Helmholtz Innovation Lab
3D-Underground-Seismic Lab

Katrin Jaksch & Rüdiger Giese

Helmholtz Centre Potsdam
GFZ German Research Centre for Geosciences
Geomechanics & Scientific Drilling
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
GI5.7 Multidisciplinary underground laboratories and test sites-what makes them tick?

**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-Seismsics

**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
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

Section of 3D data with seismic reflectors in the surrounding of salt working places
## Founding partners of 3D-US Lab

<table>
<thead>
<tr>
<th>Partner</th>
<th>From start</th>
<th>Possible in future</th>
</tr>
</thead>
</table>
| **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)   | Luossavaara-Kiirunavaara AB (LKAB)  
Svensk Kärnbränslehantering AB (SKB)  
National Cooperative for the Disposal of radioactive Waste (Nagra, LoI) |
| **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!

contact: katrin.jaksch@gfz-potsdam.de, ruediger.giese@gfz-potsdam.de

D772 EGU 2020-2179

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