Interactive comment on "MFIT 1.0.0: Multiflow inversion of tracer breakthrough curves in fractured and karst aquifers" *by* Jacques Bodin

Anonymous Referee #2

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This manuscript presents new software for modelling tracker data from fractured karst aquifers. I found it to be very well written and particularly well organised in the introduction and methods sections. Some minor improvements are needed to the figures, discussion of uncertainty results and potentially the code verification section. I have outlined these as part of some specific comments below:

The abstract and introduction is very clear, and the contribution of the paper carefully set out.

Figure 1: should this say what the dashed line represents, is it non flowing water? Line 115-116: "A possible reason is the increasing number of fitting parameters, which makes the inverse problem more complicated. The use of modern inversion tools such as PEST enables overcoming this problem, as discussed in section 3" I agree that

these methods can efficiently find parameters sets in the situation you outline but I would assume not without the possibility that the parameters best fitting the data are far from unique and more so the greater the number of parameters. For me, this sentence misses a discussion of this important caveat in an otherwise very carefully considered section.

Around line 235: For my understanding, is the optimisation run for a given number of channels and if so should the user seek the minimum number of n that perform well for the measurement objective function and regularisation terms. OK, I see later where this comes in but I'll leave the comment so you can see the issue I had when reading for the first time.

Around line 285: A series of utility functions are called here for the uncertainty analysis. I don't think they need further explanation here but a pointer to the relevant documentation/literature on these would aid completeness.

Section 4 code verification – should this also test for the case where n channels is unknown? So for test 5 if n_max was set to 6 would the same results be found as for the current test 6. Perhaps this goes beyond verification of the transport processes models, which is clearly the aim of this section, but I think checking the multistart would add value if feasible.

Figure 3: In my version the dots and labels overlap, generally this figure could be cleaner, and the scale bar is also quite small. Would it also be possible to highlight the wells used for pumping and injections in the experiments, perhaps with colours or different symbology.

Line 345: Do the parameter bounds come into play in the optimised parameter sets? i.e. do you get parameters optimising to the bounds? Generally, there is not any discussion of the parameters found, we there a reason for this? I think this should be justified.

Figure 5: Could the legend be a single legend for all plots. On my version the legend is also quite small making dashed and continuous lines difficult to identify. Worth checking in the final production of the figure for publication.

Line 390 uncertainty analysis – Could you be more explicit about why the particular model and test case was chosen for the uncertainty analysis.

Line 396: "fairly similar" could you be more precise about how similar was defined. The uncertainty analysis description in the methods is quite brief which means its difficult to fully appreciate the setup here in my opinion.

Around line 400 – I feel the discussion of these results is somewhat rushed regarding the uncertainty analysis, I don't feel I fully appreciate the results. Is this conclusion made because only the four and six channel models capture the first peak? MDP-2RNE seems to for the two channels although it's difficult to see if this is really the case.