The authors would like to thank the reviewer for their feedback and comments on our manuscript. We have addressed all the reviewer comments. Below is our response detailing all relevant changes. The reviewer comments are presented in bold text followed by our response. The line number references included correspond to the revised PDF.

An aspect that needs further clarification is the transport bias. In your answer to my comment 3, you mentioned:
"We have removed the sentence in lines 365-367 of the original manuscript: "While the mean inter-annual flows are well represented in CARIB12, the model does not capture the same amplitude of variability that GLORYS12 suggests exists in some of the passages." But the sentence "While the mean inter-annual flows are well represented in CARIB12" is still in the revised version. I think this statement is not well supported. The mean annual flows in Table 4 clearly show significant differences between CARIB12 and GLORYS, and the temporal variability is not clearly reproduced. I think you should at least recognize the discrepancies in the mean transport and provide an explanation about the temporal disagreement between the time series of transport.

Thank you for the comments. While differences between CARIB12 and GLORYS are seen both for the time mean values and interannual anomalies, CARIB12 represents observed mean flows overall better than GLORYS (Table 4). Also, we cannot assess how the transports' variability in GLORYS12 (Figures 15 and 16) compares to the real ocean, as observations are limited.

In the revised manuscript, we clarify statements that are made regarding the comparison with observations versus GLORYS (for example, lines 407-410). Also, we provide a likely reason for the disagreement between CARIB12 and GLORYS (Lines 411-413).

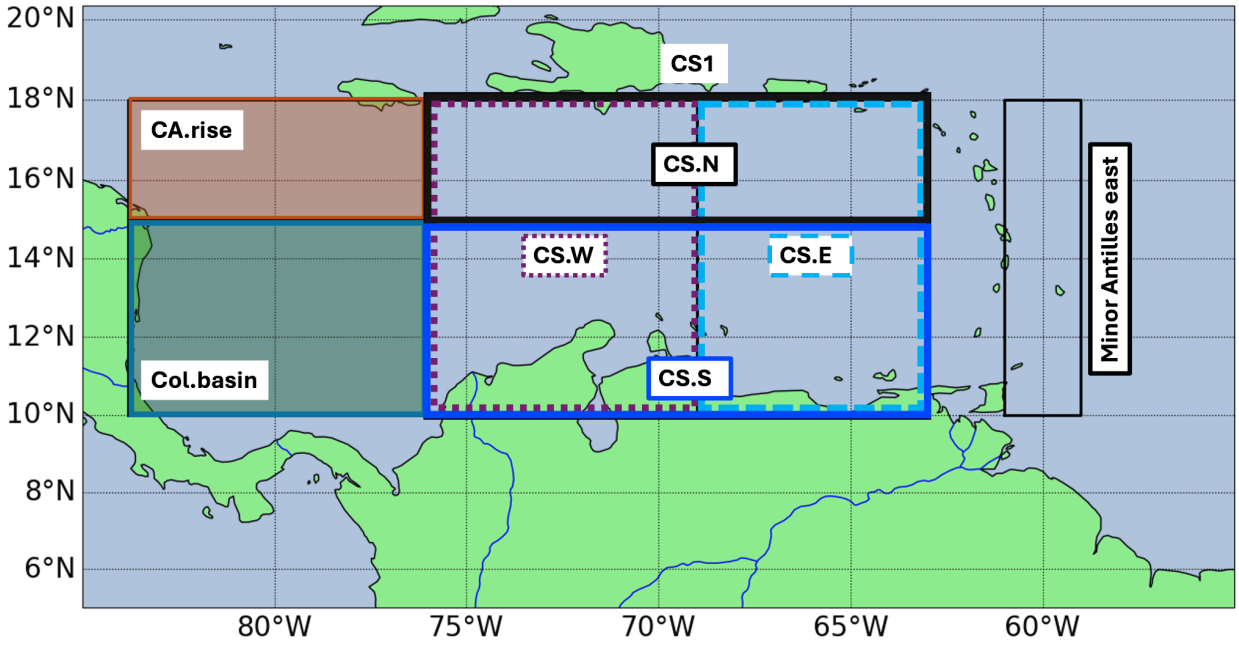
Line 408-409 "While the mean inter-annual flows are well represented in CARIB12…" has been rewritten as follows: "While the mean flows are well represented in CARIB12 compared to observations…"

Additional relevant changes are detailed below in response to other comments by the reviewer.

