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Hydrology and Earth System Sciences Discussions

Interactive comment on "Groundwater flow inverse modeling in non-MultiGaussian media: performance assessment of the normal-score Ensemble Kalman Filter" *by* L. Li et al.

Anonymous Referee #1

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The manuscript entitled "Groundwater flow inverse modeling in non-MultiGaussian media: performance assessment of the normal-score Ensemble Kalman Filter" by Li et.al. applied the normal-score ensemble Kalman filter (NS-EnKF) on a channelized synthetic aquifer. With several test scenarios, authors assessed the performance of the NS-EnKF and demonstrated it usefulness which works well under different flow configurations including both parallel and radial groundwater flow conditions. The paper is well organized and well written. In my opinion, the paper may be relevant for the large section of the HESS readers, interested in applying data assimilation techniques. I, therefore, recommend the publication of this paper in HESS after considering some

minor points as listed below.

In the paper, authors showed the application of NS-EnKF on the synthetic aquifer case. It would be interesting to see how NS-EnKF performs on a real case study.

At pp. no. 6752 and line no. 10, authors state that " .... the traditional inverse approaches mentioned above (self calibration, pilot point, etc) are CPU-intensive, need re-calibration when new data are available and handling multiple sources of uncertainty is less straightforward ... ". I am not fully convinced with this statement as in my opinion, the use of NS-EnKF is also computationally as demanding as the traditional inverse approaches are for the model calibration. Furthermore, as new data are available, the NS-EnKF technique has to operate on those data to assimilate them. The authors may consider to rephrase those wordings.

The effect of number of conditioning piezometers on identification of hydraulic conductivity fields are assessed in the section 4.4 by only once case in which the number of piezometers is reduced to one third of the original ones. It would be interesting if authors provide some more details regarding minimum number of piezometer which my be required to effectively capture the spatial heterogeneity of hydraulic conductivity in the synthetic aquifer case. It could be easily done by gradually reducing the number of piezometers one by one (or with a specified interval), rather than just reducing them to one third of the original ones which represents only one case.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 6749, 2011.