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Biogeosciences Discussions

Interactive comment on "Stoichiometries of remineralisation and denitrification in global biogeochemical ocean models" *by* A. Paulmier et al.

Anonymous Referee #2

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Review : Stoichiometries of remineralisation and denitrification in global biogeochemical ocean models

A. Paulmier, I. Kriest, and A. Oschlies

The paper by Paulmier et al. describes in detail the elemental composition of organic material and the remineralisation products in the classical view of e.g. Redfield. The authors set up equations for the reduction of organic matter under oxic and anoxic conditions and evaluate the oxygen demand involved in the different processes. The interesting next step they take is the comparison of their findings with the formulations used in global biogeochemical cycles. The model formulations are within the uncer-

tainty of the theory for remineralisation under oxic conditions whereas inconsistencies become obvious in the formulations for denitrification.

The first part of paper is well written and even the very theoretical part is, after getting used to the nomenclature, easy to follow. Only a few sentences referring to side or latter aspects might confuse the reader and should be reedited (e.g. page 2547, line 7-8 point to Fig. 1 showing the formulations used in models is an unnecessary information in this part of the paper). The section 4 is not so straight forward. Some information are given without further explanation and seem to contradict latter statements: e.g. the different numbers given in paragraph 4.2 for nitrate consumption during denitrification versus oxygen consumption for HAMOCC (0.6) and PISCES (0.7) whereas in Table 2 the numbers of process ratios for CR and CD and the given quotient in the last row are very similar for HAMOCC and PISCES.

Looking from a modeler's point of view I am missing an additional discussion on why the authors favour the formulation by Richards or Anderson and not the one by Takahashi which is used by two of the global models? How much is known about H excess to pin down the elemental composition on global scale?

Nevertheless, by highlighting implicit assumptions made in models the paper stimulates to think about well established formulations like the elemental composition of organic material and their representation within models. Therefore I strongly recommend this paper for publication after some minor revisions.

General comments:

p2542, l 9-24 I understand that the models could not be described in great detail. However I would suggest stating once the similarities of all models (e.g. HAMOCC, PISCES and BEC use fixed O2/C/P/N ratios and all three simulate cycling of C, O, N, P, . . .) and then mentioning differences relevant to the topic.

p 2550 Could you comment on any changes in the nitrate and oxygen demand in the

case of anammox with nitrite coming from different sources (nitrification or denitrification)?

p2555, l 19-20 Anaerobic remineralisation of DOC is only necessary if the livetime of DOC is long enough to build up significant concentrations in the suboxic zones.

p2556, l 26 Please comment on these numbers and if they should be identical to the ones given in Table 2, last row.

p2559 l 3-5 Please comment on the differences between the numbers for H excess, anaerobic between HAMOCC and PISCES. Given the nearly identical values that enter eq(26) it is an amazing discrepancy.

Special comments: p2548, l 14-19 these sentences seem to be displaced and should be transferred to the end of 3.1.3

p2551 l 23 typo: replace oxix to oxic

p2556 l 25 typo: replace mode to model

p2553 l22 typo: replace AR to CR

Interactive comment on Biogeosciences Discuss., 6, 2539, 2009.