

***Interactive comment on* “Distribution of inorganic and organic nutrients in the South Pacific Ocean – evidence for long-term accumulation of organic matter in nitrogen-depleted waters” by P. Raimbault et al.**

Anonymous Referee #2

Received and published: 31 October 2007

General comments:

This paper describes a detailed study of carbon, nitrogen, and phosphorus pools in the South Pacific. The paper is largely descriptive in nature and so it is not particularly novel. The value of the paper, however, is that it includes a large amount of data from analyses that are analytically extremely challenging to do well, and the authors appear to have done them extremely well. The one substantive problem with the manuscript is the awkward writing style, which I suspect is due to English being the second language for some of the authors. I offer a large number of minor suggestions for improvement

in the technical comments below.

The manuscript presents data that would be of interest to the readers of Biogeosciences. I recommend publication after revision.

Specific comments:

1. Page 3042, line 15 – The authors did not measure nitrate availability, which implies a rate process. They only measured the size of the resident pool of nitrate. This sentence needs to be redrafted to reflect this important difference.
2. Page 3048, line 17 – Why not measure light levels directly with a light meter?
3. Page 3056, line 20 – I seriously doubt that there is no DOP in deep waters. I suggest that DOP values be reported as below the limit of detection.
4. Page 3056, second paragraph – See recent review of the nitrite maximum by Lomas and Lipschultz for an excellent up to date discussion of this feature.
Lomas MW, Lipschultz F (2006) Forming the primary nitrite maximum: Nitrifiers or phytoplankton? *Limnol Oceanogr.* 51:2453-246.
5. Page 3059, line 22 – Nitrogen is really the limiting nutrient – nitrate is the form of that nitrogen. Again this is a subtle but important distinction.
6. Page 3061, line 14 – I assume the authors are talking about chlorophyll packaging as a way of increasing chlorophyll concentrations. Is this correct? If yes, this should be stated and a reference given. If not, the text needs to be revised to clarify.
7. Page 3063, line 20 – The percentage of DOC released by phytoplankton can be highly variable. I suggest a more appropriate reference would be a review chapter such as Carlson (2002).

Carlson CA (2002) Production and removal processes. In: Hansell DA, Carlson CA (eds) Biogeochemistry of Marine Dissolved Organic Matter. Academic Press, Amsterdam, p 91-151.

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Technical corrections:

Page 3042 Line 11 – add “was” after silicate

Line 13 – suggest changing text to read “in the west. . . . (UPW) in the east. . .”

Line 14 – should read thousand-fold

Line 17 – awkward sentence, instead of weak do they mean low?

Page 3043 Line 4 – change this of inorganic to **that** of inorganic

Line 8 – dissolved organic matter should be abbreviated DOM. Inconsistent use of abbreviations occurs through out the paper.

Line 24 – remove of before reported

Page 3044 Line 2, 10, and 19 – abbreviate South Pacific Gyre as SPG, consistent with earlier paragraph

Line 12 – should be distributions

Line 14 – consider changing to “. . . concentrations are often below detection. . .”

Line 16 – change been to be

Line 26 – I doubt that 24 short-term stations were studied each day!!

Page 3045 Line 2 – suggest that the authors use the more common HNLC abbreviation rather than HNC (also page 3049, line 15)

Line 5-6 – sentence starting with Station does not make sense.

Line 9 – change supported to supporting

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Line 11 – consider changing to “...sampling were chosen according to the depth of the maximum...”

Line 17 – insert a comma after -1) and 1992)

Page 3046 Line 12 – insert the before monochromatic

Page 3047 Line 3 – consider changing to “...results of filter blanks are given in Table 1

Line 4 – consider changing given to published

Line 12 – consider changing to “in the laboratory”

Line 14 – consider changing during to for

Line 20 – should be DOP

Line 24 – should be Bermuda Biological Station for Research

Line 25 – should be reagents

Page 3048 Line 2 – should be **W**hatman

Line 4 – insert an after using

Line 8 – consider changing mass to mass spectrometer for readers who may not be familiar with this instrument

Page 3049 Line 3 – start the sentence with The

Line 8 – capitalize Chilean

Line 8 – should be patterns

Line 9 – consider changing to “followed that of temperature, decreasing from...”

