Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

PEM09-15 Room:302 Time:May 28 09:00-09:15

Dynamics of the three-dimensional separator reconnection in the dayside magnetosheath-magnetopause region

FUJITA, Shigeru[1*] ; TANAKA, Takashi[2]

[1]Meteorological College, [2]Kyushu University

We have studied a driving mechanism of the magnetosphere-ionosphere coupling convection in the southward IMF condition. This study is divided into two parts. One is energy conversion in the null-separator structure in the dayside magnetosheath-magnetopause region. The other is transport of mass, momentum, and energy from the solar wind to the magnetosphere as well as a dynamo mechanism of the Region1 field-aligned current. Now, the former issue is discussed from the viewpoint of the three-dimensional separator reconnection.

The global MHD simulation reveals that interaction between the solar wind and the magnetosphere always exhibits a special magnetic field configuration called as the null-separator structure. This structure is essentially derived from a superposition of the dipole field and a uniform magnetic field (namely, the uniform IMF). Therefore, the structure is naturally generated from superposition of two source-free magnetic fields. This fact indicates that the null-separator structure does not yield significant energy conversion from the magnetic energy to others. We confirmed no energy conversion in the vicinity of the null point from the numerical simulation. This feature is quite different from the two-dimensional reconnection such as that in the plasmasheet at the substorm onset. On the other hand, the separator reconnection exhibits substantial energy conversion in the region apart from the null point. As this energy conversion is a mild one, it does not modify the plasma structure in the magnetosheath so much. Whereas, for the two-dimensional reconnection, the plasma structure consisting of anti-parallel magnetic fields and a sheet current after the reconnection onset is altered considerably after the onset. In the last, we confirm that the plasma structure in the dayside magnetosheath-magnetopause region is essentially formed by the solar wind dynamic pressure. The separator reconnection just modifies the plasma structure.

Keywords: null-separator structure, separator reconnection, three dimensional reconnection, magnetosphere-ionosphere coupling convection, MHD simulation