

Using Receiver Functions to Image Subcrustal Structures of Montana

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Previous studies imaged a high velocity lower crustal layer ~25-50 km beneath the Wyoming Craton and Medicine Hat block, outcropping in the states of Wyoming and Montana, and north into Canada, during the Deep Probe- SAREX seismic refraction projects. The layer is relatively thick (~25 km) and propagates P waves at velocities between 7-8 km/sec, giving the so-called 7x layer its name. The lower crustal layer is not well defined in the US due to poor resolution (shot spacing ~700 km), and the linearity of the seismic sampling does not define the layer's extent to the east/west. We will use receiver functions at 6 permanent Advanced National Seismic System stations, derived from 40 events to resolve crustal and uppermost mantle structure. The seismic stations are located across Montana and are the reference points for this study. The receiver functions will resolve any extant sharp velocity contrast boundaries, such as horizontal and dipping beds and juxtaposed tectonic units. Scattering of P-to-S conversions off these sharp velocity interfaces will help identify the lateral extent of the high velocity lower crustal layer. The focus of this research is to detect variability in crustal thickness and internal structure beneath the Wyoming craton and surrounding. Prior research indicates that the North American western interior has been a stable craton since the Paleoproterozoic; however, an underplating event that formed the lower crustal layer would indicate that stable cratons may be subject to younger alterations and processes not yet identified.