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Multiscale characterization of chaotic rock body for mining backfill remediation

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The sustainability of geomineral resourses' exploitation may be assured only in presence of adequate plans for the re-use and reclamation of old or abandoned sites. Among the most commonly used techniques, mining backfill is largely employed for the stabilization of underground sites. This technique recreates the original stress state of the underground, assuring the definitive stabilization of the hypogea volumes, and reduces the risks due to the interference between underground tunnels and ground surface (e.g. possible collapses and surface subsidences). Despite these obvious advantages, careful evaluations are needed to assure the environmental sustainability, with particular attention to the interaction between the hydro-geological and permeability features of the rock body and the chemical properties of the backfill material.

The present research proposes an analysis of the advantages and the risks connected with this technique, examining a case study of mining backfill in an underground gypsum quarry at the end of the active exploitation. The considered quarry is located in Monferrato (NW Italy) and is exploited within chaotic Messinian deposits made of gypsum blocks (from centimeter-size to kilometer-size) included in a marly matrix. The study includes a campaign of field and laboratory tests (i.e. geological and geo-structural mapping and modeling, geophysical surveys, mechanical and permeability tests) that aim at characterize the permeability and mechanical behaviour of the rock mass.