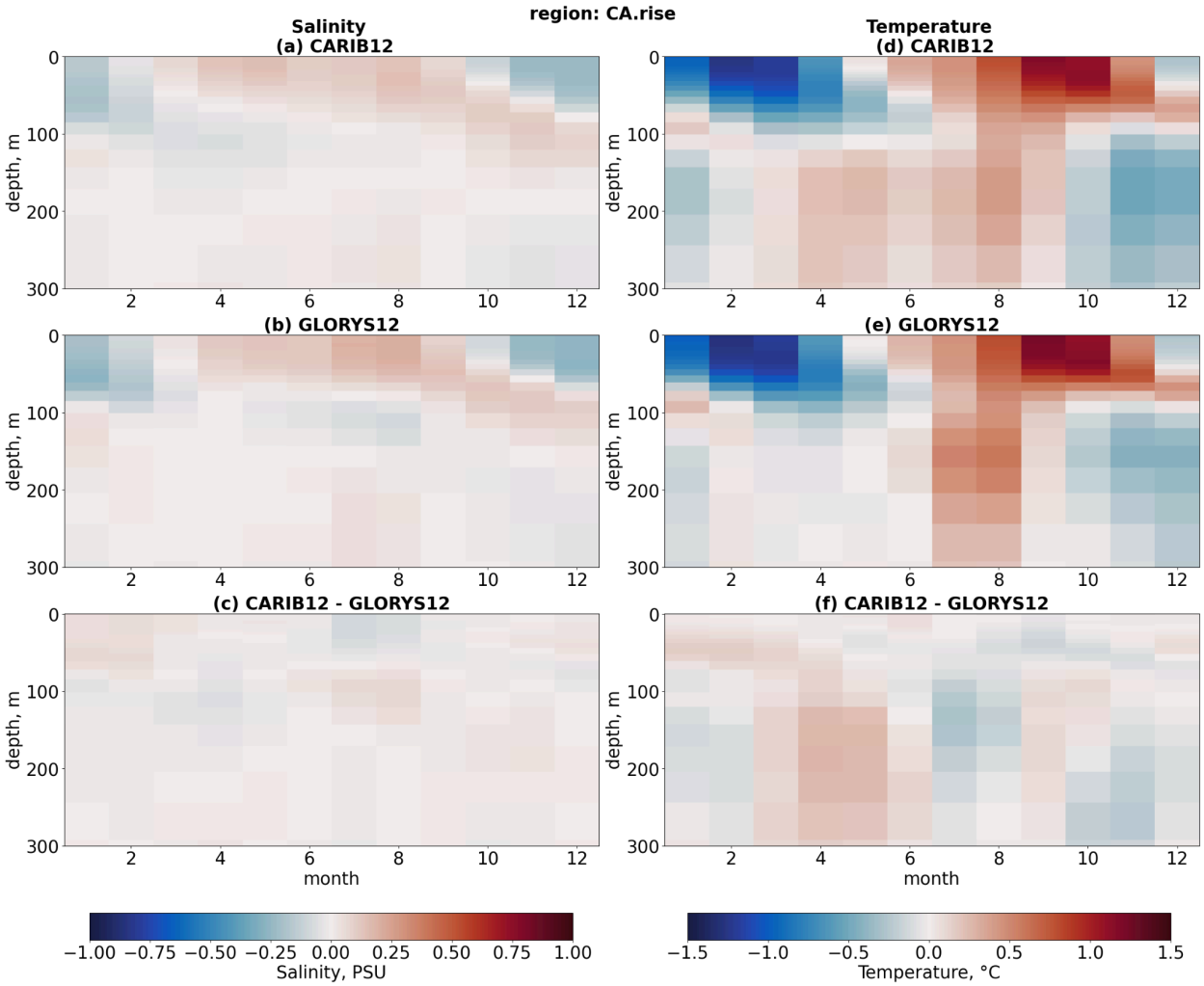
Another aspect is related to my comment 2, about monthly climatology for specific subregions. It is unclear to me what the motivation for defining the six subregions in Figure A5 are. Five of them are in the southeastern part of the Caribbean Sea, while none of them are in the northern and southwestern Caribbean Sea. Could you clarify please?

Thanks for your question. The main region of interest in developing this configuration is the region shown in the validation figures (line 192 and Figure 2, for example). The subregion named CS1 covers an important and large area of the region of interest. The sub-regions embedded in CS1 represent distinct geographical regions with particular oceanographic features and processes.

