R006-41
Zoom meeting B ：11/2 PM2 (15:45-17:30)
16:15-16:30

Fine scale structures of chorus elements characterizing internal modulation of pulsating aurora

#Satoshi Ebukuro[1)], Keisuke Hosokawa[1)], Yoshizumi Miyoshi[2)], Shin-ichiro Oyama[2)], Yasunobu Ogawa[3)], Satoshi Kurita[14)], Yoshiya Kasahara[4)], Satoshi Kasahara[5)], Ayako Matsuoka[6)], Kunihiro Keika[7)], Tomoaki Hori[2)], Shoichiro Yokota[8)], Shoya Matsuda[9)], Masafumi Shoji[2)], Masahiro Kitahara[2)], Satoko Nakamura[10)], Shun Imajo[11)], Iku Shinohara[12)], Ryoichi Fujii[13)]
[1)]UEC,[2)]ISEE, Nagoya Univ.,[3)]NIPR,[4)]Kanazawa Univ.,[5)]The University of Tokyo,[6)]Kyoto University,[7)]University of Tokyo,[8)]Osaka Univ.,[9)]ISAS/JAXA,[10)]ISEE,[11)]ISEE, Nagoya Univ.,[12)]ISAS/JAXA,[13)]ROIS,[14)]RISH, Kyoto Univ.

Pulsating aurora (PsA) is known to show two periodic variations: main pulsation and internal modulation. The main pulsation is a slower modulation whose period ranges from a few to a few tens of seconds. The internal modulation is a scintillating luminosity change, whose period is around 3Hz, only seen during the ON phase of the main pulsation. Previous ground-satellite conjunction studies demonstrated a clear relationship between the periodicities of PsA and temporal variations of magnetospheric chorus waves. The previous studies also confirmed one-to-one correspondence between the “internal modulation" of PsA and “discrete elements" of chorus. However, the internal modulations are not always observed when chorus elements exist; thus, it is still unrevealed that how the presence/absence of internal modulation is controlled by the properties of chorus waves. This was partly because the analysis of precipitating electrons corresponding to the observation of chorus elements and internal modulation was insufficient. To overcome this problem, in this study, we investigated the relationship between the properties of chorus elements and the characteristics of internal modulation of PsA by analyzing the 64 kHz waveform data from PWE/WFC(Plasma Wave Experiment/Waveform Capture) and energetic electron data from MEP-e (Medium-Energy Particle Experiments - Electron Analyzer) onboard the Arase satellite in combination with 100 Hz ground-based optical data from a network of EMCCD cameras operated in Sodankyla in Finland and Tjautjas in Sweden.
We studied a time interval of simultaneous observation on September 28, 2019 (01:00-02:40 UT). During this event, Arase was located near the magnetic equator with a distance of around 6 Re at ~04 MLT, and its footprint was within the field of view of the two EMCCD cameras. In this time interval, two signatures of injections were detected by the Arase satellite. During an ~50 min interval from the first injection which happened at around 01:00 UT, weak amplitude and short duration chorus elements were observed. In this period of less structured chorus waves, the EMCCD cameras at the ionospheric side observed PsA without internal modulation (i.e., main pulsation only). On the other hand, after the occurrence of the second injection at 01:50 UT, large-amplitude and distinct rising tone elements became obvious. An interesting point is that after this injection and associated change in the property of chorus, PsA measured on the ground suddenly started showing signatures of internal modulation superimposed on the main pulsation. That is, there was a sharp change of properties in both PsA and chorus waves at around 01:50 UT. Our previous case study on March 28, 2017 (23:30-24:10 UT) showed a similar sharp change in the presence/absence of internal modulation, but it was a spatial boundary. At that time, the position of the Arase satellite was off the magnetic equator; thus, we employed numerical simulation to suggest that both the frequency band, the repetition period of chorus elements and the energy distribution of electrons control the presence/absence of internal modulation. In this presentation, we will discuss how the electron injection modifies the temporal variation of chorus waves and eventually determines the periodicities of PsA seen from the ground.