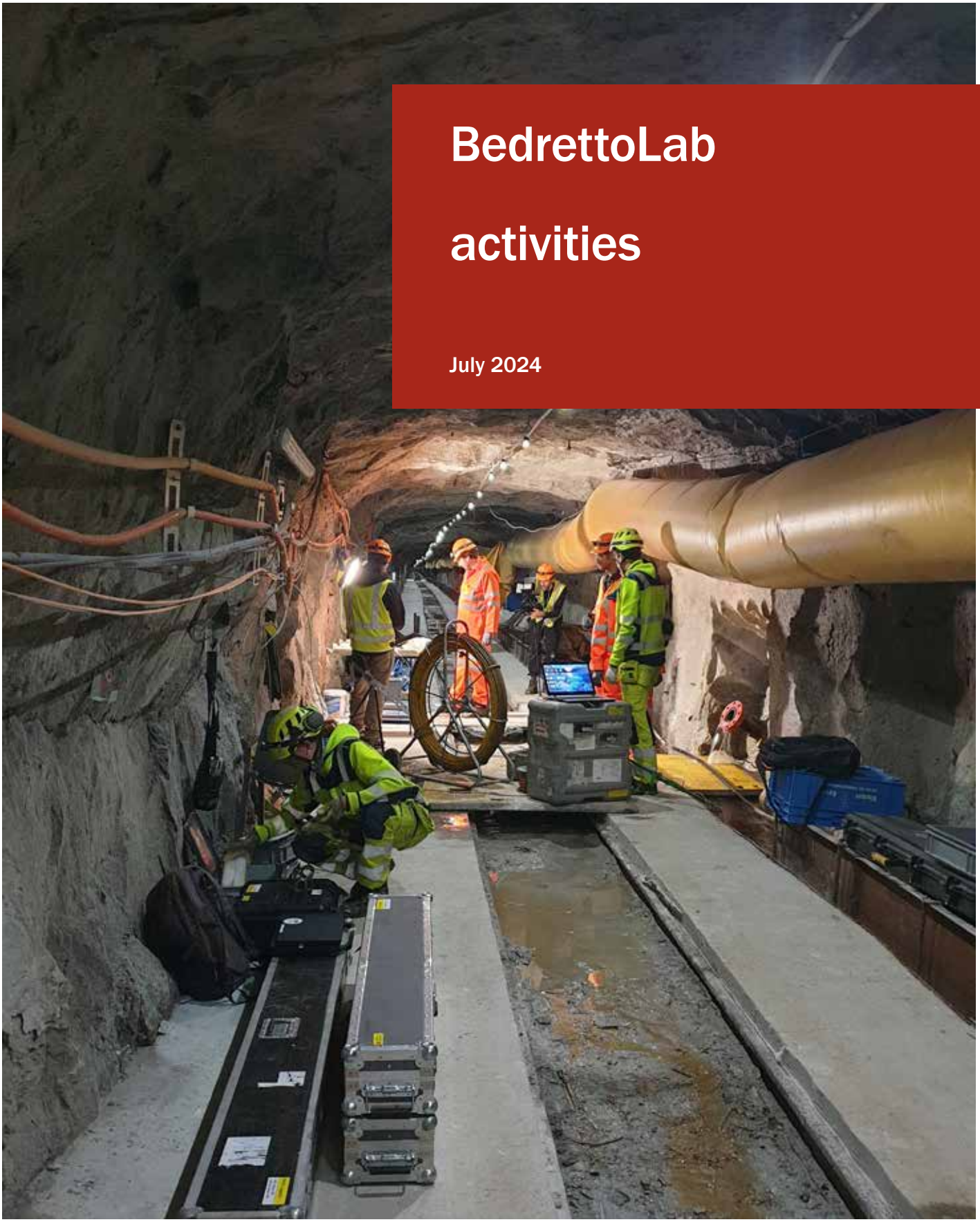
ETH zürich

Bedretto Lab

BedrettoLab activities

July 2024



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Introduction

Another year has passed at the Bedretto Underground Laboratory for Geosciences and Geoenergies. With this newsletter we would like to inform about our various activities since July 2023.

We will cover the whole bandwidth of activities performed by our team of students, researchers, technicians and administrative staff members.

This newsletter is accompanied by the latest BedrettoLab Science Report, which summarises the scientific activities in the BedrettoLab.

The Bedretto tunnel is a playground not only for researchers but also for fungi and other organisms. Here is a photo of some of the art created by the Bedretto tunnel itself inside its puddles

Administration

Oversight Committee

On November 14th 2023, the Oversight Committee and the BedrettoLab Board of Directors met for its annual meeting.

One agenda item was the planning of public visitor tours to be offered in collaboration with the nearby Sasso San Gottardo Museum. The Oversight Committee approved this project. More information under “Events & Visits”.

The Oversight Committee will meet again in Q4 of 2024.

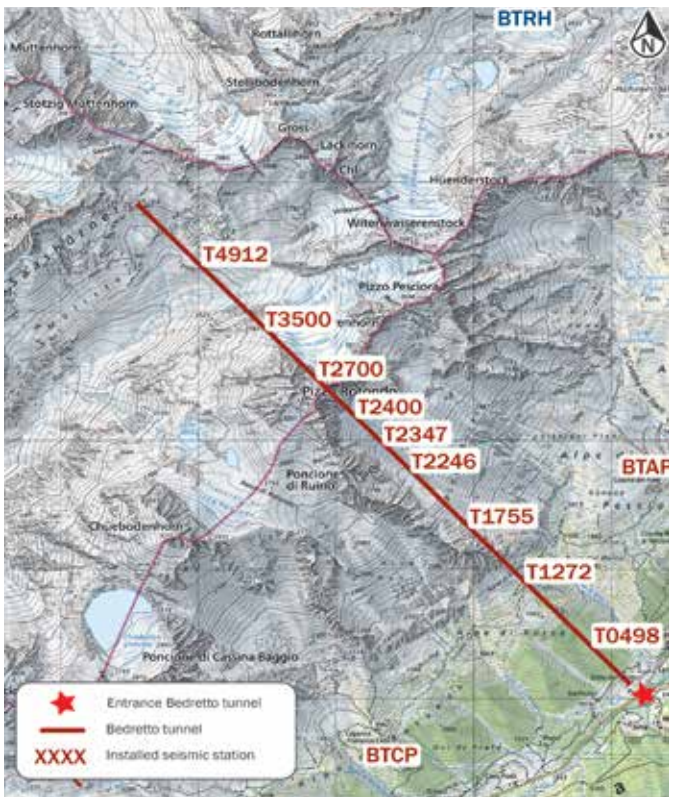
Mattherhorn Gotthard Infrastruktur (MGI)

In September 2023, a 4th amendment to the contract with Matterhorn Gotthard Infrastructure was signed for the installation of a safety door required according to SUVA regulations at tunnel meter 3’000.

