

Numerical simulation of non-fickian diffusion and advection in a fractured porous aquifer

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Abstract

A computer program, which enables us the calculation of the non-Fickian diffusion in a fractured porous media, has been developed. The conventional mathematical model of solute transport in a rock is based on the Fick's law. In general, rock masses contain a number of preexisting fractures. In the fractured porous media, the conventional model tends to predict smaller solute travel distance than that in the actual transport process. In contrast, the non-Fickian diffusion model, which is described as a fractional advection-dispersion equation, can provide realistic representation of actual fluid flow in the heterogeneous media. We provide a numerical solution of the fractional advection-dispersion equation by using implicit-finite difference method. The numerical results obtained for one dimensional fractional advection-dispersion equation using the computer program was shown to be in a good agreement with the analytical solution. © 2007 American Institute of Physics.

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Keywords

Fractal derivative, Non-Fickian diffusion, Numerical simulation, Solute transport