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

PEM29-P14 Room:Convention Hall Time:May 22 18:15-19:30

Low energy electron observation -over cusp region by LEP-ESA on Norwegian sounding rocket ICI-3

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The cusp region is a boundary between dayside and nightside magnetic field lines where solar wind directly enters into the ionosphere. E-t spectrogram of the precipitating electrons observed in the northward of the cusp region sometimes shows energy-time dispersion where high-energy electrons are observed earlier than low energy electrons. Kletzing et al.(2001) suggested that these precipitating electrons were accelerated at an altitude of thousand km by the field aligned electric field generated by Inertial Alfven wave(IAW). Tanaka et al.(2005) also suggested that acceleration altitude was between 2000km and 6000km,and the observation agreed with the numerical simulation by assuming IAW model. According to the IAW model,the altitude where electrons are accelerated is different between the electrons with different energy.

ICI-3 sounding rocket was launched on 3 Dec 2012 from Svalbard, Norway and it succeed in obtaining precious data in the RFC(Reverse Flow Channel) where plasma flow was opposite to the background convection in the high latitude ionosphere. Six science payloads including Fixed Bias Langmuir probe (FBL), Low Energy Particle experiment Electron Spectrum Analyzer (LEP-ESA), Multi-Needle&Sphere Langmuir Probe, AC/DC Magnetometer (ADM), Electric Field and Wave Experiment (E-field), and Sounding Rocket Attitude Determination System (SRADS) were on ICI-3. LEP-ESA measured the electron pitch angle distribution in the energy range between 10eV and 10keV with high time resolution of 11ms. During the flight, we repeatedly observed energy-time dispersion of the precipitating electrons that had time duration of about 1second. Different from the previously reported energy-time dispersion of the precipitating electrons where the dispersion was convex downward, most of the dispersion observed by ICI-3 LEP was convex upward. We have tried to understand the reason why the observed dispersion was convex upward. Assuming that the electrons with different energy are simultaneously accelerated, we have found that the higher the electronenergy, the higher the acceleration altitude of the electrons. We will investigate if IAW model with some altitude distribution of the electron density can explain the observed dispersion that was convex upward.

Keywords: energy-time dispersion, Inertial Alfven wave, acceleration Altitude