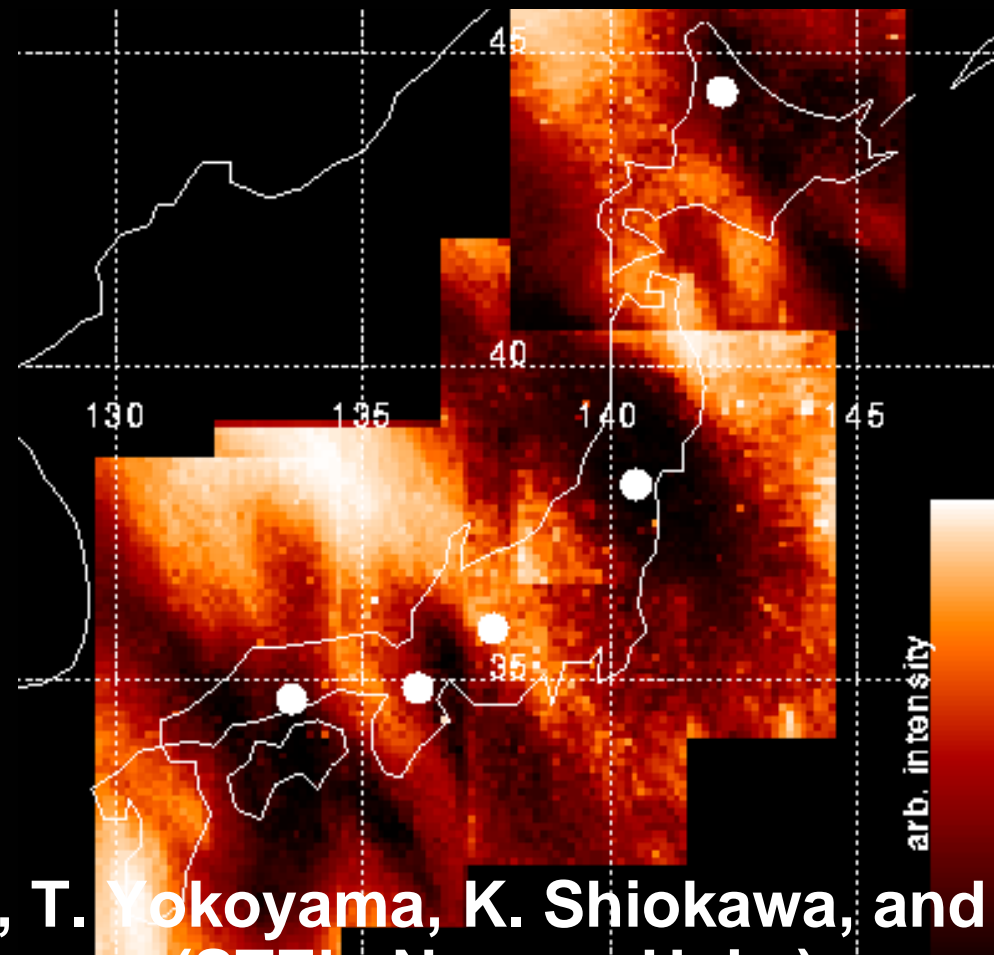


Radio and Optical Observations of Medium-Scale Traveling Ionospheric Disturbances and Field-Aligned Irregularities in the F region



Y. Otsuka, T. Yokoyama, K. Shiokawa, and T. Ogawa
(STEL, Nagoya Univ.)

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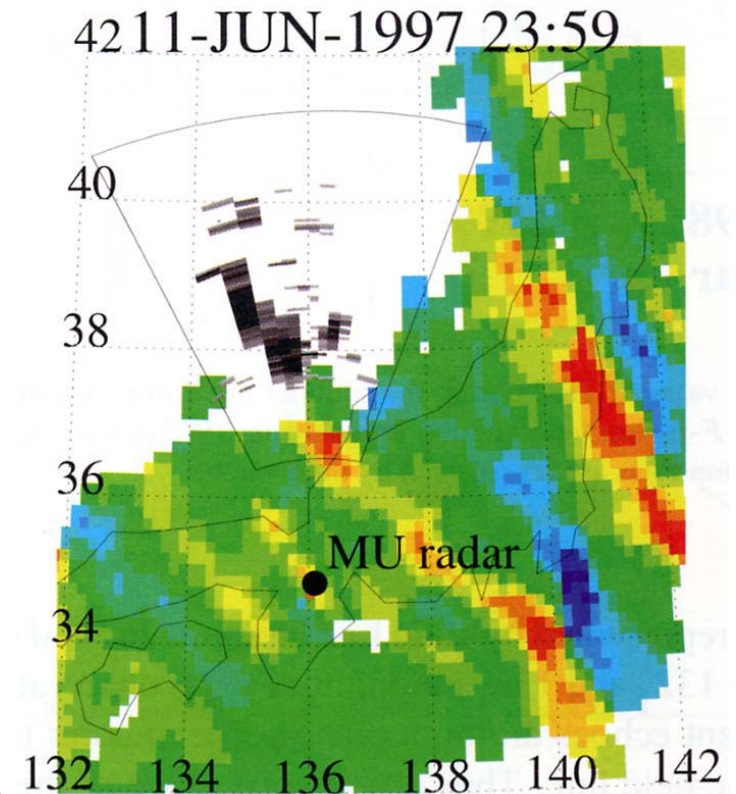
Background

Similarity between MSTID and F-FAI

- MSTID and FAI frequently occur in summer nighttime.
- They have phase front elongated from NW to SE and propagate toward SW.

