ANSWERS TO COMMENTS AND SUGGESTIONS OF RC1 (TIMOTHY SCHMID):

Author's comment: We acknowledge Timothy Schmid for the time invested in reviewing the manuscript and for his constructive feedback. Following we provide answers to his comments and suggestions.

1) My first comment addresses the somewhat confusing section numbering. At its current state, not all sections have a number. I find the attempt to divide the manuscript into Introduction and Analogue modelling disadvantageous. Since the Analogue modelling is a bigger part of the manuscript, subsection numbering becomes a bit confusing. From the manuscript title (as well as the special issue) it is evidently an analogue modelling study. Hence, the section Analogue modelling (which includes the entire manuscript apart from the Introduction) is needless. I suggest a simpler structure where Introduction, Experimental methodology, Experimental results, Discussion and Conclusion build the top level with pertinent subsections.

Author's reply: We have renumbered the sections of the manuscript according to your proposal.

2) Overall I enjoyed reading the discussion of this manuscript, however, at parts, paragraphs are lengthy and could benefit from restructuring. Fixing the section numbering (see point 1) allows to structure the discussion within additional subsections for more clarity. This addresses particularly (current) section 1.3.3 (How does inversion affects salt migration, primary welds, and the final geometry of the inverted basin?). I believe this rather long part could use rearrangement into smaller subsections that are more digestible to the reader. Such sections could address the final geometry/topographic relief, primary welds, weld reactivation/opening, coupling/decoupling, according to current section 1.3.3.

Author's reply: New subsection titles have been added and some parts of the discussions shortened and restructured according to reviewer's suggestions.

3) The reopening of welds is an interesting point and is well described in the manuscript and visually supported by Figs. 9 & 10. In most parts, I agree with the reasoning of the authors that salt flow during weld reopening is rather a passive than active process. However, I feel that there is a potential contradiction with the ramp-syncline development in Lines 308-312. Those lines perfectly describe an interplay of passive salt flow (i.e., towards the hanging wall due to the counter-clockwise basement block rotation), followed by active salt flow (due to the subsequent sinking of the ramp-syncline) when salt gets expulsed. In my opinion, lines 308-312 demonstrate, that salt flow occurs in an active and passive fashion at different deformation stages. In this light, I would argue that flow during inversion, most likely, undergoes passive as well as active stages at different times.

Author's reply: In our opinion, and according to the interpretation of the experimental results, this contradiction does not exist. The active process in the first one is thick-skinned extension, and in the second, it is the differential loading caused by the sinking of ramp-syncline basins. In both cases, salt flows passively.

One could envision, for example, that at early stages of inversion (e.g., Fig. 10b), salt may actively flow out-of-plane (i.e., along fault strike) as the basement blocks rotate in a clockwise fashion, causing an along-strike pressure gradient. Since the presented experiments show a rather regular along-strike evolution, I don't assume this to be the case in this study. However, in nature where along-strike irregularities are more likely this should be considered.

Author's reply: We agree with the reviewer. The presented models are 2D and no out-of-the-plane salt flow was appreciated by the lack of structural variations along-strike. As pointed out by the reviewer, in areas with along-strike variations, the out-of-the-plane salt flow should be expected as we have observed in other 3D analogue models with salt. We also agree with the

reviewer that in nature, as we pointed out in the manuscript (see section 4.1 of the revised manuscript), out-of-the-plane salt migration must be considered.

4) The manuscript is generally well written and concise. However, some sentences are relatively long making it difficult to grasp all the information (e.g., Lines 34-39, Lines 265-267, Lines 299-302). Such long sentences might benefit from splitting information into subsequent sentences.

Author's reply: Sentences have been divided and simplified.

Minor comments:
+ Please check the section numbering. At the moment, not all sections have a number.
Author's reply: Done.

+ Line 52: "[…] BUT/HOWEVER, the number of works of inverted basins with mechanical anisotropies […]" – missing conjunction.
Author's reply: Added "but".

+ Line 53: "While some of them considered […]" – I suggest replacing "them" with "these studies" or a similar expression.
Author's reply: Changed.

+ Line 58: "[…] used an original setup based on polymer seedS to constrain […]" – missing the S in seeds.
Author's reply: Added.

+ Lines 72-80: It would be good for the reader to know the overall model dimensions. What is the initial length of the model prior to extension? I am also curious how "deep" (i.e., along fault strike) the model setup is.
Author's reply: We have added the dimensions of the rig.

