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The Cryosphere Discussions

Interactive comment on "Greenland ice sheet surface mass balance: evaluating simulations and making projections with regional climate models" *by* J. G. L. Rae et al.

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We thank the reviewer for his/her comments, and provide our responses below.

COMMENT: *p.2062, line 10 please add the following reference: Hanna, E., Huybrechts, P., Cappelen, J., Steffen, K., Bales, R.C., Burgess, E.W., McConnell, J.R., Steffensen, J. P., van den Broeke, M., Wake, L., Bigg, G.R., Griffiths, M. and Savas, D. (2011). Greenland Ice Sheet surface mass balance 1870 to 2010 based on Twentieth Century Reanalysis, and links with global climate forcing. Journal of Geophysical Research - Atmospheres, 116, D24121, doi:10.1029/2011JD016387.*

RESPONSE: We have now added the following reference, as requested: "Hanna et

al. (2011) used reanalysis data to drive a degree-day model and obtain estimates of SMB".

COMMENT: *p.2062, line 26 "but a surface energy balance model is more physically satisfactory": this is true but it also has many more demands regarding the range and amount of necessary climate data (which are not all widely/reliably available for the whole of Greenland) required as input - should add a sentence along these lines.*

RESPONSE: We have now included a reference to the amount of input data required, as suggested by the reviewer: "...but a surface energy balance model, while requiring a larger volume of input data than a degree-day model, is more physically satisfactory". However, we are reluctant to go further than this and comment specifically on the availability of observations of such quantities for the whole of Greenland, because: (1) this issue is less likely to arise when the EBM is forced by reanalysis data or GCM output, as in the case of the two references cited here (Bougamont et al., 2007 and Vizcaíno et al., 2010); and (2) our paper is focussed primarily on modelling of the coupled atmosphere-surface system, rather than surface models forced by direct observations.

COMMENT: *p.2070, line 18: "albedo and little melt along the GrIS margins (not shown)." In fact I believe this is shown in Fig. 6(e) - please clarify.*

RESPONSE: The words "not shown" were intended to refer to the statement "little melt along the GrIS margins", which is indeed not shown. The lack of spatial variability in albedo along the GrIS margins is, as the reviewer points out, shown in Fig. 6e. We agree that we should have included a reference to this figure for our statement on HadRM3P albedo, and have therefore now added one: "...albedo (Fig. 6e), and little melt along the GrIS margins (not shown)".

Interactive comment on The Cryosphere Discuss., 6, 2059, 2012.