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Biogeosciences Discussions

Interactive comment on "Nitrification and growth of autotrophic nitrifying bacteria and Thaumarchaeota in the coastal North Sea" *by* B. Veuger et al.

Anonymous Referee #3

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This is a great paper that presents some interesting and much needed data about the relationship between nitrification, autotrophy, and the stoichiometry between N oxidation and C fixation in the coastal ocean. The investigation of the relative roles of ammonium uptake and nitrification are also interesting and timely.

General comments: One potential problem with the methods that could significantly influence the interpretation of their results is that environmental Thaumarchaea may not be captured by the 0.7 μm filter they used to measure both bulk DIC and GDGTs. In culture, N. maritimus is very small–a 0.45 μm filter was used to purify the culture and separate the archaea from the bacteria (Konneke et al. 2005) and in nature we

might expect them to be much smaller. Nitrification is even detectible in 0.2 μm filtered seawater (Santoro et al. 2010), suggesting that AOA can pass through even this small pore size. So the C fixation rates presented here could be significant underestimates. Is there a way to estimate capture efficiency by using the authors' existing data from N.maritimus culture work, the lipid yield, and the amoA gene abundance data here to estimate a % of archaea captured? At the very least, a statement about this potential consequence of their method should be made.

The line of reasoning that because archaeal abundance and nitrification rates aren't linearly correlated, archaea cannot be responsible for the majority of nitrification is misguided, just as the converse is (as the authors argue).

Is anything known about the effect of chlorate on sulfur oxidation?

Detailed comments:

p.16890 lin 25: Why is the Lipp et al. 2008 paper used for a conversion of lipid biomass to total biomass of archaea? That is a paper about sediment archaea from the deep subsurface. Given work by this group with cultures of planktonic archaea (Schouten et al. 2008), is this still an accurate conversion factor?

p.16891, Line 7: Observing a lack of correlation between abundance and rates doesn't mean that activity was zero.

Table 1. Must there have been some co-inhibition of ammonia oxidation by chlorate? How could these two supposedly specific inhibitors account for the same % of 13C fixation inhibited and or percentages that sum to greater than 100%? In other words, if we interpret the % inhibition as a proxy for the % of C fixation carried out by that process, how could C fixation be 45% from ammonia oxidation and 100% by nitrite oxidation? Does this mean nitrite oxidation is totally controlled by the ammonia oxidation rate? Also, do the authors interpret the inhibition of C fixation into crenarchaeol by chlorate as evidence of archaeal nitrite oxidizers, or sensitivity of AOA to chlorate?

BGD

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Shouldn't the caption for Fig. 5 say Dd13C values for PLFAs and crenarchaeol NOT inhibited by nitrapyrin? Am I missing something?

Interactive comment on Biogeosciences Discuss., 9, 16877, 2012.