DANUBE REGION strategy Energy

Workshop on the Danube Region Geothermal Concept (DanReGeotherm)

Budapest, 28 November 2013
Geological and Geophysical Institute of Hungary

Country Update: Germany

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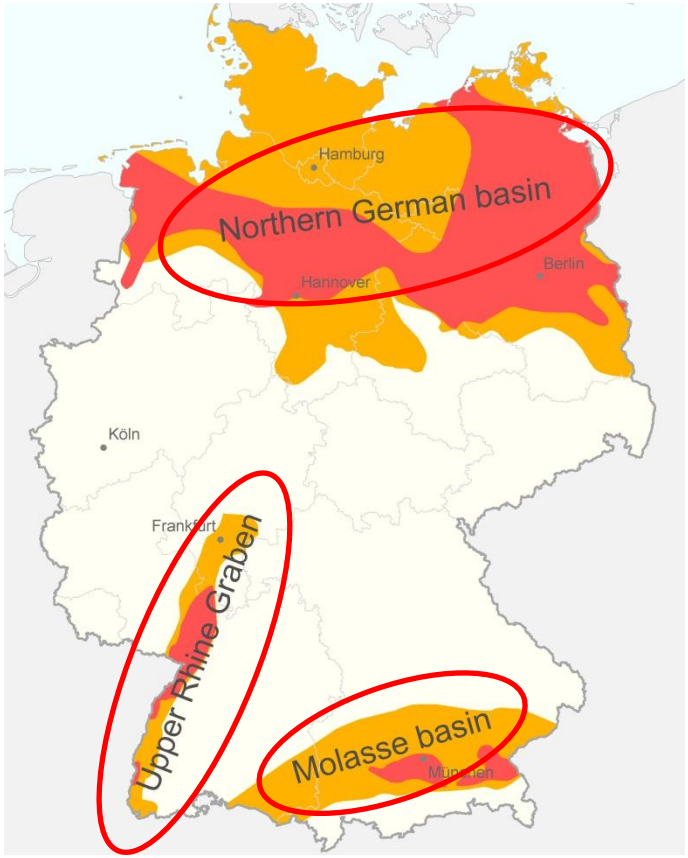
Main Deep Geothermal Reservoirs

Geothermal Information System for Germany

www.geotis.de



North German basin

Middle Buntsandstein
Rotliegend sandstone
Lower Cretaceous sandstone
Dogger sandstone
Keuper sandstone

Upper rhine graben

Upper Muschelkalk (limestone)
Middle Buntsandstein (sandstone)

