整合性地下水營運之最佳規劃研究

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摘要

本研究目的在發展一個整合操作系統與觀測系統之地下水營運最佳規劃流程，整個研究主要包含了抽水系統及觀測系統之最佳規劃，所應用的方法有遺傳演算法、動態規劃、卡門濾波等理論。其中抽水系統的決策變數為抽水量及抽水井網，而觀測系統的決策變數為觀測井網。有別於以往研究中，將抽水系統與觀測系統分開考量，本研究則把兩者整合在一起，並考量兩者之交互影響。本文並以假設的案例進行模擬，由案例分析結果顯示，水位觀測值與模擬值的模式差距越大，越能突顯觀測成效，也就是在系統描述越不準確之情況下，對於節省抽水操作成本也會越顯著。

Optimal Planning of Integrated Groundwater Management

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Abstract

This study presents a novel procedure to optimally plan an integrated groundwater system. The integrated system comprises a groundwater supply system and a groundwater monitoring system. The decision variables for the groundwater supply system include the location, number and pumping rates of the pumping wells, while the decision variables for the monitoring system refers to the location of the monitoring wells. The Genetic programming (GA), Dynamic programming (DP) and Kalman filtering are applied to solve the optimal planning problem. In contrast to a previous study that designed the supply system and monitoring system separately, this work considers the two systems holistically, i.e., the two systems can influence each other. Numerical results indicate that the increased discrepancy between the observed data and model simulation can also increase the extent to which the monitoring system influences the design of supply system. Restated, a larger uncertainty of the model simulation implies a higher likelihood of applying the proposed procedure.