

Dear Editors and Reviewers

Thank you for your letter and for the Reviewers' comments concerning our manuscript entitled "Exploring the potential relationship between the occurrence of debris flow and landslide" (ID: NHSS-294). Those comments are all valuable and very helpful for revising and improving our paper, as well as the important guiding significance to our researches. We have studied comments carefully and have made correction which we hope meet with approval. There is another thing we want to discuss with you that the Acknowledgement information need to be revised as "This work was supported by Graduate Innovation Fund of Jilin University and the National Natural Science Foundation of China (Grant No. 41972267, 41977221, and 41572257)." Revised portion are marked in red in the paper. The main corrections in the paper and the responds to the Reviewer's comments are as flowing:

For the first reviewer:

This paper presents an interesting comparison between landslide and debris flow susceptibility maps generated using Random Forest Classification. The majority of the corrections I suggested in my previous review have been carried out, and I only have the following brief comments to add, which I think will improve the clarity of the manuscript:

Response: Thank you for your approval of our work.

1. Line 17 - ROC curve stands for receiver operating characteristic, not relative operating characteristic

Response: We are agreed with you and have made it corrected. On Line 17

2. Line 23 - The order of this sentence makes it slightly unclear, it might be clearer to give to ROC for the two models and then the accuracy

Response: We are agreed with you and have made it corrected. On Line 21

3. Line 126 - I think you should specify here that you are referring to pre-event NDVI, since the change in NDVI is also often used to detect landslides

Response: We are agreed with you and have made it clear. On Line 122

4. Line 212 - Should specificity also be percentage?

Response: Yes, it should be percentage. On Line 189

5. Line 264 - remove "with"

Response: We are agreed with you and have made it clear.

6. Line 250 - Is "Melton" used throughout the paper to refer to the melton ratio, as defined on line 145? It is also used on line 126 before it has been described. I think that where it is used in tables and figures, it would be better to refer to "melton ratio" than "melton" - it will not take up more space since the name is short and might help people to understand.

Response: We are agreed with you and have made it clear. On line 126, 227.

7. Line 277 - Define acronym SPSS

Response: We are agreed with you and have made it clear. On line 254.

8. Line 381 - you say there is no relationship between the occurrence of landslides and debris flow.

I think this should be reworded as in the next sentence, you explain that landslides can be converted into debris flow, which would imply that there is a relationship. Perhaps you mean that the relationship is not straightforward? Or that the models of landslide and debris flow are not interchangeable?

Response: Yes, the relationship is not that straightforward. We have reworded this conclusion. On line 358.

For the second reviewer:

Unfortunately, this revised version is not acceptable for publication. The text is not clear and redundant. Moreover, in some parts the train of thought seems missing. Grammar should be also revised. The reader stopped the revision at section 2.

Response: We are sorry for all the mistakes we make and we will revise the manuscript based on your comments.

1. Debris flows are not landslides (see lines 11 and 13). Debris flows and landslides are gravitational mass transport phenomena. Moreover, statements at lines 13 (“An inventory map consisting of 448 landslides (399 soil slides and 49 debris flows”) and 16 (“constructed for landslide and debris flow”) are in contrast.

Response: Yes, these please are unclear and we have revised the statements. On line 12, 18.

2. Lines 11-12 “ occurred commonly” this is not an English form.

Response: It should be occurred frequently.

3. Lines 21 “with two kinds of disaster” this expression is not suitable, “with the two considered hazardous phenomena” could be better.

Response: We are agreed with you and have made it corrected. On line 21

4. Line 22 “Two models” which models? “The two used models”?

Response: Two models represent for landslide and debris flow susceptibility models constructed by random forest. It should be two used models. On line 22

5. Lines 23-25 “The loose sources need by the debris flow were not necessarily brought by the landslides although most landslides can be converted into debris flow. The area prone to debris flow did not promote the occurrence of landslide.” Which is the sense or scope of this period? Moreover, are these outcomes from field surveys or from the model results? In the first case how are they related to susceptibility maps?

