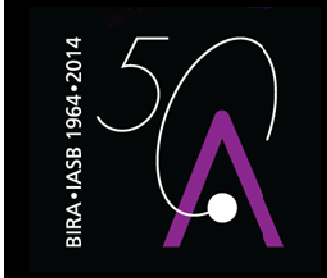


Royal Belgian Institute for Space Aeronomy (BIRA-IASB)

Université Catholique de Louvain

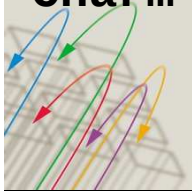
The space radiation observed by the Energetic Particle Telescope

Viviane PIERRARD

G. Lopez Rosson, J. Lemaire, M. Cyamukungu, S. Benck, S. Borisov

IAP

Charm



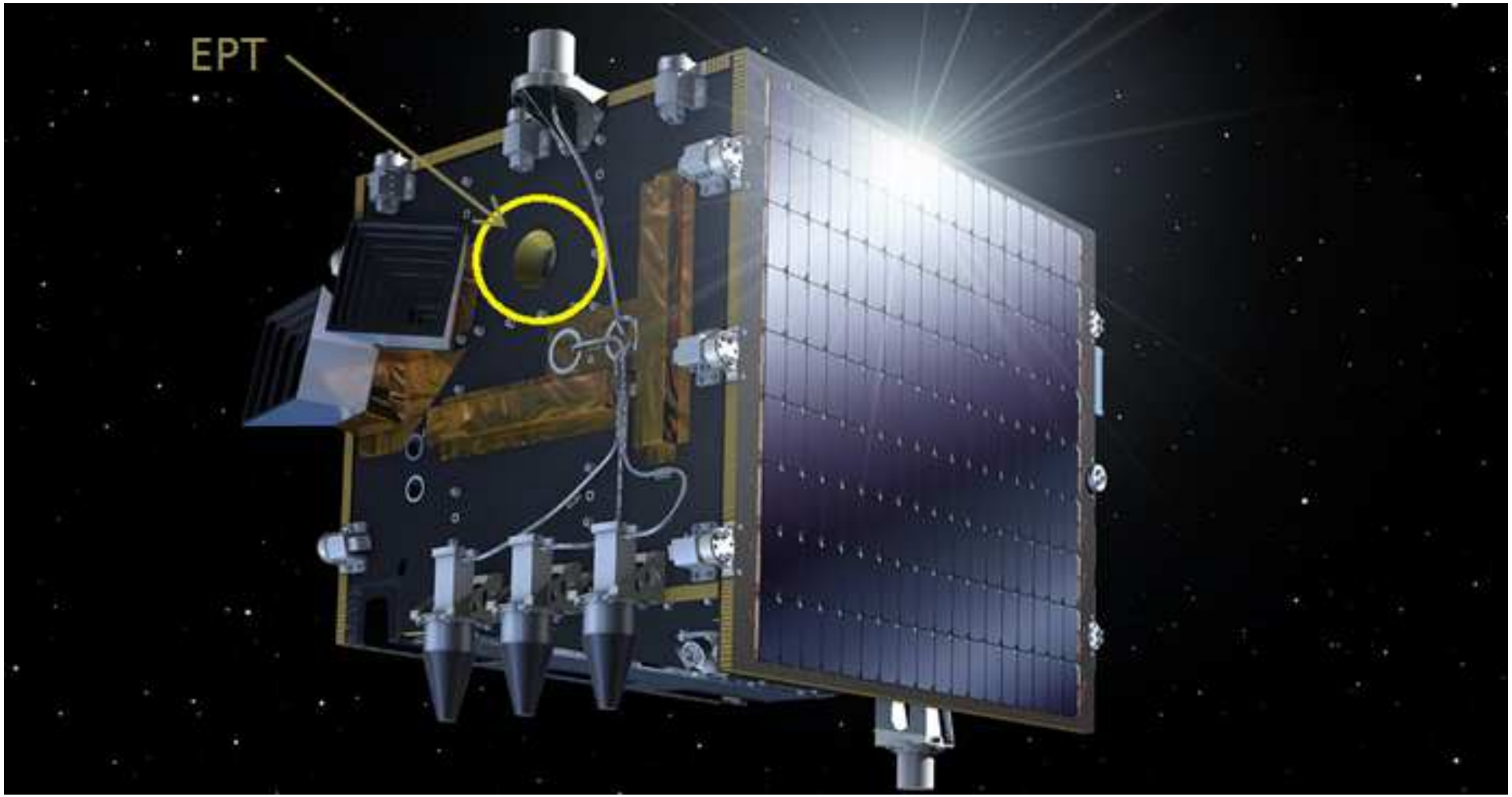
Politique Scientifique Fédérale

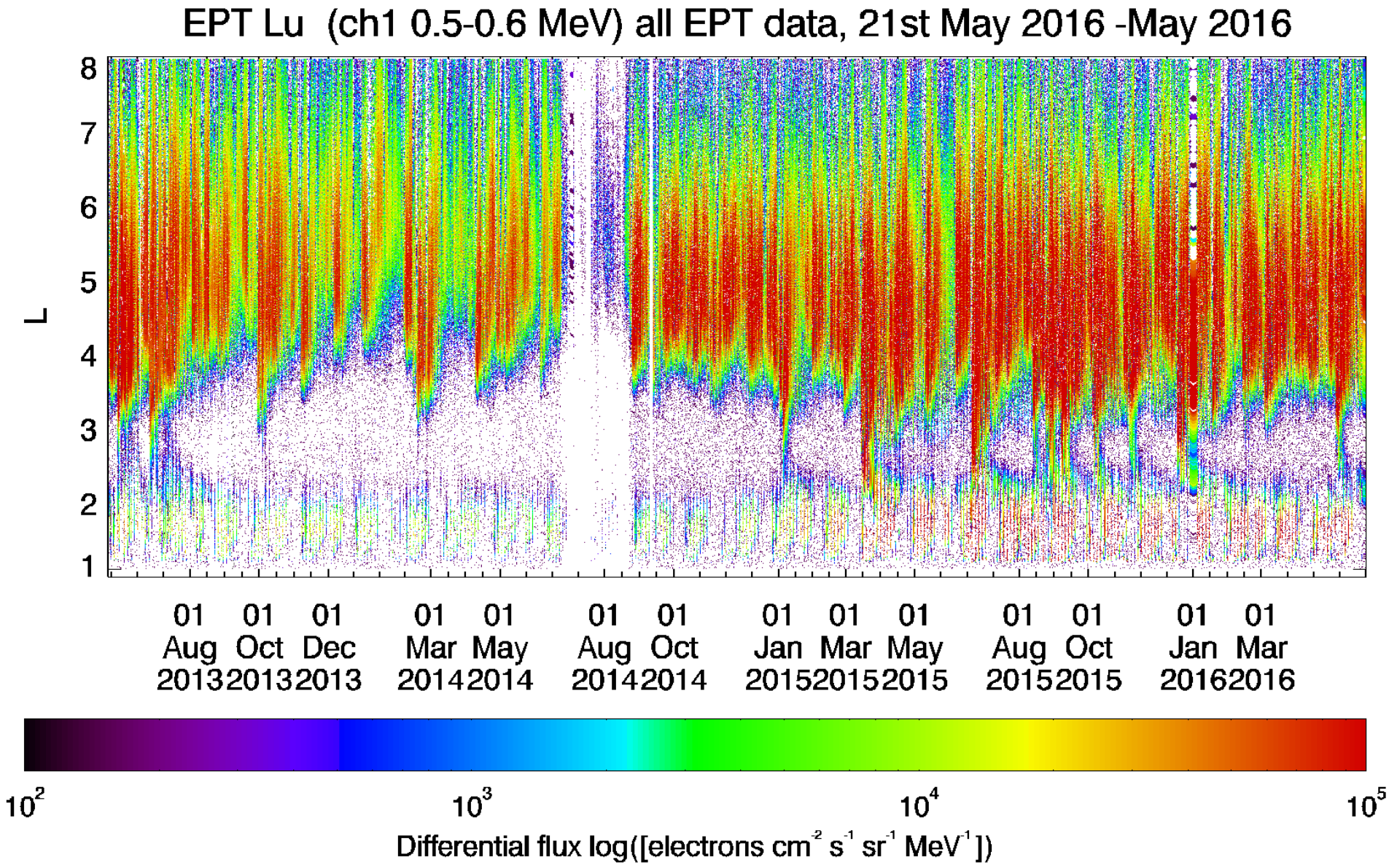
belspo

EPT on the satellite PROBA-V (launch on 7 May 2013)

