

Supplement 1: GeoB20616-1 Oxygen and carbon isotopic composition of planktonic foraminifera.

Depth	$\delta^{18}\text{O}$ (‰ VPDB)	$\delta^{13}\text{C}$ (‰ VPDB)
395	-0.44	0.554
455	-0.65	0.709
490	-0.58	0.276
505	-0.72	0.669
545	-0.63	0.622
605	-0.73	0.435
630	-0.87	0.624
675	-0.35	0.267
695	-0.39	1.277
755	-1.03	0.954
765	-0.93	0.719
775	-1.03	0.683
785	-1.00	0.267
795	-0.86	0.772
810	-1.37	0.519
820	-1.00	0.125
830	-1.25	1.091
834	-1.27	0.519
845	-1.27	0.561
855	-1.10	0.711
865	-0.77	0.625
875	-1.27	0.663
885	-1.42	0.939
895	-1.16	0.147
905	-1.66	0.208
915	-1.58	0.927
925	-1.29	0.616
935	-1.56	0.101

Supplement 2: GeoB20616-1
downcore sea surface temperatures
(SST) calculated following Lea et al.
2003 using the listed ICP-OES

depth (cm)	Mg/Ca	SST (°C)
40.5	4.38	27.5
145.5	3.77	25.8
195.5	3.44	24.7
245.5	3.40	24.6
295.5	3.26	24.1
345.5	3.89	26.1
385.5	3.40	24.6
395.5	2.97	23.1
410.5	3.42	24.7
420.5	3.20	23.9
430.5	3.44	24.7
440.5	3.53	25.0
455.5	3.37	24.5
470.5	3.35	24.5
480.5	3.30	24.3
490.5	3.09	23.5
505.5	3.28	24.2
510.5	3.44	24.8
520.5	3.33	24.4
525.5	3.26	24.2
535.5	3.60	25.3
545.5	3.28	24.2
555.5	3.60	25.3
565.5	3.48	24.9
575.5	3.61	25.3
585.5	3.50	25.0
595.5	3.24	24.1
605.5	3.56	25.1
615.5	3.55	25.1
630.5	4.04	26.6
640.5	3.22	24.0
655.5	3.30	24.3
665.5	3.82	25.9
675.5	3.62	25.3
685.5	3.71	25.6
695.5	3.61	25.3
705.5	3.70	25.6
715.5	3.66	25.4
725.5	3.80	25.9
735.5	3.97	26.4
745.5	3.78	25.8
765.5	3.74	25.7
795.5	3.46	24.8
805.5	3.64	25.4
830.5	3.72	25.6
865.5	3.72	25.6
885.5	3.75	25.7
915.5	4.22	27.1

Supplement 3: GeoB20616-1 organic geochemical down-core data. n-Alkane isotopic composition and distribution descriptive parameters averaged. The elevated CPI values ranging from 3.8 to 14 indicate that the n alkanes within the terrestrial and marine samples were likely derived from nondegraded, terrestrial, higher plant material (Eglinton & Hamilton, 1967). We focus the discussion on the isotopic signals of the n-C31 alkane but note that the n-C29 and n-C33 alkanes reveal similar trends.

