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Web-Based Visualization of (nearly) Live 3D Earthquake Data

image AI generated

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7th European Meeting on 3D Geological Modelling | 8-11 April 2025 | Warsaw

Earthquakes in Germany …and Saxony

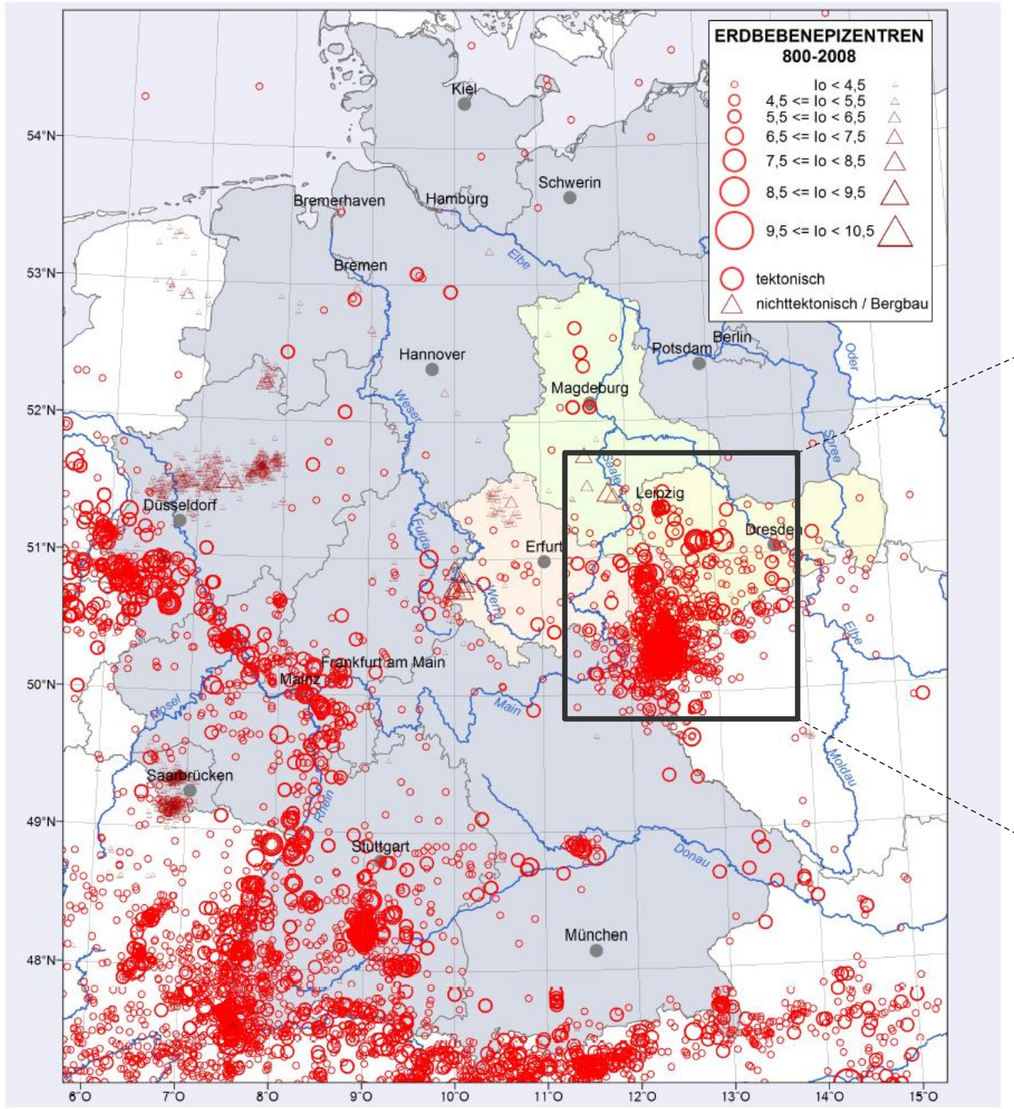

Fig. 1: Seismicity in Germany and neighboring regions for the years 800 to 2008, based on Leydecker, G. (2011).

- Seismic activity in Germany predominantly occurs along young fault zones
- northern Alpine margin, the Upper Rhine Graben, and the Vogtland
- Vogtland: recurring earthquake swarms, driven by geological stress and the ascent of crustal fluids and gases
- automatic registration of seismic signals from appr. 50 stations across Central Germany and Northwest Bohemia

