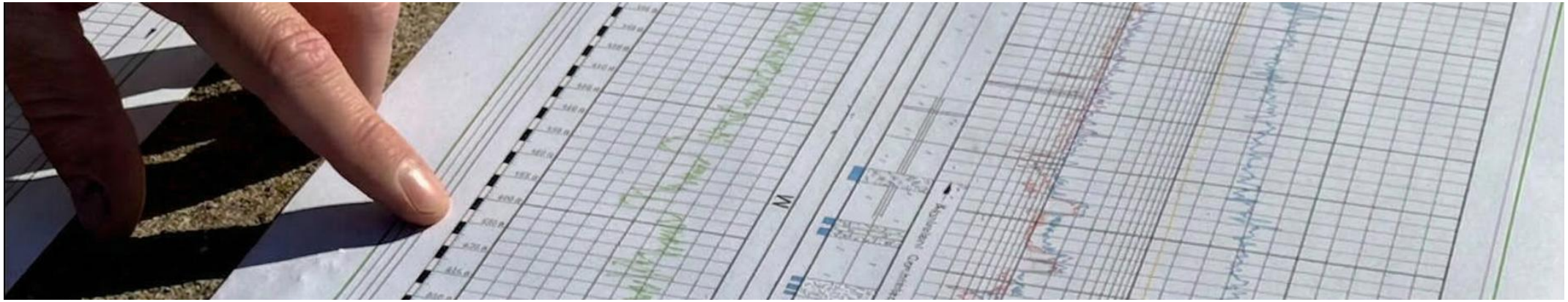
Ingenieurbüro für
Hydrogeologie & Geothermie

HYDRO GmbH

HIGH TEMPERATURE ATES IN FÜRSTENFELD (AUSTRIA)
EARLY FINDINGS FROM THE ATESref PROJECT



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ISEC 4th INTERNATIONAL SUSTAINABLE ENERGY CONFERENCE 2026
14 – 16 April 2026
Messecongress Graz
Austria

