

## ***Interactive comment on “Representation of climate extreme indices in the coupled atmosphere-land surface model ACCESS1.3b” by R. Lorenz et al.***

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1. Statistical significance of biases and resolution of comparison: We agree that it is useful to know which biases are significant and which are not. We performed a modified t-test, as described in Zwiers and von Storch (1995), to indicate which biases are statistically significant and updated plots 1c, 2c, 3c. We tested the biases of daily maximum temperature ( $T_{MAX}$ ), daily minimum temperature ( $T_{MIN}$ ) and total precipitation for statistical significance since these are the underlying data for the extreme indices. We note that the observations and model results are compared on the same resolution (the lower of the two). In most cases this is the resolution of the ACCESS run ( $1.25^\circ \times 1.875^\circ$ ), only GPCP and HadGHCND

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have a lower resolution than the model and we regridded the model output correspondingly ( $2.5^\circ \times 2.5^\circ$  for GPCP and  $2.75^\circ \times 3.75^\circ$  for HadGHCND).

2. PDF's in Figs. 9, 10: We agree that the text lacks detail in how we calculated these PDF's and we added more information in the manuscript. We added a section “2.3 Statistical Methods” which also describes the significance testing mentioned above. The PDF's are based on  $T_{MAX}(\text{time, lat, lon})$ ,  $T_{MIN}(\text{time, lat, lon})$  containing monthly means for the time period 1951–2011 for the corresponding season and region. We use R's kernel density function, using the default Gaussian smoothing kernel and a bandwidth estimated via Normal Reference Distribution (using a well supported rule-of-thumb which defaults to 1.06 times the minimum of the standard deviation and the interquartile range divided by 1.34 times the sample size to the negative one-fifth power unless the quartiles coincide when a positive result will be guaranteed). For the calculation of the skill score we used a bin size of  $0.5^\circ\text{C}$  as in Perkins et al. (2007).
3. Abbreviations: We agree that the manuscript contains a lot of abbreviations and followed the reviewer's suggestion to improve the readability of the text. We indicate variables in italic, expand the subregions and provide a table with the datasets used.
4.  $T_{MAX}/T_{MIN}$  : Thanks for this comment, we removed all occurrences of this confusing notation and changed it to  $T_{MAX}, T_{MIN}$ .
5. NCL: We included the full name of NCL to make this clearer.
6. Rx5day: we included the definition of Rx5day in the Table 1.
7. “all regions bar North America”: we rephrased the text to “all regions except North America”

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8. Figs. 4,5,6,7,8: we optimized the plot areas similar to the other figures and followed the reviewer's suggestion to remove the unnecessary subtitles.
9. Figs.9,10: We removed  $T_{MAX}/T_{MIN}$  from the x-axis

## References

Perkins, S.E. et al., 2007. Evaluation of the AR4 Climate Models' Simulated Daily Maximum Temperature, Minimum Temperature, and Precipitation over Australia Using Probability Density Functions. *Journal of Climate*, 20(17), pp.4356–4376.

Zwiers, F.W. and von Storch, H., 1995. Taking Serial Correlation into Account in Tests of the Mean. *Journal of Climate*, 8, pp.336–351.

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