Pitch angle scattering due to elastic collisions between magnetospheric 500eV-50keV electrons and neutral H_2O originated from Enceladus: Test particle simulation

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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 this study, we focus on the elastic collisional loss process with neutral H_2O originated from Enceladus. Conducting one dimensional test particle simulation, Tadokoro et al., [2014] examined the time variations of equatorial electron pitch angle distribution and electrons within loss cone through 1keV electron pitch angle scattering due to elastic collisions around Enceladus. The result showed that the electrons of 11.4 % are lost in ~380 sec. The time corresponds to the time scale of the co-rotation of the flux tube passing through the region of the dense H_2O in the vicinity of Enceladus. Assuming the uniform azimuth H2O density structure in the Enceladus torus, they estimated the electron loss rate of 33% during one co-rotation.

Next remaining issue is a calculation of energy dependent electron loss rate. We show the loss rates through pitch angle scattering of electrons with 500 eV –50keV and the comparison of the loss rates between the high (in the vicinity of Enceladus) and low (in the Enceladus torus) H_2O density regions. We also show the calculation errors by making several times calculations.

Keywords: Enceladus, Pitch angle scattering, electron-neutral collision, test particle simulation