Molasse basin

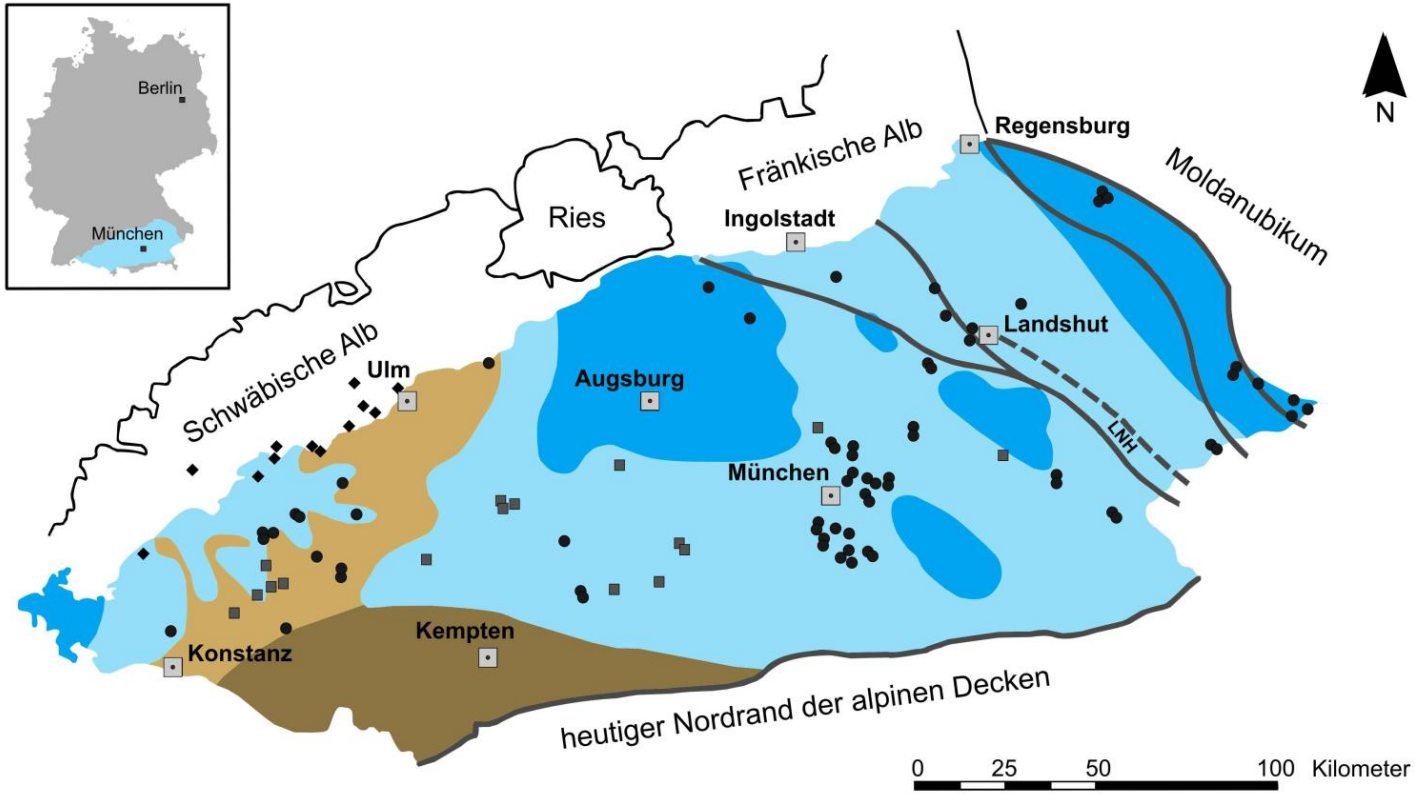
Upper Jurassic limestone

Reservoir temperature

60–100 °C

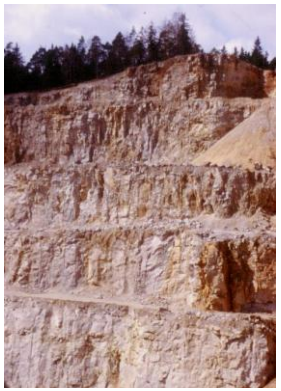
>100 °C

Jurassic Limestone Reservoire



Faziesverteilung Malm δ 1+2 (Mittel-Kimmeridge, unterer Teil) nach MEYER & SCHMIDT-KALER (1996)

- Riff-Massenfazies
- Bank-Fazies
- Schwäbisches Mergelbecken
- Übergang ins Helvetische Becken
- Störung
- östlicher Rand des LNH Landshut-Neuöttinger Hoch



Dolomite Bernhof

Limestone Ittling

(Birner et al. 2012)

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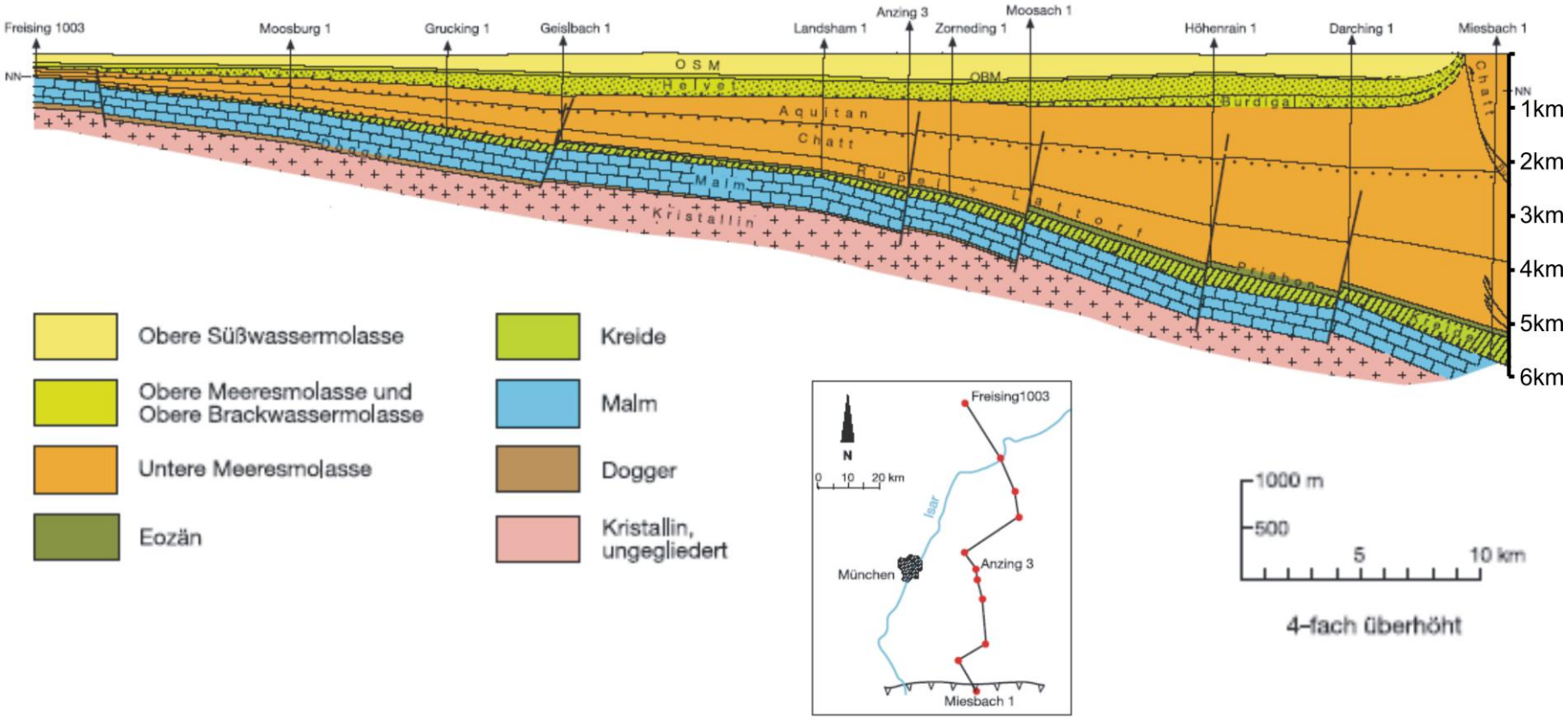
Molasse Basin – Jurassic Limestone

