

## Reviewer #2

I am unable to do a review of this paper and I am honestly very surprised to see a positive assessment from Anonymous Referee #1 because the paper lacks the Methods section. Maybe they had access to a different version of the paper than the one that is available online on this page?

The paper goes from the first section “Introduction” to the second section “Results” and the reader has no clue where the methods are. In fact, I was not able to find “Methods” in this paper and I have no idea which model simulations are used here. At some point at line 80 I am told to look at table C1 where the list of CMIP6 models would be found. Regrettably, here too I can’t find what experiments are analyzed here, just a list of ensemble members. Perhaps historical since it’s written in the title?

We apologize for the lack of a methods section – we will add a new one.

The methods are as follows:

- The simulations are indeed the historical CMIP6 simulations using the models and ensemble members from table C1.
- The time period is 1850-2014.
- The AMOC SST Index is calculated as the mean SSTs in the area between 41° and 60° N and 20° and 55° E, minus the mean global SSTs.
- The observational data is from the ERSSTv5 and HadCRUT5 datasets, and the uncertainty ranges are calculated from the uncertainty ensembles of these datasets following Ben-Yami et al. 2023.
- In the main text the CSD indicators are calculated in 60 year rolling windows.
- The restoring rate lambda is calculated by regressing the increments of the data against the data values using the GLSAR function from the statsmodel package in python, which is a Generalized Least Squares regression with AR covariance structure.

Ben-Yami, M., Skiba, V., Bathiany, S., and Boers, N.: Uncertainties in critical slowing down indicators of observation-based fingerprints of the Atlantic Overturning Circulation, <http://arxiv.org/abs/2303.06448>, 2023.

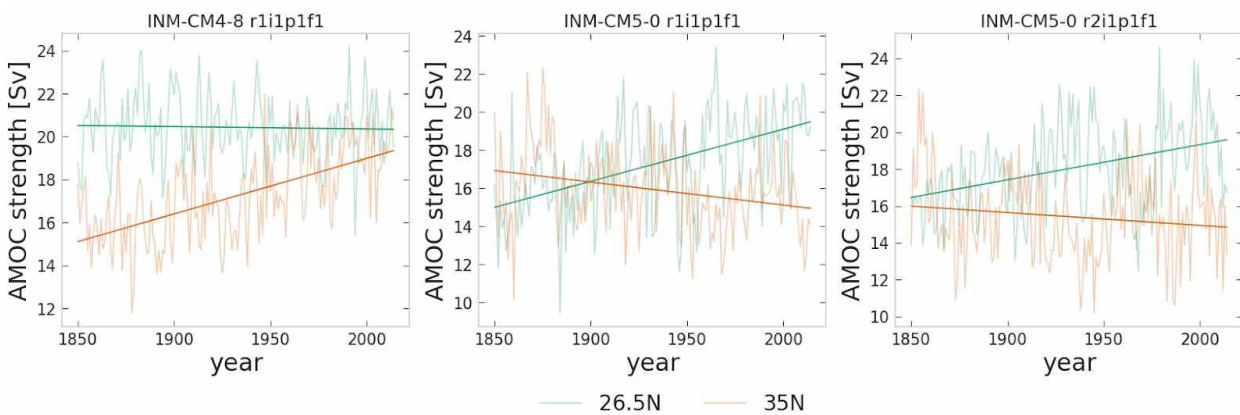
Here is a partial list of comments, but honestly I wasn’t able to progress much into the paper since I have no idea what data are being analyzed here:

L24: remove “Roughly” from here

Done.

Fig. 1: how do you explain the outliers here? The INM models? What does the streamfunction look like for the two models?

As far as we can tell, there is nothing unusual about these model time series – there’s simply a different trend for the stream function at the different latitudes (Fig. R1). This is definitely something worth investigating, but an in depth analysis of the INM models is beyond the scope of this paper.



Fig

ure R1. AMOC timeseries of the three INM model ensemble members that are outliers in Figure 1 from the main text. The faint green (orange) lines are the timeseries of the AMOC at 26.5°N (35°N), and the solid straight lines are the fitted linear trends whose slopes are plotted in Figure 1 from the main text.

Fig. 2: not having a Methods section make this plot unreadable, what am I comparing models with? Which years are used for the observational data? Even without knowing what I am looking at, here there is nevertheless an important flaw: the fitted red slope is by eye influenced by outliers... you should present an analysis of linear fit that is not sensitive to outliers. Again not having methods for me it’s impossible to figure out what the black line and gray bands mean for observations.

Thank you for pointing this out – this figure is indeed difficult to understand without a methods section. The years for the CMIP6 models are 1850-2014, and in Figure 2 are the same for ERSSTv5. The grey band is simply the minimum to maximum trend range out of the 1000 ensemble members from the ERSSTv5 uncertainty array. We hope the new methods section will clarify these questions.