

Passive Seismic Imaging of the Ruby Mountains Metamorphic Core Complex

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The Ruby Mountains Core Complex (RMCC) is a metamorphic core complex in the Basin-and-Range region in northeastern Nevada. Deep crustal rocks have been exhumed to the surface under a westward dipping detachment, with a ~1km thick mylonitic shear zone directly underlying the detachment. While the RMCC has been extensively mapped, questions remain about the deep structure and the role and timing of ductile and brittle deformation.

To further this goal, an Earthscope Flexible Array project called the Ruby Mountains Seismic Experiment was deployed from 2010 to 2012 to study the deep crustal structure of the RMCC. Passive seismic stations were spaced 5-10 km and arranged in three crossing lines over the RMCC, one NNE-SSW transect along the axis of the range and two WNW-ESE transects that ran from the Piñon Range in the west across the Ruby Mountains to the Cherry Creek Range in the east.

We used common conversion point stacking of receiver functions to produce a profile of structural discontinuities beneath the RMCC. We observe a mostly flat Moho at about 30 km depth that appears to dip slightly to the SW, with little difference between the northern and southern parts of the RMCC, despite geological observations that suggest the material in the northern part of the range was exhumed from significantly deeper in the crust.

Broader impacts included contributions to undergraduate education and public outreach. Three undergraduate summer interns worked on data we collected, contributing significant work towards our SKS splitting results and looking at methods to utilize data from mine blasts in the area; each presented posters at the AGU Fall Meeting. Additional undergraduates came out to the field with us to help install the stations, in what was for many their first field experience. We also shared our results with interested parties at local land agencies, and prepared a newsletter about our activities for the landowners we worked with to site our stations.

