Helmholtz Innovation Lab
3D-Underground-Seismic Lab

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GI5.7 Multidisciplinary underground laboratories and test sites-what makes them tick?

Reiche Zeche, Germany

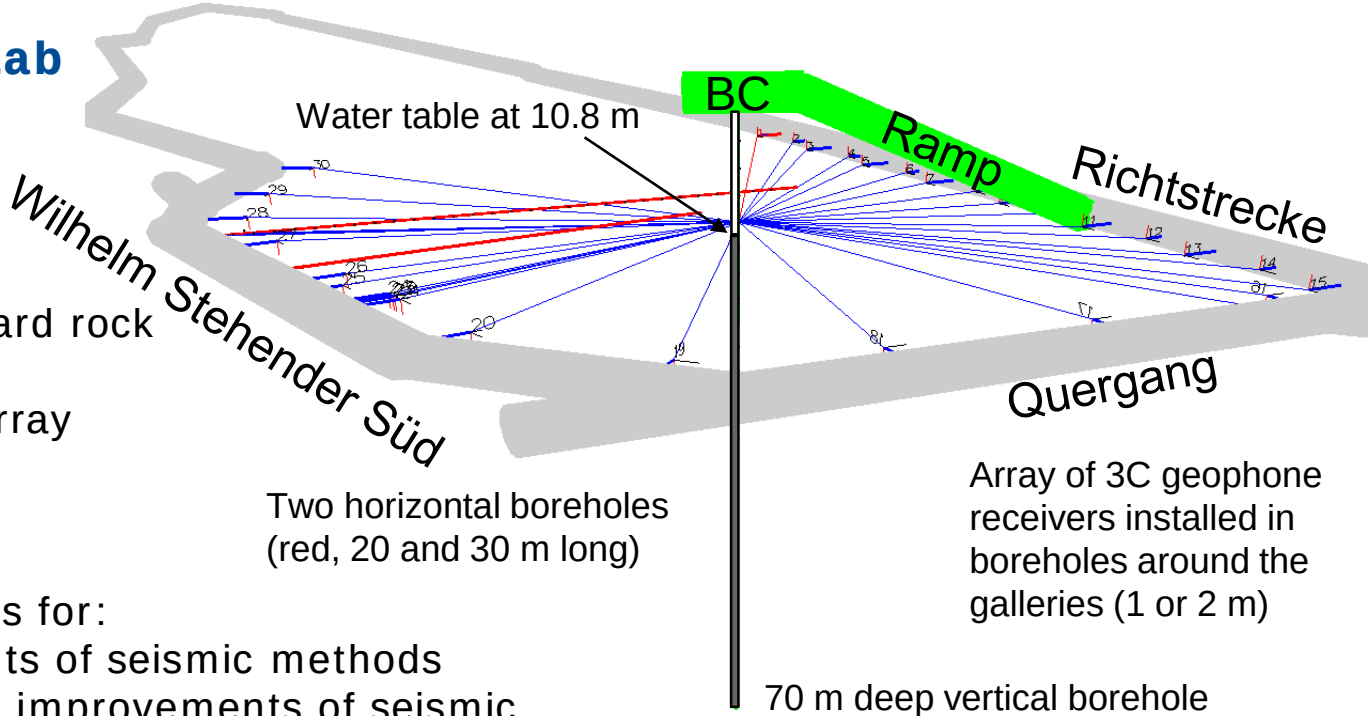
- Part of BSUIN network

- Located in Eastern Germany in Freiberg
- Former ore mine for silver
- Now research and education mine

- Rock type: Freiberger gneiss with lead-zinc deposit
- Main level at 150 m depth, down to 230 m accessible
- Good infrastructure
- Several existing underground laboratories or galleries
- Good accessibility but limitations by shaft entrance

GFZ-UndergroundLab

At Reiche Zeche



Infrastructure

- Underground lab in hard rock
- 8 1/2‘‘ boreholes
- Permanent receiver array
- Test rig for drill rods

