Snow Avalanche Hazard Mapping with Shallow Water Numerical Methods.

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Shallow water theory is used to model snow avalanches and other thin layer surface flows such as debris flows and rockslides. Numerical simulations provide runout distances and pressure maps in complicated three-dimensional terrain. In this talk we present several practical examples where advanced TVD finite difference schemes were used to solve the modified shallow water equations in order to predict snow avalanche runout distances and impact pressures. The examples are at both the single avalanche track and large area scale (500 km^2). In a first series of examples the limits of the model are defined by comparing the simulation results with real events. The role of the initial conditions is discussed. The model is useful to predict two-dimensional phenomena such as track splitting, multi-release zones and dam deflection. In the final example the model is used to determine the protective function of mountain forests over the whole area of Switzerland.