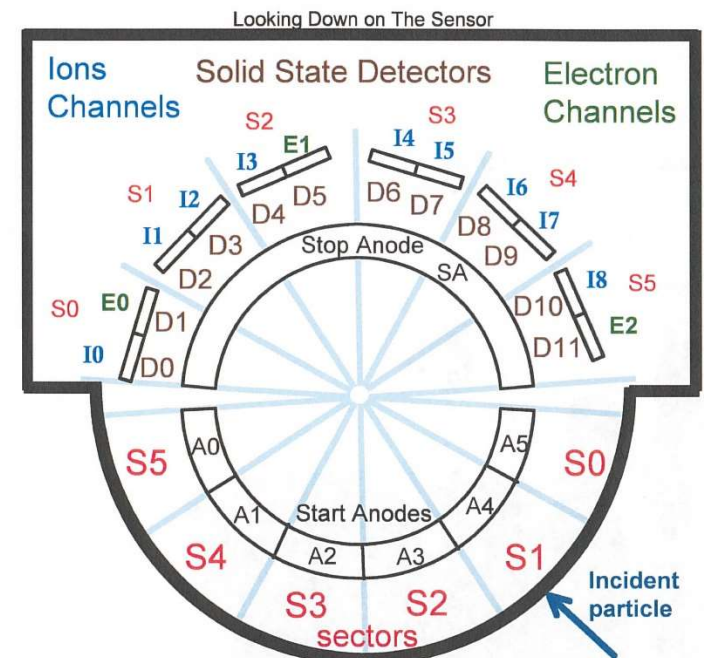
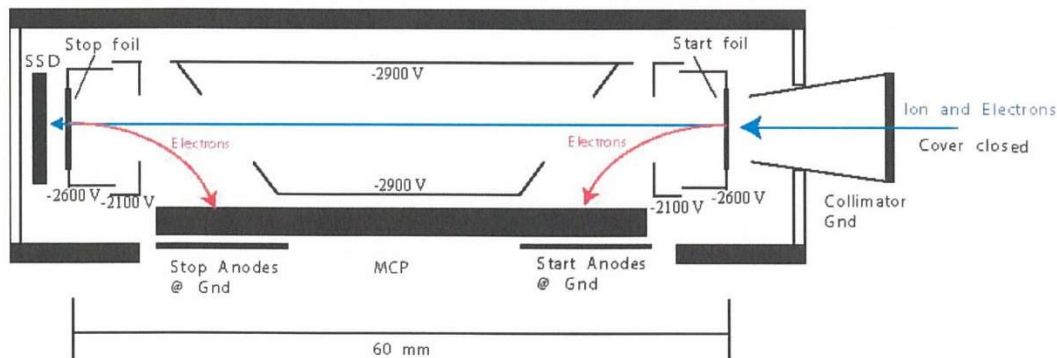


New Horizons Pluto Energetic Particle Spectrometer Science Investigation (PEPSSI)

Reviewed by S. Joy (primary)

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

Data ->

nh-x-pepssi-2-kem1-v3.0

nh-x-pepssi-3-kem1-v3.0

New Horizons PEPSSI Data Set Evaluation Tools

All Data Processing and Evaluation -
Machine: Dell XPS 15 9560
Operating System: Windows 10

Comments on review procedure

The catalog, documents, and calib directories of these volumes are nearly identical, and most of their contents have been previously reviewed many times.

I have taken advantage of this fact to reduce the review effort.

I used the folder compare option in BeyondCompare 3.3.13 to compare like folders across the four volumes, and then compare files contained in the folders. Most of the time, the only variation in the directory contents or the file therein were the file time stamps and the data_set_id's in the label files.

Once this information was available to me, I only reviewed unique files

Lastly, I looked at issues raised in the Feb 2020 review to make sure that they had been addressed in this release.

