

Solar Wind Around Pluto

SWAP

PRINCIPAL INVESTIGATOR
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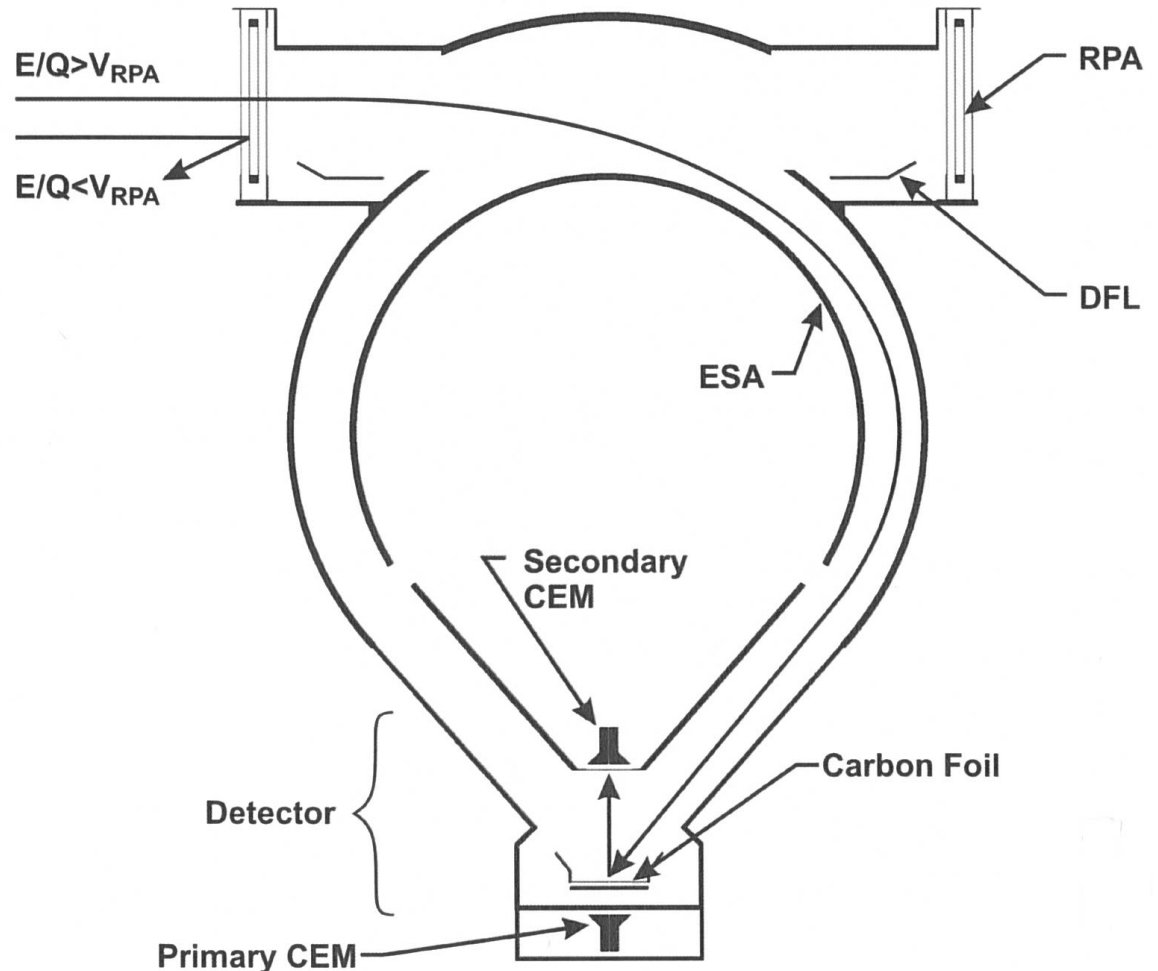
DESCRIPTION
Low Energy Plasma Instrument

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 L5 Data Sets

L5 Data Sets:

nh-p-swap-5-derived-solarwind-v1.0

New Horizons SWAP Data Set Evaluation Tools

Staging and Evaluation -

Machine: Dell Precision T3400

Operating System: Fedora 18 linux

Minor Diagnostics -

Machine: IBM lenovo T60p ThinkPad

Operating System: Fedora 27 linux

Document Evaluation

aareadme.txt in the main directory

```
OBJECT                = TEXT
PUBLICATION_DATE     = 2017-09-30
NOTE                  = "The New Horizons Solar Wind Around Pluto
instrument derived parameters for the Pluto Encounter mission phase of
solar wind speed proton density, speed, temperature, dynamic pressure,
and thermal pressure.
"
END_OBJECT           = TEXT
END
```

Extra Word



This data set presents a single table of derived results which includes the time information for a given pair of sweeps, the solar wind speed proton density, proton speed, proton temperature, proton dynamic pressure, proton thermal pressure, spacecraft position and speed in Heliographic Inertial (HGI), Heliocentric Aries ecliptic, and Heliographic (Carrington) coordinates.

Extra Word



voldesc.cat in the main directory

The voldesc.cat file should describe the type of data included within this volume. The following line is the description of one of the data files within the volume and never discusses other data within the volume. The description within this file needs re-writing to be inclusive and describe the type of data within the volume.

```
Each row represents solar wind parameters determined from a coarse-fine energy sweep. The first 4 columns provide the time information for the beginning and end of a given sweep. The next 5 columns provide the solar wind proton density, speed, temperature, dynamic pressure and thermal pressure. The remaining columns provide the location of the spacecraft in Heliographic Inertial (HGI), Heliospheric Aries Ecliptic (HAE), and Heliographic (HG). These are standard Sun centered coordinate systems.
```

Data files are included which give Plutocentric positions and are not mentioned.

indxinfo.txt in the index directory

More than just one!



