

Plasma Regions Around Enceladus

I.A.D. Engelhardt (1,2), J.-E. Wahlund (1), A.I. Eriksson (1), D.J. Andrews (1), M. Morooka (3), M.K. Dougherty (4)
(1) Swedish Institute of Space Physics, Uppsala, Sweden, (2) Department of Physics and Astronomy, Uppsala University, Sweden, (ilka.engelhardt@ifru.se), (3) Laboratory for Atmospheric and Space Physics, Colorado University, USA, (4) Blackett Laboratory, Imperial College, London, UK

Abstract

Enceladus, and ionised material in the south polar plume strongly influences the magnetospheric environment around the moon. In this study the focus is set to the downstream region and the edge of the plume. This is an overview of the electron density measurements by the Langmuir probe of the Radio and Plasma Wave Science (RPWS) instrument on Cassini of all flybys performed. We present measurements of the electron and ion density, and magnetic field, which clearly show the different plasma regions of the Enceladus interactions.

There have been four high inclination flybys passing directly through the downstream region of Enceladus where a wake could be expected (E3-E6). In these, an electron density decrease is observed where on the other hand the ion density stays constant. See figure 1 (top) as an example. A likely explanation for this mismatch between densities is electron absorption by micrometer size dust particles, which suggests that the dust is not only contained in the plume but spreads into a larger volume.

At the edge of the plume a decrease in electron density has been consistently observed in flybys parallel to the equatorial plane, see figure 1 (bottom). This may also be a consequence of electron absorption by dust, counteracted in the center of the plume by an increased gas density acting as a plasma source.

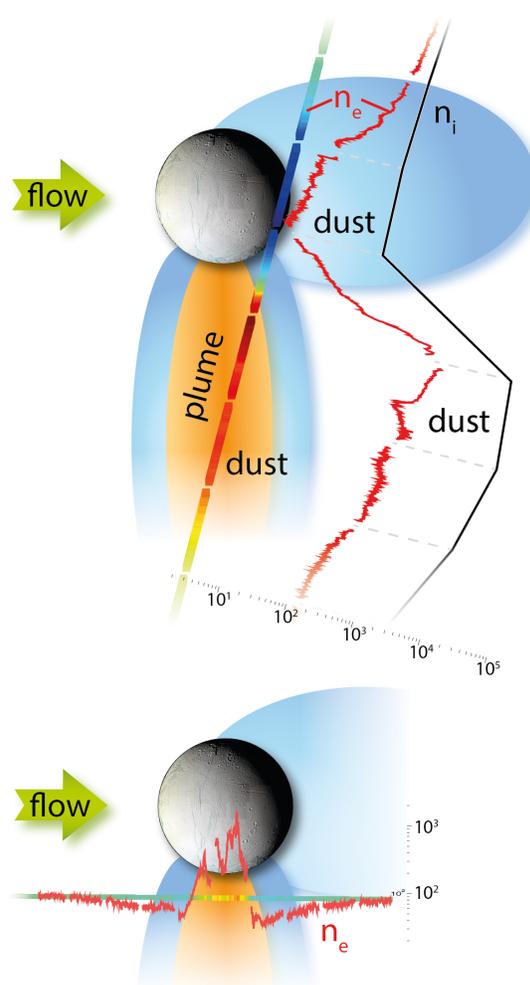


Figure 1: Overview figure of the electron density for flyby E3 (top) and E14 (bottom). The color coding on the trajectory, as well as the red line, represents the measured electron density with the Langmuir probe. The black line represents the ion density with a much smaller sampling rate. The density is given in cm^{-3} . The ambient plasma flow is indicated by the green arrow.