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Seismic evidence of active strike-slip faulting in the Horseshoe Abyssal Plain (SW Iberian Margin)

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The SW margin of the Iberian Peninsula hosts the present-day NW-SE plate convergence between the European and African Plates at a rate of 5 mm/yr. The convergence is accommodated over a wide and diffuse deformation zone characterized by a moderate and widespread seismic activity. Nevertheless, some of the largest events in Western Europe occurred in the outer Gulf of Cadiz (GC), such as the 1755 Lisbon Earthquake and Tsunami (Mw 8.5) and the 1969 Horseshoe Earthquake (Mw 7.0). Recent estimations of depth and seismic moment tensors (Mw 3.8 to 5.3) from time domain inversion of near-regional waveforms show reverse and strike-slip faulting solutions between 6 and 60 km depth in the SW Iberian margin. However, no seafloor morphology and structures consistent with this geometry have been identified yet. During the SWIM 2006 cruise swath-bathymetry, High Resolution Sub-bottom profiler TOPAS and 16 multichannel seismic reflection lines (MCS) data were acquired on board of the RV Hesperides covering the active structures in the external Gulf of Cadiz. Next, we performed a pre-stack depth migration in 9 of the 16 MCS profiles at the IFM-GEOMAR (Kiel) using a velocity model obtained by a depth-focussing error analysis of the MCS data. The swath-bathymetry shows a 160km long strike-slip WNW-ESE lineament located at 35.3-35.8 N and 9-11 W. To characterize this transference zone in depth, we present 5 NNW-SSE MCS profiles (SW3, SW12, SW14, SW15, SW16),

2 of them pre-stack migrated, extending oblique-along to the lineation. Besides, we show 1 NNE-SSW pre-stack depth migrated profile, SW07, across to the lineation. The MCS data show detailed images of the transference zone cutting laterally the continuity of the reflectors at least until 10 km depth and reaching up to the surface. The active strike slip zone is about 4 km wide and some vertical component is also observed. The surface evidence of pushing up forces in the fault area is a vertical relief of up to 80 m high. In addition, focal mechanisms of the instrumental seismicity recorded along structure by other authors indicate that the motion is dextral strike-slip.
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