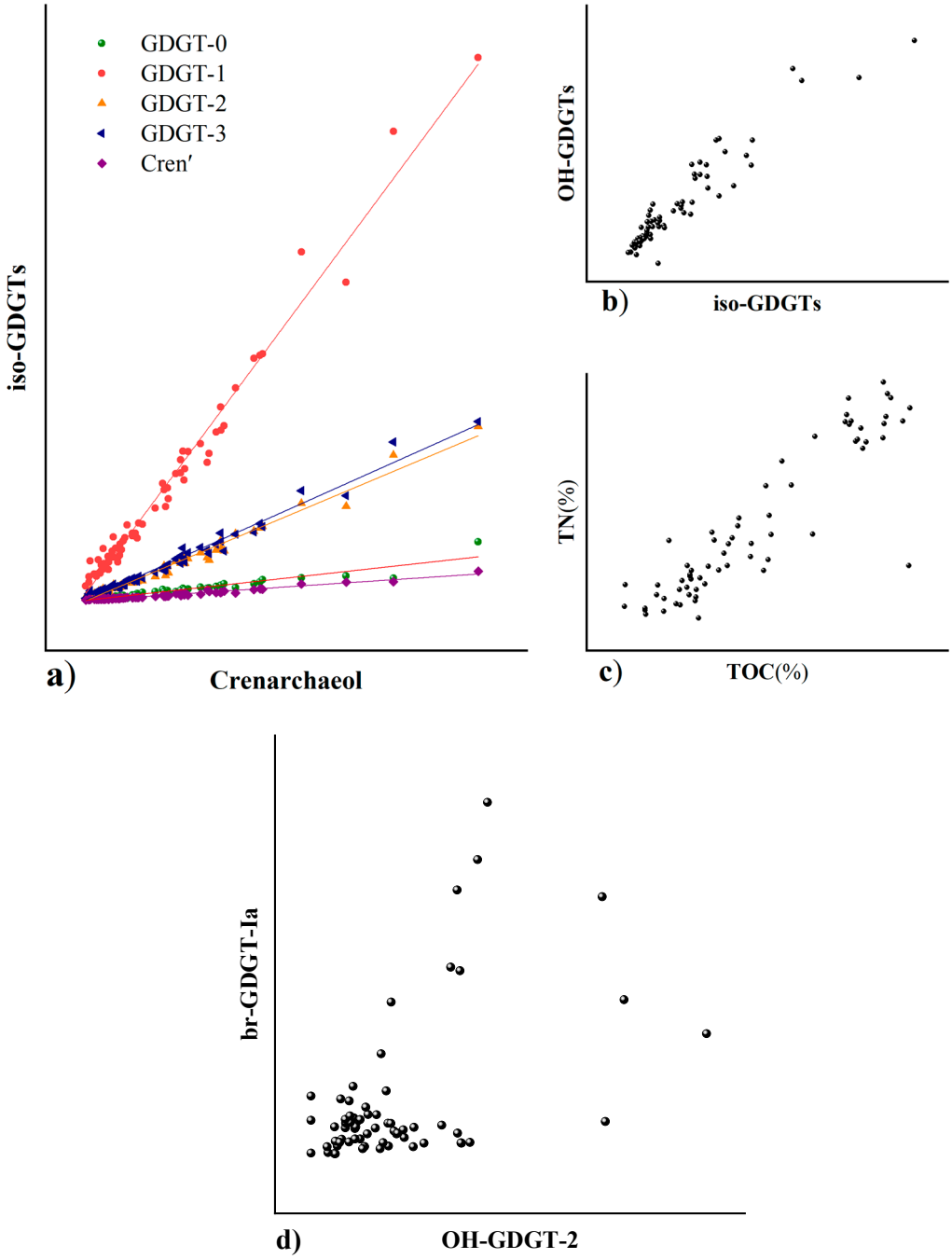

Figure S1. Relationship between GDGTs. (a) *Crenarchaeol* and other iso-GDGTs; (b) iso-GDGTs and OH-GDGTs; (c) relationship between TOC and TN; (d) OH-GDGT-2 and br-GDGT-Ia.

Table S1. Total organic carbon (TOC) and total nitrogen (TN) content, $\delta^{13}C$ and $\delta^{15}N$ values, and C/N ratio in core GC10.

