ESC2016-73, 2016
35th General Assembly of the European Seismological Commission

Signatures of Seismic Waves Using Small Aperture Arrays

Arben Pitarka
Lawrence Livermore National Laboratory, Livermore, CA, USA (pitarka1@llnl.gov)

Depending on emplacement conditions and underground structure, and contrary to what is theoretically predicted for isotropic sources, recorded local, regional, and teleseismic waveforms from chemical explosions often contain shear waves with substantial energy. In these situations, the transportability of empirical techniques for yield estimate to different source emplacement conditions and different depth of burial in regions with limited or no data becomes problematic. Therefore, it is important to understand the mechanisms of generation and conversion of shear waves during explosions. We used a small-aperture array to analyze near-field waveforms from a small underground chemical explosion recorded during the Source Physics Experiment (SPE) at the Nevada National Security Site. Our frequency–wave number beam-forming technique demonstrate that small-arrays are very efficient at detecting wave phases and their direction of propagation even when combined source process and heterogeneous velocity structure effects produce complicated waveforms. We were able to attribute key features of the waveforms, and wave phases to either source processes or propagation path effects. We also found that coda waves were more likely generated by path effects outside the source region, rather than interaction of the source generated waves with the emplacement structure.

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. LLNL-ABS- 688337