

Modeling of Terrestrial Plasmasphere

Shigeto Watanabe[1]

[1] Earth and Planetary Sci., Hokkaido Univ

The variation of magnetospheric electric field affects a production and a loss of plasma in the plasmasphere. Direct observations of plasma by satellites and radars provided us with the information about plasma escape in the polar topside ionosphere. The results showed that ion heating and outflow generated by plasma waves as well as polar wind are the important loss mechanisms of ionospheric plasma. The loss plasmas are mainly H^+ , He^+ , O^+ , O^{++} , and N_2^+ and contribute a part of ring currents. However, a three dimensional modeling of plasmasphere including plasma loss processes from topside ionosphere has not been carried out yet.

We note that collision frequency of plasma is small at high altitudes (ion exosphere) and the energy distribution of outflow plasma generated by waves becomes conics rather than Maxwellian. We, therefore, have to construct a three dimensional hybrid model of plasmasphere with both fluid and particle effects.

The simulation results showed that H^+ , He^+ and O^+ are distributed in the region between plasmopause and magnetopause and the densities depend strongly on the variation of magnetospheric electric field. The three dimensional hybrid model will become an important tool to understand the production and loss of plasmaspheric plasma and will make clear the dynamic/energetic processes of the earth ionosphere/magnetosphere if it would include models of magnetosphere and radiation belts.