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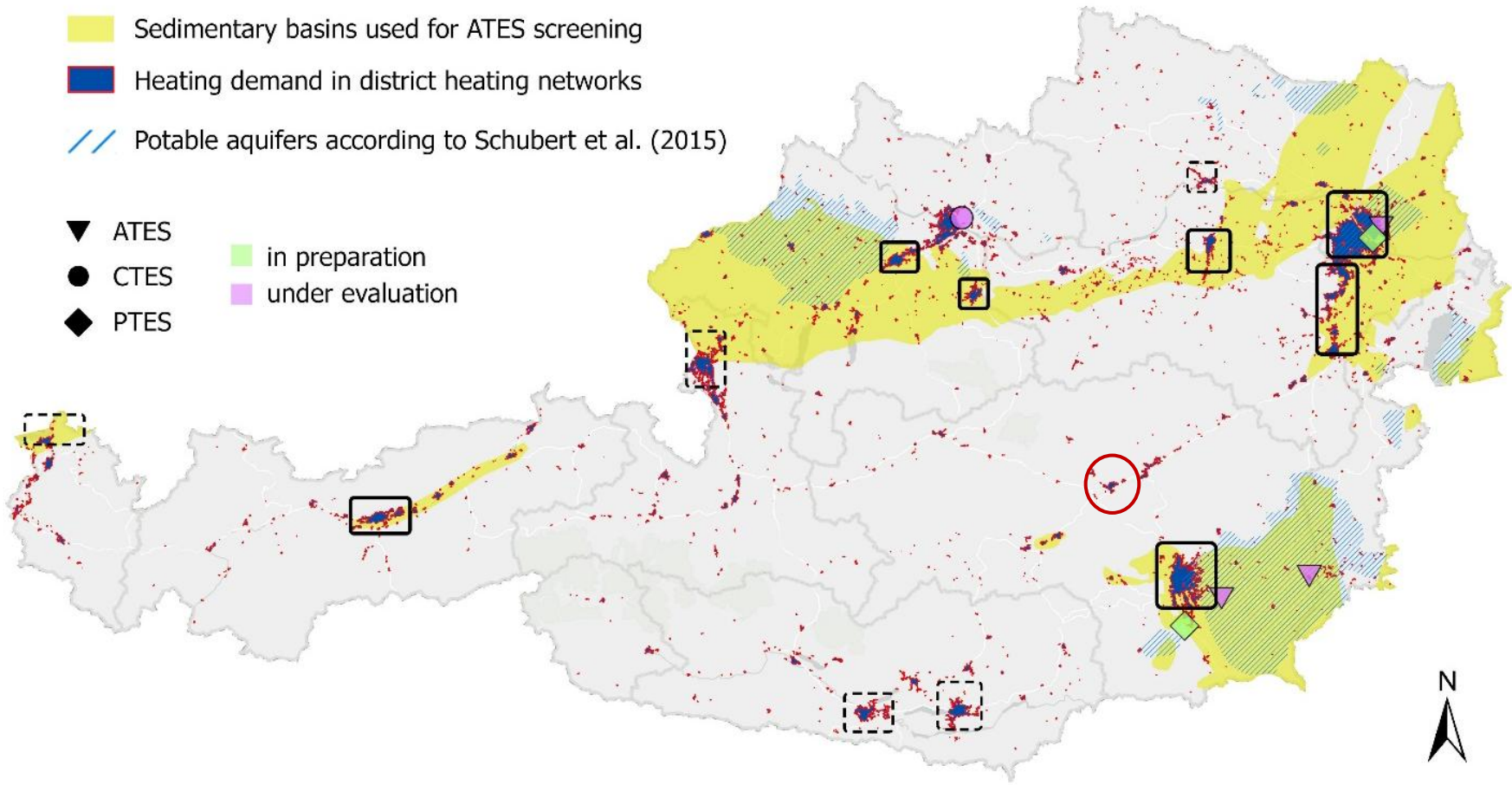
