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Interactive comment on "Carbon dioxide dynamics in an agricultural headwater stream driven by hydrology and primary production" *by* Marcus B. Wallin et al.

Anonymous Referee #1

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Headwater streams are known hotspots for CO2 emissions, although studies of headwater streams draining agricultural catchments, and specially studies that includes a temporal dimension, are sparse. In this study, a headwater stream draining an agricultural catchment was continuously monitored during for approximately one year, and the responses in CO2 concentrations to hydrological variations were studied.

General comments

This study provides important insights of CO2 and discharge dynamics in a headwater stream draining a catchment impacted by agriculture. We need more studies like this in order to better understand the exchange of greenhouse gases between inland waters

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and the atmosphere. Overall, I think the manuscript is very good. The study is well designed and presented in a well-structured way. I have only a few, although important, remarks that I think would improve the manuscript. Firstly, this paper would benefit from the authors emphasizing the relevance of their study better. For instance, this study points out potential effects of stream intermittency for streams draining agricultural catchments. This finding is highly important with respect to climate change. Despite this, the authors do no mention this neither in the abstract nor in the conclusions of the paper. Secondly, the manuscript would benefit from a more extensive discussion, for example how this stream compares to other agricultural influenced streams, if the type or insensitivity of the agriculture matters, land use change etc. Lastly, the readability of the manuscript could be greatly improved by simple sentence adjustments, such as shortening sentences and inserting more commas. Also, the figures could be designed in a more intuitive way.

Specific comments

Abstract

L15: It is unclear what "one year of open-water season" means. It would be helpful to add the dates and/or number of monitored days.

L22: I recommend the authors to add a sentence about the effects of indeterminacy of streams draining agricultural catchments here, since this is an important finding of the paper.

Introduction

L41-42: This sentence is unclear. What do you mean with positive and negative responses? Please clarify.

L44: "...dominant CO2 source areas of catchment soils"? Please rephrase this sentence.

L45: Please specify what kind of other catchments.

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L48: New paragraph needed.

L50: Please specify what “relevant” time-scales are.

L69: Please specify what you mean with high-resolution. Also, as mentioned before, it is unclear what "one year of open-water season" actually means.

Methods

L76: Please rephrase this sentence. Is it unclear if you mean the annual mean temperature or the January and July temperatures. This is especially important since you do not mention the precipitation in January or July - perhaps this could be added.

L82: Stream pH ranging between 7.4 and 8.4. Also, this sentence would be much more readable if you would add a comma. In general, I would recommend using commas more frequently.

L83-84: How much lower? Please provide a reference percentage.

L86-87: This sentence could be moved to the beginning of the paragraph.

L90: influences

L91: Table S1; Figure S2

L93: Would it be possible to add here the percentage that were snow/ice-free (and included in your study) as well as the percentage when the stream was falling dry?

L100: This is quite confusing for the reader, especially since you have not mentioned before that the stream is falling dry during some periods of the year. In general, I would recommend you to highlight the stream intermittency better, including adding some sentences in the introduction about this.

L108-109: Please clarify. What is the temporal resolution of your data?

L112-114: Please rephrase. Also, how many replicates?

L117: Please clarify. When was the phosphoric acid added?

L121: Did you run any standards?

L129: Add reference to Figure S2 here.

L140: It would probably be easier to follow if you move this paragraph to the beginning of the methods section.

L145: Another example of a sentence where the overall readability could be greatly improved if more commas are added.

Results

L155: This sentence is confusing. Precipitation is usually in mm/year however the period is for a bit more than a year. I assume that the "total precipitation" represent the precipitation for the whole period. Thus, it would be easier to read if the sentence would first state the mean air temperature (XXX) and then the total precipitation (XXX).

L205: It would be good to also add the corresponding pCO2 here for reference.

L212: Same as above, the corresponding pCO2 values would be helpful as reference values.

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L231: “highly dynamic pattern in streamwater CO2 concentration”.

L250: Please add references.

L256: could

L258-260: Please rephrase.

L266-270: Great paragraph. Would it be possible to develop more on this?

L271-272: Please rephrase.

L309-311: Another great paragraph. This could also be further developed and better highlighted.

Tables

Table 1: Throughout the manuscript, you write either "land-use" or "land use". In the table it is obviously a spelling mistake; however, please be consistent with the terminology throughout the whole manuscript.

Table 2: Would be good to add the name of the catchment and not only the abbreviation.

Figures

Figures: I recommend the authors to redo all figures. They are not intuitively designed or appealing for the reader.

Figure 7: Add regression line?

Figure 10: In the text it is written that d13C-DIC was NOT a function of Q?

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