Ionospheric signature of flow bursts in the magnetotail: Geotail-SuperDARN conjunction study

Tomoaki Hori[1]; Keisuke Hosokawa[2]; Yukinaga Miyashita[3]; Kazuhiro Ohtaka[1]; Manabu Kunitake[1]; Shinichi Watari[1]; Takashi Kikuchi[4]; Yoshifumi Saito[5]; Toshifumi Mukai[6]

[1] NICT; [2] Univ. of Electro-Communications; [3] ISAS/JAXA; [4] STELab; [5] ISAS; [6] JAXA

Ionospheric convection signatures associated with flow bursts in the magnetotail are examined statistically on the basis of the simultaneous observations made by the Geotail spacecraft and the SuperDARN radars covering the footprint of Geotail. Our statistical study shows that most (˜80 %) of the flow bursts in the magnetotail are accompanied by a significant enhancement of the ionospheric convection flow at the footprint of Geotail mapped along the field line. In those events, basically the magnetotail flows grow and decay rapidly, while the corresponding ionospheric flows develop as quickly but tend to fade away gradually. Both earthward and tailward magnetotail flows coincide with an anti-sunward flow on the ionosphere. In particular, the flow reversal events are always accompanied by the ionospheric convection enhancement, suggesting that these M-I coupled motion of flux tubes can be driven by near-Earth reconnection. Interestingly, the spatial properties of the ionospheric flows are different from event to event. Some flow bursts in the magnetotail correspond to ionospheric flows with spatial sizes of several degrees in longitude and latitude, which are consistent with the spatially limited features of flow bursts in the plasma sheet reported by past studies. Meanwhile, there are flow burst events occurring in association with somewhat larger-scale ionospheric flows, such as an overall enhancement of the nightside part of the dawn or dusk convection cell. These facts indicate that a magnetotail flow burst could reflect the entire part of, or a small part of an ionospheric flow channel.