Hydrology and
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Discussions

Interactive comment on "Sequential hydraulic tests for transient and highly permeable unconfined aquifer systems – model development and field-scale implementation" *by* C.-F. Ni et al.

Anonymous Referee #2

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The authors presented the implementation of a geostatistical inverse model for the characterization of saturated hydraulic conductivity (K) and the specific yield (Sy) in transient and unconfined aquifer systems. The study shows both synthetic examples to assess the accuracy of the model, and field scale tests to show its capability on estimating K and Sy fields with detailed spatial variations. The key point of the manuscript is the upgrade of the SSLE program developed by Ni and Yeh (2008) in order to deal with unconfined aquifer systems. The program is well known and it has been already adopted, in its former versions, in several publications. Also, the inversion of data collected during THTS performed on unconfined aquifers, doesn't represent an innovation itself. However, although the modeling modification have been actually minimal and not

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substantial (especially with regards to the optimization algorithm), and the experimental setups didn't introduce any new technique, some interesting results and conclusions came out from this study. I suggest, then, the publication of the paper. My comments below are rather minor

1. The title of the manuscript is well focused on the topics described inside, however, there's some confusion, especially in the abstract and in the introduction, about the technique adopted to collect the data for the inversions. The sequential injection tests performed in the paper provide a bi-dimensional information on the hydraulic properties of the porous medium, and this is also clear by looking at the model domains. The hydraulic tomography survey is instead a fully three-dimensional technique, which is completely different from the one previously described. Some sentences like the one written at the end of the abstract could generate confusion in the reader.

2. Pag. 6 line 21: Remove "to solve Eq.(1)" at the end of the sentence

3. Pag. 7 line 17: I don't think the pronoun "we" is appropriate for technical writing, even though it is commonly used in verbal conversation

4. Pag. 12 line 1: Replace "Eqation (11)" by "Equation (11)" or by "Eq. (11)" to follow the style used in the rest of the paper

5. Figure 1 caption (line 3): Replace "flow boundary condition" by "No flow boundary condition"

6. Pag. 14 lines 25-26: The sentence "Using the lnK and lnSy fields same as those in the base example" is redundant. The concept is already expressed on line 21

7. Pag. 15 line 6: "The developed inverse model is" instead of "are"

8. Pag. 15 line 7: Replace "allow" by "allows"

9. Pag. 15 line 19: Same remark made in comment number 3

10. Pag. 15 lines 25-27: the sentence is redundant, the same concept is already

present in lines 13-14

11. Figure 9 caption: No wells in the figure show the "ND" label described in the caption, please remove it

12. It would be interesting to see the curve matching between observed and calculated head variation. You should show at least the best and worst fitting obtained at the end of the optimization procedure

13. Pag. 25 line 3: Replace "sites" by "sizes"

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 12567, 2015.