# 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
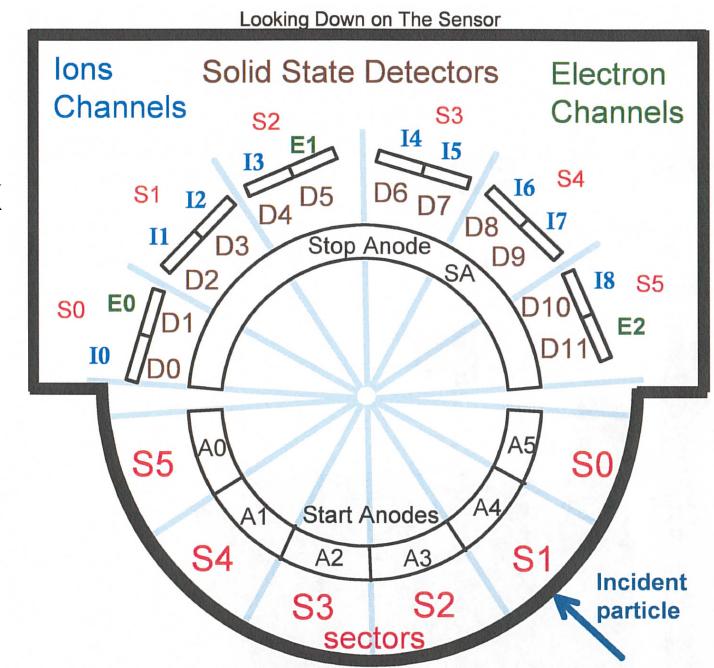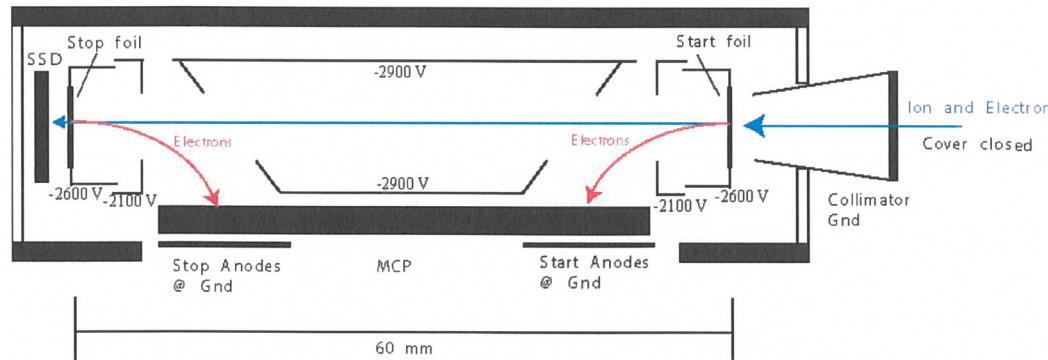
New Horizons PEPSSI Data Sets

RAW Data Sets:
nh-a-pepssi-2-kem2-v1.0

CALIBRATED Data Sets:
nh-a-pepssi-3-kem2-v1.0

New Horizons PEPSSI
Data Set Evaluation Tools

Staging and Evaluation -
    Machine: Dell Precision Tower 5810
    Operating System: Rocky-8 linux

Minor Diagnostics -
    Machine: Sun Ultra-60
   Operating System: Sun Solaris OS 5.1

Minor Diagnostics -
    Machine: Dell 7520
    Operating System: Fedora 33 linux

PEPSSI RAW and CALIBRATED Documentation Evaluation

nh-a-pepssi-3-kem2-v1.0/document nh_mission_trajectory.tab
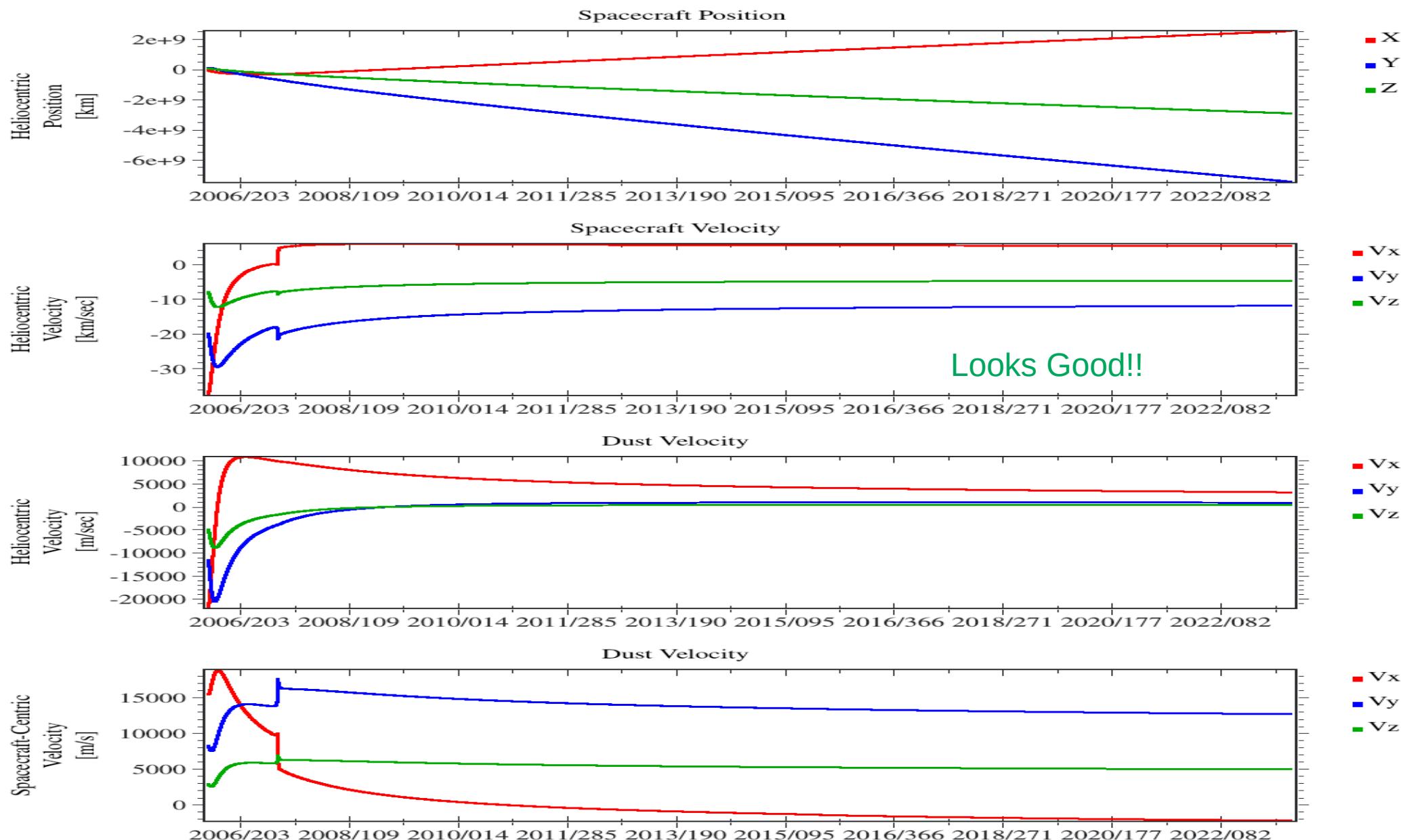
nh-a-pepssi-3-kem2-v1.0/document pep_bti.tab

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Start and End reflect the same time
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      At: 2007-040T09:00:00.0000
      At: 2007-144T13:03:00.0000
      At: 2015-212T00:40:00.0000
      At: 2015-212T00:40:00.0000
      At: 2015-213T06:45:00.0000
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nh-a-pepssi-3-kem1-v6.0/calib rateboxdefinitionplanes.fit
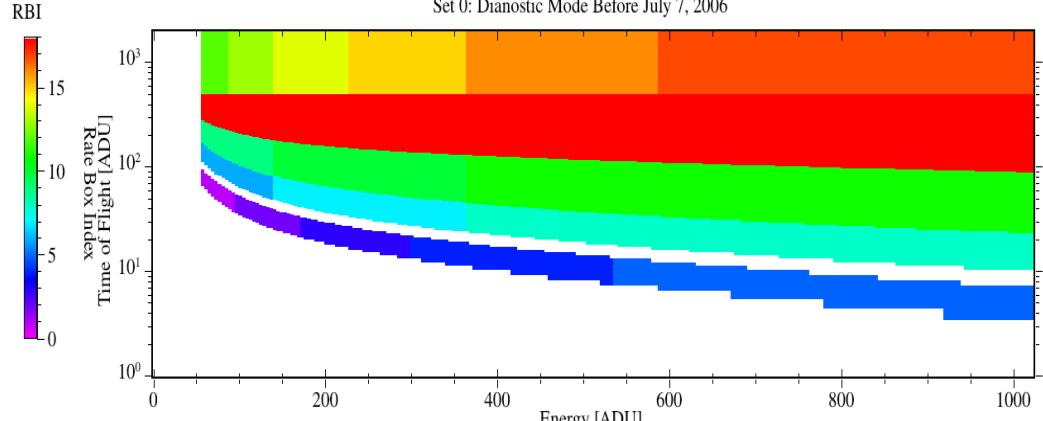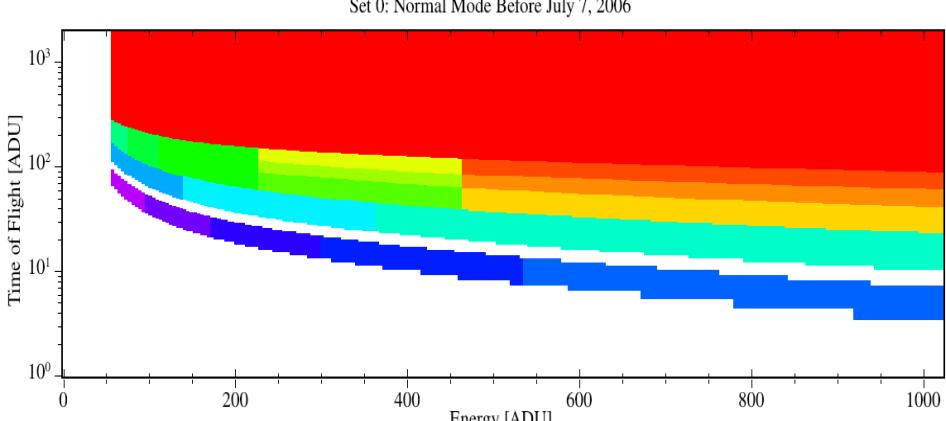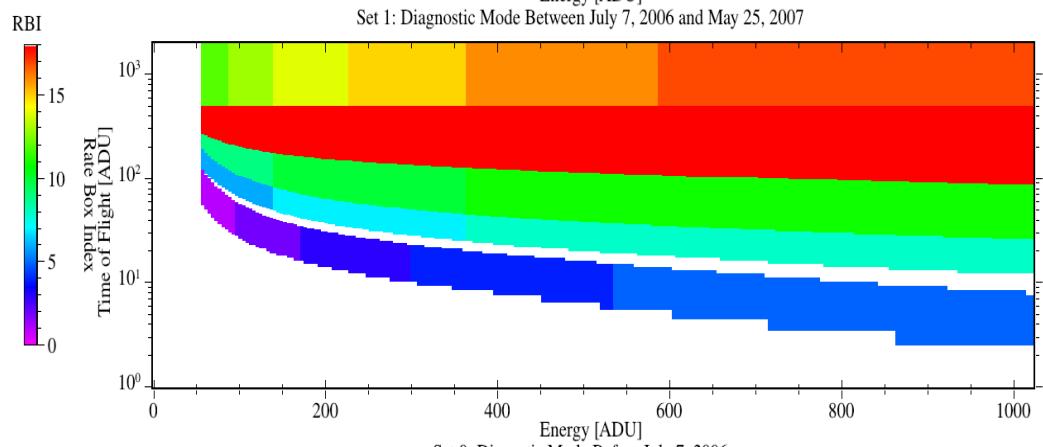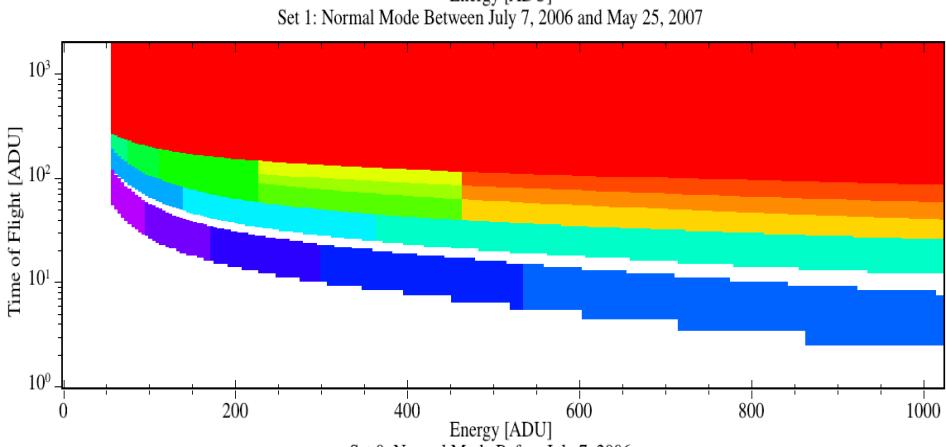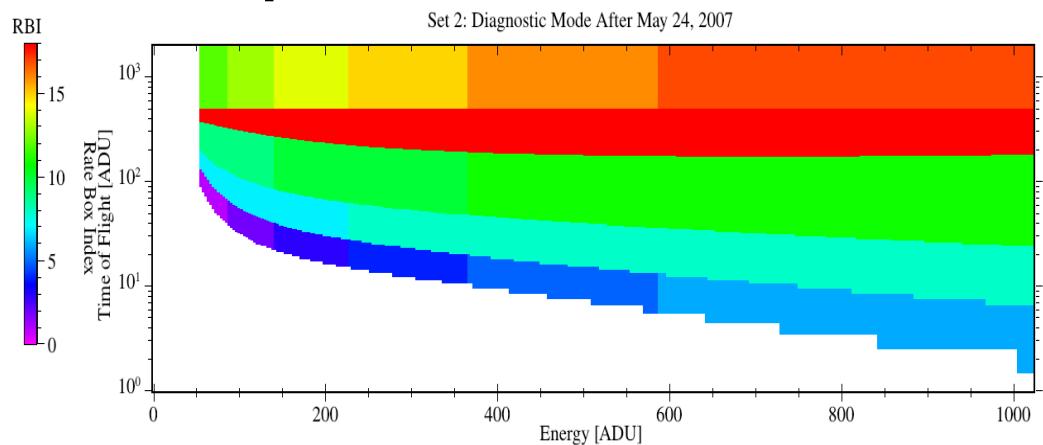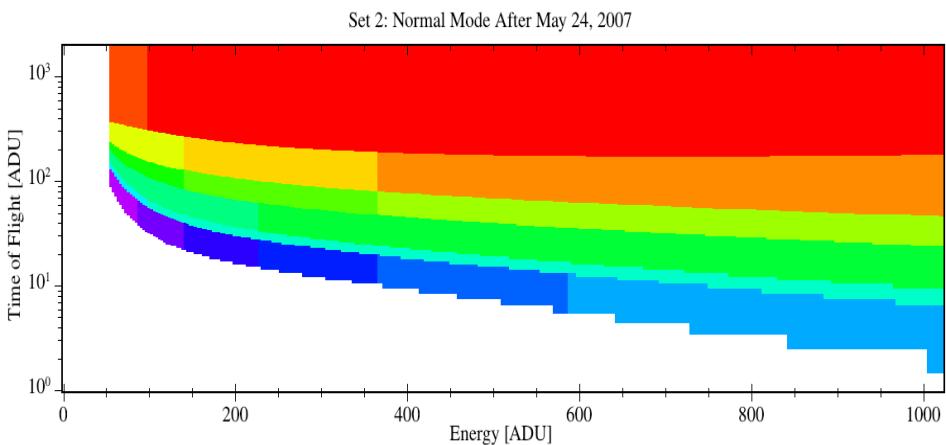
Looks Good!!

nh-a-pepssi-3-kem2-v1.0/calib rateboxdefinitionplanes.fit

Looks Good!!

