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Tomographic Analysis of Ionospheric Anomaly Preceding the 2007 Southern Sumatra Earthqauke (M8.5)

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The ionospheric anomalies possibly associated with large earthquakes have been reported by many researchers. However, a physical mechanism of pre-earthquake ionospheric anomalies has not been clarified. To understand the mechanism, it is believed that monitoring of three-dimensional ionospheric electron density distributions is effective. In this study, to investigate the three-dimensional structure of ionospheric electron density prior to the earthquake, the Residual Minimization Training Neural Network (RMTNN) tomographic approach (Ma et al., 2005) is adopted for data of GPS ground receivers and ionosonde. The advantage of this method is model-independence and flexibility in reconstruction. At first, we investigate the Total Electron Content (TEC) anomaly associated with the earthquake using the Global Ionosphere Maps (GIM) published by the Center for Orbit Determination in Europe (CODE). Then, in order to investigate the structure of electron density in ionosphere, RMTNN method is performed. As for the 2007 Southern Sumatra earthquake (M8.5), the significant decreases are found in GIM-TEC investigation and results on tomographic approach show that they take place in the heights of 250-400 km, especially at 330 km height. But the height which gives the maximum electron density is not changed. Global tendency of the decreases area is expand to the east with an altitude and it is concentrated in the southern hemisphere of over the epicenter. Such results are consistent with the observation of FORMOSAT-3/COSMIC and GPS-TEC. In our presentation, not only the case of the 2007 Southern Sumatra earthquake but also other earthquakes will be also shown.