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Energetic particle injections in Saturn's magnetosphere

B. H. Mauk (1), J. S. Saur (1), D. G. Mitchell (1), E. C. Roelof (1), P. C. Brandt (1), T. P. Armstrong (2), D. C. Hamilton (3), S. M. Krimigis (1), N. Krupp (4), S. A. Livi (1), J. W. Manweiler (2), and C. P. Paranicas (1)

(1) The Johns Hopkins University, Applied Physics Laboratory, Laurel, Maryland, USA, (2) Fundamental Technologies, Lawrence, Kansas, USA, (3) Department of Physics and Astronomy, University of Maryland, College Park, Maryland, USA, (4) Max-Planck Institut für Sonnensystemforschung, Katlenburg-Lindau, Germany (Barry.Mauk@jhuapl.edu / Fax: 240-2280386 / Phone: 240-2286023)

Measurements from the Cassini Magnetospheric Imaging Instrument (MIMI) beginning in July 2004 reveal that sudden planetward injections of energetic ions (5-200 keV) and electrons (20 – 200 keV) over confined regions of azimuth are pervasive events in Saturn's magnetosphere over the radial range of 3.8 to 11.2 Saturn radii (R_S). Saturn's magnetosphere is thus similar to both Earth and Jupiter in the pervasiveness of such injections. At Saturn with Cassini, unlike Jupiter with Galileo, the spacecraft motions convolved with the large radial gradients in the global azimuthal rotational flow pattern often dominates the dispersive particle injection signatures. Accurate knowledge of rotational flow patterns are required to calculate the age and formation positions of injections that are more than several hours old. Here we develop procedures to derive the needed flow profiles from the injections themselves.