# Lusatia Candidate Site

## and about an astonishing development in Germany


Christian Stegmann
ET Site Preparation Board Workshop
Maastricht, 23.1.2023

HELMHOLTZ SPITZENFORSCHUNG FÜR GROSSE HERAUSFORDERUNGEN

DESY.

# DESY's role in East Germany

Hamburg

Berlin

Potsdam

Lusatia

Hoyerswerda

Görlitz

## DESY location in Zeuthen

We are the host of the CTA SDMC and a key partner in international cooperations and in the region

## Astrophysics Network Potsdam

We are developing together with the AIP, AEI, U Potsdam a focal point for astronomy and astroparticle physics.

## German Centre for Astrophysics

A new large scale research center in Saxony, a bridge to East Europe and a potential region to host the Einstein Telescope.

# Lusatia, a region in the centre of Europe

Boxberg

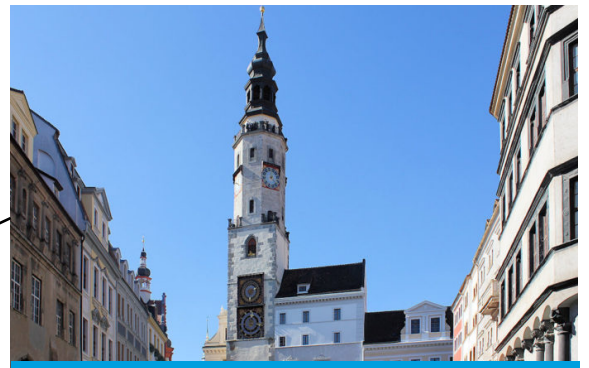
Lusatia

Hoyerswerda

Görlitz

Bad Muskau

Bautzen



Görlitz

# A competition historically unique in Germany

**ANNUAL BUDGET AFTER RAMP-UP PHASE 170 M€,**

**TOTAL VOLUME OF THE APPLICATION 1.4 B€**

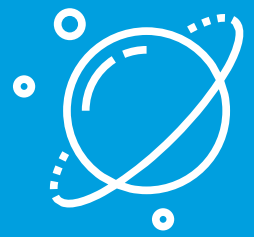
## Structural change

### KNOWLEDGE CREATES PERSPECTIVES FOR THE REGION!

Two new large-scale research centres will be established in Lusatia in Saxony and in the Central German mining region. With "Knowledge creates perspectives for the region!", the BMBF and the Free State of Saxony are launching a competition for the establishment of the centres.

https://www.bmbf.de/de/wissen-schafft-perspektiven-fuer-die-region-13122.html

# DZA concept : the challenges of astrophysics today



## Astronomy

Square Kilometre Array Observatory (SKAO)

Einstein Telescope (Low Seismic Lab)

## Instruments

Developments for future astronomical experiments

Strong participation of Saxon industry

## Data Intensive Computing

Processing huge amounts of astrophysics data from all over the world

Innovative AI based and Smart Green Computing

Interlocking of pillars → unique synergies

# 29. September 2022 12:45 (CEST)

Katharina Henjes-Kunst and Günther Hasinger in Görlitz

Me in Cunnewitz

# 29. September 2022 between 12:45 and 13:00 Uhr (CEST)

Günther Hasinger in Görlitz

# 29. September 2022 short after 13:00 Uhr (CEST)


Bettina Stark-Watzinger and Günther Hasinger in Görlitz

# Who we are

The DZA is a joint initiative of German astronomy and astroparticle physics with the idea of creating a national and also international hub of astrophysics. The idea was born out of the need for cooperation, and it is supported by many research institutions, universities and partners.

# A large team and many partners

## FOUNDING PARTNER

TECHNISCHE UNIVERSITÄT DRESDEN

MAX PLANCK GESELLSCHAFT

HELMHOLTZ SPITZENFORSCHUNG FÜR GROSSE HERAUSFORDERUNGEN

Uniwersytet Wrocławski

Fraunhofer

Leibniz Gemeinschaft

## PART OF THE SUPPORTER NETWORK

DESY.

