

Interreg

CENTRAL EUROPE



European Union
European Regional
Development Fund

GeoPLASMA-CE

TAKING
COOPERATION
FORWARD



KEW on environmental monitoring of Shallow Geothermal Energy use
DGK 2018 - Haus der Technik - Essen | 29 November 2018



**Groundwater monitoring in the pilot area Vienna for
GeoPLASMA-CE**



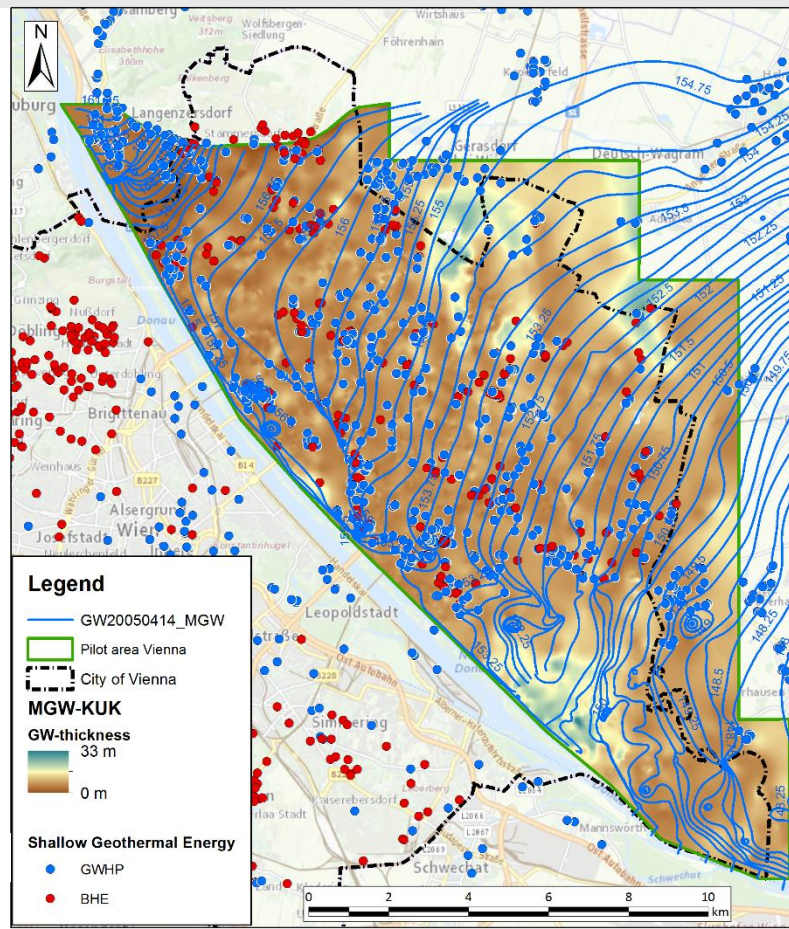
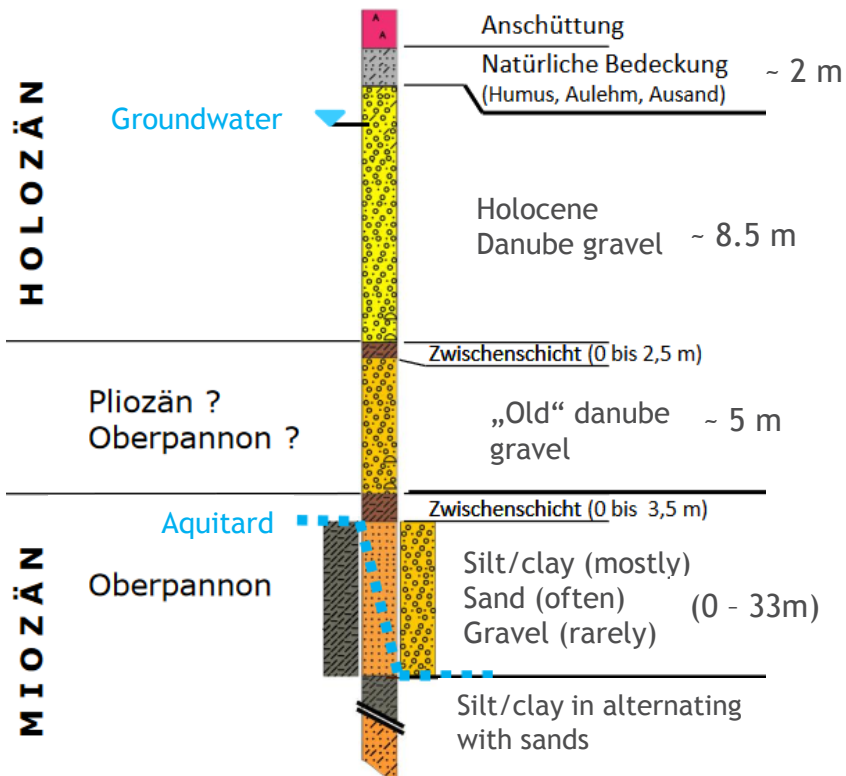
Cornelia Steiner | Geological Survey of Austria