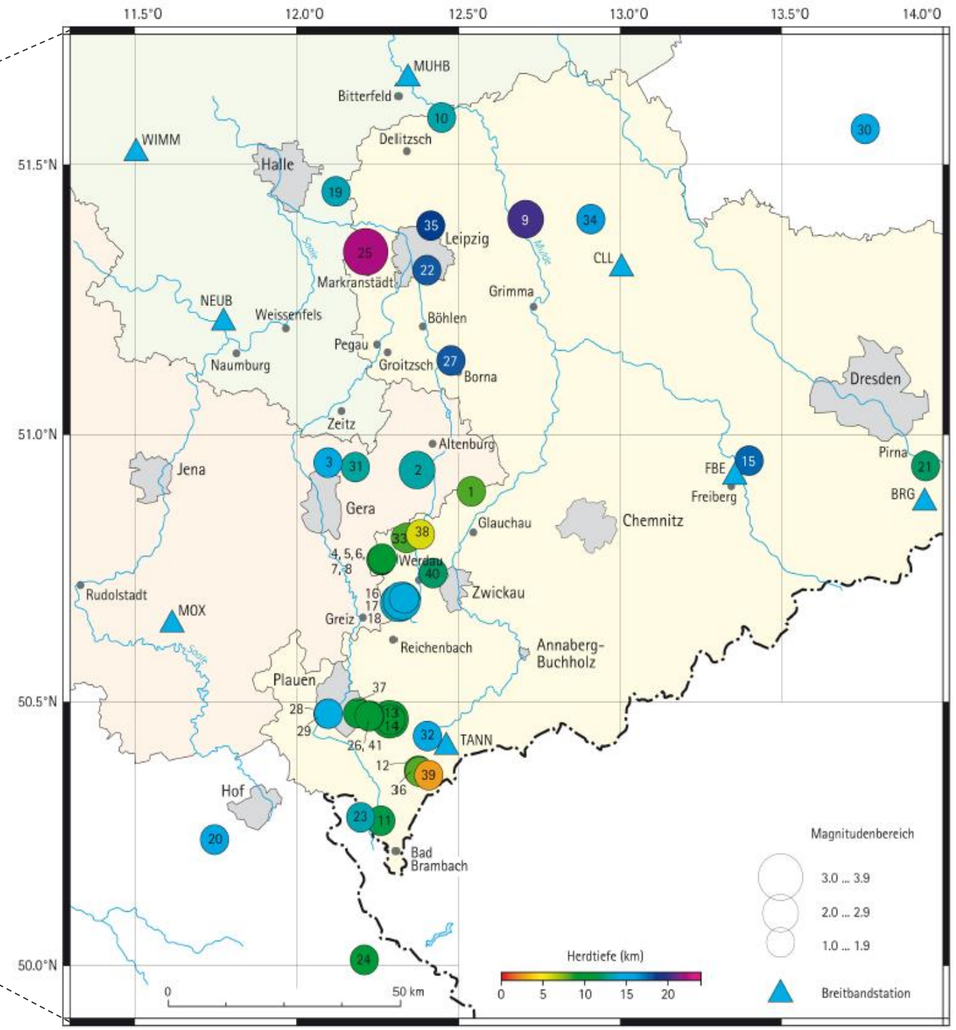

Fig. 2: Map of the epicenters of earthquakes with local magnitude M > 1.0 in Central Germany from 2016 to 2018 - excluding the earthquakes in the Czech Republic.

Cartographic representation of earthquakes

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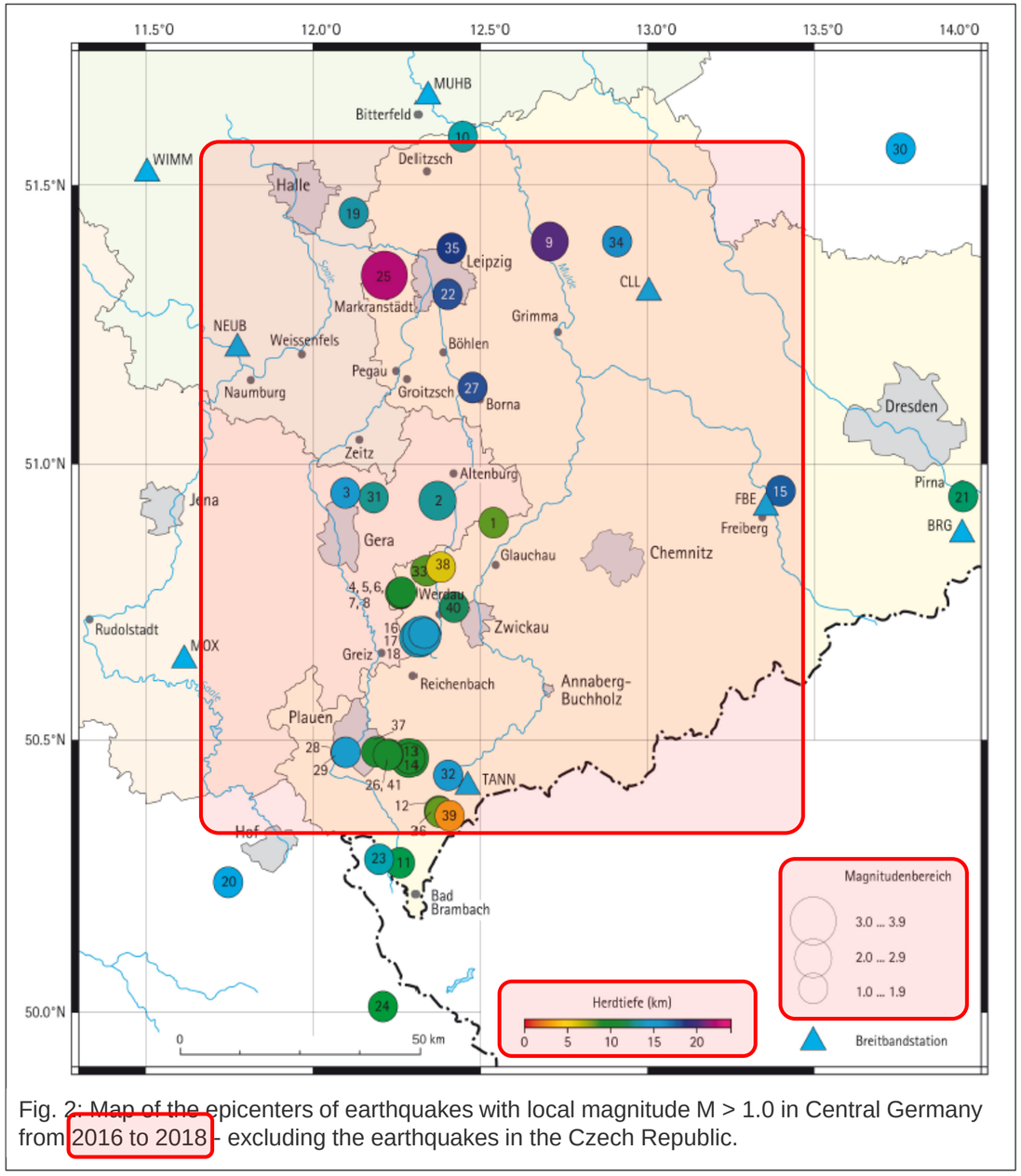

