

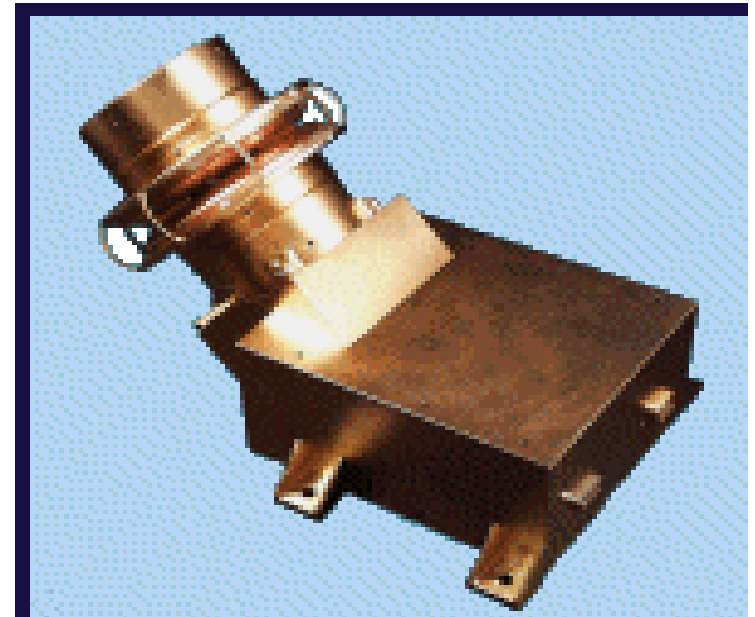
ROSETTA PLASMA CONSORTIUM ION AND ELECTRON SENSOR

Energy: Range 1 eV to 22 KeV
 Resolution 0.04

Angle: Range (FOV) 90° x 360°
 (2.8 Pi sr)
 Resolution (elect.) 5° x 22.5°
 (18 azimuthal x 16 polar)
 Resolution (ions) 5° x 45°
 (5° x 5° for in one sector)
 (18 azimuthal x 16 polar)

Temporal resolution:
 3D Distribution 3s
 Downlink Data 300s

Geometric factor:
 [in units of cm² sr eV/(eV counts/ion)]
 Total (ions) 5 x 10⁻⁴
 per 45 deg sector 5 x 10⁻⁵
 Total (electrons) 5 x 10⁻⁵
 per sector (electrons) 5 x 10⁻⁶



Mass 1040 g
 Volume 1297 cm³
 Sensor Dimensions:
 73 mm dia x 101 mm
 Electronics Dimensions:
 139 mm x 121 mm x 64 mm
 Power 1850 mW
 Downlink Data Rate 5-250 bps

RPC IES

Data Set Evaluation Tools

Staging -

Machine: IBM lenovo T60p ThinkPad
Operating System: Fedora 25 Linux

Evaluation -

Machine: Dell Precision T3400
Operating System: fedora 19 Linux

Data Processing -

Machine: Sun Ultra-350
Operating System: Sun Solaris OS 5.9

RPC IES Data Sets

ro-c-rpcies-2-prl-v2.0
ro-c-rpcies-2-esc1-v2.0
ro-c-rpcies-2-esc2-v2.0
ro-c-rpcies-2-esc3-v2.0
ro-c-rpcies-2-esc4-v1.0
ro-c-rpcies-2-ext1-v1.0
ro-c-rpcies-2-ext2-v1.0
ro-c-rpcies-2-ext3-v1.0

ro-c-rpcies-3-prl-v1.0
ro-c-rpcies-3-esc1-v1.0
ro-c-rpcies-3-esc2-v1.0
ro-c-rpcies-3-esc3-v1.0
ro-c-rpcies-3-esc4-v1.0
ro-c-rpcies-3-ext1-v1.0
ro-c-rpcies-3-ext2-v1.0
ro-c-rpcies-3-ext3-v1.0

Documentation Examination

ro-c-rpcies-3-ext3-v1.0
ro-c-rpcies-2-prl-v2.0
aareadme.txt

GOOD

ro-c-rpcies-3-ext3-v1.0
ro-c-rpcies-2-prl-v2.0
voldesc.cat

GOOD

ro-c-rpcies-3-ext1-v1.0
catalog/catinfo.txt

GOOD

ro-c-rpcies-3-ext1-v1.0
catalog/rpcies_software.cat

GOOD

ro-c-rpcies-3-ext1-v1.0
catalog/rpcies_pers.cat

GOOD

ro-c-rpcies-3-ext1-v1.0
catalog/dataset.cat

This file mentions both the HGRTN and Cheops reference frame. It defines the HGRTN reference frame in detail but not the Cheops reference frame. Why is the Cheops reference frame not defined in this document as well?

ro-c-rpcies-3-ext3-v1.0 catalog/ref.cat

There are two references in the proposed list which are ITAR controlled documents. The SwRI Legal Department reports “Revealing the existence of an ITAR controlled document is itself a violation of ITAR”.

The JPL Library staff has acknowledged that the following two references to JPL Documents are not cleared for public release: ASMAR&HERRERA1993 and ASMARETAL1995. They should not be included in this reference list and should not be referenced in the public archive. Please remove these references.

ro-c-rpcies-3-ext3-v1.0 catalog/rpcies_inst.cat

Calibration

=====

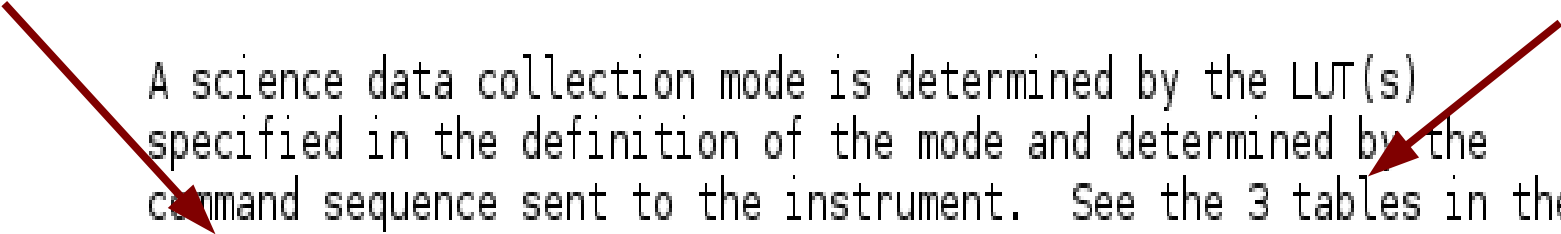
The IES instrument was calibrated on the ground in the ion calibration facility at the Southwest Research Institute, San Antonio, TX, USA. In addition cross-calibrations are performed in flight with the RPC-LAP and RPC-ICA instruments.

Since the calibration document included with this archive refers to the IES instrument as the Protoflight Unit, I would suggest adding the clarification “(the Protoflight Unit was upgraded to the Flight Unit status)” after the word “instrument” in the first sentence.

IES modes are not discussed nor described in the EAICD as stated.

