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Discussions

Interactive comment on "A reduced-order model for dual state-parameter geostatistical inversion" *by* Yu-Li Wang et al.

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Dear reviewer: Thanks for your comments. This study addressed the overfitting problem in geostatistical inversion approach. The researchers need to manually select the estimated parameters based on their experience to avoid over-calibration, an annoying issue when performing the ensemble algorithm or Monte Carlo simulation. That is to say, the previous methods are not fully automatic and objective. This study overcome this issue by proposing a reduced-order geostatistical inversion algorithm that consider input uncertainty. We further used two synthetic and one real case studies to examine the proposed method. The results of this study show that the proposed method indeed provide a more stable and objective estimate of the parameter fields than the approach without considering input uncertainty. Most importantly, the developed algorithm is to-

tally automatic and no labor requirement during the inversion procedure.

Regarding to the brick domain, here we refer to the rectangular domain in 2-D (or brick in 3-D). They are described in the introduction section. Previous reduced order algorithms require rectangular domain to efficiently decompose the unconditional covariance matrix. This requirement comes from the derivation of analytic eigenvalue and eigenvector of a separable exponential function. The details are discussed in the introduction and methodology sections as well. The word "dual state-parameter" is not first used by this study. This word is frequently used in the previous studies related to parameter and state estimation (e.g., Moradkhani et al. 2005, Sorooshian et al. 2008, Lü et al. 2011, and Lü et al. 2013). Since this study address the state and parameter estimation in the field of subsurface characterization, we adopt this word "dual state-parameter" in this study without further explanation. However, according to your comment, we will further explain it in the introduction section in the next round of review process.

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