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Memorandum

To: Dr. Monica Riva, Editor of Hydrology and Earth System Sciences

Subject: Revision of Paper hess-2018-181

Dear Editor:

Upon your recommendation, we have carefully revised Paper hess-2018-181 entitled "Reactive Transport with Wellbore Storages in a Single-Well Push-Pull Test" after considering all the comments made by the reviewers. The following is the point-point response to all the comments.

Response to Referee #1:

1. The Authors have seriously taken in consideration the main comments of the reviews and provided a stronger revised manuscript. Some technical-very minor changes are suggested.

Reply: Implemented. We have carefully revised the manuscript.

Response to Referee #1:

General Comments:

1. I reviewed the first version of this manuscript. Since all important suggestions have been taken into account through additional analysis, I think that this manuscript can be published..

Reply: Thanks a lot.

Specific Comments:

1. Page 2 - Line 19: replace "fracture" by "fractured".

Reply: Implemented (See P2 Line 19).

2. Page 3 - Line 29: replace "could be" by "is".

Reply: Implemented (See P3 Line 29).

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3. Page 14 - Lines 6 to 9: I agree with this conclusion. However, since pressure has to be measured during SWPP tests, the authors could suggest estimating permeability of the tested zone using for instance the pumping phase.

Reply: Implemented (See P14 Lines 14 - 19).

Response to Referee #2:

General Comments:

1. I appreciate the authors' effort to address my comments, including the comparison of the new model results against the results simulated using 3-D numerical model package MODFLOW/MT3DMS.

Reply: Thanks a lot.

Specific Comments:

1. I think the authors are incorrect with respect to the calculation of the water volume in the wellbore storage in MODFLOW-SURFACT and FEFLOW. As far as I know, MODFLOW-SURFACT includes a fracture-well package (FWL4 and FWL5) to overcome the problems in the original MODFLOW Well package. The FWL4 and FWL5 packages calculate the water volume using simulated heads, not aquifer thicknesses. The authors can refer to MODFLOW-SURFACT manual, Vol I, Section 3.2, Eq. 24 for details. FEFLOW also has a similar package, referred to as Discrete-feature to simulate a pumping/extraction well, if one chooses to do so. Additionally, with a FEFLOW model, the model mesh can be highly discretized to accurately represent well dimensions using a subset of elements (in centers). The modeler can assign a porosity of unit for those elements representing the wells, rather than assuming the same porosity of the surrounding materials.

Reply: Thank you very much for bringing this to our attention, and we have corrected the relevant sentences (See P10 Lines 3 - 6 and Lines 10 - 25). In the future, we will conduct a comprehensive comparative investigation of the method proposed in this study and those of MODFLOW-SURFACT and FEFLOW for understanding the effects of well mixing and wellbore storage for both flow and transport processes involving an aquifer-well system.

If you have any further questions about this revision, please contact me.

Sincerely Yours,

Hongbin Zhan, PhD, PG.