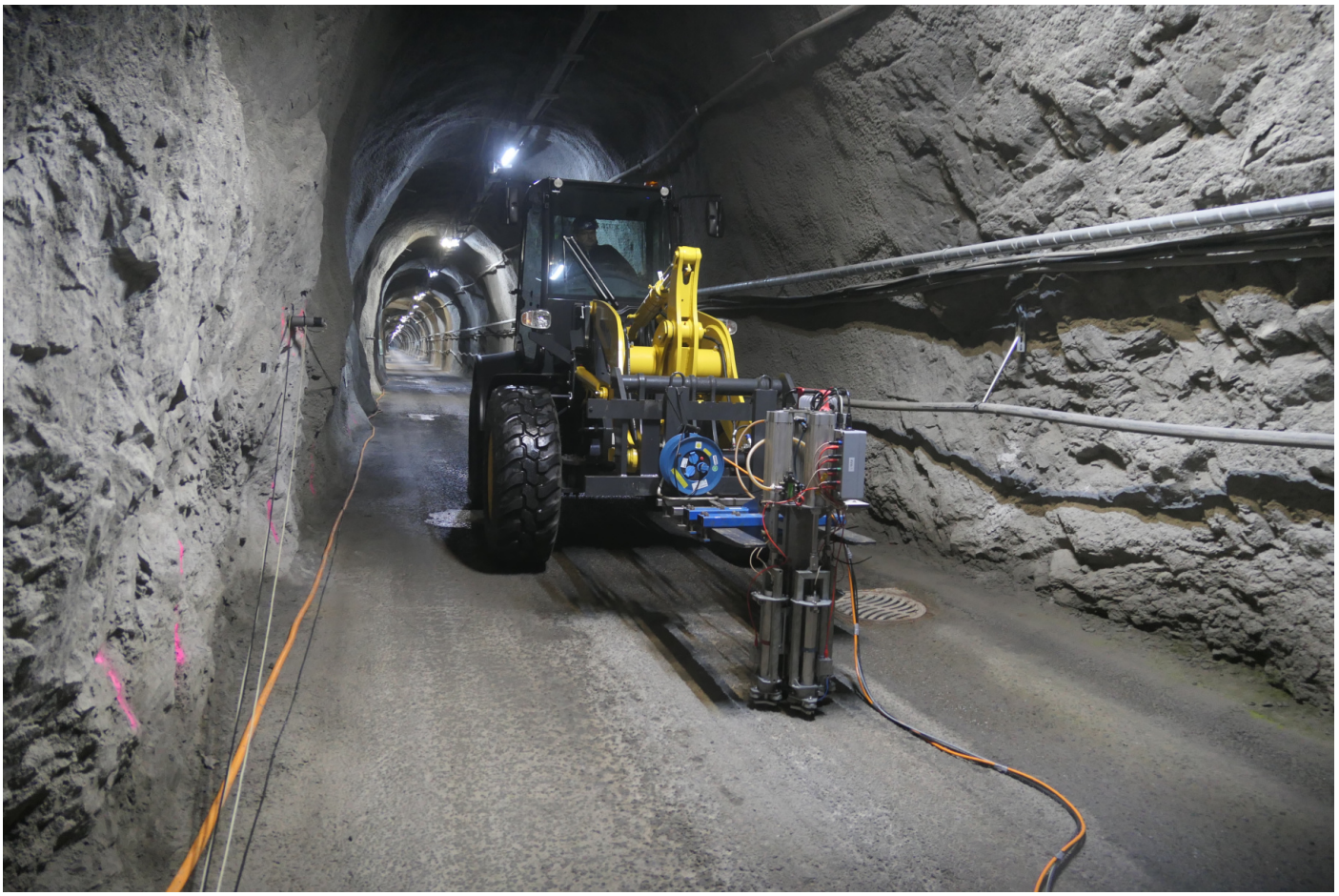
# Mont Terri Project
# Underground Rock Laboratory

