Interactive comment on "Statistical Reconstruction of Daily Precipitation and Temperature Fields in Switzerland back to 1864" by Lucas Pfister et al.

Anonymous Referee #2

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The authors present a new dataset based on a combination of long station records and the analogue resampling method for daily temperature and precipitation. These fields are then adjusted using ensemble Kalman filtering or quantile matching. Both the non-adjusted as the adjusted dataset are validated using a leave-one-out approach and against independent station observations. Finally, an application of the dataset is given in a reconstruction of snowfall and the altitude of the 0 degree line to better understand a historic avalanche winter.

The study is sound and - as far as I can tell - no methodologic errors have been made. The study is a pleasure to read and the application, presented like it is the cherry on the

cake, makes a compelling case for the dataset. Although I am quite enthusiastic about this study, there are three aspects which the authors may want to look into. One is the need for some additional explanation, one relates to an issue with the post-processing and the last one relates to the analogue method and a suggestion to overcome the drawback of the limited number of suitable analogues.

1. On page 7 (line 189) is is argued that 'reconstructions are often affected by biases in the mean, an increased number in wet days and underestimation of extreme events'. This statement is corroborated by a reference to Piani et al. This study works with global climate model data and a global dataset of hydrological forcing data. It is common knowledge that such global datasets suffer from the problems described on line 189, but one of the appealing aspects of the analogue method is that it has the potential to avoid these 'smoothing' problems. After all, it are observed situations that are used to build the reconstruction (including observed extremes) rather than a watered-down statistical interpolation. A more clear view on WHAT the reason is that the ARM provides estimates that have too many wet days, lack real extremes and suffer from a bias. After all, much of the study is devoted to adjusting for these problems.

2. On page 8, line 213, the authors state that the assumption in the post-processing method is that the precipitation distribution is not subject to changes in time. The period the authors use to calcuate the parametric transfer functions is 1961-2017. Obviously, this period includes the climate change effectson the precipitation which are also evident in the Swiss climate. Examples of time series with steep trends and/or decadal variability of e.g. RR1 (number of wet days) are Andermatt and Altdorf, extreme precipitation has changed as well, as evident in e.g. R95p in Basel-Binnigen. Can the authors comment on how climate change and decadal variability affects the effectiveness of the adjustment for precipitation?

3. A problem with the analogue method, which the authors mention several times in the study, is the limited number of analogues. Earlier, Van den Dool (1994, his section 5) stumbled upon this problem as well and he suggests a way out. He suggests to construct an analogue having greater similarity than the best natural analogue. He considers linear combinations of naturally occuring analogues. There are a few differences between the Van den Dool study and the current study (monthly vs. daily fields for instance), but it may be worth looking into this suggestion as it may make the dataset presented in this study stronger.

Other (minor) things the authors may want to look into

- page 5, line 120. What is the motivation to set this window to 60 days (and not e.g. 90 of 30)?

- page 6, line 172, an observation error of 1C is quick steep - is there a sound reason for taking it that large?

very very minor remarks

- line 185, in my humble view, observations are not corrected but adjusted (as I think that an observation is not 'wrong')

- line 223, change 'chapter' to 'section'

- line 490, the family name of the 2nd author is 'van Leeuwen' and his initials are P.J.

- caption figure 8, in my print out, the snow precipitation bars are grey and the avalanche acitvity periods are brownish

