

Examination of vertical distributions of coseismic ionospheric disturbances using GPS occultation observation.

*Yuta Inoue¹, Hiroyuki Nakata², Hiroyo Ohya², Toshiaki Takano²

1. Graduate School of Science and Engineering, Chiba university, 2. Graduate School of Engineering, Chiba university

It is reported that ionospheric disturbances are caused by large earthquakes. One of the causes is the infrasound wave excited by surface waves propagated on the ground from the epicenter. The characteristics of the ionospheric disturbances horizontally propagated after large earthquake have been examined by using a network of ground-based GPS receivers. On the other hand, the vertical propagation of coseismic ionospheric disturbances are rarely reported.

In this study, to examine the vertical propagation of the ionospheric disturbances, we have examined electron density profiles observed by GPS radio occultation measurements of FORMOSAT-3/COSMIC satellites.

We analyzed the Tohoku Earthquake (M9.0) occurred at 5:46:18 on 11th March 2011 (UTC). Density profiles located within 30 degrees both of latitude and longitude one hour of the earthquakes were analyzed. To extract the coseismic disturbances, we calculated the mean value of the electron density in the vertical direction using five-point data (corresponds to about 8 km) and extracted the disturbance from the difference between the mean value and the raw data. Variations of about 5000 electrons per cubic centimeter at two different data were observed at an altitude of 200 ~ 600 km. We also calculated propagation velocity and propagation time of the perturbations from the epicenter to the observation point. It is confirmed that the disturbances are occurred due to the earthquake.

Keywords: earthquake, ionospheric disturbance, occultation observation