

Table S1. The statistical table of main quantity elements of hot spring water samples.

Sampling Time		Temp	TDS	pH		EC	Na ⁺	K ⁺	Mg ²⁺	Ca ²⁺	F	Cl ⁻	NO ₃ ⁻	SO ₄ ²⁻	CO ₃ ²⁻	HCO ₃ ⁻	Hydrochemical
No.	(day month year)	(°C)	(mg/L)			μs/cm					(mg/L)						
S1	22 February	33.3	380	7.05	669	27.6	4.62	5.49	-	4.1	16.1	6.57	-	9.47	-	416.1	Ca-HCO ₃
	15 March 2015	93	310	9.02	595	128	5.49	-	-	-	-	-	-	-	-	-	Na-HCO ₃
	23 January 2016	53	320	8.29	515	138	6.58	0.28	5.55	1.47	6.74	-	10.93	16.95	272.3	-	Na-HCO ₃
	21 February	76	350	8.22	549	154	7.62	0.22	5.29	16.1	7.03	-	14.21	-	300.5	-	Na-HCO ₃
	16 March 2018	77.6	350	8.19	544	133	6.75	0.54	7.26	16.4	5.86	-	7.76	51.48	236.2	-	Na-HCO ₃
S2	2 May 2019	80.6	340	-	-	136	5.03	0.26	6.74	16.4	6.19	0.43	7.33	54.32	213.9	-	Na-HCO ₃
	Average	76.04	330	8.43	550.8	138	6.29	0.26	5.79	13.3	6.48	0.43	9.94	40.92	259.6	-	Na-HCO ₃
	21 February	43	650	6.82	1139	96.9	7.02	42	112	3.18	63.2	1.81	16.8	-	612.4	-	Na(Ca)-HCO ₃
S3	15 March 2015	39.2	630	8.17	961	92.3	6.54	37	113	1.99	63.8	-	15.04	-	609.3	-	Na(Ca)-HCO ₃
	23 January 2016	26.3	700	6.89	1185	99	6.98	40.7	123	0.09	66.8	2.66	19.69	-	679	-	Na(Ca)-HCO ₃
	21 February	38.9	690	6.8	1207	104	7.2	41.1	123	3.08	67.3	3.02	16.53	-	652.1	-	Na(Ca)-HCO ₃
	16 March 2018	38.61	420	6.84	1220	101	7.22	38.9	9.83	0.54	70.6	2.01	15.66	41.58	271.1	-	Na-HCO ₃
	Average	35.75	610	7.18	1143	99.1	6.99	39.5	92.2	1.42	67.1	2.56	16.73	41.58	552.8	-	Na-HCO ₃
S4	14 March 2018	62.03	560	6.83	914	137	10.6	15.7	66.9	4.96	25.5	-	14.69	84.48	400.6	-	Ca(Na)-HCO ₃
	6 May 2019	62.3	590	-	-	137	10.4	14.6	66.7	4.8	25.7	1.31	13.52	68.76	485.9	-	Ca(Na)-HCO ₃
	Average	62.17	570	6.83	914	137	10.5	15.1	66.8	4.88	25.6	1.31	14.1	76.62	443.2	-	Ca(Na)-HCO ₃

“—” represent no data.

Continued Table S1

No.	Sampling Time		TDS	pH		EC	Na ⁺	K ⁺	Mg ²⁺	Ca ²⁺	F	Cl ⁻	NO ₃ ⁻	SO ₄ ²⁻	CO ₃ ²⁻	HCO ₃ ⁻	Hydrochemical Type
	(day month year)	(°C)		(mg/L)	µs/cm												
S6	20 February	37	670	6.74	1025	49.9	6.95	30.5	159	1.07	19.2	4	111.8	-	571.4	Ca-HCO ₃	
	16 March 2018	37.04	320	6.88	1048	50.7	8.1	26.5	20	0.52	16.5	3.42	91.73	25.74	148.3	Mg(Na)-SO ₄ (HCO ₃)	
	Average	37.02	490	6.81	1037	50.3	7.52	28.5	89.7	0.79	17.8	3.71	101.7	25.74	359.8		
S7	16 March 2018	37.89	320	7.05	932	53.4	6.48	27.5	20	0.7	14.6	6.5	97.88	25.74	139.6	Mg-SO ₄ (HCO ₃)	
	19 February 2017	74	300	8.1	442	110	4.32	0.35	7.61	8.57	3.6	-	93.4	-	139.8	Na-SO ₄ (HCO ₃)	
	15 March 2018	76.2	280	8.24	407	95.5	4.35	0.13	6.92	8.48	2.85	-	68.78	12.54	151	Na-SO ₄ (HCO ₃)	
S8	8 May 2019	76.68	270	-	-	96.7	3.58	0.19	7.85	9.04	2.98	0.12	73.32	55.7	35.65	Na-HCO ₃ (SO ₄)	
	Average	75.63	280	8.17	424.5	101	4.08	0.22	7.46	8.69	3.14	0.12	78.5	34.12	108.8		
	15 March 2015	64	1510	8.03	1880	215	15.4	25	212	4.07	34.6	-	852.2	-	312.4	Ca(Na)-HCO ₃ (SO ₄)	
S9	23 January 2016	36.9	1530	6.88	1953	217	15.2	25.7	213	0.33	32.6	-	847.2	-	361.9	Ca(Na)-HCO ₃ (SO ₄)	
	20 February	51.7	1820	6.87	1912	253	17.5	31.8	264	3.33	37.3	-	1038	-	344.9	Ca(Na)-HCO ₃ (SO ₄)	
	15 March 2018	51.43	1460	6.81	1833	221	15.7	25.9	153	3.5	32.5	-	892.8	13.63	197.5	Na(Ca)-SO ₄	
	Average	51.01	1580	7.15	1895	226	16	27.1	211	2.81	34.2	0	907.5	13.63	304.2		

“—” represent no data.

