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Climate of the Past Discussions

Interactive comment on "A regional climate palaeosimulation for Europe in the period 1500–1990 – Part 1: Model validation" *by* J. J. Gómez-Navarro et al.

Anonymous Referee #2

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General comments

The manuscript reports on a study where the regional climate model MM5 is driven at its boundaries by the global AO-GCM ECHO-G in a European domain for the period 1500-1990. This study is "part I" in which the simulation itself is presented; comparisons with proxy-data will be made in a follow-up paper. The model experiment itself is described and the performance against CRU-data over the 20th century is assessed – both in terms of seasonal climatologies and probability density functions (PDFs). Finally, the evolution of the PDFs of temperatures and precipitation over the course of the 500 yr simulation is described. Although many features of the regional model climate are dictated by the driving GCM, many characteristics of means and variabilities are

substantially improved, particularly in areas of terrain. It is also found that aside from a shift there seems to be no change in the PDFs of regional spatial variability.

This kind of simulation is still quite new and the length of it offers new possibilities of studies. As such, the study is of interest to the readership of Climate of the Past. The scientific argumentation is sound and the conclusions a well backed up by the results. The manuscript seems, however, not to have been prepared carefully enough and both language and figures need an overhaul (see comments below). Although it is part I, and proxy-data comparisons are left for a future study, it would be nice with a small example or more comments on why/how the evolution of the PDF is important.

I believe that the study is of sufficient novelty and importance that it should be accepted after some minor revisions.

Specific and detailed comments:

1) The figures are much too small. Are figures 3, 4, 6, 7, 8 and 9 meant to be single- or double-column? In many of them the caption talks of black circles indicating areas of significant changes. These circles are completely invisible in the printed document and the label fonts are illegible. Perhaps they will be larger in the final version but this needs to be addressed.

2) On page 1819, you note that spatial covariance of anomalies is assumed in reconstruction techniques. Then you go on to look at the evolution of the PDFs of the spatial variability within the regions – and find that this is constant (to within a translation). Is this constancy really sufficient to ensure the stable spatial covariance needed by the reconstruction techniques?

3) Does MM5 show changes in PDF in future warming scenarios? You make a point of this happening in many RCMs, but what about this one in particular? Could your 500 year PDF-constancy be model-specific?

4) On the subject of the constant PDFs: I realize that you will deal with proxies in part

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II, but it would increase the relevance of your analyses if you gave some example or more comments on why this PDF-constancy matters and how it plays out in practice.

5) 1814.22-23: Are you assuming that the annual temp and precip series are uncorrelated? Is this a valid assumption? What is the autocorrelation of the series?

6) 1814.7: Should this not be NE-SW instead of NW-SE gradient?

7) 1822.4: “It is well known that”, please include references for this.

8) 1822.13: “most models in the CMIP3 and CMIP5 ensemble simulate a positive NAO trend”, please include references for this.

9) Fig 12: Please explain what the different shades of grey represent.

Language: The language could generally benefit from an overhaul. The below is a list of places where I would change things. This list is not necessarily exhaustive and is, granted, in some places a matter of taste:

- 1804.6-7: The merits of the simulation have been . . .

- 1805.11: Direct comparison between . . .

- 1805.27: This period has been subject . . .

- 1806.15: What does “high regional scale” mean? I guess you mean small-scale regional variations?

- 1807.9: argues

- 1807.14: In this sentence, you use slashes (/) twice. It may be a matter of taste, but I think you should choose, what you want to write.

- 1809.13: represents a reasonable choice

- 1809.20: Dalton Minimum with no or only . . .

- 1811.4: only land points are

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- 1811.21: tested through

- 1811.21: indicated with small black circles

- 1812.8: the average cold bias

- 1812.9: these warm/cold biases are

- 1812.10: remove two commas around “for the present climate”

- 1812.10: by other state-of-the-art RCMs

- 1812.12: the same information as Fig. 3

- 1813.3: the notable difference

- 1814.2: most notably

- 1814.15: or overestimation

- 1814.17: For these

- 1814.22: has been tested

- 1814.27-28: there are two possible physical explanations for this difference in behavior

- 1815.2: This forcing, albeit

- 1815.6: by the model

- 1815.27: of the annual cycle

- 1816.10: PDFs

- 1816.17: Each PDF has

- 1817.2: “bias” is this really a bias? Or rather a “change”?

- 1817.5: simulations less important

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- 1817.12: although with a spatially averaged value

- 1817.21: match quite well

- 1818.12: intensification of different types of extreme episodes (Christensen et al., 2007). (You already mentioned that it was under future warming in the first part of the sentence)

- 1819.3: reconstruction techniques

- 1819.12: while the black line

- 1819.17: gradient is particularly intense

- 1820.17: distribution behave

- 1820.27: and Scandinavia

- 1821.6: Peninsula

- 1821.27: a homogeneously

- 1822.18: could then be due

- 1822.25: capable of reducing

Interactive comment on Clim. Past Discuss., 9, 1803, 2013.