Particle Simulation of Triggered Emissions from Large Amplitude Whistler-mode Waves

*Takeshi Nogi[1], Satoko Nakamura[1,2], Yoshiharu Omura[1]

1. Reserch Institute for Sustainable Humanosphere, Kyoto University, 2. Institute for Space-Earth Environmental Research, Nagoya University

We perform one-dimensional electromagnetic particle simulations to study basic processes of whistler-mode wave radiation from an antenna locatd at the magnetic equator and its nonlinear interaction with energetic electrons. Approximating the dipole magnetic field by a parabolic magnetic field, we assume a cylindrical geometry for particle dynamics with a parabolic magnetic field taken along the axis of the cylinder, while we solve Maxwell's equations including Poisson's equation on the axis by the FDTD method. We put an antenna perpendicular to the background magnetic field, and oscillate the antenna current at fixed frequencies with different durations to change the length of the triggering pulse. We observe falling-tone emissions triggered from a short pulse at a frequency close to half the electron cyclotron frequency. Through the process of falling tone emissions, we find trapped particles generates the resonant current parallel to the wave magnetic field, which decreases the frequency of the seed waves near the equator. By changing the wave frequency and the length of the triggering wave packet, we can control the occurrence of rising and falling tone emissions.