Continued Table S1

No.	Sampling Time		Temp (°C)	TDS (mg/L)	pH		EC μs/cm	(mg/L)										Hydrochemical
	(day	month						Na ⁺	K ⁺	Mg ²⁺	Ca ²⁺	F	Cl ⁻	NO ₃ ⁻	SO ₄ ²⁻	CO ₃ ²⁻	HCO ₃ ⁻	
S10	15 March	2015	40	550	8.03	839	79.9	8.53	20	104	1.87	18	6.34	139.4	-	337.1	Na(Ca)-SO ₄ (HCO ₃)	
	23 January	2016	28.9	540	7.49	838	70.4	8.16	20.1	103	0.16	15.5	10.72	125.7	-	372.2	Na(Ca)-HCO ₃	
	20 February	2017	40	620	7.28	862	79.4	9.06	25.3	130	1.3	17.9	13.65	153.1	-	379.1	Na(Ca)-SO ₄ (HCO ₃)	
	15 March	2018	39.5	350	7.35	814	63.8	7.7	19.5	25.6	1.48	14.7	12.96	120	19.8	123.5	Na-SO ₄ (HCO ₃)	
	Average		37.1	510	7.54	838.3	73.4	8.36	21.2	90.7	1.2	16.5	10.92	134.5	19.8	303		
S11	2016/1/21		66	230	8.71	387	92.4	2.83	0.22	7.35	2.13	7.89	-	19.02	33.9	137.9	Na-HCO ₃	
S12	17 February		52.3	310	7.32	480	124	11.4	1.7	8.48	5.87	9.17	-	17.84	-	264.2	Na-HCO ₃	
S13	18 February	2017	47.2	1310	7.54	1333	153	11.4	10	209	3.42	9.7	0.35	832.4	-	170.1	Na(Ca)-SO ₄	
	15 March	2018	47.8	1130	7.21	1304	130	9.8	7.89	170	3.9	8.24	-	728.3	9.9	125.5	Na(Ca)-SO ₄	
	Average		47.5	1220	7.38	1319	141	10.6	8.96	189	3.66	8.97	0.35	780.3	9.9	147.8		
S14	15 March	2015	84	880	8.6	1180	145	16.1	4.33	115	4.98	10.3	-	525	-	123.7	Na(Ca)-SO ₄	
	22 January	2016	72	880	7.6	1197	145	16	4.45	114	0.45	10.6	-	508.2	-	158.5	Na(Ca)-SO ₄	
	16 February	2017	73.4	900	6.93	1199	147	16.3	4.27	112	5.34	9.8	-	534	-	135.1	Na(Ca)-SO ₄	
	15 March	2018	73.4	930	7.14	1167	144	16	4.31	115	4.8	9.61	-	543.1	26.4	132.9	Na(Ca)-SO ₄	
	7 May	2019	77.9	910	-	-	146	15.7	4.3	104	5.01	9.81	-	556.2	30.94	81.09	Na(Ca)-SO ₄	
	Average		76.14	900	7.57	1186	145	16	4.33	112	4.11	10	0	533.3	28.67	126.3		

“—” represent no data.

Continued Table S1

Sampling Time		Temp	TDS	pH		EC	Na ⁺	K ⁺	Mg ²⁺	Ca ²⁺	F	Cl ⁻	NO ₃ ⁻	SO ₄ ²⁻	CO ₃ ²⁻	HCO ₃ ⁻	Hydrochemical
No.	(day month year)	(°C)	(mg/L)		µs/cm						(mg/L)						
S15	14 March 2015	85	810	8.63	1280	210	23.6	7.68	45.7	6.07	17.6	-	368.8	-	259.8	-	Na-HCO ₃ (SO ₄)
	22 January 2016	82	810	7.66	1220	210	23.1	8.1	54.3	0.69	16.2	-	362	-	275.7	-	Na-HCO ₃ (SO ₄)
	16February 2017	83	980	7.43	1232	255	28.9	9.73	56.3	7.37	19.4	0.31	476	-	258.8	-	Na-HCO ₃ (SO ₄)
	14 March 2018	90.01	840	7.45	1147	213	23.9	7.91	46.6	8.51	15.1	0.23	372.3	46.2	214.1	-	Na-HCO ₃ (SO ₄)
	7 May 2019	92.5	750	-	-	198	21.2	7.31	44	9.23	12.8	0.44	316.3	35.07	217.4	-	Na-HCO ₃
	Average	86.5	840	7.79	1220	217	24.1	8.14	49.4	6.37	16.2	0.33	379.1	40.63	0.84	-	
S16	21 January 2016	79.9	970	7.75	1509	366	11.1	4.12	54.4	0.3	8.49	-	17.68	217	592.8	-	Na-HCO ₃
	17 February 2016	82	990	6.97	1459	426	12.8	4.53	20.1	3.02	9.84	-	15.95	-	992.9	-	Na-HCO ₃ (SO ₄)
	Average	80.95	980	7.36	1484	396	12	4.33	37.3	1.66	9.17	-	16.82	217	792.8	-	
S17	6 May 2019	26.7	330	-	-	2.8	1.36	23.9	93.1	-	2.21	3.82	4.76	56.38	281	-	Ca-HCO ₃
S18	14 March 2018	50.05	170	7.11	471	442	1.88	27.3	18.7	0.5	0.39	1.34	5.92	24.42	163.1	-	Ca(Mg)-HCO ₃
S19	7 May 2019	38.6	300	-	-	3.76	2.35	40.6	61.2	0.77	0.29	0.67	5.87	53.63	255.2	-	Mg(Ca)-HCO ₃
S20	7 May 2019	22.3	810	-	-	17.5	3.35	25.8	229	0.42	300	7.32	36.2	58.45	260.8	-	Ca-HCO ₃ (Cl)

“—” represent no data.