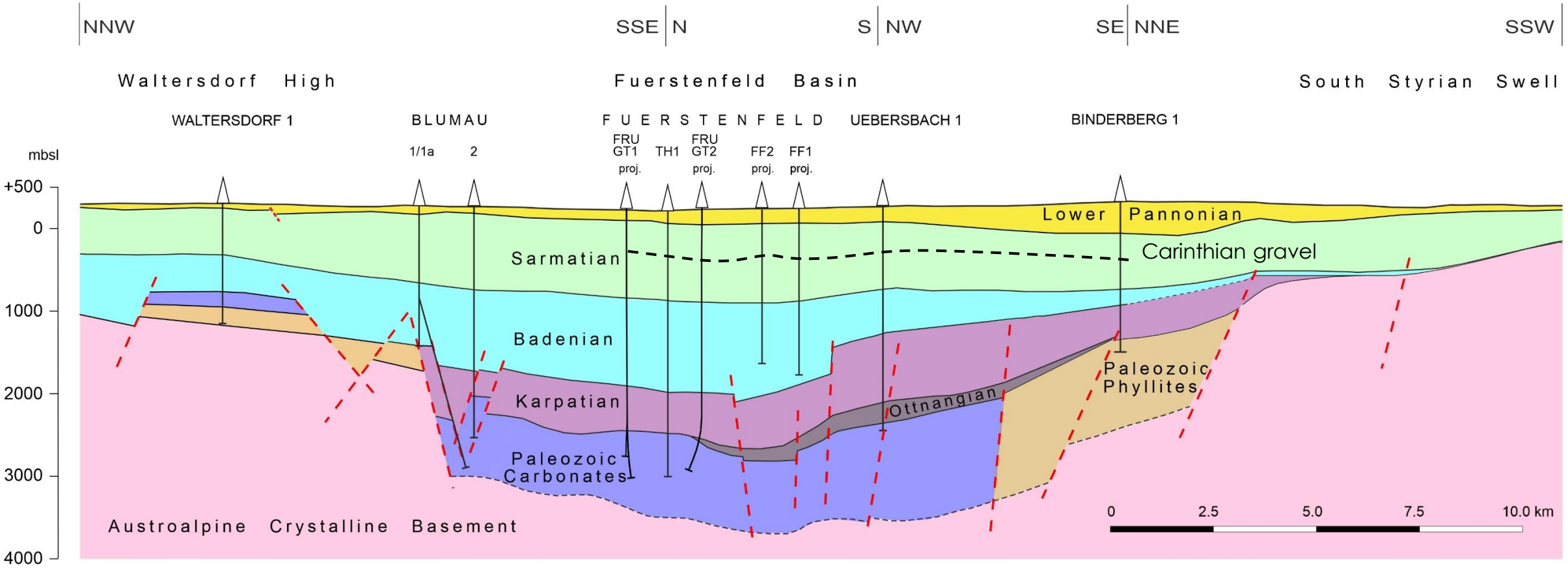
HT-ATES potential and large-scale heat storage projects



