Supplementary material for Chapter 3

Table S1.a. PHREEQC calculation of surface temperature condition for scenario I (thermal spring + Metamorphic[a]). Saturation indices for final supersaturated mineral phases (SI).

Mineral Groups	Final supersaturated Mineral	Saturation indices			
		Rambo	Kaguri	Main spring	Iyola
Weathered volcanics	Katoite		9.25		
	Mesolite	7.61	5.3	8.1	6.8
	Nontronite-Ca	2.36	1.49	2.55	2.08
	Nontronite-K	0.29		0.44	
	Nontronite-Mg	1.56	0.13	1.91	0.84
	Nontronite-Na	0.83		0.99	0.52
	Okenite	9.27	13.51	7.85	12.92
	Scolecite	8.81	6.13	9.33	7.91
	Stilbite	9.52	2.42	10.46	6.93
Clays	Annite	12.06	9.8	11.1	10.67
	Celadonite	10.65	12.57	10.11	12.08
	Montmorillonite-Ca	1.26		2.42	
	Montmorillonite-K			0.38	
	Montmorillonite-Mg	0.52		1.8	
	Montmorillonite-Na			0.9	
	Smectite-high-Fe-Mg	10.88	10.31	10.86	10.49
	Smectite-low-Fe-Mg	7.78	6.72	7.97	7.12
Carbonates	**Aragonite**		0.86		
	Calcite		1.01		
	Monohydrocalcite		1.5		
Apatites	Flourapatite	17.9	9.89	15.80	12.50
	Hydroxylapatite		19.1		
Weathered metamorphics	Clinozoisite	16.49	19.5	16	18.77
	Lime		4.5		
	Magnetite	3.9	3.45	3.53	3.54
	Pseudowollastonite	11.02	17.7	9.33	15.36
	Wollastonite	11.8	17.34	9.49	15.52
	Zoisite	16.46	19.48	15.93	18.75

[(a)] Primary minerals of Metamorphic rocks : K-feldspar, Ca-Al-pyroxene, FCO_3-apatite, titanite, amphibole, quartz, albite, and hematite (data from this study and Alexander et al., 2016).

Table S1.b. PHREEQC calculation of surface temperature condition for scenario II (thermal spring +Metamorphics[a] and Karoo[b]). Saturation indices for final supersaturated mineral phases (SI).

Mineral Groups	Final supersaturated Mineral	Saturation indices			
		Rambo	Kaguri	Main Springs	Iyola
Weathered volcanics	Katoite	0.16			
	Mesolite	7.6	1.2	1.6	1.4
	Nontronite-Ca	2.36	1.18	1.22	1.19
	Nontronite-K	0.29		0.05	
	Nontronite-Mg	1.56	0.99	1.02	1
	Nontronite-Na	0.83	0.23	0.38	0.31
	Okenite	9.3			
	Scolecite	8.81	1.14	1.3	1.22
	Stilbite	9.52	1.34	1.97	1.69
Clays	Annite	12.06	2.44	2.56	2.48
	Celadonite	10.65			
	Montmorillonite-Ca	1.26	0.82	0.75	0.78
	Montmorillonite-Mg	0.52	0.7	0.61	0.65
	Saponite-Ca		2.25	2.17	2.2
	Saponite-H		0.93	0.87	0.89
	Saponite-K		1.02	0.99	1
	Saponite-Mg		2.07	1.97	2
	Saponite-Na		1.3	1.33	1.32
	Smectite-high-Fe-Mg	10.88			
	Smectite-low-Fe-Mg	7.78			
	Talc		1.2	1.14	1.16
Apatites	Fluorapatite	17.87		0.75	
Weathered metamorphics	Clinozoisite	16.5			
	Magnetite	3.9	1.09	1.07	1.07
	Ripidolite-14A		2.8	2.8	2.8
	Zoisite	16.46			

[(a)] Primary minerals of Metamorphic rocks : K-feldspar, Ca-Al-pyroxene, FCO_3-apatite, titanite, amphibole, quartz, albite, and hematite (data from this study and Alexander et al., 2016).

[(b)] Primary minerals of Karoo rocks : Quartz, muscovite, illite/smectite, kaolinite, K-feldspars, epidote, zircon, kyanite, pyroxene, chlorite, amphibole , calcite, and hematite (data from this study; Dypvik et al., 1990; Wopfner and Kaaya, 1991).

[(c)] Primary minerals of Red Sandstone rocks : Quartz, k-feldspar, muscovite, FCO_3-apatite, albite, nontronite-Ca, and nontronite-Na (data from this study; Alexander et al., 2016; Roberts et al., 2004).

[(d)] Primary minerals of Volcanic rocks : Quartz, albite, k-feldspar, illite, kaolinite, calcite, thenardite, Ca-Al-pyroxene, FCO_3-apatite, and amphibole (data from this study; Alexander et al., 2016; Mtelela et al., 2016).

Table S1.c. PHREEQC calculation of surface temperature condition for scenario III (thermal spring + Karoo and Red Sandstone[c]). Saturation indices for final supersaturated mineral phases (SI).

