

Solid Earth Discuss., author comment AC1
<https://doi.org/10.5194/se-2022-8-AC1>, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Reply on RC1

Frank Zwaan et al.

Author comment on "Analogue modelling of basin inversion: a review and future perspectives" by Frank Zwaan et al., Solid Earth Discuss.,
<https://doi.org/10.5194/se-2022-8-AC1>, 2022

Review of "Analogue modelling of basin inversion: a review and future perspectives".

Authors: Frank Zwaan, Guido Schreurs, Susanne J.H. Buitter, Oriol Ferrer, Riccardo Reitano, Michael Rudolf and Ernst Willingshofer.

Overview and recommendation

This article is a review of analogue modelling studies of basin inversion processes. The introduction is well organised and well written. The authors give a clear definition of the process of basin inversion in the context of their review. The aim of this review is clear, and the outline of the article is presented.

In a first part, the authors give an up-to-date state of the art about basin inversions processes through analogue modelling studies. They present the mechanics of basin inversion, analogue modelling techniques, as well as detailed setups examples and typical scaling parameters. Representative results of basin inversion are presented based on their setup. Insights about the governing parameters of basin inversion are given.

The authors then compared analogue and numerical models of basin inversions. I think it is a good idea to make such comparison. I understand it is not the scope of the publication, but this part could be improved a bit by giving more detailed examples. By comparison to natural examples, the authors show the limitation of analogue modelling of basin inversion. To finish, the authors give perspectives and recommendations for future analogue modelling studies of basin inversion.

I think that the subject of this article is interesting and very attractive for the readers of Solid Earth.

The authors provide an impressive overview of what has been done and what should be improved in future analogue modelling studies of basin inversion. The overall manuscript very well organized, well written, and well illustrated. I recommend **accepting this article with really minor revisions**.

- **Author's reply:** we thank the reviewer for these kind words and the positive assessment of our submitted manuscript. We have processed the minor comments in our revised manuscript.

Minor comments

Line 138: The title of part 2 is missing (before 2.1 Mechanics of basin inversion).

- **Author's reply:** The title should be "2. Mechanics of basin inversion" instead. We have corrected this.

The authors did not mention anything about edge effects along the sidewalls of the model setups. Could there be such effects in the different initial conditions presented in the study? If yes, how to prevent edge effects or how to characterize it?

- **Author's reply:** We agree that boundary effects are an important factor in analogue models. We already mentioned the potential influence of sidewalls/glass boundaries on model results (section 3.6.1 on photography [model monitoring]). We also mentioned the importance of model preparation and handling methods in section 4 (first paragraph), and this also comes back in discussion sections 5.2 and 7.1). As pointed out at the start of section 4, there is a wide range of set-ups, so that we resort to simplified overviews. As such, there is not proper occasion to go too much into detail regarding boundary effects (also because the text is already rather long). We have however added some details to the first paragraph of section 4 to point out the importance of boundary effects (incl. Some references, e.g. works by McClay & co-authors, Schreurs et al. 2006, and Souloumiac et al. 2012), and we hope that this will suffice.

Figure 15 has a low resolution. Please improve it.

- **Author's reply:** The figure in the manuscript is (close) to the original resolution of the figure, as published in Jara et al. (2015). We have now inserted the highest possible resolution figure, and replaced the less readable text and annotation with high-resolution text/annotation.

Caër et al., (2015) provide a parametric analysis of the reactivation of a normal fault through numerical modelling using Limit Analysis. I think Limit Analysis could be mentioned as a numerical modelling technique. This methodology requires few inputs parameter. As such, it is in a way close to analogue modelling and could be easily compared to it.

- **Author's reply:** We thank the reviewer for this suggestion and have now cited the paper in section 5.2 (about linking numerical methods to analogue models)

Caër, T., Maillot, B., Souloumiac, P., Leturmy, P., Frizon de Lamotte, D., Nussbaum, C., 2015. Mechanical validation of balanced cross-sections: The case of the Mont Terri

anticline at the Jura front (NW Switzerland). *J. Struct. Geol.* 75, 32–48.
<https://doi.org/10.1016/j.jsg.2015.03.009>

Citation: <https://doi.org/10.5194/se-2022-8-RC1>