Biogeosciences

Discussions

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Interactive comment on "Dynamic seasonal nitrogen cycling in response to anthropogenic N-loading in a tropical catchment, Athi–Galana–Sabaki River, Kenya" *by* T. R. Marwick et al.

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(i) P8646, L14: Data of NO_2 is not presented. Is it negligible and is DIN assumed to be a sum of NH_4 and NO_3?

- This is a very good point. However, the data presented in the manuscript is a component of a broader study, in which the idea was to focus on organic carbon cycling within different African river basins. When setting up the sampling in the AGS catchment, we did not design our sampling to focus on N cycling in depth, hence we did not envisage

the necessity of NO_2^- measurements. - Abstract and P8646 (L14) have been adjusted to clarify the omission of nitrite measurements, and the assumption of DIN as the sum of NH_4^+ and NO_3^-.

(ii) P8646, L29: Is "5-7 60 mL" correct?

- Adjusted to read: "Between 5 and 7 borosilicate biological oxygen demand bottles with stoppers (60mL volume; Wheaton)...".

(iii) P8649: Data of conductivity shown in Fig. 2d is not described in the text at all.

- Conductivity data has been removed from the manuscript, though can still be found in the Supplementary data.

(iv) P8449-8650, 8656: Total DIN is discussed without any figures or tables. Similar to the question in P8646, L14, results on DIN and N compositions should be presented in more detail.

- We chose not to discuss total DIN in much detail given the focus on the transformations in nitrogen species and the seasonal differences therein.

(v) P8650, L11: The 2nd "WRST" should be "WSRT".

- Adjusted.

(vi) P8650, L23: CH_4 in Fig. 4b should be touched.

- Breakline has been adjusted on y-axis so scale is more clear.

(vii) P8651, L1-12: Comparison of d18O and POC:PN between three seasons are not shown in any figures or tables.

- The data are available in the supplementary data file – since the manuscript already contains quite a number of Figures, we prefer to keep them only in tabular form – but if the reviewer and/or editor feel it would be better to present them in a (supplementary?) Figure, this can easily be provided.

(viii) P8652, L19-23: Because data of river discharge was not available, loading of nitrogen or sediment cannot be directly discussed. Thus, the authors should avoid such an expression as "it is apparent that these seasonal DIN export observations agree with the suggestion of ...".

- Adjusted to read: "Despite the lack of high-frequency DIN data or the availability of discharge data at the outlet of the A-G-S catchment over the sampling period, we propose that seasonal DIN observations may reflect the suggestion of...".

(ix) P8654, L19-22: The authors did not present any proof on "the dense coverage of the water surface by macrophytes during the dry season may inhibit the outgassing of N2O to the atmosphere".

- Please see figures 1 and 2 below of the macrophytes upstream of S2.

(x) P8655, L11: "where NO3- is" should be "where delta NO3- is".

- Adjusted.

(xi) P8660, L20: "Mayorga et al., 2010" is not listed in the references section.

- Adjusted.

(xii) P8674, Fig. 1(a): Please indicate Nairobi River, Athi River, Tsavo River, Galana River, etc. in the map so that readers can understand the distribution of important land uses.

- Fig. 1 caption has been adjusted so readers have a better understanding of the spatial distribution of the rivers mentioned.

(xiii) P8674, Fig. 2: "Dissolved O2" and "pH" should be switched according to the order in the text.

- Adjusted in Results section so dissolved O2 is discussed prior to pH.

(xiv) P8682, Fig. 10(b): Please explain how to draw the non-linear line.

- This line represents the two-source mixing model results, of which the end-member values are discussed in the text. The best fit was found when assuming autochthonous C accounts for 85% of initial TSM. Given the end-member values and assuming this 85:15 C source mix, we can calculate C concentrations and %POC, and δ15N-PN for a given TSM concentration (TSM):

%POC = 100 * ((C-auto + C-terr)/TSM)

where C-auto and C-terr are the concentration of autochthonous and terrestrial carbon respectively, and:

δ15N-PN = (N-auto*δ15N-auto + N-terr*δ15N-terr)/N-total

where N-auto and N-terr are the concentration of autochthonous and terrestrial nitrogen respectively, δ15N-auto and δ15N-terr are the end-member δ15N values for autochthonous and terrestrial nitrogen respectively, and N-total is the sum of N-auto and N-terr. Assuming preferential mineralisation of phytoplankton, we can recalculate these values taking in account the gradual depletion of N-auto pool (i.e. from 0% degraded to 5%, 10%, 15%, etc.), which gives the non-linear line in Fig. 10b.

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Fig. 1. Macrophytes growing in the Athi River between S1 and S2 during the dry season. Upstream.

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Fig. 2. Macrophytes growing in the Athi River between S1 and S2 during the dry season. Downstream.