Radially anisotropic 3-D S-wave structure in the Mongolian upper mantle

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Investigations of seismic structure with surface wave analysis are essential to clarify the regional tectonics and probe the structure with lateral heterogeneity and anisotropy in the Earth's crust and upper mantle. In this study, we measured a large number of path-average phase speeds across Mongolia, using the single-station method for multi-mode dispersion measurements based on a fully nonlinear waveform fitting method (Yoshizawa and Ekstrom, 2010, GJI) for each event-station path using the permanent and temporary stations in Mongolia and neighboring GSN (Global Seismograph Network) stations. Our dataset includes seismic waveforms from over 500 teleseismic events (M>5.8) from 2011 to 2020 for Rayleigh and Love waves. We retrieved initial large-scale phase speed maps using the linearized inversion based on the method of surface-wave tomography by Yoshizawa and Kennett (2004, JGR), incorporating approximate effects of finite frequency (Yoshizawa and Kennett, 2002, GJI). We also derived regional-scale phase speed maps across the Mongolian Seismic Networks based on the array-style analysis using eikonal tomography (Lin et al., 2009, GJI). These multi-mode phase speed maps are then used to create a 3-D shear wave model, including the continental lithosphere and asthenosphere beneath central Eurasia around Mongolia. Our preliminary results reveal that the thicker lithosphere is found beneath northern Mongolia, while the thinner lithosphere is located in the southern part of Mongolia. The lateral variations of the S wave model at 50-60 km depth show slow phase speeds in the tectonically active western Mongolia, while fast phase speeds in stable eastern Mongolia. Below 260 km, shear wave-speed anomalies are significantly reduced (around -5 percent) except for the Khuvsgul region (Southern part of the Baikal).

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