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Charged particles in Titan's ionosphere

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Observations by two instruments onboard the Cassini spacecraft, Ion Neutral Mass Spectrometer (INMS) and CAssini Plasma Spectrometer (CAPS), revealed the existence of heavy hydrocarbon and nitrile species with masses of several thousand atomic mass units at altitudes of 950 – 1400 km in the atmosphere of Titan (Waite et al., 2007; Crary et al., 2009). Though these particles were believed to be molecules, they are most likely aerosols formed by the clumping of smaller molecules (Waite et al., 2009). These particles were estimated to have a density of 10-3 kg m-3 and a size of up to 256 nm. The existence of very heavy ions has also been observed by the CAPS components with a mass by charge ratio of up to 10000 (Coates et al., 2007, 2009; Sittler et al., 2009).

The goal of this paper is to find out whether the so called heavy ions (or charged particles) are generated by the charge transfer of ions and electrons to the particles. The charging of these particles has been studied by using the charge balance equations that include positive ions, negative ions, electrons, neutral and charged particles. Information on the most abundant ion clusters are obtained from Vuitton et al., (2009) and Wilson and Atreya, (2004). Mass by charge ratio thus calculated will be compared with those observed by Coates et al. (2007).

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