Geophysical Research Abstracts, Vol. 7, 01013, 2005
SRef-ID: 1607-7962/gra/EGU05-A-01013

Predicting, characterizing and modelling the Excavation Disturbed Zone (EDZ): current work in the DECOVALEX THMC project

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During all rock engineering projects, new rock faces are created and so the Excavation Disturbed Zone (EDZ) is an important concept for design in all rock engineering. When an excavation is made in rock, there is an inevitable EDZ:

- rock is removed causing the excavation-peripheral rock to move inwards;
- the orientations of the principal rock stress components are rotated to be parallel and perpendicular to the excavation surfaces and the magnitudes of the components alter;
- pressure in the excavation is reduced to the atmospheric value causing water to move into the excavation.

These consequences of excavation cannot be avoided. Also, there is an additional EDZ caused by the excavation technique itself, mechanized excavation generally having a lesser additional effect than blasting.

The EDZ is currently being studied as Task B of the DECOVALEX THMC project, involving research teams from China, Finland, Japan, Sweden and the USA The DECOVALEX acronym is derived from the DEvelopment of COupled models and their VAlidation against EXperiment — with the THMC referring to thermo-hydro-mechanical-chemical coupling within numerical models. The DECOVALEX THMC project is the fourth phase of such coupled numerical and experimental work and is being conducted within the radioactive waste disposal context.

The objective of the Task B EDZ work is to improve understanding of the evolution of the EDZ and be able to numerically model the EDZ HMC mechanisms in a fractured crystalline rock mass. A deeper understanding of the EDZ is being developed through understanding the driving forces, the couplings including C, the evolution through excavation, emplacement and closure, and a greater ability to explicitly incorporate the EDZ in performance and safety assessments.

We present the intent, content and some results of the current EDZ work covering laboratory testing, numerical modelling and the in-situ EDZ experimental work at the Äspö Hard Rock Laboratory in Sweden. The full programme includes studies of the crack/fracture evolution, benchmark numerical modelling, establishing to what extent a coupled model is required, establishing how to cope with uncertainties, and utilizing the many data available from the Äspö HRL. This leads to methods for predicting, characterizing and modelling the EDZ and techniques for reducing the additional EDZ effect.