

ENERGETIC NEUTRAL ATOM (ENA) IMAGING OF THE EUROPA GAS CLOUD FROM JUICE

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The Jupiter Energetic Neutrals and Ions (JENI) Camera is one out of six sensors of the Particle Environment Package (PEP) suite that was selected for flight on the ESA Jupiter Icy Moon Explorer (JUICE). JENI is a combined imaging energetic ion spectrometer and an ENA camera that operates in the ~ 0.5 keV to 1 MeV range for ions and ~ 0.5 ? 500 keV for ENAs and is capable of separating H, O, and S. Its angular resolution is $\leq 2^\circ$ for ≥ 10 keV H.

In ENA mode JENI's main objective is to constrain the Europa surface (or subsurface) mechanisms that release material to space by imaging the neutral gas surrounding Europa using ENAs produced when energetic ions of the Jovian magnetosphere charge exchange with the extended neutral gas atoms or molecules.

ENA observations of Jupiter by the Ion and Neutral Camera (INCA) the Cassini spacecraft have revealed ENA emissions surrounding Jupiter at about the orbital distance of Europa. The observations are consistent with a column density peaking around Europa's orbit in the range from 2×10^{12} cm⁻² to 7×10^{12} cm⁻², assuming H₂, and are consistent with the upper limits reported from the Cassini/UVIS observations. Detailed analysis shows indications that the neutral gas cloud may be centered on Europa and not symmetric around Jupiter. This would directly imply that the source of the gas is Europa itself. The INCA observations also show indications of magnetospheric dynamics that result in about a factor of two variation in ENA intensity.

We describe the INCA observations and its implications for JUICE, Juno and Europa Clipper, and discuss the neutral-plasma coupling pertinent to the Europa/Io plasma/neutral environment.

Keywords: Europa, Jupiter, Torus, Magnetosphere

