

## ***Interactive comment on “Community-based landslide hazard probability and risk assessment: A case in west Hubei, China” by Sheng Fu et al.***

**Sheng Fu et al.**

cug\_fusheng@cug.edu.cn

Received and published: 22 October 2019

Dear Referee,

Thank you for your professional comments on our manuscript. These comments are all valuable and helpful for revising and improving our manuscript. Please note that the revised manuscript has been attached in the supplement file. The main corrections in the manuscript and the point-by-point responses to your comments are as following (the page number and line number in this letter refer to the revised manuscript):

Specific comments:

(1) It needs to present in more details the work on the field done by the authors to analyze the different causes of landslides (lithology, slopes, etc. . .). The authors present

C1

only 2 examples (Figures 2 and 3) with field analysis.

In particular they do not talk enough about Chengguan area which represents the most historical cases in their database. Their approach seems to illustrate more the Chengguan area than Yuyangguan area indeed. That should be more highlighted in this manuscript. In addition, the Chengguan area shall be more detailed in terms of similarities to context with the Yuyangguan area (geology, geomorphology, climate, etc.) to support the analysis with both.

Related to this topic of historical landslides: Figure 1: the location of Chengguan community does not sufficiently precise in regard to the location of Yuyangguan community. What is Wufeng (Fig.1b) with respect to Yuyangguan? It is not clear enough for the reader. Figure 1 and Table II: the localization of historical landslides is not provided on the figure 1. In addition and the coordinates of each landslide in the table II should be added maybe.

Responses: Thank you very much for your comments. Due to the page limitation of the manuscript, we only show two landslides (Fig.2 and 3). These two are typical for the study area. Landslide in Fig. 2 represents slope instability by rainfall and Fig. 3 by slope cutting.

Our case study area is Yuyangguan community, and the objective of the manuscript is to assess landslide risk for this community. Why we use the database of Chengguan is because the number of landslides in Yuyangguan is limited and not satisfying to calculate size probability. And also, it is because that the geology background and landslide type in Chengguan are similar to in the case community (Yuyangguan). So we didn't describe the details in Chengguan but just use the historical landslide data. We have complemented the statements from Line 94 to Line 98. Sorry for the confusion.

In Figure 1, we pointed out the location of Chengguan. Sorry for the mistaken label (Wufeng) in Fig.1a, we have corrected it. We added the coordinates of each landslide in table II.

C2

(2) This analysis on the field of historical cases is used to discuss and support the landslide susceptibility result in the paragraph 5.1 (Discussion on landslide susceptibility map). However the authors should develop also: a. the description with more details about the observed lithology on the field (like the most important controlling factor); b. the structural control (fault, joints) plays also a potential part in the cause of some landslides (aggravating factor). It is not sufficiently discussed if we note the presence of numerous faults in the study area indicated on the Figure 1c.

Other point related to this topic, the authors have not mentioned the potential earthquake source (other triggering factors). If it's not relevant in this zone then it must at least mentioned and discarded. Related to this point, the tectonic context should be added in the presentation of the geological context too brief in the manuscript.

Response: It is a good comment, thank you! The observed lithology was described in line 61 to 64 and Table I. As to the geological structures, they influence the stability of slopes especially of rock slopes. As illustrated in Fig.1c, there are two landslides closing to the faults among seven landslides in red colors on the map. The majority of investigated landslides are soil or debris landslides in Table II, among which seven landslides are relatively small scales. It indicated that the fault has no significant impact to the landslides which have already occurred in this area. The manuscript has paid attention to the geological structure. Unfortunately, we lack sufficient discussions. So, we have added a necessary explanation to demonstrate the importance of these factors in the context. Please see line 65 to line 71. Actually, for regional-scale assessment, it is not easy to directly define the structural figures (faults, joints) as the factors such as defining the dip angle of faults or joints, etc. unless for a site-specific slope instability assessment. However, the manuscript has already designed an alternative index, distance to fault, to present the structures as in Fig.4 g comprehensively. For the tectonic factor, the studied area is located in a weak seismic activity region according to the assessment by the China Earthquake Administration. There were no historical records of earthquake-induced landslides in that area. More explanation has also been

C3

put in the context. Please see line 71 to line 74.

