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Understanding the global excitation of whistler-mode chorus and its effects on Earth's radiation belt dynamics

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Whistler mode chorus emissions are excited in the inner magnetosphere following the convective injection of energetic electrons from a source region in the plasma sheet. On the night-side pronounced increase in the flux of anisotropic electrons leads to large linear wave growth and the onset of non-linear processes, which are responsible for the formation of discrete chorus elements in two distinct band above and below one half the electron gyrofrequency. Rapid pitch-angle scattering and energy diffusion causes a severe depletion in electron flux (leading to diffuse auroral precipitation) and the development of highly anisotropic pitch-angle distributions during convective transport to the dayside. The modified electron distributions approach a state of marginal stability, but whistler-mode instability can be triggered by macroscopic changes in plasma density and magnetic field. The global distribution of excited chorus emissions is responsible for microburst of energetic electron precipitation and the stochastic acceleration of electrons to relativistic energies in the recovery phase of magnetic storms. Chorus is also the responsible for the origin of hiss within the plasmasphere, which provides the major scattering loss responsible for the two-zone structure of the energetic electron radiation belts.