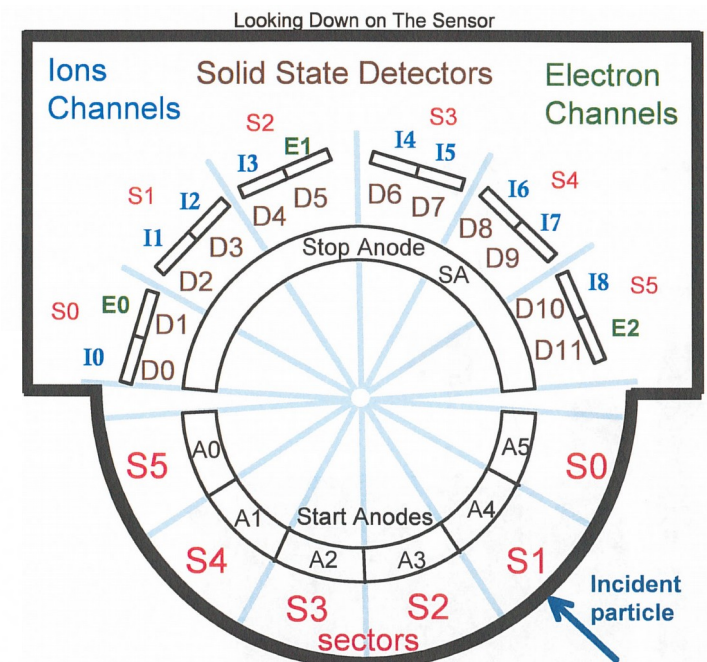
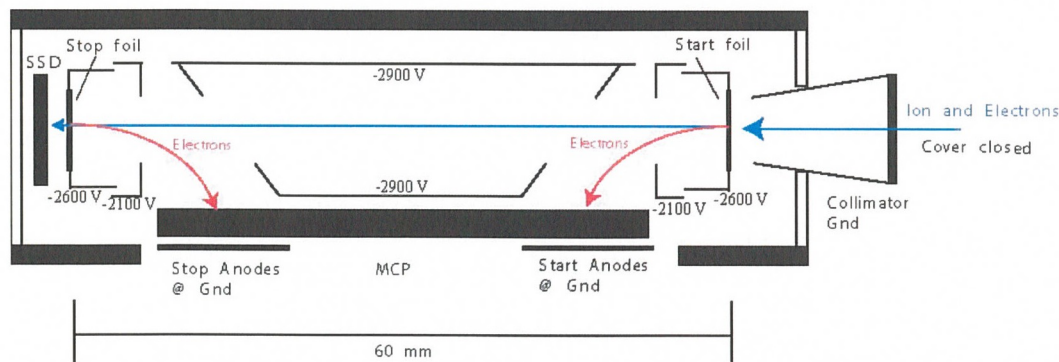


New Horizons Pluto Energetic Particle Spectrometer Science Investigation (PEPSSI)

PRINCIPAL INVESTIGATOR: Ralph McNutt, APL
 DESCRIPTION: Medium Energy Particle Spectrometer
 ENERGY RANGE: 25-1000 keV (protons)
 60-1000 keV (atomic ions)
 25-500 keV (electrons)
 FIELD OF VIEW: 160 deg x 12 deg
 ANGULAR RESOLUTION: 25 deg x 12 deg
 ENERGY RESOLUTION: 0.25 keV
 SENSOR SIZE: 7.6 cm dia. x 2.5 cm thick
 POWER: 1.4 watt
 MASS: 1.5 kg



New Horizons PEPSSI Data Sets

RAW Data Sets:

nh-x-pepssi-2-kemcruise1-v1.0

CALIBRATED Data Sets:

nh-x-pepssi-3-kemcruise1-v1.0

New Horizons PEPSSI Data Set Evaluation Tools

Staging and Evaluation -

Machine: Dell Precision T3400

Operating System: Fedora 18 linux

Data Processing -

Machine: Sun Ultra-350

Operating System: Sun Solaris OS 5.9

Staging and Minor Diagnostics -

Machine: IBM lenovo T60p ThinkPad

Operating System: Fedora 25 linux

Documentation Evaluation

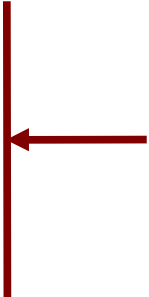
nh-x-pepssi-3-kemcruise1-v1.0/index index.lbl & index.tab

```
OBJECT      = COLUMN
COLUMN_NUMBER = 7
NAME = REDUCTION_LEVEL
START_BYTE = 172
BYTES = 10
DATA_TYPE = CHARACTER
FORMAT = "A10"
DESCRIPTION = "This parameter provides the level of data
reduction:

    LEVEL1 = Uncleaned data in units of DN

    LEVEL2 = Reduced data in engineering units
              appropriate for the instrument.
"
END_OBJECT = COLUMN
```

This is level 3 data, but the description does not give this choice. As well, this is science data and not engineering data. Level 3 data in the index.tab file lists all files are Level 2. Similarly, the index.tab file in the Level 2 data labels the Level 2 data as Level 1. this needs to be fixed.



nh-x-pepssi-2-kemcruise1-v1.0

nh-x-pepssi-3-kemcruise1-v1.0

calib/calpars/calpinfo.txt

[CALIB] Directory containing calibration files for PEPSSI data.

```
|
| - [CALPARS]                Directory containing PEPSSI
|                             calibration parameter files.
|
| - PEP_nnnnnnnnnn_0X69n_CALPAR.TAB  Files containing calibration
|                                     parameters for the data products
|                                     in this data set. Refer to the
|                                     attached PDS label of each file
|                                     for detail of the contents of
|                                     each file.
|                                     The first 21 characters of the
|                                     filename will be the same as
|                                     those of the corresponding
|                                     data product under the DATA/
|                                     directory.
|
| - calpinfo.txt              This file
|
| - calpar_columns.fmt       Description of columns in the
|                             calibration parameter files.
```

Not included in Archive

nh-x-pepssi-3-kemcruise1-v1.0/document docinfo.txt

```
|                                     .....  
|  
+-->AAREADME_BU.TXT                 Backup copy of top-level AAREADME.TXT  
|
```

Not included in the directory

nh-x-pepssi-3-kemcruise1-v1.0/document
nh_met2utc.tab

This file needs to be updated. The last entry is
January 2, 2016

nh-x-pepssi-2-kemcruise1-v1.0/document
pep_bti.tab

The lbl file says that this file was updated on February 2, 2017. The data table last entry is November 5, 2015. Is this correct? I am guessing that the table was not updated when the new label file was produced.

Data Evaluation

nh-x-pepssi-3-kemcruise1-v1.0/data Quick-look Spectrograms

Hydrogen Note:

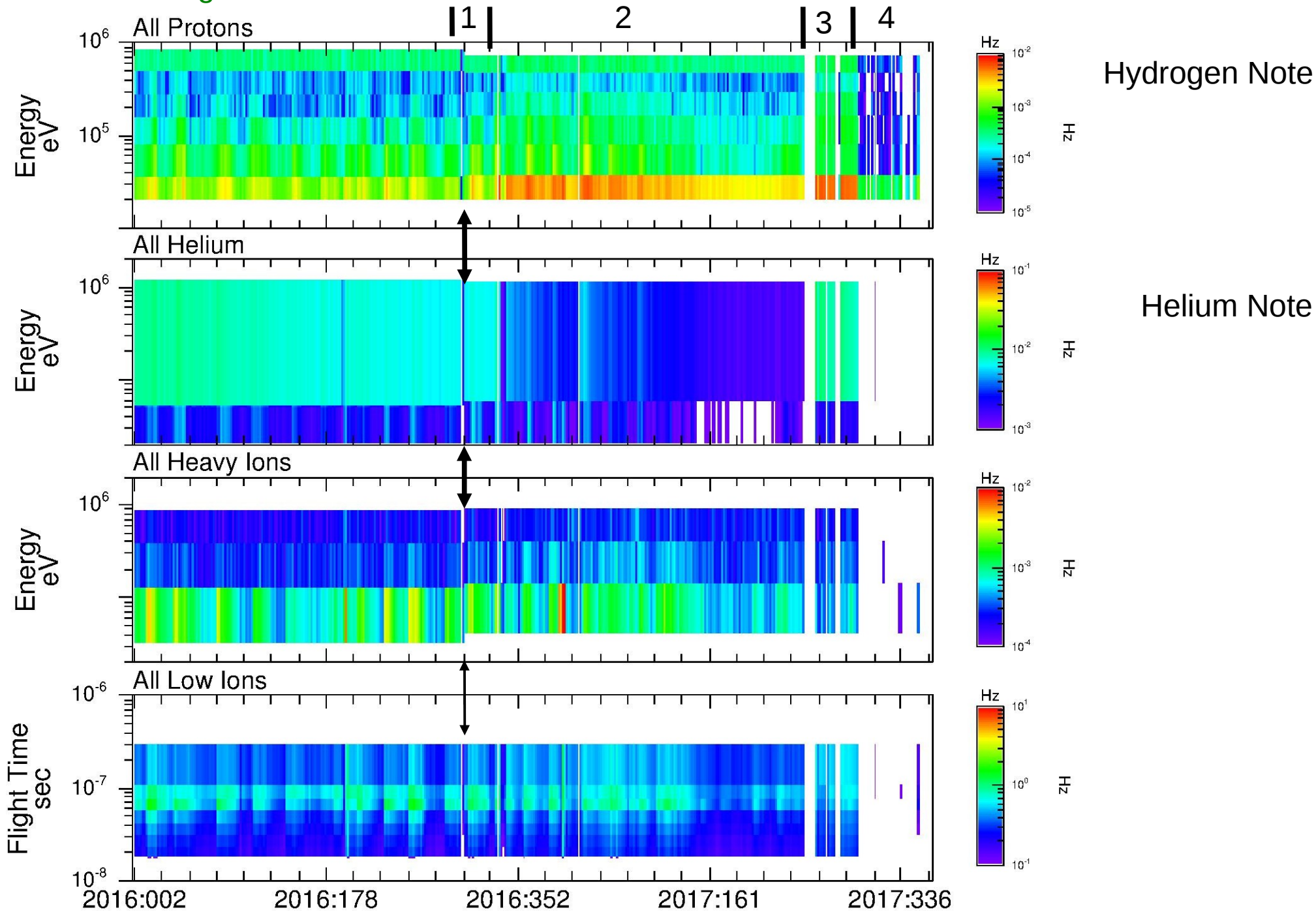
- Region 1: Start of kem data set showing slight difference in energy calibration
- Region 2: Increased count rate, but suggesting decreasing flux with increasing energy
- Region 3: Spectrum flattens?
- Region 4: Loss of counts, Loss of Flux

Helium Note:

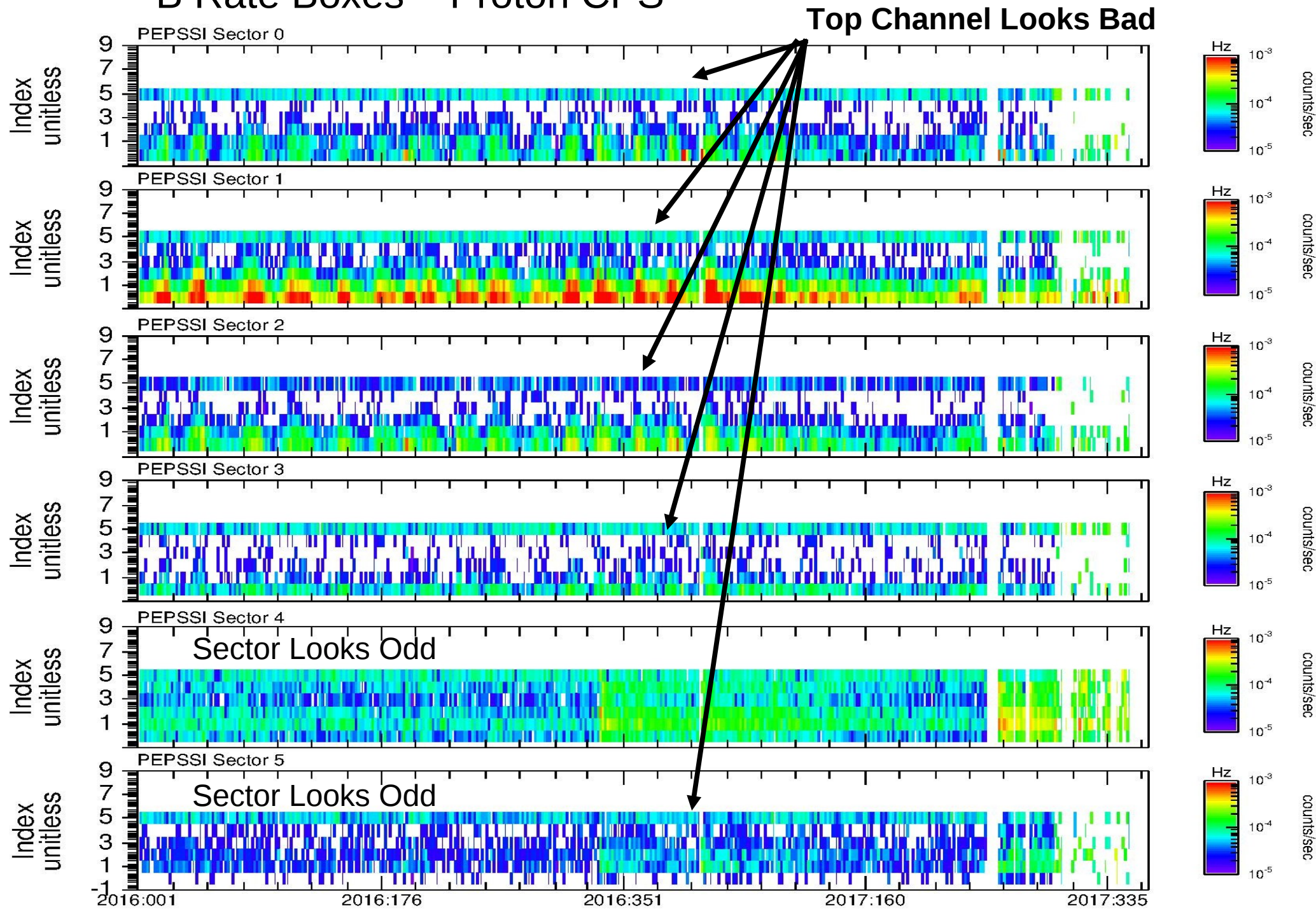
- Region 1: Resembles previous spectral data, highest channel contains calibration Source signal
- Region 2: Calibration source signal decreases in the same energy band
- Region 3: Calibration source returns to previous value
- Region 4: Calibration source vanishes

nh-x-pepssi-3-kemcruise1-v1.0/data Quick-look Spectrograms

Ignored Since These are Not Intended for Science use.

