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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Reporting Period: November 1, 2008-January 31, 2009

Technical Progress:

A. Description of Activities

**Shallow Crustal Structure beneath Southern California and
Sparse Network Source Inversions
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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 in Southern California. 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 earthquakes 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 most hard-rock sites. This simplification allows the source inversion for both mechanism and location to easily obtain 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 individual 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 complex paths across deep basins and along mountain ridges.

B. Progress - on track.

C. Progress is following the stated Work Statement.