



Sp and Ps Receiver Function Imaging of the Cenozoic and Precambrian US

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Using teleseismic USArray data we have made Ps and Sp receiver function common conversion point stacked image volumes that extend from the Pacific coast to approximately the Mississippi River. We have used iterative time-domain deconvolution, water-level frequency-domain deconvolution, and least squares inverse filtering to form receiver functions in various frequency bands (Ps: 1.0 and, 0.5 Hz, Sp: 0.2 and 0.1 Hz). The receiver functions were stacked to give an image volume for each frequency band using a hybrid velocity model made by combining Crust2.0 (Bassin et al., 2000) and finite-frequency P and S wave tomography models (Schmandt and Humphreys, 2010; and Schmandt, unpublished).

We contrast the lithospheric and asthenospheric structure of the western U.S., modified by Cenozoic tectonism, with that of the Precambrian central U.S. Here we describe 2 notable features: (1) In the Sp image volumes the upper mantle beneath the western U.S. differs dramatically from that to the east of the Rocky Mountain front. In the western U.S. the lithosphere is either thin, or highly variable in thickness (40-140 km) with neither the lithosphere nor asthenosphere having much internal structure (e.g., Levander and Miller, 2012). In contrast, east of the Rocky Mountain front the lithosphere steadily deepens to > 150 km and shows relatively strong internal layering. Individual positive and negative conversions are coherent over 100's of kilometers, suggesting the thrust stacking model of cratonic formation. (2) Beneath parts of the Archean Wyoming Province (Henstock et al, 1998; Snelson et al., 1998; Gorman et al., 2002; Mahan et al, 2012), much of the Great Plains and part of the Midwest lies a vast variable thickness (up to ~25 km) high velocity crustal layer. This layer lies roughly north of the Grenville Front, underlying much of the Yavapai-Mazatzal Province east of the Rockies, parts of the Superior Province, and possibly parts of the Trans-Hudson province.