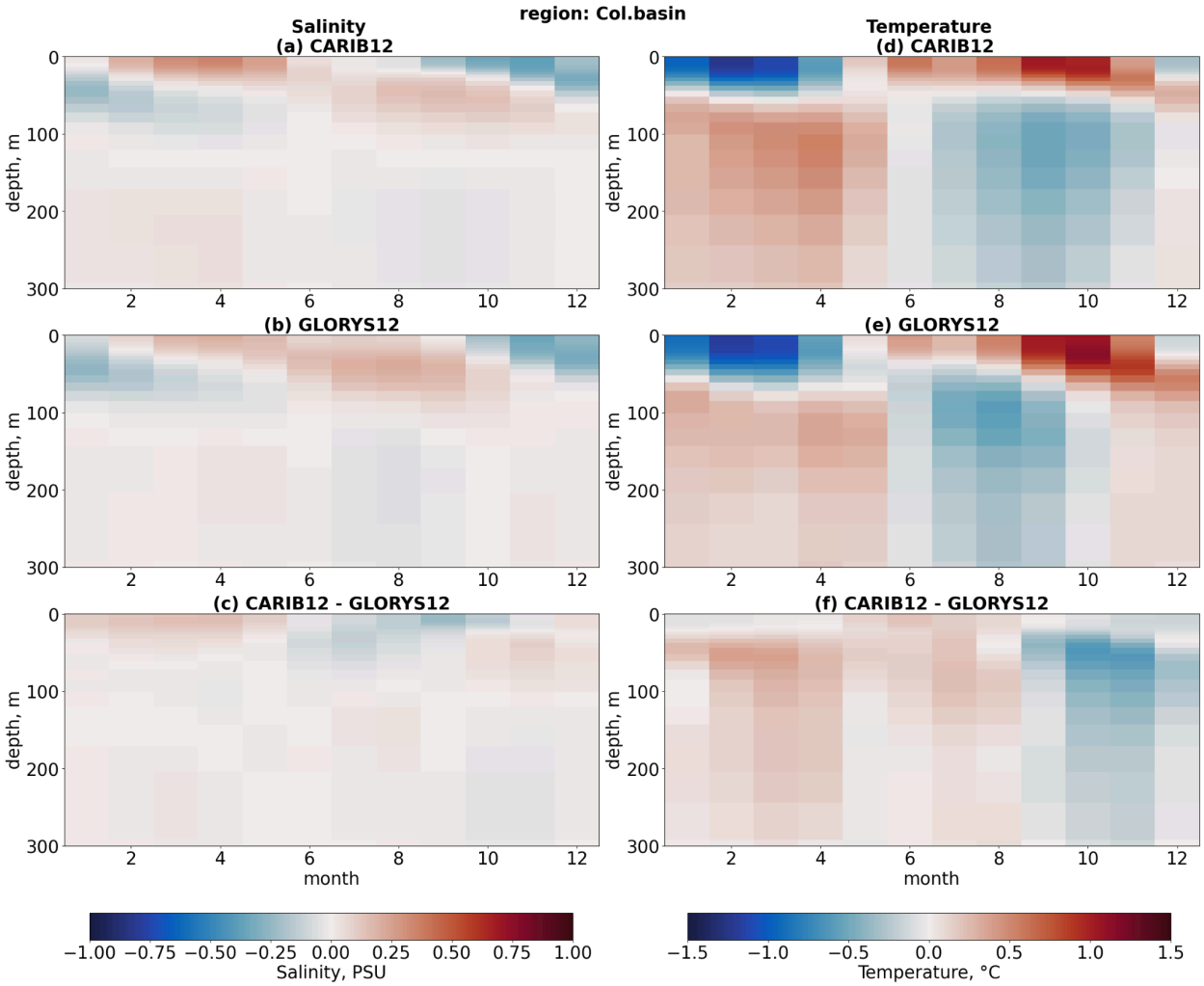
While not shown, we also validated other subregions within the domain shown in Figure A5 and outside of it. We have not included these figures in the manuscript as they show similar patterns and biases to other regions discussed. We include in the following example figures of the validation done for the Colombian Basin and the region around the Central American rise, along with a map showing these two regions.



Map showing additional sub-regions in the west/southwestern CS. Example figures for these subregions (Central American rise and Colombian basin) are included below. This figure is not included in the revised manuscript and is included here as a reference for the following two figures.



Validation of the salinity and temperature seasonal climatology within the Central American rise subregion. This figure is not included in the revised manuscript.



