R005-P23
ポスター 3 ：9/26　AM1/AM2 （9:00-12:30）

#惣宇利　卓弥[1)], 新堀　淳樹[2)], 大塚　雄一[3)], 西岡　未知[4)],PERWITASARI　SEPTI[5)], 熊本　篤志[6)], 土屋　史紀[7)], 松田　昇也[8)], 笠原　禎也[9)], 松岡　彩子[10)], 中村　紗都子[11)], 三好　由純[12)], 篠原　育[13)]
([1] 名大　ISEE,[2] 名古屋大学宇宙地球環境研究所,[3] 名大・宇地研,[4] 情報通信研究機構,[5]NICT,[6] 東北大・理・地球物理,[7] 東北大・理・惑星プラズマ大気,[8] 金沢大学,[9] 金沢大,[10] 京都大学,[11]IAR&ISEE,[12] 名大 ISEE,[13] 宇宙研／宇宙機構

Characteristics of Mid-Latitude Plasma Bubble During a Geomagnetic Storm on March 23-24, 2023 using GNSS and Arase Satellite Data

#Takuya Sori[1)],Atsuki Shinbori[2)],Yuichi Otsuka[3)],Michi Nishioka[4)],SEPTI PERWITASARI[5)],Atsushi Kumamoto[6)],Fuminori Tsuchiya[7)],Shoya Matsuda[8)],Yoshiya Kasahara[9)],Ayako Matsuoka[10)],Satoko Nakamura[11)],Yoshizumi Miyoshi[12)],Iku Shinohara[13)]
([1]Institute for Space-Earth Environmental Research, Nagoya University,[2]Institute for Space-Earth Environmental Research, Nagoya University,[3]Institute for Space-Earth Environmental Research, Nagoya University,[4]National Institute of Information and Communications Technology,[5]National Institute of Information and Communications Technology,[6]Department of Geophysics, Graduate School of Science, Tohoku University,[7]Planetary Plasma and Atmospheric Research Center, Graduate School of Science, Tohoku University,[8]Kanazawa University,[9]Emerging Media Initiative, Kanazawa University,[10]Graduate School of Science, Kyoto University,[11]Nagoya University,[12]Institute for Space-Earth Environement Research, Nagoya University,[13]Japan Aerospace Exploration Agency/Institute of Space and Astronautical Science

After sunset, a plasma density depletion (plasma bubble) often occurs at the bottom of the F region over the equator. Plasma bubbles are sometimes extended from the equator to mid-latitudes during geomagnetic storms. Many researchers have studied the characteristics of the mid-latitude plasma bubbles during geomagnetic storms using in-situ satellite observation data. The longitudinal width of mid-latitude plasma bubbles remains unknown, since inclinations of the ionospheric satellites are too low to adequately observe the mid-latitude ionosphere. In this study, we report characteristics of the mid-latitude plasma bubble during a geomagnetic storm on March 23 and 24, 2023, using the Global Navigation Satellite System (GNSS) and the Arase satellite data. We used Total Electron Content (TEC) and Rate of TEC Index (ROTI) derived from GNSS data, along with electron density estimated from the in-situ plasma wave data observed by the Arase satellite.

ROTI enhancements, associated with plasma bubbles, appeared over the magnetic equator in the evening sector around 00:30 UT on March 24 during the main phase of the geomagnetic storm. The enhanced ROTI region extended to the mid-latitudes around 45 N in geomagnetic latitudes in (or within) the American sector. The TEC depletion region also extended to the mid-latitudes. During this time, the Arase satellite passed through the northern part of the mid-latitude plasma bubble around 35 N in geomagnetic latitudes at an altitude of ˜500 km. The electron density showed a depletion from 8.65x10ˆ11 m-3 to 5.65x10ˆ11 m-3 (˜40% decrease). The location of electron density depletion corresponded to the enhanced ROTI and decreased TEC regions. The estimated longitudinal width of the electron density depletion was approximately 535.5 km.

Previous studies based on high inclination satellites such as DMSP and Swarm have reported spatiotemporal variations of mid-latitude plasma bubbles during geomagnetic storms. However, these satellite data cannot provide the longitudinal distribution of the plasma bubble, and the longitudinal structure of the plasma bubble remained unknown. For the first time, the present study revealed the longitudinal distribution of the mid-latitude plasma bubble during the geomagnetic storm, with the Arase satellite observation data. Our analysis results indicate that the longitudinal width of the electron density depletion at the mid-latitudes as observed by the remote sensing observation data (GNSS) corresponds to that as seen in the in-situ observation data (Arase satellite).