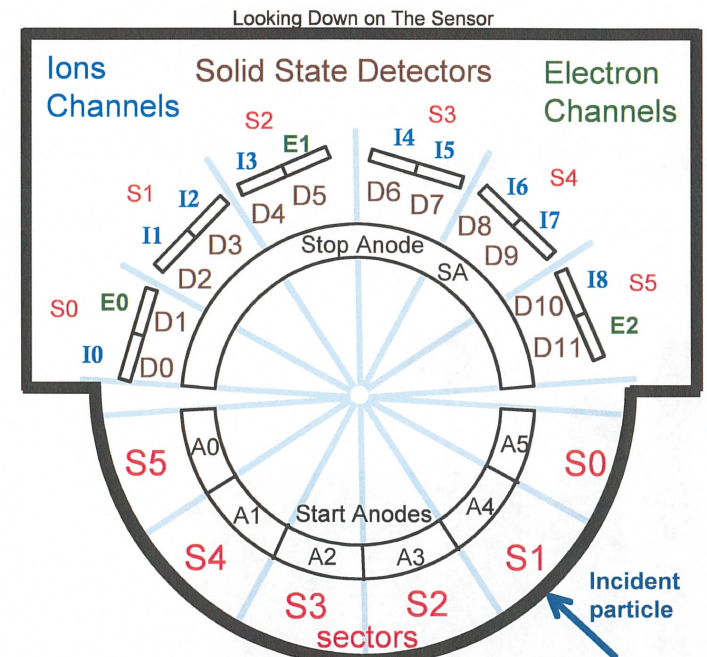
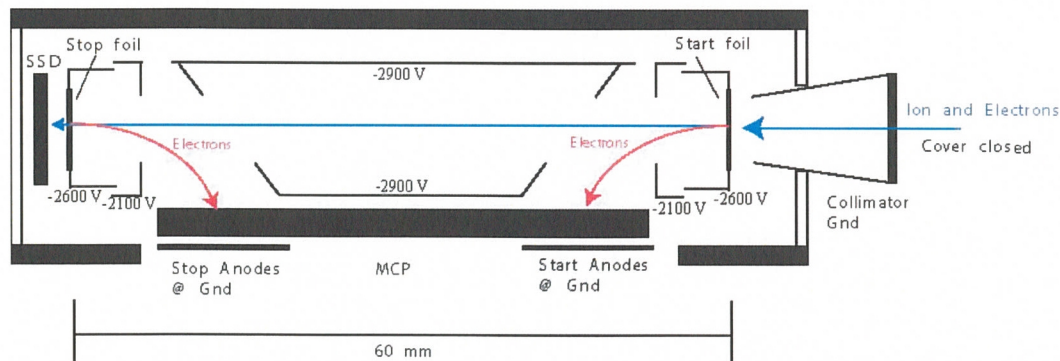


New Horizons Pluto Energetic Particle Spectrometer Science Investigation (PEPSSI)

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-p-pepssi-2-pluto-v3.0

CALIBRATED Data Sets:

nh-p-pepssi-3-pluto-v3.0

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-p-pepssi-2-pluto-v3.0
nh-p-pepssi-3-pluto-v3.0
introdoc.pdf

Unable to locate this file in directory tree;
however, it was available as a download to the
reviewer.

Data Introduction: New Horizons Spacecraft, PEPSSI Instrument

This is an abbreviated guide to the main elements of this [instrument] data set to provide an overview and a quick path

Keyword Not Replaced with Instrument Name



```
0xaaa = 0x691 (High Priority); 0x692 (Medium); 0x693 (Low, < 501 PHA); 0x694 (Low, > 500 PHA)  
0x695 (Diag " "); 0x696 (Diag " "); 0x697 (Diag " "); 0x698 (Diag " ")
```

Missing Text

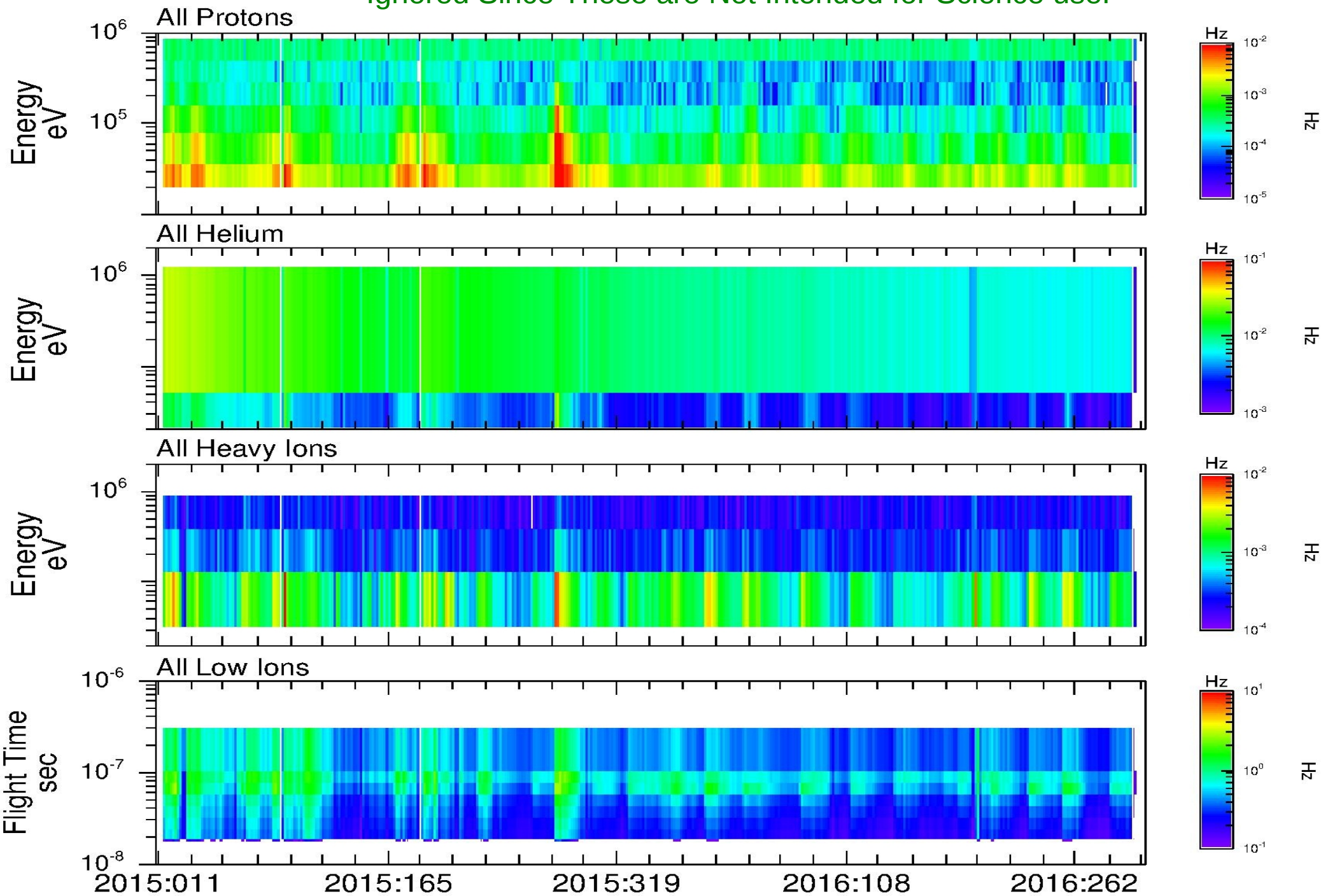


Minor notes sent to PDS.

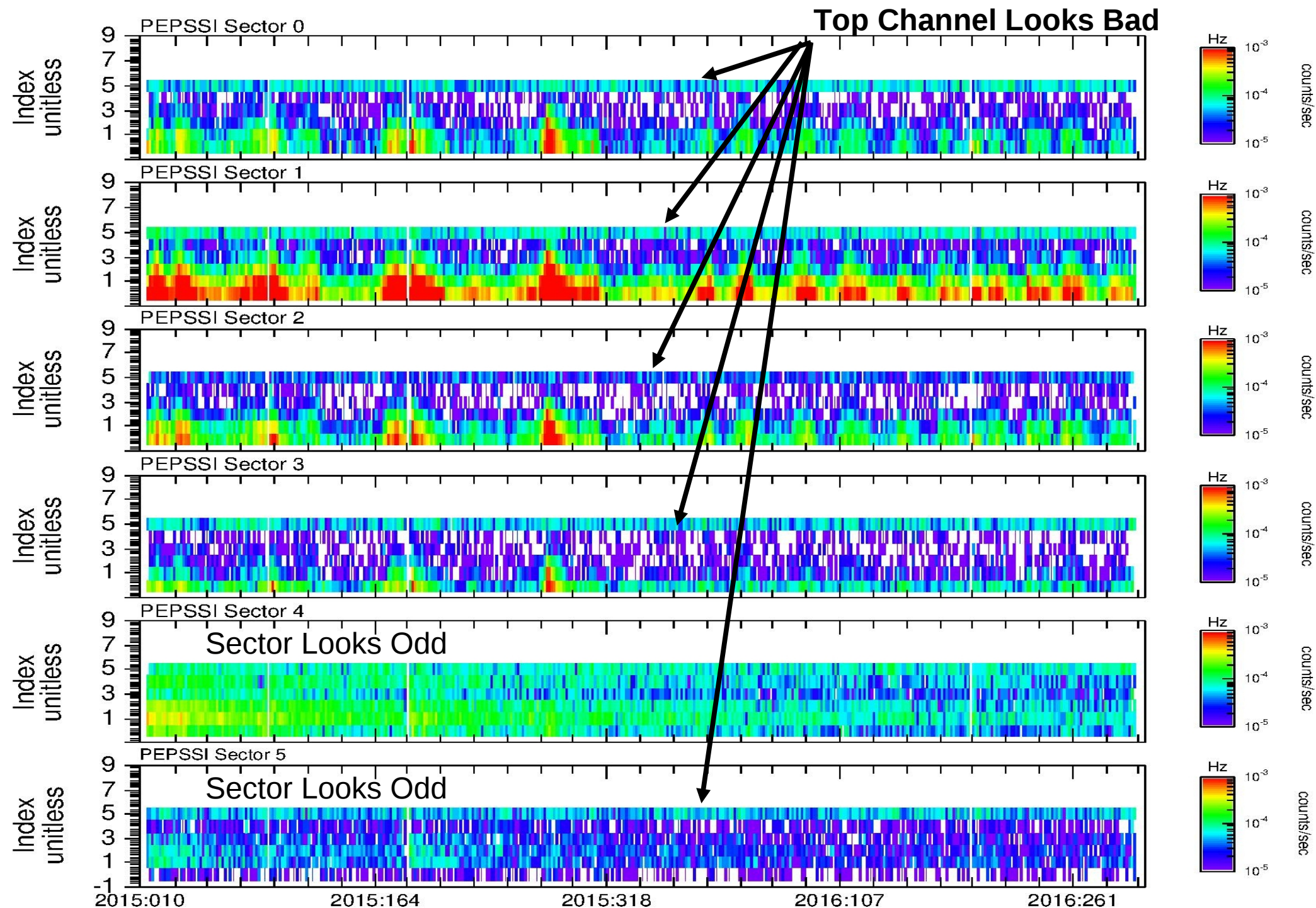
Data Evaluation

nh-p-pepssi-3-pluto-v3.0/data Quick-look Spectrograms

Ignored Since These are Not Intended for Science use.

