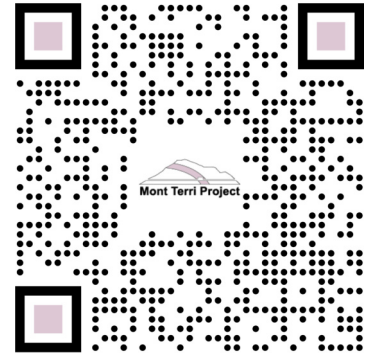


Mont Terri Project Underground Rock Laboratory

Report period: January 22–28, 2024

Assembled and edited by swisstopo, St-Ursanne



Spotlight of the week: The first CIGSS - Caprock Integrity & Gas Storage Symposium - was held on Wednesday and Thursday at the Mont Terri rock laboratory visitor centre. With around hundred participants and top-quality speakers, this first edition was a great success. Representatives from academia, government agencies and industry met to discuss the current state of knowledge on CO₂ storage and caprock in particular. This success underlines the growing and unique importance of the Mont Terri rock laboratory as an international platform for research and exchange on radioactive waste and CO₂.

BN (Bitumen-Nitrate-Clay Interaction) experiment

- On Monday, January 22, S. Schefer (swisstopo) restarted the computer for the data acquisition.

CD-A (Influence of Humidity on Cyclic and Long-Term Deformations) experiment

- On Monday, January 22, S. Schefer (swisstopo) restarted the psychrometre acquisition.
- On Tuesday, January 23, G. Ziefle, J. Massmann, V. Kumar and S. Chen (BGR) were on site to document the installations and take pictures of the experiment.
- On Friday, January 26, S. Schefer (swisstopo) removed the tiltmeters from both niches in preparation for next week's drilling operation at the front of the niches.

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

- From Monday to Friday, January 22–26, P.X. Meury (GeoEnvironnement), R. Wang (WSL) and J. Windisch (swisstopo) did the core mapping and took some samples for determining water content, rock density and much more analysis. The samples were sealed in aluminium bags.
- From Monday to Thursday, January 22–25, A. Eul, S. Braunschweig and F. Durulan (Eul GmbH) drilled borehole BCL-5 to 17.25 m, did a grinding to its final depth of 17.43 m and reamed the top 9 meters (**Figure 1**).
- On Friday, January 26, S. Schefer (swisstopo) moved the ERT measurement equipment from CD-A to the two test boreholes (BCL-3 and BCL-4) and M. Furche (BGR) remotely performed the measurements.
- On Friday, January 26, M. Garcia and J-P. Bischoff (terratec) performed borehole logging inside BCL-5 (OBI, DEV, SPEC, GAMMA, DIL and NMR).

CS-E (Mini-Fracturing and Sealing) experiment

- On Monday, January 22, K. Tuinstra, A. Celli and M. Nuus (ETHZ) set up the seismic monitoring and performed an active seismic survey with sparker in borehole BCS-D5 recording with both DAS and geophones. A. Shakas and D. Escallon (ETHZ) performed GPR measurements in both BCS-D5 and BCS-D6, with 250 MHz and 500 MHz antennas. P. Annan and A. Rinaldi (ETHZ) prepared the injection system for the mini-stimulation (mixed new fluid with CO₂ and Xenon, inflated packers, and took fluid samples). The ETH team was supported by A. Guzik (Neubrex) that prepared the fiber optics strain (DSS) measurements (**Figure 2**).
- On Tuesday, January 23, A. Rinaldi and P. Annan (ETHZ) performed DSS measurements with various devices with remote assistance by A. Guzik (Neubrex). K. Tuinstra and M. Nuus (ETHZ) performed ERT measurements. D. Escallon (ETHZ) prepared the GPR antenna in borehole BCS-D5 for continuous measurements during the injection. In the late morning, the whole team performed the first CS-E mini stimulation in interval Q4 of borehole BCS-D1. The injection constituted of 6 cycles at constant flow rate (with ramp-up from 0.04 ml/min as steady state to 200 ml/min at maximum). After the stimulation, the pump was set in constant pressure mode, and it was observed a 3.5 order of magnitude change in flow rate (from 0.04 ml/min to 130 ml/min). The constant injection was kept for about two hours, and then the flow rate was gradually limited down to 10 ml/min overnight. After the stimulation, D. Escallon performed full GPR measurements in boreholes BCS-D5 and BCS-D6, while K. Tuinstra and M. Nuus performed an active seismic survey with sparker in borehole BCS-D5 (with geophone only as the DAS was not properly working). ERT measurements were carried overnight remotely by the ETH team.
- On Wednesday, January 24, A. Rinaldi and P. Annan (ETHZ) refilled the mixing tank. They reduced further the flow rate to 5 ml/min. Further ERT measurements were carried over remotely. High resolution DSS measurements continued.
- On Thursday, January 25, A. Rinaldi (ETHZ) further refilled the mixing tank, and reduced the flow rate to 2.5 ml/min. High resolution DSS measurements continued with remote support by A. Guzik (Neubrex).
- On Friday, January 26, S. Schefer (swisstopo) refilled the injection tank up to 23 bar.

HT (Hydrogen Transfer in Opalinus Clay) experiment

- On Tuesday, January 23, M. Lundy, M. Agnel (Andra) and Y. Lettry (Solexperts) performed gas and water sampling, maintenance work on the gas circulation and water sampling modules. E. Auclerc and J. Koebcke (Endress+Hauser) checked the performances of the Raman spectrometer used for online monitoring of the gas composition during D2 injection phases (**Figure 3**).

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

- On Wednesday, January 24, T. Theurillat (swisstopo) refilled the HPT of shaft 1.

Visits

Day	Date	Group Name	Group Size	Visitors Guide
Thu	25.1.2024	Rock Laboratory Visit CIGSS	36	C. Nussbaum (swisstopo) D. Jaeggi (swisstopo) S. Schefer (swisstopo)

Figures



Figure 1: CL: Drilling of BCL-5 in Niche CL. This is the first of four monitoring boreholes (J. Windisch, swisstopo).



Figure 2: CS-E: The entire onsite-team for the mini stimulation (S. Schefer, swisstopo).



Figure 3: HT: The entire HT-team at work (T. Theurillat, swisstopo).