Geophysical Research Abstracts
Vol. 21, EGU2019-15377, 2019
EGU General Assembly 2019

A probabilistic approach for natural hazard analysis – example of framework for rockslides

Sylfest Glimsdal, Carl B. Harbitz, Finn Løvholt, and Zhongqiang Liu
Norwegian Geotechnical Institute (sylfest.glimsdal@ngi.no)

Natural hazard and risk analysis are normally conducted based on a limited number of "credible worst-case scenarios", each with a corresponding probability. Such a scenario-based approach is computationally not too costly (in terms of number of simulations) and might seem more appropriate when there are few previous events in the region, giving limited opportunities to establish magnitude frequency distribution (MFD). However, uncertainties are not quantified and hazard zoning is simply made by a single line separating between no-hazard and hazard (at the best with a corresponding probability), and it is hard to relate the results to the safety classes based on a set of different probabilities of impact.

An alternative to the scenario-based approach is a probabilistic approach (using event tree) where a large number of scenarios are analysed based on frequency distributions (uncertainties) included in all steps, e.g. for landslides, uncertainties in location, release, volume, configuration, etc. are included. The results of the various simulations are integrated in an event tree analysis to calculate exceedance probability maps, which are in turn adapted to various safety classes in the Norwegian Planning and Building Act.

In the presented work we sketch a framework for the probabilistic approach to natural hazard analysis where both frequency distributions and uncertainties are included. In the absence of data or statistics on previous events, expert judgement is often needed to a large extent, among others to establish (discrete) frequency distributions. The approach may be used for several types of natural hazards. The framework is demonstrated by an example of rockslide hazard analysis. We also show how secondary effects (e.g. run-up of tsunami generated by subaerial rockslides) can be included in the framework. Factoring in probabilities in all stages implies that previously designated danger areas (based on a limited number of conservative scenarios) can be released.