Aquifer Parameter Identification with Hybrid Ant Colony System

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Abstract: A new approach to parameter estimation in groundwater hydrology is developed using hybrid ant colony system with simulated annealing. Based on the information from the observed water heads and calculated water heads, an objective function for inverse problem is proposed. The inverse problem of parameter identification is formulated as an optimization problem. Simulated annealing has the ability of probabilistic hill-climbing and is combined with ant colony system to produce an adaptive algorithm. A hybrid ant colony optimization is presented to identify the transmissivity and storage coefficient for a two-dimensional, unsteady state groundwater flow model. The ill-posedness of the inverse problem as characterized by instability and non-uniqueness is overcome by using computational intelligence. As compared with the gradient-based optimization methods, hybrid ant colony system is a global search algorithm which can find parameter set in a stable manner. A numerical example is used to demonstrate the efficiency of hybrid ant colony system.

Keywords: *Ant colony system; parameter identification; inverse problem; simulated annealing.*

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