



Prof. Roberto Greco and the *Natural Hazards and Earth System Sciences* editorial board

Prof. Dr. Huo Miao (Sichuan Agricultural University)

Dr. Stéphane Lambert (Univ. Grenoble Alpes)

Dr. Guillaume Piton (Univ. Grenoble Alpes)

Objet : Submission of the revised version of research article EGUSPHERE-2024-3575

08 August 2025

Dear Prof. Roberto Greco,

Please find enclosed a revised version of the paper entitled "Capture of near-critical debris flows by flexible barriers: an experimental investigation" for submission in *Natural Hazards and Earth System Sciences*.

We carefully revised the paper according to the three referee comments and to your final appraisal. We submitted online on the *EGUsphere* website detailed responses to each reviewer. "Prof. Greco, your last assessment of their questions and our responses stressed that some of our responses to their comments were possibly not clear enough and that we should be careful to revise the paper making sure that these questions are addressed. We concur with this assessment and we revised again the paper to make it sure. Your full assessment is pasted at the end of this letter, but you more particularly stressed that "From your replies, I have noticed that in many cases it seems that you prefer sticking to your original text when the referee found it not completely clear (e.g., comments 1 and 5 from referee #1, and comments 1, 2, 4 and 5 from referee#2)."

In essence, these comments concern several points to which we would like to address new responses as we brought new modifications in the paper body:

- Comments 1 of referee #1 and 1 and 4 of referee #2 raise the question of the novelty and relevance of our study that focuses on near-critical debris flows (i.e. Froude ~ 1). The referees cite several papers that address much wider ranges, more precisely higher values, typically 1-7 or 1-10. Then, we are asked to justify why we think innovative, important and useful to restrain the focus on narrower ranges.

We would like to remind, that Prof. Johannes Hübl of BOKU Univ. in Vienna (AUT), a worldwide respected professor in the field of debris flows, in his paper Hübl *et al.* (2009)¹ analysed researches on impact forces and found that most experiments and simulations were performed on these high values of Froude number. Having field data monitoring not overlapping with most of these studies, he stressed that "Concluding one can state, that models are developed of an input data range which does not comply with field data. This is a systemic error." Since then, various papers presenting precise field measurements of Froude number of torrents in France, Switzerland and Italy allow us to fully concur with this statement. These articles are cited in the Introduction section.

The recent papers suggested by the referees are of value but have the same approach that was pointed by Prof. Hübl: exploring very high values of Froude number. This point is explained at length in almost all the Introduction. We are a bit surprised and we do not understand how we could justify more than through all our Introduction that a large share of the existing literature

¹ Hübl J, Suda J, Proske D. 2009. Debris flow impact estimation steep slopes. In Proceedings of the 11th International Symposium on Water Management and Hydraulic Engineering. 1–5 pp.

explores a very wide range of phenomenon. Our aim was not to explore in detail a range of process going from slowly creeping surges of $Fr \ll 1$ to rocket-speed surges with $Fr > 7-10$ for example with a new sensor, a new flume or with a more sophisticated model, again the same range of theoretical processes. This is a valuable line of research that is maybe followed by the reviewers but we decided not to follow this one. On the contrary our aim was to conduct a detailed investigation focusing on debris flows with a narrower but realistic (in the Alpine context at least) range of Froude number, to define realistic process type and to test them in the lab. The novelty is that this zoom, plus the use of a realistically behaving flexible barrier (also a novelty, done for the first time in small-scale model to the best of our knowledge, this is also mentioned and more stressed in the new version), enables to capture and describe flow – obstacle interactions with details not previously known. We did our best to revise one more time the Introduction to make it even more clear. We hope it will answer the questions raised by the referees and that we will not be asked again to explore a range of phenomenon that doesn't concern debris flows observed in many Alpine environment torrents.

- Comment 2 of referee #2, as well as less directly comment 5 of referee #1, point the absence of analysis of the impact force and ask why we focus on the force at rest. The practical justification was not detailed in the previous paper version. We added explanations of this limitation in the second paragraph of Section 2.5 of the revised version (underlined in the quotation hereafter): *“Indeed, obtaining a precise measurement of the peak force was not possible due to some technical limitations with the system (slight smoothing of the force signal inside the sensor). A few independent tests with another sensor performed after the whole series let us think that the uncertainty on the peak force in our measurements is in the range 10-20%, sometimes possibly more. As a consequence, we decided not to focus on these uncertain peak force measurements to rather analyse force at rest for which the smoothing does not induce an uncertainty.”*

We would had love to share with everybody and publish nice peak force measurements with our realistic flows and barriers. So many research papers focus on this question, and comparing our data with these would have been a real achievement. Because our sensors had a bias, rather than to publish biased values, we decided to focus the analysis on other interesting points that usually attract less attention by researchers. We hope that the Associate Editor and the referees will understand that the paper is still of values even though it does not address the main scientific question that most of this literature usually addresses, with more precise and sophisticated methods than we could deploy in the work.

- Comment 5 of referee #1 was also questioning how exactly the force on the barrier F_b was computed. The Appendix of the paper was revised to make it fully clear. Sorry that the equations were not provided extensively.
- Finally, Comment 5 of referee #2 points that *“The flexible barrier is open-type with the net allowing the pass of debris flow materials. But this part has not been discussed. I think it is also important for loading response of barrier in addition to the overflow process.”* We do not really understand how a real scale flexible barrier could not be open-type. We suppose that the referee meant to ask whether a large share of the interstitial fluid passed through the mesh opening. We agree that this question was maybe not detailed enough and so new elements were added to Section 2.3 describing the barrier. We hope it is now clearer.

We hope these responses demonstrate that we took the comments of the Associate Editor and Referees seriously. The associated revision of the paper shows that we profoundly rework and rewrote parts of the Introduction, of the Material and Methods as well as of the Results and of the Conclusion sections. In addition, the Discussion section was almost completely rewritten. We hope that *Natural Hazards and Earth System Sciences* will find some interest in this work and we are proud to publish in this journal.

Sincerely,

Prof. Dr. Huo Miao

Dr Stéphane Lambert

Dr. Guillaume Piton

PS: in addition to these elements, our responses to the reviewers' comments are available on the paper online discussion at <https://doi.org/10.5194/egusphere-2024-3575-AC1>, <https://doi.org/10.5194/egusphere-2024-3575-AC2> and <https://doi.org/10.5194/egusphere-2024-3575-AC3>

Last Editor Decision:

“Interactive discussion - 01 Jul 2025

Editor decision: Reconsider after major revisions (further review by editor and referees) by [Roberto Greco](#)

Public justification (visible to the public if the article is accepted and published):

Dear Authors,

based on the comments by three referees and on my personal assessment, I think that the manuscript needs major revisions before being reconsidered for possible publication. From your replies, I have noticed that in many cases it seems that you prefer sticking to your original text when the referee found it not completely clear (e.g., comments 1 and 5 from referee #1, and comments 1, 2, 4 and 5 from referee#2). As something that is not totally clear to a referee may be unclear also to the readers of the article, I invite you to carefully consider the comments received, even when you think that your text already contained what the referees suggested pointing out more clearly or explicitly.

However, I am confident that there is much room for improvement, and I look forward to receiving the revised version.

Best regards,

Roberto Greco”