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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 #1

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General comments: The manuscript of Wohlfart et al. describes and discusses the results of three sampling campaigns of surface waters, drain waters, and groundwater in the Tyrebaekken catchment in Jutland, Denmark. Concentrations and fluxes of nitrate, dissolved organic nitrogen and dissolved organic carbon are analyzed with respect to their dependency on the spatial distribution of land use and soils as well as topography. The experimental approach is sound and the data have been analyzed appropriately. The analysis revealed that nitrate and DON concentrations and fluxes were enhanced by coarse textured soils and reduced by a larger fraction of organic soils in the catchments of creeks. In contrast, the fraction of cropland in the subcatchments had a much smaller influence on nitrate and DON concentrations, which might also due to the small

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variation of land use in the Tyrebaekken watershed. Concentrations of DOC were correlated with the fraction of organic soils in subwatersheds. These findings regarding nitrate and DOC dynamics in surface waters are not new and have been documented in numerous studies. Nevertheless, the study has some merit in documenting the strong effect of organic soils on transfers of carbon and nitrogen from terrestrial systems to surface waters not only in landscapes with comparably small land use intensities, such as Scotland, the Canadian Precambrian Shield or forested landscapes of Scandinavia, but also in one of the most intensively used agricultural landscapes in temperate regions: Jutland, Denmark. Nevertheless, I feel that the paper is somewhat long with regard to the novelty of the findings presented. Especially the presentation of results is lengthy and can potentially be shortened by 20-30%. One aspect that is excessively presented and discussed in my opinion is the seasonality of concentrations and fluxes. I think that a time series of three points of time is insufficient to draw any conclusions regarding the seasonality of fluxes or the influence of e.g. precipitation.

Specific comments: Title: The current title stresses that role of riparian zones for carbon and nitrogen concentrations and fluxes in adjacent surface waters, but this aspect of riparian buffers is then hardly reflected in the subsequent manuscript. For example the effect of organic soils was not analyzed with respect to the importance of their distance to the creek. Also the fraction of coarsely textured soils in the subcatchment is not linked to riparian zones. I suggest either to address the aspect of riparian zones more explicitly in the manuscript or to change the title, e.g. into “Spatial distribution of soils determines export of nitrogen and dissolved organic carbon from an intensively managed agricultural landscape”... Abstract: The abstract is a little too long (315 word in my count). P 7466, Line 14: “electrical conductivity” instead of “Electro-conductivity”? P7466, Line 16: remove “return”.. P 7466, Lines 18, 20 and throughout the manuscript: I have learned that the use of “respectively” is poor style and makes the text hard to follow... Page 7466, Lines 27-28: The conclusion that soils types affect water quality is not very new and strong. Is it possible to be more specific? For example: The fraction of coarse textured and organic soils determine the fluvial export of nitrogen and DOC

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from this intensively used landscape. P7467, L 5: Vitousek et al 1997 is missing in the list of refs... P7467, L 19ff: You cite references from pristine forest ecosystems that are hardly comparable to the situation in Jutland. On the other hand, the study of Siemens et al. (J. Plant Nutr. Soil Sci. 165, 675-681, 2002) is not considered despite the fact that the Pleistocene parent material of the underground as well as the intensive agricultural management including the intensive use of manure is similar to the situation in Jutland. This seems odd to me. Interestingly, the DON concentrations leached from intensively managed sandy croplands in the study of Siemens et al resemble the concentrations found in the Northern branch of the Danish catchment.... P7468, L 21: Strange wording at the beginning of the sentence. Replace by: In order to unravel the impact of...."? P7469, L 16: Delete "((" P7469, L 20ff: coarse sandy clay, coarse clayey sand, and fine clayey sand are not soils types, but soil textures... P7470, L 10: Was a hydrological flow path analysis carried out to delineate the contributing areas? The problem in Pleistocene areas with glacial till is often that the topography of the land surface not necessarily determines the boundaries of catchments because the topography of the underlying impermeable glacial till can differ substantially... P7470, L 16: LDPE is the more common abbreviation for low density polyethylene. Avoid the abbreviation to avoid misunderstandings? P7471, L2: "Specific loads". What is specific about these loads? P 7471, L14: "cropland distribution": Do you mean areal fraction of cropland in subcatchments? A distribution would suggest to me that in addition the mere area other features like the distance to creeks etc. were analyzed... P7472, L21: replace "increased with values from..." with "increased from 2.1 to 25.4 l s⁻¹ ..." P7472, L 27: Why do the DON concentrations "correspond" to the nitrate concentrations? P 7475, L 1: I don't understand "positive correlations between the sampling date and the sandy soil properties". P 7475, L 23ff: I think the speculation about the influence of land use history on present nitrate concentrations presented here leads nowhere. Such discussion would make sense in the case that historical data on land use were available in combination with detailed information on hydrological flow paths and water travel times. P7476, L 10ff: What about the relevance of denitrification in riparian organic soils? Is

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this insignificant for the findings presented here? P7477, L 27: “Copper et al. (2007) pointed out that the leaching of DON occurs when water drains through soils.” Isn’t this trivial? P7479, L26: Do you mean DON concentrations or fluxes? I could not spot the coefficients of -0.15 and -0.22 in table 3. How do you explain a negative influence of the area of organic soils on DON concentrations and fluxes? P 7480: Wouldn’t it be more logical to present DOC results prior to DON results since DON is a part of dissolved organic matter? P7480, L 22: “According to that”...Strange formulation. According to what? P7481, L3: “Mineral soils contain...” Do you mean organic soils here? Otherwise the following sentence makes no sense... P7481, L 12ff: “...the dissolution of C into surface water through sorption...”. Sorption reduces the release of C into the aqueous phase, or not? P7481, L16ff: What about the role of (near)surface runoff through O and A-horizons for transferring DOC from land into streams? P7482, L2ff: I am skeptical that the experimental approach allows identifying the precipitation as driving factor for changes in N fluxes. What about seasonal changes in N uptake by plants for example. As pointed out earlier, I would be careful to avoid over-interpreting a time series of three points... P7490, Table 2: How do you interpret the significant increase in pH in the converged part of the creek? Outgassing of CO₂ from stream water? P7491, Table 3: How do you explain that the fraction of organic soils in the subcatchments influenced DOC concentrations, but not DOC fluxes? Or that the fraction of cropland does not affect DOC concentrations, but positively DOC fluxes? Is this related to low groundwater recharge in organic soils in depressions and high groundwater recharge in elevated mineral soils? P7495: Figure: What is the meaning of the red color of the letters? P7496: Figure title: I guess you don’t mean the contribution of DON to the TDN budget, but to TDN concentrations. A budget would consist of inputs and outputs... P7497: Can this figure be incorporated into figure 4?

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