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infrasonic wavefronts over large aperture sensor arrays

The apparent velocity and backazimuth of infrasound signals on arrays can be estimated in many ways. Estimates can vary significantly with the methods and parameters used, and with signal coherence. Larger arrays, with many sensors, allow measurement of the slowness on many different subsets of sensors. On IMS infrasound arrays with aperture 1-2 km, and with over 8 sensors, we can form parametrized slowness maps for the incoming wavefront as a function of location within the array. In most cases, the best parametrization is a plane wavefront. For near-field sources, the wavefield parametrization captures the wavefront curvature, allowing accurate distance estimates. At over 3 km aperture and with 25 sites, the ARCES seismic array is significantly larger than most IMS infrasound arrays. Strong ground-coupled airwaves from repeating explosions at 180 and 250 km allow the measurement of slowness on different parts of the array. We demonstrate that backazimuth variability resulting from atmospheric factors greatly exceeds variability from measurement uncertainty, and that the deviation from a plane wavefront varies from event to event. We conclude the shape of the infrasonic wavefront at these distances is influenced by atmospheric features with length scale comparable to the dimensions of the array.

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