Simulations of snow drift accumulation using a mesoscale non-hydrostatic NWP model and a snowpack model

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The interactions between atmosphere and snowpack are important for modelling the boundary layer (BL) over ice surfaces. To study these interactions, the mesoscale local model (LM) of the German Weather Service is applied for simulations over Greenland at a horizontal resolution of about 14km and a vertical resolution of the BL. Simulations using LM are performed for a ten-day period in July 2002, during which a field experiment took place at station Summit. To validate the model LM, the model results are compared to these measurements. Since usage of the snow soil model as implemented in LM leads to unrealistic representation of the snow pack, adjustments to the representation of snow in LM are done. Even with these adjustments the comparison with measurements shows some deficies in the near-surface values. Additionally, the LM results are used to drive the one-dimensional snow model SNOWPACK, yielding snow drift and accumulation fields for the entire area. While over large parts of Greenland the influence of snow drift on the snow accumulation is about the factor 10 smaller than evaporation/sublimation, snow drift influence is of at least the same magnitude in coastal regions.

A local mixing length approach and the parameterisation of a scalar roughness length over ice and snow are implemented in the LM and their influence on the model performance is tested. These sensitivity studies show an improvement of near-surface quantities with usage of scalar roughness length as well as local mixing length approach.