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Integrating intraplate deformation into plate tectonics: the Iberian kinematics in the frame of the Alpine Tethys evolution

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While plate tectonic reconstruction can be easily achieved for areas affected by a single deformational event, the reconstruction of areas deformed by a polyphased history, both extensional and compressive, remains difficult to quantify. Furthermore, intraplate deformation is a key parameter that is not considered in most of the current models, leading to inconsistencies in kinematics and geodynamics reconstructions.

The Iberian plate has endured both extensional and compressive major episodes of deformation since at least early Jurassic. While numerous studies have proposed reconstruction based on the study of the Atlantic system or the Alpine Tethys system, only a few have investigated the role and position of Iberia taking into account these two domains.

We integrate results from the OROGEN scientific project coupled with geological, geophysical, and stratigraphic data compiled from the literature in order to construct a regional and coherent geodynamic and kinematic model of the Iberian system from the Late Jurassic to the onset of Africa-Iberia-Eurasia convergence in the Late Cretaceous.
We propose a new model that aims to consider the internal deformation of the Iberian plate. In these deformed areas, we study the crustal evolution and quantify vertical and horizontal movements.

The Iberian plate is highly segmented, with distinct crustal domains that represent several rigid blocks, connected by deformed areas (e.g., Pyrenees, Iberian Chain, Central System, Betics), which have been subjected to strain partitioning associated with oblique and orthogonal extension and compression to accommodate the movement of the Iberian plate.
We propose that intraplate deformation played a major role in accommodating Africa-Iberia-Europe drifting/extension and later convergence.
Extension was distributed in time and space between the Atlantic-Tethys, Iberian Chain, and Pyrenean rift systems. Major transfer faults must have played a major role in transferring the deformation from the Atlantic to the Tethys domain. During convergence, these rift domains are inverted and deformation propagates through the whole Iberian plate, indicating a strong mechanical coupling between Africa, Iberia and Europe that was established by about 60 Ma.