

[Acoustic resonance and plasma depletion detected by GPS total electron content observation after the 2011 off the Pacific coast of Tohoku Earthquake](#)

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Abstract:

Two-dimensional structures of the ionospheric variations generated by the acoustic resonance between the ground surface and the lower thermosphere was observed for the first time near the epicenter after the M 9.0 Tohoku earthquake on March 11, 2011. A short-period oscillation of total electron content was observed by a GPS receiver array after the earthquake for four hours in the vicinity of the epicenter. It was centered in the east of the epicenter where the tsunami was estimated to commence. The frequency of the dominant mode of the oscillation was 4.5 mHz, 222 seconds of period, while there were minor oscillations whose frequency were 3.7 mHz and 5.3 mHz. These periods are consistent with the periods of the acoustic resonance between the ground surface and the lower thermosphere, predicted by a numerical model. The amplitude of the TEC oscillation showed a gradual change of the amplitude. The two-dimensional distributions of TEC variations generated by this resonance had wave frontal structures that extended from northwest to southeast. The resonant oscillation of the TEC was accompanied by a depletion of TEC whose duration was about 60 minutes. The area of this depletion also centered on the epicenter.

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