

## ***Interactive comment on “Reconstruction of the 1979–2006 Greenland ice sheet surface mass balance using the regional climate model MAR” by X. Fettweis***

### **Anonymous Referee #1**

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#### General overview

This is a very good paper because it is a robust study of an important, understudied problem. As recently highlighted for example by the NASA Chief of Cryospheric Science, more groups studying the long-term surface mass balance of the Greenland Ice Sheet and links with meteorological forcing, are urgently needed. The paper begins with an interesting background discussion section, which is very useful for setting the study in a wider perspective. The regional climate-surface modelling is based on existing published schemes which, while not particularly innovative, are perfectly adequate for the present purpose. However, the spatial resolution of the RCM at 25 km is some-

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what limited for modelling the (typically very narrow) ablation zone of the Greenland Ice Sheet - it is therefore hoped that this resolution can be enhanced in future work using the model. Also, is there any possibility of extending the study period to include years before 1979?

The figures are interesting, clear and instructive - the time series, trend and correlation maps of the various meteorological parameters are all very useful, and I found the links with NAO and the plots of modelled surface-elevation changes particularly interesting. It is very useful to compare these figures with those in the recent published works by Jason Box and colleagues, for example. Some regional runoff results are also presented (Fig. 17), which gives an interesting perspective on the spatial disparity of GrIS surface mass balance changes. However, I would like to know more about the "simple routing scheme based on topography" used to derive the freshwater flux from runoff shown in Fig. 18.

I would like to see some discussion and justification of the uncertainty ranges given for surface mass balance (and precipitation and runoff) trends, quoted in the paper.

The main conclusion of the study is important, and is in accordance with our own recent findings in press in JOURNAL OF CLIMATE: namely that recent changes (in this case since 1979) in the surface climate of the Greenland Ice Sheet cannot be explained by natural climatic variability but may instead be attributed to recent greenhouse-gas warming.

#### Specific comments

Please use acronym GrIS instead of GIS (commonly Geographic Information Systems!) for Greenland Ice Sheet

p.124, line 18: "loose mass" should be "lose mass"

p.127, l.7: misspelling of "afterwards"

p.129, l.17: "Box ans Steffen" should be "Box and Steffen"

p.130, l.24: Change "poor snowfall" to "low snowfall".

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Interactive comment on The Cryosphere Discuss., 1, 123, 2007.

TCD

1, S102–S104, 2007

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