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Comment on nhess-2022-135

Anonymous Referee #2

Referee comment on "Characteristics and RISM of sliding flow landslides triggered by prolonged heavy rainfall in the loess area of Tianshui, China" by Jianqi Zhuang et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2022-135-RC2, 2022

The present study aims to improve prediction model for the shallow loess landslides induced by prolonged heavy rainfall.

The outstanding work is the improvement of the Taylor slope infinite model, based on equal differential unit method, permitting to correct the error when the safety factor increases with the increased slope when the slope is larger than 50°. Moreover, the intensity duration (I-D) prediction curve is proposed for the shallow loess landslides, considering the characteristics of rainfall infiltration, and different slopes.

But several misunderstanding are encountered in this paper:

- the study is focused on the development of RISM model, for a better estimation of safety factor for slope higher than 50°. However, as seen from field data (in figure 7), all landslides are triggered in slopes lower than 35°. In that way, we do not really understand why the development of this model can help in quantifying the stability of slope in this context.

- Moreover, the validation of the approach (notably the I-D curve for different slopes) is not realised, as the I-D curves for different slopes are not tested in real case for all landslides.

- Several key information and references are missing, such as: the methodology for obtaining the landslide’s map; the justification about how the 89 studied landslides are representative of the 45 000 landslides; the initial I-D curve that has been used in this study.

Based on these main elements, I suggest to reject the manuscript.

You can also find below some additional comments:

- 3, Line 89 "7.25" loess sliding-flow landslide events in Tianshui Gansu province : please define the meaning of "7.25", otherwise you have to add the reference to this.
- Figure 1 is not a geomorphological nor geological map; please put elements concerning these 2 features ; moreover, earthquake location is not usefull to this paper, as the study works on landslides induced by heavy precipitations, and not by earthquake.
- I suggest to dedicate paragraph 2 to geological, geomorphological, and climate characteristics ; as the threshold of these landslides is heavy precipitation, I recommend to detail the climate description in a sub-paragraph 2.2 (subparagraph 2.1 could be geological and geomorphological characteristics) ; finally I suggest to move 2.2 to paragraph 3, as it concerns landslides features.
- I think it is necessary to detail input data and the processes to obtain landslides maps, with some zoom on figure 2.
- 7, table 2 : the term "area" is not appropriate ; you can use "surface area"
- 10 Line181 : you have to indicate and discuss whether these 89 landslides are statistically representative of the 47 005 landslides ; you also have to precise the characteristics of the landslide you consider for obtaining the depth of the landslide.
- figure 7 is confusing, as slope and surface areas are in the same graph. 2 separate graphs might be better
- 11, line 200 : it is necessary to provide details and possible explanation about "a certain depth of loess becoming close to liquid limit water content" : which depth? Depending on what?
- 11 line 209 : please provide references concerning the depth of shallow landslides in loess.
- P12 line 214 : it is mentioned that "loess landslide transformation to mudflows occur most often on slopes of 25 – 45°" ; why is it different from the results shown on figure 7? Please explain.
- 12 line 220 ; provide reference of Taylor;

- 12 line 222 ; the length of the body is b, not l
- 12 figure 9 ; I don't understand the different directions of arrows designing the flow lines ?
- Fig 10 : how do you chose the value c' phi', g_{sat} ? for high slopes, I am not sure that such value can be found in the field
- p15, line 292 : please provide some details or references on loess test results ; the figure 13 doesn't provide these elements
- 15, line 298 : it is necessary to plot this law on figure 13
- 17, figure 14 : we don't know what is Yan'an "7.13" group shallow landslide . Which are the values of the characteristics used here (C, phi, rainfall events, slopes ….)? more generally, how are constructed these curves ? is it still the parameters c, phi, … from figure 10 that are considered?

- I don’t see here really validation of the model or approach ; you could apply this I-D curve on the all area of study, with considering for each local area or pixel I-D curve, considering local parameters. I don’t understand how you can consider the “7.25 loess sliding-flow events” as a unique point on your analysis.
- 18, figure 15 : legends of the curves are missing, we have no information on them
- 18, paragraph 5.2 : why this part is within the discussion paragraph ?
- As a general comment, the discussion is not really realised.
- 18 Figure 16 : as figure 7, the figure is confusing ; it is better to provide One graph for each parameter;
- 18, line 349 : there are errors in internal friction angle, expressed in kPa!

The paper requires proofread by English native speakers, as it encounters several English mistakes or inadequate words, as well as sentences wrong formulation. Indeed, several sentences are not clear; for instance:

- 1, line 13
- 1, lines 16 to 18 : sentence too long
- 3, line 95 : you mean “the elevation of the study area” ? please check
- 17, line 331 : non comprehensive sentence
- 17, line 333, 334 : I don’t understand