Laboratory of Soil Mechanics

Theoretical and applied aspects in geomechanics, geo-energy, and geo-engineering iming for the practical application of the obtained results.

practical application of the obtained results.

ENERGY GEOSTRUCTURES

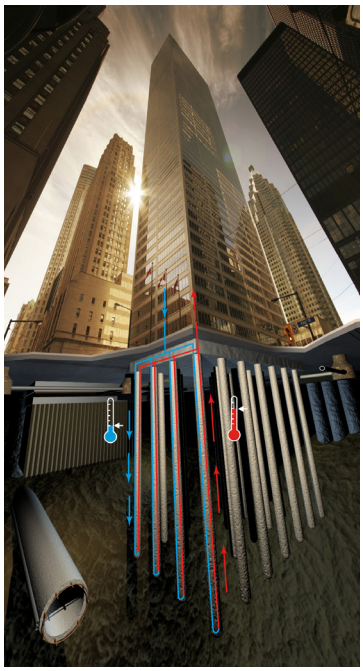
The basis of our work consists of **observing**, **measuring**, **understanding** and **predicting** how energy geostructures behave from a **multiphysical perspective**. Special attention is put on cyclic thermo-mechanical behavior as well as heat extraction in crystalline rocks at high depts. The work is targeted to develop practical tools for design and conception.

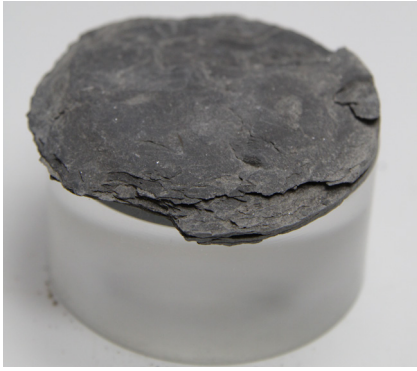
This technology meets **70%** of the energy needs of buildings

LMS supports the goals of the **Swiss Energy Strategy 2050**

SCCER SoE

SWISS COMPETENCE CENTER for ENERGY RESEARCH
SUPPLY of ELECTRICITY





SHALE GAS EXTRACTION

Shales are extremely complex geomaterials and many challenges are associated with the extraction of shale gas. **Geomechanics** is the key to achieving a better understanding and a deeper knowledge of shales' behaviour when subjected to engineering practices.

Our laboratory and nunemerical work is targeted to develop practical tools aiding in better productivities, larger flowback precentages, and a general better understanding of the shale gas reservoirs.

NUCLEAR WASTE STORAGE

Disposal in deep clay geological formations is the most promising way for disposing of high level wastes. The laboratory works as well as **numerical modelling** are being conducted taking into account complex **thermo-hydro-mechanical** (THM) behaviour of materials. Involved materials are **deeply analyzed** in order to provide reliable predictions for the behaviour of storage facilities.

Geomechanics for Construction, Energy, Resources and Environment

MAIN IDEAS

- sustainability
- environmental friendliness
- coupled characterisation of geomaterials
- integrated approach

SOIL BIOIMPROVEMENT

We investigate a novel soil improvement strategy, inspired by the natural process of **biologically driven crystal mineralization**.

The research aims to develop the conception of a geo-mechanical model to describe the enhanced behavior of the bio-treated soil, **optimize** the improv ement process and **enhance** the practical applicability of this technique. The works are carried out from laboratory to field scales.

2018 - BIOGEOS

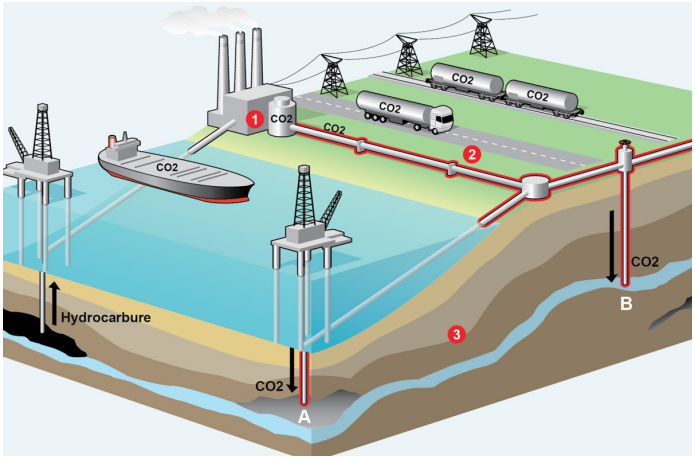
"BIO-mediated GEO-material Strengthening for engineering applications" funded by an ERC Advanced Grant.

- slope stabilization
- soil erosion risk mitigation
- foundation stabilization in urban zones
- earthquake and liquefaction protection in seismic zones

CO2 STORAGE

CO2 sequestration in deep geological formations is one of most suitable solutions for CCS (Carbon Capture and Storage).

The interplay between transport, reaction and mechanics is tackled through innovative interdisciplinary research both **experimentally** and **numerically**. Our research focuses on experimental investigation of the behaviour of shale caprocks as well as on the quantitative risk prediction of large earthquakes occurring in the basement rocks below fluid injection intervals.



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