Sessione 1 - Struttura e Geodinamica italiana: il progetto CROP
Presentazione orale

LINE CROP 04 - SOUTHERN APENNINES. GEOLOGICAL INTERPRETATION AND SECTION BALANCE

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The CROP 04 seismic line extends from Agropoli (Tyrrhenian coast) to Barletta (Adriatic coast) cutting across the entire thrust belt-foredeep-foreland system. The seismic line measures about 150 kilometres in length. The interpretation of the profile, object of our study, is based on a recent reprocessing of the seismic data down to 10 seconds TWT that has produced a final stack section showing a significant improvement in the data quality with respect to the previous obtained by a standard processing sequence (Mazzotti *et al.* 1999, 2000). Several wells located along the seismic line have provided important constraints for the identification of the geological structures both in the Apulia carbonates and in the Apennine allochthonous sheets. Commercial lines tied to the CROP 04 profile have contributed to improve the reconstruction of the subsurface structural architecture down to 5-6 seconds TWT. The interpreted time section has been depth-converted by means of the software GeoSec 4.2. We have attributed the following velocity values to the different rock units:
- 2200-2300 m/s to the Pliocene-Pleistocene deposits disconformably overlying the Apulia carbonates and unconformably covering the Apenninic nappes;
- 3000-3500 m/sec to the North-Calabrian, Liguride, Serra Palazzo and Daunia units, as well as to the Albidona formation;
- 5000-5500 metres to the Alburno-Cervati and Monti della Maddalena carbonates;
- 4000-4500 m/sec to the Lagonegro nappes;
- 5500 m/sec to the Apulia carbonates, including the Triassic evaporites;
- 4500-5000 m/sec to the Verrucano-like siliciclastic deposits underlying the Apulia carbonates (see Puglia 1 and Gargano 1 wells).

The depth-converted section has been structurally restored by means of GeoSec 4.2 until a balanced section of the buried Apulia carbonates has been obtained. Finally, the balanced section has been time-converted in order to check the correspondence between the reconstructed structures and the geometry of the seismic reflectors. Where the reconstructed geometry did not fit the observed reflectors, new operations of structural restoration have been performed.

Along the Adriatic margin of the mountain chain, the most remarkable tectonic structures crossed by the CROP 04 line are represented by the frontal ramp of the allochthonous sheets and by the San Fele antiformal stack. The geological features associated to the Apennine frontal ramp have been described in Patacca and Scandone (in press). The San Fele stack

consists of at least seven imbricates of rock units referable to the Lagonegro nappes. The San Fele 1 well penetrated these basinal deposits for 5315 metres without reaching the Apulia carbonates. The latter are supposed to form a ramp anticline at about 3 seconds TWT beneath the San Fele antiformal stack.

West of San Fele, the buried Apulia carbonates form as a whole an antiformal structures that reaches its culmination in correspondence to Monte Marzano. The top of the carbonates rises from a depth probably exceeding 5000 metres below sea level in correspondence to San Fele 1 to a depth slightly exceeding 3000 metres in correspondence to Monte Marzano. We have related this antiformal structure to an important thrust in the Apulia carbonates. The package of almost continuous, high-frequency reflectors rising from about 7 seconds TWT beneath the southern flank of the Alburni mountains to 4.5 seconds TWT beneath the Tanagro Valley corresponds, in our opinion, to the Permian-lower Triassic siliciclastic deposits that are supposed to have been transported in the hangingwall of the aforementioned thrust. The existence of these steep package reflectors fixes the depth of the base thrust of the Apennines at about 8 seconds TWT, which corresponds in the depth-converted section to a depth exceeding 20 kilometres below sea level.

Another important feature shown by the CROP 04 line is represented by continuous, strong reflectors below the Alburno-Cervati carbonates. This package of reflectors, roughly parallel to the top of the buried Apulia carbonates, is quite evident between the western termination of the seismic line and the northern margin of the Alburni Mountains at depths ranging from 3-4 seconds to 1-2 seconds TWT. We have attributed these reflectors to the Lagonegro units on the basis of regional considerations. This interpretation is strongly supported by stratigraphic data coming from the Acerno 1 well located at the northern margin of the Campagna tectonic window. This well crossed more that 3500 metres of basinal deposits referable to the Lagonegro units before reaching the Messinian evaporates on top of the Apulia carbonates at a depth of 3818 metres below sea level.

Current schemes in the recent geological literature postulate very modest displacements of the Apulia carbonates forming the buried duplex system. Our structural reconstruction, on the contrary, requires a remarkable telescopic shortening that agrees with the amount of Pliocene-Pleistocene forward transport of the allochthonous sheets and agrees with the amount of internal shortening of the roof units during the development of antiformal stacks in the Lagonegro nappes.

References

MAZZOTTI, PATACCA, SCANDONE, TOZZI. FIST Geoitalia, 2° Forum Italiano di Scienze della Terra, Riassunti, 1, 251-253 (1999).

MAZZOTTI, STUCCHI, FRADELIZIO, ZANZI, SCANDONE. Geophysics, 65(5), 1402-1417 (2000).

PATACCA, SCANDONE. In: G.B. VAI and I.P. MARTINI (Eds.) "Anatomy of a mountain: The Apennines and adjacent Mediterranean basins". Chapman & Hall Publ. (in press).