

3-D visualization of the preseismic ionospheric anomalies

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The ionospheric anomalies possibly associated with large earthquakes have been reported by many researchers. However, a physical mechanism of pre-seismic ionospheric anomalies has not been clarified. To understand the mechanism, monitoring of three-dimensional distributions of ionospheric electron density is considered to be effective. In this study, to investigate the three-dimensional structure of ionospheric electron density prior to large earthquake, the Neural Network based tomographic approach is adapted to GEONET and ionosonde data. In the case of the 2011 Off the Pacific Coast of Tohoku Earthquake (Mw9.0), the significant enhancements are found in Total Electron Content (TEC) investigation, 1, 3-4 days prior to the earthquake. Especially, TEC increase of 3 days prior to the earthquake was remarkable. As a result of tomographic analysis, the reconstructed distribution of electron density was decreased above the epicenter around 250 km altitude (below the hmF2 altitude) in comparison with 15 days backward median distribution. Meanwhile, we found the electron density enhancement above hmF2 altitude. Moreover, the similar structures were found in many other earthquake occurred in Japan. Especially, in the case of long-term GIM-TEC anomalies (10 hours per day and over) were found, the similar structure was detected at a high rate (85%). Details will be shown in the presentation.

Keywords: Ionospheric tomography, GPS-TEC, Preseismic ionospheric anomaly