Plot created by SDDAS/gPlot - J. Mukherjee, et al. Generated on Sat Jan 20 13:22:24 2024.
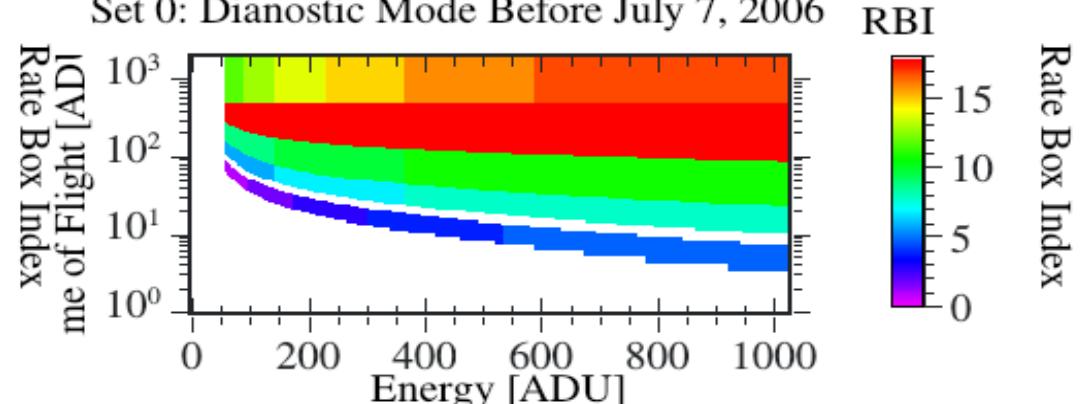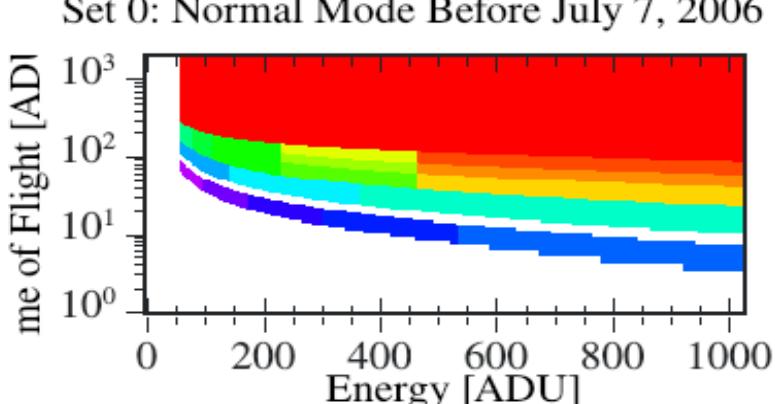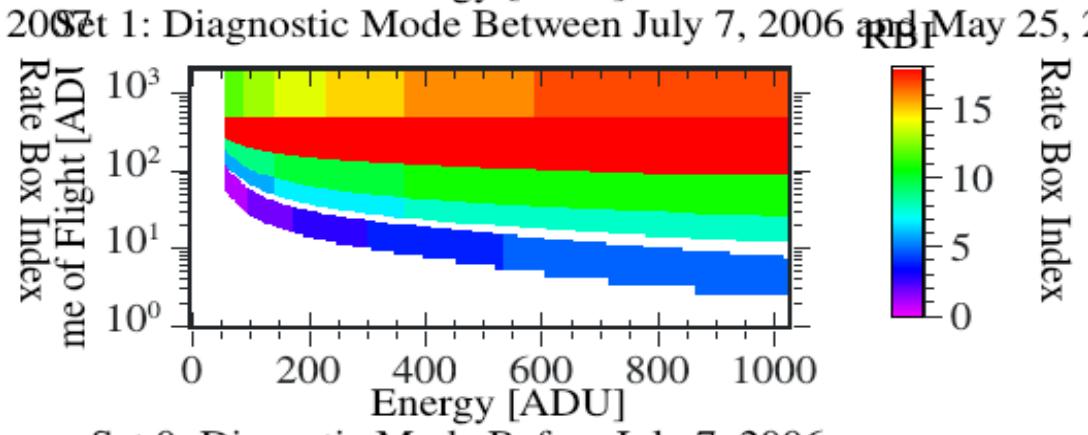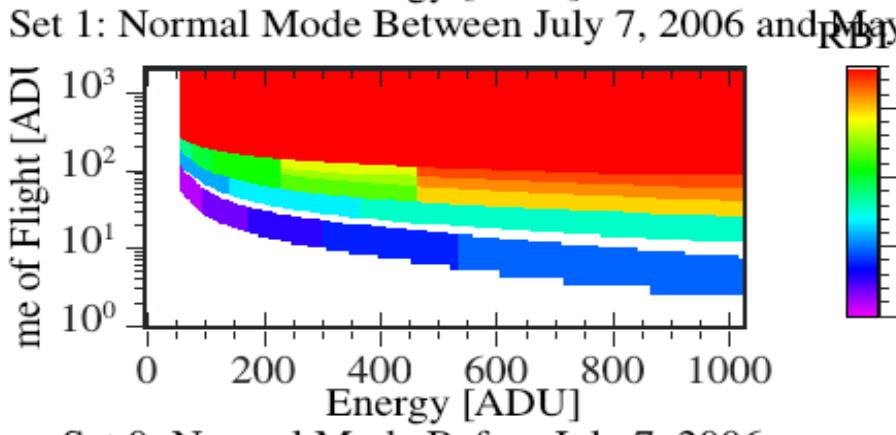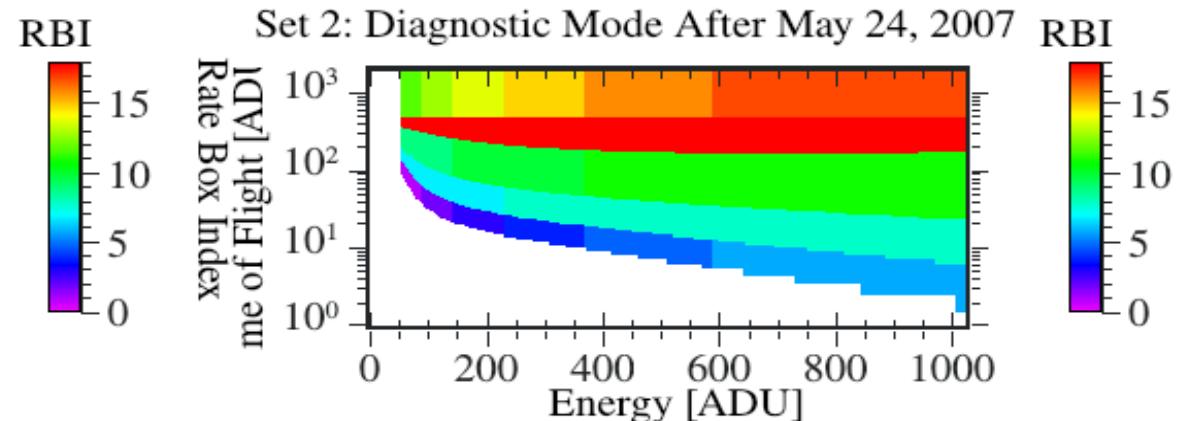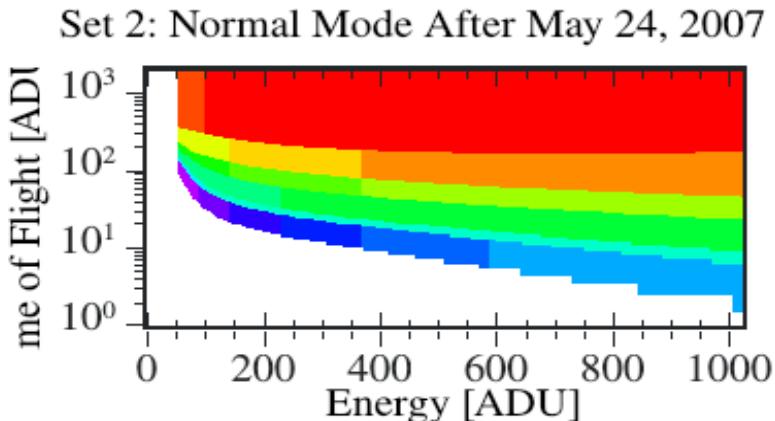
nh-a-pepssi-3-kem2-v1.0/calib/calpars pep_0542785916_0x691_calpar.tab

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INSTRUMENT_HOST_NAME        = "NEW HORIZONS"
DATA_SET_ID                 = "NH-A-PEPSSI-3-KEM2-V1.0"
PRODUCT_ID                  = "PEP_0542785916_0X691_CALPAR"
PRODUCER_INSTITUTION_NAME   = "SOUTHWEST RESEARCH INSTITUTE"
PRODUCT_CREATION_TIME       = 2023-08-01T00:00:00
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Should the Mission name be:
"NEW HORIZONS KUIPER BELT EXTENDED MISSION 2"

PEPSSI RAW and CALIBRATED Data Evaluation

# nh-a-pepssi-3-kem2-v1.0/data
PEPSSI FIT File Structure

nh-a-pepssi-3-kem2-v1.0/data
Quick Look Spectrograms - A

nh-a-pepssi-3-kem2-v1.0/data
Quick Look Spectrograms - B

nh-a-pepssi-3-kem2-v1.0/data
## Quick Look Spectrograms - C

nh-a-pepssi-3-kem2-v1.0/data
Quick Look Spectrograms - D

nh-a-pepssi-3-kem2-v1.0/data
Quick Look Spectrograms - E

```
BOX1  = 'L01SAll' / Pixel1:  L01SAll Low Ions  (20.559 to  27.045 ns) 1 / sec
BOX3  = 'L03SAll' / Pixel3:  L03SAll Low Ions  (27.370 to  36.126 ns) 1 / sec
BOX5  = 'L05SAll' / Pixel5:  L05SAll Low Ions  (36.450 to  48.773 ns) 1 / sec
BOX7  = 'L07SAll' / Pixel7:  L07SAll Low Ions  (49.098 to  66.286 ns) 1 / sec
BOX9  = 'L09SAll' / Pixel9:  L09SAll Low Ions  (66.610 to  90.284 ns) 1 / sec
BOX11 = 'L11SAll' / Pixel11: L11SAll Low Ions  (90.608 to 123.038 ns) 1 / sec
BOX13 = 'L13SAll' / Pixel13: L13SAll Low Ions (123.362 to 168.440 ns) 1 / sec
BOX15 = 'L15SAll' / Pixel15: L15SAll Low Ions  (2.723 to 666.889 ns) 1 / sec
```

Is this number correct?

PEPSSI FIT File Structure

nh-a-pepssi-3-kem2-v1.0/data
## Electron PHA - A

Electron PHA - B

nh-a-pepssi-3-kem2-v1.0/data
Low Ion PHA - A

nh-a-pepssi-3-kem2-v1.0/data
Low Ion PHA - B

nh-a-pepssi-3-kem2-v1.0/data
# PEPSSI FIT File Structure

fv: Summary of pep_0437205117_0x691_sci.fit...-a-pepssi-3-kem1-v6.0/data/20191128_043720/

File   Edit   Tools   Help

| Index	Extension	Type	Dimension	View				
0	Primary	Image	1017 X 614	Header	Image	Table		
1	SPEC_Protons	Image	1440 X 6	Header	Image	Table		
2	SPEC_Helium	Image	1440 X 2	Header	Image	Table		
3	SPEC_Heavies	Image	1440 X 3	Header	Image	Table		
4	SPEC_Electrons	Image	1440 X 3	Header	Image	Table		
5	SPEC_LowIon	Image	1440 X 8	Header	Image	Table		
6	FLUX	Binary	832 cols X 960 rows	Header	Hist	Plot	All	Select
7	FLUXN1A	Binary	502 cols X 24 rows	Header	Hist	Plot	All	Select
8	FLUXN1B	Binary	440 cols X 24 rows	Header	Hist	Plot	All	Select
9	PHA_ELECTRON	Binary	9 cols X 25552 rows	Header	Hist	Plot	All	Select
10	PHA_LOW_ION	Binary	25 cols X 1777 rows	Header	Hist	Plot	All	Select
11	PHA_HIGH_ION	Binary	23 cols X 1711 rows	Header	Hist	Plot	All	Select

# nh-a-pepssi-3-kem2-v1.0/data
FLUX Anode Singles - A
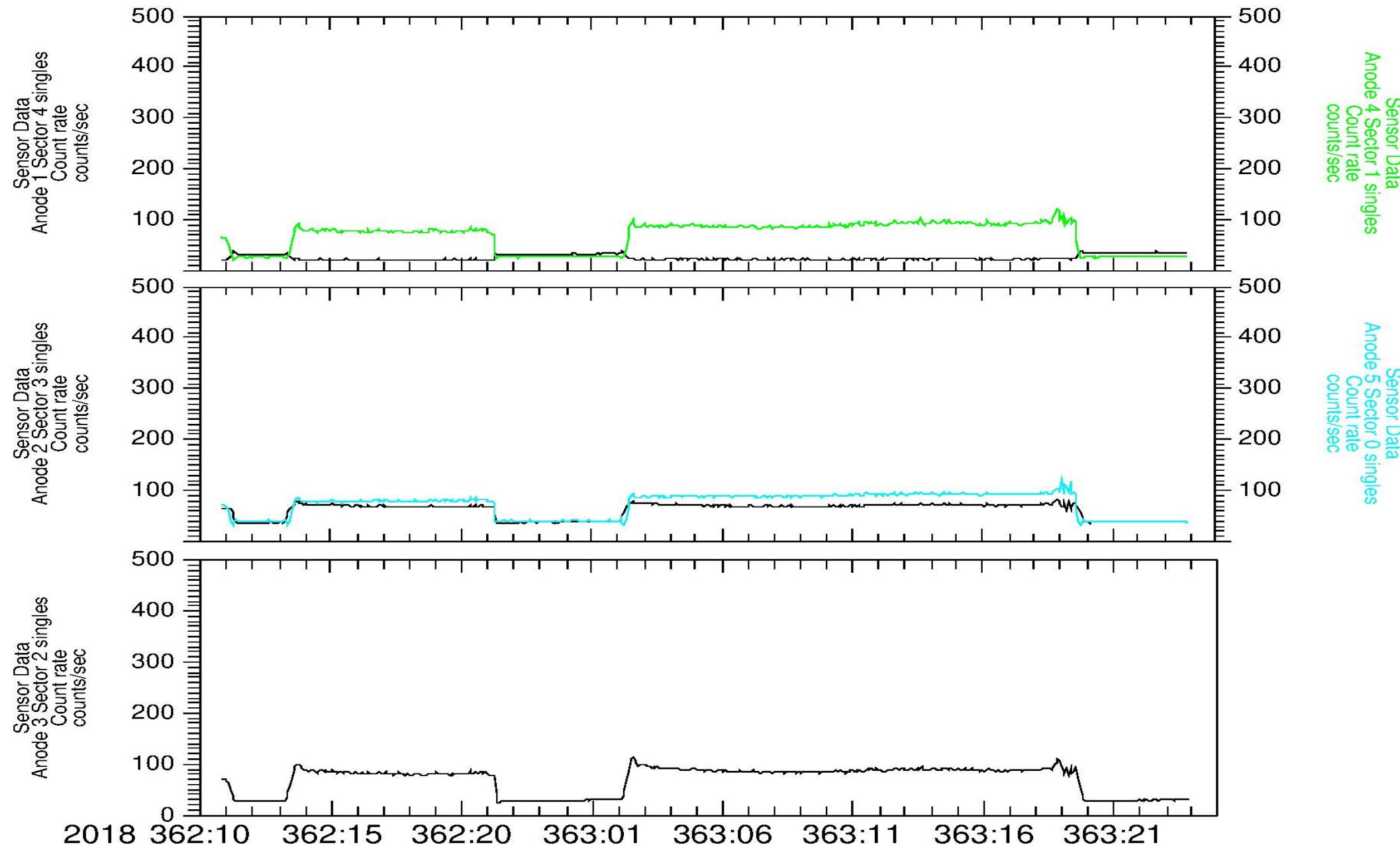
nh-a-pepssi-3-kem2-v1.0/data
## FLUX Anode Singles - B
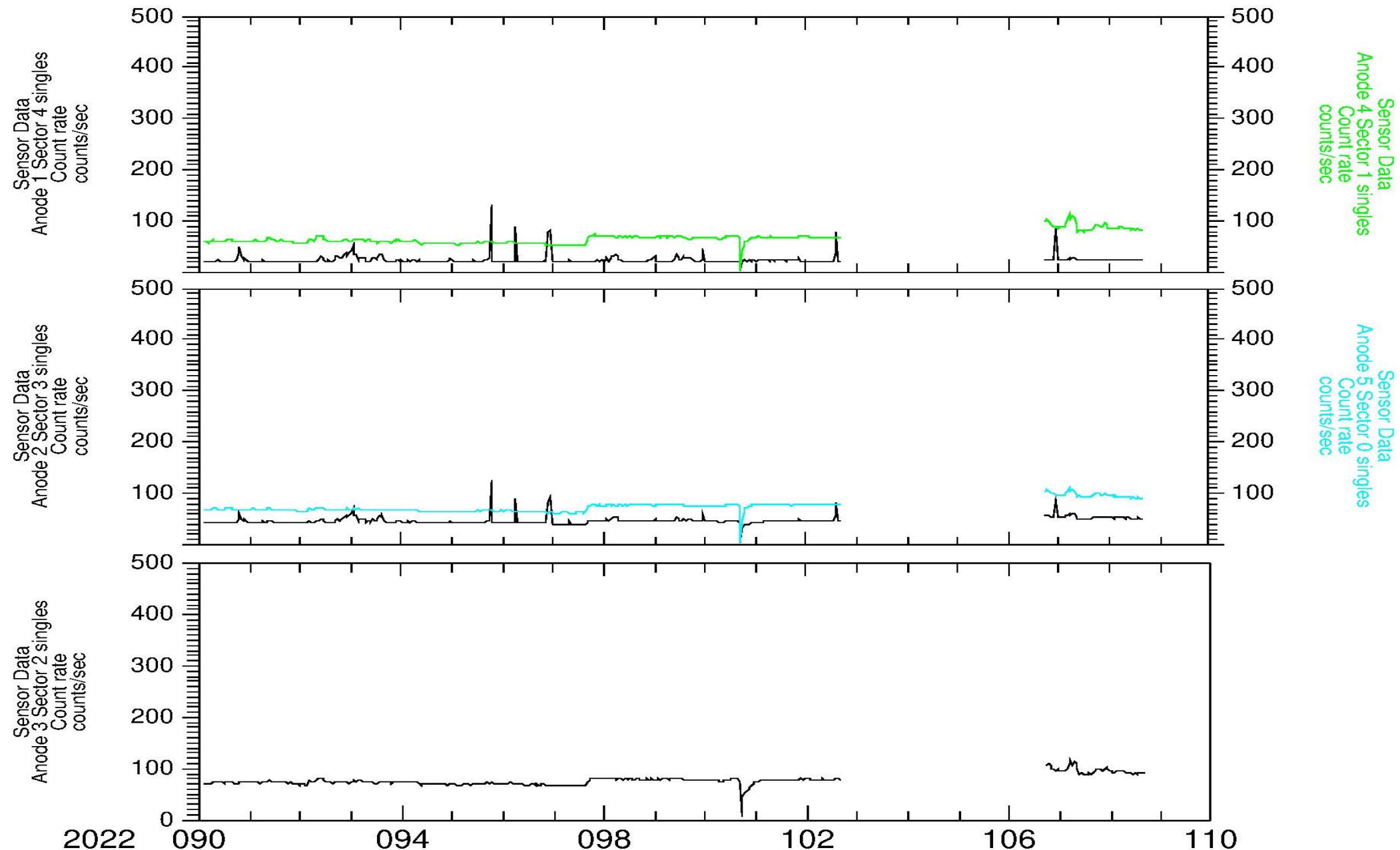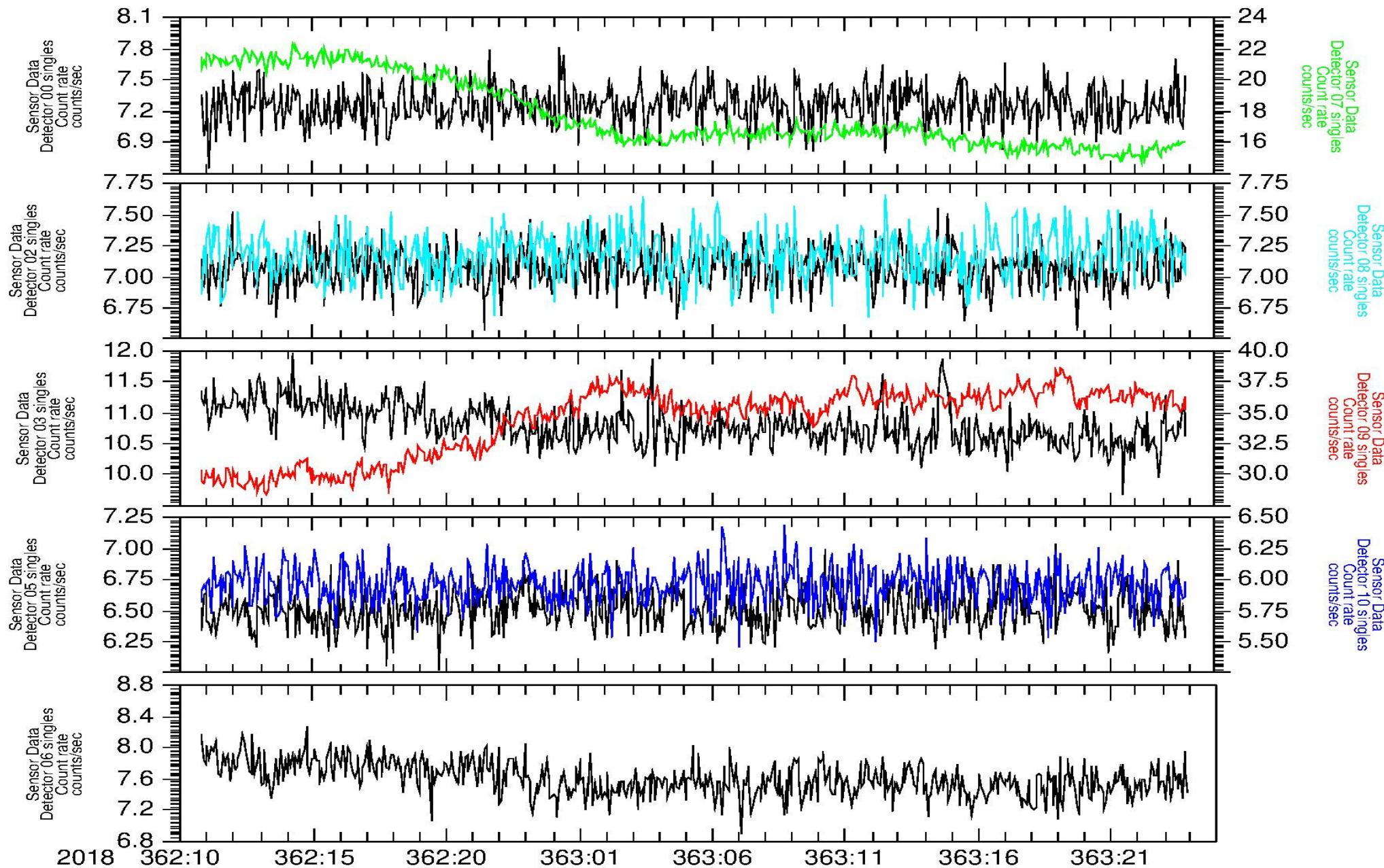
nh-a-pepssi-3-kem2-v1.0/data
FLUX Detector Singles - A