N–S Cross section



modified after
Lemcke (1988)

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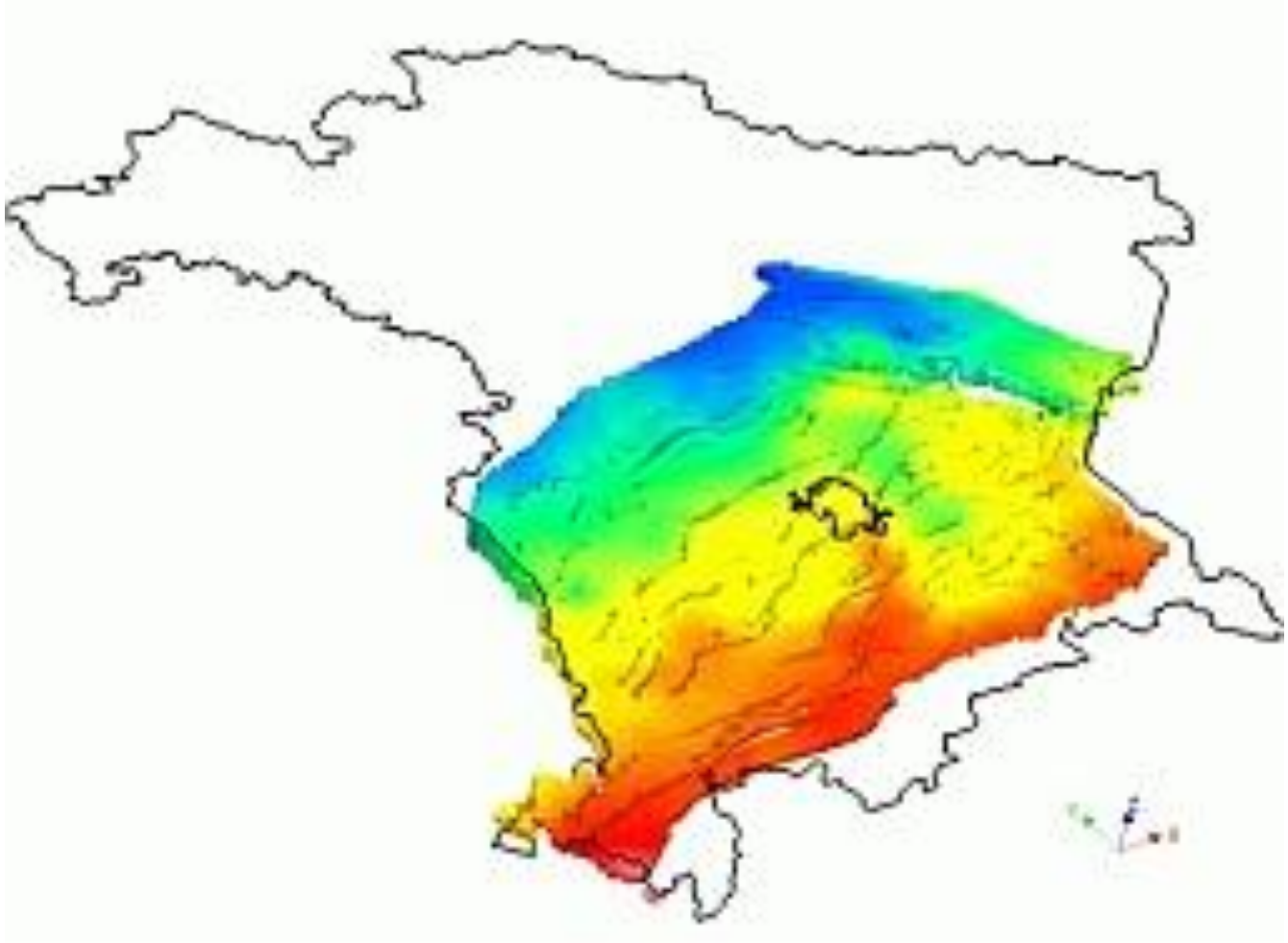
Jurassic Limestone Reservoire Temperatures



