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Zoom meeting B ：11/1 PM1 （13:45-15:30）
14:45-15:00

The energy flow route from the solar wind to the magnetosphere for infinitesimal northward interplanetary magnetic field

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The environment of near-Earth space, including the magnetosphere and ionosphere, is affected greatly by the solar activity. In particular, the interplanetary magnetic field (IMF) has a large effect on the solar wind-magnetosphere interaction. If the magnetosphere is totally closed in terms of magnetic field topology, in ideal magnetohydrodynamics, there is no solar wind energy flowing into the magnetosphere. One important element determining the energy inflow rate is the connectivity of the geomagnetic field and the IMF, namely, magnetic reconnection between the two fields. For southward IMF, reconnection occurs on the nose of the magnetosphere. The solar wind energy enters the magnetosphere effectively, producing magnetic storms, auroral substorms, and so forth. Meanwhile, for northward IMF, reconnection occurs on the high-latitude magnetopause. Though not so effective as for southward IMF, the solar wind energy also enters the magnetosphere, producing phenomena specific to northward IMF periods such as theta auroras. Thus, it is expected in the real magnetosphere that the energy inflow is minimized when the IMF is northward and extremely small (say B=0.1nT). However, prolonged periods of such IMF are of very rare occurrence, and consequently observational studies are virtually impossible. I this study, therefore, we performed a numerical simulation using the Reproduce Plasma Universe (REPPU) code (Tanaka, 2015) and reproduced a magnetosphere under northward and extremely small IMF conditions. We set the IMF magnitude to 0.1 nT and the IMF clock angle (measured from due north) to 30 degrees and made a quasi-steady state magnetosphere in the simulation. We then visualized various physical quantities in the magnetosphere and the ionosphere. We found that the energy flow route from the solar wind to the magnetosphere for northward and extremely small IMF is totally different from that for southward IMF. The major difference is the absence of the dayside “cusp" that is characterized by high pressure plasmas. Although the role of the cusp in magnetospheric dynamo energetics has been being recognized recently, the cusp did not appear for the IMF conditions we simulated. Nevertheless, a dynamo region appeared in the high-latitude boundary layer with the formation of the region 1 current system. This result is totally different from that for southward IMF (Tanaka et al., 2016), indicating the existence of another energy supply mechanism(s) and route(s) dissociated from the cusp. In the presentation, we report the results of the simulation analysis and discuss the energy supply mechanism(s) and route(s) in detail.