

AUTHOR COMMENTS

The authors thank the Reviewer and Editor for their constructive comments and corrections that have increased the scientific quality of the manuscript and its clarity.

Here we present our answers to the reviewer's comments. In particular, in addition to minor technical corrections, we included the comparison with the dissertation of Courville (2007), which we found significant in the context of the manuscript. Furthermore, the Figure 1-2-3 were modified in accordance with colour-blind standards.

We hope that the revised version of the manuscript has improved the quality of the text and of the scientific message.

Changes and answers in response to the Reviewer's comments/suggestions (in italic) are highlighted in bold.



Specific comments

Line 64, should be “Dadic et al. (2013) based their analysis” (and also, Ruzica Dadic, the author of the paper is a she, so if you want to use the singular, it should be “based her analysis”)

A: the sentence was modified as suggested.

Line 70: what is this comparing to, i.e., what is on average higher? Temperatures at depth vs. the snow surface? Spectral differences also lead to an effect on temperatures, which is on average higher than on the snow surface (Fujii et al., 1987).

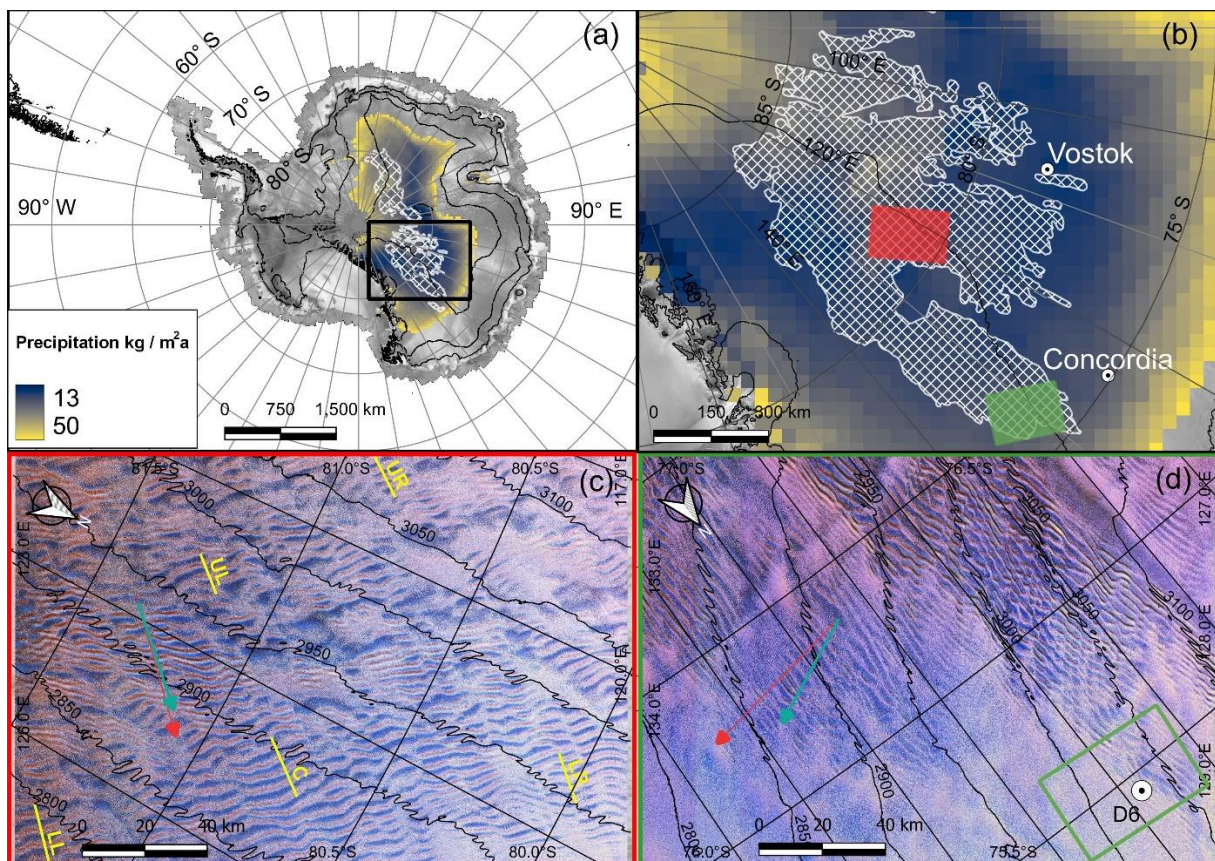
A: the comparison was intended to be between glazed surfaces and surrounding snow; thus, the sentence was modified as follows: “Spectral differences also lead to an effect on temperature, which is on average higher over glazed surfaces than on the snow surface (Fujii et al., 1987).”

Line 92: in this particular megadune region? Or across all megadune regions?

A: the megadune region from Palm et al. (2019) included the study areas of the present manuscript. The sentence was then modified as follows: “...megadune region (Palm et al., 2019), that includes the study areas of the present work.

