Thank you to editor Xavier Fettweis and reviewer Charles Amory for their continued reviews and feedback. We appreciate both of you taking the time to improve our manuscript. In order to address your comments, we have responded individually in blue. On behalf of all coauthors, we once again thank you for your time and effort.

On behalf all authors,

Eric Keenan

Editor Review - Xavier Fettweis
Comments to the Author:

Dear Authors,

I'm happy to accept your paper for publication in TC.

Thank you for accepting our manuscript! We have responded to your comments individually below.

Some minor changes ("reviewed" by me only) are nevertheless needed before final acceptation. In addition to the minor changes requested by the 1st reviewer (thanks to him!), could you list the statistics (mean bias + RMSE) of the comparison with the 69 independent sites (lines 420-432) in Table 1? The impact of using 69 vs 122 sites on the comparison will be more clear…

Thank you for the suggestion. Because the statistics you are referring to reflect the entire top 10 m, rather than the top 1 m (as in table 1), we have decided to add a new table (table 2, copied below).

	SNOWPACK	GSFC-FDM	IMAU-FDM
Bias (kg m^{-3}) at all sites	-9.7	15.5	-32.5
Bias (kg m^{-3}) at 69 independent sites	1.1	22.3	-20.4
RMSE (kg m^{-3}) at all sites	48.3	36.8	51.5
RMSE (kg m^{-3}) at at 69 independent sites	47.6	41.6	46.1

Thanks and best regards,
Xavier F.

PS: In Fig 11: the bleu of the time series is not the same bleu than the one used for the legend (South Pole). Idem in Fig3 with the listed statistics.

Good catch, thanks for noticing! We have fixed this issue in figures 3, 11, and A1.

Review 1 - Charles Amory

Many thanks to the authors for their detailed responses. The revised version has improved significantly and they have responded to my comments quite well. I think the paper now warrants publication in its current form, providing that the authors take into account the following minor suggestions:

Thank you for the positive comments. We greatly appreciate you taking the time to review our manuscript a second time. We have responded to your comments individually below.

P2L35 (revised version): Saltation is physically defined as the motions of particle within the first 10 centimeters above ground (e.g. Pomeroy, 1989), not 2 m. I see a less major issue at referring to drifting snow only as saltating snow as long as it is explicitly mentioned in the text, although I'm not aware of any reference to rely on for such a statement. But surely saltation could not be reasonably defined as the motions of particles from 0 to 2 m. Please correct. The caption of Fig. 1 could also be adapted ("mobilized" or "put in saltation" instead of suspended?) as the model more likely represents the effect of saltation rather the a full saltation+suspension layer, as explained in Section 2.1.

Good point. Upon further investigation, we agree that defining the saltation layer as the lowermost 2 m is not appropriate. However, wind-mobilized particles will be deposited only via the saltation layer, which indeed is generally considered to be the lowermost 10 cm. To address this we have modified the sentence to the following:

L34: "In particular, surface snow and firn density are known to be strongly impacted by wind-driven compaction, a process hereafter referred to as drifting snow compaction, whereby mobilized snow particles in the saltation layer, defined as the lowermost 10 cm of the atmosphere (Pomeroy 1989), break apart upon collision with the snow surface."

In the Figure 1 caption we have replaced "suspended" with "mobilized".

P5L112: I'd like to see this value for roughness length discussed and put a bit in perspective of the existing observed values over Antarctica (see for instance Amory et al. 2017 for a review but plenty other references are possible).

Good idea, we have noted that a roughness length of 2 mm lies on the high end of observed values.

L113: "Note that although 2 mm is approximately an order of magnitude larger than typically observed values over the AIS (e.g. Vignot et al., 2017), even larger values have been observed in sastrugi dominated environments (Amory et al., 2017) where drifting snow erosion and deposition is common."

Amory, C., Gallée, H., Naaim-Bouvet, F., Favier, V., Vignon, E., Picard, G., Trouvilliez, A., Piard, L., Genthon, C., and Bellot, H.: Seasonal Variations in Drag Coefficient over a

Sastrugi- Covered Snowfield in Coastal East Antarctica, Bound.-Lay. Meteorol., 164, 107–133, https://doi.org/10.1007/s10546-017-0242-5, 2017.

Pomeroy, J. W., A process-based model of snow drifting, Ann. Glaciol., 13,237-240, 1989.

References

Amory, C., Gallée, H., Naaim-Bouvet, F., Favier, V., Vignon, E., Picard, G., Trouvilliez, A., Piard, L., Genthon, C., and Bellot, H.: Seasonal Variations in Drag Coefficient over a Sastrugi- Covered Snowfield in Coastal East Antarctica, Bound.-Lay. Meteorol., 164, 107–133, https://doi.org/10.1007/s10546-017-0242-5, 2017.

Pomeroy, J. W., A process-based model of snow drifting, Ann. Glaciol., 13,237-240, 1989.

Vignon, Etienne, Christophe Genthon, Hélène Barral, Charles Amory, Ghislain Picard, Hubert Gallée, Giampietro Casasanta, and Stefania Argentini. “Momentum- and Heat-Flux Parametrization at Dome C, Antarctica: A Sensitivity Study.” *Boundary-Layer Meteorology* 162, no. 2 (February 2017): 341–67. https://doi.org/10.1007/s10546-016-0192-3.