SEMINAR

專題演講

國立中央大學 太空科學與工程學系

Department of Space Science and Engineering, National Central University

Time

Monday, July 29, 2024
14:00 – 15:00

Place

健雄館(科四館)

S4-917 教室
Room S4-917,
Chien-Shiung Building

Plasma Physical Processes of the Dayside Geospace Solar Wind-Magnetosphere Coupling

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A variety of physical processes such as Kelvin-Helmholtz instability (KHI), magnetic reconnection and turbulence occurring near the Earth's dayside magnetopause attract considerable attention for their roles in the mass, momentum and energy transport between solar wind and the magnetosphere. Those processes related to solar wind-magnetosphere interaction are studied by means of two-dimensional magnetohydrodynamics (MHD) simulations and in-situ observation analysis, and will be reviewed in this presentation. We first revisited the observational signatures of KHI. The twisted boundaries caused by the instability can lead to bipolar variations in magnetic normal component, which could be easily misidentified as Flux Transfer Events (FTE). Simulation can provide a comprehensive view for diagnosing and help distinguish KHI-created signatures from FTEs. Second, we investigated the mid-to high-latitude electron microinjections that could potentially be associated with dayside magnetic reconnection. Observation from Magnetospheric Multiscale (MMS) mission have shown that the microinjections are modulated by the mirror mode waves in the magnetosphere, where the plasma conditions are not often conducive to the wave growth. The presence of mirror mode waves in the magnetosphere was thought to depend on solar wind condition. Hence, the origin of these electron microinjections and their relationship to solar wind conditions are examined through statistical analysis. Third, we provided an estimation of the current sheet thickness in the solar wind to evaluate the instrumental requirements of the Seven Sisters mission concept, which was dedicated for the study of the inner heliospheric structures, dynamics, and space weather forecasting. This estimation could further enhance our understanding of plasma mixing between current sheet interfaces and the energy cascade to small scales within interplanetary space.