The Einstein-Telescope in the Lausitz

Exploring the universe together, shaping change and strengthening Europe.

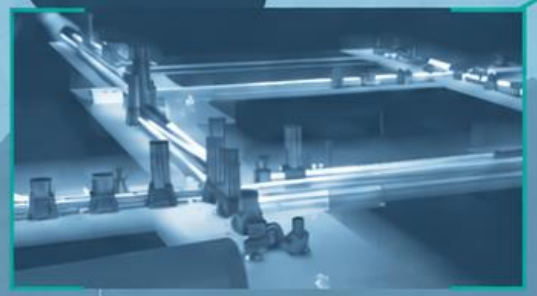
ET Lausitz-Team

ET-PP, Barcelona 02.11.2026

Einstein Telescope
Lausitz

Together for Europe





Lausitz
Saxony, Germany

Sos Enattos
Sardinia, Italy

Team Lausitz

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Project Support + Procurement TU Dresden


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Guiding our studies and this status report

The Site Selection Working Group's proposed framework - **13 criteria and 44 subcriteria organised into four subgroups** - guides our site investigations and structures the following update.

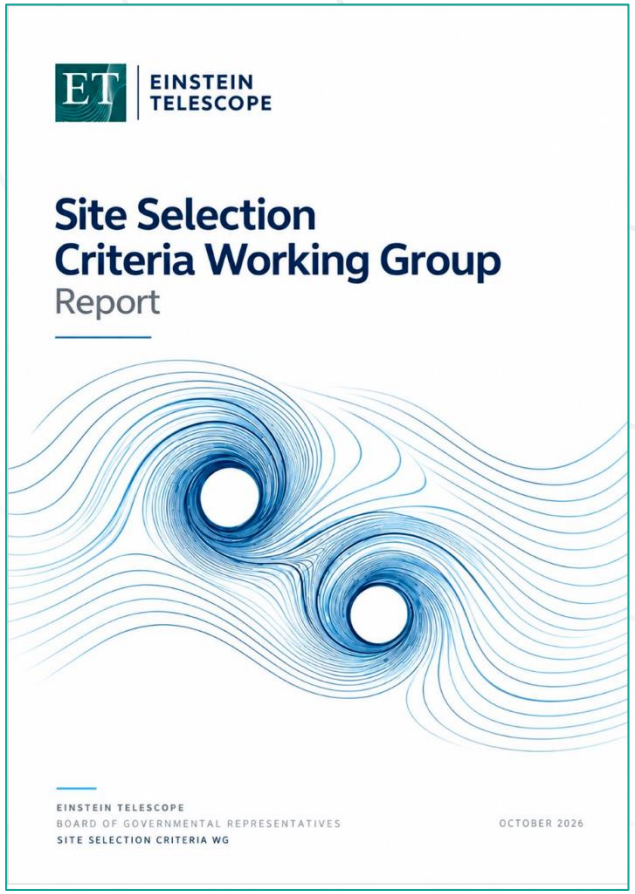
SG1 – Noise and ET performance

SG2 – Construction, environment and geology

SG3 – Costs and financing

SG4 – Contextual factors

Lusatia is progressing towards a comprehensive site assessment.



The site selection criteria

We will now focus on the status of the investigations needed to address the site selection criteria.

SG1 Site-related noise impact on ET performance

4 criteria | 13 subcriteria

C1 Seismic Noise and its Effect on ET
- Frequency band below 1 HZ
- Frequency band at or above 1Hz
- Local and regional seismicity
- Knowledge and impact of noise sources

C2 Atmospheric, Infrasound and Acoustic noise and its Effect on ET
- Atmospheric noise
- Infrastructure-generated acoustic noise
- Underground acoustic and infrasound environment

C3 Newtonian Noise and its Effect on ET
- Estimated Seismic Newtonian Noise Impact on ET Performance Before Mitigation
- Estimated Atmospheric Newtonian Noise Impact on ET Performance Before Mitigation
- Quality of the Models Used to Estimate NN and Associated Uncertainty
- Residual Newtonian Noise After Mitigation

C4 Magnetic and Electrical Noise and its Effect on ET
- Anthropogenic and Natural Magnetic and Electrical Noise
- Magnetic and Electrical Noise from the Technical Infrastructure

SG2 Civil works, environment and geology

4 criteria | 16 subcriteria

C5 Underground infrastructure & site conditions
- Underground layout including shaft/ramp/access routes, caverns, tunnels
- Underground conditions and site investigations
- Site installations and above ground structures
- Site suitability against future design changes

C6 Construction methodology & design
- Excavation and support concepts
- Groundwater control
- Ventilation concept
- Operational reliability, maintainability and long-term performance
- Safety and emergency measures
- Logistics and construction delivery

C7 Design risks & associated mitigation
- Site Specific Risks
- Resilience to Seismic Hazards
- Resilience to Climate Change

C8 Environmental impact & sustainability
- Preliminary environmental impact analysis
- Life cycle assessment (CO_2)
- Sustainability and reuse of excavated materials and groundwater

SG3 Costing and finance

2 criteria | 7 subcriteria

C9 Costing (site-dependent)
- Quality, maturity and Bill of Quantities underpinning of the cost estimate
- Treatment of site-specific risk
- Treatment of external infrastructure
- Operations costs

C10 Financing
- Financial readiness and durability of commitments
- Fiscal regime
- Permitting and construction logistics

SG4 Contextual factors

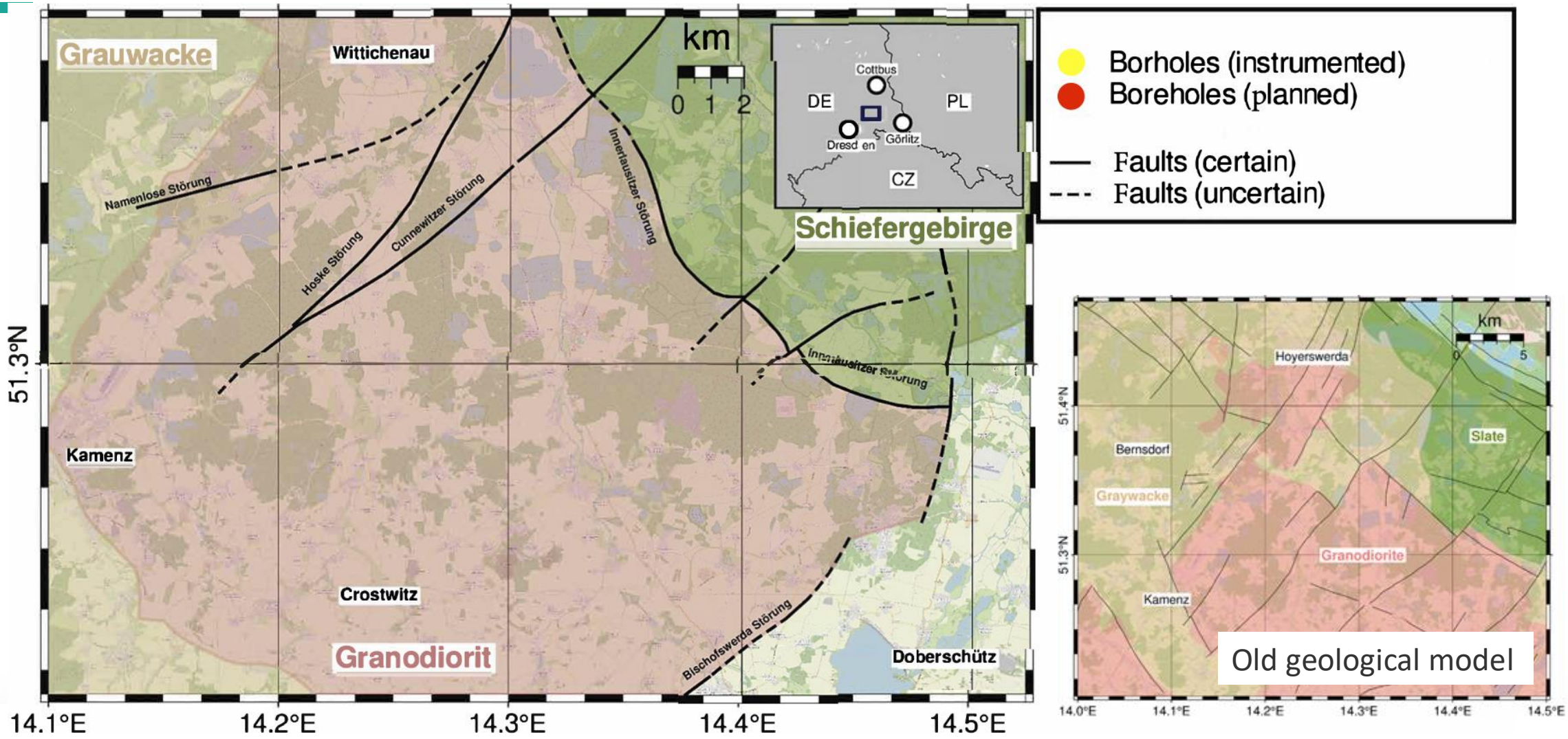
3 criteria | 8 subcriteria

C11 Institutional readiness
- Legal + regulatory capacity
- Human Capital
- Political and strategic commitment