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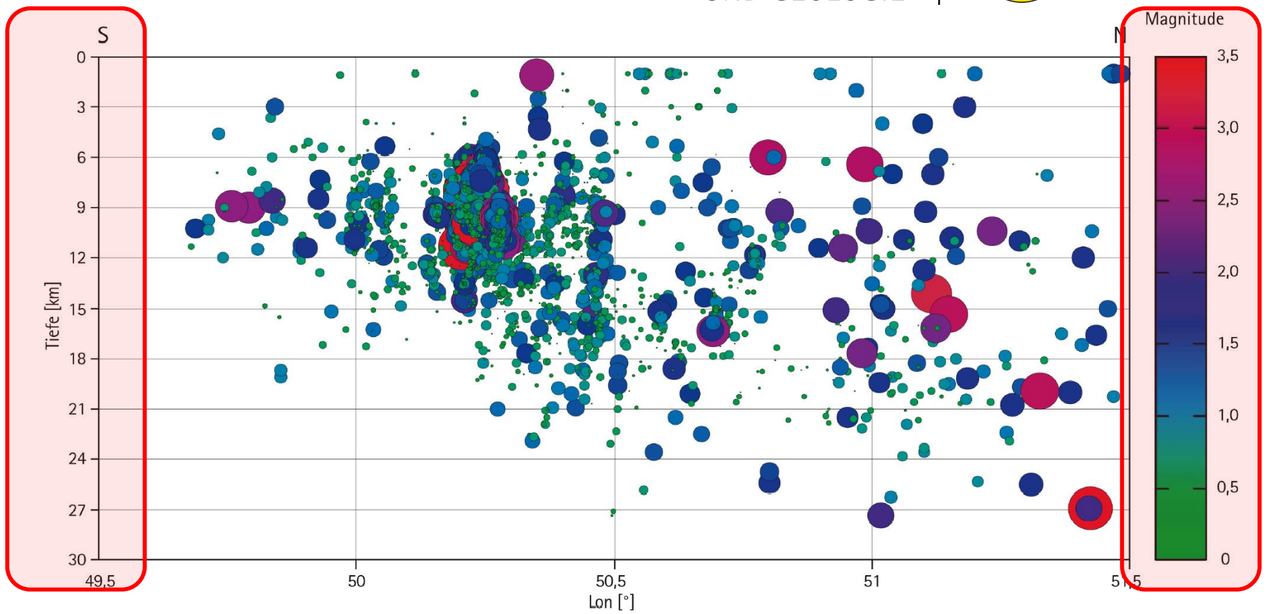

Fig. 3: Depth and magnitude of earthquakes along the Leipzig-Regensburg zone. The depth of the earthquakes increases towards the north.

Requirements for 3d visualization:

- **Location** of epi- and hypocenters
- Representation of the **magnitude**
- Focal **depth**
- **Color** Map
- Filtering by **time**

} interactive

GST-Web for visualization and provision of 3d geological data

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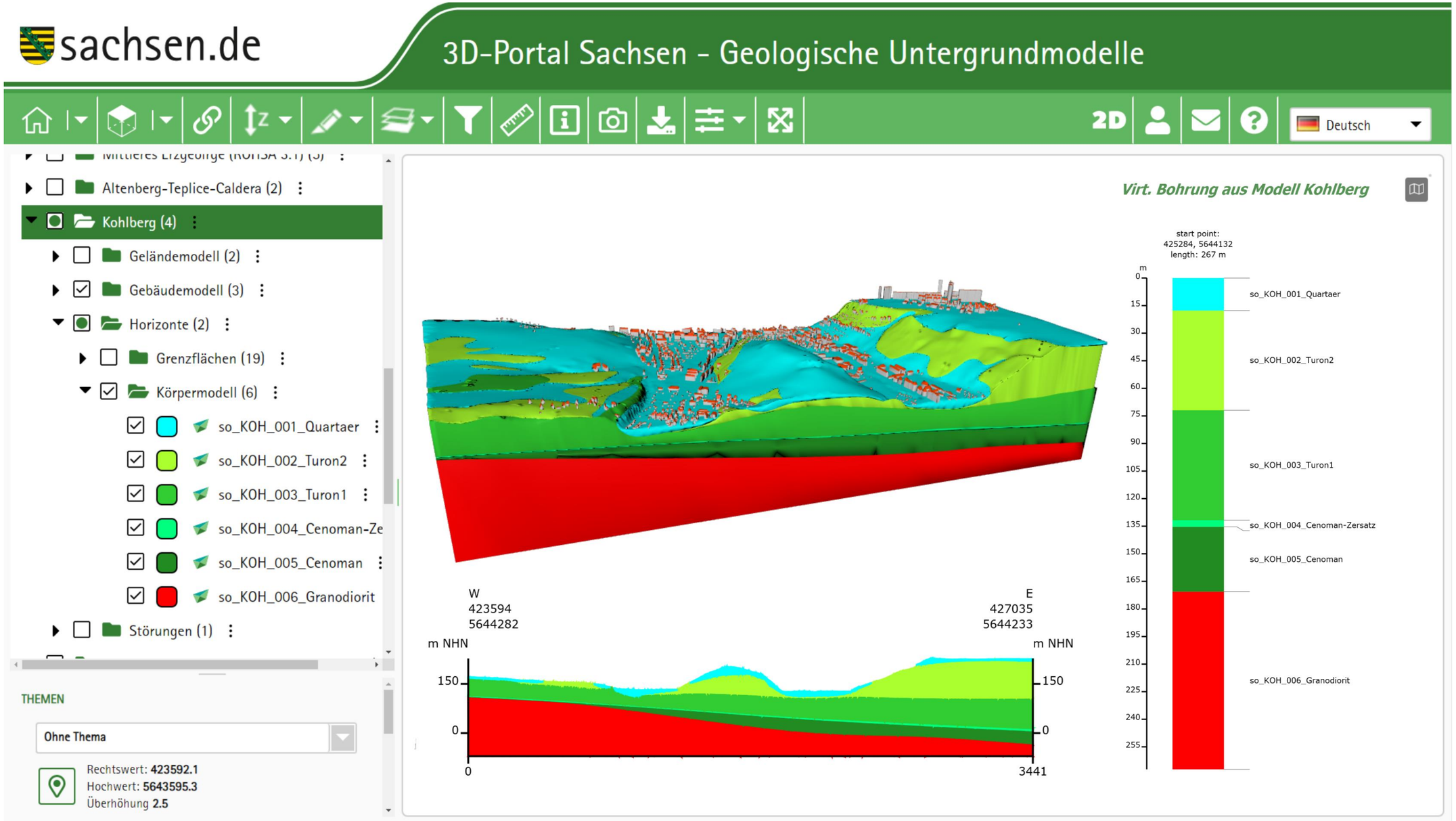

