



Supplement of

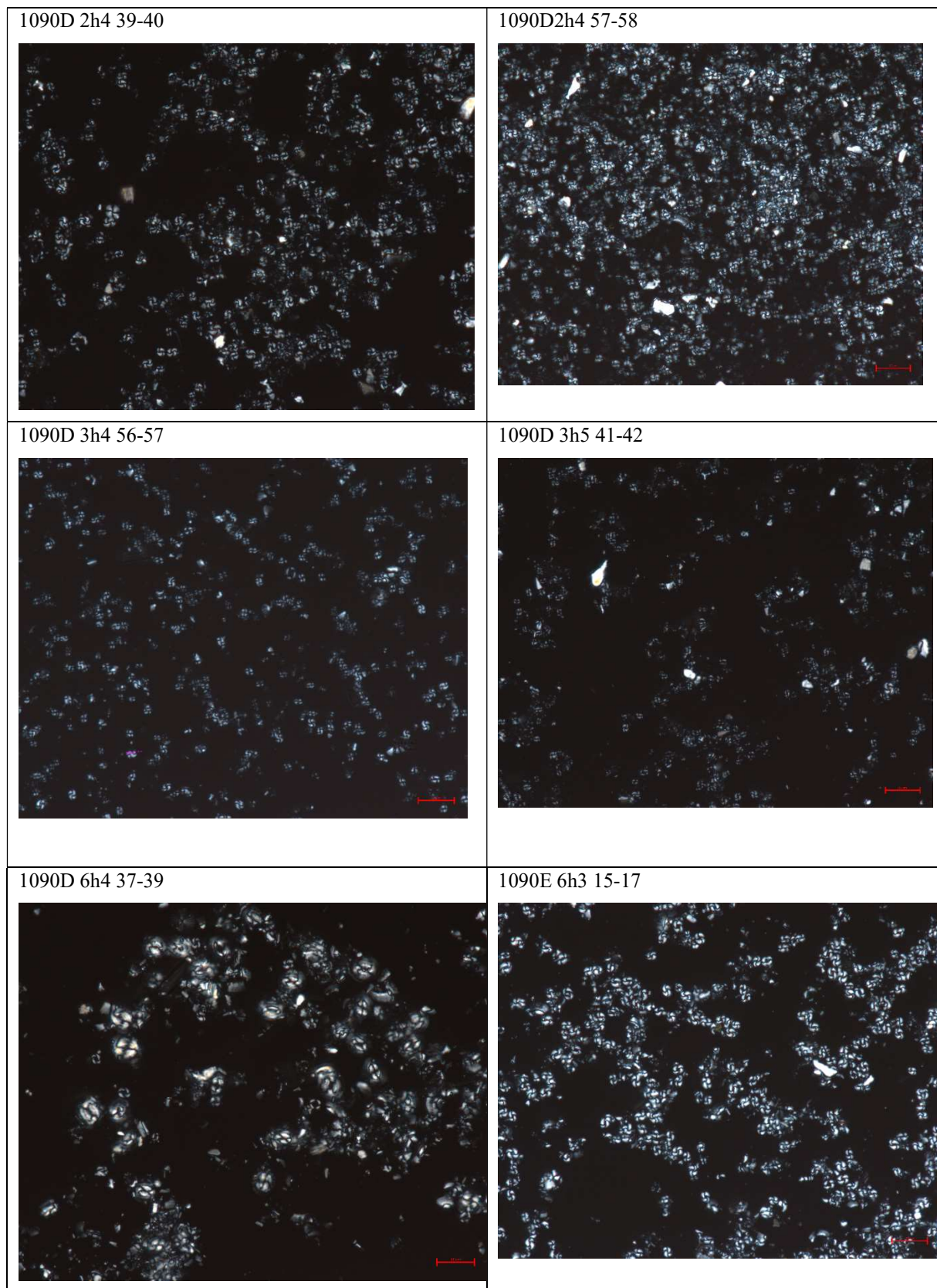
Divergent estimates of Miocene to Pleistocene upper ocean temperatures in the South Atlantic Ocean from alkenone and coccolith clumped isotope proxies

Heather M. Stoll et al.