Table S2. Concentrations of trace elements in the water samples from the 20 sites

No.	Sampling (day month)	µg/L													
		Hg	As	Ag	B	Li	Be	Ti	V	Mn	Cr	Co	Ni	Cu	Zn
S1	22 February	0.03	<1.00	0.01	67.4	66.4	<0.002	1.99	0.71	6.19	2.49	0.24	3.15	2.89	26
	15 March 2015	0.73	-	0.01	560	173	0.34	1.77	0.36	0.92	0.9	0.03	0.25	0.28	1.8
	23 January 2016	1.33	-	0.02	920	244	0.4	3.36	0.31	1.38	1.77	0.11	0.58	0.85	13.6
	21 February	1.58	<1.00	0.2	856	226	0.51	12.5	1	9.19	3.41	0.31	1.77	7.06	24.9
S2	16 March 2018	-	-	0.01	924	-	0.6	16.1	0.54	4.68	1.83	0.04	0.25	0.48	4.67
	2 May 2019	-	2.19	0	828	245	0.53	11.4	0.64	2.4	2.83	0.02	0.47	0.76	4.96
	Average	1.21	2.19	0.05	817.6	222	0.48	9.03	0.57	3.71	2.15	0.1	0.66	1.89	9.99
	21 February	0.01	<1.00	0.01	193	94.7	0.04	1.7	2.04	2.8	2.33	0.21	3.85	1.25	12.5
S3	15 March 2015	0.01	-	0.01	126	84.6	0.05	0.77	2.48	0.24	1.43	0.13	1.76	0.46	1.76
	23 January 2016	0.02	-	0.01	211	117	0.03	1.4	2.07	0.14	1.58	0.13	2.34	0.55	1.67
	21 February	0.03	<1.00	0.03	240	114	0.03	5.25	2.42	2.9	2.12	0.28	4.46	1.84	22.3
	16 March 2018	-	-	0.02	226	-	0.03	6.19	1.7	0.85	1.85	0.24	5.2	0.63	7.19
S4	Average	0.02	<1.00	0.02	200.8	105.2	0.04	3.4	2.17	1.03	1.75	0.2	3.44	0.87	8.23
	14 March 2018	-	-	<0.002	855	-	0.59	11.4	0.71	51.6	1.93	0.11	2.63	0.51	1.7
	6 May 2019	-	2.23	0.02	707	144	0.41	7.74	1.58	46.8	2.16	0.26	6.96	0.75	1.56
	Average	2.23	0.02	0.02	781	144	0.5	9.57	1.15	49.2	2.05	0.19	4.8	0.63	1.63
S5	20 February	0.02	<1.00	0.01	41.4	21	0.06	2.82	3.44	1.33	1.74	0.22	3.97	0.96	4.06
	16 March 2018	-	-	0.02	43.1	-	0.13	13.1	3.38	1.77	2.76	0.3	6.6	0.8	3.21
	Average	0.02	<1.00	0.15	42.25	21	0.1	7.96	3.41	1.55	2.25	0.26	5.29	0.88	3.64
	21 February	0.01	<1.00	0.01	193	94.7	0.04	1.7	2.04	2.8	2.33	0.21	3.85	1.25	12.5
S6	15 March 2015	0.01	-	0.01	126	84.6	0.05	0.77	2.48	0.24	1.43	0.13	1.76	0.46	1.76
	23 January 2016	0.02	-	0.01	211	117	0.03	1.4	2.07	0.14	1.58	0.13	2.34	0.55	1.67
	21 February	0.03	<1.00	0.03	240	114	0.03	5.25	2.42	2.9	2.12	0.28	4.46	1.84	22.3
	16 March 2018	-	-	0.02	226	-	0.03	6.19	1.7	0.85	1.85	0.24	5.2	0.63	7.19
S7	Average	0.02	<1.00	0.02	200.8	105.2	0.04	3.4	2.17	1.03	1.75	0.2	3.44	0.87	8.23
	14 March 2018	-	-	<0.002	855	-	0.59	11.4	0.71	51.6	1.93	0.11	2.63	0.51	1.7
	6 May 2019	-	2.23	0.02	707	144	0.41	7.74	1.58	46.8	2.16	0.26	6.96	0.75	1.56
	Average	2.23	0.02	0.02	781	144	0.5	9.57	1.15	49.2	2.05	0.19	4.8	0.63	1.63
S8	20 February	0.02	<1.00	0.01	41.4	21	0.06	2.82	3.44	1.33	1.74	0.22	3.97	0.96	4.06
	16 March 2018	-	-	0.02	43.1	-	0.13	13.1	3.38	1.77	2.76	0.3	6.6	0.8	3.21
	Average	0.02	<1.00	0.15	42.25	21	0.1	7.96	3.41	1.55	2.25	0.26	5.29	0.88	3.64
	21 February	0.01	<1.00	0.01	193	94.7	0.04	1.7	2.04	2.8	2.33	0.21	3.85	1.25	12.5
S9	15 March 2015	0.01	-	0.01	126	84.6	0.05	0.77	2.48	0.24	1.43	0.13	1.76	0.46	1.76
	23 January 2016	0.02	-	0.01	211	117	0.03	1.4	2.07	0.14	1.58	0.13	2.34	0.55	1.67
	21 February	0.03	<1.00	0.03	240	114	0.03	5.25	2.42	2.9	2.12	0.28	4.46	1.84	22.3
	16 March 2018	-	-	0.02	226	-	0.03	6.19	1.7	0.85	1.85	0.24	5.2	0.63	7.19
S10	Average	0.02	<1.00	0.02	200.8	105.2	0.04	3.4	2.17	1.03	1.75	0.2	3.44	0.87	8.23
	14 March 2018	-	-	<0.002	855	-	0.59	11.4	0.71	51.6	1.93	0.11	2.63	0.51	1.7
