

# ***Interactive comment on “Changes in extremely hot days under stabilized 1.5 °C and 2.0 °C global warming scenarios as simulated by the HAPPI multi-model ensemble” by Michael Wehner et al.***

**Anonymous Referee #1**

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## GENERAL COMMENTS:

In this manuscript, Wehner et al. use a novel set of climate model ensembles to compare extreme temperatures under scenarios with 1.5 and 2 degrees of stabilized warming. I think this manuscript presents a useful and relevant assessment of the differences in a metric of extreme temperatures between the two scenarios, but would benefit from additional explanations, particularly of the methods.

## SPECIFIC COMMENTS:

- In the abstract, I think it would be worth mentioning the range of increases compared to the All-Hist scenarios as well.

## Interactive comment

- Lines 72-75: Is the prescribed SST field determined from the CMIP5 ensemble mean?
- Lines 144-146: I'm having trouble seeing the importance of this sentence.
- Can the authors expand the explanation of the benefit of using 3-day averages?
- In line 163, it is mentioned that the 20 year return values of TX3x are estimated "using a block maxima technique", but as the TX3x values are block maxima, this description provides little information. It would probably be better to say "using the Generalized Extreme Value distribution" instead.
- It was not clear how the ensembles contributed to the values calculated and plotted in this paper. Were the block maxima pooled across the realizations before fitting the GEV distribution or are the ensemble mean return periods plotted? Additionally, it would be helpful if the number of values used to fit the GEV distributions were stated.
- Line 190: The first paragraph of the Results section can be removed, as much of this seems confusing and distracting and the relevant information is presented again at the beginning of the next paragraph.
- In all of the six-panel figures, the authors should make a distinction between CESM and the HAPPI models. I accept an argument for including the CESM model information, but these simulations are not directly comparable to the others.
- Line 233: Perhaps mention the later discussion of the changes in mean vs extremes.
- For Figure 6, the caption description does not match what is listed in the text (at line 362), which causes confusion in the understanding of what is being plotted.
- Line 419-420: Has this been tested? If not, perhaps rephrase to present this statement with less confidence.
- The "Conclusions" section is lengthy and presents new ideas/results. I would suggest moving some of this to the "Results" section or renaming this as the "Discussion" and presenting a summary of the main points in the "Conclusions."

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- It would be interesting to see the difference between the 2C and 1.5C scenarios relative to the difference between the 2C and the present. That is, what fraction of the increase with the 2C scenario occurred after 1.5C?

- What role might model resolution play in the comparisons of extreme temperatures between models?

#### TECHNICAL COMMENTS:

- I recommend changing “apparently contradicts” in line 406 with “would seem to contradict”, given the statement in lines 416-417.

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