Documentation Evaluation

Root level files

AAREADME

No issues found – files essentially identical

VOLDESC

No issues found – files essentially identical

Catalog files

CATINFO.TXT – no changes required

nh_kem.cat – ok (Frahm 2/20 review comments about date ranges **not addressed)**

(Joy suggestion about adding C/A date, mention Arrokoth and aliases **addressed)**

nhsc.cat – ok (Frahm 2/20 review comments about KBO observations **not addressed)**

pepssi.cat – good (Frahm 2/20 review comments **addressed)**

ref.cat – good

There are no differences between files that should be identical on the two volumes (pepssi.cat, ref.cat, etc.) – good, correct versions included

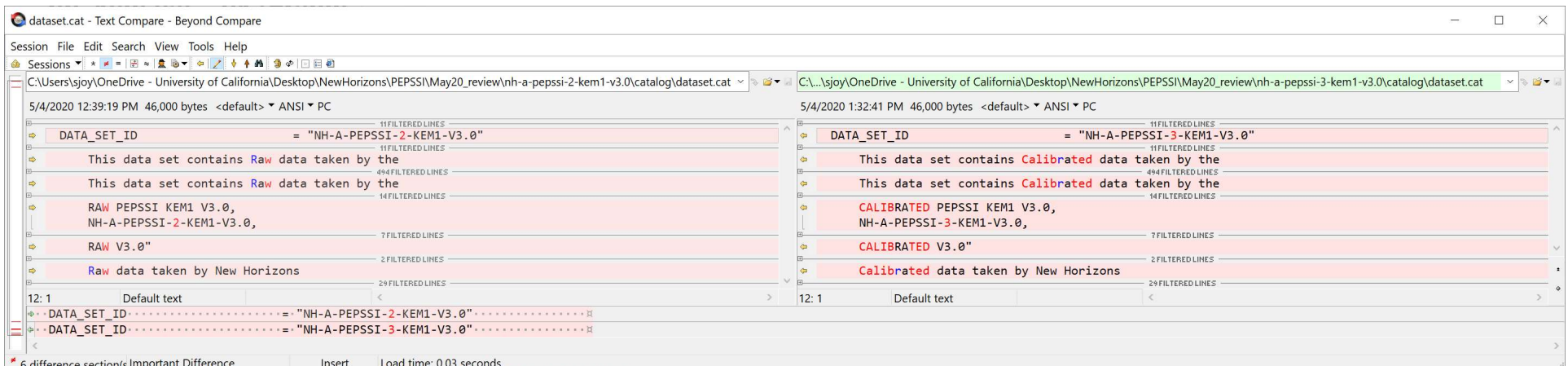
DATASET.CAT (nh-x-pepssi-2-kem1-v3.0 and nh-x-pepssi-3-kem1-v3.0)

includes discussion of versioning – good

(Joy suggestion about adding detail about mission data **addressed)**

Within a mission phase, the -2- and -3- dataset catalogs are effectively identical with the only changes being -2- becoming -3- and Raw becoming Calibrated.

This has been true and accepted for the previous PEPSSI datasets



Calib files

*calinfo.txt – good (previously reported issue **addressed**)*

hk_stat_input_20041016.tab (lbl) – good

hk_n1_input_20050228.tab (lbl) – good

*rateboxdefinitionplanes.fit (lbl) – good (Frahm 2/20 review comments **addressed**)*

calpars folder on -3- volumes only

calpinfo.txt – good

calpar_columns.fmt – good

*pep_*_0x691_calpar.tab – ok, contents clear and self-explanatory. No corresponding .lbl file but that has been the case throughout the mission and has been previously accepted.*

Document files

DOCINFO.TXT – good

All PDS documents (codmac_level_definitions, lunineetal1995, payload_ssr, pepssi_ssr, soc_inst_icd) appear to be properly formatted as PDF/A and the document labels appear to be valid. Most of these document files have been reviewed many times and have not changed recently. They appear to be the latest versions of each.

nh_fov.png (.lbl) – good

nh_met2utc.tab (.lbl) – complete (last weekly entry 2020-01-05), good

nh_mission_trajectory.tab (.lbl) – complete (last entry 2019-07-31), good

nh_pepssi_v110_ti.txt – good

pep_bti.tab (.lbl) – probably incomplete (last entry 2019-01-09) – update?

quat_xyz_instr_to_j2k.asc (.lbl) – good

seq_pepssi_kem1.tab (.lbl) – good, complete (last entry 2019-07-30)

Suggestion: Consider adding a new document that discusses the science objectives and measurements of the various instruments in the post-Pluto mission. This could be just a text file to address the comments that Rudy has raised in the last few reviews, but would have lower impact than updating the SIS and catalog files. This information can probably be easily extracted from the extended mission proposal.

