2017 年4月4日の ERG ERG-SuperDARN SuperDARN キャンペーン期間における大規模電離圏対流変動 (+ 2017/09/08 イベント速報)

Low latitude aurora behind the SuperDARN Hokkaido East radar (2015.3.18 0110 JST)

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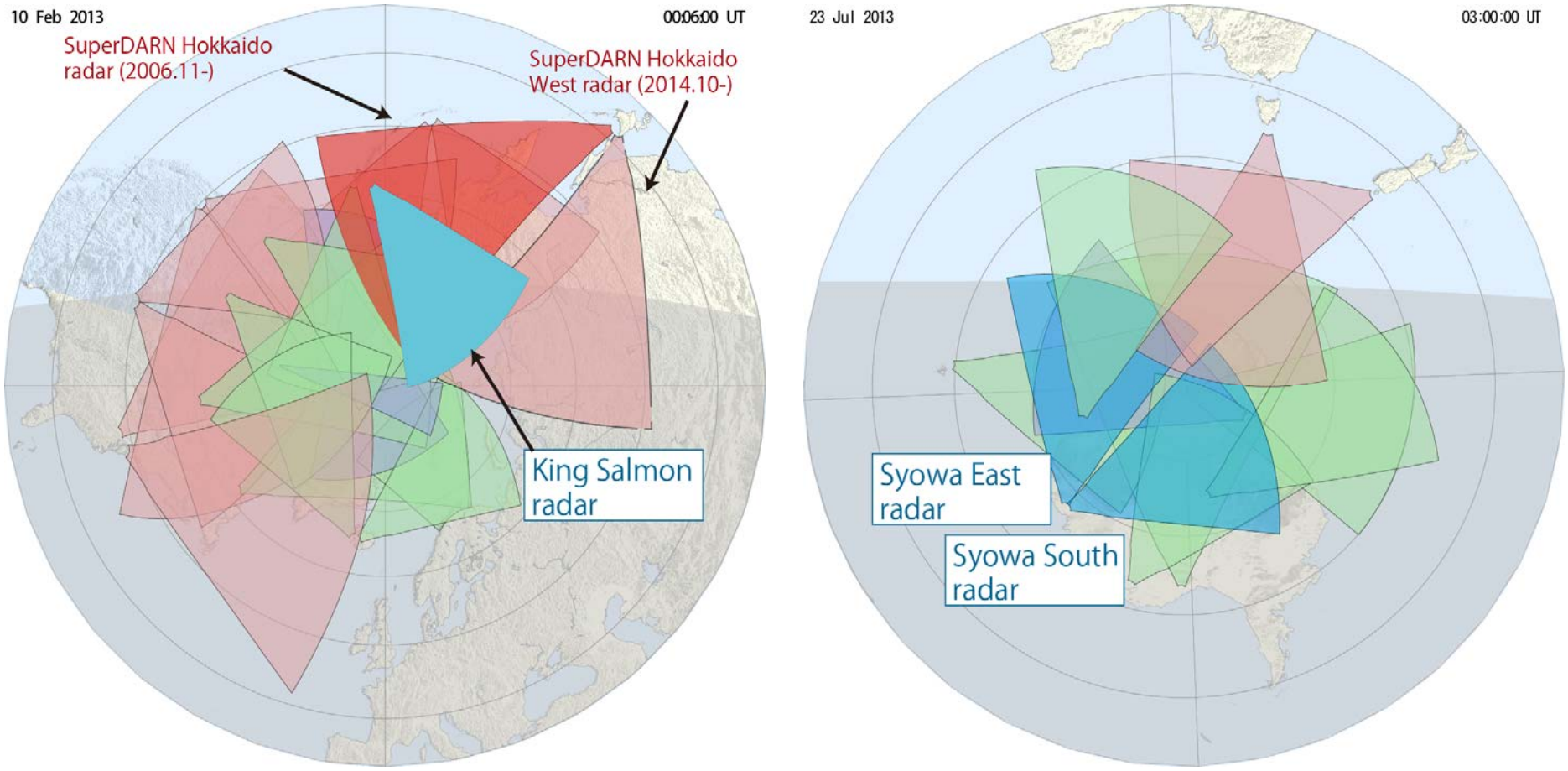
Super Dual Auroral Radar Network (SuperDARN)



Number of operating HF radars: 35 (23 in the northern and 12 in the southern hemispheres) as of Jan 01, 2017

Standard temporal resolution: 1-2 min

SAPS (Sub-Auroral Polarization Stream) and SAID (Sub-Auroral Ion Drift)

