



Thermal water in Wiesbaden

Wiesbaden, capital of the state Hessen, is one of the oldest spa towns in Europe. Since Roman times, it is famous for its multiple hot springs (Hänel, 2020). Some are classified as Heilquellen (Mittelbach and Siebert, 2014).

Anomalies

Thermal water is observed at multiple locations in Wiesbaden, with a very broad range in temperature between 14 and 67 °C. The Faulbrunnen has an exceptionally low temperature of 14 – 26.7 °C, while all other show a temperature higher than 38 °C (Griesshaber et al., 1992; Hänel, 2020; Käß and Käß, 2008; Loges et al., 2012; Mittelbach and Siebert, 2014). In all cases, the temperature values exceed the maximum temperature expected for shallow groundwater (< 500 m), i.e. 12 °C. For most of the wells where CO₂-concentration data is available, a CO₂-content of 332 – 476.5 mg/l is observed (Griesshaber et al., 1992; Käß and Käß, 2008; Mittelbach and Siebert, 2014), slightly anomalous compared to the reference value of 250 mg/l (Weertz and Weertz, 2007). Again, the Faulbrunnen forms an exception to this; 175.2 – 231 mg/l (Griesshaber et al., 1992; Mittelbach and Siebert, 2014).

Wiesbaden is, just like Bad Nauheim, Bad Hornburg and Bad Soden located on the major, ENE-WSW-oriented fault zone which borders the south side of the Taunus orogenic plateau. This fault separates the Lower Devonian 'Alter Gebirge' from the Tertiary Mainzer basin and Oberrheintalgraben sediments. Thermal water reaches the surface in Wiesbaden through this tectonically disrupted zone of the southern Taunus fault. The main NNE-SSW-oriented joint system allows deep infiltration from rain water at Vogelsberg as well as relatively rapid fluid circulation back to the surface. Most springs are located at the intersection between this major joint system with local cross-cutting joints. Likely, also some thermal (and CO₂-enriching) influence from nearby extinct Tertiary volcanism is involved. The high salinity possibly originates from the Zechstein salt layers below the Vogelsberg (Käß and Käß, 2008). Another hypothesis for the observed salinity that has been postulated is that meteoric water, infiltrated in the southern Oberrheingraben in the area of Basel, increases in salinity when passing through the region with salt lakes in the Elzas during its underground journey from south to north (Hänel, 2020).



Figure 1: Thermal springs in Wiesbaden



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				
Faulbrunnen	50°04'52" North 08°14'09" East	17			2288	1312	88	231			<1992	Griesshaber et al. (1992)	
										0.63	1992		
		17.4	28	4.76	2485	1395	98.6				1996	Käβ and Käβ (2008)	
		17.5									1998	Wagner et al. (2005)	
		26.7	30			2700	1510					<1995	Mittelbach and Siebert (2014)
		17.8									2003		
		17.6		4.90	2730	1450	97.6	175.2			2009		
		14									<2020	Hänel (2020)	
Am Schützenhofbad	50°05'00" North 08°14'18" East	38			3600	2090					<1995	Mittelbach and Siebert (2014)	
Gemeindebad Quelle	50°04'58" North 08°14'19" East	40			3600	2090					<1995	Mittelbach and Siebert (2014)	
Schützenhofquelle	50°04'59" North 08°14'17" East	50			3600	2047	68	458			<1992	Griesshaber et al. (1992)	
										0.70	1992		
		49.3	65	6.67	3600	2047	114				1996	Käβ and Käβ (2008)	
		49.3									1998	Wagner et al. (2005)	
						3200	2000	100				2012	Loges et al. (2012)
		49.2	61.5									1879	Mittelbach and Siebert (2014)
		49			3600	2090					<1995		
		50									2003		
49.1		6.30	3540	2010	111	275				2010			
		49			3490	1900	113				<2020	Hänel (2020)	
Goldbrunnen Quelle	50°05'02" North 08°14'25" East	54			4500						<1995	Mittelbach and Siebert (2014)	
Bäckerbrunnen	50°05'02" North 08°14'26" East	49			4600						<1995	Mittelbach and Siebert (2014)	
		49									<2020	Hänel (2020)	



