EGUsphere, author comment AC2
https://doi.org/10.5194/egusphere-2022-1014-AC2, 2023

Reply on RC1

Nicolás Molnar and Susanne Buiter

Author comment on "Analogue modelling of the inversion of multiple extensional basins in foreland fold-and-thrust belts" by Nicolás Molnar and Susanne Buiter, EGUsphere, https://doi.org/10.5194/egusphere-2022-1014-AC2, 2023

Dear Pablo Granado,

Thank you very much for the time taken for reading, commenting, and suggesting changes to our recently submitted manuscript. All the points raised have helped us improve the paper considerably.

Regarding the specific aspects mentioned in your response letter:

Figures/Illustrations

Figures 3 to 10 have been modified to reflect the suggested changes and to clarify aspects that weren't clear. We agree that showing uninterpreted images of our results makes it a better contribution as a modelling paper. The main difference in the illustrations is that all experiment evolution figures now show the final stage of extension and include a panel with raw side-view photographs. Additional comments made in the annotated pdf file regarding suggestions to figures have been addressed accordingly.

Rheological behaviour (comment on line 119)

The reviewer's comment in the sense that sand shows upon loading first an elastic response followed by strain hardening until peak failure and then some strain softening is of course correct. This is similar to the behaviour of rocks as described in Jaeger and Cook (1976). The elastic response occurs in the initial loading stage and for low differential stress. Mohr-Coulomb behaviour describes the relation between normal stress and shear stress at peak failure or at dynamic stable strength (when strain softening has occurred). This is described in Lohrmann et al. (JSG, 2003), their Figs 2 and 4 (and other Figs) and Panien et al. (JSG, 2006), their Figs 2 and 3. So in this way one is not at all in contradiction with the other. While this is a topic that is usually debated in depth in rheology-specific papers, we don't consider we need to revisit our basin inversion results, as our strain-rate independent modelling materials are appropriate for modelling critical compressional wedges (also backed by classic studies such as Vermeer (1990) or Krantz (1991), who have shown that fine sands follow a Coulomb criterion) and therefore the comparisons made in the text with the theory and mechanics of basin inversion (Sections 3.1 and 3.2) are valid.

Comparison with natural case studies

We understand that the interpretation given by Schmid et al. to the subduction in particular may be conjectural and some researchers may not agree with it. Since we are focusing on crustal structures in our study, our aim is to refer to previous studies from the point of view of observed/interpreted crustal structures only as well. We have modified the text accordingly to only include references that are less controversial and removed Schmid et al. to avoid further discussion on a topic that is secondary to our particular study (e.g. geodynamical drivers of the orogenic wedge). Since we consider that the chosen natural examples are good analogies to our experiments, given we focus on the crustal scale, we propose to leave the case studies we originally chose, instead of adding another example, for conciseness.

Additional comments and notes

Responses to the individual comments, including the one in **line 200,** have been appropriately addressed in the attached annotated pdf file.

Please do not hesitate to reach out to us for further clarification in any of the responses given after your insightful revision.

Best regards,

Nicolás Molnar

Please also note the supplement to this comment:
https://egusphere.copernicus.org/preprints/2022/egusphere-2022-1014/egusphere-2022-1014-AC2-supplement.pdf