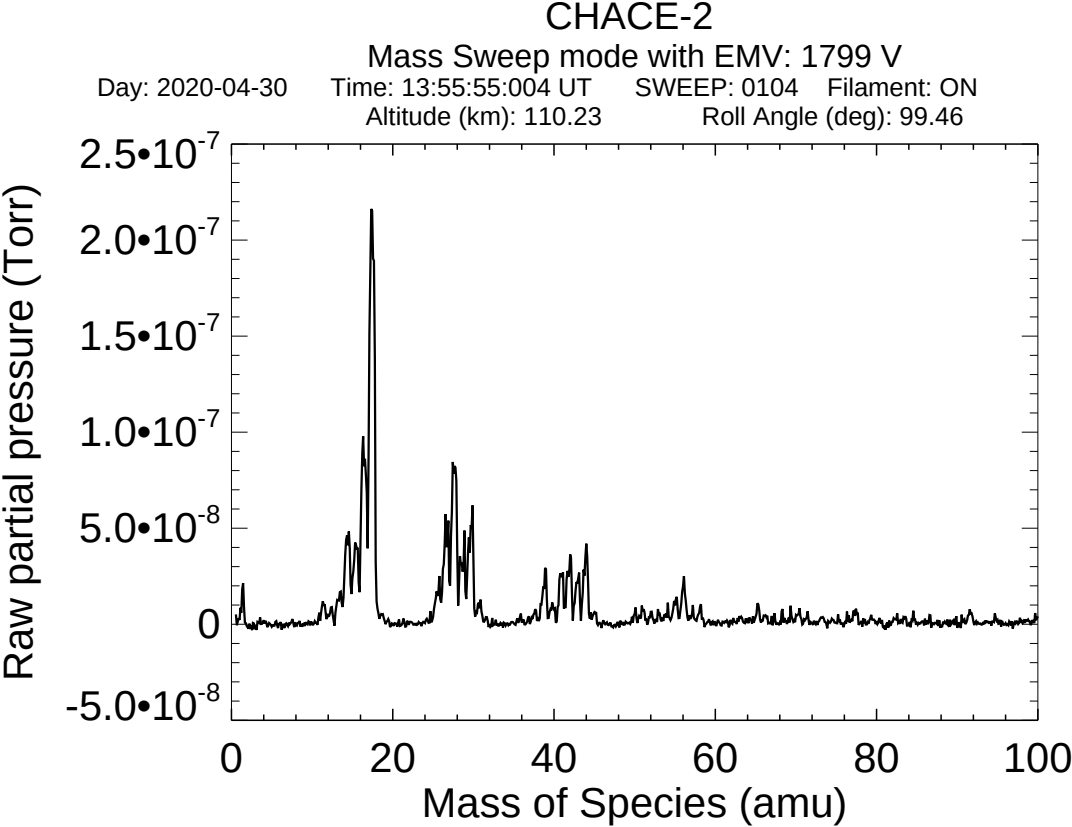

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:52:46:050 UT SWEEP: 0099 Filament: ON
Altitude (km): 108.31 Roll Angle (deg): 92.84
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

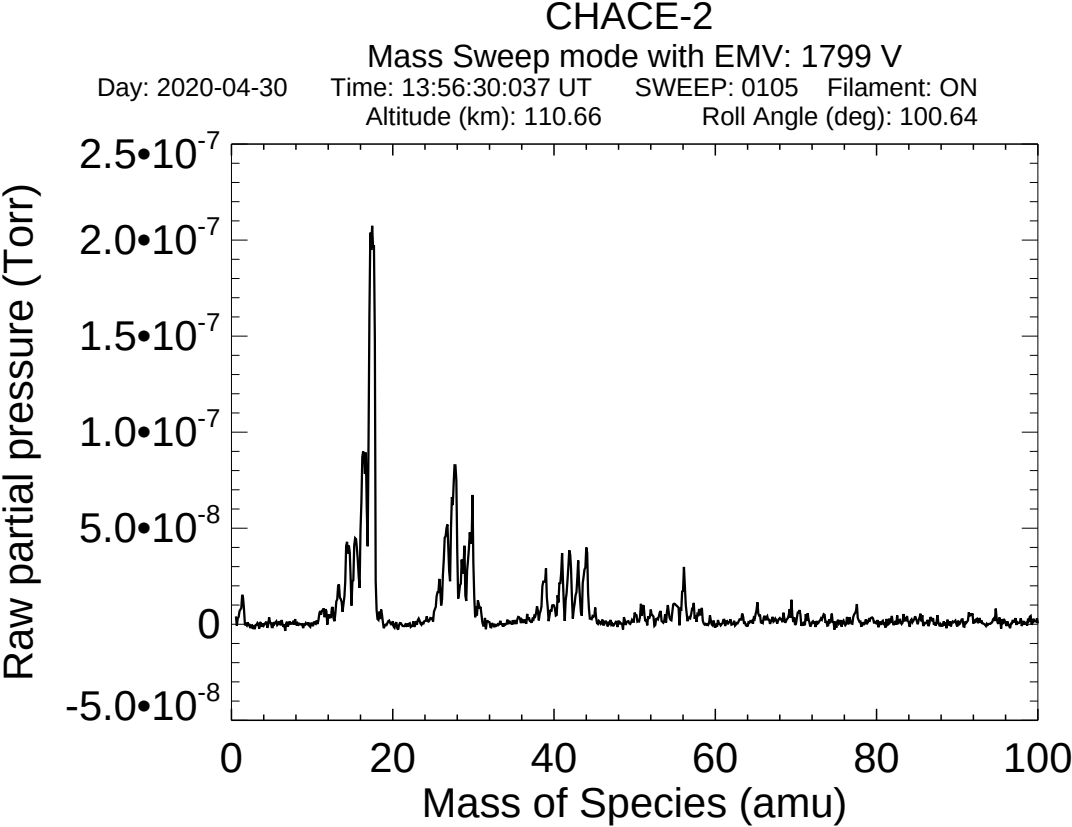

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30
Time: 13:53:29:078 UT
SWEEP: 0100
Filament: ON
Altitude (km): 108.75
Roll Angle (deg): 94.38
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

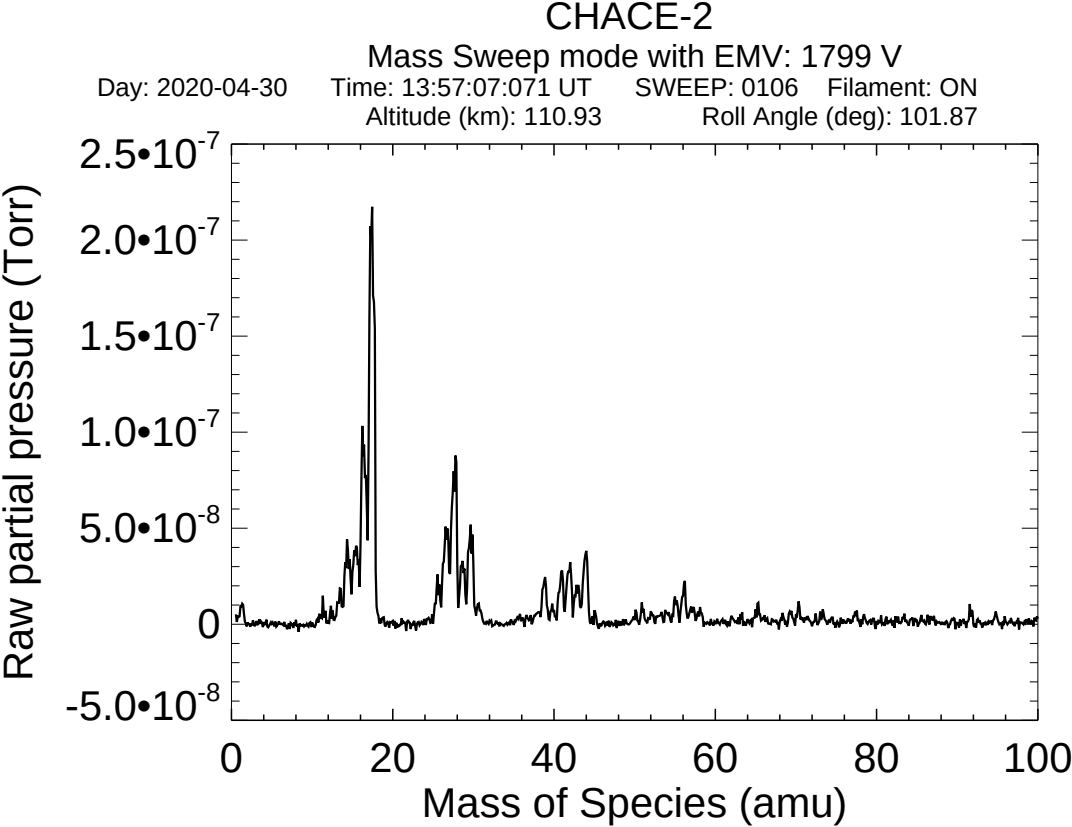

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30
Time: 13:54:07:009 UT
SWEEP: 0101
Filament: ON
Altitude (km): 109.18
Roll Angle (deg): 95.72
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

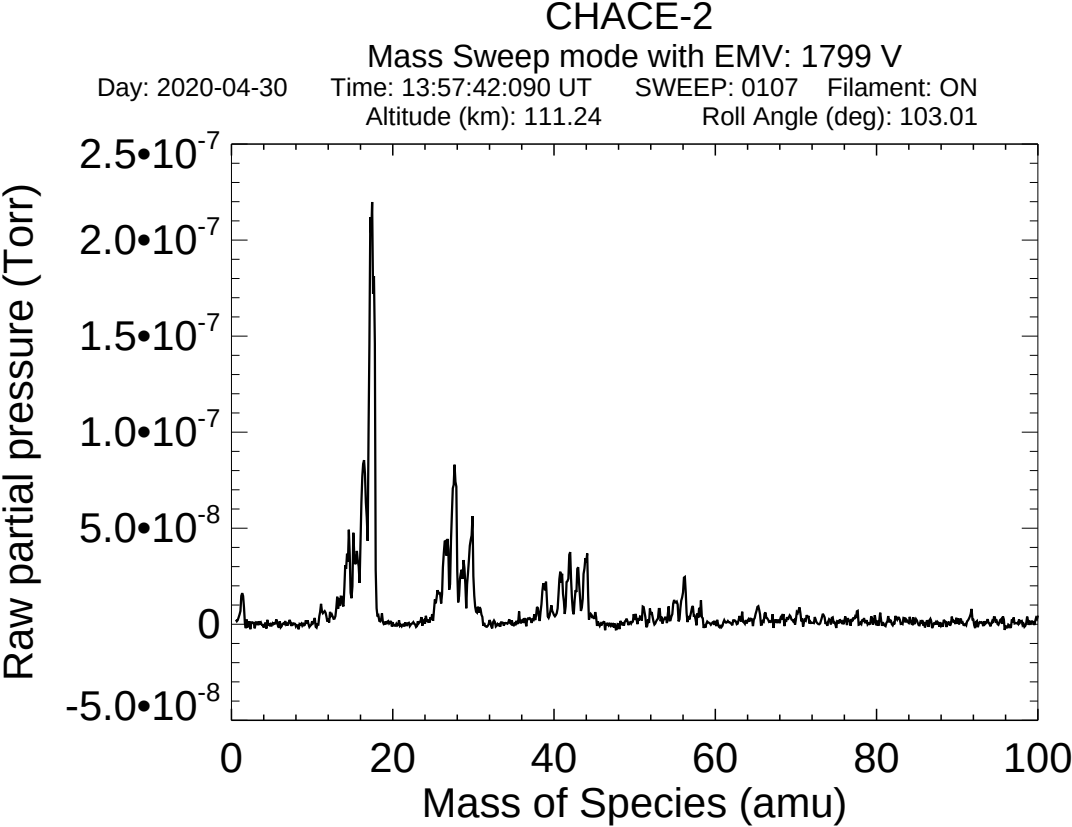

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30
Time: 13:54:42:041 UT
SWEEP: 0102
Filament: ON
Altitude (km): 109.54
Roll Angle (deg): 96.94
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

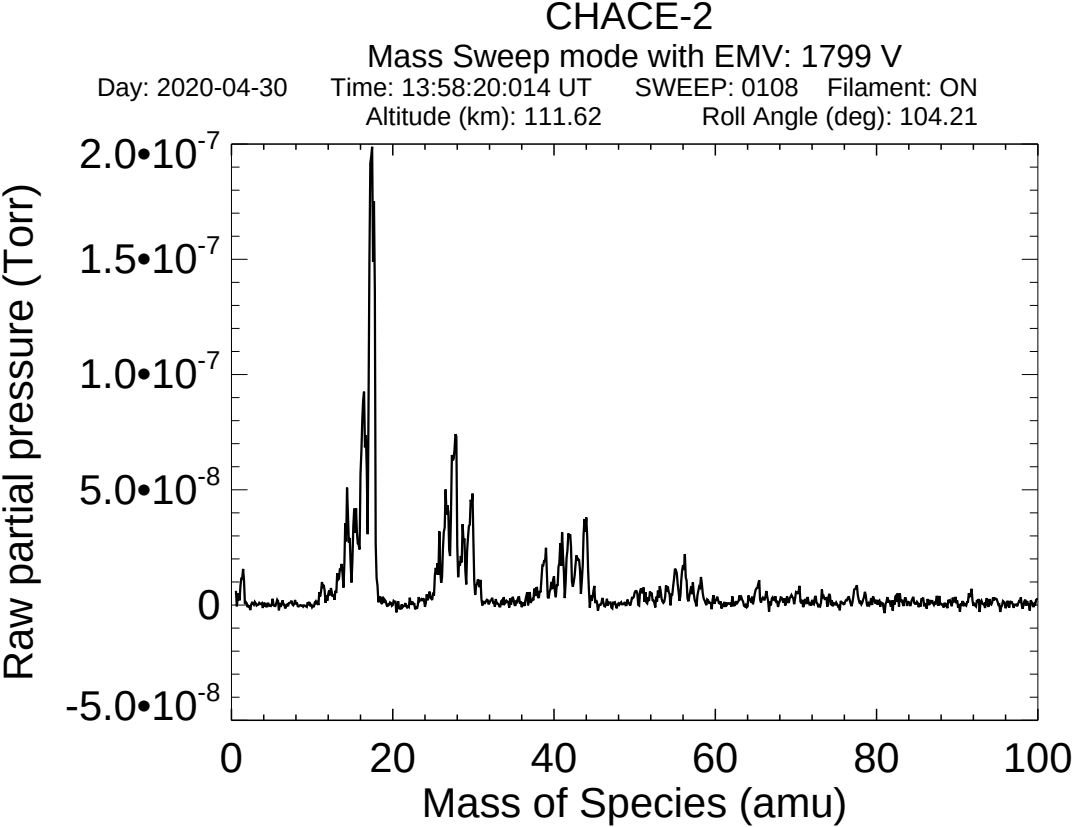

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:55:19:072 UT SWEEP: 0103 Filament: ON
Altitude (km): 109.85 Roll Angle (deg): 98.23
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

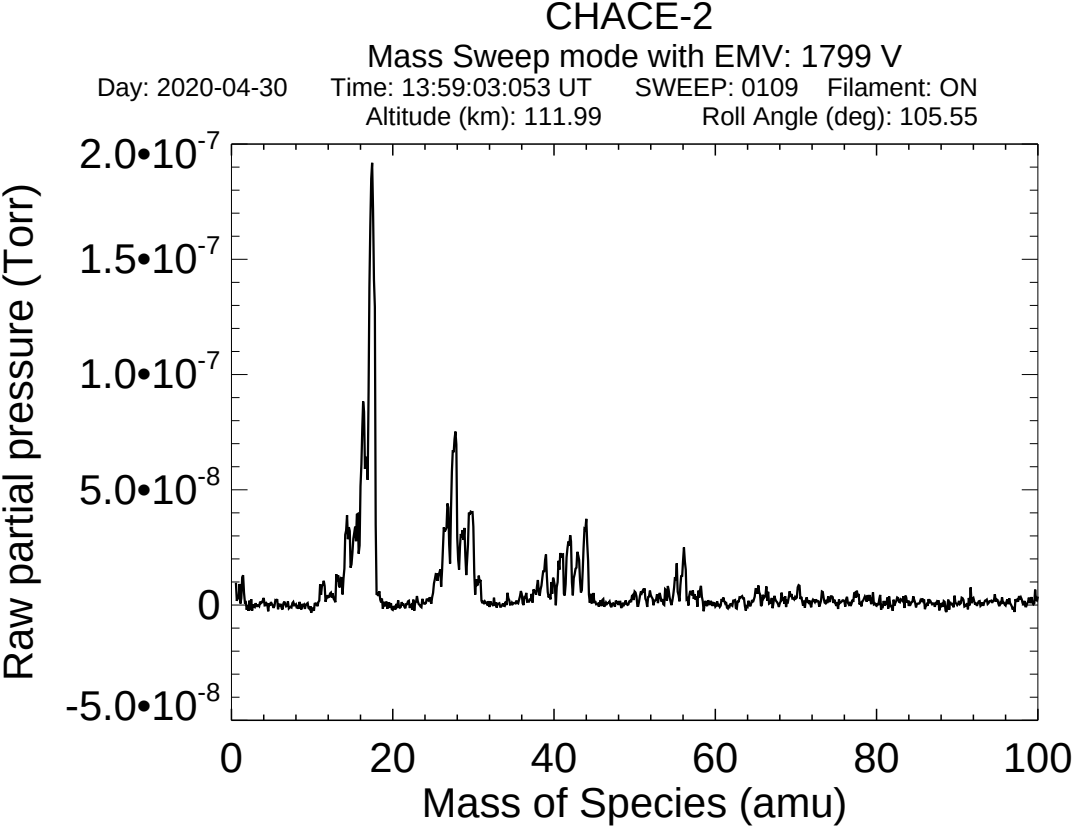

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:55:55:004 UT SWEEP: 0104 Filament: ON
Altitude (km): 110.23 Roll Angle (deg): 99.46
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

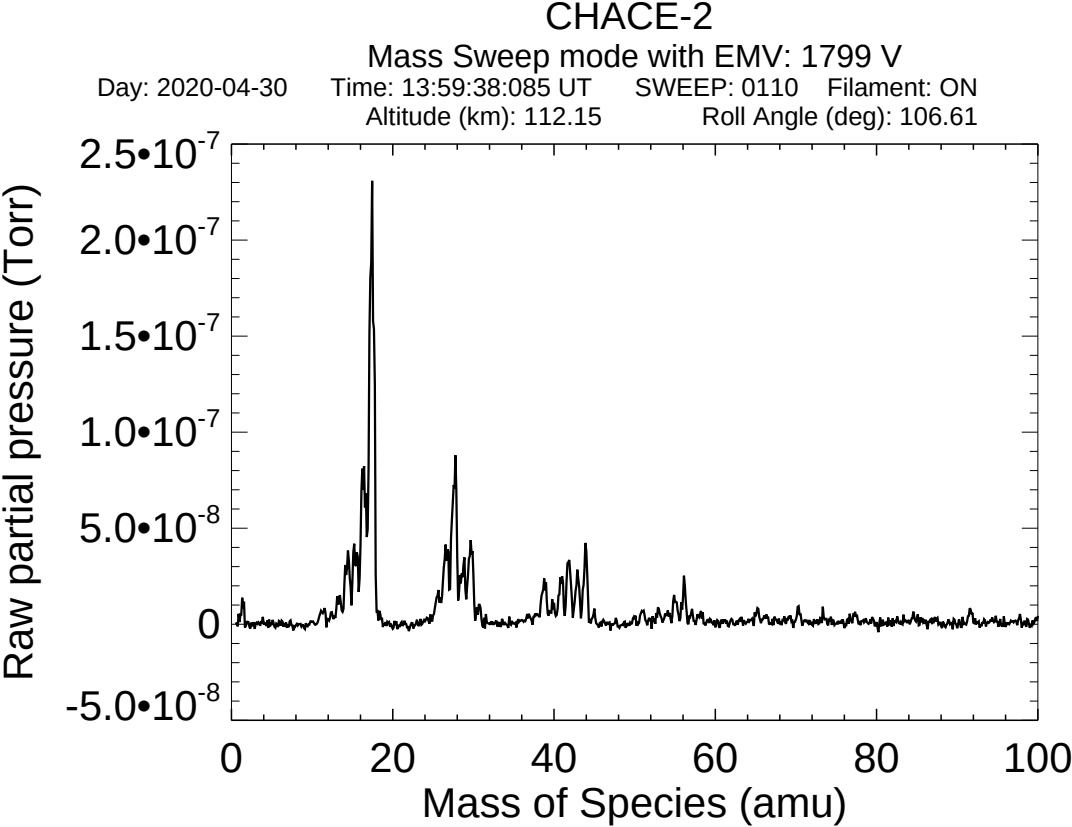

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30
Time: 13:56:30:037 UT
SWEEP: 0105
Filament: ON
Altitude (km): 110.66
Roll Angle (deg): 100.64
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

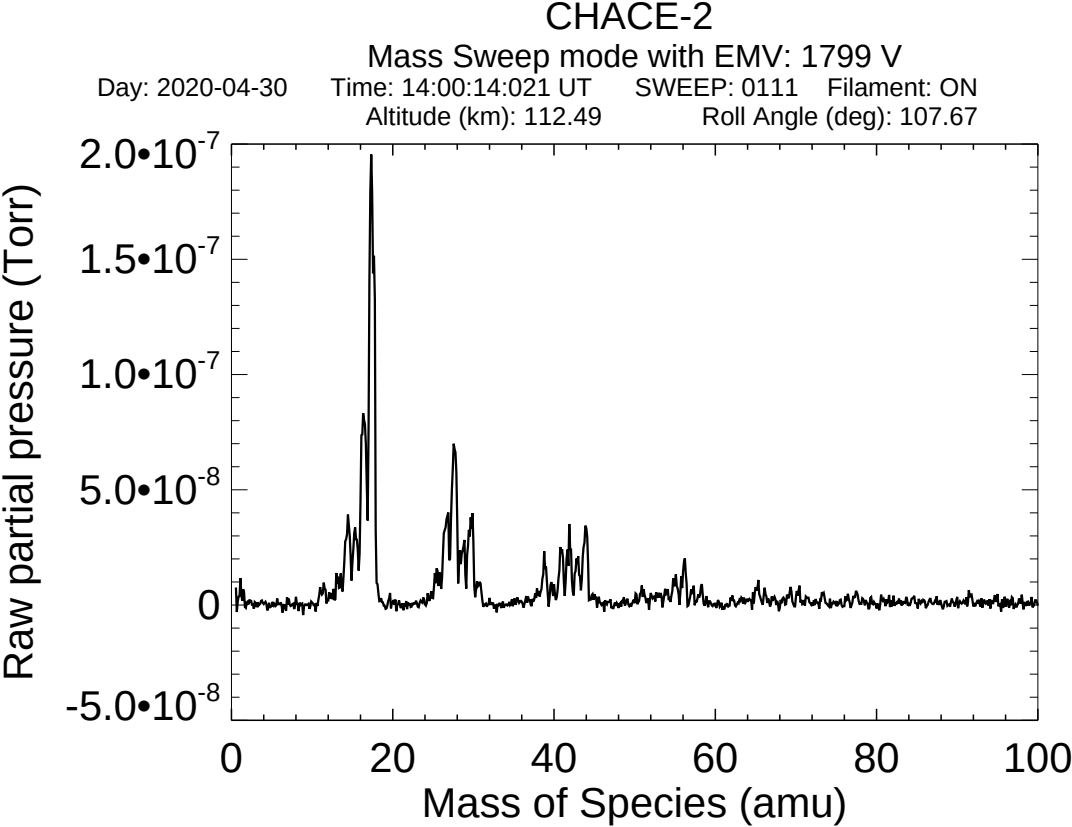

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30
Time: 13:57:07:071 UT
SWEEP: 0106
Filament: ON
Altitude (km): 110.93
Roll Angle (deg): 101.87
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

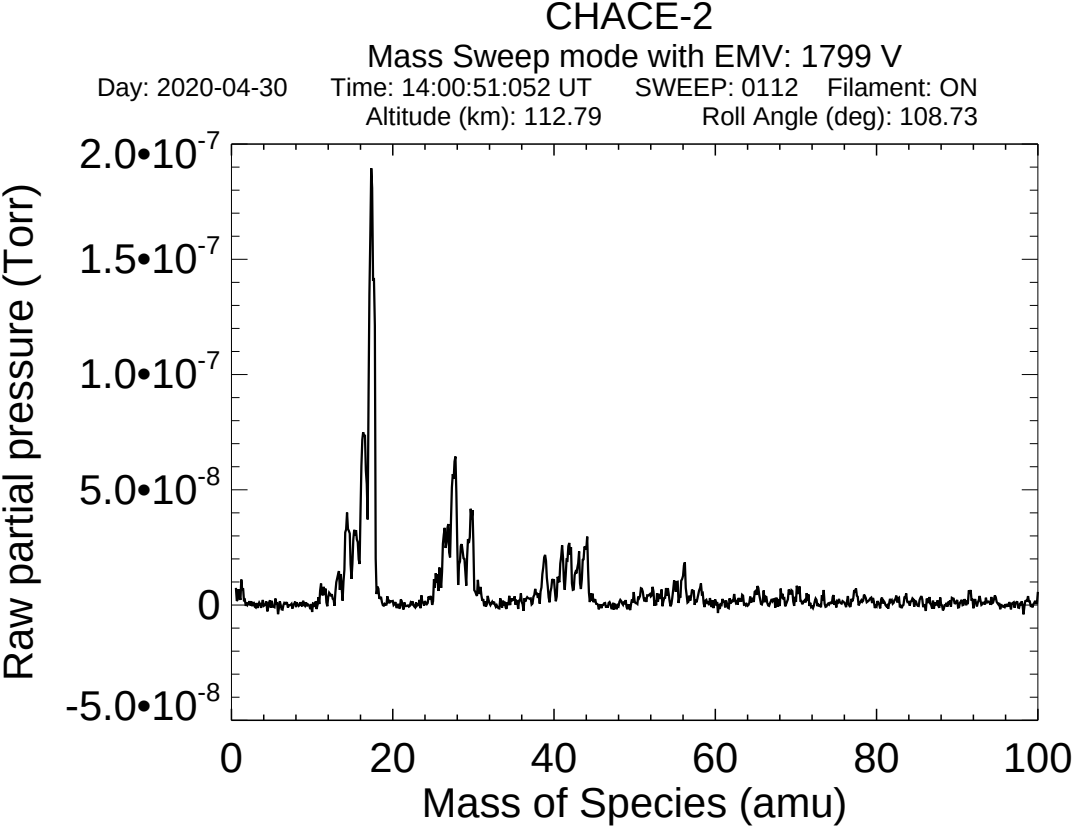

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:57:42:090 UT SWEEP: 0107 Filament: ON
Altitude (km): 111.24 Roll Angle (deg): 103.01
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

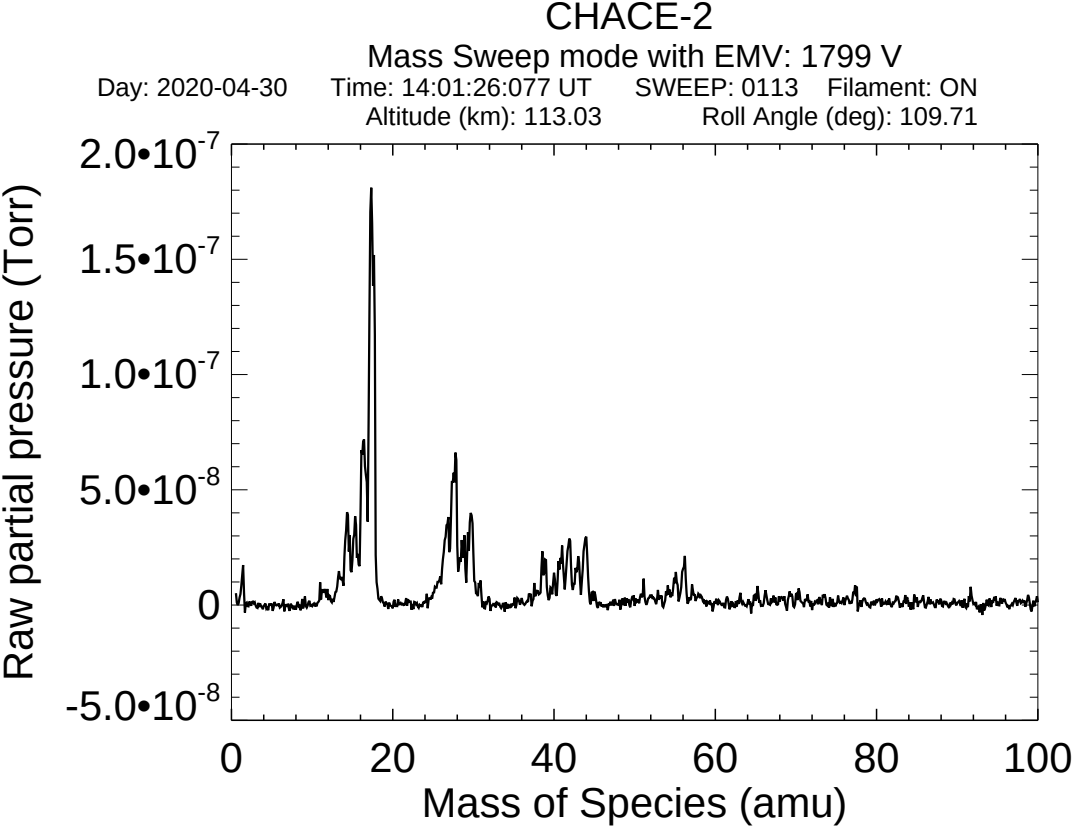

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:58:20:014 UT SWEEP: 0108 Filament: ON
Altitude (km): 111.62 Roll Angle (deg): 104.21
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

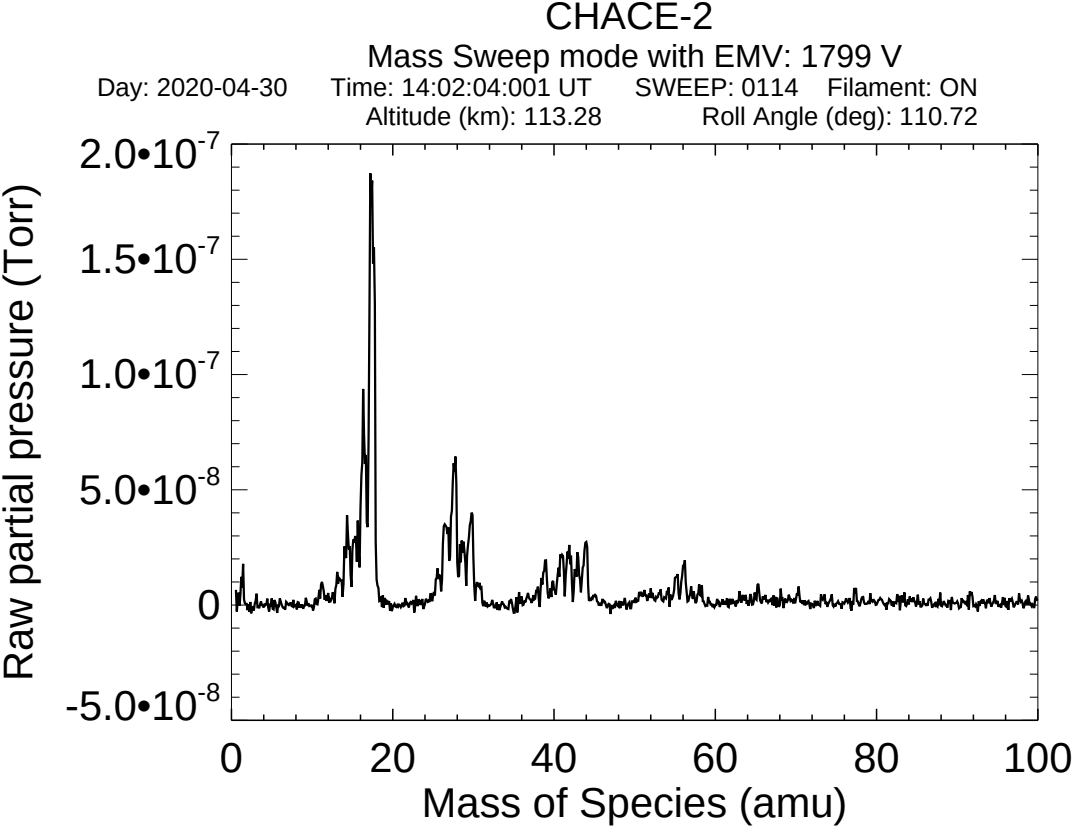

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:59:03:053 UT SWEEP: 0109 Filament: ON
Altitude (km): 111.99 Roll Angle (deg): 105.55
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

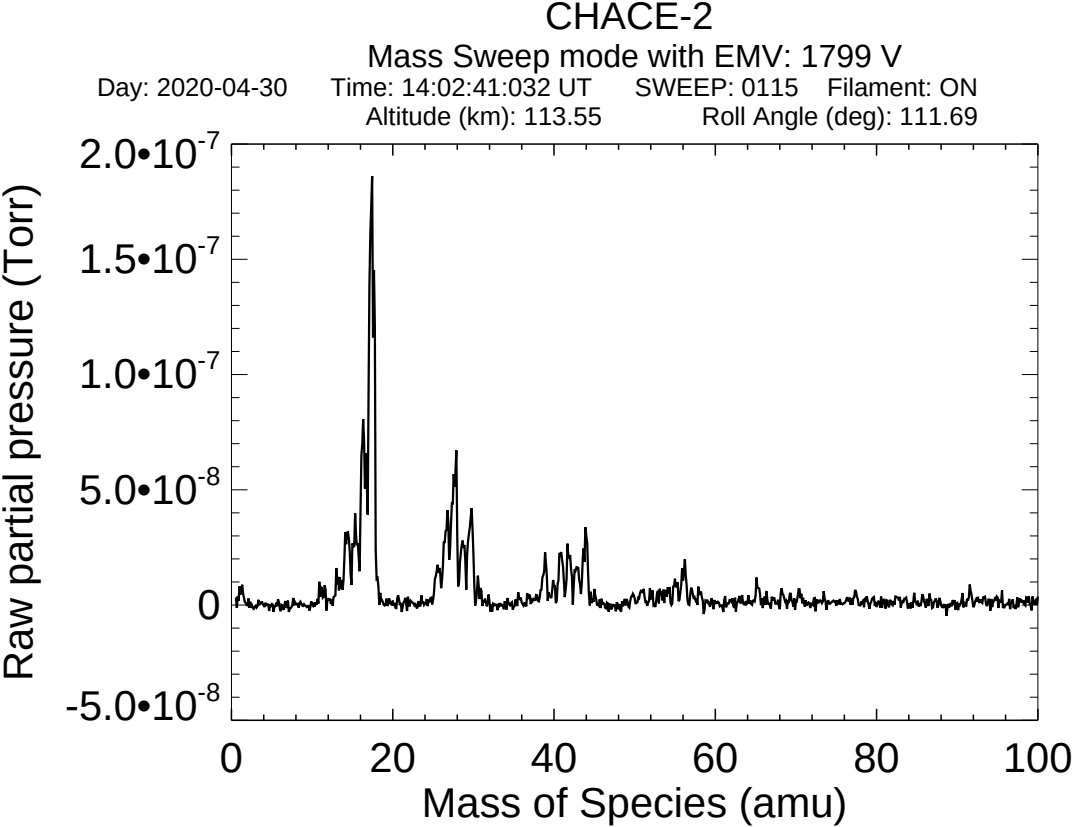

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 13:59:38:085 UT SWEEP: 0110 Filament: ON
Altitude (km): 112.15 Roll Angle (deg): 106.61
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

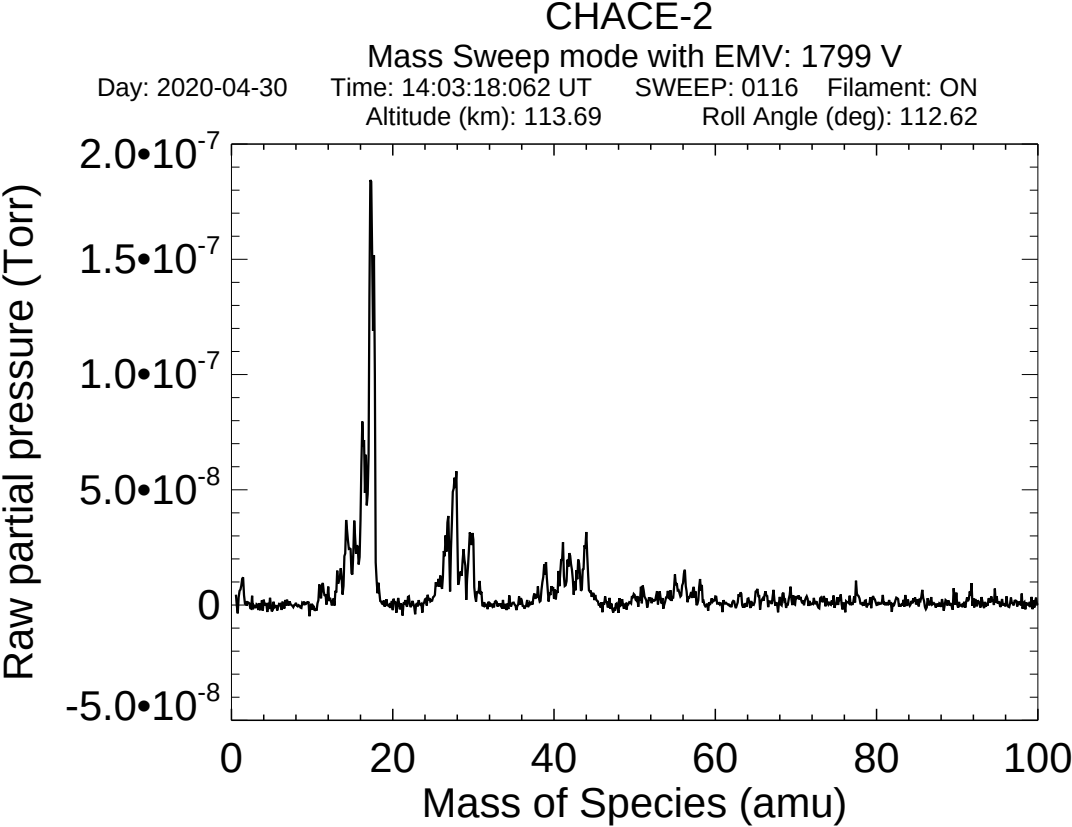

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:00:14:021 UT SWEEP: 0111 Filament: ON
Altitude (km): 112.49 Roll Angle (deg): 107.67
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

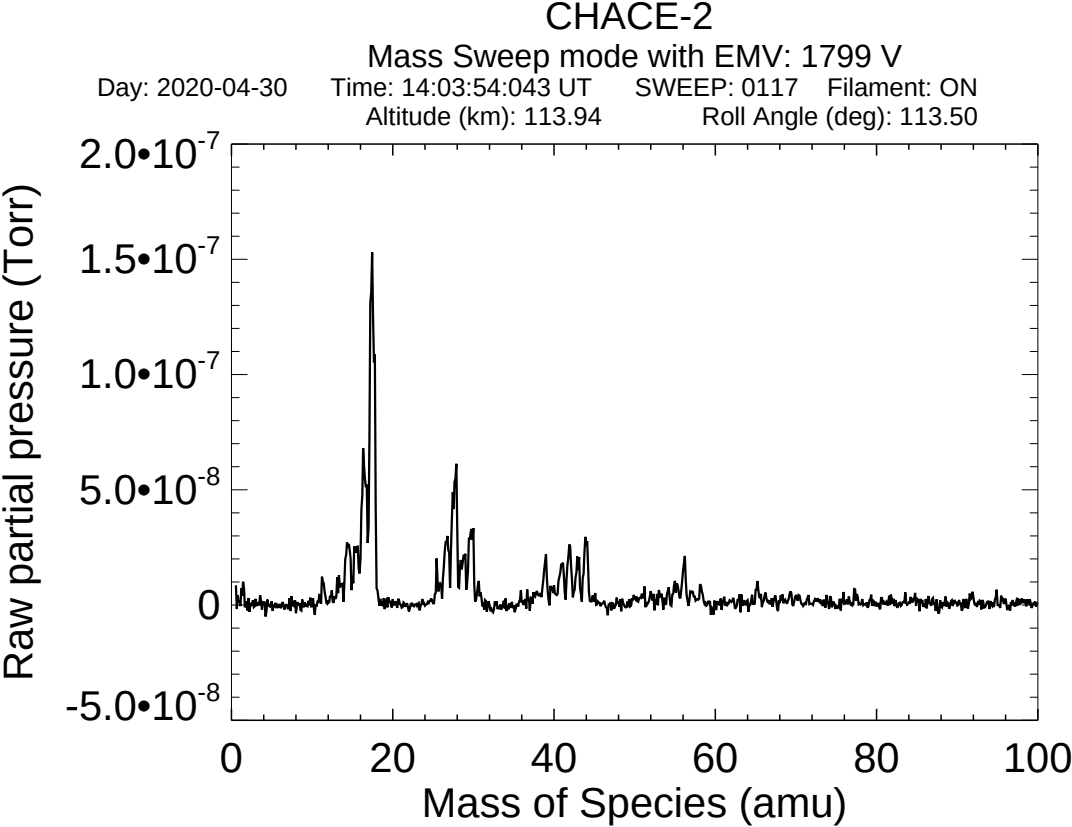

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:00:51:052 UT SWEEP: 0112 Filament: ON
Altitude (km): 112.79 Roll Angle (deg): 108.73
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

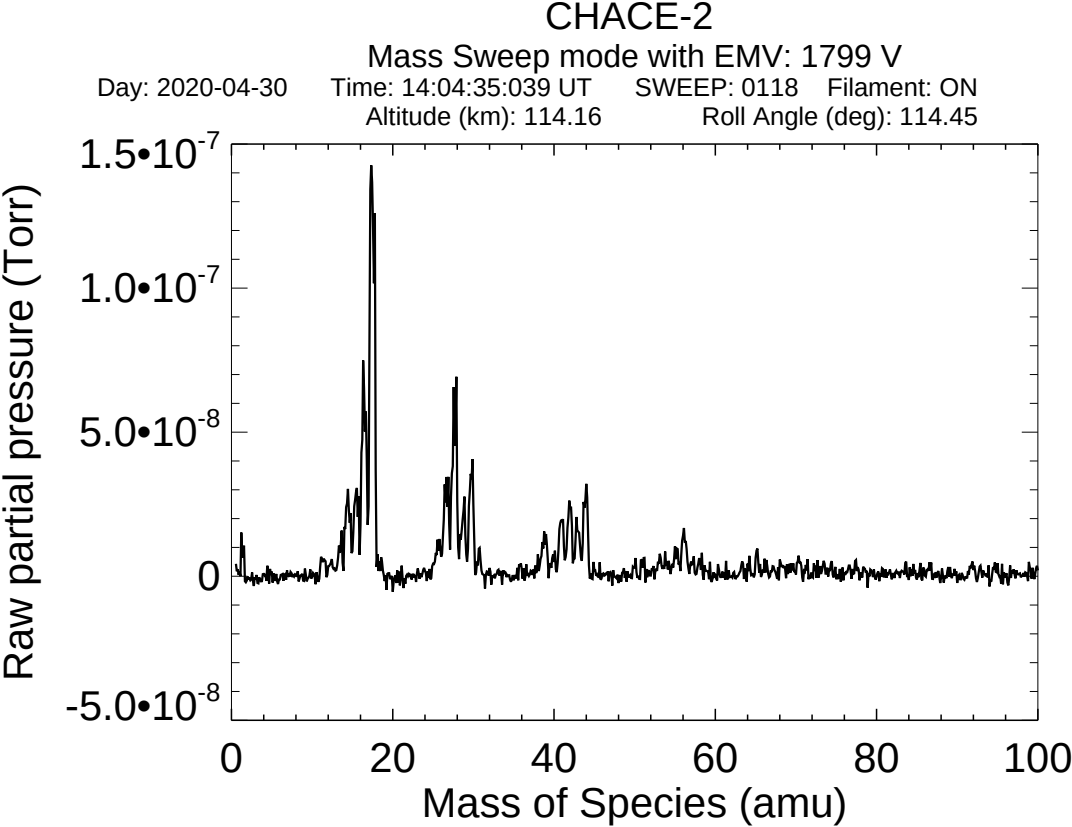

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:01:26:077 UT SWEEP: 0113 Filament: ON
Altitude (km): 113.03 Roll Angle (deg): 109.71
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

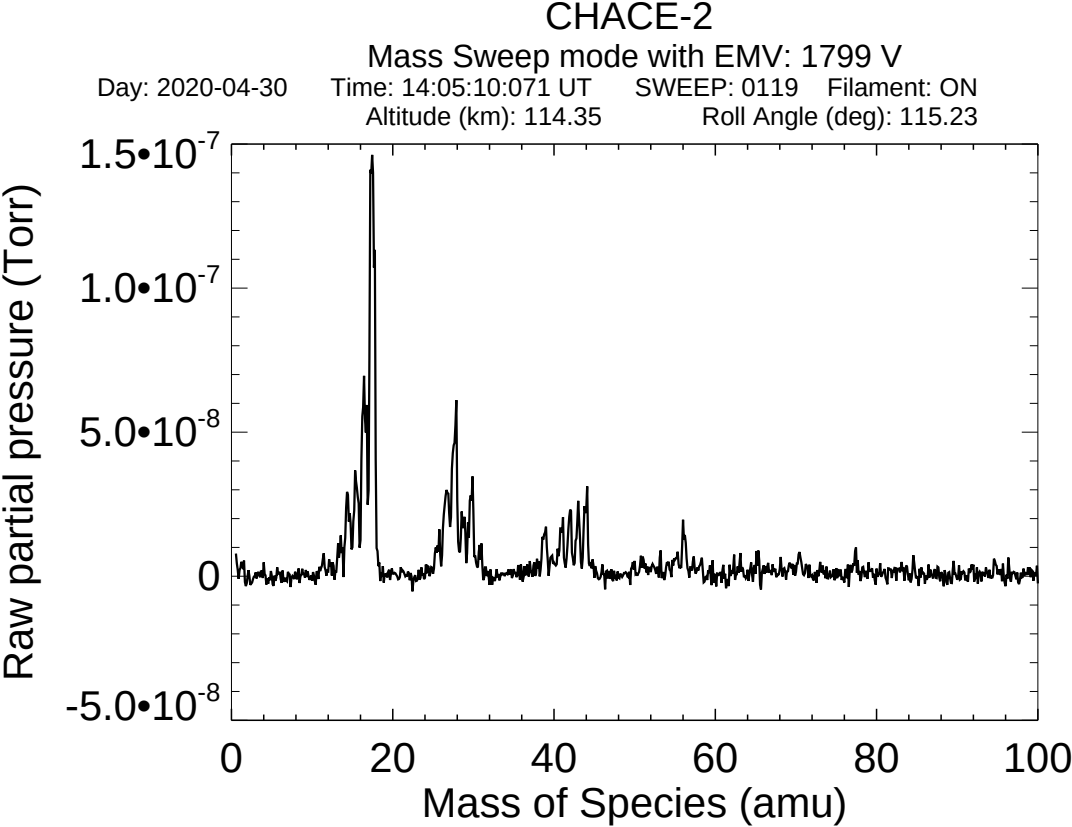

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:02:04:001 UT SWEEP: 0114 Filament: ON
Altitude (km): 113.28 Roll Angle (deg): 110.72
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

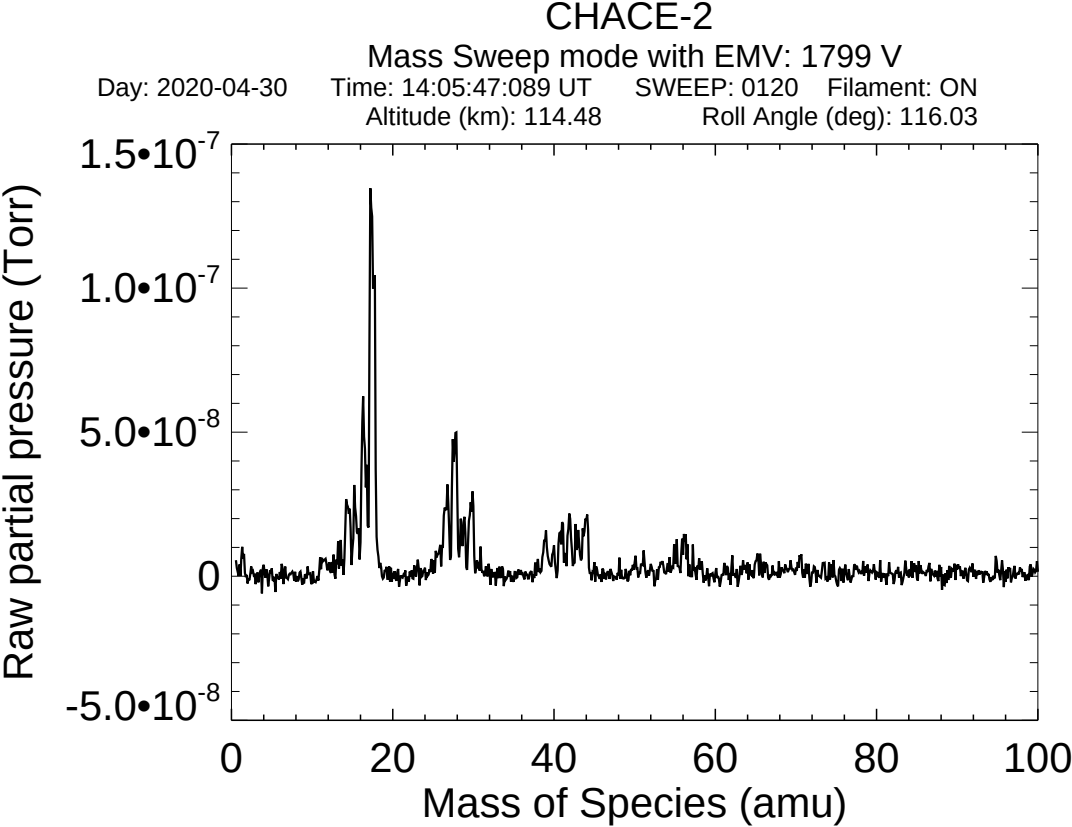

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:02:41:032 UT SWEEP: 0115 Filament: ON
Altitude (km): 113.55 Roll Angle (deg): 111.69
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

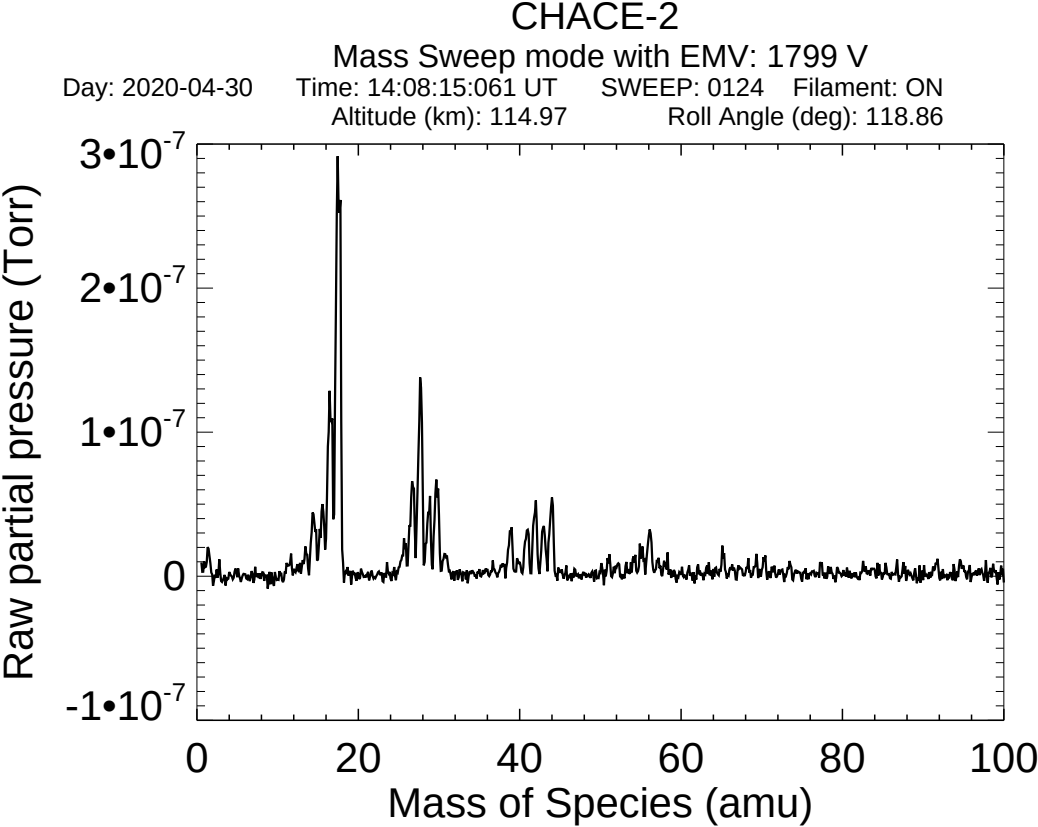

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:03:18:062 UT SWEEP: 0116 Filament: ON
Altitude (km): 113.69 Roll Angle (deg): 112.62
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

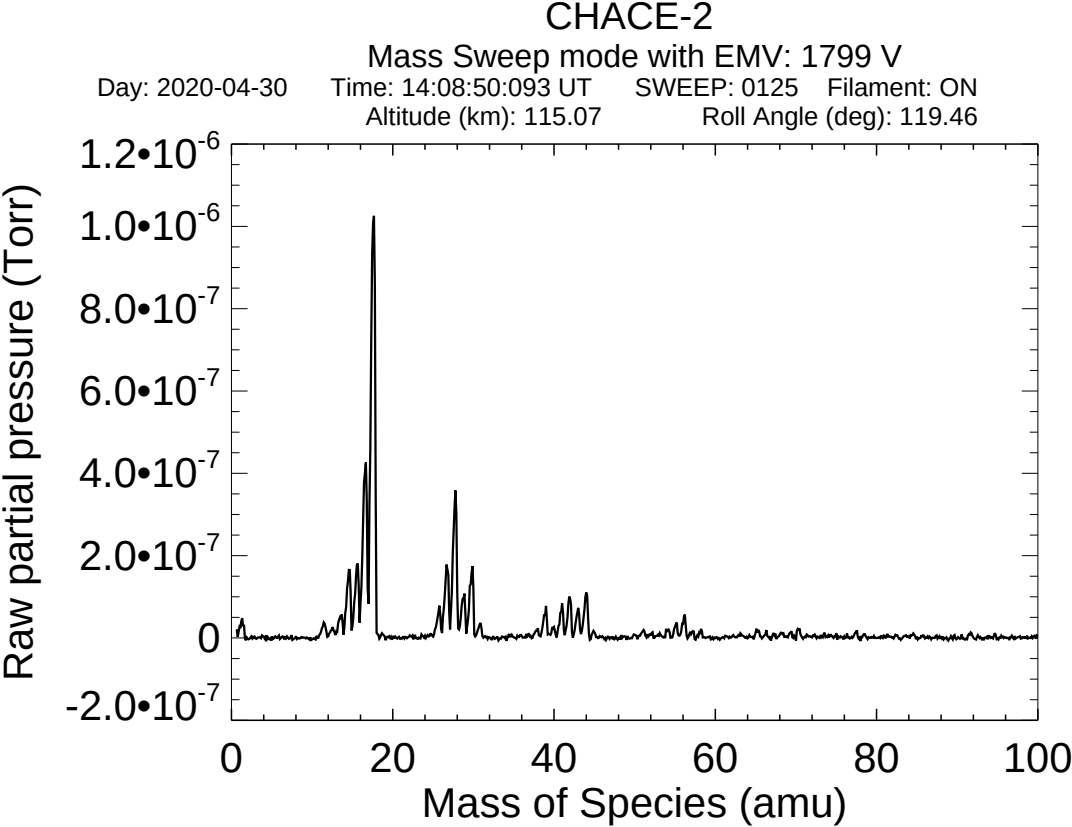

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:03:54:043 UT SWEEP: 0117 Filament: ON
Altitude (km): 113.94 Roll Angle (deg): 113.50
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

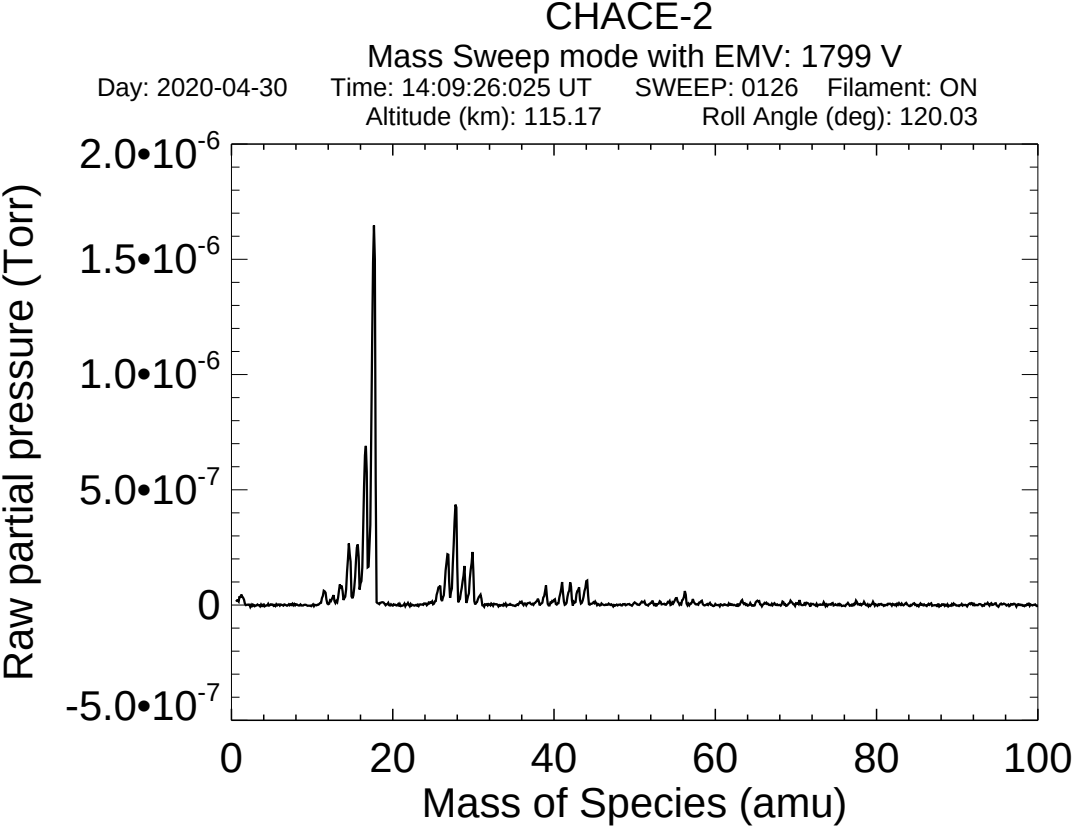

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:04:35:039 UT SWEEP: 0118 Filament: ON
Altitude (km): 114.16 Roll Angle (deg): 114.45
Raw partial pressure (Torr)
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

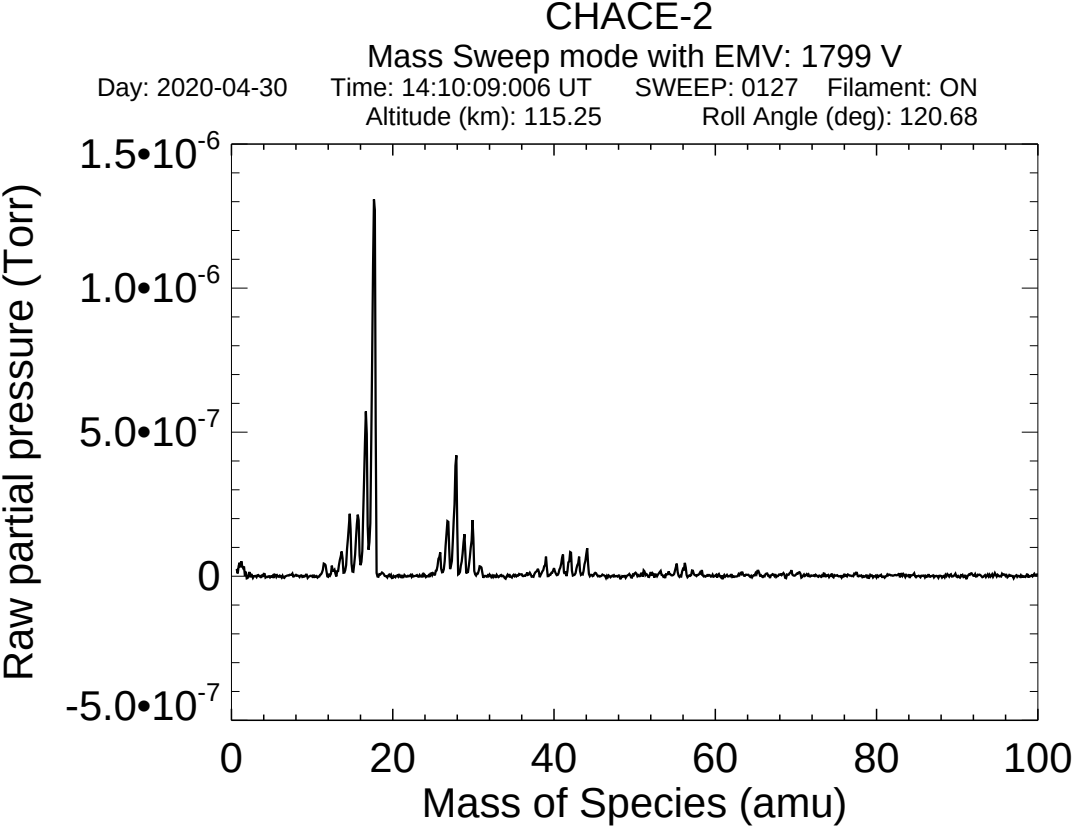

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:05:10:071 UT SWEEP: 0119 Filament: ON
Altitude (km): 114.35 Roll Angle (deg): 115.23
Raw partial pressure (Torr)
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

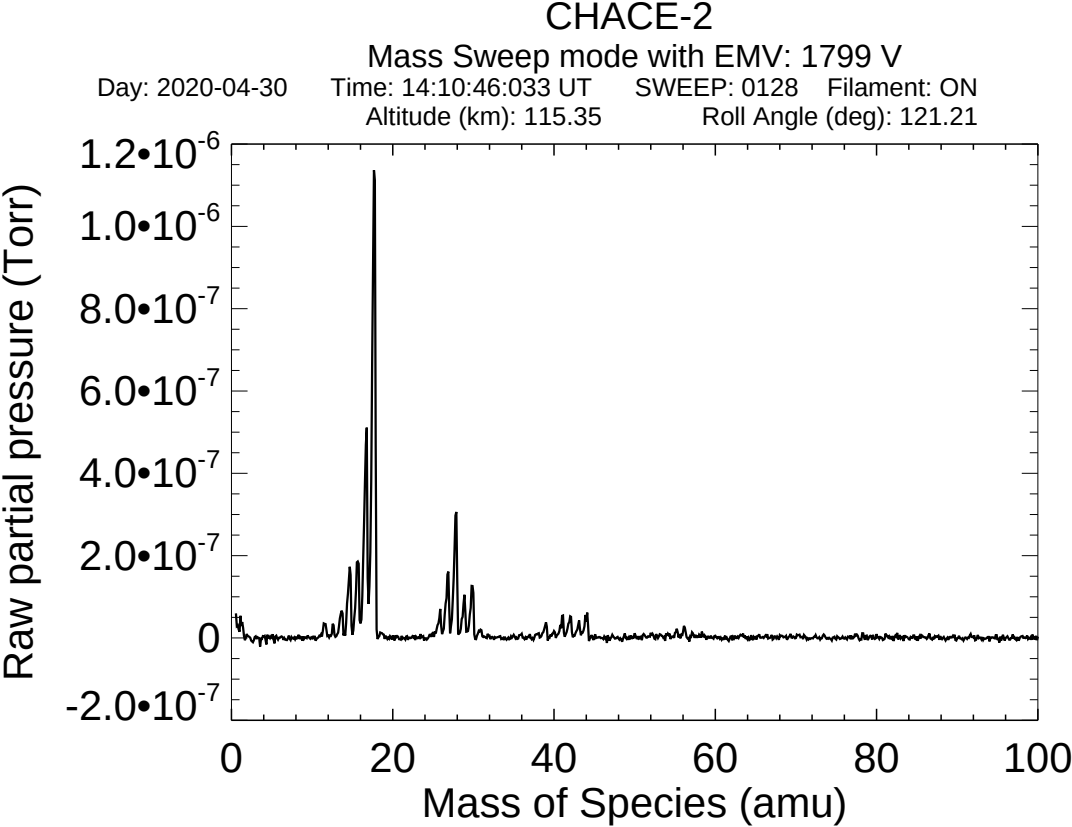

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:05:47:089 UT SWEEP: 0120 Filament: ON
Altitude (km): 114.48 Roll Angle (deg): 116.03
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

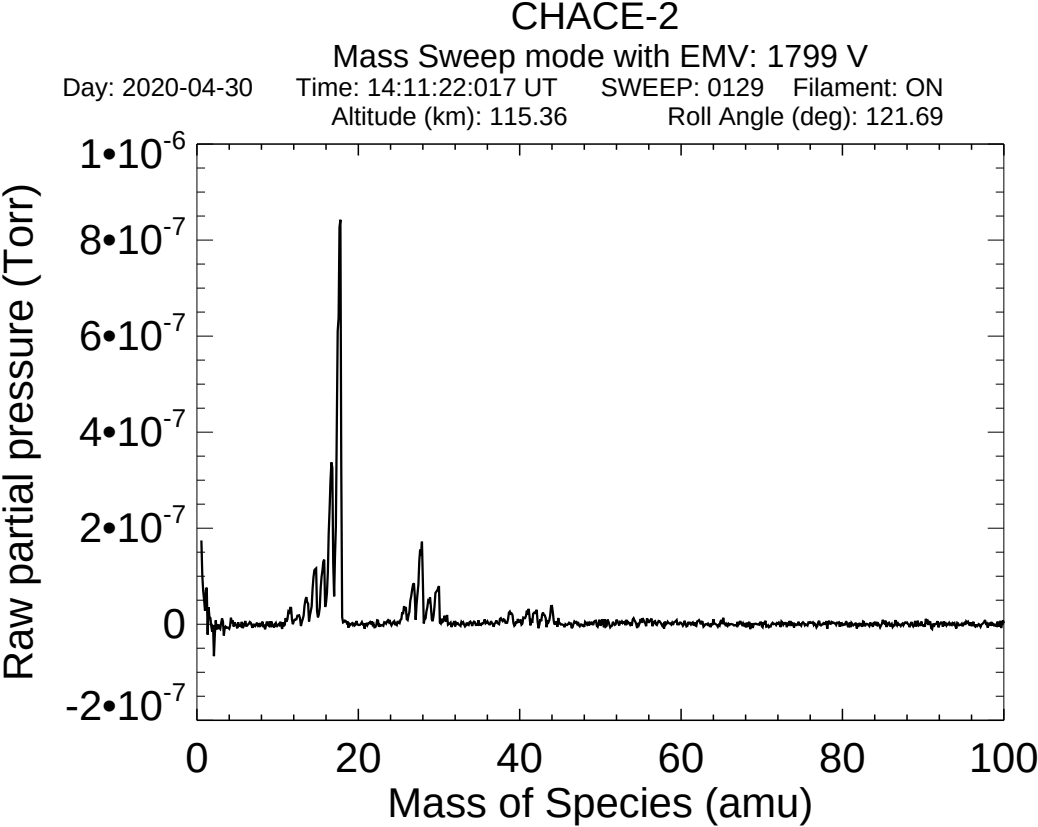

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:08:15:061 UT SWEEP: 0124 Filament: ON
Altitude (km): 114.97 Roll Angle (deg): 118.86
Raw partial pressure (Torr)
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

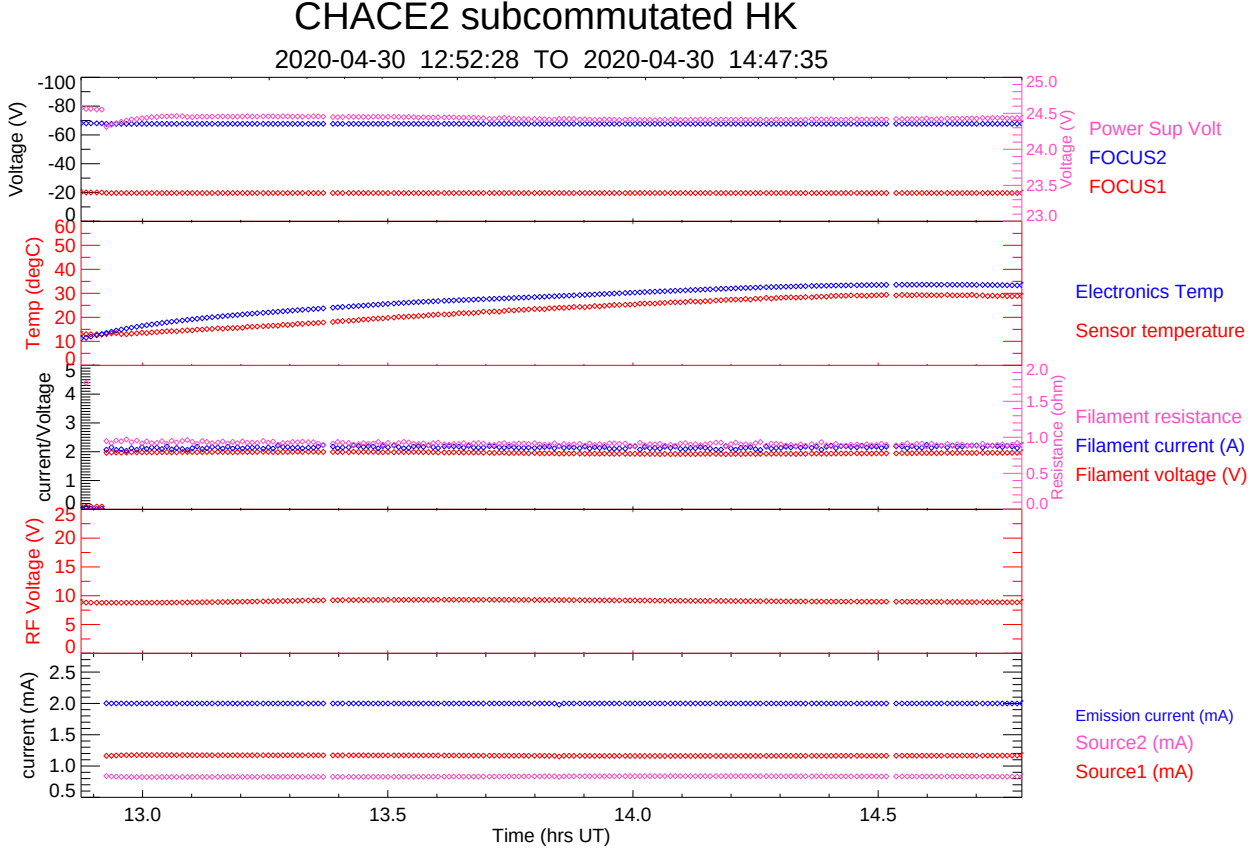

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:08:50:093 UT SWEEP: 0125 Filament: ON
Altitude (km): 115.07 Roll Angle (deg): 119.46
Raw partial pressure (Torr)
1.2•10-6
1.0•10-6
8.0•10-7
6.0•10-7
4.0•10-7
2.0•10-7
0
-2.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

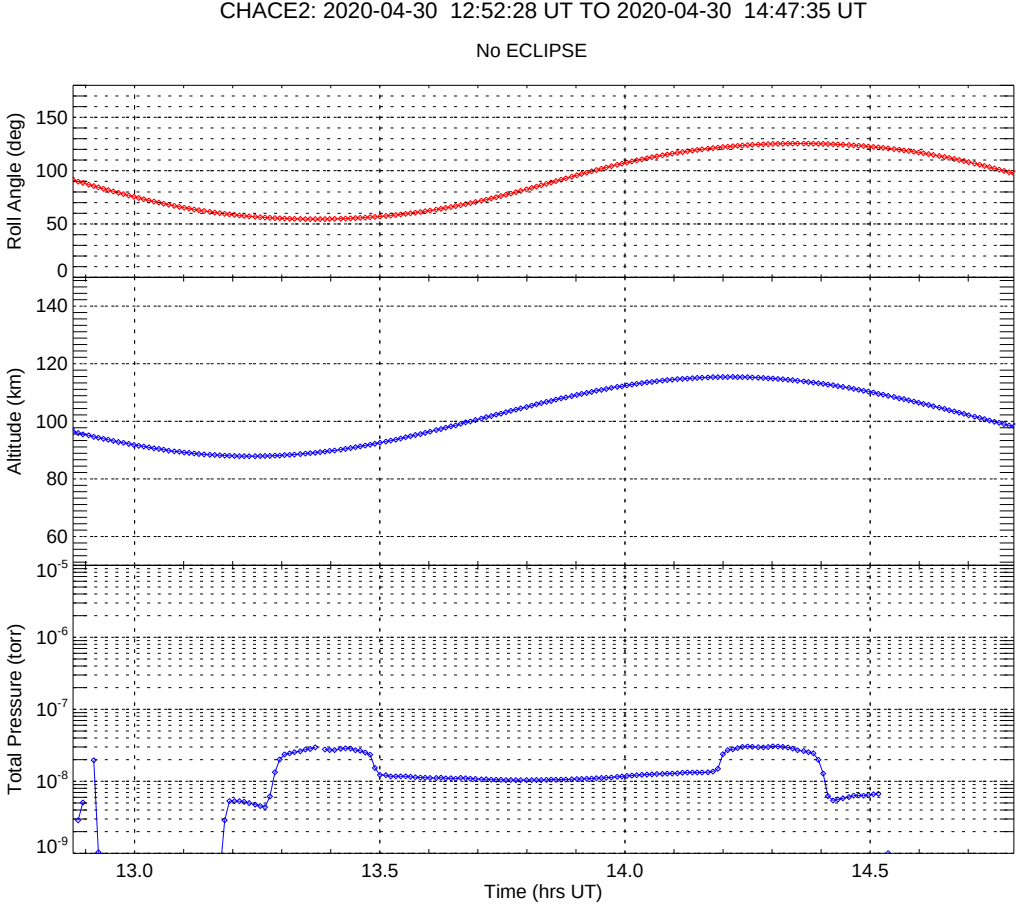

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:09:26:025 UT SWEEP: 0126 Filament: ON
Altitude (km): 115.17 Roll Angle (deg): 120.03
Raw partial pressure (Torr)
2.0•10-6
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

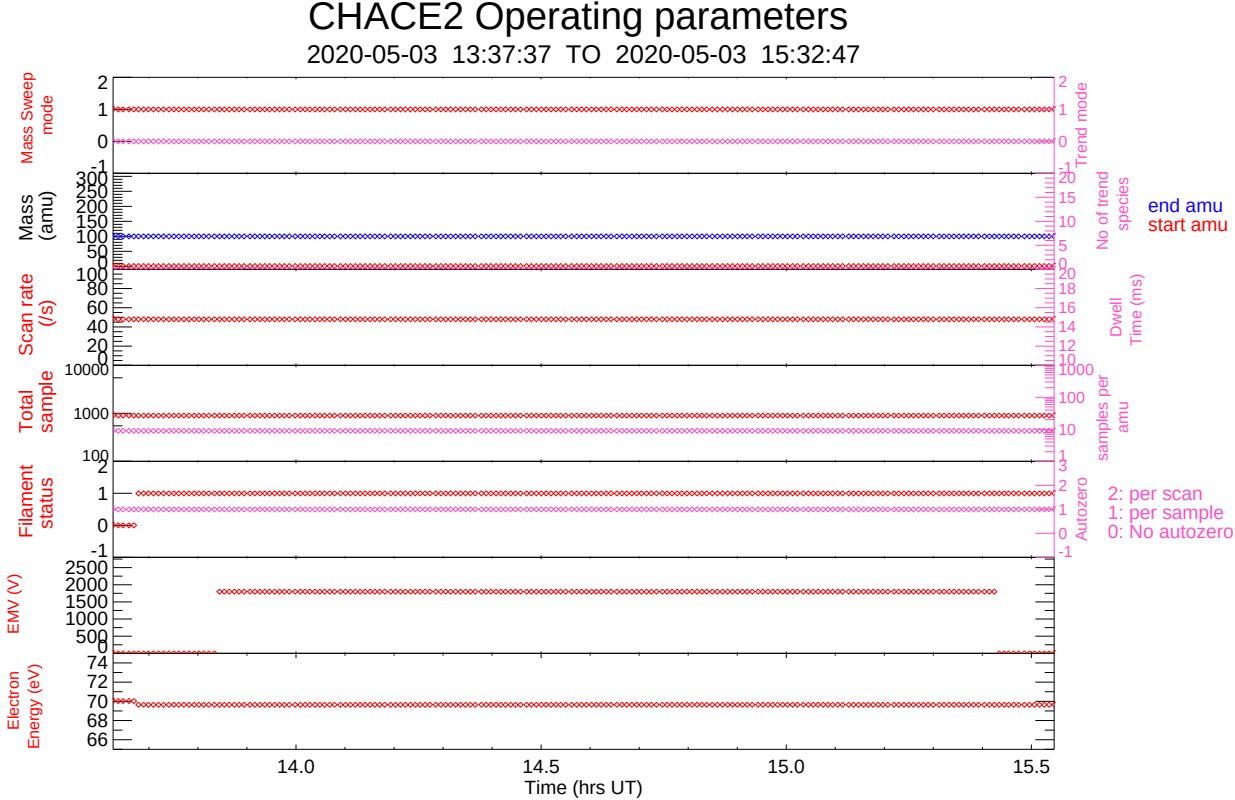

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:10:09:006 UT SWEEP: 0127 Filament: ON
Altitude (km): 115.25 Roll Angle (deg): 120.68
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

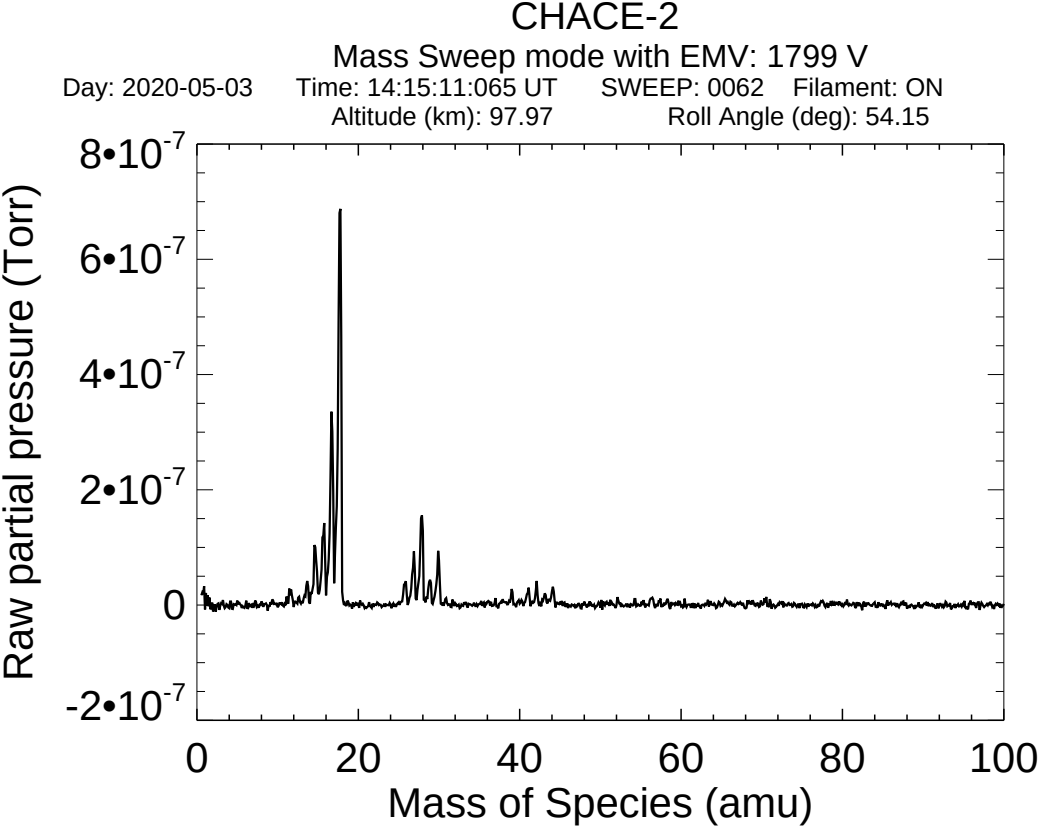

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:10:46:033 UT SWEEP: 0128 Filament: ON
Altitude (km): 115.35 Roll Angle (deg): 121.21
Raw partial pressure (Torr)
1.2•10-6
1.0•10-6
8.0•10-7
6.0•10-7
4.0•10-7
2.0•10-7
0
-2.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

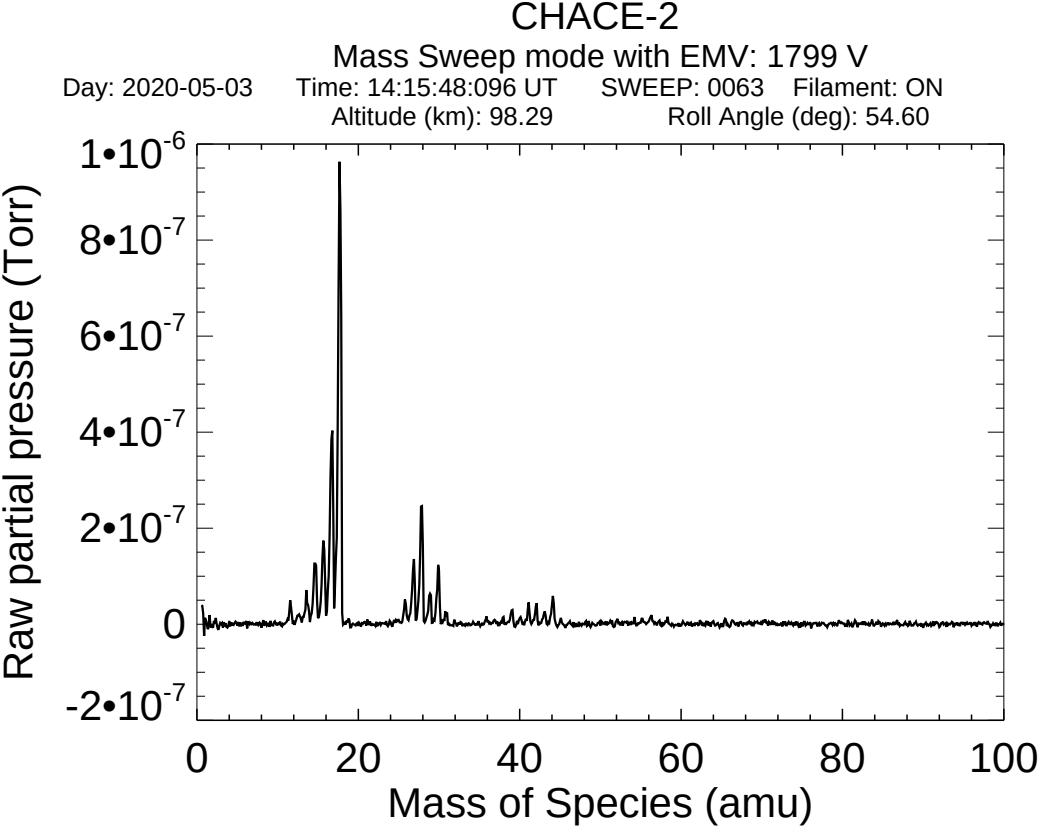

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-04-30 Time: 14:11:22:017 UT SWEEP: 0129 Filament: ON
Altitude (km): 115.36 Roll Angle (deg): 121.69
Raw partial pressure (Torr)
1•10-6
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

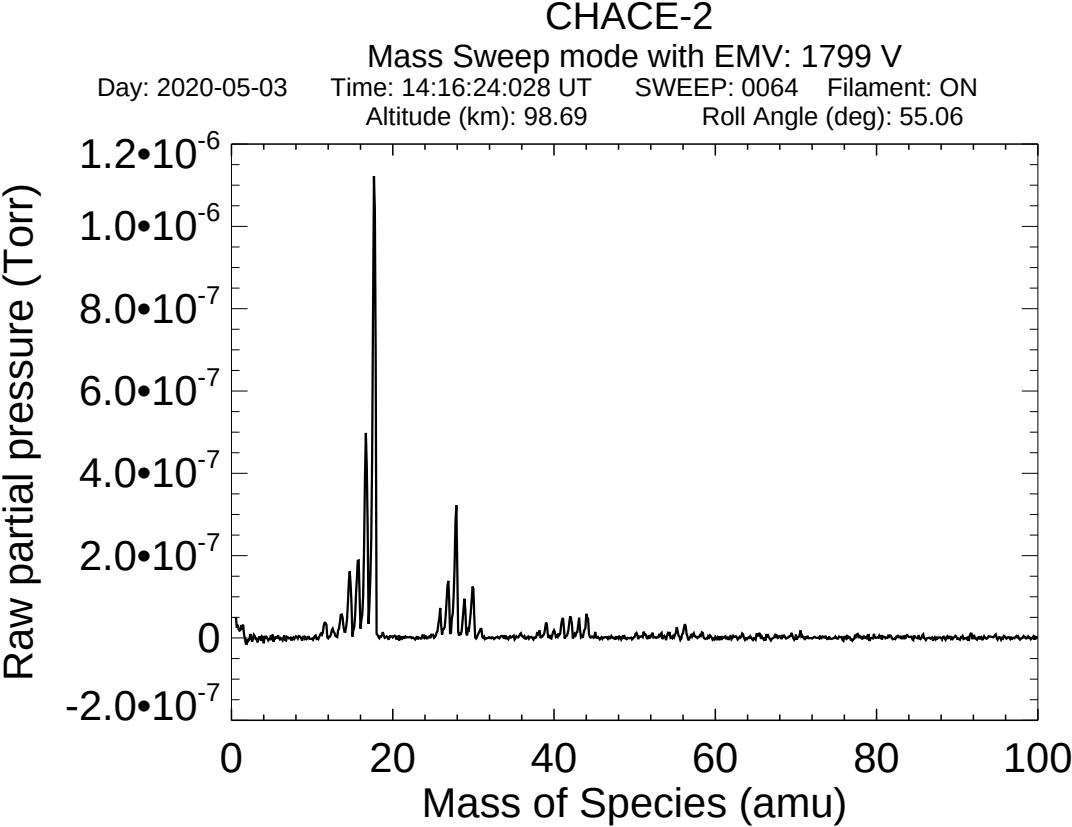

CHACE2 subcommutated HK
2020-04-30 12:52:28 TO 2020-04-30 14:47:35
Voltage (V)
Power Sup Volt
FOCUS2
FOCUS1
Temp (degC)
Electronics Temp
Sensor temperature
current/Voltage
Resistance (ohm)
Filament resistance
Filament current (A)
Filament voltage (V)
RF Voltage (V)
current (mA)
Emission current (mA)
Source2 (mA)
Source1 (mA)
Time (hrs UT)