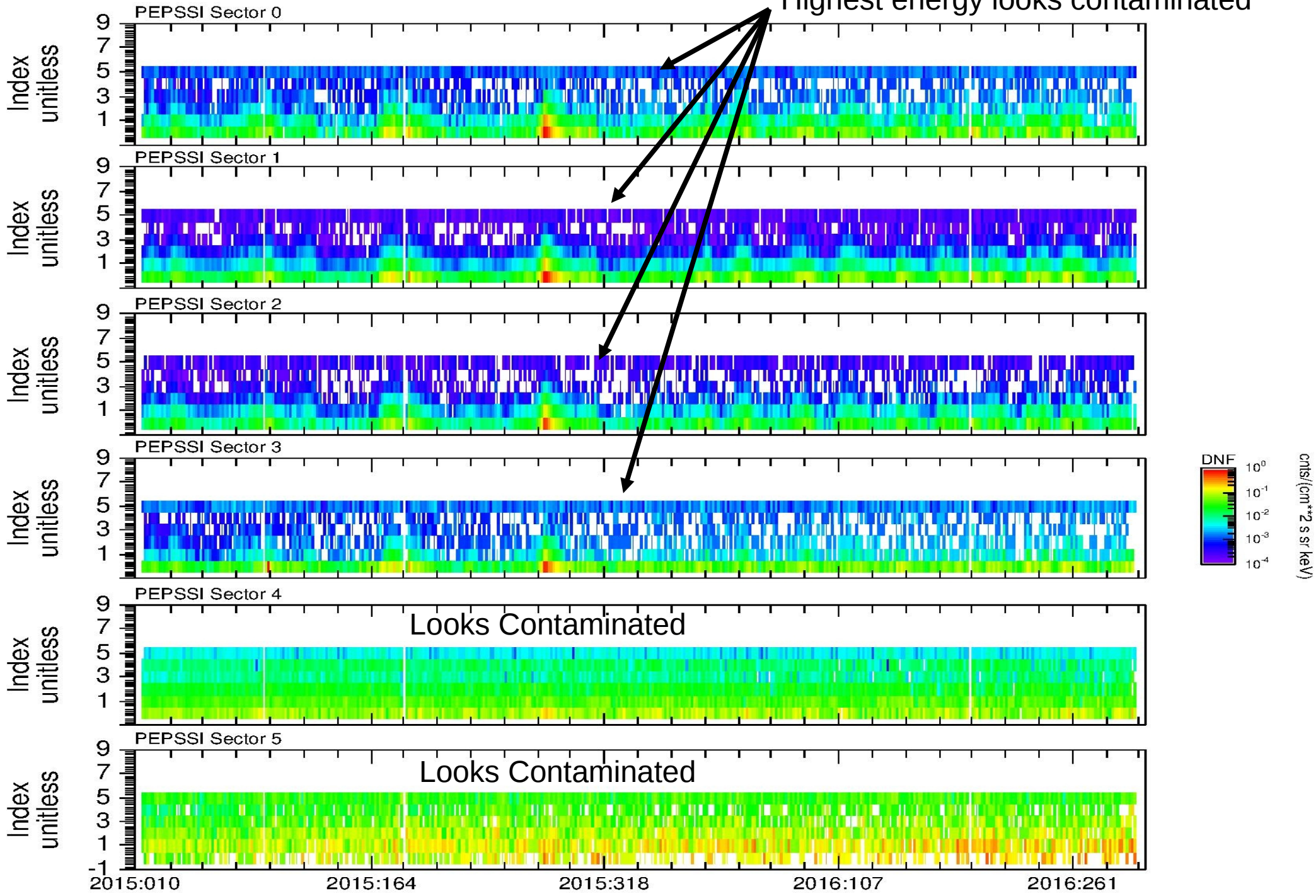


nh-p-pepssi-3-pluto-v3.0/data FLUX HDU B Rate Boxes – Proton CPS

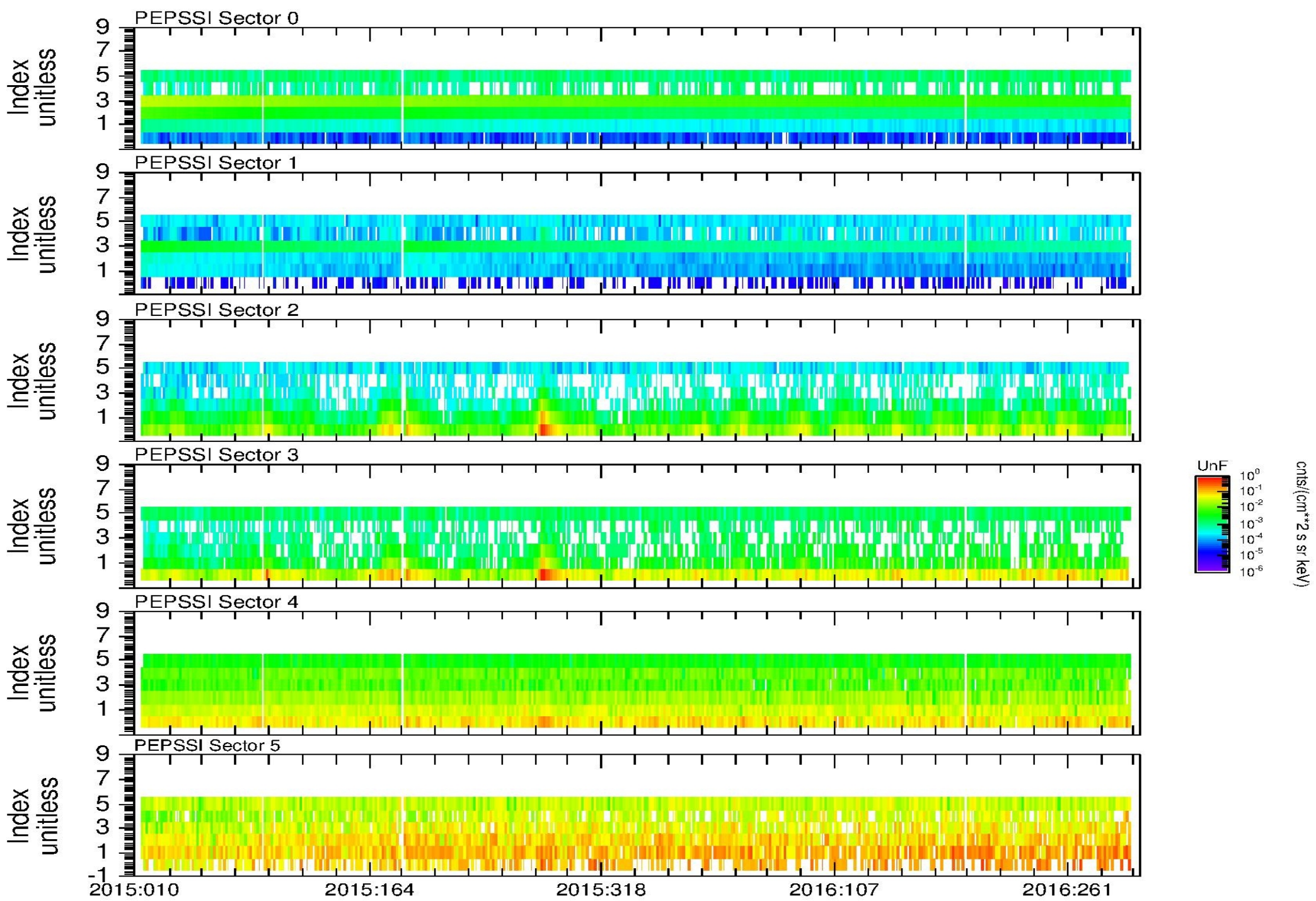


nh-p-pepssi-3-pluto-v3.0/data FLUX HDU B Rate Boxes – Proton DNF

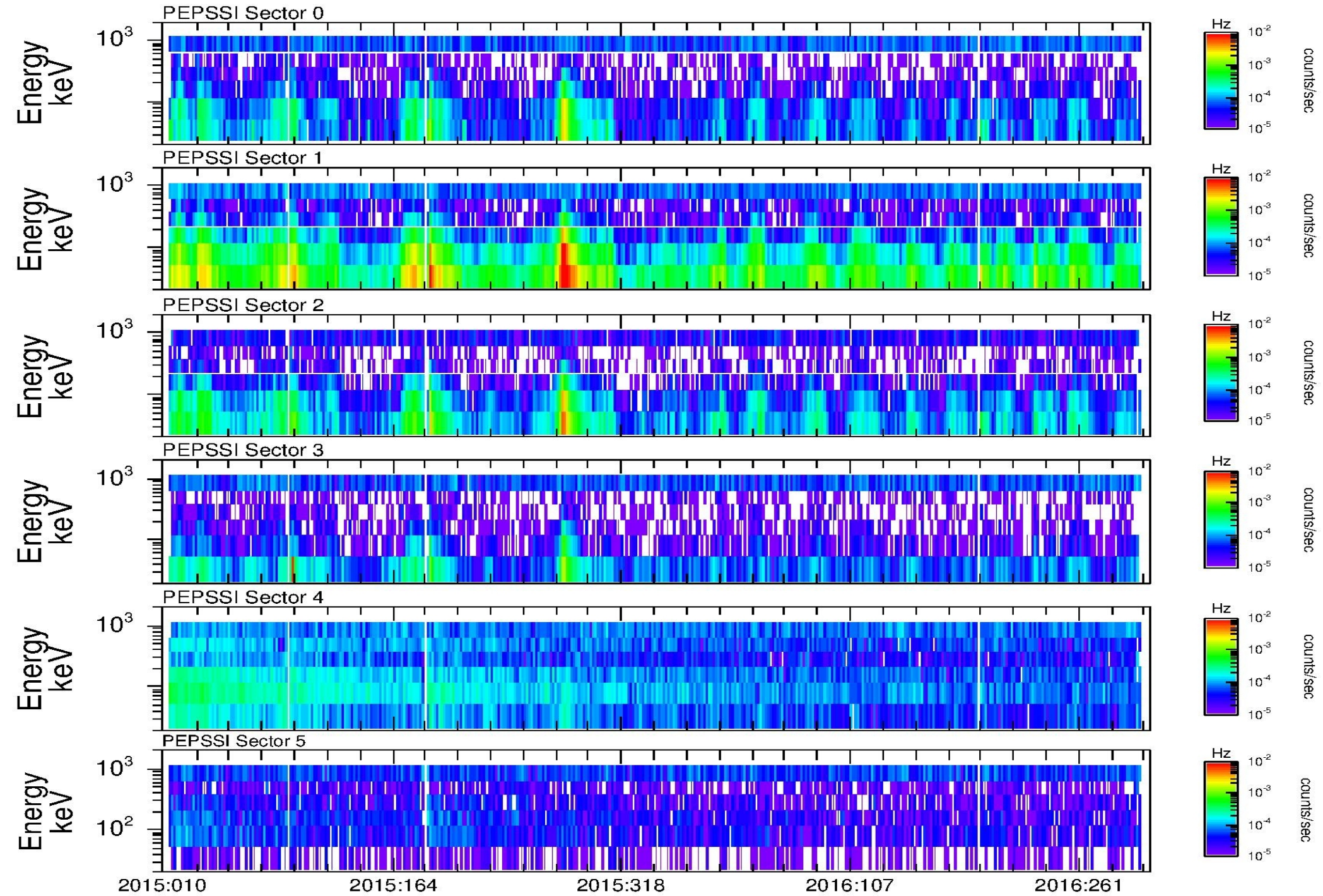
Highest energy looks contaminated



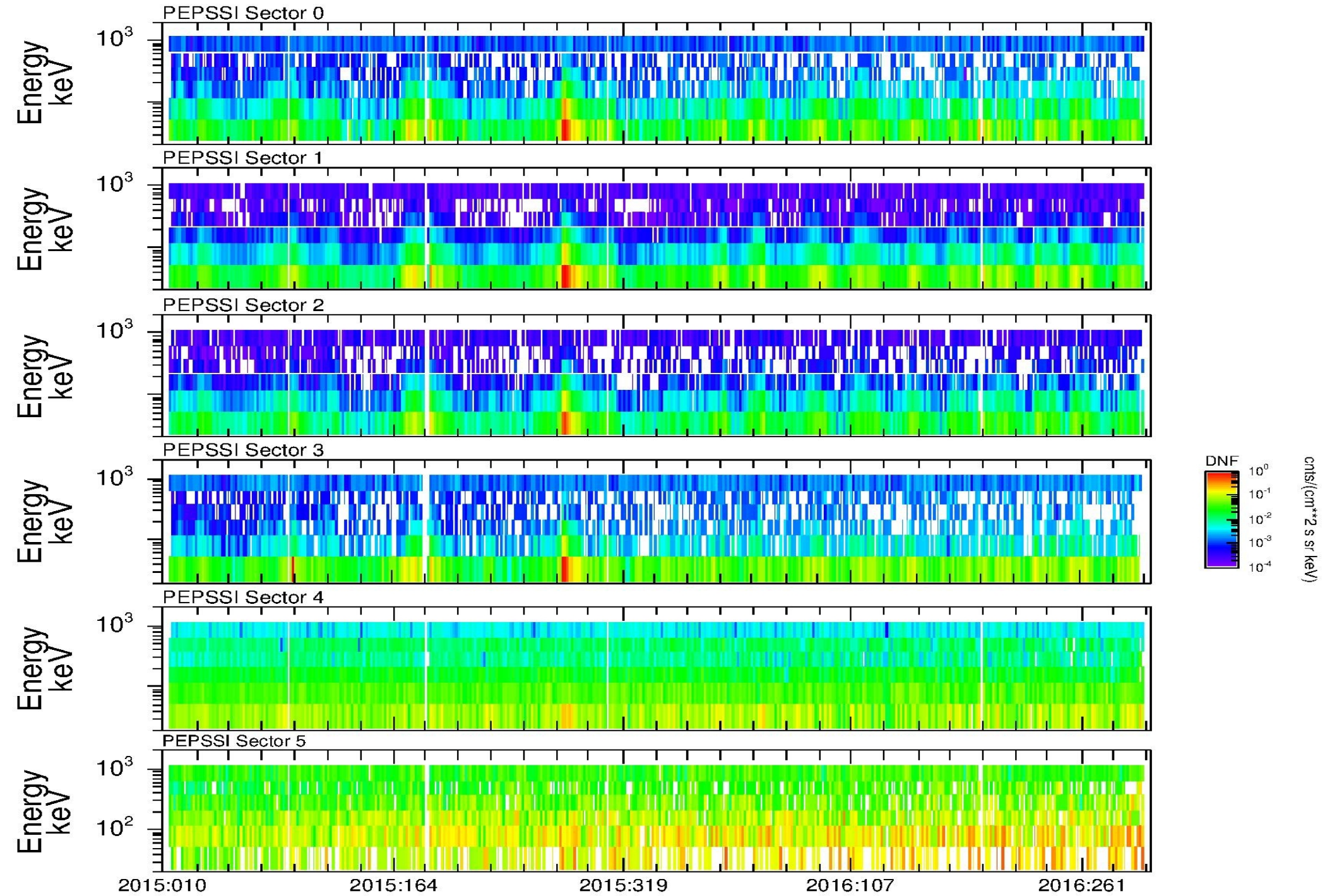
nh-p-pepssi-3-pluto-v3.0/data FLUX HDU B Rate Boxes – Proton UNC



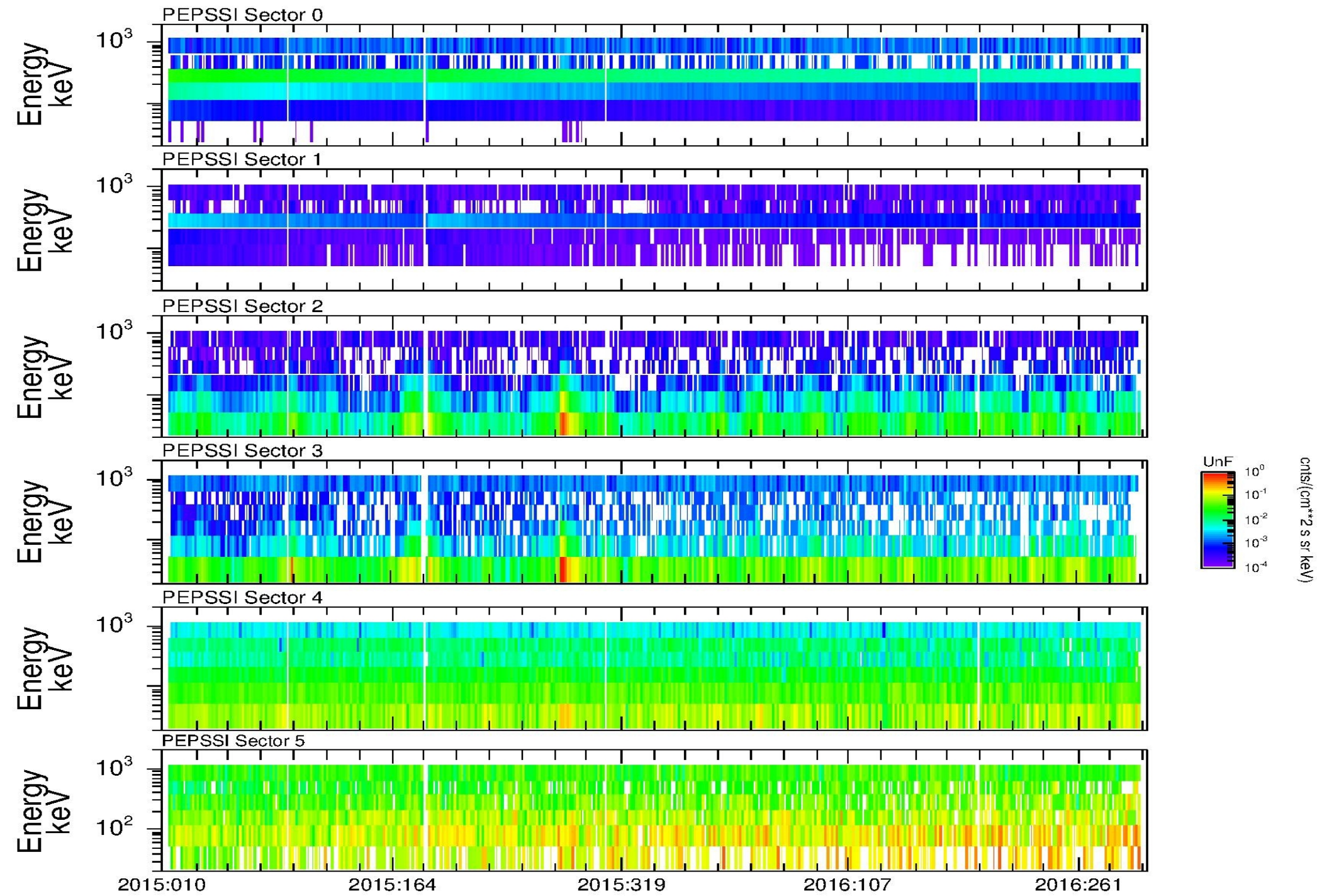
nh-p-pepssi-3-pluto-v3.0/data FLUX HDU B Rate Boxes – Proton CPS



