

Implications for S wave generation from subsurface chemical explosions using large arrays of sensors

The Source Physics Experiment (SPE) is a series of instrumented chemical explosions at the Nevada National Security Site (NNSS) designed to improve understanding of seismic wave generation and propagation from explosions. In April 2016 a temporary deployment of 996 geophones was installed at distances of 400 to 3000 m from a buried (76.5 m) 5000 kg TNT equivalent chemical explosion. The explosion was situated in a weathered granite body surrounded by volcanic tuffs, Paleozoic carbonates, and alluvium. The experiment included an active source campaign using a weight drop. In December 2018 a similar deployment (~500 sensors) was installed around a 50,000 kg TNT equivalent chemical explosion at a depth of 300 m. The geologic setting was alluvium over basement. Results show substantial differences in waveforms and associated particle motions over small spatial distances. Characterization of the velocity structure was conducted using first arrival P wave analysis, interferometry, and inter-station correlation. Statistical estimations of the spatial heterogeneity based on the recorded data led to improved modelling of the waveforms using 3D numerical models and demonstrated that path conversions account for a significant component of the observed S waves.

Primary author: MELLORS, Robert (Lawrence Livermore National Laboratory)

Presenter: MELLORS, Robert (Lawrence Livermore National Laboratory)

Track Classification: Theme 2. Events and Nuclear Test Sites