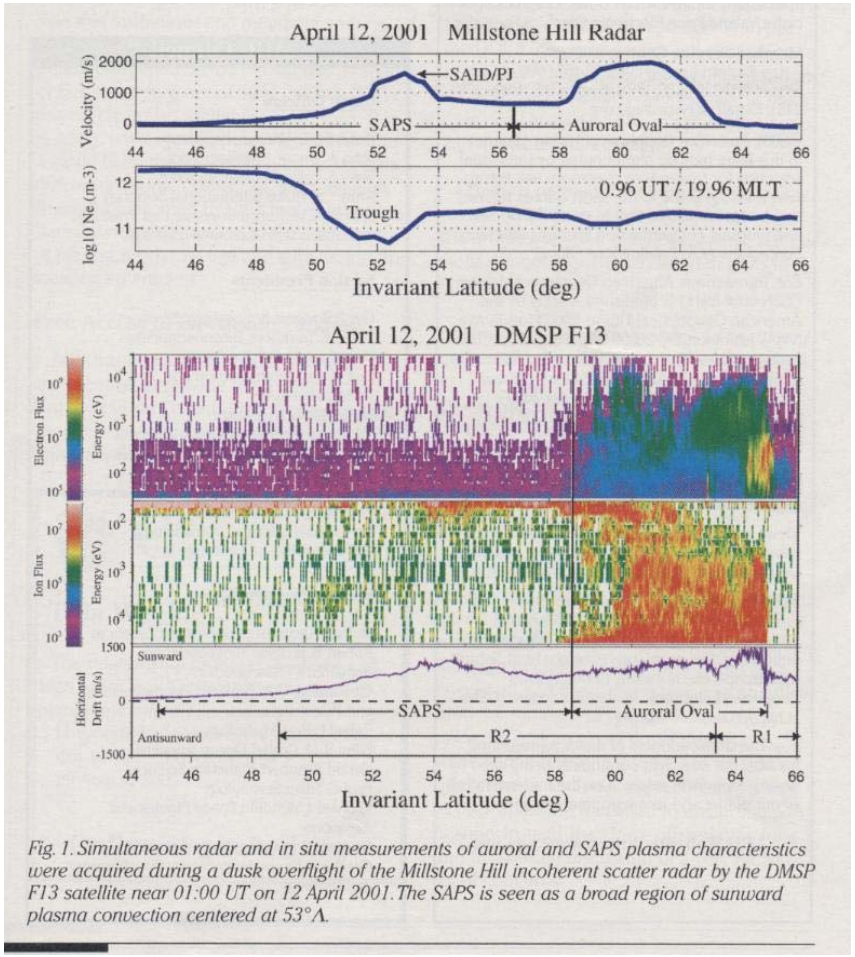


Fig. 1. Simultaneous radar and in situ measurements of auroral and SAPS plasma characteristics were acquired during a dusk overflight of the Millstone Hill incoherent scatter radar by the DMSP F13 satellite near 01:00 UT on 12 April 2001. The SAPS is seen as a broad region of sunward plasma convection centered at 53°A.

(Foster and Burke, EOS, 2002)

- SAPS: located equatorward of the auroral oval, broadly distributed
- SAID: located inside SAPS, localized in latitude (sometimes SAID coincides with SAPS)
- trough: plasma density depletion region

Importance of ring current for SAPS formation

HOK obs.

Ring current mainly generated by magnetization current: –grad(P) x B

↓

Divergence of ring current causes field-aligned currents

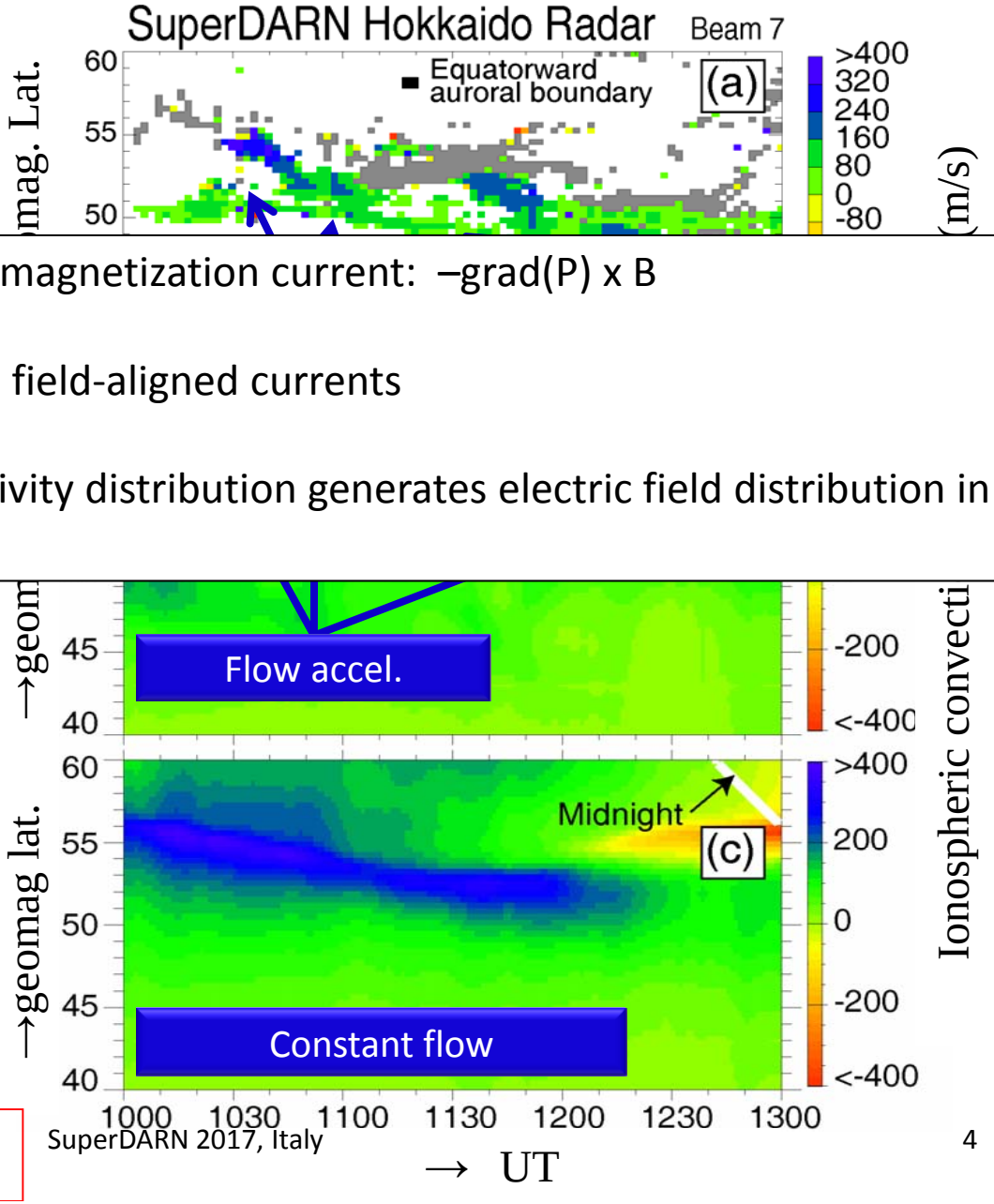
↓

Field-aligned current and conductivity distribution generates electric field distribution in the ionosphere

cond.

Simulation result

Stable bound. cond.



Ebihara et al., JGR, 2009

Clausen et al. (2012, JGR) longitudinal distribution of SAPS is interpreted in terms of ring current distribution, with no detailed discussion on temporal changes