C12 Description of the region
- Communities and locations
- Quality of life
- Staff and families

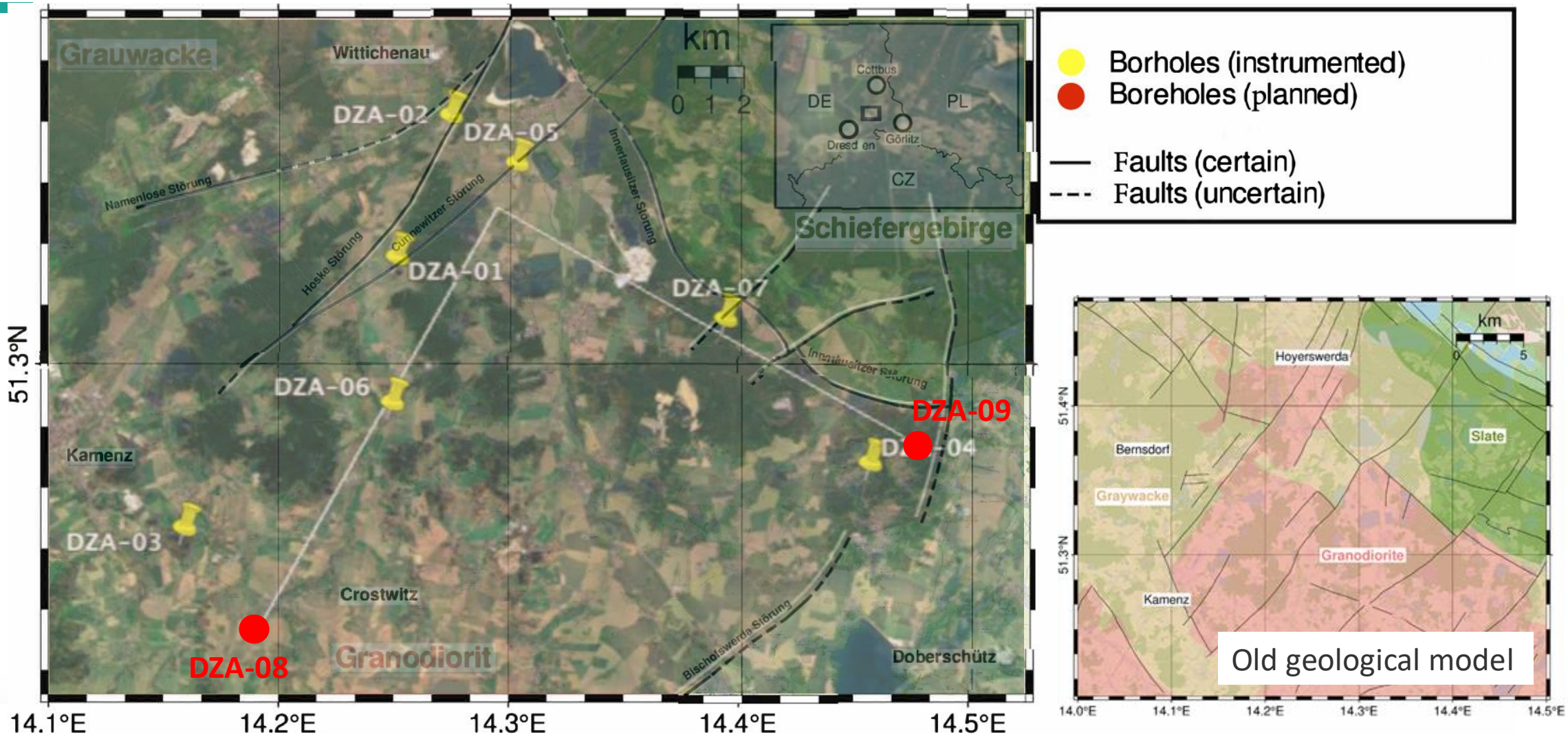
C13 Description of the ecosystem
- Innovation and research ecosystem
- Socio-economic impact of the ET

A subsurface ideally suited to build the Einstein Telescope



Old geological model

A subsurface ideally suited to build the Einstein Telescope



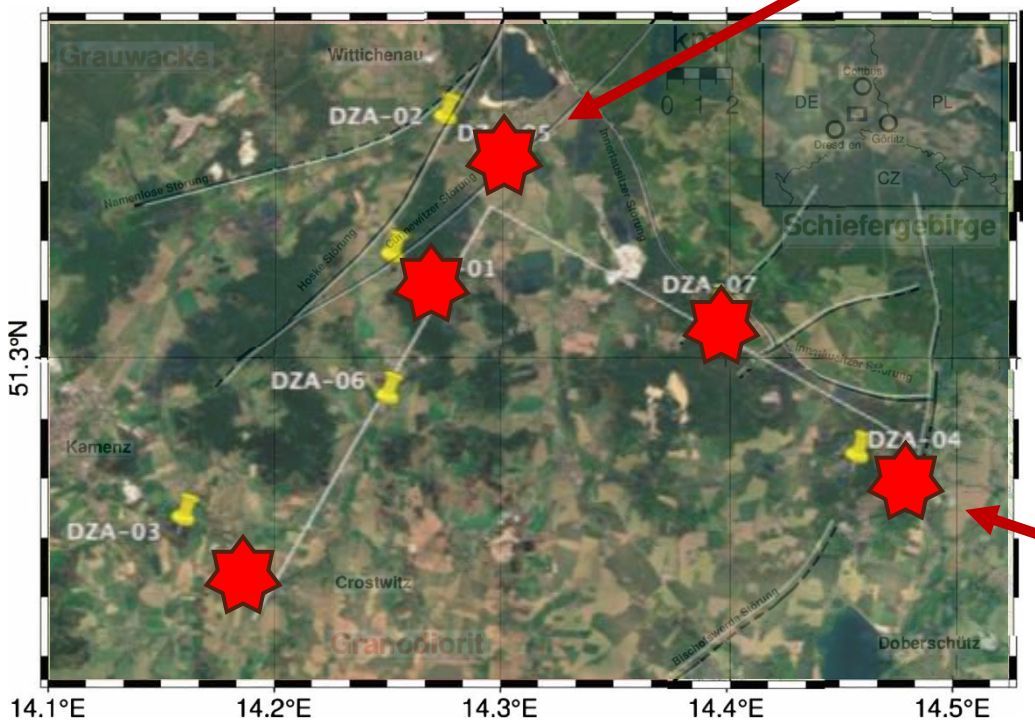
Einstein Telescope
Lausitz

MAGNETIC MEASUREMENTS

Continuous recording at DZA-01 since 12/25 (installation in cooperation with INFN)
In Aug. 2026, a 2-week-long measurement campaign at 5 locations (Ohmega Geoservices GmbH)

<u>Coming soon:</u>
Downhole measurement using newly-designed glass tube magnetic coil → transfer of magnetic noise to ET depth

