crystals and rapidly crystallised Although it is impossible to obtain representative chemical analyses of these veinlets, at least two different types were recognised: a Na+F-rich (quartz+albite+topaz) and a K+P-rich (Kfs+ apatite).

Neue seismische Refraktions- und Weitwinkel-Experimente zur Erforschung der Lithosphäre in den Ostalpen.

E. Brückl und CELEBRATION 2000 & ALP 2002 Working Groups

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CELEBRATION 2000 war ein großangelegtes seismisches Refraktions- und Weitwinkel-Experiment zur Erforschung der Lithosphäre in Zentraleuropa. Mit 1225 seismischen Stationen wurden in 3 Auslagen 147 seismische Großsprengungen registriert. Die in diesem Vortrag behandelte, dritte Auslage umfasste die Böhmische Masse, Teile der Karpaten, den Pannonischen Raum und den NO-Teil der Ostalpen. Generell wurden die seismischen Stationen auf einem Netz von Linien angeordnet. Die seismischen Schüsse wurden sowohl innerhalb der Linien als auch zwischen den verschiedenen Linien beobachtet, sodass eine 3D-Auswertung möglich ist.

Die bisherigen Auswertungen konzentrierten sich zunächst auf konventionelle Linienauswertungen mit Methoden der Tauchwellentomographie. In Ergänzung dazu wurde auch eine tomographische Methode zur 1D-Inversion von CDP-sortierten Laufzeiten angewandt. Für die Oberkante des Kristallins und die Moho wurden Delayzeit-Modelle (Zeittiefen und Refraktorgeschwindigkeiten) erstellt. Diese Modelle geben einen ersten Eindruck über die hervorragenden Möglichkeiten einer 3D-Auswertung. Insgesamt wurde mit den bisherigen Arbeiten ein konsistentes Startmodell erstellt, oder zumindest der Weg dahin geklärt.

Im Rahmen von CELEBRATION 2000 war es nicht möglich, den östlichen Teil der Ostalpen voll zu überdecken. Es wurde daher eine weiteres Experiment mit dem Namen ALP 2002 geplant. Dieses Experiment ist in der Größe mit der dritten Auslage von CELEBRATION 2000 vergleichbar und schließt an dieses im Süden an. Insgesamt 12 Profile reichen von TRANSALP im Westen bis in das Pannonische Becken im Osten, sowie die Südalpen und Dinariden Sloweniens und Kroatiens. Das Experiment wird in der ersten Juli-Woche 2002 ausgeführt.

DSS and NVR seismic data: complementary for the interpretation of TRANSALP"

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During the first TRANSALP colloquium (Vienna, April 1999) we briefly described an interpretation of the deep crustal structure in the area crossed by the transect, based on the existing DSS data. We are not aware of later acquisitions of data of the same kind: therefore we'll refer to the former interpretation for a preliminary comparison between the results of the wide angle reflection-refraction seismic survey and those shown by the preliminary NVR cross section.

The TRANSALP doesn't follow the same path of any DSS profile: it runs in between the two interpretative transepts Eschenlohe - Vicenza and Eschenlohe - Trieste; three longitudinal profiles (ALP '75, SudALP and Lago Bianco - Tarvis) are also crossing the TRANSALP.

As far as the structure of the deep crust and of the Moho boundary is concerned, a fair agreement is found. Reference can also be made to our map (TECTO 1997) that illustrates the contrast between the relatively homogeneous character of the European lower crust and the high fragmentation of the Adriatic crust along its northern margin. The same map makes also clear the lateral change of structure between the central and the eastern sector of the Alpine range.

Agreement seems also to exist as far as the extension northwards of the "wedge" of the lower Adriatic crust but not about its shape that seems better described in the NVR cross section recorded with vibrators. The latter technique gives a good detail of the sedimentary and upper crust that is not obtainable by the available DSS, owing to the intrinsically poor resolving power of the method as well as to the low density of receivers and shots. Therefore, a continuous coverage of the reflecting boundaries cannot be reached.

The two techniques are also complementary as far as the distribution of the seismic velocity is concerned: the NVR yields the information on the velocity of the shallow layers and on its lateral changes, while the DSS give the velocity model in the crystalline and deep crust.

The Adriatic indenter and the"lateral extrusion model": an approach to the Eastern Alps deep structure interpretation

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The Insubric (Periadriatic) Lineament (IL) of the Pustertal and Gailtal zones is a very strong tectonic separation between the S verging thrust belt of the Southern Alps, unaffected by Alpine metamorphism (Africa verging orogenic chain) and the metamorphic nappe building of the Alps characterized by strong tectonic polarity to the N (Europa verging orogenic chain). The lithospheric stuctural relationships of the two facing sectors of the Alps across the Insubric Lineament correspond to the more complex problem of the whole Transalp profile. N of the IL, the European units of the Central Gneiss Zone with their tectonic cover of oceanic meta-sediments and ophiolites of the Tauern Window (TW) structure were affected by strong ductile deformations, dominated by vertical narrow folds where the gneiss are largely prevailing. These units underwent very intense shortening and uplifting, rising up and/or exhuming for 30-35 km in the last 40 Ma (mostly in early-mid Miocene times, between 20 and 15 Ma) (Lammerer and Weger, 1998). Completely different is the deformational Alpine history and structural setting of the zone located to the S of the IL, that is the Italian Dolomites in the eastern Southern Alps. This belt underwent, on the contrary, mostly S-verging thrusting and brittle deformation and only moderate uplifting confirmed by fission tracks investigations in the whole eastern Southern Alpine domain. Moreover these vertical movements occurred in connection with the neo-Alpine strongest compressional events. The dipping in depth of the Insubric Lineament is a key to the solution of the lithospheric setting of the Alps in their axial zone. In the Central and Western Alps, the IL has been mostly considered N and NW dipping after the Argand's structural interpretation (1924). The modern tectonic reconstructions based on the deep seismic reflexion acquisitions in the Central and Western Alps (see for instance Pfiffner et al., 1997) confirmed these deep structural settings. With regards to the Eastern Alps, the IL in depth can been assumed dipping both to the N and to the S. Deep immersions to the N of the IL in the sector crossed by the Transalp Profile, are consistent with the tectonic structures present at the surface along the Puster Valley (e.g. Dal Piaz, 1934). The Transalp reflexion data may be considered coherent with this interpretation. In fact a transparent zone underneath the Tauern window southern side, produce a strong break in the reflective seismic facies which could correspond to the possible N dipping continuation in depth, for some 25 km, of the IL. In this case the IL may correspond to the upper surface of a thick wedge of Adriatic lithosphere indented between the Tauern Window nappe stack and the underlying subducted European units. This interpretation may be considered consistent with the structural setting of the backthrusted Southern Alps belt and with the deep images underneath the TW. Moreover in this frame the lateral and vertical extrusion of the TW structure may be better explained.

Nevertheless, the seismic data across this Lineament in depth show high to middle angle S dipping prominent reflectors, joining the IL at the surface. Similar setting of the IL in depth could support a different general crustal interpretation of this sector of the Alps. In this frame, in fact, the S dipping IL could be seen as the upper surface of a Penninic large indentation of the TW structure inside the Adriatic Plate. This view will be better explaned in a separate presentation by B. Lammerer of our TRANSALP Working Group.

*For the list of the members of the Transalp Working Group see the B. Lammerer's Abstract.

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