Mineral Groups	Final supersaturated Mineral	Saturation indices			
		Rambo	Kaguri	Main Springs	Iyola
Weathered volcanics	Mesolite	1.93	1.66	2.05	2.11
	Nontronite-Mg	0.26	7.31	0.25	0.26
	Scolecite		3.39	0.09	0.15
	Stilbite	1.21	7.74	1.32	1.45
Clays	Amesite-14A	6.67	5.14	6.84	7.06
	Annite	2.55	2.31	2.47	2.45
	Celadonite	3.16	3.04	3.27	3.34
	Chrysotile	6.63	9.65	6.85	7.05
	Montmorillonite-Ca	0.56	0.44	0.6	0.62
	Montmorillonite-K	0.1	0.72	0.12	0.14
	Montmorillonite-Mg	0.88	0.5	0.91	0.94
	Montmorillonite-Na	0.63	0.22	0.66	0.68
	Saponite-Ca	9.37	8.55	9.63	9.82
	Saponite-H	8.15	7.27	8.38	8.56
	Saponite-K	8.83	7.98	9.08	9.26
	Saponite-Mg	9.63	8.76	9.89	10.08
	Saponite-Na	9.37	8.55	9.64	9.83
	Sepiolite	5.53	2.06	5.87	6.2
	Smectite-high-Fe-Mg	2.45	1.6	2.49	2.56
	Smectite-low-Fe-Mg	1.91	0.08	1.96	2.01
	Talc	8.6	4.73	8.85	9.03
Carbonates	Dolomite		0.83	0.05	
	Dolomite-dis		0.24		
	Dolomite-ord			0.06	
Apatites	Fluorapatite	7.9	1.13	7.08	7.02
	Hydroxylapatite	2.25	0.05	1.53	1.44
Weathered metamorphics	Anthophyllite	10.68	2.45	10.97	11.34
	Phlogopite	8.21	4.95	8.43	8.61
	Ripidolite-14A	8.48	4.16	8.62	8.8
	Ripidolite-7A	5.48	11.38	5.58	5.76
Hydrothermal	Chlorite	11.46	4.05	11.78	12.09

Table S1.d. PHREEQC calculation of surface temperature condition for scenario IV (thermal spring + Red Sandstone[c]). Saturation indices for final supersaturated mineral phases (SI).

Mineral Groups	Final supersaturated Mineral	Saturation indices			
		Rambo	Kaguri	Main Springs	Iyola
Weathered volcanics	Mesolite	2.08	2.34	2.24	2.26
	Nontronite-K	0.19		0.12	0.2
	Nontronite-Mg		0.15		
	Scolecite	0.17	0.38	0.3	0.32
	Stilbite	1.62	2.0	1.8	1.9
Clays	Amesite-14A	5.2	5.11	4.08	6.07
	Celadonite	2.81	2.92	2.61	3.12
	Chrysotile	5.55	5.67	4.82	6.33
	Montmorillonite-Ca	0.45	0.48	0.38	0.55
	Montmorillonite-K				0.06
	Montmorillonite-Mg	0.7	0.69	0.56	0.81
	Montmorillonite-Na	0.51	0.54	0.44	0.51
	Saponite-Ca	8.23	8.4	7.53	9.05
	Saponite-H	7.01	7.12	6.28	7.78
	Saponite-K	7.69	7.84	6.98	8.49
	Saponite-Mg	8.42	8.55	7.65	9.24
	Saponite-Na	8.24	8.4	7.54	9.05
	Sepiolite	4.33	4.65	3.46	5.49
	Talc	7.47	7.6	6.74	8.25
Carbonates	**Aragonite**	**0.87**	**1.03**	**1.53**	**1.28**
	Calcite	**1.02**	**1.18**	**1.67**	**1.42**
	Dolomite	3.84	4.01	4.79	4.77
	Dolomite-dis	2.65	2.76	3.56	3.54
	Dolomite-ord	3.85	4,02	4.8	4.78
	Huntite	4.25	4.22	5.66	6.09
	Hydromagnesite			0.65	2.06
	Magnesite	1.49	1.45	1.75	1.98
	Monohydrocalcite		0.14	0.61	0.36
Apatites	Fluorapatite	6.48	5.36	5.49	5.49
	Hydroxylapatite	1.43	0.55	0.76	0.68
Weathered metamorphics	Anthophyllite	8	8	6	9
	Phlogopite	7.07	7.17	6.33	7.83

Table S1.e. PHREEQC calculation of surface temperature condition for scenario V (thermal spring + Metamorphics, Karoo, and Red Sandstone[c]). Saturation indices for final supersaturated mineral phases (SI).

