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Biogeosciences Discussions

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

Anonymous Referee #1

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General comments

In this paper, the authors use modified versions of two existing models for marine nutrient cycling to assess the biotic controls on the deep ocean N:P ratio. The authors show that the N:P ratio of non-nitrogen fixers in the ocean likely determines the deep ocean N:P ratio. Also, they show that N-fixers may regulate deep ocean N:P when they are present in only restricted areas of the ocean. Thus, the evolution of phytoplankton composition may have affected long-term changes in ocean composition. This is an important conclusion emphasizing the need to consider the interactions of marine biota and chemical changes in the oceans through geological time.

The paper is well-written and the results are important and well-presented. I recom-

mend publication.

Specific comments:

Just two relatively minor points:

(1) Given the strong evidence for elevated ratios of organic C/P in buried organic matter from both modern (e.g. Black Sea) and ancient environments (sapropels, black shales) under anoxia, I find it rather surprising that the authors assume a fixed ratio of C:P of 250 for buried organic matter in the LW model. The authors state in the discussion on page 439 that this does not affect the trend in the change of deep ocean N:P, but it does affect the magnitude of the change, so why not include this process and only show those results?

(2) On page 439, it is suggested that changes in phosphorite formation and denitrification in upwelling zones could be linked and could affect the deep ocean N:P ratio. However, the removal of P through phosphorite formation in these areas is much smaller than the dispersed formation and burial of authigenic apatite throughout the ocean (see for example, the work of Ruttenberg, Filippelli and others). Thus, this is not such a likely mechanism.

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