Response to Reviewer #3

This is overall well-written, and the approaches are appropriate, I have provided an annotated copy of the manuscript to assist the authors in making corrections. I have three substantive points below which require addressing.

Thank you for your detailed review of our manuscript and your constructive comments. In the following, we address the three substantive points raised by you. We are also thankful for the remarks made directly in the manuscript.

1) The snow days approach presented is not actually documenting snow days – you are presenting 'potential snow days'. What you are presenting is a 'potential snowfall days', as no observation of snowfall are made. This may seem rather pedantic but is important from an accuracy perspective, and the method you apply is likely to result in substantial overestimation of snow days. I recommend rephrasing the snow days to potential or removing this from the paper as it is likely to result in an ill-informed discussion. The sensitivity of such an approach in a country with extensive elevation differences is also liable to result in high uncertainties. I would remove this section from the paper as it I fear detracts from the paper overall, an alternative approach would be to demonstrate that the method you apply provides a good proxy for snow days for the different regions using observational records.

Thank you for this comment. We use a very simple approach to deduce days with snowfall from daily precipitation and daily mean temperature. Such a simple approach is needed because we only have these two variables available for the period back to 1763. The evaluation of Zubler et al. (2014) for the 2x2 km grid and 46 stations of the National Basic Climatological Network shows high correlations of 0.93 and a mean bias of -0.23 days stating, however, that the biases may come from the smoothed 2-km topography. We suggest recalculating this evaluation for our 1x1 km grid to evaluate the bias on the higher resolved grid. However, we will keep the snowfall days index in the manuscript because we think that an estimation of snowfall days in spring is relevant for illustrating changes in spring weather in Switzerland.

Therefore, we will add the new results of the snowfall evaluation in a short paragraph and we will emphasise that what we are showing are not actual snowfall days, but days when snowfall could potentially occur.

2) I am concerned by your use of the period 1871-1900 as pre-industrial, I appreciate that parts of Switzerland may not have been industrial, but certainly neighbouring regions and countries had extensive industry by this stage. I think using any period post-1750/1800 as pre-industrial is fraught with risk, particularly when dealing with climate and climatic parameters which are influenced beyond regional boundaries.

This period has been suggested by the Swiss national weather service based on evaluations using different periods and taking into consideration comparability to other periods and countries (Begert et al., 2019). Thus, we used the same period for consistency with respect to other publications by the Swiss national weather service. We suggest still using the 1871 to 1900 period but referring to it subsequently in the manuscript as a reference period, and not a pre-industrial reference period.

3) The discussion would benefit from a section explaining how the results of this paper relate to studies in neighbouring regions/countries, can you provide a little further context please of how this fits with other studies in Central Europe.

We will add a paragraph on how our study relates to studies in Central Europe. However, please note that only a few studies are available for the 18th and 19th centuries, especially focusing on spring.

Furher, we will correct the spelling mistakes marked directly in the manuscript. Also, we decided to change Figure 1 by creating two Figures covering the different indices. The anomalies with respect to the period 1871 to 1900 are already provided in the Appendix. We do not evaluate whether statistical step changes were present around the 1980s, since several studies have been published (e.g. Marty, 2008; Reid et al., 2016) and possible explanations provided (Sippel et al., 2020).

Thank you also for the suggestion of further literature. We will include these.

References

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