Page 3050 Line 5 – should be ranging

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- Line 7 and 8 – consider inserting the before surface
- Line 11 – consider changing to “. . . by very nutrient-poor water.”
- Line 16 – should read “. . . surface waters were phosphate-replete. . .”
- Line 18 – consider changing to valuess
- Line 19 – insert a comma after 76W and after (Fig. 2) on line 25
- Line 27 – should be not instead of no
- Page 3052 Line 6 and 14 – change concentration to concentrationss
- Line 11 – consider changing to “. . . located in the subsurface. . .”
- Line 23 – change trend to trendss
- Page 3052 Line 6 – consider changing quite to roughly
- Line 6 – insert an before HPLC
- Line 8 – insert the before surface
- Line 9 – consider changing to “. . . found in surface water. . . W, with a value. . .”
- Line 12 – consider changing value to which is
- Page 3053 Line 15 – insert the before Marquesas
- Page 3054 Line 9 – should be non-chlorophyll
- Line 14 – should be turnover times of carbon
- Line 20 – remove rate
- Line 22 – consider inserting e.g. before Wada
- Page 3055 Line 6 – insert the before signature
- Line 10 – consider changing to “. . . use of a nitrogen source enriched in ¹⁵N.”

Line 15 – consider changing to “...to a large increase innitrate reaches 10 to...”

Line 20 – insert the before nitrate

Line 22 – delete “dissolved organic matter (DOM) in terms of”

Line 27 – consider changing to “... those measured in surface waters in the upwelling regions”

Page 3056 Line 7 – do the authors mean no subsurface maximum?

Line 15 – what is meant by Isolines 0.1

Page 3057 Line 4 – change to valuess

Line 5 – change would to should

Line 7 – should be two-fold

Line 26 – insert the before Marquesas

Line 27 – insert a comma after imagery

Page 3058 Line 3 – should be “...proceduress...nitrate concentrationss in subtropical...”

Line 6 – insert comma after method

Line 7 – insert the before subtropical

Line 10 – insert such before as

Line 16 – insert the before nitracline

Line 18 – insert a before significant and change system to systemss

Line 23 – should be concentrationss

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Page 3059 Line 5 – delete the before primary

Line 11 – insert a comma after nitrite

Line 13 – should be concentrationss

Line 22 – should be biological

Line 23 – should be dynamics are important

Line 25 – insert a comma before which

Line 27 – insert the before ocean

Page 3060 Line 2 – consider changing to “. . . but acting at rates too low. . .”

Line 3 – change would to should

Line 13 versus line 25 – use the same format for abbreviations N:P or nitrogen/phosphorus – both are fine just be consistent

Line 25 – change to “. . . the elemental composition of diatoms. . .”

Line 26 – consider changing to “. . . that diatoms take up nutrients. . .”

Page 3061 Line 1 – change driving to driven

Line 5 – insert the before nitracline

Line 7 – should be four-fold

Line 8 – should be valuess

Line 9 – consider changing to “. . . at least ten-fold higher than that measured. . .”

Line 11 – very awkward sentence

Line 12 – do the authors mean no correlation?

Line 15 – do the authors mean the vertical distribution of POM?

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Line 21 – should be gradients

Line 24 – change to “. . . nitrogen sources as indicated by the natural. . .”

Line 25 – should be times

Page 3062 Line 6 – should be values

Line 8 – change than to that just before “the use of GF/F”

Page 3063 Line 4 – change west to western and turn over to turnover

Line 12 – insert a before magnitude

Line 15 – use POM

Line 19 – consider changing to “Phytoplankton are the major producers. . .”

Line 28 – should be turnover

Page 3064 Line 10 – should be nutrient deficiency

Line 12 – should be accumulated DOC or accumulation of DOC

Line 14 – should be nutrients

Page 3065 Line – consider changing to may prevail

Page 3066 Line 1 – consider changing along to throughout

Line 5 – should be a value

Line 11 – insert the before literature

Line 23 – should read nutrient distributions

Page 3067 Line 4 – consider changing more to moreover

Line 5 – consider change long time to long time periods

Line 6 – should be not immediately

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Table 1 – Include the diameter of the filters used in the legend. Also, why is there no standard deviation provided for the blank GF/F? Also, I assume that the filter blank is in addition to the reagent blank. If this is correct, add a note to the legend. Finally insert temperature after high in the column heading.

Table 2 – Include the regression for Tchl 0.2 = TchlGF/F.

Table 3 – I believe the units should be $\mu\text{moles}/\text{m}^3$. Also, these diffusive fluxes are going in two different directions. Inorganics from deep waters to surface waters and organics from surface to deep. Correct? This needs to be pointed out by having negative values for some of the fluxes.

Figures 2, 3, and 8 – The individual graphs are too small. They are very hard to read on a printed copy. Also, a lot of readers will not have access to a color printer. Consider using a color scale where the black and white version goes from light to dark.

Figure 7 – This figure is very chaotic. I suggest splitting the data into two panels to make the trends in the data clearer.

Interactive comment on Biogeosciences Discuss., 4, 3041, 2007.

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