

Simulation of atmosphere-ionosphere variations associated with the Tohoku-oki earthquake

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Significant ionospheric variations were observed after the great Tohoku earthquake on March 11, 2011. The variations consist of oscillations with a period of about 4 minutes, traveling ionospheric disturbances with a speed of a few hundred meters to a few kilometers per second, impulsive enhancement of total ionospheric content (TEC) followed by a significant decrease of TEC near the epicenter. We used a two-dimensional model of nonhydrostatic atmosphere-ionosphere coupled model to study the behavior of the ionosphere after the earthquake. The model is able to reproduce overall behavior of the total electron content (TEC), indicating that the ionospheric variation is explained by a combination of acoustic waves generated directly at the epicenter and secondary gravity waves generated at the bottom of the thermosphere. However, various observations suggest that the ionosphere is also affected by acoustic and gravity waves generated by seismic waves and by propagating tsunamis. We will report simulation results of ionospheric variations caused by those processes.

Keywords: earthquake, tsunami, ionosphere, atmosphere, wave, simulation