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Biogeosciences Discussions

Interactive comment on "Distribution and origin of suspended sediments and organic carbon pools in the Tana River Basin, Kenya" *by* F. Tamooh et al.

Anonymous Referee #1

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The manuscript provides and discusses a very interesting set of data from the Tana River, a relatively large river in Kenya, during different seasons. Patterns in suspended matter, carbon pools and their origin were studied along the full river continuum from headwater streams to lowland sites, ranging over an altitude of $\sim$4000 m. The manuscript also addresses the impact of damming on the carbon and suspended matter transport, which is very interesting though not fully discussed. Generally, the article is surely of interest for the readers of Biogeosciences. However, I have quite a lot of (mainly little) concerns, which should be correctable and should be taken care of in a revised version of the manuscript.

In many cases, it is referred to certain areas of the catchment, though it is not always clear, where the data was actually derived from. A better map indicating the different

regions and also the reservoir names would be desirable.

It is in parts quite complicated to follow the presentation of the results. It should be avoided to refer as excessively to the supplement data, but to the manuscript figures instead. Data, which is solely presented in the supplement so far (e.g. soil depth profile data), and which is of importance for the discussion should be presented as manuscript tables. Figure numbers should appear chronologically in the text, though so far they are mentioned in a strange order: e.g. Fig. 2 is not mentioned before the discussion; Fig. 4b after Fig 5; Fig. 7 before Fig. 6.; Fig. 9 before Fig. 8. Some figures are not referred to at all, e.g. Fig. 6b, 7b. It would also be helpful to refer to those figures again in the discussion more often when mentioning results. There are also some redundancies in the results section. Efforts should be made to present the data in a more concise way. To give a general example: Page 2533, Line 16-18: "Concentrations of POC during the wet season (0.23 to 119.8mgl$-$1) were much higher than during the dry season (0.3 to 5.8 mg l$-$1) and end of wet-season (0.4 to 12.6 mg l$-$1)." instead of: "Concentrations of POC ranged from 0.3 to 5.8 mg l$-$1, 0.23 to 119.8 mg l$-$1 and 0.4 to 12.6 mg l$-$1 during dry season, wet season and end of wet-season, respectively (Supplement Table 1)." Moreover, some results, e.g. those on the pigment analysis, are not mentioned at all.

In the discussion chapter, there are some redundancies. The authors should try to condense certain paragraphs. E.g. The discussion about phytoplankton contribution in the OC pool is once on page 2542 and then again on page 2544. Similarly, the discussion about C3- and C4-plant contribution as indicated by δ13C values is once on page 2541 and then again on page 2546/2547. It would be good, if those sections could be thematically combined. It should also generally be attempted to shorten the discussion. The discussion chapter may also benefit from some conclusive sentences at the end of the different chapters. More emphasis should be given on the impact of damming on the carbon and TSM distribution and potential consequences.

Besides that, there are a lot of technical errors, which are pointed out below in my

further comments and recommendations by line number. Overall, I think that moderate to major revision is needed before possible acceptance of the manuscript.

Page 2524, Line 22: Rephrase, e.g. “delta13C values in sediments from the main reservoir (-19.5 to -15.7 ‰ were higher than . . .”

Page 2524, Line 26: “signature”

Page 2524, Line 27: Remove “both”

Page 2524, Line 28: Insert “This was likely. . .” after the ;

Page 2525, Line 1: Remove “both”

Page 2525, Line 6: Add a conclusive sentence

Page 2525, Line 22: Define abbreviation of organic C = (OC) or total organic C (TOC)

Page 2525, Line 23: Why “i.e. C yields”?

Page 2526, Line 5: “suggest”

Page 2526, Line 8: Use primary or photosynthetic production instead of autochthonous, as this term is later defined in line 21

Page 2526, Line 15: This sentence sounds quite random here

Page 2526, Line 28: Exchange “;” with “,”

Page 2526, Line 29: “Besides the river continuum concept (Vannote et al., 1980),. . .”

Page 2527, Line 10: “. . .were limited to interactions with primary producers and invertebrates,..”

Page 2527, Line 22: Remove “while stable isotopes. . .” as it is redundant

Page 2527, Line 26: Remove “Organic C . . .” as it is redundant

Page 2528, Line 13: Add commas

Page 2528, Line 15: “. . .hence qualifying as . . .”

