

Stability of an Underground Limestone Mine

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Abstract

The hills of South-Limburg, the Netherlands, are crisscrossed with underground limestone mines. These "caves" are not equally stable, and can be dangerous for the people inside as well as the buildings above the ground in case of a collapse.

With COMSOL Multiphysics® 4.3a a stability assessment has been made of a cave system, the Geulhemmergroeve in Geulhem (near Valkenburg). Two solid mechanical studies are used to simulate the excavation during time. The first study examines the full stress and displacement profile without excavation. The result of this simulation is used as an input for the second solid mechanical study. In this second study the domains of the corridors are excluded in the study, to represent the excavation activities during time. A complete and mesh intensive 3D model, with dimensions of 1110 x 580 x 31.5 m³, calculates the stress variation and displacement in the pillars and roof caused by the excavation of the mines during time. The simulation results in the exact location of the stress and displacements of the limestone. Dangerous levels can be traced, and serve as an input to operate the cave in a safe way.

Figures used in the abstract

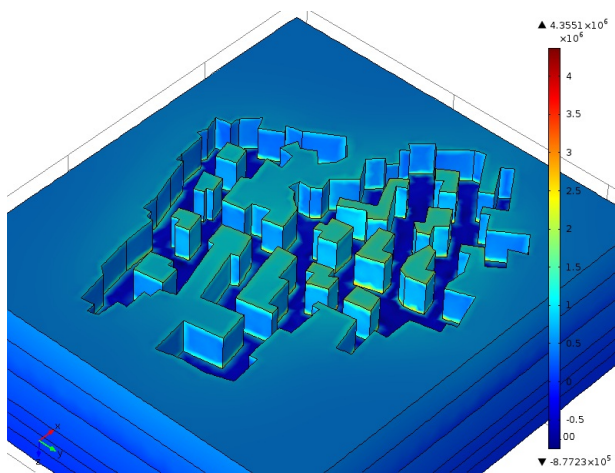


Figure 1: Stress profile in cave

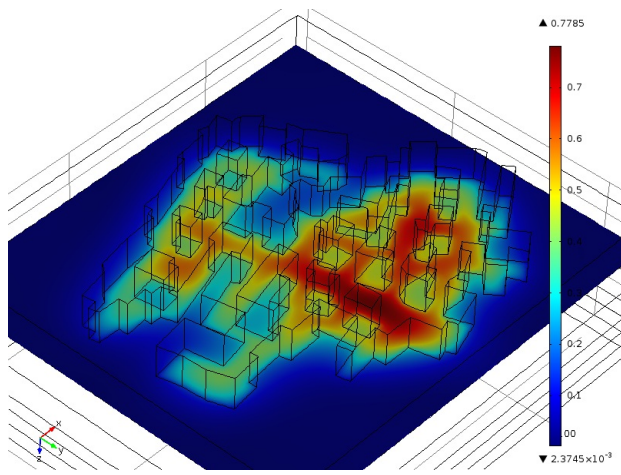


Figure 2: Displacement at 10 meters depth