Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

PEM26-06 Room:102B Time:May 22 15:00-15:15

Magnetospheric sources and mechanisms of Region 2 field-aligned currents

HANAOKA, Tomoki[1*], WATANABE, Masakazu[1], FUJITA, Shigeru[2], TANAKA, Takashi[3], SHINAGAWA, Hiroyuki[4], MURATA, Ken T.[4]

[1]Graduate School of Sciences, Kyushu University, [2]Meteorological College, Japan Meteorological Agency, [3]SERC, Kyushu University, [4]National Institute of Information and Communications Technology

Field-aligned currents (FACs) are the electric currents that flow along magnetic field lines between the ionosphere and the magnetosphere. In the ionosphere, large-scale FACs reside in an annulus that encircles the geomagnetic pole. The FACs located on the poleward side are called <region 1>, while those located on the equatorward side are called <region 2>. Of the two FAC systems, the latter Region 2 FACs are thought to be closed on the nightside, driven by the pressure gradient in the ring current region or the inner edge of the plasma sheet. In order to drive FACs constantly, there must be a region where $j*E < 0$ (with j and E being the current density and electric field, respectively). In the past, this basic energetics of the current system has not been seriously considered. To investigate the source mechanisms of region 2 FACs, we performed global MHD simulation and examined the dynamo processes in the magnetosphere. Our new finding is that the region 2 FACs are closed not only on the nightside, but also on the dayside even in a quasi-stationary magnetosphere. Similar to the nightside region 2 system, dayside region 2 FACs are driven by the plasma pressure gradient and their energy source is the thermal energy of the plasma. However, unlike the nightside region 2 system, the dynamo region of the dayside region 2 system is located at high latitudes just equatorward of and adjacent to the dayside cusp. Thus the dayside cusp is essential for the generation of dayside region 2 FACs. We discuss in detail the physical processes associated with the dayside region 2 system.

Keywords: Magnetosphere, Field-aligned current, MHD simulation