



Cassini observations of reconnection signatures at Saturn and the implications for the role of reconnection in flux transport.

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Vasyliunas-type closed-flux plasma sheet and Dungey-type open-flux lobe reconnection to account for the observed properties of the plasmoids and PPPS in Saturn's magnetotail.

Abstract

We survey the Cassini magnetometer data during the deep tail orbits in 2006, and find 34 direct encounters with plasmoids. They occur as single, isolated events but also in groups of two or more plasmoids as is frequently observed at Earth. We show a case study example of three such plasmoids over three hours, estimating the total flux closure over this time, and deriving the reconnection rate. We show the results of a superposed epoch analysis of all 34 plasmoids indicating that, on average, plasmoids at Saturn are ~8 minutes in duration and they tend toward a loop-like, as opposed to flux rope-like topology, with little or no axial core magnetic field. Our analysis shows that plasmoids at Saturn are followed by an extended interval of the post-plasmoid plasma sheet (PPPS) lasting ~58 minutes, and we derive the average open magnetic flux disconnected during this interval. We calculate expected recurrence rates for plasmoids, and compare these with an approximate observational recurrence rate, explaining the likely reasons for the differences in these numbers. We conclude that the Cassini magnetometer measurements require a combination of