LIAG (2011)

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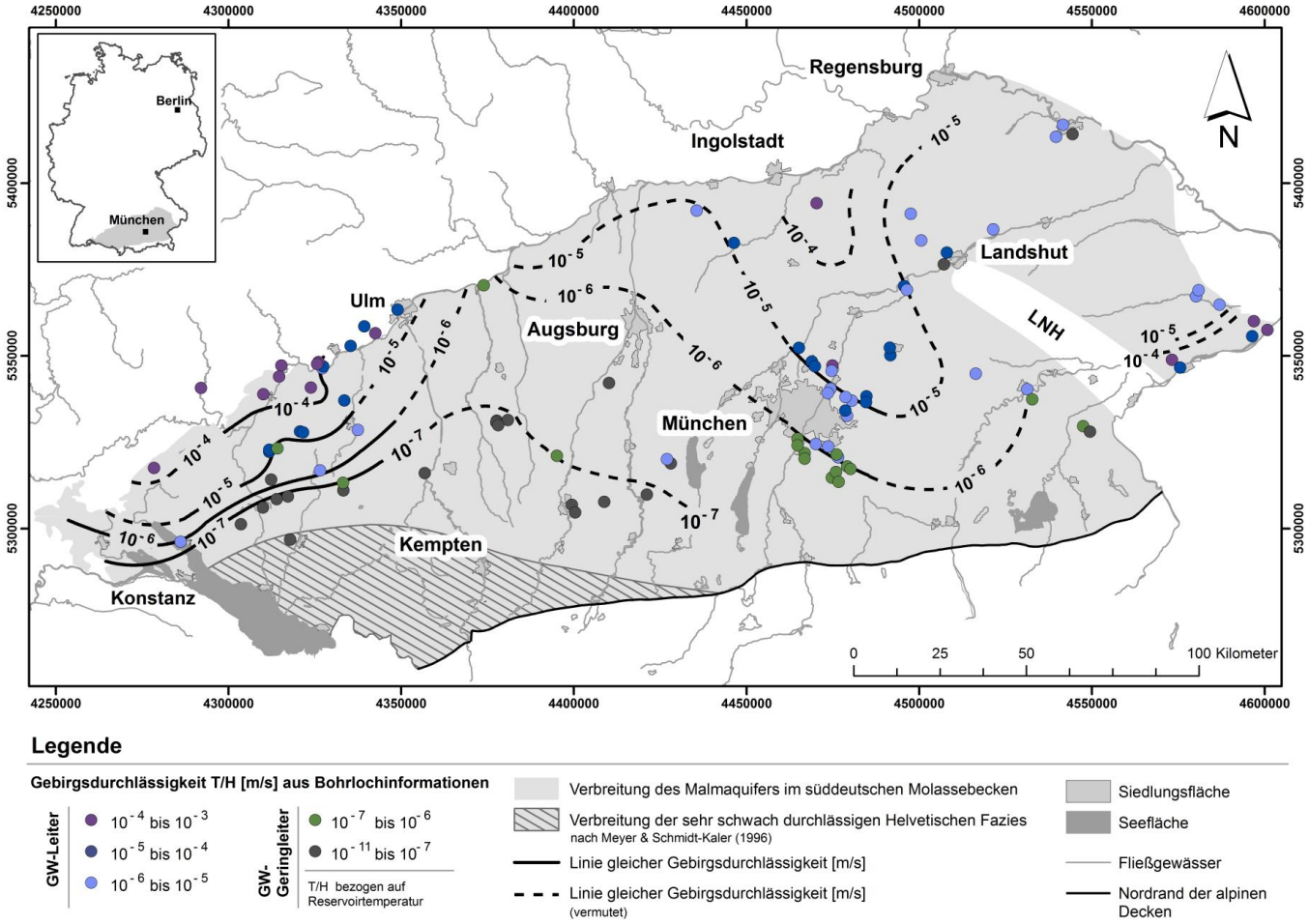
Jurassic Limestone Permeability



(Birner et al. 2012)

