

Thank you for this second revision and the very detailed answers. It has improved significantly the quality of the manuscript and the figures.

I would still like to address again some of the remarks for minor corrections, in order to ensure the clarity and reproducibility of the work. See detailed answers to the authors below.

Note that the light green color in the answers to the reviewers is very difficult to read, please consider a darker color, e.g. PineGreen ([Using colors in LaTeX - Overleaf, Online LaTeX Editor](#)).

Moreover, the figuresizes are very big: the manuscript pdf freezes when passing through a figure. Please consider reducing the size of the figures to make the readers experience smoother.

Thank you.

Answers to Authors :

- Remark 1. and remark 2. -> please adjust the manuscript so that these points are clear for the reader
- 4 : please update the manuscript with all the updated versions of the figure. E.g. Figure 2 is still the old figure in the manuscript (please check all the others)!
- 5 : *“on WRF-CCSM daily temperature data across historical (1995–2004), mid-century (2045–2054), and late-century (2085–2094) periods”* this sentence has not be included in the abstract as was said in the answer.
- 6 : please merge the answer to remark 5 in this paragraph (see comment above)
- 7 : Thank you for the answer. Is it possible to point out the main limitation (the computational costs of EMD ?) in the abstract ? It helps the reader to have a clear idea of the limitations of the methods.
- 15: add the reference to the new figure 2 (with the steps of the method)
- 19: Please clarify the manuscript so that the reader understands that only the atmospheric part was downscaled in WRF (correct?). This answer can be adapted and used in the manuscript : *“CCSM4 is a coupled global climate model incorporating an ocean component, whereas the regional WRF simulations we use are atmosphere-only. WRF uses the boundary conditions and prescribed sea-surface temperature fields supplied by CCSM4, and couples internally to the Noah land-surface model”*
- 17 and 23: please clarify the manuscript so that the readers understands that while reading using the answer *“We use the 1995–2004 WRF-CCSM regional simulation because it supplies a publicly accessible, high-resolution (≈ 12 km) North-American temperature field that has already been thoroughly vetted in the literature. The product is comparable in spatial detail and quality to NA-CORDEX and is hosted on the ClimRR platform, which ensures straightforward community access. This well-validated data set gives us a solid testbed for*

developing and illustrating the EMDBC bias-correction method without introducing additional uncertainty from a less-studied model archive.”

- 28: Please clarify the manuscript and add what is explained here :” To gauge how well each method would behave in such a setting, we carry out a split-sample experiment: the Livneh–WRFCCSM record is divided into a calibration period (1995–1999) for estimating the transfer function and a validation period (2000–2004) that serves as a pseudo-future for benchmarking the corrected output. „
- 32: please clarify the manuscript “We use the subscripts “ p ” and “ o ” consistently to distinguish model projections from observations ».
- 34: “which we will cite in the revised manuscript” -> indicate how it was included in the manuscript.
- 35: clarify the manuscript
- 36: add the reference to the Appendix A in line 153. + add details given in the answer to clarify the manuscript : ” ‘Mode mixing’ is an artifact of EMD where one IMF includes oscillations from very different frequency ranges or a single physical mode is split across several IMFs. This happens when the original signal contains intermittent or abrupt changes, which causes the spline envelopes used in EMD to misassign local extrema. The issue is well known in the EMD literature, and the ensemble EMD method proposed by Wu and Huang (2009) offers a practical remedy. EEMD adds small independent white-noise realizations to the signal, performs EMD on each noisy copy, and then averages the resulting IMFs. The added noise encourages the envelopes to sample the time–frequency space more uniformly, while the ensemble average removes the noise itself, which significantly reduces mode mixing.”
- 40 : add the maximum value and how the number is set ?
- 41 : in the Appendix it is written “In our experiments, setting $\delta_{\min} = 0.2$ and $\delta_{\max} = 0.8$ yielded satisfactory results” -> define “satisfactory”
- 47 and 49 and 50: why not clarify the manuscript using “The thresholds $\delta_{\min}$ and $\delta_{\max}$ are hyper-parameters tuned by split-sample cross-validation: we divide the historical period into two halves (as in our main validation setup), generate IMFs on the training and validation split, and select the thresholds that yield both stable IMF separation and good bias-correction skill on the second half” ? How is “stable IMF separation” and “good bias-correction” define?
- 48: thank you for sharing that, please also consider adding that to the appendix.
- 57, 58, 60, 61: why not include this answer within the manuscript for clarity?
- 59: also here, why not include this answer within the manuscript for clarity?
- 66: also here, why not include this answer within the manuscript for clarity: “For each plot, the boxes span the interquartile range (25-75 percentiles) of the metric across all grid cells in

that region; the horizontal line inside each box marks the median; whiskers extend to $1.5 \times$ IQR; and individual dots represent grid cell outliers beyond the whiskers.”

- 67: also here, why not include this answer within the manuscript for clarity?
- 71: also here, why not include this answer within the manuscript for clarity?
- Fig 3 and 4 : it is not clear if why if QMD refers to a bias correction with only QDM or with EMDBC using QDM.
- 79: it is on a specific example. The word “demonstrate” seems too strong.
- 80: please clarify in the manuscript
- 81: The comment was on making the plot easier to understand for the user (and not plotting timeframes in separate new subplots). First suggestion: change colors so that it is not a single continuous color (light to dark browns) but rather 3 different color types: Livneh (e.g. blue) – historical (e.g. browns) – projection (e.g. greens). Second suggestion: similar to plots 14., 15., 16. -> add 2 spaces between Livneh – historical and between historical – projections.
- 92: thank you. However, in <https://github.com/jeremyfifty9/emdbc> there is still only 1 plot shown. Why not add the Fig 2 ?