

GeotIS - a Geothermal Information System for Germany

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Outline

- Geothermal energy in Germany
- Project
- Catalogue of geothermal installations
- GeotIS – geothermal resources in Germany
 - Spatial scope
 - Data sources
 - User interface
 - Technical concept

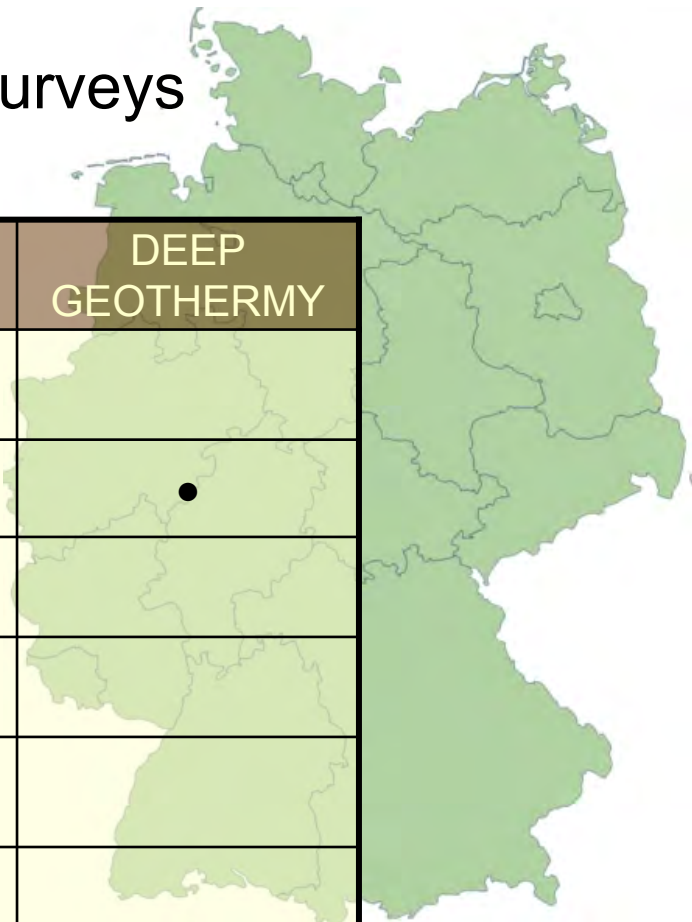
Geothermal Energy in Germany

NEAR-SURFACE GEOTHERMAL ENERGY (max. 400 m)	10 - 20°C	Heating (requires heat pump) Cooling
HYDROGEOTHERMAL ENERGY Deep Aquifers	20 - 150°C	District Heating Power Generation (>100°C)
PETROTHERMAL ENERGY Enhanced Geothermal Systems Bedrocks	>150°C	Power Generation District Heating

Geothermal Information Systems in Germany

16 Federal States = 16 Geological Surveys

	Medium	NEAR-SURFACE GEOTHERMY	DEEP GEOTHERMY
Baden- Württemberg	Internet	•	
Bavaria	CD/DVD	•	•
Brandenburg	Internet	•	
Lower Saxony	Internet	•	
Mecklenburg- Vorpommern	Internet	•	
North Rhine- Westphalia	CD	•	



Deep Geothermy in Germany

- 2004: Renewable Energy Act
 - 15 ct/kWh for geothermal electricity
- 2008: Revision of Renewable Energy Law
 - 16 ct/kWh for geothermal electricity
 - Plus 4 ct/kWh for power plants with start of operation until 2015
 - Plus 3 ct/kWh for cogeneration of heat and power
 - Plus 4 ct/kWh for enhanced geothermal systems
- Technical developments
 - Seismic
 - Drilling
 - Frac process
 - . . .
- Development of insurances covering exploration risk
- **Development of a geothermal information system**

Exploration Risk

The exploration risk is the risk of penetrating a geothermal reservoir with one (or more) borehole(s) with inadequate quantity or quality.

- Quantity is defined by the installed output:

$$P = \rho_F c_F Q (T_i - T_o)$$

- Quality is determined by the composition of the fluid

Project

An internet-based atlas of hydrogeothermal resources in Germany



- Catalogue of geothermal installations
- Compilation of all relevant subsurface parameters
 - Occurrence, thickness and depth level of aquifers
 - Faults
 - Hydraulic data
 - Temperatures
 - Well data
- Web Map Service and more
 - UMN-Mapserver
 - Java-Servlets for user-defined views
 - Box whisker plots for hydraulic data

Project

Funding:

German Federal Ministry of the Environment, Nature Conservation and Nuclear Safety (BMU)



Partners:

FU Hydrogeology Section, Berlin
GTN Geothermie Neubrandenburg GmbH
LBEG Lower Saxony, Hannover
LfU Bavaria, Augsburg
LUNG Mecklenburg-Vorpommern, Güstrow
RPF Department of Environment, Freiburg

Scientific steering: Deep Geothermy Work Group of the geological surveys (PK Tiefe Geothermie)