Orbit: Polar LEO
Period: 121 min
Altitude: 820 km
Inclination: 98°

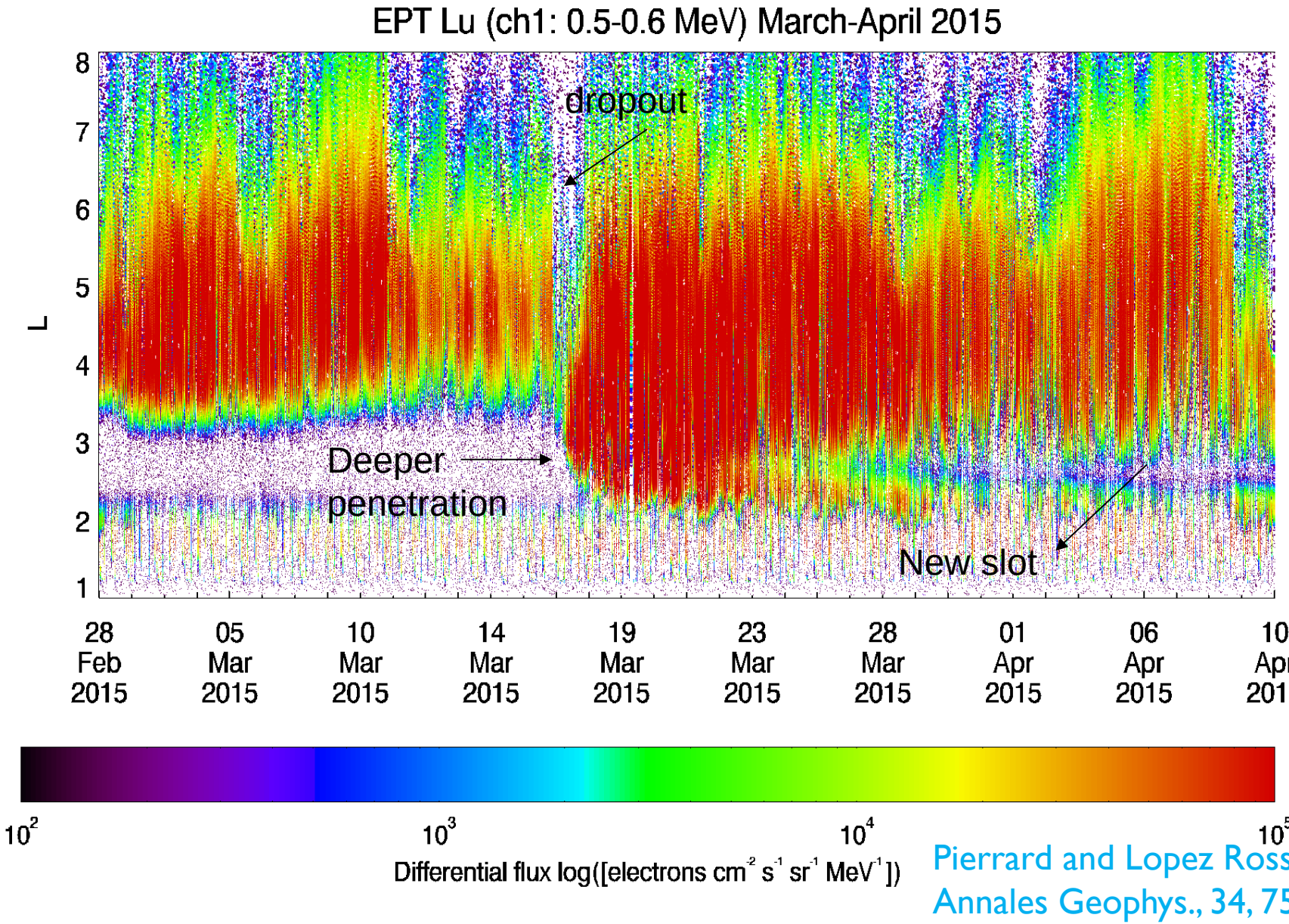
Electrons > 500 keV (7 channels)
Protons > 9.5 MeV (11 channels)
Helium ions > 38 MeV (11 channels)





