

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

**Anonymous Referee #2**

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The objective of the study was to follow the temporal dynamic of dissolved organic carbon and nutrients, i.e. N, P, Si, at the outlet of 3 small drainage basins (2 to 11 km<sup>2</sup>) with contrasted geological and land use characteristics. The large variability of temporal dynamics between these small basins justifies the need for understanding the driving factors of these variations. The analytical approach is interesting. It uses 5 years of high sampling frequency to address temporal variability at different scales ranging from flood event to inter-annual scale. The manuscript is well written and well illustrated. Some comments The “proximate and ultimate controls” terms need to be better explained in the introduction. Working hypotheses should be presented using these terms. “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

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dynamics in the 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. P. 13 line 11: “nitrate was diluted during highflows”. P.12 line 7 “the lack of significant dilution on NO<sub>3</sub> during discharge events”. There seems to be a contradiction between these two sentences. Since hydrology is a controlling factor of concentration, you should discuss the relationship between Define Åñ surface roughness Åž Be consistent in the land use description, e.g. corn in Table 1 and maize in Figure 4 Chapter 2.2 : add some information on the population density in the drainage basins. 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. P. 8 lines 8-9 should be inserted P.7 in 3.1 section. Chapter 2.3 : how many samples during baseflow and storm event ? What are the specific discharge sampled during flood event? Chapter 2.4 line 27, are you sure you want to refer to Figure 2a ? Chapter 3.1 : only rainfall is discussed. There is a discrepancy between rainfall presented in the Table S1 and values discussed in the text. Add a description of inter basin and inter annual specific discharge variability in Table 3 Figure 4 : add a, b, c Chapter 3.3 : It might be useful to add Figure S4 in the main manuscript. It provides interesting information on DOC, nitrate and PO<sub>4</sub> dynamics during flood events. Chapter 4.2 : explain DON and DOP sources (line 22) Figure 7 : increase the font size for axes and caption Figure 8 : should be better discussed.

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