HZDR HELMHOLTZ ZENTRUM DRESDEN ROSSENDORF

KAT. Komitee für Astro. Teilchen. Physik

R D S

VdR

IBM

OHB DIGITAL

b-tu

SKAO

ET EINSTEIN TELESCOPE

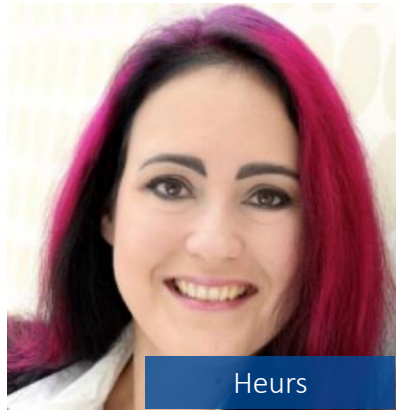
Stadt Görlitz

LRT SACHSEN/THÜRINGEN

SILICON SAXONY THE HIGH-TECH NETWORK

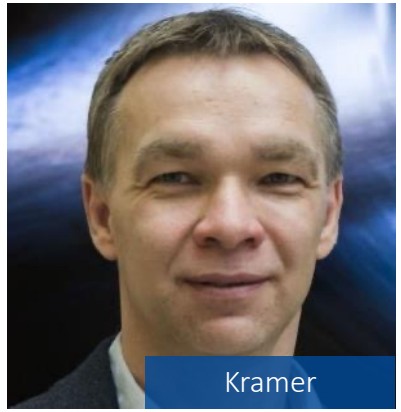
DOMOWINA


Hasinger


Heurs


Steinmetz


Nagel


Kramer


Hessling


Henjes-Kunst


Stegmann


Wagner

# The German Centre for Astrophysics

Two sites for research, technology, digitisation

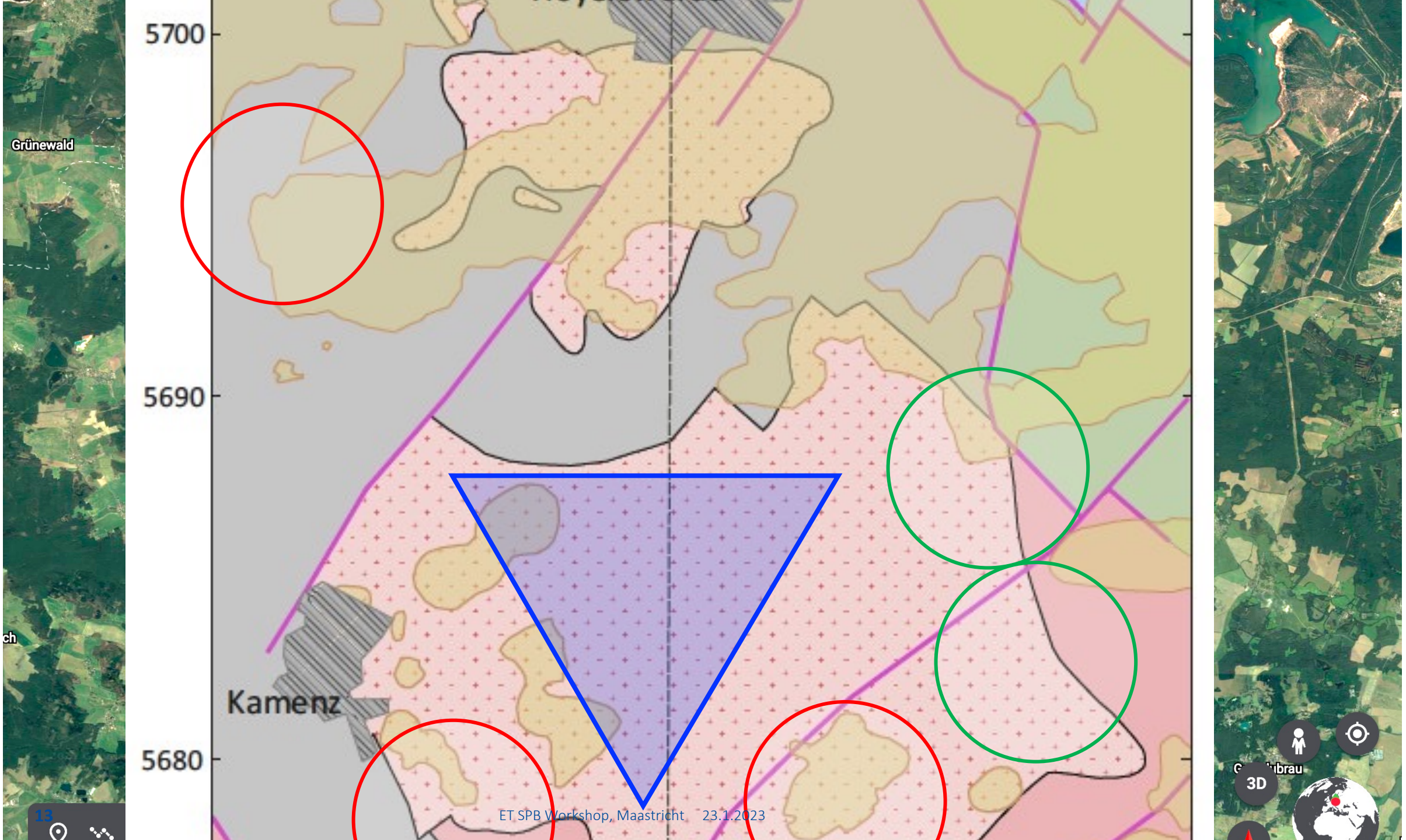

The Low Seismic Lab in the granite of Lusatia

The DZA campus on the Kahlbaum site in Görlitz

# Research
# in the treasure of Lusatia

*"The Lusatians are proud of their granite treasure, and it is a fascinating approach to let this treasure grow into a large number of long-term stable jobs in the whole range from crafts to science."*

*Dawid Statnik, Chairman Domowina, Association of Lusatian Sorbs*


Grünewald
5700
5690
5680
Kamenz
3D

# Measurements in Lusatia

# Cunnewitz, part of Ralbitz-Rosenthal


Bundesministerium
für Bildung
und Forschung
Probebohrung
für das Deutsche Zentrum für Astrophysik
DZA
