Evaluation of Various Physical Description and Numerical Solvers in Two-dimensional Model Problem of Tracer Transport

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Abstract

The motivation for this work is the movement of contaminant in fractured rock massif because of the possible placement of the nuclear waste repository in such an environment. The simulation area is located around the water treatment plant tunnel which is also being used as an underground laboratory. The aim of this paper is to compare the results of two different software codes with respect to measured data. We investigated the solute transport sensitivity in two-dimensional models on various physical descriptions, numerical schemes and computation methods, which are implemented in simulation codes DRUtES [Kuráž, 2010] and Flow123d [TUL, 2015]. DRUtES computer program is a finite element numerical solver in one and two dimensions. It solves underground water flow and contaminant transport in a dual porosity variably saturated porous media. Flow123d is a simulator of underground water flow, solute and heat transport in fractured porous media. It includes mixed-hybrid solver for steady and unsteady Darcy flow, finite volume model and discontinuous Galerkin model for solute transport of several substances. Parameters of hydraulic models were calibrated based on measured discharge from the seepage sites and then they were used in solute transport model. Its parameters were calibrated based on measured isotope concentrations. The use of an unsaturated zone confirmed its importance for shallow seepage sites and its minimal influence on discharges from deeper sites.

References

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