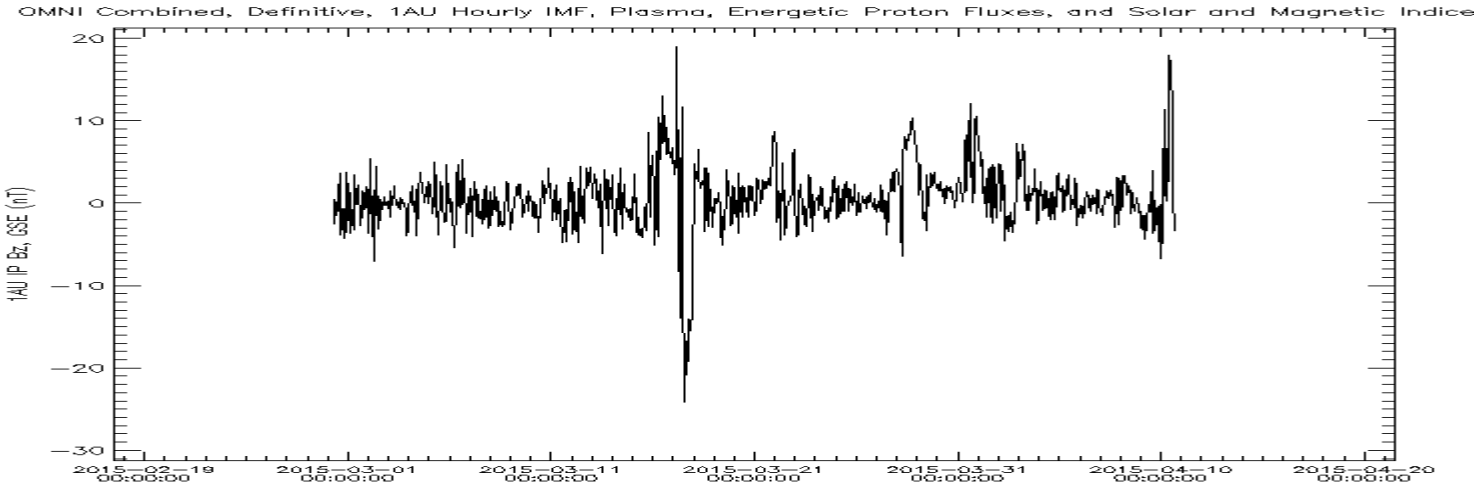
Time variations 2013-2016

St Patrick storm: 17 March 2015

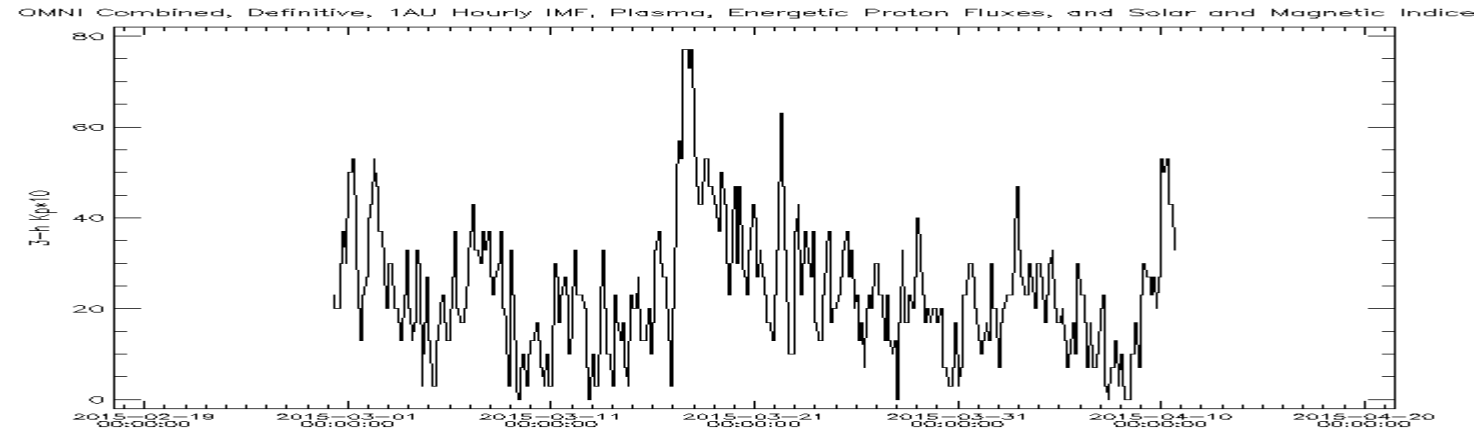


Pierrard and Lopez Rosson, Annales Geophys., 34, 75, 2016

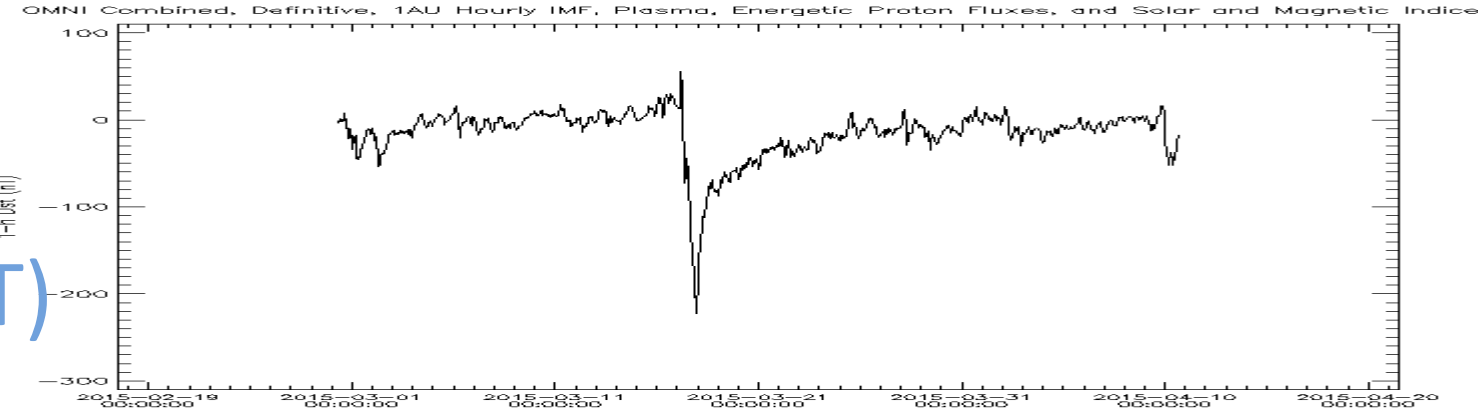
Bz

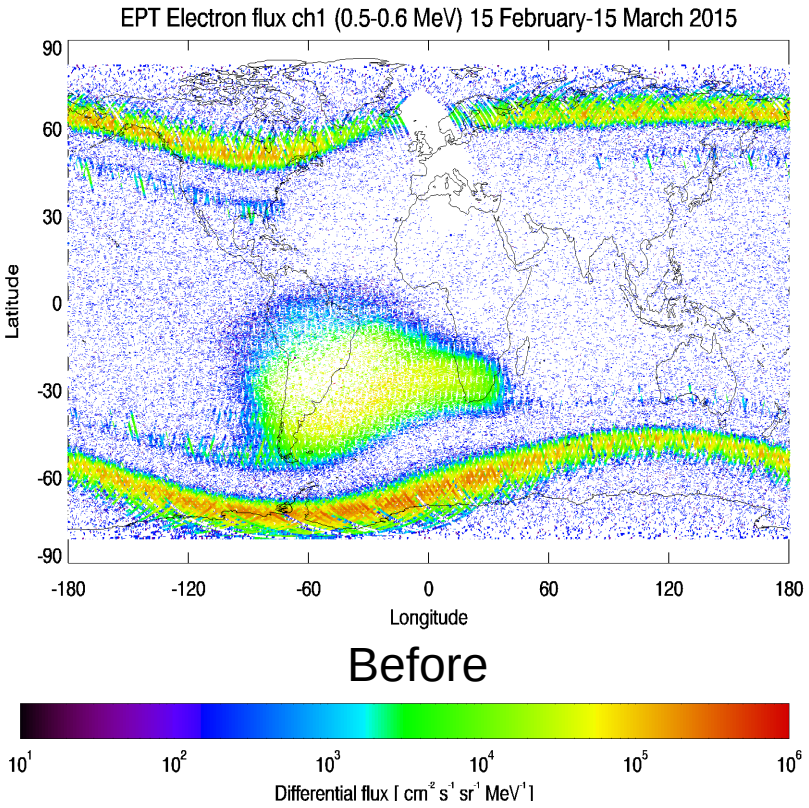


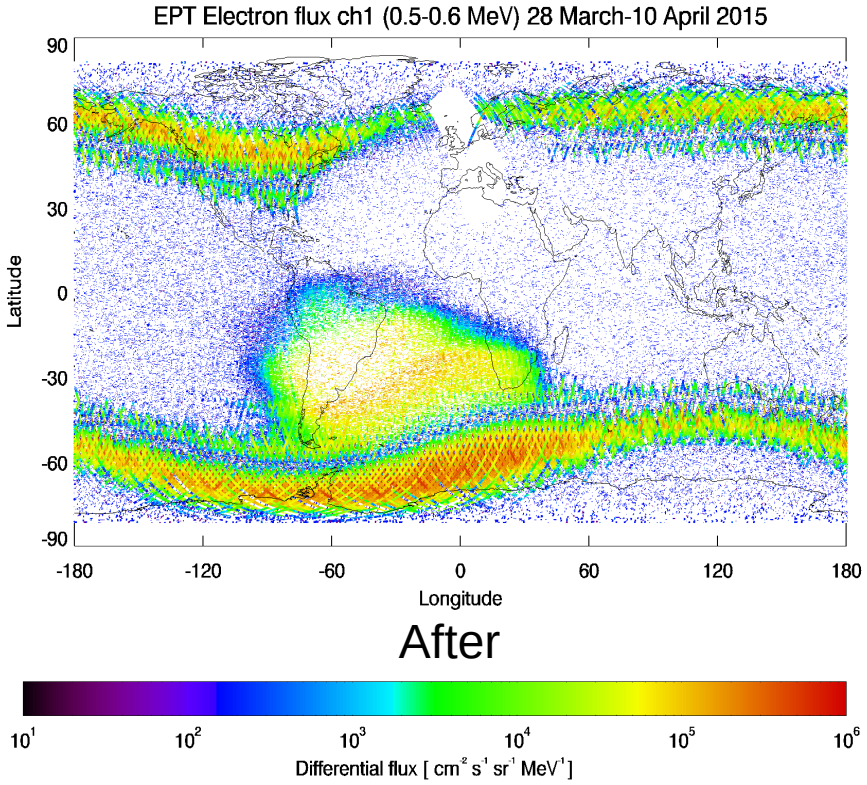
Kp

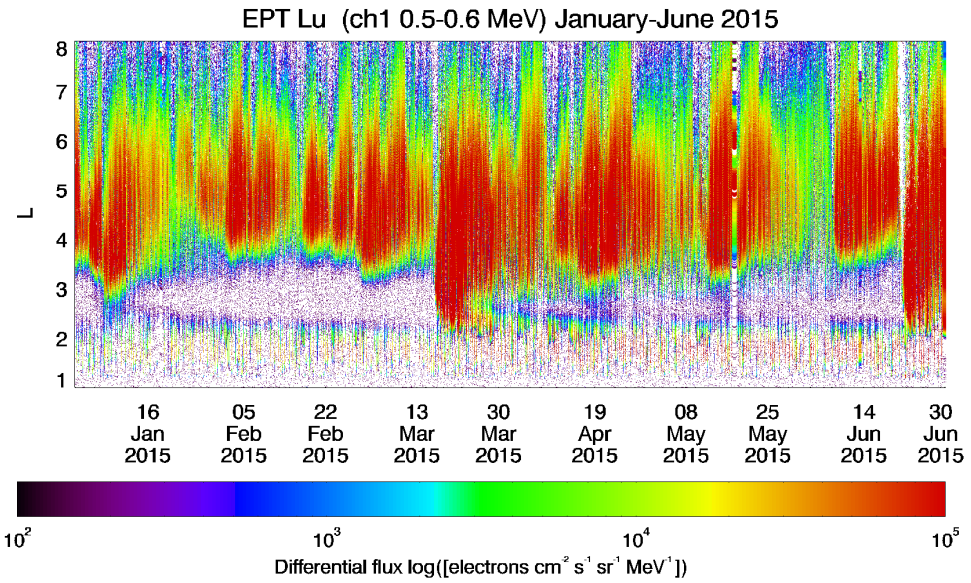


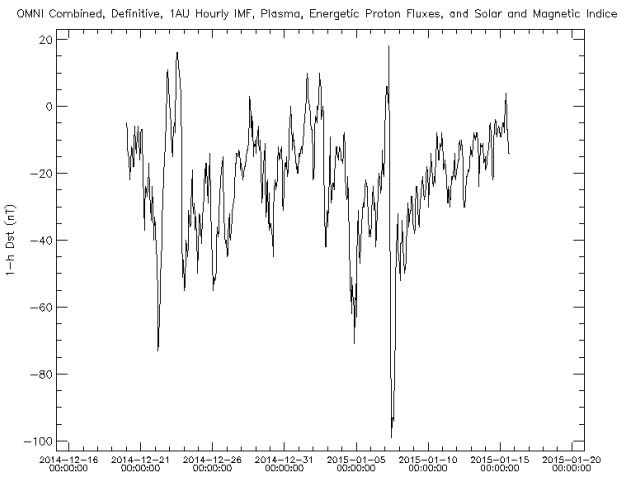
Dst
(-223 nT)