## Report period: February 12–18, 2024

Assembled and edited by swisstopo, St-Ursanne



**Spotlight of the week:** The SI-B experiment is investigating the potential of using high-frequency seismic sources for the characterization and structural investigation of Opalinus Clay and its surrounding formations. The photo is showing a magnetostrictive vibro source with four single actuators installed on a wheel loader. The source has been operated on a 480 m long profile along the Safety Gallery of the Mont Terri Tunnel. The combination of this type of seismic source and receivers placed in the 80 m deep BDS-2 borehole and in rock anchors along the gallery aims at reducing seismic noise related to the generation of “tunnel surface waves” which commonly interfere with seismic reflections from geological structures at larger distance from the underground infrastructure.

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

- From Tuesday to Thursday, February 13–15, C. Ostertag-Henning (BGR) injected a Neon gas pulse into the Niche Closed Twin and retrieved gas samples on three days to assess the gas exchange between the closed niche and the gallery.

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

- On Monday, February 12, S. Lenius and J-P. Bischoff (Terratec) performed the logging inside BCL-7 (OBI, DEV, SPEC. GAMMA, DIL).
- On Monday, February 12, J. Windisch and S. Schefer (swisstopo) measured the location and orientation of BCL-7 inside the borehole (328/33) (**Figure 1**).
- On Tuesday, February 13, T. Theurillat (swisstopo) adapted the sinter filter to the installation conditions as we noted a deviation at the bottom of the borehole BCL-7. He also connected all the injection lines to the packer.
- From Wednesday to Thursday, February 14–15, T. Fritsche, L. Singenberger (ZHAW Winterthur), J. Junker (SED), D. Jaeggi, J. Windisch, T. Theurillat and M. Ziegler (swisstopo) installed the second MMMS into the 17.5 m long monitoring borehole BCL-7. A. Eul (Eul GmbH) helped pushing the MMMS modules gently and stepwise into the borehole using the drill rig (**Figure 2**).
- On Thursday, February 15, T. Theurillat (swisstopo) installed the hydraulic packer and interval lines of borehole BCL-7 and pressurized the just installed hydraulic packer. J. Windisch (swisstopo) connected the 5 temperature sensors of BCL-7 to the data acquisition system.
- On Thursday, February 15, A. Rinaldi (SED) connected each two fiber optical sensor cables from BCL-5 and BCL-7 and started strain and temperature monitorings (**Figure 3**).
- On Friday, February 16, D. Jaeggi, J. Windisch and M. Ziegler (swisstopo) filled the annulus space of BCL-7 with resin (81 l). Furthermore, the annulus space of BCL-5 was filled with additional 11 l (**Figure 4**).

## CS-E (Mini-Fracturing and Sealing) experiment

- On Tuesday, February 13, S. Schefer (swisstopo) installed the new fibrisTerre interrogator and A. Rinaldi (ETHZ) remotely started the measurements.
- On Friday, February 16, S. Schefer (swisstopo) refilled the injection pump and the reservoir up to 20 bar.

## HE-F (Gases & Watersoluble Organic Compounds in OPA at Elevated T/p) experiment

- From Monday to Friday, February 12–16, C. Ostertag-Henning (BGR) and the BGR drilling team (A. Engelke, M. Kreutz, A. Gotsnev and D. Novotny) successfully drilled borehole BHE-F3 retrieving a 101 mm diameter core from 4 m to 13 m. The core penetrates the rock volume of the HE-D experiment. It contains rocks with different temperature history - those that have not been heated at all to those heated to near 80°C directly beneath the heater. The rock samples will be analysed to reveal what geochemical changes resulted from the heating experiment and be used in additional heating experiments in the High Pressure Experimental labs at BGR in Hannover (**Figure 5 , Figure 6**).

## HS (Hydrogeological Survey of the Mont Terri Anticline) experiment

- On Tuesday, February 13, S. Schefer and D. Jaeggi (swisstopo) installed a mechanical packer in borehole BHS-3. The packer is equipped with an autonomous pressure data logger and serves for conducting a hydraulic interference test towards BHS-1 intervals I-3 and I-4. After a certain equilibration phase a pressure pulse will be imposed at BHS-3.

