

## ***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 #1**

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This manuscript is a pleasing contribution to the literature, and very suitable for HESS. The detailed methodologies (some new) and results provide an excellent demonstration of how to measure and understand some important aspects of nitrate source-sink relationships in a stream network.

I raise just two points for discussion that might improve the manuscript:

1. Page 8591, Line 14 There is no mention of ammonium concentrations in the drainage or stream waters. Nitrate can be produced by nitrification of ammonium, but the importance of this mechanism is not mentioned. Even if it is easily dismissed as

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an important mechanism, for completeness I think it deserves a mention. It also brings into question the constraint in the analysis at this line, that negative removal rates were avoided. As an assumption, I'd like to see it justified.

2. In general, as we move to ever finer temporal and spatial scales of measurement of biophysical systems, it should not be surprising that we find different components behaving differently. The example provided here is a manifestation of this phenomenon. For me, an important follow-on discussion, which can be speculative to some degree, could be the causes behind these differences and possible ways to manage undesirable behaviours of systems. Once we have this more detailed knowledge, how can we potentially use it, which comes back the second last paragraph of the introduction 'Answering these questions is relevant for . . . ', which I'd like to see addressed better in the discussion. For example, why were some parts of the drainage system delivering relatively high nitrate concentrations? Could it be different soils, e.g. with high soil total N concentrations, lower C:N ratios, or more favourable pH? Could the drainage network in these locations be better connected to surface soil nitrate production by shallower drains or more preferential flow? What management options are available?

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