

Interactive comment on “Determination of length, area, and volume changes at Storglaciären, Sweden, from multi-temporal aerial images (1959–1999)” by T. Koblet et al.

Anonymous Referee #2

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General comments

This paper presents results on length, area and volume changes of Storglaciären based on reanalyses of aerial photographs. It assesses related errors and compares derived length results with observed values and area and volume results with previous estimates. The methods of deriving area, volume and length change and comparing such results with direct measurements are well established in glaciology and the authors do not provide much new information or new approaches. Consistent analysis of a series of aerial photographs is definitely valuable, however, and results from Storglaciären, the glacier with the longest direct mass balance series, are worthwhile

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publishing.

My major objection to this paper is that it does not include the comparison with the direct mass balance observations, but refer to a companion paper for these results both in the introduction and in the discussion. I question this choice as the paper as it is now seems incomplete without it and would be better by including these results. It is also inconsequent that the derived length results are compared with direct length change observations, but that the volume change results are not compared with the direct mass balance observations. I suggest that the paper is revised by including a comparison with the direct mass balance observations, and thus rewritten in some parts so it contains the needed information for the reader.

As it is now, I find the discussion too thin and would benefit from more analyses. This would be improved by adding comparison with direct observations as mentioned and maybe also comparisons to results from other glaciers. The authors could also discuss their DTM derivation in more detail (see for instance Kääb, 2005, for good references and further discussion on the subject).

The paper is generally written in understandable English, but would benefit from more careful editing to improve it. It is several places unclear whether the authors refer to work done previously or in this study. Using past tense and active voice for own work could improve the clarity. The authors provide many references for previous work, but could use them better. Three references for volume estimates of Storglaciären are given for instance, but are not used to estimate of the total volume loss in % of the study glacier for instance. Overall, the paper could be sharper edited to focus on the objectives in the study. The reference list is also incomplete (see specific comments).

Specific comments

P 349. Line 13-18: Unnecessary to mention all these references, e.g. modelling, hydrology and ice temperature references, if not used further in the paper. Suggest to concentrate on the references most relevant for this study.

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P 350. Line 21/22. ‘...Storglaciären classified as a small (3 km²) glacier...’. This sentence should be rewritten, the area size and altitude range should be accompanied with the mapping year in a separate sentence. A bit confusing as it is now. Line 11>: A clear objective should be stated in the introduction.

P 351. Line 3-5: Why mention maximum and minimum temperatures, not relevant or used further in this study. Focus on what is relevant for this study. Line 7: Over which period is the mean precipitation calculated? Line 22->: Information on the work carried out in this study should be written in past tense and preferably using active voice. As it is now it is unclear what was done in this study and what is previously done.

P 352. Line 15: When and by whom were the measurements carried out? Rewrite the paragraph to make this section clearer about what was done in this study and in other studies.

P 353. First paragraph: true, but why this introductory sentence here? The paragraph could need rewriting. Line 8: I assume the outline was mapped by digitising it, be specific. Line 12, it is not the changes that was digitised, but the outline/border. Line 16: Use past tense when describing what was done.

P 354. Line 3: What does ‘modelled calculations’ mean? Line 7: Kraus 2004; Kraus et al 2006 according to the reference list. Line 13: were (not are) Line 14: orthophotos (plural) ? Line 23: Use Storglaciären instead of Tarfalla Valley? Line 26: review of the photos (instead of survey years)

P 355. Line 3-4: covered by a thin snow layer Line 6: use ‘has’ instead of ‘shows a’, avoid using expressions as ‘a lot of’ and ‘having a look at’ (line 10).

P 357. Line 6: do you mean generally or the DEMs used in this study, be specific. Line 14: comma instead of full stop after 0.

P 359. Line 2: Would avoid using trend for so few data points in time. Line 5: Would emphasize that ‘according to the maps ‘

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P 361. Line 3: Done in this study right? Use past tense.

P 364. Line 10: It would be good to end with a note on the cumulative balance since 1999 and the need of a new DTM now. The new survey should ideally be a combination of digital aerial photos and laser scanning, thus ‘should’, not ‘could’. Using laser scanning would reduce the uncertainty in snowy (areas with low optical contrast).

References referred to, but not in the reference list:

-Lemke et al., 2007. -Holmlund et al., 1996 -Jansson and Rickardsson, 2007

References in the reference list, but not referred to in the text:

-Andreassen, L. M., Elvehøy, H., Kjøllmoen, B., Engeset, R. V., and Haakensen, N.: Glacier mass balance and length variations in Norway, *Ann. Glaciol.*, 42, 317–325, 2005. -Grove, J. M.: *Little Ice Ages: Ancient and modern*, vol. 1+2, Routledge, London and New York, 2 edn., 2004. -Nesje, A., Bakke, J., Dahl, S. O., Lie, O., and Matthews, J. A.: Norwegian mountain glaciers in the past, present and future, *Glob. Planet. Change*, 60(1–2), 10–27, 2008.

Reference

Kääb, A. (2005): Remote sensing of mountain glaciers and permafrost creep. *Schriftenreihe Physische Geographie*. 48, 266 pages. ISBN 3 85543 244 9 (Available online at http://folk.uio.no/kaeaeb/publications/habil_screen.pdf)

Interactive comment on *The Cryosphere Discuss.*, 4, 347, 2010.

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