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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Experimental and numerical study on the design of a deposition basin outlet structure at a mountain debris cone" *by* B. Gems et al.

B. Mazzorana (Referee)

bruno.mazzorana@provincia.bz.it

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These brief notes summarize my thoughts with respect to the discussion paper titled "Experimental and numerical study on the design of a deposition basin outlet structure at a mountain debris cone" authored by B. Gems et al. recently published in Natural Hazards and Earth system Sciences. The string of argumentation proposed by the authors for the specific cases study and the subsequent model based design of a deposition basin outlet are coherent and rational. In fact, a model based design strategy for an efficient search of optimal technical solution under given constraints is proposed. In a first step given technical solution alternatives are investigated through numerical

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modeling and then, once discarded solutions without prospects of success, the remaining (and hence promising) solutions are further investigated through a morphodynamic experimental model. Given these premises, in what follows, I'll try to identify some critical aspects that may affect the overall result in terms of sediment dosing and risk reduction. Acknowledging completely the rigorously defined focus of the paper, prior to the numerical end experimental design of a sediment dosing system, intent, aims and vision of the of the envisaged project should be accurately defined. In the specific case a list of conditions posed by the Austrian Service for Torrent and Avalanche Control is taken as starting point. This list is to be considered almost exhaustive if hazard reduction and flood risk mitigation are the only relevant criteria considered. A broader scoping including, for instance, sediment continuity targets and ecological functionality targets as required by the EU water framework directive, might have implied a different choice of the system boundaries (e.g. including at least the whole channel of the Larsennbach and the confluence with the Inn River where the effects of an extreme event might produce still relevant effects). To conclude this argumentation a clearly defined target system with a quantitative definition of the associated target values for risk reduction, benefit/cost ratios, sediment continuity enhancements would contribute to better embed the per se flawless investigation strategy proposed by the authors for the case study at hand. What might be somewhat questionable is an unmodified extension of the suggested investigation approach to a broader range of processes, including for example debris floods and debris flows. In this case the analogies with the pure water flow process might progressively vanish. For the sake of generality, I would rather suggest to always use a process-conform model (2D or 3D). I'm aware of the fact that for debris flows, currently, there are only few reliable 3D computational models available and that the rheological-closure of the physics of the process is still a matter of scientific debate. Therefore, in this case, I would suggest to use both a 2D debris flow computational model (e.g. Trent 2D) and a 3D "pure" hydrodynamic model (e.g. Flow 3D). The critical insights gained by the application of both models may be useful for a better "anticipated" understanding of depositional tendencies, before setting up the experimental

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model for a subset of possible outlet designs. To conclude I would like to express two additional doubts: Is it robust enough to design a sediment dosing structure taking as reference only the 150 year recurrence interval flood? Is it fully correct to transfer data relating to grain size characteristic diameters of geologically similar catchments to the case study under consideration? I case of an affirmative answer, grain size analyses (not conducted after events) at different spots in the catchment under consideration would be rather useless. Please provide additional argumentations to underpin your choice of transferring crucial data from other cases to your specific case. I expect to see your argumentations and to evaluate the new version of the manuscript.

Comment about the language style: Since I'm not an English native speaker, I do not intend to judge the language quality.

Bruno Mazzorana

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 3169, 2013.