SENSITIVITY ANALYSIS OF PARAMETER AND STATE ESTIMATION OF GROUNDWATER FLOW AND TRANSPORT MODELS

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Herrera (1998) proposed a data asimilation method for the estimation of groundwater contaminant concentrations in the context of optimal sampling network design. To get the estimates this method uses a space-time ensemble Kalman filter (stEnKF), based on a stochastic flow and transport model. Afterwards Herrera and Briseño (2010) extended this method to estimate the logarithm of hydraulic conductivity (ln K), together with hydraulic head (h) and contaminant concentration (c). The method has three steps: 1) Given the mean and the semivariogram of ln K, random realizations of this parameter are obtained. 2) The stochastic model is used to produce hydraulic head (h) and contaminant (c) realizations, for each one of the conductivity realizations. With these realizations the mean of ln K, h and c are obtained; for h and c, the mean is calculated in space and time. Also, the cross covariance matrix ln K-h-c is calculated in space and time. 3) Finally the ln K, h and C estimates are obtained using the stEnKF. Since usually the semivariogram of ln K parameters are not know perfectly, the main objective of this work is to analyze the sensitivity of these estimates when two of these parameters, the mean and variance of ln K, have errors. Two case studies were established to estimate ln K, h and c using different data sets. For case 1, different values of the K mean were used (0.4, 0.8, 1.2, 1.6, 2.0,2.4, 2.8, 3.2, 3.6 and 4.0 m/day) and ln K variance was constant, equal to 1.0. For case 2, different values of ln K variance were used (0.50, 1.0, 1.25, 1.50, 1.75, 2.0, 2.50 and 3.0) and the K mean was constant, equal to 1.6 m/day. The results indicate that for these examples the sensitivity of the Kalman filter estimates for ln K, h and c using h and c data, is small.