Solar Wind Around Pluto SWAP

PRINCIPAL INVESTIGATOR
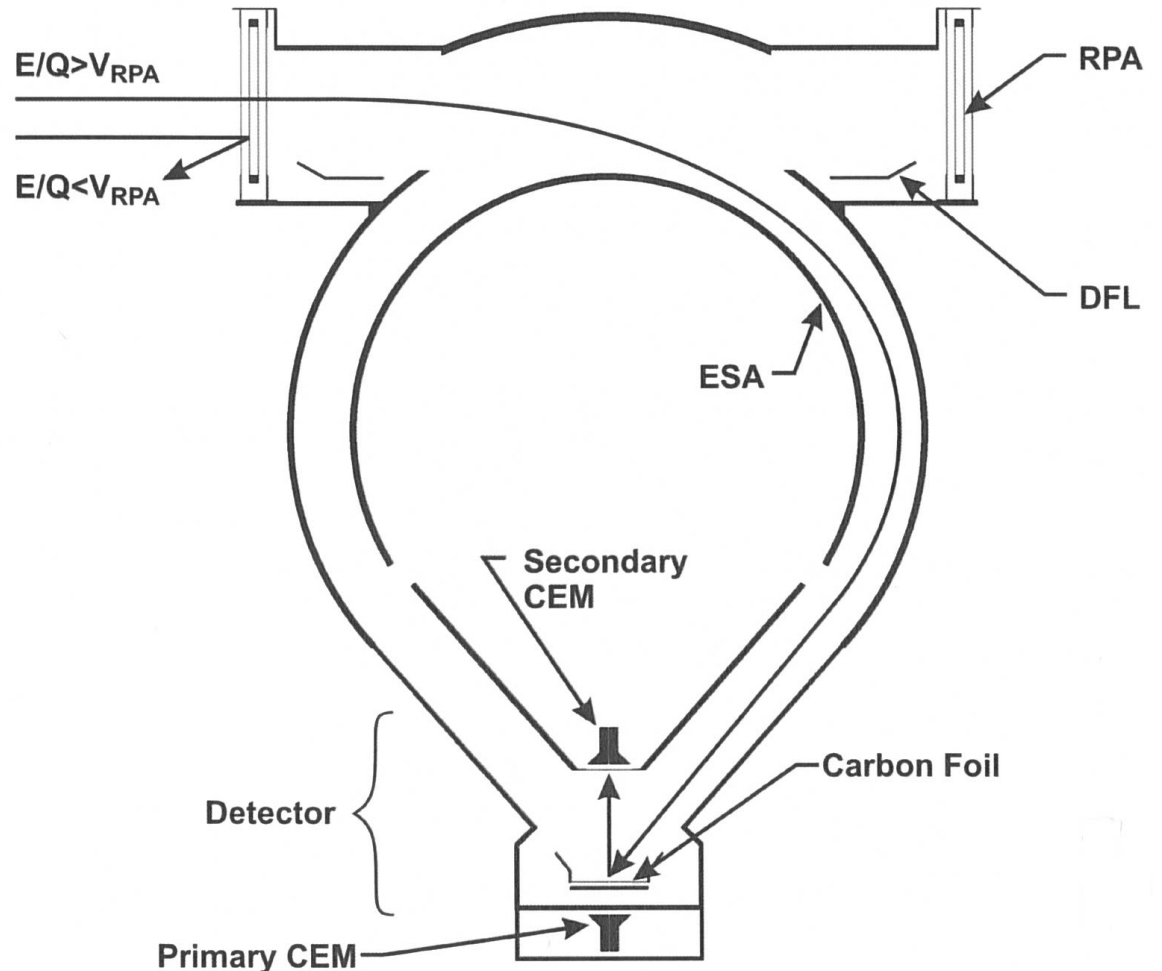Dave McComas, Princeton University

DESCRIPTION
Low Energy Plasma Instrument

ENERGY RANGE
30 eV - 7.7 keV

FIELD OF VIEW
270 deg x 10 deg
(deflection angles up to +15 deg)

ENERGY RESOLUTION
1 eV (< 2 keV); 9% (> 2 keV)

SPECIES
All Ions

New Horizons SWAP Data Sets

RAW Data Sets:
nh-j-swap-2-jupiter-v4.0
nh-x-swap-2-plutocruise-v3.0
nh-p-swap-2-pluto-v2.0

CALIBRATED Data Sets:
nh-j-swap-3-jupiter-v4.0
nh-x-swap-3-plutocruise-v3.0
nh-p-swap-3-pluto-v2.0

New Horizons SWAP
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

Minor Diagnostics -
    Machine: IBM lenovo T60p ThinkPad
    Operating System: Fedora 20 linux

Documentation Evaluation

All Data Sets in the Top Level Directory aareadme.txt

Boiler Plate Commands to Pipeline Not Deleted:

```
    /                           Top level of volume
    |
    +-- AAREADME.TXT        The AAREADME file; a backup is in /DOCUMENT/
skel_DELETE_BETWEEN_IF_INSTRUMENT_IS_rex
    |
    +--/CALIB/                  Top-level directory containing calibration files
    |   |
    |   +-- CALINFO.TXT         Description of files in the CALIB directory
    |   +-- *.*                 Calibration files
skel_DELETE_BETWEEN_IF_INSTRUMENT_IS_rex
    |
    |--/CATALOG/                Directory containing PDS catalog objects.
    |   |
    |   +-- CATINFO.TXT         Description of files in the CATALOG directory.
```

All Data Sets in the Top Level Directory voldesc.cat

GOOD, some minor issues reported to PDS

All Data Sets in the catalog Directory catinfo.txt

GOOD

All Data Sets in the catalog Directory dataset.cat

GOOD, some minor issues reported to PDS

All Data Sets in the catalog Directory swap.cat

GOOD

All Data Sets in the catalog Directory nhsc.cat

Missing text

switches required), so that a total of 16 switches control the heater elements, allowing great flexibility to operate the spacecraft safely while drawing the minimum required power. Operational requirements for catalyst bed heater

← Incomplete Sentence

The pulse duration and total on-time of each thruster are commanded very precisely, providing accurate control of the total impulse generated during a maneuver. The 0.8N thrusters can be turned on for periods as short as 5 ms. The initial propellant load was allocated

All Data Sets in the catalog Directory ref.cat

The fact that possible ITAR controlled documents are referenced is of concern and this file should be reviewed by the State Department before public release because a review of this file by SwRI finds that some of the listed references violate ITAR.

Reported by the SwRI Library: The references are marked as possibly being under ITAR control are indeed under ITAR control.

Reported by SwRI Legal Department: Revealing the existence of an ITAR controlled document is itself a violation of ITAR.

