Geophysical Research Abstracts
Vol. 18, EGU2016-2938-1, 2016
EGU General Assembly 2016

3D-modeling of Callisto's sputtered surface-exosphere environment

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We study the stoichiometrical release of various surface elements caused by plasma sputtering from an assumed icy and non-icy (i.e. chondritic) surface into the exosphere of the Jovian satellite Callisto. We apply a 3D plasma planetary interaction hybrid model that is used for the evaluation of precipitation maps of magnetospheric H+, O+ and S+ sputter agents onto Callisto's surface. The obtained precipitation maps are then applied to the assumed surface compositions where the related sputter yields are calculated by means of the 2013 SRIM code and are coupled with a 3D exosphere model. Sputtered surface particles are followed on their individual trajectories until they either escape Callisto's gravitational attraction or return to the surface. We study also the effect of collisions between sputter species and ambient O_2 molecules which form a tiny atmosphere near
the satellite's surface and compare the exosphere densities that are obtained from the 3D model with and without a background gaseous envelope with recent 1D model results. Finally we discuss if the Neutral gas and Ion Mass (NIM) spectrometer, that is part of the Particle Environment Package (PEP) on board of the JUICE mission will be able to detect sputtered particles from Callisto's icy and non-icy surface.