Comment on se-2021-17
Oriol Ferrer (Referee)

Using an experimental approach based on analogue modelling, the manuscript entitled "Contribution of gravity gliding in salt-bearing rift basins – A new experimental setup for simulating salt tectonics under the influence of sub-salt extension and tilting" by Warsitzka and co-authors present a new experimental apparatus to investigate how basin extension and tilting of the flanks affect influence suprasalt deformation. A systematic experimental program consisting of 7 experiments clearly illustrates this interaction. Experimental results have been analysed with digital image correlation techniques.

The manuscript is well written and figures perfectly support the explanations of the different manuscript sections. I appreciate the detailed and justified scaling description. I would have preferred an illustration of the kinematic evolution of some of the experiments with polymer from overhead pictures or more sections in the results section comparing different experiments. May be figures like 11 or 13 in the experimental results section will help the reader more than start directly with DIC figures. The results are well explained, although I suggest to use only the model number instead of the model name (see specific comments). The apparatus limitations are also described in the manuscript. The experimental results are finally compared with the structural styles of several natural analogues.

I consider the manuscript fits really well in Solid Earth and should be accepted with minor revisions. Please, find below some comments, suggestions and questions.

Best regards,

Oriol Ferrer

Section 1: Introduction.
Include also the reference Stewart, 2014.

Stewart, S.A. (2014). Detachment-controlled triangle zones in extension and inversion tectonics. Interpretation, 2 (4), SM29-SM38.

“prompt the question of which” instead “provoke the question”?

Include also the reference Roma et al. 2018.

Roma, M; Ferrer, O; McClay, K.R; Muñoz, J.A; Roca, E; Gratacós, O; Cabello, P. (2018). Weld kinematics of synrift salt during basement-involved extension and subsequent inversion: Results from analog models. Geologica Acta, 16 (4) 391-410 DOI: 10.1344/GeologicaActa2018.16.4.4

Roma, M., Vidal-Royo, O., McClay, K., Ferrer, O., Muñoz, J.A. (2018). Tectonic inversion of salt-detached ramp-syncline basins as illustrated by analog modeling and kinematic restoration. Interpretation, 6 (1), T127-T144. http://dx.doi.org/10.1190/INT-2017-0073.1.

“work, paper or article“ instead “project”.

We designed a new “experimental” apparatus...

Please remove “of the presence”, not necessary in the sentence.

May be is preferable to use “rollers” instead “roll-over” in Fig. 1d.

(c) Upper Triassic showing “tilted” flanks (instead inclined?).

(d) change “rollovers” by rollers. If not, please be consistent with the style used in Fig. 1d (roll-overs).

(d) as well as “diapirs”. An “i” is missing.

(e) “Conceptual sketch” of the experimental setup applied in “this” study.

Section 2: Geological prototype and experimental setup.

There are some inconsistencies between the values indicated in the manuscript and those in Table 1. Please check and modify if necessary.

In Table 1, please introduce the reference O’Sullivan et al. (2021) for the Slyne Basin.

O’Sullivan, C. M.; Childs, C. J.; Saqab, M. M.; Walsh J. J.; Shannon, P. M. (2021). The influence of multiple salt layers on rift-basin development; The Slyne and Erris basins, offshore NW Ireland. Basin Research, https://doi.org/10.1111/bre.12546.

Is correct the value of 60000 km for the width of the flanks in Table 1? Please check it.

Please check “Parentis Trough” for “Parentis Basin” in Table 1.

Table 1: for Central Graben, please use also capital letters for “Central” and “South”.
Section 3: Method

**Line 90:** How was controlled the vertical movement of the central graben structure? Gravitationally as bendable plates were pushed or with a motor? Please explain it.

**Line 93:** “tilted” instead “inclined”?

**Line 96:** According to the Figure 2, the y-axis correspond to the width of the apparatus and z-axis to the depth. Please, check the text and modify. In this line you also indicate the width of the experimental apparatus is 60 cm, but the number that appears in figure 2b is 50 cm. I understand this last value refers to the effective width of the model without the width of the two lateral sand walls. This is not clear in the text and should be better explained.

**Lines 109 to 111:** Could you explain a little more the proportions of quartz sand and silicate censpheres mixtures? Which were these mixtures? Why did you use different mixtures and not the same? Please explain it.

