R010-20
Zoom meeting C ：11/4 PM1 (13:45-15:30)
14:30-14:45

Study of Sporadic E layer characteristics by using ROTI maps

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The density of the sporadic E (Es) layer can be so high as to reflect VHF radio waves. It has been shown that aeronautical VHF navigation signals in 108-118 MHz band can propagate beyond the radio horizon to cause potential interference. Therefore, it is important to monitor the occurrence and distribution of the Es layer, and even to predict its occurrence. For the Es layer prediction, it is important to understand the detailed physics of the Es layer.
Recently, multiple ways of observing the Es layer have been developed, such as observations of anomalous propagation of VHF radio waves from known locations, synthetic aperture radar measurements, perturbation in the ionospheric total electron contents (TECs) derived from a dense GNSS network. However, these methods can show the two-dimensional distribution of the Es layer.
In this study, we use the ROTI (rate of TEC index) values derived from the dense GNSS network over Japan (GEONET). When the strong Es layer appears, a well-defined frontal structure of a high ROTI value region is often seen. We have further developed a method to derive the front direction and velocity automatically. By using these Es layer parameters and time series of TEC variation, the vertical structures of the Es layer can be inferred. We have applied this method to several intense Es events and successfully derived Es layer velocities.
Our results are useful not only in understanding the three-dimensional structure of the Es layer but also in regularly monitoring the occurrence and propagation of the Es layer, as the Es layer signature in the ROTI map can automatically be detected.