

Interactive comment on “Understanding snow-transport processes shaping the mountain snow-cover” by R. Mott et al.

Anonymous Referee #2

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This paper describes snow redistribution processes in alpine terrain using modelling and intensive field observations. The combination of physical modelling with intensive field observations is good to see in a paper. It is generally well written and interesting and shows new findings, specifically that highly variable features such as snow drifts are due to blowing snow redistribution and less variable snow deposition amounts are strongly influence by snowfall without redistribution and preferential deposition effects. There are clearly some problems with the full model simulation of the change in snow depth that should be more openly addressed in the discussion of results and conclusions. It is very strange that in a wind-blown landscape the model results without blowing snow transport were better than with in some zones and this could be more clearly discussed. The final concluding chapter is too long and wordy and could be condensed.

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Please correct small typographical errors: for instance you can use north-west instead of North-West for wind direction and snowfall is one word, not snow-fall.

p. 867 line 21 – “oversimplification”: perhaps “simplification” could be used here as many of these models are designed for use at larger scales or where detailed topographic or snow information is lacking or not needed and are trying to avoid overparameterization.

P 867 – what about sublimation of blowing snow (e.g. Schmidt 1972; Pomeroy, 1989)? This has been shown to affect some alpine blowing snow transport in Scotland and Canada (Pomeroy, 1990; MacDonald et al. 2010)

P 868 line 7 – Increased horizontal wind flow scours snow and increased downward wind flow normal to the surface is not consistent with a boundary layer so this will need to be explained a bit more or differently. Can you put this accumulation area in terms of zones of convergence and divergence of wind fields?

P 868 line 15. No, Fang and Pomeroy (2009) used 6 m spacing.

P 868 line 16 – Why insufficient? Suggest word this as Have used “low density”.which make their promising results difficult to validate.

P 868 line 25 to p 869 line 5 – recast this summary as a series of objectives for the paper or hypotheses that will be tested in the paper. You should not be describing your field site in the introduction.

P 869 line 10 – this is a vague description of the instrumentation. A table should be included with instruments and key variables measured at the various types of stations. Terms like SensorScope mean nothing without this. It sounds like you did not measure wind direction?? Perhaps this is not correct but if so it is unfortunate for a wind flow study.

P 869 line 25 – define TLS.

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P 870 line 20 – RMS error or mean error would be more useful statistics here.

P 872 line 15 – what is the order of calculation for preferential deposition and wind transport processes? Is sublimation calculated?

P 872 line 25 – water vapour pressure (limited by saturation) should be conserved rather than relative humidity when extrapolating from meteorological stations. Why would you assume that RH is constant? Where does the water vapour go as temperature changes???

P 877 line 13 – the effect of avalanche is substantial. Can you perform an empirical correction to accommodate this effect?

P 880 line 4 to p. 881 table 1 discussion – you should note and openly discuss the very poor performance of the snow transport calculations in determining changes in snow depth at some sites and the reasons that your model seems to suggest preferential deposition is the major redistribution process when you know well that you have substantial snow transport from your wind speed observations and from surface features like sastrugi. For instance, having a lower correlation between modeled and measured depth than between wind speed and measured depth suggests that another modelling approach might be required to develop reliable snow depth maps over the whole mountain landscape???

P 883 line 11 – define LES

Some references that might help in addressing above comments.

Fang, X. and J.W. Pomeroy. 2009. Modelling blowing snow redistribution to Prairie wetlands. Hydrological Processes, DOI: 10.1002/hyp.7348.

MacDonald, M.K., Pomeroy, J.W. and A. Pietroniro. 2010. On the importance of sublimation to an alpine snow mass balance in the Canadian Rocky Mountains. Hydrol. Earth Syst. Sci., 14, 1401–1415. doi:10.5194/hess-14-1401-2010

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Interactive comment on The Cryosphere Discuss., 4, 865, 2010.

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