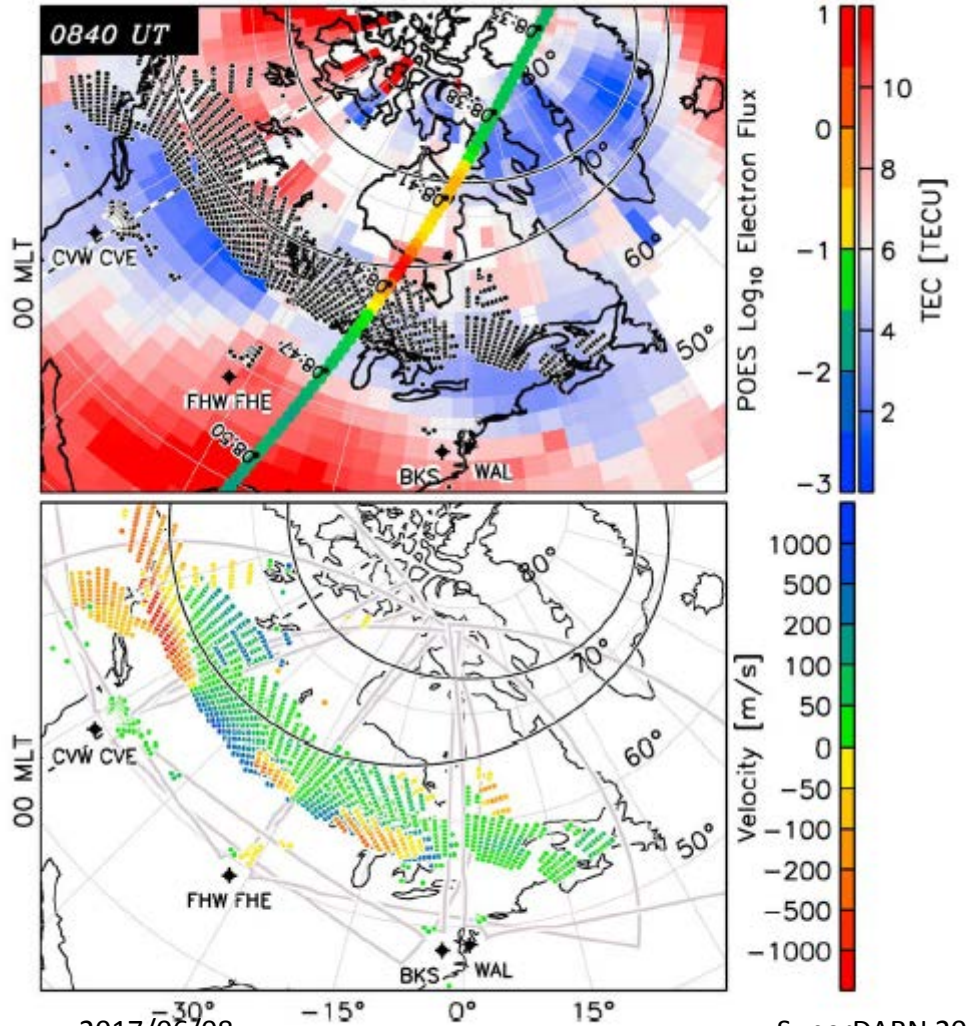


Figure 5. Overview of the measurements made of the

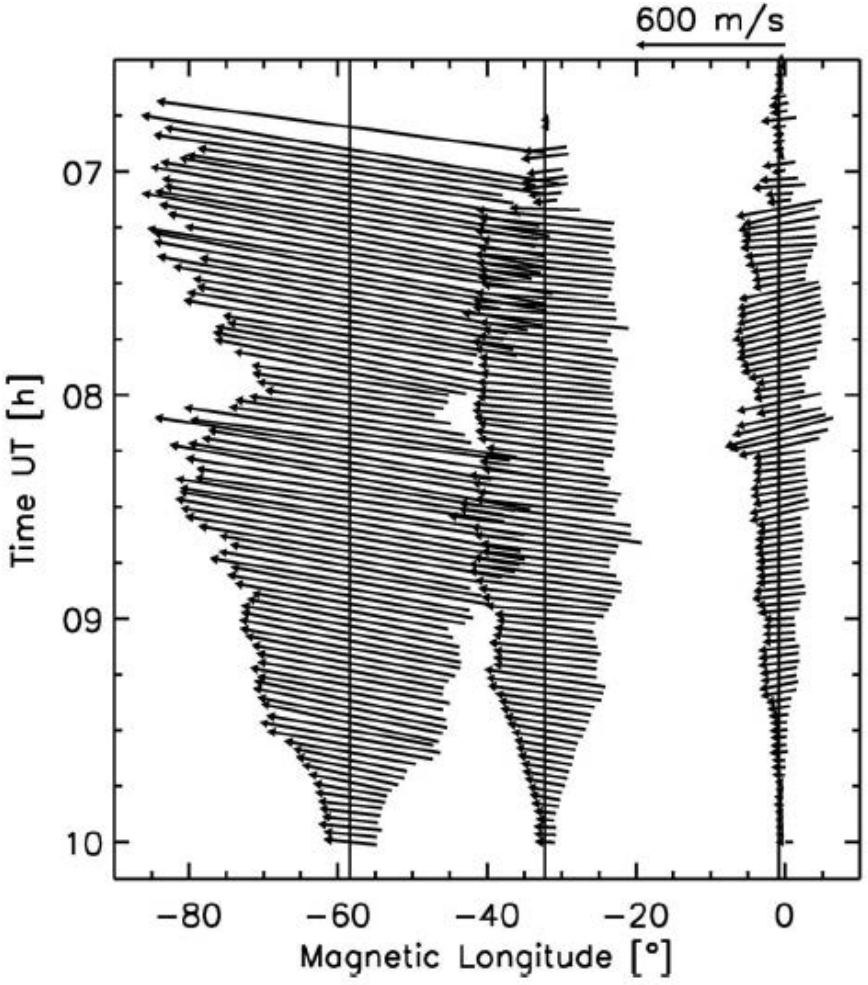


Figure 7. Vector representation of the average large-scale SAPS flow direction and the inferred SAPS speed identified by the three radar pairs. Time runs along the *y* axis, increas-

Possible parameters for determining SAPS intensity

- Ionospheric origin
  - Ionospheric conductivity due to
    - Solar radiation (EUV etc.)
    - Energetic particle precipitation
- Magnetospheric origin
  - IMF effect
  - Substorm / storm effects (particle injection, ring current)
- Question:

1. How do SAPS flows grow and decay in the framework of global convection?
2. What is the relationship between the SAPS / global convection and the IMF changes / substorms?