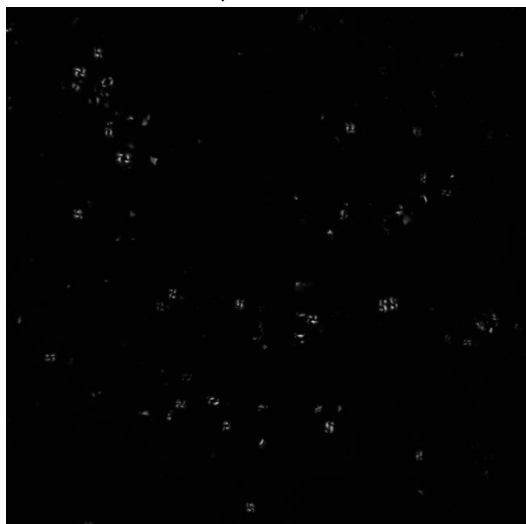
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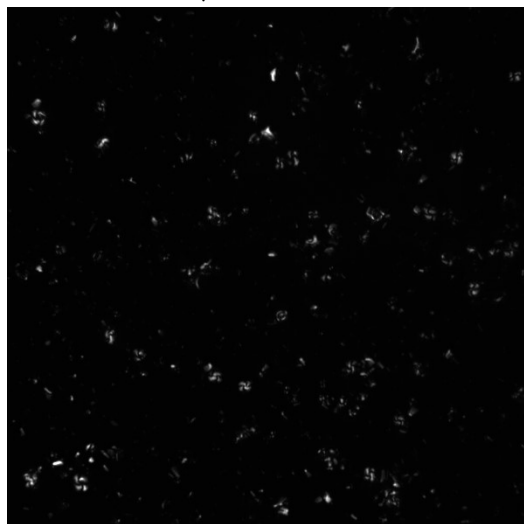
Figure S1. Polarized light microscopy images of the separated coccoliths from Site 1090. Scale bar is 10 μm .



