

***Interactive comment on “Climatology and ablation  
at the South Greenland ice sheet margin from  
automatic weather station observations” by  
D. van As et al.***

**Anonymous Referee #1**

Received and published: 17 March 2009

GENERAL COMMENT

This study presents new meteorological data gathered in the ablation zone of Southern Greenland at three different sites, and relates these data to causal factors responsible for ice ablation. The authors first describe the site characteristics and measurements, as well as the associated difficulties. They present the energy balance model employed, which was used successfully in former studies of the Antarctic boundary layer and energy balance. The first two subsections of the results refer to the meteorological conditions recorded, where one interesting phenomenon (typical cold winds) is emphasized. The latter part of results shows the model results for energy and ablation

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conditions. A summary repeats the key points of their paper.

At a first glance it may seem that quite a few data gaps in their recordings diminish the significance of this study. In my mind the study is still a valuable contribution, since (a) the authors address a region where hardly any recordings exist, so we should be thankful about any efforts to better understand the local atmosphere-ice sheet interactions, if these efforts are scientifically sound (which is the case: see item c), (b) it demonstrates that - despite technological advances - we still face great challenges in measuring ice sheet processes, and (c) the authors thoroughly discuss the data gaps and required corrections to the recordings. I therefore suggest publication of this research after the minor comments below have been addressed. The only point that I would like to see more clearly in the manuscript refers to the nature of their modeling. Unfortunately there are no continuous recordings that enable an extensive model validation. In the MS the authors still state that there is a "comparison" between model and measurements. What they do is, however, more a kind of putting their results into a context by discussing measurements from other sites (which can actually be quite distant even if "nearby" on an ice sheet scale). I do believe that the modeled energy balance characteristics are close to the "real" characteristics, but please state more explicitly that the modeling at this stage helps to interpret, but does not verify the atmosphere-ablation links.

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## SPECIFIC POINTS

Multiple times it is talked about atmospheric or meteorological "parameters" (e.g., abstract). I think you should say "variables". Particularly in conjunction with modeling a "parameter" is more associated with one constant value (e.g., surface roughness length).

Have you thought of measuring LW\_out at the stations? It would provide a validation chance for the model (radiative surf. temp. vs. simulated surf. temp.) in the given case

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of no ablation recordings, since there is at least some variability of surf. temp. I'm sure the authors are aware of this, though, as the first author applied this strategy in past studies.

P118/L23: "Changes in ice dynamics....": Isn't the link between dynamics and mass balance based on a mutual feedback? Indeed, two sentences later you state that surface melt (a mass balance component) impacts ice dynamics considerably. I think you should modify the opening sentence.

section 2.1: Do I understand right that there is no data logger at the stations, and all data are directly transmitted to an office?

section 2.3: What is the model time step of the calculations? Input data are available six-hourly, so was the model run at six-hourly steps or with hourly interpolated data? - If I missed the information please ignore this comment....

P124/L11: suggest "exceeds" instead of "is limited by"

P126/L12: just write "or assumptions"; as a modeler you always try to impose reasonable assumptions, not "false" assumptions.

P126/L20: "temperatures above freezing point" instead of "positive temperatures" (since the latter could be any temperatures in Kelvin and differ between °C and °F).

P126/L21-24: Is there a reference that supports the explanation through the large-scale circulation?

P137/L13: Wintertime precip. is used in the discussion, but the model only refers to summertime and does not use precipitation input. please clarify;

P138/L22-23: write "removes .... of ice from the mass budget", as you only show in the related table the negative case (and usually the response is not entirely linear around zero).

P139/L2: Would starting a new paragraph with "The importance of the timing ...." be

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appropriate?

Table 3: The way of computing the statistics is clear, but the associated discussion in the text is a bit confusing due to the chosen measures, e.g., can a factor contribute  $> 100\%$  to a process? I think to discuss the relative importance of energy balance components for melt either (a) each the negative components and the positive ones should together have  $-100\%$  and  $+100\%$ , respectively - then you can discuss the relative importance of factors providing, and of factors removing energy for melt. Or (b) all fluxes are viewed as magnitude only, i.e.,  $|Q|$ , then the relative importance would also emerge nicely. For Nuuk this would thus look as follows. SRnet: 63% (gain), LRnet: 16.8% (loss), SH: 17.9% (gain), LH: 2.0% (loss), SSH: 0.3% (gain). - - If my suggestions do not make sense, or others do not see your way of interpretation as problematic, the original may also be acceptable.

Fig. 3: It would probably help to give for each station the number of available months in the caption; Fig. 5: Please provide a period or number of data in the caption; Fig. 9: The caption only refers to the upper panel. Please complement caption for the lower panel.

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## TECHNICAL COMMENTS

The language is at times too informal, which impacts the fluency of the text, in my mind. E.g., P124/L3: "parameter when it comes to" - suggest "energy source of"

P129/L28: "zooms in" - suggest "focuses"

P130/L13: "as we will see below" - suggest "as clarified below"

P132/L22: "every time" - suggest "in all three cases"

P140/L6: "100+" - suggest " $> 100$ "

P130/L19: "percentage units" instead of "percents"

Axis titles of figures: they are sometimes hard to read; I think you could occasionally use larger font.

Fig. 1: the contour labels are very small; Fig. 2: can you enlarge the whole figure? It is difficult to differentiate between asterisks and dots.

For future publications: if you send future studies to journals that address more a climatology than glaciology community, please avoid the abbreviation "DMI"; it is typically associated with the "Dipole Mode Index", a measure of Indian Ocean dynamics.

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Interactive comment on The Cryosphere Discuss., 3, 117, 2009.

**TCD**

3, S57–S61, 2009

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