Development of estimating permeability of rock mass based on physical data

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Fracture distribution in bedrock has a great influence on the groundwater flow, whose characteristics should be understood for resource exploration and deep geological repository and so on. Previous studies have been attempting to grasp the hydraulic characteristics on a local scale using boreholes and so on. However, it is considered to be difficult to grasp the hydraulic permeability without drillings. In this study, we tried to estimate the permeability of rocks in deep underground from physical property values like resistivity and Young's modulus in order to grasp macroscopic hydraulic characteristics of rock including fracture. The validity of the present estimation method was examined, by comparing this estimated value with the measured value. The resistivity and Young's modulus of exposed granitic rock mass at depth of 300-500m were measured in the underground research gallery at the Mizunami Underground Research Laboratory, Japan Atomic Energy Agency in 2017. We estimated the permeability using a rock physics model. The permeability was also measured in 2015 along the same gallery, therefore compared with the estimated permeability from our geophysical measurements.