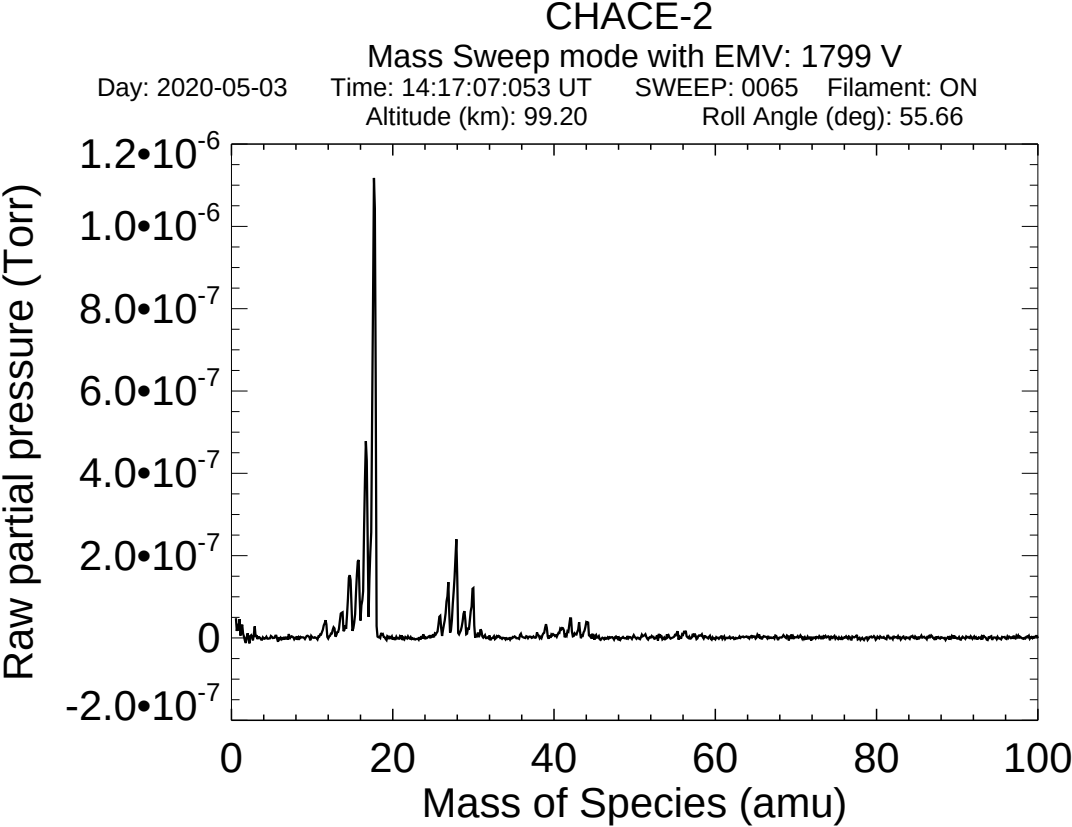

CHACE2: 2020-04-30 12:52:28 UT TO 2020-04-30 14:47:35 UT
No ECLIPSE
Roll Angle (deg)
150
100
50
0
Altitude (km)
140
120
100
80
60
Total Pressure (torr)
10-5
10-6
10-7
10-8
10-9
13.0
13.5
14.0
14.5
Time (hrs UT)

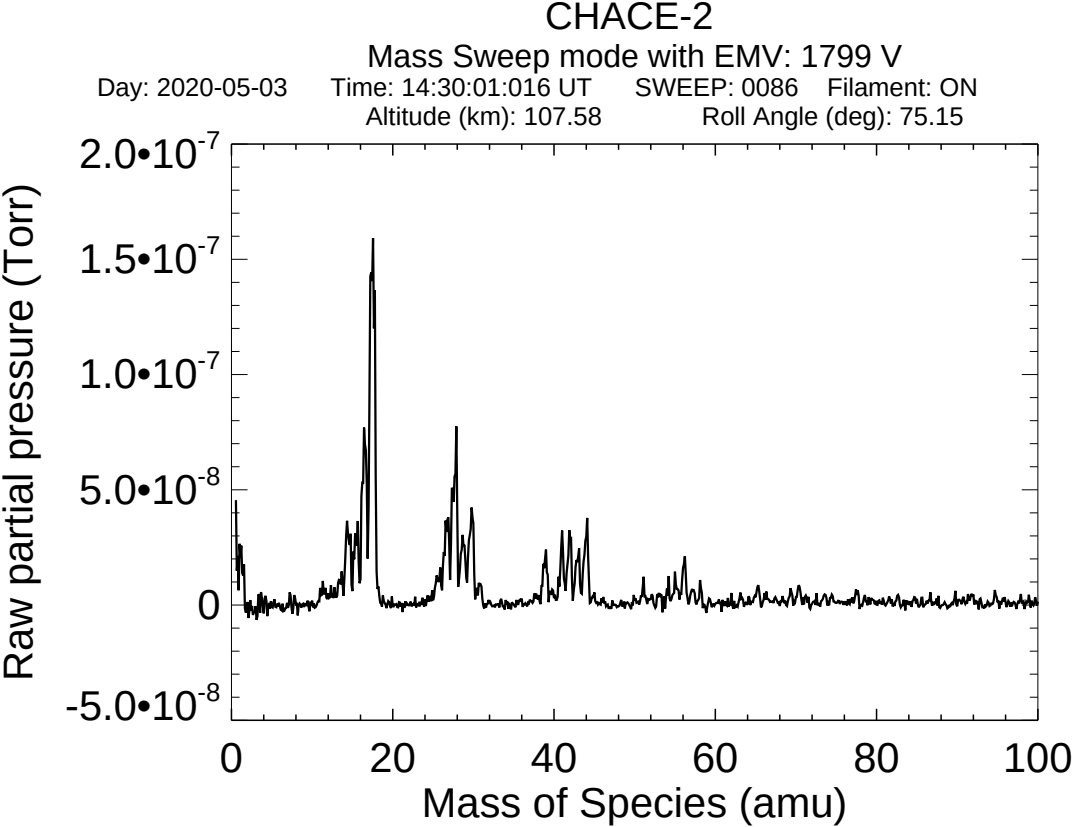

CHACE2 Operating parameters
2020-05-03 13:37:37 TO 2020-05-03 15:32:47
Mass Sweep mode
Trend mode
Mass (amu)
No of trend species
end amu
start amu
Scan rate (/s)
Dwell Time (ms)
Total sample
samples per amu
Filament status
Autozero
2: per scan
1: per sample
0: No autozero
EMV (V)
Electron Energy (eV)
14.0
14.5
15.0
15.5
Time (hrs UT)

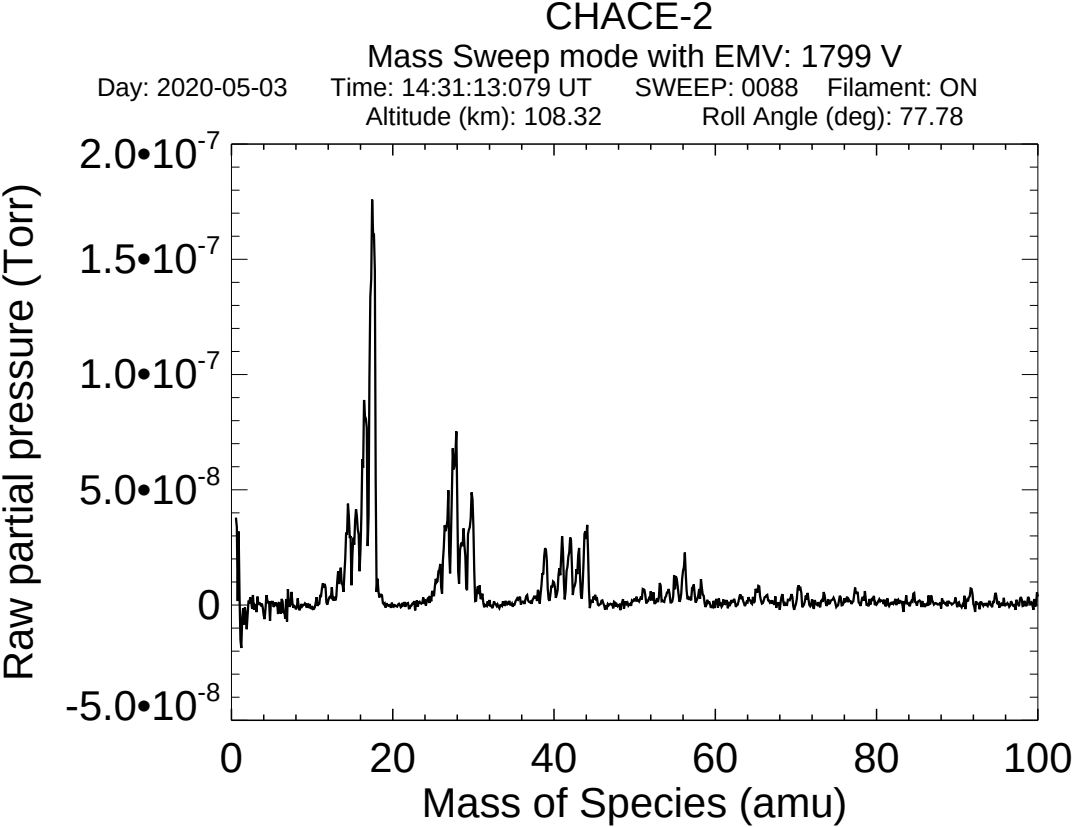

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:15:11:065 UT SWEEP: 0062 Filament: ON
Altitude (km): 97.97 Roll Angle (deg): 54.15
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

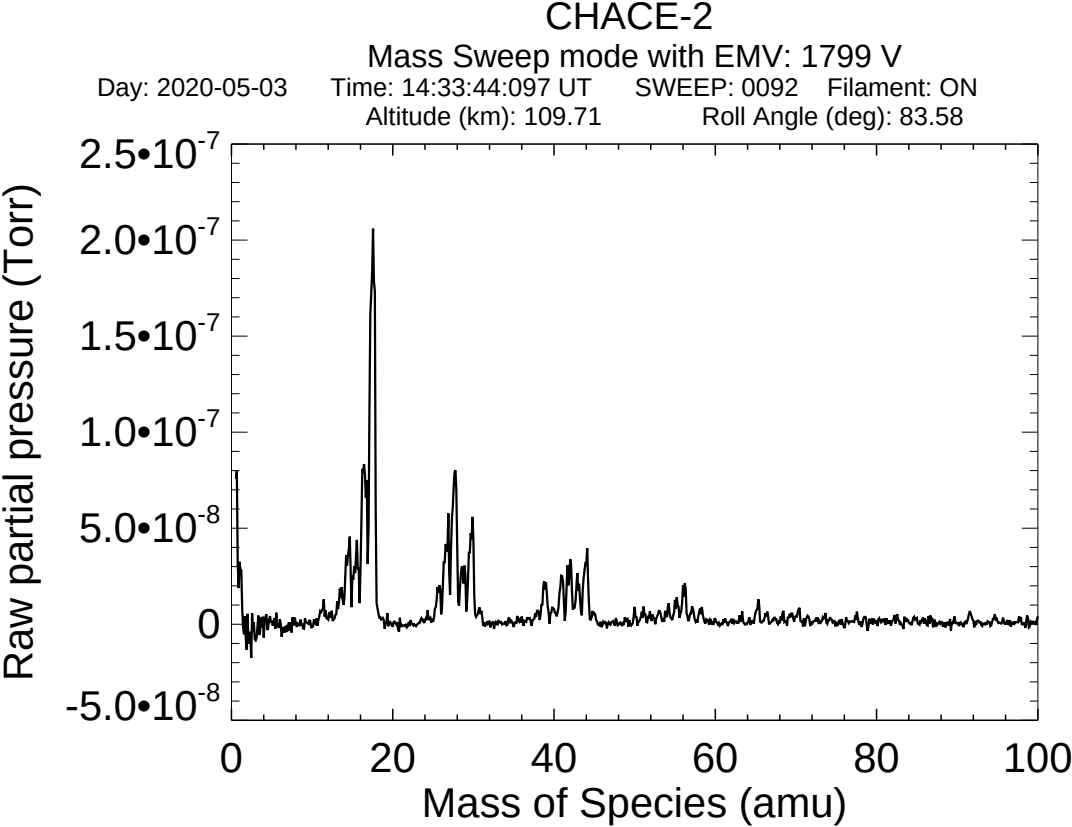

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:15:48:096 UT SWEEP: 0063 Filament: ON
Altitude (km): 98.29 Roll Angle (deg): 54.60
Raw partial pressure (Torr)
1•10-6
8•10-7
6•10-7
4•10-7
2•10-7
0
-2•10-7
0
20
40
60
80
100
Mass of Species (amu)

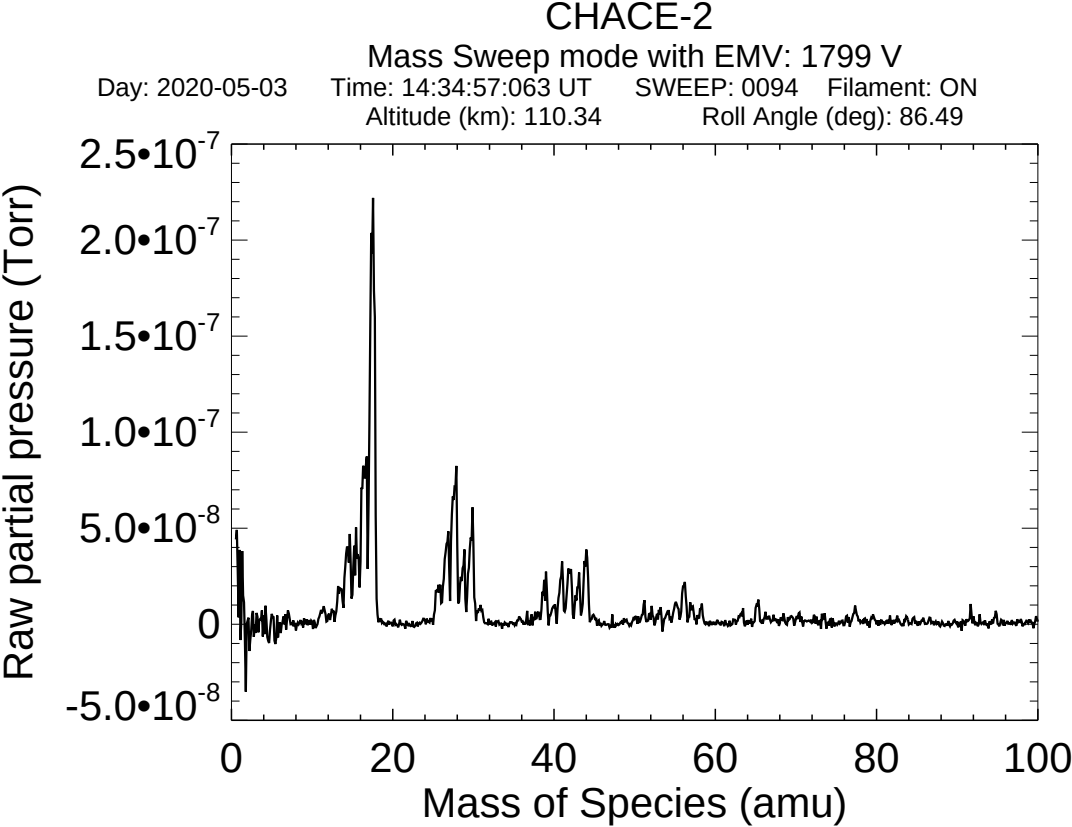

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:16:24:028 UT SWEEP: 0064 Filament: ON
Altitude (km): 98.69 Roll Angle (deg): 55.06
Raw partial pressure (Torr)
1.2•10-6
1.0•10-6
8.0•10-7
6.0•10-7
4.0•10-7
2.0•10-7
0
-2.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

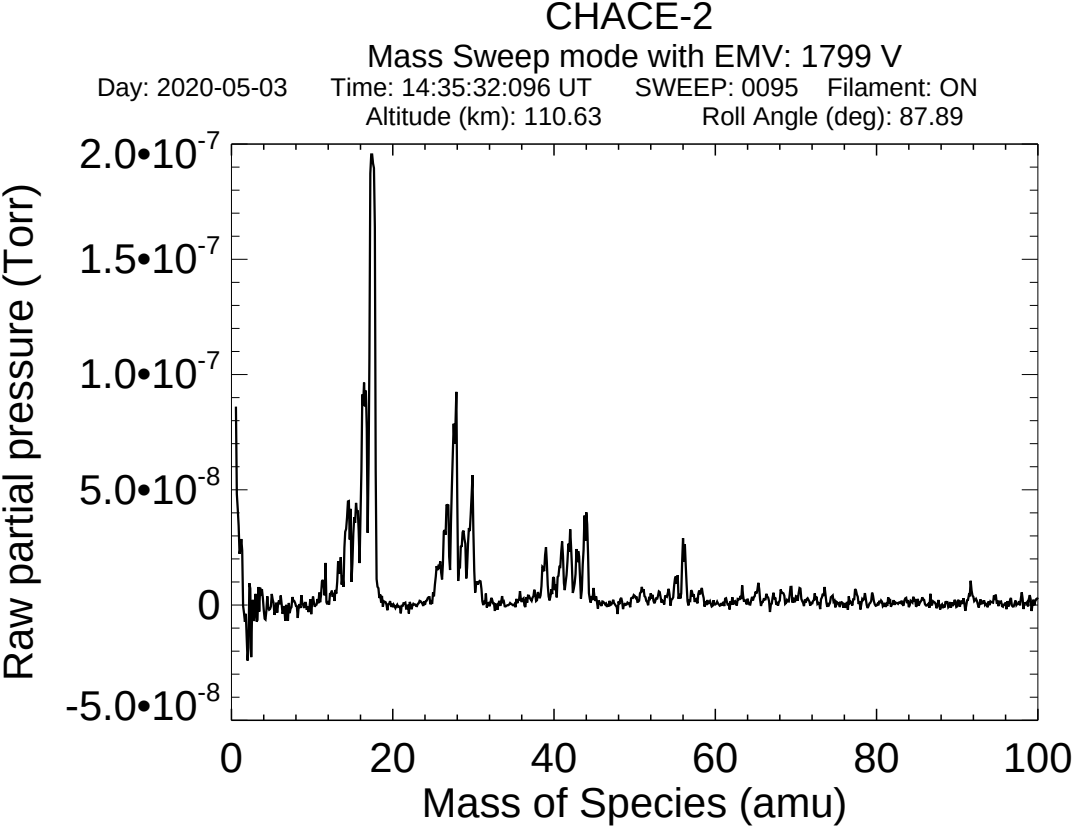

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:17:07:053 UT SWEEP: 0065 Filament: ON
Altitude (km): 99.20 Roll Angle (deg): 55.66
Raw partial pressure (Torr)
1.2•10-6
1.0•10-6
8.0•10-7
6.0•10-7
4.0•10-7
2.0•10-7
0
-2.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

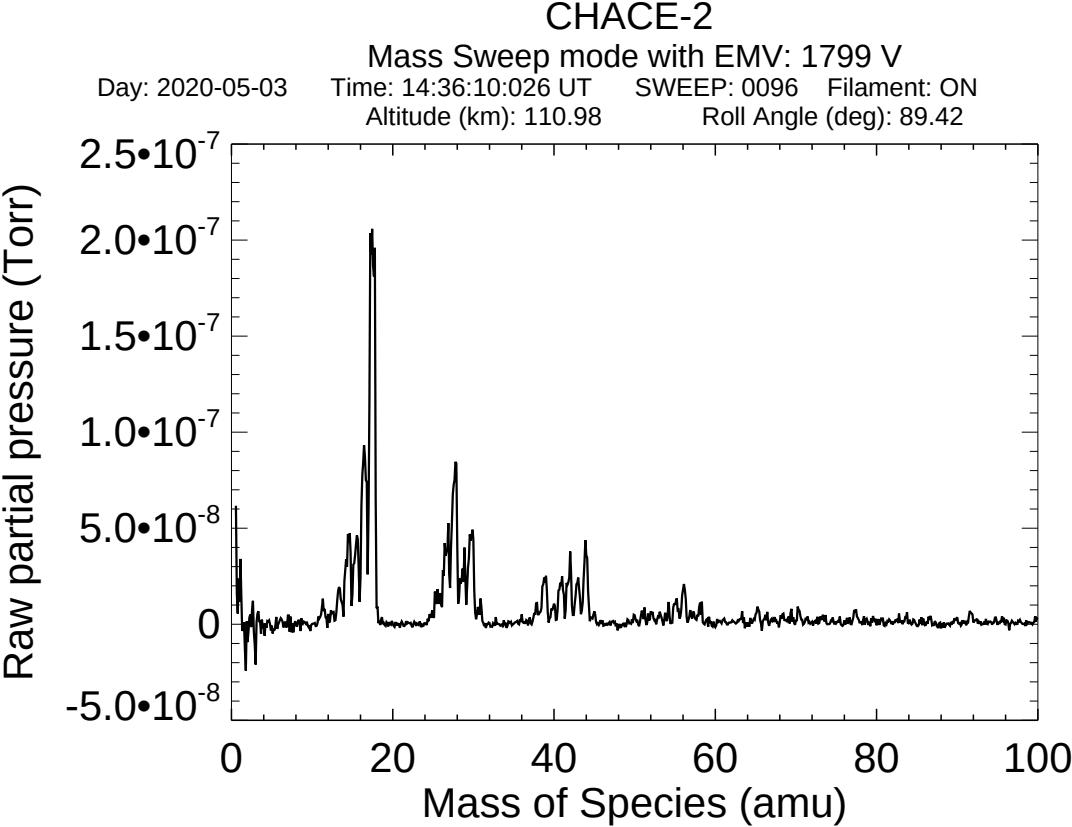

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:30:01:016 UT SWEEP: 0086 Filament: ON
Altitude (km): 107.58 Roll Angle (deg): 75.15
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

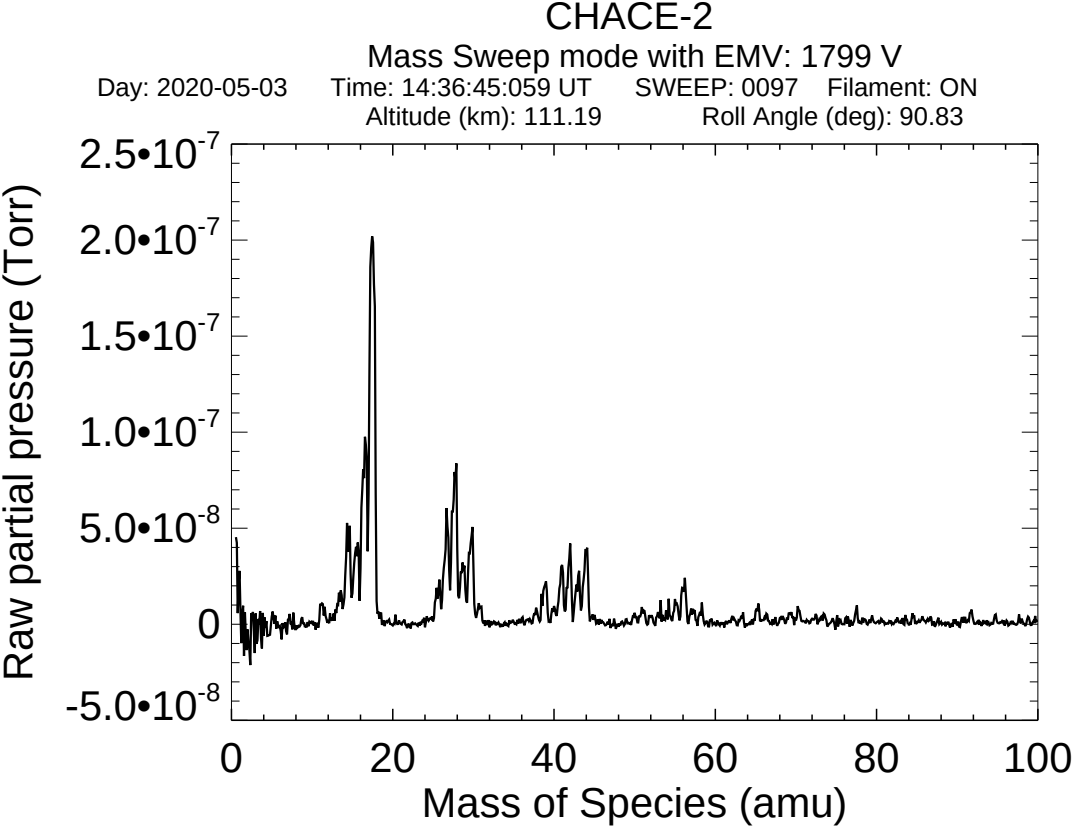

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:31:13:079 UT SWEEP: 0088 Filament: ON
Altitude (km): 108.32 Roll Angle (deg): 77.78
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

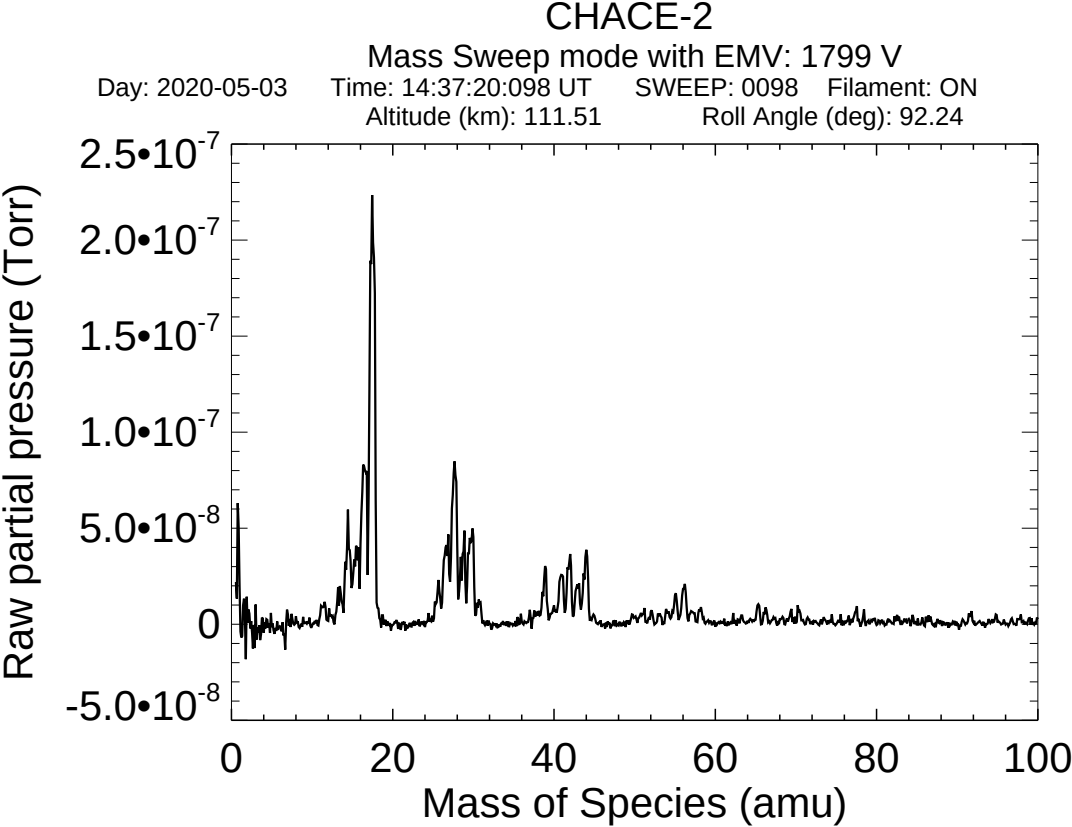

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:33:44:097 UT SWEEP: 0092 Filament: ON
Altitude (km): 109.71 Roll Angle (deg): 83.58
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

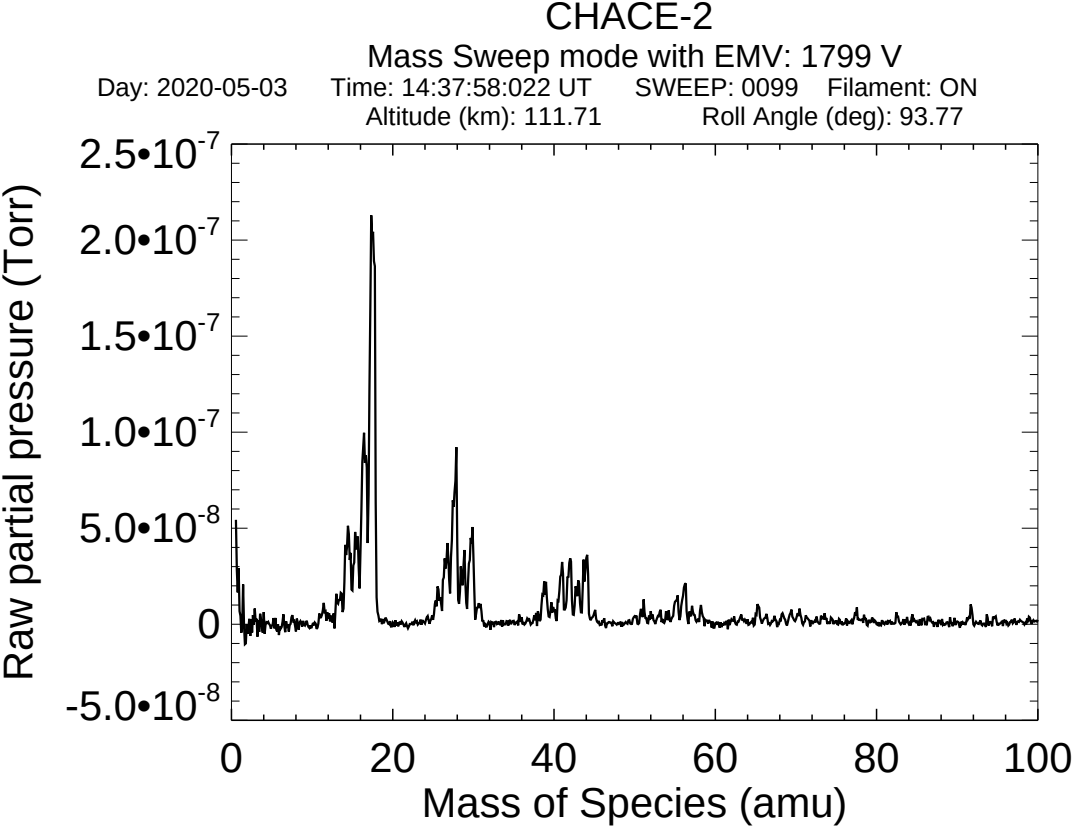

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:34:57:063 UT SWEEP: 0094 Filament: ON
Altitude (km): 110.34 Roll Angle (deg): 86.49
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

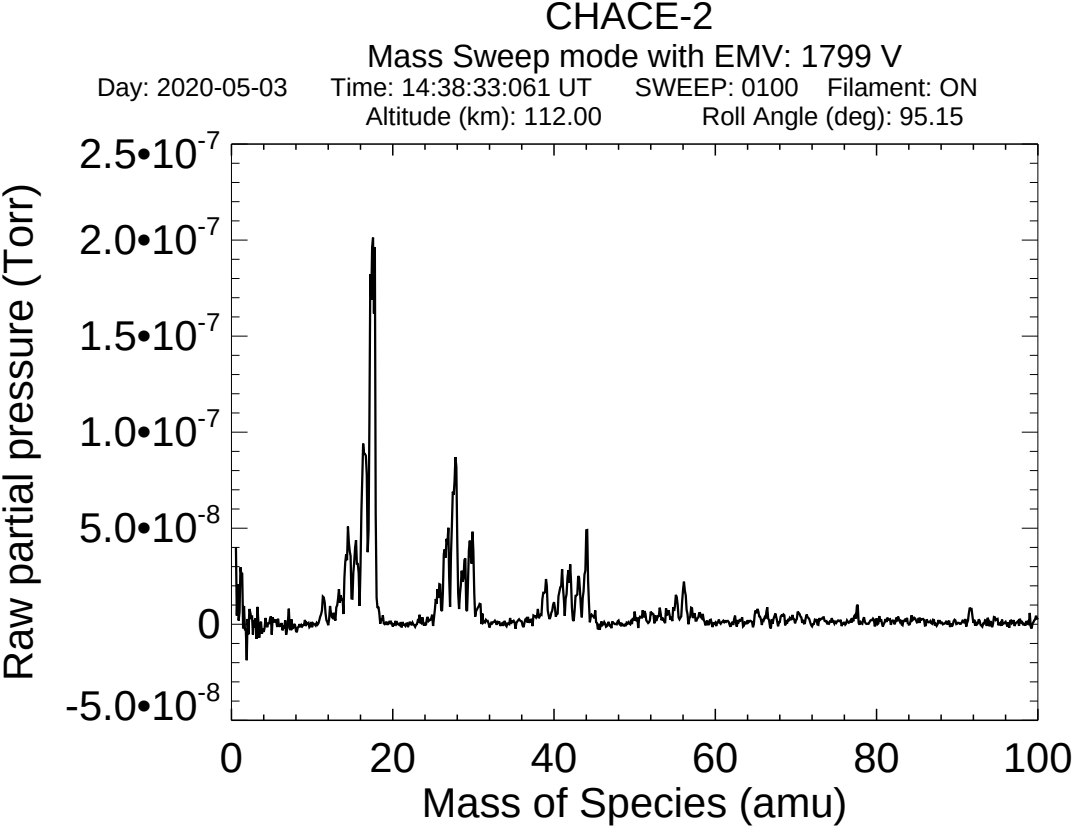

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:35:32:096 UT SWEEP: 0095 Filament: ON
Altitude (km): 110.63 Roll Angle (deg): 87.89
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

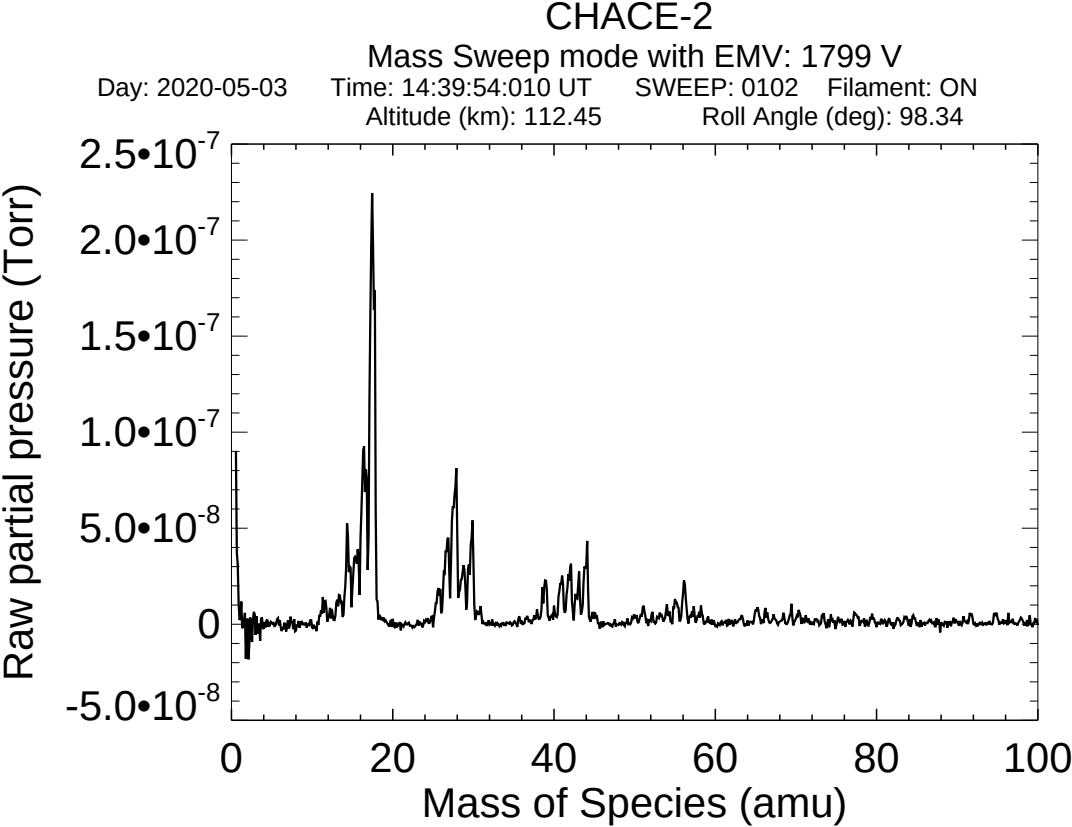

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:36:10:026 UT SWEEP: 0096 Filament: ON
Altitude (km): 110.98 Roll Angle (deg): 89.42
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

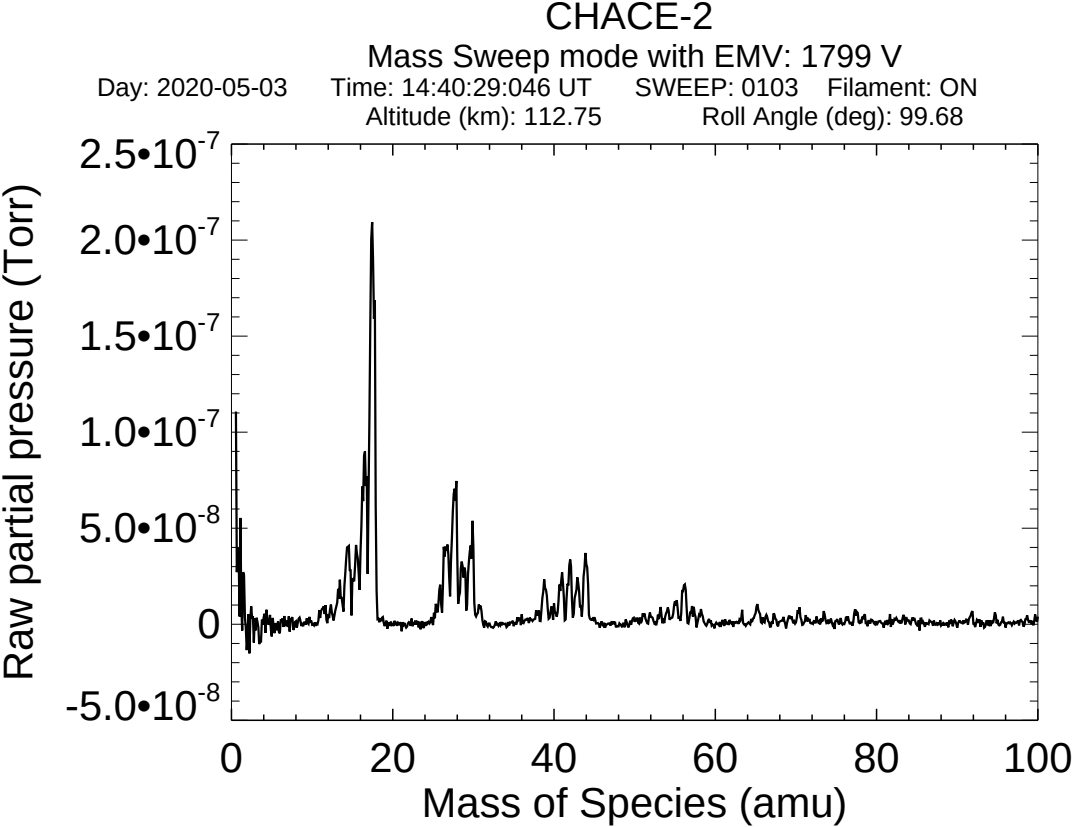

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:36:45:059 UT SWEEP: 0097 Filament: ON
Altitude (km): 111.19 Roll Angle (deg): 90.83
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

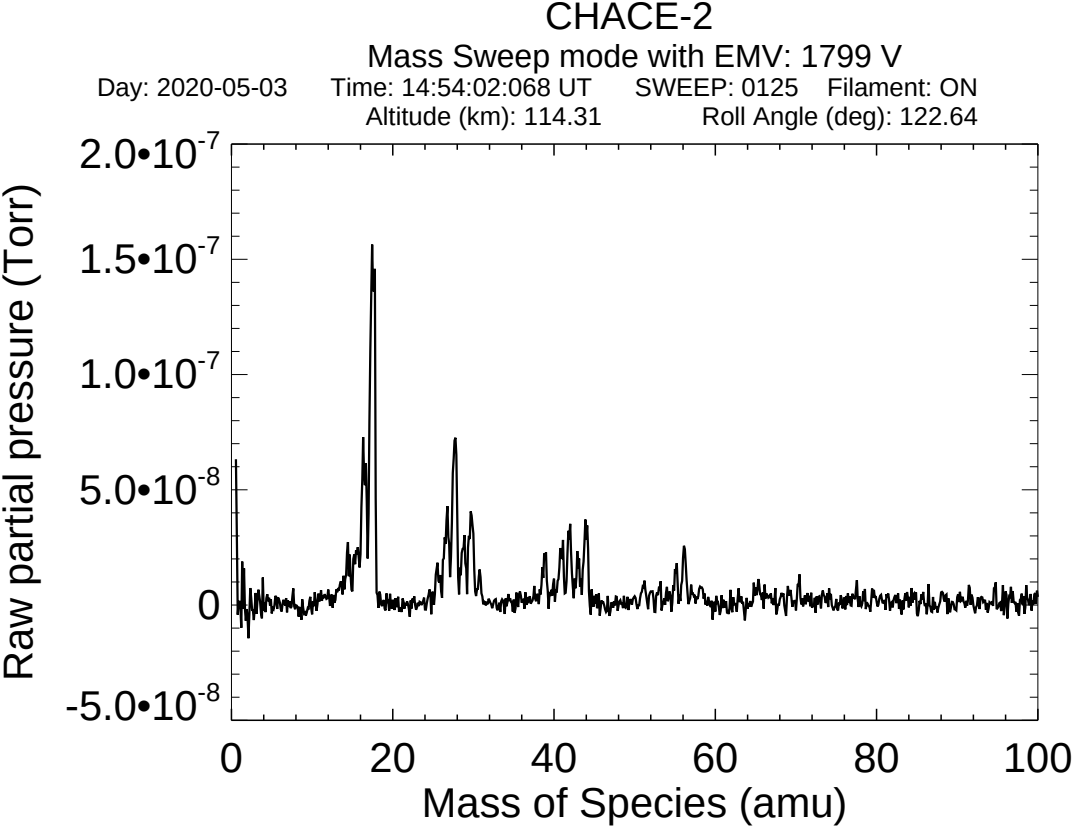

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:37:20:098 UT SWEEP: 0098 Filament: ON
Altitude (km): 111.51 Roll Angle (deg): 92.24
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

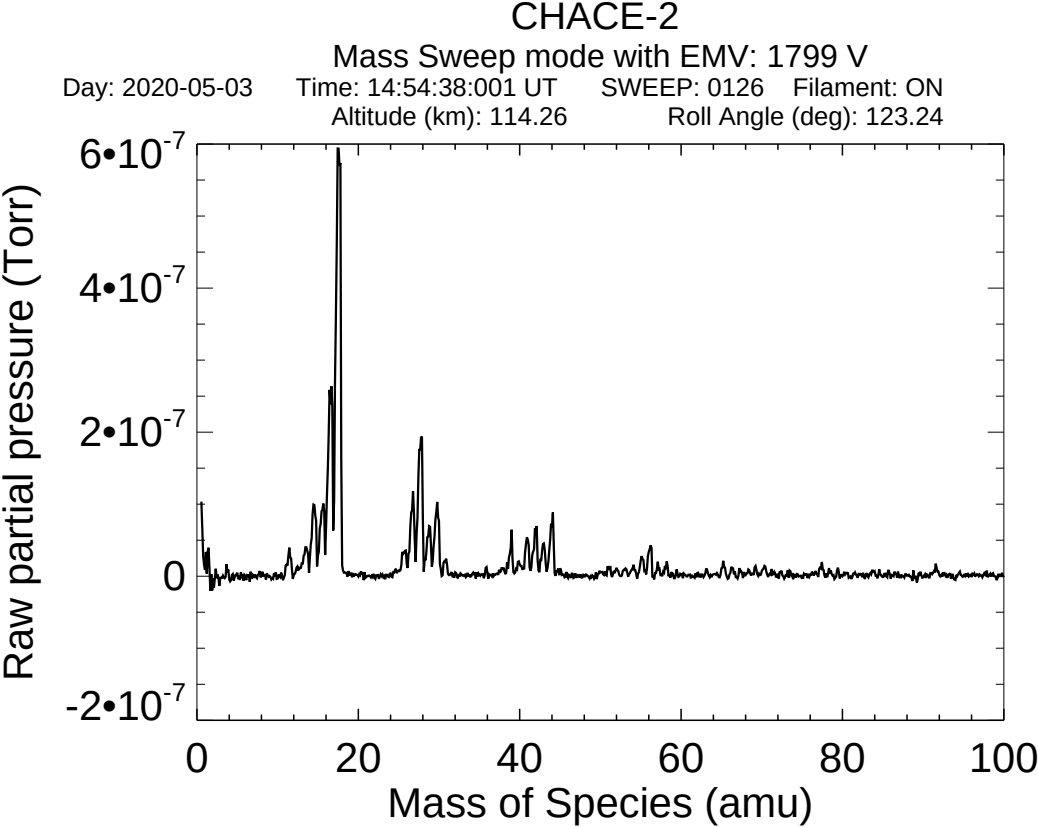

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:37:58:022 UT SWEEP: 0099 Filament: ON
Altitude (km): 111.71 Roll Angle (deg): 93.77
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

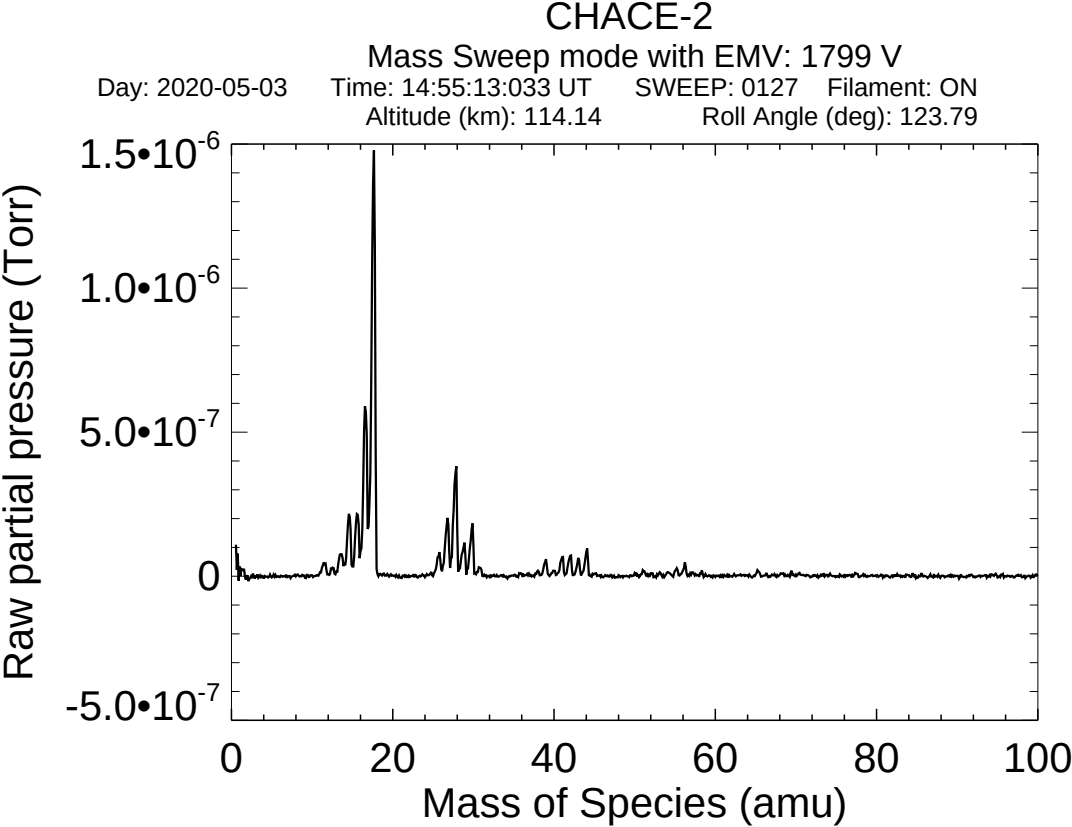

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:38:33:061 UT SWEEP: 0100 Filament: ON
Altitude (km): 112.00 Roll Angle (deg): 95.15
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

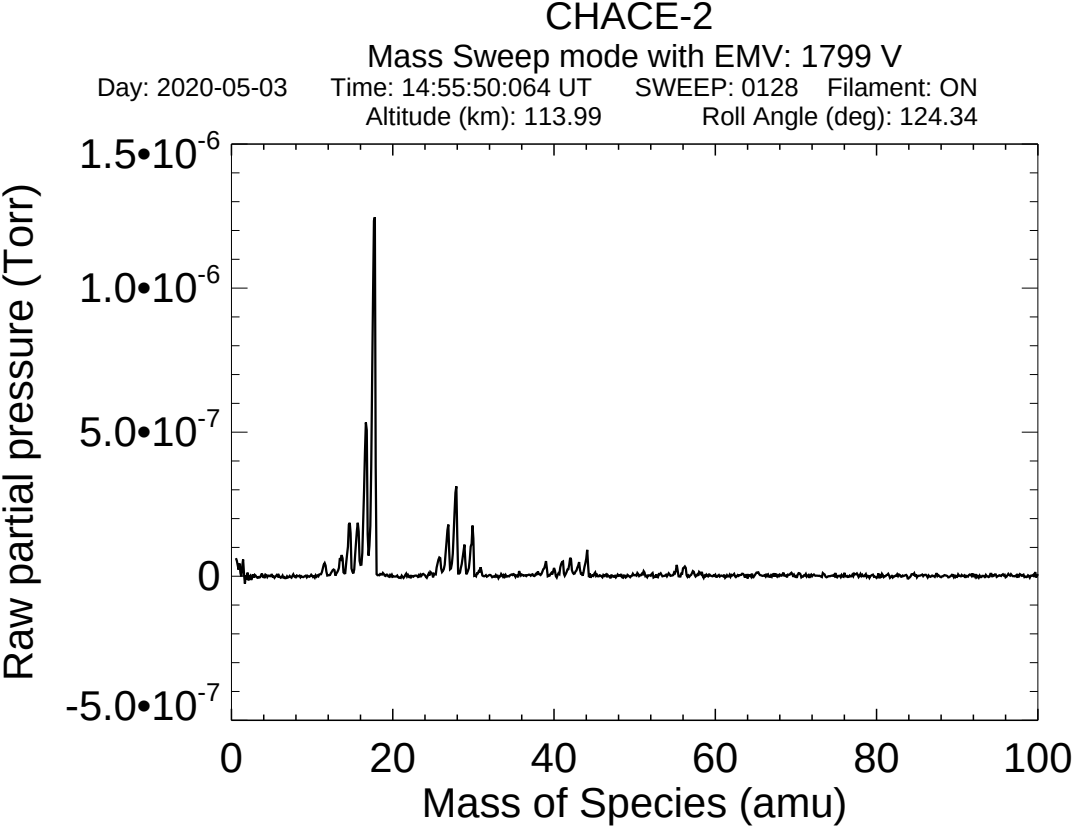

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:39:54:010 UT SWEEP: 0102 Filament: ON
Altitude (km): 112.45 Roll Angle (deg): 98.34
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

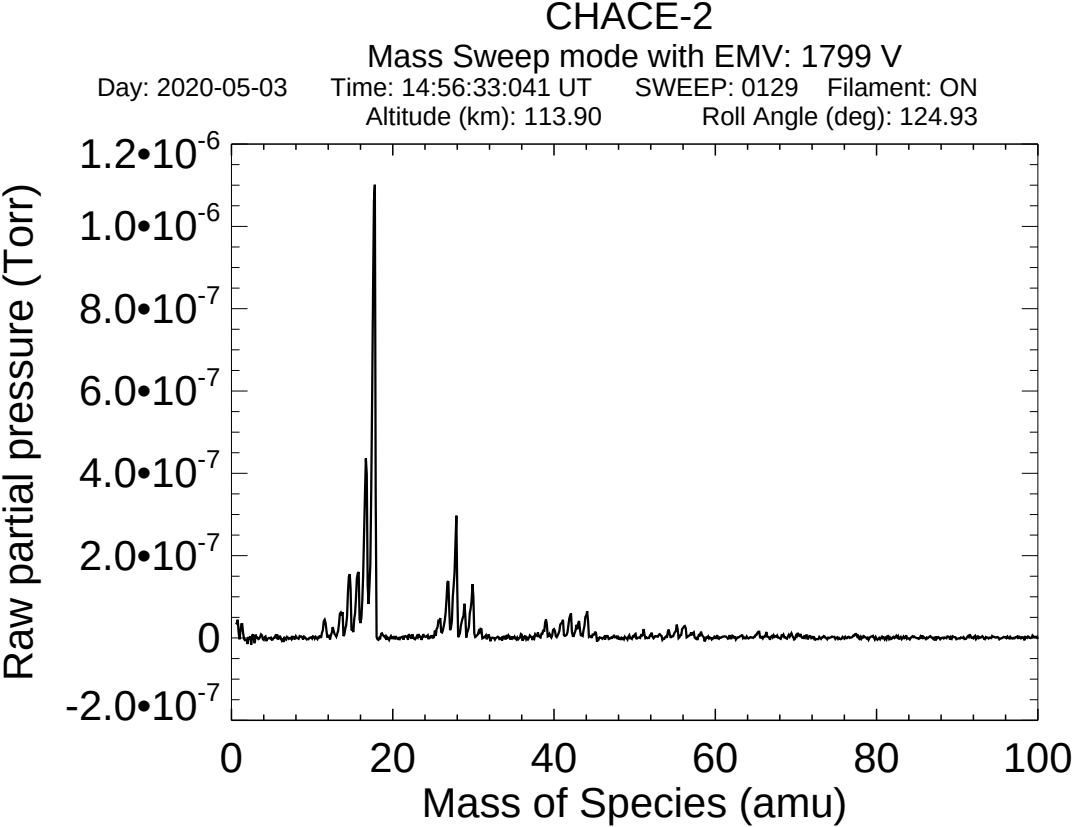

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:40:29:046 UT SWEEP: 0103 Filament: ON
Altitude (km): 112.75 Roll Angle (deg): 99.68
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

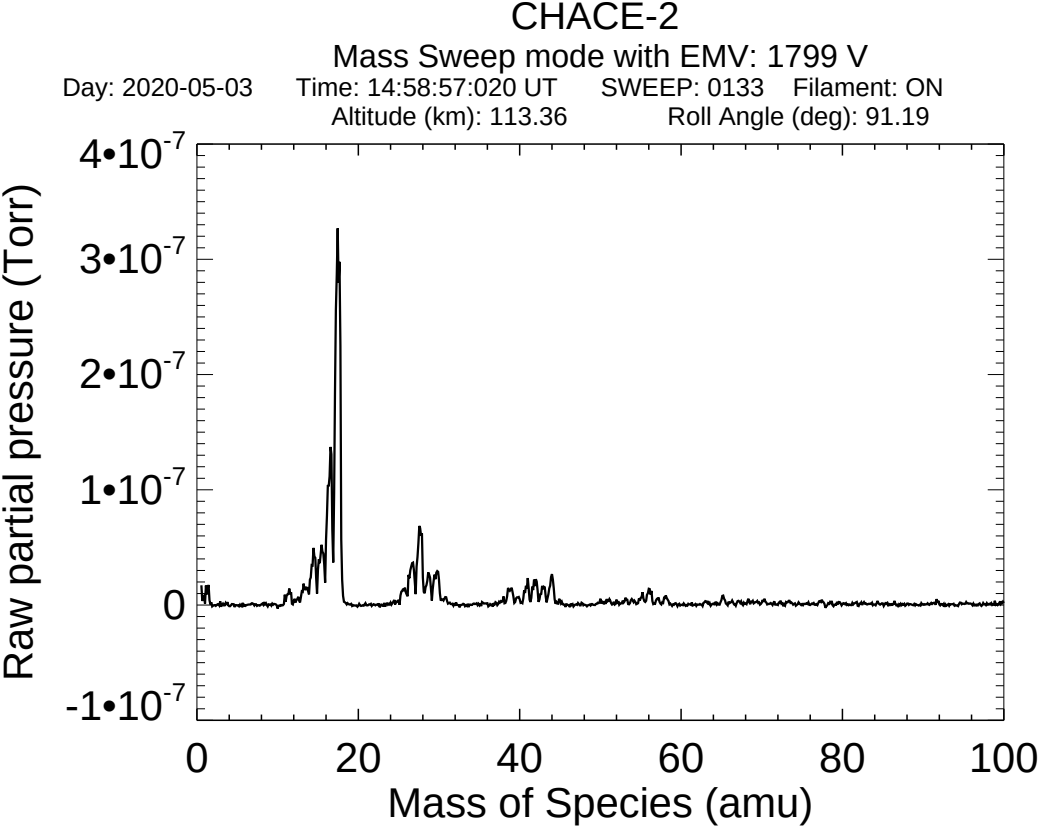

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:54:02:068 UT SWEEP: 0125 Filament: ON
Altitude (km): 114.31 Roll Angle (deg): 122.64
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

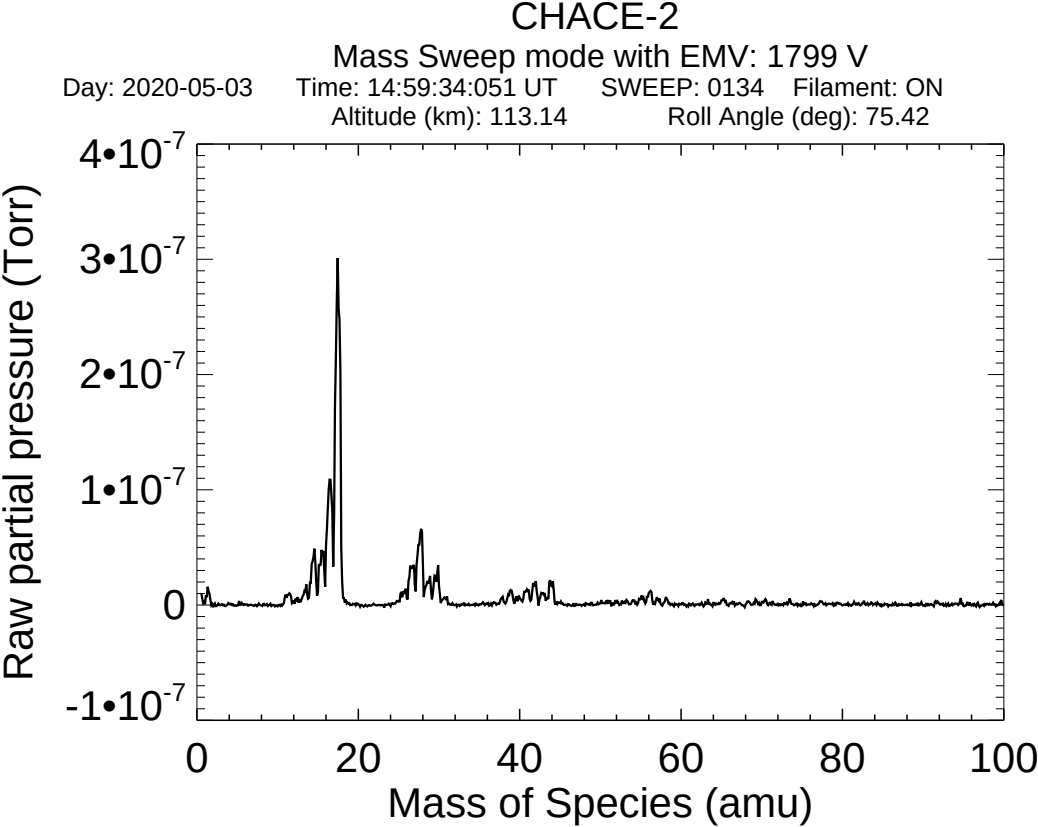

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:54:38:001 UT SWEEP: 0126 Filament: ON
Altitude (km): 114.26 Roll Angle (deg): 123.24
6•10-7
4•10-7
2•10-7
0
-2•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

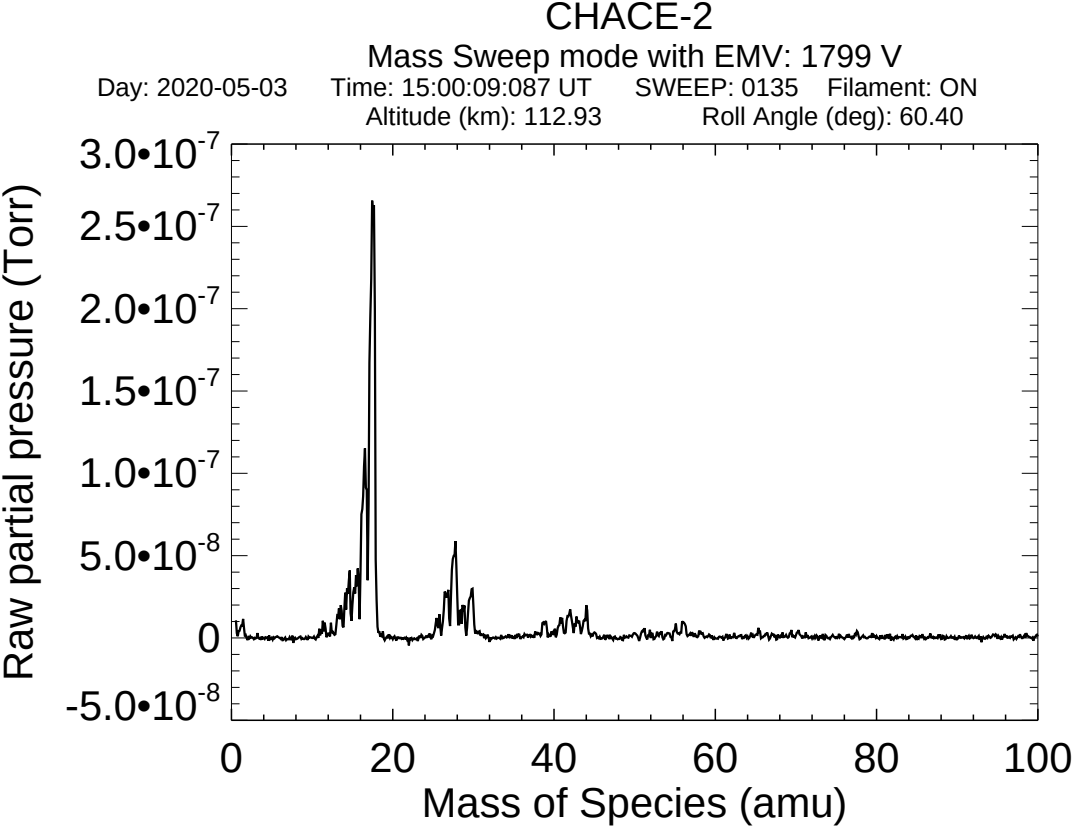

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:55:13:033 UT SWEEP: 0127 Filament: ON
Altitude (km): 114.14 Roll Angle (deg): 123.79
Raw partial pressure (Torr)
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

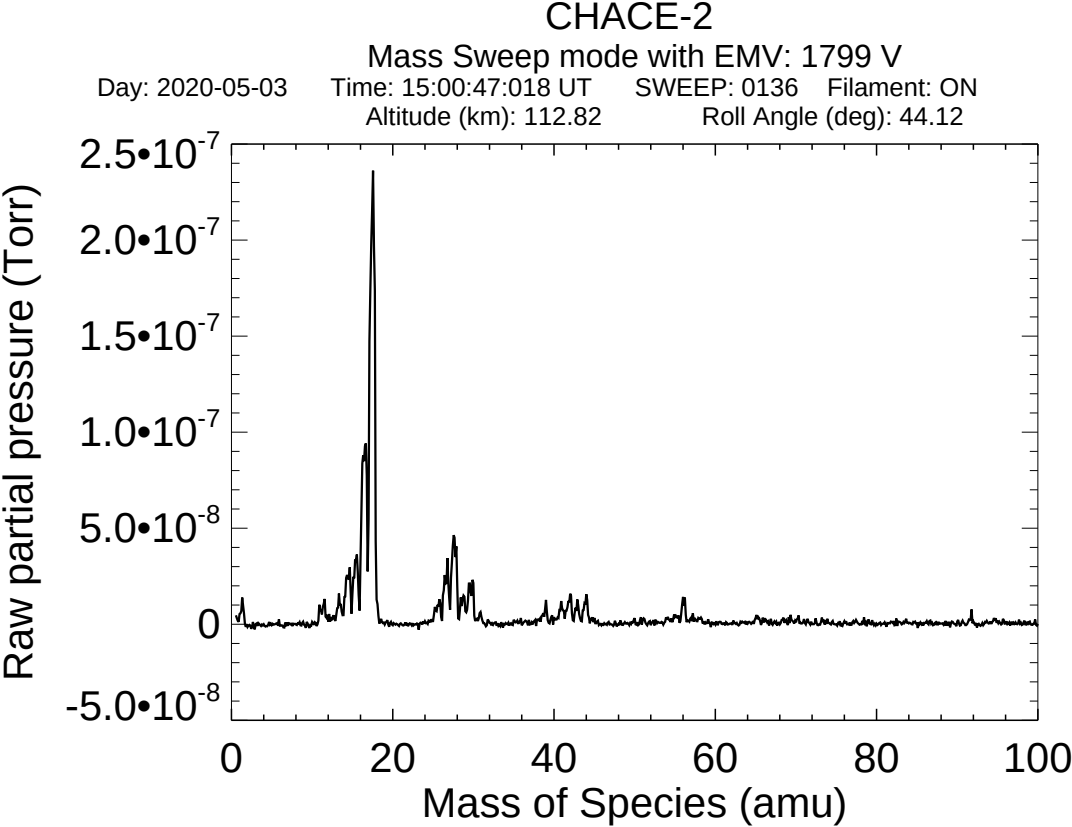

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:55:50:064 UT SWEEP: 0128 Filament: ON
Altitude (km): 113.99 Roll Angle (deg): 124.34
1.5•10-6
1.0•10-6
5.0•10-7
0
-5.0•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

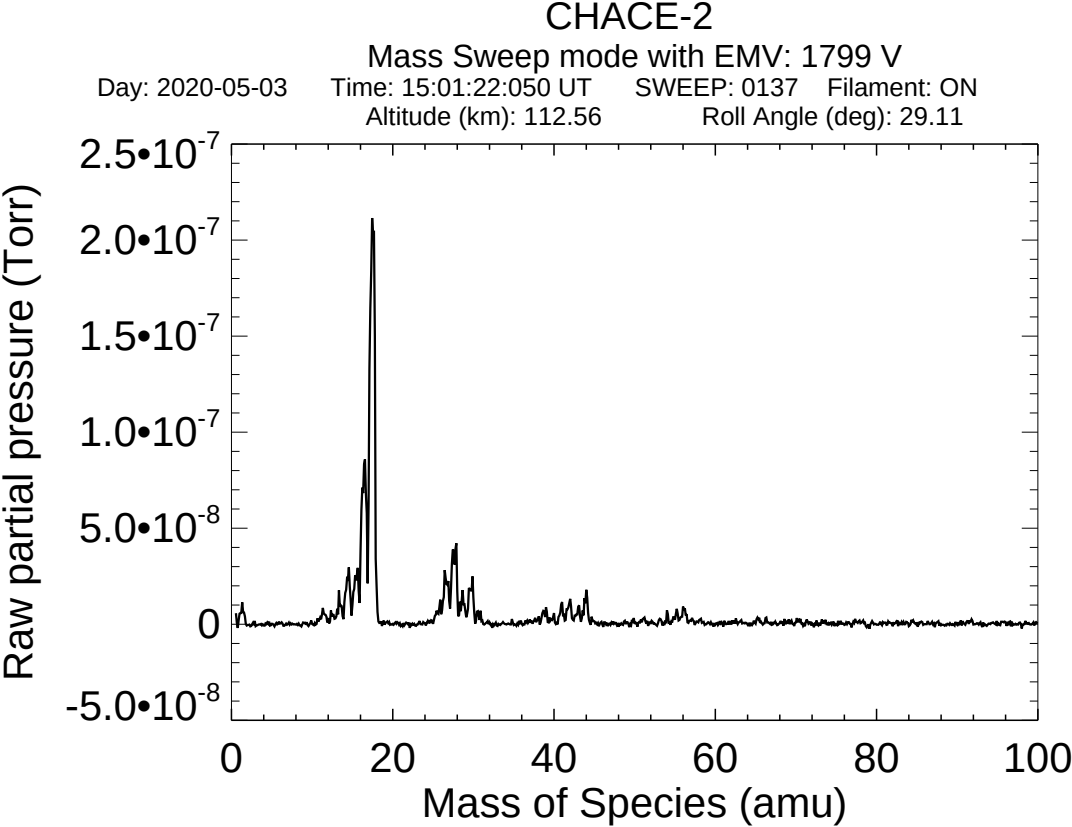

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:56:33:041 UT SWEEP: 0129 Filament: ON
Altitude (km): 113.90 Roll Angle (deg): 124.93
Raw partial pressure (Torr)
1.2•10-6
1.0•10-6
8.0•10-7
6.0•10-7
4.0•10-7
2.0•10-7
0
-2.0•10-7
0
20
40
60
80
100
Mass of Species (amu)

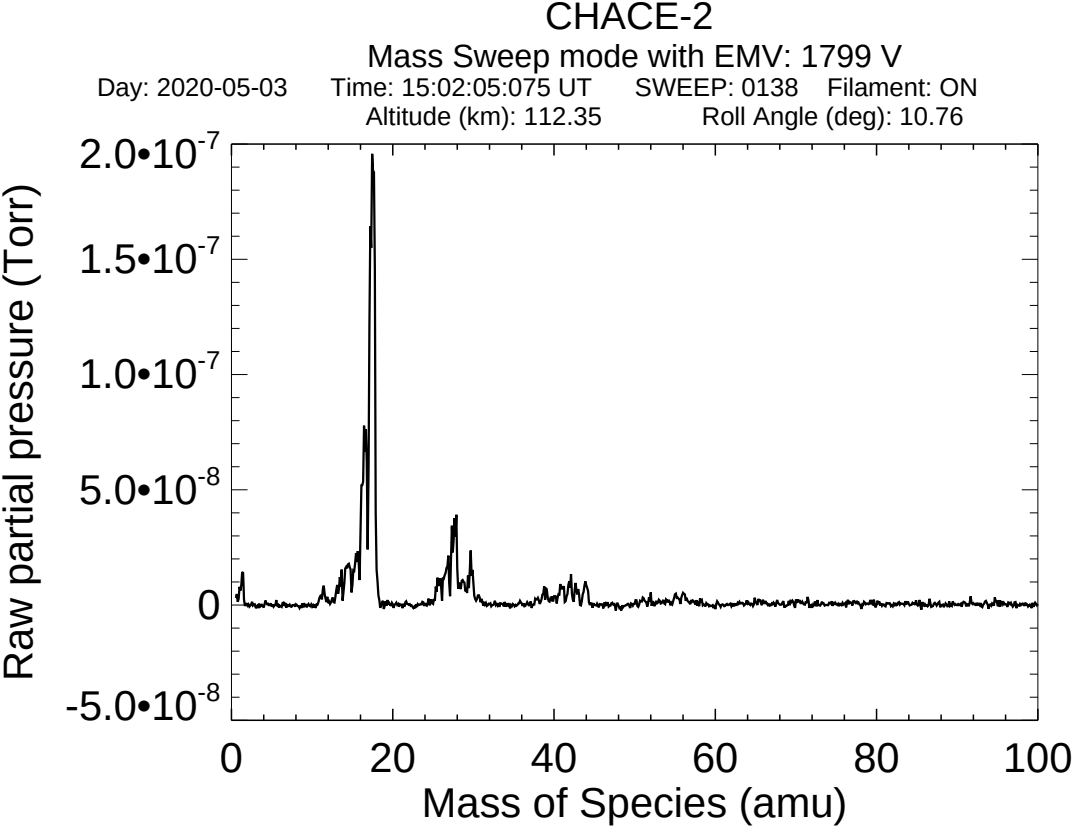

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:58:57:020 UT SWEEP: 0133 Filament: ON
Altitude (km): 113.36 Roll Angle (deg): 91.19
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
Raw partial pressure (Torr)
0
20
40
60
80
100
Mass of Species (amu)

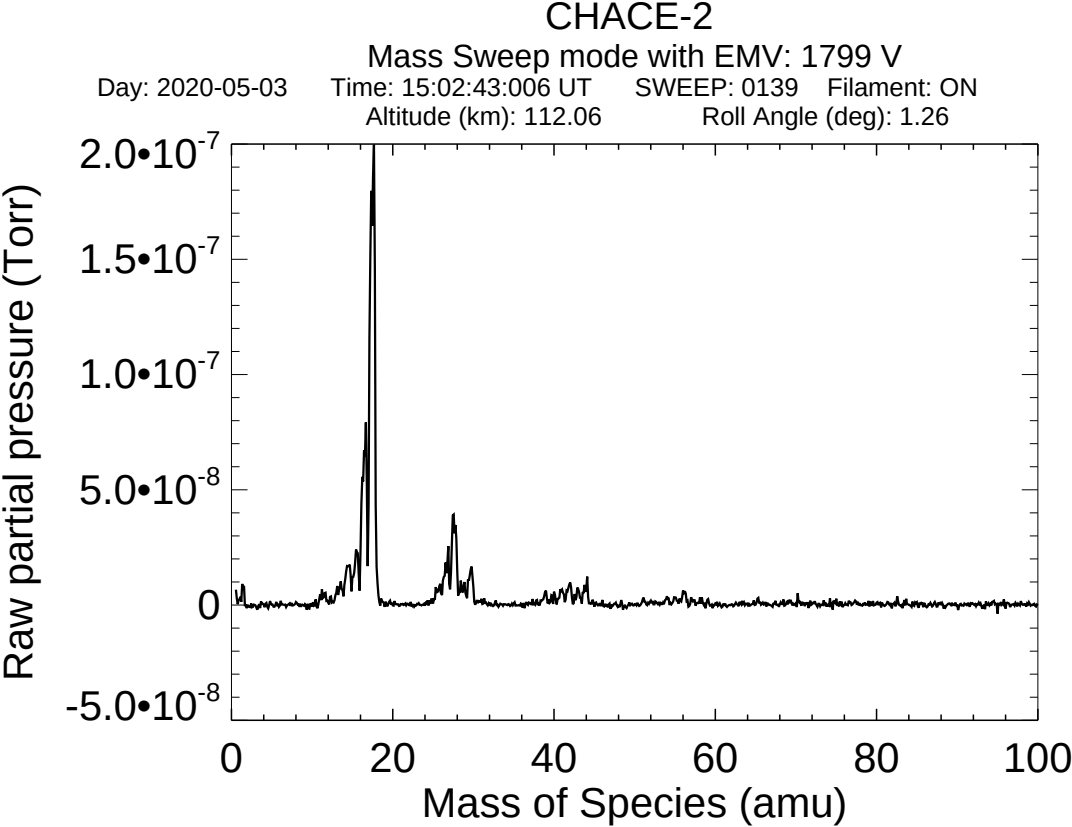

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 14:59:34:051 UT SWEEP: 0134 Filament: ON
Altitude (km): 113.14 Roll Angle (deg): 75.42
Raw partial pressure (Torr)
4•10-7
3•10-7
2•10-7
1•10-7
0
-1•10-7
0
20
40
60
80
100
Mass of Species (amu)

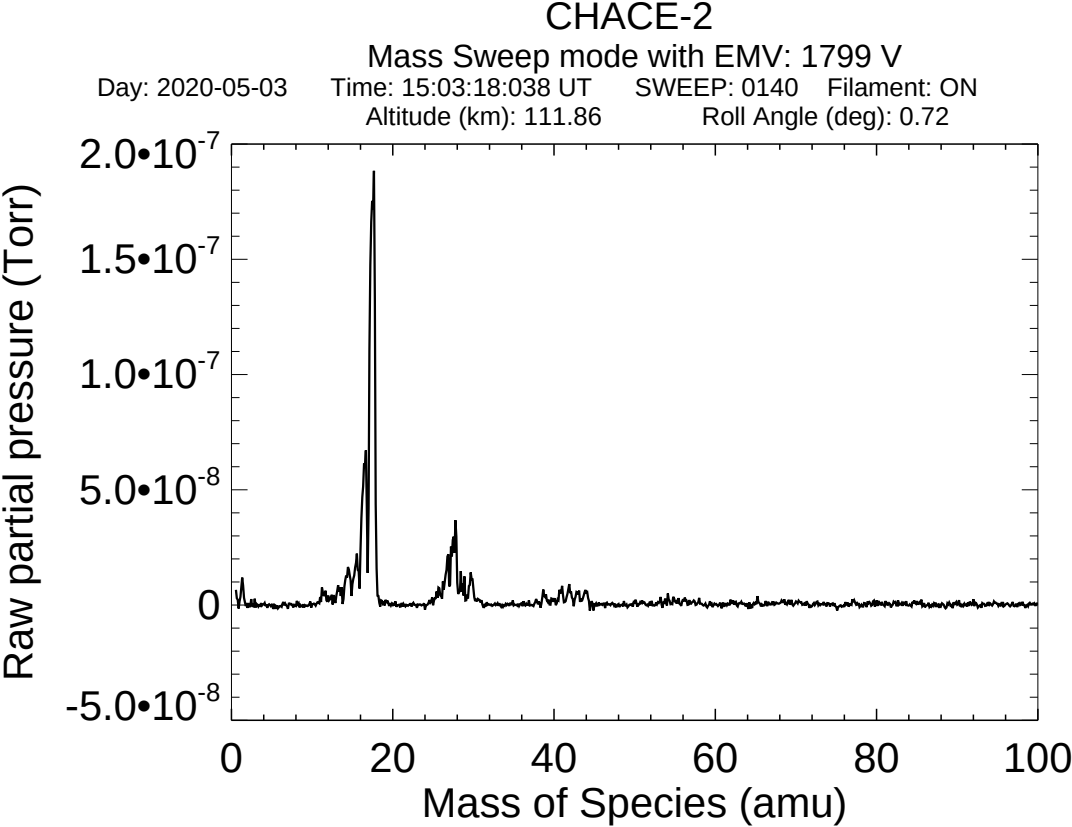

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:00:09:087 UT SWEEP: 0135 Filament: ON
Altitude (km): 112.93 Roll Angle (deg): 60.40
Raw partial pressure (Torr)
3.0•10-7
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

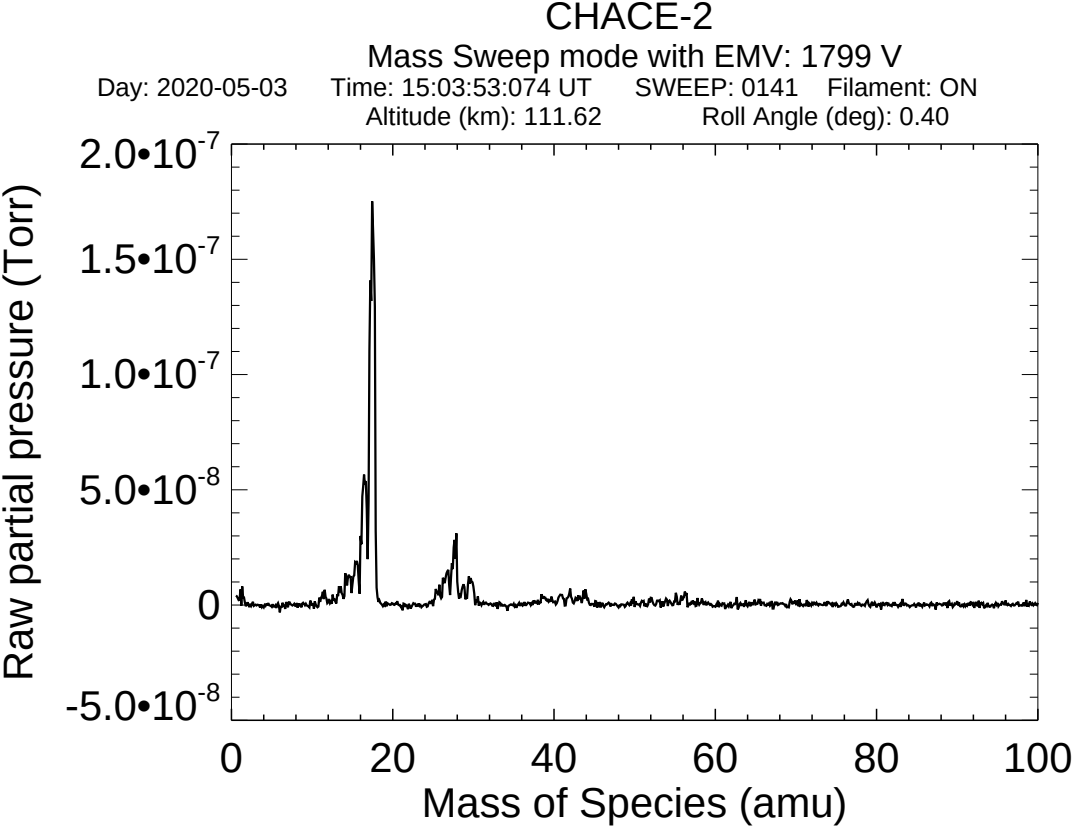

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:00:47:018 UT SWEEP: 0136 Filament: ON
Altitude (km): 112.82 Roll Angle (deg): 44.12
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

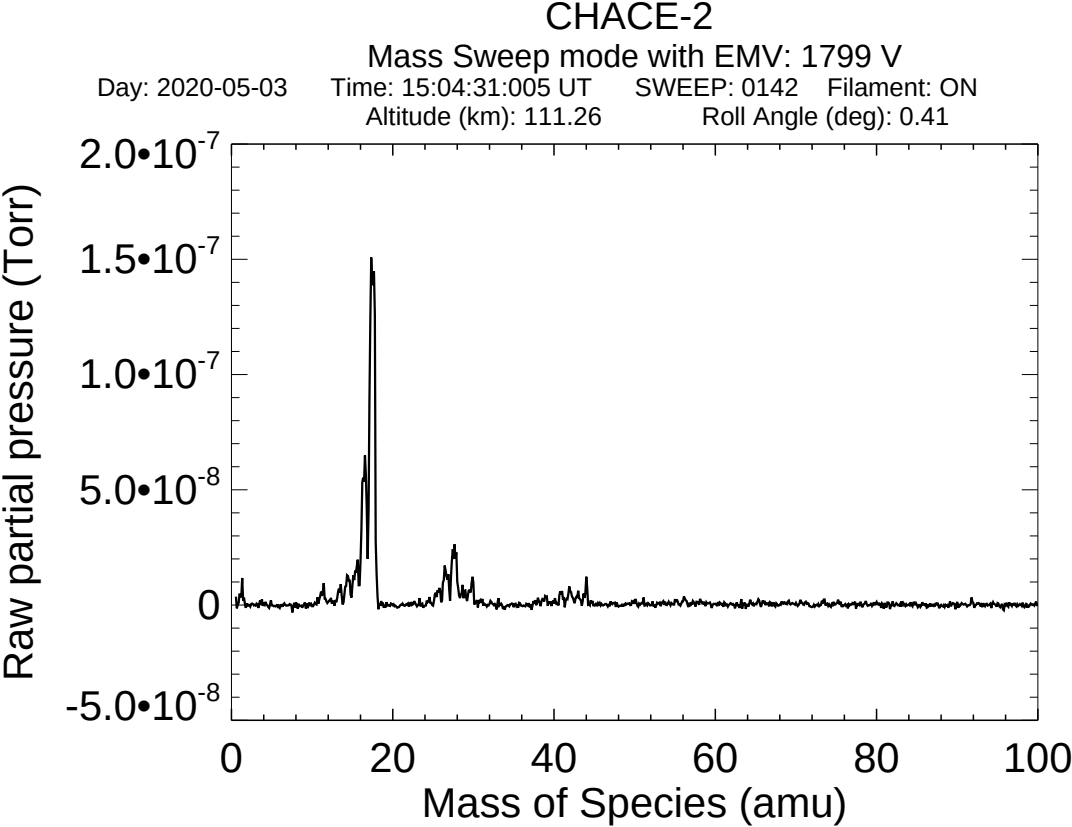

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:01:22:050 UT SWEEP: 0137 Filament: ON
Altitude (km): 112.56 Roll Angle (deg): 29.11
Raw partial pressure (Torr)
2.5•10-7
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