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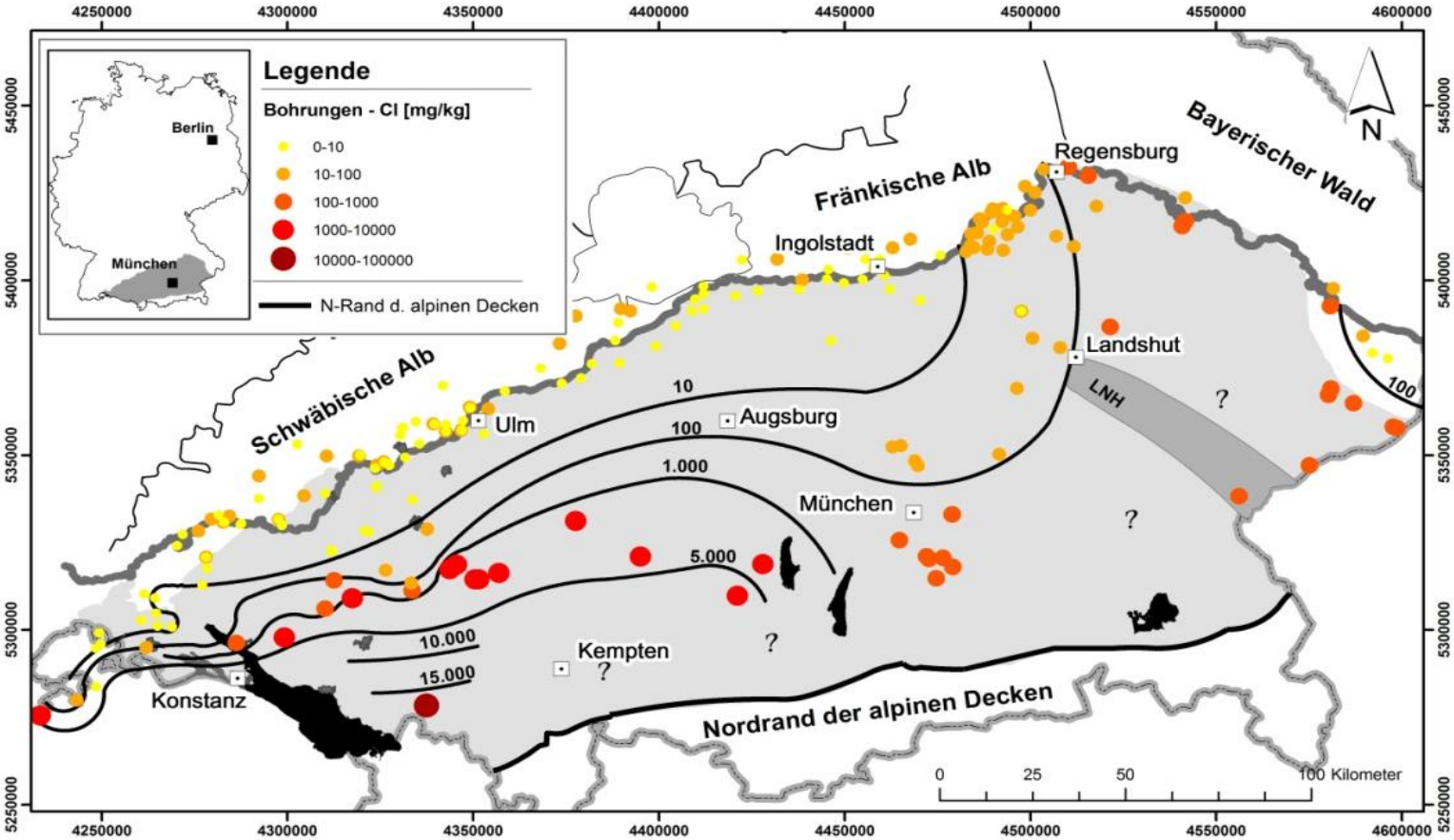
Jurassic Limestone Groundwater Salinity



Stober, I., Wolfgramm, M., Birner, J. (2013) in prep.

