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Active tectonics along the offshore Carboneras Fault (SE Iberian Margin): High-resolution seismic characterization and paleoseismic signature

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The southern margin of the Iberian Peninsula hosts the convergent boundary between the European and African Plates. At the eastern Betic Cordillera, the Neogene and Quaternary shortening has mainly been absorbed by left-lateral strike-slip faults, which in the Iberian Peninsula is represented by the Eastern Betics Shear Zone (EBSZ) [1]. One of the longest structures in the EBSZ is the Carboneras Fault, with almost 50 km onshore and more than 100 km offshore [2]. The low record seismicity along its trace, suggest either non seismic behaviour or long recurrence intervals (10^4 years), but onshore paleoseismological data reveals this fault is seismogenic with at least four late Quaternary events [3]. HITS 2001 cruise data (swath-bathymetry, deep-towed sidescan sonar TOBI and High Resolution Sub-bottom profiler TOPAS) show the seafloor morphology along the Carboneras Fault as an up warped 5-10 km wide deformation zone bounded by subvertical faults. Geomorphic features, usually found on strike-slip faults onland, suggest a left-lateral shear deformation with a vertical slip component [2]. In order to determine the past activity and seismic parameters of the Carboneras Fault offshore, the IMPULS 2006 marine cruise [4] was carried out on board the RV Hesperides, acquiring a total of 46 high-resolution multichannel, single channel and magnetic profiles; up to 60 TOPAS sub-bottom profiler, gravimetric, swath bathymetry/backscatter together with five gravity cores along the offshore

Carboneras Fault and associated structures in the Almería Margin. High-resolution MCS profiles across the Carboneras Fault allow us to investigate the shallow geometry, structure and tectonic variability along the Carboneras Fault Zone, Preliminary observations of the N-S succession of seismic profiles show large morphostructural variability along the main trace of the fault: flower structures morphologies in the shelf zone, underlapping restraining step-over in the central segment, and buried pressure ridges in the south segment. Closely spaced TOPAS profiles give us an idea of the vertical geometry of the fault just under the surface. TOPAS profiles show fault scarps, displaced reflectors (faulted layers and faulted mass-transport deposits) and horizons sealing faulted layers. The main objective of the coring survey was to sample and subsequent dating the specific horizons identified on the TOPAS profiles. Sampling of the most recent units (Holocene to Late Pleistocene) will give us a sediment rate and a fine chronology for these specific horizons. This will allow us to calculate a Late Quaternary vertical slip rate of the marine segments of the Carboneras Fault and to estimate a recurrence interval of past earthquakes. These parameters are of paramount importance to assess seismic hazard models in the Iberian Peninsula, especially when considering high magnitude earthquakes and long recurrence intervals (104 yrs). [5, 6, 7, 8].

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