Two-dimensional simulation of whistler mode wave packets interacting with energetic electrons

*Takeshi Nogi[1], Yoshiharu Omura[1]

1. Reserch Institute for Sustainable Humanosphere, Kyoto University

We perform two-dimensional electromagnetic particle simulations to study basic characteristics of whistler-mode wave particle interaction involved in the generation and propagation processes of chorus emissions with wave normal angles oblique to the static magnetic field. We assume a simple periodic (x, y) system with the magnetic field taken in the x-direction. We find the linear phase of the instability is much affected by electrostatic thermal fluctuations. It is necessary to put many super-particles in a grid cell to suppress the thermal fluctuation. We next put an array of antennas perpendicular to the background magnetic field, and oscillate the antenna current to generate obliquely propagating waves. In addition to the nonlinear trapping of energetic electrons through the cyclotron resonance, another nonlinear trapping of electrons takes place through the Landau resonance. Structures of the nonlinear trapping potentials change with the varying frequency, affecting efficiency of energy transfer between the wave and energetic electrons. We study nonlinear evolution of the wave packet, and competing processes of both resonances in accelerating energetic electrons to higher energies.