Study of 2 events

- Event on 4 Apr 2017 (Arase / SD conjunction)

- Event on 8 Sep 2017 (possibility of Arase / SD conjunction)

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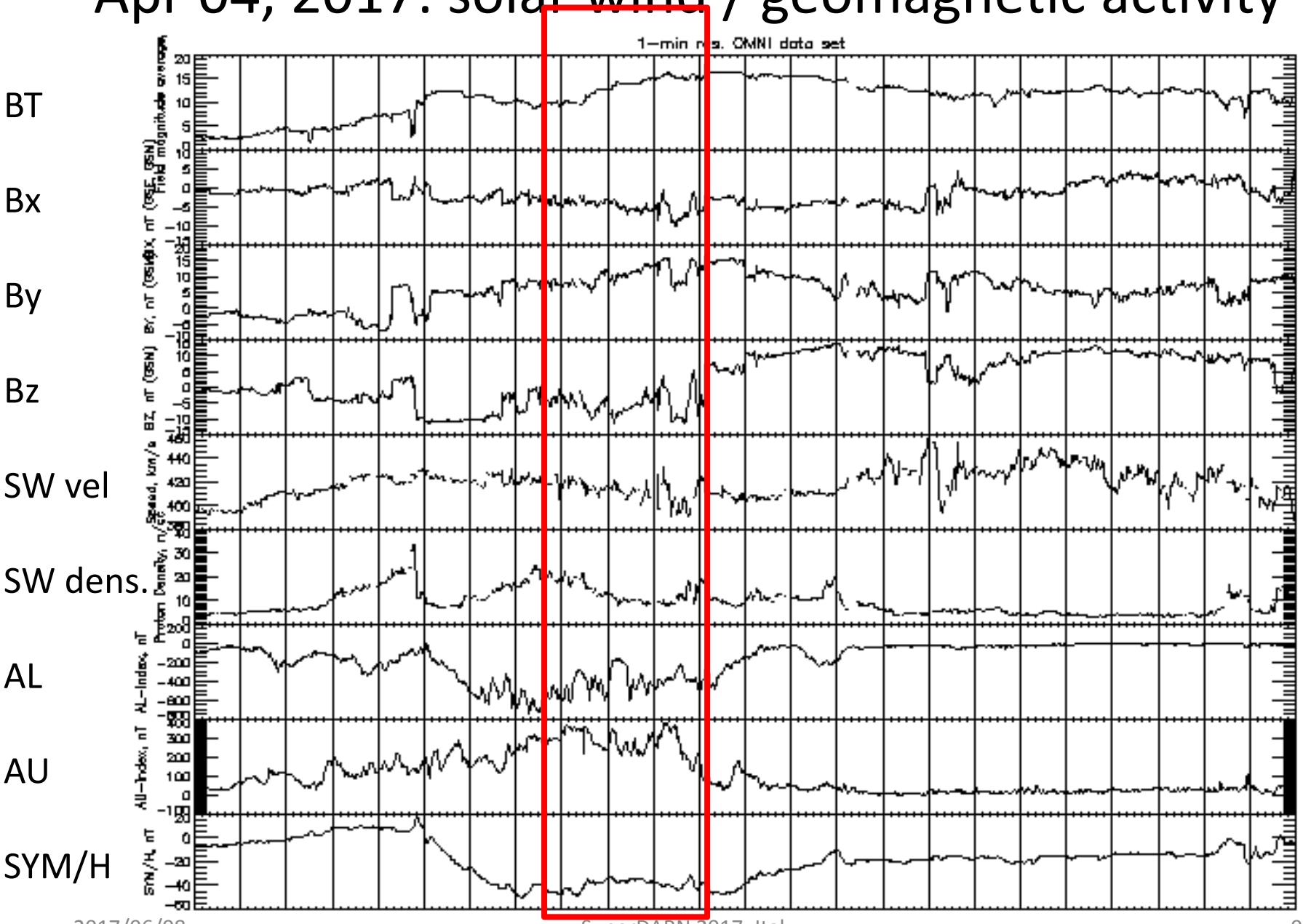
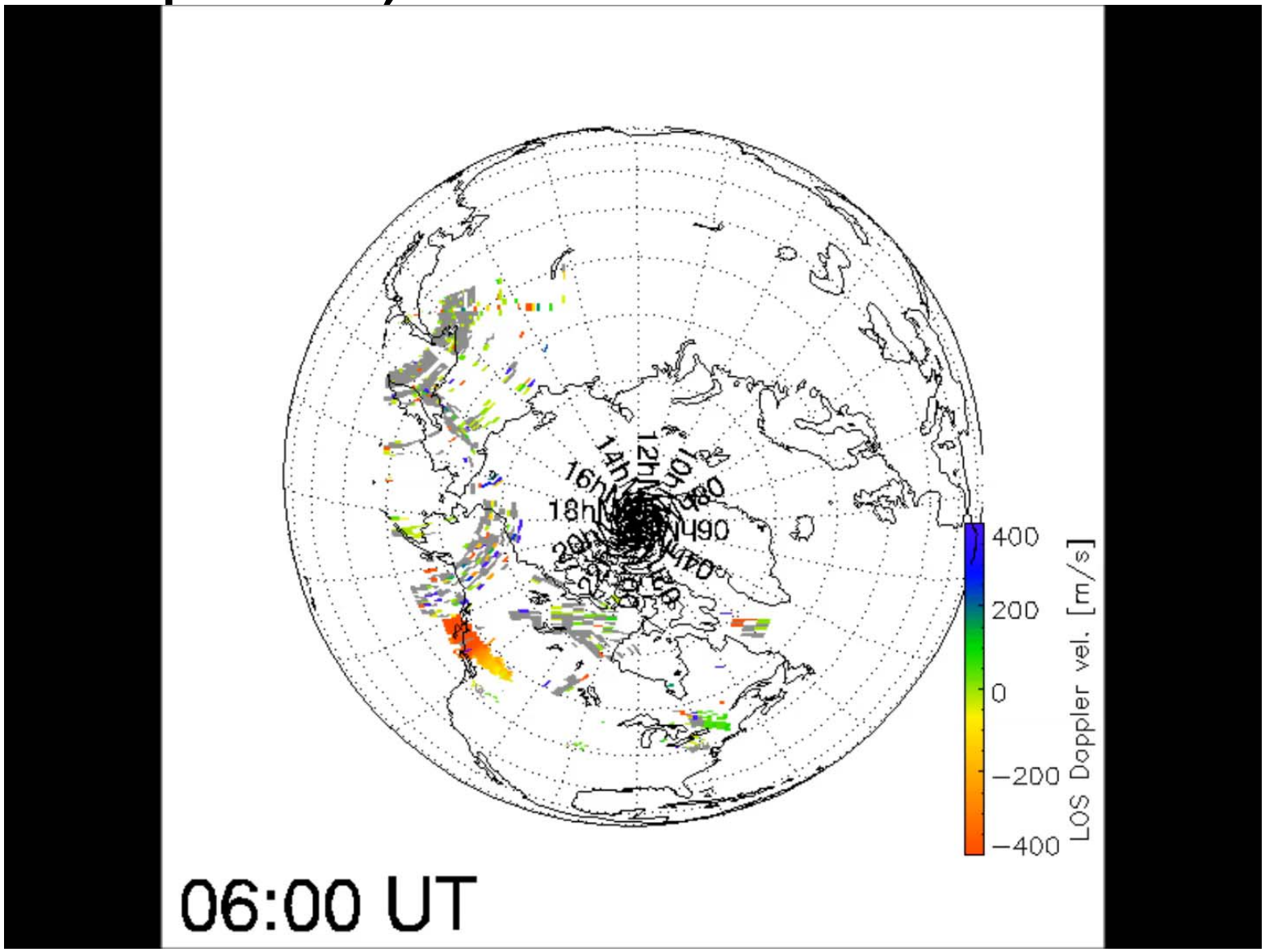
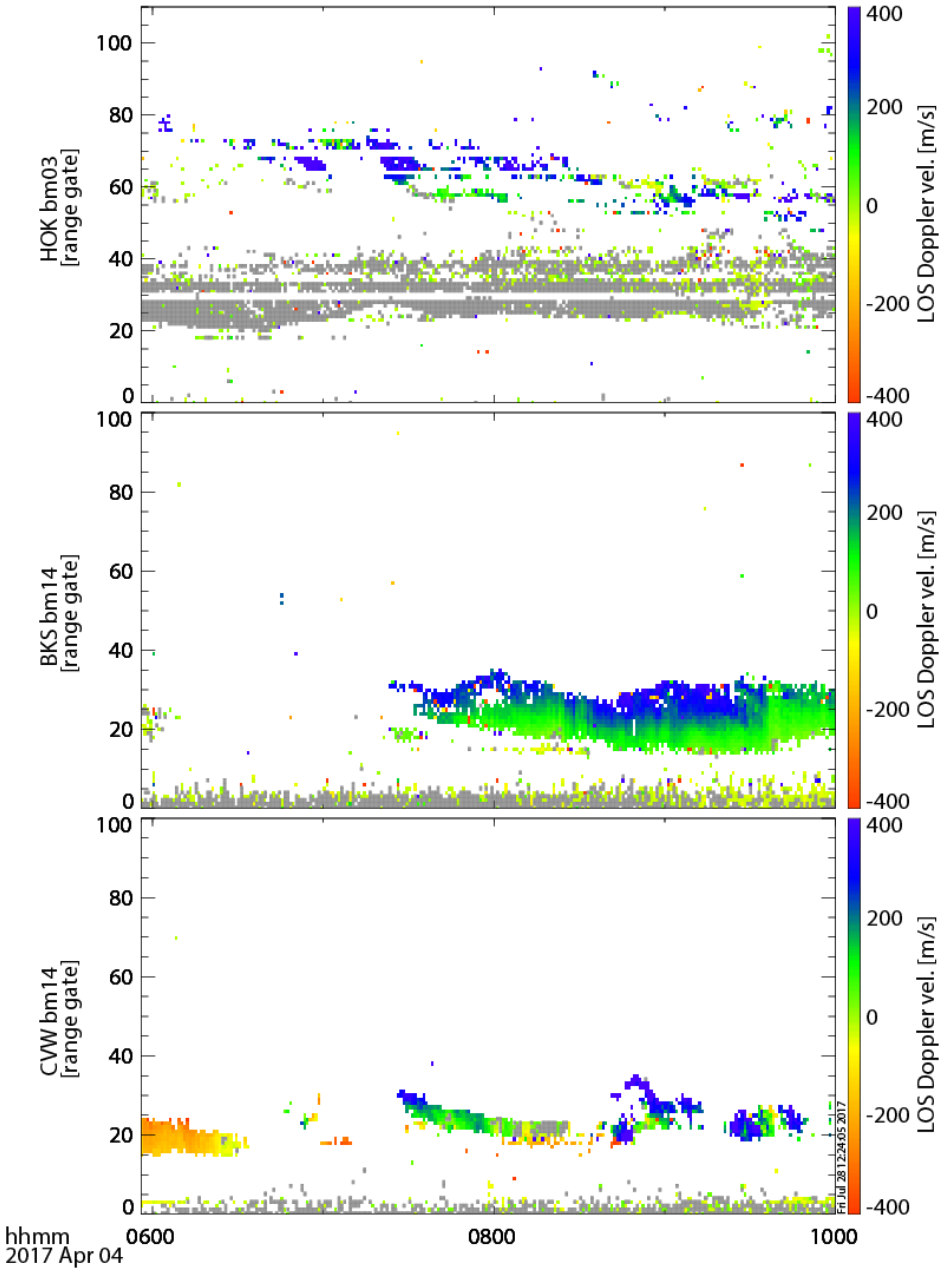
Apr 04, 2017: solar wind / geomagnetic activity



