

## ***Interactive comment on “MOPS-1.0: modelling the regulation of the global oceanic nitrogen budget by marine biogeochemical processes” by I. Kriest and A. Oschlies***

**Anonymous Referee #2**

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### **Summary:**

The manuscript presents the extension of an existing marine biogeochemistry model grounded on the phosphorus cycle, to one that includes the nitrogen cycle and processes such as denitrification and nitrogen fixation. The resulting model is examined within the framework of the so-called Transport Matrix Method, a computationally-efficient offline mode that readily permits the simulation of time periods appropriate for examining equilibrium states (and the role of different processes in reaching these states). As part of the manuscript's sensitivity analysis, assumptions going into the revised model – including stoichiometry, substrate affinities, temperature dependence and detrital sinking – are examined to determine their role for realism and performance.

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Among other conclusions, the model lends support to lower observed estimates of denitrification, and its investigation favours a classic remineralisation profile of sinking material.

### **Overview:**

Overall, the paper is a solid piece of work that builds well on previous modelling work by the same authors. It is thorough in its exploration of the various assumptions that frame its new nitrogen cycle, giving the reader confidence in the resulting understanding provided by the model. I do not have any show-stopping concerns or criticisms of the manuscript. I do, however, have a short list of specific additions / changes that I think would strengthen the manuscript or give it a broader appeal, plus a longer list of more minor comments or queries. The former are included below, the latter are presented as in-text modifications to the GMDD draft. I do not see any of these as critical, but would ask that the authors consider them. My recommendation is publication after minor revision.

### **Specific comments:**

For a GMD manuscript, I find the expulsion of model description to an appendix a strange decision. It would make more sense for the model equations, etc., to move from the appendix to the model description section in the main body. Not least because it would obviate the need to keep skipping forwards to the appendix to properly understand the context of the text currently in the description section.

A paragraph summarising the basic concepts involved in the TMM would be extremely helpful. Nothing much, just an outline so that readers aren't obliged to consult other manuscripts to get a basic idea of what's going on.

I would like to see a short section describing the alternative approaches taken by other contemporary models for dealing with the aspects of the nitrogen cycle considered by the manuscript (e.g. denitrification and nitrogen fixation). This is already done in

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a piecemeal way through the manuscript, but it would be better (to my mind) if there were a specific subsection devoted to it. In the GMD framework, it's important that a new model is contextualised in this way so that readers can better judge what it brings to the table. This could include, for instance, noting where (why?) other models neglect such processes.

Please also note the supplement to this comment:

<http://www.geosci-model-dev-discuss.net/8/C936/2015/gmdd-8-C936-2015-supplement.pdf>

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Interactive comment on Geosci. Model Dev. Discuss., 8, 1945, 2015.