PRESENT-DAY REACTIVATION IN THE EASTERN IBERIAN AND BALEARIC MARGINS: MESSINIAN AS VERTICAL MARKERS.

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Abstract
The offshore Eastern Spain and Balearic margin area is studied with seismic lines and bathymetric data. The aim of the study is to use the MSC markers (erosions and deposits) in order (1) to provide a complete scenario of the Crisis from land to deep basin and (2) to quantify the vertical movements and recent tectonics implications.
Keywords: Messinian, Tectonics, Balear Islands, Continental Margin

The Balearic area is located between two extensive basins, the Valencia Oligo-Miocene aborted rift to the North and the Algerian oceanic basin to the south. It is however the place of intense compressive activity as it has been affected by the Betic thrusts ([1], [2]), well known in the Ibiza and Mallorca Islands. The north of the Balearic promontory was during the Miocene a compressional front, whereas its southern border was the northern “passive or transform margin” of the Algerian basin ([3], [4]). From the Tortonian to now on, the northern edge of the Balearic promontory seems to have been affected mostly by extension. In southeastern Spain, the Western Internal Betics Ranges are actually affected by deformation like strike-slip, thrusts faults and uplift and by an important seismicity, as well as the adjacent Alboran Sea ([5], [6]). Between the Alicante Margin and the Ibiza Margin a strait connects the Valencia Trough and the Algerian Basin. An important work [5] studied the Present day deformation in the Alicante Region and showed a recent reactivation of the structures. Offshore, we show that the Eastern Margin of South Spain and south Balearic margin are also submitted to inversion. A dense net of seismic lines is used and the structural information is correlated with the very accurate multibeam maps that have been acquired [7] and show highs correlated to uplifted Miocene and/or Plio-Quaternary units. For example, a 650 m bathymetric high (150 m high relative to the surrounding seafloor, "El Cid" High) forms an E-W threshold between the La Nao Cape and Ibiza, also
observed by the seabeam map ([8]; figure 1).

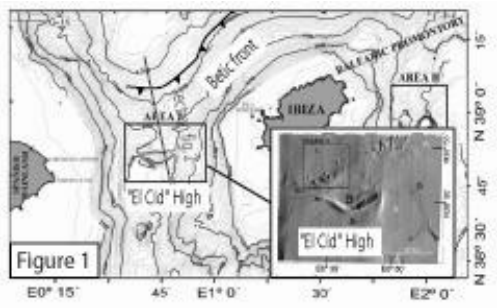

Fig. 1. Bathymetric map and sonar between the Eastern Spain and Ibiza Island, from [8].

The Messinian unconformity between Miocene and Plio-Quaternary units is well marked in the area (M on figure 2). It has been followed and mapped from the Valencia Basin to the Algerian Basin through the high Balearic area and is a precious chrono-stratigraphic marker of the end of the Miocene. The El Cid fold is E-W elongated, in that parallel to the Betic front. The Betic front clearly predates the actual deformation, as shown by the Messinian unconformity that sealed the deformation. Figure 2 shows the proximity of structures deformed before the Messinian Salinity Crisis (MSC) and structures deformed after. Uplift can be important as eroded Miocene units and even MSC units can reach the sea-floor. The MSC resulted in the Balearic promontory not only in erosions but also in thin depositional units (combination of clastic, fluvio-lacustrine sediments, reworked material and/or evaporites?) that can be compared to the ones deposited in the Valencia Basin [9]. Those thin deposits are distributed in several small basins between Valencia and Algerian Basins. An isobaths map of the base of the Pliocene units (Maillard et al., in prep) shows that the area is however shallower than the Valencia area. The MSC markers must thus record the recent tectonics that uplifted the area. The location of these basins should however question the relationship between deep basin evaporites and marginal evaporites. The studied area is well located because it records the MSC continuously from the land (evaporites in Salinas area, Bajo Segura Basin) to the deep basin, and from the intermediate depth basin (Valencia) to the deep basin (Algerian). The observations in this area provide a new basis to discuss not only the development of the MSC, but also the reconstruction of the uplifted and compressive structures in this area since 5 millions years. One important point is to understand how the compressional stress transmits from Algerian margin to Eastern Spain through the thinned continental crust of the Alboran Sea once, but also through, which is more complex, the Algerian oceanic crust.

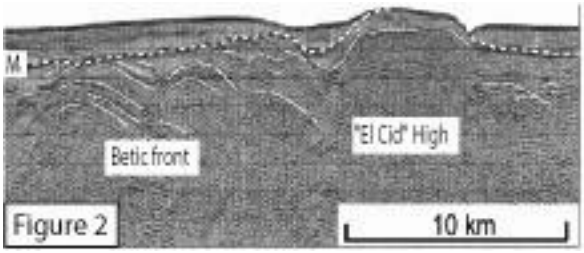

Fig. 2. Seismic line between the Eastern Spain and Ibiza Island showing the pre-MSC (Betic front) and post-MSC ("El Cid" high) deformation.

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