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Discussions

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

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Dear Authors, I think your experiments were very well conducted, the results are clearly explained, and your ms is nicely written. However, I believe some clarifications are necessary before publication. Please find below my comments.

Best wishes Francesco Comiti

Introduction This section is too much focused on bedload transport issues, whereas little is presented about why check dams are used and how their implementation evolved over the past decades/centuries (see paper by Piton et al. ESPL). As the topic is very technical on check dam designing, I think the introduction should summarize the historical evolution of such structures

Design approach for permeable sediment traps The statement about the dominance of supercritical flows in mountain rivers is not true, as many lab and field investigations - also related to high flows - found out that critical flow conditions (Fr around 1) represent a sort of upper limit in mobile beds , for example see Grant (1997, WRR), Comiti et al. (2007, J. Hydrol, 2009, WRR), Yochum et al. (2012 J. Hydrol), Zimmermann (2012 WRR). Therefore I think you should modify your phrase, making explicit that only in the case of a smooth, stable bed (bedrock, artificial revetment) supercritical flow can onset in steep channels and thus a stable hydraulic jump can form in the retention basin downstream. Also, the assumption that bankfull discharge corresponds to effective discharge for sediment transport does not hold for steep channels (see Lenzi et al., 2006 J. Hydrol.) I would merge section 3 with section 2, as they are quite short

Methodology This section is quite well written and complete. However, I'd suggest some minor changes/comments: - the use of the term "torrential barrier": I would avoid the adjective torrential, it is not needed and in English it refers more to debris flow processes. Actually, you should clarify also earlier in the ms that debris flows are not considered in your work. - driftwood: In English refers to wood drifting in lakes or ocean, not in rivers. I'd suggest use simply "large wood" or "wood material" - Why did you choose a value of roughness n equal to 0.02 ? Please comment on its appropriateness relative to prototypes

Results Also this section reads well and presents useful information. However, I find the number of figures a bit too high and I suggest to consider removing 2-3 figures to make the paper more concise and shorter.

Discussion Can you offer an explanation for the lack of incision and reshaping of the deposit, differently from previous studies ? More in detail, is it possibly due to the relative size of sediments (with respect to flow discharges ?) Didn't previous studies obtain grain imbrication too ? Could there be a the role of test durations ? Please comment on how this lack of reworking compares to real cases You argue that the guiding channel should be rough to favor fish passage, this is correct, but isn't this in contradiction with the Manning n=0.02 you tested ? Also, the rougher the channel the less the flushing is effective. As to driftwood passage (but please call it large wood), this can be favored for frequent, low floods and for moderate log lengths, and thus relatively large bottom openings are good also to this respect . Wood should be trapped during large, infrequent events only, as for "excessive" bedload (Comiti et al., 2016, Geomorph) The term torrential hazards again suggests debris flow-like processes in English, whereas here you mean intense bedload. I suggest to drop the term torrential

Conclusions Although your experiments do provide very interesting insights on the deposition processes during a flood, I am left with a doubt: are we sure that the guiding channels are actually beneficial for bedload permeability in the long run ? You state that after the deposition the receding flows were not able to rework the sediment deposit as the channel "attracted" the flow, leaving the deposit untouched, and then one has to intervene mechanically (with very high costs !) For ordinary floods, in a check dam without a guiding channel but with large openings the flushing could be similarly effective, I suspect. I have seen "very open" check dams which do not trap much bedload during ordinary floods, and very likely they are able to partially self-clean after a flood event through "wandering flows" over the deposit (if openings are located at different heights), apparently better than with a guiding channel (based on your experiments). The question is about how much sediment can be let pass during a flood, and this is very site specific depending on the conveyance of the downstream channel. Can you please try to "convince" more the reader on the real advantages of guiding channels ? Also, I think a big issue that you should highlight again in the conclusions is the very critical role of wood on clogging the openings, and how this should be contrasted (as discussed in the literature you already cite) or accounted for.

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