



Space weathering effects at the Galilean icy moons

Christina Plainaki (1), Anna Milillo (1), Alessandro Mura (1), Stefano Orsini (1), Timothy Cassidy (2), Elisabetta De Angelis (1), Valeria Mangano (1), Stefano Massetti (1), Giovanna Rinaldi (1), and Rosanna Rispoli (1)

(1) IFSI-INAF, Rome, Italy (christina.plainaki@ifsi-roma.inaf.it), (2) University of Virginia (USA)

The heavy energetic ions of the Jovian plasma can erode the Galilean icy moon surfaces via ion sputtering (IS), and also break the chemical bonds of the ejected species which can result in the formation of new molecules (e.g. oxygen), a process called radiolysis. UV Photons impinging the moon surfaces can also result in neutral atom release via photon stimulated desorption (PSD) and chemical change (photolysis). In this work, we model the efficiency of IS and PSD processes for ejecting water molecules in the Europa's case. We simulated the resulting neutral H₂O density, finding that they alone cannot sustain the tenuous atmosphere deduced from the Galileo Orbiter data. We also estimate the contribution to the total neutral atom release by the Ion Backscattering and Neutralization process, by sublimation and by the micrometeoroid impact vaporization. In view of these results, we figure out the conditions in the Ganymede's and Callisto's cases by considering the different external fluxes and the Ganymede's internal magnetic field. Moreover, we estimate the possibility of detecting the sputtered high energy atoms in both these environments, in order to distinguish the action of the IS process from other surface release mechanisms.