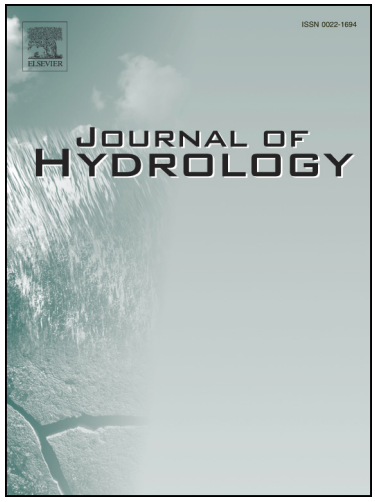

Research papers

Modeling of transport processes through large-scale discrete fracture networks using conforming meshes and open-source software

Tri Dat Ngo, André Fourno, Benoit Noetinger

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Modeling of transport processes through large-scale discrete fracture networks using conforming meshes and open-source software

Tri Dat Ngo*, André Fourno, Benoit Noetinger

*Corresponding author, Tel.:+33 1 47 52 75 03. Fax: +33 1 47 52 60 31.

IFP Energies Nouvelles, 1&4 Avenue de Bois Préau, 92500 Rueil-Malmaison, France

Abstract

Most industrial and field studies of transport processes in Discrete Fracture Networks (DFNs) involve strong simplifying assumptions, especially at the meshing stage. High-accuracy simulations are therefore required for validating these simplified models and their domain of validity. The present paper proposes an efficient workflow based on open-source software to obtain transport simulations. High-quality computational meshes for DFNs are first generated using the conforming meshing approach FraC. Then, a tracer transport model implemented in the open-source code DuMux is used for simulating tracer transport driven by the advection-dispersion equation. We adopt the box method, a vertex-centered finite volume scheme for spatial discretization, which ensures concentration continuity and mass conservation at intersections between fractures. Numerical results on simple networks for validation purposes and on complex realistic DFNs are presented. An a-posteriori convergence study of the discretization method shows an order of convergence $O(h)$ for tracer concentration with h the mesh size.

Highlights

- Conforming meshes for DFNs are built using the user-friendly meshing method FraC.