

# High energy particle observation at GEO obtained from Space Environment Data Acquisition Monitor (SEDA) onboard Himawari-8

T. Nagatsuma (NICT)

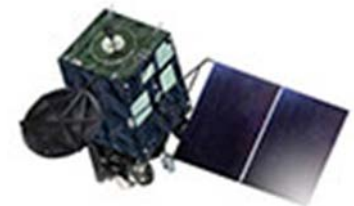
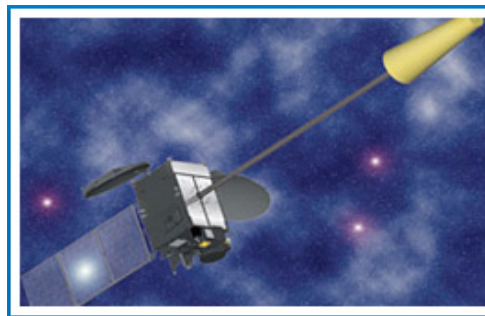
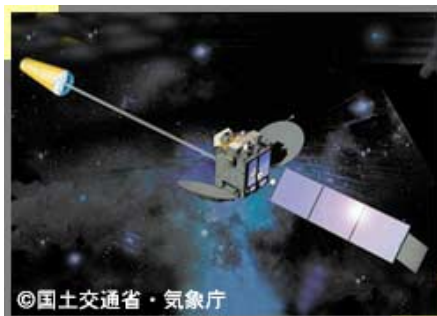
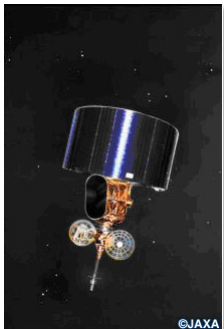
# History of Japanese Meteorological Satellite

- GMS-1 (Himawari-1) 1977/07/14~
- GMS-2 (Himawari-2) 1981/08/11~
- GMS-3 (Himawari-3) 1984/08/03~
- GMS-4 (Himawari-4) 1989/09/06~
- GMS-5 (Himawari-5) 1995/03/18~
- MTSAT-1R (Himawari-6) 2005/02/26~
- MTSAT-2 (Himawari-7) 2006/02/18~
- Himawari-8 2014/10/07~
- Himawari-9 2016 (Plan)

**Space  
Environment  
Monitor (SEM)**

**Gap of Space  
Environment  
Monitoring**

**Space  
Environment  
Data Acquisition  
Monitor (SEDA)**



# Space Environment Data Acquisition Monitor (SEDA) onboard Himawari-8,9



Items	Description
Number of Channels	Protons : 8 (individual 8 sensor elements)
	Electrons : 8 (8 stacked plates in one elements)
Energy Range	Protons : 20 MeV – 100 MeV Electrons : 0.2 MeV – 5 MeV
Time Resolution	10 sec.
Field of View	Protons : $\pm 39.35$ deg. Electrons : $\pm 78.3$ deg.



- High-energy particle environment over Japanese sector will be monitored by SEDA.
- Near-real time SEDA data is provided from JMA to NICT. We will provide SEDA data as part of space weather information.

Longitude:  $\sim 140$  deg.

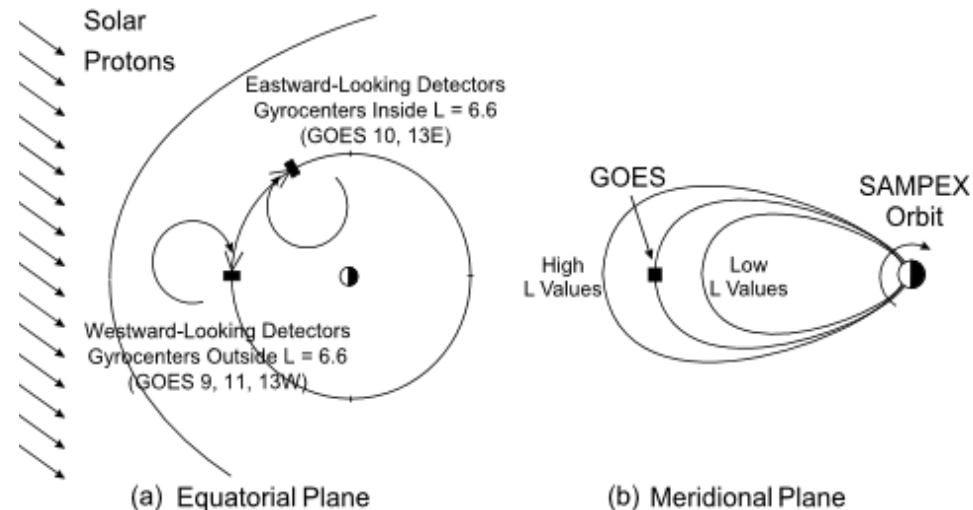
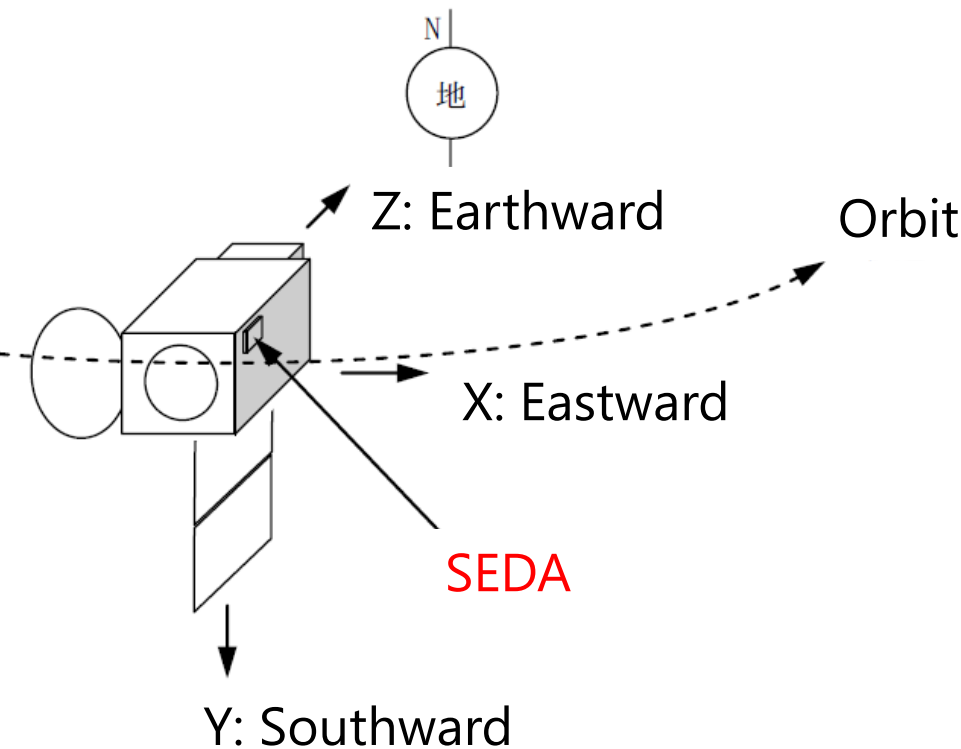
Himawari-8 Launch: 2014/10/07

Himawari-9 Launch; 2016

**SEDA observation is started at Nov. 03, 2014.**

# Looking Direction of SEDA

SEDA measures Proton fluxes inside of GEO.