	6 May 2019	-	2.23	0.02	707	144	0.41	7.74	1.58	46.8	2.16	0.26	6.96	0.75	1.56
	Average	2.23	0.02	0.02	781	144	0.5	9.57	1.15	49.2	2.05	0.19	4.8	0.63	1.63
S11	20 February	0.02	<1.00	0.01	41.4	21	0.06	2.82	3.44	1.33	1.74	0.22	3.97	0.96	4.06
	16 March 2018	-	-	0.02	43.1	-	0.13	13.1	3.38	1.77	2.76	0.3	6.6	0.8	3.21
	Average	0.02	<1.00	0.15	42.25	21	0.1	7.96	3.41	1.55	2.25	0.26	5.29	0.88	3.64
	21 February	0.01	<1.00	0.01	193	94.7	0.04	1.7	2.04	2.8	2.33	0.21	3.85	1.25	12.5
S12	15 March 2015	0.01	-	0.01	126	84.6	0.05	0.77	2.48	0.24	1.43	0.13	1.76	0.46	1.76
	23 January 2016	0.02	-	0.01	211	117	0.03	1.4	2.07	0.14	1.58	0.13	2.34	0.55	1.67
	21 February	0.03	<1.00	0.03	240	114	0.03	5.25	2.42	2.9	2.12	0.28	4.46	1.84	22.3
	16 March 2018	-	-	0.02	226	-	0.03	6.19	1.7	0.85	1.85	0.24	5.2	0.63	7.19
S13	Average	0.02	<1.00	0.02	200.8	105.2	0.04	3.4	2.17	1.03	1.75	0.2	3.44	0.87	8.23
	14 March 2018	-	-	<0.002	855	-	0.59	11.4	0.71	51.6	1.93	0.11	2.63	0.51	1.7
	6 May 2019	-	2.23	0.02	707	144	0.41	7.74	1.58	46.8	2.16	0.26	6.96	0.75	1.56
	Average	2.23	0.02	0.02	781	144	0.5	9.57	1.15	49.2	2.05	0.19	4.8	0.63	1.63
S14	20 February	0.02	<1.00	0.01	41.4	21	0.06	2.82	3.44	1.33	1.74	0.22	3.97	0.96	4.06
	16 March 2018	-	-	0.02	43.1	-	0.13	13.1	3.38	1.77	2.76	0.3	6.6	0.8	3.21
	Average	0.02	<1.00	0.15	42.25	21	0.1	7.96	3.41	1.55	2.25	0.26	5.29	0.88	3.64
	21 February	0.01	<1.00	0.01	193	94.7	0.04	1.7	2.04	2.8	2.33	0.21	3.85	1.25	12.5
S15	15 March 2015	0.01	-	0.01	126	84.6	0.05	0.77	2.48	0.24	1.43	0.13	1.76	0.46	1.76
	23 January 2016	0.02	-	0.01	211	117	0.03	1.4	2.07	0.14	1.58	0.13	2.34	0.55	1.67
	21 February	0.03	<1.00	0.03	240	114	0.03	5.25	2.42	2.9	2.12	0.28	4.46	1.84	22.3
	16 March 2018	-	-	0.02	226	-	0.03	6.19	1.7	0.85	1.85	0.24	5.2	0.63	7.19
S16	Average	0.02	<1.00	0.02	200.8	105.2	0.04	3.4	2.17	1.03	1.75	0.2	3.44	0.87	8.23
	14 March 2018	-	-	<0.002	855	-	0.59	11.4	0.71	51.6	1.93	0.11	2.63	0.51	1.7
	6 May 2019	-	2.23	0.02	707	144	0.41	7.74	1.58	46.8	2.16	0.26	6.96	0.75	1.56
	Average	2.23	0.02	0.02	781	144	0.5	9.57	1.15	49.2	2.05	0.19	4.8	0.63	1.63
S17	20 February	0.02	<1.00	0.01	41.4	21	0.06	2.82	3.44	1.33	1.74	0.22	3.97	0.96	4.06
	16 March 2018	-	-	0.02	43.1	-	0.13	13.1	3.38	1.77	2.76	0.3	6.6	0.8	3.21
	Average	0.02	<1.00	0.15	42.25	21	0.1	7.96	3.41	1.55	2.25	0.26	5.29	0.88	3.64
	21 February	0.01	<1.00	0.01	193	94.7	0.04	1.7	2.04	2.8	2.33	0.21	3.85	1.25	12.5
S18	15 March 2015	0.01	-	0.01	126	84.6	0.05	0.77	2.48	0.24	1.43	0.13	1.76	0.46	1.76
	23 January 2016	0.02	-	0.01	211	117	0.03	1.4	2.07	0.14	1.58	0.13	2.34	0.55	1.67
	21 February	0.03	<1.00	0.03	240	114	0.03	5.25	2.42	2.9	2.12	0.28	4.46	1.84	22.3
	16 March 2018	-	-	0.02	226	-	0.03	6.19	1.7	0.85	1.85	0.24	5.2	0.63	7.19
S19	Average	0.02	<1.00	0.02	200.8	105.2	0.04	3.4	2.17	1.03	1.75	0.2	3.44	0.87	8.23
	14 March 2018	-	-	<0.002	855	-	0.59	11.4	0.71	51.6	1.93	0.11	2.63	0.51	1.7
	6 May 2019	-	2.23	0.02	707	144	0.41	7.74	1.58	46.8	2.16	0.26	6.96	0.75	1.56
	Average	2.23	0.02	0.02	781	144	0.5	9.57	1.15	49.2	2.05	0.19	4.8	0.63	1.63
S20	20 February	0.02	<1.00	0.01	41.4	21	0.06	2.82	3.44	1.33	1.74	0.22	3.97	0.96	4.06
	16 March 2018	-	-	0.02	43.1	-	0.13	13.1	3.38	1.77	2.76	0.3	6.6	0.8	3.21
	Average	0.0.													

