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Predictive modelling of the mine water rebound in an old abandoned Dongwon mine in Korea

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The closure of over three-hundred deep coal mines in Korea since the late-1980s, primarily due to the energy and environmental concerns, has produced significant side effects. One of the major challenges is to assess the risk from mine water rebound to overlying aquifers and surface waters, which can produce significant environmental hazards. Some numerical models such as VSS-NET, GRAM and MODFLOW have been developed to predict the quantity, timing and location of discharges resulting from mine water rebound. In this study, we developed a GRAM-based windows program for mine water rebound modelling in abandoned deep mine systems. The program consists of the simulation engine and the GUI modules, each has several subroutines.
Changes in mine water level of the Dongwon coal mine, presumably hydrogeologically connected to nearby old abandoned mines, has been monitored after the mine was finally closed in 2005. The water level in the vertical shaft rised up to 420m during the period of 3 years. The system was modelled as two ponds connected by a pipe. Input data include the areas of each pond, catchment areas, the storage coefficient, etc. The predicted changes in the mine water level was very similar to the observed data in the field. For this modelling, in fact, some of the input variable were roughly assumed to match the field data. Nevertheless, this program can be effectively applied to predict the rising of the mine water after the mine closure.