

Interactive comment on “A physical approach on flood risk vulnerability of buildings” by B. Mazzorana et al.

P. Ronco (Referee)

paolo.ronco@unive.it

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General comment

The paper provides an excellent and innovative insight on the challenging topic of (buildings) vulnerability to flood risks. With respect to the current state-of-the-art on the topic, it represents an innovative and original contribution towards the establishment of conceptual scheme for a physical-based vulnerability assessment for buildings stricken by a flood event. The approach is both rigorous, scientifically sound based, innovative and robust with an interesting application/validation to a real case study. The overall structure and cause-consequences pattern of the paper is clear, well established and linear. However, some detailed and minor revisions are needed in order

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to improve some particular aspects and clusters of analysis, as follow.

1. Introduction

a. More references and in-depth bibliographic analysis are needed with respect to the concept of (flood) risk (page 2, row 23; page 3, row 6), in particular when it comes to its formalization as a function of different clusters and dimension of analysis (hazard, exposure, vulnerability, from an social, economic, environmental and . . . viewpoints?) and its practical “application” in the framework of the European Flood Directive, among the others.

b. Page 4, rows 5-6: which typological classes of buildings are you referring to? Please specify.

c. Page 6, rows 11-12 and 17 to 19 (and more on page 17, rows 1 to 7): the definition of the “serviceability” is not clear, in particular (suggestion): why do not you consider also the loss of service of the facilities (electricity, water, power supply) in the characterization of the SLS of the building, since you suggest to include in the design situations to be considered also the “comfort of people”?

d. Page 7, rows 1 to 3: you stated: “we will discuss the added value of the presented methodological approach for the planning of both functionally and economically efficient local structural measures as a complement to conventional mitigation strategies”, but this does not appear both along the text and the conclusions as well. Please add some comments on this.

2.3.2. Fluid flow impacts relevant for structural and physical responses analysis

a. Page 12, row 6 and follows: what is the difference between the “confined and unconfined flow”? Is the confined flow situation the most frequent one in mountain environment? If so, is there any reason to prefer the use of the unconfined flow formula provided by Eq. (1) in the formalization of pDFD and pDFT (page 13, row 19)?

b. You provide the reference of Suda et al. (2012) for the Eq. (2) but the paper is in

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German. Any English reference is available?

c. Page 13, row 11 to 20: please use the bullet-points structure to details the definition of the variables.

2.4 Structural and physical response analysis

a. Page 17, rows 7 to 13: it seems that there a repetition of concepts, please check.

b. Page 18, rows 2-3: no accurate arguments are provided for the exclusion of SLS from the analysis. Please specify.

c. Page 18, row 5: Fig.6 does not provide any additional information to the concepts clearly expressed in the text and therefore it can be avoided.

d. Page 18, row 6: Eq. (11) is not present, please check.

e. Page 18, rows 9-10: the sentence is not clear and no arguments to prove the suitability of the methods adopted are provided. Please specify.

3.1.1 Process analysis

a. Page 20, rows 11 to 14: It is not clear the role of the various models used (Armanini, Rosatti and Rigon) in computing the solid transport component represented in Fig.10, as well as its interaction with the debris flow component. Please specify.

3.1.2 Results of process analysis

a. Page 20, rows 15 to 23: some more details regarding the calibration of the model vs the observed events are needed to prove the validation.

b. Page 21, rows 1 to 6: it is not clear the positioning of the various sides of the building with respect to the (observed) debris flow. I believe that one figure could help on this.

3.3 Structural and physical response analysis

a. Page 22, rows 10 to 12: it is not clear enough the reason to exclude the ECU limit

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state from the analysis. Please add some more arguments.

b. Page 22, rows 26-27: you stated that “simple exposure to wetting is not critical for the considered building” but no arguments to support this sentence are provided and from the comparison with Eq. (10) and Table 2 does not clarify this aspect. Please specify.

4. Discussion

As already affirmed, the method you provided seems to be reasonably robust and applicable to a wide range of case studies, but it has been conceived and validated for debris flows , and comparable natural hazards, only. Some more consideration for its application to “water floods” situations are needed, in order to justify the title of the paper too.

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