In May 2024, a 5th amendment was signed regarding public visits organized by the Sasso San Gottardo Foundation.

We are already in discussion with MGI to secure the continued operation of the rock laboratory for another ten years.

The 2024 annual review meeting with MGI is scheduled for September 19th 2024 in Bedretto.



The seismic stations installed in the BedrettoLab

Infrastructure

Tunnel road extension

Over the last year the tunnel extension kept the operations team busy. The two-lane road is now paved over the entire tunnel. The section of the tunnel beyond the earthquake physics testbed (TM 2’300 until 5’200) was equipped with LED lighting to provide a safer second exit and thus more safety for all people working inside. A redundant internet connection was installed in collaboration with MGI.

Now that the tunnel infrastructure extension is finished, operational work focuses on the new side tunnel, the installation of sensors and instruments, and drilling of boreholes (see FEAR section).

The tunnel extension was funded by the Werner Siemens Foundation.

Barack Bedretto tunnel (BRB)

Construction start was delayed. Planning together with ETH Immobilien is still ongoing, with the aim of submitting the building application in winter 2024/25.

Operational vehicles

Four electrical bikes, each with three seats, a small cargo area and a trailer coupling have been purchased. They make logistics and transport of material easier.

Seismic Background Monitoring Network

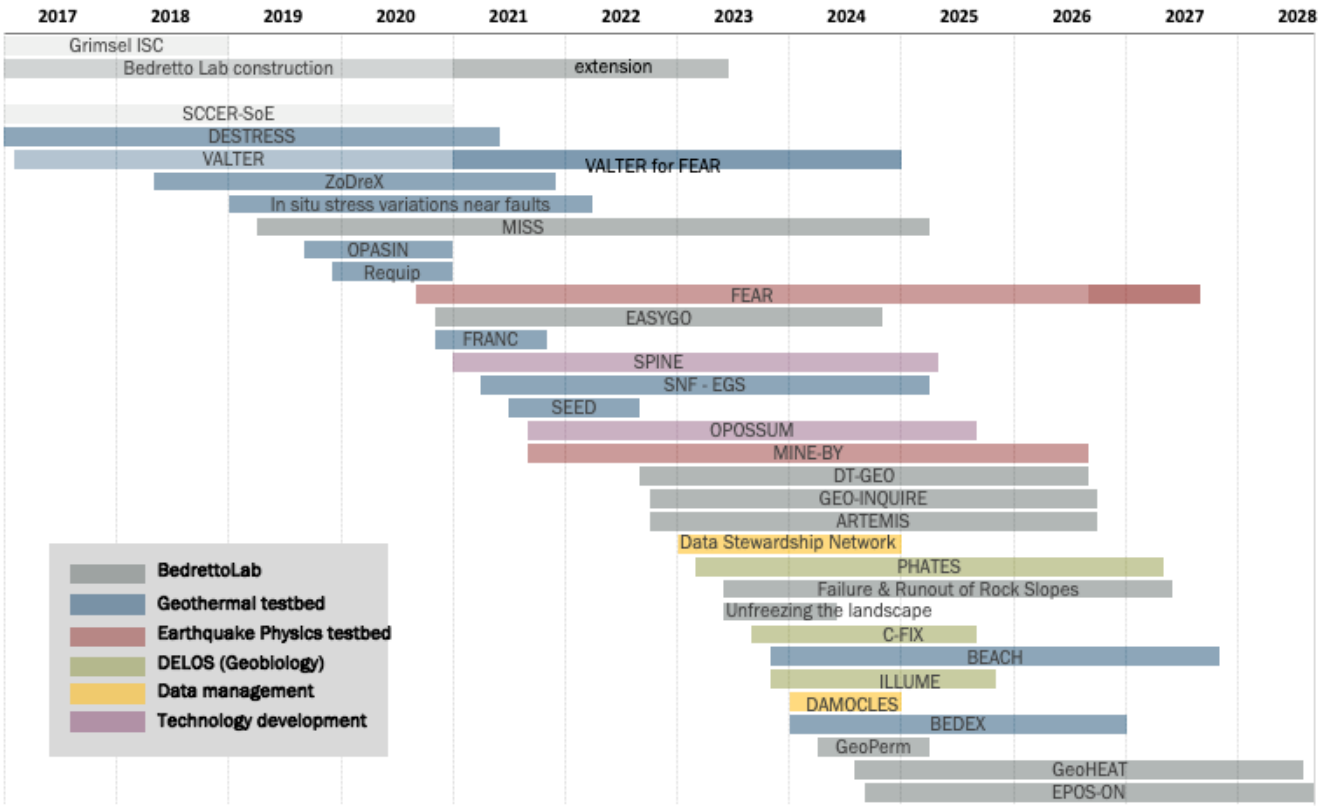
The seismic background monitoring network is now nearly finalized with only 1 final station to be installed at TM 3’400.

IT

As our system is getting more and more complex with different projects, we updated our IT system in the Lab. This meant: updated speed to communicate with Zurich, a remote control system for safer experiments, updated network with the fiber optics and network devices, and a real time data receiver.

