

Interactive comment on “Nitrogen uptake and regeneration pathways in the equatorial Pacific: a basin scale modeling study” by X. Wang et al.

X. Wang et al.

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We appreciate the reviewer’s constructive comments. We have revised the manuscript accordingly. The revised manuscript is attached as supplement. The following is our reply.

Major concerns:

This paper is the third one from the main author focusing on the nitrogen cycle in the equatorial Pacific (with one submitted study on the nitrification?): *Wang, X.J., Le Borgne, R., Murtugudde, R., Busalacchi, A. J., and Behrenfeld, M.: Spatial and temporal variations in dissolved and particulate organic nitrogen in the equatorial Pacific: biological and physical influences, *Biogeosciences*, 5, 1705–1721, 2008,

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<http://www.biogeosciences.net/5/1705/2008/>. *Wang, X. J. and Murtugudde, R.: Nitrification implications for basin-scale distributions of inorganic nitrogen and biological production in the equatorial Pacific, *Geophys. Res. Lett.*, submitted, 2009.

One would think that the authors should discussed the novelty of the results presented here and maybe justify why they did not publish one study investigating the whole modeled cycle of nitrogen instead of part of it in numerous papers.

Reply: This paper addresses nitrogen uptake and regeneration pathways, aimed at studying N fluxes, particularly ammonium uptake and regeneration. We have stated the problem in the introduction, i.e., “our knowledge is limited in terms of understanding the ammonium dynamics and associated processes such as nitrogen regeneration and regenerated production. To date, there are only a few studies addressing ammonium uptake and regeneration in the equatorial Pacific”. We have discussed the results, e.g., “ the subsurface surplus of ammonium regeneration, largely explains the observed DAM in the equatorial Pacific Ocean”, “Our study indicates that zooplankton excretion and DON remineralization play a different role in nitrogen regeneration in the upper ocean. Zooplankton excretion supplies most ammonium in the euphotic zone, and is largely responsible for the spatial variability. DON remineralization provides a steady supply of ammonium in the upper ocean, and is a major source of inorganic nitrogen for the oligotrophic regions”.

I also have a concern about the sensitivity test of the nitrification. This test is conducted at 150_W. This location is in the model HLNC region (cf Fig 9. in Wang et al., 2008). Therefore phytoplankton growth is limited by iron, isn’t it? If so, a change of the nitrification rate is unlikely to affect the nitrogen uptake... Basically, you just change the ratio nitrate/ammonium by adjusting nitrification rate without affecting phytoplankton or grazers. Then, results would probably have been different in the Warm Pool.

Reply: The sensitivity test is conducted for the whole basin. We only presented model outputs long 150W (Fig. 1 and 2) where field measurements were carried out. The

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purpose of the test is to use observations to assess what nitrification rate should be applied.

Minor comments: Figure 9 : there is no "d", but two "c". Figure caption of figure 9 seems incorrect for a,b and c.

Reply: We have corrected.

Page 8260: L22: I think the authors are refering to figure 9c and f.

Reply: Yes, we have corrected.

Page 8255: L8: You should include Aumont and Bopp, 2006 in your citation (biogeochemical model use a 0.05d⁻¹ nitrification rate in this paper).

Reply: Done.

Page 8254: L26: add reference to Aumont and Bopp, 2006.

Reply: Done.

Page 8250: L3 : I think the authors should add "regeneration" at the end of the sentence: " : :to the subsurface surplus of ammonium regeneration."

Reply: Done.

Please also note the Supplement to this comment.

Interactive comment on Biogeosciences Discuss., 6, 8247, 2009.