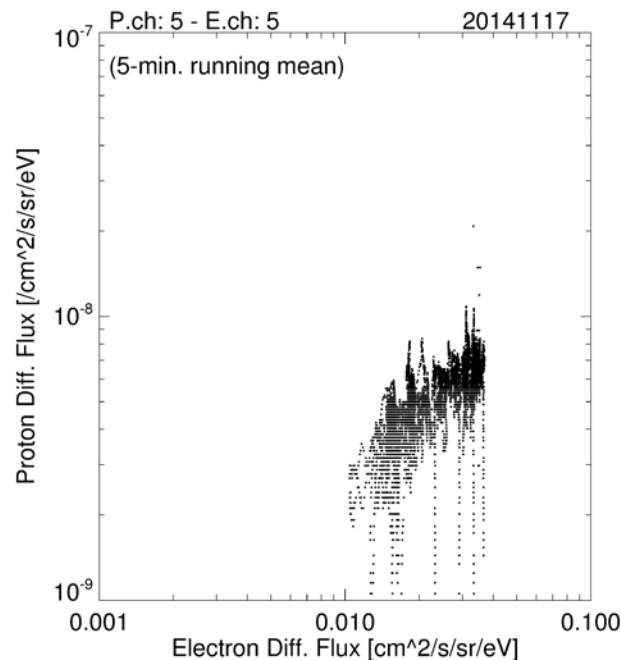


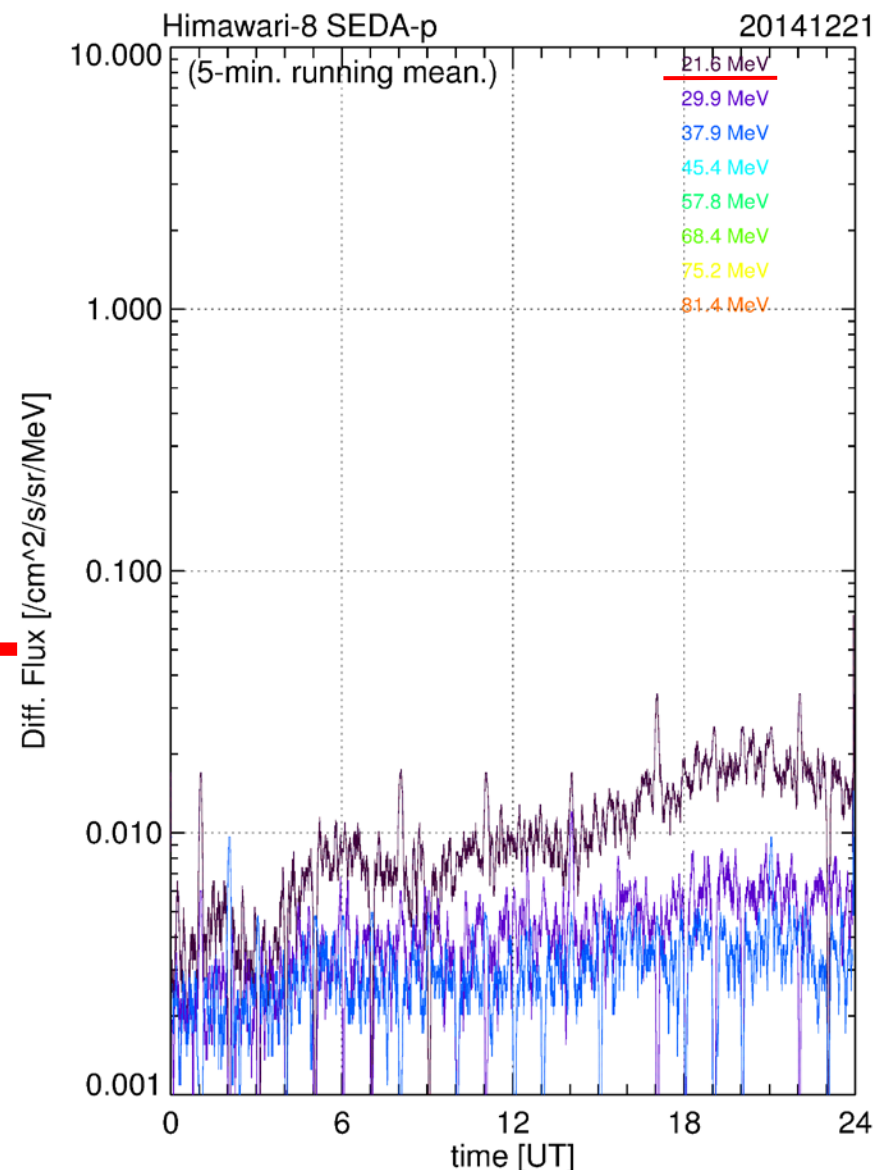
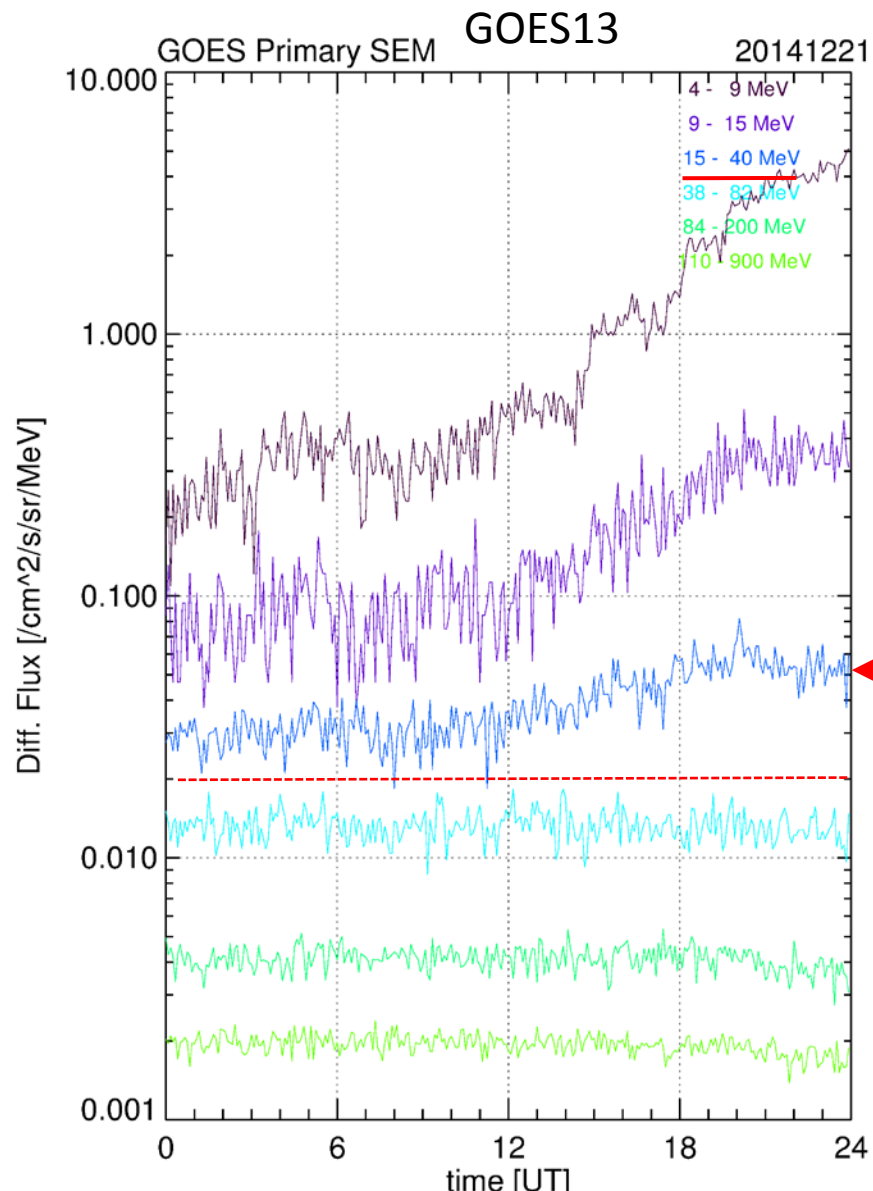
Solar proton observations in the equatorial plane by westward-looking (GOES 9, 11, 13W) and eastward-looking (GOES 10 and 13) detectors. A westward (eastward) detector observes protons whose gyrocenter is outside (inside) geostationary orbit. (b) Meridional plane cross-section of  $L$  shells. In low earth orbit, GOES “inside” proton fluxes at lower  $L$  shells than the GOES “outside” proton fluxes.