One of the four electrical bikes

R & D Projects



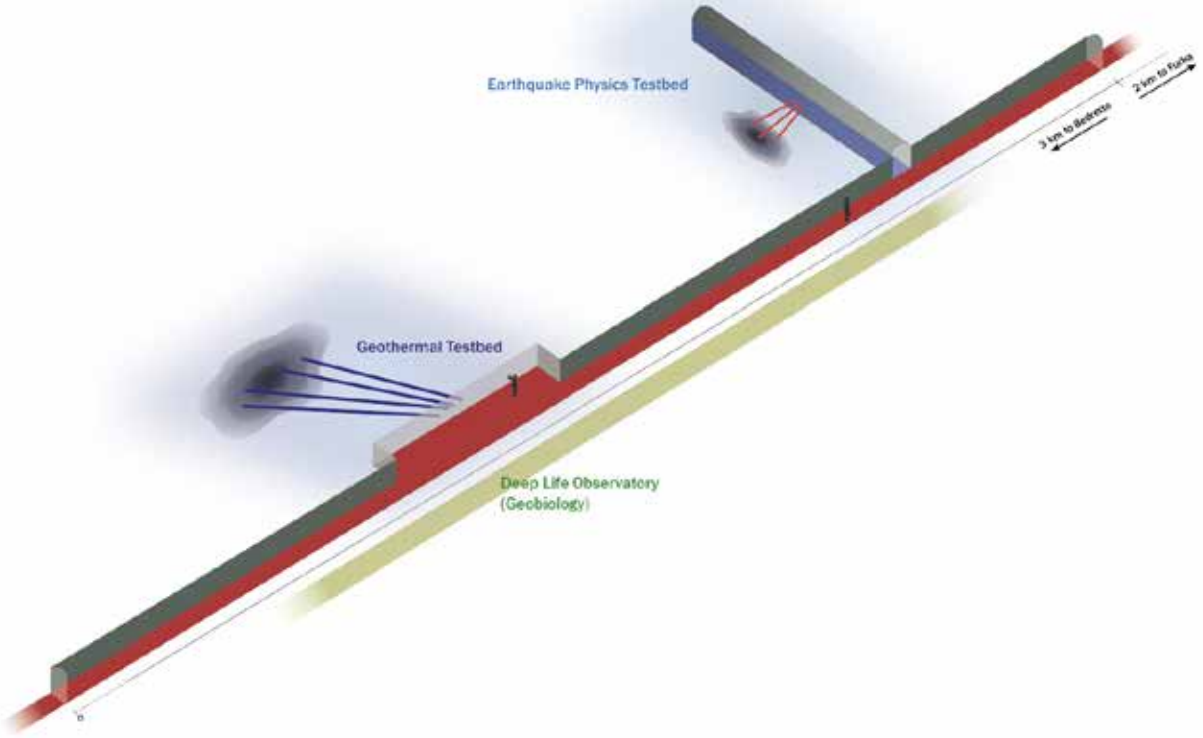
In 2024 the following projects with an involvement in the BedrettoLab have been approved:

- **BEDEX (Bedretto Experiment):** is part of the joint project called “Synthesis of numerical Model Approaches for Reservoir Treatments in Enhanced Geothermal Systems - SMART-EGES”, which is part of the “Geo Research for Sustainability (GEO:N)” programme and aims to compare numerical methods for modelling improvement measures in geothermal reservoirs.
- **GeoHEAT:** aims to improve geothermal energy exploration through two major strategic innovations: reducing pre-drilling exploration costs while managing risks, and increasing the efficiency and cost-effectiveness of exploration drilling. This project uses different passive imaging technics to reduce above mentioned costs and make prestudies. Its kickoff is set for the 15th of August.
- **EPOS-ON: (EPOS Optimization and EvolutioN)** through which the BedrettoLab will provide access to BedrettoLab data within the TCS MSL (Multi Scale Laboratories) initiative of EPOS (European Plate Observing System). The TCS collects and harmonises laboratory data on the properties and processes controlling rock system behaviour at multiple scales.
- **GeoPerm:** Permeability estimation from laboratory analyses and borehole geophysics with an application to a geothermal reservoir
- **DAMOCLES:** Data Management Concept for Underground Laboratories - a project aimed at organizing and standardizing data collected at the BedrettoLab to facilitate open data access.
- The BedrettoLab is part of the Pilot group of **Data Stewards** established **at ETH Zurich** through the Swissuniversities programme on Open Research Data. In this context, a new data management position was created and filled for October 1st 2024.

The following proposals have been submitted and are awaiting approval:

- An Earthquake On-Fault Observatory at the Bedretto Underground Laboratory (M.A. Meier; SNF Requip)

The BedrettoLab testbeds



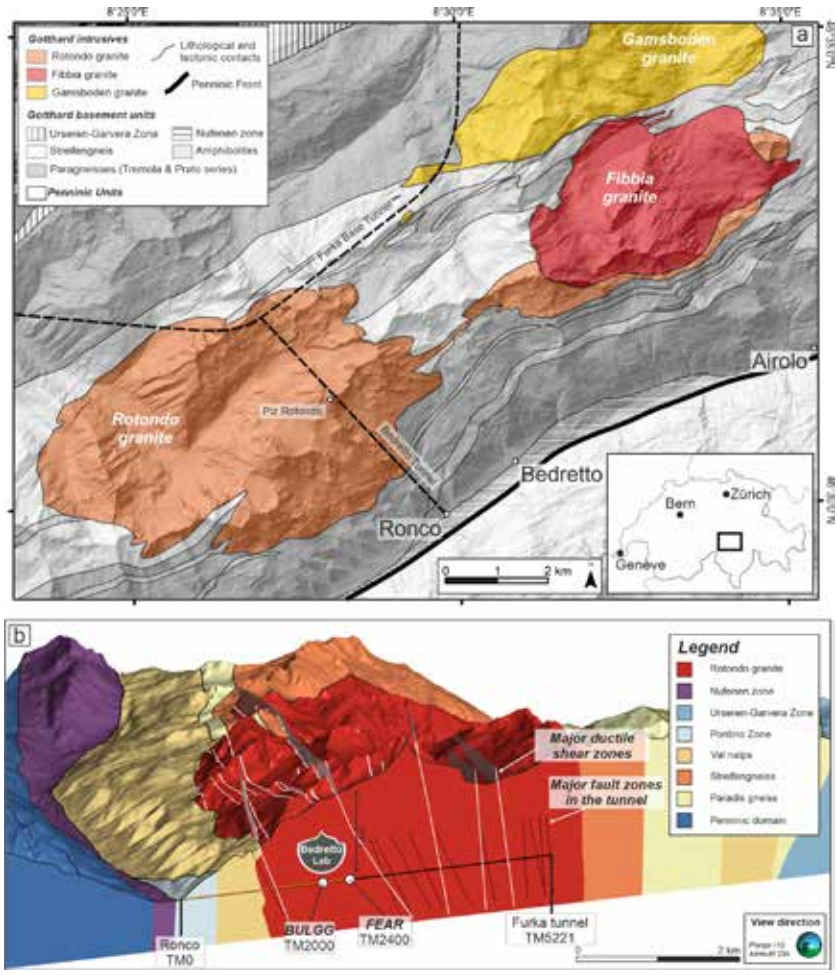
Geothermal testbed, focusing on the development of large-scale deep reservoirs for water circulation, storage and extraction of geothermal energy.

Earthquake Physics testbed, focusing on the fundamental understanding of earthquake physics.

DELOS (Deep Life Observatory) to study organisms living at the energy limit of life.

Geological Mapping of the Rotondo granite

Extensive field work by the BedrettoLab geologists have produced a geological map linking the faults observed in the BedrettoLab to the surface. ►



3D model presenting the distribution of the geological units of the Val Bedretto Area.

The model is sliced parallel to the Bedretto tunnel, showing in the cross-section the tunnel within the Rotondo granite and some of the fault zones that can be traced from the surface to the tunnel.

