

Study of IMF transport into the magnetosphere using a system of Magnetic Field Tracing in Global MHD simulations

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Dayside magnetic reconnection is a main mechanism that transports solar wind energy into the magnetosphere. When the IMF is northward, the energy transfer is small and relatively constant. When the IMF is southward, the energy transfer increases in proportion to the strength of the field. The purpose of this study is to investigate transport process of the solar wind energy into the magnetosphere by tracing a field line reconnected with the geomagnetic field at the dayside magnetopause using a system of Magnetic Field Tracing in Global MHD simulations.

The simulation is an MHD simulation of the interaction between the solar wind and magnetosphere. The data of ACE satellite with 5 minute interval at Galaxy15(2010/4/5) event is used as the solar wind input. We use the simulation data which are the size of $450 \times 300 \times 300$ in the Cartesian coordinates and are outputted for 2 hours which has 14400 steps and a time resolution of 0.5 s. We visualize large quantities of the simulation data using visualization application 'Virtual Aurora' developed by based on AVS and the parallel distributed processing at "Space Weather Cloud" in the National Institute of Information and Communications Technology (NICT).

As a first result, we trace the IMF when the IMF is southward ($B_z = -12\text{nT}$, $B_y = 5\text{nT}$) at 8:20 UT. We find that the magnetic field lines tracing in the region from the subsolar point to $\pm 5R_e$ in the dawn-dusk directions reconnect with the geomagnetic field at the dayside magnetopause as shown in Figure 1 and are transported into the nightside magnetosphere. In region of flank sides over $\pm 5R_e$, magnetic field lines do not reconnect and are transported through the sheath region to the downstream. In this lecture, we discuss relation between directions of IMF and dayside reconnection region and which path the reconnected IMF is transported through into the magnetosphere.

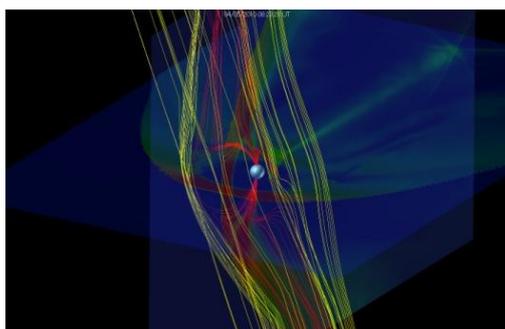


Figure 1. The magnetic field lines tracing in the region from the subsolar point to $\pm 5R_e$ in the dawn-dusk directions. These lines reconnect with the geomagnetic field at the dayside magnetopause.