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Finite Difference Method of Modelling Groundwater Flow

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ABSTRACT

In this study, finite difference method is used to solve the equations that govern groundwater flow to obtain flow rates, flow direction and hydraulic heads through an aquifer. The aim therefore is to discuss the principles of Finite Difference Method and its applications in groundwater modelling. To achieve this, a rectangular grid is overlain an aquifer in order to obtain an exact solution. Initial and boundary conditions are then determined. By discretizing the system into grids and cells that are small compared to the entire aquifer, exact solutions are obtained. A flow chart of the computational algorithm for particle tracking is also developed. Results show that under a steady-state flow with no recharge, pathlines coincide with streamlines. It is also found that the accuracy of the numerical solution by Finite Difference Method is largely dependent on initial particle distribution and number of particles assigned to a cell. It is therefore concluded that Finite Difference Method can be used to predict the future direction of flow and particle location within a simulation domain.

KEYWORDS

Finite Difference Method, Groundwater Modelling, Particle Tracking, Algorithm, Discretization, Flow Rates, Hydraulic Heads

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