

## ***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**

Received and published: 30 March 2018

#### [General comments]

In this paper, the authors present new continuous observations of atmospheric O<sub>2</sub> and CO<sub>2</sub> in the North Pacific using a cargo ship for the period December 2015 – November 2016. Since continuous O<sub>2</sub> 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 O<sub>2</sub> per mol of dry C<sub>1</sub>

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air does not necessarily result in a 1-ppm change in the O<sub>2</sub> mole fraction but always corresponds to a 4.77 per meg change in the  $\delta(\text{O}_2/\text{N}_2)$  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 page 5, 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  $-1.189 \pm 0.004$  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  $\delta(\text{O}_2/\text{N}_2)$  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 O<sub>2</sub> are used in the manuscript, but I couldn't catch the difference. For example, authors use "O<sub>2</sub>/N<sub>2</sub> ratio" on page 3 (line 12), but "These O<sub>2</sub> and ...", "...continuous O<sub>2</sub>/N<sub>2</sub> observation...", and "...the  $\delta(\text{O}_2/\text{N}_2)$  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 CO<sub>2</sub> should also be reconsidered throughout the manuscript. For example, "CO<sub>2</sub> mixing

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ratio” (e.g. page 8, line 18) and “CO<sub>2</sub> 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 CO<sub>2</sub> and  $\delta(\text{O}_2/\text{N}_2)$ .
- 5) P12, L5: Remove “- (hyphen)” from “the -variation”.
- 6) Units in section 2: Units of “cm<sup>3</sup> min<sup>-1</sup>” and “cm<sup>3</sup>” 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 “ $\Delta$ ” 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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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-195>, 2018.