

Holistic Simulation Studies of Quiet Auroral Arcs Formation

Hiroki Hasegawa[1]; Tooru Sugiyama[1]; Akira Kageyama[2]; Shigenobu Hirose[1]; Kanya Kusano[1]; Kunihiko Watanabe[1]; Tetsuya Sato[3]

[1] ESC/JAMSTEC; [2] JAMSTEC; [3] ESC

It has been proposed that quiet auroral arcs are formed by a magnetosphere-ionosphere feedback instability[1]. Many authors have thus studied a magnetosphere-ionosphere system with magneto-hydro-dynamics (MHD) simulation[2]. On the other hand, auroral energetic particles (electrons) are thought to be accelerated by the double layer, which has been extensively investigated by means of plasma particle simulations[3].

Therefore, we developed the holistic simulation code which solves a feedback instability and particle accelerations self-consistently. In this code, a magnetosphere-ionosphere system is described by macro MHD model with a dipole geomagnetic field[4], and the electron acceleration in the double layer is computed by micro particle-in-cell (PIC) model. Obtained field-aligned current densities in MHD model are sent to PIC model, and the electron acceleration effect is simulated under the given field-aligned current structure. Thereafter, the effect of energetic particles is returned from PIC model to MHD model.

In this paper, we will show the results of quiet auroral arcs simulation by use of above holistic model. We are going to exhibit comparison of linear growth rates between simulation results and the feedback theory, and discuss the role of accelerated electron in arc formation.

[1] T. Sato, J. Geophys. Res., **83**, 1042, 1978.

[2] K. Watanabe and T. Sato, Geophys. Res. Lett., **15**, 717, 1988 and references therein.

[3] T. Sato and H. Takamaru, Phys. Plasmas, **2**, 3609, 1995.

[4] A. Kageyama, *et al.*, Comp. Geosci., **32**, 265, 2006.