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Interaction of Europa with Jovian Plasma Torus

Pavel M. Travnicek (1), Ondrej Sebek (2), Stuart D. Bale (1), Petr Hellinger (2), and Jasper Halekas (3)

(1) Space Sciences Laboratory, University of California, Berkeley, USA, (2) Astronomical Institute and Institute of Atmospherics physics, AS CR, Czech Republic, (3) University of Iowa, Physics and Astronomy, Iowa City, IA, United States

We present results of a simulation study of the interaction of Europa with Jupiter's magnetospheric plasma compared to in situ observations of Galileo spacecraft. For simulations we use multi-species hybrid (kinetic ions and fluid electrons) three-dimensional model. We consider O++, S++ as the main constituents of the Jovian plasma torus at Europa while its neutral atmosphere is considered to be composed primarily of (neutral) O_2 molecules. We consider ionization processes of the neutral O_2 atmosphere which is then a source of dense population of pick-up ions at Europa. We examine global structure of the interaction and we compare the simulated results with in situ measurements of spacecraft Galileo. The plasma composed of pick-up ions represents an obstacle for the Jovian magnetic field resulting in the compression of the magnetic field lines which in return causes development of temperature anisotropies. We study the regions where the threshold of temperature anisotropy driven instabilities has been reached. We also focus on the refiling processes of the small cavity formed in the plasma downstream the relative plasma flow between Europa and the magnetospheric plasma. We acquire high resolution simulated data along virtual trajectories of Galileo spacecraft which allows us to directly compare simulation results to in situ observations.