+ Lines 106-107: "[…] and the positive reliefs caused by salt inflation were episodically eroded." – This needs clarification. How were the reliefs eroded?
Author's reply: Clarified "were episodically eroded with the scraper and the sand vacuumed".

+ Line 118: The subsection number here should be 1.1.2 (but see major comment 1).
Author's reply: We have changed the section numbering. This section is 2.1.2 in the reviewed manuscript.

+ Line 123: "To color it […]" – T at the beginning of the sentence should be capital.
Author's reply: Changed.

+ Line 125: Is the polymer viscosity really 10^{-4} Pa s? I assume the sign in the exponent is wrong and 10^{4} Pa s is more reasonable for PDMS. This also concerns Line 127 as well as Table 2.
Author's reply: Good observation! Value modified in line 125 and Table 2.

+ Line 128: (Ferrer et al., 2017) should be 2016? Otherwise, this reference is not listed.
Author's reply: Yes, it is 2016. Number changed.

+ Line 135: It would be interesting for the reader to know the camera model as well as the actual resolution.

Author's reply: We don't think it's necessary to include this information in the manuscript. In any case, the digital cameras used in the lab were two Canon EOS 70D.

+ Line 140: Please provide the name and version of the commercial software.
Author's reply: On the first version of the manuscript, the commercial software was listed on the acknowledges. We also add the names here.

+ Lines 210-220: Figure references should refer to Fig. 4d rather than Fig. 4e.
Author's reply: Changed.

+ Lines 223-281: The color coding for structures in Fig. 5 is not clear to me (see also comment on Fig. 5). I would recommend to describe in the text (where suited) the meaning of fault colors (i.e., red à inherited?) in Figure 5.
Author's reply: We have added a legend for the faults at the lower part of Fig. 5. With this legend, we don't think it necessary to describe it in the text.

+ Lines 239-240: "[…] thrusts affecting the overburden are directed towards the fixed wall […] " – I find this terminology (i.e., directing) ambiguous. I would recommend to use "dipping towards/away" or "top to the…" to avoid confusion. This also concerns line 254.
Author's reply: This is also a common comment with the second reviewer. We have added foreland and hinterland in Fig. 1 and we have described the emplacement of thrusts according to those directions. Hereinafter, the nomenclature used in the manuscript follows the convention foreland- and hinterland-directed thrust. This nomenclature is widely used by structural geologists working in fold-and-thrust belts (i.e. ….). This nomenclature describes both the geometry of the thrust but also the kinematics. Foreland and hinterland labels are also indicated in the upper part of Fig. 5.

+ Lines 308-312: This refers to major comment 3. In my opinion, it well demonstrates the interplay of active and passive salt flow.
Author's reply: See the answer in comment 3).

+ Lines 330-364: The description of Fig. 7d and Fig. 7h is missing here. I would like to read that for completeness.
Author's reply: We have added some sentences describing Figs. 7d and 7h.

+ Lines 372-373: "[…] the trajectory of the salt-detached ramp-syncline depocenters is not lineal but curved thus recording the salt migration process that occurs as extension progresses […]" – I struggle to understand this sentence. Please be more specific here.
Author's reply: This process and the evolution of the deponcenters during extension is widely developed in Ferrer et al., 2023. To avoid a longer and tedious article, and at the same time minimizing the possible overlap (as second reviewer proposed) we prefer to refer the interested reader to this work.

+ Lines 386-389: "[…] of structures allowing to generate relief is directly related to the degree of decoupling between […]" – This is an important statement! Unfortunately it is not that clear. I suggest rephrasing for clarification.
Author's reply: We have rewritten the whole section. We think that in this way it is clearer as suggested by the reviewer.

+ Line 432: Fig. 10b – this should be Fig. 10c, I believe.
Author's reply: We have added 10b to d.

+ Figure 4: Please indicate in the caption the meaning of the white dashed line (Datum?) and the white dots (welding). Additionally, Fig. 4a (DOM4), F4 contains an antithetic fault in the counter-clockwise rotated basement that should be indicated for consistency.

Author's reply: Indicated.

+ Figure 5: As in Figure 4, the white dashed line as well as the white dots should be explained in the caption.
Author's reply: Explained in the figure caption.