Catalogue of Geothermal Installations (VGS)

<http://www.geotis.de/vgs>

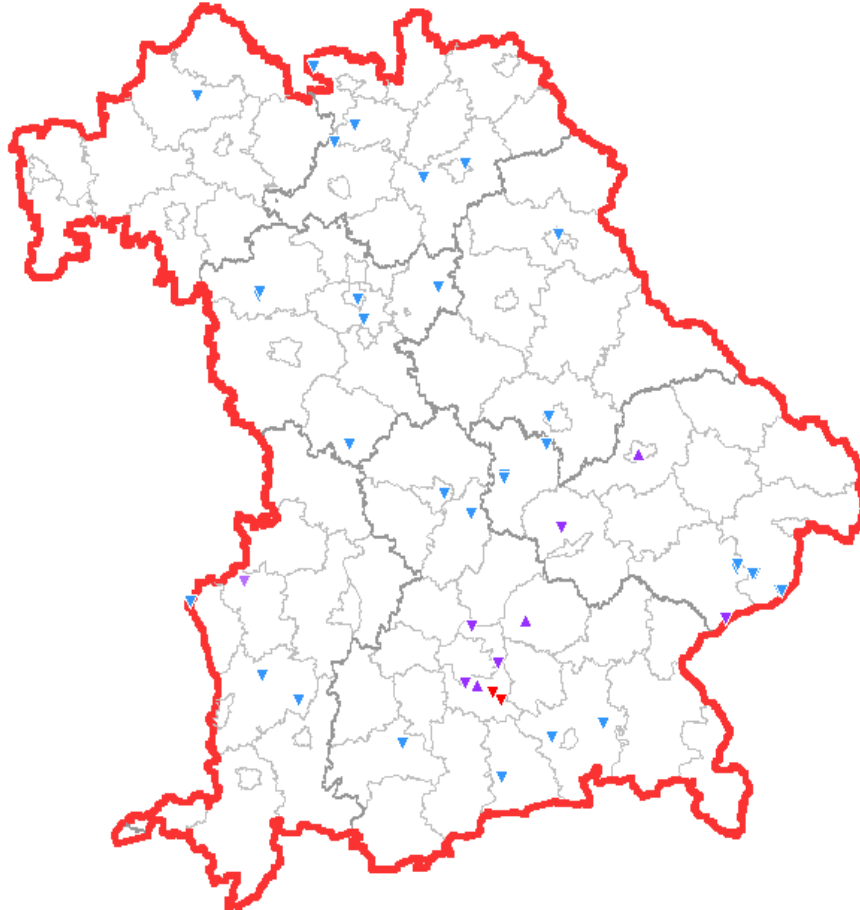


- data compilation by “*PK Tiefe Geothermie*“
- interactive maps (UMN-Mapserver)
 - location specific data (e.g. flow rate, temperature, use ...)
 - permission fields
 - various map backgrounds (e.g. topography ...)
- integrated community index
- federal state selection mode



Kartenfenster

ATKIS® DLM250/1000, G N250/1000, VG250, © BKG 2008



Standortfilter **themat. Filter**

Abfrage auf das Kartenfenster

Temperatur [°C] Leistung ges. [MWt]

Fließrate [l/s] Leist. geotherm. [MWt]

Teufe [m] Jahresprod. [GWh/a]

Betrieb Bau

Referenzkarte

Legende

- △ Standorte mit Nebennutzung
- ▽ Standorte ohne Nebennutzung
- ▲ Stromerzeugung
- ▲ Fernwärme
- ▲ Gebäudeheizung
- ▲ Thermalbad / Balneologie

Grenzen

- Bayern
- Regierungsbezirk
- Kreis

Layer alle öffnen | alle schließen

Ebenen

- Standorte (an - aus)
 - Stromerzeugung
 - Fernwärme
 - Gebäudeheizung
 - Thermalbad / Balneologie
 - Gewächshaus
 - Trink- / Brauchwasser
 - CO₂-Gewinnung
 - Forschung
 - sonstige
 - ungenutzt
- Konzessionsgebiete
- Hintergrundkarten

Informationen zu Standorten (Betrieb, Bau)