Purpose

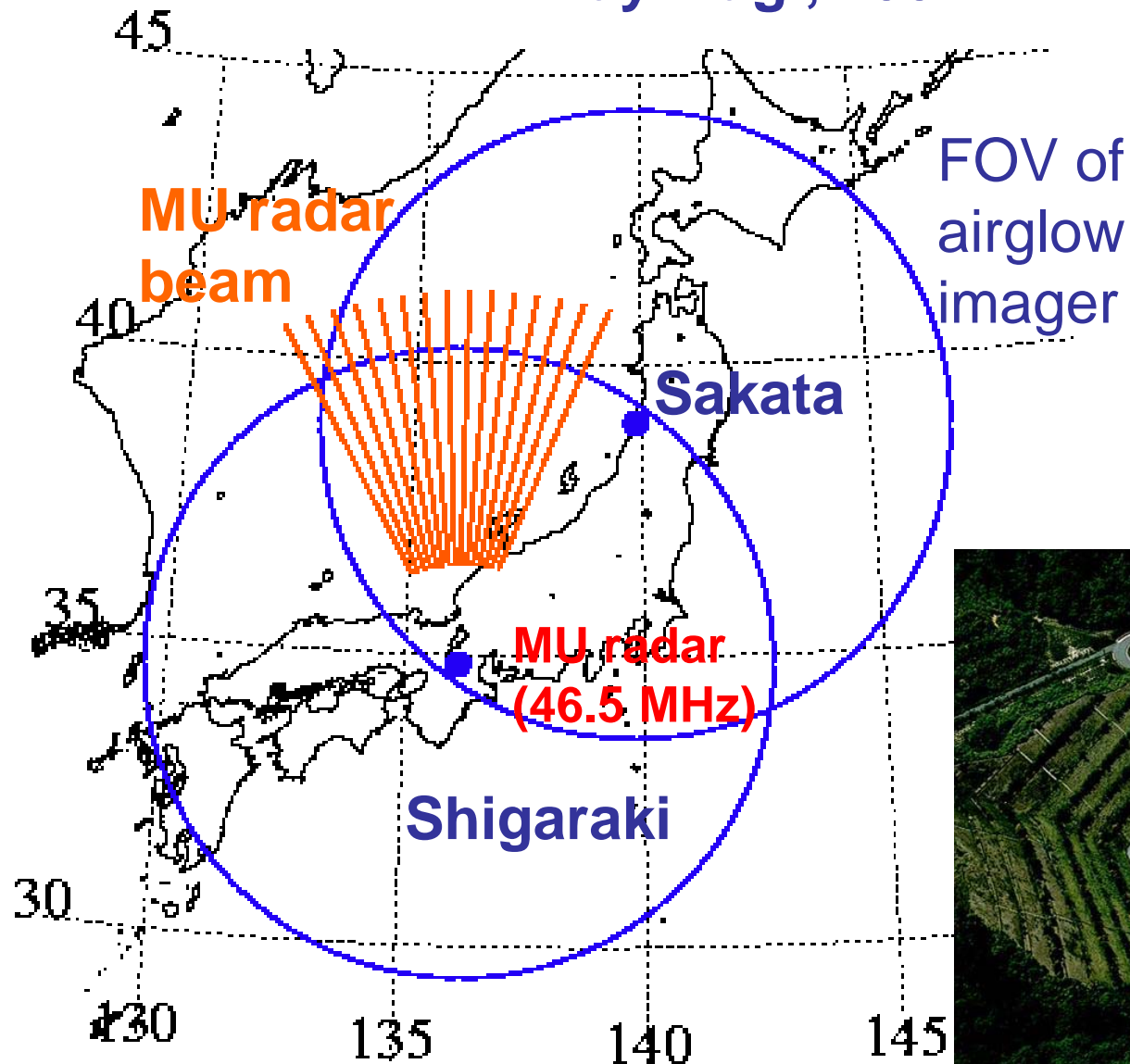
Investigate spatial relationship between MSTID and FAI.



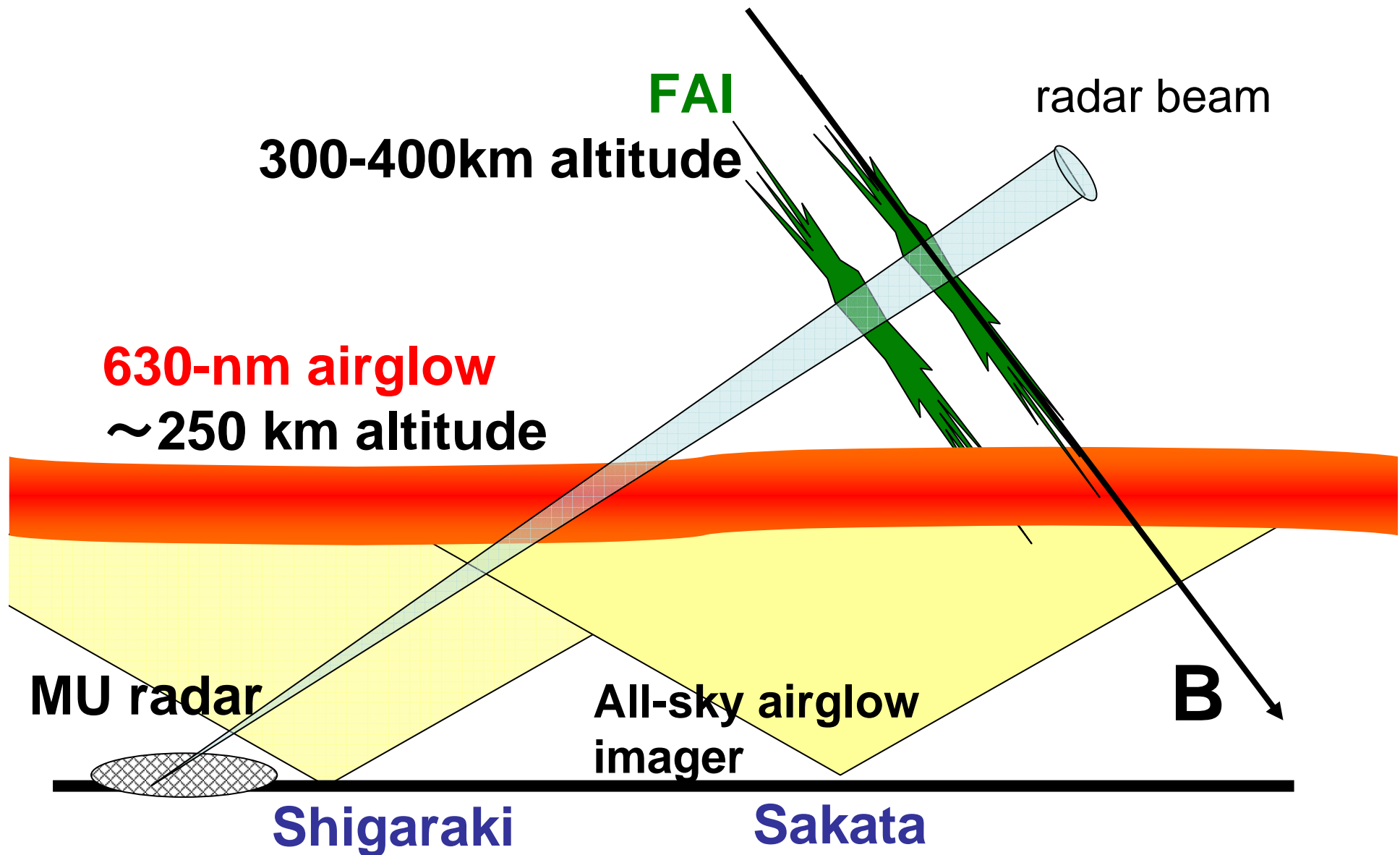
TEC perturbation and F-region FAI on the night of June 1, 1997 [Saito et al., 2002]

