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Biogeosciences Discussions

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

E. Ryabenko et al.

eryabenko@ifm-geomar.de

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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

below the detection limit of 0.02μmol/l, thus contamination via nitrite cannot be the reason for low δ15N values. Nitrite concentrations >0.1μmol/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 δ15N-NO3- and δ15N-NO2- 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 δ15N-NO3- and δ15N-NO2- 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 δ15N-NO2-, decreasing the difference between δ15N-NO2- and δ15N-NO3-, 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 δ15N analysis of both nitrite and nitrate was meant. Cd-reduction/azide method does not require separate sampling for nitrite and nitrate δ15N 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.

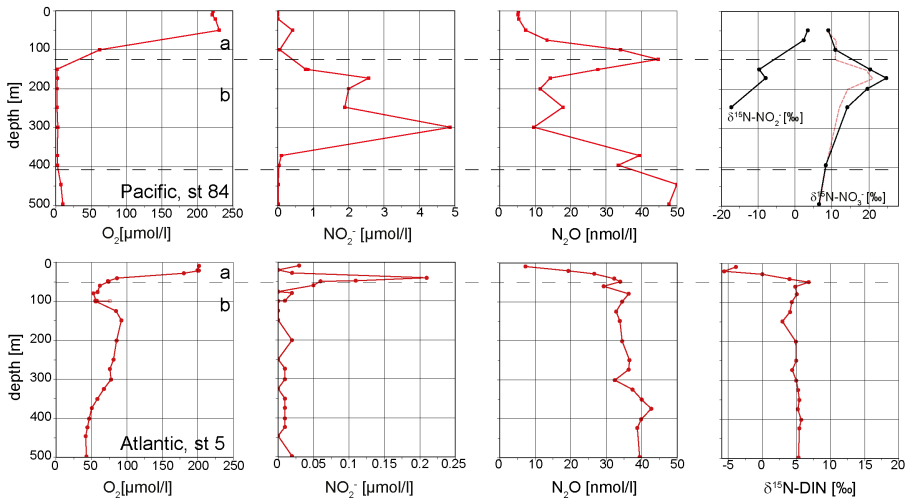
depth [m]
Pacific, st 84
a
b
O2[µmol/l]
NO2- [µmol/l]
N2O [nmol/l]
δ15N-NO2- [‰]
δ15N-NO3- [‰]
Atlantic, st 5
δ15N-DIN [‰]

Fig. 1.