

### **General comments**

In this manuscript, the authors present a transient storage model they developed. This model is similar to some existing ones (OTIS mainly) and the aim of the authors is to show the advantages of their model. I think that the research developed in this manuscript could be worth publishing but that the demonstration made through the manuscript is not really convincing. I would recommend a major revision of this manuscript for the following reasons:

- The manuscript need to be rewritten in correct English. I would advise the writers to ask the help of an English speaking reviewer.
- The last part of you manuscript (section 4) implying the real case studies is not clear. You compare the simulations made by your model, OTIS and Mike11 to the real data. However your simulations are based on a set of fixed parameters but we don't know where these come from... Have they been calibrated by another program? In this case which one? Why would these parameters be considered as the right ones? My point is that maybe you would have a better fitting to the real data with another program in considering another calibration....! Actually, what you should compare is the best fit you can have for each model in calibrating the parameters for each model. So you'll have 3 different sets of calibrated parameters and that would be interesting to see if they are close or very different.
- OTIS is often really close to your model result. I'm not really convinced that getting slightly better statistical analysis is enough to show the efficiency of a model. The real point of developing such models is their use to dimension the geometrical and transport parameters in rivers. I think that showing the numerical and statistical stability of you model is not enough and that you should show the impact of your model on the parametrization.

### **Specific comments**

I would like to add some minor and moderate remarks on some specific points of the manuscript. The number of pages and lines refers to the manuscript draft version.

- Page 3, line 16. What defines a "good performance"?
- Page 6, line 20. The parameters involved in the Dal and their units should be mentioned. Furthermore, in addition to the Dal, I would also consider the numerical Peclet and Current to asses of the model stability for each simulation.
- Page 7, line 24. The meaning of the error indexes you calculate must be roughly explained.
- Page 10, section 3.2. The main features of the 2D-model should be explained. Why do you consider it as a reference to which other models must be compared?
- Page 11, line 13. All along the manuscript you use sometimes "CTQS, CTCS, BTCS" or "This study, OTIS, Mike11". Please choose one of those nomenclature to more clarity.
- Page 11, line 18. Why is a tiny least error percentage synonymous of better accuracy?
- Page 12, figure 7b. How can you simulate a BTCS with storage while you mentioned in Table 1 that Mike11 is not able to simulate transient storage..?
- Page 13, line 14-15. I don't see your point. The example developed in this chapter considers no storage.
- Page 14, fig. 9 and 10. Those figures are not necessary. They are redundant with figure 8.
- Page 17, table 16. The origin of the parameters calibration should be explained. See the general remark above.

- Page 19, Figure 16. How were the storage zone concentration simulated?
- Page 19, lines 9 to 17. The importance of simulating storage areas in such transport is well known and has been demonstrated by other authors. I don't think your manuscript should include this discussion because it is not the point of your paper.
- Page 20, table 18. The origin of the parameters calibration should be explained. See the general remark above
- Page 22, table 19. At 433 m, all models have rather bad error indexes. How can you explain that? To me, this could be linked to a wrong initial parameters calibration...
- Page 23, lines 19-20. You never mentioned trial error tests before. Where does it come from? Did you do trial-error tests to calibrate transient storage? So you should have three different values of transient storage parameters for each model? This is not clear...
- Page 25, table 22. The origin of the parameters calibration should be explained. See the general remark above
- Page 26, table 23. I'm surprised Mike11 has a much better  $R^2$  than the two others. Are you sure of those values?
- Page 27, section 5. Why did you performed the sensitivity analysis on the transient storage parameters only? Your model does also dimension dispersion and main flow section. So to me, they should be part of a sensitivity analysis as well.
- Page 27, line 18-22. What is the meaning of "not remarkable delay" or "significant increase" in this context? It should be quantified.
- Page 28, fig 24 and 25. The initial model fitting (the "0% change") must be shown on the graph.

Finally, some technical comments should be taken into account:

- Page 1, equation 1, line 23-24. Units should be mentioned; either here or in a general notation section.
- Section 2, page 3 to 6. Units should be mentioned; either here or in a general notation section.
- In all your error indexes tables, your data must be presented with the same number of significant digits after the coma in order to be compared accurately.