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Implementation of a blowing snow scheme in a meso-scale atmospheric model

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In mountainous area such as the Alps the location and release of avalanches is strongly influenced by the redistribution of snow due to the wind. Modelling such a process requires a detailed representation of the snow surface and the simulation of high-resolution wind fields in a complex topography. The recent development of meso-scale meteorological models and the increase in computation capacity make possible the explicit simulation of blowing snow in an atmospheric model. We want to present the first development of a new blowing and drifting snow scheme.

The model divides the blowing snow into two layers: saltation and suspension. The saltation layer acts as a lower boundary condition for the suspension layer. Properties of snow particles in saltation (e.g. number, concentration) and snow erosion threshold depend on the snow type at the surface given by the snow model ISBA-ES. It has been modified to include the same snow grain representation as Crocus, the French snow model used for avalanche forecasting. The modification has been evaluated against observations from the Col de Porte in the French Alps over the period 1998-2007. The model reproduces with a good agreement observed snow depth and snow erosion threshold simulated by Crocus.

The meso-scale atmospheric model Meso-NH (Lafore et al., 1998) computes wind fields and simulates the transport of suspended snow particles using a two-moment microphysical scheme. Snowdrift sublimation and turbulence damping due to the presence of snow particle are included. The coupled model (ISBA-ES + Meso-NH) is tested under two idealized configurations: a 1D column and an idealized ridge with a fixed inflow. It yields realistic evolution of the vertical profile of blowing snow concentration as well as the deposition and erosion patterns. This is the first step towards the development of a fully coupled 3D blowing snow model.