April 04, 2017 0600-1200 UT

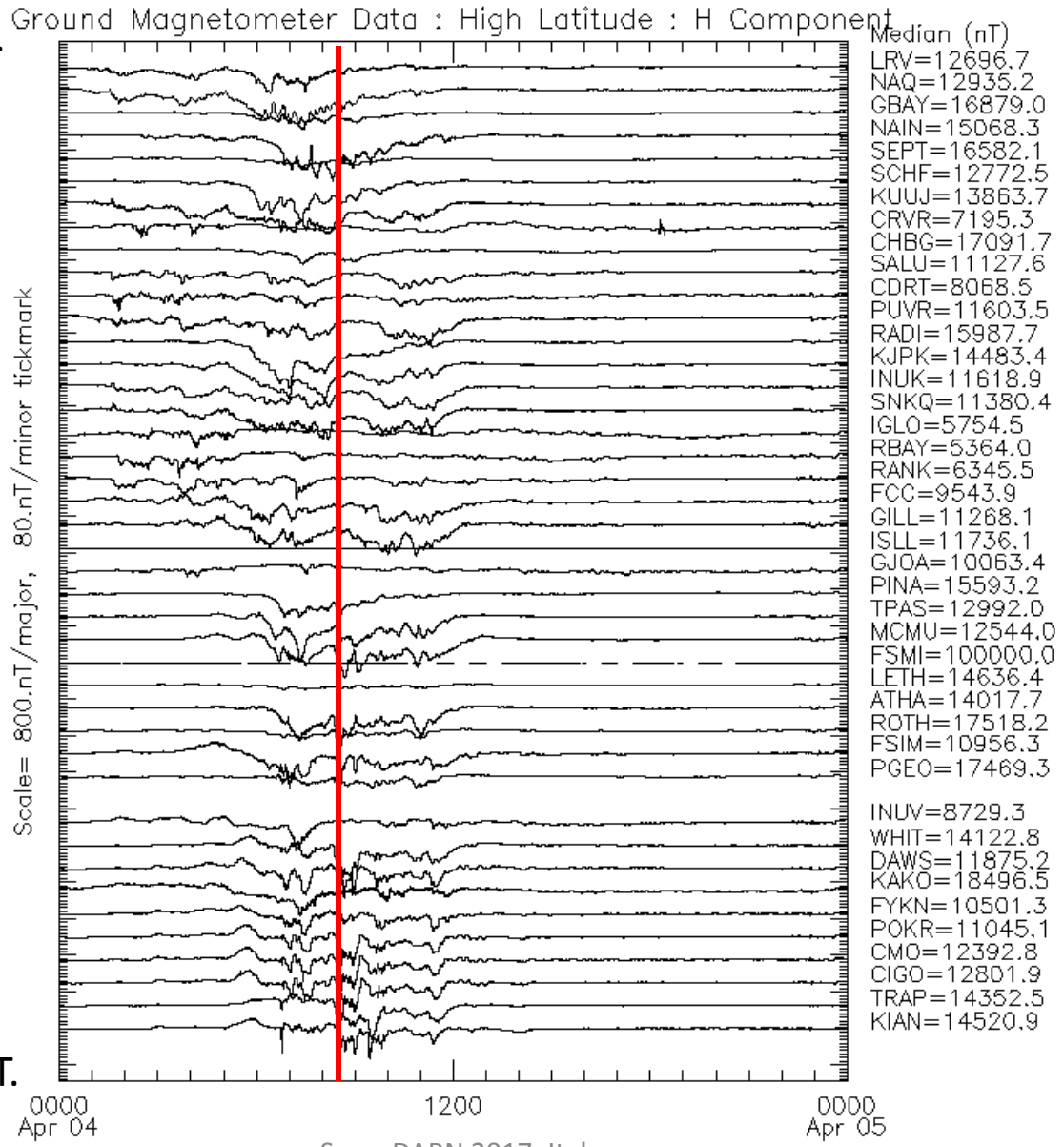




Hokkaido East (toward NNE), Blackstone (toward NW) and Christmas Valley West (toward NW) rti plots of Doppler velocities

THEMIS GBO geomagnetic data (H) on 2017/04/04

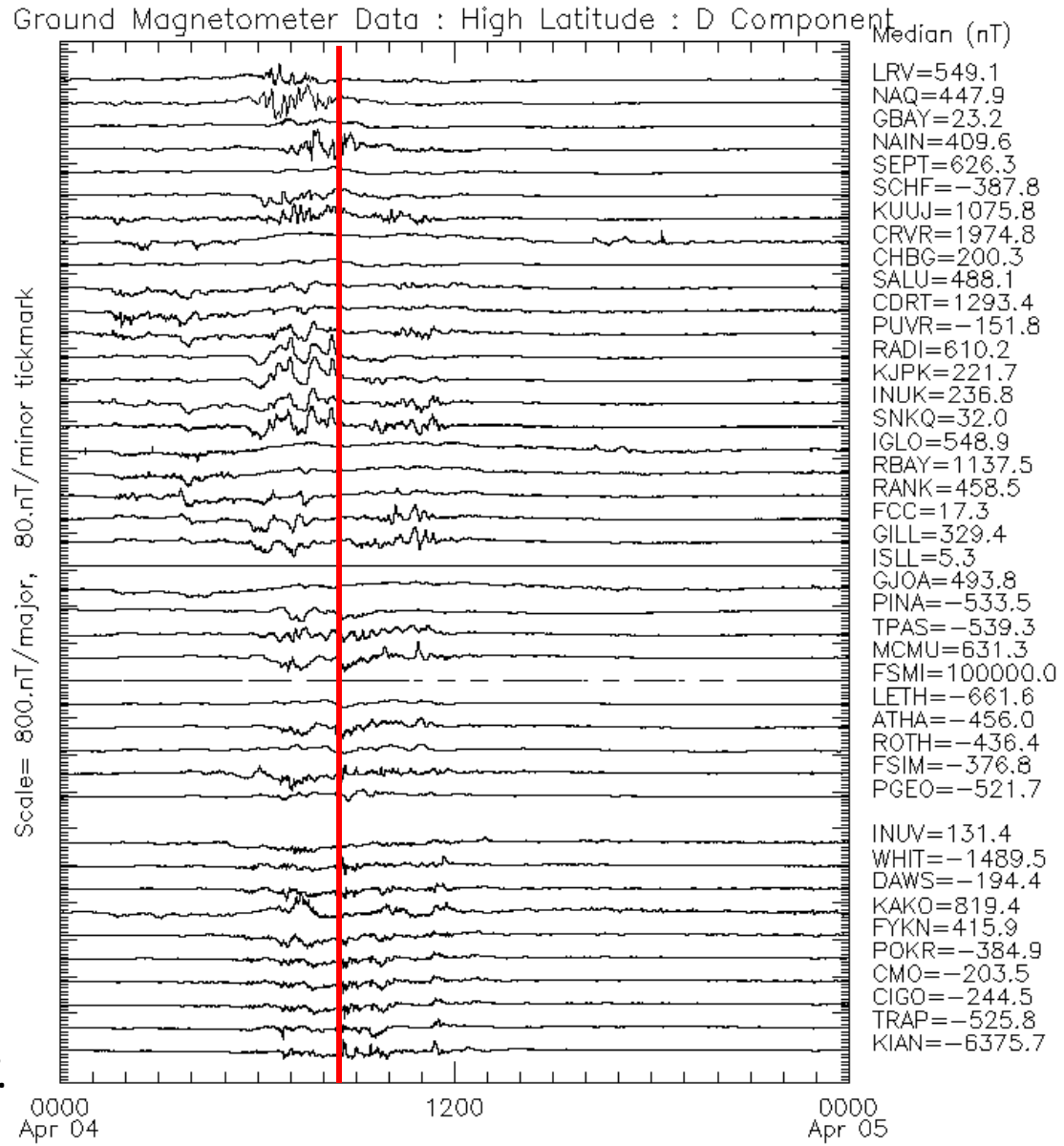
↑EASTERN ST.



↓WESTERN ST.

