Nuclear Explosion Monitoring Research and Engineering (NEMR&E) Program
Quarterly Report DOE DE-FC52-06NA27319

Research Title: "Advanced Waveform Simulation for Seismic Monitoring Events"

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Technical Progress:

A. Description of Activities

This quarter involved continued efforts in helping people at AFTAC and LLNL. We are also preparing a paper on regional source estimation, see ***Abstract.***

How Good are Sparse Network Solutions?

Abstract

We conduct a detailed test of a recently developed technique, CAPloc, in recovering source parameters from a few stations against results from a large broadband network. The method uses a library of 1D Green's functions which are broken into segments and matched to waveform observations with adjustable timing shifts. These shifts can be established by calibration against a distribution of well-located earthquake and assembled in tomographic images for predicting various phase-delays. Synthetics generated from 2D cross-sections through these models indicates that 1D synthetic waveforms are sufficient in modeling but simply shifted in time for hard-rock sites. This simplification allows the source inversion for both mechanism and location to be easily obtained by grid search. We test one-station mechanisms for 160 events against the array for both PAS and GSC which have data since 1960. While one station solutions work well (about 90%), joint solutions produce more reliable and defensible results. Inverting for both mechanism and

location also works well except for certain difficult paths that cross deep basins or propagate along mountain ridges.

B. <u>Progress</u> - on track.

C. <u>Progress is following the stated Work Statement</u>.