nh-a-pepssi-3-kem2-v1.0/data
## FLUX Detector Singles - B
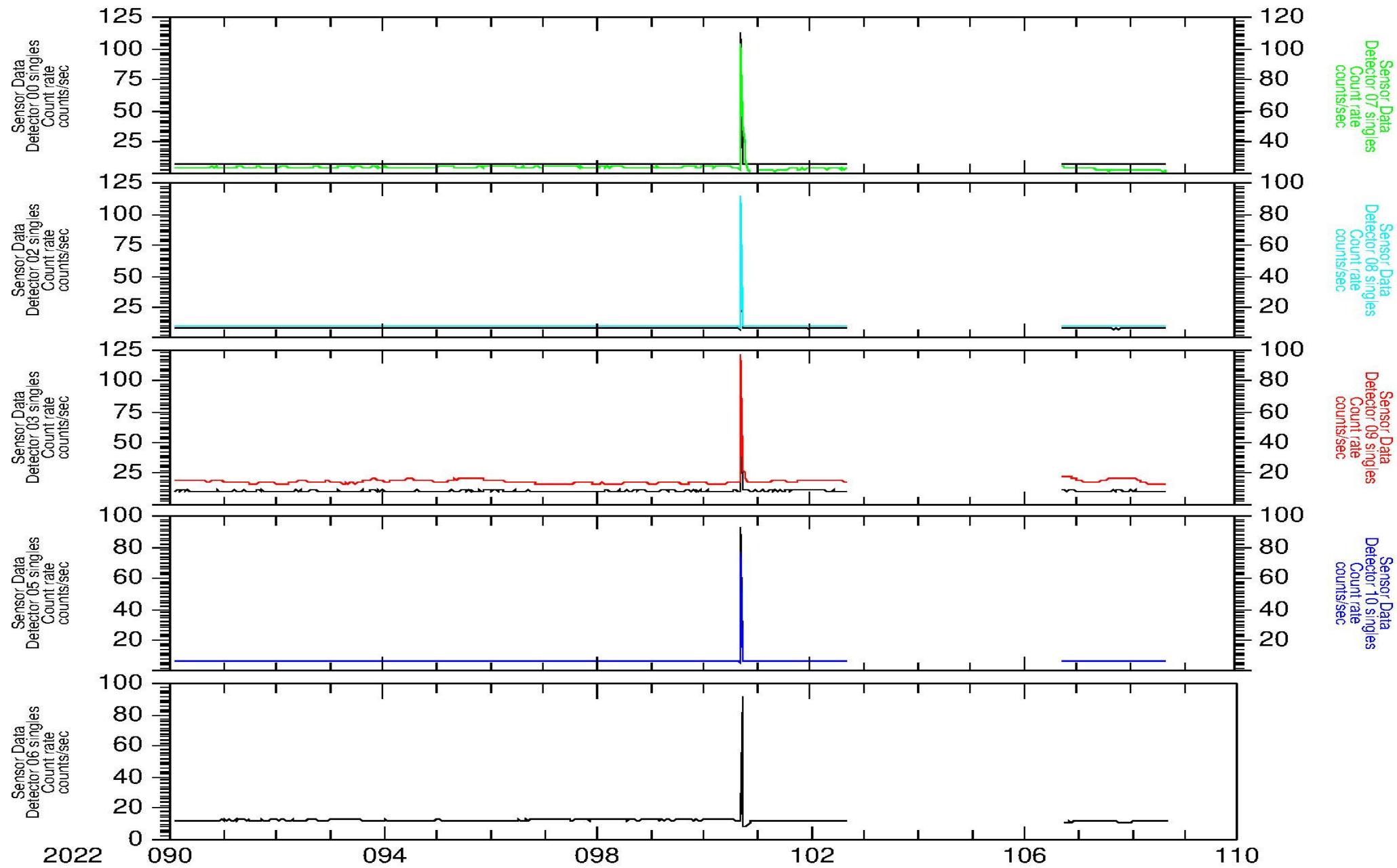
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## FLUX Events "C" Rates - A
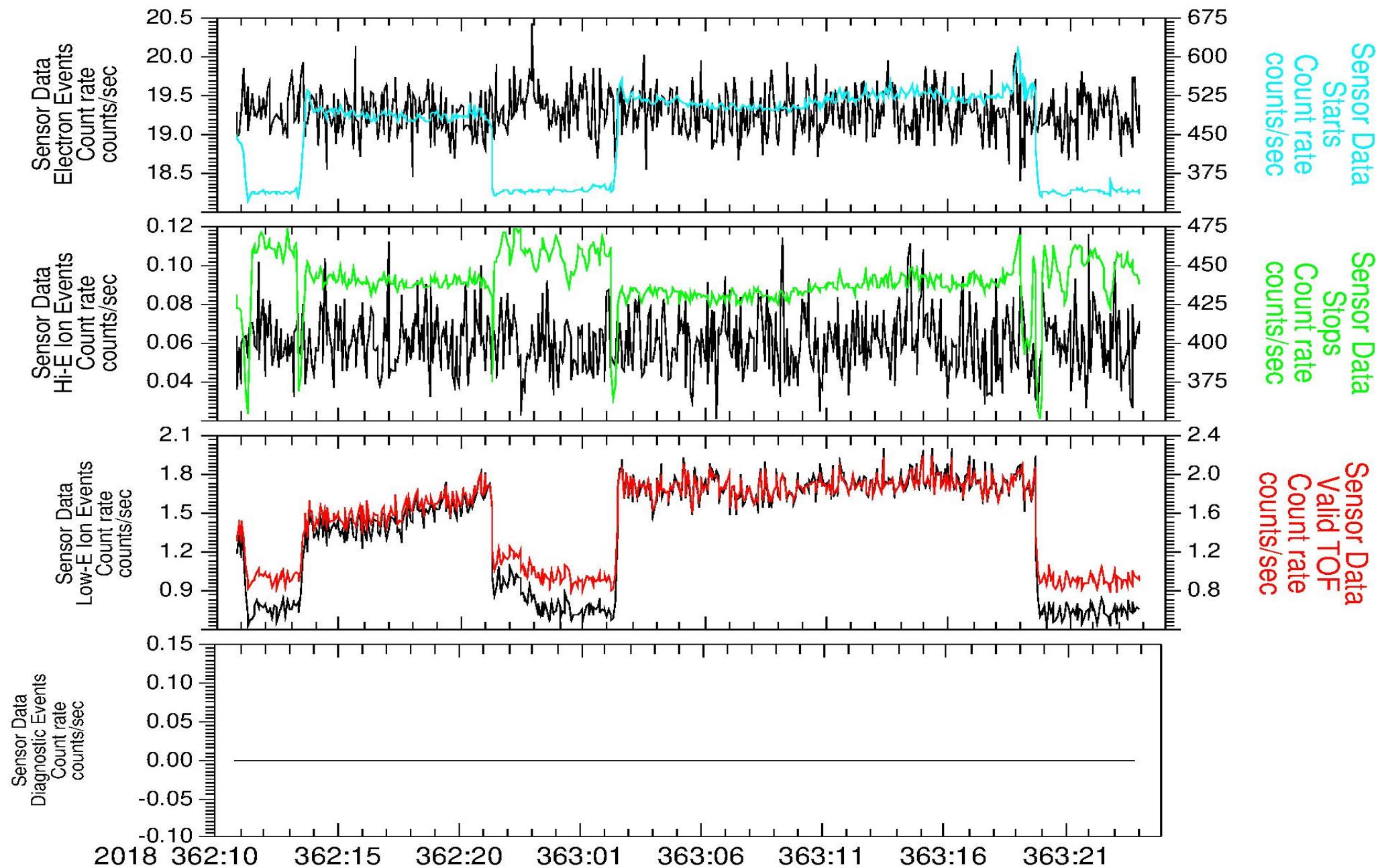
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FLUX Events "C" Rates - B
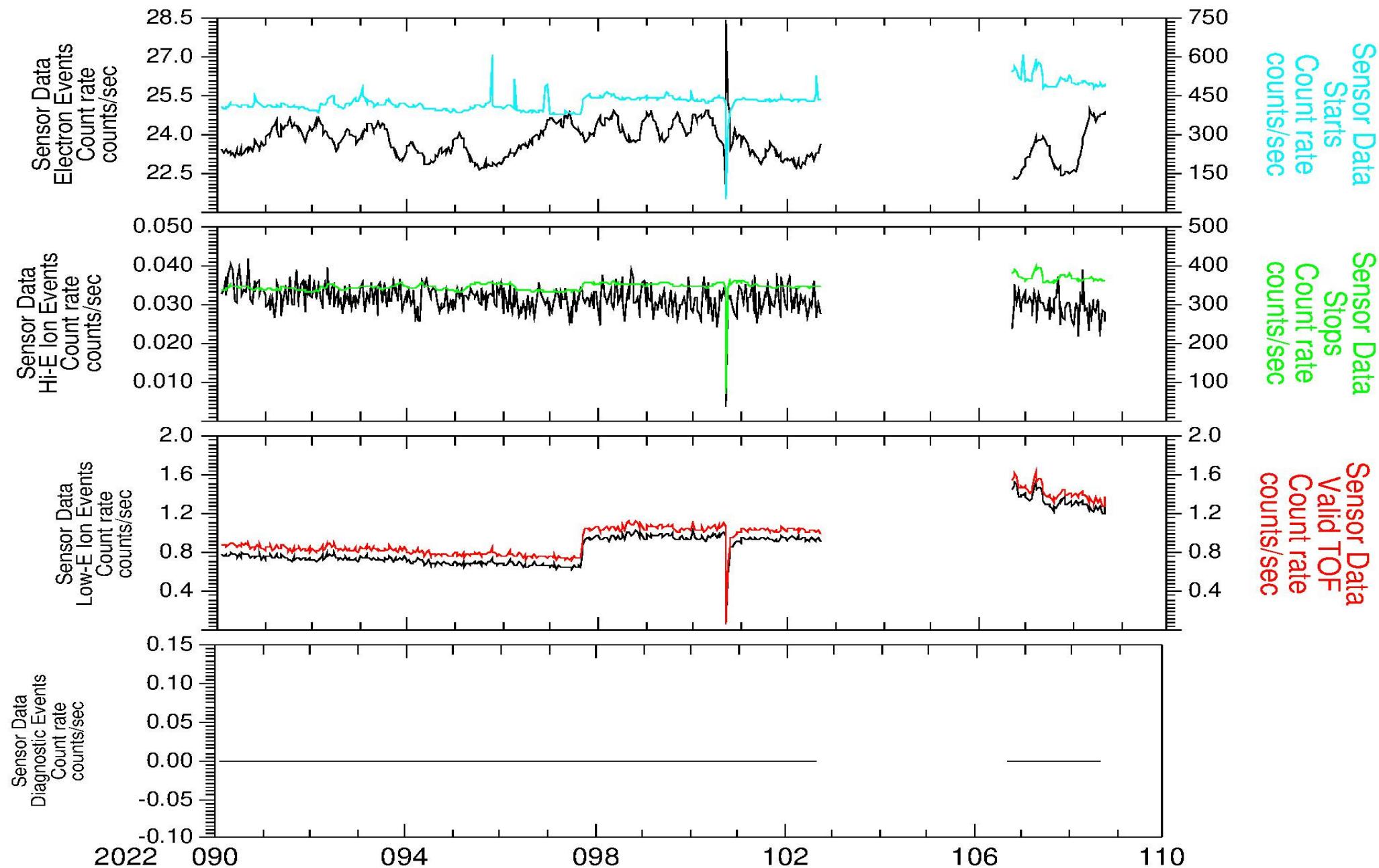
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FLUX Discards "J" Rates - A
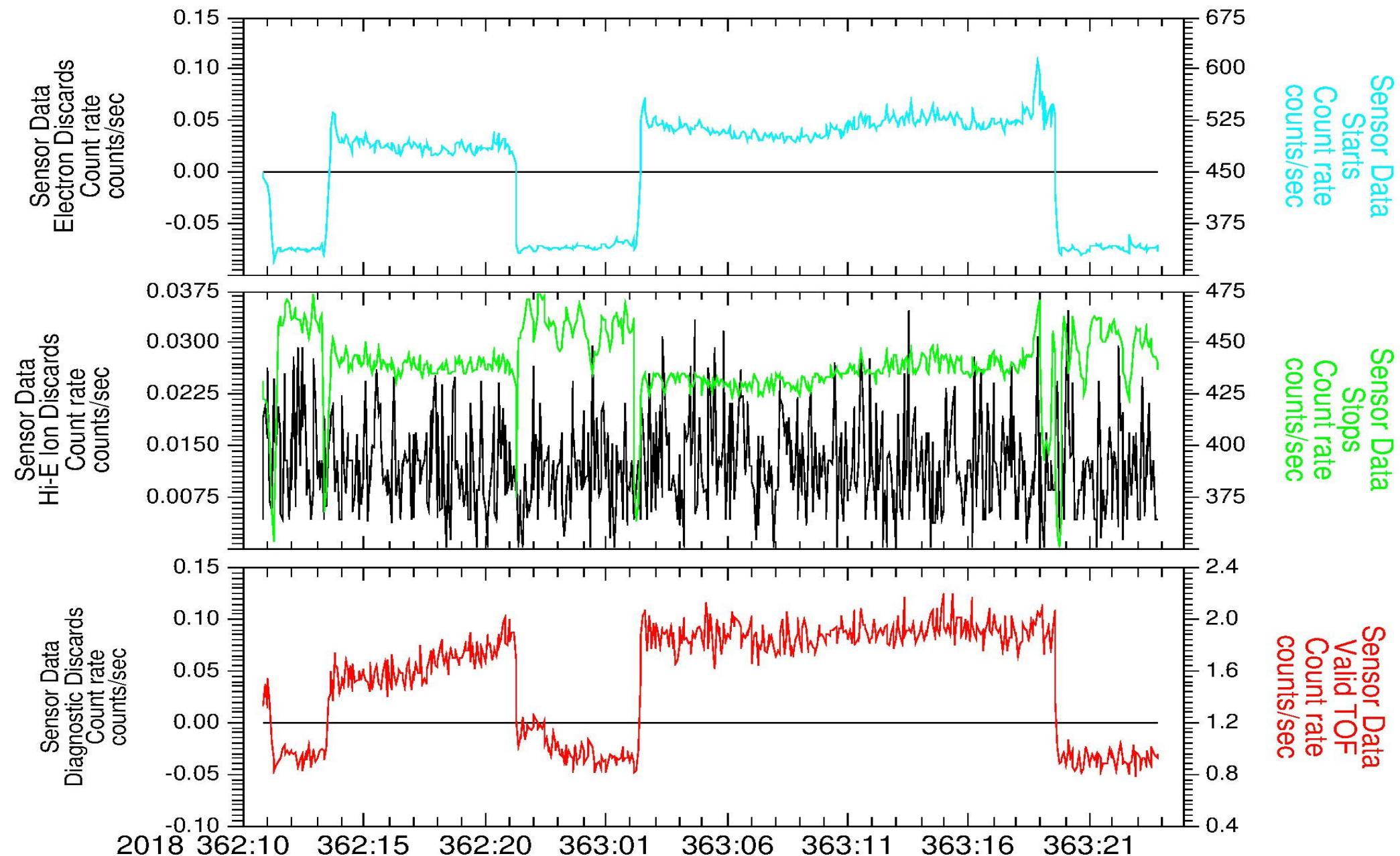
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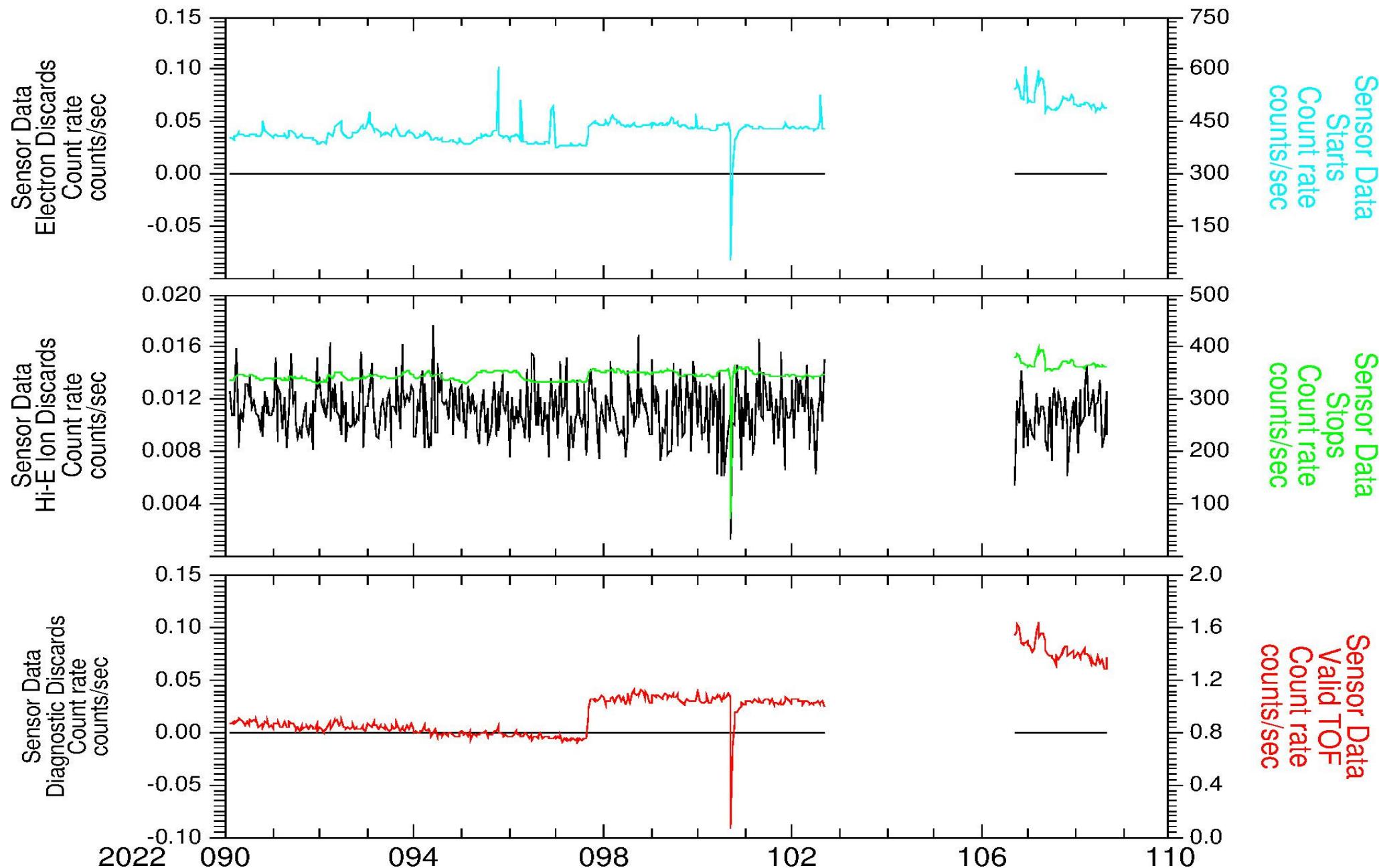
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FLUX Doubles ("L") DNF - A
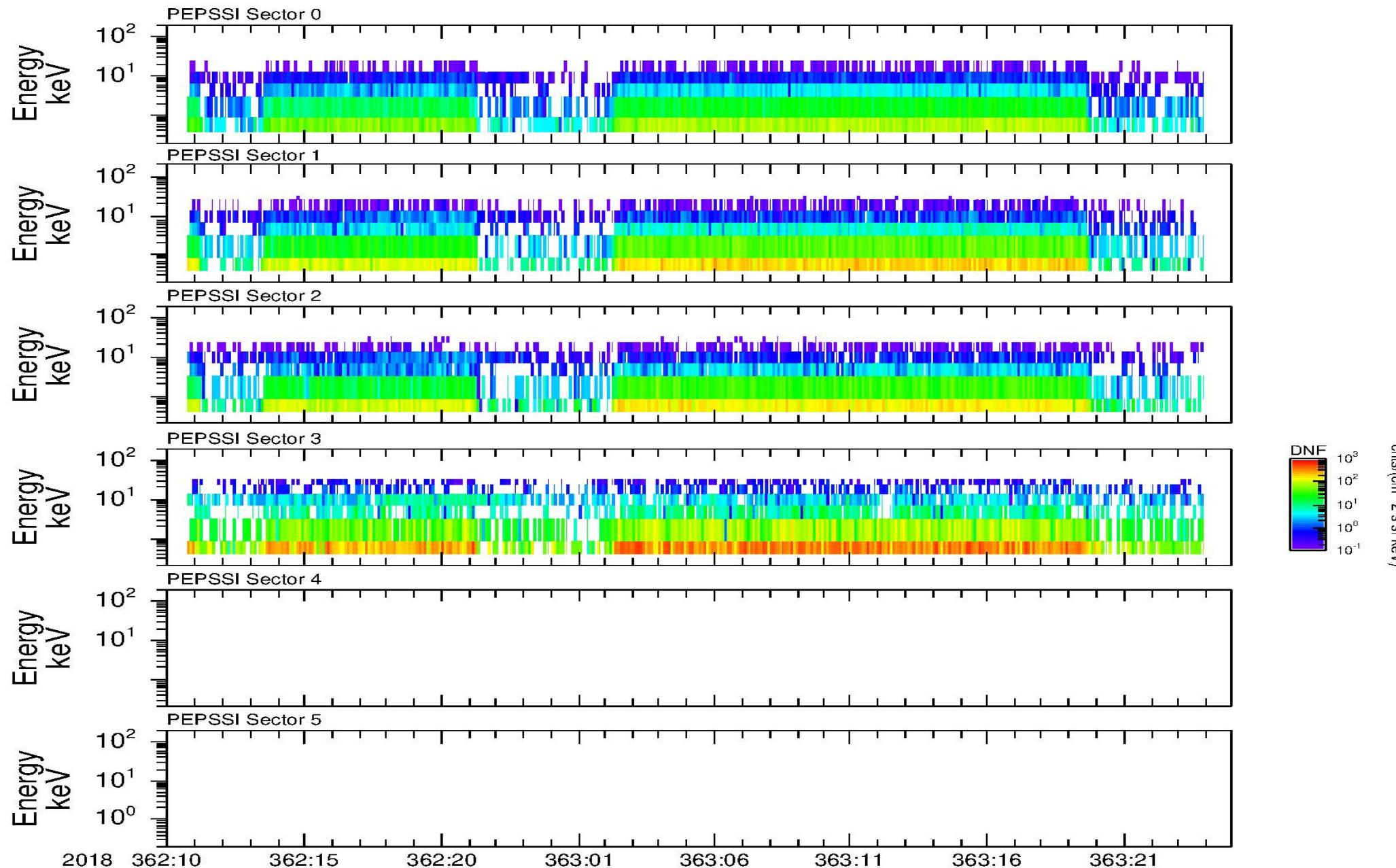
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FLUX Doubles ("L") DNF - B
