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Implications of Juno energetic particle observations over Jupiter's polar regions for understanding magnetosphere-ionosphere coupling at strongly magnetized planets

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Juno obtained low altitude space environment measurements over Jupiter's poles on 27 August 2016 and then again on 11 December 2016. Particle distributions were observed over the poles within the downward loss cones sufficient to power nominally observed auroral emissions and with the characteristic energies anticipated from remote spectroscopic ultra-violet auroral imaging. However, the character of the particle distributions apparently causing the most intense auroral emissions were very different from those that cause the most intense aurora at Earth and from those anticipated from prevailing models of magnetosphere-ionosphere coupling at Jupiter. The observations are highly suggestive of a predominance of a magnetic field-aligned stochastic acceleration of energetic auroral electrons rather than the more coherent acceleration processes anticipated. The Juno observations have similarities to observations observed at higher altitudes at Saturn by the Cassini mission suggesting that there may be some commonality between the magnetosphere-ionosphere couplings at these two giant planets. Here we present the Juno energetic particle observations, discuss their similarities and differences with published observations from Earth and Saturn, and deliberate on the implications of these finding for general understanding of magnetosphere-ionosphere coupling processes.