Issues

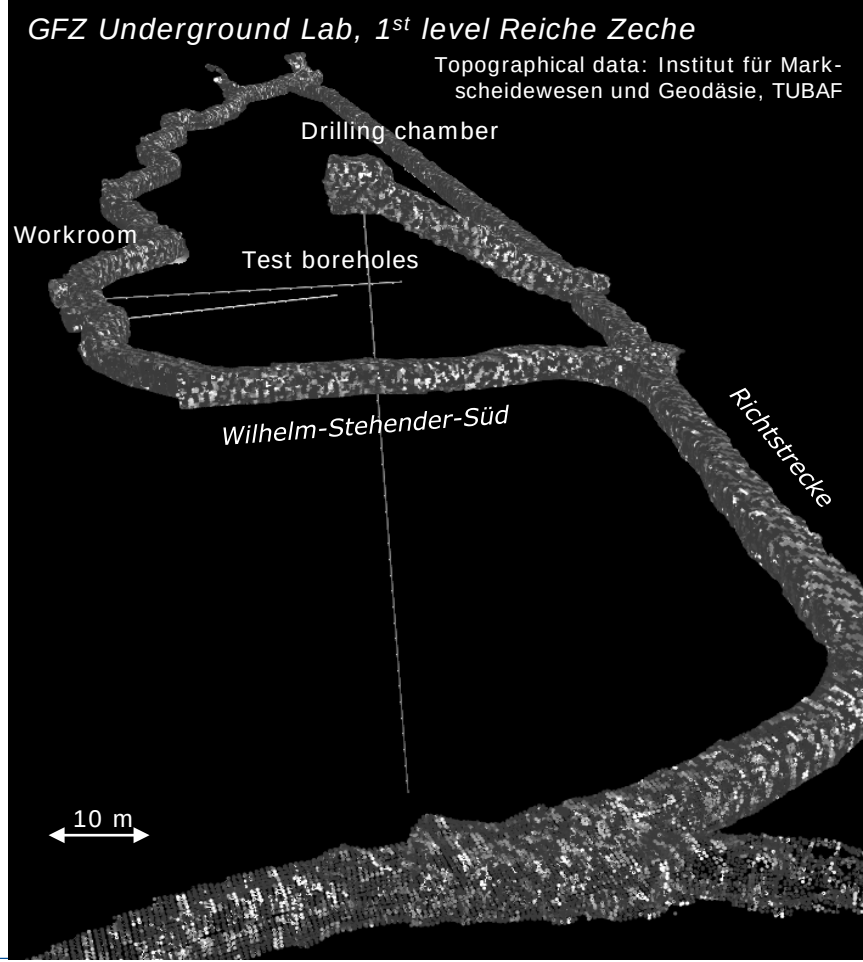
Used since over 20 years for:

- Technical developments of seismic methods
- Place for calibration & improvements of seismic measurements
- Reproducibility of seismic measurements
- Project development
- Development of new applications of seismic exploration

Key component:

GFZ Underground Lab in the Reiche Zeche mine Freiberg

- Physical place to test, evaluate and adapt new technologies for the application in drill holes and along mining surfaces under close to reality conditions
- Demonstration of newly developed hard- and software products for costumers and industrial partners (roadshows)



Example: Test of SPWD-wireline prototype at the GFZ-UndergroundLab

Helmholtz Innovation Lab 3D-Underground-Seismics
3D-US Lab

Seismic prediction while tunneling

Seismic exploration around boreholes

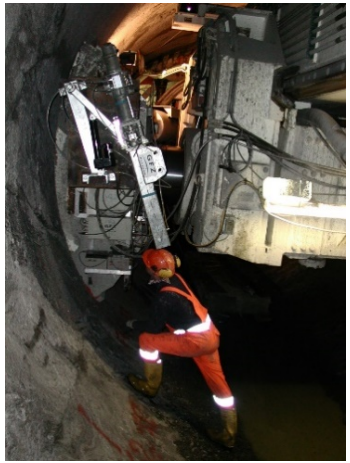
Seismic 3D-exploration in underground

GFZ-Undergroundlab at LFB Freiberg

Technology lab 3D-US within Helmholtz Association improves the effective and safe construction of underground buildings by an

