Biogeosciences Discuss., 12, C6668–C6671, 2015
www.biogeosciences-discuss.net/12/C6668/2015/

Biogeosciences Discussions
Open Access

Interactive comment on "Dissolved organic carbon lability and stable isotope shifts during microbial decomposition in a tropical river system" *by* N. Geeraert et al.

Anonymous Referee #1

Received and published: 19 October 2015

Review of submitted manuscript number BG-2015-350

Title: Dissolved organic carbon lability and stable isotope shifts during microbial decomposition in a tropical river system (by N. Geeraert, F.O. Omengo, G. Govers and S. Bouillon)

General Comments

The authors report a study in which they assess the extent of microbial decomposition of dissolved organic carbon (DOC) in a tropical river system through incubation experiments, and effect of the presence of particulate organic carbon (POC) on the DOC degradation rate and extent. They measured the changes in stable carbon iso-

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

topes during decomposition and note a shift of as much as 3 permil towards more 13C depleted values, which they attribute to the contrasting lability of C4 vs. C3 derived organic matter. They conclude that the carbon stable isotope signature measured for total DOC in a river, which is traditionally interpreted as representing the relative proportions of 13C-enriched C4-derived DOC and the 13C-depleted C3-derived DOC, can be influenced by microbial decomposition processes and should thus be exploited with care for determining the sources of DOC within a watershed.

The topic of this study fits well within the scope of BG and should be of interest for a broad range of readers. Its main strengths are the stable isotope approach used to assess the dynamics of biodegradation of riverine DOC, and the fact that the study was carried out on a river with mixed C3 and C4 sources of DOC. The data appears of excellent quality (S. Bouillon is a recognised specialist in the measurement of 13C signature of DOC), but it would be more convincing if the standard deviations of the reported averages would be available in addition to the ranges of values (see specific comments below).

On a less positive note, the quality of the writing should be improved a lot. I understand that English is not the mother tongue of the authors but in several places the text would gain in clarity if reviewed by someone fluent in English. The manuscript is also very short and reports a very small dataset – although I realize that collecting water samples in Kenya is not a simple task. The discussion and conclusions would also have gained from complementary analyses of the bulk chemical composition of the DOC before and after incubation to differentiate between C3 vs. C4 decomposition and differential biochemical decomposition (optical analysis, as proposed by the authors, or FTIR/NMR analysis on freeze-dried residues). While reporting a change in the d13C signature of DOC upon bacterial degradation is novel (most studies assume that biodegradation does not lead to such changes), understanding the reason why the signatures change would have been even more enlightening.

I feel that an improved version of this manuscript would be worthy of publication in BG

BGD
12, C6668–C6671, 2015

mostly because it would report for the first time (to the best of my knowledge) changes in δ13C stable isotope signature upon microbial degradation of DOC originating from mixed C3 and C4 sources. I feel however that more DOC characterization work would have resulted a much stronger paper.

Specific Comments

1. Page 1, lines 21-24: The concluding sentence of the abstract should be reworked; the authors probably mean that the stable isotope signature of total DOC in rivers does not necessarily reflect the relative proportion of C4- and C3-derived DOC in the catchment. 2. Page 4, line 2: Decomposition mechanisms were not determined in this work – only speculative hypotheses are provided in the discussion section. Reference to the mechanism should be removed since this is the paragraph that describes the work that was performed. 3. Page 5, line 28 to page 6, line 2: More details should be given on the DOC-IRMS setup or a reference to published work should be provided. 4. Page 7, lines 1-7: The authors should provide a quantitative result for the differences between incubations with and without POC. What is the percent contribution of the POC bacterial pool to total degradation in each sample? 5. Page 7 line 10, line 11, line 20, line 21, line 23 and line 24 (and everywhere else in the text): Please provide the standard deviation whenever an average is given – giving a range of values is not sufficient. 6. Page 7, lines 18-24: How do these degradation rates compare with literature values? The authors cite several studies reporting such rates in their introduction. 7. Page 8, line 10 and line 14: Please provide the significance level for the statistical test used here. 8. Page 8, line 22: What statistical test was carried out to decide whether these two values are outliers? Please explain. 9. Page 8, lines 27-27: Again, please provide the standard deviation for these averages. Are the differences between these averages significant? 10. Page 9, lines 4-5: Please provide a reference for the heavier d13C signature of carbohydrates. 11. Page 9, line 24, to page 10, line 10: An alternative reason for the similar reactivity between the upstream and downstream sites could be the photo-activation of a fraction of the non-labile DOC pool (photocleavage of large

BGD
12, C6668–C6671, 2015

biochemical into smaller, more bioavailable components. This possibility should be added. 12. Pages 14-15, Table 1: The column titles should be reformatted.

Sincerely,

Interactive comment on Biogeosciences Discuss., 12, 12761, 2015.