Depth(cm)	$d^{15}N_{Air}$ ‰	TN %	$d^{13}C_{V\text{-}PDB}$ ‰	TOC %	C/N
4	4.71	0.17	-20.87	1.75	11.78
6	4.53	0.18	-20.12	1.73	11.21
10	4.63	0.17	-20.08	1.75	11.77
12	4.68	0.17	-20.29	1.76	12.01
16	4.58	0.18	-20.18	1.81	11.80
18	4.55	0.18	-20.89	1.87	12.00
22	4.62	0.18	-20.11	1.74	11.37
24	4.36	0.19	-20.17	1.81	11.22
28	4.38	0.19	-20.26	1.82	11.45
30	4.47	0.18	-20.46	1.73	10.98
34	4.36	0.18	-20.67	1.82	11.57
36	4.62	0.18	-20.49	1.73	11.40
40	4.58	0.17	-20.58	1.81	12.12
42	4.59	0.18	-21.13	1.85	12.12
46	4.50	0.18	-20.58	1.72	11.30
48	4.48	0.17	-20.59	1.77	11.95
52	4.55	0.18	-20.46	1.76	11.63
54	4.56	0.18	-20.73	1.81	11.89
58	4.67	0.17	-20.81	1.66	11.09
60	4.81	0.17	-20.51	1.58	10.99
64	4.68	0.16	-20.61	1.55	11.16
66	4.58	0.15	-20.93	1.49	11.30
70	4.37	0.15	-20.81	1.55	11.76
72	4.67	0.15	-20.76	1.48	11.43
76	4.67	0.15	-20.78	1.46	11.62
78	4.64	0.15	-21.27	1.56	12.18
82	4.64	0.15	-20.86	1.33	10.52
84	4.75	0.15	-20.90	1.43	11.11
88	4.67	0.14	-20.87	1.45	11.73
90	4.78	0.15	-21.19	1.47	11.57
94	4.72	0.15	-21.25	1.51	12.02
96	4.86	0.15	-21.22	1.43	11.29
100	4.83	0.15	-21.69	1.65	12.89
102	4.73	0.14	-22.28	1.86	15.36
106	4.81	0.14	-21.05	1.38	11.67
108	4.90	0.14	-21.04	1.38	11.59
112	4.88	0.14	-21.61	1.41	12.03
114	4.64	0.16	-20.59	1.60	11.56
118	4.85	0.14	-21.63	1.54	12.83
120	5.00	0.14	-21.26	1.44	11.99

124	4.74	0.14	-21.32	1.39	12.00
126	4.72	0.14	-21.34	1.24	10.54
130	4.37	0.14	-21.16	1.40	11.81
132	4.56	0.14	-21.18	1.37	11.32
136	4.34	0.14	-21.44	1.55	12.66
138	4.46	0.14	-21.00	1.42	11.72
142	4.49	0.14	-21.40	1.46	12.05
144	4.38	0.14	-20.90	1.36	11.53
148	4.48	0.14	-21.68	1.51	12.28
150	4.45	0.14	-21.07	1.38	11.49
154	4.59	0.14	-21.09	1.38	11.55
156	4.58	0.14	-20.81	1.31	11.17
160	4.49	0.14	-21.30	1.37	11.77
162	4.58	0.13	-21.14	1.30	11.35
166	4.29	0.13	-21.36	1.32	11.86
168	4.61	0.14	-21.35	1.36	11.67
172	4.49	0.13	-21.25	1.36	12.04
174	4.38	0.13	-21.13	1.28	11.46
178	4.45	0.13	-21.43	1.35	11.93
180	4.19	0.13	-21.19	1.28	11.42
184	4.43	0.13	-21.69	1.39	12.16
186	4.21	0.13	-21.04	1.23	10.97
190	4.12	0.13	-21.56	1.40	12.72
192	4.23	0.13	-21.38	1.38	11.98
196	4.22	0.13	-21.49	1.32	11.58
198	4.13	0.13	-21.67	1.39	12.24
200	4.49	0.13	-21.36	1.28	11.57

Table S2. Reconstruct paleotemperatures based on TEX_{86} and RI-OH in core GC10.

