IMPROVING GROUNDWATER MODELING BY COUPLED HYDROGEOPHYSICAL DATA ASSIMILATION

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A sequential Bayesian approach for joint assimilation of hydrological and geophysical data in a variably saturated flow model is presented. The study aims to improve simulation results and system understanding by assimilation of multiple-type data using a Monte Carlo approach and avoiding the inversion of the geophysical measurements.

A SIR based particle filter data assimilation is implemented in a 3D variably saturated flow model. Point measurements are directly assimilated in time while spatial information are blended in the simulation by assimilating Electrical Resistivity Tomography (ERT) measurements. To avoid the inversion of the latter, a forward 3D model of electrical current distribution is implemented as the measurements model in the data assimilation algorithm. The connection with the hydrological parameters occurs via the Archie's law.

A synthetic test case is used to test the assimilation of pressure data, ERT data and the joint assimilation of pressure and ERT data. Performance of the proposed modelling approach are evaluated in terms of predicton efficiency and parameter estimation. Perspectives and limitations of coupled hydrogeophysical data assimilation are discussed.