

A NEW METHOD FOR AVALANCHE HAZARD MAPPING USING A COMBINATION OF STATISTICAL AND DETERMINISTIC MODELS

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The main purpose of the present paper is to propose a new method for avalanche hazard mapping using a combination of statistical and deterministic modelling tools. The method is based on frequency-weighted impact pressure, and uses an avalanche dynamics model embedded within a statistical framework. The statistical model of Keylock et al. (1999) is used to obtain avalanche encounter probability as a function of avalanche size and location along the path, as well as to obtain the frequency distribution of avalanche sizes. The impact pressures are obtained by the one-dimensional form of the VARA avalanche dynamic models (Barbolini, 1998; 1999), which is tuned to the runout distances provided by the statistical model.

The methods outlined provide a useful way for avalanche experts to produce hazard maps in the typical case of avalanche sites where historical records are either poorly documented or even completely lacking, that is where a “direct” calibration of dynamic models on known events is problematic. The procedure can be easily implemented using different design return periods and impact pressure thresholds, and can be used to produce confidence limits on the proposed zoning scenarios.

The overall methodology is applied to a real world avalanche mapping problem using an avalanche path and avalanche information from Iceland and, without loss of generality, the Swiss mapping criteria.