

## ***Interactive comment on “Wind-packing of snow in Antarctica” by Christian Gabriel Sommer et al.***

### **Anonymous Referee #1**

Received and published: 16 April 2018

This manuscript introduces the measurements of the snow surface features on the Antarctic ice sheet with the terrestrial laser scanning (TLS) and the SnowMicroPen (SMP) and tries to approach the wind-packing process. First of all I would like to express my sincere respect for authors' effort to obtain the valuable data under harsh conditions. I am quite sure that these measurements and the deduced facts are informative and important to recognize the change in the snow surface features. However, I have got the impression that explanations and the deduced conclusions described here remained qualitative and look wishy-washy. This manuscript needs more polite explanations and robust concluding for the publication. Presumably, at this stage, this manuscript will be more suitable for the “Letters” than the “Article”. I suggest followings comments are also taken in to account. Page 2, line 12: Height of the SPC sensor needs to be shown in order to recognize the drifting snow flux introduced below properly. Page 2, line 19: It looks wind speeds at 1 m and 3.5 m are shown together without

C1

adjusting the height. To say the least, it should be attested that the both sensors are out of the boundary layer and averaged wind speed shows the same value when the data logging system worked properly. Page 2, line 28:  $S_x$  is determined with the 1 m search distance in Antarctica. On the other hand, in the wind tunnel experiments,  $S_x$  has been obtained with much more short distance based on the measurements with the Microsoft Kinect sensor. I have doubts both can be compared directly since the scales, deduced  $S_x$ , are rather different. Page 4, Fig. 1: Air temperature during the observation period needs to be shown as well. Sintering which is strongly depends on the temperature is important for the snowpack hardening. Further, wind direction should be shown not only based on the barchans direction but also the anemometer measurements. Page 5, Fig. 2: Color code which shows the snow depth change should be shown as Fig.3. Page 5, line 2: “Zastrugi Filhol and Strum (2015) are” should be expressed as “Zastrugi (Filhol and Strum, 2015) are”. Page 5, line 4: “in the literature Filhol and Strum (2015)” should be expressed as “in the literature by Filhol and Strum (2015)”. Page 5, line 5: Do you have any idea why the snow barchans is much smaller and flatter in general than the sand ones? Page 5, line 10: “from before the snowfall”? Pages 7, and 9, Figs. 4 and 6: Regression line should be also indicated. Page 8, line 5: Perhaps it is helpful to explain briefly what is the Kruskal-Wallis tests with reference (textbook). Such as, it is a non-parametric method to compare plural independent samples. Page 8, line 13: “A homogenous snowfall” could be also achieved by the wind tunnel experiments? Page 9, line 4: Snow mass flux is also within the same range between the observation in Antarctica and the wind tunnel experiments? Page 9, line 6: Since this is the discussion part, authors need to discuss how the higher wind speeds and more intense drifting made the snow surface harder and created the wind packing. Page 9, line 10: Kuznetsov (1960) also observed the hardness of barchans in Antarctica? Page 9, line 13: I wonder when the trail area had been eroded partly, old snow surface is exposed and hardness becomes larger? Page 9, line 20: As is pointed out before, the scales to evaluate  $S_x$  are rather different between the observation in Antarctica and the wind tunnel experiments. Thus, I am not sure the comparison here

C2

is reasonable. Page 10: Although several ideas that brought discrepancies between the direct observations and the wind tunnel measurements are given, all of them seem wishy-washy. Authors say that “the results from Antarctica are less clear”. However, I believe that observed one in Antarctica is an undoubted fact and the attempt in the wind tunnel still rooms for further discussions. In fact, no wind pack is confirmed there.

---

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2018-36>, 2018.