A reconstruction of Iberia accounting for West Tethys/North Atlantic kinematics since the Late Permian-Triassic

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The West European kinematic evolution results from the opening the West Neo-Tethys and the Atlantic oceans since the Late Paleozoic and the Mesozoic, respectively. Geological evidence suggests that the Iberian domain was strongly overprinted by the propagation of these two rift systems and is therefore key to significantly advance our understanding of the regional plate reconstructions. The Late Permian-Triassic tectonic evolution of Iberian rift basins show that they have accommodated a significant component of extension, which remain however difficult to quantify. This tectonic stage is therefore often neglected in most plate kinematic models, leading to the overestimation of the movements between Iberia and Europe during the subsequent Mesozoic (Early Cretaceous) rift phase.

We compile seismic profiles and geological constraints along the North Atlantic margins and over Iberia, as well as existing kinematic and paleogeographic reconstructions to build a coherent, global kinematics model that consider both the Neo-Tethyan and Atlantic evolutions. We use tectonic subsidence analyses from the literature to quantify the apparent extension during the Late Permian to Early Cretaceous extensive phase. We show that an improved knowledge of the distribution in space and time of the deformation between Europe and the Iberian domain can be obtained for the Late Permian-Mid Cretaceous period. Our model differs from standard models that consider left-lateral strike-slip movement localized in the northern Pyrenees. The Europe-Iberia plate boundary rather forms a domain of distributed and oblique extension made of two rift systems, in the Pyrenees and in the Iberian intra-continental basins. This reconstruction emphasizes the need for an Ebro block and the significant strike-slip movement south of the Ebro block that is however minimized by accounting for the previous Late Permian-Triassic extension. We propose that these two rifts accommodated the same order of magnitude of strike-slip movement during the evolution of the Iberia-Europe (diffuse) plate boundary.

Our reconstructions reveal that the Late Permian-Triassic rift and magmatic evolution of the western Europe, at the western tip of the Neo-Tethyan Ocean, controlled the subsequent localization of the Atlantic rift. Our study provides a significant advance that allows reconciling the main geological observations, including the lack of major strike-slip faulting and a large oceanic basin in northern Iberia. The temporal overlap between Late Variscan magmatism and the Neo-
Tethyan extension is not directly addressed in this contribution but its impact on the Earth's surface evolution and topography during initial rifting certainly requires further investigations.