

Auroral physics at Jupiter: Outstanding issues to be addressed by Juno

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Abstract

Juno is on course to enter polar orbit at Jupiter on July 4, 2016. After a small number of preliminary orbits during which the orbital period is reduced, approximately 30 science orbits will be executed to explore the interior of Jupiter, hence, its origin. A second primary objective of the mission, and the subject of this talk, is to carry out the first exploration of Jupiter's polar magnetosphere with an emphasis on the physics of the Jovian aurora. All previous missions to Jupiter, including Ulysses, remained at low Jovian latitudes at close range, hence, our knowledge of Jupiter's polar magnetosphere and, in particular auroral processes, is a composite of remote sensing (such as radio emissions in the hectometric and decametric bands as well as IR and UV images); application of observations of Earth's auroral and polar cap particles, fields, and auroral emissions; and modeling. While these likely inform our expectations of what Juno will actually measure qualitatively, Juno will provide the first in depth exploration of auroral processes at another planet, other than a small number of very brief encounters of Saturn's kilometric radio source region by Cassini. With a reasonably complete suite of in situ magnetospheric measurements coupled with remote sensing, Juno will enable us to compare the physics of Jupiter's polar magnetosphere with those expectations. Certainly, understanding the nature of auroral currents and mechanisms for particle acceleration are high on the list of priorities for these studies. In addition, it is expected that Juno will greatly improve our understanding of the mapping of auroral processes from high latitudes and low altitudes to the middle and outer magnetosphere.