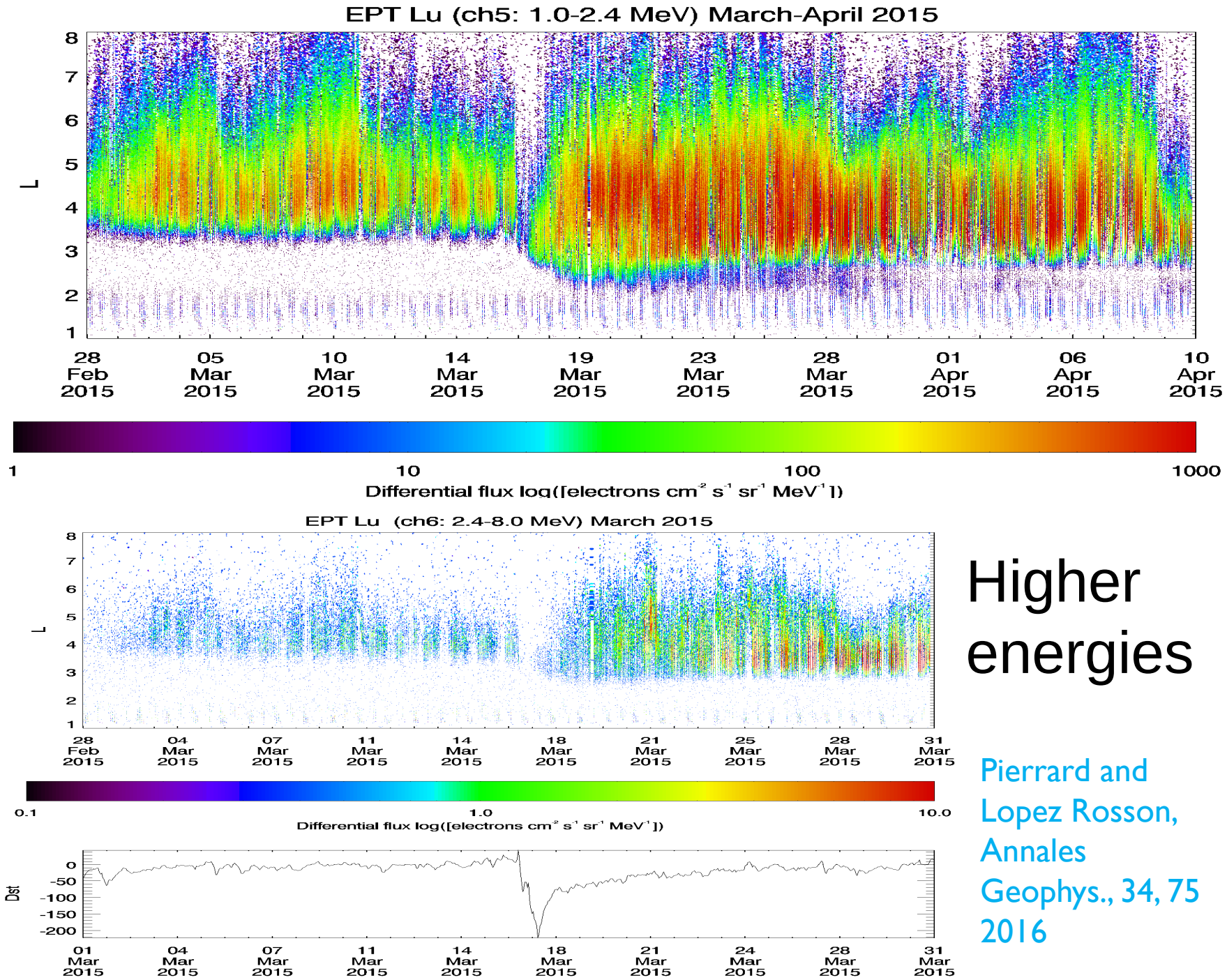



EPT Electron flux ch1 (0.5-0.6 MeV) 15 February-15 March 2015
Latitude
Longitude
Before
Differential flux [cm-2 s-1 sr-1 MeV-1]


EPT Electron flux ch1 (0.5-0.6 MeV) 28 March-10 April 2015
Latitude
Longitude
After
Differential flux [cm-2 s-1 sr-1 MeV-1]


EPT Lu (ch1 0.5-0.6 MeV) January-June 2015
L
16 Jan 2015
05 Feb 2015
22 Feb 2015
13 Mar 2015
30 Mar 2015
19 Apr 2015
08 May 2015
25 May 2015
14 Jun 2015
30 Jun 2015
Differential flux log([electrons cm-2 s-1 sr-1 MeV-1])

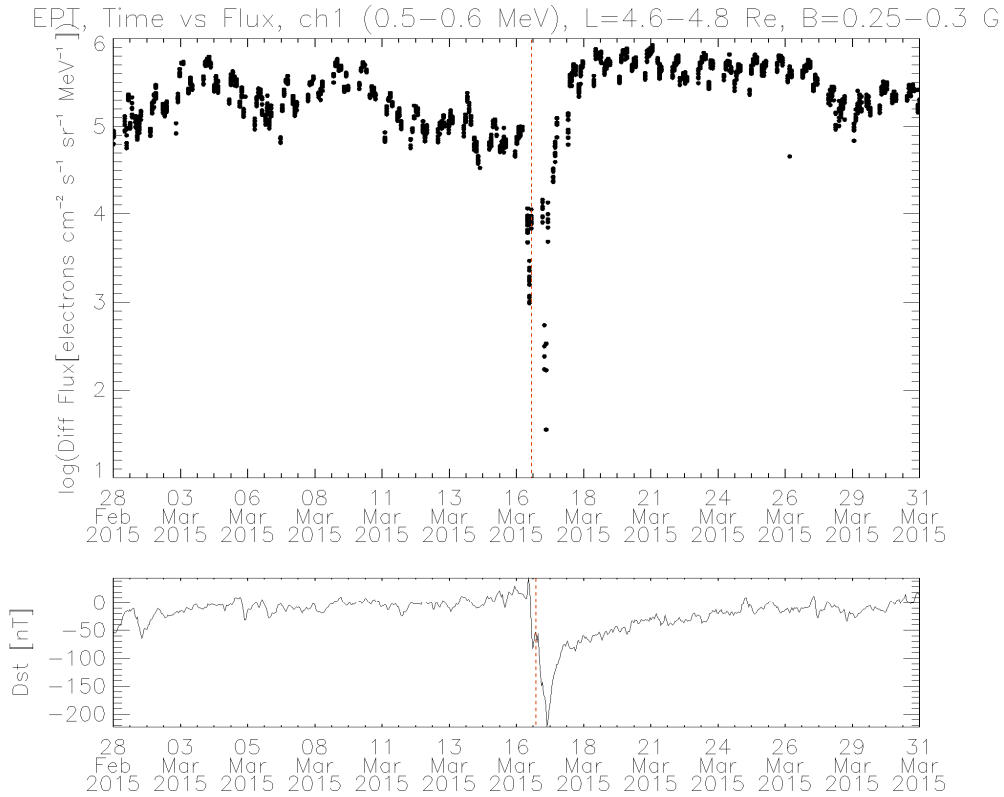

OMNI Combined, Definitive, 1AU Hourly IMF, Plasma, Energetic Proton Fluxes, and Solar and Magnetic Indice
1-h Dst (nT)