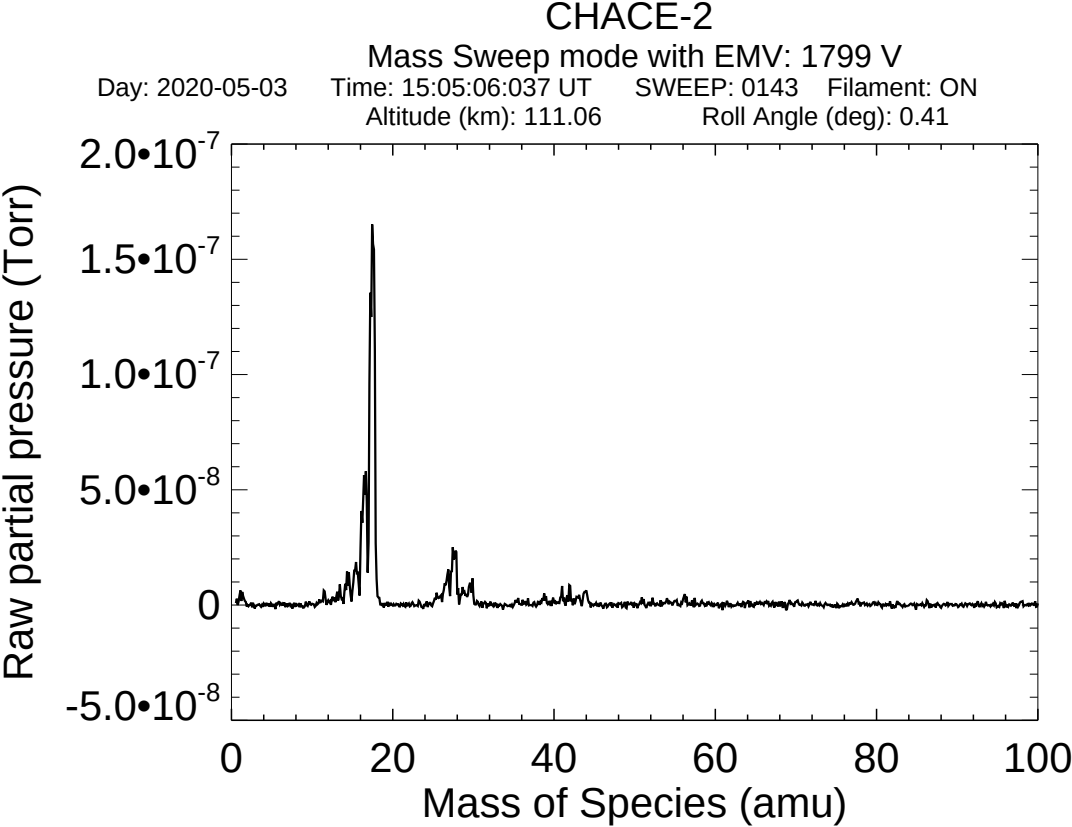

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:02:05:075 UT SWEEP: 0138 Filament: ON
Altitude (km): 112.35 Roll Angle (deg): 10.76
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

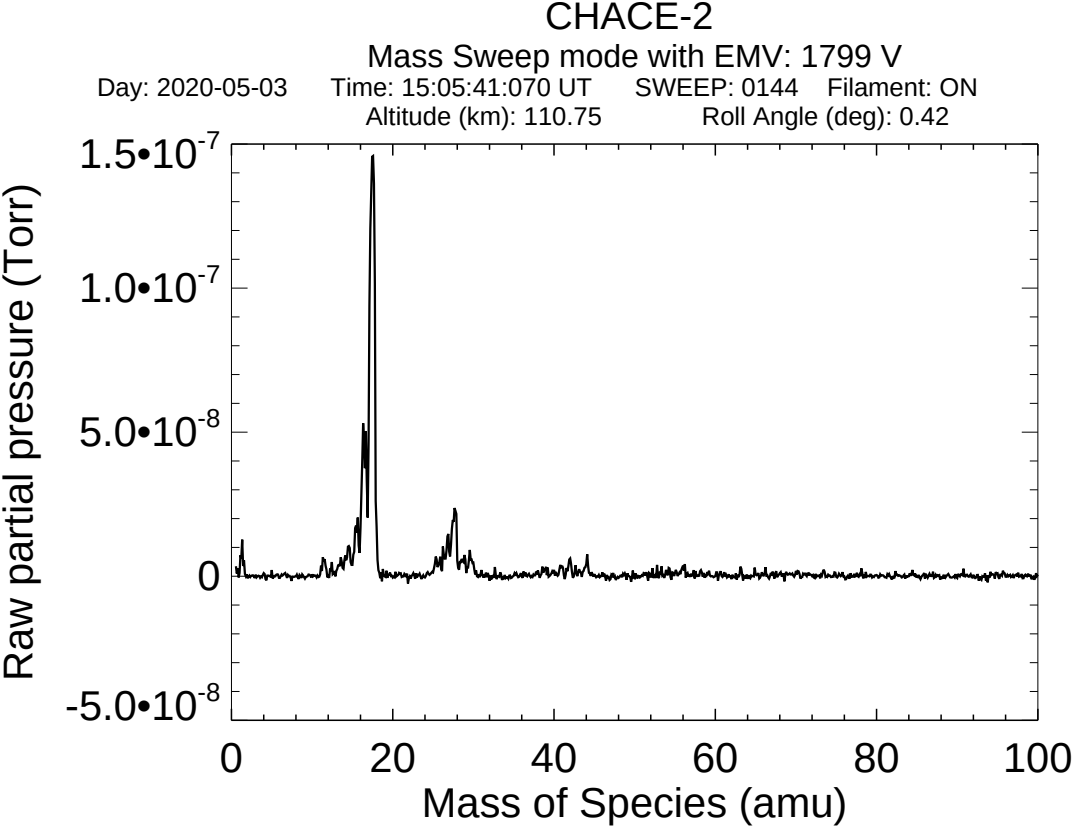

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:02:43:006 UT SWEEP: 0139 Filament: ON
Altitude (km): 112.06 Roll Angle (deg): 1.26
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

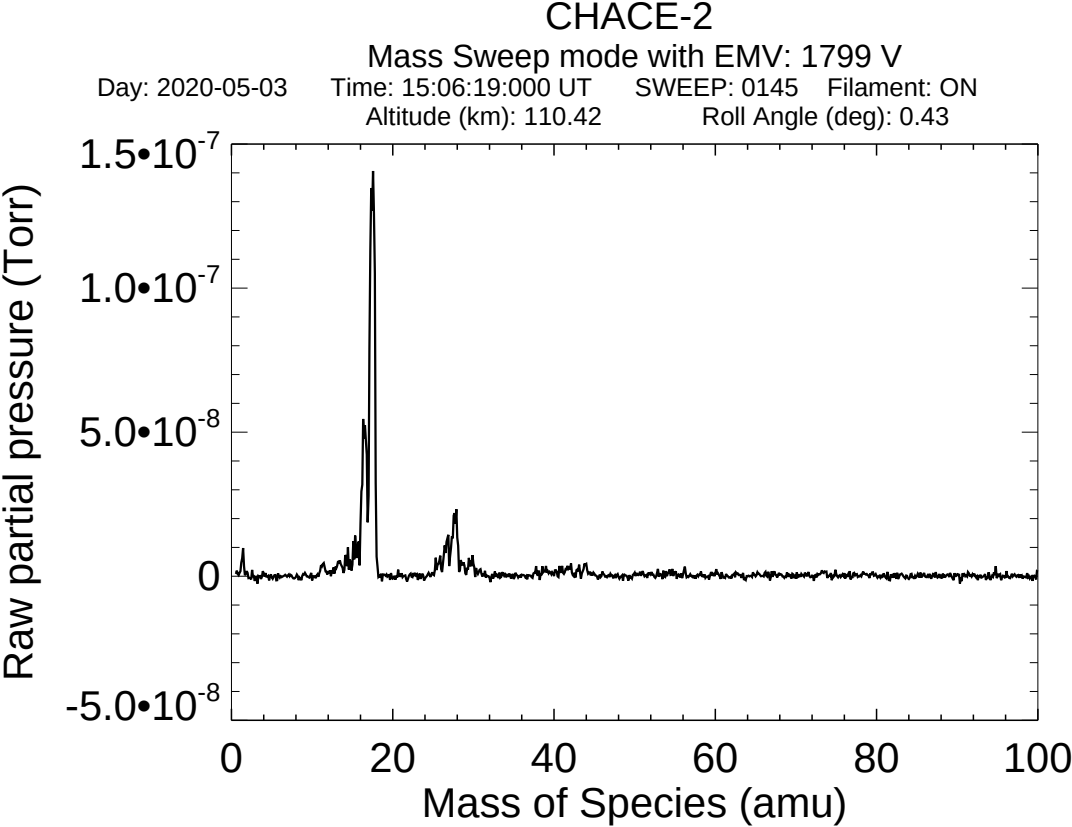

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:03:18:038 UT SWEEP: 0140 Filament: ON
Altitude (km): 111.86 Roll Angle (deg): 0.72
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

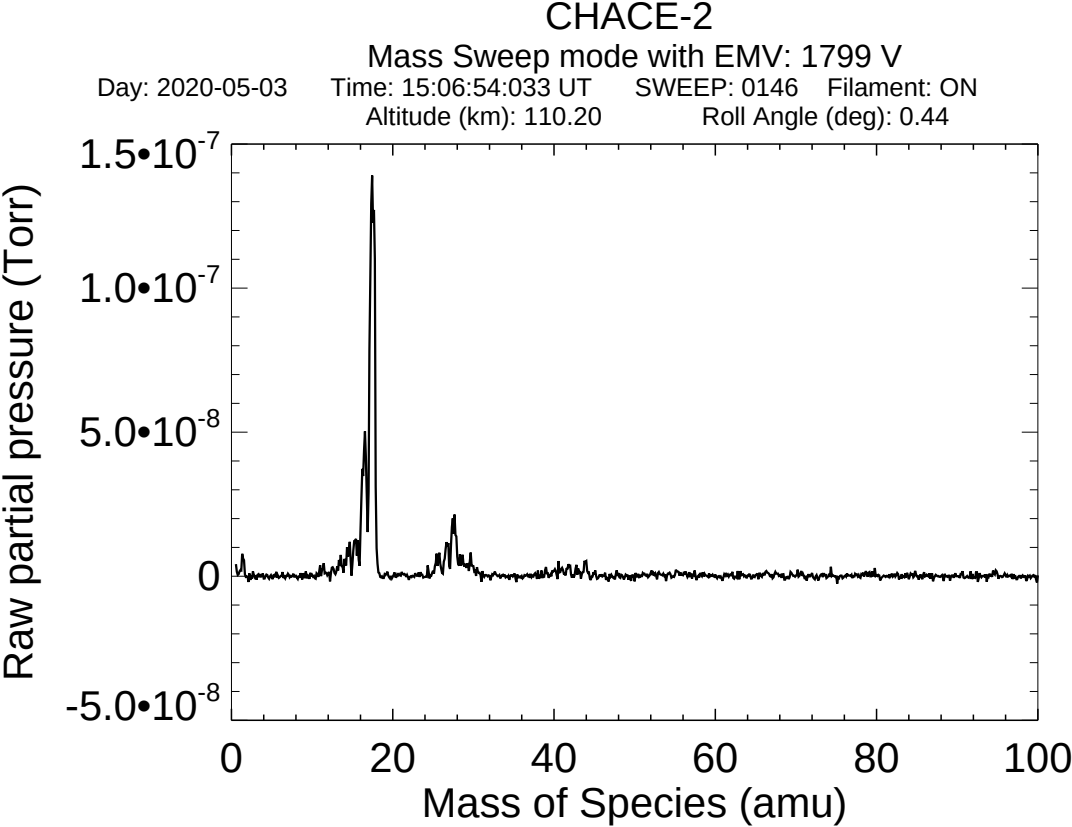

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:03:53:074 UT SWEEP: 0141 Filament: ON
Altitude (km): 111.62 Roll Angle (deg): 0.40
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

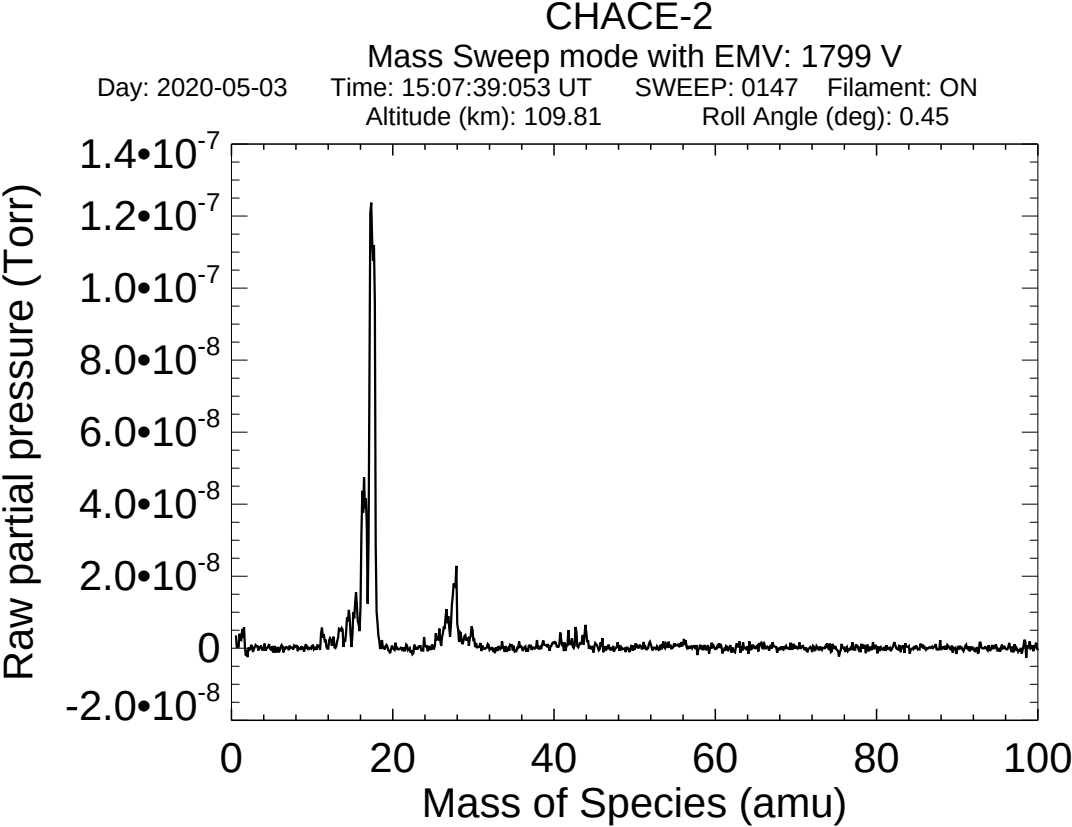

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:04:31:005 UT SWEEP: 0142 Filament: ON
Altitude (km): 111.26 Roll Angle (deg): 0.41
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

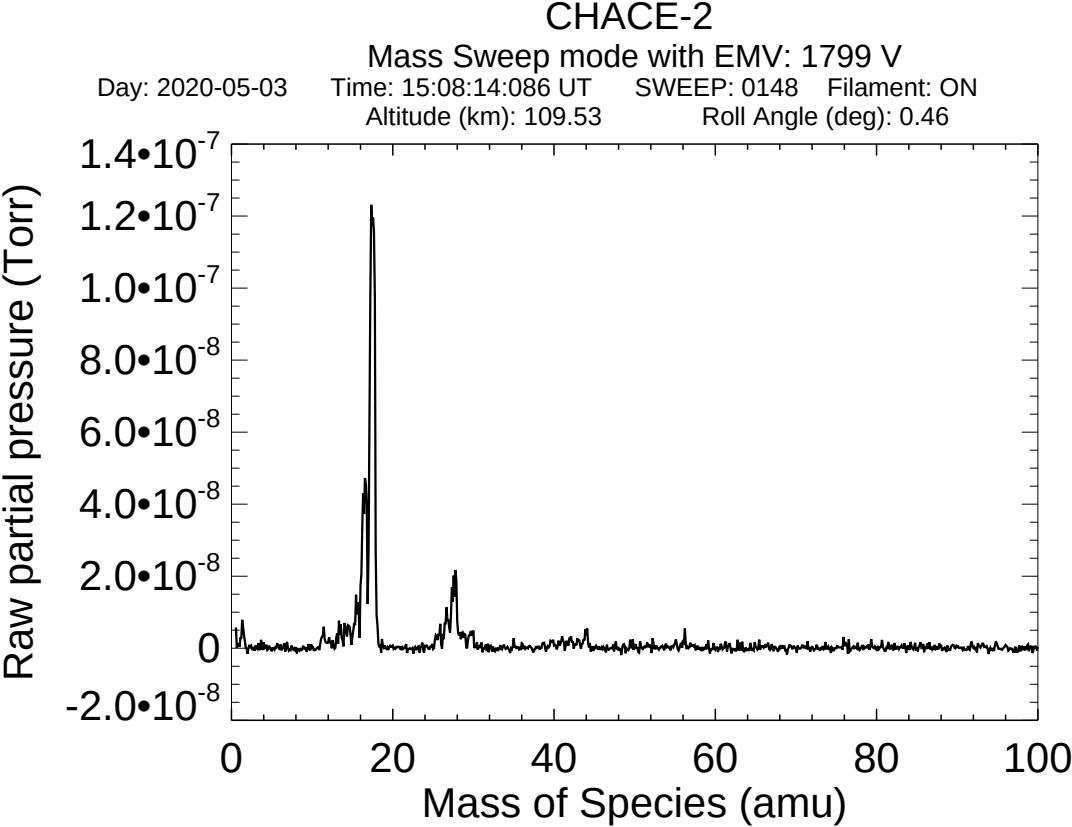

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:05:06:037 UT SWEEP: 0143 Filament: ON
Altitude (km): 111.06 Roll Angle (deg): 0.41
Raw partial pressure (Torr)
2.0•10-7
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

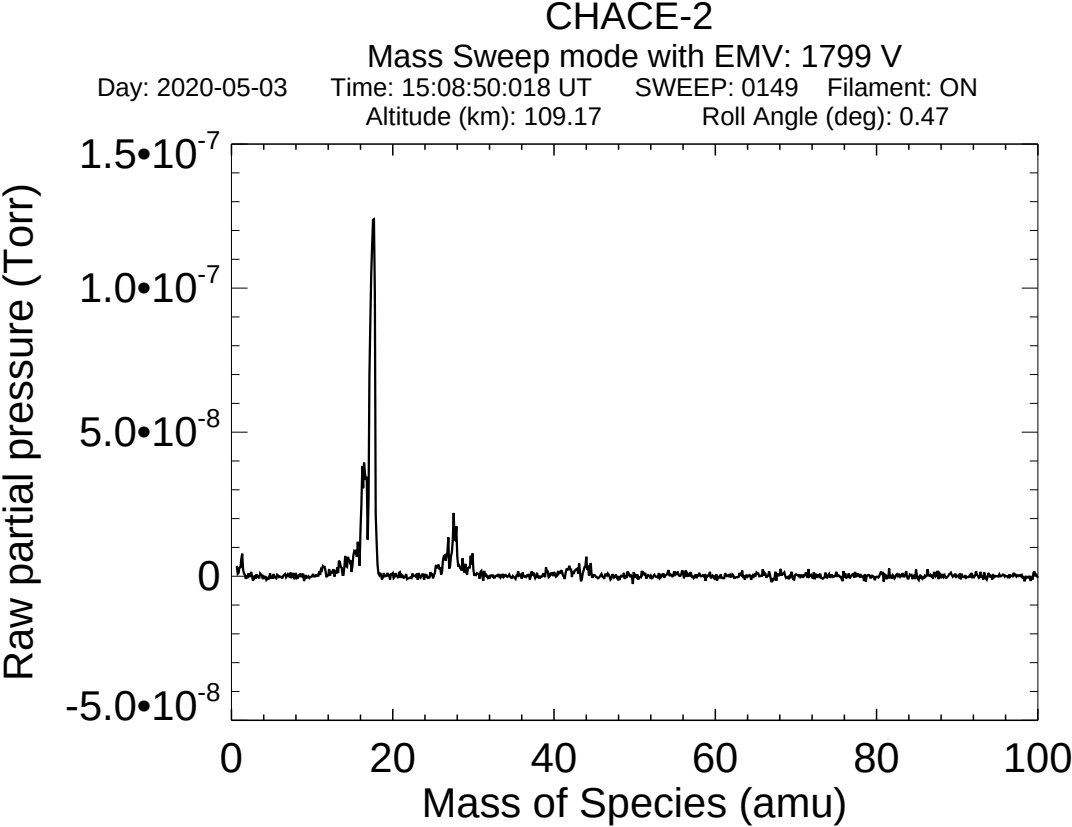

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:05:41:070 UT SWEEP: 0144 Filament: ON
Altitude (km): 110.75 Roll Angle (deg): 0.42
Raw partial pressure (Torr)
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

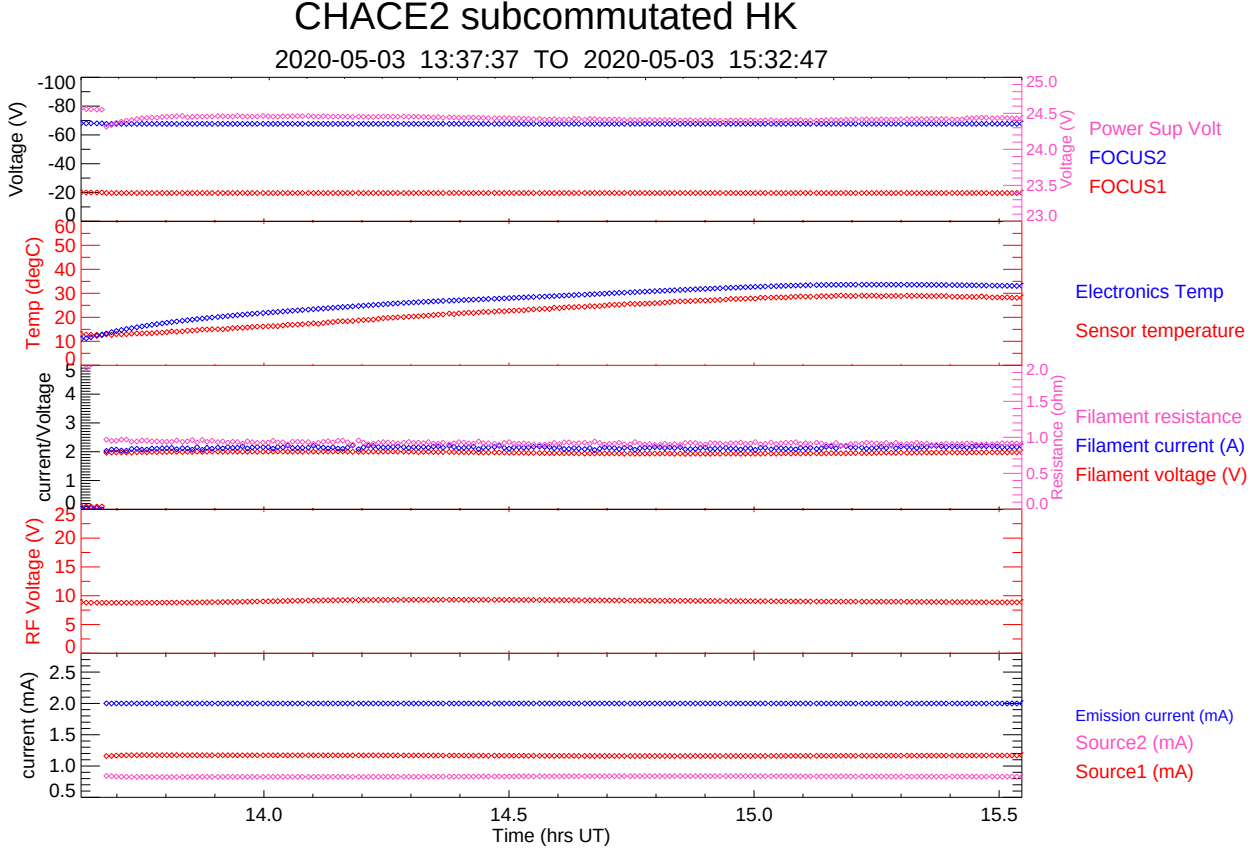

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:06:19:000 UT SWEEP: 0145 Filament: ON
Altitude (km): 110.42 Roll Angle (deg): 0.43
Raw partial pressure (Torr)
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)

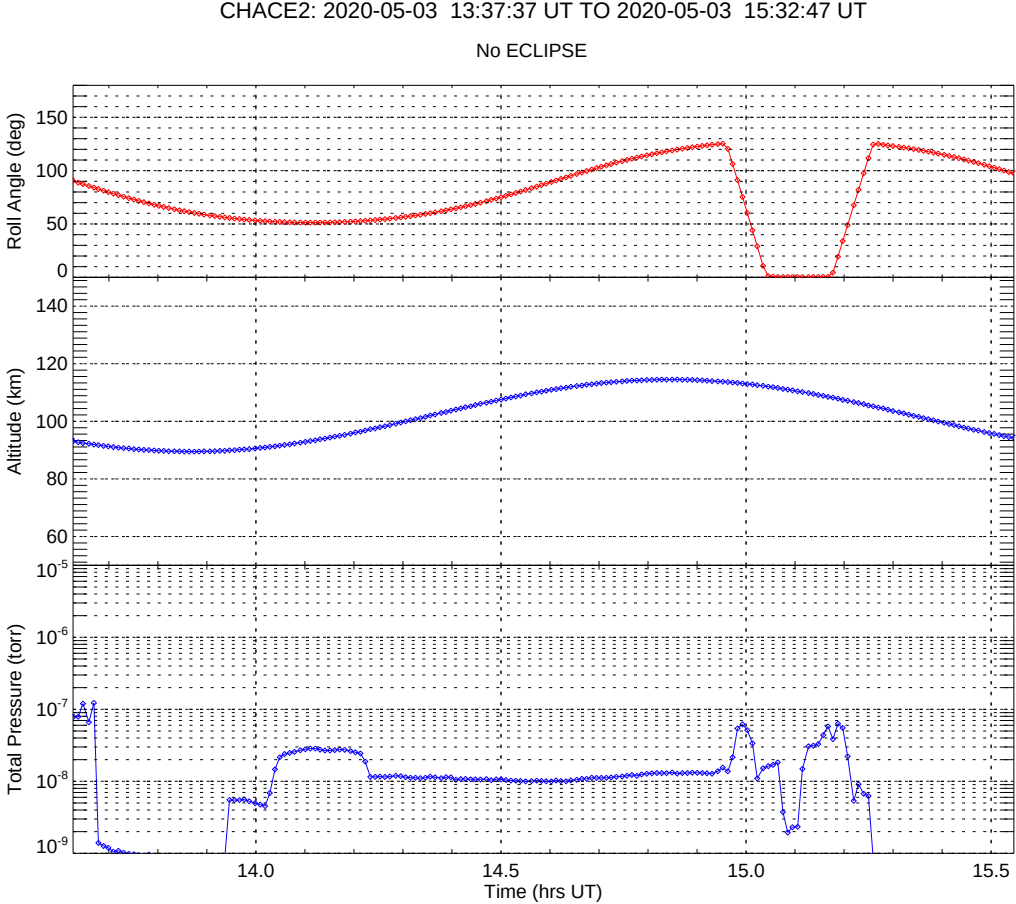

CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:06:54:033 UT SWEEP: 0146 Filament: ON
Altitude (km): 110.20 Roll Angle (deg): 0.44
Raw partial pressure (Torr)
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)


CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:07:39:053 UT SWEEP: 0147 Filament: ON
Altitude (km): 109.81 Roll Angle (deg): 0.45
Raw partial pressure (Torr)
1.4•10-7
1.2•10-7
1.0•10-7
8.0•10-8
6.0•10-8
4.0•10-8
2.0•10-8
0
-2.0•10-8
0
20
40
60
80
100
Mass of Species (amu)


CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:08:14:086 UT SWEEP: 0148 Filament: ON
Altitude (km): 109.53 Roll Angle (deg): 0.46
Raw partial pressure (Torr)
1.4•10-7
1.2•10-7
1.0•10-7
8.0•10-8
6.0•10-8
4.0•10-8
2.0•10-8
0
-2.0•10-8
0
20
40
60
80
100
Mass of Species (amu)


CHACE-2
Mass Sweep mode with EMV: 1799 V
Day: 2020-05-03 Time: 15:08:50:018 UT SWEEP: 0149 Filament: ON
Altitude (km): 109.17 Roll Angle (deg): 0.47
Raw partial pressure (Torr)
1.5•10-7
1.0•10-7
5.0•10-8
0
-5.0•10-8
0
20
40
60
80
100
Mass of Species (amu)


CHACE2 subcommutated HK
2020-05-03 13:37:37 TO 2020-05-03 15:32:47
Voltage (V)
-100
-80
-60
-40
-20
0
25.0
24.5
24.0
23.5
23.0
Voltage (V)
Power Sup Volt
FOCUS2
FOCUS1
Temp (degC)
60
50
40
30
20
10
0
Electronics Temp
Sensor temperature
current/Voltage
5
4
3
2
1
0
2.0
1.5
1.0
0.5
0.0
Resistance (ohm)
Filament resistance
Filament current (A)
Filament voltage (V)
RF Voltage (V)
25
20
15
10
5
0
current (mA)
2.5
2.0
1.5
1.0
0.5
Emission current (mA)
Source2 (mA)
Source1 (mA)
14.0
14.5
15.0
15.5
Time (hrs UT)

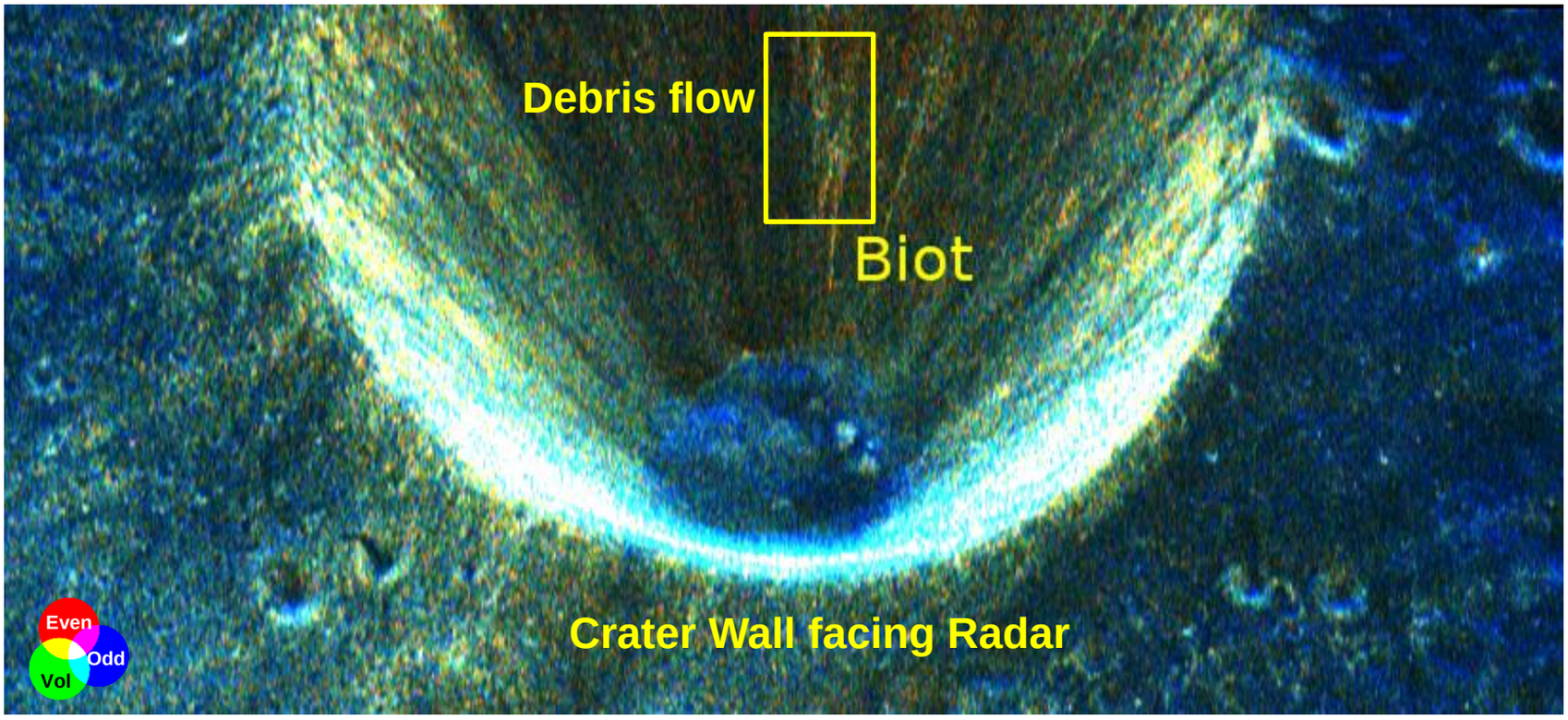

CHACE2: 2020-05-03 13:37:37 UT TO 2020-05-03 15:32:47 UT
No ECLIPSE
Roll Angle (deg)
150
100
50
0
Altitude (km)
140
120
100
80
60
Total Pressure (torr)
10-5
10-6
10-7
10-8
10-9
14.0
14.5
15.0
15.5
Time (hrs UT)



Annexure-4

Data Products of Dual Frequency Synthetic Aperture Radar (DFSAR)

First L-band image of any lunar feature

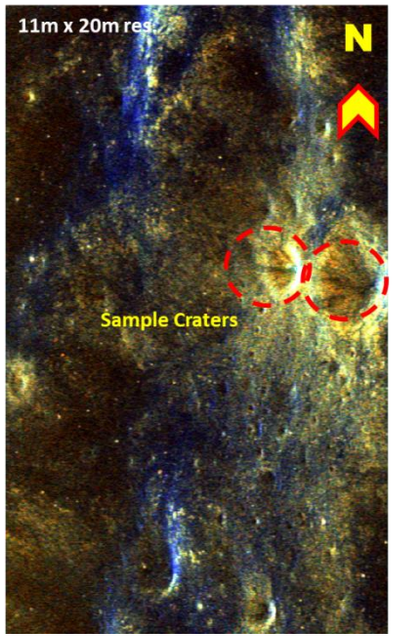


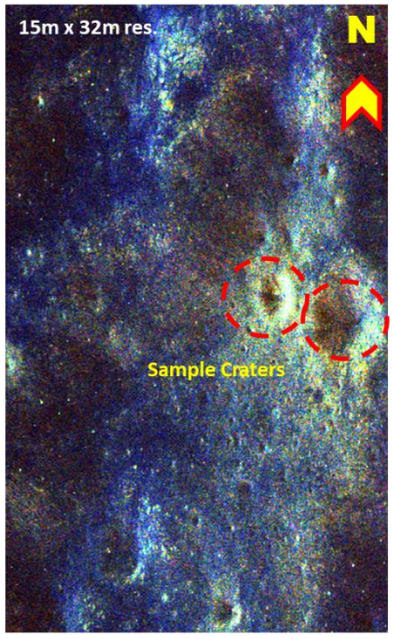
First imaging operation of DFSAR on 4th September, 2019 over Biot crater
L-band Compact-pol acquisition with 20m slant-range resolution mode

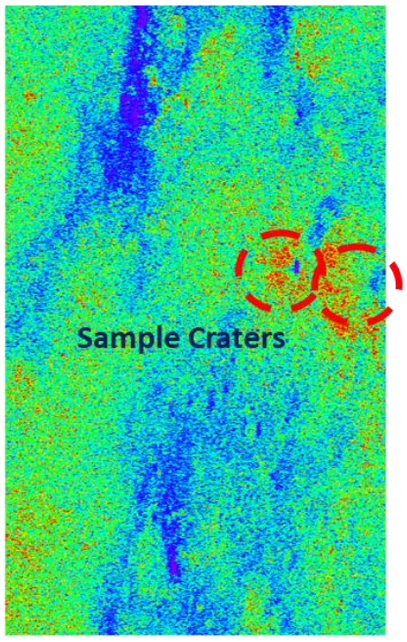
The compact pol data is decomposed (using m-delta decomposition) into different scattering mechanisms which distinctly separates the crater-floor and the walls; debris flow on the steep crater walls is also identified by mixed volume & even-bounce scattering.

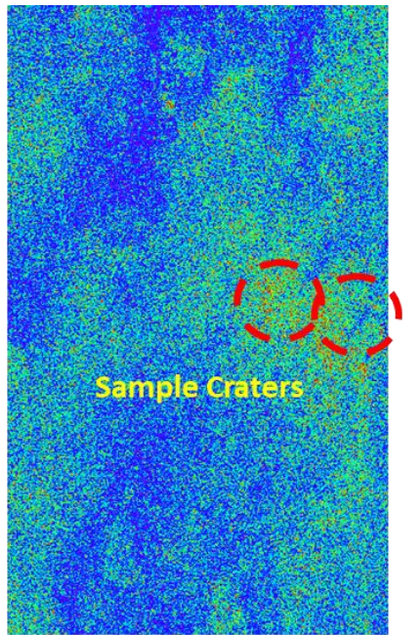
Biot crater in the lunar mid-latitude is a small bowl shaped lunar impact crater of 13 km diameter and 1.5 km deep.

Comparative analysis of DFSAR and LRO-MiniRF











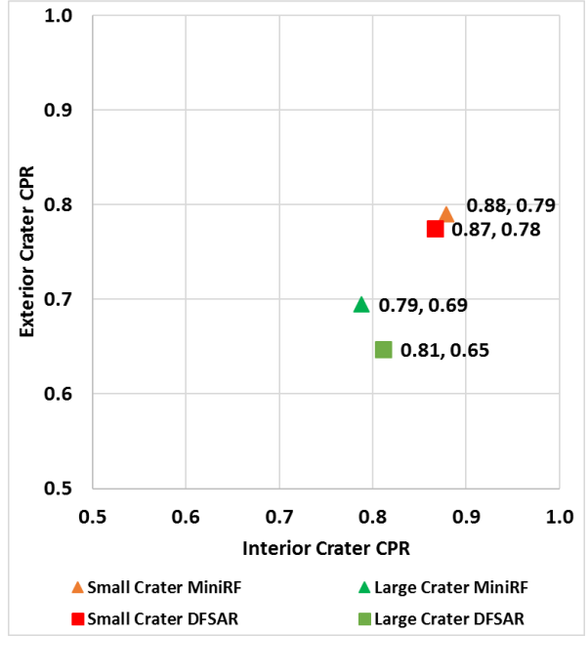
DFSAR S-band CP **MiniRF S-band CP** DFSAR S-band CPR MiniRF S-band CPR

Images with Polarimetric decomposition

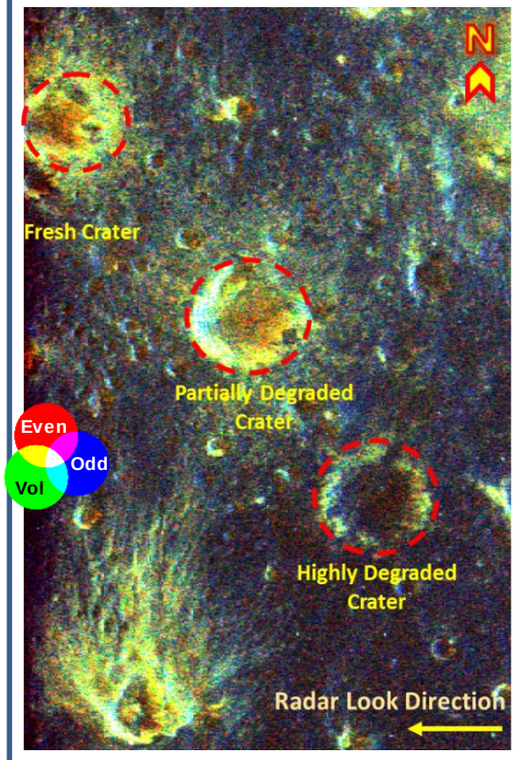
- Comparative analysis of Circular Polarization Ratio (CPR) carried out between:
  1) S-band DFSAR and S-band MiniRF
  2) L-band DFSAR and S-band MiniRF

Distribution of Circular Polarization Ratio (CPR) is studied using DFSAR and MiniRF data and found to be in good agreement.

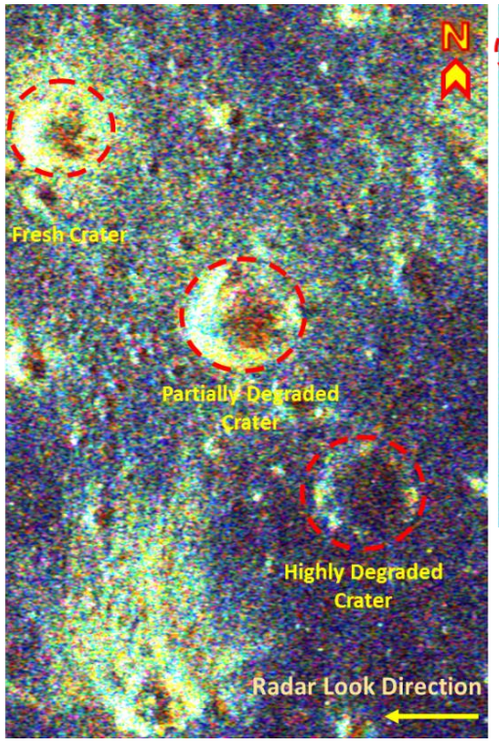
With improved resolution of DFSAR, finer features are better decipherable.



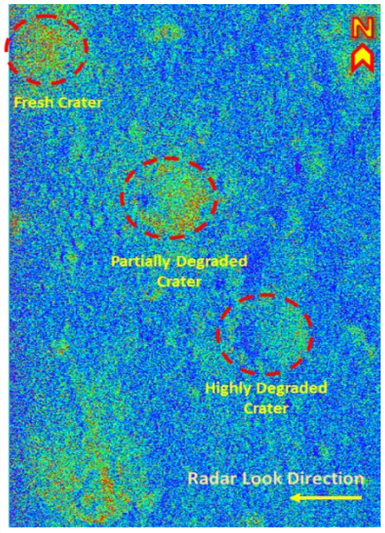
Characterization of impact craters



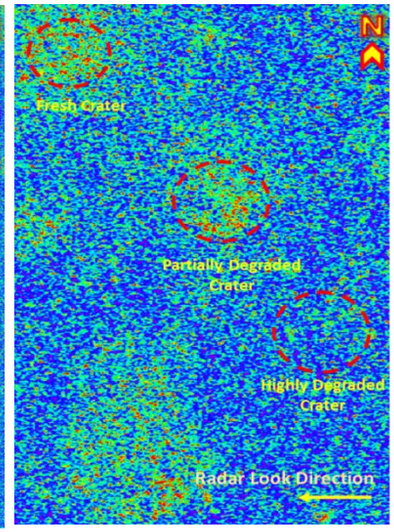
DFSAR L-band CP:
m-chi decomposition



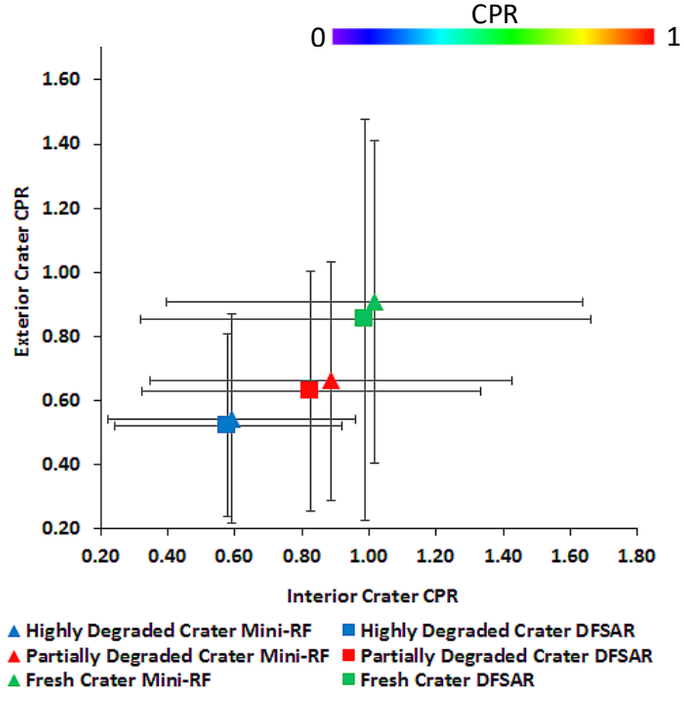
MiniRF S-band CP:
m-chi decomposition



CPR from DFSAR



CPR from MiniRF

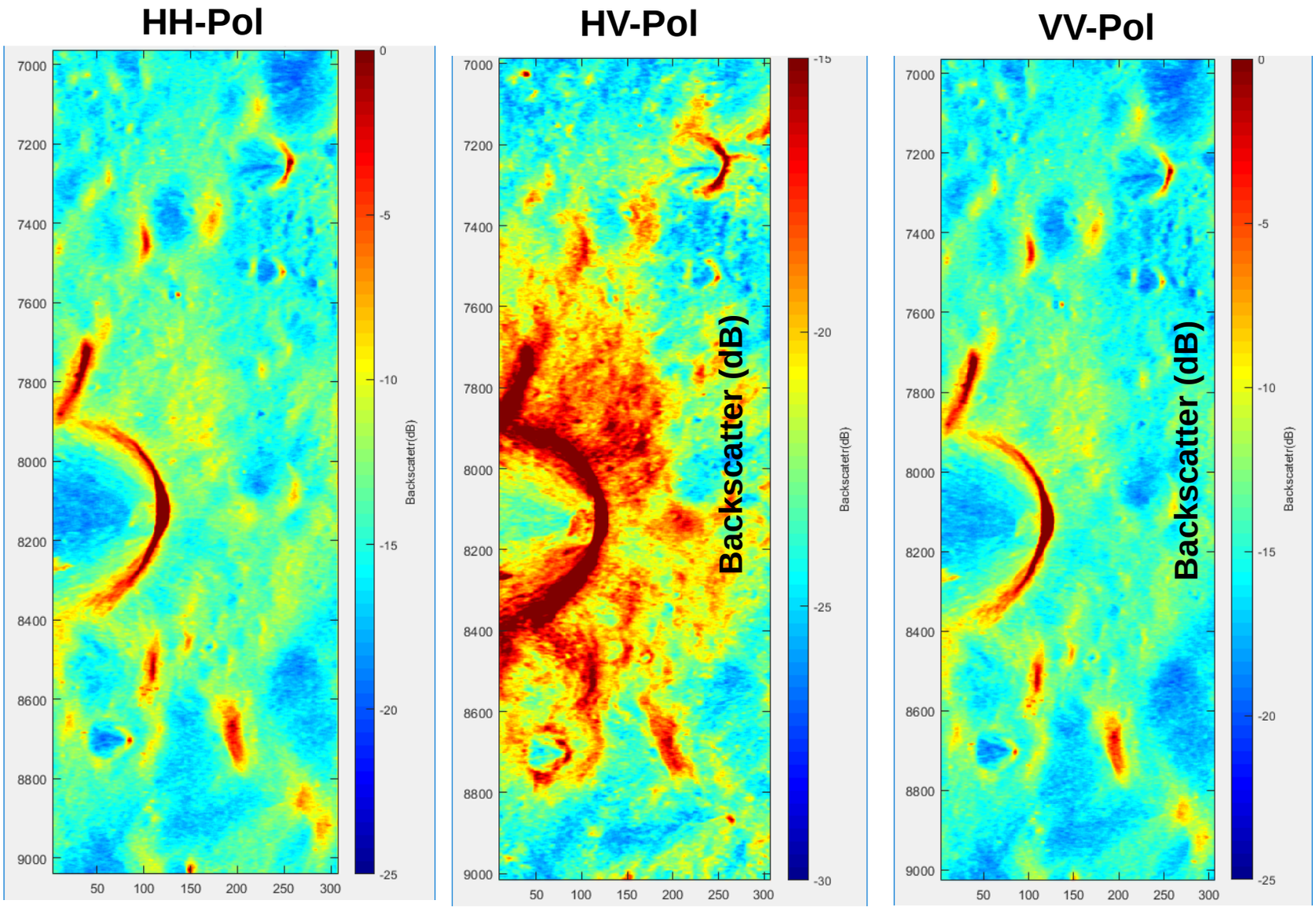


- Similar CPR values obtained from DFSAR and Mini-RF data of three different crater regions (as shown above on the right) suggest the presence of centimeter-to-decimeter rocks.

Deepak Putrevu et al., LPSC 2020, Abstract #1420

Characterization of Crater Ejecta Distribution

using L-Band Full-Pol Data

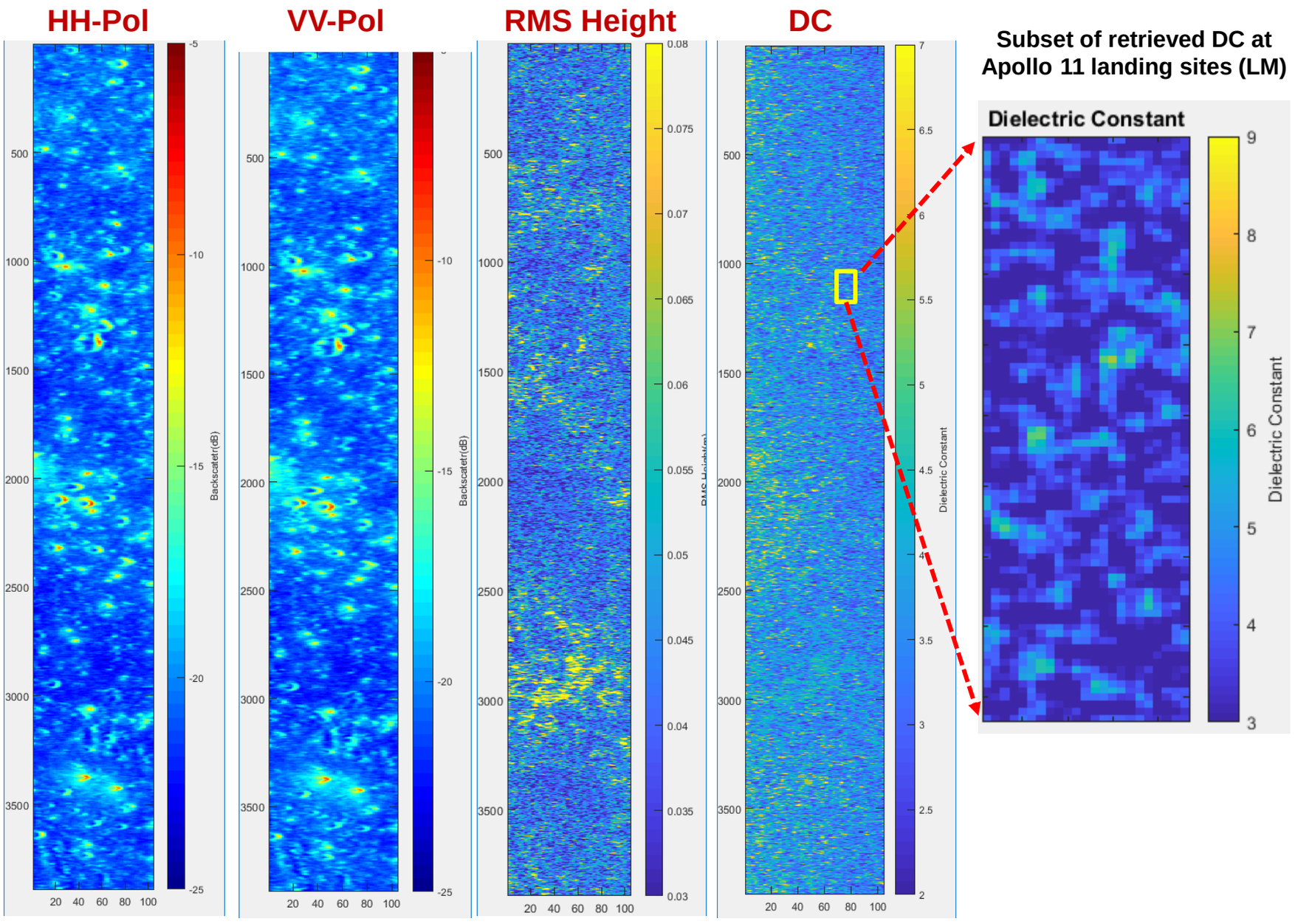


Cross-polarization channel is highly sensitive to diffuse scattering and is optimum for mapping and characterization of Crater Ejecta distribution.

Deepak Putrevu et al., LPSC 2020, Abstract #1420

Estimation of Dielectric Constant and Surface Roughness

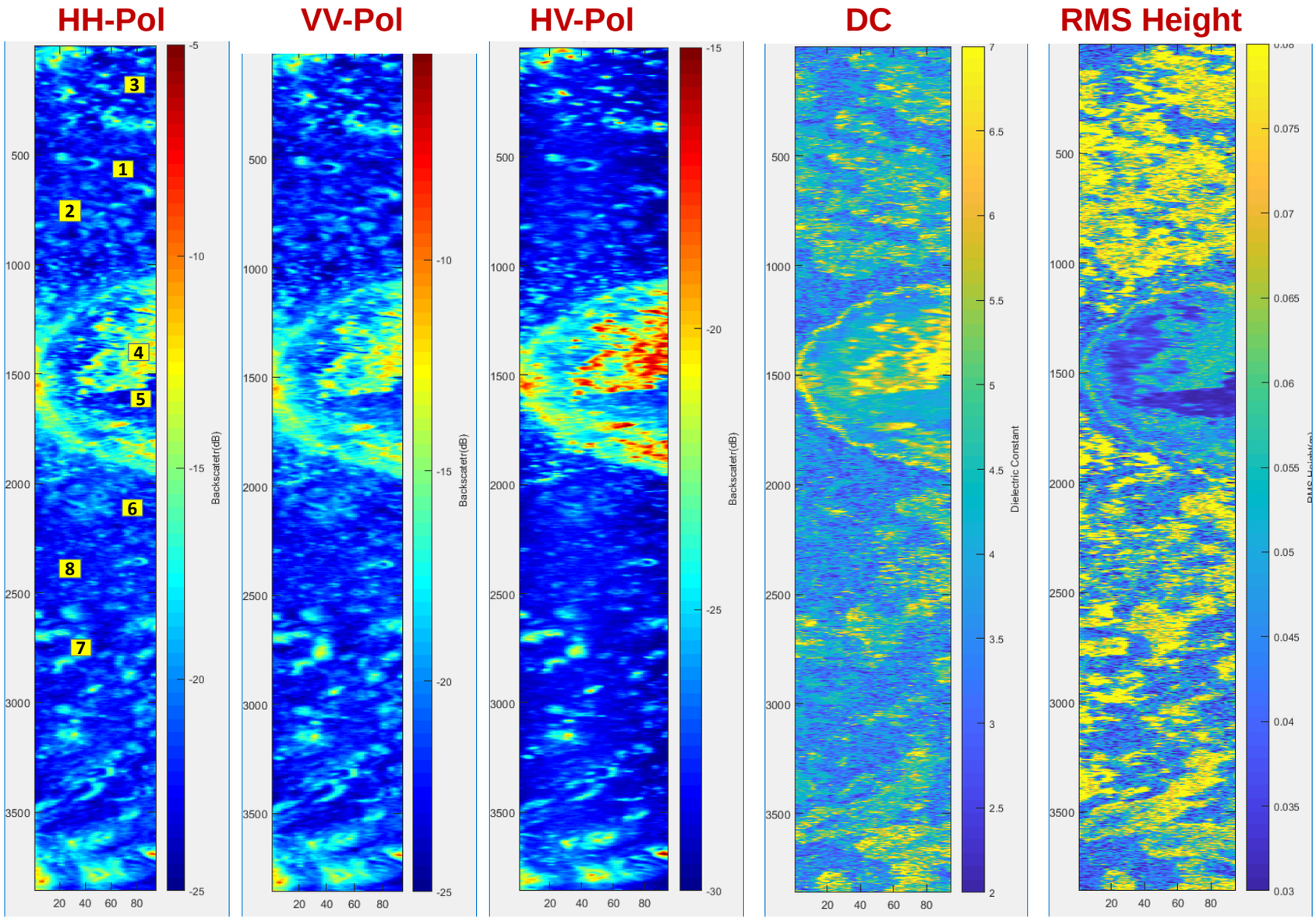
Using L-band FP DFSAR



First time model-based estimation of lunar dielectric constant and surface roughness has been done at high resolution (25m), and validated over Apollo-11 landing site.

Estimation of Dielectric Constant and Surface Roughness

Using L-band FP DFSAR



Model-based estimation of lunar dielectric constant and surface roughness has been done at high resolution (25m), over non-polar anomalous Gardner Crater

Analysis of derived Dielectric Constant and Roughness Distribution over PSRs

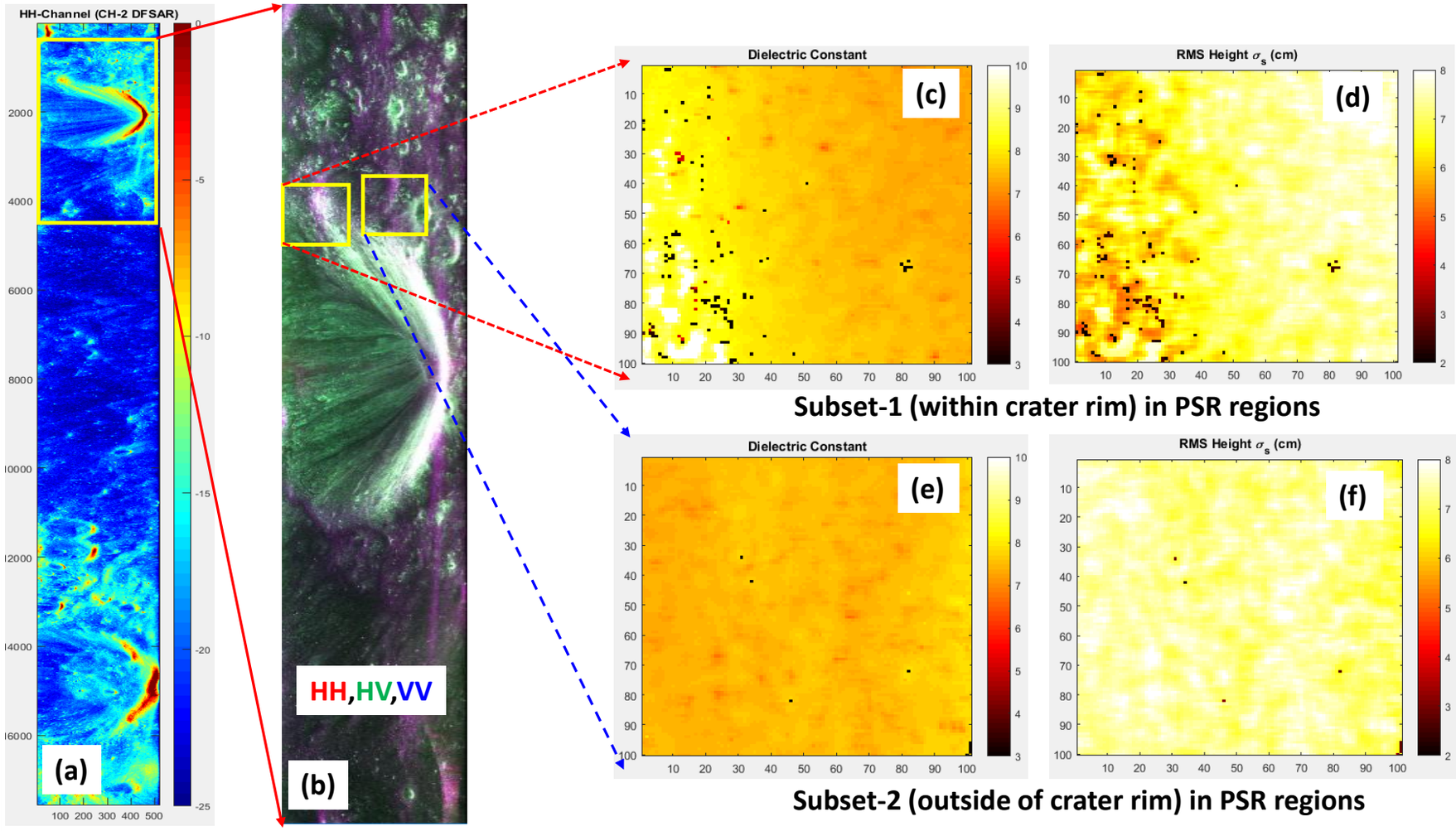
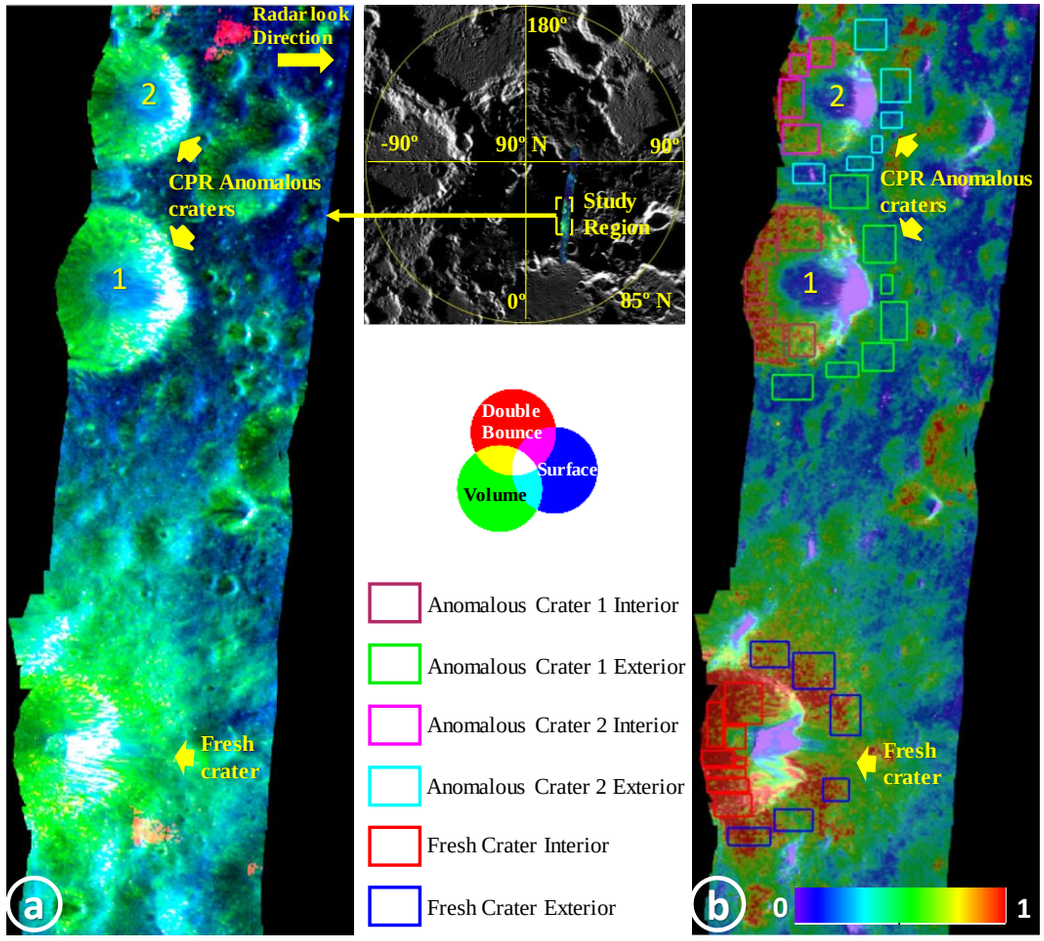


Figure: (a) L-band SAR HH backscatter (b) RGB images composite (c & d) DC and RMS height within crater rim (e & f) DC and RMS height outside of crater rim, over Haworth crater in PSR

Possible ranges of DC and roughness found to be promising for water-ice within crater-rim, as compared to these on the exterior. This supports the requirement of these parameters to be used for unambiguous detection of water-ice regions.

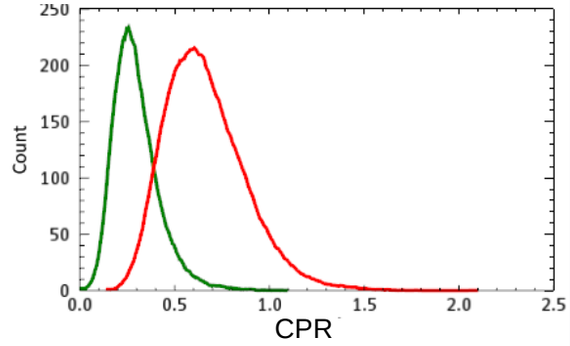
Characterization of Polar Anomalous Craters

Using L-band Fully Polarimetric DFSAR Data over Peary Crater, Lunar North Pole



Yamaguchi Decomposition

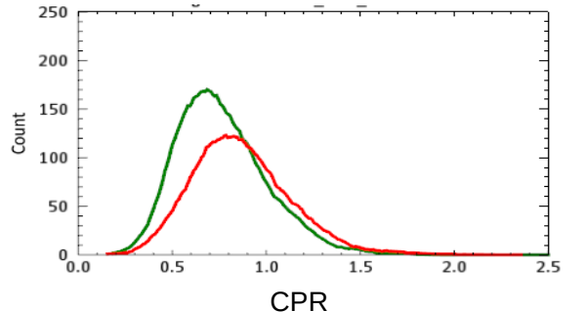
CPR



Anomalous Crater

$CPR_{Interior}$ = 0.67 ± 0.21

$CPR_{Exterior}$ = 0.30 ± 0.12



Fresh Crater

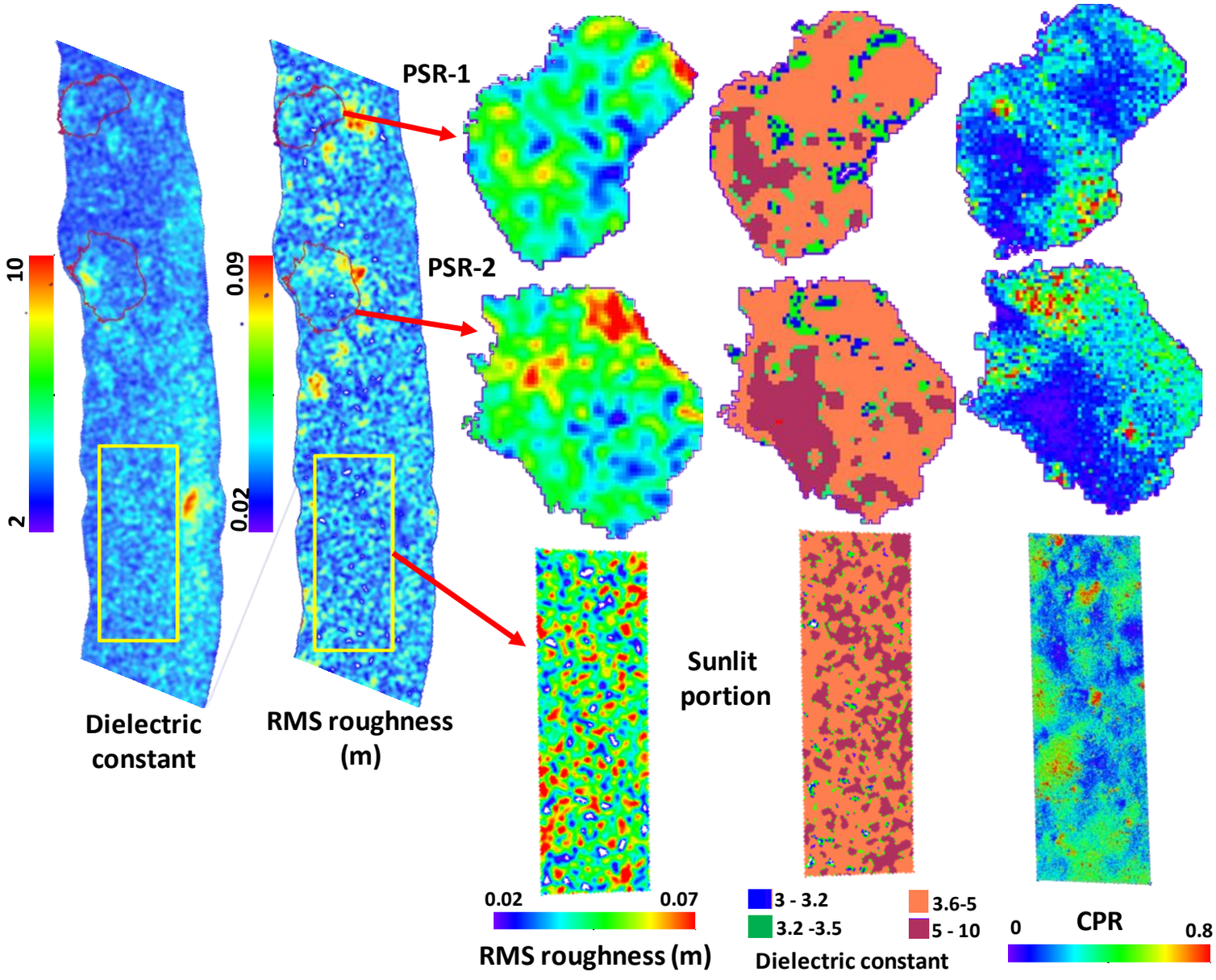
$CPR_{Interior}$ = 0.87 ± 0.26

$CPR_{Exterior}$ = 0.77 ± 0.24

Sriram, et al., Planetary Sci Journal, 2021

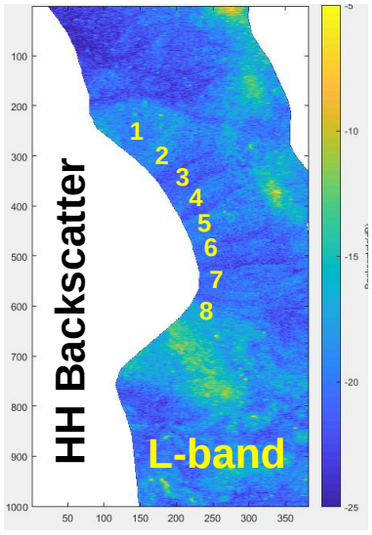
Anomalous craters are known to be potential candidates for hosting water-ice in lunar permanently shadowed regions (PSRs) based on CPR distribution between interior and exterior of the craters. Hence, CPR distribution is studied to identify and discriminate these craters from the other category of craters.

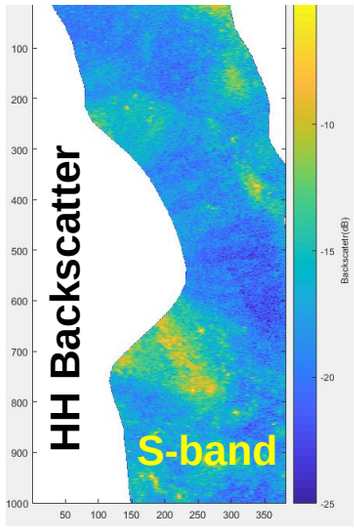
Characterization of PSR and non-PSR in Cabeus Crater

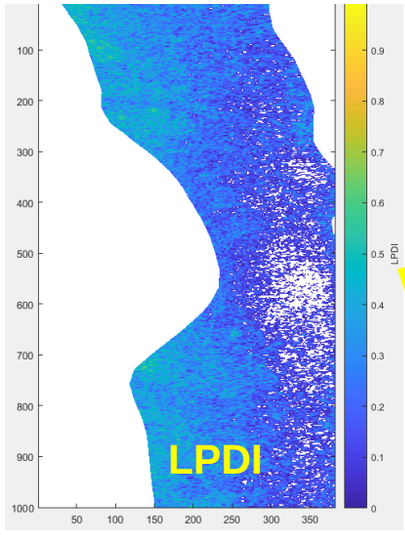


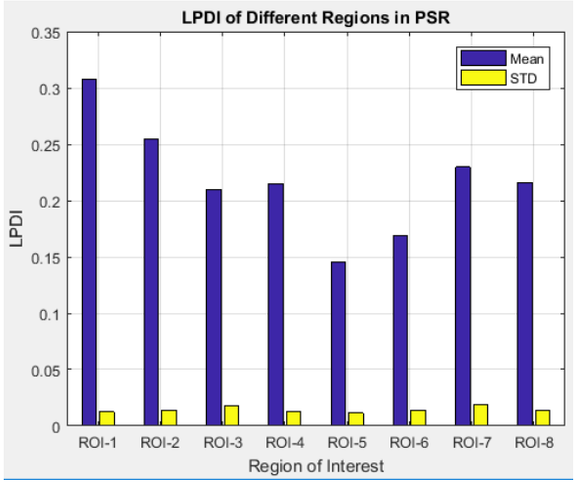
Integrated approach merging CPR and derived physical parameters has been utilized to identify potential patches of “dirty ice” within the Cabeus’ crater floor.

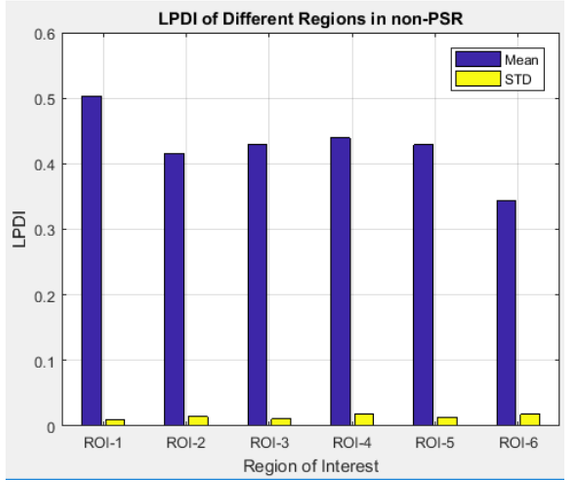
Dual Frequency (L & S) based Characterization of PSR and Non-PSR regions

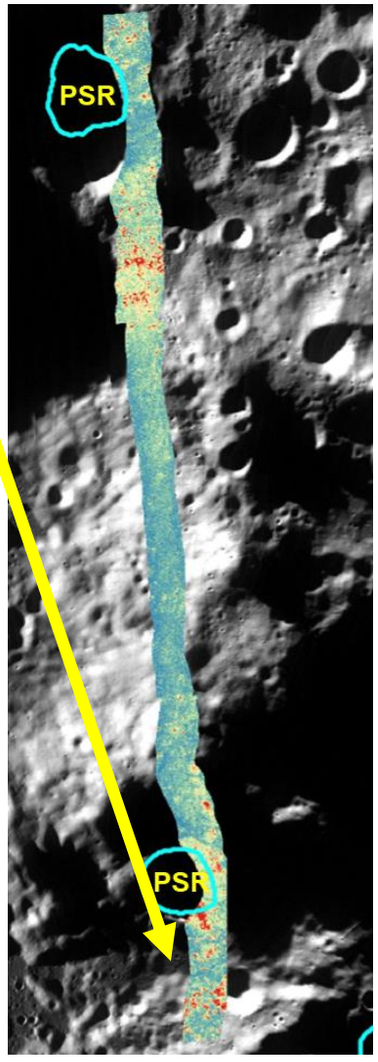








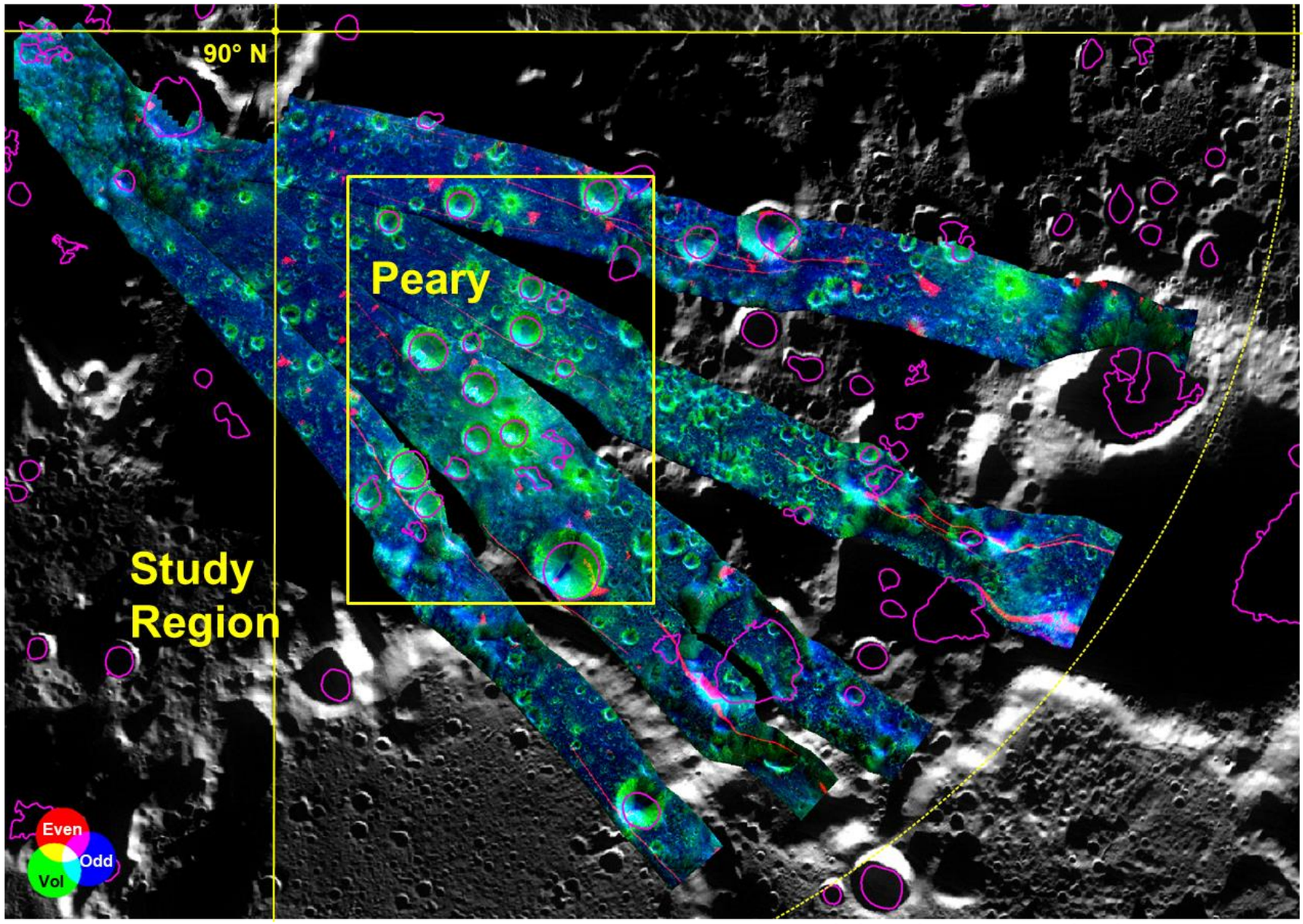




Data acquired on 17 Mar 2020
Cabeus impact crater in South Pole

Dual Frequency derived Index (LPDI) shows distinct ranges for craters in PSR (as 0.15-0.31) compared to non-PSR (0.35-0.52) which is useful for differentiating regions in lunar poles. It will also be utilized for characterization of water-ice regions, complementary to full-polarimetry-based algorithm.

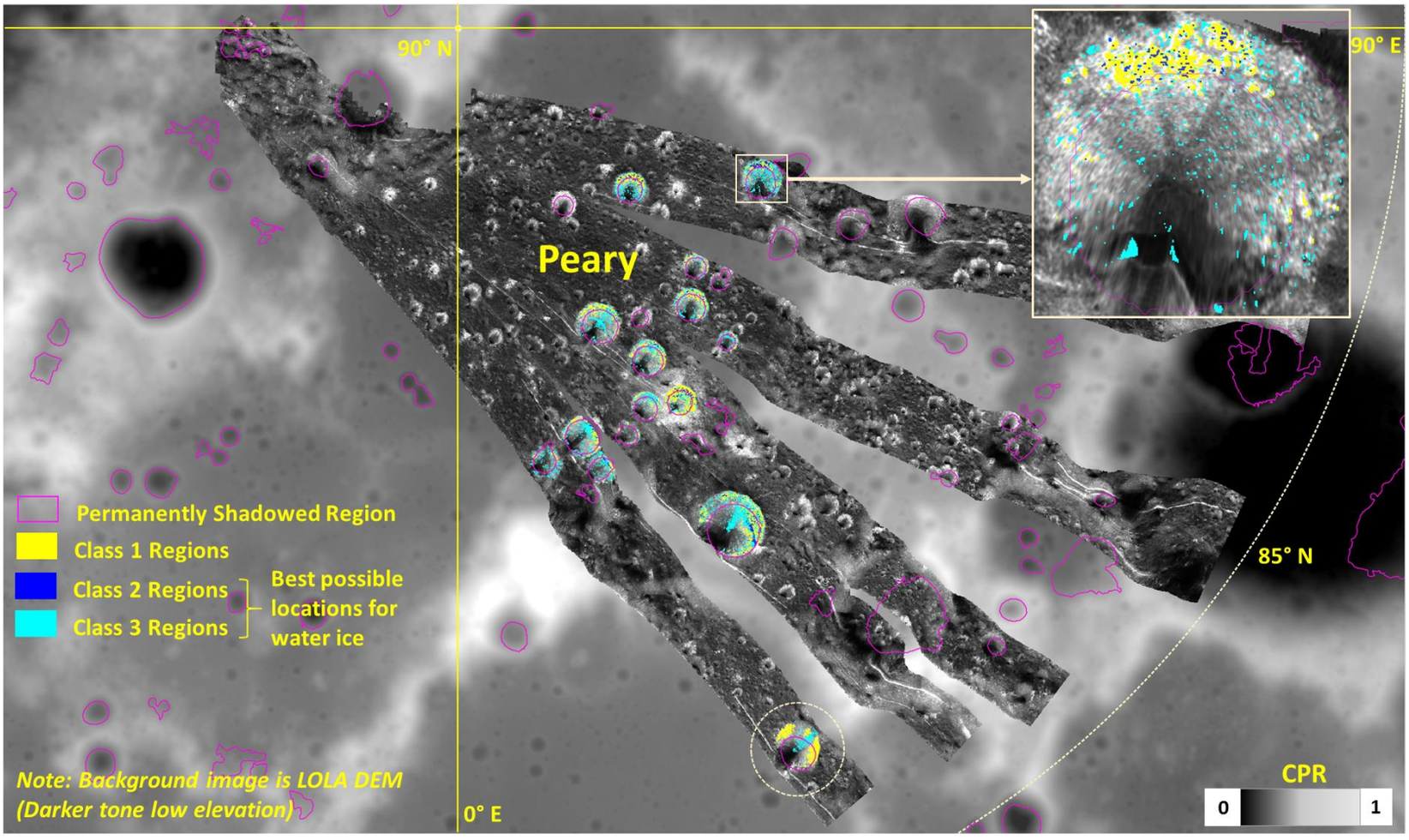
Polarimetric Analysis of Polar Anomalous Craters in PSRs



Pink polygons marked are PSRs

Potential polar anomalous craters for hosting water-ice are identified using L-band Full-Pol analysis of DFSAR data

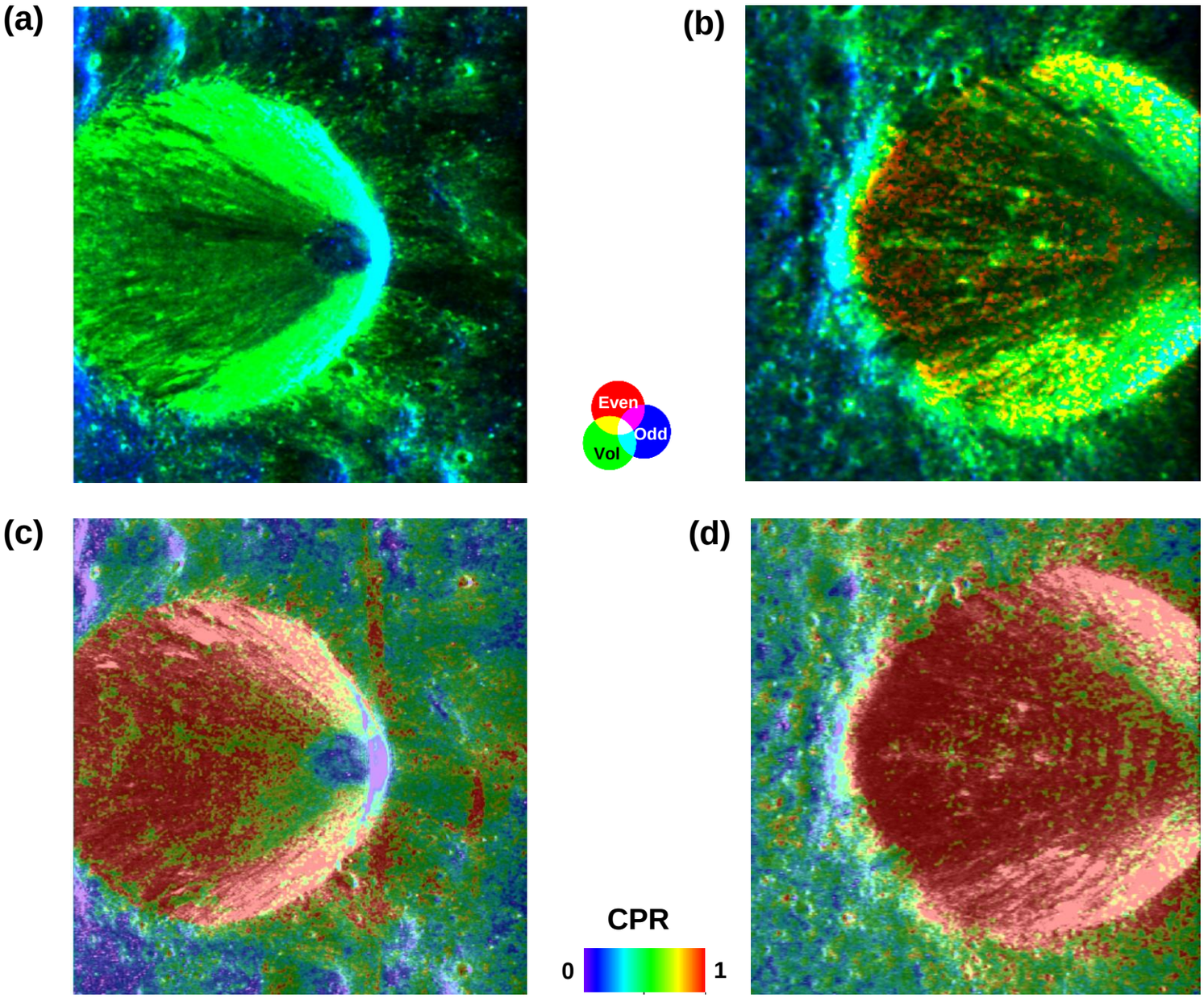
Unambiguous Detection of Water Ice Regions



- Culmination of:
  - **Novel in-house developed methodology based on full polarimetric descriptors**
  - **First time retrievals of Dielectric Constant and surface roughness**

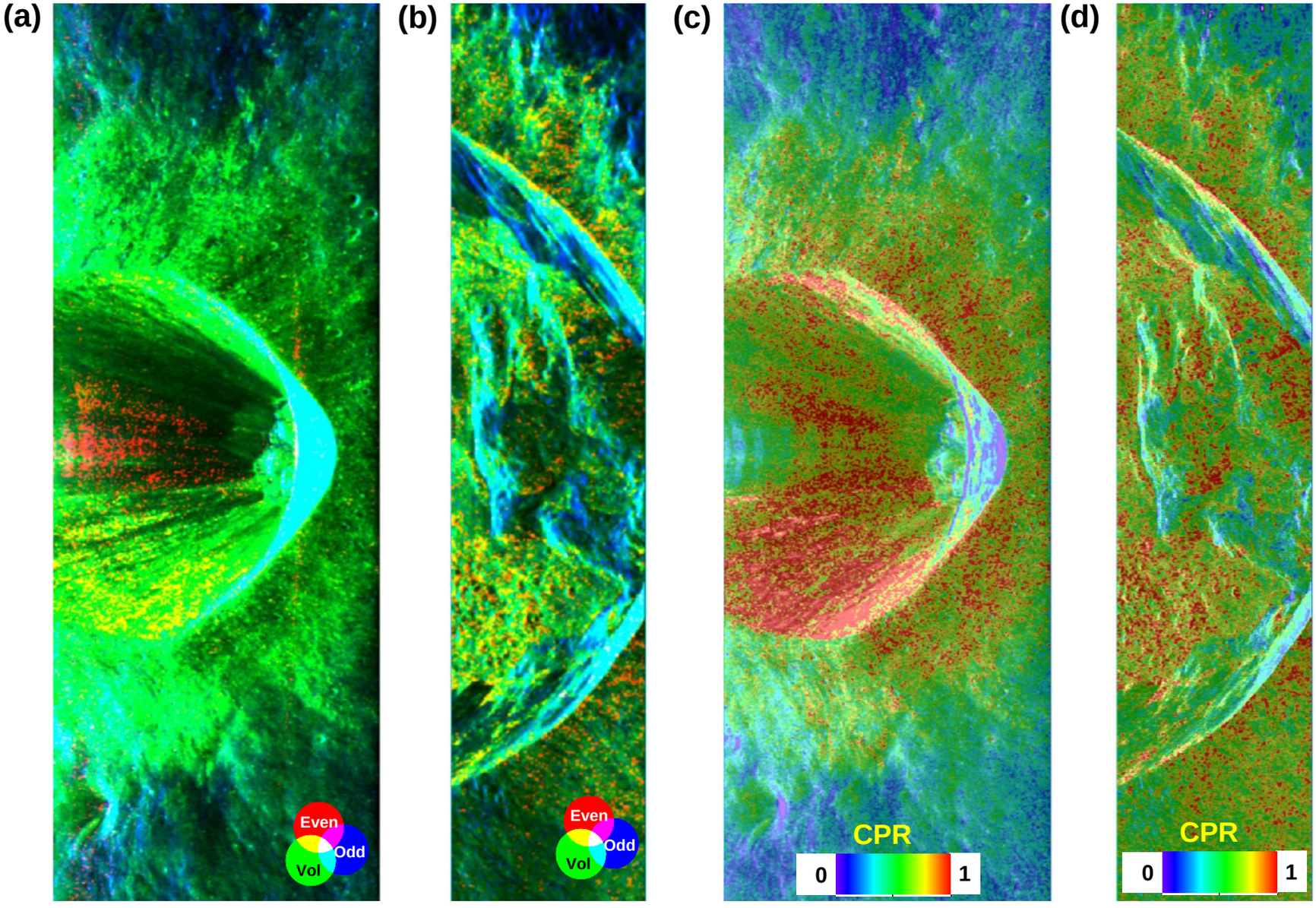
  has enabled to identify:
- Best regions holding water ice detected in Permanently Shadowed Regions of Peary Crater in Lunar North Pole
- **Above results from Chandrayaan-2 DFSAR are found to be promising to resolve the ambiguities related to water-ice from past lunar SAR/ Radar missions.**

Study of Anomalous Craters



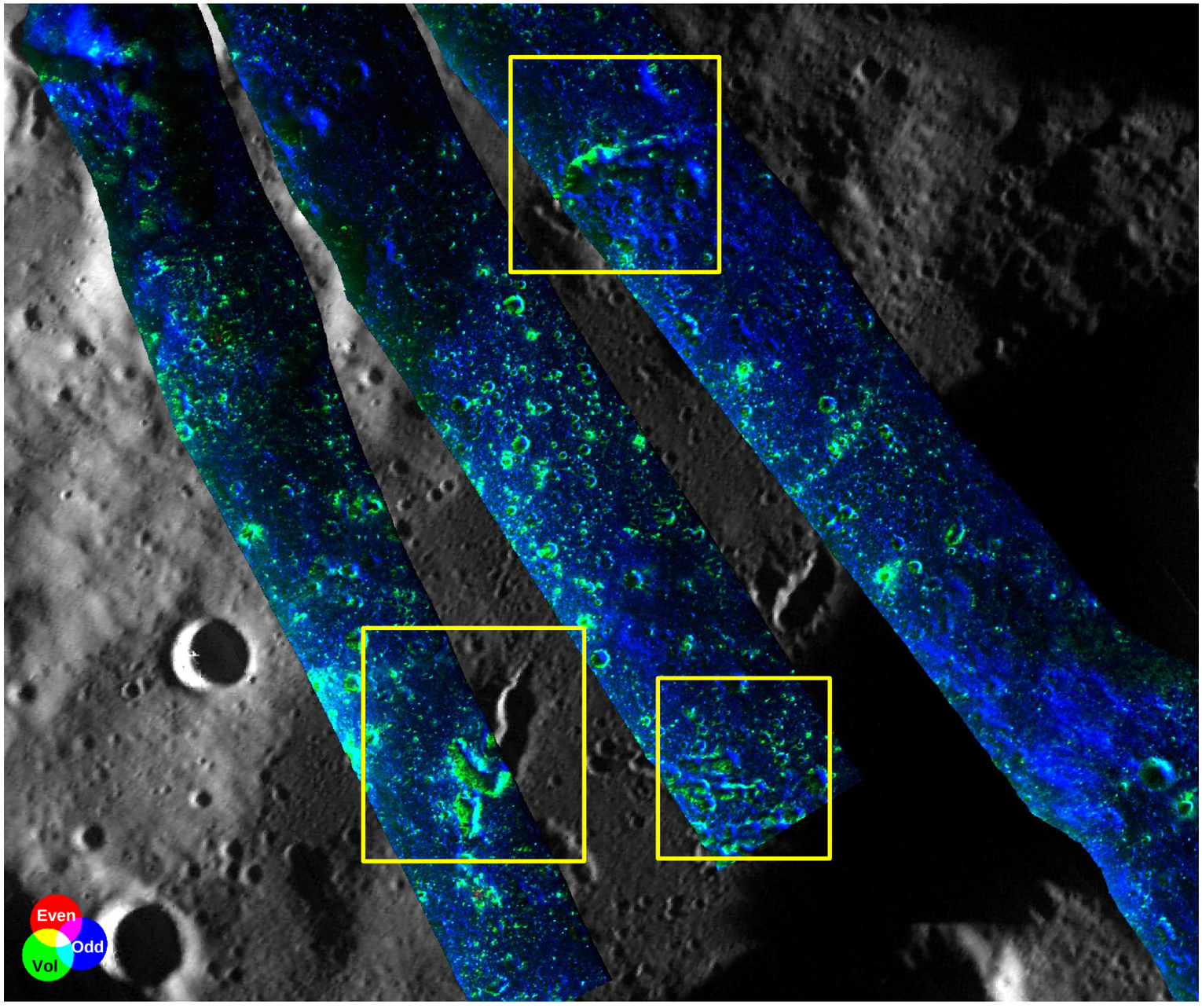
Polarimetric Decomposed image of (a) secondary crater of Hermite crater in Lunar north pole, which is a polar CPR-anomalous crater, and (b) Byrgius C crater in mid-latitude area, which is a non-polar CPR-anomalous crater. Likewise, Circular Polarization Ratio (CPR) image of (c) secondary crater of Hermite crater, and (d) Byrgius C crater.

