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# Modeling of Atmospheric and Ionospheric Disturbances Excited by a Large Earthquake - In the case of the 2008 Iwate-Miyagi Nairiku Earthquake -

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Evidences of the 2008 Iwate-Miyagi Nairiku Earthquake, of which moment magnitude is 6.9 and focal depth is only 6km or less, were recorded in non-seismic observations such as atmospheric and electromagnetic observations. A CTBT infrasound monitoring station at Isumi, Japan at an epicentral distance of 417km recorded air pressure variations excited by this earthquake. Clear two large wave packets having amplitudes of several pascals appeared in 1 minute and 20 minutes after the origin time. The earlier arriving packet was the Rayleigh wave coming together with the ground motion whereas the later one was the acoustic waves that had propagated in the atmosphere directly from the rupture zone. On the other hand, an electromagnetic observation using the HF-Doppler radar, which monitors ionospheric activities at the same epicentral distance with the Isumi observatory, recorded the Rayleigh wave traveling in the ionosphere at an altitude of 250km.

A normal mode summation technique synthesizes these observational evidences based on a given realistic source mechanism in a one-dimensional joint model that consists of the solid Earth and the atmosphere extending from the center of the Earth to the altitude of 1000 km. The obtained synthetic waveforms successfully account for the observed ones in the period range >30 seconds assuming a focal depth of 3-4km, which is shallower than the previously proposed models. Since the amplitude of such seismoacoustic wave is significantly sensitive to the focal depth, a joint analysis with seismograms could give strong constraints on seismic mechanisms especially in the cases of shallow earthquakes.