Ground-Based Observation of Aurora, Airglow, and Geomagnetic Pulsations at Subauroral Latitudes to Contribute to the THEMIS Inner Magnetosphere Research

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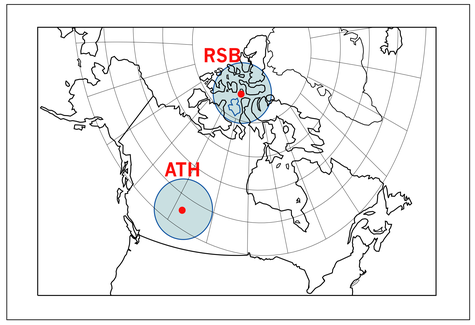
STEL

STATIONS IN CANADA



GROUND-BASED OBSERVATIONS

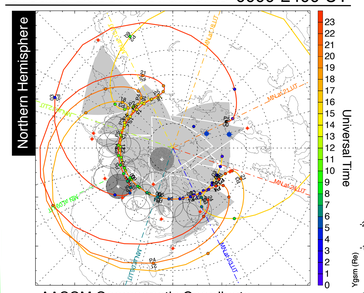
Resolute Bay (RSB), 82.9MLAT
all-sky imager
557.7nm, 630.0nm, OH-band, 777.4nm, 589.3nm

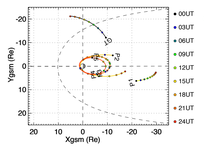
Athabasca (ATH), 62.6MLAT
all-sky imager
557.7nm, 630.0nm, OH-band, 486.1nm (Hbeta), 844.6nm, 589.3nm
meridian-scanning filter-tilting photometer
427.8nm, 486.1nm (Hbeta), time resolution : 2 min, 5 points in the sky
induction magnetometer

We have been conducting aurora/airglow measurements using highly sensitive all-sky cooled CCD cameras at Resolute Bay, Canada (74.7° GLAT) and at Athabasca, Canada (54.7° GLAT) since 2005. High-latitude processes including polar cap plasma patches and sun-aligned arcs have been observed at Resolute Bay, while plasma processes related to the inner magnetosphere, such as ring current loss and interactions between the ring current and the plasmasphere, have been observed at Athabasca. In the Athabasca station we also installed an induction magnetometer with a sampling rate of 64 Hz to measure Pc 1 geomagnetic pulsations. These measurements will contribute to the THEMIS mission by giving two-dimensional information of ionospheric projection of the magnetospheric processes and temporal variation of wave activities in the inner magnetosphere.

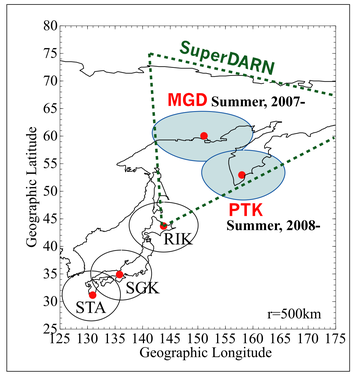
From this summer 2007, we plan to install the same set of all-sky imager and the induction magnetometer at two stations in the eastern Russia at 45-55MLAT. These stations are in the FOV of the newly-installed SuperDARN radar in Hokkaido Japan, which has started operation since December 2006. By combining these measurements at subauroral latitudes with the THEMIS satellites, we will investigate plasma dynamics

Spacecraft Footprints and Ground-Based Instruments 20080205 0000-2400 UT





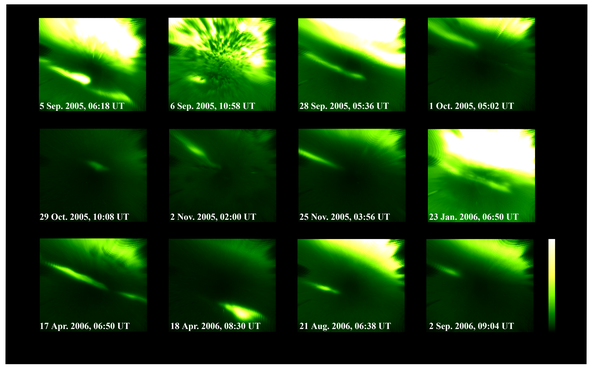
Magadan (MGD), 51.9MLAT
Paratunka (PTK), 45.8MLAT
all-sky imager
557.7nm, 630.0nm, OH-band,
486.1nm (Hbeta), 777.4nm
induction magnetometer



