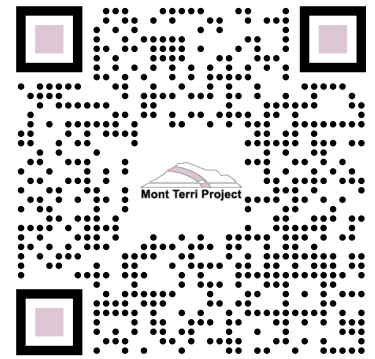
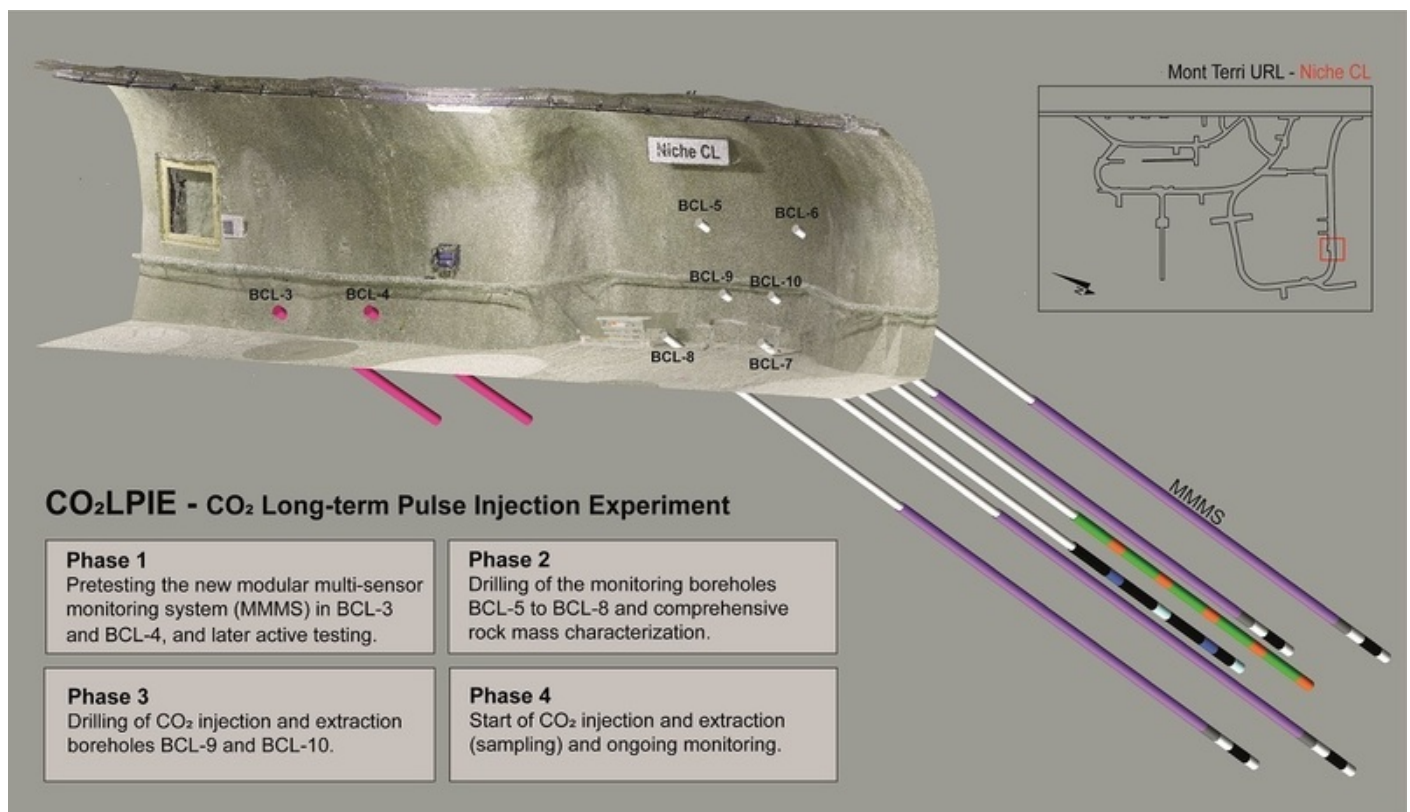


Mont Terri Project Underground Rock Laboratory



Report period: October 2–8, 2023

Assembled and edited by swisstopo, St-Ursanne



Spotlight of the week: The CL experiment (CO₂LPIE) investigates the influence of CO₂-saturated fluids on the integrity of geological barriers under realistic in-situ conditions. These real-world conditions explicitly consider rock anisotropy, heterogeneity, and isolated and interconnected fractures in the Opalinus Clay at Mont Terri. A key aspect of the project is its novel monitoring approach, which includes a modular multi-sensor system that allows for robust characterization of the test volume, baseline measurements, and high temporal and spatial resolution monitoring during the injection phase. Prior to its final deployment the new monitoring system will undergo tests in a borehole pair (BCL-3 and BCL-4) that will be used later for active sensitivity tests. The chosen spatial scale (meters) of the in-situ experiment bridges and connects the large scales of natural analogs with the small scales of analytical laboratory studies and thus, together with numerical modeling, creates the basis for transferring laboratory results to the relevant scales of real geological CO₂ sequestration. The figure shows a laser scan of Niche CL with recently drilled boreholes BCL-3 and BCL-4 and proposed borehole positions of BCL-5 to BCL-10 for the main experiment.

