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ALP 2002 EXPERIMENT – 2D RAYTRACING MODELLING AND SEISMIC TOMOGRAPHY OF SELECTED PROFILES

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ALP 2002 WORKING GROUP

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The transition zone between the Alps, Dinarides and Pannonian basin was explored in the frame of the international project ALP 2002 using deep seismic refraction/wide-angle reflection method. Following the successful deep seismic reflection profiling in Central and partly in Eastern Alps and refraction experiments conducted in the northern part of the Central Europe, it was very important to extend the investigations also to this key area, in order to improve the understanding of the collision and lateral extrusion mechanisms of European, Adriatic (African) and Tisza plates. Different processing and interpretation methods are used in data elaboration from delay time decomposition, 2D and 3D ray-tracing modelling and tomographic inversion to signal detection and stacking techniques. In this work the preliminary results of 2D ray-tracing modelling and back-projection tomography along selected lines are presented. 2D velocity models give good insight into variation of the crustal thickness and of other crustal properties (e.g. thickness of the sediments). We concentrated mainly on two longest high-density lines. Alp01 profile extends in N-S direction from NW of Prague to Istra peninsula. It gives transect from the Bohemian massif across the Alps to the Adriatic platform. Alp02 profile extends in NW-SE direction from Innsbruck to Slavonski Brod across the Alpine, Dinaric and Pannonian basin structures (Fig. 1).

2D raytracing technique method using programs SEIS 83 (Cerveny and Pšencik, 1983; Komminaho, 1997) and ZPLOT was the main interpretational approach. Raytracing models of the two longest lines, Alp01 and Alp02, are presented. For the upper crustal structure in the Austrian Molasse and in Pannonian basin results of seismic reflection investigations for oil and data from drilling were used.

In the Alp01 line (Fig. 2) the Alpine part of the profile resembles well the structures established along TRANSALP: low velocities in the lower crust on the European vs. high velocities on the Adriatic side; downbending of the European Moho starts directly below the Alpine front. European Moho reaches greater depth than Adriatic, what can be a weak implication for the subduction to the South. Main difference to TRANSALP is in the maximum depth of the Alpine root (55 km vs. 46 km).

In the Alp02 profile (Fig. 3) the most important features are: low velocity zone in the upper crust between shot points 206 and 207 (E Slovenia, W Croatia) which can be related to the Mid-Hungarian tectonic Zone; there is a high velocity lower crust in the central part of the profile which is missing in the Pannonian basin; the depth to Moho is less reliable in the western part below the Alps, where it is in the Alp01 profile better constrained.

In 2D iterative back-projection tomographic inversion (Hole, 1992) first arrivals were used to obtain a velocity model. The penetration depth was stepwise increased by successively selecting larger maximum offset. A total of 1080 picks were used for the inversion of line Alp01 and 624 for the inversion of line Alp02. The density of the computation grid was 2 km. If 7.8 or 7.9 km/s velocity isoline is taken as a rough estimate of Moho, we obtain up to 10 km deeper interface than with raytracing modelling. But some velocity anomalies as is low-velocity upper crust in the Alp02 line between shot points 206 and 207 and higher-velocity at the S end of line Alp01 are clearly visible also in tomographic images.

