

Quantification of river-groundwater dynamic interactions of hyporheic zones in dry and wet seasons by numerical models

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Abstract

Due to the precipitation of Taiwan is ununiform on both spatial and temporal, it has limited the use of water resources. Such difficulty leads to a challenging task in integrating available water resources for efficient and sustainable management. Hyporheic water flows beneath the stream bed and the area is where the groundwater and surface water interaction zone. The development and management of hyporheic water require interdisciplinary knowledge of hydrology and hydrogeology. The storage and optimal use of hyporheic water are most the important issues of development of hyporheic water. The dynamics of water interactions in hyporheic zones are crucial to quantifying the storage and optimal use of hyporheic water resources. This study aims to develop a procedure that couples index overlay and assess the dynamics of hyporheic water flow for dry and wet seasons in different scales of groundwater region via numerical models. Analyzation and evaluation of the potential of development of hyporheic flow at each scales are also examined. A coupled surface water and saturated/unsaturated groundwater models are used to assess dynamics of surface-groundwater interactions in wet and dry seasons at Lanyang river Qingshui reach, Yilan County. The objective of the reach-scale numerical modeling is to quantify effects of hydrogeological properties on hyporheic water fluxes and dynamics along a reach. Using HYDRUS that estimate the quantity of hyporheic flow. Future work will complete the integration of the hyporheic flow potential area. The index overlay method uses selected weighting maps generated by Kriging geostatistical interpolation algorithm.

數值模式量化分析河川伏流水豐枯時期地表地下水交換機制

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摘要

台灣地區降雨時間空間分布本就極為不均，導致實際可使用之水資源不多，因此水資源的有效整合管理為永續利用的重要工作之一。伏流水(Hyporheic)於伏流水層中流動，包含部分地表水，為地表地下水交換區域，具有較易取得與較佳水質的優點。伏流水可用水量開發與管理需合併地表水與地下水同時考慮，伏流水的蘊藏量以及如何取水可達到最佳效益等問題，一直是伏流水開發受關切與爭論的重點。本研究之目的係以指標評估方法結合數值模式，聯合分析台灣本島地區不同尺度(地下水分區、集水區、區域河段)下河川伏流水豐枯時期地表與地下水交換量與動態機制，並分析與評估各尺度下伏流水之開發潛能。目前以蘭陽溪支流清水溪段作為研究區域，以地表水及飽和/非飽和地下水模式分析配合部分現地與實驗室試驗，量化評估清水溪段豐枯水期地表地下水交換量與影響機制。利用 HYDRUS 軟體推估伏流水適合取用水量。未來將完成全台主要河川之伏流水潛勢區判釋，配合克利金(Kriging)地質統計插值法，評分加權獲得伏流水開發潛勢分布。