CI-D (Diffusion Across 10-Year-Old Concrete/Claystone Interface) experiment

- A. Eul and S. Braunschweig (Eul GmbH) drilled BCI-D3 down to 2.80 m. BCI-D3 overcores borehole BCI-15 with 400 mm diameter. It targets the two intervals in which the tracer and the artificial pore water were circulating for the last 4 years.

CL (CO₂LPIE-CO₂ Long-Term Pulse Injection) experiment

- From Tuesday to Wednesday, October 3–4, M. Ziegler, A. Grignaschi, J. Windisch (swisstopo) with S. Czerner and T. Fritsche (ZHAW) performed a resin test in a two meters long transparent PVC tube to validate the leakage integrity of the Modular Multi-Sensor Monitoring System (MMMS) and discuss further modifications. Resin will be air-cooled inside the borehole after its injection to reduce the thermal impact of the resin polymerisation reaction on the rock mass and the MMMS (**Figure 1**).
- On Wednesday, October 4, J. Windisch (swisstopo) measured the weight of the dried rock samples of BCL-3 and BCL-4 to calculate the water content.
- On Thursday, October 5, J. Windisch and A. Grignaschi (swisstopo) checked the resin pretest in Niche CL. Temperature data acquisition was stopped and ventilation was turned off because the resin was cured (**Figure 2**).

DR-E (Long-Term Diffusion Experiment in the Main Fault-Zone) experiment

- On Tuesday, October 3, T. Theurillat (swisstopo) decreased the water flow in the circulation circuit of the borehole BDR-E2 from 0,8 to 0,3 l/h according to the instructions received by phone from A. Ammon (Solexperts).

GT (Gas Transport Models and the Behavior of OPA to Gas Pressure) experiment

- On Monday, October 2, B. Piedevache (Solexperts France) went on site to remove the high-precision Luna measurement system.

HE-E (In-Situ Heater Test in VE-Micro-Tunnel) experiment

- From Monday to Friday, October 2–6, U. Mäder (RWI) and F. Kober (Nagra) put the PVC liner segments and the fibreglass tubes into the borehole. After sealing the annulus between PVC casing and borehole, they injected resin to stabilise the rock (**Figure 3**).

MA-A (Modular Platform for Microbial Studies) experiment

- On Friday, October 6, T. Theurillat (swisstopo) changed the gas bags.

SM-C (Permanent Nanoseismic Monitoring) experiment

- On Wednesday, October 4, I. Gutierrez and E. Meier (EMP) prepared for the touch-point calibration of the hydrostatic-leveling system (HLS); the electric valve was disassembled (**Figure 4**).
- On Thursday, October 5, T. Theurillat and Y. Gerber (swisstopo) closed the pressure compensation pipe.

SW-A (Large-Scale Sandwich Seal in Opalinus Clay) experiment

- On Monday, October 2, T. Theurillat (swisstopo) re-established the water flow for the saturation by gravity in the borehole BSW-A2, following instructions from S. Tuñón (Amberg).
- On Monday, October 2, T. Theurillat (swisstopo) refilled the HPT dedicated to the borehole BSW-A1. He also increased the injection pressure.
- On Thursday, October 5, T. Theurillat (swisstopo) increased the injection pressure of BSW-A1 from 19,88 to 19,98 bar.

Varia

- Past weekly report entries were added to the new „Mont Terri Logbook“ database. All logbook data will be made available through MONTEIS in the future.
- On Friday, October 6, Y. Gerber accomplished his last week of civil service here at the Mont Terri. He leaves us after a very nice time where he helped the site management and the visitors center. We wish you all the best for the future and thank you for your great efforts, Yanick.

Visits

Day	Date	Group Name	Group Size	Visitors Guide
Tue	3.10.2023	Pro Senectute Kanton Luzern	27	H. Sager (Nagra) R. Nicol (swisstopo)
Wed	4.10.2023	Leibniz University Hannover	44	A. Grignaschi (swisstopo) M. Ziegler (swisstopo)
Thu	5.10.2023	Pro Senectute Kanton Luzern	19	H. Sager (Nagra)
Fri	6.10.2023	Musikverein Sattel	27	H. Hauser (freelance) H. Sager (Nagra)
Fri	6.10.2023	Gemeinderat Gomadingen (Germany)	23	H. Sager (Nagra)

Figures



Figure 1: CL: M. Ziegler, A. Grignaschi, J. Windisch (swisstopo) with S. Czerner and T. Fritsche (ZHAW) prepare the setup for the resin injection (A. Grignaschi, swisstopo).



Figure 2: CL: J. Windisch (swisstopo) checking if the resin is cured (A. Grignaschi, swisstopo).



Figure 3: HE-E: U. Mäder injecting resin into BHE-E3 (J. Windisch, swisstopo).



Figure 4: SM-C: I. Gutierrez and E. Meier (EMP) preparing the calibration of the hydrostatic-leveling system (HLS) (J. Windisch, swisstopo).