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Hydrology and Earth System Sciences
Discussions

Interactive comment on "High-frequency NO_3^- isotope (δ^{15}N, δ^{18}O) patterns in groundwater recharge reveal that short-term land use and climatic changes influence nitrate contamination trends" *by* Martin Suchy et al.

Anonymous Referee #1

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Review of:

High-frequency NO3- isotope (δ15N, δ18O) patterns in groundwater recharge reveal that short-term land use and climatic changes influence nitrate contamination trends Submitted to HESS (hess-2018-35) by Martin Suchy, Leonard I. Wassenaar, Gwyn Graham, and Bernie Zebarth

The submitted manuscript focusses on nitrate concentrations and there relation to N inputs from different natural and anthropogenic sources in the transboundary Abbotsford-

Sumas aquifer (ASA). Over a five-year period, they took monthly samples from newly-recharged groundwater for isotope and concentration analysis, to get insights into spatial and temporal nitrate dynamics.

Major comments:

Due to its clear structure and to the comprehensible English, the author's thoughts are easy to follow and the manuscript is good to read. The presentation of data in figures and tables could be improved (remarks below-mentioned).

The authors explained clearly the gaps of knowledge and there objectives in the introduction section. The used data including a five-year monitoring of nitrate concentrations (plus chloride as conservative tracer) and corresponding isotopic signatures for 19 monitoring wells presents an interesting dataset for a region which is partly impacted by high agricultural landuse and poultry.

Possibly, it would be useful to generate a depth profile which represents the specific sampling depth for each monitoring well. Thereby, different nitrate sources which appear relatively close (Figure 4, 91-03 und 91-07) could perhaps better explained.

Does exist a direct connection between dominant landuse type (blueberry, raspberry, poultry etc.) in the surrounding of the monitoring well and major nitrate source or rather microbial process dynamics? Please try to explain in more detail dominate N-sources for wells with a small distance but different δ15N source grouping.

To get insights into residence time and the connection to surface water, it would have been nice to additionally measure deuterium and oxygen isotopes in water. Sad, that these additional variables are not part of this monitoring concept.

The manuscript represents an interesting five-year dataset which interpret the major nitrate sources on a spatial and temporal scale for the ASA which is highly impacted by cultivation and poultry input. The interpretation of the results is precise and clear. Some figures need further improvement. Despite the above mentioned questions and

comments, I'd suggest accepting the manuscript for publication in the Journal HESS if the authors are willing to address those questions and to apply major revisions.

Minor comments:

In chapter 3.1, the authors describe the dissolved oxygen content (DO – used abbreviation not explained) which is usually higher than 3 mg L-1. Unfortunately, I can't find further information in the Supplementary Table which is referred to.

Chapter 2.2: "The analytical uncertainty for δ8O was $\pm$1.0‰' – correct δ18O

Chapter 3.2: first line "+7.9 $\pm$ .11‰' – correct/complete the last number (0.11‰

Chapter 3.2: What is the "Bayesian VVV"? Please briefly explain.

Figure 2A: It would be useful to see typical δ15N signatures for dominate nitrate sources (endmember) on the left site of the diagram. Is it possible to add arrows with the typical range for manure, soil-N and synthetic fertilizer?

Figure 3: Correct the axes labels (delta, shift and units in breaks)

Figure 4: ECCC sites are presented in the legend but I can't find one single red dot in the scheme. Consider the uniform use of capitalization.

Figures generally: What is the reason of the used nomenclature from the monitoring wells? Is it necessary to use these abbreviations?

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