Depth/cm	TEX_{86}-SST	RI-SST	RI-OH $_{summer\text{-}SST}$	OH-2/OHs-SST
4	23.624	21.829	26.78	30.36
6	24.047	23.877	27.79	30.53
10	23.776	22.249	26.99	30.57
12	23.214	21.498	26.62	30.44
16	23.432		-0.09	30.55
18	25.220	24.287	27.99	30.63
22	24.173	24.994	28.34	30.52
24	23.706	24.330	28.01	30.37
28	23.308	24.283	27.99	30.44
30	24.350	23.828	27.76	30.44
34	21.778	22.959	27.34	30.38
36	23.702	22.723	27.22	30.42
40	23.712	22.496	27.11	30.50
42	22.974	22.093	26.91	30.43

46	22.394	23.783	27.74	30.34
48	23.659	21.456	26.60	30.45
52	24.205	23.075	27.39	30.49
54	22.560	22.250	26.99	30.45
58	23.889	22.862	27.29	30.49
60	23.382	23.150	27.43	30.47
64	23.263	21.706	26.72	30.52
66	25.060	23.346	27.53	30.63
70	23.907	21.209	26.48	30.50
72	25.103	23.466	27.58	30.66
76	23.910	23.406	27.55	30.54
78	23.772	23.277	27.49	30.43
82	25.138	2.850	17.46	30.64
84	25.096	23.822	27.76	30.63
88	24.371	22.308	27.02	30.65
90	24.311	22.038	26.88	30.63
94	23.999	22.876	27.29	30.51
96	24.625	22.202	26.96	30.59
100	23.850	21.526	26.63	30.54
102	25.422	20.732	26.24	30.66
106	24.034	22.659	27.19	30.59
108	24.937	22.952	27.33	30.69
112	23.273	22.892	27.30	30.54
114	21.284	24.406	28.05	30.42
118	23.709	22.179	26.95	30.54
120	24.825	22.692	27.20	30.68
124	25.235	22.645	27.18	30.68
126	24.620	23.070	27.39	30.62
130	23.978	22.180	26.95	30.61
132	23.692	21.019	26.38	30.64
136	24.874	24.102	27.90	30.64
138	23.990	22.643	27.18	30.58
142	24.110	22.792	27.25	30.67
144	21.297	24.816	28.25	30.51
148	20.711	22.287	27.01	30.62
150	24.797	23.222	27.46	30.67
154	24.939	22.476	27.10	30.61
156	24.773	24.437	28.06	30.68
160	23.252	23.810	27.75	30.58
162	25.438	23.861	17.46	30.71
166	23.332	23.189	27.45	30.50
168	22.224	21.755	26.74	30.52
172	25.476	22.604	27.16	30.71
174	25.049	24.815	28.25	30.62

178	23.100	22.864	27.29	30.61
180	25.126	21.314	26.53	30.68
184	26.696	21.876	26.80	30.76
186	24.566		-0.09	30.63
190	24.096	23.692	27.70	30.61
192	23.745	21.990	26.86	30.53
196	24.957	23.816	27.76	30.54
198	22.173	21.866	26.80	30.41
200	23.104	22.083	26.91	30.50

Table S3. Indices of br-GDGTs and percentage of terrestrial organic carbon based on a binary mixing model of $\delta^{13}C$ and BIT.

Depth(cm)	BIT	DC	$\delta^{13}C$ -OC%$_{terr}$	BIT -OC%$_{terr}$
4	0.09	0.24	12.36%	7.10%
6	0.06	0.27	1.70%	3.76%
10	0.05	0.26	1.11%	2.42%
12	0.04	0.25	4.17%	0.97%
16	0.04	0.27	2.53%	1.37%
18	0.04	0.29	12.70%	1.23%
22	0.05	0.29	1.63%	1.88%
24	0.05	0.30	2.43%	1.78%
28	0.02	0.29	3.76%	-0.98%
30	0.03	0.30	6.59%	-0.02%
34	0.02	0.29	9.50%	-0.72%
36	0.04	0.28	6.99%	1.27%
40	0.04	0.29	8.33%	1.53%
42	0.02	0.29	16.20%	-0.86%
46	0.02	0.32	8.29%	-0.94%
48	0.02	0.28	8.47%	-0.82%
52	0.03	0.32	6.50%	0.37%
54	0.02	0.29	10.37%	-0.92%
58	0.04	0.29	11.50%	0.59%
60	0.05	0.27	7.23%	2.53%
64	0.04	0.29	8.74%	1.65%
66	0.05	0.26	13.27%	2.74%
70	0.04	0.24	11.56%	1.23%
72	0.06	0.25	10.80%	3.10%
76	0.07	0.21	11.13%	4.18%
78	0.08	0.24	18.20%	5.49%
82	0.07	0.24	12.34%	4.97%
84	0.07	0.23	12.86%	4.53%
88	0.08	0.21	12.39%	5.78%
90	0.06	0.22	16.99%	3.85%