Mineral Groups	Final supersaturated Mineral	Saturation indices			
		Rambo	Kaguri	MS	Iyola
Weathered volcanics	Mesolite	1.62	1.66	1.85	1.75
	Nontronite-Mg	0.28	0.22	0.26	0.28
	Stilbite	0.34	0.08	0.76	0.45
Clays	Amesite-14A	6.34	5.14	6.64	6.81
	Annite	2.64	2.45	2.52	2.55
	Celadonite	3.01	2.8	3.18	3.21
	Chrysotile	6.32	5.56	6.67	6.79
	Montmorillonite-Ca	0.52	0.44	0.57	0.58
	Montmorillonite-K	0.05	0.72	0.09	0.09
	Montmorillonite-Mg	0.85	0.5	0.89	0.92
	Montmorillonite-Na	0.58	0	0.63	0.64
	Saponite-Ca	9.18	8.55	9.53	9.7
	Saponite-H	7.96	7.27	8.27	8.44
	Saponite-K	8.64	7.98	8.97	9.15
	Saponite-Mg	9.45	8.76	9.79	9.98
	Saponite-Na	9.18	8.55	9.53	9.71
	Sepiolite	4.61	3.39	5.29	5.26
	Smectite-high-Fe-Mg	2.4	2.06	2.47	2.54
	Smectite-low-Fe-Mg	1.85	1.6	1.92	1.97
	Talc	8.41	7.74	8.74	8.91
Carbonates	Dolomite		0.82	0.34	0.36
	Dolomite-ord		0.83	0.35	0.37
	Magnesite		0.05		0.02
Apatites	Fluorapatite	7.82	6.48	7.02	6.92
	Hydroxylapatite	2.12	1.06	1.43	1.26
Weathered metamorphics	Anthophyllite	10.39	8.46	10.83	11.24
	Phlogopite	8.02	7.31	8.32	8.49
	Ripidolite-14A	8.2	7.23	8.44	8.56
	Ripidolite-7A	5.2	4.16	5.41	5.52
Hydrothermal	Chlorite	10.99	9.65	11.5	11.71

Table S1.f. PHREEQC calculation of surface temperature condition for scenario VI (thermal spring + Metamorphic[a], Karoo[b], Red Sandstone[c], Volcanic[d]). Saturation indices for final supersaturated mineral phases (SI).

Mineral Groups	Final supersaturated Mineral	Saturation Indices
		Ikumbi
Weathered volcanics	**Analcime**	1.9
	Hematite	9.05
	Kalsilite	2.88
	Mesolite	7.73
	Natrolite	6.82
	Nontronite-Ca	1.6
	Nontronite-K	1.7
	Nontronite-Mg	0.28
	Nontronite-Na	2.33
	Prehnite	8.62
	Scolecite	4.09
Clays	Amesite-14A	1.26
	Annite	15.82
	Muscovite	**7.28**
	Paragonite	6.42
Carbonates	Hydromagnesite	15.71
Apatites	Fluorapatite	4.63
	Hydroxylapatite	3.72
Weathered metamorphics	Clinozoisite	9.63
	Grossular	10.9
	Magnetite	14.11
	Ripidolite-14A	5.39
	Ripidolite-7A	2.13
	Wollastonite	0.04
	Zoisite	9.6
Hydrothermal	Gibbsite	13.51
	Epidote	2.32

Table S2.a. PHREEQC calculation of high temperature condition for scenario I (reservoir water + Metamorphic[a]). Saturation indices for final supersaturated mineral phases (SI).

Mineral Groups	Final supersaturated Mineral	Saturation indices for each hot spring at two temperatures (ºC)									
		Rambo 125	Rambo 148	Kaguri 125	Kaguri 148	MS 125	MS 148	iyola 125	Iyola 148	Ikumbi 125	Ikumbi 148
Weathered volcanics	Clinoptilolite-Ca							7.83			
	Clinoptilolite-hy-Ca					2.43		7.11			
	Mesolite			2.96				5.7		5.71	
	Nontronite-Ca			0.55		1.18		1.58		1.58	
	Nontronite-Mg							0.67		0.66	
	Nontronite-Na									0.19	
	Okenite	8.75	5.6	12.99	7.53	9.64	5.6	11.35	7.54	11.32	7.77
	Scolecite			3.62		5.52		6.72		6.74	
	Stilbite					3.18		6.13		6.17	
Clays	Amesite-14A		18.59		17.1		18.86		19.02		18
	Annite	15.88	16.58	16.61	16.46	16.97	16.58	17.2	16.8	17.2	16.75
	Celadonite	12.7	12.96		13.75	11.85	13.02	12.14	13.64	11.96	13.59
	Smectite-high-Fe-Mg	12.25	12.08	11.88	11.99	12.18	12.16	12.01	12.26	11.82	12.04
	Smectite-low-Fe-Mg	7.55	6.27	7.42	5.97	8.16	6.33	8.05	6.42	7.9	6.19
Weathered metamorphics	Clinozoisite	16.39	15.9	17.87	16.96		15.9	16.53	16.67		
	Lime	5.22	9.27	6.92	11.6	2.3	9.28	3.21	10.43	3.17	10.83
	Magnetite	6.15	7.48	5.96	7.51	5.87	7.48	5.82	7.43	5.82	7.44
	Pseudowollastonite	16.22	19.69	17.91		13,3	19.69	14.21			
	Wollastonite	16.33	19.77			13.4	19.78	14.32		14.27	
	Zoisite	16.36	15.86	17.84	16.93		15.86	16.5	16.64	16.48	16.79

Table S2.b. PHREEQC calculation of high temperature condition for scenario II (reservoir water + Metamorphic[a], Karoo[b]). Saturation indices for final supersaturated mineral phases (SI).