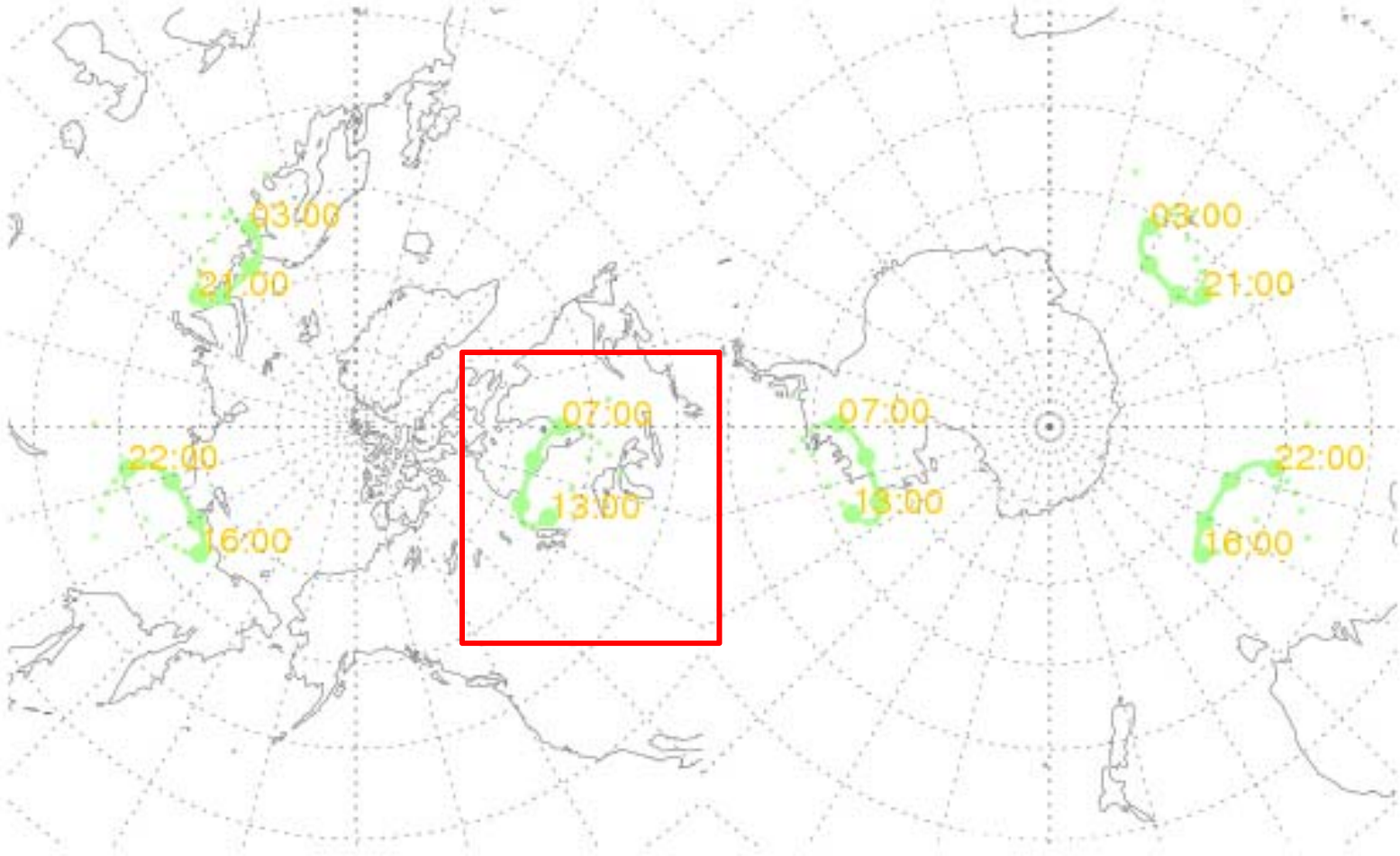
THEMIS GBO geomagnetic data (D)on 2017/04/04

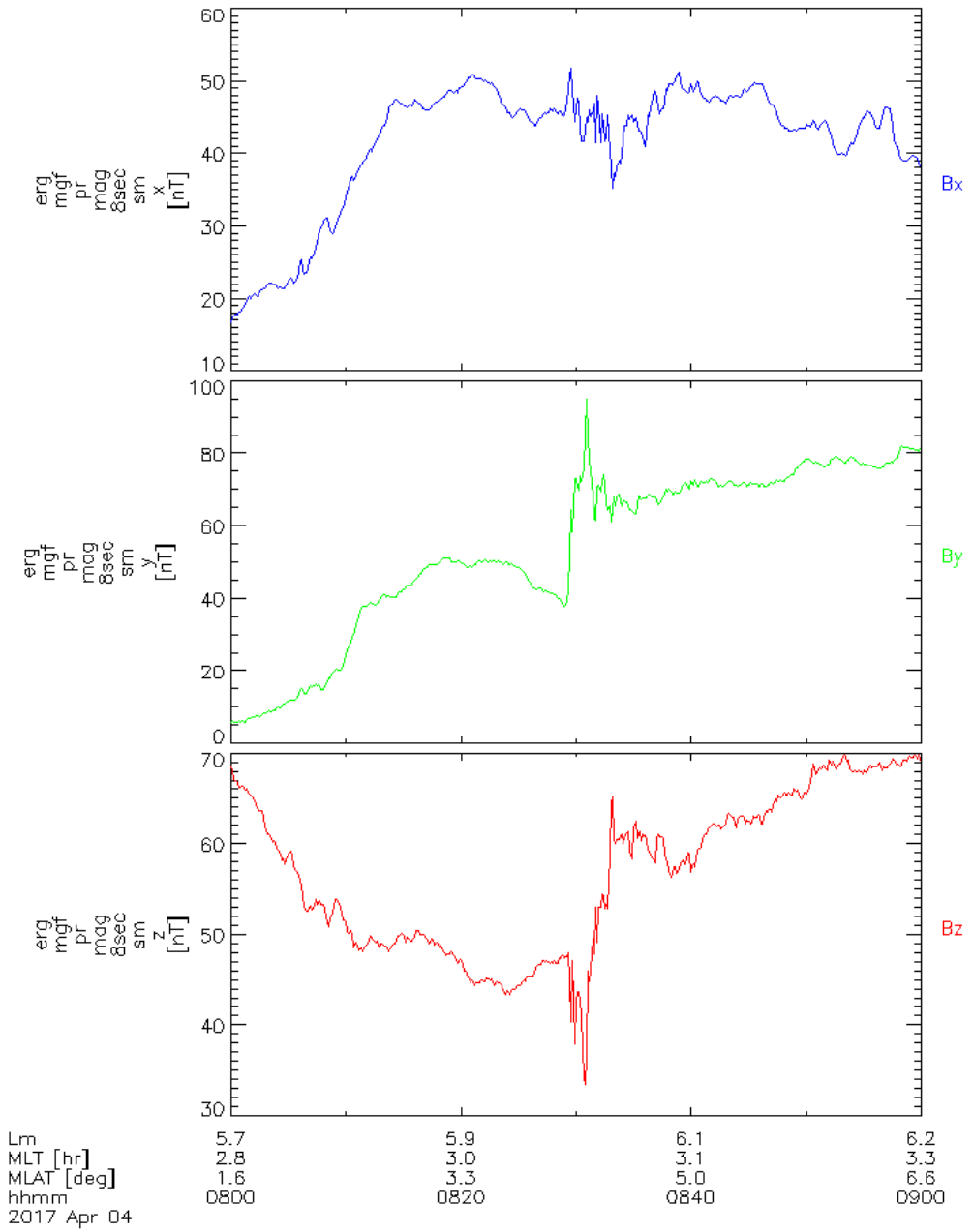
↑EASTERN ST.