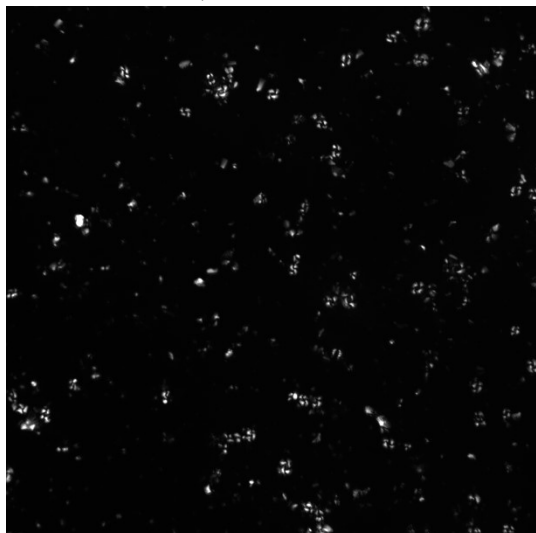
1088B 4h1 67.5 2-5 μ m



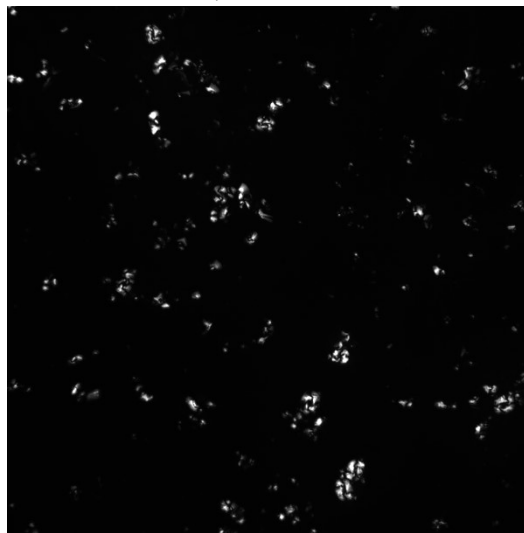
1088B 6h1 81 2-5 μ m



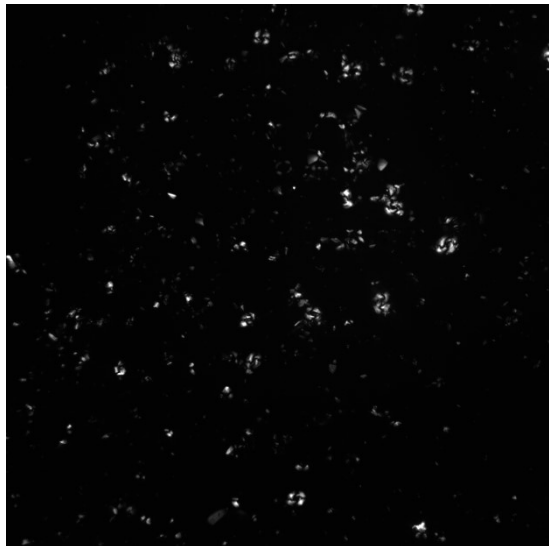
1088B 9h6 22 2-5 μ m



1088B 13h1 75 2-5 μ m



1088C 13h7 10 2-5 μ m



1088C 13h7 10 6-9 μ m

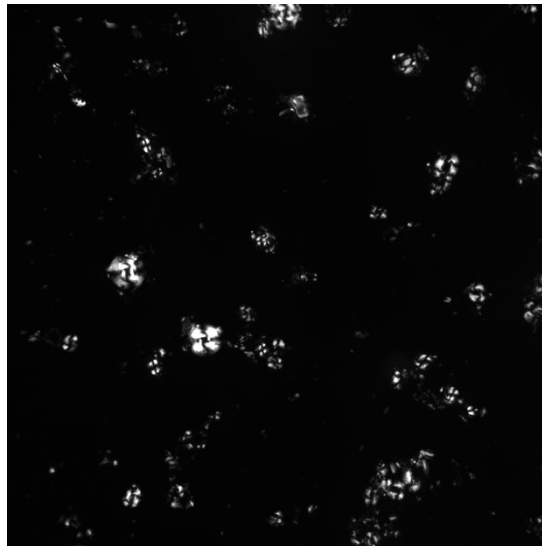


Figure S2(preceding page). Polarized light microscopy images of the separated coccoliths from Site 1088. Each image has dimensions of 131x131 μm .

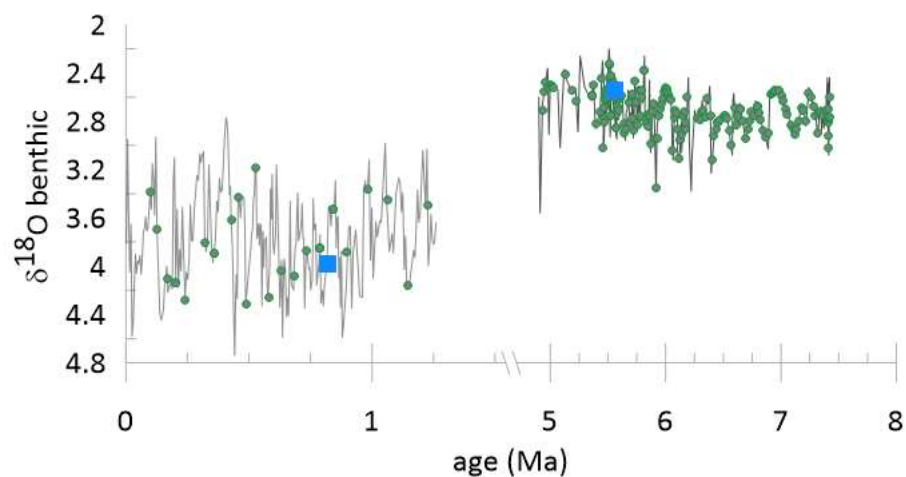


Figure S3. For Site 1088, position of samples for Δ_{47} coccolith (blue squares) and for Uk'37 (green circles) relative to glacial-interglacial variability as manifest in benthic $\delta^{18}\text{O}$ from the Pleistocene (Hodell et al., 2003) and Late Miocene (Billups et al., 2008).

Table S1. Coccolith assemblages and Δ_{47} temperature results from Site 1088.

