



The mystery of rotational signals from Saturn's magnetosphere revealed

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Saturn's internal magnetic field is exceptionally symmetric about its rotation axis. Yet planetary scientists have been puzzled by rotational periodicities in local and remote sensed measurements. In this presentation we provide evidence from Cassini observations of a new class of semi-permanent plasma and field anomalies located in the ring current region of Saturn which we demonstrate are the time keepers of Saturn's magnetospheric clock. Additionally, we show that the ring current anomalies are responsible for a novel phenomenon namely the asymmetric lift of Saturn's magnetosphere by the solar wind which tilts the planet's current sheet even when the internal field is completely axisymmetric. The current sheet tilt is the other primary source of periodicities in Saturn's magnetosphere. We explore ideas on how the ring current region anomalies may be generated and maintained in the magnetosphere. A major implication of this work is that the official IAU value of Saturn's length of day (10hr 39 min 22 sec) derived from Saturn's Kilometric radiation (SKR) modulation is suspect because the SKR modulations have their root in the ring current anomalies and not the interior of Saturn.