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Syn-orocline brittle deformation in the core of the Ibero-Armorican Arc. Timing orocline formation.

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The time-frame for the development of the Ibero-Armorican Arc (IAA) (West European Variscan Belt), as a bend of a previously more linear orogenic belt, has recently been constrained paleomagnetically as an orocline in the Cantabrian Zone, northern Iberia (the core of the arc) (Weil et al, 2001, 2010). According to the known evidence, oroclinal generation took place in the uppermost Carboniferous-lowermost Permian, between about 310 and 295 Ma, and it is interpreted to have been ultimately caused by the self-subduction of the Pangean global Plate (Gutiérrez-Alonso et al., 2008).
In the core of the IAA there are a host of coal-bearing continental basins developed coevally with the alleged timing of the arc and distributed along it. Because of this timing the syn-orocline rocks should record brittle deformation coherent with the closure of the IAA.
In this study, we have analyzed the brittle fractures systems (joints) present in pre-, syn- and post-orocline rocks and performed the "orocline test" (Schwartz and Van der Voo, 1983; Eldredge et al., 1985), classically used for paleomagnetic and strain data (Weil et al 2001, Weil and Yonkee, 2010). According to the analysis of the joints we conclude that each of the data sets present in the different rock groups have been originated at a different stage in relation to the IAA origin. The joints in the pre-orocline rocks (Neoproterozoic and pre- Upper Carboniferous) trace the orocline with the same geometry as the bent large scale structures that have been used to define it. In addition, the joints in the syn-orocline rocks (Upper Pennsylvanian or Stephanian, 304 to 299 Ma) depict a curved trace with less curvature than the orocline. Furthermore, post-orocline rocks (Permian) contain joints which show no rotation.
The described dataset evidences that the rotation of the IAA took place in Upper Pennsylvanian in agreement with the paleomagnetic arguments as the syn-orocline continental basins have been less rotated than the underlying basement. The dataset also provides further evidence to assess that the orocline was formed by bending around a vertical axis of an initially linear, or almost linear, orogenic belt.

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