



Detection of a new Sub-Lithospheric Discontinuity in Central Europe with S-Receiver Functions

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S-receiver functions (i.e. S-to-P converted signals) are useful for studying seismic discontinuities in the upper mantle between the Moho and the 410 km discontinuity. We obtained c. 49.000 S-receiver functions from c. 700 permanent and temporary broadband stations in central Europe as made available by the open EIDA archives. Knowledge of the existence and topography of upper mantle discontinuities sheds light on the dynamics of continental collision events which formed Europe. Below Phanerozoic Europe we observed the expected discontinuities like Moho, Lithosphere-Asthenosphere Boundary (LAB), Lehmann discontinuity and the 410 km discontinuity with an additional low velocity zone above. Below the East European Craton (EEC) we observed the Mid-Lithospheric Discontinuity (MLD) and in addition the controversial cratonic LAB at c. 200 km depth. At the boundary of the EEC but below the Phanerozoic surface and below LAB we observed large regions with another sharp downward velocity reduction between 150 and 300 km depth which we named Sub-Lithospheric Discontinuity (SLD). These regions are: the North German-Polish Plain where we observed it at about 200 km depth; the Bohemian Massif where it is north-west dipping and reaching about 300 km depth; and the Pannonian Basin where it is at about 150 km depth and north-east dipping to 200 km depth below the western Carpathians and the EEC. At the northern edge of the Bohemian Massif we see a sharp vertical step of about 100 km in this discontinuity. It is too early for a lasting interpretation of these new findings. However, a possibility could be that a prong of the cratonic mantle lithosphere penetrated at the western and south-western edges of the EEC into the Phanerozoic asthenosphere during continental collision.