

DEEP 2023 Annual Meeting

**5 - 7 July 2023, Zürich, Switzerland**

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**Preamble**

DEEP project	
Project acronym	DEEP (Innovation for <b>De</b> -risking <b>Enhanced</b> Geothermal <b>Energy</b> <b>Projects</b> )
Date	05.07.2023 – 07.07.2023
Venue	ETH Zürich Main Campus: ML Building (Room E12)

Dear DEEP participants,

We are happy to share with you the agenda for the 3 days meeting on 5-7 July in Zürich.

The key objectives of the meeting are:

- 1) To update everybody on what has happened in the tasks and WPs in the past months.
- 2) To plan the next 12 months, the most critical time for DEEP, when we need to wrap up our activities and to ensure a lasting impact beyond DEEP. This implies a strong focus on highlights and operational services.
- 3) To look beyond DEEP, connect what we do to other ongoing and upcoming projects in our domain and discuss interesting science.
- 4) To network, exchange and enjoy an in-person meeting!

To meet the objectives, we plan short presentations that look back and look forwards, interactive, and cross-cutting discussion rounds. We plan also a field trip to the Bedretto Underground Lab at the beginning of the meeting, this is a friendly time for networking while learning about the activities and ongoing experiments at the Switzerland's newest underground rock laboratory. The next few pages explain the locations of the venue and events as well as include a list of hotels nearby. For the actual agenda, please jump to page 4. Your feedback and suggestions are highly appreciated.

Looking forward to see you all again in Zürich!

Federica, Stefan & Banu

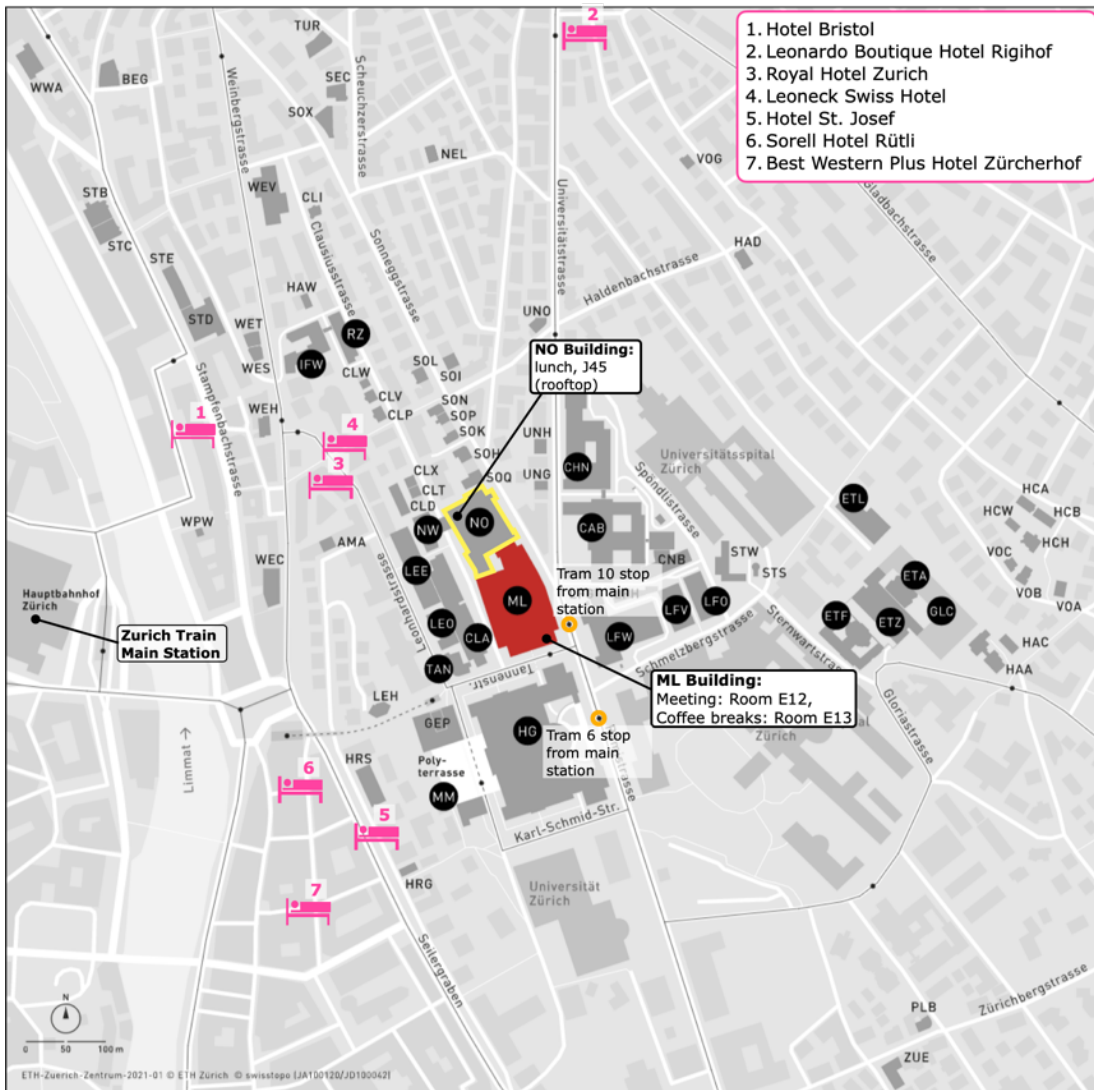
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This project has been subsidized through the Cofund GEOTHERMICA, which is supported by the European Union's HORIZON 2020 programme for research, technological development and demonstration under grant agreement No 731117.