(in press Achtziger et al. (2024))

Earthquake Physics testbed

FEAR side tunnel

For the ERC Synergy project FEAR, a new side tunnel is excavated. The work started in fall 2023 with the excavation (drill-and-blast) of two niches necessary for further logistics. In summer 2024, excavation work for the new side tunnel began with a first phase of drill-and-blast, followed by a subsequent phase of soft excavation. The construction will have a 1-month pause (August 2024) during which boreholes will be drilled for the PRECODE MineBy project and the first FEAR experiment.

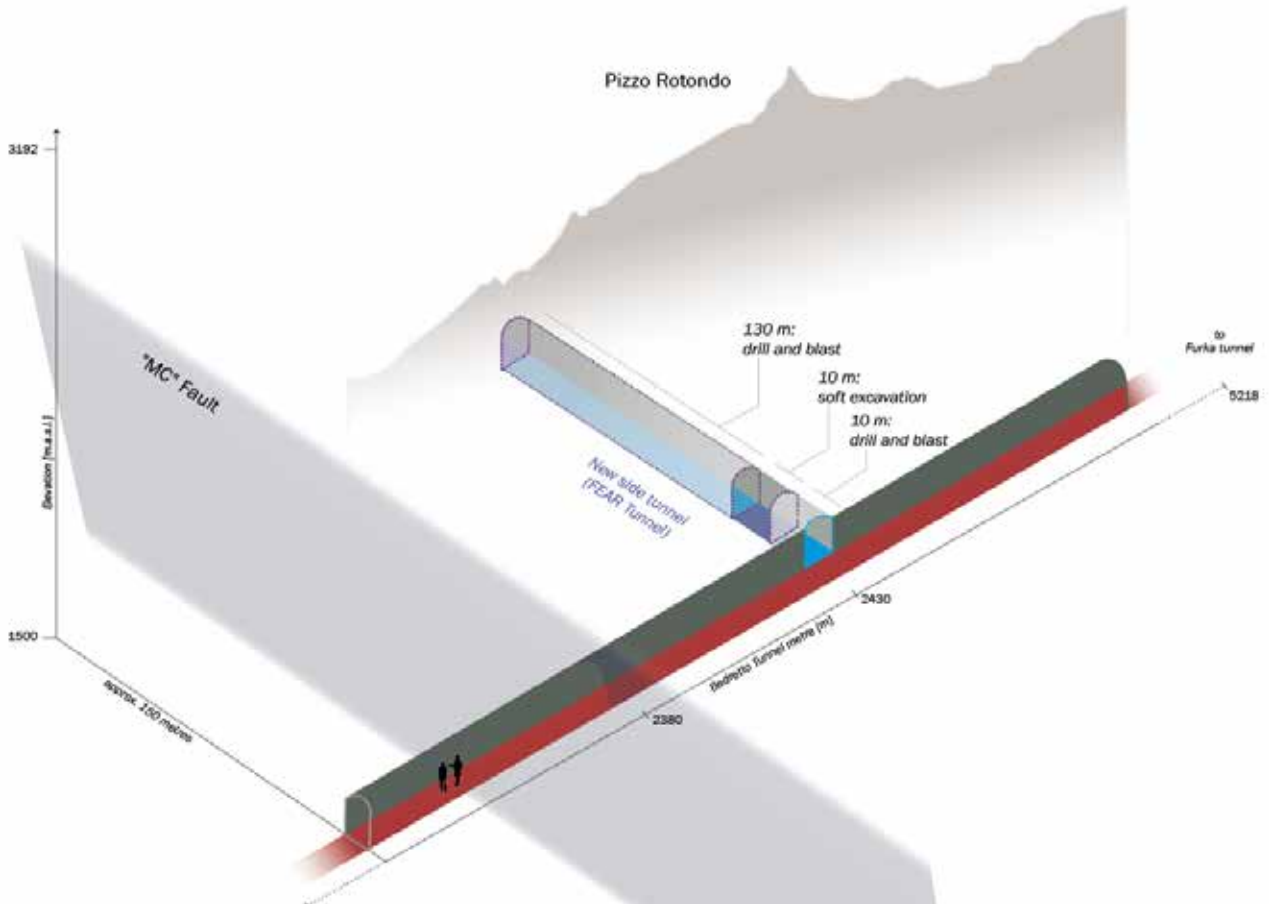
The so-called FEAR 1 experiment is planned for November 2024. The FEAR side tunnel will be finalized by Q3 2025.

Bedretto on-fault observatory

With the submitted SNF Requip proposal “An Earthquake on-fault observatory at the Bedretto Underground Laboratory” (proposal submitted), the BedrettoLab moves from near fault observatories to on-fault observatories. It will be the first on-fault observatory of its kind.

DORSA Installation

In July 2023, a high-sensitive local slip monitoring probe (Downhole. Robotic Stress Analysis, DORSA) was installed across the FEAR target fault zone in borehole BFE_A_07, one of the pilot boreholes of the FEAR exploration and characterization phase. The probe is clamped with a pressurized clamping system. For the local conditions with water-filled boreholes and variable downhole pressures during equilibration, depletion, and injections, the Bedretto team developed an automatic differential pressure regulation system that keeps the clamps at constant relative pressures independent of the ambient downhole pressure. With this major improvement, the probe is now recording continuously and is expected to provide important information on the local fault displacement during the next experiments in that testbed.



Schematic of the excavation process of the new side tunnel

SPINE

The BedrettoLab, together with its project partners UniNE (University of Neuchâtel) and LBNL (Lawrence Berkeley National Laboratory), is working on the stress inversion of the **SIMFIP (Step-Rate Injection Method for Fracture In-Situ Properties)** experiments that took place in December 2022. The SIMFIP tool was used to measure the 3D fracture displacement during small volume injection tests along 11 intervals in borehole BFE_A_05. The inversion of these data is used to estimate the full stress tensor and its variability along the borehole.

MineBy & PRECODE

The **PRECODE** (Progressive Excavation Damage Zone Evolution During And Post Mine-by Tunnelling) project aims to deepen our understanding of spatial and temporal development of brittle fracturing in the BedrettoLab. There are significant synergies with the FEAR project.

Before and during the mine-by excavation of the 120 m FEAR tunnel, the vicinity of the tunnel will be densely instrumented with various sensors, including strain, pore pressure, microseismic sensors, etc. to monitor the evolution of the excavation damage zone (EDZ) over a period of 2-3 years.

Comprehensive laboratory testing is planned to characterize the brittle fracturing at the micro scale. In addition, advanced numerical modeling will be carried out to evaluate the current modeling capabilities to simulate the EDZ around tunnels.

