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Biogeosciences Discussions

Interactive comment on "The importance of riparian zones on stream carbon and nitrogen export in a temperate, agricultural dominated landscape" *by* T. Wohlfart et al.

Anonymous Referee #2

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Report on the manuscript "The importance of riparian zones on stream carbon and nitrogen export in a temperate, agricultural dominated landscape" By T. Wohlfart, J.-F. Exbrayat, K. Schelde, B. Christen, T. Dalgaard, H.-G. Frede, and L. Breuer

This study deals with an important topic on the links between land use, soil types and water quality in agricultural catchments. The analysis is based on the comparison between two catchments in the same area in Denmark, with different soil types (organic soils vs. mineral soils and different textures among sandy soils).The experimental methods focused on stream water analysis for nitrate, DON and DOC, with samplings made at different locations in two streams, artificial drains and groundwater

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Interactive Discussion
Discussion Paper

in the study area. Due to different reasons, the link between the observed concentrations and loads and soil types/land use, as well as the link between the different measured compounds is not easy to establish. This subject is clearly relevant for Biogeosciences.

General comments

This study is well presented and the methods are clearly exposed. The results are clearly presented, even though this section is sometimes difficult to read. The main results are presented in figure 4. However, the discussion should clearly be improved before this manuscript can be accepted for publication. To my opinion, three main concerns arise from this paper:

1. The discussion is often too general and does not give quantitative and convincing arguments to interpret the data or highlight their limits.

- The discussion provides many comments on processes which could explain the observations, but few/no link is made with the study case. For example in page 7476, line 5-9, an argument is given to explain the constant nitrate concentration at one location, but no argument on the local hydrology is given to prove that it worked so. In page 7477, lines 10-18, the authors mention some agricultural practices as an explanation for nitrate concentration, but no information is provided on these agricultural practices. The soil texture (esp. sandy soils) are often quoted as an explanation but few references are given on the influence of the soil texture on transfer and biotransformation of N and SOM in soils, in a quantitative perspective.

- As a whole, the agricultural practices are mentioned in different place in the text as an explanation for both temporal change in concentration and difference between the northern and southern catchments. However, few information is given on these practices to support the arguments. Considering the previous studies made on this area, these data are certainly available and usable for analysis.

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- The observed concentrations can be explained by a range of variables (soils, climate, agricultural practices, etc.); these are analyzed separately and a synthesis is lacking. For example the nitrate concentration might depend on fertilization and soil tillage practices, soil type and climate. The different effect should be balanced. For example in page 7476, lines 12-15, it is assumed that the differences in nitrate concentration are due to rainfall, but it might be also explained by fertilization (in April) and climate (e.g. influence of temperature on mineralization)). This should be at least discussed.

- The variability should be commented more thoroughly, as it is large in several cases, especially for DON and DOC. - The origin of N in the two catchments (mineral and organic fertilization, atmospheric deposition, plant and soil processes) should be discussed in a more precise and quantitative way, with relation with the natural and anthropogenic processes and their range of variation. For example the authors mention the potential of atmospheric deposition but do not try to consider it in a quantitative way, nor to discuss the N transformation which may apply to this nitrogen.

2. One major interest of this paper is to have measured simultaneously nitrate, DON and DOC; however the authors make insufficient link between these chemical species to interpret the data. These interrelations could be used into more detail to explain the spatial and temporal variations in stream concentrations. It must be noticed that the measured pH and EC values are not used in the data analysis.

3. The statistical analysis is based on the comparison between two sets of data only as well as limited number of sampling along time. There is a risk that this limits strongly the interpretation. It is mentioned by places (e.g. page 7477, lines 4-8) but this should be commented more precisely.

Specific comments

- The title is not the same in the manuscript (The importance of riparian zones on stream C and N ...) and on the Biogeosciences site. I consider that the title on the manuscript is not relevant, as the study do not focus on riparian zones.

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Interactive Comment

- Figures 1, 2 and 3: delineation of the sub-catchment should be added to clarify interpretation and link with Tables 1 and 2.

- Figure 5 could be converted to a table (could be added to Table 2). This figure is referred to after Fig. 6 in the text.

- Figure 6 should be clarified: lines/figures types in order to distinguish between drains, groundwater and pools; include year in the date on the X-axis - The reference Hutchings et al. (2004) is missing in the Reference list

- Page 7474, line 23: it is not explained what are “Pool” and “TPool” (and difficult to see where they are in Figs. 1 and 2) and what is there significance in this context.

- It seems that the words “runoff”, “load” and “discharge” are sometimes used for the same thing. Please check and choose one of these words.

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