



Reflection tomography of the uppermost mantle arrivals beneath West Carpathians – analysis of reliability

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The 2-D crustal models across the West Carpathians, obtained from CELEBRATION'2000 seismic dataset, consistently show a reflecting discontinuity in the uppermost mantle. It is well constrained thanks to good quality of the reflections, observed on several profiles. The arrivals from the reflector are correlated also on off-line recordings. In this study, 3-D reflection tomography was performed using recordings from in-line and off-line shots from trans-carpathian profiles in order to constrain the 3-D geometry of the discontinuity. The crustal and mantle velocity model needed as a background for reflection tomography was previously prepared using first arrivals tomography and inversion of PmP arrivals. In the resulting model, the discontinuity is located at 40-70 km depth and dips to the north - opposite to the direction of Carpathian subduction, inferred from geological and other studies. Therefore, the interpretation of the result in terms of a subducted slab is problematic. Another interpretation may involve a shear zone or set of shear zones, originated during collision of the continental lithospheric plates. To constrain the Vp contrast at the reflector, the results of the tomography were supplemented by the analysis of the reflection amplitudes using full-waveform modelling in 2-D.

The result of the tomography (reflector depth) depends on initial reflector model, crustal and mantle velocity model used, and on Moho depth. Therefore an analysis of the influence of these factors on the final model was performed. It consisted of performing several variants of inversion with different initial velocity models of the crust and varying initial models of the Moho discontinuity as well as the mantle reflector, and statistical analysis of the results. As the lower crust is very poorly constrained with Pg tomography, due to limited penetration depth, influence of different lower crustal velocity models was also investigated.