Equatorial counterelectrojets during the main phase of geomagnetic storms

Takashi Kikuchi[1]; Kumiko Hashimoto[2]; Yusuke Ebihara[3]; Tsutomu Nagatsuma[4]
[1] STEL, Nagoya Univ.; [2] KUHW; [3] IAR, Nagoya Univ.; [4] NICT

The convection electric field is significantly enhanced in the magnetosphere by the southward interplanetary magnetic field (IMF) during storm main phase, which propagates to the polar ionosphere accompanying the Region-1 field-aligned currents (R1 FACs) and is further transmitted to the low latitude ionosphere near-instantaneously by the TM0 mode wave in the Earth-ionosphere waveguide. The convection electric field drives DP2 currents in the global ionosphere, intensifying the eastward electrojet (EEJ) at the dayside dip equator and causing dramatic changes in the F-region ionosphere at low latitude and equator. The electric field is further transmitted into the inner magnetosphere, causing ring currents and the R2 FACs responsible for the shielding/overshielding electric field. As a result, the counterelectrojet (CEJ) appears at the dayside dip equator during storm recovery phase, when the convection electric field decreases substantially. On the other hand, it has been known that the CEJ also occurs during storm main phase. We found that substorm signatures were associated with the CEJ, although the CEJ could be attributed to the disturbances dynamo. We also report that fluctuations in the EEJ often occur during a period of rather steady southward IMF. The stormtime electric field responsible for the CEJ and fluctuations in the EEJ remains a crucial issue in the magnetosphere-ionosphere-thermosphere coupled system.