Field measurements & analysis of existing data

- Groundwater temperature
 - Baseline temperature map for open loop systems
- Groundwater chemistry
 - Identification of problematic groundwater zones



HYDROGEOLOGY

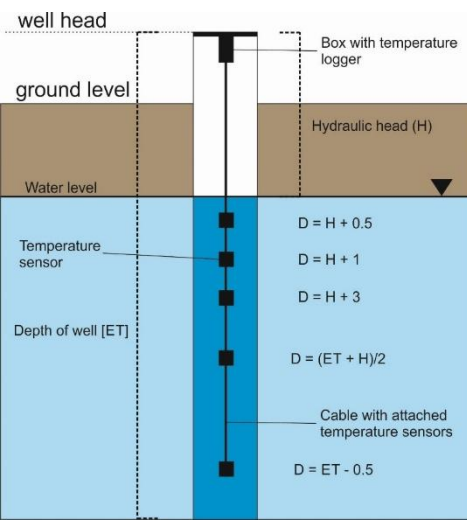


Grube, S. (2017): Angewandte hydrogeologische Forschung - Stadtgebiet Wien: Hydrogeologie des linksufrigen Donaubereichs

GW MONITORING - TEMPERATURE

Automatic measurements

- Number of wells: 10
- Number of sensors per well: 4 - 6
- Start date measurements: Dez. 2017
- Interval of measurements: daily
- Accuracy of sensors: $<0.1 \text{ } ^\circ\text{C}$