Wissenschaftliche Bohrung bis in 250m Tiefe zur Prüfung der möglichen Ansiedlung des geplanten europäischen Gravitationswellen-Observatoriums Einstein-Teleskop und eines unterirdischen Forschungslabors im Granitstock der Oberlausitz. Die Bohrung ist Teil der Initiative zur Gründung des Deutschen Zentrums für Astrophysik in der Lausitz.
Die Besichtigung der Bohrstelle ist nach Absprache möglich. Auch Schulklassen sind herzlich willkommen vor Ort mehr über das Projekt zu erfahren. Kontakt: dza@desy.de
Probowe
točenje za Němski centrum za astrofyziku (DZA)
Wědomostne točenje hač do hłubokosće 250 m k pruwowanju móžneho připrawjenja planowaneho europskeho obserwatorija grawitaciskich žołmow Einsteinoweho teleskopa a podzemskeho slědźerskeho labora zornowcoweho zakłada Hornjeje Łužicy. Točenje je wobstatk iniciatiwy k założenju Němskeho centruma za astrofyziku we Łužicy.
Wobhladanje točenskeho městna je po dorečenju móžne. Też šulske rjadownje su wutrobne witane na městnje wjace wo projekće zhonić. Kontakt: dza@desy.de
Auftraggeber: Deutsches Elektronen-Synchrotron DESY in der Helmholtz-Gemeinschaft
Platanenallee 6
D 15738 Zeuthen
www.desy.de
Bohrunternehmen:
Brunnenbau Conrad GmbH
Brunnenbau-Conrad-Str.
D 99947 Bad
www.br