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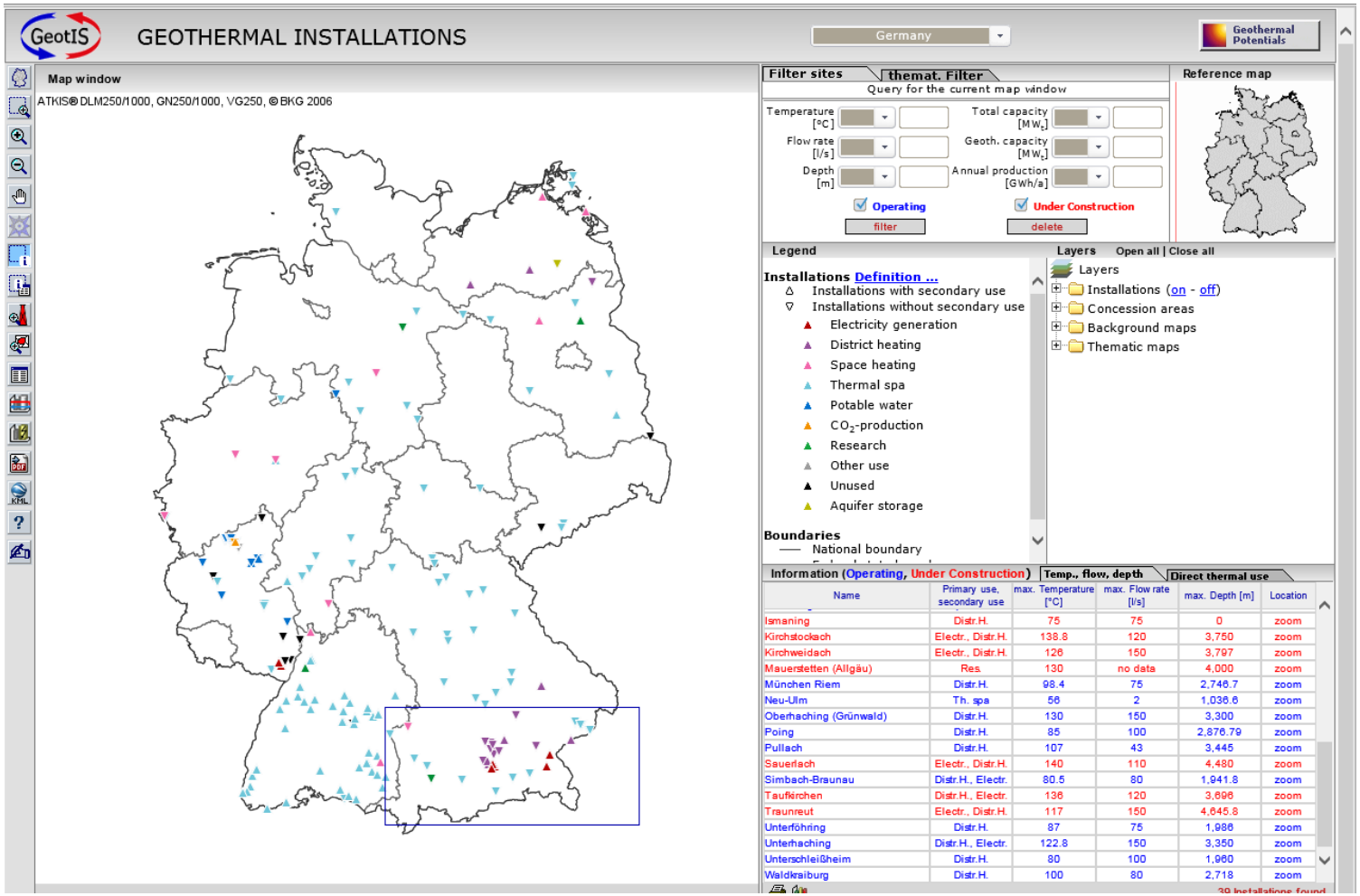
Main types of current utilization of geothermal energy



Name	Primary use, secondary use	max. Temperature [°C]	max. Flow rate [l/s]	max. Depth [m]	Location
Ismaning	Distr.H.	75	75	0	zoom
Kirchstockach	Electr., Distr.H.	138.8	120	3,750	zoom
Kirchweidach	Electr., Distr.H.	126	150	3,797	zoom
Mauerstetten (Allgäu)	Res.	130	no data	4,000	zoom
München Riem	Distr.H.	98.4	75	2,746.7	zoom
Neu-Ulm	Th. spa	56	2	1,036.6	zoom
Oberhaching (Grünwald)	Distr.H.	130	150	3,300	zoom
Poing	Distr.H.	85	100	2,876.79	zoom
Pullach	Distr.H.	107	43	3,445	zoom
Sauerlach	Electr., Distr.H.	140	110	4,480	zoom
Simbach-Braunau	Distr.H., Electr.	80.5	80	1,941.8	zoom
Taufkirchen	Distr.H., Electr.	136	120	3,696	zoom
Traunreut	Electr., Distr.H.	117	150	4,645.8	zoom
Unterföhring	Distr.H.	87	75	1,986	zoom
Unterhaching	Distr.H., Electr.	122.8	150	3,350	zoom
Unterschleißheim	Distr.H.	80	100	1,960	zoom
Waldkraiburg	Distr.H.	100	80	2,718	zoom