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

- On Thursday, February 15, S. Schefer (swisstopo) restarted the Gloetzl data acquisition system.
- On Thursday, February 15, T. Theurillat (swisstopo) refilled the HPT of shaft 1.

# Figures

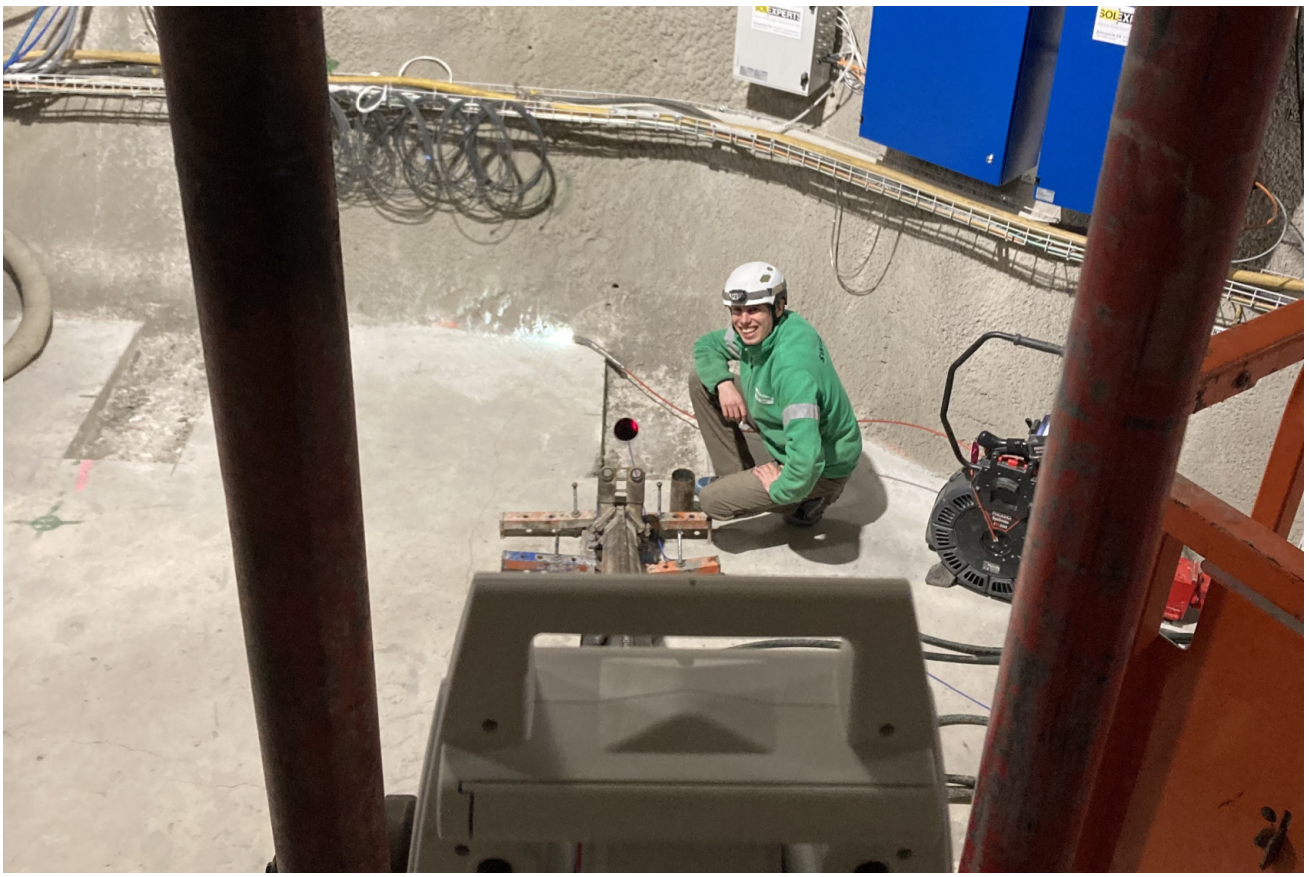


