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Electron pitch-angle diffusion in the radiation belts: effects of whistler waves oblique propagation.

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The major difficulty in the modeling of the radiation belts dynamics is related with our restricted knowledge of the probability distribution of whistler wave intensity and wave-vector directions upon various parameters: frequency, magnetic latitude, L-shell, et. We use statistical analysis of ten years (2001-2009) measurements of wave characteristics by Cluster STAFF-SA to establish the wave-vectors distribution upon magnetic latitudes. These distributions represent an important step in the development of the more precise procedures for the diffusion coefficients evaluation. We present hereafter the study of the pitch-angle diffusion of electrons in the outer radiation belt. The propagation direction of magnetospherically generated whistler waves (chorus waves generated in the vicinity of the geomagnetic equator) rapidly deflects from the magnetic field with the increase of latitude. The width of the distribution and consequently the variance increases also. We take into account obtained distributions of the angle mean value and variance to calculate pitch-angle diffusion coefficients for various latitudes and eventually to determine the diffusion rates by averaging over electron bounce oscillations. The diffusion coefficients obtained using of these new procedures are compared with those calculated under assumption of whistler parallel propagation with constant value of variance. We show that the increase of the angle mean value and the variance of the wave vector distribution with latitude results in significant growth of the pitch-angle diffusion rates. This growth is related to significant increase of the contribution of high order cyclotron resonances to electron diffusion at large latitudes, which is most efficient for electrons with small equatorial pitch-angles.