# Data Assimilation in Hydraulic Conductivity Identification using Bayesian Statistical Method

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Characterizing spatially heterogeneous hydraulic conductivity plays a crucial role in groundwater resources management and subsurface contaminant remediation. Since the direct measurements of hydraulic conductivity are sparse, the uncertainty is inherent in the estimated parameters. We propose decreasing the uncertainty by assimilating auxiliary data (electrical resistivity) with the direct data (hydraulic conductivity) using Bayesian statistical method. Different from classical geostatistical methods, both linear and nonlinear relations between the direct and auxiliary data can be considered in Bayesian statistical method. A synthetic example is designed to evaluate the method. Results show that the accuracy of hydraulic conductivity is improved through the Bayesian statistical method. Moreover, the effectiveness of auxiliary data in estimation error decrease is more significant when high correlation exists. However, the relation type has little influence on the accuracy. The estimation uncertainty quantified by variance is also compared. The uncertainty is inversely proportional to the amounts of auxiliary data and the correlation in both linear and nonlinear cases. The usefulness of auxiliary data in variance reduction is more obvious in linear cases. A systemic discussion of the sampling strategies of auxiliary data for improving hydraulic conductivity identification is also proposed.

Keywords: Data assimilation, Bayesian statistical method, Hydraulic conductivity, Nonlinear

 