

Seismic structure of the passive continental margin of SE Spain and the SW Balearic promontory, Western Mediterranean Sea

David Pesquer (1), Ingo Grevemeyer (1), Cesar R. Ranero (2), Josep Gallart (3)

(1) Leibniz Institute of Marine Sciences, IFM-GEOMAR, Kiel, Germany (email: dpesquer@ifm-geomar.de)

(2) Instituto de Ciencias del Mar, CSIC, Barcelona, Spain

(3) Instituto de Ciencias de la Terra J. Almera, CSIC, Barcelona, Spain

The Western Mediterranean Sea is a natural laboratory to study the processes of continental extension and rifting in a convergent setting. Gravitational collapse due to tectonic thickening of continental lithosphere and the rollback of a subducting oceanic slab during the latest phases of consumption of the Tethys ocean have led to rapid Neogene extension in an area characterized by a constant convergence of the African and European Plates since Cretaceous time, rifting Spain/Balearic Islands from Algeria, causing passive continental margins on both sides of the Western Mediterranean Basin. Unfortunately, little is known about the crustal and upper mantle structure of much of the area, including the Algerian-Balearic Basin and the Spanish/Balearic margin. Here we present results from two onshore/offshore seismic refraction and wide-angle lines surveying the Spanish passive continental margin to the south of the town of Alicante and the southwest of the Balearic promontory to the south of Ibiza. The data were acquired during the cruise M69/2 of the German research vessel METEOR in September of 2006. As seismic source we used two 32-litre BOLT airguns, providing seismic offsets of 30 to 80 km, including wide-angle reflections from the crust/mantle boundary zone (seismic Moho) along both survey lines. Profile P03 approaching Alicante had 20 ocean bottom receivers and 10 landstations; profile P04 had 6 landstations on Ibiza and 22 offshore stations. Both lines extend roughly 100 km into the Algerian-Balearic basin, yielding for the first time constraints on the nature of the crust covering the seafloor between Spain and Algeria. Crust in the Algerian-Balearic basin is roughly 6 km thick and the seismic velocity structure mimics normal oceanic crust. Seismic Moho in the Algerian basin occurs at ~11 km below sea level, reaching >24 km under SE Spain and Ibiza. Profile p03 off Alicante reveals a narrow continent/ocean transition zone while the SW Balearic promontory at Ibiza is characterized by a much wider transition zone. Both transition zones, however, did not provide any evidence for velocities intermediate between lower crustal and upper mantle rocks, representing magmatic under plating or lower crustal intrusions as typical for volcanic margins. Thus, margins in the Western Mediterranean Sea belong to the class of so call non-volcanic margins.