Reply to Referee #2 comments on "Daytime-only-mean data can enhance understanding of land-atmosphere coupling"

Zun Yin on behalf of co-authors

The authors have improved their manuscript and have mostly addressed my earlier criticisms; I do not need to see the manuscript again. This said, I think they should do a little bit more to address the potential limitations of the quantile approach. (See my previous review.) Much of their response-to-reviewers was written to convince me of why their approach is valid without actually transferring equivalent arguments to the text. The paragraph that is added ("The TLMs are designed to highlight…") provides a justification for the approach but doesn't really address any pitfalls. As a reviewer, I represent the general reader who will likely still have the same concerns. As the text is currently written, for example, the general reader will still be wondering if a more regionally limited quantile analysis would give different results.

AR: Thank you so much for taking the time to do the second round review. And we are glad to know that our responses have addressed your major concerns. We apologize for overlooking several key contents of our previous responses in the revision. In the new revision, apart from several minor revisions of the contents, we mainly improved the introduction and the discussion regarding quantile analysis. Via testing the quantile analysis at different regional scales, we demonstrated why the results in this study can avoid potential pitfall due to quantile analysis.

In the methodology, we explicitly explain why the quantile analysis, which has been widely used in different fields, is a suitable tool for the specific situation, as (Line 100 to 105) "The quantile approach can reflect the spatial patterns of TLM and provide the possibility of pattern comparison between TLMs based on different inputs. Other climate-relevant studies have also successfully utilized the quantile approach to compare estimates based on different algorithms. For example, because satellite-based and modeled estimations are not suitable for direct comparison with gauge measurements, the quantile approach was employed for relevant bias correction or downscaling in the form of probability density functions (PDF) Guo et al. (2018); Vrac et al. (2012); Xie et al. (2017)."

In the result section, we compare regional and global TLM diagnostics to demonstrate the consistency of the results based on the quantile analysis, as (Line 220 to 228) "While Figures 2b and 2c provide information pertaining to the sensitivity of Figure 2a to different threshold values, supplementary Figures S2 and S3 provide evidence that confining the analysis to smaller regions (i.e., extratropics and North America) does not substantively alter the results presented in Figure 2a. Generally, there are no significant differences in the spatial patterns of strong TLM values in the Northern Hemisphere during the strongly coupled seasons (MAM, JJA, and SON) when the analysis region is the entire globe (Supplementary Fig. S2c, S2d, and S2g) or is limited to just the Northern extratropics (Supplementary Fig. S3c, s3d, and S3g). Some differences emerge in DJF because L-A coupling is weak in Northern Hemisphere in winter. The quantile analysis at the global scale can help us to ignore those

weakly coupled regions. All in all, Figures 2, S2, and S3 demonstrate that the key results based on the quantile analysis are not particularly sensitive to changes in the analysis region or the quantile threshold." The attached two figures has been added to the online supplementary materials as Figure S2 and S3.

References

Guo, L.-Y., Gao, Q., Jiang, Z.-H., and Li, L.: Bias correction and projection of surface air temperature in LMDZ multiple simulation over central and eastern China, Advances in Climate Change Research, 9, 81–92, https://doi.org/https://doi.org/10.1016/j.accre.2018.02.003, including special topic on China Energy Modeling Forum, 2018.

Vrac, M., Drobinski, P., Merlo, A., Herrmann, M., Lavaysse, C., Li, L., and Somot, S.: Dynamical and statistical downscaling of the French Mediterranean climate: uncertainty assessment, Natural Hazards and Earth System Sciences, 12, 2769–2784, https://doi.org/10.5194/nhess-12-2769-2012, 2012.

Xie, P., Joyce, R., Wu, S., Yoo, S.-H., Yarosh, Y., Sun, F., and Lin, R.: Reprocessed, Bias-Corrected CMORPH Global High-Resolution Precipitation Estimates from 1998, Journal of Hydrometeorology, 18, 1617 – 1641, https://doi.org/10.1175/JHM-D-16-0168.1, 2017.

