

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

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We would like to thank Susanna Hietanen for her constructive feedback, and the careful review, in which she helped us to resolve some rather confusing issues in the manuscript. According to her suggestions, we edited the manuscript, hopefully adding clarity especially to the discussion section. Below, we address each comment and the according changes we made to the manuscript.

Abstract: I would not state that the denitrification rates were “tremendously high”, as these are potential rates, only – a point that the authors mention themselves in chapter Implications for water column nitrate composition. Additionally, they mention (page

C500

690) that the rate was similar to other shallow coastal sediments.

→ We deleted the reference to tremendously high rates, which was indeed not quite appropriate.

Materials and methods: what was the isotopic composition of the added nitrate?

→ The isotopic composition was 0.1‰ and = 24.2‰ for N and O, respectively. We now mention this in the materials and methods section.

The sediment was depleted of any ambient nitrate after pre-incubation, I presume.

→ First incubations with Boknis Eck sediment had shown that nitrate was rapidly consumed in the sediment (easily within a few hours), so yes, this pre-incubation was performed to strip the sediment of any ambient nitrate. We added a brief statement regarding this to the manuscript as well.

Discussion: page 693 row 5 on. Have you possibly mixed concentration and isotope value? How could sedimentary denitrification increase the concentration of nitrate in bottom water? By preferentially depleting 14 over 15 it can affect the isotope signature of nitrate in bottom water, but not the concentration, right?

→ Referring to nitrate concentration only was indeed a mistake, and somewhat mixed up with isotope properties. We rewrote this section now, referring to nitrification as a potential (but unlikely here) nitrate source which might affect concentration, but would not raise isotope signatures, as opposed to denitrification, which might use nitrate, but will potentially prefer the isotopically light species, leading to an isotope enrichment in nitrate.

Same chapter, page 694 row 8, shouldn't that be nitrate, not nitrite?

→ That's right, we corrected this now.

Chapters 4.4.1- 4.4.2. were slightly confusing.

C501

→ We slightly edited these sections. Changes include reference to reversibility of nitrate reduction on the enzyme level as opposed to re-oxidation in low-oxygen environments and some minor changes in 4.4.2 that hopefully help to guide the reader through the text more easily.

One would not expect re-oxidation of nitrite to nitrate (nitrification) under anoxic conditions.

→ Re-oxidation in an anoxic environment is indeed unlikely. However, reversibility on the enzyme level is also possible under anoxic conditions, and this is the process we were referring to. Admittedly, this was not clear in the original manuscript, and we now clearly address this reversibility on the enzyme level to avoid misunderstandings.

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