Earth Surf. Dynam. Discuss., 2, C505–C508, 2014
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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 #1

Received and published: 18 November 2014

This study by Attal et al. tackles the challenging question of what controls the grain size distribution of material supplied to channels by hillslopes. Specifically, the authors use a transient landscape in the northern Sierra Nevada to test whether increasing landscape steepness (and commensurate erosion rates) results in an increase in grain size on hillslopes and in channels. At one level, the results show few surprises – it is obvious even to a casual observer that landslides contribute the coarsest material to rivers. But the authors take it one step farther and show that there is a systematic coarsening on hillslopes with increasing hillslope gradient that is attributed to a de-

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crease in soil residence time and degree of chemical alteration. This to me is the most interesting aspect of the study and perhaps warrants more discussion than is currently in the manuscript. The analysis of sediment caliber in fluvial gravel bars is somewhat messier, but also shows a pattern of coarsening with increasing flow competence.

The results from this study will surely garner some attention, especially as there are few detailed and systematic grain size analyses of coupled hillslopes and channels. However, I think the presentation (especially the figures) and the interpretation could use some cleaning up in places before the manuscript is ready for publication.

My main concern is with the analysis and interpretation of the fluvial grain size distributions. I guess I remain unconvinced that the relationship between grain size and flow competence is causal. Due to the basin configuration, higher flow competence is tied to the reaches downstream of knickpoints where hillslopes are steeper and landslides are more common. So how do you untangle the potentially dominant effect of hillslope sediment supply on channel grain size distributions? It seems that more than just the grain size on gravel bars is needed to test this hypothesis.

Line comments: P1051 Line 9: This is a sharp break. I would rewrite the end of section 1 to emphasize what the goals of the study are and perhaps keep the study area description in section 2.

P 1059 Line 11: Perhaps describe the reach lengths in terms of # of channel widths?

P 1062 Lines 3-5: I wanted to see a map of flow competence for the field area – perhaps add as another panel to figure 1? Also, why not just use specific stream power? It is easier to conceptualize (at least for me) and I suspect that changing the slope exponent from 1.15 to 1 will not fundamentally change the patterns/interpretations in figure 11.

P 1063 Lines 18-22: This sentence is difficult to unpack. Not much is said elsewhere in the manuscript about the difference in hillslope flux for relict vs. adjusting slopes. Perhaps this deserves a whole paragraph here.

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P1063 Line 26: I suspect there is minimal to no salt weathering occurring in the Feather River sites!

P 1064 Lines 14-15: Units missing. I think you mean 0.51 meters right?

P 1064 Lines 14-19: Interesting to note that nearly similar soil thickness despite 2-fold increase in predicted erosion rates. . .

P 1067 Lines 15-17: Isn't the rapid hillslope response simply reflected in the lack of inner gorges?

Figure 1: I would pair this with figure 3 as a two part overview figure, and eliminate the inset graphic currently with figure 3 (this is redundant since figure 4a serves much of the same purpose). As a general note, make sure that all labels and symbols can be read when printed out! I needed to zoom in significantly to see any details on many of the figures.

Figure 2: You could easily add the hillslope length and relief to this figure to help clarify the meaning of those variables (i.e., that Sh is a hillslope-averaged quantity rather than local. . .)

Figure 4: Enlarge Figure 4a, and perhaps color code the sample sites to make them visible. It's a little confusing to use circles for indicating the steepened channel reach, but it may work if the sample sites are color.

Figures 4b, 5, and 7 seem more like supplemental figures, but if they are included in the main text, perhaps combine them into one place?

Figure 6: This figure is a little tricky to interpret since the relative position of the profiles within the basin is unclear. Aside from Bean Creek, which looks like it drains to the NF Feather River, I suspect it would be easier to follow if you plotted all the tributary profiles alongside that of the MF Feather River.

Figure 8b: This figure is confusing because of the discontinuity across measurement

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methods. Personally, I would remove it since all this info is readily available in figure 8a.

Figure 9: Plots a) and b) are basically showing the same thing. I think it would be clearer to just show 9a and remove 9b.

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