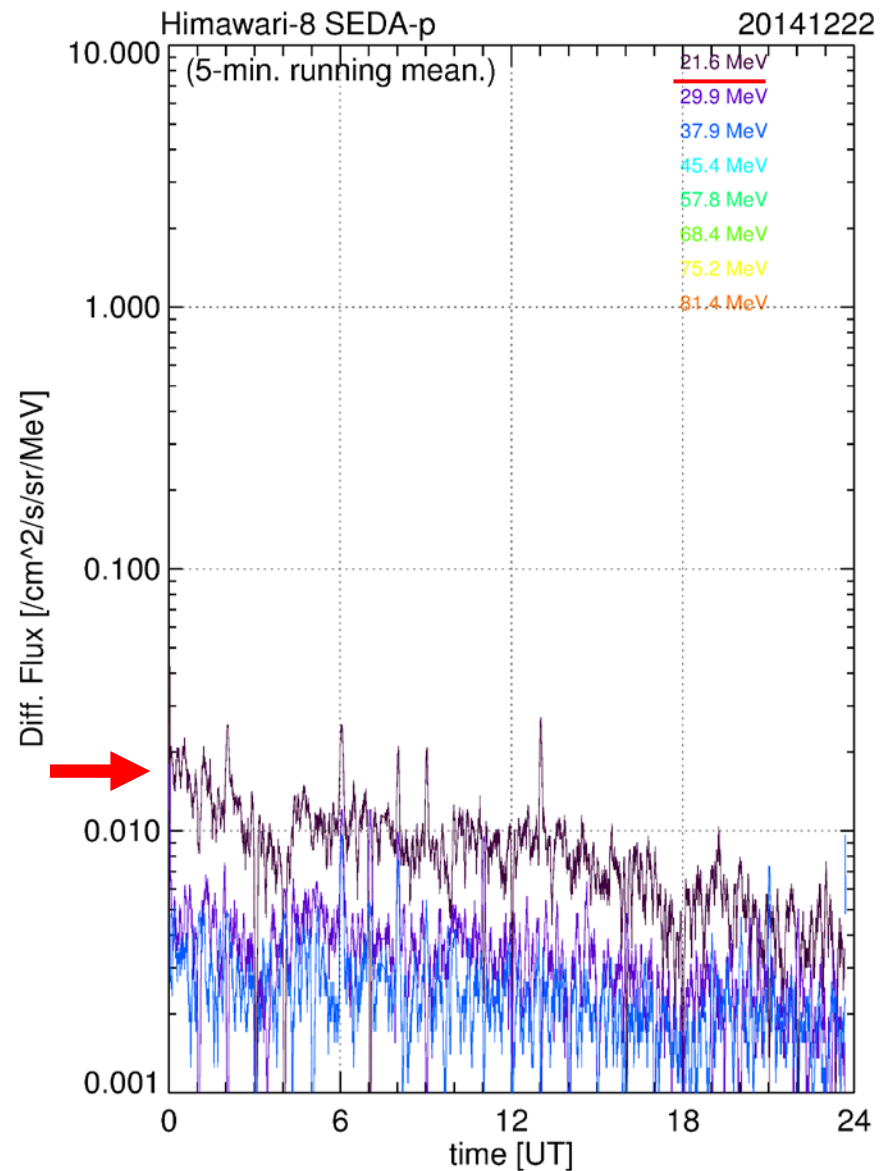
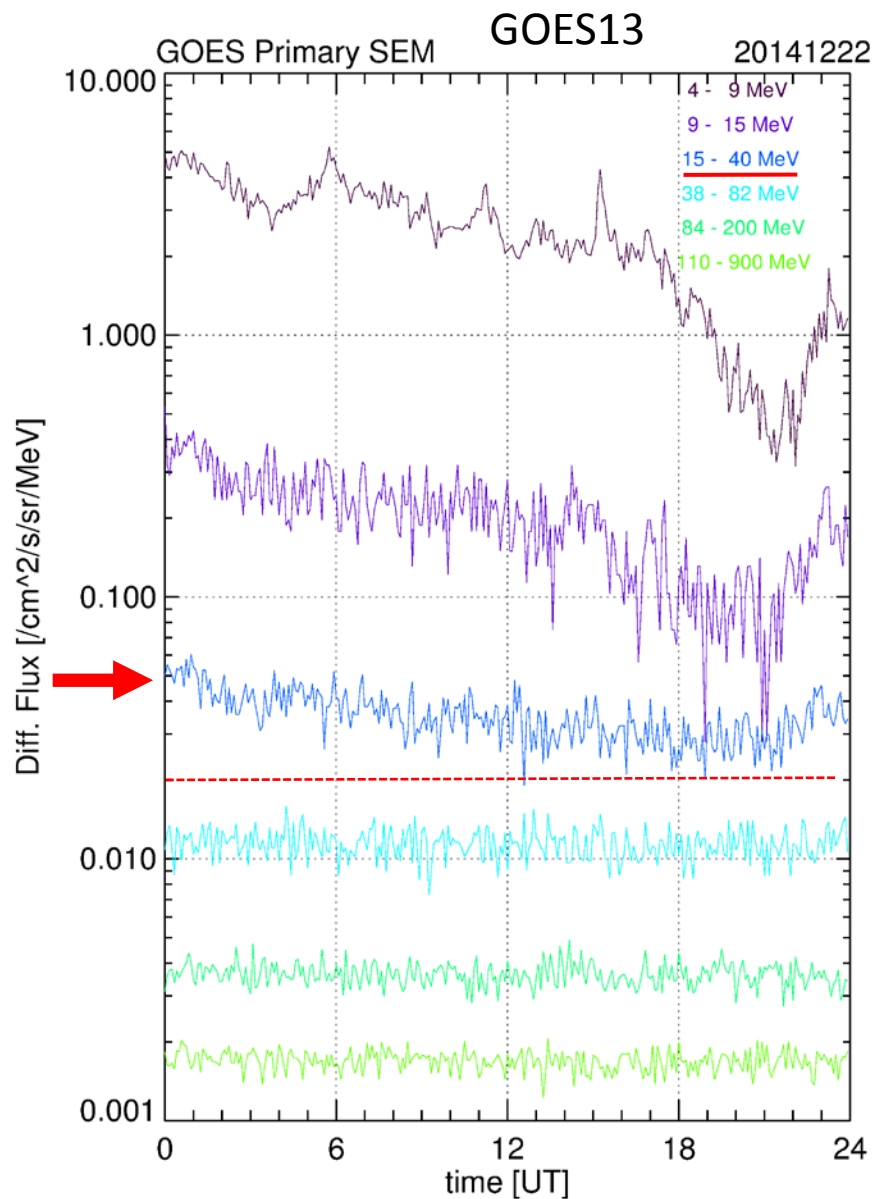
[Rodriguez et al., 2010]