Data Evaluation

nh-x-pepssi-2-kem1-3.0

Files open with both NASAVIEW and FV suggesting that the PDS and FITS labels are well-formed. Validate tool did not catch any errors with labels. All of the files and labels selected for spot inspection appeared nominal.

All tables and columns accessible in NASAVIEW, listings look as expected

FV allow the user to plot data from any table versus time (MET or ET) and the plots look nominal

NASAVIEW 3.15.0 November 2016

File Edit Image Large Image Selection Label Options Help

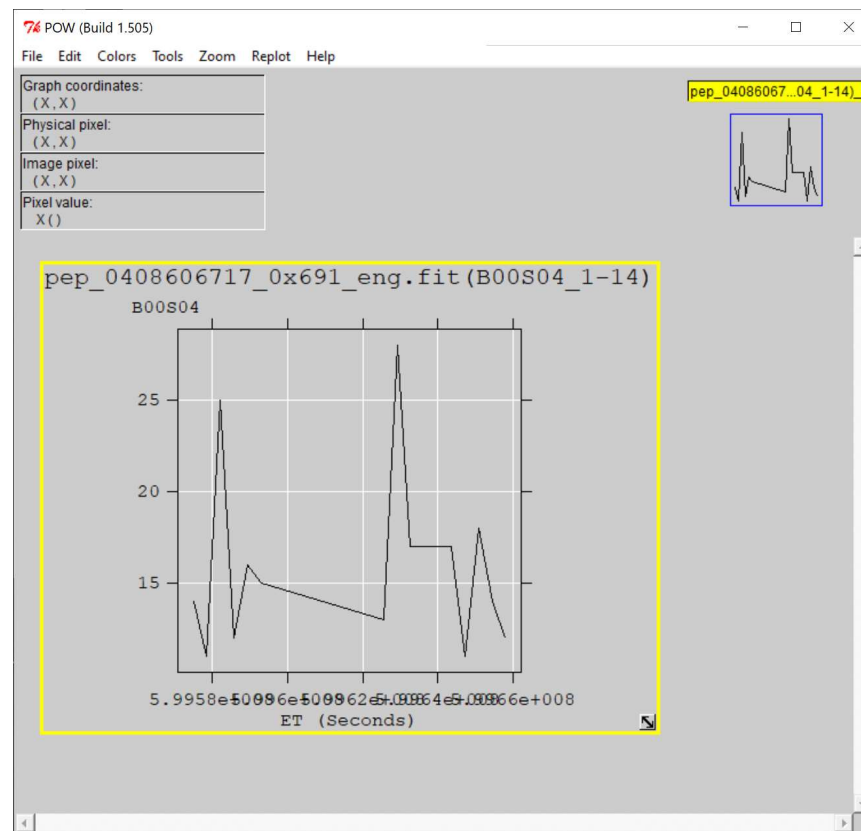
NASAVIEW - Table Display - pep_0408606717_0x691_eng.tbl

Column Number : 1 of 7

1)	599574181.5086056
2)	599574181.5086056
3)	599574181.5086056
4)	599574181.5086056
5)	599574181.5086056
6)	599574181.5086056
7)	599574181.5086056
8)	599574181.5086056
9)	599574182.5086056
10)	599574182.5086056
11)	599574182.5086056
12)	599574182.5086056
13)	599574182.5086056
14)	599574182.5086056
15)	599574182.5086056

1) Table Name :EXTENSION_PHA_ELECTRON_TABLE
2) Rows :136607
3) Columns :7
4) Row Bytes :25
5) Prefix Bytes :0
6) Suffix Bytes :0
7) Interchange Format :Unknown
8) Data File :PEP_0408606717_0X691_ENG.
9) Data Byte Location :17732161
10) Containers in Table :0
1) Column Name :ET
2) Displayed Format :TEXT
3) Data Type :IEEE_REAL
4) Bytes :8
5) Start Byte :1
6) Items :1
7) Items Offset :8
8) Has Bit Columns :0

