Responses to editor and reviewers

Dear editor,

Thanks very much for taking your time to review this manuscript entitled “The formation and geometry characteristics of boulder bars due to outburst flood triggered by the overtopped landslide dam failure” (Esurf-2020-92). I appreciate all your and reviewers’ comments and suggestions! Those comments are constructive for us to revise and improve our paper. We have read these comments carefully and tried our best to revise and improve the manuscript. The revised contents have been highlighted in blue in the revision. The followings are the point-to-point response for each comment. We hope our revision will make the manuscript acceptable for publication. Thanks again!

Best regards,

Xiangang Jiang

suggestions of Editor:

I have now reviewed two reviews of your revised manuscript, one of whom reviewed the original manuscript. Although Referee #3 has some serious concerns regarding congruency of the experimental design with the study objectives, I believe that you should be able to address this concern through more careful wording of the objectives and discussion of the results. In addition to addressing this major concern, please address the additional minor comments from both reviewers before the manuscript is ready for publication.

Thanks for your suggestion. We have added the relative explanations in section 2.1 and Discussion in the revision. Please see 146 to 156 lines of page 8 and 358 to 360 lines of page of 21.

Response to the Reviewer 2

Line 17: check that you have written "field" rather than "filed" where appropriate in the text.

Thanks a lot for the reviewer's comment. We have changed "filed" to "field" in the revision. Please see the line 17 of page 1.

Figure 6: consider a log scale for the y-axis so that the width and height data are easier to see.

Thanks a lot for the reviewer's suggestion. We have adjusted Figure 6 as follows:

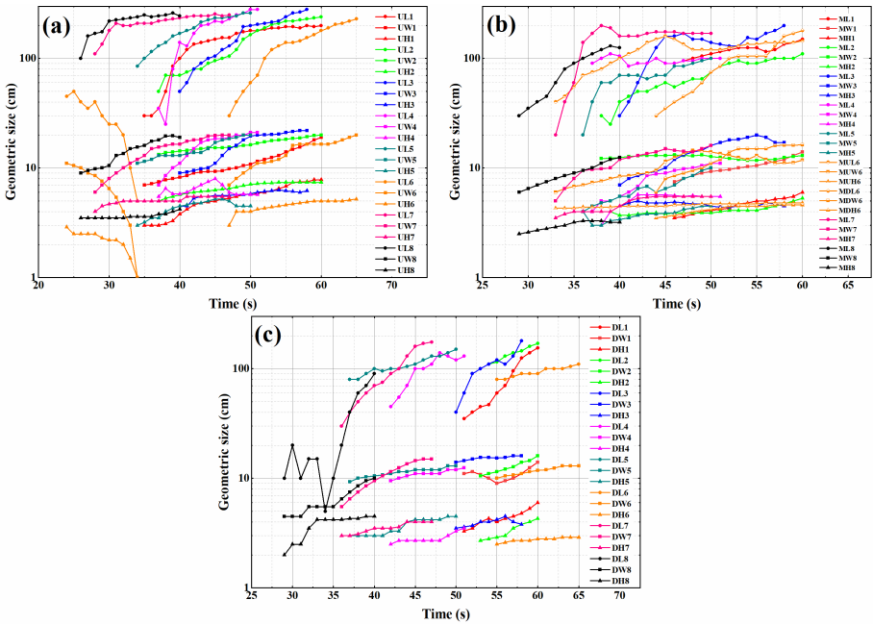

Figure. 6. The lengths, widths, and heights of the boulder bars: (a) sizes of the boulder bars near the upstream reaches; (b) sizes of the boulder bars near the middle reaches; (c) sizes of the boulder bars near the downstream reaches. Notation: L, W, and H represent the length, width, and height of the boulder bar, respectively. i represents the Ti experiment. For example, MUL6 indicates the length of the boulder bar near the middle-upstream reaches for the T1 test.

Figures 8 and 10 are a nice addition to this study: consider plotting the flume data on the field data plot in figure 10 to show how well they compare

Thanks a lot for the reviewer's suggestion. We have plotted the flume data on the field data plot in figure 10. It shows the two groups of data are compared well.

