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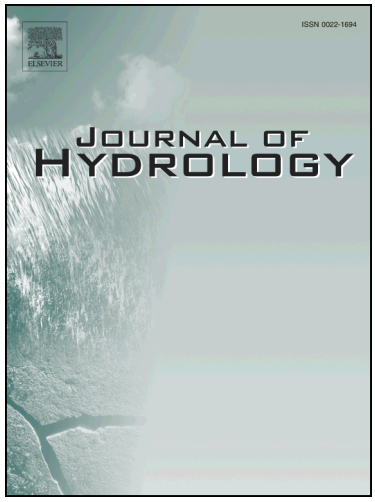

Research papers

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Estimation of In-Situ Bioremediation System cost using a Hybrid Extreme Learning Machine (ELM)-Particle Swarm Optimization Approach

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Abstract

In-situ bioremediation is the most common groundwater remediation procedure used for treating organically contaminated sites. A simulation-optimization approach, which incorporates a simulation model for groundwater flow and transport processes within an optimization program, could help engineers in designing a remediation system that best satisfies management objectives as well as regulatory constraints. In-situ bioremediation is a highly complex, non-linear process and the modelling of such a complex system requires significant computational exertion. Soft computing techniques have a flexible mathematical structure which can generalize complex nonlinear processes. In in-situ bioremediation management, a physically-based model is used for the simulation and the simulated data is utilized by the optimization model to optimize the remediation cost. The recalling of simulator to satisfy the constraints is an extremely tedious and time consuming process and thus there is need for a simulator which can reduce the computational burden. This study presents a simulation-optimization approach to achieve an accurate and cost effective in-situ bioremediation system design for groundwater contaminated with BTEX (Benzene, Toluene, Ethylbenzene, and Xylenes) compounds. In this study, the Extreme Learning Machine (ELM) is used as a proxy simulator to replace BIOPLUME III for the simulation. The selection of ELM is done by a comparative analysis with Artificial Neural Network