

## A Novel Approach to Modelling of Flow in Fractured Porous Medium

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*Abstract:* There are many problems of groundwater flow in a disrupted rock massifs that should be modelled using numerical models. It can be done via “standard approaches” such as increase of the permeability of the porous medium to account the fracture system (or double-porosity models), or discrete stochastic fracture network models. Both of these approaches appear to have their constraints and limitations, which make them unsuitable for the large-scale long-time hydrogeological calculations. In the article, a new approach to the modelling of groundwater flow in fractured porous medium, which combines the above-mentioned models, is described. This article presents the mathematical formulation and demonstration of numerical results obtained by this new approach. The approach considers three substantial types of objects within a structure of modelled massif important for the groundwater flow – small stochastic fractures, large deterministic fractures, and lines of intersection of the large fractures. The systems of stochastic fractures are represented by blocks of porous medium with suitably set hydraulic conductivity. The large fractures are represented as polygons placed in 3D space and their intersections are represented by lines. Thus flow in 3D porous medium, flow in 2D and 1D fracture systems, and communication among these three systems are modelled together.

*Keywords:* finite element method; Darcy’s flow; fractured porous medium;

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