Losses and Sources of the Radiation Belts Electrons due Wave-particle Interactions

Y.Y. Shprits, D. A. Subbotin, and R. M. Thorne

The evolution of the relativistic electron fluxes in the radiation belts may be described by the 3D modified Fokker-Plank equation in terms of radial distance, pitch-angle, and energy. We present the results of numerical simulations using a newly developed at UCLA 3D radiation belt diffusion code. Quasi-liner diffusion coefficients are computed for resonance scattering by chorus, EMIC and hiss waves. We show that radial diffusion, pitch-angle scattering, energy diffusion, and various feedback mechanisms play an important role in the evolution of the relativistic electron fluxes in the radiation belts. Our results indicate that the peaks in phase space density are produced by chorus energy diffusion at L~5.5, while EMIC and hiss waves in the regions of plumes may provide a dominant loss mechanism during storms. We also present comparison of the simulations with in-situ observations of the relativistic electron fluxes.