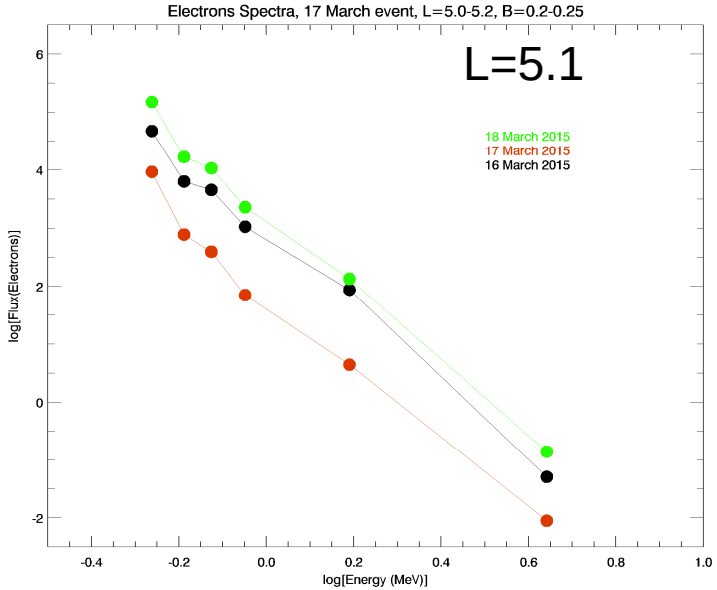


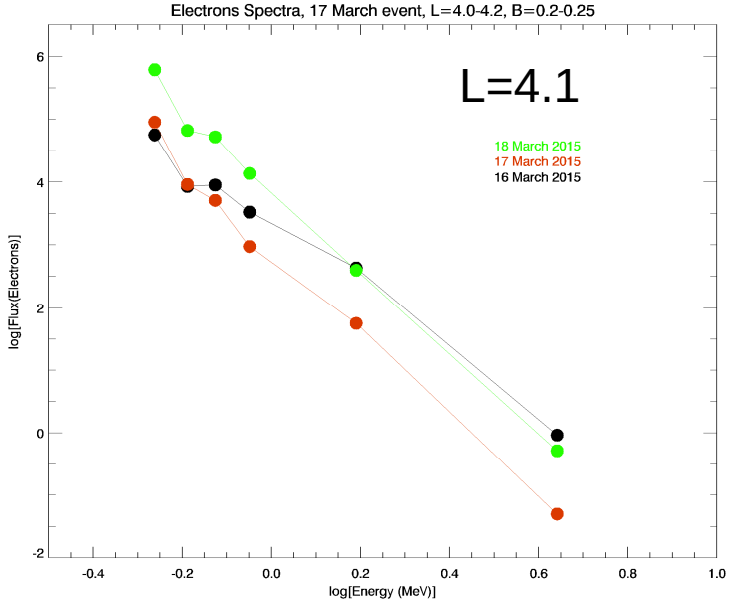
Higher energies

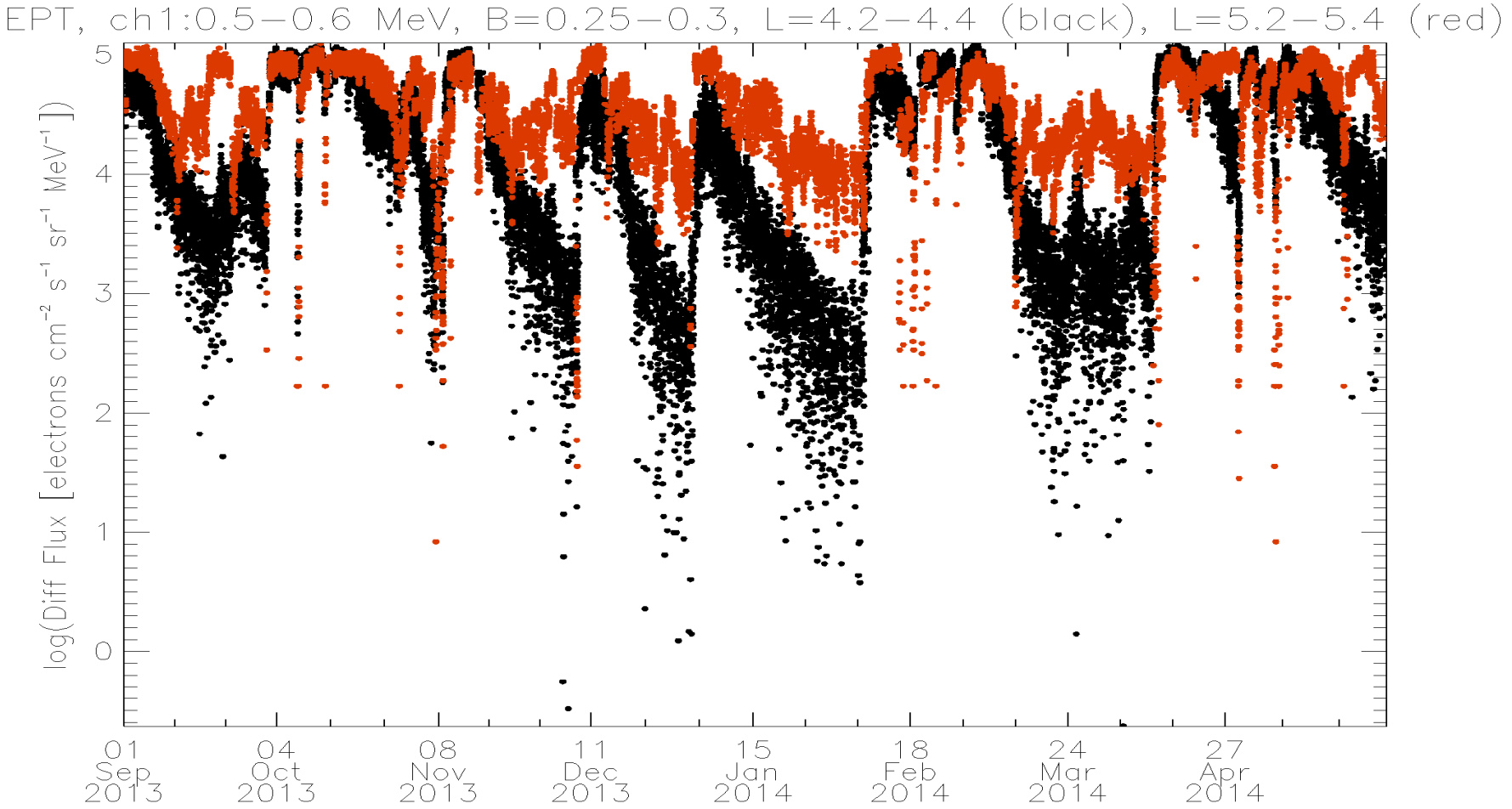
Pierrard and Lopez Rosson, Annales Geophys., 34, 75 2016

