Application of Hydrogeological Investigation to Determine Groundwater Modeling Approach in Taiwan Mountainous Region

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Investigating a subsurface system of mountainous regions requires appropriate models (e.g. equivalent porous media, dual porosity, and discrete fracture network) of predicting groundwater flow and transport in consolidated rocks. These must consider the physical properties of geologic materials of the subsurface system which control the storativity and ability of fluids to move through them. Comprehensive investigations, including various hydrogeological tests (borehole televiewer, borehole electrical logging, sonic logging, flowmeter measurement, and double packer test) at 29 boreholes on different geological formations and laboratory tests (physical properties test of soil and rock, triaxial permeability test of soil, porosity determination test using mercury air pump and helium, gas permeability test, laser particle size analyzing test, X-ray diffraction test, and petrographic analysis) from core samples, were carried out to determine applicable models for every corresponding subsurface system at the basins of Mid-Jhuoshuei River and Beigang River in Taiwan Mountainous Region. Hydraulic conductivity, storativity, and porosity on different geological formations have been revealed. The aforementioned results regarding the hydrogeological properties can be utilized to classify the study area into three types of groundwater conceptual models as shown in Figure 1. The map also presents spatially different flow characteristics leading to the further study of groundwater availability.

Keywords: Dual Porosity Model; Equavelent Porous Media; Discrete Fracture Network; Hydrogeological Properties; Hydrogeological Investigation.

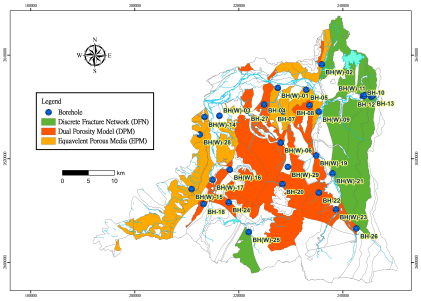

Figure 1. Classification of groundwater models in the study area and locations of investigation boreholes