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Earth Surface Dynamics Discussions

Interactive comment on "On how sediment supply affects step formation, evolution and stability in steep streams: an experimental study" *by* Matteo Saletti and Marwan A. Hassan

Anonymous Referee #1

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Thank you for the opportunity to review this article. The subject matter is important and interesting, dealing with the question of how sediment supply into a steep stream channel influences step dynamics in terms of step frequency, location, and stability. Some important conclusions are drawn from the results, that can be of value to the scientific community and practical use for river restoration efforts. I suggest a few points to improve the clarity of the MS:

Line 88: instead of 'feed capacity' it would be better to use 'transport capacity' since this is the term used throughout the manuscript.

The paragraph starting from line 97 could be moved up (possibly before the paragraph

starting from line 84).

Line 99: Define ψ here.

Table 1 and figure 3 both provide the same information, so I suggest using only the table which provides values of unit discharge and feed rates. If there is a practical need to include both the table and the figure, the legend in figure 3 should be boxed, as it looks like another sediment feed! Also in the figure caption, instead of 'In the last hours' it would be better to say 'after 7 hours'.

In table 1, if flow rates were increased by 20% every hour even after the sediment feed was stopped, why are the values same for some experiments (e.g. exp_07, exp_08, exp_09 in experiment 50, and exp_09 and exp_10 in experiment 100 and 150)?

In figures 3, 4, 5, 6, and 12, it is better to box the legend to avoid confusion.

Line 164: It would be helpful to the reader if you define jamming ratio here.

The paragraph starting from line 176: Correct the figure numbers referred in the 3 points.

Figure 7: Consider adding the results of the no-feed experiments also here, since it can provide a comparison between the step dynamics with and without sediment supply.

Line 258: Can you explain how your results can be used to elucidate the difference between channel stability and morphological stability in steep mountain streams?

The conclusion that 'the maximum number of steps is achieved for average values of sediment feed' can be misleading. If you consider the sediment feeds 50%, 100%, and 150% of the transport capacity, one can categorize them as low, average, and high sediment supplies, respectively. Then your conclusion implies that sediment feed corresponding to the 100% transport capacity (which is the average sediment feed in this categorization) creates the maximum number of steps, which is not true. Moreover, according to this categorization, it is actually the low sediment feed (not the average)

that creates the maximum number of steps. Therefore, I think the term ‘average value’ needs to be more explicitly stated. This is appropriately mentioned in line 287 where you have explained ‘average value’ in parenthesis (i.e., when the sediment feed is half of the transport capacity). But in other places including the abstract, the term ‘average values of sediment supply’ may lead to confusion.

Needs proofreading for grammatical errors and typos throughout the MS. Some examples are: Line 68: In hypothesis 3, qualitatively is mentioned twice Line 102: top of a moving chart (‘of’ is missing) Line 128: ‘average number of’ instead of ‘average numbers of’ The paragraph starting from line 155: check grammar in this paragraph. e.g. flow rates increases Figure 8 caption: ‘. . .that formed and destroyed’ instead of ‘an’. Line 226: ‘...as it is. . .’ not ‘. . .at it is. . .’ Line 340: ‘. . .conceptual model that relates. . .’ not ‘the relates’

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