Validation of the salinity and temperature seasonal climatology within the Colombian Basin subregion. This figure is not included in the revised manuscript.

Specific comments are listed below.
15-17:
"We show that mean ocean mass transports across the multiple passages in the eastern Caribbean Sea compare favorably to observation-based estimates, but the model exhibits smaller variability compared to ocean reanalysis transport estimates"
CARIB12 underestimates the transport at Yucatan channel when compared to GLORYS and the longest observational record (Candela et al., 2019). Also, the overall comparison between ocean transport at the different passes does not show "minor" disagreements. That should be considered in the abstract. Maybe you could add "but the model exhibits smaller variability and underestimates total Yucatan channel transport when compared to ocean reanalysis estimates"

Thank you for your comment. Following the reviewer's suggestion we have added the following text to lines 15-16:

"...but the model exhibits smaller variability and underestimates the mean Yucatan channel transport when compared to observations and ocean reanalysis estimates."

17-19: You could be more concise about this CARBI12 vs CESM-1º comparison. Those are not surprising results.

Thanks for the comment. We have revised the text as follows (lines 16-19):

"Furthermore, a brief comparison against a 1º CESM global ocean configuration shows that the higher resolution regional model better represents the extent and seasonality of the Amazon river plume, hence better represents near surface salinity and mixed layer depth in the CS."

222-223: No need of a new paragraph here

We thank the reviewer for this suggestion. We have merged the paragraphs in the revised manuscript.

249-250: No need of a new paragraph here

We thank the reviewer for their suggestion. We have merged these two paragraphs in the revised manuscript.

250: The smallest biases => The smallest SSS biases

Thank you for the suggestion. We have added "SSS" in line 228 as suggested.

267-268: No need of a new paragraph here

Thank you for your suggestion. We feel splitting the paragraph here makes the reading easier. The first paragraph characterizes overall biases in surface speeds across the validation region, and the second paragraph characterizes particular features in the biases of the surface flows. The resulting paragraph following the suggestion would be long and splitting further down the paragraph would interrupt the flow of the description provided there. We have decided to keep the paragraphs here as they are.

273: "represents well the inflow" => "represents well the surface inflow"

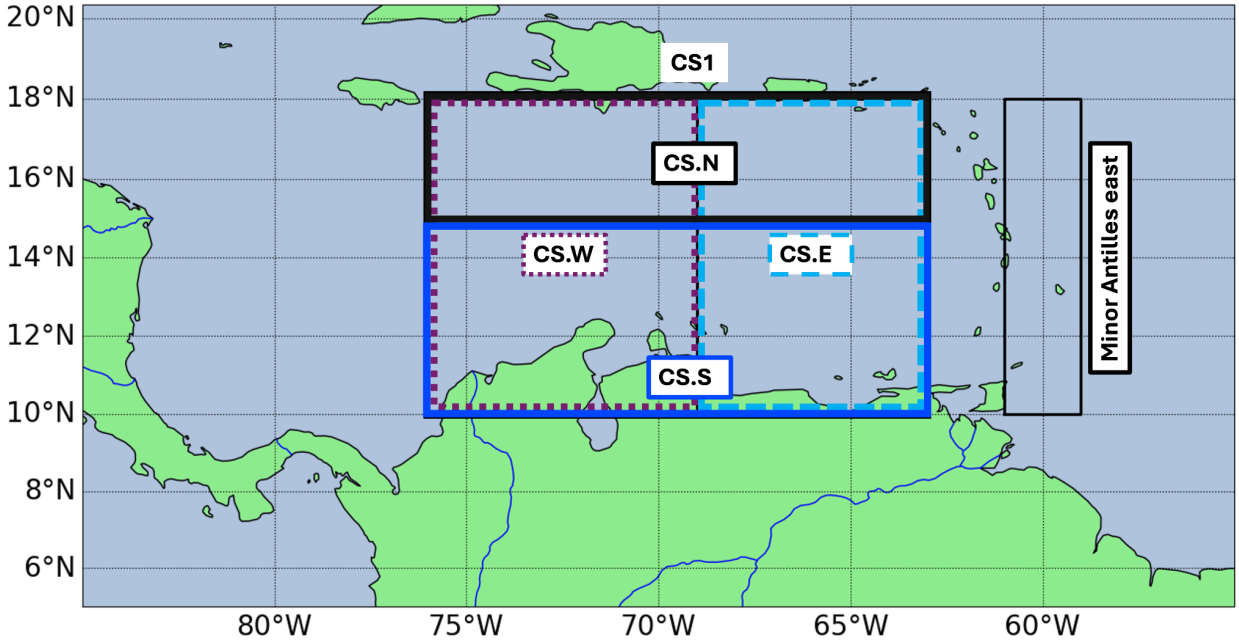
Thank you for your suggestion. We have edited line 252 to reflect this suggestion:

345: "Figure 4 shows" => "Figure 8 shows"

Thank you for pointing out this error, we have corrected this reference in line 315.

