# 磁気圏電離圏対流と磁場構造の相互作用
# The interaction between the magnetosphere-ionosphere compound system and the magnetic field topology

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The steady convection in the magnetosphere-ionosphere coupling system is composed of the following self-consistent elementary processes; dynamo in the cusp-mantle region, the field-perpendicular current system in the magnetosphere, the field-aligned current system connecting the ionosphere, the ionospheric electric field, the magnetospheric convection corresponding to the ionospheric electric field, and the high plasma pressure distribution in the cusp region [Tanaka, 2007].

The energy of the convection is transported from the solar wind across the magnetopause where the magnetic field configures the null-separator structure. Since the magnetic field configuration of the null-separator structure is originally derived from the superposition of two scalar fields [Stern, 1973], say, the dipole field and the uniform field, the magnetic field of the null-separator would not have free energy necessary for plasma acceleration. However, the simulation reveals that the magnetic field has a tension force near the null point. Therefore, we need a mechanism that transports the energy to this region.

It is revealed from the simulation that the bow shock supplies the energy. Indeed, the current from the bow shock deforms the magnetic field of the null-separator structure. In addition, it is noted that the Chapman-Ferraro current also deforms the magnetic field configuration in the magnetopause. This fact indicates that the convection system in the magnetosphere contributes to deformation of the null-separator structure. That is to say, energy transport from the solar wind to the magnetosphere-ionosphere compound system is affected by the physical processes in the convection. Therefore, as a result of the interaction between the magnetosphere-ionosphere convection and the null-separator structure, the magnetosphere-ionosphere compound system can be extended to the solar wind-magnetosphere-ionosphere compound system.

References

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