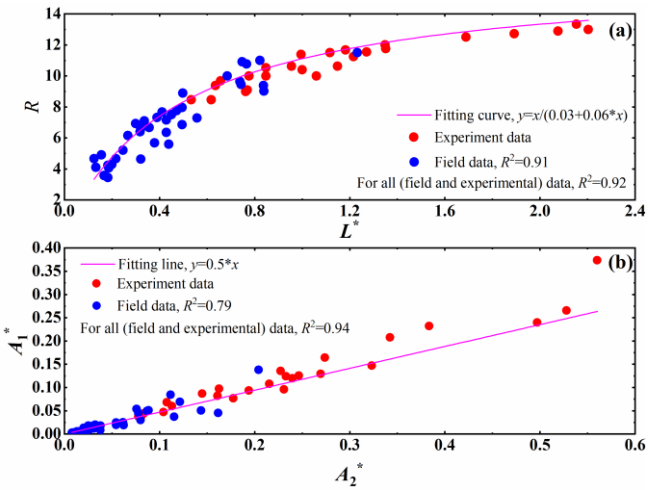

Figure.10. Geometry characteristics of boulder bars after the dam failed in the field. The experimental data are also plot in the figure to compare to the field data. (a) The relationship between boulder bar length to width ratio (R) and dimensionless length (L^*); (b) The relationship between boulder bar's dimensionless area (A_1^*) and the cross-sectional dimensionless area of the river channel along the boulder bar (A_2^*).

Response to the Reviewer 3

1.The materials of riverbed is quite different from that of landslide dam, thus an inappropriate design is that the riverbed consisted of the same material as the landslide dam;

Thanks a lot for the reviewer's comments. There is indeed difference between the materials of the field riverbed and dam. However, in the existing researches, the difference of materials between the two has not been quantitatively analyzed so far, and there is no clear description on this subject. Moreover, in different areas, the materials of landslide dam and riverbed may be significantly different. Therefore, in the present

experiments, it is considered that the dam material and the river bed material are the same.

In lines 146-148 of the revised manuscript, we have added explanations as: “While the materials of riverbed are different from that of landslide dam, it is hard to find a general description of the difference. Thus, we designed the materials of riverbed and landslide dam the same for present experiments.”

And, we have also added the related contents in the Discussion section in the revision.

2. The initial location (or distribution) of coarse particle within landslide dam is unclear, and this factor can have an important influence on dam failure and boulder bars formation;

Thank you very much for the comments. As the reviewer’s comment, the initial position (or distribution) of the coarse particle within the landslide dam has an important influence on dam failure and boulder bars formation. We agree with the reviewer’s opinion. However, there is still no quantitative and accurate description about the distribution of the coarse particles within the dam. To simplify the experimental conditions, homogenous dams and riverbeds were set in the experiments. We have added the contents in lines 148-152 of the revised manuscript as follows “Moreover, the compositions of field dam and riverbed can be heterogeneous, i.e. the distribution of coarse particle within landslide dam is inhomogeneity, there is still no quantitative representation of the heterogeneity. Therefore, the coarse particles and fines were mixed

uniform, which means the distribution of coarse particles were homogeneous."

Also, the related contents have been added in the Discussion section.

3. Channel morphology that probably has a clear impact on the formation process and geometry characteristics of boulder bars is not considered. The results based on the experiment with only a river type are unconvincing, e.g. two dimensionless parameters;

Thank you for your comment. The authors agree the reviewer's opinion. However, the topography of river channels in the field is complex and diverse. To reveal the fundamental characteristics of boulder bars' formation process and geometrical characteristics, the experiments did not consider the real channel morphology. Instead, a straight and flat river channel is adopted. This "idealized" model is conducive to reveal the boulder bar formation process and geometrical characteristics. We have added an explanation in the revised manuscript, please see lines 152-156.

4. The flow direction in fig. 5 should be marked.

Thanks a lot for the reviewer's comments. We have added the flow direction mark in fig. 5 according to your suggestion in the revision.