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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A model-based assessment of the potential use of compound specific stable isotope analysis in river monitoring of diffuse pesticide pollution" *by* S. R. Lutz et al.

Anonymous Referee #1

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This paper investigates the usefulness of Compound-specific stable isotope analysis (CSIA) in the assessment of pesticide degradation. The author demonstrated three scenario simulations including steady-state, extreme rainfall event and long-term with daily rainfall and evapotranspiration. Since all the simulations are well designed and the results are clearly illustrated with sufficient discussions, this paper definitely provides various insights into the process of diffuse river pollution in subsurface and surface flow. In contrast, I found some difficulty to follow the logic from the simulation results to conclude "CSIA is a feasible and expedient technique for the analysis of transport pathways and the assessment of the extent of degradation of diffusive pollutants". To

make this main conclusion statement clear, the authors should primarily state what parameters (e.g. degradation rate, proportion of surface/subsurface flow pathways, contribution of aerobic and anaerobic reactions etc.) are expected to be quantified (or qualitatively described) in what conditions.

Following sentences appeared in the abstract and conclusion are related to my above comment:

1. P8790-L16 "These results suggest that CSIA can help to determine whether pesticides enter the stream via groundwater exfiltration or via surface runoff." In the actual condition, the streamflow is typically originated through both flow pathways. Does the author intend to say the proportion can be quantified by CSIA?

2. P8790-L24 "The analysis of simulated isotope ratios also allowed quantifying the contribution of two different reaction pathways to the overall degradation." Does "two different reaction pathways" mean aerobic and anaerobic? If so, what is the effect of the assumption of "aerobic reaction in the topsoil and anaerobic reaction in the subsoil and bedrock"? In other words, if the proportion of aerobic and anaerobic reactions are quantified based on the assumption of enrichment factors, how certainly can we relate this to the different flow paths (i.e. topsoil and subsoil-bedrock)?

3. P8822-L1 In conclusion, "CSIA thus offers a unique tool for the assessment of pesticide transformation, and even for the analysis of the interplay between different transport routes". This sentence needs to be more precise. I could not understand how the authors quantified the interplay between different transport routes in the simulation, and which extent they expected to do so under various uncertainties in the actual fields.

The followings are other minor comments.

5. P8802-L9 "Two conservative tracers with C0 = 1.0 were applied ... across the entire surface of the model domain and at the application area". The statement of "entire surface" and "the application area" seem to be in conflict.

6. P8802-L17 What is the "coupling length"?

7. P8807-L18 and Fig.4(b) Why do the simulated isotopic ratios of d13C and d2H are constant during rainfall event and change rapidly after the cease of rainfall? Is there any interpretation presented in the main text?

8. P8817-L14 Describe the authors' perspective with respect to preferential flow representation of the applied model either implicitly represented or excluded from the simulation. If it is excluded, it needs to describe the effects of preferential flow on the obtained conclusions.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 8789, 2013.