Review of: ***From rockfall source areas identification to susceptibility zonation: a proposed workflow tested in El Hierro (Canary Islands, Spain)***

General comments

This is a well-structured manuscript that provides a clear methodology to address some of the uncertainties in rockfall susceptibility map production. Overall, I found it easy to read and follow, and it provides a valuable contribution to the more general issue of producing hazard maps at larger (regional) scales. I have a few questions, primarily around the technical implementation of some of the methods and how to interpret some of the later figures, however, none of these are major issues and I look forward to seeing the published revised version.

Specific comments

1. Locations of past rockfall events vs locations of future rockfall events

In this work there is the inherent assumption that past rockfall areas not only inform future rockfall areas but are also still "on-the-list". After a rockfall has occurred, should the probability of a future event at the same location decrease? At some point you presumably will run out of rocks to fall?

2. The term "probability" without any conditional information

It is slightly misleading to have probability == 1 for a whole set of pixels without some sort of dependency. A probability of 1 is a certain event. These maps (e.g., figure 4) – are essentially saying there are huge areas where a rockfall will definitely pass through. Does this mean that the next event to occur will definitely pass through all of these places? Or that all of these places will eventually have a rockfall event? (if so, what time frame). I presume the values are just to simplify calculations – maybe some context or an example statement of what p == 1 at a specific pixel means might help?

3. Slopes of past rockfall events informing CDF_{RSA}

If I understood this method correctly, any area with a slope LESS than the minimum observed slope of an existing rockfall source area has a probability of 0, and similarly, any place with a slope GREATER than the maximum observed slope has a probability of 1. It seems unlikely that the most extreme events have already been observed (especially given the small areas of the island where the rockfall data come from). It would be more realistic (and fair to the method) to have assumed observed values were (e.g.) 5 and 95 % values of the true slope distribution (actual % should be dependent on the number of data you're using to build the ecdf). Some idea of the range of these slope values would be beneficial in the text too (e.g., are we looking at 42 – 42.5 degree slopes or 30 to 57 degrees).

4. How many rocks == a rockfall? And an idea (histogram?) of how many pixels these rockfalls are hitting on their way down (e.g., are most simulated trajectories only passing through 1 (start) or 2 pixels or is it closer to 100?).

5. Data resolution

I might have missed it but I couldn't see where the information was on pixel size(s), whether the resolution of data for the different maps were identical to start or if interpolation was necessary, whether there was any concern or consideration of the method sensitivity to raster size (e.g., is it 10 x 10 m or 200m x 200m) and how do these compare to rockfall source areas?

6. The external validation data

Lines 242 to 244 suggest that external data (not used in the rest of the analyses) were used to "validate the models". This is a great idea – but we are not told enough about this external data, the number, the extent, whether they are completely separate from the data used in the rest of the manuscript or are essentially just a subset. I also didn't completely understand the buffer idea – how do these values (5, 50, 200m) align with pixel size?

7. Supervised is better

Given the finding that the supervised classification system is better – some discussion around the original rockfall data used is necessary – how biased is the original dataset by (e.g.) proximity to populations? Size of rockfall? Age of rockfall? And was any sensitivity analysis done via subsetting this data during the classification process?

Technical corrections

Line 37 - There are several places where rockfalls should be rockfall, this is one of them, I have not noted them throughout.

Line 49 – Sources → source
Line 86 – EL → El
Line 130 – evidences → evidence

Line 188 – I think dependent should be independent here? Unless you're doing some subsetting of the dependent variable?

Lines 94 – 95 [and repeated on lines 354 – 357] – this looks like it was a valuable exercise – but the results aren't included in the paper?

Lines 203 & 208 – physically → physics
Line 247 – regardless the adopted → regardless of the adopted
Lines 256 – 269 – most of this text is just Table 1 in words and could be removed.
Line 280 – 66,80 → 66.80

Lines 345-347 – this seems completely out of place – suggest removing or adding some context so it is obvious why it is included.

Line 350 – helps reducing….. → helps to reduce differences and homogenise zonation

Table 2 – I just can't wrap my head around this table, but I am assuming this is just me!

Figure 2 – Would be good to add the number of red pixels for each of the source area maps (LHS ones) or add some text in the caption (e.g.) "see Table 1 for pixel count".

Figure 3 – I don't quite understand the numbers in the legend compared to the maps – in the map the visible pixels are mainly green and dark blue, but according to the legend, green should be one of the least observed and there should be more peach/pink colours??

Figure 5 – because of the differences in x-axis scale it is virtually impossible to compare these ecdfs. Would it be possible to add the unsupervised line in a different colour to the supervised ones as well so we can see what's going on?

Figure 6 – I thought my printer had broken. Also, its not "probability of rockfall trajectories" because you can't have -1 probability, it is the *difference in* probabilities of rockfall trajectories.

Figure 7 – where do the zeros get binned in these histograms? Would probably be better (given that 0 is a "match") to have 0 as the mid-point of the central bin.

Figure 8 – Needs a better explanation when talked about in the text, and what is the total number of "measurements" number of total pixels across the island? Or only those that were included in at least one of the models as $p > 0$? Or other?

Figure 9 – This one also needs some extra information as I don't understand it – how did you measure "true positives"? and as the "empirical ROC" is consistent across rows, and all the points appear to be on the line – how is model fit calculated? And if the numbers are probability threshold reference values – should these be in the opposite order and vaguely align with the numbers of the y-axis to estimate fit? Also, they're all black lines as far as I can tell.