

Interactive comment on “Back to the Future II: Tidal evolution of four supercontinent scenarios” by Hannah S. Davies et al.

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Firstly all the authors of this manuscript would like to thank Daniel Pastor-Galán for his insightful and constructive comments on the paper.

1. “I feel the discussion is a little limited. It verses mostly about the size (4500 Km) of ocean width”.

The 4500 Km ocean width and the equations mentioned in the discussion represent the main conclusions of the paper. We wanted to show that we had experimentally verified the ocean width and depth required for resonance. The discussion has been expanded in the revised manuscript, because of this comment, and other comments by both reviewers.

C1

2. Reviewer 1 mentions that a more synthetic analysis of the tide in oceans with various simplified or facsimile shapes i.e. the Tethys/annular/circular/triangular.

Synthetic modelling of different shaped oceans which close at different angles was tested, and it was deemed too much to present both the synthetic and the future supercontinent model results in one paper. Preliminary synthetic modelling was carried out by a colleague who has submitted the results in a paper to GRL. Detailed synthetic modelling (covering the ocean and continent arrangements mentioned by the reviewer in their first, second and third comments) is currently ongoing with the aim of producing sufficient results to publish in a separate paper furthering the exploration of the topic.

3. “I am convinced that tidal cycles are intrinsically linked to the Wilson cycle in 4D: when, how quick and where oceans open control the tides. Do you really think there is a supercontinent-supertide connection?”

We would still like to argue for a supercontinent-super-tide connection because even though the tide does change predominantly with the progression of the Wilson cycle, (i.e. after the ocean has opened sufficiently it will pass through at least one tidal resonance) there is still a long term trend occurring. In all scenarios we see a trend of stronger average tides during the dispersed continent phase of a supercontinent cycle, and weaker average tides during the gathered phase of the supercontinent cycle. We have clarified this idea further in the discussion section of the updated manuscript.

4. “Line 10: “Ma””

We agree that Myr is a more widespread unit and have therefore changed “Ma” to Myr” throughout the manuscript.

5. “Line 29: I think Trond’s and my paper suggest that it might be. Other authors are more convinced about it, but Perhaps Trond and I are among the people that think that maybe it is linked to everything and maybe it is not.”

Acknowledged, updated manuscript to include ongoing discussion

C2

6. "Lines 129-130: Is this error +/-12. Is it just 12 cm over or under the maximum tide? Is a +/-6? Please specify. In general, I think the way the uncertainty is treated over the paper is superficial."

Root mean square error represents the standard deviation of the error, so 12 is the amount the model results deviate from the observed result of the M2 tide. This value can apply as positive or negative, either side of the "line of best fit of the data" (which in this case is measured "real world" tidal values). We have clarified the whole section presenting error and uncertainty in the updated manuscript.

7. "Lines 236-237: This is particularly interesting. Considering the particularities of supertidal periods, you should try getting a rough estimate (Fermi problem style) of how often such things had happened through Earth history... And check if that fit with our knowledge of global tectonics and moon formation etc..."

Myself and my co-authors were very intrigued by this comment and have since added a fermi/drake equation to the manuscript.

Interactive comment on Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2019-61>, 2019.