Not Included

Not Included



A science data collection mode is determined by the LUT(s) specified in the definition of the mode and determined by the command sequence sent to the instrument. See the 3 tables in the Appendix to the Rosetta-RPC-IES Planetary Science Archive Interface Control Document, Document No. 10991-IES-EAICD-01 for details of the data collapsing for each science mode. These tables

ro-c-rpcies-3-ext3-v1.0/calib
azimuth_angles.tbl
azimuth_angles.tab

GOOD

ro-c-rpcies-3-ext3-v1.0/calib
elevation_angles.tbl
elevation_angles.tab

GOOD

ro-c-rpcies-3-ext3-v1.0/calib
energy_steps.lbl
energy_steps.tab

GOOD

ro-c-rpcies-3-ext3-v1.0/calib
ies_modes.lbl
ies_modes.tab

GOOD

ro-c-rpcies-3-ext3-v1.0/calib
polar_sectors.lbl
polar_sectors.tab

GOOD

ro-c-rpcies-3-ext3-v1.0/calib
step_integration.tbl
step_integration.tab

GOOD

ro-c-rpcies-3-esc1-v1.0
ro-c-rpcies-3-ext3-v1.0
ro-c-rpcies-3-prl-v1.0
calib/calinfo.txt

The Level 3 data sets include subdirectories in the calib folder. These directories are not described in the calinfo.txt file.

ro-c-rpcies-3-ext3-v1.0
document/docinfo.txt

GOOD

ro-c-rpcies-3-ext3-v1.0/document/
ground_calib/8182-calpfm-01_r0.lbl
ground_calib/8182-calpfm-01_r0.pdf

GOOD

ro-c-rpcies-3-ext3-v1.0/document/
anodes/anodes.lbl
anodes/anodes.pdf

GOOD

ro-c-rpcies-3-ext3-v1.0/document/
ies_modes/ies_modes.lbl
ies_modes/ies_modes.pdf

GOOD

ro-c-rpcies-3-ext1-v1.0/document/
ies_eaicd/10991-ies-eaicd-03.lbl

GOOD

ro-c-rpcies-3-ext1-v1.0/document/ ies_eaicd/10991-ies-eaicd-03.pdf – 1 of 5

Fix Error	3.3.3.3	Index Directory	12
	3.3.3.4	Browse Directory and Browse Files	12
	3.3.3.5	Geometry Directory	Error! Bookmark not defined.
	3.3.3.6	Document Directory.....	12
	3.3.3.7	Data Directory.....	12

No Browse Directory exists under the Root Directory

3.3.3.1 Root Directory

Table 2: Root Directory Contents	
File Name	File Contents
AAREADME.TXT	This file completely describes the Volume organization and contents
VOLDESC.CAT	A description of the contents of this Volume in a PDS format readable by both humans and computers
CATALOG/	Catalog directory
DOCUMENT/	Document directory
INDEX/	Index directory
DATA/	Data directory
BROWSE/	Browse directory
CALIB/	Calibration data directory

ro-c-rpcies-3-ext1-v1.0/document/ ies_eaicd/10991-ies-eaicd-03.pdf – 2 of 5

Incorrect file naming exists under the Catalog Directory

3.3.3.2 Catalog Directory

Table 3: Catalog Directory Contents

File Name	File Contents
CATINFO.TXT	A description of the contents of this directory
DATASET.CAT	PDS Data Set catalog description of all the IES data files
INSTHOST.CAT	PDS instrument host (spacecraft) catalog description of the Rosetta orbiter spacecraft
INST.CAT	PDS instrument catalog description of the IES instrument
MISSION.CAT	PDS mission catalog description of the Rosetta mission
PERSON.CAT	PDS personnel catalog description of IES Team members and other persons involved with generation of IES Data Products
REF.CAT	IES-related references mentioned in other *.CAT files
SOFTWARE.CAT	Software catalog file

Found were files: rpcies_inst.cat, rpcies_pers.cat, and rpcies_software.cat

ro-c-rpcies-3-ext1-v1.0/document/ ies_eaicd/10991-ies-eaicd-03.pdf – 3 of 5

Incorrect file name and missing files under the IES_EAICD Directory

3.3.3.5 Document Directory

Table 4: Document Directory Contents	
File Name	File Contents
DOCINFO.TXT	A description of the contents of this directory and all subdirectories.
IES_EAICD/	Directory containing the IES EAICD document
IES_EAICD/IES_EAICD.DOC	The IES Experiment-Archive Interface Control Document as a MS Word doc
IES_EAICD/IES_EAICD.TXT	The IES Experiment-Archive Interface Control Document in plain text
IES_EAICD/IES_EAICD.LBL	A PDF detached label that describes IES_EAICD.HTM, IES_EAICD.ASC, and IES_EAICD.PDF

Missing files are: IES_EAICD.DOC, IES_EAICD.LBL, and IES_EAICD.TXT
Undefined file is: 10991-ies-eaicd-03.lbl and 10991-ies-eaicd-03.pdf

Extra files found under the Document Directory are:

anodes/anodes.lbl, anodes/anodes.pdf,
flux_calculation/flux_calculation.lbl, flux_calculation/flux_calculation.pdf,
ground_calib/8182-calpfm-01_r0.lbl, ground_calib/8182-calpfm-01_r0.pdf,
ies_modes/ies_modes.lbl, and ies_modes/ies_modes.pdf

ro-c-rpcies-3-ext1-v1.0/document/ ies_eaicd/10991-ies-eaicd-03.pdf – 4 of 5

Missing from this document is the following:

- 1) Description of the file format for the uncertainty and background files.
- 2) Description of the location of the uncertainty and background files
- 3) Discussion of how uncertainties are determined
- 4) Discussion of data compression modes and reference to appropriate tables

Background and uncertainty data files are suggested to be under the DATA directory; however, they were found under the calibration directory. The EAICD should be updated to include the correct information on where to locate these files or they should be moved to the DATA directory.

ro-c-rpcies-3-ext3-v1.0/document/
flux_calculation/flux_calculation.lbl

GOOD

ro-c-rpcies-3-ext3-v1.0/document/ flux_calculation/flux_calculation.pdf – 1 of 3

$$\epsilon_{electrons} = 0.52 e^{-\left(\frac{\log E - 2.30}{\sqrt{2} * 0.64}\right)^2} - 0.028 * \log^2 E + 0.4 \log E + 0.071 \quad (8)$$

Unknown Text

$$\epsilon_{electrons} = 0.52 e^{-\left(\frac{\log(20 + \lambda \mu) - 2.30}{\sqrt{2} * 0.64}\right)^2} - 0.028 \log^2(20 + \lambda \mu) + 0.4 \log(20 + \lambda \mu) + 0.071 \approx 0.6 \mu$$

Unknown Text

Unknown Text

$$DF = \frac{15 (C) / 0.095 (s)^{-0.3 (C) / 0.095 (s)}}{2.8 * 10^{-9} \left(m^2 * sr * eV / \left(eV \frac{counts}{electron} \right) \right) * 0.6 \mu} = 8.5 \mu * 10^{10} \left(\frac{electrons}{m^2 * s * sr * (eV / eV)} \right) \quad (10)$$

Unknown Text

ro-c-rpcies-3-ext3-v1.0/document/ flux_calculation/flux_calculation.pdf – 2 of 3

This reference is incomplete:

Broiles, T.W. et al., Characterizing cometary electrons with kappa distributions, *Journal of Geophysical Research-Space Science*, in preperation

It has been published over a year ago, so please update the text....

 **AGU** PUBLICATIONS



Journal of Geophysical Research: Space Physics

RESEARCH ARTICLE

10.1002/2016JA022972

Characterizing cometary electrons with kappa distributions

T. W. Broiles¹, G. Livadiotis¹, J. L. Burch¹, K. Chae¹, G. Clark², T. E. Cravens³, R. Davidson⁴, A. Eriksson⁵,

Citation:

Broiles, T. W., et al. (2016), Characterizing cometary electrons with kappa distributions, *J. Geophys. Res. Space Physics*, 121, 7407–7422, doi:10.1002/2016JA022972.

