TEMPORAL AND SPATIAL DISTRIBUTION OF HIGH ENERGY ELECTRONS AT JUPITER

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ABSTRACT

Measurements of the high energy, omni-directional electron environment by the Galileo spacecraft Energetic Particle Detector (EPD) were used to study the high energy electron environment in the Jovian magnetosphere, especially in the region between 8 to 18 Rj (1 Rj = 1 Jovian radius = 71,400 km). 10-minute averages of the EPD data collected between Jupiter orbit insertion (JOI) in 1995 and the orbit number 33 (I33) in 2002 form an extensive dataset, which has been extremely useful to observe temporal and spatial variability of the Jovian high energy electron environment. The count rates of the EPD electron channels (0.174, 0.304, 0.527, 1.5, 2.0, and 11 MeV) were grouped into 0.5 Rj or 0.5 L bins and analyzed statistically. The results indicate that: (1) a log-normal Gaussian distribution well describes the statistics of the high energy electron environment (for example, electron differential fluxes) in the Jovian magnetosphere, in the region studied here; (2) the high energy electron environments inferred by the Galileo EPD measurements are in a close agreement with the data obtained using the Divine model, which was developed more than 30 years ago from Pioneer 10, 11 and Voyager 1, 2 data; (3) the data are better organized when plotted against magnetic radial parameter L than Rj; (4) the standard deviations of the 0.174, 0.304, 0.527 MeV channel count rates are larger than those of the 1.5, 2.0, 11 MeV count rates in <12 Rj, and comparable in >12 Rj. These observations are very helpful to understand short- and long-term, and local variability of the Jovian high energy electron environment, and discussed in detail.

KEY WORDS: Jupiter, Jovian Magnetosphere, Galileo Spacecraft, Energetic Particle Detector, and Statistical Radiation Model