From online earthquake catalog to 3d point clouds

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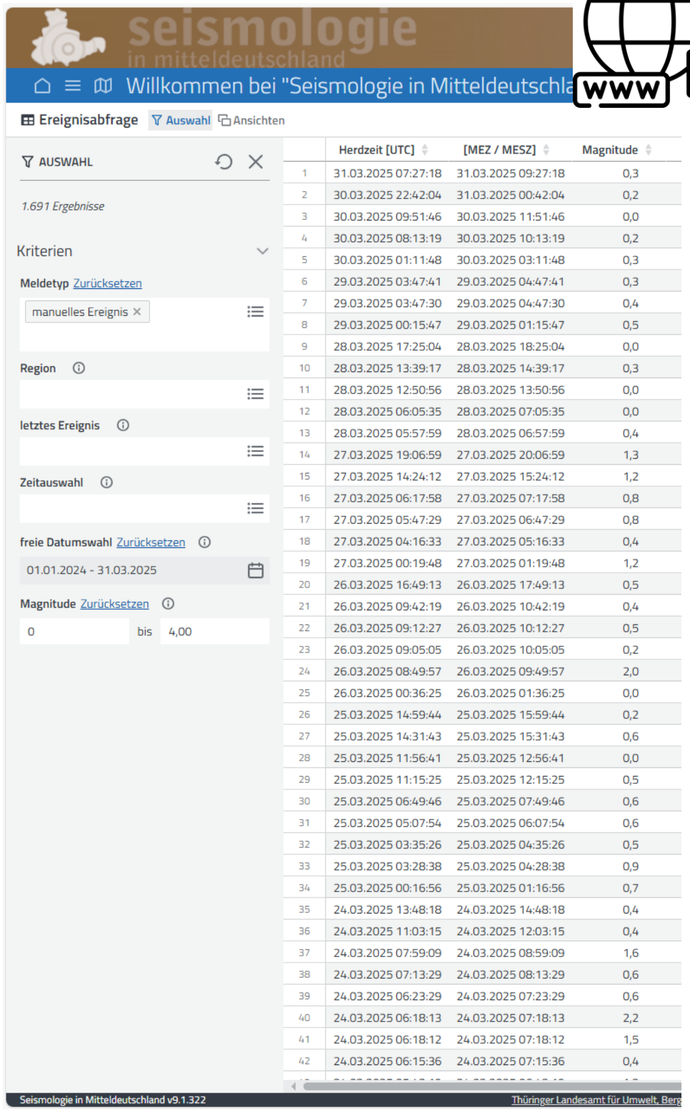
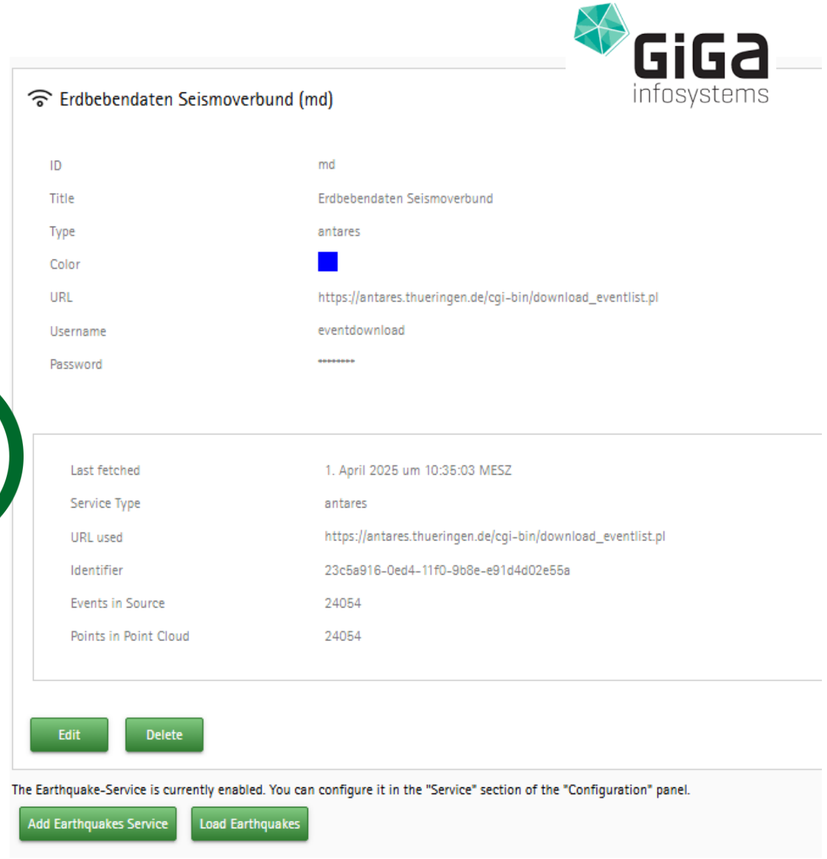
seismology catalog (https)…



