

## Four minutes acoustic resonance detected above the epicenter of the 2011 Tohoku earthquake

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Total electron content (TEC) oscillation in four minutes period was observed above the epicenter after the M9.0 Tohoku earthquake on March 11, 2011. It was observed by a GPS receiver array after the earthquake for four hours in the vicinity of the epicenter. The frequency of the dominant mode of the oscillation was 4.5mHz, 222 seconds of period, while there were minor oscillations whose frequency were 3.7mHz and 5.3mHz. 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 gradual change of the amplitude. This would be generated by the beat of two modes of the resonance. The reflection height of the acoustic wave is considered around 100km altitude. The TEC oscillation would be caused by the acoustic wave that leaked from the reflection layer vertically. The two-dimensional distributions of TEC variations generated by this resonance showed wave frontal structures that stretched from northwest to southeast, and traveled to the southwest direction. These structures cannot be explained by the propagation of the acoustic wave. The interaction between the neutral wave and the ionized atmosphere would play a role in the formation of these frontal structures of TEC. The ionospheric variations above the epicenter after the earthquake will be presented.

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