

Excitation of convection as a potential field and consequential restraint to the substorm mechanism

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Whereas the region 1 FAC is the most important point of issue to construct convection system, its origin and magnetospheric closure are the most poorly understood problem in the magnetospheric physics. In this paper we research this problem based on four natural principles governing in the convection system. They are (1) force balance must be maintained in the convection system among gradient P force, $\mathbf{J} \times \mathbf{B}$ force, and acceleration force, (2) energy conversion process to form a dynamo must work in the magnetosphere to supply the FAC, (3) shear motion must co-exist with the FAC to twist the magnetic field, and (4) electric field equivalent to the magnetospheric convection must coincide with electric field that promotes the ionospheric closure of FAC. The understanding of region 1 FAC generation is also inevitable for the substorm research. Since it is difficult from the observation to confirm the above four principles over the whole M-I system, observational substorm studies tend to attribute the cause of substorm to the local process. On the contrary, we try to understand the substorm as the development and transition of the convection system.

Keywords: convection