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Synchrotron Measurements and Models at Jupiter

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Since the discovery of the Jovian synchrotron emission in the late fifties, numerous measurements at a variety of radio frequencies (from 74 MHz up to 15 GHz using Earth-based radio telescopes and the Radiometer Subsystem of the Cassini Radar Instrument) have been used to portray the distribution of high-energy electrons around Jupiter, but also to speculate on the causes of the brightness's features of the mapped emission and attempt to understand the time variability of the total flux density. The development of parameter models, semi-empirical models (parameterization of the particle transport equation), and physical models of the Jovian electron radiation belts during the last decades have led to new insights in the understanding of the distributions and sources of the synchrotron emission. In this paper, we present a review of observation and modeling results as well as some results of our recent investigation of the synchrotron emission based on a three dimensional model. We propose to discuss in particular the dependence of the Jovian synchrotron emission on physical processes, longitudinal asymmetry of the magnetic field and the viewing aspect from Earth, and physical parameters capable of driving the long-term variations of the radio flux (radial diffusion and particle injections, solar activity).