**Figure 1: CL:** View from the tachymeter into BCL-7. J. Windisch for scale… (S. Schefer, swisstopo).

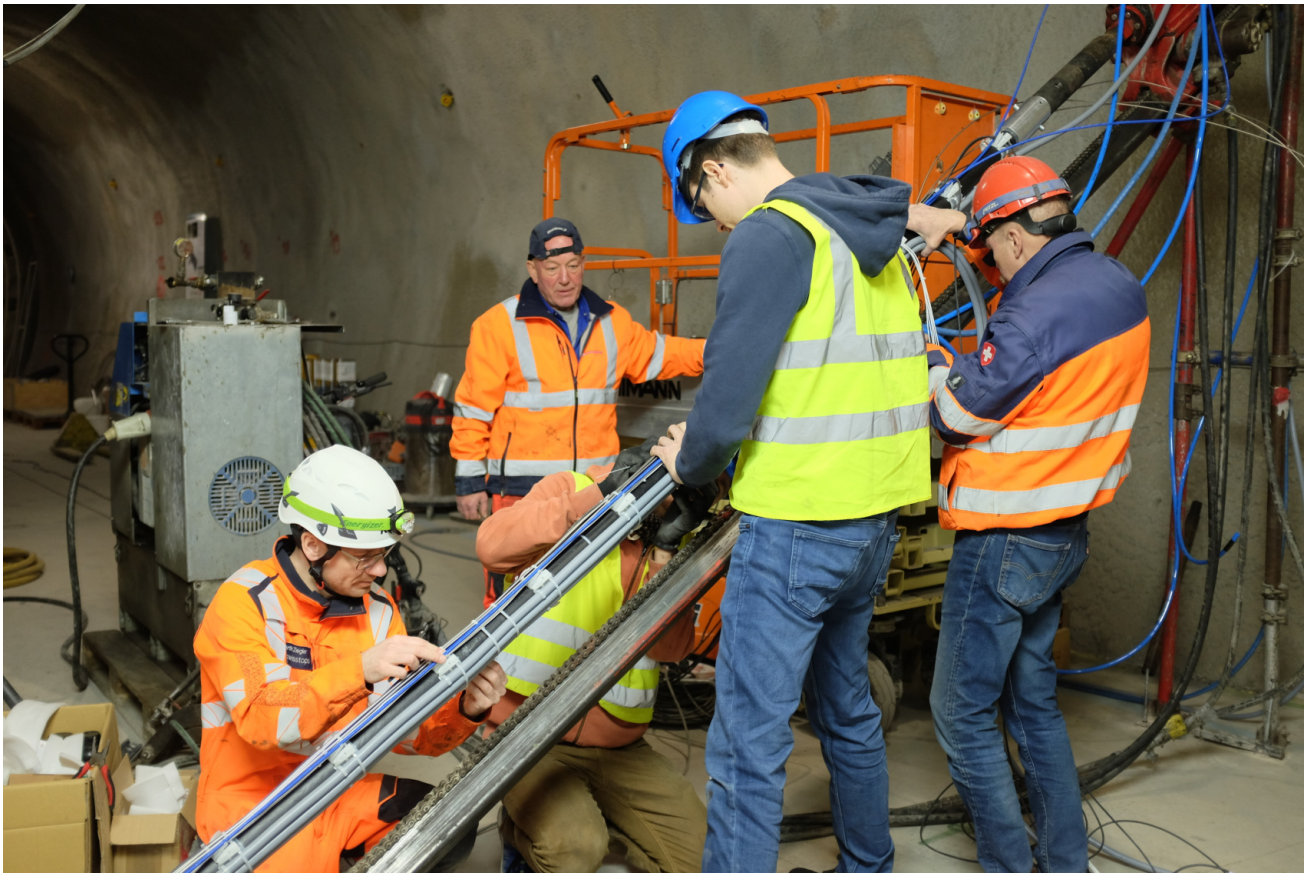


**Figure 2: CL:** Inserting the MMMS is a joint effort. There are many cables and lines to attach (S. Schefer, swisstopo).

