

PEM026-P03

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Particle simulations about generation mechanism of low frequency component of BEN

Tetsuya Hirono¹, Taketoshi Miyake^{1*}, Yoshiharu Omura², Hirotsugu Kojima²

¹Toyama Prefectural University, ²RISH, Kyoto University

According to PIC simulations, ESW (Electrostatic Solitary Wave) is generated from electron beam instabilities. We know ESW composes 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 two-dimensional electrostatic particle simulations of beam instabilities with different parameters, and observed time evolutions of these beam instabilities, in time as well as in space.

In this study, we investigate 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.

According to the simulation results, we confirmed the excitation of harmonic low frequency waves in the perpendicular direction to the magnetic field. We are going to investigate the effect of ion dynamics on these waves, and compare frequency spectra 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: Broadband Electrostatic Noise, Particle simulation, Low frequency plasma wave