Line 117 and figure 1 (boxes c and d): It’s confusing as stated that the wind direction in both boxes c and d are coming from the SW due to the orientation differences in both boxes. I think a directional/south arrow would clear that up in boxes c and d (even though it is clear from box b what the orientation is, just think a directional arrow would help)

A: north arrows were added to boxes c and d of the figure 1, which now is as follows:



Line 121: DEM should be defined in the first instance it is used (is defined later on)

A: the sentence was modified as suggested and now DEM is defined at line 121 and not later on.

Line 130: It would be good to mention the size of the imagery/scenes used in the analysis, since that factors into the number of features listed in Table 1.

A: the size of both L8 and S2 tiles is now mentioned at lines 130-131 (“Landsat 8 OLI satellite images (tile area ~38,000 km²) and Sentinel-2 images (tile area ~12,000 km²”), as well as in the caption of table 1 (“Table 1. Results of the absolute migration of megadunes calculated from IMCORR based on Landsat 8 OLI (L8), with tile area of ~38,000 km², and Sentinel-2 (S2), with tile area of ~12,000km², imagery at the It-ITASE and EAIIST sites.”).

Line 145: This sentence is confusing as written: To a “higher” amount of solar radiation absorbed by the glazed surface, corresponds also a different BT on snow glazed surfaces (Fujii et al., 1987; Scambos et al., 2012 and references therein).

I think it means: A “higher” amount of solar radiation is absorbed by the glazed surface, and also corresponds to a different BT on snow glazed surfaces (Fujii et al., 1987; Scambos et al., 2012 and references therein).

A: the sentence was modified as suggested.

Line 221: How were these threshold values chosen? I.e., what does it mean that a “conditional calculation” was used to automatically map the snow. This should be explained in more detail since it is a critical step in determining glazed area extent.

A: the values were chosen based on the specific case of the analysed images. This concept and the definition of conditional calculation are now better explained in the manuscript at lines 220-222 of the revised version. The new sentences are as follows: “For the self-defined-threshold method, we applied a conditional evaluation (i.e., output result for each pixel based on whether the pixel value is assessed as true or false in a set conditional statement) to automatically map glazed snow. The thresholds were visually identified and iteratively adjusted to obtain a best fit as follows: SPWD > 1 m km⁻¹, with the aim of considering the leeward flanks only, NIR albedo < 0.82 and thermal BT > 246.5° K.”.

Table 1: as mentioned in the remark on for the paragraph discussing satellite imagery, it seems like the number of features is related to the coverage area of the satellite imagery, or is it all due to the higher resolution? If that’s the case, I think the different coverage of the imagery is worth mentioning, or if there is another cause of the variation besides the resolution, that should be mentioned here.

A: see comment above and modification to the manuscript referring to this issue. A further sentence was added at line 348, i.e., “...even if the number of pixels is higher (with a ratio of 1.4) in Landsat scenes.”.

Line 290: Figure 2: Looks like some of the figure caption is incomplete or mislabeled, i.e., there is a missing description of box d. “Corresponding normalised moving average of NIR 290 albedo (b) and thermal BT TIRS1 (c) during the austral summer season 2013-2014 for transect C and elevation from REMA DEM (detrended topography).” Isn’t the description in the caption

describing (c) really describing the normalized data in box (d)? Regardless, this caption should be clarified.

A: the caption of figure 2 was modified and made clearer as follows: “Figure 2: Moving averages (based on 11 transect pixels) of NIR albedo (a) and thermal BT TIRS1 (c) between November 2013 and February 2014 for transect C at the EAIIST site (see Fig. 1c for location) and elevation from REMA DEM. Corresponding normalised moving averages of NIR albedo (b) and thermal BT TIRS1 (d) during the austral summer season 2013-2014 for transect C and elevation from REMA DEM (detrended topography).”

Line 273: Dic should be Dec

A: the sentence was modified as suggested.

Line 274: “Similar” should not be capitalized

A: the sentence was modified as suggested.

Line 513: I have data in my dissertation (Courville 2007) not published in a journal article based on migration rates calculated by Mark Fahnestock based on satellite remote sensing images and AVHRR data (from Fahnestock et al., 2000, but updated and not published) and firn cores that were drilled in 2003/04. I determined a burial rate of 330 years based on our firn core, and migration rates of approx. 12 m yr-1 based on a more detailed analysis of the features mentioned in Fahnestock et al. 2000. This data, not published outside of my dissertation, is obviously not well known and the authors wouldn't be expected to know about it or cite it. I just found it very interesting that the values are so close to one another in such different spots.

A: the comparison, as very inherent to the present analysis, was added to the manuscript. Now, at lines 462-465 the following sentence was added: “These results are strongly in accordance with Courville (2007), who determined a burial rate of 330 years based on a firn core drilled in 2003/04, and migration rates of approx. 12 m a-1 (from AVHRR data) at a field located at 80° 47' S, 124° 29' E in the megadune region of EAIIST site.”