Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2019-552-AC1, 2020

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Aged streams: Time lags of nitrate, chloride and tritium assessed by Dynamic Groundwater Flow Tracking" *by* Vince P. Kaandorp et al.

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Received and published: 30 April 2020

First we would like to thank the reviewer for their extensive and constructive review. Based on the reviewer's comments, we will rewrite large parts of the text, change some of the structure and add some extra analysis.

The large changes to the manuscript are:

We will clearer articulate the innovative method that we use: this paper is one of the first to apply dynamic Travel Time Distributions to explore and interpret the processes driving observed water quality and isotopes dynamics.

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The sensitivity analysis has been renamed to an ‘exploration of the model behaviour under different scenarios’, which better reflects the aim of the analysis. Parts of the manuscript have been rewritten for this.

The measurements of concentrations in-stream will get a more prominent place in the manuscript. They will now be presented in a new paragraph in the Results: “3.1. Water quality measurements of surface water” and more detail will be added on e.g. the time of observations, the resolution of the data and the amount of measurements. We will discuss the seasonal variability shown in the data and calculated by the model in more detail. Likewise, the constructed input curves are now added to the Results section.

The way that the unsaturated zone was incorporated in the method is clarified and more extensively discussed.

The discussion will be extended and rewritten to focus on the hydrological and chemical processes that occur in the breakthrough of agricultural solutes and the associated time lags, especially for nitrate. For instance, an extra scenario has been added in which a distinction is made between directly-available nitrogen and organic N that is more slowly leached towards the groundwater. We also intend to better define the concept of ‘time lags’ to avoid confusion over this term.

Paragraph 4.4 on ‘Improving and use of the model’ for the study catchment, which included Figure 10 with the ‘Best model fit’ will be removed. This part of the manuscript was confusing and distracted from the overall aims of the manuscript. Relevant parts from this paragraph have been added elsewhere in the paper.

We response in more detail on all the points raised by the reviewer in the attached Supplement.

Please also note the supplement to this comment:
https://www.hydrol-earth-syst-sci-discuss.net/hess-2019-552/hess-2019-552-AC1-supplement.pdf

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2019-552, 2019.

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