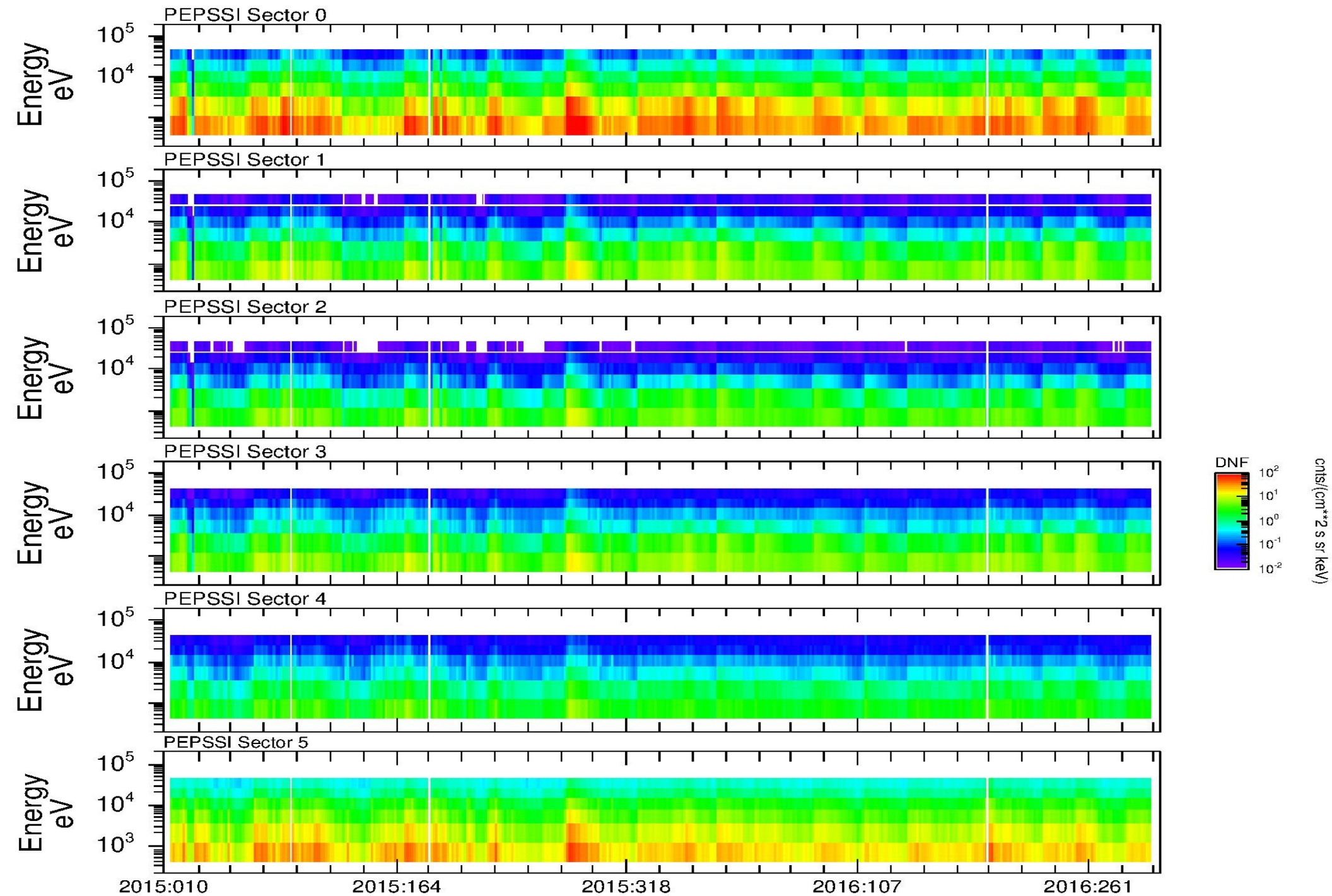
nh-p-pepssi-3-pluto-v3.0/data FLUX HDU B Rate Boxes – Proton DNF



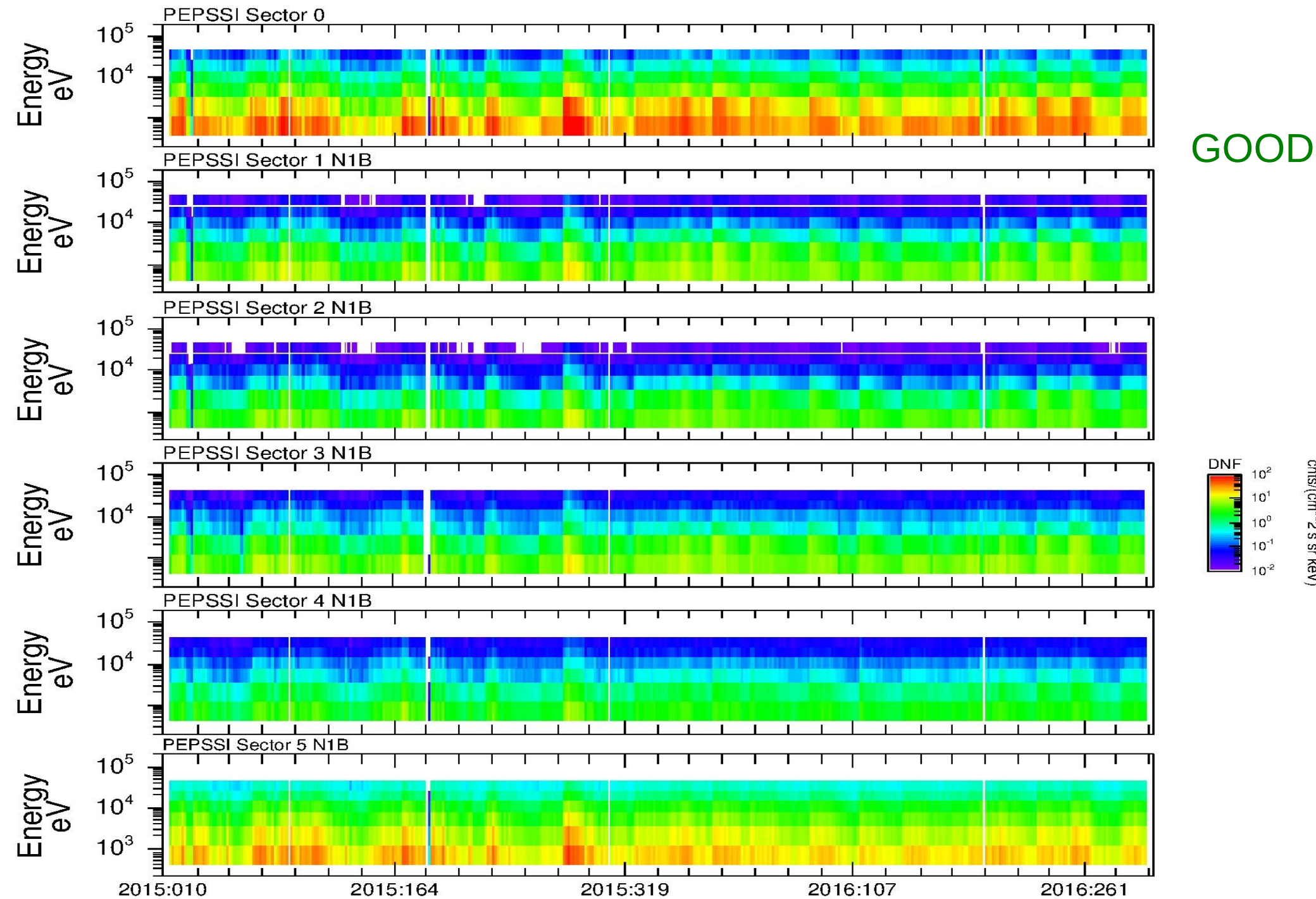
nh-p-pepssi-3-pluto-v3.0/data FLUX HDU B Rate Boxes – Proton UNC



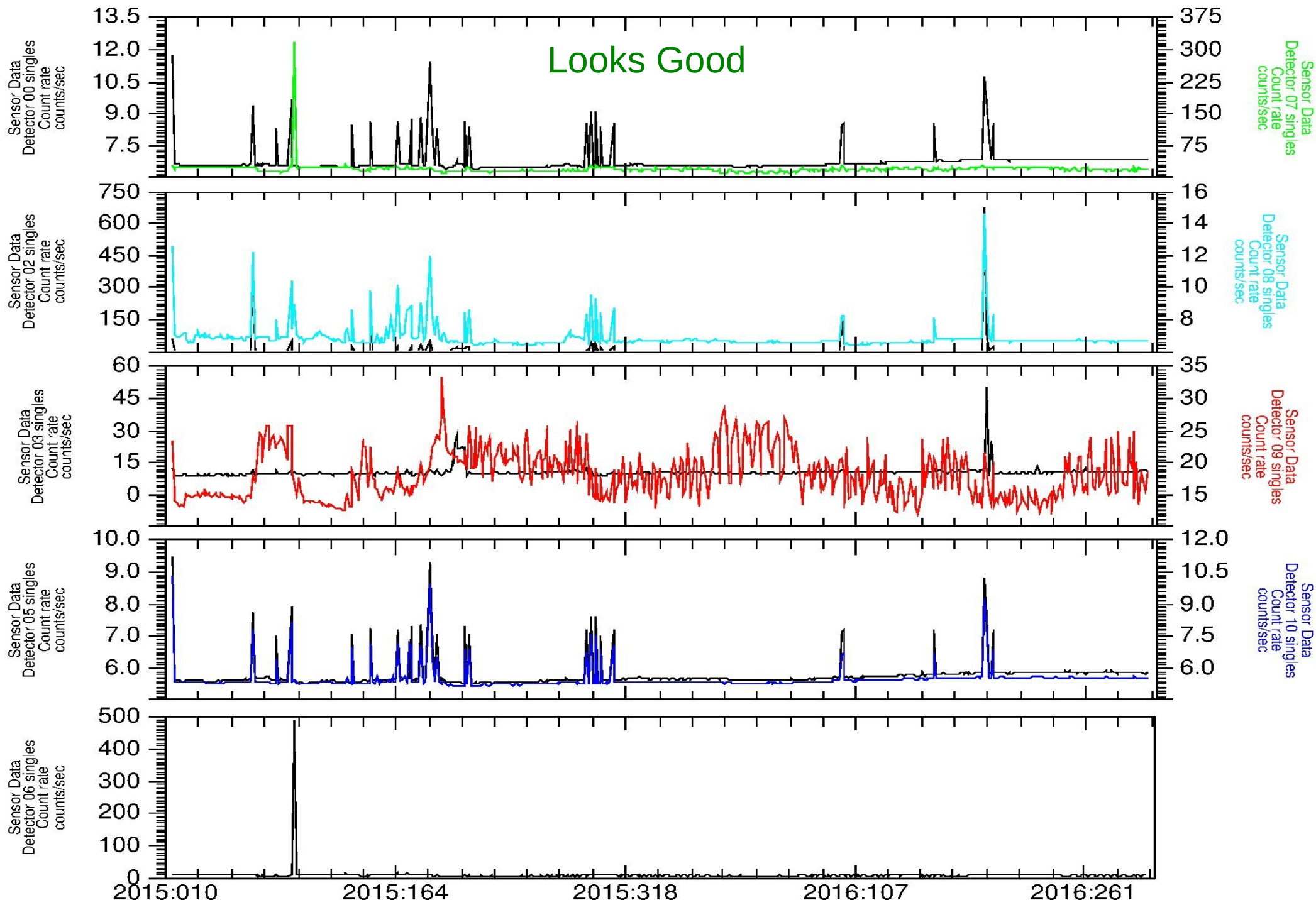
nh-p-pepssi-3-pluto-v3.0/data FLUX HDU L Rate Boxes – Proton DNF



