



Thermal, CO₂-rich groundwater in Bad Rippoldsau-Schapbach

Bad Rippoldsau-Schapbach, located in SW Germany, has had spa-infrastructure since many centuries. The groundwater is naturally rich in CO₂ and has a slightly elevated temperature.

Anomalies

The groundwater in Bad Rippoldsau-Schapbach is slightly to very enriched in CO₂; 409 – 4871 mg/l (Käβ and Käβ, 2008). This is in all cases exceeding the reference value of 250 mg/l, above which water generally is classified as Sauerling (Weertz and Weertz, 2007). Temperature data are not available for all 'Quellen', but if present, indicate a small positive thermal anomaly of 1 – 9 °C (assuming a maximum temperature of 12 °C for shallow groundwater).

Water in Bad Rippoldsau-Schapbach originates from meteoric infiltration in the Black Forest highs through deep-seated joints. After topography-driven fluid flow and encountering CO₂ from magmatic origin in the subsurface, it reaches the surface in the valley of Bad Rippoldsau along joints (Käβ and Käβ, 2008).

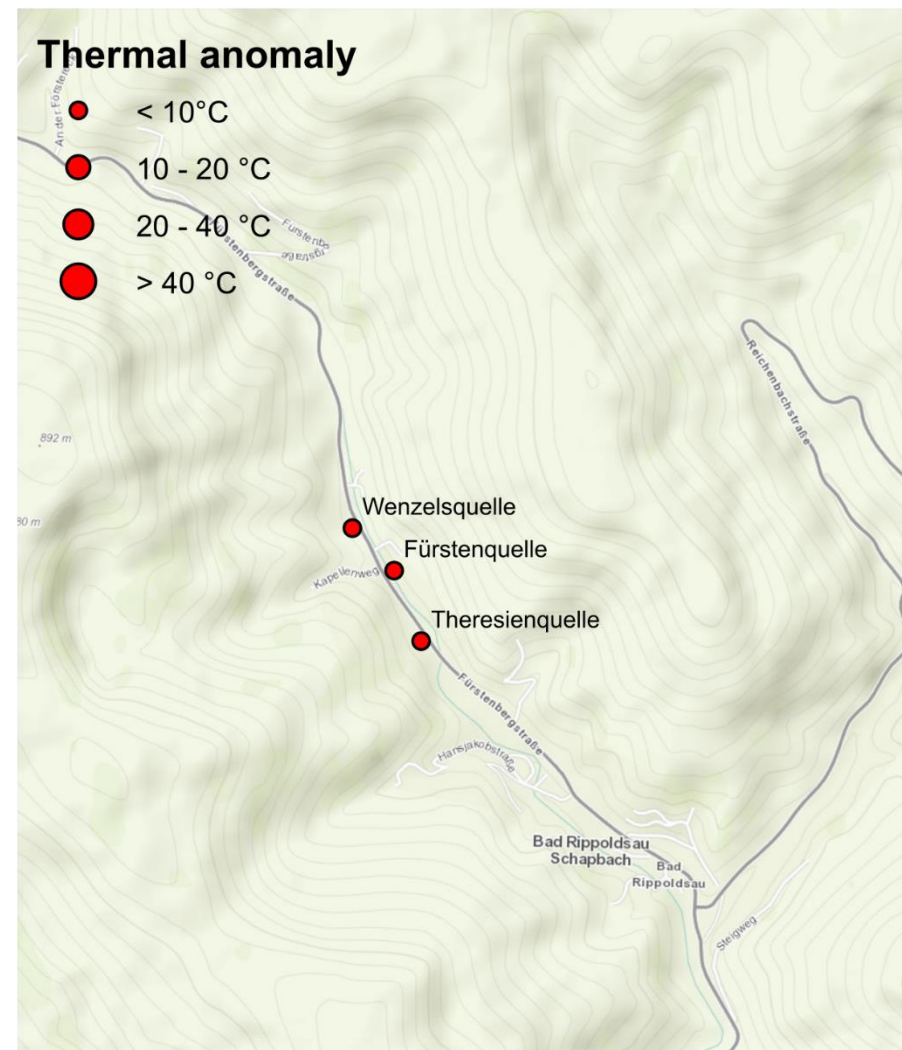
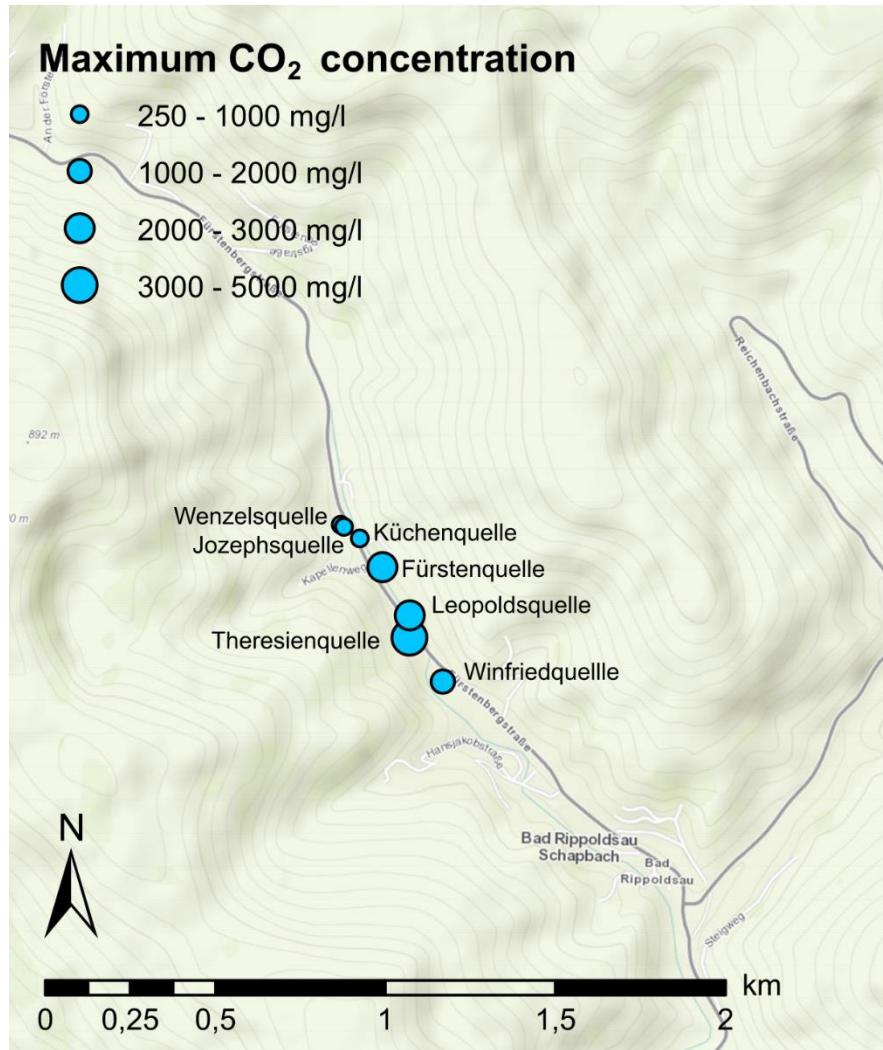


