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Interactive comment on "New Model of Reactive Transport in Single-Well Injection-Withdrawal Test with Aquitard Effect" *by* Quanrong Wang et al.

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This is an impressive mathematical work that involves several injection phases, adsorption (linear) and first-order degradation, the presence of aquitards, and the separation between mobile/immobile domains. The solution is fully analytical, just expressed in Laplace space (thus the need for inversion at the end). If the solution is analytical, what is the point to test it? The only reason is that some simplifications are involved. This is tested for example in Figure 2, showing limitations.

Assumptions are quite strong: - Homogeneity – it might also be valid for mild heterogeneity - The well extends all the thickness of the aquifer - Reactions: actually you only include linear sorption (K_d values) and first-order degradation (μ values). This is a very small subset of reactions.

At the end there is a validation effort with real data. According to the authors, the new

model performs better. Yes, it also has many more parameters, and so in a real case some model selection criteria should be performed to discriminate the "best" model. More, the authors provide just a single set of parameters, without any study of uncertainty in the parameters, or even the reason why these numbers were chosen and how they represent real physical quantities.

The mathematical work is really impressive, and I praise the authors for it, but in my opinion the resulting work can be hardly used with real data, and the problem would be better solved using a numerical model that can provide best fit, but also some uncertainty evaluation.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2019-699, 2020.