

Magnetospheric interactions of Saturn's moon Dione 2004-2017

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Abstract

The moon Dione is embedded deep within the highly dynamic Kronian magnetosphere and orbits the planet at about 6.2 planetary radii (R_S). The in-situ study of the moon-magnetosphere interaction processes near Dione was possible with the Cassini/Huygens mission which flew by close to the third-largest moon of Saturn five times (flybys D1-D5) at closest approach distances between 99 and 516 km. In addition, Cassini crossed the L-shell of Dione more than 400 times between 2004 and 2017 and documented the variability of the magnetosphere along the orbit of Dione over more than 13 years.

We describe here the particle environment obtained by the two particle instruments onboard Cassini (Low Energy Magnetospheric Measurement System LEMMS, one of the sensors of the Magnetosphere Imaging Instrument MIMI and the Cassini Plasma Spectrometer Investigation CAPS). This paper is a follow-on publication of [1] where first results of D1-D3 were described and a follow-up on fieldline tracing results during D1 published by [2]. Cassini encountered Dione during different magnetospheric conditions and along different flyby geometries. This allowed to at least partly study the moon-magnetosphere interaction processes upstream of the moon during D1, in the low-energy wake during D2 and D3, and above the north pole of the moon during D4 and D5. We also compare simulation results of Dione's environment from the hybrid simulation code "A.I.K.E.F." [3] with real measurements and we trace back the features in the data along the disturbed field lines to interpret the signatures in the particle fluxes.

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