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.

C.-F. Ni et al.

nichuenfa@geo.ncu.edu.tw

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The reviewer pointed out a very important issue for evaluating the contribution of the nonlinearity involved in unconfined aquifer systems. Yes, we are working on this issue based on a series of numerical examples. We have identified a number of factors that might directly or indirectly influence the results of parameter estimations. These factors can be roughly divided into three categories, including the variation of heterogeneity (or geostatistical structure) in aquifers, the selections of hydrological and numerical conditions such as domain sizes, BCs, IC, and aquifer thicknesses, and the misuse or interchange of data from confined and unconfined aquifers. The detailed comparison

and quantification are possible because we have two conceptually similar models on hand. The output of the results can be interested for aquifer characterization and practical hydraulic tests. However, the inclusion of all the results in this paper should make the paper very long. In this paper, we prefer to point out the fundamental differences between confined and unconfined aquifer system and outline the potential factors that may directly or indirectly influence results for the extension of the unconfined flow. Based on one realization of the numerical example in this study, an additional figure includes several subfigures will be presented in current paper. One of the key parameter for confined aquifer system is the aquifer thickness applied at the test site. We can simply show the effect of confined aquifer thicknesses on the head observations as compared with the unconfined heads. These head observation can lead to differences of the parameter estimations. Figure 1 below shows preliminary results and the discussion for the issue will be organized in the improved manuscript.

Other comments raised by the reviewer are valuable to improve the presentation of our paper. We will add the required references to enhance the section of introduction. Some unclear points in the paper will be handled and revised for clear presentation. We do have multiple realizations to show the general performance of the developed model and will add the information to current paper. We thank the reviewer for all the editorial comments. These suggestions will be implemented in the paper.

Chuen-Fa

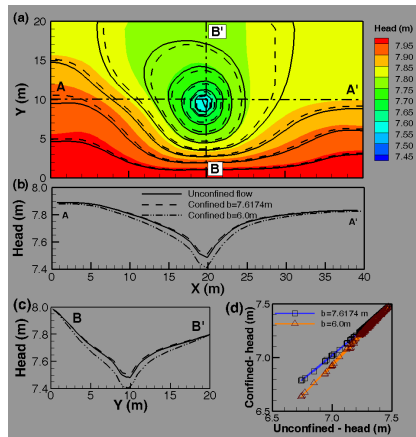Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 12567, 2015.

Figure 1. The comparison of head observations for unconfined and confined aquifers: (a) the plane view of the head distributions, (b) the head profiles along Y =10 m, (c) the head profiles along X=20 m, and (d) the scatterplot for head observations at well locations.

Fig. 1. The comparison of head observations for unconfined and confined aquifers.

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