3) Hypothesis from lines from 215 to 216: the assertion "assuming that the past is the future", landslides in the study area will probably occur with the same amount of landslides over the next 50 years as the past 50 years" is not sufficiently discussed and argued. In particularly the possibility of impacts of climate change (more heavy rains) should be included or at least introduced for the next 50 years like a limit or a next development to this study. This paragraph echoes to lines from 335 to 337 where the authors remind this assumption of a same condition between future and past to cause landslides. They indicate without details some possible changes of conditions but this issue deserves to be developed.

Response: thank you very much for the suggestion. The assumption is very important for hazard probability calculation in this study. We have discussed this limitation in section 5.3. Further study and development are being taken in our research team now. But as you said, we did not sufficiently discuss the limitation. So we added more details about the possible changes in line 359 to line 361.

4) From line 105 to 109: Please develop the explanation lacks of information. It needs to detail more ("Subsequently. . . .in study area") Response: thank you very much for the comment. We have added more detail information in this part from line 123 to line 127.

5) Line from 319 to 322: Would other factors exist to explain the difference with the classical distribution model (Malamud et al., 2004, Stark and Hovius, 2001)? Response: thank you very much for the suggestion. As illustrated in the context (line 338 to 341), no small landslides (< 1000 m<sup>2</sup> in Malamud's research) in our study area is the main reason for the difference. Maybe landslide types and triggering factors are the other reasons for this difference. Further studies in comparison should be taken with more landslides events considering these factors. Complementary statements were added in line 342 to line 343.

C4

6) The conclusion should be more developed about limits and potential application of results. Response: thank you very much for the comment. After carefully checking, we found that the limitations and potential application of results had been sufficiently pointed out in the conclusion part. Thank you for your reminding.

#### C. Technical corrections

(1) Figure 1: About faults on the figure 1c, could you indicate more information about the type of faults? Response: thank you very much for the comment. We added the type and name of the fault in Fig.1c. And the more detailed description was added in the context. Please see line 65 to line 72.

(2) Figure 3: add scale into the zoom called "landslide surface". Response: thank you very much for the comment. We have added the scale bar into the figure called "landslide surface".

(3) Figures 4,11,12,13 and 14: those maps are too small to be readable and impact the quality of this work. The names of villages or localities are difficult to read also. Response: thank you very much for the suggestion. We have enlarged the figures 4,11,12,13 and 14.

Text:

(1) From line 61 to 62: the main lithological units should be presented in the order of the geological ages.

Response: thank you very much for the suggestion. We have revised and presented the main lithological units in the order of the geological ages. Please see line 61 to line 62.

(2) From line 115 to 155: the methodology should be presented with more of clarity between each paragraph: determination of spatial probability (1), temporal probability (2) and size probability (3).

#### C5

Response: thank you very much for the suggestion. We have clarified the methodology from line 115 to 155 by the third level section. Please see line 137 to line 165

(3) Line 199: rewrite and clarify the second part of this sentence "these two geological units can be susceptible to erosion and can quickly accelerate erosion".

Response: thank you very much for the suggestion. We have rephrased this sentence. Please see line 221 to Line 222.

(4) Line from 204 to 205: rewrite "the value of slope varies from 10°to 30° is 0.19".

Response: thank you very much for the suggestion. We have rephrased this sentence. Please see line 226 to line 227.

(5) Line from 304 to 305: rewrite, problem with the grammar sentence "This is because that although . . . , but the area. . .".

Response: thank you very much for the suggestion. We have rephrased this sentence. Please see line 322.

(6) Line 314: The world compatible or suitable seems to be more adapted than "feasible".

Response: thank you very much for the suggestion. We have revised this sentence using the word "suitable". Please see line 335.

(7) Line 318: Bibliographical order according the growing age: 2001 before 2004. Review in the whole document.

Response: thank you very much for the comment. We have reviewed the whole document very carefully and revised them.

We tried our best to improve the manuscript and made some changes in the manuscript. We feel great thanks for your professional review work on our article, and hope that the correction and response will meet with approval.

#### C6

Looking forward to hearing from you.

Sincerely,

Lixia Chen

Please also note the supplement to this comment:

<https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2019-259/nhess-2019-259-AC1-supplement.pdf>

---

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2019-259>, 2019.