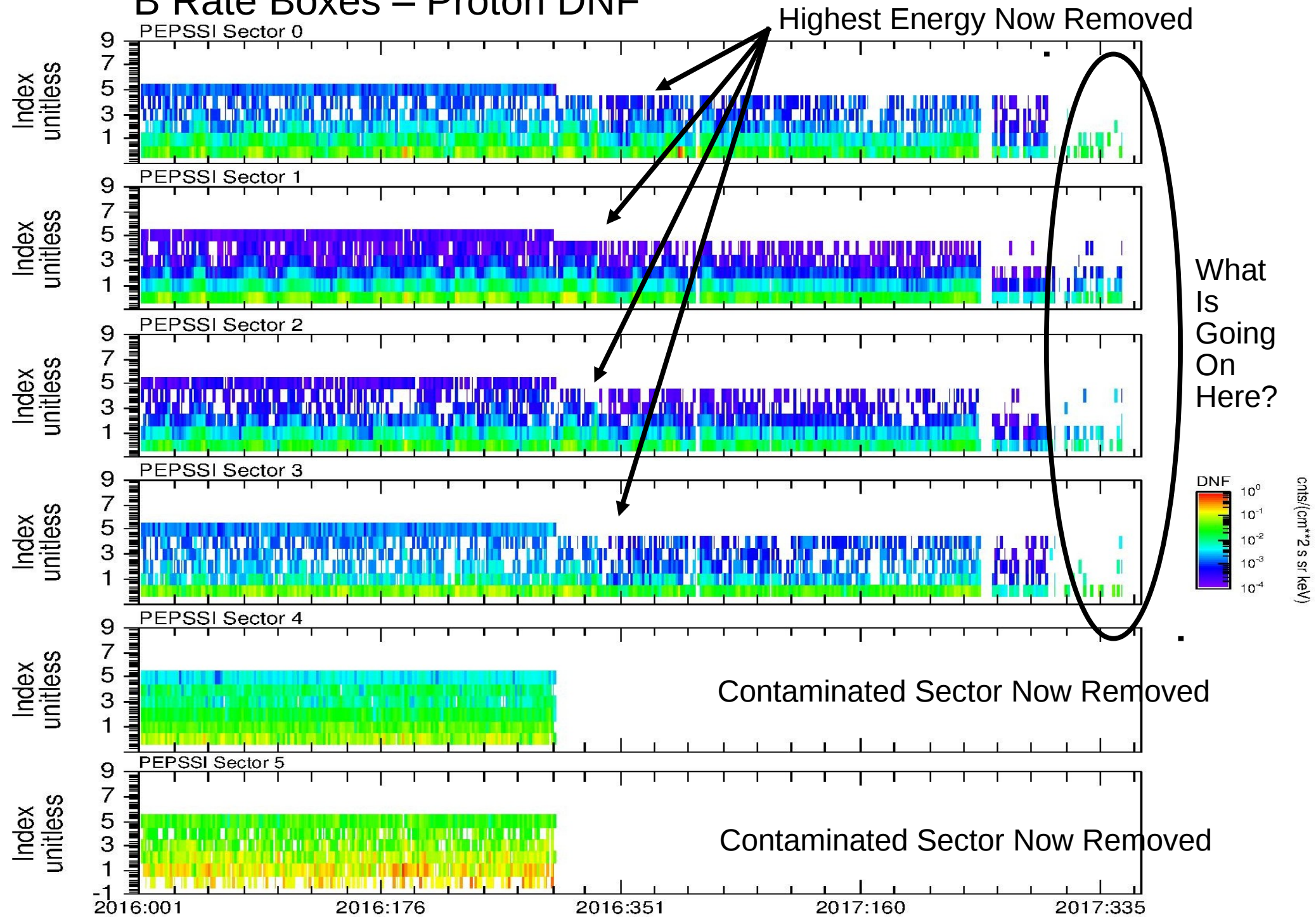


nh-x-pepssi-3-kemcruise1-v1.0/data FLUX HDU B Rate Boxes – Proton CPS

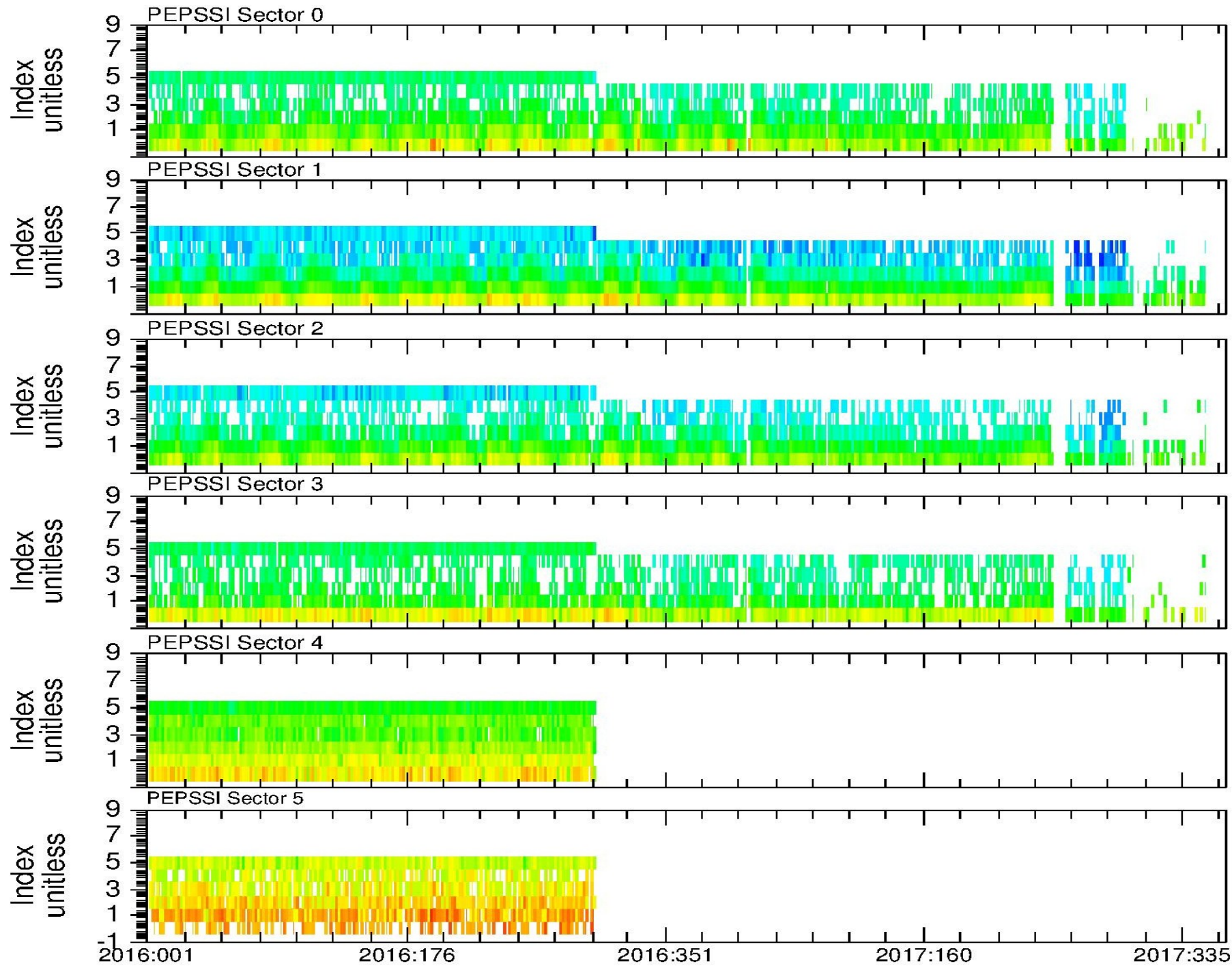


nh-x-pepssi-3-kemcruise1-v1.0/data FLUX HDU

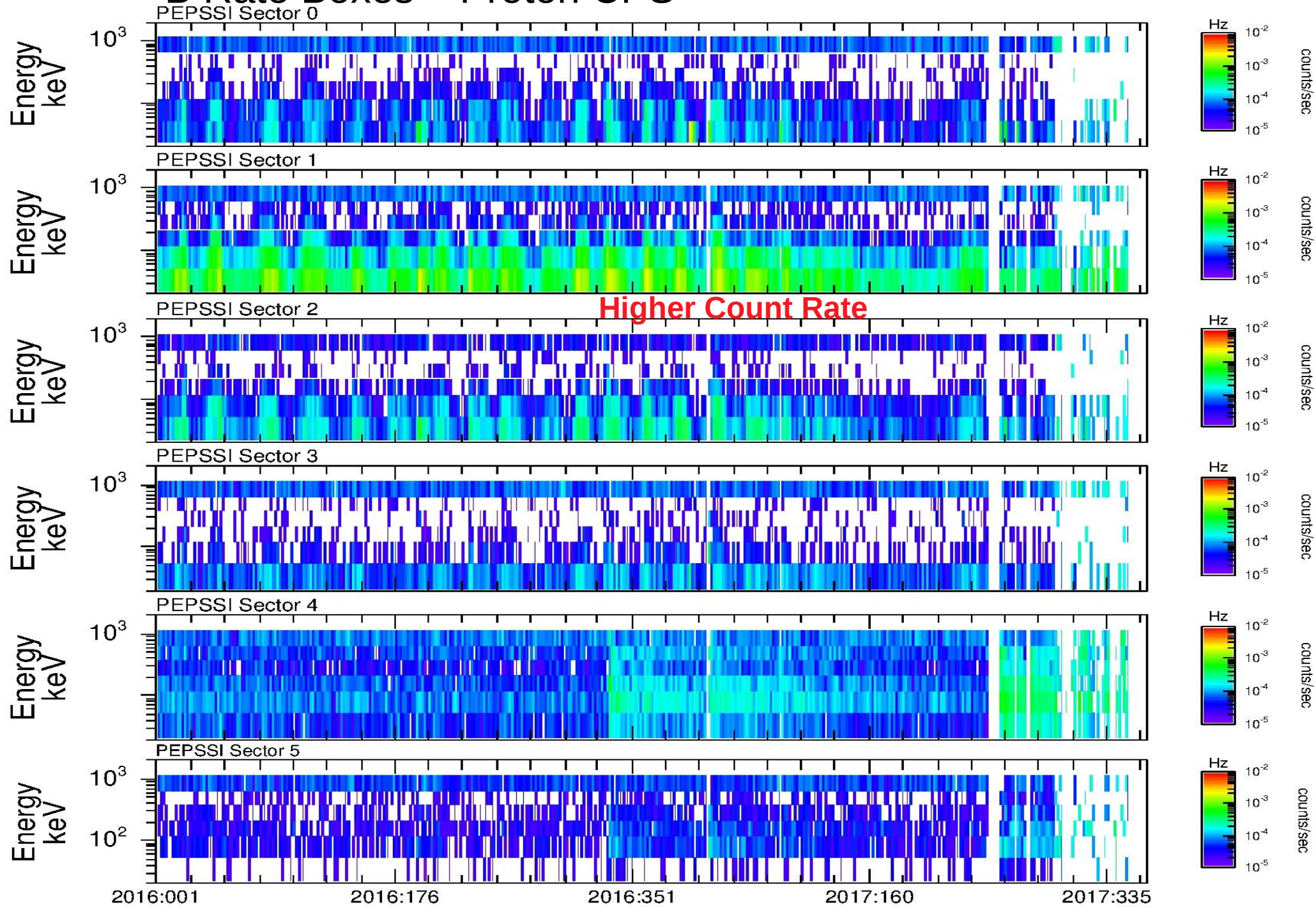
B Rate Boxes – Proton DNF



nh-x-pepssi-3-kemcruise1-v1.0/data FLUX HDU B Rate Boxes – Proton UNC

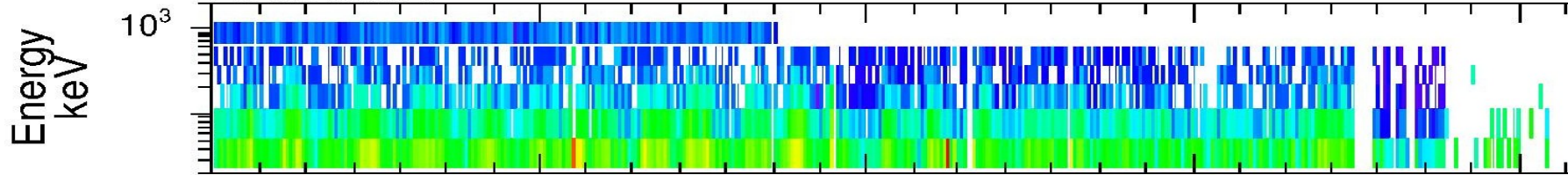


nh-x-pepssi-3-kemcruise1-v1.0/data FLUX HDU B Rate Boxes – Proton CPS

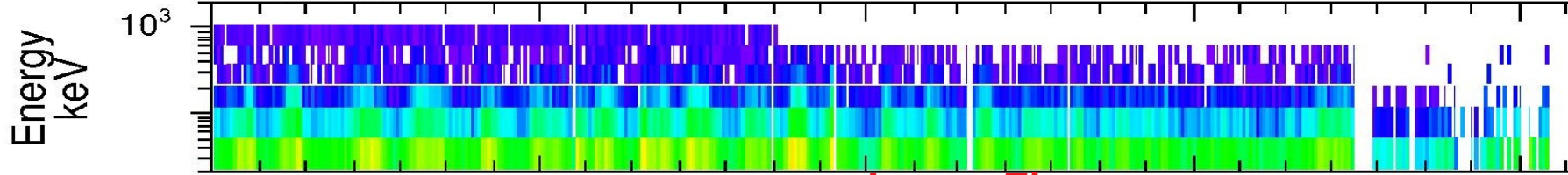


nh-x-pepssi-3-kemcruise1-v1.0/data FLUX HDU B Rate Boxes – Proton DNF

