



Observations of negative ions at Titan and other objects in the Saturn system using the Cassini CAPS Electron Spectrometer (ELS)

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The discovery of heavy negative ions by Cassini's CAPS Electron Spectrometer (ELS) in Titan's ionosphere was one of the significant and unexpected results of the Cassini mission (Coates et al, 2007, Waite et al, 2007), necessitating the reconsideration of chemical processes in this enigmatic atmosphere. Complex hydrocarbon and nitrile processes occur which are also linked to haze formation. Negative ions are observed during Titan encounters at altitudes below 1400 km and reach masses up to 13,800 amu/q (Coates et al., 2009). Recurring peaks in the mass spectra can be used to identify different mass groups as reported by Coates et al. (2007) and Wellbrock et al. (2013). Similarly, close flybys of the moon Enceladus have revealed the existence of negatively charged water group cluster ions in the satellites' plumes (Coates et al., 2010). In addition, negative pickup ions have been observed in the vicinity of Saturn's second largest moon, Rhea, originating close to the satellite's tenuous atmosphere (Teolis et al., 2010), as well as other contexts in the Saturn system. In this paper we review the highlights of ELS negative ion observations in these captivating environments. We also provide an overview of new density profiles from selected Titan flybys demonstrating clear differences in the behavior of different mass groups.