Earth **Surface**
Dynamics
Discussions

Interactive comment on "Short communication: Field data imply that the sorting (D_{96}/D_{50} ratios) of gravel bars in coarse-grained streams influences the probability of sediment transport" *by* Fritz Schlunegger et al.

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General comment

The authors quantify and cross-compare the probability of sediment mobilisation in a number of streams in the Alps (Switzerland) and the Andes (Peru). They attribute the observed differences in the probability of mobilisation between the two environments to the different degrees of sediment sorting characterising the two settings (quantified as the D(96)/D(50) ratio). The authors provide adequate context and they use

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a well-known modelling framework (based on the exceedance of critical shear stress $\tau > \tau^*$) to calculate the probability of sediment mobilisation. They also use standard techniques to approximate grain sizes and merge different sampling techniques in a convincing way. Uncertainties are then propagated using a Monte Carlo framework and the derived results are analysed using standard regression techniques. These two latter components of the paper need to be discussed more. The Monte Carlo calculations need to be introduced separately from the bed load modelling and the grain size sampling framework to a) enhance readability** and b) extend the justification on the assumed uncertainties used in the error propagation. The regression analysis needs further validation and does not directly quantify the relationship explored in this work. I consider those revisions to be minor since they can be directly addressed using the existing calculations and the should not affect the key outcomes of this work. I find the main message of the paper, the dataset and the methodological approach very interesting, important and within the scope of EarthSurfD. But I also believe that the presentation can be enhanced.

** I kept the specific comments as they occurred in a "start- to - finish" type of reading. Some of the initial comments are addressed in the methodology but this does not enhance clarity.

Specific comments

1. Lines 32-34 Need to clarify this hypothesis. For example, for the first part: "well sorted bars are less frequently reworked", I think it is necessary to add "under relatively low sediment flux conditions". The second part ("braided streams host gravel bars...") is clearer.

2. Lines 41-42: That sentence is vague. How is the mobilisation quantified? If it is an approximation based on a function of critical shear stress then it is a threshold by definition. Is this an a-posteriori evaluation? (implying that the authors observed particular events?)

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3. Lines 45-46 One can read this as selecting from a braided river the only segment that is not effectively braided. How can the authors justify that the confined segment will have similar (or relevant) mobility with the rest of the (braided) river?

4. Lines 54-55 This is very clear, but it is necessary to clarify the corresponding part of the introduction as well (Comment 2).

5. Lines 63-66 It is not very clear how you employ the full range of φ, I assume that you imply a uniform distribution between 0.03 and 0.06 in a randomisation type framework, but it needs clarification.

6. Lines 73-74 I am not sure the reference to the D(50) threshold adds anything to the methodology here. On the contrary, it slightly complicates it.

7. Line 92. This similarity needs to be explained (or the comment needs to be removed).

8. Lines 93 to 96 The Monte Carlo framework needs to be introduced earlier. That will put in context some of the methodological comments that are difficult to understand (e.g. Comment 5). It is also possible to separate completely the layout of the bed load equations from the error propagation and devote one short section on the Monte Carlo calculations only.

9. Lines 105-106 This is a small detail, but it would be great (for completeness) if the authors could state how they calibrated their photographs (what is the measured dimension that converts from pixels to length?)

10. Line 110 "few millimetres" is vague. A number is needed here (preferably in conjunction with the pixel-length conversion).

11. Lines 119 and 121 The assignment of those uncertainties is not justified in a quantitative manner. It would be useful to see (here or in appendices) some quantification on the variance of channel widths and gradients (a simple boxplot would be more than enough) and statistics of the validation of DEMs (which must be already calculated).

Similarly, the uncertainty assigned to the grain size data set should also be a function of natural variability and measurement error.

12. Lines 154-155 Is Maggia the only river with a confluence <1km upstream? I think the argument about the response to an extreme holds better.

B. Lines 158-162 I find this interpretation quite strong. These regressions show (in my opinion), that sorting explains a higher percentage of the variance of the mobilisation probability in the Alps than it does for the Andes. Additionally, the weak correlation for the Peruvian rivers indicates that sorting can be a secondary control in the Andes. Consequently, it is difficult to compare the two regressions (the model for the Alpes and the model for the Andes) in terms of the effect of sorting. That would be the case if they were two very strong regression models and there was a noticeable difference between the regression parameters.

14. Lines 178-180 That is true, however no information on the distribution of the residuals is provided so there is a question regarding the assumed linearity of these relationships.

15. Lines 182-183 I believe that this is the main message of this work, however the regression analysis presented here does not quantify that difference. It is possible make this observation in the scatter graph of Figure 3 but another type of presentation is necessary.

16. Lines 193-194 The regression analysis presented here supports that statement although further validation is needed.

Please also note the supplement to this comment:
https://www.earth-surf-dynam-discuss.net/esurf-2019-75/esurf-2019-75-RC1-supplement.pdf

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