## Location of Venue on Map



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## Location & Transportation

**Venue:** ETH Zürich, ML Building, Room E 12

**Address:** Sonneggstrasse 3, 8092, Zürich, Switzerland

**How to find us:** <https://idsc.ethz.ch/the-institute/how-to-find-us.html>

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## List of Accommodations options near the event venue

There are many hotels or Airbnb in Zürich, and most of you prefer to book online. We have not made reservation, but we do list a few hotels that are well located. All of the following accommodations are available at booking.com or other search engines:

1. Hotel Bristol
2. Leonardo Boutique Hotel Righihof
3. Royal Hotel Zürich
4. Leoneck Swiss Hotel

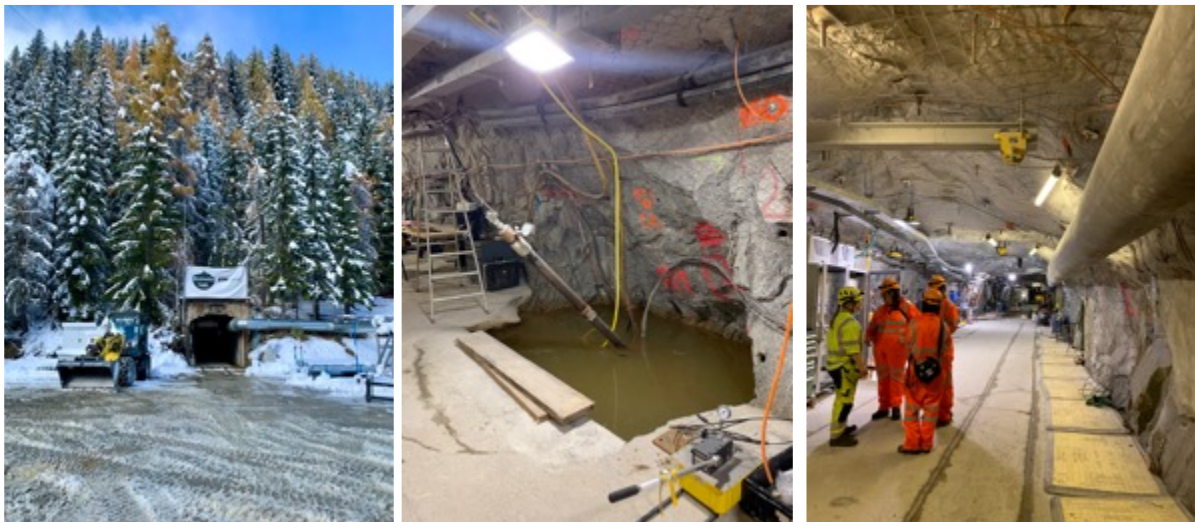
5. Hotel St. Josef
6. Sorell Hotel Rütli
7. Best Western Plus Hotel Zürcherhof)

