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Earth System Dynamics
Discussions

Interactive comment on "Calibrating large-ensemble European climate projections using observational data" *by* Christopher H. O'Reilly et al.

Anonymous Referee #4

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This paper presents a novel study which attempts to create better projections by calibrating large ensembles over a calibration period where we have both observations and large ensemble simulations. This study investigates three methods of calibration and finds that while all methods perform well, no method performs substantially better than the others. They then show improvement by using a dynamical decomposition method.

They find that the calibration works much better for temperature than precipitation, and attribute this to the lack of clear forced change in the calibration period for precipitation. For temperature they find improvement for both large ensembles over Europe by using

this calibration method and find that it reduces warming as compared to the calibrated ensemble. I recommend publication with a few minor points to be addressed.

Minor points: Page 3 line 2 should be 'ensembles' Page 3 lines 27/28 MPI-GE is initialized from different years of a long pre-industrial control run, not in the same way as LENS Page 4 line 22 should be 'projections' Section 2.3.1 Are you results sensitive to the choice of reference period? For the dynamical decomposition can you explain why and how you use SLP? Pg 7 lines 7/8. Please explain what you mean by "The raw ensemble is clearly has a positive bias" Section 3.3 The explanation at the beginning of the section should be in Section 2.4

Additional studies that may be of interested: only cite if you feel appropriate. https://www.earth-syst-dynam-discuss.net/esd-2019-69/ https://journals.ametsoc.org/doi/full/10.1175/JCLI-D-16-0905.1 Deser, C., F. Lehner, K. B. Rodgers, T. Ault, T. L. Delworth, P. N. DiNezio, A. Fiore, C. Frankignoul, J. C. Fyfe, D. E. Horton, J. E. Kay, R. Knutti, N. S. Lovenduski, J. Marotzke, K. A. McKinnon, S. Minobe, J. Randerson, J. A. Screen, I. R. Simpson and M. Ting, 2020: Insights from earth system model initial-condition large ensembles and future prospects. Nat. Clim. Change, doi: 10.1038/s41558-020-0731-2. [SharedIt Link]

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