Thermal CO_2-rich water in Bad Krozingen

Water in the spa town Bad Krozingen shows it anomalous character in two aspects: an elevated temperature and enriched CO_2-content.

Anomalies

Water extracted from the Steinmergel Keuper (Thermalhorizont [I], 423 m depth) and the Oberer Muschelkalk (Thermalhorizont [II], 578.5 – 610 m depth) in Bad Krozingen has a temperature between 27.3 and 40.2 °C (Göb et al., 2013; Griesshaber et al., 1992; Käβ and Käβ, 2008). These values exceed the expected value (when assuming a surface temperature of maximum 12 °C and a geothermal gradient of 10 + 30 °C/km) by 10 to 15 °C. In addition, CO_2-concentrations vary between 655 and 2230 mg/l (Göb et al., 2013; Griesshaber et al., 1992; Käβ and Käβ, 2008), significantly higher than the 250 mg/l criterium to be classified as Säuerling (Weertz and Weertz, 2007). The origin of the thermal CO_2-water in Bad Krozingen is found in meteoric water that infiltrates at the west-side of the Black Forest, and is heated up as well as enriched in CO_2 and other elements while journeying through the Keuper and Jura schists in the Oberrhein-valley (Käβ and Käβ, 2008).

This file is part of the GeoConnect³d project that has received funding by the European Union's Horizon 2020 research and innovation programme under grant agreement n.731166.

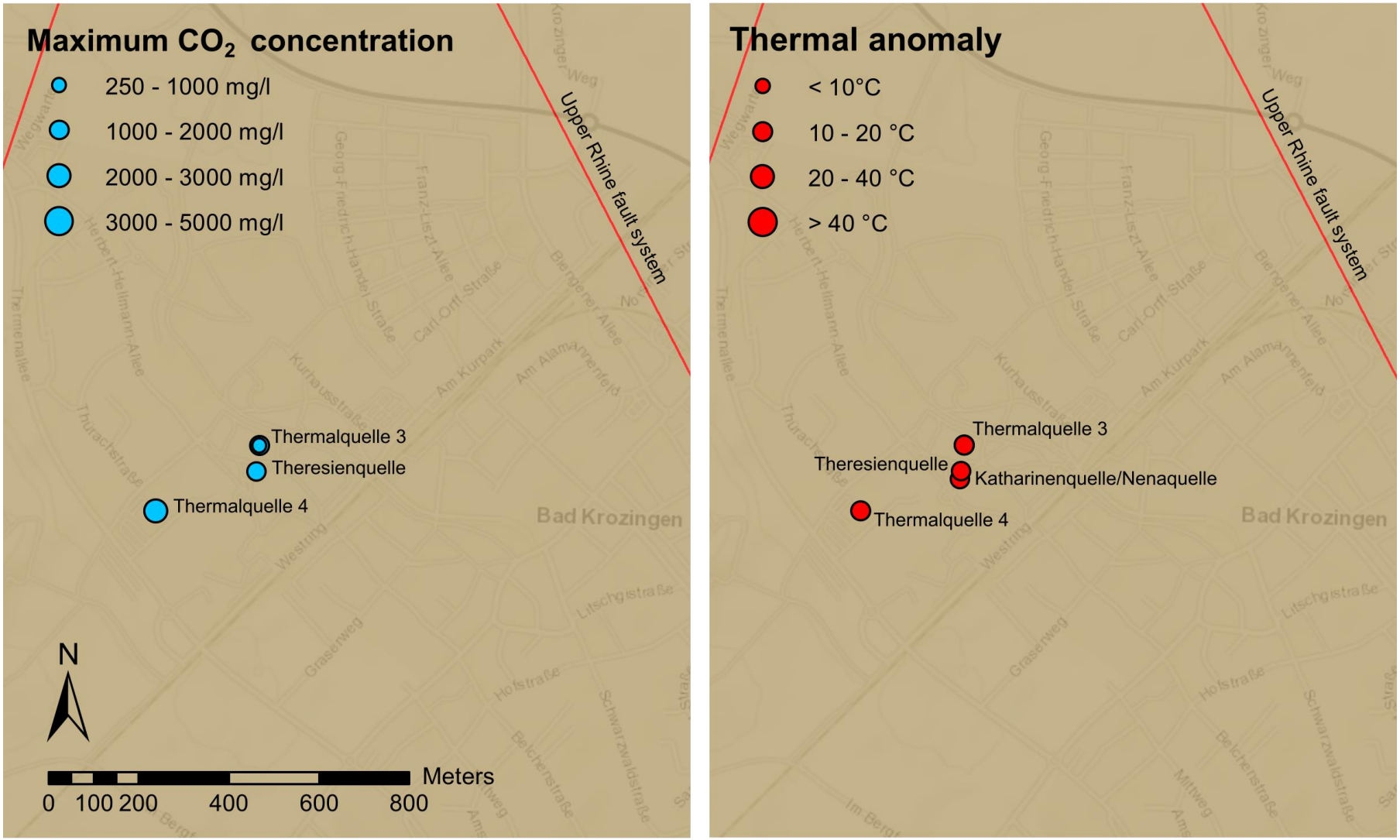

Figure 1: Thermal CO_2-rich water in Bad Krozingen

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Data

ID	Coordinates	T	Depth	TDS°	Cl	Na	SO_4	Free CO_2	He	$^3He/^4He$	Analysis year	References
		°C	m	g/l	mg/l	mg/l	mg/l	mg/l	ppmv			
Katharinenquelle (Nenaquelle) [II]	47°55'07" North 07°41'33" East	40.2	583	4.63							1919	Käβ and Käβ (2008)
Theresienquelle [II]	47°55'07" North 07°41'33" East	38.1	596	4.13				1658			1992	Käβ and Käβ (2008)
Thermalquelle 3 [I]	47°55'09" North 07°41'33" East	27.3	423	7.95 – 8.62	992	1430	2442	655 – 1340			1960	Käβ and Käβ (2008)
Thermalquelle 3 [II]	47°55'09" North 07°41'33" East	39.4	610	4.39	134.4	308	1755	1756			1992	Käβ and Käβ (2008)
Thermalquelle 4 [II]	47°55'04" North 07°41'22" East	37			154	348	1706	2230			<1992	Griesshaber et al. (1992)
										1.73	1992	
		37.5	578.5	4.34				2208			1993	Käβ and Käβ (2008)
		34.4		1.9	91.8	307	1770				2013	Göb et al. (2013)

° TDS = Total Dissolved Solids

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Cite this source

Van Daele, J. & Ferket, H., 2021. Thermal CO_2-rich water in Bad Krozingen [Fact sheet]. Flemish Planning Bureau for the Environment and Spatial Development (VPO).

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