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Low energy energetic neutral atom imaging in the Jovian system

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We modeled low energy energetic neutral atoms fluxes originating from the interaction of Jovian magnetospheric plasma with the surface of Ganymede and from charge exchange reactions in the Io torus. We then calculated the instrument response of the Jovian Neutrals Analyzer instrument (JNA) to these fluxes.

JNA is part of the proposed Particle Environment Package (PEP) for ESA's JUICE mission and is based on the Energetic Neutral Atom instrument (ENA) built for the BepiColombo Magnetospheric Orbiter. JNA is an imaging energetic neutral atom instrument for energies from 10eV to 3.3keV and it provides angular as well as mass resolution for major neutral species.

Depending on magnetic field configuration magnetospheric plasma is able to precipitate onto the surface of Ganymede. The plasma surface interaction produces energetic neutral atoms by backscattering and/or sputtering that travel on ballistic trajectories. Imaging of the energetic neutral atoms fluxes allows to remotely study the precipitation pattern onto the surface, its dependence on magnetic field configuration and its evolution over time. Simulated JNA images are shown for typical conditions.

Energetic neutral atoms are also generated by charge exchange reactions in the Io torus. Energetic neutral atoms allow us to study torus dynamics remotely. We show expected energetic neutral atoms fluxes and simulated JNA data from imaging the Io torus from a vantage point outside of Europa's orbit well reachable by the JUICE mission.