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Interactive comment on "Nitrification and its oxygen consumption along the turbid Changjiang River plume" *by* S. S.-Y. Hsiao et al.

Anonymous Referee #1

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General comments: The Aim of this study according to tittle is " Nitrification and its oxygen consumption along a turbid river plume". The article present many data (DOC, DO , DON, CR, DIN, POC, PON, NOD, ammonium, nitrate, nitrite, Mn, Fe, TSM, salinity), AmoA quantification, nitrifying rate. In addition of the description of the peculiar river plume, the interesting data of this study is the presence and activity of nitrifyers on particles .

However, reading the article, it is difficult to keep in mind the aim of this study (Nitrification and its oxygen consumption along a turbid river plume) because of the multiplicity of results (DOC, DO , DON, CR, DIN, POC, PON, NOD, ammonium, nitrate, nitrite, Mn, Fe, TSM) , that serve more to describe the river plume than to bring information about nitrification and its oxygen consumption and the reader is a little lost in the reading. The

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multiplicity of acronyms does not help reader. It would be probably better to present only relevant results identified by multiparametric statistic tests than the important list of two by two parameter correlations. The manuscript should better focus on the subject. I have reservations about the accuracy of the measurement of the community respiration and on nitrification rate

Specific comments Although the study is focused on nitrification , the authors do not explain the details of this process and stipule that nitrification correspond to ammonium oxidation into nitrate and N2O is a byproduct. I found that a detailed description of nitrification process is lacking

Indeed, nitrification is composed of two independent steps, each of one is performed by a specific community. In aerobiosis the first one is Ammoniac oxidizing bacteria or Archaea and oxidize ammoniac (NH3) into nitrite (NO2-) (NH3 + 3/2O2 à NO2- + H2O + H+), This community is analyzed usually through AmoA gene (and that is done in this study). In some circumstances, ammonia oxidizing prokaryotes produce N2O as by product (when oxygen is limiting, probably because some strain possess denitrification gene) The second step is performed by nitrite oxidizing bacteria (NO2- + 1/2 O2 à NO3-) that are followed through norA or nrxA gene. Ammonia and Nitrite oxidizing communities are phylogenetically and physiologically different. This latter community was not analyzed in this study. Authors should better describe the process they are studying.

The main results of this study imply nitrification rate measurement. To do so, author have overflow water in bottle without head space, and incubated for up to 24h. I am concern about the oxygen concentration in flask during this 24h incubation , since nitrification is performed only in aerobiosis and oxygen might be exhausted during time. So if oxygen concentration is too low, nitrification rate would be inaccurate. Furthermore, nitrification rate in this study correspond to the sum of ammoniac oxidizing rate and nitrite oxidizing rate since the sum of 15NO3 and 15NO2 is used in the calculation, whereas only community corresponding to the first step (AmoA) were analyzed.

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Author should take consideration about this fact. . For community respiration, despite the fact that this process correspond to the main topic of this study, this rate seem to be done by the decrement of oxygen after 24h, and not by a kinetic, so this rate could be underestimated if it has been measured only with two points. This point is crucial since Dissolved oxygen might be low in this area. As several abiotic processes could consume oxygen (oxidation of Mn2+ or Fe2+ for example) , CR rate should be also corrected with abiotic value.

I found some discrepancy in the manuscript concerning degradation of the organic matter. P8694, l5, it is say that aerobic degradation of the organic matter was the major source of ammonium which may fuel nitrification. Latter (p8697l, 15) author used eq 1, that correspond to mineralization of organic matter by redfield model, but the product is nitrate not ammonium. So it seem that mineralization of organic matter can not fuel nitrification since ammonium is not formed. However, eq 2 same page, author still affirm that the product of eq 1 substrate of eq 2 are connected. I do not understand also how the author can calculated the % of oxygen consume theoretically by nitrification according to the equation. Since the product of eq1(NO3) is not the substrate (NH3)of equation 2. Redfield value are widely used in the manuscript. This parameter is still useful in deep ocean or away from coast, however deviations from the canonical Redfield Ratio have been observed for many areas, and this plume strongly influence by human activity can be also concerned. This fact weakens the conclusion of authors.

The conclusion of the author about the possible role of ammonium oxidation implying MnOx or FeOx, seem to be overestimated since, the 317 % of oxygen consummation calculated for nitrification correspond only to one point of the data set and all the other are lower or just above 100% of CR. Furthermore, the CR rate is probably underestimated as outline before. In addition, the author stipulate that all ammonium is converted to nitrate that imply that consumption of 2 O2 by NH3 whereas only 1,5 oxygen is necessary if ammonium is converted to nitrite. Further more, author suggest

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another reaction implying NO2- and MnO2 to form Mn2+ (eq 4) , I do not understand why this reaction would take place and why the author have chosen this reaction instead of other putative suggested by Hulth et al 1999 (4MnO2 + NH4+ + 6H+ -> 4 Mn2+ + NO3- + 5H2O) for example

Fe and Mn Oxyde are particulate so it is logic to find them associated with particle. The nitrification is mainly associated to particle, but this is maybe casual, due to other factor and not necessary due to the presence of these metal oxide.

Technical corrections : Please check that all acronyms are defined, for example I am not sure that DON was defined. P8693 line 4, sentence refer to Fig2i for Al, Fe Mn pattern whereas this figure concern only active Fe. Line 5, is % correspond to w/w or w/v can you precise. P8693 line 3. I am concern about the linear correlation found Fig4d, I do not seem that it is valid since there is a cloud containing many data and very few data are outside P8696 line 24-25, I do not understand the sentence

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Interactive comment on Biogeosciences Discuss., 10, 8685, 2013.