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Earth Surface Dynamics Discussions

Interactive comment on "Impact of change in erosion rate and landscape steepness on hillslope and fluvial sediments grain size in the Feather River Basin (Sierra Nevada, California)" *by* M. Attal et al.

Anonymous Referee #2

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This manuscript by Attal et al. discusses how hillslope processes determine the granulometry of the bedload fraction of river sediments through a transient landscape. The authors have chosen a very well confined study site that is well suited to study this thematic and have delivered extensive field observations of grain-size distributions from characteristic landscape features and river reaches. The main results of this study are: 1) fluvial sediment granulometry mirrors the contiguous hillslope distribution; 2) grain-size in the source areas depends on the slope angle, which obviously controls the residence time and thus the exposure time of sediments to weathering; and 3) the

hillslope response to base-level lowering is fast with respect to the river network. The authors have crafted a nice manuscript that is overall very clear and well supported by data and is well suited for publication in ESURF. I have only few minor comments that I believe can easily be incorporated, as well as few suggestions concerning the figures.

* My major criticism of this work is that the analyzed sediment deposits in the active river channel provide only a snap shot without any information on how and when these sediments have been deposited. I could imagine that some of the studied gravel bars have been deposited during unusual floods while others during high river stages in a rather continuous manner; the latter however are not special from a flood terminology point of view. This makes it difficult to relay grain-size with the flow competence of river reaches, since the depositional process is very little understood. - e.g. would the authors find the same results if this study was carried out a year earlier or later? - Last, the rather fine-grained material from the upstream low relief areas might leave the catchment predominantly in suspension and might be thus underrepresented in the analysis (?). I think it is fair to discuss this problematic in the manuscript more extensively and especially to highlight the fact that the analyzed sediments are immobile during sampling times. Maybe the authors have some more information on flood statistics of this area that could be included? It would help also if the authors could give more information on the climatology of the study area in order to understand how flushy/seasonal the system is.

* The leading research question(s) of this study has to be better highlighted. At the moment the elaborated introduction lets the reader only vaguely adumbrate what the goal of this study is.

* Considering that particle residence time is an essential argument for one of the major conclusions, the discussion of this parameter (page 1064, line 10 onwards) is coming a little out of the blue. It should be better introduced, explained in the method section and reported in the results.

Minor comments: Page 1056, line 21: Table A1 is not exactly giving this information.

Page 1061, line 20 onwards: Is it necessary to apply such a complicated model? or could the same conclusion be drawn from solely channel steepness or adjacent hillslope relief? This would make the findings intuitively simpler and would exclude a set of uncertainties, e.g. A=Q.

Page 1062, line 4 onwards: But this is intrinsic because the model is designed to work on slope and area. The conclusion should be that the model is a good predictor for landscape changes.... To derive this conclusion the model is not needed.

Page 1065, line 1 onwards: It would be helpful to include some close-ups of the weathering brim and pristine sediments in the manuscript.

Page 1065, lin 10 to 22: It can also mean that the fines are just depleted because of higher transport capacities, flow velocities, etc.

Page 1067, line 14: I do not understand this sentence.

Page 1067, line 15: What is abnormal?

Page 1067, line 24: I do not understand how the authors know that the sediments have only been transported few 100m? And after 100m where do they go?

Table 1: Indicate what is t and p for completeness.

Figure 1: This could be combined with figure 2. Please include the basin outlines and river network.

Figure 2: The slope map would be easier to understand if slopes would be classified to few major classes and draped over a shaded relief. Sample locations need to be better highlighted as well as the river network. For orientation a flow direction indication of the MFFR would help.

Figure 5 upper panel: In the lower left part it looks like man made metal structures.

Can these features have influenced your hillslope granulometry?

Figure 6: It would be helpful to include the development of the flow competence along the river channel in one of the panels.

Figure 8 b: I understand that it is difficult to combine different grain-size measuring technics. But still it would be helpful to normalize the laser measurements to the smallest sieve fraction in order to have one continuous curve. Somehow this must have been applied in panel a already. By looking at this figure, could the bimodal peaks contain any information of the sediment origin (mixing equilibrium, etc.) and how meaningful is a D50, D84, . . . , value for bi-modal distributions?

Figure 10: Differentiate the plateau and canyon part in the basins outline by shading. Zoom to the river section with data in plot a.

Interactive comment on Earth Surf. Dynam. Discuss., 2, 1047, 2014.