

Dear Editor,

We thank both reviewers for taking the time to go through the manuscript once again. We have addressed all comments and have gone through the entire manuscript correcting for readability errors once again. Referee #1 questions the use case in section 5 should be part of the main text or in an appendix. Both reviewers from the first round were happy with it, but we will leave it up to the editor to decide if this section is appropriate for an ESSD data paper.

Thank you for considering this dataset and paper for publication.

Best regards,  
Signe Hillerup Larsen

Report #2.

Review of "Climate and ablation observations from automatic ablation and weather stations at A. P. Olsen Ice Cap transect, NE Greenland, May 2008 through May 2022" by Signe Hillerup Larsen et al.

Earth System Science Data #essd-2023-444

General comments:

Please note that this reviewer did not participate in the open discussion; therefore, this reviewer only evaluates the authors' responses to the initial reviewers' comments/suggestions. The line numbers below are from the authors' responses (version 3). My overall impression is that the authors' responses are generally poor: In most of the responses, they indicate only the original and revised texts, and therefore, it is frequently unclear whether they agree or disagree with each review comment, which makes it difficult for this reviewer to assess the authors' responses appropriately. However, this reviewer suggests that this data paper can be considered for publication in the journal ESSD once the authors attend to the following comments/suggestions.

We thank the reviewer for going through our answers to reviewers and apologies for not giving more details in each answer. We agree to all reviewer comments and please see answers to the specific comments below.

Specific comments

Referee #1:

Lines 57-62: I think the referee suggests that "in-situ observations of near surface climate and ablation are available from very few peripheral glaciers distinct from the Greenland ice sheet in Greenland, and a transect of three AAWs is, to the current knowledge of the authors, unique to Greenland." can be merged with the second paragraph of the introduction section. In my opinion, the authors did not answer this comment sufficiently. Please consider the suggestion again.

We agree the part about the importance of the in-situ observations is already stated in the second paragraph of the introduction and the uniqueness of the transect of three stations has now been placed up in the beginning of the third paragraph.

Lines 82-85, line 90, and Line 92-93: The authors' response is unclear. What did they do in response to the referee's comments? Because these points are related to the major comments, the authors must attend to them carefully and describe their responses in detail.

It is correct, we should have responded to these points, but didn't.

The details in lines 82-85 has been moved to the data availability section.

The comment for line 90, where it is stated that ice ablation is mentioned in the head line but is not described in the section, has been addressed by the restructuring of the text and headlines match the content now.

Regarding line 92-93. The paragraph has been rephrased in order to make it clearer to the reader how height of the instruments relative to the surface can change over the year.

Lines 118/119: Table 3 has been updated in response to the referee's comment. However, the intention of

“maintenance” is unclear. Do the authors intend to indicate information on the sensor replacement schedule using the word? I think using another word instead of “maintenance” is better.  
We agree to this point and has changed the column to: Calibration.

Line 168: Regarding the height of the installation, it is informative for readers if this height information is summarized in Table 3.

Good idea. The height above surface is now in Table 3.

Line 188: The authors’ response here is not enough. What do the authors do by combining albedo, Z\_pta and Z\_boom to detect the melt onset manually? This is the most critical point here.

We agree that this was still quite unclear. We have elaborated the description of how we, manually, find the onset of melt.

Lines 196-197: The revised sentences are still redundant, in my humble opinion. Suggest rephrasing “Corrections and quality control of the data is done to the best of our current knowledge, but the dataset is considered living data and should be directly comparable with data from the continued monitoring at the A. P. Olsen transect. As an example this means that if a better method for correcting the radiation sensor for tilt is implemented in the continued monitoring, the dataset will be updated to ensure consistency. The unfiltered data could offer significant insights, and this is therefore included as supplementary data.” -> “The unfiltered data are included in the dataset because it allows us to update it when a better quality-control method is developed.”

We agree that there is some redundancy in this. We have revised this part of the text and now it just says: “The unfiltered data could offer significant insights to expert users and are thus included as supplementary data in the dataset.”

Figure 8: Although the caption has been updated to include an explanation of the shaded gray area, the figure legend still includes a gray line plot (I\_toa) that should be modified as well.

The legend is correct, it is just that due to the high variability of the I\_toa due to the daily solar cycle, the line looks like a shaded area. We have made the line thinner and the figure 2 columns wide in order to make it clearer what the line represents.

New section 5, “Use case”: In my opinion, this section is not necessary for the main content at all because its purpose is to show the energy balance model's sensitivity to the parameter choices of roughness lengths for momentum and its accuracy in terms of daily melt amount, which are not relevant to the data itself. Please consider removing the section from the main content and moving it to supplementary material.

This has also been discussed amongst the authors, however, since the two other reviewers have been happy with this, we will leave it up to the editor to decide if the section does not match the format of ESSD.

Referee #2:

Major comment 1: Although the authors have updated Fig. 1 following the referee's suggestion, some figure descriptions are still difficult to follow. The figure legend tells that the glacier catchments are indicated with black and gray outlines; however, they are difficult to identify. Additional explanations are needed. In the “base map,” a black box is indicated. Does it indicate the exact area shown in the main figure? It should be explained in the caption.

We agree that it is hard to see the exact outlines. The figure has been updated, and the overview map legend and black box has been altered to cover the exact map area and the outlines have been made more visible.

