

Interactive comment on “Comparison of the glacial isostatic adjustment behaviour in glacially induced fault models” by Rebekka Steffen et al.

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Dear Reviewer,

We thank you for reviewing our paper and your feedback.

First, we would like to address your last concern that our paper is "without clearly identifiable benefits for the Geosci. Model Dev. community". The Aims and Scope of Geoscientific Model Development, see website, list several types of papers to be considered for publication, one type being "Model evaluation papers", which aim for "full evaluations of previously published models". Our paper clearly matches this type of definition as, e.g., it says "Typically, this comprises a comparison of the performance of different model configurations or parameterisations." We present a comparison of already existing models and test them with respect to their model configuration and the

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different outputs with respect to stresses and displacement. Therefore, we kindly rebut your concern.

Our second point discusses the usefulness of our study, which is questioned by you, especially as you correctly noted that a comment and a reply were recently published discussing the two modelling approaches. We would like to note here that our reply only dealt with rebutting the many issues raised in the comment, but not a detailed comparison of the two approaches, which is, on another note, not possible due to page limitations for a reply by the other journal. Therefore, the reply paper contains only one figure which adds information to a figure by Hampel et al. (2009) that was mentioned in the comment to support one of the issues raised. The reason to submit the current manuscript coincides with your statement that you were "not very surprised that their outcomes in terms of displacements and stresses differ". It is of course clear that two different approaches can lead to different results. However, the questions are how much they differ and if the process they want to describe is actually addressed by the approach. A side-by-side comparison of model results including a fault is not possible due to several reasons and this was already discussed in the reply. However, as both approaches are claimed by each author-team to show the response of faults during a glacial cycle, the correct description of the glacial isostatic adjustment (GIA) behavior is a necessity, and this has only been touched in the reply with a figure of a displacement curve. Here we show by adding substantial material compared to that of the reply (2D and 3D models are tested, the stress behavior is shown, different locations and GIA observations are addressed) that one approach unfortunately fails to do so. This may not come as a surprise for someone with GIA modelling background, but researchers not working in such field may be surprised. It is not our aim to further re-ignite the discussion between the two groups, it is more important for us to show researchers interested in these studies (GIA, tectonics, intraplate seismicity and more) that the base for the analysis of fault response due to large-scale load scenarios of ice and water must also give correct description of other GIA observables.

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We are very thankful for your review as it shows that our motivation for the paper has to be refined. Hence, we will adjust our paper, mainly in the introduction, according to your concerns to make our points clearer and more concise as well as to show the importance of our study especially with respect to the former published discussion.

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