GeoSphere Austria – Bundesanstalt für Geologie, Geophysik, Klimatologie und Meteorologie; Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

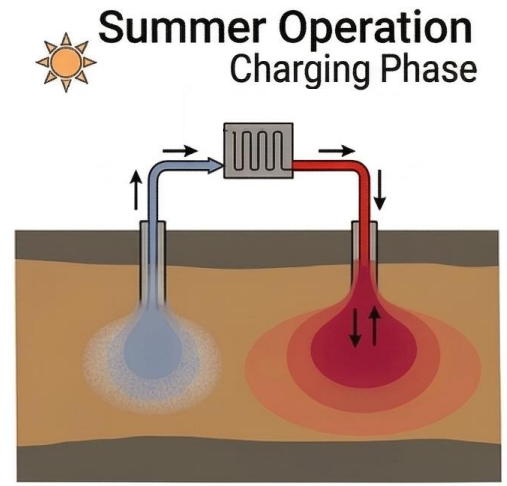
Goetzl et al., 2025

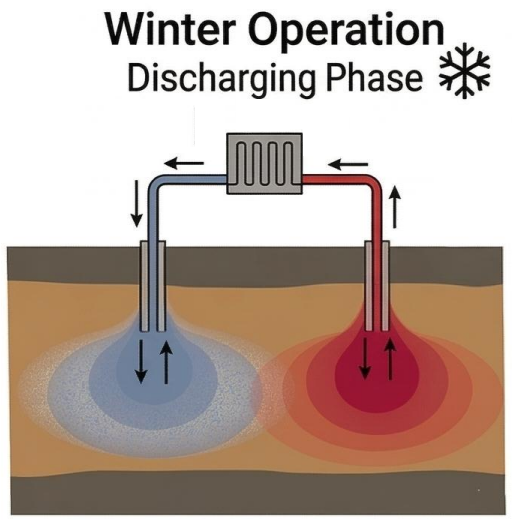
Geological cross - section

