

Interactive comment on “Proximate and ultimate controls on carbon and nutrient dynamics of small agricultural catchments” by Z. Thomas et al.

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We would like to thank the reviewer for his or her constructive comments and suggestions.

The “proximate and ultimate controls” terms need to be better explained in the introduction. working hypotheses should be presented using these terms.

-We have rephrased our hypotheses in the introduction specifying the proximate controls (land use and hedgerow density) and ultimate controls (geology and topography).

“Base flow” and discharge event” are the considered hydrological periods in this manuscript. High flow period, apart from flood events should be better characterized. It would allow to get rid of the ambiguity on the nitrate concentration dynamics in the

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discussion section. Indeed, it seems that nitrate concentrations do not vary with discharge during base flow and high flow periods; yet, they are diluted during flood event. The effect of rainfall during these events might be necessary to be taken into account.

-We realize that our description of the sampling design was unclear and have clarified in the text that we are referring rather to high-frequency (collected only during storms) and low-frequency data (collected across the hydrograph including both base and high flow periods). Thank you for bringing this up and we think our revisions resolve this ambiguity.

P. 13 line 11: “nitrate was diluted during high flows”. P.12 line 7 “the lack of significant dilution on NO₃ during discharge events”. There seems to be a contradiction between these two sentences.

-Indeed as originally stated it is unclear due to a mistake in the text. We have corrected so P.12 line 7 and P. 13 line 9-11 refer to the significant dilution during high discharge events as shown figure 6.

Since hydrology is a controlling factor of concentration, you should discuss the relationship between Define \hat{A}' n surface roughness $\hat{A}z$.

-We have better defined surface roughness and added a discussion of its effect on hydrology.

Be consistent in the land use description, e.g. corn in Table 1 and maize in Figure 4

-We have revised to use corn throughout.

Chapter 2.2 : add some information on the population density in the drainage basins.

-We will add a sentence about population density in Brittany.

Table 1: leave only one digit. Delete the elevation difference value which is redundant with the 2 previous lines. Add mean interannual specific discharge of the 3 drainage basins.

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-We have revised the table as suggested.

P. 8 lines 8-9 should be inserted P.7 in 3.1 section.

-We have revised as suggested. Thank you.

Chapter 2.3 : how many samples during baseflow and storm event ?

-We have specified that there were 174 samples for base flow (now referred to as low-frequency) and 566 during storm event (high-frequency).

What are the specific discharge sampled during flood event?

-Flood event discharge is indicated in Figure 6.

Chapter 2.4 line 27, are you sure you want to refer to Figure 2a ?

-We changed the reference to Fig. 1d. Thanks for catching this.

Chapter 3.1 : only rainfall is discussed. There is a discrepancy between rainfall presented in the Table S1 and values discussed in the text.

-In section 2.1 we indicated the annual precipitation which is about 965 mm. Fig S show monthly precipitation for 20 years period the mean interannual was indicated in the plot (up-right). In the text we indicate the actual precipitation for the studied period. We have added an explanation in the text.

Add a description of inter basin and inter annual specific discharge variability

-We added this description in section 3.1.

in Table 3 Figure 4 : add a,b, c

-Added.

Chapter 3.3 : It might be useful to add Figure S4 in the main manuscript. It provides interesting information on DOC, nitrate and PO₄ dynamics during flood events.

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-Thanks for this suggestion. We agree that this result is really interesting, we moved it to the manuscript.

Chapter 4.2 : explain DON and DOP sources (line 22)

-We added a description that in Brittany, DOM is largely derived from wetlands and hydromorphic soils of bottomlands (see Lambert et al., 2014-BG, Jeanneau et al., 2015-BGD; Hood et al., 2005-BG).

Figure 7 : increase the font size for axes and caption.

-Changed.

Figure 8 : should be better discussed.

-We have added a better description of the conceptual model particularly focusing on the temporal scaling and transport between hydrologic compartments.

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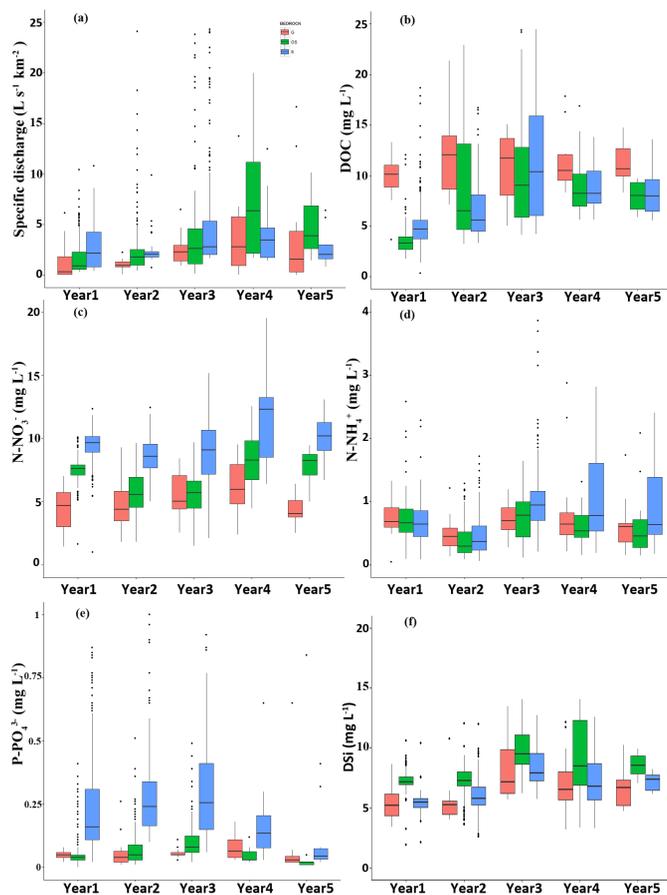


Fig. 1.