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Biogeosciences Discussions

Interactive comment on "Diagenetic alterations of amino acids and organic matter in the upper Pearl River Estuary surface sediments" *by* J. Zhang et al.

Anonymous Referee #2

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General comments:

This manuscript describes amino acid composition in different size fractions of sediments from an estuary in the Pearl River. Three different size fractions were studied for C and N conc., and ratios, total hydrolysable and D amino acids. Whereas the idea of looking into different size fractions is a good one, I have my doubts that the fractions that were chosen are relevant for the amino acid investigation that was done. This is a very crucial point and please see my comments below concerning this topic. Furthermore I think that the discussion does not really discuss the samples that were investigated but focuses on studies that were done by others and therefore rather rep-

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resents a literature review.

- Methods: I do not understand the sampling strategy, why were samples taken in this round shaped area of the estuary? Wouldn't it be much better to take a transect from the river towards the open sea? For me the samples do not look very different from each other when looking at O2 and chlorophyll for instance. Maybe make clear why the samples were chosen using Table 1. I have some concerns that the treatment of the samples has an effect on the size fractions, as sediment aggregates probably get destroyed by freezing, grinding and/or sonification. When then afterwards the samples were dispersed how original is the sample in respect to grain size (after grinding)? This is a major point! There is also no real overlap of the description of the "Sediment fractionation" paragraph and Figure 2 explaining how the fractions were reached. What was done exactly, what are the grain sizes of the resulting fractions named CPOM, FPOM, UDOM? I think it would have been much more appropriate to separate the fractions and especially the UDOM fraction from the original fresh sample (before freeze drying and grinding). Maybe it would have even been more useful to compare amino acid concentrations of the pore water with the amino acid concentrations of the solid phase. It is necessary to include error estimations on the different methods used. Another issue is the use of the 0-8 cm sediment fraction instead of concentrating on single sediment depths (or only the surface sediment) since as stated sedimentation rate is very distinct between samples (a factor of 10). This makes the 0-8 cm very different in age and probably ongoing degradation and difficult to compare.

- Results: The description of the results rather concentrates on the THAA and the DAA. It could be also of interest to look at the concentrations of other amino acids. Especially, the concentration pattern of the nonprotein amino acids Orn, β-Ala, γ-Aba and α-Aba which were analyzed could indicate organic matter degradation as they are diagenetic in origin. Is there an increase in the concentrations of these amino acids along the river or with decreasing sediment fraction size? Also the calculation of the degradation index based on amino acids by Dauwe et al. (1999) could give insights

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into the degradation of the organic matter in the sediments. Muramic acid data might also be used to estimate the contribution of bacteria to the organic matter. One would also include D/L ratios into the study. All this data seems to be available and need to be used. This might lead then to a valuable contribution.

- Discussion: My major point here is that data that was produced and shown or to a great extent not shown (there were 21 AA analyzed but only the D-AA are shown and the other combined toTHAA) is hardly used to make a story here in the discussion. Please use all the data that seems to be available (see recommendations below). What it is so far is a description of work from other people and the outcome of their work. However, the link to the studied samples here is not made. A main part of the discussion bases on data from other studies about particulate matter in ocean water and the Amazon River and not on other sediment studies. It is very difficult to compare water sample fractions like done in Hedges et al. with the sediments investigated here. Also the fractions used in the Hedges study are different from the ones presented here (if I understood the grain size fractions correctly). I would suggest to the authors to go very thoroughly through their data, if samples are still available use a surface sediment sample and a deeper sampler (same age, depending on the sediment rate) and compare the THAA composition and concentration, use various degradation indices (DI, non -protein AA, D/L ratios etc.), and compare this to studies that used sediments instead of water column work. It would be really good if it is possible to include some samples towards the open ocean.

Specific comments:

- Sampling: As the sedimentation rate varies in the system between 0.42-4.26 cm a-1, it might be interesting to have more detailed information about the sedimentation rates of the single sampling sites. How strongly is the system affected by tidal dynamics? Can the timing of the sampling explain differences in the water samples properties?

- Methods: Was deionized water used for the sieving procedure?

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p. 3334 line 4 I do not understand the sentence “the low abundance of muramic acid. . .” how can a low abundance indicate a significant contribution?

Figure 2: This figure is not clear and describes the fractionation business different from the text in the method section

Figure 6: Why is D-Asp in the FPOM so low, i.e. lower than in UDOM, any explanation?

Figure 7: I think this figure does not add new knowledge but is only representing nitrogen to occur in amino acids which is naturally true

Technical corrections:

- Table 2 lines 4 to 7 are redundant

- There are some misspellings: e.g. p. 3325 line 11: Lomestein -> Lomstein p. 3325 line 18:dissolved p. 3325 line 20: aminobytyric -> aminobutyric

- p. 3328 line 10 should read “sediment accumulation” instead of sediment flux - p. 3328 line 15, reference for 78% is missing - p. 3329 line 26, “which included” must be replaced by “to which were added” - p. 3331 line 20 should read “were found in..” - p. 3331 line 22 should read “both” instead of “either” (?) - p. 3333 line 5 “were other sources” - p. 3333 line 23 delete “recently” - p. 3337 line 8, diversified -> diverse - p. 3337 line 24 should read “to accurate quantify bacterial. . .” - p. 3338 line 14 “that” should be deleted

- Fig. 2: TOC and Total N do not occur in the figure and can be deleted in the caption. The line starting between 63-μm sieving and <63 μm going to the right is irritating.

1. Does the paper address relevant scientific questions within the scope of BG? The idea of the paper is good and would address relevant scientific questions within the scope of BG, however, the execution of the study fails to accomplish this aim 2. Does the paper present novel concepts, ideas, tools, or data? The study focuses on a new location (however, why the samples were chosen like they are is not clear to me) but

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uses well established concepts and no new ideas are presented 3. Are substantial conclusions reached? The conclusion do summarize findings in connection to what has been described in the discussion but are to a some extend not based on own data 4. Are the scientific methods and assumptions valid and clearly outlined? I have strong concerns about how the sediment fractions were revealed and therefore the outcome of the study 5. Are the results sufficient to support the interpretations and conclusions? As mentioned in my detailed report there is not much of interpretations of own results 6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes, but error estimations need to be added 7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Credit is given properly 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 mostly 12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? No formula used, abbreviations and units OK

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Figure 7 should be erased. If the fractionation scheme is better explained Fig. 2 can be deleted too.

14. Are the number and quality of references appropriate? Yes 15. Is the amount and quality of supplementary material appropriate? No supplementary material available

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Interactive comment on Biogeosciences Discuss., 8, 3323, 2011.