All-Sky Airglow Imaging and FAI observations

May-Aug., 2004

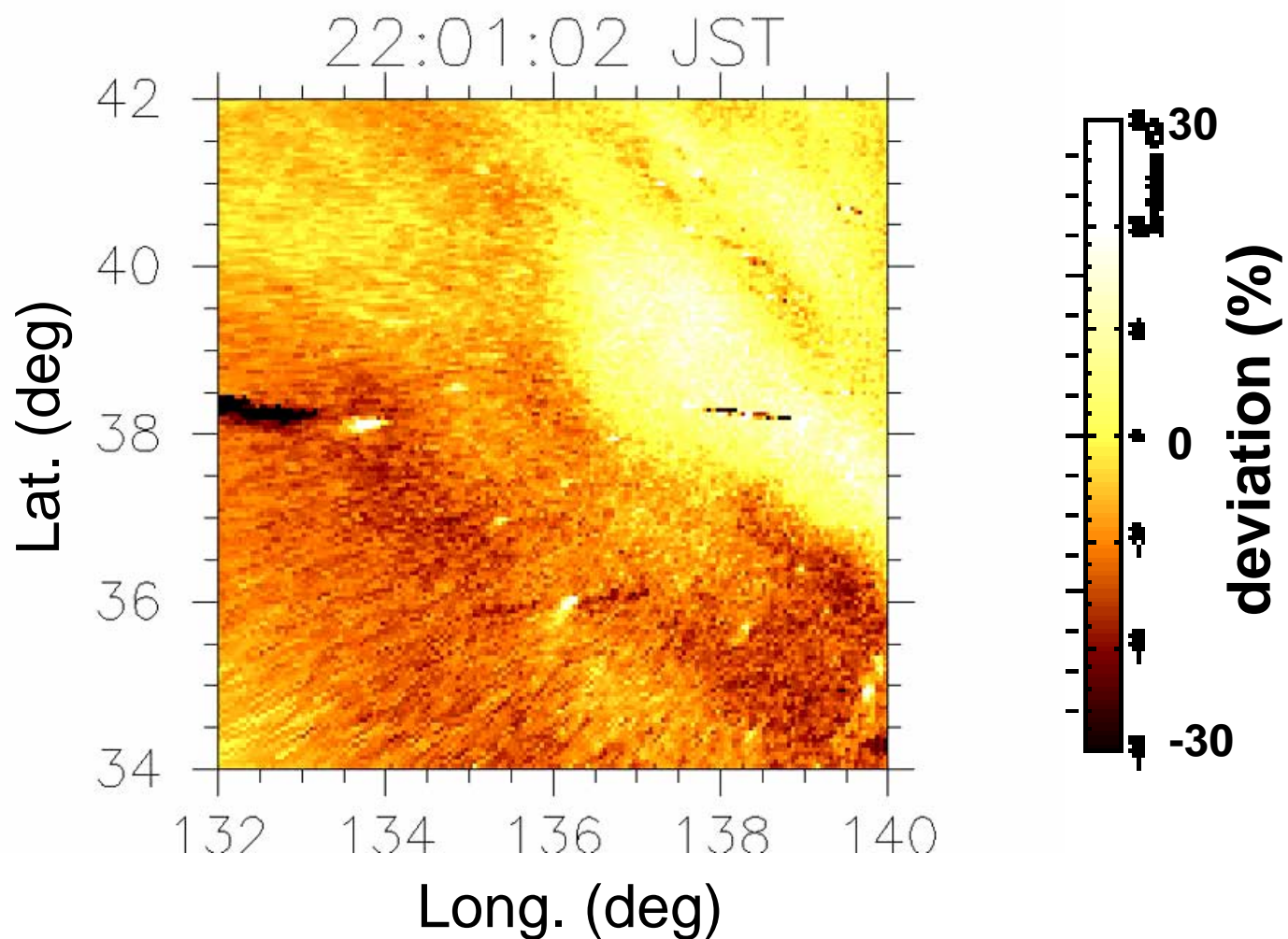


F-region FAI and 630-nm Airglow