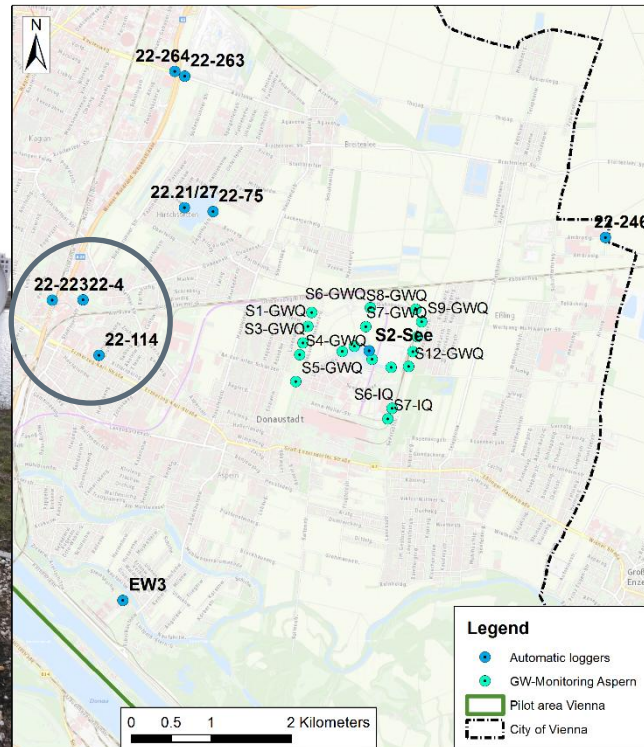
Arduino microcontroller

SD Card

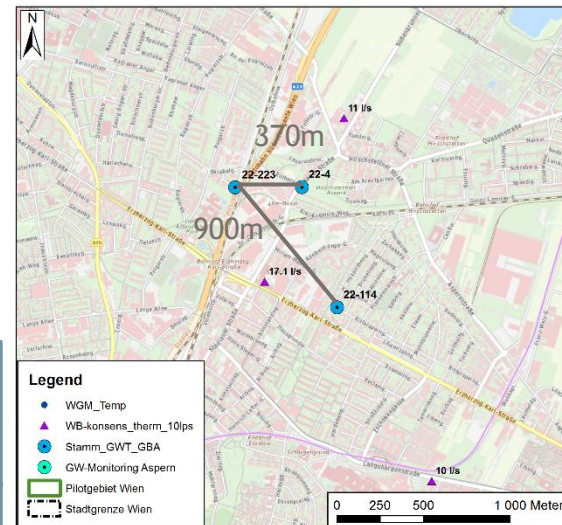
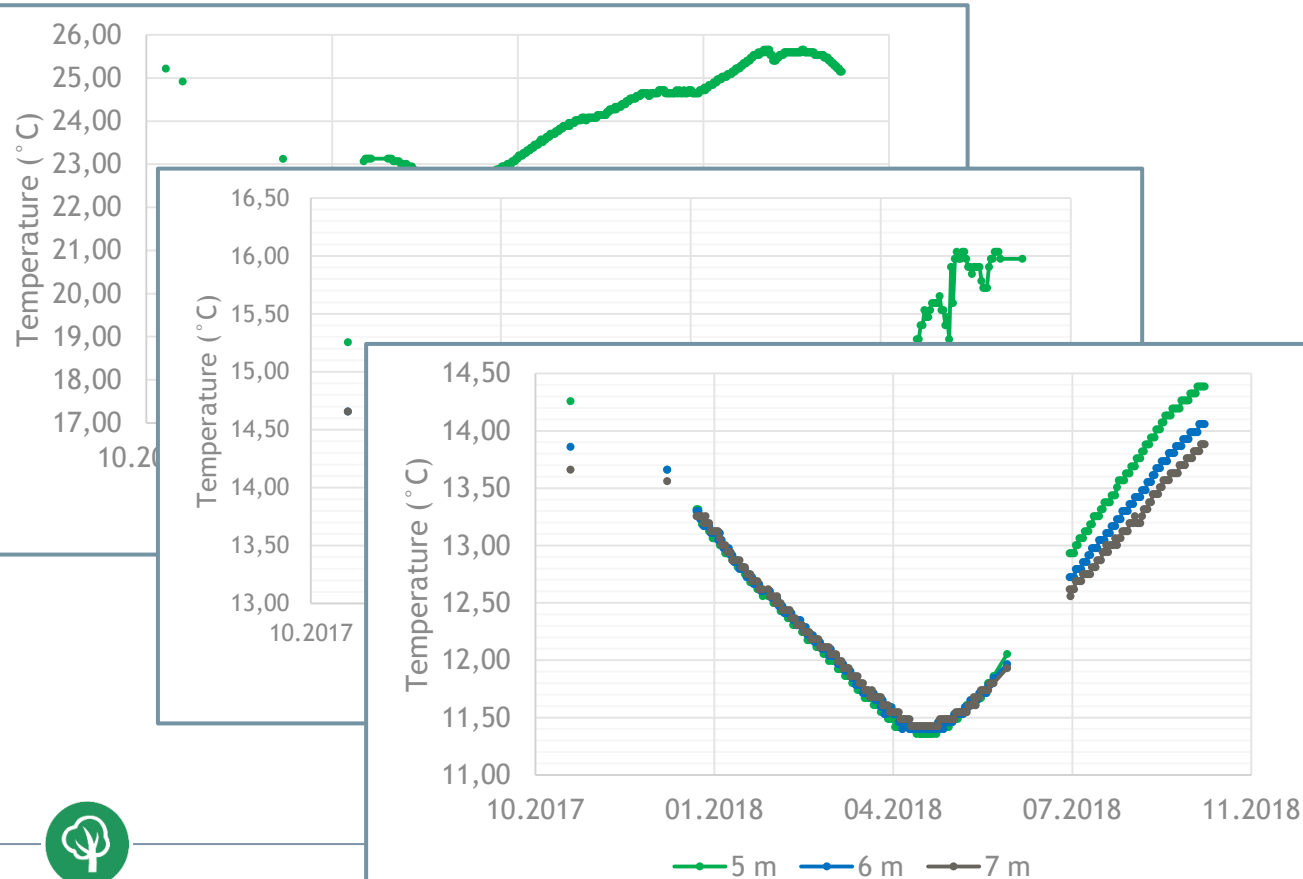