Probebohrung
DZA
Probowe
CATERPILLAR

# Great public interest

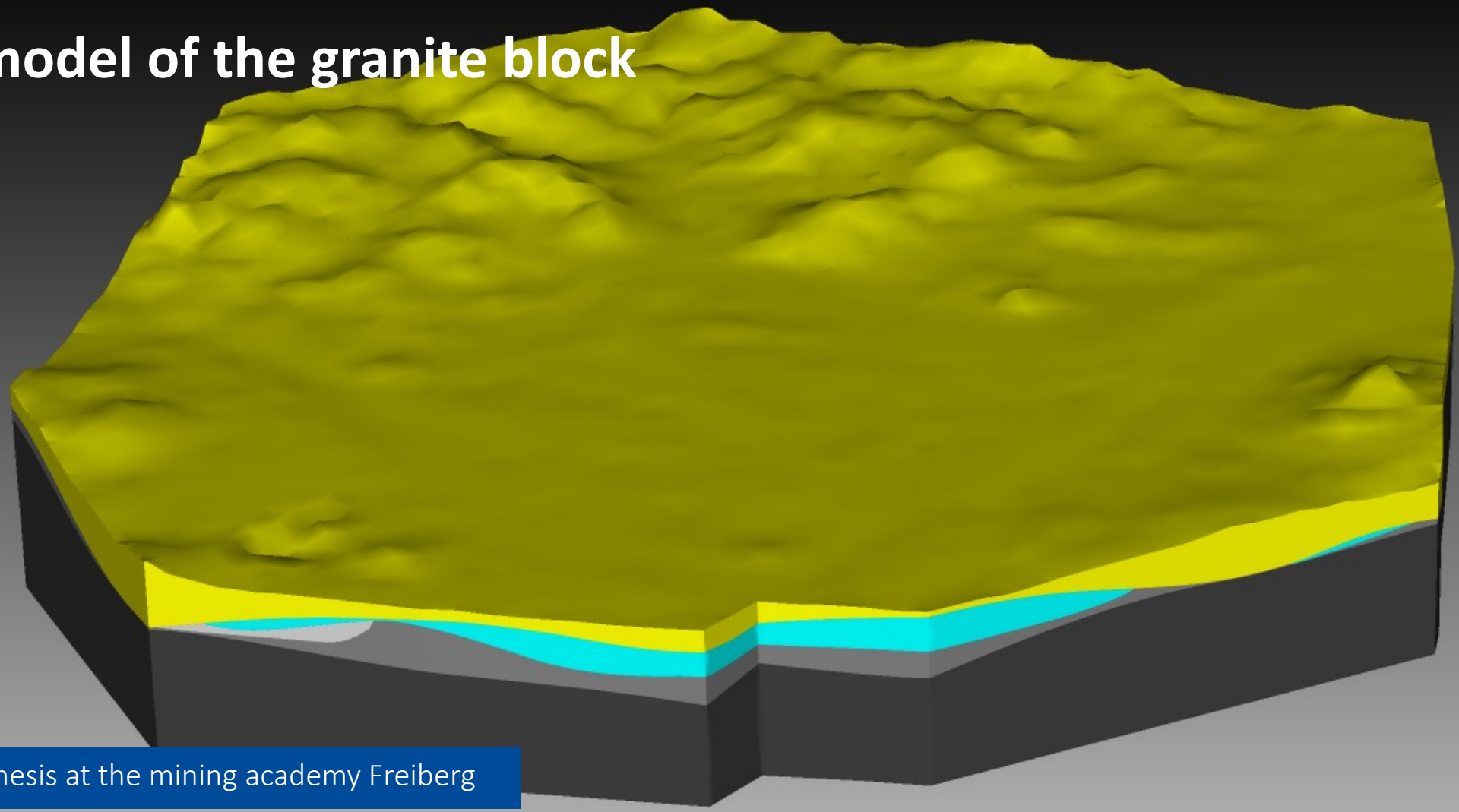






# Drill cores

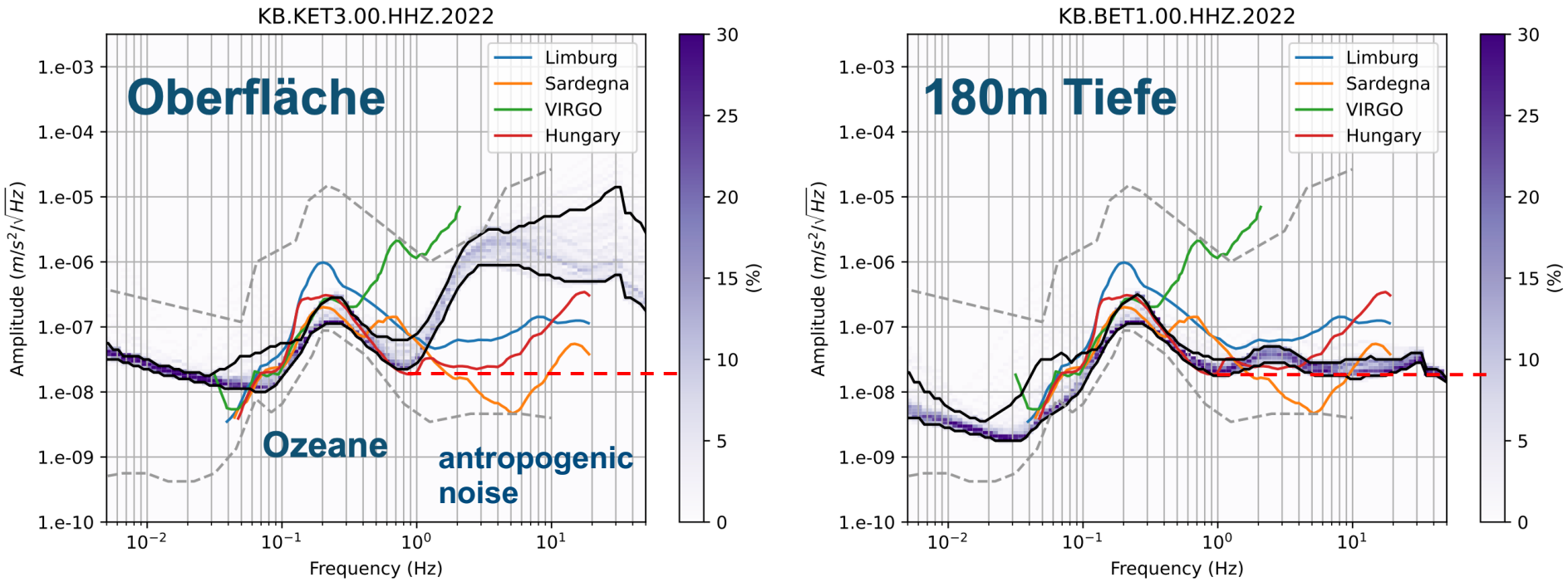
# A model of the granite block



DZA Master thesis at the mining academy Freiberg


10 km

# First measurement of the low noise level already in 180m depth



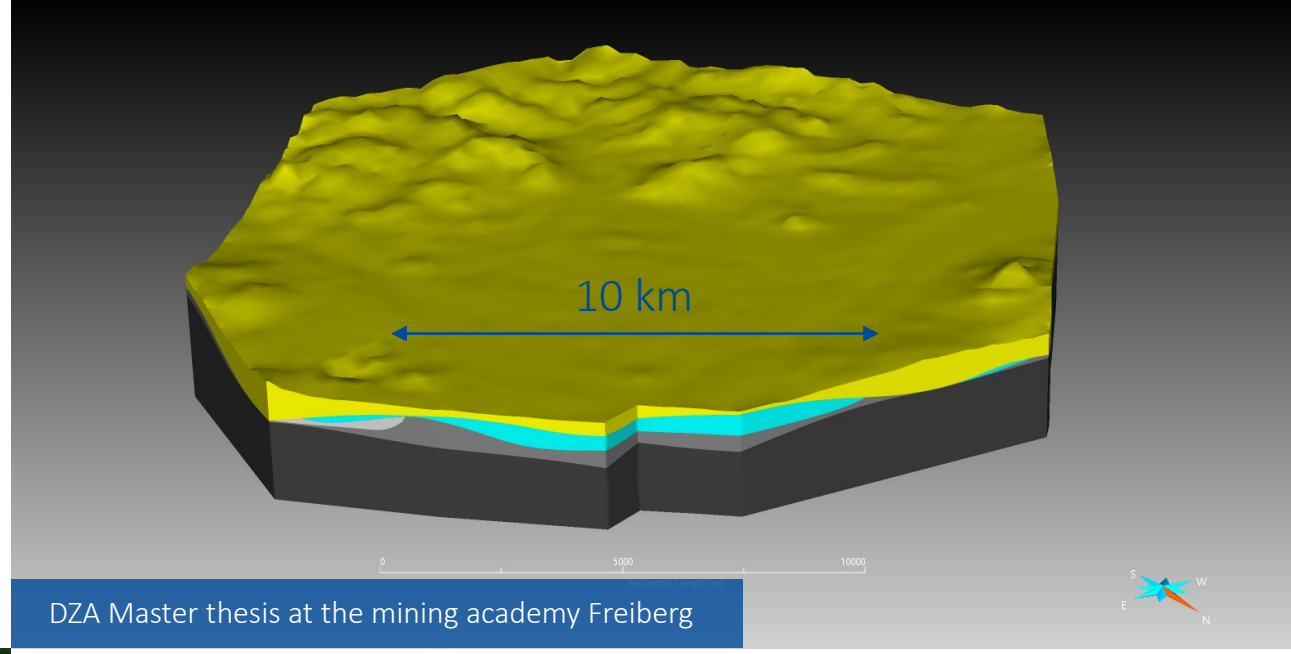