PEPSSI Sector 0

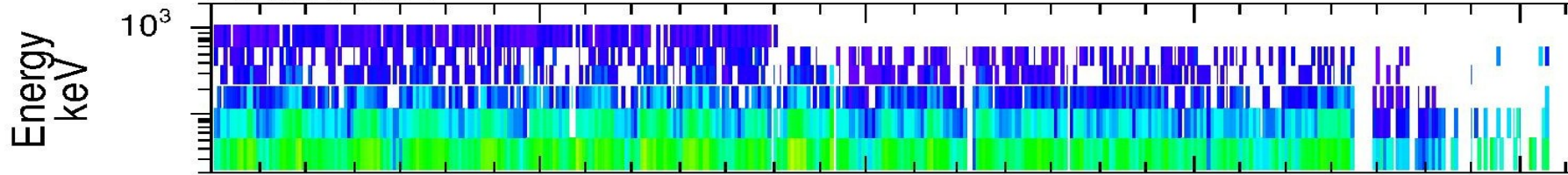


PEPSSI Sector 1

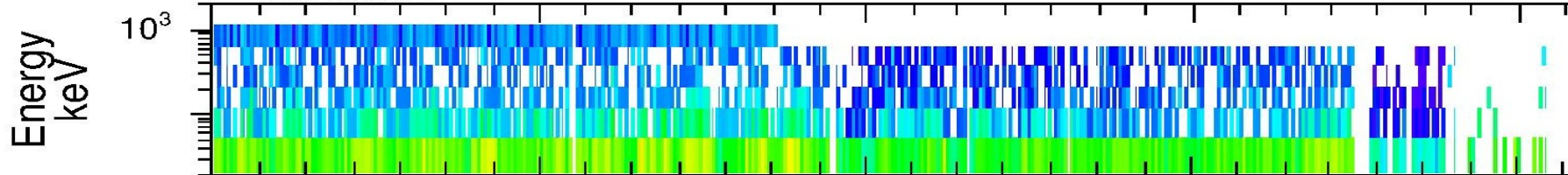


PEPSSI Sector 2

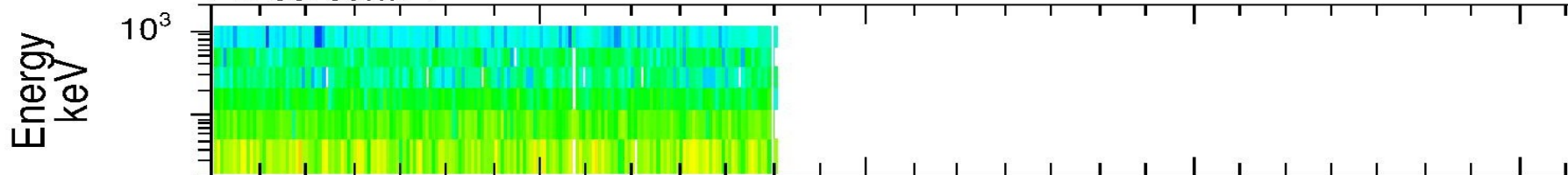
Lower Flux



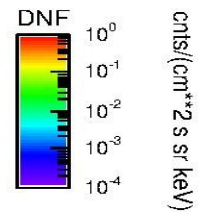
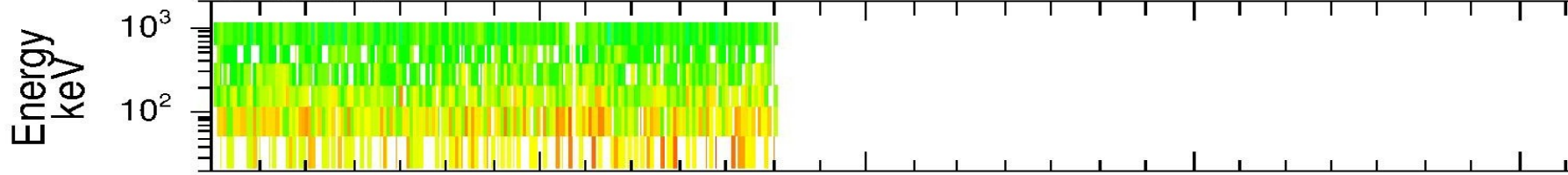
PEPSSI Sector 3



PEPSSI Sector 4

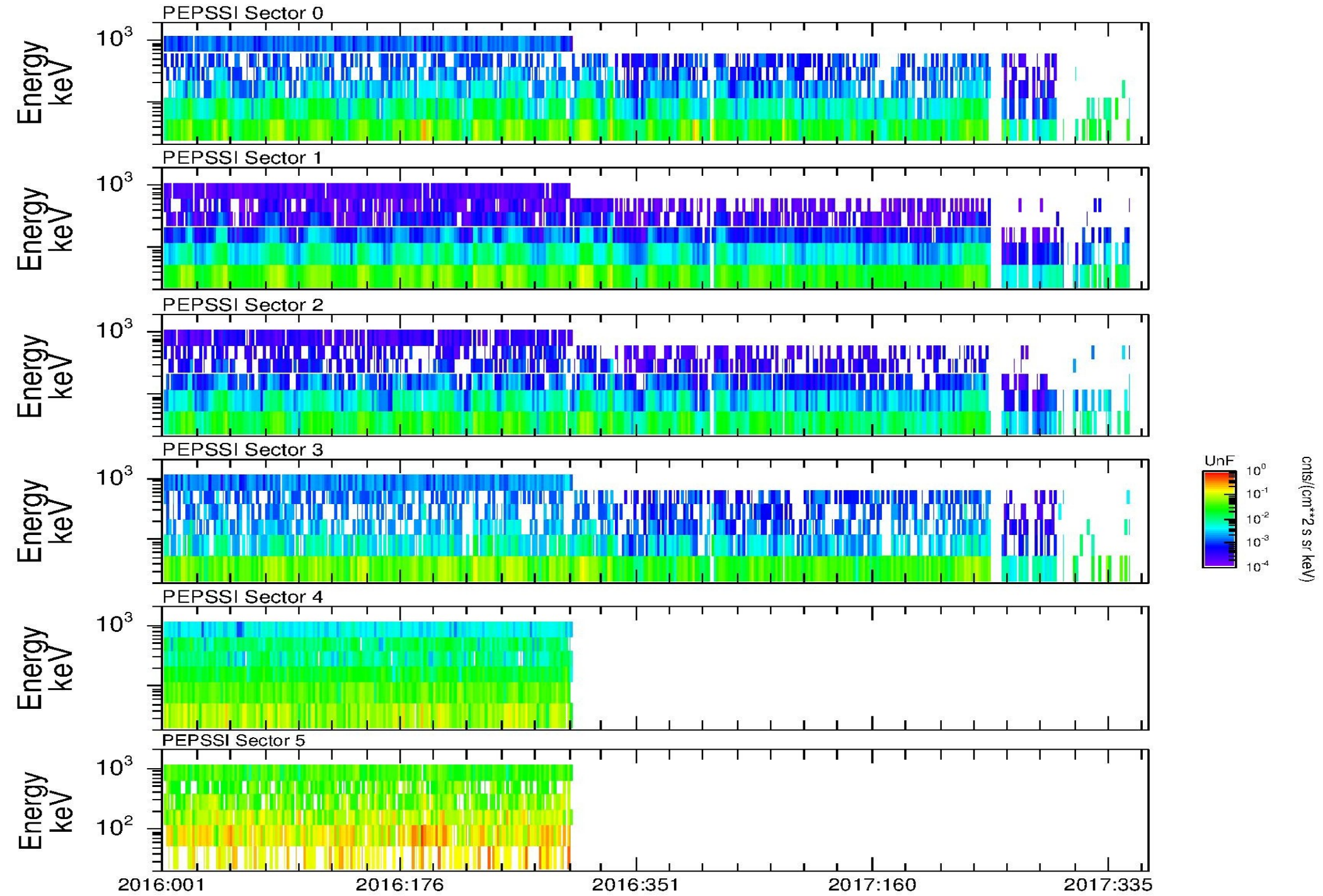


PEPSSI Sector 5



2016:001 2016:177 2016:352 2017:160 2017:335

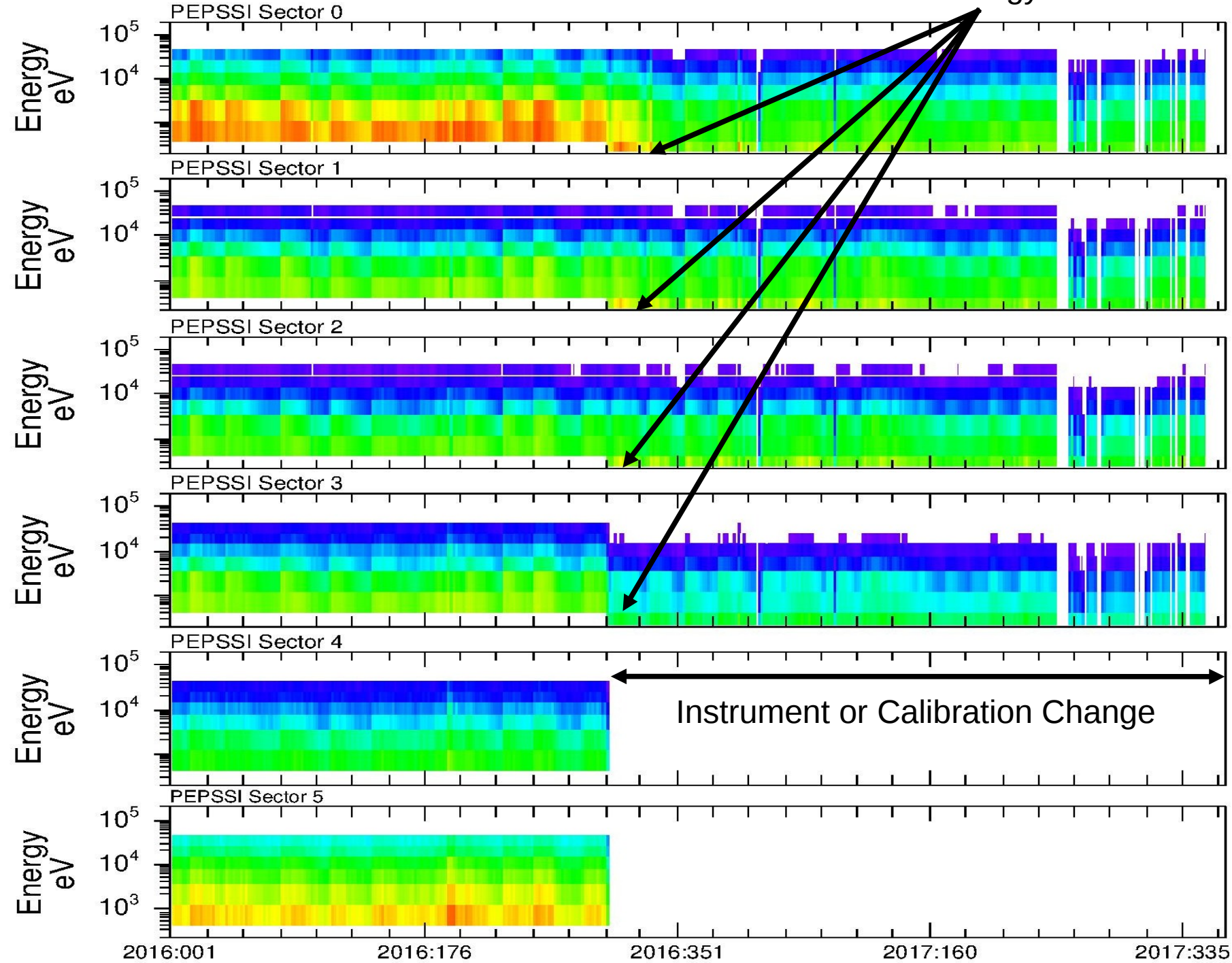
nh-x-pepssi-3-kemcruise1-v1.0/data FLUX HDU B Rate Boxes – Proton UNC