nh-p-pepssi-3-pluto-v3.0/data FLUXN1B HDU L Rate Boxes – Proton DNF

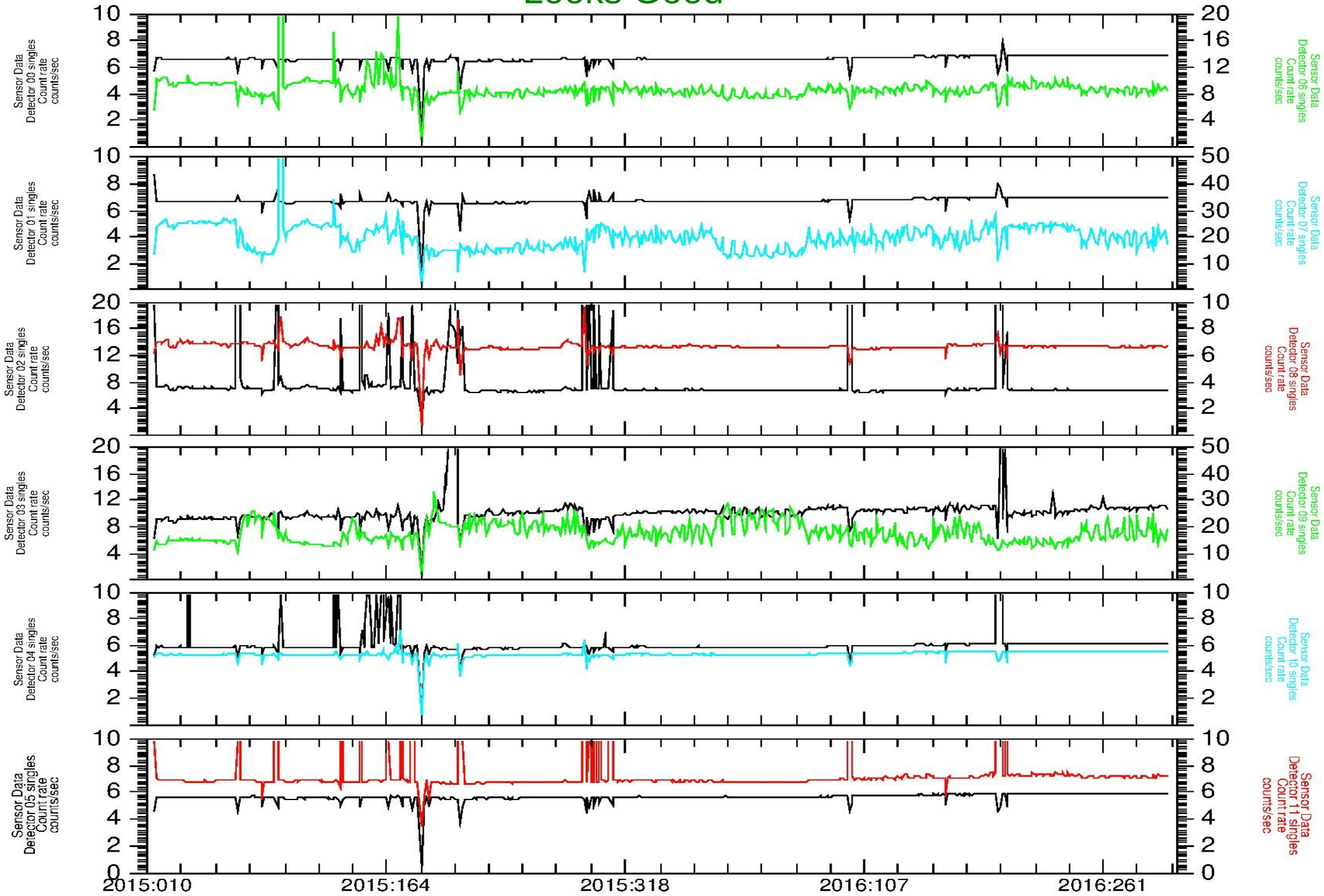


nh-p-pepssi-3-pluto-v3.0/data FLUX HDU Detector Singles

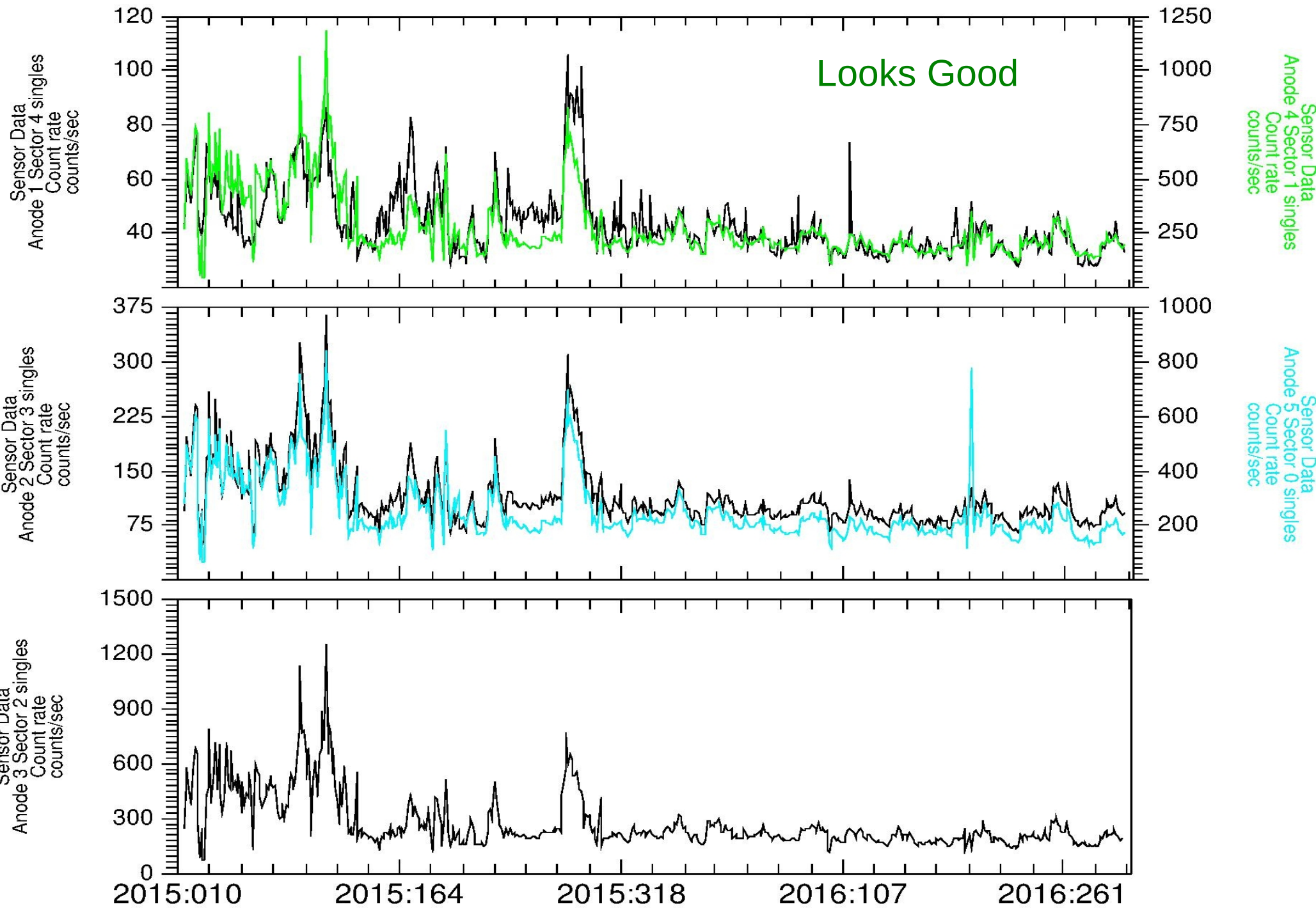


nh-p-pepssi-3-pluto-v3.0/data FLUXN1B HDU Detector Singles

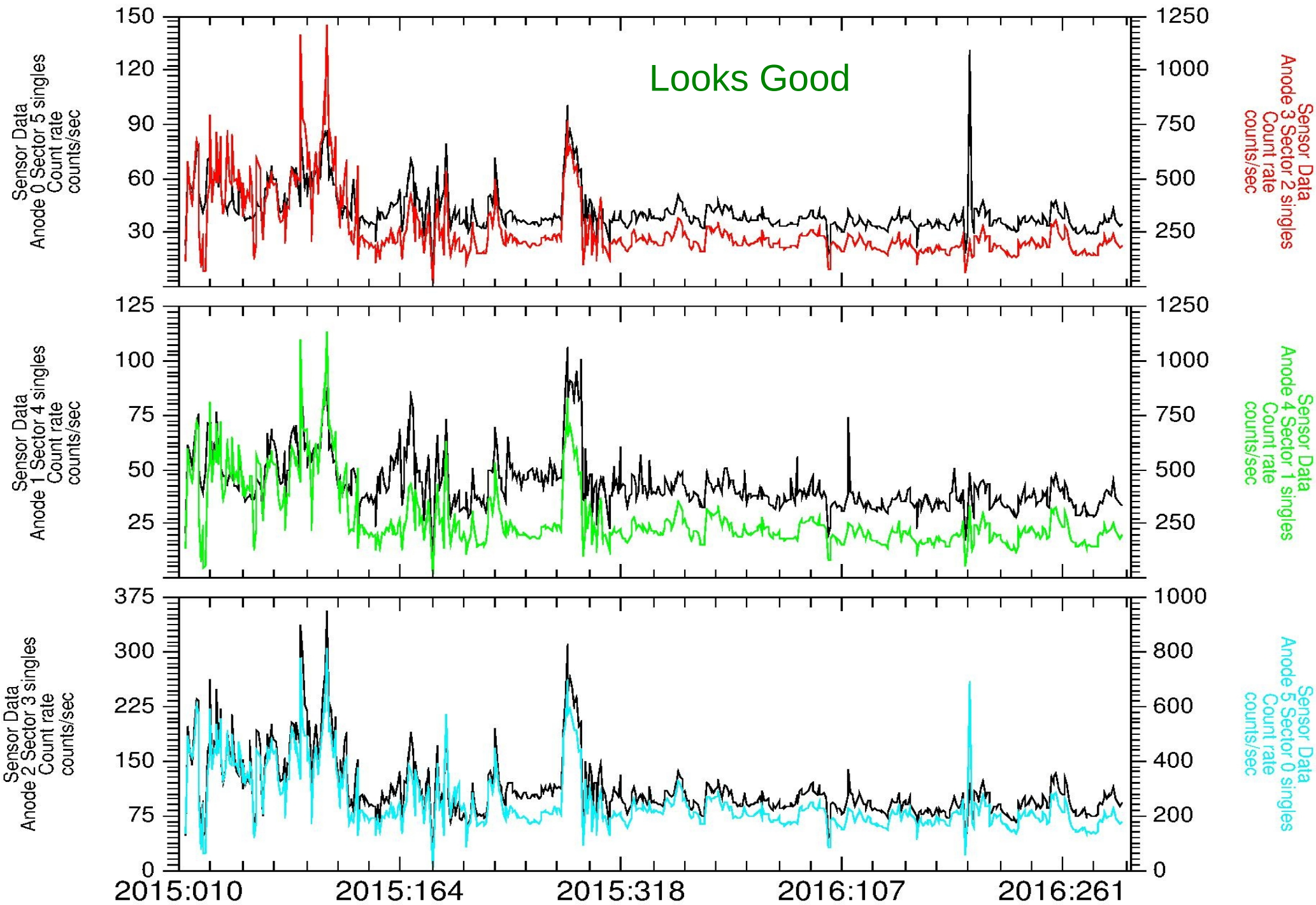
Looks Good



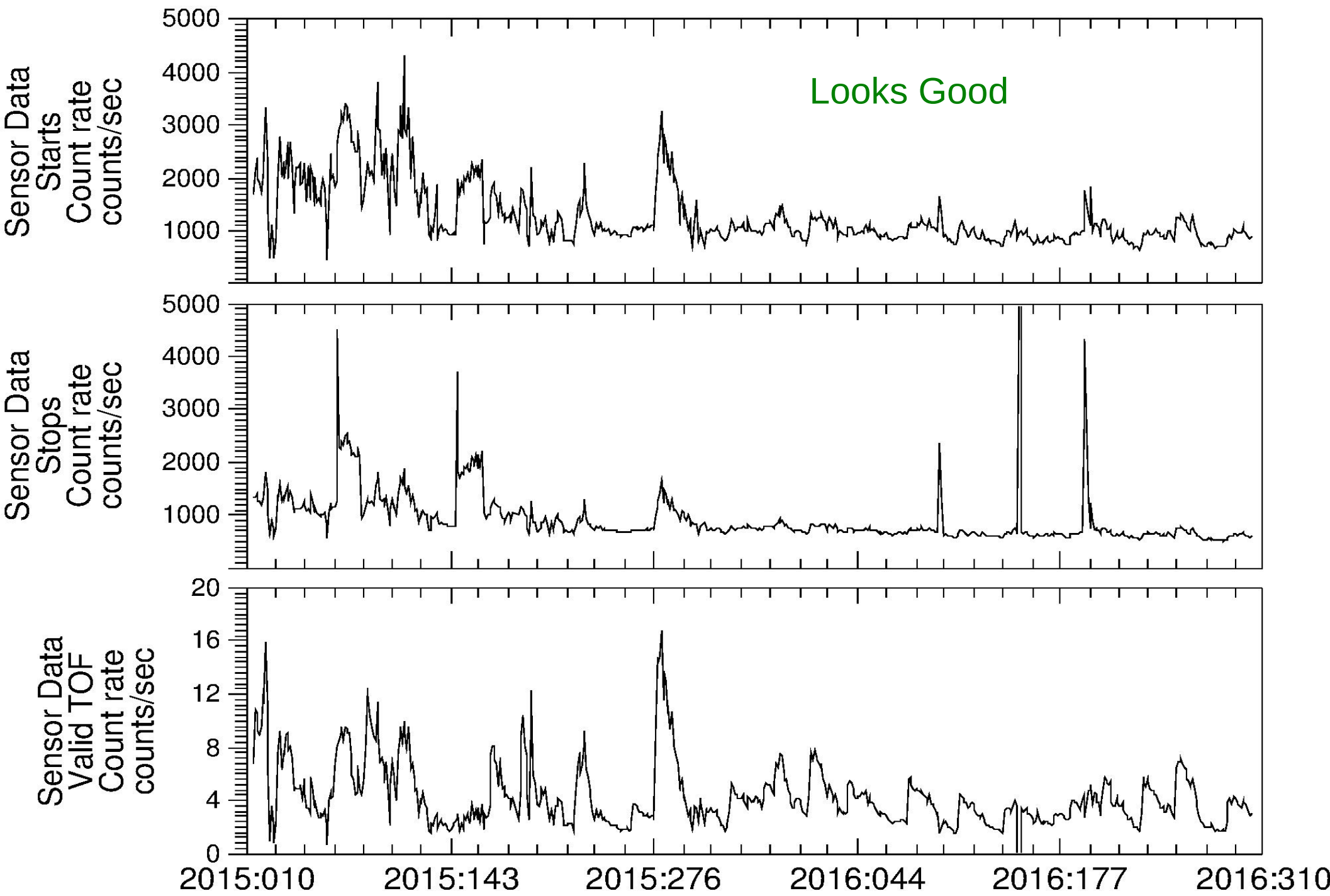
nh-p-pepssi-3-pluto-v3.0/data FLUX HDU Anode Singles



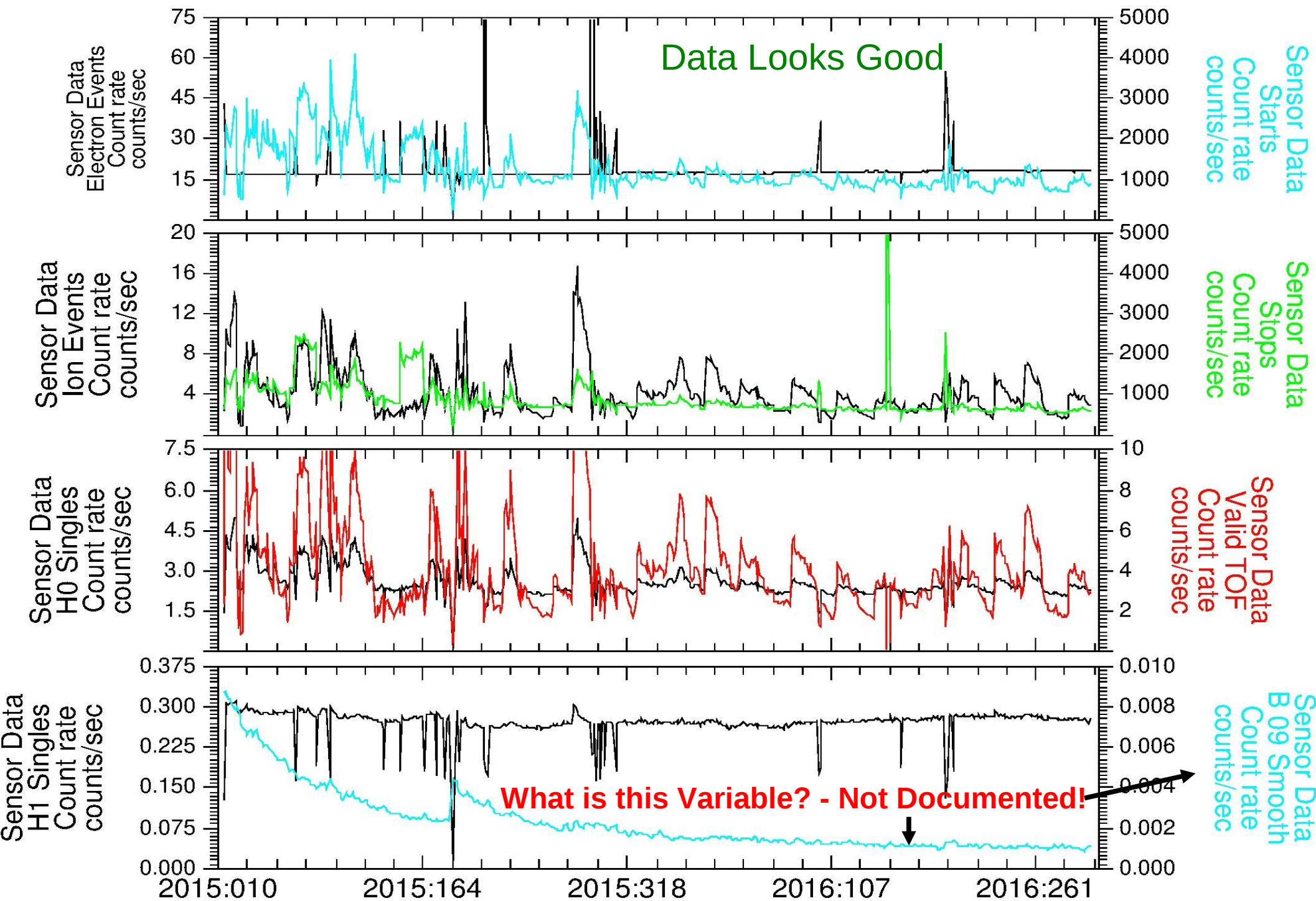
nh-p-pepssi-3-pluto-v3.0/data FLUXN1B HDU Anode Singles



