

HYDROTHERMAL INTERACTION OF WYOMING BENTONITE AND OPALINUS CLAY

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**Supplementary Material**

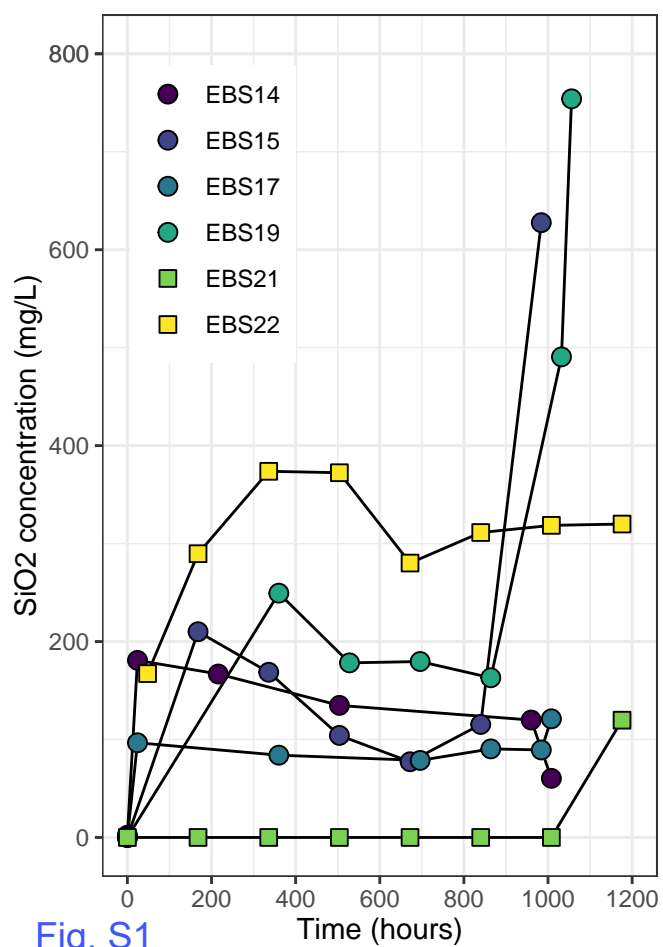
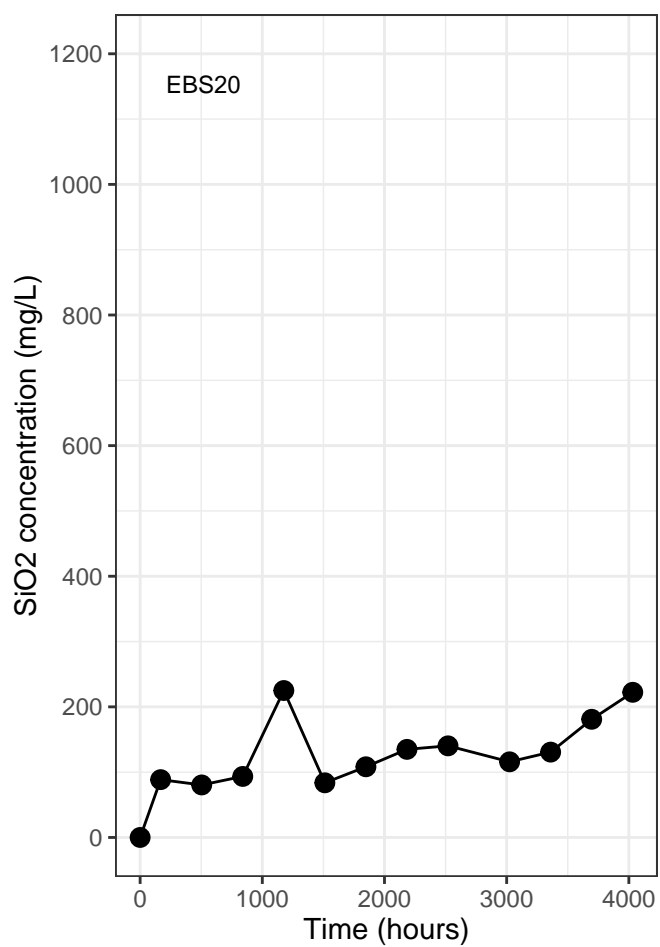
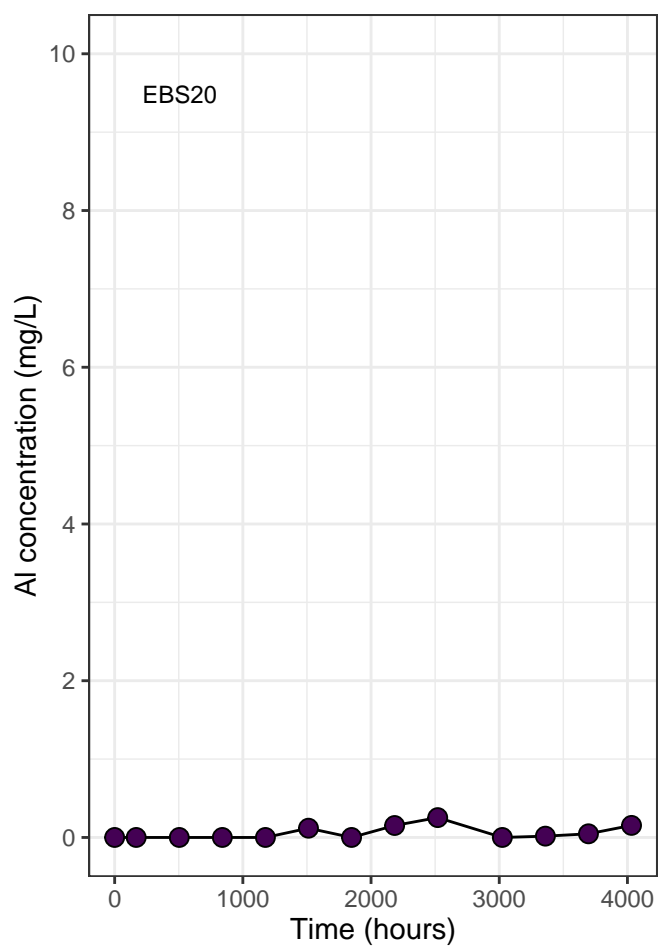
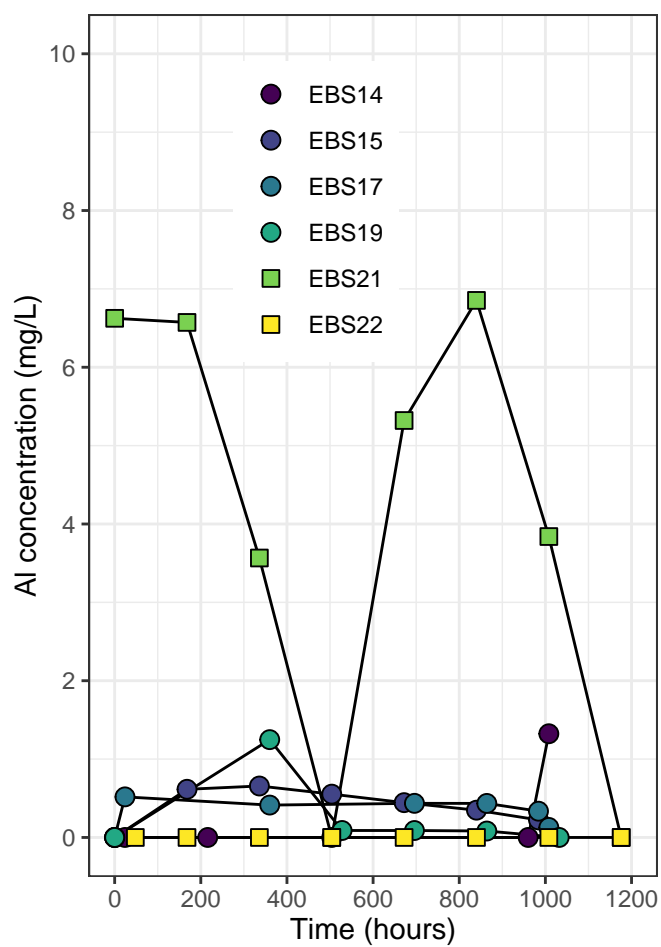
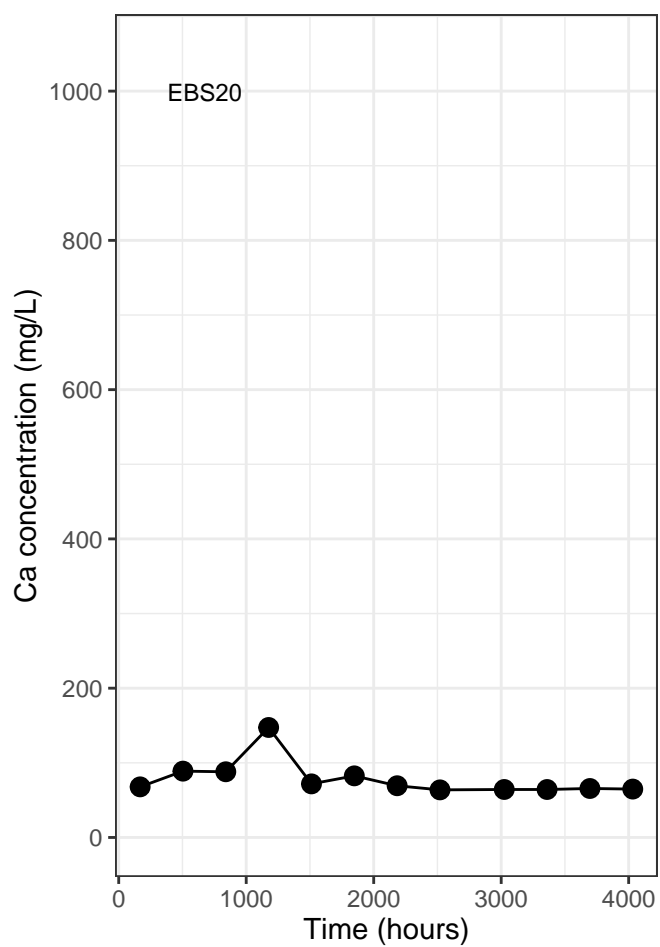
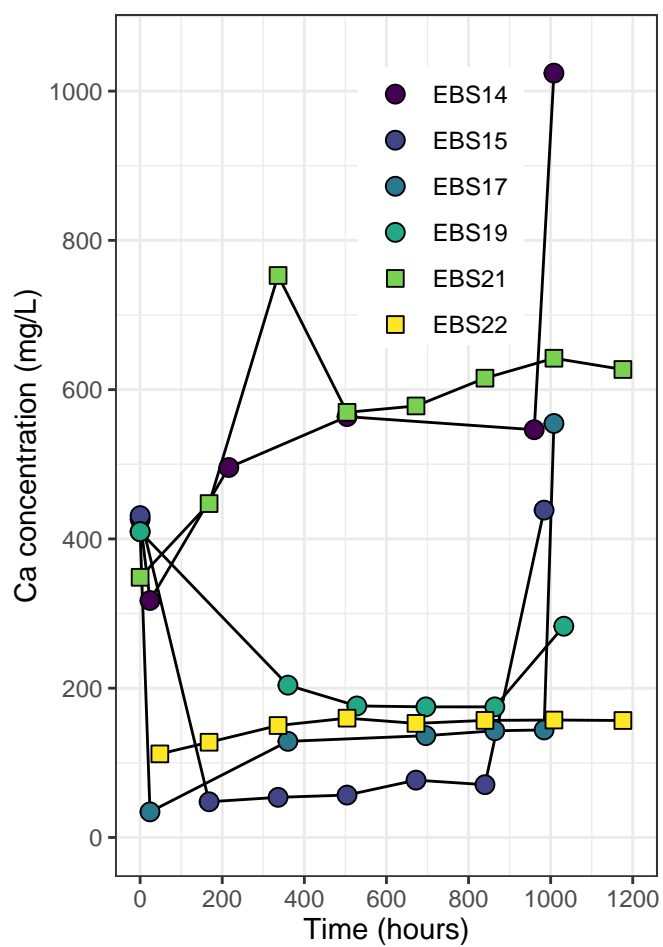


