SuperDARN data analysis on the conjugacy of magnetic impulse events (MIEs)

Ryuho Kataoka[1], Hiroshi Fukunishi[2], Keisuke Hosokawa[3], Akira Sessai Yukimatu[4], Natsuo Sato[5]

[1] Dep. of Geophysics, Tohoku Univ., [2] Department of Geophysics, Tohoku Univ., [3] Dept. of Geophysics, Kyoto Univ., [4] UAP, NIPR (SOKENDAI, Polar Science), [5] NIPR

http://pat.geophys.tohoku.ac.jp/~ryuho/indexj.htm

Magnetic impulse events (MIEs) are identified as solitary magnetic disturbances observed by ground-based magnetometers with durations of 5-15 min and amplitudes of 50-200 nT at dayside high-latitudes. Because of the solitary features, MIEs provide an important clue to the understanding of the transient response of the coupled magnetosphere-ionosphere system to solar wind disturbances. Traveling convection vortex (TCV), that is transient ionospheric Hall current loops passing overhead of ground-based magnetometers, is the best interpretation of MIEs.

We have investigated the conjugacy of TCV current system by equivalent current analysis of magnetic field data obtained from magnetometer networks extending in the northern and southern polar regions. It has been found that the conjugacy of current vortices exists and that magnetic field disturbances in the vicinity of the vortex centers have comparable amplitude in the northern and southern hemispheres. On the other hand, electric field data obtained from SuperDARN conjugate observations in the northern and southern hemispheres were not analyzed so far to investigate the north-south amplitude ratio of electric fields related to TCV events. Recently, the coverage of SuperDARN has extended over the entire polar regions of the northern and southern hemispheres. Taking advantage of these SuperDARN and magnetometer coverage, we have derived simultaneous ionospheric currents and electric fields in the conjugate regions. Based on the obtained results, we investigate the three dimensional current system of TCVs including its generator in the magnetosphere.