

## ***Interactive comment on “High resolution modelling of snow transport in complex terrain using simulated wind fields” by M. Bernhardt et al.***

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Fresh snow is highly susceptible to redistribution by wind and trapping by topographic features or vegetation. Snow depths are thus typically highly variable over landscapes, even with moderate topography, and this has important consequences for surface energy balance, hydrology, loading on avalanche slopes and glaciation. There has been considerable interest in the development of models that explicitly simulate snow redistribution, but this modelling is complicated by the complexity of the physics of wind flow, snow erosion and transport and the length scales on which these processes operate. Simple models have generally been required to achieve the computational efficiency required for simulations over large areas and entire seasons, whereas the sophisticated models required for simulation of wind fields over extreme alpine topography

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have mostly limited simulations of blowing snow in these regions to small areas and single events. The work of Bernhardt and co-authors is innovative in using a library of wind fields from a mesoscale model, downscaled to an appropriate resolution for explicit snow redistribution simulations.

p514, line 23 Not only may snow accumulate "at the windward side of taller vegetation" in extensive patches, it can also accumulate in the lee of isolated individuals or vegetation strips acting like snow fences. This highlights the complexity of interactions between vegetation and wind-blown snow.

p515, lines 14-18 These two sentences should be made clearer.

p516, line 9 For the elevation of Königssee, either quote "lake level"; or delete "sea level" (several readers of this paper will have fond recollections of cruising on the Königssee with the authors after the Munich alpine snow workshop).

p517, line 12 Rather than "aspired interval", something like "intended interval" would be better English.

p517, Equation (1)  $\rho_s$  should be  $\rho_s$  and  $\rho_w$  should be  $\rho_w$  The last term should be  $-Q_v$  if this represents loss of snow by positive sublimation (although this same sign convention is used by Liston and Sturm, 1998).

p518, Equation (5)  $(v/u)$  should not be a superscript

p518-519 The text here, essentially just providing captions to Equations (2) - (10), is hard to read. As the equations are all reproduced from Liston references, perhaps the principles could be discussed here and the details referred to the original papers. Should this discussion not, in any case, go in section 5.4?

p519, Equation (10) Canopy wind speed should be  $W_{ca}W$ , not  $W_{ca}$ ?  $\rho$  is a poor choice of variable name for vegetation height.

p520 Why does the smoothing of the topography for MM5 also cause shifts? The

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corrections described in 5.1 and 5.2 are very obscure, to me at least.

p521, line 2 "to prevent of artefacts" - delete "of"

p523, line 3 Change "nearer at" to "nearer to"

p523, lines 10-20 There should be a reference to Figure 8 in this paragraph. What is "not substantive" meant to mean? How can differences in direction be expressed as a percentage?

p523, line 21 "commonly to low" - change "to" to "too"

p525, line 24 The reference to Figure 4 should be Figure 12

p526, line 20 "below of 1800 m" - delete "of"

p527, line 1 Change "After than" to "Then"

p528, lines 13-25 A reference to Figure 18 is required in this paragraph.

p528 A clearer and more self-contained presentation of the conclusions is required.

Labels on the figures are generally too small

Figures 3 and 4 The different symbols used for marking the sample points are not explained.

Figure 6 What is the "eq. 45" referred to here?

Figure 7 Despite what the caption says, the regression lines are clearly not forced through the origin.

Figure 14 What do the pink areas in (a) and (b) show? Change "Mai" to "May"

Figure 17 Are "run\_1" and "run\_2" INTER\_30 and MM5\_30?

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Interactive comment on The Cryosphere Discuss., 2, 513, 2008.

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