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GSA SUPPLEMENTAL MATERIAL

A 23 million-year record of low atmospheric CO_2

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Description of the Inputs Used to Calculate Atmospheric CO_2 Concentration

Within Eqn. (3), we set $CO_{2(t=0)}$ and $\delta^{13}C_{atm(t=0)}$ equal to Holocene average values [270 ppmv, Kawamura et al. (2007) and -6.4‰, Lüthi et al. (2008)]. Estimates of $\delta^{13}C_{atm(t)}$ value were determined from Tipple et al. (2010), which used isotopic records of benthic foraminifera to reconstruct a long-term record of Cenozoic $\delta^{13}C_{atm}$. We chose to use the $\delta^{13}C_{atm}$ record based on benthic foraminifera over the one based on planktonic foraminifera, which can be influenced by non-equilibrium factors and a variety of biologic, diagenetic, and temperature effects (Tipple et al., 2010). Because the $\delta^{13}C_{atm}$ record of Tipple et al. (2010) is only reported at 1 Myr resolution, we interpolated this record to match the resolution of the $\delta^{13}C_p$ data (Fig. S1), and therefore sub-million year changes in CO_2 should be interpreted with caution. We set $\delta^{13}C_{p(t=0)}$ = -25.0‰, which represents the average of 20 Holocene TOM $\delta^{13}C_p$ records compiled within Schubert and Jahren (2015). Because the $\delta^{13}C_p$ value recorded in plant lipids averages 5.0‰ lower values than TOM (Diefendorf and Freimuth, 2017), we set ε = 5.0‰ (i.e., $\delta^{13}C_{TOM}$ –

25 $\delta^{13}C_{lipid}$) when using plant lipid $\delta^{13}C_p$ values for calculating $CO_{2(t)}$. Our fossil data
26 revealed the offset (ε) between fossil TOM $\delta^{13}C_p$ and lipid $\delta^{13}C_p$ values to be $\varepsilon = 5.5 \pm$
27 1.7‰, which is within uncertainty of modern values and consistent with expectations that
28 ε value does not change with increasing CO_2 (Schubert and Jahren, 2012). Table S1
29 reports input values for each time *t* used to calculated $CO_{2(t)}$ via Eqn. (3).
30 We note that Eqn. (1) and Eqn. (3) differ in appearance from the equations
31 presented in Schubert and Jahren (2015) and Cui and Schubert (2016), respectively.
32 These previous studies related changes in CO_2 to changes in net carbon isotope
33 discrimination [i.e., $\Delta^{13}C$, $\Delta^{13}C = (\delta^{13}C_{atm} - \delta^{13}C_p) / (1 + \delta^{13}C_p/1000)$], rather than
34 directly to changes in $\delta^{13}C_p$. We prefer the current version because it most directly
35 follows the theory developed by Farquhar et al. (1982), which explains changes in the
36 $\delta^{13}C_p$ value of plants by changes in: 1) $\delta^{13}C_{atm}$, 2) environmental conditions, via changes
37 in the ratio of intercellular and atmospheric CO_2, and 3) photorespiration, via changes in
38 CO_2 [as reviewed by Schubert and Jahren (2018); note the effects of dark respiration are
39 likely negligible, e.g., Lin and Ehleringer (1997)]. This present approach therefore
40 allowed for direct presentation of $CO_{2(t)}$ as a function of $\delta^{13}C_p$ and $\delta^{13}C_{atm}$ (after Farquhar
41 et al., 1982); however, had a negligible effect on calculation of $CO_{2(t)}$ [average Neogene
42 CO_2 = 284 ppmv using Eqn. (3) versus 285 ppmv using Eqn. (4) within Schubert and
43 Jahren (2015)].
44 We note that $\delta^{13}C_{p(t=0)}$ is now explicitly listed within the equation for calculating
45 $CO_{2(t)}$, and careful consideration of this value is required for each application of this
46 proxy. For example: 1) sites dominated by gymnosperm species, which show $\delta^{13}C_p$
47 values ~3‰ higher than angiosperm species, will require a higher $\delta^{13}C_{p(t=0)}$ value than

that used for angiosperm dominated systems, or 2) CO_2 reconstructions from arid or semi-arid sites will benefit from use of a correspondingly higher $\delta^{13}C_{p(t=0)}$ value than that used for forested sites. We also added the term ε, which allowed for equal comparison across diverse plant tissues – e.g., lipids and TOM, as shown here – but also cellulose, lignin, or other plant biomarkers that show a predictable biosynthetic fractionation (e.g., Lukens et al., 2019). We hope that these changes: 1) improve the efficacy of this equation via direct correspondence between $\delta^{13}C_p$ value and CO_2, consistent with theory, and 2) offer improved flexibility for applying this proxy to a diversity of C_3 ecosystems (including pre-Cenozoic gymnosperm dominated ecosystems).

Uncertainty in $CO_{2(t)}$

Uncertainty in each estimate of $CO_{2(t)}$ was determined via a modified Monte Carlo uncertainty analysis (after Cui and Schubert, 2016). We assigned a 0.5‰ confidence interval on all $\delta^{13}C_{atm(t)}$ values (Tipple et al., 2010) and 0.1‰ for $\delta^{13}C_{atm(t=0)}$ (Schmitt et al., 2012). The uncertainty on $\delta^{13}C_{atm(t)}$ values (± 0.5‰) includes consideration of equilibrium and non□equilibrium isotope effects and processes, as well as age resolution of the data (Tipple et al., 2010). We applied error of ±1.6‰ (± 1σ) on $\delta^{13}C_{p(t=0)}$ to account for variability in $\delta^{13}C_p$ values measured across diverse species and environments (Cui and Schubert, 2016); this value represents the standard deviation of a global literature compilation of 479 $\delta^{13}C_p$ measurements made on modern leaves collected from across ~125 degrees of latitude and mean annual precipitation ranging from ~1-3700 mm/yr (Kohn, 2010). This uncertainty recognizes that species and environmental change (e.g., water availability) can drive $\delta^{13}C_p$ change, independent of

atmospheric CO_2 (Lomax et al., 2019; Schubert and Jahren, 2018). Analytical uncertainty of 0.1‰ was assigned to all $\delta^{13}C_p$ values compiled from the literature (after Cui and Schubert, 2016). The value for A is defined, while uncertainty for the value B was determined via bootstrapping to be equal to 0.028; uncertainty in the value for C was determined via the Monte Carlo analysis (Cui and Schubert, 2016).

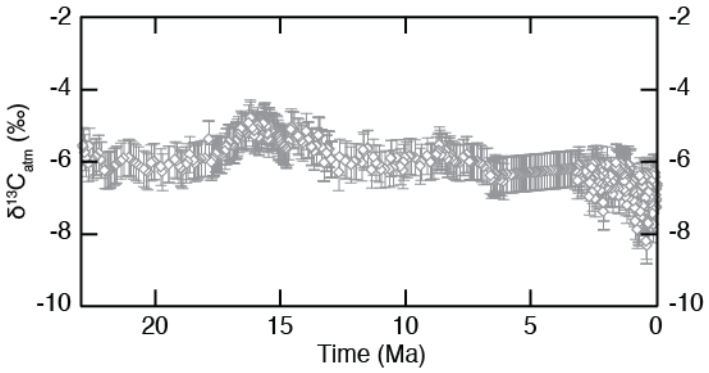

Figure S1. Estimates of $\delta^{13}C_{atm(t)}$ from Tipple et al. (2010), based upon isotopic records of benthic foraminifera, interpolated to match the age resolution of the compiled $\delta^{13}C_{p(t)}$ dataset. Uncertainty in $\delta^{13}C_{atm(t)} = \pm 0.5‰$. Data reported in Table S1.

TABLE S1. COMPILED $\delta^{13}C_p$ DATA USED TO CALCULATE $\delta^{13}C_{anomaly}$ AND CO_2 FOR EACH TIME *t*.