Power supply

High precision clock



GW MONITORING - TEMPERATURE



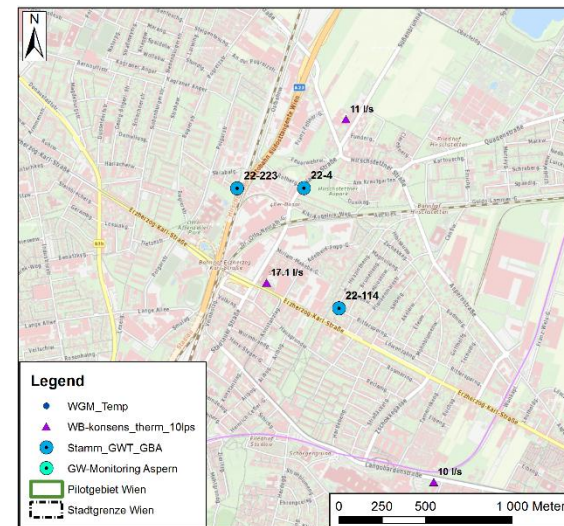
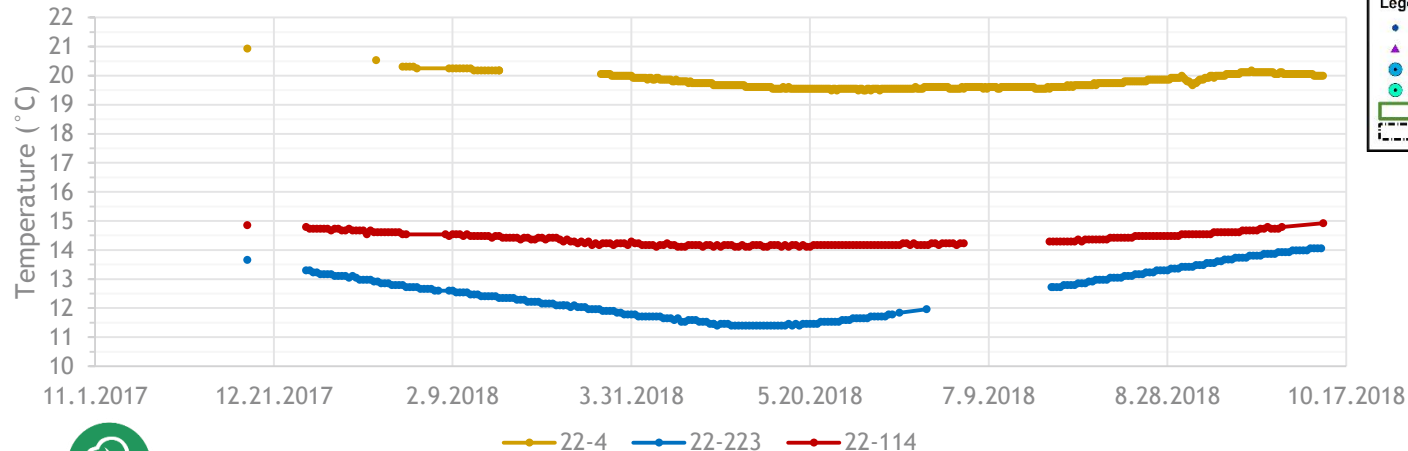
22-223



GW MONITORING - TEMPERATURE

Comparison of observation wells at 7 m depth

Observation well	22-4	22-114	22-223
Temperature influence	District heating system	Open loop system	Air temperature
GW Temp mean	17.6	14.4	12.5
Temp. diff. to well 22-223	5.1	1.9	
Amplitude	1.4	0.8	2.5

