Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2019-149-RC2, 2019
© Author(s) 2019. This work is distributed under
the Creative Commons Attribution 4.0 License.

Hydrology and Earth System Sciences
Discussions
Open Access
EGU

Interactive comment on "A soil non-aqueous phase liquid (NAPL) flushing laboratory experiment based on time domain reflectometry (TDR) and modeling" *by* Alessandro Comegna et al.

Magnus Persson (Referee)

magnus.persson@tvrl.lth.se

Received and published: 18 June 2019

General comments This paper deals with TDR measurements to asses different washing fluids to remove oil from soil samples. The topic should be of interest for the readers of the journal. In general the manuscript is well written, properly organized and in most parts easy to follow, although some awkward sentences could be found. However, the methodology needs to be better described (see comments below). I also miss a more thorough analysis and discussion of the results. A final language check would improve the paper even more. I have a few major comments listed here, and further some minor

Printer-friendly version

Discussion paper

CC BY

comments listed below. My recommendation is that the paper can be published after a moderate revision.

Scientific questions 1. Title I would suggest removing “and modeling” from the title since the modeling part is not the main focus of the paper. Furthermore, no new model was developed, you only used an existing one.

2. Novelty/objectives Using TDR to measure NAPL content is not new, neither is the use of mixing models. Despite of this, very few applications outside controlled laboratory conditions have been published. Most published studies have merely showed the possibilities of using TDR without much practical focus of how this should be done and why. The topic itself is, thus, not very novel. The present paper, however, has its strengths in that TDR is used as a real time and in situ monitoring tool to asses different washing fluids. This is, to my knowledge, the first time this is done. This should be made more clear in the manuscript and this should be reflected in both the objectives and in the conclusion.

3. Using initially oven dried soil In (almost) every natural application, there would be both water and NAPL present in a contaminated soil. I can see why you chose to use a NAPL/dry soil mix to start with as this will lead to measurements that are relatively easy to interpret. But, you should at least discuss this in the manuscript and also point out what would need to be done differently is water also was present in the contaminated soil from the beginning.

4. Distribution of NAPL within the sampling volume The TDR reading is not only affected by the volumetric content of the components, but also the distribution of the components in the sampling volume. You discuss this in the section Model calibration and validation. However, I think you could elaborate this a bit. Especially with respect to my previous comment. How would water affect the distribution of the NAPLs in the contaminated soil and what does all this mean in terms of accuracy and applicability of the method? During the upward infiltration the NAPL distribution will change both

CC BY

along and transverse the probe length. How is this affecting the measurements?

5. Saturated samples During the upward flow experiments the soil samples are saturated with NAPL and washing fluids. In any real application there will also be air present to some extent unless you are in the saturated zone. I think you should point this out.

technical corrections Line 14 and 15 Change “diverse” to “different” and “varying” in line 14 and 15, respectively Line 17 You use three different terms for the same thing; NAPL, hydrocarbon, and oil. I think you should stick to one term in order to avoid confusion. Line 107 Also include the value for water at 25 degrees. Line 116 What is the width of the TDR probe? Line 122 Include units for the NAPL content (m3/m3) to make clear that you are talking about volumetric content. Both here and in the entire manuscript. Line 129 How was the oil content of the effluent determined? Line 165 It is a little unclear which data you use for calculating the alpha parameters in Table 1. Is it the data from the leaching experiments? I guess it must be since no other experiment with both NAPL and washing fluid was described. But when you, e.g., say that the NAPL content is 0.4 m3/m3, this is only the NAPL content when the experiment starts. As the experiment goes on the NAPL content will decrease. When the NAPL content changes, also the alpha parameter is likely to change. Could you comment on this? And perhaps show the raw data and the model estimations to see the scatter in the data. Perhaps I misunderstand how you did this, if so please try to explain better. Line 169 This is the first time you mention “validation dataset”. Which dataset is this? This implies that you also have a calibration dataset (which I guess you used to achieve the alpha parameters, see my comment above). Again, I think I do not fully understand which datasets you have. Line 163-187 This could be elaborated. What does the different alpha values mean, how do they correspond to other studies? Line 190-199 the conclusion could be elaborated a little. Table 1 the alpha value for wda#2 and NAPL content 0.20 (005) is very different from the others, can you explain why?

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

CC BY

149, 2019.

Printer-friendly version

Discussion paper

CC BY