A case study of fluid flow in fractured rock mass based on 2-D DFN modeling

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A two dimensional steady-state fluid flow through fractured rock mass of an abandoned copper mine in Korea is addressed based on discrete fracture network modeling. An injection well and three observation wells were installed at the field site to monitor the variations of total heads induced by injection of fresh water. A series of packer tests were performed to estimate the rock mass permeability. First, the two dimensional stochastic fracture network model was built and validated for a granitic rock mass using the geometrical and statistical data obtained from surface exposures and borehole logs. This validated fracture network model was combined with the fracture data observed on boreholes to generate a stochastic-deterministic fracture network system. Estimated apertures for each of the fracture sets using permeability data obtained from borehole packer tests were discussed next. Finally, a systematic procedure for fluid flow modeling in fractured rock mass in two dimensional domain was presented to estimate the conductance, flow quantity and nodal head in 2-D conceptual linear pipe channel network. The results obtained in this study clearly show that fracture geometry parameters (orientation, density and size) play an important role in the hydraulic behavior of fractured rock masses.