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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Experimental study of sediment traps permeable for frequent floods" *by* Sebastian Schwindt et al.

Anonymous Referee #3

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Dear Editor, Dear Authors, I carefully reviewed the manuscript titled "Experimental study of sediment traps permeable for frequent floods" submitted as a discussion paper to the NHESS journal by Sebastian Schwindt and co-authors. I read also the other comments which have been posted. In my review I'll try, as far as possible, to avoid redundant suggestions.

General comments:

The study fits into the specific scopes of the journal since it's a potentially valuable contribution to the design, and anticipated critical evaluation of mitigation measures to reduce the impact of hazardous natural events on human-made structures and infrastructure, thereby trying to maintain or reestablish minimal levels of hydro-morphological end ecological functioning in mountain streams. In my view the

manuscript needs to be enhanced in certain aspects to reach its full potential and to be finally considered for publication in NHESS. First and crucially, the authors should better clarify the new contents with respect to the previous publication by Schwindt et al. titled "Analysis of mechanical-hydraulic bedload deposition control measures" published in Geomorphology in 2017. It's very important to minimize the overlaps and to focus almost exclusively on the analyzed new concepts for permeable sediment traps. I'm my opinion it would be advisable to summarize these previous findings in a short section titled "Current state of the experimental research" to pave the way for the presentation of the completely new research and the associated results. As stated in the abstract the new elements consist in a guiding channel featuring a permeable barrier on the downstream end. This concept is presented as completely new. I'm aware of at least two partial efforts to address a similar problem setting. One is an already implemented mitigation measure in the River Rienz in South Tyrol (compare Guis et al. 2016) and the other is an experimental study of the deposition basin in the Gadria stream as well in South Tyrol (compare https://www.baunat.boku.ac.at/fileadmin/data/H03000/H87000/H87100/IAN_Reports/REP01 With respect to the former a sort of guiding channel has been implemented upstream of the filter (although not featuring a regular cross section). With respect to the latter the experimental variant 5 embodies as well the idea of facilitating the throughput for frequent but less intense flood events). Perhaps it could be advisable to acknowledge the existence of such partial efforts and to point out that in this study explicitly focusses on a full conceptualization. Second, it would be recommendable to extend in the introduction the description of the importance for design to quantify the nexus between an enhanced sediment flux control, reduced risks for the built environment and hydro-morphological amelioration of downstream river reaches. Additionally, I suggest to unveil the underlying design problem explicitly. Which real world problem are you attempting to solve? Sparsely throughout the text you report field data, so it would be interesting to know if a real world case (or more than one) motivated your study. This is not of minor importance, since an optimal functioning of a certain sediment dosing

or filtering system can be ultimately judged based on the sediment supply needs of the specific river and the natural hazard risk of the specific built environment. Has a specific design objective been defined in terms of risk reduction, eco-morphological enhancement, cost minimization?

Specific comments:

Title: As a result of the revision process the authors should judge if the title merits to be slightly adapted.

Introduction: 1) Is the effective or dominant discharge also a useful concept in heavily modified (e.g. by check dams) alpine mountain torrents. If not, it would be interesting to know how the sediment demand for downstream reaches should be assessed. In my view this is a crucial design element. 2) The references are sometimes presented in chronologically ascending order and sometimes not, please adhere to the journal guidelines in this respect. 3) You mention that "The application of the grain size of the traveling bed load to bed load transport formulae can be used for establishing sediment rating curves, as a computation basis for the dominant discharge." Which grain sixe exactly? Please specify. 4) You use the terms eco-morphological depletion. I prefer degradation. Consider revising your wording.

Design approach for permeable sediment traps

If possible, the design approach should be presented in a much more coherent way. For example, stating, first, the objective(s) of the design and the applicable design principles and, consequently, the physical effects to be achieved and, lastly, the detailed structural design.

Methodology – Experimental setup: You start by "The design of the experimental set-up (Figure 3) was inspired by 132 characteristic datasets from mountain rivers (Schwindt, 2017). Thus, even though any particular prototype underlay the model, a geometric scale in the range of 1:10 to 1:40 can be supposed." I think it would be advantageous

to specify what exactly inspired the design of the experimental set-up. Moreover, also the second sentence needs further clarification.

Subsection 4.2 Deposition area with guiding channel: I'm not particularly convinced of the effectiveness of this subsection title.

Further minor issues:

Section 5 – Results and Analysis. Also in this case I urge the authors to slightly change the section title. Check carefully the reference style to consistently use brackets where needed. Moreover, equations should not contain references (e.g., Johnson, 2016).

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