Continued Table S2

No.	Sampling	Mo	Cd	Sb	Ba	Tl	Pb	Th	U	Sr	Sn	Fe	Al	Se
	(day month)	µg/L												
S1	22 February	0.57	0.01	0.38	450	0.15	3.96	0.01	0.54	323	0.09	1361	32.2	-
	15 March 2015	0.23	0.01	2.78	1.93	0.11	2.46	0.01	0	88.2	0.02	41	108	-
	23 January 2016	0.47	0.01	1.88	70.3	0.15	9.54	0.01	0.03	146	0.74	136	59.9	-
	21 February	1.11	0.02	1.6	19.6	0.14	25.6	0.04	0.03	156	0.38	408	295	-
	16 March 2018	0.32	0.01	1.37	2.31	0.1	0.38	0.04	0.01	141	0.05	610	111	-
S2	2 May 2019	0.37	0.01	1.42	3.05	0.1	0.16	0	0	143	0.11	39.3	45.9	0.1
	Average	0.5	0.01	1.81	19.44	0.12	7.63	0.03	0.02	134.8	0.26	246.9	124	0.1
	21 February	0.42	0.01	0.26	268	0.38	3.32	0	0.53	1014	0.08	326	27.5	-
S3	15 March 2015	0.35	0.01	0.09	244	<0.002	1.2	<0.002	0.46	631	0.03	171	23.6	-
	23 January 2016	0.37	0.01	0.05	290	0.48	2.9	<0.002	0.69	1183	0.04	174	9.97	-
	21 February	0.59	0.01	0.1	277	0.46	8.41	0	0.66	1226	0.03	302	47.2	-
S4	16 March 2018	0.43	0.01	0.04	304	0.48	0.15	<0.002	0.66	1311	0.02	78.1	3.73	-
	Average	0.44	0.01	0.07	278.8	0.36	3.17	<0.002	0.62	1088	0.03	181.3	21.13	-
	14 March 2018	0.03	0.01	0.66	866	0.14	0.07	0	0.02	1713	0.02	13.2	5.54	-
S5	6 May 2019	0.02	0	0.61	864	0.15	0.21	<0.002	0.02	1525	0.06	107	3.48	-
	Average	0.03	0.01	0.64	865	0.15	0.14	<0.002	0.02	1619	0.04	60.1	4.51	-
	20 February	0.86	0.03	0.03	38.2	0.07	2.17	0	1.98	819	0.02	237	20.2	-
S6	16 March 2018	0.9	0.03	0.01	40.1	0.07	0.08	0	1.76	878	0.02	340	24.3	-
	Average	0.88	0.03	0.02	39.15	0.07	1.13	0	1.87	848.5	0.02	288.5	22.25	-

“—” represent no data.