Mineral Groups	Final supersaturated Mineral	Saturation indices for each hot spring at two temperatures (ºC)									
		Rambo 125	Rambo 148	Kaguri 125	Kaguri 148	MS 125	MS 148	Iyola 125	Iyola 148	Ikumbi 125	Ikumbi 148
Weathered volcanics	Analcime			3.25	3.53						2.58
	Clinoptilolite-hy-Na			9.11	9.79						4.82
	Clinoptilolite-Na			9.08	9.75						4.79
	Mesolite			4.58	4.49			0.81	0.44	0.72	3.9
	Natrolite			5.29	6						4.35
	Nontronite-Ca			0.76	0.53	0.62	0.24	0.75	0.57	0.74	
	Nontronite-Mg			0.55				0.63	0.48	0.62	
	Nontronite-Na			1.66	1.55						0.46
	Scolecite			0.96	0.71	0.66	0.09	0.95	0.81	0.92	0.67
	Stilbite			1.83	1.16			1.05	0.65	0.95	0.27
Clays	Amesite-14A	1.47	1.42			1.47	0.5				0.6
	Annite	10.76	9.9	1.89	1.63	9.78	10.07	1.96	1.75	1.98	1.22
	Beidellite-Ca	1.76	1.64	0.32	0.52	1.76	0.95	0.32	0.45		
	Beidellite-Ca	0.57	0.52								
	Beidellite-Mg	1.86	1.73	0.12	0.35	1.86	0.93	0.2	0.36		
	Beidellite-Na			1.22	1.54						0.88
	Montmorillonite-Ca	1.62	1.5	0.49	0.7	0.92	1.12	0.81	0.84	0.82	0.25
	Montmorillonite-Mg	1.77	1.64		0.57	0.88	1.14	0.73	0.79	0.74	0.19
	Montmorillonite-Na			1.61	1.77						1.07
	Paragonite			4.2	4.82						
	Saponite-Ca	2.3	2.08	0.4	0.08	2.3	1.84	1.81	1.68	1.82	0.96
	Saponite-H	1.11	0.96			1.11	0.75	0.68	0.6	0.68	
	Saponite-K	0.46	0.34	0.19		0.46	0.42	0.61	0.47	0.61	
	Saponite-Mg	2.39	2.16			2.39	1.82	1.68	1.58	1.69	0.85
	Saponite-Na			1.31	1.1			0.89	0.69	0.85	1.73
	Smectite-low-Fe-Mg			**0.2**	**0.2**						
	Talc	1.09	0.94			1.09	0.82	0.85	0.74	0.85	
Apatites	**Fluorapatite**	**4.46**	**9.05**			**6.62**	**10.38**		**8.12**	**0.59**	
	Hydroxylapatite		**3.4**				**5.07**		**3.9**		
Weathered metamorphics	Albite			3.69	4.18						2.9
	Albite_high			2.86	3.43						2.15
	Albite_low			3.69	4.18						2.9
	Magnetite	4.8	4.46	1.05	1.08	4.8	4.14	1.08	1.09	1.09	1.09
	Paragonite										4.03
	Ripidolite-14A	8.98	8.33	1.02	0.7	8.98	8.14	2.48	2.48	2.5	2.27
	Ripidolite-7A	6.18	5.61			6.18	5.43				

Table S2.c. PHREEQC calculation of high temperature condirion for scenario III (reservoir water + Karoo[b], Red Sandstone[c]). Saturation indices for final supersaturated mineral phases (SI).

