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Hydrology and Earth System Sciences
Discussions

Interactive comment on "How runoff components affect the export of DOC and nitrate: a long-term and high-frequency analysis" *by* Michael P. Schwab et al.

Anonymous Referee #3

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Overview: Recent technological developments have enabled watershed researchers to monitor important biogeochemicals at high frequency for long periods. Sensors that measure both carbon and nitrate are uniquely suited to study the coupling of nitrogen and carbon cycles across varying temporal scales. The authors present a high-frequency, multi-year data set of nitrate and dissolved organic concentration over a range of hydrological and climatological conditions in a forested watershed. The authors leverage this high density dataset to examine rain-fall runoff responses of nitrate and DOC over varying climatological conditions. The authors suggest that antecedent moisture conditions, and as a result, groundwater levels, drives the relative fluxes of nitrate and DOC form the basin.

General comments: This study was well conceived and the results are clearly presented. However, several elements of the manuscript need attention before this study warrants publication. 1. Further, claims that seasonal differences in nitrate/doc fluxes were observed, are not clearly supported by the data presented in this manuscript. Rather, initial dryness is the direct driver. Consider including data that clearly links the occurrence of preceding dry conditions to season over a longer period of time (longer than two years) to support the seasonal link to hydrologic conditions over the period of this study. 2. The authors fail to put the implications of the study- that "dry"/"reduced wetness" antecedent conditions results in larger fluxes in nitrate to the stream-into a larger context. 3. Consider removing "long-term", as data collected for less than three years hardly justifies the use of this term. 4. The authors should consider using an outside editing service, given the occurrence of several awkward statements throughout the text (e.g. Pg 2, Line 5; Pg.3 lines 28-30; Pg 12, lines 10-13).

Specific comments: Abstract: Pg 1 Line 11: Define "dry", as this definition is critical in the interpretation of the results as well as applying the findings to other locales and placing the implications of this study into a larger context. Introduction: Well cited, however, consider adding Pellerin et al., given the similarity in use of continuous DOC and nitrate sensors to document varying biogechemical yield over different hydrological conditions in a forested watershed. Methods: I was puzzled as to how the probability density plots were developed, and the source of the data. Please explain in detail which if not all storms were considered and how these distribution plots were generated/modeled. The deployment techniques should be more clearly documented to ease duplication of the study. Was the approach modeled after the used in another study? If so please cite. For example, one important aspect is how the sensor cleaned (Birgand et al., 2016, Etheridge et al., 2013)? Pg 5, line 6-7. What was the typical (or max) holding time before analysis of discrete samples?

Results: Consider moving Figure 1 to supplemental material. Characterize the model fits and explain or speculate when/why the outliers tended to occur, especially high

residuals for DOC in late 2015. Placing discrete sample data on the time series Figure 4, would help interpret the limitation of this measurement strategy, i.e. non-linearity due to fouling, light blockage, high turbidity, etc. Please explain the DOC/nitrate data gaps in the summers of 2014/2015.Are these gaps a result of sensor limitations, or were the data otherwise removed? Also, what is the presumed influence of these missing data on cumulative DOC/NO3 export presented in Figure 10. Figures 3, panel b and Figure 4, panel e and Figure 6, panels d, h, nitrate trace is almost illegible given the color selection. Consider a darker color for the trace and y-axis font. Figure 4 Justify the presentation of was daily mean values rather than another descriptive statistic (mean, max, etc). Pg 9, line3: If the data is sampled to daily mean, how are sub-daily peaks resolved? Pg 11, line 3: replace remarkable to “notable” or equivalent. Pg.11, Line 3-5/Figure 6. Do the authors speculate on the mechanism for a steady decline/recession in DOC, despite the rise in discharge during second peak? Pg 12, lines 10-13: be specific about which end members Consider replacing figure 8, which is unclear and messy and rather plot a few select storms that illustrate hysteresis loops. Pg 12, line 18. Change “increasing” to “variable” Pg 13 Lines 10-13.More detail needed here, e.g. what direction were hysteresis loops, for example? Discussion: Pg 16, lines 5-7.Citation suggested here instead of personal experience not included in this study. Pg 16, line 29-30.Where is the evidence of a rise on groundwater table to support this claim? Pg 17, line 26.Consider changing “concur to the” to “suggests that”

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