

## ***Interactive comment on “The formation processes and development characteristics of sandbars due to outburst flood triggered by landslide dam overtopping failure” by Xiangang Jiang et al.***

### **Anonymous Referee #1**

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General Comments: The manuscript by Dr. Jiang and colleagues summarizes results of an experiment investigating bar dynamics following breach of a landslide dam. The manuscript appears to be a re-working of results from a similar paper published by the same lead author in 2020 in the journal ‘Landslides’ (Jiang et al., 2020, cited in the manuscript). The experimental design appears sound, the experiment is well documented, and the results appear different enough from that paper to justify a separate publication. Nonetheless, the current manuscript suffers from a confusion of terminology and formative processes of the primary sedimentary body being investigated (fluvial bars), is lacking in scientific justification, and does not effectively communicate the novel scientific contribution of the experimental results. It is my judgement that

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the results of the experiment could make a contribution to the scientific community, but the manuscript needs very substantial revision to meet the aims and scope of Earth Surface Dynamics. The other recommendation would be to revise the manuscript and submit to journal with different aims and scope.

Specific Comments:

1. The use of the term ‘sandbar’ is ill-founded. The experiment does, in fact, use a substrate that is approximately 40 percent sand. However, because of the scale and high Froude conditions ( $>2$ ), the experiment best represents a canyon, gravel bed system. The formative processes of ‘sandbars’ in this experimental design are entirely different than the sedimentary bodies described in lines 54 to 108 of the Introduction. In that section, there is extensive review of sedimentary bodies that are not genetically nor stratigraphically related to the sandbodies formed in these experiments which, at the scale of the experiment are gravel alternate bars. The fact that the bars in the experiment migrate in the upstream direction is evidence that the experiments are simulating Froude-supercritical (diffusive) conditions (Shaw and McElroy, 2016), whereas most of the sandbars described in the Introduction (except those formed by landslide dams) are formed by translative depositional processes. I would suggest the authors re-visit the process scaling of the experiments to re-frame and strengthen the experimental justification and basis, and the scientific contributions of the results. Kleinhans et al. (2014) and Shaw and McElroy (2016) provide excellent discussions on linkages between sedimentary processes in flumes and those in rivers.

2. The authors do not provide a clear basis and justification for the experiments. Neither a hypothesis nor scientific question are presented in the introductory material as a basis for the experiments. Instead, the justification appears to be that ‘sandbars are important’. Because the authors appear to have confused sandbars in low-slope, low Froude-number rivers with gravel bars from outburst floods, this justification is moot. In line 52 of the Introduction, the author’s state “Sandbars are one typical landform formed during the outburst flood evolution (Turzewski et al., 2019; Jiang and Wei, 2020; Wu

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et al., 2020).” Neither the Turzewski nor Wu papers describe sandbars at all, they describe gravel bars from outburst floods. Only the paper written by Dr. Jiang, which also appears to have confused sandbars with gravel bars, uses the term ‘sandbars’. The authors should re-visit their results and the literature to provide the reader with a clear justification for the experiments by clearly stating a hypothesis or scientific question being addressed.

3. The manuscript lacks a clear description or discussion of the scientific contribution. The Results contain very long, detailed descriptions of the spatial-temporal dynamics of bar formation, geometries, and migration processes in the experiments. These descriptions could be shortened, and the scientific community would be better served with a discussion detailing how the results add to our understanding of bar formation from landslide outburst floods. For example, are the final geometries and along-stream scaling of the bars helpful in geologic interpretation of ancient bar deposits? Can they be used to improve interpretation of return frequency of certain outburst floods over recent geologic history? This manuscript simply does not contain any discussion linking the experimental results to the broader scientific literature, nor does it effectively relay the importance of the results to interpretation or prediction of landslide-dam outburst events.

References:

Kleinhans, M.G., van Dijk, W.M., van de Lageweg, W.I., Hoyal, D.C., Markies, H., van Maarseveen, M., Roosendaal, C., van Weesep, W., van Breemen, D., Hoendervoogt, R. and Cheshier, N., 2014. Quantifiable effectiveness of experimental scaling of river- and delta morphodynamics and stratigraphy. *Earth-Science Reviews*, 133, pp.43-61.

Shaw, J.B. and McElroy, B., 2016. Backwater number scaling of alluvial bed forms. *Journal of Geophysical Research: Earth Surface*, 121(8), pp.1436-1455.

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