The main objectives of the PRECODE experiment are to understand:

(1) short-term rock mass behavior and EDZ formation during tunneling

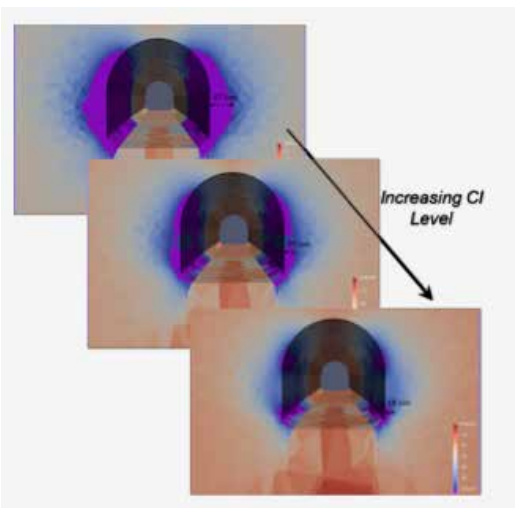
(2) long-term fracture propagation within the EDZ associated with environmental conditions (fluctuations in humidity and temperature)

(3) permeability evolution around an open excavation

(4) the impact of tunneling on potential dislocations of nearby fault zones

On 28th June 2024, the drilling blast of the first meters stopped and the PRECODE soft excavation started.

Laser scanning carried out from TM 2000 to 4000 m



Stimulation of the impact of tunneling

Geothermal testbed

M0 experiment

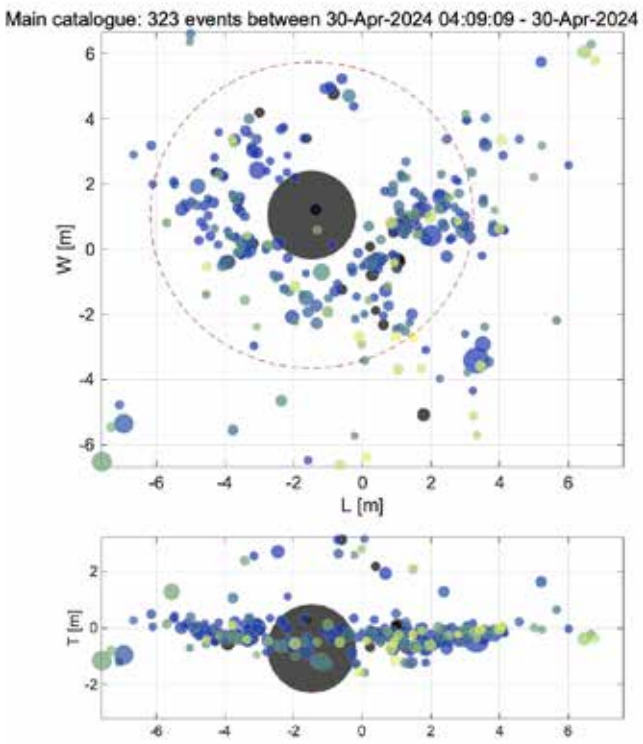
At the end of April, the BedrettoLab team successfully conducted the M0 experiment, the first long-term injection experiment in the framework of the FEAR project. The experiment lasted several days aiming to generate an earthquake of about magnitude 0 and monitor it from close by.

Following a week of preliminary tests and a four-day preparation phase, high-pressure hydraulic stimulation commenced, with around-the-clock real-time monitoring. The target earthquake occurred at 6 o'clock in the morning of 30 April, somewhat earlier than expected, achieving the experiment's goal and prompting the cessation of injection.

In an earthquake of this magnitude, the rock moves along a plane by about 1-2 millimeters over an area of roughly 5-by-5 meters. This rupture lasts only a millisecond and radiates seismic waves, which our sensitive monitoring arrays are designed to capture. The waves are much too weak to be felt at the surface.

The seismology team uses these detailed recordings of such a small event to study the physical processes that occur during an earthquake.

A better understanding of such processes may lead to improvements in earthquake risk mitigation and management in the future. It also contributes to better management of induced seismicity related to deep geothermal energy projects. The team is analyzing and modeling the collected data to prepare the next long-term injection experiment (M1) scheduled for autumn.



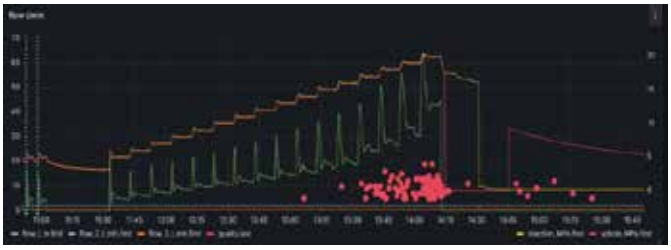
Remote Control

Before the M0 experiment, technicians and engineers used a screw wrench to adjust the flow board (as shown in the photo). Since March 2024, small motors are remotely activated from a computer in Zurich to operate the valves and pumps. With the M0 experiment conducted in April 2024 and more large-scale experiments planned, these motors and their remote-control system significantly enhance the safety and reproducibility of experiments.

Personnel no longer need to be physically present in the laboratory; all processes can be managed and monitored remotely from Zurich. Moreover, the remote adjustment of valves is far more precise than manual adjustments with a wrench, which is crucial for the reproducibility of experiments.

This new experimental setup also broadens the BedrettoLab's offerings, enabling external research groups to conduct experiments without needing to travel to Switzerland.

The flowboard including the remotely controlled motors



The dashboard for monitoring the experimental volume

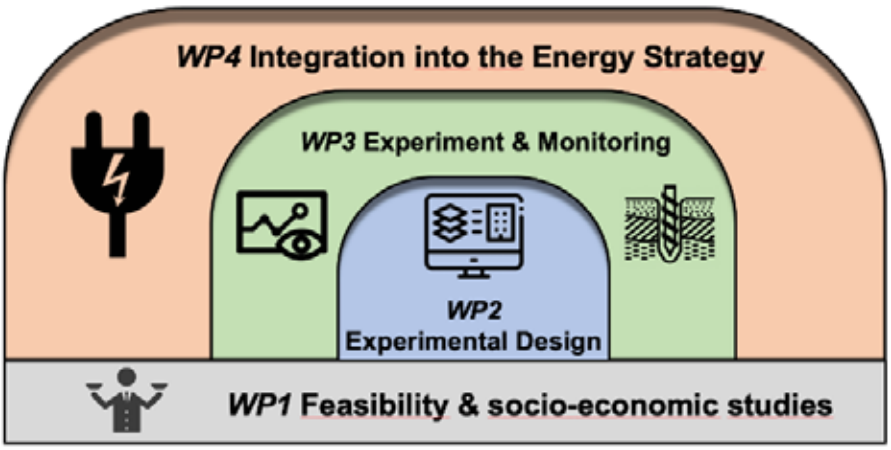
BEACH

The project kick off happened this year in April. The consortium consists of scientists from the BedrettoLab, the Geothermal Energy and Geofluids group at ETH Zurich, researchers from SUPSI, and industry experts from Azienda Elettrica Ticinese (AET) as well as Geo-Energie Suisse (GES).