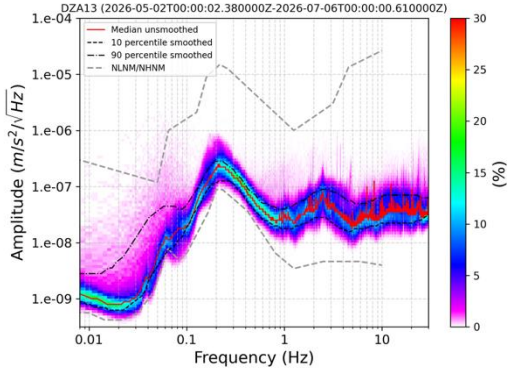
Collaboration with INFN and Ohmega GmbH

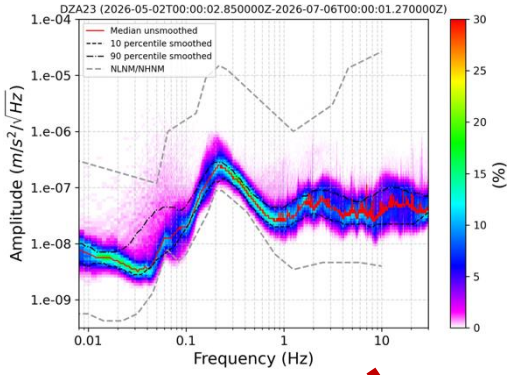


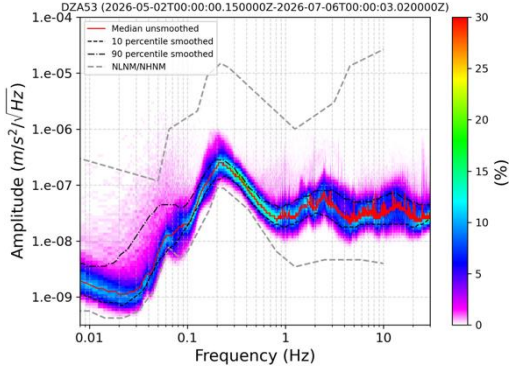


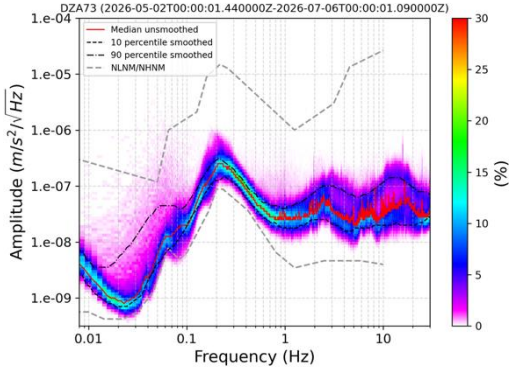


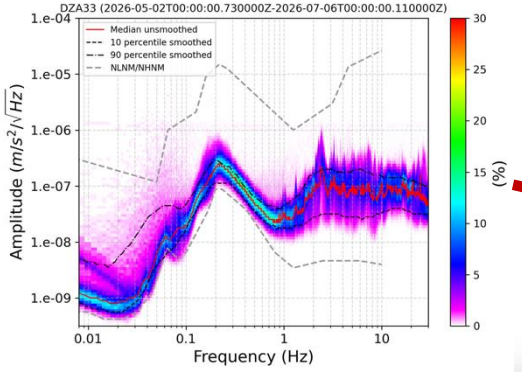
Borehole stations: 7 sites continuously running (1 in offline mode)

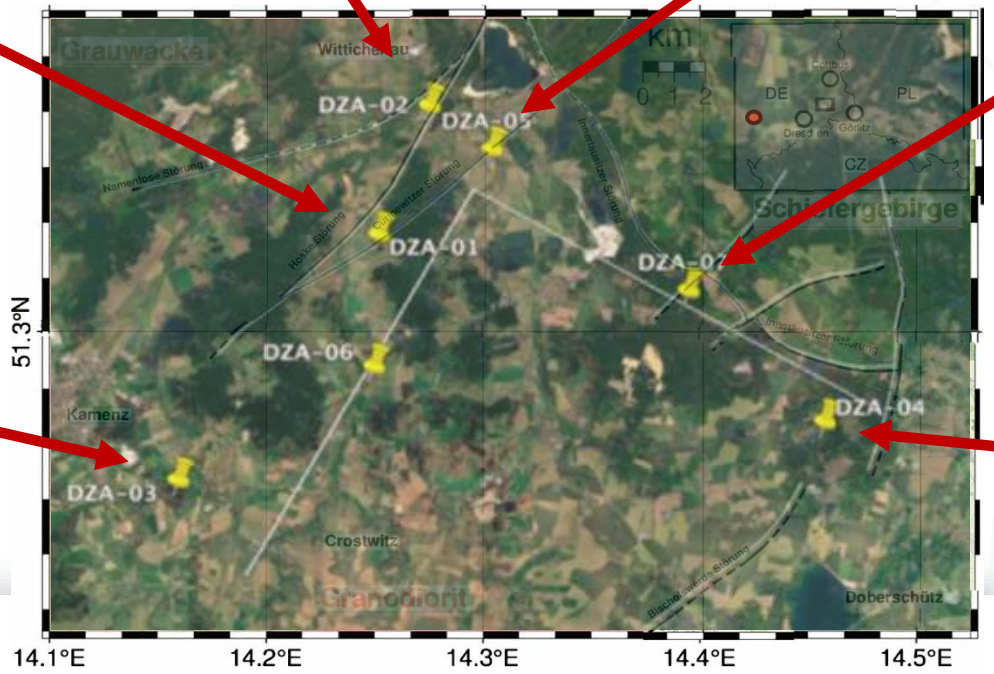


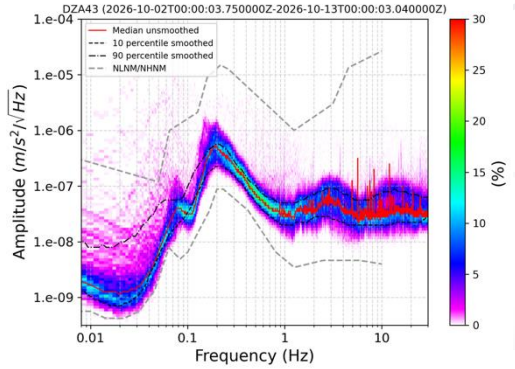






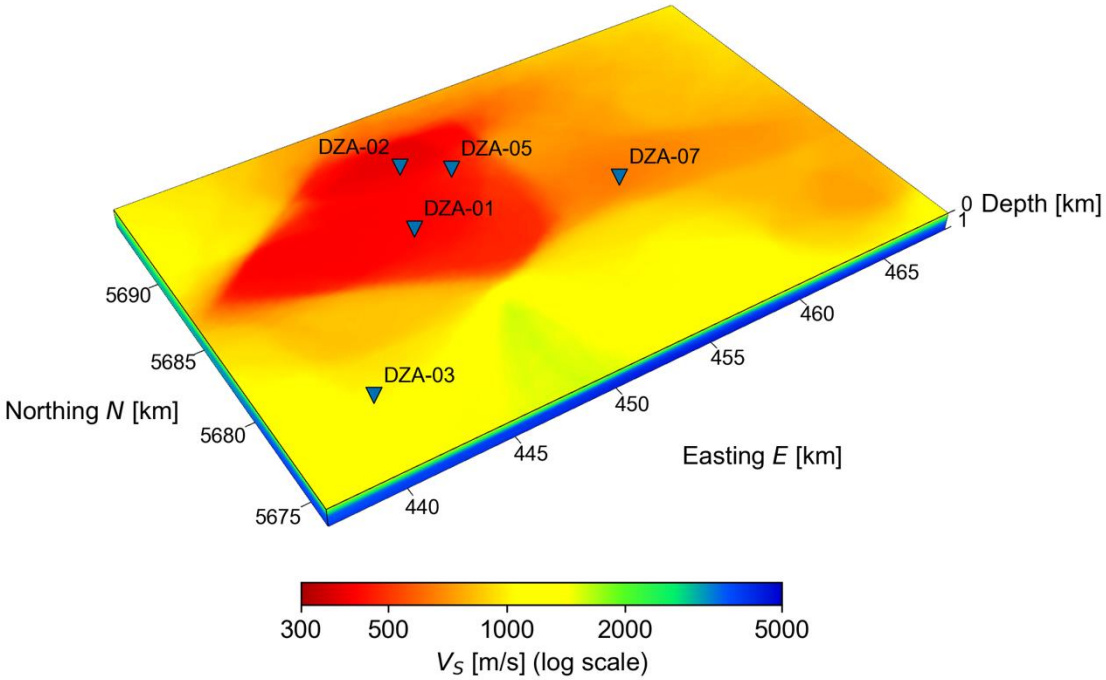






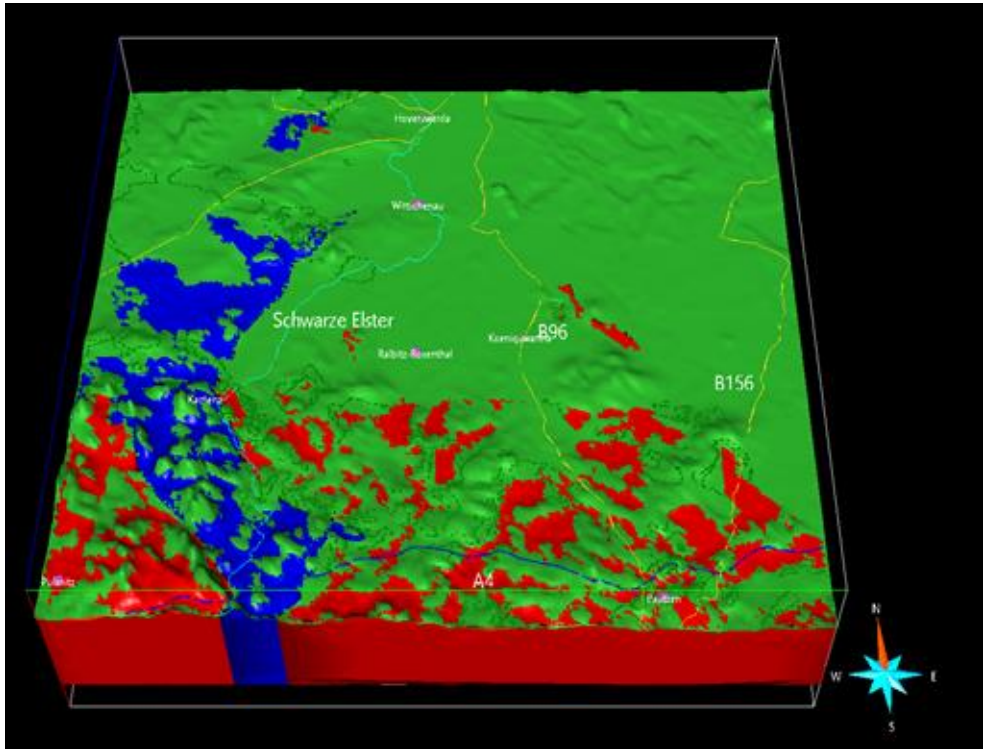
Developing physical geological models: subsurface