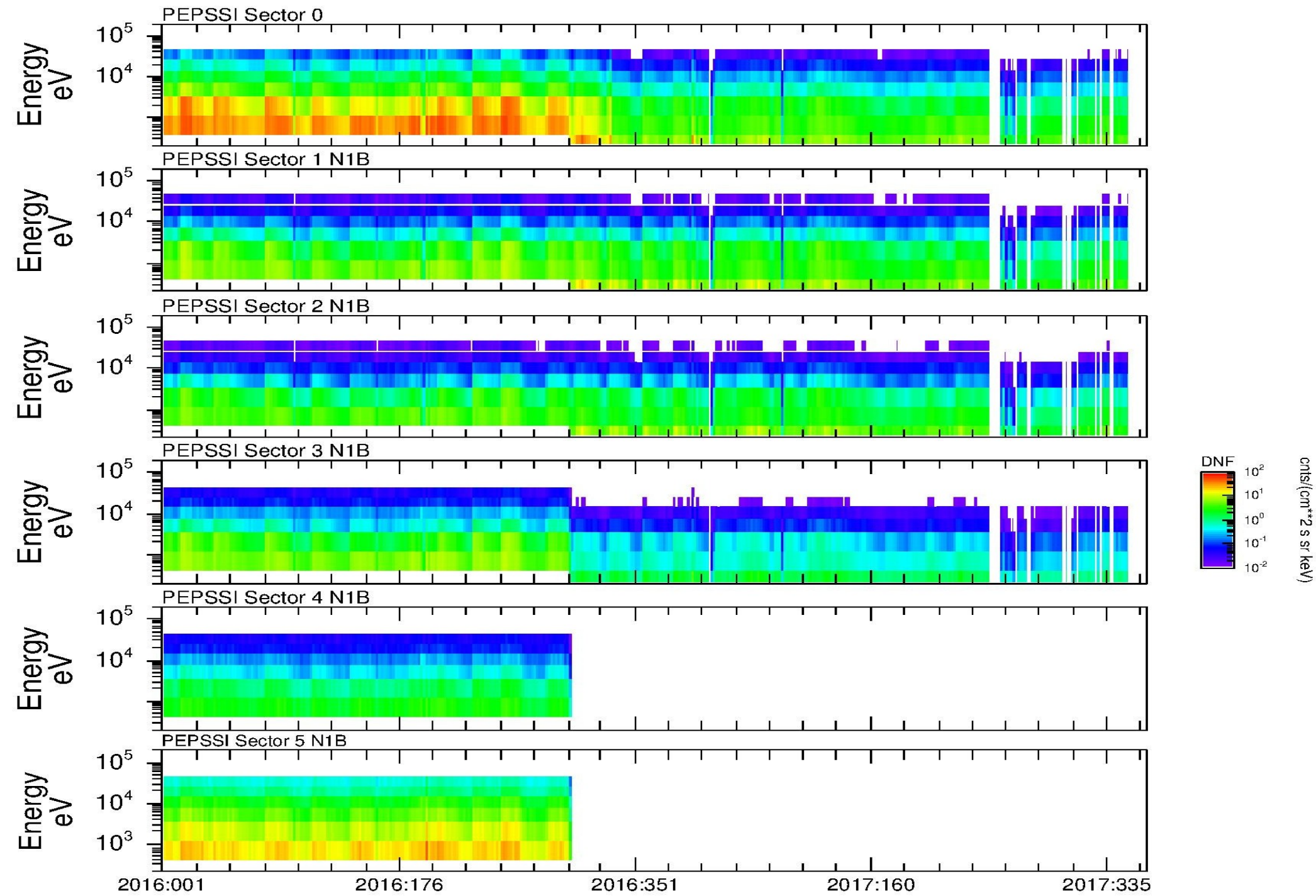
nh-x-pepssi-3-kemcruise1-v1.0/data FLUX HDU

L Rate Boxes – Proton DNF

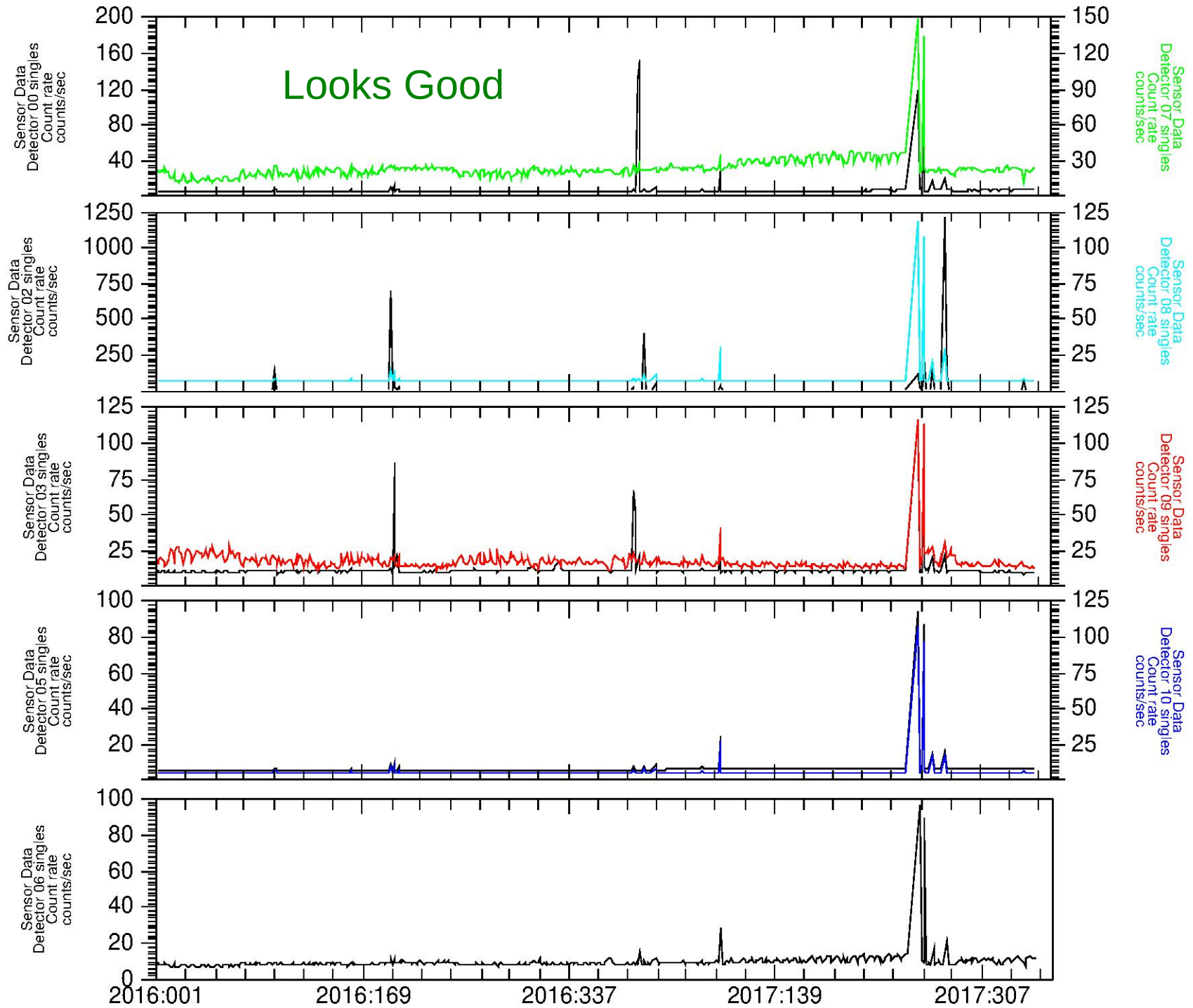
Energy Calibration Change



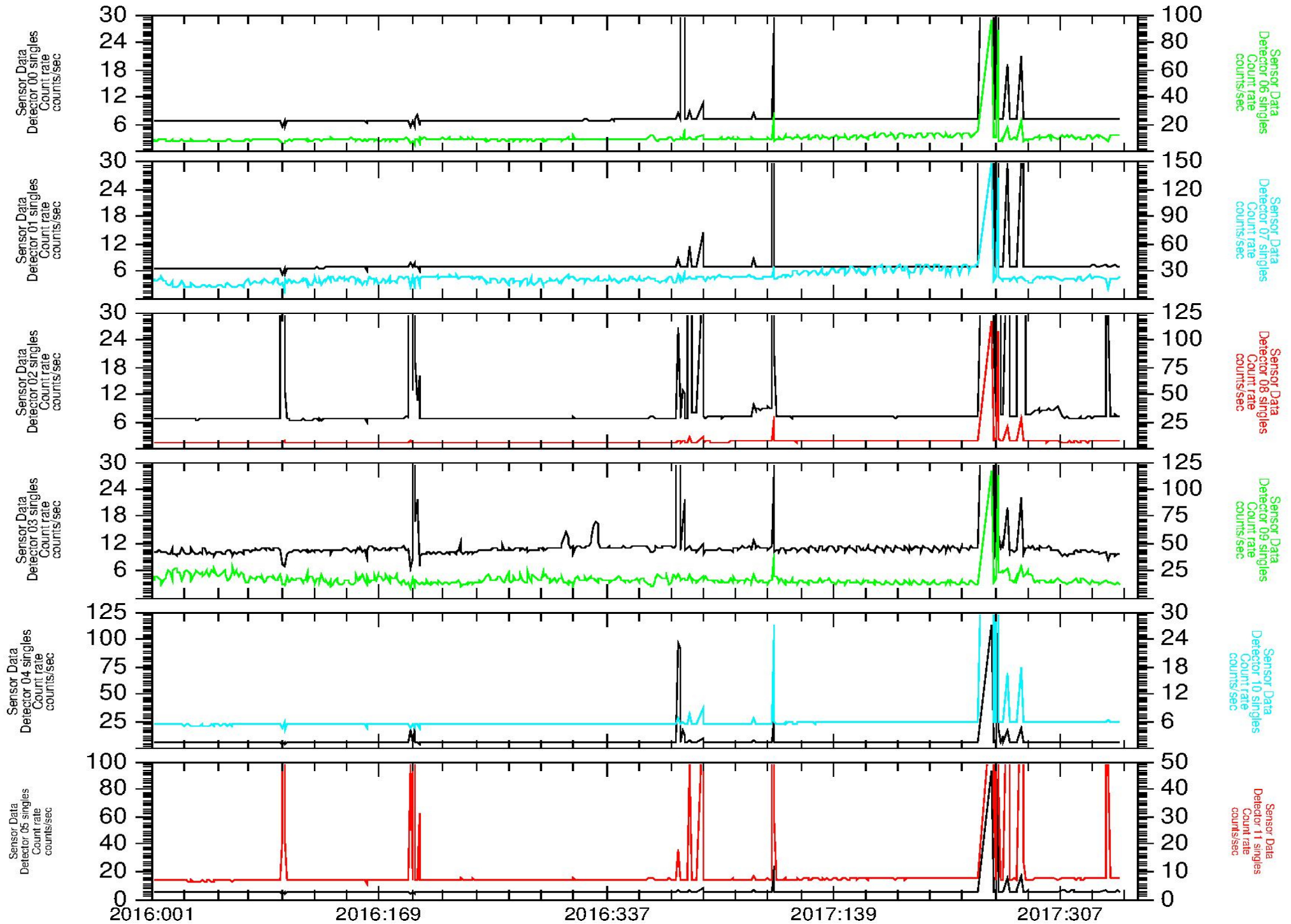
nh-x-pepssi-3-kemcruise1-v1.0/data FLUXN1B HDU L Rate Boxes – Proton DNF



