Test-particle simulation of elastic collisions between magnetospheric 500eV-50keV electrons and neutral H_2O molecules originated from Enceladus

*Hiroyasu Tadokoro[1], Yuto Katoh[2]

1.Musashino University, 2.Tohoku University

Water group neutrals (H_2O, OH, and O) in Saturn's inner magnetosphere play the dominant role in loss of energetic electrons and ions because of abundance of the neutrals [e.g., *Paranicas et al.,* 2007; *Sittler et al.,* 2008]. The observations of injected plasmas in the inner magnetosphere suggest that these particles do not survive very long time due to the neutral cloud originated from Enceladus [e.g., Paranicas et al., 2007; 2008]. Thus, the previous studies suggested that the neutral cloud contributes to loss processes of plasma in the inner magnetosphere. However, little has been reported on a quantitative study of the electron loss process due to electron-neutral collisions.

In the present study, we examine the variation of energetic electron pitch angle distribution at the magnetic equator and loss rate of precipitated electrons into Saturn's atmosphere through pitch angle scattering due to elastic collisions with neutral H_2O along Saturn's dipole magnetic field line around Enceladus. We conduct one dimensional test-particle simulation for monoenergetic electrons along Saturn's dipole magnetic field line around Enceladus when the co-rotating electron flux tube passes the dense H_2O region in the vicinity of Enceladus (~6.4 minutes). The initial electron pitch angle distribution is assumed to be isotropic.

Tadokoro et al., [2014] examined the variation of 1keV electron pitch angle distribution due to elastic collisions with the dense region of H_2O originated from Enceladus. The examination of elastic collisions with other electron energy is required to understand the electron loss process due to elastic collision. We show the loss rates through pitch angle scattering of electrons with 500 eV –50keV.

Keywords: Enceladus, Saturn, electron-neutral collision