Received 18 MAY 2016

Accepted 21 JUL 2016

Accepted article online 26 JUL 2016

Published online 12 AUG 2016

Corrected 23 AUG 2016

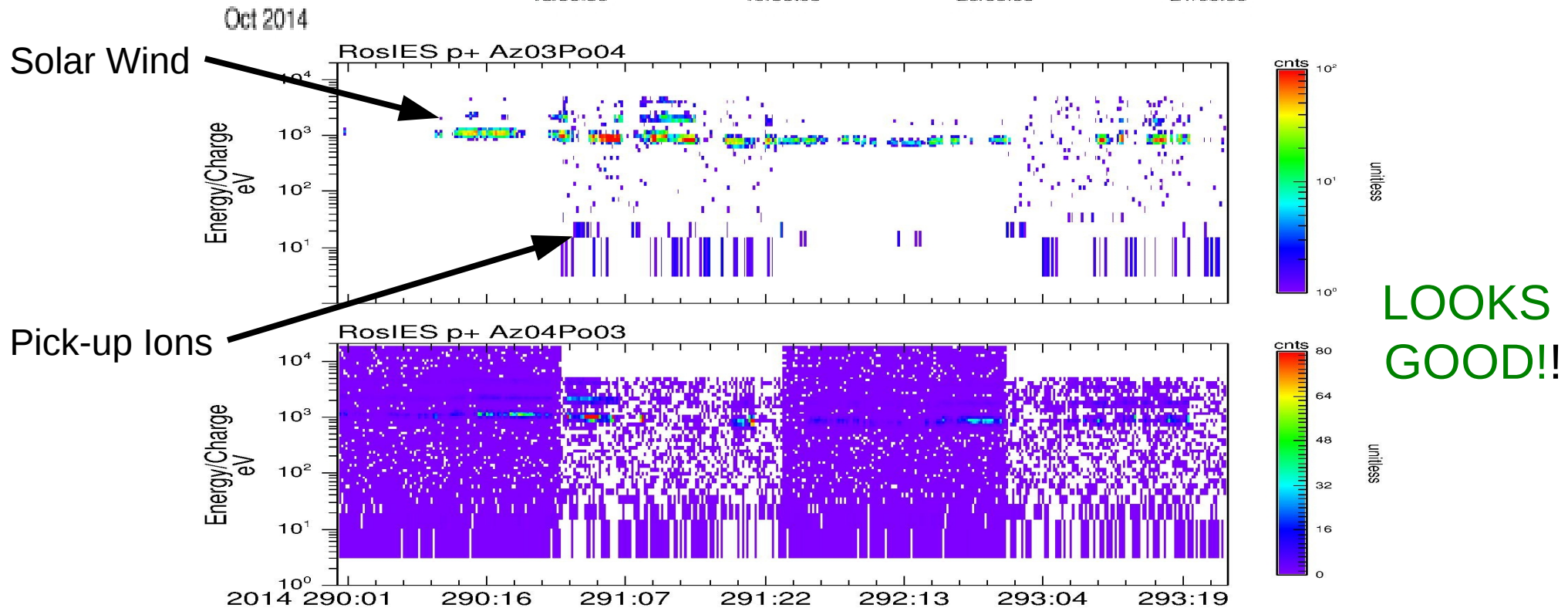
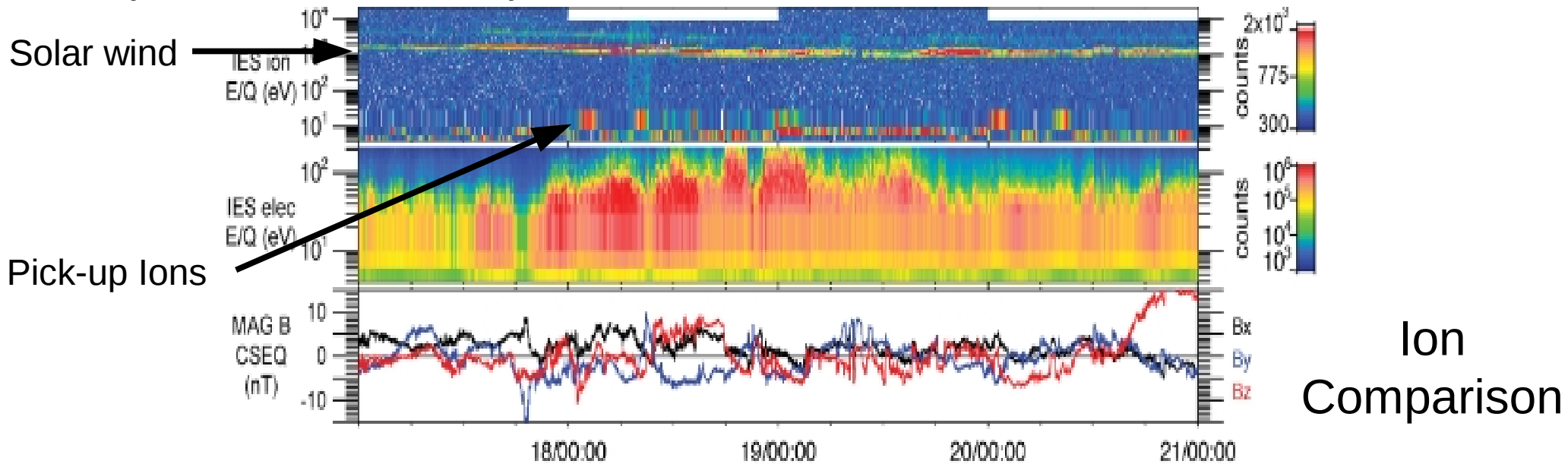
ro-c-rpcies-3-ext3-v1.0/document/ flux_calculation/flux_calculation.pdf – 3 of 3

Document fails to explain the difference between the “Coarse BG Counts” and “Fine BG Counts” described in the data files for ions. This document only describes one procedure for generating background which is dependent on only one anode for each species. How can two values be derived from one anode for the ions? This document does not describe which quantity is used to generate calibrated flux since it makes no distinction between the ion and electron background calculations. This document does not describe when it is appropriate to use each type of background and needs to include a complete description of determination of the ion background.

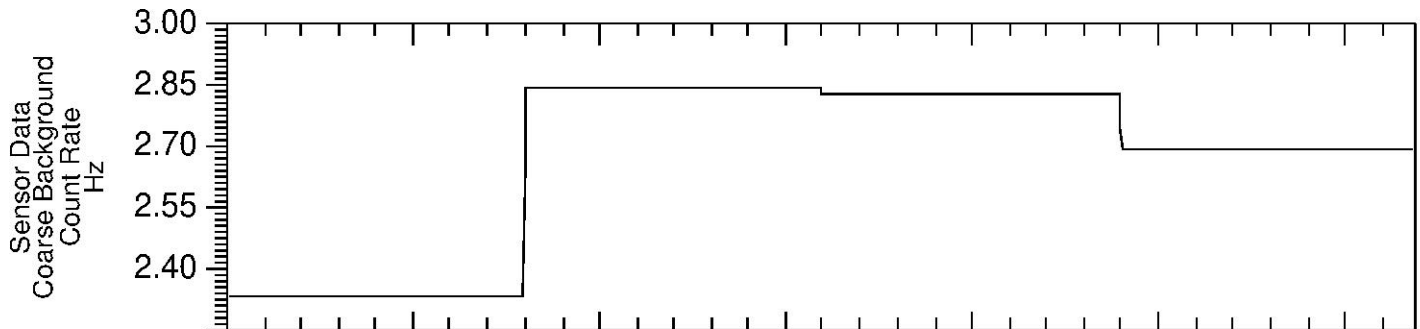
Negative flux values were found in the flux data files. Missing from this file is a discussion of negative flux values and what a user should do when they are encountered. For example, the user should know if negative values mean to reflect the flux value in angle, average the flux data, or ignore the flux data.