Surface wave dispersion tomography



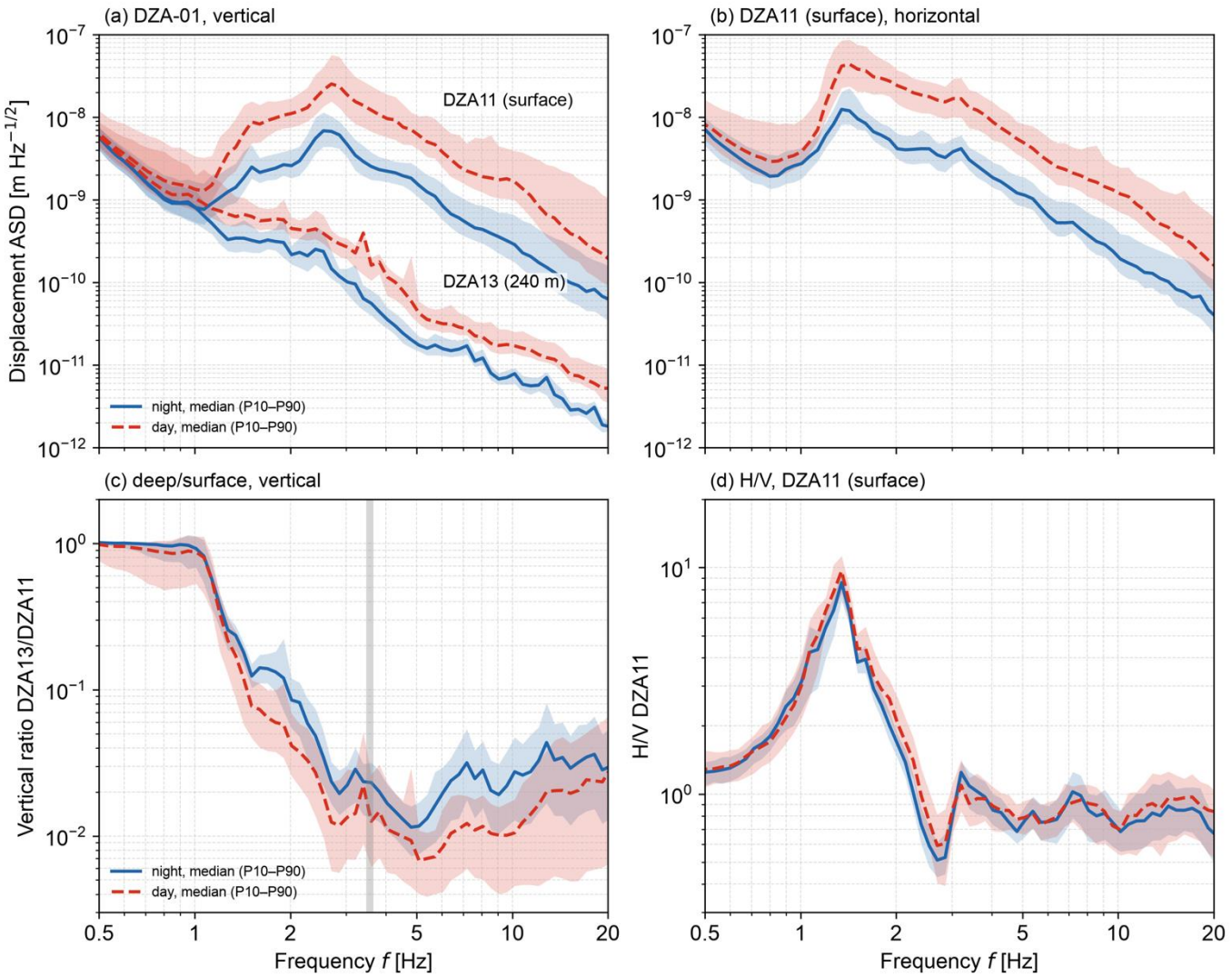
Geological modelling

(TU Bergakademie Freiberg 2026, **down to 300 m**)



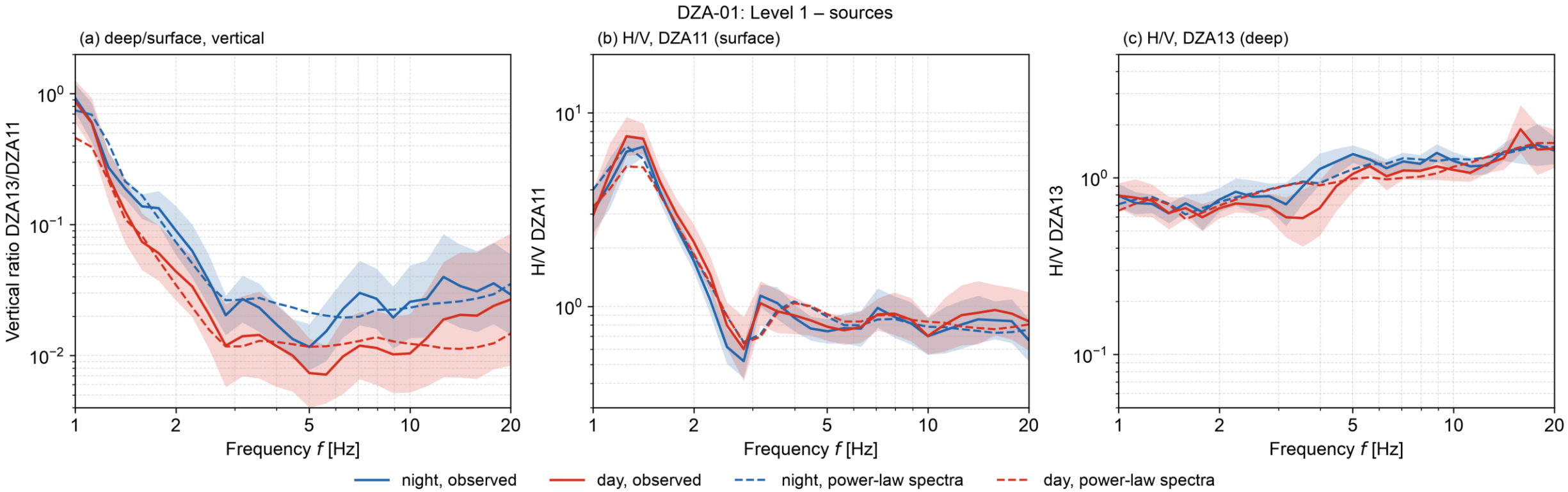
- Tomography: fits the surface-wave dispersion but **smooths the sediment-granodiorite interface** into a gradient
- Geological model: gives sharp interface and the geometry of the units, but **no elastic properties**

Developing physical geological models: observations at DZA-01



- Day vs night: above about 1.5 Hz, daytime noise at the surface is **3-4 times the night level**
- Deep/surface ratio: about **1 below 1 Hz**, then it falls to about **10^{-2} above 3 Hz**
- Surface H/V: **a resonance at 1.35 Hz** with **a second peak near 3.2 Hz**. It is the same day and night, provides a stable structural constraint
- The first peak sets the **S-wave travel time through the cover, $f_0 \approx \bar{c}_S / 4H$**. The second peak **is the first S-wave overtone**.

