

Interactive comment on “Modelling snowdrift sublimation on an Antarctic ice shelf” by J. T. M. Lenaerts et al.

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General comments

Lenaerts et al. address an important question in determining Antarctic surface mass balance, and have assembled a useful dataset for driving a sophisticated model study of snowdrift sublimation. It is disappointing that there is less in the paper on the, admittedly challenging, observations that would allow the model predictions to be assessed. A figure is mentioned for accumulation at the study site, but without an estimate of precipitation it is not possible to evaluate the prediction that 16% is removed by sublimation.

Specific comments

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Equation (1) I guessed immediately that the divergence of blowing snow transport would not be discussed in this paper, but I had to read on to realize that precipitation and runoff are not addressed either. These should be acknowledged in the discussion of SMB here.

p123, line 3 Note that Figure 1 shows modelled SMB, not observations.

p126 How often were sondes launched every 12 hours at Neumayer? Were they used in the model forcing? How, in fact, are the observations used in the model forcing – a direct replacement of model temperature, humidity and wind speed interpolated to model levels? Does interpolating the 24 hour observations to 12 hour forcing not suppress any diurnal variation that the model would generate itself?

p127 Does the model's momentum roughness length depend on snowdrift? The stated roughness length is very far from consistency with the stated ratio of 7 m and 10 m wind speeds.

p129, line 26 The “measured” energy balance components in Figure 5 are actually modelled.

p130, line 20 What are the 3-h observations referred to here?

p131 In reality, the latent heat required for sublimation of drifting snow cools the air, not the surface. Does this not decrease the temperature gradient between the air and the surface and act to decrease the sensible heat flux into the surface, not increase it as stated here? Was the same threshold friction velocity used at Kohnen despite the less frequent precipitation? A friction velocity of 0.3 m/s corresponds with a 10 m wind speed of 8 m/s for a 0.25 mm roughness length. If the wind speed reached 12 m/s between 13 and 20 January, why was no snowdrift simulated? What were the wind speeds during the observed snowdrift events that were not simulated?

p140, Table 1 400 kg/m³ is very high for fresh snow density.

p148, Figure 7 Are what are marked as “Obs snowdrift” in B actually the predictions

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of snowdrift produced by the model driven with hourly observations, and not “observations” at all?

Technical corrections

p133, line 17 To what the feedback between SU and SUDs?

p144, Figure 4 The colour scale for q is labelled in kg/kg, not g/kg.

p148, Figure 7 The “SHF” title is missing from C.

p152, Figure 11 Why is TRDs presented as a shaded area rather than a line?

Interactive comment on The Cryosphere Discuss., 4, 121, 2010.