Study of Young (Fresh) Craters



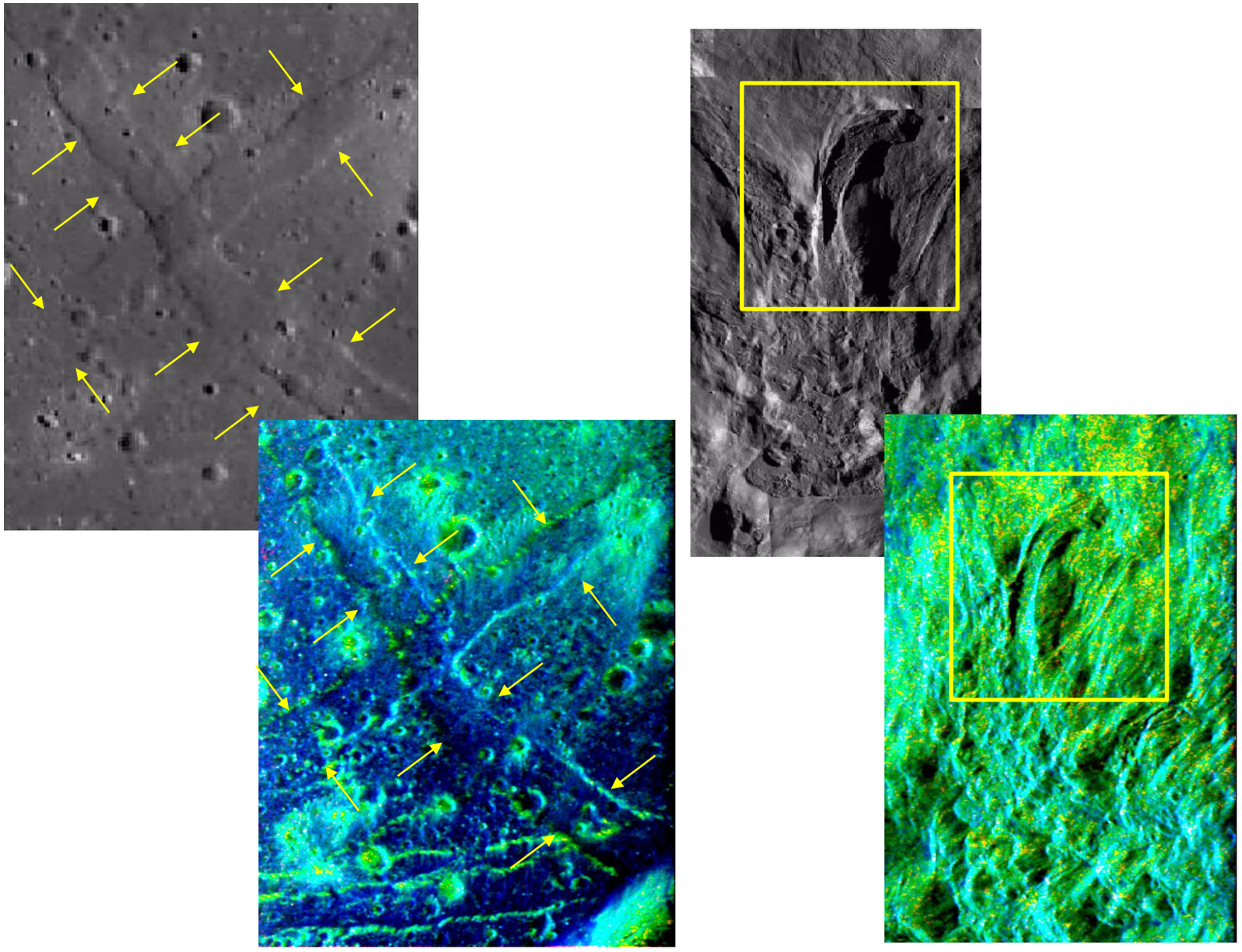
Polarimetric Decomposed image of (a) secondary crater of Rozhdestvenskiy crater in Lunar north pole, which is a polar fresh (Young) crater, and (b) Giordano Bruno crater in mid-latitude area, which is a non-polar fresh (Young) crater. Likewise, CPR image of (c) secondary crater of Rozhdestvenskiy crater, and (d) Giordano Bruno crater .

Study of Elongated Groove Features



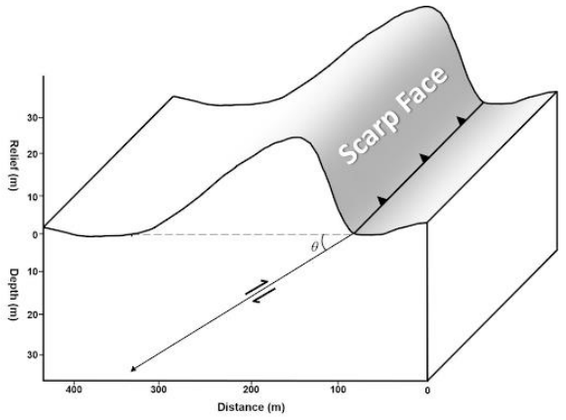
Certain elongated rift/groove morphological features observed near Idel'son crater, lunar south pole. Polarimetric decomposed image of these features show volume scattering from the walls of the rifts due to mass wasting or debris flows.

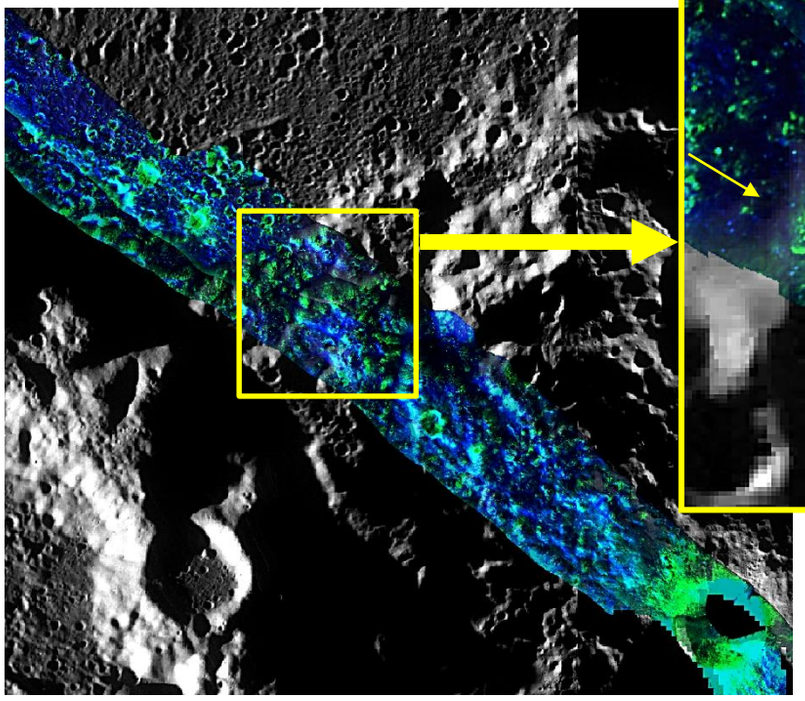
Study of Volcanic Melt Features

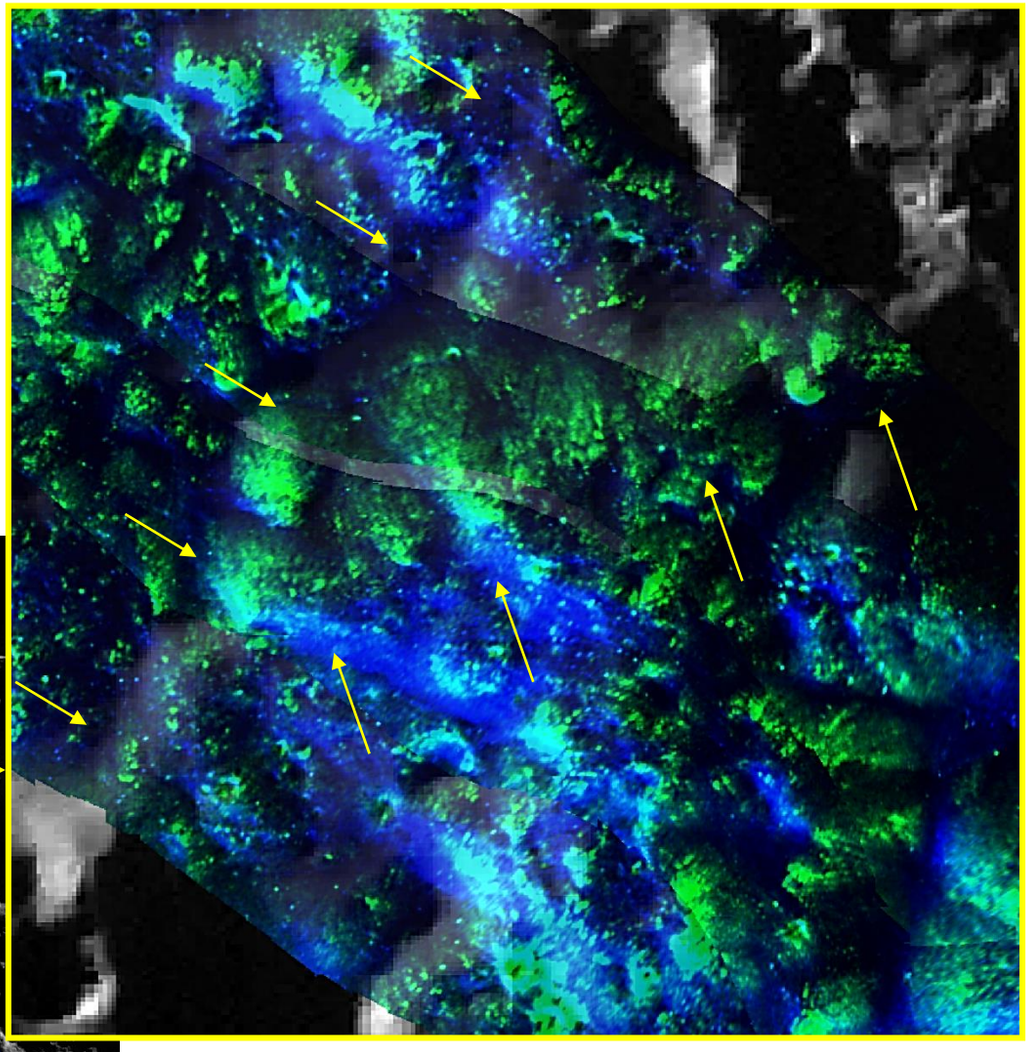


Various volcanic features like Rilles (Left) and Impact Melt Channels (Right) as observed by optical (greyscale) and polarimetric DFSAR data (colour). It appears from optical images that the features are having smooth surface, however, polarimetric images reveal that the rilles are having smooth surface, whereas impact melt have very rough surface.

Study of Tectonic Features: Polar Scarp

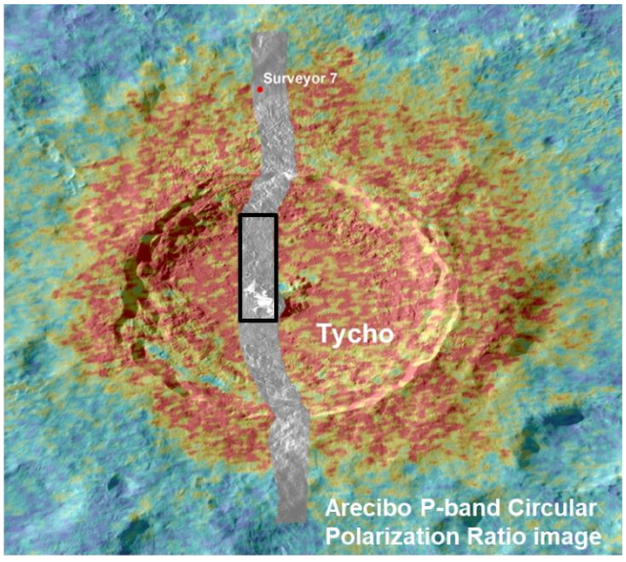






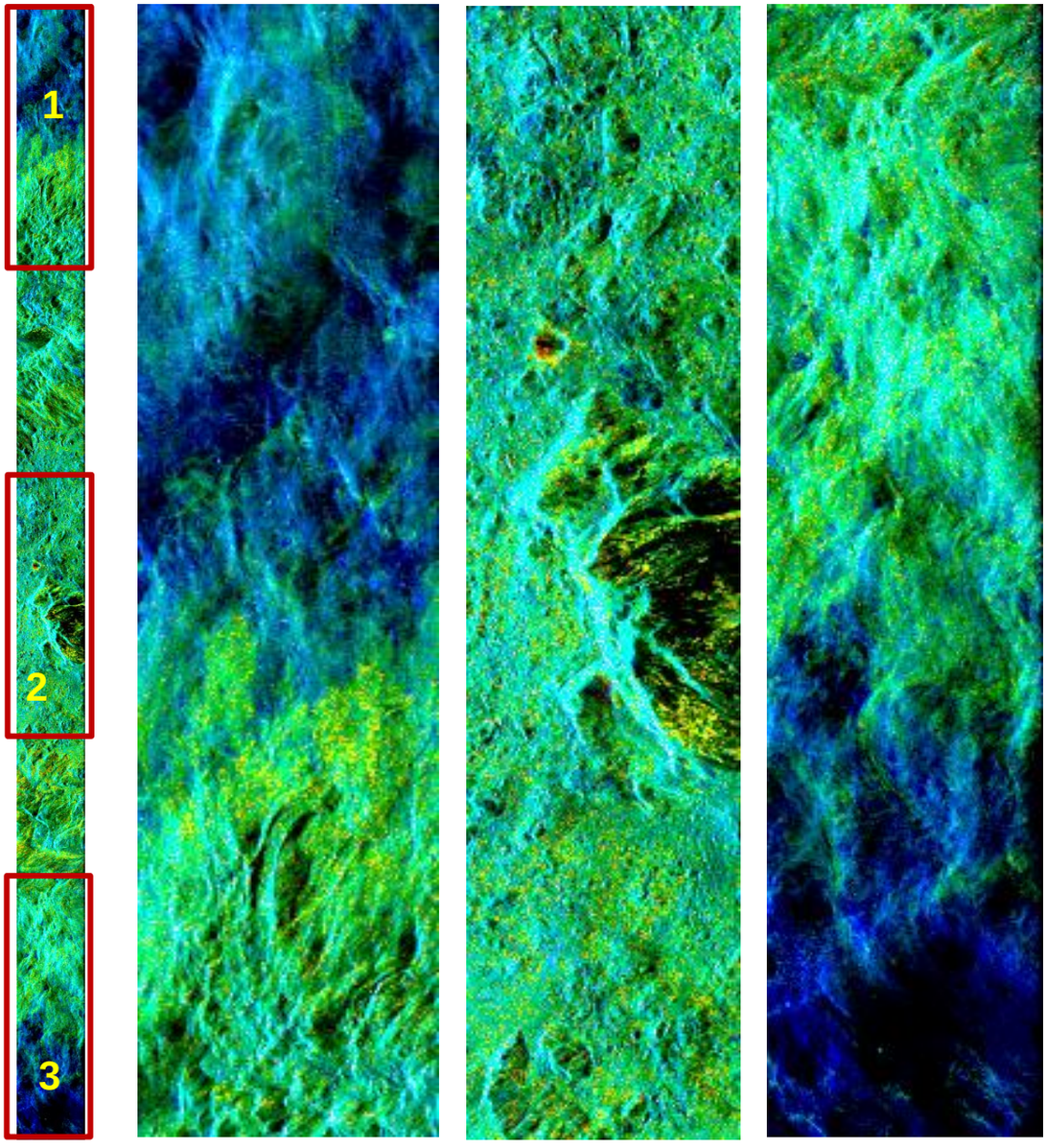
Polar Scarp are the uplifted geomorphological features form due to formation of thrust faults because of compressional force. The Polar Scarp in Rozhdestvenskiy crater in lunar north pole is shown in the figure, which is characterized by volume scattering (green) due to debris flow along the scarp face.

Large, young impact craters: Tycho



L-band DFSAR HH polarization image of Tycho crater (43.3°S, 11.3°W)

Comparison of the physical and compositional properties of impact melt and non-melt units on the floor, central peaks, and ejecta of large, young craters will provide further insight into the emplacement dynamics and regolith development of impact melts.

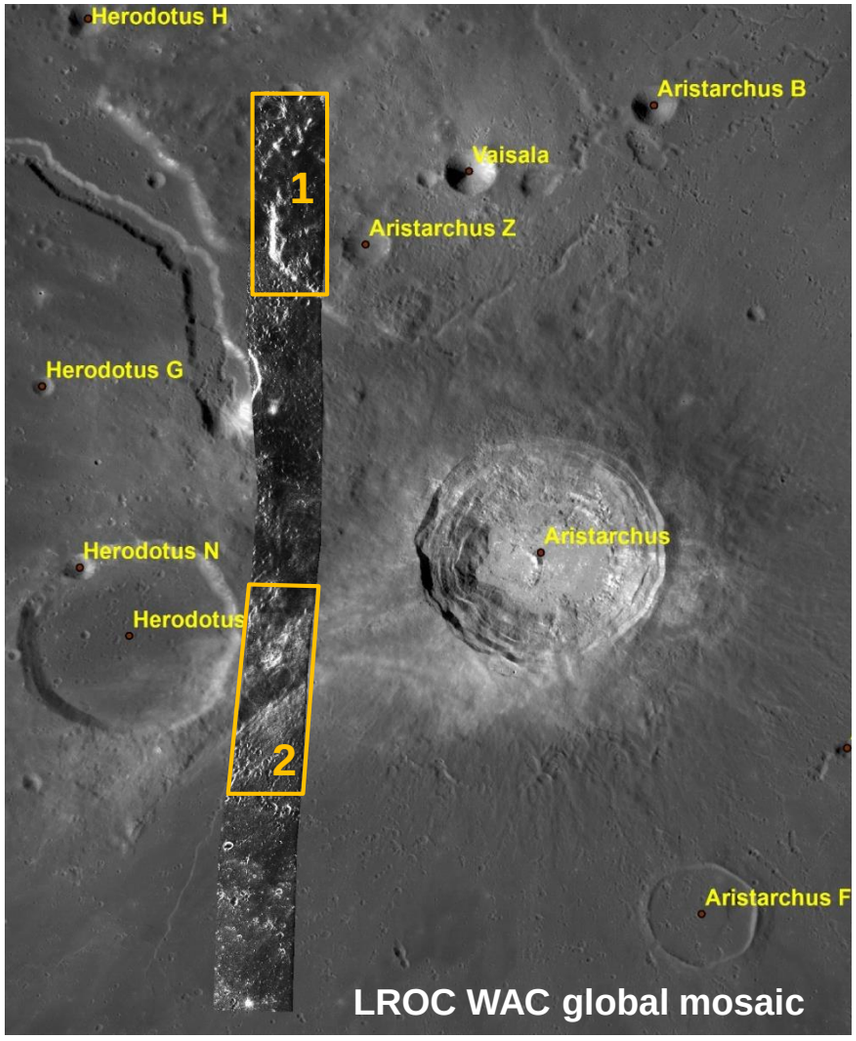


1 (Top) : Impact melts

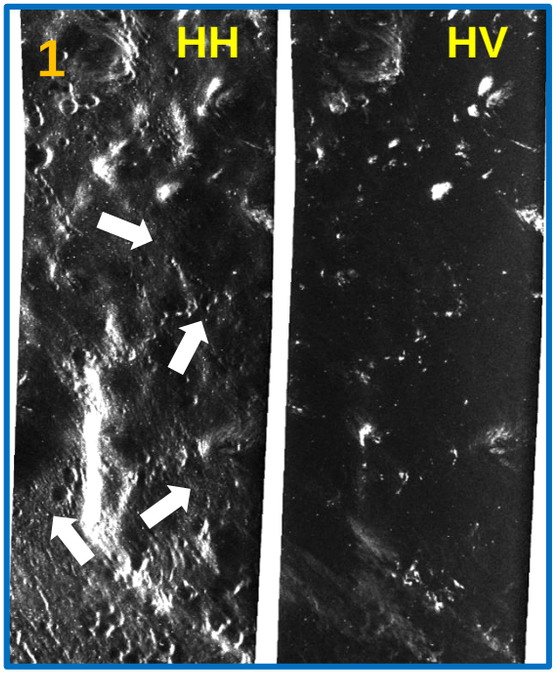
2 (Centre): Central Peak

3 (Bottom): Crater ejecta

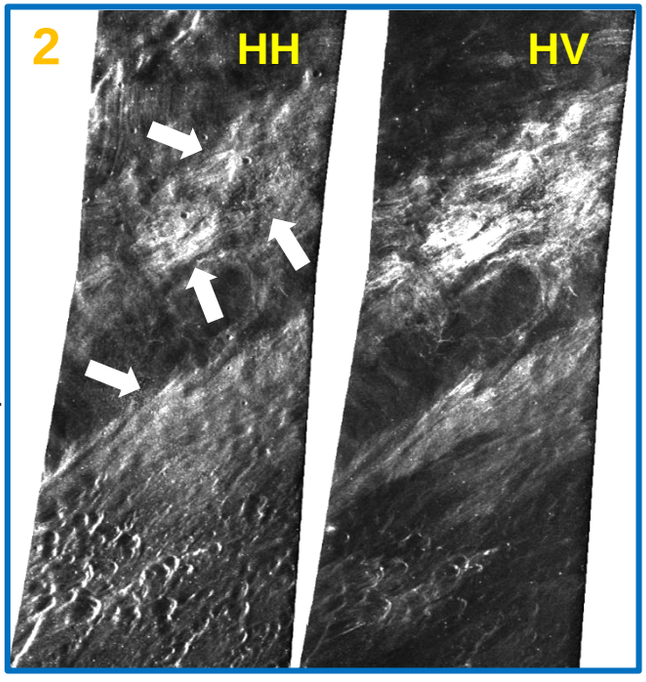
Characterization of lunar volcanic features over Aristarchus Plateau



L-band DFSAR HH polarization image of Aristarchus crater (23.7°N, 47.4°W) region



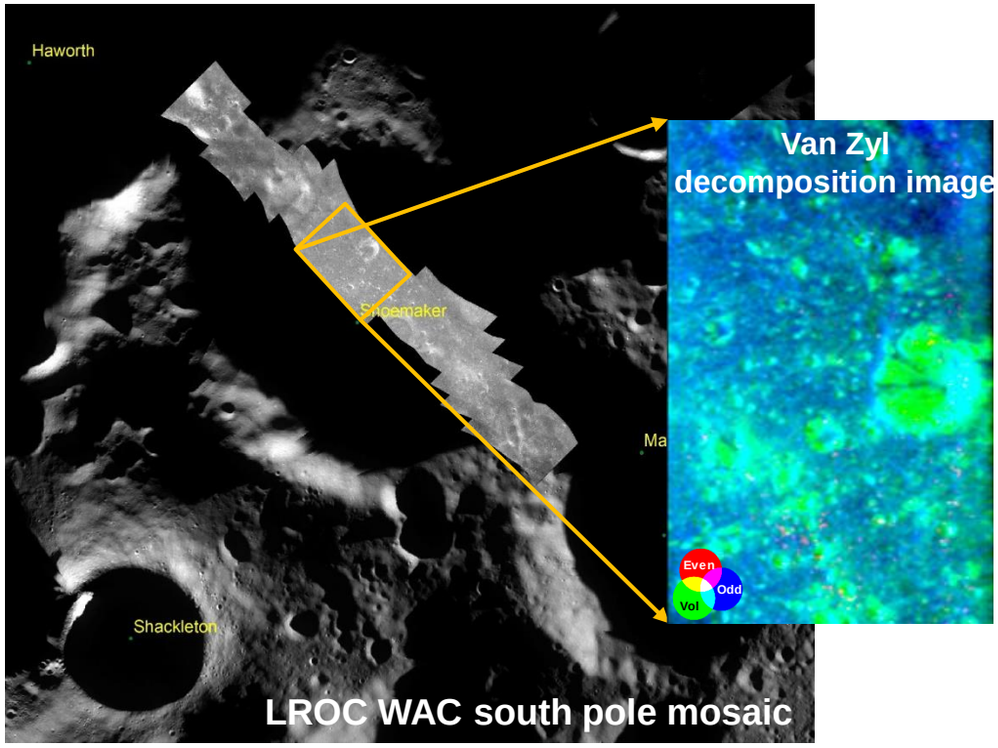
Dark-mantled pyroclastic deposits



Aristarchus crater ejecta

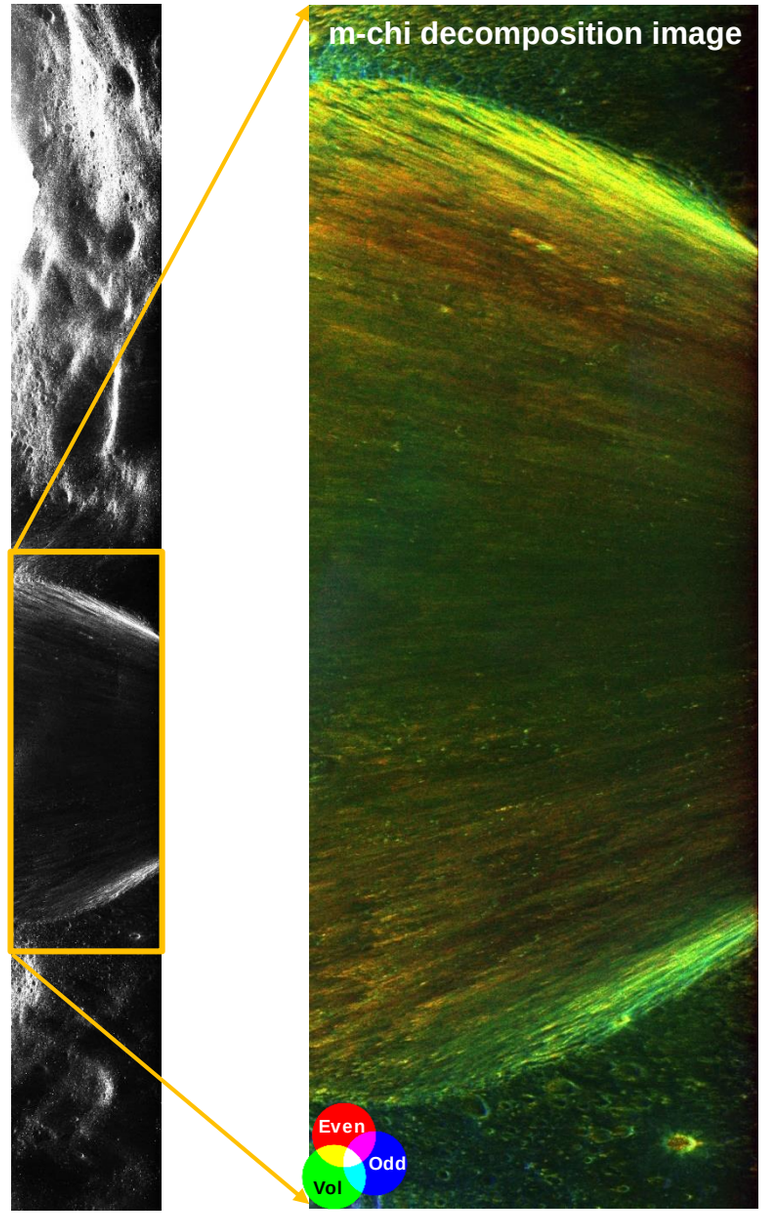
The cross-polarization (HV) radar images distinctly highlight the extent of dark-mantled pyroclastic deposits and crater ejecta that are not readily apparent in the corresponding co-polarization (HH) radar images, as indicated by arrows.

Permanently Shadowed Regions (PSRs): Lunar South Pole



L-band DFSAR fully polarimetric radar image of PSRs inside Shoemaker crater (88.1°S, 44.9°E)

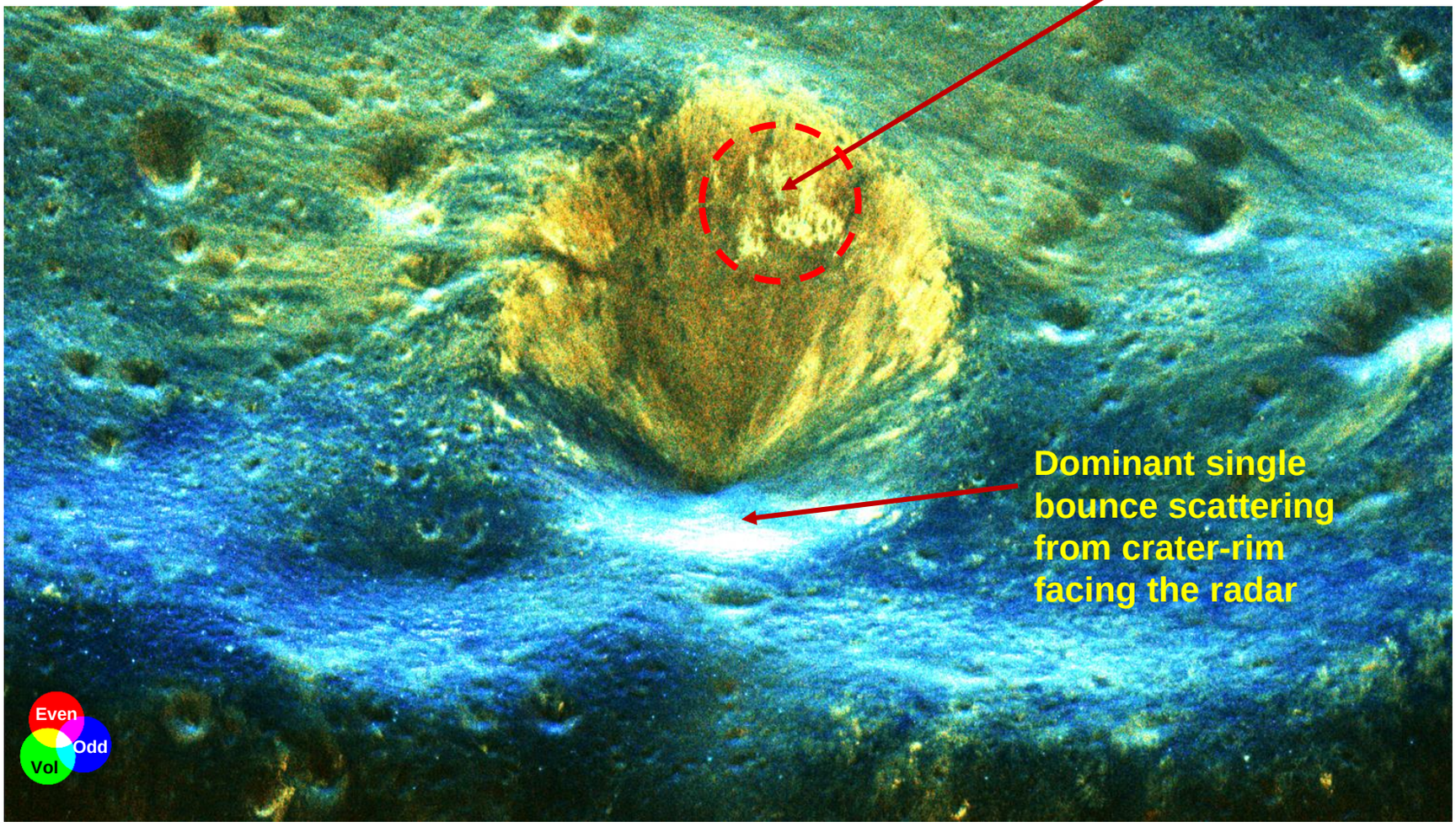
First ever L-band radar data of PSRs at the lunar poles



Highest resolution (6 m/pixel) radar images of Shackleton crater (89.9°S, 0°E)

Boulder distribution using high resolution mode

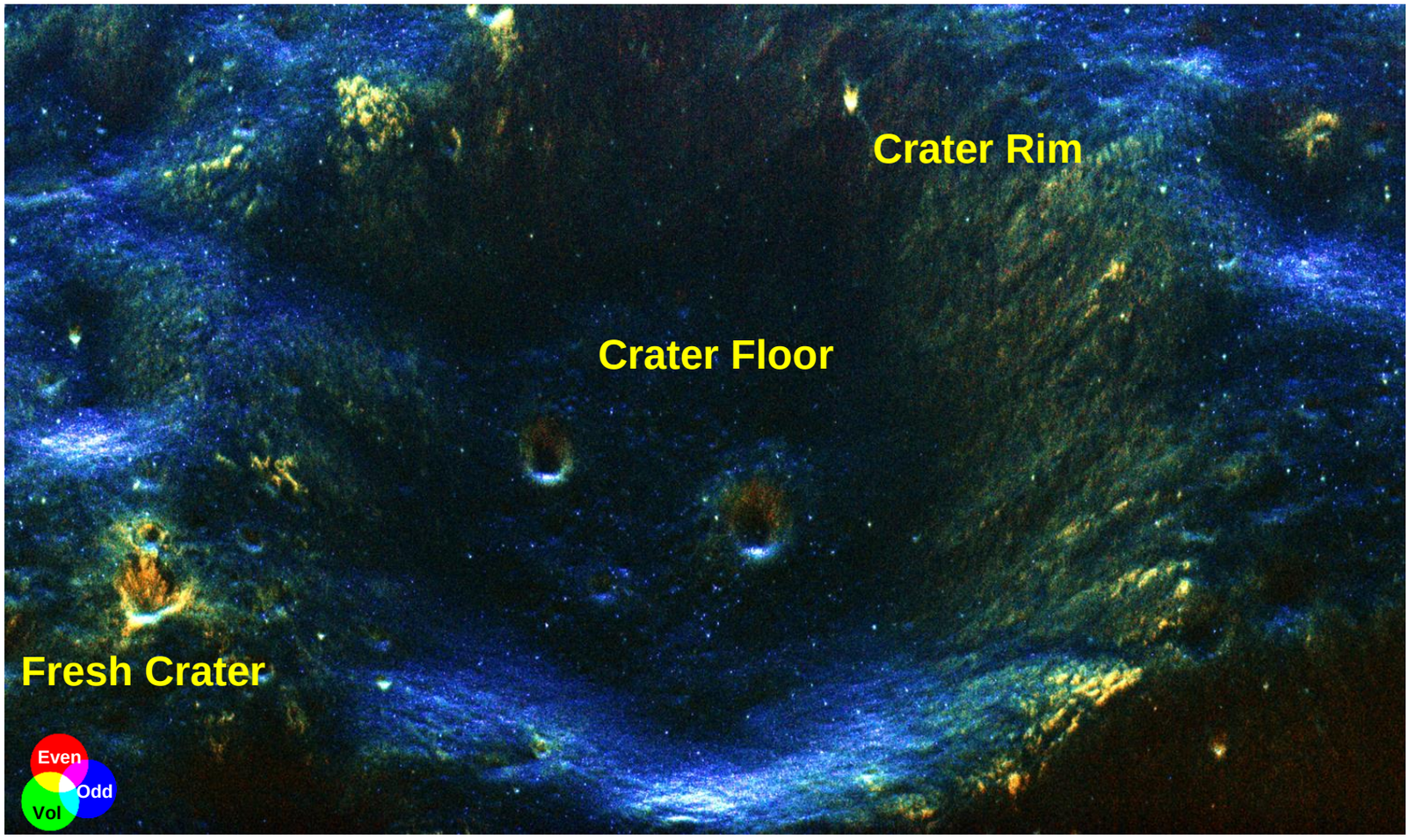
Enhanced Radar Scattering due to presence of meter scale boulders on the inner crater wall



Slant range resolution: 2m
Pixel Spacing: 2m

Presence of large (cm to m scale) boulders on the inner wall of the secondary crater (on the floor of Manzinus crater) is identified from high resolution polarimetric decomposed image

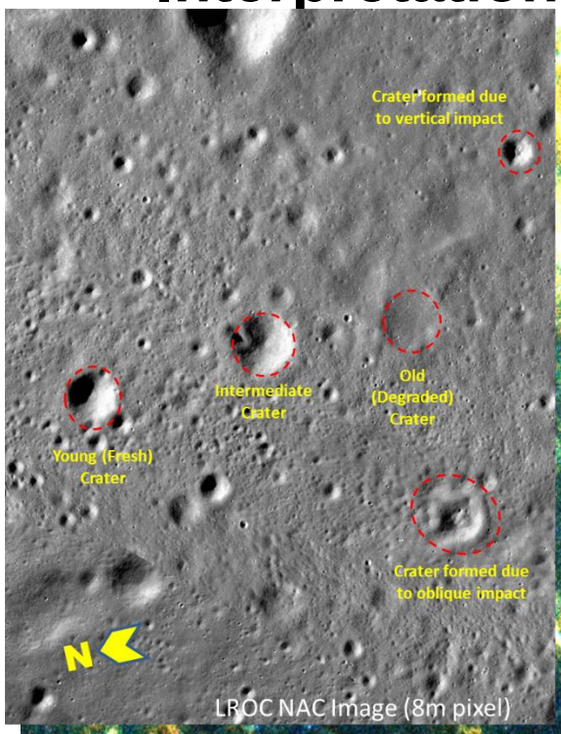
Polar degraded craters with thick regolith layer



Slant range resolution: 2m
Pixel Spacing: 2m

Unnamed degraded crater (near Schomberger D crater) covered by thick layers of regolith is identified by the dominance of surface (odd bounce in blue tone) scattering in the interior of the crater.

Interpretation of relative-age and origin of craters



Crater formed due to vertical impact

Old (Degraded) Crater

Crater Ejecta

Crater Rim

Intermediate Crater

Young (Fresh) Crater

Crater formed due to oblique impact

Even
Odd
Vol

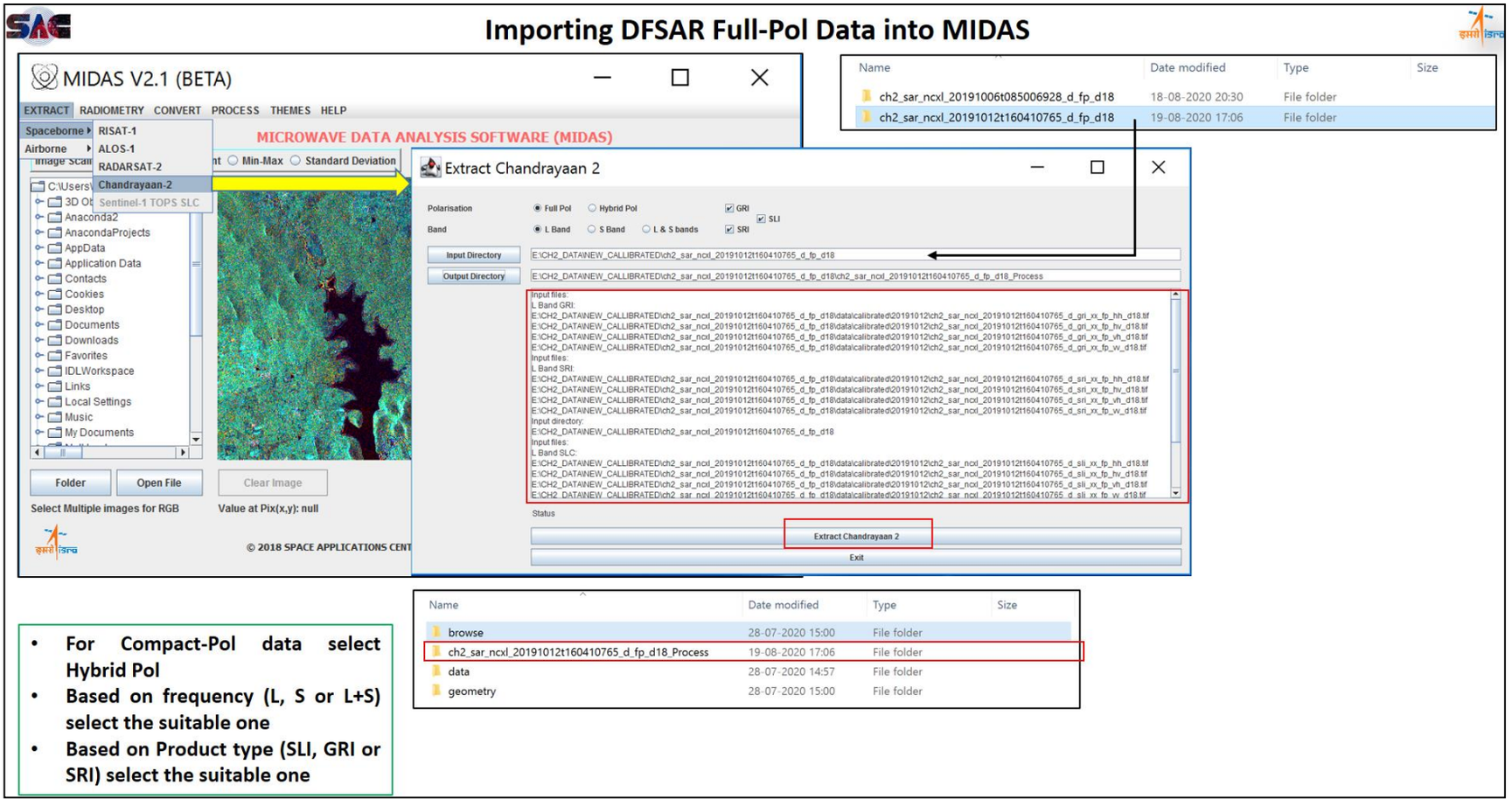
Craters of different age and origin seen along with their ejecta distribution. The ejecta is mostly subsurface and not visible in optical images (inset); this shows capability of DFSAR to interpret age and origin process of the craters.

Slant range resolution: 2m
Pixel Spacing: 2m

DFSAR processing using MIDAS - in-house software

DFSAR processing interface has been built into Microwave Data Analysis Software (MIDAS), an in-house developed software.

MIDAS has been hosted on ISSDC and VEDAS, and shared with users.



- **For Compact-Pol data select Hybrid Pol**
- **Based on frequency (L, S or L+S) select the suitable one**
- **Based on Product type (SLI, GRI or SRI) select the suitable one**

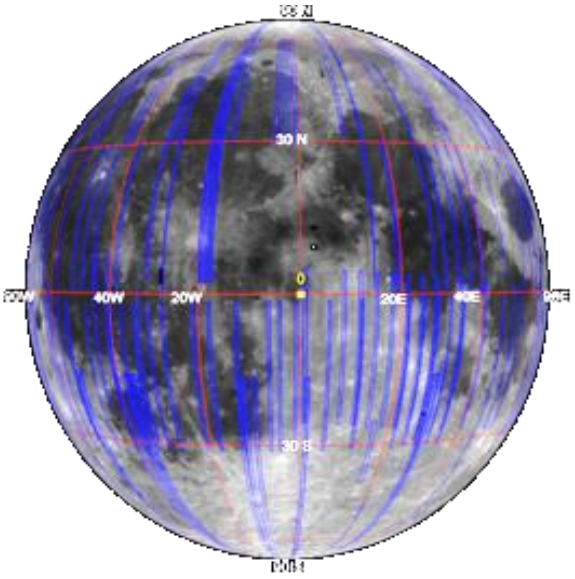


Annexure-5

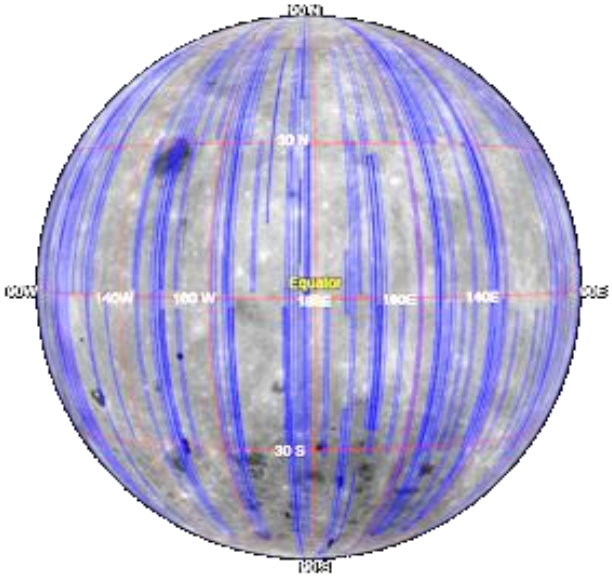
Data Products of Imaging Infra-Red Spectrometer (IIRS)

Imaging InfraRed Spectrometer (IIRS) Coverage Map and Selected Images

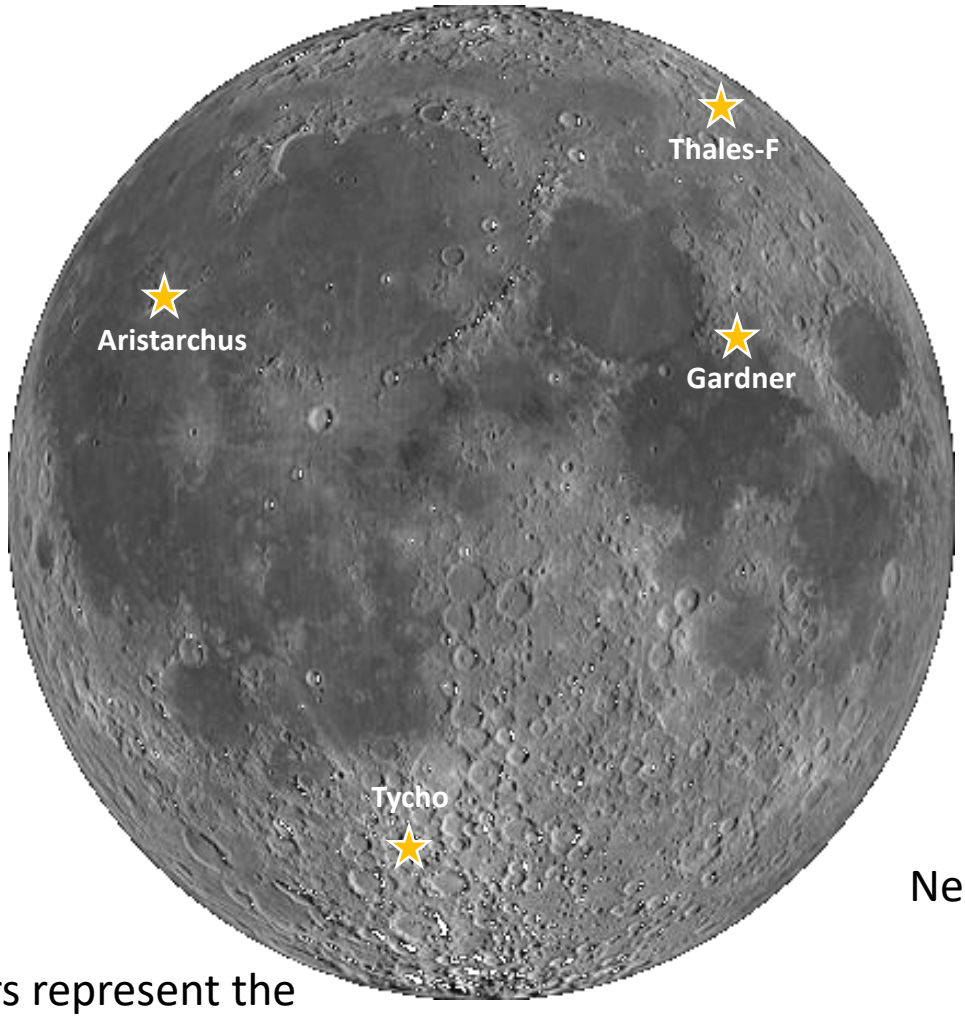
Near Side



Far Side

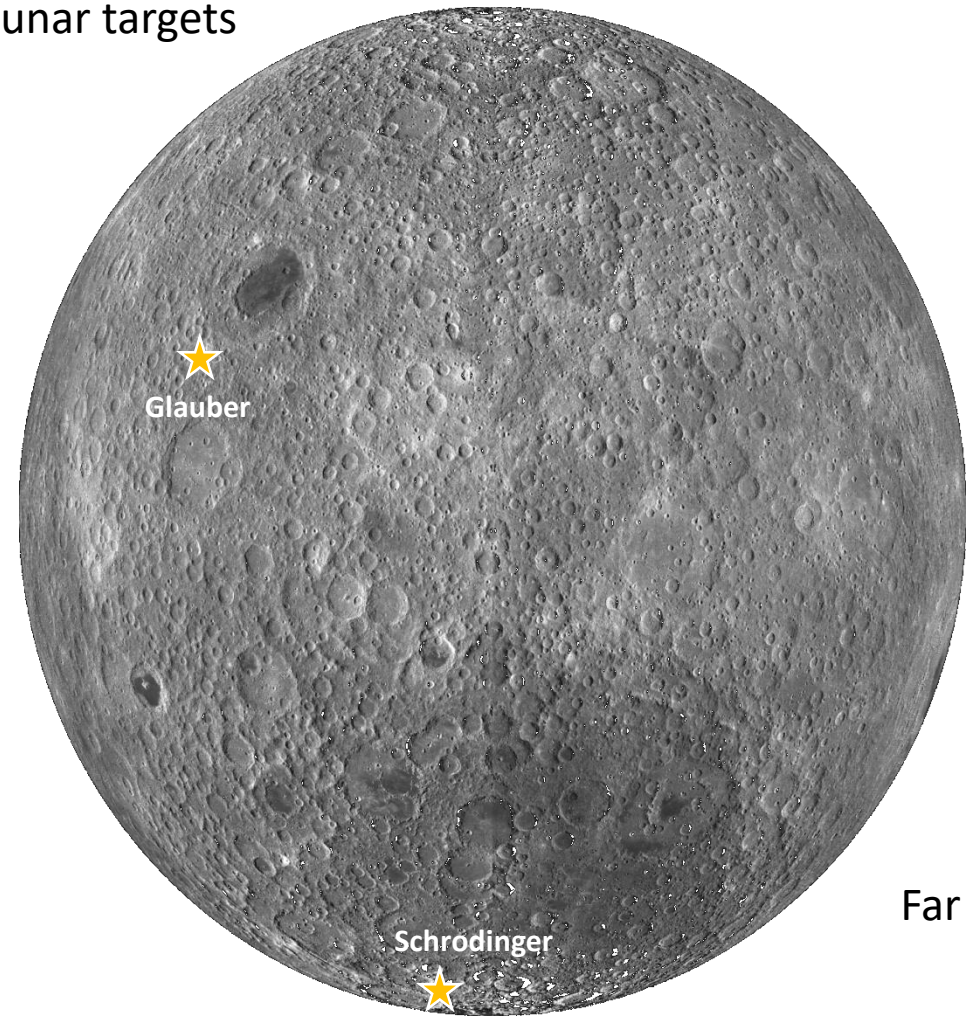


Payloads	Area Covered	Percentage
IIRS	22.75 million sq. km	60%



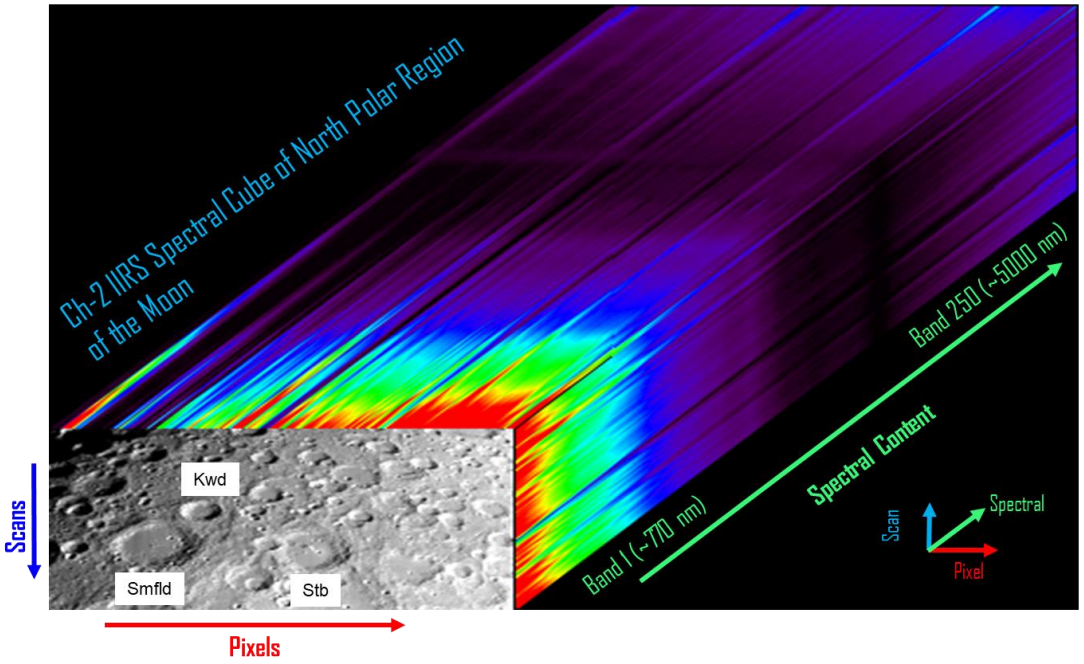
Near Side

Yellow stars represent the selected lunar targets



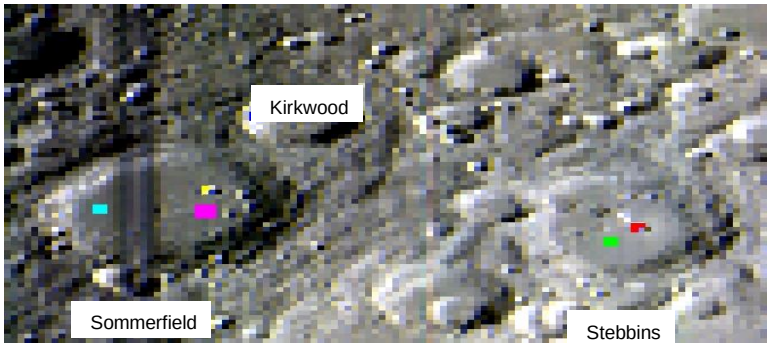
Far Side

IIRS Spectral Data Cube

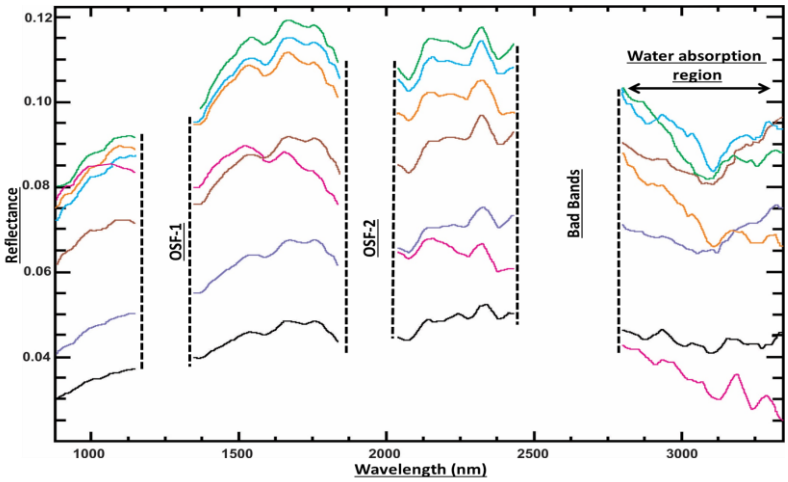


The first light image of the lunar surface was acquired on August 23, 2019 from an altitude of ~4300 km. It covers part of the lunar far side in the northern hemisphere that include craters Sommerfield (Smfld), Stebbins (Stb) and Kirkwood (Kwd). Figure shows the 3-dimensional nature of the IIRS hyperspectral data cube of a subset image acquired on August 23, 2019. The subset of the image has 169 cross-track samples, 73 lines and 251 spectral channels measuring from 810 to 5026 nm.

Hydration feature (OH/H_2O) in the north polar region



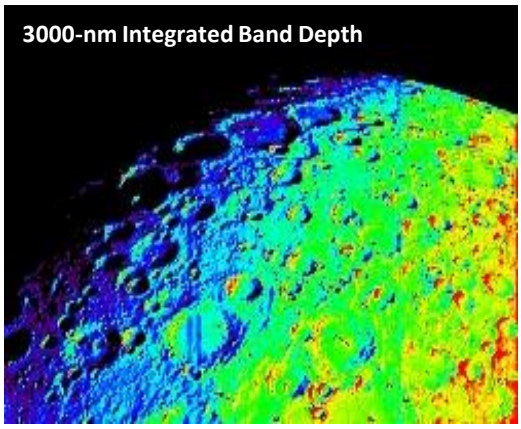
- Coloured rectangular boxes represent the regions of interests (ROIs) from where representative IIRS spectra have been obtained.



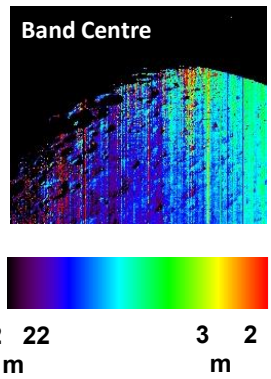
- Mean spectra showing presence of prominent 3000-nm hydration feature (yellow double-headed arrow). First ever detection of hydration in the spectral range of 2.7-3.2 µm at spatial resolution of ~80 m.

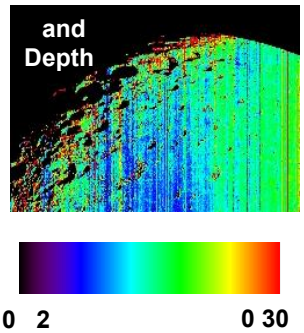
Bhattacharya et al., LPSC-2020, Abstract #1516

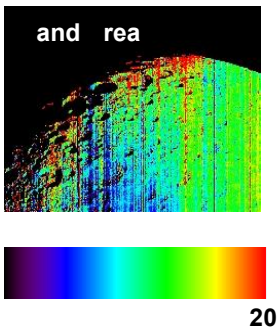
Unambiguous characterization of hydration feature in the north polar region



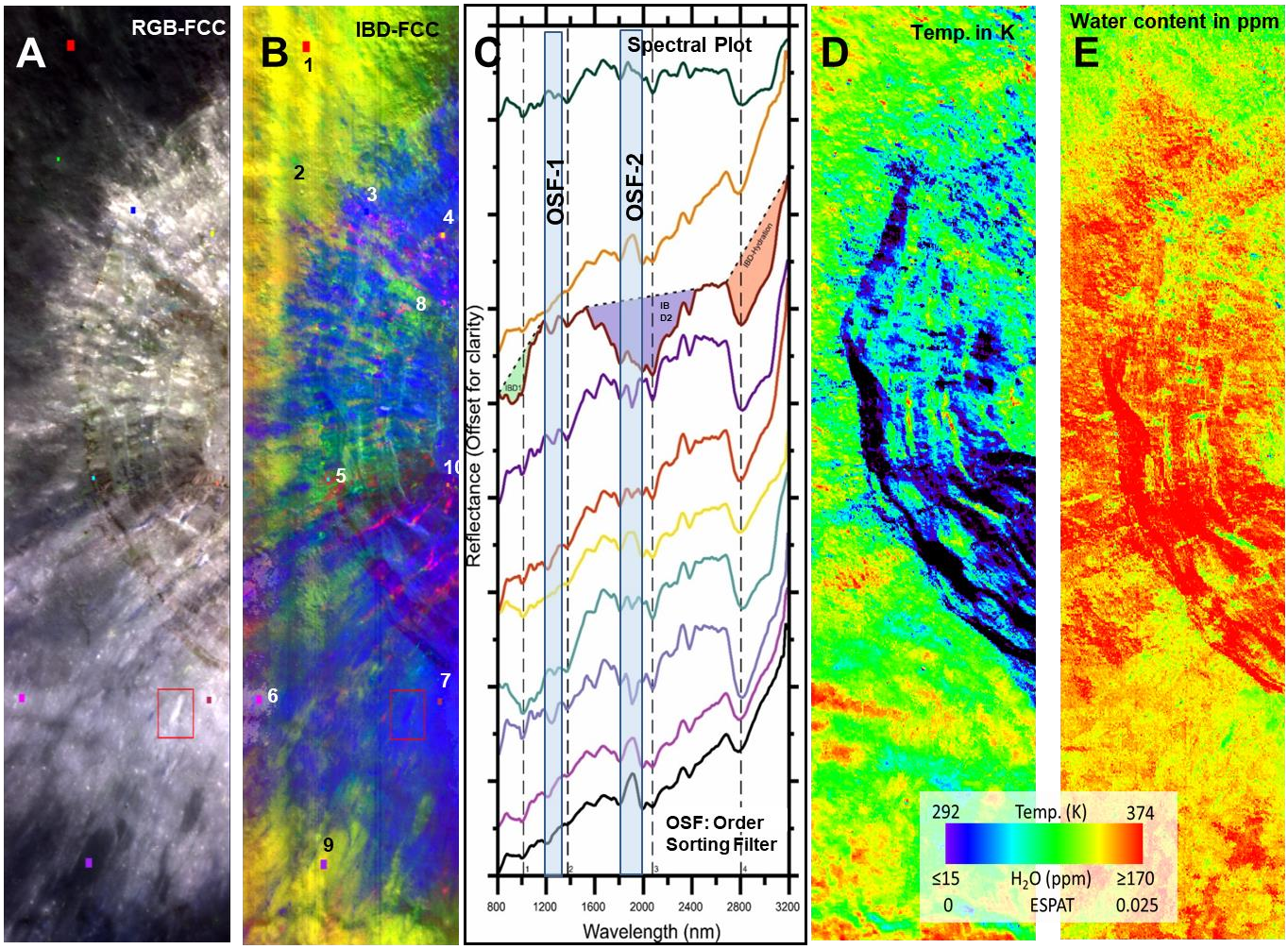
- For the first time, OH and H_2O has been separately identified.
- Band Center value of the 3000-nm feature is found to vary from ~2.82 to 3.16 µm having two modes with mean Band Center locations near ~2.86- and 2.95 µm respectively suggesting the presence of both OH and H_2O in the north polar region on the far side of the Moon.



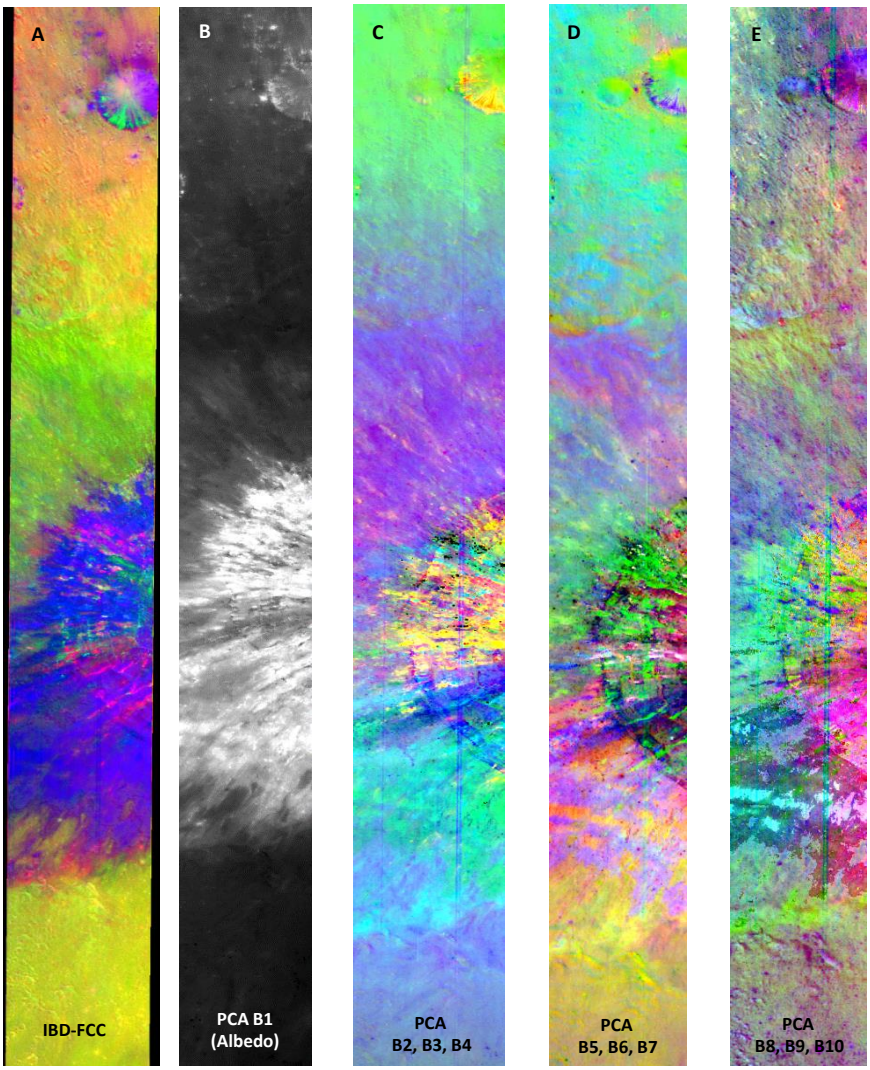




Detection, characterization and quantification of hydration feature at crater Aristarchus



Panel A. Ch-2 IIRS RGB-FCC. Colored boxes indicate regions of interests (ROIs); B. IBD-Albedo-based FCC. ROIs are marked as 1-10; C. Mean spectral plot corresponding to the ROIs; D. Temperature map; E. ESPAT vis-à-vis H_2O content map of crater Aristarchus. The nature of the hydration feature strongly suggests it to be hydroxyl (OH) and the water content is found to vary from ~15-170 ppm. The IIRS spectral range beyond 3 µm has helped in complete characterization of the lunar hydration feature for the first time.



One Moon Many Colors

Spectral diversity as depicted by Ch-2 IIRS data over Aristarchus crater and adjoining Regions

Panel A: Integrated Band Depth based FCC (IBD-FCC) highlighting the compositional variations in and around crater Aristarchus. Dark colored silicate minerals-bearing rocks appear green to yellow in IBD-FCC, whereas plagioclase-bearing light colored rocks appear in blue to purple.

Panel B: Principal Component Analysis (PCA) Band-1 showing the overall albedo of the studied site.

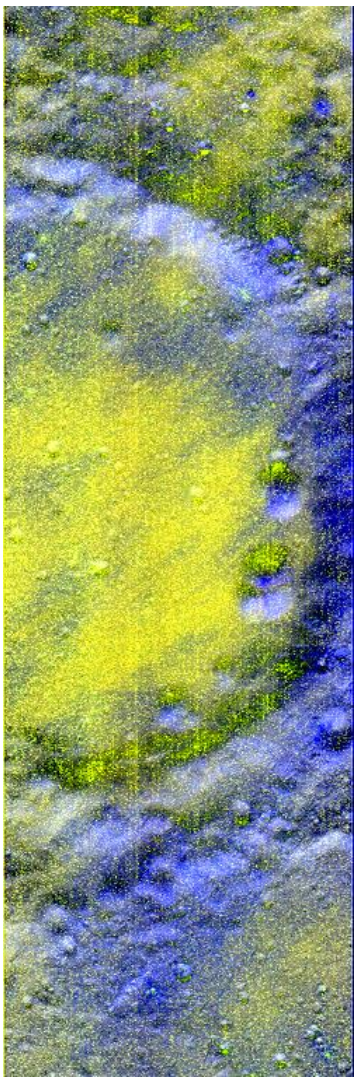
Panels C-E: FCCs of various PCA band combinations showing subtle spectral variations owing to the variations in the crustal composition.

Ch-2 R Data nalysis o Crater Thales-

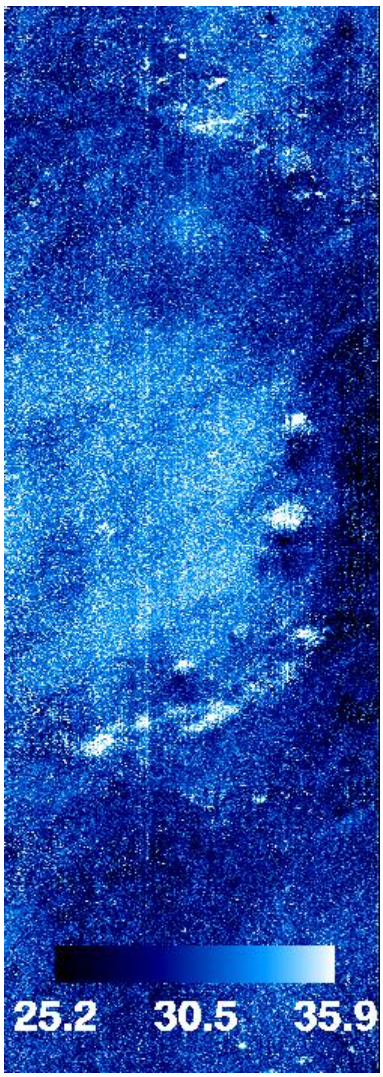
Situated East of crater Gartner and NW of crater Endymion. The crater is filled by mare basalts and the craterlets within the mare chiefly comprise of pyroxene-rich dark colored materials characterised by prominent absorptions near 1000- and 2000 nm arising due to the electronic transition of Fe^{2+} in the crystal lattice of pyroxenes



FCC mosaic Crater Thales-F
R: 1.08 micron IIRS band
G: 1.67 micron IIRS band
B: 2.27 micron IIRS band



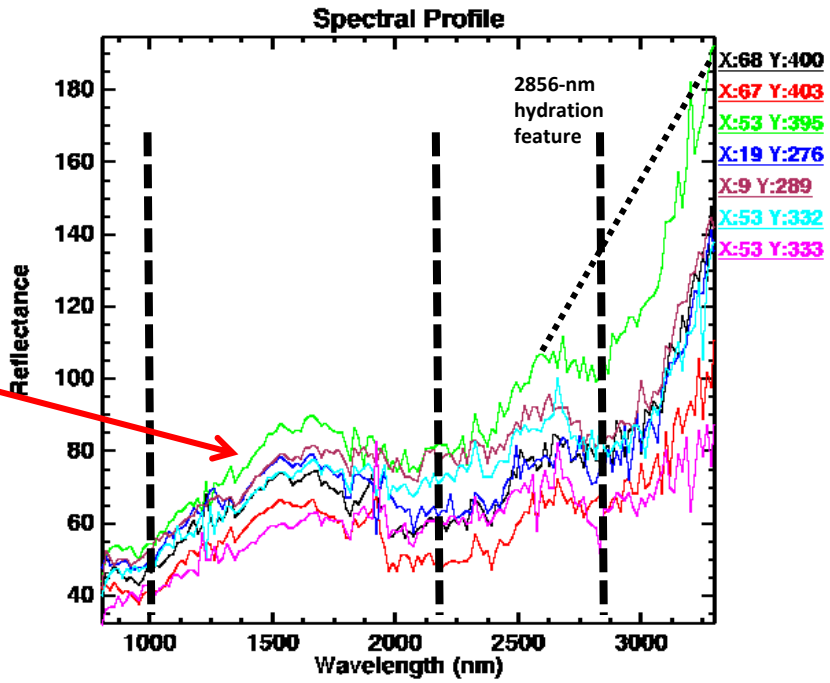
IBD mosaic Crater Thales-F
R: IBD-1 (1-µm feature)
G: IBD-2 (2-µm feature)
B: 1.56-µm IIRS Albedo Channel



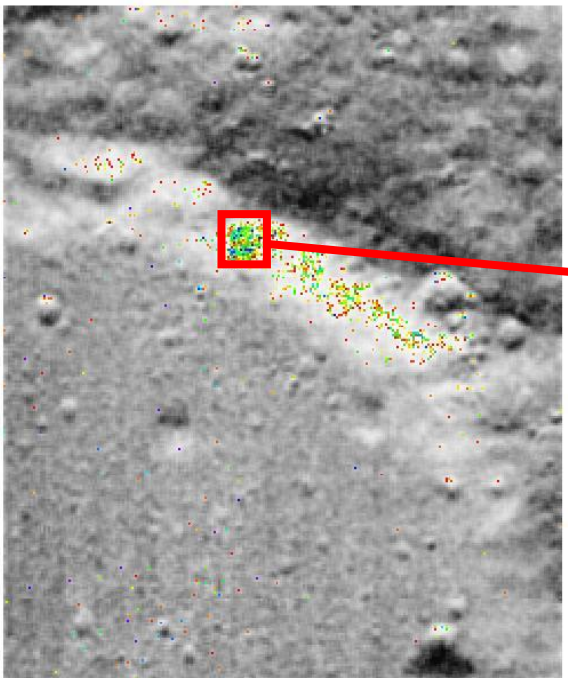
Crater Thales-F
IBD-3 (3-µm hydration feature)



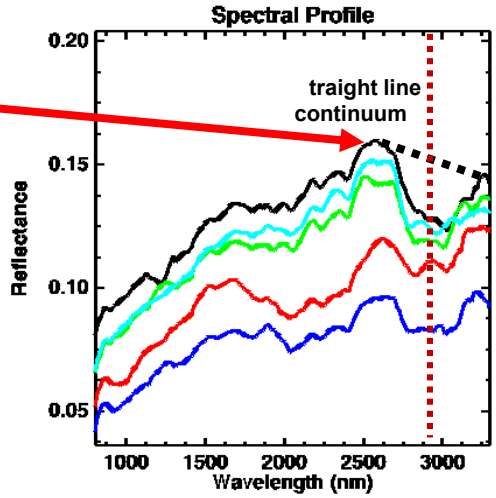
FCC mosaic Crater Thales-F
R: 1.08 micron IIRS band
G: 1.67 micron IIRS band
B: 2.27 micron IIRS band

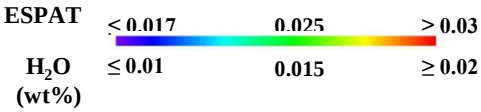


IIRS Reflectance spectra of Pyroxenes associated with 3000-nm hydration feature in crater Thales-F. The dashed lines are the guides for mineral and hydration related absorption features.



The e ective single-particle absorption thickness P T -based water content map o the northern inner lank o crater Thales-

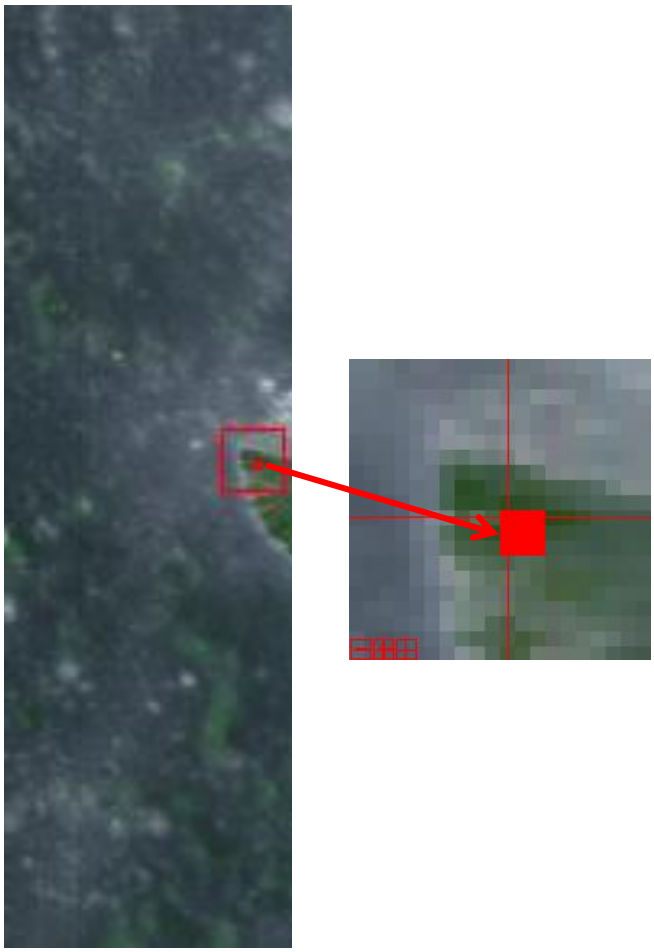




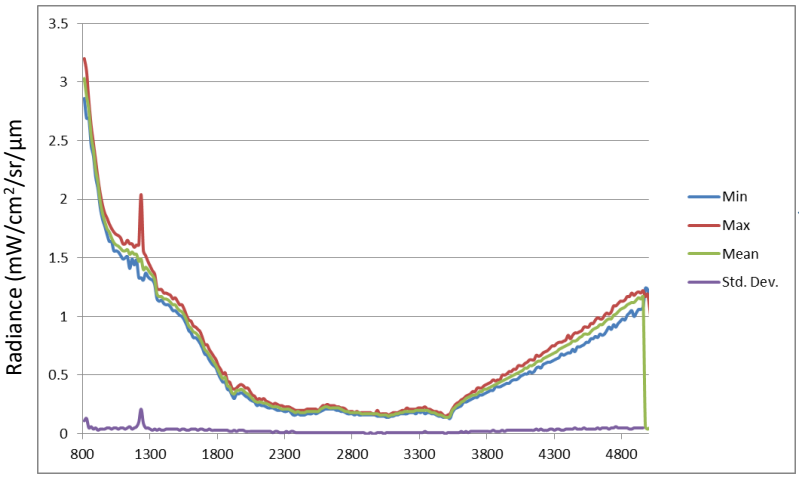
Ch-2 IIRS vs. Ch-1 M³ comparison



C. Coarse-resampled Ch-2 IIRS scene w.r.t. Ch-1 M³ resolution of ~280 m

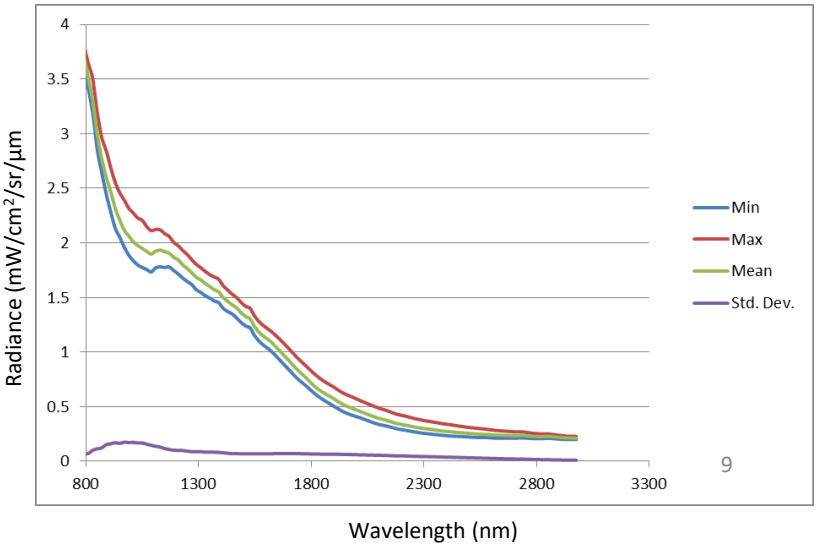


D. Ch-1 M³ scene from 200-km orbit at ~280 m spatial resolution

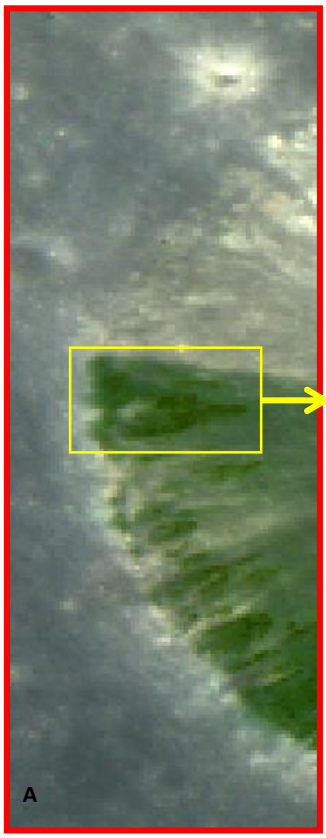


Ch-2 IIRS spectral radiance profile (3×3 pixels) of a fresh exposure along the inner flank of a small, young crater

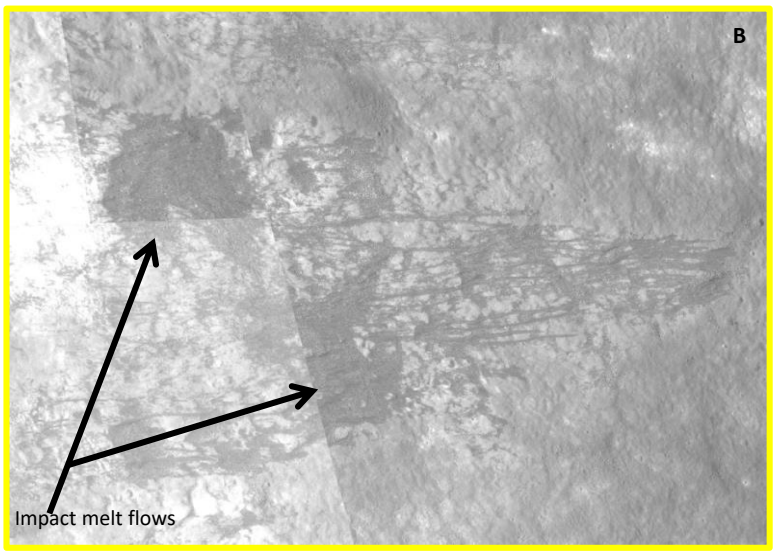
Ch-1 M³ spectral radiance profile (3×3 pixels) of the same fresh exposure as that measured by Ch-2 IIRS along the inner flank of a small, young crater



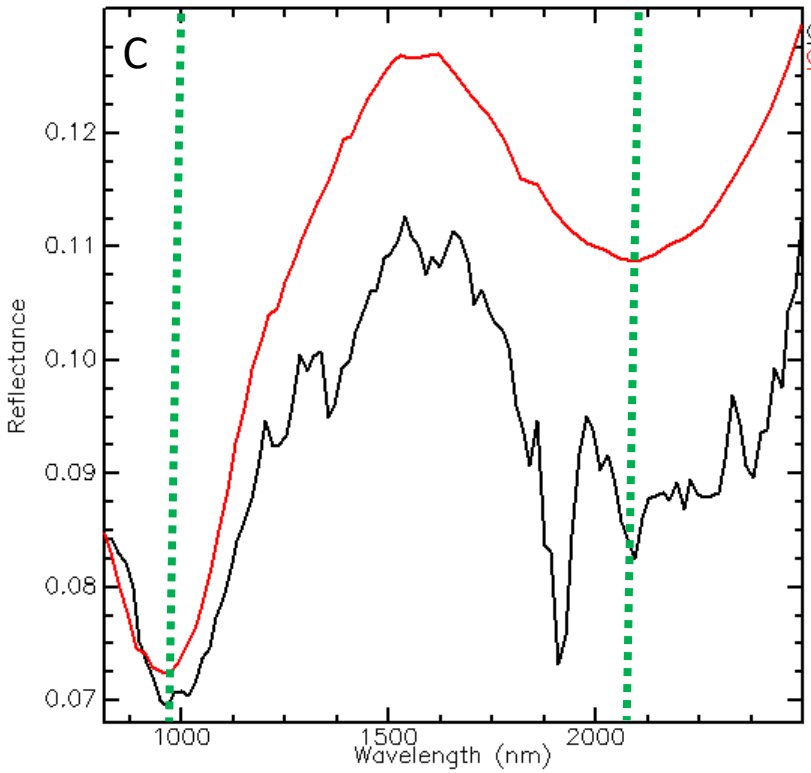
Mineralogical characterization of the clast-enriched impact melt flows of crater Gardner By Chandrayaan-2 Imaging InfraRed Spectrometer (IIRS)



A. Ch-2 IIRS image covering parts of crater Gardner



B. High-resolution (~0.5 m) LROC-NAC image of the Gardner impact melt flow feature corresponding to the yellow rectangular box shown in Figure A.

