

Review of Brief Communication: Annual variability of the atmospheric circulation at large spatial scale reconstructed from a data assimilation framework cannot explain local East Antarctic ice rises' surface mass balance records

By Cavitte, Goose, Dalaiden, Ghilain

We thank the authors for addressing all points raised in the first round of reviews.

We thank the reviewer for taking the time to review our manuscript one more time, we really appreciate it.

I have a few remaining points that need to be addressed, mainly textual in nature.

Line numbers refer to the manuscript without tracked changes.

We thank you for these further edits and have implemented them accordingly, see detailed point-by-point replies below.

L4: Add 'be' behind 'may'. This changes the intended meaning, and therefore we keep as is.

L10-11: In the answer to the comments the authors indicated this sentence was removed, but it is still there. Please rephrase or remove. The processes that make up the surface mass balance are (reasonably) well understood, as are the processes that result in the spatial distribution. The actual absolute amounts are not well constrained, resulting in uncertainties in the details of the spatial patterns. We agree and have now changed to "Surface mass balance (SMB), which is the net accumulation or removal of snowfall at the surface, over Antarctica is well understood while the actual absolute amounts are not well constrained, yet it is a very important term for net global sea level rise"

L14: At this point you introduce RACMO as the abbreviation of the Polar oriented Regional Atmospheric Climate Model version 2.3. Later you also use RACMO2.3p and in figures RACMO5 and R5. Please use the same abbreviation consistently throughout the text, including the figures and figure captions. I suggest RACMO2.3p, and R23 when something short is needed for the figures. Thank you for noticing this, RACMO has been changed to RACMO2.3 here in the text, and R5 in the figures (this is now explicitly defined in the Fig 2 caption where it appears)

L26: Remove 'that' behind 'but'. Done

L41: Replace 'improves' with 'to improve'. Done

L44: Remove the 'a' in Fig. 1a), and add dot at the end of the sentence. Done, but (a) is kept, see comment on Figure 1

L46: Remove 'then' behind 'goal is'. Done

L58: Add ', in order' behind 'period'. Done

L62: Remove 'here' behind 'origins'. Done

L66: Replace 'by' by 'when doing'. Done

L67-70: Split sentence in two to increase readability. We have now changed to " We note that model results unconstrained by data may not follow well the SMB derived from ice cores, maybe because they have some biases in simulating the regional atmospheric dynamics or the link between large-scale and regional atmospheric circulation. We assume in our investigation

that the physics of the model is adequate to represent the regional processes and the data constraint imposed by the assimilation of ice core records will ensure a better agreement between observed and reconstructed variability."

L80: Add 'as' behind 'referred to'. [Done](#)

L81: Remove 'However' and replace 'use only' by 'only use'. [Done](#)

L82: Replace 'First' by 'Because firstly'. [Done](#)

L83: Replace 'Second' by 'And secondly'. [Done](#)

L128: Replace 'and this' by 'which'. [Done](#)

L151: Replace 'but show' by 'showing'. [Done](#)

L153: Replace 'we point out' by 'note'. [Done](#)

L157: To which ice core records do you refer here? To all, or to those from the central section? [All, now specified](#)

L166: Replace 'wider' with 'larger scale', remove 'precisely', and consider rephrasing 'no clear target' to something referring to observations, which I guess is what you mean. [We have now changed to "and no direct observations are available "](#)

L167: Not sure what you mean here but 'should not appear to be'. Do you mean that it is not allowed to be too strongly correlated? [We mean it should not be too strongly constrained / correlated to each individual record \(overfitting\), now changed to "should not look too strongly constrained"](#)

L167: Add 'be' after 'or'. [Done](#)

L186: Remove '7%.... large enough'. Sentence is a repeat of a previous sentence. [Removed](#)

L188: Replace 'tried applying' by 'applied'. [Done](#)

L201: Add 'The' before 'De'. [Done](#)

L216: Move 'directly' to before '(which retains....)'. [Done](#)

Figure 1: Caption: remove (a) at the beginning. Remove the part about 'with the inset showing', which is explained more clearly later when explaining the background image, at that point write out RAMP. Remove the last sentence '(b)...! [Somehow, panel b was missing when the manuscript was resubmitted. It is now added back in. The other suggestions have been implemented.](#)

Figure 2: See my comment at L14 on the use of different abbreviations to indicate RACMO results. [We now have modified RACMO5 to R5 for short, and explicitly state it in the figure caption](#)

Figure 3. Caption: Replace 'zoomed in onto the grounded ice sheet' by 'limited to the ice sheet and ice shelves'. And replace 'offshore' with 'full domain including the offshore region'. [Done](#)

Table 1: Move the caption to above the table. [Done](#)

Editor decision: Publish subject to minor revisions (review by editor)

by [Reinhard Drews](#)

Public justification (visible to the public if the article is accepted and published):

Dear Authors,

thank you for submitting a revised version. The re-review has indicated that most concerns have been adequately addressed. There are a number of minor suggestions for further improvement which I ask you to implement. I will then have a final look, no further external review is necessary at this stage.

Kind regards, Reinhard Drews

Editorial Comment:

l. 100 "The instrumental error is calculated from the measurement error propagated by the 1D inverse model applied to obtain the SMB records." -- It is unclear to me what the inverse model refers to. I understand that the shallow layer assumption has been applied to infer SMB from the radar observations, but I wouldn't call that an "inverse 1d model". Solving an inverse problem requires from my perspective a forward model and some sort of inversion scheme (gradient descent etc.). The reference where some of this goes back to (Medley 2013) also does not use the terminology inversion as far as I know. Consider rephrasing.

Dear Editor,

We thank you for your time reviewing our manuscript again and for allowing us extra time throughout the review process, we really appreciate it. We have implemented all changes suggested in the latest review. And regarding your comment about the 1D model, we agree, this is not a 1D inverse model but rather the fitting of the depth–density profiles. We have now reworded this sentence to “...propagated by the best-fit depth–density profile calculated to obtain the SMB records.”

Thank you,

Marie Cavitte, on behalf of the co-authors