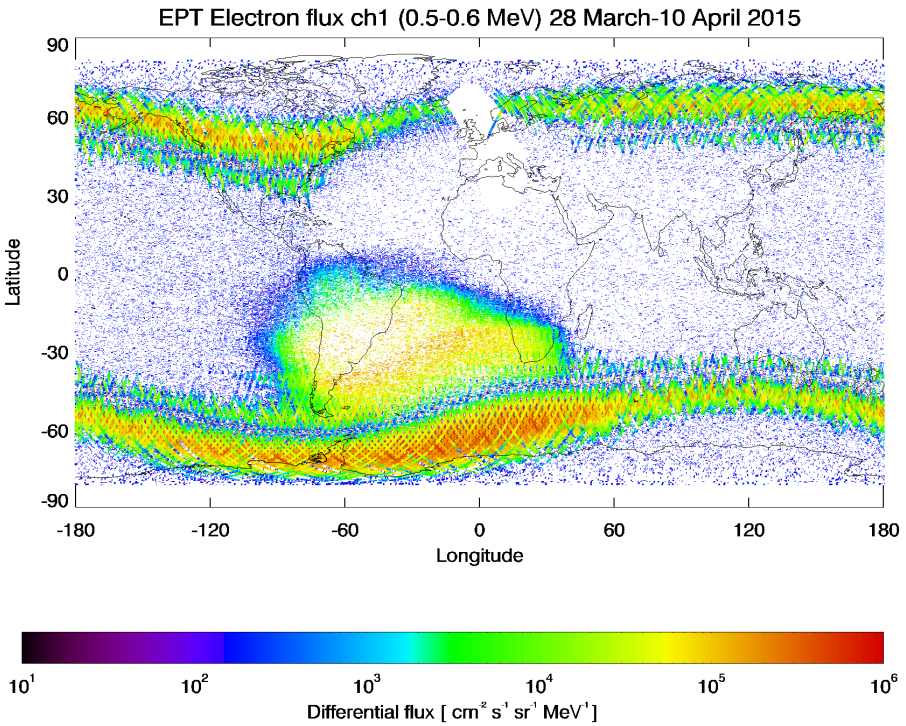
Dropout on 17 March 2015

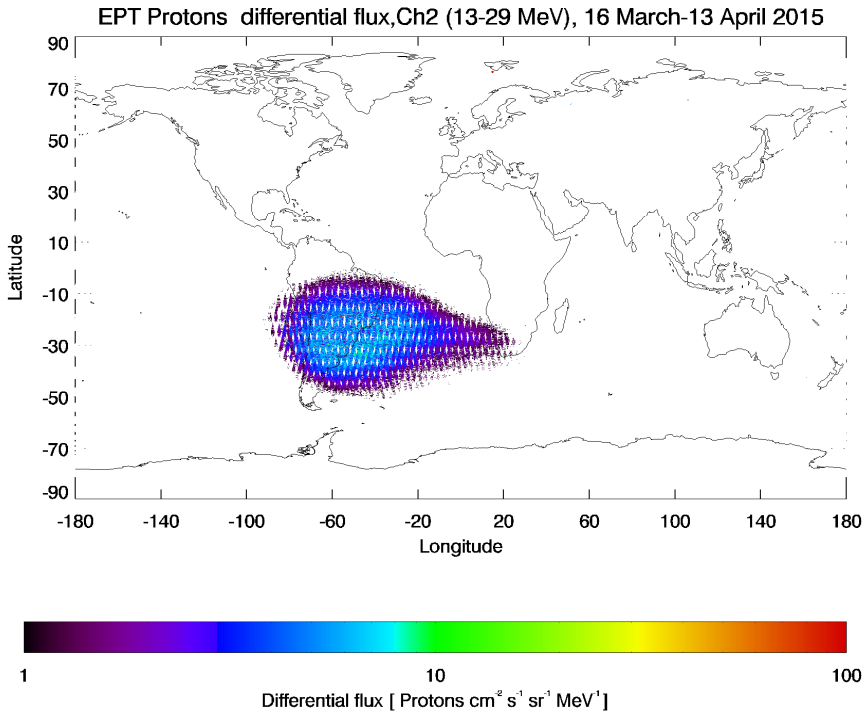






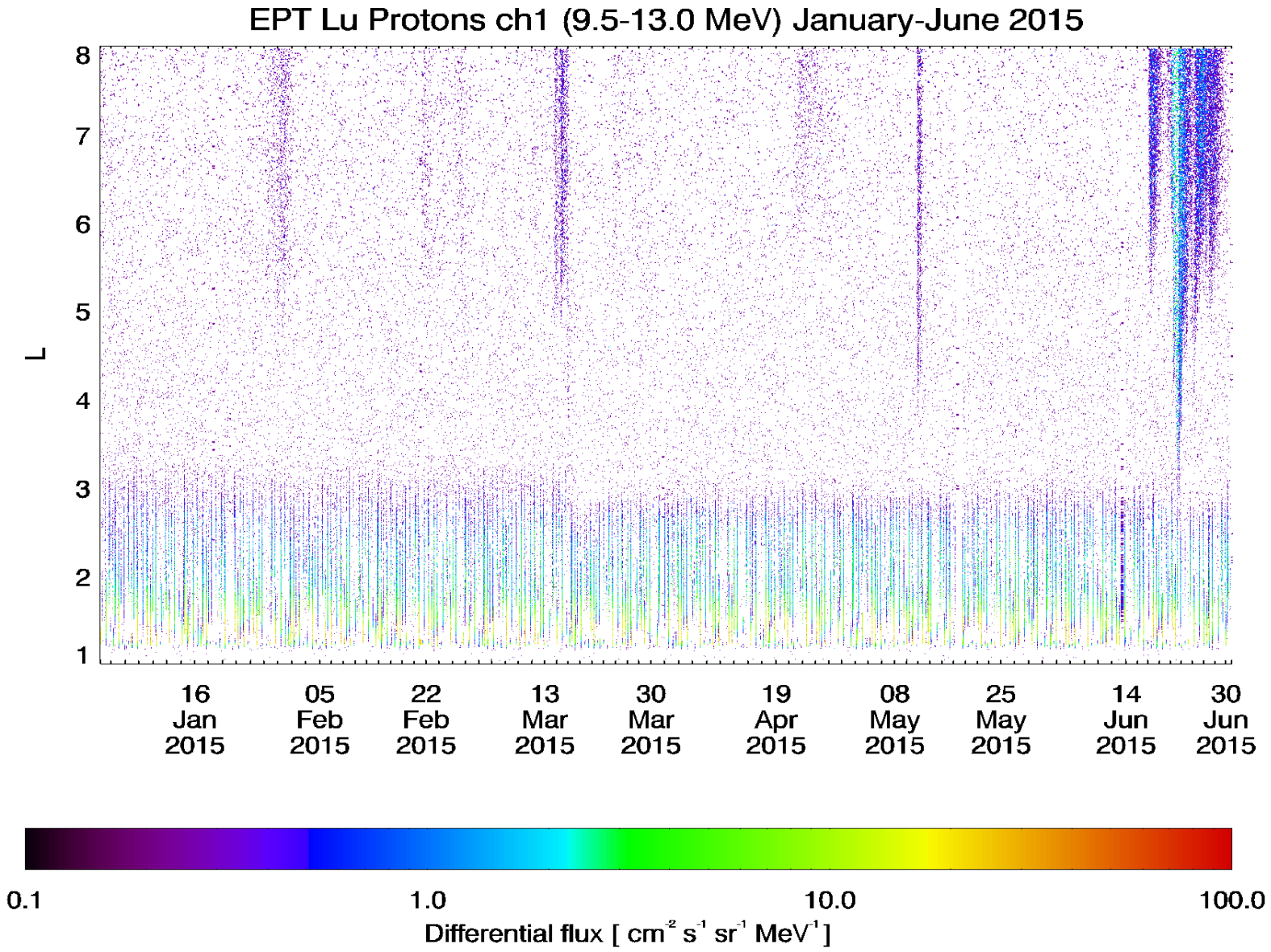

EPT, ch1:0.5−0.6 MeV, B=0.25−0.3, L=4.2−4.4 (black), L=5.2−5.4 (red)
log(Diff Flux [electrons cm^{-2} s^{-1} sr^{-1} MeV^{-1}])
5
4
3
2
1
0
01 Sep 2013
04 Oct 2013
08 Nov 2013
11 Dec 2013
15 Jan 2014
18 Feb 2014
24 Mar 2014
27 Apr 2014





