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Interactive comment on “Contrasting biogeochemistry of nitrogen in the Atlantic and Pacific oxygen minimum zones” by E. Ryabenko et al.

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The second referee was expecting to find information on importance of anammox and anam-mox-denitrification ratios. This study, however, is concentrated on natural abundance of ni-trogen isotopes. Anammox-denitrification ratios cannot be extracted from isotope ratio pro-files as long as we are looking at nitrate and nitrite isotopic signature. Nitrite, produced by nitrate reduction, can be used as a source for anammox as well as for canonical denitrification. Thus no anammox-denitrification ratios can be calculated in this study.

In the surface waters (<20 m depth) south to Cape Verde nitrite concentration was

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below the detection limit of $0.02\mu\text{mol/l}$, thus contamination via nitrite cannot be the reason for low $\delta^{15}\text{N}$ values. Nitrite concentrations $>0.1\mu\text{mol/l}$ was only observed in the Pacific study region. Each sample with low nitrate concentrations was measured at least five times with the standard deviation not exceeding 0.2%.

The $\delta^{15}\text{N-NO}_3^-$ - and $\delta^{15}\text{N-NO}_2^-$ - signals (fig.1) and their differences in the pacific region are indeed complicated (p8007, l.25). The expected difference between the two signals within OMZ lay around 30% due to denitrification and in the oxycline around 13% due to nitrification. With-in OMZ, however, we observe a larger difference between $\delta^{15}\text{N-NO}_3^-$ - and $\delta^{15}\text{N-NO}_2^-$ - signals. We infer in the article that this signal can be produced by nitrite oxidation and Referee#2 was asking if this signal may come from anammox. Yes, nitrite oxidation was observed in previous studies as a side-reaction of anammox (Strous 2006&1998, van de Graaf 1996). However, few weeks ago published article of Kartal et al (2011) discuss the mechanism of anammox, which include a step of nitrite reduction to NO. This process has positive fractionation factor of 5-25% (Casciotti 2009) and would lead also to increase $\delta^{15}\text{N-NO}_2^-$, decreasing the difference between $\delta^{15}\text{N-NO}_2^-$ - and $\delta^{15}\text{N-NO}_3^-$, which was not observed in this study. In the end, the only important factor is the combination of these processes and what “total” fractionation it would lead to.

P 8004, l.11: Water samples for $\delta^{15}\text{N}$ analysis of both nitrite and nitrate was meant. Cd-reduction/azide method does not require separate sampling for nitrite and nitrate $\delta^{15}\text{N}$ analysis (see p8004 l.19).

Further minor comments will be taken into consideration in the revised version and formulations will be changed.

Interactive comment on Biogeosciences Discuss., 8, 8001, 2011.

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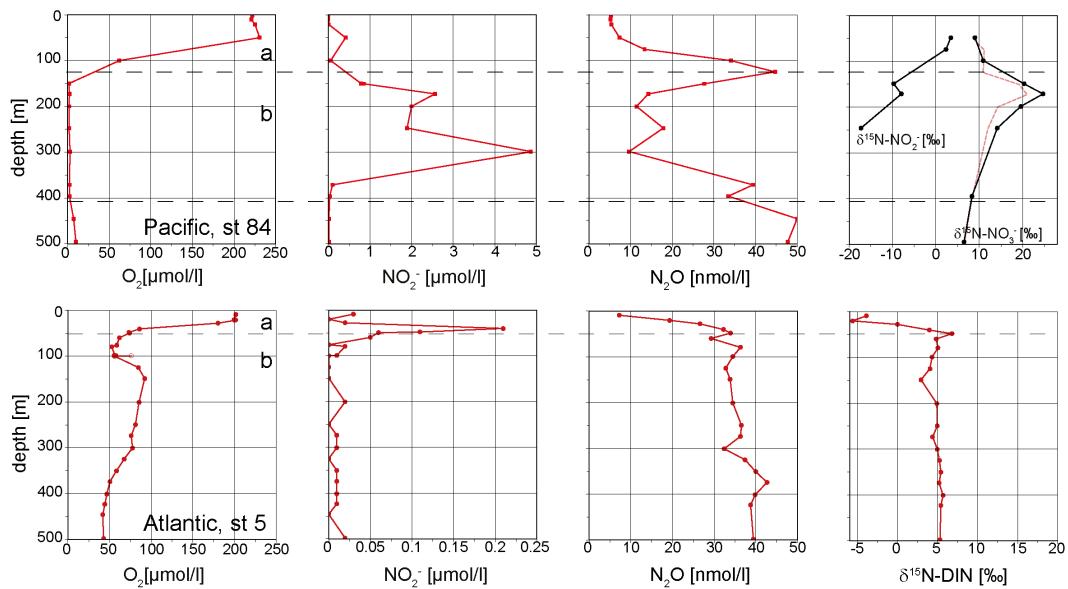
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Fig. 1.

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