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A new kinematic model for the Mesozoic evolution of the Iberia plate

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During the Mesozoic Iberia was progressively surrounded by rift systems leading to its transient individualization as a tectonic plate. The kinematic evolution of Iberia prior to oceanic magnetic anomaly C34 (~83 Ma) is controversial. To date, no kinematic models accounts for the Late Aptian to Albian hyper-extended rift phase observed in the Pyrenees. Consistent isochronal features, such as oceanic magnetic anomalies, representing the backbones of oceanic plate reconstructions are lacking. The only potential candidate, the J-anomaly, located offshore Iberia and Newfoundland has recently been re-interpreted as resulting from polyphased and polygenic magmatic events and does not provide a useful constraint.

We use a new reconstruction approach that integrates the spatio-temporal evolution of adjacent hyper-extended rift domains systems to investigate Iberia plate motion during the separation of the super-continent Pangea. The plate modeling is based on careful mapping and restoration of the rift domains with key rift events dated within the study area. The main outcomes of this new model are as follows:
1) A full-fit of the southern North Atlantic
2) Extension on the southern and eastern boundary of Iberia related to the opening of the Central Atlantic
3) Segmentation of the Iberia-Newfoundland rift system by fracture zones prior to a V-shape propagation of mantle exhumation and seafloor spreading
4) No Aptian subduction in the Pyrenean domain and a limited rotation of the Iberia plate
5) The partitioning of deformation between different micro-blocks along the Iberian-Eurasian boundary enabling Late Aptian to Albian extension in the Pyrenees

The resulting plate kinematic model for Iberia differs from previous ones on three main points: it does not make use of the J magnetic anomaly because the J anomlay is neither an isochron or a COB marker; the deformation along the Iberian-Eurasian boundary is partitioned between distinct rift systems; and it incorporates extension in the Pyrenees consistent with published geological studies. Nonetheless this model is non-unique and additional observations are needed to further constrain the plate modeling notably by adding new constraints on the rift evolution of the southern and eastern margin of the Iberia plate during the Jurassic.