"An important point to stress here is not to overestimate the overall noise levels due to:

1) The borhole was freshly cemented
2) The drill rig was still attached to the steel casing
3) The borehole seismometer was suspended from the drill rig
4) No thermal insulation at the top
5) The instrument was still adjusting to the surroundings
6) Many other things we have not thought off so far…"

A. Rietbrock, KIT

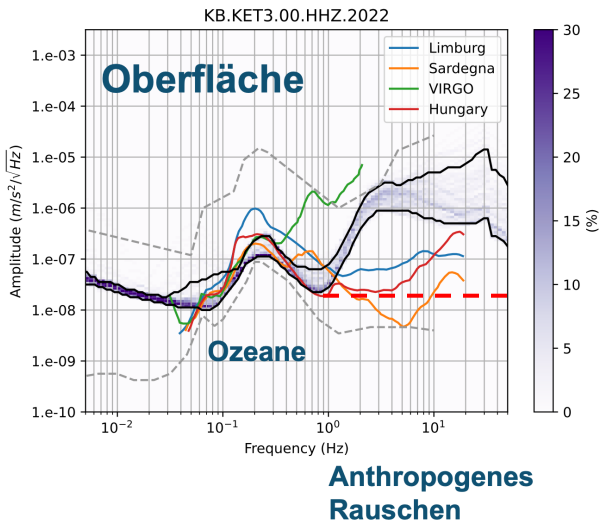
# The granite block in Lusatia

A unique monolithic and smooth granite block with an extension of at least 20 km with a homogeneous damping and seismic isolation layer!