Reference*	Sample ID	Age (Ma)	$\delta^{13}C_{p(t)}$ (‰)	$\delta^{13}C_{atm(t)}$ (‰)†	$\delta^{13}C_{anomaly}$ (‰)§	$CO_{2(t)}$ (ppmv)#	Substrate
Jia et al. (2003; Table DR1, black carbon)	930	0.008	-27.2	-6.6	2.0	395	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1331	0.009	-29.0	-6.7	-1.3	216	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1332	0.018	-27.8	-7.3	-3.1	158	Lipids
Jia et al. (2003; Table DR1, black carbon)	931	0.024	-27.5	-7.3	1.6	369	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1333	0.029	-27.3	-7.1	-3.4	151	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1220	0.030	-28.4	-7.0	-2.3	182	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1334	0.041	-27.5	-6.8	-2.8	165	Lipids
Jia et al. (2003; Table DR1, black carbon)	932	0.045	-23.1	-6.7	-2.3	183	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1335	0.054	-31.4	-6.9	0.8	315	Lipids
Jia et al. (2003; Table DR1, black carbon)	933	0.059	-24.9	-7.2	-1.0	227	TOM
Naafs et al. (2012; Table S1, n-C29+C31)	1186	0.059	-31.5	-7.3	0.6	304	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1336	0.069	-31.0	-6.3	1.0	328	Lipids
Jia et al. (2003; Table DR1, black carbon)	934	0.084	-23.0	-6.4	-2.0	190	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1337	0.085	-26.7	-6.4	-3.4	151	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1338	0.102	-25.6	-6.4	-4.4	126	Lipids
Jia et al. (2003; Table DR1, black carbon)	935	0.111	-26.4	-6.6	1.2	339	TOM
Da et al. (2015; Table 1 and S1, SOM)	148	0.120	-24.1	-6.3	-0.8	234	TOM
Da et al. (2015; Table 1 and S1, SOM)	145	0.120	-23.8	-6.3	-1.1	222	TOM
Da et al. (2015; Table 1 and S1, SOM)	146	0.120	-23.7	-6.3	-1.2	219	TOM
Da et al. (2015; Table 1 and S1, SOM)	147	0.120	-23.7	-6.3	-1.2	219	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1339	0.121	-29.5	-6.4	-0.5	245	Lipids

Jia et al. (2003; Table DR1, black carbon)	936	0.134	-25.5	-7.4	-0.5	245	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1340	0.142	-30.3	-7.7	-1.1	223	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1341	0.164	-29.5	-7.3	-1.4	210	Lipids
Jia et al. (2003; Table DR1, black carbon)	937	0.175	-26.4	-7.4	0.3	286	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1342	0.187	-25.8	-6.9	-4.7	120	Lipids
Jia et al. (2003; Table DR1, black carbon)	938	0.223	-24.7	-6.9	-0.8	232	TOM
Da et al. (2015; Table 1 and S1, SOM)	149	0.240	-22.4	-6.5	-2.8	167	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1343	0.266	-30.2	-7.2	-0.6	244	Lipids
Naafs et al. (2012; Table S1, n-C29+C31)	1187	0.276	-31.2	-7.0	0.6	299	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1344	0.295	-30.5	-7.0	-0.1	268	Lipids
Jia et al. (2003; Table DR1, black carbon)	939	0.314	-26.6	-6.7	1.3	347	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1345	0.326	-30.8	-6.7	0.4	293	Lipids
Da et al. (2015; Table 1 and S1, SOM)	151	0.330	-23.9	-6.9	-1.6	204	TOM
Da et al. (2015; Table 1 and S1, SOM)	150	0.330	-23.6	-6.9	-1.9	193	TOM
Da et al. (2015; Table 1 and S1, SOM)	152	0.330	-22.5	-6.9	-3.0	161	TOM
Jia et al. (2003; Table DR1, black carbon)	940	0.339	-23.8	-7.7	-2.6	173	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1346	0.358	-30.6	-7.7	-0.7	237	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1347	0.391	-27.9	-6.4	-2.1	187	Lipids
Da et al. (2015; Table 1 and S1, SOM)	155	0.420	-24.6	-8.3	-2.3	180	TOM
Da et al. (2015; Table 1 and S1, SOM)	153	0.420	-24.4	-8.3	-2.5	175	TOM
Da et al. (2015; Table 1 and S1, SOM)	154	0.420	-23.6	-8.3	-3.3	152	TOM
Jia et al. (2003; Table DR1, black carbon)	941	0.420	-24.3	-8.3	-2.6	172	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1348	0.426	-30.5	-8.2	-1.4	212	Lipids
Zhou et al. (2017; Table	1349	0.463	-31.7	-7.0	1.1	330	Lipids

S1, weighted mean values)							
Jia et al. (2003; Table DR1, black carbon)	942	0.474	-26.5	-6.4	1.5	359	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1350	0.500	-30.7	-7.4	-0.4	253	Lipids
Jia et al. (2003; Table DR1, black carbon)	943	0.514	-25.8	-7.2	0.0	272	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1351	0.540	-31.0	-7.4	-0.1	268	Lipids
Jia et al. (2003; Table DR1, black carbon)	944	0.551	-23.8	-7.2	-2.0	190	TOM
Jia et al. (2003; Table DR1, black carbon)	945	0.572	-26.4	-6.7	1.1	333	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1352	0.580	-33.2	-6.5	3.0	498	Lipids
Jia et al. (2003; Table DR1, black carbon)	946	0.615	-24.7	-6.5	-0.5	249	TOM
Jia et al. (2003; Table DR1, black carbon)	947	0.644	-29.2	-7.5	3.1	513	TOM
Naafs et al. (2012; Table S1, n-C29+C31)	1188	0.655	-29.5	-7.5	-1.6	202	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1353	0.666	-31.1	-7.4	0.1	276	Lipids
Jia et al. (2003; Table DR1, black carbon)	948	0.681	-27.4	-6.4	2.4	436	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1354	0.711	-30.7	-7.7	-0.6	242	Lipids
Naafs et al. (2012; Table S1, n-C29+C31)	1189	0.712	-30.9	-7.7	-0.4	249	Lipids
Jia et al. (2003; Table DR1, black carbon)	949	0.719	-24.4	-7.8	-2.1	189	TOM
Jia et al. (2003; Table DR1, black carbon)	950	0.756	-24.6	-7.8	-1.8	198	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1355	0.758	-31.0	-7.7	-0.4	252	Lipids
Da et al. (2015; Table 1 and S1, SOM)	156	0.780	-24.2	-6.9	-1.3	216	TOM
Da et al. (2015; Table 1 and S1, SOM)	157	0.780	-23.9	-6.9	-1.5	207	TOM
Jia et al. (2003; Table DR1, black carbon)	951	0.792	-21.8	-7.9	-4.7	121	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1356	0.806	-31.5	-7.2	0.8	312	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1357	0.855	-28.9	-7.1	-1.8	198	Lipids
Jia et al. (2003; Table DR1, black carbon)	952	0.870	-23.9	-7.6	-2.3	180	TOM

