

Interactive comment on “Glaciological and geodetic mass balance of ten long-term glaciers in Norway” by L. M. Andreassen et al.

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Andreassen et al (2015) provide an important analysis of long term glaciological and geodetic mass balance in Norway. They work with the best long term regional mass balance data network that exists. This leads to a more comprehensive comparison than can otherwise be accomplished. The level of detail is particularly helpful. The recommended changes are all minor, could be briefly addressed and simply suggest more specificity at locations noted below.

Specific Suggestions:

6584-28: change “reference series of” to “reference glacier for”.

6585-25: Does last century mean 1900-1999 or 1910-2010?

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6586-1: “most so” to “greatest at”.

6586-3: What about prior to the 1990’s?

6587-1: Is the end of summer transient snowline used as a measurement?

6589-20: The profile method relies on the consistency of the annual balance gradient. Pelto et al (2013) noted in Figure 4 and 6 the consistency of the balance gradient from year to year on Lemon Creek and Taku Glacier, Alaska that justifies its use. Rasmussen and Andreassen (2005) illustrate this for many of the glaciers in this study and Andreassen et al (2012) on Langfjordjokelen. This point should be more emphasized and its appropriateness quantified.

6587-2: What is the range of stake measurement density?

6590-21: Please better quantify large surplus and small deficit.

6590-25 or 6601-10: On Nigardgsbreen there is a paucity of measurements from 600 to 1200 m, can you comment more directly on the role this has in potential geodetic/field measured mass balance, it is obliquely noted at 6604-3.

6604-5: Any ability to discern if a changing flux through these steep fast flowing sections has caused some of the discrepancy?

6604-17: On Engabreen there is a lack of field mass balance data from 600 to 1000 m this could be specifically noted if as noted at 6604-3 this is the issue for accurate field mass balance data. On Alftotbreen there is a diverse mass balance pattern that the balance gradient poorly captures that is not necessarily well mapped by the stakes used according to the NVE annual reports, which are biased to the east side. Rasmussen and Andreassen (2005), note the highest standard deviations in gradient for this glacier. Is this the cause of the greater discrepancy? How is the lack of a representative balance gradient dealt with?

6606-10: Is the consistent finding that glaciological mass balances were too positive

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on each of these glaciers indicative of a specific field practice? Such as limited network of ablation stakes below the snowline or lack of end of summer snow depth soundings.

6608-27: Is there a relationship between mean density of annual measurements on a glacier and the magnitude of recalibration? This would be a key motivation for an increased observation network.

6609-7: Rasmussen and Andreassen (2005) and Andreassen et al (2012) observe that the slope of balance gradients on Grasubreen, Hellstugubreen, Langfjordjokelen and Storbreen are quite uniform. Is this an important reason why there is good agreement with geodetic measurement?

Table 4: I had trouble understanding column heading units.

Andreassen, L. M., Kjølmoen, B., Rasmussen, A., Melvold, K., and Nordli, Ø.: Langfjordjøkelen, a rapidly shrinking glacier in northern Norway, *J. Glaciol.*, 58, 581–593, 2012.

Pelto, M., Kavanaugh, J., and McNeil, C.: Juneau Icefield Mass Balance Program 1946–2011, *Earth Syst. Sci. Data*, 5, 319–330, doi:10.5194/essd-5-319-2013, 2013.

Rasmussen, L. A. and Andreassen, L.M.: Seasonal mass balance gradients in Norway. *Journal of Glaciology*. 51(175), 601-606, 2005.

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