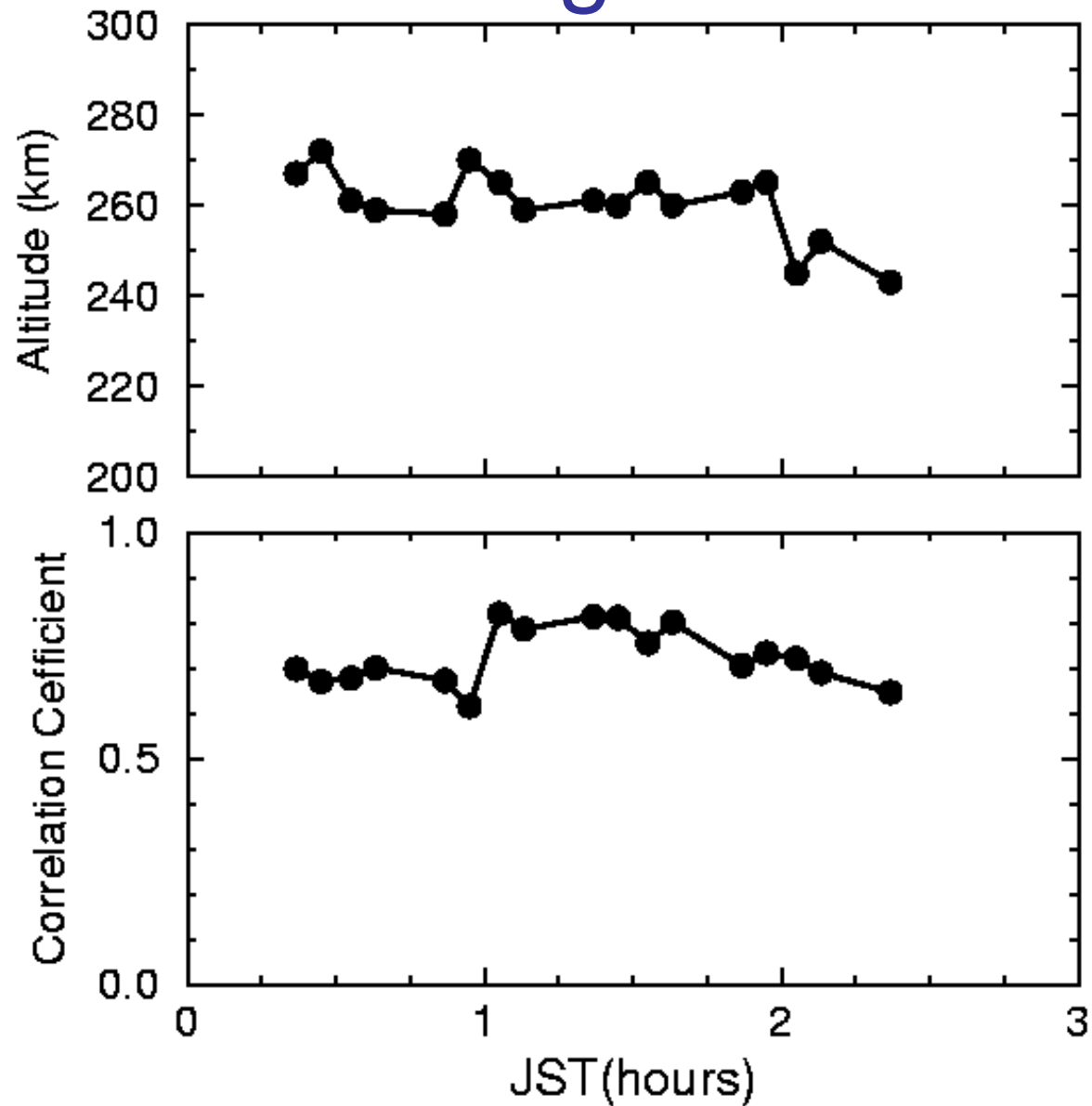


630-nm airglow over Sakata

June 16, 2004

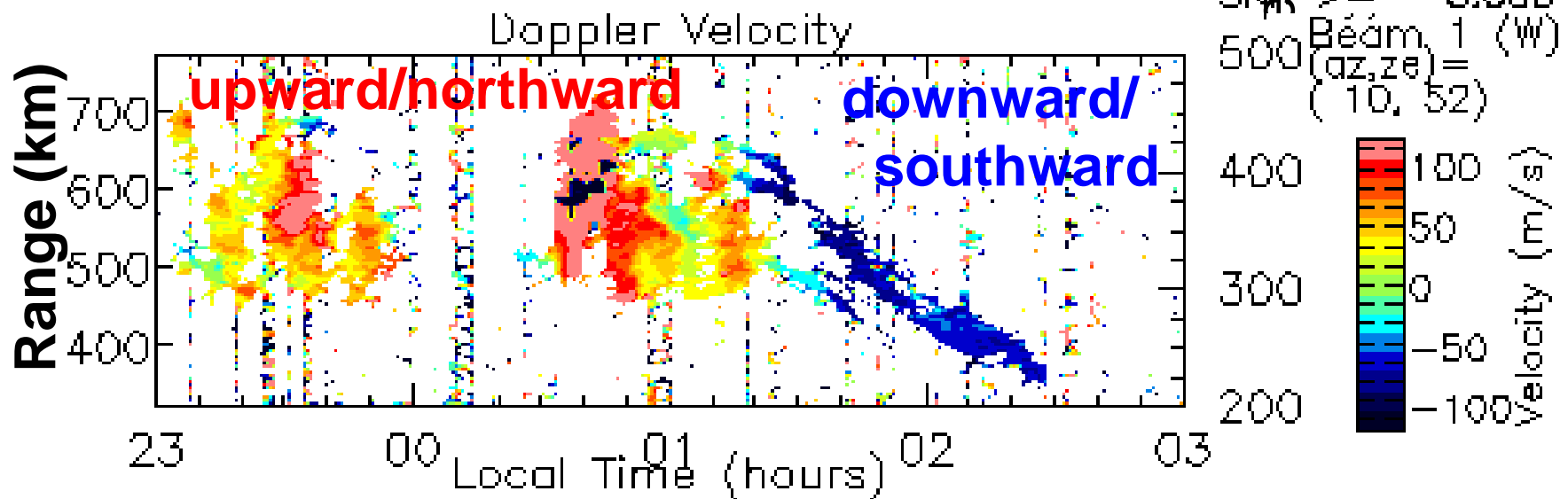
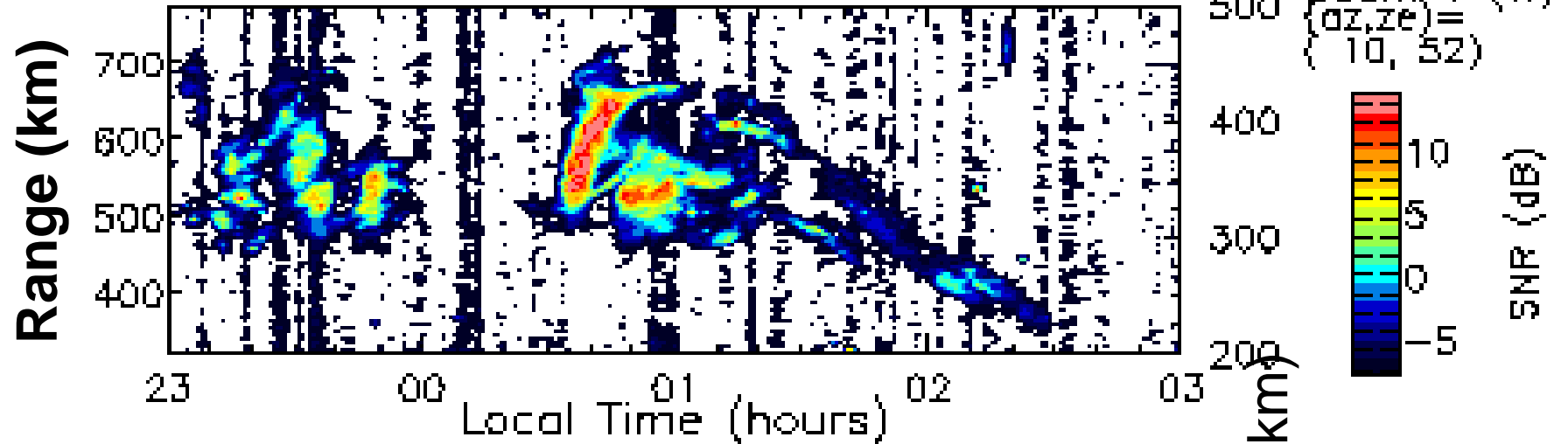


