Deductions concerning dynamics and structure of the Saturn magnetosphere using the Cassini magnetometer

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The presently accumulated Cassin spacecraft magnetometer data set is used as a basis for describing a scenario for the dynamics of the Saturn magnetosphere where mass transport, accomplished in the inner magnetosphere by interchange motion, feeds into the outer magnetosphere where ballooning driven by centrifugal stress, leads to field reconnection and plasma loss. It is shown that the model can be consistent with aspects of the empirical 'camshaft' model proposed by Espinosa et al. 2003 to explain Pioneer and Voyager data. A fundamental observational feature in the Saturnian context is a planetary induced magnetic field asymmetry, which we propose could originate from a localized ionospheric magnetic anomaly while the resulting cyclic stress modulation leads to the current in the current sheet itself being modulated as well as moving up and down. Rotating field aligned current structures would thus be a basic feature of the Saturn system. The site of magnetic flux return (lightly loaded flux tubes moving inwards) seems to be localised and may not clearly be related to rotation phase.