

Interactive comment on “Winter temperatures in the second half of the XVI century in the central area of the Iberian Peninsula” by T. Bullón

Anonymous Referee #2

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General comments This manuscript presents the results of a winter temperature reconstruction for the central part of the Iberian peninsula during the second half of the 16th century. The author uses documentary evidence from a large number of archives to statistically reconstruct winter temperatures for the greater Madrid area. The steps of data gathering, interpretation, generating of indices and statistical temperature reconstruction are presented in chronological order. Finally, the author presents the newly generated winter temperature reconstruction in two examples showing the importance of winter temperature to forest resources and agricultural production.

The data presented in the study are very valuable for the reconstruction of winter temperature on the central Iberian peninsula. Archives from the Iberian Peninsula mostly provide information about precipitation. The body of information stems from various

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archives including the Spanish crown, monasteries and town archives.

However the manuscript suffers from rather large insufficiencies that should be addressed when revising the text. In general, there are three major points that need special attention. First, the general structure is confusing. An introductory section is basically missing even though there is a subtitle suggesting the contrary. The data and method section lacks details as well as the result and the discussion section (see remarks and suggestions below). Second, terminology and references should be used carefully. Examples such as "Brazdil et al. along with other methods" (p. 701/l. 19) is not precise and does not help to understand the method applied. Third, language style and grammar should be checked by a native or very experienced English speaker.

Specific comments Specific comments below intend help the author for the revision of the manuscript. They are as specific as possible for this version of the manuscript. The introductory section should present the state of the art of winter climate reconstruction from different parts of the Iberian peninsula. Recent studies performed in the last decade have confirmed that the two Iberian countries (Spain and Portugal) have a considerable amount of climate documentary information since the Low Middle Age (fourteenth-fifteenth countries). Spain, in particular, possesses information with a good degree of continuity and homogeneity for a large number of cities. Thus, the Spanish historical archives exhibit great potential for inferences into climate variability at different timescales and for different territories. The references below report on the main archives and discuss the techniques and strategies to obtain climate relevant information from documentary records. The following should be included in the review: From Spain: Barriendos (1997, Holocene); Barriendos and Martin-Vide (1998, Climatic Change); Garcia-Herrera et al. (2003, Bull. Americ. Met. Soc.); Martin-Vide and Barriendos (1995, Climatic Change); Rodrigo and Barriendos (2007, Global and Planetary Change); Rodrigo et al. (1998, Climatic Change); Rodrigo et al. (1999, 2000, International Journal of Climatology); Rodrigo et al. (2001, Journal of Geophysical Research); Rodrigo (2008, Climatic Change); Vicente-Serrano and Cuadrat (2007,

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Climatic Change); Dominguez-Castro et al. (2008, Global and Planetary Change). A lot of information is also available from Portugal: Alcoforado et al. (2000, Holocene); Taborda et al. (2004). Page 698/lines 19-21: give misterious indications but lack referenes to relevant literature. Please also give a more specific summary on the methods you use in your analysis. Brazdil et al. 2005 is for sure a good review of the state of the art. Please consult the references to methodological work in Brazdil et al. Define the aim of the study at the end of the introductory section. What are the relevant questions to be answered by your work? P. 699/l. 6-13 can serve as raw material.

The data section should include detailed description of the area include. P 698/ l. 22ff provide a good start. Please include information about the surface hydrology as it is important for fish and freeze events (p 699/l. 1). Clearly define your research period with respect to the available data that follows this paragraph. Figure 1 should also include the locations of the modern temperature stations used as well as the locations of the independent forest and vine production data used in the discussion section.

P 699/l. 25ff give an introduction to the documentary data consulted in various archives. Do not exclude forest product and wine production data used in the discussion section. Please explain Figure 2 in the text and try an English translation of technical terms such as "casas y sitios reales" or "parraces" etc. Please include examples of the kind of information that you found in the sources. E.g. "there was a heavy and long-lasting snow cover". You cite your own work (Bullon 2006, 2008), however, the first reference is in Spanish and the second one does not show details about the data. As the major scientific contribution is the novelty of the data, I suggest to elaborate data description and the potential as a specific climate-proxy without getting lost in epic descriptions. Please explain the structure, strengths and limitations of the database (p. 700/l. 17.). Move p.699/l. 18-24 to the introductory section.