While thermal energy storage in soft sediments (e.g. in the Netherlands) is well established, storing heat in the hard, fractured rock most common in Switzerland remains largely unexplored. The BEACH project will explore a so-called fractured thermal energy storage in the limited permeability of the crystalline rocks in the BedrettoLab.

For demonstrating the feasibility, warm water (30 - 70 °C) will be injected into existing fractures, where it will be stored and kept warm by the surrounding rock until it will be retrieved again. In a real-world roll-out scenario, the heat could then be converted into energy or used for district heating.

The project is devided in 4 work packages, defined in the figure below. We will enter phase 2 with experiemnt by December 2024-January 2025.



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Deep Life Observatory

The **Deep Life Observatory** (**DELOS**) of the BedrettoLab was established in 2021 to study organisms living at the energy limit of life.

Over the last year, the Geobiology team, together with the BedrettoLab team and in collaboration with the Geomicrobiology Research Group from Friedrich Schiller University Jena, embarked on a week-long scientific experiment to unravel the unknowns of deep groundwater carbon fixation rates as part of efforts to elucidate deep dark carbon cycling processes.

Additionally, research attention was paid to understanding the evolution of life by tracing and cultivating uncharacterized bacteria in the groundwater through rock fractures.

Moreover, the Geobiology team was closely involved in monitoring geochemical changes and the alteration of indigenous microbial community structure during the first long-term hydraulic injection experiment in the BedrettoLab.

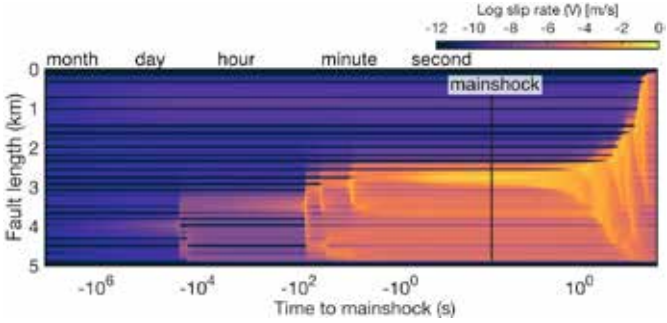
Collecting water sample with uncharacterized bacteria.

Biogeochemical monitoring setup at the injection tank during the hydraulic stimulation

Other projects

DT-GEO & Digital Twins

Within project **DT-Geo** data from the various stimulation experiments which generate huge data sets (e.g. 70'000 seismic events during the recent M0 experiments) is used to improve the data driven modeling to create a digital twin. This will enter in the EU flagship initiative "Destination Earth" (DestinE).



The hydro-mechanical modeling of foreshock-mainshock sequences in a fault zone reveals that heterogeneity in hydraulic properties, such as permeability, significantly influences seismic behavior. The simulation demonstrates slip rate acceleration during foreshock sequences, occurring over days to a month, which ultimately culminates in a mainshock and complete dynamic rupture of the fault.

TIMBER

The **Timber (TiltMeter Inference In BEdRetto)** project makes use of high-precision borehole tiltmeters to infer fault-slip mechanisms and characterise the stresses and fluid flow in fractured geothermal systems. Borehole tiltmeters measure the tilt of the ground with nano-radian precision such that they can detect deformations arising from the tides compacting on the continent. In collaboration with CSIRO (Commonwealth Scientific and Industrial Research Organisation), the Australian research institute, project TIMBER has installed three borehole tiltmeters to infer subtle changes in pressure and fault-slip as a result of tunnel excavations and fluid injection into fractured rock. The insights from tiltmeters are aiding the development of tools for the monitoring and characterisation of fractured geothermal systems, tunnelling processes, and fault-slip mechanisms.

DAMOCLES

Project **DAMOCLES (Data Management Concept for Underground Laboratories)** financed by the ORD programm of Swiss Universities aims at organizing and standardizing data collected at the BedrettoLab to facilitate open data access.

Key aspects are a systematic data workflow (acquisition, transfer, storage and dissemination) to produce exchangeable and comparable data. With the BedrettoLab as a young research facility, there is the opportunity to develop a prototype workflow for a state-of-the-art data management structure which is applicable in other underground laboratories. Ideally, the results of the project provide the basis for a standardization of data workflows for underground laboratories in Switzerland.

Geo-INQUIRE

In the framework of EU Project Geo-INQUIRE (www.geo-inquire.eu) the BedrettoLab will provide physical and virtual access to the infrastructure and data for other research institutions or projects.

The third call for proposals to access to the BedrettoLab will open in October 2024. With this project, new partnerships and projects are attracted and are likely to be carried out in the BedrettoLab.

OPOSSUM

Within project **"Ultra-sensitive photonics accelerometers for next generation seismic sensor networks (OPOSSUM)"**, the Swiss Seismological Service (SED) and the BedrettoLab team, in collaboration with the Centre Suisse d'Electronique et de Microtechnique (CSEM), is developing a new optomechanical accelerometer to measure high-frequency acceleration.

Over the summer months, under the leadership of CSEM, the first generation of OPOSSUM optomechanical accelerometer chips for the project have been successfully fabricated. After further modifications, testing and packaging a testing phase in the BedrettoLab is about to start.

ArtEmis & MiniRuedi

The **ArtEmis** project is a European collaboration project intended to design, build, and operate a multi-sensor system comprising of more than 100 sensors, which determine radon (Rn) concentrations in groundwater.

