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Seismic imaging of the upper mantle beneath the border of the North American Craton based on USArray data

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The upper mantle structure beneath North America has been investigated using a number of seismological methods. EarthScope USArray project creates an unique opportunity to verify previous models and improve our understanding of the upper mantle. Our analysis is based on the data retrieved from the Transportable Array of the USArray. We use travel time data from natural earthquakes recorded in the far regional distance range (up to 3000 km from the source) for imaging of the upper mantle structure down to about 500 km depth. We present both P- and S-wave velocity models for tectonically stable central part of USA and the active western one. Travel time-based models are verified by synthetic seismograms calculated using reflectivity method. Our analysis is focused on the rim of North American Craton. We calculate 2D model for the Colorado – Virginia profile. The inversion procedure was applied as well. An updated P-wave velocity MP-1 model shows significant differences in the first-arrival travel times observed for the 800-1800 km epicentral distance range. For the western tectonically active region, a 300-km discontinuity is observed. It is characterized by a refracted wave with velocity of 8.7-8.9 km/s and also clearly observed reflected waves. The stable part of the continent, corresponding to the North American Craton, is characterized by obscured arrivals from the 300-km discontinuity. In the case of the western part of the USA, which is tectonically active, we also found a low-velocity zone atop the 410-km discontinuity and its significant depression. We will use our results of modelling as the input reference models for 3D first-arrival tomographic imaging.