Natural Hazards and Earth System Sciences Discussions

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC2
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Comment on nhess-2021-292

Tommaso Baggio (Referee)

Referee comment on "Physically based modeling of co-seismic landslide, debris flow, and flood cascade" by Bastian van den Bout et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2021-292-RC2, 2022

The authors presented a new version of the model OpenLISEM for which they introduced the implementation of different features involving the slope stability/failure and bed entrainment. They successively described the cascade process that lead to the flood of the town of Yinxiu in China, back calculating it.

The study resulted of high interest for the scope of the journal and it provided new advances in the topic of cascade process numerical simulations involving mass flow movements and related phenomena. The value of the study is increased by the use of physical based models together with an accurate preparation of the input data of which some of them were acquired on the field. Results and limitations of the study were well discussed. The paper is well structured and written in good English.

Consequently I would consider the publication of the work after moderate/minor revisions.

Main comment: It is not really clear if the main objective of the study is: (i) the presentation of a new version of the OpenLISEM model, (ii) the possibility to simulate the mass flow process cascade occurred in Yinxiu or (iii) both of them. In my opinion from the title it looks like the first case (i) while from the abstract the second one (ii). Try to clarify this aspect.

Minor comments:

65-66 Please add at least a reference supporting this statement. e.g. Baggio et al. (2021) simulated the process of debris flow initiation through bed erosion releasing an input hydrograph characterized by a solid concentration equal to the 10 % respect the total input volume. (Baggio, T., Mergili, M., & D'Agostino, V. (2021). Advances in the simulation of debris flow erosion: The case study of the Rio Gere (Italy) event of the 4th August 2017. Geomorphology, 381, 107664.)

99-100 It is not clear if the entire model is presented in the study for the first time or if in the study is presented an updated version of the model characterized by new important features.

339 Please specify the range of the terrain slope of the watershed instead of "> 30 degrees". If possible provide information about the type of vegetation (dense forest, shrubs,…)

345 Is there an estimation of the total volume of the moved material?

Fig.4 To improve the understanding of the process you may consider to add a dem of difference map involving the pre- and post-earthquake DTMs.

351 satellite instead of "ssatellite"

356 Please provide also the value of the second highest peak in rainfall and the total duration of the storm event. Here you can directly refer to Figure 12 for the rainfall pattern and to Table 1 for the rainfall source.

358 Can you provide also the length and width of the debris dam?

Tab. 1 Please provide the acquisition dates of the DTMs and the position of the rainfall station in terms of distance to the watershed outlet.

385 The end of the sentence is not really clear. A suggestion could be "…, we resampled the input base maps to the final resolution of 10 meters."

391 These inputs refer to simulation 1? Please specify it

499 I suppose the correct number of the figure is 9D instead of 12

528 Please provide the value of the simulated deposit volume producing the debris dam and make a comparison with the observed one if possible.

529 I suppose the correct figure number is 10.

Fig. 11 In the legend I would substitute "water depth" with "flow depth" since the model is biphasic.

548 regarding the Min river, what is the discharge value used to reproduce the flow of the river? Could you also provide the location of the input hydrograph in Figure 11?

Fig. 12 The scale of the rainfall intensity is not reported. Please also consider to use another colour for the rainfall intensity since the figure is not clear. Moreover, I noticed a constant value equal to 0 in correspondence of the first rainfall peak regarding the fluid height, while the fluid+solid height is around 3 meters. Is it correct?

626 I think it is Figure 14. Please check.

610 It would be interesting to calculate the total volume of simulated eroded material entrained downstream the dam breach and to successively compare it with the original dam-debris volume. Furthermore, consider also to derive the mean eroded volume for channel length (downstream the dam breach) in order to compare it with other studies involving debris flow erosion.

642 If available please report the estimated return period of the rainfall event to assess its magnitude.

691 "Were" is repeated two times.