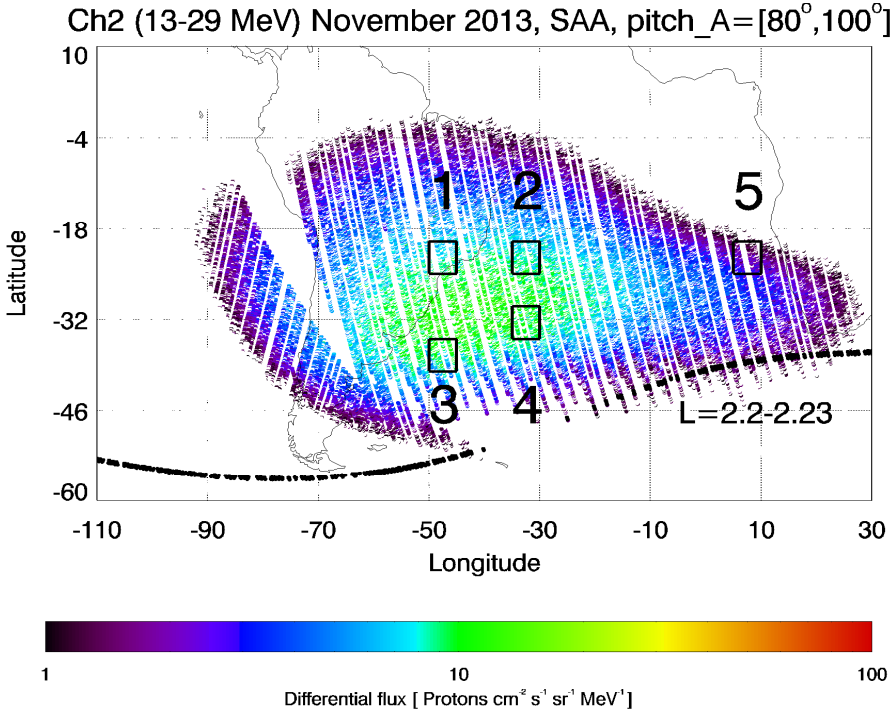
After the apparition of the new slot

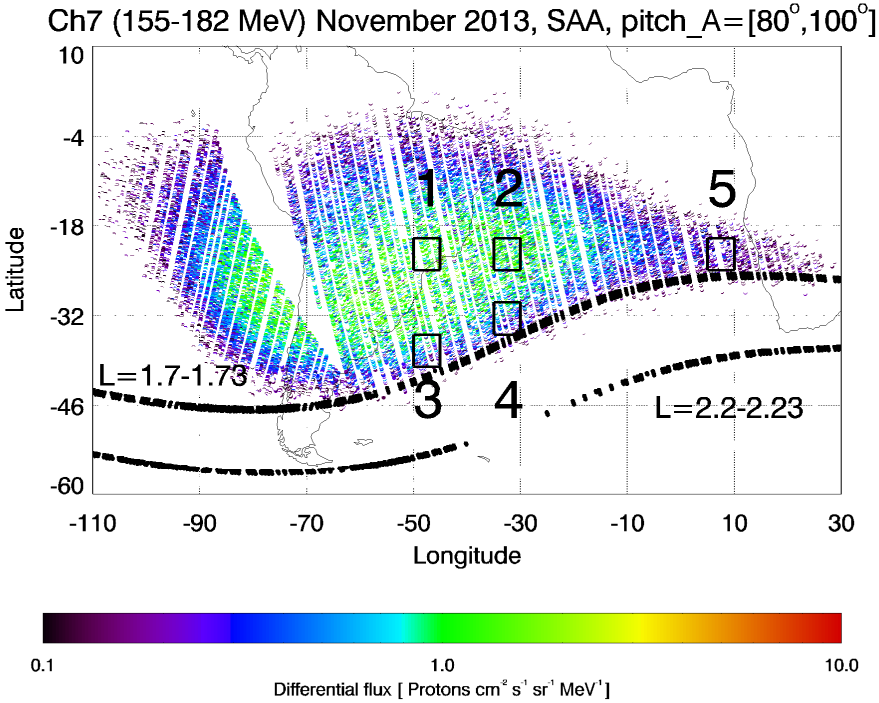
Protons

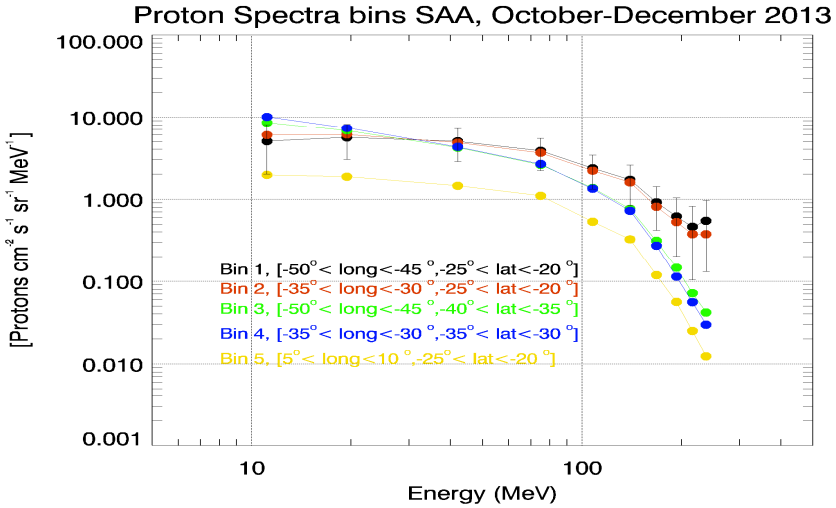


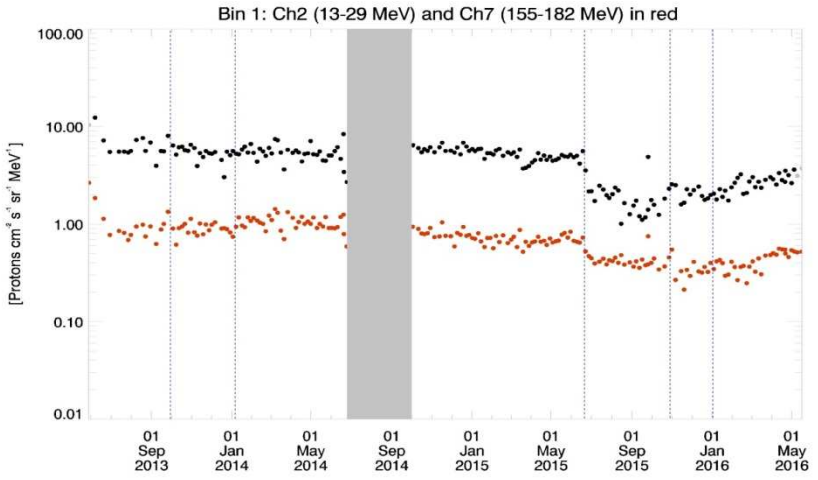
Pierrard and Lopez Rosson, Annales Geophys., 34, 75 2016

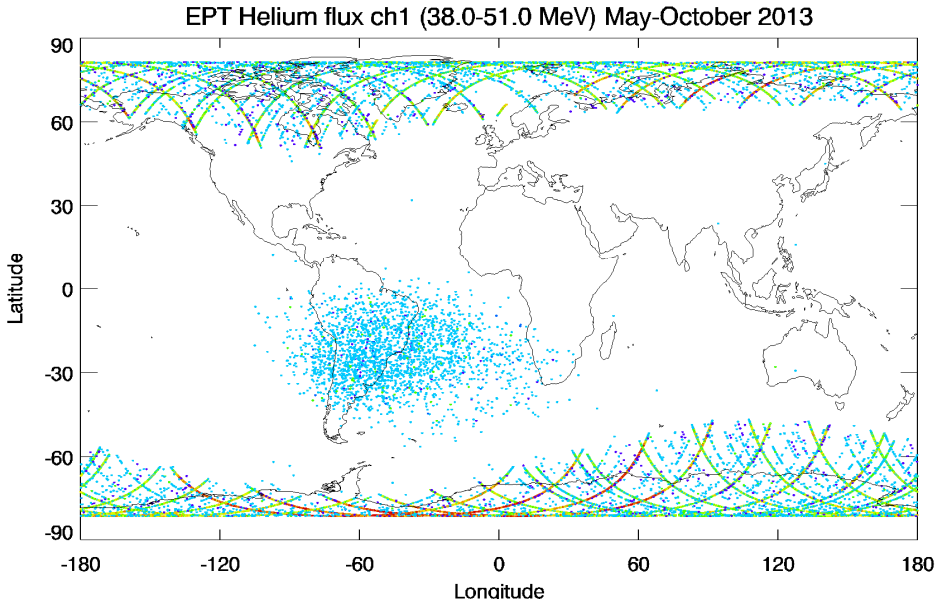
Lopez Rosson and Pierrard, Adv. Space Res., 60, 796, 2017.

