A comparison of terrain-based parameter, wind-field modelling and TLS snow depth data for snow drift modelling

Wind and the associated snow drift are dominating factors determining the snow distribution and accumulation in alpine areas, resulting in a in high spatial variability of snow depth that is difficult to evaluate and quantify. In our study, we compare the results of a terrain-based parameter to snow-depth distribution and redistribution data obtained by high-accuracy TLS (Terrestrial Laser Scan) and to the results of wind-field simulations. Our results are from the test site at the Col du Lac Blanc, close to the ski resort of Alpe d'Huez in the French Alps, an area particularly suited for our study due to its constant wind direction, the availability of wind and precipitation data from a meteorological station and data from multiple TLS scan campaigns. We first spatially identify areas of good and poor correlation between terrain-based parameter and measured data, and identify common characteristics for these areas. Second, we present the differences in the results of the terrain-parameter based on a) summer terrain and b) snow-covered surface in mid-winter, and show how this affects the spatial correlation with the measured snow depth data. Third, we present comparisons of the terrain-based parameter to wind-field simulations with ARPS (Advanced Regional Prediction System), a 3-dimensional atmospheric model for simulating microscale airflows. The results of our study are another step towards improving the terrain-based parameter's ability to quantitatively describe snow redistribution.

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