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3D anisotropic S-wave velocity model of the Asian upper mantle

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We study mantle structure of the Asian continent (30°–70° N, 60°–165° E) from the data on dispersion of fundamental modes of Rayleigh and Love wave group velocities along more than 3200 earthquake-station paths for each surface wave type. The dispersion curves were processed by a frequency-time analysis procedure at periods from 10 to 250 s that allow us to investigate the S-wave velocity structure up to the depths of 500 km. A 2D tomography technique developed for spherical surface without the sphere-to-plane transformation was implemented to image the distributions of the group velocities at different periods. Totally, we calculated 18 maps for each wave type and estimated their lateral resolution. Locally averaged dispersion curves were calculated using the obtained group velocity maps, with reference to the resolution, and then inverted to SV- and SH-wave velocity-depth profiles. Finally, the radial anisotropy coefficient was estimated as the ratio of the difference between SH- and SV-wave velocities to the average S-wave velocity. The obtained results show that anisotropy is observed in the upper mantle up to the depth of about 250 km which is approximately coincides with the bottom of the asthenosphere. It is the most prominent in the depth interval from the Moho to 150 km. The upper mantle under the Siberian Platform and West Siberian Plate is characterized by the minimum anisotropy coefficient (+1.5%). Maximum values of the anisotropy coefficient (+10%) are observed under the Tibetan Plateau and its surroundings. The upper mantle of the marginal seas at the east of Asia is also strongly anisotropic. An interesting feature of the obtained distributions is a local maximum of the anisotropy coefficient located at the north-eastern flank of the Baikal rift where a mantle plume is suggested to exist from the gravimetric data. Evidences of negative radial anisotropy were found in the mantle below 220 km.
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