



Energetic neutral atoms emitted from ice by ion bombardment under Ganymede surface conditions

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Magnetospheric or solar wind ions directly interacting with a planetary surface result in backscattering or sputtering of energetic neutral atoms. One example is the solar wind interaction with the surface of the Moon, where the produced energetic neutral atoms were observed by the Sub-keV Atom Reflecting Analyzer instrument (SARA) on Chandrayaan-1. At Jupiter, magnetospheric plasma interacts in a similar way with the surface of the Galilean moons. However, the emission of energetic neutral atoms from "dirty" ices as found e.g. on Ganymede's surface is poorly understood.

We set up an experiment to study the ion to surface interaction under Ganymede surface environment conditions using the unique capabilities of the MEFISTO test facility at University of Bern. Ions of various species and energies up to 33 keV/q were impacted on a block of ice made from a mixture of water, NaCl and dry ice. The energetic neutral atoms produced by the interaction were detected with the prototype of the Jovian Neutrals Analyzer instrument (JNA.)

JNA is proposed as part of the Particle Environment Package (PEP) for ESA's JUICE mission to Jupiter and instrument is based on the Energetic Energetic Neutral Atom instrument (ENA) built for the BepiColombo Magnetospheric Orbiter.

We present energy spectra for different ion beam species and energetic neutral atom species combinations. The data show high yields for energetic neutral atoms up to the upper end of the instrument energy range of 3.3 keV. The energy spectra of the neutral atom flux emitted from the ice could only partially be fitted by the Sigmund-Thompson formula. In some cases, but not all, a Maxwellian distribution provides a reasonable description of the data.