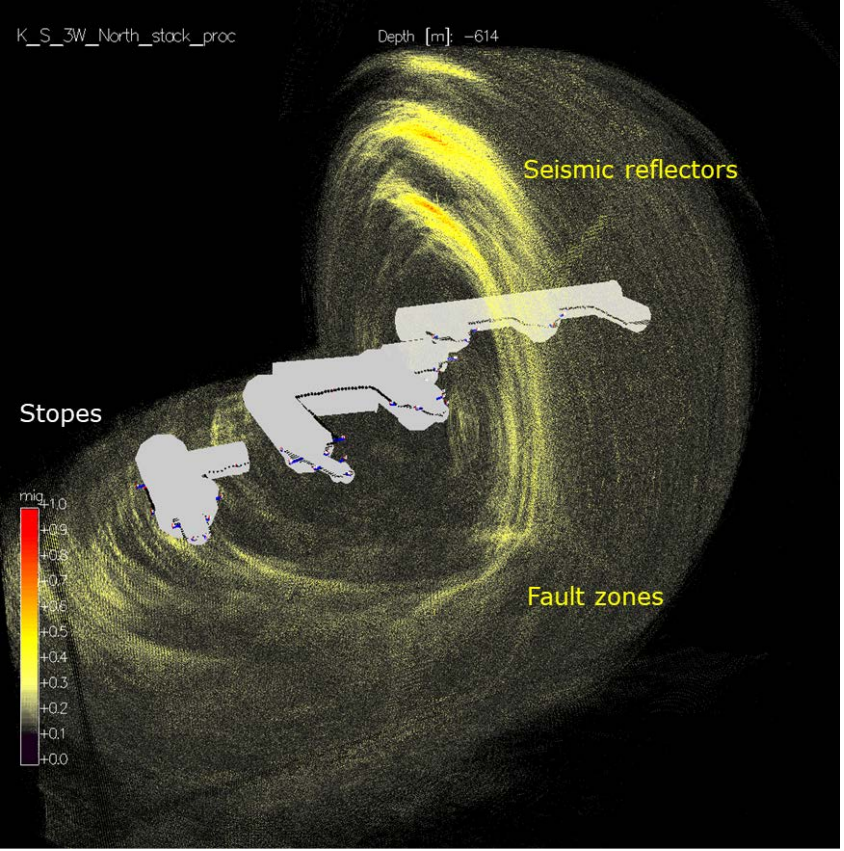
- Exploration of fluid-filled horizons and salt solution areas
- Exploration and monitoring of disposal sites of radioactive wastes
- Exploration of shafts and galleries for mining mineral resources used for digital infrastructure and E-mobility
- Exploration ahead of tunnels in the field of transport & logistics

Seismic survey in a salt mine



Exploration in boreholes in ore mine (Kiruna, Sweden)

Exploration in drill holes (PITOP, Italy)



Section of 3D data with seismic reflectors in the surrounding of salt working places

Objectives of the 3D-US Lab

- Standardisation and modularization of developed seismic methods for mines, tunnel and boreholes to an unique ***3D-US*** technology
- Establishment of ***3D-US*** as standard and key technology for an effective and secure construction of underground buildings
- Exploitation the range of underground application

Founding partners of 3D-US Lab

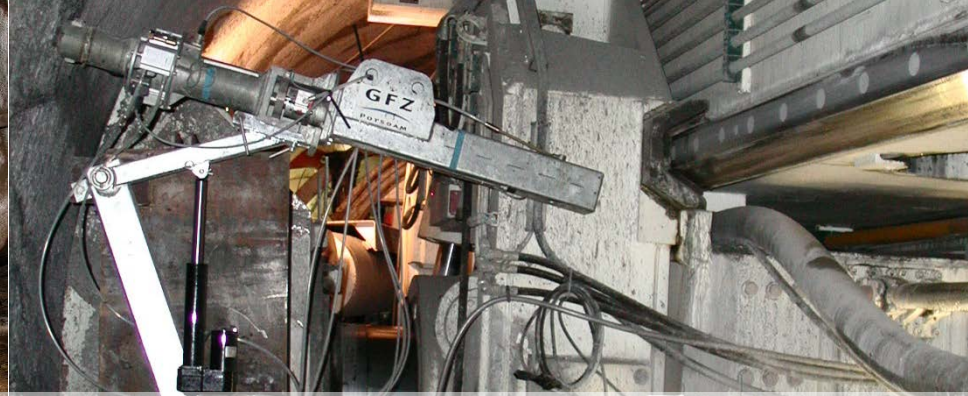
Partner	From start	Possible in future
Mining	K+S Aktiengesellschaft (K+S, **MoU**)	Glückauf Sondershausen Entwicklungs- und Sicherungsgesellschaft mbH (GSES) GTS Grube Teutschenthal Sicherungs GmbH & Co. KG
Tunneling & Logistics	Amberg Technologies (AT, **MoU**)	China Railway Construction Heavy Industry coop. limited (CRCHI)
Radwaste storage	Bundesgesellschaft für Endlagerung (BGE, **LoI**) National Cooperative for the Disposal of radioactive Waste (Nagra, **LoI**)	Luossavaara-Kiirunavaara AB (LKAB) Svensk Kärnbränslehantering AB (SKB)
Science	TU Bergakademie Freiberg (TUBAF, **LoI**) Ruhr-Universität Bochum (RUB, **LoI**)	

Summary

- **BSUIN - Networking for development of business and innovation of underground labs in the Baltic Sea**
  - **Standardization of underground labs, concepts and innovation possibilities**
  - **improvement for usage of underground labs of mines by networking, outreach and transfer of knowledge**

➢ **Initiation of Helmholtz Innovation Lab 3D-US at GFZ**

- ➢ **Openness to research opportunities**
- ➢ **Research in underground labs improves mining exploration in active mines**
- ➢ **Technology transfer of applied research**



Many thanks for your attention, Glückauf!

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