Substorm electric fields at nighside low latitude

Kumiko Hashimoto[1]; Takashi Kikuchi[2]; Ichiro Tomizawa[3]; Tsutomu Nagatsuma[4]
[1] KIU; [2] STEL, Nagoya Univ.; [3] SSRE, Univ. Electro-Comm.; [4] NICT

The convection electric field penetrates from the polar ionosphere to low latitude and drives the DP2 currents in the global ionosphere with an intensified equatorial electrojet (EEJ). The electric field often reverses its direction, that is, the overshielding occurs and causes the equatorial counterelectrojet (CEJ) during storm and substorms. The overshielding electric field has been observed at the equator with the incoherent scatter radar in Jicamarca and SuperDARN radars in mid latitude. In this paper we report that the overshielding electric field is detected at low latitude by the HF Doppler measurements. In this paper we analyzed the Doppler frequency of the HF radio signals propagated over 120 km in Japan at frequencies of 5 and 8 MHz and compared with the equatorial EEJ/CEJ during substorm expansion phases. We found that the overshielding electric field reaches around 2 mV/m during major disturbed substorms (AL <-800 nT). Taking the geometrical attenuation into account, we have the equatorial electric field of about 1.5 mV/m. We also found that the electric field drives the eastward electrojets in the equatorial ionosphere on the night side. It is to be noted that the overshielding electric field is observed on the nightside at low latitude during major substorm events, while the convection electric field is dominant for small scale substorms, as the CEJ flows on the dayside. These results suggest that the overshielding electric field associated with the Region-2 field-aligned currents becomes dominant during substorms at low latitude on the nightside as well as on the dayside.