MODERN BASALT EXTRACTION STRUCTURES IN THE SOUTHERN ROCKY MOUNTAINS: MULTI-BAND IMAGES FROM THE JEMEZ LINEAMENT

A. Levander, C.A. Zelt, M.B. Magnani • Rice University
K. Dueker, H. Yuan • University of Wyoming

The CD-ROM seismic experiments targeted Paleoproterozoic suture zones in the western U.S. in a north-south study corridor from central New Mexico to central Wyoming. Seismic reflection, refraction, and teleseismic measurements were made across the Jemez Lineament in northern New Mexico, a linear trend of modern volcanics extending SW from southern Colorado to Arizona. The Jemez Lineament spatially coincides with the southern edge of the suture between the Yavapai and Mazatzal island arc terranes thought to be one of the Paleoproterozoic assembly boundaries remaining from initial continental accretion. Karlstrom and Humphreys (1998) have speculated that the assembly boundaries have profoundly influenced Cenozoic tectonism in the western U.S., noting the correlation of NE-SW upper mantle tomography anomalies with geochemical boundaries and mapped suture zones in the Southern Rocky Mountains.

The reflection data image a Paleoproterozoic bivergent orogen occupying more than half the crust marking the Yavapai-Mazatzal orogeny, and bright upper crustal reflections that we interpret as Quaternary basaltic sills (Magnani et al., 2004). Refraction velocities in the upper mantle under a slightly thinned crust suggest that the upper mantle contains 1% partial melt (Hammond and Humphreys, 2000; Levander et al., 2005). In the same upper mantle region the P and S teleseismic tomography models show large magnitude low velocity anomalies (Yuan and Dueker, 2005). A pre-stack depth migrated receiver function image shows a series of subhorizontal, very bright, negative polarity upper mantle conversions extending from the Moho to depths of ~125 km, roughly corresponding to the tomography low velocity region (Levander et al., 2005). We interpret this complex series of converters in the upper mantle as the source zone for the Quaternary basaltic magmas found at the Jemez Lineament. We speculate that the paleo-suture zone left from continental accretion acts as a crustal conduit for basaltic magmas to pass from the mantle into the crust, form sills, and erupt.