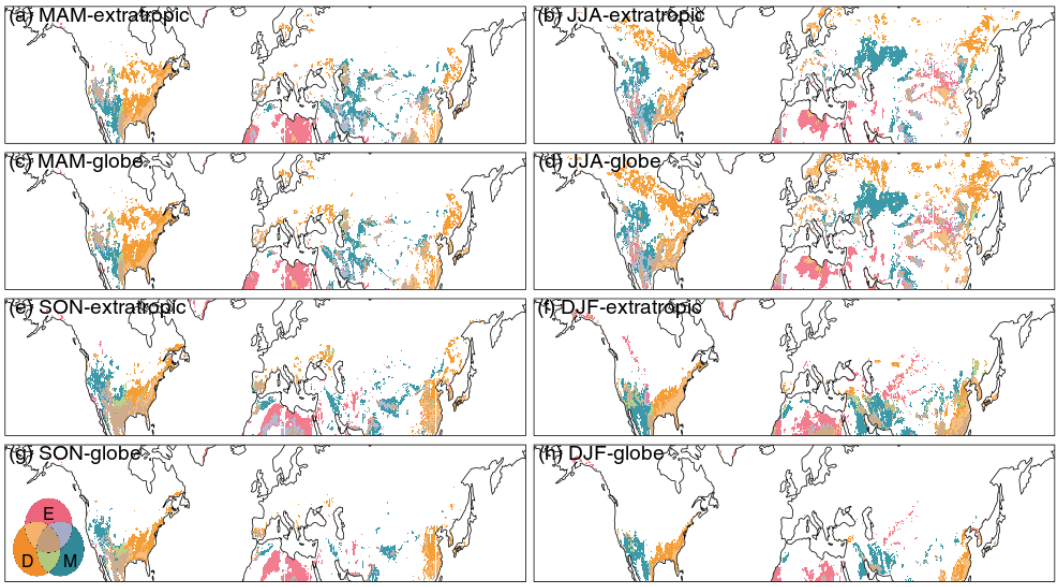

Figure R1. Spatial patterns of significant $\mathcal{A}_{\mathrm{M}}$, $\mathcal{A}_{\mathrm{E}}$, and $\mathcal{A}_{\mathrm{D}}$ (top 10% quantile of absolute values) of different seasons in the extratropic region of the Northern Hemisphere. Euler diagrams show the colors for specific relationships (intersections, unions, or disjoints) among $\mathcal{A}_{\mathrm{M}}$, $\mathcal{A}_{\mathrm{E}}$, and $\mathcal{A}_{\mathrm{D}}$. (a), (b), (e), and (f) are screenshots from the global quantile analysis. (c), (d), (g), and (h) are based on quantile analysis of the illustrated region.

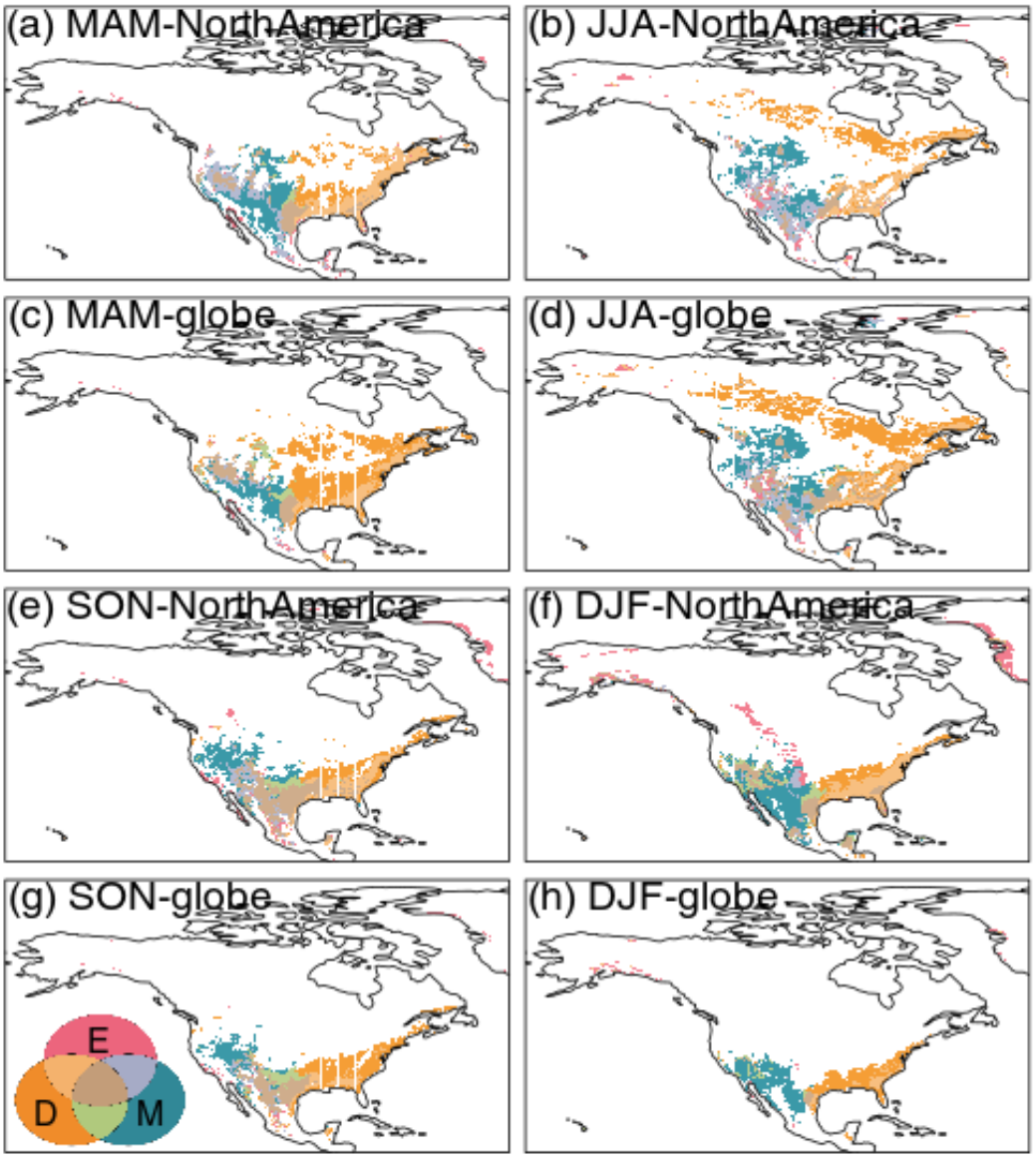

Figure R2. Spatial patterns of significant $\mathcal{A}_{\mathrm{M}}$, $\mathcal{A}_{\mathrm{E}}$, and $\mathcal{A}_{\mathrm{D}}$ (top 10% quantile of absolute values) of different seasons in the North America. Euler diagrams show the colors for specific relationships (intersections, unions, or disjoints) among $\mathcal{A}_{\mathrm{M}}$, $\mathcal{A}_{\mathrm{E}}$, and $\mathcal{A}_{\mathrm{D}}$. (a), (b), (e), and (f) are screenshots from the global quantile analysis. (c), (d), (g), and (h) are based on quantile analysis of the illustrated region.