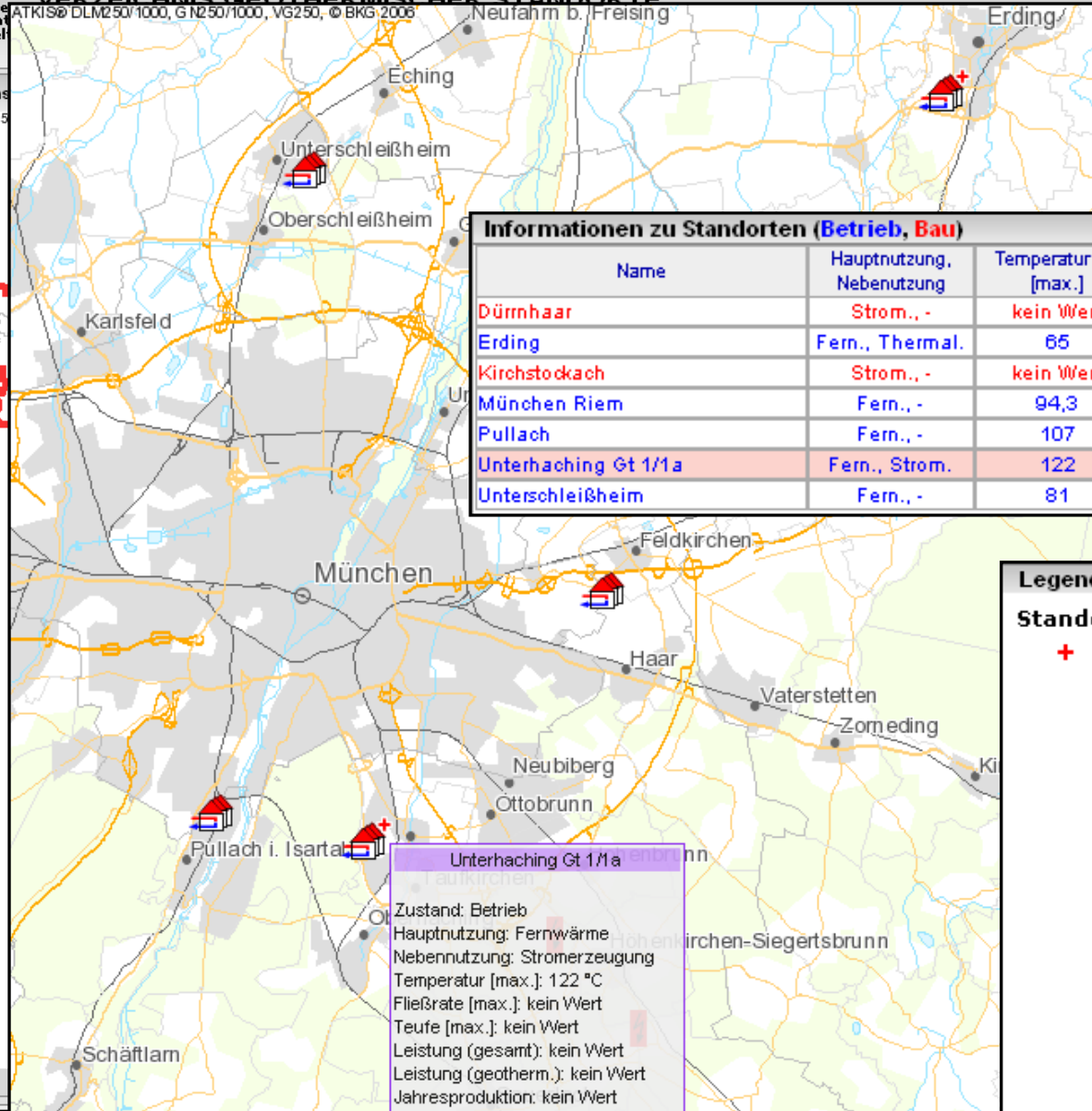
Name	Hauptnutzung, Nebennutzung	Temp., Fließ-, Teufe			Direktwärmenutzung
		Temperatur °C [max.]	Fließrate l/s [max.]	Teufe m [max.]	

0 49 98 147 196 km

Maßstab ca. 1: 2.070.000

Mauszeiger R: 3329116 H: 6004523 (DHDN Zone 3)

VERZEICHNIS GEOTHERMISCHER STANDORTE



Informationen zu Standorten (Betrieb, Bau)		Temp., Fließ., Tiefe		Direktwärmenutzung	
Name	Hauptnutzung, Nebenutzung	Temperatur °C [max.]	Fließrate l/s [max.]	Tiefe m [max.]	Lage
Dürnhaar	Strom., -	kein Wert	kein Wert	kein Wert	zoom
Erding	Fern., Thermal.	65	kein Wert	2200	zoom
Kirchstockach	Strom., -	kein Wert	kein Wert	3750	zoom
München Riem	Fern., -	94,3	64,4	2746,7	zoom
Pullach	Fern., -	107	40	3445	zoom
Unterhaching Gt 1/1a	Fern., Strom.	122	kein Wert	kein Wert	zoom
Unterschleißheim	Fern., -	81	90	1960	zoom

Unterhaching Gt 1/1a
 Zustand: Betrieb
 Hauptnutzung: Fernwärme
 Nebenutzung: Stromerzeugung
 Temperatur [max.]: 122 °C
 Fließrate [max.]: kein Wert
 Tiefe [max.]: kein Wert
 Leistung (gesamt): kein Wert
 Leistung (geotherm.): kein Wert
 Jahresproduktion: kein Wert

Legende

Standorte

- + Standorte mit Nebenutzung
- ⚡ Stromerzeugung
- 🏠 Fernwärme
- 🏠 Gebäudeheizung
- ♨️ Thermalbad / Balneologie
- 🚰 Trink- / Brauchwasser
- 🌡️ CO₂-Gewinnung
- 🔍 Forschung
- 🚰 sonstige
- 🚰 ungenutzt