Mineral Groups	Final supersaturated Mineral	Saturation indices for each hot spring at two temperatures (ºC)									
		Rambo 125	Rambo 148	Kaguri 125	Kaguri 148	MS 125	MS 148	Iyola 125	Iyola 148	Ikumbi 125	Ikumbi 148
Weathered volcanics	Mesolite	0.89	0.55	1.07	0.62	1.01	0.62	1.08	0.66	1.08	0.66
	Nontronite-Na									0.46	0.44
Clays	Amesite-14A	8.24	7.44	8.16	7.58	8.43	7.52	8.68	7.58	9.18	7.61
	Annite	3.01	2.91	2.84	2.84	2.92	2.84	2.84	2.8	2.81	2.78
	Celadonite	3.09	2.69	3.1	2.74	3.16	2.73	3.23	2.75	3.36	2.75
	Chrysotile	7.19	6.35	7.17	6.46	7.36	6.42	7.56	6.47		6.5
	Montmorillonite-Ca	0.58		0.58		0.6		0.63		0.67	0.49
	Montmorillonite-K									0.28	0.15
	Montmorillonite-Mg	1.06	0.96	1.05	0.97	1.08	0.96	1.11	0.97	1.17	0.97
	Montmorillonite-Na	0.63		0.64		0.65		0.68		0.72	0.54
	Saponite-Ca	9.88	8.95	9.79	9.05	10.01	9.01	10.18	9.04	10.56	9.07
	Saponite-H	8.85	8.01	8.76	8.1	8.98	8.06	9.15	8.09	9.53	8.12
	Saponite-K	9.41	8.52	9.33	8.61	9.54	8.57	9.71	8.6	10.09	8.63
	Saponite-Mg	10.31	9.39	10.21	9.48	10.43	9.44	10.61	9.47	11.01	9.5
	Saponite-Na	9.88	8.96	9.8	9.05	10.01	9.01	10.18	9.04	10.56	9.07
	Sepiolite	5.44	4.16	5.7	4.43	5.85	4.38	6.23	4.5	6.74	4.54
	Smectite-high-Fe-Mg	**2.95**	**2.69**	**2.89**	**2.71**	**2.98**	**2.69**	**3.03**	**2.69**	**3.17**	**2.7**
	Smectite-low-Fe-Mg	**2.21**	**1.98**	**2.18**	**2**	**2.25**	**1.99**	**2.29**	**2**	2.4	2
	Talc	9.23	8.36	9.15	8.45	9.36	8.41	9.53	8.45	9.91	8.48
Carbonates	Dolomite		0.58		0.57		0.55		0.55	0.27	0.66
	Dolomite-ord		0.59		0.58		0.56		0.56	0.28	0.67
	Magnesite		0.75		0.74		0.72		0.72	0.6	0.78
Apatites	**Fluorapatite**	**12.1**	**14.43**	**12.12**	**14.44**	**12.1**	**14.43**	**12.08**	**14.43**	11.98	14.38
	Hydroxylapatite	**5.46**	**7.33**	**5.57**	**7.37**	**5.48**	**7.33**	**5.45**	**7.33**	5.29	7.27
Weathered metamorphics	Anthophyllite	13.72	12.34	13.43	12,52	13.96	12.42	14.32	12.48	15.21	12.55
	Magnetite		0.74		0.68		0.68		0.64	0.37	0.64
	Phlogopite	8.93	8.11	8.85	8.2	9.06	8.16	9.23	8.19	9.61	8.22
	Ripidolite-14A	9.5	8.68	9.39	8.76	9.62	8.72	9.78	8.74	10.14	8.75
	Ripidolite-7A	6.7	5.96	6.58	6.04	6.82	6	6.98	6.02	7.34	6.04
Hydrothermal	**Chlorite**		**11.5**	**12.3**	**11.7**	**13**	**11.6**	**13.3**	**11.7**	**14**	**11.7**

Table S2.d. PHREEQC calculation of high temperature condirion for scenario IV (reservoir water + Red Sandstone[c]). Saturation indices for final supersaturated mineral phases (SI).

Mineral Groups	Final supersaturated Mineral	Saturation indices for each hot spring at two temperatures (ºC)									
		Rambo 125	Rambo 148	Kaguri 125	Kaguri 148	MS 125	MS 148	Iyola 125	Iyola 148	Ikumbi 125	Ikumbi 148
Weathered volcanics	Mesolite	1.22	0.8	1.22	0.8	1.22	0.8	1.22	0.8	1.23	0.81
	Nontronite-Mg									0.47	0.46
	Stilbite									0.5	
Clays	Amesite-14A	3.41	2.85	3.82	3.27	3.49	2.66	3.89	2.54	9.8	8.5
	Celadonite	1.94	1.59	2.04	1.7	2.08	1.54	2.06	1.51	3.53	3
	Chrysotile	3.63	2.95	3.94	3.27	4.04	2.81	4	2.7	8.41	7.18
	Montmorillonite-Ca									0.72	0.57
	Montmorillonite-K									0.34	0.23
	Montmorillonite-Mg									1.24	1.08
	Montmorillonite-Na									0.78	0.62
	Saponite-Ca	6.2	5.47	6.5	5.78	6.6	5.32	6.56	5.22	10.97	9.69
	Saponite-H	5.17	4.52	5.47	4.84	5.57	4.38	5.53	4.27	9.94	8.75
	Saponite-K	5.73	5.03	6.04	5.35	6.13	4.89	6.09	4.78	10.5	9.26
	Saponite-Mg	6.4	5.69	6.72	6.02	6.82	5.54	6.78	5.42	11.43	10.14
	Saponite-Na	6.2	5.47	6.51	5.78	6.6	5.32	6.56	5.22	10.97	9.69
	Sepiolite	1.24		1.65		1.78		1.72		7.61	5.69
	Smectite-high-Fe-Mg									0.33	
	Smectite-low-Fe-Mg									0.8	
	Talc	5.55	4.87	5.86	5.19	5.95	4.73	5.91	4.62		9.1
Carbonates	Aragonite	0.75	0.59	0.67	0.5	0.88	0.84	1.06	1.02		
	Calcite	**0.9**	**0.74**	**0.82**	**0.66**	**1.03**	**0.99**	**1.21**	**1.17**		
	Dolomite	3.56	3.29	3.5	3.24	3.95	3.75	4.31	4.08	2.39	2.26
	Dolomite-dis	2.57	2.38	2.5	2.33	2.96	2.84	3.31	3.17	1.4	1.35
	Dolomite-ord	3.57	3.3	3.51	3.25	3.96	3.76	4.32	4.09	2.4	2.27
	Huntite	4.33	4.14	4.3	4.14	5.24	5.02	5.93	5.64	3.57	3.48
	Hydromagnesite					0.75		1.42	0.63	2	1.47
	Magnesite	1.49	1.46	1.51	1.48	1.75	1.66	1.92	1.81	1.7	1.7
Apatites	Fluorapatite	10.7	13.3	10.74	13.34	10.61	13.2	10.5	13.0	11.35	13.91
	Hydroxylapatite	4.78	6.75	4.81	6.78	4.73	6.66	4.67	6.6	4.99	7.03
Weathered metamorphics	Anthophyllite	5	4	6	5	6	4	6	3	16.1	14
	Phlogopite	5.25	4.62	5.56	4.94	5.65	4.47	5.61	4.37		8.8

Table S2.e. PHREEQC calculation of high temperature condition for scenario V (reservoir water + Metamorphic[a], Karoo[b], Red Sandstone[c]). Saturation indices for final supersaturated mineral phases (SI).

