

RAMMS - A Modeling System for Snow Avalanches, Debris Flows and Rockfalls

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The software package RAMMS combines three-dimensional process modules for snow avalanches, debris flows and rockfalls in one tool. Because the system is embedded in a GIS environment, RAMMS is a powerful, user-friendly tool for hazard mitigation studies in mountainous regions that are affected by gravity driven, rapid mass movements. The focus of this presentation will be on the application of RAMMS in snow avalanche hazard mapping, which involves predicting avalanche runout distances, impact pressure and flow velocities. The RAMMS process module to predict these values employs a TVD finite difference scheme that numerically solves the governing differential equations describing the depth-averaged motion of dense flowing avalanches in general terrain. Semi-automatic GIS based procedures for specification of release zones and friction values have been developed to simplify the input process. The RAMMS model has been extensively calibrated using experimental data from the Vallée de la Sionne snow test site. In addition the model has been applied to calculate the runout distances of many catastrophic avalanches recorded during the catastrophic avalanche winter of 1999. A special feature of the snow process model is specification of a snow cover which, depending on the mechanical properties of the snow, can be entrained by the avalanche. This allows an accurate modeling of the avalanche mass balance, which is especially important in mitigation studies involving dams. Example calculations are presented as well as a short introduction into the debris flow and rockfall modules.