Hydrogeothermal Resources

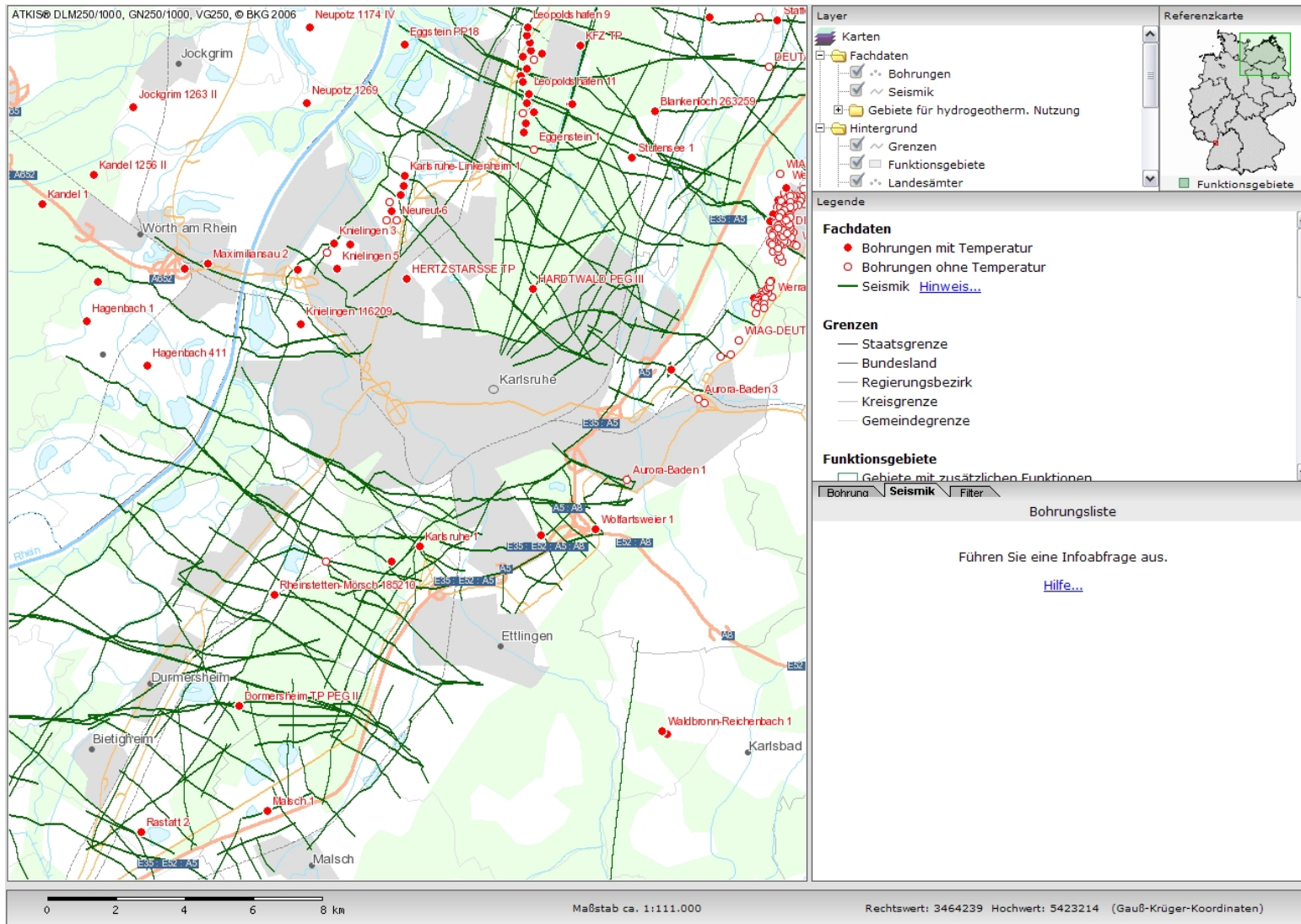
- North German Basin
 - Aquifer Complex Lias-Rhaetian
 - Middle Bunter Sandstone
 - Rotliegend Sandstone
 - Lower Cretaceous Sandstone
 - Dogger Sandstone
 - Keuper Sandstone
- Upper Rhine Graben
 - Upper Muschelkalk
 - Middle Bunter Sandstone
- Southern German Molasse Basin
 - Upper Jurassic (Malm)