All Data Sets in the catalog Directory
nh.cat

GOOD, some minor issues reported to PDS

All Data Sets in the calib Directory
calinfo.txt

GOOD, some minor issues reported to PDS

All Data Sets in the calib Directory
background_009_dac_jup.lbl

GOOD, some minor issues reported to PDS

All Data Sets in the calib Directory
background_009_dac_jup.tab

GOOD

All Data Sets in the calib Directory background_009_dac.lbl

GOOD, some minor issues reported to PDS

All Data Sets in the calib Directory background_009_dac.tab

GOOD

All Data Sets in the calib Directory
esa_rpa_v16_energy_binsf_new.lbl
esa_rpa_v16_energy_binsf_new.tab

GOOD

All Data Sets in the calib Directory
esa_rpa_v18_energy_binsf_new.lbl
esa_rpa_v18_energy_binsf_new.tab

GOOD

All Data Sets in the calib Directory
esa_rpa_v19_energy_binsf_new2.lbl
esa_rpa_v19_energy_binsf_new2.tab

GOOD

All Data Sets in the calib Directory
esa_rpa_v19_energy_binsf_new2.lbl
esa_rpa_v19_energy_binsf_new2.tab

GOOD

All Data Sets in the calib Directory
list_energy_files.lbl & list_energy_files.tab

GOOD

All Data Sets in the calib Directory esa_shape.lbl & esa_shape.tab

GOOD

All Data Sets in the calib Directory rpa_shape.lbl & rpa_shape.tab

GOOD

All Data Sets in the index Directory indxinfo.txt

GOOD

All Data Sets in the index Directory checksum.lbl & checksum.tab

GOOD

All Data Sets in the index Directory
index.lbl

GOOD

All Data Sets in the index Directory slimindx.lbl

GOOD

All Data Sets in the document Directory aareadme_bu.txt

Boiler Plate Commands to Pipeline Not Deleted:

```
      /                        Top level of volume
      |
      +--  AAREADME.TXT        The AAREADME file; a backup is in /DOCUMENT/
skel_DELETE_BETWEEN_IF_INSTRUMENT_IS_rex
      |
      +--/CALIB/               Top-level directory containing calibration files
      |   |
      |   +--  CALINFO.TXT     Description of files in the CALIB directory
      |   +--  *.*             Calibration files
skel_DELETE_BETWEEN_IF_INSTRUMENT_IS_rex
      |
      |--/CATALOG/             Directory containing PDS catalog objects.
      |   |
      |   +--  CATINFO.TXT     Description of files in the CATALOG directory.
```

nh-j-swap-2-jupiter-v4.0 document Directory
nh-j-swap-3-jupiter-v4.0 document Directory
docinfo.txt

Text Not Replaced in Automatic Process

```
 |
 +->SEQ_SWAP_JUPITER.TAB          Sequence summary table
 +->SEQ_SWAP_JUPITER.LBL          Label for "; read label for description
 |
 +->NH_MISSION_TRAJECTORY.TAB     NH Spacecraft mission trajectory
 +->NH_MISSION_TRAJECTORY.LBL     Label for "; read label for description
 |
 +->NH_TRAJECTORY.TAB             NH Spacecraft Jupiter-relative trajectory
 +->NH_TRAJECTORY.LBL             Label for "; read label for description
 |


 |
 +->NH_MET2UTC.TAB                Conversion table btw S/C MET & UTC
 +->NH_MET2UTC.LBL                Label for "
 |
 +->NH_FOV.PNG                    NH pre-flight Field-Of-View figure; JPG
 +->NH_FOV.LBL                    Label for "
 |
 +->NH_SWAP_V###_TI.TXT           SWAP SPICE I-Kernel as documentation
 |
 +->QUAT_AXYZ_INSTR_TO_J2K.ASC    Quaternion description target for PDS
 |                                   label pointer QUATERNION_DESC.
 +->QUAT_AXYZ_INSTR_TO_J2K.LBL    Label for "
 |
```

nh-p-swap-2-pluto-v2.0 document Directory
nh-p-swap-3-pluto-v2.0 document Directory docinfo.txt

Text Not Replaced in Automatic Process

```
    |
    +->SEQ_SWAP_PLUTO.TAB          Sequence summary table
    +->SEQ_SWAP_PLUTO.LBL          Label for "; read label for description    <----
    |
    +->NH_MISSION_TRAJECTORY.TAB   NH Spacecraft mission trajectory
    +->NH_MISSION_TRAJECTORY.LBL   Label for "; read label for description     <----
    |



    |
    +->NH_MET2UTC.TAB              Conversion table btw S/C MET & UTC
    +->NH_MET2UTC.LBL             Label for "                                   <----
    |
    +->NH_FOV.PNG                 NH pre-flight Field-Of-View figure; JPG
    +->NH_FOV.LBL                 Label for "                                   <----
    |
    +->NH_SWAP_V###_TI.TXT        SWAP SPICE I-Kernel as documentation
    |
    +->QUAT_AXYZ_INSTR_TO_J2K.ASC Quaternion description target for PDS
    |                                 label pointer QUATERNION_DESC.
    +->QUAT_AXYZ_INSTR_TO_J2K.LBL Label for "                                   <----
    |
```

nh-x-swap-2-plutocruise-v3.0
nh-x-swap-3-plutocruise-v3.0
document/docinfo.txt

Text Not Replaced in Automatic Process

```
 |
+->SEQ_SWAP_PLUTOCRUISE.TAB       Sequence summary table
+->SEQ_SWAP_PLUTOCRUISE.LBL       Label for "; read label for description    ←
 |
+->NH_MISSION_TRAJECTORY.TAB      NH Spacecraft mission trajectory
+->NH_MISSION_TRAJECTORY.LBL      Label for "; read label for description    ←
 |
```

```
 |
+->NH_MET2UTC.TAB                 Conversion table btw S/C MET & UTC
+->NH_MET2UTC.LBL                 Label for "                                ←
 |
+->NH_FOV.PNG                     NH pre-flight Field-Of-View figure; JPG
+->NH_FOV.LBL                     Label for "                                ←
 |
+->NH_SWAP_V###_TI.TXT            SWAP SPICE I-Kernel as documentation
 |
+->QUAT_AXYZ_INSTR_TO_J2K.ASC     Quaternion description target for PDS
 |                                    label pointer QUATERNION_DESC.
+->QUAT_AXYZ_INSTR_TO_J2K.LBL     Label for "                                ←
 |
```

Missing Text

Analyzer (RPA), the Electrostatic Analyzer (ESA), and the deflector (DFL). shows a cross section of the instrument. The RPA consists of four grids with the inner two having a positive voltage, which repels ions with

At the last review, it was determined that the summary data (0x585) from SWAP (solar wind speed, density, and temperature) not useful as a science product. The data described by the summary packet was to be generated for science use as a Level 4 product and the summary packet was to be marked as an engineering packet since it did contain some useful information, and as such, was to be left as an engineering file in the PDS archive. To date, this Level 4 product has not materialized. What is the status of this data new Level 4 data product?
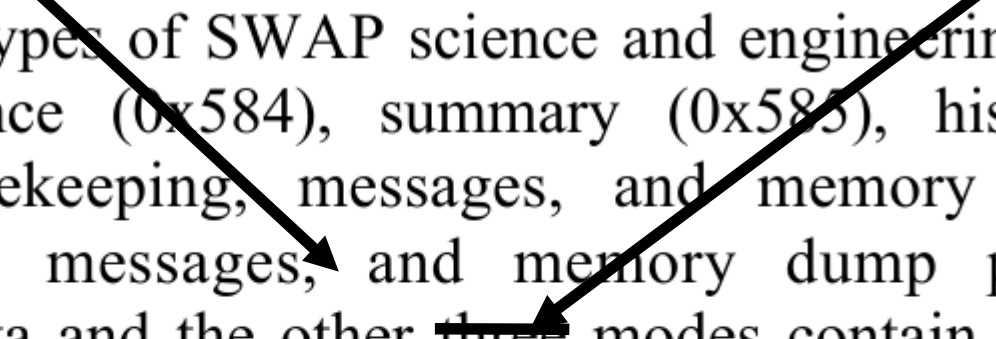
Since the summary data from SWAP (0x585) is included within the SWAP PDS data sets as a Level 2 product, I would suggest the following changes to the ICD:

summary,

two

There are six types of SWAP science and engineering data: real-time science (0x584), summary (0x585), histogram (0x586), housekeeping, messages, and memory dump. Housekeeping, messages, and memory dump provide engineering data and the other ~~three~~ modes contain science data. Real-time data provide the most detailed science measurements since they contain the full count rate distribution as a function of energy (speed). For ~~science~~ summary and science histogram modes, the full distribution is not recorded. Instead, parameters are derived from the

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parameters require less memory than storing the whole distribution. The ~~science~~ summary and

Summary data consist of parameters related to the average speed, temperature, and density. The summary data are designed to study the bulk solar wind. The peak of the count distribution is related to the density, the bin location of the peak is related to the speed, and the distribution width is related to the temperature and speed combined. Along with the average values, the variance, maximum and minimum values of the peak counts, width of the peak, and energy of the peak are also recorded. The summary data 0x585 packet ~~are not~~ included in the PDS SWAP data sets.

is

; however, they are delivered as a level 2 product only. It was found that the solar wind speed, density, and temperature provided in the summary packet were not adequate for science studies of the solar wind. These values will be included in the PDS data set for SWAP as a Level 4 data product.

