

CAPS-ELS negative ion density trends at Titan

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Abstract

The Electron Spectrometer part of the Cassini Plasma Spectrometer (CAPS-ELS) has revealed the existence of negative ions in Titan's ionosphere [1], [2]. These are observed during every encounter when the instrument points in the ram direction at altitudes between 950 and 1400 km. The heaviest ions observed so far have masses up to 13 800 amu/q. This suggests that complex hydrocarbon and nitrile chemical processes take place in Titan's upper atmosphere, playing a role in haze formation. Even heavier particles such as tholins can form which fall to lower altitudes and build up on Titan's surface [3]. Groups of masses can be identified because recurrent peaks are observed in the "mass" spectra of different encounters. We investigate the effects of different controlling parameters such as altitude, solar zenith angle, latitude and different seasons on the densities of the different mass groups. One striking result is the discovery of a region with a distinct lack of intermediate or higher densities. This region is called the Near Terminator Depression (NTD) region and is observed at solar zenith angles between 100° and 120°, i.e. in a region of low solar flux. This effect is particularly prominent at higher masses.

References

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