CRUSTAL STRUCTURE OF EASTERN ALPS DERIVED FROM DATA OF RECENT WAR/R EXPERIMENTS

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The Alps are the result of a long and ongoing tectonic evolution, initiated coevally with the opening of the Atlantic Ocean in the early Jurassic. Major geodynamic processes involved in the orogenesis of the Eastern Alps include the subduction of the Meliata ocean in the Jurassic and Cretaceous, the subduction of the Alpine Tethys in the Tertiary and the following continent-continent collision between the European and Adriatic-Apulian plates. In the Miocene, parts of the Eastern Alps were vertically or horizontally extruded or escaped tectonically eastwards into the Pannonian domain along major strike-slip fault systems.

Since 2000 several large WAR/R experiments (CELEBRATON 2000, ALP 2002, SUDETES 2003) covered this area by a dense net of seismic profiles. We present the most recent seismic models of the Eastern Alps and their transition to the surrounding tectonic provinces (Bohemian massif, Southern Alps, Dinarides, Pannonian domain) derived from CELEBRATION 2000 and ALP 2002 data. The seismic data were processed by different 2D and 3D techniques, resulting in P-wave velocity models of the crust and upper mantle, and a new Moho depth map.

P-wave velocity structures of the upper and middle crust correlate well with geologic and tectonic units. Examples of regions with relatively low velocities are sedimentary basins and their basement and granite intrusions in the Bohemian massif. Significant high velocity areas are a deep reaching zone north of the Tauern window, the middle crust of the Tisza unit, and, most pronounced the upper crust of the Adriatic foreland. High velocities in the lower crust are found below the Vienna basin and its north-western and south-eastern surroundings.

The Moho depth map shows a fragmentation of the crust and upper mantle into three parts: the European plate, the Adriatic-Apulian micro-plate, and the newly interpreted Pannonian fragment. The Moho depth map indicates a southward subduction of the European plate below the Adriatic-Apulian plate and below the Pannonian fragment. However, the Adriatic-Apulian Moho dips in north-north-eastern direction below the Pannonian Moho. We interpret that the Pannonian fragment was part of the Adriatic-Apulian plate before and during an early state of the collision. Crustal thinning and Moho uplift of the Pannonian fragment was initiated during the subsequent tectonic escape to the unconstrained margin in the east, represented by the Pannonian basin. Since the Miocene, underthrusting of the Adriatic-Apulian plate below the Pannonian fragment could have been one mechanism of continuing crustal shortening in the region of the Eastern Alps and the most northern Dinarides.

Ongoing studies on crustal structure in the area of the Eastern Alps focus on the interpretation of the S-wave velocity structure. Despite that only vertical component geophones were used in the above mentioned experiments, significant shear wave phases are also regularly observed in the seismic sections, in particular diving waves through the crust (Sg), and reflections from the Moho (SmS). The results so far show significant structures of the Vp/Vs ratio in the upper crust. In case of the Moho, the evaluation of reflected S-waves confirms the results derived by P-wave modelling.