Geophysical Research Abstracts
Vol. 14, EGU2012-5192, 2012
EGU General Assembly 2012

Distribution of the electron pitch-angle diffusion rates in the radiation belts

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We performed a statistical study for VLF emissions using a whistler frequency range for ten years (2001-2010) of Cluster measurements. We utilized data from the STAFF-SA experiment, which spans the frequency range from 8.8 Hz to 3.56 kHz and present distributions of wave magnetic and electric field amplitude and wave-normals as a function of MLat, MLT, L-shell and geomagnetic activity in a form of probability levels, which were directly applied for electrons diffusion coefficients calculation in the outer radiation belt. The propagation direction of chorus waves rapidly deflects from the magnetic field with the increase of latitude and for a given frequency tends to the resonance cone at 15-25 degrees. The width of the distribution increases also. Results were proved using numerical ray tracing simulation. The increase of the mean value and the variance of the wave vector distribution with latitude results in important growth of the pitch-angle diffusion rates due to significant increase of the contribution of higher order cyclotron resonances at larger latitudes, which is most efficient for electrons with small equatorial pitch-angles. The statistics of the wave magnetic field amplitude also shows strong dependence on magnetic latitude. The probability density function of the magnetic field preturbation has the form, which significally deviates from Gaussian, and can not be represented by its averaged value. We processed the set of the amplitude levels of the probability cumulative function to compose the probability density functions for the diffusion coefficients for day and night sectors and for different geomagnetic activity regimes.