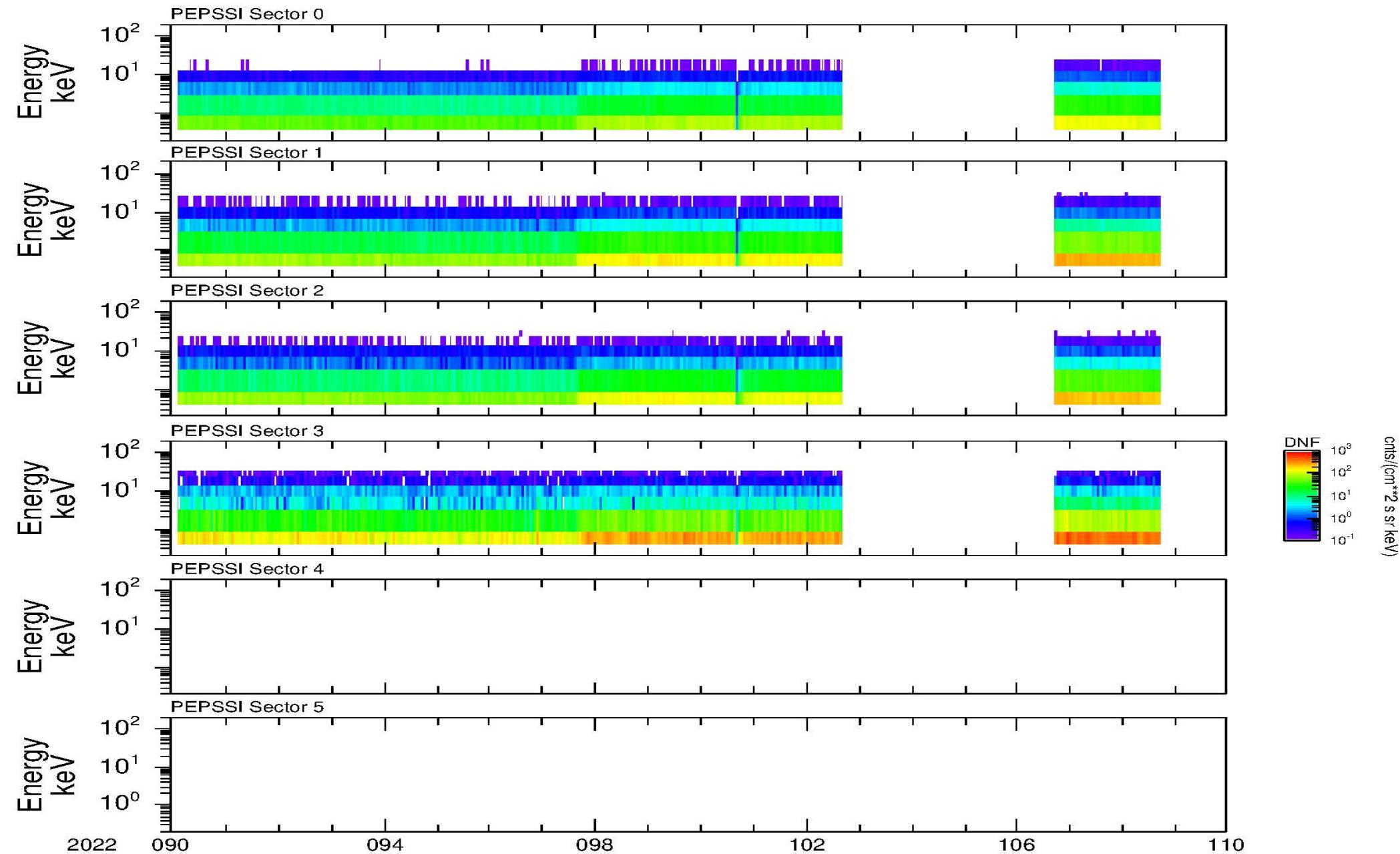
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FLUX Triples ("D") CPS Protons - A
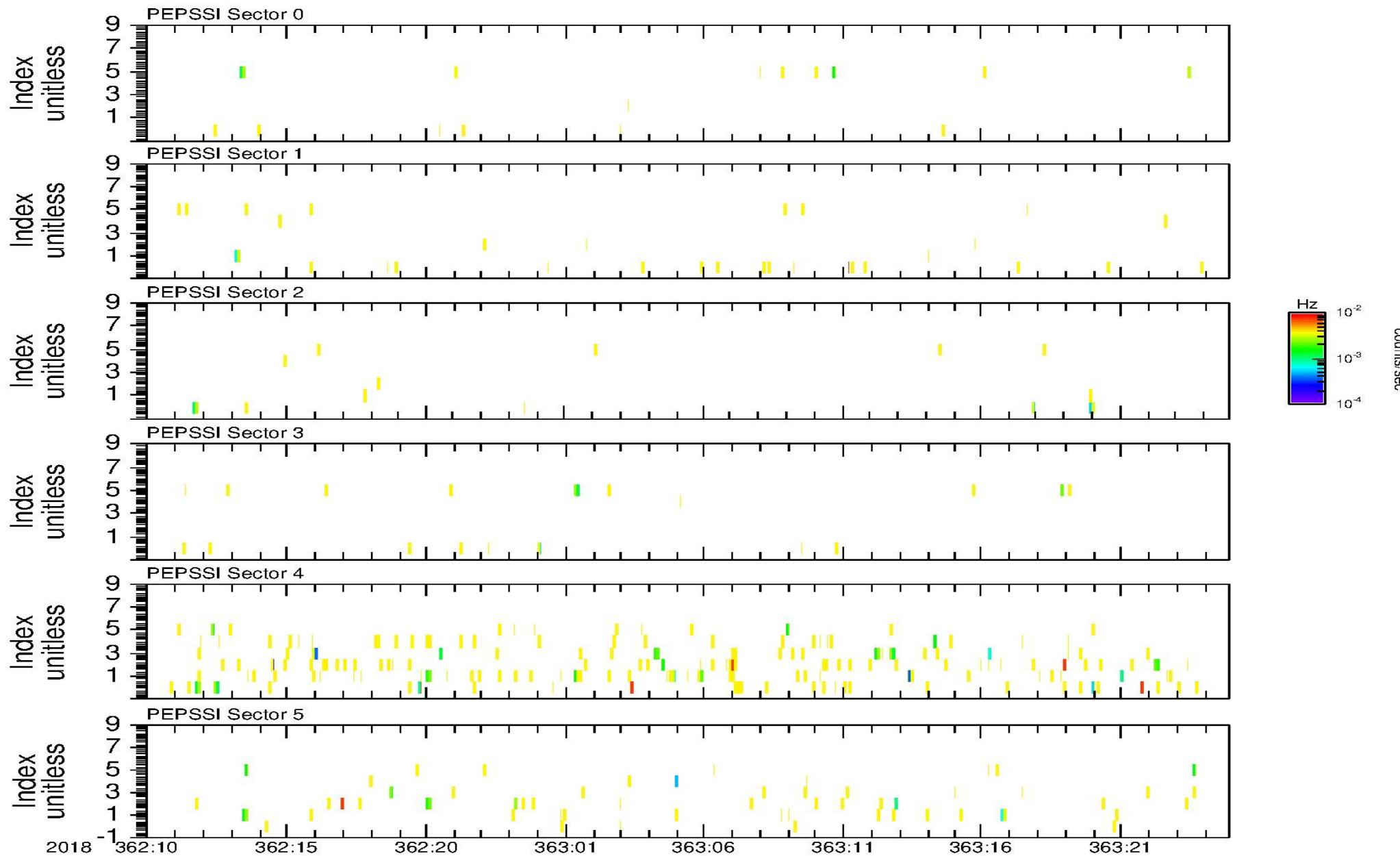
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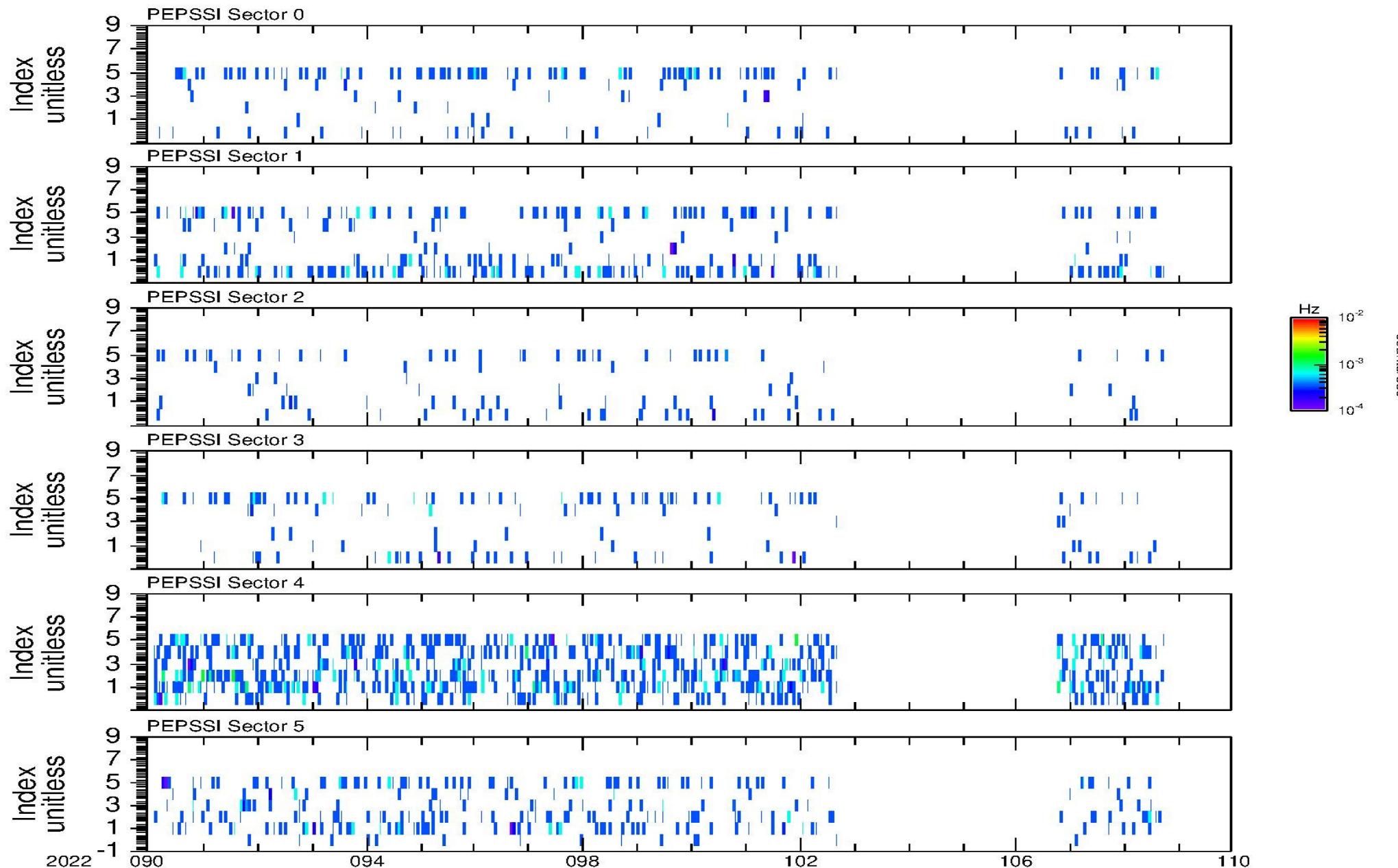
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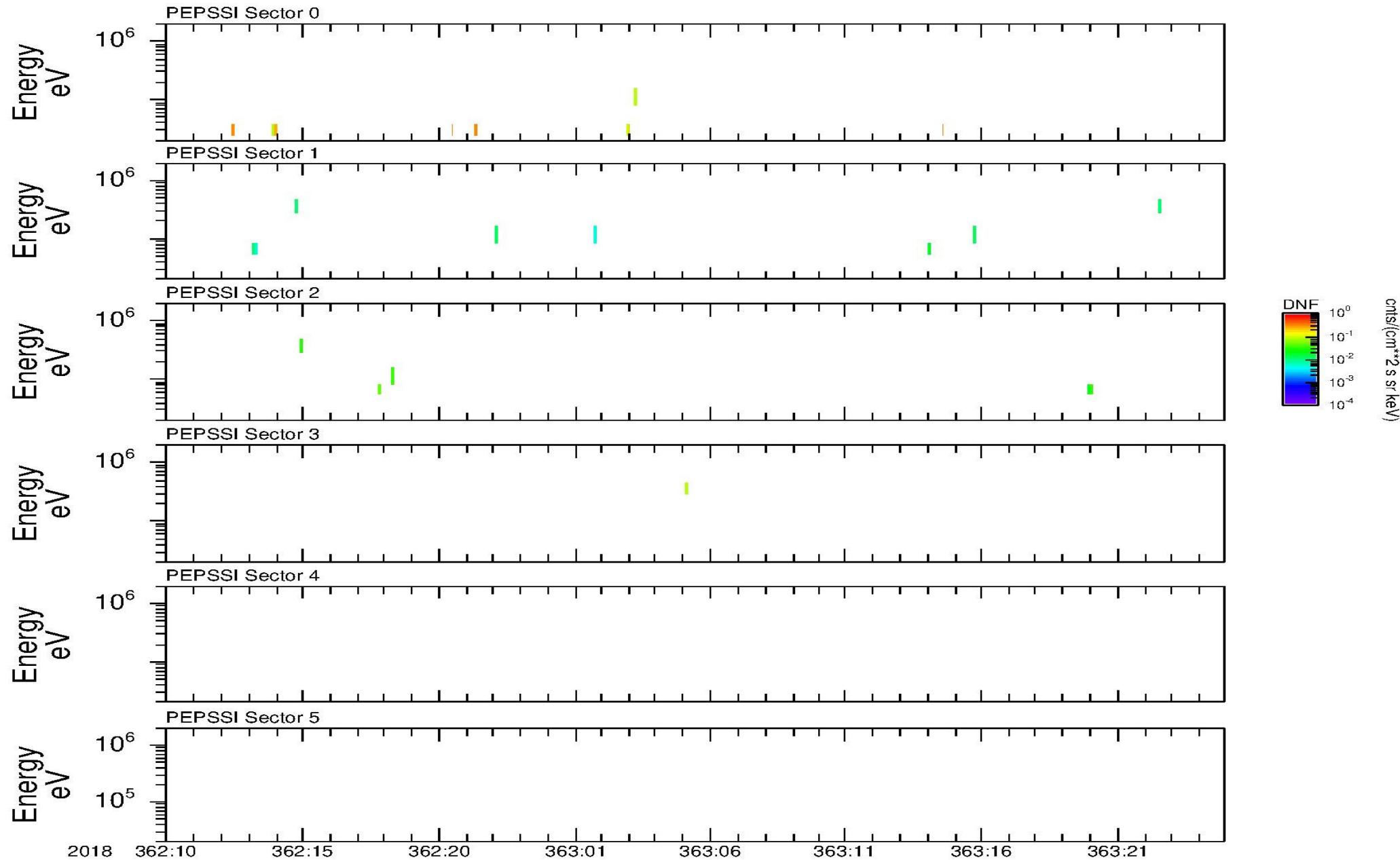
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FLUX Triples ("D") DNF Protons - B
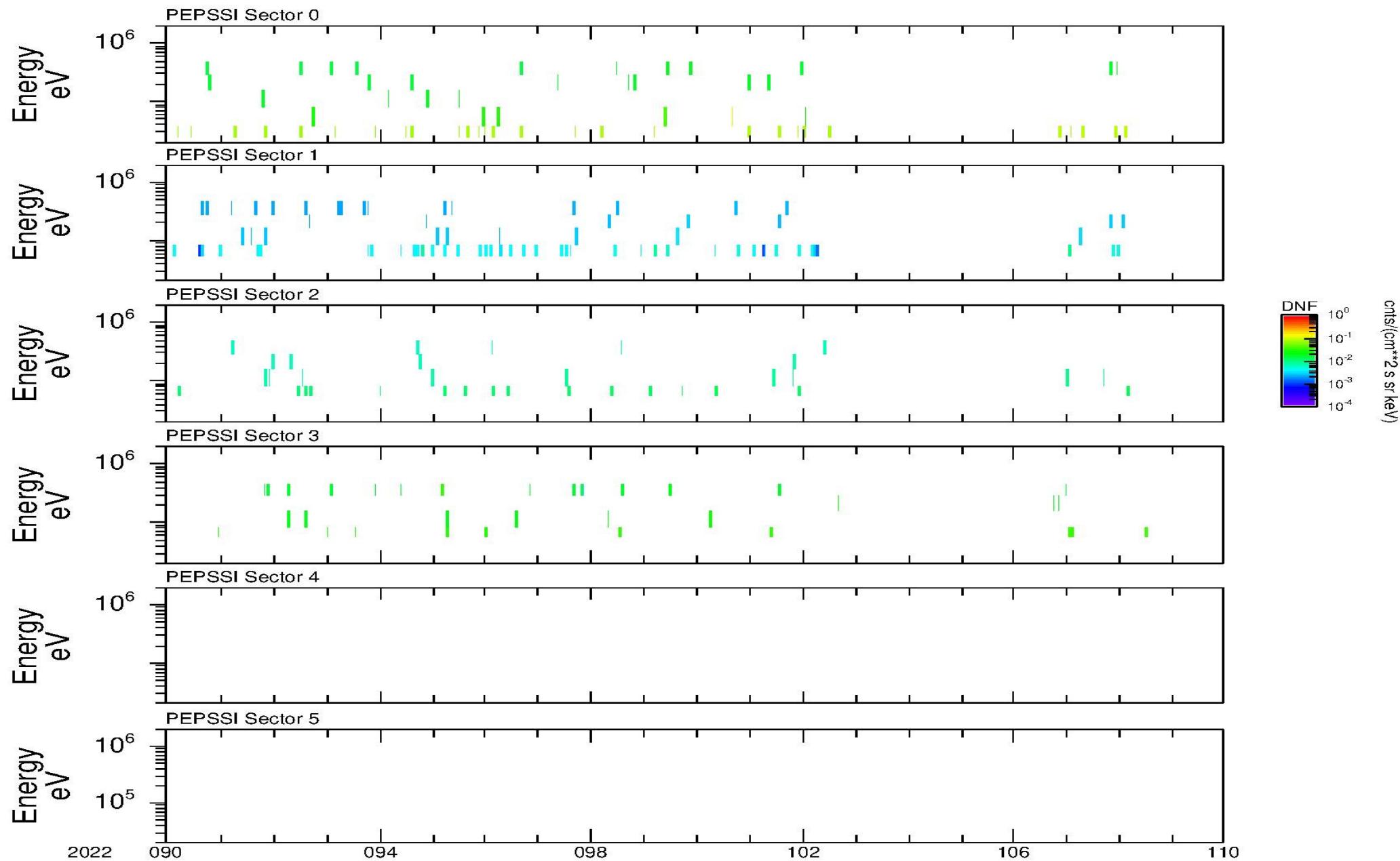
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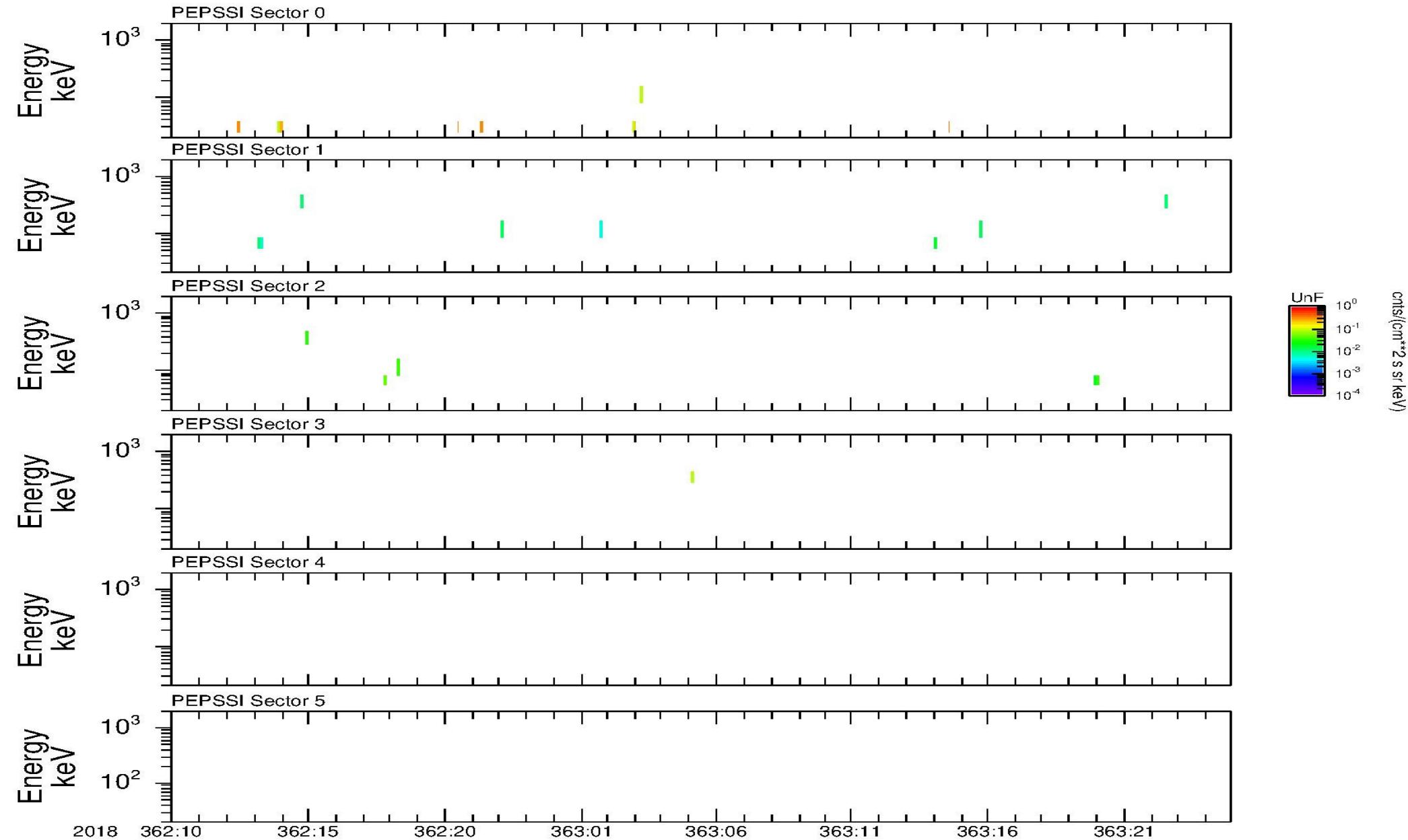
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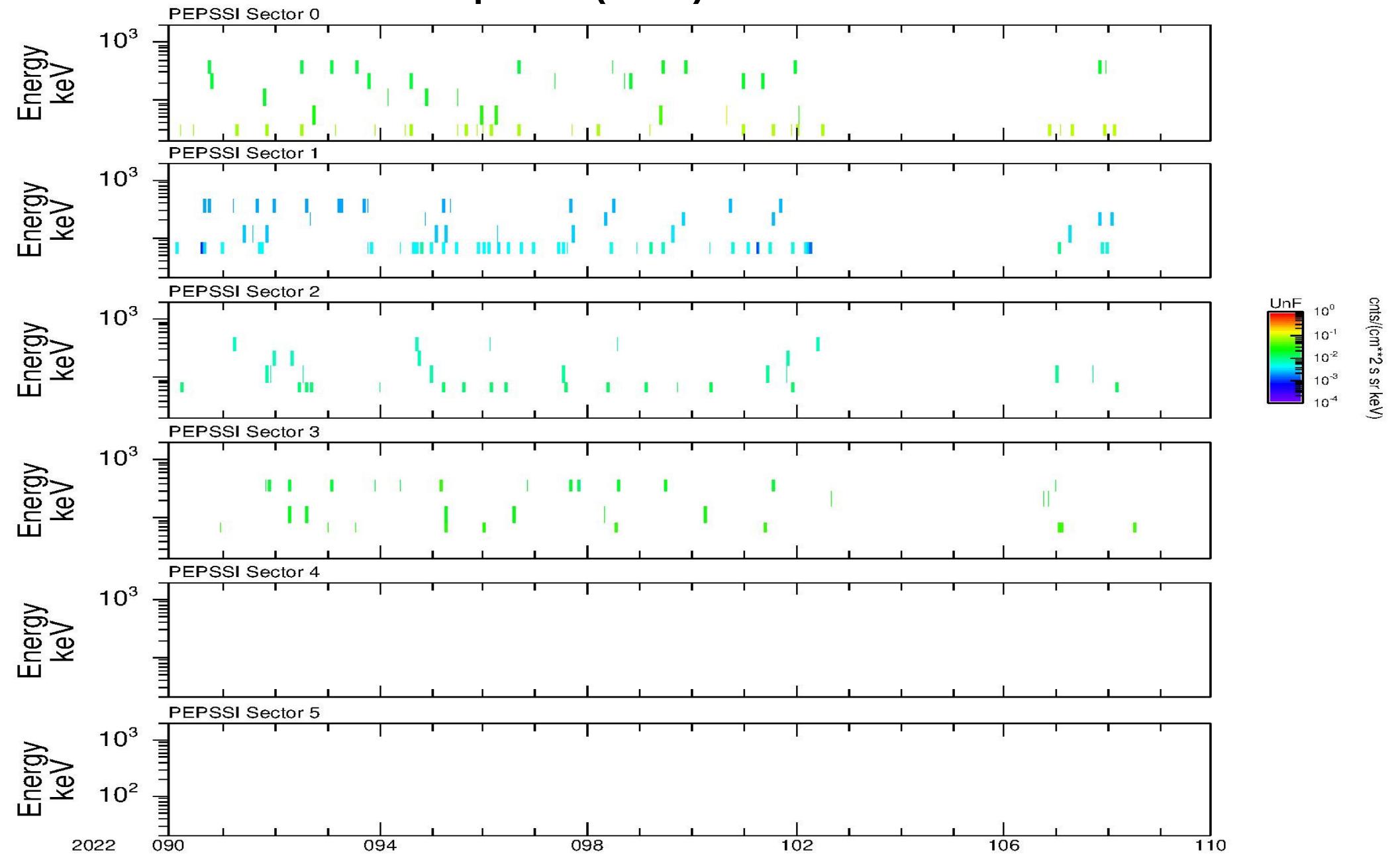
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PEPSSI FIT File Structure

