

Summary: The study investigates the impact of the Atlantic Overturning Circulation on the amplitude and covariance of continental temperatures over the past 1000-2000 years. It is based on comparison of simulations with a climate mode of intermediate complexity (iLoveclim), simulations with a few Earth System Models from the CMIP5 project, additional simulations with the CESM model, and proxy-based temperature reconstructions from PAGES-2K. The initial hypothesis is that the AMOC can impact the level of continental cross-correlation and explain why CMIP5 models tend to overestimate it. The authors conclude that the spread in correlations and amplitude of temperature variability is so large that it is difficult to prove or dismiss this hypothesis.

Recommendation: The manuscript is very well written, the research question is very clearly stated and the study, although in the end not conclusive, is useful on the way to pin down the real physical reason. I have a few comments that the authors may want to consider, but in my opinion, the manuscript can be published with very little changes.

General comment: I enjoyed reading this manuscript. As I wrote, the conclusions are not definitive, but the research questions and the experimental set-up are nice and the study is well conducted. Certainly, this study would be very difficult to conduct with a full fledged Earth System model, so that iLoveclim seems well suited for it.

Particular comments

1) line 136 'CMIP5 last millennium simulations that had all necessary variables available at time of writing on ESGF (Taylor et al., 2012, MRI-CGCM3, GISS-E2-R and MIROC5;)'

The sentence may be a bit uprising, as there are other past 1000 simulations. Perhaps it would be helpful to state that the critical variable is the AMOC index. Nevertheless, the MPI-ESM-P mode does provide this variable (see attached file).

Probably, it is not worth to repeat the calculations including this model, as the model spread is already large, but if the MPI-ESM-P model could have been included, the sentence should be amended.

2) line 148 a butterworth filter

Butterworth should be capitalized as it is the name of the scientist that designed this filter

3) Fig 2 correlations per continental time series

time series is also singular

4) line 205 Given that the impact of AMOC variability is mostly limited to the Northern Hemisphere (Figure 3), one could expect inter-continental temperature correlations between continents on both hemispheres to decrease with stronger AMOC variability (a negative slope in Figure 4), however, we do not find any such relationships, neither significant or non-significant.

This expectation assumes that the AMOC does have an impact on the southern hemisphere. If this impact is too low compared to other mechanisms of internal variability and to the impact of the external forcing, the correlations would be already too low to be able to further decrease.

5) line 305 4 Discussion Conclusion

Discussion and Conclusion

6) line 328with the magnitude of AMOC variability. Whether or not we correct for possible lead-lag relationships within the system has only a minor impact on these results.

I think the stop after 'variability' should be replaced by a comma.

7) Perhaps the authors can consider placing the results of Figure 1 and 2 within each continent on a global map. Not totally necessary but perhaps more useful

WCRP World Climate Research Programme

You are at the [ESGF-DATA.DKRZ.DE](#) node

Home [Technical Support](#)

Enter Text: [Search](#) [Reset](#) Display 10 results per page [More Search Options](#)

Show All Replicas Show All Versions Search Local Node Only (Including All Replicas)

Search Constraints: [CMIP5](#) | [past1000](#) | [mon](#) | [ocean](#) | [mstfmyz](#)

Total Number of Results: 2

-1-
Please login to add search results to your Data Cart
Expert Users: you may display the search URL and return results as XML or return results as JSON

1. **project=CMIP5, model=MPI-ESM-P, Max Planck Institute for Meteorology (MPI-M), experiment=last millennium, time_frequency=mon, modeling realm=ocean, ensemble=r11p1, version=20120625**
Description: MPI-ESM-P model output prepared for CMIP5 last millennium
Data Node: [esgf1.dkrz.de](#)
Version: 20120625
Total Number of Files (for all variables): 1051
Full Dataset Services: [Show Metadata](#) | [List Files](#) | [THREDDS Catalog](#) | [WGWT Script](#) | [Globus Download](#)
2. **project=CMIP5, model=MRI-CGCM3, Meteorological Research Institute, experiment=last millennium, time_frequency=mon, modeling realm=ocean, ensemble=r11p1, version=20140306**
Description: MRI-CGCM3 model output prepared for CMIP5 last millennium
Data Node: [esgf-data1.diasjp.net](#)
Version: 20140306
Total Number of Files (for all variables): 1398
Full Dataset Services: [Show Metadata](#) | [List Files](#) | [THREDDS Catalog](#) | [WGWT Script](#) | [LAS Visualization](#)

Project: CMIP5 (2)

Product:

Institute:

Model:

Experiment: past1000 (2)

Experiment Family:

Time Frequency: mon (2)

Realm: ocean (2)

CMIP Table:

Ensemble:

Variable: mstfbarot (2) mstfmyz (2)