



Late Miocene heterogeneous extension at the Algero-Balearic and East Alboran basins (Western Mediterranean)

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We present four deep multichannel seismic (MCS) reflection lines, multi parametric echo-sounder profiles and bathymetric data at the transition between the east Alboran and the Algero–Balearic basins obtained during the TOPOMED-GASSIS seismic survey. The crustal transition between the east Alboran and the Algero-Balearic basins was driven by late Miocene back-arc magmatic accretion and east-directed faulting that led to the opening of Algero-Balearic basin. However, to the north and south of this region, at the Betics and the Algerian margin, low-angle normal faults and listric fans with westward-directed extension, related to slab tearing and edge delamination, accommodated extension. This heterogeneity in extensional styles and transport sense was accommodated by large transfer faults like the Carboneras sinistral fault to the north and the Yusuf dextral fault to the south. These faults separate regions with different crustal structure and thickness. Crustal thinning occurs without fault-block structures at the Palomares margin, suggesting that ductile stretching and magmatic intrusion/accretion accommodated extension during the Serravallian and the Tortonian. In contrast, at the Algerian margin extension was accommodated by a westward-directed listric fault-system with minor conjugate faults that cuts through the entire crust, detaching at the Moho discontinuity at depths between 7 and 9 s TWTT. These faults produce eastward tilting of large crustal blocks and crustal necking. The Moho reflections deepen westward from 6.5 to 10 s TWTT in ~ 30 km describing a flat-ramp geometry. Furthermore, MCS lines highlight the occurrence of two fault-related large depocenters infilled by Tortonian to Plio-Quaternary sediments separated by a volcanic high, probably corresponding to an accretion center (NE Cabliers Bank). The depocenter sedimentary infill indicates an age between the Tortonian to early Messinian for the listric normal-faulting at the Algerian margin.