R006-30
Zoom meeting B ：11/2 AM2 (10:45-12:30)
11:30-11:45

Swarm measurement of ionospheric plasma density oscillation associated with Pc1 geomagnetic pulsations

#Hyangpyo Kim, Kazuo Shiokawa, Jaeheung Park[2)], Yoshizumi Miyoshi, Yukinaga Miyashita[2)], Claudia Stolle[3)], Khan-Hyuk Kim[4)], Jurgen Matzka[3)], Stephan Buchert[5)], Tanja Fromm[6)]
ISEE, Nagoya University,[2)]Korea Astronomy and Space Science Institute,[3)]GFZ, German Research Centre for Geosciences,[4)]School of Space Research, Kyung Hee University,[5)]Swedish Institute of Space Physics,[6)]Alfred-Wegener-Institut fur Polar- und Meeresforschung

Electromagnetic ion cyclotron (EMIC) waves propagate along the magnetic field as shear Alfven mode from the magnetospheric source region toward the ionosphere and observed as Pc1 geomagnetic pulsations on the ground. On arriving at ionospheric altitudes, they undergo mode conversion to the compressional mode due to the Hall conductivity and then they propagate across the magnetic field. According to the ideal magnetohydrodynamic (MHD) wave theory, EMIC Pc1 waves can be accompanied by density perturbation when they propagate in compressional mode. This expectation, however, has not yet been confirmed observationally due to the lack of in situ data with sufficient time resolution. In this presentation, we show the first observation of ionospheric plasma density oscillations driven by EMIC Pc1 waves based on the observation by the Swarm satellites. Swarm satellites observed compressional Pc1 wave activity in the 0.5-3 Hz band, which was coherent with in-situ plasma density oscillations. Around the Pc1 event location, the Antarctic Neumayer station (L ~ 4.2) recorded similar Pc1 pulsations in the horizontal component while NOAA-15 observed isolated proton precipitations at energies above 30 keV. All these observations support that the compressional Pc1 waves at Swarm were oscillations converted from EMIC waves coming from the magnetosphere. Cross-spectral analyses between the plasma density and EMIC Pc1 waves showed high coherence, but the amplitude ratio and phase change exhibited characteristics deviating from the ideal MHD wave theory: e.g., significant larger amplitudes than predicted were observed in electron density. This difference cannot be explained by a simple MHD model, although steep horizontal/vertical gradients of background ionospheric density can partly explain the discrepancy.