630-nm airglow altitude estimated by the triangulation

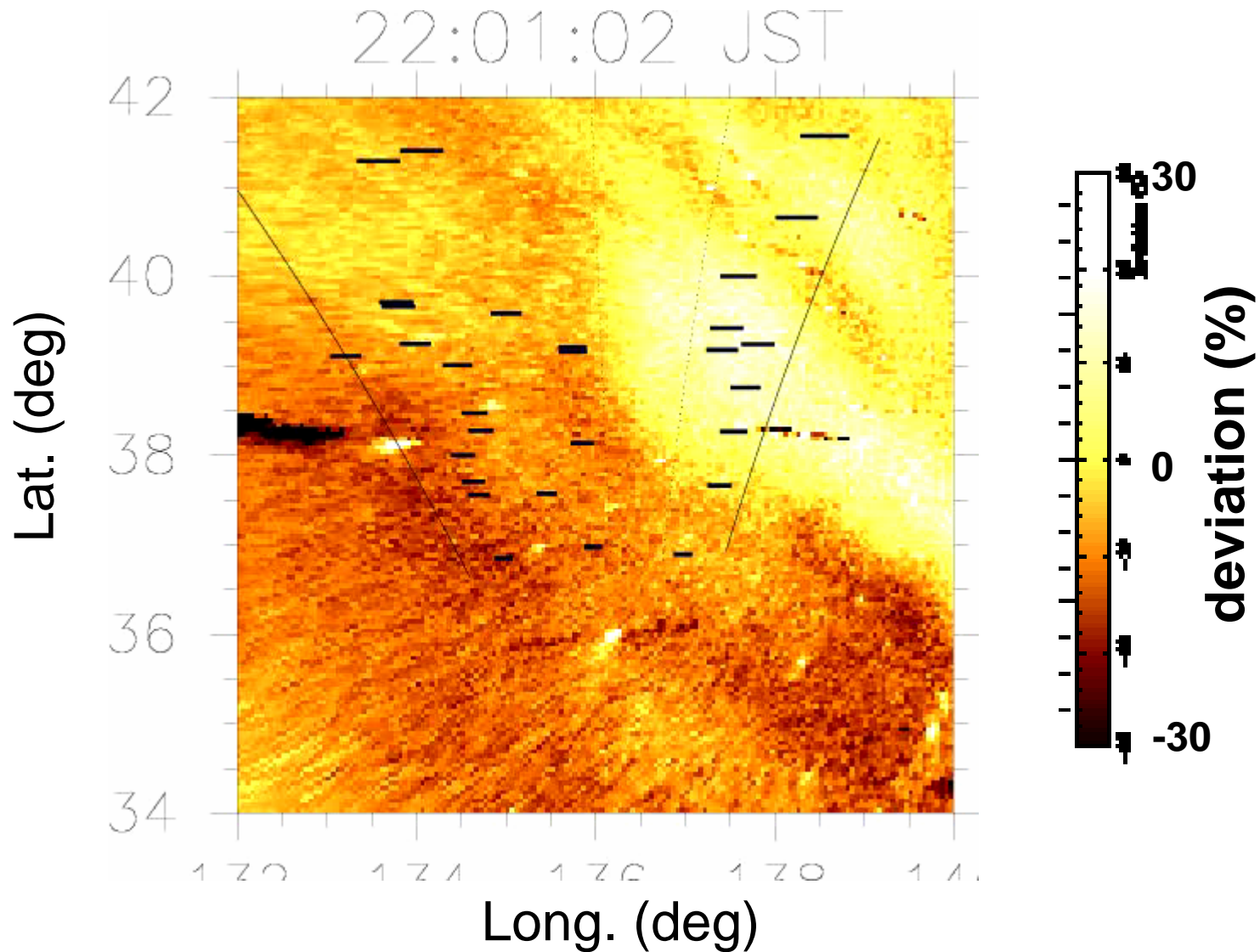


F-region FAI

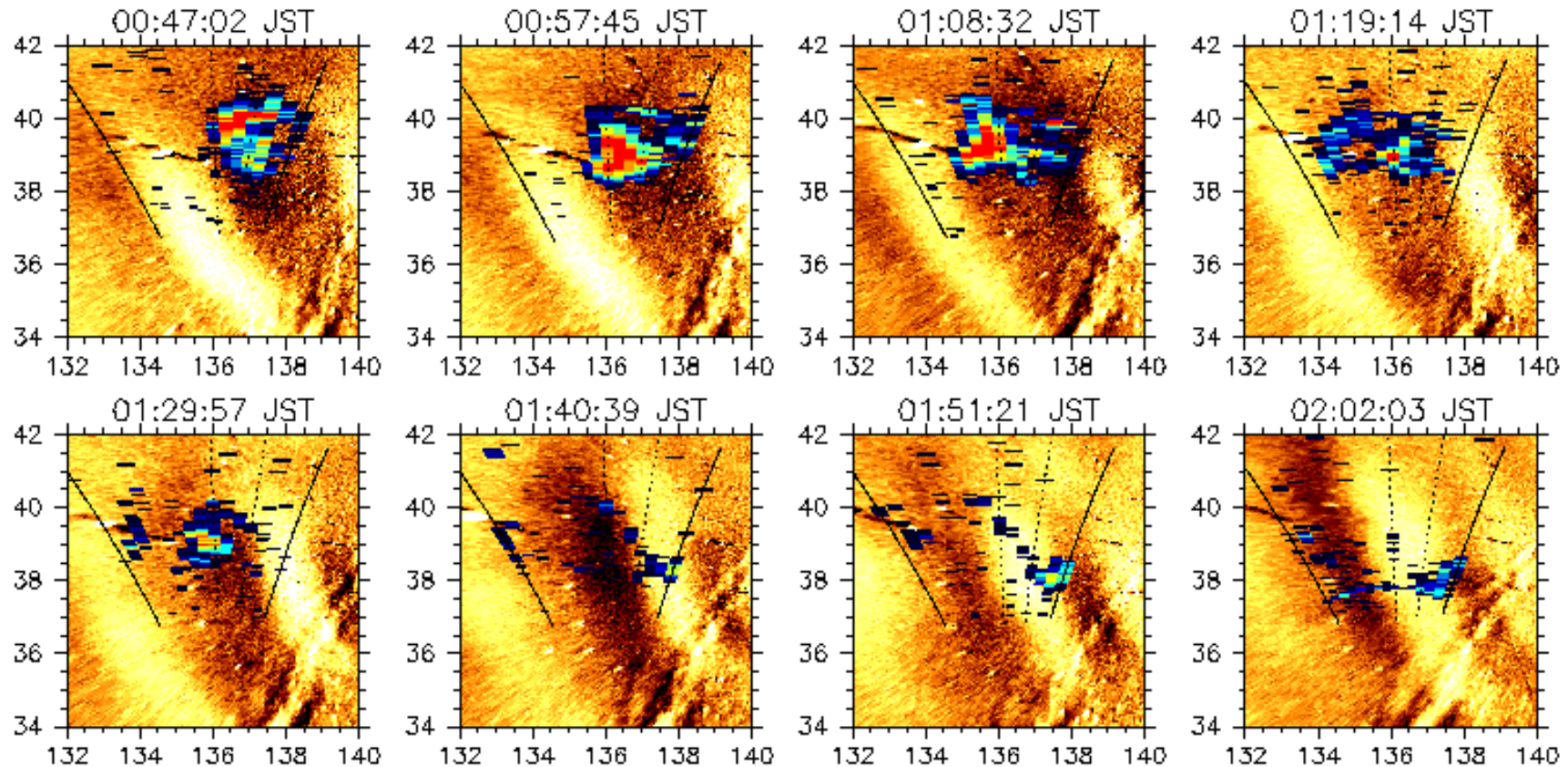
16-JUN-2004 23:00 - 17-JUN-2004 03:01 (ifmy)
Echo Power



