

Interactive comment on “Quantifying the snowmelt-albedo feedback at Neumayer Station, East Antarctica” by Constantijn L. Jakobs et al.

Anonymous Referee #2

Received and published: 27 December 2018

The manuscript "Quantifying the snowmelt-albedo feedback at Neumayer Station, East Antarctica" by Jacobs et al. presents meteorological data and simulation results to determine the albedo feedback effect at a single point for an ice shelf region of Antarctica. The chosen location (Neumayer Station) is well-equipped with instruments to measure four component radiation and sensors are maintained regularly. Such data allow for determination of contributing parameters such as surface roughness and microscale wind fields to estimate full energy balance. I consider the quantification of the melt albedo feedback as highly relevant for the cryospheric community especially for snow on ice sheets. However, some missing information as well as the confusing structure of the manuscript prevent publication in the current state. Major points of criticism are:

- The reader gets very confused by the structure of the manuscript. I recommend to

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revise carefully. The presented results sections consist of results and discussion, while large fractions of the first results (Section 3) mostly consist of data presentation. In addition, measured data and results simulated by model approaches are constantly mixed in Figures and text. It would be much easier to follow if measured parameters such as temperature, wind, humidity and radiation are separated from generated parameters such as Q_s , Q_l etc. Same appears for manuscript sections and paragraphs: for instance, P6 L12-20 is solely discussion same as P6 L29-L3 P7 while before and after those paragraphs you mix measured data and model outputs. In addition, the manuscript title indicates quantification of the melt albedo feedback, while only 2 pages and 2-3 Figures (out of 13 – not mentioning the numerous panels) are referring to snowmelt and albedo feedbacks. I understand that it is necessary to introduce the meteorological data, however, please carefully evaluate the necessity of the presentation of each parameter (Figs 6-9) with sometimes redundancies in the text. Some of the Figures would fit into a supplementary material section. I consider the colorbar in Fig. 7 as being useless. It is impossible to identify differences.

- The nomenclature is sometimes not correct. First of all, what is “fresh snow”? I assume you refer to new snow, which would not be the correct nomenclature either. New snow refers to “Recently fallen snow in which the original form of the ice crystals can be recognized” among others presented in Fierz et al. (2009). The term recently implies a defined time frame. The snow you refer to in the manuscript can rather be defined as near surface snow or surface snow for which you should define a depth range as well. Such a surface snow undergoes rapid transformations especially for polar regions on ice sheets. I am not sure I understand which formulations are used to estimate snow metamorphism at the surface. It might be beyond the scope of the manuscript but you should distinguish between temperature gradient metamorphism (TGM), equi-temperature metamorphism, melt-freeze metamorphism and Firnification and pressure metamorphism. The latter two can be excluded for surface snow but simply assuming grain growth by melt-freeze metamorphism has to be discussed more in detail. Can you present in-situ data on surface densities and grains recorded by the

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staff at Neumayer? Please see the following paper for more details on metamorphism (Calonne et al. 2014; doi:10.5194/tc-8-2255-2014). Grain size might be a good tuning parameter but is not a parameter quantifying adequately properties of snow. For the here referred optical properties, it is recommended to use the optical-equivalent grain size or specific surface area (SSA). Again, this might be beyond the scope of the paper but you should at least be up to date with nomenclature and references.

- Please quantify parameterizations (e.g. P9 L16-17).

- Please be consistent: snow pack versus snowpack. I recommend to use snowpack as stated in Fierz et al. 2009. Same appears for T_s as surface temperature or T_0 as in Fig. 7 or P3 L10.

Fierz, C., Armstrong, R.L., Durand, Y., Etchevers, P., Greene, E., McClung, D.M., Nishimura, K., Satyawali, P.K. and Sokratov, S.A. 2009. The International Classification for Seasonal Snow on the Ground. IHP-VII Technical Documents in Hydrology N°83, IACS Contribution N°1, UNESCO-IHP, Paris.

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2018-221>, 2018.