Geophysical Research Abstracts, Vol. 8, 05197, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05197

Radio Emission and Dynamics of the Jovian Electron Radiation Belts

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In this paper, we present details on the results of our recent investigation of the synchrotron emission based on a physical model. The purpose of this work is to analyze the general dynamics of particles in the magnetosphere of Jupiter by combining models and observations of the electron radiation belts (radio and particles). Making use of adiabatic invariant theory, the model determines the distribution of the trapped electrons populating the Jovian inner magnetosphere by solving the governing Fokker-Planck equation. The 3-D transport equation consequently describes the time evolution of the distribution functions in a phase space equivalent to energy, latitude and radial distance. Fitting the Pioneer data sets and VLA maps, the physical model allows us to discuss the dependence of the synchrotron emission of Jupiter (2-D brightness distribution, radio spectrum, 10-hour and long-term fluctuations) on physical processes and physical parameters capable of driving the dynamics of the high-energy electrons in Jupiter's magnetosphere. The EPD data accumulated during Galileo full tour made from 1995 to 2003 will assist us to discuss circulation of particles in the magnetosphere of Jupiter in order to draw a general transport of the energetic electrons and possible correlation with the solar activity.