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Plasma Transport Signatures at Saturn Observed During Cassini Inbound Orbit Insertion

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Cassini magnetic field and plasma observations during Saturn Orbit Insertion revealed inner regions of the Saturnian magnetosphere characterized by various unusual magnetic field and plasma signatures that were related to the rotationally-driven plasma transport cycle. Throughout this cycle, magnetic flux tubes of dense and cold plasma move outwards and are replaced by flux tubes of tenuous and hot plasma that return inwards.

We will detail the set of observations supporting this picture and recorded on its inbound trajectory by the whole Cassini instruments suite dedicated to Magnetosphere And Plasma Science. The following properties enable us to discuss plasma transport processes going on in the planetary system:

- The magnetometer (MAG) instrument observes between 6 and 10 R_s numerous intermittent unusual flux tubes in which some of the magnetic pressure is replaced by increased plasma pressure;
- The plasma (CAPS and MIMI) instruments reveals that these signatures are

correlated with localized hot plasma injections followed by longitudinal drift dispersion and superimposed on a cooler and denser background plasma;

- The Radio and Plasma Wave Science (RPWS) instrument confirms undoubtedly the presence of a density cavity within these flux tubes based on estimates of the total plasma density from the upper hybrid frequency;
- A preliminar analysis of the initial fluid moments derived by *Sittler et al.* (2005) indicates that these empty flux tubes tend to have negative radial and supercorotating azimuthal velocities;
- The re-analysis of Voyager 1 data reveals that similar signatures were present at that time in the inner regions of the Saturnian magnetosphere.