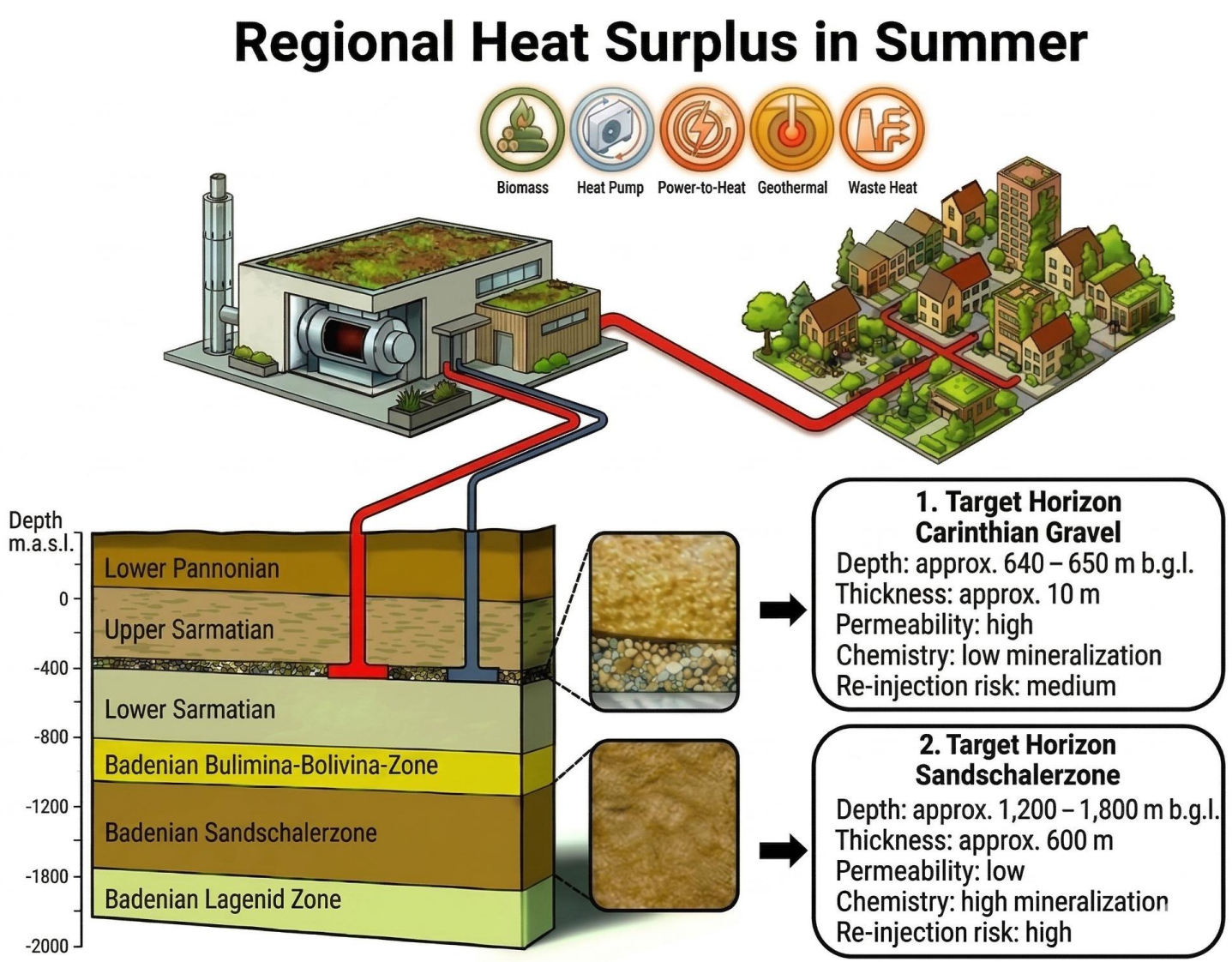


Schreilechner et al., 2024

Storage concept development







Subsurface characterization

20 deep wells and
borehole logs were evaluated

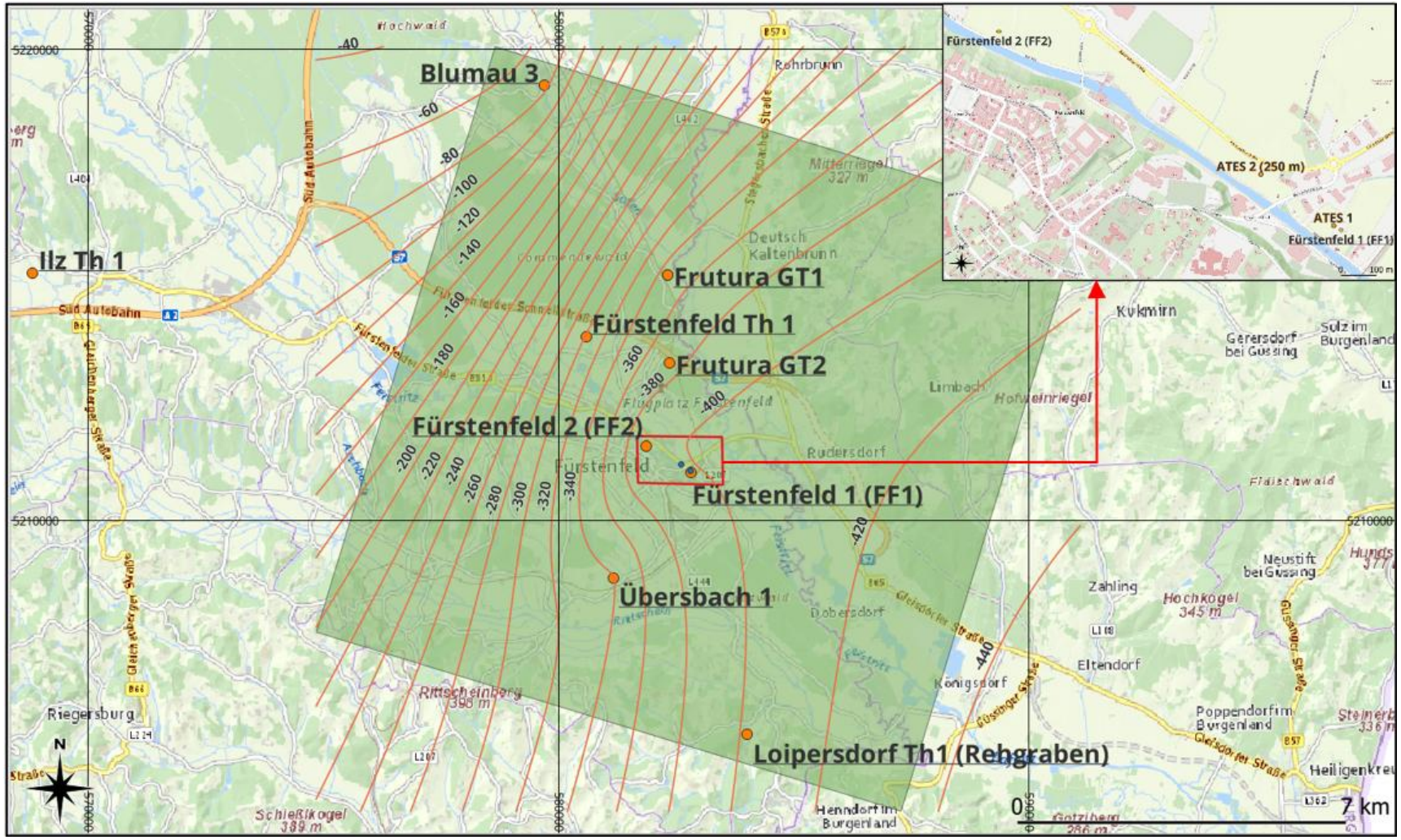
14 seismic profiles
reprocessed and reinterpreted

