Geoscientific
Model Development
Discussions

Interactive comment on "Changes in regional climate extremes as a function of global mean temperature: an interactive plotting framework" *by* Richard Wartenburger et al.

Richard Wartenburger et al.

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Comments from referee RC1 and author's response

Minor points

- The breakdown of the importance of multi-model variability and internal variability is not particularly meaningful. The authors compare an ensemble of r1i1p1 members, with an ensemble using all initial condition members from all models. Un- surprisingly, the results are very similar, as one would expect both ensembles to be subject to both initial condition and structural uncertainty. Perhaps a more meaningful comparison

would be to look at the spread in initial condition members from a single model version, where a significant sample is available - this would give a more mean- ingful interpretation of what fraction of the multi-model spread is due to initial condition variability alone.

We choose to show the ensemble spread as a combined effect of structural uncertainty and initial conditions from all models, as we would like to show the magnitude by which the overall spread (based on all models) is influenced by the number of model runs used. We could of course also pick a single model with a sufficient number of real- izations, but then we would not be able to say whether the magnitude of this spread is a good estimate for internal variabiliy of models with an insufficient number of initial condition members nor could we say whether this spread dominates the magnitude of the inter-model ensemble spread or not.

- Section 3.1: would the authors like to comment a little on potential mechanisms for why different regions exhibit different gradients of response. The NEU response seems likely associated with polar amplification. Is the Amazon response typical of the tropics in general - or is there a particular feedback associated with this region?

Thanks for these suggestions. Although we do not intend to substantially extend the interpretation of our results, we added a few extra statements about the responses found in NEU and AMZ (see tracked changes document).

- Could the authors comment a little on how sensitive the 1.5 / 2 degree results are to the scenario chosen? Establishing whether there are significant differences in the dis- tributions of response using different scenarios in any regions arising from the method would be a useful result for the pattern scaling community which could be trivially as- sessed from the analysis already done here.

We agree that these results may be of interest for the pattern scaling community. We added two sentences (for the temperature and the precipitation based indices) stating by what degree the significance of the differences of 1.5 vs. 2 degree is dependent on

the scenario (see tracked changes document).

- the shaded regions in Figures 7/8 are a little confusing, and could do with a little more explanation. Presumably - discontinuities arise because some models never reach some levels of warming in some scenarios, but the fact that the number of models change along the x-axis makes the grey bars difficult to interpret. Are some of the apparent nonlinearities mainly due to the fact that the ensemble sample is changing along the x-axis?

The reviewer is right, the apparent discontinuities in the shaded areas arise from individual models that do not reach a specific level of warming. We still prefer to show ΔT_{glob} of up to $6°C$ to also include models that predict very strong warming and to see the entire range. The spread always has to be interpreted as a spread in both ΔT_{glob} and ΔI. This is explained on page 5 lines 26f. We were asked by reviewer 2 to add a Figure showing the number of models simulating specific levels of global mean temperature, which we have added to the appendix.

Author's changes

Please find attached a marked-up version of the manuscript with all changes highlighted.

Please also note the supplement to this comment:
https://www.geosci-model-dev-discuss.net/gmd-2017-33/gmd-2017-33-AC1-supplement.pdf