New Snow in the Snow-Cover Model SNOWPACK

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A correct representation of new snow and its properties is crucial in order to initialize the simulation of snow-cover evolution. On the one hand, adding a new snow layer to an ongoing numerical snow-cover simulation is straightforward and adjusting the density of new snow according to the meteorological conditions is common practice in snow-cover modeling, e.g. using a statistical model. On the other hand, however, assigning proper initial microstructural and textural parameters such as grain size, bond size, dendricity or sphericity to this new snow layer is more involved. For the sake of simplicity, these parameters are usually set to arbitrarily fixed values for new snow.

As dendricity and sphericity relate to the shape of snow grains in the different layers of the snow cover, these two textural parameters strongly influence snow-cover evolution, and in particular settling and metamorphism. Accordingly, initial values for both dendricity and sphericity should depend on meteorological conditions at the time of deposition too. To improve on this aspect, a method is first proposed to characterize objectively and unambiguously both new and fragmented snow collected in the field. Second, based on field measurements, functional relationships between both initial dendricity and initial sphericity and meteorological parameters such as wind and air temperature are developed. In particular, emphasis is given on strong wind conditions.

Improvements reached by using those new initial conditions are shown by means of comparing SNOWPACK simulations performed with and without the newly developed relations.

KEWORDS: Modelling, snow metamorphism, snow pack