The Cryosphere Discuss., 9, C1712–C1715, 2015
www.the-cryosphere-discuss.net/9/C1712/2015/


The Cryosphere
Discussions
Open Access

# *Interactive comment on* "Summertime evolution of snow specific surface area close to the surface on the Antarctic Plateau" *by* Q. Libois et al.

**Anonymous Referee #1**

Received and published: 23 September 2015

General comments:

In this paper, the authors present temporal evolution of summer time near surface snow specific surface area (SSA) at Dome C, Antarctica estimated from two types of in-situ measurements (performed during two summer campaigns: 2012–2013 and 2013–2014), and satellite remote sensing in the microwave region (obtained during 2000–2014). In addition, they investigate whether the Crocus snowpack model forced by ERA-Interim reanalysis data can be used as a useful tool to understand observed changes in near surface SSA. In conclusion, they state that observed variations of near surface SSA were successfully reproduced by Crocus; however, effects of wind on the snow compaction and SSA evolution can be overestimated in the model.

Overall, this manuscript is well written and easy to follow. Provided information are



valuable for TC readers who are interested in not only physics of SSA but also surface energy balance in Antarctica. In addition, snow modelers might also find this manuscript interesting. Therefore, this reviewer recommends its publication once the authors attend to the following comments. My major concern is whether the authors have confirmed the adequacy of ERA-Interim data (note that this is not observation) in Antarctica. If the accuracy of input data for Crocus (ERA-Interim) is insufficient, the reliability of presented model performance in this study can be somewhat lowered.

In the following part, this reviewer gave specific comments. Please note that page and line numbers are denoted by "P" and "L", respectively.

Specific comments:

P4501, L7-9: SSA also controls the e-folding depth as well.

P4502, L22: Please describe more why detailed snowpack models are not fully adequate for polar environments.

P4505, L3-5: Does it mean that the authors used data obtained only under clear-sky conditions? Please clarify.

P4509, L1-6: Please indicate expected accuracy of this remote sensing technique.

P4509, L13: This reviewer could not understand why the authors listed "sphericity" here. This is a "virtual" parameter.

P4510, L3-6: The explanation provided here is a bit difficult to follow. Please describe in more detail.

P4510, L24: typo: "both were both . . ."

P4510, L27: The authors introduce ERA-Interim to drive Crocus in this study. Have the authors confirmed its accuracy in Antarctica? In case systematic biases were found in some properties, did the authors correct them?

P4510, L27 – P4511, L1: Please indicate time intervals of ERA-Interim and output data from Crocus simulations.

P4511, L1: Please indicate how many model layers were set in the 12 m snowpack. In addition, it might be informative to list model layer thicknesses set in this study.

P4512, L9: It seems to me that the title of Sect. 3.1 “Daily variations of SSA” is not suitable, because data intervals presented in Fig. 3 are several days (not a few hours or less).

P4513, L14: Does this explanation mean that the top most model layer thickness of Crocus is less than 2 mm?

P4513, L23-26: Please discuss why Crocus could not simulate the effect of soft snow removal by the wind, and the formation of surface hoar.

P4514, L20-25: This reviewer could not follow what the authors intended to explain here. It might be better to reformulate.

P4515, L1-2: The contrasting feature of summer SSA decrease between 2012–2013 and 2013–2014 is interesting. Could the authors discuss the reason of this difference by referring to meteorological conditions during these two summers?

P4520, L6-15: Before discussing the impact of wind speed on the topmost 7 cm SSA evolution, the authors should demonstrate accuracy of wind speed obtained from ERA-Interim (related to “P4510, L27”). If wind speed from ERA-Interim is overestimated, this discussion has no meaning.

P4520, L20: The validity of meteorological forcing used in this study has not been confirmed (related to “P4510, L27”).

Figure 1: “mat”: typo?

Figure 3a: Two hatched areas are difficult to distinguish from each other.



Figure 3b: What do the authors mean by the “dark line”? In addition, what are the dark dots? This is not explained in the caption.

---

Interactive comment on The Cryosphere Discuss., 9, 4499, 2015.