94	0.09	0.22	17.90%	7.03%
96	0.08	0.24	17.47%	5.76%
100	0.06	0.21	24.17%	2.86%
102	0.09	0.22	32.61%	6.38%
106	0.10	0.20	14.96%	7.38%
108	0.08	0.20	14.84%	6.09%
112	0.07	0.19	22.94%	4.10%
114	0.05	0.24	8.41%	2.67%
118	0.12	0.19	23.30%	9.68%
120	0.11	0.18	17.94%	9.10%
124	0.10	0.20	18.90%	8.23%
126	0.11	0.21	19.10%	9.34%
130	0.10	0.22	16.51%	8.09%
132	0.10	0.19	16.80%	7.58%
136	0.09	0.21	20.54%	6.78%
138	0.09	0.21	14.27%	6.78%
142	0.11	0.19	20.06%	9.53%
144	0.10	0.20	12.86%	8.33%
148	0.13	0.17	23.93%	11.20%
150	0.11	0.18	15.33%	8.82%
154	0.12	0.20	15.57%	10.46%
156	0.13	0.19	11.57%	10.67%
160	0.09	0.17	18.50%	6.49%
162	0.14	0.19	16.26%	12.15%
166	0.21	0.17	19.41%	19.86%
168	0.13	0.17	19.29%	10.70%
172	0.14	0.16	17.87%	12.26%
174	0.12	0.16	16.17%	9.82%
178	0.12	0.17	20.40%	9.92%
180	0.18	0.18	17.06%	16.66%
184	0.16	0.16	24.10%	14.98%
186	0.16	0.16	14.89%	14.75%
190	0.19	0.18	22.33%	17.70%
192	0.18	0.16	19.69%	16.73%
196	0.19	0.17	21.26%	18.19%
198	0.18	0.19	23.89%	17.08%
200	0.19	0.18	19.46%	18.04%

Table S4. Various indices were used to evaluate the source of GDGTs.