Quelle am Grabenstrasse	50°05'02" North 08°14'27" East	47			4600						<1995	Mittelbach and Siebert (2014)	
Wilhelms-Heilanstquelle	50°05'02" North 08°14'28" East	40.1									1871	Mittelbach and Siebert (2014)	
		44			4600	2690					<1995		
Quelle am Goldgasse	50°05'02" North 08°14'28" East	48			4500	2620					<1995	Mittelbach and Siebert (2014)	
Goldenes Ross Quelle	50°05'03" North 08°14'27" East	48			4500						<1995	Mittelbach and Siebert (2014)	
(Große) Adlerquelle	50°05'05" North 08°14'25" East	65.1	60	8.46	4580	2654	67.8				1996	Käb and Käb (2008)	
		63									1998	Wagner et al. (2005)	
					3900	2600	64					2012	Loges et al. (2012)
		64.9	60									1932	Mittelbach and Siebert (2014)
		67			4600	2670						<1995	
		64.2										2003	
		65.5		8.10	4530	2600	66.1	396.1				2009	
Kleine Adlerquelle	50°05'06" North 08°14'26" East	67	12.06		4600	2670					<1995	Mittelbach and Siebert (2014)	
		52.6									2003		
		65.5		8.20	4570	2500	65.2	376.8			2010		
Quelle an der Dreililienplatz	50°05'04" North 08°14'31" East	46			4500						<1995	Mittelbach and Siebert (2014)	
Quelle Hotel Bären	50°05'04" North 08°14'30" East	52			4500						<1995	Mittelbach and Siebert (2014)	
Kölnische Hof Quelle	50°05'04" North 08°14'31" East	55									1906	Mittelbach and Siebert (2014)	
		48.5			4500						<1995		
Zwei Böcke Quelle	50°05'05" North 08°14'31" East	49			4500						<1995	Mittelbach and Siebert (2014)	
Drei Lilien Quelle	50°05'06" North 08°14'31" East	59.2									1935	Mittelbach and Siebert (2014)	
		59			4600	2650					<1995		
Goldene Kette	50°05'06" North 08°14'28" East	47			4600	2650					<1995	Mittelbach and Siebert (2014)	



Sternquelle	50°05'06" North 08°14'29" East	55			4600	2650					<1995	Mittelbach and Siebert (2014)
Sonnenbergquelle	50°05'07" North 08°14'33" East	52			4500	2590					<1995	Mittelbach and Siebert (2014)
Gold Kreuz Quelle	50°05'08" North 08°14'33" East	46			4600	2650					<1995	Mittelbach and Siebert (2014)
Pariser Hof Quelle	50°05'08" North 08°14'33" East	58			4600	2670					<1995	Mittelbach and Siebert (2014)
Römerquelle	50°05'09" North 08°14'31" East	65			4600	2680					<1995	Mittelbach and Siebert (2014)
Brunnen	50°05'08" North 08°14'30" East	49			4500	2670					<1995	Mittelbach and Siebert (2014)
Spiegelquelle	50°05'11" North 08°14'31" East	66			4600	2670					<1995	Mittelbach and Siebert (2014)
Kochbrunnen	50°05'11" North 08°14'32" East	66			4540	2633	65	332			<1992	Griesshaber et al. (1992)
									1.00	1992		
		67.3	43	8.38	4530	2625	68.				1996	Käß and Käß (2008)
		66.1		8.12	4380	2520	69	454			1998	
		66.1									1998	Wagner et al. (2005)
					4500	2500	63				2012	Loges et al. (2012)
		66	43		4670	2670					<1995	Mittelbach and Siebert (2014)
		65.7								2003		
		66.3		8.10	4430	2600	67.4	444.4		2009		
66									<2020	Hänel (2020)		



Salmquelle	50°05'12" North 08°14'33" East	64			4480	2597	68	458			<1992	Griesshaber et al. (1992)
										0.93	1992	
		64.2	47	8.30	4480	2597	68.0				1996	Käβ and Käβ (2008)
		64.4									1998	Wagner et al. (2005)
					4600	2600	64				2012	Loges et al. (2012)
		47	47		4500	2660					<1995	Mittelbach and Siebert (2014)
		63.5								2003		
65.2	8.10	4710		2650	64.7	476.5		2009				

° TDS = Total Dissolved Solids

References

- Griesshaber, E., O'Nions, R.K., Oxburg, E.R., 1992. Helium and carbon isotope systematics in crustal fluids from the Eifel, the Rhine Graben and Black Forest, F.R.G. *Chemical Geology* 99, 213-235.
- Hänel, M., 2020. *Wasserquellen-Atlas*. <http://www.quellenatlas.eu/39994.html>
- Käβ, W., Käβ, H., 2008. *Deutsches Baderbuch*, 2 ed. Vereinigung für Bäder- und Klimakunde e.V., Stuttgart.
- Loges, A., Wagner, T., Kirnbauer, T., Göb, S., Bau, M., Berner, Z., Markl, G., 2012. Source and origin of active and fossil thermal spring systems, northern Upper Rhine Graben, Germany. *Applied Geochemistry* 27, 1153-1169.
- Mittelbach, G., Siebert, S., 2014. Gutachten zur Festsetzung eines Heilquellenschutzgebietes für die Heilquellen (Große und Kleine Adlerquelle, Schützenhofquelle, Kochbrunnen, Salmquelle und Faulbrunnen) von Wiesbaden, Stadt Wiesbaden (WSG-ID 414-005), Wiesbaden, pp. 1-52.
- Wagner, T., Kirnbauer, T., Boyce, A.J., Fallick, A.E., 2005. Barite–pyrite mineralization of the Wiesbaden thermal spring system, Germany: a 500-kyr record of geochemical evolution. *Geofluids* 5, 124-139.
- Weertz, J., Weertz, E., 2007. Eifelbronnetjes met een vulkanisch trekje. *Grondboor en Hamer* 2, 37-41.

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