630nm airglow and F-region FAI echo



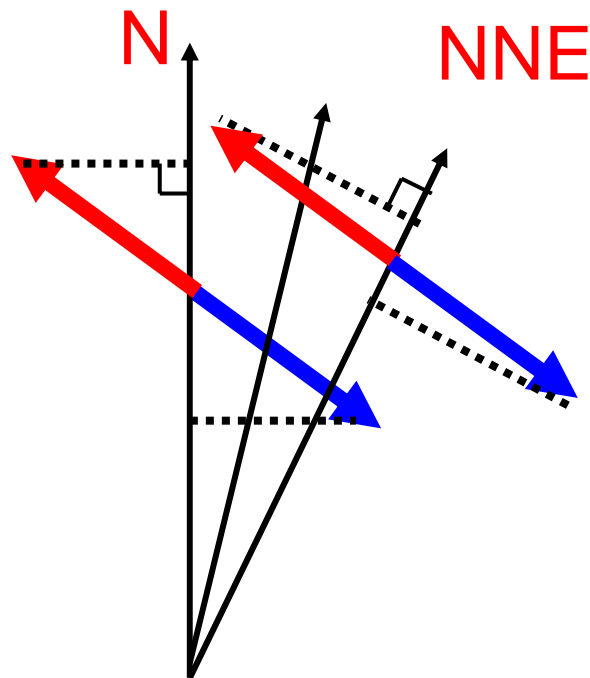
630nm airglow and F-region FAI echo



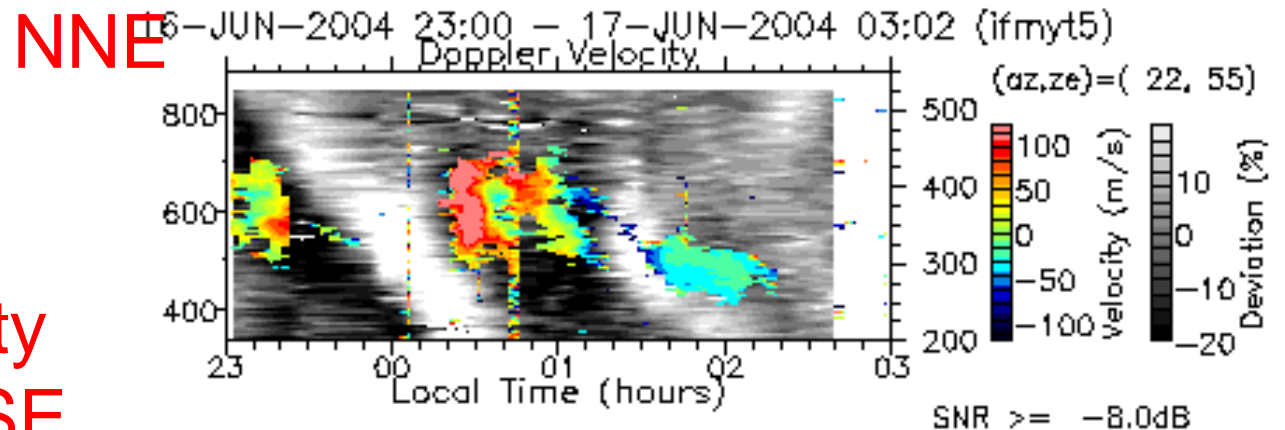
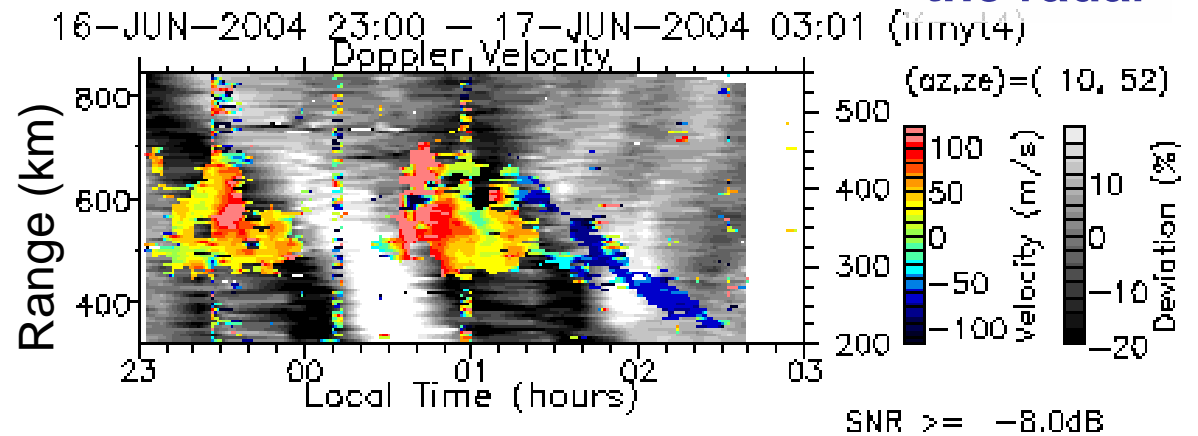
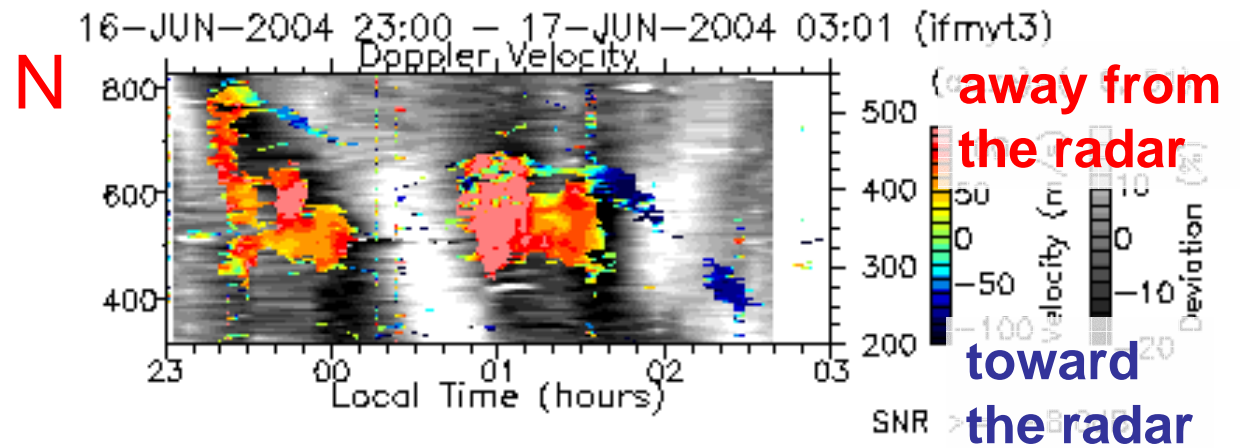
Intense FAI echo
coincides with airglow
depletion.

Weak FAI echo
coincides with airglow
enhancement.

