

## Seismo-ionospheric precursors of the 11 March 2011 M9.0 Tohoku Earthquake

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In this paper, the total electron content (TEC) of the global ionosphere map (GIM) is used to observe seismo-ionospheric anomalies associated the 11 March 2011 M9.0 Tohoku earthquake, while the Thermosphere Ionosphere Electrodynamics General Circulation Model (TIEGCM) is applied to simulate and understand the observed anomalies. The GIM TEC associated with  $M \geq 6.0$  earthquakes in Japan are statistically examined during 1998-2011. It is found that the GIM TEC significantly enhance day 3 before the earthquakes. On the other hand, the TEC over the epicenter also significantly and continuously enhances on 6-8 March 2011, 4-2 days before the Tohoku earthquake. The agreement between the statistical result and the event anomaly implies that seismo-ionospheric precursor related to the Tohoku earthquake might be observed. The spatial analysis further is further conducted to find that the enhancement anomaly specifically and persistently appears in the northern epicenter area. Simulation results well agree with the observations, which suggest that the electric potential around the epicenter has been distorted and significantly affects the TEC during the earthquake preparation period.

Keywords: Seismo-ionospheric precursors, Tohoku Earthquake