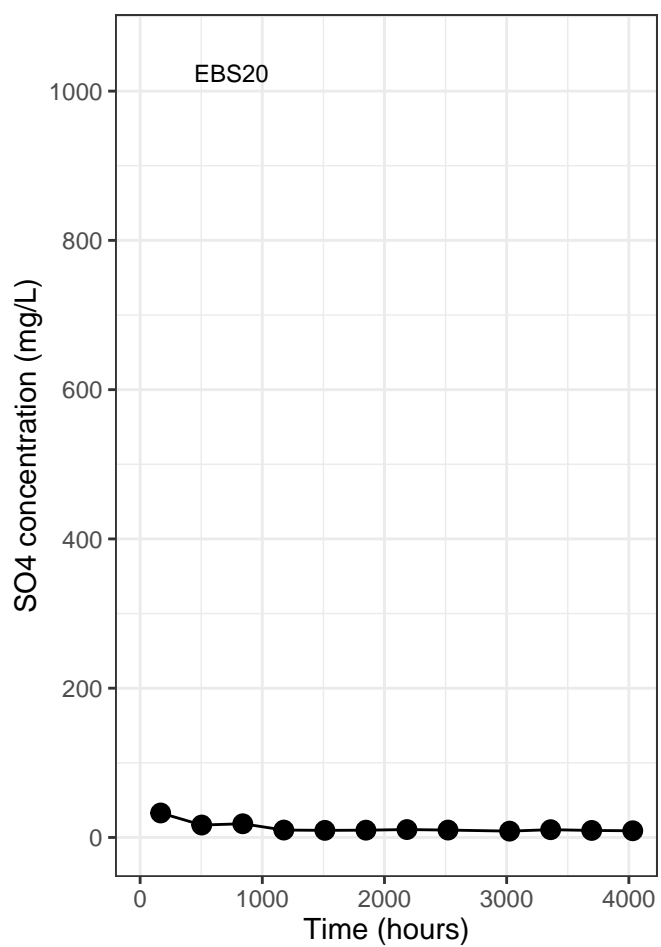
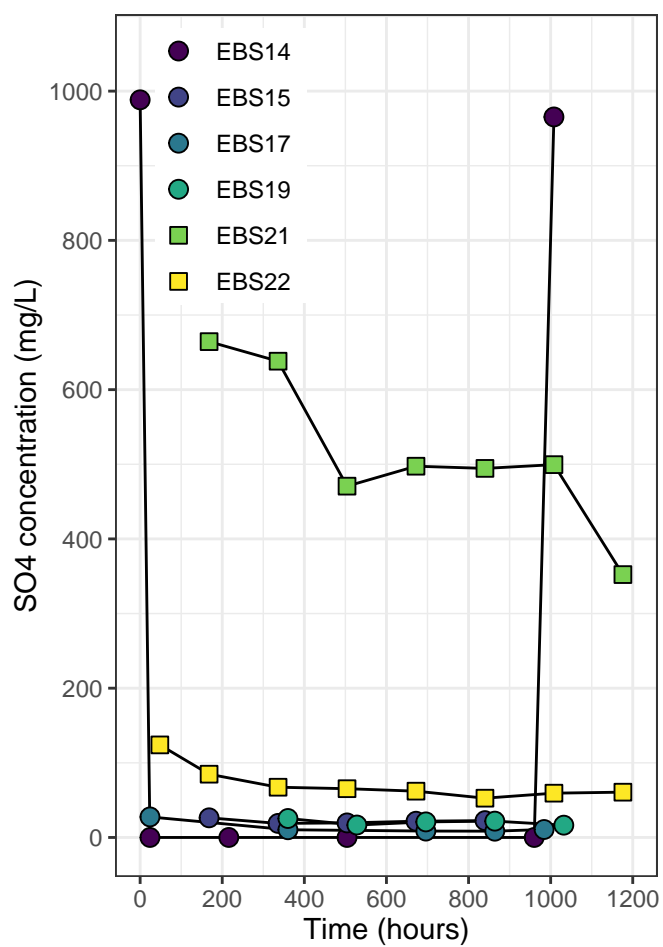
Fig. S1

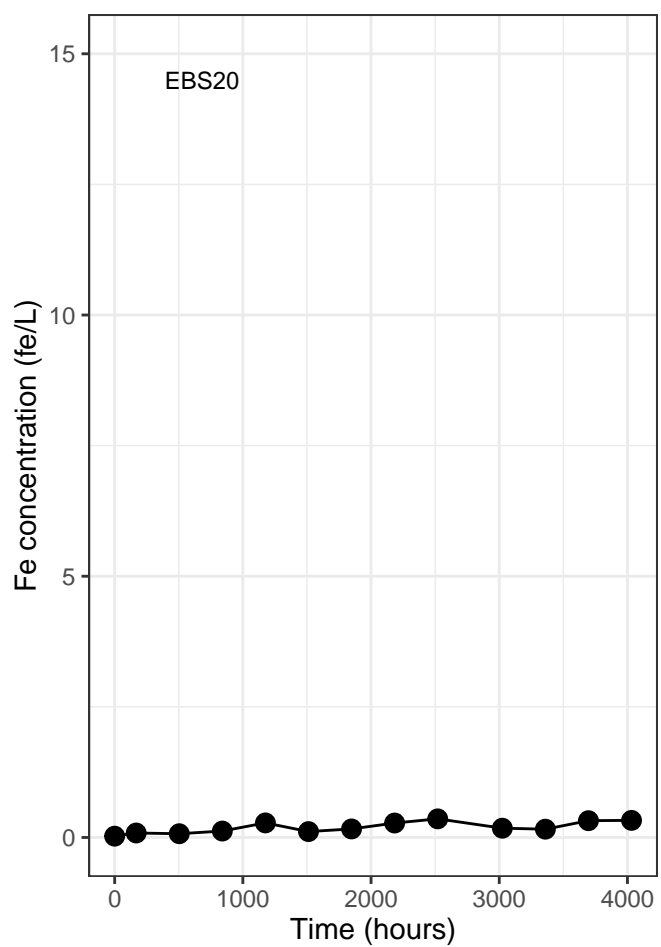
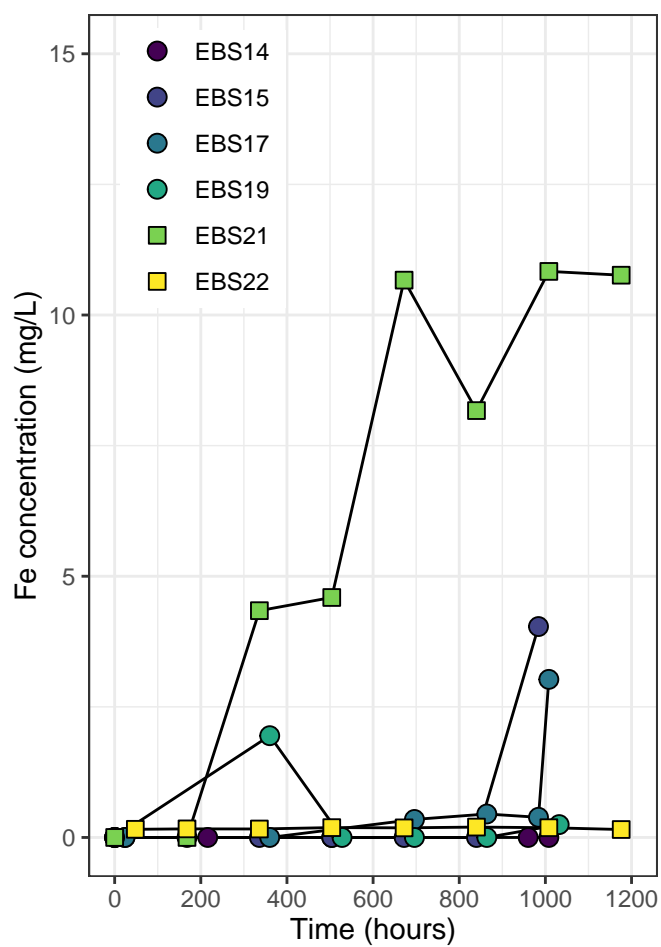


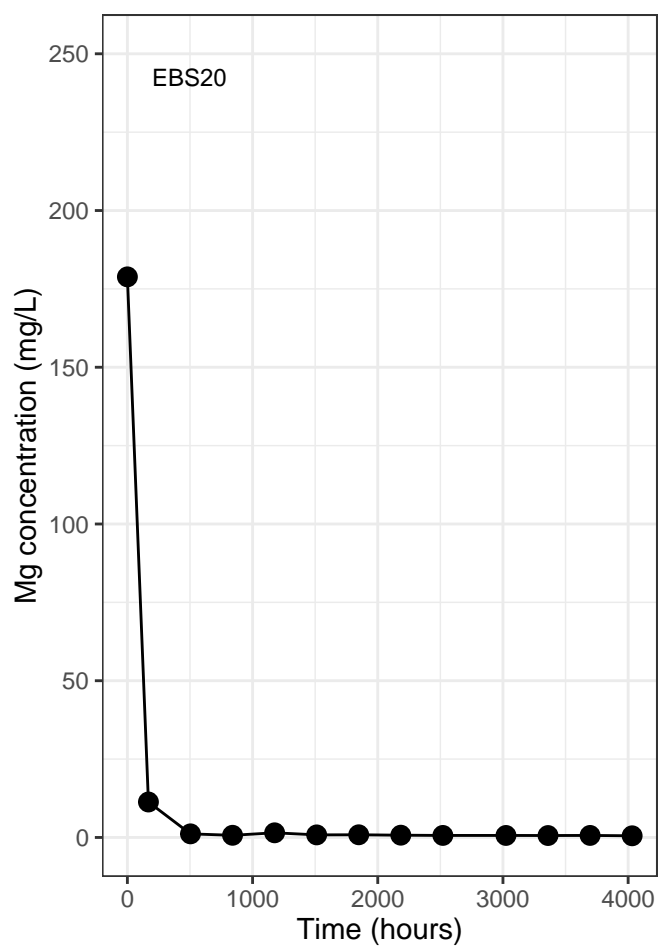
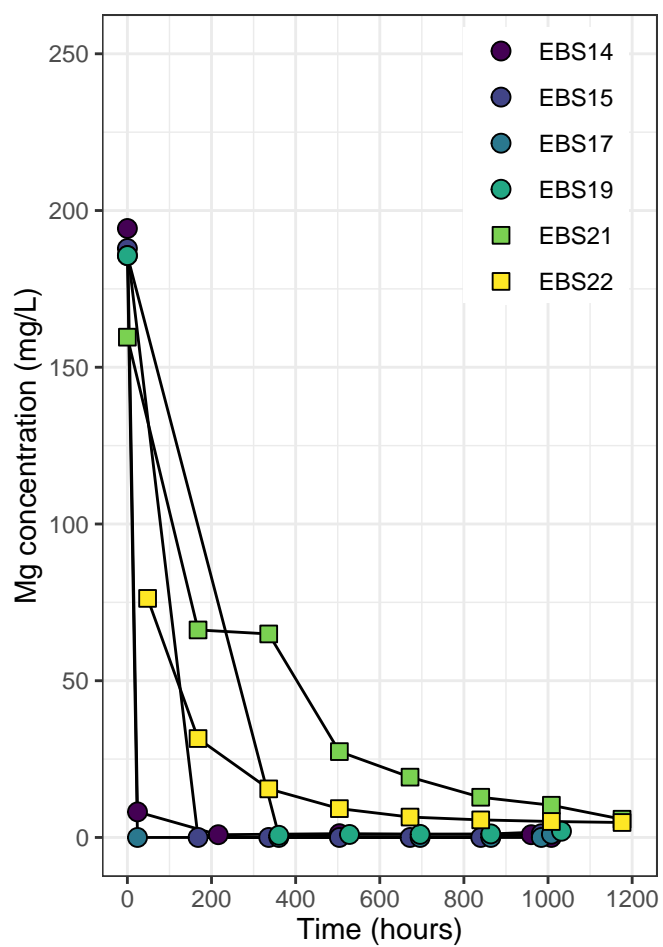
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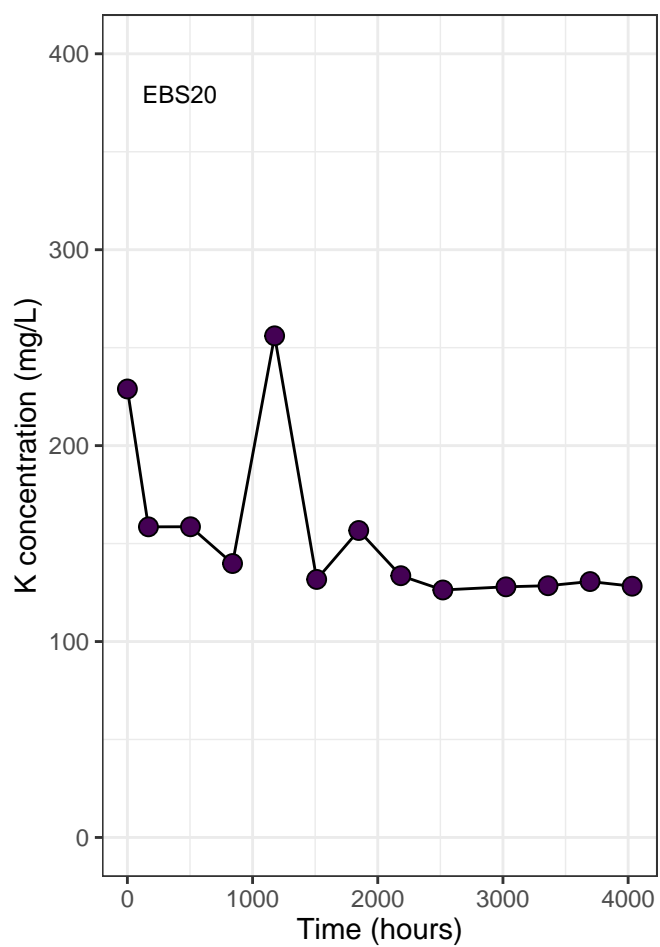
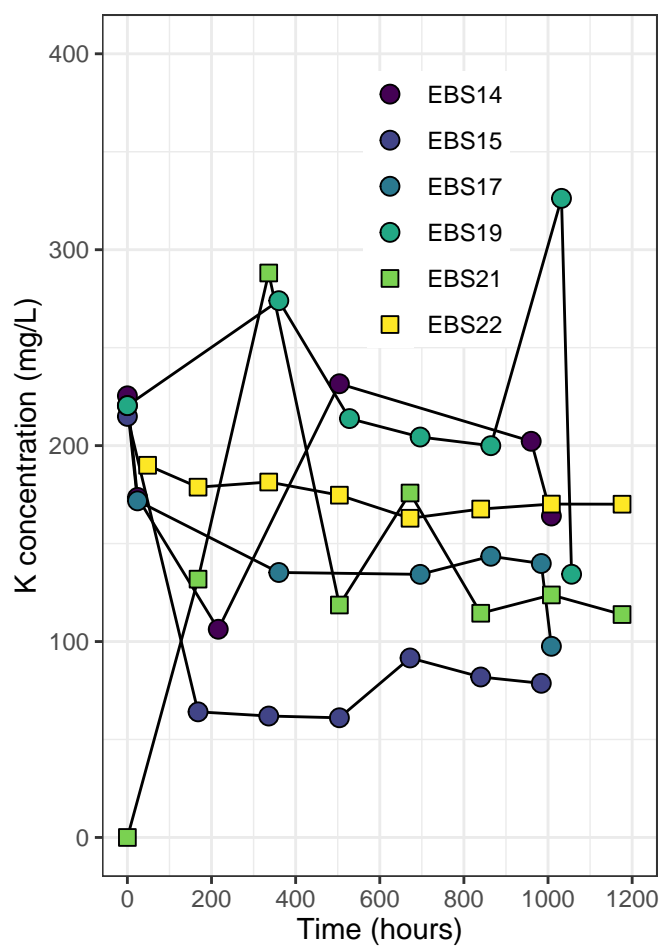














