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Comparing empirical models, 2D- and 3D process-based models for delineating maximum rockfall runout distances

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An important step in rockfall hazard analysis is the delineation of potential maximum runout distances. Different approaches exist to determine the runout zones of rock falls varying from empirical models to 2D and 3D process-based models. Depending on the research goal, spacial scale, and quality of available input data, the appropriate model approach has to be applied according to the requested data validity domain of the output data.
A highly rockfall prone area in Carinthia (Austria) was chosen for a model comparison, also because of the fact that a large amount of field data about past rockfall events and rockfall determining factors was already available. This allows an evaluation of the different model types, and a more accurate validation of the different modeling results in respect to the real conditions of the study area.
The present study compares the capacity of empirical models (e.g. energy line principle) and a 2D resp. 3D process-based models ("Rockfall 7.1" resp. "Rockyfor3D") to predict rockfall runouts at various spatial scales. We focus on the analysis of the effects of the quality of the model input data on the modeling results. This is conducted by a step-wise downscaling from the regional scale (e.g., 1:25.000) to the slope scale (e.g., 1:2000), which brings about an increasing quality of the accompanying model input maps.
This study aims to summarise advantages and limitations of each model type, and their sensitivity to variations in the accuracy of the input data.