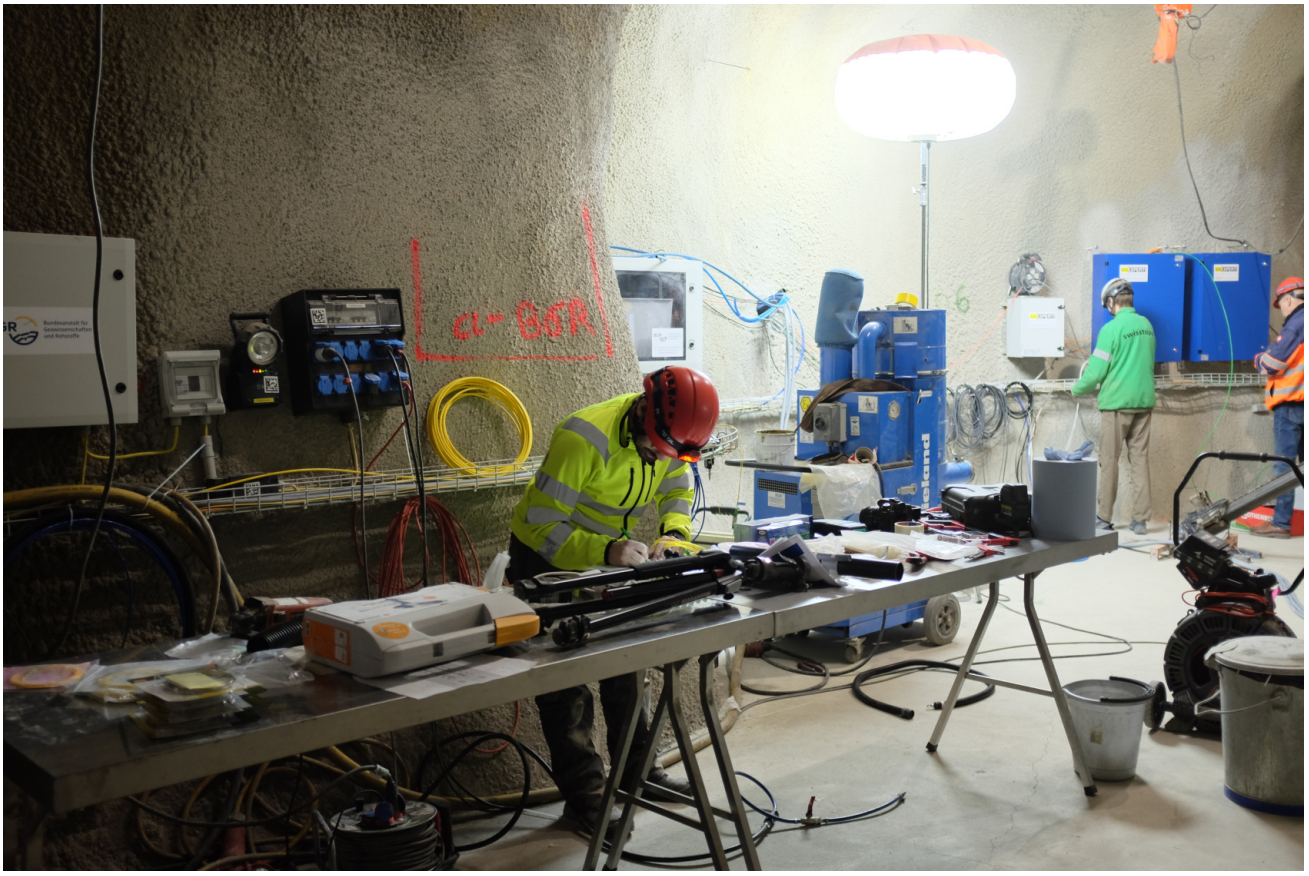


**Figure 3: CL:** A. Rinaldi connecting the fibres of BCL-5 and BCL-7 (S. Schefer, swisstopo).

**Figure 4: CL:** The resin is injected with a pump. A lot of cleaning is involved… (S. Schefer, swisstopo).

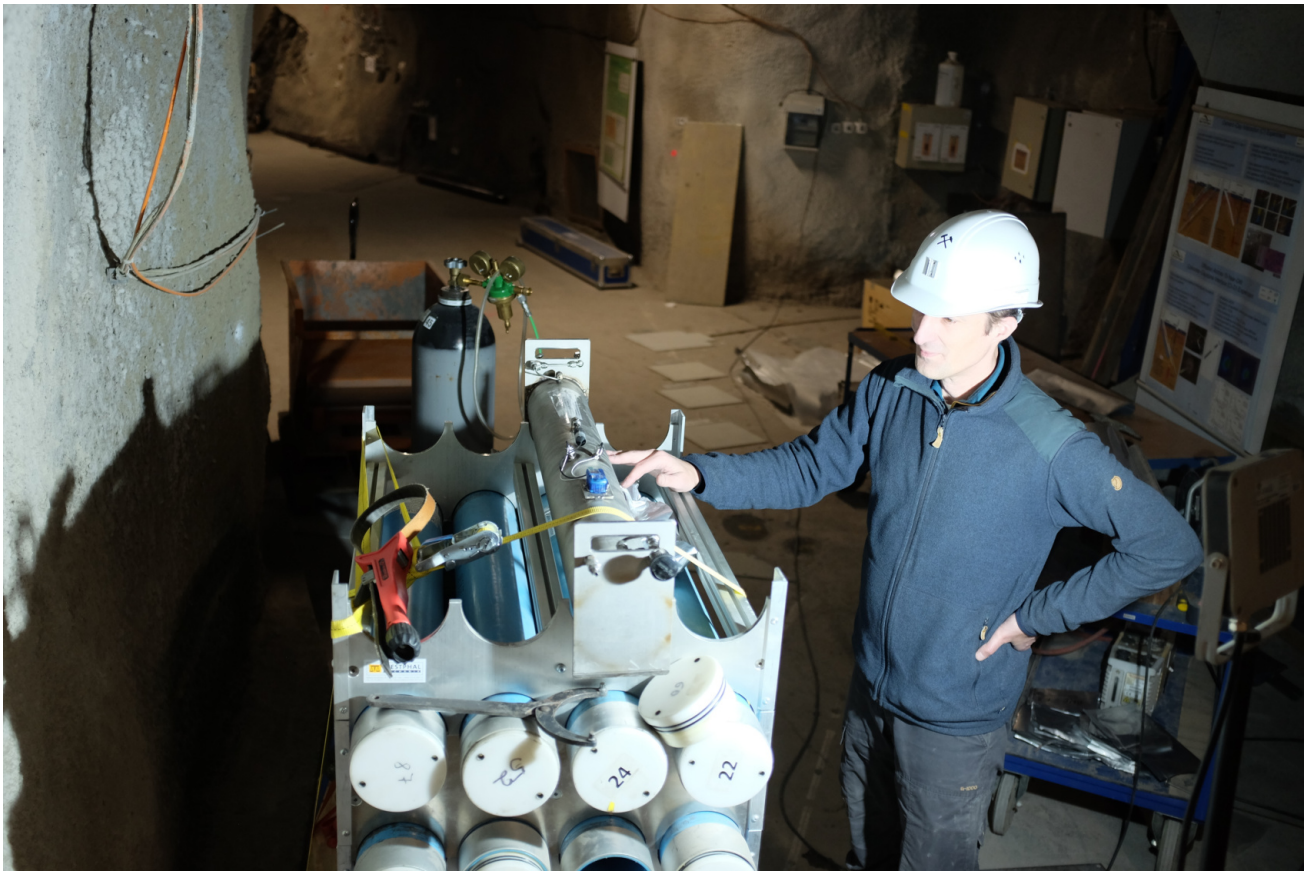


**Figure 5: HE-F:** The core section 6.22 - 7.16 m was stored after evacuation under nitrogen gas in a special liner with continuous logging of temperature, pressure and humidity. The liner allows gas sampling through a septum port (S. Schefer, swisstopo).

