



Supplement of

Ancient clays support contemporary biogeochemical activity in the Critical Zone

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	C/N Ratio	N mg/kg	C mg/kg	Microbi al Biomass	Respirati on	Exchangeabl e NO ₃ ⁻	Exchangeabl e NH ₄ ⁺	TIN	Microbial Biomass N	Potential net N Mineralizatio	Potential net Nitrificati	Denitrificati on Potential	± OM
C/N Ratio	1	0.351	.860**	0.310	0.362	0.300	.389*	.482**	.548**	.626**	.439*	.381*	.464*
		0.067	0.000	0.108	0.058	0.120	0.041	0.003	0.003	0.000	0.019	0.045	0.013
	28	28	28	28	28	28	28	28	28	28	28	28	28
N mg/kg		1	.633**	.339*	.333*	.550**	.528**	.668**	.645**	.456*	0.127	0.065	.714**
			0.000	0.035	0.033	0.002	0.004	0.000	0.000	0.015	0.521	0.742	0.000
			28	28	28	28	28	28	28	28	28	28	28
C mg/kg			1	.503**	0.369	0.360	.559**	.645**	.635**	.635**	.435*	0.293	.725**
				0.006	0.053	0.060	0.002	0.000	0.000	0.000	0.021	0.130	0.000
				28	28	28	28	28	28	28	28	28	28
Microbial Biomass C				1	.645**	-0.034	0.067	0.115	0.131	0.238	0.211	-0.016	.424*
					0.000	0.636	0.736	0.558	0.507	0.224	0.281	0.936	0.025
					28	28	28	28	28	28	28	28	28
Respiration					1	0.013	0.144	0.233	0.278	0.303	0.137	0.118	.400*
						0.947	0.465	0.234	0.153	0.117	0.488	0.551	0.035
						28	28	28	28	28	28	28	28
Exchangeabl e NO ₃ ⁻						1	0.306	.504**	.471*	.446*	0.130	0.348	0.218
							0.113	0.006	0.011	0.017	0.511	0.063	0.264
							28	28	28	28	28	28	28
Exchangeabl e NH ₄ ⁺							1	.343**	.768**	.430*	0.281	-0.089	.627**
								0.000	0.000	0.022	0.147	0.654	0.000
								28	28	28	28	28	28
TIN								1	.870**	.571**	0.367	0.016	.638**
									0.000	0.002	0.055	0.934	0.000
									28	28	28	28	28
Microbial Biomass N									1	.746**	.462*	0.004	.723**
										0.000	0.013	0.982	0.000
										28	28	28	28
Potential Net N Mineralizati										1	.532**	0.135	.438**
											0.001	0.435	0.007
											28	28	28
Potential net Nitrification											1	0.135	.377*
												0.432	0.048
												28	28
Potential Denitrificati on												1	-0.047
													0.814
													28
± OM													1

**-. Correlation is significant at the 0.01 level.

*-. Correlation is significant at the 0.05 level.

Table S1. Spearman's rho correlation of all measured variables.

Sample / Location	Texture	Color	Microbial Biomass C $\mu\text{g C g}^{-1}$	Microbial Respiration $\mu\text{g C g}^{-1} \text{d}^{-1}$	Microbial Biomass N $\mu\text{g N g}^{-1}$	Potential Net N Mineralization $\mu\text{g N g}^{-1} \text{d}^{-1}$	Potential Net Nitrification $\mu\text{g N g}^{-1} \text{d}^{-1}$	Denitrification Potential $\mu\text{g N g}^{-1} \text{h}^{-1}$
1N-GP	packed clay	red	112.132	3.396	0.465	-0.046	0.000	5.252
2N-GP	packed clay	red	102.732	4.104	0.686	-0.106	0.000	0.948
3N-GP	packed clay	yellow	97.321	7.876	1.302	0.084	0.036	0.827
4N-GP	packed clay	yellow	75.851	2.906	1.201	0.006	0.015	-0.389
5N-GP	packed clay	yellow	75.674	3.110	0.770	-0.026	-0.010	0.536
6N-GP	sandy clay	white	62.501	3.011	0.569	-0.026	0.000	0.598
7N-GP	packed clay	dark gray	173.448	9.057	12.744	0.238	0.000	0.747
8N-GP	packed clay	dark gray	212.542	5.364	17.528	0.469	0.000	-0.286
9N-GP	packed clay	dark gray	151.138	5.291	33.209	0.347	0.033	-0.243
10N-GP	packed clay	dark gray	134.974	3.863	26.106	0.054	0.000	-0.079
11N-GP	packed clay	red	86.812	3.759	5.889	-0.368	0.007	-0.283
12N-GP	packed clay	light gray	81.445	3.319	1.927	-0.004	0.000	0.119
13N-GP	packed clay	dark gray	60.787	2.932	14.337	0.041	-0.014	-0.094
14N-GP	packed clay	light gray	67.861	2.584	3.454	0.149	0.000	0.301
1N-HHW	packed clay	light gray	69.060	3.671	28.177	0.732	0.521	1.034
2N-HHW	packed clay	light gray	97.301	4.293	15.866	0.571	0.414	9.720
3N-HHW	packed clay	brown	189.972	5.411	22.730	1.310	0.242	0.273
4N-HHW	sandy clay	light gray	144.766	4.026	1.473	0.010	-0.017	1.322
5N-HHW	sandy clay	light gray	98.937	5.312	0.889	0.023	-0.008	0.394
6N-HHW	packed clay	light gray	75.907	2.675	4.390	0.047	0.002	1.389
7N-HHW	packed clay	red	162.892	3.401	0.631	0.029	0.004	-0.683
8N-HHW	packed clay	light gray	167.119	4.589	14.534	0.491	0.458	16.005
9N-HHW	sandy clay	white	62.253	4.381	0.309	0.007	-0.010	0.136
1N-CSP	sandy clay	brown	54.959	2.640	3.212	0.045	0.024	0.470
2N-CSP	sandy clay	brown	87.658	2.899	0.485	0.026	0.017	-0.028
3N-CSP	watery clay	brown	251.434	3.313	0.295	0.009	0.022	0.300
4N-CSP	watery clay	brown	143.976	4.595	0.391	-0.048	-0.026	0.304
5N-CSP	sandy clay	red	77.525	2.971	0.364	-0.033	-0.012	-0.070