# Known problem of SEDA data

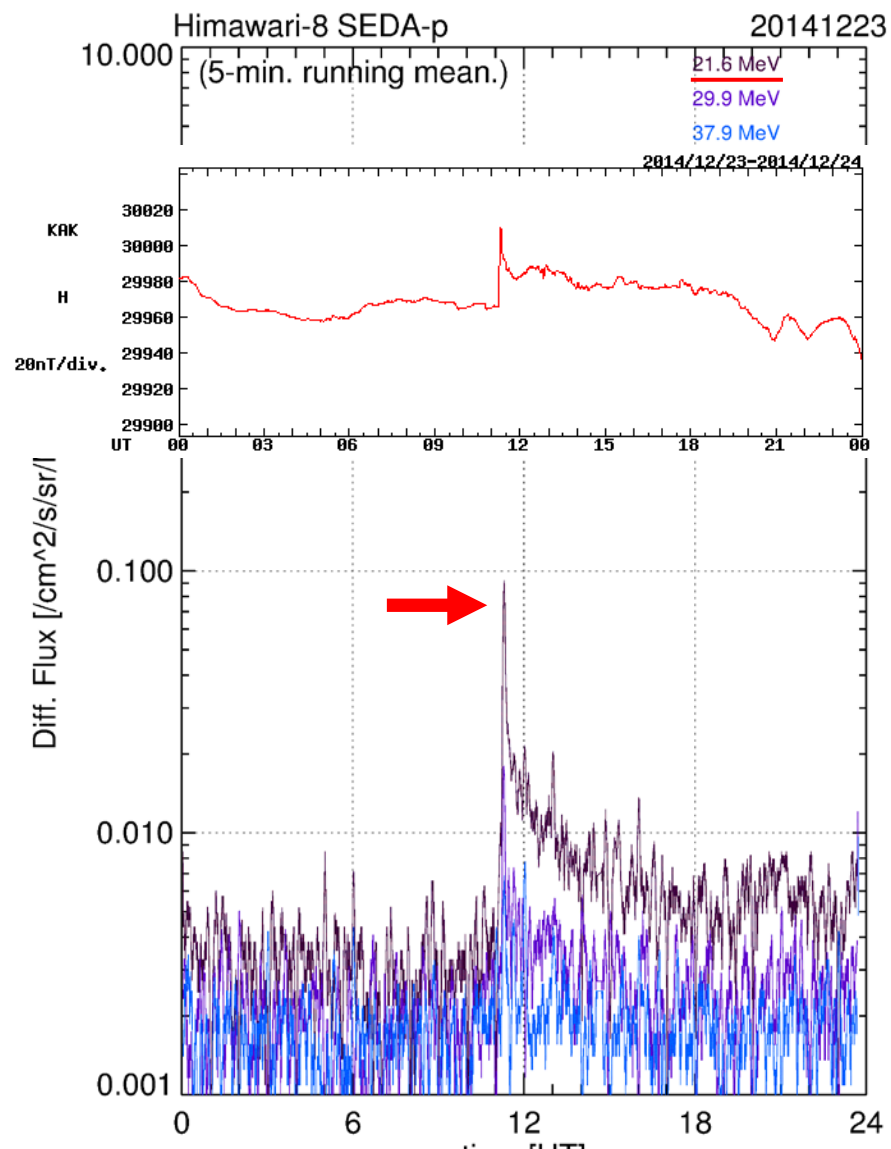
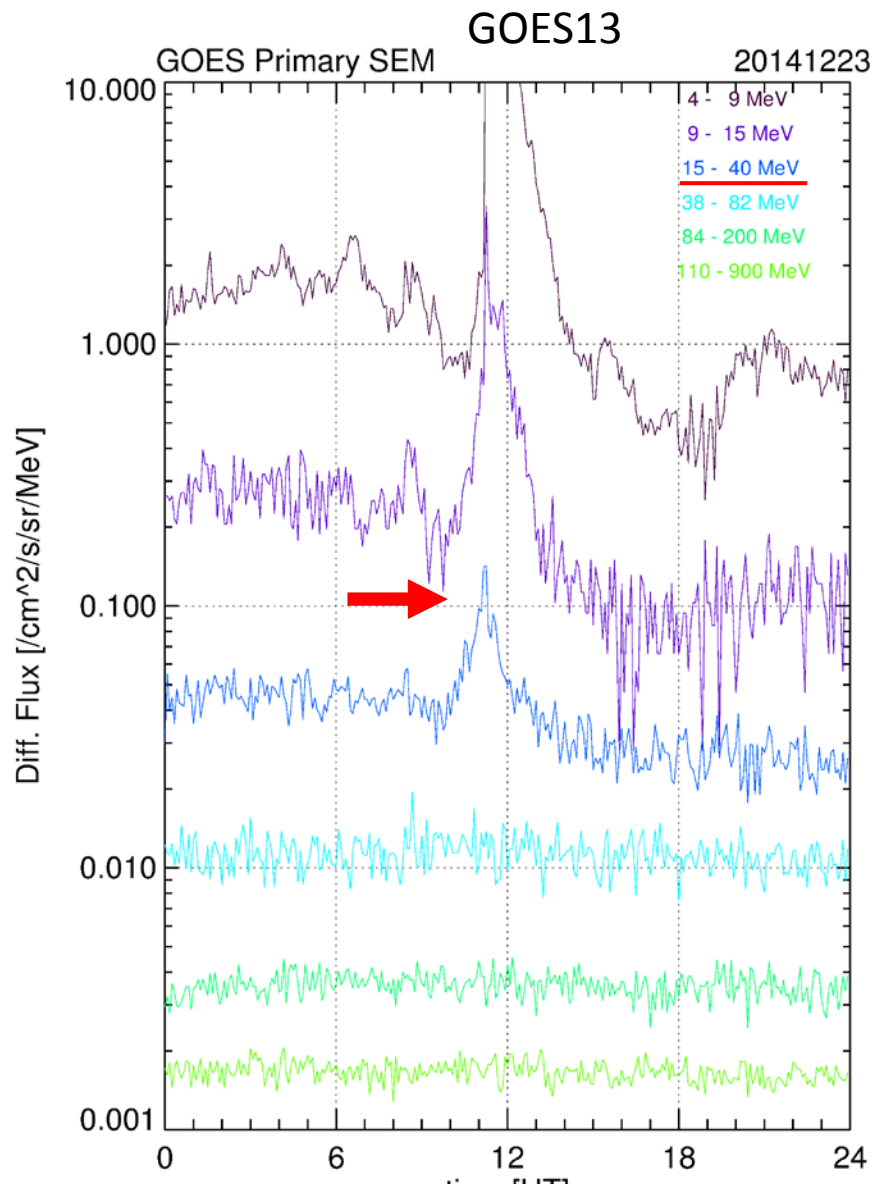
- Sensitivity for Ch.6,7 of electron sensor is low.
- Data from Ch.5,6,7 of proton sensor include contamination of high energy electrons.



