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Biogeosciences Discussions

Interactive comment on "Distributions of dissolved trace metals (Cd, Cu, Mn, Pb, Ag) in the southeastern Atlantic and the Southern Ocean" *by* M. Boye et al.

Anonymous Referee #2

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Distributions of dissolved trace metals (Cd, Cu, Mn, Pb, Ag) in the southeastern Atlantic and the Southern Ocean M. Boye, B. D. Wake, P. Lopez Garcia, J. Bown, A. R. Baker, and E. P. Achterberg Biogeosciences manuscript number bg-2012-102

This fairly short paper comprises data that appears to be of good accuracy and the various interpretations, that are mostly qualitatively, are sensible. Therefore its acceptance for publication is recommended.

The accuracy of the data is partly supported by the results provided on the SAFe/GEOTRACES reference samples with the one caveat that the Cu values reportedly are too low, while as yet there is no other data to compare with for Ag.

The statement footnote with Table 1 as follows:

b) in general methods based upon ICP-MS yield higher dissolved Mn concentrations than methods based upon catalytic-enhanced flow injection. Furthemore there are significant difference between UV treatment and non-UV treated samples for dissolved Mn (http://www.geotraces.org/images/stories/documents/intercalibration/Files/Reference Samples November11/SAFe Ref Mn.pdf).

is recently falsified by the excellent agreement between shipboard FI and home ICP-MS at Bermuda station by Rob Middag (presentation De Baar, Middag et al. at recent Ocean Sciences meeting).

The major omissions of this paper are the absence of the following data information: 1. complete table of the dataset also including S,T, major nutrients etc. 2. graphs of each station showing the vertical profiles at each single station of the trace metals and where relevant the co-related major nutrient (notably silicate or phosphate) in same graph.

The Figure 3 with contour plots in ODV graphics is nice and useful but is not really informative on the smoothness of each vertical profile at each station, and that expected smoothness (or not) is indicative of analytical accuracy and therefore not unimportant.

Briefly by the interpolation routine of a program like ODV one may obtain a somewhat flattered overall impression of reality. Or in other words as a colleague once told me: "believe me my friend, there are lies, there are big lies, and there are contour plots." I am not saying here that the ODV plots do give a flattered impression of reality, but in order to see the reality one would like to be able to see or plot oneself the data station by station.

My advice would be that definitely a complete data table should be available, either in the article itself or in the accompanying electronic supplementary material, the latter assuming that the journal Biogeosciences offers the options of such supplementary

material.

Next it would be wise to consider having at least some vertical profile graphics of individual stations in either the article itself or the supplementary material. How many and which profile to place either in the paper or in the supplement I cannot say right now, because I have not seen such plots, in other words it is up to the authors to make such plots, discuss among each other on their meaning and implications, and finally decide on which plot is shown where, if at all.

Another verification of the accuracy of the data is by a more systematic comparison with previously published datasets. However all, except one, previously published datasets in the region are from years ago in the pre-GEOTRACES era of reference samples and improved sampling methods. Nevertheless when there is good agreement then both previously published data and the new data are proven to be accurate. On the other hand when there is no agreement then perhaps the previously published data of many years ago is more doubtful. For Cu I do not see such more formal comparison, if anything it could perhaps by comparison of Cu-Si plots shed light on the reported underestimation versus the SAFe reference samples, on the other hand the old data by Loscher et al may just as well have had its problems.

The one element for which an extensive recent dataset exists is Mn, and in fact some of the here reported stations do appear to either overlap or be very close to stations of Middag et al 2011 in the about 43 to 57 degree South range, and the complete database is reportedly (Middag, top of their page 2664) available. Thus a more formal comparison of absolute values of Mn between the two datasets appears feasible hence is advised.

Minor corrections and typo's

p.3580 Abstract line 19 typo: nano-flagelattes should be nano-flagellates

p.3583 line 20 (ultrapur HNO3 insert e : ultrapure HNO3

p.3584 section 2.3. line 5: Dissolved trace metal (Cd, Pb, Cu) concentrations .... should be: Concentrations of dissolved trace metals (Cd, Cu, Pb) .....

line 10: 0.024 M UpA HNO3 please replace UpA with a normal word, presumably ultrapure

p.3585 line 19-22 comprises important statement on less than adequate recovery of Cu: Dissolved Cu concentrations determined by ID-ICPMS were lower compared to the consensus values, especially in the deep samples (Table 1), possibly because the samples were not exposed to UV-irradiation prior their analyses (Milne et al., 2010).

p3586 line 20 We emphasis that dry deposition insert e and z instead of s is preferable: We emphasize that dry deposition

p3588 lines 20-23: this is confusing, going from Weddell Gyre in first sentence to subtropical waters in second sentence implies going in northward direction and not in southward direction.

The highest Cu concentrations in surface waters were recorded in the northern branch of the Weddell Gyre (Fig. 3). Conversely dissolved Cu concentrations decreased southward in the subtropical waters

Perhaps you want to say it like this, I am not sure, please verify waht you want to state here and state this unambiguously:

The highest Cu concentrations in surface waters were recorded in the northern branch of the Weddell Gyre (Fig. 3). In contrast in the subtropical waters, the dissolved Cu concentrations decreased in southward direction.

p3589 lines 1-4: This is an example where separate plots for each station of vertical profiles at each station of dissolved Ag and silicate would be informative, in general the ODV plots on their own are not very informative. Vertical distributions of dissolved Ag generally showed lower concentrations in surface waters and increasing concentrations with depth (Fig. 3), similar to silicate (Le Moigne et al., 2012). p3589 line 23: macro-

nutrient is here and everywhere else in the text confusing for those old people that are aware of the original literature.

In the original book chapter 'The Micronutrient Elements' by C.P. Spencer (Chemical Oceanography, Volume 2, Chapter 11) the micronutrients are N, P and Si as compared to macronutrient C and also conveniently in same 'Micro' as their micromolar concentrations in seawater. Recently there is a tendency for a 3 order of magnitude shift where here also the authors refer to N, P, Si as macronutrients and the bio-essential transition metals as micronutrients. This is unfortunate as causing confusion. For circumventing this problem our lab uses the words major nutrients for N,P,Si and trace nutrients for Fe, Zn, Cd, Cu etc.

p3590 line 2 and line 12: instead of SBdy please write full word Southern Boundary or better ACC Southern Boundary. It is good practice to only use abbreviations or acronyms that are commonly used by others is published literature, everyone knows the meaning of NADW or AABW but SBdy is not commonly used in the publishe literature.

p3591 line 24: please add Ocean at the end of sentence: of trace elements to the southeastern Atlantic Ocean.

p3594 line 5: replace shell with frustule, diatoms do not have shells but external frustules ... incorporated into the siliceous frustule of diatoms ....

also insert 'the' further in the same sentence: .. and that the ocean Ag cycle ....

line 27 insert 'to' as follows: .... (L ÂÍoscher, 1999), compared to those in the .....

p3595 line 14: relatively as follows: 2010). The relatively low concentrations ....

p3597 line 23: again please in full AAC Southern Boundary. p3597 line 3: same

p3597 line 7: insert 'the' as follows: due to the limited .....

Interactive comment on Biogeosciences Discuss., 9, 3579, 2012.