

Rotational modulation of Saturn radio emissions during Cassini's Grand Finale

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Abstract

Despite of the close axial symmetry of Saturn's internal field, modulation periods close to 10.7 hours are observed in all three Saturn radio emissions, Saturn kilometric radiation (SKR), narrowband emission, and auroral hiss. Furthermore, the modulation periods of these emissions have been found to consist of two components, one associated with each hemisphere. The two components show seasonal variation and cross each other after equinoxes. The hemispheric asymmetry arises from different solar illuminations in two polar regions, which leads to different ionosphere conductivities that determine the relative strength of the rotating field-aligned currents in two hemispheres. SKR and auroral hiss are known to be generated by the upward and downward field aligned currents, respectively. In 2016, Cassini shifted to high inclination orbits, providing good opportunities to observe all three radio emissions in both hemispheres. We will show that north hemisphere emissions have become dominant and their modulation rates have slowed to the level of their southern counterparts before equinox. The phase relation between three radio emissions and the local time dependence of their intensities will also be discussed. The Cassini's grand finale orbits would allow in-situ observations of the sources of the radio emissions as well as the field-aligned currents in both hemispheres, which would help confirm the seasonal control theory by showing the hemispherical asymmetry in source strength near the northern summer solstice.