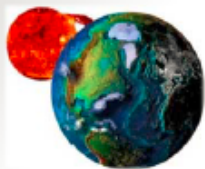




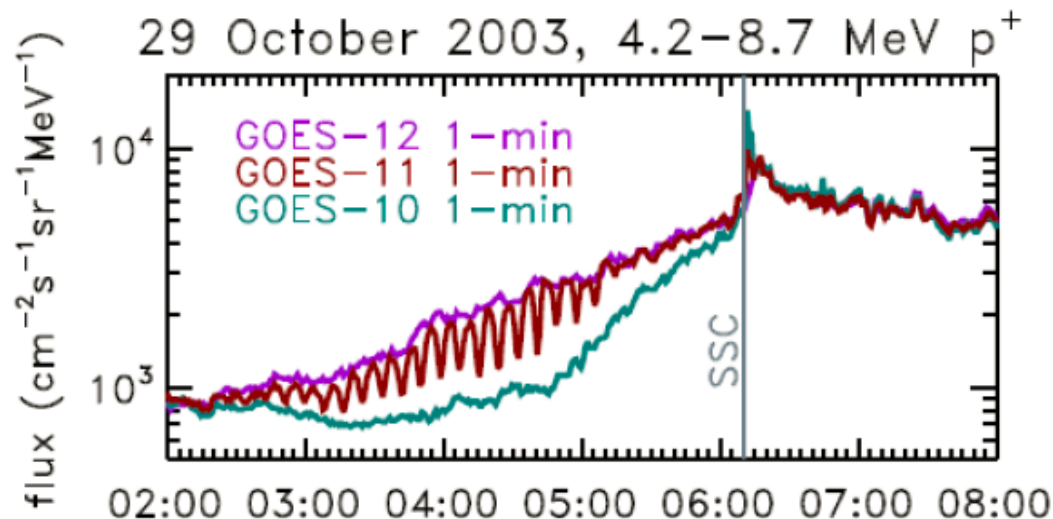
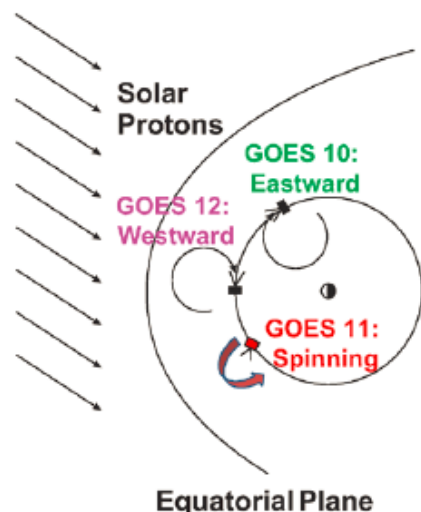