Jia et al. (2003; Table DR1, black carbon)	953	0.905	-21.3	-7.2	-4.5	125	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1358	0.906	-27.3	-7.3	-3.6	146	Lipids
Naafs et al. (2012; Table S1, n-C29+C31)	1190	0.933	-31.9	-6.9	1.4	352	Lipids
Da et al. (2015; Table 1 and S1, SOM)	158	0.950	-24.5	-6.6	-0.7	238	TOM
Da et al. (2015; Table 1 and S1, SOM)	159	0.950	-24.3	-6.6	-0.8	233	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1359	0.958	-31.0	-7.1	0.3	285	Lipids
Jia et al. (2003; Table DR1, black carbon)	954	0.968	-22.9	-6.8	-2.5	174	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1360	1.01	-30.6	-6.7	0.3	283	Lipids
Naafs et al. (2012; Table S1, n-C29+C31)	1191	1.01	-29.8	-6.6	-0.4	249	Lipids
Jia et al. (2003; Table DR1, black carbon)	955	1.01	-24.3	-6.6	-0.9	230	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1361	1.07	-32.9	-6.2	3.1	511	Lipids
Da et al. (2015; Table 1 and S1, SOM)	160	1.07	-23.4	-6.1	-1.4	211	TOM
Jia et al. (2003; Table DR1, black carbon)	956	1.08	-22.0	-6.2	-2.8	166	TOM
Jia et al. (2003; Table DR1, black carbon)	957	1.12	-20.9	-6.7	-4.3	128	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1362	1.12	-31.3	-7.0	0.7	305	Lipids
Da et al. (2015; Table 1 and S1, SOM)	161	1.16	-24.9	-6.1	0.2	279	TOM
Da et al. (2015; Table 1 and S1, SOM)	163	1.16	-24.6	-6.1	-0.1	264	TOM
Da et al. (2015; Table 1 and S1, SOM)	162	1.16	-23.9	-6.1	-0.7	236	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1363	1.18	-30.6	-6.3	0.8	310	Lipids
Jia et al. (2003; Table DR1, black carbon)	958	1.21	-24.7	-7.2	-1.1	222	TOM
Da et al. (2015; Table 1 and S1, SOM)	166	1.23	-25.3	-6.3	0.5	293	TOM
Da et al. (2015; Table 1 and S1, SOM)	167	1.23	-25.0	-6.3	0.1	274	TOM
Da et al. (2015; Table 1 and S1, SOM)	168	1.23	-24.2	-6.3	-0.7	240	TOM
Da et al. (2015; Table 1 and S1, SOM)	164	1.23	-23.9	-6.3	-1.0	225	TOM
Da et al. (2015; Table 1 and S1, SOM)	165	1.23	-23.7	-6.3	-1.2	218	TOM

Zhou et al. (2017; Table S1, weighted mean values)	1364	1.24	-30.4	-6.5	0.3	283	Lipids
Jia et al. (2003; Table DR1, black carbon)	959	1.26	-23.6	-7.0	-2.0	192	TOM
Naafs et al. (2012; Table S1, n-C29+C31)	1192	1.26	-30.1	-6.8	-0.3	254	Lipids
Da et al. (2015; Table 1 and S1, SOM)	169	1.28	-23.9	-6.3	-1.0	227	TOM
Da et al. (2015; Table 1 and S1, SOM)	170	1.28	-23.0	-6.3	-1.9	194	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1365	1.30	-30.0	-6.4	0.0	268	Lipids
Da et al. (2015; Table 1 and S1, SOM)	176	1.31	-24.9	-6.2	0.1	277	TOM
Da et al. (2015; Table 1 and S1, SOM)	173	1.31	-24.3	-6.2	-0.4	250	TOM
Da et al. (2015; Table 1 and S1, SOM)	174	1.31	-24.3	-6.2	-0.5	248	TOM
Da et al. (2015; Table 1 and S1, SOM)	175	1.31	-23.9	-6.2	-0.9	230	TOM
Da et al. (2015; Table 1 and S1, SOM)	172	1.31	-23.6	-6.2	-1.1	221	TOM
Da et al. (2015; Table 1 and S1, SOM)	171	1.31	-23.2	-6.2	-1.6	205	TOM
Jia et al. (2003; Table DR1, black carbon)	960	1.32	-21.8	-6.5	-3.4	151	TOM
Jia et al. (2003; Table DR1, black carbon)	961	1.34	-22.1	-6.8	-3.3	152	TOM
Da et al. (2015; Table 1 and S1, SOM)	178	1.36	-23.9	-6.2	-0.9	229	TOM
Da et al. (2015; Table 1 and S1, SOM)	177	1.36	-23.6	-6.2	-1.2	220	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1366	1.36	-30.8	-6.4	0.9	318	Lipids
Da et al. (2015; Table 1 and S1, SOM)	181	1.39	-25.3	-6.1	0.7	305	TOM
Da et al. (2015; Table 1 and S1, SOM)	182	1.39	-25.2	-6.1	0.5	295	TOM
Da et al. (2015; Table 1 and S1, SOM)	179	1.39	-23.9	-6.1	-0.8	233	TOM
Da et al. (2015; Table 1 and S1, SOM)	180	1.39	-23.4	-6.1	-1.3	216	TOM
Jia et al. (2003; Table DR1, black carbon)	962	1.39	-23.3	-6.1	-1.4	210	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1367	1.43	-29.7	-6.3	-0.2	260	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1368	1.43	-30.5	-6.1	0.8	312	Lipids
Da et al. (2015; Table 1 and S1, SOM)	183	1.44	-23.8	-6.1	-0.9	232	TOM
Jia et al. (2003; Table	963	1.44	-22.5	-6.2	-2.2	183	TOM

DR1, black carbon)							
Da et al. (2015; Table 1 and S1, SOM)	185	1.48	-24.8	-6.2	0.0	269	TOM
Da et al. (2015; Table 1 and S1, SOM)	184	1.48	-23.8	-6.2	-1.1	223	TOM
Jia et al. (2003; Table DR1, black carbon)	964	1.51	-21.9	-6.9	-3.6	145	TOM
Da et al. (2015; Table 1 and S1, SOM)	186	1.52	-24.9	-6.2	0.0	272	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1369	1.53	-30.3	-6.7	0.0	269	Lipids
Jia et al. (2003; Table DR1, black carbon)	965	1.55	-23.3	-6.9	-2.3	182	TOM
Da et al. (2015; Table 1 and S1, SOM)	187	1.56	-25.1	-6.2	0.3	286	TOM
Da et al. (2015; Table 1 and S1, SOM)	188	1.56	-25.0	-6.2	0.2	281	TOM
Da et al. (2015; Table 1 and S1, SOM)	189	1.56	-24.3	-6.2	-0.5	247	TOM
Jia et al. (2003; Table DR1, black carbon)	966	1.60	-23.0	-6.1	-1.7	200	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1370	1.63	-30.5	-6.2	0.8	313	Lipids
Da et al. (2015; Table 1 and S1, SOM)	190	1.64	-25.1	-6.0	0.5	296	TOM
Da et al. (2015; Table 1 and S1, SOM)	191	1.64	-24.4	-6.0	-0.2	259	TOM
Da et al. (2015; Table 1 and S1, SOM)	193	1.64	-24.1	-6.0	-0.5	247	TOM
Da et al. (2015; Table 1 and S1, SOM)	192	1.64	-24.1	-6.0	-0.5	247	TOM
Jia et al. (2003; Table DR1, black carbon)	967	1.70	-21.9	-6.7	-3.5	149	TOM
Da et al. (2015; Table 1 and S1, SOM)	194	1.73	-24.3	-6.5	-0.8	234	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1371	1.74	-30.5	-6.5	0.4	290	Lipids
Jia et al. (2003; Table DR1, black carbon)	968	1.74	-22.2	-6.5	-2.9	164	TOM
Naafs et al. (2012; Table S1, n-C29+C31)	1193	1.75	-31.1	-6.9	0.6	302	Lipids
Jia et al. (2003; Table DR1, black carbon)	969	1.79	-21.8	-6.6	-3.4	150	TOM
Da et al. (2015; Table 1 and S1, SOM)	198	1.82	-24.8	-6.8	-0.6	245	TOM
Da et al. (2015; Table 1 and S1, SOM)	195	1.82	-24.6	-6.8	-0.7	238	TOM
Da et al. (2015; Table 1 and S1, SOM)	196	1.82	-24.2	-6.8	-1.2	219	TOM
Da et al. (2015; Table 1 and S1, SOM)	197	1.82	-24.1	-6.8	-1.2	217	TOM
Zhou et al. (2017; Table S1, weighted mean	1372	1.84	-30.9	-6.4	0.9	319	Lipids