Page 2528, Line 25: Use OC

Page 2529, Line 2-4: Remove

Page 2529, Line 7: The river length of 1300 km appears to me quite a bit too long regarding the scale in Fig. 1 and internet sources. Please confirm numbers or state a reference.

Page 2529, 2.1: More information should be given about the rain pattern (how much and where especially?). Also, please provide detailed information about river discharge here (instead of in the discussion chapter Page 2538, Line 3-6) and refer to Fig. 2. More background information e.g. on land-use, vegetation,. . . would also be desirable.

Page 2529, Line 16: Remove “$\sim$”

Page 2530, 2.2: Please indicate how the samples were collected (e.g. from the shore or boat expedition?, with a bucket?...). For POC and PN analysis, filters must have also been weighed. Were sediment samples also dried before grinding and weighing sub-samples? If so, please state that. What was the reproducibility of the POC and PN analysis?

Page 2530, Line 1-3: Why referring now to four sampling campaigns instead of three as earlier? Indicate clearly that there were three detailed sampling campaigns and one follow-up fieldtrip in 2011 in order to. . .

Page 2531, Line 19: Use DOC as defined before

Page 2533, Line 1-2: Delete sentence as redundant.

Page 2533, Line 7-15: Paragraph not clear. Fix grammar and make the reader known which rivers is referred to.

Page 2534, Line 1-3: Are differences in POC/PN ratios between the sampling seasons

really statistically significant? There is no p-value given and the standard deviations appear to me quite large.

Page 2534, Line 6: Refer to Fig. 4a

Page 2534, Line 10: Delete . . . “for the three. . .”

Page 2534, Line 16-20: Rephrase and make more concise

Page 2534, Line 26: Refer to Fig. 5b

Page 2535, Line 13: Use OC

Page 2535, Line 17: Refer to Fig. 3:

Page 2536, Line 12-14: increase/decrease is not well seen in Fig 8a

Page 2537, 3.5: Description of age calculation may be more appropriate in the Methods section

Page 2538, Line 3-6: Move to Results chapter

Page 2539, Line 4-10: This discussion is not clear to me: Why does it imply that the river bed must act as a sink of TSM at other times? Can the TSM not just be derived from the collapse of incised and unstable river banks as stated later?

Page 2539, Line 20-24: Since values differ between bank sediments and SPM of the lower Tana, it should be made clear that bank sediments are an end-member that mixes with TSM from upstream. Adding TSM values of the upper Tana to Fig. 11 may improve the understanding of end-member mixing (see below).

Page 2541, Line 9: Delete (MAP) as not stated later any more Page 2541, Line 21-24: It is not clear, whether this statement applies to the upstream or downstream sites, or to both.

Page 2543, Line 1: Insert: . . . “the” deepest sediment core.

Page 2544, Line 28: “due to”

Page 2545, Line 17-25: Change order. First describe the situation in the study area and then set it in context with global values.

Page 2545, Line 29: “A. amethystinus”

Page 2546, Line 1-2: What do the authors exactly mean by this statement?

Page 2546, Line 7: Use OC

Page 2546, Line 13: “TOC:PN” generally: use PN or TN consistently the same as the way of indicating ratios (e.g. DOC:POC or DOC/POC) for all parameters.

Page 2546, Line 10-12: This may also explain the increase in DOC concentrations in lower altitudes.

Page 2547, Line 8: “two”

Generalyl: All units need to be checked and made sure that they are used consistently (e.g. always mg l-1 and not sometimes mg L-1 or mgl-1), and that there is a blank between numbers and units.

Fig. 1 An overview map would be desirable including information about latitude and longitude. At least refer to latitude and longitude in the text. Please indicate the position of the dams and reservoirs and especially those that were sampled in the map. If possible, a profile (distance from river mouth vs. elevation of the sampling station) would be a good addition.

Fig. 3 The additional separate sector of 3a is not really needed in my opinion. Consider adding a figure of the POC (mg l-1)

Fig. 10. Data could be combined into one graph

Fig. 11. Consider adding TSM data from the upper Tana River to this graph in a different color in order to emphasize the mixing behavior.

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