Nat. Hazards Earth Syst. Sci. Discuss., 2, C2793–C2797, 2014
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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "A feasibility study on the influence of the geomorphological feature in identifying the potential landslide hazard" *by* M. H. Baek and T. H. Kim

Anonymous Referee #1

Received and published: 23 December 2014

After my quick review, the manuscript improved but, in my opinion, it is not ready for publication yet. Please note that I consider NHESS a journal with high quality standards, therefore I encourage the authors to make some additional efforts. My comments are focused to improve the quality of the manuscript through major revisions and are organized in three sections: - Some additional discussion about the reply to the comments of the quick review. - General comments - Some specific comments

REPLY TO THE COMMENTS OF THE QUICK REVIEW

ATC1 (answer to comment 1): Slope, aspect, curvature etc. are not methods. They are

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terrain attributes. Landslide hazards methods could be susceptibility mapping, rainfall thresholds, distributed physical modelling of the initiation of landslides, etc. Moreover the reply "idea for evaluate the landslide hazard when only digital elevation model is available" is weak. Even when only the DEM is available, a number of terrain attributes can be derived and used in susceptibility mapping methods. Some of those are very simple to apply with commonly available GIS. Therefore the idea of using a single feature for the landslide assessment needs to be revised. In my general comments I will try to provide some hints.

ATC2: Numbers and percentages should be explicitly entered in the tables (see general comments).

ATC3: At least two issues addressed here should be incorporated in the manuscript discussion: first, very rough area without landslides could be considered an indicator of areas susceptible to future landslides; second, the mismatch between landslide locations and planarity classes could be due to the influence of other resisting or driving factors (different land use typologies, influence of other geomorphological features, etc.).

ATC16: I suggest an additional reference to a recent manuscript that makes a review of LIDAR applications in landslide studies: Jaboyedoff, M., Oppikofer, T., Abellán, A., Derron, M. H., Loye, A., Metzger, R., & Pedrazzini, A. (2012). Use of LIDAR in landslide investigations: a review. Natural hazards, 61(1), 5-28.

ATC20: I understand that the three sites are close each other, but providing different descriptions makes believe that they have different features. E.g. landslide typology is not reported in site B and soil thickness is reported only in site B. Moreover, some features may change even at small distances: land cover (forest, agricultural, urban fabric, etc...), slope gradient etc... Lastly, if a feature is identical in all the three sites it should not be replicated in their singular descriptions (sections 3.x) , but should introduced in advance in section 3.

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GENERAL COMMENTS I still am not comfortable with the title. The main issue, which is recurring elsewhere in the text, is the assumption that planarity is THE "geomorphological feature". The truth is that planarity is ONE of the many geomorphological features that can be derived from a DEM. Geomorphology is complex and it is impossible to use a single feature to describe it. Planarity is just one of the terrain attributes defined in the field of geomorphology (topographic wetness index, stream power index, etc...). Planarity is not a new feature, it is has already been used to describe the roughness of the terrain, and in this work it is used for the first time as an indicator for preliminary assessments on landslide susceptibility. In this light, a possible title could be "A study on the use of planarity for quick identification of potential landslide hazard". After the title, something should change in the text as well and major revisions are needed to demonstrate the hypothesis of the manuscript. It is mandatory to:

1- rephrase the parts of the text where the scope of the work is described. A possible outline could be as follows.

The identification of locations potentially susceptible to landslides is a long debated topic and a large variety of methods has been proposed to map those areas (Soeters and van Westen, 1996 and references therein; Guzzetti et al., 1999 and references therein). Although many studies proved that a large number of explanatory variables has to be combined to obtain the best possible landslide susceptibility assessments (Nefeslioglu et al. 2011; Catani et al. 2013), sometimes a preliminary assessment is needed and a single terrain attributed easily derivable from DEM could be used as indicator of potential landslide areas. For this scope, this work proposes the use of a measure of the roughness of the terrain, defined by a statistical analysis of axial orientation data in a three dimensional space performed on a high resolution DEM.

2- Perform a quick study by means of univariate and bivariate statistics to demonstrate that planarity performs better than other terrain attributes (slope gradient, topographic wetness index, planform and profile curvature and others chosen by the authors) as a proxy for potential landslide areas. This study could be performed by means of GIS

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analyses.

3- The result section should contain a table with the following structure: Roughness class | threshold values | percentage of area | number of landslides.

Authors should clarify how they chose the threshold values. An additional idea could be to adjust the threshold values to empirical data in order to maximize the number of landslides in the highest roughness classes containing at the same tome the percentage of area occupied by those classes.

4- The same should be performed for the other terrain attributes to compare the performance and to demonstrate that planarity is the best terrain attribute to be used as a landslide indicator.

5- please, revise the terminology. "Geomorphological feature" cannot be used as a synonym of "roughness". Roughness is one of the many geomorphological features that can be derived form a DEM.

SOME SPECIFIC COMMENTS

11: . . .inventory mapping, expecially. . .

143: hills and mountains are different things. Maybe "hilly reliefs"?

213: please, explain clearly how you combined planarity and slope. Is 19 degrees used as a cut-off value? Please clarify and, in case, explain why you selected the 19° value.

236 hazard is also

240 you can add in the conclusion that, after what you have proved with this work, planarity could be used in complete susceptibility assessments as an explanatory variable.

Figure 9. I suggest deleting this figure. The table I suggested in point 3 of general comments could contain more information than this figure.

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Table 2. Here we have a total of 150 initiation zones. It is interesting to know in which planarity class they are located. That is why the aforementioned table is important. Does each of the 13 landslides has at least an initiation zone located in high or very high roughness areas?

CITED REFERENCES

Catani, F., Lagomarsino, D., Segoni, S., and Tofani, V.: Landslide susceptibility estimation by random forests technique: sensitivity and scaling issues, Nat. Hazards Earth Syst. Sci., 13, 2815-2831, doi:10.5194/nhess-13-2815-2013, 2013.

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Nefeslioglu, H.A., et al., 2011. Medium-scale hazard mapping for shallow landslide initiation: the Buyukkoy catchment area (Cayeli, Rize, Turkey). Landslides, 8, 459–483.

Soeters, R. and van Westen, C.J., 1996. Slope instability recognition analysis and zonation. In: K.T. Turner and R.L. Schuster, eds. Landslides: investigation and mitigation. Washington, DC: Transportation Research Board, National Research Council, 129–177, Special Report No. 247.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 7119, 2014.