one pumping test
evaluated

regional studies were
included

drill cuttings were analyzed

Conceptual Model



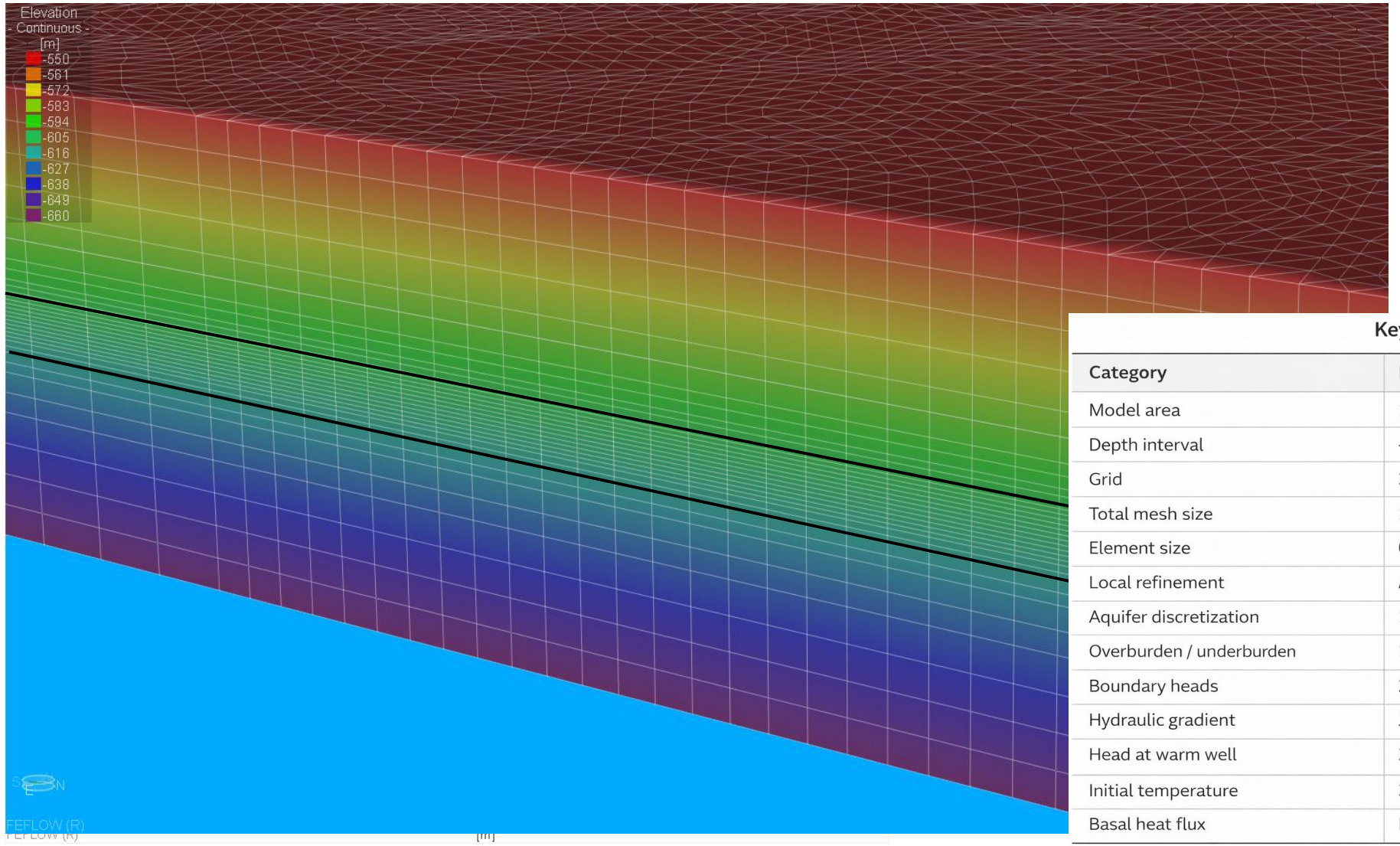
Regional groundwater flow: WNW-ESE

Hydraulic gradient: 3 ‰

kf: 5 x 10^{-5} m/s (gravel)
thickness: 10 m

kf: 2 x 10^{-8} m/s (clay)
thickness: 50 m
over- and underburden

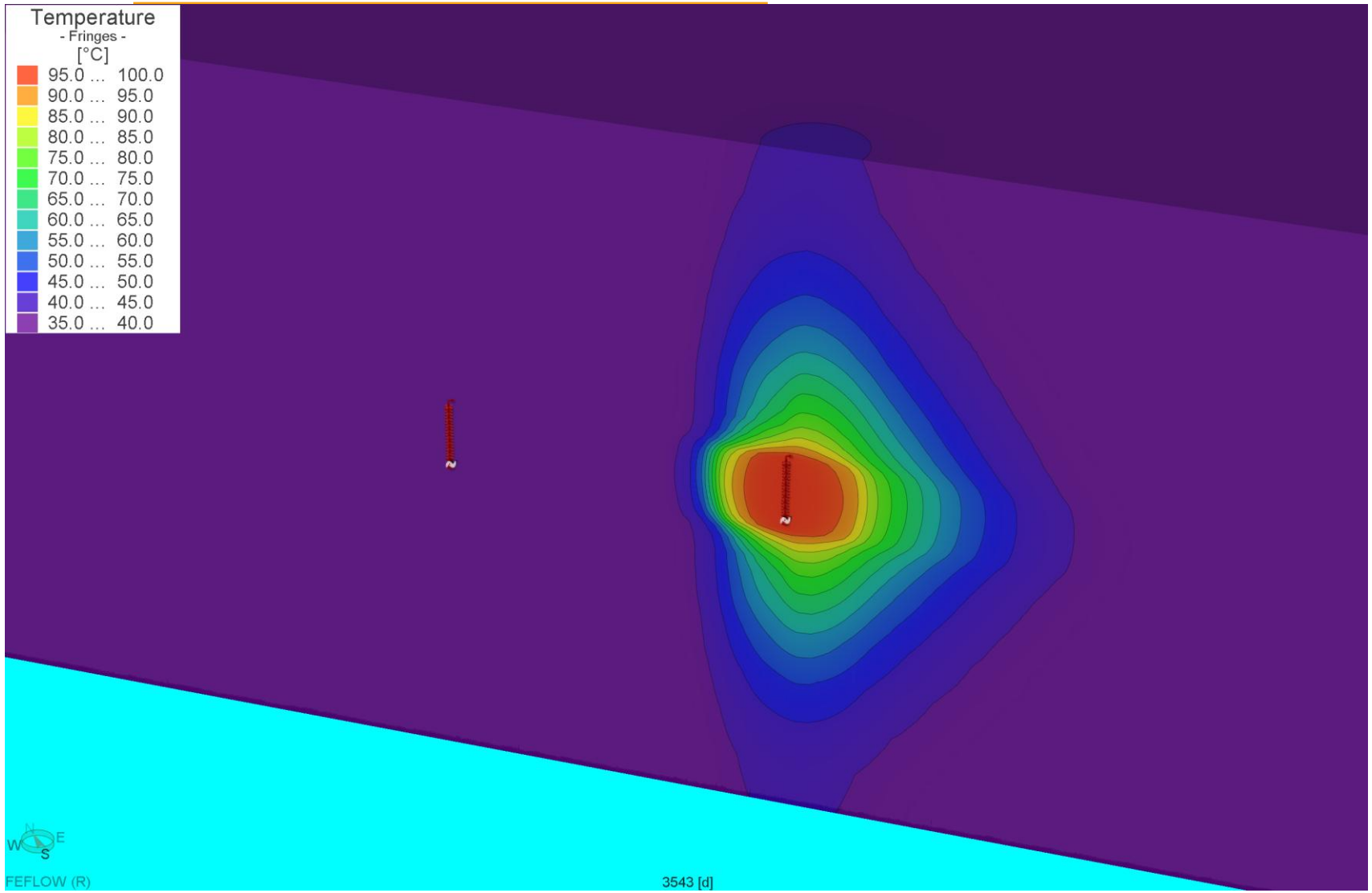
Numerical Model



Key Model Data

Category	Key data
Model area	13 × 13 km (169 km^2)
Depth interval	−660 m to −550 m
Grid	32 model layers
Total mesh size	1,567,808 prism elements, 815,364 nodes
Element size	0.75 m to ~ 100 m
Local refinement	Around the wells / near-well zone
Aquifer discretization	10 layers, 1 m each
Overburden / underburden	11 layers each, 1–7.75 m
Boundary heads	269.5 m a.s.l. (NW), 230.5 m a a.s.l. (lake)
Hydraulic gradient	I = 0.003
Head at warm well	250 m a.s.l.
Initial temperature	38°C, constant with depth
Basal heat flux	None

