P-5 PRELIMINARY RESULTS ALONG THE SOUTHERN SECTOR OF THE TRANSALP PROFILE

L. BERTELLI [1], A. CASTELLARIN[2], R. FANTONI[1], C. PESSINA[1]
and THE TRANSALP WORKING GROUP
[1]*Eni SpA Agip Division, Via Dell'Unione Europea 3, 20097 San Donato Milanese, Italy*
[2]*Bologna University*

Abstract

This contribution concern with the first and preliminary results on the seismic reflection profile across the Eastern Alps, in the frame of the Austrian, German and Italian Trans-Alp Project.

GEOLOGICAL SETTING

The Eastern Alps, located to the east of the N Giudicarie Line, has been originated by polyphase compressional evolution of Tertiary age.

The oldest structural system corresponds to the Mesoalpine (Eocene) and early Neoalpine (Oligo-Miocene) compressional events, which originated the Dinaric structural system (NW-SE trending), recognised in the NE side of the Southern Alps.

The subsequent tectonic belt is the Valsugana Structural system, ENE-WSW trending, Serravallian – Tortonian in age. The intense activity of this compressional event is documented both by stratigraphic-structural data and by fission track studies which indicate uplifting of some 4 km in the hanging wall of the Valsugana overthrust between 12 and 8 Ma B.P.
The most external structures NE-SW trending are located in the Montello-Friuli zone which were generated by the Messinian-Pleistocene compressions (whose principal stress axis is NW striking) (figs. 1-3).

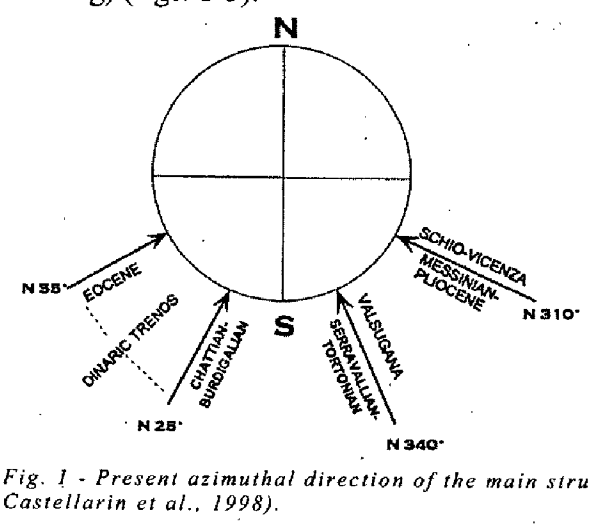

Fig. 1 - Present azimuthal direction of the main structural systems of the eastern Southern Alps (from Castellarin et al., 1998).

L.: tectonic line, lineament, overthrusting, transfer faults. S.: local structural system. B.: structural belt. Palmanova L. (PL); Udine L. (UD); Bernadia L. (BE); Sacile L. (SC); Bassano-Valdobbiadene-Montello L. (BVM); Caneva L. (CA); Pinedo-Avasinis L. (PAV); Barcis-Taro Selo L. (BT); Alto Tagliamento L.-Fella L. (ATF); Sauris L. (SA); Val Pesarina-Lozzo L. (VPL); Pontebba-Tarvisio L. (PT); Poludnig L. (PG); M. Zermula-M. Cavallo L. (ZC); Forni Avoltri-Ravascletto L. (FR); Croce di Comelico-Val Visdende L. (CCV); S. Candido-S. Stefano di Cadore L. (SCST); Val Bordaglia L. (VB); Dolomiti di Sesto S. (DS); Funes L. (FU); Falzarego L. (FZ); M. Parei-Col Becchei-Fanes S. (PB); Stava-Collaccio L. (ST); Marmolada-Antelao L. (MA); 'Giunzione Cadorina' (GA); Valsugana S. (VV); Val di Sella L. (VS); Colombarone klippe (C); Belluno L. (BL); Civetta L. (CI); Duron-Fedaia L. (VDF); Foiana-Mezzocorona S. (FMZ); Trento-Cles L. (TC); Calisio L. (CAL); Val d'Astico L. (VAS); Schio-Vicenza L. (SCHV); Castel Malera klippe (MA); Rovereto-Riva-Arco transfer zone (R); Recoaro zone (RE); Cima Marana L. (CM); 'Flessura Pedemontana' (FP); M. Pastelllo-Ala L. (PAL); Volta Mantovana L. (VM); Doss del Vento L. (DV); Tremosine-Tignale-Costa L. (TT); Giudicarie S. L. (GS); Val Trompia L. (VTP); Brenta Group S. (BR); Ballino L. (B); M. Baldo-M. Stivo-M. Bondone L. (MB); Sarca-Paganella L. (S); Molveno L. (MO); Pre Adamello B. (PA); Gallinera L. (GA).