Show Items Item Number: 1 of 1
 Show Bit Columns Previous Table Next Table
Previous Column Next Column Previous Row Block Next Row Block
No. of Cols to Skip Go To Row Number
Move to Column Named Summary



nh-x-pepssi-3-kem1-v.0

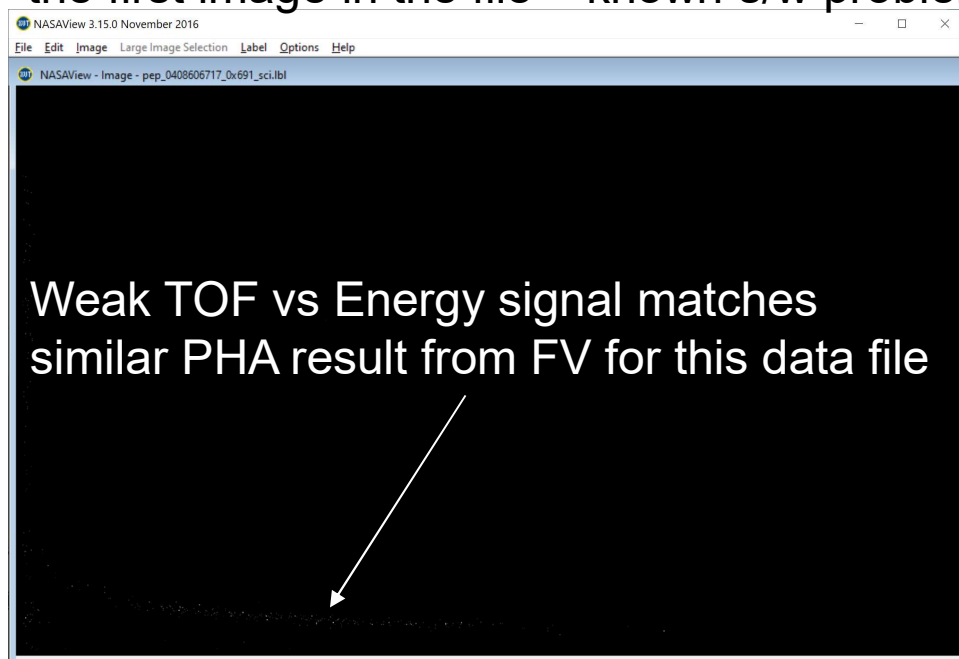
Files open with both NASAVIEW and FV suggesting that the PDS and FITS labels are well-formed. Validate tool did not catch any errors with labels. However, Rudy found errors in the column description fields that are not inspected by any software validation tools.

All of the data files selected for spot inspection appeared nominal. NASAView has some display issues with these data/labels

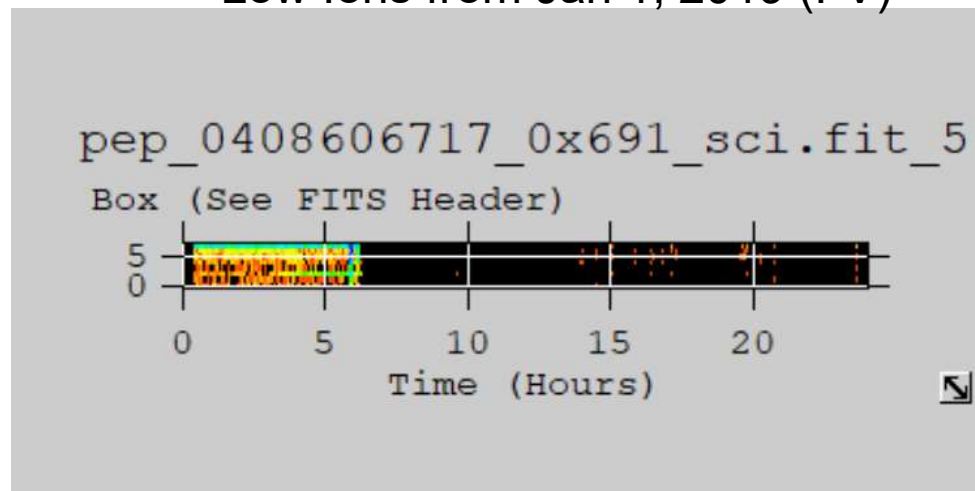
FV allow the user to plot data from any table versus time (MET or ET) and the plots look nominal

Flyby Files

NASAVIEW won't allow users to navigate past the first image in the file – known s/w problem



