

Interactive comment on “Air–sea CO₂ fluxes and the controls on ocean surface pCO₂ variability in coastal and open-ocean southwestern Atlantic Ocean: a modeling study” by R. Arruda et al.

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Review for Air-Sea CO₂ fluxes and the controls on ocean surface pCO₂ variability in coastal and open-ocean south-western Atlantic Ocean: a modeling study by Arruda et al.

The study by Arruda et al simulates, using a regional high-resolution ocean biogeochemical model in the south-western Atlantic Ocean, the ocean carbon cycle with the goal of exploring and quantifying the drivers of variability in the surface carbon fluxes at the seasonal timescale. As part of this they drive the model with SODA products, and boundary conditions from the CESM model.

C3826

This is a well-targeted study and the sensitivity experiments well thought-out and executed. The results are interesting, highlighting the importance of biological production on the shelf and the compensating role played by physical transport and solubility; surprisingly the role of air-sea CO₂ fluxes appears lower than what may have been initially considered. In particular the comparison of the open-ocean with the shelf waters are very interesting. Overall this is a well-written and structured paper than will be of interest to the carbon and oceanographic communities. There are a few minor issues, which will need to be addressed prior to publication, otherwise I recommended this paper for publication.

Comments: Title: The title (And abstract) should contain the term seasonal – as longer-term variability is not assessed here, nor could it be due to the experimental design.

P7372: line 11 acting -> acts

P7372, line 27: the reference to Takahashi et al (2002) seems to be referencing to coastal ocean, while this ref refers to the open-ocean. This should be rephrased.

P 7375, line 1-10: this seems better placed in the discussion

P7379, line 1-19: this evaluation is a bit unclear, the authors need to add a bit more information to the reader about what this means and what are the thresholds. Also please be consistent "reasonable/good" or "good/reasonable"

P73780 1-3: remove satisfyingly.

P7381, line 16: what is metabolic DIC? Clarify

P 7384, line 5 and after: I think it is actually Sea-air fluxes, not air-sea fluxes, please check this.

P7385, Section 4.4 This model only deals with seasonal variability, therefore any statements about this site, and what is simulated needs to be tempered with a caveat. Also a reference to Fig 1 is needed in this section.

C3827

Conclusion: in the methods a number of limitations of the modelling approach are highlighted, could the authors please make a comment on how these may modulate the results e.g. riverine input, large phytoplankton etc? Perhaps the implications of only addressing the seasonal variability also need to be considered (particularly as part of the paper deals with the Argentina OOI site – see above).

Table 1: If this table is from Gruber (2006), is it needed here?

Figure 2-3: consider a diff plot.

Figure 4: EKE is shown, but not really used in the text – is this the correct figure to show, given that the analysis does not explicitly deal with eddies?

Figure 12: I don't follow the figure caption, could it be clarified?

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