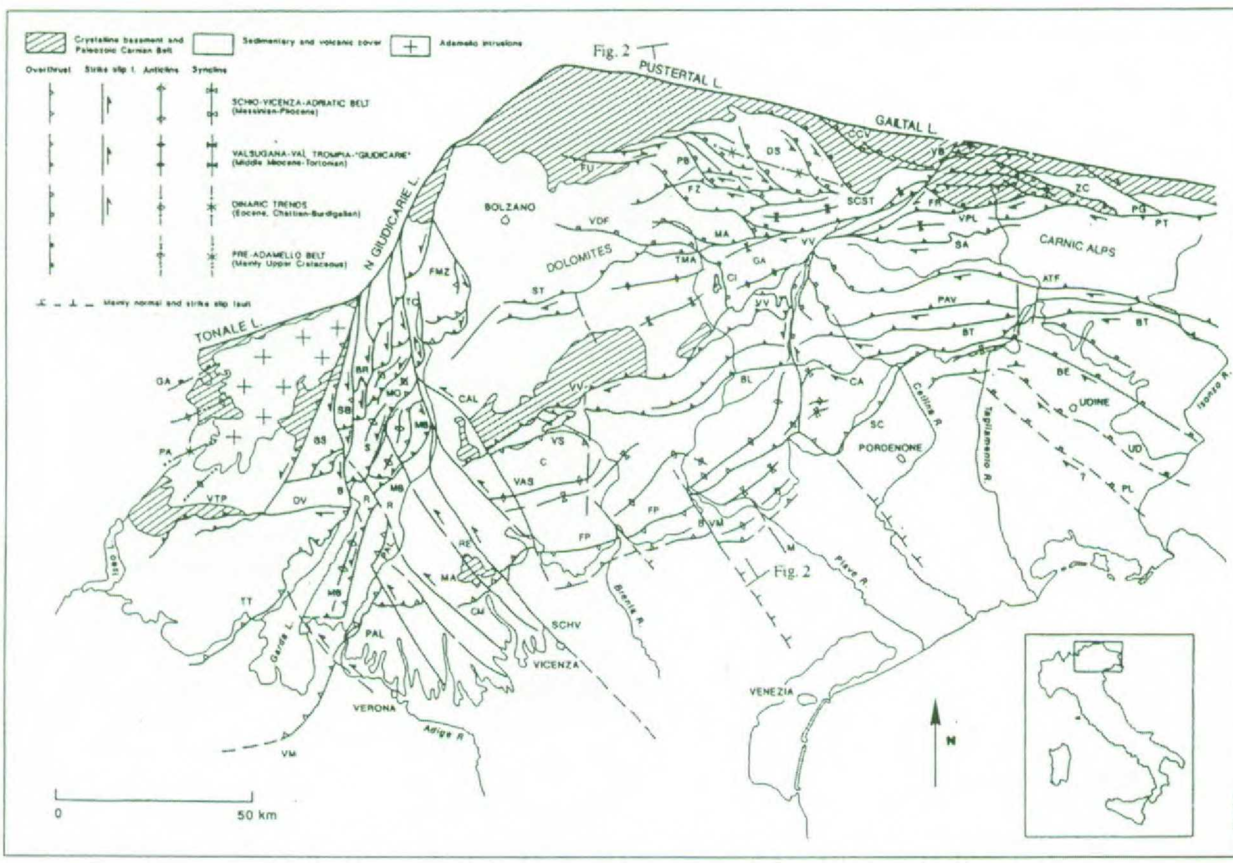

Fig.2 – Synthetic structural map of the eastern Southern Alps.

