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Discussions
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Interactive comment on "Mechanisms of destructing translational domains in passive margin salt basins: Insights from analogue modelling" *by* Zhiyuan Ge et al.

Tim Dooley (Referee)

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This manuscript uses physical models to assess the formation, deformation and over-printing of translational domains on gravity-driven salt-cored passive margins. I like the models in general and they should be useful to people interested in salt tectonics. Tim Dooley

General comments:

These experiments follow on from several papers published since 2017 on the impact of base-salt relief on deformation on these types of margins and are thus quiet timely.

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Discussion paper

These other studies used physical models, numerical models and seismic-based studies. I think the authors should refer to these in the introduction and state the differences, and similarities, between those studies and their own, rather than just adding this in as a footnote at the end of the manuscript.

My main problem with the manuscript is the presentation of results. There are 3 experiments with essentially 2 basins in each experiment, and the authors present them in pairs. There is no need to do this. There are 6 distinct experiments as there was no connectivity between the "basins". Split these up so that you can present the parameters you tested in a logical fashion. See the comments on the manuscript for more details bu you can work it like so:

1. Evaluating sediment thickness controls on size of translation zone 2. Evaluating sediment depositon rates on translation zones – but use strength 3. Evaluating discontinuous loads on translation zones

I also feel that some areas of the text need expanding on, and others are perhaps too wordy. See the comments on the PDFs.

Specific comments:

I refer you to the attached PDFs for specifics on the text and figures.

Please also note the supplement to this comment:
https://www.solid-earth-discuss.net/se-2019-2/se-2019-2-RC2-supplement.pdf

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Solid Earth Discussions

Mechanisms of destructing translational domains in passive margin salt basins: Insights from analogue modelling

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Abstract. Current gravitational tectonics models illustrating the structural style of passive margin salt basins typically have domains of upslope extension and corresponding downslope contraction, separated by a domain of rather undeformed mid-slope translation. However, such a translational domain is rarely observed in natural systems where extensional and contractional structures may interfere in the mid-slope area. In this study, we use sandbox analogue modelling analyzed by 4D digital image correlation (DIC) to investigate how the pre-kinematic layer thickness, differential sediment loading and sedimentation rate control the structural evolution of translational domains. As in nature, experimental deformation is driven by slowly increasing gravitational forces associated with continuous basal tilting. The results show that a translational domain persists throughout the basin evolution when the pre-kinematic layer is evenly distributed, although a thin (1 mm in the experiment, 100 m in nature) pre-kinematic layer can render the translational domain relatively narrow when comparing to settings with a thicker (5 mm) pre-kinematic layer. In contrast, early differential sedimentary loading in the mid-slope area creates minibasins intervened by salt diapirs overprinting the translational domain. Similarly, very low sedimentation rate (1 mm per day in the experiment, equates to < 17 m/Ma in nature) in the early stage of the experiment results in an immature translational domain quickly overprinted by downslope migration of the extensional domain and upslope migration of the contractional domain. Our study suggests that the architecture of passive margin salt basins is closely linked to the sedimentary cover thickness and sedimentation pattern and rate. The translational domain, as an unformed region in the supra-salt cover, is likely a transient feature in nature and destructed in passive margins with either low sedimentation rate or a heterogeneous sedimentation pattern.

Keywords translational domain, thin-skinned, salt tectonics, passive margin, analogue modelling, digital image correlation (DIC)

Fig. 1. Comments on text TD

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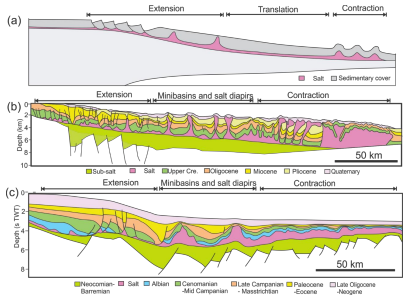

Figure 1. (a) Simplified cross section illustrating the kinematic domains and structural styles in a typical passive margin salt basin (modified after Rowan et al., 2004; Brun and Fort, 2011). (b) Regional interpreted seismic profile crossing the Lower Congo Basin (modified after Marton et al., 2000). Note the minibasins and diapirs in the mid-slope. (b) Regional interpreted seismic profile crossing the Central Santos Basin (modified after Modica and Brush, 2004). Note the large minibasin and diapirs in the mid-slope area.

Fig. 2.