Nonlinear interactions of charged particles and large-amplitude waves have a significant impact on magnetospheric dynamics. Here we focus on the cyclotron resonant interaction between energetic electrons and the discrete, whistler-mode chorus emissions in the Earth's outer radiation belt. The subject is introduced by an extensive review of whistler-mode dispersion properties, resonant electron trajectories and nonlinear wave-growth theories. We then present a new semi-empirical model of rising-tone chorus emissions with a fine subpacket structure. The model is then used in test-particle simulations to investigate nonlinear perturbations in hot electron distributions. Based on changes in electron fluxes, we estimate the resolution of spacecraft particle detectors required to detect the predicted perturbations. The test-particle method is further used to simulate atmospheric precipitation of electrons caused by interaction with a single chorus wavepacket, and the result is put into connection with microbursts and pulsating auroras. We also detected a violation of the strong diffusion limit by the cyclotron resonant interaction, resulting in loss cone overfilling.