

Interactive comment on “Comparison of glaciological and volumetric mass balance measurements at Storglaciären, Sweden” by M. Zemp et al.

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We thank the two anonymous referees and Mauri Pelto for their thorough reviews and constructive comments that are of great help to improve our work. In the following, we give a short response to some general issues including a summary of how we will revise the paper under consideration of the vast majority of received comments.

Scientific novelty of the paper: The comparison of glaciological and volumetric mass balance measurements (with established methods!) is of fundamental importance in order to guarantee the quality of the observation programme, especially with increasing time length of the data series, and subsequently of all scientific results that are built on

C363

the corresponding dataset. In our study, we provided - for the very first time - such a comparison for Storglaciären that is based on a reanalysis of all available data. Moreover, only very few of the worldwide mass balance series have yet been compared including a complete uncertainty assessment (e.g., Thibert et al. 2009; Huss et al. 2009). The majority of existing comparison (cf. reference list on page 369, line 13–19) do only address selected error sources. Using the words of Referee #2, we hope that our study will “encourage other groups which hold and produce [...] mass balance series to re-evaluate their records and to detect and assess their main uncertainties in a similar way.”

Uncertainty assessment: We do agree with the referees that such an assessment should result in total (systematic and stochastic) uncertainties. As a consequence, we will complete the list of potential error sources and elaborate the related uncertainties in more details. The revised paper will provide systematic corrections and stochastic error bars that allow a quantitative basis for the decision about a potential adjustment at decadal scale.

Methodological details: Based on the received comments, we will further elaborate and improve the methodological section, such as related to internal accumulation, summer accumulation, minimum density estimation, reference areas, and superimposed ice.

Implications of the study: In response to Referee #2 (of Koblet et al.), we will revise our manuscripts in order to make better use of the given references and discuss the implications of the study for earlier and future work.

Combination of Koblet et al. and Zemp et al. into one paper: Referee #1 (of both manuscripts) and Referee #2 of the one by Koblet et al. suggest that the two manuscripts would profit from a combination into one paper. At the same time, all referees suggest to extend specific sections, and there is only one comment related to ‘redundant’ information (Table 3 in both manuscripts). During the entire publication process, this issue was discussed several times among the authors. Based on the

C364

following reasons, we adhere to our original two-paper-decision as this allows us to:

- provide enough detail on data, methods, and related uncertainty that is required to reproduce our work, - summarize and discuss the large number of earlier studies that are related to the combination of in-situ and remote sensing methods as well as to our re-analysis at Storglaciären in particular, - focus on the different objectives of the studies (i.e., Koblet et al.: re-analysis of all available aerial photographs, determination of length, area, and volume changes, comparison with related earlier studies; Zemp et al.: comparison of glaciol. and volum. mass balance, review of previous related studies, uncertainty assessment, conclusions for mass balance monitoring) - give the analysis of the glacier mass balance a higher weight than the one of length, area and volume changes, - include reference lists that are adequate to more than six decades of research, - acknowledge the differing contributions of the authors.

The online publication of both papers at the same time as companion papers in *The Cryosphere* will ensure that the complete information is readily available to everyone.

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C365