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Cassini Observations of Periodic Modulations in Saturn's Magnetospheric Current Sheet

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Fields and particles instruments on the Cassini spacecraft report periodic modulations near the planetary rotation period throughout Saturn's magnetoshere. In this paper we explore the nature of these modulations and their spatial variation, and the effect on the geometry of Saturn's plasma sheet. We study the stretched current sheet region outside of $18R_S$ on the dawn flank and investigate two hypotheses: 1) the current sheet is moving vertically up and down in response to the small but significant tilt between Saturn's dipole and spin axes. 2) The current density varies with Saturn longitude corresponding to an active magnetospheric sector, caused by a magnetic anomaly for example.

Magnetic field models are used with the Cassini magnetometer data to explore the implications of these hypotheses. Our results are correlated with data from the plasma spectrometer and energetic particles instruments, and also the spatial variation of fluctuations in the magnetic field. These fluctuations in the magnetic field are evidence of the spacecraft encountering the plasma sheet and so enable us to better characterise the location of the spacecraft with respect to the current sheet.

Our view of Saturn's plasma sheet geometry is described and we comment on the influence of the solar wind on such a structure and the associated periodicities. The implications for Saturn's magnetospheric configuration and dynamics are discussed.