**Line 172:** Maybe you can also use the work of Carter & Hansen (1983) as a reference.

Carter, N. L. and Hansen, F. D., (1983). Creep of rocksalt. Tectonophysics, 92, 275–333, https://doi.org/10.1016/0040-1951(83)90200-7.

Section 3.5: Experimental procedure

The number and/or the name of the experiment are used indistinctively both in the manuscript and in table 3. Personally, I think the name of the experiment is something that as a modeler we use to organize our experimental program. Nevertheless, I suggest to use just the number of experiments in manuscripts because it greatly simplifies reading and understanding of the article.

**Table 3:** Please, use the same units in all the table. Change cm for mm in the thickness of pre-kinematic sand layer and thickness of the polymer.

**Line 266:** “sedimentation” instead “accumulation”.

**Line 269:** “syn-kinematic sand is sieved on the model surface”. Did you label the sand after sieving? How? I noticed a positive surface elevation over the basin in Fig. 9 a and b. Is this because the surface of the experiments was not levelled after the sedimentation of each syn-kinematic layer?

Section 4: Results

**Line 288:** movement of the cover layer... Please, remove layer. Not necessary here.

**Figure caption 6:** At the end of the (e/f) explanation, please add “for experiment E1 and E2 respectively.”

**Figure caption 7:** At the end of the (e/f) explanation, please add “for experiment E1 and E2 respectively.”

**Figure caption 8:** At the end of the (e/f) explanation, please add “for experiment E1 and
E2 respectively.”

Line 326: “This implies that sequentially filling of the downslope depocenter with syn-
kinematic sand significantly reduces downslope glidding of the cover”. à Equivalent
observations were done by Rowan et al., 2004 and Rowan 2020.

Rowan, M.G.; Peel, F.J.; Vendeville, B.C. (2004). Gravity-driven fold belts on passive
margins. In: K.R. McClay (Ed.). Thrust tectonics and hydrocarbon systems. AAPG Memoir
82, 157-182.

Rowan, M.G. (2020). Salt- and shale-detached gravity-driven failure of continental
margins. In: Scarselli, N.; Adam, J.; Chiarella, D. (Eds.). Regional Geology and Tectonics:
Principles of Geologic Analysis. Elsevier, 894 pp.

Figure 11: Fig. b looks more like an overhead detail than a perspective or oblique view.
Please, change it in figure caption.

Section 5: Discussion

Line 356: Please, remove one of the two “the” at the beginning of the sentence.

Lines 359-360: You should refer the work that I have commented in line 326 of my
review.

Line 375: Are you referring to inherited pre-salt relief? Please specify their origin as
Dooley et al. (2017) or Ferrer et al. (2017) did. Other works have recently studied the
effect of base-salt relief on the dynamic of salt-bearing passive margins and should be
also included in this section of the discussion:

Ferrer, O., Gratacós, O., Roca, E., Muñoz, J.A. (2017). Modelling the interaction between
presalt seamounts and gravitational failure in salt-bearing passive margins: The Messinian
case in the northwestern Mediterranean Basin. Interpretation, 5(1), SD99-SD117.
https://doi.org/10.1190/INT-2016-0096.1

Pichel, L. M., Jackson, C. A.-L., Peel, F., and Dooley, T. P. (2020). Base-salt relief controls
salt-tectonic structural style, São Paulo Plateau, Santos Basin, Brazil: Basin Research, v.
32, no. 3, p. 453-484, http://doi.org/10.1111/bre.12375.

Figure 14: Please move this figure before Conclusions chapter.

Line 397: A nice field example that maybe you can include in the application to nature
and outlook section is the Cotiella Basin in the Pyrenees. This is an outstanding and
incredible outcrop example of the structures developed in the outer rift basin during the
post-rift stage. It might be interesting to take a look to the works of Lopez-Mir and co-
authors.

López-Mir, B., Muñoz, J.A., García-Senz, J. (2015). Extensional salt tectonics in the
partially inverted Cotiella post-rift basin (south-central Pyrenees): structure and evolution.
International Journal of Earth Sciences, 104, 419-434.

López-Mir, B., Muñoz, J.A., García-Senz, J. (2016). 3D geometric reconstruction of Upper
Cretaceous passive diapirs and salt withdrawal basins in the Cotiella Basin (southern
Pyrenees). Journal of the Geological Society. 173, 616-627. doi:10.1144/jgs2016-002
References

I have not located the following works from the reference list in the text of the manuscript. Please check.

Rudolf et al. (2015) and Vendeville (2005).