

Tethys-Atlantic reconstructions along Iberia-Africa boundary: implication for Pyrenean reconstructions

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Assessing the detailed movements of tectonic micro-plates involves serious difficulties because of their ability to move independently from the large limiting plates and due to the large-scale vertical axis rotations they can experience. The Iberian plate located at the western boundary of the Tethys Ocean in Mesozoic and early–mid Tertiary times, is one of these puzzling micro-plates. The combined study of large scale plate motions together with geological observations constrains the evolution of the Iberian plate despite arguable areas and time periods that need to be refined.

The Iberian plate acted as an independent micro-plate until Late Cretaceous (around Santonian times) when Africa started to move north and northwestward against Eurasia. The northern motion of Africa squeezed the Iberian plate, producing the Pyrenees orogenic chain along its northern margin and the Betic–Rif orogen along its southern boundary. The interior of the Iberian plate was deformed, inverting all previously rifted regions and producing intraplate mountain ranges.

It is generally accepted that deformation in the Pyrenees occurred from Late Cretaceous to Oligocene whereas the southern margin of Iberia was quiescent. From late Oligocene onwards the convergence of Africa was mostly accommodated across the Betic–Rif system along the southern plate boundary of Iberia.

We propose here a different model for the Betic-Rif system with an initial SE-dipping slow subduction of the Ligurian–Tethys lithosphere beneath Africa from Late Cretaceous to middle Oligocene twisting to a later faster E-dipping subduction of the subcrustal lithosphere as an efficient geodynamic mechanism to structure the arcuate Betic–Rif orogenic system.

This geodynamic model for the Betic-Rif subduction-related orogenic system, partially competing with the Pyrenees continental collision system, needs to be accounted and discussed when trying to reconstruct the evolution of the Iberian plate, especially of its margins during Late Cretaceous and Tertiary.