Hydrology and Earth System Sciences Discussions

Interactive comment on "Spatial pattern analysis of landslide using landscape metrics and logistic regression: a case study in Central Taiwan" *by* Y.-P. Lin et al.

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Reviewer 1

1. This paper applied landscape metrics to analysis of the spatial distribution of landslides. The authors introduce terms such as edge density and shape index but do not explain what these terms mean in landslide research. For example, in the conclusions section, the authors state that "Although the overall patch [i.e., landslide] shapes in low-occurrence and sustained landslides are irregular, the edge boundary in new landslide[s] is large." What does the statement mean to landslide researchers? How does

an 'irregular' landslide differ from a 'regular' landslide in terms of landsliding? What kinds of landslides tend to have longer perimeters (edge boundaries)? Are shape and perimeter really important to landslide research?

Reply: The study concerns about landslide landscape across a large scale. In the study area, land cover contains historical memory in landslides activity. Landscape metrics enhance a way to characterize and quantify landslide composition and configuration with various occurrences. Landscape metrics can be categorized as the following: area, density, edge, shape, isolation and connectivity metrics. To present the landslide composition and configuration in the watershed, landscape metrics comprises the number of patches (NP), mean patch size (MPS) from patch size metrics, Patch size standard deviation (PSSD) and patch size coefficient of variance (PSCOV) from Patch size variability, total edge (TE) and edge density (ED) from edge metrics, mean shape index (MSI) from shape metrics, and mean nearest neighbor (MNN) from isolation metrics. Detailed descriptions of the above metrics can be found in McGarigal and Marks (1994); Elkie et al. (1999). From the landscape metrics results, landslide patches in low-occurrence landslide spread the catchment near stream channel while the high-occurrence landslide areas cluster near the ridge and stream channel. Moreover, the study followed the landscape ecology concept. Landscape ecology emphasizes the interaction between the spatial pattern and ecological process, that is, the causes and consequences of spatial heterogeneity across a range of scales (Turner et al., 2001). In addition, landslide shape, area, and perimeter were related to recovery rate of landslide area (Lin et al., 2006).

2. The authors make statements that are not supported by data. For example, in the conclusions section, the authors state that "Susceptibility maps reveal tha t low occurrence landslides are close to stream channels. However, high-occurrence landslides are more likely to be close to ridge lines." This statement is not supported by results presented in Table 4; in fact, distance to ridge was not even mentioned as an explanatory variable. Another example is from P. 10, where the authors state that "It

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is found that the MPS is negatively correlated with the occurrence number in small occurrence number landslide[s] but is positively correlated with the occurrence number in large one[s]." This statement is based on Fig. 5; no correlation analysis was actually performed.

Reply: From the results, high-occurrence landslides are more likely to be close to ridge lines. The study does not directly consider the distance to ridge as an explanatory variable. However, steep slope and high relative elevation are possible to ridge. Both variables are in consideration of the explanatory variables in the models. Figure 5 shows the relationship between mean patch size (MPS) of landslide patch and various occurrence numbers. From the figure, we can find that MPS is negatively related with the occurrence number in small occurrence number (occurrence number 4) landslide but is positively related with the occurrence number in large one.

Specific comments: The paper is riddled with many confusing terms (e.g., the mean size of each landslide), grammatical errors, and bad sentences. The annotated copy of the paper shows some of the examples.

Reply: We restructured introduction, method, and results in the reversion. Moreover, grammatical and writing style errors in the original version have been corrected by our colleague who is a native English speaker. Moreover, 'The mean size of each landslide' was modified to 'the mean size of landslide patch.'

Reference Elkie, P.C., Rempel, R.S., Carr, A.P.: Patch Analyst User Manual: A Tool for Quantifying Landscape Structure. NWST Technical Manual TM- 002. Ontario, 1999.

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tifying Landscape Structure. Reference Manual, Forest Science Department, Orgon State University, Corvallis, Oregon, 38-53, 1994.

Turner MG, Gardner RH, O'Neill RV, Landscape Ecology in Theory and Practice: Pattern and Process, Springer, 2001.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/7/C1206/2010/hessd-7-C1206-2010-supplement.pdf

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 3423, 2010.