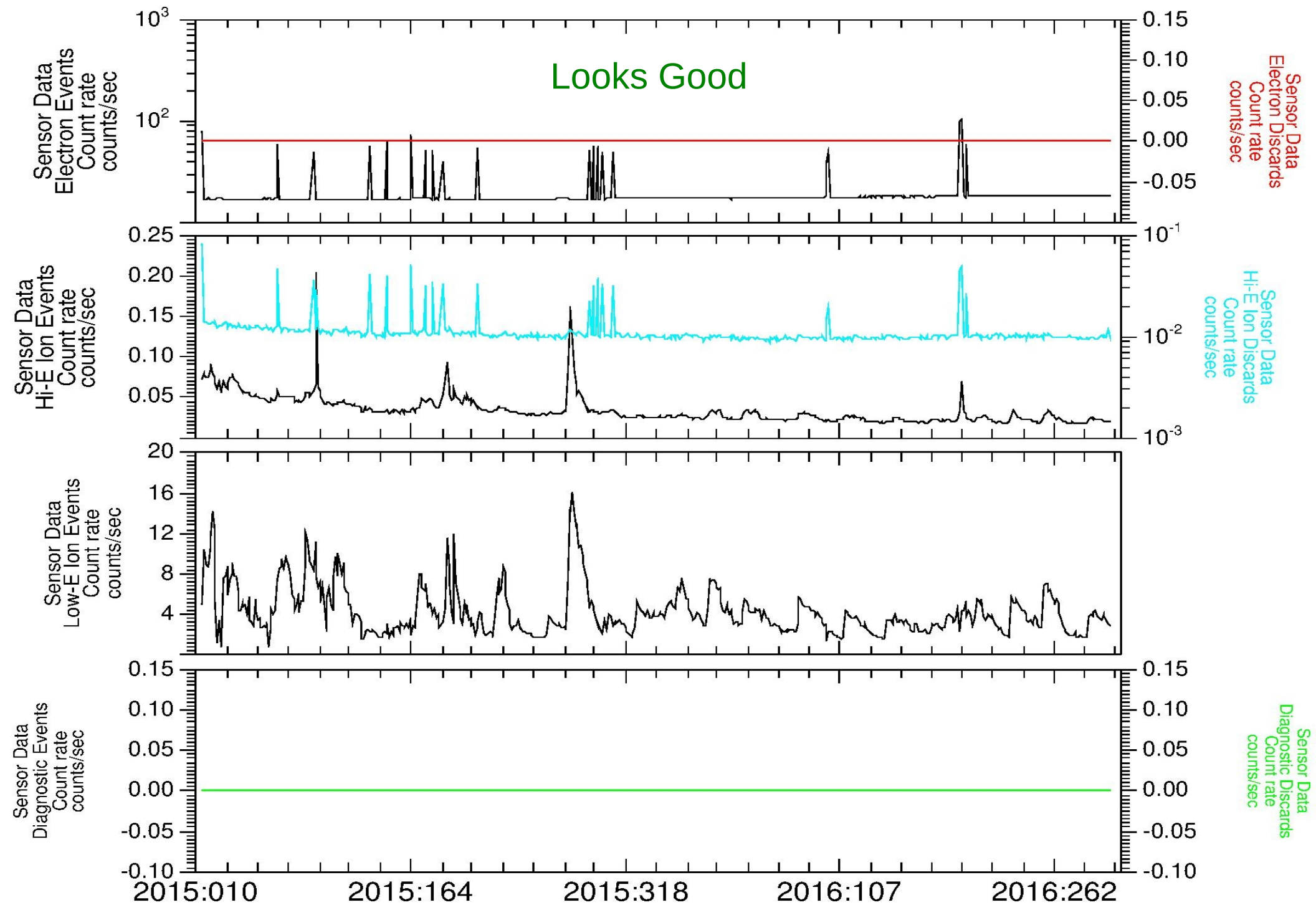
nh-p-pepssi-3-pluto-v3.0/data FLUX HDU Starts, Stops, Valid TOF



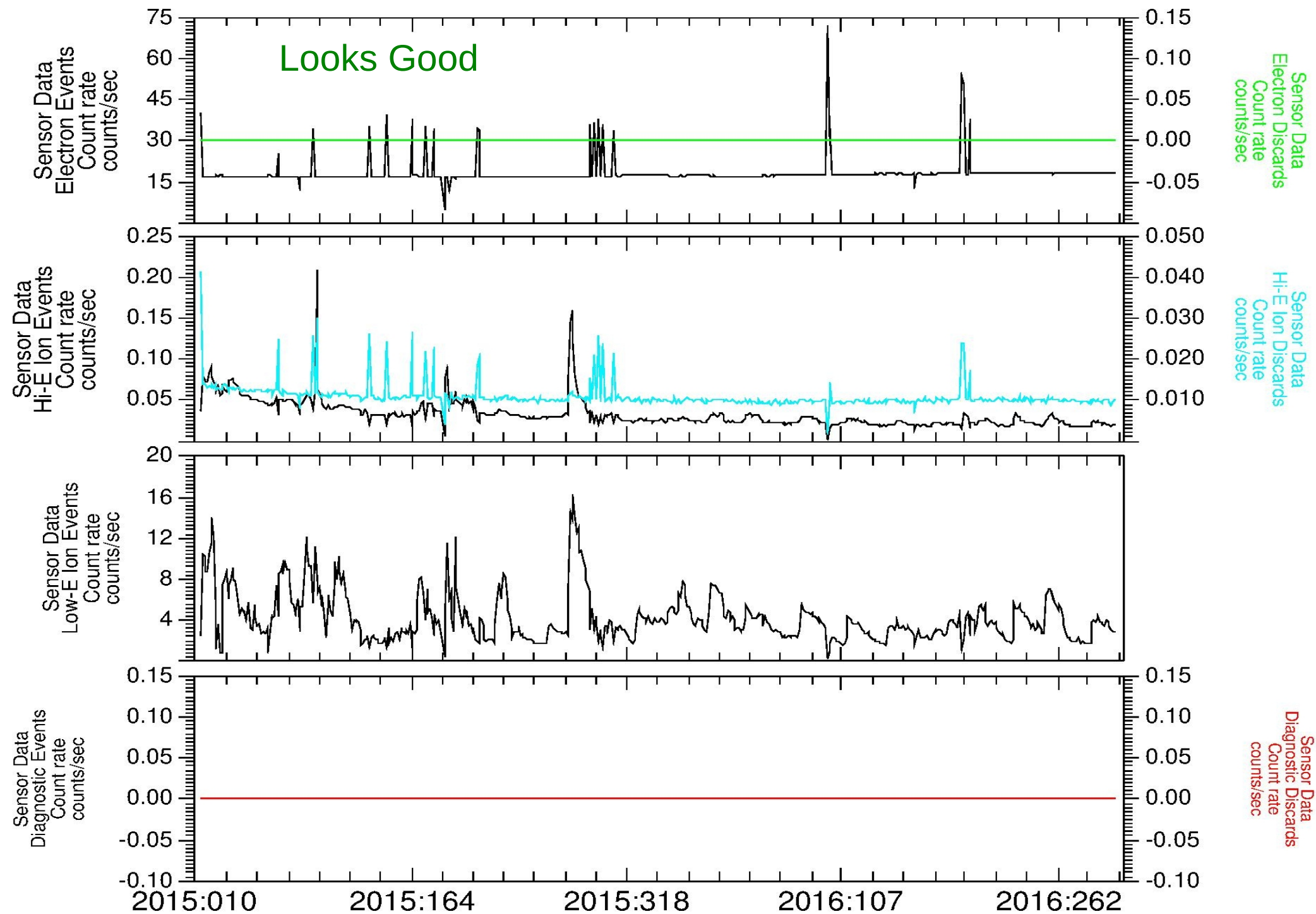
nh-p-pepssi-3-pluto-v3.0/data FLUXN1B HDU Starts, Stops, Valid TOF



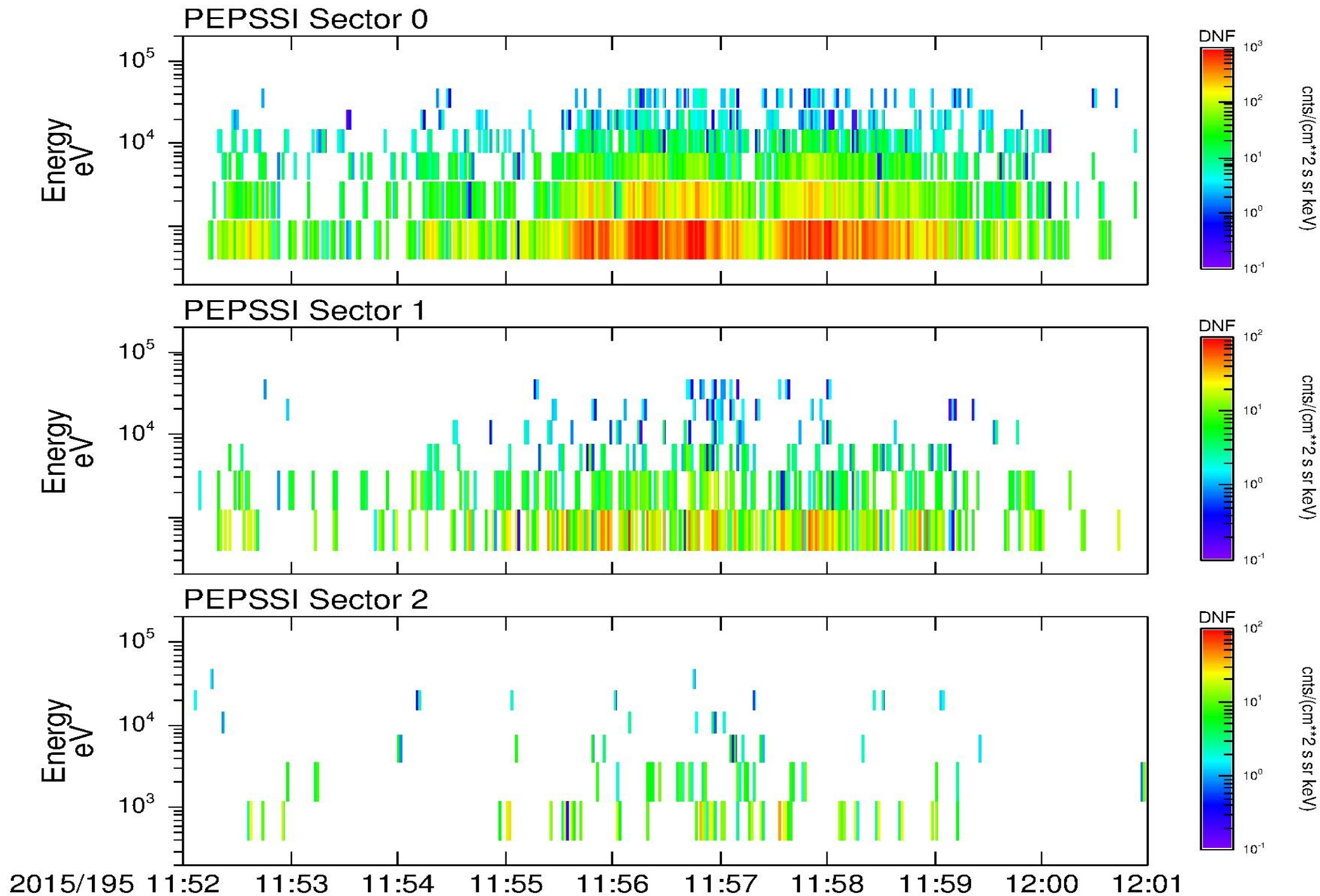
nh-p-pepssi-3-pluto-v3.0/data FLUX HDU Events



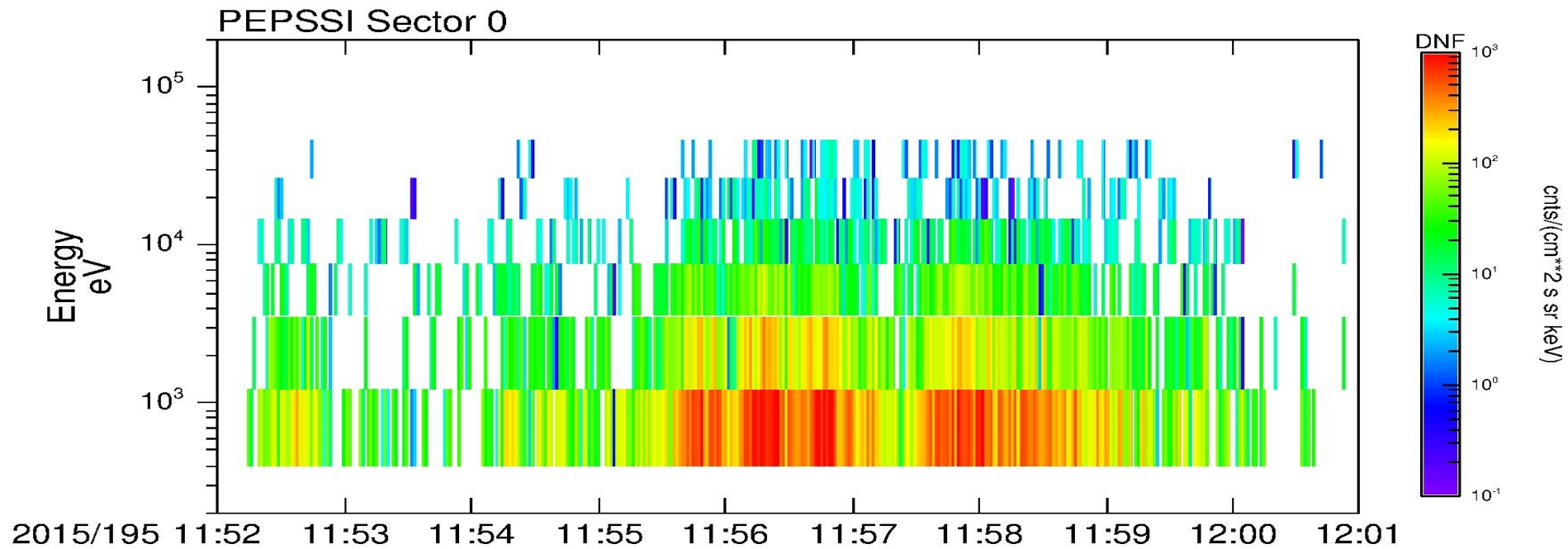
nh-p-pepssi-3-pluto-v3.0/data FLUXN1B HDU Events



