Study of long-range infrasound propagation from the Chelyabinsk Meteor using the Transportable Array

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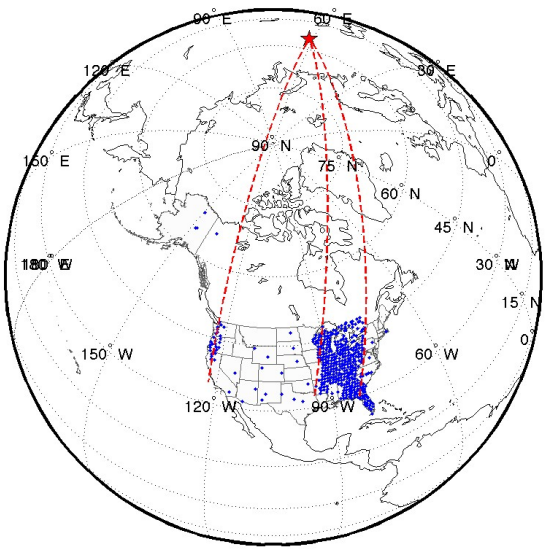
The large meteor that entered Earth's atmosphere above Russia in February 2013 injured over a thousand people and caused structural damage in the Chelyabinsk area. A preliminary study of seismic data from the Chelyabinsk region shows this event generated high amplitude, long-period surface waves, but only very low amplitude body waves at high frequencies. The shock wave from the combined explosive/ballistic source excited large fundamental mode Rayleigh waves that can be seen to a distance of 40°. Preliminary work indicates that the USArray Transportable Array did not record the event seismically, as it was located at distances of over 70°. However, air pressure and infrasound sensors recently added to the TA recorded the passage of a very long wave train of infrasound. Although the entry and final burst of the meteor occurred in a 16 second time span, the wave train seen crossing the TA lasted for over 50 minutes. The TA shows that the speed of sound crossing the polar region to the western United States was approximately 290 m/s while the main part of the TA, in the eastern United States, recorded slower signals at about 270 m/s. Although the recordings made of this event by the TA are unprecedented due to the high density of the network and its spatial extent, infrasound was also recorded at even greater distances by infrasound arrays in the International Monitoring System. We present modeling of the wavetrain characteristics recorded by IMS and TA infrasound stations and compare these predictions to observations.

The general public has shown intense interest in this once-in-a-century event. The event should provide an excellent opportunity to inform the public about basic research into the long-range propagation of infrasound made possible by this unprecedented dataset.



Infrasound from the Chelyabinsk meteor crosses the polar region before being detected at stations across the USArray Transportable Array at distances of over 70°.