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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Nitrate sinks and sources as controls of spatio-temporal water quality dynamics in an agricultural headwater catchment" *by* T. Schuetz et al.

Anonymous Referee #2

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Review of Schuetz et al. "Nitrate sinks and sources as controls of spatio-temporal water quality dynamics in an agricultural headwater catchment"

General comments:

The authors present a detailed assessment of synoptic sampling results from a small headwater catchment and develop a mixing/removal model to analyze in-stream retention and fluxes. The paper is well written and the results are presented in an interesting way. However, I was struck by how much in-depth analysis and theoretical underpinning was devoted to a small 100 to 600-m reach in a small 1.7 km2 catchment. The

authors wish to investigate nitrate sinks and sources in a "stream network", but can a such a small catchment with intermittent streams and tiles really represent a stream network? The authors go to great details attempting to resolve the mixing and removal model but how appropriate is this approach at such a small scale? How does a 100-600m reach in a 1.7 km2 headwater catchment represent a stream network? For me, the stream "network" would consist of many order 1, 2 , 3 and more streams – in my opinion, the present study is only focused on a single 1st order catchment and nothing more. I'm not sure how the authors can extrapolate beyond this small basin to say much about "stream network" behavior.

On lines 283-289, the authors acknowledge that they were not able to do an uncertainty analysis since they are uncertain about Q measurements and other estimated parameters. If there are not enough differences in the system to be able to accurately measure, I wonder if the scale of the site is not too fine for the methods. If the authors applied their methodology to a true stream network, perhaps there would be greater differences to quantify. As such, the reader is left to wonder how much of the in-stream mixing and removal model is real or an artifact of the measurements?

Lastly, the synoptic sampling of the system was done during a short season of baseflow in one year. I question how much insight can be gained from this limited time period. Again, this goes back to the idea that the study is somehow addressing fundamental questions of stream networks when 1) the catchment and reach are very small; 2) there is unknown data quality and modeling differences are greater than measurement differences; and 3) the study was done for a limited time frame. I believe the paper presents an interesting study of a first order catchment but think the authors should back away from the idea that the study represents new insights on fundamental dynamics of nitrate in a stream network.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 8577, 2015.