# Increased solar wind dynamic pressure enhances SEP access to GEO

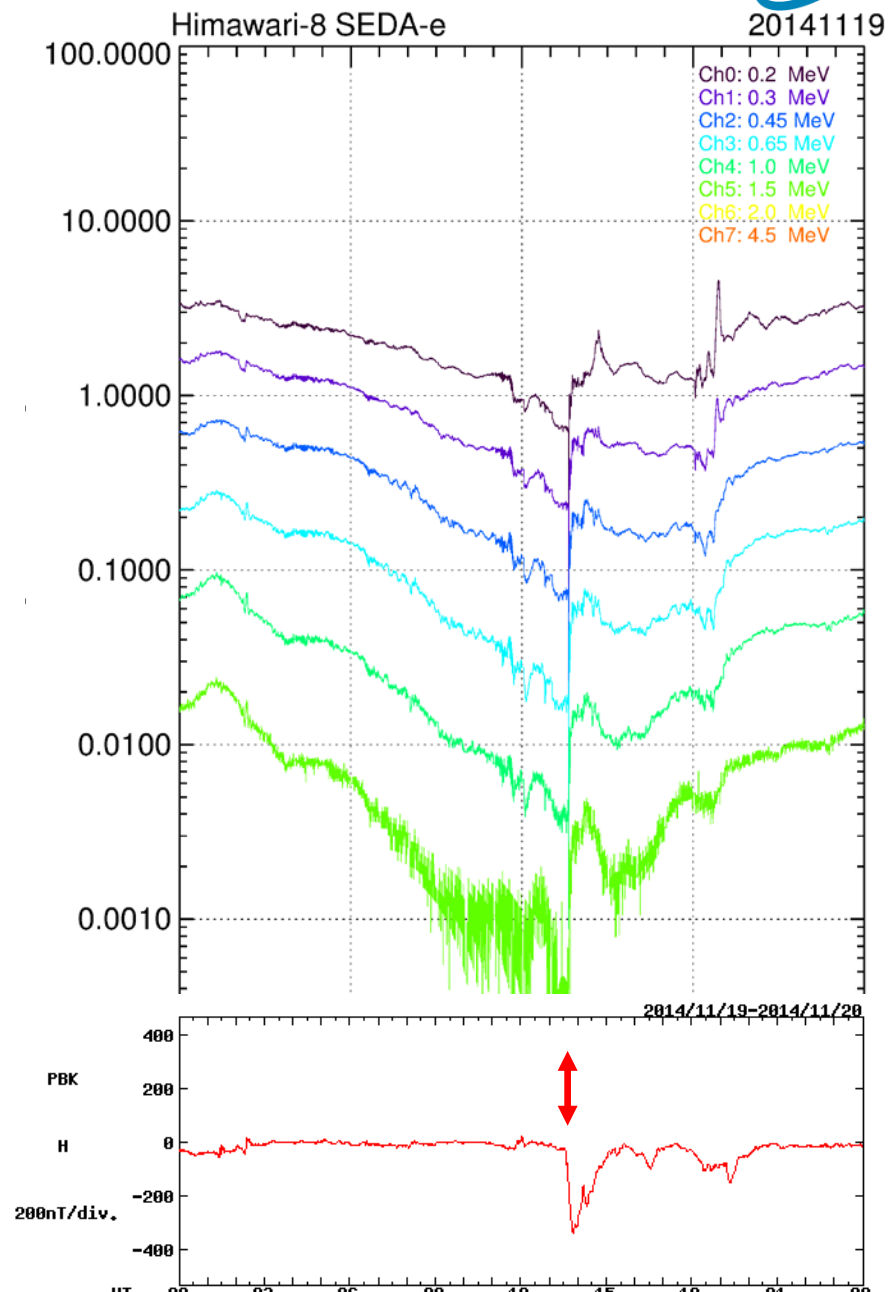
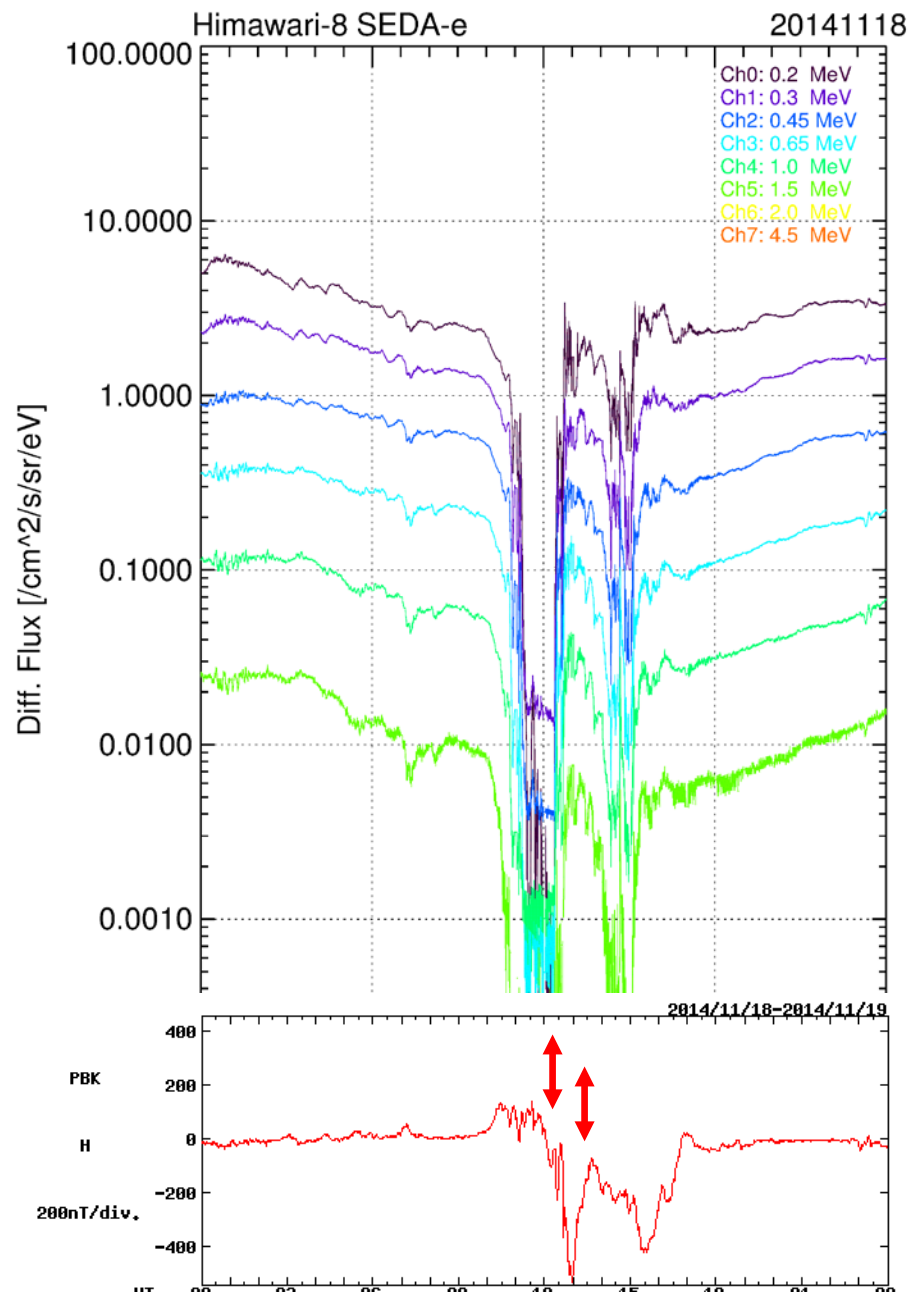