Data Examination

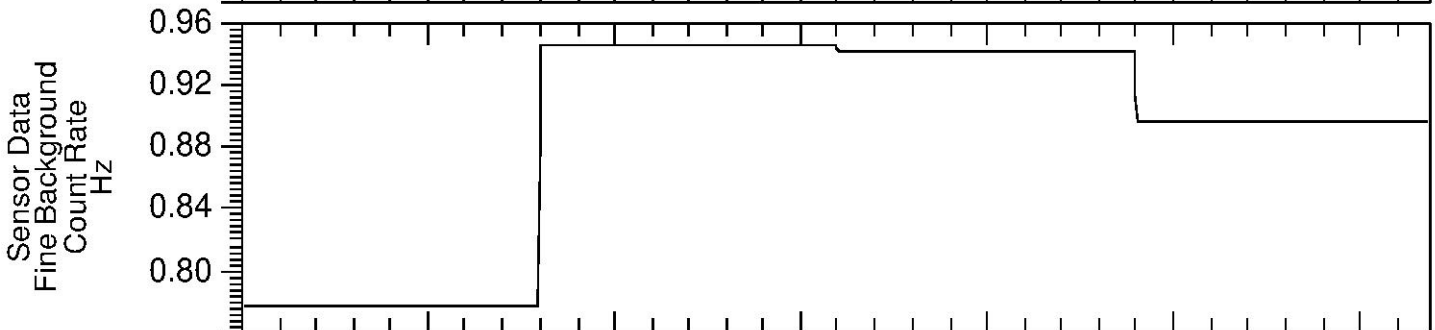
Galand *et al.*, Ionospheric plasma of comet 67P probed by Rosetta at 3 AU from the Sun, Royal Astronomical Society, *MNRAS*, **462**, S331-S351, doi:10.1093/mnras/stw2891, 2016.



LOOKS GOOD!!

