磁気圏境界層におけるプラズマ不安定の３次元グローバルＭＨＤシミュレーション

伊藤 和博 [1]; 荻野 竜樹 [2]
[1] 名大 STEL; [2] 名大 STE 研

Three dimensional global MHD simulation of plasma instabilities in the magnetospheric boundary layers

Kazuhiro Ito[1]; Tatsuki Ogino[2]
[1] STEL, Nagoya Univ.; [2] STEL, Nagoya Univ.

http://center.stelab.nagoya-u.ac.jp/kenkyusitu/kenkyusitu.html

When the solar wind collides with the earth's magnetosphere, relatively uniform regions and boundary layers, where physical quantities sharply change, are formed in magnetosphere. Magnetosheath between the bow shock and magnetopause is a typical example of the relatively uniform regions. Then the bow shock, magnetopause and plasma sheet are typical examples of the boundary layers. Strong cross currents generally flow in the boundary layers and therefore it is possible that plasma instabilities are excited in the layers. In particular, magnetic reconnection may occur at the magnetopause and plasma sheet due to the anti-parallel magnetic field configuration and Kelvin-Helmholtz instability may occur at the magnetopause due to velocity shear.

Magnetic reconnection in the earth's magnetosphere has been studied many local and global simulations, however it is not trivial that same or similar phenomena may be happened in global simulations because of stability effect in connection with finite length along magnetic field lines. Moreover, Kelvin-Helmholtz instability is not yet reproduced in previous global simulations for northward IMF conditions, even though wavy structure at the magnetopause was found for southward IMF condition from local simulations as well as observations. Therefore, we have executed high resolution 3-dimensional global MHD (magnetohydrodynamics) simulation of interaction between the solar wind and earth's magnetosphere. When global simulation was executed for uniform northward IMF, Bz=20nT, there appeared wavy structures from near sub-solar point. The wavy structures propagated from dayside to tail along low latitude boundary layer (LLBL) and vortices were rolled up. In this report, we will present a more detailed research about formulation of wavy structures and vortex train at the magnetopause.