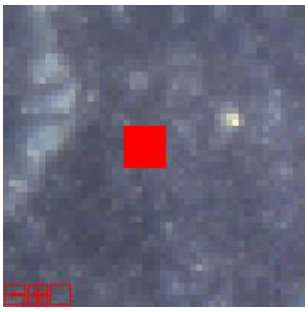


C. Ch-2 IIRS spectral plot of the crater Gardner impact melt flow feature (solid black spectra is from Ch-2 IIRS, whereas red spectra is that of Ch-1 M^3) highlighting the presence of pyroxene-bearing lithologies. The differences in the spectral reflectance of Ch-2 IIRS and Ch-1 M3 is primarily due to their different spatial resolutions and viewing geometry. Blue lines are the guides for mineral absorptions.

Plot showing comparison between the spectral responses of Ch-2 IIRS and Ch-1 M^3 as obtained from a fresh clast-rich exposure along the inner flank of a young impact crater. Green dotted lines are the guides for mineral absorption features

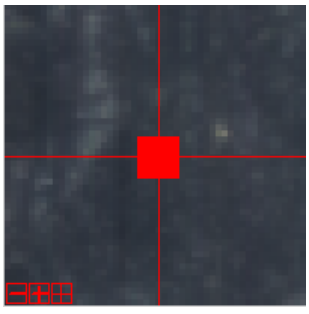
Ch-2 IIRS data over matured highland soil compared with Ch-1 M3 spectra of same highland soil exposure



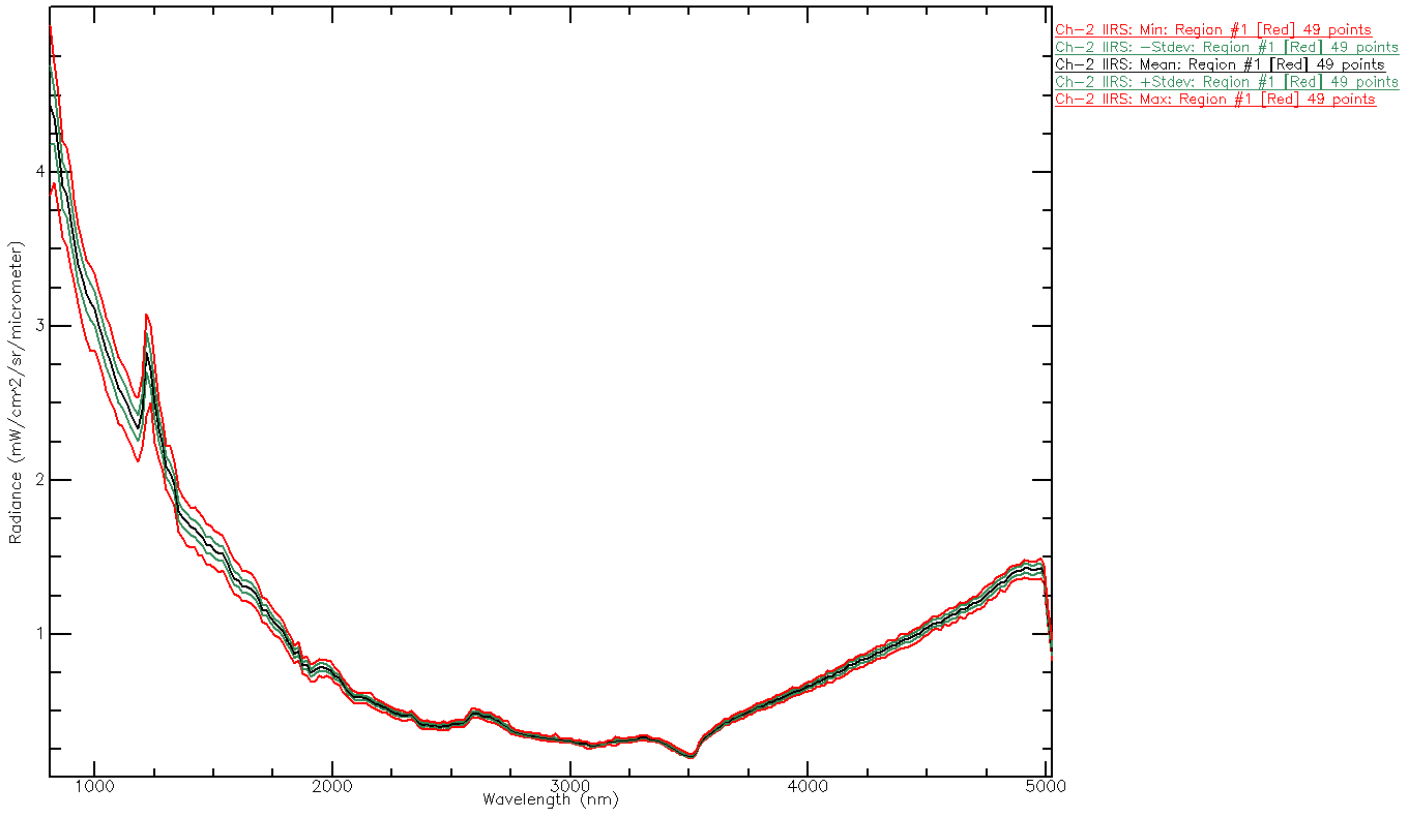


A. Ch-2 IIRS coarse-resampled to Ch-1 M^3 spatial resolution representing matured highland region as indicated by the red solid rectangular box (region of interest).

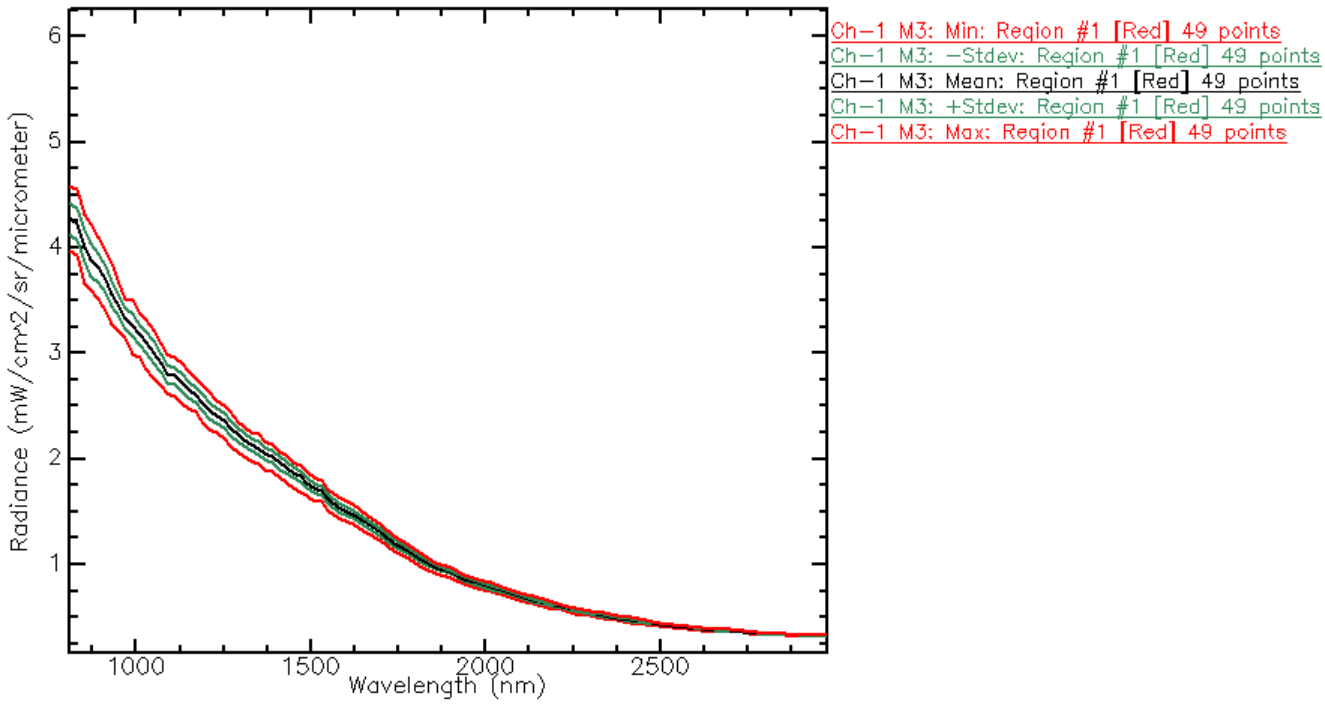




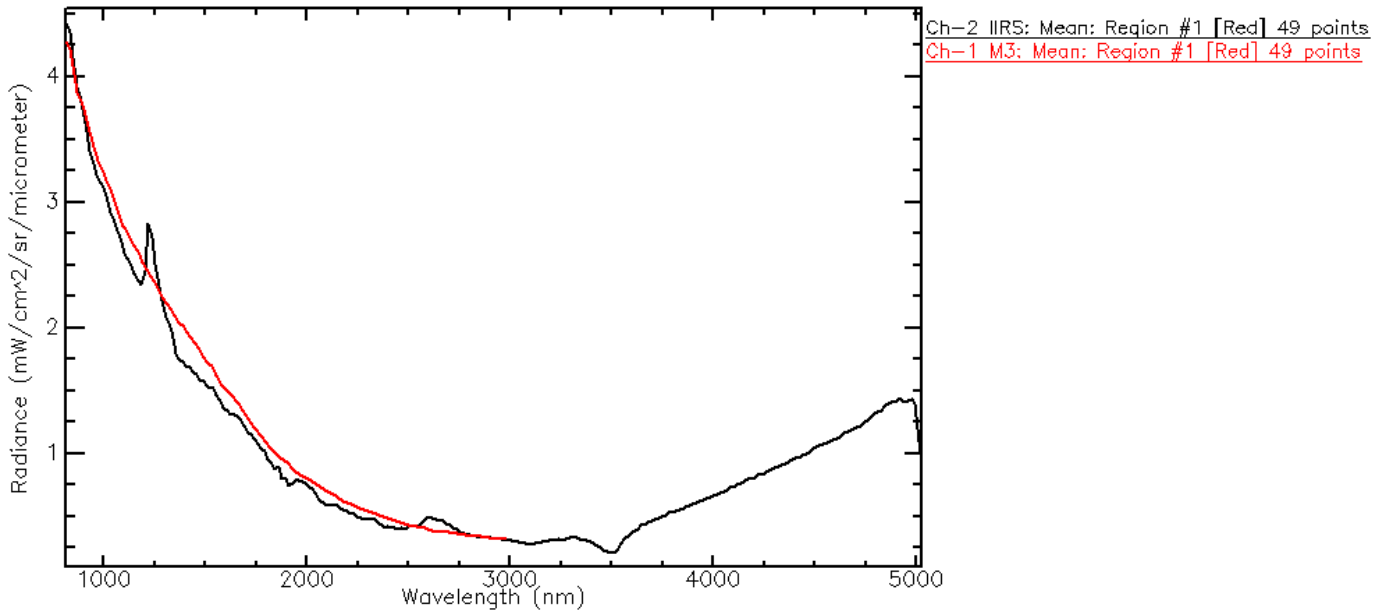
B. Ch-1 M^3 highlighting matured highland region. Red solid rectangular box represents the region of interest.



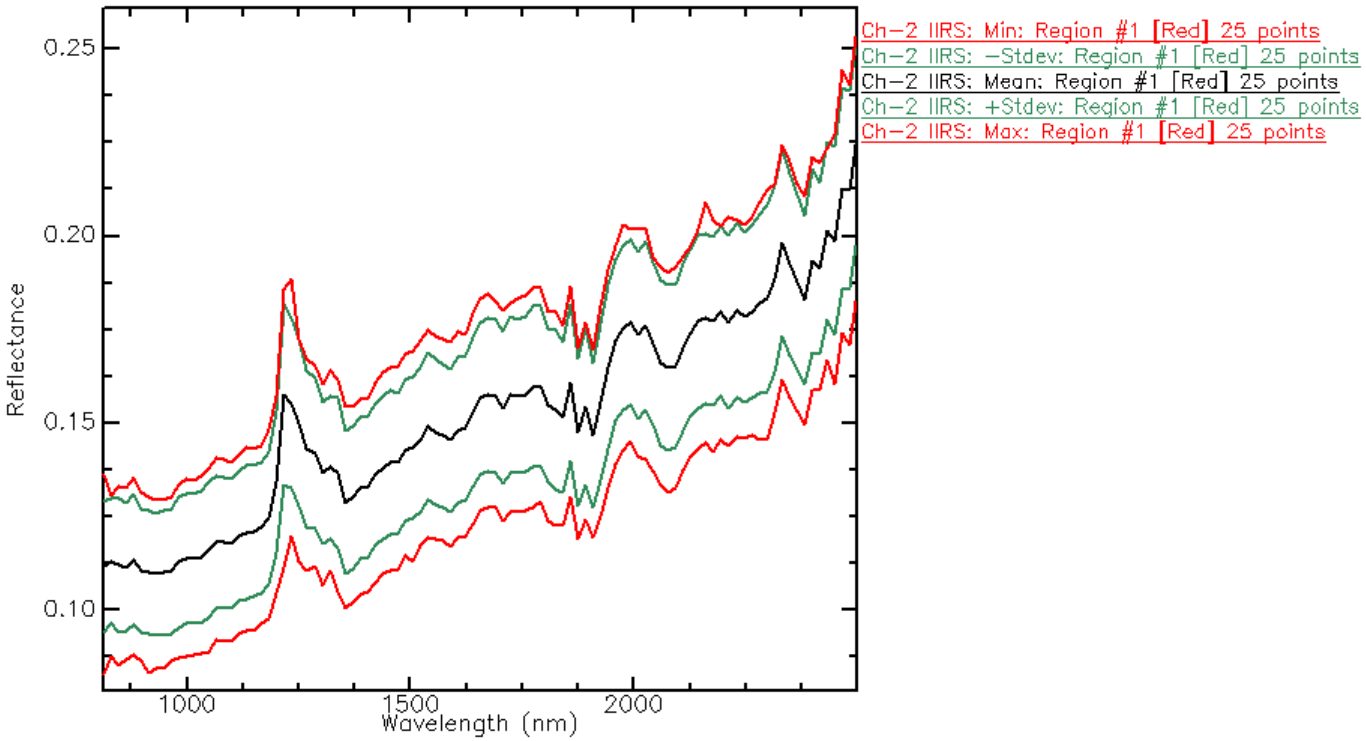
Min, Max, Mean and Std. Dev. Plots of spectral radiance of a matured highland region (7×pixels) as measured by Ch-2 IIRS



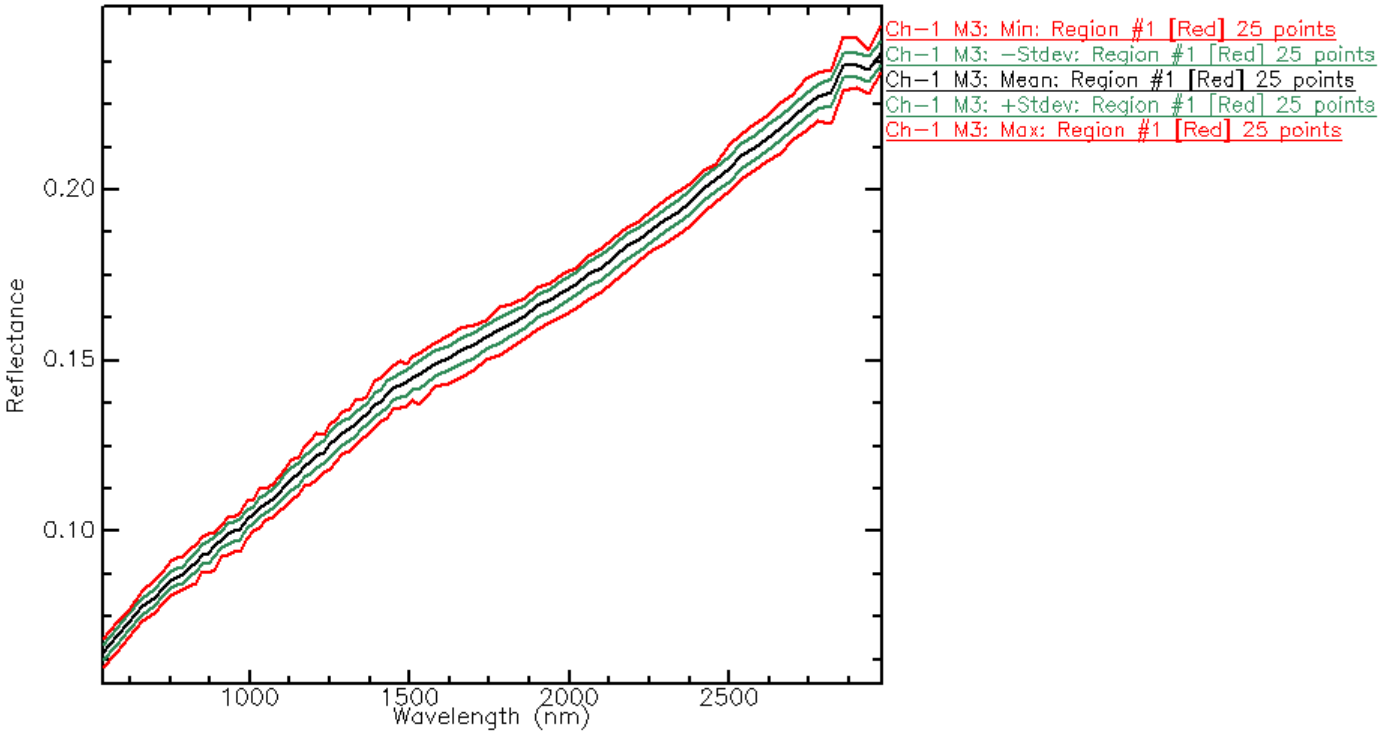
Min, Max, Mean and Std. Dev. Plots of spectral radiance of a matured highland region (7×pixels) as measured by Ch-1 M3



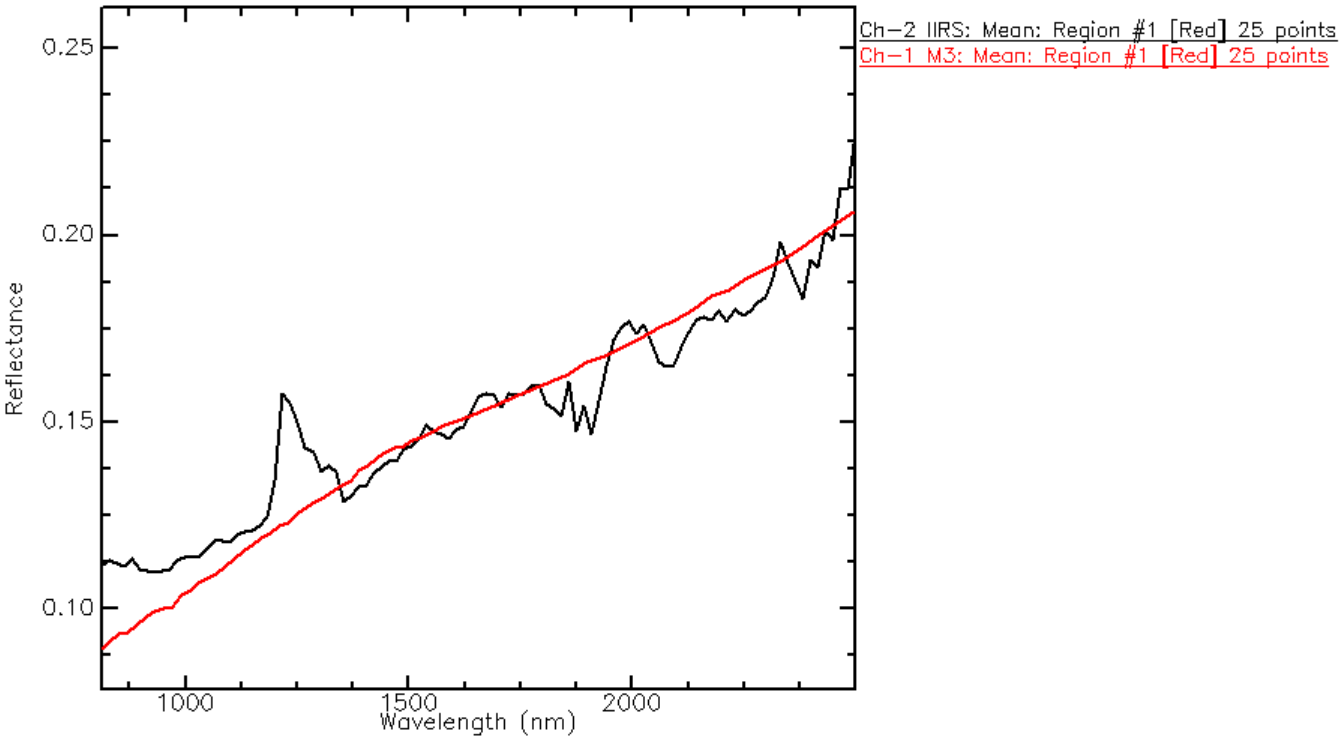
Mean spectral radiance comparison between Ch-2 IIRS (Black solid line) and Ch-1 M^3 (Red solid line) for matured highland soil



Min, Max, Mean and Std. Dev. Plots of spectral reflectance of a matured highland region (5×5 pixels) as measured by Ch-2 IIRS



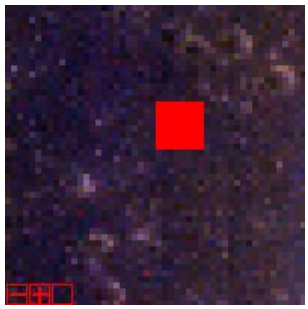
Min, Max, Mean and Std. Dev. Plots of spectral reflectance of a matured highland region (5×5 pixels) as measured by Ch-1 M3



Mean spectral reflectance comparison of a matured highland region (5×5 pixels) as measured by both Ch-2 IIRS and Ch-1 M3

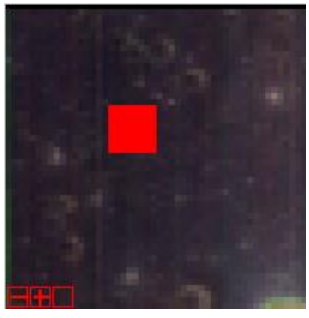


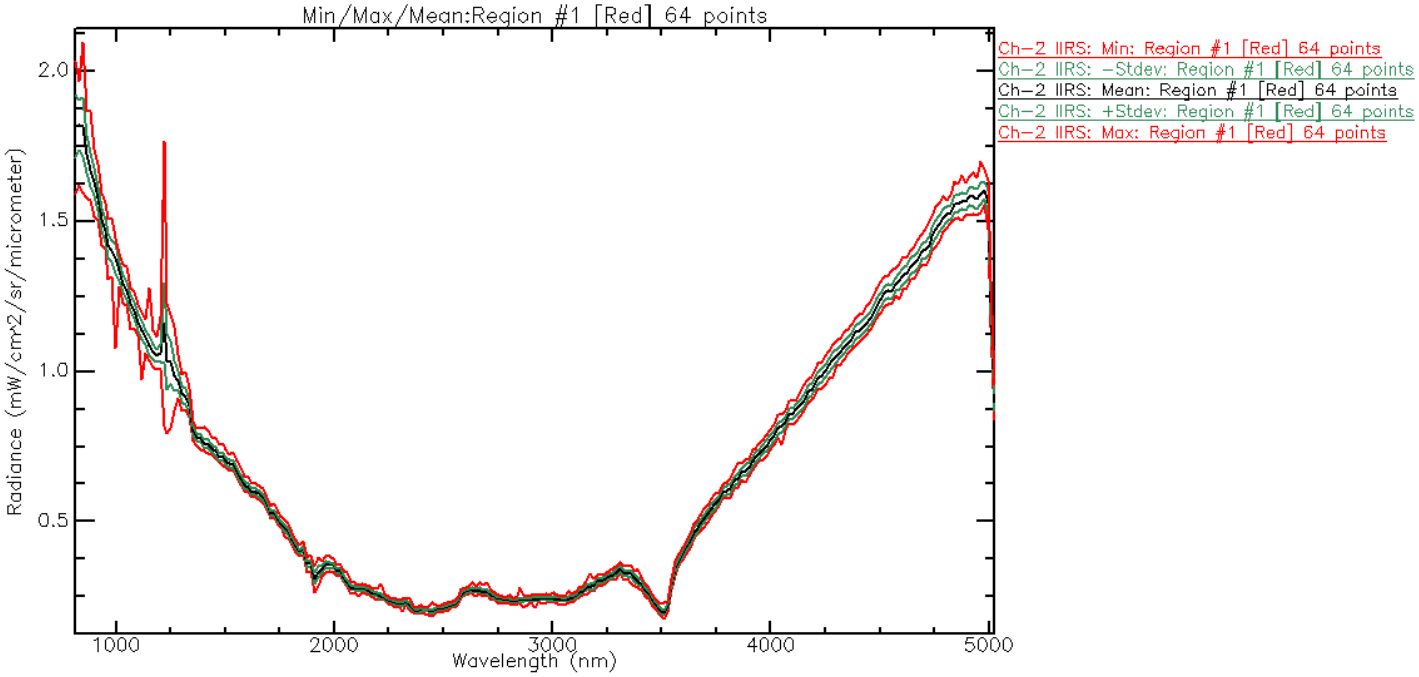
A. Ch-2 IIRS coarse-resampled to Ch-1 M^3 spatial resolution representing a matured mare region as indicated by the red solid rectangular box (region of interest).



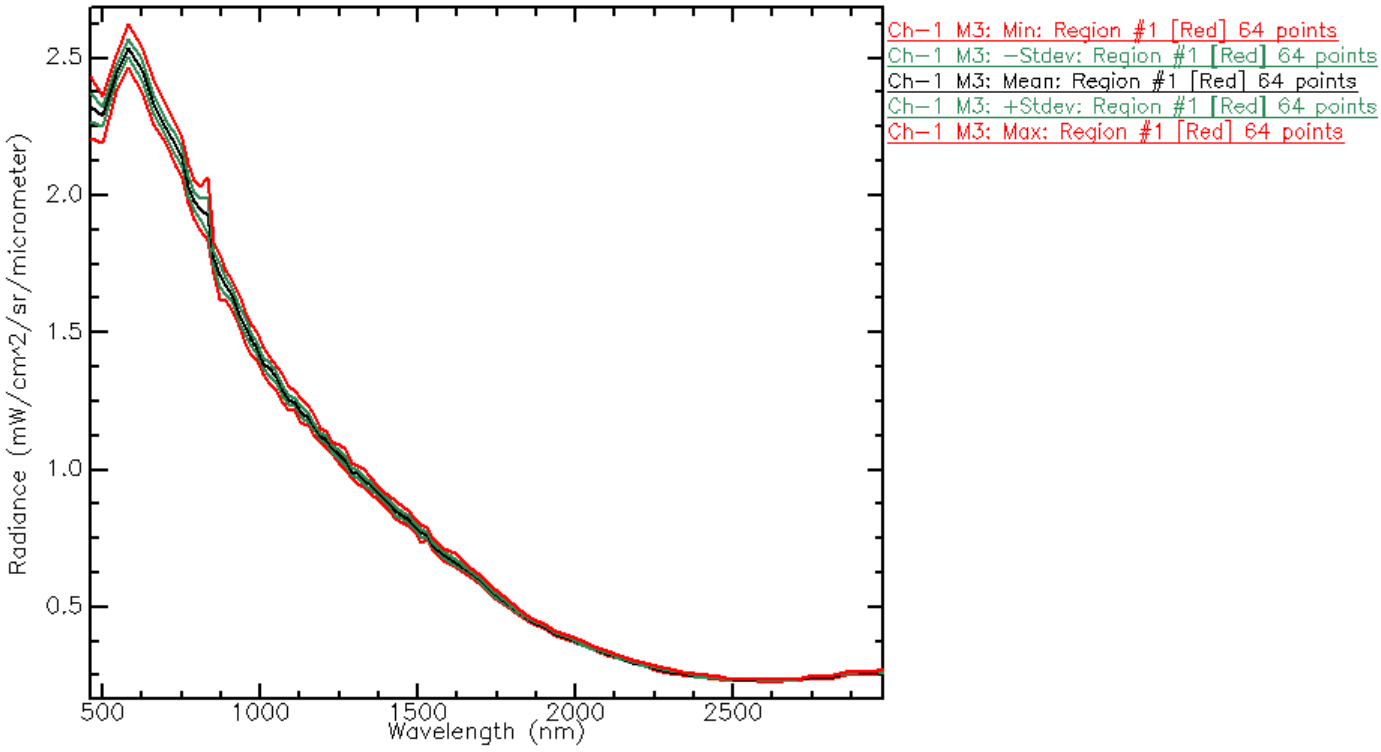


B. Ch-1 M^3 highlighting matured highland region. Red solid rectangular box represents the region of interest.

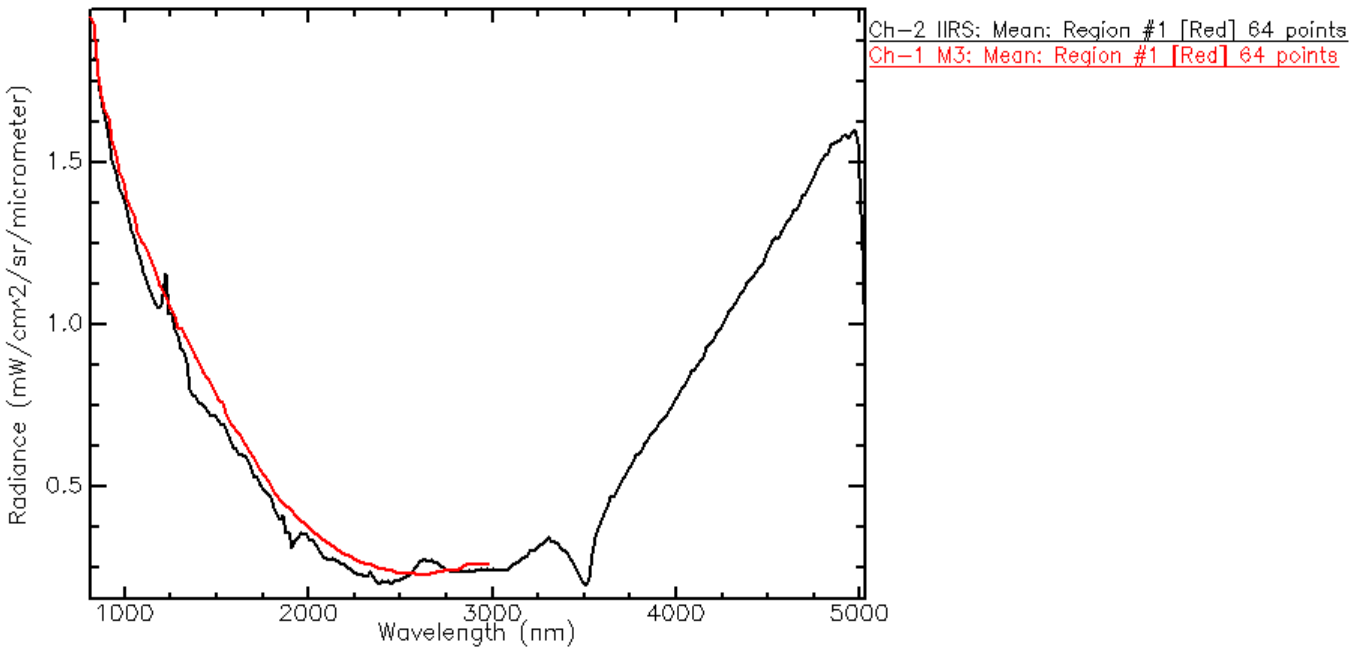




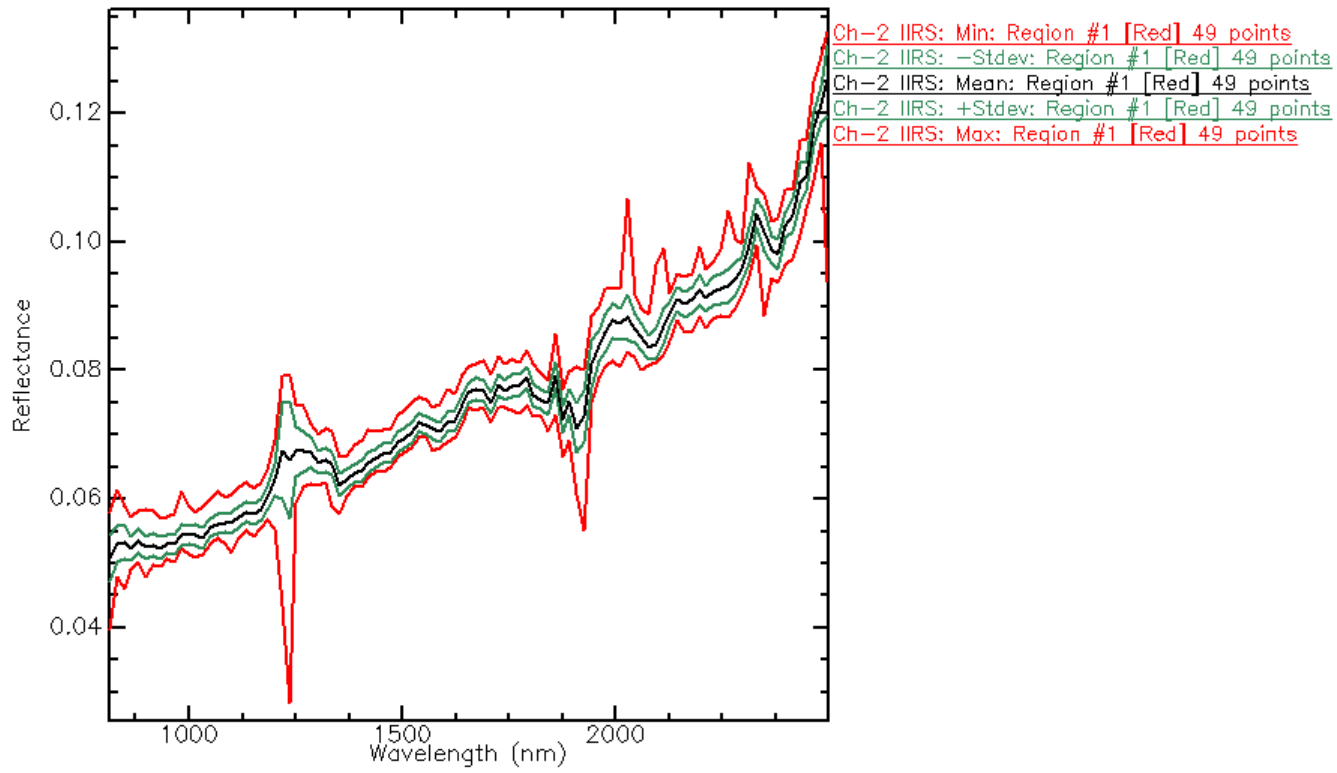
Min, Max, Mean and Std. Dev. Plots of spectral radiance of a matured mare region (8×8 pixels) as measured by Ch-2 IIRS



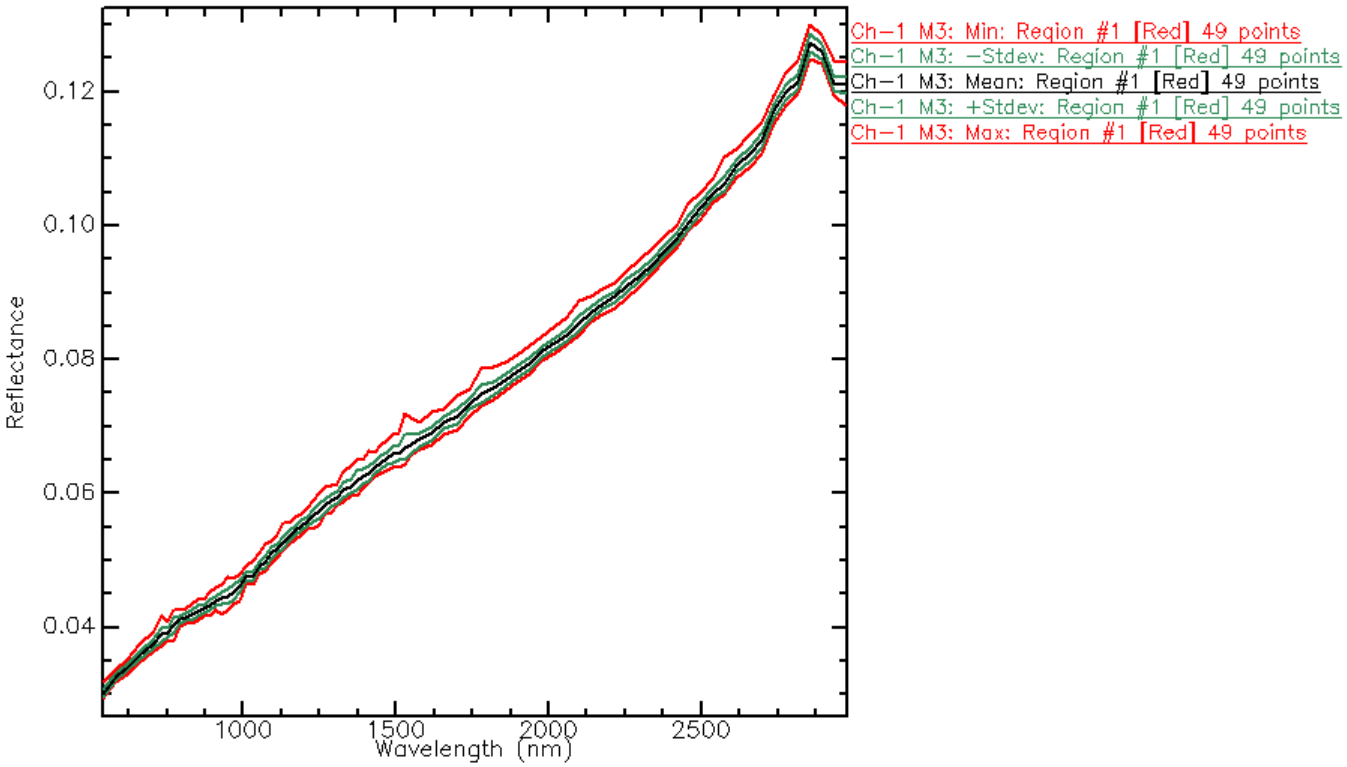
Min, Max, Mean and Std. Dev. Plots of spectral radiance of a matured mare region (8×8 pixels) as measured by Ch-1 M3



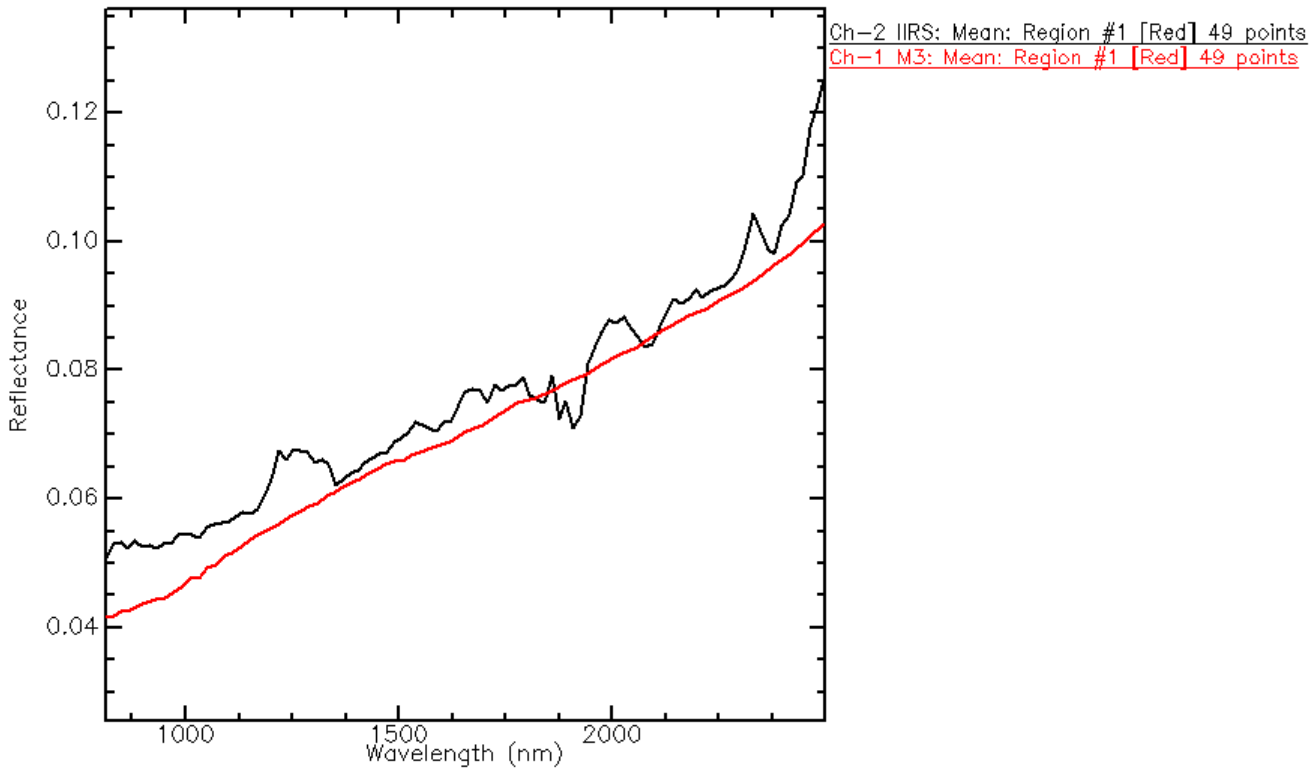
Mean spectral radiance comparison between Ch-2 IIRS (Black solid line) and Ch-1 M³ (Red solid line) of matured mare soil



Min, Max, Mean and Std. Dev. Plots of spectral reflectance of a matured mare region (7×7 pixels) as measured by Ch-2 IIRS



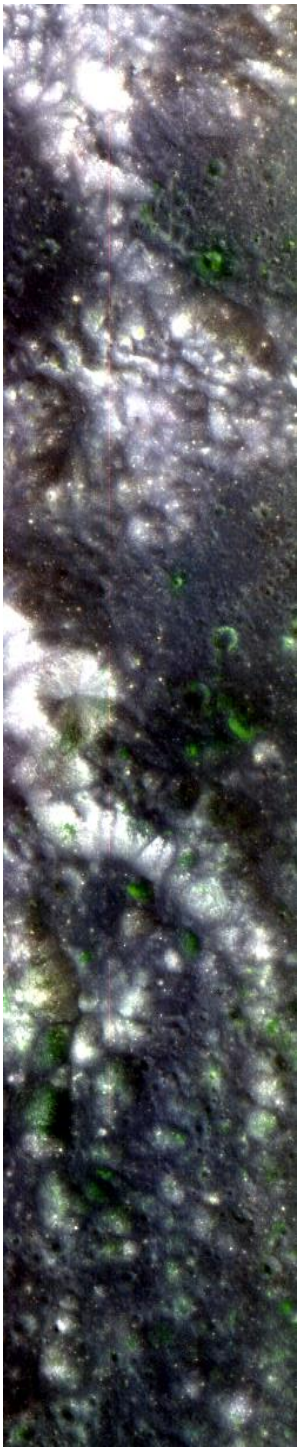
Min, Max, Mean and Std. Dev. Plots of spectral reflectance of a matured mare region (7×7 pixels) as measured by Ch-1 M3



Mean spectral reflectance comparison of a matured mare region (7×7 pixels) as measured by both Ch-2 IIRS and Ch-1 M3

RGB-FCC vs. IBD-Albedo FCC of parts of the highland-mare transition near Mare Tranquilitatis

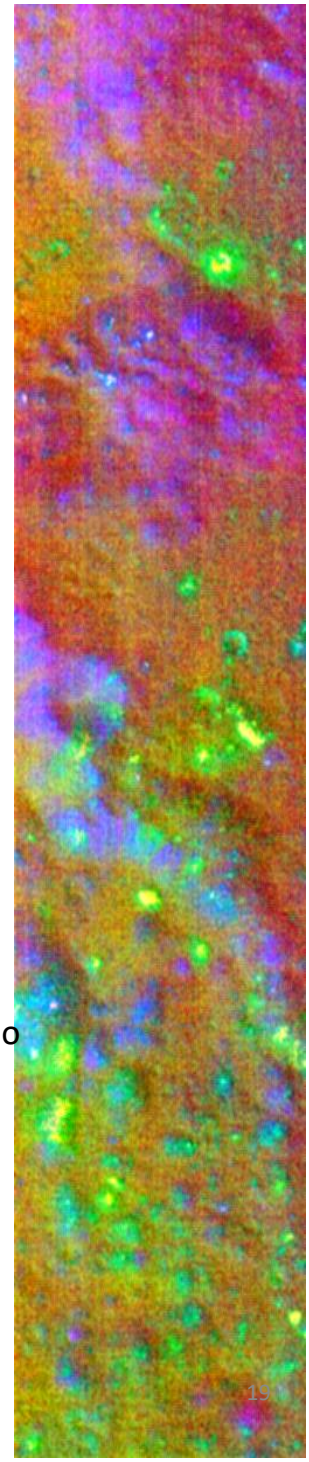
IBD provides a first-order map of mineralogical diversity as Manifested by distinct colors as a function of the inherent compositional heterogeneity of the lunar crust



Integrated Band Depth (IBD)-Albedo based FCC of Mare-Highland transition region near Mare Tranquilitatis

R: 1000-nm reflectance channel
G: 1535-nm lunar albedo channel
B: 2100-nm reflectance channel

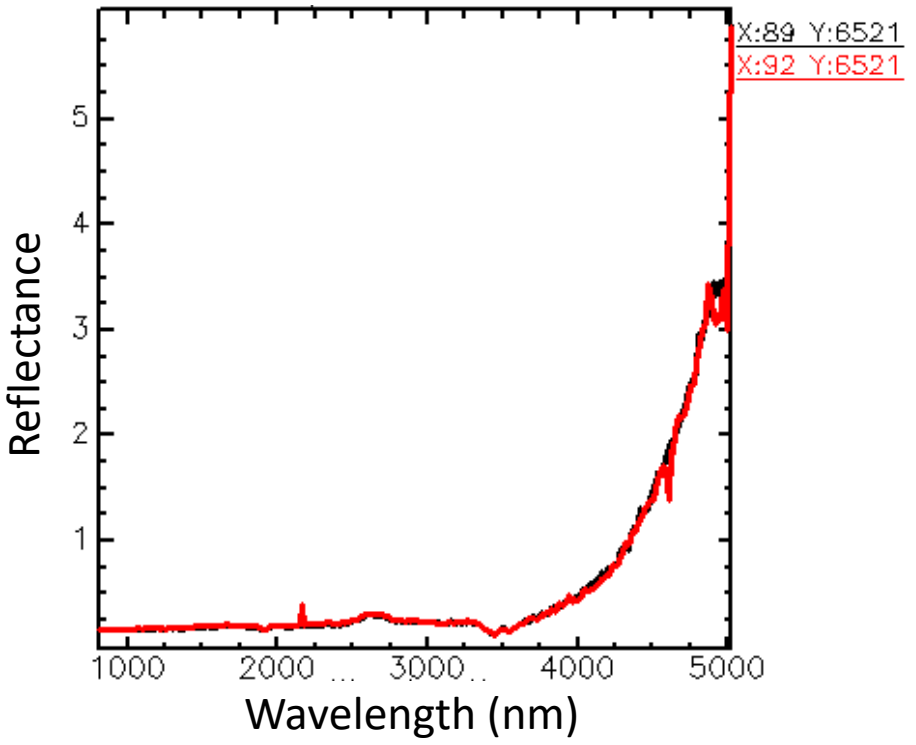
R: 1000-nm IBD
G: 2000-nm IBD
B: 1535-nm lunar albedo

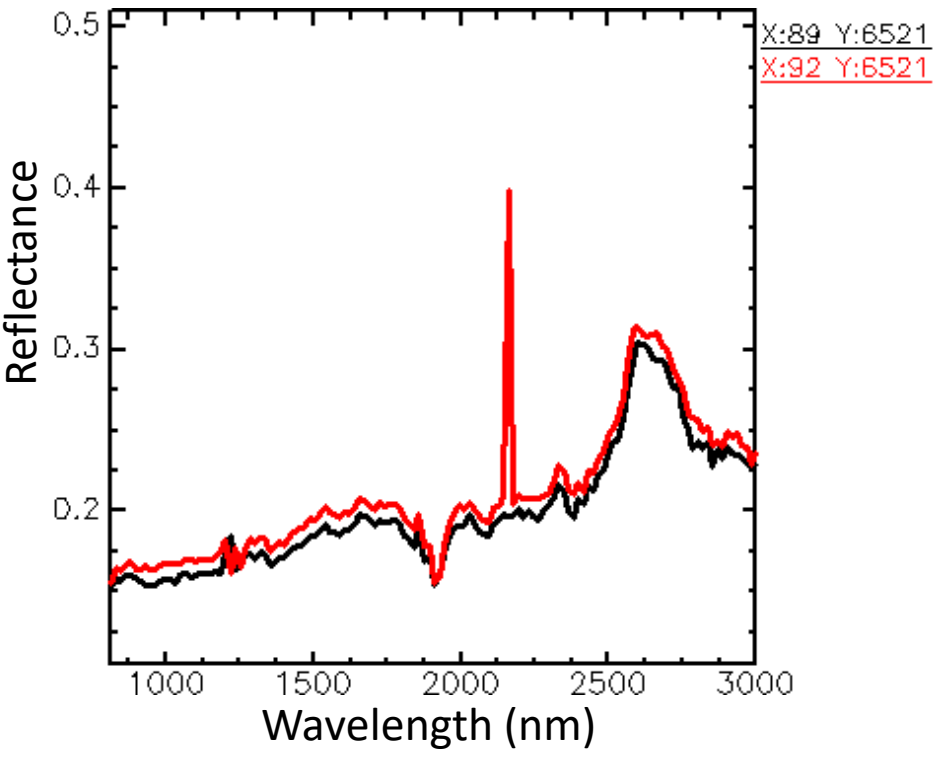




IIRS data acquired in E1G2 mode on 2nd December 2019 covering western part of Moscoviense basin

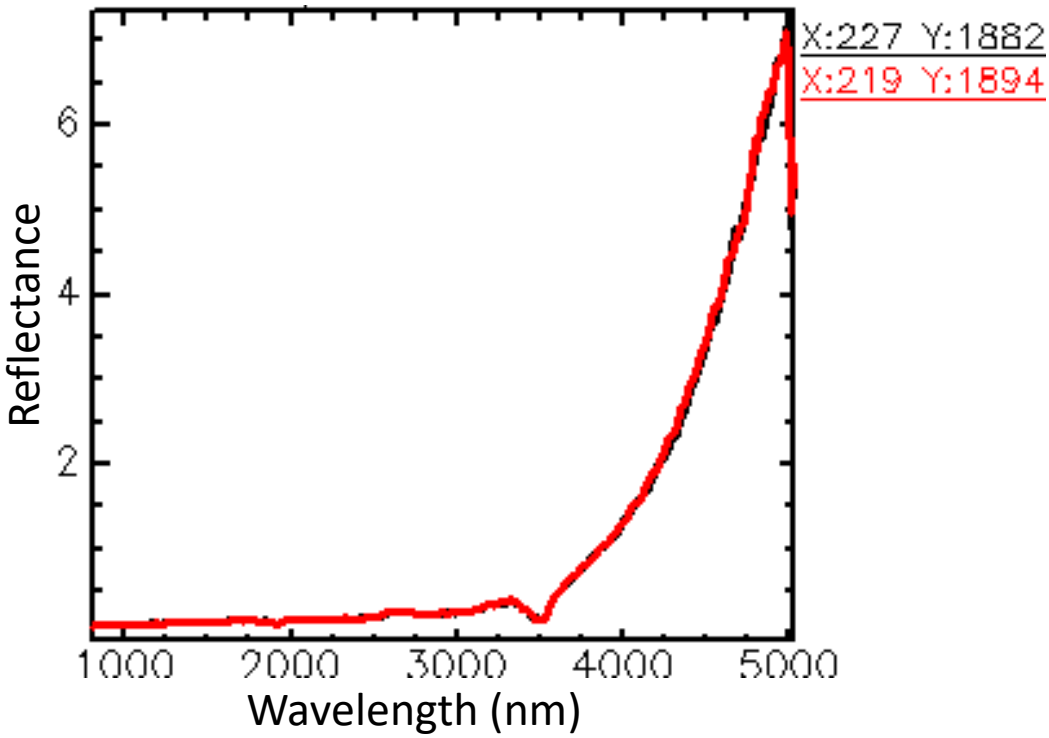
1588-nm albedo channel of IIRS showing Glauber crater and adjoining regions situated SW of Moscoviense basin



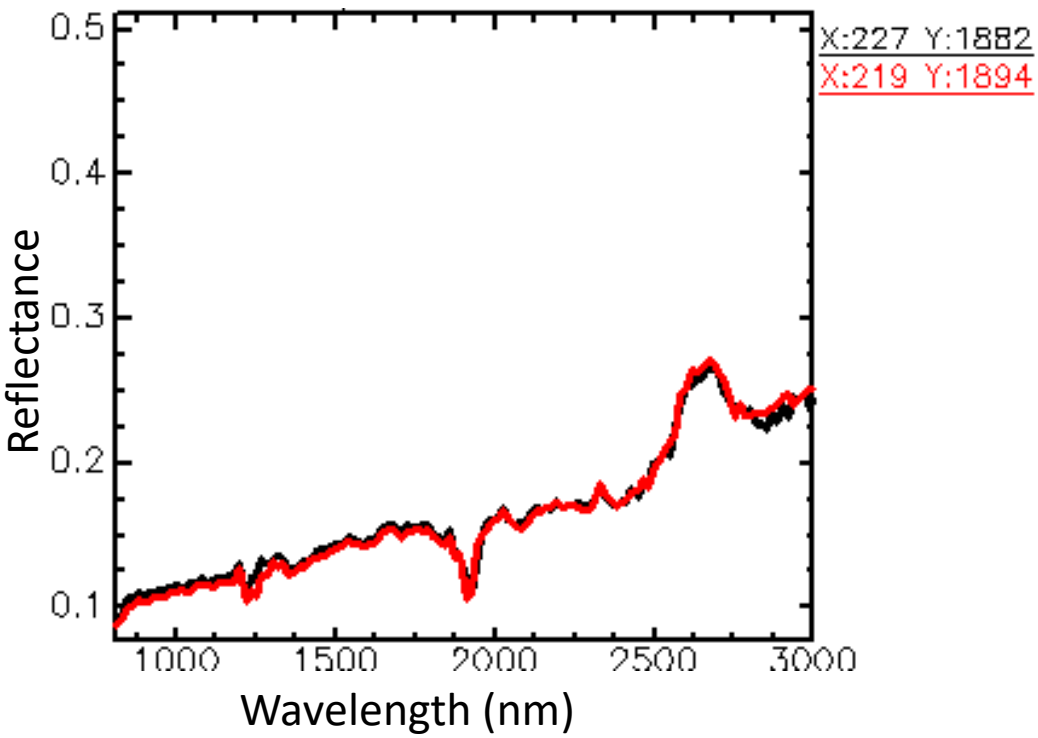




IIRS data acquired in E1G2 mode on 2nd December 2019

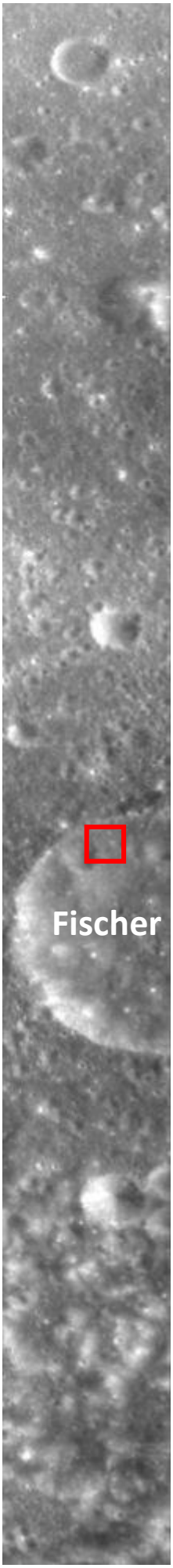


A. IIRS complete spectra from ~800-5000 nm. Thermal Emission dominates the lunar spectra beyond ~3000 nm

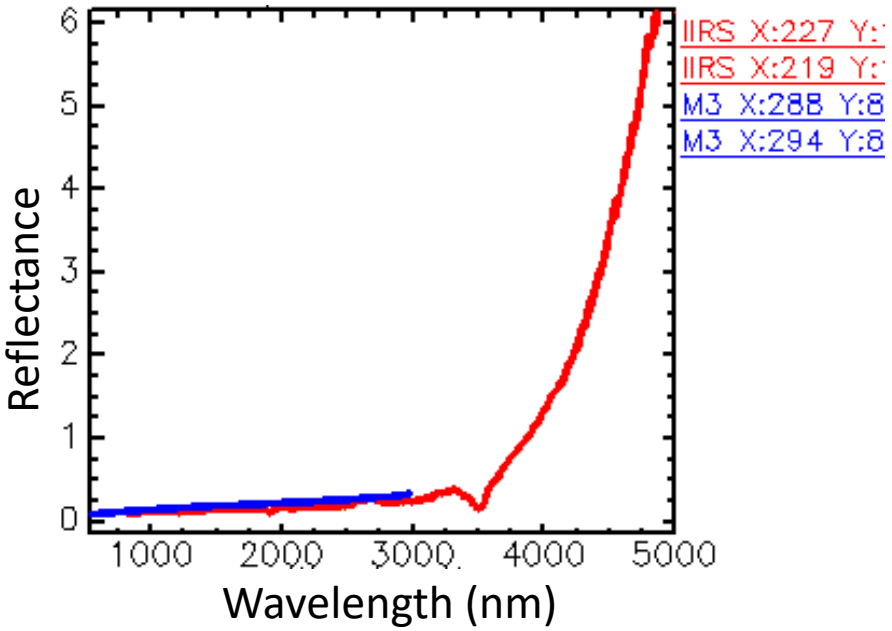


B. IIRS spectra highlighting the spectral region of ~800-3300 nm

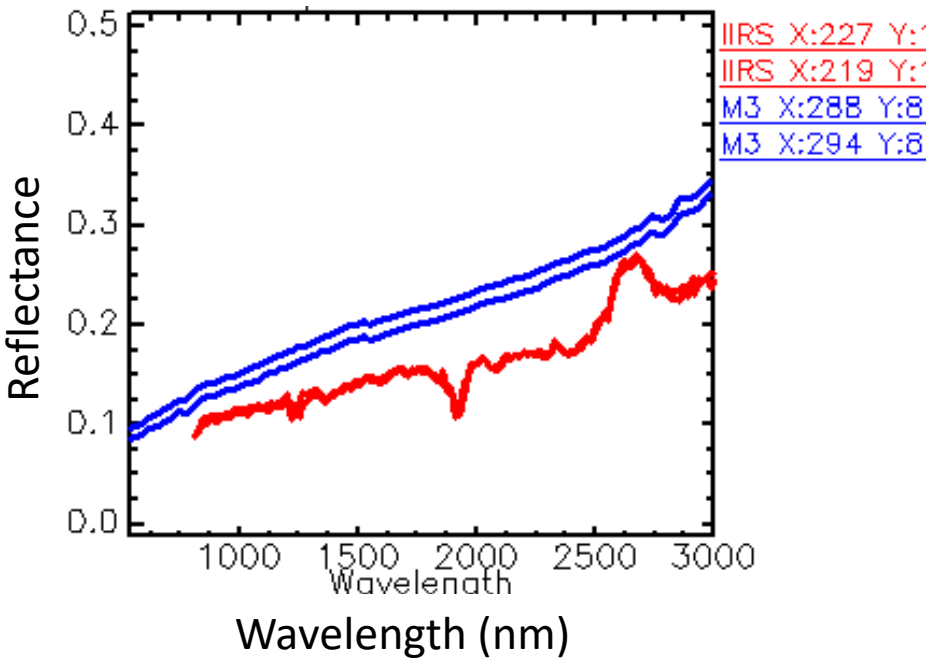
1588-nm albedo channel of IIRS



IIRS data acquired in E1G2 mode on 2nd December 2019 on the far side of the Moon south of Moscoviense basin

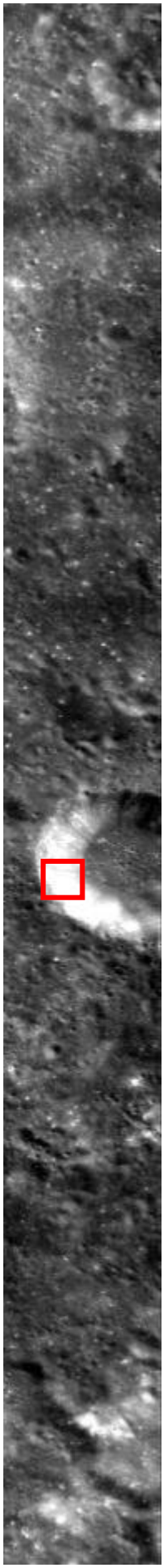


A. IIRS complete spectra (red) from ~800-5000 nm. Thermal Emission dominates the lunar spectra beyond ~3000 nm. IIRS (red) Spectra is compared with the Ch-1 M3 spectra (blue)

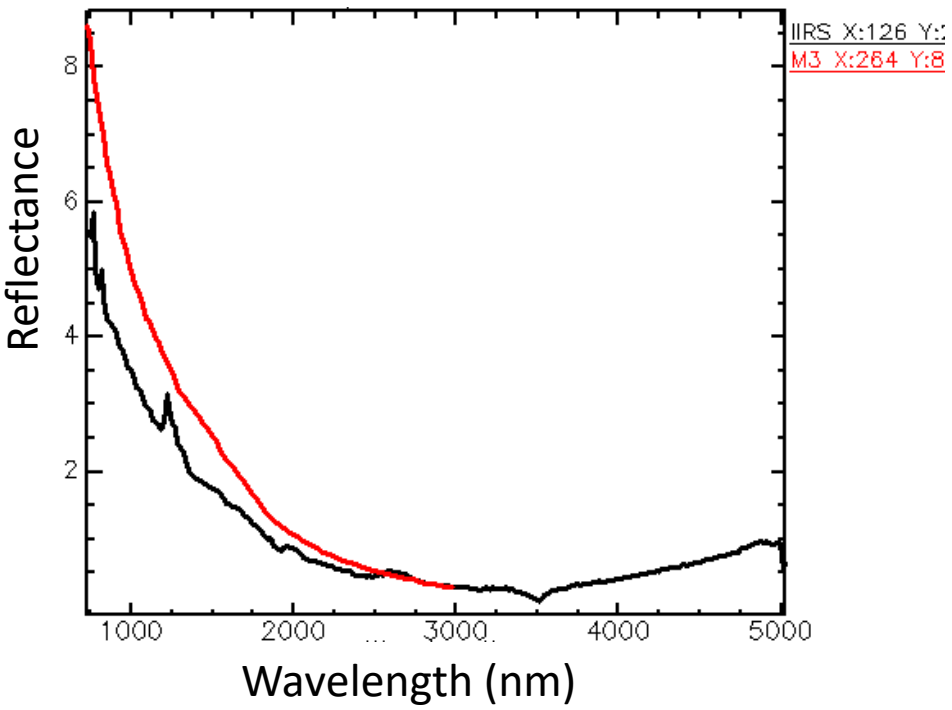


B. IIRS spectra (red) compared with that of Ch-1 M3 spectra (blue) In the spectral range up to 3000 nm for the same location within Crater Fischer south of Glauber crater

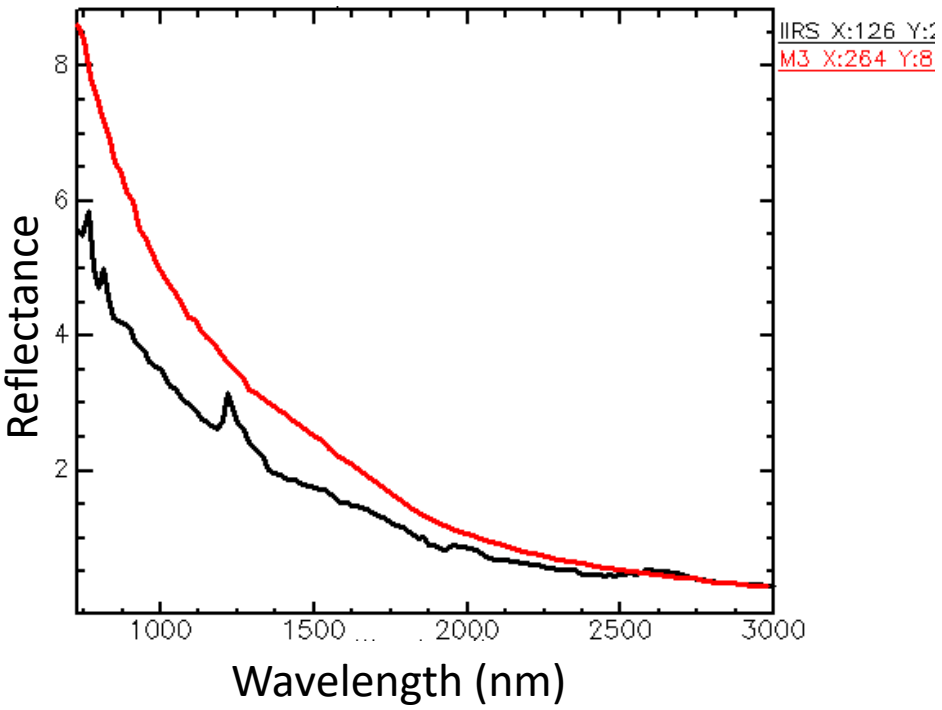
1588-nm albedo channel of IIRS



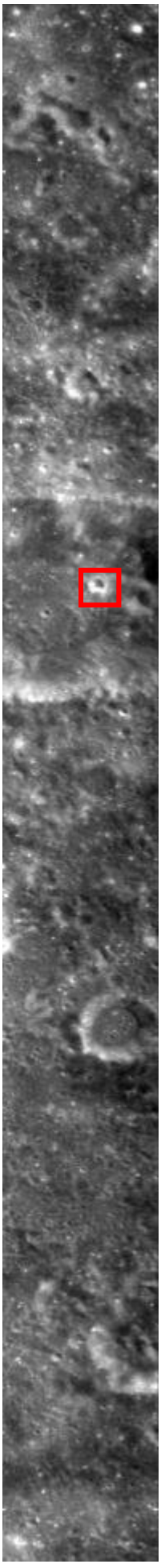
IIRS data acquired in E1G2 mode
on 7th December 2019



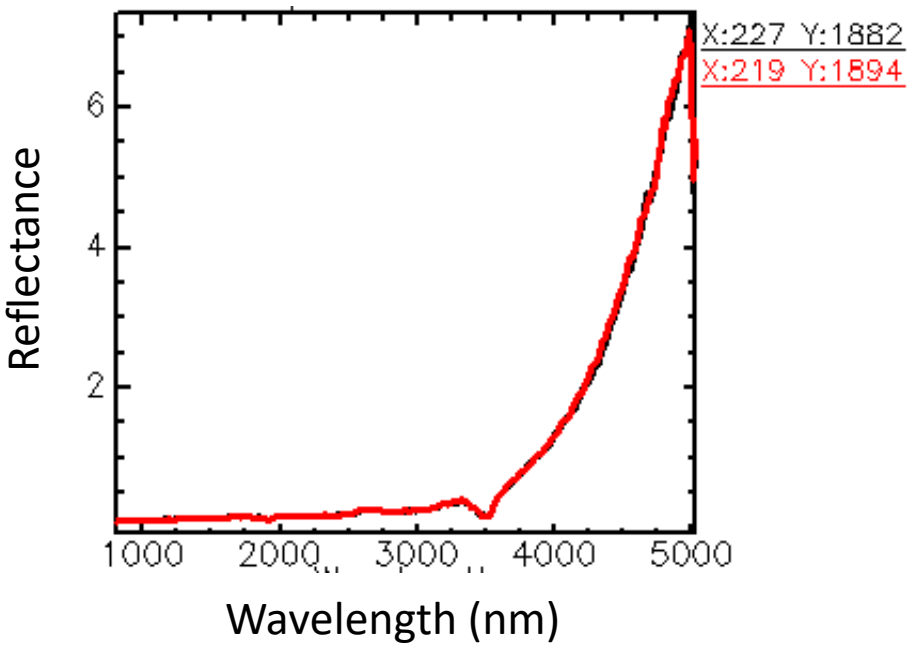
Spectral comparisons of Ch-2 IIRS with Ch-1 M^3 for the same locations on the lunar surface



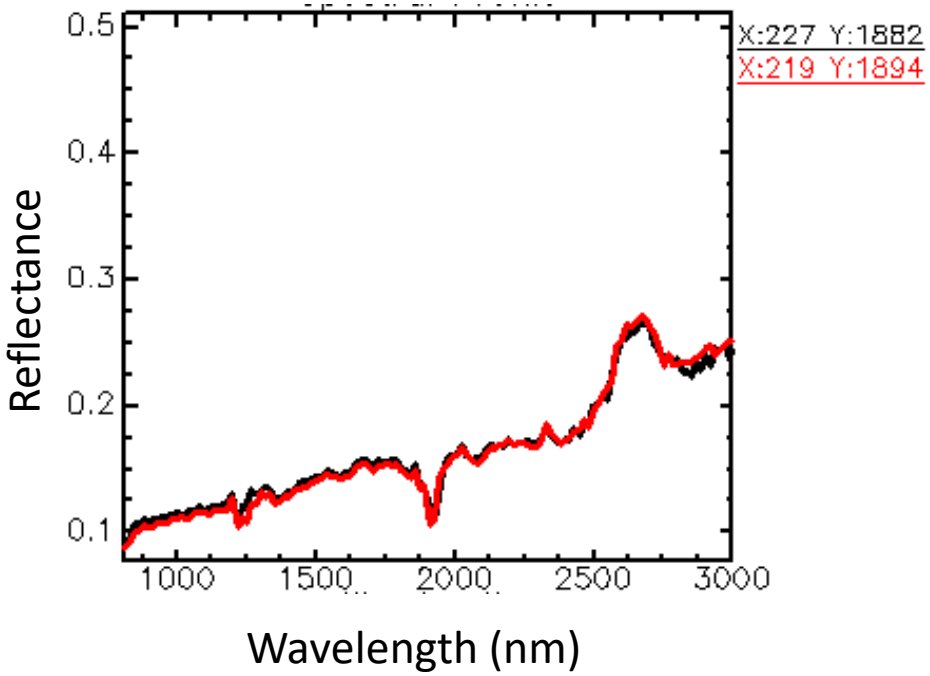
1588-nm albedo channel of IIRS



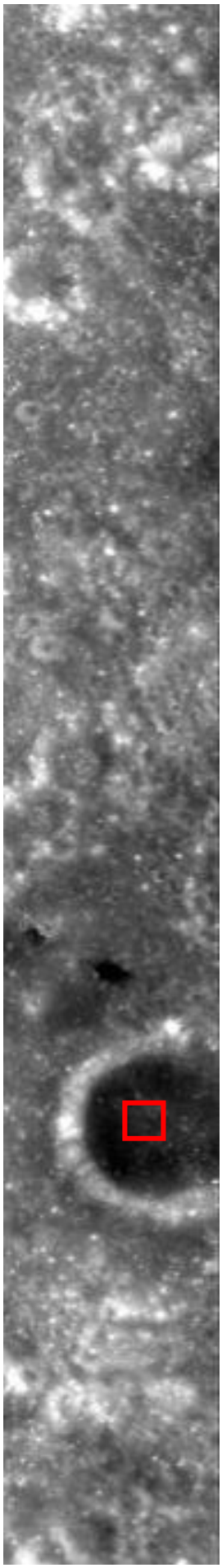
IIRS data acquired in E1G2 mode on 7th December 2019



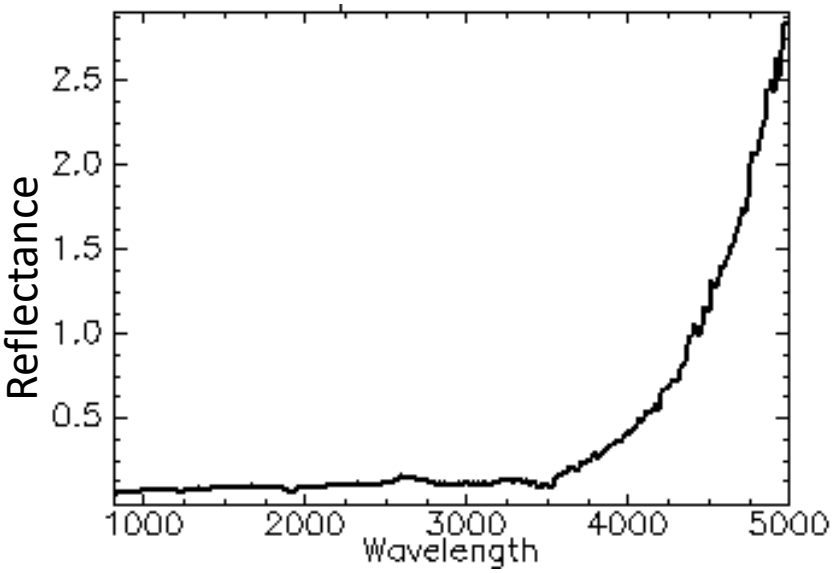
A. IIRS complete spectra from ~800-5000 nm. Thermal Emission dominates the lunar spectra beyond ~3000 nm



B. IIRS spectra highlighting the spectral region of ~800-3300 nm

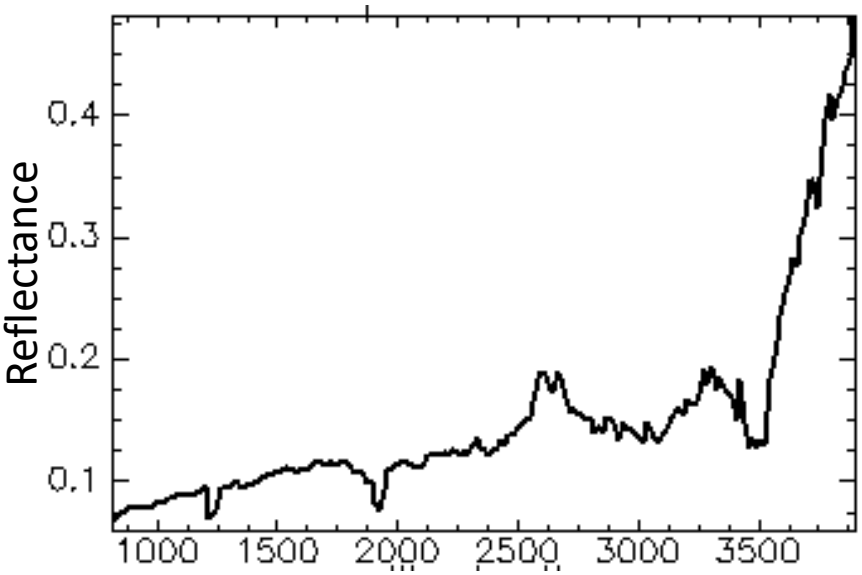


IIRS data acquired in E1G2 mode on 7th December 2019



Wavelength (nm)

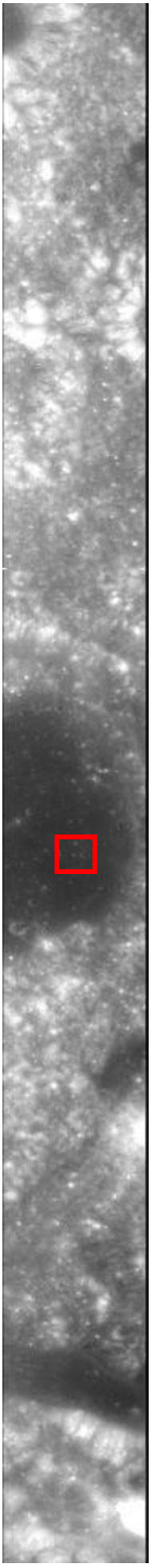
A. IIRS complete spectra from ~800-5000 nm. Thermal Emission dominates the lunar spectra beyond ~3000 nm



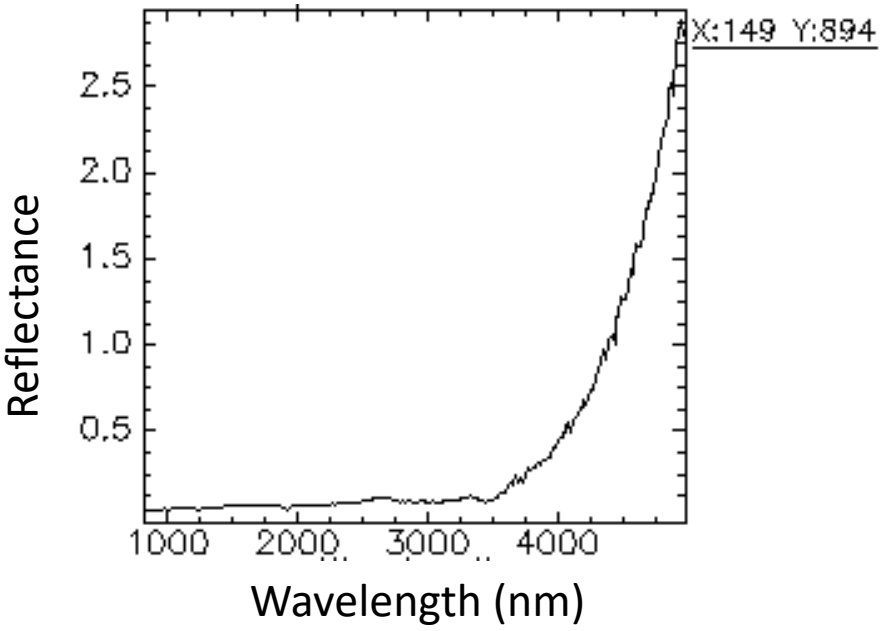
Wavelength (nm)

B. IIRS spectra highlighting the spectral region of ~800-3300 nm

1588-nm albedo channel of IIRS



IIRS data acquired in E1G2 mode on 8th December 2019



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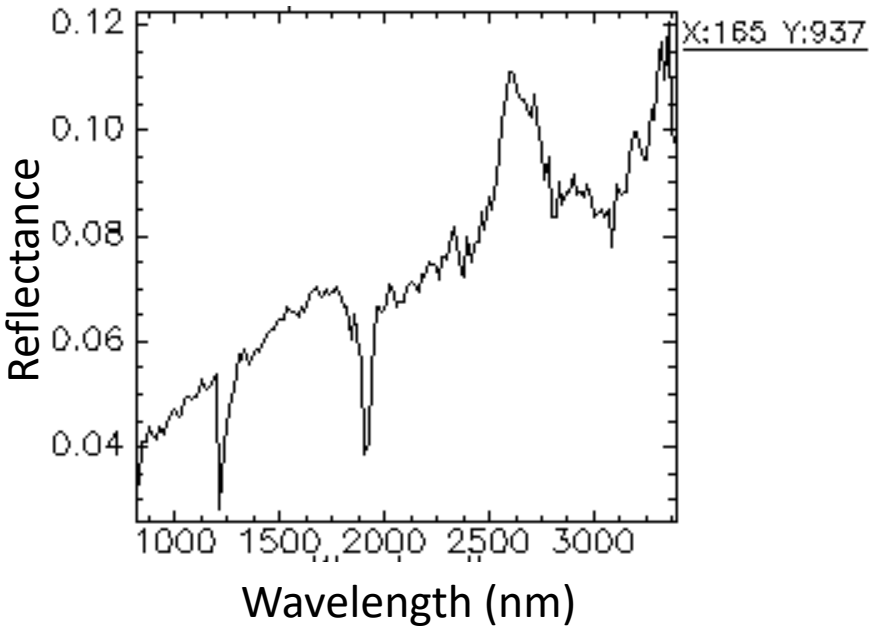
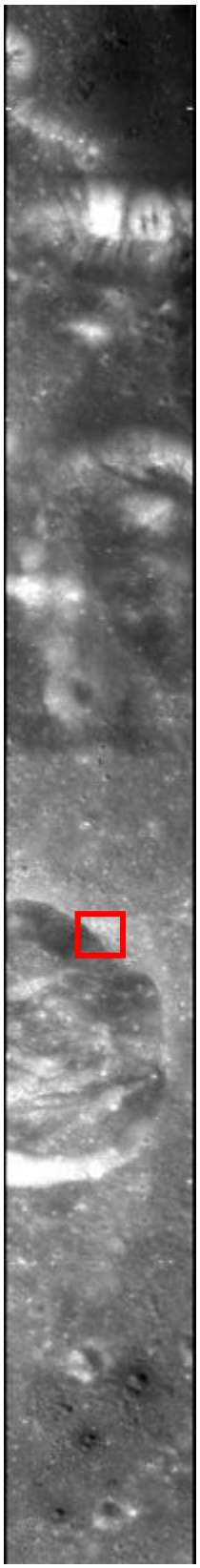
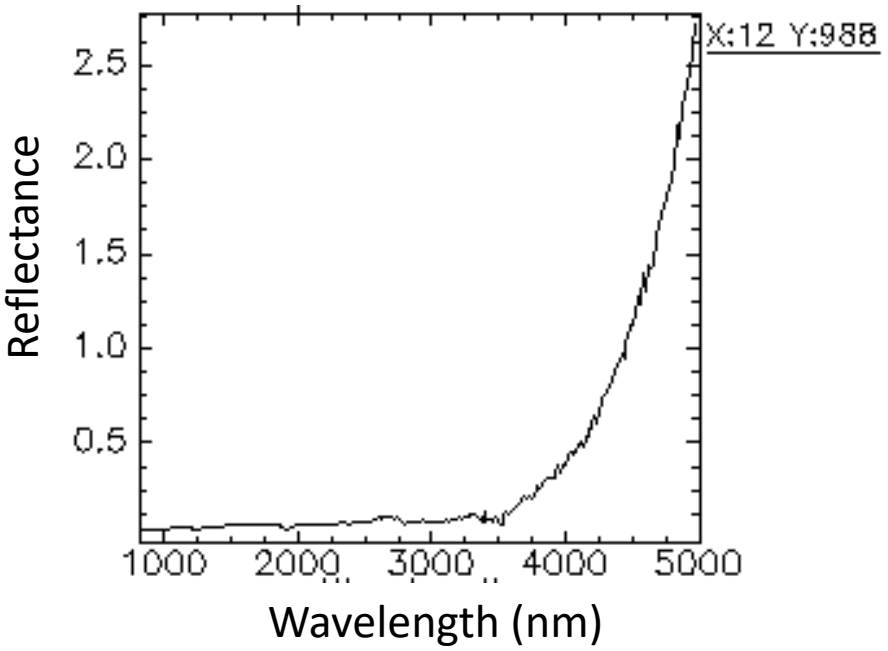


