Nuclear Explosion Monitoring Research and Engineering (NEMR&E) Program - Quarterly Report –
BAA No. DE-PS52-04NA25154
Contract No. DE-FC52-04NA25543

Research Title: Calibration of 3D Upper Mantle Structure in Eurasia Using Regional and Teleseismic Full Waveform Seismic Data

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Reporting Period: 10/15/04-1/15/05

Technical Progress:
Description of Activities conducted this Reporting Period:

Task 1.1

A global dataset of surface wave waveforms crossing the region of interest was collected. We started from the existing waveform database that was collected at Berkeley over the last 10 years for the construction of global mantle tomographic models (Li and Romanowicz, 1996; Megnin and Romanowicz, 2000; Gung et al., 2005; Panning and Romanowicz, 2005). The goal was to complement this global database in the region of interest. After choosing data from 20 new events, and adding in the data from the existing dataset, we now have 38826 3-component waveforms from 393 events recorded at 169 stations. The data has been processed using an automated algorithm, which removes glitches, and checks for many common problems related to timing, poor instrument response, and excessively noisy windows. A weighting scheme has been applied to insure even distribution of data across the region.

Task 1.2 from the report
Set up the coupled SEM/mode code for the case where the 3D model is limited to the region of interest and to the upper mantle.

Work is underway to adapt the code to the regional case. Because coupling the SEM solution to a 1D mode solution at a spherical interface is a key feature of the coupled SEM (CSEM) code, limiting the region to the upper mantle is easily accomplished using previously existing versions of the code and has been done. Limiting the 3D portion of the model to a selected region, however, requires larger

changes to the code. Currently, work is underway to most efficiently integrate this into the code using the latest algorithms to apply boundary conditions at the boundaries of the region of interest for the SEM code.

Task 1.3a
Assemble the starting 3D S velocity model.

The starting 3D S velocity model is based on our existing 3D global models. We have converted the global parameterization used in our global tomography to one based on local functions, specifically spherical splines. This parameterization is now available for inversions using the approximate NACT methodology (Li and Romanowicz, 1995).

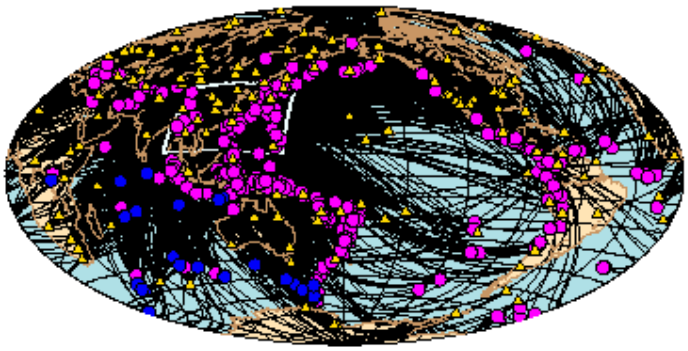

Figure 1:
Source-receiver paths of waveforms included in the dataset. Receivers are shown as yellow triangles, events that are part of the previously existing waveform collection are shown by purple circles, and newly collected events are shown with blue circles.