Hydrol. Earth Syst. Sci. Discuss.,
doi:10.5194/hess-2016-303-RC2, 2016

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Can controlled drainage control agricultural nutrient emissions? Evidence from a BACI experiment combined with a dual isotope approach" *by* M. V. Carstensen et al.

Anonymous Referee #2

Received and published: 4 September 2016

General comment

This paper focuses on the assessment of the impacts of controlled drainage on drain flow, groundwater levels and nutrient emission. The authors used a before-after control-impact (BACI) sampling design in four adjacent drainage systems to test whether the controlled drainage had a significant impact on nutrient losses. They found that controlled drainage significantly affects the decrease in drain water flow and nitrate loss. The authors also combined the BACI experiment with a dual isotope approach (relation between δ18O and δ15N) to determine whether denitrification occurred in the impacted plots. The aim of the study is of interest for the readers of the journal and overall the paper is well written. Nonetheless, I suggest changes to the materials and

methods section to add some important details, which are missing, and rephrase the conclusions to better highlight the novelty of the study.

Specific comments

- The authors state that field management practices were similar during the three-year monitored period (lines 34-35, page 2), but at lines 22-24, page 5, they justify the lower nitrate concentration with the different agricultural management in the plots in 2011/2012. To avoid inconsistencies throughout the paper, I suggest to describe the field management practices carried out in the plots during the experiment (including the quantities of fertilizers) and clarify the possible effects of previous managements on the results obtained with the BACI experiment.

- In lines 28-30, page 3, the authors refer to an intensive sampling campaign carried out in Y1 to assess whether the opening would lead to an increase in the release of nutrient enriched water. The results of this intensive campaign are not reported in the paper. Do these results support the findings and are they relevant for the paper? If they are not relevant for the paper, it is better to remove the sentence in the Materials and Methods to improve the clarity of the section.

- Sections 2.3 and 2.4 omit how the water samples were stored before the analyses, if they were filtered and analysed immediately after the collection. These details should be included in the two sections.

- Figure 1 reports that there are eight piezometers installed in each plot for groundwater level measurements (and water sampling), but in Fig. 2b there are only two series of dots. Do the dots represent an average groundwater level? If so, this information should be included in the caption and the authors should discuss the spatial and temporal variability of groundwater levels and nutrient concentrations and report which values (all the data collected?) they used for the BACI test (Table 2) and for the calculations of total losses of chemicals (Table 3). Furthermore, the description of the locations of piezometers in the plot, as reported in Table S3, is quite confusing. Is it

possible to add letters/numbers in Fig. 1 or have another map in the supplementary material?

- The authors should explain why they replaced CP2 values with CP1 in the calculations for Table 3. Did the authors assume that the difference between the samples collected at the two control plots is not significant?

- In Section 4.4 (lines 16-18, page 8) the authors report the slope for the relation between δ18O and δ15N in Y0 and comment it. In order to improve the consistency and compare Y0 with Y1 and Y2, is it possible to add the data in Fig. 3?

- The Conclusions section reports briefly the main findings of the study, but the novelty is not very clear or is not highlighted as it should be. Therefore, I would recommend to rephrase the Conclusions.

Technical corrections

- Figure 2: Please report the origin of nitrate concentrations (drain water?).

- Figure 3: Measurement units are missing in the x and y axis. Please add them and zoom in to improve the readability of the figure.

- Table 1: Please add the measurement units and standard deviations whether average values are reported in the table.

- Table 2: Please report in the caption what 'b.d.l.' means.

- Table 3: Please add the measurement units and standard deviations whether average values are reported in the table.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-303, 2016.