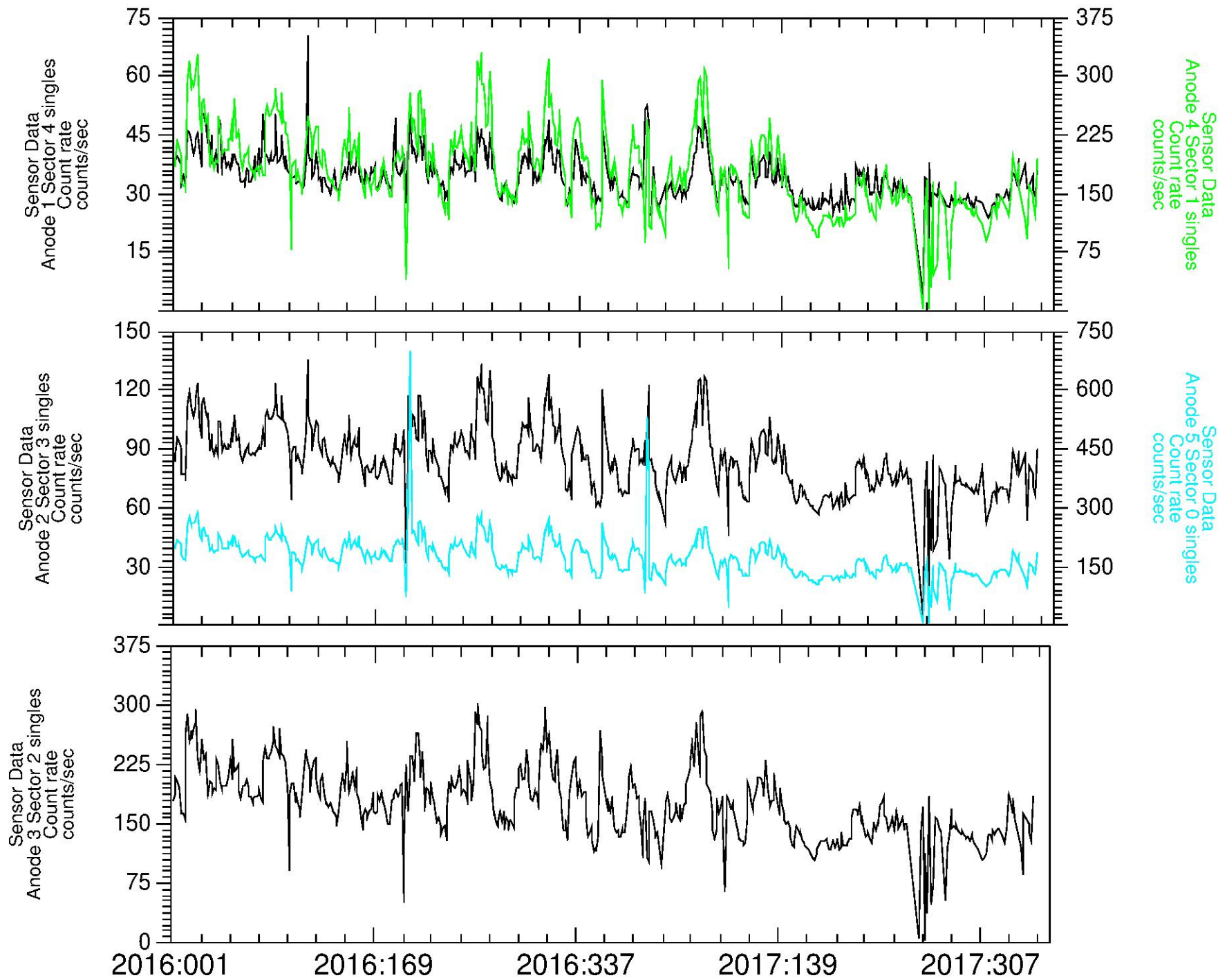
nh-x-pepssi-3-kemcruise1-v1.0/data FLUX HDU Detector Singles



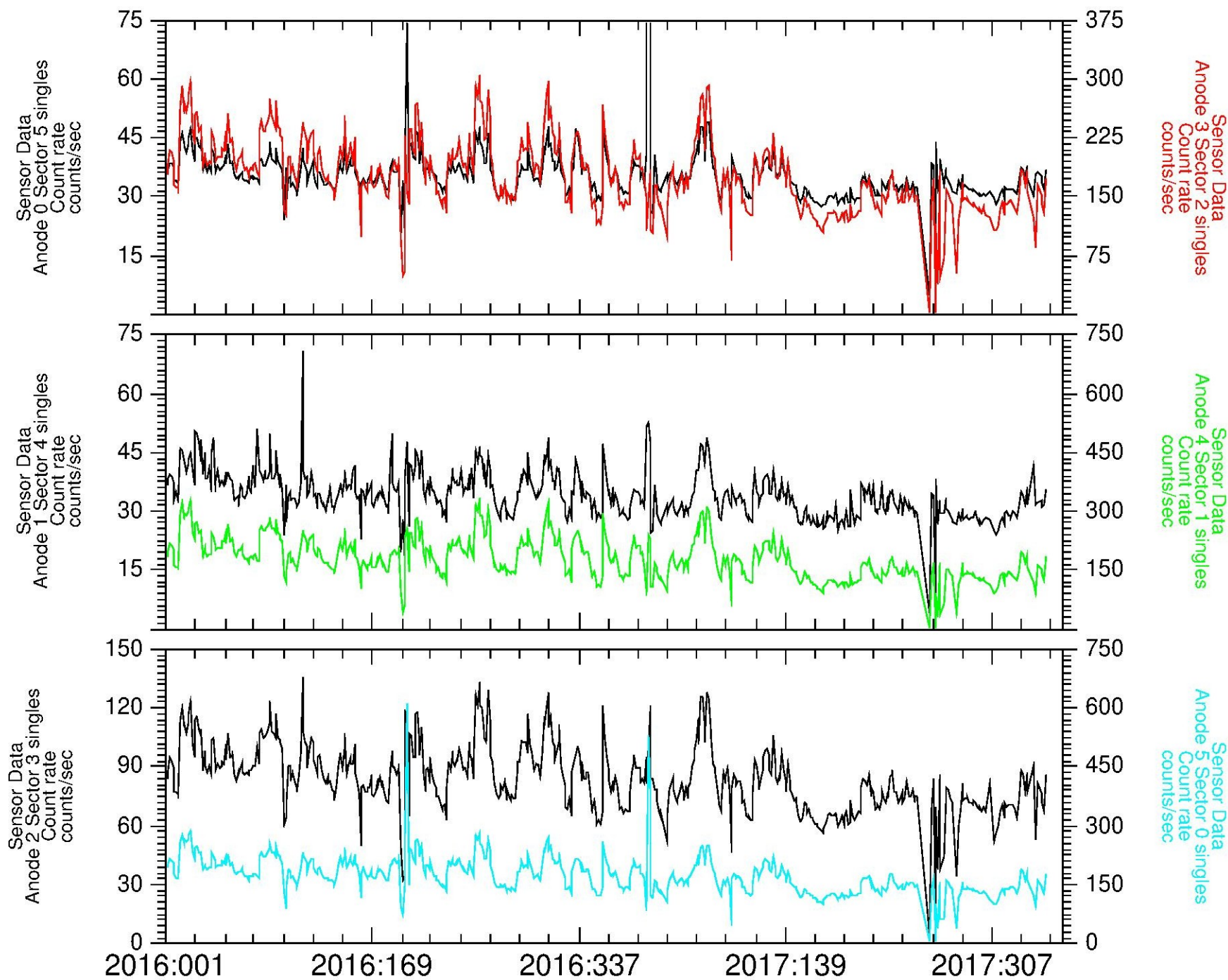
nh-x-pepssi-3-kemcruise1-v1.0/data FLUXN1B HDU Detector Singles



