Origin of energetic electron precipitation with fast fluctuation: Data-driven simulations using the ERG plasma wave observations

*Shinji Saito[1], Yoshizumi Miyoshi[2], Shoya Matsuda[3], Satoshi Kurita[2], Yoshiya Kasahara[4], Atsushi Kumamoto[5], Fuminori Tsuchiya[5], Ayako Matsuoka[3]

1. Graduate School of Science, Nagoya University, 2. ISEE, Nagoya University , 3. ISAS/JAXA, 4. Kanazawa University, 5. Tohoku University

Bursty precipitation of keV electrons can be a source of pulsating aurora which has quasi-periodic on-off switching of luminosity. On the other hand, relativistic electrons also precipitate into the atmosphere with intermittent and bursty nature, which are observed as relativistic electron microbursts. A common cause of the electron bursty precipitation for the pulsating aurora and for the microbursts is expected to be whistler chorus waves propagating along a field line.
In this study, we demonstrate electron precipitation caused by realistic whistler chorus waves using our newly developed test-particle model, GEMSIS-RBW-II simulation code. Wave form data obtained from ERG satellite are applied to the simulation model as a boundary condition at the magnetic equator. The simulation shows that the whistler chorus waves propagating to high magnetic latitudes along the field line can precipitate electrons with energy from keV to MeV. We found that amplitude modulation of a whistler chorus burst observed by ERG causes over ten Hz modulation of keV electron precipitation. At relativistic energies fluctuation with higher frequencies and bursty/intermittent nature appear in time history of precipitation flux. It suggests that whistler chorus bursts can cause electron precipitation associated with pulsating aurora and relativistic electron microbursts.

Keywords: Pulsating Aurora, Relativistic electron microbursts, Whistler chorus bursts, Data-driven test-particle simulation, ERG

