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Rifting of the Tyrrhenian Basin, a complex interaction among faulting , magmatism and mantle exhumation.

C. R. Ranero (1), V. Sallarés (2), I. Grevemeyer (3), N. Zitellini (4), M. Guzman (5), M. Prada (2), S. Moeller (3), R. de Franco (6), and T h e MEDOC 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, (3) GEOMAR | Helmholtz Centre of Ocean Research, Kiel, Germany, (4) ISMAR. CNR. Via Gobetti 101 - 40129 - Bologna – Italy, (5) Barcelona Center for Subsurface Imaging, ICM-CSIC, , Barcelona, Spain (cranero@icm.csic.es, +34-(0)93-2309555), (6) IDPA. CNR, Milan, Italy

The Tyrrhenian basin has been created during the extension of continental lithosphere driven by the retreat of a Ionian slab across the mantle. The basin does not seem to be actively extending, but its preserved crustal structure provides information of the time evolution of the processes involved in rifting. The basin rifted from north to south, with rifting stopping after progressively larger stretching factor towards the south. The northern region stopped opening after a relatively low extension factor. Towards the south extension increased up to full crustal separation that produced mantle exhumation. The final structure displays two conjugate margins with asymmetric structures. Thus, the basin provides a natural laboratory to investigate a full rift system, that displays variable amounts of extension.

We present observations from a two-ship seismic experiment that took place in spring 2010. The cruise took place on two legs. In the first leg, the Spanish R/V Sarmiento de Gamboa and the Italian R/V Urania collected five E-W trending wide-angle seismic (WAS) profiles across the entire basin using 17 Ocean Bottom Seismometers and 25 Ocean Bottom Hydrophones and a 4800 c.i. G-II gun array. The profiles were extended with land stations that recorded the marine shots. During a second leg the R/V Sarmiento de Gamboa collected 16 Multichannel Seismic Reflection (MCS) profiles using a 3.75 km-long streamer and a 3000 c.i. G-II gun array. MCS profiles were acquired coincident with the WAS profiles, and a number of additional lines concentrated in the central region of the basin where mantle exhumation took place. The seismic profiles were located to cover regions of the basin that displays different amount of extension, and the coincident wide-angle and MCS transects cross the entire basin to image the two conjugate margins.

In this presentation we compare observations from different transects mapping the structures produced at different extension factors. A comparison of the different transects permits to trade space (different transects mapping different extension factors) for time (different transects provide an evolutionary snapshot of the extension process). Each transect provides the tectonic structure, the geometry of sedimentary deposits, and P-wave seismic velocity distribution. This information allows to interpret the mechanisms of deformation, infer the importance and potential role of magmatism in the rifting process, and estimate the region of mantle exhumation, currently inferred from one drill site. The analysis of the data provides insight in the process of formation of asymmetry structure conjugated margins.