Mineral Groups	Final supersaturated Mineral	Saturation indices for each hot spring at two temperatures (ºC)									
		Rambo 125	Rambo 148	Kaguri 125	Kaguri 148	MS 125	MS 148	Iyola 125	Iyola 148	Ikumbi 125	Ikumbi 148
Weathered volcanics	Mesolite			7.42				0.82		0.78	
Clays	Amesite-14A							8.37	6.96	8.54	
	Annite	13.36	12.86	1.39	1.66	10.86	12.14	2.92	2.9	2.95	1.84
	Celadonite							3.11	2.54	3.14	
	Chrysotile							7.28	5.96	7.4	
	Montmorillonite-Ca							0.58		0.6	
	Montmorillonite-Mg							1.08	0.9	1.1	
	Montmorillonite-Na							0.64		0.65	
	Saponite-Ca	1.93	2.78			2.57	2.85	9.99	8.63	10.13	
	Saponite-H	0.73	1.62			1.54	1.76	8.96	7.68	9.1	
	Saponite-K	1.29	2.13			2.1	2.27	9.53	8.19	9.66	
	Saponite-Mg	1.93	2.82			2.64	2.89	10.44	9.06	10.58	
	Saponite-Na	1.76	2.57			2.57	2.7	10	8.63	10.13	
	Sepiolite							5.43	3.38	5.54	
	Smectite-high-Fe-Mg	**1.71**	**1.98**			**1.48**	**1.88**	**2.99**	**2.56**	**3.04**	
	Smectite-low-Fe-Mg	**0.73**	**0.96**			**0.76**	**0.96**	**2.24**	**1.87**	**2.28**	
	Talc	1.11	1.97			1.92	2.11	9.35	8.04	9.48	
Carbonates	Aragonite			2.23	1.99						1.28
	Calcite			**2.08**	**1.84**						**1.43**
	Dolomite			1.61	2.21				0.57		2.27
	Dolomite-dis			0.61	1.3						1.36
	Dolomite-ord			1.62	2.22				0.58		2.28
	Magnesite								0.73	0.59	
Apatites	**Fluorapatite**			**10.27**	**12.81**			**12.08**	**14.41**	**12**	**13.07**
	Hydroxylapatite	**18.76**	**15.85**	**4.47**	**6.31**	**15.51**	**19.63**	**5.35**	**7.22**	**5.19**	**6.48**
Weathered metamorphics	Anthophyllite							14.02	11.66	14.36	
	Magnetite	5.06	4.85			3.41	4.25		0.81	0.57	
	Phlogopite	0.81	1.72			1.62	1.86	9.05	7.78	9.18	
	Ripidolite-14A	7.29	7.91			7.16	7.99	9.52	8.26	9.66	
	Ripidolite-7A	4.49	5.19			4.35	5.27	6.71	5.55	6.85	
Hydrothermal	Fluorite	5.37	5.97			4.2	5.9				

The bold minerals are the surface minerals encountered at the hot springs.

Table S2.f. PHREEQC calculation of high temperature condition for scenario VI Ikumbi springs (reservoir water + Metamorphic[a], Karoo[b], Red Sandstone[c], Volcanic[d]). Saturation indices for final supersaturated mineral phases (SI).

Mineral Groups	Final supersaturated Mineral	Saturation indices for Ikumbi spring at two temperatures (°C)	
		Ikumbi 125	Ikumbi 148
Weathered volcanics	Analcime	1.50	1.34
	Hematite	**16.02**	**17.37**
	Kalsilite	2.58	2.2
	Mesolite	5.13	4.76
	Nontronite-Ca	**9.09**	**11.15**
	Nontronite-H	7.31	9.47
	Nontronite-K	9.25	11.2
	Nontronite-Mg	8.14	10.25
	Nontronite-Na	**9.72**	**11.63**
	Prehnite	4.62	4.42
	Scolecite	2.08	2.14
Clays	**Muscovite**	**6.33**	**5.77**
	Paragonite	5.58	5.05
	Smectite-high-Fe-Mg	**0.4**	**1.26**
Apatites	**Fluorapatite**	**12.15**	**14.67**
	Hydroxylapatite	**9.23**	**11.08**
Weathered metamorphics	Clinozoisite	6.35	6.06
	Grossular	5.43	5.13
Hydrothermal	Gibbsite	1.88	1.71

[(d)] Primary minerals of Volcanic rocks : Quartz, albite, k-feldspar, illite, kaolinite, calcite, thenardite, Ca-Al-pyroxene, FCO_3-apatite, and amphibole (data from this study; Alexander et al., 2016; Mtelela et al., 2016).

