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Simulation of snow cover development and snow cover distribution for glaciated sites (Sonnblick, Austrian Alps) with the ALPINE3D model

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Snowdrift is one of the major factors influencing seasonal snowcover distribution on glaciers. For mass and energy balance research, it is important to know the amount of redistribution of already deposited snow due to snowdrift as well as the preferential deposition of snow during snowfall events on glaciered areas. The investigation focuses on modelling typical saisonal accumulation and ablation patterns as well as the distributed snow cover development on two alpine glaciers, the Goldbergkees and Kleinfleisskees, located in the Austrian Alps. High resolution windfields over the complex topography of the Rauriser Sonnblick area were computed with the mesoscale atmospheric model ARPS (Advanced Regional Prediction System). The calculated windfields were used as input for the three dimensional model of drifting snow within the coupled physically based, distributed snowpack model Alpine3D, developed at the Swiss Federal Institut of Snow and Avalanche Research. The influence of terrain effects on the snow surface energy balance were taken into account with a 3D energy balance module. Furthermore the threedimensional model is coupled with the one-dimensional heat and mass balance model SNOWPACK, describing the evolution of snow covers and snow cover characteristics. Validation of the simulated snowdeph distribution were done using monthly snow stake readings at six different locations in the basin, seasonal snow profiles (snow layers, snow temperature) and winterbalance maps presenting the distributed snow depth measurements at the end of the accumulation season 2002/2003. The following model results are presented: (1) modelled flow

fields during the accumulation period, representing the influence of the main wind characteristics and their potential contribution to the saisonal snow depth distribution;the flow fields show realistic features of acceleration, flow deflection and flow separation; (2) influence of the redistribution of already deposited snow due to snowdrift events; these results show the amount of drifted snow due to saltation processes and suspension; (3) potential accumulation areas due to preferential deposition during snowfall events with moderate wind speed; (4) the saisonal snow cover distribution of the accumulation season winter 2002/2003; The model results from our work are used as an important input for detailed modelling of snow- and ice melt processes of Goldbergkees catchment (see Michlmayr et al. A physically based snowpack and icemelt model for the distributed simulation of the water balance in a high Alpine catchment).