R006-02
C 会場 ：11/5　PM1 （13:45-15:30）
14:00～14:15

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Evolution of electrostatic potential in magnetosphere-ionospheric system as simulated by global MHD model with Alfvenic-coupling

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By using the Polarization Field Separation method [Nakamizo and Yoshikawa, 2019] and a global MHD model [Tanaka, 2015], we have shown that the ionosphere plays an active role in the configuration and dynamics of the global magnetosphere due to its non-uniform conductance distribution. The feedback process from the ionosphere to the magnetosphere in the current global MHD simulations can be described as follows; (1) The ionospheric conductance non-uniformity generates polarization fields, thereby deforming the ionospheric electric potential pattern. (2) The information of deformation is reflected in the magnetospheric bulk velocity updated by the potential mapped back to the magnetospheric inner boundary. (3) The updated velocity disturbances propagate the magnetosphere, modifying the force and energy balance of MHD field. (4) The FAC distribution at the next time step is calculated in the magnetosphere updated in this way and is inputted again to the ionosphere, generating the ionospheric potential of the next time step. (5) Thus, the effect of ionospheric polarization fields is accumulatively included in the development of the magnetosphere－ ionosphere system.

In order to investigate precisely the role of ionosphere, we implement Alfvenic-coupling scheme proposed by Yoshikawa et al. [2010] in the MHD code. In the Alfvenic-coupling scheme, both FACs and potential are mapped between the magnetosphere and ionosphere in terms of the incident and reflection process of shear Alfven waves, therefore the continuities of physical quantities and the conservations of momentum and energy are ensured.

As an implementation test, we investigate how the reflected FACs, reflected potential, and total (M-I coupled) potential change depending on the ratio of Pedersen conductance and Alfven conductance. It is found that the total potential becomes larger and its distribution is more deformed as ratio of Pedersen conductance and Alfven conductance increases. The result is consistent with theoretical prediction [Yoshikawa & Fujii, 2018]. We also compare the total FACs, total potential, and velocity perturbations around the inner boundary obtained by the normal coupling and Alfvenic-coupling.