

Characteristics of Total electron content variation after the M9.0 2011 off the Pacific coast of Tohoku earthquake

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Sudden strong vertical displacement of Japan Trench by the M9.0 2011 off the Pacific coast of Tohoku earthquake (the Tohoku EQ) that occurred on 11 March 2011 triggered huge tsunami and the tsunami inflicted intolerable damage on Tohoku district, Japan. Acoustic and gravity waves excited by the tsunami propagated to thermosphere and disturbed ionosphere about 10 minutes after the mainshock, which are often observed after the large earthquakes. After the atmospheric waves arrive at the ionosphere and initial enhancement and depletion of plasma appeared, huge plasma depletion in the hundred kilometer scale occurred over the tsunami source area and lasted for a tens minimums. Simultaneously, various ionospheric disturbances were observed. In this paper, we investigate characteristics of ionospheric disturbances using Total Electron Content (TEC) calculated from the data of GPS network, GEONET (GPS Earth observation network system) which has more than 1000 GPS receivers. In order to investigate frequency of disturbances, we analyze TEC variation with Hilbert-Huang Transform (HHT) which can analyze data of non-stationary time series. Moreover, initial variations of TEC after arrival of the atmospheric waves at ionosphere are examined. Finally, interaction between atmosphere and ionosphere is discussed.

Keywords: the off the Pacific coast of Tohoku earthquake, ionospheric disturbance, tsunami, acoustic wave, gravity wave, total electron content