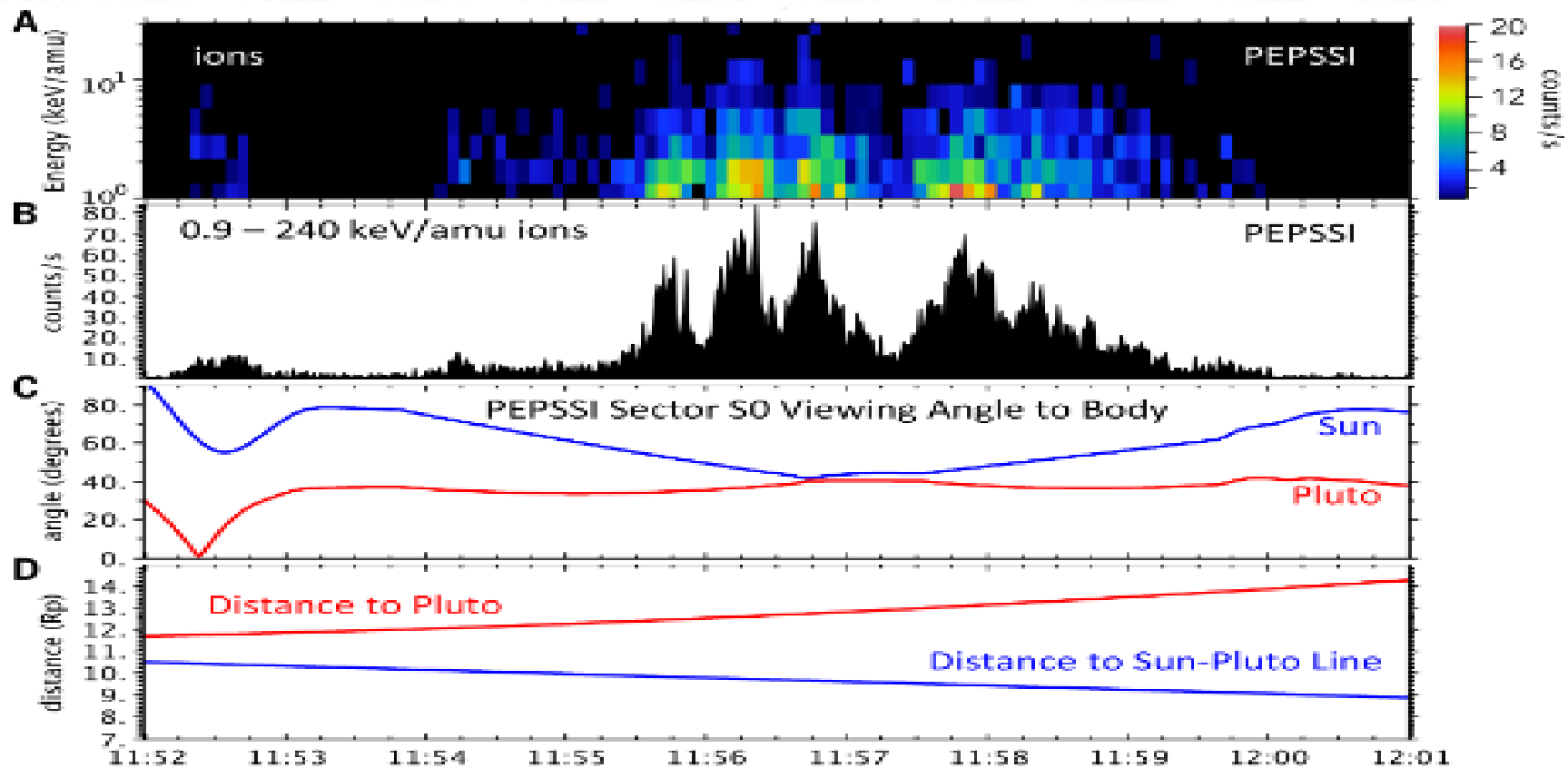
PEPSSI Flux at Pluto



PDS Data



Bagenal et al / Published Data



Back-Up Slides

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.

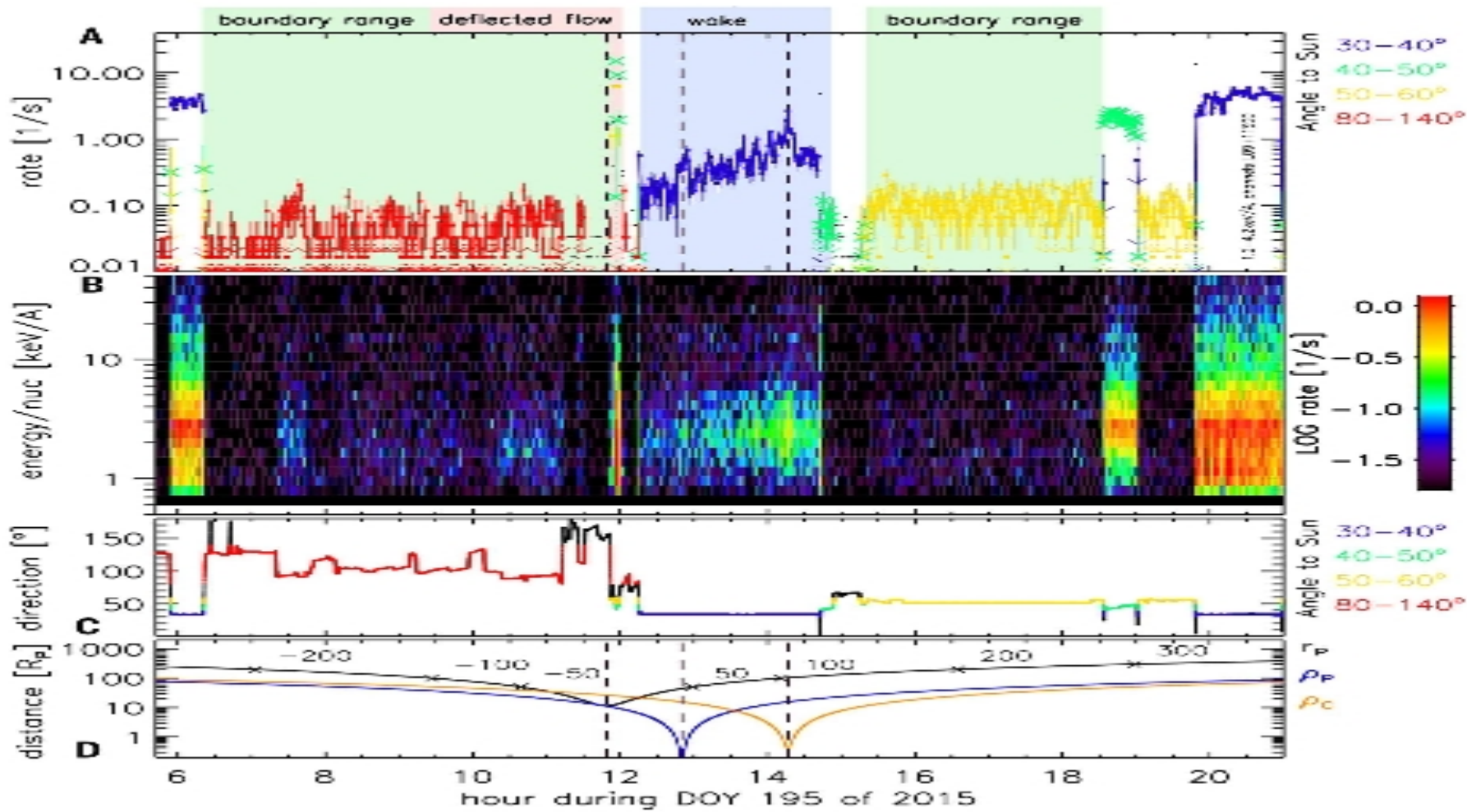
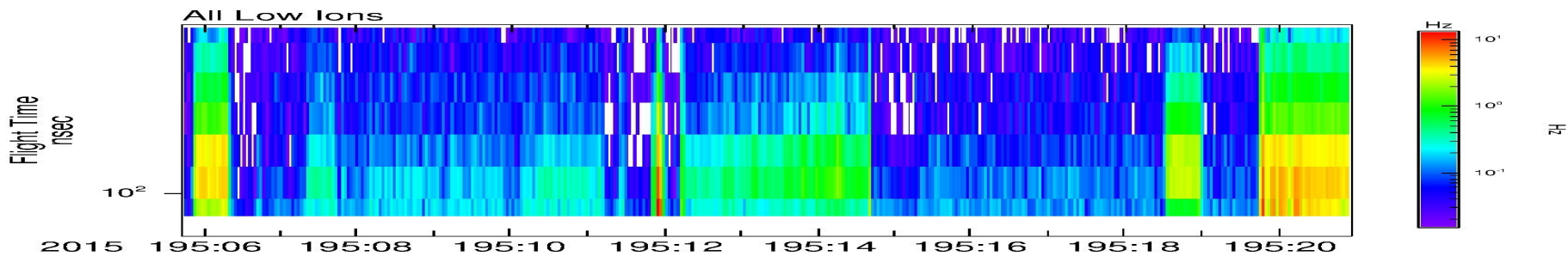
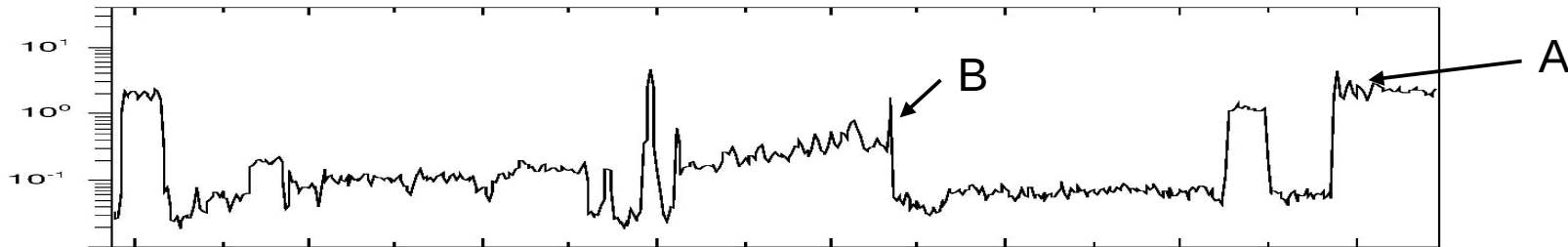
Time coverage of the published plots was set to match those locally produced and the horizontal axes are aligned.

Bagenal et al. Published Data

PDS Data

Sensor Data
All Low Ions

Frequency
Hz
SCAN: 20 - 150



Bagenal *et al.* Figure 3

The line plot comparison replicates to the degree as can be seen.

The details in marking the average points are masked due to the error bars in the Bagenal *et al.* figure; however, there are two differences which are easily picked out:

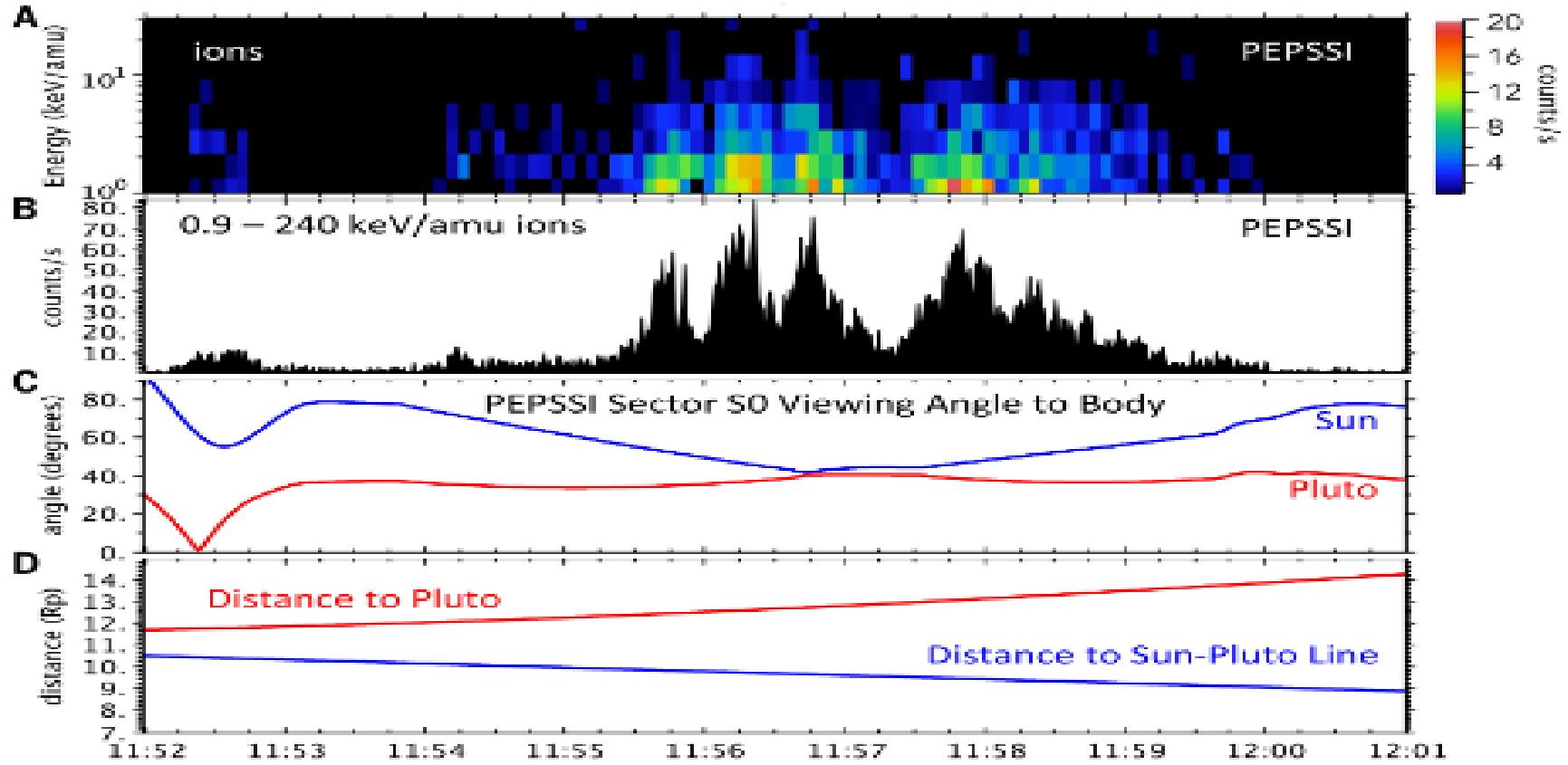
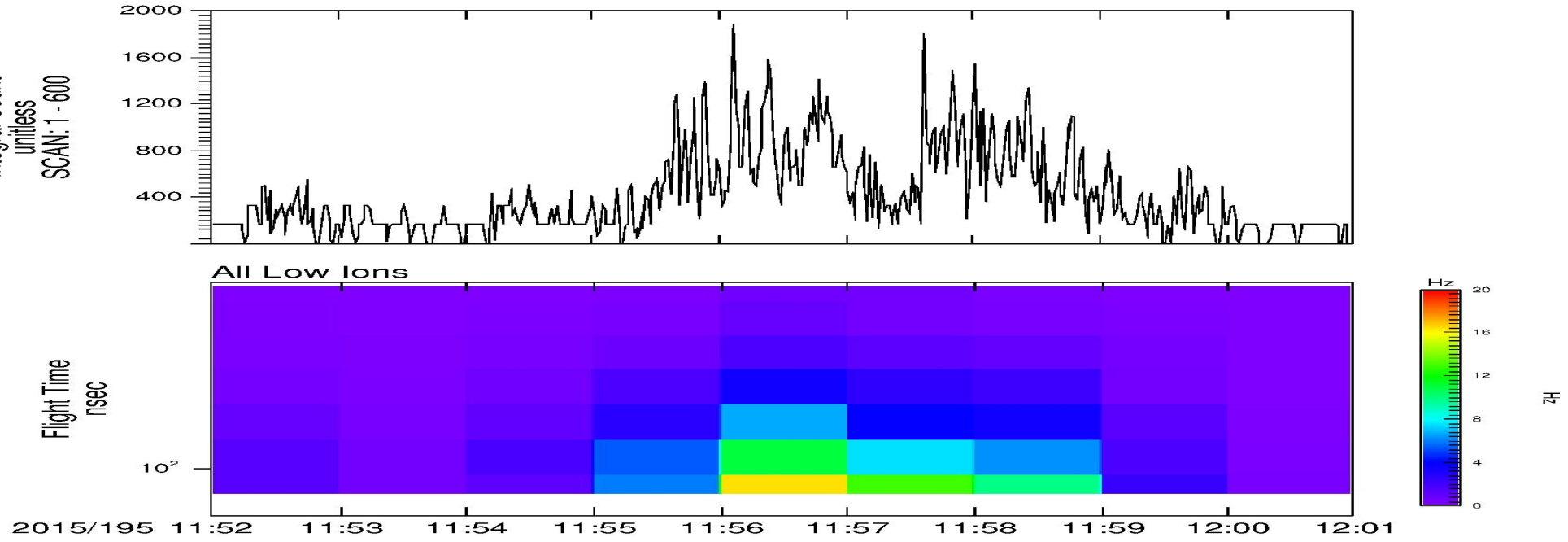
- A: after 1930 UT, there are higher levels of PDS data values at the the angle transition boundary and the PDS data appears to be flatter until the end of the spectrogram,
- B: there are several data values in the PDS data which appear to be missing in the published figure.