TRANSALP PROFILE

The Trans-Alp seismic reflection acquisition along the main line of the profile (about 350 km from Muenchen to Treviso) has been completed during the1999 campain.
The Italian contractor GEOITALIA (1998) acquired the southernmost part of the profile (about 50 km). The German contractor THOR (1998,1999) acquired the central and the northern part of the profile.

The basic parameters of the 1998, 1999 acquisition includes 130-fold average Vibroseis measurements combined with 2-fold recording of explosive source with a shot point spacing of about 5 Km and an average charge size of 10-30 Kg in 30 m deep holes (3 at least in each station).
The combined vibrator-explosive source has been selected following the positive experiences achieved in the Central Alps (NFP20-Swiss Profile) where the mixed source strategy proved to be effective for deepest lithospheric penetration. While recording the main vibrator-explosive profile some cross-line were also recorded to assure tridimensional control at selected locations.

On the southernmost part of the main north-south line, Geoitalia used four vibrators and a Sercel 368 system for recording a 360 active channels spread for the main line and 220 channels for the crossline. The nominal group spacing was 50 m. While rolling along the main profile, a Sercel 368 system was used to record the 220 channel fixed spread cross-line.
The cross-line recorded all Vibro and explosive shot/vibro points of the main line within certain offset ranges, as well as repeated off-end shots at the cross-lines.
Acquired data along the main profile have been preliminarly processed with a time processing flow that includes, after geometry assignment and QC, editing of the bad traces, first break picking for static corrections recomputation, T.V. filter, F-K filter, gap deconvolution before stack, pre-stack TV array simulation, pre-stack S/N attenuation, residual statics, preliminary velocity analysis, common offset DMO, final velocity analysis and 13000% stack.

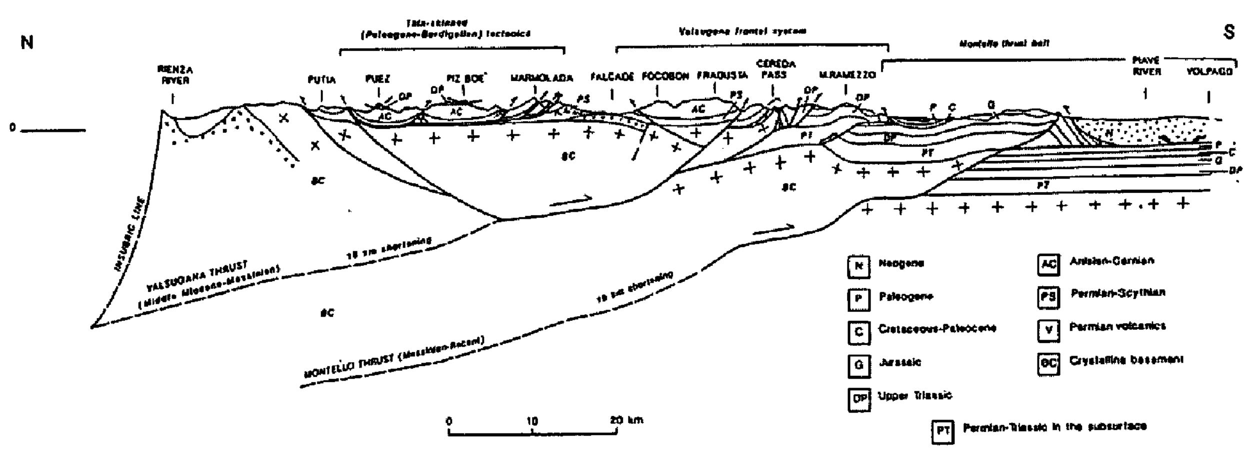

Fig. 3 – Geological section across the eastern Southern Alps from the Insubric Line to the Belluno area (from Castellarin et al., 1998)

PRELIMINARY RESULTS

The preliminary results of vibroseis in the Italian sector of the profile are mostly coherent with previous structural interpretations (fig. 3) and shows that along the foothill southern border of the orogenic chain, the Venetian foreland is thrusted by a large south-verging structure (S. Maria di Feletto-Montello Anticline), involving both the sintectonic Paleogene-Pleistocene clastics and the underlying Mesozoic carbonatic units (fig. 4).
To the north, in the adjacent structural belt of the Southern Alps the Mesozoic carbonatic units are thrusted along three main south-verging overthrusts (S.Boldo, Belluno and Valsugana lines). Which involve the underlying crystalline rocks of the metamorphic basement, largely outcropping in the Gosaldo-Agordo nucleus (Valsugana overthrust). These main trusts are decakilometrically spaced with about 10 km in shortening and 5 km in vertical displacement component, each one.
In the northern part of the Southern Alps (Dolomiti) the seismic profile shows the outcropping Triassic units affected by south- and north-verging thrusts whose surfaces involve the Variscan basement.

