

## Frequency characteristics of the variations of ionospheric total electron content after earthquakes using 1-second TEC

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There are many reports that ionospheric disturbances occur by giant earthquakes, such as the 2011 off the Pacific coast of Tohoku Earthquake. It is important to examine the ionospheric disturbance excited by earthquakes. Since this study is able to monitor the tsunami from satellites, and arise a social concern. Therefore, purpose of this study is examination of the ionospheric disturbances after earthquakes by frequency analysis of temporal variations of TEC observed by GEONET. In previous studies, frequency band have been limited to less than 15 mHz because of using 30-second GPS-TEC. While in this study we use 1-second GPS-TEC to examine high-frequency band temporal variations that can not examined by using 30 seconds GPS-TEC. We cover the earthquakes larger than M6.0 occurred in March 2011. We used GPS data where the elevation angle of satellites was larger than 30 degrees observed by 800 GPS receivers of GEONET. We derived a frequency characteristic of GPS-TEC by Fast Fourier Transform.

As a result, the variations by earthquakes are shown in two events over M6.5. We analyzed a frequency characteristics of the variations above the epicenters and 300km far from the epicenters. It is shown that the variation at 3.9 mHz and 4.9 mHz are observed above the epicenters in both events. These frequencies are close to those observed after the Pacific coast of Tohoku Earthquake, by using 30-seconds GPS-TEC.

Additionally, in Sanriku Earthquake on March 9 and the Pacific coast of Tohoku Earthquake on March 11, we detected the oscillation around 15 mHz and 20 mHz above the epicenter. It is thought that the variations at these frequency are not excited by the resonance in the neutral atmosphere that have ever been reported.

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