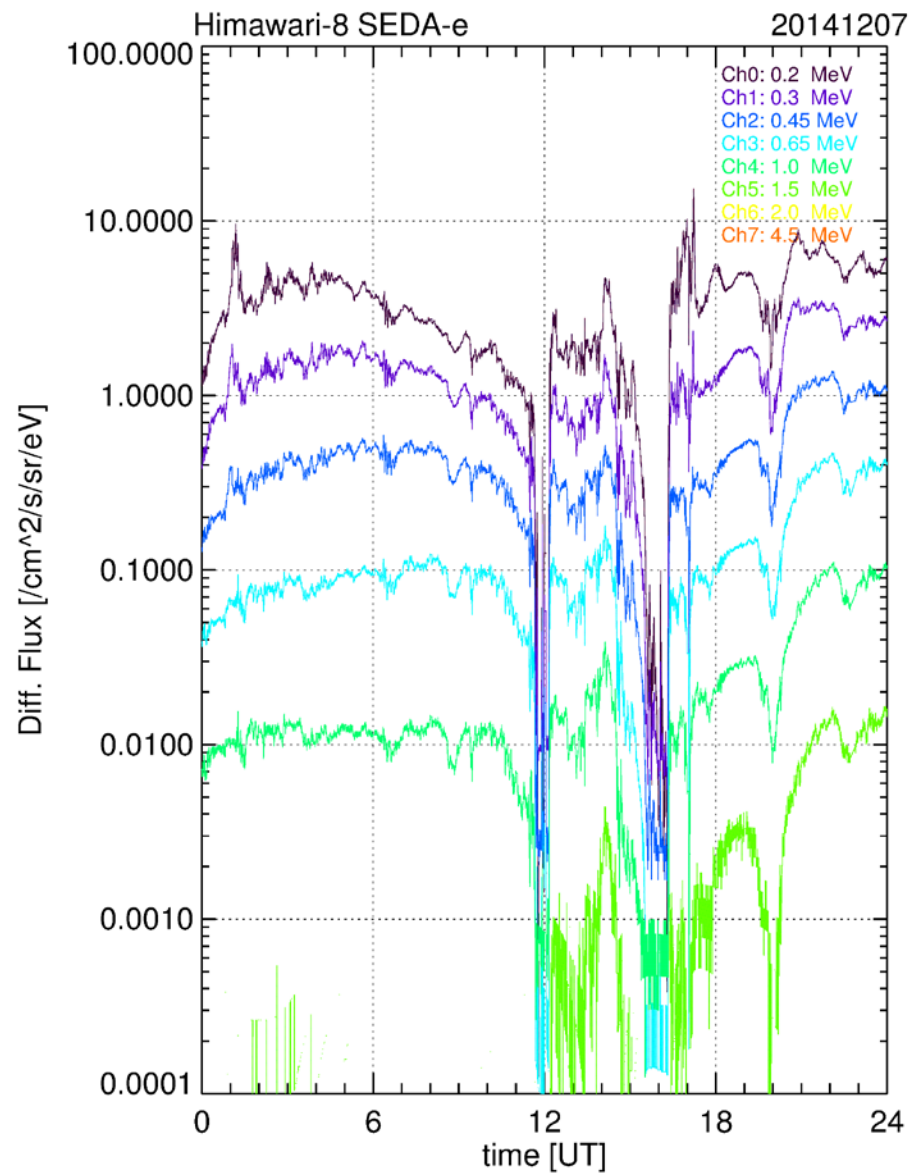
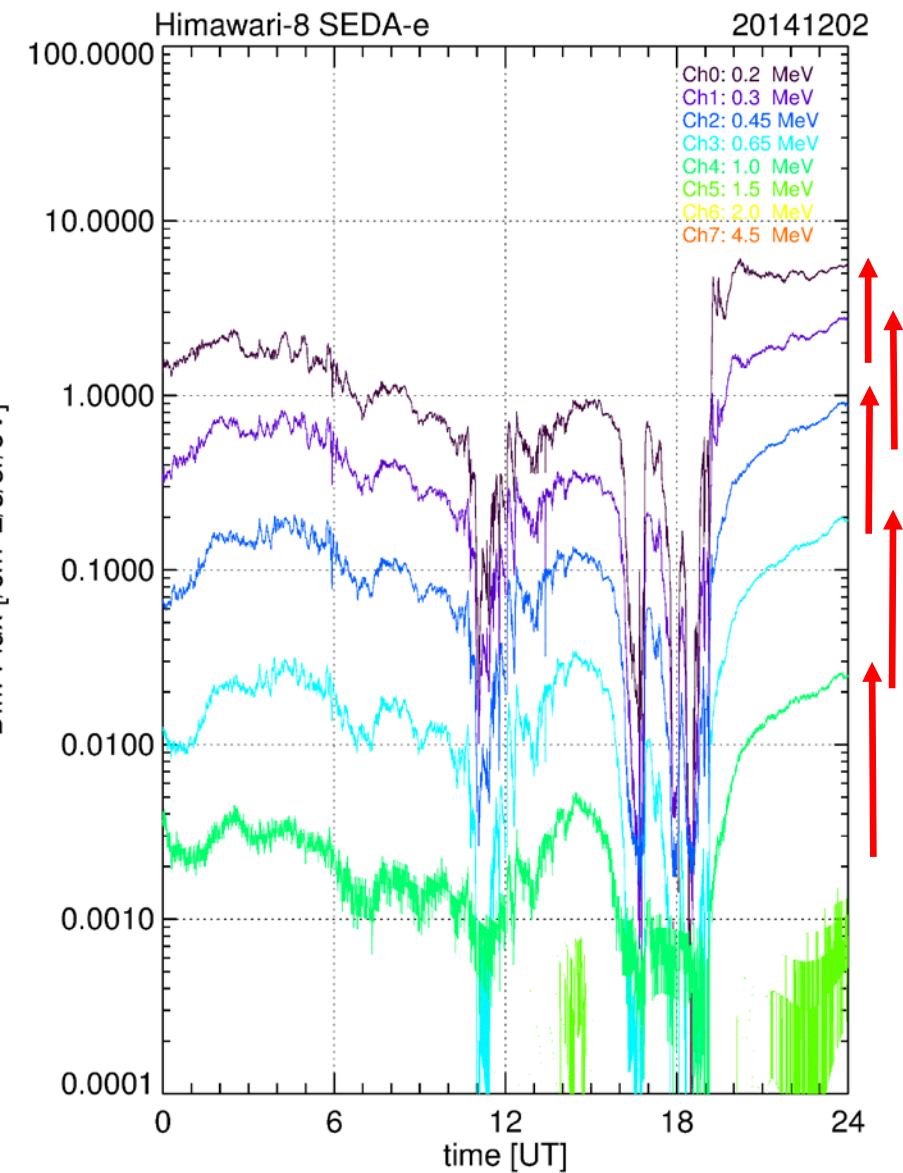
Spinning (GOES-11) and eastward (GOES-10) observations attenuated

