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Imaging the Gibraltar Arc system across the Alboran Sea and South Balearic Basin (South Iberia): Results of the TOPOMED-GASSIS cruise

C. R. Ranero (1), E. Gràcia (2), and T h e TOPOMED-GASSIS cruise party ()

(1) Barcelona Center for Subsurface Imaging, ICREA at CSIC, ICM-CSIC, Barcelona, Spain (cranero@icm.csic.es, +34-(0)93-2309555), (2) Barcelona Center for Subsurface Imaging, UTM-CSIC, Barcelona, Spain

Collision between the African and Eurasian plates is currently resolved through a diffuse deformation zone in the region of the southern Iberian Peninsula and north Africa. Crustal deformation is mainly driven by the NW–SE, slow 4-5 mm/yr convergence that is partitioned among numerous active faults. The strain distribution in many structures is characterized by low to moderate seismicity (typically < Mw 5), although historical records indicate that large and even great earthquakes may have also occurred. Typically, the faults that have caused the large historical events are not yet clearly identified, or are poorly characterized.In the frame of the European Science Foundation Eurocores TopoEurope, the TOPOMED Collaborative Research Project has carried out the GASSIS (Gibraltar Arc System Seismic Investigations Survey) cruise onboard the Spanish R/V "Sarmiento de Gamboa" in September – October 2011. The main objective of the GASSIS cruise was to characterize the structure of the entire Gibraltar Arc system from the frontal imbricated units of the Gulf of Cadiz, across the west Alboran Sea Basin, the east Alboran Sea Basin and volcanic zone, and South Balearic Basin. The cruise aimed at imaging the crystalline crust structure, sedimentary basin structure, Moho boundary geometry and character, and eventual uppermost mantle structures. The scientific goals of the project include understanding the geodynamic evolution of the region, the relationship of shallow and deep processes, to study the processes of basin formation, and to map and investigate large active fault systems. Active fault systems were considered a priority when designing the cruise tracks because they represent a seismic and tsunami hazard for the surrounding coasts of Iberia and North Africa. These project goals have been undertaken in two consecutive cruise legs using the new seismic equipment of the "Sarmiento de Gamboa" including a 5.3 km (leg 1) and 6-km-long (leg 2) solid-state digital multichannel streamer (480 channels) and 2 G-II gun arrays totalizing 4600 c.i. fired every 50 meters at 2000 p.s.i. (140 bar) of pressure. The data images the deep structure of previously fairly unexplored regions of north Africa (Morocco and Algeria) and south of Spain. We present a selected set of post-stack time migrations of multichannel seismic profiles processed imaging the main fault systems across the region.