fv: Summary of pep_0511941116_0x691_sci.fit...-a-pepssi-3-kem2-v1.0/data/20220411_051194/

File   Edit   Tools   Help

Index	Extension	Type	Dimension	View				
0	Primary	Image	0	Header	Image	Table		
1	SPEC_Protons	Image	1440 X 6	Header	Image	Table		
2	SPEC_Helium	Image	1440 X 2	Header	Image	Table		
3	SPEC_Heavies	Image	1440 X 3	Header	Image	Table		
4	SPEC_Electrons	Image	1440 X 3	Header	Image	Table		
5	SPEC_LowIon	Image	1440 X 16	Header	Image	Table		
6	FLUX	Binary	832 cols X 480 rows	Header	Hist	Plot	All	Select
7	FLUXN1A	Binary	502 cols X 480 rows	Header	Hist	Plot	All	Select
8	FLUXN1B	Binary	440 cols X 480 rows	Header	Hist	Plot	All	Select
9	PHA_ELECTRON	Binary	9 cols X 19520 rows	Header	Hist	Plot	All	Select
10	PHA_LOW_ION	Binary	25 cols X 858 rows	Header	Hist	Plot	All	Select
11	PHA_HIGH_ION	Binary	23 cols X 3622 rows	Header	Hist	Plot	All	Select