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### Field Trip on Day 1: Field trip to the Bedretto Underground Lab

The BedrettoLab has now been in operation for four years and has become a unique underground laboratory run by ETH Zurich. It offers a wide range of possibilities for research in the fields of earthquake physics, geothermal energy and geobiology. In addition to the state-of-the-art research infrastructures of the underground laboratory, the Bedretto tunnel offers an exciting chance to walk through the deep geology of the Alps.

The field trip will include a series of talks on Bedretto Lab's history and current research activities and experiments, as well as a visit to the laboratory which is located 2.5 km from the entrance of the tunnel. Note that the laboratory is reachable only by foot. Please wear sturdy shoes, like hiking boots. The temperature in the tunnel is about 15° C, please dress accordingly. You will be equipped with a helmet and a safety vest which must be worn at all times.



Website: <http://www.bedrettolab.ethz.ch/en/home/>

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### Social Event on Day 2: Dinner at Gasthof Falken-Wiedikon

**Address:** Birmensdorferstrasse 150 8003 Zürich

**Website:** <https://www.falken-wiedikon.ch/>



## Agenda

### Day 1 - Wednesday 5 July 2023

#### Field Trip to Bedretto Lab – Full Day

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##### Morning

- 8:05 - 10:28 Travel to Bedretto, Bivio per Ronco via train and bus
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- 10:30 - 10:45 Safety briefing + equipment (helmet, safety, vest, flashlight)
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- 10:45 - 12:30 Visit in the tunnel (ca. 5 km walking in & out)
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*12:30 - 13:00 Organized lunch (sandwiches)*

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##### Afternoon

- 13:00 – 14:30 Talks (~15 minutes + Q&A)
- Marian Hertrich: history of the BedrettoLab
  - Stefan Wiemer: current projects led by ETH (FEAR, VALTER, PRE-CODE)
  - Peter Meier: main activities led by GES
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14:32 – 16:55 Return to Zürich via bus and train

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## Day 2 - Thursday 6 July 2023

\*Each time slot is 15 mins (including questions)