This directory contains the required PDS index manifest of the (single) data file in this data set, a checksum table for all files in the data set (except itself and its label) and PDS labels for those two files.

error_notes.txt in the document directory

The instrument design for the Solar Wind Around Pluto (SWAP) instrument c
New Horizons is described by McComas et al. (2008), and the overall
fitting procedure for the SWAP solar wind observations is described by
Elliott et al. (2016). This document provides a very brief summary to
~~provide an indication of confidence level in the data as presented.~~
Interested users should consult the referenced papers for full details.

indicate the

Elliott, et al. (2016) included two figures illustrating the Poisson count
rate error bars used in the forward model count rate ~~model~~ analysis of the
fit to obtain the solar density, speed, and temperature. The error bars

density are more shallow and span +/-30%. This is consistent with the
levels of agreement typically found at 1 AU when comparing ACE and WIND
solar wind observations. ACE and WIND speeds typically are within 5 to 10%

with those from SWAP

Suggested Edits

dataset.cat in the catalog directory

1 of 2

Each file of this data set includes the time information for a given pair of sweeps in the original CODMAC level 2 raw data file, the solar wind speed proton density, proton speed, proton temperature, proton dynamic pressure, proton thermal pressure.

Where is Figure 1?

For the plasma parameters shown in Figure 1 we assume that the heavy ion species is methane (CH₄) as anticipated by atmospheric models (Strobel and Zhu, 2017, and references therein) [STROBEL&ZHU2017] and indicated as being most likely in the SWAP data as show by Zirnstein et al. 2016, [ZIRNSTEINETAL2016]. The instantaneous SWAP FOV is 276 degrees by

Pluto J2000

The J2000 coordinate system with the origin translated to the center of Pluto. Pluto International Astronomical Union (Pluto-IAU) This is a cartographic coordinate system centered on Pluto where the frame is fixed and does not move with respect to the surface of the planet. The International Astronomical Union (IAU) defines the orientation of the frame.

This reads like there is missing text. It seems that the remainder of the Pluto J200 description is missing all the way through the heading For the Pluto IAU coordinate system.

dataset.cat in the catalog directory

2 of 2


```
ABSTRACT_DESC = "
```

```
This data set presents characteristics of the solar wind derived from data taken by the New Horizons Solar Wind Around Pluto (SWAP) instrument during the Pluto encounter. This archive contains two data products. Each product compiles the CODMAC level 2 source data used, the solar wind speed, proton density, proton speed, proton temperature, proton dynamic pressure, proton thermal pressure, spacecraft position and speed. The two product files differ in that one is in Heliographic Inertial (HGI) coordinates and the other is in Pluto centric J2000 and IAU J2000 coordinates.
```

and



No spacecraft speed is
Included within this dataset



Note: I found HGI positions included within the Pluto coordinate data file. This document suggests that HGI values should only be included within the Heliospheric data file.

swap.cat in the catalog directory

```
Calibration
```

```
=====
```

```
See
```

```
/DOCUMENT/SWAP/SWAP_CAL.*
```

Directory and file do not exist.



See the SWAP SSR paper for more detail.

I would suggest something like:

See McComas et al. (2008) [MCCOMASETAL2008] for more detail.

nh_heliocentric_sw_2015-07-14.tbl nh_plutocentric_sw_2015-07-14.tbl in the data directory

```
DESCRIPTION          = "This field provides the solar wind proton
                        dynamic pressure in units of nPa.
                        "
END_OBJECT            = FIELD
OBJECT                = FIELD
  NAME                = "PTH"
  FIELD_NUMBER        = 9
  BYTES               = 7
  DATA_TYPE          = "ASCII_REAL"
  FORMAT              = "F7.5"
  UNIT                = "pPa"
  DESCRIPTION         = "This field provides the solar wind thermal
                        dynamic pressure in units of pPa.
                        "
END_OBJECT            = FIELD
```



