Crustal Structure of the Basin and Range, Colorado Plateau, Rocky Mountains, and Great Plains

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By combining seismic data from multiple past PASSCAL arrays we have created a map of crustal thickness traversing the intermountain-west from the western edge of the Basin and Range to the Great Plains (Figure 1). This map illustrates the variations in crustal structure across the region with the thickest crust (~50 km) found beneath the Rocky Mountains and Great Plains. Thinner crust (30 km) is present beneath the Basin and Range, possibly as a result of thinning that occurred while that region experienced extension. The Colorado Plateau appears as a transitional region between the thicker crust to the east and the thinner crust to the west. Investigating variations in crustal structure over an expansive region also permits us to observe variations in the character of the Moho (boundary between the crust and mantle noted in Figure 2). We find that the Moho exhibits diminished amplitudes within the Colorado Plateau, possibly as a result of seismically fast lower crust within the plateau due to underplating of mantle material.

Figure 1. Color contour map of crustal thickness for the intermountain west. Areas of thicker crust are shown as blue colors while red colors show thinner crust. Thicknesses range between 30 and 50 km. Color saturation is scaled by the uncertainty of our observations. Also shown are boundaries (dashed line) between the Great Plains (GP), Rocky Mountains (RM), Colorado Plateau (CP), and Basin and Range (BR) provinces.

Figure 2. West to east cross-sections of geographically stacked receiver functions. Location of this cross-section is indicated on Figure A (line X-X'). Stacked receiver functions and their error are shown in black and thinner blue lines respectively. White circles and error bars show picked depths used to make crustal thickness map (Figure A). Lines are drawn at 30 and 50 km depth for reference.