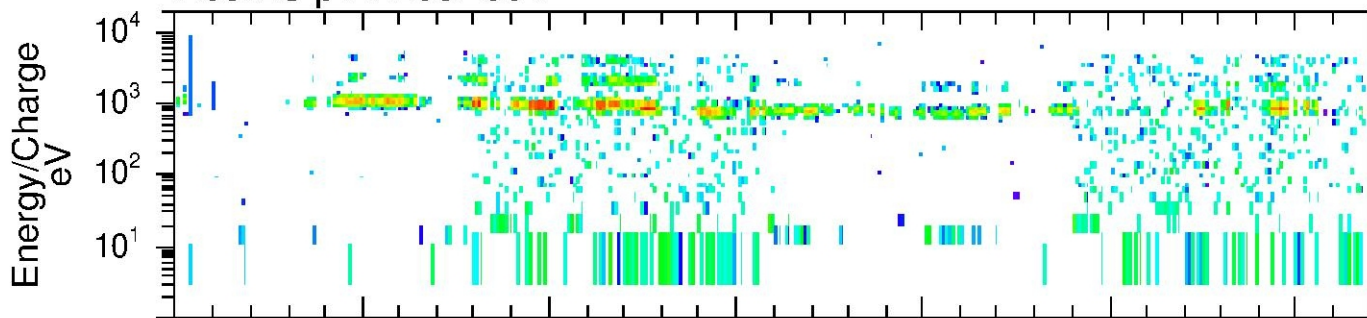


Coarse Background



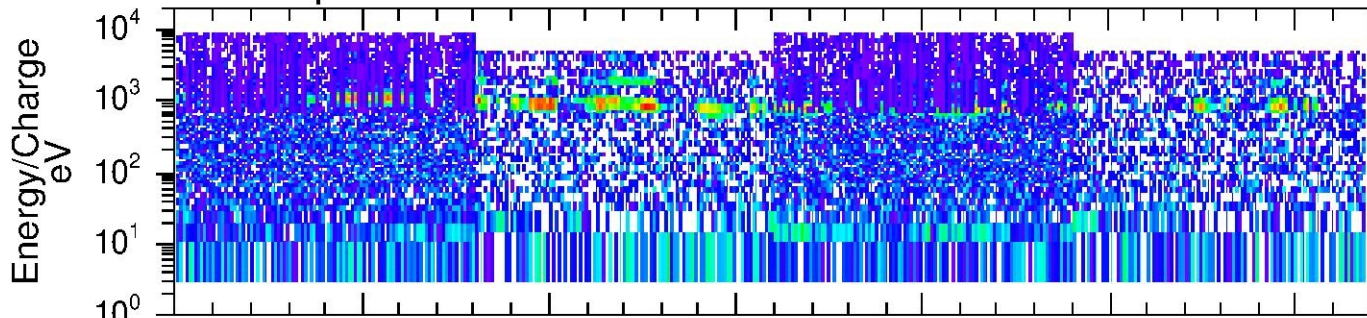
Fine Background

RosIES p+ Az03Po04



Calibrated Flux

RosIES p+ Az03Po04

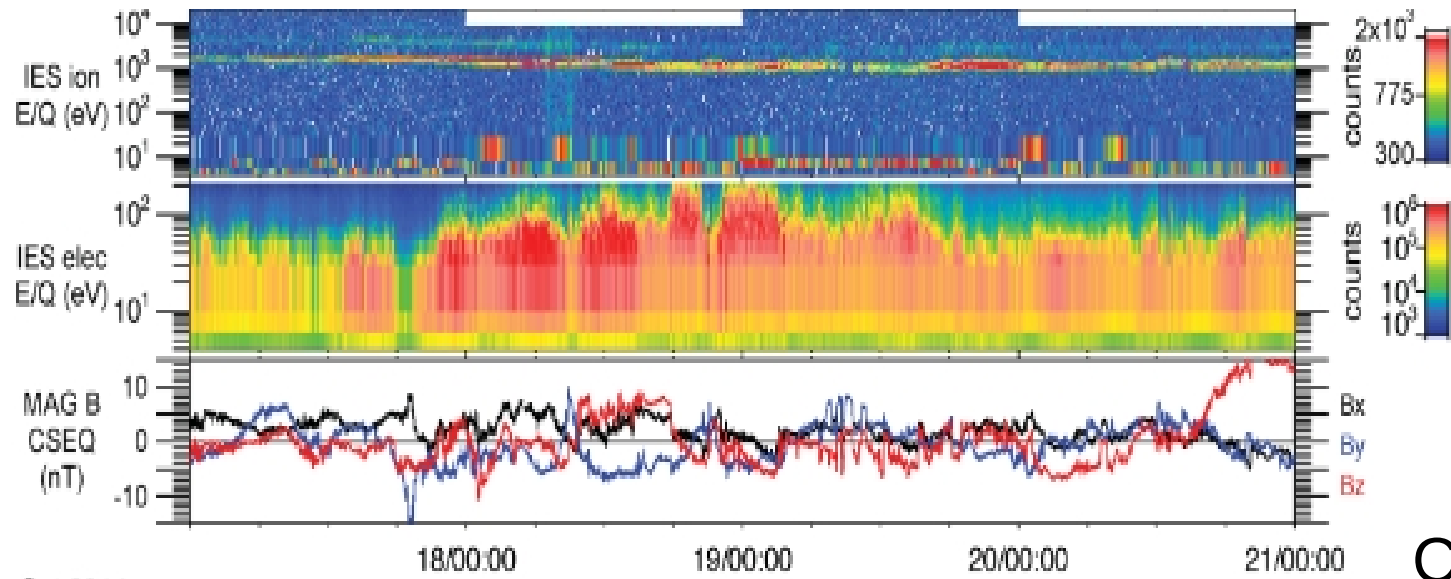


Flux Uncertainty

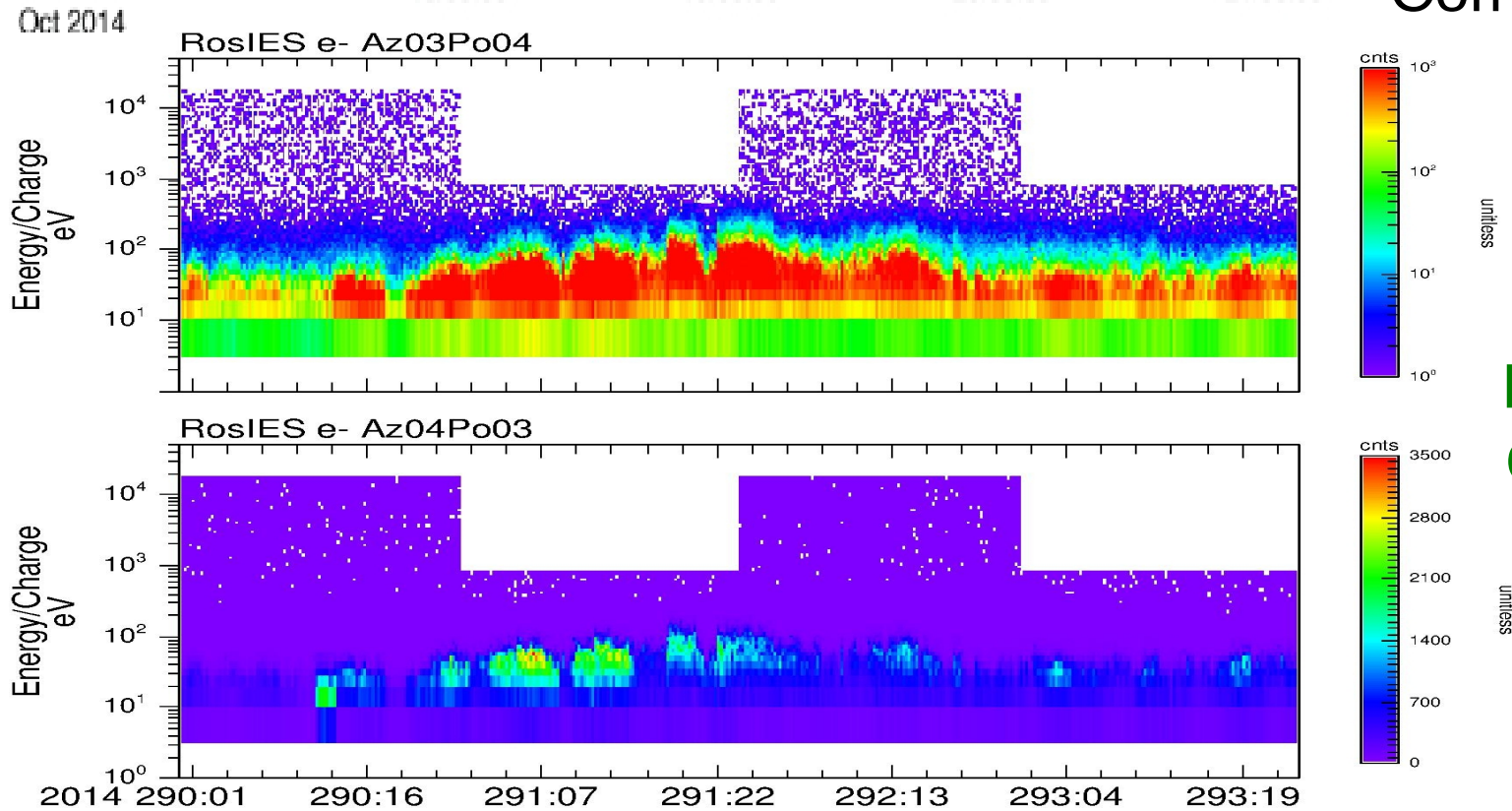
2014 290:00 290:15 291:06 291:21 292:12 293:03 293:18

LOOKS
GOOD!!

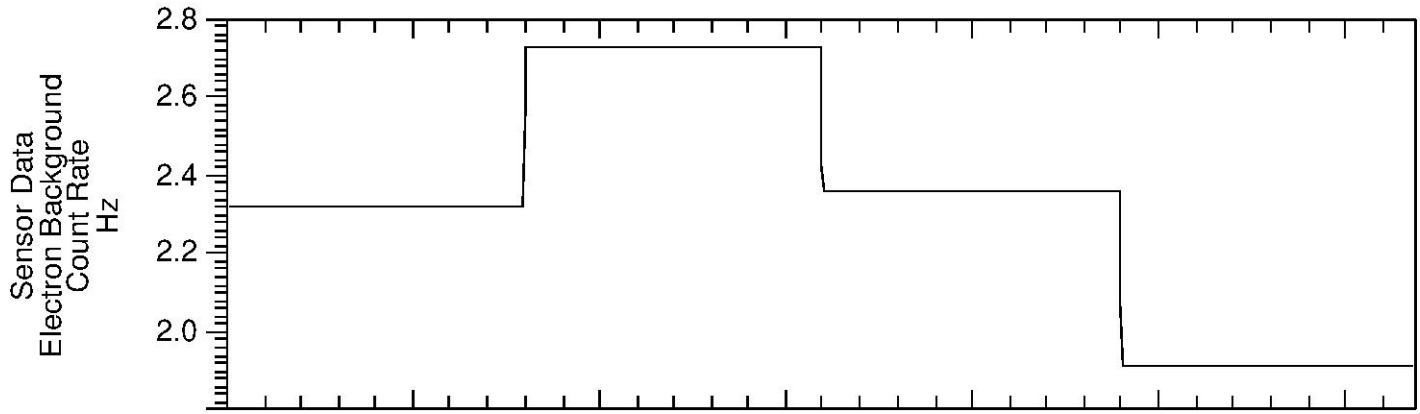
Galand *et al.*, Ionospheric plasma of comet 67P probed by Rosetta at 3 AU from the Sun, Royal Astronomical Society, *MNRAS*, **462**, S331-S351, doi:10.1093/mnras/stw2891, 2016.