Figure 1: Thermal, CO₂-rich groundwater in Bad Rippoldsau



Data

ID	Coordinates	T	Depth	TDS°	Cl	Na	SO ₄	Free CO ₂	He	³ He/ ⁴ He	Analysis year	References
		°C	m	g/l	mg/l	mg/l	mg/l	mg/l	ppmv			
Wenzelsquelle	48°26'13" North 08°18'55" East		100	0.11	14.5			458			1981	Käβ and Käβ (2008)
		17		0.17	19.7	22.9	25.3				2010	Göb et al. (2013)
Josephsquelle	48°26'13" North 08°18'55" East		250	1.15	15.5			409			1981	Käβ and Käβ (2008)
Küchenquelle	48°26'12" North 08°18'58" East		10	1.84	82.5			541			1981	Käβ and Käβ (2008)
Fürstenquelle	48°26'09" North 08°19'01" East	12.6		1.68	49.5	159	442.1	2433			1986	Käβ and Käβ (2008)
			39	1.70	49.3			2433			2001	
			12	0.23	52.4	33.4	28.3					2010
Leopoldsquelle	48°26'05" North 08°19'05" East		43	1.68	24			2484			1992	Käβ and Käβ (2008)
				1.72	40.8	154	355	2800			2006	
Theresienquelle	48°26'02" North 08°19'05" East	20.6	300	4.30	56.2	404.2	1071	4871			1980	Käβ and Käβ (2008)
Winfriedquelle	48°25'58" North 08°19'10" East		5	1.54	37			1990			1976	Käβ and Käβ (2008)

° TDS = Total Dissolved Solids

References

Göb, S., Loges, A., Nolde, N., Bau, M., Jacob, D.E., Markl, G., 2013. Major and trace element compositions (including REE) of mineral, thermal, mine and surface waters in SW Germany and implications for water–rock interaction. *Applied Geochemistry* 33, 127-152.

Käβ, W., Käβ, H., 2008. *Deutsches Baderbuch*, 2 ed. Vereinigung für Bäder- und Klimakunde e.V., Stuttgart.

Weertz, J., Weertz, E., 2007. Eifelbrunnetjes met een vulkanisch trekje. *Grondboor en Hamer* 2, 37-41.

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