

Interactive comment on “Diagnosing the extreme surface melt event over southwestern Greenland in 2007” by M. Tedesco et al.

M. Tedesco et al.

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This paper seeks to explain the cause for the "record" melt of 2007, as derived with passive microwave satellite data, through the analysis of model output fields from NCEP, ECMWF and MAR. The paper is well-written, clear and concise. The figures easy to read and are effective at conveying the information presented.

Unfortunately, however, this paper lacks the level of rigor necessary to make it a contribution to the scientific literature, and really requires much more substantive analyses and interpretation. The authors appear to have done some very simple between melt data and model analysis fields to draw a somewhat superficial and obvious conclusion that the high ice sheet melt levels have been caused by warm temperatures. The southerly flow as a cause for these warmer temperatures is a useful result, but it is nothing new, and is a simple product of the analysis fields.

Reply: We disagree with the reviewer about the lack of rigor. We do not just analyze the temperature fields but also all the components of the surface energy balance. Also, see comments by the other anonymous referee and M. Olfes about the insightfulness, complexity and process oriented approach of this paper.

For this paper to be publishable, in my view, much more analyses would have to be done examining the atmospheric conditions in other years besides 2007, and how those pertain to the melt characteristics of the ice sheet. In particular, it would be worth examining conditions that may have contributed to previous high melt years (e.g. 1987, 1991, 1998, 2002, and 2005). With the 2007 melt being only 2.1 standard above the mean, it is not so large an outlier that there needs to be a particularly unusual explanation. It would be much more meaningful had the authors explored the mechanisms that influence high (or low) melt years, and that show some consistency throughout the high (or low) melt years indicative of causal mechanisms. At a minimum, I would have expected to see some assessment of how the southerly flow of 2007 compares to atmospheric conditions of other years. Was it unusual in and of itself? Is it related to the AO or NAO, and if so, what will this mean for future melt conditions? Is increased southerly flow an expected response to a warming Arctic?

Reply: Our intent was to focus on 2007. The reviewer raises some avenues that could be explored in a later paper. Indeed, co-author X. Fettweis is preparing a paper addressing mechanisms that influence variability in the annual surface mass balance.

In addition, the discussion about the MODIS cloud fractions is not clear to me. Is it intended to lend credibility to the MAR model? Did the authors derive cloud cover from MODIS data? If so, this needs to be explained or at least the technique needs to be referenced. If they used the MODIS cloud product, then this too needs to be stated. However, the use of the MODIS cloud product, which is intended for data filtering purposes, to draw any conclusions is not appropriate, particularly with such small differences between the early and late parts of the record.

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Reply: We have removed reference to the MODIS data.

Because of the lack of rigor in this analyses, the paper does not really offer any particularly valuable insights into the behavior of the Greenland ice sheet and the mechanisms that drive melt. (as Mote has done in the past, for example). Much more analysis needs to be done in order for this paper to be acceptable for publication.

Reply: We respectfully disagree and suspect that reviewer 1 (above) and M. Olef (see below) would feel the same.

Interactive comment on The Cryosphere Discuss., 2, 383, 2008.

TCD

2, S286–S288, 2008

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