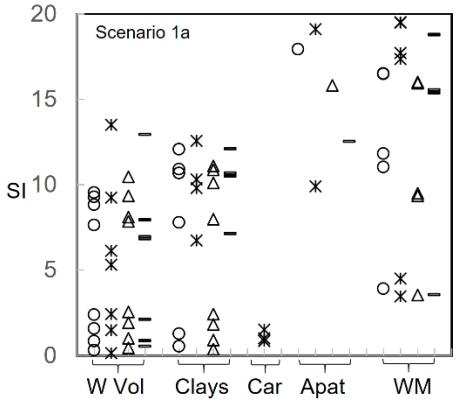
The bold minerals are the surface minerals encountered at the hot springs.

Table S2.g. PHREEQC calculation of high temperature condition for scenario VII Ikumbi springs (reservoir water + Karoo[b], Red Sandstone[c], Volcanic[d]). Saturation indices for final supersaturated mineral phases (SI).

Mineral Groups	Final supersaturated Mineral	Saturation indices for Ikumbi spring at two temperatures (ºC)	
		Ikumbi 125	Ikumbi 148
Weathered volcanics	**Hematite**	15.93	17.44
	Nontronite-Ca	**9.43**	**11**
	Nontronite-Na	**9.93**	**11.5**
Clays	**Muscovite**	6.06	5.89
	Smectite-high-Fe-Mg	0.98	1.42
Apatites	**Fluorapatite**	12.22	14.64

Table S2.h. PHREEQC calculation of high temperature condition for scenario VIII Ikumbi springs (reservoir water + Red Sandstone[c], Volcanic[d]). Saturation indices for final supersaturated mineral phases (SI).

Mineral Groups	Final supersaturated Mineral	Saturation indices for Ikumbi spring at two temperatures (ºC)	
		Ikumbi 125	Ikumbi 148
Weathered volcanics	**Hematite**	16.71	18.07
	Nontronite-Ca	13.19	14.8
	Nontronite-Na	13.09	14.64
Clays	**Muscovite**	4.26	4
	Smectite-high-Fe-Mg	2.35	2.82
	Smectite-low-Fe-Mg	0.42	0.77
Apatites	**Fluorapatite**	13.29	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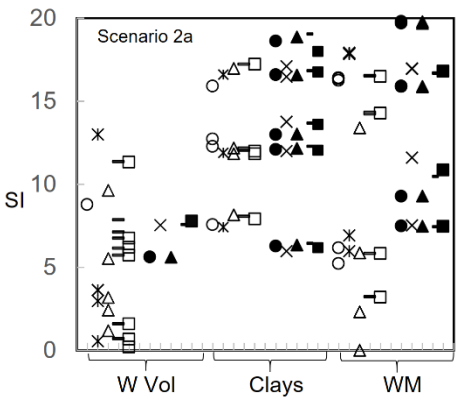
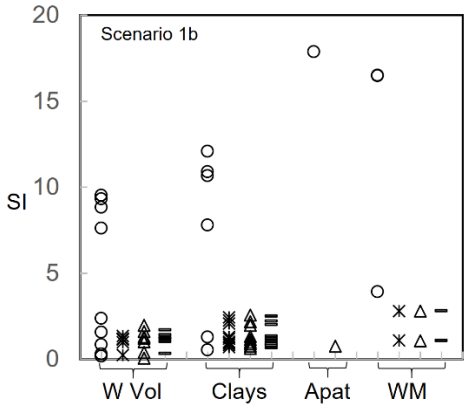
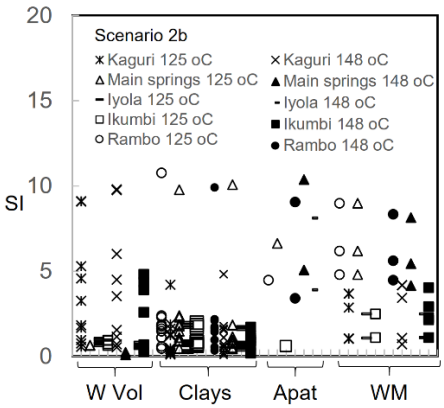
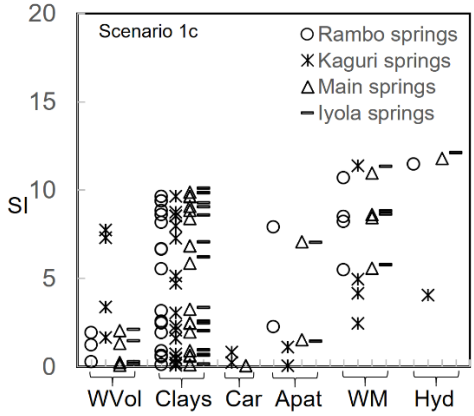
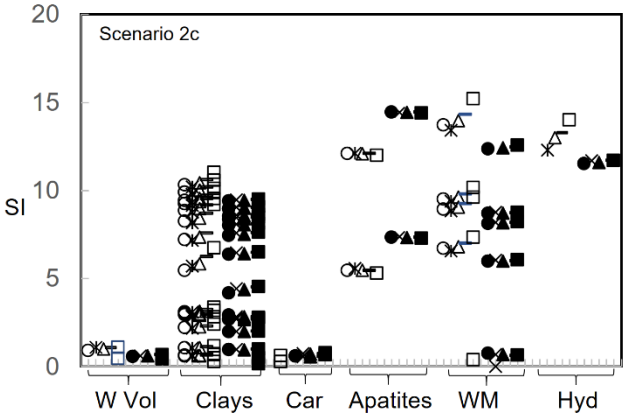
SI
20
15
10
5
0
W Vol
Clays
Car
Apat
WM


