R006-23
A 会場 ：9/26　AM2 （10:45-12:30）
11:00～11:15

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Evolution of M-I convection depending on the Alfven conductance as simulated by global MHD model with Alfvenic coupling

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In global magnetosphere models, the magnetosphere-ionosphere coupling process is conventionally described in the following manner. (1) First, at the inner boundary, which is usually placed at the altitude of 2 – 3 Re, the distribution of FAC is calculated from the magnetic field. (2) The FAC is mapped to the ionospheric altitude and input to the ionospheric potential solver. (3) Then the calculated potential is mapped back to the inner boundary and the magnetospheric bulk velocity is updated there.

Here we would like to point out that this conventional coupling scheme has two issues.

The first issue is about the way of exchanging information of physical quantities at the inner boundary. The ionospheric input, FAC, is specified only by the magnetic field, whereas the quantity updated by ionospheric output is only the velocity. Therefore, the current continuity, momentum and energy conservations are not guaranteed before and after this procedure. The second issue concerns the ionospheric potential solver. The potential solver calculates the electrostatic potential so that it is consistent with the input FAC for the given conductance distribution. This means that it is designed to generate no FACs in the ionosphere. However, in reality, the ionospheric current divergence will be released partially to the magnetosphere due to the finite Alfven conductance.

Considering these two issues of the conventional scheme, a new scheme called Alfvenic Coupling was proposed by Yoshikawa et al. [2010]. In this scheme, both the magnetic field and velocity disturbances (FAC and potential) are input to the ionospheric solver and updated with the required consistency for the current closure condition including the Alfvenic disturbances.

We have implemented this scheme into the global MHD model to investigate the dynamics of M-I coupled system. In this study, we perform simulation by setting a fixed ratio of the Alfven conductance to the Pedersen conductance to examine the effect of the Alfvenic coupling. As the ratio increases, the ionospheric potential is intensified, and its distribution is more deformed. This tendency is consistent with a theoretical prediction [Yoshikawa & Fujii, 2018]. We will also show how the evolution of magnetospheric convection field differs for the convectional and Alfvenic coupling schemes.