



Periodicities in Saturn's magnetosphere generated by an inner magnetospheric vortex

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The length of the day of a planet lacking a solid surface has traditionally been obtained from the modulations of radio waves emanating from its auroral region. Saturn also emits intense radio waves called Saturn's Kilometric Radiation (SKR) modulated by its rotation but with a period that is known to vary by about 1% over a time scale of years. Recently, it was shown that the SKR emitted from the northern and the southern hemispheres have slightly different modulation periods creating a puzzling but persistent dual clock in the Saturn system. Field and plasma observations from the magnetosphere show that on closed field lines and on the southern open field regions, the modulations occur at the southern SKR modulation period.

In this presentation, we will show that the modulations of SKR emissions and many field and plasma parameters are the manifestations of a massive ($M > 10^8$ kg) slow-moving ($V < 1.5$ km/s) two-cell plasma convection system operating in the inner magnetosphere of Saturn that was independently proposed by Gurnett et al. (2007). We show that during the southern summer the longer-period southern SKR emissions are exclusively excited by sources in the plasma outflow region of the convection system which lags corotation to conserve angular momentum. We illustrate, how, various field and plasma parameters synchronize themselves to the southern SKR clock.