Response: All the conclusion we obtained in the study come from the model results. We should first present the combined maps and then the conclusion. It will be more clear and we have added related information. On line 23-25.

6. Lines 41-42 “Most of debris flows are runoff generated (Ma et al., 2018).” Such statement is misleading. Ma et al. (2018) do not state that most runoff are generated debris flows. In the

previous review the writer suggested other references to confirm it. Therefore, at least the following references should be added: Imaizumi et al. (2006), Coe et al., (2008), Gregoretti and Dalla Fontana (2008), Theule et al. (2020).

Response: We have added the related references. On line 41-42

7. Lines 44-46 “Debris flow usually occurs on a channel bed for the entrainment into abundant runoff of debris supplied by deep or shallow slides of slopes incised by the channel (Imaizumi et al.2019; Zhou et al., 2019)” Again at least other two references should be added to provide a base to this statement: “Hurlimann et al. (2014) and Simoni et al. (2020)” .

Response: We have added the related references. On line 46-47.

8. Line 47 “and most of the slides are accompanied by debris flow” please add some reference

Response: We have added the related references. On line 48-49.

9. Lines 47-49 “In the past, it is not clear the way the potential relationship between debris flow and landslide is approached through the separated susceptibility analysis (Alessandro et al., 2015; Guzzetti et al., 2005)” Unclear period.

Response: It should be “In the past, seldom researches have explored the potential relationship between debris flow and landslide through the separated susceptibility maps (Alessandro et al., 2015; Guzzetti et al., 2005)” line 49-56

10. Lines 49-56 “In addition, some scholars made separate evaluations of slides and debris flow

(Park et al., 2011; Haydar et al., 2016). Some scholars have proposed a coupled model of landslide-debris flow (Chiang et al., 2012; Gomes et al., 2013). However, not every slide has evolved into a debris flow and the material source of the debris flow is not necessary coming from slides. The formation and manifestations of different types of landslides are different, especially debris flow, which is a kind of “wet flow” (Varnes, 1978). In other words, there is no determined connection between debris flow and other types of landslide.” Very confused and ill organized period. It should be rewritten in a more concise, clear and synthetic form. In addition, “not every slide has evolved into a debris flow” seems to contradict what written at line 47 “and most of the slides are accompanied by debris flow”.

Response: We agree with the comment. Debris flow and landslide should be expressed individually. We have rewritten the part. “not every slide has evolved into a debris flow” seems to contradict what written at line 47 “and most of the slides are accompanied by debris flow”. The statement is redundant. line 49-57

11. Lines 58-59 “Besides, the conditioning factors and mapping units involved in the susceptibility assessment for different kinds of landslides are not identical.” Another confused and unclear sentence.

Response: It should be “Besides, the conditioning factors and mapping units involved in the susceptibility assessment for different kinds of landslides are not identical.”

12. Lines 61-62 “As an example, one landslide inventory map includes only one type of landslide, as does debris flow.” Useless sentence: the same concept has been introduced at the previous

line.

Response: We have deleted the sentence.

13. Lines 63-69 “The methods of susceptibility assessment can be broadly classified as qualitative or quantitative (Aleotti et al., 1999). Several methods and approaches have been proposed and tested to ascertain susceptibility, such as physical-based approaches (Carrara et al., 2008), heuristic methods (Blais et al., 2016) and statistically-based approaches (Reichenbach et al., 2018). In addition, new machine learning models, such as neural networks (Park et al.,2013), support vector machines (Colkesen et al.,2016) and random forest (RF) (Zhu et al., 2020a), have also been applied.” This period is full of redundancy and as written does not merge with the text: it is not linked to the previous and following text. The following a proposal for rewriting it “The methods used for the susceptibility assessment can be broadly classified as qualitative or quantitative (Aleotti et al., 1999). About the quantitative methods there are those physically-based (Carrara et al., 2008), those heuristic (Blais et al., 2016) and those statistically-based (Reichenbach et al., 2018). Recently new machine learning models have been used for susceptibility analysis: neural networks (Park et al.,2013), support vector machines (Colkesen et al.,2016) and random forest (RF) (Zhu et al., 2020a)