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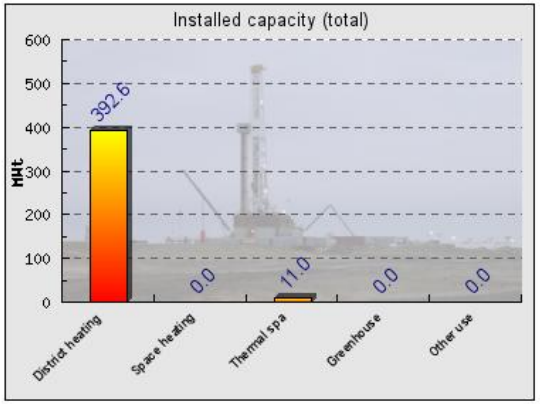
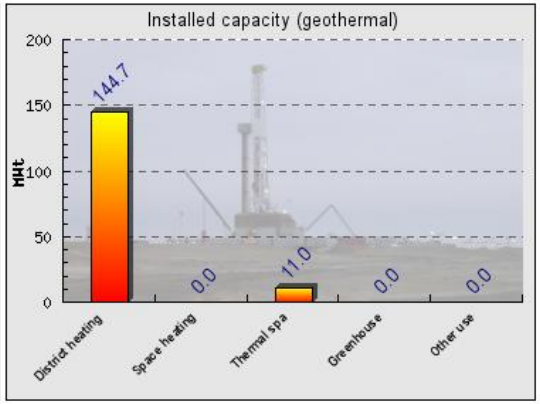
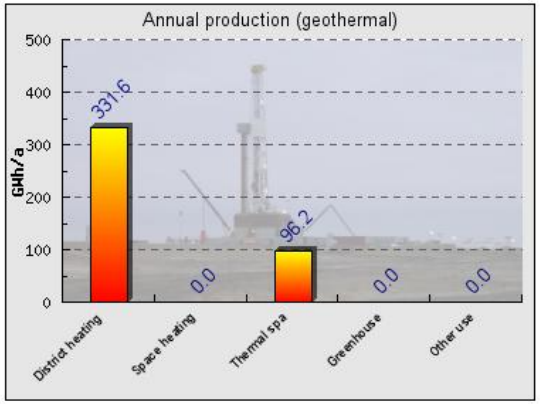
Main types of current utilization of geothermal energy

GeotIS	Direct use from measured and calculated values		
Primary use*	**Installed capacity total**	**Installed capacity geothermal****	**Annual production geothermal**
District heating	392.6 MWt	144.6 MWt	331.6 GWh/a
Space heating	-	-	-
Thermal spa	11.0 MWt	11.0 MWt	96.2 GWh/a
Greenhouse	-	-	-
Other use	-	-	-
Sum	403.5 MWt	155.6 MWt	427.9 GWh/a







Electricity:

Unterhaching (3.2 MWel), Simbach-Braunau (0.2 MWel), Taufkirchen (4.3 MWel u.c.), Kirchweidach (6.7 MWel u.c.), Traunreuth (3.5 MWel u.c.), Dürrnhaar (5.5 MWel u.c.), Sauerlach (5.1 MWel u.c.)

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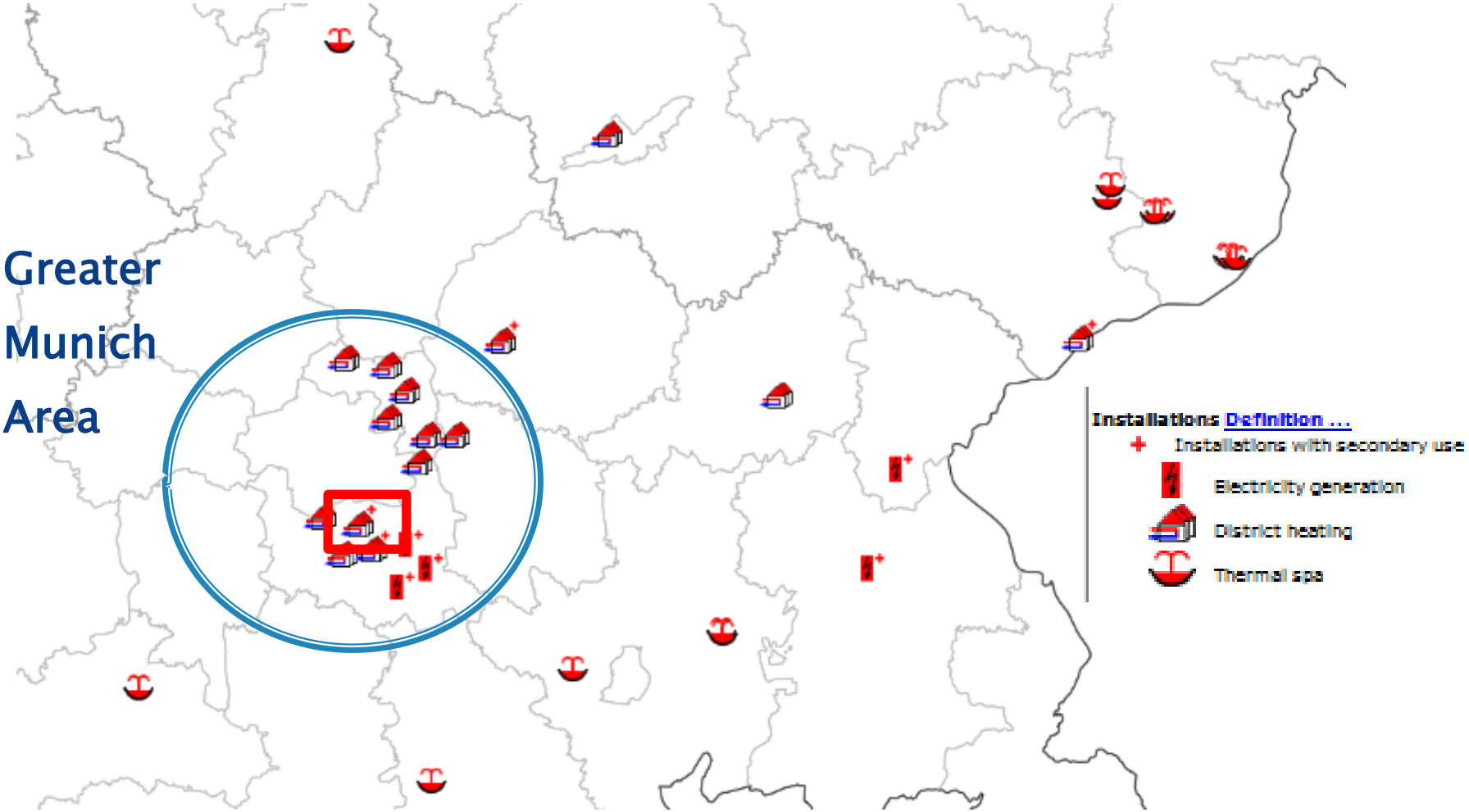
Main types of current utilization of geothermal energy

