Reply on RC2
Lea Geibel et al.

Author comment on "Rescue and homogenisation of 140 years of glacier mass balance data in Switzerland" by Lea Geibel et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2022-56-AC2, 2022

We would like to acknowledge the reviewer for the positive review and the helpful comments.

All reviewer comments are pasted below (in Italics) and are answered. The revised text is given in quotation marks.

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L 89-90: The sentence “The annual observations…” is obsolete.

Answer:

Removed.

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L 95: Could a reference be provided as an example where short term observations have been used for mass balance model calibration and validation?

Answer:

References are now provided: Braithwaite, 2009; Litt et al., 2019; Landmann et al., 2021.

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L 253: check wording /grammar (“with for a…“), and, do you mean w.e. > 0.1 m (instead of “beyond”)?

Answer:

Thanks for this remark. The sentence has been edited correspondingly.

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In line 274 the average of all end-of summer snow density is given as 539 km/m³. Is this the same as the annual density (in contrast to the winter density)? Annual snow density has a slightly different value in Table 2, please check. Why do you chose to replace a missing density at annual scale (year X prior to 2020) with the average annual snow density over all years, and not the average until that specific year (X)?

Answer:

Yes, this value corresponds to the measured density at the annual scale (we never use the term “annual density”).

Regarding the slightly different value given here in contrast to Table 2 the explanation is simple: Table 2 shows the period 1951 to 2020 while here (and on line 435 and 492) we refer to the complete data set (1880-2021). Although this only adds relatively few data points, the average is slightly different. To clarify this, we extended the caption of Table 2, emphasizing that only part of the entire data set is shown here. Furthermore, winter densities shown in Table 2 have been homogenized to correspond to 30 April based on the temporal densification rate to allow direct comparability, while the overall averages stated here and on L 435 and L 492 refer to the raw measurements. This has now been emphasized in the caption of Table 2.

We understand the reviewer’s comment regarding the long-term temporal variations in density. This analysis is only presented later in the manuscript. We thus added a reference to these findings (lack of evidence for temporal changes in density) that support our decision to use a constant value. The analysis shown in Fig. 4, as well as in Table 2, clearly indicated that for end-of-summer snow density (or density at the annual scale) neither a dependence on potential explaining variables (date of measurements, elevation, snow depth), nor a temporal trend over the last century can be detected. It would therefore not be appropriate to vary the value supplemented for missing densities as the available data set simply does not provide sufficient information on such potential variations. We therefore decided to choose the most robust solution, i.e. to use the average of all measurements.

Revised text:

«In addition, no long-term temporal changes in density at the annual scale are evident from the data (see Section 4.3 for details). We therefore use the average of all observations of the end-of-summer snow density (539 kg m⁻³) to provide a density estimate for missing entries at the annual scale.»

Fig 4: Please explain better what the red lines indicate.

Answer:

The caption was extended to provide more information.

Revised text:

«The straight black line corresponds to a linear fit, and bold red lines show average densities for five equally-spaced classes of each analyzed variable for illustration. The latter indicates trends beyond the variability of the individual data points.»
L 335: Glaciers are not always consistently named, cf. e.g. L 385 (Jöri, Jörigletscher). Also in other places, please check.

Answer:

Thanks for making us aware of this. We have gone through the paper again to check for consistency. We decided to not use any short names (i.e. without “glacier” or equivalent) in the text now.

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L 435: Annual snow density, and winter snow density, as given here differ from the values in Table 2, please check.

Answer:

See explanation above.

Revised text:

«Decadal averages of observed snow densities both at the annual scale $\rho_{\text{ann}}$ and for the winter period $\rho_{\text{win}}$ between 1951 and 2020.»

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L 492: cf. L 435

Answer:

See above.