Scenario 2a
SI
20
15
10
5
0
W Vol
Clays
WM


Scenario 1b
SI
20
15
10
5
0
W Vol
Clays
Apat
WM


Scenario 2b
Kaguri 125 oC
Main springs 125 oC
Iyola 125 oC
Ikumbi 125 oC
Rambo 125 oC
Kaguri 148 oC
Main springs 148 oC
Iyola 148 oC
Ikumbi 148 oC
Rambo 148 oC
SI
20
15
10
5
0
W Vol
Clays
Apat
WM


Scenario 1c
Rambo springs
Kaguri springs
Main springs
Iyola springs
SI
20
15
10
5
0
WVol
Clays
Car
Apat
WM
Hyd


Scenario 2c
SI
20
15
10
5
0
W Vol
Clays
Car
Apatites
WM
Hyd

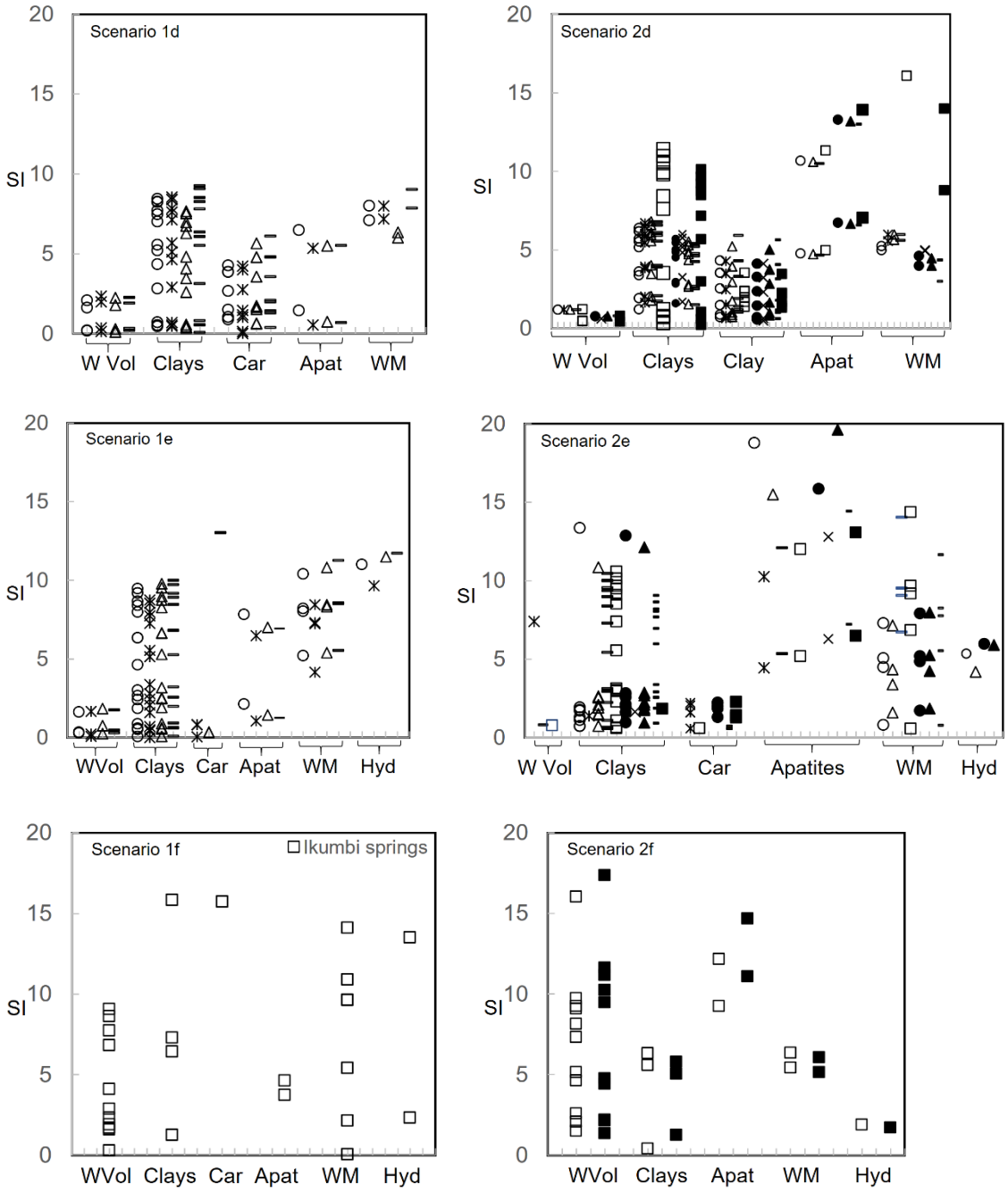


Fig S1: Supersaturated minerals for each modelled scenario for spring and reservoir water including SI values.