…provided as Service (JSON)…

…parsed by GiGa GST (pointcloud)



→also suitable for FDSN-Services

GST-Web visualization of earthquake hypocenters along with geological structures

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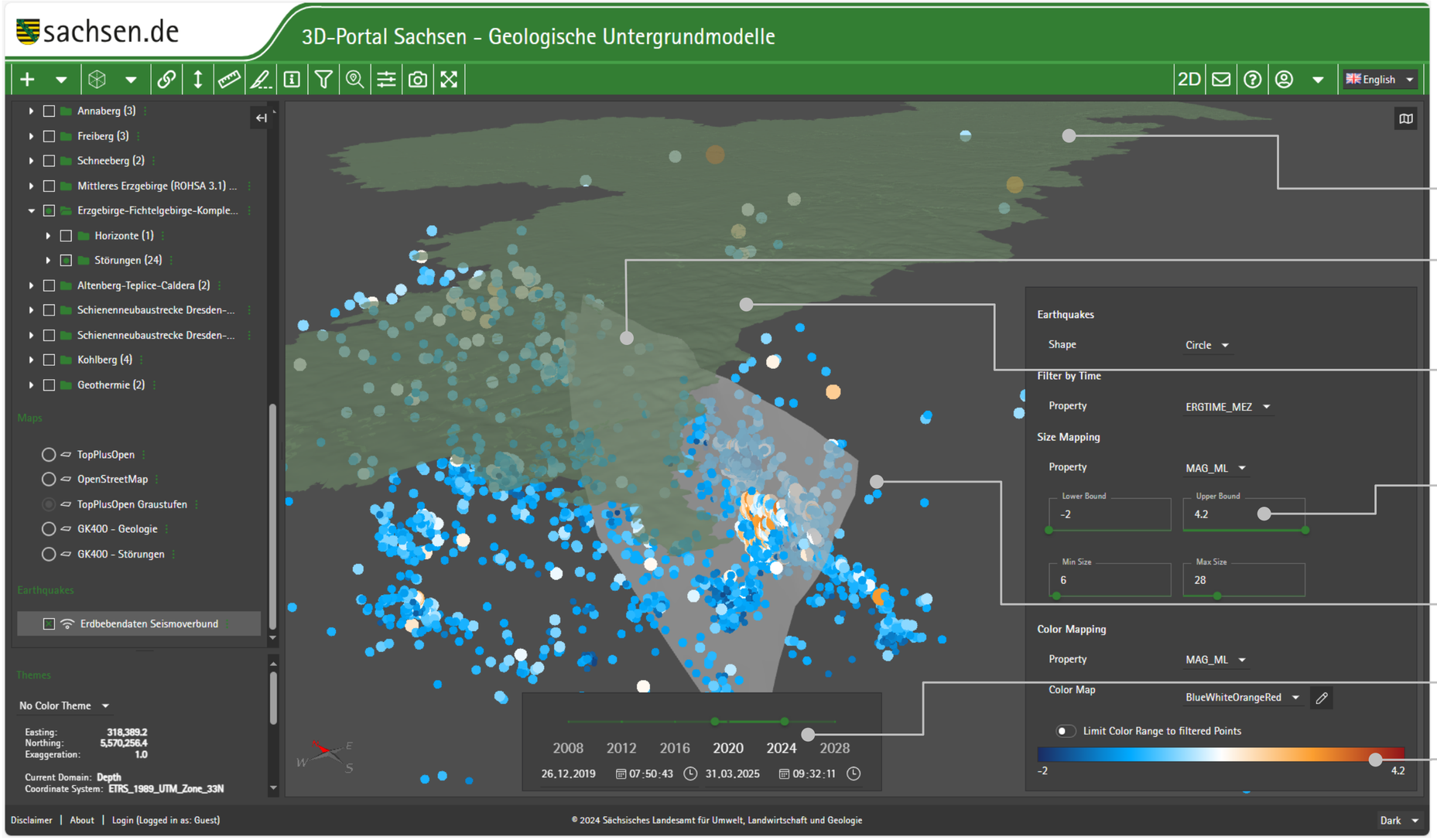


