

## ***Interactive comment on “A first estimation of the contraction related to vertical axis rotation: the case of the Ibero-Armorican Arc formation” by Josep Maria Casas et al.***

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Received and published: 8 October 2020

Dear reviewer, Thank you very much for your comments. We agree that the manuscript may be improved following some of your suggestions. To the best of our knowledge, “progressive arc” models have not been invoked for the formation of the Ibero-Armorican arc. Maybe the most similar could be the indenter model, which is thought to originate a progressive deformation in the indented plate. We will consider this point in the revised version of the manuscript. In the same way, we will reorganise the Introduction in order to clarify which is the main problem we would like to address. In our view, this is that the different models proposed for the arc formation do not consider the geo-

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metrical consequences of their proposals. This is particularly evident when considering the amount of contraction required for the different vertical axis rotations proposed for the formation of the Ibero-Armorican Arc. Concerning your comment about the method we use: “these estimations are very, very rough and are not presented rigorously”, we have to say that we present a first estimation of this contraction. As far as we know, nobody has tried this approach before. The proposed geometry of the Variscan Arc is at the scale of hundreds of kilometers, defined by the boundaries between the Variscan zones in Iberia. The only markers that can be used to estimate its deformation at that hecto-kilometric scale are those boundaries. Deformation at smaller scales should be consistent to this analysis, if a secondary arc is to be accepted. Our analysis is not, then, an oversimplification. Moreover, we think that our conclusion is that the deformation observed from structures at smaller scales than that of the arc is far less than the one needed to explain its formation from a previous linear orogen, and even we found some inconsistencies on the proposed age of the arc development. So, the statement that “not only the type of structures and the shortening due to each set of structures, but also the timing of these latter” should be asked to the authors who proposed that the Variscan Arc is secondary. Concerning the surface measurement methods, we would like to precise that in order to estimate the amount of surface of lost lithosphere needed –assuming the Ibero-Armorican Arc was formed as an orocline or a secondary fold forming as a result of strike-slip faulting– the original maps were escalated in a CAD environment (Microstation<sup>®</sup>). The boundaries of the lost area were defined comparing the WALZ-CZ boundary previous and after the arc formation, and assuming an arcuate path to the line tips during deformation. The areas bounded between these three lines were measured using the CAD tool for this purpose and rounded to 103 km<sup>2</sup>. In this estimation, the values of lost lithospheric surface should be considered as minimum, as it is assumed that there is no change in the position of the fold hinge during its development. In a general way, we agree that the Geological Setting is hard to read for anyone not familiar with the complex geology of the Iberian Massif. We will try to make it more clear and readable in the new version and also to improve the location

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of the localities and case studies not localized in the figures. In the same sense, we will rewrite and reorganize the manuscript in order to expose our ideas in a more clear way. Thank you again for your comments. Sincerely yours, On behalf of the co-authors

Josep Maria Casas

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Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2020-126>, 2020.

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