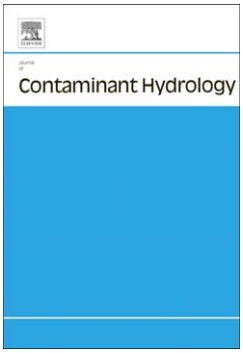

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Longitudinal dispersion coefficients for numerical modeling of groundwater solute transport in heterogeneous formations

Jonghyun Lee[1,2,*], Massimo Rolle[3], Peter K. Kitanidis[1]

Abstract

Most recent research on hydrodynamic dispersion in porous media has focused on whole-domain dispersion while other research is largely on laboratory-scale dispersion. This work focuses on the contribution of a single block in a numerical model to dispersion. Variability of fluid velocity and concentration within a block is not resolved and the combined spreading effect is approximated using resolved quantities and macroscopic parameters. This applies whether the formation is modeled as homogeneous or discretized into homogeneous blocks but the emphasis here being on the latter. The process of dispersion is typically described through the Fickian model, *i.e.*, the dispersive flux is proportional to the gradient of the resolved concentration, commonly with the Scheidegger parameterization, which is a particular way to compute the dispersion coefficients utilizing dispersivity coefficients. Although such parameterization is by far the most commonly used in solute transport applications, its validity has been questioned. Here, our goal is to investigate the effects of heterogeneity and mass transfer limitations on block-scale longitudinal dispersion and to evaluate under which conditions the Scheidegger parameterization is valid. We compute the relaxation time

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