

Interactive comment on “Climate of the Greenland ice sheet using a high-resolution climate model – Part 2: Near-surface climate and energy balance” by J. Ettema et al.

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The paper presents new results of the spatial variability of meteorological variables and energy balance components as derived from high-resolution climate modeling. Results are important for providing boundary conditions to ice sheet modeling and assessing the response of the Greenland Ice Sheet to climate change. The paper is simply a pleasure to read: It is interested, contains solid work, and it is very well structured and written. I strongly recommend it to be published as soon as possible.

However, I concur with reviewer I that distinguishing between summer and winter (in addition to the annual means) would be highly desirable. Furthermore, I only have a

C524

few minor comments mostly regarding possible improvements in writing and clarity.

General

- 1.) The abstract does not really reflect what is in the paper. The abstract only talks about temperature and wind. It should include the main results of all parts of the paper.
- 2.) Compared to the rest of the paper the conclusions are somewhat weak and I suggest that the authors rewrite them. Many sentences are very qualitative with statements that do not appear very novel, but rather concluding things that have been known for a long time. Maybe more quantitative conclusions could be added extracting the most novel results that are useful to modelers, and that go beyond basic knowledge on ice sheet meteorology.
- 3.) The paper contains a lot of acronyms. Please reduce the number, especially of those that do not appear very often, to make the paper more readable for non-meteorologists. E.g. ABL and SL should be spelled out (to avoid writing atmospheric boundary layer each time you may use ‘boundary layer’ in those cases where it is unambiguous that it is the atmosphere). Acronyms just reduce readability especially for those only moderately interested and familiar with overall topic.
- 4.) It would be nice to have the model results compared to in-situ data, but I guess this is beyond the scope of this paper, and I hope this will be followed up in future papers by the authors.

Details

- 5.) Abstract line 13: replace ‘seen’ by ‘modeled’ (or add ‘in the model’).
- 6.) Introduction, line 25: Explain what ‘temperature deficit’ is to make the paper more readable for non-experts in this field.
- 7.) Page 605 (introduction), line 1: What is ‘efficient emission’. Don’t you mean here: ‘and negative net longwave radiation’?

C525

- 8.) Page 605, line 25. Give reference for model. I see this is done a few lines later, but that sentence (first sentence under chapter 2) can simply be deleted because you just said that you use this model.
- 9.) page 606: corresponds to (not with)?
- 10.) Is the symbol 'dc' for directional constancy well established? If not I would avoid a symbol comprised of 2 letters because mathematically this mean d times c. Use for example one letter with a subscript.
- 11.) Equation 7: Why minus is all fluxes directed towards the surface are defined as positive (and hence all directed away as negative like the longwave outgoing radiation). Also, not sure if the longwave part is correctly formulated (but I may miss something here). Longwave incoming is LW. Longwave outgoing is $-\text{[surface emissivity} \cdot \sigma \cdot T_4^4 + (1 - \text{surface emissivity}) \cdot \text{LW}]$. This seems not the same as in Equation 7.
- 12.) page 612, line 18: 'along' means parallel. Don't you mean 'perpendicular' here?
- 13.) page 613, line 3: which averaging period? do you mean a 'clear maximum of annual averaged wind speed (>14)?
- 14.) page 614, line 4-5: 'Limit' seems to 'hard'. The surface temperature is clearly limited, but the air temperature can actually in principle get quite high over melting surfaces.
- 15.) page 616, line 23-24: why would this only be valid when T_s is at the melting point. This is valid under any conditions (melt may just be zero under certain conditions).
- 16.) page 617, first line: maybe more correctly: If the sum of all terms on the right hand side in Equation 7 is positive. (or simpler: If M (Equation 7) is positive ...)
- 17.) page 618, blanc missing line 8
- 18.) Figures 1: a.s.l and not m.s.l. I suggest that you use the same contour increment for better comparability. Should not be a problem considering that increments do not

C526

differ so much (15-30).

/Regine Hock, June 2010

Interactive comment on The Cryosphere Discuss., 4, 603, 2010.