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Hydrology and Earth System Sciences Discussions

Interactive comment on "Optimal estimator for assessing landslide model efficiency" *by* J. C. Huang and S. J. Kao

Anonymous Referee #2

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This paper presents a new index, named as the Modified Success Rate (MSR), to assess efficiency of landslide prediction. The authors claim that the proposed MSR avoids over-prediction of unstable cells over total actual landslide sites because it includes the prediction performance of stable cells too. The modification in the MSR is sought by adding an equally weighted efficiency of prediction of stable cells. Since any new index can have new scope and potential to be used in various ways, the proposed MSR has potential to attract interest of possible readers. The mathematics and results are quite simple but the paper presents it in a complex way. On the other hand, the paper does not contain essential details about the model. So, this paper is likely to lose satisfaction of its potential readers. Following are some of my concerns, which should be addressed before the paper is ready to publish.

General concerns

- Motivation of the study is particularly focused into the weakness of SR, which avoids including stable cells in efficiency measurement. The paper does not describe why the stable cells have to be included in the landslide model prediction. A straight-forward understanding of landslide prediction efficiency is to take account of unstable cells, as measured by SR, whereas stable cells do not resemble to landslides. The paper is not clear on what extra advantage would result by forcing the new index to account the stable cells in estimation of landslide prediction.

- Kappa index has been criticized repeatedly as a “stern”. The outcome of Kappa is not surprising particularly in the test similar to this study. Kappa is not a good estimator where the portion of sample exhibiting actual agreement is mutually exclusive to the portion of sample exhibiting expected agreement.

- Performance of model or efficiency of prediction is usually judged in relative terms. If a, b, and c are three cases of predictions such that they yield SR(a)<SR(b)<SR(c). If the same cases yield Kappa(a)<Kappa(b)<Kappa(c) or MSR(a)<MSR(b)<MSR(c), then all of these indices are apparently presenting the same result in different form. In fact, the paper contains this information but it is not presented well.

Specific comments

- The “unstable” and “stable” cells are not defined.

- Random distribution of landslides on the maps would be a crude way for evaluation of prediction efficiency because it does not represent the case that agrees with nature (1129-17).

- It is not clear under what basis the MSR is assigned equal weights for prediction of stable and unstable cells. If one proposes unequal weights based on the proportion of stable cells to total cells or unstable cells, what would be response of the authors?

- 1129-line 23, what is “landslide aggregation”?

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- 1130-line 4-16 requires explanation and re-phrasing as it is hard to comprehend message from this portion. For example, model results, parameter a and b, spacing of parameters, etc. is suddenly introduced in the text with no backgrounds. The details about the model and the role of parameters are missing, which might frustrate readers.

- What is the “method-derived model efficiency? 1130-line 19.

- Authors emphasize the use “C++ language”, which does not seem giving any specific advantage (1127-13).

- The procedure used to generate landslide susceptibility map is very confusing. Adopting a randomized stochastic field might serve the purpose of testing SR versus MSR instead of using the generated maps. The paper fails to clarify about advantage of using the generated landslide susceptibility map. (1129-17)

- The scale of a cell used in the study is not mentioned. Use of different scale of the cell might pose challenge on the analysis and/or interpretation. (1129-17)

- It is not clear why authors have preferred using kriging method to interpolate contour patterns, which has resulted curled lines for no good reason.(1131-3)

- It is not clear why authors believe the MSR avoids over-prediction of unstable cells looking onto its less sensitivity on one axis. Can same logic be presented as the MSR avoids under-prediction of unstable cells too? (1131-20)

- 1132-6to18 and 19-28 is difficult to understand. I would suggest clarifying the parameters, calibration process and direction of calibration in detail.

- The authors’ logic stating that linear response of the MSR to both stable and unstable cell errors lead to optimality of the estimator is questionable. This raises a question whether authors are looking for an optimal estimator or linearly responding estimator. A linearly responding estimator is not necessarily preserve optimality. (1133-10)

- No description of SHALSTAB model is presented. Present brief description of the

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model, the specific methodology adopted in this study, similarities and differences with respect to original SHALSTAB etc. may be added for better clarity (1133-15).

- Technical details has been omitted in many parts of the paper, e.g. DEM resolution is missing; how spatial patterns of C is derived from GIS and satellite images is omitted; how and why R & T are chosen randomly are not mentioned; how GIS gave internal friction angle (or is it simply derived from geological data, if so, what are they?) is not described; and so on. Without having these details, the landslide modeling part of the analysis is hard to conceive.

- It is unclear how the model and its parameters are being effective to test a real case of landslide versus generated landslide susceptibility maps using random parameters while comparing SR and MSR.

- A smaller range of MSR (0.5-0.75) as opposed to the wide range of SR (0.1-0.9) seems coming from the halved weight of SR and halved weight of its complement. If SR is small, it is likely to have smaller percentage coverage of unstable cells. The complement of SR, other half in the MSR, would then be larger yielding a large MSR value. This would bring the lower range of the MSR near 0.5. However, at the higher side of SR, the differences between the index of actual agreement (Ka) and the index of expected agreement (Ke) would play role to limit the higher side of MSR at around 0.75. This dynamic is easily understood, which authors have elaborated (1135-1to16). However, the paper fails to clarify on specific gain by knowing this dynamics of index in landslide prediction.

- It is not clear why authors claim in the conclusion that use of only SR may retrieve improper parameter combination. On what basis is it possible to claim that the use of MSR would retrieve proper parameter combination?

- The notion of “reliable and sensitive measure in model efficiency” can be argued as a subjective judgment of authors in favor of their claim because the MSR is not investigated enough by testing its reliability and sensitivity.

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- Explanations of figure 2c and 2f are not clear.

- What do the “correct direction” and “wrong direction” refers in figure 3?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 3, 1125, 2006.