Extra Word

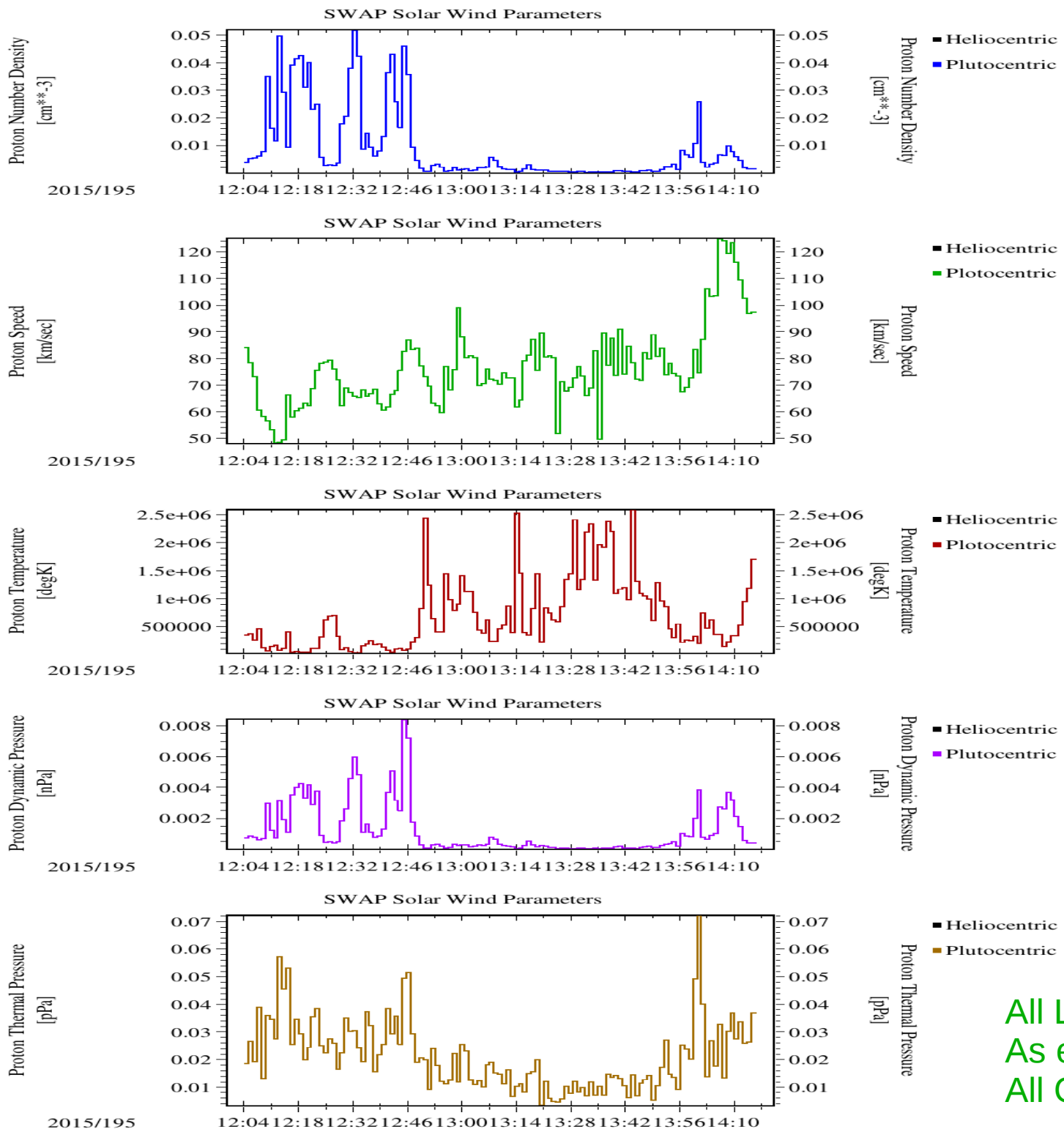
Science Data Evaluation

Solar Wind Parameters

The solar wind proton parameters (density, speed, temperature, dynamic pressure, and thermal pressure) are included both in the `nh_heliocentric_sw_2015-07-14.csv` and `nh_plutocentric_sw_2015-07-14.csv` files. The values recorded in each file should be the same.

Heliocentric

Plutocentric



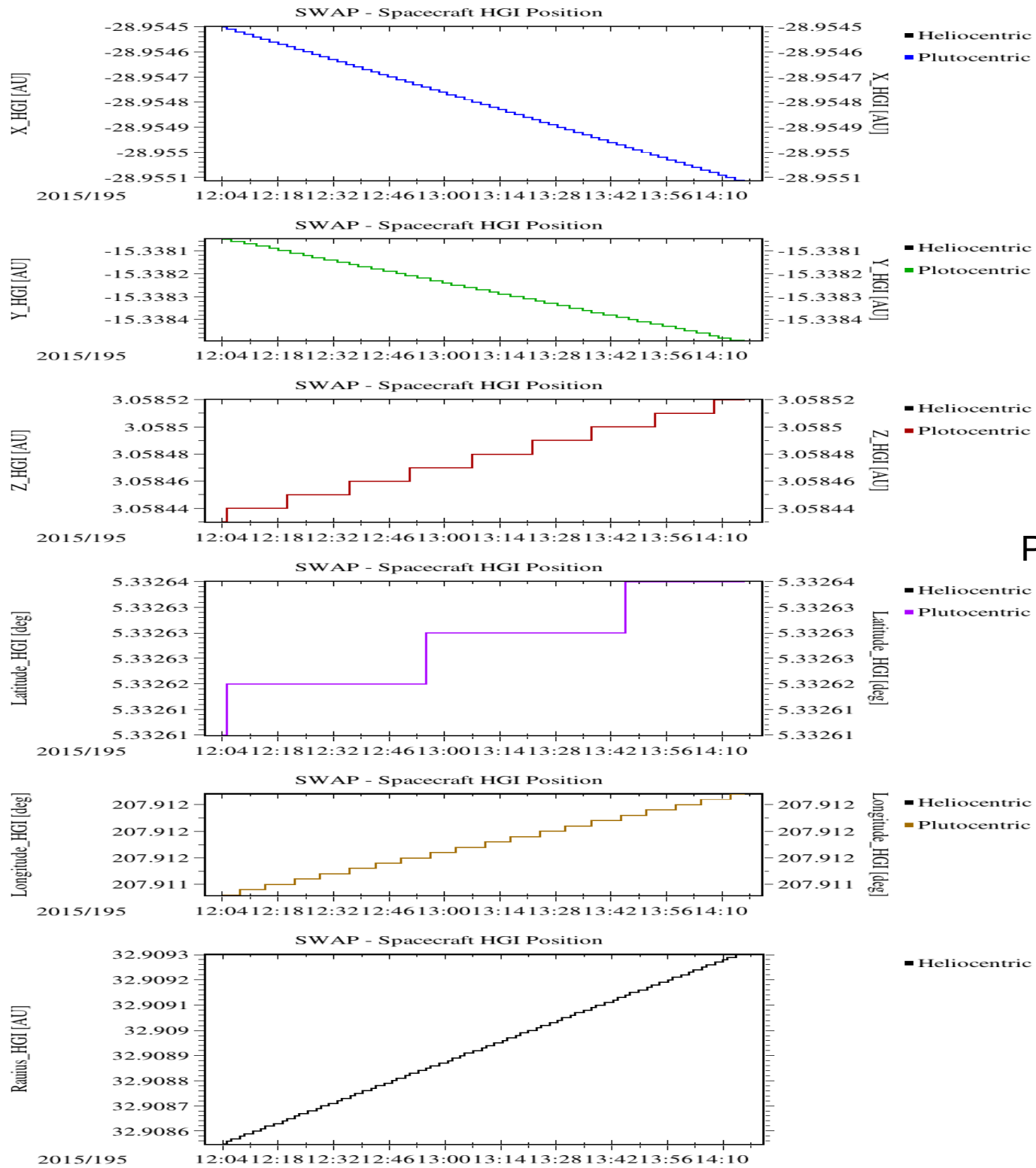
All Look identical
As expected
All Good!!

Heliographic Inertial (HGI)

The Heliographic Inertial (HGI) coordinates given in the files `nh_heliocentric_sw_2015-07-14.csv` and `nh_plutocentric_sw_2015-07-14.csv` were examined. Note that the radial distance to the spacecraft is not given in the `nh_plutocentric_sw_2015-07-14.csv` file.