14.4.2 Definition of an "Observation"

A complete histogram observation consists of one histogram type 1 packet and 63 histogram type 2 packets. A complete set of real-time science measurements consists of a full 64-second cycle. This is described in detail in section 14.4.1. One summary packet constitutes a complete measurement. Summary packets are ~~no longer~~ included in the SWAP PDS delivered data sets. Housekeeping data are required for all science measurements since the housekeeping data are key to interpreting the data and determining error flags.

; however, they are delivered as a level 2 product only.

All Data Sets in the document Directory swap_cal.lbl

GOOD

All Data Sets in the document Directory swap_cal.pdf

GOOD, some minor issues reported to PDS

All Data Sets in the document Directory
codmac_level_definitions.lbl
codmac_level_definitions.pdf

GOOD

All Data Sets in the document Directory lunineetal1995.lbl & lunineetal1995.pdf

GOOD

All Data Sets in the document Directory
nh_fov.lbl & nh_fov.png

GOOD

All Data Sets in the document Directory nh_met2utc.lbl & nh_met2utc.tab

GOOD

All Data Sets in the document Directory nh_trajectory.lbl & nh_trajectory.tab

GOOD

All Data Sets in the document Directory nh_swap_v200_ti.txt

GOOD

All Data Sets in the document Directory
swap_ssr.lbl & swap_ssr.pdf

GOOD

All Data Sets in the document Directory payload_ssr.lbl & payload_ssr.pdf

GOOD

All Data Sets in the document Directory
quat_axyz_instr_to_j2k.lbl
quat_axyz_instr_to_j2k.asc

GOOD

nh-j-swap-2-jupiter-v4.0/document
nh-j-swap-3-jupiter-v4.0/document
seq_swap_jupiter.lbl
seq_swap_jupiter.tab

GOOD

nh-j-swap-2-jupiter-v4.0/document
nh-j-swap-3-jupiter-v4.0/document
swap_ju_xlate.lbl
swap_ju_xlate.csv

GOOD

nh-x-swap-2-plutocruise-v3.0/document
nh-x-swap-3-plutocruise-v3.0/document
seq_swap_plutocruise.lbl
seq_swap_plutocruise.tab

GOOD

nh-x-swap-2-plutocruise-v3.0/document
nh-x-swap-3-plutocruise-v3.0/document
swap_pc_xlate.lbl
swap_pc_xlate.csv

GOOD

nh-p-swap-2-pluto-v2.0/document
nh-p-swap-3-pluto-v2.0/document
seq_swap_pluto.lbl
seq_swap_pluto.tab

GOOD

All data sets in the document Directory
traj/traj_pluto_flyby.lbl
traj/traj_pluto_flyby.tab

GOOD

All Data Sets in the document Directory subdirectory aaa_generic_readme

Why does this subdirectory exist in the PDS archive? - Rudy to look at this if there is time...otherwise delete this slide.

