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Interactive comment on "Regional-scale lateral carbon transport and CO_2 evasion in temperate stream catchments" *by* Katrin Magin et al.

Anonymous Referee #1

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General Comments

Rivers and streams are an important link in the global C cycle and C export via aquatic systems has repeatedly been concluded to make a significant proportion of catchment C budgets at different spatial scales and in different climate zones. This is an interesting paper that will make a good contribution to the understanding of regional-scale carbon export via streams with stream order 1-4 in the temperate zone.

The authors observed a narrow range of variability of C export per catchment area and conclude that other processes than water surface area or location of mineralization of terrestrial derived C control the aquatic-terrestrial coupling and the role of inland waters in regional C cycling. However, the final version of the paper would benefit from more details about lateral C export calculations. It is not clear if extreme runoff events are

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covered appropriately. The lack of extreme event data would of course lead to a much narrower range of variability of C export.

Specific Comments

Ln 20. Explain “catchment-specific”

Ln 53. Why is the fluvial C load dominated by DIC? Are there carbonates? Please also state why you neglected methane.

Ln 56. Strahler stream order?

Ln 61-66. What about the geology? Is there C-containing bedrock in the catchments?

Ln 70. “15 800” do not separate numbers

Ln 71. Delete “order”

Ln 82. How are pH values of investigated waters? The pCO2 calculation with alkalinity was found to high uncertainties for low pH values (Abril et al. 2014).

Ln 89. How exactly did you aggregate annual means? Did you calculate a (discharge) weighted average?

Ln 128. Name the program used for statistics

Ln 145-148. Discuss variance of organic C. How about peaty areas?

Ln 152. Specify which value is meant: mean NPP or mean specific NPP?

Ln 169. In Figure 3 some of the data points (mostly stream order 1 and one of stream order 2) scatter more. Please discuss reasons for these outliers.

Ln 186. You talk about average fluxes, but what happens during floods/ extreme events? Do measurement intervals cover extreme events?

Ln 205. “. . .wetlands covering up to 16 % of the land surface area.” Add a reference.

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Ln 226. Expected for temperate zones? In dry regions such as deserts this can be different.

Ln 235. Discuss “uncertainty of the various estimates”

Ln 236. Name potential controlling factors

Ln 244-247. How do you know that? In regions with corresponding geology also weathering of C-bearing minerals can be a large source of stream DIC. Respiration in soils is more likely the dominant DIC source in catchments that lack carbonate rocks. Is that true for catchments in Rhineland-Palatinate? Can you give an example for cases with predominance of aquatic respiration? I would expect predominance of aquatic respiration in warmer climates where large DOC concentrations prevail.

Ln 249. How is the range of discharge? The study by Hotchkiss et al. covers values from 0.0001 to 10,000 m3 s-1. Can the lower range in your study be the reason that you do not observe findings in Hotchkiss et al.?

Ln 252. Does “small number of observations” relate to this study?

Ln 255-257. This section summarizes the paper well but it could go further. It might be speculative but can you say what these other, poorly explored processes could be?

Ln 267. I think it is preferable to provide data as supplement material.

Table 1 and Table 2 would be more informative if you could add ranges. Please also add calculated gas transfer velocity values to Table 2.

References:

Abril, G., S. Bouillon, F. Darchambeau, C. R. Teodoru, T. R. Marwick, F. Tamooh, F. O. Omengo, N. Geeraert, L. Deirmendjian, P. Polsenaere, and A. V. Borges (2015), Technical Note: Large overestimation of pCO2 calculated from pH and alkalinity in acidic, organic-rich freshwaters, Biogeosciences, 12(1), 67-78, doi:10.5194/Bg-12-67-2015.

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