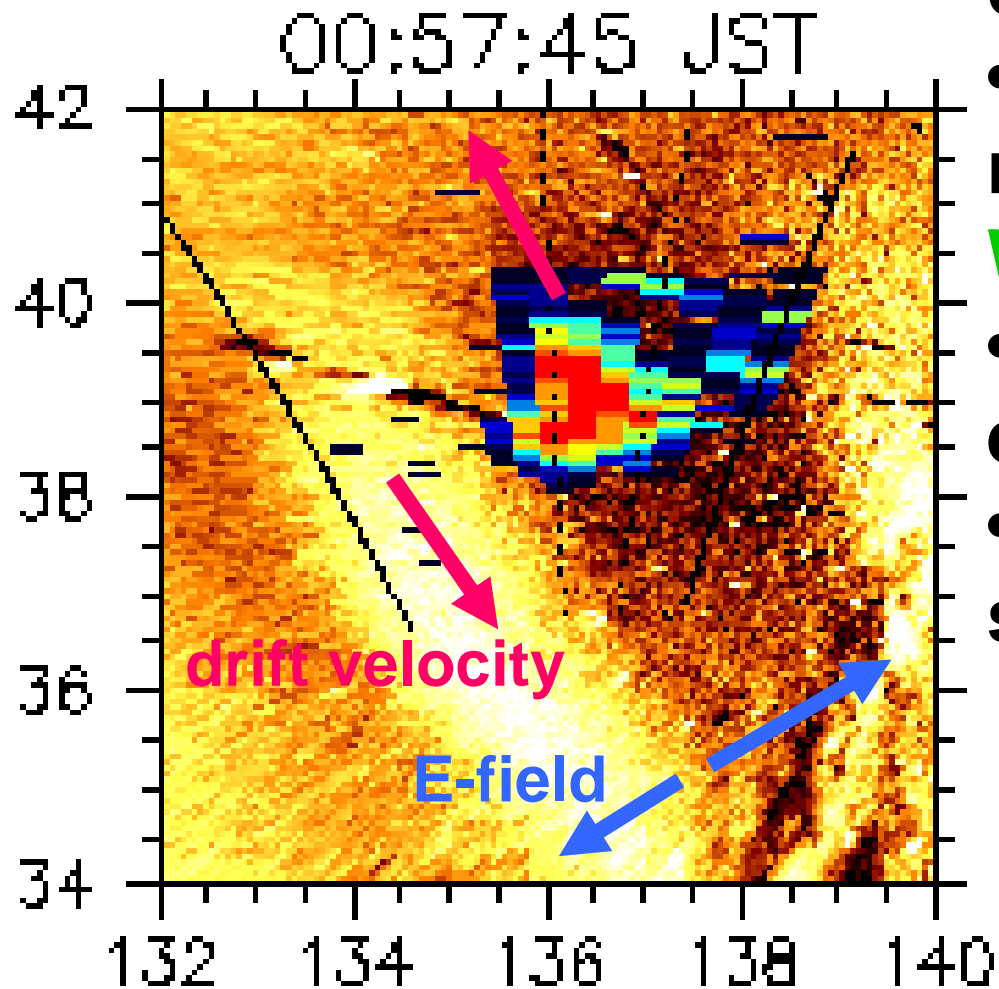
Doppler velocity



⇒ Doppler velocity oscillated in NW-SE



Summary



Intense FAI echo

- coincides with airglow depletion.

- drift velocity is northwestward.

Weak FAI echo

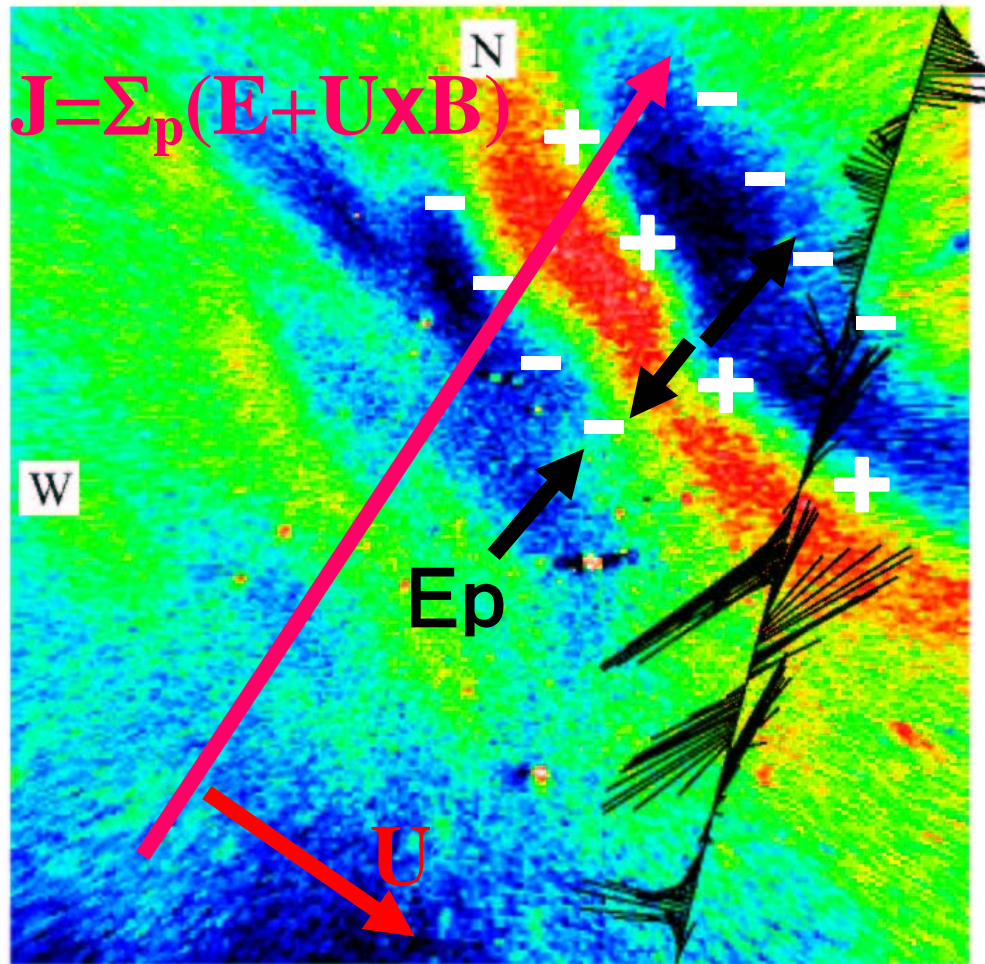
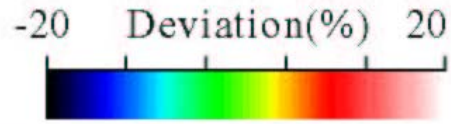
- coincides with airglow enhancement.

- drift velocity is southeastward.

Direction of the FAI drift velocity is consistent with $E \times B$ drift caused by the MSTDI-related E-fields.

Perturbations of Airglow Intensity and Electric Field

Shigaraki 630nm
 altitude: 300 km
 May 17, 2001, 1220:49UT, 1024kmX1024km

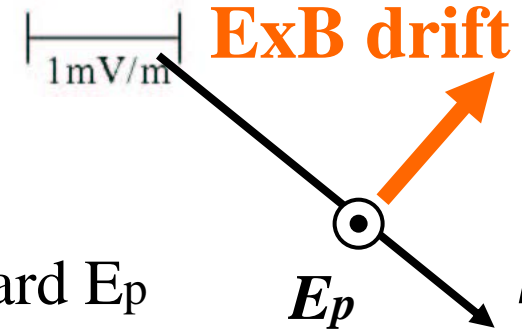


$$I_{630nm} \propto \Sigma_p$$

[Shiokawa et al., 2003]

