

Research project for investigation of active role of ionospheric dynamics on the magnetosphere-ionosphere coupled system

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Ionospheric Hall effect strongly controls spatiotemporal evolution of Magnetosphere-Ionosphere (MI) coupling system.

Generation of polarization electric field at the conductivity gradient region causes rotation, shear, and acceleration and deceleration of ionospheric convection field in both local and global manners. The ionospheric polarization field activates upward shear Alfvén wave that could cause ionospheric driven magnetospheric dynamics and induce new type of MI coupled current system.

Generation of induction electric field at the wave front of ionospheric disturbances enable to horizontally propagate an electrostatic type electric field as a result of coupling between magnetosonic mode and shear Alfvén mode at the ionospheric E-layer induced by multistep Hall effect in a time domain. Understanding a combined effect of ionospheric polarization and induction on the ionospheric dynamics becomes key element formation of global current system from polar to equatorial ionosphere.

To understand active role of ionospheric dynamics on the global MI-coupled system, we coordinate integrated study of theory, numerical simulation, global observation of ionospheric dynamics and satellite observation of magnetospheric aspects. In this talk, we will discuss what is essential physics of this project, how to identify elementary components from coupled phenomena, and how to coordinate integrated study for understanding active role of ionospheric dynamics.

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