

## Observations of seismo-traveling ionospheric disturbance during the 2011 Tohoku earthquake using HF Doppler

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This paper reports seismo-traveling ionospheric disturbances (STIDs) induced by the 11 March 2011 M9.0 Tohoku-oki earthquake and following pan-Pacific tsunami by two networks of HF (high-frequency) Doppler sounding systems in Japan and Taiwan. The Hilbert-Huang Transform (HHT) is applied to analyze Doppler frequency shifts (DFSs) detecting STIDs, while the time delay, circle, ray-tracing, and beam-forming methods are used to compute the propagation of the detected STIDs. Both STIDs induced by the Rayleigh waves and tsunami of the Tohoku-oki earthquake are detected and discussed.

Keywords: STIDs, Ionosphere, earthquake, tsunami