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Enceladus flybys in the view of energetic particles

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Abstract

We report on particle measurements in the vicinity of Enceladus in the Saturnian magnetosphere taken onboard the Cassini Spacecraft between 2005 and 2015. Enceladus, embedded in Saturn's radiation belts has been investigated by Cassini during 23 close flybys including those where the spacecraft went through the south polar plumes of the moon.
This paper is an update of the results from the first 14 flybys published by [2]. We report on the results of energetic electron measurements in the energy range 27 keV to 21 MeV taken by the Low Energy Magnetospheric Measurement System LEMMS, part of the Magnetospheric Imaging Instrument MIMI onboard combined with measurements of the magnetometer instrument MAG and the Electron Spectrometer ELS of the Plasma instrument CAPS onboard the spacecraft.
The analysis showed that Cassini was connected to the plume material along field lines well before entering the high density region of the plume. Sharp absorption signatures as the result of losses of energetic electrons bouncing along those field lines, through the emitted gas and dust clouds, clearly depend on flyby geometry as well as on measured pitch angle/look direction of the instrument and we use those depletion signatures to map out the interaction region.
In addition we use A.I.K.E.F hybrid code simulation results near Enceladus [1] to better understand the "ramp-like" features where only a partial depletion has been observed further away from the moon followed by nearly full absorption of electrons closer in.
During some of the flybys MIMI data are consistent with the presence of dust in energetic electron data when Cassini flew directly through the south polar plume.

References

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