



Probabilistic evaluation of snow avalanche runout

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Snow avalanches in mountainous areas affect infrastructure, settlements and other human activities worldwide. Tools such as hazard mapping and avalanche warning services are implemented in many countries to manage the avalanche risk at hand. The reoccurring question in the risk management strategies is at what probability a natural avalanche can be expected in a certain location given the timeframe of a year (for hazard mapping) or of the next 24 hours (for avalanche warning). This probability consists of minimum three conditional probabilities e.g. 1) The probability of a weather event that can cause snow conditions that lead to natural avalanches, 2) The probability that an avalanche actually releases and 3) The probability to reach a certain point in the avalanche path given that an avalanche is released. The probability of the critical weather event is today provided by the ensemble modelling of the weather forecasting services. In our model, we address the release probability with a fuzzy logic approach based on expert experience. The run out probability makes use of the statistical relationship between the avalanche path's geometry and the recorded run out length of over 200 large avalanches. The product of these three probabilities gives then the total probability that an avalanche will reach a certain point in the avalanche path within a given period of time. Currently the model is implemented in a GIS system that gives the probabilities for each grid point, based on the meteorological input for the next 24 hours. The aim of the study is to apply the model in local avalanche warning and to extend its function to annual probabilities for hazard mapping purposes.