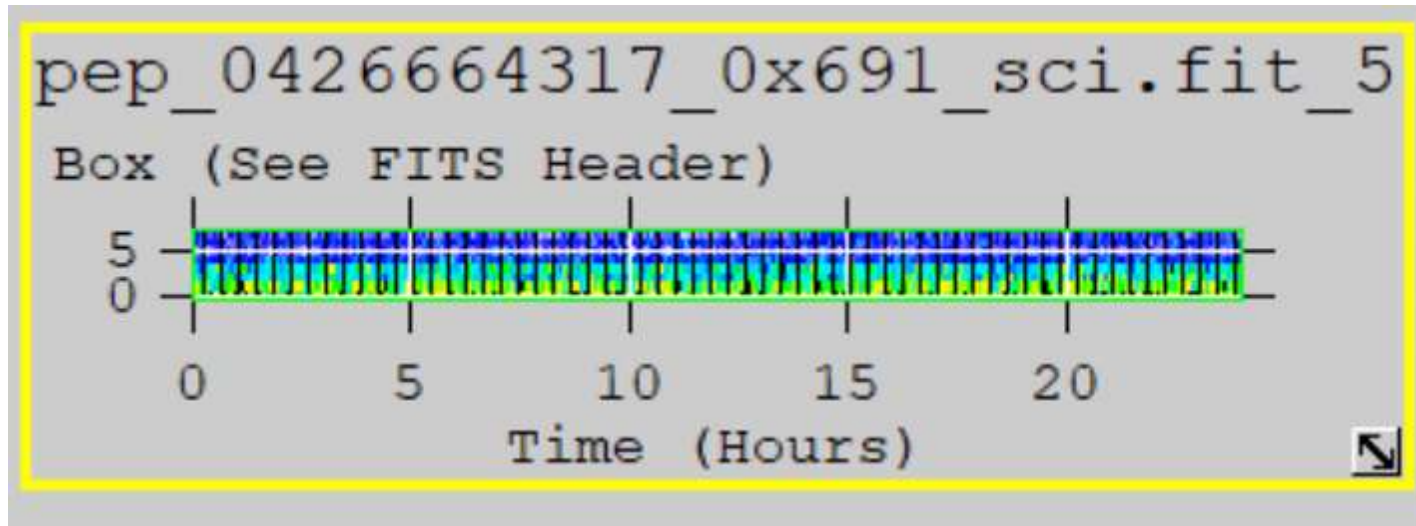
Low Ions from Jan 1, 2019 (FV)