All Data Sets in the document Directory traj/traj.fmt

GOOD

Data
Evaluation

nh-j-swap-3-jupiter-v4.0/data

Solar Wind

Jupiter

Primary CEM

Secondary CEM

Coincidence

2007   007   042   077   112   147
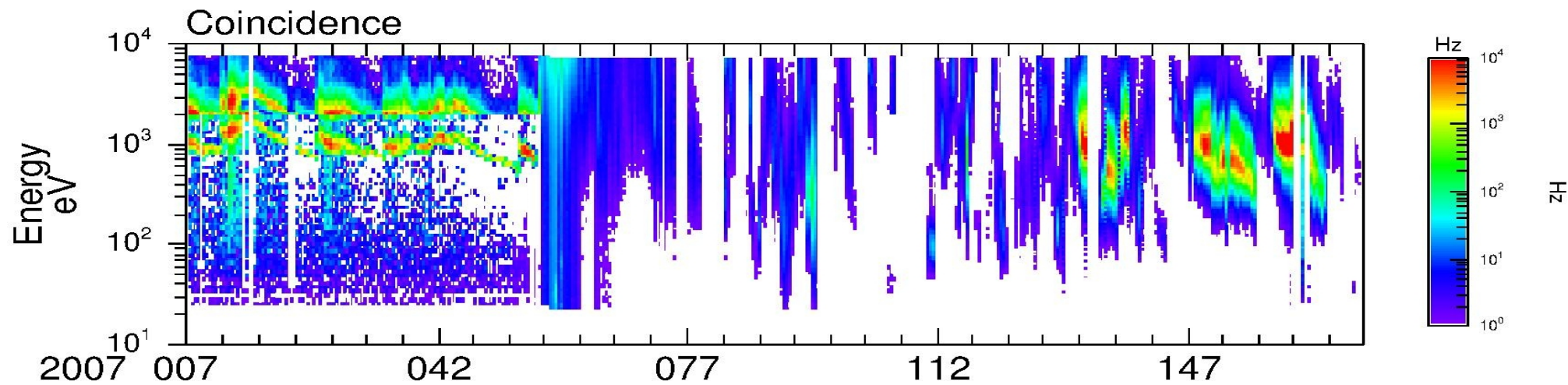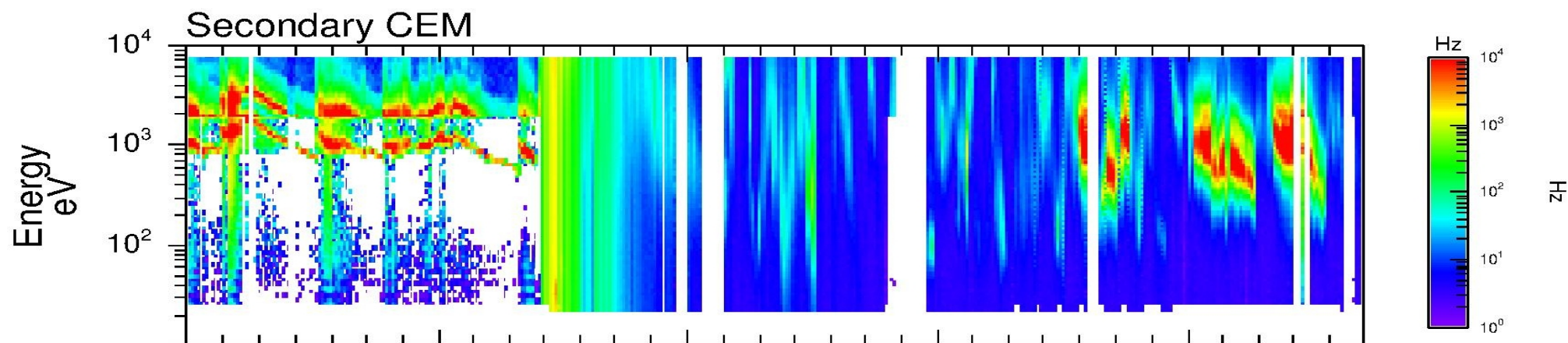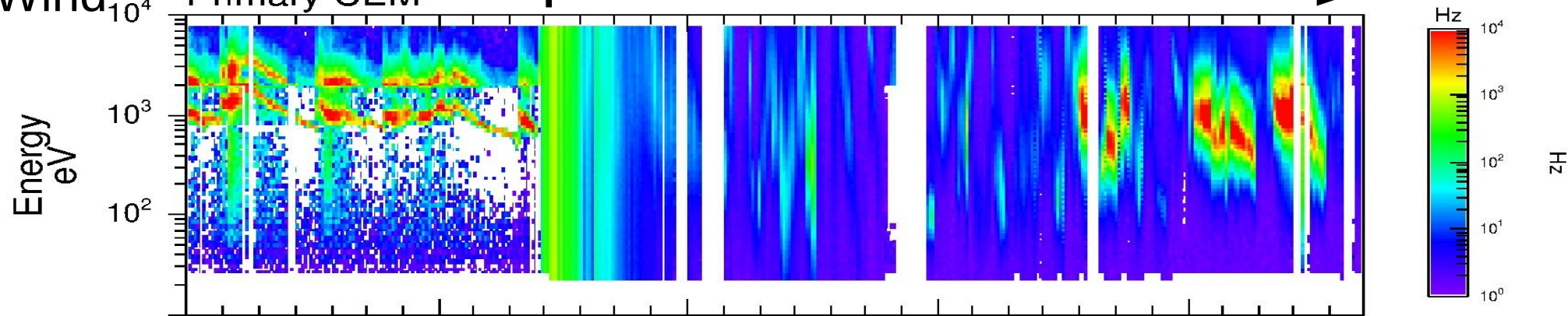
nh-x-swap-3-plutocruise-v3.0/data
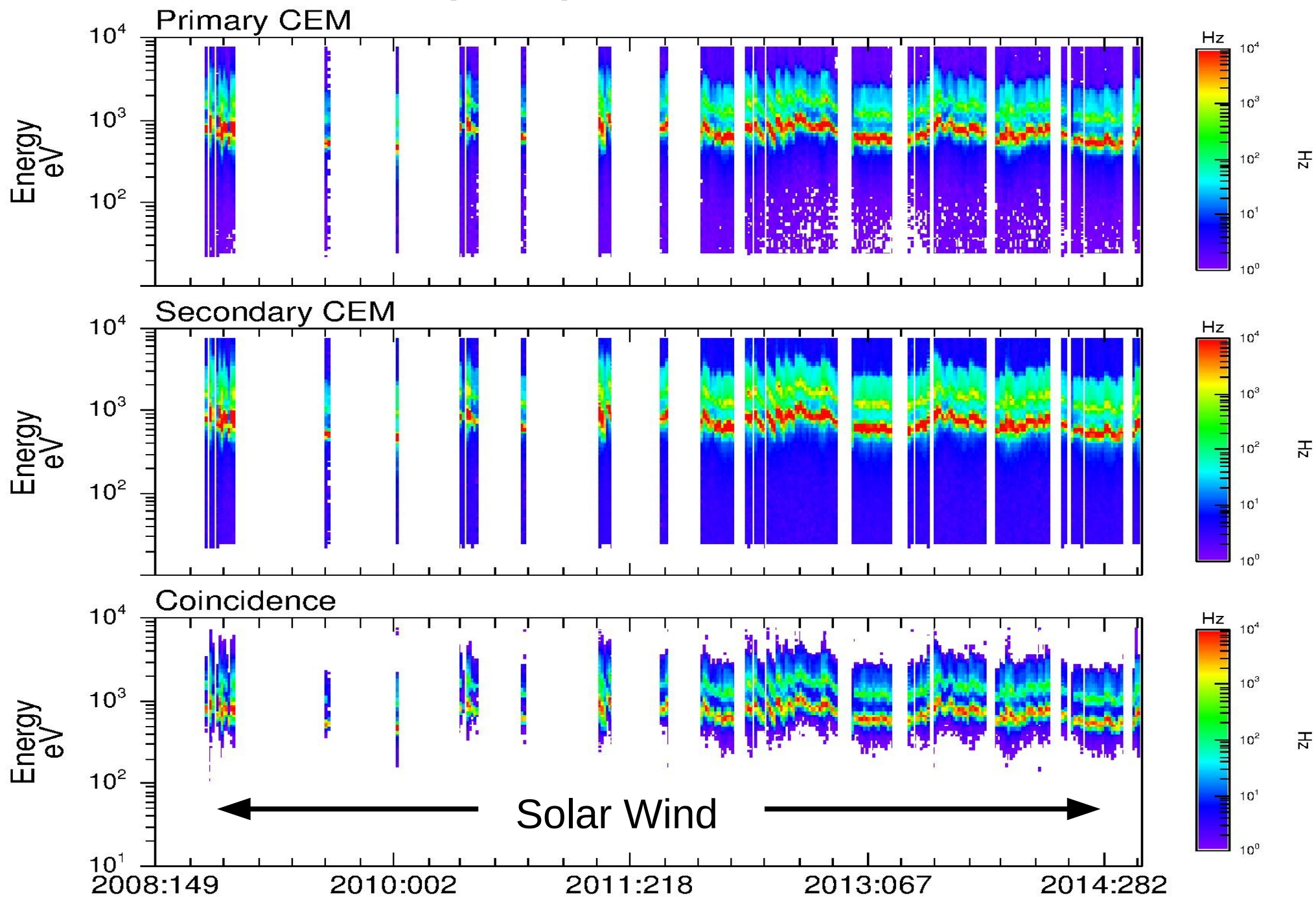
nh-p-swap-3-pluto-v2.0/data
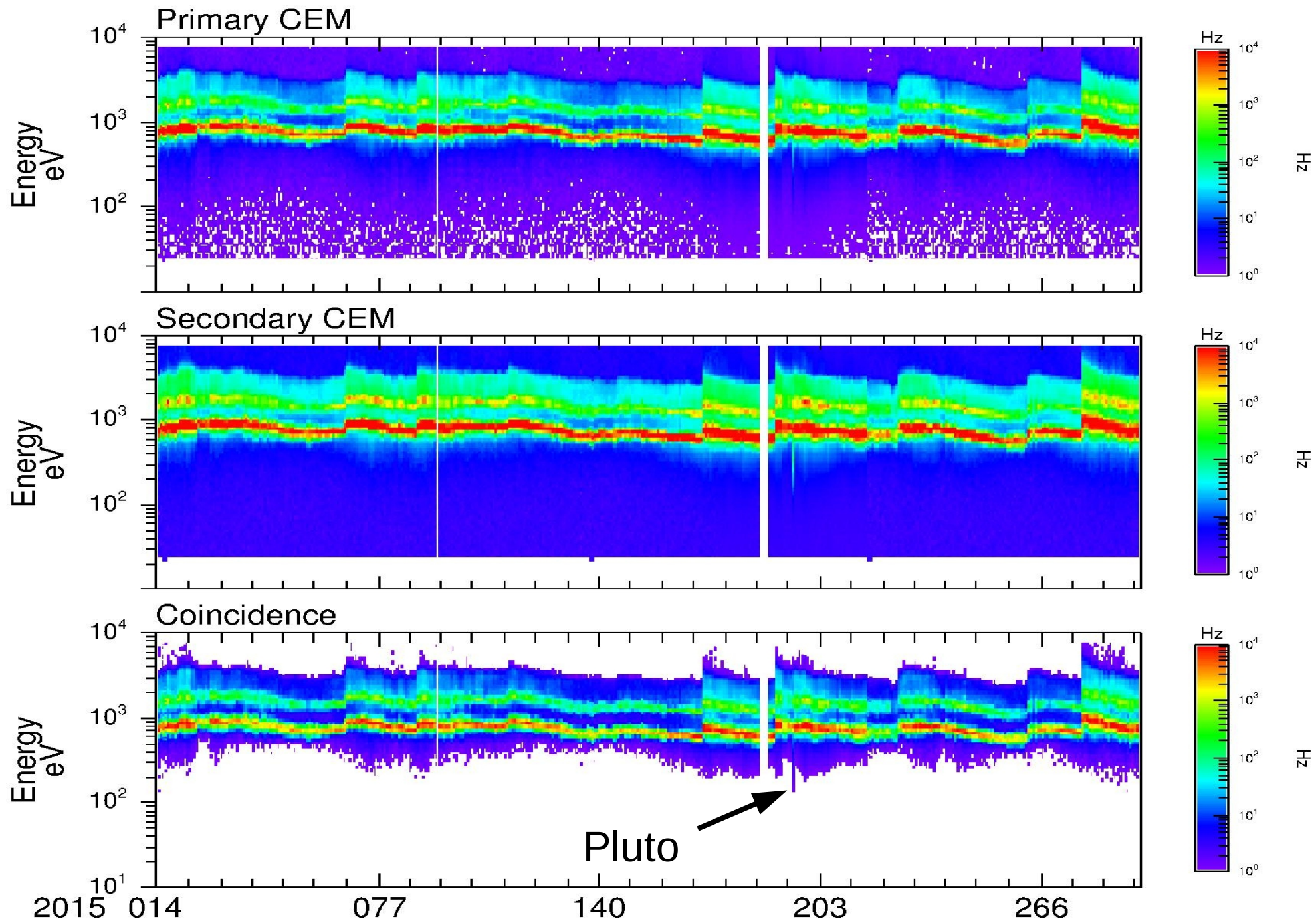
nh-j-swap-3-jupiter-v4.0/document summary_plots

