REVIEW

"Landslide susceptibility mapping in Mawat area, Kurdistan Region, NE Iraq: a comparison of different statistical models"

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REMARKS FOR THE AUTHOR

The paper is focused on the comparison of landslide susceptibility zonations derived using four susceptibility models in the Mawat area, Kurdistan Region, NE Iraq. The models proposed are frequency ratio (FR), weight of evidence (WOE), logistic regression (LR) and probit regression (PR). Among those the PR was applied for the first time for the susceptibility zonation. In the entire paper, the authors use the term LSI landslide susceptibility index to refer to a probabilistic susceptibility. Landslide susceptibility is more appropriate to avoid confusion with susceptibility index-based estimation approaches. The landslide terminology in not always correct (e.g. triggering area in place of depletion zone, etc.). Some of the paper speculation on the susceptibility comparison are based on small differences in the susceptibility model performances: this can be critical in particular if not considering the possible uncertainty associated to the different susceptibility model. Basically the authors need to prove that the differences obtained using the different models are not within the modelling uncertainties. Moreover, the paper has two additional critical problems: (i) the authors make wrong use of ROC term, indeed they use this term to refer to success rate curves, (ii) the authors make wrong use of the term of validation to define model skill prediction performance measures. The tables in the appendix can be probably put in the text, in any case these need to be correctly numbered. English grammar need a check, in particular the verb tenses are not correct in all the cases, probably the use of past tense in place of the present for describing what was done in the analysis is more appropriate. Please see the following section for specific comments.

COMMENTS AND SUGGESTION TO THE AUTHOR

TEXT

Page 2 **Line 26** The term erosion here in not appropriate, use the correct terminology (e.g. use depletion zone).

Page 2 **Line 31** Here and in the rest of the paper the authors use "landslide susceptibility index (LSI)" in place of the more appropriate "landslide susceptibility". In fact using the term index is misleading, since the authors in most cases intend to refer to probabilistic susceptibility values. I suggest to use here and in the rest of the paper the term "landslide susceptibility"

Page 2 **Line 34** Substitute "potential regions of landsliding" with "landslide prone areas"

Page 2 **Line 37** These are not “different mapping techniques” but “susceptibility estimation techniques”

Page 3 **Line 63** “GIS techniques” is too general, please be more descriptive”

Page 3 **Line 63** Substitute “between four types of LSI mapping” with “the four landslide susceptibility models”

Page 3 **Line 64** Something seems missing here. Please check the phrase.

Page 3 **Line 66** Substitute “included” with “was organize following four main steps”

Page 3 **Line 67** Please rephrase “without any consideration of time the occurrences”

Page 4 **Line 105** Substitute “The study area has frequent landsliding because of environmental and/or human–induced reasons” with “Landslides in the area are frequent and they are mainly due to natural and anthropogenic triggers.”

Page 4 **Line 108** Substitute “of” with “controlling the distribution of”

Page 4 **Line 111** Something is missing here. Please rephrase.

Page 4 **Line 113** The term “high certainty” is too general; please express these in a quantitative way.

Page 4 **Line 116** How can you obtain a total landslide area of 3.127 km2, having 351 and a maximum landslide area of 0.32 km2? Please check.

Page 5 **Line 143** Substitute “prepared” with “were prepared”

Page 5 **Line 146** Substitute “The input parameters have two forms: discrete and continuous. The discrete form (group A) includes lithology, land cover and slope aspect, while the rest (group B) are continuous forms. We prepared the input parameters in two ways based on the applied model.” With “The input parameters can be discrete and continuous: lithology, land cover and slope aspect (group A) are discrete, while the rest (group B) are continuous.”.

Here probably the distinction between categorical and numerical is more appropriate.

Page 5 **Line 150** Substitute “to test” with “to exploit”

Page 5 **Line 152** Substitute “to test” with “to exploit”

Page 5 **Line 153** From here to the end of the section: not clear, please be more descriptive.

Page 6 **Line 158** Substitute “We used the following eight factors as geomorphological predictive factors of landsliding” with “In the susceptibility estimation we used the following eight geomorphological variables”

Page 6 **Line 159** “which is an important factor causing the landslides” please be more descriptive.

Page 6 **Line 163** the definition of aspect is not complete and the following sentence need to be rephrased.

