

Reply to Community comments 1

Overview

This manuscript presents a new winter temperature reconstruction for southwestern China and introduces a probabilistic perspective that assimilates uncertainties inherent in historical documentary records. The resulting reconstructions appear solid and the approach holds potential for further application. However, the presentation could be improved, as some methods and results are difficult to follow without an overall understanding of the Bayesian approach. I recommend publication after revision, with specific comments provided below.

Response: Thank you for your positive comments of our work and for the many helpful suggestions. In response, we will carefully revise the manuscript to improve the explanation of the methodology and better guide the reader through the overall structure of the Bayesian approach. We provide point-by-point responses to your specific comments below.

Specific comment

1. Line 22: The characteristics of “data-sparse” and “complex climate” appear to be influenced by multiple factors, including both natural and social-economic conditions. Clarifying these two aspects separately may improve the readability.

Response: Thank you for your comment and suggestion. In the revised manuscript, we will split this sentence into two parts to separately describe the “data-sparse” and “complex climate” characteristics from social-economic and natural perspectives, respectively, to improve clarity.

2. Line 143-144: The description of the procedure for extracting the snowfall boundary is not sufficiently clear. It would be helpful to describe the extraction process in more detail with explicit reference to the dataset actually used which is mentioned in subsection 2.4 and to clarify how the boundary longitudes and latitudes are derived based on it.

Response: Thanks for your comment. For the process of extracting the snowfall boundary, we firstly extracted the most south or west county-level or prefecture-level locations and then extracted their geophysical location (latitude and longitude) to be boundary. We will add more explanation to better introduce the procedure.

3. Line 146: The phrase “multiple climate zones” is repeated in this sentence. Please remove instance would improve the readability.

Response: Thanks for pointing it out. We will modify this sentence in the revised manuscript.

4. Figure 1(a): The legend label “Chongqing” is misspelled.

Response: Thanks for pointing it out. We will modify the legend in the revised manuscript.

5. Line 195-205: Without a general introduction to the Bayesian framework, it is difficult for readers to understand what the prior and likelihood specifically represent, and to maintain this understanding when reading the subsequent results, especially for readers who are less familiar with the Bayesian approach. I recommend adding a brief introductory paragraph under the title of sub-section 3.3, outlining the basic principles of Bayesian theory and explaining how it is applied in this study to climate reconstruction based on documentary records. In addition, this paragraph introduces several reconstructions, including the CWI-ModE-Sim, CWI-LME, and CWI-ModE-Clim. It is difficult to understand what the acronyms refer and how are they linked to the first reconstructed index (CWI). I recommend including a clear flowchart illustrating the input datasets, reconstruction procedure, and derived products, which would greatly improve the clarity and readability of the methods section.

Response: Thank you for this helpful and constructive comment. We agree that the lack of a general introduction to the Bayesian framework may make the methodology difficult to follow, particularly for readers less familiar with this approach. In response, we will add a brief introductory paragraph at the beginning of Section 3.3 to outline the basic principles of Bayesian theory. We also recognize that the acronyms (e.g., CWI-ModE-Sim, CWI-LME, and CWI-ModE-Clim) were not sufficiently explained. In the revised manuscript, we will use clearer and less ambiguous acronyms to better distinguish the different output data. In addition, we will include a flowchart to illustrate the input datasets, reconstruction procedure, and derived products, which we expect will significantly improve the clarity of the methods section.

6. Lines 235–237: The meaning of “cumulative observed frequency” is not entirely clear. In addition, Figure 2a is somewhat confusing, especially with respect to the rapid decrease in the observed frequency of “snow” during the first few decades. Further clarification and explanation would improve readability.

Response: Thank you for your comment. The “cumulative observed frequency” refers to the frequency of a certain phenomenon observed from 1700 up to a given year. Since “snow” was observed in the first few years, the cumulative frequency is initially high; however, as no observations are recorded in subsequent years, the cumulative frequency gradually decreases. We will revise the Figure 2 as a moving-window frequency plot to improve its readability.