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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Detection of regional scale sea-to-air oxygen emission related to spring bloom near Japan by using in-situ measurements of atmospheric oxygen/nitrogen ratio" *by* H. Yamagishi et al.

H. Yamagishi et al.

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Author Comments to Referee No. 1

We thank for valuable and constructive comments, to which we reply in the following:

»*Specific comments / typos: Headline: ...measurements of the atmospheric oxygen/ nitrogen ...* « We have corrected.

»*p2227,l11: ...Alaska (CBA... p2228,l2: ...field based* O_2 */*N_2*...* « We have corrected.

»*l19ff: The fast sample flow...How exactly did you ensure that thermal fractionation*

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effects are not relevant? « To examine the diurnal variability of APO precisely, we selected data observed on clear days (based on solar radiation measurements) and computed monthly-averaged diurnal APO variations. We were not able to find decrease in APO that is typical for thermal fractionation effects at the intake. We have added a discussion about diurnal variations in section 3.1 and added Fig. 4 in our revised manuscript. Fig. 4 Monthly-averaged diurnal variations of Atmospheric Potential Oxygen on clear days for the months of (a) May, June, July, August, (b) September, November, February, and April for Ochi-ishi.

»*p2230,l14: ...(Parker Balston...* « We have corrected.

»*p2232,l2 ff: While the Ar/N_2 ratio remains largely constant in ambient air, this is not true for the air in cylinders which are used for calibration. Here, a correction for the Ar/N_2 difference is probably required?*« Although Keeling et al. (2004) found fractionations of the O_2/N_2 and Ar/N_2 ratios in their working-gas cylinders, we have not found any systematic drift of the O_2/N_2 ratio in our cylinders before and after the usage within the range of 4 per meg. We also have not found any systematic drift in the working gas relative to the fractionation in the cylinders in our laboratory (Tohjima et al., 2008). Working gas cylinders in our case are usually used up to the fractional usage of 0.75. If the fractionation observed by Keeling et al. (2004) also occurred in our measurement, we can detect the decrease of the O_2/N_2 ratio in the working-gas cylinders before and after usage by 2.25 per meg. (About 0.25 per meg of this is due to the Ar/N_2 ratio.). Since we apply a constant to the O_2/N_2 ratio of each reference gas cylinder, the assumption of a constant Ar/N_2 ratio can also be adopted for the working gas. Thus, we do not think we need a correction for the fractionation of the Ar/N_2 ratio in our working-gas cylinders to calculate the O_2/N_2 ratio. With a longer dataset, we can evaluate the fractionation effect more precisely in the future.

In order to address the above issue, we have included the following sentences in section 2.1: ”Working gas cylinders are used up to the fractional usage of 0.75. Although Keeling et al. (2004) found the fractionations of the O_2/N_2 and Ar/N_2 ratios in their

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working-gas cylinders, we found that the O_2/N_2 ratio in our cylinders stays within 4 per meg before and after deployment at the monitoring station, indicating no significant drift. The averaged O_2/N_2 ratio is, therefore, applied to the O_2/N_2 ratio of each reference gas cylinder."

We have included the following sentences in section 2.2: "Since we apply a constant to the O_2/N_2 ratio of each reference gas cylinder, the assumption of a constant Ar/N_2 ratio can also be adopted for the working gas."

References

Keeling, R. F., Blaine, T., Paplawsky, B., Katz, L., Atwood, C., and Brockwell, T.: Measurement of changes in atmospheric Ar/N_2 ratio using a rapid-switching, single-capillary mass spectrometer system, Tellus Series B-Chemical and Physical Meteorology, 56(4), 322-338, doi: 10.1111/j.1600-0889.2004.00117.x, 2004.

Tohjima, Y., Mukai, H., Nojiri, Y., Yamagishi, H., and Machida, T.: Atmospheric O_2/N_2 measurements at two Japanese sites: estimation of global oceanic and land biotic carbon sinks and analysis of the variations in atmospheric potential oxygen (APO), Tellus Series B-Chemical and Physical Meteorology, 60(2), 213-225, doi: 10.1111/J.1600-0889.2007.00334.X, 2008.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 2225, 2008.