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Theory and modelling of cusp particle signatures at Saturn and Jupiter

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Abstract

Cassini observations of Saturn's polar magnetosphere have revealed a variety of cusp-like particle signatures suggesting the presence of magnetopause reconnection. Some of these signatures display evidence of bursty unsteady reconnection.

The presence of rapid planetary rotation and large Parker-spiral IMF conditions lead to unique effects on cusp signatures and we explore these aspects in this presentation. We present theoretical considerations of the cusp and numerically model cusp particle signatures at both Jupiter and Saturn. We pay particular attention to the structure of energy-time ion dispersions and their generation by poleward and azimuthal convection of newly opened flux tubes, the effects of bursty reconnection, and the effect of periodicities in the Saturn system.

This study is relevant to ongoing data exploitation from Cassini and to future observations from Juno. Comparisons will be made to Cassini observations of Saturn's cusp. We also present predicted signatures along Juno's trajectory.