

HIGH-RESOLUTION IMAGING OF THE CARBONERAS FAULT ZONE ON THE ALMERIA MARGIN (NE ALBORAN SEA): PALEOSEISMIC IMPLICATIONS

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Abstract

The South Iberian Margin is located at the convergence of the European and African plates, where large magnitude earthquakes in Western Europe take place. Based on data from Spanish and European programs, we identified several active structures which are potential sources of large magnitude earthquakes and tsunamis ($M_w > 6$) (1). We plan to undertake a paleoseismological onshore-offshore integrated study of the Carboneras Fault (Almería Margin). This is the best approach to accurately determine the past activity and seismic parameters of active faults (geometry, slip rate, maximum event magnitude, recurrence interval and time elapsed since the last earthquake). These parameters are of paramount importance to assess seismic hazard models in the Iberian Peninsula, especially when considering large magnitude earthquakes and long recurrence intervals (10^3 - 10^4 years).

Keywords: TOBI sidescan sonar, active faulting, turbidite system, Western Mediterranean

The continental margin south of Almería, located at the NE part of the Alboran Sea (Western Mediterranean), is a complex and active area characterized by recent swarms of superficial earthquakes with magnitudes ranging from M_w 5.1 and 4.7 (2). With the main objective of identifying active structures potentially generators of earthquakes, we recently surveyed this area in the frame of the HITS project (3). During the HITS cruise carried out onboard the *BIO Hesperides* in September 2001, a multidisciplinary dataset comprising high-resolution (6 m) TOBI sidescan sonar from the Southampton Oceanography Centre (UK), Simrad EM12S swath bathymetry and backscatter, TOPAS sub-bottom profiler, and gravity data were acquired. This high-resolution dataset, exhibiting a range of acoustic facies, fully covers an area of approximately 33.3 x 100 km in water depths ranging from 80 m to 1700 m, and provides new insights into the control of neotectonic structure on the Plio-Quaternary sedimentary architecture of the Almería turbidite system.

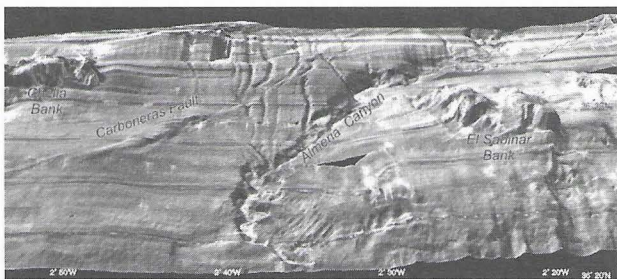


Fig. 1. Bathymetry superimposed on the high resolution TOBI sidescan sonar mosaic of the SE Spanish Margin, where we can easily identify the submarine prolongation of the left-lateral Carboneras Fault, tributary channels and Almería Canyon and turbidite system.

The Almería Canyon is a meandering channel system (4) showing steep slopes over most of its course (up to 17%), and confined between the Cabo de Gata Spur, Chella and El Sabinar Banks carbonate platforms, imaged as high-reflectivity areas in the TOBI mosaics. North of $36^{\circ}26'N$, the upper to middle part of the canyon parallels the submarine continuation of the Carboneras Fault Zone, following a N47 trend, whereas south of it, the canyon meanders downslope with a net N-S trend. At latitude $36^{\circ}26'N$, the 60 km long left-lateral Carboneras Fault shows a positive topography on the seafloor which suggesting a transpressional flower-structure, and offsets (about 2.5 km) into two segments: a northern N47-trending segment and a southern N60 trending segment. The fault also modifies locally the trend of tens of sub-rectilinear highly incised gullies and channels which converge feeding into the Almería Canyon. Slope instability features and mass wasting deposits (headscarps, detached blocks and debris flows) are commonly observed on the flanks of the banks and especially south of the El Sabinar Bank. They might be associated with the seismic activity taking place along this margin.

The assessment of seismic risk in the region is largely based on the relatively short period of instrumentally recorded earthquakes

(e.g., 5). Forthcoming work, in the frame of the National project IMPULS and ESF-Eurocores EuroMargins WESTMED project, will be based on onshore-offshore paleoseismic analysis and sedimentary record preserved in deep-sea cores, devoted to determining the past activity of the faults along the south Iberian Margin and to calculating their slip and recurrence rate.

Acknowledgement : The authors are grateful for funding from MCYT Acción Especial HITS (REN2000-2150-E), European Commission EASSS-III programme (HPRI-CT99-0047), and Spanish national project IMPULS (REN2003-05996MAR). We thank the captain and crew on board the R/V *Hesperides*, and particularly the UTM-CSIC technical staff and TOBI Team from the Southampton Oceanography Centre (UK) for their assistance throughout the data collection.

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