GOOD

nh-x-swap-3-plutocruise-v3.0 document/data_summary_plots - 1
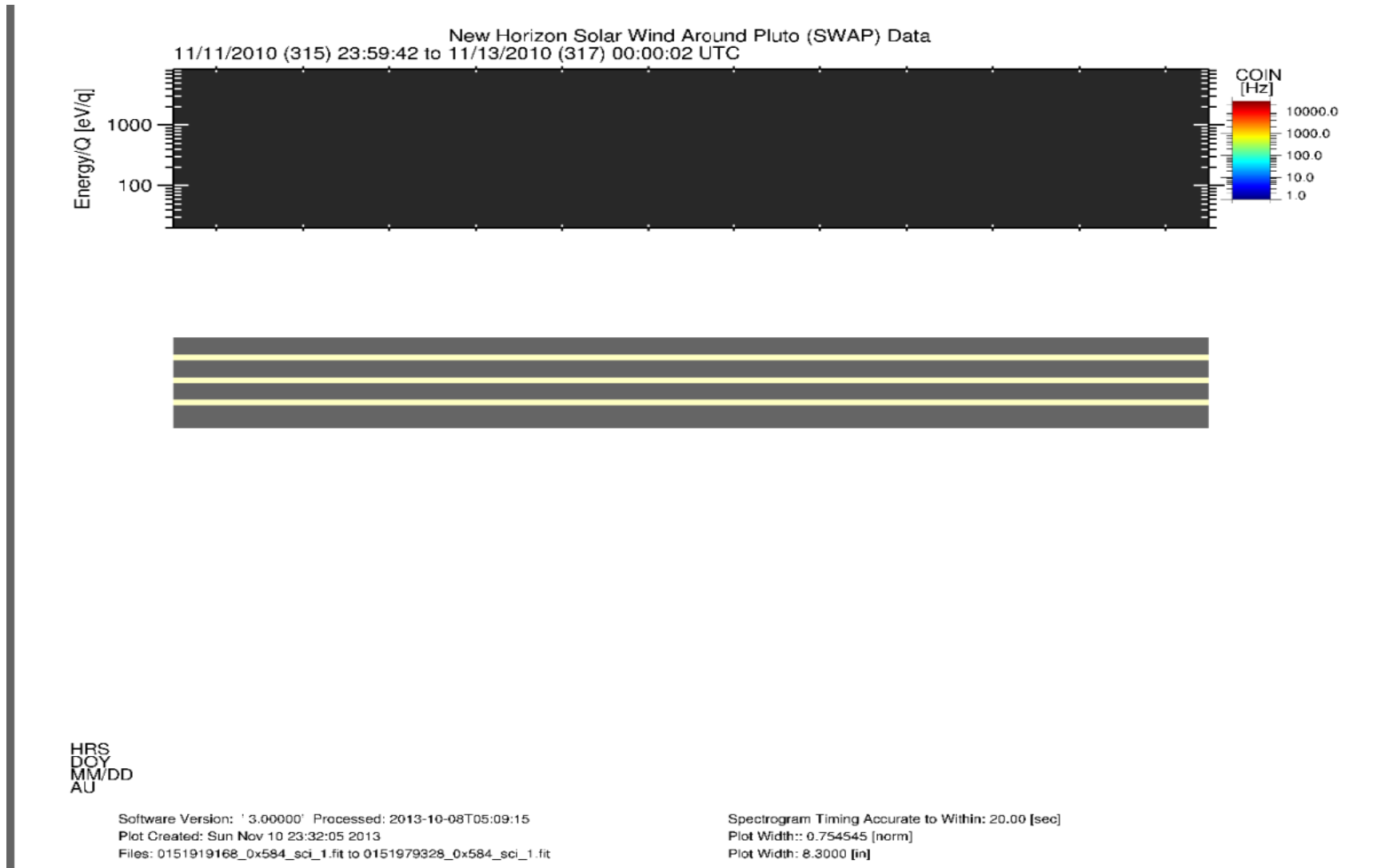
New Horizon Solar Wind Around Pluto (SWAP) Data
11/11/2010 (315) 23:59:42 to 11/13/2010 (317) 00:00:02 UTC

Multiple summary plots are generated in the data set – No Data or Plot Failure?

Time sequence of 3 plots from archive.

No SWAP Data Showing

Data begins at day boundary.
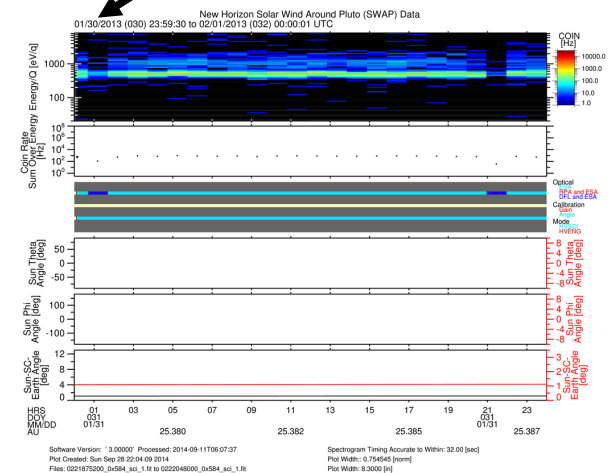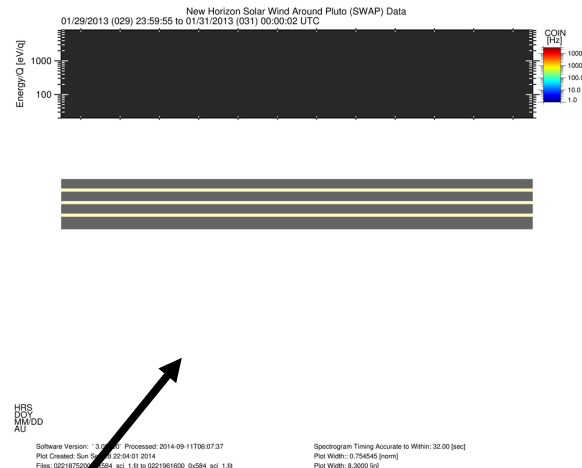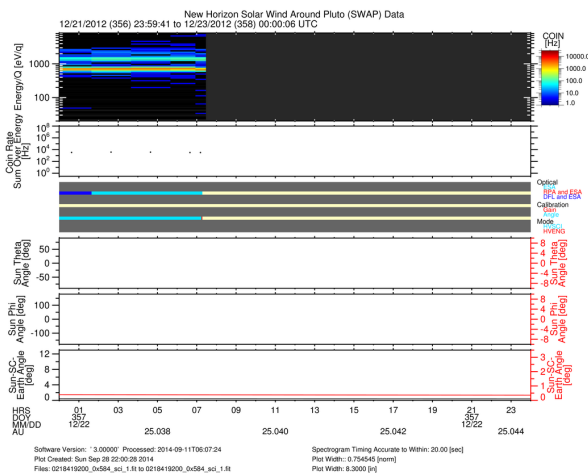
No Angular Data showing.

