NEOGENE DEFORMATION IN THE CENTRAL ADRIATIC SEA

Adria represents a portion of relatively undeformed continental lithosphere rimmed on three sides by fold-and-thrust belts belonging to the Alpine orogen: to the west the E-verging Apennines, to the north the S-verging Southern Alps, and to the east the W-verging Dinarides. Adria, therefore, represents the foreland of these fold-and-thrust belts which loaded its lithosphere to originate a peripheral system of foreland basins. Convergence between Africa and Europe is still ongoing, as testified by the belt of earthquakes that surrounds the Adria promontory. Minor seismic activity occurs also within the foreland, and tectonic structures, not obviously related to the adjacent fold-and-thrust belts, have been reported in the central Adriatic Sea (Argnani et al., 1993; Argnani and Gamberi, 1995; De Aliteris, 1995; Argnani and Frugoni, 1997; Gambini et al., 1997). Not enough data, however, are available in the public domain, and the structural picture remains not well resolved, leaving room for rather different interpretations (e.g. Gambini et al., 1997 vs Bertotti et al., 2001).

The IGM acquired a grid of multichannel seismic reflection profiles in the central Adriatic Sea, that extends east of the Italian economic zone, with the objective to illustrate and characterise the deformation style in that region.

The grid of high resolution multichannel seismic profiles allows to outline the main tectonic structures of the central Adriatic.

Contractional structures represent the most common type of deformation observed on seismic profiles, typically with the appearance of upright, open folds with low amplitude and large wavelength (10-20 km). Elsewhere, folds are asymmetric, likely related to reverse faults, with smaller wavelength (5-10 km). The dominant tectonic trends are NW-SE to WNW-ESE and NE-SW to ENE-WSW. Asymmetric folds belong to the NE-SW trend; whereas open folds typically characterises the NW-SE trend and are more diffuse. Deformation is active until present over most of the central Adriatic Sea, although different structures are active at different time, defining a pattern of complex and diffuse deformation.

In some instances the WNW-ESE folds seem to be the lateral prolongation of the thrust-related folds occurring in the southern part of the Dinaride front, where contractional deformation is still active, as indicated by seismicity, and the direction of the frontal folds swings from NW-SE to almost E-W. The most convincing example is the Mizar-Jabuka allignment. Mizar well shows upper Triassic evaporites resting unconformably below about 500 m of Plio-Quaternary sediments, whereas early Jurassic gabbros outcrop at Jabuka rock. Further east, along the same allignment, fold axes in Korkula island show a similar WNW-ESE trend. This suggests that the WNW-ESE trends in the southern part of the Dinarides can be originated by reactivation of pre-existing faults, likely related to the Mesozoic extension. Folds and thrust are well developed where the Dinaride thrust front touches the pre-existing system, whereas reactivation is much reduced moving away from the thrust front, in the central Adriatic foreland, with the structures assuming a character of small push up folds, apparently cored by evaporites.

The stratigraphy encountered in the deeper wells of the central Adriatic indicates
the occurrence of a rifting event in the early Mesozoic (Argnani and Gamberi, 1995; Argnani et al., 1993). Tilted blocks originated by the Jurassic extension can be recognised in the northern and eastern side of the central Adriatic basin (Gambini et al., 1997; Cirilli et al., 2000), and it has been suggested that some of these faults have been tectonically inverted already in Aptian-Albian (Gambini et al., 1997). According to several Authors tectonic inversion continued through the Tertiary, originating pop-up structures and also diapirs in the central Adriatic (Argnani et al., 1993; De Alteriis, 1995; Gambini et al., 1997).

As an alternative to tectonic inversion, crustal-scale buckling has been recently proposed to explain the deformation of the central Adriatic (Bertotti et al., 2001). However, amplitude of pop-up structures is rather low and wavelength is in the order of 10-20 km, suggesting that crustal scale-buckling is unlikely. In addition, whereas anticlines are commonly observed, synclinal structures of comparable wavelength are not so common. Therefore, even assuming the buckling of a thinner package of rocks, decoupled along Triassic evaporites, this does not explain the observed structural geometry, as both synclines and anticlines should have similar wavelengths. The observed pattern is more suggestive of compressional reactivation of localised structures.

Altogether, diffuse deformation of small magnitude, the coexisting variety of structural trends, and the variable character of seismicity, all point to a deformation all point to a deformation that affected a previously structured volume of rocks.

REFERENCES

De Alteriis G.; 1995: Different foreland basins in Italy: examples from the central and southern Adriatic Sea. Tectonophysics, 252, 349-373.