nh-x-pepssi-3-kemcruise1-v1.0/data FLUX HDU Anode Singles

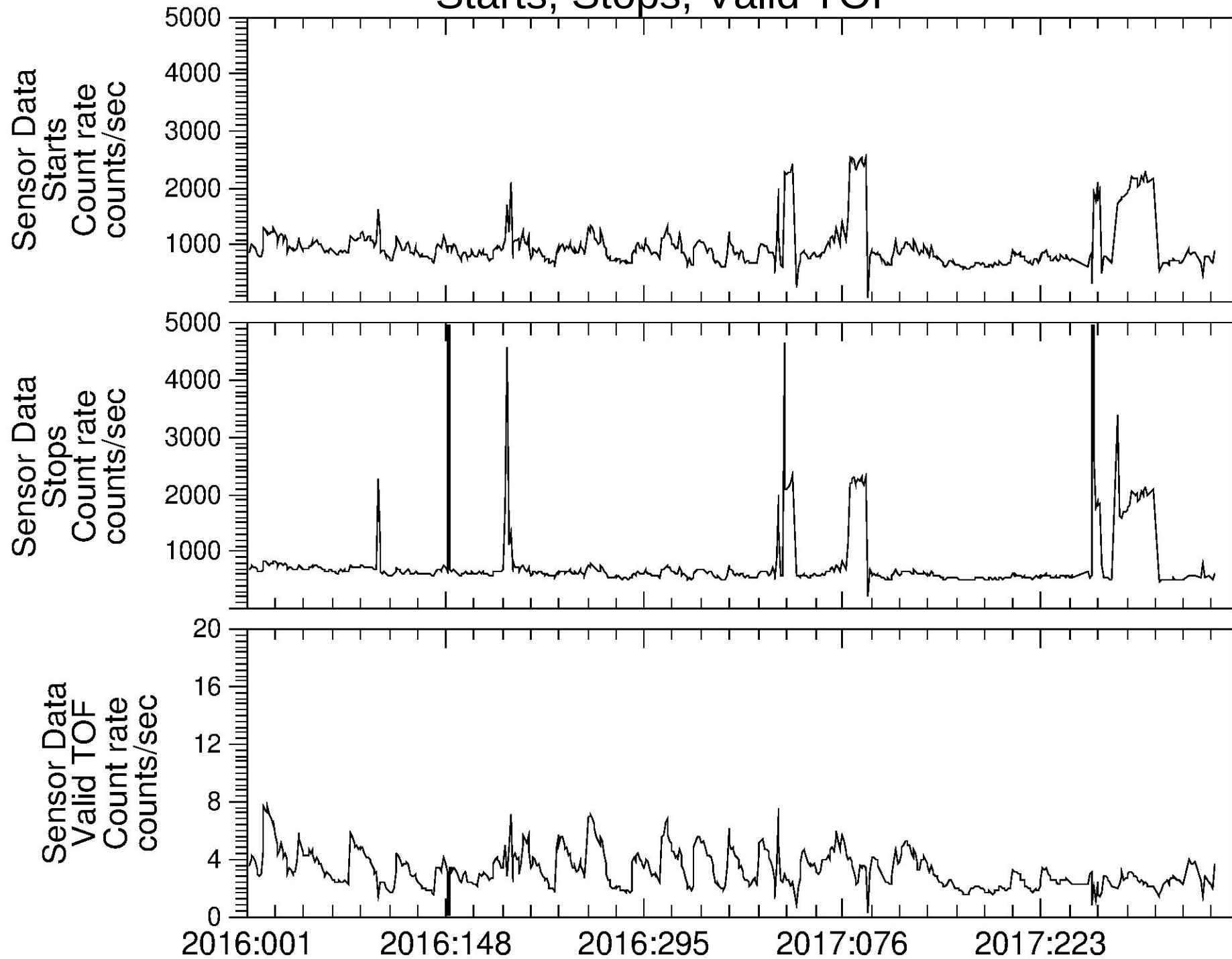


nh-x-pepssi-3-kemcruise1-v1.0/data FLUXN1B HDU Anode Singles

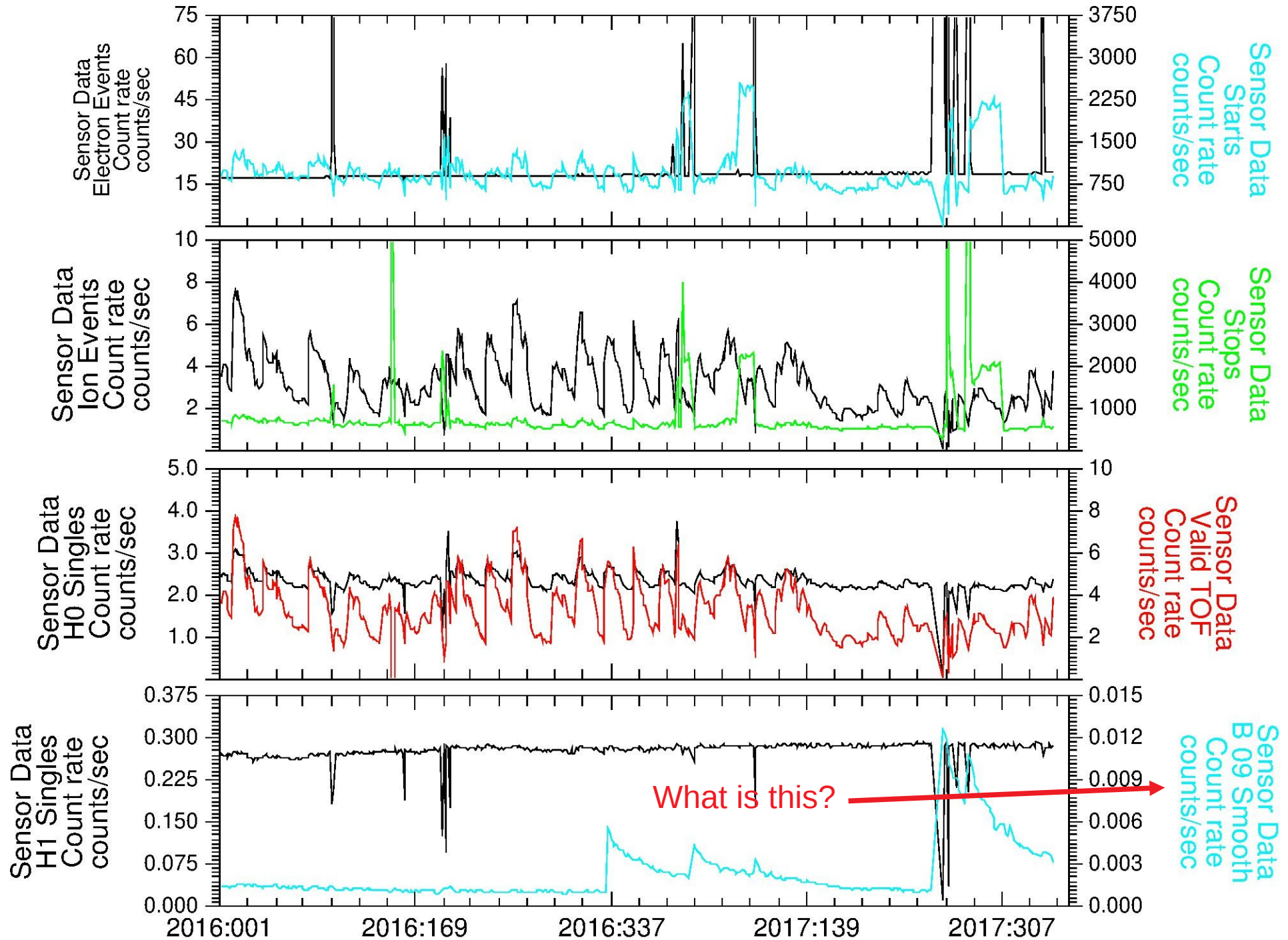


nh-x-pepssi-3-kemcruise1-v1.0/data FLUX HDU

Starts, Stops, Valid TOF



nh-x-pepssi-3-kemcruise1-v1.0/data FLUXN1B HDU Starts, Stops, Valid TOF



B09SMOOTH in every L3 data file

```
OBJECT          = COLUMN
NAME            = "B09SMOOTH"
BYTES          = 8
COLUMN_NUMBER  = 6
DATA_TYPE      = "IEEE_REAL"
START_BYTE     = 37
DESCRIPTION    = "
                Derived B09 Rate
                "
UNIT           = "CPS"
END_OBJECT     = COLUMN
OBJECT        = COLUMN
```

Which Sector?

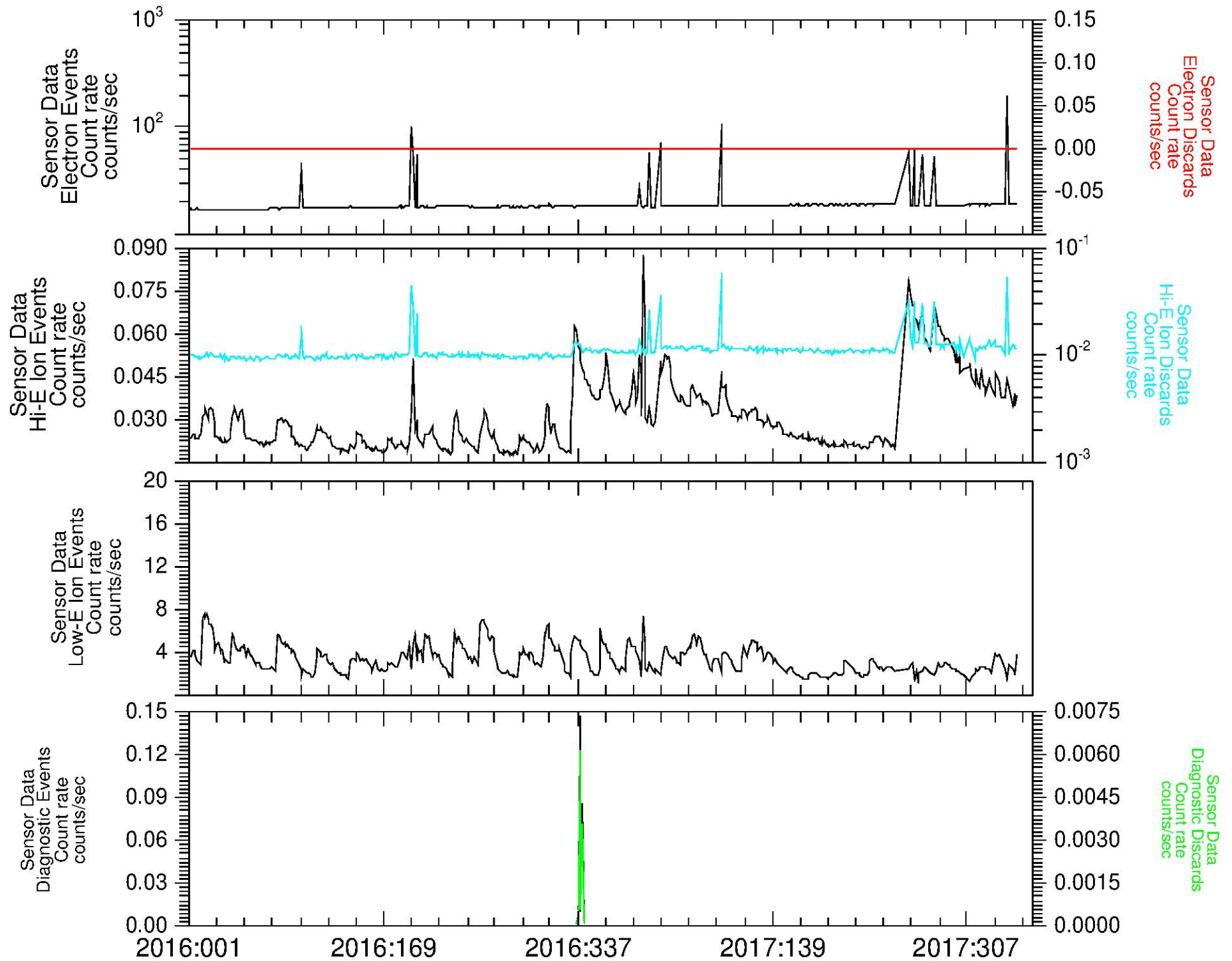
Which Start Anode?

Which Detector?

Note: Box 09 is lower energy ⁴He

What is this variable? I can find no information except the description. Please tell me what this is and why it is important.

nh-x-pepssi-3-kemcruise1-v1.0/data FLUX HDU Events



Comments

Something occurred within the kem data set time period. PEPSSI spectral shapes and intensities changed. This could be due to a change in attitude; however, that does not explain the He⁺⁺ contamination change from the nuclear source. Instrument sensitivity levels could have been altered, but this is undocumented. The instrument could also be failing. Input from the instrument team is requested.

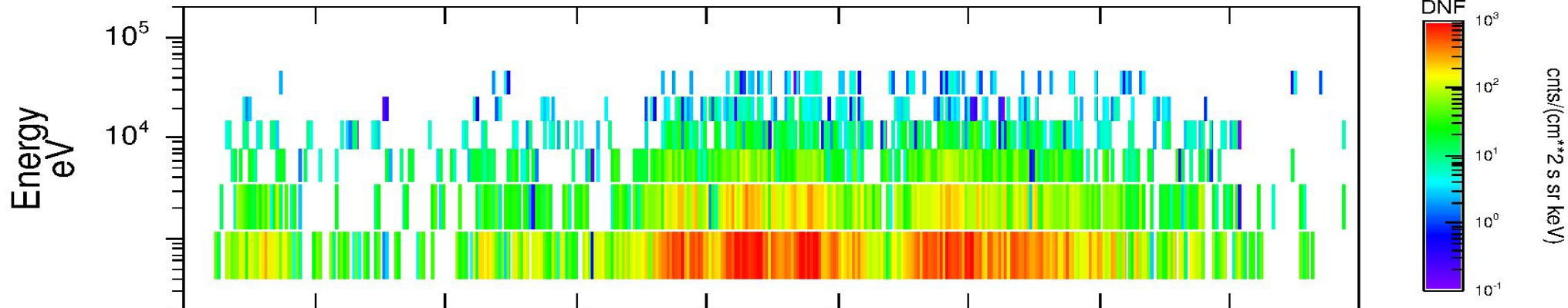
nh-x-pepssi-3-kemcruise1-v1.0/data FLUXN1B HDU Events