DMSP F15
 1221:18-1224:29UT

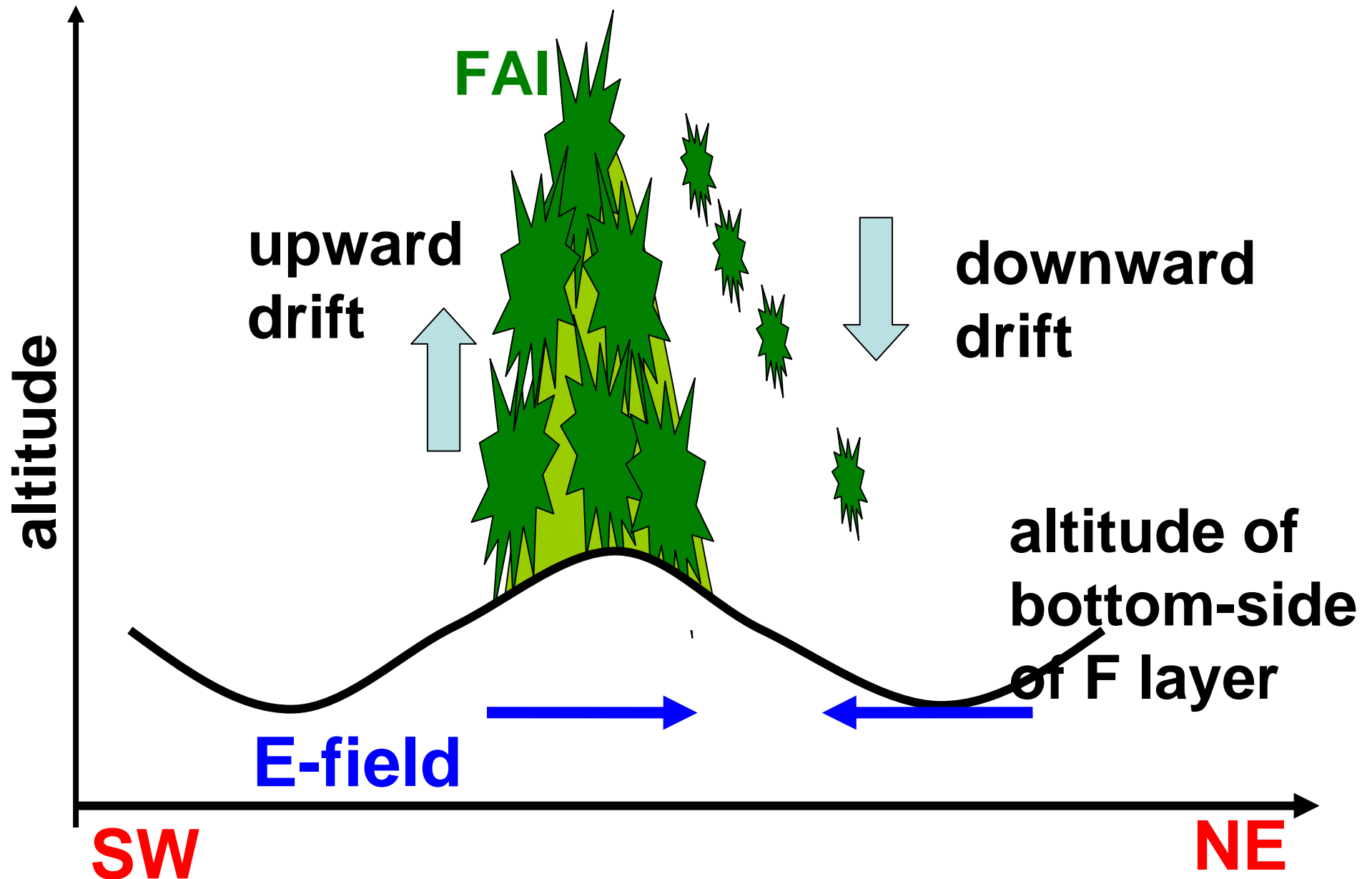
Electric Field Vector



Eastward E_p
 Uplift of F layer
 → Decrease of airglow intensity

Polarization E could be generated by the plasma density perturbations and also generate the plasma density perturbations.

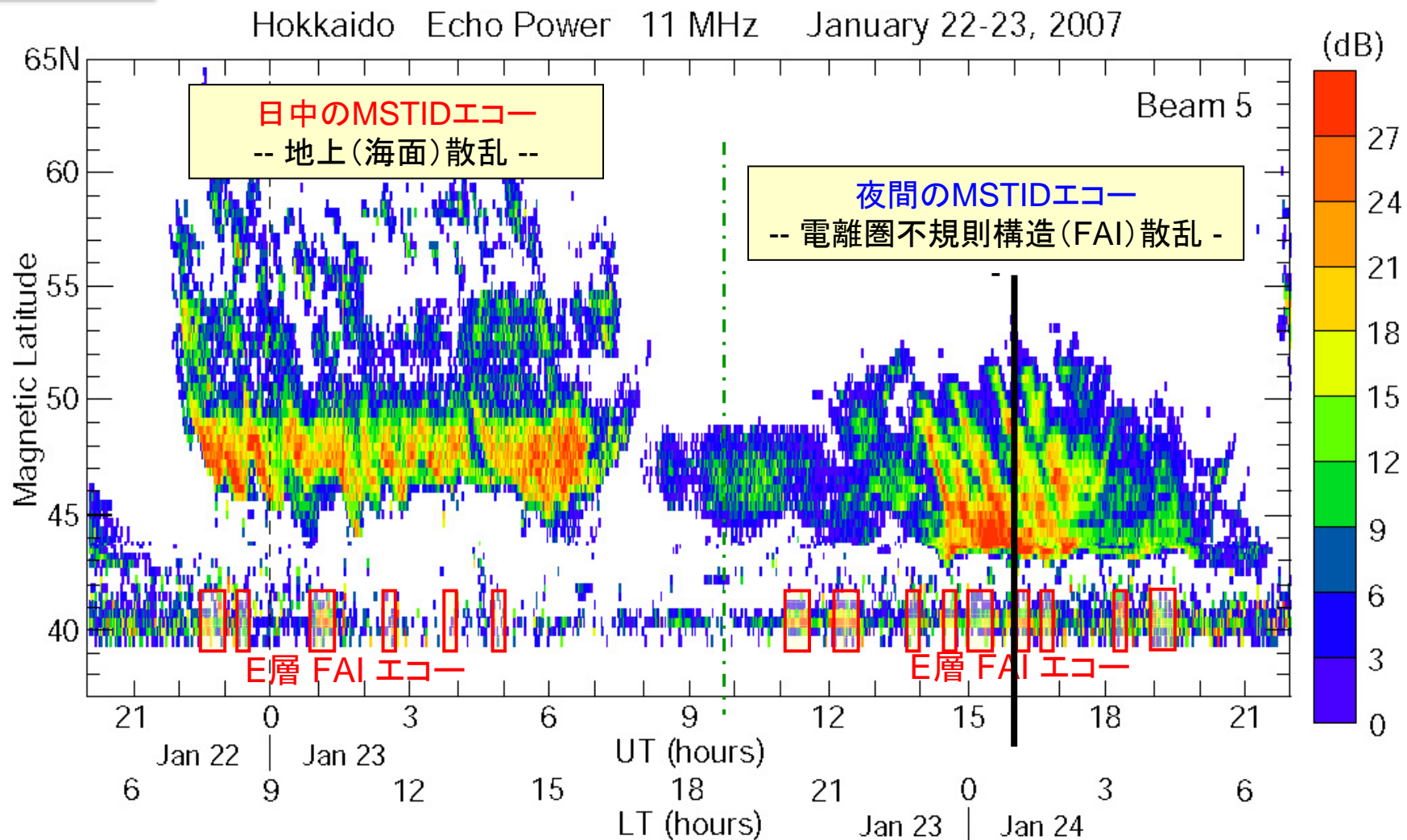
FAI and altitude variation of F layer



Summary

- We conducted simultaneous observations of MSTID and FAI using two-all sky imagers and the MU radar in Japan on June 16, 2004.
 - Intense FAI echo with upward/northward Doppler velocity coincided with the airglow-depleted regions.
- ⇒ FAI could be generated at the uplifted F region.

冬季



Hokkaido Radar Site (Rikubetsu)

- Geographic: 43.53°N, 143.61°E
- AACGM magnetic coordinates (model=2000) : 36.46, -145.34
- L = 1.546

昼夜とも一部の時間帯を除いてE-F層結合あり