Datashare 61:

Evaluation of the compositional changes during flooding of reactive fluids using scanning electron microscopy, nano-secondary ion mass spectrometry, x-ray diffraction, and whole-rock geochemistry

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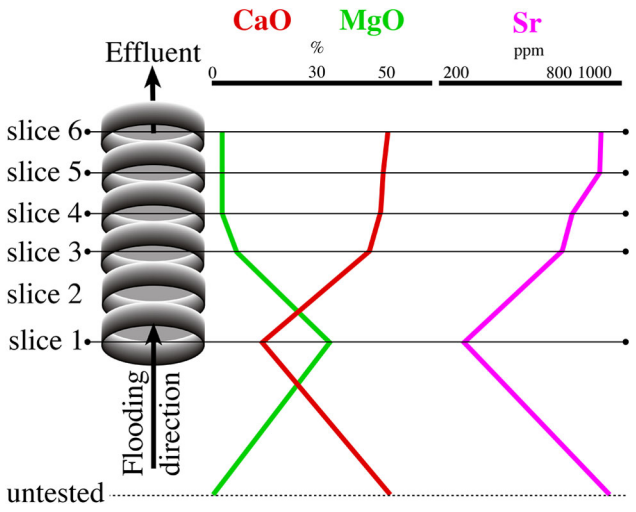
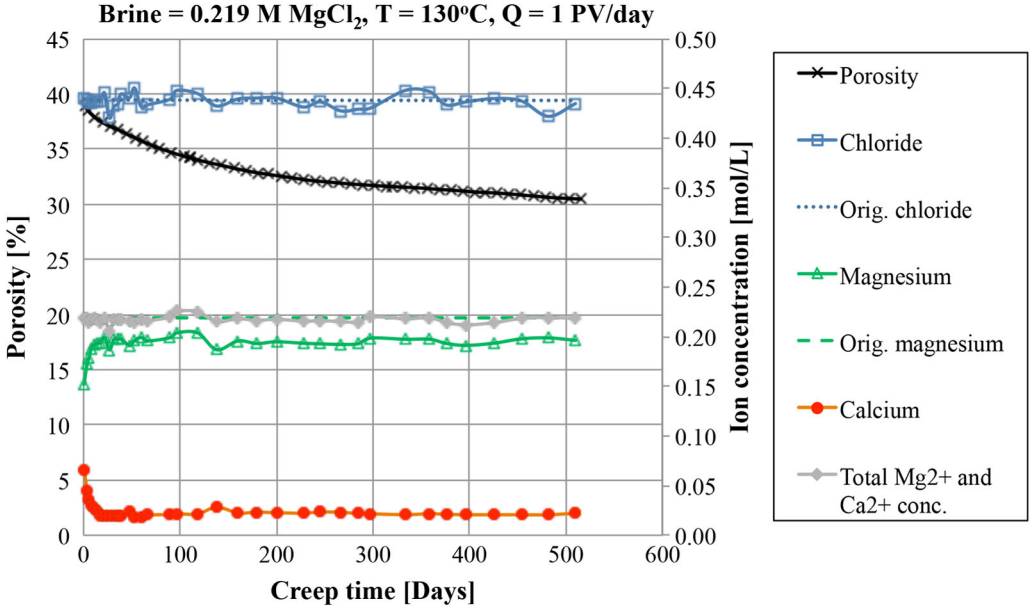


Figure S1. Cross section of the core with changes of the geochemical composition. % = weight percent; ppm = parts per million.

Figure S2. Effluent composition and porosity changes versus time for the long-term test. PV = pore volume.



