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Interactive comment on “Organic nutrients and excess nitrogen in the North Atlantic subtropical gyre” by A. Landolfi et al.

Anonymous Referee #3

Received and published: 9 April 2008

This manuscript describes a series of dissolved nutrient measurements performed along a west to east transect of the Atlantic and utilises a series of models to help describe the evolution of an inferred excess of nitrogen. The presentation of this dataset is of importance, being one of only a small number of observations of organic N + P on this spatial scale. I do have a small number of fundamental issues which concern the subsequent treatment/interpretation of the data. With the greatest respect to the authors and their backgrounds, my impression is that the approach taken has been biased to some extent from the modellers view of the ocean without sufficient reference to what is currently understood about biogeochemical processes, particularly in the surface oligotrophic ocean. Whilst the three models are presented well and their approach valid, I would like to see this manuscript: . Firstly make an assessment of the

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value of the Redfield ratio when considering organic nutrients and consider whether this is a realistic tool for the purpose used here. I would contend that we know that inorganic C:N:P dissolved and particulate concentrations, and their uptake ratios rarely agree with Redfield values in these (surface) waters; that accumulation of refractory material is likely to be disproportionate with respect to N:P; and that microbial use of dissolved organic material does not conform to Redfield stoichiometry.

Include ammonium within their assessment. For much of the area of the study, ammonium will likely be the dominant inorganic N species in terms of concentration and uptake in the upper 100m. Ignoring this will result in spurious concentrations of DIN (too low) and TON (too high).

Explain what is meant by preferential mineralisation and uptake and do these processes, if commonplace, argue against the appropriateness of the Redfield ratio in this particular context? Rather than just use these terms to explain anomalies in the dataset without further consideration, it would be of benefit to consider what conditions might favour these occurrences, what observed evidence is there and address the potential for quantifying the extent to which this is happening.

Recognise the accumulation of refractory N, which is largely ignored. Whilst not possible from the current data, a refinement might be to consider only labile material.

Specific comments:

P690-691 The statistical treatment applied to precision of nutrient measurements is invalid as it appears to be based only on duplicate samples. This should be clarified or acknowledged.

P701 Remaining TNxs signal may also come from the accumulation of refractory material

Throughout the text there are a number of references to DINex, which should be DINxs. The authors should also endeavour to be consistent with units $\mu\text{mol m}^{-3}$;

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μ M. When discussing DON/DOP and TOP/TON e.g. P702, it might help to explain the magnitude of the difference

Fig 1. The legend should identify what the black dots and red crosses denote.

Fig 2. This is hard to interpret. Firstly the isopycnals need identifying in the legend and should be less frequent. The contours need smoothing.

Fig 7. Is very poorly described and therefore difficult to interpret.

Fig 9. Built up should be build up

Fig 10. Density value for box a) appears to be incorrect.

1) Does the paper address relevant scientific questions within the scope of BG? Yes 2) Does the paper present novel concepts, ideas, tools, or data? Yes 3) Are substantial conclusions reached? Yes 4) Are the scientific methods and assumptions valid and clearly outlined? Largely, however the points raised above should be addressed 5) Are the results sufficient to support the interpretations and conclusions? As for 4) 6) Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes 7) Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes 8) Does the title clearly reflect the contents of the paper? Yes 9) Does the abstract provide a concise and complete summary? Yes 10) Is the overall presentation well structured and clear? Yes 11) Is the language fluent and precise? Yes 12) Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes 13) Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Small number of points noted above 14) Are the number and quality of references appropriate?

Interactive comment on Biogeosciences Discuss., 5, 685, 2008.

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