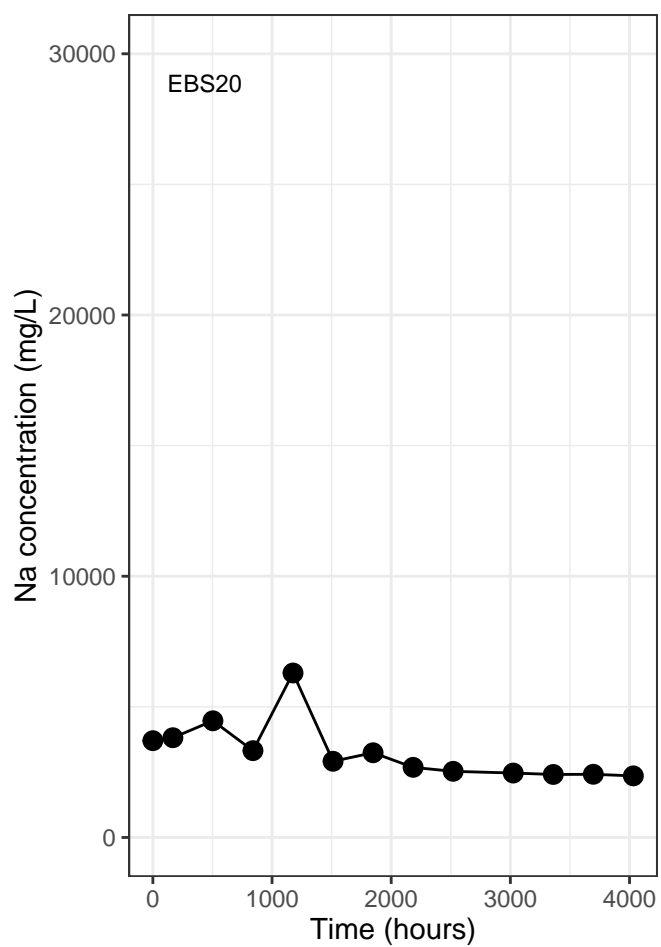
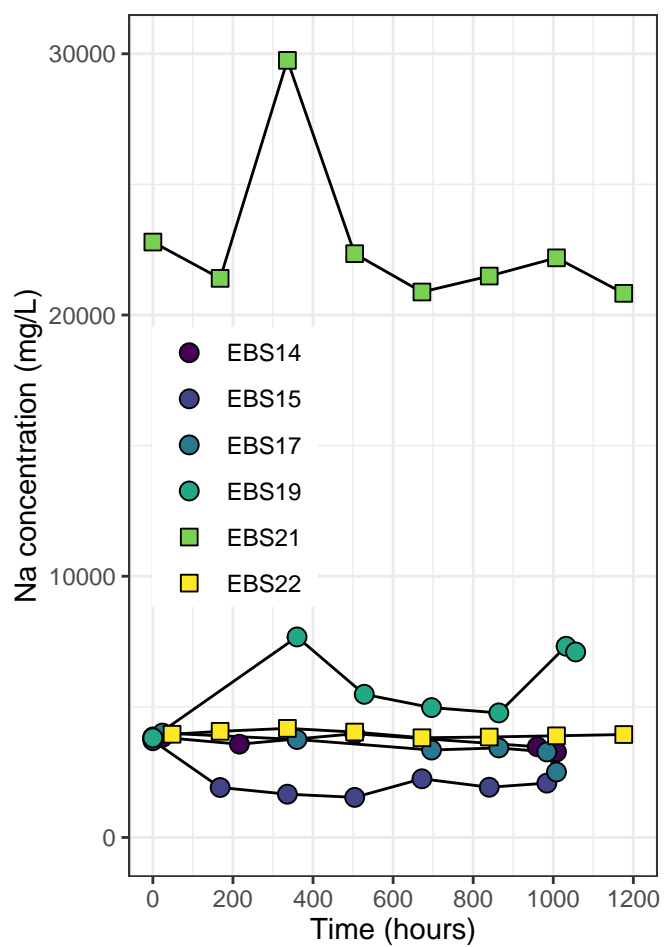


Table S1. Aqueous Chemistry

## EBS-14 UNFILTERED

Lab ID	Sample Date	Al	B	Ba	Br	Ca	Cl	Cr	F	Fe	K	Li	Mg	Mn	Na	NO <sub>3</sub>	PO <sub>4</sub>	Si	SiO <sub>2</sub>	SO <sub>4</sub>	Sr	Ti	Zn	TDS	Cation	Anion	Balance	
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
EBS14-00 UF	27/11/2013	<0.05	0.1	<0.05		426.33	6470	<0.05	<0.5	<0.5	225.42	<0.05	194.27	<0.05	3846.1			1.08	2.32	988.32		0.16	<0.1	<0.05	12153	208	201	0.02
EBS14-01 UF	27/11/2013	<0.05	5.25	0.18		317.5	6484	<0.05	<0.5	<0.5	173.57		2.37	8.16	0.09	3831.33		84.48	180.79	<1		2.46	<0.1	0.06	11006	188	181	0.02
EBS14-02 UF	06/12/2013	<0.05	5.68	0.17		495.68	6538	<0.05	<0.5	<0.5	106.26		5.82	0.87	0.17	3570.56		77.97	166.86	<1		1.53	<0.1	0.08	10892	184	183	0
EBS14-03 UF	18/12/2013	<0.05	6.42	0.16		563.85	6497	<0.05	<0.5	<0.5	231.58		11.95	1.21	0.23	3970.85		63.01	134.83	<1		2.28	<0.1	0.09	11420	208	181	0.07
EBS14-04 UF	06/01/2014	<0.05	6.69	0.28		546.31	6518	<0.05	<0.5	<0.5	202.22		7.46	0.88	0.29	3472.8		56.01	119.85	<1		2.06	<0.1	0.09	10877	184	182	0.01
EBS14-05 UF	08/01/2014	1.32	6.41	0.22		1024.1	6630.39	<0.05	<0.5	<0.5	164.06		6.04	<0.5	<0.05	3272.6		28.19	60.33	965.38		4.33	<0.1	0.81	12136	197	205	-0.02

## EBS-14 FILTERED

Lab ID	Sample Date	Al	B	Ba	Br	Ca	Cl	Cr	F	Fe	K	Li	Mg	Mn	Na	NO <sub>3</sub>	PO <sub>4</sub>	Si	SiO <sub>2</sub>	SO <sub>4</sub>	Sr	Ti	Zn	TDS	Cation	Anion	Balance	
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
EBS14-00 F	27/11/2013	<0.05	0.22	<0.05		441.14	--	<0.05	<0.5	<0.5	223.44	<0.05	193.25	<0.05	3781.04			0.51	1.08	--		0.17	<0.1	<0.05	4640	207	0	1
EBS14-01 F	27/11/2013	<0.05	5.07	0.21		318.73	--	<0.05	<0.5	<0.5	176.14		2.41	8.18	0.09	3835.18		36.27	77.61	--		2.47	<0.1	0.11	4426	188	0	1
EBS14-02 F	06/12/2013	<0.05	6.48	0.12		507.28	--	<0.05	<0.5	<0.5	105.55		5.71	1.07	0.16	3581		40.68	87.05	--		1.54	<0.1	0.06	4296	185	0	1
EBS14-03 F	18/12/2013	<0.05	6.1	0.23		573.26	--	<0.05	<0.5	<0.5	224.62		11.12	1.27	0.22	4056.12		50.56	108.2	--		2.39	<0.1	0.08	4984	213	0	1
EBS14-04 F	06/01/2014	<0.05	5.51	0.29		590.49	--	<0.05	<0.5	<0.5	334.21		13.32	1.3	0.24	4065.48		46.53	99.56	--		2.81	<0.1	0.15	5113	217	0	1
EBS14-05 F	08/01/2014	1.28	6.9	0.27		1083.92	--	<0.05	<0.5	<0.5	171.96		6.32	<0.5	<0.05	3370.66		26.65	57.03	--		4.49	<0.1	0.58	4703	206	0	1

## EBS-15 UNFILTERED

Lab ID	Sample Date	Al	B	Ba	Br	Ca	Cl	Cr	F	Fe	K	Li	Mg	Mn	Na	NO <sub>3</sub>	PO <sub>4</sub>	Si	SiO <sub>2</sub>	SO <sub>4</sub>	Sr	Ti	Zn	TDS	Cation	Anion	Balance		
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
EBS15 00 UF	13/03/2014	<0.05	0.4	<0.05		431.23	7159.09	<0.05	<0.5	<0.5	214.91	<0.05	187.89	<0.05	3702.44			<0.5	<1		1168.57		0.15	<0.1	0.58	12865	201	223	-0.05
EBS15 01 UF	10/04/2014	0.61	4.09	0.16		47.8	3434.72	<0.05	<0.5	<0.5	64.11		0.64	<0.5	0.05	1912.15		98.14	210.02		26.28		0.48	<0.1	0.48	5701	89	97	-0.04
EBS15 02 UF	17/04/2014	0.66	4	0.23		53.77	3002.23	<0.05	<0.5	<0.5	61.98		0.91	<0.5	<0.05	1656.21		78.8	168.64		18.82		0.27	<0.1	0.47	4968	78	85	-0.04
EBS15 03 UF	24/04/2014	0.55	3.48	0.31		56.78	2818.92	<0.05	<0.5	<0.5	61.09		0.7	<0.5	<0.05	1534.58		48.67	104.15		19.48		0.27	<0.1	0.53	4601	72	80	-0.05
EBS15 05 UF	01/05/2014	0.44	5.36	0.5		76.77	4800.87	<0.05	<0.5	<0.5	91.62		1.48	<0.5	<0.05	2246.19		36.11	77.27		21.74		0.42	<0.1	0.79	7323	104	135	-0.13
EBS15 06 UF	08/05/2014	0.35	4.74	0.38		70.72	3725.19	<0.05	<0.5	<0.5	81.9		1.24	<0.5	<0.05	1922.19		53.9	115.35		22.54		0.35	<0.1	0.66	5946	90	105	-0.08
EBS15 07 UF	14/05/2014	0.22	5.05	0.37		438.57	1231	<0.05	<0.5	<0.5	78.69		1.48	1.19	<0.05	2079.3		293.26	627.58		4108		1.47	<0.1	1.01	8578	121	119	0.01

