

Thermomechanical behavior of rock salt in the context of underground energy storage

Rock salt has been used for several decades as a storage and disposal medium (hydrocarbons, nuclear waste, etc.) because of several assets, including very low permeability and porosity, and time-dependent behaviour. The proposed research is directly related to the massive underground energy storage required within the energy transition context. The main goal of the Ph.D. is to improve current understanding on the behaviour of rock salt, with an initial focus on its thermo-mechanical response. A new constitutive law is under development at the Geosciences Department of MINES ParisTech, and a new methodology to design salt caverns is also underway. The experimental work consists in performing laboratory-scale tests under different loading conditions to validate and improve the new constitutive model. Phenomena that are not currently fully understood – such as inverse creep or the effect of temperature – are investigated. The numerical work consists in implementing and using the new model to simulate salt caverns, coupling the thermo-mechanical response of the host rock with the thermodynamics of the stored fluid. In-house FEM codes will be used.