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Could the IMS Infrasound Stations Support a Global Network of Small Aperture Seismic Arrays?

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The infrasound stations of the International Monitoring System are arrays consisting of up to 15 sites and with apertures of up to 3 km. The arrays are distributed remarkably uniformly over the globe and provide excellent coverage of South America, Africa, and Antarctica. This is to say that there are many infrasound arrays in regions many thousands of kilometers from the closest seismic array. Several infrasound arrays are in the immediate vicinity of existing 3-component seismic stations and these provide us with examples of how typical seismic signals look at these locations. We can make idealized estimates of the predicted performance of seismic arrays, consisting of seismometers at each site of the infrasound arrays, by duplicating the signals from the 3-C stations at all sites of the array. However, the true performance of seismic arrays at these sites will depend both upon Signal-to-Noise Ratios of seismic signals and the coherence of both signal and noise between sensors. These properties can only be determined experimentally. Recording seismic data of sufficient quality at many of these arrays may require borehole deployments since the microbarometers in the infrasound arrays are often situated in vaults placed in soft sediments. The geometries of all the current IMS infrasound arrays are examined and compared and we demonstrate that, from a purely geometrical perspective, essentially all the array configurations would provide seismic arrays with acceptable slowness resolution for both regional and teleseismic phase arrivals. Seismic arrays co-located with the infrasound arrays in many regions would likely enhance significantly the seismic monitoring capability in parts of the world where only 3-component stations are currently available. Co-locating seismic and infrasound sensors would facilitate the development of seismic arrays that share the infrastructure of the infrasound arrays, reducing the development and operational costs. Hosting countries might find such added capabilities valuable from a national perspective. In addition, the seismic recordings may also help to identify the sources of infrasound signals with consequences for improved event screening and evaluating models of infrasound propagation and atmospheric properties.