Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

PEM026-P01 Room: Convention Hall Time: May 23 17:15-18:45

Particle simulations about generation mechanism of low frequency component of BEN

Tetsuya Hirono[1*], Taketoshi Miyake[1], Hirotsugu Kojima[2], Yoshiharu Omura[2]

[1]Toyama Pref. Univ., [2]Kyoto Pref. Univ RISH

According to our PIC simulations, ESW (Electrostatic Solitary Wave) is generated from electron beam instabilities. We know ESW is composing the upper frequency part of BEN (Broadband Electrostatic Noise) which is frequently observed in space plasma. The generation mechanism of the low frequency component of BEN, however, is still unexplained. To clarify whether such low frequency waves are generated by electron beam instabilities, we performed a series of long-term simulations of beam instabilities with different parameters, and observed time evolutions of these beam instabilities. We performed two-dimensional electrostatic computer experiments of electron beam instabilities, and demonstrate nonlinear evolutions of electron beam instabilities, in time as well as in space.
In this study, we investigated parameter dependence on the formation mechanism of ESW and the excitation conditions of low frequency electrostatic waves after long-time evolution of weak electron beam instabilities. We performed a series of simulations with different parameters, electron cyclotron frequencies and drift velocities of the electron beam, and then confirmed that low frequency waves are excited with plasma parameters in the magnetospheric region. These low frequency waves are polarized in the perpendicular direction to the ambient magnetic field. We are going to analyze relations between dynamics of plasma particles and exited waves, and compare frequency spectrum of satellite observation with those of simulation result. We perform more detailed simulations with various parameters in order to clarify the excitation mechanism of these low-frequency waves.

Keywords: simulation, instability, ESW, plasma