Developing physical geological models: waveform simulations (ratios)



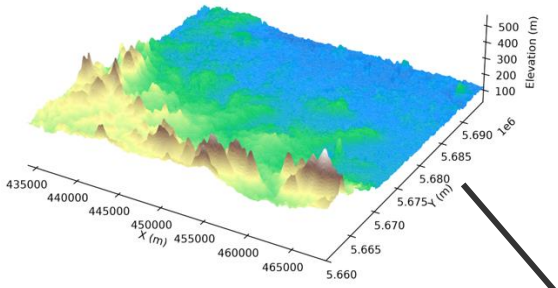
- **18 structural models fit the ratios** within the data spread once the nearby **sources are free**
- Each implies a different wavefield at depth, and so **a different Newtonian noise**

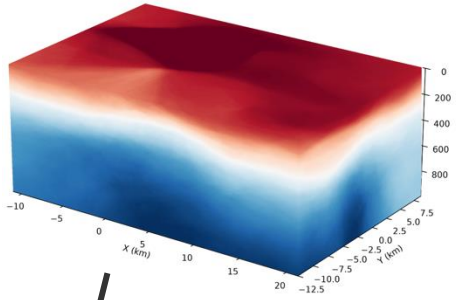
Estimating Newtonian Noise in a collaborative environment (KIT-RWTH)

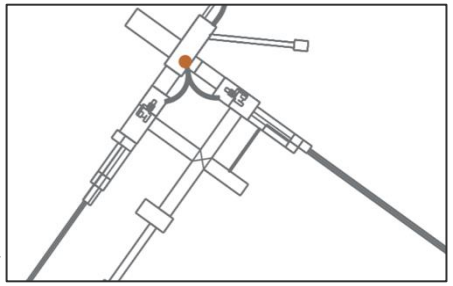
Topography

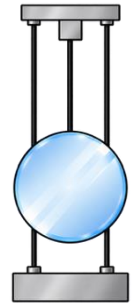
Material properties

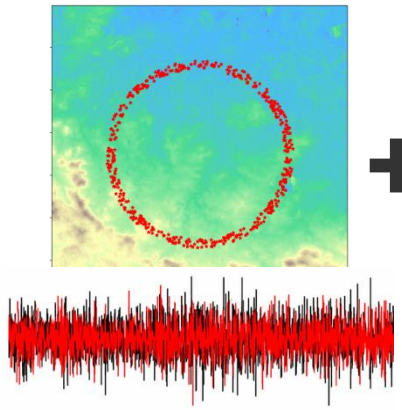
Tunnel & cavern geometry



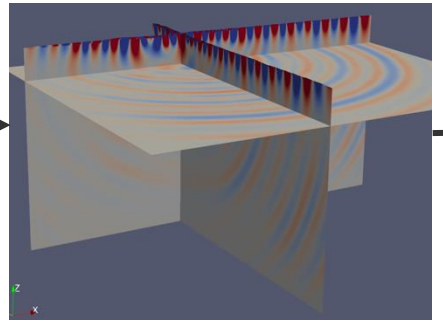


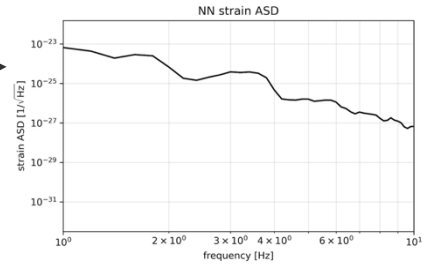






SEM





Source

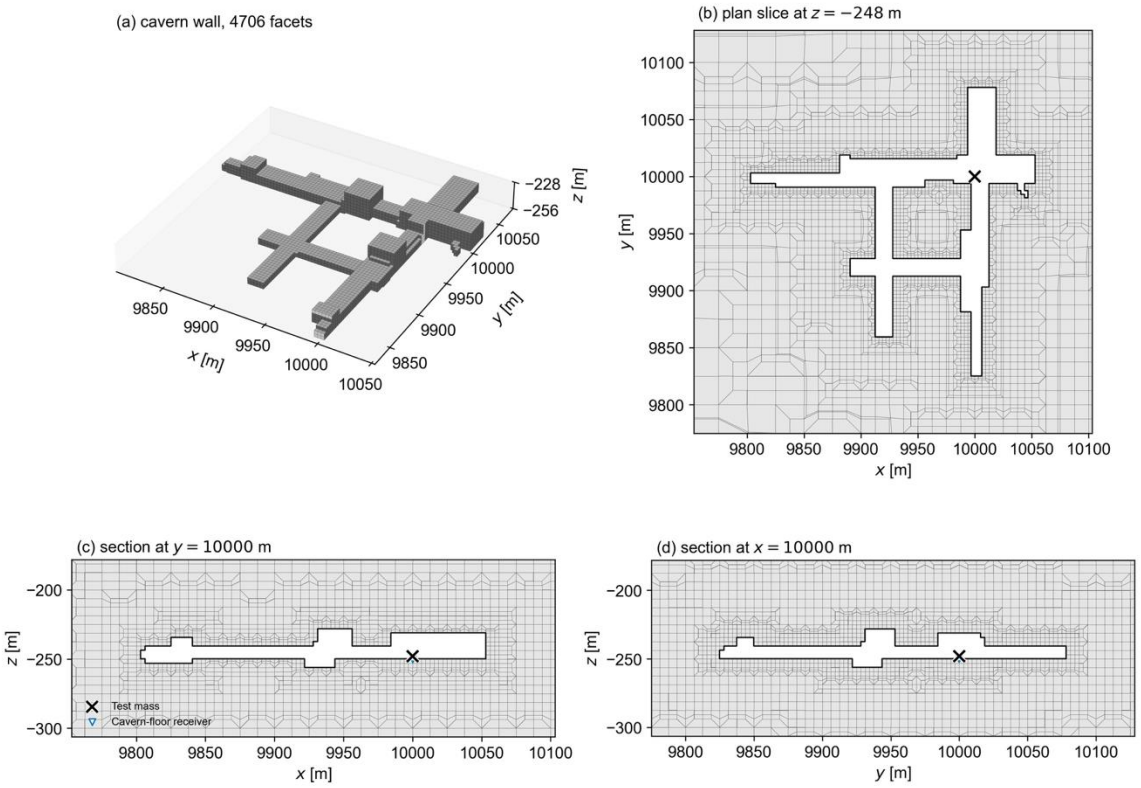
Hexahedral mesh

Seismic displacement

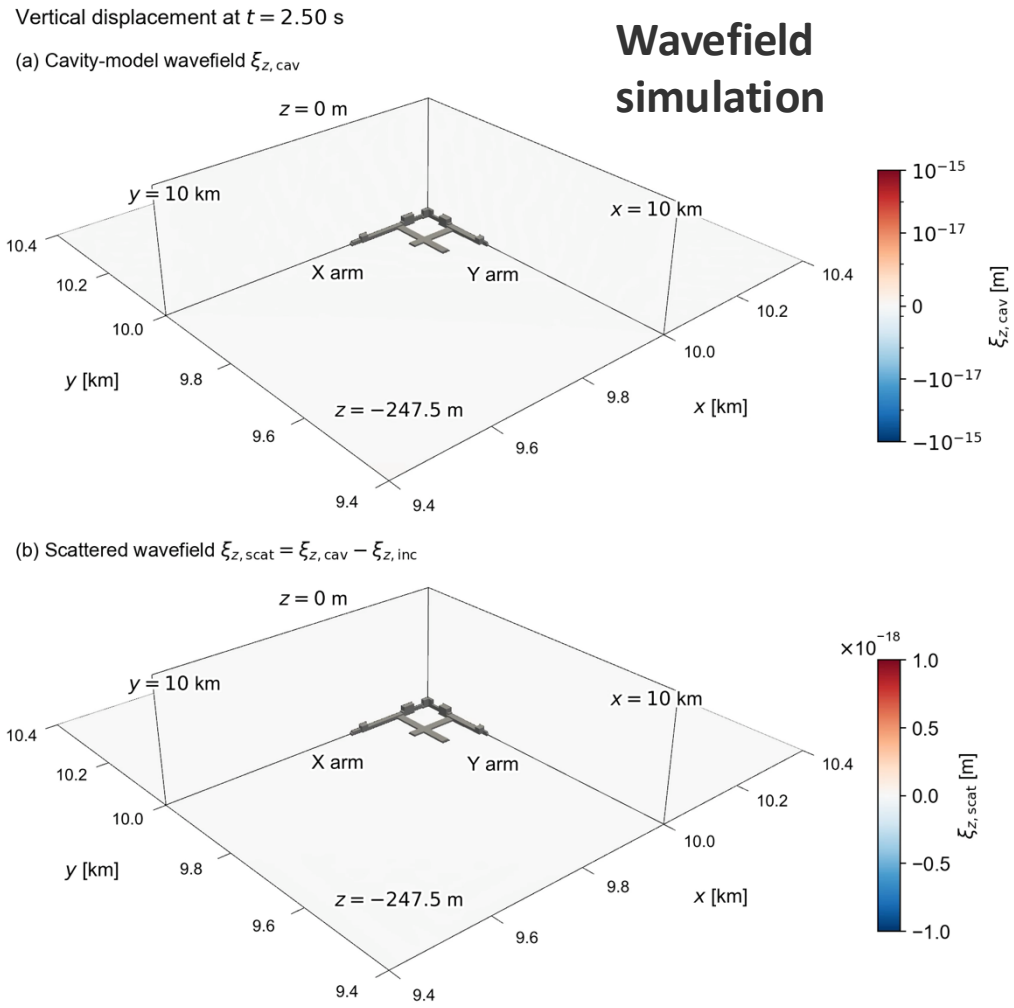
Newtonian noise

Estimating Newtonian Noise in a collaborative environment (KIT-RWTH)