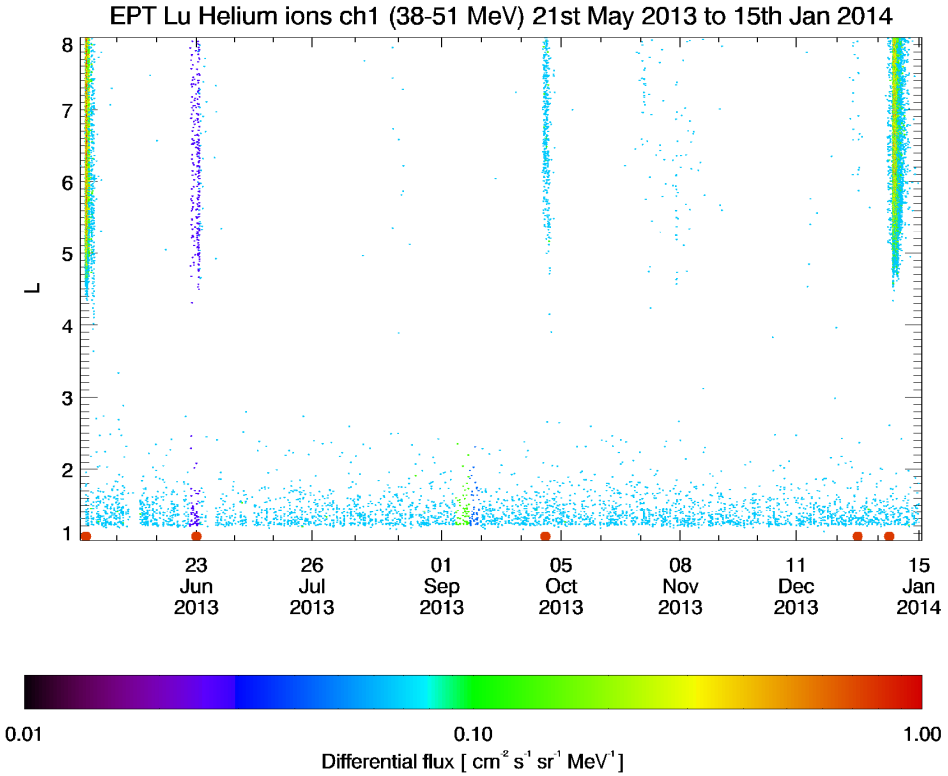












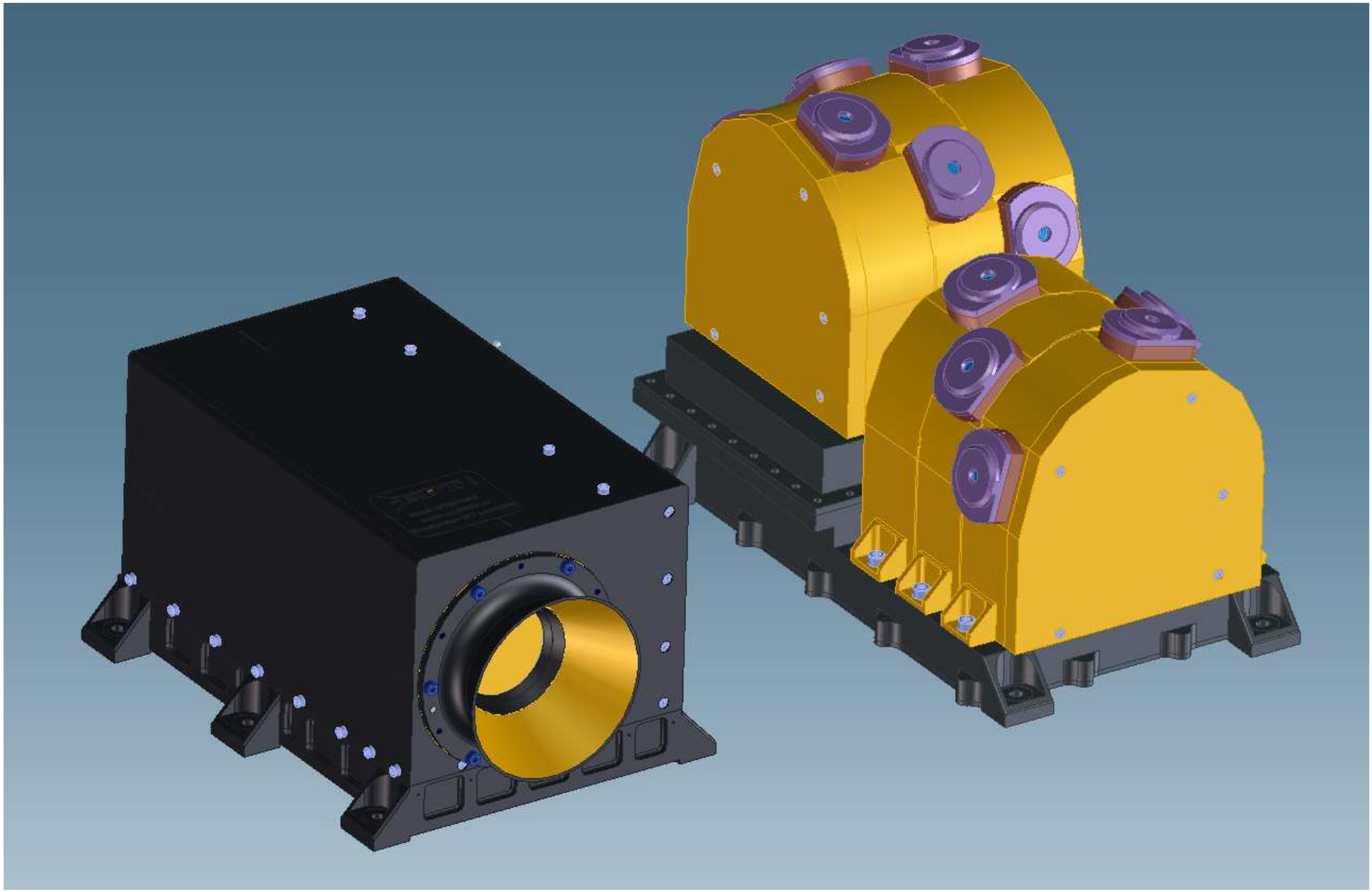
Helium ions Channel 1 (38-51 MeV)

16 May to 21 October 2013

Injection during SEP events

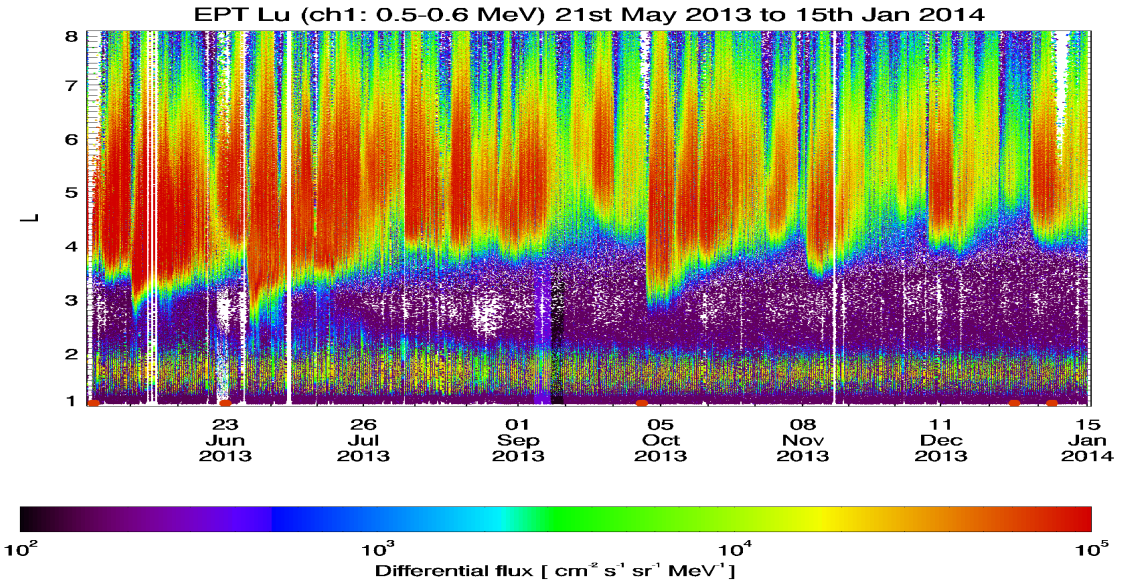
Pierrard et al., Space Sci. Rev. 184, 87, 2014

EPT and 3DEES

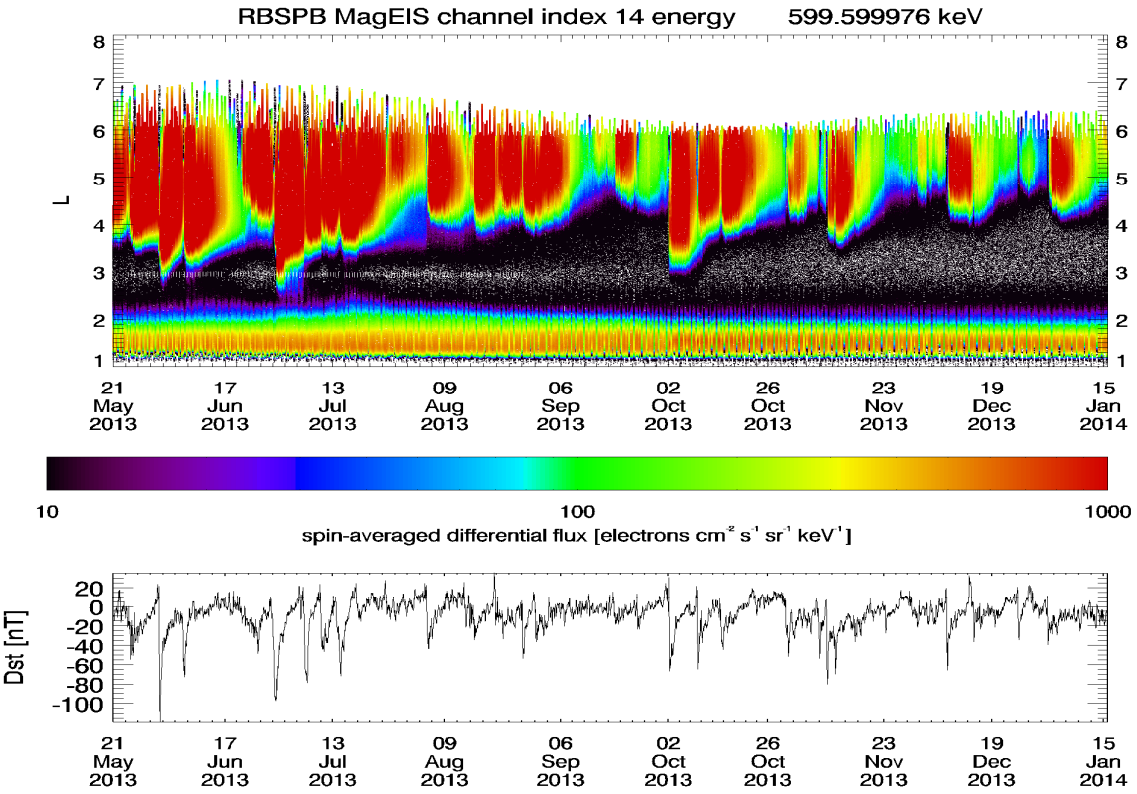


Conclusions

- New performant detector EPT (and 3DEES in development)
- Higher geomagnetic activity in 2015
- Analysis of dropout events, geomagnetic storms (electrons)
- Injections during SEP events (protons)
- Analysis of spectra and fits
- Understand the physical processes (sources and losses, links with plasmasphere…)
- Comparisons with other satellite data (VAP, Cluster, GOES, SAC-D…) and models (AE-8, AP-8, …)



PROBA-V/EPT



VAN ALLEN PROBE/MAGEIS

Pierrard et al., Space Sci. Rev. 184, 87, 2014