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Interactive comment on "Carbon cycling in the North American coastal ocean: A synthesis" *by* Katja Fennel et al.

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A note upfront from the submitting person: I am a master students in earth system science at the University of Zurich. The review was part of an exercise during a master level seminar. I would like to highlight that the depth of scientific knowledge and technical understanding of this review represents that of master student. I enjoyed discussing the manuscript in the seminar, and hope that our comments will be helpful for the authors.

The authors did a review to summarize the recent findings of costal carbon uptake and ocean acidification for the margins of North America. It was a part of an assessment for the 2nd State of the Carbon Cycle report (SOCCR-2). The following research questions

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were asked: “1) whether the costal ocean of North America takes up atmospheric CO2 and subsequently exports it to the deep ocean, and 2) discuss patterns and drivers of coastal ocean acidification”. In a first step the authors give an overview on the different carbon stocks that exist in the coastal waters and the mechanics that moves the carbon pools from one to another. Then the synthesis looks at the stock in different areas around the North American margin and their carbon fluxes. Fennel et al. also look at the overall up take of CO2 in the North American margins and the influence of the anthropogenic CO2 on it. Furthermore, the authors showed the acidification trend and the main driver for it. Fennel et al. concluded that in general the North American costa acts as a sink for atmospheric carbon. However, the authors also mention that there are large uncertainties and reginal variation. As for the acidification Fennel et al. concluded, that the North American costal water are below aragonite saturation and therefore, favoring dissolution. In general the synthesis gives an overview of the work that is done on the carbon fluxes and stocks around the North American costal ocean and therefore answers the question about the Carbon cycling in this area. The data that is shown in the review support the conclusion that Fennel at al. have made. The synthesis gives a good overview of the work that is done, however I have some concerns with this study:

The main concern is that there is no description of the approach to the review. For me it was not clear how the data was generated for Sections 3 and 4. I would suggest to see and follow the suggestions in the paper by Gurevitch et al. (2018) on how to do a systematic Review. These authors identified the four stages of the systematic review process (‘identification’, ‘screening’, ‘eligibility’ and ‘included’). I think if this this would be included in the review, it would help to improve it significantly because then the reader would know how the papers that were used in this synthesis were selected and analyzed, and it would make the review more reproducible. It would also highlight how complete is your review and give strength to the findings and gaps in knowledge identified.

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In my opinion Sections 2, 3 and 4 need some additional editing. Section 2 is confusing and needs some focus. It seems to me that it provides too many topics and the flow between them could be improved. In general, this section could go from the general overview to a more detailed view of the carbon fluxes, even consider removing the detailed mechanistic explanations and focus on sections 3 and 4 which are the ones that address your research question. This adjustment would improve the paper because it makes it easier for the reader to follow the study. Section 3 (page 6-17) is written quite differently from the rest of the text and this makes it difficult to follow the argument. For example Section 3.2 and 3.3 have the same structure and both section are clear verbalized so that the reader follows the main arguments easily. This is not the case for section 3.1 and 3.4. Section 4 (page 17): In all the other sections there was a short introduction before the subsection were addressed. I would recommend to do this here as well, because this would lead to a consistency in your paper.

In my opinion Section 3.4 (page 13-14) fails to address its stated purpose, and perhaps one of the goals of the review. This section was stated to review the fluxes that take place in north American oceans, but instead it does not mention the numbers of the fluxes that are shown in figure 3 (page 7) and gives more of an overview of how the fluxes mechanics are in the arctic region. I would suggest to remove general introduction to mechanisms and add more of an overview of the different fluxes.

Minor comments:

Page 1 – Is Figure 1 out of place? Why not combine it with Figure 3?

Page 3 lines 10-20 – I find this information too detailed for the introduction and would suggest to move it to section three or to a new section methods and study area section.

Page 4 line 3-15 – There are no references in these sections. I did not understand if this is a conclusion of yours or not. If not, could you provide some references?

Page 5 line 14-22 – There are no references in these sections I did not understand if

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this is a conclusion of yours or not. If not, could you provide some references?

Page 6 line 2-5 – There are no references in these sections I did not understand if this is a conclusion of yours or not. If not, could you provide some references?

Page 6 line 8-14 – This paragraph looks out of context here since it does not connect with the rest of this section. Maybe this part (page 6 line 8-14) could be added to page 2 line 3-7.

Page 6 line 18-19 – the authors state that the fluxes might not be comparable. I would suggest to add some information on how you interpreted these variable estimates from different methods.

Page 6 line 21-25 – There are no references in these sections I did not understand if this is a conclusion of yours or not. If not, could you provide some references?

Page 11 line 30 – is the unit of the 14 Tg C sink correct? If a flux shouldn't it be per unit of time? Figure 6 (page 19) – Why not making the figure a bit bigger?

Why is table 2 (page 36) is after the references? My guess is that the files got mixed up during the uploading.

References: Gurevitch, J., Koricheva, J., Nakagawa, S. and Stewart, G. (2018). Meta-analysis and the science of research synthesis. Nature, 555(7695), 175.

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