TITLE « Mathematical analysis and numerical modeling of mass transfer processes and density flows using the mixed finite element method. »

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Abstract

Saltwater intrusion occurs extensively in coastal zones, which are variably saturated porous media. Consequently, dissolved salts are the most common contaminants in freshwater in coastal aquifers, and this contamination stems from saltwater invasion, caused mainly by human activities due to heavy urbanization. To investigate methods of increasing fresh groundwater storage and preventing seawater encroachment, it is crucial to predict the location and movement of the saltwater interface. Saltwater intrusion problems are so complex that they generally cannot be solved analytically.

Consequently, numerical methods are ideal tools for simulating and predicting results.

In this paper, a mixed finite element method based on a triangular mesh is developed to analyze the evolution of saltwater intrusion in coastal aquifer systems. The model formulation consists of a groundwater flow equation and a salt transport equation. Simulation results are compared with previously published solutions, where good agreement is observed.