

Nonlinear analysis of magnetospheric wave-particle interactions

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The dynamics of the Earth's radiation belts are largely controlled by wave-particle interactions. Gyro-resonant whistler-mode chorus - electron interactions can generate relativistic (MeV) electrons in the outer zone during magnetic storms. Whistler-mode waves can pitch-angle scatter electrons and induce precipitation loss from the inner magnetosphere. Here we analyze the growth of magnetospheric whistler mode waves with particular emphasis on the nonlinear growth phase. We show that nonlinear wave growth can only take place over a restricted parameter space. We examine the conditions under which chorus wave growth can take place, and discuss how the results can be compared with computer simulations and experimental observations.

Keywords: wave-particle interactions, whistler-mode waves, radiation belts, nonlinear cyclotron resonance, chorus wave growth