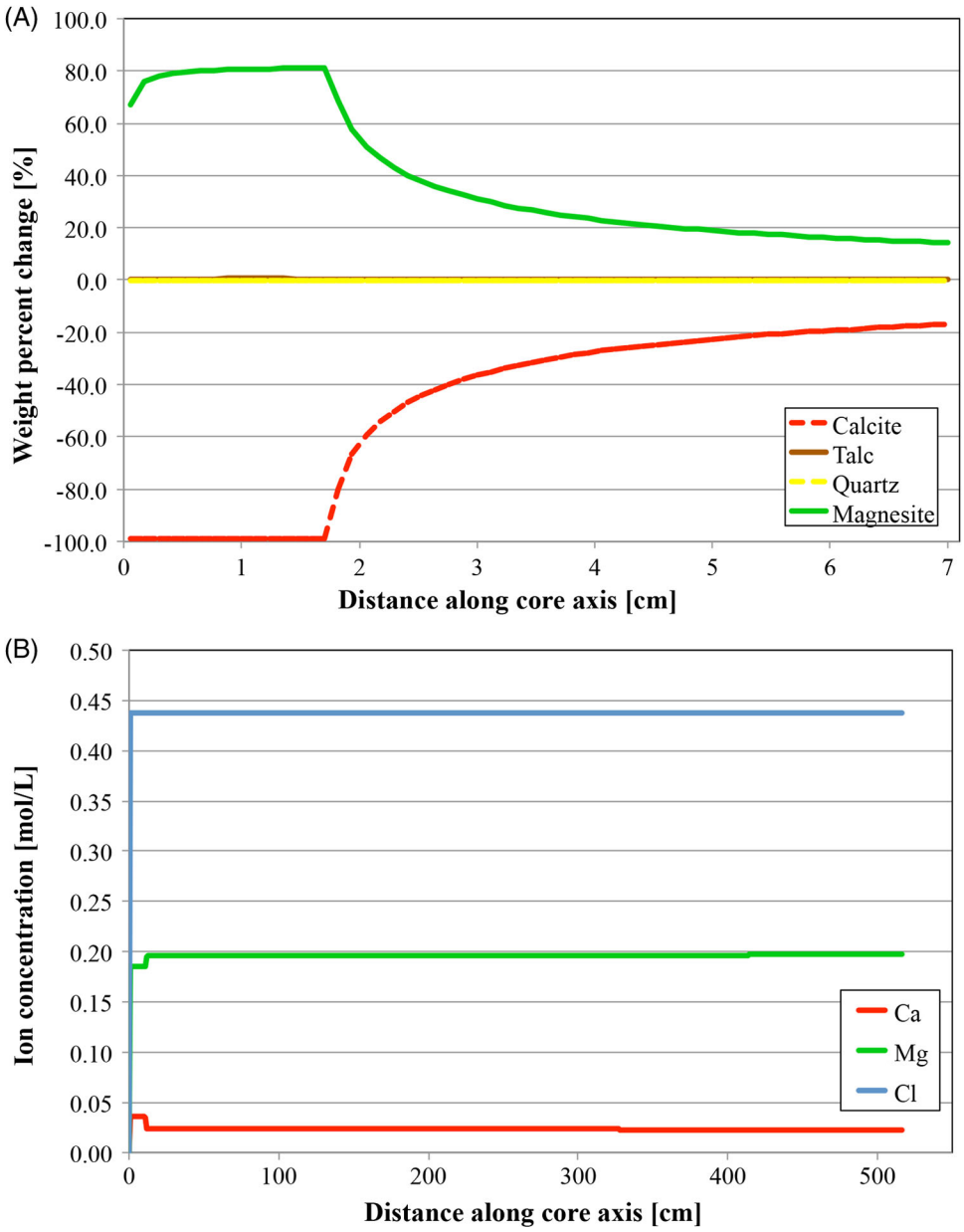


Figure S3. Predicted mineralogical change along the core with (A) the changes in weight and in (B) the concentration of Mg, Ca, and Cl.

