

## ***Interactive comment on “A regional climate palaeosimulation for Europe in the period 1501–1990 – Part II: Comparison with gridded reconstructions” by J. J. Gómez-Navarro et al.***

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Received and published: 26 June 2015

*General comments: The manuscript is an interesting comparison between climate model simulations and gridded reconstructions based on proxy data. It helps to analyze the advantages and problems inherent to both, models and reconstructions. My recommendation is to accept with minor modifications.*

We thank the anonymous reviewer for carefully reading the manuscript and his/her positive view on it. We believe his/her very detailed and constructive comments will allow us to improve the current version of the manuscript. Although we agree with most of them, we are not fully convinced by some points raised by the reviewer. Hence, we

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would like to outline our thoughts before submitting a new version of the manuscript.

1) *"The authors present in the manuscript results corresponding to winter (DJF) and summer (JJA). What about spring and autumn? The behavior of rainfall in these seasons is particularly interesting, mainly in Mediterranean areas."*

We agree. We decided to leave out the intermediate seasons because it reduces the length of the paper at the same time that allows us to keep most of the information. However, as the reviewer suggests, valuable information gets lost about the climate behaviour in the intermediate seasons. Hence, we will include the analysis of these seasons, although maybe only the results will be outlined whereas the figures will be included in the supplementary material.

2) *"According to the authors "the physical interpretation of EOFs has to be performed with caution" (page 316, lines 20-21). Although there is not a common criterion on its convenience, rotation technique produces compact patterns, less sensitive to the disC185 CPD 11, C185–C186, 2015 Interactive Comment Full Screen / Esc Printer-friendly Version Interactive Discussion Discussion Paper tribution of observing locations, and statistically more stable than conventional EOFs (von Storch and Zwiers, 2001). Have the authors performed this analysis, using, for instance, the widely used Varimax method?"*

The use of rotation techniques is controversial. The reason is that, as pointed out by the reviewer, there is no a unique criterion to perform such rotation. Although the varimax algorithm is somewhat standard, the decision to use this technique can not be entirely made based on mathematical arguments, since it has not been demonstrated that this method is better than standard EOFs, which on the other hand have the clear advantage of being defined unequivocally. In any case, the use of rotation techniques depends on the purpose. The aim of rotation is to produce more physically meaningful patterns beyond the limitation of traditional EOFs of being mutually orthogonal. In this respect, it is important to note that our aim is not to discuss in detail the physical

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meaning of such EOFs. Instead, we use the this analysis as a tool to decompose the variability modes of seasonal temperature and precipitation. Note that the use we make of EOF analysis consists of disentangling how variability is distributed in consecutive modes. We show how the reconstructions tend to oversimplify them by concentrating the variance in the leading modes. This is the most remarkable result of our analysis, and it is independent of whether we apply further rotation of EOFs or not. Hence, we believe that rotating EOFs would only add a layer of complexity to our analysis that would hardly benefit the the paper without enriching the results we can draw from this comparison.

3) *“The nine regions in Fig. 1 defined according to geographical criteria. . .” (page 320, line 25). What criteria? It is misleading to consider, for instance, the Iberian Peninsula as an unique region, in particular in relation to rainfall regime, with clear differences between the Mediterranean coast, northern coast and western-central area. I suppose that this problem may appear in other European areas. This regionalization is arbitrary, and may mask results on trends and variability (Figures 2 and 3) in both, simulations and reconstructions.”*

Splitting the domains in subregions is motivated by the trade-off between using various regions that allow to get advantage of the regional details provided by the RCM and the gridded reconstructions and by having a reasonably small number of regions that enable drawing clear conclusions that summarise most of the features of the European climate. Further, using not very small areas is also important from the statistical point of view, since it enlarges the sample size. We consider that 9 subregions is a sensible choice that allows to show the main differences in the European climate. We acknowledge that the Iberian Peninsula can be split in further subregions, but the same can be argued to other subregions and thus the number of regions can grow considerably. Eventually, the regions employed will always be arbitrary at certain extent, and will contain certain amount of subjective criteria. Hence, we opted by a rather simple criterion, that is based on a geographical argument, separating the areas ac-

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ording to main climatic zones. Yet subjective, this criterion follows the guidelines employed in other RCM studies, namely within the framework of the European project PRUDENCE (Christensen, 2007). We will emphasise this aspect in the new version of the manuscript.

Finally, these areas were employed in the first article regarding the validation of the simulation, so we believe it is important to keep these areas for consistency with the former publication.

*"Technical corections Figures 2 and 3 are not clear. I suggest to enlarge these figures. Now, it is difficult to see the comparison discussed by the authors, except the situations of over and/or subestimation."*

We will take this comment into account. Hopefully in the final layout of the manuscript the figures are displayed using a whole page. We have tested that in this format the figures can be read without problems, and we provide high-quality figures that can be shown at great sizes without loosing quality.

## Reference

Christensen, J. H., Christensen, O. B. (2007). *A summary of the PRUDENCE model projections of changes in European climate by the end of this century*. Climatic change, **81**(1), 7-30.

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Interactive comment on Clim. Past Discuss., 11, 307, 2015.

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