+ **Topography**

+ **Structures:** faults & geological horizons

- **Location** of epi- and hypocenters

- Representation of the **magnitude**

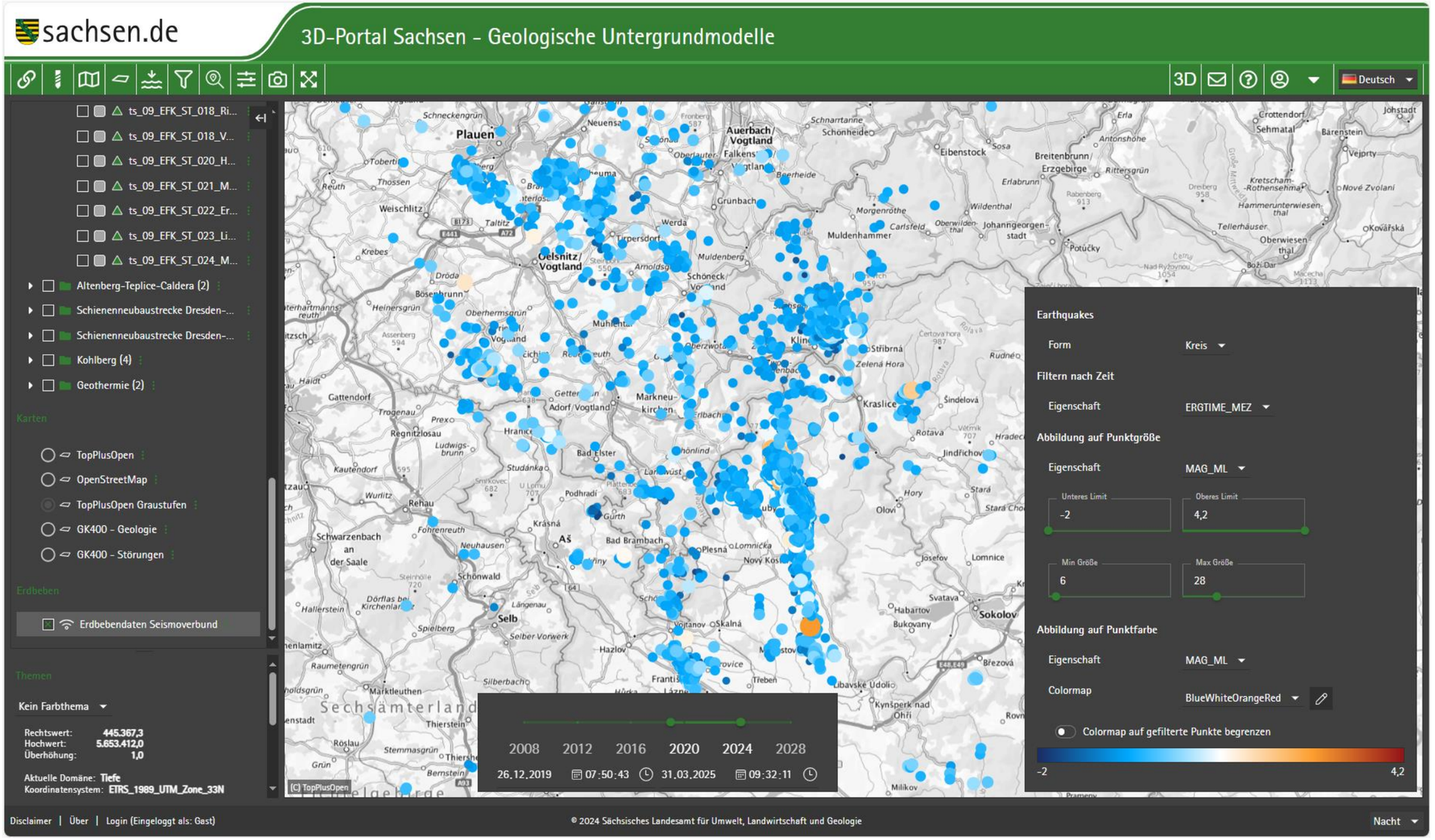
- Focal **depth**

- Filtering by **time**

- **Color** Map

→ Live-Demo