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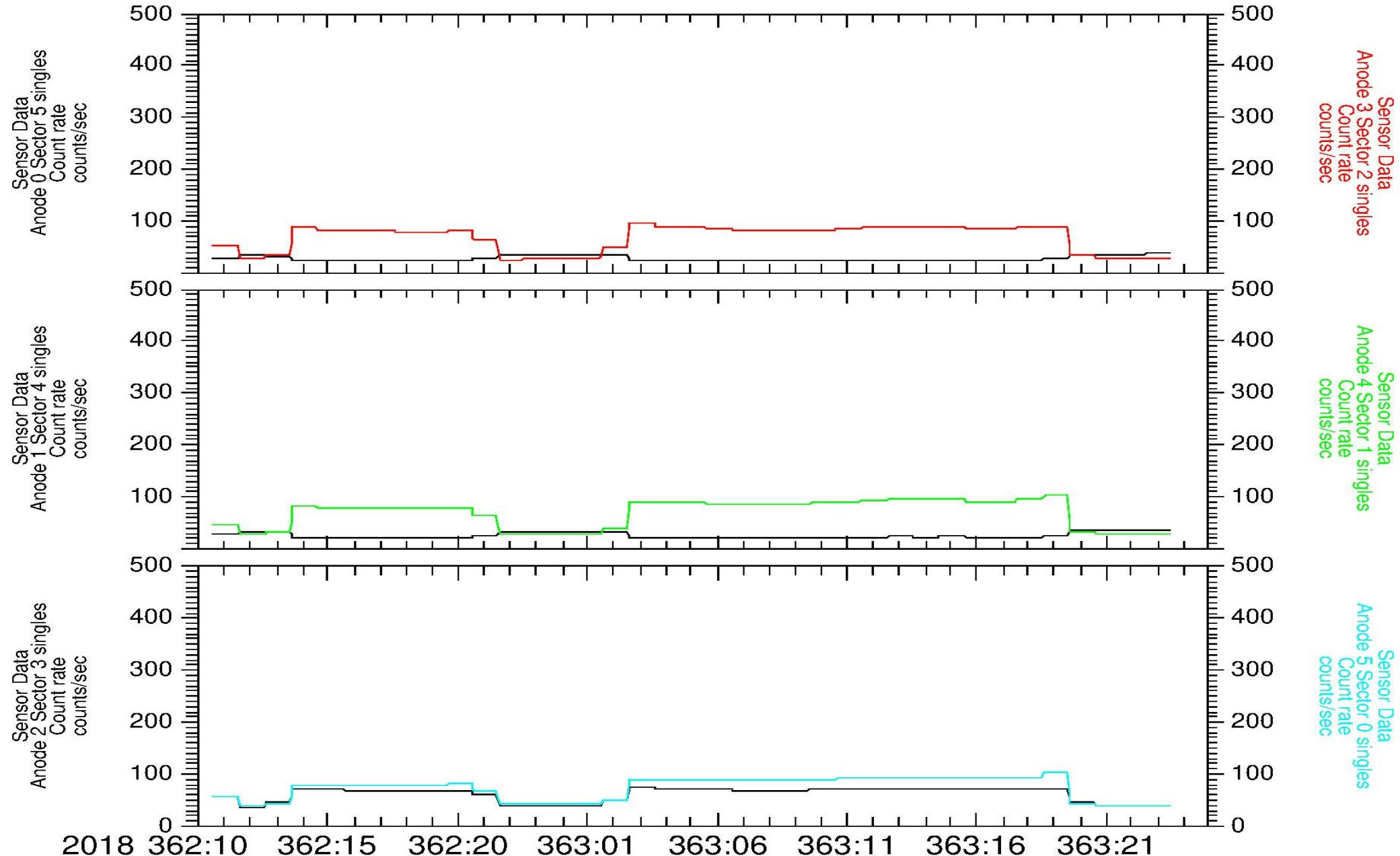
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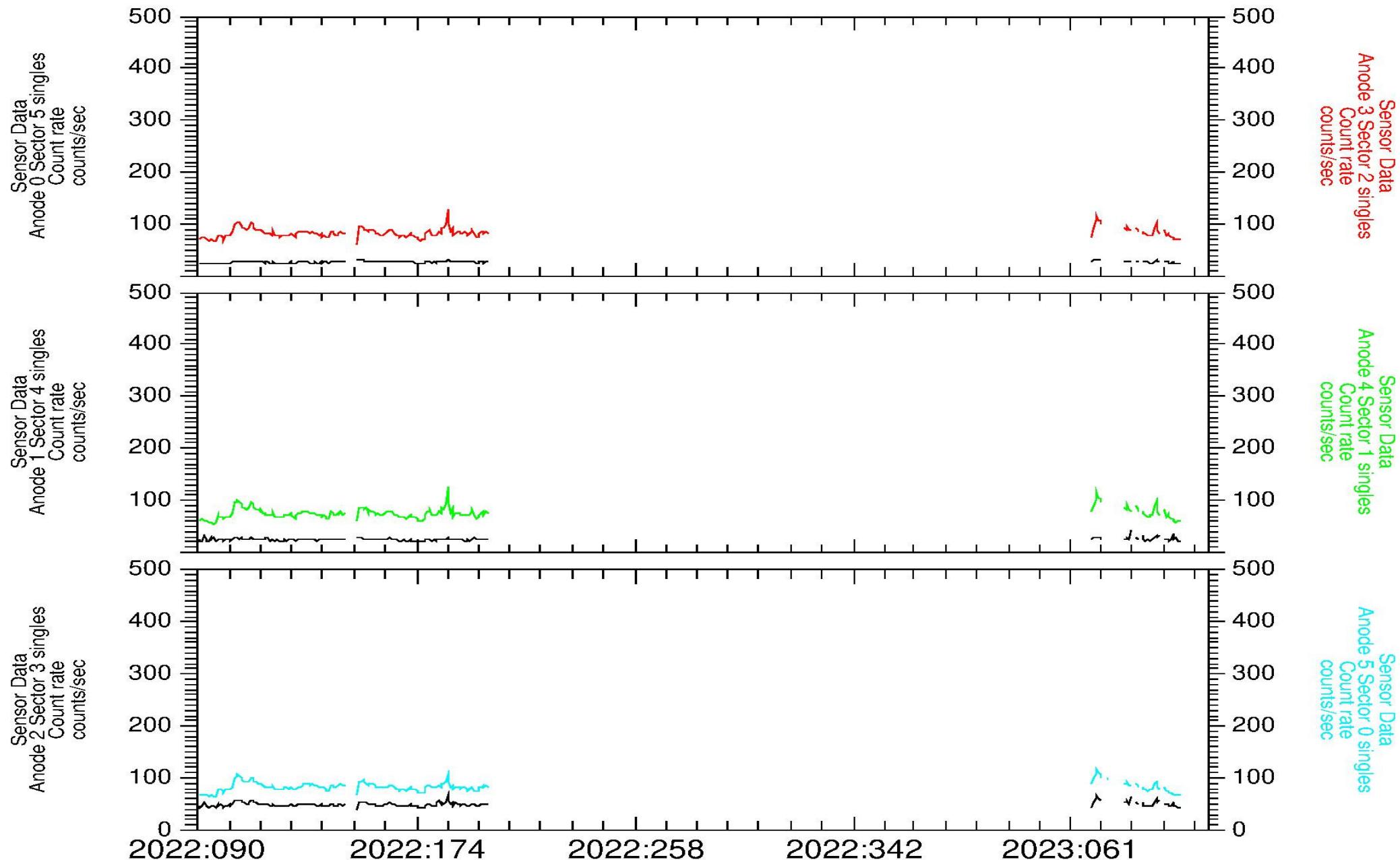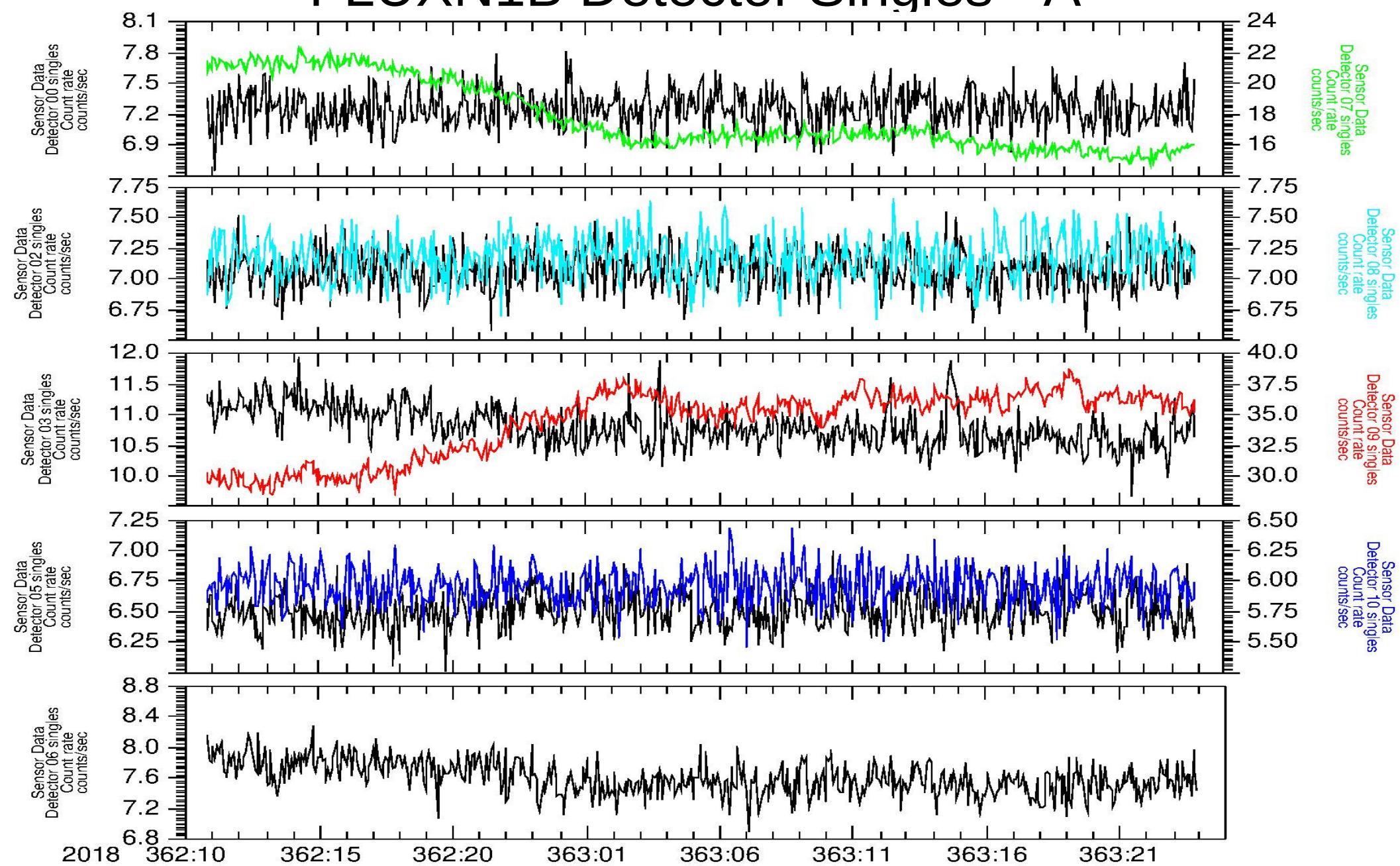
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FLUXN1B Detector Singles - A