Continued Table S2

No.	Sampling Time (day month year)	µg/L													
		Hg	As	Ag	B	Li	Be	Ti	V	Mn	Cr	Co	Ni	Cu	Zn
S7	16 March 2015	-	-	0.01	57.5	-	0.07	10.9	6.14	2.08	2.22	0.23	5.64	1.75	6.41
	19 February 2017	0.76	<1.00	0.01	111	196	0.31	3.47	0.33	2.47	0.64	0.02	0.44	3.15	3.55
	15 March 2018	-	-	<0.002	119	-	0.47	18	0.2	7.51	1.07	0.01	0.19	1.06	2.21
	8 May 2019	-	0.39	<0.002	132	243	0.39	10.9	0.45	7.34	1.4	0.02	0.47	0.87	2.47
	Average	0.76	0.39	0.01	120.7	219.5	0.39	10.79	0.33	5.77	1.04	0.02	0.37	1.69	2.74
S8	15 March 2015	0.14	-	0	245	159	0.24	1.43	1.3	8.95	0.61	0.34	4.83	1.81	1.81
	23 January 2016	0.28	-	0.01	437	215	0.35	4.84	0.77	75.9	1.15	0.25	4.17	3.49	7.77
	20 February 2017	0.33	<1.00	0	408	209	0.56	4.21	1.26	93.9	0.98	0.28	3.6	3.53	8
	15 March 2015	-	-	0	428		0.69	16.4	1.06	94.1	1.28	0.35	7.8	4.16	2.97
	Average	0.25	<1.00	0	379.5	145.8	0.46	6.72	1.1	68.21	1.01	0.31	5.1	3.25	5.14
S9	15 March 2015	0.06	-	0.01	123	47.4	0.05	11.3	6.47	0.33	1.01	0.16	2.79	0.55	2.02
	20 February 2017	0.04	<1.00	0.01	166	51.2	0.08	2.97	7.57	0.63	2.04	0.14	2.13	0.95	3.21
	15 March 2018	-	-	0.01	161	-	0.13	11.3	6.76	0.88	2.06	0.17	3.7	1.29	1.86
	Average	0.05	<1.00	0.01	150	49.3	0.09	8.52	6.93	0.61	1.7	0.16	2.87	0.93	2.36
	17 February 2017	0.38	1.95	0	331	85.6	0.29	3.09	0.44	20.5	0.77	0.03	0.72	0.26	3.01

“—” represent no data.

Continued Table S2

No.	Sampling Time		µg/L												
	(day month year)		Mo	Cd	Sb	Ba	Tl	Pb	Th	U	Sr	Sn	Fe	Al	Se
S7	16 March 2018	1.25	0.01	0.03	48.9	0.05	0.1	<0.002	1.49	688	0.03	241	18.5	-	
	19 February 2017	1.55	0.01	0.23	1.98	0.06	0.77	0	0.02	117	0.04	63.8	48.5	-	
	15 March 2018	1.35	0.01	0.06	1.6	0.03	0.01	0	0	112	0.02	87.3	27.8	-	
	8 May 2019	1.39	0	0.15	2.12	0.03	0.06	0	0	102	0.07	28.3	22.3	0.12	
	Average	1.43	0.01	0.15	1.9	0.04	0.28	0	0.02	110.3	0.04	59.8	32.87	0.12	
S8	15 March 2015	1.16	0.01	0.03	22.3	0.03	0.44	0.01	0.16	1202	0.01	358	<0.002	-	
	23 January 2016	1.62	0.01	0.03	31.4	0.04	1.37	0.01	0.22	2294	0.03	318	6.66	-	
	20 February 2017	1.51	0	0.03	29.9	0.04	5.41	0.06	0.24	2283	0.09	331	6.14	-	
	15 March 2018	1.42	0	0.01	27.1	0.03	0.02	0	0.21	2513	0.02	7299	4.7	-	
	Average	1.43	0.01	0.03	27.68	0.04	1.81	0.03	0.21	2073	0.04	2077	4.38	-	
S9	15 March 2015	2.16	0.02	8.59	43.1	0.16	2.57	<0.002	1.25	705	1.92	199	8.92	-	
	20 February 2017	2.42	0.01	0.85	50.3	0.13	0.24	0	1.51	1124	0.01	276	11	-	
	15 March 2018	2.1	0.02	0.04	43.3	0.12	0.02	<0.002	1.39	1161	0.01	43.4	6.69	-	
	Average	2.23	0.02	3.16	45.57	0.14	0.94	<0.002	1.38	996.7	0.65	172.8	8.87	-	
	17 February 2017	1.15	0.01	6.14	12.9	0.03	2.35	0.01	0.01	233	0.04	138	35.1	-	

“—” represent no data.

Continued Table S2

No.	Sampling	Hg	As	Ag	B	Li	Be	Ti	V	Mn	Cr	Co	Ni	Cu	Zn
	(day month)	µg/L													
S13	18 February	0.2	<1.00	0.01	85.5	64.9	0.05	5.12	0.56	1.32	0.76	0.22	2.45	5.9	4.75
	15 March 2018	-	-	0.01	88.2	-	0.16	19.9	0.39	81.2	1.23	0.26	6.55	3.57	4.95
	Average	0.2	<1.00	0.01	86.85	64.9	0.11	12.51	0.48	41.26	1	0.24	4.5	4.74	4.85
S14	14 March 2015	0.08	-	0	163	91.6	0.27	2.99	0.39	0.73	0.43	0.2	3.05	1.38	4.81
	16 February	0.14	<1.00	0.01	219	102	0.34	5.93	0.41	37	0.98	0.15	1.75	1.86	4.66
	15 March 2018	-	-	0	244		0.49	27.2	0.36	38.8	1.19	0.18	4.42	3.23	3.43
S15	7 May 2019	-	1.36	0.01	241	133	0.3	15.9	0.86	32.1	0.95	0.45	11.1	2.03	0.97
	Average	0.11	1.36	0.01	216.8	108.9	0.35	13.01	0.51	27.16	0.89	0.25	5.08	2.13	3.47
	14 March 2015	0.11	-	0	241	176	1.08	3.57	0.5	42.4	0.19	0.06	1.81	0.69	3.42
S16	16 February	0.19	9.13	0.01	346	182	1.25	5.59	0.69	57.5	1.26	0.09	1.32	4.18	7.46
	14 March 2018	-	-	<0.002	367	-	1.77	26.3	0.48	54.6	1.43	0.08	1.5	1.86	4.96
	7 May 2019	-	11.1	0.01	273	203	1.36	17.1	1.92	42.1	1.71	0.16	3.91	1.2	1.49
S17	Average	0.15	10.12	0.01	306.8	187	1.37	13.14	0.9	49.15	1.15	0.1	2.14	1.98	4.33
	17 February	0.47	<1.00	0.08	4468	870	0.22	5.1	0.7	61.8	1.05	0.02	0.68	2.35	8.39
	6 May 2019	-	2.06	0.01	13.9	3.66	0.01	1.91	0.93	0.79	2.98	0.45	9.8	0.5	5.23
S18	14 March 2018	-	-	0	77.1	-	0	4.86	4.33	0.83	1.88	0.13	2.88	0.53	4.15
	7 May 2019	-	2.27	0	7.74	4.03	0.03	2.21	1.94	0.8	2.12	0.25	5.83	0.63	6.36
	7 May 2019	-	8.9	0.02	2.12	3.62	0.01	2.07	7.31	1.58	2.56	1.04	24.2	2.96	76.5