Detailed views of web visualization tool: 2d map view



Appendix 1

Detailed views of web visualization tool: earthquakes in march 2025

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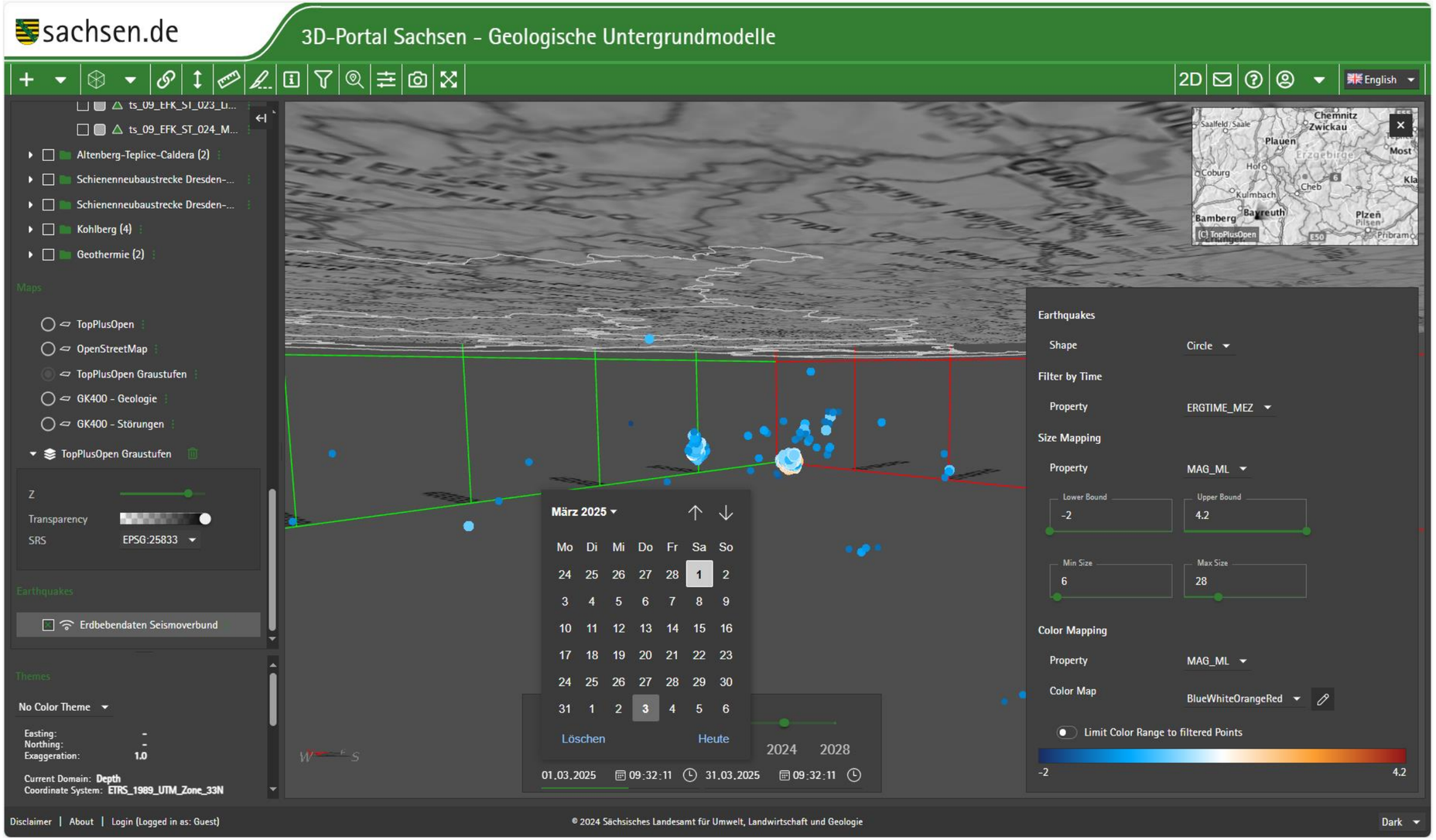
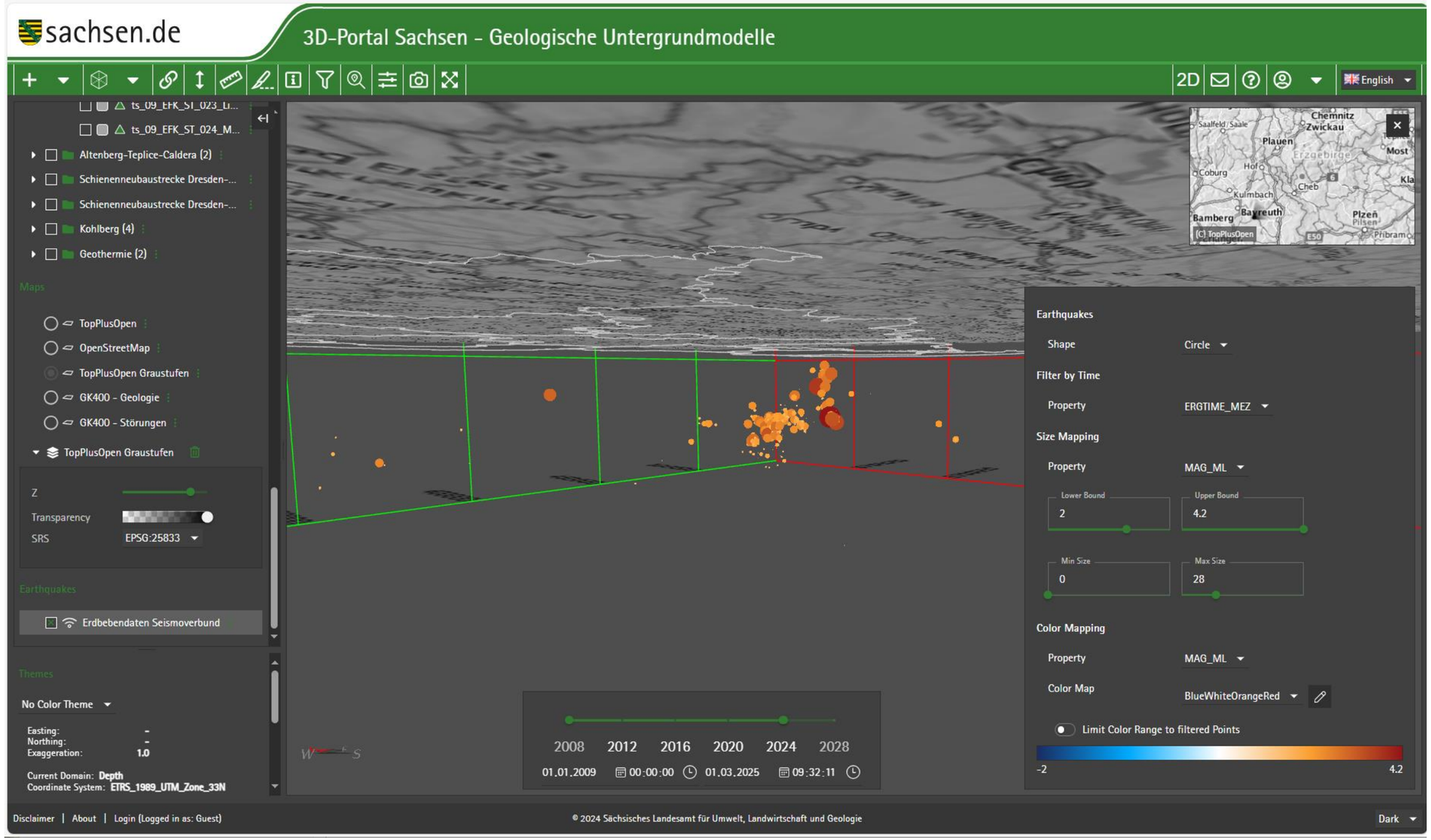


