Passive Crustal Refraction Experiments Using IRIS/PASSCAL Facilities:
New Surveys Show Variable Crustal Thickness in the Western Great Basin

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Utilizing commercial mine blasts and local earthquakes, as well as a dense array of portable seismographs, we have achieved long-range crustal refraction profiles across northern Nevada and the Sierra Nevada Mountains. In our most recent refraction experiment, the Idaho–Nevada-California (INC) transect, we used a dense spacing of 411 portable seismographs and 4.5-Hz geophones. The instruments were able to record events ranging from large mine blasts to small local earthquakes. Our instruments sensed blast first arrivals out to a distance of approximately 400 km. We have obtained 99% data recovery and clear refractions across the central Sierra Nevada and the northern Great Basin. The Northern Walker Lane refraction experiment, completed in 2002, confirms the presence of a thin crust ranging from 19-23 km thick in a 100 km region in the vicinity of Battle Mountain, Nevada. Pn crossover distances of less than 95 km from both the INC and Northern Walker Lane experiments support this observation. We also observe an unexpectedly deep crustal root under the northern Sierra Nevada, over 50 km in thickness and centered west of the topographic crest. In addition, we have created contoured crustal thickness maps based on literature cited from previous compilations. These maps integrate our current experiments with past geophysical assessments of the Great Basin. Our seismic-refraction reconnaissance of the western Great Basin will contribute to the assessment of geothermal potential in poorly constrained areas.


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