



Magmatic and non-magmatic history of the Tyrrhenian backarc Basin: new constraints from geophysical and geological data

Manel Prada (1), Valenti Sallares (2), Cesar R. Ranero (3), Nevio Zitellini (4), and Ingo Grevemeyer (5)

(1) DIAS, Geophysics Section, Dublin, Ireland (mprada@cp.dias.ie), (2) Barcelona Center for Subsurface Imaging, ICM, CSIC, Barcelona, Spain, (3) Barcelona Center for Subsurface Imaging, ICM, ICREA at CSIC, Barcelona, Spain, (4) Istituto di Scienze Marine, ISMAR-CNR, Bologna, Italy, (5) GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany

The Western Mediterranean region is represented by a system of backarc basins associated to slab rollback and retreat of subduction fronts. The onset of formation of these basins took place in the Oligocene with the opening of the Valencia Through, the Liguro-Provençal and the Algero-Balearic basins, and subsequently, by the formation of the Alboran and Tyrrhenian basins during the early Tortonian. The opening of these basins involved rifting that in some regions evolved until continental break up, that is the case of the Liguro-Provençal, Algero-Balearic, and Tyrrhenian basins. Previous geophysical works in the first two basins revealed a rifted continental crust that transitions to oceanic crust along a region where the basement nature is not clearly defined. In contrast, in the Tyrrhenian Basin, recent analysis of new geophysical and geological data shows a rifted continental crust that transitions along a magmatic-type crust to a region where the mantle is exhumed and locally intruded by basalts. This basement configuration is at odds with current knowledge of rift systems and implies rapid variations of strain and magma production. To understand these processes and their implications on lithospheric backarc extension we first need to constrain in space and time these observations by further analysis of geophysical and geological data. Here we present two analyses; the first one is focused on the spatial variability of magmatism along the Cornaglia Terrace axis, where magmatic-type crust has been previously interpreted. The comparison of three different seismic refraction transects, acquired across the basin axis from North to South, allows to infer that the highest magmatic activity occurred beneath the central and most extended region of the terrace; while it was less important in the North and almost non-existent in the South. The second analysis focuses on the presence of exhumed mantle in the deepest region of the Tyrrhenian, previously interpreted by other authors as oceanic crust. In this case, converted S-waves were used to derive the overall V_p/V_s and Poisson's ratio, as well as S-wave velocity of the basement. The results show values in agreement with serpentinized peridotite, rather than gabbro/diabase, in agreement with our first observation that the mantle is exhumed beneath this particular area of the basin. Then, we used P-wave velocity models to quantify the amount of hydration, which appears to present a depth distribution similar to Continent-Ocean Transition zones at magma-poor rifted margins. These results, together with basement sampling information of MOR-type and intraplate magmatism in the area, suggests that the late stage of mantle exhumation was accompanied or soon followed by the emplacement of MOR-type basalts forming low ridges that preceded intraplate volcanism responsible for the formation of large volcanos in the area. The results presented here demonstrates that the Tyrrhenian Basin has a complex 3D structure within the Mediterranean realm that deserves further exploration of its formation processes by means of numerical modelling.