Biogeosciences Discuss., 10, C503–C505, 2013
www.biogeosciences-discuss.net/10/C503/2013/

Biogeosciences
Discussions

Interactive comment on "Nitrogen isotope dynamics and fractionation during sedimentary denitrification in Boknis Eck, Baltic Sea" *by* K. Dähnke and B. Thamdrup

K. Dähnke and B. Thamdrup

kirstin.daehnke@hzg.de

Received and published: 25 March 2013

We would like to thank this reviewer for his/her constructive feedback that helped to improve the manuscript. The reviewer's main concern was that diversity of organisms, not the alternative use of different nitrate reductase enzymes, might be the driving mechanism for the fractionation behaviour we find for nitrate nitrogen and oxygen. We find that this option does not at all contradict our hypothesis, but this obviously was not clear in the original manuscript. Accordingly, we slightly modified the manuscript addressing diverse denitrifying communities more clearly. Below, we individually address each point brought up by the reviewer, and explain the changes we made to the manuscript

according to the reviewer's suggestions. We also give our reasons for some cases in which we did not follow his/her suggestions.

[...] the authors discuss the intracellular regulation and processing mechanisms with regard to the alternative use of two different nitrate reductases. This idea is interesting, however, a bit speculative, as well. With regard to this point, it could also be the case, that just the diversity of organisms that contribute to denitrification, here, is responsible for the difference of nitrate and nitrite processing, as it is to expect that different organisms react largely different to the same environments.

–> We fully agree that diversity of denitrifiers probably plays an important role in nitrate and nitrite processing, especially with regards to the 18e/15e ratio, and we find that it does not at all contradict the option of diversity among organisms. The theory of two different nitrate reductases was brought up by Granger et al (2008), and as they explored the same phenomenon, we felt it was only adequate to address this theory in our manuscript. To avoid misunderstandings, we however inserted a short section addressing diverse denitrifying communities.

p. 690 (4.1), p. 695 (4.4): The diversity of denitrifiers along with the absence of anammox based on molecular data and rate measurements is nicely shown in Bertics et al. (same issue), referring to this paper would strengthen the importance of denitrification at Boknis Eck.

–> While the discussion version of the paper by Bertics et al indeed addressed denitrification and anammox in Boknis Eck, data regarding denitrification have now been removed from the final revised version of the manuscript. We accordingly chose not to refer to this work, as the relevance for our data is not obvious – our rates are truly potential rates and very difficult to compare to the N2 fixation rates obtained in bottle assays by Bertics et al.

However, as the diversity of denitrifiers is not that high on the level of the nirS gene coding for the nitrite reductase, does it make sense then to speculate on higher diversity

on the level of the nitrate reductase?

–> See comment above - Granger et al (2008) explored 18e/15e ratios based on investigations of alternative nitrate reductases Nar and Nap. Our data do not allow conclusions on the nature of the nitrate reductase involved in our experiment, but the study by Granger et al nicely illustrates the impact of nitrate reductases on 18e/15e. Different adaptations in freshwater versus marine denitrifiers in this respect are possible, as the denitrifying communities most likely are different as well. We inserted a short section in the manuscript to make this point clear.

p. 693 (4.3): Is nitrification to ammonium very likely, here? I assume that oxygen is nearly depleted in surface sediments. Could you give an oxygen concentration, here?

–> We do not have oxygen concentrations for the surface sediment. Nevertheless, the surface sediments at Boknis Eck were of a light brown colour that indicated sufficient oxygen supply to allow nitrification (as mentioned in the materials and methods section). [O2] in the water column was still above 200 μM(see Fig. 2), so it seems plausible that is an overlap between ammonium and oxygen co-occurrence not only in the water column, but also in the uppermost sediment layer. We now clearly refer to surface sediments here, to distinguish it from our incubations, where nitrification would indeed be unlikely.

Interactive comment on Biogeosciences Discuss., 10, 681, 2013.