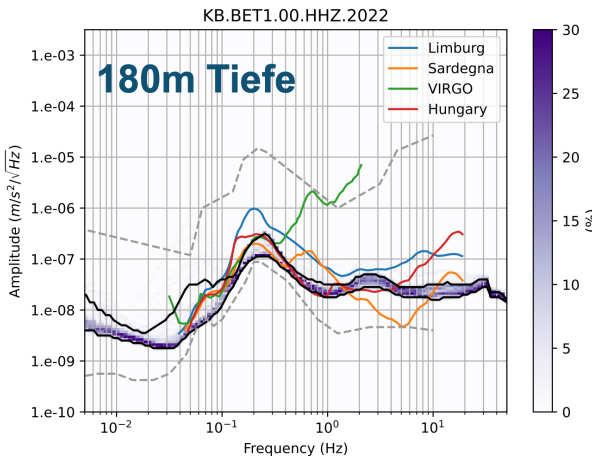

DZA Master thesis at the mining academy Freiberg

Drill cores




Anthropogenes Rauschen

Surface measurement




In 180m depth

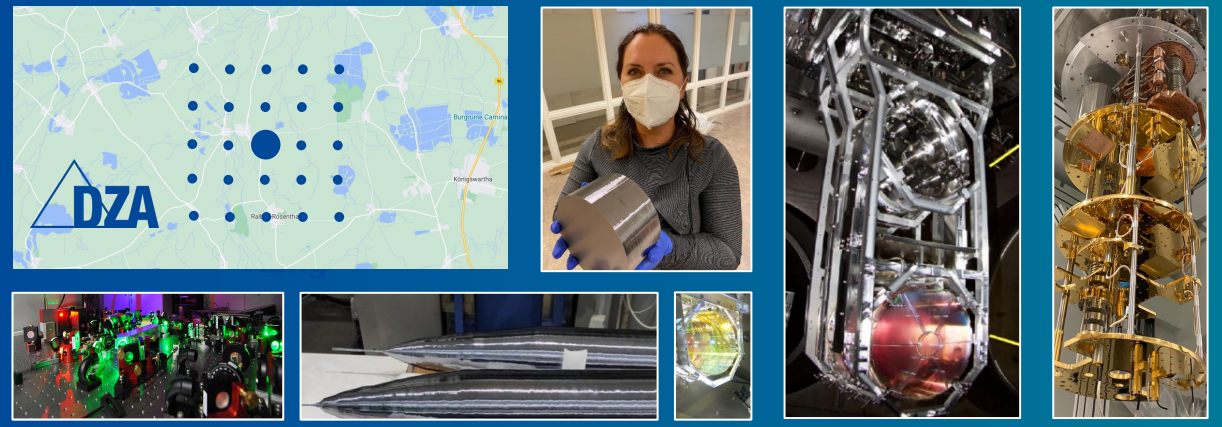
A. Rietbrock, KIT

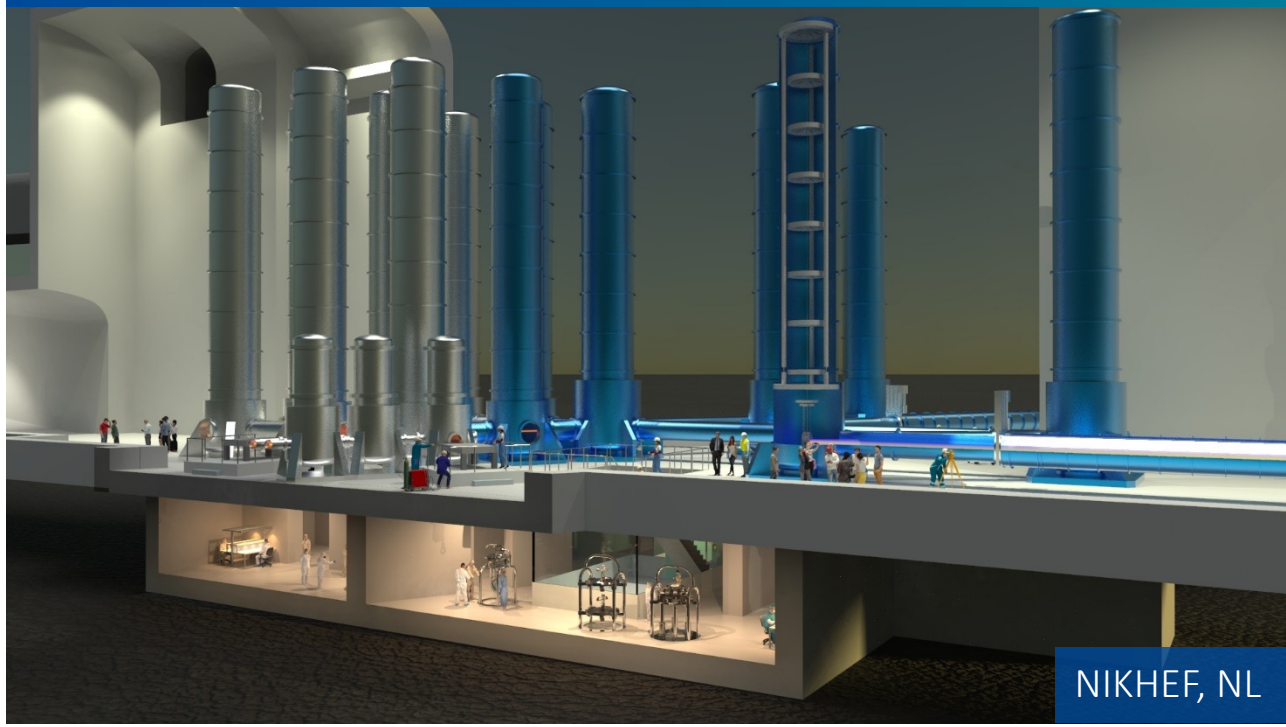
# At least: The Low Seismic Lab

Innovation platform of approx. (40 x 30 x 30) $m^3$ in 200m depth in the Lusatian granite

With a square kilometre 3D seismometer sensor array.

→ Metrological validation of advanced seismic isolation concepts on a large scale




## THE PLACE FOR FUTURE "DEEP TECH":

- Technology development for gravitational wave astronomy
- Adaptive seismic noise reduction
- Subnanometer microscopy and photolithography
- Quantum computing experiments
- Astrophysics with accelerators

# A potential site for ET?

The investigations and preparations for the Low Seismic Lab and the site for ET are very similar

The four categories of questions to be answered:

1. Is the site suitable for the scientific programme to be implemented?
2. Can the infrastructure be built there cost-effectively?
3. Can the infrastructure be operated there over its entire lifetime?
4. Is there political support from the host country?

# Future seismic noise and geophysical investigations

- DESY, as a partner of the DZA, will perform the investigations in the coming years together with KIT, GFZ, TU Bergakademie Freiberg, LfUG Sachsen, RWTH Aachen

- Programm
  - Development of a 3D subsurface model of the seismic properties of the subsurface (backbone model).
  - Investigations of incident seismic noise field and its temporal and spatial coherence will be investigated.
  - Comparison with the seismic data observed in the pilot borehole at different depths for predictions for potential further borehole locations.
  - Passive seismic measurements on a 10 km x 10 km grid to determine the three-dimensional shear wave velocity.
  - 2D reflection/refraction lines to determine the seismic velocities and calibration of the passive experiment.
  - Development of an integrated geological map for Lusatia incl. evaluation of old data and drill cores
  - Characterisation of the seismic noise including borehole measurements and development of a seismic-geological "back-bone model".
  - 5 further boreholes incl. further geophysical investigations

# The German Centre for Astrophysics in Lusatia

A big success for fundamental science or more specifically astronomy, astrophysics and astroparticle physics and an important step towards a significant German participation in the Einstein Telescope

## PROJECT PHASE (2023-2026):

- Further test drills and geological / seismic investigations to determine suitability of granite for LSL & ET

## "FULL FUNDING“ PHASE (2026 ONGOING):

- Buildings and underground lab construction, full ramp-up of personnel and research & science

## IN ANY CASE:

- DZA will conduct technology development for gravitational wave astronomy and in particular for ET

At the day of the decision