

# ***Interactive comment on “Hydrological and ecological controls on dissolved carbon concentrations in groundwater and carbon export to surface waters in a temperate pine forest watershed” by Loris Deirmendjian et al.***

**Anonymous Referee #1**

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Major comments- The study address an important question and could be a significant contribution to the field of carbon biogeochemistry. Methods and sampling design are appropriate but the paper suffers from poor organization and presentation. Furthermore, there are several other critical issues that authors need to address before manuscript can be recommended for publication. Firstly, authors broadly discussed some knowledge gap in the Introduction section but no clarity on why this study was needed at the first place. What is necessary is a more thorough review of similar studies in forested catchments and clearly working out the current knowledge gap that authors attempted to address. Secondly, the Result section is too detailed, unguided, and

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extremely difficult to follow. The reader has no idea what is coming up next and what are the take away messages from each paragraph. Thirdly, the Discussion section is detailed, but somewhat unguided and does not show : a) how the study advances our general understanding of groundwater's role in mediating carbon exports from forested catchments, and b) how this study builds on the past work. Fourthly, massive overuse of the term "control". Control is a pretty strong word in the Catchment Science and I am not sure if the current sampling design (i.e., 3 wells, 1 rain gauge) is robust enough to reveal hydrological controls of carbon exports for a 2100 km<sup>2</sup> catchment. Lastly, there are several typos and grammatical errors throughout the draft, and I have only highlighted a few of them here.

Minor comments: Abstract: line20-21: When you say drainage here, did you mean to say- subsurface flow? Unclear? Line 21: Instrumented or implemented? Please revise this sentence. Line 29-30: Grammatical issue, please revise the sentence. Can you please add a sentence on the major implication of the study?

Introduction Line 59-60: Please add references? Line 62: How so, please explain? No references, is this the first study to address this question?

I can understand the overall aim of the study, but it would be helpful if you could clearly layout research questions or even hypotheses.

Methods Line 76: Several places you have used "per mill" symbol. Line 92: You are focusing on shallow groundwater, may be worth mentioning once for clarity? Line 97: Some abbreviations are not in the table 1; SOC? Line 110: Sampled for what ? Line 166: How did you interpolate groundwater stages between two dates? Line 196: How did you estimate D, please explain. I am extremely confused about how you took the catchment scale response from a stream gauge, and after multiplying it by a factor of 2 assumed it is as discharge for the bilos site? Line 214: With monthly sampling frequency, you will miss a lot of variation in DOC/DIC storage, especially during storms, no? Line 233, Equation 7 will be followed by the equation 6? Line 246 In equation 8,

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how did you estimate Qmean, unclear?

BGD

Results and Discussion- Too many ideas in a single paragraph, and the main message is lost in the details. It is left to the reader to figure out the take home message. I would recommend re-writing results and discussion sections for better presentation of the key ideas. Line 354: Given the study design, this sentence is a major overstatement. Line 460: Soil DOC in shallow layers cannot be mobilized by Precipitation? Lack of correlation between Soil DOC and P is not surprising as DOC exports from soil horizon is highly non-linear process. Line 490: Sentence unclear

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I would recommend adding an Implication section at the end of the discussion section.

Conclusion: I am not sure you have summarized your work clearly. Line 556: Thus?

Tables and Figures Table 5. It is good to provide conceptual table and later figure 7, but please remember you can only interpret so much from your limited study design. Fig1. If possible, please show locations of the rain gauge and flux tower (or location of Eddy covariance measurements) on the map. Fig4: There is no gray side bar in the figure. Please revise caption or add the bar to the figure. How did you estimate error bars,  $\pm 1$  standard deviation? Fig7. The texts within the boxes are bit small, if possible please increase their font sizes.

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