Reference

Van den Dool, H. M. (1994). Searching for analogues, how long must we wait?. Tellus A, 46(3), 314-324.
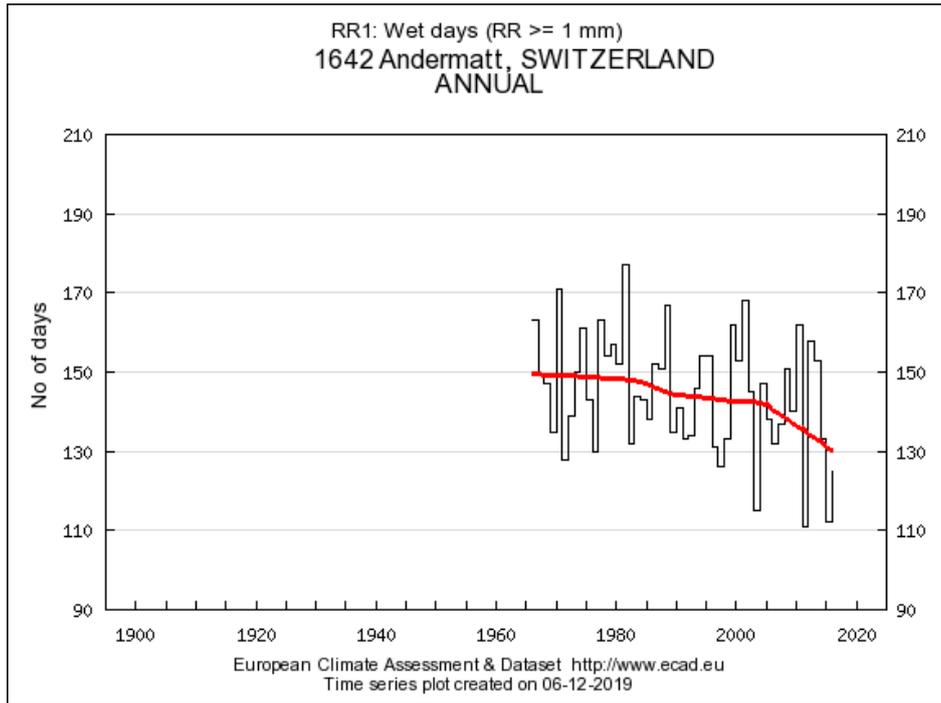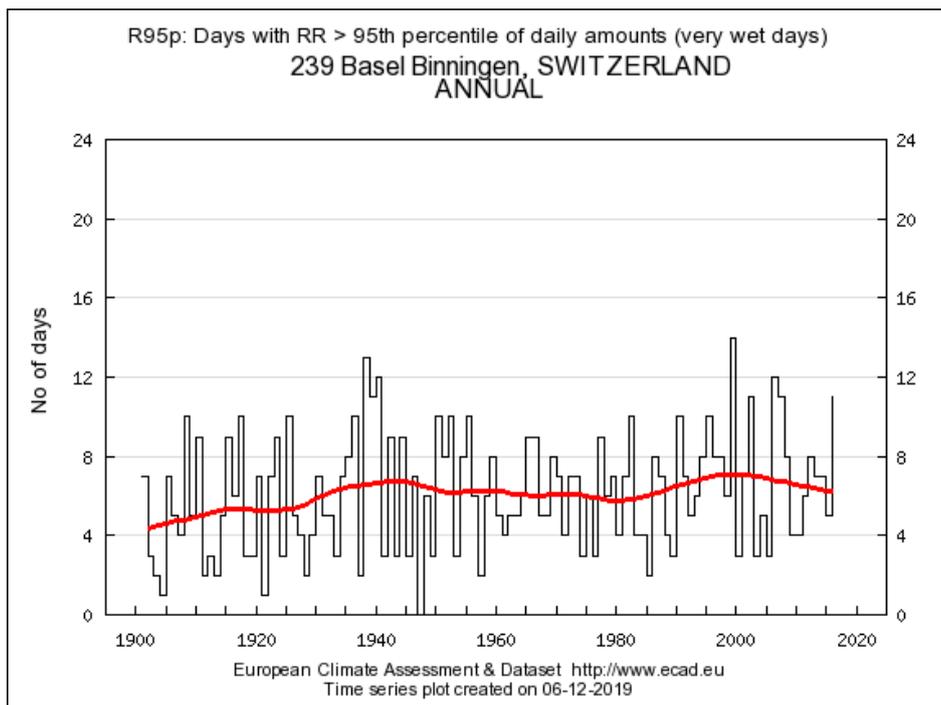
Fig. 1. Number of anual rainy days for Andermatt

C5

Fig. 2. Number of very wet days for Basel-Binningen