

Strategies for Recording the Full Seismic Wavefield

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A demonstration experiment was recently conducted in the state of Oklahoma in the USA to evaluate strategies for observing the full seismic wavefield, for events at local to teleseismic distances and across a wide range of frequencies. The experiment tested new instrumentation and deployment strategies, producing an open-use dataset for evaluating a range of array processing techniques. The field effort, organized by the Incorporated Research Institutions for Seismology, used a crew of ~50 students and faculty to deploy 363 3-component “nodal” sensors along three seismic lines and in a seven-layer nested gradiometer array. The seismic lines spanned a region ~13x5 km. A broadband, 18 element “Golay 3x6” array was deployed with an aperture of approximately 5 km, encompassing the two nodal arrays. In addition, 9 infrasound stations were deployed to capture and identify acoustic events that might be recorded by the seismic array. We summarize the design considerations for the gradiometer and Golay arrays, along with preliminary analyses of the data. We examine the performance of the various types of instrumentation, including co-located surface and buried nodes, and co-located nodes and broadband stations. We present ground motion visualizations illustrating the wavefield complexity observed by these arrays.

Primary author: WOODWARD, Robert (Incorporated Research Institutions for Seismology)

Presenter: WOODWARD, Robert (Incorporated Research Institutions for Seismology)

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