Appendix 2

Detailed views of web visualization tool: earthquakes > M2.0 since 2008



Appendix 3

Detailed views of web visualization tool: integration with 3d models

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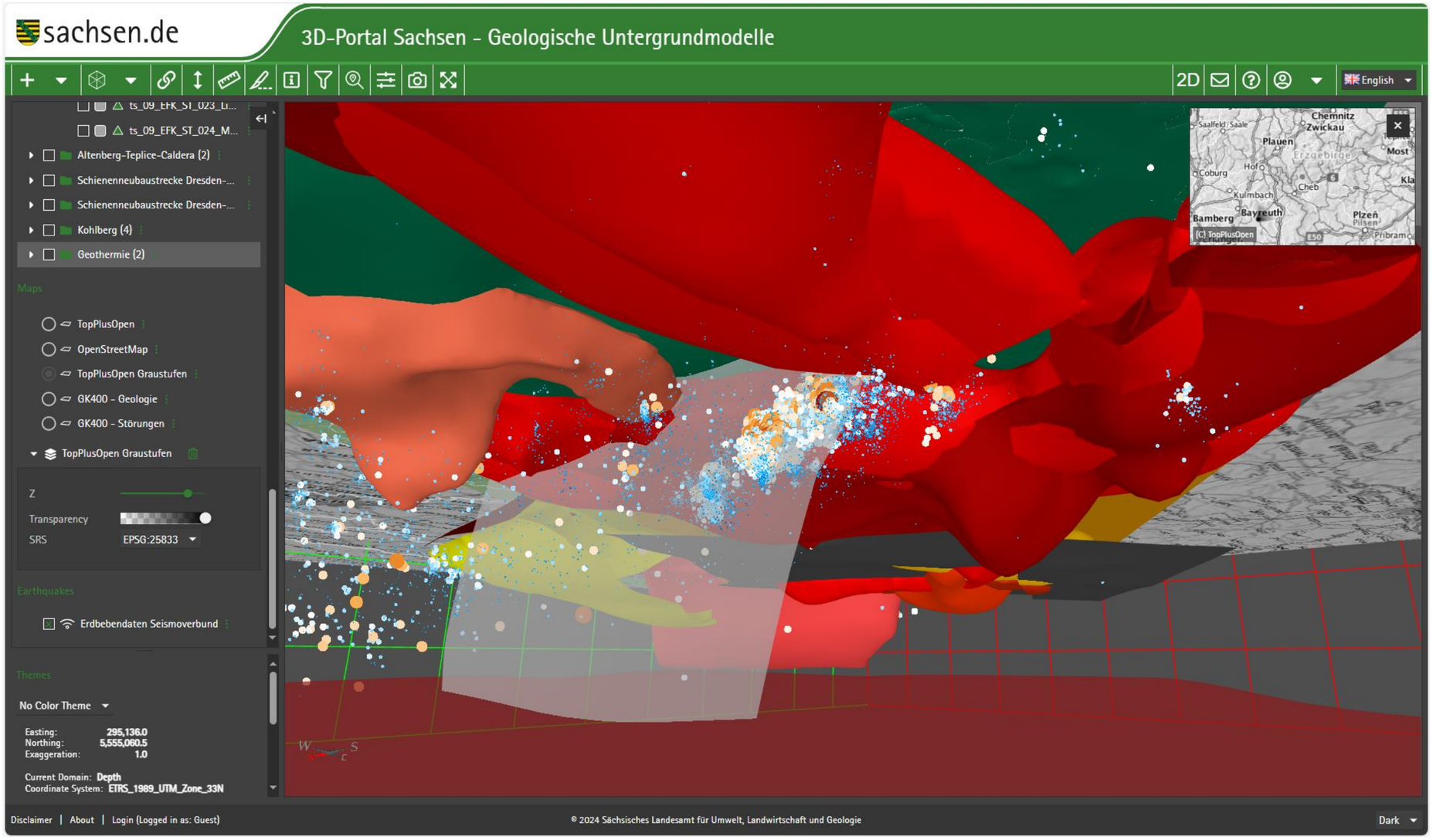

Appendix 4

Summary and take home message

Usefulness of the 3D Earthquake Visualization Tool:

- Interactive Viewing: Allows users to explore seismic events in 3D and filter data by time, magnitude, and type.
- Integration with 3D Models: Combines seismic data with subsurface models to visualize fault lines and geological features.

Advantages Over 2D Maps:

- Better Spatial Understanding: Provides a more complete view of earthquake depth and orientation.
- Dynamic Exploration: Offers interactive, engaging visuals that improve data interpretation.

Public Outreach and Communication:

- Enhanced Awareness: Helps the public understand seismic risks and earthquake preparedness.
- Real-Time Data Access: Provides authorities and the public with current earthquake information for informed decision-making.

→ try yourself

Thank you for your attention!

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