Major comment 2: Regarding the newly added sentence, “Ice loss from glaciers distinct from the Greenland Ice Sheet are on a par with the mass loss of the ice sheet. Globally, the melting of glaciers distinct from the main ice sheets accounts for approximately 25-30% of the sea level rise attributed to the melting of land ice.” a reference for the statement is needed.

This sentence has been revised and the text changed in order to cite a more recent source that was used in earlier versions of this manuscript:

“Peripheral glaciers and ice caps (GICs) that are separate from the Greenland Ice Sheet make up only about 4% of Greenland’s total glaciated area but are responsible for approximately 14% of the island’s current ice loss, contributing disproportionately to the overall ice reduction (Khan et al., 2022).”

Figure 4 caption: Suggest rephrasing “Gray is data considered to show natural variation and red is flagged data considered to show variability caused by a faulty sensor at one of the stations.” -> “Gray line indicates

data considered to show natural variation and red line denotes flagged data considered to show variability caused by a faulty sensor at one of the stations.”

Thank you for this concrete suggestion, we have changed the caption according to the suggestion.

Figure 11: Why did the authors remove the figure legend incorporated in the original figure? This is certainly necessary. For the 2013 rapid decrease in the sonic ranger observation, the authors state that the decrease was caused by the situation that “the stake system being almost melted out and unstable”. If it is true, the rapid reduction in 2013 does not tell a realistic state. Please consider masking the rapid reduction.

A legend has been inserted and the SR50 data from 2013 has been removed completely, as we agree that it makes no sense to compare with data we do not trust to be good.

L. 226: In my humble opinion, the authors’ quality control of relative humidity is subjective. It seems to me that the authors think that the relative humidity values from ZAC\_L and ZAC\_U are more reliable than those from ZAC\_A. How do the authors find that? A more objective method should be considered and applied. The quality control of relative humidity is really hard to do objectively. And it is correct that perhaps we have been biased towards trusting the lower stations more. Investigating trends in median values, we could not define any objective method for rejecting the data and we will based on this discard less data for ZAC\_A.

The paragraph has been changed, and the data has been updated to include former discarded data:

“The humidity sensor typically requires recalibration every 1-2 years. However, due to logistical challenges, this was not always feasible, and an uncalibrated sensor will drift towards increasingly poorer performance. Drifting values of relative humidity are hard to objectively quantify. From a visual inspection of the relative humidity time series in Figure 5, drifting could have occurred at ZAC\_A during 2012-2014 and we will leave it up to the user to define when data is useful.”

## Report #1

### Summary and major points

I thank the authors for their revisions which address the points raised in my previous review. I do only have a few minor points to raise concerning the revised version of the manuscript. In general, I had the impression that the revisions were done a bit quickly here and there, with words sometimes missing and other minor inconsistencies being introduced. I list a few of these issues below, but there might be more that I have not noticed. I suggest to thoroughly scan the document once again before submitting the final version.

We thank the reviewer for going through the manuscript once again and for the suggested corrections. We have gone through the entire manuscript to correct for readability errors, missing commas etc. Please see the line by line answers below.

### Detailed remarks

Line 20: I think it should read "is on a par". Furthermore, I am surprised by this statement as it suggests that total mass loss from the ice sheet and from the local glaciers is very similar, which I doubt. Is this statement correct? Please modify so this is clearer and in any case provide a citation.

This sentence has been revised and the text changed in order to cite a more recent source that was used in earlier versions of this manuscript:

“Peripheral glaciers and ice caps (GICs) that are separate from the Greenland Ice Sheet make up only about 4% of Greenland’s total glaciated area but are responsible for approximately 14% of the island’s current ice loss, contributing disproportionately to the overall ice reduction (Khan et al., 2022).”

Lines 21 - 22: What are the sources of these numbers? Please provide citations.

This has been addressed by the above revisions.

Line 31: “This all sums up...” or “These all sum up ...”

The sentence has been rephrased to “This all sums up...”

Lines 113-114: The statement is unclear, sounds like the HygroClip has been replaced with some other type of instrument. I assume you mean that the HygroClips are regularly (what interval?) replaced with a freshly calibrated HygroClip.

The sentence has been slightly restructured to make it clearer:

“The HygroClip has been replaced with a freshly calibrated instrument at each field visit.”

Line 232: This is the second time you use the title "Ice ablation", please use another heading, for example “Correction of measured ice ablation”.

Thanks for the concrete suggestion the section title is changed to "Correction of measured ice ablation".

Line 287: A verb is lacking here: "... been discarded." Insert "have" or "has", depending on your use of the word "data".

This sentence has been removed completely based on a comment from the other reviewer.

Figure 8: The dashed lines for minimum daily radiation are very hard to read. I suggest to make better use of the space in the figure and set the maximum of the y-axis to around 900  $\text{w m}^{-2}$ ?

Thanks for this concrete suggestion, the figure has been updated both with the new y-lim at 900 and it has also been made broader to be able to clearly distinguish all lines.

Figure 8, caption, first sentence: The year is not mentioned for panel a but for panel b.

Thanks for noticing this error, it has been corrected so that it is clear that panel a is 2009.

Figure 11: Which colour denotes which instrument?

A legend has been inserted and reference to the color has been added in the caption.