

## ***Interactive comment on “Nitrate assimilation and regeneration in the Barents Sea: insights from nitrogen isotopes” by Robyn E. Tuerena et al.***

**Anonymous Referee #2**

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In the manuscript Nitrate assimilation and regeneration in the Barents Sea: insights from nitrogen isotopes, Tuerena and colleagues present a timely study on nitrate supply and dynamics in the Barents Sea. To date the majority of work in the Arctic utilizing the isotopes of nitrate and particulate N has focused on the western Arctic Ocean, so the spatial coverage and seasonal aspects of this study will be well received by the community. Overall the manuscript is well written (and clarification is just needed in some instances), but the data seems underutilized in places and there are a number of figure panels that are never discussed, for example Figure 4f,  $\delta^{15}\text{N}$ (15,18), I think this could help elevate the discussion of nitrification in this system. I have expanded on these points in detail below.

Line 20: please clarify what season you are referring to here with the phrase ‘through

the season'.

BGD

Line 24 to 25 / 396 to 398: the foundations of this conclusion are not clear to me and hence it seems a little speculative as currently presented, please rephrase / elaborate.

Line 90: im not sure efficiently is the correct word here, I think you mean the reaction goes to completion and hence no fractionation is expressed. It would also be nice to see some of the more recent literature here that has looked at the cellular and apparent fractionation factors associated with sedimentary denitrification e.g. the work of Moritz Lehmann, Kirstin Dähnke and colleagues.

Line 140: the wrong delta has been used here.

Line 141 / 142: 48mm filters? Is this correct, or should it be 47mm?

Line 170 to 171: The correction used here needs to be clarified, what is the basis for the -24 ‰ from Kemeny et al, 2016, looking at that paper I think this value is -24 +/- 38 ‰ is this correct? Why have you only corrected the  $^{15}\text{N}$  values here and not the  $^{18}\text{O}$ , could you not assume that the  $\text{NO}_2^-$  would have fully exchanged with the water and use that value in a correction? I think it would also be beneficial if you could mention the nitrite concentrations observed in your samples (just the range maybe), either here or in the results (around line 191).

Line 175: Please provide information on the standards used and the reproducibility (standard deviation) of these measurements.

Line 199 to 203: here you note that there is no significant difference in  $^{15}\text{N-NO}_3^-$  or  $\text{N}^*$  between AW and ArW, but note in the opening line that nitrate concentrations are lower, are nitrate concentrations significantly lower? Looking at the errors presented it doesn't look like it, please clarify and adjust language where needed (and check throughout).

Line 217: here you refer the reader to Table 1, but the values don't match and I assume that is because of the depth cut-off, please clarify and delete the references to Table 1 if needed.

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Line 220 to 242: throughout this section I am a little unclear what is your contribution and what has come from the literature.

Line 228: a reference is needed here.

Line 254: why are you only discussing the  $^{15}\text{N}$  fractionation here, and not the  $^{18}\text{O}$  as well? In the introduction you take the time to introduce the idea of 1:1 relationship, so it seems surprising here that you don't take the time to talk about the  $^{18}\text{O}$  values shown in Figure 5b. This section would also benefit from a comparison to literature values.

Line 270: how you determined the concentrations of PON needs to be mentioned in the methods and where can the reader see this data?

Line 278: why are you not using the isotope effect that you determined in this study (I know a value of 5 is close, but it would still be nice to see you using your own value, unless there is a reason not to)?

Line 283: I think this should be Figure 6d.

Line 308 to 309: for clarity i suggest you add in an  $^{18}\text{O}$  to this sentence, so 'range in nitrified  $^{18}\text{O}$ -nitrate values'. The work of Carly Buchwald on this was not only from co-cultures but also field measurements, making this work / values even more valuable.

Section 4.3.1: how do your  $i\Delta(15,18)$  values fit in here (Figure 4f), it seems like a missed opportunity to not utilize this data here and also to compare it to literature values.

Line 386: communicating?

Figure 2: based on how the water masses have been characterized (Table 1 and the results text) I think the labelling is wrong in Panel A, I don't think they should all be ArW.

Figure 3 caption: it should be 'proportion of regenerated nitrate' not percentage in order to match the figure.

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Figure 4: The panels need to be labeled in this figure and it seems a shame that the depth profiles of  $^{15}\text{N-PN}$  are not shown.

Figure 5 caption: it would be beneficial to more clearly explain what is shown in panel C.

Figure 6: For panels c and d, I think it would be beneficial to include the statistics in the figure caption. In addition it could help to clearly mark the ArW points, so that the reader can clearly see the points that move between the two panels, but I understand that this might make the figure too busy, if so I suggest that the authors remind the reader in the caption that ArW is associated with the lower temperatures. Where do you discuss / utilize panel b in the text?

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