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Abstract

How In-Situ Plasma Measurements at the Outer Planets Can Inform our Understanding of the Earth's Magnetosphere.

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In rapidly spinning magnetospheres plasma produced in the inner magnetosphere flows outward carrying magnetic flux and causing the planetary field to balloon and stretch. The Earth's magnetic field becomes stretched via plasma loading from the solar wind and field line draping. In both cases the expansion of the magnetic field cannot continue unabated and magnetic flux lost from the inner magnetosphere must be returned. Mechanisms by which flux can be returned from the outer magnetosphere are lively areas of debate.

Plasma bubbles were first postulated to exist at Jupiter by *Pontius and Hill* [1989] (referred to as "transient flux tubes") in order to satisfy observational constraints provided by the Voyager spacecraft [*Richardson and McNutt,* 1987]. Data from the Cassini spacecraft at Saturn have now shown that "injection events" are a pervasive phenomenon in the Saturn magnetosphere. At the Earth similar events have been referred to as "bursty bulk flows", "traveling compression regions" or simply "fast flows"…(other?…) but their identification is relatively difficult due to the different fundamental plasma timescales at the Earth versus the gas giants Jupiter and Saturn. We will discuss how small planet ward flowing bubbles are manifest in the Saturn system and how they may be a key element in returning the magnetic flux lost from large scale outward transport.