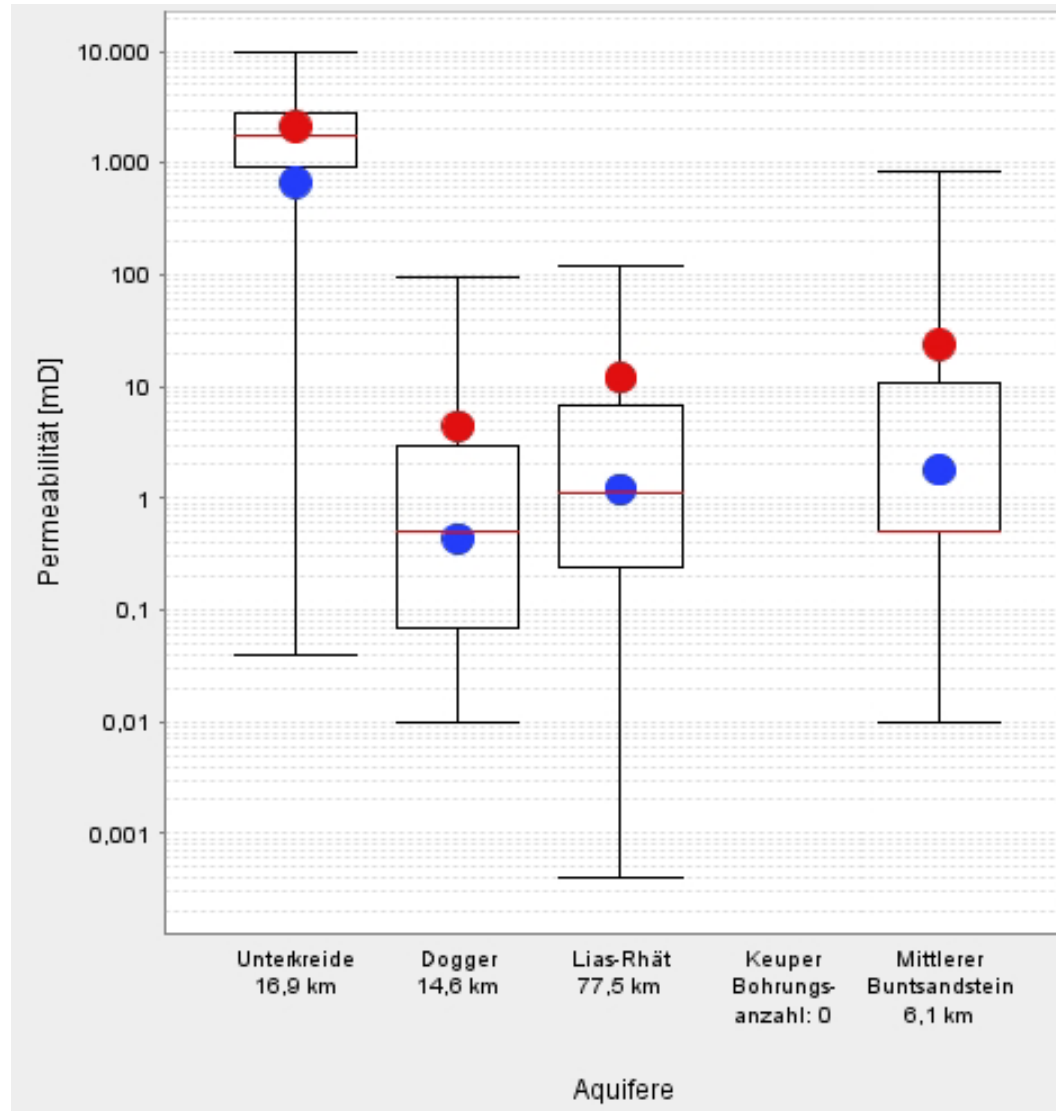
Data Sources

- Well Data:** Hydrocarbon exploration (ca. 27,000)
Geothermy
Mining
Water
- Hydraulics:** Hydrocarbon Information System, LBEG
Datasets of partners
- Temperatures:** Geophysical Information System, GGA
(ca. 9,500 locations)
- Structural Data:** Maps of geothermal resources (NE-Germany)
Maps of Malm depth level (Molasse Basin)
Geological cross sections:
- Western Molasse Basin
- Upper Rhine Valley

