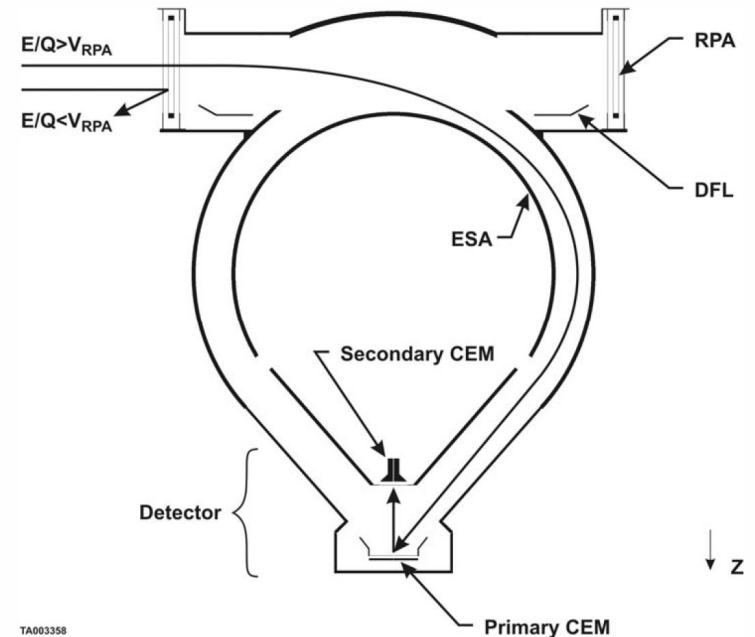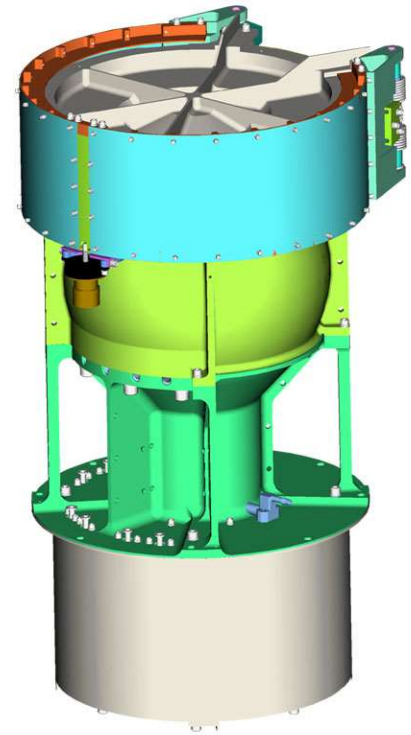# New Horizons
Solar Wind Around Pluto
SWAP
Reviewed by S. Joy (secondary)

Low Energy Plasma Instrument consisting of a Retarding Potential Analyzer (RPA), and Electrostatic Analyzer (ESA), and a deflector (DFL).

Mass:	3.29 kg
Power:	2.84 W
Energy (min,max):	30-7700 eV
Energy Resolution:	1 eV
Field of View:	270° x 10°
Angular Resolution:	N/A
Geometric Factor	$1.8 \times 10^{-3} cm^2$ sr eV/eV
Sweep Time (128 steps)	64 s
Accumulation Time	0.39 s

NH-SWAP
Data Set Evaluation Tools

Evaluation -
   Machine: Dell XPS 15 9560
   Operating System: Windows 10

Datasets:

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

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

Volumes:

NHKESW_1001

NHKESW_2001

Volume Level Files

AAREADME – files are acceptable

VOLDESC – files are acceptable

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.

Catalog Directory:

*catinfo.txt   - ok, might consider updating http://pds.jpl.nasa.gov/ to use
    https://*

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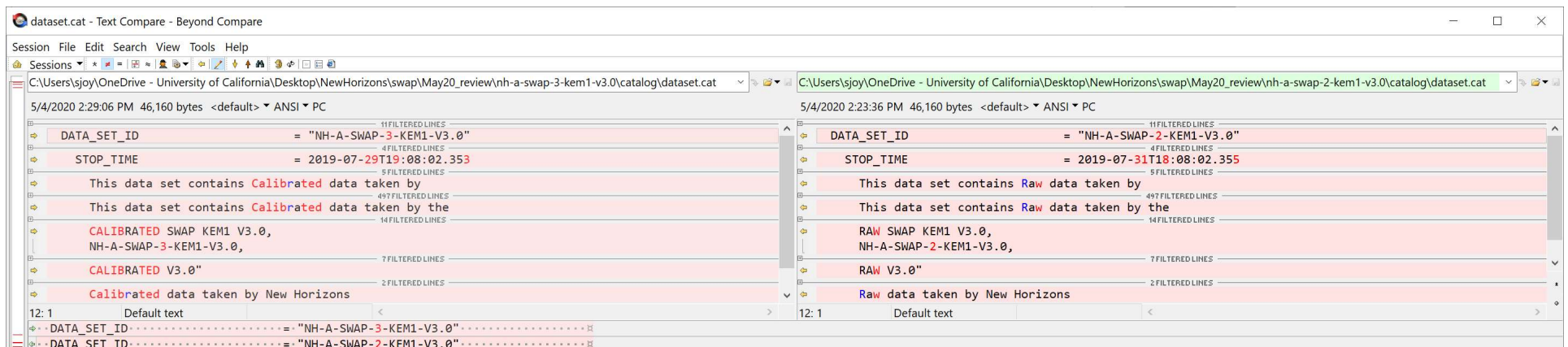   *(nh_kem.cat, nhsc.cat, ref.cat, swap.cat, etc.) – good, correct versions included*