Heliocentric

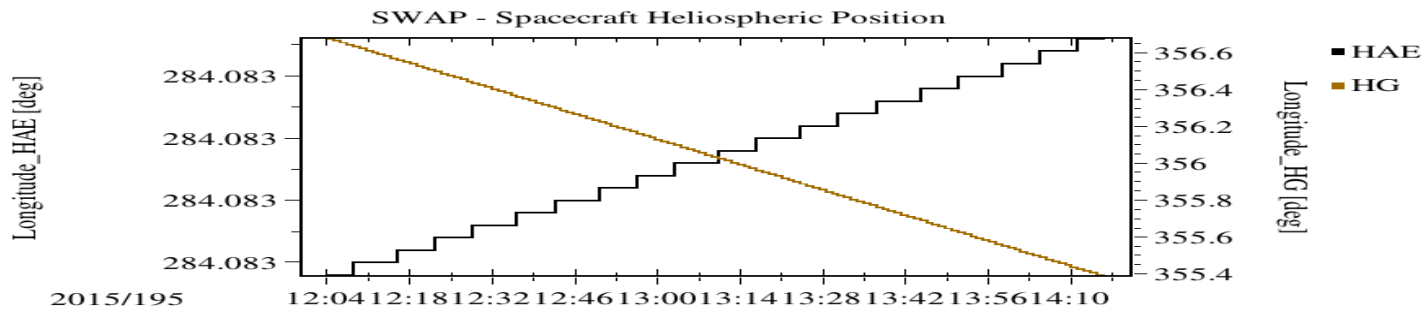
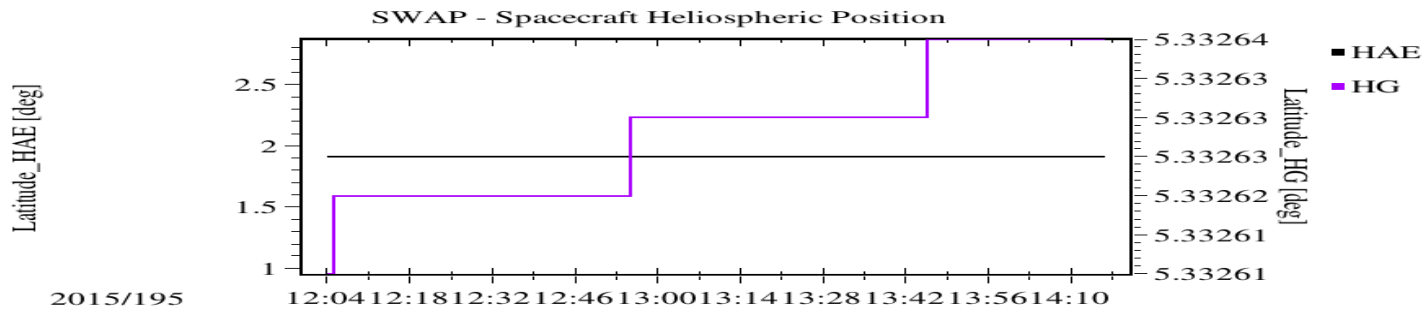
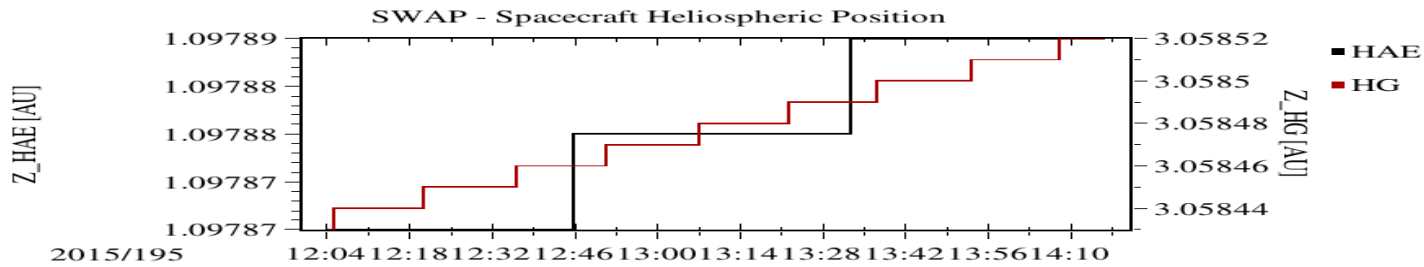
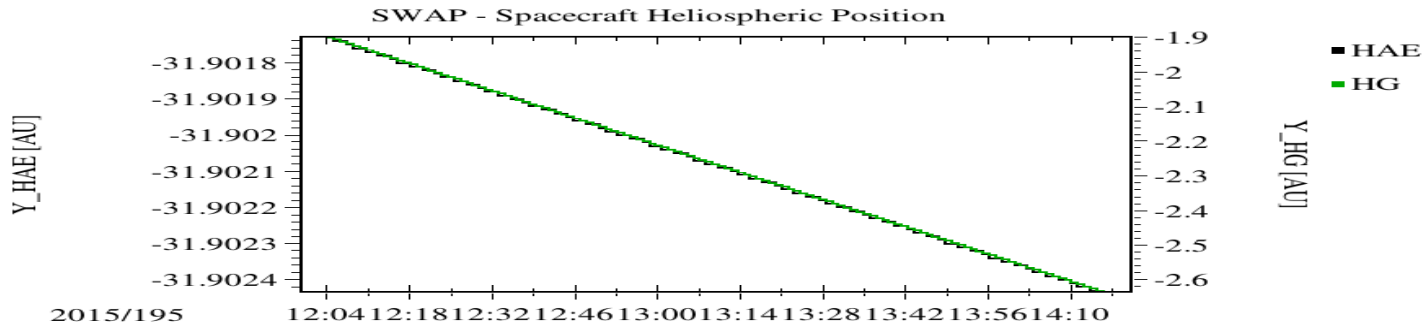
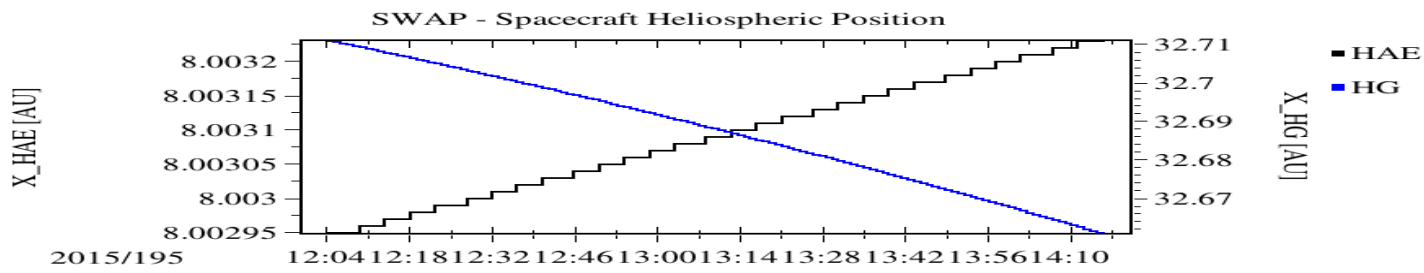
Plutocentric



