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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Land use and land cover geoinformation properties and its influence on the landslide susceptibility zonation of road network" *by* Bruno M. Meneses et al.

Anonymous Referee #1

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General comments

The manuscript addresses the effect of using land cover data of different spatial and thematic resolution in landslide susceptibility modeling, particularly for susceptibility zonation of a road network. The topic is interesting and significant. Land cover data is used in susceptibility mapping, often without questioning its quality and suitability for such an analysis. The authors provide us with an overview of what we might be missing in case we use unsuitable data (or data which is too coarse for example).

The authors first introduce us to landslides in general, and their effect on human lives, activities, infrastructure, etc. They proceed with describing the usefulness of landslide

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susceptibility assessments. Afterwards, we are introduced to the role of land cover and how the choice of geoinformation details of land cover is usually not studied – despite being a significant factor. The authors demonstrate their approach in a watershed in Portugal (with a detailed focus on three smaller areas within the watershed boundaries). They use two different land use and land cover data to demonstrate the effect of using different data on landslide susceptibility: the Portuguese land cover map (COS), and the European Corine Land Cover (CLC). The landslide susceptibility mapping itself is straightforward, and is based on acknowledged and commonly used methods (information value). Although, there are other approaches, where similar data could be used (logistic regression, weights of evidence. . .), the authors chose this method, as it has been applied at a similar scale, also in Portugal. Generally, it is a nice study, however with some major flaws - most of them related to the fact that some topics were not addressed. This means, that my revision recommendation is mostly based on rewriting the main body of the text, adding additional clarifications, or expanding the discussion. Aditional analyses are not needed.

First, while the authors investigated the role of land cover data on modeling landslide susceptibility, they did not compare different methods. I do not expect the authors to perform additional analyses with other modeling approaches – however, I would like them to discuss the method used a bit more extensively. For example, could other methods lead to larger (or smaller) differences between different land cover data?

Second, I have seen many landslide susceptibility studies, where data with relatively coarse data has been used. Also here, the data on soil and lithology is on a (much) coarser resolution than other data (slope characteristics, and land cover). We can see, that while all other data has a fine and detailed pattern, the lithology and soil maps have clear boundaries, with relatively large mapping units. This is of course not the authors fault – this are probably still the most detailed soil and lithology maps available for the study area. Nevertheless, I would like to see a more detailed section in the discussion, reflecting on the discrepancy of such differences (e.g. scale and mapping

unit) and the effects on susceptibility modeling. The authors already did this for the land cover maps, and wrote a few sentences in the discussion.

Third, I have two comments regarding the landslide inventory (page 9, lines 5-10). To be clear, the authors mapped landslides using orthophotos and google earth themselves? And the authors went on the field themselves as well? Currently, it is not clear if they received the data that was developed by photointerpretation, or if they performed it themselves. Moreover, it seems that the most landslides are outside forested areas – I compared the two land cover maps with the landslide distribution map visually. This is of course possible, as evidence shows that forests have a positive role on slope stability (e.g. due to roots). Nevertheless, it is also difficult to map landslides in forests, using photointerpretation only. This can have significant effects on the results. For example, if we look at Figure 4, the areas where the differences between the two susceptibility maps are the lowest are indeed areas covered by forests (or seem to be, the authors did not provide additional information that would lead to other conclusions). Also, studies have shown that landslide unit definition have a significant effect on landslide susceptibility modeling. It makes a difference if a landslide is mapped as a point, as the whole landslide area, or only the scar of the landslide. What did the authors map? From the text, I cannot see if a landslide is presented by a (centroid) point, by the whole area, or something else. Please clarify how you mapped landslides.

Specific comments

Title

In my opinion, geoinformation properties is too vague. What about simply “effects of different land cover data on. . .”

Data

Effect of the different land cover data used – what I would be interested in, is also the extent of the influence of any land cover data at all. The difference between the

results of the two LUC data used suggests, that land cover does play a role – we do not fully know how significant it is (in this study area). I would be interested in seeing the difference between the two land cover data, and a susceptibility map without a land cover map. It would also be a sort of sensitivity analysis.

I would like to see the distribution of landslides (so, the points) on the data figure (Figure 2) as well (so, where are landslides located on a land cover map, soil map. . .)

Figure 4. I would like to see a different color map for the difference map. First of all, it would make sense, that there is a more logical center class. Currently, there are classes between 0.1 – 1 and -0.9 -0 (I assume, 0 is completely within this class). It would make more sense, to have a class -0.5 - +0.5 (or something similar).

Results

The authors compared the two maps visually, by map overlay, and by performing an overall accuracy and kappa coefficient. There is something I do not understand: what exactly is the overall accuracy? You compared the two maps, so this cannot be overall accuracy, is it maybe overall agreement? The same goes for commission and omission errors. These are not errors, but differences between two maps (so, two models). Also, I do not fully understand Table 4. From what I see in the table, most of the area is modelled as very high susceptibility in the study area – this however cannot be true. Or is the table presenting something else – maybe the susceptibility of the road network only? Please explain or modify the table.

Table 4 is one of the main results in my opinion, however, now you present it in % of total area. This is fine, but then you really need to replace the term accuracy with agreement, because 66.7% of accuracy (LSRN2/LSRN1) for the class high does not mean accuracy, but agreement.

Discussion

I already mentioned above what needs to be expanded in the discussion. Besides that,

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I would like to see the following in the discussion: - Any recommendations based on the results? (in terms of using land cover data) - Comparison with other, similar studies, and what did they find out? - The influence of the method used (maybe information value results to fewer differences between using different land cover maps) - Discussion on other data, particularly landslide inventory (potentially missed landslides in forests, or type of mapping).

Technical corrections

In the abstract, the authors use the term “very good” when describing their models – please either replace it with a different term, or add justification for it being very good (e.g. both have an AUC over 0.9). Also, the AUC is not the only measure to address the model success, so I would refrain myself by using very good – you can state that the models have a high accuracy in terms of AUC or something similar.

The last sentence – landslide susceptibility maps are exactly what their name implies, maps providing information on how susceptible an area is to landslides. They are not maps, where landslides will probably occur. Please change this.

Generally, the level of English is high. Nevertheless, a spell check or rewriting of some parts of the manuscript is necessary: - The authors tend to use the word “the” too much in my opinion (the landslides, the total or partial, the landslide susceptibility assessment. . .). - Study area description, first sentence: simplify and write “We performed this study in Zezere. . .). Also, what does “high slopes” mean? Steep slopes? Same goes for low slopes.

The authors use a lot of abbreviations – while some are presented in the main body, some are presented only in the abstract (e.g. LUC, COS, CLC). I recommend that you again define the abbreviations in the main text, when you use them for the first time.

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