EPSC Abstracts
Vol. 5, EPSC2010-755, 2010
European Planetary Science Congress 2010

Atomic and molecular hydrogen ions in Saturn's high-latitude magnetosphere

F. J. Crary (1)
(1) Southwest Research Institute, San Antonio, Texas, USA

Abstract

During 2008, the Cassini spacecraft made multiple passes through the high-latitude regions of Saturn's magnetosphere. These orbits had a periapsis distance within 5 R_S of the planet and crossed the (dipole) L-shells associated with Saturn's aurora. During these orbits, the Cassini Plasma Spectrometer (CAPS) measured the composition and velocity distribution of atomic and molecular hydrogen ions.

Protons are the most abundant species, but H_2^+ and H_3^+ were also measured. H_2^+ is distinguished from He^{++} using the CAPS Ion Mass Spectrometer's reflectron time-of-flight mass spectrometer. This sensor measured the presence of proton fragments from a 2 AMU/q molecular ion, identifying H_2^+ separately from any He^{++} which may have leaked into the magnetosphere through the high latitude cusp.

The origin of the molecular hydrogen ions is uncertain. Although Saturn's atmosphere is a potential source of H_2^+, this species has also been observed in the equatorial magnetosphere and may be produced from the icy surfaces of the rings and from satellites of Saturn. H_3^+ is more likely to be a product of Saturn's atmosphere, since theoretical models predict it in Saturn's ionosphere but do not suggest that it would be produced in from the rings or satellites. The observed velocity distribution of the ions will be used to clarify the source of these species.