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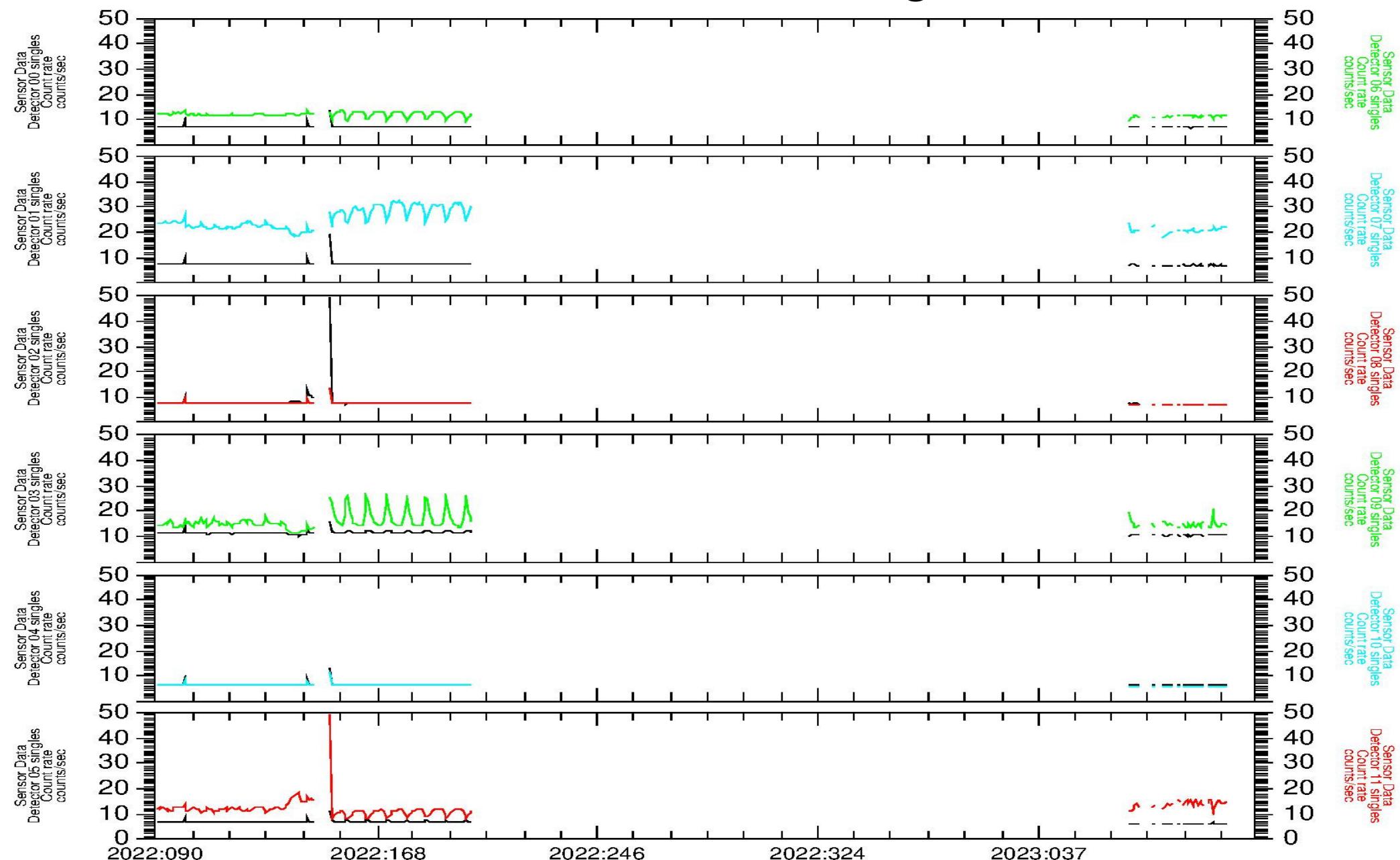
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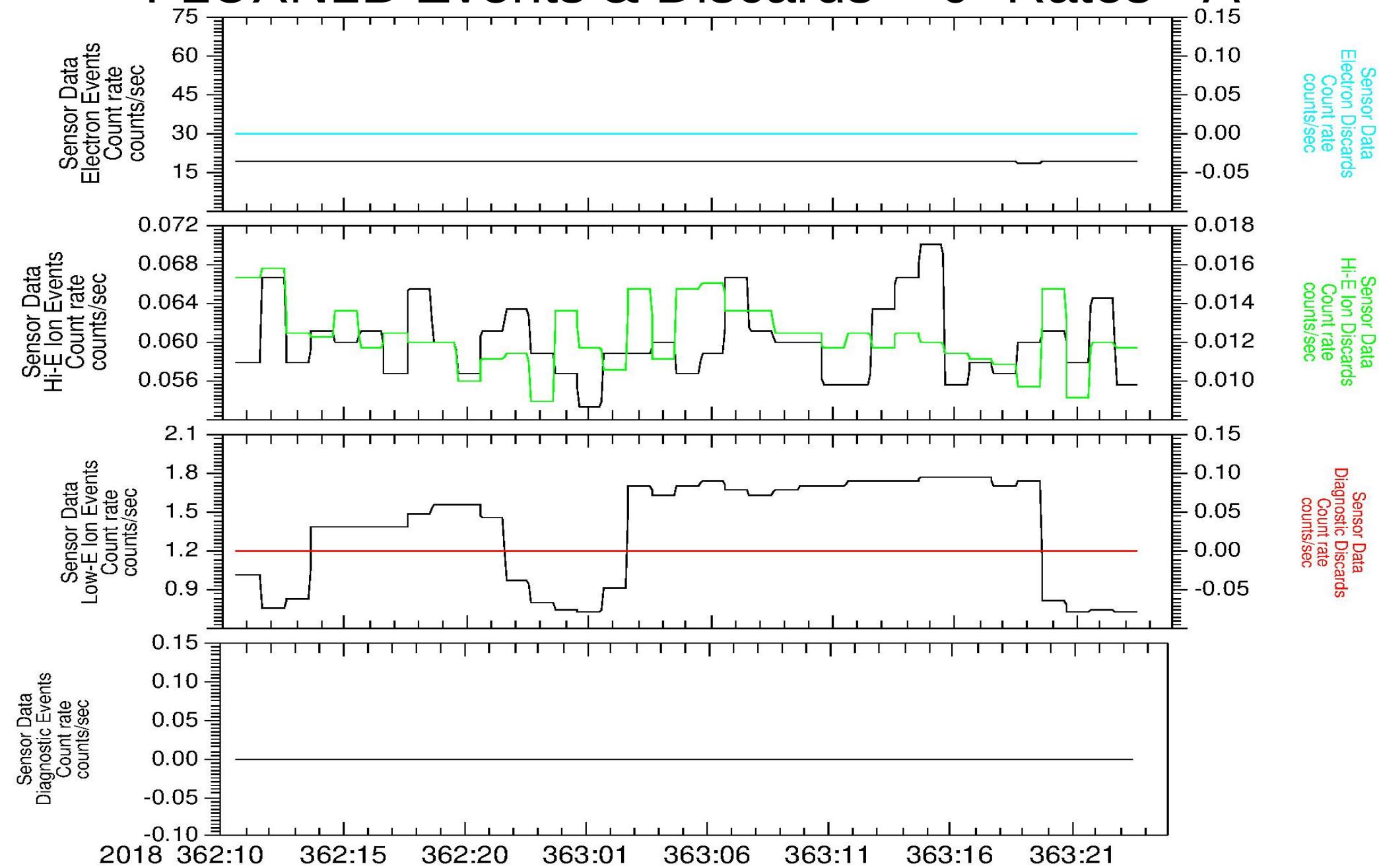
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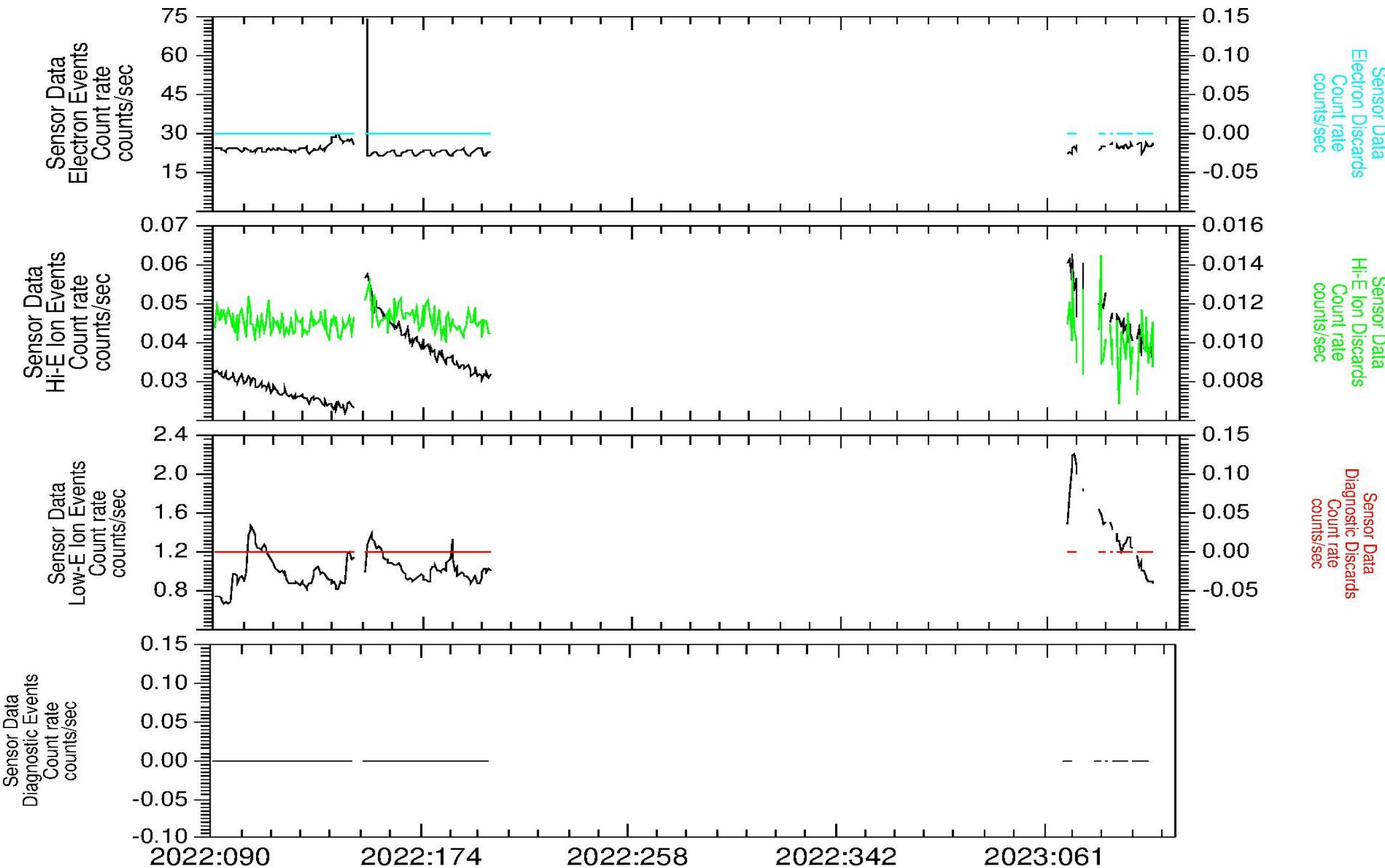
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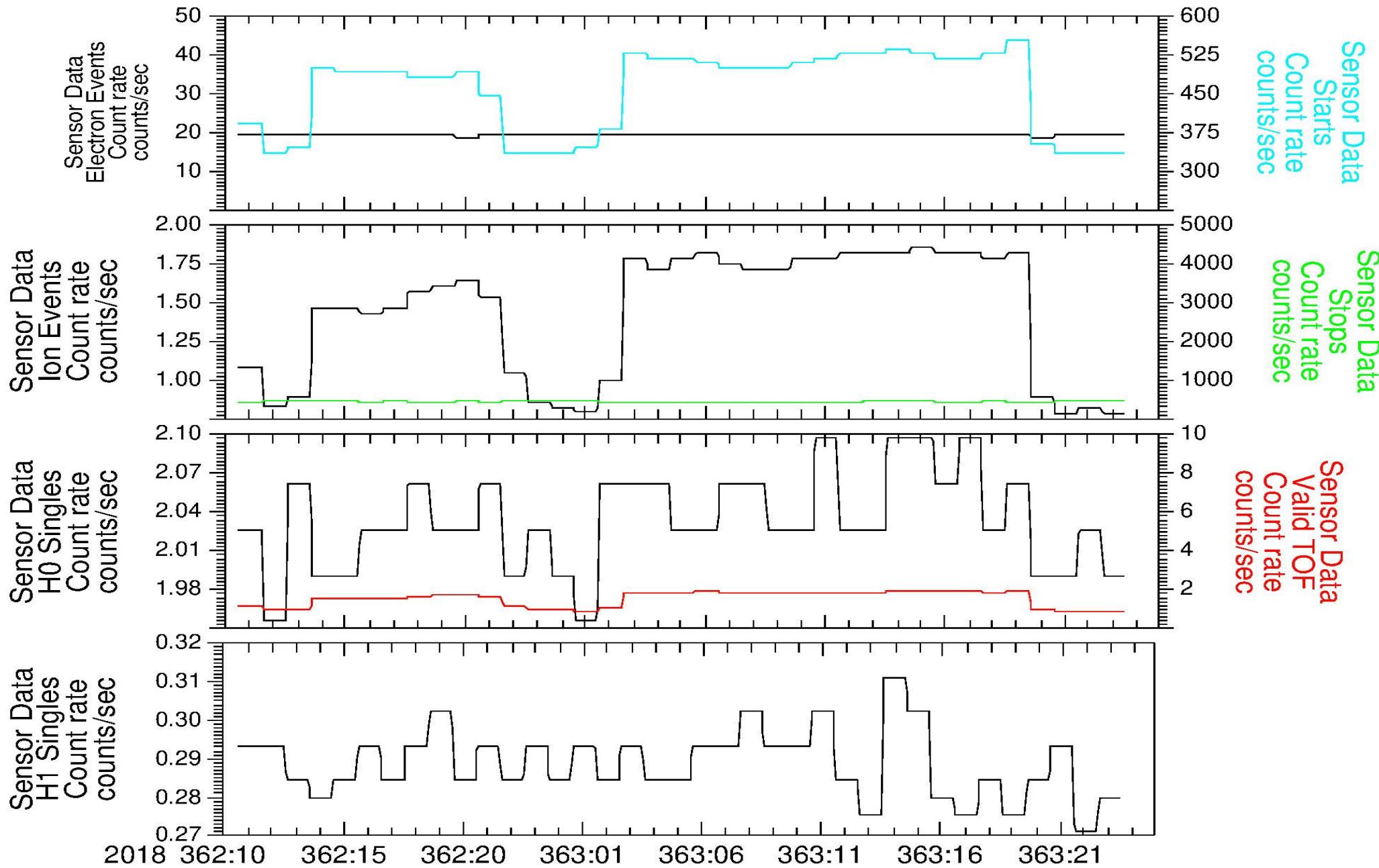
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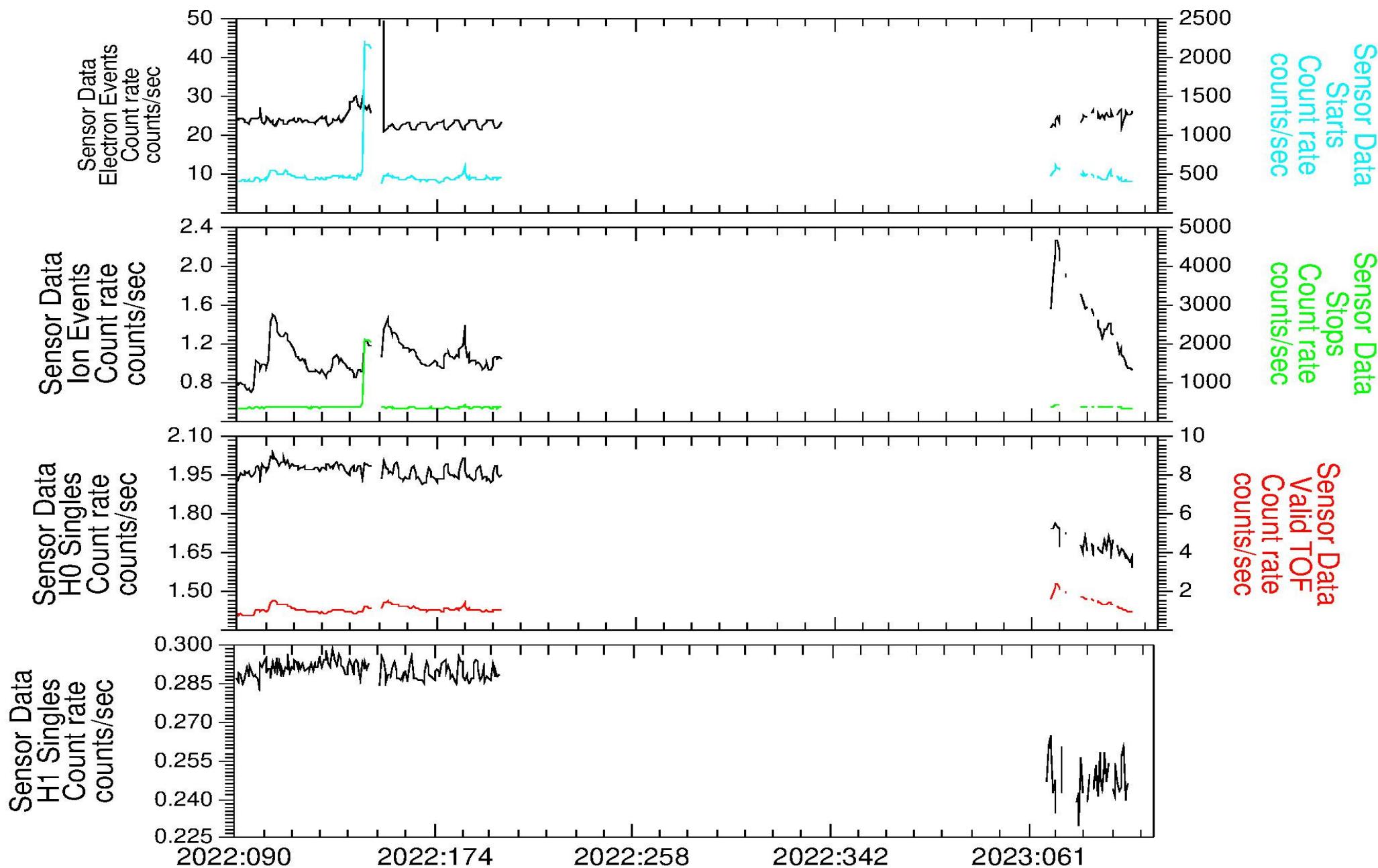
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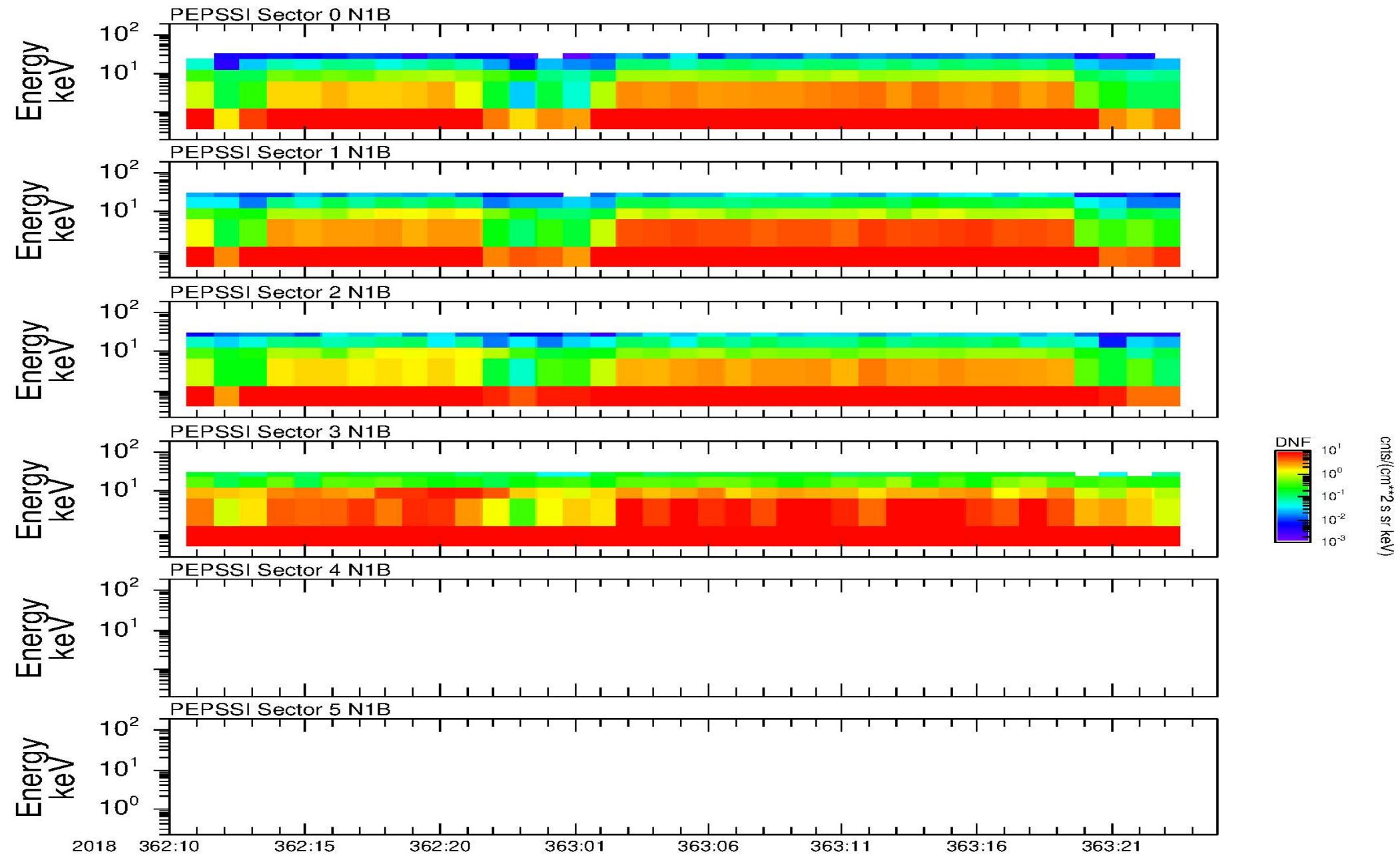
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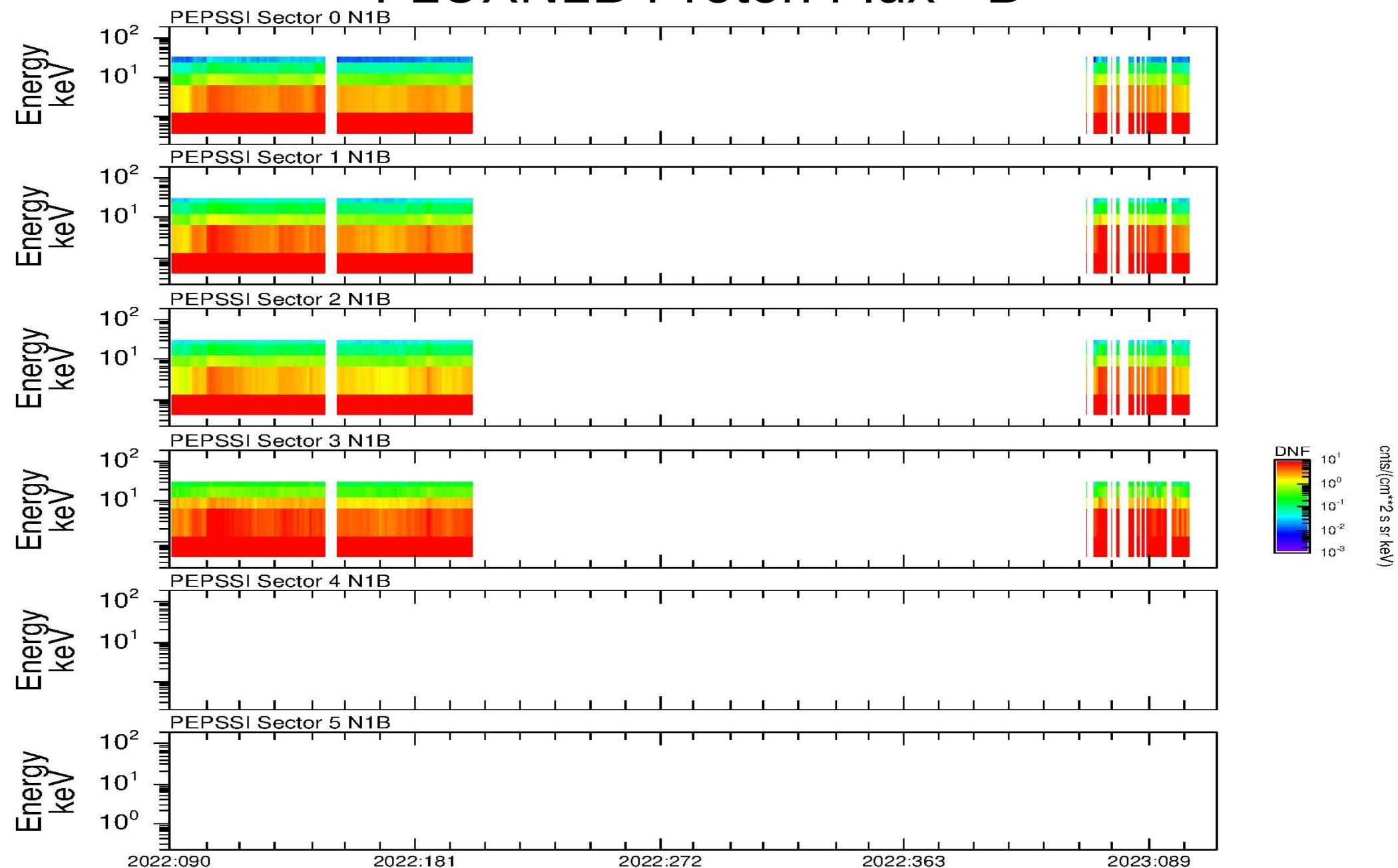
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FLUXN1B Oxygen Flux - A
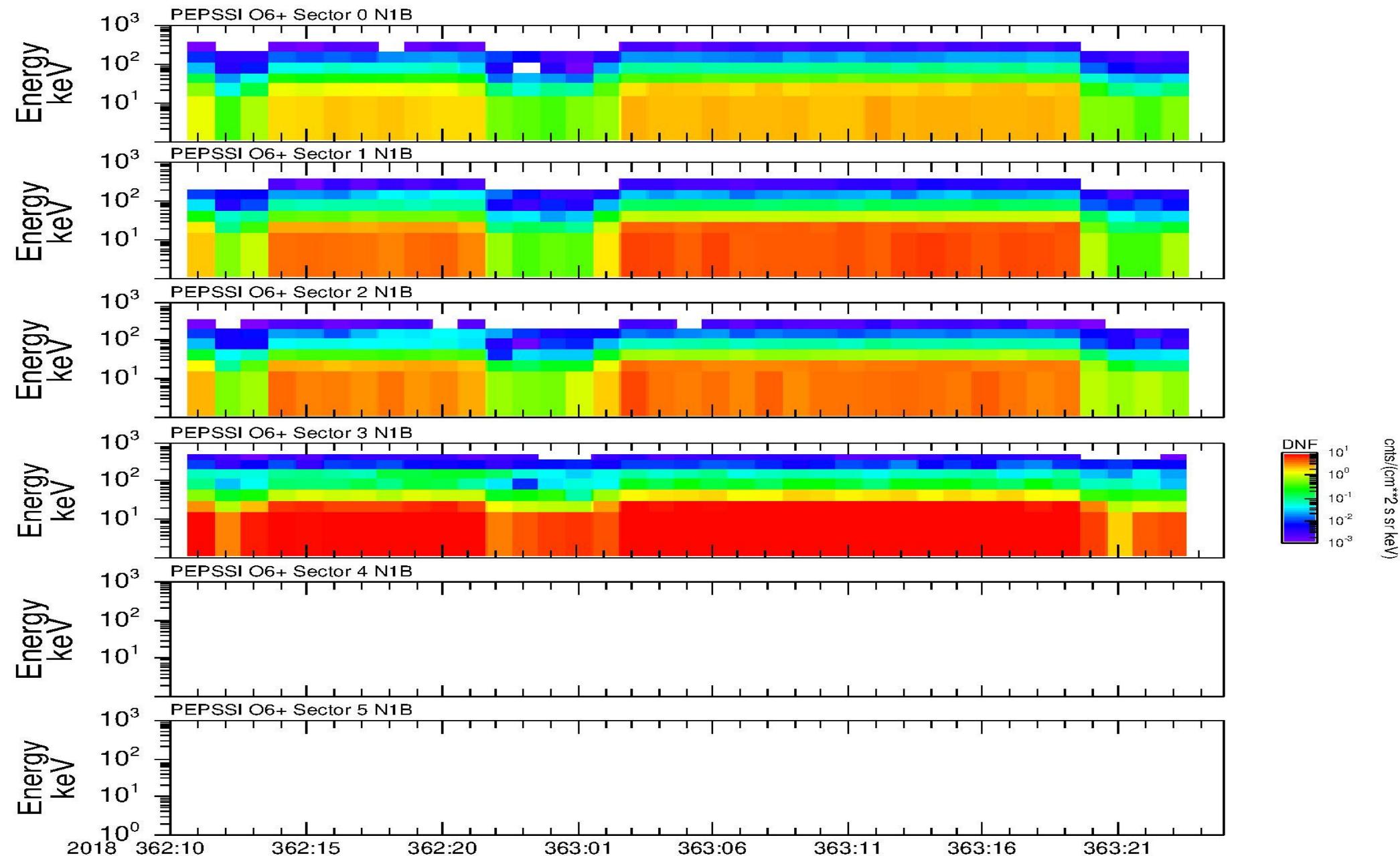
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FLUXN1B Oxygen Flux - B
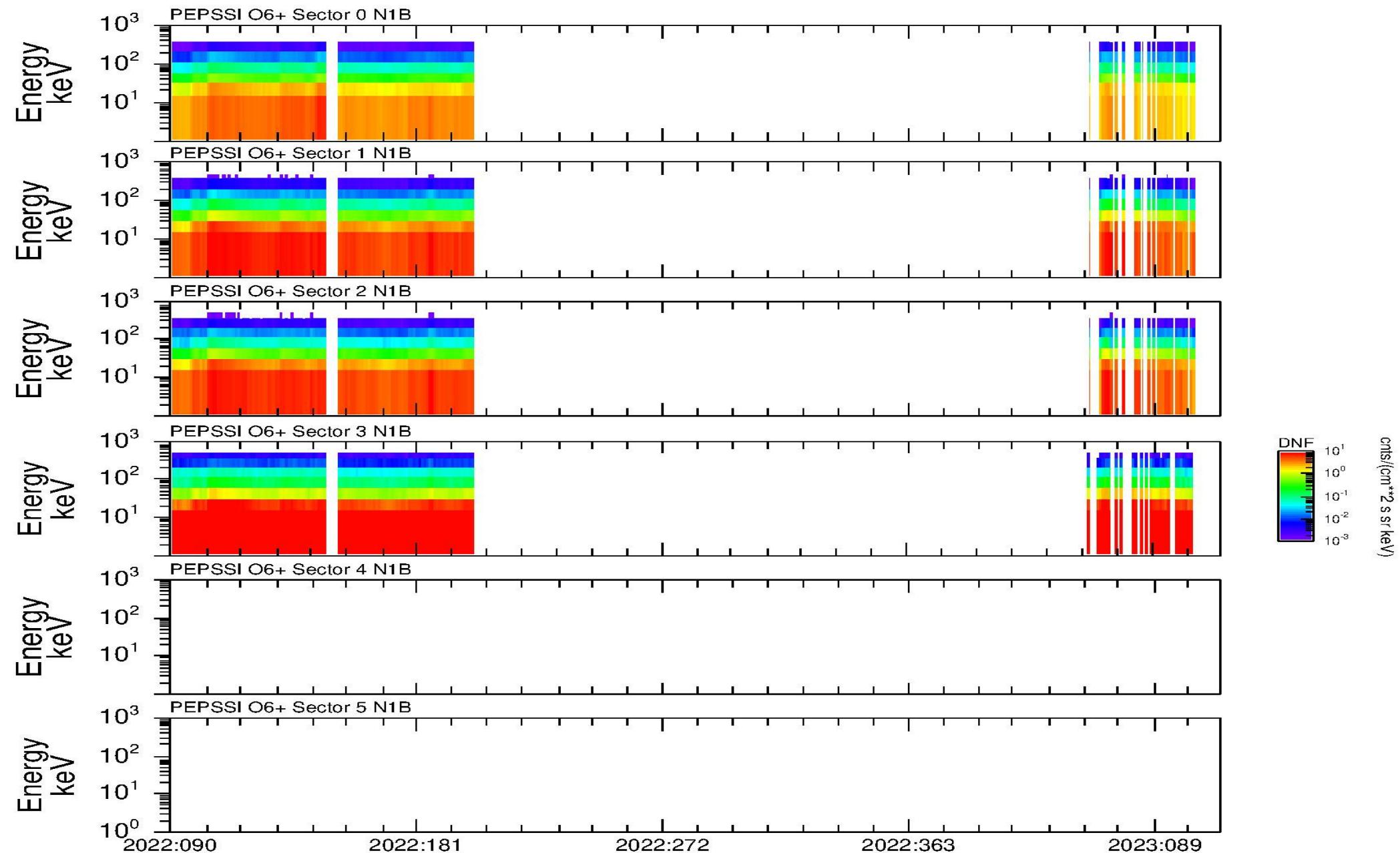
Certification Recommendation

