Earth Surf. Dynam. Discuss.,
https://doi.org/10.5194/esurf-2020-92-RC2, 2021

Earth Surface Dynamics Discussions

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 #2

Received and published: 14 January 2021

Summary:

The authors use a flume study to understand the effects of outburst flooding on downstream sandbar development. Different dam geometries (width and downstream slope angle) and a constant dam height were used. The upstream pool was allowed to fill and then overtop and fail under the same constant flow rate in all experiments. The authors relate bar frequency and volume to different dam geometries, and also note that bars tend to grow upstream during the experiments. The authors proceed to relate their observations to the flow hydraulics and sediment concentrations during the experiment. While the experimental set up seems reasonable, and the general result

reproducible, there are several parts of the analysis that are flawed. For example, the "sandbars" are not scaled appropriately, and in fact the median grain size is gravel in the experiment. Instead, these grains are equivalent to very coarse (boulders?) grains in the field scale. The framing of the introduction and paper in general is therefore not appropriate. Further, the Froude numbers during these experiments are all supercritical, leading to spurious correlations between transport capacity and flow depth (for example, I assume that dimensionless shear stress is calculated using subcritical flow assumptions via the depth-slope product embedded in u*). Nor is it clear how sediment concentration (figure 8) was calculated with the reference to Laursen given. Later, they use the Meyer Peter-Muller equation to calculate bedload, but, again, not considering the supercritical flow regime of the experiments and the influence on energy slope as far as I can deduce. Therefore, it is difficult to interpret whether any of the results in sections 4 and 5 are valid. I believe this paper should be rejected at this time – perhaps it could be resubmitted with sufficient re-analysis, but I would suggest the authors also consider a different journal.

General Comments:

Introduction: make it clear how the background information will provide context for the results of the study. For example, the reference to Demirci et al. (2014) does not provide much insight into how these results for a coastal beach will provide context for this study. The authors could use the introduction to describe more precisely how these different previous studies relate to sandbars formed in settings 1, 2, and 3 described on lines 67-70. And then state how the sandbars in this study fit within one of those settings, or whether they are some different phenomenon related to outburst floods (as is implied). Further, the references should be more directly related to the coarse-grained alternate bars that form during the experiment, rather than sandbars.

Section 3: It would be very useful to have some information on grain size on the bars in this section. Much of the sediment in the experiment seems equivalent to boulders in the field case, and the coarse sediment seems to comprise much of the bar material.

Even in that case, the grain size of the sediment is going to be a very important factors in depositional patterns and should also be reported.

Section 4: It is confusing that sediment concentration is calculated using a reference to Laursen, with no reference to how this was done or whether we are talking about bed load or suspended load. For true sandbars, it seems that the suspended sediment component would dominate. Later in this section, the MPM formula is used for bed load transport capacity, but how is u* defined given the supercritical flow conditions. I don't know if it is appropriate to use MPM without consideration of the effect of Froude number on the energy slope; this may lead to spurious negative correlations between Froude number and transport capacity.

Section 5: given the unknown equation to calculate sediment concentration, and uncertainty in the calculation of sediment transport capacity described above, I don't know how to interpret the results of this section.

Line Comments:

29: It "is" found. . .

35: Exchange "reference the research on" with "can be applied to"

41: delete "collapses" and just use "landslides"

60: "At present, much research. . ."

74: throughout the introduction, I suggest replacing semicolons with periods and starting new sentences.

118-131: good concluding paragraph of the introduction

156: spelling: "gravels"

156-157: Was there any dimensional scaling of the grain size? What would this sediment size correspond to in a field setting?

180: Were the balls buoyant in the flow?

188: Are you only able to measure the height along the flume wall? Rather than the average height across the channel?

220: Are these sandbars or gravel bars? They look to be dominated by the coarse fraction in the photos.

227-229: This sounds like alternate bar formation, for which there is significant literature that was not discussed in the introduction.

314-316: I don't understand why a smaller discharge would lead to a larger bar spacing. Please elaborate.

297-324: It would be useful to have a table or figure to show these differences between the experiments explicitly, or discuss in the context of Figure 5.

401: Please provide some more on the calculation based on Laursen; bed load? Suspended load?

407-422; Figure 8: I have no basis to judge any of this section because I do not know how the authors calculated these values with the available data. Using the surface velocity in different sections as measured with ball movement? What was the grain size used in the concentration calculation?

422: Spelling: abdomens? I think a different word was intended.

444: Were the concentration calculations using Laursen based on bedload as well?

451: equation 4 is not correct – need to square u* in the numerator

473-477: Not sure I agree with this logic. These Froude numbers are well over 1 in the supercritical regime. The shear stress as calculated is lower at higher Froude numbers because it will be shallower, but the velocity will actually be even greater.

Figure 3: It looks like these are essentially alternate bars forming in a straight flume

channel – you state that this is similar to the field setting, but are the bar locations sometimes also controlled by the presence of obstructions?

Figure 4: I wonder if this figure could be simplified to focus on the key points in the discussion of the figure that describe the 3 variations of response.

Figure 5: This is a complex of a figure relative to its discussion in the text; the scale bar doesn't allow us to see much of a trend except for length. There is not consistency in the labeling scheme (dots for length, triangles for width, for example; same colors for the same model runs).

Figure 6: Same comment as figure 5 with regard

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