AOGS 2005

The Cassini Ion and Neutral Mass Spectrometer: Initial Observations

RALPH L. MCNUTT JR.[1], J. HUNTER WAITE JR.[2], HASSO NIEMANN[3], ROGER V. YELLE[4], WAYNE T. KASPRZAK[3], THOMAS E. CRAVENS[5], JANET G. LUHMANN[6], WING-HUEN IP[7], DAVID GELL[2], VIRGINIE DE LA HAYE[2], INGO MÜLLER-WORDAG[8], BRIAN MAGEE[2], NATHAN BORGGREN[4], STEVE LEDVINA[6], G. FLETCHER[2], ERIN WALTER[2], RYAN MILLER[2], STEFAN SCHERER[2], ROB THORPE[9], JING XU[2], BRUCE BLOCK[2] and KEN ARNETT[2]

[1]*The Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Road, Laurel, MD 20723 U.S.A.*
[2]*Department of Atmospheric, Oceanic, and Space Sciences, University of Michigan, Ann Arbor, MI 48109-2143, USA*
[3]*NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA*
[4]*Lunar and Planetary Laboratory, University of Arizona, 1629 E. University Blvd., Tucson, AZ 85721-0092, USA*
[5]*Department of Physics and Astronomy, University of Kansas, Lawrence, KS 66045, USA*
[6]*Space Sciences Laboratory, University of California, Berkeley, CA 94720, USA*
[7]*National Central University, Chung-Li, Taiwan*
[8]*Space and Atmospheric Physics Group, Imperial College, London, UK*
[9]*Southwest Research Institute, P.O. Drawer 28510, San Antonio, TX 78228-0510, USA*

The Ion and Neutral Mass Spectrometer (INMS) onboard the Cassini Orbiter was activated subsequent to the end of the Saturn Orbit Insertion burn of Cassini's main engines. While above the A-ring, INMS observed clear signatures of both molecular and atomic oxygen ions and of protons. These measurements support the existence of an "ionosphere" (or plasma environment) associated with the A-ring. The likely source of these ions is photoionization by solar ultraviolet radiation of neutral O_2 molecules associated with a tenuous ring atmosphere. INMS direct measurements of this neutral population was precluded by large background signal.

During the first close flyby of Titan, INMS detected N_2, CH_4, H_2, Ar, and a host of more complex hydrocarbon and nitrile species in Titan's upper atmosphere. INMS has also provided evidence for atmospheric waves in the upper atmosphere and made the first direct measurements of isotopes of nitrogen, carbon, and argon that together provide interesting clues about the evolution of the atmosphere. The bulk composition and thermal structure of the moon's upper atmosphere do not appear to have changed since the Voyager 1 flyby of the large moon in November 1980.

Keywords: Saturn; Titan; Cassini