

Far field response to excavation in clay rocks

Context and objectives

Tunnel excavation causes changes in the rock around the tunnel. These effects include deformation, changes in fluid pressure conditions and eventually rock failure. These processes are generally fairly well understood, and are limited to a radius of influence of around 3 tunnel diameters, beyond which disturbances are normally negligible. However, longer-range effects are also possible, notably in relation to poro-elastic responses, non-linear and focused diffusive effects or slow displacements on zones of weakness, such as fault zones. These effects have been little studied in-situ, and knowledge of their real impact and relative importance remains unclear.

The excavation of the 2018 galleries at the Mont-Terri laboratory, in an environment that has been heavily instrumented over the long term and with a wide spatial distribution of sensors, offers a unique opportunity to study these effects. The aim of this MSc project will be to compile and integrate the information available at Mont-Terri in order to systematically identify the responses associated with gallery excavation. These observations will enable us to hypothesize what processes are active and to quantify their effect. Finally, in collaboration with the project partners, numerical simulations will be used to test the hypotheses and improve our understanding of the effects of distant disturbance associated with tunnel excavation.

Méthodology

The main method of work will be the compilation and representation of the numerous data collected at Mont-Terri (pore pressure, deformation, temperature, ...) in relation to the documentation relating to the 2018 gallery excavation. The aim of this work will also be to determine which effects are linked to the excavation and which other effects are also at play (e.g. changes in ventilation conditions, long-term effects, instrumental drift, etc.). This analysis of the available data will then be completed by coupled modelling carried out in collaboration with the project partners, nagra and swisstopo.

Supervision and collaboration

The project will be supervised by Benoît Valley at CHYN and Martin Schoenball (nagra). The project will be part of the RI experiment of the Mont-Terri. The project partners with which collaborations can take place are the nagra, GRS, BGR, ANDRA, swisstopo and the swiss seismological service.

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