Geophysical Research Abstracts
Vol. 13, EGU2011-10519, 2011
EGU General Assembly 2011

From the Variscan to the Alpine Orogeny: crustal structure at the contact of the Bohemian Massif and the Western Carpathians in the light of seismic refraction data

Pavla Hrubcova (1) and Piotr Sroda (2)

(1) Institute of Geophysics, Academy of Science, Seismology, Prague, Czech Republic (pavla@ig.cas.cz), (2) Institute of Geophysics, Polish Academy of Sciences, Warsaw, Poland

The Variscan orogeny is the major Middle to Late Palaeozoic tectonometamorphic event in central Europe and marks the final collision of Gondwana with the northern continent, Laurasia. The largest Variscan unit in central Europe, the Bohemian Massif, represents the most prominent outcrop of pre-Permian rocks deformed during this orogeny. Adjacent to this massif in the southeast, the Western Carpathians form an arc-shaped mountain range related to the Variscan collisional event complicated by subsequent Alpine compression during the Cretaceous to Tertiary.

The complex crustal-scale geological structure of the Variscan Bohemian Massif and the Western Carpathians, and especially their contact, were analysed employing the data of the CELEBRATION 2000 and SUDETES 2003 international seismic refraction experiments. The data were interpreted by 2-D trial-and-error forward modelling of P waves, additional constraints on crustal structure were provided by gravity modelling. The seismic modelling revealed a complex structure not only within the tectonic units, but also at their contacts, which may reflect, to some extent, the structural variances related to tectonic events. The crustal thickness of the whole area varies from 23 – 39 km with the most prominent lateral variations of the Moho depth detected at the contact of the Bohemian Massif with the Western Carpathians. The deepest and the most pronounced Moho is reached in the central part of the Bohemian Massif with a strong velocity increase. At the western side of the Carpathians the Moho rises from 32 km to a depth of 26 km and steeply dips to the NW to a depth of 37 km. Considering the Pieniny Klippen Belt as a deep-seated boundary between the colliding Palaeozoic lithospheric plate and the Alcapa microplate, the abrupt change of the crustal thickness can represent the continuation of this boundary to depth. The close later proximity (<50 km) between these two significant crustal features (PKB and the abrupt Moho depth change) may suggest that the zone between them is an area of the contact of the European Platform plate and the Alcapa microplate.

The Moho in the Carpathians is relatively shallow and reaches a depth of 32 – 33 km. This relatively small thickness compared to those of many other orogens, e.g., the Alps, reflects a different tectonic evolution of the Carpathians. In contrast, in the Pannonian Basin the Moho rises up to a depth of 25 km, which corresponds to the Pannonian gravity high and the Pannonian lithospheric thinning.