R006-09
A 会場 ：9/25　PM2 （15:45-18:15）
16:15〜16:30

沿磁力線電流ダイナモと地磁気サブストーム発達の関係について

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Relation between field-aligned current (FAC) dynamo and evolution of geomagnetic substorm

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Field-aligned currents (FACs) are known to give rise to enhancements of the ionospheric currents that characterize the evolution of geomagnetic substorms from the growth phase to the recovery phase. The generation of the FACs is a key in understanding the geomagnetic substorm, but it is a long-lasting issue. By incorporating a new method into the global magnetohydrodynamics (MHD) simulation, we have identified key regions that act as the generator of the FACs, that is, FAC dynamos. Hereinafter, we call it an FAC dynamo. In the FAC dynamo, (1) the field-perpendicular current is converted to FAC, (2) plasma performs negative work against the magnetic tension force so as to excite the Alfven waves, and (3) rate of change in the FACs is nonzero, according to Ampere's and Faraday's laws. We backtraced packets of the Alfven waves from the ionosphere to the magnetosphere, and identified two regions that probably act as FAC dynamos. One is located in the flank (low-latitude) magnetopause region, which generates most of the Region 1 FACs. Solar wind plasma pulls newly reconnected magnetic field lines. When the Region 1 FACs develop, the two-cell ionospheric convection is enhanced, giving rise to the geomagnetic disturbances that characterize the growth phase of the geomagnetic substorm (Ebihara and Tanaka, 2022). The other one is located in the near-Earth region in the nightside equatorial region. Azimuthally flowing plasma driven by the near-Earth reconnection pulls the magnetic field lines so as to generate the Region 1-sense FAC. When the Region 1-sense FACs arrives at the Earth, substorm expansion begins (Ebihara and Tanaka, 2023). From these results, it can be said that the evolution of the geomagnetic substorm is characterized by the development of the FAC dynamo. We will overview the FAC dynamos in the magnetosphere by showing 3-dimensional distribution of them, and relation to the magnetospheric and ionospheric disturbances.