

# ***Interactive comment on “Data assimilation with multiple types of observation boreholes via ensemble Kalman filter embedded within stochastic moment equations” by Chuan-An Xia et al.***

## **Anonymous Referee #2**

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### General Comments

This research is orientated to a numerical flow modeling of a 3D confined aquifer. The scope of the exercise is to achieve the hydraulic conductivity field on a uniform flow system using different strategies for optimizing the analysis. The model is based on a tetrahedrons finite-element numerical solution with 13 layers. Some hydraulic parameters were imposed as constants as the variance of the hydraulic conductivity. In the domain a set of monitoring wells were arranged in order to give information about hydraulic heads. These wells were defined by three different types: 3-point sensors,

partly penetrating wells and fully penetrating boreholes.

The inverse problem was solved using two different methods: (i) Moment-Equations (MS) and (ii) Montecarlo Simulations (MC). Both methods were optimized via Ensemble Kalman Filter (EnKF). The exercise compares 4 different group of piezometers for 26 test cases analyzed taking into account different situations as: (i) neglecting flux exchanges, (ii) data achieved solely from a specific depth and (iii) the exploration of the effect of error in measurements.

As a result, a comparison on time-efficiency optimization method and the reliability on measurements of the implemented observation wells.

### Specific comments

This is an interesting work based on a previous methodology implemented on 2D systems. This application shows us that MEs-EnKF has better time performance than MC-EnKF. Some assumptions were established as the size of the piezometers and the effective radius of the well. It is necessary to detail the units of each parameter and variable. It is also necessary to show the numerical features of each test. Finally, a formal review of citations and reference list is necessary. The figures that show the temporal evolution the parameters for appraising quality need would be done in color and bigger.

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Discussion paper

