

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

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Review of, “Nitrate assimilation and regeneration in the Barents Sea: insights from nitrogen isotopes”

Overall, I found this to be a useful study of nitrate supply to the Barents Sea. Among the interesting results are the seasonal surface nitrate  $\delta^{15}\text{N}$  across the Barents Sea Opening and the full water column nitrate isotopes and particulate matter  $\delta^{15}\text{N}$ .

I would like some clarification on a couple points. First, I don't think the particulate matter sampling strategy is ever detailed—this is key to interpreting the particulate  $\delta^{15}\text{N}$  measurements in relation to the nitrate isotopes. Is this entirely euphotic zone particulate  $\delta^{15}\text{N}$ ? Are these the same sample locations and depths as the nitrate sam-

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ples? Or sub-euphotic zone? This is important—no, critical—for interpreting the particulate N measurements. I list other requests for clarification below. Given that these are necessarily suspended particulate N measurements, I found the strong relationship with nitrate  $\delta^{15}\text{N}$  (and therefore connection to seasonal nitrate utilization) to be very surprising. This is because suspended N typically displays some degree of independence from surface ocean nitrate utilization (see studies by Knapp et al., Fawcett et al., and others). This question about the particulate N measurements is important. I detail other points needing clarification below.

Line by line notes

Title: It might be more accurate to describe this as insights from nitrate isotopes since it also includes nitrate O isotope measurements

Line 38-40: I understand the sentence, but others might not. Would clarify. And does the word “inflow” belong there? Line 54: Define “It” Line 68: Would insert more callouts to figures throughout this description. Line 73: I really like this description of the water masses and their influence. Line 93: Is this acronym used more than once? 140: Wrong delta symbol? 141-142: Might want to be more explicit about why the filtration persisted until “good colour was obtained on the filter”. And where exactly are these samples? Are they at the same depths as the nitrate samples? 190: Entire sentence is passive and can be clearer. Also, callout to figure (e.g., “far right in Fig. 2A & 2B) 210-216: Would begin with the “Therefore,” sentence and be more active statement. 233: “in transit”? And does this refer to nitrate assimilation at depth? Or is the text calling on some earlier nitrate assimilation that was then mixed to depth? This latter seems the most likely considering seasonal North Atlantic mixing, right? There's a lot of questions here and I think this statement needs to be supported and/or described in more detail. 291: These repeat transects are very cool. 308: I would want to qualify this statement with words like, “likely represents...” or “is consistent with...” 345: This equality between nitrate  $\delta^{15}\text{N}$  and sediment  $\delta^{15}\text{N}$  will only be the case where there is complete nitrate consumption. I think this is the case here, but this

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should be clarified. 356: released in other regions? 380: This assumes that nutrient inventory is proportional to production, right? 385: "The N inventory is also dependent" right? 393: I feel that this last part of the manuscript is pretty speculative. I think it is ok, but can see how others might have a problem with it.

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