Not Pluto Centered

Since the `nh_plutocentric_sw_2015-07-14.tbl` file suggests that the HGI coordinates are centered at Pluto instead of the Sun, I expected that the values in each file would be different. Since the values are identical, it has to be that an HGI coordinate system with a Sun center, not a Pluto center, was used for these values. The HGI description is not included within the `DESCRIPTION` field. This is just a documentation issue which needs to be corrected.

The time variation of
Heliospheric Aries Ecliptic (HAE) and
Heliographic (HG) coordinates in the
nh_heliocentric_sw_2015-07-14.csv file was
examined.



HAE

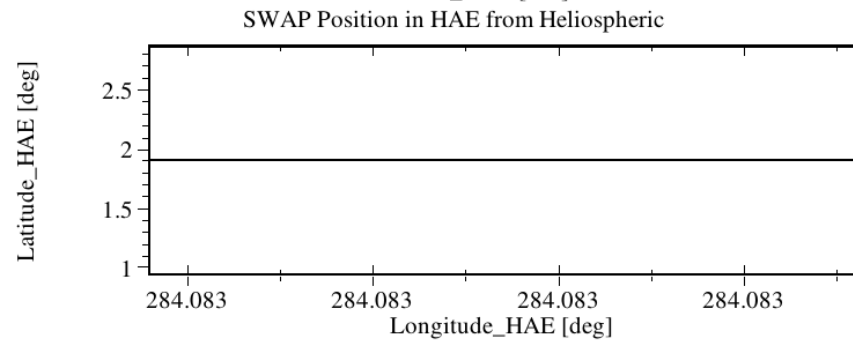
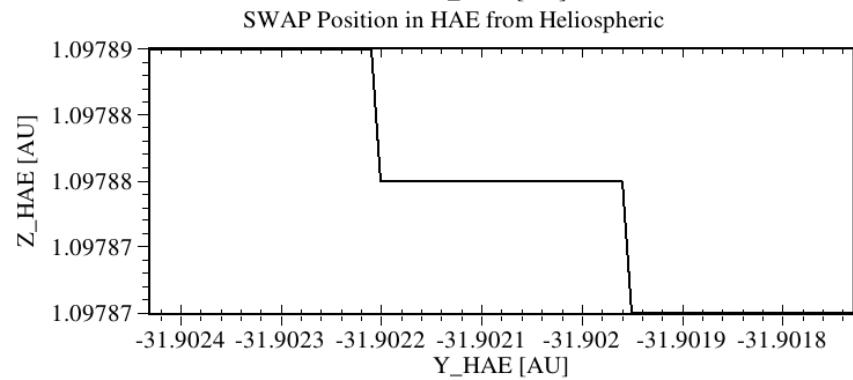
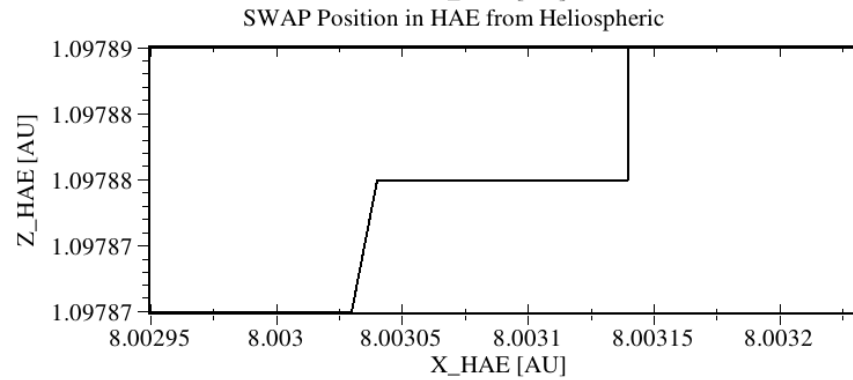
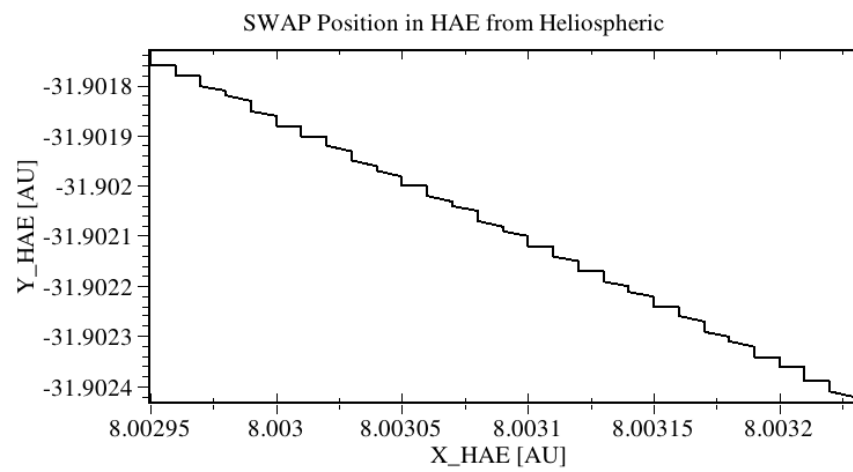
HG

All Look as Expected.

