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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Exploring the potential relationship between the occurrence of debris flow and landslide" *by* Zhu Liang et al.

Zhu Liang et al.

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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: NHESS-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. 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:

1)Introduction should partially enlarged for a better and specific presentation of debris

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flow phenomena (seebelow). Response: We have modified it according to the comments. Line 41, 44-45, 48-49.

2)Section3 is not clear:authors should explain the method or model they used. There is no connection between 3.1 and 3.2. Moreover, the presentation of the RF model is not clear. Response: We have re-write related information of the modeling of RF. Section 3.1 and 3.2 belong to the method used in this study. Section 3.1 explain the sampling strategy and elevation indexes for RF models. Section 3.2 introduce RF model.

3)Section4.The procedure should be introduced at the beginning:at first evaluation of the training dataset and after that of the remaining dataset. Moreover,there is some confusion on the presentation of data analysis(e.g.see the comment to lines252-253). Response: Yes, we have introduced the performance of RF model in terms of training data set first and then compared the results with validation data set. Section 4.3 is confusing because we have to compare the results of debris flow and landslide. The maps were both reclassified into five levels and we tried to present them on the same map. We have checked the results and make it easier to be understood.

4)Section5. All the assumptions claimed by the authors should be supported by results shown at the previous section. Otherwise, all this section is thin air. In other words,each assumption should be justified by the findings of the previous section. Response: Yes, we could not agree more. The results we obtained indicate that RF was suitable for landslide susceptibility mapping, there is no determined relationship between debris flow and landslide, it is feasible to map two kinds of disaster in the same susceptibility map.

5) English form is not always acceptable Response: We have checked the whole manuscript again.

5)Introduction The writer suggests a brief characterization of debris flows based on the triggering mechanisms and conditions to explain the phenomenon and avoid confusion,as that below:Most of debris flows are runoff generated (Imaizu-

mietal.2006;Coeetal.,2008,Gregoretti&DallaFontana,Ma etal.,2018).In many cases they occur on a channel bed for the entrainment into abundant runoff of debris supplied by deep or shallow slides of slopes incised by the channel. (Theuleetal.(2012),Hurlimannetal.(2014),Imaizumietal.2019,Zhouetal.,.2019;Simonietal.,2020). Conversely,landslide or natural dam failure that evolve into a debris flow(Iversonetal.,;Keanetal.,2013) are not frequent. Moreover,it is not clear the way the potential relationship between debris flow and landslide is approached through the separated susceptibility analysis:some concise information could help the reader. Response: We have add related information in the Introduction.

Other spotted errors and comments are as follows: Line75 perhaps “surface”instead of “area” Response:We modified it accordingly. Line78

Line 82 “Three types of lithology were mainly observed”rather than“There were three common lithology observed” Response:We modified it accordingly. Line85

Line85 “Main common disasters in the study area mainly consist”instead of“The disasters in the study area mainly consist” Response:We have already modified it. Line88 Lines104-105“The geometry of debris flow is better represented by a polygon or a set of polygons in vector format”Which is the sense of such a sentence?Authors should explain,as in the case of landslide which typology of unit is preferable for debris flow. Response:We have added related information. The watershed unit is preferable for debris flow.line 109-110. Line115:Moreover, before availability Response:We have added related information. Lines114-116“The occurrence of debris flow emphasizes the indispensability of provenience, topography and triggering factors.Availability,reliability,and practicality of thefactor data were also considered (vanWestenetal.,2008).”Such period should be postponed to that at lines116-119. Response:We have already modified it.

Line122:elevation of what? Response:Maximum elevation difference is another conditioning factor.ine124:Figure 5 concerns landslide. The figure 6 concerning debris flow should be also added.The writer suggests to distinguish the reference to these two

figures by means of the phenomenon. Response:We have already modified it. line126 please separate the controlling factors concerning landslide from those concerning debris flows. Response:We have already modified it.

Line127 Why do the authors use reclassify and not classify? Response:Reclassify is an tool in ArcGIS platform. Line128: the proximity of roads,rivers rather than roads,river....Therefore the distance from roads,river was classified

Lines137-138“Considering the correlation between the two controlling factors,basin area and main channel length are represented by the same graph,which was reclassified into four classes(Fig.6h).”unclear sentence. Response:We have already modified it. Line 148-149

Line148“Totally 18 factors are obtained by processing the row data in the ArcGIS10.2 platform.”Perhaps the values of 18 controlling factors were classified by processing..... Response: We have already modified it. Line 161-162

Line149 The DEM size,30 m seems too large.The author should justify it.Please consider that Boreggioetal.(2018) suggested the use of 1m grid size. Response:The DEM size is accessible for 30m and 90m. Some studies use 5m or 1m by resampling tool of ArcGIS. However, 30m is the most common.

