

The Betic-Gibraltar-Rif System: a Squeezed Plate Boundary

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The Alcapec (Alboran-Kabylies-Peloritan-Calabria) tectonic domain model has been conventionally used when trying to interpret the geodynamics of the arcuated orogenic belt constituted by the Betics, Arc of Gibraltar and Rif as well as the enclosed Alboran Basin. This model suggests the existence of a relatively large continental block attached to the NE Iberian margin during the early Oligocene that dismembered in smaller pieces that formed the present day allochthonous terranes cropping out along the western Mediterranean region. In this model the Alboran block would have travelled a large distance to the SW and then W to finally collide with the SE margin of Iberia and NW margin of Africa. Questions like the original shape of the Alboran block, its detailed path of motion, how this motion fits with the general evolution of the western Mediterranean, what is the structure behind the fast moving Alboran Block, what is the geodynamic mechanism that triggered the rapid westwards motion of the block are difficult to answer and are currently ignored.

We present a new evolution model for the arcuated Betics- Arc of Gibraltar-Rif orogenic belt and its Alboran back arc basin that tries to fit the bunch of published geological and geophysical results that are difficult to interpret with previously proposed models. Our interpretation is supported by surface geology and especially by the map distribution of the basement rocks in both the SE margin of Iberia and the NW margin of Africa, the timing of the complex tectonic, magmatic, and metamorphic evolution in both the Betics-Arc of Gibraltar- Rif orogenic belt and its back arc Alboran basin, the present highly irregular geometry of the two margins, the present day crustal and lithospheric structure and the proposed plate-scale reconstructions of the Iberia-Africa boundary, especially at the onset of African northern convergence in Late Cretaceous times.

We discuss the evolution model based on four main geodynamic scenarios: a) Late Cretaceous at the onset of N to NNW African convergence; b) Oligocene when first limited foreland basins formed in front of advancing thrusting in the Betics; c) early Miocene to late Miocene during the westwards motion of the Arc of Gibraltar and allochthonous tectonic units in the Gulf of Cadiz; and d) from late Miocene to present to show the change in tectonic regime in the entire area as well as the present deformation taking place along the Iberia-Africa boundary.