Natural Hazards
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Discussions

**Interactive
comment**

Interactive comment on "Simple rules to minimize exposure to coseismic landslide hazard" *by* David G. Milledge et al.

David G. Milledge et al.

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Dear Dr Scaringi,

Many thanks for your thoughtful comments and questions, we have tried to respond to each below.

David Milledge

COMMENT- You mentioned multiple times that the DEM resolution can influence some of your results. It would be nice to quantify this influence at least for one inventory for which a higher resolution DEM is available (e.g. Northridge). Perhaps, moving from 30 m to 10 m DEM will only produce marginal improvements while increasing the computational cost significantly, or on the contrary it will change the result significantly.

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RESPONSE: This is a good idea and should be straightforward to do. We will attempt it for Northridge, where we have previously tested (but not yet compared results from) the 10 m NED elevation data.

COMMENT - There are cases in which several inventories are available for the same study area (e.g. Wenchuan). These inventories are sometimes quite different from each other. Among others, we discussed this in a recent submission, still under review (see the revised manuscript in the discussion at https://www.earth-syst-sci-data-discuss.net/essd-2018-105/) and we found substantial areal mismatches (up to 67%) between inventories in the Wenchuan, and rather low pixel-based correlations (R-squared as low as 0.35). We showed that this translates in quite some differences in landslide-size probability distributions and hence in landslide volume estimations. This might condition some types of hazard assessments based on volume-runout correlations. However, we did not go deeper into the topic, as it was out of the scope of our manuscript, and we did not investigate how this mismatch between inventories translates into statistics of controlling factors (e.g. slope, upstream contributing area, etc.). It would be interesting if you could estimate to what extent choosing a different inventory for the same study area would affect your assessment.

RESPONSE: We certainly want to follow up on this suggestion and had hoped to report results to you within the discussion period but have been unable to do so. We will attempt it for the revised publication, though in the interests of space, the results may need to go in a supplementary information section unless they have a strong effect on our overall findings.

COMMENT - Also, again about the Wenchuan case, you only chose a subset of the inventory by Li et al. (2014) containing about 1/3 of the landslides. It would be good to explain whether this subset can be thought as representative of the entire study area (e.g. in terms of landslide metrics, topography, lithology, distance from epicentre and fault rupture, etc.) so that one would be confident that the results you obtain have more general validity and are not biased by your choice, which was only due to a data

availability issue. What you report in the conclusion (see my point below), that is that the site-specific and averaged rules perform similarly, is comforting in this sense, but what if it is just a coincidence?

RESPONSE: This is another good suggestion and in the light of it we will make some comparisons to the full study area excluding areas with data gaps. We will also try to give the reader a better sense of the characteristics of the subset relative to those of the full study area.

COMMENT - From your analyses you obtained a set of simple and easily understandable rules to minimise the exposure, and you wrote that the hazard area calculated with averaged parameters performs only slightly worse than hazard area calculated with site-specific parameters. This is encouraging and, as you wrote, it suggests that the average parameters can be applied to other inventories (or subsets of inventories). Thus, it would be very interesting to see these averaged parameters being applied to other inventories, across a variety of landscapes, climates and seismic characteristics. Also, it would be interesting to apply your rules to a highly seismic region in which no recent earthquake has occurred, and relate it to the current distribution of population and exposed goods (but I recognise the latter is out of the scope of this work, so it is just an idea).

RESPONSE: These are both very interesting ideas, though they are out of scope for this work as you say. We are keen to examine these rules in different contexts to establish the range of conditions under which they apply but felt that the six cases used here make a useful initial contribution. We have taken an approach similar to your second idea to provide an indication of the spatial distribution of co-seismic landslides that might be expected in a scenario earthquake for the specific case of an earthquake on the Weinan-Jinyang fault near Xian, China (in prep for IJDRR).

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2018-271, 2018.