Reanalysis of Cassini's Saturn Kilometric Radiation source crossing: Search for loss cone Cyclotron Maser Instability

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Résumé

Saturn Kilometric Radiation (SKR) are strong non-thermal radio auroral emissions between a few kHz and 1 MHz. They were detected by Voyager in the 1980s, and Cassini analysed their sources in 2008 with its radio, plasma and magnetic measurements. At that time, the generation mechanism was confirmed to be the Cyclotron Maser Instability (CMI), which generates waves close to the local cyclotron frequency, in highly magnetized plasma from mildly relativistic electrons exhibiting a gradient in the direction perpendicular to the magnetic field. The source of free energy for SKR was then identified to be the shell distributions of 6-12 keV themselves generated by parallel currents that is assumed to be upward field aligned currents. Since then, new results from Juno identified shell distributions as a secondary source of free energy at Jupiter. In these Jovian sources, shell distributions were identified in upward fiedl aligned currents regions along with unstable broadened loss cones.

Therefore, in light of these new results, we propose to reanalyze the data from Cassini during SKR source crossings to verify whether similar enlarged loss cone concomitant with shell distributions exist at Saturn and whether they can be a secondary source of free energy at Saturn and to compare these newly identifed loss cone distributions with the Jovian case.

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