Leg	Site/Hole	Core	Sect	Half	Interval Top cm	Interval Bottom cm	mcd top (m)	mcd bottom (m)	Age Ma	Coccolith fraction analysed	Coccolith assemblage composition in analyzed fraction	oxidation	$\Delta 47$ cocco. Temp (°C) (Clark calib)	68%ci from D47 mean (°C)
177	1088B	2H	4	W	4	5	10.0	10.1	0.82	2b	very small reticulofenestrids (<3 µm) (mainly <i>Gephyrocapsa</i> spp.)	5h	4.6	1.8
177	1088B	2H	4	W	4	5	10.0	10.1	0.82	2b	very small reticulofenestrids (<3 µm) (mainly <i>Gephyrocapsa</i> spp.)	overnight	6.8	1.8
177	1088B	4H	1	W	67.5	68.5	25.2	25.2	2.77	2b	very small (<3 µm) and medium (3-5 µm) reticulofenestrids (mainly <i>Reticulofenestra</i> spp.)	5h	8.4	1.6
177	1088B	4H	1	W	67.5	68.5	25.2	25.2	2.77	2b	Small and medium (2-5 µm) reticulofenestrids (mainly <i>Reticulofenestra</i> spp.)	overnight	8.4	2.0
177	1088B	5H	1	W	117	118	35.2	35.2	3.76	2b	Dominated by medium (3-5 µm) reticulofenestrids (<i>Reticulofenestra</i> spp.), smaller contributions from large <i>Reticulofenestra</i> , <i>Coccolithus pelagicus</i> , <i>Calcidiscus leptoporus</i> , <i>Helicosphaera carteri</i> .	5h	10.0	2.4
177	1088B	5H	1	W	117	118	35.2	35.2	3.76	2b	Dominated by medium (3-5 µm) reticulofenestrids (<i>Reticulofenestra</i> spp.), smaller contributions from <i>Coccolithus pelagicus</i> , <i>Calcidiscus leptoporus</i> , <i>Helicosphaera carteri</i> .	overnight	9.7	1.7
177	1088B	6H	6	W	81	82	51.8	51.8	5.56	2b	Small (<3 µm), Medium (3-5 µm) and large (5-7 µm) reticulofenestrids (<i>Reticulofenestra</i> spp.). V. minor contributions from <i>C. pelagicus</i> and <i>C. leptoporus</i> .	5h	7.6	1.6
177	1088B	9H	6	W	22	23	79.7	79.7	7.72	2b	Small (<3 µm) and Medium (3-5 µm) reticulofenestrids (<i>Reticulofenestra</i> spp.). Minor contributions from and large (5-7 µm) reticulofenestrids, <i>C. pelagicus</i> , and <i>C. leptoporus</i> .	5h	10.7	2.1
177	1088B	13H	1	W	75	76	110.8	110.8	9.53	2b	Medium (3-5 µm) and large (5-7 µm) reticulofenestrids (<i>Reticulofenestra</i> spp.), minor contributions from <i>C. pelagicus</i> and <i>C. leptoporus</i> .	5h	9.2	1.1
177	1088C	5H	5	W	76	77	157.7	157.7	10.73	2b	Medium (3-5 µm) and large (5-7 µm) reticulofenestrids (<i>Reticulofenestra</i> spp.)	5h	11.8	2.6
177	1088C	11X	4	W	10	11	207.1	207.2	12.67	2b	Medium (3-5 µm) and large (5-7 µm) reticulofenestrids (<i>Reticulofenestra</i> spp.)	5h	10.3	1.4
177	1088C	13X	7	W	10	11	230.9	231.0	14.82	2b	Medium (3-5 µm) reticulofenestrids (<i>Reticulofenestra</i> spp.), minor contributions from <i>C. pelagicus</i>	5h	14.6	1.9
177	1088C	13X	7	W	10	11	230.9	231.0	14.82	4b	Medium (3-5 µm) and large (5-10 µm) reticulofenestrids (<i>Reticulofenestra</i> spp., <i>Cyclicargolithus floridanus</i>), common <i>C. pelagicus</i> and <i>Helicosphaera carteri</i> .	5h	15.6	1.2
177	1088C	13X	7	W	10	11	230.9	231.0	14.82	4b	Medium (3-5 µm) and large (5-10 µm) reticulofenestrids (<i>Reticulofenestra</i> spp., <i>Cyclicargolithus floridanus</i>), common <i>C. pelagicus</i> and <i>Helicosphaera carteri</i> .	overnight	18.6	1.1

Table S2. Coccolith assemblages and $\Delta 47$ temperature results from Site 1090.

Site/Hole	Core	Section	Top	Bottom	Age (ka)	Size fraction analyzed	Coccolith assemblage composition in analyzed fraction	detrital carbonate	$\Delta 47$ coccolith temperature (Clark calibration) (°C)	68% clumped uncert (°C)
1090D	2	4	39	40	473.66	<5 µm	very small (<3 µm) and medium (3-5 µm) reticulofenestrids (mainly <i>Gephyrocapsa</i> spp.)	<5% of carbonate	6.99	0.54
1090D	2	4	57	58	477.40	<5 µm	very small (<3 µm) and medium (3-5 µm) reticulofenestrids (mainly <i>Gephyrocapsa</i> spp.)	<5% of carbonate	9.32	1.53
1090D	3	4	56	57	784.67	<8 µm	very small reticulofenestrids (<3 µm) (mainly <i>Gephyrocapsa</i> spp.)	negligible	4.91	1.82
1090D	3	5	41	42	807.18	<5 µm	very small reticulofenestrids (<3 µm) (mainly <i>Gephyrocapsa</i> spp.)	5 to 10% of carbonate	8.07	1.19
1090D	6	4	37	39	2697.50	<10 µm	dominantly <i>Coccolithus pelagicus</i> with more minor contributions from <i>Calcidiscus leptoporus</i> and medium reticulofenestrids (mainly <i>Reticulofenestra</i> spp.).	negligible	8.47	1.48
1090E	6	3	15	17	2970.66	<8 µm	Dominated by very small (<3 µm) and medium (3-5 µm) reticulofenestrids (mainly <i>Reticulofenestra</i> spp.); contribution from <i>C. pelagicus</i> (~10%)	negligible	5.17	1.02

Billups, K., Kelly, C., and Pierce, E.: The late Miocene to early Pliocene climate transition in the Southern Ocean, *Palaeogeography, Palaeoclimatology, Palaeoecology*, 267, 31-40, 2008.

Hodell, D. A., Charles, C. D., Curtis, J. H., Mortyn, P. G., Ninnemann, U. S., and Venz, K. A.: Data report: Oxygen isotope stratigraphy of ODP Leg 177 Sites 1088, 1089, 1090, 1093, and 1094, *Proc. Ocean Drill. Program Sci. Results*, 1-26,