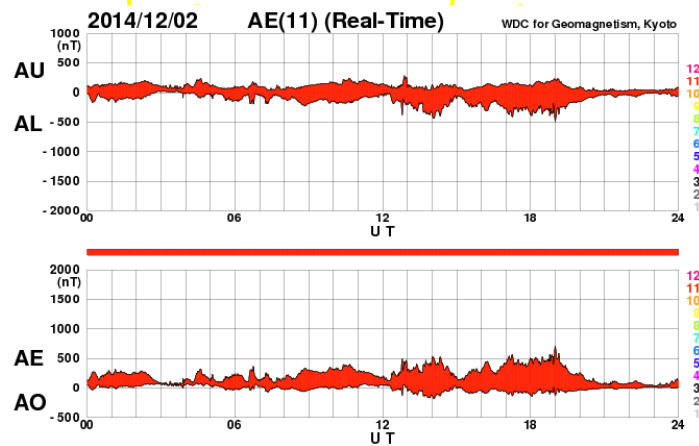
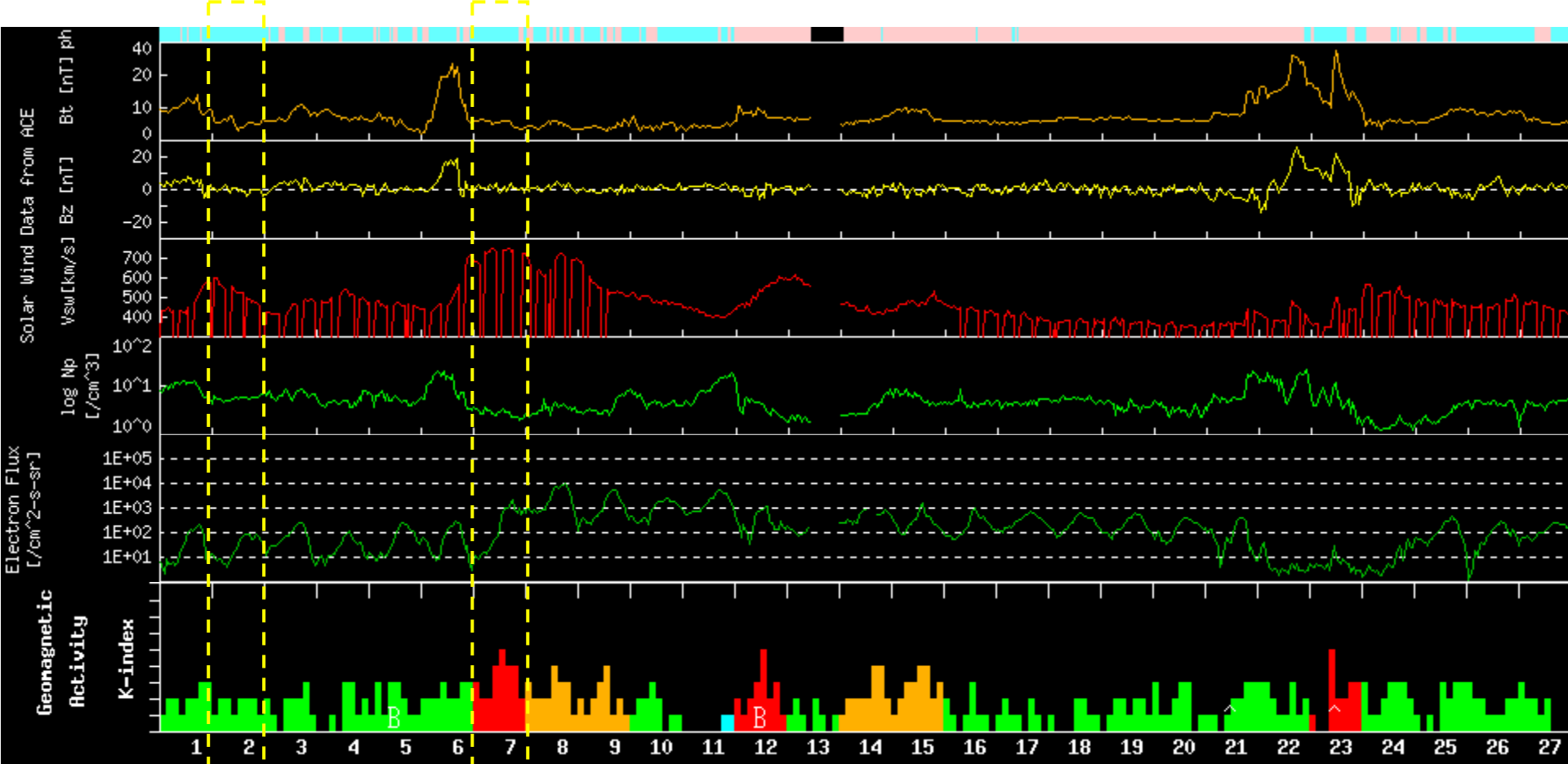
Shock arrives; solar wind pressure increases

All GOES observe the same fluxes;  
 $P_{\text{dyn}} (\text{He}) \sim 10 \text{ nPa}$

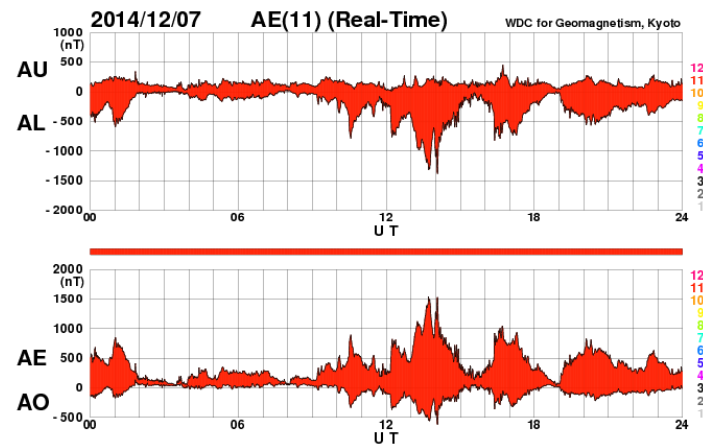
**Cutoffs strongly suppressed when  $P_{\text{dyn}} > 10 \text{ nPa}$ : intercalibrate!**







[Created at 2015-03-03 15:13UT]



[Created at 2015-03-03 15:13UT]

# Summary

- SEDA onboard Himawari-8 have started their observation since Nov. 03, 2014.
- SEDA data is transferring from JMA to NICT in near real time for space weather monitoring.
- We are checking the quality of the data, and calibration of data is needed for quantitative data analysis.
- We are preparing SEDA/Himawari-8 database for data providing.