



## **Mechanism and control of water inrush from Karstic paleo-sinkholes in northern China**

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The karstic paleo-sinkhole is an ancient karstic collapse column typically formed in the Permo-Carboniferous coalfields in northern China. Due to their specific structures and hydrogeological characteristics, they normally act as pathways to connect groundwater from the Ordovician limestone aquifer (simplified as  $O_2$ ) to the strata of coal measures. Because some paleo-sinkholes exist and are hidden in these strata of coal measures, which change the strata hydrogeological conditions, the water disasters caused by the paleo-sinkholes usually are catastrophic and unpredictable. When the paleo-sinkhole consists of highly permeable rocks, once it connects to the mining space through mining induced fractures, the water influx is very significant. Many water inrush incidents have happened in the coal mines in China, resulting in considerable damages. In general, there are two different ways to solve the problems of mining over the karst aquifers. One is to drain the aquifer before mining operation, and the other is to mine without drainage. But water drainage is infeasible because of many environmental problems. So, it is of vital importance to investigate the geological and hydrological characteristics of the paleo-sinkholes and study mining-induced strata failure and water inrush mechanism, and thereafter find a way to predict and prevent water inrushes, and present technical measures for improving mine design and safety for coal extraction over aquifers, such as grouting and mining method modification.