nh-x-pepssi-3-kem1-v.0

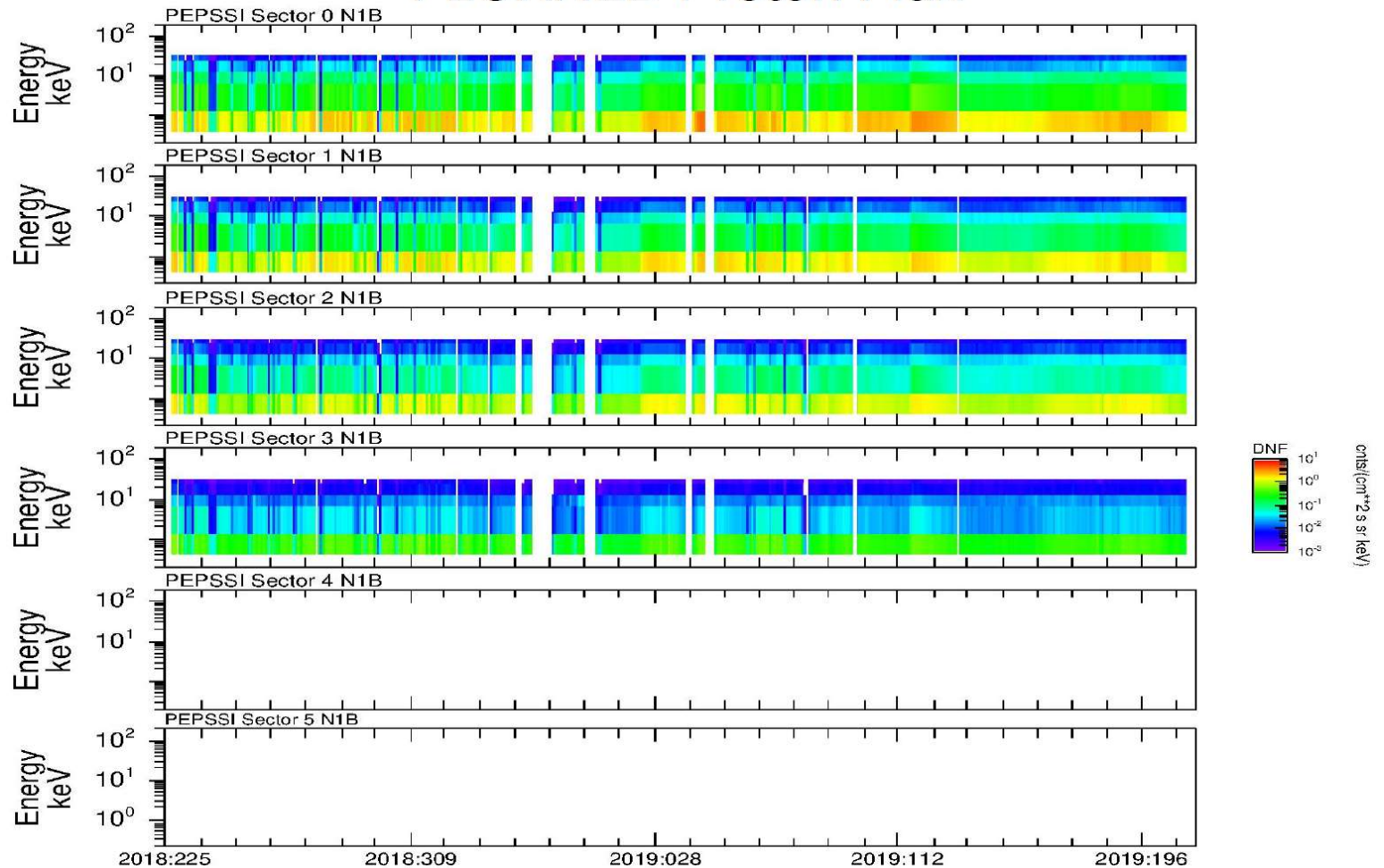
New Solar Wind Data

FV plot of “Low Ion Spectra” From 7/29/19



Count rates were too low to get a useful TOF plot out of NASAVIEW for any of the new solar wind files that I tried to view. Plot “stretching” is limited in NASAVIEW. Program opened files just fine and allowed me to view labels and histograms, which are not useful for these data.

nh-a-pepssi-3-kem1-v3.0/data FLUXN1B Proton Flux



Plot courtesy
of R. Frahm

Plot shows that the flux data are nominal, and that the continuity issues present in previous versions of the data have mostly been resolved. The remaining gaps are likely to be real, as described in the documentation, and not the result of data not having been returned yet.

Summary of Liens

In general, the documentation is a bit sparse, particularly the dataset.cat files which are generic, not specific to the datasets. This is just a comment and there is no associated lien, however, should the team decide to update the -3- dataset.cat file, it would improve the archive.

Liens:

- 1) Fix column description issues in the -3- dataset in the PHA_LOW_ION and PHA_HIGH_ION tables.
- 2) Determine if there are any missing entries in the *pep_bti.tab* file and replace/update if necessary.

Recommendation:

Consider adding a new document that describes the science objectives of the KEM mission for all of the instruments. The information could likely be extracted with little effort from the extended mission proposal.

Comment:

Neither the DS.CATs nor the labels for the Jan 1, 2019 file list MU69 (Arrokoth) as a TARGET (TARGET = "SOLAR WIND"). It's mentioned in the dataset description of the DS.CAT but wouldn't show up in a search for data associated with this target.

The -2- data files appear to be nominal and the documentation and supporting files are mostly complete. These data can be certified with minor liens.

The -3- data labels need to be corrected before the data are made public.

Inspection of older data sets

Since the NH PEPSSI data processing pipeline is so mature, I found the issue with the labels somewhat perplexing and decided to go back and see how far back these issues have been impacting the data

All KEM and Pluto datasets, including those certified and online have the “Auto description failed:” error.

The plutocruise data do not have this error because the structure of the PHA_LOW_ION and PHA_HIGH_ION tables were different, and did not contain the columns that now give the errors.

All files inspected, including KEM, Pluto and plutocruise files have the S_Incident_Energy column described as “Incident Energy if proton(keV)”

Possible Paths Forward

- 1) Update all -3- labels and redeliver volumes
- 2) Issue ERRATA providing the correct column descriptions for the impacted columns on older data sets, fix pipeline software and current dataset.