

Contribution of Cassini/RPWS observations to the study of the spin modulation of Saturn's magnetosphere

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Abstract

Two distinct and variable rotation periods in Saturn's radio emissions were revealed from observations performed by the radio and plasma wave science (RPWS) experiment on board the Cassini spacecraft. These two periods, first measured at 10.6 hours and 10.8 hours, were quickly attributed to SKR produced in the northern and southern hemispheres respectively. Later observations showed that these two periods varied and became equal after the time of Saturn's equinox. Most of magnetospheric phenomena in Saturn's environment are affected by the planet spin despite the apparent steep axi-symmetry of the internal magnetic field. The existence of a double period makes the study of the planetary magnetic field much more complicated and the building of a field model, based on the direct measurements of the MAG experiment from the mag-

netometers embarked on board Cassini, turns out to be uncertain. The first reason is the difficulty for defining a longitude system linked to the variable period, because the internal magnetic field measurements from MAG are not continuous. The second reason is the existence itself of two distinct periods which could imply the existence of a double rotation magnetic structure generated by Saturn's dynamo. However, the radio observations from the RPWS experiment allow a continuous and accurate follow-up of the rotation phase of the variable two periods, since the SKR emission is permanently observable and produced very close to the planetary surface. We have performed a wavelet transform analysis of the intensity of the SKR signal received at 290 kHz in order to calculate the rotation phase of each saturnian hemisphere. Then this allows us to study the magnetic field in rotating frames in which constant magnetic structures could exist.