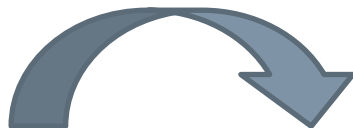


Conclusions for our pilot area



Groundwater temperatures are...
... strongly influenced locally
Examples: 22-223/22-4/22-114

... depending on depths
Example: 22-114



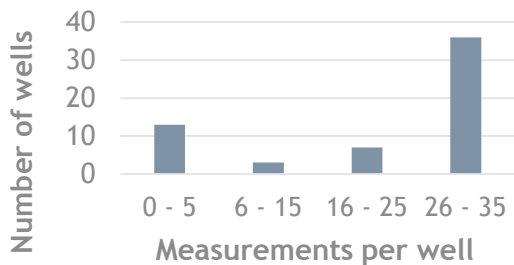
Important information...
... for elaborating groundwater
temperature maps

... to set up monitoring systems of SGE

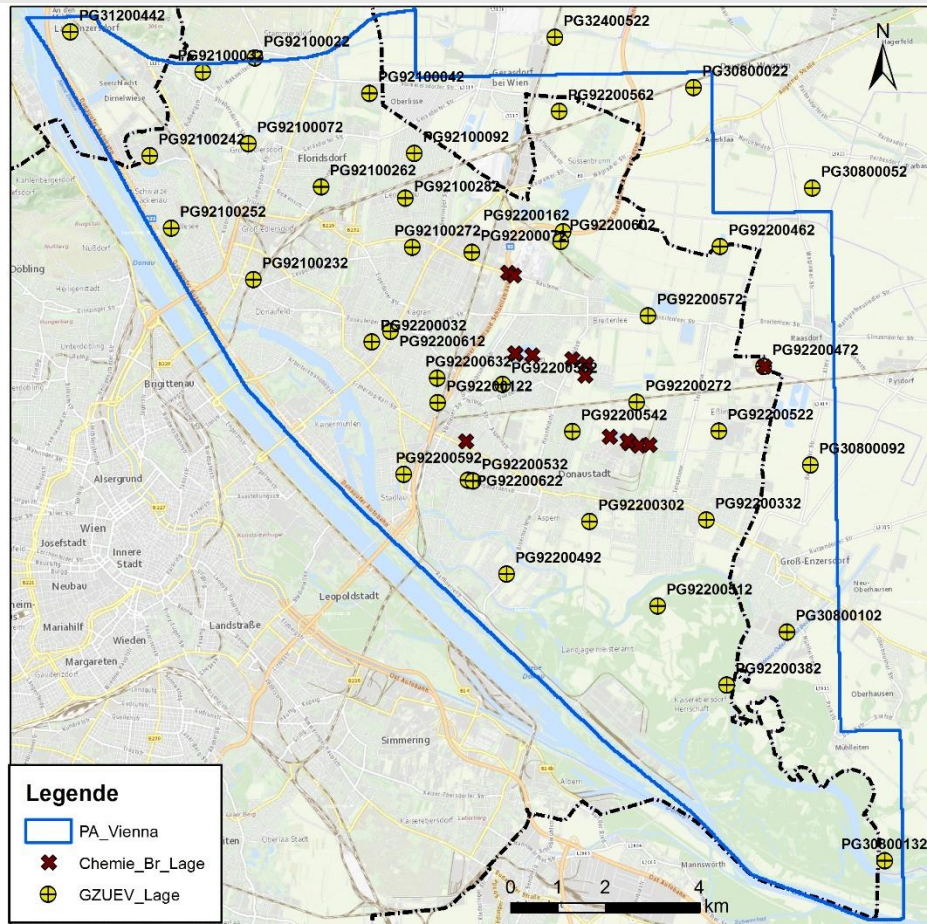


GW MONITORING - CHEMISTRY

- Available data:
- Taking groundwater samples and additional data from national monitoring system
- Analyses of 59 groundwater wells with different sample sizes (2007-2017)



