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Biogeosciences
Discussions

Interactive comment on "Controls of longitudinal variation in δ^{13}C-DIC in rivers: A global meta-analysis" *by* K. A. Roach et al.

Anonymous Referee #1

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MAJOR COMMENTS

I suggest that the authors make their data-base public (as a supplement) for future studies and comparisons. The compilation is far from complete, the authors missed numerous papers (see below). I was not convinced from such a broad analysis that cyanobacteria have a major influence on the delta13C-DIC distribution in rivers.

SPECIFIC COMMENTS

I suggest the authors use the term "isotopic composition" instead of "isotopic signature". A signature is individual and invariable, which is not the case of stable isotopes.

L 23 : What's the difference between "decomposition" and "respiration" ?

L55 : HCO_3^- is also formed from weathering of silicate rocks

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Discussion paper

L55 : $CaCO_3$ precipitation can also occur in rivers at travertines (Herman & Lorah 1987) or in highly eutrophic rivers (Abril et al. 2003).

L 269: replace "carbonate dissolution" by carbonate rock weathering

L 284 : statement "pCO_2 in rivers tends to decline downstream" is to some extent correct in temperate rivers with limited wetlands. It is not correct in tropical rivers where the presence of floodplains and wetlands in lowlands leads to increases in pCO_2 downstream (Abril et al. 2014; Borges et al. 2015a;b).

L 286 : statement "tropical rivers typically have higher concentrations of CO_2 (aq) than temperate rivers" is not entirely true (anymore). Since the Aufdenkampe paper there have several studies rivers that show that pCO_2 is very variable in tropical rivers (e.g. Borges et al. 2015a), and values are frequently lower than the "tropical average" given by Aufdenkampe.

L 301-303 : this statement is incorrect. The two largest rivers in the world (Amazon and Congo) have extremely low carbonate alkalinity values. The carbonate alkalinity is strongly function of latitude (that co-varies with lithology). Refer to classic work by Meybeck or Gaillardet.

L 310: This is not entirely true. While there's abundant organic carbon, black water rivers have also very low nutrient concentrations (N,P) that limit bacterial growth (Castillo et al. 2003) in addition to low pH and low O_2 conditions that are not favorable to bacteria. What is important for delta 13C-DIC is that these rivers have very low HCO_3^- and most of the DIC is CO_2.

L 336 : Abril et al. (2014) showed that root respiration by living macrophytes also contributes directly to CO_2 in the water. Regarding the importance of C4 inputs in tropical watersheds refer to Marwick et al. (2014).

It could useful to try to include wetlands/floodplains into Figure 8.

There are numerous studies that were missed in the data compilation that should be

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updated. A much more scrupulous search of literature is needed. Here's a list that came from the top of my mind:

Abril et al. (2013)

Balagizi et al. (2015)

Borges et al. (2014)

Brunet et al. (2009)

Darling et al. (2016)

Dubois et al. (2010)

Polsenaere & Abril (2012)

Teodoru et al. (2015)

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