All Good!!

The coordinate system relation of Heliospheric Aries Ecliptic (HAE) and Heliographic (HG) in the nh_heliocentric_sw_2015-07-14.csv file was examined.

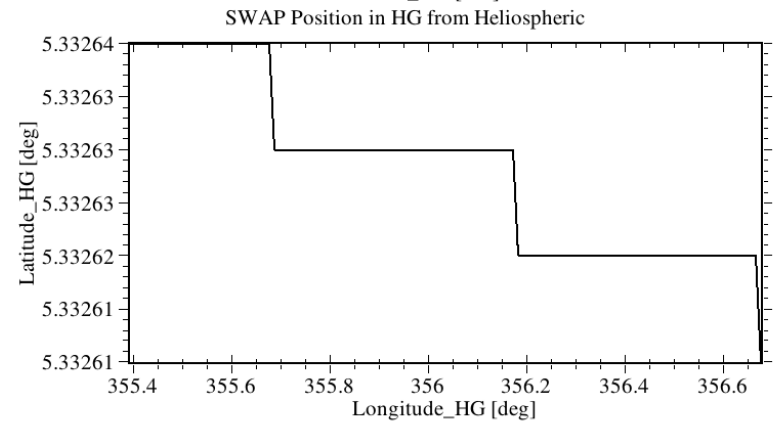
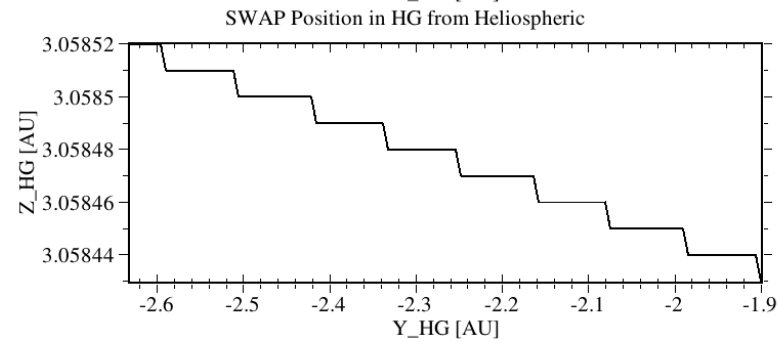
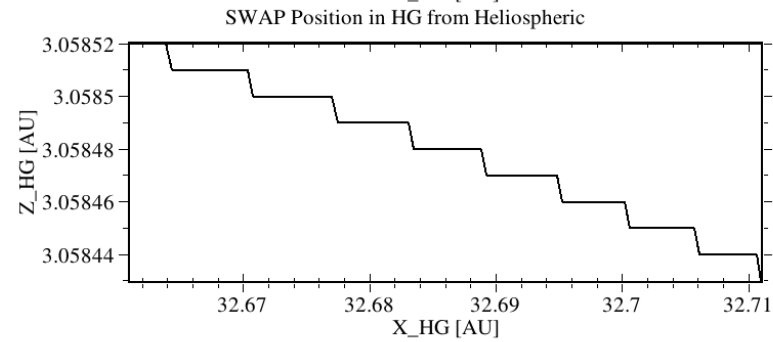
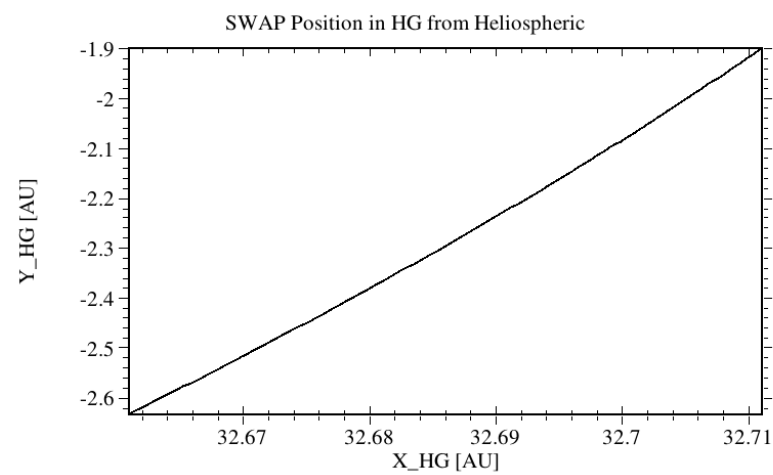
HAE



All Look as
Expected.

All Good!!

