



EGUsphere, referee comment RC1
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Comment on egusphere-2022-581

Tiago Alves (Referee)

Referee comment on "Tectonostratigraphic evolution of the Slyne Basin" by Conor M. O'Sullivan et al., EGUsphere, <https://doi.org/10.5194/egusphere-2022-581-RC1>, 2022

Dear authors,

I reviewed your paper soon after it was sent to me as your study area is of great interest. I found your paper well organised and clear, though needing to be somewhat 'retouched' in a few sections. I found a few typos and minor aspects, which I will comment in detail below. All in all, a more complete understanding of the Slyne Basin is paramount to characterising the history of North Atlantic rifting, so your work is commendable and welcome to the geological community.

Detailed comments (see attached .pdf for reference):

1. The abstract refers to two tectonic events, but only one post-rift unconformity. Please, check this part.

2. There are published examples in the literature of Paleozoic fault zones controlling the formation of rift basins in deep offshore Portugal. The most documented of such examples is the Messejana Fault Zone in SW Portugal - see Pereira and Alves (2013). Crustal deformation and submarine canyon incision in a Meso-Cenozoic first-order transfer zone (SW Iberia, North Atlantic Ocean). *Tectonophysics* 601, 148-162.

3. In specific points in the text, I felt that a map of the Caledonian suture zones and basement structures may be of use to your reasoning. Please, check the literature for one such maps - an example being Figure 4 in Alves et al. (2022). Analysis of a basement fault zone with geothermal potential in the Southern North Sea. *Geothermics* 102, 102398. Could you find one such maps for the region around Ireland/West GB?

4. Figure 2 looks slightly tentative as the tectonic events in the right-hand column seem not to correlate well with the unconformities and units to the left. There are some incorrect detail regarding the ages of rifting and ocean spreading in West Iberia and the Central Atlantic. I would suggest you to review the ages of these tectonic events.

5. An example of item 4. above is clear in Lines 168-170, in which you are recording an Albian-age succession that is associated with the break-up process in the Bay of Biscay. This continental-breakup process was terminated in the Cenomanian-Turonian and is part of a Breakup Sequence in NW Iberia (see Alves and Cunha, 2018, EPSL; Alves et al., 2020, JMPG). Thus, your stratigraphic recorded in Ireland is being influenced by events that happened in SW Europe.

6. The mid part of the paper is informative and very nice to read. Some quantification is missing, though. The role of salt in basin inversion needs to be quantified and compared with similar basins in Portugal (Lusitanian Basin) and Southern North Sea (Broad Fourteens Basin and the Dutch offshore). Again, as an example Alves et al. (2003) Post-Jurassic tectono-sedimentary evolution of the Northern Lusitanian Basin (Western Iberian margin). Basin Research 15, 227-249 developed such a comparison to find out that a value of horizontal shortening around 10% was able to preserve multiple petroleum systems in the Dutch offshore basins, while disrupting trap potential in the Lusitanian Basin - in great part due to the generalised exhumation of the basin during the Cenozoic, accompanying basin inversion.

Could you add information on the impact of salt as a facilitator of such inversion? Are you dealing with a thin-skinned tectonic style (Alves et al., 2002. Marine and Petroleum Geology) in your study area, or this is apparent only in parts of your study area? Is the tectonic shortening in your region concentrated close to basin-bounding structures, or more widespread.

As a final remark, some parts of the paper are excellent and honest accounts of the geological evolution of the Slyne Basin. A better link between basement Caledonian structures (via a map) and the major fault trends in the study area will significantly improve this paper. Similarly, the role of salt in the subsidence and basin inversion histories of the study area should be developed in more detail. This is a very interesting article just needing a minor to moderate re-focus of some aspects.

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Please also note the supplement to this comment:

<https://egusphere.copernicus.org/preprints/2022/egusphere-2022-581/egusphere-2022-5>

[81-RC1-supplement.pdf](#)