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MODELLING SEAWATER INTRUSION IN COASTAL AQUIFERS USING AUTOMATIC PROGRAMMING

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Abstract

In this study, we introduce a novel branch of automatic programming algorithms known as Biogeography-Based Programming (BBP) for the purpose of modelling seawater intrusion into coastal aquifers. We assess the performance of the BBP algorithm by comparing its output with the results obtained from both dispersive and sharp-interface models, focusing on parameters such as salinity toe (X_t), salinity height, and the transition zone area. Our findings reveal that the BBP-based model effectively estimates these parameters with a high degree of accuracy and within a reasonable timeframe. Notably, the R-squared value for X_t in the training datasets stands at an impressive 0.97. To further validate the BBP model, laboratory-scale observations of X_t were utilized, resulting in an R-squared value of 0.87. Additionally, the root mean square error falls within an acceptable range consistent with previous research findings. While the computational times of the BBP and sharp-interface models are comparable, the developed BBP model demonstrates a superior capability in predicting the transition zone area, making it the preferred choice for this application.

Key words: BBP algorithm, groundwater, mathematical modelling, seawater, transition zone

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