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TRANSALP – NEW SEISMIC REFLECTION IMAGES OF THE EASTERN ALPS

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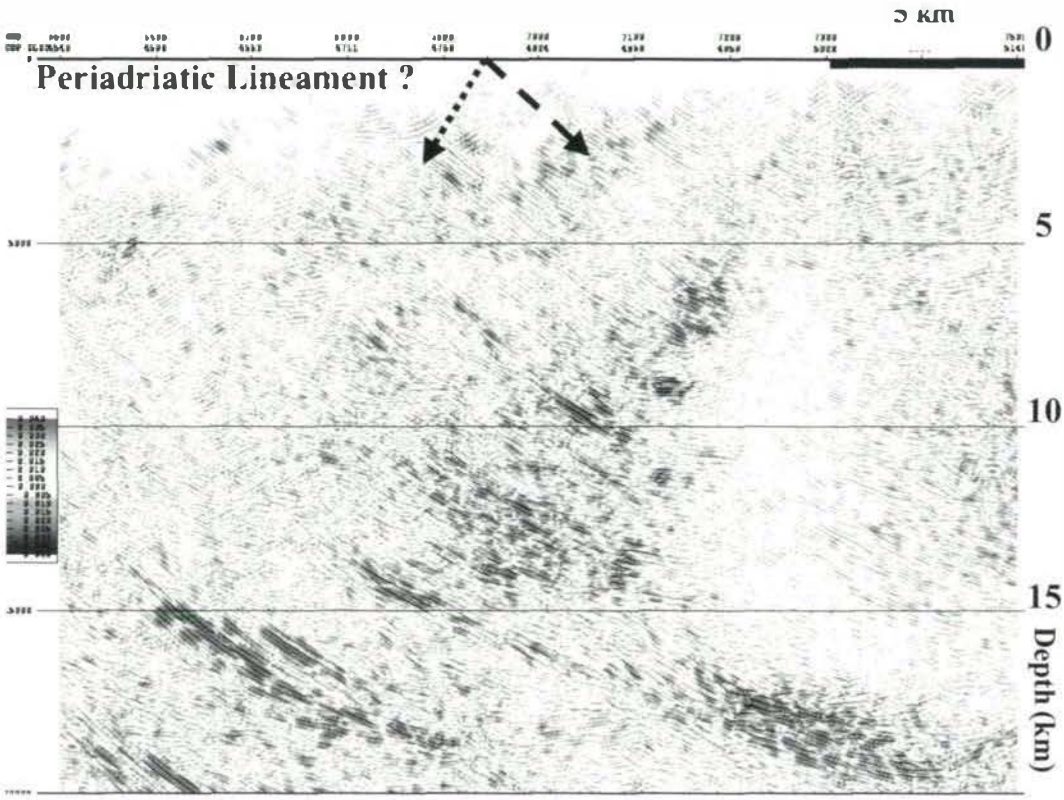
The TRANSALP Group comprising partner institutions from Italy, Austria and Germany acquired a 340 km long deep seismic reflection line crossing the Eastern Alps between Munich and Venice. Although the field campaign was split into three different parts, the northernmost 120 km in autumn 1998, the southernmost 50 km in winter 1998/1999 and the central 170 km in autumn 1999, the project gathered for the first time a continuous section enabling consistent data processing from common-midpoint sorting to depth migration including the orogen itself as well as the two adjacent basins.

The Vibroseis survey as the core of the project was designed to accomplish high resolution and depth penetration for the upper crust mainly, thus using the following field parameters:

vibratorpoint spacing 100 m with 4 heavy vibrators, sweep signal 10-48 Hz of 28 s length, recording time 20 s after correlation, geophone group spacing 50 m, spread length 18 km in split spread configuration with 360 recording channels resulting in 90-fold common midpoint coverage. The Vibroseis survey was accompanied by explosive seismic recording using shotpoints of 90 kg charge in 30 m deep boreholes and 5 km spacing. The explosive seismic survey was designed to provide low-fold, but high-energy signals from the deeper parts of the crust. Seven receiver cross-lines, each approx. 20 km long, recorded off-end shotpoints and passively the sources of the main line in order to provide three-dimensional control. All these measurements were performed by contractor companies.

The data processing was done at the universities of Munich and Leoben and at the offices of ENI-AGIP at Milan on different hardware and software platforms. At the beginning of the processing all data of the main Vibroseis line (3841 vibratorpoint records, 27 Gbyte) were combined to form one consistent dataset. A visualisation of the complete processing steps from geometry installation (all coordinates given in UTM-WGS84 system) to Kirchhoff depth migration (poststack) will be shown for a sample portion of the line using a MS-Powerpoint presentation. Static corrections to a datum level (500 m a.m.s.l.) turned out to be a crucial step. A combination of elevation statics, velocity statics based on a tomographic inversion of the first breaks and subsequent residual statics proved to be very efficient for stacking enhancement. This conventional common-midpoint (CMP) processing scheme was complemented for comparison by non-conventional schemes, such as dip-moveout (DMO) processing and pre-stack depth migration with subsequent stacking. The conventional CMP technique proved to be very robust despite of several strongly dipping reflection patterns. For the explosive seismic data a different way was chosen. Because of the large shotpoint interval of 5 km and the low-fold coverage, traces of best quality were selected to form a single-fold section, which was then normal-moveout corrected and (poststack) depth-migrated. The cross lines were processed with the standard CMP technique as well as with a three-dimensional pre-stack migration.

The northernmost and southernmost parts of the 300 km long Vibroseis section (measured along the smoothed CMP-line) display the Molasse basins with the Tertiary base in the Bavarian Molasse as the most prominent reflection. Several hydrocarbon exploration targets can be clearly identified at antithetic normal faults. Thin Mesozoic sediments and the top of the



(European) basement can be seen as subhorizontal reflections beneath the Northern Calcareous Alps (NCA) and the Grauwackenzone (GWZ) with vertical displacements of about 4-5 km each beneath the Alpine front and beneath the Inn valley. The nappes of the NCA can be clearly correlated with southward dipping reflections. The contact between the NCA and the GWZ south of the Inn valley is imaged as a 40-50°, from the surface southward dipping reflection pattern. The Tauern Window is marked by a southward dipping reflection pattern distributed throughout the whole crust, particularly pronounced south of the Periadriatic Fault (PF). The figure shows the upper part of this pattern. Controversial interpretations concerning the trace of the PF are presently debated (compare contributions by CASTELLARIN et al., LAMMERER et al. and NEUBAUER et al.). If it is assumed that the PF itself is seismically non-reflective, that is, there is no impedance contrast across the PF, then one could trace the PF steeply dipping northward separating a highly reflective domain from a non-reflective domain. If the PF exists here at all and is assumed to be reflective, then it must be traced towards South. The base of the crust is imaged by a gently southward bending, relatively thin reflective lower crust on the European side and an Adriatic/African lower crust more than twice as thick. The crustal thickness is asymmetric with 30 km in the North and 45 km in the South, having its peak with about 55 km below the PF where the lower crust appears to be seismically transparent.

The seismic sections will be presented also as posters at different scales. One poster will present a compilation of all seismic sections at the same scale for comparison.

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