

## ***Interactive comment on “Response of the ice cap Hardangerjøkulen in southern Norway to the 20th and 21st century climates” by R. H. Giesen and J. Oerlemans***

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Received and published: 6 April 2010

We like to thank the anonymous referee for his/her positive reaction on the manuscript and suggestions for further improvement. Below is our response to all comments.

### *More detailed model description*

We added a table with the model parameters in the revised manuscript and describe the parameterizations on which the model is based. The calibration procedure is also described in more detail. Furthermore, we state more specifically in the abstract, introduction and conclusions what type of models are used.

### *Validation with measured DEMs*

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We have added a comparison of modelled and observed ice cap topography in Figure 9, using the 1995 and the 1961 DEM.

### *Seasonally varying lapse rate*

As the referee notes, we use two different lapse rates: one to calculate the air temperature at the AWS site on Midtdalsbreen from measurements at synoptic stations outside the ice cap, and one to extrapolate the air temperature at the AWS site over the ice cap. Because all parameterizations in the surface energy balance have been calibrated with air temperatures at the AWS site, it is important to accurately obtain this temperature from observations outside the ice cap. Because of differences in local boundary-layer conditions between the synoptic stations and the AWS site, a seasonally varying lapse rate is necessary. Lapse rates were derived separately for the data from Bergen and Finsevatn, to capture all local effects that may influence air temperature. These lapse rates cannot be used for extrapolation over the ice cap, where boundary-layer conditions are similar to the AWS site. We therefore use a constant lapse rate, based on measurements from the AWSs at Midtdalsbreen and the ice cap summit, for extrapolation over the ice cap. Hence, all lapse rates used are derived from observations and the good correspondence of modelled and observed air temperatures at the two AWS sites indicates that errors are minimized by this approach. The origin of the used lapse rates was not included and has now been added, together with a comparison of modelled and measured air temperatures and a discussion of the model sensitivity to the values used.

### *Description meteorological data*

To improve readability, the information from the appendix was moved to the main text in the revised manuscript. The paragraph about the control climate was partly rewritten to clarify that the control climate was created by averaging the hourly input data records used for the years 1961-1990 over all 30 years.

*Specific comments* All specific comments from the referee were addressed in the revised manuscript and the text was clarified where needed.

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Interactive comment on The Cryosphere Discuss., 3, 947, 2009.

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