Missing due to Reviewer plotting issues

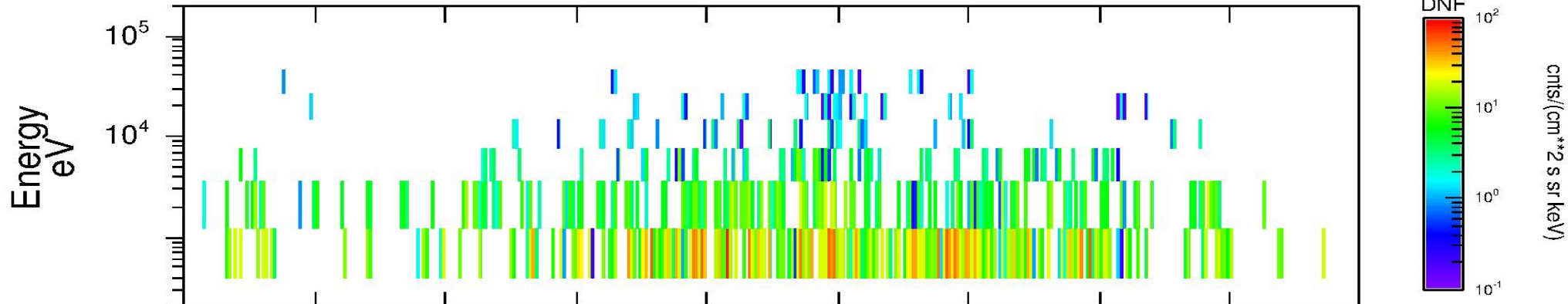
Back-Up Slides

PEPSSI Flux at Pluto

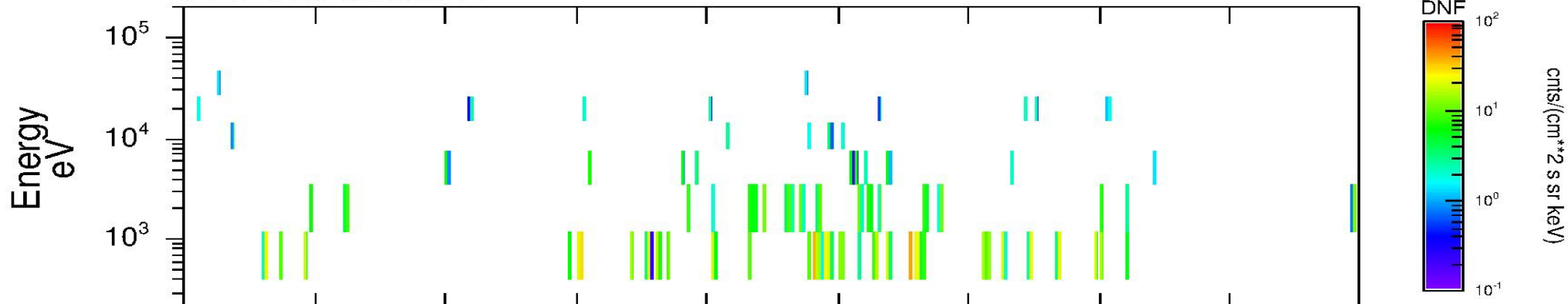
PEPSSI Sector 0



PEPSSI Sector 1

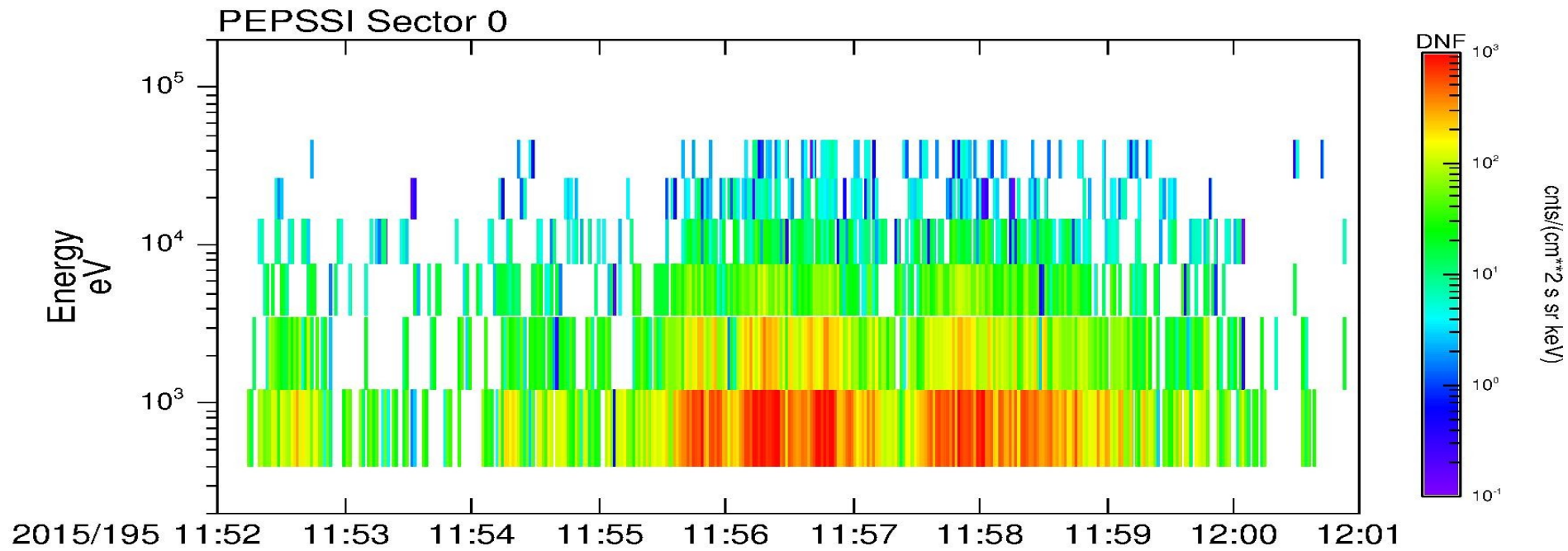


PEPSSI Sector 2

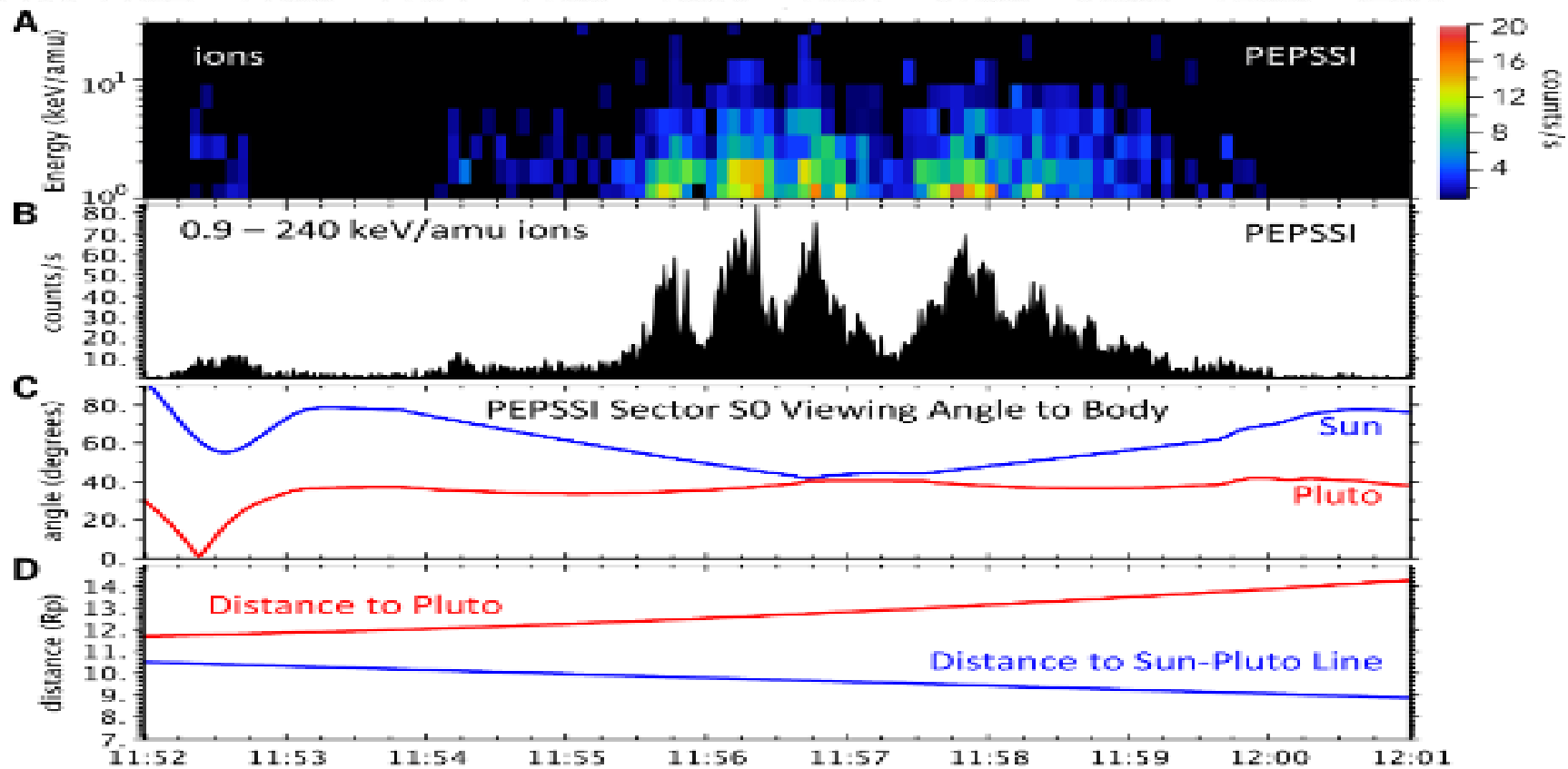


2015/195 11:52 11:53 11:54 11:55 11:56 11:57 11:58 11:59 12:00 12:01

PDS Data



Bagenal et al/ Published Data



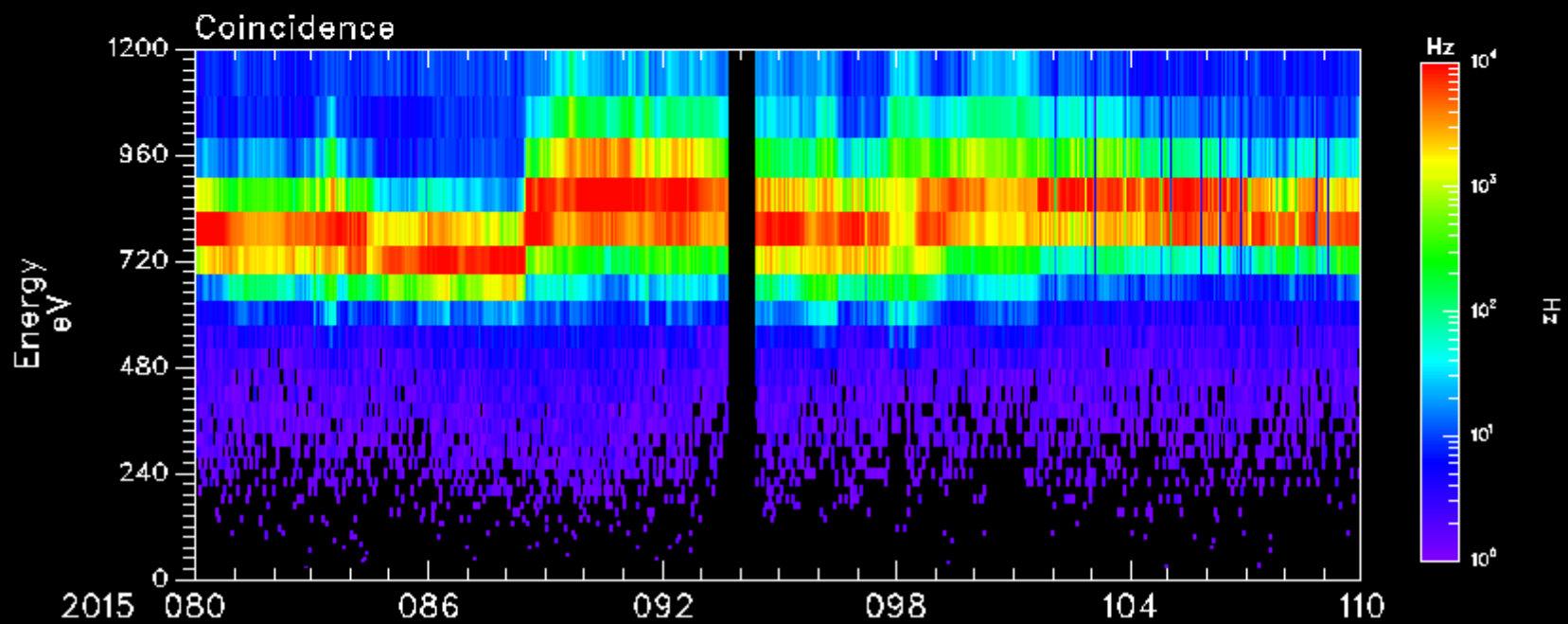
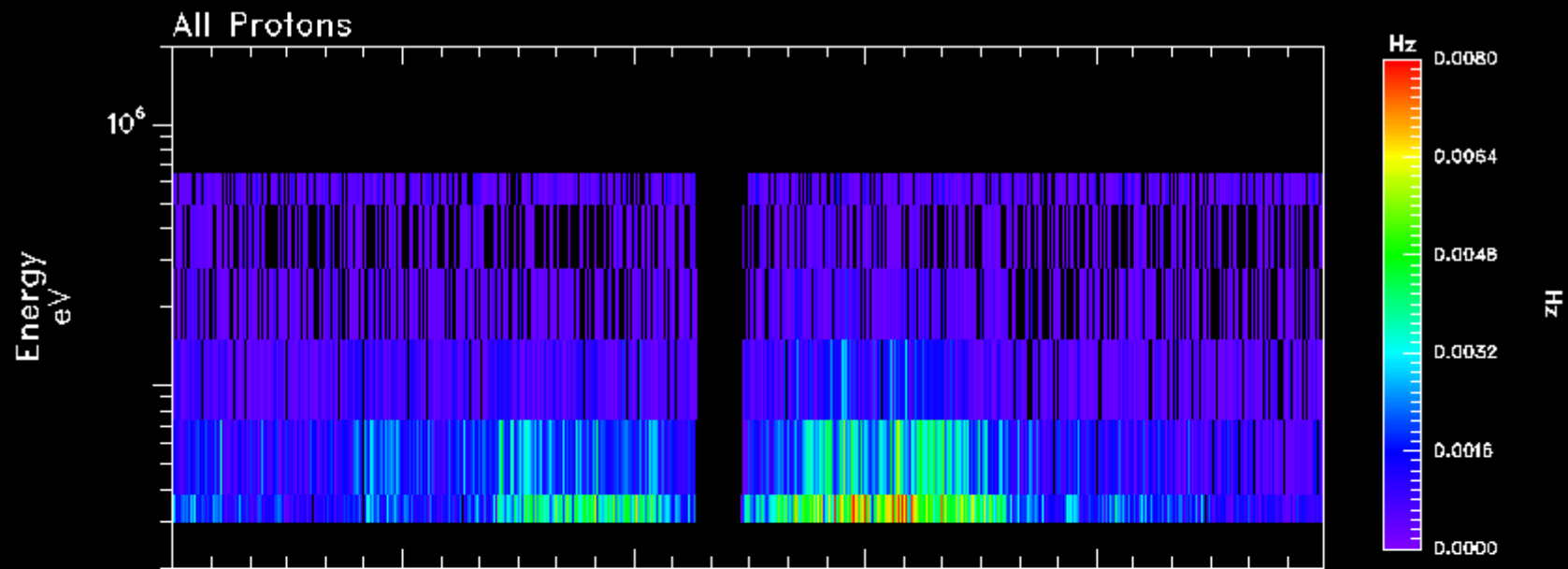
Comparison with the Published PEPSSI TOF data

Comparisons were made to the PEPSSI figures published in Bagenal *et al.*, Pluto's interaction with its space environment: Solar wind, energetic particles, and dust, Science, **351**(6279), 1282 (aad9045 1-8). 2016. Bagenal *et al.* figures are below, figures matching data times from this data are shown above.

Time coverage of the published plots was set to match those locally produced and the horizontal axes are aligned.

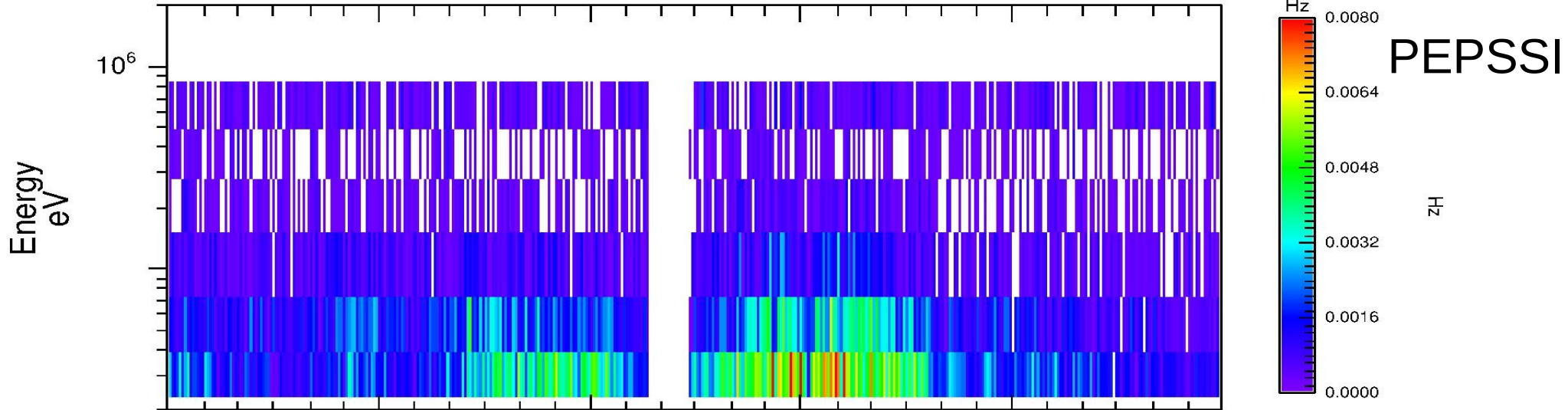
Heliospheric Shock or Heated Region in the Solar Wind

So is this really a heliospheric shock or just heated plasma from the Sun. Attached is a blow-up on the SWAP H⁺ region on a linear scale. The PEPSSI data resembles more of an extension of the SWAP H⁺.