HG

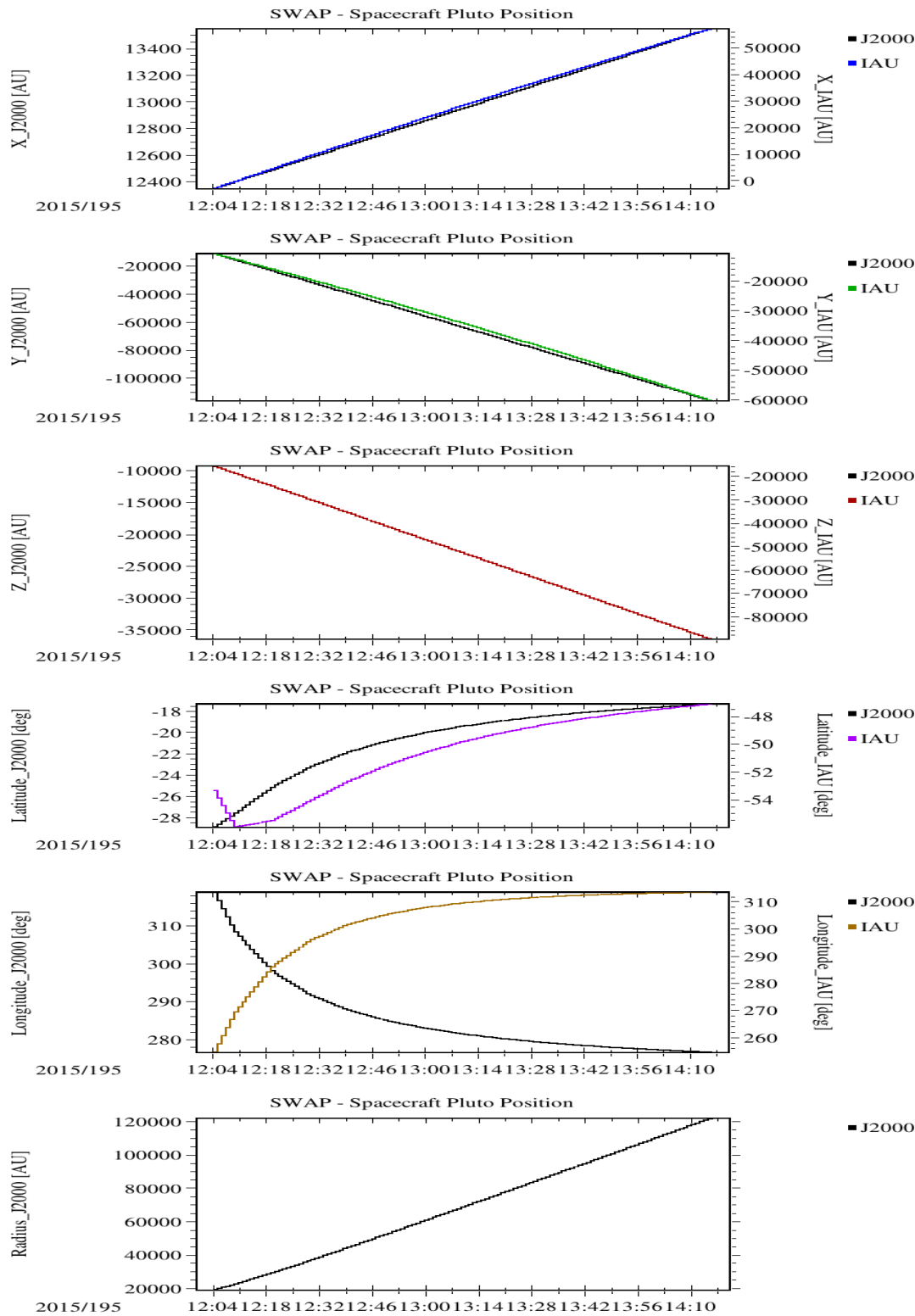


All Look as Expected.

All Good!!

The time variation of the Pluto J2000 (J2000) and Pluto IAU (IAU) coordinates in the file `nh_plutocentric_sw_2015-07-14.csv` was examined. The distance units are not consistent with the AU unit described in the `nh_plutocentric_sw_2015-07-14.tbl` file. These distances are probably in km.

