3-Dimensional MHD Simulation of Magnetosphere-Ionosphere Coupling by Yin-Yang Grid

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In the global MHD model, the ionosphere has been treated as a sheet model with electrical conductivity. However, the sheet model is not sufficient to essentially understand the magnetosphere-ionosphere coupling system. We need the 3D model to self-consistently solve structure and dynamics of ionosphere. When we calculate magnetosphere-ionosphere coupling system in spherical geometry, it takes so much time. In this study, we adopt Yin-Yang grid composed of two identical spherical grids. The Yin-Yang grid was developed by Kageyama and Sato [2004]. We intend to develop a substantial 3D MHD model extended by including hall term in order to self-consistently simulate magnetosphere-ionosphere coupling. To begin with, we simulated 3D wave equation by a new code with Yin-Yang grid and studies propagation of a density pulse with ring-shape. At the time, problems occur at Yin-Yang grid boundary. We are correcting the program now.

We have tried to complete the simulation code to solve 3D wave equation. Then we develop a simulation code to solve 3D MHD equation to be extended by including the hall term and collision term with neutral particle in order to self-consistently solve the magnetosphere-ionosphere coupling system.