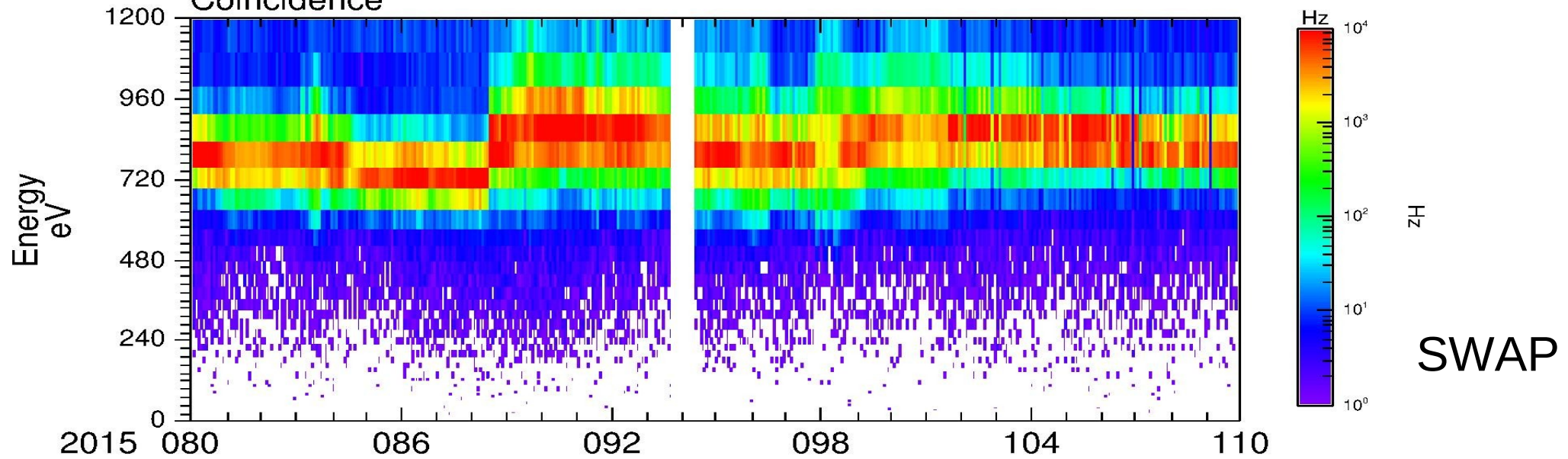


Heliospheric Shock or Heated Region in the Solar Wind - Updated

All Protons

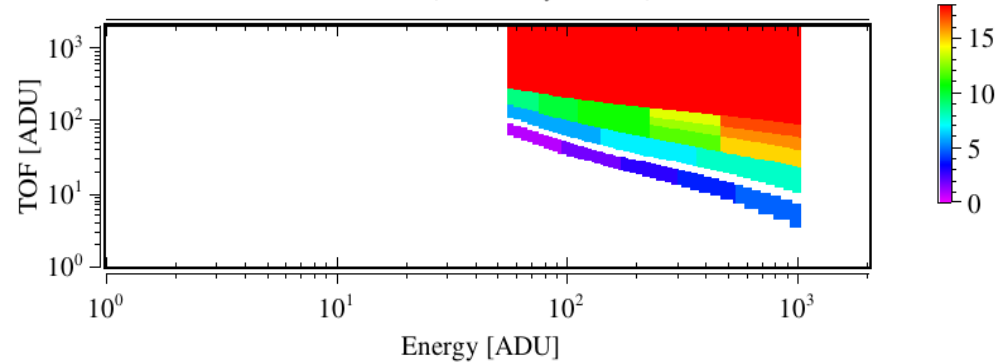


Coincidence

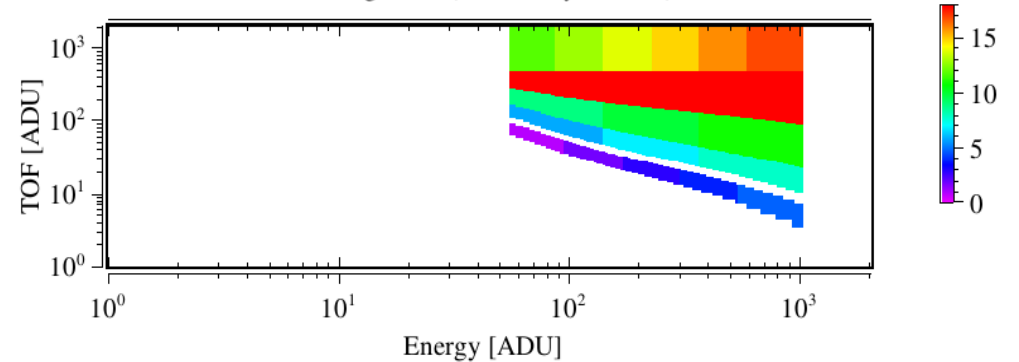


nh-p-pepssi-2-pluto-v3.0/calib nh-p-pepssi-3-pluto-v3.0/calib rateboxdefinitionplanes.fit

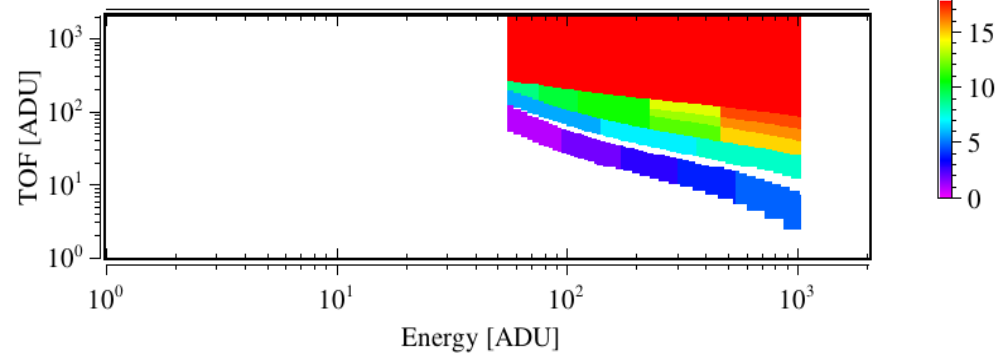
Set 0 Normal (before July 7, 2006)



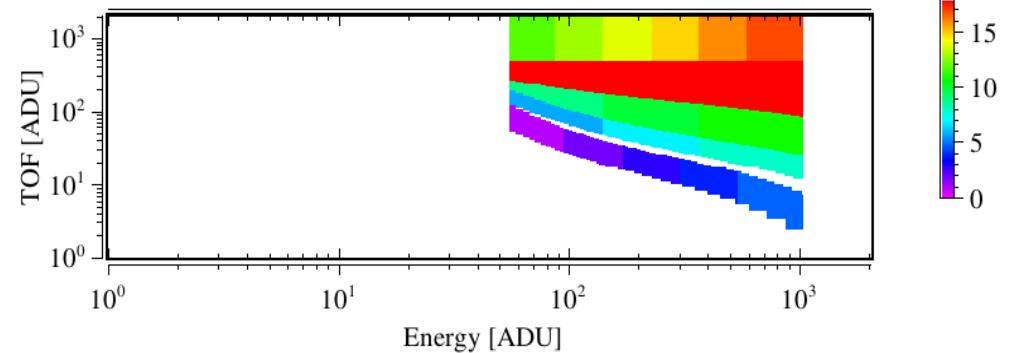
Set 0 Diagnostic (before July 7, 2006)



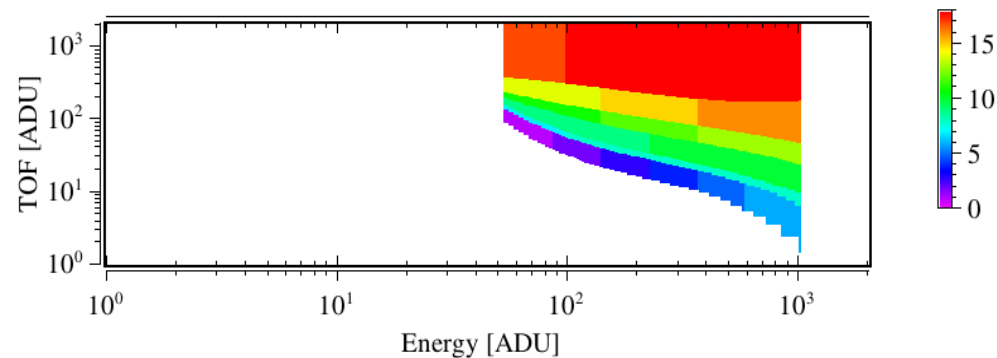
Set 1 Normal (July 7, 2006 - May 24, 2007)



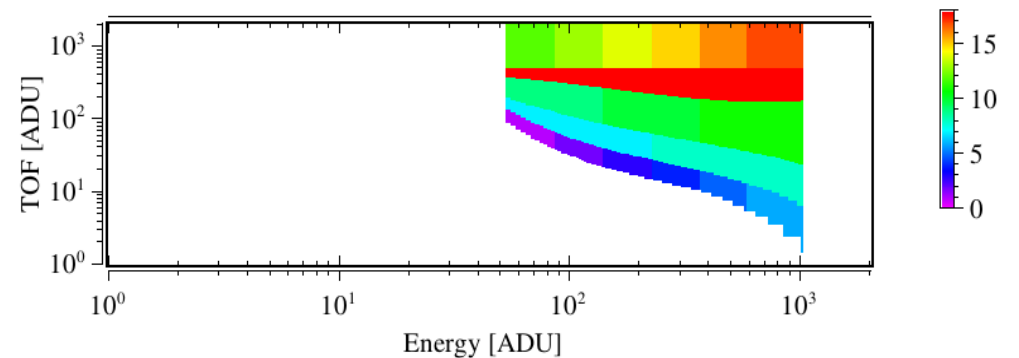
Set 1 Diagnostic (July 7, 2006 - May 24, 2007)



Set 3 Normal (after May 24, 2007)



Set 2 Diagnostic (after May 24, 2007)



nh-x-pepssi-2-kemcruise1-v1.0/document
nh_mission_trajectory.tbl &
nh_mission_trajectory.tab

GOOD

nh-x-pepssi-2-kemcruise1-v1.0/document
nh_fov.lbl & nh_fov.png

GOOD

nh-x-pepssi-2-kemcruise1-v1.0/document
nh_pepssi_v110_ti.txt

GOOD

nh-x-pepssi-2-kemcruise1-v1.0/document
quat_axyz_instr_to_j2k.lbl &
quat_axyz_instr_to_j2k.asc

GOOD

nh-x-pepssi-2-kemcruise1-v1.0/document
lunineetal1995.tbl & lunineetal1995.pdf

GOOD

nh-x-pepssi-2-kemcruise1-v1.0/document
codmac_level_definitions.lbl &
codmac_level_definitions.pdf

GOOD

nh-x-pepssi-3-kemcruise1-v1.0/calib
hk_stat_input_20041016.tbl &
hk_stat_input_20041016.tab

GOOD

nh-x-pepssi-2-kemcruise1-v1.0
nh-x-pepssi-3-kemcruise1-v1.0
calib/calpars/calpar_columns fmt

GOOD

nh-x-pepssi-3-kemcruise1-v1.0/document
pepssi_ssr.lbl & pepssi_ssr.pdf

GOOD

nh-x-pepssi-3-kemcruise1-v1.0/document
payload_ssr.lbl & payload_ssr.pdf

GOOD

nh-x-pepssi-3-kemcruise1-v1.0/document
nh_met2utc.lbl

GOOD

nh-x-pepssi-2-kemcruise1-v1.0/document
pep_bti.lbl

GOOD

nh-x-pepssi-3-kemcruise1-v1.0
aareadme.txt

GOOD

nh-x-pepssi-3-kemcruise1-v1.0
voldesc.txt

GOOD

nh-x-pepssi-3-kemcruise1-v1.0/index
indxinfo.txt

GOOD

nh-x-pepssi-3-kemcruise1-v1.0/index
checksum.tbl & checksum.tab

GOOD

nh-x-pepssi-3-kemcruise1-v1.0/index
slimindx.lbl & slimindx.tab

GOOD

nh-x-pepssi-3-kemcruise1-v1.0/catalog
catinfo.txt

GOOD

nh-x-pepssi-3-kemcruise1-v1.0/catalog
dataset.cat

GOOD

nh-x-pepssi-3-kemcruise1-v1.0/catalog
nh_kem.cat

GOOD

nh-x-pepssi-3-kemcruise1-v1.0/catalog
pepssi.cat

Minor Corrections Sent to PDS

nh-x-pepssi-2-kemcruise1-v1.0
nh-x-pepssi-3-kemcruise1-v1.0
calib/calinfo.txt

GOOD

nh-x-pepssi-3-kemcruise1-v1.0/calib
hk_n1_input_20050228.tbl &
hk_n1_input_20050228.tab

GOOD