Modeling Groundwater Flow Behavior of Fractured Rock Aquifer Using the Hybrid DFN-EPM Approach

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ABSTRACT

Fractured rock formations exist under a wide range of geological situations. As a result the investigation of flow movement through fractured aquifers is an important field of groundwater research. Despite its importance, our understanding of flow behavior within a fractured rock mass is limited. To consider in details how the geological structure influence groundwater flow pathway and storage capacity within the fractured rock aquifer. In this study, we focus on modeling groundwater flow behavior within fractured rock aquifers in the mountainous region. This study presents local-scale modeling for characterizing groundwater flow pathway between wells and estimating the groundwater capacity of fracture zones in the mountainous region. This model is developed using FracMan software, which traditionally benefits from high resolution datasets obtained during hydrogeological exploration, including rock core record data, borehole logging data, and double packer test data. The technique consists of interpreting outcrop investigation data, regolith thickness and using these data to generate representative Hybrid Layered Discrete Fracture Network (DFN)-Equivalent Porous Medium (EPM) Model. Hybrid layered DFN-EPM Model meet this by incorporating both EPM volume elements, and DFN elements. This study illustrates a layered DFN-EPM model, with the EPM representing regolith layer, and the DFN representing fractured bedrock. The advantage of this approach is that it is able to more accurately model the response of the groundwater table and shallow wells using continuum EPM elements, while still using the DFN for evaluating flow pathways and connectivity between wells in the fractured bedrock and assessing the groundwater capacity of the shallow fracture zones.