dataset.cat (NH-X-SWAP-2-KEM1-V3.0)
        and
dataset.cat (NH-X-SWAP-3-KEM1-V3.0)
        are effectively the same file with only the most minor differences
        - previously noted and accepted

Calib Directory:

calinfo.txt   - good

background_009_dac.tab (lbl) - good
background_009_dac_jup.tab (lbl) - good
esa_rpa_v16_energy_binsf_new.tab (lbl) - good
esa_rpa_v18_energy_binsf_new.tab (lbl) - good
esa_rpa_v19_energy_binsf_new2.tab (lbl) – good
esa_shape.tab (lbl) – good
fov_mask_2d.tab (lbl) – good
list_energy.tab (lbl) – good
rpa_shape.tab (lbl) - good

Document Directory:

docinfo.txt (all) - good

codmac_level_definitions, lunineetal1995, payload_ssr, swap_ssr
  PDF files all PDF/A format. All previously reviewed and acceptable
swap_cal – good
nh_met2utc.tab file has be updated as requested.
data_summary_plots directory contents are ok, plots are useful
nh_mission_trajectory.tab (lbl) – good, complete
quat_axyz_instr_to_j2k.asc (lbl) – good
seq_swap_kem1.tab (.lbl) - good, complete
seq_swap_kemcruise1.tab (.lbl) – good, complete
nh_fov.png (lbl) - good

Document/data_summary_plots Directory:

Plots available for all days when data are available - issue corrected

Document/traj Directory

trajinfo.txt – good
traj_2006_2021_1d.tab (lbl, fmt) – Label indicates use of out-of-date
kernels naif0011.tls vs. naif0012.tls, no BC after 2018, etc. Please verify that this is a labelling error and that the correct kernels were used to generate the data file (don't match the set in the SWAP data file labels). See next

