

A broad examination of energetic particle distributions over Jupiter's aurora and polar-regions

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Abstract

The Juno spacecraft has now had, as of this writing, over 19 close encounters with Jupiter's northern and southern polar-regions, including its auroras. To date, we have reported in the literature a number of distinctive features regarding the distributions of energetic particles (> 30 keV electrons and ions) in these regions. We provide a partial list of such features at the end of this abstract. What we have not provided to date are substantial indications about how common, persistent or important such features are. For example, while Earth-like downward electron inverted-V's have been observed over Jupiter's main aurora, with peak energies extending up to 400 keV, little indication has been provided in the literature regarding how common such features are. We provide here a broad overview of such features with a goal of assessing their importance and persistence. Among the features discussed and placed into context are the following. 1) Polar cap upward-directed electron angle beams with broad energies up to multi-MeV energies. 2) Polar cap downward ion inverted-V's with peaked energies up to multi-MeV energies. 3) Polar cap upward electron inverted-V's with peaked energies up to 400 keV. 4) Main aurora broadband, bi-directionally beaming electrons. 5) Main aurora downward electron inverted-Vs with peaked energies up to 400 keV. 6) Main aurora downward-directed (not bi-directional) broadband electron distributions observed in close association with downward electron inverted-V's. 7) Main auroral upward ion angle and energy beams. 8) Main aurora downward ion inverted-V's, with peaked energies sometime greater than 400 keV, but also associated with intense, downward broadband electron distributions. 8) Intense trapped electron populations with empty upward loss cones and full downward loss cones as one might expect within the diffuse auroral regions. 9) Similar trapped ion distributions, with empty upward loss cones and full

downward loss cones, equatorward of the corresponding electron trapped distributions.