テスト粒子シミュレーションを用いた500eV-50keV磁気圏電子とEnceladusトーラス中H2O分子の弾性衝突

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Simulation of elastic collisions between magnetospheric 500eV-50keV electrons and neutral H2O molecules in the Enceladus torus

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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.

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 using one-dimensional test-particle simulation. They reported that the electrons of ˜11.4% to the total number of equatoriall electrons at the initial condition are lost in ˜380sec, corresponding to the co-rotating electron flux tube passes the dense H_2O region in the vicinity of 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. We compare the loss rate due to the elastic collision close to the plume with that in the neutral torus.