Interactive comment on “In situ observation of atmospheric oxygen and carbon dioxide in the North Pacific using a cargo ship” by Yu Hoshina et al.

Anonymous Referee #1

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[General comments]

In this paper, the authors present new continuous observations of atmospheric O2 and CO2 in the North Pacific using a cargo ship for the period December 2015 – November 2016. Since continuous O2 measurements are still limited globally, the results and know-how presented in the paper would give a valuable contribution to the understanding of carbon cycle and air-sea gas exchange. The manuscript is well written and can be accepted with only minor revisions.

[Specific comments]

1) P3, L3–5: Authors should clarify the reason why “a change of O2 per mol of dry air does not necessarily result in a 1-ppm change in the O2 mole fraction but always corresponds to a 4.77 per meg change in the δ(O2/N2) value”. And/or please add the appropriate reference(s).

2) P4, L14 “The sample air is drawn by a diaphragm pump...”: It is better to add the information of filter. What kind of filter did you use? (material, mesh size... etc.)

3) P5, L9 “three standard gases”: Are these “standard gases” same as “reference gases” on page5, line 12?

4) P6, L17 “1–5 min intervals”: According to page 4, line 4, I understood that the switching interval is 2 min. What do the “1–5 min intervals” mean? Did you test the switching intervals from 1 min to 5 min and decide it 2 min?

5) P7, L15–16: How many hours of data did you use for the calculation of the standard deviations? 1-h? 24-h? Please clarify it in the text.

6) P8, L3: It would be better to mention what the slope value of -1.189±0.004 means.

7) P8, L4 and L13 “10-L cylinder”: Are these 10-L cylinders different from “9.8-L cylinder” on page 5, line 12?

8) P10, L10–11: Please clarify the time period for averaging. It seems that the differences from February to June in each figure are scattered around zero, but the differences in δ(O2/N2) and APO from September to November look shifting downward. Are there any possibilities that the differences between the in-situ data and flask data are temporally changing? Is it negligible because of uncertainty?

9) Some expressions of O2 are used in the manuscript, but I couldn’t catch the difference. For example, authors use “O2/N2 ratio” on page 3 (line 12), but “These O2 and...” “...continuous O2/N2 observation...”, and “...the δ(O2/N2) ratio is...” are used on page 3 (line 15), page 4 (line 4), and page 7 (line 9), respectively. These expressions should be reconsidered throughout the manuscript. Similarly, the expressions of CO2 should also be reconsidered throughout the manuscript. For example, “CO2 mixing
ratio” (e.g. page 8, line 18) and “CO2 concentration” (e.g. page 9, line 24) are used in the manuscript.

Technical corrections:
1) P2, L18: Change “:” after Naegler et al., 2007 to “;”.
2) P4–5, 2.1 Analytical system: Uniform the names of parts in the system in the text and Figure 1. For example, “glass vessel”, “4-way 2-position valve”, and “piezo actuator valve” are used in the text, but these are showed as “glass flask”, “2-position valve”, and “variable valve” in Figure 1.
3) P8, L1: I think it would be better to add some words to make the readers focus to Figure 5. For example, “As shown in Fig. 5,”.
4) P10, L1 and 9: I think it would be better to switch the order of CO2 and δ(O2/N2).
5) P12, L5: Remove “- (hyphen)” from “the -variation”.
6) Units in section 2: Units of “cm3 min-1” and “cm3” are used as flow rate and volume in the text, but those in Figure 1 are “mL/min (or L/min)” and “L”. Please uniform the units throughout the manuscript.
7) Figure 4 a: I think “∆” in the label of vertical axis should be removed.
8) Figure 6 b: It is not clear the apparent variations of several tens of ppm amplitudes and 20s intervals in this figure. It would be better to add the expanded figure of apparent variations.
9) Figure 9: It would be very informative to add the cruise information in this figure. For example, changing the color depending on cruises, adding cruise-name labels...etc.
10) Figure A1: Modify from “Figure A12” to “Figure A1”.


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