Depth (cm)	$\delta^{13}\text{C}-n\text{C}_{29}$ (‰ VPDB)	$\delta^{13}\text{C}-n\text{C}_{31}$ (‰ VPDB)	$\delta^{13}\text{C}-n\text{C}_{33}$ (‰ VPDB)	$\delta\text{D}-n\text{C}_{29}$ (‰ VSMOW)	$\delta\text{D}-n\text{C}_{31}$ (‰ VSMOW)	$\delta\text{D}-n\text{C}_{33}$ (‰ VSMOW)	CPI ₂₅₋₃₃
2	-26.0	-25.2	-23.3	-133	-147	-150	6
12	-25.6	-24.8	-23.2	-140	-147	-150	6
22	-26.2	-25.1	-23.3	-138	-145	-148	7
32	-26.1	-25.0	-23.2	-144	-147	-151	7
42	-26.0	-24.8	-23.0	-130	-146	-148	7
52	-25.7	-25.3	-23.2				7
62				-140	-147	-148	7
72	-25.9	-24.9	-23.0	-137	-150	-150	8
82	-25.2	-24.3	-22.5	-134	-145	-149	7
92	-24.9	-24.5	-22.4	-136	-150	-151	8
102	-25.1	-24.4	-22.5	-141	-150	-151	7
112	-25.2	-24.5	-22.6	-136	-150	-150	7
122	-25.2	-24.4	-22.5	-145	-151	-151	8
132	-25.4	-24.5	-22.7	-135	-150	-149	7
142	-25.5	-24.9	-22.8	-141	-147	-147	7
152	-24.8	-24.1	-22.2	-139	-148	-145	7
162	-25.0	-24.7	-22.6	-143	-149	-149	8
172	-25.2	-24.6	-22.6	-135	-148	-149	7
182	-24.9	-24.2	-22.3	-138	-149	-151	7
192	-25.0	-24.3	-22.4	-139	-147	-147	7
202	-25.1	-24.4	-22.5	-138	-148	-148	7
212	-25.0	-24.2	-22.4	-130	-147	-148	7
222	-24.7	-24.1	-22.2	-137	-150	-150	11
232	-25.0	-24.2	-22.4	-135	-151	-149	8
242	-25.5	-24.4	-22.5	-135	-151	-150	7
252	-24.7	-24.2	-22.3	-132	-149	-148	7
262	-25.3	-24.3	-22.5	-132	-148	-148	7
272	-25.4	-24.3	-22.4	-131	-147	-148	7
282	-25.0	-24.0	-22.3	-135	-145	-149	7
292				-138	-146	-148	8
312	-25.2	-24.3	-22.4	-138	-144	-148	7
322	-25.4	-24.3	-22.6	-130	-145	-147	7
332	-25.4	-24.6	-22.6	-132	-145	-147	7
342	-25.3	-24.3	-22.5	-142	-149	-151	7
352	-25.5	-24.5	-22.6	-127	-144	-147	7
362	-25.9	-25.2	-23.2	-141	-145	-150	8
372	-25.1	-24.0	-22.1	-133	-148	-152	8
382	-25.1	-24.2	-22.3	-132	-148	-149	7
392	-25.0	-24.3	-22.6	-143	-151	-153	7
402	-24.9	-23.9	-22.2	-137	-152	-152	8
412	-24.8	-23.9	-22.1	-143	-153	-155	7
422	-24.8	-23.9	-22.0	-144	-153	-153	8
432	-24.9	-23.9	-22.1	-142	-152	-154	8
442	-25.0	-24.0	-22.2	-136	-151	-152	7
452	-25.3	-24.1	-22.4	-138	-154	-154	7
462	-24.9	-23.9	-22.2	-137	-153	-154	7
472	-25.0	-23.9	-22.0	-143	-150	-152	7
482	-24.7	-23.8	-22.0	-145	-150	-152	6
492	-25.0	-24.0	-22.1	-138	-153	-154	7
502	-24.7	-24.0	-22.1	-142	-153	-153	7
512	-25.0	-24.1	-22.1	-145	-152	-153	7
522	-24.9	-24.3	-22.2	-143	-154	-155	7
532	-24.9	-23.9	-22.0	-142	-152	-154	7
542	-24.9	-23.9	-22.1	-141	-152	-155	6
552	-24.1	-24.3	-22.7	-139	-151	-154	7
562	-24.7	-23.6	-22.0	-141	-154	-155	9
572	-24.4	-23.6	-21.9	-137	-151	-153	7
582	-24.6	-23.6	-22.1	-147	-153	-154	7
592	-24.3	-23.6	-22.0	-147	-153	-155	7
602	-24.8	-23.7	-21.9	-138	-153	-155	6
612	-24.7	-23.6	-22.1	-147	-156	-156	7
622	-25.1	-24.1	-22.3	-145	-151	-152	7
632	-25.1	-24.0	-22.3	-138	-150	-152	7
642	-25.0	-23.9	-22.1	-134	-147	-148	6
652	-25.1	-24.1	-22.4	-139	-149	-148	7
662	-25.1	-24.1	-22.4	-136	-148	-149	7
672	-25.4	-24.5	-22.8	-132	-149	-148	7
682	-25.4	-23.9	-22.5	-146	-153	-153	8
692	-24.8	-24.0	-22.4	-134	-151	-152	7
702	-25.0	-24.1	-22.6	-134	-150	-151	7
712	-24.8	-24.1	-22.5	-134	-151	-153	7
722	-25.1	-24.0	-22.6	-144	-151	-152	7
732	-25.3	-24.2	-22.8	-138	-154	-156	7
742	-25.6	-24.1	-22.7	-138	-153	-155	7
752	-25.4	-24.2	-22.6	-138	-153	-156	7
762	-25.4	-24.1	-22.6	-140	-152	-153	7
772	-25.4	-24.1	-22.6	-145	-151	-153	7
782	-26.3	-24.5	-23.0	-137	-147	-150	6
793	-25.8	-24.4	-22.7	-142	-151	-154	8
802	-25.2	-24.2	-22.3	-153	-157	-159	7
812	-25.3	-24.0	-22.3	-137	-157	-159	6
822	-25.3	-23.9	-22.3	-149	-156	-159	6
832	-24.0	-23.8	-22.2	-137	-154	-155	5
842	-25.5	-24.2	-22.6	-144	-151	-153	6
852	-25.6	-24.5	-22.8	-141	-147	-152	7
862	-26.2	-24.9	-23.1	-142	-146	-151	1
872	-25.9	-24.5	-22.8	-146	-156	-157	6
882	-26.2	-24.6	-22.9	-147	-157	-157	6
892	-25.8	-24.4	-22.7	-151	-158	-161	7
902	-26.1	-24.5	-22.9	-150	-159	-160	6
912	-26.4	-25.0	-22.9	-139	-154	-157	7
922	-26.6	-25.2	-23.1	-141	-155	-158	7
932	-26.3	-25.7	-23.6	-134	-144	-146	7

