# 磁気圏対流生成機構（まとめ）

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# The driving mechanism of the Magnetosphere-ionosphere coupling convection

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The global MHD simulation successfully reproduces the realistic distribution of the Region 1 field-aligned current (R1FAC) which controls the magnetosphere-ionosphere coupling convection.　The simulation also reveals that a dynamo of the R1FAC appears in the cusp-mantle region [Tanaka, 1995].　However, a link between the solar wind energy and the dynamo of the R1FAC is still missing.　We study the link by analyzing the simulation results in the southward IMF condition.　It is noted that the dominant energy of the supersonic, high-β solar wind is the flow motional energy.　Besides, the dynamo of the R1FAC is driven as conversion from the thermal energy to the magnetic energy.　Therefore, to elucidate the link, we need to investigate both the energy flow from the solar wind to the dynamo region of the R1FAC and the energy conversion in the way of the energy flow.　In addition, we need to understand the plasma motion and the plasma pressure distribution regulated by the magnetic field configuration of the null-separator structure for investigation of the energy conversion.

The simulation reveals the following results.　Plasma pressure in the dayside magnetosheath is enhanced at the bow shock because the solar wind is decelerated.　In the open field line region in the dayside magnetosheath, plasmas are accelerated by the magnetic tension force and the pressure gradient force.　The accelerated plasmas invoke the dynamo in the upper boundary region of the cusp.　This process is named as the local Dungey convection.　The solar wind energy is directly transported up to this region.　However, it does not reach the dynamo region of the R1FAC.　The Poynting flux generated by the local Dungey convection acts as a bridge between the energy flow from the solar wind and the other energy flow transporting the thermal energy to the dynamo region of the R1FAC.　The magnetic energy is deposited as the thermal energy in the cusp entry region.　The thermal energy in the cusp entry region is accelerated along the field lines and converted to the perpendicular flow.　The perpendicular flow invokes pressure enhancement in the lower-latitude side of the cusp through the mechanism contrary to the slow mode expansion mentioned below.　In the cusp-mantle region, as the perpendicular flow becomes slower, the magnetic energy is enhanced.　At the same time, plasmas are transported to the lobe along the field lines. This mechanism is the slow mode expansion.　Thus, the link between the solar wind energy and the dynamo is elucidated.

The combined model of the energy transport mechanism investigated in this paper and the R1FAC formation mechanism revealed by Tanaka (1995) is the alternative of the convection model presented by Dungey (1961).

**References**

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