

Interactive comment on “Sorption and transformation of the reactive tracers resazurin and resorufin in natural river sediments” by D. Lemke et al.

Anonymous Referee #2

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I did not read any other review before submitting this review.

The overarching aim of the manuscript is to better understand and quantify sorption of Raz-Rru in tracer experiments. The manuscript describes laboratory experiments and aims at “assessing the relative importance of kinetic and equilibrium sorption of Raz-Rru under various physicochemical conditions”. And secondly, it aims to “assess whether Raz-Rru can be described under normal field tracer concentration ranges with linear models”. The manuscript details on several batch and 4 column experiments (2 sediments and 2 pH). The topic is interesting for the hydrological community and it can contribute to improve the use of Raz-Rru as reactive tracer. The manuscript is very

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well written and structured. Overall I found the results interesting and trustworthy and the methods are described in a manner the tests can be reproduced.

However, the ms left me disappointed for one sole reason: too limited amount of experiments and data. In my opinion the manuscript is promising, important but not finished. How to extrapolate from 2 sediments with 2 pH conditions? To make these results really useful for the community, I would like to see a larger range of experiments. I do appreciate the time and energy involved in doing robust lab experiments but at the end of the day, these results are most appreciated by the community if they do not leave too many open questions.

Furthermore, I would like to see a writing style that is more specified. Please refrain from using “a series of lab column experiments”, “a range of pH”, etc. I would rather write: 6 batch experiments, with 2 sediments with different physicochemical characteristics, 2 pH conditions (or pH of 7 and 9). As an example. L5 of abstract could read: “We present 2 lab column and 6 batch experiments on Rza and Rru transport, sorption and transformation within 2 sediments with different physicochemical properties under neutral (pH=7) and alkaline (pH=9) conditions.”. The same in the introduction (P12190, L10 – L16). By using words like a series, a range, various, etc., the authors hint on more data rich analysis than the ms is really based on.

Some specific points: P12204, L1. Raz-RRu behaves non-conservative. This implies we need batch and column experiments adjacent to field experiments to be able to model and interpret field experiments in order not to have “erroneous characterization of hyporheic exchange”. - The column experiments have a duration of 15 minutes. Is this also the time scale of field hyporheic exchange? Would longer duration lab column experiments give different results? - Is the 2.5 cm radius of the column not allowing for too much preferential flow to the side walls of the cylinder? Do we get same results if upscaled to 10 cm radius? - Along the same line, would a longer cylinder / lower flow velocity to increase residence time influence the results?

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P12204, L15. “However, we could not identify clear relations of physicochemical properties with sorption characteristics.”. You only have two sediments, how would this result in reliable relationships between physicochemical conditions and Raz-Rru behaviour? More, different sediments are needed.

P12204, L20: OK not to study the relations between reaction rate and pH for Raz to Rru, as it is about interaction with sediments and OM you are interested in. But you see pH dependence. Would it not be robust to extend the experiments with pH = 6, 8, 10 and have some information about the influence of pH on reaction rate / decay rate?

- How well was the sterilization of the sediments? Did you test different intensities or duration of sterilization?

P12205, L 7. “we highly advice independent column studies . . .” What I was probably looking for, based on a wider palette of experiments, was some kind of recipe for ‘standardized’ batch and lab experiments to run alongside a tracer field experiment for ‘optimal’ interpretation. Although maybe a step too far at this stage, it seems to me it would be beneficial if the authors summarize their experience in specific column / batch experiment ‘guidelines’.

Minor point: It could be beneficial to add a flow direction arrow in the column (Fig 1) as the flow direction arrow in the resolution reservoir in the right upper part is not that clear.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 12187, 2013.

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