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Hydrology and
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Discussions

Interactive comment on "Controls of fluorescent tracer retention by soils and sediments" *by* Marcus Bork et al.

Anonymous Referee #2

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Fluorescent dyes are highly important tracers for many different applications because of their ease of use, highly sensitive and selective detection methods, benign environmental and toxicological behaviour, and a large dataset of specific properties. Applications range from simple water transport studies, the visualization of flow patterns and accumulation sites to contaminant transport studies, where the tracers are used as a proxy for pollutants with similar transport behaviour.

This submission aims to extend the characterisation of the sorption behaviour of two tracers, Na-fluorescein and sulforhodamine B, to some soil components. The sorption properties are tested as a function of the pH-value, content of organic matter, and clay content.

Unfortunately, there are too many open questions with regard to the experimental setup

and the data evaluation, as well as inconsistencies in text and tables. Eg. it is written, that SRB does not sorb to Clay0 (p10 l8) but a K_D of 1.3 is given in table 4. The mineralogical composition of the sediment is missing. The effect of the SSA on the sorption parameters should be included as a figure. None ot the results are given with quantitative prediction intervals or confidence intervals.

Since the experimental setup with a complex matrix leads to ambiguous results, the derived conclusions have to remain vague. This issue is intrinsic to a majority of experiments with natural sediments. One potential way to overcome this issue would be to do a multicomponent analyses of the sorption behaviour and a forward calculation of the sorption parameters based on the sorption parameters of the individual components. This way, parameters which are not easily accessible in experiments, like the effect of multilayered surfaces, show up at least semi-quantitatively.

Some specific remarks:

p4 l21: Our own studies did show that SRB and UR do compete for sorption places on carbonates. The reason why you might not have seen this behaviour is that the K_D values in carbonates in our studies are on the order of 0.02-0.3 for UR and 3-30 for SRB, whereas the K_D values in this study, especially for UR are higher.

p4 l23: please state the \Delta lambda and the wavelength range used for the synchron scan (or did you just measure at 488 and 560 nm?).

p4 l24: at pH 7 UR shows 80% of the fluorescence intensity (Käss, 2004) which is why usualy 3 drops of KOH are added to the solution to ensure a pH above 10!

This might explain, why the K_D values for UR are so high.

Did you measure the pH value after addition of EDTA?

p5 l5: the simplification should be supported by data, not by words, as small is not defined anywhere.

p5 l27: how was the pH measured and kept constant during shaking?

p5 l32: why are you going for linear sorption isotherms? Freundlich is also an option and would be much better to describe the overall behaviour at a wider range of concentrations. At the moment the use of the presented data is strictly limited to the concentration range tested.

p6: which type of fit did you apply in R (lm/lqs/nls)? Please give the prediction intervals for each fitted parameter (predict function in R).

p9 l29: the unit for the SSA (%) is wrong. The discussion should focus on the accessibility of the surfaces, which is clearly different for pure montmorillonite added to the sediment and clay minerals coated with eg. OC in the topsoil.

p10 l8 and table 4: if no SRB is sorbed to the sediment, which we never observed in any of our experiments, how is the K_D value of 1.3 in table 4 justified?

Table 1 should include the ranges of the presented study (excerpt from table 4)

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