

Interactive comment on “Inter-annual variability of the carbon dioxide oceanic sink south of Tasmania” by A. V. Borges et al.

A. V. Borges et al.

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Reply to Referee #2

Referee comment : The manuscript entitled Inter-annual variability of the carbon dioxide oceanic sink south of Tasmania by A. Borges et al. reports and evaluates a pCO_2 data set, obtained from 22 cruises during more than 10 years. This in itself is a tremendous step forward as it provides insight into the carbon cycle variability on longer time scales. This in particular applies to the Southern Ocean, for which only very few data sets exist compared to other ocean basins. I am impressed by the data evaluation and the development of a conceptual model, explaining the fundamental functioning and the variability of the carbon cycle in the Tasman Sea. Relating large scale climate oscillation to relatively localized data appears to be a tricky issue, and Borges et al. definitively have

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succeeded here.

My only general comment on the paper is rather on the technical / editorial side: I think the paper is strong enough on its own, and does not need to continuously refer to other (modeling) studies to justify its findings. It should not be overlooked that this study finally provides data for model validation. This obviously is not a request to ignore other studies, I rather think that most of the findings are genuine considering the fact that the Borges et al. study applies a purely observations based approach.

By rewriting the text accordingly, which currently is closer to a technical report than to a scientific paper, the readability of the paper would substantially improve, and a dedicated discussion section still can acknowledge earlier work. Such a section could then highlight both the agreements and disagreements between the present and other studies leading into a nice and lively discussion. Both, agreements and disagreements currently tend to remain below the surface of the paper.

ALL figures except for 1 and 5 are far too small. They are unreadable in the print version, and only a little better in the screen version.

In conclusion I think, Borges et al. report an excellent data set and an excellent scientific evaluation, which doubtless deserves publication in BIOGEOSCIENCES. From the editorial or presentational point of view the paper the paper has more potential than the current version reveals.

Reply : We thank the reviewer for her/his encouraging comments and useful suggestions. We changed the structure of the text separating the results from the discussion. The Introduction was shortened to avoid repetitions with the Discussion. We kept the references to published modelling studies since we cannot ignore previous studies on inter-annual variability of pCO_2 in the Southern Ocean. If the ms is accepted, we'll

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make sure during proof-editing that the figures are readable in the final version of the paper.

Referee comment : Specific comments: Overall: The text reveals a tendency of too many acronyms. This hampers readability and might cause confusion here and there. I would for example suggest to spell out CS, except for the figures.

Reply : Some abbreviations (SST, SSS, pCO_2 , DIC) are universal in oceanography, others (SAZ, STZ) are universal in Southern Ocean studies. We decided to keep specific abbreviations like CS and F to alleviate the text.

Referee comment : Abstract: The abstract is very hard to read. I suggest a complete rewriting.

Reply : Abstract has been to a large extent rewritten based on more specific comments by the other reviewers.

Referee comment : Line 3 of abstract: please define the anomaly: is it annual, seasonal?

Reply : This has been clarified

Referee comment : Line 9: suppressed or depressed? This sentence is not to understand.

Reply : We replaced “depressed” by “reduced”

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Referee comment : Line 12: which trend?

Reply : We replaced “trend” by “pattern”

Referee comment : Introduction: Page 3641, line26 to page 3642 line 5: This means that the studies have had not tool at hand for validation. This opportunity is now provided by the present paper and data set, which is great.

Reply : We agree but since we are unsure if the reviewer wants the text modified, no action was taken.

Referee comment : Results: Line below equation 2: There is a lost -C-. It seems that it should lead into a reference of Copin-Montegut papers?

Reply : We agree. This was a modification introduced during the production stage by Biogeosciences.

Referee comment : Page 3646, line 3: There seems to be a sign (-) missing when specifying the anomaly?

Reply : Indeed. Text was changed accordingly.

Referee comment : Chapter 3.3: A longer section introducing the flux computations needs to be moved to the methods section.

Reply : Part of the section on the CO_2 fluxes computations was moved to the methods

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section.

Referee comment : Page 3649, line16-17: Please give annual flux values (as well).

Reply : Annual flux values are given at the start of this paragraph.

Referee comment : Pages 3651 lines 1-10: I would suggest to start with the own findings and then refer to recent work. This is not a review paper.

Reply : Indeed. Text was changed accordingly.

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