Multiple summary plots are generated in the data set – No Data or Plot Failure?

nh-p-swap-3-pluto-v2.0 document/data_summary_plots
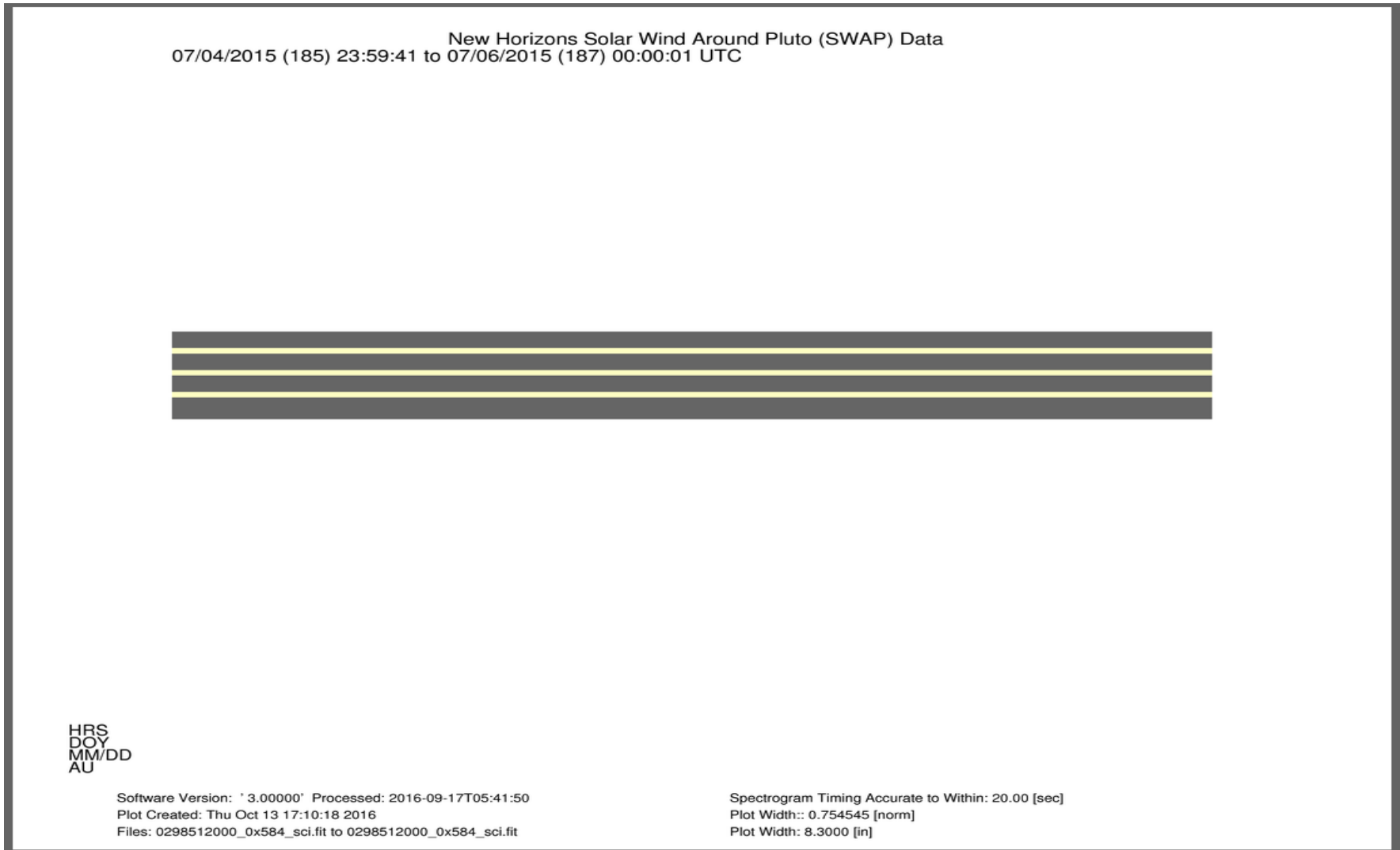
New Horizons Solar Wind Around Pluto (SWAP) Data
07/04/2015 (185) 23:59:41 to 07/06/2015 (187) 00:00:01 UTC

HRS
DOY
MM/DD
AU

Software Version: ' 3.00000' Processed: 2016-09-17T05:41:50
Plot Created: Thu Oct 13 17:10:18 2016
Files: 0298512000_0x584_sci.fit to 0298512000_0x584_sci.fit

Spectrogram Timing Accurate to Within: 20.00 [sec]
Plot Width:: 0.754545 [norm]
Plot Width: 8.3000 [in]

Multiple summary plots are generated in the data set – No Data or Plot Failure?

nh-p-swap-3-pluto-v2.0 data/0x584 files

Why does extension 14 (SPICE Orbit Attitude Calc) include calculations for Jupiter instead of Pluto in the Pluto fits files?

```
TTYPE32 = 'SC_IAU_JUP_X_0'      / X component of SC In IAU_JUPITER 1st
TTYPE33 = 'SC_IAU_JUP_Y_0'      / Y component of SC In IAU_JUPITER 1st
TTYPE34 = 'SC_IAU_JUP_Z_0'      / Z component of SC In IAU_JUPITER for 1st
TTYPE35 = 'SC_IAU_JUP_VX_0'     / VX component of SC In IAU_JUPITER 1st
TTYPE36 = 'SC_IAU_JUP_VY_0'     / VY component of SC In IAU_JUPITER 1st
TTYPE37 = 'SC_IAU_JUP_VZ_0'     / VZ component of SC In IAU_JUPITER for 1st
TTYPE38 = 'SC_IAU_JUP_X_1'      / X component of SC In IAU_JUPITER 2nd
TTYPE39 = 'SC_IAU_JUP_Y_1'      / Y component of SC In IAU_JUPITER 2nd
TTYPE40 = 'SC_IAU_JUP_Z_1'      / Z component of SC In IAU_JUPITER 2nd
TTYPE41 = 'SC_IAU_JUP_VX_1'     / VX component of SC In IAU_JUPITER 2nd
TTYPE42 = 'SC_IAU_JUP_VY_1'     / VY component of SC In IAU_JUPITER 2nd
TTYPE43 = 'SC_IAU_JUP_VZ_1'     / VZ component of SC In IAU_JUPITER 2nd
TTYPE44 = 'SC_J2000_JUP_X_0'    / X  of SC In J2000_JUPITER 1st
TTYPE45 = 'SC_J2000_JUP_Y_0'    / Y of SC In J2000_JUPITER 1st
TTYPE46 = 'SC_J2000_JUP_Z_0'    / Z of SC In J2000_JUPITER for 1st
TTYPE47 = 'SC_J2000_JUP_VX_0'   / VX of SC In J2000_JUPITER 1st
TTYPE48 = 'SC_J2000_JUP_VY_0'   / VY of SC In J2000_JUPITER 1st
TTYPE49 = 'SC_J2000_JUP_VZ_0'   / VZ of SC In J2000_JUPITER for 1st
TTYPE50 = 'SC_J2000_JUP_X_1'    / X of SC In J2000_JUPITER 2nd
TTYPE51 = 'SC_J2000_JUP_Y_1'    / Y of SC In J2000_JUPITER 2nd
TTYPE52 = 'SC_J2000_JUP_Z_1'    / Z of SC In J2000_JUPITER 2nd
TTYPE53 = 'SC_J2000_JUP_VX_1'   / VX of SC In J2000_JUPITER 2nd
TTYPE54 = 'SC_J2000_JUP_VY_1'   / VY  of SC In J2000_JUPITER 2nd
TTYPE55 = 'SC_J2000_JUP_VZ_1'   / VZ of SC In J2000_JUPITER 2nd
```

