

Variability of Infrasound Propagation and Detectability in the European Arctic

Infrasound is a technology for verifying compliance with the Comprehensive Nuclear-Test-Ban Treaty. To quantify the capability of infrasound to detect and classify potential treaty violations, we need to assess both the detection threshold of the global network and the statistical properties of atmospheric signal propagation. Unlike seismic waves in the solid earth, infrasound propagates through an anisotropic medium in continuous motion. Different atmospheric conditions can result in qualitatively different infrasonic observations with significant differences in propagation times and the combination of phases detected. In the European Arctic, we have numerous infrasound arrays and many repeating sources of infrasound. We have compiled an extensive database of repeating, seismically constrained, Ground Truth explosions including many thousands of events and spanning almost 30 years. For each explosion, we include parametric descriptions of the infrasonic wavetrain observed at each available station. Non-detection is also a key observation for an event-station combination. Paths cover distance ranges from a few tens of kilometers to many hundreds of kilometers, an exceptional range of azimuthal directions, and observations exist for all times of year. We display and discuss changes in infrasound propagation for tropospheric, stratospheric and thermospheric phases over time-scales from days to seasons and from year-to-year.

Primary author: GIBBONS, Steven John (NORSAR)

Presenter: GIBBONS, Steven John (NORSAR)

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