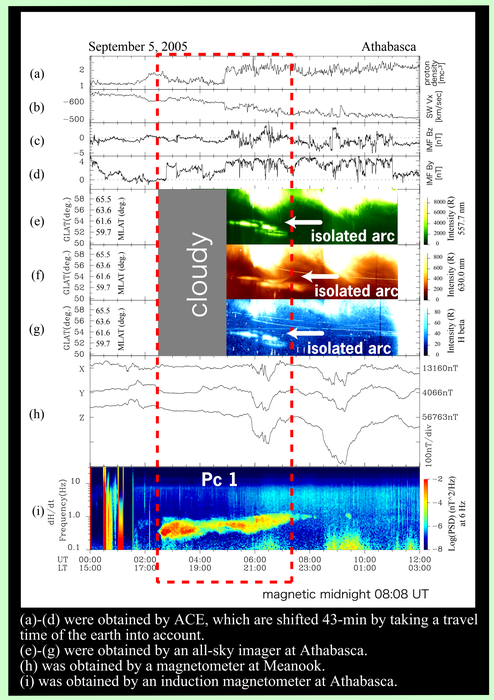
CONJUNCTIONS with THEMIS

STATIONS IN THE EASTERN RUSSIA

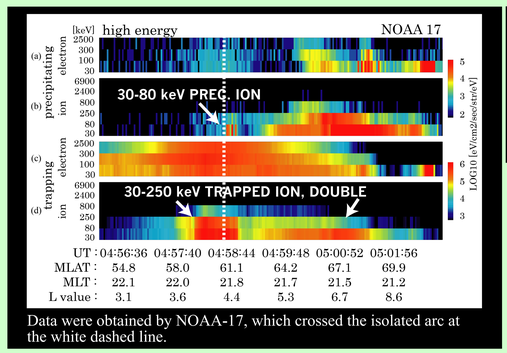
ISOLATED AURORAL ARCS AND RELATED PC 1



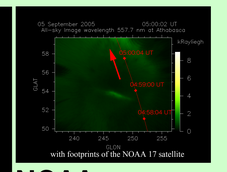
As an example of the subauroral phenomena that reflect plasma processes in the inner magnetosphere, we show events of isolated proton arcs observed at Athabasca. The arcs appear coincident with strong Pc 1 geomagnetic pulsations in the frequency range of the electromagnetic ion cyclotron (EMIC) wave. From particle data obtained by the NOAA satellite, we found that the isolated arc was located in the localized enhancement of ion precipitation fluxes at an energy range of 30-80 keV at L~4, embedded on trapped ion flux enhancements (ring current ions). The DMSP satellite observed signatures of ionospheric plasma trough near the conjugate point of the arc in the southern hemisphere. The trough is considered to be connected to the plasmapause. We conclude that the observed isolated proton arc at subauroral latitudes were driven by the EMIC waves, which were generated near the plasmapause and scattered the ring current protons resonantly into the loss cone.



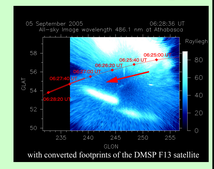
(a)-(d) were obtained by ACE, which are shifted 43-min by taking a travel time of the earth into account.
(e)-(g) were obtained by an all-sky imager at Athabasca.
(h) was obtained by a magnetometer at Meanook.
(i) was obtained by an induction magnetometer at Athabasca.



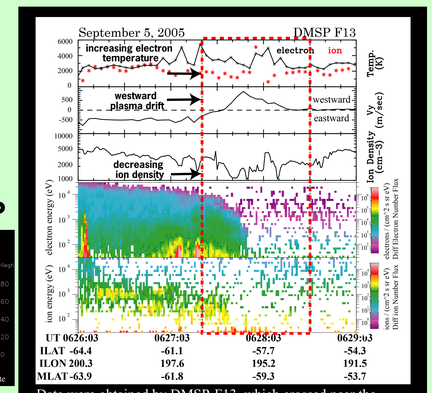
Data were obtained by NOAA-17, which crossed the isolated arc at the white dashed line.



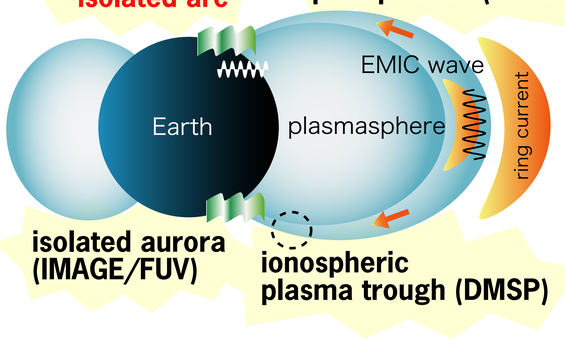
NOAA



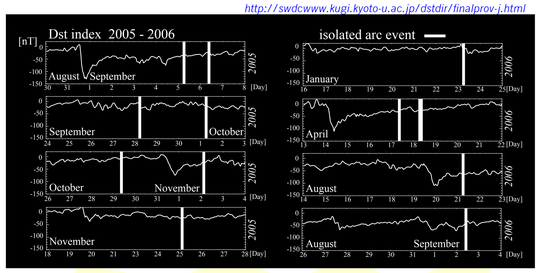
DMSP



Data were obtained by DMSP-F13, which crossed near the conjugate point of the arc in the red dashed square.



http://swdcwww.kugi.kyoto-u.ac.jp/dstdir/finalprov-j.html



These events tend to occur during late recovery phase

Isolated arcs and Pc 1 were observed simultaneously

Equatorward movement of the isolated arc was consistent with increase of the Pc1 frequencies

THEMIS pre-launch science meeting 2007 in Florida