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A Heavy Ion and Proton Radiation Belt Inside of Jupiter's Rings

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The JEDI instrument onboard the Juno spacecraft obtained the first in-situ observations of energetic charged particles in Jupiter's inner radiation belt, located between Jupiter's rings (1.3-3.2 planetary radii from Jupiter) and its atmosphere. The inner belt contains protons and heavier ions (up to the atomic mass of sulfur) with energies of hundreds of keV.
The measured energy spectra are unusual, exhibiting an increase in intensity above about 300keV. We suggest that this is due to inefficient removal of ions at these high energies due to charge exchange in Jupiter's tenuous upper atmosphere and/or by ring material absorption.
Since this innermost belt includes heavy ions it cannot be exclusively supplied by cosmic ray albedo neutron decay (CRAND), an important source in the inner magnetospheres of Earth and Saturn; CRAND only supplies protons and electrons. We propose as an alternative that the inner radiation belt may be supplied by stripping of energetic neutral atoms (ENAs) in Jupiter's tenuous upper atmosphere. This mechanism is consistent with the unusually low ratio of energetic electrons to ions found in this belt, since electrons stripped from energetic neutrals are of low energy.