Greater Munich Area



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Main types of current utilization of geothermal energy

- Information on each individual site:

GeotIS
www.geotis.de

Geothermal

INSTALLATION		
Production well	**State**	**Easting**
Unterhaching	Bavaria	3,693,695 m
DIRECT USE (Definitions ...)		
Installed total capacity		**Installed geothermal capacity**
47 MWt		37 MWt
POWER GENERATION		
Installed capacity	**Annual production**	
3.36 MWe	7.59 GWh/a	
USE (Definitions ...)		
Primary use	**Secondary use**	
District heating	Electricity generation	
TEMPERATURE		
Temperature (reservoir)		**Temperature (wellhead)**
123.7 °C		123.3 °C

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Main types of current utilization of geothermal energy

- Information on each individual site:

FLOW RATE		
Max.		**Operating**
150 l/s		120 l/s
CONCEPT OF DEVELOPMENT, MINING LAW and CONCESSION AREA NAME (Definitions ...)		
Concept of development	**Mining law**	**Concession area name**
Doublet	Existent authorized area	Unterhaching
AQUIFER / HORIZON		
Stratigraphy		**Petrography**
Malm		no data
INFLOW depth		
Inflow		
3,000 to 3,350, Total depth 3,350 m		
Further information		
Remarks (German only)		**Data sources / Publications**
In Betrieb seit 2009; Kalina-Anlage zur Stromerzeugung.		Homepage geothermie-unterhaching.de: Date
Further information		
http://www.geothermie-unterhaching.de		
Responsible geological survey		
Bayerisches Geologisches Landesamt		

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Data Policy

- Geothermal Information System for Germany (GeoTIS) operated by the LIAG (Leibniz Institute for Applied Geophysics) (www.geotis.de)
- Geothermal marketing board (WFG Wirtschaftsforum Geothermie)
- Geothermal Association of Germany (GTV)
- Hydrocarbon Information System operated by LBEG (State Agency for Mining, Energy and Geology of Lower Saxony) – NIBIS map server (www.lbeg.de)
- State Geological Surveys or State Agencies for the Environment (Bavaria, e.g.)

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Main Stakeholders Of Geothermal Projects (Bavaria)

Licensing:

- Mining Authority of South Bavaria
- Bavarian State Agency for the Environment
- Water Management Agencies

Ministries responsible for energy policy:

- Federal Ministry of Economics and Technology
- Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
- Bavarian State Ministry of Economics and Media, Energy and Technology
- Bavarian State Ministry for the Environment and Consumer Protection

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Main stakeholders of geothermal projects (Baveria)

Research institutes:

- TUM – Technical University of Munich
- Munich University of Applied Sciences
- GFZ – German research center for Geosciences
- LIAG – Leibniz Institute for Applied Geophysics
- BGR – Federal Institute for Geosciences and Natural Resources

Financing banks:

KfW; LfA Bayern (public sector bank of Bavaria)

Project developers:

Lokal communities; SWM (munich public utilities), GTN (Mannvit); GEOenergie Bayern; Erdwärme Bayern; EON; BMW

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Thank you for your attention!

GTN INGENIEURE & GEOLOGEN

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