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Plasma precipitation and neutral particle emission at Ganymede

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Ganymede, the largest moon of Jupiter is characterized by a tiny magnetosphere produced by an intrinsic magnetic moment; it is linked to the Jovian magnetosphere and embedded in its energetic plasma environment. In addition, since the plasma co-rotating with Jupiter impinges on Ganymede trailing side at subsonic speed, there is no bow-shock formation. Here we present preliminary results of Monte Carlo simulations aimed to evaluate the expected ion precipitation onto the polar caps of Ganymede, by means of the magnetic and electric fields derived by a global magnetohydrodynamic (MHD) model that realistically describe Ganymede's magnetospheric environment. We discuss precipitation pattern differences between the simulated ion species (H+, O+ and S+) at different energies in the range 10-100 keV.

Plasma precipitating onto the surface of Ganymede modifies it both physically (via ion sputtering) and chemically (via radiolysis). Directly sputtered H_2O molecules as well as products of H_2O decomposition, that may recombine and produce diverse molecules, such as O_2 and H2 are released. The yields of these processes have been estimated by means of accurate function that includes the dependence of the release on impacting ion species and energy as well as on the moon's surface temperature. In this study we attempted to isolate the temperature dependent part of this yield function and to assign it exclusively to the chemical processes taking place on ice and to the subsequent release of new molecules. In this way we make a rough preliminary distinction between the sputtering and radiolysis exospheric contributions. In our estimations we take into account also the energy spectra of precipitating plasma.

A MonteCarlo model has been used to simulate the neutral density of escaping particles. Here we present results in terms of density and fluxes.