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Geoscientific Model Development Discussions

Interactive comment on "Towards an objective assessment of climate multi-model ensembles. A case study in the Senegalo-Mauritanian upwelling region" *by* Juliette Mignot et al.

Anonymous Referee #1

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General comments

In this paper, the authors develop a statistical method for assessing CMIP5 climate model simulations of upwelling in the Senegalo-Mauritanian upwelling region and briefly discuss future projections of upwelling from a subset of the best-performing models. The method for assessing the models appears sound and seems to produce acceptable results in evaluating the models. However, I found the description of the method and its application difficult to follow at some points, as detailed in the specific comments below. There are also a number of typographical, grammatical, and organizational issues which impede the reader's ability to interpret the writing at some points.

I have provided some specific comments on some corrections needed in the technical corrections section, but this is not an exhaustive list and the authors should carefully proofread the paper prior to submitted any revised version. Finally, there seems to be a mismatch in the wind data discussed in the Data section versus the wind data used to produce Figure 10, as detailed in the specific comments below. All of these issues should be corrected before any subsequent version of the paper can be evaluated.

Specific comments

Lines 22-23: Give a brief summary of the main findings on the future behavior of the Senegalo-Mauritanian upwelling in the abstract, rather than simply stating that the future behavior was assessed.

Lines 106-107: More detail is needed on the ERSST_v3b data set. How is this dataset produced, and why was it chosen as the "observation field" for comparison with the models?

Lines 112-114: Similar to the ERSST_v3b data set, please provide some additional detail on the QUICKSCAT (sic) product. And is this product actually used in the paper? In the caption for figure 10, the TropFlux data set is referenced rather than QuikSCAT in the discussion of the wind stress and Ekman transport (see comment on line 826), and there is no mention of QuickSCAT or TropFlux in the discussion of this figure in section 5.1. Additionally, "QuikSCAT" is the correct spelling of this satellite.

Line 118: Does "Sylla et al. (in rev.)" refer to the Sylla et al. 2019 Climate Dynamics paper, or another work? If this is another paper, it should be added to the reference list.

Section 3.2 (starting on line 168): It's not clear to me why the SOM classification followed by the HAC clustering was necessary. What is the reason for performing both classifications rather than just using one method or the other?

Lines 197-198: What is a "standard statistic algorithm"? Is this referring to the calcula-

tion of the standard deviation?

Section 3.4 (lines 255-330): Perhaps it is just my own ignorance, but I find figure 4 and the accompanying discussion quite difficult to interpret. What, conceptually, do the x and y axes and the grouping of the points on the plot represent? The description says that "proximity between a model and a region-cluster leads us to affirm that this region-cluster is well represented by that model", but the observations and the "highest skill" models 7 and 25 are far away from any of the region clusters. . .? And I think I understand that model 7 is considered as having good skill because it lies close to the "obs" point on the plot, but why is model 25 considered to have better skill than models 24, 19, 8, and 40, which are located a similar distance from the "obs" point as model 7? Have any previous studies used this method to assess the skill of models?

Line 826: What is the TropFlux data set? This needs to be described and its use justified in the Data section.

Technical corrections

The writing in this paper is frequently conversational in tone rather than technical, and there are many instances of imprecise filler words like "very", "pretty", and "nicely". In line 250, "let us say. . ." is a conversational phrase that is not appropriate to use in a scientific manuscript in this context. Also, the mention of "ongoing studies in our group" (line 527) is fine for a conference presentation but, in my opinion, is not appropriate to write in a scientific paper. Please proofread the paper and correct these and other such instances of informal language.

There are several excessively long paragraphs that are taxing on the reader. For example, the paragraph from lines 30-73 in the Introduction and the paragraph from lines 332-377 in section 4 are very difficult to read due to their length. Please break up and reorganize these and other long paragraphs.

There are a number of typographical and grammatical errors throughout the paper,

which impede its interpretability to the reader in some places. I have given a few examples below, but this is not an exhaustive list, and the authors should check the entire paper carefully for such errors in any subsequent versions of the manuscript.

- Title: Extra space after the word "in"

- I am not able to read the full "short summary" on the discussion paper web site, but the part I can see contains three misspelled words.

- Errors in capitalization of words (e.g. "Observation field" in line 108, seasonal "Cycle" in line 299)

- Lines 16-18: Abrupt shift from first-person to third person ("We used a neural classifier. . ." to "One can then determine. . .")

- Line 83: Typo ("lies at is the southern. . .")

- Lines 109-110: Typo ("were been regridded")

- Line 525: Typo ("costal" instead of "coastal")

Line 16: Typically self-organizing maps are described as an "artificial neural network" rather than a "neural classifier".

Line 21: What is meant by the phrase "performing multi-model ensemble"?

Line 26: CMIP5 stands for the "Coupled Model Intercomparison Project, Phase 5" (not the "5th Climate Model Intercomparison Project").

Line 383: Shouldn't this say "(Fig. 8, left)"?

Line 755: Figure 1 appears distorted and blurry in the PDF version of the paper. Please correct this figure to make it easier to read.

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