B. IIRS spectra highlighting the spectral region of ~800-3300 nm

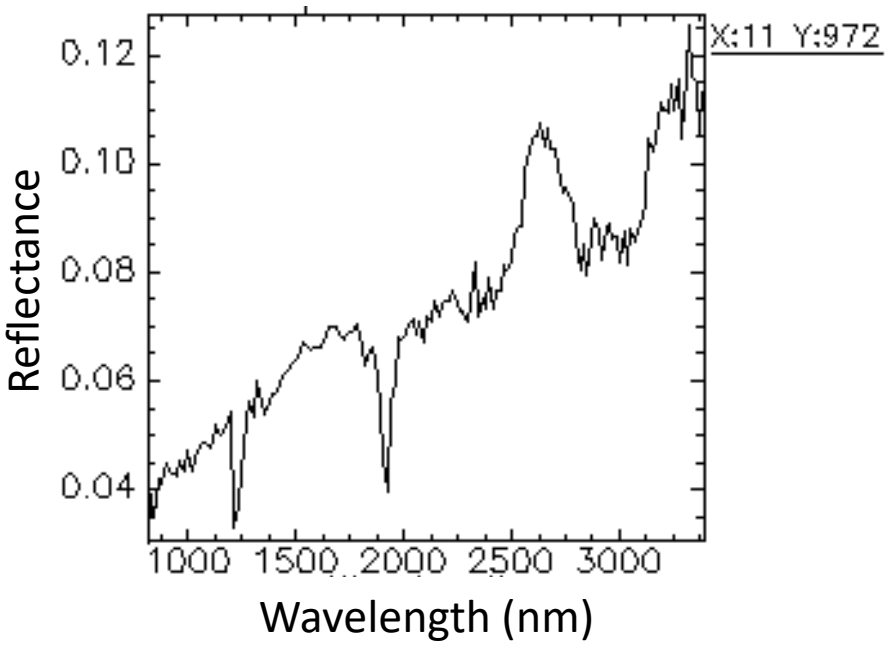
1588-nm albedo channel of IIRS



IIRS data acquired in E1G2 mode on 8th December 2019

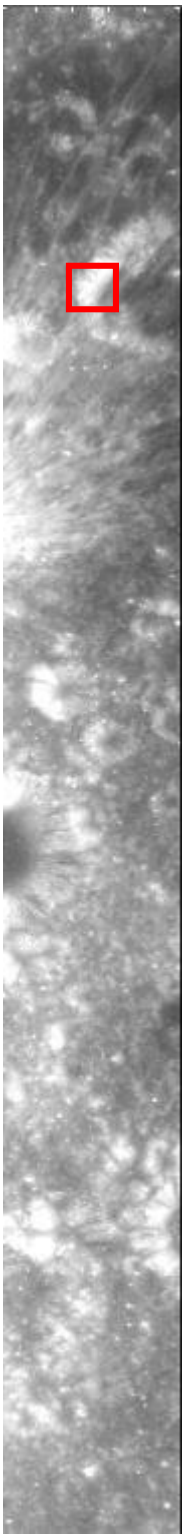


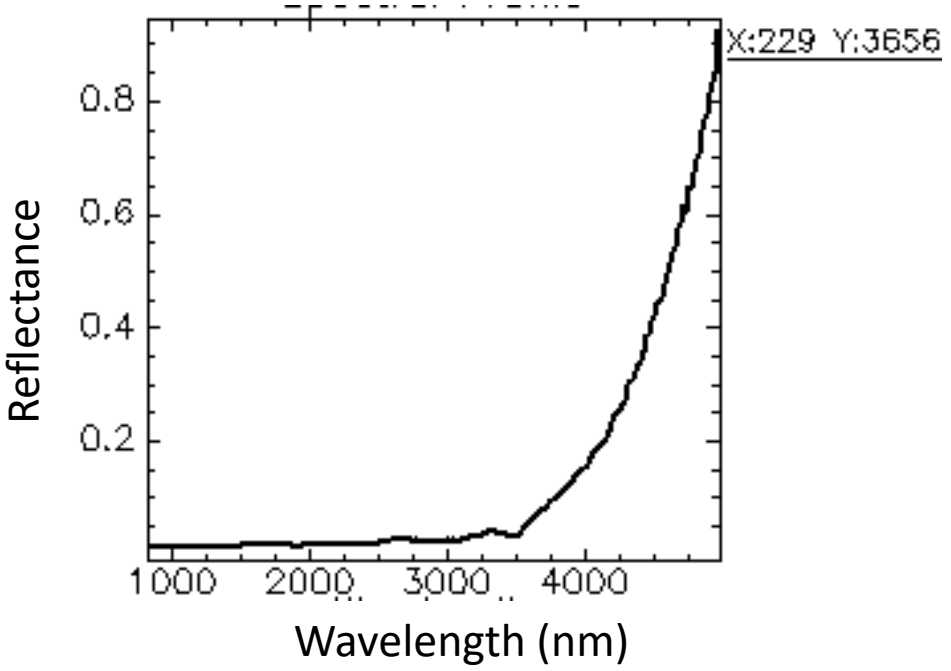
A. IIRS complete spectra from ~800-5000 nm. Thermal Emission dominates the lunar spectra beyond ~3000 nm



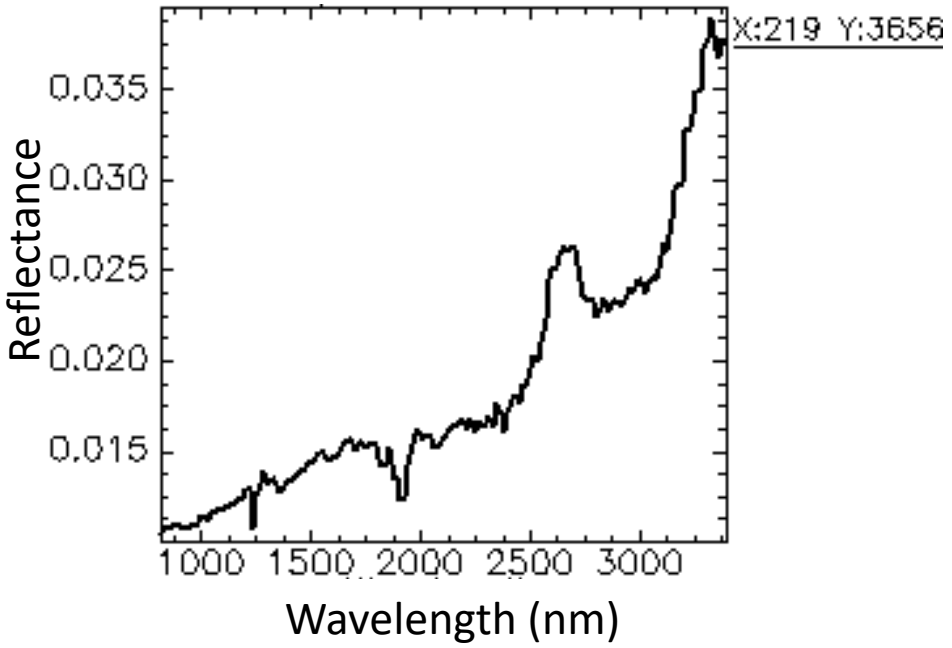
B. IIRS spectra highlighting the spectral region of ~800-3300 nm. An absorption near 2000 nm is seen due to the presence of dark colored materials

IIRS data acquired in E1G2 mode on 8th December 2019





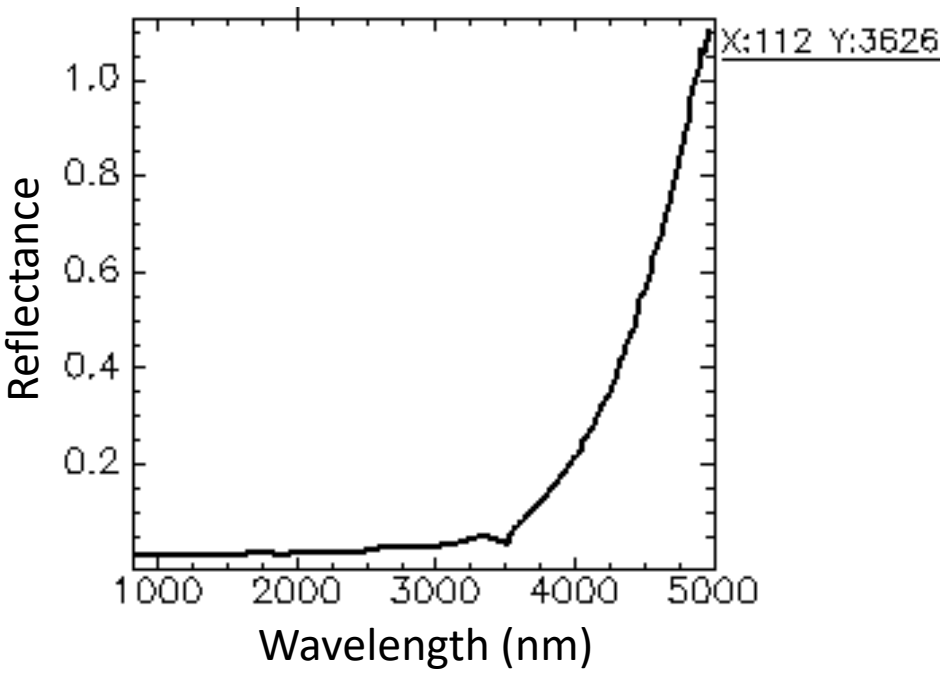
A. IIRS complete spectra from ~800-5000 nm. Thermal Emission dominates the lunar spectra beyond ~3000 nm



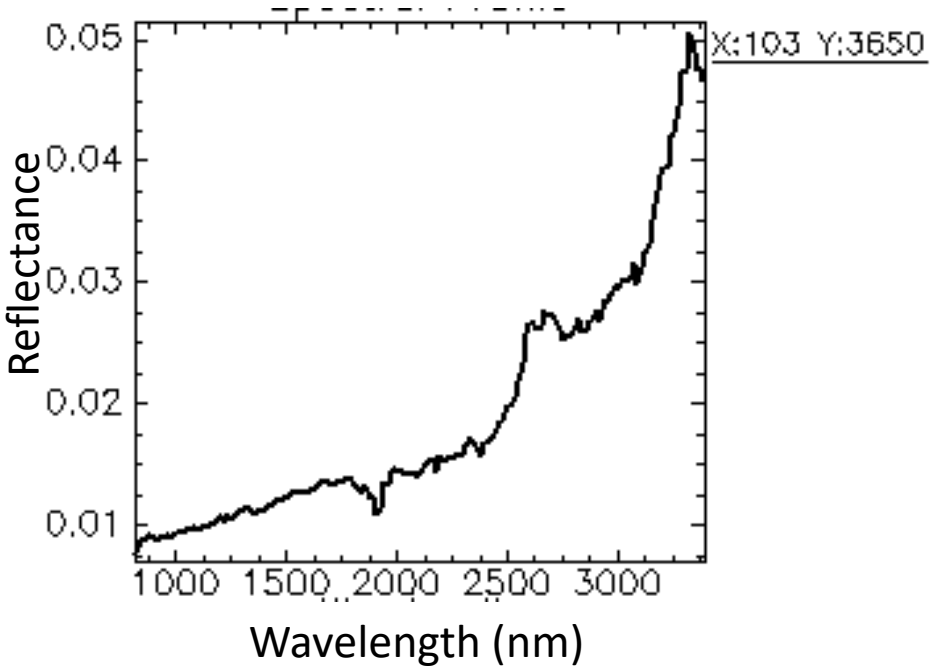
B. IIRS spectra highlighting the spectral region of ~800-3300 nm. An absorption near 2000 nm is seen due to the presence of dark colored materials



IIRS data acquired in E1G2 mode on 3rd January 2020

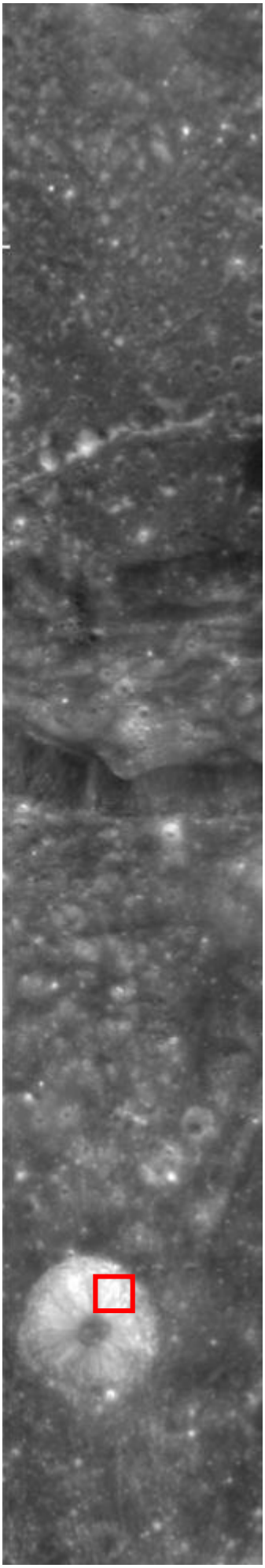


A. IIRS complete spectra from ~800-5000 nm. Thermal Emission dominates the lunar spectra beyond ~3000 nm

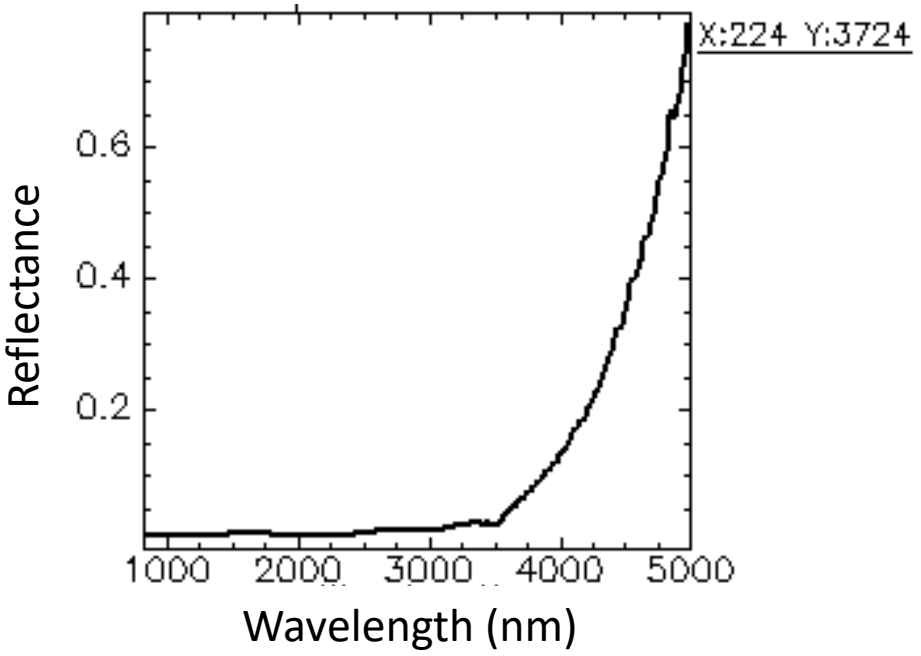


B. IIRS spectra highlighting the spectral region of ~800-3300 nm. An absorption near 2000 nm is seen due to the presence of dark colored materials

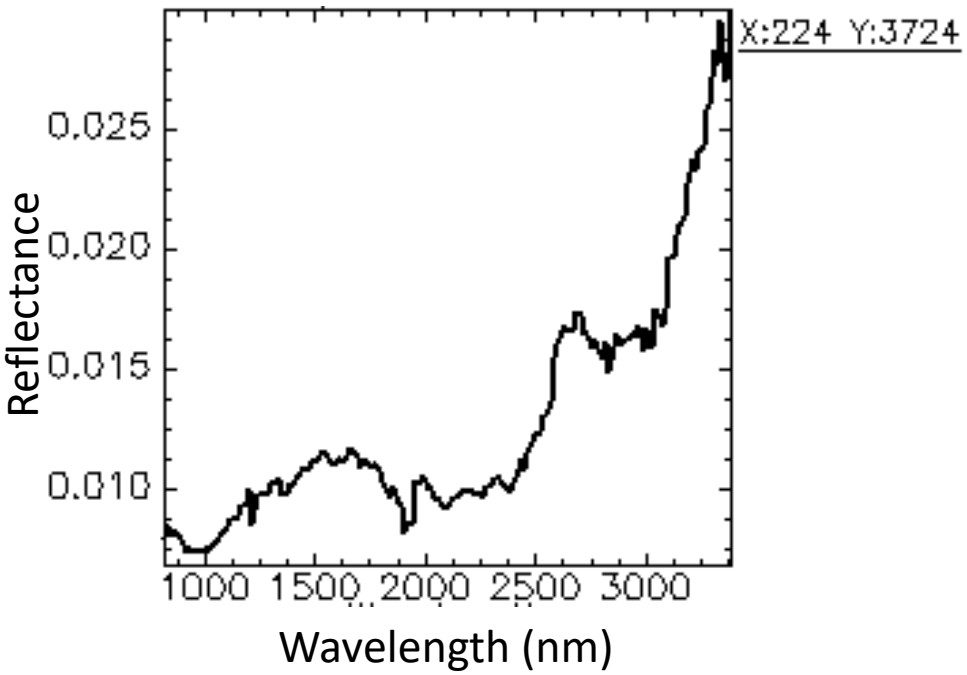
Crater floors with fractures are seen with raised rims



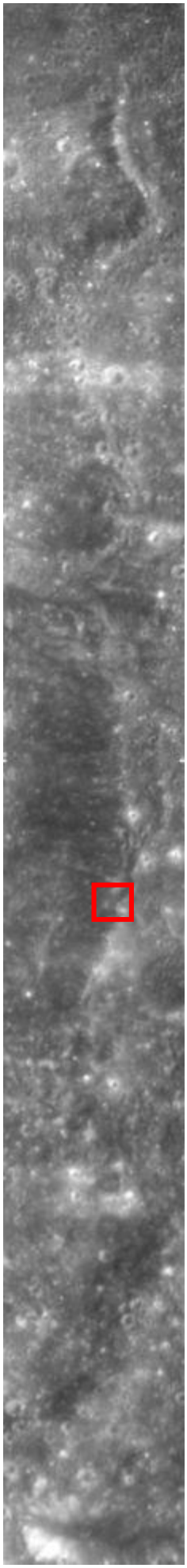
IIRS data acquired in E1G2 mode on 3rd January 2020



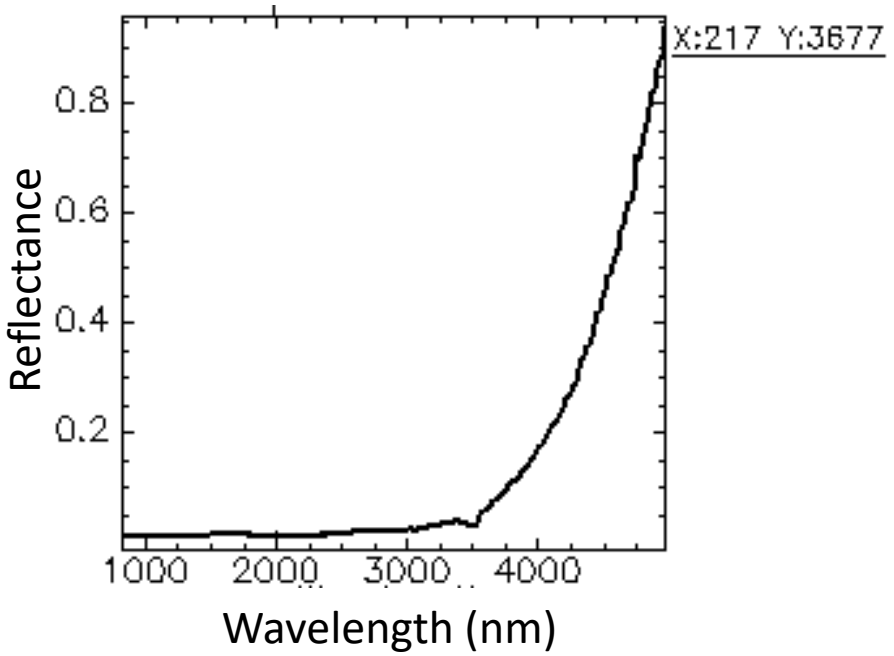
A. IIRS complete spectra from ~800-5000 nm. Thermal Emission dominates the lunar spectra beyond ~3000 nm

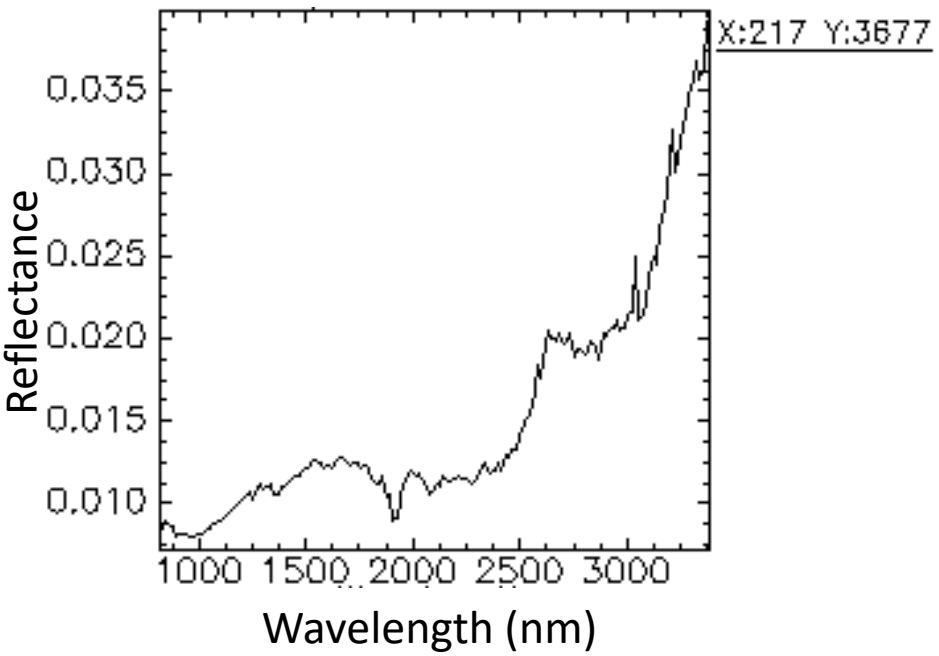


B. IIRS spectra highlighting the spectral region of ~800-3300 nm. Absorption features near 1000- and 2000 nm is seen suggesting the presence of pyroxene-bearing rock types. A 3000-nm hydration feature is also seen in the spectra.



IIRS data acquired in E1G2 mode
on 14th January 2020

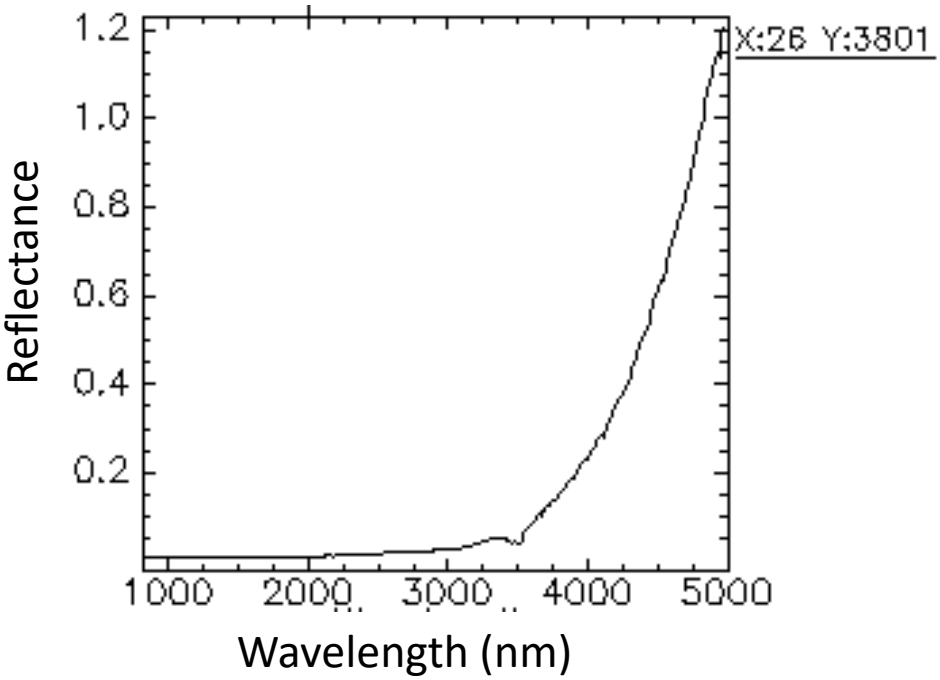


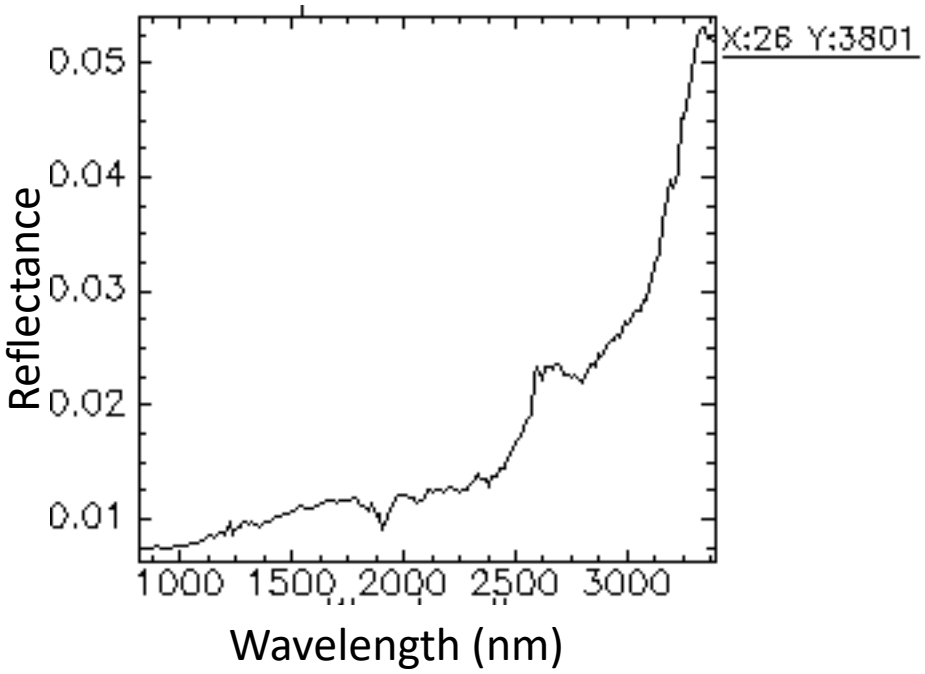


Spectral reflectance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer



IIRS data acquired in E1G2 mode
on 14th January 2020

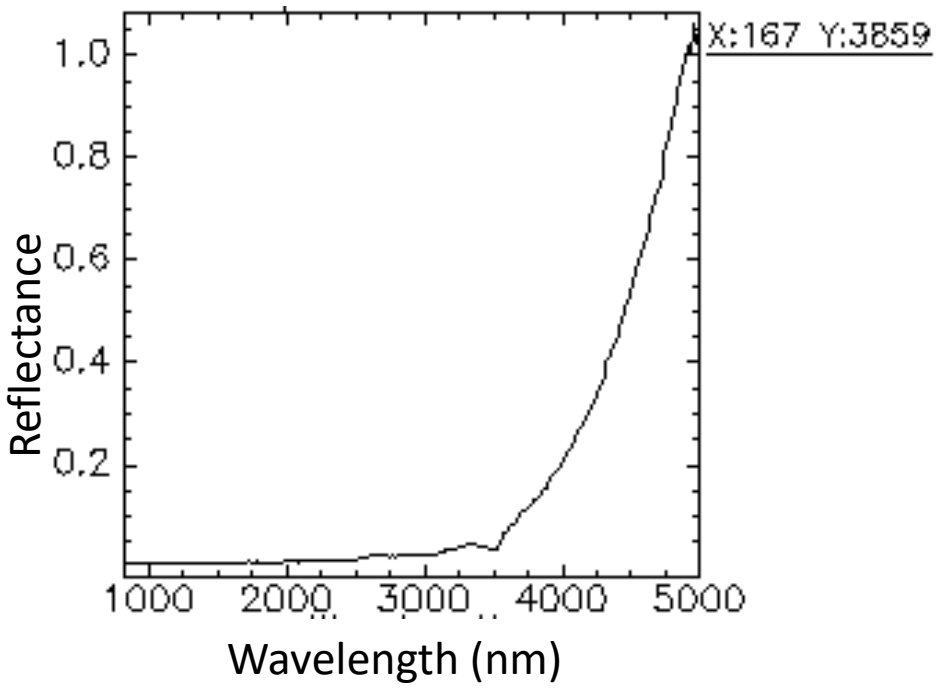


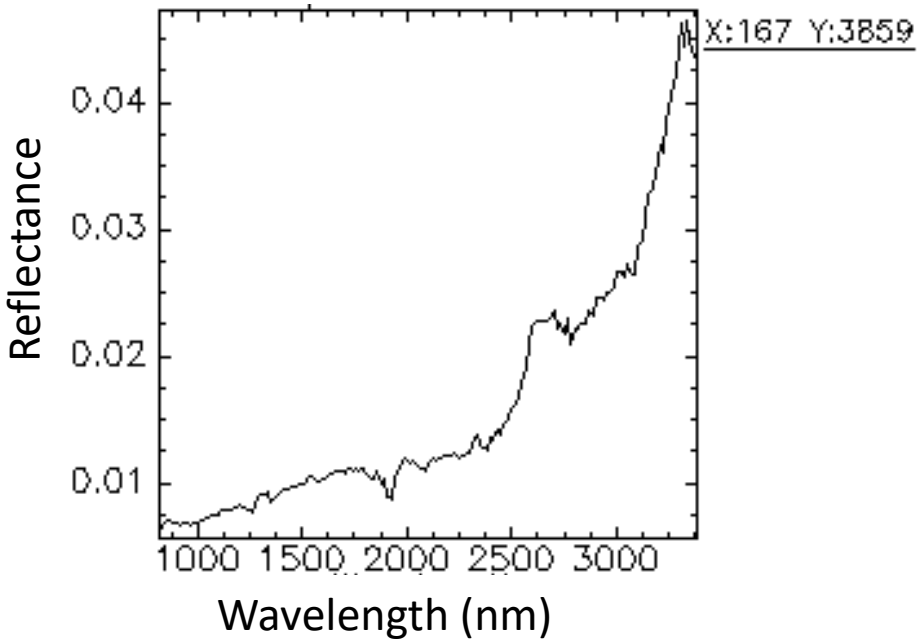


Spectral reflectance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

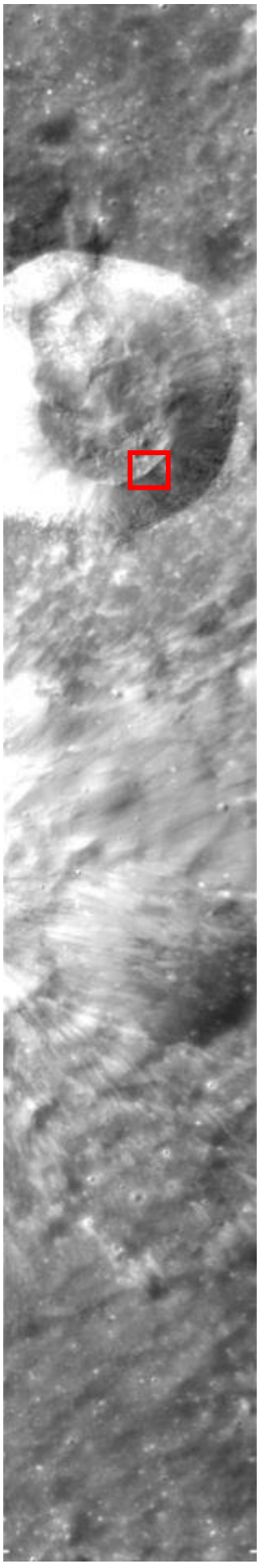


IIRS data acquired in E1G2 mode on 29th January 2020

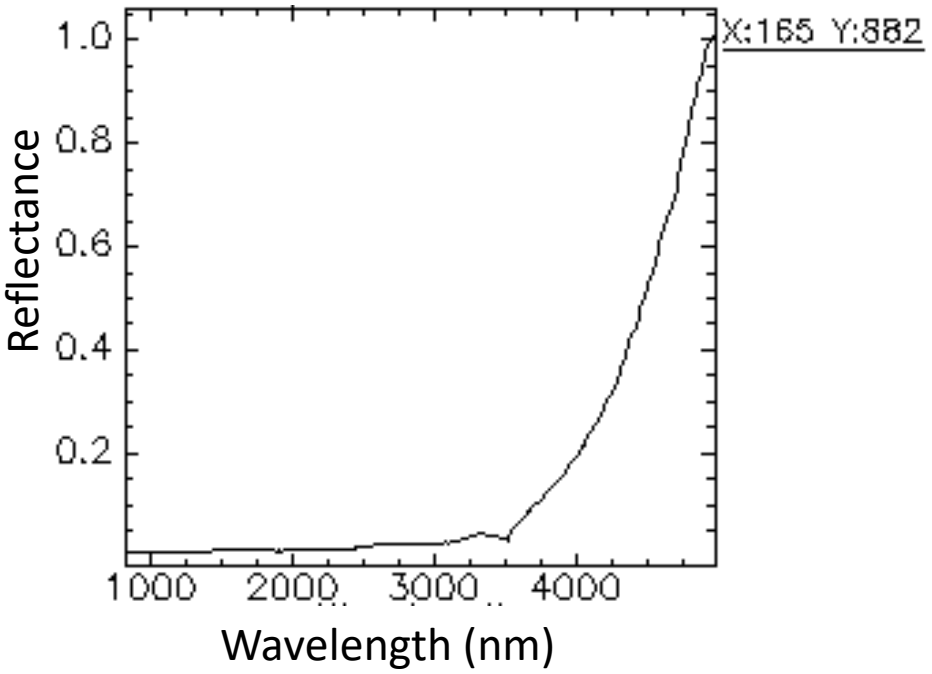


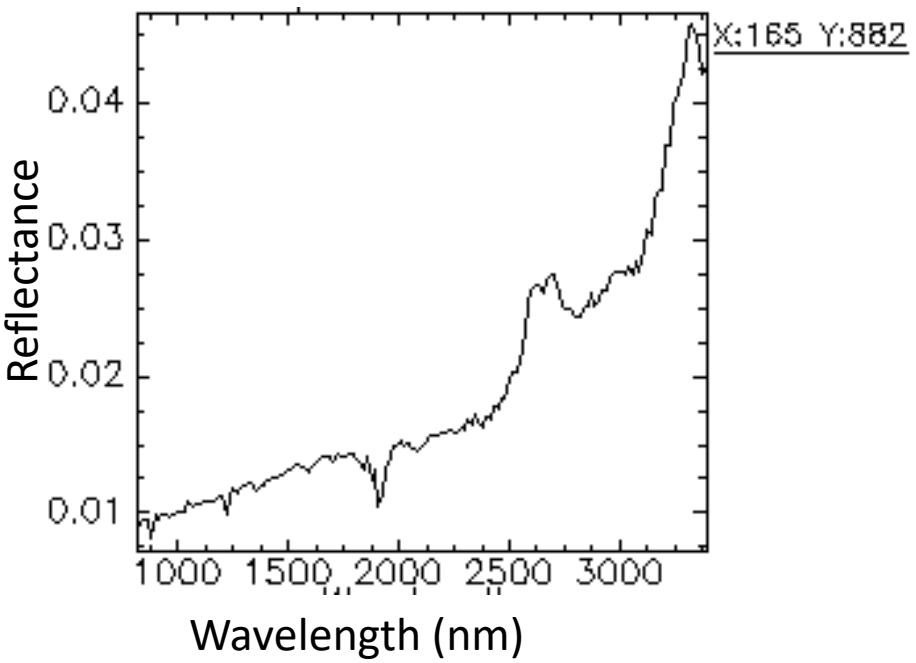


Spectral reflectance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

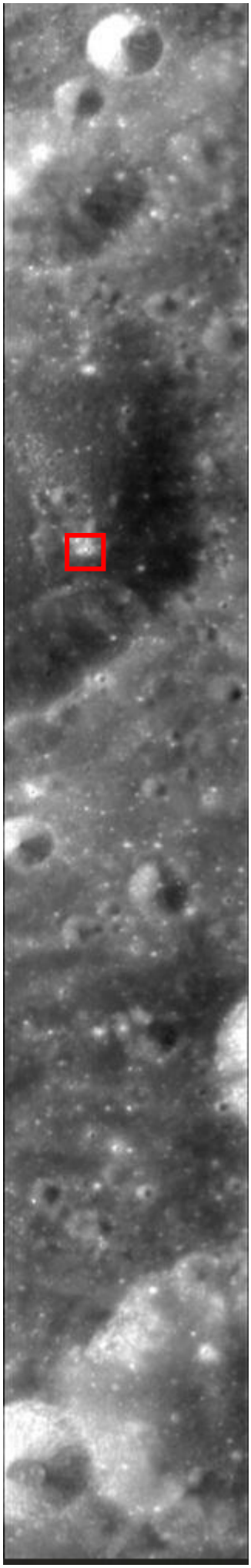


IIRS data acquired in E1G2 mode
on 29th January 2020

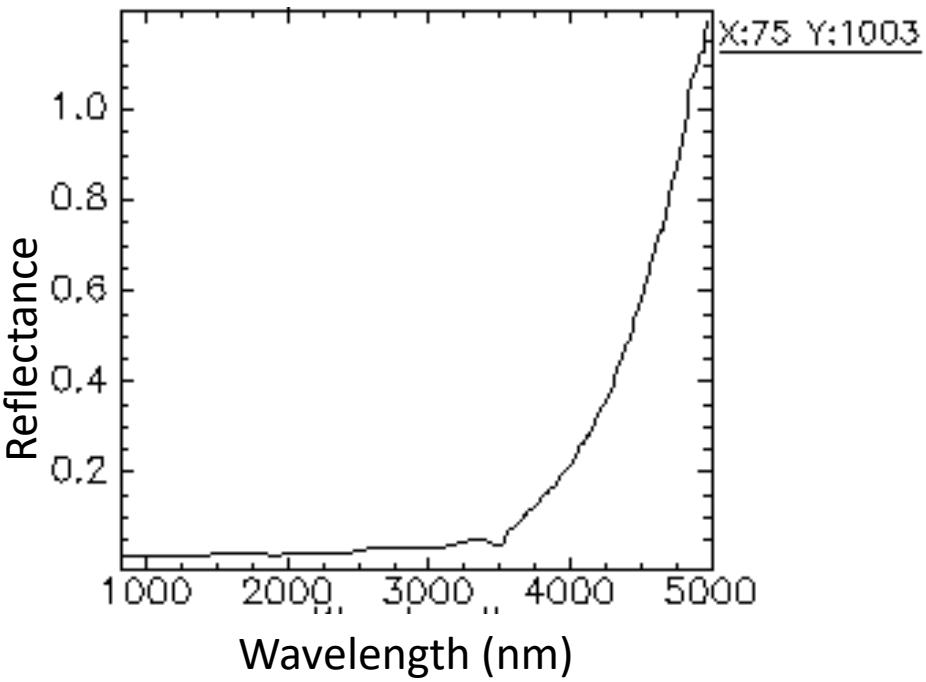


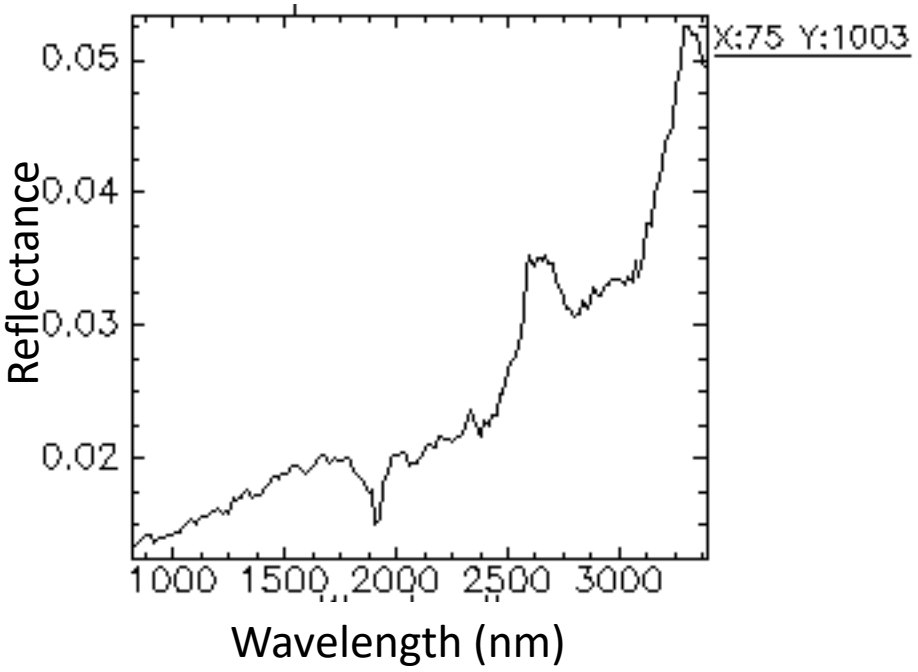


Spectral reflectance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer



IIRS data acquired in E1G2 mode on 29th January 2020

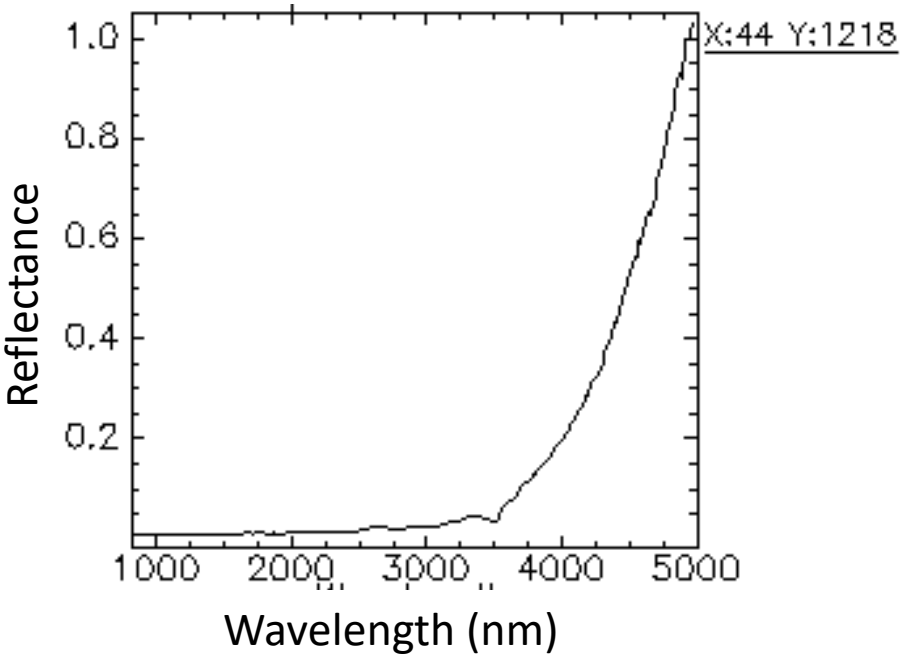


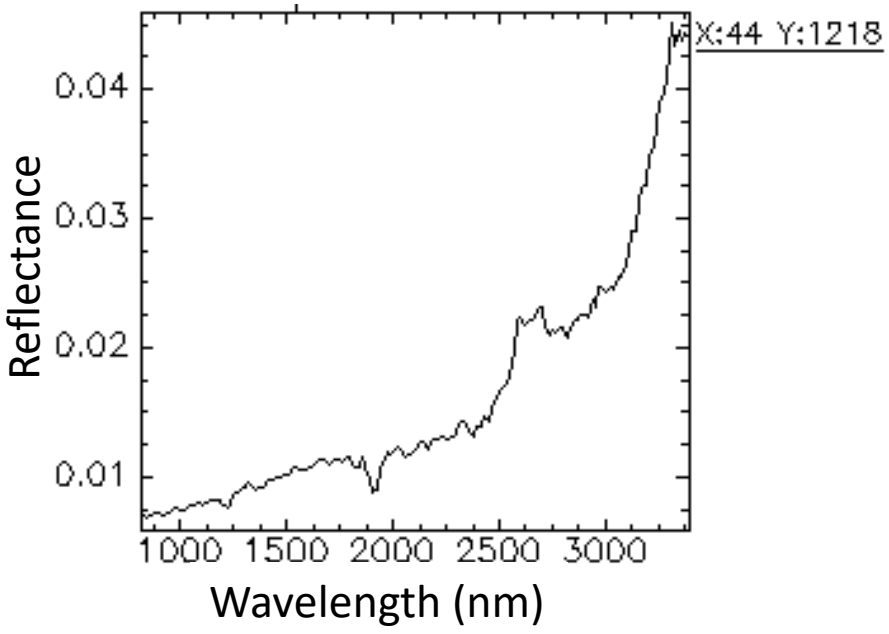


Spectral reflectance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

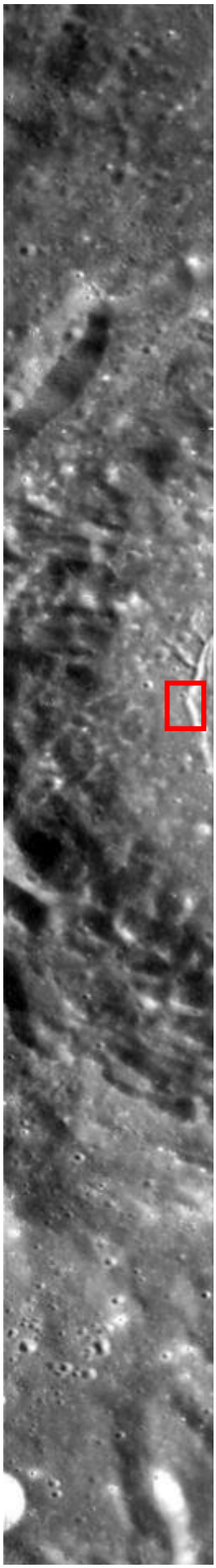


IIRS data acquired in E1G2 mode on 5th February 2020

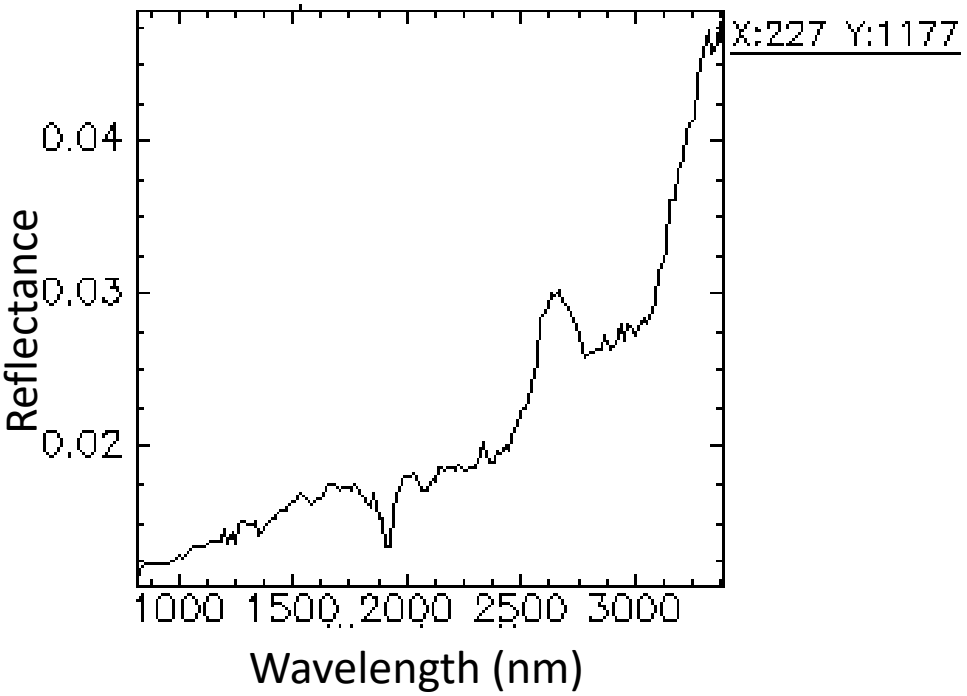


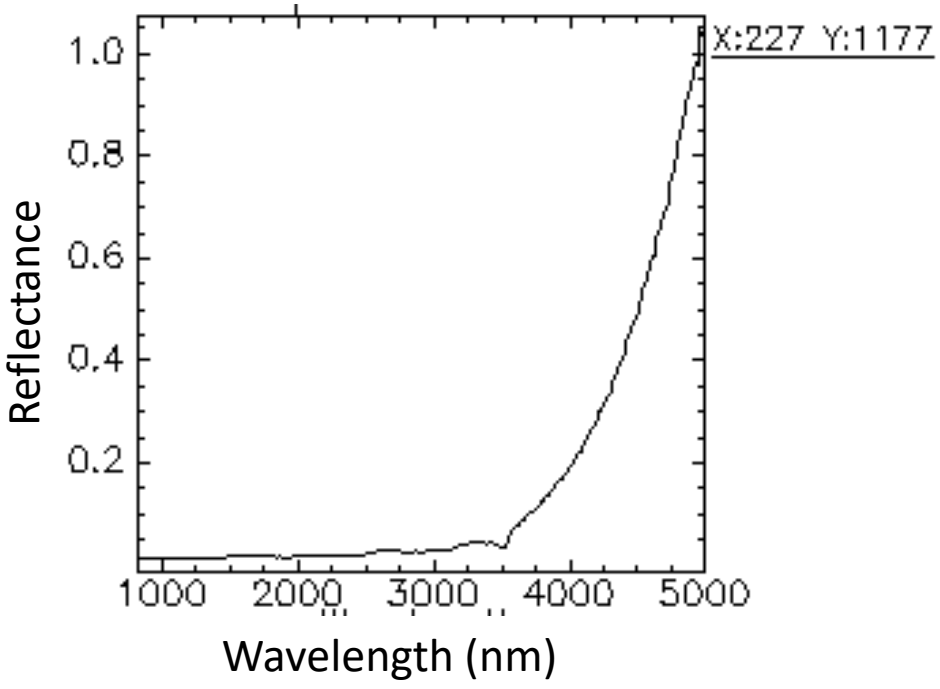


Spectral reflectance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

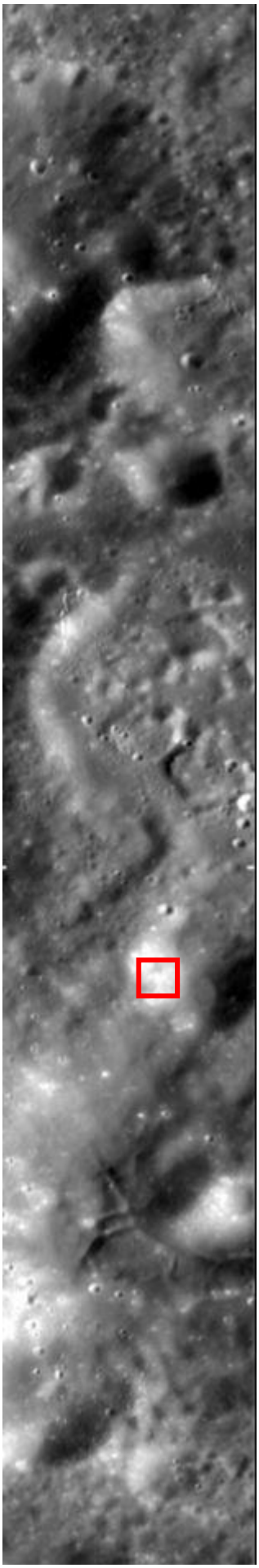


IIRS data acquired in E1G2 mode on 5th February 2020

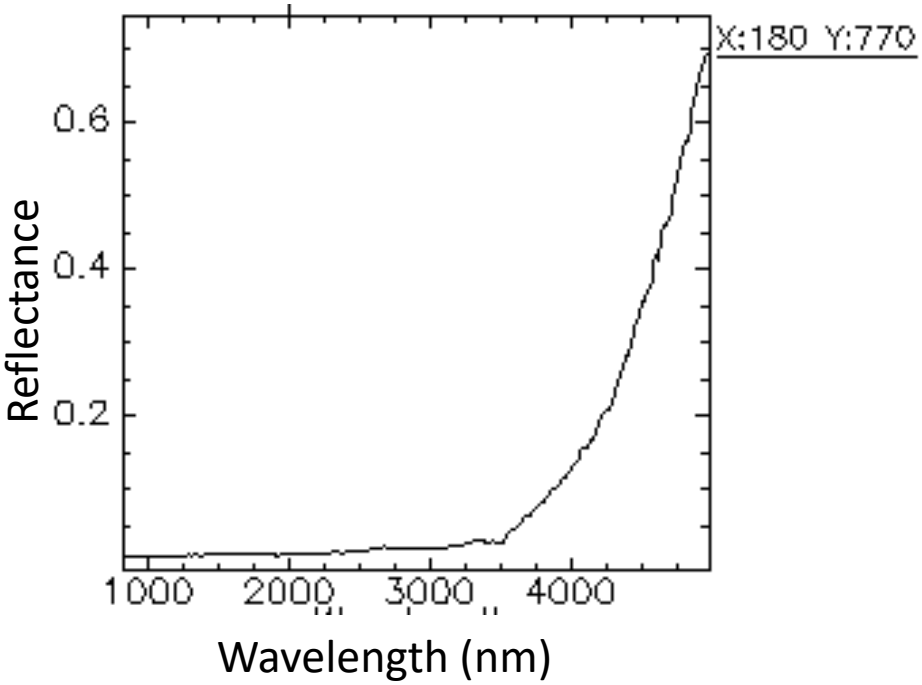


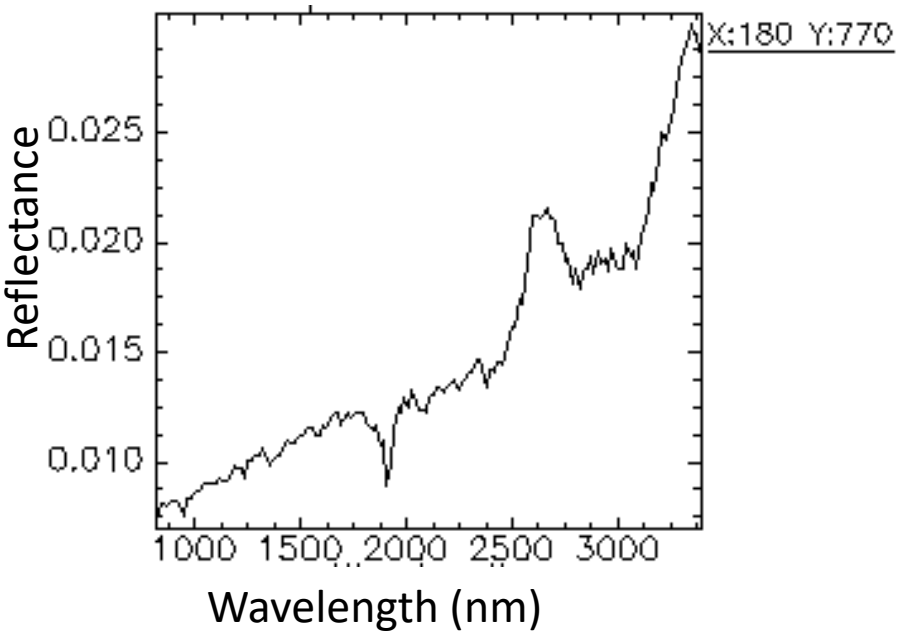


Spectral reflectance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer



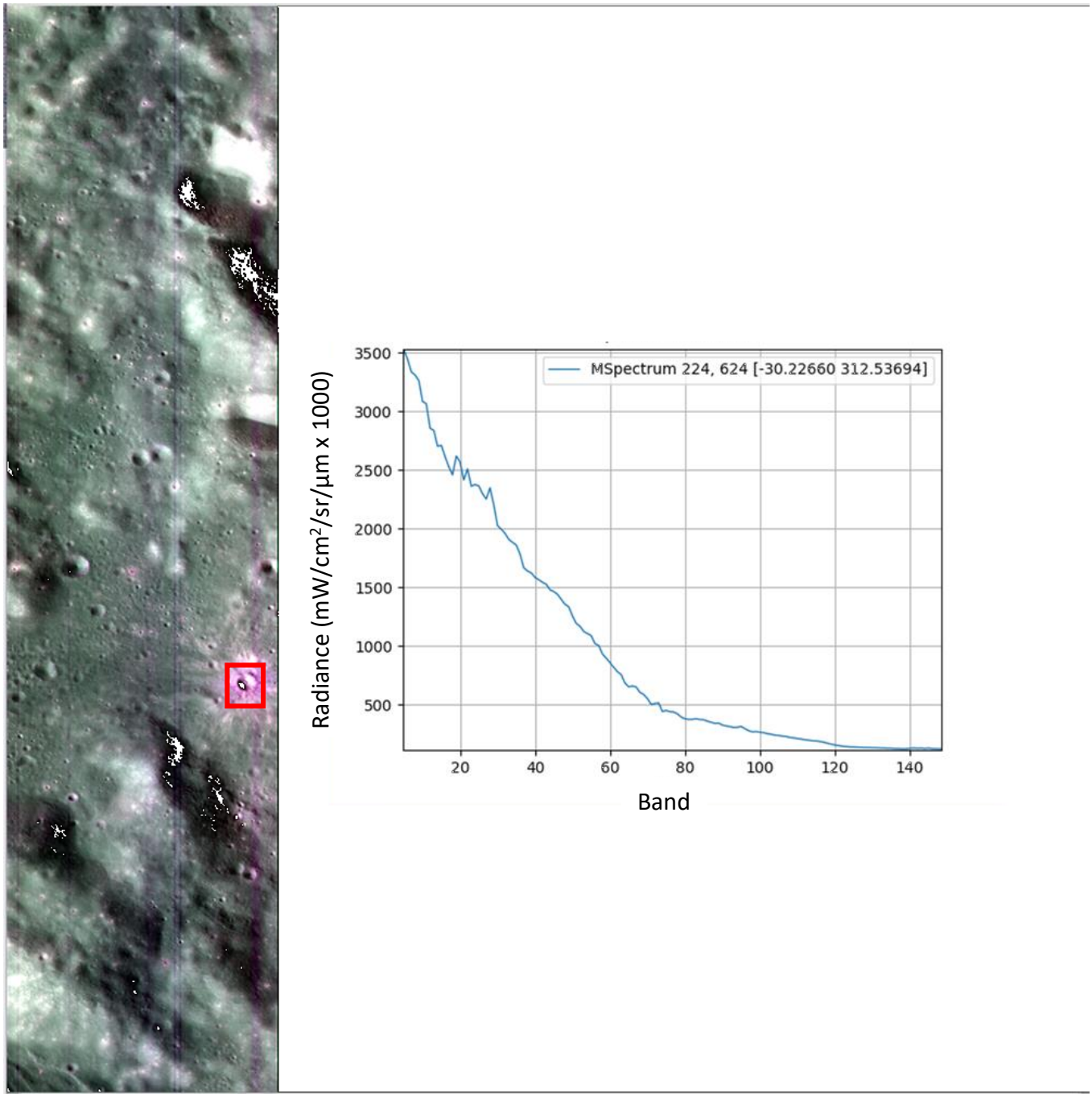
IIRS data acquired in E1G2 mode on 5th February 2020





Spectral reflectance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

IIRXXCNBCHO0205702NNNN20040115656331_V2_1



Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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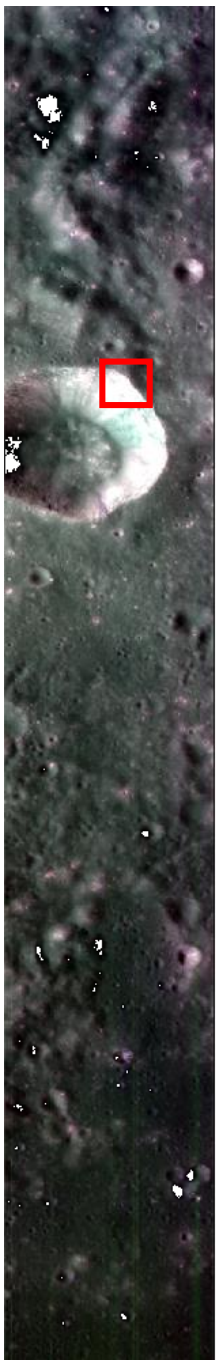

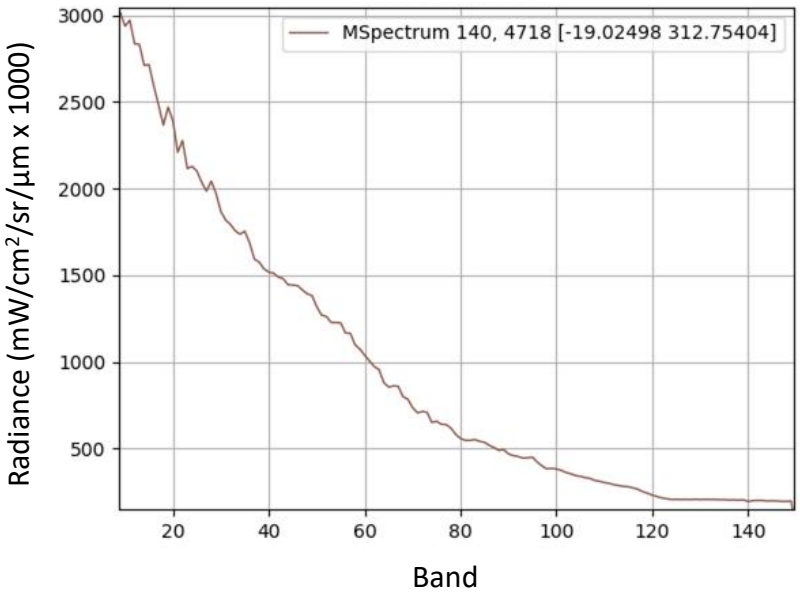

Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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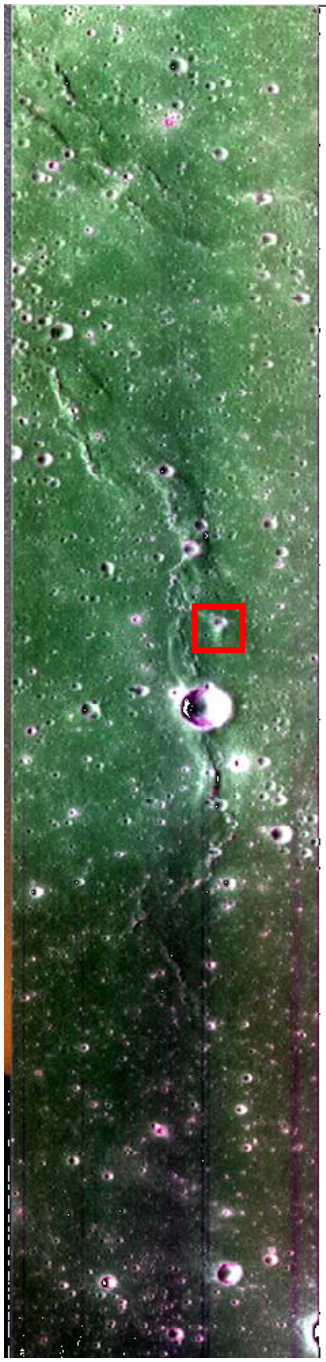
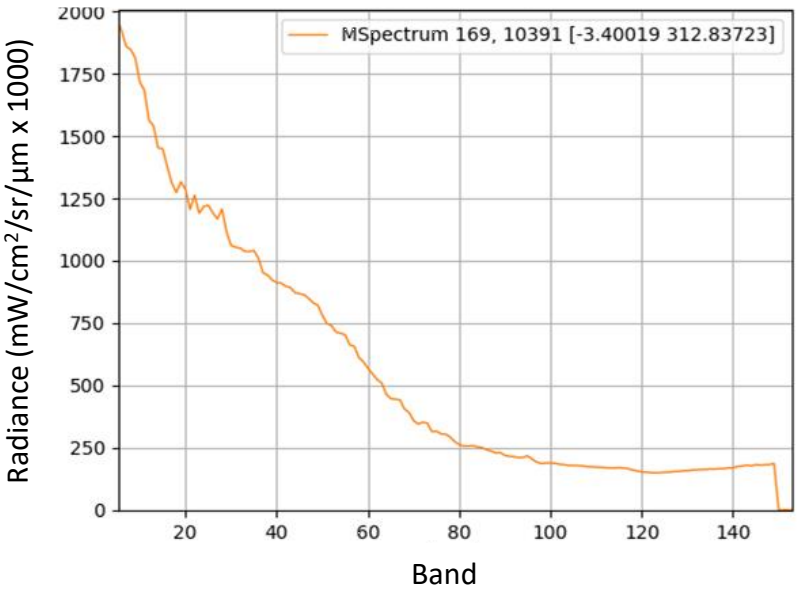
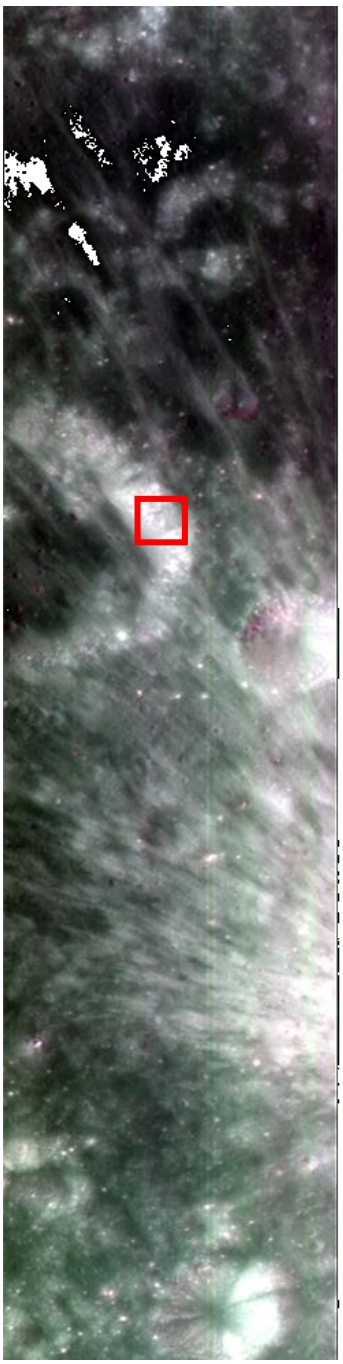
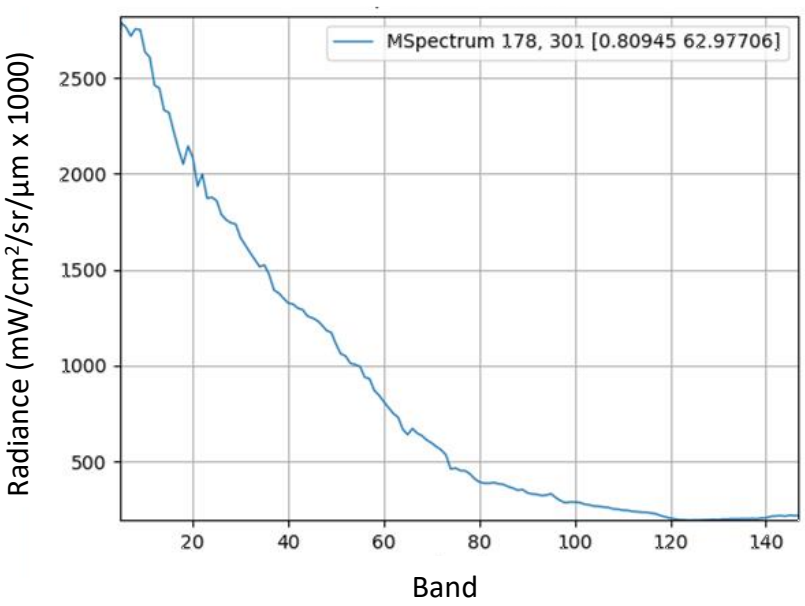




Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

IIRXXD18CHO0128702NNNN19342114049300_V3_1

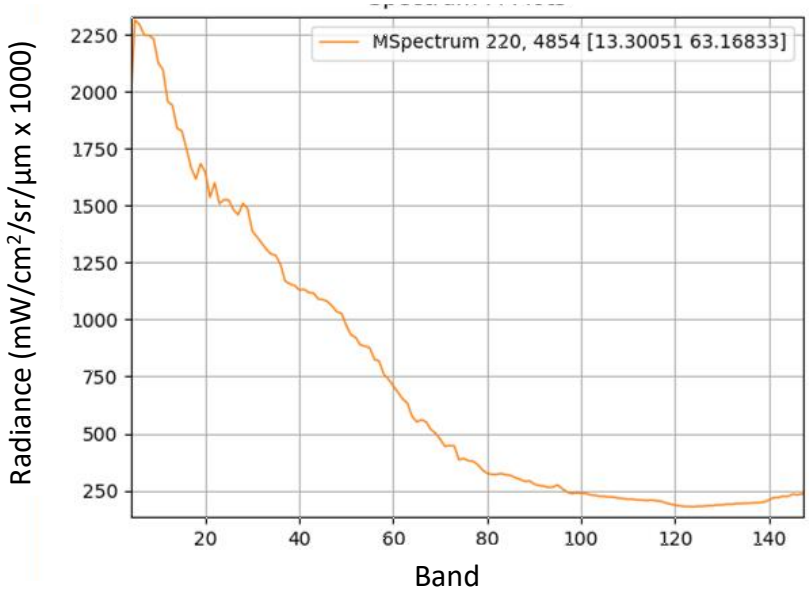




Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

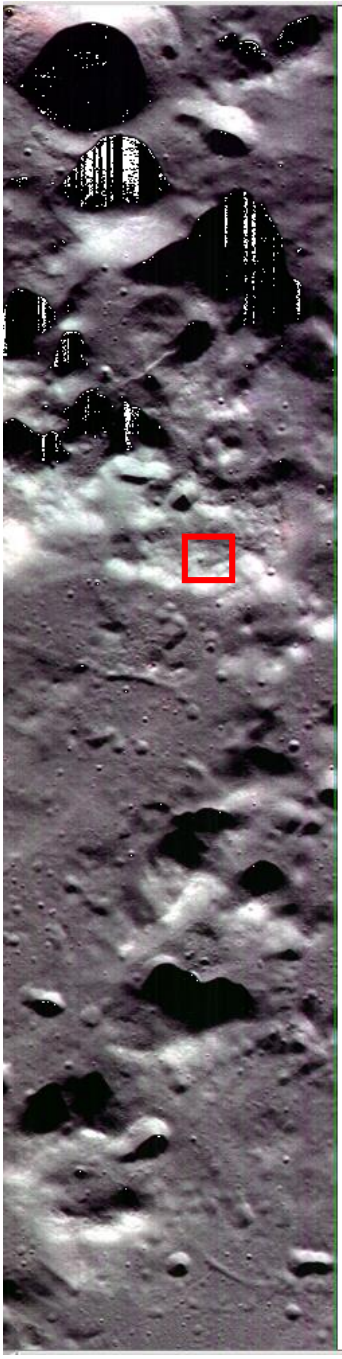
IIRXXD18CHO0128702NNNN19342114049300_V3_1

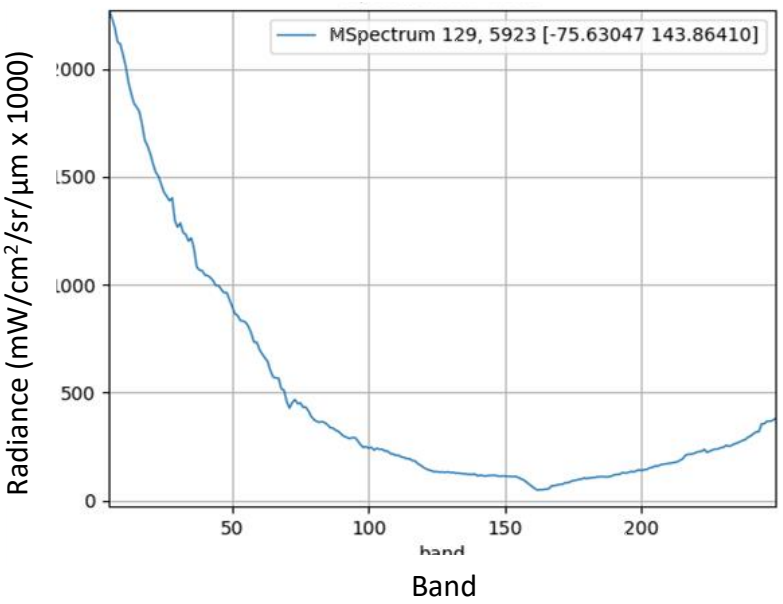




Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

IIRXXD32CHO0587102NNNN20353105025776_V1_0





Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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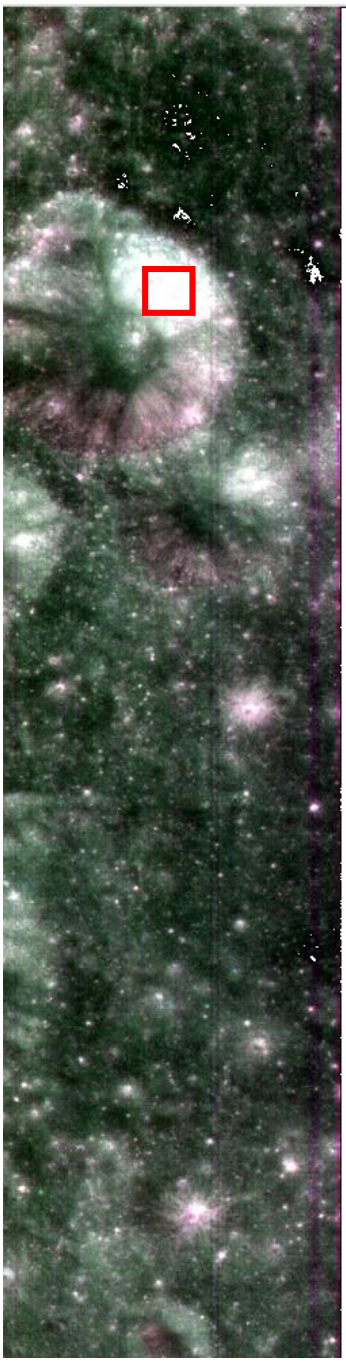
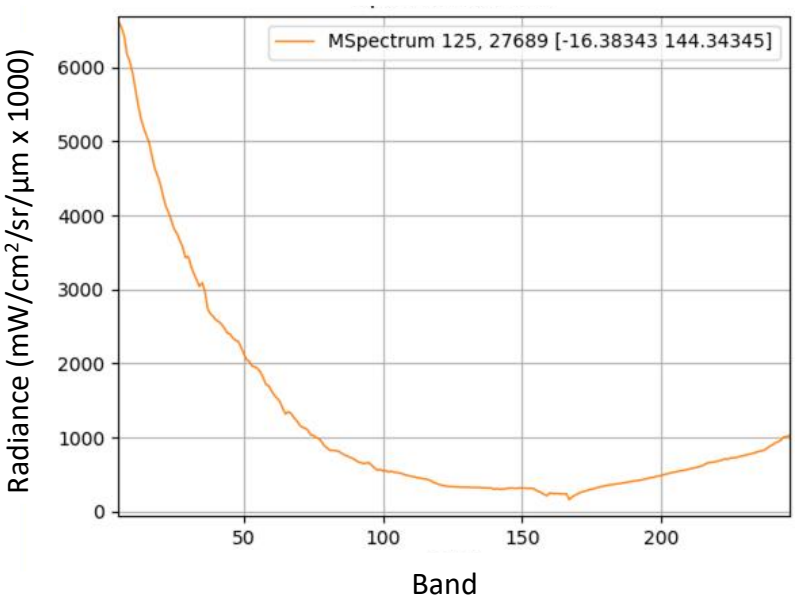
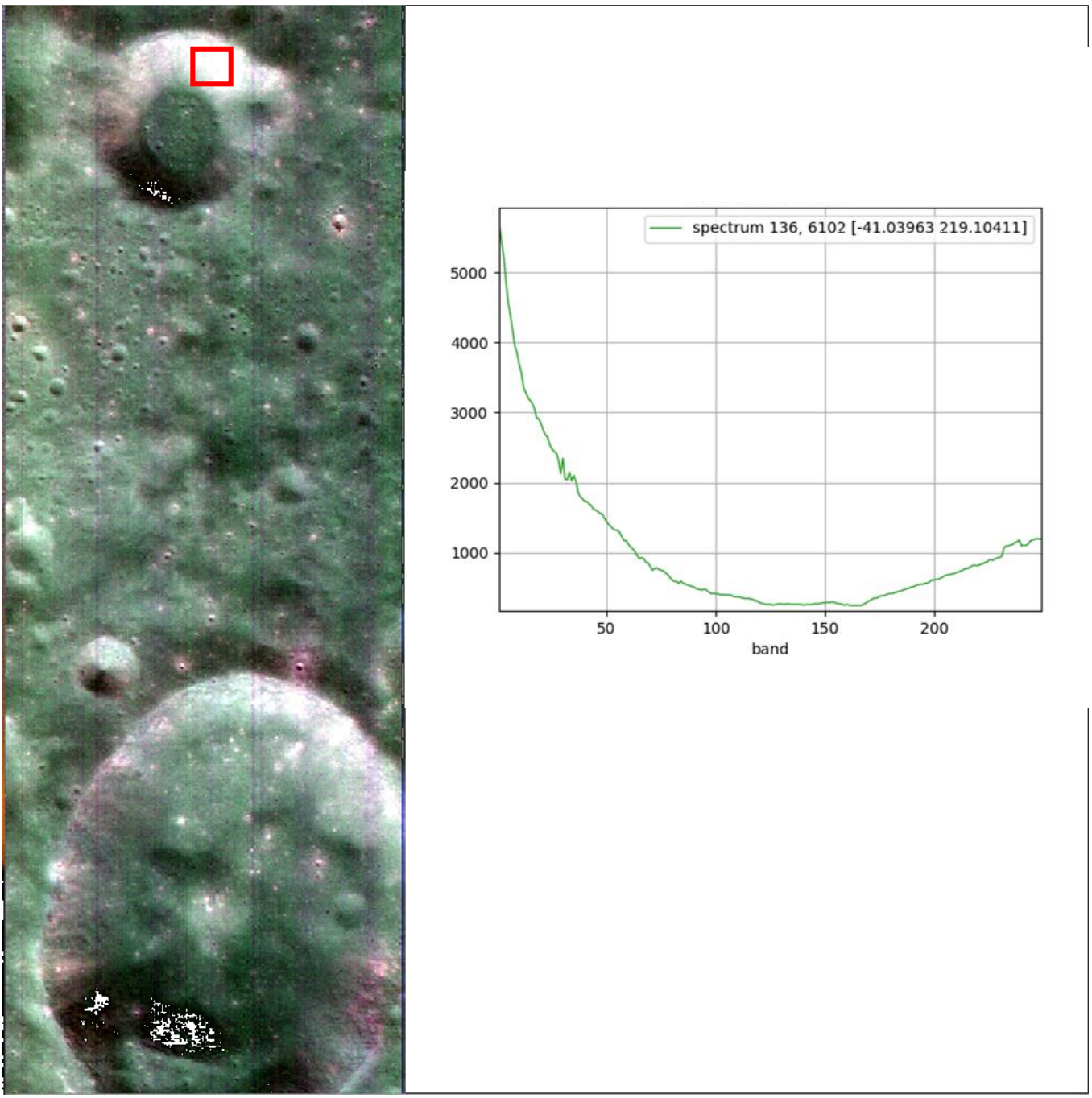




Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

IIRXXD32CHO0613402NNNN21009000319140_V1_0



Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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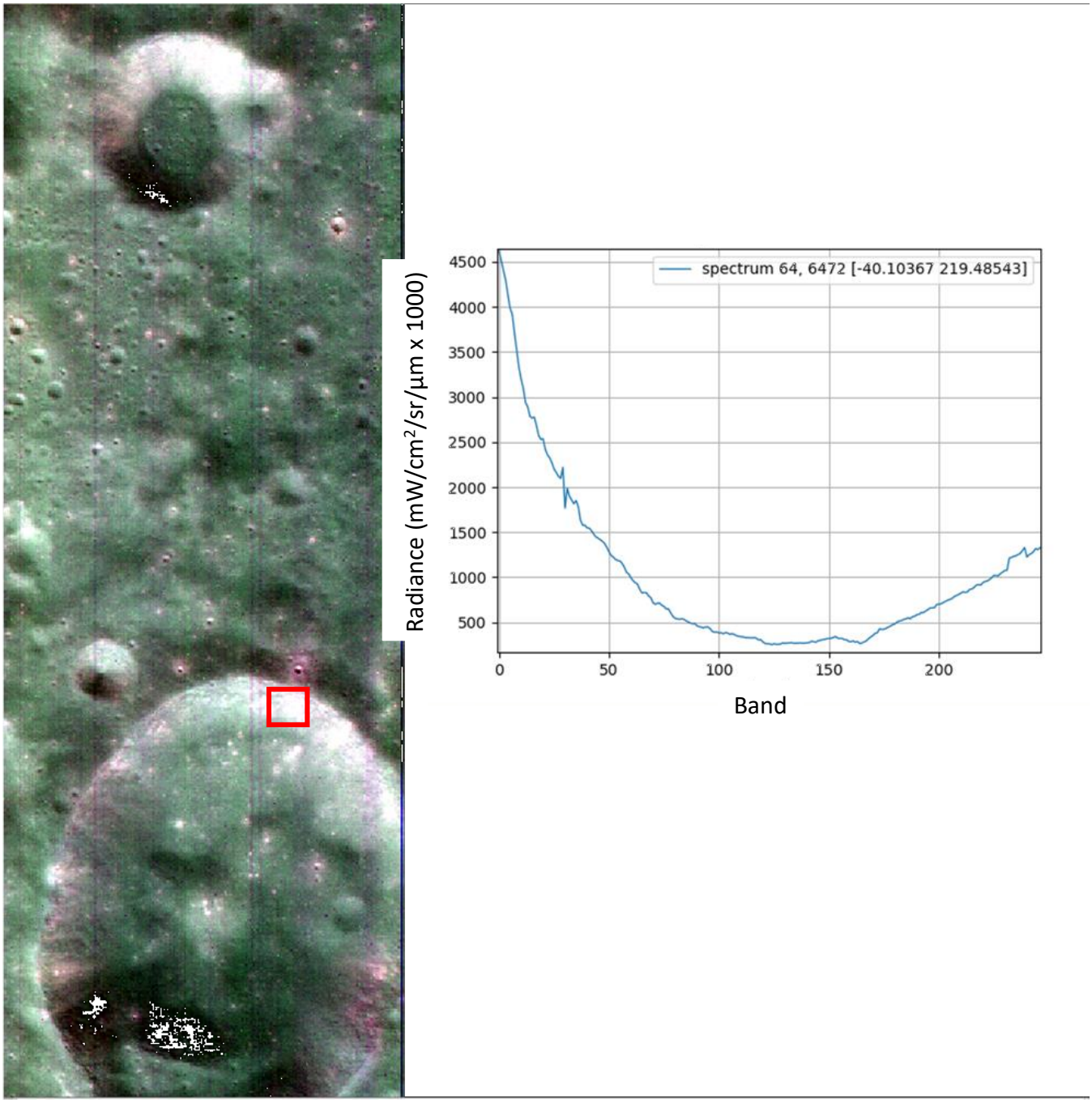

Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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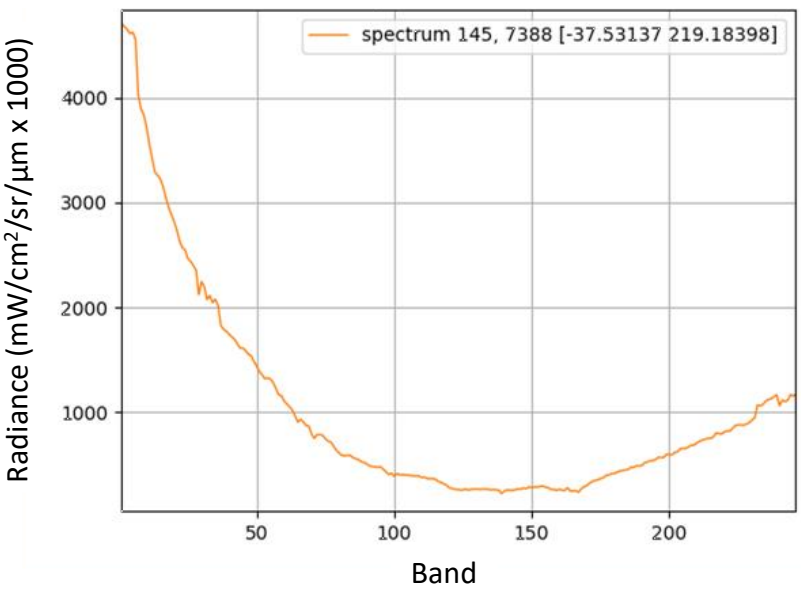

Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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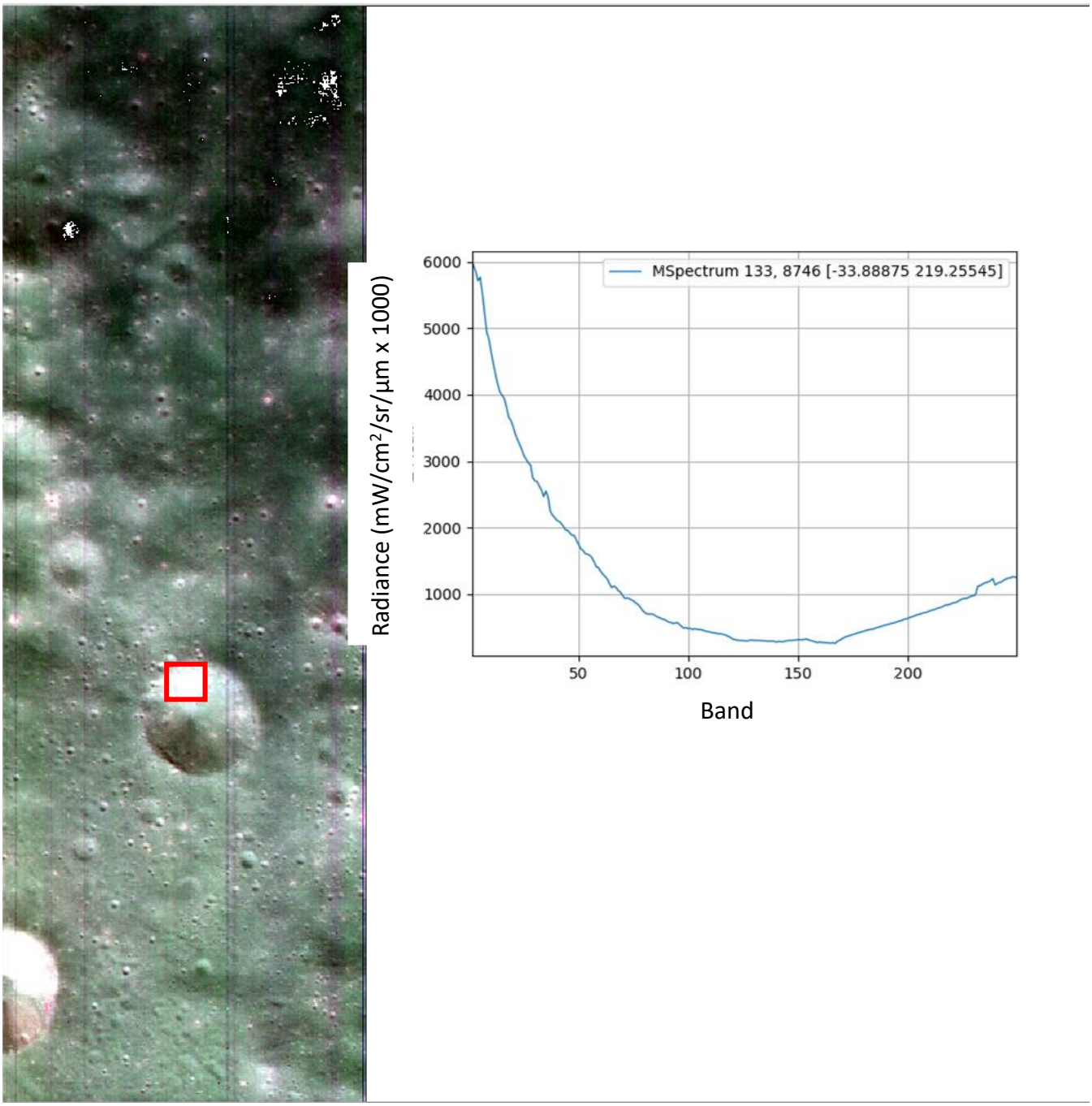

Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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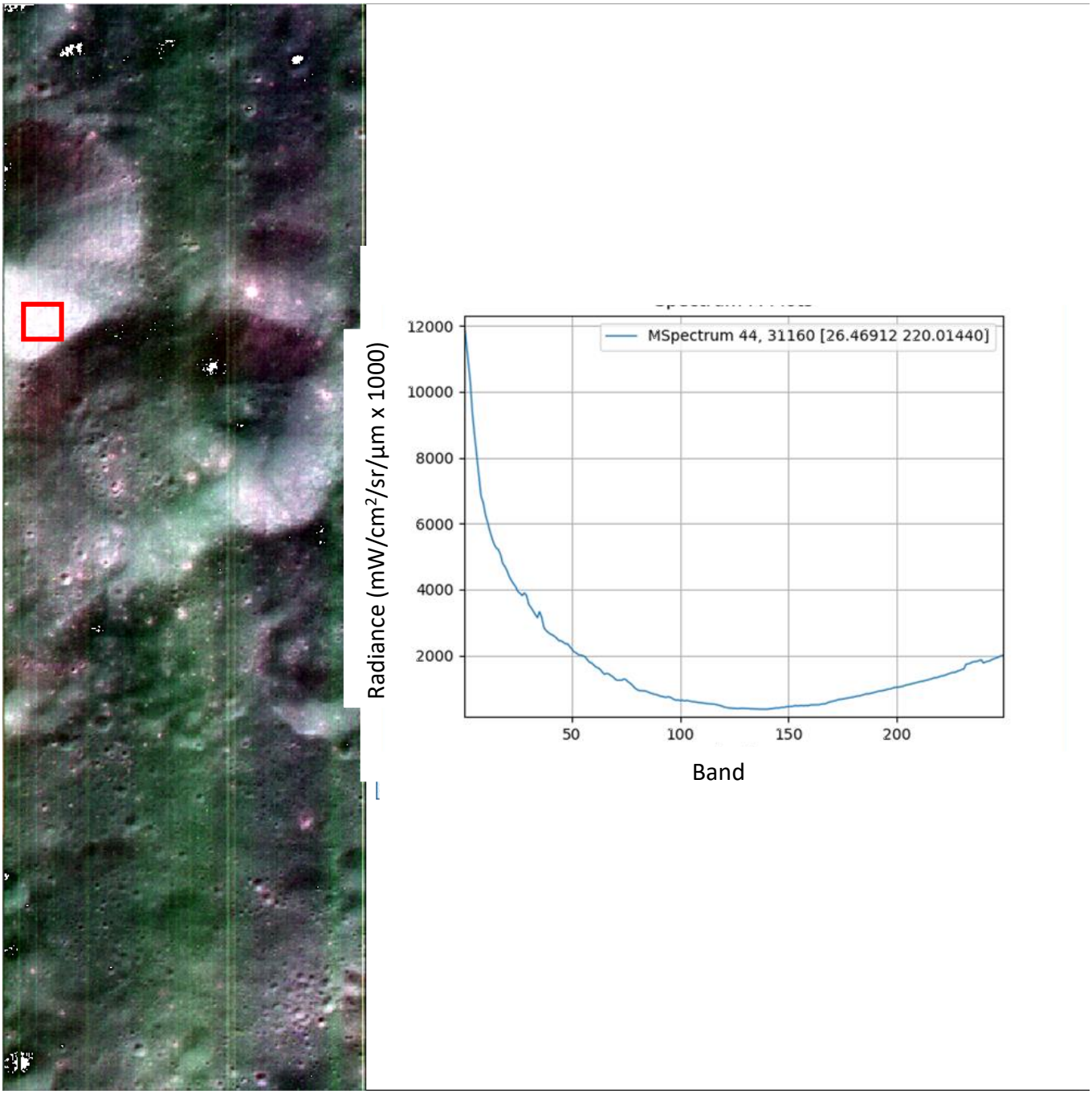

Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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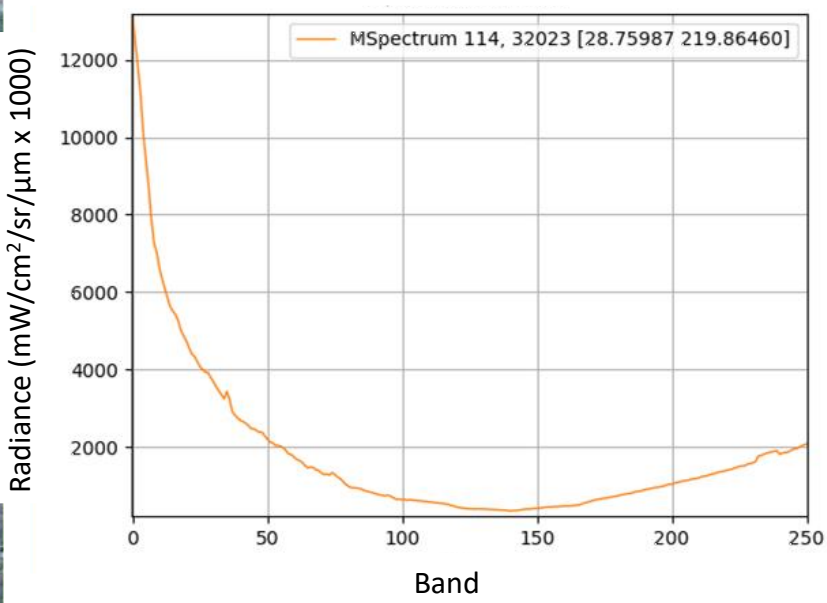
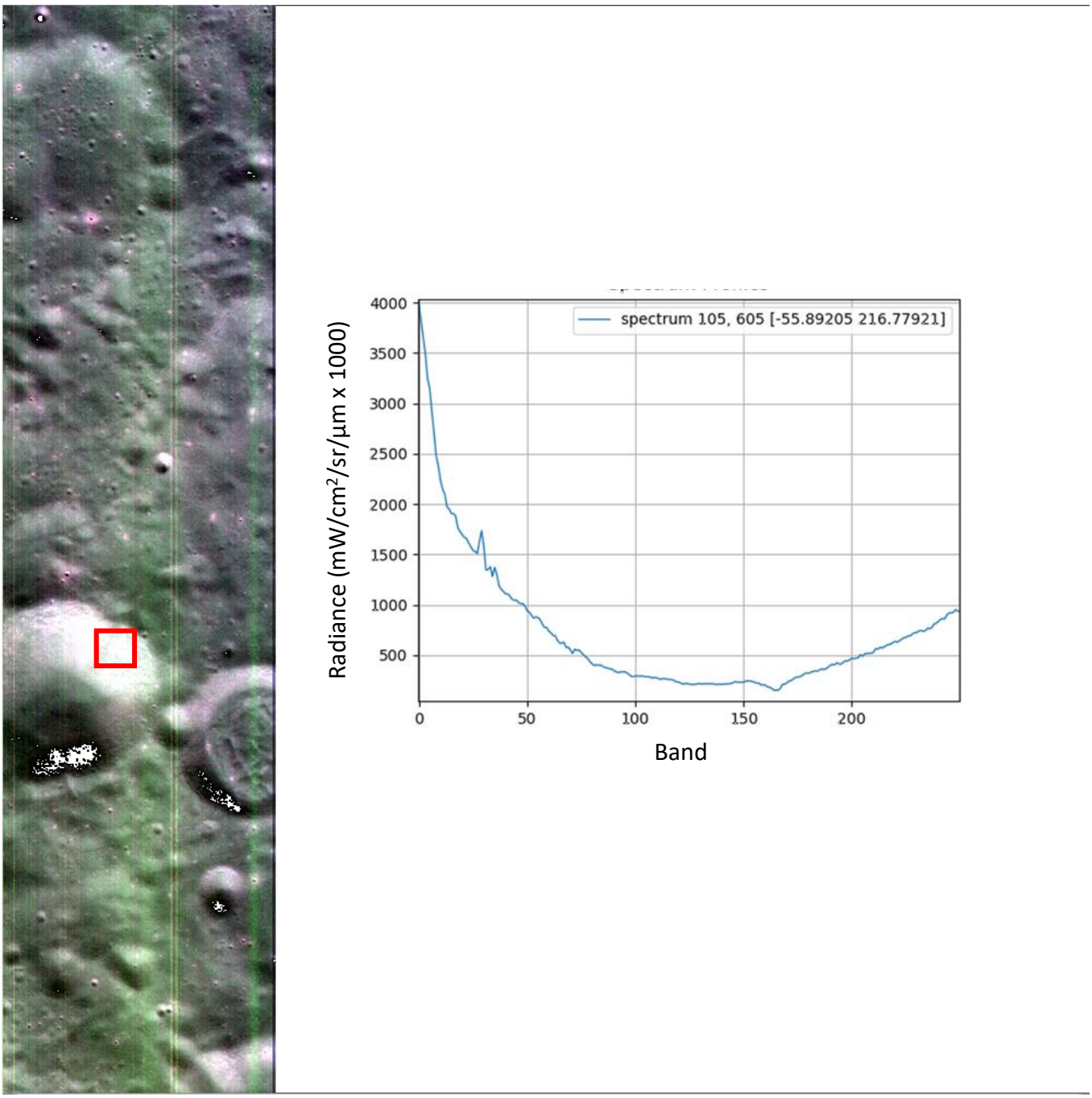


Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

IIRXXD32CHO0613602NNNN21009040304528_V1_1



Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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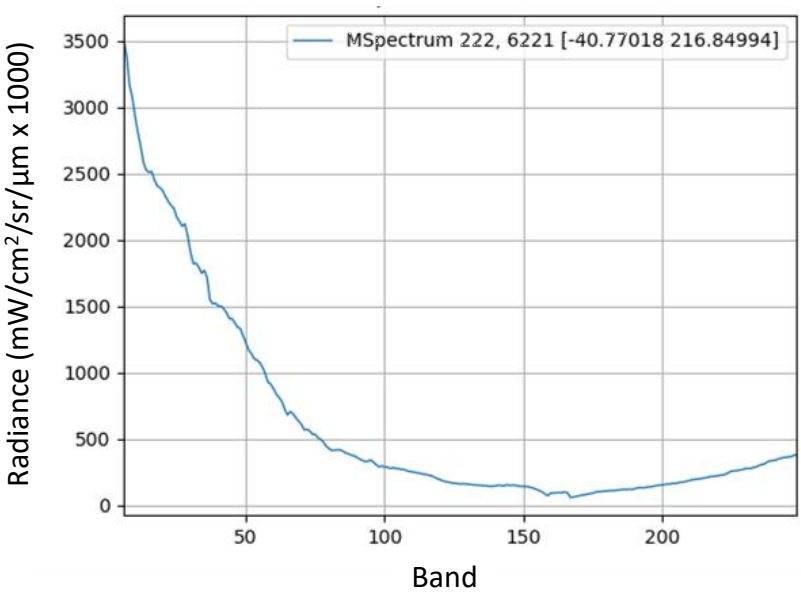

Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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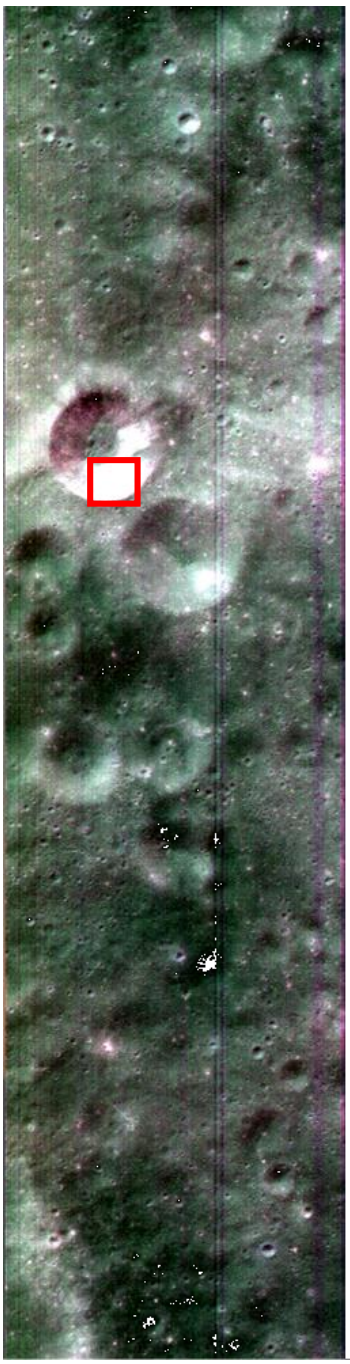

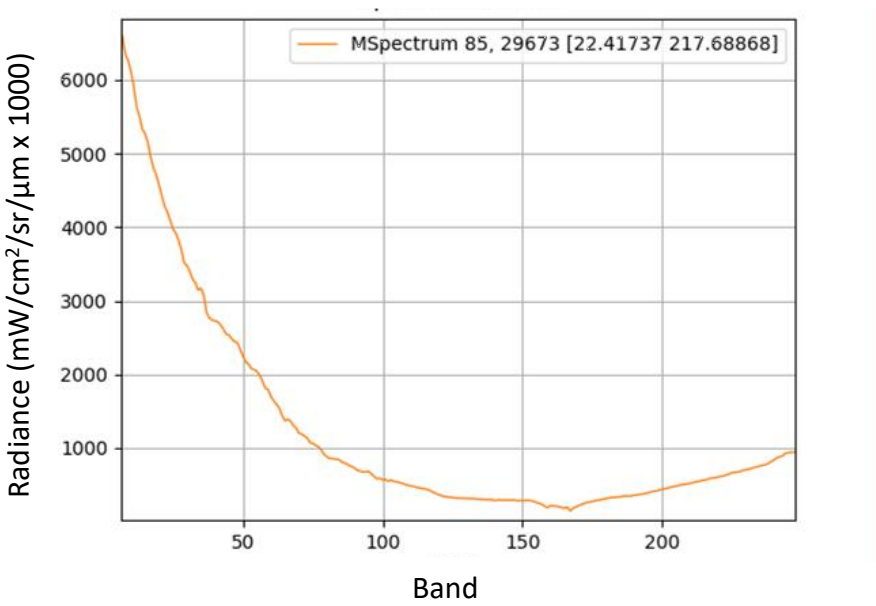

Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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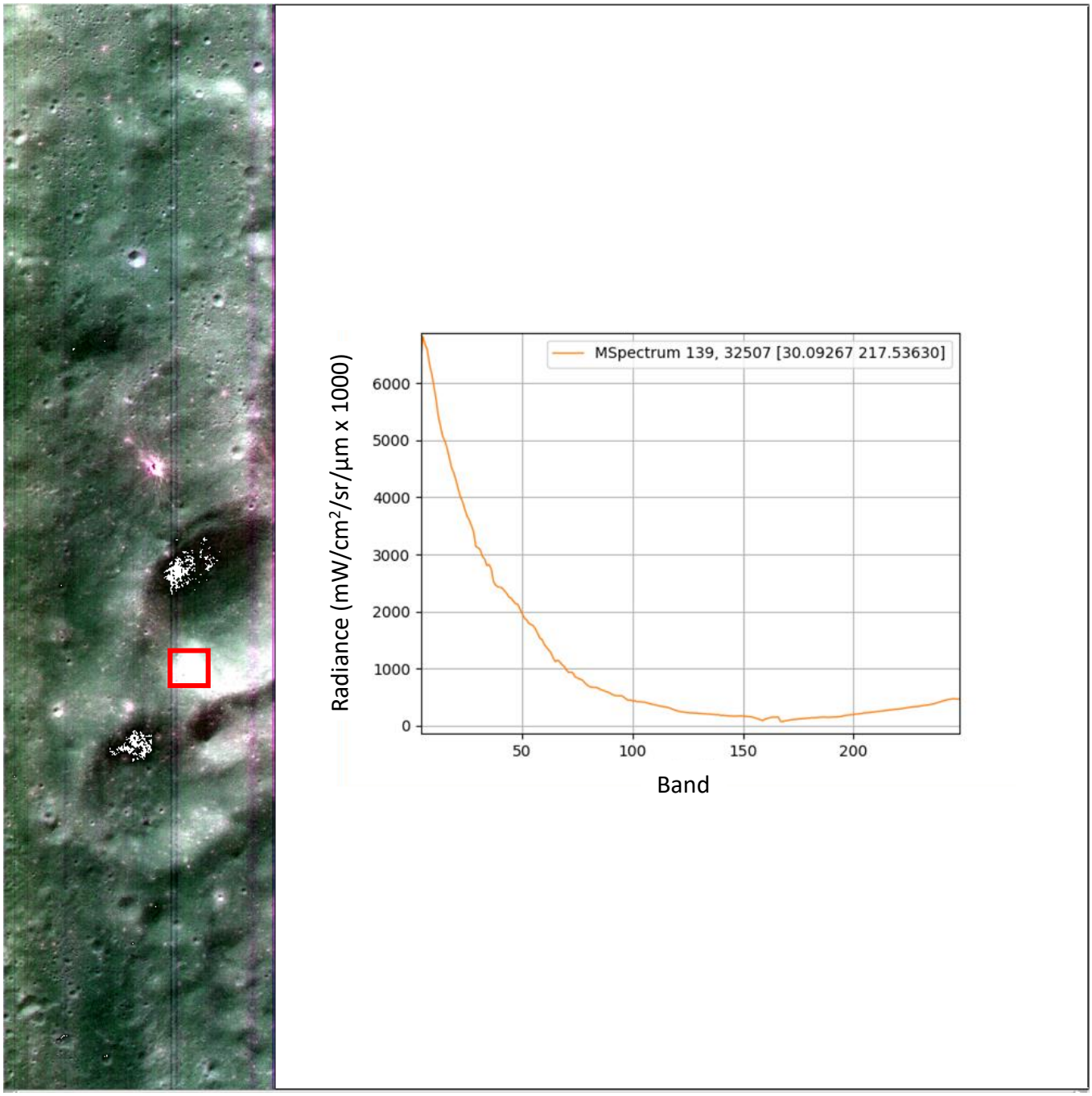

Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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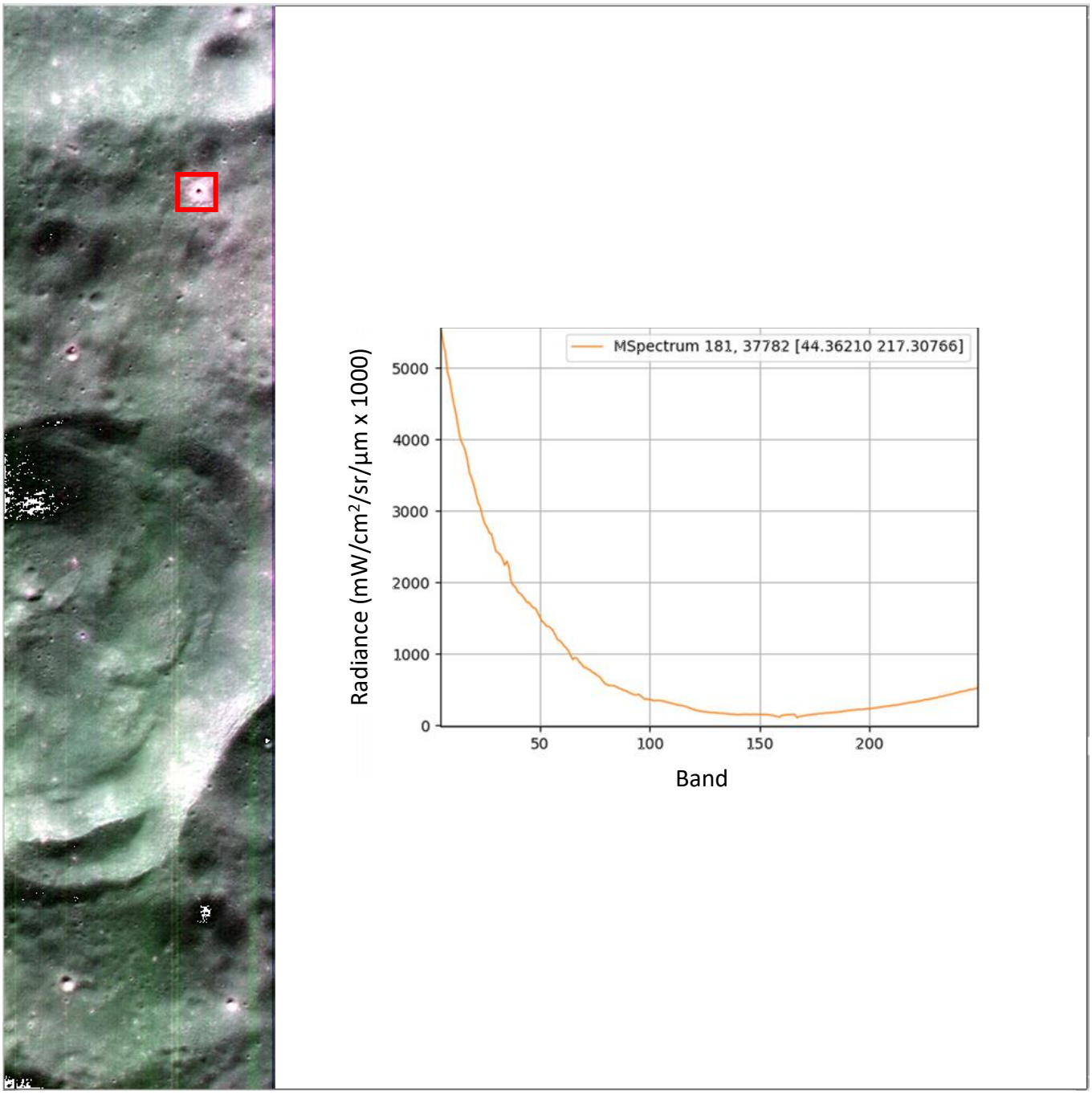

Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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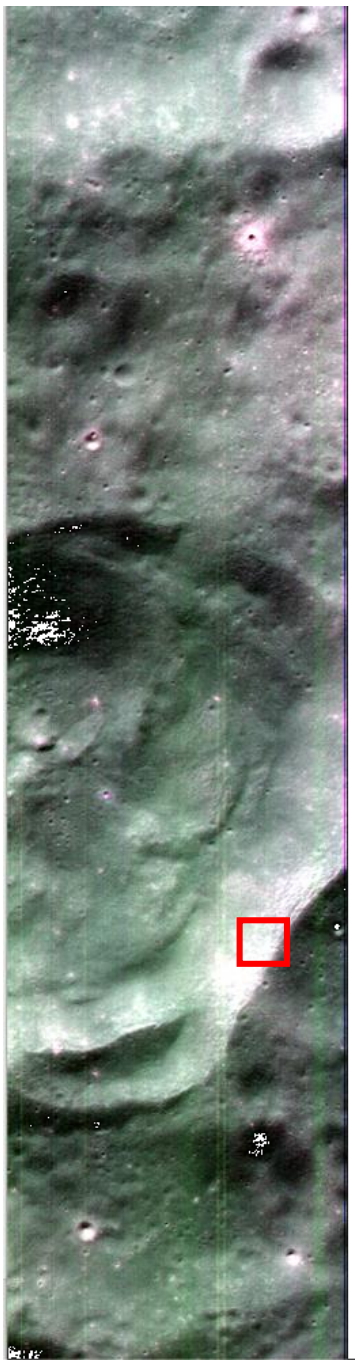
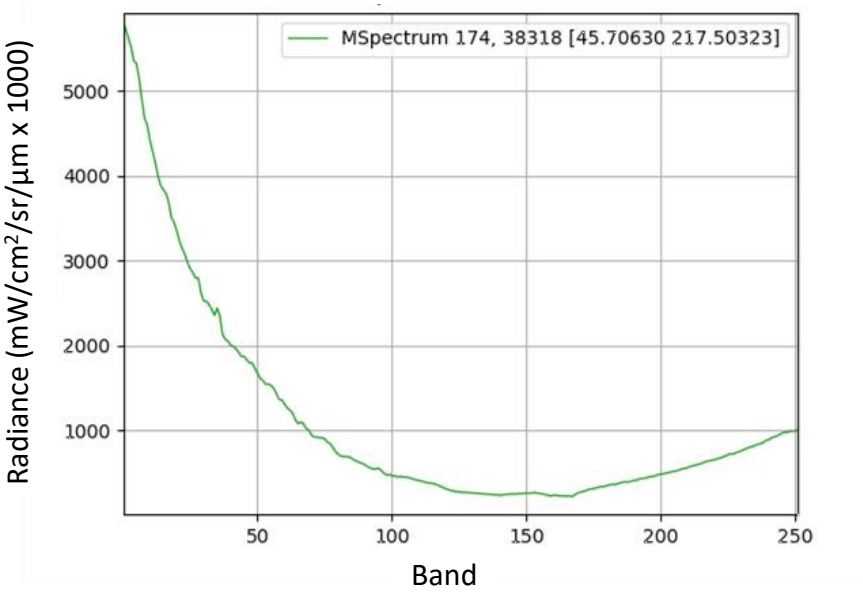
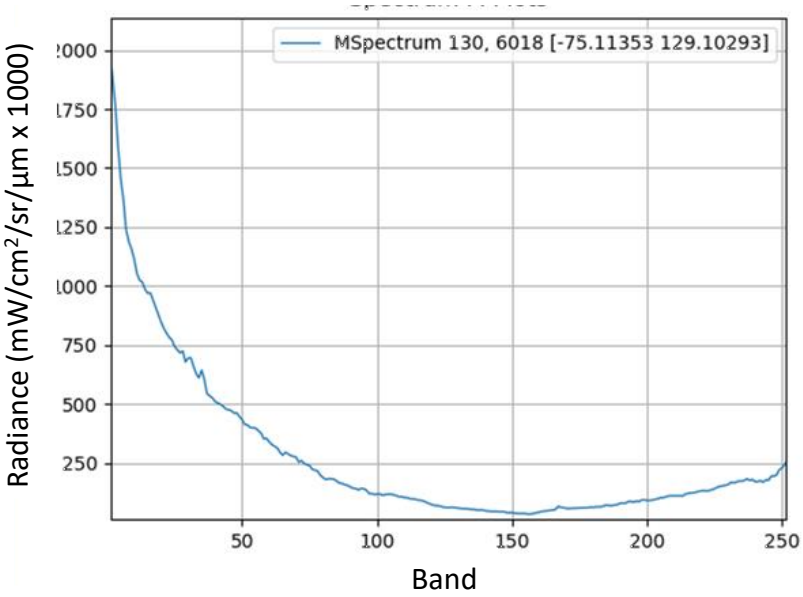




Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

IIRXXD32CHO0588402NNNN20354113900858_V2_1





Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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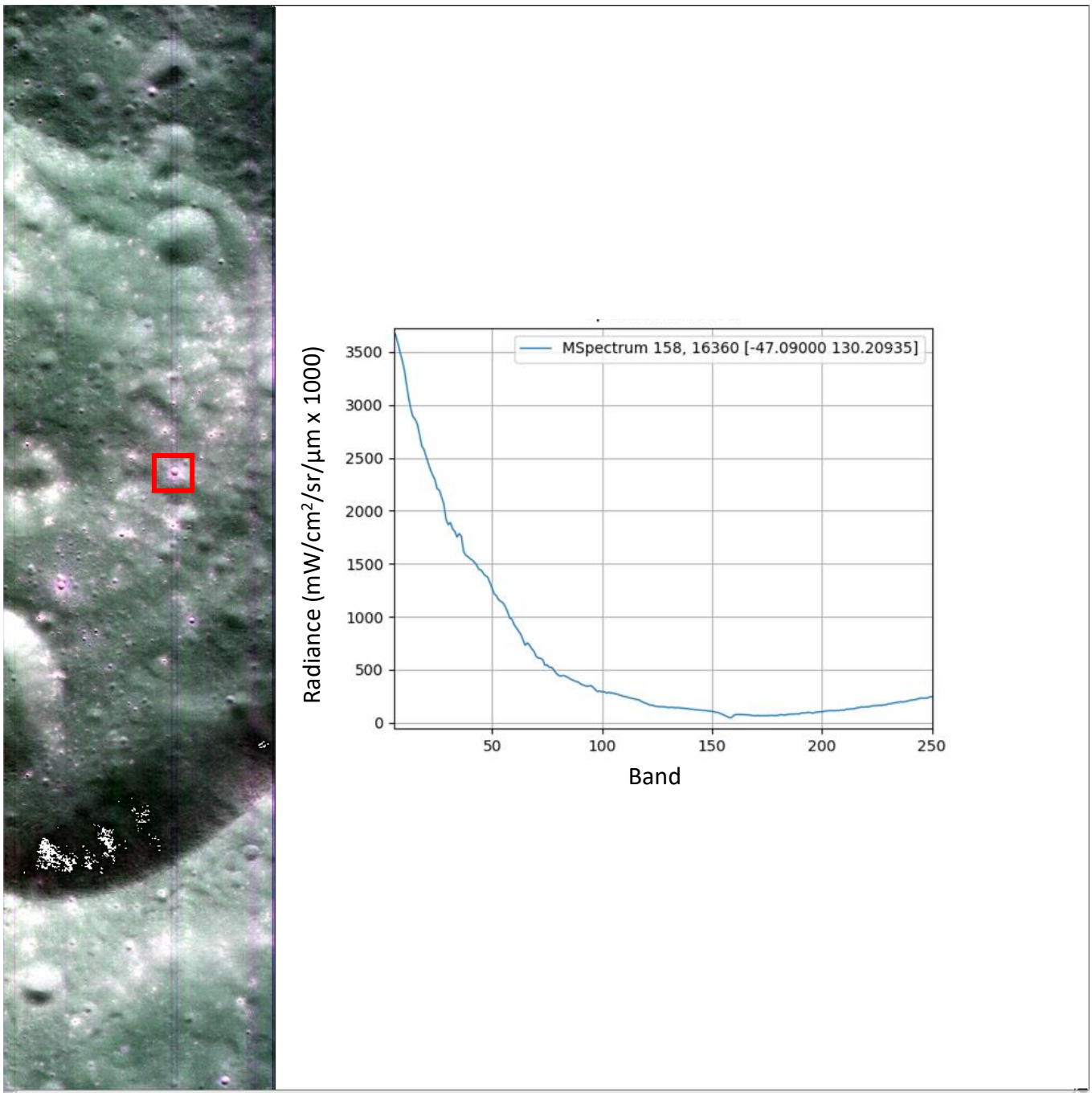

Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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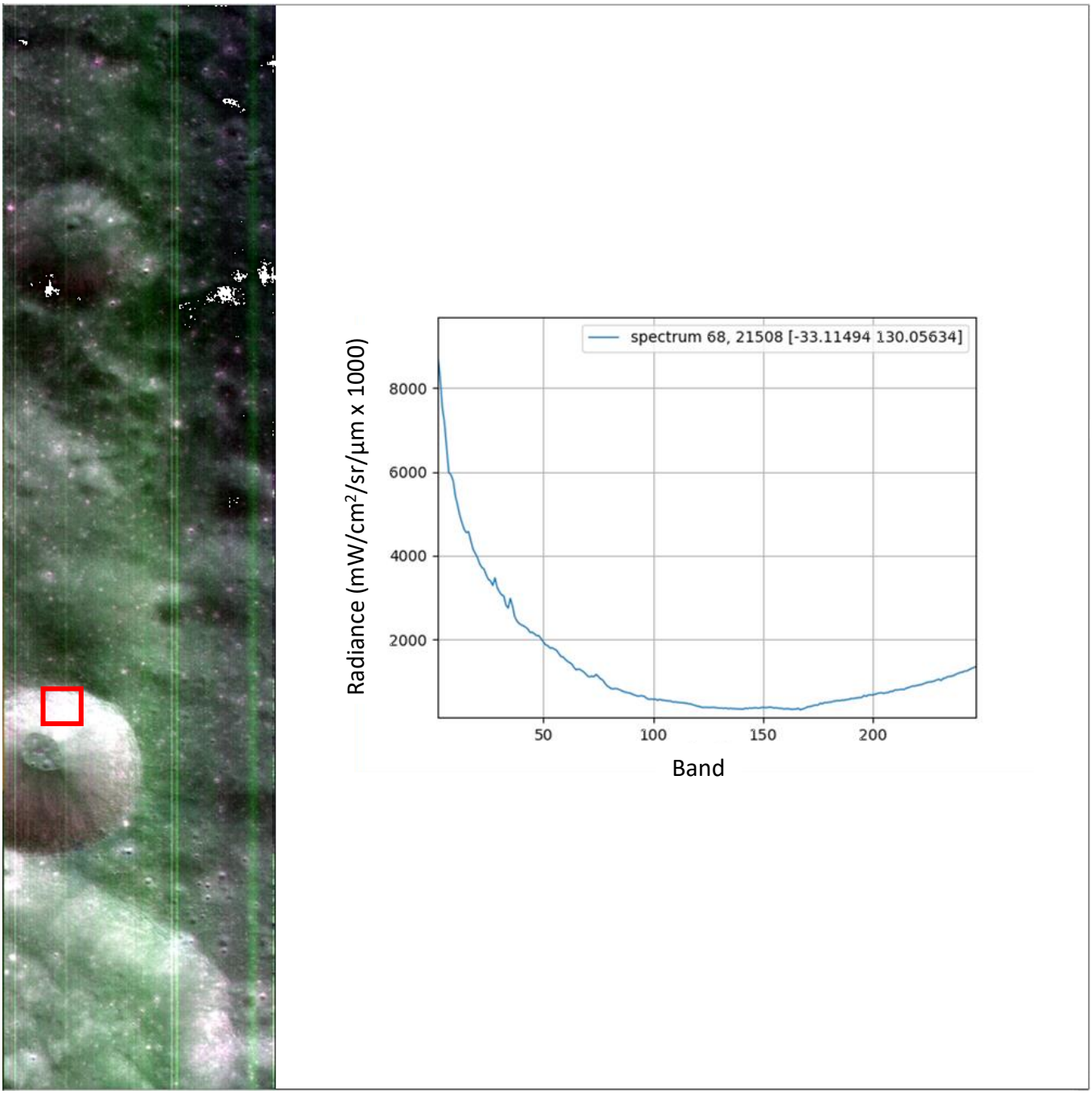

Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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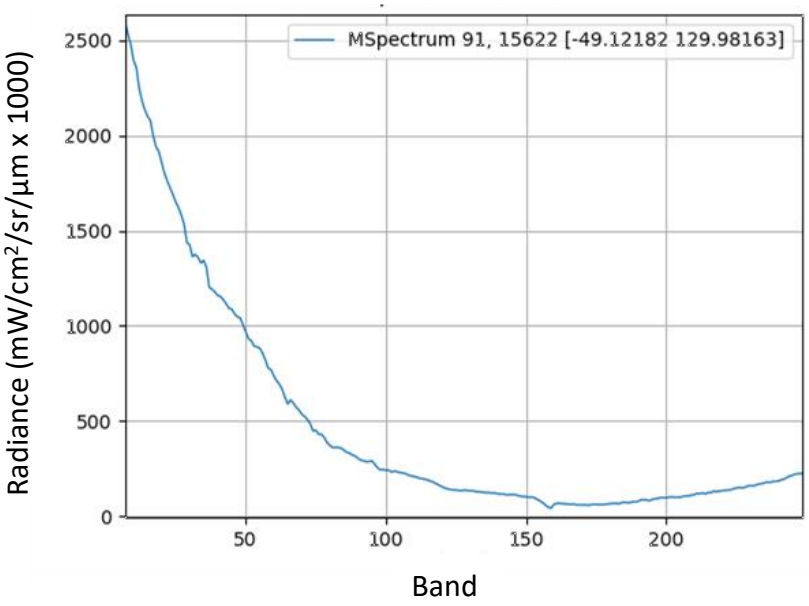
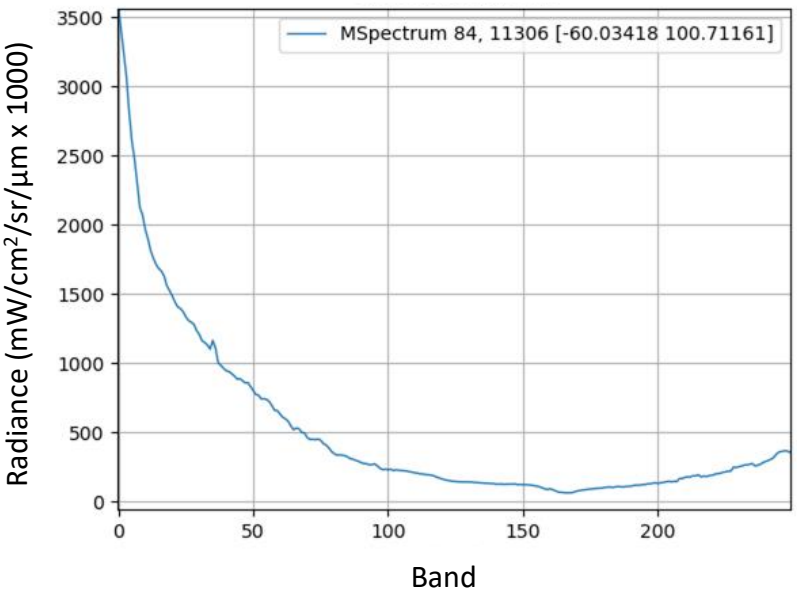


Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

IIRXXD32CHO0591002NNNN20356153307616_V1_0





Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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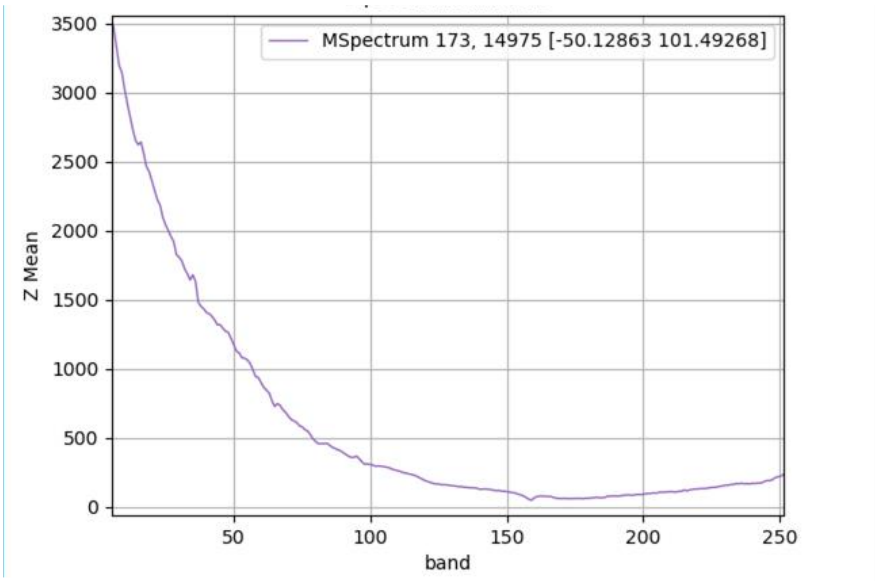
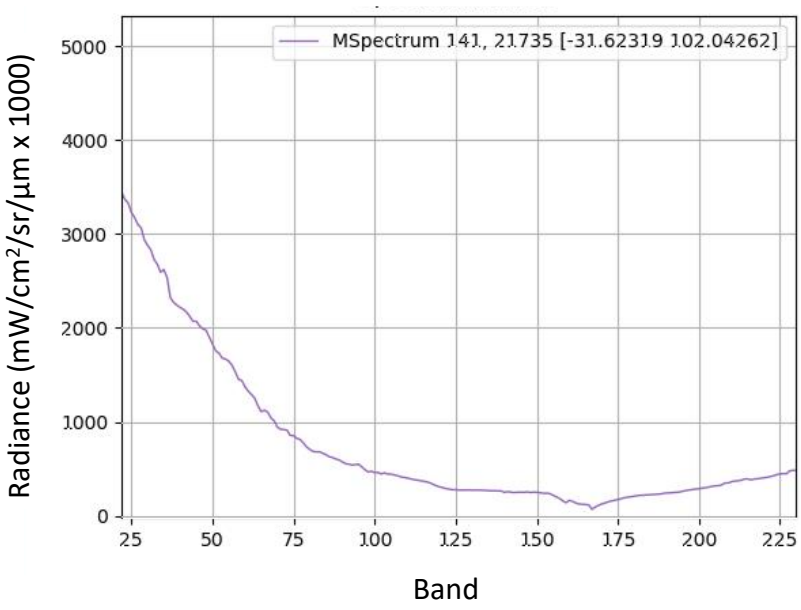


Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

IIRXXD32CHO0591002NNNN20356153307616_V1_0





Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

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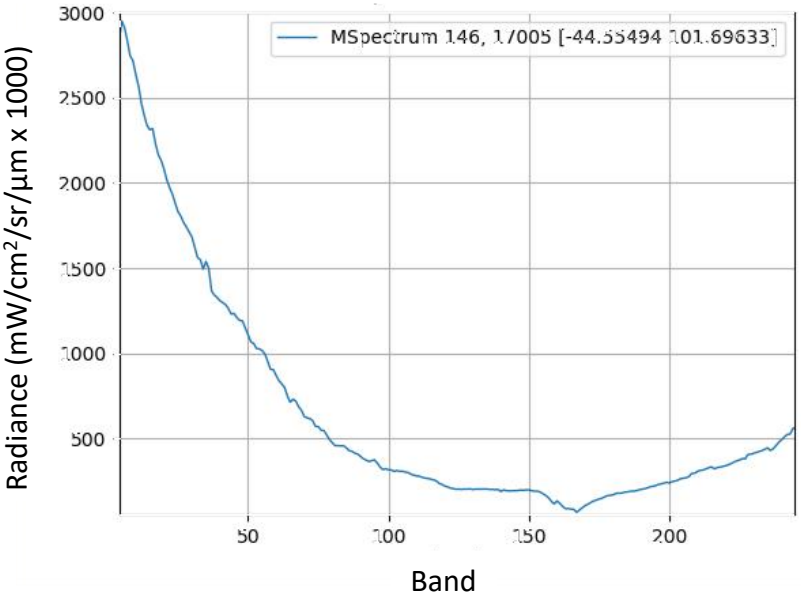
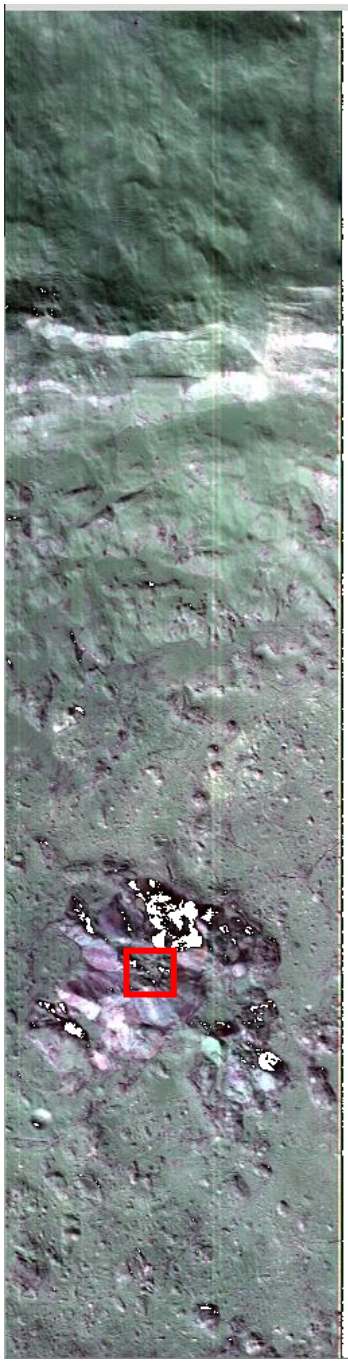
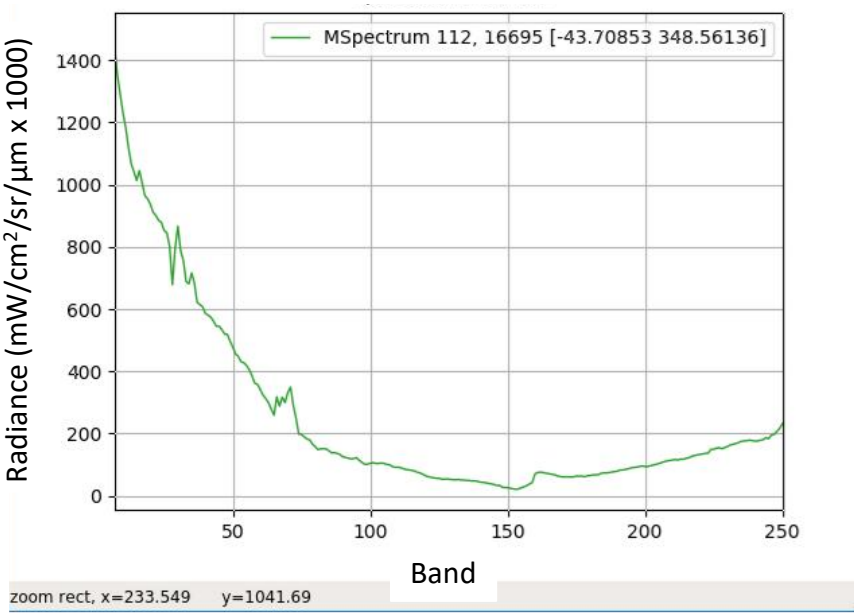


Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

IIRXXD32CHO0568102NNNN20337215407729_V1_0



Radiance plot of Tycho crater central peak



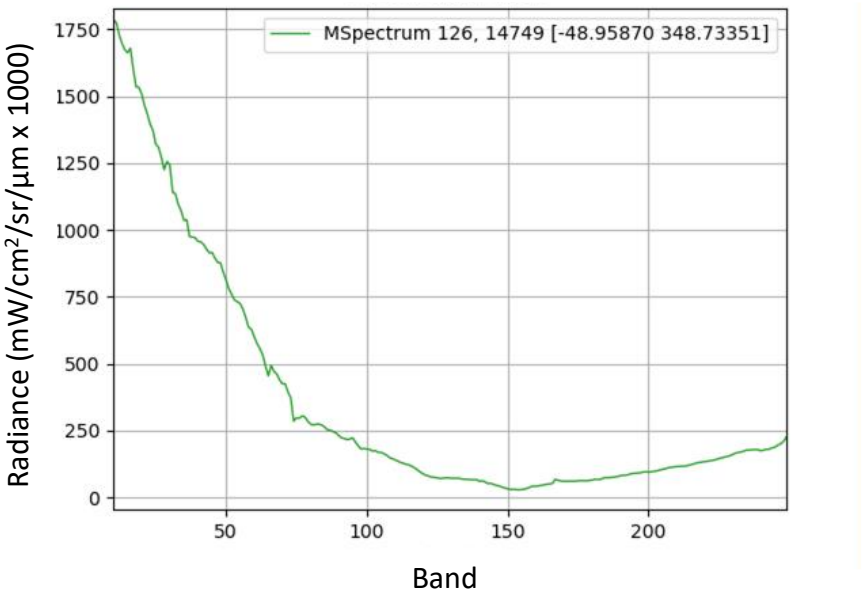
Tycho's central peak is highlighted in purple to Blue to green colors owing to the compositional Heterogeneity that exists at the central peak

Tycho crater central peak

Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

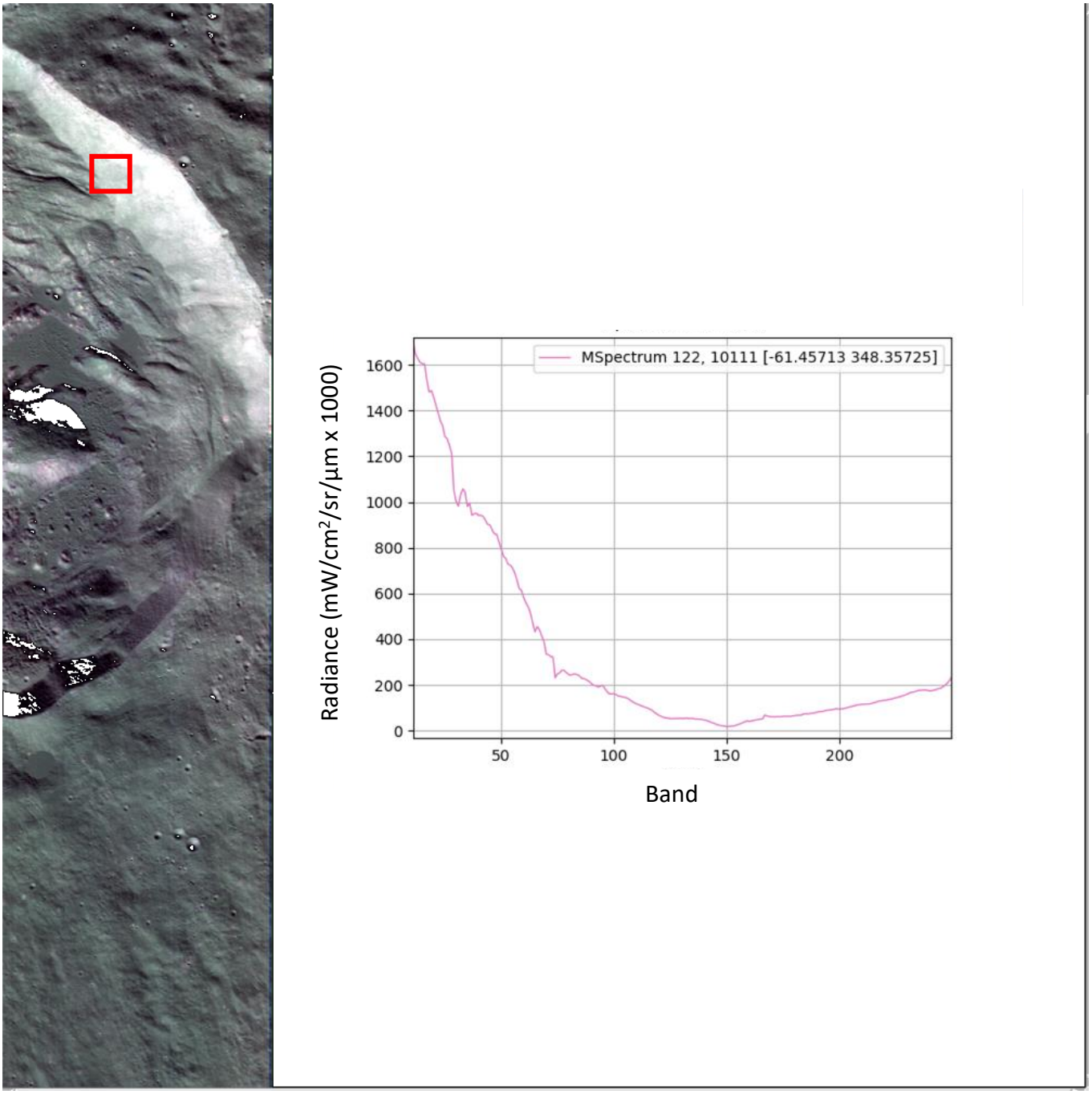
Job ID: IIRXXD32CHO0568102NNNN20337215407729_V1_0





Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

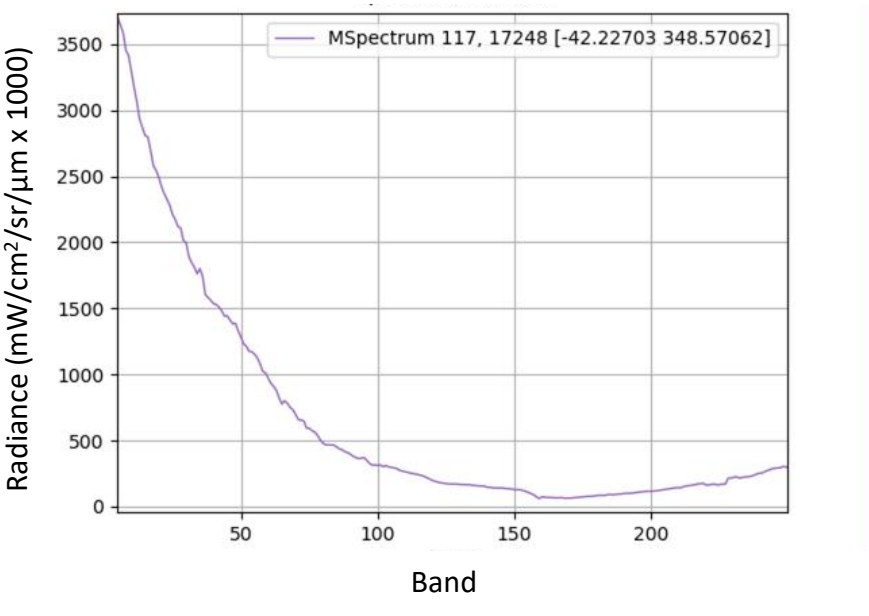
Job ID: IIRXXD32CHO0568102NNNN20337215407729_V1_0



Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

Job ID: IIRXXD32CHO0568102NNNN20337215407729_V1_0





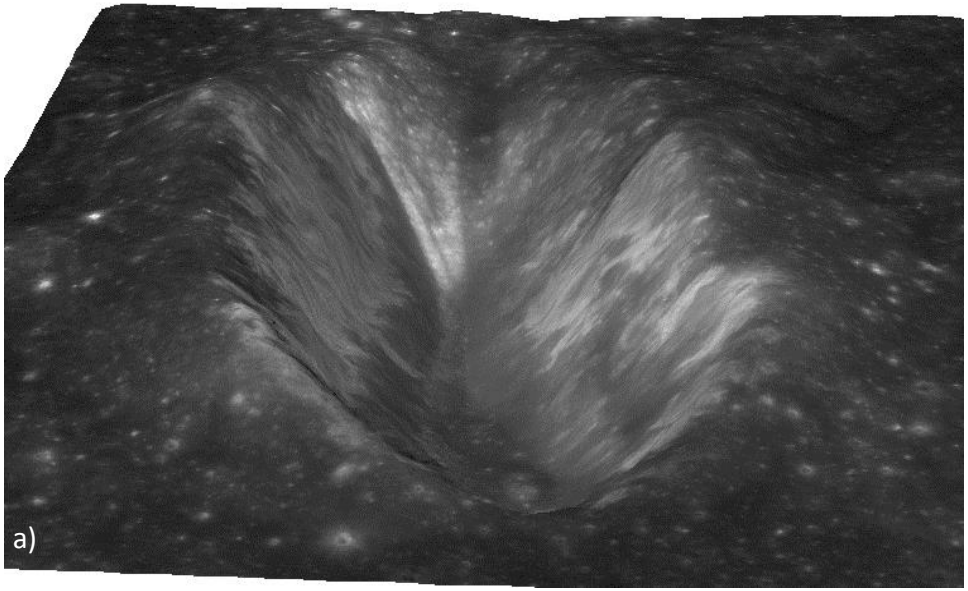
Spectral radiance plots of the various parts of the Lunar surface as obtained by Ch-2 IIRS spectrometer

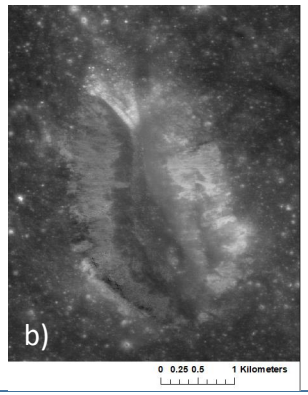


Annexure-6

Data Products of Terrain Mapping Camera -2 (TMC-2)

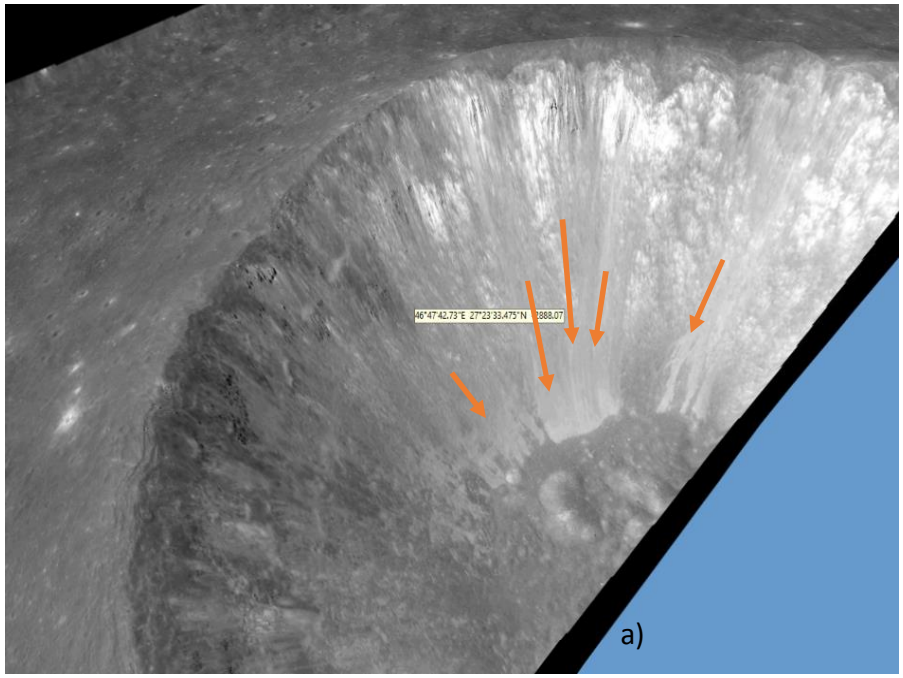
Oblique Crater

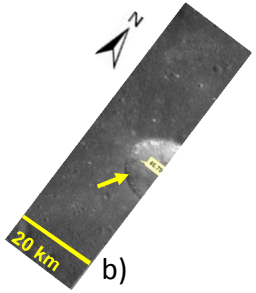




Oblique craters are generally believed to be created by high speed angular impacts (b). A 3D perspective view (a) of an oblique crater is prepared by draping the TMC-2 orthoimage on DEM. This crater (23.2799 W, 18.7235 N) lies near DraperA crater in the southern part of Mare Imbrium region. Study of such craters reveal the past impact dynamics of the incoming projectiles hitting the Moon.

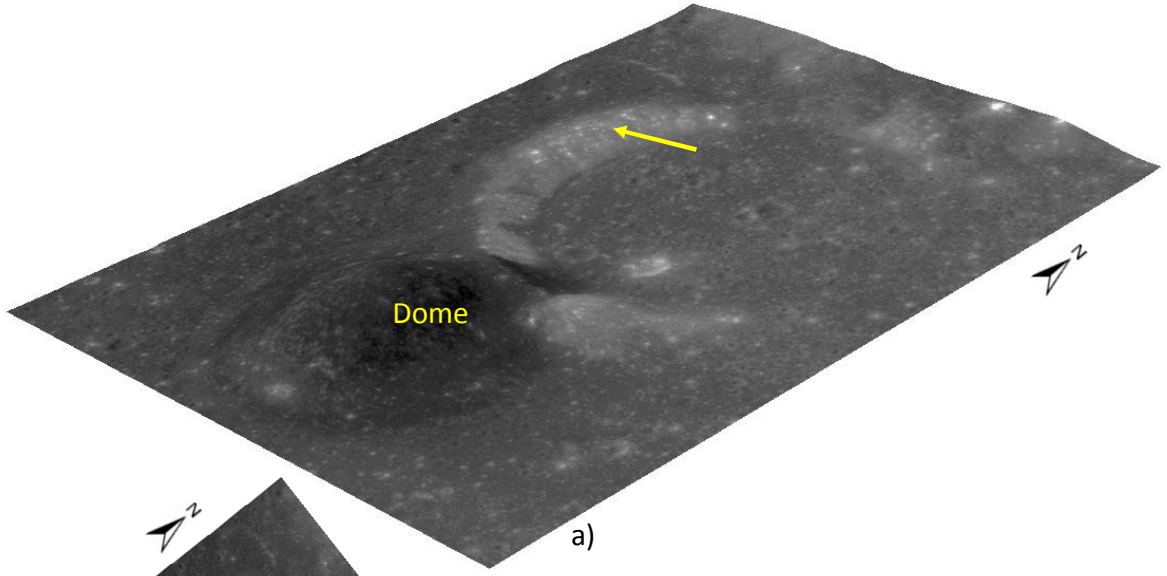
Mass Wasting in Crater





Mass wasting in a crater refers to the slumping of loosely held rock debris and/or soil downslope along the wall of crater under the effect of gravity. Image shows Tralles A crater (46.7952 E, 27.3926 N). The 3D perspective view (a) is prepared by draping the TMC-2 orthoimage (b), on DEM. The signs of mass wasting are seen on the inner wall of crater (red arrows). Debris accumulated at the floor of the crater are also observed.

Lava-Filled Crater and an effusive dome



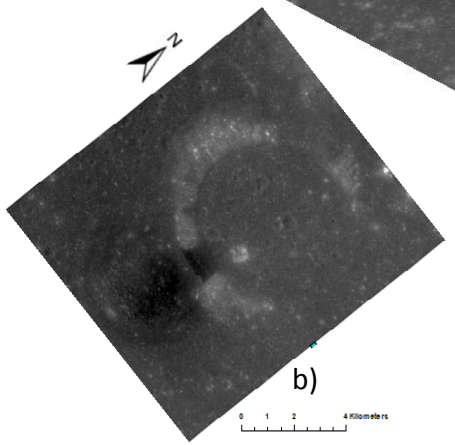
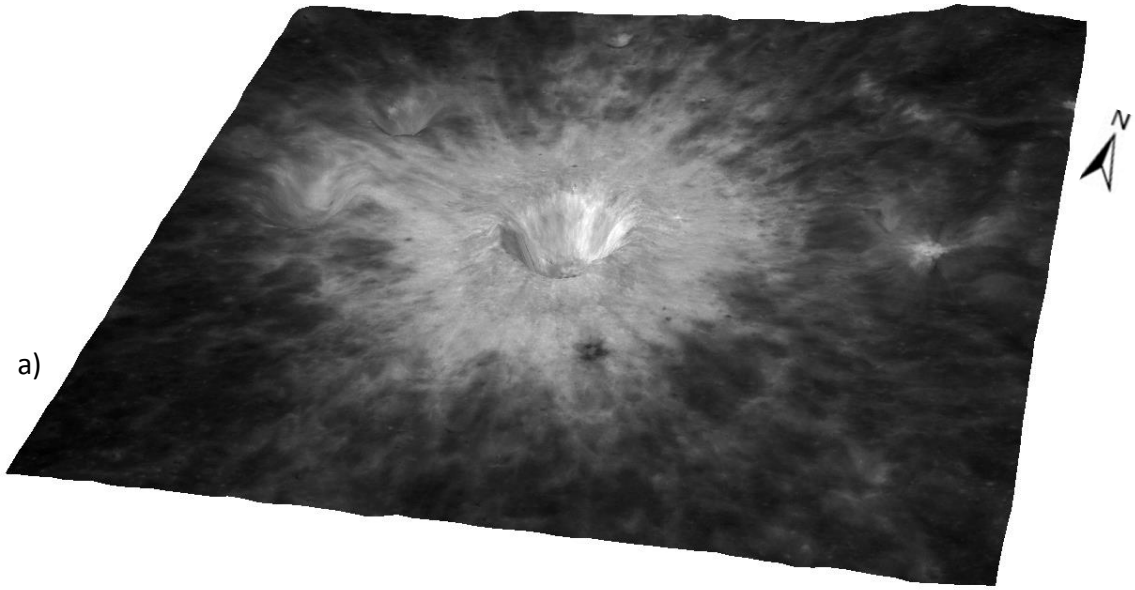
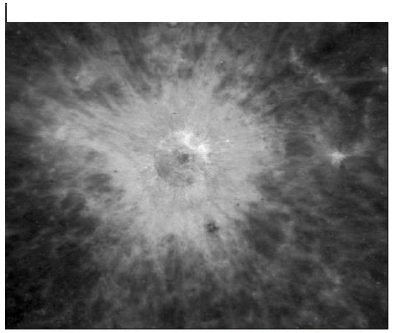


Image shows partially exposed rims of a crater (Yellow Arrow; 3.2696 E, 16.4446 N) lying in Mare Vaporum region near Yangelô crater. The crater has been filled with Lava, probably supplied by an effusive dome adjacent to the crater (b). The 3D perspective view (a) is prepared by draping the TMC-2 orthoimage on DEM.

Fresh Young Crater

a)

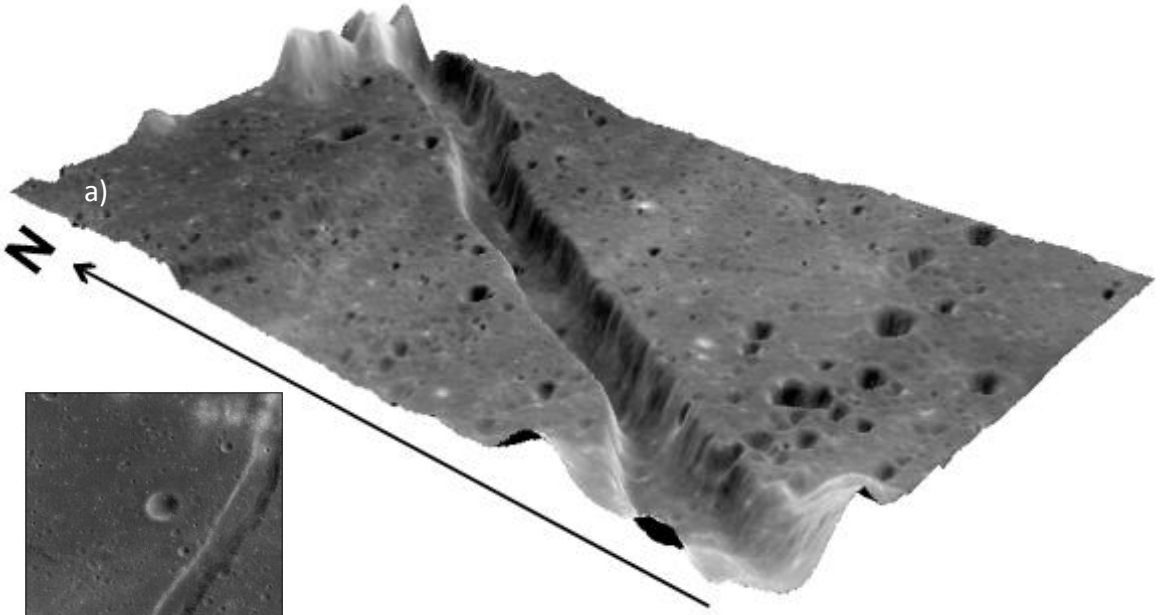


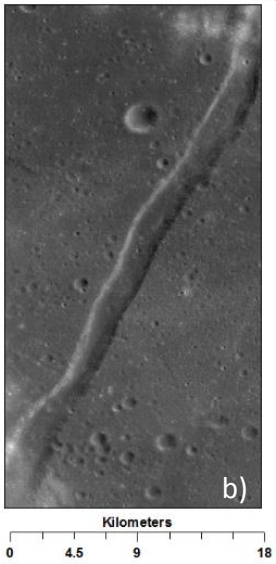


b)

The fresh young craters are identified by bright rays radially and uniformly distributed around them. TMC-2 Image shows star shaped bright ejecta material spread around a fresh young crater (64.1461 W, 14.5529 N) in western Oceanus Procellarum region near Galilaei S crater. The ejecta material (bright) can be seen uniformly spread in all directions for this fresh crater (b). The 3D perspective view (a) is prepared by draping the TMC-2 orthoimage on DEM.

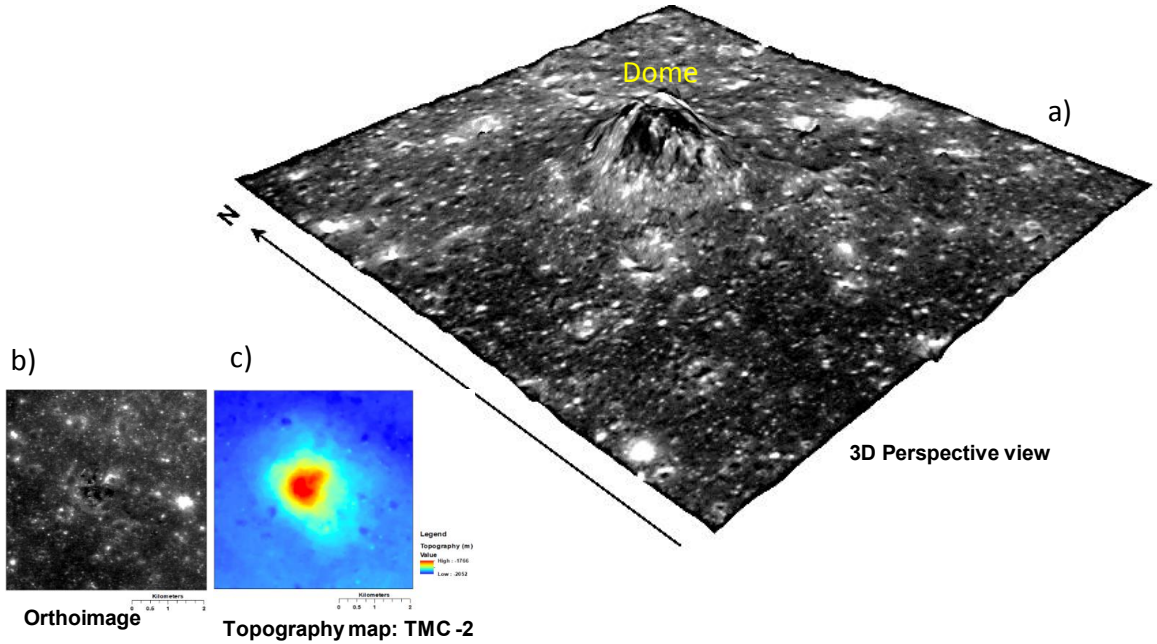
Lunar rilles proximal to basin margin





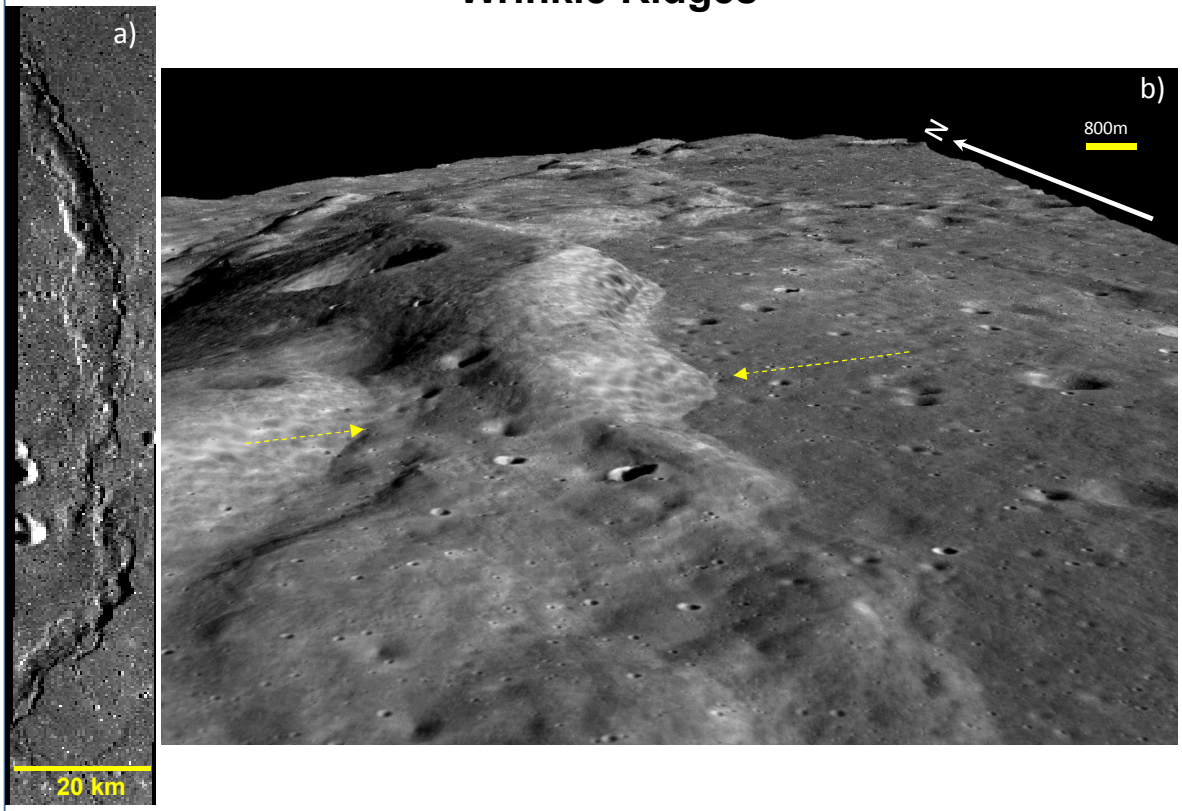
Many large rilles (trench like structures) running for 100s of kilometer some times tend to follow the margins of Mare basins in curvilinear/concentric form. This Rille (b, 329.3^0E,26.4^0N) is part of a large concentric rille at the basin margin of Mare Humorum. This might have been emplaced due to tectonic/volcanic processes. 3D perspective view of the same is shown in (a).

Lunar Volcanic Dome



Lunar domes represent past volcanic activity of the Moon and they are important evidences of sites of lava effusion. TMC-2 DEM at spatial resolution of 10 m , enhances topographic variations (c) and helps in identification / mapping of lunar domes/cones having small relief. Merging of orthoimage (b) and DEM (c) helps in creating 3D perspective view (a). TMC-2 data also helps in surface age determination and estimation of rheological properties (viscosity of lava, effusion rate etc.) based on morphometric parameters (diameter, height). Orthoimage (b), topography (c) and 3D perspective view (a) of a dome (57.93^0W, 15.30^0N) mapped in the Marius hills region are shown in the maps

Wrinkle Ridges



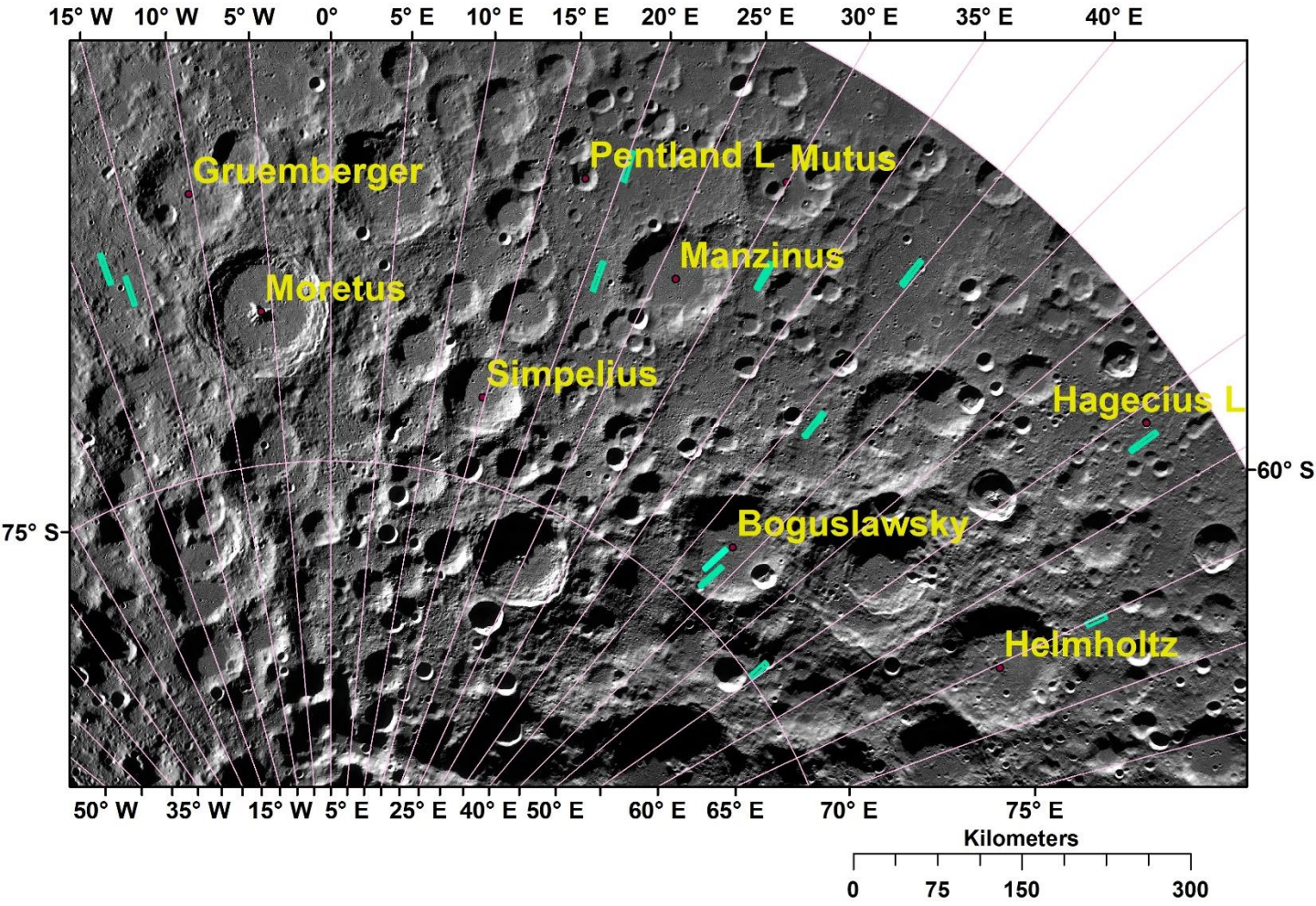
Wrinkle Ridges are low sinuous ridges found in Lunar Maria regions and involve faulting / folding of the lunar crust and believe to be of tectonic origin. They are evidence of lunar crustal shortening. Orthoimage (a) and 3D perspective views (b) of wrinkle ridge Dorsa Geikeie are shown. Yellow arrows indicate direction of compressional stress perpendicular to the ridge.