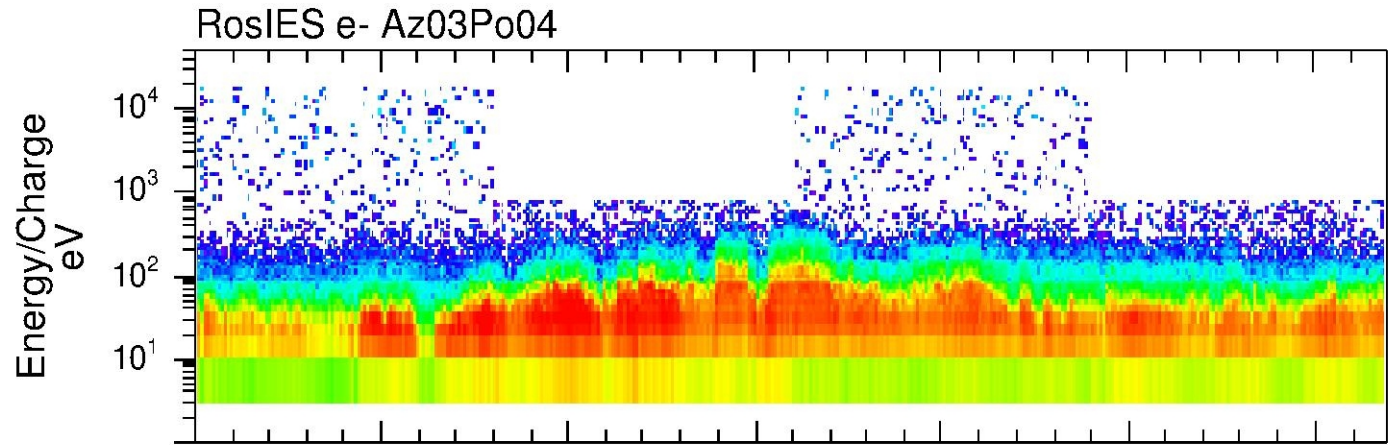
Electron
Comparison



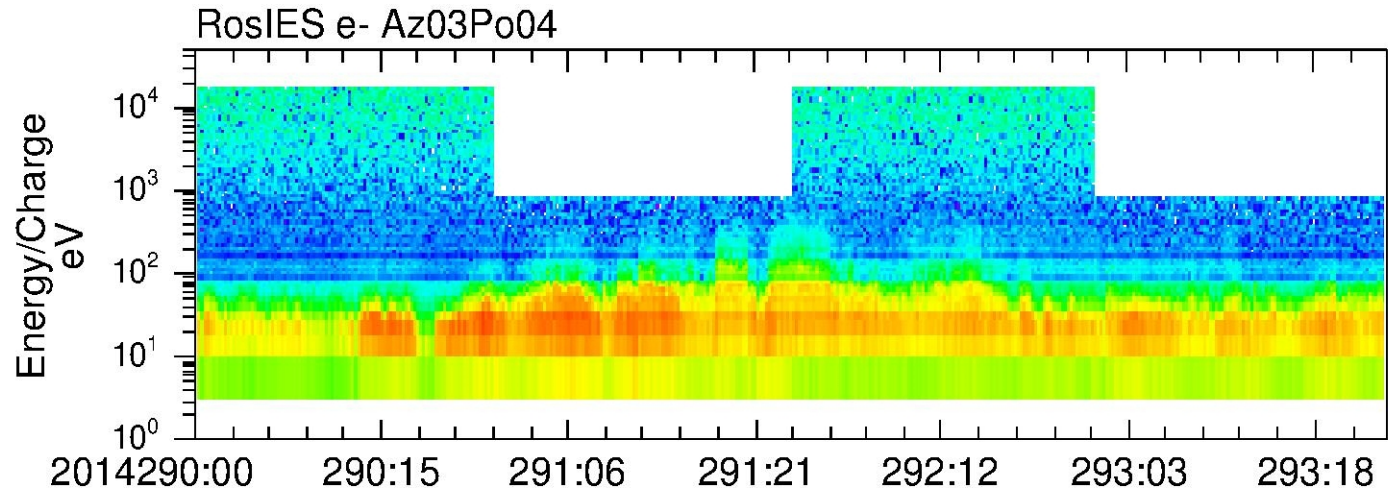
LOOKS
GOOD!!



Electron Background



Electron Flux

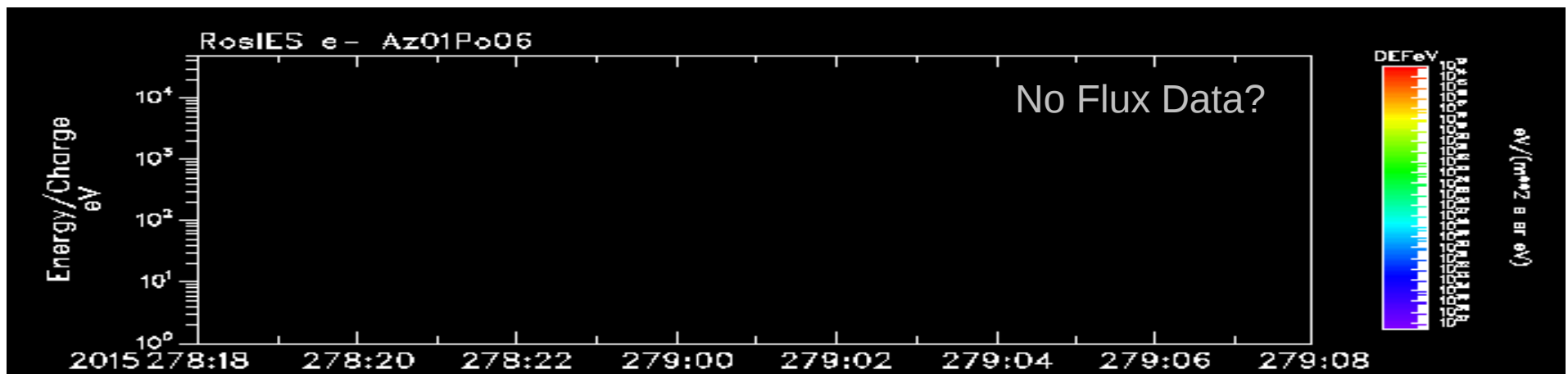
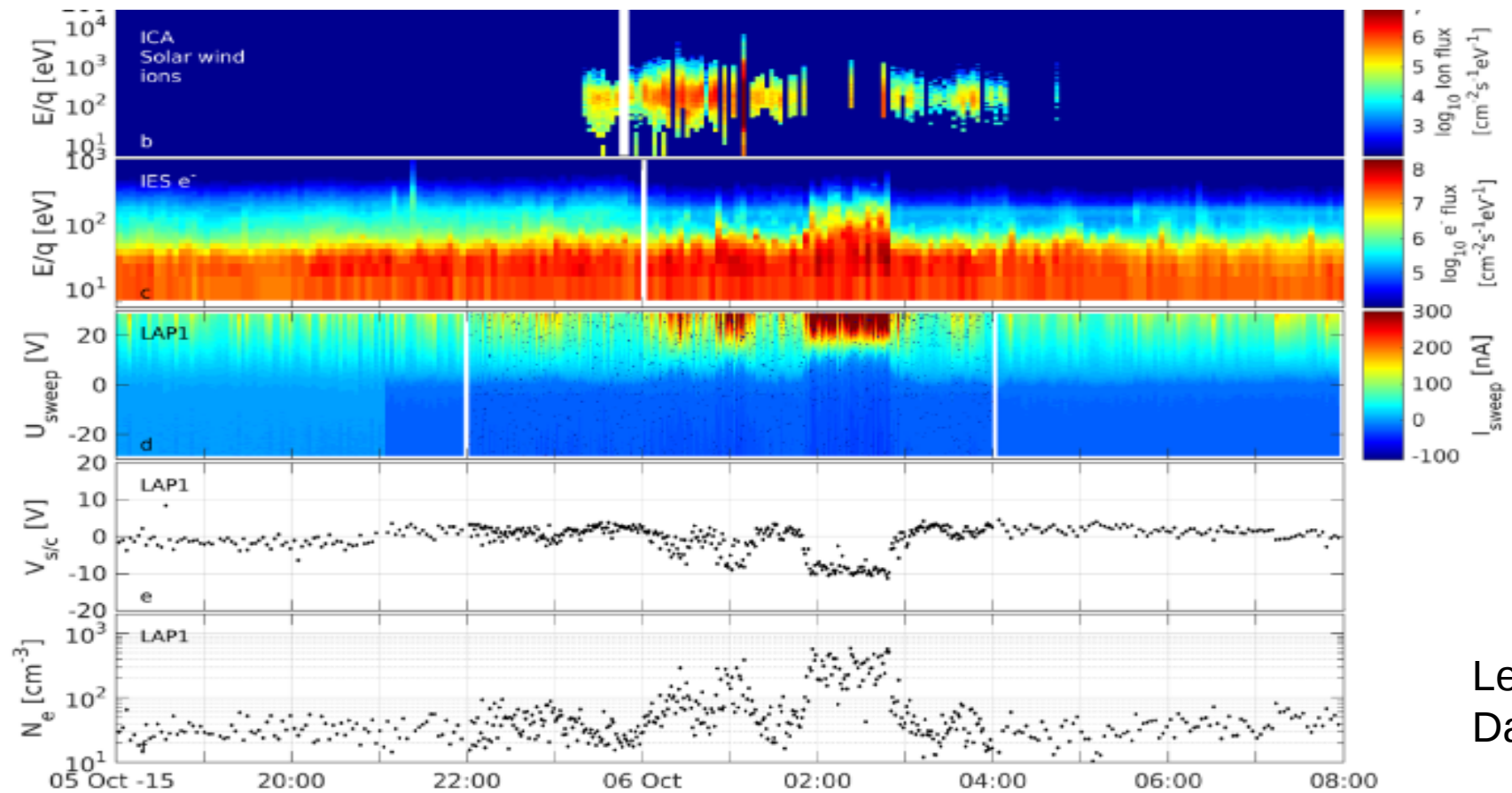