nh-p-swap-3-pluto-v2.0/data 20150115_028356 swa_0283564800_0x584_sci.lbl

Start of octal dump (ASCII) ->

Byte offset in Octal

Value (character, integers[4,8], hex values, native floats[4,8])

```
0000000  S  I  M  P  L  E        =
0000020                                            T     /
0000040  D  u  m  m  y     C  r  e  a  t  e  d     b  y
0000060     M  W  R  F  I  T  S     v  l  .  6  a
0000100
0000120  B  I  T  P  I  X        =
0000140                                            8     /
0000160  D  u  m  m  y     p  r  i  m  a  r  y     h  e
0000200  a  d  e  r     c  r  e  a  t  e  d     b  y
0000220  M  W  R  F  I  T  S
0000240  N  A  X  I  S        =
0000260                                            0     /
0000300  N  o     d  a  t  a     i  s     a  s  s  o  c
0000320  i  a  t  e  d     w  i  t  h     t  h  i  s
0000340  h  e  a  d  e  r
0000360  E  X  T  E  N  D        =
0000400                                            T     /
0000420  E  x  t  e  n  s  i  o  n  s     m  a  y     (
0000440  w  i  l  l  !  )     b  e     p  r  e  s  e  n
0000460  t
0000500  M  I  S  S  I  O  N     =     '  N  e  w     H
0000520  o  r  i  z  o  n  s  '                       /
0000540     M  i  s  s  i  o  n     n  a  m  e
```

Let's use the octal dump to count the Bytes!!

nh-p-swap-3-pluto-v2.0/data 20150115_028356 swa_0283564800_0x584_sci.lbl

PDS Header End ->

(2880 = 05500 octal)

PDS_VERSION_ID   = PDS3
RECORD_TYPE   = FIXED_LENGTH
RECORD_BYTES   = 2880
FILE_RECORDS   = 2241

```
0005320   e     A   c   t   i   v   i   t   y       P   l   a   n
0005340   d   e   s   c   r   i   p   t   i   o   n
0005360   V   I   S   I   T   I   D       =
0005400                                       3   8   1   0   7       /
0005420       V   i   s   i   t       I   D
0005440
*
```

First section is called a PDS header in the lbl file.

Start FITS Header ->

```
0005500   V   I   S   I   T   N   A   M   =       '   X   _   S   W   A
0005520   P   _   O   N   _   0   1   5   '                           /
0005540       V   i   s   i   t       n   a   m   e
0005560
*
0005620   V   I   S   I   T   D   S   C   =       '   S   W   A   P
0005640   P   o   w   e   r       O   n       i   n       A   P   l
0005660   r   a   t   e   '   /       V   i   s   i   t       d   e
0005700   s   c   r   i   p   t   i   o   n
```

Second section is called the FITS header in the lbl file.

nh-p-swap-3-pluto-v2.0/data
20150115_028356
swa_0283564800_0x584_sci.lbl

By mutual agreement with PDS-SBN, FITS headers are the domain of the NH Project and were not part of the peer review beyond adherence to the FITS standard.

End FITS Header ->

2880 + 17280 = 20160 (047300)

```
OBJECT                      = HEADER
 BYTES                      = 17280
 HEADER_TYPE                = "FITS"
 INTERCHANGE_FORMAT         = "BINARY"
```

```
0047160   T   T   Y   P   E   2   2       =       '   D   F   L   _   L
0047200   V   L   1   '                                           _   /
0047220       D   F   L       l   e   v   e   l       d   u   r   i   n
0047240   g       f   i   r   s   t       h   a   l   f   -   s   e   c
0047260   o   n   d
0047300   T   T   Y   P   E   2   3       =       '   E   S   A   _   L
0047320   V   L   1   '                                           _   /
0047340       E   S   A       l   e   v   e   l       d   u   r   i   n
0047360   g       f   i   r   s   t       h   a   l   f   -   s   e   c
0047400   o   n   d
0047420   T   T   Y   P   E   2   4       =       '   M   O   D   E   '
0047440                                                               /
```

This does not look correct...try 17280 (= 041600 in octal) if the 2880 bytes are part of the first object.

nh-p-swap-3-pluto-v2.0/data 20150115_028356 swa_0283564800_0x584_sci.lbl

End FITS Header ->

17280 (= 041600 in octal)

```
0035460        S  W  A  P        s  o  f  t  w  a  r  e        v
0035500  e  r  s  i  o  n
0035520
0035540  N  H  _  L  E  V  E  L  =        '
0035560        2  '                                                    /
0035600  L  e  v  e  l        o  f        F  i  l  e
0035620
*
0035660  E  N  D
0035700
*
0041600  X  T  E  N  S  I  O  N  =        '  B  I  N  T  A
0041620  B  L  E  '                                                    /
0041640  B  i  n  a  r  y        t  a  b  l  e        w  r  i
0041660  t  t  e  n        b  y        M  W  R  F  I  T  S
0041700  v  l  .  6  a
0041720  B  I  T  P  I  X        =
0041740                                                       8       /
0041760  R  e  q  u  i  r  e  d        v  a  l  u  e
0042000
*
```

FITS Header

Extension_Real_Time_Header

This looks correct, so the conclusion is that the PDS header is included
Within the FITS header.

nh-p-swap-3-pluto-v2.0/data 20150115_028356 swa_0283564800_0x584_sci.lbl

End Extension_Real_Time_Header ->

17280 +11520 = 28800
(= 070200 in octal)

OBJECT
BYTES
HEADER_TYPE

= EXTENSION_REAL_TIME_HEADER
= 11520
= "FITS"

```
0067400
0067420          p  h  y  s  i  c  a  l     u  n  i  t     /
0067440   o  r        f  i  e  l  d                            f
0067460
0067500   T  U  N  I  T  3  8     =        '  '
0067520                                                         /
0067540          p  h  y  s  i  c  a  l     u  n  i  t     /
0067560   o  r        f  i  e  l  d                            f
0067600
0067620   E  N  D
0067640
*
0070200 220     c  @  3  /  0  2  8  3  5  9  9  6  8  0
0070220   :  0  0  0  0  0  2  0  1  5  -  0  1  -  1  5
0070240   T  0  3  :  4  9  :  2  2  .  7  9  0  7  7  5
0070260   A     I  L           024 2  0  1  5  -  0  1  -
0070300   1  5  T  0  3  :  4  9  :  2  3  .  2  9  0  7
0070320   7  5  A     I  L     y     024 2  0  1  5  -  0
0070340   1  -  1  5  T  0  3  :  4  9  :  2  3  .  1  8
0070360   0  7  7  5  A     I  L     ]  w 036 2  0  1  5
```
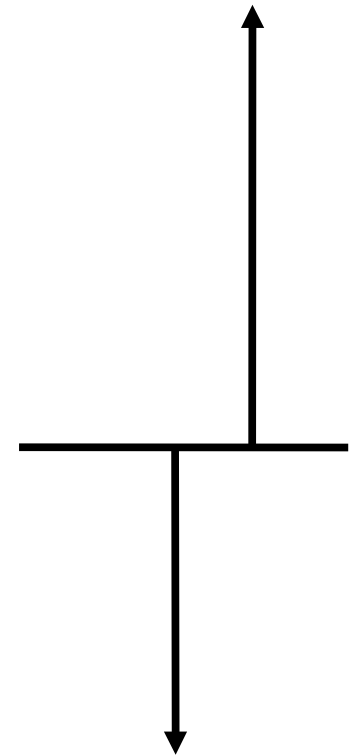
Check of the next segment and it looks correct.