The method section should include precise description on how index values are attributed to the documentary evidence (raw text material after p. 700/l. 23ff). Include the definition of each category of the ordinal scale from -4 to 4 and discuss why you

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selected 9 categories. Describe how you attribute the documentary information (such as "there was a heavy and long-lasting snow cover") to an index value of e.g. -2, and thus to the temperature conditions of this winter. How can you be sure that information is not related to precipitation instead of temperature? P. 701/l. 7: give formulas on how you calculated the final index values (WCI) for each winter. Describe statistical reconstruction model development in a subsequent paragraph in the method section. P. 701/l. 19: specify "along with other methods". Concerning the temperature reconstruction method and reference measurements used in the 20th century, summarize your procedure in one or two paragraphs in the method section. This might also clarify the obscurities of p. 701/l. 16-25. How can Nicolas et al (1979) give a statement about data quality when your period selected ends in 1990, more than ten years later than the reference publication year? How do explain the very high value of explained variance R^2 (Table 2)? Try not to mix the methods used for the degradation of 20th century temperature measurements to 20th century ordinal-scale temperatures indices and the temperature reconstruction for the 16th century.

The results section (p. 703/l. 1ff) should solely present the outcome of the study starting with Figure 3. The text accompanying Fig. 3 is already in the previous section. Please specify whether Fig. 3 presents WCI or winter temperature. P.703/l.3-5 present again methodological remarks. Move this paragraph to the method section. Please explain Fig. 4 in more details: what do $U(t)$ and $U'(t)$ denote? How did you define the periods in Table 3? Did you also use Mann-Kendall test for trend analysis?

Discussion section: Assuming that the forest exploitation data are completely independent from WCI, the comparisons seems very interesting. Why don't you show this in a figure instead using spurious arguments for the explanations of Figure 6? Concerning the comparisons with wine production, give more details on the wine production series. What are the units of the documentary source before you standardize the series? Explain what you mean by cumulative wine production and WCI? It is a mystery to me how you explain the impact of winter temperatures on wine production when vine does

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not grow at all during that season of the year. How can climate thus influence wine production? Please give the reference from relevant literature such as e.g. Mullins, M. (1992), *Biology of the Grapevine*, Cambridge Univ. Press, Cambridge, U. K. Or: Winkler, A.; Cook, J.; Kliewere, W.; Lider, L. (1974), *General viticulture*, University of California Press, London. Have a look again at Brazdil et al (2005, p. 404): Failure of wine production is attributed to summer temperature rather than winter temperature. They come to a different conclusion than Landsteiner (1999, abstract) that attributes high importance to winter temperature. The Spanish data might contribute to solve this discrepancy. Consulting relevant literature on grape vine (see above) is necessary. This study could benefit from comparisons with independent reconstructions. I could think of using a couple of gridpoints of reconstructed temperature from Luterbacher et al. (2004, *Science*) and compare your data with the independently derived temperature. You might also make comparisons of the WCI-Index with precipitation reconstructions (Pauling et al. 2006, *Clim Dyn*) to check for a precipitation signal in your documentary series. All have uncertainties, but would allow a preliminary comparison. You can easily access and process the data through the KNMI Climate Explorer webgate at http://climexp.knmi.nl/selectfield_rapid.cgi?someone@somewhere.

Finally, the conclusion section should recapitulate the major findings of the study. From my point of view, the importance of the data should be stressed. Second, this study is one of the few that reconstructs temperature from documentary data in contrast to many precipitation reconstructions from the Iberian peninsula.

Even though the plethora of comments could be used as an argument to reject this study, I would like to motivate the author to submit an improved manuscript after major revisions and language corrections. In a modified version, this contribution very well supports the aim of "Climate of the Past" by publishing important studies that generate past climate proxy data from documentary archives.

Interactive comment on *Clim. Past Discuss.*, 4, 697, 2008.