Flux Uncertainty

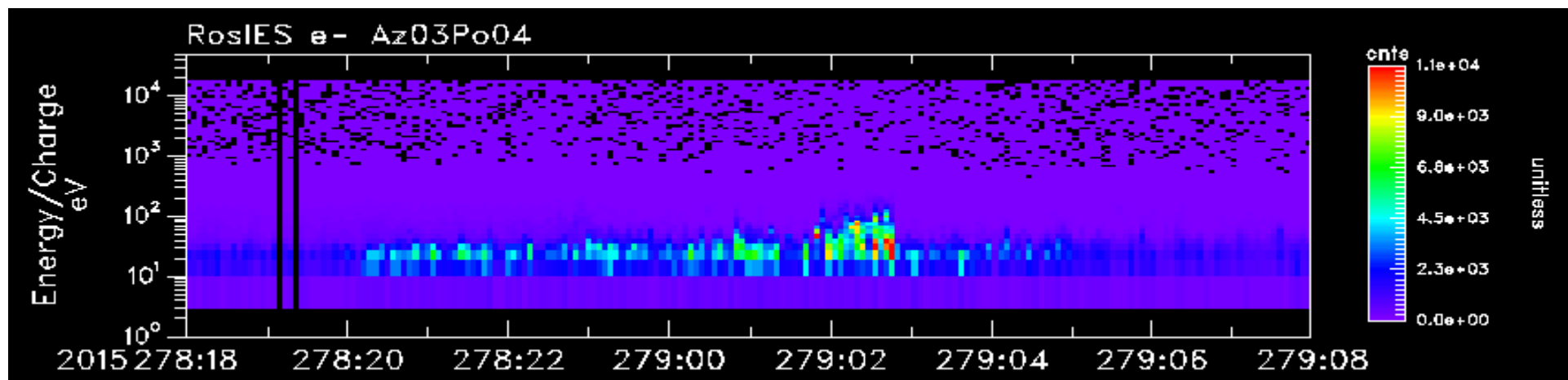
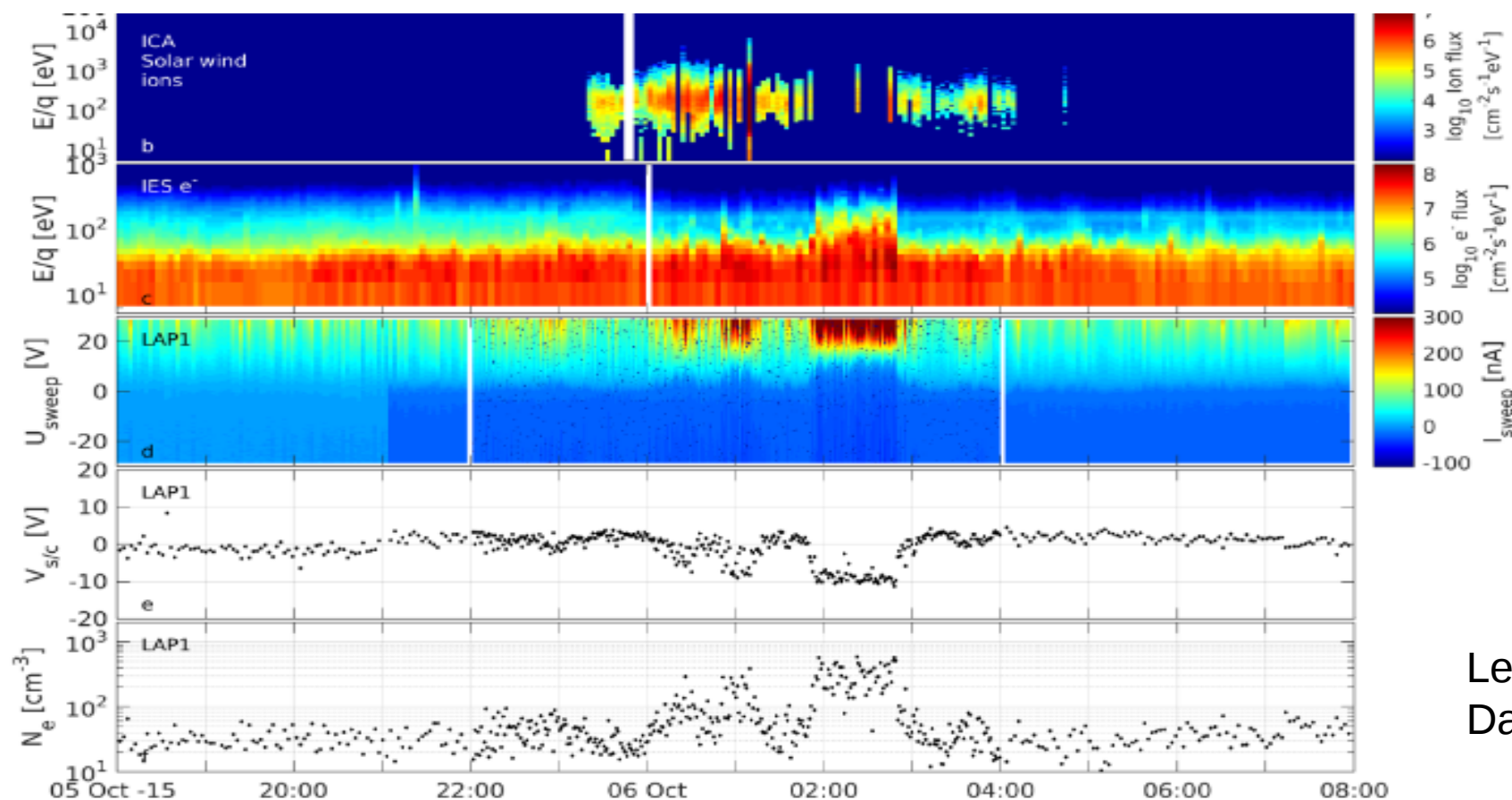
LOOKS
GOOD!!