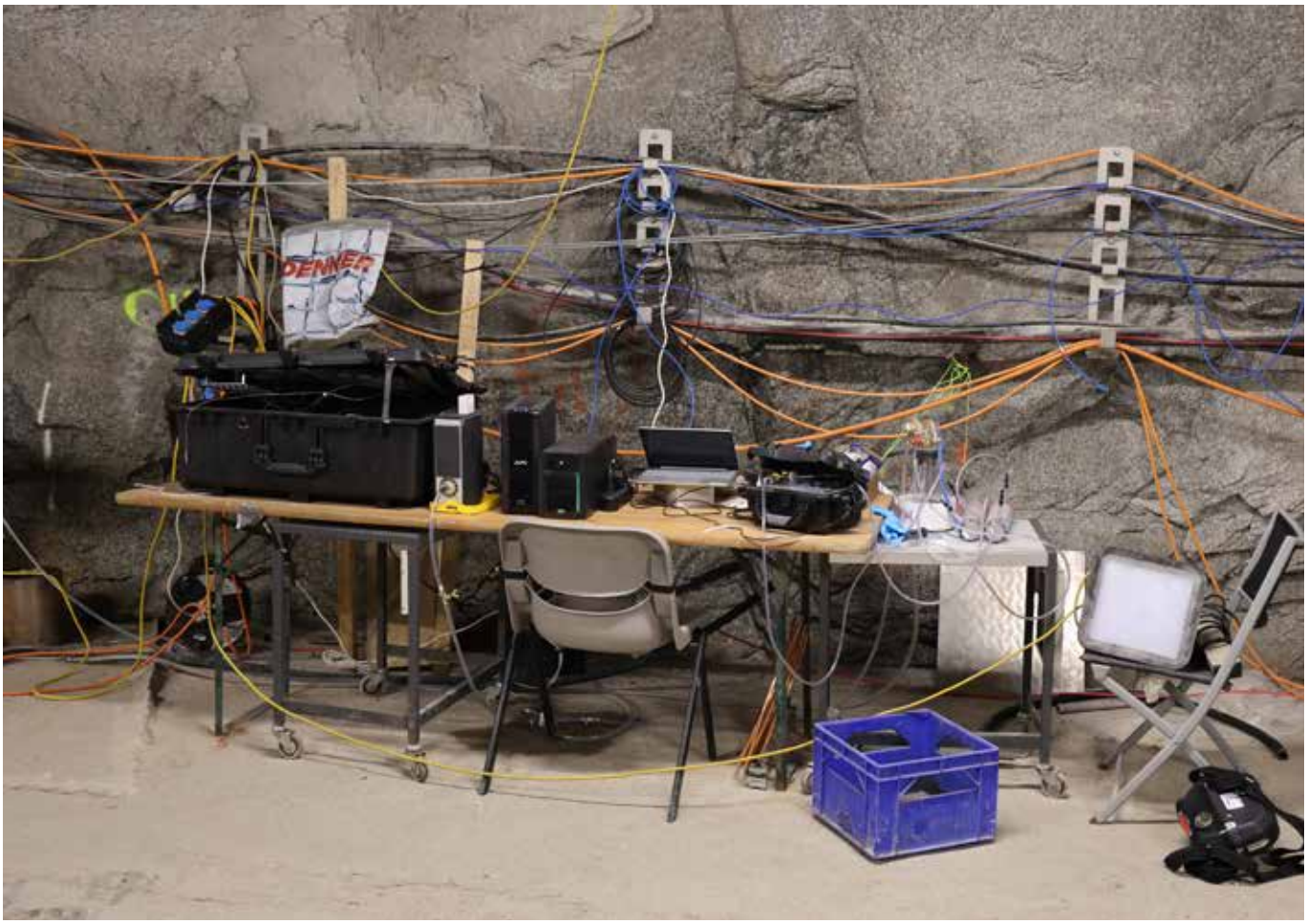
It tests if changes in radon concentrations can be used as potential precursors to earthquakes by feeding measurement data into machine learning algorithms and correlate them to seismic data.

The **ArtEmis (Awareness and Resilience Through European Multi-Sensor System)** sensor, designed for continuous monitoring of radon, temperature, and acidity in groundwater, was installed during the M0 experiment in Bedretto. It was done in the hopes to observe the changes in the previously mentionned observables in relation to induced earthquakes.

The ArtEmis project additionally plans to expand sensor usage to monitor such observables for natural seismic events, and has already identified several sites in the Valais region for additional sensor placements.

On the side of that project, a portable mass spectrometer (MiniRuedi) is in place in the tunnel. It measures the changes in the dissolved gas partial pressures (He, Kr, Ar, N_2, CO_2, O_2) at the ST2 borehole. Some changes were already obeserved as water was injected into ST1 on 25.04.2024 for the M0 experiment.

In the preparation of the FEAR experiment both Artemis and MiniRuedi sensors will be deployed in the region of boreholes BFE_5 and BFE_6 where the injection will occur.



MiniRuedi set up in the lab.

Events & Visits

Mangia & Cammina

The BedrettoLab took part at the Mangia & Cammina event on August 13, 2023. The event organized by a local commitee brings around 1,400 visitors to the Bedretto valley. On a dedicated path, the visitors are served local specialties at different alps. Their 9 km long path ends at the BedrettoLab. It has become a new tradition and BedrettoLab will participate in 2024's edition as well.

Service for St. Barbara on 4 December

Celebration of St. Barbara

Every year, a service is held in honor of Saint Barbara, the patron saint of miners on the 4th of December.

ETH's Robotic Systems Lab in the BedrettoLab

In January, a group from ETH Zurich's Robotic Systems Lab tested their wheeled-legged robot Chimera in the BedrettoLab. The robot is trained to serve for rescuing, logistics or monitoring in environments that are not accessible for humans. The BedrettoLab and the area in front of the tunnel entry proved to be an ideal environment for testing the robot's locomotion and navigation capabilities in complex conditions.

Robot Chimera from ETH's Robotic Systems Lab at a test run in the BedrettoLab

Bedretto Science Days

Over the last year two “Bedretto Science Days” took place in September 2023 and June 2024. These events help to give other team members an overview over ongoing research and proved to stimulate fruitful discussions.

Doctoral student Miriam Schwarz presents her work during a pico session at the Bedretto Science Day

ETH Foundation

As part of their yearly retreat, the ETH Foundation visited the BedrettoLab on June 25th.

ETH Foundation at the BedrettoLab

Eawag PhD student’s retreat

As part of their retreat, some PhD students visited the BedrettoLab on April 12th.

FEAR Annual Meeting 2024

From March 13 – March 15, 2024, the 4th FEAR annual meeting took place in Aachen.

Sasso San Gottardo: Training day of the new guides

On July 3, the museum guides of Sasso San Gottardo did a training day at the BedrettoLab as they will be guiding the public tours in the future.

Our lab manager, Marian Hertrich, told them all they need to know about research, history and safety. Our geologist Alba Zappone explained the geology of the tunnel.