Extension_Real_Time_Table

nh-p-swap-3-pluto-v2.0/data 20150115_028356 swa_0283564800_0x584_sci.lbl

End Extension_Real_Time_Table ->

28800 + 5440 * 315 = 1742400
(= 06513100 octal)

```
OBJECT                       = EXTENSION_REAL_TIME_TABLE
INTERCHANGE_FORMAT           = "BINARY"
ROW_BYTES                    = 315
ROWS                         = 5440
COLUMNS                      = 38
```

```
6512720 214    v    V    ?    ?    x    H    ?    p    ?    ?    P    ?    ?    (    q
6512740 224 037 217    ?    ?    ? 232    ? 214    v    V    ?    ?    x    ) 215
6512760 230    Z    K    ?    H    V    S    C    I    R    A    W    R    A    W    R
6513000   A    W    R    A    W    R    A    W    R    A    W    @ 232    ?    ?    |
6513020   ?    ?    |    @    ?    ?    ?    ?    |    ?    ?    @ 203    ?    ?    ?
6513040   ?    ?    ?    @ 231    ? 032    A    ? 032    A    @    ? 034    N    ?
6513060   ?    N    ?    @ 202    ?   \0   \0   \0   \0   \0 206 200   \0   \0 206
6513100   X    T    E    N    S    I    O    N    =         '    B    I    N    T    A
6513120   B    L    E    '                                                          /
6513140   B    i    n    a    r    y         t    a    b    l    e         w    r    i
6513160   t    t    e    n    b    y         M    W    R    F    I    T    S
6513200   v    l    .    6    a
6513220   B    I    T    P    I    X         =
6513240                                                                   8         /
6513260   R    e    q    u    i    r    e    d         v    a    l    u    e
6513300
*
6513340   N    A    X    I    S                   =
6513360                                                                   2         /
6513400   R    e    q    u    i    r    e    d         v    a    l    u    e
```
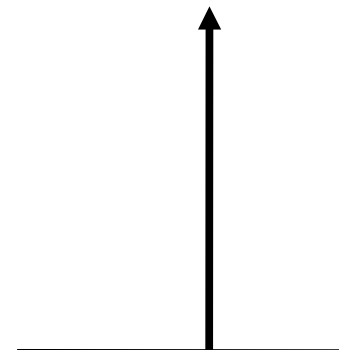
The next offset looks correct as well!

nh-p-swap-3-pluto-v2.0/data 20150115_02... swa_0283564800_0x...

Extension_Real_Time_Table ->

```
OBJECT          = COLUMN
  NAME          = "ESA_LVL1"
  BYTES         = 8
  COLUMN_NUMBER = 23
  DATA_TYPE     = "IEEE_REAL"
  START_BYTE    = 232
  DESCRIPTION   = "
            Full Mnemonic:
              SWAP_RT.ESA_LVL1

            General Description:
              ESA level during first half-second


            Conversion:   polynomial coefficients:
              Order 0:   -2.09581555993411
              Order 1:   -0.978374690699071

            Subsystem:  SWAP
            Packet ApID:  0X584
            Byte Offset within ApID packet:  19
            Bit Offset within Byte of ApID packet:  4
            Bit Length within ApID packet:  12
            Type of value:  UNSIGNED
            Units:  V
            "
  UNIT          = "V"
END_OBJECT      = COLUMN
OBJECT          = COLUMN
  NAME          = "MODE"
  BYTES         = 5
  COLUMN_NUMBER = 24
  DATA_TYPE     = "CHARACTER"
  START_BYTE    = 240
  DESCRIPTION   = "
            Full Mnemonic:
              RALPH_HK.MODE

            General Description:
              Current DE Mode

            Extended Description:
              CURRENT DE MODE

            Conversion:  STATES
            - [lo:hi]=state description:
              [0:0]=INVALID
              [1:1]=DE_MVIC_FRAME_MODE
              [2:2]=DE_MVIC_TDI_COLOR
              [3:3]=DE_MVIC_TDI_PAN1
              [4:4]=DE_MVIC_TDI_PAN2
              [5:5]=DE_MVIC_TDI_PAN_BIN
              [6:6]=INVALID
              [7:7]=DE_LEISA_FRAME
              [8:8]=DE_LEISA_FRAME_RAW
              [9:17]=INVALID
              [18:18]=DE_IDLE
              [19:19]=DE_ABORT
```

This looks like it is for RALPH, not SWAP

RALPH information is described other places
In this file. The word "RALPH" appears 12
Times within this file.

0x586 Histogram data
file swa_0283651232_0x586_sci.fit

The histogram data consists of two linear arrays. In the Primary HDU is stored the number of number of times a sample was accumulated at an index of the histogram. Stored in the Histogram HDU is the sum of the counts for each index. Thus, there should be 0 counts stored in the histogram at each location where there is no samples made. This fits file shows an example where there are accumulated counts in the histogram, but no samples made.

fv: Summary of swa_0283651232_0x586_sci.fit in /mnt/usb1/PDS/Reviews/NH/SWAP/nh-p-swap-3-pluto-v2.0/

File   Edit   Tools   Help

Index	Extension	Type	Dimension	Vie
■ 0	Primary	Image	2048	Header Plot
■ 1	HISTOGRAM	Image	2048	Header Plot
■ 2	HOUSEKEEPING	Binary	99 cols × 14 rows	Header Hist
■ 3	QUALITY	Binary	56 cols × 14 rows	Header Hist
■ 4	THRUSTERS	Binary	22 cols × 1155 rows	Header Hist
■ 5	SPICE_ORBIT_ATTITUDE_CALC	Binary	55 cols × 14 rows	Header Hist

fv: Image of swa_0283651232_0x586_sci.fit[0] in /mnt/us...

File   Edit   Tools   Help

■ 1

Select
■ All
Invert

Primary HDU Table

2048	0
2047	0
2046	0
2045	0
2044	0
2043	0
2042	0
2041	0
2040	0
2039	0
2038	0
2037	0
2036	0
2035	0
2034	0
2033	0
2032	0
2031	0
2030	0
2029	0

There are summed counts shown, but it is indicated that no samples were taken.

fv: Image of swa_0283651232_0x586_sci.fit[1]

File   Edit   Tools   Help

■ 1

Select
■ All
Invert

Histogram HDU Table

2048	18
2047	26
2046	29
2045	43
2044	26
2043	26
2042	33
2041	34
2040	33
2039	38
2038	38
2037	51
2036	48
2035	52
2034	58
2033	64
2032	76
2031	67
2030	98
2029	98

This can not occur According to the documentation

Back-Up Slides