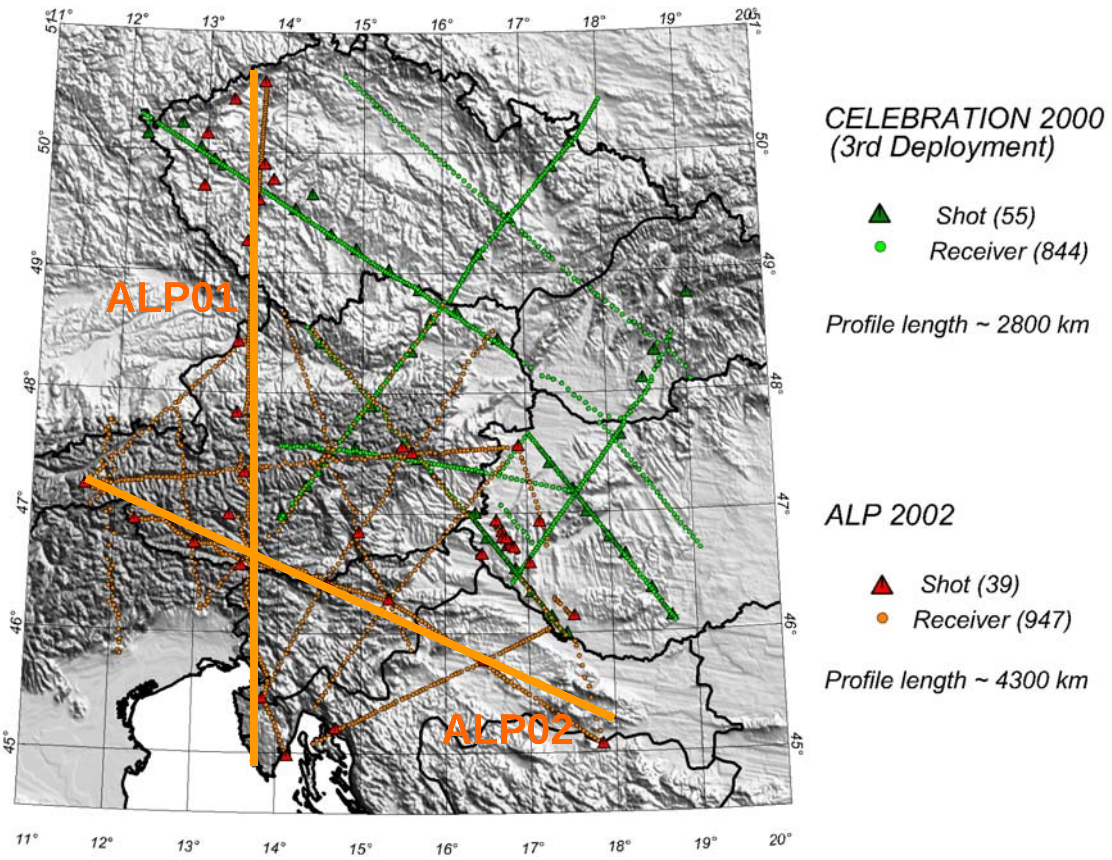

Figure 1: Location of profiles

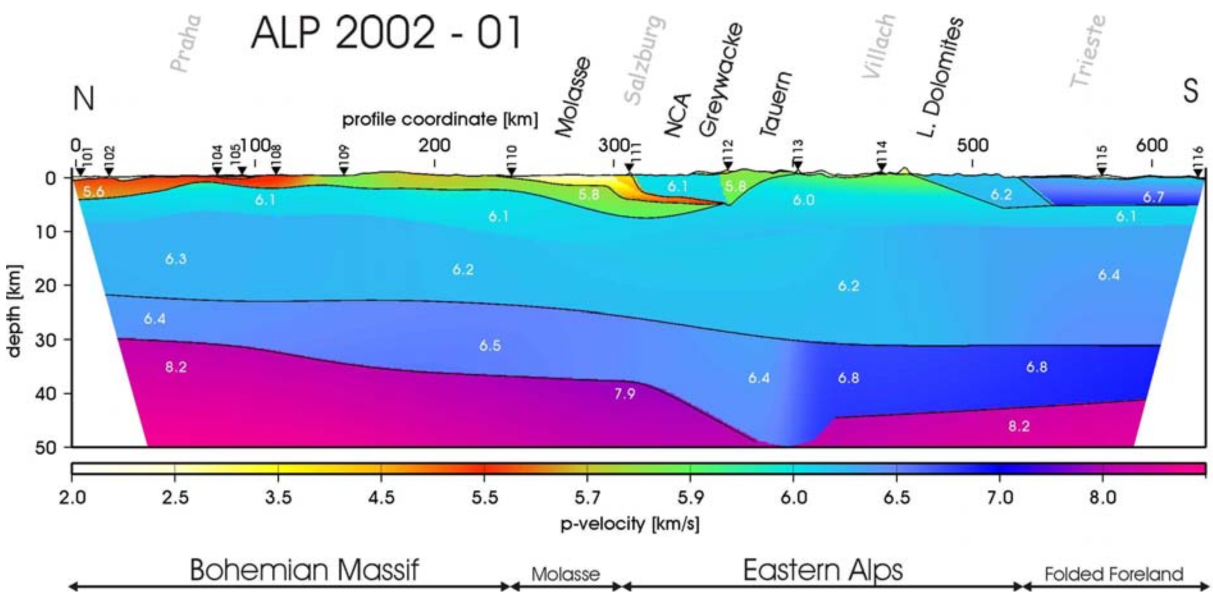

Figure 2: Raytracing modelling of profile ALP01

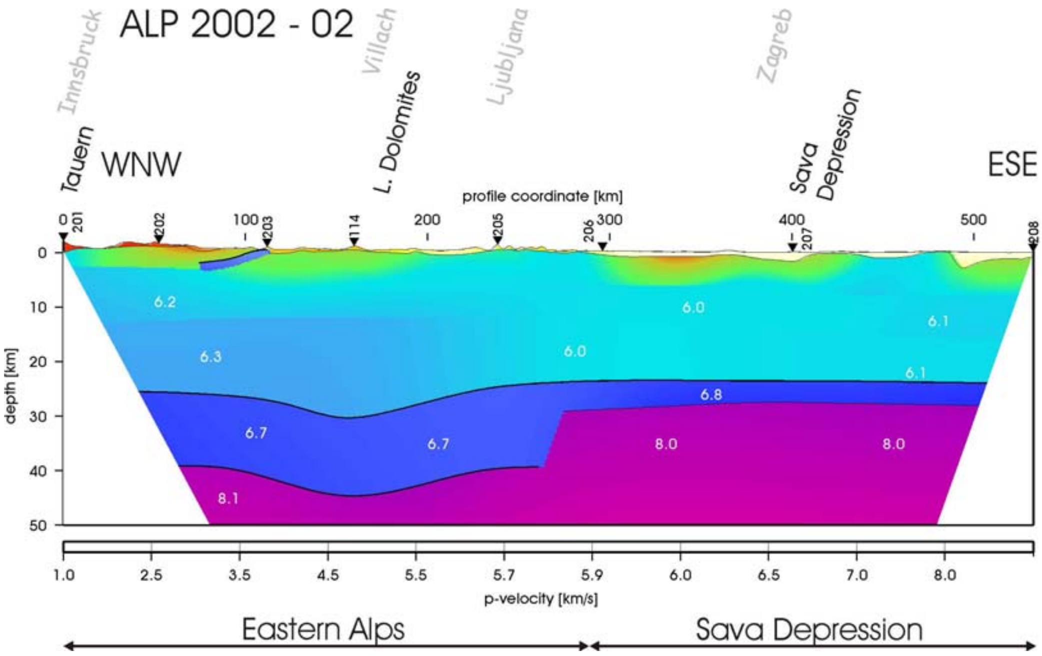

Figure 3: Raytracing modelling of profile ALP01

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