Geophysical Research Abstracts
Vol. 13, EGU2011-3763, 2011
EGU General Assembly 2011

Studies of infrasonic propagation using dense seismic networks

Michael Hedlin, Catherine de Groot-Hedlin, and Kris Walker

Laboratory for Atmospheric Acoustics, Scripps Institution of Oceanography, University of California, San Diego, La Jolla, United States (hedlin@ucsd.edu, 18585346354)

Although there are approximately 100 infrasonic arrays worldwide, more than ever before, the station density is still insufficient to provide validation for detailed propagation modeling. Much structure in the atmosphere is short-lived and occurs at spatial scales much smaller than the average distance between infrasonic stations.

Relatively large infrasonic signals can be observed on seismic channels due to coupling at the Earth's surface. Recent research, using data from the 70-km spaced 400-station USArray and other seismic network deployments, has shown the value of dense seismic network data for filling in the gaps between infrasonic arrays. The dense sampling of the infrasonic wavefield has allowed us to observe complete travel-time branches of infrasound and address important research problems in infrasonic propagation.

We present our analysis of infrasound created by a series of rocket motor detonations that occurred at the UTTR facility in Utah in 2007. These data were well recorded by the USArray seismometers. We use the precisely located blasts to assess the utility of G2S mesoscale models and methods to synthesize infrasonic propagation. We model the travel times of the branches using a ray-based approach and the complete wavefield using a FDTD algorithm. Although results from both rays and FDTD approaches predict the travel times to within several seconds, only about 40% of signals are predicted using rays largely due to penetration of sound into shadow zones. FDTD predicts some sound penetration into the shadow zone, but the observed shadow zones, as defined by the seismic data, have considerably narrower spatial extent than either method predicts, perhaps due to un-modeled small-scale structure in the atmosphere.

Although we currently use coupled signals, we anticipate studying pressure recordings as the USArray is currently being upgraded with infrasonic microphones. These new sensors will allow us to make semi-continental scale network recordings of infrasound free of concerns about how the signals observed on seismic channels are modified when converted to seismic energy.