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Test of high-resolution 3D P-wave velocity model of Poland by back-azimuthal sections of teleseismic receiver function

Monika Wilde-Piorko, Marcin Polkowski, and Marek Grad
University of Warsaw, Faculty of Physics, Institute of Geophysics, Warsaw, Poland (mwilde@igf.fuw.edu.pl)

Geological and seismic structure under area of Poland is well studied by over one hundred thousand boreholes, over thirty deep seismic refraction and wide angle reflection profiles and by vertical seismic profiling, magnetic, gravity, magnetotelluric and thermal methods. Compilation of these studies allowed to create a high-resolution 3D P-wave velocity model down to 60 km depth in the area of Poland (Polkowski et al. 2014). Model also provides details about the geometry of main layers of sediments (Tertiary and Quaternary, Cretaceous, Jurassic, Triassic, Permian, old Paleozoic), consolidated/crystalline crust (upper, middle and lower) and uppermost mantle. This model gives an unique opportunity for calculation synthetic receiver function and compering it with observed receiver function calculated for permanent and temporary seismic stations. Modified ray-tracing method (Langston, 1977) can be used directly to calculate the response of the structure with dipping interfaces to the incoming plane wave with fixed slowness and back-azimuth. So, 3D P-wave velocity model has been interpolated to 2.5D P-wave velocity model beneath each seismic station and back-azimuthal sections of components of receiver function have been calculated. Vp/Vs ratio is assumed to be 1.8, 1.67, 1.73, 1.77 and 1.8 in the sediments, upper/middle/lower consolidated/crystalline crust and uppermost mantle, respectively. Densities were calculated with combined formulas of Berteussen (1977) and Gardner et al. (1974). Additionally, to test a visibility of the lithosphere-asthenosphere boundary phases at receiver function sections models have been extended to 250 km depth based on P4-mantle model (Wilde-Piórko et al., 2010). National Science Centre Poland provided financial support for this work by NCN grant DEC-2011/02/A/ST10/00284 and by NCN grant UMO-2011/01/B/ST10/06653.