User Interface: Map Navigation

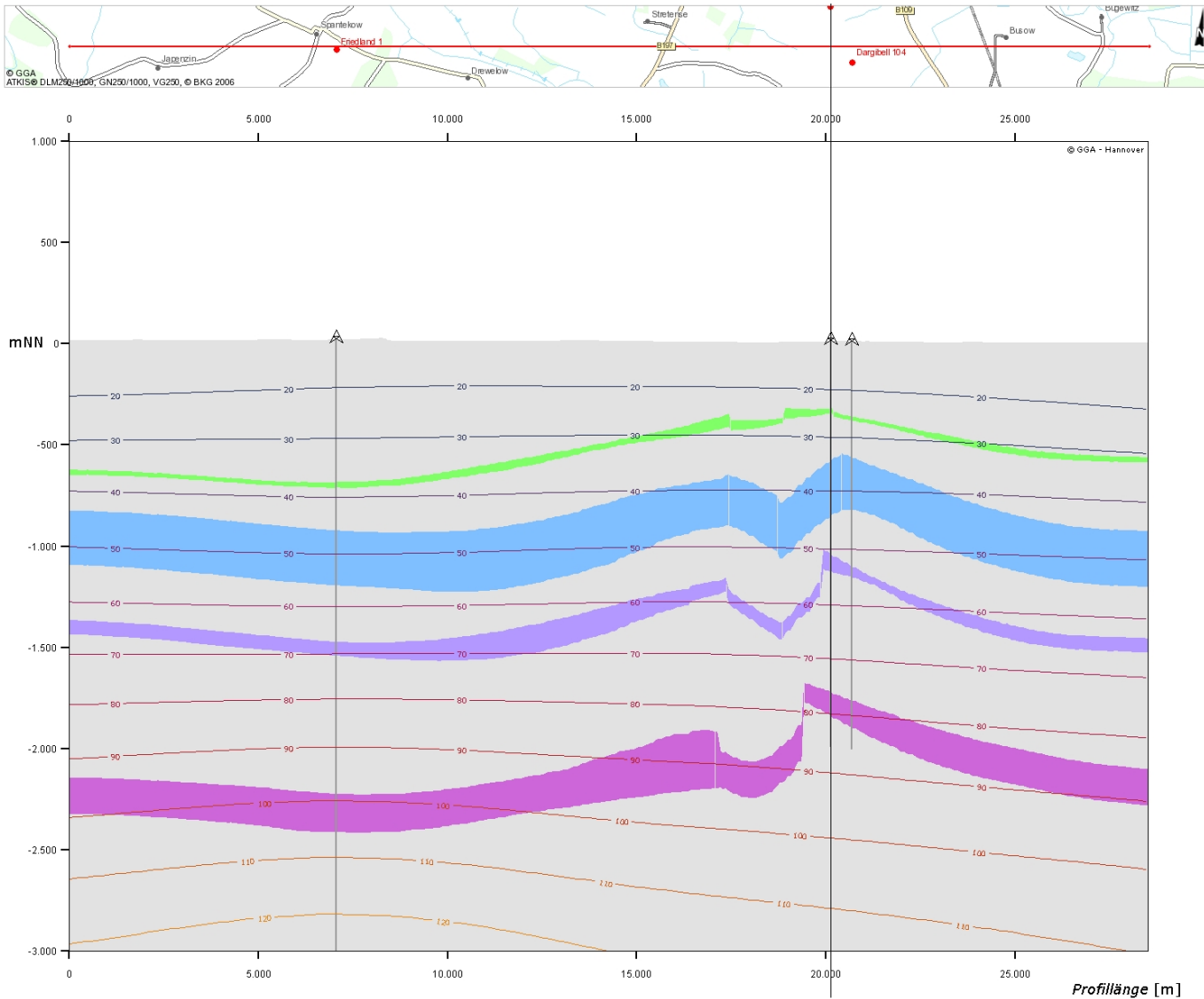


User Interface: Box Whisker Plot of Hydraulic Data



Retrieve mean values for porosity or permeability.

