

## Rotational Signatures in Saturn's Inner Magnetosphere

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Saturn's magnetosphere display rotational periodicities in many of the data obtained by Cassini. We focus here on the signatures of the inner magnetosphere (the corresponding terrestrial "ring current") observed from global energetic neutral atom (ENA) images, obtained by the Ion and Neutral Camera (INCA), and observed in the in-situ ion data obtained by the LEMMS ion spectrometer. INCA obtains ENA images in the  $\sim 3\text{-}200$  keV/nuc of protons and  $\text{O}^+$ . The typical observations show hot plasma distributed roughly between 6 to  $30 R_S$  orbiting the planet at a period around the 10h45min rotation period depending on energy and species. The physical mechanisms for this behavior is explained in terms of simple drift physics. Several phenomena in Saturn's magnetosphere appear to prefer a certain fixed longitudinal sector of the planet. The most famous phenomenon is the Saturn Kilometric Radiation (SKR), that has been used to define Saturn's rotational period, but has lately come into question due to the observed changing period. Simultaneous SKR and ENA observations suggest a strong connection between the two phenomena. We discuss possible physical mechanisms relating the two. We further investigate if the energetic ion population of the inner magnetosphere can be organized in some longitudinal system fixed to the planet.