Depth /cm	%GDGT-0	GDGT-0/Cren	GDGT-2/Cren	%GDGT-2	MI	Cren/Cren'	#Rings indices
4	0.51	1.05	0.27	0.39	0.35	10.22	0.84
6	0.39	0.65	0.18	0.40	0.27	15.70	0.38
10	0.33	0.48	0.15	0.39	0.24	17.88	0.29
12	0.38	0.62	0.20	0.43	0.29	22.64	0.33
16	0.35	0.54	0.17	0.41	0.25	20.82	0.51
18	0.35	0.53	0.19	0.47	0.26	24.18	1.00
22	0.35	0.55	0.19	0.44	0.27	19.77	0.78
24	0.41	0.68	0.22	0.41	0.31	13.49	0.35
28	0.40	0.66	0.21	0.43	0.29	19.32	0.30
30	0.41	0.68	0.24	0.45	0.31	17.29	0.40
34	0.40	0.66	0.21	0.43	0.30	24.30	0.31
36	0.40	0.66	0.23	0.45	0.31	18.91	0.34
40	0.40	0.65	0.21	0.45	0.28	21.09	0.36
42	0.40	0.66	0.20	0.41	0.29	17.73	1.17
46	0.43	0.74	0.25	0.46	0.33	27.86	0.34
48	0.38	0.62	0.21	0.44	0.29	18.71	0.34
52	0.37	0.58	0.20	0.44	0.28	18.83	0.35
54	0.40	0.68	0.19	0.41	0.28	20.80	0.33
58	0.37	0.59	0.20	0.43	0.28	19.76	0.33
60	0.37	0.60	0.19	0.42	0.28	18.55	0.31
64	0.37	0.59	0.19	0.44	0.27	25.85	0.35
66	0.36	0.56	0.17	0.43	0.25	18.10	0.30
70	0.39	0.65	0.21	0.45	0.28	19.48	0.26
72	0.34	0.51	0.17	0.45	0.24	22.32	0.37
76	0.34	0.52	0.17	0.41	0.26	20.36	0.27
78	0.44	0.77	0.24	0.44	0.32	19.43	0.24
82	0.35	0.55	0.16	0.42	0.24	16.50	0.26
84	0.36	0.56	0.19	0.46	0.26	23.76	0.25
88	0.35	0.53	0.16	0.43	0.24	25.09	0.29
90	0.38	0.60	0.16	0.42	0.24	18.59	0.23
94	0.37	0.59	0.19	0.43	0.28	21.60	0.24
96	0.35	0.54	0.17	0.41	0.25	18.86	0.26
100	0.38	0.60	0.18	0.42	0.28	26.40	0.90
102	0.35	0.53	0.17	0.43	0.24	18.90	1.83
106	0.37	0.59	0.17	0.42	0.25	21.75	0.30
108	0.37	0.58	0.16	0.43	0.24	21.81	0.36
112	0.38	0.61	0.19	0.44	0.27	26.22	1.12
114	0.38	0.61	0.17	0.38	0.27	19.52	0.61
118	0.37	0.58	0.17	0.39	0.26	17.49	0.50
120	0.36	0.57	0.17	0.45	0.24	24.21	1.03
124	0.33	0.49	0.17	0.46	0.24	27.94	0.62

126	0.35	0.53	0.17	0.43	0.25	21.71	1.09
130	0.32	0.48	0.14	0.39	0.23	18.50	0.64
132	0.32	0.47	0.14	0.41	0.22	25.70	0.61
136	0.30	0.42	0.16	0.44	0.24	26.39	0.73
138	0.43	0.76	0.19	0.43	0.28	24.70	0.60
142	0.34	0.52	0.15	0.44	0.23	29.62	0.22
144	0.37	0.60	0.15	0.39	0.25	26.95	0.49
148	0.34	0.51	0.10	0.32	0.20	23.22	0.19
150	0.33	0.50	0.16	0.44	0.24	26.97	0.34
154	0.35	0.54	0.17	0.43	0.26	21.01	0.23
156	0.37	0.59	0.15	0.41	0.23	18.32	0.62
160	0.41	0.69	0.19	0.46	0.27	42.07	0.89
162	0.33	0.50	0.16	0.44	0.23	24.05	0.35
166	0.37	0.60	0.17	0.40	0.27	19.90	0.42
168	0.45	0.83	0.19	0.42	0.29	24.59	0.55
172	0.32	0.48	0.15	0.44	0.23	25.49	0.81
174	0.38	0.61	0.18	0.43	0.26	21.87	0.17
178	0.37	0.59	0.15	0.40	0.24	25.67	0.53
180	0.33	0.50	0.16	0.45	0.24	25.54	0.22
184	0.30	0.42	0.14	0.40	0.20	14.57	0.18
186	0.33	0.49	0.15	0.42	0.24	21.15	0.20
190	0.35	0.54	0.16	0.41	0.24	21.05	0.21
192	0.37	0.59	0.18	0.41	0.27	20.03	0.60
196	0.34	0.52	0.19	0.43	0.27	21.27	0.35
198	0.41	0.69	0.20	0.42	0.30	27.77	0.45
200	0.43	0.77	0.20	0.42	0.29	20.98	0.63

Table S5. Annual average surface seawater temperature (SST) and surface seawater salinity (SSS) data of the equatorial Atlantic from 1955 to 2017(3.5°N; 5.5°E).

Month	1	2	3	4	5	6	7	8	9	10	11	12
Salinity/psu	/	33.91	32.60	34.66	34.00	33.49	34.62	34.38	33.69	32.81	30.48	29.69
SST/℃	27.51	29.06	29.26	27.79	28.99	28.11	26.72	26.06	26.51	27.67	27.99	28.36