EPSC Abstracts,
Vol. 4, EPSC2009-682, 2009
European Planetary Science Congress,

Titan Ionospheric Conductivities from Cassini Measurements

L. Rosenqvist (1), **H. J. Opgenoorth** (1,2), J.-E. Wahlund (1), K. Agren, (1), R. Modolo (1,2), D. Strobel (7), I. Mueller-Wodarg (4), P. Garnier (1,5,6), C. Bertucci (4)

(1) Swedish Institute of Space Physics, Box 537, 751 21 Uppsala, Sweden, (2) Centre d'Etude des Environments Terrestre et Planétaires, 10-12 Avenue de l'Europe 78140 Velizy, France, (3) Solar System Mission Division, ESA/ESTEC, Keplerlaan 1, Noordwijk, The Netherlands, (4) Space and Atmospheric Physics group, Imperial College London, Prince Consort Road, London SW7 2BW, Great Britain, (5) Université de Toulouse (UPS), Toulouse, France, (6) CESR (Centre d'Etude Spatiale des Rayonnements), CNRS, UMR 5187, Toulouse, France, (7) Johns Hopkins University, 3400 North Charles Street, Baltimore, Maryland 21218, USA

Abstract

We present the first results of ionospheric conductivities at Titan based on Cassini

measurements during 17 Titan flybys. We identify an ionospheric region ranging from 1450 km ± 95 km (approximately the location of the exobase) to approximately 1000 km where electrical currents perpendicular to the magnetic field may become important. In this region the ionosphere is highly conductive with peak Pedersen conductivities of 0.002- 0.05 S/m and peak Hall conductivities of 0.01-0.3 S/m depending on Solar illumination and magnetospheric conditions. Ionospheric conductivities are found to be typically higher on the sunlit side of Titan. However, Hall and Pedersen conductivities depend strongly on the magnetic field magnitude which is highly variable, both in altitude and with respect to the draping configuration of Saturn's magnetic field around Titan.

Furthermore, resulting from a decreasing magnetic field with decreasing altitude, a consistent double peak nature is found in the altitude profile of the Pedersen conductivity. A high altitude peak is found to be located between 1300 and 1400 km. A second and typically more conductive region is observed below 1000 km, where the magnetic field strength drops sharply while the electron density still remains high. This nature of the Pedersen conductivity profile may give rise to complicated ionospheric-atmospheric dynamics and may be expected also at other unmagnetized objects with a substantial atmosphere, such as e.g. Mars and Venus.

Estimates of the total Pedersen conductance are found to range between 1300-22,000 S. The Pedersen conductance is always higher than the local Alfvén conductance but the difference varies by two orders of magnitude (from a factor 4 to 100). Thus, the conditions for reflection or absorption of Alfvén waves in Titans ionosphere are highly variable and depends strongly on the magnetic field strength.