## EBS-15 FILTERED

Lab ID	Sample Date	Al	B	Ba	Br	Ca	Cl	Cr	F	Fe	K	Li	Mg	Mn	Na	NO <sub>3</sub>	PO <sub>4</sub>	Si	SiO <sub>2</sub>	SO <sub>4</sub>	Sr	Ti	Zn	TDS	Cation	Anion	Balance	
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
EBS15 00 F	13/03/2014	<0.05	<0.1	<0.05		431.65	--	<0.05	<0.5	<0.5	214.73	<0.05	185.98	<0.05	3742.47			7.62	16.3	--		0.15	<0.1	0.83	4592	204	0	1
EBS15 01 F	10/04/2014	0.32	3.91	0.17		46.2	--	<0.05	<0.5	<0.5	62.26		0.6	<0.5	<0.05	1847.16		36.44	77.98	--		0.23	<0.1	0.26	2039	85	0	1
EBS15 02 F	17/04/2014	0.69	3.66	0.25		52.04	--	<0.05	<0.5	<0.5	60.91		0.7	<0.5	<0.05	1625.45		85.5	189.38	--		0.25	<0.1	0.54	1934	77	0	1
EBS15 03 F	24/04/2014	0.5	3.69	0.3		56.21	--	<0.05	<0.5	<0.5	60.2		0.68	<0.5	<0.05	1513.7		74.93	160.36	--		0.26	<0.1	0.53	1796	72	0	1
EBS15 05 F	01/05/2014	0.27	5.13	0.53		76.72	--	<0.05	<0.5	<0.5	90.26		1.44	<0.5	<0.05	2205.95		37.63	80.52	--		0.41	<0.1	0.83	2462	103	0	1
EBS15 06 F	08/05/2014	0.28	4.75	0.4		71.99	--	<0.05	<0.5	<0.5	83.35		1.25	<0.5	<0.05	1962.22		65.96	141.15	--		0.36	<0.1	0.38	2266	93	0	1
EBS15 07 F	14/05/2014	<0.05	5	0.27		435.05	--	<0.05	<0.5	3.42	78.42		1.48	0.87	<0.05	2052.9		281.36	602.11	--		1.44	<0.1	0.45	3181	120	0	1

## EBS-17 UNFILTERED

Lab ID	Sample Date	Al	B	Ba	Br	Ca	Cl	Cr	F	Fe	K	Li	Mg	Mn	Na	NO <sub>3</sub>	PO <sub>4</sub>	Si	SiO <sub>2</sub>	SO <sub>4</sub>	Sr	Ti	Zn	TDS	Cation	Anion	Balance		
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
EBS17 00 UF	27/06/2014	<0.05	<0.1	<0.05		409.76	7117.83	<0.05	<0.5	<0.5	220.42	<0.05	185.63	<0.05	3812.21			<0.5	<1		1169.14		0.12	<0.1	<0.05	12915	205	222	-0.04
EBS17 01 UF	16/07/2014	0.52	6.1	0.51		34.31	7134.86	<0.05	<0.5	<0.5	171.81	<0.05	<0.5	<0.05	3996.96			45.16	96.64		27.51		0.39	<0.1	<0.05	11470	179	200	-0.05
EBS17 02 UF	31/07/2014	0.41	6.8	0.5		128.77	6981.99	<0.05	<0.5	<0.5	135.25	<0.05	<0.5	0.17	3750.13			39.24	83.97		10.32		0.85	<0.1	<0.05	11099	172	195	-0.06
EBS17 03 UF	07/08/2014	0.51	6.82	0.62		139.96	6738.79	<0.05	0.24	0.24	140.91	<0.05	<0.5	0.28	3581.2			55.53	118.84		11.13		0.94	<0.1	0.08	10740	166	189	-0.06
EBS17 04 UF	14/08/2014	0.44	6.36	0.75		136.4	6860.33	<0.05	0.34	0.34	134.29	<0.05	<0.5	0.38	3346.94			36.76	78.66		8.55		0.93	<0.1	0.24	10575	155	192	-0.11
EBS17 05 UF	21/08/2014	0.43	6.2	0.86		142.94	6494.33	<0.05	0.45	0.45	143.52	<0.05	<0.5	0.47	3428.02			42.24	90.4		8.41		0.98	<0.1	0.5	10318	159	182	-0.07
EBS17 06 UF	26/08/2014	0.34	6.64	0.72		144.06																							

EBS-19-2 F	23/06/2016	0.17	10.18	0.64	117.7	<0.02	<0.2	137.6	3.66	0.74	0.43	3600	54.46	116.54	0.74	<0.04	<0.02	3988	167	0	0.99
EBS-19-3 F	30/06/2016	0.41	14.28	0.96	173.16	<0.02	<0.2	194.37	5.19	0.99	0.78	4850.35	79.59	170.32	1.07	<0.04	<0.02	5412	226	1	0.99
EBS-19-4 F	07/07/2016	<0.02	16.01	1.13	202.17	<0.02	<0.2	229.66	6.07	1.29	1.09	5491.53	85.22	182.37	1.25	<0.04	0.04	6133	256	1	0.99
EBS-19-5 F	14/07/2016	0.26	17.86	1.34	227.02	<0.02	<0.2	257.8	6.87	1.68	1.37	5982.56	103.74	222	1.41	<0.04	<0.02	6720	280	1	0.99
EBS-19-6 F	15/07/2016	<0.02	17.89	1.39	1223.7	<0.02	13.94	109.23	8.4	9.39	3.14	6195.51	247.2	529.01	4.97	<0.04	0.02	8116	340	1	1

#### EBS-20 UNFILTERED

Lab ID	Sample Date	Al	B	Ba	Br	Ca	Cl	Cr	F	Fe	K	Li	Mg	Mn	Na	NO <sub>3</sub>	PO <sub>4</sub>	Si	SiO <sub>2</sub>	SO <sub>4</sub>	Sr	Ti	Zn	TDS	Cation	Anion	Balance
EBS-20 Start	06/09/2016	<0.016	<0.203	<0.011	0.24	388.54	7233.7	0.08	0.02	228.92	0.01	178.84	<0.003	3705.09	5.43	<0.278	<0.59492	1096.77	0.14	<0.052	12838	199	224	-0.06			
EBS-20-1 UF	08/09/2016	<0.016	8.62	0.9	0.68	67.78	7679.15	0.85	0.09	158.54	1.07	11.31	0.11	3817.63	15.42	41.36	88.52	32.82	0.62	<0.052	11884	174	215	-0.11			
EBS-20-2 UF	22/09/2016	<0.032	10.04	0.58	0.37	88.84	7120.7	0.01	1.55	0.07	158.59	3.16	1.15	0.15	4465.79	2.85	37.57	80.4	16.63	0.69	0.17	11952	202	199	0.01		
EBS-20-3 UF	06/10/2016	<0.016	8.83	0.65	0.89	88	14401.96	1.46	0.12	139.82	2.6	0.69	0.22	3323.4	219.21	43.66	93.44	18.34	0.63	<0.052	18300	151	404	-0.46			
EBS-20-4 UF	20/10/2016	<0.032	15.94	1.2	0.76	147.34	6013.24	1.37	0.28	256.04	5.02	1.48	0.48	6295.94	2.6	105.14	225.01	9.91	1.19	0.29	12978	288	168	-0.26			
EBS-20-5 UF	03/11/2016	0.12	6.75	0.58	0.25	71.79	5516.05	0.01	2.27	0.11	131.7	2.7	0.82	0.32	2915.69	2.74	39.1	83.68	9.49	0.6	<0.208	8746	134	155	-0.07		
EBS-20-6 UF	17/11/2016	<0.016	7.59	0.71	0.81	82.54	5777.6	0.01	2.14	0.16	156.69	3.03	0.85	0.37	3242.46	2.02	50.56	108.21	9.74	0.66	0.12	9396	150	162	-0.04		
EBS-20-7 UF	01/12/2016	0.15	6.42	0.6	1.34	69.27	4338.48	0.01	1.9	0.28	133.59	2.54	0.72	0.32	2683.7	2.3	63.03	134.88	10.59	0.58	0.13	7388	125	122	0.01		
EBS-20-8 UF	15/12/2016	0.25	6.21	0.6	0.32	63.75	5002.75	0.01	1.85	0.36	126.32	2.34	0.64	0.31	2531.71	3.04	65.55	140.29	9.89	0.54	0.05	7891	118	141	-0.09		
EBS-20-9 UF	05/01/2017	<0.016	5.96	0.63	0.2	64.28	4861.78	0.01	1.72	0.18	127.92	2.37	0.64	0.3	2465.47	1.42	54.12	115.81	8.47	0.55	0.08	7658	115	137	-0.09		
EBS-20-10 UF	19/01/2017	0.02	5.74	0.66	0.8	64.26	5933.85	0.01	1.27	0.16	128.5	2.35	0.61	0.31	2411.16	2.58	61.06	130.68	10.42	0.56	0.08	8695	112	167	-0.19		
EBS-20-11 UF	02/02/2017	0.05	5.57	0.69	0.12	65.62	4731.67	0.01	1.61	0.32	130.62	2.4	0.65	0.26	2418.17	2.89	84.55	180.93	9.39	0.58	0.1	7552	114	133	-0.08		
EBS-20-12 UF	16/02/2017	0.15	5.53	0.8	0.66	64.81	4634.58	0.01	1.47	0.33	128.25	2.35	0.53	0.32	2357.02	4.7	103.86	222.25	8.96	0.6	0.1	7433	111	130	-0.08		

#### EBS-20 FILTERED

Lab ID	Sample Date	Al	B	Ba	Br	Ca	Cl	Cr	F	Fe	K	Li	Mg	Mn	Na	NO <sub>3</sub>	PO <sub>4</sub>	Si	SiO <sub>2</sub>	SO <sub>4</sub>	Sr	Ti	Zn	TDS	Cation	Anion	Balance
EBS-20-1 F	08/09/2016	<0.016	8.51	0.95	0.28	96.55	0	0.08	0.28	160.49	1.06	10.32	0.09	3663.34	0.82	48.04	102.8	0.52	0.07	4045	170	204	0	1			
EBS-20-2 F	22/09/2016	<0.016	9	0.56	0.37	78.55	0	0.08	0.08	135.91	2.61	0.56	0.12	3685.98	0.82	45.66	97.72	0.57	0.08	4010	169	204	0	1			
EBS-20-3 F	06/10/2016	0.12	8.42	0.63	0.81	81.69	0	0.33	0.33	126.96	2.27	0.64	0.2	3014.62	0.92	52.48	112.31	0.58	0.07	3349	140	204	0	0.99			
EBS-20-4 F	20/10/2016	0.07	15.26	1.15	0.76	150.43	0	0.39	0.39	251.48	4.91	1.43	0.47	6134.54	0.92	103.45	221.39	1.13	0.25	6783	282	204	1	1			
EBS-20-5 F	03/11/2016	0.12	6.75	0.58	0.25	71.79	5516.05	0.01	2.27	0.11	131.7	2.7	0.82	0.32	2915.69	2.74	39.1	83.68	9.49	0.6	<0.208	8746	134	155	-0.07		
EBS-20-6 F	17/11/2016	<0.016	7.59	0.71	0.81	82.54	5777.6	0.01	2.14	0.16	156.69	3.03	0.85	0.37	3242.46	2.02	50.56	108.21	9.74	0.66	0.12	9396	150	162	-0.04		
EBS-20-7 F	01/12/2016	0.15	6.42	0.6	1.34	69.27	4338.48	0.01	1.9	0.28	133.59	2.54	0.72	0.32	2683.7	2.3	63.03	134.88	10.59	0.58	0.13	7388	125	122	0.01		
EBS-20-8 F	15/12/2016	0.25	6.21	0.6	0.32	63.75	5002.75	0.01	1.85	0.36	126.32	2.34	0.64	0.31	2531.71	3.04	65.55	140.29	9.89	0.54	0.05	7891	118	141	-0.09		
EBS-20-9 F	05/01/2017	<0.016	5.96	0.63	0.2	64.28	4861.78	0.01	1.72	0.18	127.92	2.37	0.64	0.3	2465.47	1.42	54.12	115.81	8.47	0.55	0.08	7658	115	137	-0.09		
EBS-20-10 F	19/01/2017	0.02	5.74	0.66	0.8	64.26	5933.85	0.01	1.27	0.16	128.5	2.35	0.61	0.31	2411.16	2.58	61.06	130.68	10.42	0.56	0.08	8695	112	167	-0.19		
EBS-20-11 F	02/02/2017	0.05	5.57	0.69	0.12	65.62	4731.67	0.01	1.61	0.32	130.62	2.4	0.65	0.26	2418.17	2.89	84.55	180.93	9.39	0.58	0.1	7552	114	133	-0.08		
EBS-20-12 F	16/02/2017	0.09	5.8	0.77	0.66	66.27	4634.58	0.01	1.47	0.33	128.25	2.35	0.53	0.32	2374.58	4.7	95.43	204.22	8.96	0.6	0.1	7287	112	130	-0.08		