Response: Thank you for the proposal and the sentences seem more logical and clear. Line 58-63

14. Lines 70-71 “The Longzi County in Southeastern Tibet is always exposed to slides and debris flow hazard because of climatic and topographic conditions, which is chosen as the study area
The purpose of the present study is to explore the potential relationship between the

occurrence of debris flow and soil slide by establishing susceptibility zoning maps separately with the use of random forest. It also provides a reference for the study of landslide-debris flow, a common disaster chain” Again all this period is not properly written and seems a collage of sentences, in the sense that a train of thought is missing.

Response: We have rewritten this paragraph. Line 64-67

15. Line 83 “belongs” too many repetitions.

Response: We used be distributed in. Line 75

16. Lines 111-112 “First-order sub-catchments, which is also called watershed unit, was applied to the susceptibility of debris flow” sub-catchments is plural, therefore, it should be “are” and “were” instead of “is” and “was” respectively.

Response: Yes, thank you so much. We have revised them. line 100-103.

17. Lines 118-119 “there are a lot of difference between the factors used by different landslide susceptibility assessments.” Unclear sentence and “a” before “lot” is missing.

Response: We are sorry for the mistake. It should be “there are a lot of difference between the factors used by different landslide susceptibility assessments.” But we have revised this sentence.

Line 106-110.

18. Lines 123-124 “Moreover, availability, reliability, and practicality of the factor data were also considered (van Westen et al., 2008).” Which is the sense of this sentence and its scope in the

paper?

Response: It should be presented firstly. We have revised this sentence on Line 106-110.

19. Line 119-130 All this period should be rewritten in a more organized and concise form. At the beginning it should be stated that 11 and 12 controlling factors are selected for landslide and debris flow susceptibility assessment respectively.

Response: Yes, this paragraph is obviously lengthy. We have deleted the duplicate information.

Line 106-110.

20. Line 142 “reclassified” why reclassified? Was it previously classified?

Response: Reclassify is an tool in ArcGIS platform. Controlling factors belong to continuous variable (like aspect, rainfall..). Reclassify helps to express the difference between different units.

21. Line 148 “Basin area was reclassified into four classes and main channel length are represented” Unclear and grammatically incorrect sentence.

Response: We have revised this sentence. Line 128-129.

22. Line 158 “have” instead of “has”.

Response: We have revised this sentence. Line 138-139.

23. Line 161 “The values of 18 controlling factors were classified by processing the raw data in the ArcGIS” At the previous lines 11 and 12 controlling factors are introduced for landslides

debris flows respectively: please explain the new 18 controlling factors.

Response: Not the new 18 controlling factors. There are 11 and 12 controlling factors are introduced for landslides debris flows respectively. But 4 factors like rainfall, slope, Maximum elevation difference and elevation were both used in landslide and debris flow. "18" have been deleted in the text.

24. About rainfall: rainfall triggering debris flows is much different from those triggering landslides. The former is usually a short duration precipitation, while the latter is a long duration precipitations. Therefore, considering the annual rainfall depth for both the phenomena could not have a physical base.

Response: Rainfall as the only triggering factor in the paper should be considered in landslide and debris flow. We agree with the comment that the mechanism of induction may different between debris flow and landslide. Rainfall in the study are mainly concentrated on summer. Annual rainfall has also been applied for many times. It is true that both intensity and persistence of rainfall have the influence on the occurrence of landslide and debris flow.

25. Line 449 The reference is bad written: Francesco is a name, not a surname

Response: We have revised it.

We appreciate for Editors and Reviews' warm work earnestly, and hope that the correction will meet with approval. Thank you and best regards.

Yours,

Zhu