values)							
Jia et al. (2003; Table DR1, black carbon)	970	1.88	-21.4	-6.4	-3.6	146	TOM
Da et al. (2015; Table 1 and S1, SOM)	199	1.94	-25.2	-6.7	-0.2	262	TOM
Da et al. (2015; Table 1 and S1, SOM)	202	1.94	-24.5	-6.7	-0.8	232	TOM
Da et al. (2015; Table 1 and S1, SOM)	201	1.94	-24.4	-6.7	-0.9	229	TOM
Da et al. (2015; Table 1 and S1, SOM)	200	1.94	-24.2	-6.7	-1.2	219	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1373	1.94	-30.7	-6.7	0.4	288	Lipids
Jia et al. (2003; Table DR1, black carbon)	971	1.98	-24.1	-6.6	-1.1	220	TOM
Jia et al. (2003; Table DR1, black carbon)	972	2.01	-25.1	-6.1	0.4	291	TOM
Jia et al. (2003; Table DR1, black carbon)	973	2.04	-25.4	-6.5	0.3	286	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1374	2.05	-31.1	-6.7	0.8	312	Lipids
Da et al. (2015; Table 1 and S1, SOM)	203	2.12	-25.2	-6.4	0.3	283	TOM
Da et al. (2015; Table 1 and S1, SOM)	205	2.12	-25.1	-6.4	0.1	275	TOM
Da et al. (2015; Table 1 and S1, SOM)	206	2.12	-24.9	-6.4	-0.1	264	TOM
Da et al. (2015; Table 1 and S1, SOM)	204	2.12	-24.4	-6.4	-0.6	244	TOM
Da et al. (2015; Table 1 and S1, SOM)	207	2.12	-24.1	-6.4	-0.9	229	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1221	2.13	-28.5	-7.1	-2.3	182	Lipids
Da et al. (2015; Table 1 and S1, SOM)	210	2.14	-24.7	-7.4	-1.3	214	TOM
Da et al. (2015; Table 1 and S1, SOM)	209	2.14	-24.6	-7.4	-1.3	213	TOM
Da et al. (2015; Table 1 and S1, SOM)	211	2.14	-24.3	-7.4	-1.7	202	TOM
Da et al. (2015; Table 1 and S1, SOM)	208	2.14	-24.1	-7.4	-1.9	194	TOM
Jia et al. (2003; Table DR1, black carbon)	974	2.14	-26.1	-7.1	0.4	289	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1375	2.15	-30.9	-6.7	0.6	302	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1222	2.16	-28.9	-6.3	-1.0	227	Lipids
Da et al. (2015; Table 1 and S1, SOM)	213	2.20	-25.2	-6.6	0.0	271	TOM
Da et al. (2015; Table 1 and S1, SOM)	215	2.20	-25.0	-6.6	-0.2	260	TOM
Da et al. (2015; Table 1 and S1, SOM)	214	2.20	-24.9	-6.6	-0.3	256	TOM

Da et al. (2015; Table 1 and S1, SOM)	212	2.20	-24.6	-6.6	-0.6	244	TOM
Jia et al. (2003; Table DR1, black carbon)	975	2.21	-23.8	-6.6	-1.5	209	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1223	2.23	-29.2	-6.1	-0.5	245	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1376	2.25	-30.9	-6.7	0.6	304	Lipids
Da et al. (2015; Table 1 and S1, SOM)	216	2.26	-24.5	-6.8	-0.9	232	TOM
Da et al. (2015; Table 1 and S1, SOM)	217	2.26	-24.5	-6.8	-0.9	232	TOM
Da et al. (2015; Table 1 and S1, SOM)	219	2.26	-24.1	-6.8	-1.3	215	TOM
Da et al. (2015; Table 1 and S1, SOM)	218	2.26	-23.7	-6.8	-1.7	201	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1224	2.27	-29.0	-6.3	-0.8	233	Lipids
Jia et al. (2003; Table DR1, black carbon)	976	2.28	-24.6	-6.4	-0.4	250	TOM
Da et al. (2015; Table 1 and S1, SOM)	222	2.34	-24.1	-6.6	-1.1	222	TOM
Da et al. (2015; Table 1 and S1, SOM)	220	2.34	-23.2	-6.6	-1.9	192	TOM
Da et al. (2015; Table 1 and S1, SOM)	221	2.34	-23.0	-6.6	-2.1	186	TOM
Jia et al. (2003; Table DR1, black carbon)	977	2.37	-21.7	-6.1	-3.0	160	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1225	2.39	-28.4	-6.0	-1.2	218	Lipids
Jia et al. (2003; Table DR1, black carbon)	978	2.43	-24.7	-6.8	-0.7	239	TOM
Naafs et al. (2012; Table S1, n-C29+C31)	1194	2.44	-32.1	-6.5	2.0	397	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1226	2.45	-28.4	-6.1	-1.2	217	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1377	2.47	-30.5	-7.0	-0.1	266	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1227	2.48	-28.0	-6.3	-1.9	194	Lipids
Naafs et al. (2012; Table S1, n-C29+C31)	1195	2.48	-33.1	-6.3	3.2	515	Lipids
Jia et al. (2003; Table DR1, black carbon)	979	2.49	-25.4	-6.4	0.4	289	TOM
Naafs et al. (2012; Table S1, n-C29+C31)	1196	2.52	-32.1	-6.2	2.4	428	Lipids
Jia et al. (2003; Table DR1, black carbon)	980	2.55	-23.3	-6.2	-1.5	209	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1228	2.55	-28.1	-6.2	-1.7	202	Lipids
Da et al. (2015; Table 1 and S1, SOM)	226	2.56	-24.1	-6.1	-0.6	244	TOM
Da et al. (2015; Table 1 and S1, SOM)	224	2.56	-23.8	-6.1	-0.9	232	TOM

Da et al. (2015; Table 1 and S1, SOM)	227	2.56	-23.3	-6.1	-1.4	210	TOM
Da et al. (2015; Table 1 and S1, SOM)	223	2.56	-22.9	-6.1	-1.8	198	TOM
Da et al. (2015; Table 1 and S1, SOM)	225	2.56	-22.9	-6.1	-1.8	197	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1378	2.58	-31.0	-6.7	0.7	308	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1229	2.58	-28.7	-6.9	-1.8	197	Lipids
Naafs et al. (2012; Table S1, n-C29+C31)	1197	2.61	-31.0	-6.2	1.2	340	Lipids
Jia et al. (2003; Table DR1, black carbon)	981	2.62	-21.7	-6.5	-3.4	151	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1230	2.66	-28.9	-6.5	-1.2	218	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1379	2.68	-30.1	-6.6	-0.1	267	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1231	2.70	-28.4	-7.0	-2.2	185	Lipids
Jia et al. (2003; Table DR1, black carbon)	982	2.78	-24.2	-6.4	-0.8	235	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1380	2.79	-31.2	-6.3	1.3	343	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1381	2.90	-29.9	-6.3	0.1	273	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1382	3.01	-30.7	-6.5	0.6	303	Lipids
Jia et al. (2003; Table DR1, black carbon)	983	3.04	-24.8	-6.5	-0.3	256	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1232	3.09	-29.3	-6.1	-0.4	249	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1233	3.11	-29.2	-6.2	-0.6	243	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1234	3.12	-29.0	-6.2	-0.8	235	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1235	3.13	-27.3	-6.4	-2.6	171	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1236	3.14	-27.4	-6.1	-2.3	181	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1237	3.16	-27.9	-6.3	-2.0	189	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1238	3.17	-28.2	-6.3	-1.7	201	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1239	3.18	-28.9	-6.5	-1.2	217	Lipids
Jia et al. (2003; Table DR1, black carbon)	984	3.19	-24.2	-6.2	-0.6	243	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1240	3.27	-28.6	-6.3	-1.2	217	Lipids
Jia et al. (2003; Table	985	3.40	-25.6	-6.2	0.9	316	TOM

