Geophysical Research Abstracts
Vol. 17, EGU2015-8050-3, 2015
EGU General Assembly 2015

Time Variability of Titan's Ionosphere Revisited

Jen-Kai Hsu (1), Wing-Huen Ip (1,2), Rebecca Perryman (3), and Hunter Waite (3)

(1) National Central University, Graduate Institute of Space Science, Taoyuan City, Taiwan (tabriskai.hsu@gmail.com), (2) National Central University, Graduate Institute of Astronomy, Taoyuan County, Taiwan, (3) Space Science and Engineering Division, Southwest Research Institute, San Antonio, Texas, United States of America

Since the Saturn Orbital Insertion in 2004, the Ion Neutral Mass Spectrometer (INMS) experiment aboard the Cassini-Huygens spacecraft has acquired an extensive data set. The decadal coverage of the measurements during numerous close encounters with Titan allows the study of spatial and temporal variations of Titan's nitrogen-rich atmosphere above 1000-km altitude.

Titan's ionosphere is quite different to that of Earth's ionosphere. Due to Titan's thick (hundreds of kilometers) and dense atmosphere, the measurable ion density of Titan's nightside ionosphere extends well beyond the terminator. The diurnal variation of the ion density profiles and compositional changes are the result of photoionization and magnetospheric electron ionization (important at the night side). The different time evolutions of the light and heavy species from day to night could be indicative of the effects of flow dynamics and ion-molecule chemistry. From the observations, we can determine the ion content in Titan's night-side and the asymmetry between the dawn and dusk ion density profiles.

We have also found in the long term data base the signature of the equatorial expansion of Titan's atmosphere during solar maximum. In addition the global distributions of the major compound N_2 and minor species like CH_4 and H_2 all exhibit significant changes over a solar cycle as the closest approach points of Cassini moved from the northern hemisphere to the southern hemisphere.

In this work, we will first compare the diurnal variations between different ion species and simulate the ion densities to study the possible contributing factors. Then we will compare the results of our analysis to those reported by other groups to construct a comprehensive model of Titan's neutral atmosphere and ionosphere under different solar conditions.