

Observations of seismo-traveling ionospheric disturbance triggered by earthquake and tsunami

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In this study, the seismo-traveling ionospheric disturbances (STIDs) of total electron content (TEC) generated by the 2011 Mw9.0 Tohoku earthquake at 05:46:23 UT on March 11, 2011, are investigated by using ground-based Global Positioning System (GPS) receiver networks. The STIDs are not only triggered by seismic surface waves but also by tsunami waves of the Tohoku earthquake. A method of wavelet analysis is used to investigate the spectral characters of STIDs induced by seismic surface waves and tsunami waves. Results find that the spectrum of STID by surface waves shows a single short period enhancement, while the spectrum of STID by tsunami waves shows multiple long-period responses. Multiple events, including 1999 Chi-chi, 2003 Hokkaido, 2004 Sumatra, and 2010 Chile earthquakes, are employed to investigate the general spectral characteristics of seismic surface and tsunami waves. This study also find that the arrival time of STID by surface waves is earlier than that by tsunami waves, which could be applied for the short-term tsunami warnings.

Keywords: ionosphere, STID, tsunami