DR1, black carbon)							
Cotton et al. (2014; Table S3, SOM)	123	3.42	-23.3	-6.2	-1.5	206	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1383	3.46	-30.4	-6.2	0.6	301	Lipids
Cotton et al. (2014; Table S3, SOM)	124	3.48	-25.1	-6.2	0.3	283	TOM
Cotton et al. (2014; Table S3, SOM)	125	3.55	-26.1	-6.2	1.3	345	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1384	3.57	-30.1	-6.2	0.3	285	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1385	3.69	-30.6	-6.2	0.8	310	Lipids
Jia et al. (2003; Table DR1, black carbon)	986	3.72	-24.9	-6.2	0.1	276	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1386	3.80	-29.8	-6.2	-0.1	267	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1241	3.88	-29.0	-6.2	-0.9	232	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1242	3.89	-29.7	-6.2	-0.2	262	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1387	3.92	-30.6	-6.2	0.7	310	Lipids
Cotton et al. (2014; Table S3, SOM)	126	3.95	-25.5	-6.2	0.7	305	TOM
Cotton et al. (2014; Table S3, SOM)	127	3.97	-25.0	-6.2	0.1	276	TOM
Cotton et al. (2014; Table S3, SOM)	128	3.99	-25.9	-6.2	1.1	330	TOM
Jia et al. (2003; Table DR1, black carbon)	987	4.00	-24.2	-6.2	-0.6	242	TOM
Cotton et al. (2014; Table S3, SOM)	129	4.02	-24.5	-6.2	-0.3	254	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1388	4.04	-30.7	-6.2	0.8	316	Lipids
Cotton et al. (2014; Table S3, SOM)	130	4.04	-24.5	-6.2	-0.3	254	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1243	4.11	-28.7	-6.2	-1.1	220	Lipids
Cotton et al. (2014; Table S3, SOM)	131	4.13	-26.1	-6.2	1.3	343	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1244	4.14	-29.7	-6.2	-0.1	263	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1389	4.16	-30.2	-6.2	0.4	290	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1390	4.27	-30.7	-6.3	0.8	313	Lipids

Jia et al. (2003; Table DR1, black carbon)	988	4.28	-26.3	-6.3	1.4	353	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1391	4.39	-30.3	-6.3	0.4	292	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1392	4.51	-30.8	-6.3	1.0	323	Lipids
Jia et al. (2003; Table DR1, black carbon)	989	4.61	-25.9	-6.3	1.0	327	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1393	4.63	-30.8	-6.3	0.9	320	Lipids
Cotton et al. (2014; Table S3, SOM)	132	4.73	-23.1	-6.3	-1.8	196	TOM
Cotton et al. (2014; Table S3, SOM)	133	4.75	-25.2	-6.3	0.3	286	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1394	4.75	-31.0	-6.3	1.1	332	Lipids
Cotton et al. (2014; Table S3, SOM)	134	4.79	-24.1	-6.3	-0.8	234	TOM
Cotton et al. (2014; Table S3, SOM)	135	4.86	-28.1	-6.3	3.2	522	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1395	4.88	-30.1	-6.3	0.2	282	Lipids
Jia et al. (2003; Table DR1, black carbon)	990	4.88	-23.5	-6.3	-1.4	212	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1396	5.00	-31.1	-6.3	1.2	337	Lipids
Jia et al. (2003; Table DR1, black carbon)	991	5.05	-24.3	-6.3	-0.6	243	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1397	5.12	-29.6	-6.3	-0.3	254	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1245	5.21	-29.5	-6.3	-0.4	251	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1398	5.25	-30.6	-6.3	0.7	305	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1246	5.25	-29.2	-6.3	-0.8	235	Lipids
Jia et al. (2003; Table DR1, black carbon)	992	5.26	-22.9	-6.3	-2.0	190	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1247	5.31	-28.5	-6.3	-1.4	212	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1248	5.34	-28.3	-6.3	-1.6	204	Lipids
Cotton et al. (2014; Table S3, SOM)	136	5.35	-25.2	-6.3	0.3	285	TOM
Cotton et al. (2014; Table S3, SOM)	137	5.37	-23.7	-6.3	-1.3	216	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1249	5.38	-27.5	-6.3	-2.5	176	Lipids

Tipple and Pagani (2010; Table 1, n-C31)	1250	5.39	-28.9	-6.3	-1.1	223	Lipids
Cotton et al. (2014; Table S3, SOM)	138	5.42	-23.8	-6.3	-1.2	220	TOM
Jia et al. (2003; Table DR1, black carbon)	993	5.44	-24.6	-6.3	-0.3	254	TOM
Cotton et al. (2014; Table S3, SOM)	139	5.46	-25.4	-6.3	0.5	295	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1399	5.50	-29.6	-6.3	-0.4	252	Lipids
Cotton et al. (2014; Table S3, SOM)	140	5.51	-22.3	-6.3	-2.6	172	TOM
Jia et al. (2003; Table DR1, black carbon)	994	5.55	-21.7	-6.3	-3.2	154	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1400	5.62	-29.5	-6.3	-0.4	251	Lipids
Jia et al. (2003; Table DR1, black carbon)	995	5.65	-24.4	-6.3	-0.5	245	TOM
Cotton et al. (2014; Table S3, SOM)	141	5.72	-23.9	-6.3	-1.1	224	TOM
Cotton et al. (2014; Table S3, SOM)	142	5.75	-24.6	-6.4	-0.4	253	TOM
Jia et al. (2003; Table DR1, black carbon)	996	5.82	-24.6	-6.4	-0.4	253	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1401	6.01	-29.7	-6.3	-0.2	259	Lipids
Jia et al. (2003; Table DR1, black carbon)	997	6.02	-23.8	-6.4	-1.2	220	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1402	6.13	-30.4	-6.5	0.3	283	Lipids
Cotton et al. (2014; Table S3, SOM)	143	6.16	-22.5	-6.3	-2.4	177	TOM
Cotton et al. (2014; Table S3, SOM)	144	6.17	-22.4	-6.4	-2.6	173	TOM
Jia et al. (2003; Table DR1, black carbon)	998	6.20	-24.1	-6.4	-0.9	230	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1403	6.26	-30.6	-6.5	0.5	298	Lipids
Matson et al. (2012; Table 1, SOM)	1125	6.30	-25.7	-6.4	0.7	307	TOM
Matson et al. (2012; Table 1, SOM)	1128	6.30	-25.7	-6.4	0.7	307	TOM
Matson et al. (2012; Table 1, SOM)	1169	6.30	-25.7	-6.4	0.7	307	TOM
Matson et al. (2012; Table 1, SOM)	1127	6.30	-25.6	-6.4	0.6	301	TOM
Matson et al. (2012; Table 1, SOM)	1167	6.30	-25.5	-6.4	0.5	295	TOM
Matson et al. (2012; Table 1, SOM)	1168	6.30	-25.5	-6.4	0.5	295	TOM
Matson et al. (2012;	1144	6.30	-25.4	-6.4	0.4	290	TOM

Table 1, SOM)							
Matson et al. (2012; Table 1, SOM)	1145	6.30	-25.2	-6.4	0.2	279	TOM
Matson et al. (2012; Table 1, SOM)	1126	6.30	-25.1	-6.4	0.1	274	TOM
Matson et al. (2012; Table 1, SOM)	1160	6.30	-25.1	-6.4	0.1	274	TOM
Matson et al. (2012; Table 1, SOM)	1136	6.30	-25.0	-6.4	0.0	269	TOM
Matson et al. (2012; Table 1, SOM)	1139	6.30	-25.0	-6.4	0.0	269	TOM
Matson et al. (2012; Table 1, SOM)	1143	6.30	-25.0	-6.4	0.0	269	TOM
Matson et al. (2012; Table 1, SOM)	1129	6.30	-24.9	-6.4	-0.1	264	TOM
Matson et al. (2012; Table 1, SOM)	1146	6.30	-24.9	-6.4	-0.1	264	TOM
Matson et al. (2012; Table 1, SOM)	1147	6.30	-24.9	-6.4	-0.1	264	TOM
Matson et al. (2012; Table 1, SOM)	1148	6.30	-24.9	-6.4	-0.1	264	TOM
Matson et al. (2012; Table 1, SOM)	1149	6.30	-24.9	-6.4	-0.1	264	TOM
Matson et al. (2012; Table 1, SOM)	1155	6.30	-24.9	-6.4	-0.1	264	TOM
Matson et al. (2012; Table 1, SOM)	1161	6.30	-24.9	-6.4	-0.1	264	TOM
Matson et al. (2012; Table 1, SOM)	1163	6.30	-24.9	-6.4	-0.1	264	TOM
Matson et al. (2012; Table 1, SOM)	1134	6.30	-24.8	-6.4	-0.2	260	TOM
Matson et al. (2012; Table 1, SOM)	1137	6.30	-24.8	-6.4	-0.2	260	TOM
Matson et al. (2012; Table 1, SOM)	1138	6.30	-24.8	-6.4	-0.2	260	TOM
Matson et al. (2012; Table 1, SOM)	1140	6.30	-24.8	-6.4	-0.2	260	TOM
Matson et al. (2012; Table 1, SOM)	1141	6.30	-24.8	-6.4	-0.2	260	TOM
Matson et al. (2012; Table 1, SOM)	1142	6.30	-24.8	-6.4	-0.2	260	TOM
Matson et al. (2012; Table 1, SOM)	1150	6.30	-24.8	-6.4	-0.2	260	TOM
Matson et al. (2012; Table 1, SOM)	1153	6.30	-24.8	-6.4	-0.2	260	TOM
Matson et al. (2012; Table 1, SOM)	1154	6.30	-24.8	-6.4	-0.2	260	TOM
Matson et al. (2012; Table 1, SOM)	1157	6.30	-24.8	-6.4	-0.2	260	TOM
Matson et al. (2012; Table 1, SOM)	1162	6.30	-24.8	-6.4	-0.2	260	TOM
Matson et al. (2012; Table 1, SOM)	1135	6.30	-24.7	-6.4	-0.3	255	TOM
Matson et al. (2012; Table 1, SOM)	1152	6.30	-24.7	-6.4	-0.3	255	TOM

