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2.5D S-wave velocity model of the TESZ area in northern Poland from receiver function analysis

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Receiver function (RF) locally provides the signature of sharp seismic discontinuities and information about the shear wave (S-wave) velocity distribution beneath the seismic station. The data recorded by "13 BB Star" broadband seismic stations (Grad et al., 2015) and by few PASSEQ broadband seismic stations (Wilde-Piórko et al., 2008) are analysed to investigate the crustal and upper mantle structure in the Trans-European Suture Zone (TESZ) in northern Poland. The TESZ is one of the most prominent suture zones in Europe separating the young Palaeozoic platform from the much older Precambrian East European craton. Compilation of over thirty deep seismic refraction and wide angle reflection profiles, vertical seismic profiling in over one hundred thousand boreholes and magnetic, gravity, magnetotelluric and thermal methods allowed for creation a high-resolution 3D P-wave velocity model down to 60 km depth in the area of Poland (Grad et al. 2016). On the other hand the receiver function methods give an opportunity for creation the S-wave velocity model. Modified ray-tracing method (Langston, 1977) are used to calculate the response of the structure with dipping interfaces to the incoming plane wave with fixed slowness and back-azimuth. 3D P-wave velocity model are interpolated to 2.5D P-wave velocity model beneath each seismic station and synthetic back-azimuthal sections of receiver function are calculated for different Vp/Vs ratio. Densities are calculated with combined formulas of Berteussen (1977) and Gardner et al. (1974). Next, the synthetic back-azimuthal sections of RF are compared with observed back-azimuthal sections of RF for "13 BB Star" and PASSEQ seismic stations to find the best 2.5D S-wave models down to 60 km depth. National Science Centre Poland provided financial support for this work by NCN grant DEC-2011/02/A/ST10/00284.