Annexure-7

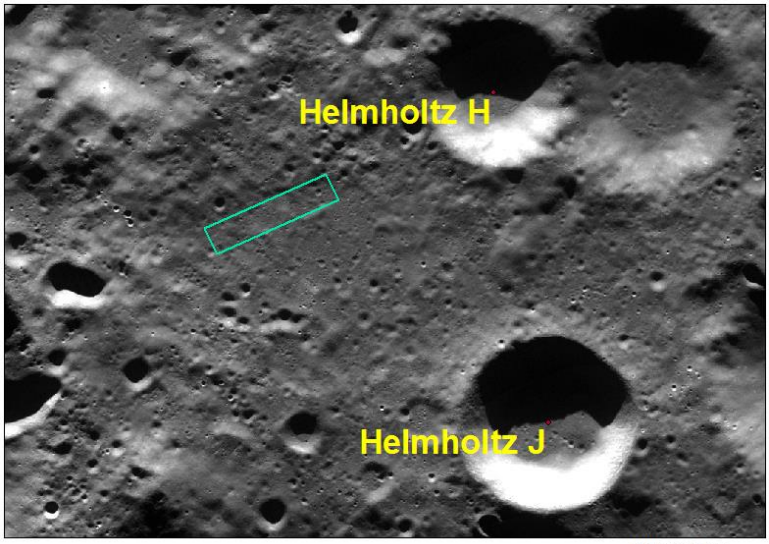
Data Products of Orbiter High Resolution Camera (OHRC)

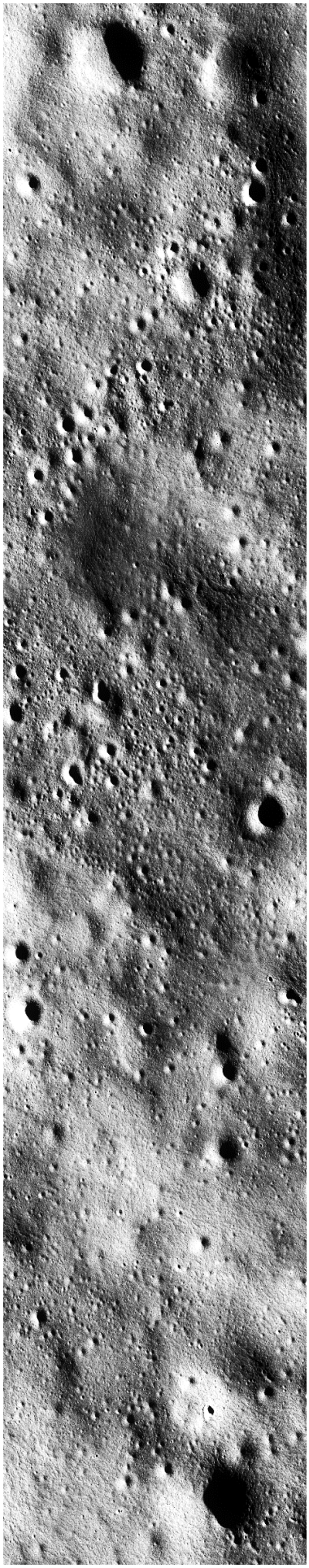
Coverage of Orbiter High Resolution Camera (OHRC) Coverage Map and Images



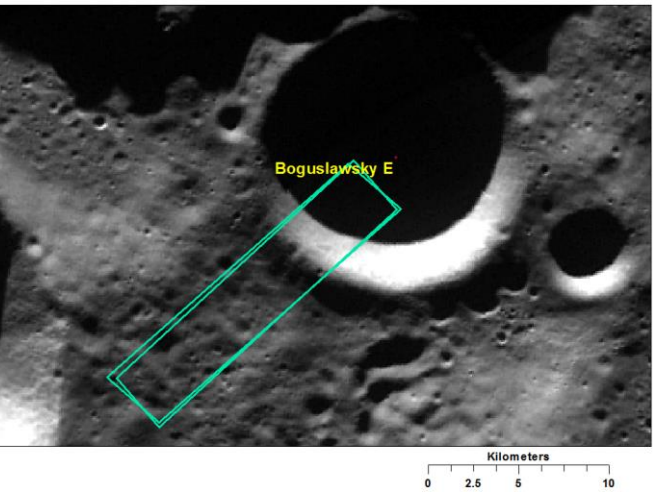
Cyan colour rectangles represent the location of images

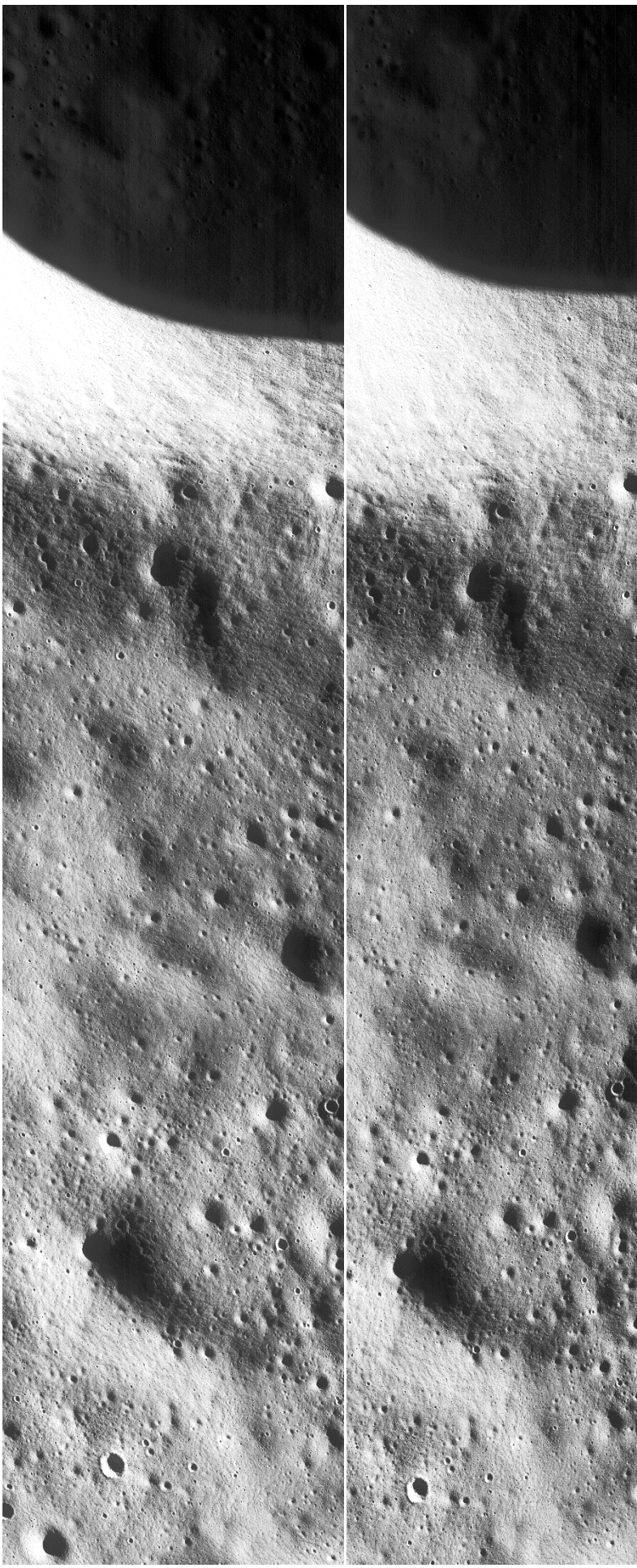
Single image acquired on 03 Sep, 2019 near Helmholtz H crater



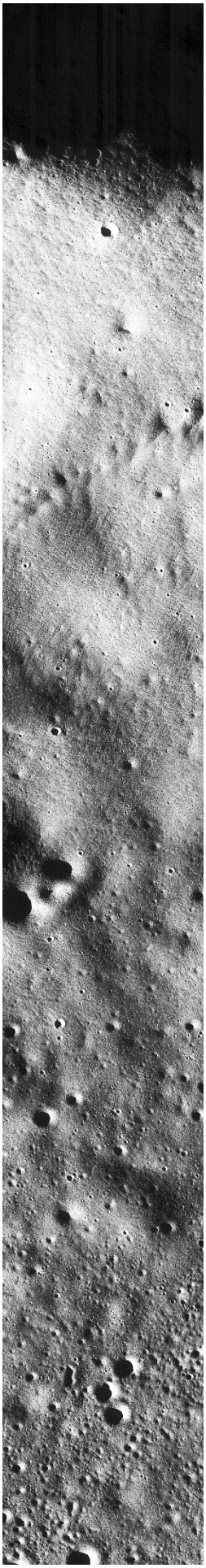


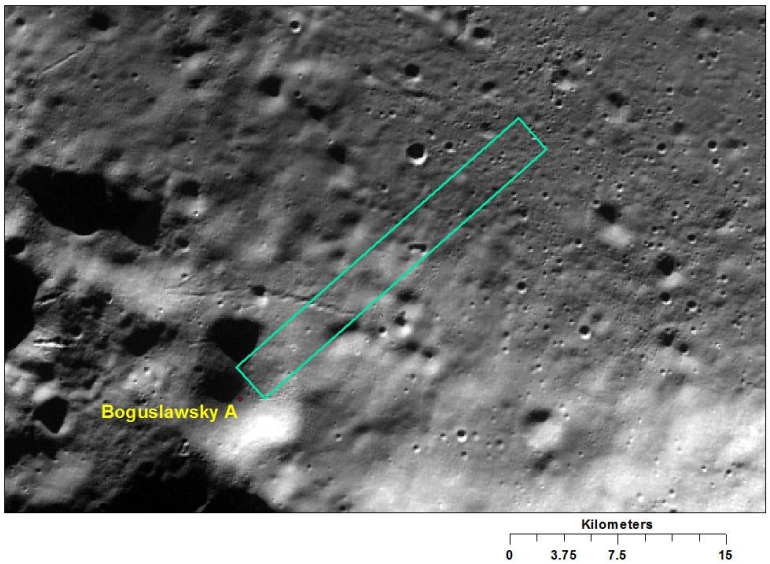
Pair of images acquired on 04 Sep, 2019 near Boguslawsky E crater



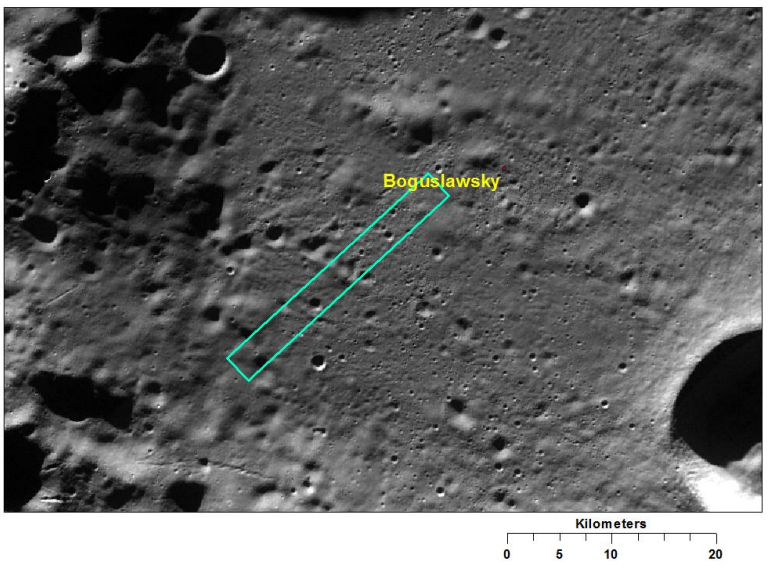


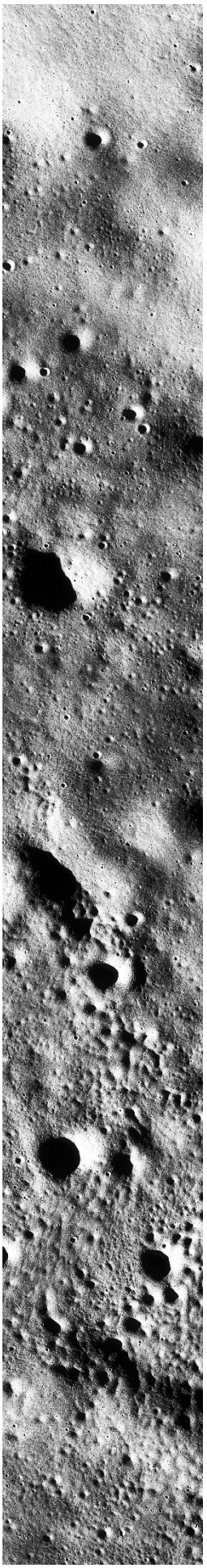
Single image acquired on 29 Feb, 2020 near Boguslawsky A crater



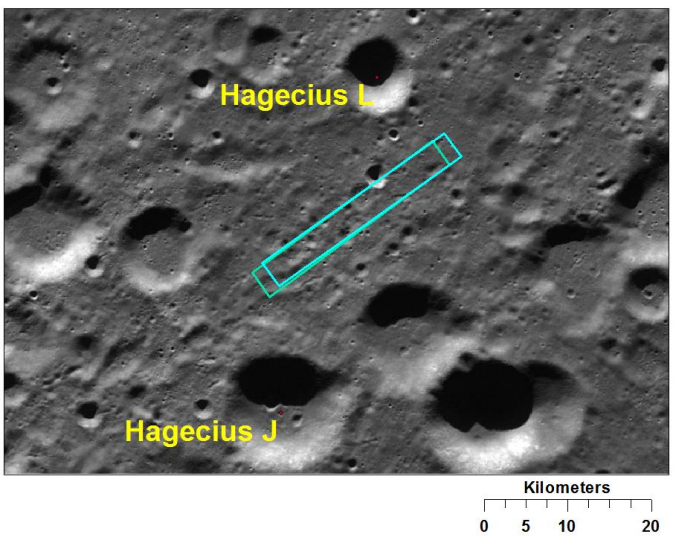


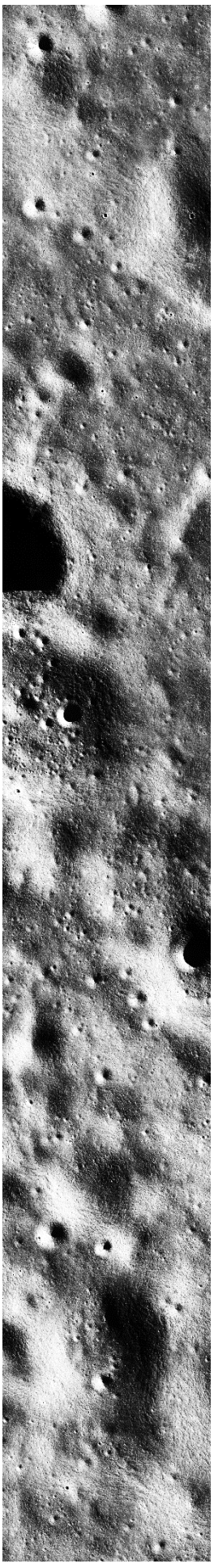
Single image acquired on 29 Feb, 2020 on Boguslawsky crater floor

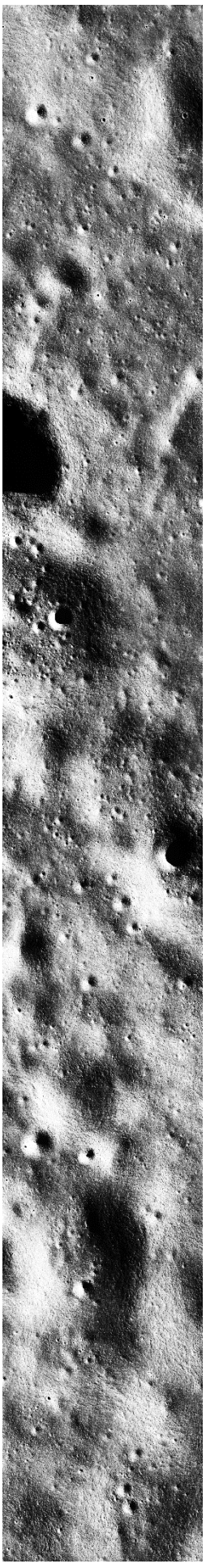




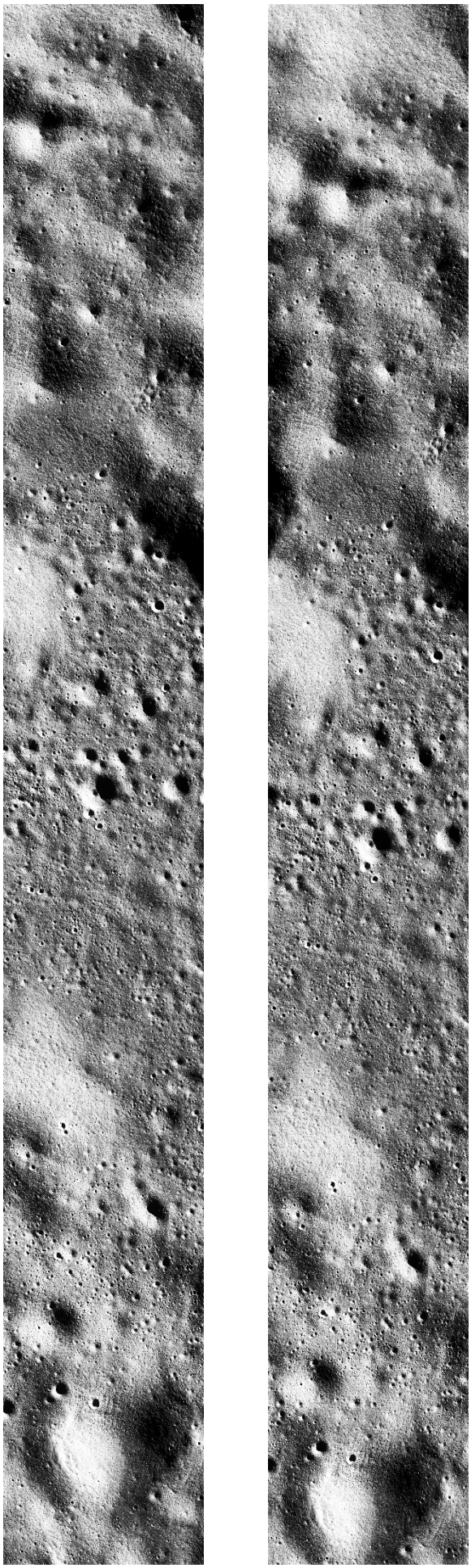
Pair of images acquired on 24 Aug, 2020 near Hagecius L crater

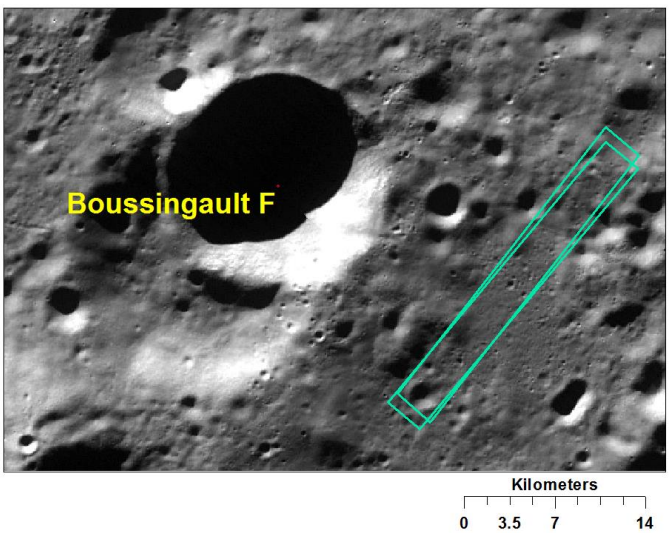




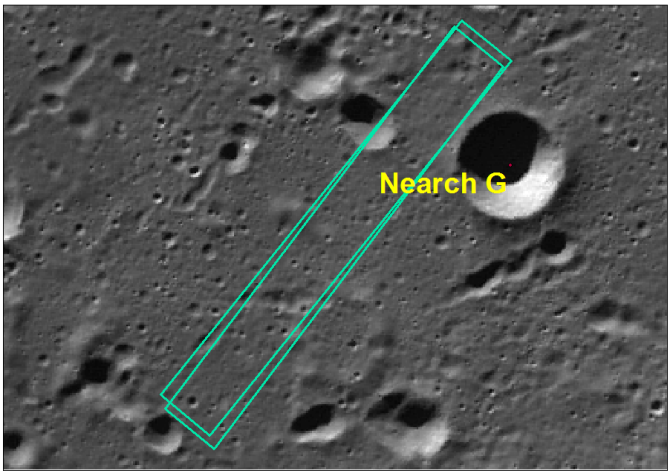


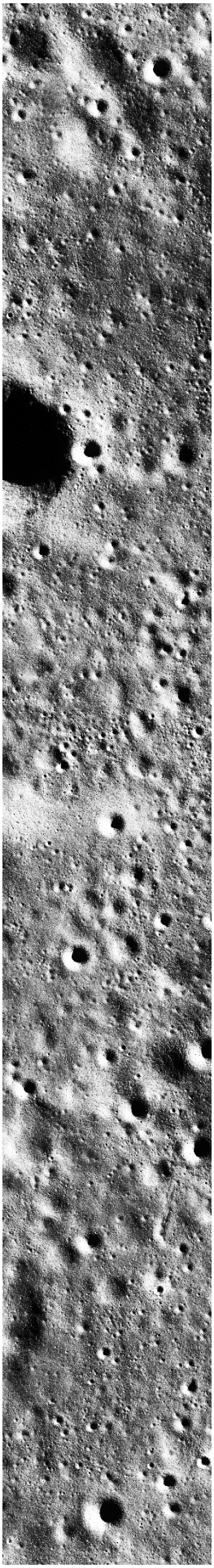
Pair of images acquired on 25 Aug, 2020 near Boussingault F crater

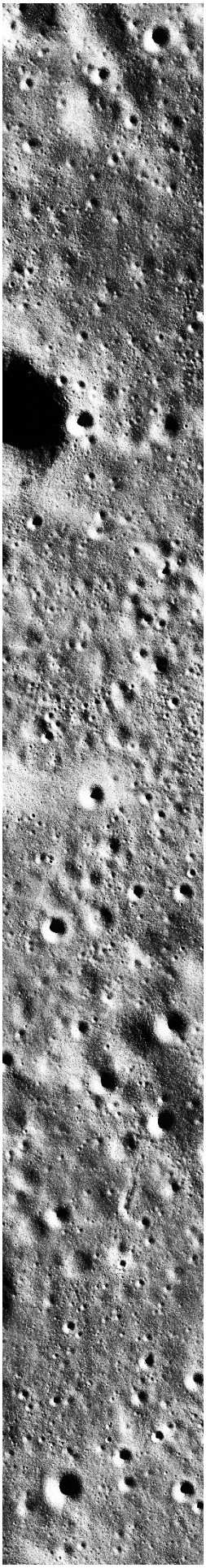




Pair of images acquired on 25 Aug, 2020 near Nearch G crater

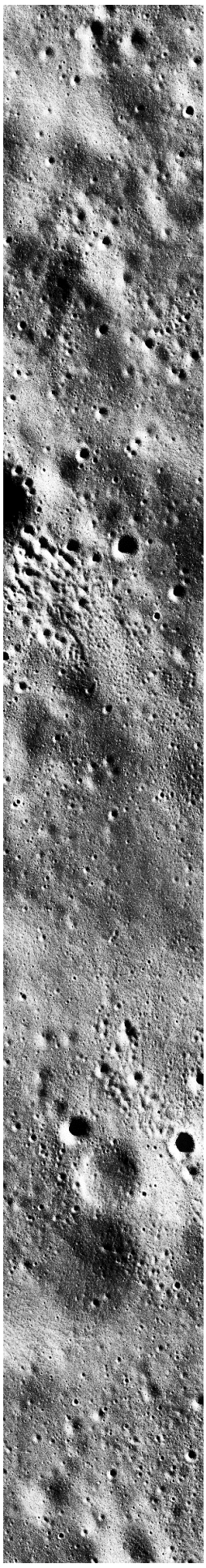


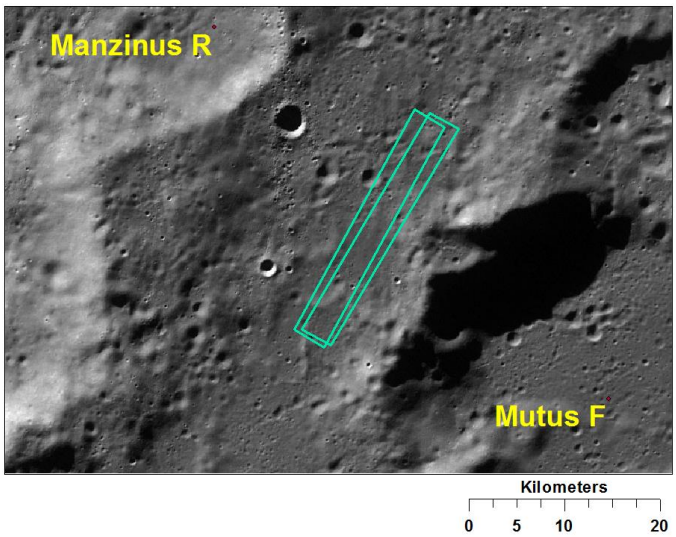




Pair of images acquired on 26 Aug, 2020 near Manzinus R crater

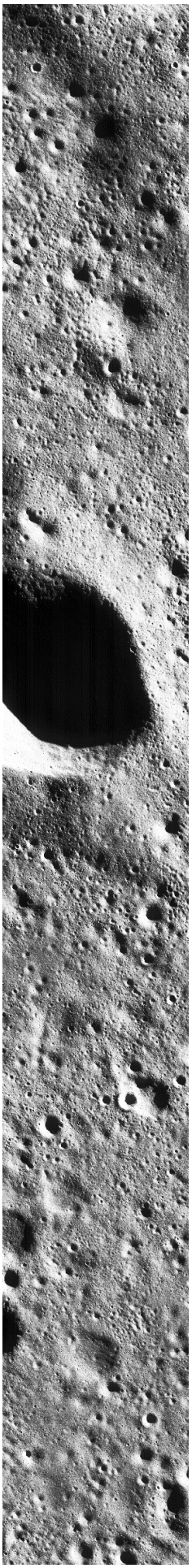


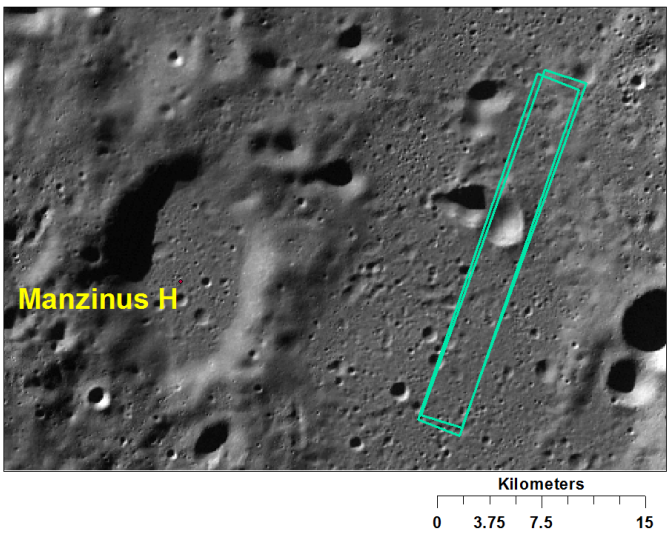




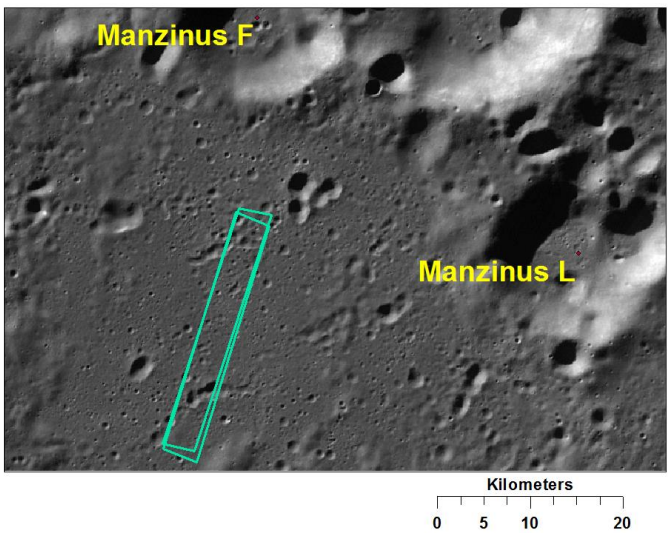
Pair of images acquired on 27 Aug, 2020 near Manzinus H crater

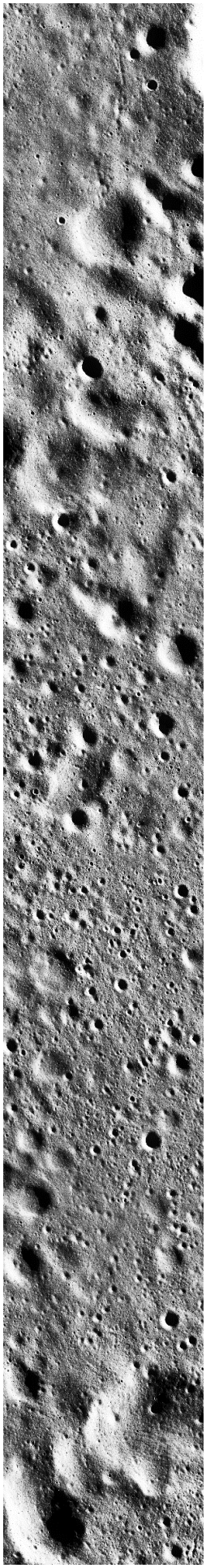


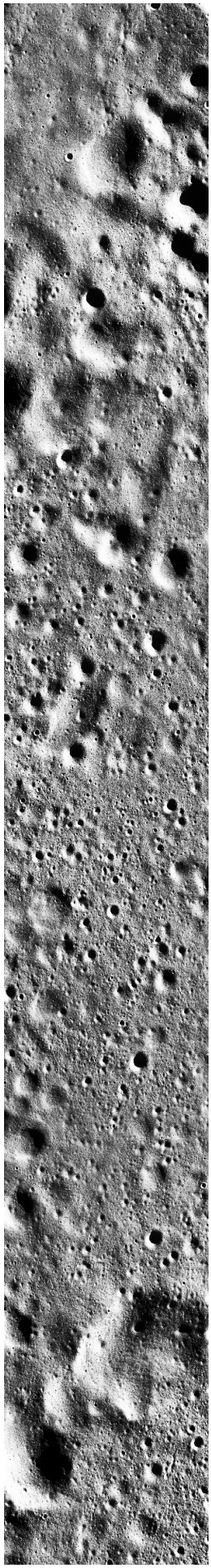




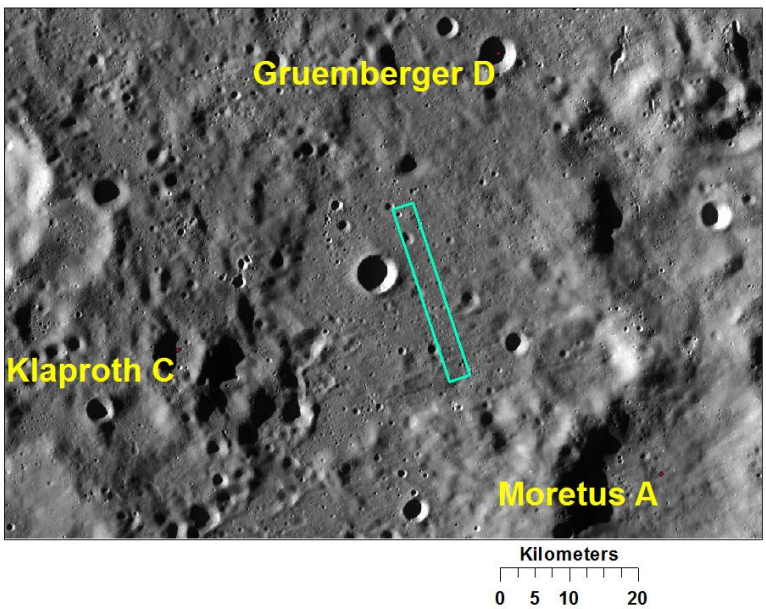
Pair of images acquired on 27 Aug, 2020 near Manzinus F crater

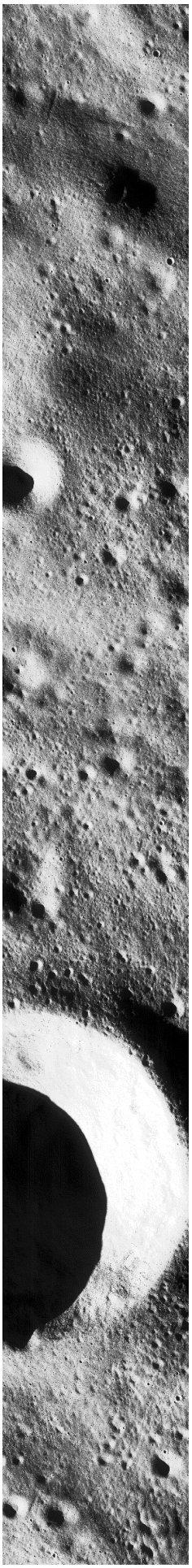




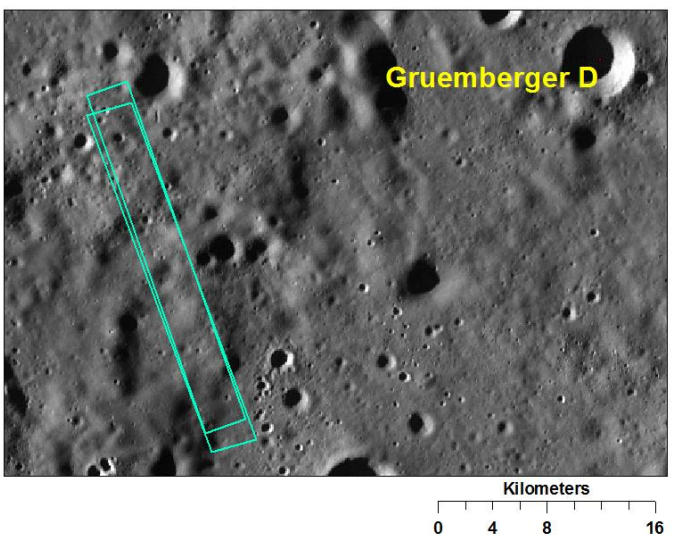


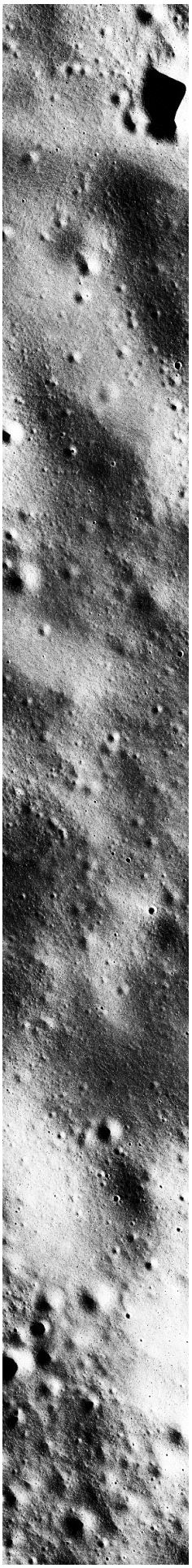
Single image acquired on 23 Feb, 2021 near Moretus A crater





Pair of images acquired on 23 Feb, 2021 near Gruemberger D crater



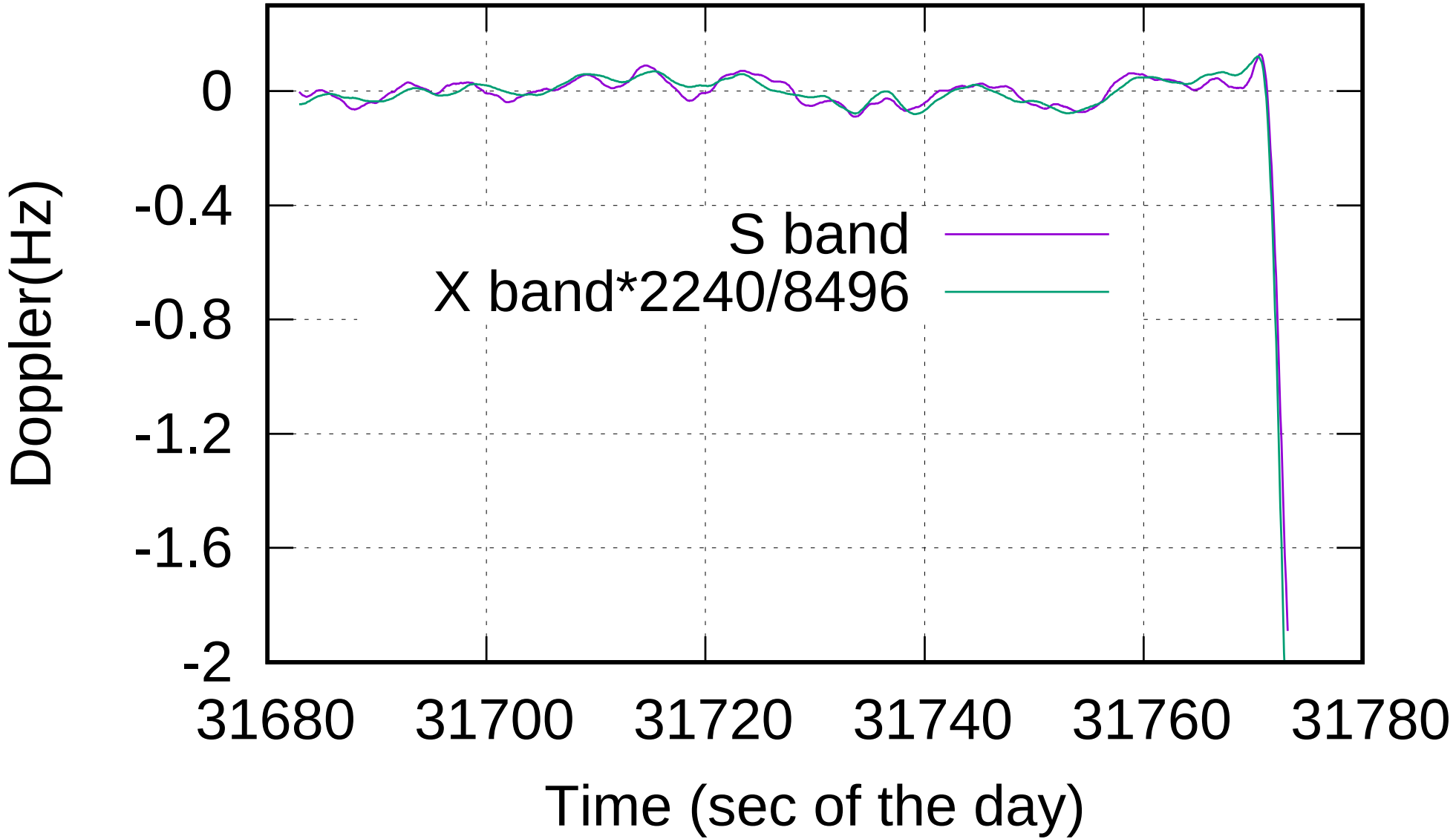






Annexure-8

Dual Frequency Radio Science (DFRS) Experiment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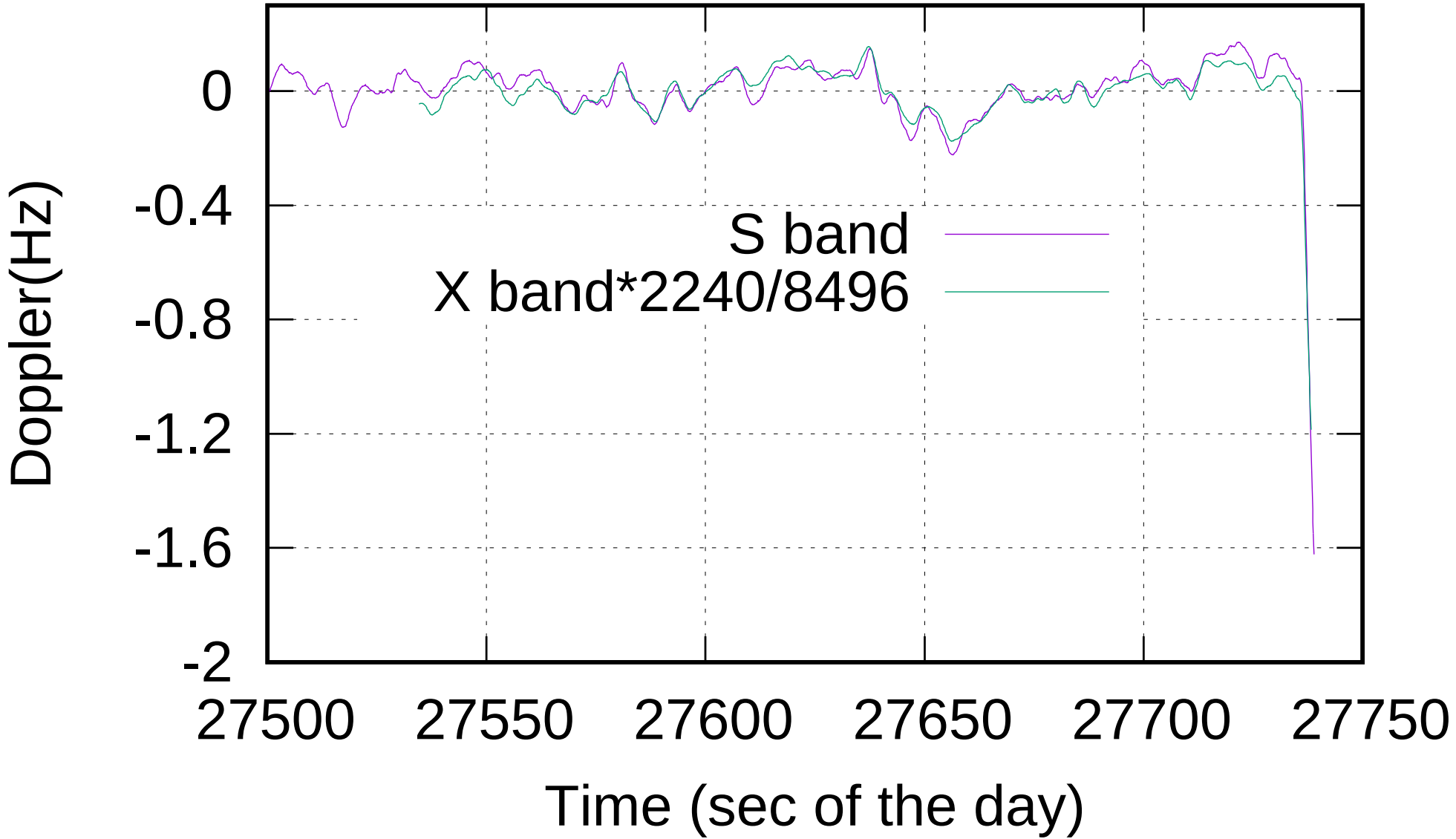
-0.8
-1.2
-1.6
-2
Doppler(Hz)
S band
X band*2240/8496
31680
31700
31720
31740
31760
31780
Time (sec of the day)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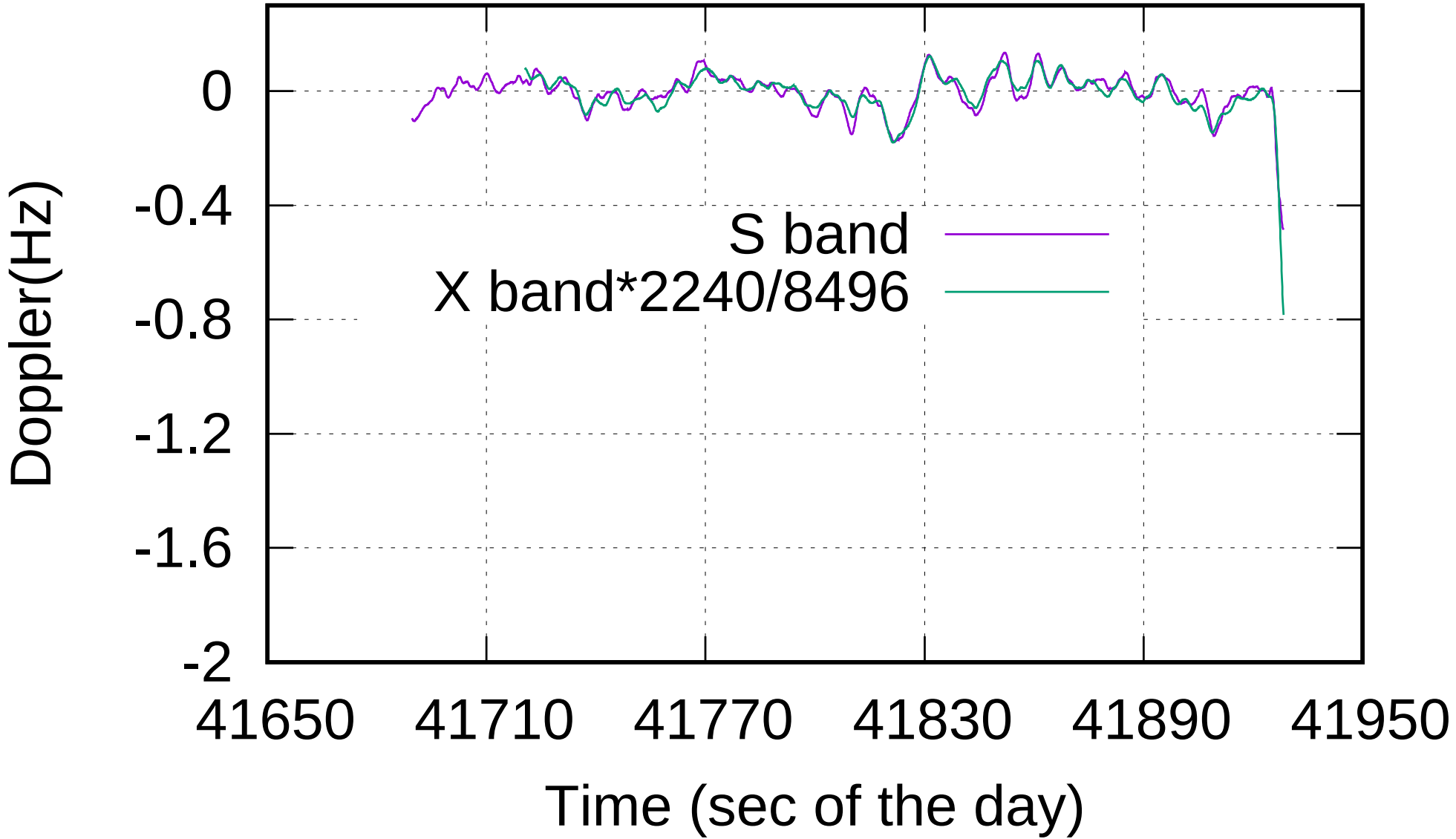
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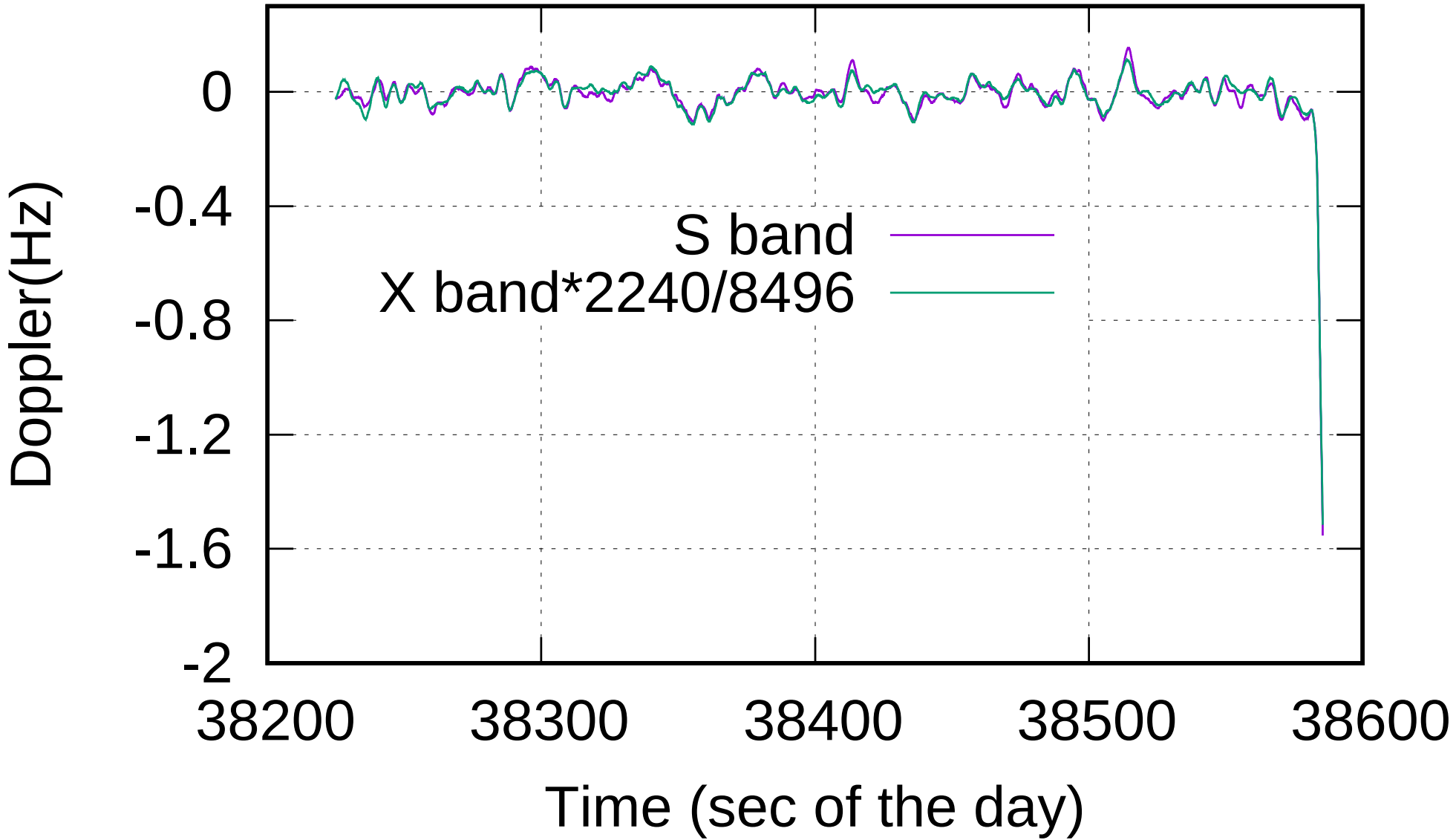
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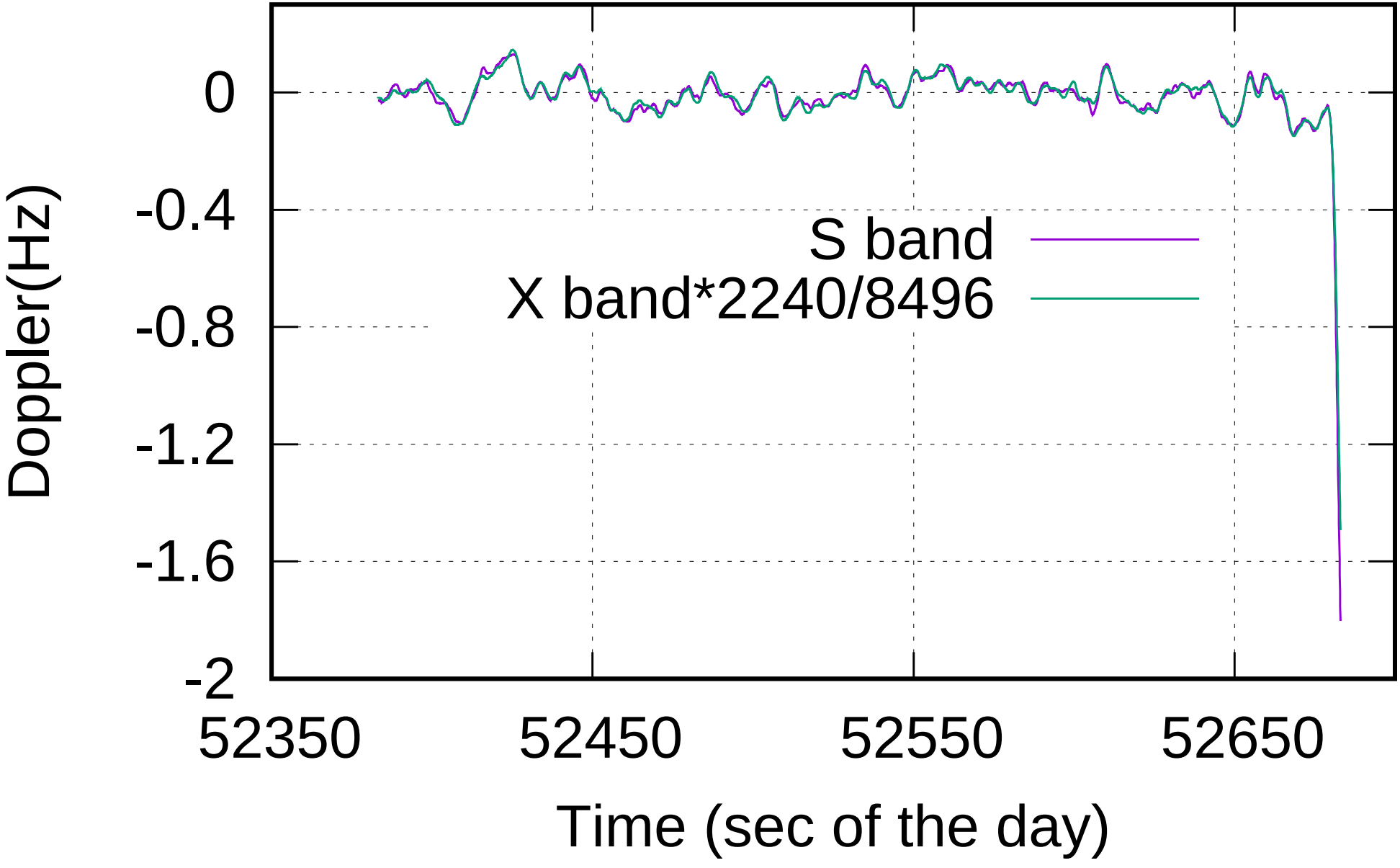
Time (sec of the day)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X band*2240/8496
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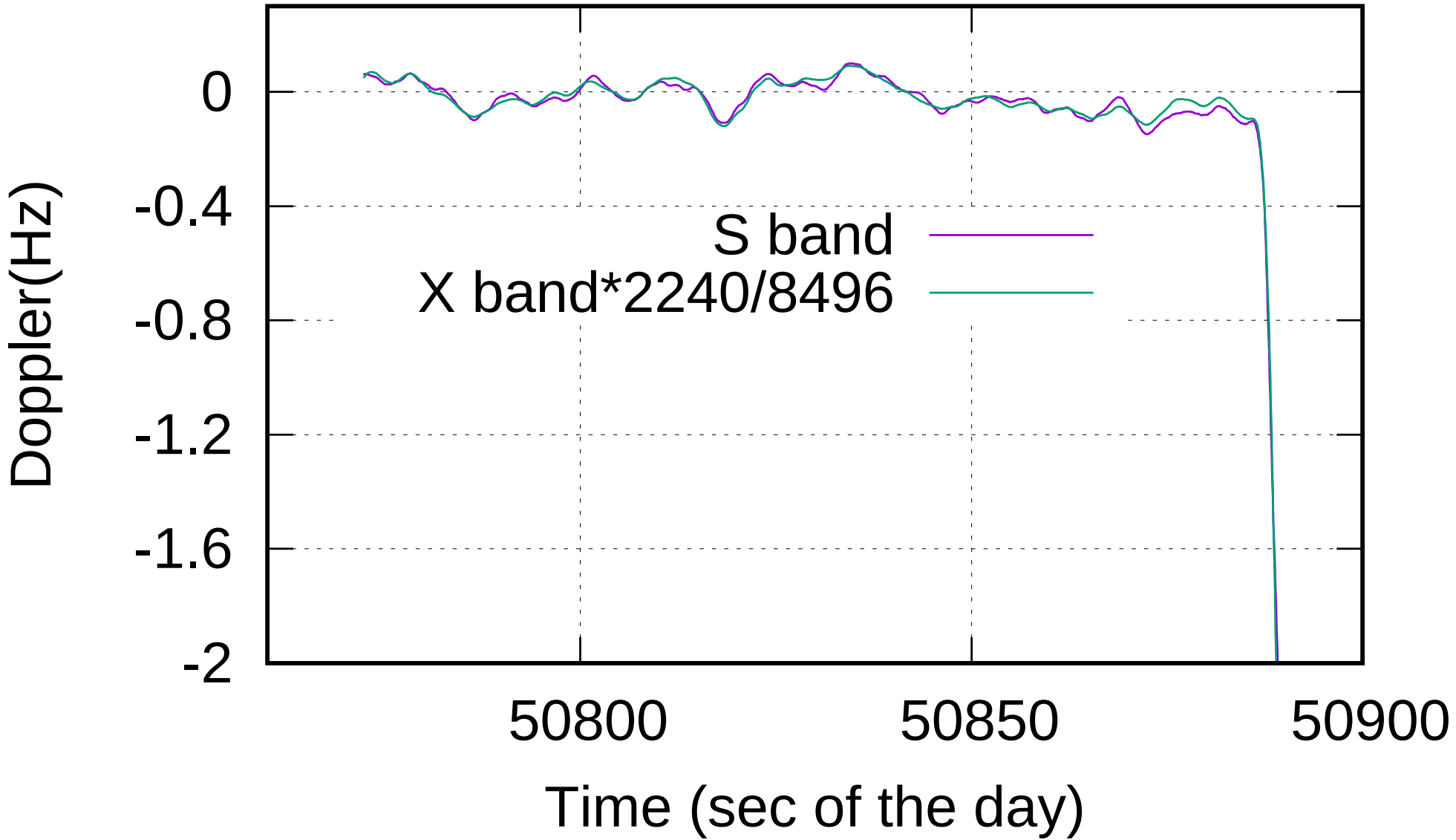
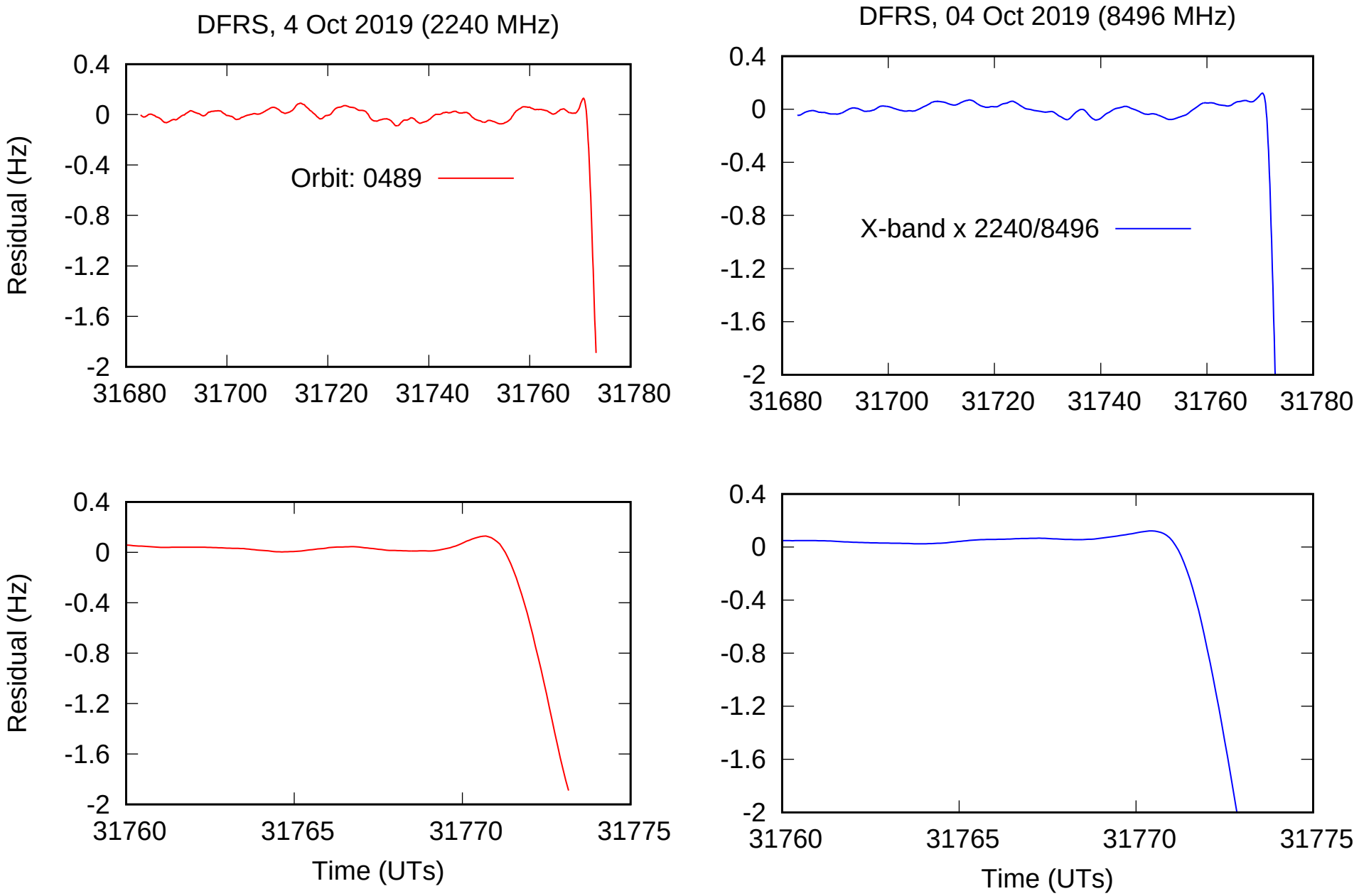
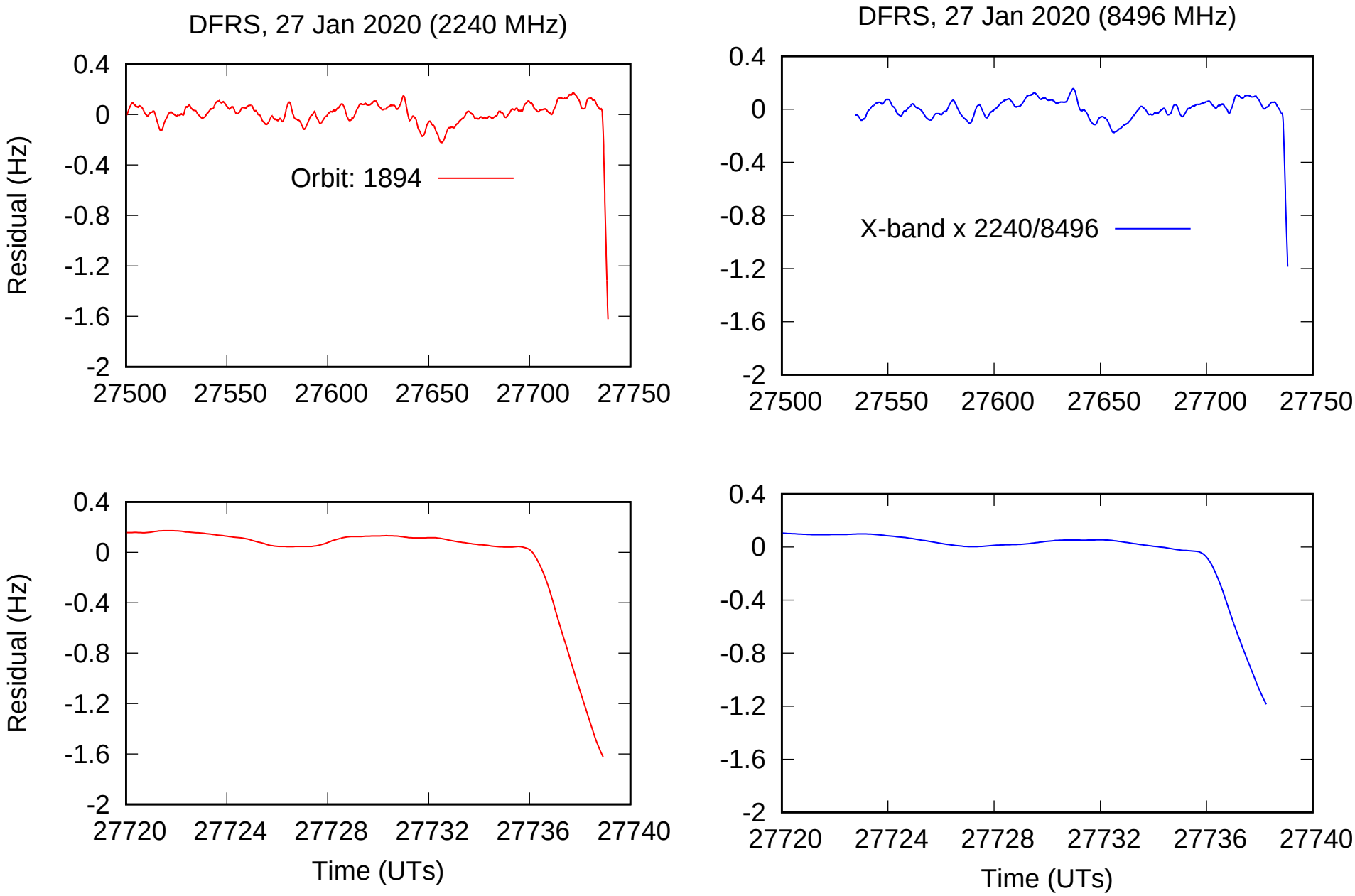
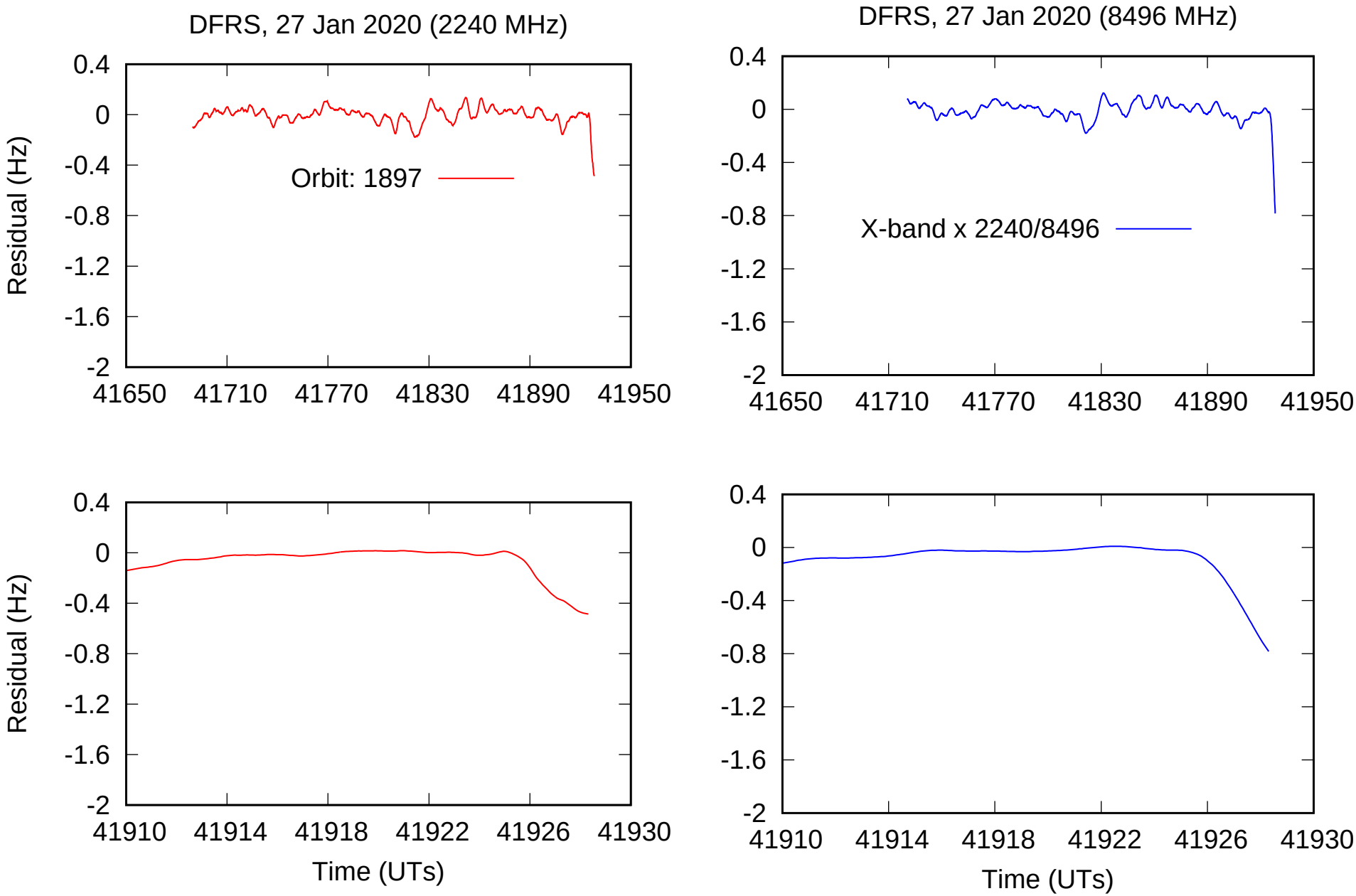
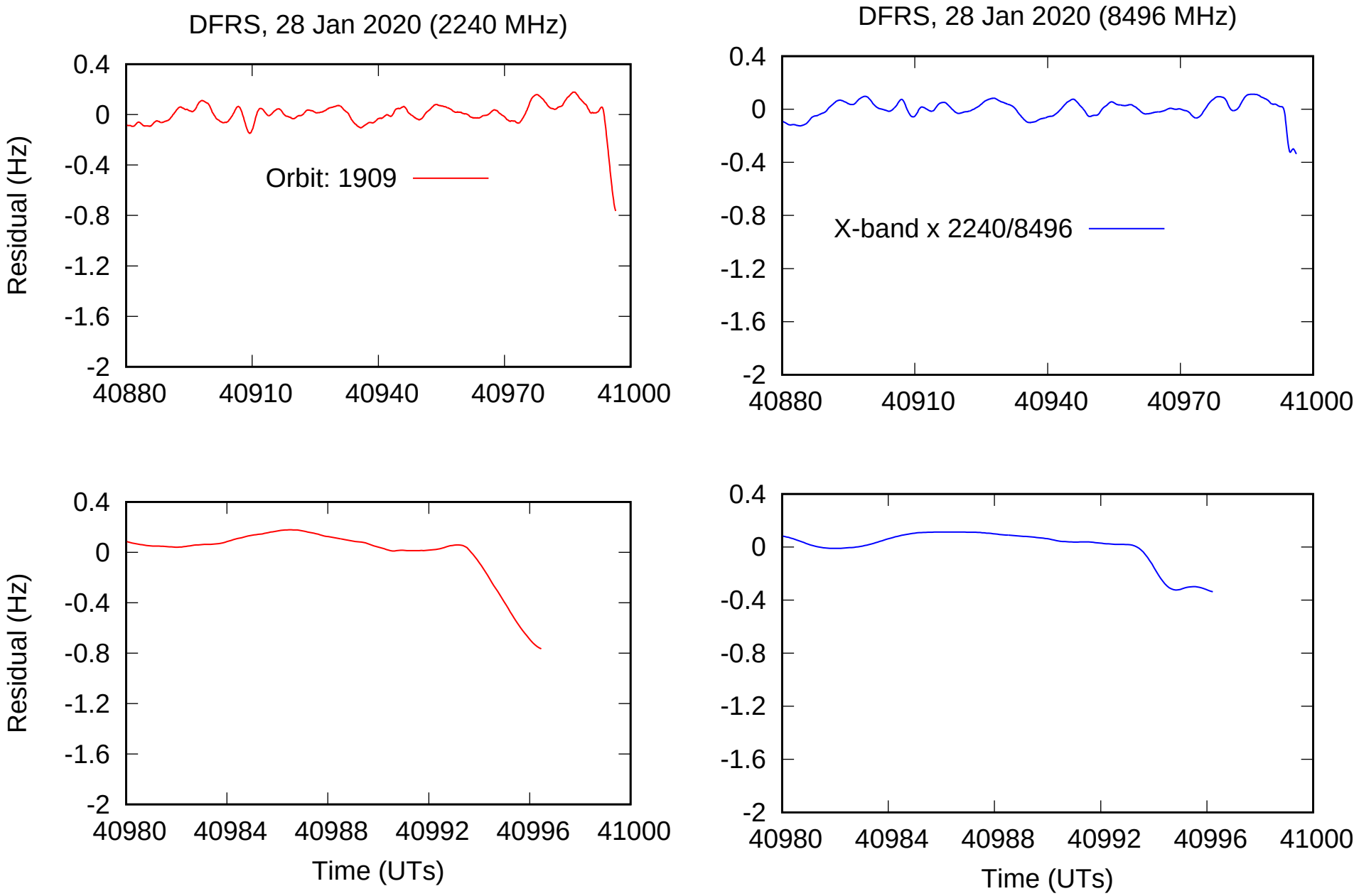
52450
52550
52650
Time (sec of the day)

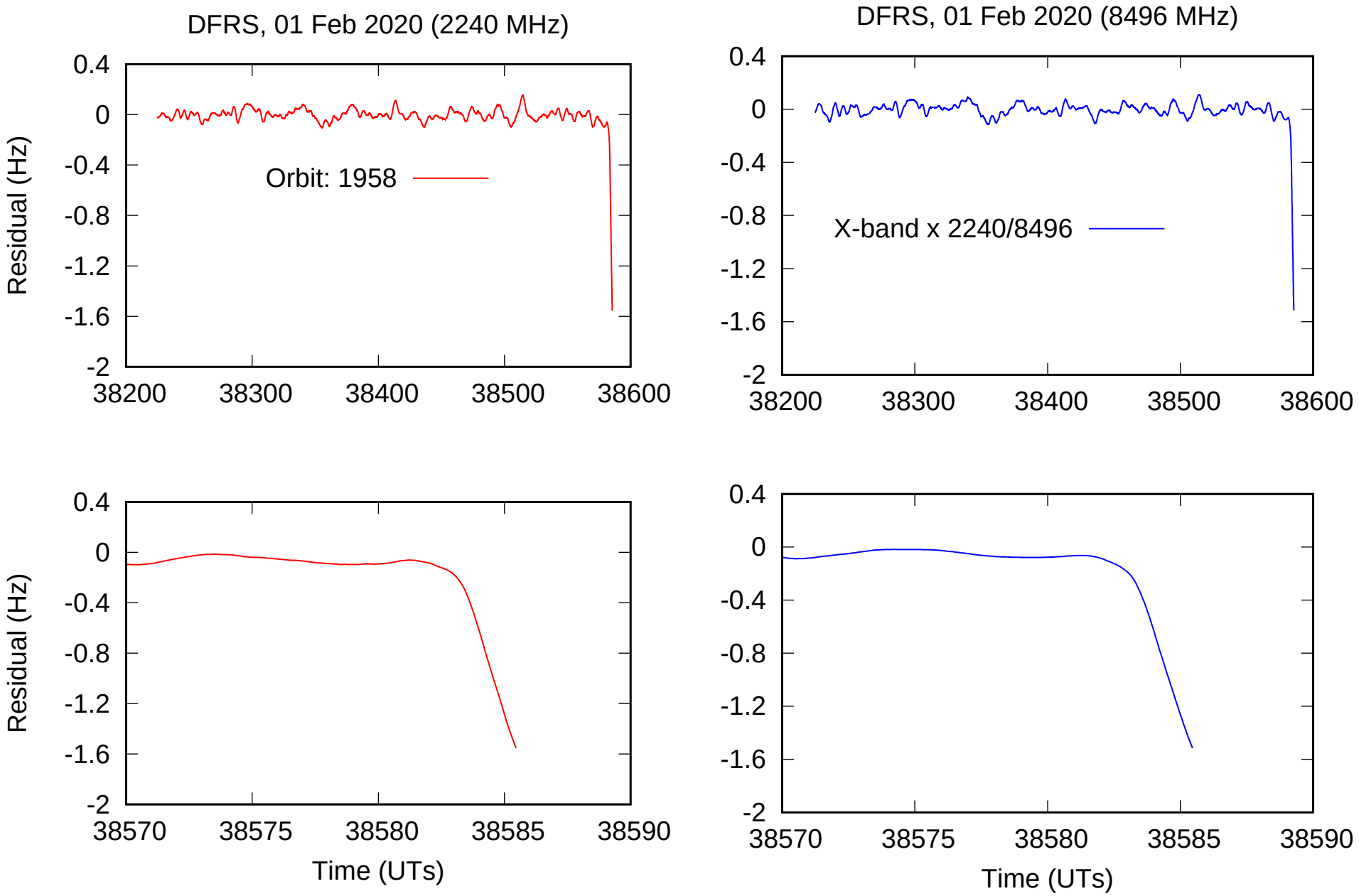

0
-0.4
-0.8
-1.2
-1.6
-2
Doppler(Hz)
S band
X band*2240/8496
50800
50850
50900
Time (sec of the day)

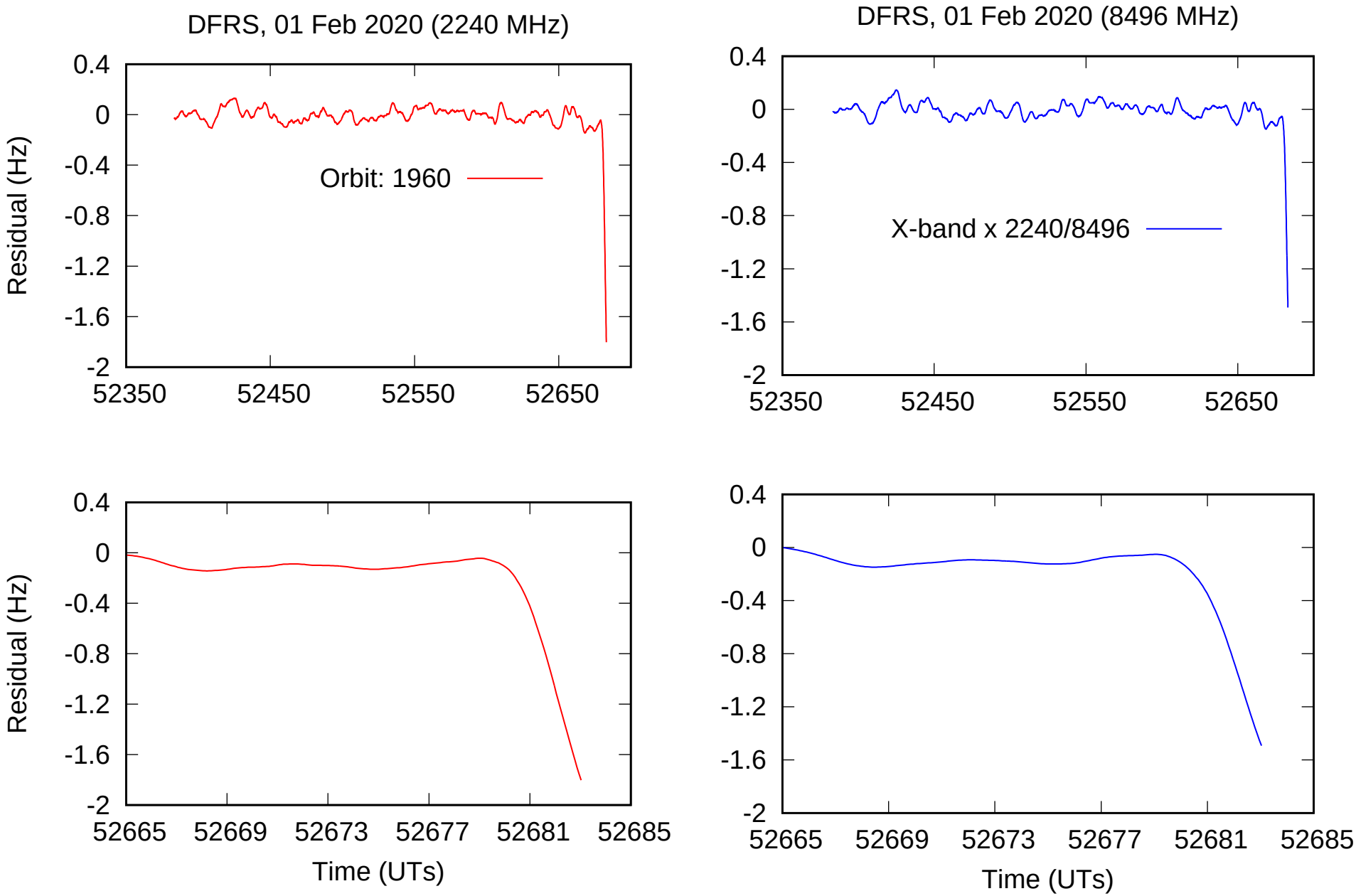

DFRS, 4 Oct 2019 (2240 MHz)
DFRS, 04 Oct 2019 (8496 MHz)
Residual (Hz)
Orbit: 0489
X-band x 2240/8496
0.4
0
-0.4
-0.8
-1.2
-1.6
-2
31680
31700
31720
31740
31760
31780
31765
31770
31775
Time (UTs)

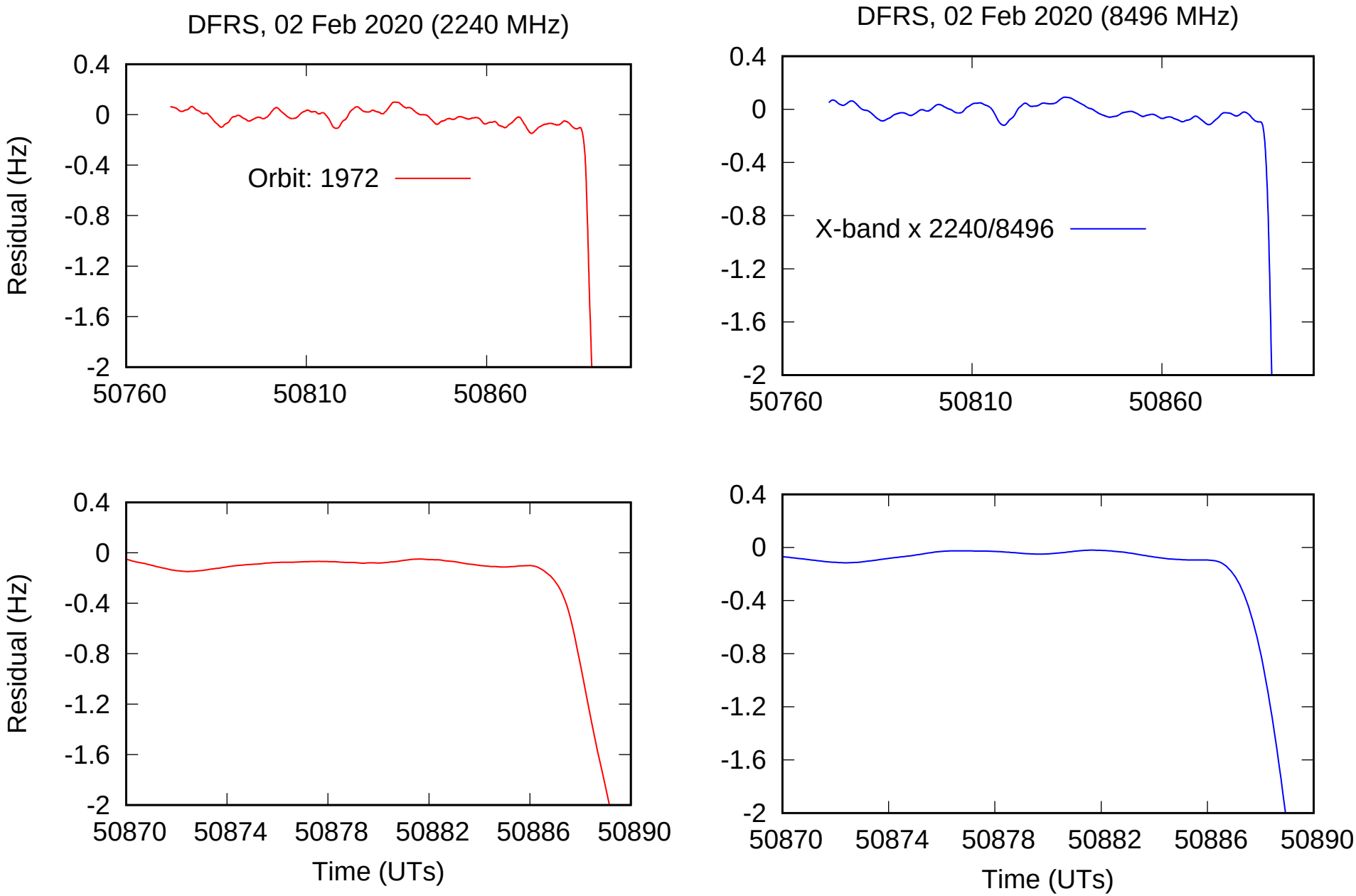

DFRS, 27 Jan 2020 (2240 MHz)
DFRS, 27 Jan 2020 (8496 MHz)
Residual (Hz)
Orbit: 1894
X-band x 2240/8496
Time (UTs)
0.4
0
-0.4
-0.8
-1.2
-1.6
-2
27500
27550
27600
27650
27700
27750
27720
27724
27728
27732
27736
27740


DFRS, 27 Jan 2020 (2240 MHz)
DFRS, 27 Jan 2020 (8496 MHz)
Residual (Hz)
Orbit: 1897
X-band x 2240/8496
Time (UTs)
0.4
0
-0.4
-0.8
-1.2
-1.6
-2
41650
41710
41770
41830
41890
41950
41910
41914
41918
41922
41926
41930

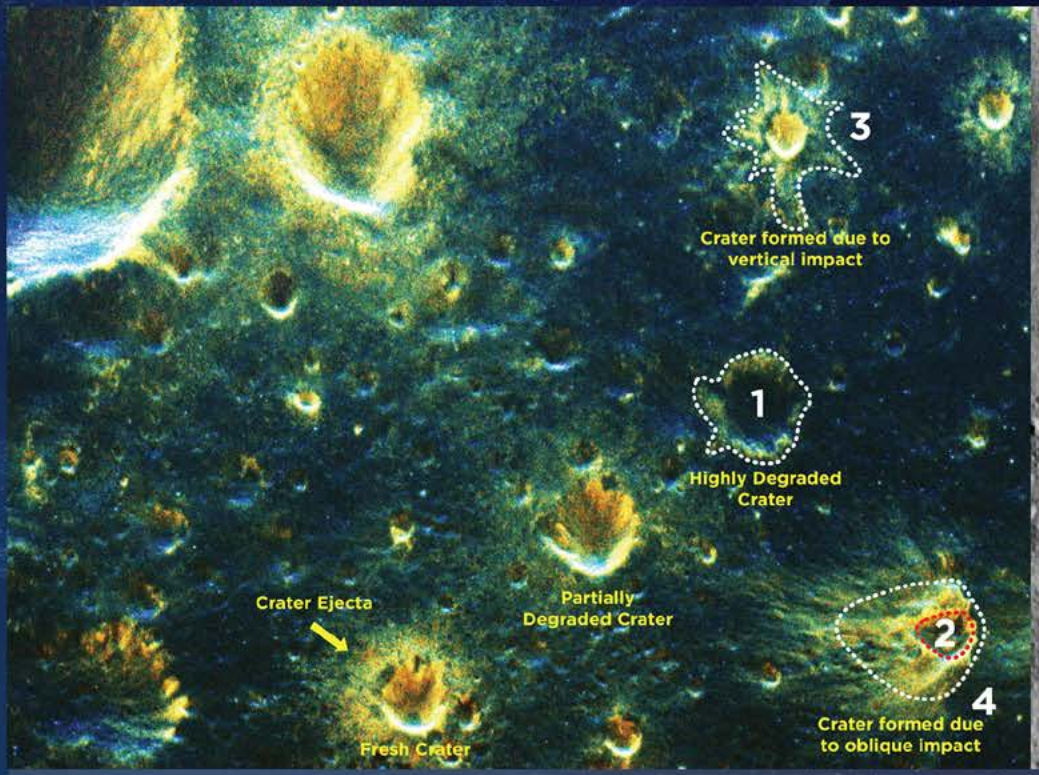

DFRS, 28 Jan 2020 (2240 MHz)
DFRS, 28 Jan 2020 (8496 MHz)
Residual (Hz)
Orbit: 1909
X-band x 2240/8496
Time (UTs)
0.4
0
-0.4
-0.8
-1.2
-1.6
-2
40880
40910
40940
40970
41000
40980
40984
40988
40992
40996


DFRS, 01 Feb 2020 (2240 MHz)
DFRS, 01 Feb 2020 (8496 MHz)
Residual (Hz)
Orbit: 1958
X-band x 2240/8496
Time (UTs)
0.4
0
-0.4
-0.8
-1.2
-1.6
-2
38200
38300
38400
38500
38600
38570
38575
38580
38585
38590

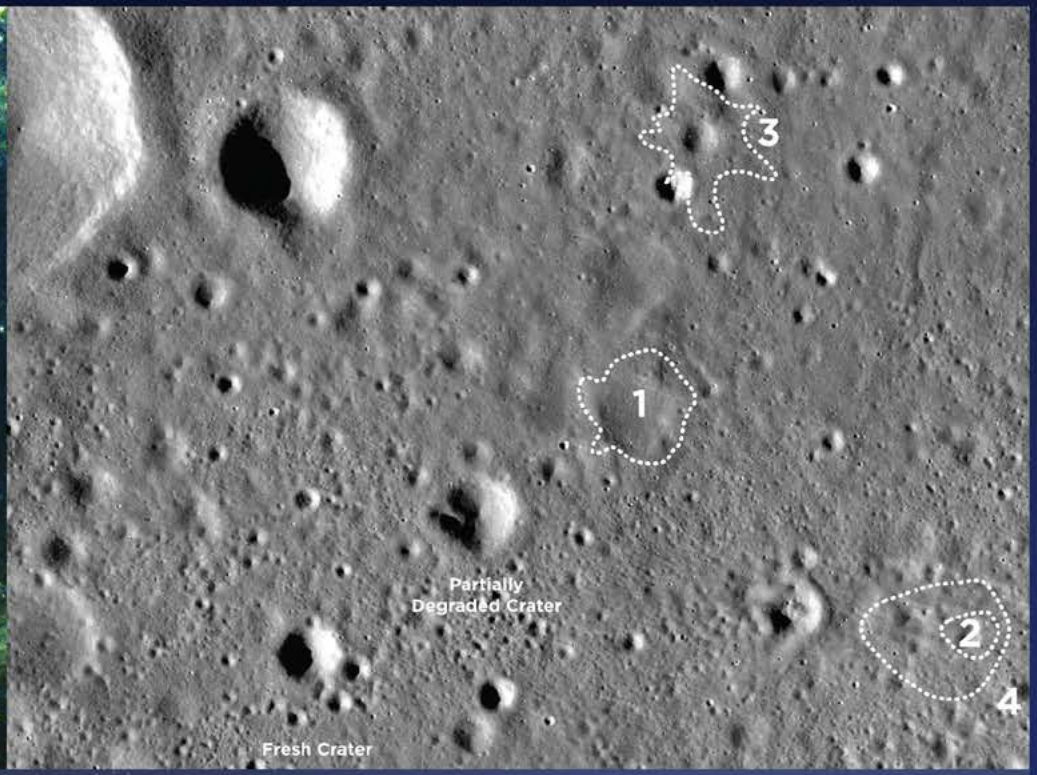

DFRS, 01 Feb 2020 (2240 MHz)
DFRS, 01 Feb 2020 (8496 MHz)
Residual (Hz)
Orbit: 1960
X-band x 2240/8496
0.4
0
-0.4
-0.8
-1.2
-1.6
-2
52350
52450
52550
52650
52665
52669
52673
52677
52681
52685
Time (UTs)


DFRS, 02 Feb 2020 (2240 MHz)
DFRS, 02 Feb 2020 (8496 MHz)
Residual (Hz)
Orbit: 1972
X-band x 2240/8496
0.4
0
-0.4
-0.8
-1.2
-1.6
-2
50760
50810
50860
50870
50874
50878
50882
50886
50890
Time (UTs)

Sub-surface of lunar craters revealed by India's Chandrayaan-2



Radar image from Chandrayaan-2 (ISRO)



Optical image from LRO (NASA)

Chandrayaan-2's L-band Synthetic Aperture Radar is the most advanced radar experiment ever flown to the Moon. It reveals craters hidden below the surface (1,2) and disturbed regions (3,4) hidden by powdery lunar soil.