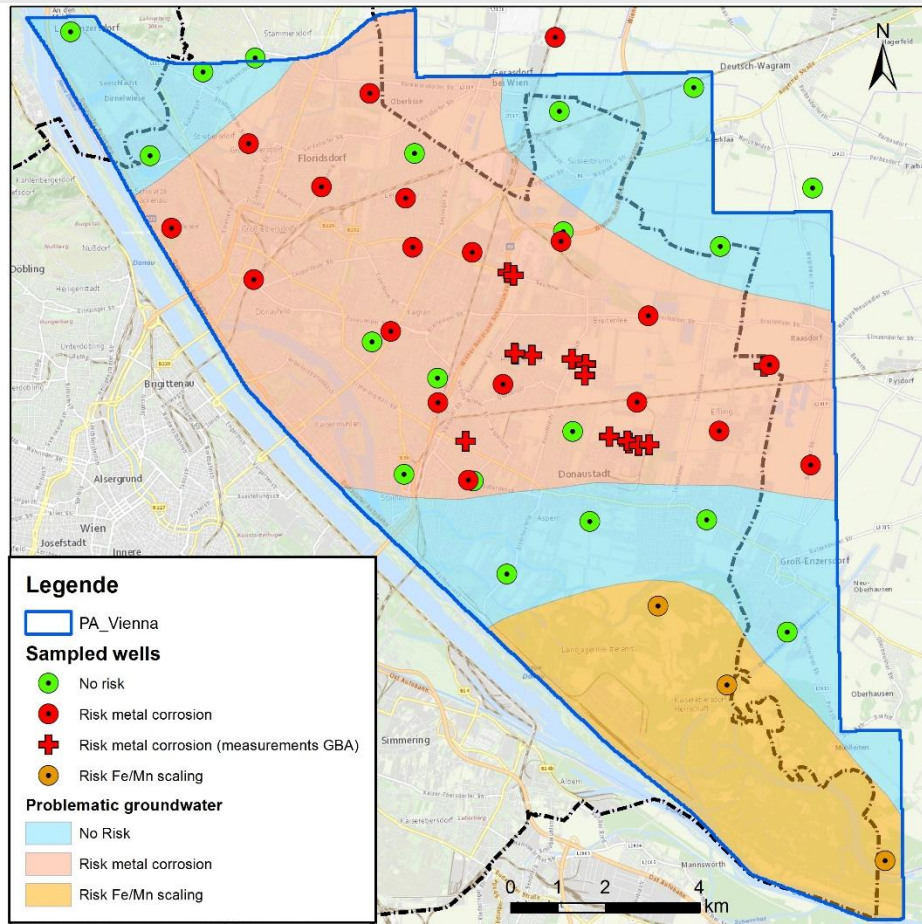
Locations of groundwater wells analyzed by GBA (cross) and by other sources (points)



