

Interactive comment on “weather@home 2: validation of an improved global-regional climate modelling system” by Benoit P. Guillod et al.

Anonymous Referee #2

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Review of ‘weather@home 2: validation of an improved global-regional climate modelling system’ by Guillod et al.

The paper is a useful and fairly thorough documentation of the w@h system with a focus on Europe, although some gaps remain that can easily be filled. Also, there are some qualitative statements that can be converted to quantitative ones with, I think, relatively minor effort.

I am looking forward to a more complete version, which would be very informative.

Major comments

1. Can you comment how the biases in the global model compare to other, state-of-the-art, GCMs, eg in Chapter 9 of the IPCC WG1 AR5?

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2. For attribution, a correct representation of variance is as important as trends (Uhe et al, 2016). Please add the equivalent of Figs 1-3 for the variance, preferably of daily data but monthly should be OK if these were not saved. In that case CRU-TS can also be used as ground truth, for daily data Berkeley Earth has temperature fields and CPC precipitation fields over the required period.

3. Section 4.3. It would be useful to explicitly comment to what extent the biases in extremes can be corrected by a simple additive (temperature) or multiplicative (precipitation) bias correction.

4. Section 4.4 Given the strong connection between the reliability and trends, please add trend maps of the observations and model results in addition to the reliability diagrams, preferably also with SLP trends.

Minor comments

p.5 l.30 Why is Z500 taken from the ancient ERA40 reanalysis rather than a more modern one? JRA-55 covers the period 1961-1990.

p.6 l.8 "30 years period from 1961–1990". I understand that this is dictated by the short runs of w@h1. Can you add a comment on how different the biases of w@h2 are over the whole century?

Almost all figures would be more intuitive for readers with a left-to-right script if w@h1 was plotted to the left of w@h2.

Please show Fig. S1 in the main text instead of Fig.3 as it is much more informative.

p.7 l.8 "suggesting that certain modes are not well represented". To be nit-picking: misrepresentation of modes will affect the variability much more than the mean state. Just delete, as it carries no useful information.

p.7 l.22-31. You should mention that by prescribing SST you pretty much fix the trends over land as well (eg Shin et al, Clim.Dyn. 2011 and other papers from Sardeshmukh's

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group). The agreement is therefore not all that surprising.

p.7 l.22-31 Some formal analysis how many times the temperature falls outside the ensemble range seems called for, ie whether the ensemble is reliable: is the spread a good representation of variability? Note that this is not covered in section 4.4, as there the distributions are normalised to their own variability.

p.7 l.32- The same holds for the regional time series.

p.11 l.2 "and may be the subject of further work" is not useful information.

p.11 l.14 Why did you not take a standard percentile for the shading, like the 95% CI, rather than the full range of 1000 bootstrap sample?

p.11 l.29 I am also not impressed by the cold extremes in France and the British Isles, especially with the non-linear behaviour there.

p.12 l.19 Can you make the connection between the "attribution of extreme weather events" and "seasonal temperature in the upper tercile" more explicit? What are the reasons to assume that if the model is reliable in the latter it is suitable for the former?

p.12 l.20 It is not clear to me whether these reliability diagrams are computed using all grid points in the region, as the Met Office group does, or using the area-averaged value for the region. Please clarify.

Fig.13 Please explain the difference between the red and green dots.

p.12 l.31 How does this assessment that the model performs well after calibration compare to publications that w@h1 and other RCMs are very poor at simulating trends in heat waves (Min et al, 2013; Sippel et al, 2016)?

p.13 l.6 "For low summer precipitation (Fig. 15), the reliability is found to be rather good in IP, AL, EA, ME" I do not see that by eye. Please use a more objective criterion, such as the fit by Weisheimer and Palmer (2014).

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p.13 l.15 "Therefore, these results may be dominated by the long-term trend arising from increased greenhouse gas concentrations," This is fairly certain, as seasonal predictability in Europe is dominated by the trend.

p.14 l.30 "Overall, weather@home is an excellent tool for the investigation of extreme weather events." should read "may be a useful tool if proper bias corrections and other caveats are taken into account". As with every climate model.

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