ET-L tunnel model

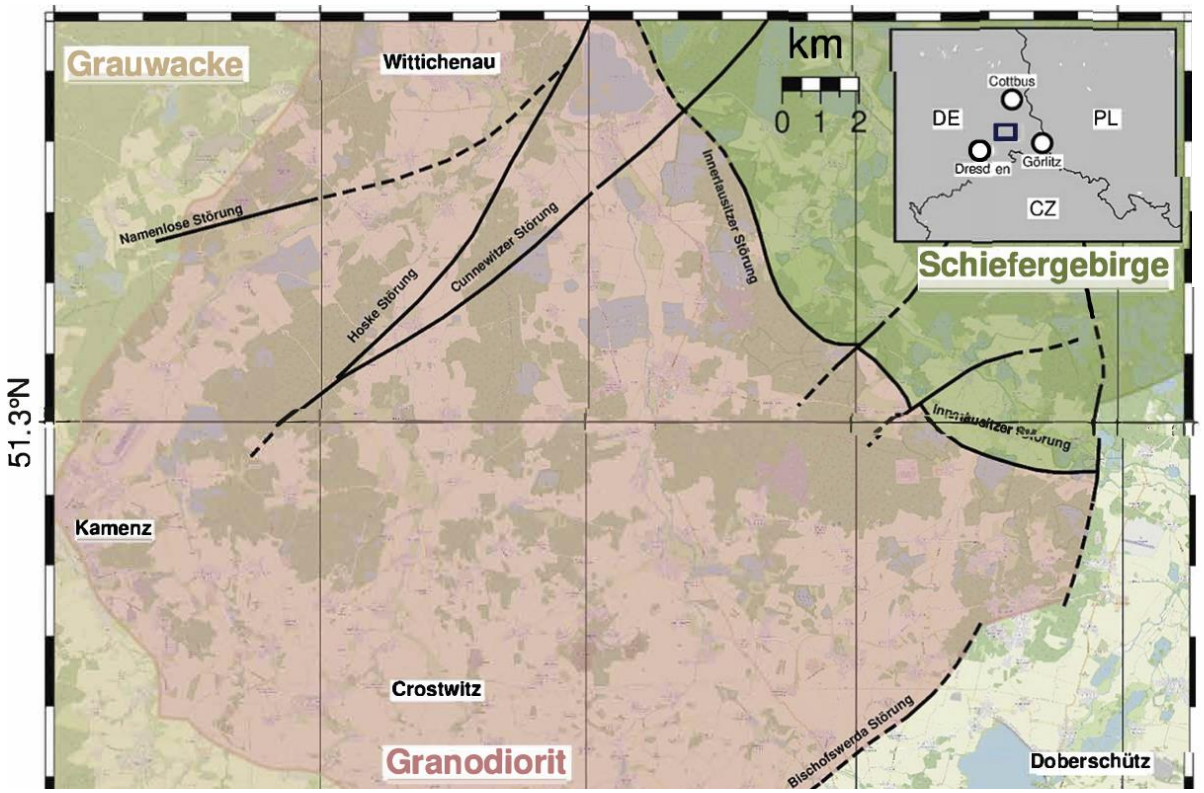


Wavefield simulation

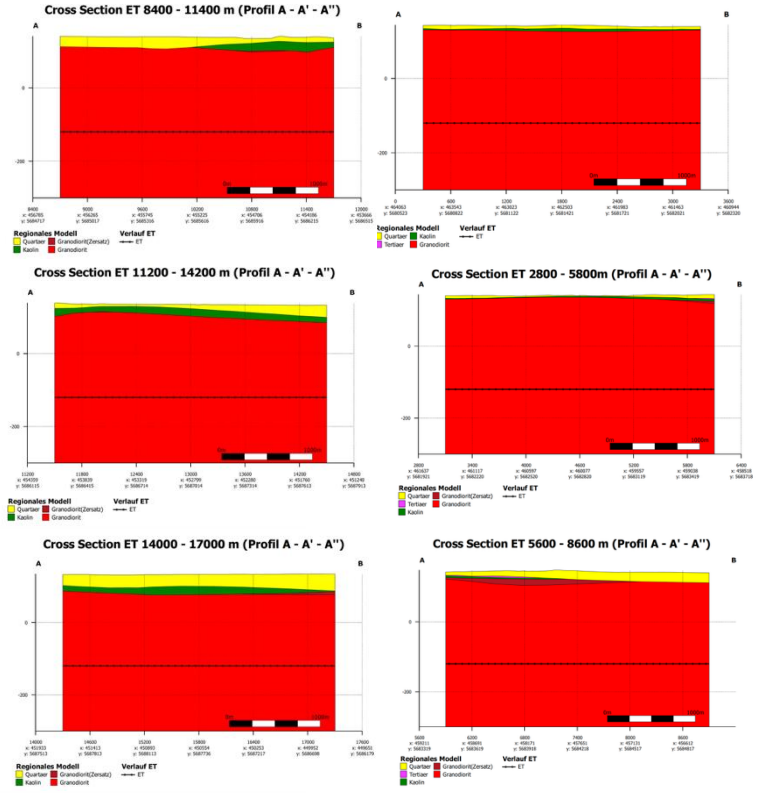


A subsurface ideally suited to build the Einstein Telescope

ET will be placed in only one rock unit: dry granodiorite



Geological cross-sections



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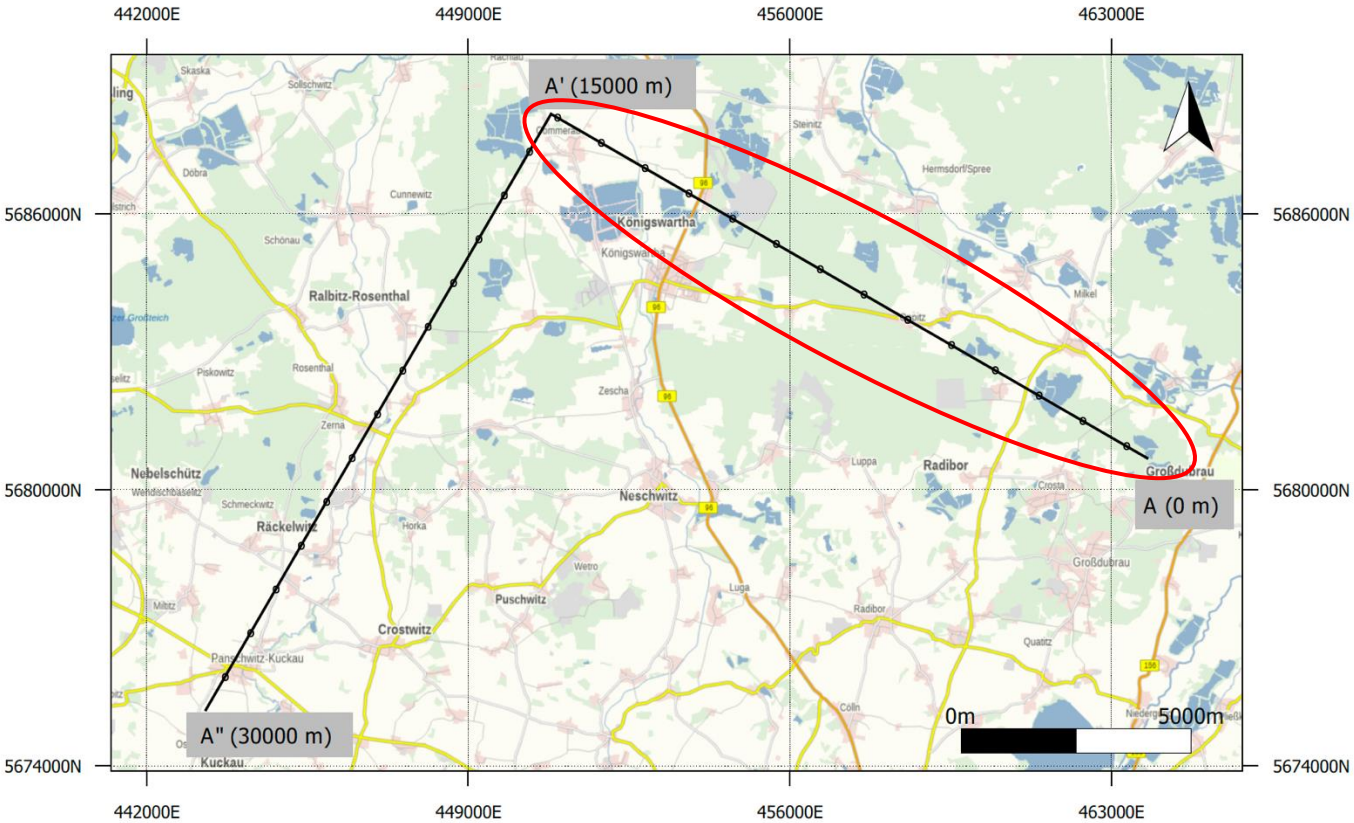
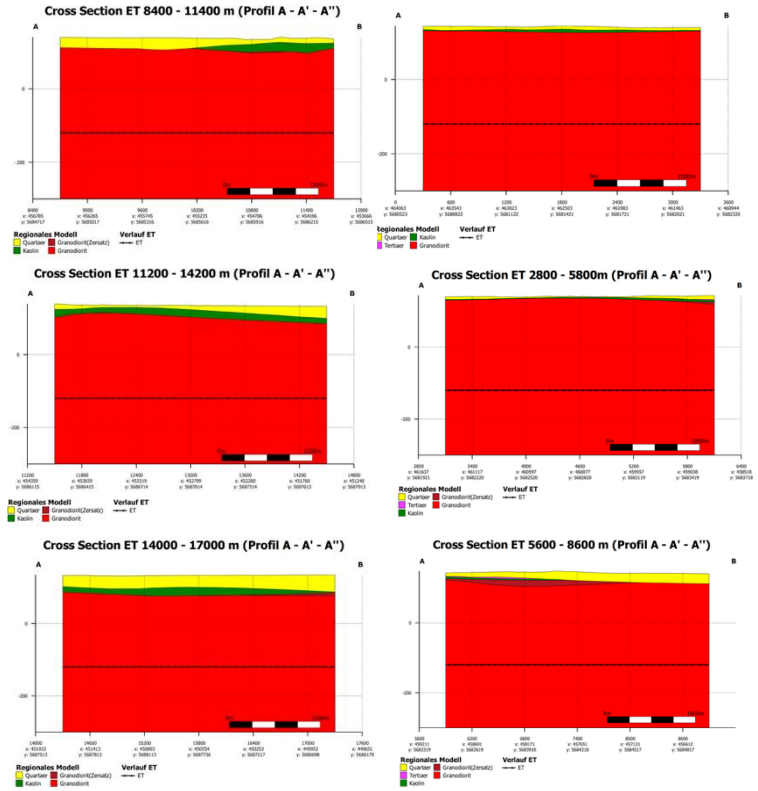
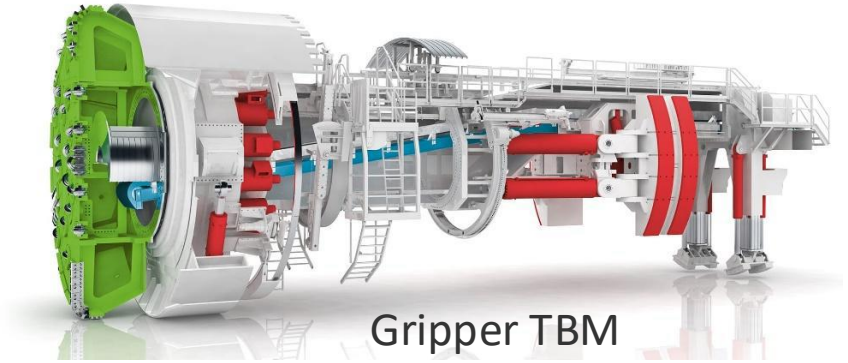


