

***Interactive comment on* “Biotic stoichiometric controls on the deep ocean N:P ratio” by T. M. Lenton and C. A. Klausmeier**

Anonymous Referee #2

Received and published: 26 February 2007

General comments

The authors endeavor to define the relationship between the nitrogen-to-phosphorus ratio N:P of deep ocean water and the “Redfield ratio” of N:P required by phytoplankton. N-fixing organisms are selected when $N:P < 16$ but out-competed by non N fixers when $N:P > 16$. Using 2 models - Lenton and Watson 2000 & Tyrrell 1999, and the finding that N:P ratios have decreased over the last 1 Gyr, the authors concluded that Redfield’s mechanism is robust, and suggest that phytoplankton C:N:P and deep ocean N:P have co-evolved.

Specific comments

1. Table of symbols, definitions and equations required.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

2. For LW & TT models, it would be good to have figures showing actual data versus modeled data to get a feeling for how well the models fit the data.
3. For TT model, a figure showing population dynamics, not just the equations, in this case, 11-13.
4. How does the arguments presented fit in with those of say Falkowski, Knoll, Pahlow, Riebesell and others that have examined evolution of phytoplankton and Redfield ratios ? It would be valuable to know if their model findings provide complimentary or contrary findings, and if this is provided in the essay.
5. The model assumes balance & tight coupling which we rarely see in nature. In some areas of the world's oceans (eg. HNLC) the supply and assimilation of N, P and C are not tightly coupled, even on an annual average. How would this inefficiency in the biological pump affect the outcomes of the model, particularly the switching from N fixers to non-N fixers ?
6. What evidence is there to support the decrease in N:P over the last 1 Gyr ? The authors did not present evidence for a shift from green to red phytoplankton or a decrease in weathering, etc..
7. My biggest issue is there is not enough detail to really understand the models or interpret the originality of the findings. Others have talked about the link between deep ocean N:P and stoichiometry of phytoplankton - the authors need to really clarify what makes their paper so unique, aside from the use of the models.

Interactive comment on Biogeosciences Discuss., 4, 417, 2007.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper