

Author's response to suggested corrections by referees 2

"The regional scale surface mass balance of Pine Island Glacier, West Antarctica over the period 2005–2014, derived from airborne radar soundings and neutron probe measurements" by S.Kowalewski et al.

The Cryosphere Discuss.
<https://doi.org/10.5194/tc-2020-102>

We are pleased to receive the valuable suggestions by referee 2.

Stefan Kowalewski

In Table 1 : O (10 m) => does it mean approximately 10m?

We are now explicitly writing out „order of“ for the “O()” notation, which has been used in the earlier version

In Table 2: I suggest to add the mean SMB value measured at each point because it is interesting for model validation.

Uploaded data to Pangaea contain the alongtrack high resolution and smoothed SMB estimates (Fig. 5a,b). The latter were used for the kriging interpolation and may be the favourable choice for comparisons with regional climate models.

Figure 4 a and c : I still don't understand why the combined error in this figure is not the sum of the spatial, temporal and digitization errors.

As stated on line 195, the combined error is calculated by the root-sum-of-squares, which is based on the assumption that individual error components are uncorrelated and normally distributed (Line 190). See also Medley et al., 2013 (supplement), which we refer to on line 199.

Line 267 : “By comparison with the flight track shown in Fig. 1, even when considering the practical range as a maximum threshold for the spatial SMB estimation, we do not cover the entire PIG basin.” => the boundaries of the spatial SMB estimation are visible in Figure 8 and the authors could refer to this figure here.

We added “see Fig.8” in brackets.

Page 17, Line 320: “With regard to the MAR estimates, we find that sigma+ values are about 5% higher for Pine Island and 38% higher for the Wedge area..” => this sentence is not clear. Do you refer to the comparison between the MAR and M14 or with RACMO? Indeed, the difference between MAR and M14 (for Jul.1985–Jan.2010) is 3% for Pine Island and 18% for Wedge not 5% and 38% respectively.

Here, estimates are compared between RACMO and MAR, which yields the stated percentages. To clarify the comparison, we changed

“ With regard to the MAR estimates, we find that sigma+ values [...]” to

„In comparison with RACMO and MAR estimates, we find that MAR based sigma+ values [...]”

Table 3 : “RACMO estimates in brackets refer to the July 1985 to January 2010 averaging period in accordance with the results from M14” => there are no values in brackets in the table and I understand from the table that this remark also refers to MAR data? Please verify this caption.

Well spotted! "Brackets" in the caption refers to an earlier version of Table 3. Now, both values are separated by semicolon, which we changed in the caption:

“[...] RACMO and MAR estimates separated by semicolon refer to the July 1985 to January 2010 averaging period in accordance with the results from M14“ [Appendix A: List of Abbreviations and Notations](#) : This list is really useful. Perhaps the authors could mention this list in the main text ?

We added to Line 53 (end of Introduction): “We include a list of abbreviations and notations in Appendix A“

Additional minor edits by the authors of this study:

- Line 195, „Figure 4 (a) displays the propagated individual measurement error components as well as the combined error according to Eq. (5) as a function of geometric depth.“ -> Added „measurement“ between „combined error“ to avoid ambiguous usage when speaking in terms of combined errors in the later sections.

For further clarification, we included two new entries in the abbreviation list:

Combined Error	root-sum-of-squares of measurement and interpolation standard deviation
Measurement Error	root-sum-of-squares of spatial, temporal, and digitization error components

- Line 284, “The horizontal resolution of simulated SMB is 27 km for **the** RACMO and 10 km for MAR runs.”, removed “the” as indicated
- Figure 1, caption: Removed "the" in front of "SCAR Antarctic Database"
- Figure 2. caption: Removed "T1 and" in "Compiled density-depth profiles from traverse ~~T1~~ and T2 at all 22 iSTAR sites". We noticed that T1 can be confusing in the caption. As stated in the main text, all profiles shown in Fig.2 were collected during T2: Line 79-81

"To evaluate the effect of densification, the ground team repeated the density profiling in the same boreholes during traverse T2. Because the most recent accumulation is missing in these profiles, they drilled an additional borehole of less than 6 m depth and a nearby distance of about 1 m to capture it during traverse T2."

- Figure 8. caption, "Red triangle denotes the position of an interpolation artefact (see ~~Sec. 4.4~~ **Sec. 4.5**).", fixed reference to wrong section as indicated.
- Bibliography, provided URL by Zwally et al. (2012) is now correctly displayed.
- Added to the acknowledgments:
“We sincerely appreciate the valuable comments and suggestions by the referees and editor.“
- Supplement: Added line break before "(c,d)" in the caption

Data availability

Please note that the current reference to the data repository still contains a placeholder:

<https://doi.pangaea.de/10.1594/PANGAEA.XXXXXX>

According to communication with the PANGAEA support, they are working hard to create the final doi as soon as possible. Hence, we will add the doi number during the final proof phase of the manuscript.