

結合水力剖面掃描評估沿海含水層地下水時空動態特徵

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摘要

為解決近年來台灣水資源之枯旱現象，地下水成為抗旱之關鍵水資源。而如何描繪與評估地下水流場為水資源開發領域之重要關鍵議題之一。本研究將結合各類水文地質試驗、正反推估數值模式等方法推估水文地質參數空間分布與建構地下水流場時空動態特徵。本研究以國立中央大學 TaiCOAST 臨海工作站地下水觀測井場作為主要研究場域，共包含 6 口觀測井，進行水力剖面掃描相關試驗，包含單井、複井、分層抽水及觀測、微水試驗。同時參考現地岩心材料分佈配合 VSAFT2 反推估水平向水力傳導係數之二維空間分布。本研究將使用數值模式融合水力試驗獲得之含水層特徵參數空間分布，並對各試驗之空間代表性及其反推估結果，進行參數空間分布不確定性分析。此模式將用於研析本場址地下水與海水交互作用之反應特性，同時探討不同試驗尺度代表性，對於水力剖面掃描反演算結果不確定性，以評估水力試驗尺度效應之影響。結合複井抽水結果，試驗推得之 K 值大致符合合理的 K 值範圍內。研究結果顯示在井數量許可下，結合抽水試驗之結果並搭配水力傳導係數反推估，能大致描繪含水層異質性的分布狀況。

關鍵詞：反演算、含水層參數、水力剖面掃描、地下水流場。

Characterization of flow dynamics in coastal aquifers based on hydraulic tomography.

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Abstract

Water shortage in recent years has become a crucial issue in Taiwan, groundwater is an essential alternative water resource to support the water supply system. How to characterize the aquifer system and evaluate the groundwater flow are critical issues of water resource management. This study combines different approaches, field and laboratory hydrogeological experiments and inversion models, to estimate the spatial distribution of hydrogeological parameters and assess the groundwater system's temporal and spatial dynamic characteristics. There are 6 observation wells installed in the research site, which were used to conduct cross-hole pumping tests and multi-layered water level observations to analyze the hydraulic conduction of the site. The inversion model, VSAFT2, was selected to estimate the spatial distribution of hydraulic conductivity. Water level variation were measured for setting initial conditions and verification of numerical model. This model will be used to study and analyze the response characteristics of the interaction between groundwater and seawater at this site. At the same time, it will discuss the representativeness of different test scales, and the uncertainty of the inversion results of hydraulic tomography to evaluate the impact of hydraulic test scale effects.

Combined with the results of multi-well pumping test, the K values obtain from the tests are fall in the range of empirical value. If the data is sufficient, the aquifer heterogeneity can be described by combining the results of the pumping test and the inverse model to estimate the hydraulic conductivity distribution.

Keywords: Inverse model Aquifer parameters, Hydraulic tomography, Groundwater flow fields.