<b>8:30 – 9:00</b> <i>Coffee/ light breakfast</i>		
9:00 – 9:10	Welcome by Project Coordinator	Stefan Wiemer (ETH)
<b>Session on Microseismic Monitoring: Catalogs</b>		
9:10 – 9:25	GES microseismic processing and event distribution update of the Utah FORGE April 2022 16A stimulation monitoring	Ben Dyer (GES)
9:25 – 9:40	Microseismic monitoring processing for real-time catalogs with SeisComp: application to the Utah FORGE 2022 stimulation	Federica Lanza (ETH)
9:40 – 9:55	A First Glimpse into the DEEP High-Resolution Earthquake Catalog at Utah FORGE EGS Site	Peidong Shi (ETH)
9:55 – 10:10	Clustering analysis of microseisms generated during the Utah FORGE 2022 stimulation recorded by downhole geophones	Nori Nakata (LBNL)
<b>10:10 – 10:30</b>	Discussion on microseismic monitoring methods (focus: borehole geophones)	All
<b>10:30 – 11:00</b> <i>Coffee break</i>		
<b>Session on Microseismic Monitoring: Catalogs (continued)</b>		
11:00 – 11:15	QuakeMatch: a Swiss-army-knife python toolbox to enhance microearthquake sequence analysis.	Tania Toledo (ETH)
11:15 – 11:45	Seismic Monitoring at Utah FORGE: What We Have Learned and What is Next	Kris Pankow (UUTAH)
<b>11:45 – 12:30</b>	Discussion and planning of next FORGE stimulation: logistics and real-time monitoring (SeisComp, geophones, DAS, nodal arrays)	All
<b>12:30 – 14:00</b> <i>Lunch break: organized lunch in NO J45 (rooftop)</i>		
<b>Session on Microseismic Monitoring: Arrays</b>		
14:00 – 14:15	Potentials and limitations of nodal patches for cost-efficient monitoring of EGS-induced seismicity <b>*invited</b>	Peter Niemz (UUTAH)
14:15 – 14:30	Mini seismic arrays (France/ FORGE)	Remi Fiori (EOST)
14:30 – 14:45	Seismic field array experiment at the Haute-Sorne geothermal site, Switzerland	Ben Dyer (GES)
<b>14:45 – 15:00</b>	Discussion on microseismic monitoring methods (focus: surface arrays)	All
<b>Session on Distributed Acoustic Sensing (DAS)</b>		
15:00 – 15:15	Full wavefield modeling of DAS	Nicolas Celli (DIAS)
15:15 – 15:30	Borehole DAS	Katinka Tuinstra (ETH)
<b>15:30 – 15:45</b>	Discussion on DAS as passive microseismic monitoring tool	All
<b>15:45 – 16:15</b> <i>Coffee break</i>		
<b>Session on Imaging/ waveform modeling</b>		
16:15 – 16:30	VSP survey	Nori Nakata (LBNL)
16:30 – 16:45	P-wave tomography <b>*online</b>	Don Vasco (LBNL)
16:45 – 17:00	Synthetic continuous waveform data of induced seismicity sequences at Utah FORGE	Laura Ermert (ETH)
17:00 – 17:15	FORGE digital twin for DAS using HeidimodX	Claudia Finger (IEG)
<b>17:15 – 17:30</b>	Discussion on imaging and waveform modeling role in EGS de-risking	All
<b>18:30 – 21:00</b> <i>Organized Dinner: Gasthof Falken-Wiedikon</i>		

## Day 3 – Friday 7 July 2023

*\*Each slot is 15 mins (including questions)*

<b>8:30 – 9:00</b> <i>Coffee/ light breakfast</i>		
<b>Session on Forecasting Models/ Hazard</b>		
9:00 – 9:15	Spatio-temporal analysis of the FORGE 2022 catalogs	Luigi Passarelli (INGV)
9:15 – 9:30	Probabilistic seismic risk assessment/ Mmax models	Iason Grigoratos (ETH)
9:30 – 9:45	A multi-Lasso model to forecast induced seismicity	Arnaud Mignan
9:45 – 10:00	RT-RAMSIS: current implementation and future plans	Antonio Pio Rinaldi (ETH)
10:00 – 10:15	Rock laboratory analysis	Benedikt Ahrens (IEG)
<b>10:15 – 10:40</b>	<b>Discussion and planning of next FORGE stimulation: real-time forecasting models, operational ATLS (RT-RAMSIS)</b>	<b>All</b>
<b>10:40 – 11:10</b> <i>Coffee break</i>		
<b>Session on EGS Guidelines/Knowledge Transfer</b>		
11:10 – 11:25	General EGS Guidelines: status update	Wen Zhou (TUD)
11:25 – 11:40	Results and ongoing work on risk communication	Evelyna Trutnevyte (UNIGE)
11:40 – 12:10	GEOEBST2020+: assisting Swiss authorities in dealing with the induced seismic risk in deep geothermal projects <b>*invited</b>	Toni Kraft (ETH) & GEO-BEST team
<b>12:10 – 12:30</b>	<b>Discussion: guidelines, communication strategies and public perception towards EGS</b>	<b>All</b>
<b>12:30 – 13:00</b> <b>Recap and Goodbye</b>		