Active transfer fault zone linking a segmented extensional system (Betics, southern Spain): insight into heterogeneous extension driven by edge delamination in the context of Africa-Europe convergence.

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Pliocene and Quaternary tectonic structures mainly consisting of segmented northwest-southeast normal faults, and associated seismicity in the central Betics do not agree with the transpressive tectonic nature of the Africa-Eurasia plate boundary in the Ibero-Maghrebian region. Active extensional deformation here is heterogeneous, individual segmented normal faults being linked by relay ramps and transfer faults, including oblique-slip and both dextral and sinistral strike-slip faults. Normal faults extend the hanging wall of an extensional detachment that is the active segment of a complex system of successive WSW-directed extensional detachments which have thinned the Betic upper crust since middle Miocene. Two areas, which are connected by an active 40-km-long dextral strike-slip transfer fault zone, concentrate present-day extension. Both seismicity distribution and focal mechanisms agree with the position and regime of the observed faults. The activity of the transfer zone during middle Miocene to present implies a mode of extension which must have remained substantially the same over the entire period. Thus, the mechanisms driving extension should still be operating. Both the westward migration of the extensional loci and the high asymmetry of the extensional systems can be related to edge delamination below the south Iberian margin coupled with roll-back under the Alboran Sea; involving the asymmetric westward inflow of astenospheric material under the margins.