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Anisotropic Rayleigh wave tomography of Northeast China using ambient seismic noise

Zhikun Liu (1,2), Jinli Huang (1,2), Huajian Yao (3,4)

(1) Key Laboratory of Geo-detection (China University of Geosciences, Beijing), Ministry of Education, Beijing, China, (2) School of Geophysics and Information Technology, China University of Geosciences, Beijing, China, (3) Laboratory of Seismology and Physics of Earth's Interior, School of Earth and Space Sciences, University of Science and Technology of China, Hefei, China, (4) National Geophysical Observatory at Mengcheng, Anhui, China

The ambient noise data recorded by 249 seismic stations in the permanent and temporary networks in Northeast China are used to invert for the isotropic phase velocity maps and azimuthal anisotropy of Rayleigh waves in the period band 5 to 50 s. The inversion results reflect the structure from the shallow crust to upper mantle up to a depth of approximately 120 km. Beneath the Songliao basin, both the fast direction in shallow crust and strike of a low-velocity anomaly in the middle crust are NNE-SSW, which is coincident with the main tectonic trend of the (Paleo) Pacific tectonic domain. This indicates that the rifting of the Songliao basin was influenced by the subduction of (Paleo) Pacific plate. The upper mantle of Songliao block (except the central area of Songliao basin) to the west of Mudanjiang fault, and the east of the North-South Gravity Lineament, is characterized by high-velocity and weak anisotropy at the depth up to $\sim$120 km. We infer that there was delamination of lithospheric mantle beneath the Songliao block. Obvious N-S, NE-SW, and E-W trending fast directions are found in the lithospheric mantles of the east, west, and south sides of Songliao block, respectively, which coincide with the strikes of the Paleozoic tectonic in these areas. This suggests that the frozen-in anisotropic fabric in the lithospheric mantle can be used to indicate the historical deformation of the lithosphere. In the northern margin of the North China Craton, the spatial variations of phase velocity and azimuthal anisotropy are more dramatic than those in Northeast China blocks, which indicates that the lithosphere of the North China Craton has experienced more complicated tectonic evolution than that of the Northeast China blocks.