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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Risk-based analysis of monitoring time intervals for landslide prevention" *by* Jongook Lee et al.

Anonymous Referee #1

Received and published: 27 December 2017

General Comments: The paper "Risk-based analysis of monitoring time intervals for landslide prevention" presents a landslide risk and mitigation study conducted in northern South Korea in order to establish monitoring frequencies, appropriate to reduce landslide risk over a wide area. The paper is written clearly and its method based on previous publications. By using approaches from civil engineering, Lee et al. are able to estimate the reduction in landslide probability through monitoring efforts. This combination of different risk evaluation methods will be of interest to readers of NHESS, and hence I think this paper is suitable for publication in this journal.

Nevertheless, the paper has some significant flaws that need to be addressed. My major concern is that the analysis is based on landslides triggered by one extreme weather event of 2006. Although a high number of landslides were triggered and may thus pro-

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Discussion paper

vide a good spatial estimate of landslide probability, determining a landslide frequency from a single event is, at least in my view, highly speculative. Thus some questions remain unanswered (e.g., does prolonged, intense rainfall trigger landslide, or is it only extreme events?) and I think the temporal frequency for the different hazard classes may be over- or underestimated. This, in turn, has then an impact on the calculation of the risk reduction by monitoring. Which, brings me to my second point. In your paper you state that by law risk areas have to be monitored at least once a year. In your analysis, one year is given as the minimum. Depending on the failure mechanism, some slopes may require a monitoring frequency well below one year. This is something you touch onto in your discussion, but I think this issue should play a more significantly role throughout the paper, also given that the title of the paper is "Risk based analysis of monitoring time interval to prevent landslide". Hence, it would be more appropriate to include significantly higher monitoring frequencies (hourly/daily/weekly/yearly).

Generally, I think the paper is well structured. However, the strict and comparably long description of the methodology is unnecessary. I would suggest reducing the description of the standard approaches, and extending the description of the novel risk analysis. The paper would also benefit from a revision of grammar and sentence structure by a native English speaker. There are many very long sentences, which contain an exceptional amount of information and are therefore very difficult to understand for a reader reading it for the first time. I suggest splitting those sentences in two or three separate sentences.

Specific comments:

Page 3, Line 14: You mention that topography is the main factor for landslides in the area. Although this may be the case, the geology will almost certainly play a major role as well. Hence, please add some description of the local geology (bedrock and soil cover).

Page 5, Line 14: I think developing a landslide susceptibility map on just one weather

event is not ideal. Was there no previous data available? If not, please add a discussion on the limitation of using the landslide data of one extreme weather event only and its impact on the reliability of your estimated temporal and spatial landslide probability.

Page 8, Lines 11-12: Can Typhoon Ewiniar be classified as a common example of regional weather patterns that are likely to be reoccurring, or was this a truly exceptional event? In that case, how reliable are your estimates of landslide probability?

Page 12, Lines 18-21: I think it is highly speculative to define a rainfall threshold based on a landslide inventory of just one event. Next to extreme events, are landslides triggered by prolonged, intense rainfall events, which may be more characteristic for years 2010-2014?

Page 18, Lines 5-8: Is this necessarily true? The unit is given as landslide event $\times$ pixel-1 $\times$ year-1; if the pixel size increases the probability will decrease, but with increasing size more events may be counted. Please revise this statement.

Technical comments:

Page 1, Lines 14-15: “manually read inclinometer and piezometer” – continuously logging and transmitting inclinometer and piezometer are available, but you are talking about manually logged installations.

Page 2, Line 2: “relatively expensive” is potentially a misleading expression, perhaps “comprehensive monitoring methods” may be a better choice. Page 2, Line 5: I don’t think that singular is the right choice here. Although, a single inclino- and piezometer is the bare minimum, in real applications, you would have more than that. Also, could you please clarify the last two parts of the sentence.

Page 2, Line 10: “a few articles have addressed the time intervals for monitoring” – missing references.

Page 2, Lines 23-29: This is a reoccurring issue in the paper – please avoid those very long sentences, these are confusing and very difficult to follow.

Page 7, Line 6: Missing full stop after “items N”?

Figure 3: Do the red points correspond to dates with landslide occurrence?

Figure 4: I think it would be better to show landslide occurrence on the map of the hazard grades.

Figure 5: axis label should read ". . . Landslide Occurrence"

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