User Interface: Cross Section + Temperature

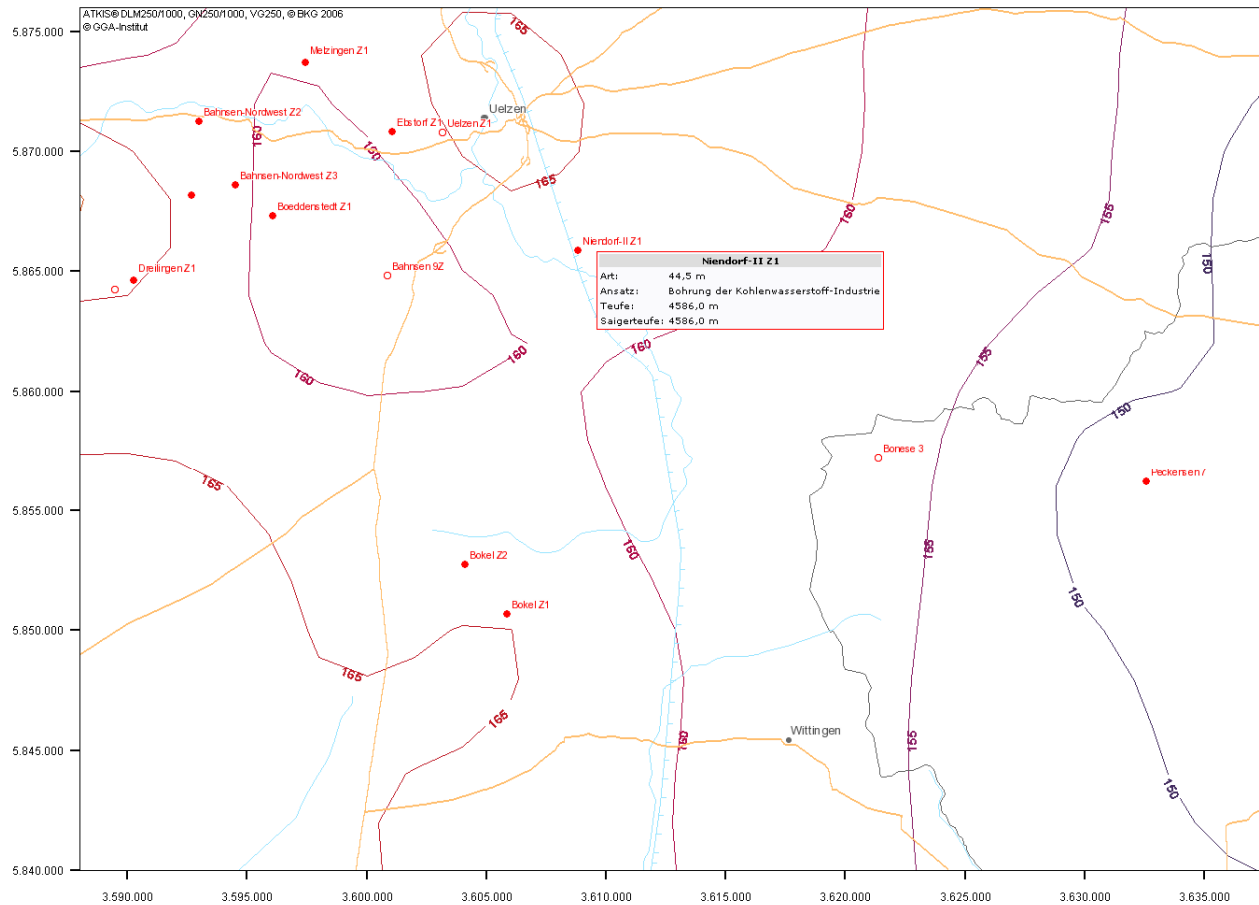


Use your mouse to draw a line on the map . . .

explore the deep underground on a geologic cross section . . .

and save all as one PDF-file!

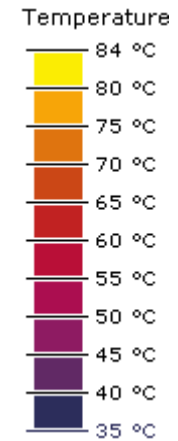
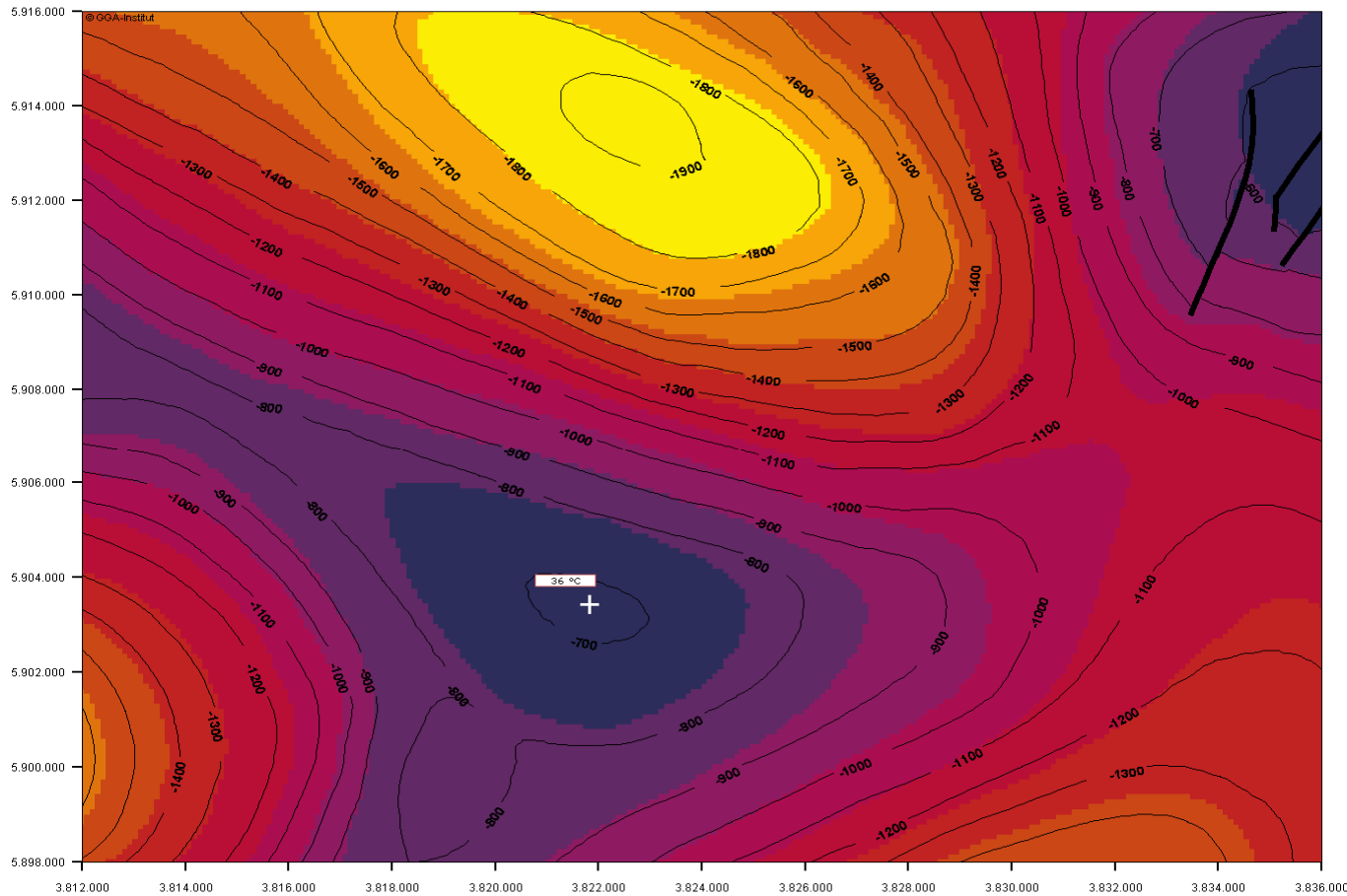
User Interface: Temperature + Well Locations



