

Review on Carbonate system distribution, anthropogenic carbon and acidification in the Western Tropical South Pacific (OUTPACE 2015 transect), by Wagener Thibaut et al. for publication in Biogeosciences Discussions.

General comments:

The main goal of the manuscript is to report a new dataset of measurements of the carbon system for the western tropical South Pacific (OUTPACE cruise). The authors describe the distribution of the different variables along the OUTPACE transect highlighting the differences between the western (Melanesian Archipelago, MA) and the eastern (western South Pacific gyre, WGY) part of the transect. The authors also present results for derived properties (pH , Ω_{cal} and Ω_{ara}) of the carbon system and for anthropogenic carbon (C_{ANT}) that has been estimated by the TrOCA method. Making use of ancillary data, the authors present temporal changes in the properties (measured and estimated) observing: 1) a decrease in total alkalinity restricted to the MA area that disappears when using normalized alkalinity; 2) an "over accumulation" of total inorganic carbon and an increase in C_{ANT} (close to the thermodynamic value) in the upper thermocline waters; 3) a decrease in pH and shoaling of the aragonite saturation depth.

The dataset reported in the study is of high quality and without any doubt complements the decadal P21 hydrographic line. The manuscript is well written and ordered and the results are well presented. Nevertheless, I have some specific comments that need to be addressed before being considered for publication.

Specific comments:

Abstract:

Page 1, line 22. Eliminate "of" after C_{ANT} increases.

Page 1, line 23. "in C_{ANT} " instead of "of C_{ANT} ".

Page 1, line 24. " pH_T " instead of " pH ".

1 Introduction:

Page 2, line 42. Delete "hereafter named".

Page 2, line 54. "in recent years". Please, specify the period of study.

2.1 Cruise and sampling strategy:

Page 3, lines 83-84. "(1)" and "(2)" not needed.

2.4 Derived parameters:

Page 5, line 138. "calcite (Ω_{cal})". There is no need to mention this variable because it is not displayed in the distributions (fig. 3) and its temporal change is not estimated. See comment on section 4.

4 Carbonate chemistry along the OUTPACE transect:

Page 7, line 200. Why is C_T slightly lower in bottom waters?

Page 7, line 211. " pH_T " instead of "pH".

Page 8, lines 217-220. Not need to add these sentences or maybe use them in section 2.4 to explain why you're not considering this variable for the temporal changes.

5 Anthropogenic carbon estimation along the OUTPACE transect:

Page 9, lines 272-279. The authors make the reader notice that denitrification could be affecting their estimates but nothing is concluded. The authors don't explain how they deal with this issue. In section 6 the authors give a reference for the low effect of denitrification over C_{ANT} estimates that could be added in this section as a conclusion of why they don't consider N^* .

Page 10, line 285. The year of publication of the reference is 2017.

6 Temporal changes of inorganic carbon in the OUTPACE area:

Section's title: The authors talk about other variables than just inorganic carbon. I suggest to change "inorganic carbon" to "carbonate chemistry".

Page 10, lines 303-305. Add the errors in the trends for A_T . What is/are the oceanic process/es behind the change/not change in alkalinity.

Page 10, lines 306-307. Add the errors in the trends for C_T and C_{ANT} .

Page 10, line 310. Do the authors have an explanation for this "over accumulation"? What is the error in the increase of C_T associated to the increase in atmospheric CO_2 ? (line 308).

Page 11, lines 315-318. Considering the information given by the authors (page 10, lines 303-305), can the changes in A_T still be due to remineralization processes? Can the authors give a possible scenario/explanation for the difference of C_{ANT} between MA and WGY?

Page 11, line 319. Add the error for the change in C_{ANT} .

7 Towards an enhanced "Ocean Acidification" in the WTSP?:

Pages 11 and 12, lines 329, 331, 336, 337, 344, 345, 346, 347, 352, 357. " pH_T " instead of "pH".

Page 11, lines 341-342. Add the errors in the trends for fCO_2 , C_T and pH_T .

Page 12, line 362. Add errors in the trends. They are given in the text of reference.

Page 12, lines 363-364. Add the values of the change in Ω_{ara} (with the uncertainty) that you obtained with your data. Give some explanation for the difference between your values and the ones obtained by Murata et al. (2015).

Page 12, line 368. Add the migration rate observed by Feely et al. (2004) and the period of study.

8 Conclusion:

Page 12 line 375. "pH_T" instead of "pH".