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Electron absorption signatures in the vicinity of Rhea: Evidence for a debris disk

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Abstract

During its November 2005 flyby of Saturn's second-largest moon, Rhea, the LEMMS portion of Cassini's Magnetospheric Imaging Instrument, MIMI, detected an unexpected decrease in the fluxes of magnetospheric electrons with energies exceeding approximately 20 keV. This depletion extended to around 8 Rhea radii on either side of the moon. When combined with data from several other Cassini instruments, including those from the Cassini Plasma Spectrometer, CAPS, that also detected the electron depletion, it was proposed that the signature indicates the presence of a disk of electron-absorbing debris orbiting Rhea [1]. A set of brief, deeper electron depletions on either side of the moon may indicate the presence of discrete rings or arcs within the debris disk. A similar signature was detected during a more distant Rhea flyby in August 2007. No successful remote observations of a debris disk or rings have been reported to date.

We present further analysis of MIMI and CAPS data from these close flybys, and report on a survey of the numerous crossings of Rhea's L shell that have occurred during the course of Cassini's mission to date. The implications of all these observations on the proposed debris disk scenario are discussed.

References

[1] Jones, G. H., et al. (2008) Science 319, 1380-1384.