372: Figure A5: The borders of these overlapping regions are somewhat unclear. Maybe, you could depict with a distinct color each specific regional border. Also, you may want to provide a justification about why you are defining those regions. The selection of regions seems to me somewhat arbitrary, and not fully informative of the main interest region.

Thank you for the comment. The selection of the sub-regions presented in the manuscript and Appendix is representative of the main interest region for our work, indicated e.g. at line 192. We have reviewed Figure A5 following this and other comments by the reviewer. We also show examples of validations of additional sub-regions in a previous comment by the reviewer.



Updated version of Figure A5 in the revised manuscript.

371-378: No mention to Figure 12. Also, I am not convinced that you need to include three figures (Figures 10, 11, and 12) in the paper main body (which show very similar patterns) to describe the vertical variability of temperature and salinity at the seasonal timescale.

Thank you for the comment. The omission of Figure 12 was a grammatical error. We agree with the reviewer that the sub-regions presented (and other subregions not presented) show very similar patterns. We now moved Figures 11 and 12 to the Appendix, but we are keeping the text at Lines 342-349 describing reduced biases within the CS as that is relevant for the main region of interest in developing this configuration.

433-450: There is no mention to the evident weak correlation between CARIB12- and GLORYS-derived patterns at the intraseasonal and interannual timescales (Figures 15 and 16g-l). Something about this temporal mismatch should be added.

Thanks for the comment. Mismatches between CARIB12 and GLORYS12 mean transports and variability are described in section 3.4 (e.g. lines 368-369, 371, 380-389, 390-398, 399-400, and 407-409). In addition, in lines 409-415 we address potential differences in the models leading to these discrepancies. We also clarify that we cannot assess how real the variability shown in GLORYS12 is as the observational record for the passages in the eastern CS is short. We have rewritten lines 407-410 as follows:

“While the time mean flows are well represented in CARIB12 compared to observations, the model does not capture the same amplitude and frequency in flow variability that GLORYS12 suggests exists in some of the passages at sub-seasonal and inter-annual time scales (Figures 15 and 16g-l).”

And in line 413:
“Continuous observations would be needed to better assess how CARIB12 and GLORYS12 represent variability across timescales…”

442: “While the mean inter-annual flows are well represented in CARIB12”. This statement is not supported by Table 4. The differences between the CARIB12- and GLORYS-derived transport are not minor.

Thanks for your comment, We have addressed this in the reply to a previous comment.

481-482: You could insert this statement in section 3.1, maybe including an additional Figure in the Supplement. Otherwise, remove it.

Thanks for the comment. We have moved the statement to lines 283-284 under Section 3.1.2. While we do not include a figure regarding validation of tides given several limitations (resolution, topography, lack of filtering for additional contributors to water elevations), we believe the text in question could be useful to the reader and users of this and other configurations of CESM-MOM6.

482-483: As mentioned before, I disagree with this statement. You should recognize some discrepancies.

Thanks for the comment. We reworded the text in lines 425-426 as follows:

“The mean flows are also well represented compared to observations, but CARIB12 shows lesser variability when compared to GLORYS12 flows and underestimates the mean Yucatan channel transport.”

492-497: You should tone down this paragraph. There are important differences between the transport series from CARIB12 and GLORYS, in terms of mean variance as well as temporal correlation.

Thank you for the comment. The lines referenced describe what the model does well and doesn't do well in terms of the transports when compared to observations and GLORYS12. We have reworded the following lines (438-440) to address the reviewer's comment:

"The seasonal transports in CARIB12 compare overall well with the GLORYS12 reanalysis, yet GLORYS12 exhibits larger variability at sub-seasonal and interannual timescales."

514-517: You are attributing the biases mainly to two sources, but this is no supported by any analysis. If this is only speculation, I would use "might" instead of "can".

Thanks for the suggestion, we rewritten the sentence in line 452 as follows: "The main biases in CARIB12 may be attributed to two sources."