Test particle simulation of energetic electrons interacting with sub-packet chorus emissions in the inner magnetosphere

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A whistler-mode chorus emission is known as a rising tone wave with a smooth amplitude growth in the magnetosphere. Recently there has been a discovery about a new feature of the chorus wave amplitude. When a chorus wave is generated at the equator, the wave amplitude does not show a smooth growth but a gradual growth with multiple peaks. Waves with this feature are called sub-packet waves. The present study includes two attempts. The first attempt is to simulate the generation and development process of the sub-packet wave over the magnetosphere. The sub-packet's unsmooth amplitude growth at the equator is reproduced by suppressing the amplitude growth with the possible maximum amplitude defined as the optimum amplitude, which is calculated by other geophysical factors. Secondly it is aimed to simulate interaction between the sub-packet wave and energetic electrons under the dipole magnetic field. In the simulation results, a distinct wave form of sub-packet is successfully simulated at the equator as theoretically expected, and it has been also verified that the sub-packet's wave form evolves through propagation to higher latitudes depending on the related geophysical factors such as the inhomogeneity of the magnetic field. By simulating the interactions of sub-packet chorus emissions and resonant electrons, we have found notable features in the energetic electron dynamics in the magnetosphere. The details of these effects on electron dynamics are discussed under the various conditions of physical parameters such as particle initial energy and pitch angle.

