Geophysical Research Abstracts
Vol. 12, EGU2010-4661, 2010
EGU General Assembly 2010

Databases for Studies of Infrasound Propagation in the European Arctic

Steven J. Gibbons and Frode Ringdal
NORSAR, Seismology, Kjeller, Norway (steven@norsar.no, +47 63805939)

Industrial and military sources in northern Fennoscandia and NW Russia generate both seismic and infrasound signals observed at regional distances. Similar seismic signals constrain origin times and explosion yield and, using correlation detectors at the ARCES array, have enabled us to detect and classify hundreds of events from a small number of sites. This has in turn provided superb datasets for infrasound propagation studies. The multi-channel waveform correlation procedure has even had considerable success in detecting closely spaced events when the signals from subsequent events show considerable differences. A post-processing system which examines the alignment of the single-channel cross-correlation traces allows for very low detection thresholds with low false alarm rates.

Near-surface explosions at Hukkakero in northern Finland generate infrasound signals on the seismic sensors at ARCES, 175 km to the North, near to the edge of the classical "Zone of Silence". Many tropospheric phase observations can be predicted using ray-tracing given favourable winds at low altitudes. However, the vast majority of the observed infrasound signals - probably refracted from stratospheric heights - are not predicted by ray-tracing, warranting a re-evaluation of propagation models for these distances. In 2008, a mini-array of microbarographs, co-located with ARCES seismometers, also observed later signals probably refracted from thermospheric heights. These signals are more impulsive and of smaller amplitude than the more typically observed signals.

A second site near the northern coast of the Kola Peninsula is approximately 250 km from ARCES to the West and Apatity to the South. Despite poor waveform similarity between events, multichannel correlation detectors assign confidently over 350 events over an 8 year period to this site. Infrasound is observed at ARCES for almost all events in the summer and almost no events in the winter, and is observed at Apatity for almost all events. We conclude that the direction of the zonal winds is crucial to infrasound detectability at stations to the East and West, but that the meridional winds may have less effect.

Further application of seismic correlation detectors is allowing the collection of extensive event lists from additional sites including the Suurikuusikko gold mine in northern Finland and the Kostomuksja ore mine in western Russia. Infrasound generated by events at these sites is frequently detected by stations at distances from 50 to many hundreds of kilometers.