Get temperature distribution at any depth level between 0 and -5000 m NN.

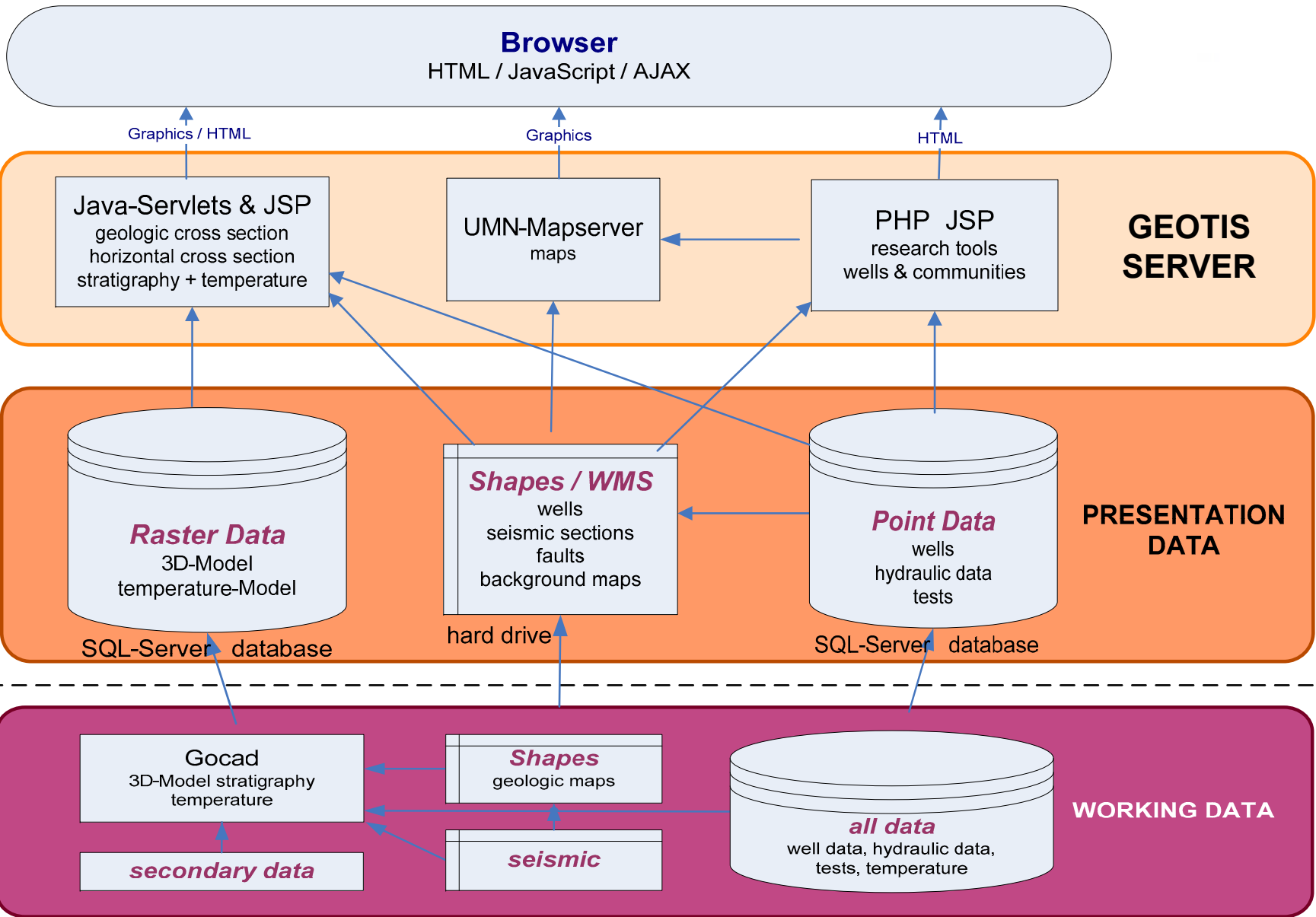
-4500 m NN
constant depth level

User Interface: Stratigraphy + Temperature



Lias (Base)

depth level & temperature



Thank you!