

Magnetospheric plasma interaction effects on Titan's ionosphere

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Abstract

Cassini INMS and RPWS, combined with modeling, established that Titan's ionosphere is controlled primarily by solar EUV exposure. However complementary observations, together with inferences of some nightside ionosphere production by magnetospheric electrons, suggest that its location around Saturn may also play a role. An investigation of overall magnetospheric influences on Titan's ionosphere was carried out using ion density profiles observed by the Cassini INMS and MAG observations for context. A dozen selected flybys down to 950 km were separated according to the Saturn local time location of Titan, so as to distinguish between near-magnetotail external conditions characteristic of the hours surrounding midnight and near-noon conditions which are affected by proximity to the dayside magnetopause. Organization of the ion data by both solar-oriented coordinates and magnetospheric corotation coordinates reveals some differences in the profiles obtained mainly near the Titan terminator. Near midnight, the terminator profiles appear to be both more eroded and variable in appearance, while around noon they exhibit the density profiles expected for the extended, optically thin upper atmosphere that make Titan's ionosphere predictably depart from Chapman Layer behavior. The reasons for this difference must be related to the prevailing magnetotail lobe-like plasma and field conditions as opposed to magnetodisk conditions, that dominate the subsolar Titan orbit sector.