

Reviewer #1:

I thank the authors for the effort in responding to the comments and making the corresponding changes in the manuscript. There are only a few technicalities that I noticed in the revised version. Line numbers refer to version without track-changes.

Abstract should be self-contained, so acronyms need to be introduced here as well. Maybe a few brief methodology sentences would be useful in the abstract as well, in order to understand the differences between CLQM and EKF.

We agree and modified the corresponding sentences in the Abstract

L225 “not really suitable for time series with many zero values” not sure I agree with this. Otherwise, QM applied to precipitation would also be wrong. I agree that zeros are challenging, but I guess you applied the equivalent to wet-day correction for precipitation in the QM step? Then, this should somehow alleviate the effect.

Please see Michel et al (2024) who noted:

“In the case of precipitation, a probabilistic frequency adaptation approach can be used by randomly choosing one of the quantiles of the training distribution corresponding to a zero value in the model distribution. On a long-term scale (i.e. enough data points are considered), this leads to a precipitation frequency and accumulated mass similar to the training data (Rajczak et al., 2016). In the case of snow, such an approach is not possible. In fact, the SWE value depends not only on the accumulation at the current time step, but also on the value at the previous time step. Consequently, a probabilistic approach cannot be used to decide whether snow should be present at a given time step. This issue has already been highlighted by Jörg-Hess et al. (2014).”

Figure 4 looks the same in the new version, maybe a copy’n’paste mistake?

We disagree. Look for example at lower outliers of the RMSE.” -> “Amongst others, the RMSE outlier statistics changed.

L294ff some figure (also in the supplement) backing up these statements would be very useful

While we do not have such a figure at hand, we believe, that Figure 3 and Figure 4 already demonstrated that the performance of quantile mapping approach used in OSHD-CLQM is limited in case of low-snow environments.

\$L429 energy balance of what?

We added “Earth’s surface”

L430 I’m not sure about also including PV power here. From my (personal) experience, PV panels are cleaned from snow like the streets. Besides missing out on production, refreezing snow cover can pose challenging problems on PV panels.

Please note that we referred to increase in the PV production due to the albedo effect of the snow cover.

L511 “by definition not really capture extreme values” is not really true, since QM works for any type of extreme (with corresponding quantile). The problem is that, at highest quantiles, it has to sometimes extrapolate when the range of data (calibration, application) is different. Fig1 in 10.5194/hess-21-2649-2017 maybe helps to understand.

Thank you, we agree and changed the corresponding sentence to “Furthermore, we urge caution when using maximum values, because the applied quantile mapping method does not capture extreme values as they are corrected according to the correction of the 99th quantile (Michel et al., 2024).”

Reviewer #2:

Thank you for your patient and thorough responses to my comments. I agree with you that at times my comments, especially the general ones, were not always clear and constructive. The authors have clarified many of the phrases and concepts that were unclear or underdeveloped in the original manuscript. Additions to the methods have improved the overall comprehension of the manuscript. The manuscript would benefit from language editing.

Minor comments

Figures 5: suggest increasing the minimum y-axis value to highlight more of the differences between the various models and/or temporal aggregations.

[Thank you, we agree and increased the minimum y-axis value for R in Fig. 5, Fig.S3 and Fig. S4.](#)

In the discussion of trends I think it's important to state explicitly that the OSHD-Comb and OSHD-CLQM data only differ after 1998/1999. The figure you provided in your responses might be useful in the supplement. Perhaps something along the lines of:

'OSHD-Comb and OSHD-CLQM data only differ after 1998/1999; any differences in their long-term trends are due to differences in the most recent period (after 1999). However, the differences in trends between the two model chains after 1999 are still fairly similar (Figure S#).'

[Thank you, the additional text and the figure in the supplement has been implemented as suggested.](#)

Conclusion L503-509: Perhaps add the specific model names in parentheses immediately after the first mention of SPASS in the conclusion. Since it's the first time this term is used outside of the introduction this might help link the specific models and analysis to the broader project.

[We agree and added the model names as suggested.](#)

Editorial suggestions

L19: 'Together' instead of 'All'

[Done](#)

L49: and limits the start of the time period to the beginning of the 1980s

[Done](#)

L50: suggest 'coarse' instead of 'sparse'

[Done](#)

L57: 'hereafter' instead of 'is from now on'

[Done](#)

L63: which mimics the higher-quality shorter-duration OSHD-EKF

[Done](#)

L110: cross reference Sect. 2.1

[Done](#)

L111: through the conversion of SWE using

[Done](#)

L121: spatial mean of the respective 1 km grid cells

[Done](#)

L133: between 1999 and 2023

[Done](#)

L133-134: Suggest removing 'these' from 'All these stations' to read 'All stations' and use a period or semi-colon after (Figure 2) and remove 'whereas'. [All stations...(Figure 2); stations below 2000 m ...]

[Done](#)

L135: The station data have been

[We prefer to keep the current wording.](#)

L136: remove 'in separate steps'

[Done](#)

L155: suggest removing 'facts' , i.e. given by the following:

[Done](#)

L155: remove analysis

[Done](#)

L159: suggest snow conditions instead of situations

[Done](#)

L195: remove text after the last comma (delete: 'which implies that we have three differences classes of snow days') as it repeats from the beginning on the sentence.

[Done](#)

L204: The scores provide the basis for boxplots of

[Done](#)

L235: remove either 'values' or 'scores'

[Done](#)

L278: In relative terms

[Done](#)

L298-299: seasonality issues only affects the 1000 and 1500 m elevation bands.

[Done](#)

L302: remove 'also'

[Done](#)

L303: remove 'found'

[Done](#)

L374: remove 'case of' ('is limited in low-snow environments'

[Done](#)

L457-458: Suggest: "small-scale patterns may not be accurately represented (in both extent and amplitude) at the scale of the model grid"

[Done](#)