The spectrogram compares a time scale and an energy scale, but ere appear to be more pixels represented in the vertical direction. The general shapes are shown to be the same. Differences exist the vertical scale, but can not account for the number of pixels. The color intensity is also different due to the ranges of the color bar values. However, matching the color scales saturates the PDS data plot. This suggests that the top of the color scale shown on the Bagenal *et al.* figure may have been inadvertently cut off.

Bagenal *et al.* Figure 4

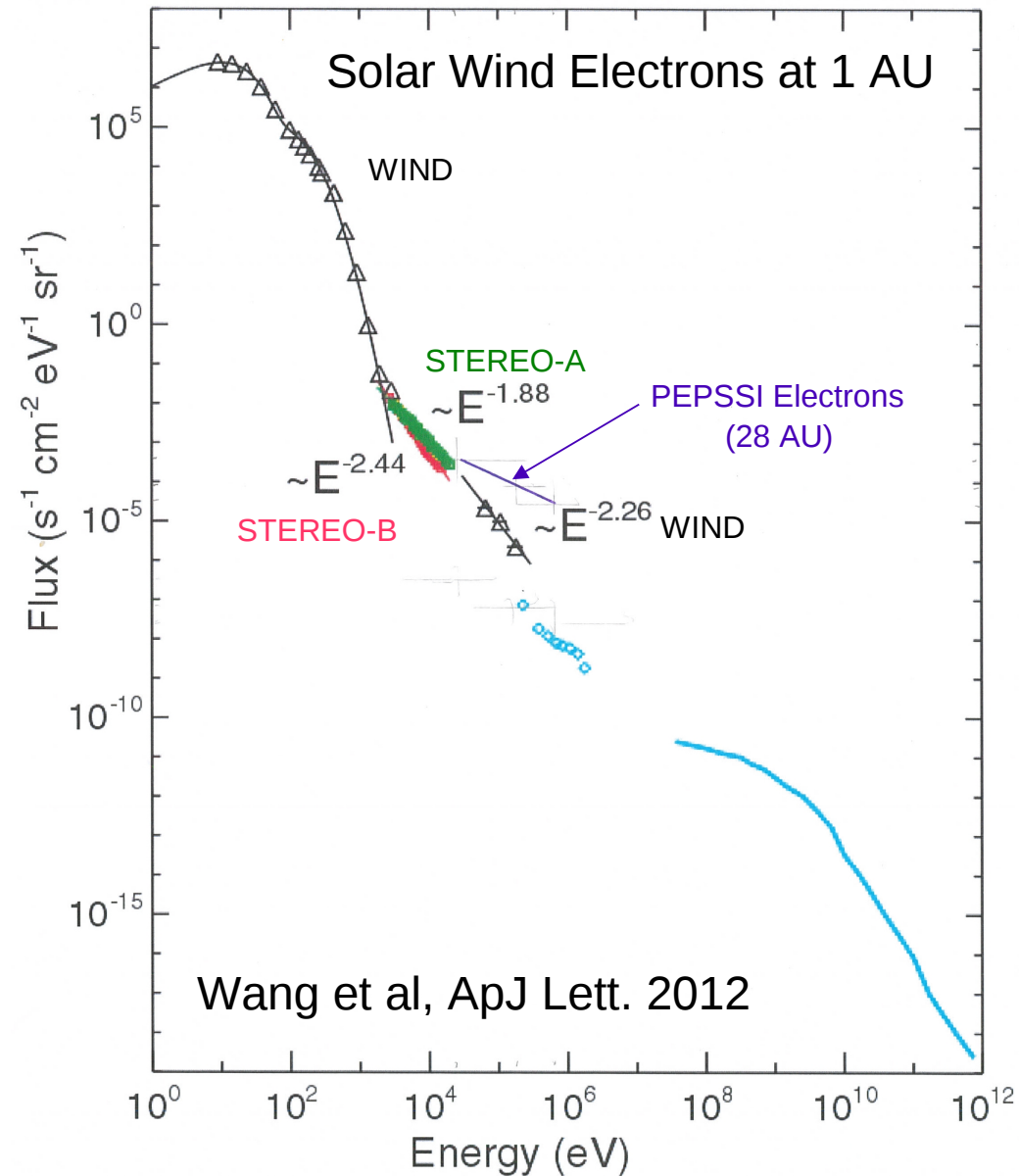
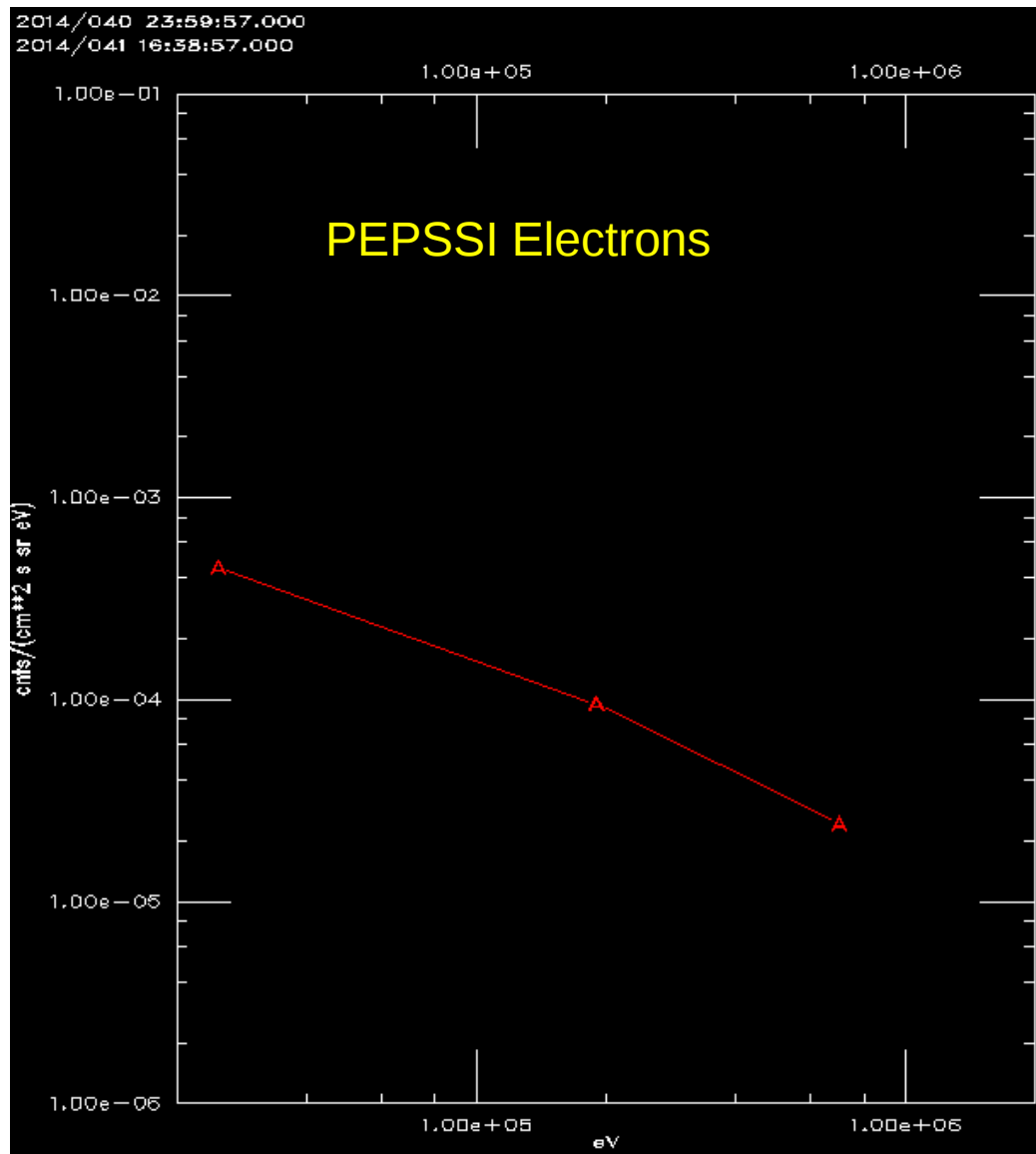
The line plot comparison is the total sum (the label is incorrect) of the Low Ion PHA for each entry in the PDS data file. The overall structure seems to replicate, but not the details of the PHA sum. It is possible that in the Bagenal *et al.* figure, the Level 2 data was binned differently to achieve different values.

The spectrogram compares a time scale and an energy scale on the vertical axis; however the time resolution on the horizontal axis shows that the time resolution of the PDS data is greater than the time resolution of the published data. The details of the TOF are not adequate to determine that there are indeed multiple TOF peaks within the Pluto encounter. The number of pixels in the vertical direction appears to be the same.



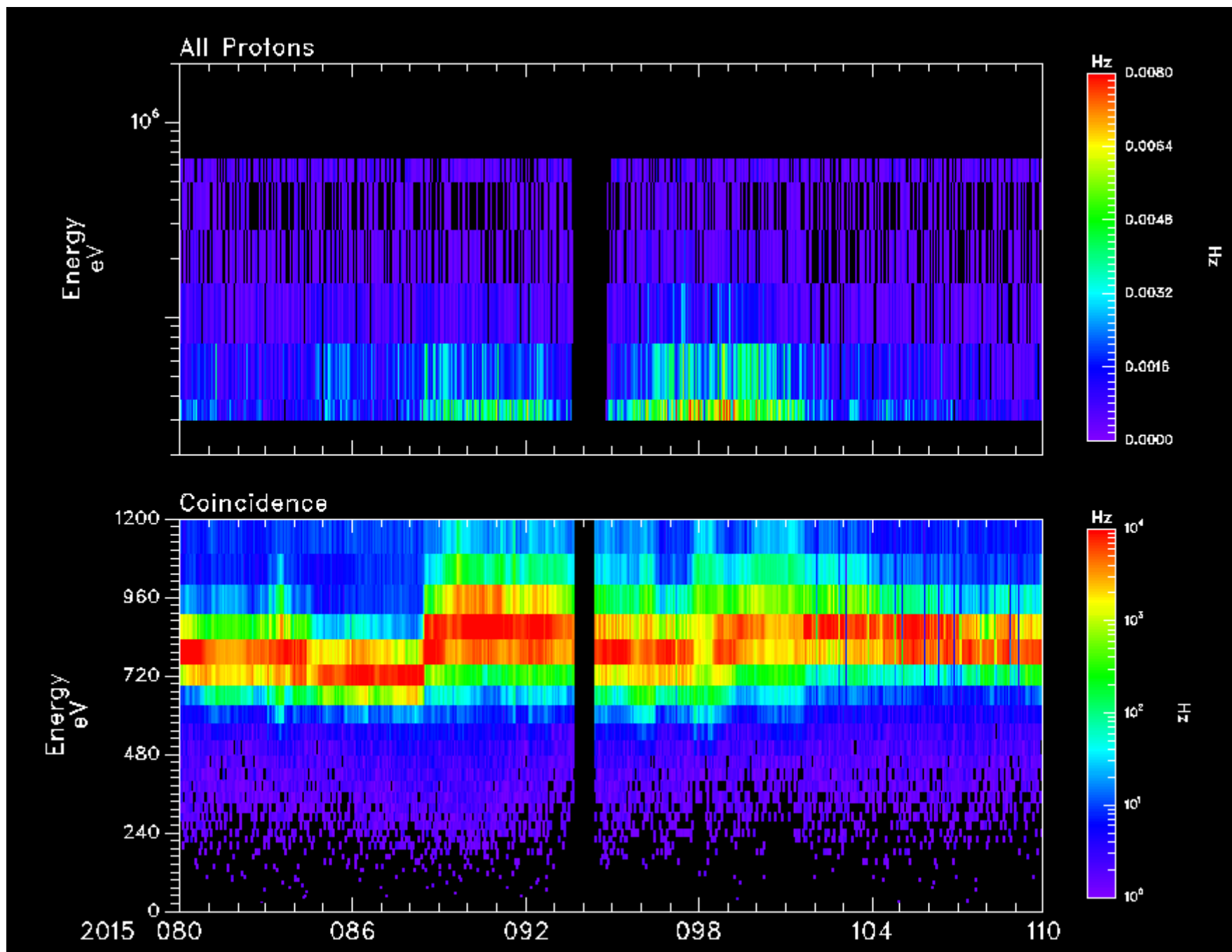
PEPSSI Electrons - 3

Why are the fluxes from PEPSSI abnormally high?



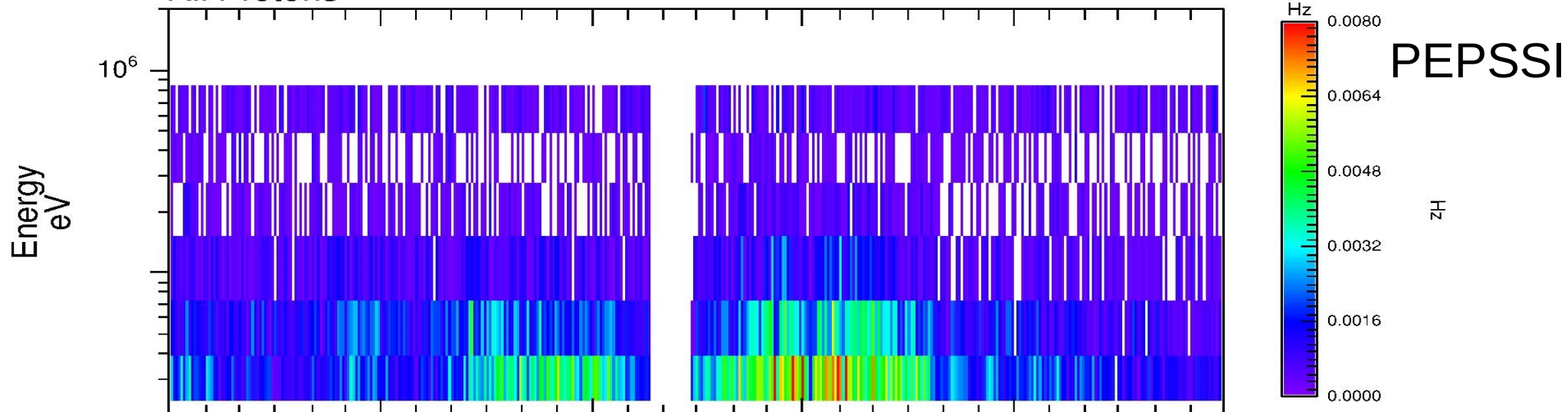
Heliospheric Shock or Heated Region in the Solar Wind

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⁺.

