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Climate of the Past Discussions

Interactive comment on "Western Europe is warming much faster than expected" *by* G. J. van Oldenborgh et al.

G. J. van Oldenborgh et al.

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Dear Laurent,

thank you for your comments, which we have addressed as follows.

1. *This first comment is just to question the choice of the metric to select the sub-sample of CMIP3 models you are going to look at. You based your choice on a specific circulation index (other possibilities do exist and will likely give different results) which might be relatively appropriate for winter but not really for summer. It appears that among the models you have been selected, at least two of those have very strong biases in summer in their representation of the mechanisms which control evapotranspiration over France (and likely elsewhere as well). These biases may have a strong impact on temperature and precipitation*

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changes as shown in Boe et Terray GRL 2008 Vol 35. So I would certainly not pick them up if I wanted to compare recent summer temperature trends between model and observations. My suggestion would be not to use a metric at this point but rather to carry out the analysis on all CMIP3 models.

Thank you for the reference. A note has been added that other metrics are also possible, and that some of these models do not perform well on these alternative metrics.

We have followed your suggestion and repeated the analysis with the full CMIP3 ensemble (minus the GISS EH model, as the results diverged wildly between the 3 runs of this model). The observed trends are again higher than any member in the full ensemble in large parts of Europe, coinciding pretty well with the regions where the ESSENCE ensemble cannot reproduce the trends. Only the first run of the MIROC medres model gives trends comparable to the observed ones in Europe. (This run shows a strong heating throughout the northern hemisphere, which gives more or less the observed signal in Europe but far too high values over the Pacific area.)

We have added a histogram for the full CMIP3 ensemble in Fig.1c, and added a set of four seasonal maps with the quantile of the observed trend in the PDF defined by the CMIP3 ensemble (weighing all models equally, i.e., downweighing multiple runs). The analysis was repeated for the 17-member UK Met Office perturbed physics ensemble that was alluded to in the original text. In this ensemble the obserevd trends are outside the ensemble in similar areas. The climate models are very consistent.

We chose to keep the original subset of CMIP3 models in the paper for KNMI-specific reasons: these are the models that the KNMI'06 scenarios are based on.

2. *Another point is the use of the PRUDENCE models: there are new regional simu-*

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lations out there and they are available (ENSEMBLES RT2b): have you checked if you do find the same results ? The reason why I am asking that is that we have carried out a similar analysis for a very high quality temperature dataset of 91 homogenized France stations: we have compared the station point values with those coming from several ensembles of zoomed ARPEGE simulations (resolution of 50 km over France) with different forcings. For many stations, the recent observed trends are within the simulated spread, very often on the high end but not always. I believe that the very strong statement expressed by the title of the paper has to be mitigated a little or the analysis has to be extended to the last regional model results.

We have performed the same analysis for both the RT2b and RT3 ENSEMBLES RCM experiments. For 15 RT3 runs and 11 RT2b runs lat-lon data were available mid-November 2008. Again the observed annual mean temperature trends are outside the spread of the multi-model ensemble in large areas of Europe, which coincide well with the areas found in the ESSENCE, CMIP3 and QUMP ensembles.

A paragraph has been added that the discrepancy is also present in the ENSEMBLES RT3 and RT2b ensembles for which regridded data was abailable. We plan to publish a full analysis separately, this paper is already too long. Preliminary plots are available on request.

We judge that if the effect is present in one large single-model ensemble and four multi-model ensembles of 11-22 members the strong title is justified.

Interactive comment on Clim. Past Discuss., 4, 897, 2008.