

Interactive comment on “Biogeochemical controls and isotopic signatures of nitrous oxide production by a marine ammonia-oxidizing bacterium” by C. H. Frame and K. L. Casciotti

Anonymous Referee #3

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The work presented in this paper represents an outstanding and innovative contribution to the knowledge of the pathways of nitrous oxide production in the ocean, and surely deserves to be published in Biogeosciences. I have a few concerns and comments detailed below:

General aspects:

In my opinion, you should express absolute oxygen concentrations instead of saturation percent, or, at least, include concentrations between parentheses after the first appearance of the percents, in order to make easier the comparison of your results with other works. Furthermore, organism activity is related with chemical species con-

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centration, and not necessarily with its percent of saturation.

I'm not sure if the aspect of your research presented in the appendices deserves an entire section. I think that this part can be included in the methodology in a less extended form. If you still decide to keep the appendices, please add a title for the appendix A.

Specific comments

Page 3022, lines 19-21: The yield estimates of Goureau et al. (1980) are not directly applicable to any natural media, as you state. However, Goureau's work shows a relative trend of the yields on nitrate and nitrous oxide produced by ammonia-oxidizing bacteria. If we assume that the pathway of nitrification is closely the same for known nitrifying organism, the results of Goureau et al. can't be dismissed a priori. Your work doesn't change the findings of Goureau; only take them a step beyond. Please rewrite this part.

Page 3024, lines 10-12: If you previously state (page 3023, lines 23-25) that $\delta^{18}\text{O}$ of the N_2O derived from nitrifier-denitrification depends on the $\delta^{18}\text{O}$ of the NO_2^- , why you say in this part that $\delta^{18}\text{O}$ of the N_2O derived from nitrifier-denitrification depends on the H_2O ?

Page 3034, lines 1-6: You should mention that high $\delta^{15}\text{N}$ are not influenced only by the substrate, but also the reduction of N_2O to N_2 by denitrification, as is suggested by Yoshida et al. (1989).

Page 3034, lines 22-25: The observation that bacteria need NH_4^+ to produce N_2O seems very important to me, and needs more support than “unpublished observation”. I suggest that include these observations as a part of your work, or, provide a valid reference.

Section 3.3: The meaning of M is not clear. Please define it.

Page 3035 and Figure 3: I think that you avoid the fact that different oxygen concentration can yields different end-members mixing proportions, represented in your model

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by equation 1. This is evident when you look at Figure 3: data from 20

Section 3.4, pages 3039-3040: If your model is too sensitive to the value of fractionation factors (ε), and there are no confident values for them, you should mention specifically which values you use to calculate the end-member's SP and how varies these SP values with different ε values. I suggest using a table to present these results.

Interactive comment on Biogeosciences Discuss., 7, 3019, 2010.