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Stability analysis of the mine adits with a hydrogeologic model of groundwater flow at an underground mine in Korea

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The safety and environmental issues should be addressed for sustainable mining operations. Recently, the use of underground openings for various purposes is expanding, particularly for the crushing and processing facilities in open-pit limestone mines. The suitability of current rockmass classification systems for limestone or dolostone is therefore one of the major concerns for field engineers. Consequently, development of the limestone mine site characterization model is underway through the joint efforts of some research institutes and universities in Korea. One of the key factors is the groundwater flow into underground mine workings, affecting the overall workability and efficiency of the mining operation.
Prediction of the groundwater inflow requires a detailed knowledge of the geologic conditions, including the presence of major geologic structures at the mine site. The hydrologic boundaries and depth of the phreatic surface of the mine area, as well as other relevant properties of the rockmass, are also provided. For assessing the stability of underground structures, in terms of the maximum stresses and deformations within the rockmass, both the dried and saturated conditions should be considered with appropriate safety factors. Also, the distribution of the water pressure within the rockmass directly affects the stability. Various numerical codes have been used to construct the hydrogeologic models of mine sites, and the MINEDW by Itasca is one of those groundwater flow model codes developed to simulate groundwater flow related to mining.
In this study, with a hydrogeologic model constructed using the MINEDW for an underground limestone mine, the rate of mine water inflow and the porewater pressure were estimated. The stability of mine pillars and adits was analyzed adopting the porewater pressure and effective stress developed in the rockmass. The results were also compared with those from other 2D stability analysis procedures.