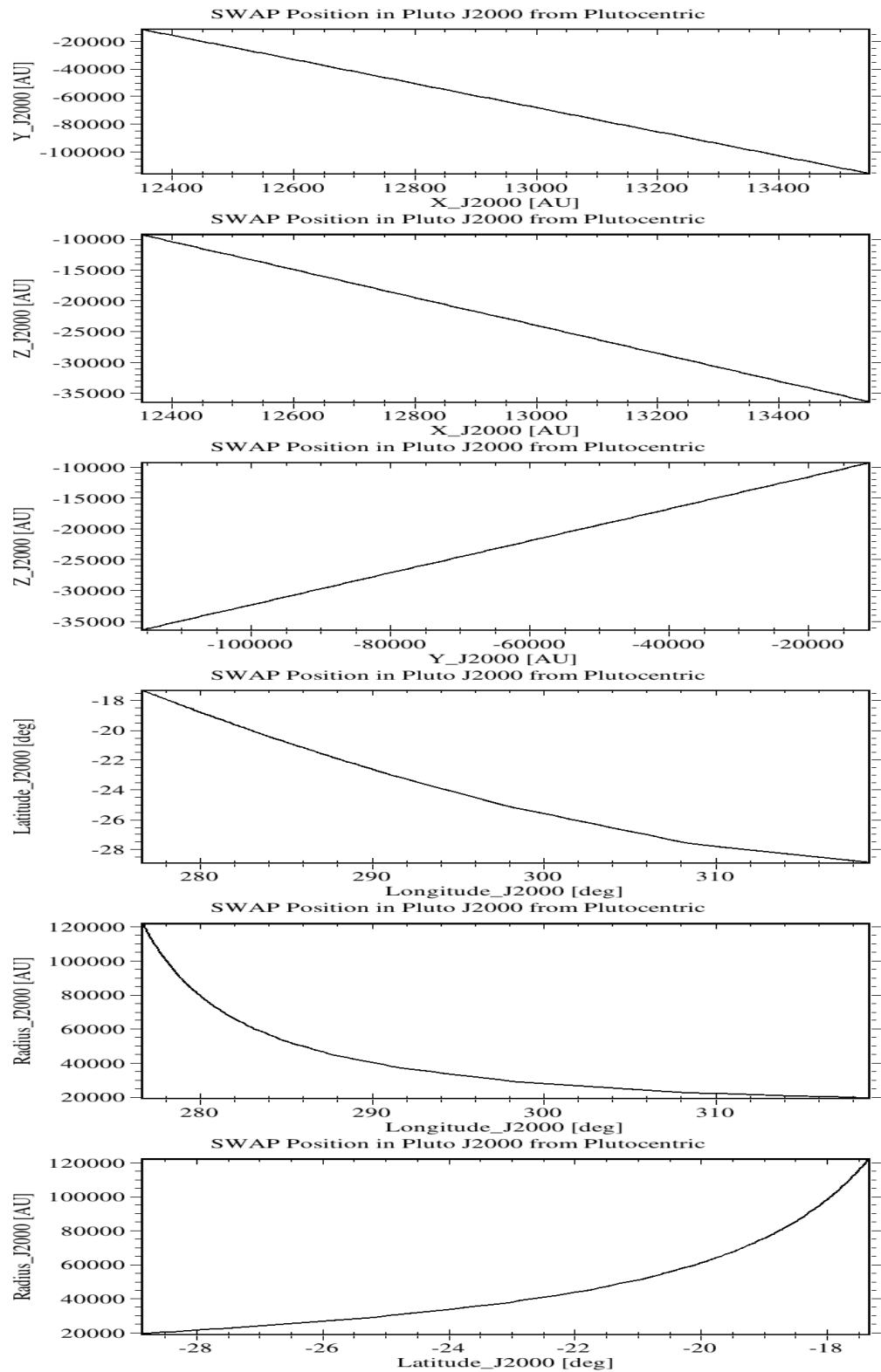
J2000



IAU

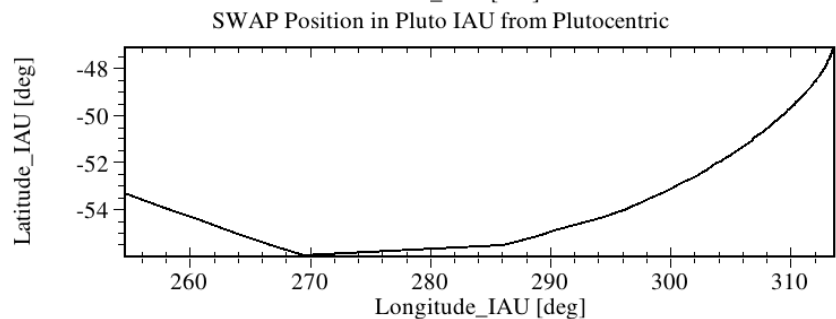
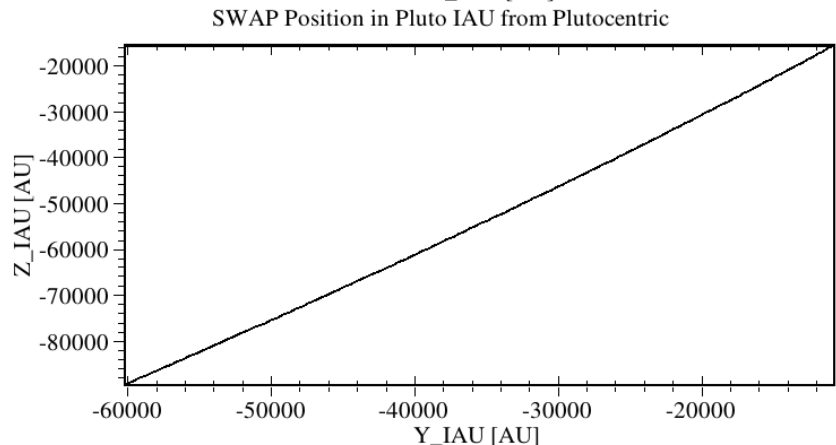
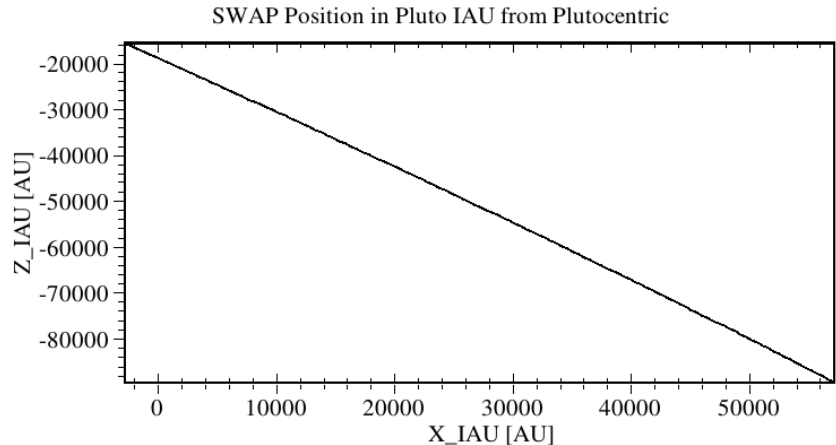
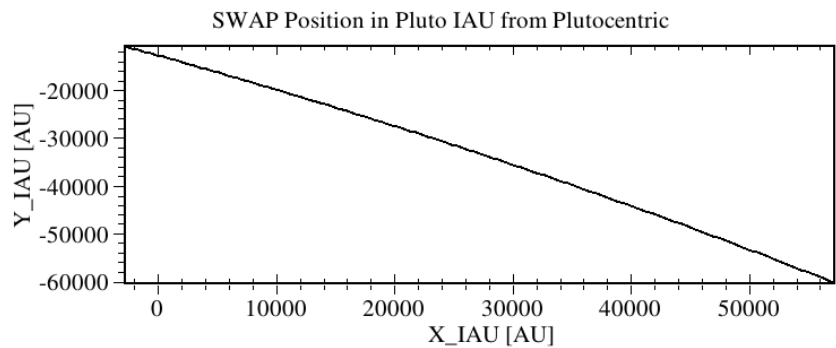
Distances are not in AU as stated in the Label file.

The coordinate system relation of the Pluto J2000 (J2000) and Pluto IAU (IAU) systems in the file `nh_plutocentric_sw_2015-07-14.csv` was examined. The distance units are not consistent with the AU unit described in the `nh_plutocentric_sw_2015-07-14.tbl` file. These distances are probably in km.



Distances are not in AU as stated in the Label file

IAU



Distances are not in AU as stated in the Label file

Conclusion

The Data Itself Looks Great; however, there are some documentation items fixed!! Certification recommended once documentation issues are fixed.

BACK-UP SLIDES

checksum.tbl & checksum.tab
in the index directory

GOOD

index.lbl & index.tab
in the index directory

GOOD

docinfo.txt in the document directory

GOOD

ref.cat in the catalog directory

GOOD

nh.cat in the catalog directory

GOOD

nhsc.cat in the catalog directory

GOOD