

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

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Overall This paper presents the results of a basin scale modeling study of nitrogen cycling in the equatorial Pacific. The processes of nitrate and ammonium uptake and remineralization are included. The deep ammonium maximum (DAM) receives special focus. Model simulations are compared with data from the US JGOFS EqPac Process Study at 140W and OLIPAC at 150W

Specific Comments 1. Model runs The model was initialized by climatology. What varies during the interannual runs so that they are different.

2. Do the equations for grazing (eqn 6 and 7) apply to both micro-zooplankton and meso-zooplankton?

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3. N<sub>2</sub>-Fixation All the main rates for nitrogen cycling are considered except N<sub>2</sub>-fixation. Bonnet et al (2009) have recently published (GBC, 23, GB3012) N<sub>2</sub>-fixation rates from five stations along the equatorial Pacific and in the Bismark Sea. Measured rates (integrated) varied from 0.018 to 0.358 mmol N m<sup>-2</sup> d<sup>-1</sup>. Bonnet et al state that N<sub>2</sub>-fixation can account for as much as 50% of N demand. So some discussion about the role of N<sub>2</sub>-fixation in the nitrogen balance would be appropriate.

4. Data – Model comparison When possible I think the data should be plotted in the same way as the model results so the reader can evaluate the statements made by the authors. For example in Fig. 1 the meridional sections observed during EqPac could be shown as Figures 1a and 1b.

5. Role of zooplankton Which zooplankton? I had the impression from Landry et al (1997) that in the HNLC part of the equatorial Pacific the growth rate of phytoplankton ( $\mu$ ) was mostly balanced by grazing by microzooplankton (m). But in this paper I don't see a clear distinction made between microzooplankton and mesozooplankton. In fact I have the impression that when they refer generically to zooplankton they mean mesozooplankton (e.g., p. 8259 line 25 and page 8260 line 4 and everywhere where they refer to zooplankton excretion).

6. f-ratios I'm not sure I understand their distinction between f-ratios using new production versus nitrate uptake (Table 2). Nitrification is just oxidation of NH<sub>4</sub> to NO<sub>3</sub> and if that occurs in the in the euphotic zone the NO<sub>3</sub> still comes from remineralized NH<sub>4</sub> so would not be new production. Could the authors explain this a little better and maybe include some comparison with measured rates of new production?

Technical Comments 1. There are many awkward word orders and missing words that can be fixed examples: p. 8254 line 28. Nitrification “rates” are “larger” p. 8253 line 1 these are excretion rate “constants” not rates; p. 8255 line 1 We carried out a sensitivity study. . . p. 8256 line 28 from the observations range from 0.5 -2.7. . . p. 8258 line 13 Previous observations along. . . p. 8260 line 11 regeneration is greater than ammonium

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uptake. . . p. 8260 line 17 a significant relationship with. . . p. 8260 line 22 text refers to eastern upwelling region (Fig. 9b and d) but neither 9b or 9d are in the EEP. In addition the figures are mislabeled in Fig 9. There are two Fig. 9c.

Fig.2 Modeled concentrations of. . . Fig. 9 Caption says rates but a, b and c are concentrations

2. In general it is best not to start sentences with “Fig 4 shows. . .”

3. Standard procedure is to list cited references in chronological order.

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