Submitted Abstract

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Abstract

Glacier surface changes are formed by different processes taking place on the glacier at different spatiotemporal resolutions. These processes include, amongst others, snowfall, snow redistribution by wind and melt, and strongly influence the glacier mass balance and, thus, the catchment hydrology.

Present day glacier models are able to simulate the glacier mass balance, but smaller scale processes, such as snow redistribution, are normally not represented. This is partly caused by the limited number of point observations which are used to represent glacier variations by evening out higher resolution spatiotemporal changes. But also the lack of process-understanding and implementation of the processes into models hinders detailed simulations of glacier surface changes.

Glacier-wide surface change observations are needed to validate and calibrate the models. To obtain them, we use the data of a permanent and automated terrestrial laser scanner (TLS) at Hintereisferner, Ötztal Alps, Austria. This TLS observes the glacier daily at high-resolution (>1 point/m2). This data is used to calibrate and validate the Canadian Hydrological Model (CHM). CHM generally puts the focus on cold-region processes in hydrology and it is, thus, able to simulate blowing snow transport. It is a three-dimensional model which is spatially discretized using a variable resolution unstructured mesh. It has been proven that an unstructured mesh leads to a reduction in computational elements and a decrease in computation time compared to a fixed mesh. The inclusion of blowing snow in this model increases the spatial heterogeneity of snow water equivalent, as applied to a snow-dominated basin located in the subarctic mountains of southern Yukon, Canada. Originally, CHM is driven by wind-fields modelled with WindNinja. Instead, we plan to use high-resolution wind-fields simulated with the Weather Research and Forecasting (WRF) model. The combination of CHM, WRF-simulations and the unique high-resolution TLS data from our test site Hintereisferner will enhance our process-understanding of blowing snow and snow redistribution at an Alpine glacier.