

Interactive comment on “Grain sorting in the morphological active layer of a braided river physical model” by P. Leduc et al.

Anonymous Referee #1

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Overview This paper uses a physical scale model of a braided gravel bed to measure the grain sorting in the vertical ‘morphologically active layer’. The topic of the paper is of interest to readers with some interesting findings that are applicable to the wider discipline. I feel the journal should be accepted with minor revisions, as detailed below. However the authors should strongly consider the current balance of the paper as the introduction and methods section is very long as compared to the results and discussion. This currently leaves the reader wanting more detail, particularly in the analysis section. There also needs to be some clarifications to the methodology and results section. Detailed comments are given below.

Introduction Page 579, Line 16 – the term morphological active layer is introduced here. I think it would be good the distinction between the morphological active layer and the

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grain exchange active layer made earlier – I would suggest moving the 4 lines at the top of page 581 to here just to make the explicit difference clearer. Page 579 – lines 11-15 relating to patchiness seems out of place and I would consider deleting it as it does not add to the understanding of the problem being addressed. Page 581- Line 23-26 beginning with ‘because of the progressive development’ doesn’t make sense- consider re-working Page 581- Line 27 beginning ‘our solution is to use’ – is a very long sentence – consider re-wording

Methodology Page 582, Line 23 – what was the geometric sorting value of the grain size distribution? Page 583, line 10 – you mention that some bed features were inherited from earlier in the experiment – what re the potential impacts of this inheritance on your results? Were there specific features which were inherited? Page 583- Line 13 – the vertical stereo images were taken of the dry bed surface. It is therefore assumed that the flume was stopped and started 40 times to capture the stereo images? If so this is likely to have an impact on the sediment transport dynamics, particularly the fine sediment dynamics. Did you take this into account and if so how? I think this is worth of mentioning in the methodology. Page 584, lines 2-15 – you mention that the you calibrated and validated your image texture method over the full grain size range however the axis on figure 1a and b only go up to 4mm when you have a maximum grain size of 8mm – can you explain why this is the case? You also mention that there is a relative error on the absolute values of up to 100% (although half the set had less than 20%) – were these errors correlated with grain size i.e. were any grain sizes better/ more poorly captured using this technique? Potentially you could plot a histogram of these errors against grain size to clarify this point. What impact might this have on your results?

Analysis and Results

Page 586, line 20 - The whole section on bed layer construction reads like it should be in the methodology section of the paper. I would move it to after Equation 1. Page 587, line 5 - The section on equivalent texture distribution covers the main results of

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your paper yet you dedicate only 12 lines to its description analysis. I think that given the changes to the results section suggested above (namely moving section 3.2 to the methodology section) it would be advantageous to combine the results and discussion section together given the brevity of the analysis section, especially the equivalent texture distribution analysis. This would help the latter part of the paper to flow better.

Discussion

Page 587, line 25- you mention that every equivalent texture occurs in each layer with approximately equal frequency- could the resolution you are measuring with have any impact on your results and ability/ inability to pick up some of the grain sizes, especially the fine grains? Page 588, lines 19- 24- very long sentence, consider revising

Conclusions

Page 589, line 2 – the experiments are analysed over a 40h period (plus the previous 140 hours formation time) – do you have a feel for how this scales to the temporal dynamics on the Sunwapta River? Page 589, line 11-12 – you mention that further analysis is needed to understand how the mixing develops. This suggests the obvious link to the temporal dynamics of the system. In the paper, although you analyse over the 40 h time period you do not look at the temporal evolution of the development. I think this would be worth exploring as it would offer real insight into the timescales of development in the field and how we can use those timescales in numerical models and future experiments. I don't think you need analyse this over every hour of the time step but potentially breaking it down into 4-5 hour sections may yield some interesting results.

Interactive comment on Earth Surf. Dynam. Discuss., 3, 577, 2015.