1) Evaluate NULL times in BIT File.

2) Update calpar tab file(s).

3) Evaluate Low Ion TOF band for pixel 15.

4) Certify the data.

BACK-UP
Slides

Stern et al., Science, 2019, Figure 8
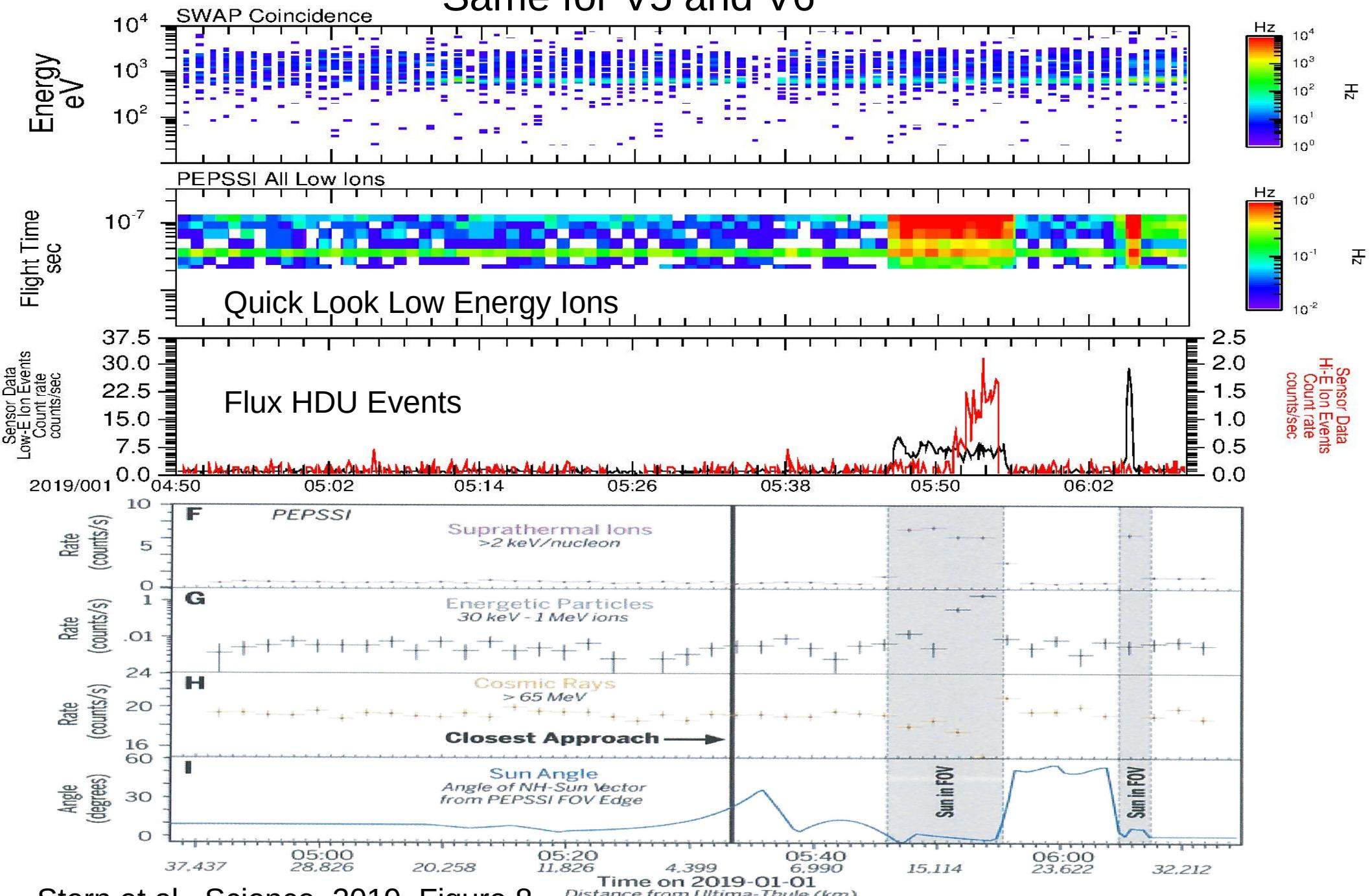
PEPSSI Electrons - 3

Why are the fluxes from PEPSSI abnormally high?

Solar Wind Electrons at 1 AU

Wang et al, ApJ Lett. 2012
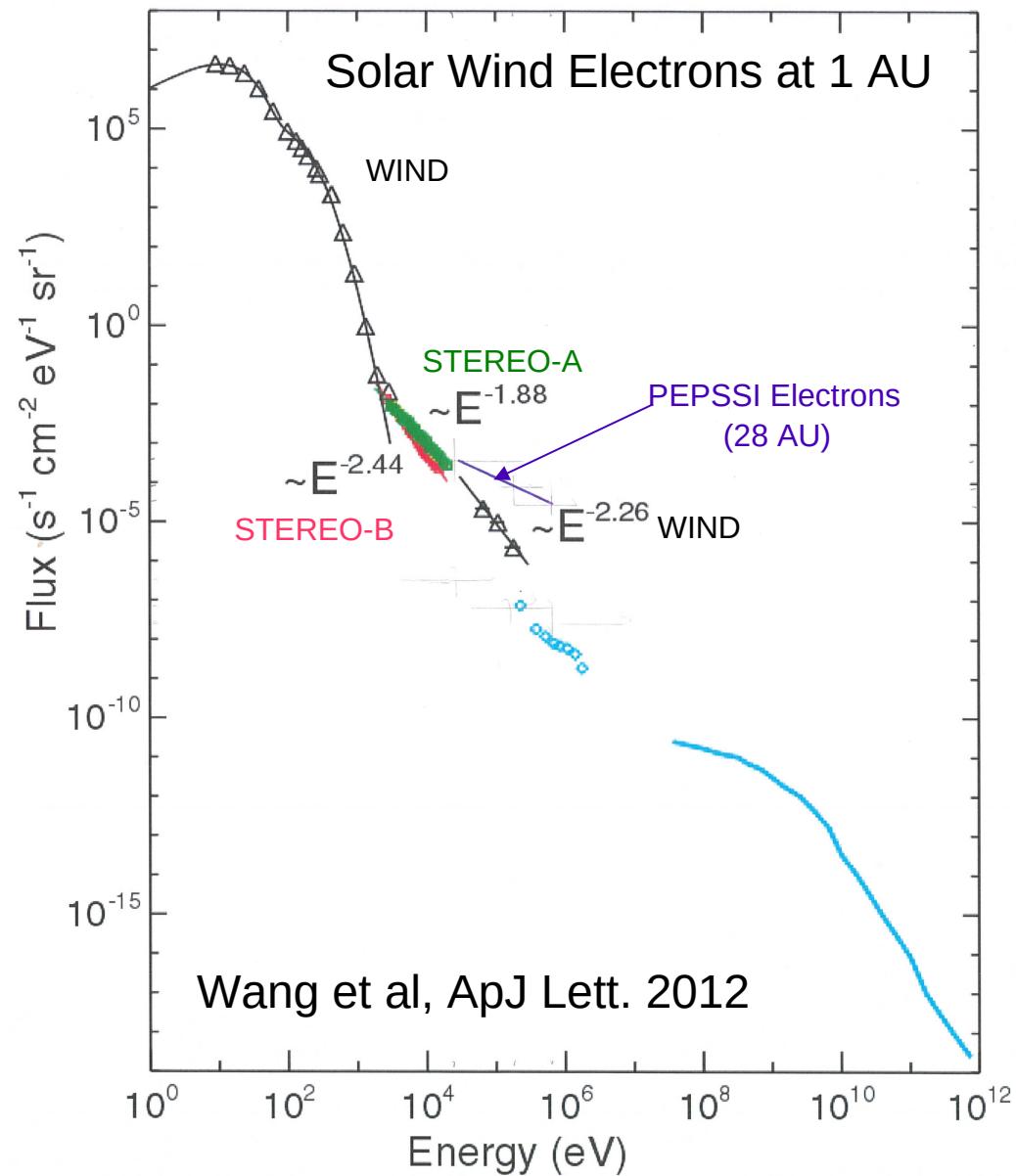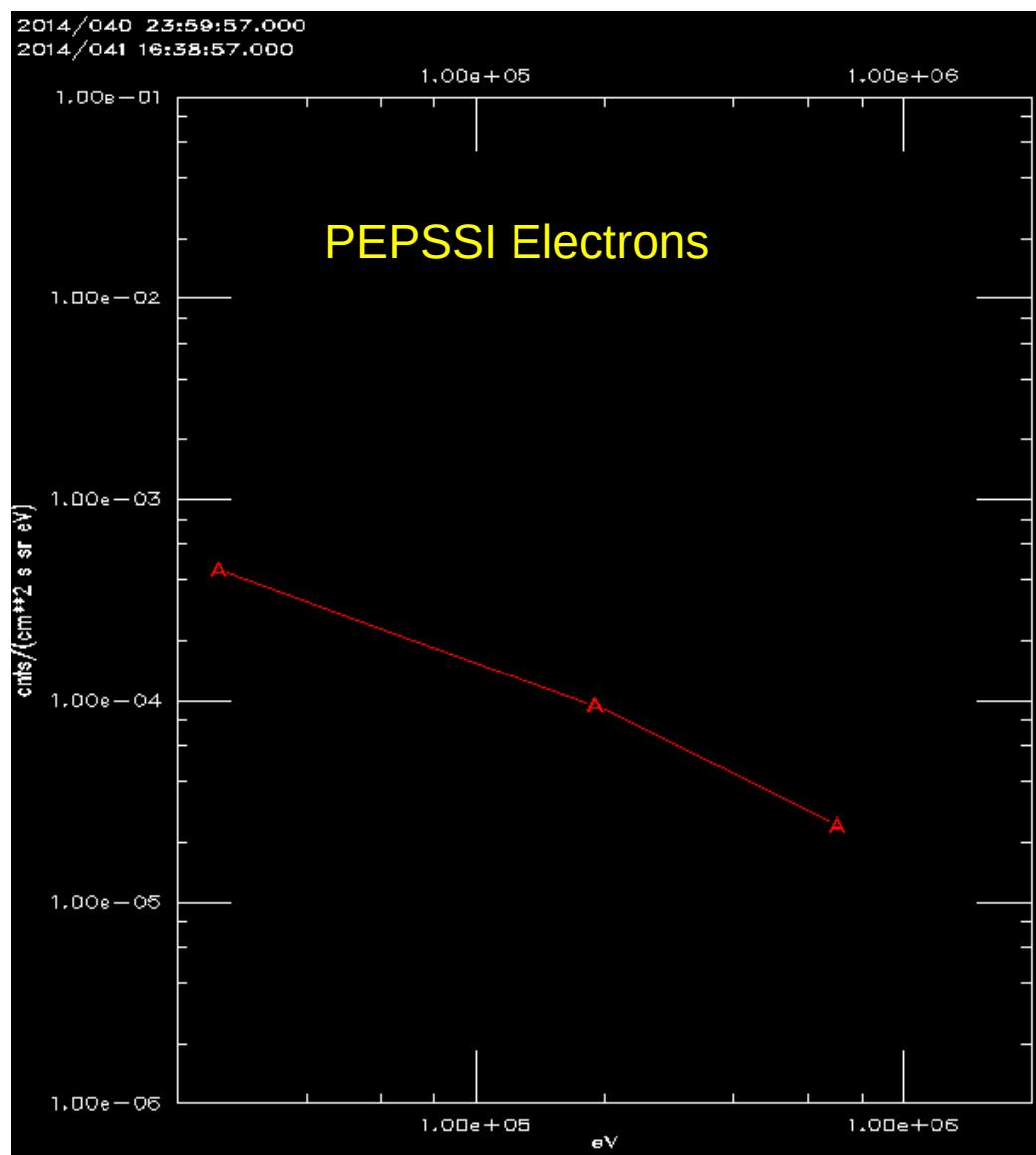
nh-a-pepssi-2-kem2-v1.0
nh-a-pepssi-3-kem2-v1.0
aareadme.txt

GOOD

nh-a-pepssi-2-kem2-v1.0
nh-a-pepssi-3-kem2-v1.0
voldesc.txt

GOOD

nh-a-pepssi-2-kem2-v1.0/catalog
nh-a-pepssi-3-kem2-v1.0/catalog
catinfo.txt

GOOD

nh-a-pepssi-2-kem2-v1.0/catalog
nh-a-pepssi-3-kem2-v1.0/catalog
dataset.cat

GOOD

nh-a-pepssi-2-kem2-v1.0/catalog
nh-a-pepssi-3-kem2-v1.0/catalog
nh_kem.cat

GOOD

nh-a-pepssi-2-kem2-v1.0/catalog
nh-a-pepssi-3-kem2-v1.0/catalog
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GOOD

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GOOD

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GOOD

nh-a-pepssi-3-kem2-v1.0/document
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GOOD

nh-a-pepssi-3-kem2-v1.0/document
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GOOD

nh-a-pepssi-3-kem2-v1.0/document
nh_fov.lbl & nh_fov.pdf

GOOD

nh-a-pepssi-3-kem2-v1.0/document
nh_met2utc.lbl

GOOD

nh-a-pepssi-3-kem2-v1.0/document nh_met2utc.tab

GOOD, no need to update

nh-a-pepssi-3-kem2-v1.0/document
nh_mission_trajectory.lbl

GOOD

nh-a-pepssi-3-kem2-v1.0/document
nh_pepssi_v110_ti.txt

GOOD

nh-a-pepssi-3-kem2-v1.0/document payload_ssr.lbl & payload_ssr.pdf

GOOD

nh-a-pepssi-3-kem2-v1.0/document
pep_bti.lbl

GOOD

nh-a-pepssi-3-kem2-v1.0/document
pepssi_ssr.lbl & pepssi_ssr.pdf

GOOD

nh-a-pepssi-3-kem2-v1.0/document
quat_axyz_instr_to_j2k.lbl
quat_axyz_instr_to_j2k.asc

GOOD

nh-a-pepssi-3-kem2-v1.0/document
seq_pepssi_kem1.lbl

GOOD

nh-a-pepssi-3-kem2-v1.0/document seq_pepssi_kem1.tab

GOOD, updated

nh-a-pepssi-3-kem2-v1.0/document
seq_pepssi_kem2.lbl & seq_pepssi_kem2.tab

GOOD

nh-a-pepssi-2-kem2-v1.0/document
superseded_files_pepssi-2.lbl &
superseded_files_pepssi-2.tab

GOOD

nh-a-pepssi-3-kem2-v1.0/document
superseded_files_pepssi-3.lbl &
superseded_files_pepssi-3.tab

GOOD

nh-a-pepssi-3-kem2-v1.0/document
soc_inst_icd.lbl

GOOD

nh-a-pepssi-3-kem2-v1.0/document
soc_inst_icd.pdf

GOOD

nh-a-pepssi-3-kem2-v1.0/calib
calinfo.txt

GOOD

nh-a-pepssi-3-kem2-v1.0/calib
hk_n1_input_20050228.lbl
hk_n1_input_20050228.tab

GOOD

nh-a-pepssi-3-kem2-v1.0/calib
hk_stat_input_20041016.lbl
hk_stat_input_20041016.tab

GOOD

nh-a-pepssi-3-kem2-v1.0/calibrateboxdefinitionplanes.lbl

GOOD

nh-a-pepssi-3-kem2-v1.0/calib/calpars
calpinfo.txt

GOOD

nh-a-pepssi-3-kem2-v1.0/calib/calpars
calpar_columns.fmt

GOOD

nh-a-pepssi-3-kem2-v1.0/index indxinfo.txt

GOOD

nh-a-pepssi-3-kem2-v1.0/index
checksum.lbl & checksum.tab

GOOD

nh-a-pepssi-3-kem2-v1.0/index
slimindx.lbl & slimindx.tab

GOOD

nh-a-pepssi-3-kem2-v1.0/index
index.lbl & index.tab

GOOD