Page 6 **Line 166** The definition of slope curvature is not clear

Page 6 **Line 174** Substitute “mapped the landslide susceptibility map” with “realized a susceptibility zonation”

Page 6 **Line 181** TPI and HI are inverted in Equation (1) and (2)

Page 6 **Line 182** this is not true, TPI was used for instance by (A) Li, Y., Chen, G., Tang, C., Zhou, G., & Zheng, L. (2012). Rainfall and earthquake-induced landslide susceptibility assessment using GIS and Artificial Neural Network. Natural Hazards and Earth System Science, 12(8), 2719-2729. (B) Mohammady, M., Pourghasemi, H. R., & Pradhan, B. (2012). Landslide susceptibility mapping at Golestan Province, Iran: a comparison between frequency ratio, Dempster–Shafer, and weights-of-evidence models. Journal of Asian Earth Sciences, 61, 221-236. (C) Ozdemir, A., & Altural, T. (2013). A comparative study of frequency ratio, weights of evidence and logistic regression methods for landslide susceptibility mapping: Sultan Mountains, SW Turkey. Journal of Asian Earth Sciences, 64, 180-197.

Page 7 **Line 208** Before “The precipitation” add “Form the daily data series we estimated the year precipitation. ”Which type of precipitation map?

Page 7 **Line 209** here you probably use IDW to “interpolate the precipitation data”

Page 8 **Line 251** the definition of A is missing

Page 10 **Line 290** Make the sentence more clear and use the correct terminology: e.g. depletion zone scarp

Page 10 **Line 300** In place of “landslide-present pixels” use “pixel with landslides” or “unstable pixels” and in place of “landslide-absent pixels” use “pixel without landslides” or “stable pixels”

Page 10 **Line 307** The reference for R is missing.

Page 10 **Line 309** Here you are not doing a model validation but you are measuring the prediction skill of the model. Validation requires the application of the model in areas different from those the model were trained.

Page 10 **Line 312** Here you are indicating ROC curve (Fawcett, 2006), but what you are using is a success rate curve (e.g. see Chung and Fabbri, 2003)

Page 13 **Line 387** The sentence is not clear

Page 13 **Line 389** “The ranges of the prediction factors are good indicator to their effect”. This is not straightforward, be more descriptive.

Page 13 **Line 403** Substitute “withheld of” with “excluded from”

Page 13 **Line 407** Substitute “of” with “controlling the”

Page 13 Line 408 Remove “This means that” because this is implicit in the definition of odd ratio

Page 13 Line 415 Substitute “distribution of the LSI of” with “susceptibility zonations obtained using ”

Page 13 Line 417 Substitute “that their spatial distributions are similar” with “a similar spatial distribution”

Page 14 Line 420 The sentence is not clear, please rephrase

Page 14 Line 422 Substitute “with each other” with “with other susceptibility models”

Page 14 Line 426 Substitute “from GIS to a statistical software program” with “from GIS standard formats to the format required by the statistical software”

Page 14 Line 428 Substitute “forme.” with “form.”

Page 14 Line 436 In the paper the term “ROC curves” are wrongly used to refer to success rate curves.

Page 14 Line 438 Here and after substitute the terms “yield” with other terms.

Page 14 Line 445 Again here the term validation is probably used to refer to the evaluation of the model skill performances. Please also refer to the comment on section 3.5.

Page 14 Line 458 Substitute “that tested” with “tested”

Page 14 Line 474 This conclusion is a bit weak, remember that curvature can be calculated also considering different and greater kernel sizes.

Page 15 Line 480 Substitute “as the factor of” with “as significant factor to explain”. Moreover in the rest of the sentence be more descriptive.

Page 16 Line 497 See previous comment on the topographical position index

Page 16 Line 500 See previous comment on curvature

Page 16 Line 504 Substitute “to one other” with “one to each other”

Page 16 Line 509 See previous comments on validation

FIGURE

Fig 1 Use “return period” in place of “of the Imbricated Zone” in the legend

Fig 3 Pictures do not allow to verify the real landslide type. Try to use different or more descriptive pictures. The graphical scale here are not useful, please try to use these to indicate some of the landslide characteristics (e.g. width, length, etc)

Fig 4 Use another color scale in maps in Figure F to highlight better or the curvature variation in the study area

Fig 6 Is the figure A portraying TWI? It seems just a shaded relief of the study area. Please check.

Fig 7 What are the “prediction factors estimation ranges”?

Fig 9 A is not a ROC curve plot but a success rate curve plot

FIGURE CAPTIONS

Fig 1 Use “the Imbricated Zone” in place of “of the Imbricated Zone”

Fig 3 Please use a standard term for the classification of “slumps” (e.g. Cruden & Varnes classification).

Fig 8 What “based on different combinations models” means here?

Fig 9 Move “Bar graph showing” after “(B)”. The plot in A is not a ROC curve plot but a success rate curve plot.

TABLES APPENDIX A

Number both table and modify their references in the text.