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Finite Element Method-based geomechanical risk assessment of underground laboratory located in the deep copper mine

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Underground laboratories provide a unique environment for various industries and are a suitable place for developing new technologies for mining, geophysical surveys, radiation detection, as well as many other studies and measurements. Unfortunately, any operation in underground excavations is associated with exposure to many hazards not necessarily encountered in surface laboratories. One of the most dangerous events observed in underground conditions is the dynamic manifestation of rock mass pressure in form of rockburst, roof falls and mining tremors. Therefore, proper evaluation of geomechanical risk is a key element ensuring the safety of work in underground conditions. Finite Element Method-based numerical analysis is one of the tools which allow conducting a detailed geomechanical hazard assessment already at the object design stage. The results of such calculations may be the basis for the implementation of preventive measures before running up the underground facility.

Within this paper, the three-dimensional FEM-based numerical analysis of large-scale underground laboratory located in deep Polish copper mine was presented. The calculations were made with GTS NX software, which allowed determining the changes in the safety factor in surrounding of the analyzed area. Finally, the possibility of underground laboratory establishment, with respect to predicted stress and strain conditions, were determined.