Matson et al. (2012; Table 1, SOM)	1164	6.30	-24.7	-6.4	-0.3	255	TOM
Matson et al. (2012; Table 1, SOM)	1130	6.30	-24.6	-6.4	-0.4	251	TOM
Matson et al. (2012; Table 1, SOM)	1132	6.30	-24.6	-6.4	-0.4	251	TOM
Matson et al. (2012; Table 1, SOM)	1133	6.30	-24.6	-6.4	-0.4	251	TOM
Matson et al. (2012; Table 1, SOM)	1151	6.30	-24.6	-6.4	-0.4	251	TOM
Matson et al. (2012; Table 1, SOM)	1158	6.30	-24.6	-6.4	-0.4	251	TOM
Matson et al. (2012; Table 1, SOM)	1131	6.30	-24.5	-6.4	-0.5	246	TOM
Matson et al. (2012; Table 1, SOM)	1156	6.30	-24.5	-6.4	-0.5	246	TOM
Matson et al. (2012; Table 1, SOM)	1165	6.30	-24.5	-6.4	-0.5	246	TOM
Matson et al. (2012; Table 1, SOM)	1159	6.30	-24.2	-6.4	-0.8	233	TOM
Matson et al. (2012; Table 1, SOM)	1166	6.30	-23.5	-6.4	-1.5	207	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1404	6.39	-29.2	-6.4	-0.8	235	Lipids
Jia et al. (2003; Table DR1, black carbon)	999	6.43	-24.4	-6.4	-0.6	243	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1251	6.46	-29.6	-6.3	-0.3	257	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1252	6.47	-31.0	-6.3	1.1	331	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1253	6.49	-29.2	-6.4	-0.8	233	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1254	6.50	-29.2	-6.5	-0.9	229	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1255	6.52	-29.5	-6.5	-0.5	246	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1256	6.52	-29.2	-6.5	-0.9	232	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1405	6.53	-29.1	-6.4	-1.0	228	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1257	6.53	-29.4	-6.4	-0.7	239	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1258	6.54	-28.2	-6.4	-1.8	196	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1259	6.55	-30.0	-6.4	0.0	270	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1260	6.55	-29.9	-6.4	-0.2	263	Lipids
Jia et al. (2003; Table DR1, black carbon)	1000	6.61	-25.0	-6.5	-0.2	262	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1406	6.66	-31.3	-6.4	1.3	343	Lipids
Zhou et al. (2017; Table	1407	6.79	-30.1	-6.1	0.3	288	Lipids

S1, weighted mean values)							
Jia et al. (2003; Table DR1, black carbon)	1001	6.79	-24.5	-6.1	-0.2	260	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1408	6.92	-30.7	-6.1	0.9	321	Lipids
Jia et al. (2003; Table DR1, black carbon)	1002	7.00	-25.1	-6.1	0.4	293	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1409	7.06	-30.3	-6.0	0.6	303	Lipids
Jia et al. (2003; Table DR1, black carbon)	1003	7.18	-24.3	-6.0	-0.3	256	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1410	7.19	-30.6	-6.0	1.0	327	Lipids
Jia et al. (2003; Table DR1, black carbon)	1004	7.32	-23.9	-6.0	-0.7	237	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1411	7.33	-30.8	-6.0	1.2	340	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1261	7.34	-30.9	-6.0	1.3	346	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1262	7.34	-30.6	-6.0	1.0	328	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1263	7.35	-29.2	-6.0	-0.4	251	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1264	7.36	-29.2	-6.0	-0.5	249	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1265	7.37	-29.1	-6.0	-0.6	244	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1266	7.38	-30.3	-6.0	0.7	308	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1267	7.38	-29.9	-6.0	0.3	285	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1268	7.40	-29.2	-6.0	-0.4	251	Lipids
Jia et al. (2003; Table DR1, black carbon)	1005	7.41	-25.0	-6.0	0.3	287	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1270	7.42	-29.9	-6.0	0.3	286	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1269	7.42	-29.1	-6.0	-0.6	244	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1271	7.44	-29.4	-6.0	-0.2	260	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1272	7.46	-29.3	-6.0	-0.3	254	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1412	7.47	-30.1	-6.0	0.5	294	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1273	7.47	-29.8	-6.0	0.2	281	Lipids
Jia et al. (2003; Table DR1, black carbon)	1006	7.48	-25.1	-6.0	0.5	298	TOM
Tipple and Pagani (2010;	1274	7.48	-29.9	-6.0	0.3	286	Lipids

Table 1, n-C31)							
Jia et al. (2003; Table DR1, black carbon)	1007	7.60	-25.7	-5.8	1.3	343	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1413	7.60	-30.0	-5.8	0.6	304	Lipids
Jia et al. (2003; Table DR1, black carbon)	1008	7.72	-22.5	-5.9	-2.0	191	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1414	7.74	-28.2	-5.9	-1.3	216	Lipids
Jia et al. (2003; Table DR1, black carbon)	1009	7.87	-25.1	-6.0	0.5	294	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1415	7.88	-29.4	-6.0	-0.2	259	Lipids
Jia et al. (2003; Table DR1, black carbon)	1010	8.00	-25.7	-6.0	1.0	328	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1416	8.02	-29.8	-6.0	0.2	279	Lipids
Jia et al. (2003; Table DR1, black carbon)	1011	8.06	-23.4	-6.0	-1.2	219	TOM
Jia et al. (2003; Table DR1, black carbon)	1012	8.12	-24.3	-6.0	-0.3	256	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1275	8.26	-28.7	-5.8	-0.7	240	Lipids
Jia et al. (2003; Table DR1, black carbon)	1013	8.30	-26.9	-5.8	2.5	439	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1276	8.31	-29.9	-5.8	0.4	293	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1277	8.35	-28.6	-5.9	-0.9	229	Lipids
Jia et al. (2003; Table DR1, black carbon)	1014	8.38	-26.2	-5.9	1.7	373	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1417	8.44	-30.1	-5.7	0.8	315	Lipids
Jia et al. (2003; Table DR1, black carbon)	1015	8.47	-25.9	-5.8	1.5	358	TOM
Matson et al. (2012; Table 1, SOM)	1177	8.60	-26.5	-5.7	2.2	412	TOM
Matson et al. (2012; Table 1, SOM)	1178	8.60	-25.9	-5.7	1.6	364	TOM
Matson et al. (2012; Table 1, SOM)	1173	8.60	-25.2	-5.7	0.9	317	TOM
Matson et al. (2012; Table 1, SOM)	1174	8.60	-25.2	-5.7	0.9	317	TOM
Matson et al. (2012; Table 1, SOM)	1172	8.60	-25.1	-5.7	0.8	311	TOM
Matson et al. (2012; Table 1, SOM)	1175	8.60	-25.1	-5.7	0.8	311	TOM
Matson et al. (2012; Table 1, SOM)	1170	8.60	-24.9	-5.7	0.6	300	TOM
Matson et al. (2012; Table 1, SOM)	1176	8.60	-24.8	-5.7	0.5	294	TOM