#### EBS-21 UNFILTERED

Lab ID	Sample Date	Al	B	Ba	Br	Ca	Cl	Cr	F	Fe	K	Li	Mg	Mn	Na	NO <sub>3</sub>	PO <sub>4</sub>	Si	SiO <sub>2</sub>	SO <sub>4</sub>	Sr	Ti	Zn	TDS	Cation	Anion	Balance
EBS-21 Starting Solution	04/01/2017	6.62	<2.2	1.92	348.58	46884.48	<0.6	0.05	<3.6	<112.2	<1.2	159.6	<0.6	22792.91	0.82	<55.6	<118.984	1200.36	<0.08	71395	950	1251	-0.14				
EBS-21-1 UF	12/01/2017	6.57	3.49	1.83	447.35	47951.11	<0.6	0.72	<3.6	131.85	<1.2	66.2	0.79	21403.15	2.26	<55.6	<118.984	664.35	6.51	70686	895	1270	-0.17				
EBS-21-2 UF	19/01/2017	3.57	5.9	2.29	752.94	46268.36	<0.6	0.74	4.34	288.12	2.03	64.92	2.1	29748.25	0.92	<55.6	<118.984	638.12	12.34	77795	1241	1216	0.01				
EBS-21-3 UF	26/01/2017	<3.2	5.61	2.03	569.6	45110.26	<0.6	0.5	4.59	118.65	1.9	27.39	1.33	22347.95	1.28	<55.6	<118.984	470.68	9.89	68672	938	1194	-0.12				
EBS-21-4 UF	02/02/2017	5.32	7.18	2.42	578.16	47752.38	<0.6	0.7	10.67	175.81	2.39	19.24	1.5	20880.99	1.48	<55.6	<118.984	497.43	9.99	69946	879	1262	-0.18				
EBS-21-5 UF	09/02/2017	6.85	5.83	2.16	615.35	46875.66	<0.6	0.8	8.17	114.44	2.28	12.83	1.62	21491.4	1.17	<55.6	<118.984	494.48	10.5	69644	904	1239	-0.16				
EBS-21-6 UF	16/02/2017	3.84	9.33	2.38	642.07	44433.15	0.85	0.74	10.83	123.79	2.39	10.27	1.73	22189.2	1.39	<55.6	<118.984	499.52	10.99	67942	935	1178	-0.11				
EBS-21-7 UF	23/02/2017	<3.2	8.33	1.64	626.99	44191.3	<0.6	0.65	10.76	113.79	1.84	5.81	1.77	20829.41	1.26	55.94	119.7	352.2	10.4	66276	881	1171	-0.14				
EBS-21-8 UF	28/02/2017	<3.2	8.99	1.82	894.8	45055.54	<0.6	0.5	12.76	117.07	2.81	7.8	3.34	22230.5	0.74	77.38	165.59	929.73	12.31	69444	948	1200	-0.12				

#### EBS-21 FILTERED

Lab ID	Sample Date	Al	B	Ba	Br	Ca	Cl	Cr	F	Fe	K	Li	Mg	Mn	Na	NO <sub>3</sub>	PO <sub>4</sub>	Si	SiO <sub>2</sub>	SO <sub>4</sub>	Sr	Ti	Zn	TDS	Cation	Anion	Balance
EBS-21-1 F	12/01/2017	<3.2	8.38	1.82	472.09	472.09	<0.6	0.6	19.75	128.33	2.38	71.36	1.42	22032.65	0.6	<55.6	<118.984	6.82	22743	9							

EBS-22-2 F	30/03/2017	<0.03392	5.82	0.73	128.21	0.01	0.24	193.35	0.81	33.26	0.2	4343.44	119.7	256.16	1.65 <0.00424	0.27	4964	205	0	1
EBS-22-3 F	06/04/2017	<0.03392	4.66	0.68	147.45	0.01	0.08	183.61	0.89	14.96	0.17	3895.75	53.92	115.39	1.77 <0.00424	0.19	4366	183	0	1
EBS-22-4 F	13/04/2017	<0.03392	5.39	0.86	150.32	0.01	0.1	173.51	0.91	9.27	0.17	4035.89	51.44	110.09	2.15 <0.00424	0.16	4489	189	0	1
EBS-22-5 F	20/04/2017	<0.03392	6.22	1	172.89	0.01	0.12	194.79	1.04	7.62	0.2	4506.72	64.43	137.87	2.58 <0.00424	0.15	5031	211	0	1
EBS-22-6 F	27/04/2017	<0.03392	5.63	0.94	159.59	0.01	0.13	177.4	0.95	5.63	0.18	4064.14	54.1	115.77	2.42 <0.00424	0.2	4533	190	0	1
EBS-22-7 F	04/05/2017	<0.03392	5.98	1.04	174.63	0.01	0.13	189.24	0.99	5.78	0.21	4290.33	70.37	150.59	2.61 <0.00424	0.5	4822	202	0	1
EBS-22-8 F	11/05/2017	<0.03392	7.03	1.21	200.69	0.02	0.19	214.02	1.22	6.01	0.25	4865.11	188.3	402.95	3.06 <0.00424	0.28	5702	231	0	1
EBS-22-F F	18/05/2017	<0.03392	5.6	0.81	466.34	0.01	1.17	169.78	0.95	9.22	0.65	4021.31	67.74	144.95	4.01 <0.00424	0.28	4825	204	0	1

Table S2, EQ 36 calculations.

Sample	Temperature	pH <sup>1</sup>	Eh(volts)	pe-	Ah(kcal)	SiO <sub>2</sub> (aq)			
						Molality	LogMolality	LogGamma	LogActivity
StartingSolution	300	6.0251	-0.1395	-1.23E+00	-3.2177	1.66E-05	-4.7795	0	-4.7795
ebs14f-1	300	4.7038	0.3336	2.93E+00	7.6928	1.29E-03	-2.8889	0	-2.8889
ebs14f-2	300	5.0445	0.2953	2.60E+00	6.8094	6.77E-04	-3.1694	0	-3.1694
ebs14f-3	300	4.859	0.3162	2.78E+00	7.2916	1.80E-03	-2.7446	0	-2.7446
ebs14f-4	300	4.9122	0.3102	2.73E+00	7.1535	1.80E-03	-2.7446	0	-2.7446
ebs15f-1	300	4.6971	0.3347	2.94E+00	7.7193	1.30E-03	-2.8868	0	-2.8868
ebs15f-2	300	4.2997	0.3796	3.34E+00	8.7555	3.15E-03	-2.5014	0	-2.5014
ebs15f-3	300	4.302	0.3794	3.34E+00	8.7492	2.67E-03	-2.5737	0	-2.5737
ebs15f-5	300	4.5062	0.3562	3.13E+00	8.215	1.34E-03	-2.8729	0	-2.8729
ebs15f-6	300	4.6653	0.3383	2.97E+00	7.8021	2.35E-03	-2.6291	0	-2.6291
ebs17f-1	300	4.3939	0.3686	3.24E+00	8.5015	1.66E-03	-2.7795	0	-2.7795
ebs17f-2	300	4.3051	0.0647	5.69E-01	1.492	1.33E-03	-2.8754	0	-2.8754
ebs17f-3	300	4.4432	0.034	2.99E-01	0.7844	1.33E-03	-2.8769	0	-2.8769
ebs17f-4	300	4.7012	-0.0196	-1.72E-01	-0.4516	1.28E-03	-2.8939	0	-2.8939
ebs17f-5	300	4.4623	0.0264	2.32E-01	0.6081	1.28E-03	-2.8939	0	-2.8939
ebs17f-6	300	4.5275	0.0131	1.15E-01	0.302	1.57E-03	-2.8035	0	-2.8035
ebs19f-1	300	5.3794	-0.1451	-1.28E+00	-3.3463	2.79E-03	-2.5551	0	-2.5551
ebs19f-2	300	5.6274	0.2298	2.02E+00	5.2998	1.94E-03	-2.7125	0	-2.7125
ebs20f-1	300	5.574	-0.181	-1.59E+00	-4.1734	1.71E-03	-2.7669	0	-2.7669
ebs20f-2	300	5.536	-0.1529	-1.34E+00	-3.527	1.63E-03	-2.7889	0	-2.7889
ebs20f-3	300	5.2824	-0.1313	-1.15E+00	-3.0288	1.87E-03	-2.7284	0	-2.7284
ebs20f-4	300	5.1904	-0.1047	-9.21E-01	-2.4151	3.70E-03	-2.432	0	-2.432
ebs20f-6	300	5.4368	-0.158	-1.39E+00	-3.6434	1.82E-03	-2.7408	0	-2.7408
ebs20f11	300	5.2592	-0.1296	-1.14E+00	-2.9893	3.04E-03	-2.5177	0	-2.5177
ebs20f12	300	5.1955	-0.1258	-1.11E+00	-2.9022	3.40E-03	-2.4687	0	-2.4687
ebs21f7	200	5.5045	-0.1758	-1.87E+00	-4.0537	-	-	-	-
ebs22cf1	200	5.7178	-0.1768	-1.88E+00	-4.0773	2.8008E-03	-2.5527	0.0000	-2.5527
ebs22cf2	200	6.5639	-0.303	-3.23E+00	-6.9886	4.2084E-03	-2.3759	0.0000	-2.3759
ebs22cf3	200	5.4059	-0.1211	-1.29E+00	-2.7933	1.9188E-03	-2.7170	0.0000	-2.717
ebs22cf4	200	5.4894	-0.137	-1.46E+00	-3.1586	1.8303E-03	-2.7375	0.0000	-2.7375
ebs22cf5	200	5.5392	-0.1464	-1.56E+00	-3.3768	2.2917E-03	-2.6398	0.0000	-2.6398
ebs22cf6	200	5.4134	-0.1286	-1.37E+00	-2.9665	1.9251E-03	-2.7156	0.0000	-2.7156
ebs22cf7	200	5.5277	-0.146	-1.56E+00	-3.3676	2.5033E-03	-2.6015	0.0000	-2.6015
ebs22cf8	200	5.4253	-0.1343	-1.43E+00	-3.0969	6.6998E-03	-2.1739	0.0000	-2.1739

<sup>1</sup>Calculated using the B-dot pH scale of Helgeson (1969)

Table S3. EMPA Oxide Data.

