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Interactive comment on "Two cases of aerodynamic adjustment of sastrugi" *by* C. Amory et al.

Anonymous Referee #2

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Review "Two cases of aerodynamic adjustment of sastrugi" by Amory et al.

General: The paper describes an interesting data set that documents the influence of a shift in wind direction on sastrugi alignment. Two short periods are described during which an increase in wind speed together with a shift in wind direction leads to a new orientation of the existing sastrugi within a time scale of hours. The main message of the paper is that this temporarily leads to a marked increase in form drag and a decrease in saltation mass flux. The paper is well written, concise and has rather the form of a letter than of a full-length paper. The results are described in sufficient detail and conclusions are supported through the material presented. In the discussion, it is speculated how often these events may occur. And along these lines, I have my major suggestion. I would encourage the authors to present more of the

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valuable data from the met station and show how often roughness changes occur in the course of the whole Austral winter. If they also have FlowCapt data from the whole time period, I would present them, too. In summary, I believe that the potential impact of the paper could be much enhanced by 1) analyzing longer time series, which appear to be available and 2) publishing the data along with the publication. This would even be valid if no detailed documentation of the surface is available for most of the time.

Detailed Comments: Abstract l. 19: is this just restating the increase (to 120%) from above? In this case, I would cancel the repetition.

Abstract l. 24: orders of magnitude of what?

Abstract l. 27: I would add "... aeolian snow transport models and general drag parameterizations for weather, climate and earth system models".

Introduction l. 2: I don't think "metric-scale" is correct here. You probably want to say "scale of meters".

Introduction l. 23: Very awkward and contradictory formulation, please rephrase. What is a "greater but slower decrease in the increase rate"?

p. 6009 l. 7 ff: Maybe also mention earlier FlowCapt validations?

p. 6007 l. 19 (and elsewhere): This is a logarithmic and not semi-logarithmic profile.

p. 6013 l. 7: What do you mean with "for a given set of particles..."

p. 6013 l. 13ff: I suggest that this effect is properly discussed and in more detail. First of all you should extend the discussion to Raupach (1991), who gave an improved relationship, which is more physical in terms of the feed-back on the flow, especially limiting the stress reduction close to the surface. This is quite important since the reduction of shear stress near the surface is crucial in limiting the growth of the mass flux (Groot et al., 2014).

p. 6015 l. 2ff: It is an open question in how far the shear stress at some height can be

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used to predict the skin friction in case of surface roughness and other obstacles. See also the recent discussion on how to predict surface peak shear stress and surface shear stress distribution in case of obstacles in Walter et al. (2012).

References:

Raupach, M. R. (1991): Saltation layers, vegetation canopies and roughness lengths. Acta Mech Suppl 1:83–96.

Walter, B., Gromke, C., Lehning, M., 2012: Shear stress partitioning in live plant canopies and modifications of Raupach's model. Boundary-Layer Meteorology, doi:10.1007/s10546-012-9719-4.

Groot Zwaaftink, C.D., M. Diebold, S. Horender, J. Overney, G. Lieberherr, M. Parlange and M. Lehning, 2014: Modelling small-scale drifting snow with a Lagrangian stochastic model based on large-eddy simulations, Bound. Layer Meteorol., 153:117–139, DOI 10.1007/s10546-014-9934-2.

Interactive comment on The Cryosphere Discuss., 9, 6003, 2015.