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Mantle Discontinuities Beneath the United States and Gulf of Mexico From ScS Reverberations

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AB: We modeled mantle discontinuities beneath the United States and Gulf of Mexico using multiple ScS reverberations from Central and South American earthquakes captured by 65 stations of the IRIS Global Seismograph Network, GEOSCOPE, and the Terrascope Network across the United States. Data were separated into 8 geographic paths, 6 from Central American events and 2 from South American events, creating a fan pattern across the United States and Gulf of Mexico. Discontinuity depths and impedance contrasts across the discontinuities were calculated using the hierarchical waveform inversion method described by Revenaugh and Jordan (1989, 1991). The path-averaged depth of the 410-km discontinuity varies between the paths and is particularly shallow ($\sim$395 km) beneath the eastern United States. The path-averaged depth of the 660-km discontinuity also varies, but only by about $\pm$ 5 km. The 520-km discontinuity is seen in all of the paths, though the depth of the discontinuity and the impedance contrast across the boundary vary significantly across the study area. The easternmost paths have strong 520-km discontinuities, with impedance contrasts greater than 2.5%. The mid-continent and western paths have impedance contrasts of less than 2.0%. Further modeling of the ScS reverberations includes mantle discontinuities below the transition zone as well. In the mid-continent region, a discontinuity near 1375-km is present in 2 paths, and a 1525-km discontinuity appears in an adjacent path to the west. Further east, two paths show a discontinuity between 920-960 km. The easternmost path also contains a discontinuity below the transition zone, with an approximate depth of 1125 km. Mantle discontinuities below the transition zone are not seen beneath the western United States. Envelope stacks, with the modeled discontinuities and noise subtracted, were created for each path, which describe the degree of residual scattering in the mantle with depth. All of the profiles have a paired-caternary curve appearance, with a lower amount of scattering in the transition zone, a rise in scattering in the

mid-mantle, and a high degree of scattering at the crust and core-mantle boundaries.
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