



EGUsphere, referee comment RC1
<https://doi.org/10.5194/egusphere-2022-267-RC1>, 2022
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Comment on egusphere-2022-267

Lucy Clarke (Referee)

Referee 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-RC1>, 2022

General comments

This paper presents the findings of four physical model experiments; this is a well established technique for evaluating processes on these landforms however the authors expand on previous research by using episodic sediment supply which is more representative of natural conditions during fan evolution. This provides a novel set of results which will be of interest to the ESurf readership both for those interested experimental methodologies, those in the alluvial fan community and also those with an interest in wider environmental reconstruction. The paper present a series of well created figures that display results and the links to the time-lapse videos of the experiments is a welcome addition, as is the provision of the model code. Overall I think that this paper should be accepted following some minor amendments detailed below.

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.

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.

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.

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.

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.

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

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.

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

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

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

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.

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

Line 290 "elongate" should be "elongated"

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.

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

Review by:

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