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Hydrology and Earth System Sciences Discussions

Interactive comment on "Quantifying flow and remediation zone uncertainties for partially opened wells in heterogeneous aquifers" *by* C.-F. Ni et al.

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We thank Dr. Lu for the detailed comments on our manuscript. The points raised in the comments are crucial to our manuscript, especially for the accuracy and methodology issues. We will follow the suggestions to improve our model and revise the text relevant to the new results. The following is the summary of our responses to the comments from Dr. Lu.

Responses to the specific comments:

(1): It is true that the early time period is transient for most realistic problems. To

account for the particle tracking in early time, we will revise our model to be able to simulate transient state problems. An additional figure that shows the early time head and velocity variances will be presented in this study. All the new results and the associated text parts will be updated in the manuscript. Thanks for the suggestion.

(2): The sentences for the derivation of equations (4)-(6) will be rephrased for clearly presenting our approach. The study of Zhang and Lu(2004) presented high-order solutions of the means and variances for hydraulic head in heterogeneous aquifers. Their results show that the high-order correction can improve the head variances significantly, especially for large ln K variances and correlation lengths. Our spectral approach shows accurate head and velocity variances for small ln K variances and small correlation lengths (as shown in figures 7 and 8). However, large ln K variances and correlation lengths may lead to inaccurate solutions of head and velocity variances. This is consistent with the conclusions proposed in the study of Zhang and Lu (2004). We will follow the suggestions to provide detailed discussion on the accuracy of our first-order approximations.

(3): Thanks for the suggestion. We will follow the derivation of Lu and Zhang (2003) for the calculation of the R and the associated bandwidths for capture zones. All the simulation results will be updated based on the new equations.

(4): The descriptions for the boundary conditions will be added in the newly uploaded manuscript. Thanks for the comments.

(5): We will add brief description of the Fourier increment Zf for ln K fluctuations.

(6): This is a typo error. In equations (22) and (23), the variances of r and z displacements should be presented with standard deviations of r and z (remove the superscript 2). Also, the variances of velocity in r and z directions should be presented with standard deviations. Thanks for the detailed comment.

(7): The definitions and descriptions for these terms will be added in the newly up-

HESSD

8, C2068–C2070, 2011

loaded manuscript.

(8): Yes, the value should be 2.718m/day.

(9): The developed model is for single well remediation system. To model multiple well systems with partially opened screens, one may rely on a full three-dimensional Cartesian model.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 3133, 2011.