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Session 8B Paper 3

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Simulation of Ionospheric Effects from Acoustic Waves Produced by Explosive Events at Ground Surface

A growing number of observations appear to suggest that earthquakes and powerful explosions at ground surface may cause noticeable perturbations in the ionosphere. The earliest (in arrival time) explosion-related ionospheric effects are attributed to the infrasound (acoustic) waves. It is believed that internal gravity waves arrive with a considerable delay after the acoustic pulse.

According to some reports the ionospheric effects from acoustic pulses are discernable in time series of GPS TEC data collected by ground-based TEC receivers. While observational research on correlation of ionospheric effects with explosive events are abundant, there is still scientific need to confirm existence of such effects in physics-based simulations.

In this paper we present simulation of propagation of acoustic pulses generated by explosions or earthquakes. The simulation employs realistic model of the background atmosphere, ionosphere, and wave dissipation. The acoustic pulse propagation model is based on ray approximation, and employs appropriate dispersion relationship for atmospheric waves. We simulate the GPS TEC response to an earthquake event, and observe that characteristic features of simulated TEC time series are similar to those reported in observations.