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The tectonic and sedimentary structures of the Tyrrhenian rifted basin from multichannel seismic images

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The Tyrrhenian basin has developed during the Neogene in a convergence setting between the Nubian and the European plates. The aim of this work is to unravel at basin-scale, the geological processes that have been working during the last 15 M.y. and giving the current structures.
Data used in this study consist in a serie of multichannel seismic profiles acquired during the MEDOC survey with the Spanish R/V Sarmiento de Gamboa in 2010. These profiles have been processed to obtain images of the crustal structure. These seismic sections have been calibrated with data from some drillings from ODP (Oceanic Drilling Project) and DSDP (Deep Sea Drilling Project), for the identification of the main sedimentary units. In addition, this information has been integrated with full coverage multibeam bathymetry of the basin that permits to map the lateral extension of the main structures imaged in the seismic data.
The seismic lines cross the entire basin at locations designed to provide images of the main tectonic units. The basin presents a strong lateral heterogeneity in the internal structure of the basement that may indicate lateral changes in its nature. The distribution of the sedimentary depositional centers, their size and thickness is also variable.
We observe a transition from little extension in the northernmost region of the basin, to an increasing amount of extensions southeastwards, where extension has proceeded and may have lead to full crustal separation and mantle exhumation at the time of rifting.
The conjugated margins show an asymmetric distribution of the extension and the relationships between faulting and sedimentary deposits. On the west side, the faults bound the largest sedimentary sub-basins in the Thyrrhenian, and conjugate side displays more dense faulting, but the faults have smaller offset, and lateral continuity implying smaller amounts of extensions. The sub-basins at this side are shallow and spatially restricted. The discontinuous nature of the deposits in gravens and half-gravens makes the correlation of sedimentary units difficult.
The data shows that the basin crustal structure and the distribution of sedimentary deposits have been controlled by early extensional tectonics. Subsequent magmatism may have even dominated over tectonic stretching and finally the systems changed to produce crustal break up and mantle exhumation without no melting related to the extension.