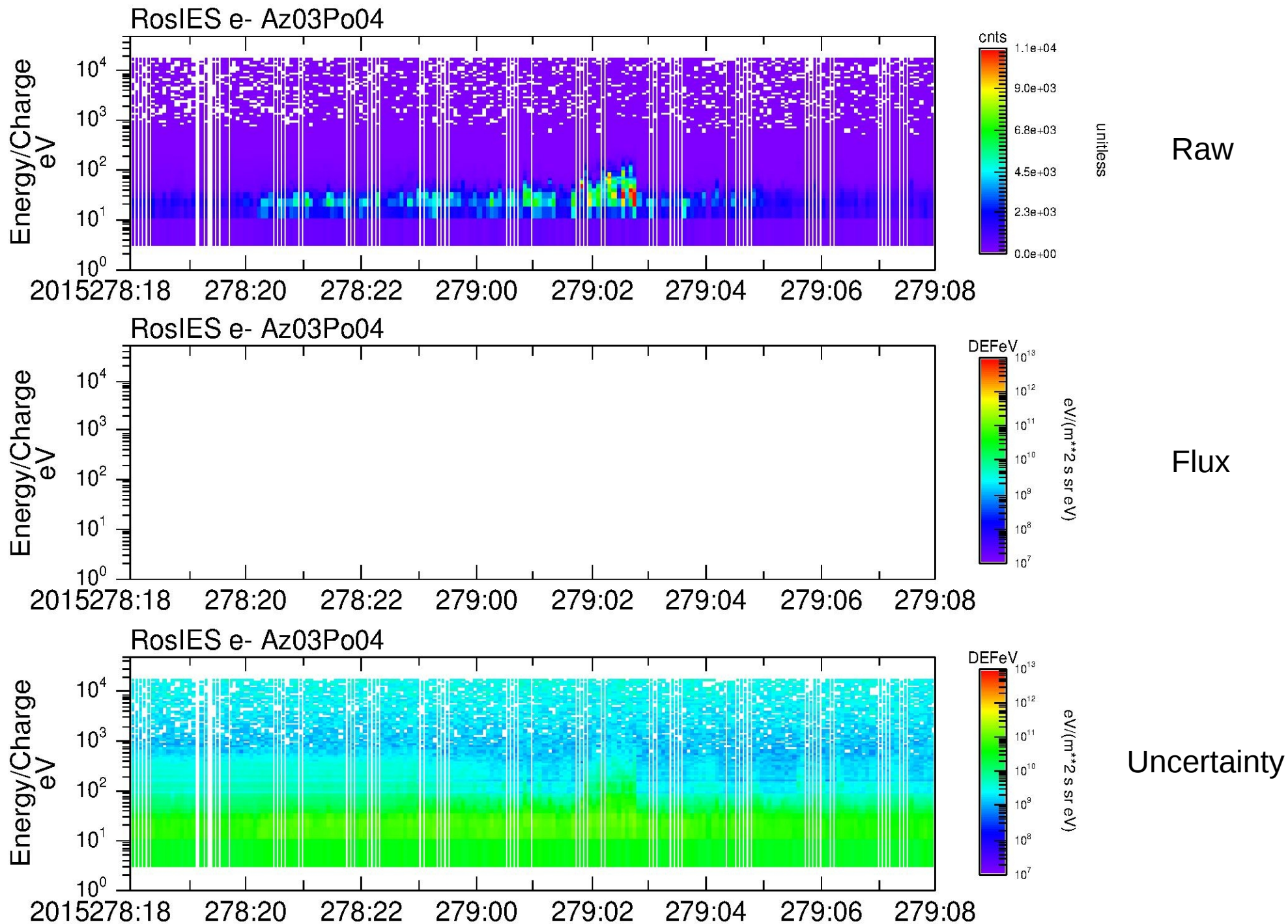
2014290:00 290:15 291:06 291:21 292:12 293:03 293:18

Edberg et al., ,CME impact on comet 67P/Churyumov-Gerasimenko, Royal Astronomical Society, *MNRAS*, **462**, S45-S56, doi:10.1093/mnras/stw2112, 2016.

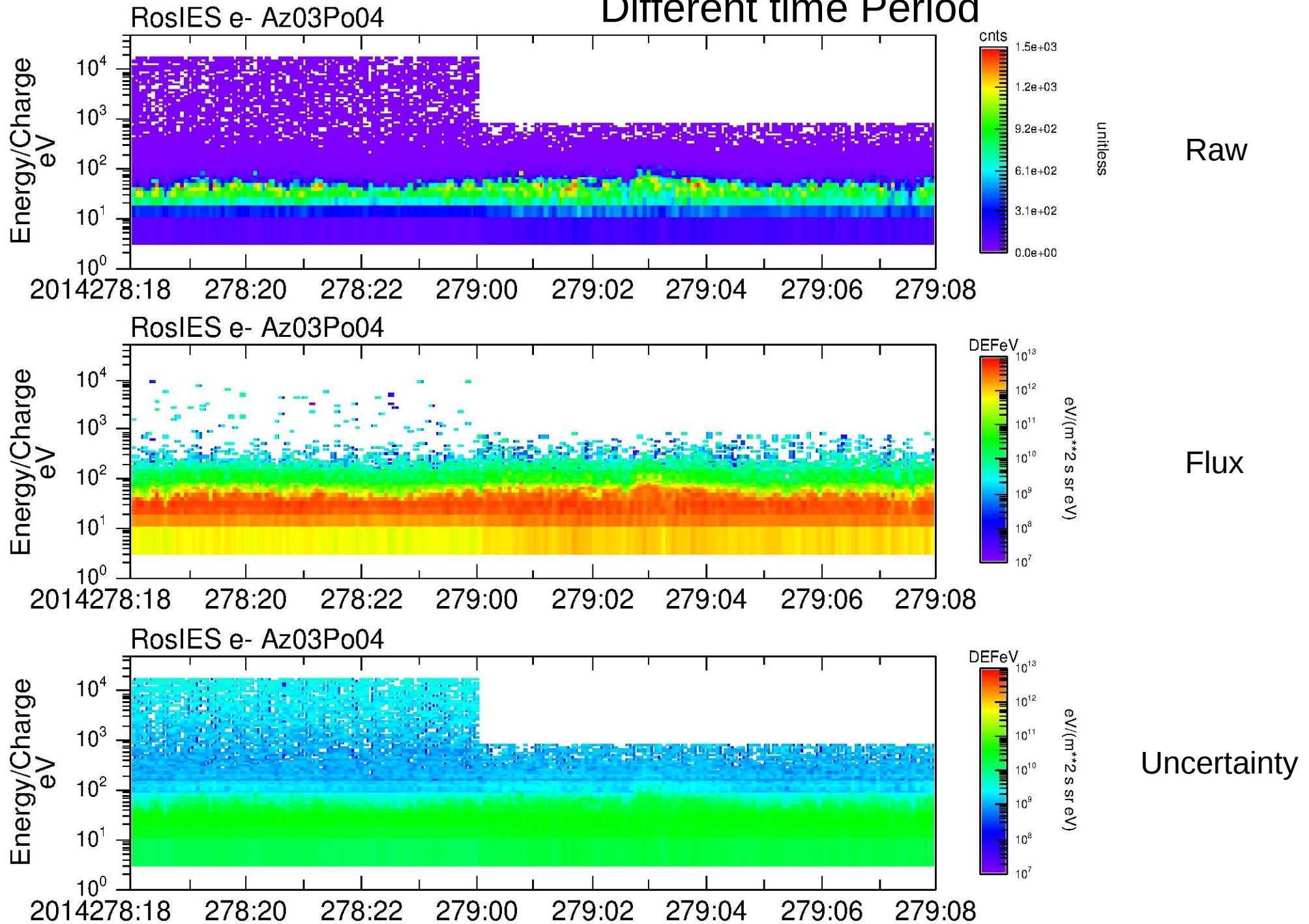


Edberg et al., ,CME impact on comet 67P/Churyumov-Gerasimenko, Royal Astronomical Society, *MNRAS*, **462**, S45-S56, doi:10.1093/mnras/stw2112, 2016.





Different time Period



Conclusion

The contents of the Level 3 Flux data file was examined to determine that there were non-zero Flux values. So I must have something incorrect in my definitions in order to produce the effect that is observed. This is probably ICA Mode related since the data draws correctly for other modes at other times.

Therefore, the Flux data file is proper and the fault is mine.

Backup Slides