Experiment ID	type	value	mineral	Sample	SiO2	TiO2	Al2O3	Cr2O3	FeO	MnO	MgO	NiO	ZnO	CaO	Na2O	K2O	F	Cl	TOTAL
EBS14	wt_percent	analysis	analcime	EB14-Anl-0	57.60	0.01	22.39	0.00	0.10	0.02	0.00	0.00	0.00	10.64	1.66	0.07	0.00	0.01	92.48
EBS14	wt_percent	analysis	analcime	EB14-Anl-1	57.05	0.01	21.73	0.01	0.08	0.03	0.00	0.00	0.00	10.50	1.46	0.07	0.05	0.01	90.99
EBS14	wt_percent	analysis	analcime	EB14-Anl-2	56.05	0.01	22.01	0.00	0.12	0.01	0.00	0.00	0.00	10.76	1.36	0.05	0.00	0.01	90.39
EBS14	wt_percent	analysis	analcime	EB14-Anl-3	57.58	0.00	22.40	0.02	0.12	0.00	0.00	0.01	0.01	10.17	1.89	0.06	0.06	0.00	92.34
EBS14	wt_percent	analysis	analcime	EB14-Anl-4	57.45	0.02	21.70	0.01	0.10	0.01	0.00	0.01	0.01	10.57	1.48	0.06	0.00	0.01	91.42
EBS14	wt_percent	analysis	analcime	EB14-Anl-5	56.32	0.02	21.95	0.01	0.08	0.02	0.00	0.00	0.00	10.94	1.30	0.05	0.00	0.00	90.70
EBS14	wt_percent	analysis	analcime	EB14-Anl-6	55.41	0.00	21.94	0.00	0.07	0.00	0.00	0.01	0.01	10.47	1.74	0.05	0.06	0.00	89.77
EBS14	wt_percent	analysis	analcime	EB14-Anl-7	57.08	0.01	21.76	0.00	0.08	0.01	0.00	0.00	0.00	10.69	1.31	0.05	0.00	0.00	90.99
EBS14	wt_percent	analysis	analcime	EB14-Anl-8	57.78	0.00	21.52	0.01	0.10	0.00	0.00	0.00	0.00	9.73	1.96	0.08	0.00	0.00	91.18
EBS14	wt_percent	analysis	analcime	EB14-Anl-9	57.62	0.03	21.58	0.00	0.10	0.00	0.00	0.00	0.00	10.04	1.81	0.07	0.01	0.01	91.28
EBS14	wt_percent	analysis	analcime	EB14-Anl-10	57.84	0.02	21.48	0.00	0.11	0.00	0.00	0.01	0.01	10.24	1.67	0.06	0.04	0.00	91.47
EBS14	wt_percent	analysis	analcime	EB14-Anl-11	59.22	0.02	21.28	0.01	0.05	0.01	0.00	0.00	0.00	10.05	1.76	0.05	0.00	0.00	92.46
EBS14	wt_percent	analysis	analcime	EB14-Anl-12	57.32	0.03	21.90	0.00	0.08	0.00	0.00	0.00	0.00	10.34	1.61	0.05	0.02	0.01	91.38
EBS14	wt_percent	analysis	analcime	EB14-Anl-13	57.23	0.03	21.66	0.00	0.10	0.00	0.04	0.01	0.01	10.72	1.42	0.06	0.00	0.02	91.31
EBS14	wt_percent	analysis	analcime	EB14-Anl-14	56.18	0.00	21.89	0.01	0.11	0.00	0.00	0.00	0.00	10.83	1.40	0.06	0.00	0.01	90.51
EBS14	wt_percent	analysis	analcime	EB14-Anl-15	56.72	0.00	21.65	0.01	0.13	0.00	0.00	0.00	0.00	10.27	1.59	0.06	0.23	0.00	90.66
EBS14	wt_percent	analysis	analcime	EB14-Anl-16	53.71	0.00	21.21	0.01	0.06	0.00	0.00	0.02	0.02	10.45	1.36	0.07	0.00	0.01	86.90
EBS14	wt_percent	average	analcime	Average	56.95	0.01	21.77	0.01	0.09	0.01	0.00	0.00	0.00	10.44	1.58	0.06	0.03	0.01	90.95
EBS14	wt_percent	stdev	analcime	Std Dev	1.17	0.01	0.32	0.01	0.02	0.01	0.01	0.01	0.01	0.31	0.20	0.01	0.06	0.01	1.24
EBS15	wt_percent	analysis	analcime	EB15-Anl-1	65.29	0.00	19.90	0.01	0.54	0.01	0.12	0.00	0.00	3.57	4.15	0.01	0.00	0.01	93.61
EBS15	wt_percent	analysis	analcime	EB15-Anl-2	65.79	0.03	20.34	0.00	0.23	0.01	0.06	0.01	0.01	3.91	4.40	0.04	0.00	0.01	94.82
EBS15	wt_percent	analysis	analcime	EB15-Anl-3	65.92	0.01	20.75	0.00	0.19	0.02	0.04	0.02	0.02	4.20	3.39	0.03	0.08	0.00	94.69
EBS15	wt_percent	analysis	analcime	EB15-Anl-4	66.44	0.01	19.63	0.00	0.48	0.02	0.13	0.02	0.02	3.53	3.41	0.03	0.07	0.03	93.78
EBS15	wt_percent	analysis	analcime	EB15-Anl-5	66.29	0.01	20.25	0.00	0.41	0.02	0.11	0.02	0.02	3.71	3.50	0.02	0.00	0.02	94.37
EBS15	wt_percent	analysis	analcime	EB15-Anl-6	66.21	0.04	19.43	0.01	0.42	0.03	0.09	0.00	0.00	3.83	2.90	0.01	0.00	0.02	92.99
EBS15	wt_percent	analysis	analcime	EB15-Anl-7	65.54	0.01	20.23	0.00	0.55	0.02	0.17	0.00	0.00	3.45	3.39	0.05	0.00	0.02	93.45
EBS15	wt_percent	analysis	analcime	EB15-Anl-8	65.61	0.00	19.52	0.00	0.30	0.02	0.05	0.02	0.02	4.05	3.67	0.03	0.08	0.01	93.36
EBS15	wt_percent	analysis	analcime	EB15-Anl-9	65.92	0.04	19.15	0.00	0.35	0.01	0.13	0.00	0.00	3.57	4.36	0.02	0.02	0.02	93.60
EBS15	wt_percent	analysis	analcime	EB15-Anl-10	66.11	0.01	19.05	0.00	0.19	0.01	0.04	0.01	0.01	3.66	3.89	0.06	0.00	0.02	93.05
EBS15	wt_percent	analysis	analcime	EB15-Anl-11	65.82	0.02	19.36	0.03	0.34	0.00	0.11	0.01	0.01	3.78	3.77	0.02	0.11	0.01	93.39
EBS15	wt_percent	analysis	analcime	EB15-Anl-12	66.19	0.01	19.23	0.01	0.25	0.00	0.09	0.01	0.01	3.95	3.79	0.01	0.00	0.02	93.55
EBS15	wt_percent	analysis	analcime	EB15-Anl-13	65.73	0.00	20.06	0.00	0.24	0.02	0.06	0.00	0.00	3.72	4.37	0.08	0.00	0.03	94.34
EBS15	wt_percent	average	analcime	Average	65.91	0.01	19.76	0.01	0.34	0.01	0.09	0.01	0.01	3.76	3.77	0.03	0.03	0.02	93.77
EBS15	wt_percent	stdev	analcime	Std Dev	0.33	0.01	0.53	0.01	0.13	0.01	0.04	0.01	0.01	0.22	0.46	0.02	0.04	0.01	0.60
EBS17	wt_percent	analysis	analcime	EB17-Anl-1	64.82	0.03	20.36	0.00	0.20	0.01	0.03	0.01	0.01	4.05	4.12	0.02	0.00	0.01	93.67
EBS17	wt_percent	analysis	analcime	EB17-Anl-2	64.74	0.03	21.00	0.00	0.70	0.02	0.22	0.00	0.00	4.07	4.14	0.03	0.12	0.04	95.11
EBS17	wt_percent	analysis	analcime	EB17-Anl-3	65.07	0.01	20.95	0.00	0.40	0.00	0.12	0.02	0.02	3.94	4.41	0.02	0.07	0.02	95.02
EBS17	wt_percent	analysis	analcime	EB17-Anl-4	65.62	0.01	19.40	0.00	0.51	0.00	0.14	0.01	0.01	4.21	3.63	0.07	0.00	0.01	93.62
EBS17	wt_percent	analysis	analcime	EB17-Anl-5	65.84	0.00	19.86	0.00	0.24	0.01	0.06	0.02	0.02	4.04	4.17	0.02	0.00	0.01	94.30
EBS17	wt_percent	analysis	analcime	EB17-Anl-6	65.64	0.03	19.87	0.00	0.16	0.00	0.04	0.00	0.00	4.18	4.17	0.02	0.06	0.02	94.20
EBS17	wt_percent	analysis	analcime	EB17-Anl-7	65.17	0.01	19.69	0.00	0.17	0.01	0.04	0.02	0.02	4.38	3.74	0.03	0.00	0.01	93.29
EBS17	wt_percent	analysis	analcime	EB17-Anl-8	65.64	0.01	19.86	0.00	0.16	0.01	0.04	0.00	0.00	4.01	3.88	0.04	0.00	0.01	93.66
EBS17	wt_percent	analysis	analcime	EB17-Anl-9	65.73	0.00	19.72	0.01	0.13	0.00	0.04	0.02	0.02	4.16	4.28	0.03	0.00	0.01	94.12
EBS17	wt_percent	analysis	analcime	EB17-Anl-10	66.49	0.03	19.89	0.00	0.27	0.01	0.09	0.00	0.00	3.76	4.30	0.04	0.04	0.00	94.94
EBS17	wt_percent	average	analcime	Average	65.47	0.01	20.06	0.00	0.29	0.01	0.08	0.01	0.01	4.08	4.09	0.03	0.03	0.01	94.19
EBS17	wt_percent	stdev	analcime	Std Dev	0.53	0.01	0.54	0.00	0.19	0.01	0.06	0.01	0.01	0.17	0.25	0.02	0.04	0.01	0.65