“—” represent no data.

Continued Table S2

No.	Sampling (day month)	Mo	Cd	Sb	Ba	Tl	Pb	Th	U	Sr	Sn	Fe	Al	Se
µg/L														
S13	18 February	1.11	0.01	3.05	32.9	0.07	1.13	0	0.01	3379	0.05	312	11.6	-
	Average	0.99	0.01	0.03	33.1	0.06	0.02	0	<0.002	3688	0.02	4093	4.47	-
	Average	1.05	0.01	1.54	33	0.07	0.58	0	0.01	3534	0.04	2203	8.04	0
S14	14 March 2015	0.05	<0.002	0.75	48	0.13	0.77	0.04	0	1734	0.04	269	16.8	-
	16 February	0.04	<0.002	1.87	51.7	0.18	3.17	0.02	0	3291	0.03	227	29.7	-
	Average	0.02	0	0.06	58	0.12	0.03	0	<0.002	3386	0.02	83.1	7.55	-
S15	7 May 2019	0.01	0.01	0.03	48.7	0.14	0.05	<0.002	<0.002	3028	0.02	174	3.54	0.12
	Average	0.03	0.01	0.68	51.6	0.14	1.01	0.03	<0.002	2860	0.03	188.3	14.4	0.12
	Average	0.03	0.01	0.68	51.6	0.14	1.01	0.03	<0.002	2860	0.03	188.3	14.4	0.12
S16	14 March 2015	0.03	0	1.5	30.5	0.19	1	0.02	0	491	0.01	170	23.6	-
	16 February	0.21	0	1.2	34	0.25	1.04	0	0.01	934	0.05	130	9.62	-
	Average	0.08	0.01	0.84	33.3	0.19	0.03	0.01	<0.002	952	0.02	129	22	-
S17	7 May 2019	0.08	0	0.96	31	0.17	0.12	0	0	764	0.02	76.1	10.4	0.11
	Average	0.1	0.01	1.13	32.2	0.2	0.55	0.02	0.01	785.3	0.03	126.3	16.41	0.11
	Average	0.04	0	2.34	3016	0.01	1.67	0	0.01	611	0.03	84	48.8	-
S18	6 May 2019	0.21	0.03	0.15	23.3	0.05	0.09	<0.002	0.48	73.5	0.02	140	14.2	0.11
	14 March 2018	2.39	0.01	0.79	37	0.18	0.09	<0.002	2.8	345	0.02	170	7.92	-
	Average	3.15	0.02	0.14	52.3	0.17	0.12	<0.002	7.78	126	0.02	87.2	6.95	0.1
S19	7 May 2019	0.1	0.01	0.01	84	0.01	1	0	1.05	1189	0.08	664	4.72	0.11
	Average	0.1	0.01	0.01	84	0.01	1	0	1.05	1189	0.08	664	4.72	0.11
	Average	0.1	0.01	0.01	84	0.01	1	0	1.05	1189	0.08	664	4.72	0.11

"—" represent no data.

Table S3 Z score normalization of ion concentrations were calculated for comparing with the geochemical background of different springs

Sampling Time (day month year)	Na ⁺	K ⁺	Mg ²⁺	Ca ²⁺	F ⁻	Cl ⁻	NO ₃ ⁻	SO ₄ ²⁻	CO ₃ ²⁻	HCO ₃ ⁻
15 March 2015	0.00	0.54	-1.22	0.25	-0.18	-0.77	-	0.68	-	-1.34
15 March 2015	1.24	1.72	-0.94	-0.83	0.05	-0.39	-	0.17	-	-0.41
15 March 2015	-0.32	-1.12	-	-1.47	2.12	-0.96	-	-1.02	-	-0.30
15 March 2015	-1.01	-0.95	1.53	0.22	-0.80	1.99	-	-1.00	-	1.98
15 March 2015	1.34	0.44	0.52	1.74	-0.37	0.49	-	1.76	-	-0.05
15 March 2015	-1.24	-0.64	0.10	0.08	-0.82	-0.37	-	-0.59	-	0.12
21 January 2016	-0.83	-1.37	-0.94	-1.19	2.11	-0.66	-	-0.76	-0.61	-1.21
21 January 2016	2.21	-0.02	-0.65	-0.46	-0.59	-0.63	-	-0.77	1.41	1.31
22 January 2016	-0.25	0.77	-0.63	0.46	-0.37	-0.52	-	0.93	-	-1.10
22 January 2016	0.48	1.94	-0.36	-0.47	-0.02	-0.23	-	0.43	-	-0.45
23 January 2016	-0.32	-0.76	-0.93	-1.22	1.13	-0.73	-	-0.79	-0.80	-0.47
23 January 2016	-0.76	-0.70	2.04	0.60	-0.91	2.42	-1.00	-0.76	-	1.79
23 January 2016	0.55	0.65	0.94	2.00	-0.55	0.63	-	2.11	-	0.03
23 January 2016	-1.08	-0.50	0.53	0.29	-0.80	-0.27	1.00	-0.39	-	0.09
16 February 2017	-0.05	0.79	-0.89	0.16	0.08	-0.61	-	0.83	-	-1.13
16 February 2017	1.01	2.75	-0.53	-0.55	0.61	-0.14	-0.84	0.65	-	-0.61