Supplement 4: GeoB20616-1 inorganic geochemical down-core data from discrete XRF measurements.

depth (cm)	Al (mg/kg)	Ca (mg/kg)	Fe (mg/kg)	K (mg/kg)
5.5	41601	17248	27159	8911
10.5	40009	184378	26882	8863
15.5	33894	202638	23765	8045
20.5	32489	209794	22430	7864
25.5	42712	174836	30180	10010
30.5	51353	145437	36638	11646
35.5	52964	143556	38025	12066
40.5	61319	114217	41607	13549
45.5	62755	114701	43780	13466
50.5	76367	67954	51567	15949
55.5	64118	106827	43037	13586
60.5	81808	55271	53594	16917
65.5	78369	59242	50854	16399
70.5	75738	70803	48374	15809
75.5	78203	60655	52427	16661
80.5	78352	59011	51635	16528
85.5	77321	59370	54169	16743
90.5	76465	63916	55399	16351
95.5	75170	61400	53243	16427
100.5	77240	61674	55229	16505
105.5	74527	68091	55522	16528
110.5	74176	67078	52330	15914
115.5	71905	75806	48928	15316
120.5	68726	82184	47674	15031
125.5	64537	95917	45311	13962
130.5	61688	99668	41571	13308
135.5	59928	106381	41391	13475
140.5	62339	102200	42106	13815
145.5	53917	124124	38125	12401
150.5	53583	129426	38349	12385
155.5	62463	104697	43747	13950
160.5	66270	88069	48473	14453
165.5	56286	115156	39825	13046
170.5	67792	80244	44942	14654
175.5	66981	88478	45807	14197
180.5	62491	95931	42658	13873
185.5	65334	99870	47296	14113
190.5	62511	102887	41707	13467
195.5	66868	96885	48235	14988
200.5	67068	89420	49711	15021
205.5	69028	90573	44979	14341
210.5	60283	114739	42526	13499
215.5	69104	88862	45349	14645
220.5	70456	88409	45770	14638
225.5	72078	84770	46615	14792
230.5	65131	103541	43173	13557
235.5	56941	129414	38257	12407
240.5	60846	120300	40670	12692
245.5	57609	129981	41183	12521
250.5	58536	123484	41087	12795
255.5	58042	123364	40032	12580
260.5	57797	129772	43287	13060
280.5	60102	118404	40438	13120
285.5	59111	122979	41101	12896
290.5	60619	123278	41523	12833
295.5	48348	167591	34485	10447
300.5	44819	174138	31605	10008
305.5	44879	172727	32203	10102
310.5	45798	169598	32696	10287
315.5	51376	146621	36184	11618
320.5	45342	164907	31759	10547
325.5	54584	140547	36636	12082
330.5	49338	155126	34580	11003
335.5	49564	154649	34299	11218
340.5	52464	140437	37184	11815
345.5	53070	137093	36736	11702
350.5	53940	137642	38276	12143
355	55917	113821	35189	12547
355.5	56963	129853	40731	12948
360	56742	111906	36524	12790
360	51651	124407	35717	11300
360.5	57729	127739	40217	12990
365	55346	112114	34237	12311
365.5	56217	128293	39866	12775
370	52984	117699	35315	11500
370	54704	116866	36474	12137
370.5	57846	110492	39138	13301
375.5	66718	83800	46061	14718
380	66930	72739	41065	14458
380	64675	79088	46574	13757
380.5	65197	85613	44766	14634
385.5	64755	94671	44168	14123
390	63041	93578	42042	12755
390.5	64839	97063	45540	13991
395.5	64293	101333	43352	13659
400	56336	111917	37771	11815
400.5	59540	116418	40174	12958
405	60525	101730	35780	13075
405.5	60053	113436	41620	13286
410	56134	111014	37702	11909
410.5	61267	115191	40783	13059
415.5	68070	96946	45136	14410
420	60132	92248	41222	12966
420.5	63673	107364	44591	13908
425	64280	79834	42446	14274
425.5	67059	90673	43957	14495
430	66538	74768	44034	13772
430.5	74425	72721	49023	16000
435	68276	73664	46167	14581
435.5	74586	74890	48272	15428
440	68894	68864	42636	13686
440.5	73481	85417	52971	15420
445	63726	90121	43258	13714
445.5	70805	90745	47880	14455
450	62794	94709	41966	12541
450.5	66645	102400	44605	14024
455.5	63058	110000	43305	13270
460	60234	103253	41532	12445
460	63467	94432	41345	13774
460.5	66633	99157	45814	14019
465.5	63091	106734	43179	13627
470	58903	94189	39768	12457
470.5	63933	103868	45098	14305
475	60994	86668	37042	13787
475.5	61837	98873	41100	14153
480	56561	90832	40272	12613
480.5	66192	89069	45694	14571
485.5	67609	86077	46304	14804
490	62425	78589	42526	13456
490.5	73996	74298	50343	15312
495	63854	82115	42127	14185
495.5	70040	79558	47674	14918
500	58443	92436	39597	12792
500.5	67806	89654	41300	14255
505.5	64302	95964	42143	13817
510	56298	89156	36482	12774
510.5	58933	107154	37850	13198
515.5	56637	121832	39000	13166
520	69152	66613	44369	14418
520.5	61249	103619	40885	14223
525.5	59082	98837	38056	13993

