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Hydrology and Earth System Sciences
Discussions

Interactive comment on "High-frequency monitoring reveals nutrient sources and transport processes in an agriculture-dominated lowland water system" *by* B. van der Grift et al.

Anonymous Referee #2

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General comment

The study evaluates transport processes of TP and nitrate-N in a highly drained lowland catchment using high resolution data. The main concern I have with the manuscript is that it is highly descriptive and several findings are highly vague. Because only water quality data have been used for evaluating the export mechanisms often a serious proof is missing. The main drawback of the study is the short measurement period which does not allow a clear explanation of the seasonal export behavior of the catchment. It is not clear why a half year period has been selected for the study. The study shows some methodological weaknesses because important constitutes like suspended sed-

iments (e.g. via turbidity) have not been measured. This leaves the conclusions somewhat open. Furthermore the used modelling approaches are highly simple and do not provide deeper insight into transport mechanisms. Reading the manuscript was somewhat exhausting because the ratio of new findings to the length of the text was often small. I would not like to recommend the manuscript for publication in HESS.

Specific comments

Page 8344, line 25: please provide correlation measures on that comparison.

Page 8350, line 4: representative for what? Residence time during the period after mid of November? Residence time is the time a water parcel needs to move from rainfall through soil (and groundwater) to the stream or ditch. The fact that nitrate concentration peaks five days after peak discharge does not imply that residence time of water is also five days. That would only be the case if whole nitrate stems from rainfall and nitrate would be a stable tracer. This is of course not the case. The mentioned mean residence time of 5 days is from my point of view unrealistic. The cited literature refers to a residence time of 6.6 days in the main channel and not in the catchment area!

Page 8350, line 17: Are there any measurements on turbidity or sediment concentrations which support this statement? Where should the sediments come from if sediment concentrations can be assumed very low between pumping events? The time series data suggest that the few high DRP concentrations data are mostly associated with high TP concentrations. Therefore high TP concentrations can also be caused by high DRP concentrations. As far as the data suggest PP has not been measured directly during the events and therefor the given explanation that SS are responsible for high TP concentrations are speculative. It is well known that DRP concentrations are often high in surface runoff and may explain also high TP concentrations, at least during freeze-thaw cycles. Without additional data on turbidity/suspended sediments of direct PP measurements it is not possible to identify sediments as a main source of high TP values.

Page 8351, line 2: highly speculative, is there any proof on this?

Page 8351, line 3-4: That is not true. Simply high DRP concentrations, which are elevated in surface runoff, can be responsible for high TP concentrations. Here the investigation lacks from missing direct DRP measurements.

Page 8351, line 10: What does this tell us? It is not surprising that rainfall is related to nitrate concentrations if the soil is saturated (after mid of November). All rainfall is transformed into discharge via transport through the soil and pipe drains. Rainfall becomes not directly discharge but exchanges the soil water rich in nitrate.

Page 8352, line 9: I fully agree. The time series is too short to gain sound information for explaining the export behavior

Page 8352, line 17: "overestimation" is a wrong term because these loads are calculated with the best available data. Low frequency data underestimate the load!

Page 8353, line 5: Why discussing it here when it will be discussed one more time later on. Likely is not a clear proof.

Page 8353, line 14: why are the chloride data presented here?

Page 8353, line 25 and ff: these findings are not surprising and can be therefore shortened

Page 8354, line 8: is there any evidence on that? Has the cited reference conducted the investigation on the same site than this study?

Page 8357, line 10-15: the restriction of the TFN model to less variable (wet) soil moisture conditions allows better model predictions but reveals less information about transport processes within the catchment since only a relatively short duration of several month is captured. State of the art is continues modelling for at least several years. The presented results are not really new as indicated by the discussion.

Page 8358, line 20-25: two different reasons are described for the increase of DRP

in autumn (change of loading and in-streams processing). Because of missing detailed studies at least of one of these processes the authors are not able to clarify the importance of both possible processes, the statement therefor keeps vague

Page 8359, line 20-25: because suspended sediment P (PP) measurements are missing it is not clear whether the TP concentrations during pump cycles stem from higher PP or DRP concentrations. If resuspension of sediments is the main reason of increased PP concentrations during events than decreasing PP peak concentrations could be expected with subsequent events because of exhausting sediment deposits in the channel. The data do not show this. Due to missing parallel measurements of DRP and TP a clear statement is not possible.

Page 8360, line 1-23: the discussion starts with a statement which should be part of the problem section. The chapter ends up with a conclusion without referring to the study. No results of the study are discussed.

Page 8360, line 27: I do not see that a NO3 peak concentration of 10.4 mgN/L during a given high flow event is a proof of manure input. During January peak concentrations also reached a range between 8 and 9 mgN/l

Page 8361, line8-25. The discussion poses more questions than reveals explanations of the measured time series. No clear findings can be presented because of missing supplementary measurements despite the concentration measurements at the outlet. Missing PP or turbidity measurements have already been mentioned.

Page 8362, line 1-10: if this information is important for the discussion it should be given in the method section.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 8337, 2015.