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Dependent Backprojection of Seismo-Acoustic Signals

Recent earthquakes in the Alaska region have generated a set of interesting seismo-acoustic coupled signals that have been detected by an International Monitoring System (IMS) array, I53US, local infrasound arrays of the Alaska Volcano Observatory (AVO), and some stations of the EarthScope Transportable Array (TA) that is currently deployed in Alaska and western Canada. In this study we analyze the seismo-acoustic coupling by making use of array-processing and backprojection techniques. Specifically, we beam-form and backproject the detections in narrow frequency bands to outline locations where seismic waves couple to the atmosphere to generate infrasound. Whereas some infrasound sources are broadband, others are band limited and are detectable only when processed in the right frequency band. We show that different features are illuminated at different frequencies. At low frequencies, < ~1 Hz, large topographical features such as entire mountain ranges and large basins are visible. At higher frequencies, > 1.5 Hz, individual mountain peaks and small alluvial valleys are illuminated. The ability to correctly associate infrasound detections with source locations is important for the verification of the Comprehensive Nuclear-Test-Ban Treaty. The above technique provides a tool for better understanding the seismo-acoustic coupling process and more accurate location of remote infrasound sources.

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