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Comparative studies on polar ionosphere and magnetotail dynamics based on simultaneous multi-point observations: (2)

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For observations of the nightside polar ionosphere, the Reimei satellite is capable of simultaneous observations for auroral 2D distribution by Multi-spectral Aurora Imaging Camera (MAC) and auroral particles by Electron/Ion Energy Spectrum Analyzer (ESA/ISA). Reimei has been observing the auroral fine structures at altitudes of about 640km by the unprecedented high spatial and temporal resolutions and promoting the understanding of the their fine structures. On the other hand, the field-aligned electric field and Alfven waves have been investigated in the auroral acceleration region by using data of FAST, Polar, Akebono and the other satellites. The phenomena in this region are thought to be due to the fluctuation of plasma and electromagnetic field in the magnetotail. In addition to the auroral observations of the polar ionosphere, the data comparison between in the magnetotail and in the polar ionosphere will give us more comprehensive understandings of the auroral phenomena.
For observations of the magnetotail, we use data by THEMIS satellites consisting of 5 probes. The simultaneous multipoint observations by these satellites are useful for the distinction between temporal variation and spatial distribution. THEMIS-GBOs(Ground-based observatories) which are located on the Northern America also enable us to observe global aurora.
In this presentation, in the dataset for 1.5-years interval possibly providing the simultaneous observations by Reimei and THEMIS, we focus on the data obtained on Feb. 9, 2008. When Reimei passed over Canada(70ILAT) from poleward to equatorward, the Inverted-V precipitating electrons signatures lasted about 13 seconds corresponding to 0.7 ILAT width, and the characteristic electron energy was 1-5keV according to the ESA measurement. Near the poleward edge observed for three seconds, a south-eastward flow and a folded arc were observed and then stable and faint aurora was observed according to the MAC. These two types of auroras corresponded to the Inverted-V precipitating electrons. At the same time, THEMIS-GBO observed the relatively steady arc when THEMIS P3 and P4 were located at (x,y,z)=(-10.7Re,-2.2Re,-3.1 Re) and (-11.1Re,-1.3Re,-3.3Re) in the plasma sheet , respectively. When Reimei passed the Inverted-V region, there was almost no variation of the energy and flux of electron and ion in the magnetotail. The flow reversal, however, appeared, which changed from antisunward flow to sunward flow when Reimei passed the Inverted-V region. Although P3 and P4 were at different locations, the similar variations were seen at the same time for both probes. This change is thought to be caused not by passing through the spatial variation but by the temporal variation covering one Re in the plasma sheet. These results are summarized as follows:
1. The 1-5keV Inverted-V electrons are producing the steady auroras.
2. The flow reversal occurs when such auroras appears.
3. Although the magnetotail fluctuation is small, the 1-5keV Inverted-V electrons are accelerated above the altitude of Reimei.