

Transmission of the magnetospheric electric fields to the mid and low latitude ionosphere during geomagnetic sudden commencements and pulsations

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The geomagnetic sudden commencement (SC) and Pi2 and Pc5 geomagnetic pulsations have been recognized to be MHD waves in the magnetosphere. In this paper, we present local time features of electric fields of these waves at mid and low latitudes, using the Hokkaido SuperDARN radar, UEC HF Doppler sounders and NICT magnetometers. The electric field of the main impulse of SC is eastward on the dayside and westward on the nightside, contrast to westward at all local times in the magnetosphere [Kikuchi et al., 2016]. The local time features of the SC electric field are characterized by the evening anomaly where the electric field is in the same direction as in the day. Furthermore, the mid and low latitude electric fields are well correlated with the equatorial electrojet (EEJ), which implies that the electric field is associated with ionospheric currents flowing near-instantaneously from high latitude to the equator. The observed day-night asymmetry with the evening anomaly is found to be consistent with the global electric potential distribution disseminated by the TM0 mode electromagnetic waves in the Earth-ionosphere waveguide [Kikuchi, 2014]. Similar relationship between the mid latitude electric field and EEJ was observed for the Pi2 and Pc5 pulsations. We suggest that the ionospheric electric fields of the SC, Pi2 and Pc5 are not an inductive field available in the magnetosphere, but should be a potential field associated with ionospheric currents similar to the DP2 electric fields with periods of 40m [Kikuchi et al. 2010].

References

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