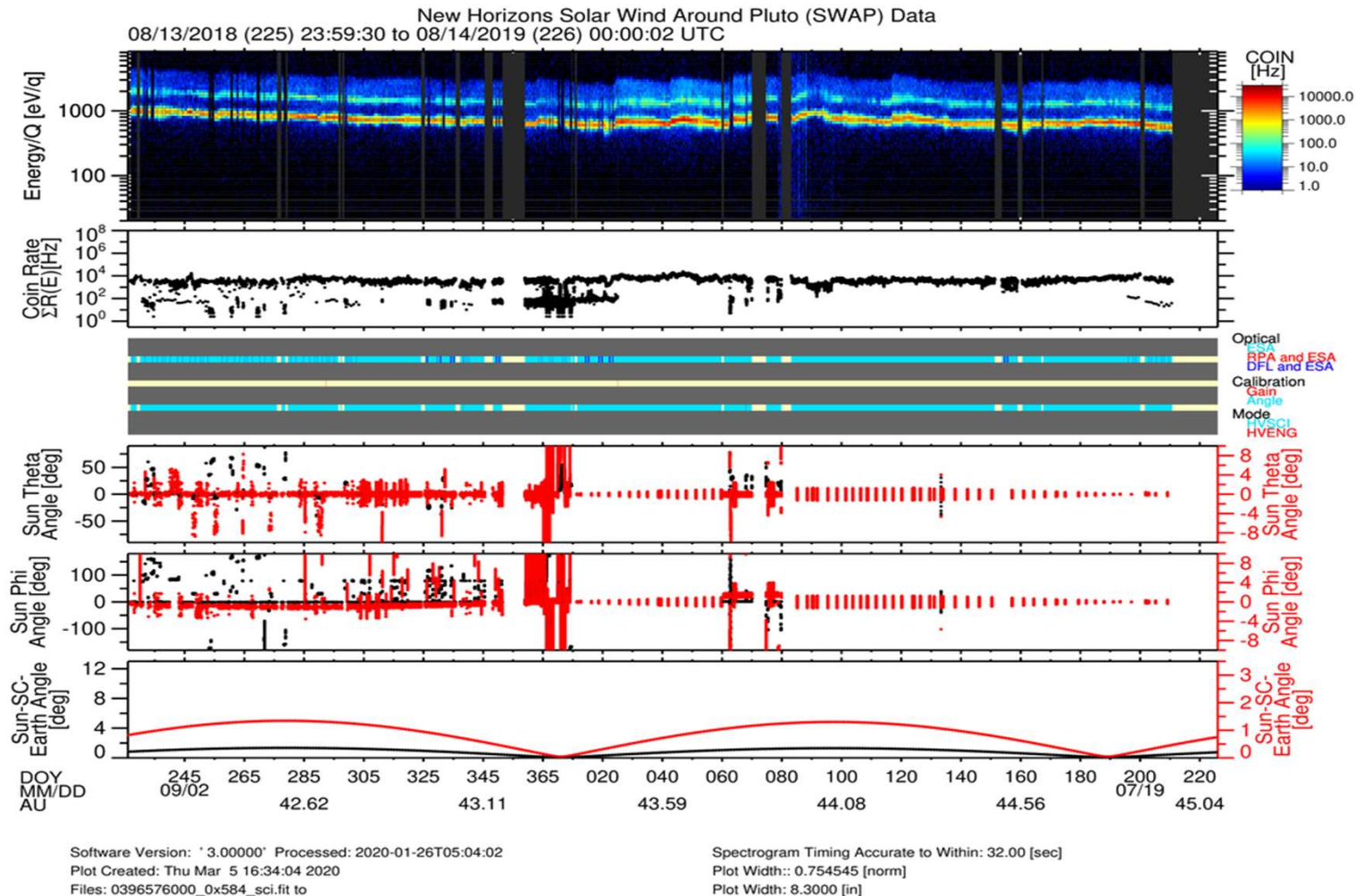| From TRAJ_2006_2021_1D.LBL	From swa_0426729632_0x586.lbl
SPICE_FILE_NAME = ("NH_V03.TM"	not included
, "NAIF0011.TLS"	current = naif0012.tls
, "PCK00010.TPC"	same
removed TPC, TI, and TF files	
, "DE418.BSP"	
, "JUP260.BSP"	same
, "NH_PLU017.BSP"	
, "KBO_CENTAUR_20131129.BSP"	same
, "NH_EXTRAS.BSP"	same
, "SB_2002JF56_2.BSP"	same
, "SB_2014MU69_20150903_S6.BSP	NavSBE_2014MU69_od151.bsp
, "NH_NEP_URA_000.BSP"	same
, "NH_PRED_ALLEPH_OD124.BSP"	
, "NH_RECON_E2J_V1.BSP"	same
, "NH_RECON_J2SEP07_PRELIMV1.BSP"	same
, "NH_RECON_OD077_V01.BSP"	
, "NH_RECON_OD117_V01.BSP"	
, "NH_RECON_PLUTO_OD122_V01.BSP"	same
, "MERGED_NHPC_2006_V011.BC"	same
, "MERGED_NHPC_2007_V006.BC"	same
, "MERGED_NHPC_2008_V001.BC"	same
, "MERGED_NHPC_2009_V001.BC"	same
, "MERGED_NHPC_2010_V001.BC"	same
, "MERGED_NHPC_2011_V001.BC"	same
, "MERGED_NHPC_2012_V001.BC"	same
, "MERGED_NHPC_2013_V001.BC"	same
, "MERGED_NHPC_2014_V001.BC"	same
, "MERGED_NHPC_2015_V001.BC"	merged_nhpc_2015_v039.bc
, "MERGED_NHPC_2016_V001.BC"	merged_nhpc_2016_v003.bc
, "MERGED_NHPC_2017_V001.BC"	merged_nhpc_2017_v014.bc
, "MERGED_NHPC_2018_V001.BC"	merged_nhpc_2018_v097.bc
missing 2019 BC kernel	merged_nhpc_2019_v015.bc
)	

