

Interactive comment on “Radar measurements of blowing snow off a mountain ridge” by Benjamin Walter et al.

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I do value the idea to use a precipitation radar to measure the spatial extent and intensity of wind blowing snow, and I understand the difficulty to adapt an instrument to perform new types of measurements. I have a few comments, suggestions on the results and I hope the authors may decide to clarify or implement, at least some of them.

Fig. 3a) during event 2, which is the most significant one, I note opposing trends between the measured velocity and the distance. I would expect the velocity of the snow to reduce as the wind gust propagates through the accumulation slope. I interpret it as an initially concentrated jet that entrains air along its streamwise axis, lose momentum

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as it spreads laterally causing the snow to settle on a wider area. So why is the snow velocity increasing with the distance (during some times of event 2, but also 3 and 4)? It would be interesting to correlate with the sonic to get a sense of the structure of the wind gust contributing to a blowing snow event. What is the sonic streamwise velocity time series for events 2 and 3?

Fig 4b: why the vMRR velocity occurs randomly and not necessarily at higher wind velocity. I understand sonic recording are continuous and I would expect suspended snow event to occur more systematically under strong winds.

Fig 5 : the y axis should be normalized by the sonic velocity to provide a % difference. Alternatively a scatter plot of vs versus vMRR could be provided for different ranges of directions. The figure as it is not particularly informative.

Fig 6: the exponential distribution should be assessed with log scale vertical axis. The formula are not required in my opinion as they are dimensionally questionable. Perhaps the shear velocity (from the Reynolds stress) could be introduced to normalize the distance (like a term u^*2/g) ? Just a thought... May be different events could be combined under a generalized law. In general the interpretation of MRR turbulent intensity is difficult to provide and to some extent speculative. Mostly because a wind gust is a transient phenomenon and therefore any reduction in "mean" velocity with distance could be perceived as a high turbulence intensity.

Fig 7 is convincing. I am again curious about the structure of the wind gust, they might be quite coherent in both space and time to have such a lasting signature on the distance of the snow cloud. Still debated if these gusts are more like atmospheric surface layer coherent structures (see e.g. Heisel et al JFM 2018), or large sweep events that expand in the slope like a jet structure or a mixing layer.

What I suggest to the author in the next campaign, for a future paper perhaps, is to place the MRR in a flat region, such as a frozen lake and make sure that the sonic is located downstream of the MRR so that comparison in velocity could be more local, in

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space and time, and over a more homogeneous topography , thus limiting as much as possible unsteady effects.

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2019-260>, 2019.