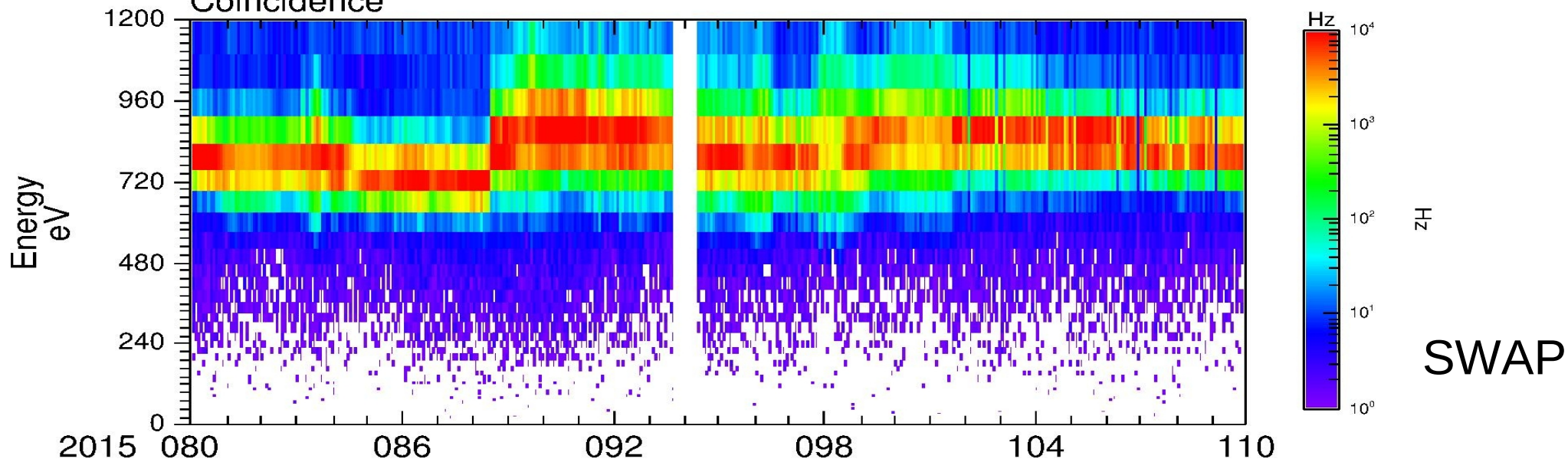


Heliospheric Shock or Heated Region in the Solar Wind - Updated

All Protons



Coincidence



nh-p-pepssi-2-pluto-v3.0
nh-p-pepssi-3-pluto-v3.0
aareadme.txt

GOOD

nh-p-pepssi-2-pluto-v3.0
nh-p-pepssi-3-pluto-v3.0
voldesc.txt

GOOD

nh-p-pepssi-2-pluto-v3.0/catalog
nh-p-pepssi-3-pluto-v3.0/catalog
catinfo.txt

GOOD

nh-p-pepssi-2-pluto-v3.0/catalog
nh-p-pepssi-3-pluto-v3.0/catalog
dataset.cat

GOOD

nh-p-pepssi-2-pluto-v3.0/catalog
nh-p-pepssi-3-pluto-v3.0/catalog
nh.cat

GOOD

nh-p-pepssi-2-pluto-v3.0/catalog
nh-p-pepssi-3-pluto-v3.0/catalog
nhsc.cat

GOOD

nh-p-pepssi-2-pluto-v3.0/catalog
nh-p-pepssi-3-pluto-v3.0/catalog
pepssi.cat

GOOD?

nh-p-pepssi-2-pluto-v3.0/catalog
nh-p-pepssi-3-pluto-v3.0/catalog
ref.cat

GOOD

nh-p-pepssi-2-pluto-v3.0/document
nh-p-pepssi-3-pluto-v3.0/document
aareadme_bu.txt

GOOD

nh-p-pepssi-2-pluto-v3.0/document
nh-p-pepssi-3-pluto-v3.0/document
docinfo.txt

GOOD

nh-p-pepssi-2-pluto-v3.0/document
nh-p-pepssi-3-pluto-v3.0/document
codmac_level_definitions.lbl
codmac_level_definitions.pdf

GOOD

nh-p-pepssi-2-pluto-v3.0/document
nh-p-pepssi-3-pluto-v3.0/document
lunineetal1995.lbl & lunineetal1995.pdf

GOOD

nh-p-pepssi-2-pluto-v3.0/document
nh-p-pepssi-3-pluto-v3.0/document
nh_met2utc.lbl & nh_met2utc.tab

GOOD

nh-p-pepssi-2-pluto-v3.0/document
nh-p-pepssi-3-pluto-v3.0/document
nh_fov.lbl & nh_fov.png

GOOD

nh-p-pepssi-2-pluto-v3.0/document
nh-p-pepssi-3-pluto-v3.0/document
nh_mission_trajectory.tbl
nh_mission_trajectory.tab

GOOD

nh-p-pepssi-2-pluto-v3.0/document
nh-p-pepssi-3-pluto-v3.0/document
nh_pepssi_v110_ti.txt

GOOD

nh-p-pepssi-2-pluto-v3.0/document
nh-p-pepssi-3-pluto-v3.0/document
payload_ssr.lbl & payload_ssr.pdf

GOOD

nh-p-pepssi-2-pluto-v3.0/document
nh-p-pepssi-3-pluto-v3.0/document
pep_bti.lbl & pep_bti.tab

GOOD

nh-p-pepssi-2-pluto-v3.0/document
nh-p-pepssi-3-pluto-v3.0/document
 quat_xyz_instr_to_j2k.lbl
 quat_xyz_instr_to_j2k.asc

GOOD

nh-p-pepssi-2-pluto-v3.0/document
nh-p-pepssi-3-pluto-v3.0/document
seq_pepssi_pluto.lbl & seq_pepssi_pluto.tab

GOOD

nh-p-pepssi-2-pluto-v3.0/document
nh-p-pepssi-3-pluto-v3.0/document
soc_inst_icd.lbl

GOOD

nh-p-pepssi-2-pluto-v3.0/document
nh-p-pepssi-3-pluto-v3.0/document
soc_inst_icd.pdf

Minor note sent to PDS.

nh-p-pepssi-2-pluto-v3.0/calib
nh-p-pepssi-3-pluto-v3.0/calib
calinfo.txt

GOOD

nh-p-pepssi-2-pluto-v3.0/calib
nh-p-pepssi-3-pluto-v3.0/calib
hk_n1_input_20050228.lbl
hk_n1_input_20050228.tab

GOOD

nh-p-pepssi-2-pluto-v3.0/calib
nh-p-pepssi-3-pluto-v3.0/calib
hk_stat_input_20050228.tbl
hk_stat_input_20050228.tab

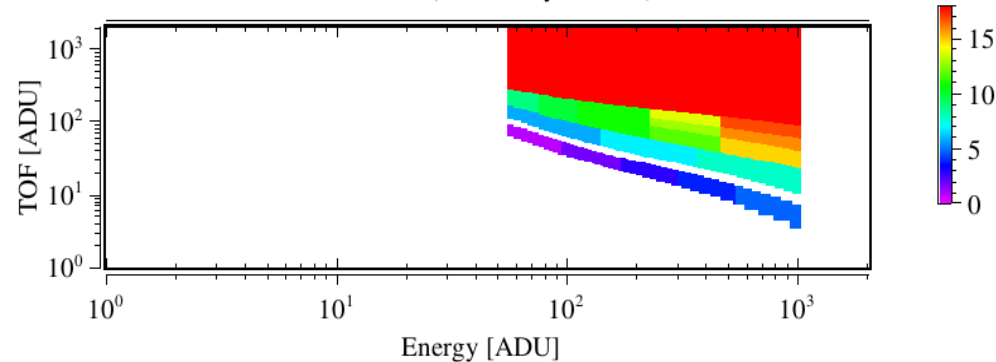
GOOD

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

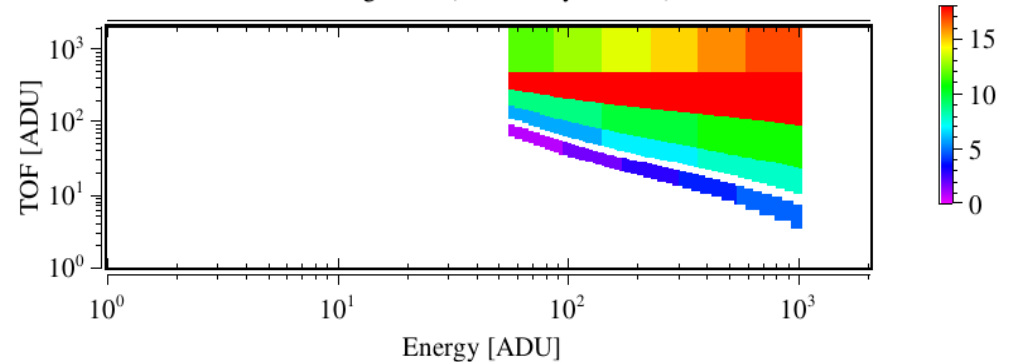
GOOD

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

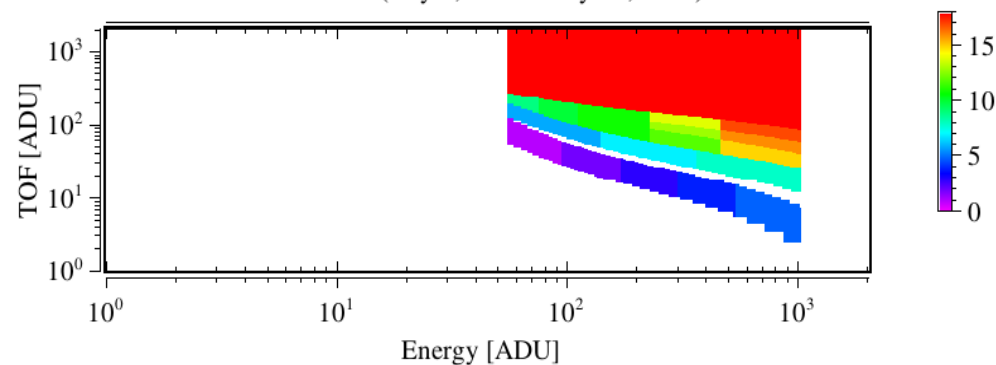
Set 0 Normal (before July 7, 2006)



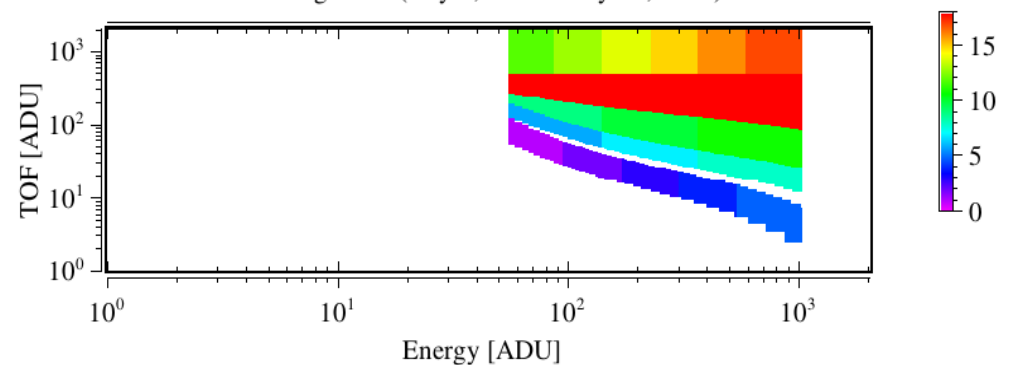
Set 0 Diagnostic (before July 7, 2006)



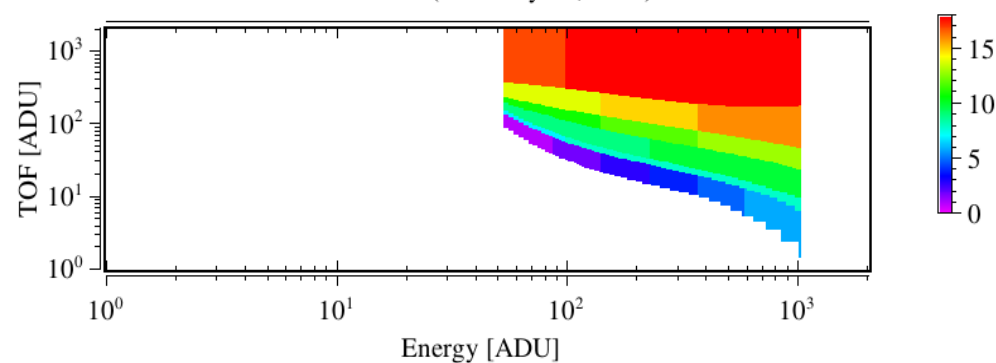
Set 1 Normal (July 7, 2006 - May 24, 2007)



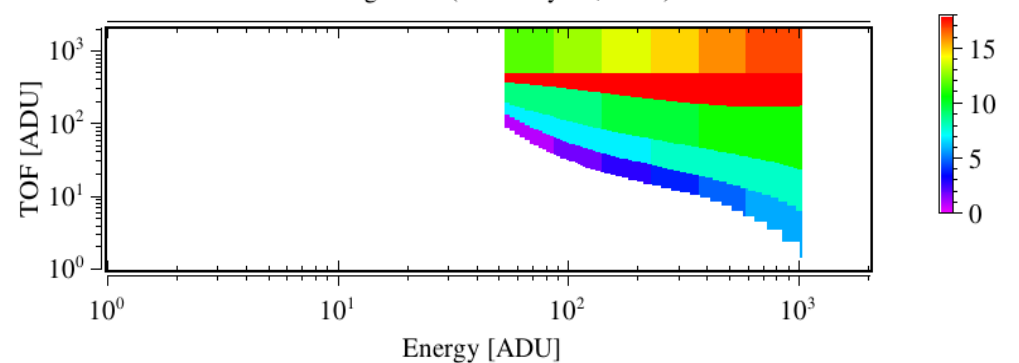
Set 1 Diagnostic (July 7, 2006 - May 24, 2007)



Set 3 Normal (after May 24, 2007)



Set 2 Diagnostic (after May 24, 2007)



nh-p-pepssi-2-pluto-v3.0/calib/calpars
nh-p-pepssi-3-pluto-v3.0/calib/calpars
calpinfo.txt

GOOD

nh-p-pepssi-2-pluto-v3.0/calib/calpars
nh-p-pepssi-3-pluto-v3.0/calib/calpars
calpar_columns.fmt

GOOD

nh-p-pepssi-2-pluto-v3.0/calib/calpars
nh-p-pepssi-3-pluto-v3.0/calib/calpars
pep_0337672317_0x691_calpar.tab

GOOD

nh-p-pepssi-2-pluto-v3.0/index
nh-p-pepssi-3-pluto-v3.0/index
indxinfo.txt

GOOD

nh-p-pepssi-2-pluto-v3.0/index
nh-p-pepssi-3-pluto-v3.0/index
index.lbl & index.tab

GOOD

nh-p-pepssi-2-pluto-v3.0/index
nh-p-pepssi-3-pluto-v3.0/index
slimindx.lbl & slimindx.tab

GOOD

nh-p-pepssi-2-pluto-v3.0/index
nh-p-pepssi-3-pluto-v3.0/index
checksum.tbl & checksum.tab

GOOD