Table S1. Complete Geochemical Data of the Tested Chalk and Five Samples of Chalk from the Same Sample Locality for Comparison*

Sample		SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	TiO_2	P_2O_5	MnO	LOI	Sum	Ba	Hf	Nb	Rb	Sr	Th	U		Zr	Y	Cu	Pb	Zn	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Y/Ho	$La/La_{(SH)}$‡	$Ce/Ce_{(SH)}$‡	$Eu/Eu_{(SH)}$‡	TOT/C	TOT/S
	Minimum detection limit	0.01	0.01	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01			1	0.1	0.1	0.1	1	0.2	0.1	8	0.1	0.1	0.1	0.1	1	0.1	0.1	0.02	0.3	0.05	0.02	0.05	0.01	0.05	0.02	0.03	0.01	0.05	0.01					0.02	0.02
	Unit	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm					%	%
LT1	First slice	4.68	0.89	0.38	33.03	14.43	b.d.l.	0.09	0.05	0.06	0.05	45.6	99.4	23	0.4	0.7	3.7	244	0.6	0.8	11	18	8.7	6	1.9	18	9.7	8.9	1.74	8.0	1.23	0.28	1.25	0.20	1.20	0.27	0.90	0.13	0.49	0.10	32	2.13	0.71	1.11	12.53	b.d.l.
LT3	Third slice	4.05	0.68	0.29	6.99	45.58	0.03	0.06	0.04	0.1	0.02	41.9	99.8	14	0.4	b.d.l.	2.7	816	0.7	0.6	b.d.l.	15.6	8.3	3.9	1.1	12	8.6	6.5	1.55	6.0	0.96	0.23	1.08	0.19	1.01	0.20	0.54	0.09	0.64	0.04	42	1.30	0.47	1.08	11.61	b.d.l.
LT4	Fourth slice	3.94	0.71	0.33	3.88	49.42	0.02	0.07	0.04	0.06	0.02	41.3	99.8	15	0.6	0.5	2.9	876	0.4	0.5	b.d.l.	14.9	6.9	2.2	1.1	15	7.7	6.6	1.36	5.9	0.90	0.17	0.89	0.13	0.79	0.22	0.51	0.09	0.48	0.08	31	1.77	0.62	0.96	11.47	0.02
LT5	Fifth slice	3.93	0.71	0.35	3.18	49.87	0.02	0.05	0.04	0.06	0.02	41.6	99.8	18	0.6	b.d.l.	2.8	1019	0.6	0.5	b.d.l.	14	8.4	1.7	1.2	13	9.7	8.0	1.58	7.0	1.01	0.26	1.28	0.17	1.20	0.24	0.68	0.10	0.58	0.08	35	2.05	0.66	1.24	11.48	b.d.l.
LT6	Sixth slice	4.22	0.73	0.29	3.03	50.15	0.02	0.06	0.04	0.08	0.02	41.2	99.8	15	0.3	b.d.l.	3	1016	0.6	0.6	10	13.9	8.9	2.7	1.4	12	10.5	9.0	1.55	6.4	0.96	0.22	1.08	0.17	0.85	0.20	0.65	0.10	0.53	0.05	45	1.84	0.70	1.08	11.55	b.d.l.
LT7	Not tested inlet	4.37	0.7	0.32	0.33	52.22	0.03	0.14	0.04	0.07	0.02	41.6	99.9	25	0.3	0.1	6.2	1096	0.4	0.6	b.d.l.	15.7	7.8	2.3	1.3	12	9.2	7.9	1.54	6.5	1.19	0.23	1.01	0.17	0.87	0.21	0.57	0.08	0.50	0.08	37	1.72	0.63	0.99	11.66	0.02
LT8	Not tested outlet	4.99	0.73	0.37	0.39	51.82	0.03	0.15	0.04	0.08	0.02	41.2	99.8	22	0.4	0.4	6.3	1089	0.6	0.7	11	15.5	7.3	2.8	1.7	14	8.7	7.0	1.7	6.0	1.08	0.23	1.22	0.19	1.07	0.22	0.66	0.08	0.57	0.06	33	1.02	0.42	1.01	11.66	b.d.l.
LT8-A†	Repeat not tested outlet	4.99	0.73	0.37	0.39	51.82	0.03	0.15	0.04	0.08	0.02	41.2	99.8	22	0.4	0.4	6.3	1089	0.6	0.7	11	15.5	7.3	2.8	1.7	14	8.7	7.0	1.7	6.0	1.08	0.23	1.22	0.19	1.07	0.22	0.66	0.08	0.57	0.06	33	1.02	0.42	1.01	11.66	b.d.l.
