ESC2016-347-5, 2016
35th General Assembly of the European Seismological Commission


# Application of multicomponent receiver function inversion to small-aperture array data from the central part of the Russian platform.

Andrey Goev (1), Grigoriy Kosarev (2), Irina Sanina (1), and Oksana Riznichenko (2)

(1) Institute of Geospheres Dynamics Russian Academy of Sciences, Moscow, Russia (a.g.goev@gmail.com), (2) Schmidt Institute of Physics of the Earth Russian Academy of Sciences, Moscow, Russia

This study focuses on obtaining the detailed lithospheric structure of the central part of the East European platform, which has been an “unvisited area”.
We estimate the velocities in the Earth’s crust and upper mantle using simultaneous inversion of P- and S-wave receiver functions combined with surface wave data. The inversion algorithm is applied to the broadband small-aperture array data acquired at the central part of the East European Platform, to the East and South-East of Moscow. Compact groups of sensors helped increase both the amount of acquired data and the signal to noise ratio. We include short-period data in receiver function inversion to properly account for the influence of the shallow layers on the observed waveforms. Based on the frequency content of the observed data, we estimate the high-frequency cut-off as 4 Hz. To accurately estimate P- and S-wave velocities, we design a two-stage inversion algorithm that operates with two sets of the receiver functions: short-period (frequency 0.5 – 3 Hz) and broadband (frequency 0.01 – 1 Hz). At the first stage, short-period P-receiver functions are used to accurately estimate the heterogeneity and thin layering of the sedimentary layer, which reaches 2 km depth at the study area. Then, keeping the velocity in sedimentary layer fixed, we combine the broadband P- and S-wave receiver functions with the surface wave data to recover the velocity structure of the Earth’s crust and upper mantle to the depth of 300 km. The employed inversion algorithm yields the lithosphere thickness and the parameters of the low-velocity layer in the upper mantle. The converted waves from the mantle transition zones are detected despite the thick sediments. The converted wave data corroborate with the theory and confirm the inversion results. Times of P410s and P660s conversions in the mantle transition zone are 0.5 s less compared to IASP91 model. The depth of the upper boundary of lvl (astenosphere) varies from 120 to 150 km, depending on the observation point. The depth of Lehman discontinuity varies from 170 to 200 km, whereas Hales discontinuity is not detected.
This publication is based on work supported by the Russian Foundation for Basic Research (RFBR), project № 15-05-04938 and by the leading scientific school № NS-3345.2014.5.