Geological cross-sections

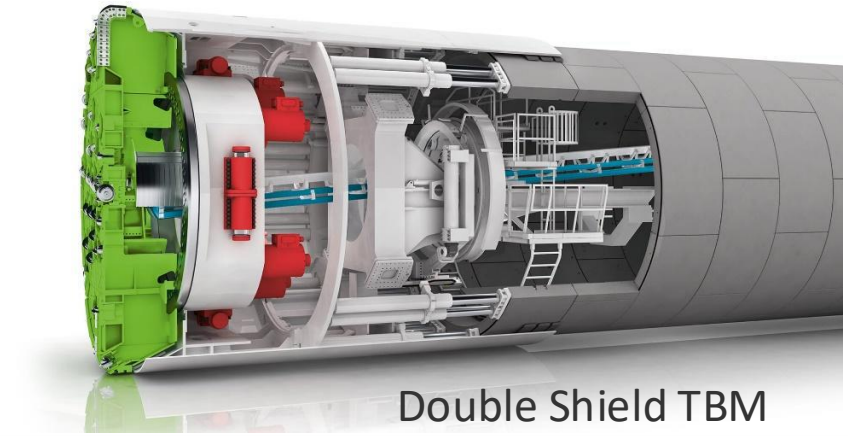


Opportunities for optimising Cost – Time – Maintenance – Risk

Tunnel segments or shotcrete: consequences on cost and time

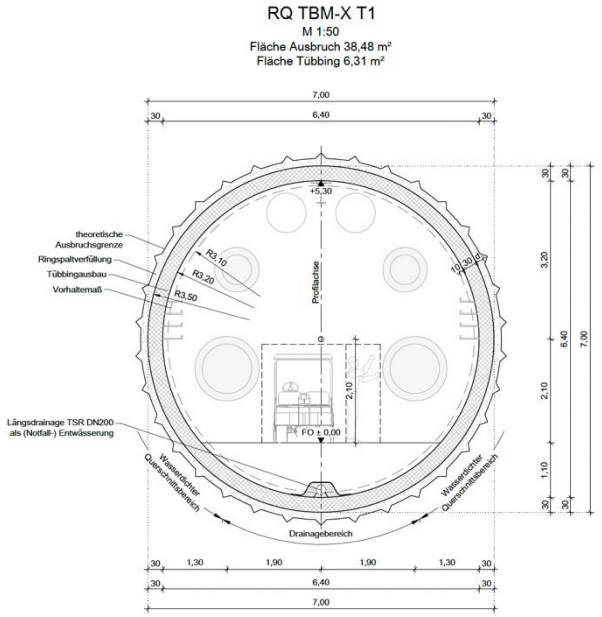


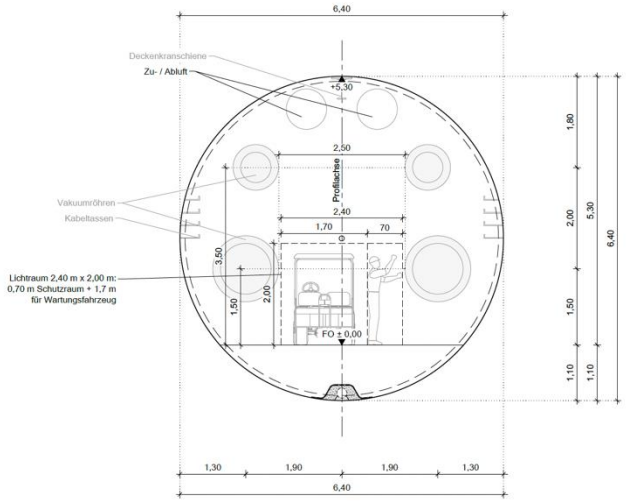
Gripper TBM



Double Shield TBM

Standard cross sections





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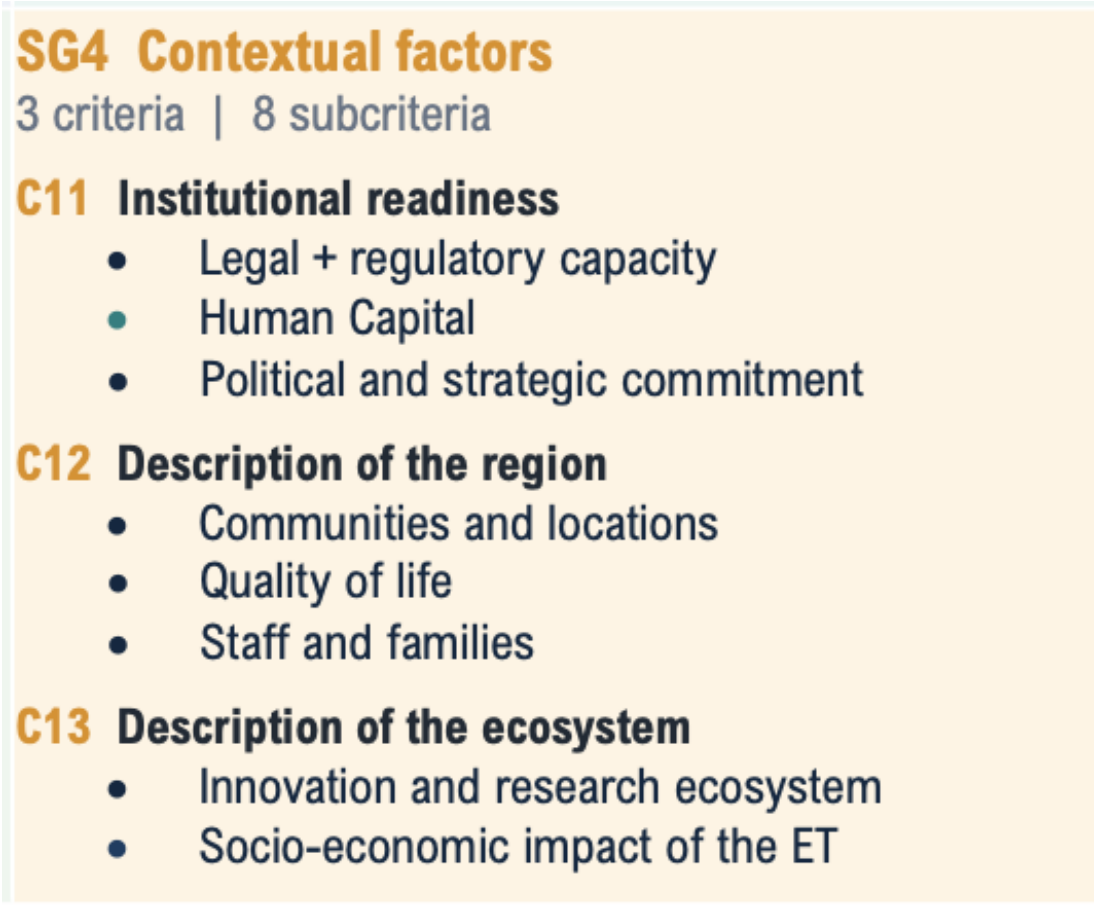
Advancing the support

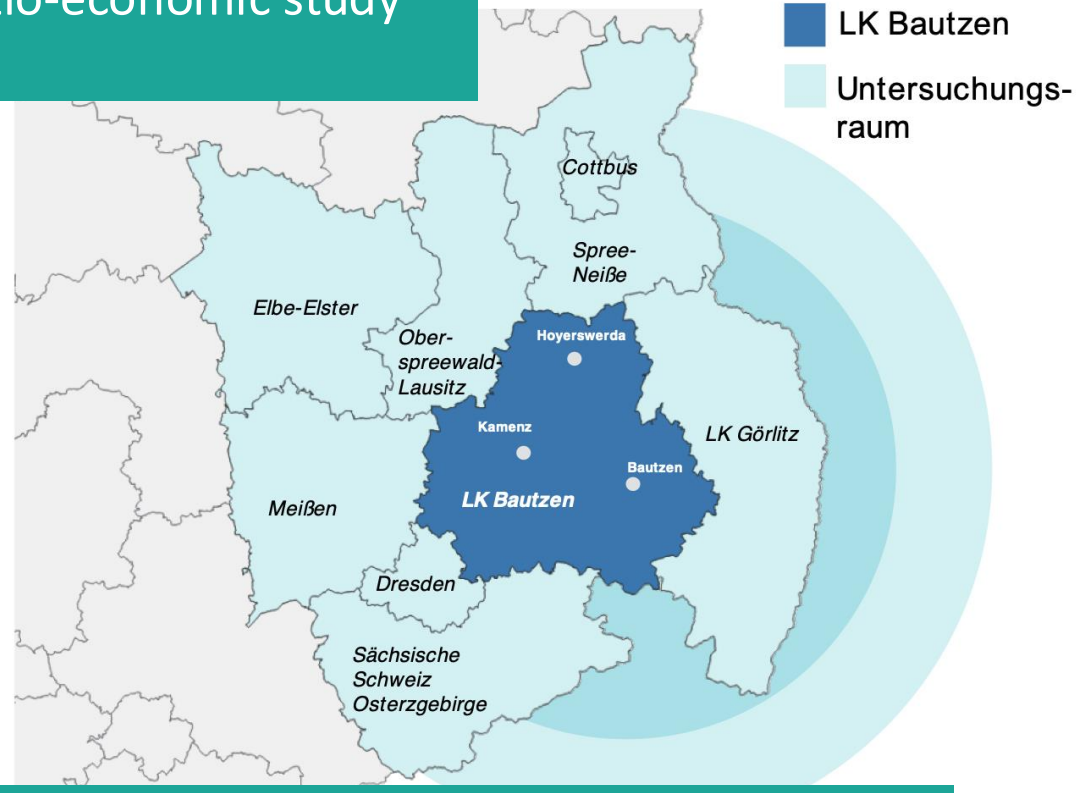
- **All contextual factors are being assessed**, including legal and regulatory capacity, human capital and socioeconomic impact.
- **The region and its research and innovation ecosystem are well characterized**.
- **Political support is growing** (see following slide)
- **Formal political and strategic commitments will be addressed once the study results are available**, particularly robust estimates of construction and operating costs.



Socioeconomic study

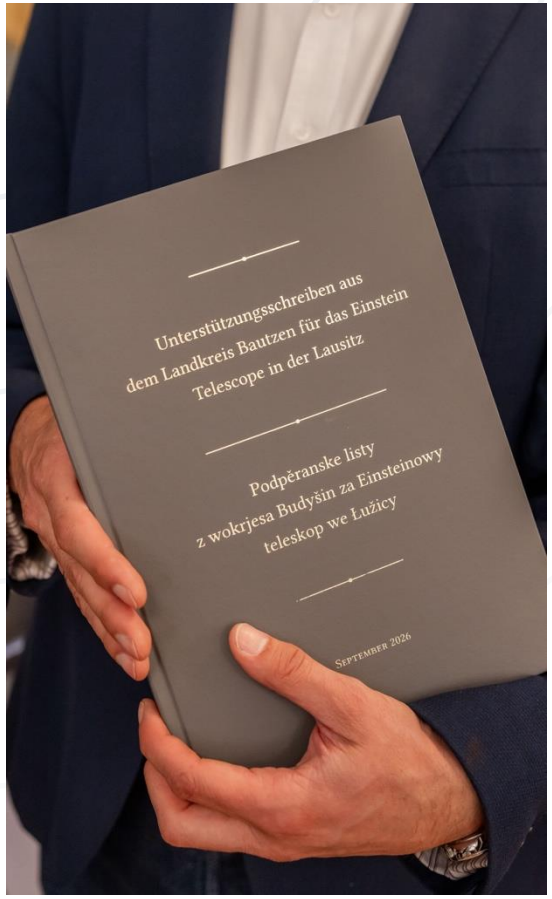
- **Above-average expertise in mining and underground construction:** e.g. TUBAF & teaching mine Reiche Zeche
- **Existing scientific links & strong research network**: TU Dresden (University of Excellence); BTU Cottbus-Senftenberg, Zittau/Görlitz University of Applied Sciences, DZA (with planned LSL)
- **Technology links:** Silicon Saxony provides expertise in microelectronics, precision manufacturing & sensor technologies
- **Cross-border links:** connections to Prague, Liberec and Wrocław. Polish workers contribute to regional construction capacity; strong road links, indirect rail connections
- **Fit with structural change:** Economic transition from coal-mining & need for long-term development opportunities amid demographic change and a shrinking workforce
- **Important for sucessful implementation:** Workforce recruitment, public engagement & involvement of Sorbian community

Sozio-economic study



East Saxony and the surrounding area
+ border regions with Poland and the Czech Republic

Letter of support from all 57 towns and municipalities in the Bautzen district









The ET candidate site Lusatia

- **The site selection criteria guide our investigations** and the development of a comprehensive site assessment.
- **Site characterisation is advancing:** borehole seismic monitoring and magnetic measurements are building the evidence base; KIT and RWTH are jointly advancing Newtonian-noise modelling.
- **The tunneling study is well advanced,** an appropriate L-location has been chsoen and Environmentla impacts is beeing assessed.
- **Geological findings support a promising construction concept**, with opportunities to optimise cost, schedule, maintenance and risk.
- **The socioeconomic study examines regional capabilities and benefits,** along with strong local support from all 57 towns and municipalities in the Bautzen district.

- **Lusatia is well on track:** the next steps will strengthen the evidence, quantify uncertainties and address remaining criteria.