GW MONITORING - CHEMISTRY

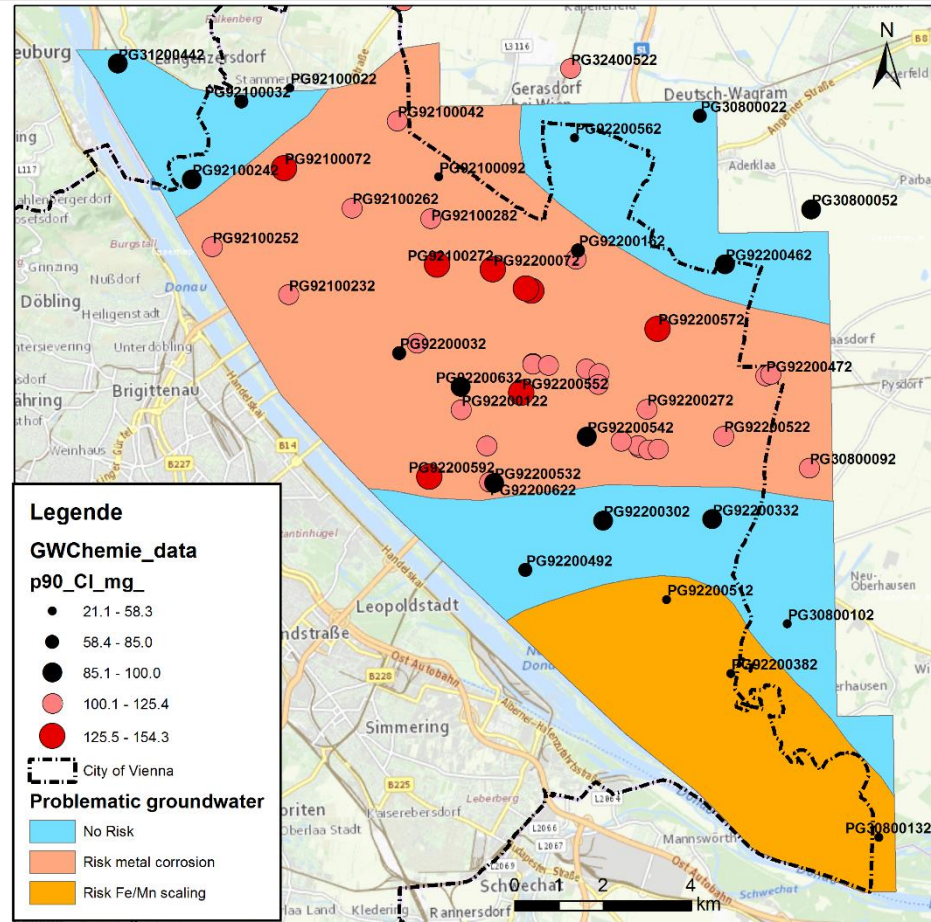
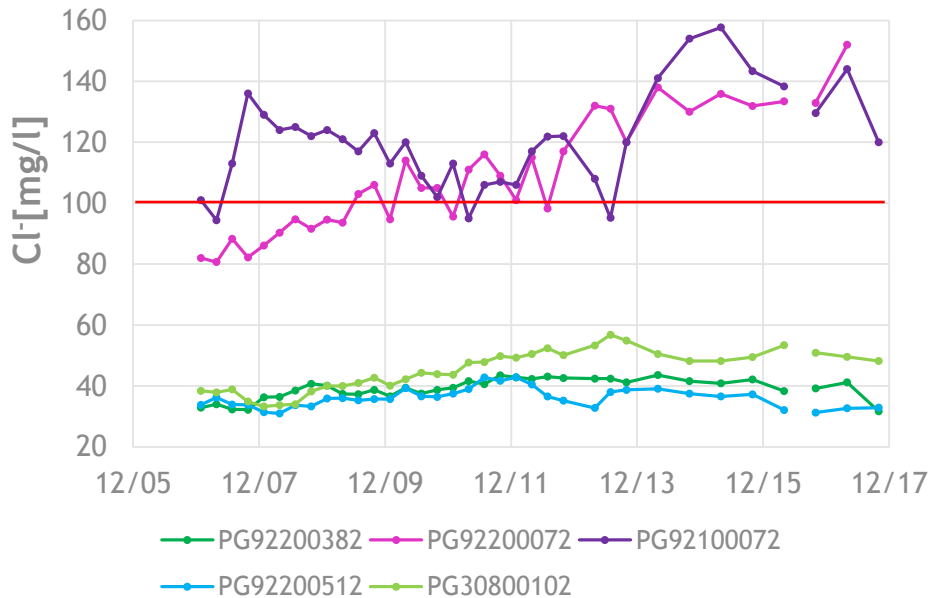
- Data processing and results of risk analysis

System	Risk scenario	Risk factor
Open loop	Scaling of Fe/Mn	High Fe/Mn content Low pH and O ₂ content
	Scaling of carbonates	High HCO ₃ ⁻ and CO ₂ content
	Corrosion of casings / heat exchangers	High Cl ⁻ , SO ₄ ⁻ , EC, RSI, H ₂ S and O ₂ content
Closed loop	Corrosion of grouting / cementation of BHEs	Low pH High SO ₄ and CO ₂ content



GW MONITORING - CHEMISTRY

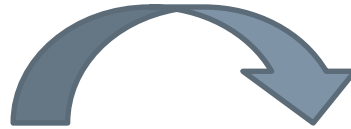
- Data processing and results of risk analysis



Conclusions for our pilot area



Groundwater chemistry ...
... varies locally
... changes over time



Important information...
... for planning of SGE



FOLLOW OUR PROJECT



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!!New!!



Geologische Bundesanstalt



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