Are the Enceladus Plumes a Hotbed of Negativity? (Negative ion observations in the Enceladus plumes compared with observations at Titan and Earth)

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Introduction: The well documented Enceladus plumes create a dusty, asymmetric exosphere in which electrons can attach to small ice particles - forming anions, negatively charged nanograins and dust - to the extent that cations can be the lightest charged particles present and, as a result, the dominant current carriers. Several instruments on the Cassini spacecraft are able to measure this environment in both expected and unexpected ways. Cassini Plasma Spectrometer (CAPS) measures ions, electrons and photo-electrons and also measures the energy/charge of charged nanograins when present. When the plasma is sufficiently dense the Cassini Radio Plasma Wave Sensor (RPWS) and Magnetometer (MAG) data can be used to derive electron density and RPWS also detects dust impacts. Langmuir Probe (LP) measures the electron density and temperature via direct current measurement. The Magnetospheric Imaging Instrument (MIMI) measures energetic particles as well as energetic neutral atoms produced during charge exchange interactions in and near the plumes. The Ion Neutral Mass Spectrometer (INMS) measures ions and neutral molecules and the Cosmic Dust Analyser (CDA) measures down to micron sized dust. By consolidating data from these Cassini sensors we will present an assessment of the near Enceladus environment, discuss what is consistent and otherwise, and the implications for the plasma environment at Enceladus in the context of work to date as well as implications for future studies.