Line153“under study as a reference.”Unclear expression. Response:We have already modified it.

Lines157-158“data set”rather than“set” Response:We have already modified it. Line 172

Lines159-161The partition of landslide inventory is approached.....among them that of one time random selection() is the most used. Response:We have already modified it. Line 175-177

Lines179-180“RF uses the bagging technique (bootstrap aggregation)to select, at each node of the tree,random samples of variables and observations as the training data set

for model calibration.”Unclear sentence Response:We have already modified it. Line 194-192

Lines186-194.Unclear period. Response:We have already modified it. Line 200-202.

Line197“training data set”rather than“training set” Response:We have already modified it.

Line198“of for”???? Response:We have already modified it.

Line199“with a sensitivity value” Response:We have already modified it.

Line203“for models”?????? Response:We have already modified it.

Line206 Values of 88.69 and 86.05% are claimed for sensitivity and specificity respectively.Why at the previous lines the values are91.62 and 89.96%? Please explain Response:The data set were divided into two groups, one for training, the other for validation. Therefore, the sensitivity and specificity values were different.

Line207“with a value” Response:We have already modified it.

Line208“training model”???? perhaps it is training dataset Response:We have already modified it.

Line214 delete“reached 179” Response:We have already modified it.

Lines215,216,231 what does relate the percentage?The total number of units?Please specify Response:We have already modified it.

Line219“were” in stead of “was” Response:We have already modified it.

Line230 delete“reached to 26” Response:We have already modified it.

Line235 which is the sense of the following sentence¿‘which has significant influence on the occurrence of debris flow Response:We have already modified it.

Line236 substitute “which are”with“:” Response:We have already modified it.

Figure8.The writer suggests the use of the same colours for both the susceptibility maps Response: We have compared the results before and found it better when the maps were made from different colour to highlight the difference between debris flow and landslide.

Lines249-251“There are 23 watershed units belonging to high-class in the debris flow susceptibility zoning map (Fig.8),of which17 units are covered with high or very high-class slope units in the landslide zoning map(Table5).”it is better substitute“are covered”with“correspond to high or very high-class”Moreover, add the following sentence:“Therefore,there are 6 units that does not overlap (about26%).” Response:We have already modified it.

Line251 about the 4 watershed units:do the belong to the 6 watershed units with no high or very-high slope units? Response: The susceptibility maps were reclassified into five levels as very low, low, moderate, high and very high.

Lines252-253 which susceptibility maps do belong the 19 high and very-high class watershed units(19) Response:Watershed units were for debris flow and slope units were for landslide.

Line269 which two models? Response: We have added detail information.

Lines 313-314 “has been little used until now for susceptibility analysis of landslide and debris flows”instead of “has less application in landslide and debris flow analysis” Response:We have already modified it.

Line322“ from the concept”unclear expression Response:We have already modified it.

Lines326-329 this period should be summarized in a more concise and clear form Response:We have already modified it.

Line 338 Where the relationship between landslide and debris flow is illustrated? Response:We have added related information.

Lines 348-349 “The fact that the appropriate prediction method and mapping units applied to the two disasters makes it possible to merge the two zoning maps”Which appropriate prediction method?Which is sense of this sentence? Response: Random forest has proved its superiority in this study. Mapping two kinds of disaster in the same map has not been explored before and we try to explain why and how does it works.

Line 359 “models based on random forest“if the authors mean“based on RF models”the expression is unclear(seelines197;241).This ambiguity is elsewhere present in the submitted manuscript. Response:We have already modified it.

Points 2 and 3 of the conclusion could be merged in a unique one.This point should begin after explaining that there is no potential relationship between the occurrence of the two considered phenomena. After that,the authors could explain the reasons in 2.1.and2.2 corresponding to the points 2 and 3 of the submitted work. Response: We have modified it.

Finally, we have added related reference based on the comments.

We appreciate for Editors and Reviews’ warm work earnestly, and hope that the correction will meet with approval. Once again, thank you very much for your comments and suggestions. With best regard, Yours sincerely, Zhu Liang Jilin University

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