

Interactive comment on “Regional trends and controlling factors of fatal landslides in Latin America and the Caribbean” by S. A. Sepúlveda and D. N. Petley

Anonymous Referee #1

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The paper is a clear and reasonably well written. The data presented are new, and provide a valuable addition to (relatively small) the literature on the subject.

The analyses performed and the results presented are not all fully convincing, but this depends on the size of the dataset, which is not large, and not on methodological problems or significant flaws. In places, the authors acknowledge the limits of their work, but the limitations should be stated more explicitly. I have found of interest, although not entirely new, the attempt to determine correlations between the catalogue of the fatal landslides and societal metrics, including e.g., the Country Corruption Index.

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The two tables and the 12 figures are all useful, and contribute to understanding the text. The quality of the figures is good, although the readability of some of them is not optimal, and should be improved. See specific comments below.

Below, I list more specific comments related to single sentences or paragraphs in the text.

Page 2778, line 13. “. . . with the production of research articles with a local author . . .” is not entirely clear here. It will become clear towards the end of the paper, but it is ambiguous in the Abstract.

Page 2778, line 19. “. . . occurring in every high relief areas in the world”. This is a bit ambiguous, as landslides occur and cause fatalities also in non high relief areas.

Page 2779, lines 8 to 12. It is not fully clear what are the studies referred to as “those studies”, and what is the “original study”. Please resolve the possible ambiguities.

Page 2780, line 10. Define “useful” location. For certain analyses, just knowing the country of occurrence of the landslide would be useful.

Pages 2780-1, lines 27 to 8, is not fully clear and contains some ambiguity that should be resolved.

Page 2781, line 12-13. This is a general comment. The authors have used the 30 m SRTM DEM. Despite the know problem, this is a rather accurate source of topographic (morphometric) information. However, the authors have stated that their ability to locate the fatal landslides geographically is limited to a few kilometres. Given this accuracy, determining (and using) terrain information from a 30 m DEM may not be very useful, or sensible. The authors should clarify this point, here and/or in other section of the text. See also comment on page 2784, line 26, below.

Page 2782, line 4. The text should read “. . . data, it remains one . . .”.

Page 2782, line 16. “Surprisingly, . . .”. Why surprisingly? This is in line with what is

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stated in the previous sentence. Or am I missing something?

Page 2782, lines 25-27. A possible mix of apples and oranges, here. I think the authors are missing meteorological phenomena (e.g., hurricanes, tropical storms), with rainfall characteristics (e.g., the intensity of the rainfall. Intense rainfall is typical of hurricanes, tropical storms and other storms.

Page 2783, lines 19-22. It is unclear to me why there should be, or the authors expect a “rollover” in their probability density plot, a part from one due to under sampling of the small events. The cited work of Malamud et al. (2014) did not show a rollover for all of their landslides. For rock falls, the statistics did not reveal a rollover, for example. This should be clarified.

Page 2784, line 26. See also previous comment on page 2781, line 12-13. The authors state that they have used the local slope calculated from the 30×30 m SRTM data to account for “relief”. This is rather questionable. First, how do the authors have attributed a value of terrain slope to the single landslides? Taking the slope at the exact coordinates of the landslide? If it so, how do they have coped with the fact that the local slope may be quite different than the regional slope, which is the one that measure “relief” somewhat? Second, given the error associated with the location of the fatal landslide, which is acknowledged by the authors, which point is used to represent the landslide? Even in mountain areas terrain slope can vary largely even across short distances. My recommendation here is to use a different topographic measure to identify “relief” areas, and particularly relative (local) relief in a reasonably sized window. For example a size that corresponds to the uncertainty (error) associated to the mapping of the landslide.

Page 2785, lines 5 to 8. Although I am convinced that geology is important for landslide occurrence, I wonder how can you really inform any model or speculation on the role of geology on the occurrence of landslides based on very small, synoptic scale geological information has the one used in this work.

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Page 2786, line 1. Text should probably read “... in central Colombia, SE Brazil, and some ...”.

Page 2786, lines 16-18. Why is the scatter large? Is it because the societal index used is uncertain, or because the natural phenomenon (landslide) difficult to explain, at this scale? I wonder if the authors can comment on this.

Page 2786, line 20. “slope gradient.” See my previous comments on the same subject. Terrain relief (within a local window) would work also, and probably better.

Page 2786, lines 24-26. I am not fully convinced by the argument that “these three factors should be considered as primary controlling factors of fatality-inducing landslides in the study region” holds. The three mentioned factors are slope gradient, precipitation and population density maps. Clearly all of them are related to the occurrence of fatal landslides. However, given the scale of the information used, the three parameters are proxies. And this is what is not convincing in the argument made. A proxy may not be a “primary controlling factor”. The authors should comment, and clarify the issue.

As a side note, the reference given to support the statement (i.e., Parker (2010) is an unpublished MS thesis, which is therefore difficult to examine for many of the potential readers. Is there any better reference that can be added here?

Page 2787, line 3. The statement “It is generally accepted that research can play a key role in reducing the impact of natural hazards” is rather strong, and not fully supported. It would be good to back up this (strong) statement with some reference, or evidence.

Page 2788, lines 5 - 7. Again, I am not fully convinced that there is a simple link – as the authors seem to indicate – between research (and publications) and the number of landslide fatalities. This is because not all the publications are good and useful, or can be applied. Also, there must be a lag time between research (and publication), its possible application, and the positive effect of a reduced number of fatalities.

Page 2788, lines 13-15. What about education? Isn't it important as research, and

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possibly more than research?

Page 2790, lines 1 – 2. "... showing that there is only partial coincidence with our dataset from one decade later." Is this because of the natural variability of the landslide phenomena, or is it due to data availability? Clearly, the long-term effect will be different.

Page 2790, line 7. Reference not in the list of references, or not correct. Please check.

Notes on the Figures.

Figure 1. It would be better to use a bar chart to show the temporal data. The cumulated data should remain a line.

Figure 2. Legend is not very visible. Consider adding a white background.

Figure 3. Text is too small, and almost impossible to read. Legend is also too small.

Figure 4. The many lines are difficult to discriminate. Use colours instead of the confusing patterns. A methodological question: How were the probability density functions (pdf) obtained? The method / technique used may influence the results, and it is therefore useful to give some detail on how the pdf were obtained.

Figure 5. Text is too small, and almost impossible to read.

Figure 6. Text is too small, and impossible to read. Consider using bar charts instead of line plots, to improve readability.

Figure 7. Maps are very small. Landslides (black dots) are not really evident. Legends are not very visible. Consider adding a white background.

Figure 8. Same as Figure 7.

Figure 9. Same as Figure 7. Text and symbols in the scatter plot are too small.

Figure 10. Same as Figure 7.

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Figure 11. Consider using colours instead of shades of grey and patterns.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 3, 2777, 2015.

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