+ Figure 5, Lines 833-834: "[…] colors of the faults keep consistent with Figure 1 […]" – To my understanding, the color coding of the faults is not defined in the manuscript. I suggest to reuse the color coding according to Figure 1 in the text where appropriate (e.g., results section).
Author's reply: We have added a legend for the faults at the lower part of Fig. 5. With this legend we don't think it necessary to describe it in the text.

+ Figure 5, Line 834: Figure 1 – F should be capital.
Author's reply: Modified.

+ Figure 6: Both columns (a-d and e-h) could use a title (i.e., "after extension" and "after inversion") to make the figure arrangement more clear.
Author's reply: This was originally indicated in the figure caption, but we have followed your suggestion adding those two titles to the figure.

+ Figure 7: Similar to Figure 6, titles for both columns would help for clarification (e.g., "top basement/base salt layer" and "basin infill/syn-extension").
Author's reply: This was originally indicated in the figure caption, but we have followed your suggestion adding these two titles to the figure.

+ Figure 8: Very nice visualization! Just out of curiosity: Before cutting the model, how do you generally manage that the hardening agent pierces through the PDMS layer and reaches the basement configuration?
Author's reply: This is a technical and procedural matter. There are several options, but the best is to leave a space filled with sand between the silicone layer and the long walls of the model. In this way water can percolate during the preservation and reach the pre-kinematic sand unit.

+ Figure 9: I don't understand the term "weld widened" in sub-Figure 9a. To my understanding, these areas indicate where welds remain after the inversion (i.e., they remain close). With that respect, the term "widened" should be clarified.
Author's reply: Agree. We have removed the term "weld widened" from the figure. In fact as the reviewer noted these areas correspond to the common location of welds at the end of the extensional and inversion stages.

ANSWERS TO COMMENTS AND SUGGESTIONS OF RC2 (TIM DOOLEY):

Ferrer et al. present a nice modeling study on inversion of a domino-style rift system with prekinematic layers of "salt" embedded within this sequence. Model salt thickness is varied, as is the suprasalt overburden thickness, in order to better understand the impact of such a weak layer on deformation styles during extension and inversion. A just published paper by the same lead author focuses solely on extension of a domino-style system with more variety in terms of number of weak layers etc. The authors do refer to this paper and acknowledge that there is some overlap. I don't believe this overlap is problematic at all. This paper is aimed at inversion, and destined for a special issue on Inversion.

I like the models presented in this paper and I do think this study should be published after moderate revisions. I have heavily annotated two attached PDFs and would like the authors to revise the manuscript accordingly.

Author's reply: We thank Tim Dooley for taking the time to go through out work and for the constructive feedback to our manuscript. We have included all the general and specific suggestions of the reviewer in the annotated manuscript. All the review is answered in detail in the annotated manuscript.

My main concerns as it stands right now are:

1. The Introduction is quite poor and some simple revisions should help better frame the study as well as stating what the research questions are. Doing this would also set up the Discussion to answer the questions posed in the Introduction.

Author's reply: Both sections have been reviewed and improved according to the reviewer's suggestions.

2. In the model description section some of the text concerning the extensional stages of deformation are either not illustrated in any way and are possibly redundant. A better way to describe the models might be to focus on one in both extension and inversion, and then focus on the differences shown by the other models in the series.

Author's reply: With the performed revisions, we consider that the description of the extensional stage has improved. In addition and in order to avoid overlapping between this manuscript and the recently published one by Ferrer et al. (2023), dealing specifically with the extensional stage, we have summarized the main key points of this part of the results.

3. The discussion needs work in terms of how it flows and for clarity. Answering questions posed in the Introduction might be the way forward here. See comments on the manuscript. Some issues with terminology here too. Mixtures of impingement and welding can be a struggle. And then effective weld versus full weld – see comments. There is also a lack of comparison of structural styles seen in these models and those from older studies and lack of citing in this section.

Author's reply: Discussions and introduction have been reviewed according to the reviewer's comments and suggestions.

4. The figures are all of good quality and necessary but some additional information on some of these figures is needed – keys to fault colors, annotations, etc.

Author's reply: We have followed all the comments of the reviewer in order to add the required additional information to the figures.

5. Just a general need to tighten the text for clarity etc. See comments. I hope these comments help to improve the manuscript.

Author's reply: Thanks for all the comments, which have certainly helped to improve the quality of the manuscript. We followed all the comments and suggestions of the reviewed manuscript provided by the reviewer.