Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

PEM07-22 Room:105 Time:May 22 16:45-17:00

Electron hybrid simulations of whistler-mode chorus emissions with real parameters in the Earth's inner magnetosphere

Yuto Katoh[1*], Yoshiharu Omura[2]

[1]Graduate School of Science, Tohoku University, [2]RISH, Kyoto University

In the Earth's inner magnetosphere, whistler-mode chorus emissions are observed mostly on the dawn side and are enhanced during geomagnetically disturbed periods. Chorus emissions are narrow band emissions observed in the typical frequency range of 0.2 to 0.8 f_{ce0} with a gap at the half f_{ce0}, where f_{ce0} represents the electron gyrofrequency at the magnetic equator.

The generation process of chorus has been explained by the nonlinear wave growth theory [see review by Omura et al., in AGU Monograph "Dynamics of the Earth's Radiation Belts and Inner Magnetosphere, 2012]. Recent self-consistent numerical experiments reproduced the generation process of chorus emissions [e.g., Katoh and Omura, GRL 2007; Hikishima et al., JGR 2009].

In the present study, we show the result of electron hybrid simulation of the generation process of whistler-mode chorus emissions under realistic initial conditions. We refer in-situ observation by Cluster [Santolik et al., 2003] for the initial parameters of energetic electrons and the spatial inhomogeneity of the background magnetic field. In the simulation results, chorus emissions with rising tones are reproduced, while the spectral characteristics is consistent with the observation. We also find that the simulation result is consistent with threshold and optimum wave amplitudes of chorus elements estimated by the nonlinear wave growth theory.

Keywords: whistler-mode chorus, numerical experiments, wave-particle interactions