Geophysical Research Abstracts
Vol. 12, EGU2010-1071, 2010
EGU General Assembly 2010

Global Structure and Dynamics of Jupiter's Magnetosphere

Fran Bagenal and Peter Delamere
University of Colorado, Boulder CO USA (bagenal@lasp.colorado.edu)

The structure and dynamics of Jupiter's magnetosphere are primarily driven by the strong internal source of plasma from Io. Coupling to Jupiter's ionosphere keeps the iogenic plasma rotating with the planet's 10 hour spin period to distances of ∼20-30 Rj. Centrifugal forces confine the sulfur/oxygen dominated plasma to an equatorial plasmasheet. The plasma is believed to move radially outwards (on timescales of 10s of days) via the diffusive process of flux tube interchange. Beyond ∼20-30 Rj the coupling to the rotation breaks down, driving strong currents along the magnetic field. The equatorial confinement of the plasma means that there is a lack if current carriers at high latitudes leading to development of potential structures. Intense auroral emissions indicate fluxes of electrons are accelerated into Jupiter's atmosphere. Beyond ∼20-30 Rj the plasma continues to rotate with Jupiter, albeit subcorotation rates. At ∼60 Rj the outflow reaches the local Alfven speed and the plasma spirals (advection) away from the planet and down the magnetotail. Unlike the Earth's magnetosphere where reconnection between the IMF and the planetary field drives large scale convective motions, we believe the solar wind interaction with Jupiter's high-beta magnetosphere is via a viscous interaction mediated by Kelvin-Helmholtz instabilities in a low-latitude boundary layer. Mass and momentum of the solar wind are transferred across the magnetopause in an interaction region that thickens down the flanks. Maxwell stresses from the solar wind interaction at the magnetopause drive anti-sunward flows down the magnetotail. This paper summarizes the structure and dynamics of the magnetosphere resulting from this viscous interaction with the solar wind and discusses the observational evidence from auroral emissions and spacecraft data.