

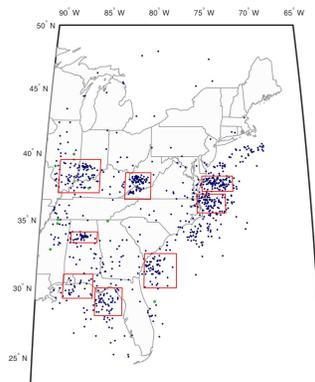
Study of atmospheric gravity waves and infrasonic sources
using the USArray Transportable Array pressure data

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The upgrade of the USArray Transportable Array (TA) with microbarometers and infrasound microphones has created an opportunity for a broad range of new studies of atmospheric sources and the large- and small-scale atmospheric structure through which signals from these events propagate. These studies are akin to early studies of seismic events and the Earth's interior structure that were made possible by the first seismic networks. In one early study with the new dataset we use the method of de Groot-Hedlin and Hedlin (2015) to recast the TA as a massive collection of 3-element arrays to detect and locate large infrasonic events. Over 2,000 events have been detected in 2013. As shown below a subset of these events (in the .5-2 Hz band) are seen to cluster in highly active regions on land and offshore. Stratospherically ducted signals from some of these events have been recorded more than 2,000 km from the source and clearly show dispersion due to propagation through atmospheric gravity waves. Modeling of these signals has been used to test statistical models of gravity waves.

The network is also useful for making direct observations of gravity waves. The TA records gravity waves from below that are also observed from above, once in the stratosphere, by satellites (such as AIRS). Our group at UCSD is working collaboratively with Lars Hoffmann (Jülich Supercomputing Center), Joan Alexander and Claudia Stephan (University of Colorado) to reconcile TA and satellite observations of gravity waves from singular events to better understand how the waves near ground level relate to those observed aloft. We are also studying the long-term statistics of these waves. Early work shows that both the TA and satellite data reveal highly active source regions, such as near the Great Lakes. One step in informing the general public of this new avenue of research for the TA was made via UCSD's Perspectives on Ocean Science televised lecture series (<http://www.uctv.tv/shows/Listening-to-Earths-Atmosphere-Tuning-into-the-Sounds-of-Our-Dynamic-Planet-24911>).



Over 900 infrasonic events were detected in the .5-2 Hz band in 2013. Most events occurred from Monday through Friday during the local working hours. A small number of scattered events occurred from 00:00 to 04:00 local time are highlighted in green. The red boxes highlight active areas on land and offshore. The on-land events occurred in known coal mining regions. The cause of the offshore events is less clear but at least some may be due to military activity.

de Groot-Hedlin and Hedlin, 2015, A method for locating geophysical events using clusters of arrays, in review with *Geophysical Journal International*.