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09:15-09:30

Particle simulation of VLF triggered emissions in a parabolic magnetic field

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We perform one-dimensional electromagnetic particle simulations to study fundamental processes of VLF triggered emissions in the inner magnetosphere. Approximating the dipole magnetic field by a parabolic magnetic field, we assume a cylindrical model to describe particle dynamics along the magnetic field line. We put antennas perpendicular to the background magnetic field at the magnetic equator and oscillate currents with the fixed frequencies for the different duration and the different amplitudes. We observe triggered emissions with frequency variations from the triggering waves with 0.40 of the electron cyclotron frequency. We have analyzed the nonlinear wave-particle interaction in the vicinity of the magnetic equator in detail. In the generation process of triggered emissions, counter-streaming energetic electrons form nonlinear resonant currents causing the frequency variation and growth of triggering wave packets, resulting in the formation of subpackets with slightly higher frequencies. The nonlinear triggering process is repeated many times with gradually increasing frequencies of subpackets, forming a chorus element of large frequency variation. By changing the wave amplitude and frequency of the triggering wave packet, we can control the occurrence of rising tone emissions.