EBS19	wt_percent	analysis	analcime	EBS-19 Anl-1-2	64.85	0.01	19.08	0.03	0.17	0.00	0.02	0.00	3.72	2.49	0.04	0.00	0.04	90.47
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-1-3	63.43	0.01	19.06	0.00	0.19	0.00	0.02	0.00	3.83	2.76	0.03	0.06	0.02	89.37
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-1-4	66.14	0.02	19.31	0.00	0.34	0.00	0.12	0.01	3.38	2.68	0.01	0.03	0.07	92.09
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-1-5	64.72	0.01	19.08	0.00	0.40	0.00	0.06	0.01	3.30	2.39	0.04	0.01	0.35	90.36
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-1-6	65.64	0.02	19.40	0.02	0.37	0.00	0.04	0.00	3.55	2.47	0.02	0.00	0.03	91.57
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-1-7	62.94	0.01	20.57	0.01	0.28	0.01	0.08	0.01	3.87	2.12	0.04	0.10	0.23	90.17
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-1-8	63.99	0.00	19.46	0.00	0.25	0.02	0.05	0.00	3.42	2.10	0.03	0.07	0.08	89.41
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-2-1	61.55	0.00	20.15	0.00	0.25	0.01	0.06	0.00	3.63	2.23	0.02	0.02	0.05	87.96
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-2-2	63.24	0.01	20.10	0.01	0.22	0.00	0.07	0.00	3.63	1.58	0.02	0.00	0.06	88.94
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-2-3	66.78	0.00	19.72	0.00	0.30	0.01	0.10	0.00	3.48	2.86	0.05	0.00	0.21	93.52
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-2-4	66.07	0.00	20.75	0.00	0.35	0.02	0.09	0.00	3.33	3.18	0.03	0.08	0.17	93.99
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-2-5	65.24	0.00	19.71	0.01	0.20	0.00	0.04	0.01	3.50	2.17	0.05	0.02	0.18	91.12
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-2-6	66.66	0.02	20.25	0.00	0.21	0.00	0.06	0.01	3.77	2.01	0.01	0.07	0.07	93.07
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-1-1	68.65	0.02	21.03	0.01	0.17	0.03	0.08	0.00	3.33	1.40	0.08	0.00	0.05	94.84
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-2-1	68.62	0.01	21.08	0.00	0.30	0.00	0.16	0.01	3.30	2.43	0.03	0.03	0.03	96.02
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-3-1	65.84	0.01	21.08	0.00	0.28	0.01	0.09	0.00	3.50	1.66	0.09	0.00	0.05	92.63
EBS19	wt_percent	analysis	analcime	EBS-19-zeolite-4-1	65.48	0.01	20.57	0.17	0.70	0.03	0.15	0.08	3.40	1.82	0.06	0.00	0.05	92.52
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-5-1	65.43	0.01	19.94	0.00	0.36	0.04	0.14	0.00	3.09	2.42	0.05	0.00	0.06	91.54
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-6-1	67.47	0.01	20.57	0.01	0.24	0.02	0.07	0.00	3.75	2.78	0.06	0.00	0.02	95.00
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-7-1	66.94	0.06	20.44	0.00	0.35	0.03	0.26	0.00	3.41	2.27	0.30	0.06	0.25	94.38
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-8-1	68.99	0.00	21.43	0.00	0.48	0.01	0.20	0.00	3.14	2.79	0.12	0.10	0.12	97.37
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-10-1	68.72	0.02	22.20	0.00	0.47	0.02	0.18	0.00	3.15	1.63	0.04	0.00	0.13	96.56
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-11-1	64.56	0.01	20.35	0.00	0.30	0.00	0.10	0.00	3.16	1.15	0.04	0.00	0.07	89.76
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-12-1	66.28	0.03	20.01	0.00	0.41	0.01	0.14	0.00	2.95	2.46	0.04	0.04	0.14	92.49
EBS19	wt_percent	analysis	analcime	EBS-19 Anl-13-1	63.13	0.26	20.92	0.00	0.99	0.01	0.39	0.02	3.59	2.66	0.67	0.02	0.12	92.78
EBS19	wt_percent	average	analcime	Average	65.66	0.02	20.24	0.00	0.33	0.01	0.11	0.00	3.45	2.28	0.08	0.03	0.11	92.31
EBS19	wt_percent	stdev	analcime	Std Dev	1.97	0.05	0.80	0.01	0.16	0.01	0.08	0.01	0.24	0.49	0.14	0.03	0.08	2.49
EBS20	wt_percent	analysis	analcime	EBS-20 Anl-1-1	66.87	0.00	19.17	0.01	0.27	0.00	0.09	0.00	3.65	2.54	0.03	0.04	0.04	92.70
EBS20	wt_percent	analysis	analcime	EBS-20 Anl-1-2	64.49	0.01	19.44	0.01	0.23	0.02	0.08	0.00	3.71	1.91	0.03	0.02	0.12	90.06
EBS20	wt_percent	analysis	analcime	EBS-20 Anl-1-3	66.43	0.13	18.69	0.00	0.20	0.01	0.06	0.02	3.66	1.47	0.03	0.01	0.02	90.75
EBS20	wt_percent	analysis	analcime	EBS-20 Anl-1-4	66.66	0.00	19.01	0.00	0.32	0.03	0.11	0.01	3.50	2.24	0.02	0.07	0.06	91.96
EBS20	wt_percent	analysis	analcime	EBS-20 Anl-1-5	63.72	0.00	19.17	0.00	0.30	0.00	0.08	0.00	3.77	2.07	0.03	0.04	0.01	89.16
EBS20	wt_percent	analysis	analcime	EBS-20 Anl-1-6	66.84	0.00	18.36	0.00	0.24	0.00	0.06	0.02	3.49	1.80	0.02	0.00	0.01	90.84
EBS20	wt_percent	analysis	analcime	EBS-20 Anl-1-7	64.70	0.00	18.84	0.01	0.24	0.01	0.07	0.00	3.55	2.34	0.01	0.02	0.03	89.80
EBS20	wt_percent	analysis	analcime	EBS-20 Anl-1-8	64.90	0.02	19.27	0.00	0.36	0.03	0.13	0.00	3.53	2.49	0.01	0.02	0.02	90.76
EBS20	wt_percent	analysis	analcime	EBS-20 Anl-1-9	63.32	0.01	17.91	0.01	0.27	0.03	0.08	0.00	3.57	2.34	0.03	0.00	0.09	87.66
EBS20	wt_percent	analysis	analcime	EBS-20 Anl-1-10	64.71	0.01	17.82	0.00	0.23	0.02	0.05	0.00	3.52	2.29	0.03	0.06	0.05	88.74
EBS20	wt_percent	analysis	analcime	EBS-20 Anl-1-11	65.57	0.01	17.63	0.00	0.27	0.00	0.10	0.00	3.32	2.45	0.04	0.09	0.07	89.48
EBS20	wt_percent	average	analcime	Average	65.29	0.02	18.66	0.00	0.27	0.01	0.08	0.01	3.57	2.18	0.03	0.03	0.05	90.17
EBS20	wt_percent	stdev	analcime	Std Dev	1.20	0.04	0.61	0.00	0.04	0.01	0.02	0.01	0.12	0.32	0.01	0.03	0.03	1.37
EBS21	wt_percent	analysis	glass	EBS-21 Gl-1-1	64.12	0.01	8.66	0.02	0.11	0.00	0.05	0.00	0.90	5.25	0.10	0.02	0.00	79.21
EBS21	wt_percent	analysis	glass	EBS-21 Gl-2-1	58.46	0.01	12.06	0.01	0.11	0.00	0.08	0.00	0.86	4.89	0.05	0.00	0.01	76.55
EBS21	wt_percent	analysis	glass	EBS-21 Gl-2-2	62.63	0.00	11.65	0.01	0.11	0.00	0.06	0.02	1.04	3.58	0.05	0.06	0.00	79.14
EBS21	wt_percent	analysis	glass	EBS-21 Gl-3-1	62.76	0.01	12.30	0.00	0.42	0.02	0.14	0.00	0.64	4.20	0.11	0.01	0.02	80.60
EBS21	wt_percent	analysis	glass	EBS-21 Gl-3-2	65.01	0.01	11.51	0.00	0.22	0.00	0.07	0.01	0.64	4.89	0.13	0.00	0.00	82.49
EBS21	wt_percent	average	glass	AVE	62.60	0.01	11.24	0.01	0.19	0.00	0.08	0.01	0.81	4.56	0.09	0.02	0.01	79.60
EBS21	wt_percent	stdev	glass	Std Dev	2.25	0.00	1.32	0.01	0.12	0.01	0.03	0.01	0.16	0.60	0.03	0.02	0.01	1.95

EBS21	wt_percent	analysis	glass	EBS-21 shard-1-1	65.38	0.00	13.19	0.06	0.65	0.01	0.09	0.03	0.66	1.47	3.90	0.00	0.01	85.45
EBS21	wt_percent	analysis	glass	EBS-21 shard-1-2	70.50	0.01	14.12	0.07	0.36	0.00	0.06	0.00	0.65	2.09	4.95	0.00	0.02	92.85
EBS21	wt_percent	analysis	glass	EBS-21 shard-3-1	66.00	0.00	11.55	0.38	0.32	0.01	0.08	0.03	1.32	0.91	0.29	0.00	0.20	81.08
EBS21	wt_percent	analysis	glass	EBS-21 shard-3-2	74.37	0.01	13.29	0.04	0.13	0.00	0.10	0.03	1.19	1.61	0.23	0.01	0.24	91.25
EBS21	wt_percent	average	glass	AVE	69.06	0.01	13.04	0.14	0.36	0.01	0.08	0.02	0.95	1.52	2.34	0.00	0.12	87.66
EBS21	wt_percent	stdev	glass	Std Dev	3.65	0.01	0.93	0.14	0.19	0.00	0.01	0.01	0.30	0.42	2.12	0.01	0.10	4.69

Mineral standards and oxide detection limits

Phlogopite (Synthetic): MgO = 0.02 wt.% , F = 0.11 wt. %

Albite (Amelia, NC, U.S.A, Rutherford mine): Na2O = 0.02 wt. %

Labradorite (Chihuahua, Mexico): Al2O3 = 0.02 wt. %, SiO2 = 0.02 wt. %, CaO = 0.01 wt. %

Tugtupite (Greenland): Cl = 0.01 wt. %

Adularia (St. Gotthard, Switzerland): K2O = 0.01 wt. %

Titanite glass (Penn State): TiO2 = 0.02 wt. %

Magnesiochromite (Synthetic): Cr2O3 = 0.04 wt. %

Rhodonite (unknown locality): MnO = 0.02 wt. %

Augite (unknown locality): FeO = 0.02 wt. %

Liebenbergite (synthetic): NiO = 0.06 wt. %

Gahnite: ZnO = 0.05 wt. %



Table S4. EMPA cation data.

Experiment ID	type	value	mineral	Sample	Si	Ti	Al	Cr	Fe	Mn	Mg	Ni	Zn	Ca	Na	K	F	Cl	TOTAL
EBS14	cations	analysis	analcime	EB14-Anl-0	2.06	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.11	0.00	0.00	0.00	3.53
EBS14	cations	analysis	analcime	EB14-Anl-1	2.07	0.00	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.10	0.00	0.01	0.00	3.52
EBS14	cations	analysis	analcime	EB14-Anl-2	2.05	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.10	0.00	0.00	0.00	3.52
EBS14	cations	analysis	analcime	EB14-Anl-3	2.06	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.13	0.00	0.01	0.00	3.54
EBS14	cations	analysis	analcime	EB14-Anl-4	2.07	0.00	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.10	0.00	0.00	0.00	3.52
EBS14	cations	analysis	analcime	EB14-Anl-5	2.05	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.09	0.00	0.00	0.00	3.52
EBS14	cations	analysis	analcime	EB14-Anl-6	2.05	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.12	0.00	0.01	0.00	3.54
EBS14	cations	analysis	analcime	EB14-Anl-7	2.07	0.00	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.09	0.00	0.00	0.00	3.51
EBS14	cations	analysis	analcime	EB14-Anl-8	2.09	0.00	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.14	0.00	0.00	0.00	3.52
EBS14	cations	analysis	analcime	EB14-Anl-9	2.08	0.00	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.13	0.00	0.00	0.00	3.52
EBS14	cations	analysis	analcime	EB14-Anl-10	2.09	0.00	0.91	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.12	0.00	0.00	0.00	3.52
EBS14	cations	analysis	analcime	EB14-Anl-11	2.11	0.00	0.89	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.12	0.00	0.00	0.00	3.51
EBS14	cations	analysis	analcime	EB14-Anl-12	2.07	0.00	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.11	0.00	0.00	0.00	3.52
EBS14	cations	analysis	analcime	EB14-Anl-13	2.07	0.00	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.10	0.00	0.00	0.00	3.52
EBS14	cations	analysis	analcime	EB14-Anl-14	2.05	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.10	0.00	0.00	0.00	3.53
EBS14	cations	analysis	analcime	EB14-Anl-15	2.07	0.00	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.11	0.00	0.03	0.00	3.53
EBS14	cations	analysis	analcime	EB14-Anl-16	2.05	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.10	0.00	0.00	0.00	3.53
EBS14	cations	average	analcime	Average	2.07	0.00	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.11	0.00	0.00	0.00	3.52
EBS14	cations	stdev	analcime	Std Dev	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.01	0.00	0.01
EBS15	cations	analysis	analcime	EB15-Anl-1	2.25	0.00	0.81	0.00	0.02	0.01	0.00	0.00	0.00	0.13	0.28	0.00	0.00	0.00	3.49
EBS15	cations	analysis	analcime	EB15-Anl-2	2.24	0.00	0.82	0.00	0.01	0.00	0.00	0.00	0.00	0.14	0.29	0.00	0.00	0.00	3.50
EBS15	cations	analysis	analcime	EB15-Anl-3	2.24	0.00	0.83	0.00	0.01	0.00	0.00	0.00	0.00	0.15	0.22	0.00	0.01	0.00	3.46
EBS15	cations	analysis	analcime	EB15-Anl-4	2.28	0.00	0.79	0.00	0.01	0.01	0.00	0.00	0.00	0.13	0.23	0.00	0.01	0.00	3.45
EBS15	cations	analysis	analcime	EB15-Anl-5	2.26	0.00	0.81	0.00	0.01	0.01	0.00	0.00	0.00	0.14	0.23	0.00	0.00	0.00	3.45
EBS15	cations	analysis	analcime	EB15-Anl-6	2.28	0.00	0.79	0.00	0.01	0.00	0.00	0.00	0.00	0.14	0.19	0.00	0.00	0.00	3.42
EBS15	cations	analysis	analcime	EB15-Anl-7	2.25	0.00	0.82	0.00	0.02	0.01	0.00	0.00	0.00	0.13	0.23	0.00	0.00	0.00	3.45
EBS15	cations	analysis	analcime	EB15-Anl-8	2.26	0.00	0.79	0.00	0.01	0.00	0.00	0.00	0.00	0.15	0.25	0.00	0.01	0.00	3.47
EBS15	cations	analysis	analcime	EB15-Anl-9	2.27	0.00	0.78	0.00	0.01	0.01	0.00	0.00	0.00	0.13	0.29	0.00	0.00	0.00	3.49
EBS15	cations	analysis	analcime	EB15-Anl-10	2.28	0.00	0.77	0.00	0.01	0.00	0.00	0.00	0.00	0.14	0.26	0.00	0.00	0.00	3.46
EBS15	cations	analysis	analcime	EB15-Anl-11	2.27	0.00	0.79	0.00	0.01	0.01	0.00	0.00	0.00	0.14	0.25	0.00	0.01	0.00	3.47
EBS15	cations	analysis	analcime	EB15-Anl-12	2.27	0.00	0.78	0.00	0.01	0.00	0.00	0.00	0.00	0.15	0.25	0.00	0.00	0.00	3.46
EBS15	cations	analysis	analcime	EB15-Anl-13	2.25	0.00	0.81	0.00	0.01	0.00	0.00	0.00	0.00	0.14	0.29	0.00	0.00	0.00	3.50
EBS15	cations	average	analcime	Average	2.26	0.00	0.80	0.00	0.01	0.00	0.00	0.00	0.00	0.14	0.25	0.00	0.00	0.00	3.47
EBS15	cations	stdev	analcime	Std Dev	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.02
EBS17	cations	analysis	analcime	EB17-Anl-1	2.23	0.00	0.83	0.00	0.01	0.00	0.00	0.00	0.00	0.15	0.28	0.00	0.00	0.00	3.49
EBS17	cations	analysis	analcime	EB17-Anl-2	2.21	0.00	0.85	0.00	0.02	0.01	0.00	0.00	0.00	0.15	0.27	0.00	0.01	0.00	3.51
EBS17	cations	analysis	analcime	EB17-Anl-3	2.22	0.00	0.84	0.00	0.01	0.01	0.00	0.00	0.00	0.14	0.29	0.00	0.01	0.00	3.51
EBS17	cations	analysis	analcime	EB17-Anl-4	2.26	0.00	0.79	0.00	0.01	0.01	0.00	0.00	0.00	0.16	0.24	0.00	0.00	0.00	3.47
EBS17	cations	analysis	analcime	EB17-Anl-5	2.25	0.00	0.80	0.00	0.01	0.00	0.00	0.00	0.00	0.15	0.28	0.00	0.00	0.00	3.49
EBS17	cations	analysis	analcime	EB17-Anl-6	2.25	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.28	0.00	0.01	0.00	3.49
EBS17	cations	analysis	analcime	EB17-Anl-7	2.25	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.25	0.00	0.00	0.00	3.47
EBS17	cations	analysis	analcime	EB17-Anl-8	2.25	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.26	0.00	0.00	0.00	3.47
EBS17	cations	analysis	analcime	EB17-Anl-9	2.25	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.28	0.00	0.00	0.00	3.49
EBS17	cations	analysis	analcime	EB17-Anl-10	2.26	0.00	0.80	0.00	0.01	0.00	0.00	0.00	0.00	0.14	0.28	0.00	0.00	0.00	3.49
EBS17	cations	average	analcime	Average	2.24	0.00	0.81	0.00	0.01	0.00	0.00	0.00	0.00	0.15	0.27	0.00	0.00	0.00	3.49
EBS17	cations	stdev	analcime	Std Dev	0.02	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.01
EBS19	cations	analysis	analcime	EBS-19 Anl-1-2	2.29	0.00	0.79	0.00	0.01	0.00	0.00	0.00	0.00	0.14	0.17	0.00	0.00	0.00	3.40
EBS19	cations	analysis	analcime	EBS-19 Anl-1-3	2.27	0.00	0.80	0.00	0.01	0.00	0.00	0.00	0.00	0.15	0.19	0.00	0.01	0.00	3.42
EBS19	cations	analysis	analcime	EBS-19 Anl-1-4	2.29	0.00	0.79	0.00	0.01	0.00	0.01	0.00	0.00	0.13	0.18	0.00	0.00	0.00	3.40
EBS19	cations	analysis	analcime	EBS-19 Anl-1-5	2.29	0.00	0.80	0.00	0.01	0.00	0.00	0.00	0.00	0.13	0.16	0.00	0.00	0.02	3.39
EBS19	cations	analysis	analcime	EBS-19 Anl-1-6	2.29	0.00	0.80	0.00	0.01	0.00	0.00	0.00	0.00	0.13	0.17	0.00	0.00	0.00	3.40
EBS19	cations	analysis	analcime	EBS-19 Anl-1-7	2.24	0.00	0.86	0.00	0.01	0.00	0.00	0.00	0.00	0.15	0.15	0.00	0.01	0.01	3.41
EBS19	cations	analysis	analcime	EBS-19 Anl-1-8	2.28	0.00	0.82	0.00	0.01	0.00	0.00	0.00	0.00	0.13	0.15	0.00	0.01	0.01	3.39
EBS19	cations	analysis	analcime	EBS-19 Anl-2-1	2.24	0.00	0.86	0.00	0.01	0.00	0.00	0.00	0.00	0.14	0.16	0.00	0.00	0.00	3.41
EBS19	cations	analysis	analcime	EBS-19 Anl-2-2	2.26	0.00	0.85	0.00	0.01	0.00	0.00	0.00	0.00	0.14	0.11	0.00	0.00	0.00	3.37
EBS19	cations	analysis	analcime	EBS-19 Anl-2-3	2.29	0.00	0.80	0.00	0.01	0.00	0.01	0.00	0.00	0.13	0.19	0.00	0.00	0.01	3.41
EBS19	cations	analysis	analcime	EBS-19 Anl-2-4	2.25	0.00	0.83	0.00	0.01	0.00	0.00	0.00	0.00	0.12	0.21	0.00	0.01	0.01	3.44

