



EGUsphere, author comment AC1
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Reply on RC1

Anya S. Leenman and Brett C. Eaton

Author comment on "Episodic sediment supply to alluvial fans: implications for fan incision and morphometry" by Anya S. Leenman and Brett C. Eaton, EGU Sphere,
<https://doi.org/10.5194/egusphere-2022-267-AC1>, 2022

Thank you Dr Clarke for your helpful suggestions and feedback. We have copied your comments here for reference (in *italic text*) and respond to each point individually.

Specific comments

The four experiments are labelled as Run 1, 7, 8 and 9 – I understand that this is due to results being presented in other papers and to maintain consistency but it is a confusing way to present the runs in this paper. It would be more appropriate to label them 1-4 or have an abbreviation to represent the degree of oscillation in the sediment supply, and in Line 50 refer to how they link to other publications and run numbers in these.

Relabelled with CON, OSC10, OSC20 and OSC40 following your second recommendation.

In Section 2.3 (Lines 109-111) you introduced the experimental scenarios that you used and mentioned that three repeats were carried for the constant sediment supply runs but only one set of data was presented in this paper, which was selected as it best fit the other runs. I think that you need a stronger justification here for why an average wasn't used and/or the implications of bias selection for this to showcase to the reader that you are presenting the unbiased results.

Instead of adding more justification, we have added data from the other two repeats of Run 1 (now named Run CON) to all relevant plots. The only plot to which we have not added data from repeats 1 and 3 is Figure 10; adding the extra data would smooth out the random oscillations in erosion/deposition across the fan that are visible in column 1 (Run CON), which provide important context for the strength of the signal in columns 2-4 (OSC runs).

In Section 5 (Conclusions) I think you can have a stronger final paragraph to emphasise the novelty and applicability of this work. I understand your point about your experiments being more realistic than previous constant supply experiments, however certainly in relation to my experiments (Clarke et al, 2010) they were never meant to represent long-term fan evolution but instead were highlighting that even under constant climatic periods autogenic processes could still cause changing processes on alluvial fans. Therefore I think a stronger selling point of this work is that this represents the first study to use experiments to recreate alluvial fan processes that are more representative of natural conditions on alluvial fans, and therefore the processes shown are more directly applicable

to hazard management and understanding the link between climate change (i.e. sediment-supply) and fan response, thus you are starting a shift-change in how alluvial fans should be modelled in experiments to start answering these real-World issues. Emphasising this at the end of the paper (and in the abstract) would broaden the appeal of the paper and showcase the strengths in your approach.

We have added to the final paragraph and abstract to both highlight the utility of constant input experiments, and to point out the utility of our own variable input experiments for understanding hazards, as you suggest (lines 11 and 488-490).

Technical comments

Line 34 At the end of the sentence "...most alluvial fan experiments use a constant sediment supply" it would be useful to cite the key papers here for – I know that you do refer to these later in the paper but they should be brought in here to show the body of previous work that you are building on.

Done.

Lines 43-47 I'm unclear why this is here. A summary of the key findings is provided in the abstract, discussion and conclusion and so doesn't need repeating here. Suggest removing.

We prefer to have a summary of key findings at the end of the intro to "signpost" what the reader should keep an eye out for while reading through the results – otherwise it is possible to get lost in the details of our data. However, we can remove this if the editors/other reviewers advise.

Lines 70-72 Repetition of start of Section 2.4 – remove from here and merge information into Section 2.4.

We feel this is worth keeping – here, it is to tell readers about the key data products from (i.e. what was the point of) our camera array. At the start of section 2.4, it is to remind readers that these two products were the starting point for all subsequent analysis.

Line 89 Where on the fan was Re^ estimated from? This would vary greatly depending on the position on the fan and so this needs clarifying as I was unclear whether this was calculated in the same position on the fan head as Fr or elsewhere.*

Same position on the fan-head. Have edited line 105 for clarity.

Section 2.4 What were the error metrics for the SfM output and the DEM?

Detailed assessment in PhD dissertation (cited), with relevant information now cited in line 152-153.

Line 135 Unclear what you are trying to say here, suggest rephrasing.

Rephrased, now line 154-155.

*Line 242 "Deposition rates then **decayed**..." – suggest using an alternative for decayed*

Changed to "decreased"

Line 243 "...most evident in Runs 8 and 9" – this paragraph is focused on these two

runs and so this is unnecessary but could be amended to Run 9 as this showed the most significant decline.

Opted to remove; you're right that it is unnecessary.

Lines 273/274 Suggest removing "that of" after the first and second points.

Rewrote these two sentences to remove "that of" and also be grammatically correct.

Line 290 "elongate" should be "elongated"

Done.

Figure 9 Make sure that the ensemble lines for all of the plots are plotted in front of the individual oscillations so that these are clearly visible.

Replaced with separate plot so these data are more clear.

Figure A1: Annotate to the aerial photograph to show the fan and catchment extents.

Done.