Table S2. Values of response variables measuring microbial biomass, respiration, and N cycle processes.

Sample / Location	Texture	Color	Exchangeable $\text{NO}_3^- \mu\text{g N g}^{-1}$	Exchangeable $\text{NH}_4^+ \mu\text{g N g}^{-1}$	Total Inorganic N (TIN) $\mu\text{g N g}^{-1}$	% OM
1N-GP	packed clay	red	0.231	1.184	1.415	5.090
2N-GP	packed clay	red	0.240	1.469	1.709	4.590
3N-GP	packed clay	yellow	0.124	0.841	0.966	2.208
4N-GP	packed clay	yellow	0.246	0.560	0.806	3.013
5N-GP	packed clay	yellow	0.245	0.828	1.073	4.398
6N-GP	sandy clay	white	0.203	0.547	0.750	0.547
7N-GP	packed clay	dark gray	0.283	10.959	11.242	15.805
8N-GP	packed clay	dark gray	0.269	14.686	14.955	11.391
9N-GP	packed clay	dark gray	0.200	30.308	30.509	7.106
10N-GP	packed clay	dark gray	0.274	24.531	24.805	6.301
11N-GP	packed clay	red	0.026	8.398	8.424	5.833
12N-GP	packed clay	light gray	0.260	0.628	0.889	5.767
13N-GP	packed clay	dark gray	0.305	14.932	15.237	4.749
14N-GP	packed clay	light gray	0.231	2.480	2.711	4.370
1N-HHW	packed clay	light gray	8.914	1.976	10.890	7.015
2N-HHW	packed clay	light gray	10.950	1.168	12.118	10.312
3N-HHW	packed clay	brown	4.130	9.233	13.362	4.684
4N-HHW	sandy clay	light gray	0.216	0.132	0.348	2.247
5N-HHW	sandy clay	light gray	0.207	0.193	0.400	1.527
6N-HHW	packed clay	light gray	1.821	0.889	2.710	1.567
7N-HHW	packed clay	red	0.157	0.103	0.261	5.298
8N-HHW	packed clay	light gray	10.083	0.597	10.680	5.861
9N-HHW	sandy clay	white	0.205	0.047	0.252	0.928
1N-CSP	sandy clay	brown	0.709	2.033	2.743	0.988
2N-CSP	sandy clay	brown	0.059	0.136	0.195	2.039
3N-CSP	watery clay	brown	0.038	0.374	0.412	1.685
4N-CSP	watery clay	brown	0.283	0.283	0.565	1.499
5N-CSP	sandy clay	red	0.335	0.224	0.559	0.440

Table S3. Values of response variables measuring N cycling content and organic matter.

Sample / Location	Texture	Color	Total N mg N kg ⁻¹	Total C mg C kg ⁻¹	C/N Ratio
1N-GP	packed clay	red	285	2480	9
2N-GP	packed clay	red	295	3440	12
3N-GP	packed clay	yellow	195	715	4
4N-GP	packed clay	yellow	275	620	2
5N-GP	packed clay	yellow	375	830	2
6N-GP	sandy clay	white	75	595	8
7N-GP	packed clay	dark gray	1895	54780	29
8N-GP	packed clay	dark gray	1235	39160	32
9N-GP	packed clay	dark gray	1245	39305	32
10N-GP	packed clay	dark gray	550	5655	10
11N-GP	packed clay	red	340	735	2
12N-GP	packed clay	light gray	340	760	2
13N-GP	packed clay	dark gray	380	1080	3
14N-GP	packed clay	light gray	335	1425	4
1N-HHW	packed clay	light gray	975	17625	18
2N-HHW	packed clay	light gray	1540	33200	22
3N-HHW	packed clay	brown	500	4150	8
4N-HHW	sandy clay	light gray	440	4565	10
5N-HHW	sandy clay	light gray	85	875	10
6N-HHW	packed clay	light gray	280	3130	11
7N-HHW	packed clay	red	205	1160	6
8N-HHW	packed clay	light gray	710	8145	12
9N-HHW	sandy clay	white	100	705	7
1N-CSP	sandy clay	brown	120	1580	13
2N-CSP	sandy clay	brown	140	995	7
3N-CSP	watery clay	brown	245	1445	6
4N-CSP	watery clay	brown	405	655	2
5N-CSP	sandy clay	red	570	355	1

Table S4. Values for total N and C content and their ratio.