

## ***Interactive comment on “Air–sea CO<sub>2</sub> fluxes and the controls on ocean surface pCO<sub>2</sub> variability in coastal and open-ocean southwestern Atlantic Ocean: a modeling study” by R. Arruda et al.***

**Anonymous Referee #1**

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This manuscript describes a sensitivity analysis to figure out which processes predominantly affect surface-ocean pCO<sub>2</sub>. In general, I liked the results and discussion, giving a good overview over the respective roles of physical and biotic processes in the different regions. The text is well written and the study appears nicely designed and performed, although I have no experience with 3D biogeochemical modelling. I am unfamiliar with the statistical indicators used here to indicate model performance, which makes it very difficult to judge how well the model works. I also found the references and discussion of missing processes in the model somewhat confusing. I recommend that this should be published after revision.

I have only two major points for revision, but they are important:

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1. As stated above, I do not know the statistical indicators used by the authors, and these are not used in any biogeochemical modelling studies I am aware of. In addition, from the way they are used here, it appears that they provide only a very coarse qualitative assessment of model performance. Thus, I find these indices of no value here and would suggest to replace them with a Taylor diagram, which is more quantitative and would greatly facilitate the comparison with other modelling studies.

2. The authors describe several processes lacking in their model, e.g., rivers and tides (p. 7374 bottom to p. 7375 top). While I have no problem accepting this decision, I found the discussion somewhat confusing. On p. 7375, l. 8, it says that the "model results should not be significantly affected ..." but in the next sentence: "These processes will be implemented in future studies." This does not make sense to me: either these processes are (expected to be) important, then the authors should discuss the reasons why they expect that these processes do not strongly affect their present conclusions, or they are not important, then there is no reason to include them in future studies. For example, on p. 73887, l. 10, an expectation is expressed that including tides and rivers could help "diminishing the biases in the southernmost and La Plata regions", which seems to contradict the above statement. This should be resolved in a revised manuscript.

Some minor problems:

P. 7374, l. 21 "(CESM) climatological model product": a reference should be provided for this product.

On the ocean -> In the ocean (several places)

The axis and tick labels in all figures are much too small and should be increased to the font size of the main text.