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Zoom meeting C ：11/1 PM2 (15:45-18:15)
15:45〜16:00

Observation of ionospheric irregularity by using scintillation of VHF to UHF satellite signals

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The ionosphere plays an important role as a communication path between a ground-ground and satellite-ground. The irregularity of the plasma density in the ionosphere is often generated from a few tens of kilometers to a few meters. Notably, irregularities on the scale of hundreds of meters to a few kilometers cause fluctuation in the radio wave transmitted from the Global Navigation Satellite System (GNSS) satellites. Previous studies presented small-scale ionospheric irregularities were generated by cascading of the large-scale irregularities. Therefore, it is important to observe large (few km) scale irregularities simultaneous with small (100 m-few km) scale irregularities.

We receive the VHF (150 MHz) and UHF (400 MHz) beacon signals transmitted from Low Earth Orbit satellites by receivers based on the software-defined radio (SDR). We plan to install the satellite beacon receiver to observe the scintillation and conduct a simultaneous observation with the GPS receivers from high to low latitude regions. We developed a SDR-based beacon receiver based on the GRBR (GnuRadio Beacon Receiver) and installed at Electronic Navigation Research Institute, Chofu, Tokyo (35.68 N, 139.56 E).

To test the receiver we observe scintillation caused by the sporadic E (Es) layer. The Es layer is known to include kilometer-scale irregularities to cause quasi-periodic scintillations in the VHF/UHF beacon signals which reflects the spatial structure. Recently, structures of the Es layers have also been studied with two-dimensional ROTI (the rate of TEC (Total Electron Content) index) maps and precise TEC measurements based on GNSS signals. We compare the VHF/UHF scintillations with the Es layer structure inferred from ROTI and TEC analysis. The beacon satellite measurement could be not only an independent validation of the ROTI/TEC analysis but also provide better view of Es layer irregularities.

In this presentation, we will show initial observation results as well as the comparison of the VHF/UHF scintillation and ROTI map and discuss the spatial structure of Es layer.