LIEGE†	Average (n = 5)	2.366	0.414	0.162	0.272	53.542	0.034	0.076	0.024	0.112	0.02	42.8	99.9	34	0.2	0.7	3.8	1053	0.36	1.08	11.2	9.78	8.26	1.68	1.18	10	8.4	5.7	1.41	5.2	0.94	0.23	1.01	0.17	0.91	0.22	0.61	0.09	0.48	0.08	38	1.28	0.43	1.13	12.13	b.d.l.
LIEGE (for average)																																														
V14-L		1.59	0.29	0.17	0.24	54.17	0.03	0.06	0.02	0.08	0.02	43.2	99.9	30	0.2	0.4	2.6	851	0.3	0.9	b.d.l.	11.3	7.2	1.3	1.1	13	6.7	4.7	1.17	4.6	0.78	0.19	0.87	0.13	0.82	0.19	0.52	0.07	0.45	0.07	38	1.39	0.46	1.18	11.86	b.d.l.
V1-L		1.75	0.36	0.08	0.26	53.96	0.03	0.07	0.02	0.07	0.02	43.2	99.9	31	0.1	0.7	3.4	1154	0.2	0.9	13	5.9	6.7	1.5	1	7	7.6	4.8	1.26	4.0	0.84	0.21	0.89	0.15	0.85	0.17	0.56	0.08	0.56	0.07	39	1.04	0.36	1.18	12.39	b.d.l.
V2-L		2.11	0.37	0.2	0.28	53.73	0.04	0.06	0.02	0.21	0.02	42.8	99.8	31	0.2	0.8	3.4	1033	0.4	1.7	11	8.1	10.1	2.4	1.6	13	9.8	6.0	1.73	6.7	1.20	0.27	1.36	0.21	0.82	0.26	0.56	0.12	0.44	0.08	39	1.33	0.39	1.07	12.25	b.d.l.
V3-L		1.57	0.32	0.1	0.27	54.26	0.03	0.05	0.02	0.13	0.02	43.1	99.9	29	0.1	0.3	2.8	1073	0.3	1.2	13	6.2	8.3	1.6	1	6	7.9	4.6	1.25	4.2	0.82	0.20	0.88	0.17	1.13	0.19	0.64	0.08	0.37	0.09	44	1.17	0.36	1.08	12.37	b.d.l.
V3D-L		4.81	0.73	0.26	0.31	51.59	0.04	0.14	0.04	0.07	0.02	41.8	99.8	51	0.4	1.3	6.8	1154	0.6	0.7	19	17.4	9	1.6	1.2	9	10.0	8.2	1.64	6.5	1.06	0.26	1.04	0.19	0.94	0.29	0.75	0.11	0.58	0.11	31	1.51	0.57	1.15	11.80	b.d.l.

*% = weight percent; ppm = parts per million; TOT/C = total carbon; TOT/S = total sulphur; LOI = loss on ignition; b.d.l. = below detection limit; base metals without significance for carbonate material and below detection limit (like Be, Cr, Cd, W, etc.) are excluded.
†Repeated measurement of sample LT8 to ensure accuracy of the geochemical data.
‡Values calculated based on the given data in same table and normalized to shale after Taylor and McLennan (1985).

Table S2(A). Expected Mineralogical Change inside the Core per Pore Volume Flooded of 0.219M $MgCl_2$

Mineral	Weight % Change per PV* Flooded
Calcite	−0.095
Magnesite	0.047
Quartz	−0.027
Talc	0.039

*PV = pore volume.

Table S2(B). Density Measurements on the Flooded Sample

Sample ID	Sample Weight [g]	Solid Volume Pycnom. [ml.]	Solid Density [g/ml.]
LT1–inlet	7.88	2.82	2.798
LT2	10.60	3.83	2.768
LT3	6.96	2.60	2.673
LT4	9.20	3.45	2.669
LT5	7.54	2.82	2.670
LT6–outlet	9.69	3.64	2.662
	20.34	7.58	2.684
	14.97	5.60	2.674
			2.679