530	63717	71262	40987	13969
530.5	62272	86967	41175	14570
535.5	66636	77489	41972	15207
540	67956	65810	40760	14770
540.5	68530	79364	46688	15272
545.5	71167	71372	47010	16052
550.5	69486	77430	47457	15274
555.5	73000	67616	47939	15957
560	70124	57144	42084	15288
560	65831	79730	43561	13966
560.5	70140	86254	47706	15075
565.5	72087	78510	46632	15068
570	66312	82360	42526	14264
570	66194	76845	43042	13921
580	65247	80417	44078	14268
580	68014	77544	46462	13950
590	66355	83582	44236	14347
590	65058	82253	45714	13717
600	61234	89130	40404	13039
610	55032	110938	38905	12495
610	58564	100873	40606	12782
620	45455	139095	31370	10910
620	44378	145060	31074	10138
625	43060	142267	29805	10433
630	42528	144291	29578	9941
635	42342	162679	30808	10245
640	43435	145528	30639	10129
645	43778	146212	29584	10425
650	42732	148481	29140	10062
660	51553	125405	35513	11277
670	61084	96695	42103	12882
670	64483	93359	45537	13816
680	67129	77902	46161	14021
680	62970	93170	43272	13659
690	67932	76483	44205	13923
690	68020	73796	46466	14663
700	67826	80960	48905	14043
710	58768	103678	40525	12421
710	62192	95677	50634	13671
720	62300	100698	43941	13308
720	59517	102095	41114	12571
730	51990	130019	36401	11173
730	60917	103143	43866	13069
740	42149	152024	32335	9772
740	48978	143668	38215	11380
750	48501	141805	34406	11020
760	45861	150455	33980	10725
760	47125	143183	34141	10539
770	42528	162159	31551	10067
770	39344	169696	30045	9127
780	34419	192887	25895	8236
780	31427	202857	23010	7502
790	35777	183667	26151	8677
790	35244	183499	24784	8237
800	51577	132777	38252	11201
810	55158	111085	40599	11873
820	50305	125661	37449	11178
825	52630	126976	38524	12155
830	48311	141565	35482	10618
835	48136	145329	35219	11257
840	47482	150996	34356	10533
850	32646	192928	21969	7706
860	22912	239594	17648	5737
860	26057	230951	18877	6348
870	28890	213965	20228	6753
870	52404	134379	37382	11542
880	62396	105431	42914	13482
880	57738	112182	39138	11802
890	54070	123836	39282	11467
890	61059	108961	41761	13009
900	63645	102706	44565	13416
900	62597	112688	41009	13450
910	61222	107700	40574	12949
910	62867	108253	42496	13677
920	55146	133032	37836	11767
920	55676	134602	38464	12232
930	51392	139805	33200	11087
930	50522	153534	33390	11269
940	44837	163431	28193	9756
940	22365	244843	14395	5517
950	21712	244971	13257	5156