↓WESTERN ST.

ERG footprints on April 04, 2017





ERG/Arase MGF data on 2017 Apr 4 (SM X,Y,Z coordinates)

Possibly looking at the effects of field-aligned currents associated with substorm injection – other ERG quicklook particle data such as MPE show evidence of injection (data not shown).

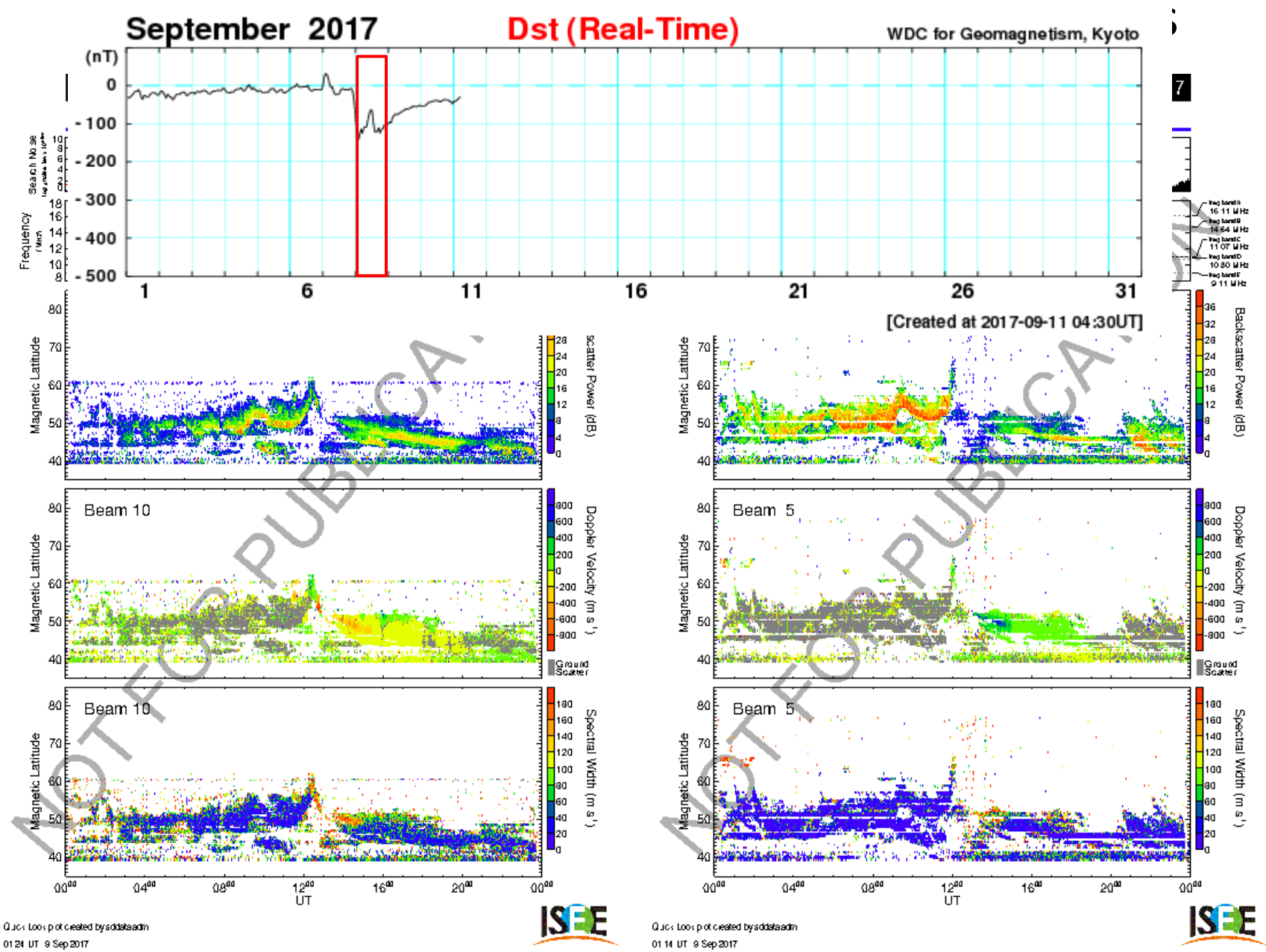
Summary of observations (2017/04/04 storm event)

- There are several substorm onsets (e.g., at 0830 UT).
- The SuperDARN data show several activities both in the postmidnight and premidnight sectors. Some of the disturbances are global while some of them are not.
- The Arase MGF data also show perturbations associated with substorms.

Study of 2 events

- Event on 4 Apr 2017 (Arase / SD conjunction)

- Event on 8 Sep 2017 (possibility of Arase / SD conjunction) – preliminary result (no omniweb data available yet)


September 2017
Dst (Real-Time)
WDC for Geomagnetism, Kyoto
(nT)
0
- 100
- 200
- 300
- 400
- 500
1
6
11
16
21
26
31
[Created at 2017-09-11 04:30UT]
Beam 10
Beam 5
Beam 10
Beam 5
Magnetic Latitude
Backscatter Power (dB)
Doppler Velocity (m s⁻¹)
Spectral Width (m s⁻¹)
Ground Scatter
UT
NOT FOR PUBLICATION

2017.9.8 hok/hkw movie