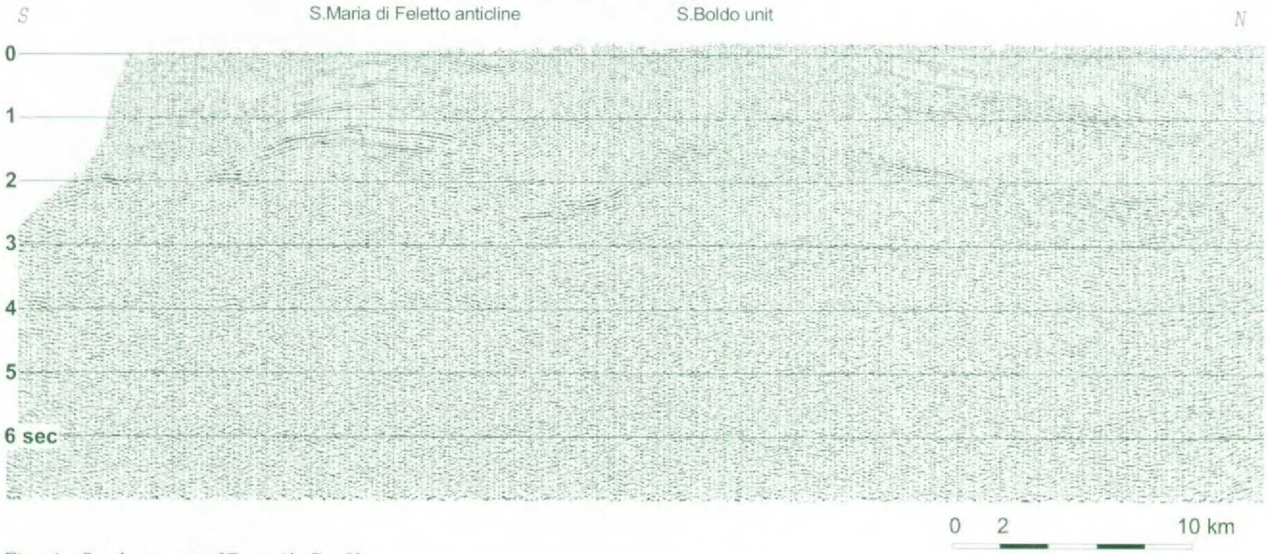

Fig. 4 – Southern part of TransAlp Profile

Although the Vibroseis penetration is generally rather modest, crustal reflectors are present at various depth on the lower part of the profile, but a more reliable trend in their geometries require the merge of vibroseis profile with the explosive data, whose penetration in depth is wider.

SELECTED REFERENCES

BRESSAN G., SNIDARNIC A. & VENTURINI C., (1998): Present state of tectonic stress of the Friuli area (eastern Southern Alps). Tectonophyisics, 292, 211-227.

CASTELLARIN A., SELLI L.,.PICOTTI V. & CANTELLI L., (1998): La tettonica delle Dolomiti nel Quadro delle Alpi Meridionali Orientali. Mem. Soc. Geol. It., 53, 133-143.

CASTELLARIN A. & CANTELLI L., (2000): Neo-Alpine evolution of the Southern Eastern Alps. Journal of Geodynamics, 30, 251-274.

DOGLIONI C., 1987. Tectonics of the Dolomites (Southern Alps Northern Italy). Journal of Structural Geology, 9, 181-193.

ROURE F. HEITZMANN P. & POLINO R., (1990): Deep structure of the Alps. Vol. Spec. Soc. Geol. It., N° 1, 1-367.

SCARASCIA S. & CASSINIS R., (1997): Crustal structures in the central-eastern Alpine sector: a revision of available DSS data. Tectonophyisics, 271, 157-188