Geophysical Research Abstracts
Vol. 20, EGU2018-1930, 2018
EGU General Assembly 2018

Surface wave group velocity tomography of the Arctic region

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We study deep velocity structure of the poorly investigated Arctic region (>60° N) based on the surface wave data. A representative dataset of Rayleigh (1555 seismic paths) and Love (1265 seismic paths) wave group velocity dispersion curves in the period range from 10 to 250 s was collected using a frequency-time analysis procedure. 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. The obtained group velocity maps show some general trends in distribution of large-scale lateral inhomogeneities which appear as zones of high velocity gradients at the boundaries of tectonic units and local velocity minimums and maximums. The highest group velocities (variations up to +5%) are observed under the Canadian and Baltic Shields. The Siberian and East European Platforms are also characterized by high group velocities (+1…+3%). The lowest velocities (variations up to –10%) are observed under the fold belts at the north-east of Eurasia and Alaska and under the Bering Sea basin. We found evidences of the mantle plumes under Iceland and Jan Mayen Islands represented by group velocity minimums. The spreading Gakkel Ridge is manifested as low velocity zone which widens at the Laptev Sea shelf. Thus, the revealed velocity anomalies are correlated with the positions of the main tectonic structures of the study area. The results obtained are of great value for further development of reliable geodynamical models of the Arctic region.
This work was supported by the grant of the Russian Science Foundation, project No 17–77–10037.