

The mantle transition zone beneath eastern North America

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The eastern continental margin of North America, despite being a passive margin at present, records a comprehensive tectonic history of both mountain building and rifting events. This record is punctuated by several igneous events, including those associated with the Great Meteor and Bermuda hotspots. To gain a better understanding of the state of the mantle beneath this region, we employ USArray data to image the mantle transition zone beneath eastern North America. We first calculate P -to- s receiver functions using an iterative time-domain deconvolution algorithm. These receiver functions are then automatically filtered by their quality, using a set of rigorous criteria, and subsequently summed using common conversion point stacking. Cross sections through these stacks show remarkable features such as a thinned transition zone beneath the independently observed northern Appalachian and central Appalachian low-wavespeed anomalies, as well as a thickened transition zone beneath western Tennessee associated with the Laramide slab stagnating at depth. A technical analysis of the effects of using various seismic velocity models for the moveout correction of our receiver functions reveals that the thickness of the mantle transition zone under eastern North America is a robust measurement, while the resolved depths of the 410 and 660 km discontinuities are model dependent.

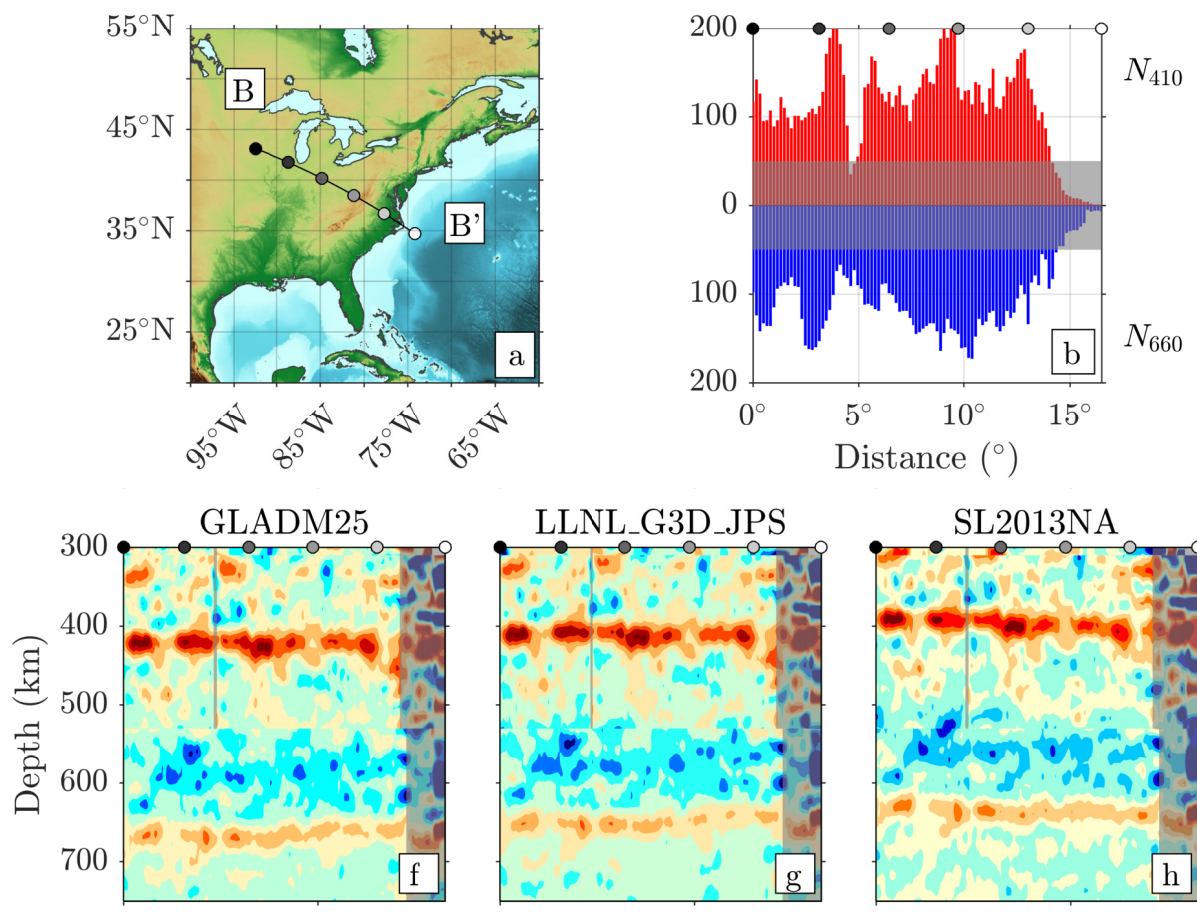


Figure 1: *Mantle transition zone (MTZ) structure in the region of the Central Appalachian Anomaly. Note the considerable amount of topography on the 410 discontinuity, and the strong thinning of the MTZ at the SE end of the cross section. Also note the data sparsity and poor resolution at the southeasternmost end of this cross section. The negative-polarity signals around 600 km depth are most likely artifacts from filtering and the presence of PcP.*