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Strain partitioning and westwards migration of deformation in NW Gulf of Cadiz (Africa-Iberia plate boundary)

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The Gulf of Cadiz (West of the Gibraltar Strait, offshore SW Iberia and NW Morocco), has been increasingly recognized as a critical site for the understanding of a broad spectrum of geological phenomena, namely concerning the tectonics related to the Africa (Nubia)-Iberia plate boundary, and the characterization of the associated main seismogenic/tsunamigenic structures, such as the one responsible for the 1755 Great Lisbon Earthquake.

We present an up-to-date tectonic map of the NW Gulf of Cadiz area (Terrinha et al., submitted), where the main morpho-tectonic structures are geometrically characterized, mostly based on the available MCS seismic reflection data, and on high resolution multi-beam swath bathymetry. Moreover, taking into account both the average direction of the Maximum Horizontal Stresses (SHmax) and recently reported geodetic models, we attempt a coherent interpretation of the kinematic/dynamic chronologic evolution of some of these structures, adding to the above data the results of analogue modelling experiments, focusing on the deformation on a soft sedimentary cover caused by underlying basement strike-slip faulting.

We conclude that: (i) deformation in the study area is being partitioned in two fault systems (approximately NNE-SSW thrust faults, and E-W right lateral strike-slip faults); (ii) these active faults were successively re-worked by the Triassic through Early Cretaceous rifting, and Late Cretaceous through Miocene polyphase tectonic inversion; (iii) the thrust deformation front in NW Gulf of Cadiz is migrating westwards, away

from the Betic-Rif frontal orogenic arc, accommodated by a 300 km long en echelon fault system comprising the Horseshoe Fault, the Marques de Pombal Fault and the Tagus Abyssal Plain Fault; and (iv) this fault system is capable of producing major earthquakes, such as the Lisbon 1755 earthquake, alone or in association with other fault systems by means of complex rupture processes.