Geophysical Research Abstracts, Vol. 7, 09390, 2005
SRef-ID: 1607-7962/gra/EGU05-A-09390

Energetic ion injection into the water product gas cloud in the inner Saturnian magnetosphere: Loss rates and Saturn rotation synchronicity

D. G. Mitchell (1), P. C. Brandt (1), C. P. Paranicas (1), D. E. Shemansky (2), P. Zarka (3), W. S. Kurth (4), B. H. Mauk (1), E. C. Roelof (1), J. Saur (1), S.M. Krimigis (1), N. Krupp (5), D. C. Hamilton (6)

(1) Johns Hopkins University, Applied Physics Laboratory, Laurel, Maryland, (2) Department of Aerospace Engineering, University of Southern California Los Angeles, California, (3) Département de Recherche Spatiale, Observatoire de Paris-Meudon, Meudon Cedex France, (4) Department of Physics and Astronomy, University of Iowa, Iowa City, Iowa, (5) Max-Planck-Institut für Sonnensystemforschung, Lindau, Germany, (6) University of Maryland, College Park, Maryland

The region between roughly 6 and 10 Rs in Saturn's equatorial magnetosphere is the most consistently bright region in terms of the emission of energetic neutral atoms (ENA). The emission from this region is, however, quite variable. The variability may be understood in terms of the ENA emission from fresh energetic ion injections from the region outside of about 10 Rs into smaller radial distances, where rather dense clouds of gas reside (OH, O, H, etc.). This inner region is characterized by depressed average energetic ion flux in the ˜10 keV/nucleon to ˜200 keV/nucleon energy range because of the relatively high charge exchange cross-sections of these ions on the cold gas, and their subsequent high loss rates. The background ion population continuously creates ENAs as it interacts with the neutral gas, and to first order, this is a uniform signal from the magnetosphere. The presence of fresh ion injections, which is at times frequent and persistent, leads to an enhancement of the ENA flux that becomes the dominant ENA signal from the magnetosphere. Furthermore, the ion injection and subsequent corotation, combined with the Compton-Getting effect (c.f. Paranicas et al., this meeting), create a Saturn spin modulation of the ENA emission. In one case, 2004 day 351-358, this injection and modulation persisted for seven days, with several new injections re-invigorating the ENA flux in phase with the original injection.

This can be explained by injection at a preferred planetographic (System III) longitude, such that new injections occur preferentially at a location that maintains the established spin periodicity without a significant spin-phase discontinuity. The seven-day interval was also characterized by particularly well-defined and regular Saturn Kilometric Radiation enhancements, long-term averages of which form the basis for defining planetographic longitude.