Index Directory:

indxinfo.txt   - good

index.tab (lbl)   - good

slimindx.tab (lbl)   - good

checksum.tab (lbl) - good
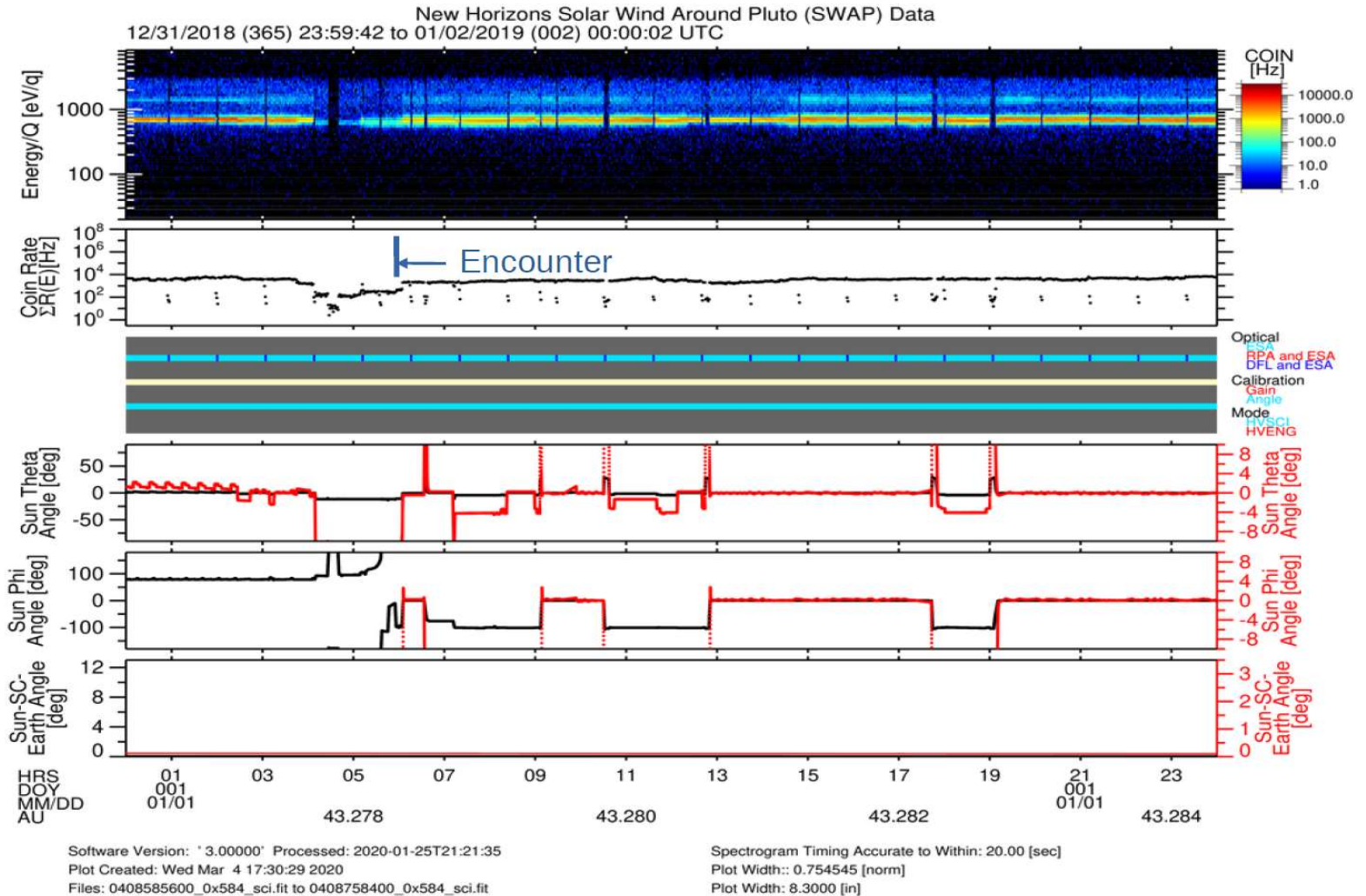
Data Directory Contents

Data are fairly continuous. Gaps in the E/Q spectra are either associated with gaps in the trajectory data (real data gaps), or with time intervals when the spacecraft was not Sun-pointed (unfavorable geometry). In general, the data show a clear solar wind beam signature when Sun-pointed.

Data Directory Contents

(486958) 2014 MU69 (Arrokoth) Flyby

Data around the encounter are nearly continuous and look good.

New Horizons Solar Wind Around Pluto (SWAP) Data
12/31/2018 (365) 23:59:42 to 01/02/2019 (002) 00:00:02 UTC

Plot courtesy of R. Frahm

Recommendations

In general, both of these datasets are in good shape. As previously noted, the dataset.cat descriptions are very generic and do not contain any specific discussion of these particular data. Since the other documentation is complete, no liens have been written.

Liens:
1) *Check the traj_2006_2021_1d.tab file and verify it was generated using the latest set of SPICE kernels. Either update the data and label, or the label as required.*
2) *The swap_cal.pdf file is corrupted (equations missing), probably when converting to PDF/A after correcting issues reported in last review – text corrected.*

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.

These datasets are currently usable by the science community and can be certified.