The guides of the museum Sasso San Gottardo at the BedrettoLab

Outreach

Bedretto Lab

Il Gazzettino di Bedretto

Numero 4 (Gennaio 2024)

Cari residenti di Bedretto, cari lettori,

Siamo lieti di presentarvi la quarta edizione del Gazzettino. In questo numero vi parleremo di un nuovo ambito di ricerca del BedrettoLab: la geobiologia. Cara Magnabosco, professoressa di geobiologia presso l'ETH di Zurigo, ci descrive il suo ambito specialistico e ci guida in un viaggio dalle profondità del Laboratorio sotterraneo Bedretto fino ai confini dell'Universo. Inoltre, come sempre presentiamo altre attività di ricerca dei membri del nostro team e tracciamo un bilancio di quest'anno, con i suoi eventi e le sue visite.

Vi auguriamo una buona lettura!

Il team del BedrettoLab

Uno sguardo in profondità su rocce e pianeti lontani: la ricerca geobiologica nel BedrettoLab

Cara Magnabosco è professoressa di geobiologia e con il suo gruppo conduce ricerche presso il BedrettoLab. In particolare Cara è interessata agli ambienti sotterranei e cerca forme di vita semplici come batteri o altri microrganismi in grado di sopravvivere respirando le rocce. Una delle questioni fondamentali sulle quali sta indagando riguarda le condizioni in cui la vita è in grado di emergere o sussistere. Nel BedrettoLab lei e il suo team hanno già individuato alcuni microrganismi rari e affascinanti e stanno effettuando diversi esperimenti per approfondire le conoscenze sul loro modo di vivere.

Di cosa si occupa la tua ricerca al BedrettoLab?

Il mio percorso di ricerca presso il BedrettoLab ha avuto inizio nel 2020. In generale, nel mio campo non è facile avere accesso agli ecosistemi profondi. Il fatto di essere così vicina al BedrettoLab e di avere la possibilità quasi permanente di accedervi e quindi un'opportunità eccellente. All'inizio volevamo solo scoprire che cosa c'era nei pozzi e nell'acqua che scorre attraverso le diverse fratture. Abbiamo iniziato a prelevare diversi campioni di acque per farci un'idea della sua origine e delle sue proprietà chimiche. Il nostro obiettivo è identificare le fonti di energia nell'acqua o sulla superficie rocciosa in grado di nutrire i microrganismi. Tra queste si annoverano ad esempio CO_2 e azoto, rintracciabili in quantità diverse in tutto il tunnel.

Una volta avuta un'idea più precisa su cosa c'era, abbiamo iniziato anche a esaminare gli effetti della stimolazione idraulica sul microbioma, ossia sui microrganismi esistenti in un particolare ambiente. Durante le stimolazioni abbiamo osservato dei cambiamenti nelle proprietà

Il Gazzettino di Bedretto

Il Gazzettino di Bedretto adresses the population of the Bedretto Valley and region. It has been published in January 24 (4th issue)

BedrettoLab in the Media

The BedrettoLab is often visited by the media. Here is a selection of articles or videos published during the year:

- Arbeiten nah am Epizentrum (Schweizer Familie / Tages-Anzeiger, 03.09.2024, in German)
- Wärmespeicherung im Gestein (10vor10, SRF, 02.08.2024, in German)
- Il papà (buono) dei terremoti (Corriere del Ticino - La Domenica, 02.06.2024, in Italian)
- Il laboratorio in cui si innescano terremoti: cos'è e a cosa serve il progetto FEAR (Geopop.it, 06.03.2024, video in Italian)
- Digital Twins: affrontare i terremoti in tempo reale; Luca Dal Zilio | TEDxTreviso (TED Talk, in Italian)

Public visits: New collaboration with Sasso San Gottardo

Due to the high demand in visits at the BedrettoLab, a new collaboration with the nearby museum Sasso San Gottardo enables public visits during weekends starting from July 2024.

The public visitor days will take place on three Saturdays in summer and autumn: 20 July, 3 August and 28 September. These three dates serve as a pilot phase aiming at offering more visits in the future. Ticket sale and administration is carried out by Sasso San Gottardo.

Besides these visitor days, a company excursion and a local comittee have already been scheduled for late summer and autumn and will be carried out by the Sasso guides.

Education

During the last year, the BedrettoLab hosted the following courses:

- the **case studies course of the Joint Master in Applied Geophysics** where the students visited the Swiss Underground Rock Laboratories Grimsel, Mont Terri and the BedrettoLab
- the **borehole geophysics lecture** (ETH) with some visiting students from EPFL (Engineering geology for geoenergy)
- the final meeting of the **EasyGo** students

The **first doctoral thesis** focusing on processes investigated in the BedrettoLab has been finalized at the end of 2023 by **Kai Bröker**.

Kai Bröker defended his thesis titled *"From stress field heterogeneity to hydraulic stimulation mechanisms: Insights from a hectometer-scale fractured rock mass." in December 23 successfully.*

He continues his research in the BedrettoLab as a postdoctoral researcher at the Center for Hydrogeology and Geothermics at Université de Neuchâtel.

The following students have finalized their **Master's theses** with projects involving the BedrettoLab:

- Theo Halter: "*Exploring the Feasibility of Energy Extraction from the Bedretto Tunnel in Switzerland."*
- Yige Zhang: "*Distributed strain sensing and seismic localities for connectivity of injection-stimulated boreholes in BedrettoLab."*

Kai Bröker (right)

Ongoing **doctoral theses** in the BedrettoLab:

- Martina Rosskopf: "*Seismicity analysis during hydraulic stimulations."*
- Miriam Schwarz: "*Illuminating hydraulic stimulation processes by advanced seismic techniques."*
- Victor Clasen Repollés: "*Multi-scale performance evaluation of different induced seismicity forecasting models."*
- Daniel Escallon: "*Quantifying Fracture Geometry and Heterogeneity in Rock Reservoirs Using GPR."*
- Kathrin Behnen: "*Investigation of seismic anisotropy in the BedrettoLab."*
- Aurora Lambiase: "*The seismic signatures of aseismic processes."*
- Lu Tian: *"Unveiling the Seismic Signatures of Fault Activation."*
- Danyang Jiang: "Physics-based modeling of fault reactivation"
- Jiayi Ye: *"Integrating hydro- and thermo-mechanical processes in fault slip dynamics."*

Personnel

In November 2023, **Georgia Cua** started as administrative assistant of the BedrettoLab.

In the same month, **Aurora Lambiase** started with her doctoral thesis at the BedrettoLab.

Georgia Cua

In May 2024, **Mathilde Wimez** started as a new project manager in the BedrettoLab.

She is working partly in Bedretto and partly in Zurich. We wish her a great start in the Bedretto family.

Mathilde Wimez

In October 2024 **Liliana Vargas Melez** will be joining the Bedretto team as Data Manager. We are looking forward to her arrival.

Liliana Vargas Melez

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