EBS19	cations	analysis	analcime	EBS-19 Anl-2-5	2.28	0.00	0.81	0.00	0.01	0.00	0.00	0.00	0.13	0.15	0.00	0.00	0.01	3.39
EBS19	cations	analysis	analcime	EBS-19 Anl-2-6	2.28	0.00	0.82	0.00	0.01	0.00	0.00	0.00	0.14	0.13	0.00	0.01	0.00	3.38
EBS19	cations	analysis	analcime	EBS-19 Anl-1-1	3.06	0.00	1.10	0.00	0.01	0.00	0.01	0.00	0.16	0.12	0.00	0.00	0.00	4.46
EBS19	cations	analysis	analcime	EBS-19 Anl-2-1	3.03	0.00	1.10	0.00	0.01	0.00	0.01	0.00	0.16	0.21	0.00	0.01	0.00	4.52
EBS19	cations	analysis	analcime	EBS-19 Anl-3-1	2.26	0.00	0.85	0.00	0.01	0.00	0.01	0.00	0.13	0.11	0.00	0.00	0.00	3.37
EBS19	cations	analysis	analcime	EBS-19-zeolite-4-1	2.26	0.00	0.84	0.01	0.02	0.00	0.01	0.00	0.13	0.12	0.00	0.00	0.00	3.38
EBS19	cations	analysis	analcime	EBS-19 Anl-5-1	2.28	0.00	0.82	0.00	0.01	0.00	0.01	0.00	0.12	0.16	0.00	0.00	0.00	3.40
EBS19	cations	analysis	analcime	EBS-19 Anl-6-1	2.27	0.00	0.82	0.00	0.01	0.00	0.00	0.00	0.14	0.18	0.00	0.00	0.00	3.42
EBS19	cations	analysis	analcime	EBS-19 Anl-7-1	2.27	0.00	0.82	0.00	0.01	0.00	0.01	0.00	0.12	0.15	0.01	0.01	0.01	3.40
EBS19	cations	analysis	analcime	EBS-19 Anl-8-1	2.27	0.00	0.83	0.00	0.01	0.00	0.01	0.00	0.11	0.18	0.01	0.01	0.01	3.41
EBS19	cations	analysis	analcime	EBS-19 Anl-10-1	2.26	0.00	0.86	0.00	0.01	0.00	0.01	0.00	0.11	0.10	0.00	0.00	0.01	3.36
EBS19	cations	analysis	analcime	EBS-19 Anl-11-1	2.28	0.00	0.85	0.00	0.01	0.00	0.01	0.00	0.12	0.08	0.00	0.00	0.00	3.34
EBS19	cations	analysis	analcime	EBS-19 Anl-12-1	2.28	0.00	0.81	0.00	0.01	0.00	0.01	0.00	0.11	0.17	0.00	0.00	0.01	3.39
EBS19	cations	analysis	analcime	EBS-19 Anl-13-1	2.20	0.01	0.86	0.00	0.03	0.00	0.02	0.00	0.13	0.18	0.03	0.00	0.01	3.47
EBS19	cations	average	analcime	Average	2.33	0.00	0.85	0.00	0.01	0.00	0.01	0.00	0.13	0.15	0.00	0.00	0.01	3.48
EBS19	cations	stdev	analcime	Std Dev	0.21	0.00	0.08	0.00	0.01	0.00	0.01	0.00	0.01	0.03	0.01	0.00	0.00	0.30
EBS20	cations	analysis	analcime	EBS-20 Anl-1-1	2.30	0.00	0.78	0.00	0.01	0.00	0.01	0.00	0.14	0.17	0.00	0.00	0.00	3.40
EBS20	cations	analysis	analcime	EBS-20 Anl-1-2	2.28	0.00	0.81	0.00	0.01	0.00	0.00	0.00	0.14	0.13	0.00	0.00	0.01	3.38
EBS20	cations	analysis	analcime	EBS-20 Anl-1-3	2.32	0.00	0.77	0.00	0.01	0.00	0.00	0.00	0.14	0.10	0.00	0.00	0.00	3.34
EBS20	cations	analysis	analcime	EBS-20 Anl-1-4	2.31	0.00	0.78	0.00	0.01	0.00	0.01	0.00	0.13	0.15	0.00	0.01	0.00	3.38
EBS20	cations	analysis	analcime	EBS-20 Anl-1-5	2.28	0.00	0.81	0.00	0.01	0.00	0.00	0.00	0.15	0.14	0.00	0.00	0.00	3.39
EBS20	cations	analysis	analcime	EBS-20 Anl-1-6	2.33	0.00	0.76	0.00	0.01	0.00	0.00	0.00	0.13	0.12	0.00	0.00	0.00	3.35
EBS20	cations	analysis	analcime	EBS-20 Anl-1-7	2.30	0.00	0.79	0.00	0.01	0.00	0.00	0.00	0.14	0.16	0.00	0.00	0.00	3.39
EBS20	cations	analysis	analcime	EBS-20 Anl-1-8	2.28	0.00	0.80	0.00	0.01	0.00	0.01	0.00	0.13	0.17	0.00	0.00	0.00	3.40
EBS20	cations	analysis	analcime	EBS-20 Anl-1-9	2.31	0.00	0.77	0.00	0.01	0.00	0.00	0.00	0.14	0.17	0.00	0.00	0.01	3.39
EBS20	cations	analysis	analcime	EBS-20 Anl-1-10	2.32	0.00	0.75	0.00	0.01	0.00	0.00	0.00	0.14	0.16	0.00	0.01	0.00	3.38
EBS20	cations	analysis	analcime	EBS-20 Anl-1-11	2.33	0.00	0.74	0.00	0.01	0.00	0.01	0.00	0.13	0.17	0.00	0.01	0.00	3.38
EBS20	cations	average	analcime	Average	2.31	0.00	0.78	0.00	0.01	0.00	0.00	0.00	0.14	0.15	0.00	0.00	0.00	3.38
EBS20	cations	stdev	analcime	Std Dev	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.02
EBS21	cations	analysis	glass	EBS-21 GI-1-1	3.42	0.00	0.55	0.00	0.01	0.00	0.00	0.00	0.05	0.54	0.01	0.00	0.00	4.58
EBS21	cations	analysis	glass	EBS-21 GI-2-1	3.24	0.00	0.79	0.00	0.01	0.00	0.01	0.00	0.05	0.53	0.00	0.00	0.00	4.63
EBS21	cations	analysis	glass	EBS-21 GI-2-2	3.33	0.00	0.73	0.00	0.01	0.00	0.01	0.00	0.06	0.37	0.00	0.00	0.01	4.50
EBS21	cations	analysis	glass	EBS-21 GI-3-1	3.29	0.00	0.76	0.00	0.02	0.00	0.01	0.00	0.04	0.43	0.01	0.00	0.00	4.55
EBS21	cations	analysis	glass	EBS-21 GI-3-2	3.33	0.00	0.70	0.00	0.01	0.00	0.01	0.00	0.04	0.49	0.01	0.00	0.00	4.57
EBS21	cations	average	glass	Average	3.32	0.00	0.70	0.00	0.01	0.00	0.01	0.00	0.05	0.47	0.01	0.00	0.00	4.56
EBS21	cations	stdev	glass	Std Dev	0.06	0.00	0.09	0.00	0.01	0.00	0.00	0.00	0.01	0.06	0.00	0.00	0.00	0.04
EBS21	cations	analysis	glass	EBS-21 shard-1-1	3.28	0.00	0.78	0.00	0.03	0.00	0.01	0.00	0.04	0.14	0.25	0.00	0.00	4.53
EBS21	cations	analysis	glass	EBS-21 shard-1-2	3.27	0.00	0.77	0.00	0.01	0.00	0.00	0.00	0.03	0.19	0.29	0.00	0.00	4.58
EBS21	cations	analysis	glass	EBS-21 shard-3-1	3.39	0.00	0.70	0.02	0.01	0.00	0.01	0.00	0.07	0.09	0.02	0.02	0.00	4.31
EBS21	cations	analysis	glass	EBS-21 shard-3-2	3.39	0.00	0.71	0.00	0.01	0.00	0.01	0.00	0.06	0.14	0.01	0.02	0.00	4.33
EBS21	cations	average	glass	Average	3.33	0.00	0.74	0.01	0.01	0.00	0.01	0.00	0.05	0.14	0.14	0.01	0.00	4.44
EBS21	cations	stdev	glass	Std Dev	0.06	0.00	0.04	0.01	0.01	0.00	0.00	0.00	0.02	0.03	0.13	0.01	0.00	0.12