

SPACE AND COSMIC RAY PHYSICS SEMINAR

*University of Maryland
Computer & Space Sciences Building, Room 2400
4:30 PM Monday, January 31, 2005
Coffee, Tea & cookies 4:00-4:30 PM*

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Global Energetic Ion Dynamics at Saturn: Inner Magnetospheric Ion Injections & Corotation, Magnetotail Substorm-like Activity, & Titan Exospheric Interaction

The Ion and Neutral Camera (INCA), one of three sensors that comprise the Magnetospheric Imaging Instrument (MIMI) on the Cassini/Huygens mission to Saturn and Titan, is an Energetic Neutral Atom (ENA) camera that images the ENA emission from various ion/gas interaction regions in the Saturnian magnetosphere. During Cassini's approach to Saturn INCA began its imaging at great distances, where Saturn is an unresolved ENA source. The Saturn source strength varied on time scales of hours to weeks, and showed a rough correlation with Saturn Kilometric Radiation as measured by the University of Iowa Radio and Plasma Wave Science instrument. During Saturn Orbit Insertion with its traversal of the magnetosphere including the region inside the radius of Saturn's main rings, INCA had the opportunity to image the interaction between the inner magnetospheric trapped ion population and the inner magnetospheric cold gas population. The energetic ions and cold gas inside about 10 R_s dominates the Saturn output of ENA most of the time. Additionally, although the Cassini spacecraft has yet to visit Saturn's magnetotail, and Pioneer and Voyager traversals were inconclusive, the ENA data show evidence for strong ion heating and/or acceleration in the midnight quadrant, well beyond 20 R_s (the orbit of Titan), possibly as far out as 40 R_s . MIMI also observed the interaction of Saturn's largest moon, Titan, with Saturn's magnetosphere during two close encounters of Titan on 25 October and 14 December 2004. During each Titan approach, INCA continuously imaged the ENA generated by charge exchange reactions between the energetic, singly ionized trapped magnetospheric ions, and the outer atmosphere, or exosphere, of Titan. The images reveal a halo of ENA emission about Titan's nearly collisionless outer atmosphere that fades at larger distances as the exospheric density decays exponentially. The short-term variations in ENA brightness reflect the temporal variability in the local magnetospheric ion intensity. The variability of the altitude dependence and departure from symmetry of the ENA emissions reveal the complexity of the interactions between Titan's upper atmosphere and Saturn's space environment, highlighting the need for a kinetic-MHD hybrid approach to modeling it.

<http://space.umd.edu/seminars>

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