“–” represent no data.

Continued Table S3

Sampling Time (day month year)	Na ⁺	K ⁺	Mg ²⁺	Ca ²⁺	F ⁻	Cl ⁻	NO ₃ ⁻	SO ₄ ²⁻	CO ₃ ²⁻	HCO ₃ ⁻
17 February 2017	-0.28	0.04	-1.05	-1.17	0.22	-0.65	-	-0.71	-	-0.58
17 February 2017	2.69	0.26	-0.87	-1.02	-0.52	-0.61	-	-0.71	-	2.49
18 February 2017	0.01	0.04	-0.52	1.41	-0.42	-0.62	-0.83	1.71	-	-0.98
20 February 2017	-0.41	-1.06	-1.14	-1.18	0.93	-0.92	-	-0.48	-	-1.11
20 February 2017	-1.00	-0.65	0.81	0.77	-1.03	-0.15	0.03	-0.43	-	0.71
20 February 2017	0.99	0.99	0.89	2.12	-0.44	0.76	-	2.32	-	-0.24
20 February 2017	-0.71	-0.33	0.47	0.40	-0.97	-0.21	2.31	-0.30	-	-0.10
20 February 2017	0.02	-0.55	-1.15	-1.21	2.90	-0.75	-	-0.72	-	-0.43
21 February 2017	-0.54	-0.64	1.55	0.16	-0.48	2.04	-0.49	-0.71	-	0.88
21 February 2017	-0.48	-0.61	1.50	0.30	-0.51	2.25	-0.20	-0.71	-	1.05
22 February 2017	-1.22	-1.01	0.92	-0.20	-0.37	-0.38	0.02	-0.74	-	0.06
14 March 2018	0.40	0.12	-0.10	0.21	0.10	0.41	-	-0.78	2.59	2.69
14 March 2018	1.63	2.43	-0.74	-0.15	0.88	-0.16	-0.97	0.42	0.71	0.29
14 March 2018	-1.74	-1.38	0.86	-0.65	-0.89	-0.98	-0.71	-0.81	-0.36	-0.37
15 March 2018	-0.27	-0.96	-1.38	-0.86	0.87	-0.84	-	-0.60	-0.95	-0.53
15 March 2018	1.75	1.00	0.75	1.75	-0.23	0.80	-	2.17	-0.90	0.07

“–” represent no data.

Continued Table S3

Sampling Time (day month year)	Na ⁺	K ⁺	Mg ²⁺	Ca ²⁺	F ⁻	Cl ⁻	NO ₃ ⁻	SO ₄ ²⁻	CO ₃ ²⁻	HCO ₃ ⁻
15 March 2018	-0.78	-0.38	0.22	-0.52	-0.67	-0.19	1.99	-0.42	-0.59	-0.88
15 March 2018	0.28	-0.01	-0.74	2.05	-0.14	-0.54	-	1.61	-1.08	-0.86
15 March 2018	0.51	1.07	-1.04	1.06	0.06	-0.47	-	0.99	-0.27	-0.76
16 March 2018	0.34	-0.54	-1.35	-0.85	2.62	-0.67	-	-0.80	0.97	0.57
16 March 2018	-0.18	-0.46	1.83	-0.80	-0.88	2.91	-0.56	-0.77	0.48	1.02
16 March 2018	-0.99	-0.31	0.80	-0.62	-0.88	-0.09	-0.23	-0.52	-0.30	-0.56
16 March 2018	-0.95	-0.59	0.88	-0.62	-0.84	-0.19	0.49	-0.50	-0.30	-0.68
2 May 2019	0.62	-0.42	-1.06	-1.05	1.91	-0.40	-0.65	-0.63	0.23	1.08
6 May 2019	0.64	0.37	0.00	-0.15	-0.33	-0.20	-0.29	-0.60	1.46	3.21
6 May 2019	-1.27	-0.96	0.69	0.25	-	-0.44	0.73	-0.64	0.40	1.60
7 May 2019	0.76	1.16	-0.76	0.42	-0.29	-0.36	-	2.26	-1.77	0.04
7 May 2019	1.51	1.97	-0.54	-0.49	0.52	-0.33	-0.64	1.00	-1.42	1.10
7 May 2019	-1.26	-0.82	1.92	-0.23	-1.11	-0.46	-0.55	-0.64	0.17	1.40
7 May 2019	-1.06	-0.67	0.83	2.29	-1.18	2.64	2.16	-0.48	0.58	1.44
8 May 2019	0.06	-0.63	-1.07	-1.04	0.49	-0.43	-0.77	-0.28	0.35	-0.32

“—” represent no data.