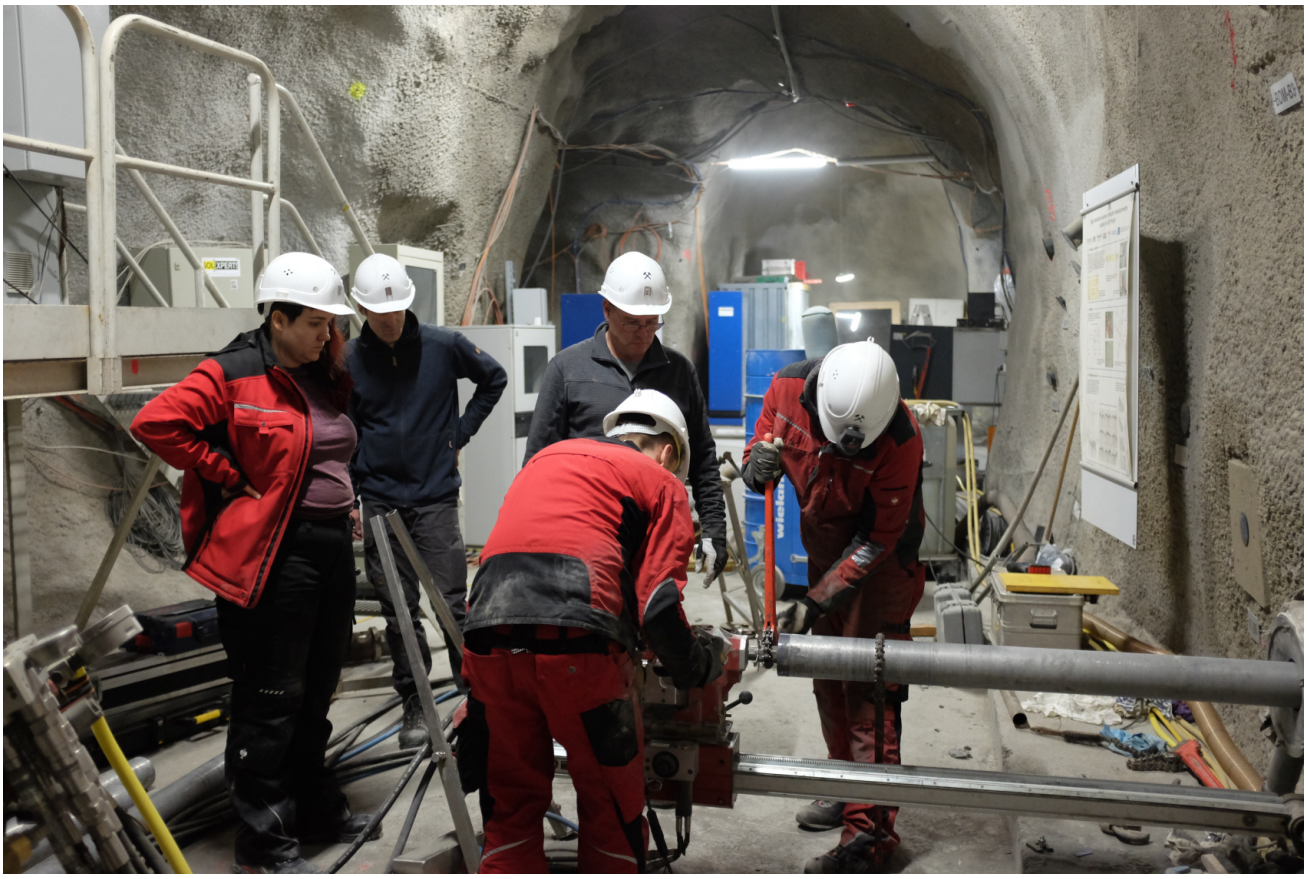


**Figure 6: HE-F:** Retrieving the core is a very interesting moment! (S. Schefer, swisstopo).