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Biogeosciences Discussions

Interactive comment on "Nitrous oxide distribution and its origin in the central and eastern South Pacific Subtropical Gyre" *by* J. Charpentier et al.

Anonymous Referee #1

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Review of "Nitrous oxide distribution and its origin in the central and eastern South Pacific Subtropical Gyre" by J. Charpentier

General Comments: The production of nitrous oxide in oceans is an important source of the potent greenhouse gas. This manuscript addresses this issue by presenting water column nitrous oxide concentration and isotopic data. In addition, supporting data such as phosphorus and oxygen concentrations is supplied to aid with interpretations. Bulk stable isotope and isotopomeric nitrous oxide data from marine samples is lacking so this study is both timely and significant. Although, the dataset is a valuable contribution to efforts to understand nitrous oxide production, the manuscript needs major revisions to improve the quality of the writing. It is difficult to follow at some points and a major emphasis should be placed on firming up the interpretations with supporting

references. Less emphasis should be placed on postulating about mechanisms for site preference and more emphasis placed on references about the environmental context of nitrification and denitrification.

Specific Comments:

Introduction section- The terminology used in the introduction section to describe nitrification is not what is commonly used in the microbiological literature. In order to avoid confusion, please use ammonia oxidation in the place of primary nitrification and nitrite oxidation for secondary nitrification.

Introduction section- Nitrous oxide production by nitrite oxidizers is far less established than as a byproduct during ammonia oxidation, what evidence or references exist that strengthen the case that it should be considered in the context of this study?

Introduction section-pg 1676 Wrage et al., did not include kinetic isotope data? Why not include the isotopomeric data from Sutka et al 2006 indicating that nitrous oxide produced by denitrification is indistinguishable from nitrifier denitrification?

Figure 1- Nitrifier denitrification only refers to the reduction of nitrite by ammonia oxidizing organisms so it is recommended that the step from ammonia to hydroxylamine then to nitrite is removed from the illustration of nitrifier denitrification.

Introduction section-pg 1677 The statement that the “SP is independent from d15N of its precursors, or the extend of reaction, and is only dependant on the reaction mechanism, the observed changes in SP in the water column must be associated with changes in the mechanistic sources of nitrous oxide” was not found by Schmidt et al 2004 and was a conclusion of Sutka et al 2006 and Toyoda et al. 2005.

Introduction section- General point to make the manuscript more concise- It is recommended that the authors decrease the amount of speculation about the mechanism of the site preference and biochemical pathways and concentrate more on surveying site preference data that exists in the literature. This will build a basis for supporting the

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interpretations that are made later.

Page 1683, line 5. Why has the differentiation between d15Nbulk and d15N been made in the results and discussion?

Page 1683, lines 15-25 The conclusion made about the non-bacterial production of nitrous oxide seems to be too far a leap to make with the limited amount of support that you present for this possibility.

Page 1684, lines 1-10 It is recommended that you remove the discussion about the mechanism for the site preference during nitrification because it has already been covered by Toyoda et al. It would be far better to compare the site preference to data available in the literature now that there is actually site preference available and discontinue conjecture about what biochemical pathways might produce as far as site preference.

Page 1684, lines 20-30 Again, it is recommended that any discussion about mechanism be removed from the discussion section and that the paragraph focuses on other studies of nitrifier denitrification because it is extremely difficult to attribute N2O production to nitrifier denitrification in the environment.

Page 1687, lines 20-25 It is difficult to attribute N2O production to nitrifier denitrification, but some studies have attempted to based on oxygen isotopes so it is suggested to strengthen the interpretation about nitrifier denitrification. Denitrification-derived N2O has the same site preference and there should be more evidence present to dismiss it because it is one of the critical assumptions behind your major conclusion about the importance of nitrifier denitrification to nitrous oxide production.

Technical corrections:

There are numerous grammatical errors and typos that will need to be corrected in the revised version of the manuscript. If a mark up copy is desired, it can be made available to the editor.

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