

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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We like to thank Mauri Peltó for his positive reaction on the manuscript and suggestions for further improvement. Below is our response to his comments.

Equilibrium-line altitudes

In the paper we compare the modelled winter, summer and net mass balance with values measured by the NVE for the period 1963–2005. In the PhD thesis (Giesen, 2009), the mean modeled and measured mass balance profiles, for the 33 years with a profile available, are compared and show good correspondence, especially at higher elevations. The mean modelled ELA is 32 m higher than the measured value (1638 m

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a.s.l.), mainly due to slightly different shapes of the modelled and measured profiles. At altitudes below the ELA, the measured profile is based on a limited number of stakes (only two in recent years) and the uncertainty in the interpolated profile is larger. To answer the question by Mauri Pelto, we determined the ELA for the individual annual profiles and compared these to the values given in the NVE report (rounded to 5 m elevation intervals). In the period considered (1963-2005, excluding 1978 and 1979), there were six years with a reported ELA above the ice cap summit (1963, 1969, 1977, 1980, 1996 and 2003). The modeled ELAs are also above the ice cap in these years, except for 1977 and 1996. Additionally in 1970, 1988 and 2001, modelled mass balances are negative for the entire ice cap, but in good agreement with observed values, although the measured ELA was lower. For all years with both observed and modelled ELA below the ice cap summit, the modelled ELA is on average 26 m higher, with a RMSE of 61 m. We will add a short discussion on the model ability to replicate the ELA.

Satellite image

We agree that a satellite image or aerial photograph of the ice cap would be a useful addition to the paper, but regarding the large number of figures already included and the length of the paper, this was not feasible.

Reference

Giesen, R. H.: The ice cap Hardangerjøkulen in the past, present and future climate. Ph.D. thesis, Institute for Marine and Atmospheric research Utrecht, The Netherlands, 2009. <http://igitur-archive.library.uu.nl/dissertations/2009-1104-200130/UUindex.html>

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

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