Natural Hazards and Earth System Sciences

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Discussions

Interactive comment on "Quantifying the effectiveness of early warning systems for natural hazards" *by* M. Sättele et al.

Anonymous Referee #2

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Dear editor, dear authors,

The study "Quantifying the effectiveness of early warning systems for natural hazards" aims to classify and quantify the effectiveness of all types of natural hazard early warning systems, illustrated by two Swiss experiences. Up to now, this research topic is innovative and interesting, since it could have a valuable impact for risk management; this manuscript is then relevant for publication in NHESS.

The manuscript quality reaches international standards, in term of language and content. Nevertheless, there are in my opinion three critical points that should be considered before any acceptance of the submitted paper.

1. First, the accumulation of acronyms (POC, POD, CPT, MTBF, etc.) makes the

reading less fluent and thus the manuscript sometime difficult to follow. I would strongly advice to reduce the number of acronyms in the text, and to provide a table of all cited acronyms.

2. Then, is it really justified that the forecasting system is considered as an early warning system? Indeed, as for monitoring systems, this system does not actively deliver warning information (Schmidt 2002, Glantz 2003) since the experts have to manually and periodically check data from the monitoring network. In addition, the Swiss snow avalanche forecasting system, that is used to illustrate this type of system, could be considered as well as a part of an early warning system, providing additional information for local experts (at municipality or ski resorts scales) to manage locally the associated risk. This limit to the classification should be at least addressed in the discussion.

3. Last but not least, the paper presents theoretical concepts to compute the EWS effectiveness; nevertheless, there are no practical and concrete keys to estimate and compute parameters of the effectiveness equation, such as PFA, RF(PFA) or sensor failure probability. As a consequence, it would be really difficult to apply the exposed concept for another natural hazard somewhere else, since it misses explanations to concretely estimate them. Quantified examples of Illgraben or Preonzo are given, but without no details on their calculations (as for example results of table 2). I assume that further explanations are provided in Sättele 2015a and b, but this manuscript should be understood by itself.

Specific remarks:

- Equation 1: Ew is not defined, and details objectives (results of an effective EWS as close as 1?)

- Line 23 page 4482 "in three different models": which ones? Specify.

- Sections 2.1, 2.2, 2.3: italic words are not enough highlighted. Try bold fonts or

summarize them in a table or in figure 2.

- Section 2.1: you only describe the system once it is set up. But you do not describe pre-investigation works on the natural hazard (monitoring network design, threshold settings, etc.) and the procedure in case of alarm, as you do in section 2.2.

- Section 2.1 line 13 "automated alarm call is activated": to whom, experts or population?

- Section 3.1 "3rd determine conditional probabilities": would it be possible to design a decision tree or include it in the BN in order to clarify actions according to AND or OR? This remark highlights as well that no flowcharts defining actions and chain of command seem to be required in you process, while they are recommended by other authors (such as Cardellini 2011; Intrieri et al. 2012; Michoud et al. 2013; Froese and Moreno 2014). Please explain or clarify.

- Section 3.1 "4th estimate component failure. . . example of Illgraben": how do you estimate it at Illgraben? Please specify.

- Section 3.2 "5th evaluate the reliability" What about the reliability, efficiency of the chain of control/command required from warning checks to real actions?

- Section 3.2 line 20 page 4495: how 0.4 is estimated?

- Section 3.2 line 2 page 4496: evacuation from 7 May to when (only one day, or evacuation until rock mass failure)?

- Section 3.2 last sentence: please provide more details on how the human-decision makers have a significant influence on EWS reliability. Table 3 does not provide valuable information to better understand.

- Section 4 line 11 page 4502: Please develop or illustrate with an example what tools the software would need to improve your process.

- Table 1: with only 2 sensors, the table means: if one sensor indicates an event, send

alarm. It would be more interesting to illustrate your process with the 5 sensors of the Illgraben, except if even with 5 sensors, only 1 is enough to send alarms.

- Table 2 is useless. Numbers should be integrated within the text.

- Table 3: as far I understand the table, it means that for both less and more risk tolerant cases, only 1 sensor is required to evacuate (20% of 5 sensors and 50% of 2 sensors). What is the difference then? Or if I misunderstand the table, please clarify.

- Figure 2: it would be interesting to add requirements of each system, in term of lead time and expressiveness of available precursors.

- Figure 13: is the fit really representative? If I do not refer to Sättele et al. 2015a to understand the caption, I can doubt about that. Please clarify.

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