

Interactive comment on “The significance of vertical moisture diffusion on drifting Snow sublimation near snow surface” by Ning Huang and Guanglei Shi

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Dear reviewer, We'd like to thank you for your insightful comments and positive evaluation of our work. We have studied your comments carefully and will do our best to revise and improve the manuscript. A point to point responds to the reviewer's comments are listed as following: Item 1: The authors present a relatively comprehensive snow drift model, taking into consideration of vertical diffusion of humidity. The results are compared with published data. It is shown that the results are at least qualitatively consistent with the observations and in some aspect also quantitatively consistent. I see considerable value in the further development of the model to a full scale com-

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prehensive model. This model is a very good starting point, as it already has all the ingredients. Response: Thanks for the positive comments. Our goal is to develop a more comprehensive model considering the sublimation of both saltation and suspension particles in the atmospheric turbulent boundary layer in the future.

Item 2: The introduction can be shorter. The very first sentence in the abstract is a very long sentence trying to say too much. Also, the model formulation can be made more concise, e.g., Equation (1). It is unnecessary to write it in such a complex way. Response: Following the reviewer's suggestion, we will simplify the introduction and model formations in the revised manuscript.

Item 3: The discontinuity of the model results is somewhat surprising, like in Figure 2a. The authors should explain what makes the model to behave like that and how it can be improved. Response: The discontinuity is at a height of about 0.1m in Fig.2a. It can be seen from Fig. 10a that 0.1m is approximately equal to the maximum height of the saltation particles, and snow particles near the height of 0.1m is rare. Therefore the randomness of snow particles' number and their sizes at 0.1m is relatively large, which leads to the discontinuity of snow mass concentration. This problem is more serious in case the wind speed is smaller, for the smaller the wind speed is, the fewer number of snow particles in the air (See Fig.2a). It's much improved when the wind speed is higher (see Fig.2c). We will explain this phenomenon in the revised manuscript.

Item 4: I hope the authors can give a critical assessment of their model and point out the potential for further development. Response: For the future development of the model, we will: (1) extend the model to three dimensions and take into consideration of the effects of turbulence on the sublimation of both saltation and suspension particles in the atmospheric turbulent boundary layer, which will lead to a more accurate and realistic model; (2) propose a parametric model of the blowing snow sublimation, which will provide parameterized values for the mesoscale climate model of the polar ice sheet, the alpine glacier, snowy in the high latitude and so on.

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Item 5: In general, I find the work very interesting and represents a very useful contribution to snow drift modelling. As it has been revised and many question from the earlier review reports have been considered, I think the paper is now of good quality.
Response: Thank you for your affirmation.

Once again, thank you very much for your comments and suggestions. Best regards
Ning Huang and Guanglei Shi

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