

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

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The paper entitled "Back to the Future II" is a well written paper which numerically models the evolution of tides into four hypothetical future scenarios where (or I should say when...) a supercontinent has formed again, namely the classical Pangea Ultima and Novo Pangea and the two more recent Amasia and Aurica models. The authors investigated the effects of the Wilson cycle on tides during the different stages of assembling such four supercontinents. Davis et al., confirmed previous studies focused in paleoclimate and also deduced from moon dynamics, tides have been much less energetic than now for most periods of time. Authors found that the moments of "super-tides" (that is, similar or stronger than present day) are tightly linked with the width of oceans and therefore the Wilson cycle. Authors also found significant differences

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between the 4 hypothetic supercontinents and tide evolution, which in my opinion is very significant. Considering my lack of expertise in water dynamics, I assume the code works (it has been tested before and nobody complaint), I wish other reviewers are more capable than I am and can test the modeling.

In general terms, I think it is a good research paper with some provocative ideas and deserves publication. However, after reading the paper I have questions about the work they did and I would like to see them discussed before it gets published.

1) The models that Davis et al., performed are remarkable despite the limitations and simplifications applied. However, I feel the discussion is a little limited. It verses mostly about the size (4500 Km) of ocean width. Your models seems to suggest that the shape and connections between oceans are relevant. How relevant is the shape? How relevant are the different bridges between oceans? (from a rather annular-section shape, to circular-oval and triangular?)

2) Although I understand the "catch" into modeling tides in 4 hypothetical future supercontinents, I have the feeling that a synthetic modeling in which ocean basins open and close at different angles (respect to the equator, for example) might have been more useful. In the end 3 out of 4 supercontinent models tested suggest the formation of the new supercontinent at the equator. This is, however, under debate for previous supercontinents (not only about Amasia). What would have happened in the case of opening very oblique oceans rather than equator parallel or equator perpendicular?

3) Also, the set of models do not investigate interesting settings like tethyan style oceans, mostly triangular shaped E-W oriented oceans, that have been common at least during 1.5 supercontinent cycles (Iapetus, Rheic, Paleotethys and Neotethys). What would be expected in such conditions?

4) I understand the temptation to link the supercontinent cycle with almost any long term process on Earth. At least following the 4 scenarios tested, it seems that cyclicity does not correspond with the supercontinent cycle. Results mostly imply that that the

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way a supercontinent forms can change the supertidal cycles completely. And this is a great outcome!! In contrast, after reading the paper, 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?

Other minor details:

Line 10: "Ma" Particularly I do not care about the debate itself on the terminology of Ma vs Myr but many (if not the majority) of geologists use Ma as "Million years ago" and prefer Myr as Mega-year to talk about time span. Also, it seems to be the recommended: -Aubry, M. P., Van Couvering, J. A., Christie-Blick, N., Landing, E., Pratt, B. R., Owen, D. E., & Ferrusquía-Villafranca, I. (2009). Terminology of geological time: Establishment of a community standard. -<https://www.geosociety.org/gsatoday/archive/22/2/article/i1052-5173-22-2-28.htm#link-a>

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.

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.

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...

Finally: "Back to the Future II" is not my favorite film from the saga, McFly.

I hope my questions and comments help the authors to improve the paper.

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

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