

Interactive comment on “Insignificant enhancement of export flux in the highly productive Subtropical Front, east of New Zealand: a high resolution study of particle export fluxes based on ^{234}Th : ^{238}U disequilibria” by K. Zhou et al.

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Received and published: 26 October 2011

Review of 'Insignificant enhancement of export flux in the highly productive Subtropical Front, east of New Zealand: a high resolution study of particle export fluxes based on ^{234}Th : ^{238}U disequilibria,' Zhou et al., BG L. Miller

General comments: This paper presents a nice, thorough little study that provides very useful insight into a pressing question about the extent to which carbon export is decoupled from iron-fertilized primary production. I think the paper requires only minor

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modification before publication: mainly, some details just need to be clarified to make it easier to compare these results with those of others.

Detailed comments:

Although overall, the paper is very well written in English that is clear and accurate, in places, some peculiar syntax does sneak into the manuscript, and I encourage the New Zealander co-authors to use a heavier hand in editing the paper.

I encourage the authors to report their radioactivity values in the proper SI units of mBq, instead of dpm. To aid readers' mental comparison with the literature, the values in dpm can be included in parentheses after the most important and/or significant values, but the use of dpm is anachronistic.

Make it very clear throughout the paper what salinity scale was used (presumably the practical scale, PSU?). With the recent change in the standard salinity scale, it is extremely important to explicitly state what scale has been used.

Explain what the uncertainties on the average values reported in the text are and how they were determined. The values given don't agree with the direct standard deviations or standard errors of the averages or with the propagated errors from those on the individual values that went into the averages.

Abstract: Page 9536, line 13: these flux numbers appear to have too many significant figures, which contradict the assertion that the values are essentially the same. Reduce the number of significant figures reported and possibly also include the uncertainty(ies) in the values.

–, line 15: specify that it was 'The derived POC flux...' that was not enhanced.

Introduction: Adding a hemispherical map of the entire Southern Ocean (including the approximate location of the subtropical front all the way around) to Figure 1 and introducing it in the first paragraph would help readers follow the introduction.

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Figure 1: Explicitly identify Chatham Rise on the map.

The red circles are hard to see. It might help to make the station numbers black. They are also difficult to read and should be bigger.

The axis and scale labels are too small and difficult to read. (also for Figures 3, 4, 5, 6, and 9)

Methods: Th-234 analysis: Specify what the reported uncertainties on the Th-234 numbers are – are they based only on the counting errors, or do they also include the uncertainties in the tracer recovery analyses, the variability in the filter blanks, etc.?

Other ancillary parameters: Specify what the fluorescence numbers are and in what units they're reported. Even if they're uncalibrated data from the CTD, make that clear and indicate that the numbers are in volts. If they're some sort of unitless ratio, that means they've been normalized to something, and that needs to be explained. Later, on page 9542, the Results section explains that the fluorescence signal was calibrated against chlorophyll, but there's nothing in the methods section explaining how chlorophyll was measured, and it appears to be the raw fluorescence data that are shown in figure 4 – if the fluorescence data were actually calibrated against chlorophyll measurements, the results would be reported in chlorophyll units. Perhaps the authors don't actually mean 'calibrated' on line 10 of page 9542, but rather just mean to say that the fluorescence signal from the CTD correlated well with the discrete chlorophyll samples.

Results: Page 9542, line 7: Saying that the mixed layer depth was 'higher' is ambiguous. Just say that the mixed layer was deeper at the high-salinity stations....

–, lines 13-4: The fluorescence signal is not homogeneously distributed within the surface mixed layer at station C15.

–, lines 15-20: This description of the variations in fluorescence is very difficult to understand, with apparently contradictory statements. At the least, this section needs

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to be reworked to be clearer and simpler, but perhaps this much detail isn't required, since the fluorescence data are shown in the figures (i.e., Figure 6d could be separated out and moved up earlier – which should be done, anyway, since that figure is being used as the basis for the water mass classifications).

–, lines 25-6: '... POC distributions generally followed those of fluorescence...;' also, note that in that sentence 'its' refers back to 'fluorescence,' not 'POC.'

Figure 4: It would help follow the story, if the stations were identified as SAW, STF, and STW directly on this figure.

Table 1: Include the specific dates for each station.

The uncertainties in the U-238 and POC measurements need to be included also.

Be consistent with reporting the data to either 1 or 2 digits in the uncertainties – you have the particulate Th and Th:U ratio with 1 uncertain figure, but the total Th and the fluxes with 2 uncertain figures. Personally, I prefer for data to be reported with 2 uncertain figures, because that allows others to do calculations on the data without accumulating additional errors.

Page 9543, line 14: Make sure the number of significant figures matches between the values and their uncertainties.

–, lines 17-8: Only station C11 in figure 4 shows total Th-234 to be homogeneous in the surface mixed layer.

Equation 2: The way the reference is placed in this sentence implies that equation 2 came directly out of the Buesseler et al., 1992 paper, which it didn't. Because the derivation of that equation isn't intuitively obvious, the actual derivation needs to be either referenced or explained in more detail here.

Figure 7: Give the actual dates for each station sampling in the caption.

Table 2: Too many significant figures are reported for the Th flux results.

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Uncertainties (variabilities) in the POC and fluorescence values are needed.

A concentration quantity (as opposed to a flux) at a given depth would not be in units of m^{-2} . I assume that those are actually integrated inventories, in which case, the column labels should be, for example: POC, 0-100 m.

Footnote 'b' makes no sense – if Th-234 were in equilibrium with U-238, the flux would just be 0. The calculation actually done needs to be explained better.

Page 9547, 1st paragraph: Too many significant figures are reported on almost all of those numbers.

–, line 25: Table 1, not 2.

Discussion:

Page 9549, line 15: Replace first comma with a period.

Table 3: Emphasize which P values are significant and which are not.

References:

There are a lot of errors in the references. Only a few of the errors would make it difficult for a human to find the paper, but many would cause a search by a computer to fail.

The most prevalent error is in the authors' initials: too many, not enough, or just the wrong ones. It is important that the authors initials exactly match those used in the specific paper cited, so that citation index searches can find them.

For both Limnology and Oceanography and Aquatic Microbial Ecology, it's useful to include the issue numbers, because of the way the web sites are organized.

Michiel Rutgers van der Loeff's name is presented wrong in every reference in which he not the first author. That is, it should be, for example, Rutgers van der Loeff, M.M., not Van der Loeff, M.M.R.

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Special characters are often left out of peoples names, but should be included.

Volume numbers needed: Buesseler et al., 1992; Kawakami et al.

Errors in titles: Nodder et al., 1998b; Orsi et al.; Probert et al.

Errors in page numbers: Pollard et al.; Redfield et al.; Rutgers van der Loeff, 2002

Comiso et al.: title doesn't include hyphens.

Kara et al. has the wrong title.

Nodder et al., 1998a: that's Deep-Sea Research I, not II.

Interactive comment on Biogeosciences Discuss., 8, 9535, 2011.

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