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Modelling and measuring snow distribution for potential avalanche release zones

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The spatial variability of snow distribution in alpine terrain is known to be highly influenced by snow drift processes. In this study the physically based distributed snow cover model Alpine3D was used to compute the snow cover distribution for a potential avalanche release zone after a major snow fall event in February 2007. To this end high resolution wind fields over the complex topography of the study area were modelled with the atmospheric model ARPS (Advanced Regional Prediction System). The calculated wind fields were used as input for Alpine3D. Within the model frame of ALPINE3D the three-dimensional transport module describes the three processes saltation, advection-diffusion and erosion/deposition. The influence of terrain effects on the snow surface energy balance are taken into account with a three-dimensional energy balance module. The processes in the snow cover were described by the one-dimensional heat and mass balance model SNOWPACK. Particular to our application is the deployment of a very high resolution numerical grid of 5 m in the numerical wind, drift and snow cover simulations. Validation of the simulated snow depth distribution was done using terrestrial laser scanning technology (TLS). The Long-Range Laser Profile Measuring System Riegl LPM-i800HA was used to determine the spatial snow depth distribution before and after the respective snow fall event. The wavelength of the device is 0.9 μm (near infrared). The accuracy ranges between 10 mm and 100 mm. The comparison between measured and simulated snow distribution in the area of Lech (Austria) shows a good agreement, suggesting that both methods, TLS and numerical simulations with Alpine3D, are able to capture the major drift

zones in avalanche terrain.