Sensitivity Analysis



Boundary conditions

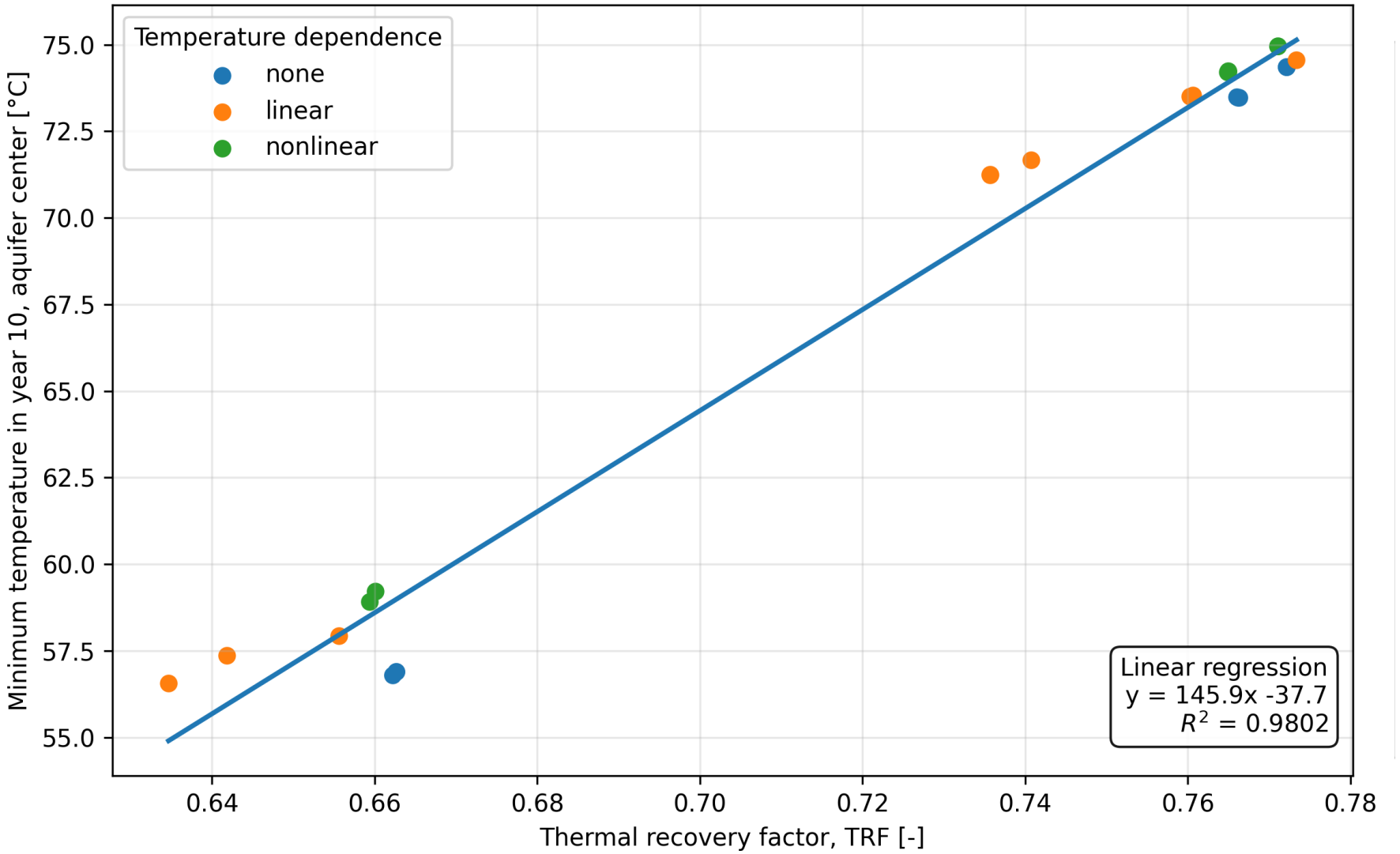
Injection and extraction rate of 30 L/s
Injection temperature: 100 °C
Initial Temperature: 38 °C

Study design

- 3 conductivity levels: 5×10^{-6}, 5×10^{-5}, and 5×10^{-4} m/s
- 3 anisotropy cases: kx = ky = kz, 5 x kz, and 10 x kz
- Temperature dependence: none, linear, nonlinear

vertically exaggerated by a factor of 10

Sensitivity Analysis



Outlook

Finalization of the detailed structural model based on geophysical data

Final site-specific process simulation for Fürstenfeld under realistic boundary conditions

Hydrogeochemical modeling to assess fluid–rock interactions and long-term operational effects

Laboratory characterization of samples, including porosity and multi-flow-rate permeability measurements

Petrophysical and numerical analyses, including pore-network characterization, permeability simulation, MICP calibration, and sensitivity studies

Digital rock workflow using miniplugs, micro-CT imaging, and digital twin generation

ATESref Aquifer Thermal Energy Storage and Reinjection Fürstenfeld