Matson et al. (2012; Table 1, SOM)	1179	8.60	-23.5	-5.7	-0.8	233	TOM
Matson et al. (2012; Table 1, SOM)	1171	8.60	-22.0	-5.7	-2.3	180	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1278	8.63	-29.5	-5.8	0.1	275	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1279	8.67	-30.1	-5.6	0.8	316	Lipids
Jia et al. (2003; Table DR1, black carbon)	1016	8.69	-26.6	-5.5	2.5	438	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1280	8.73	-29.8	-5.7	0.5	296	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1281	8.76	-29.6	-5.7	0.3	284	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1282	8.81	-29.7	-5.8	0.3	285	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1283	8.91	-29.7	-6.0	0.1	273	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1284	8.99	-29.8	-6.0	0.3	283	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1285	9.03	-29.7	-6.0	0.1	273	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1286	9.05	-29.2	-6.0	-0.4	251	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1418	9.17	-30.4	-5.8	0.9	322	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1419	9.42	-30.3	-6.0	0.7	309	Lipids
Jia et al. (2003; Table DR1, black carbon)	1017	9.46	-25.2	-6.1	0.5	293	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1420	9.66	-30.2	-5.9	0.7	307	Lipids
Jia et al. (2003; Table DR1, black carbon)	1018	9.83	-25.6	-5.9	1.1	332	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1421	9.91	-30.3	-5.9	0.9	317	Lipids
Jia et al. (2003; Table DR1, black carbon)	1019	9.98	-25.6	-5.9	1.1	332	TOM
Uno et al. (2016; Table S5, >10 Ma)	1312	10.08	-33.1	-5.9	3.6	574	Lipids
Jia et al. (2003; Table DR1, black carbon)	1020	10.11	-24.4	-6.0	-0.2	259	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1422	10.15	-29.8	-6.3	0.0	269	Lipids
Jia et al. (2003; Table DR1, black carbon)	1021	10.24	-25.6	-6.1	0.8	315	TOM
Jia et al. (2003; Table DR1, black carbon)	1022	10.40	-26.1	-5.9	1.6	369	TOM
Jia et al. (2003; Table DR1, black carbon)	1023	10.54	-23.4	-6.2	-1.3	213	TOM
Jia et al. (2003; Table	1024	10.61	-22.0	-5.9	-2.5	175	TOM

DR1, black carbon)							
Zhou et al. (2017; Table S1, weighted mean values)	1423	10.63	-29.6	-5.9	0.1	275	Lipids
Jia et al. (2003; Table DR1, black carbon)	1025	10.69	-24.1	-6.2	-0.7	239	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1424	10.86	-30.2	-6.2	0.4	289	Lipids
Jia et al. (2003; Table DR1, black carbon)	1026	11.03	-25.1	-6.2	0.3	282	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1425	11.10	-29.9	-6.1	0.3	283	Lipids
Jia et al. (2003; Table DR1, black carbon)	1027	11.23	-23.9	-6.0	-0.7	237	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1426	11.33	-30.5	-5.9	1.1	330	Lipids
Jia et al. (2003; Table DR1, black carbon)	1028	11.39	-23.5	-6.2	-1.4	211	TOM
Jia et al. (2003; Table DR1, black carbon)	1029	11.55	-24.7	-5.6	0.4	292	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1427	11.56	-29.0	-5.6	-0.3	256	Lipids
Jia et al. (2003; Table DR1, black carbon)	1030	11.71	-26.0	-5.7	1.7	371	TOM
Uno et al. (2016; Table S5, >10 Ma)	1313	11.72	-32.9	-5.7	3.6	577	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1428	11.78	-29.1	-6.0	-0.6	244	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1429	12.01	-29.5	-6.0	-0.1	266	Lipids
Jia et al. (2003; Table DR1, black carbon)	1031	12.09	-25.7	-6.0	1.1	333	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1430	12.23	-28.7	-6.1	-1.0	227	Lipids
Jia et al. (2003; Table DR1, black carbon)	1032	12.41	-23.3	-5.9	-1.2	217	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1431	12.45	-28.4	-6.0	-1.2	218	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1432	12.67	-30.9	-5.9	1.4	353	Lipids
Jia et al. (2003; Table DR1, black carbon)	1033	12.72	-27.0	-6.3	2.2	411	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	373	13.00	-26.1	-5.9	1.6	365	TOM
Fang et al. (2013; Supplemental file, Site	372	13.00	-26.1	-5.9	1.5	360	TOM

28, bulk TOM)							
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	406	13.00	-26.3	-5.9	1.8	382	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	412	13.00	-25.8	-5.9	1.3	344	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	407	13.00	-25.8	-5.9	1.3	342	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	410	13.00	-25.8	-5.9	1.2	339	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	409	13.00	-25.6	-5.9	1.1	331	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	411	13.00	-25.3	-5.9	0.7	308	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	408	13.00	-24.6	-5.9	0.0	271	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1433	13.10	-29.7	-5.7	0.4	291	Lipids
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	414	13.10	-26.3	-5.7	2.0	399	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	415	13.10	-25.7	-5.7	1.4	354	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	413	13.10	-24.6	-5.7	0.3	287	TOM
Jia et al. (2003; Table DR1, black carbon)	1034	13.16	-25.5	-5.6	1.2	341	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	417	13.20	-25.8	-5.8	1.4	353	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	419	13.20	-25.5	-5.8	1.2	337	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	418	13.20	-25.3	-5.8	1.0	323	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	416	13.20	-25.0	-5.8	0.6	302	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	374	13.30	-26.0	-6.0	1.4	349	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	422	13.30	-26.3	-6.0	1.7	374	TOM
Fang et al. (2013; Supplemental file, Site	425	13.30	-26.2	-6.0	1.6	363	TOM

29, bulk TOM)							
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	423	13.30	-25.9	-6.0	1.3	343	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	424	13.30	-25.9	-6.0	1.2	341	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	421	13.30	-25.4	-6.0	0.8	315	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	420	13.30	-25.4	-6.0	0.8	314	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	375	13.40	-26.0	-5.6	1.8	383	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	376	13.40	-25.8	-5.6	1.6	368	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	377	13.40	-25.7	-5.6	1.5	362	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	426	13.40	-25.9	-5.6	1.7	372	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	427	13.40	-25.8	-5.6	1.6	363	TOM
Uno et al. (2016; Table S5, >10 Ma)	1314	13.48	-32.2	-5.3	3.3	534	Lipids
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	345	13.50	-24.1	-5.3	0.2	280	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	431	13.50	-25.3	-5.3	1.4	353	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	430	13.50	-24.9	-5.3	1.1	330	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	429	13.50	-24.6	-5.3	0.8	310	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	428	13.50	-24.3	-5.3	0.4	291	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1434	13.52	-30.2	-5.3	1.3	346	Lipids
Jia et al. (2003; Table DR1, black carbon)	1035	13.59	-24.6	-5.5	0.4	291	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	346	13.60	-25.6	-5.6	1.4	353	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	347	13.60	-25.4	-5.6	1.2	340	TOM

Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	378	13.60	-24.4	-5.6	0.2	281	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	434	13.60	-25.3	-5.6	1.2	336	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	435	13.60	-25.2	-5.6	1.1	329	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	437	13.60	-25.1	-5.6	0.9	319	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	436	13.60	-24.9	-5.6	0.7	309	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	432	13.60	-24.5	-5.6	0.3	286	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	433	13.60	-24.5	-5.6	0.3	285	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	348	13.70	-24.7	-5.7	0.4	291	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	379	13.70	-24.9	-5.7	0.6	299	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	438	13.70	-24.0	-5.7	-0.3	257	TOM
Johnson et al. (2009; Fig. 9, Middle Miocene, bulk TOM)	1117	13.80	-23.3	-5.6	-0.9	229	TOM
Jia et al. (2003; Table DR1, black carbon)	1036	13.91	-25.0	-5.4	1.0	325	TOM
Uno et al. (2016; Table S5, >10 Ma)	1315	13.93	-32.4	-5.4	3.4	548	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1435	13.93	-29.4	-5.4	0.4	292	Lipids
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	349	14.00	-24.3	-5.2	0.5	298	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1436	14.14	-28.7	-5.5	-0.4	253	Lipids
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	439	14.20	-24.3	-5.4	0.3	285	TOM
Jia et al. (2003; Table DR1, black carbon)	1037	14.30	-23.8	-5.3	-0.1	264	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1437	14.34	-28.8	-5.3	-0.1	266	Lipids
Fang et al. (2013; Supplemental file, Site	350	14.50	-24.1	-5.1	0.3	286	TOM

27, bulk TOM)							
Zhou et al. (2017; Table S1, weighted mean values)	1438	14.54	-29.3	-5.1	0.6	300	Lipids
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	440	14.60	-24.0	-5.0	0.4	289	TOM
Jia et al. (2003; Table DR1, black carbon)	1038	14.63	-24.1	-5.1	0.3	287	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	441	14.70	-24.1	-5.4	0.1	273	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1439	14.73	-29.8	-5.6	0.6	302	Lipids
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	351	14.80	-25.2	-5.7	0.9	319	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	380	14.80	-25.5	-5.7	1.3	343	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	381	14.80	-24.6	-5.7	0.4	289	TOM
Jia et al. (2003; Table DR1, black carbon)	1039	14.81	-26.7	-5.6	2.5	442	TOM
Jia et al. (2003; Table DR1, black carbon)	1040	14.89	-24.2	-5.6	0.1	273	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	352	14.90	-26.0	-5.6	1.8	385	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	387	14.90	-25.5	-5.6	1.4	351	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	383	14.90	-25.0	-5.6	0.8	313	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	384	14.90	-24.6	-5.6	0.5	294	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	382	14.90	-24.2	-5.6	0.1	274	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	385	14.90	-24.1	-5.6	0.0	268	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	386	14.90	-24.1	-5.6	-0.1	266	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	442	14.90	-24.8	-5.6	0.7	304	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1440	14.93	-29.7	-5.5	0.7	304	Lipids

Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	388	15.00	-25.4	-5.5	1.3	342	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	443	15.00	-25.0	-5.5	0.9	321	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	444	15.00	-23.9	-5.5	-0.2	262	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	389	15.10	-24.1	-5.5	0.0	271	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	446	15.10	-24.4	-5.5	0.3	285	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	445	15.10	-23.8	-5.5	-0.2	259	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1441	15.12	-28.9	-5.4	-0.1	267	Lipids
Jia et al. (2003; Table DR1, black carbon)	1041	15.14	-23.8	-5.3	-0.1	264	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	447	15.20	-24.8	-5.2	1.0	323	TOM
Jia et al. (2003; Table DR1, black carbon)	1042	15.27	-28.0	-5.2	4.2	681	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	353	15.30	-26.2	-5.2	2.4	435	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	449	15.30	-25.3	-5.2	1.5	362	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	448	15.30	-25.1	-5.2	1.4	349	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1442	15.31	-29.2	-5.2	0.5	293	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1287	15.39	-25.2	-5.2	-3.6	146	Lipids
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	450	15.40	-25.2	-5.1	1.5	358	TOM
Jia et al. (2003; Table DR1, black carbon)	1043	15.40	-27.7	-5.1	4.0	636	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1288	15.46	-24.8	-5.1	-3.8	140	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1443	15.50	-29.8	-5.0	1.2	336	Lipids
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	354	15.50	-25.7	-5.0	2.1	410	TOM
Fang et al. (2013;	452	15.50	-25.3	-5.0	1.7	373	TOM

Supplemental file, Site 29, bulk TOM)							
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	451	15.50	-24.8	-5.0	1.2	339	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1289	15.51	-26.7	-5.4	-2.2	183	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1290	15.55	-28.9	-5.2	0.1	275	Lipids
Jia et al. (2003; Table DR1, black carbon)	1044	15.56	-27.4	-5.2	3.6	577	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	453	15.60	-25.2	-5.0	1.6	366	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	454	15.60	-24.9	-5.0	1.3	344	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1291	15.66	-28.4	-4.9	-0.1	266	Lipids
Jia et al. (2003; Table DR1, black carbon)	1045	15.68	-27.2	-4.9	3.7	588	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1444	15.68	-29.9	-4.9	1.4	352	Lipids
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	456	15.70	-25.5	-4.9	1.9	393	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	455	15.70	-25.2	-4.9	1.7	374	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	457	15.70	-24.7	-4.9	1.2	340	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1292	15.71	-28.1	-4.9	-0.4	250	Lipids
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	355	15.80	-24.6	-5.1	0.8	315	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	458	15.80	-23.7	-5.1	0.0	269	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	459	15.80	-23.0	-5.1	-0.8	236	TOM
Jia et al. (2003; Table DR1, black carbon)	1046	15.80	-27.0	-5.2	3.2	524	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1445	15.87	-29.8	-5.2	1.0	328	Lipids
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	461	15.90	-24.6	-5.3	0.7	305	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	460	15.90	-24.5	-5.3	0.6	301	TOM
Fang et al. (2013;	462	15.90	-24.1	-5.3	0.2	280	TOM

Supplemental file, Site 29, bulk TOM)							
Jia et al. (2003; Table DR1, black carbon)	1047	15.95	-26.6	-5.0	3.0	497	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1293	15.96	-28.6	-5.1	-0.1	265	Lipids
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	463	16.00	-23.3	-5.2	-0.4	250	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1294	16.03	-27.6	-5.2	-1.2	217	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1446	16.05	-29.4	-5.2	0.5	297	Lipids
Jia et al. (2003; Table DR1, black carbon)	1048	16.07	-26.7	-5.3	2.9	480	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1295	16.09	-27.8	-5.1	-0.9	229	Lipids
Jia et al. (2003; Table DR1, black carbon)	1049	16.15	-26.5	-5.1	2.8	472	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1447	16.23	-29.0	-4.8	0.5	296	Lipids
Jia et al. (2003; Table DR1, black carbon)	1050	16.23	-25.6	-4.8	2.2	415	TOM
Jia et al. (2003; Table DR1, black carbon)	1051	16.30	-26.4	-4.9	2.9	487	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1448	16.40	-29.1	-5.2	0.3	285	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1296	16.45	-27.7	-5.1	-1.0	225	Lipids
Jia et al. (2003; Table DR1, black carbon)	1052	16.47	-27.8	-5.2	4.0	640	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1297	16.55	-28.6	-5.2	-0.2	261	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1449	16.58	-29.9	-5.1	1.1	333	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1298	16.60	-28.5	-5.1	-0.2	260	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1299	16.71	-27.7	-5.3	-1.1	221	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1450	16.75	-28.7	-5.3	-0.3	257	Lipids
Jia et al. (2003; Table DR1, black carbon)	1053	16.80	-27.1	-5.4	3.1	512	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	357	16.80	-25.5	-5.4	1.5	361	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	356	16.80	-25.5	-5.4	1.5	356	TOM
Fang et al. (2013; Supplemental file, Site	358	16.80	-25.2	-5.4	1.2	340	TOM

27, bulk TOM)							
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	359	16.80	-25.2	-5.4	1.1	334	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	464	16.80	-23.5	-5.4	-0.6	244	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1300	16.82	-28.1	-5.5	-1.0	226	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1301	16.89	-29.2	-5.5	0.1	274	Lipids
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	361	16.90	-26.3	-5.5	2.1	407	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	363	16.90	-25.8	-5.5	1.7	371	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	364	16.90	-25.7	-5.5	1.5	361	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	360	16.90	-25.6	-5.5	1.5	359	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	365	16.90	-25.4	-5.5	1.3	343	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	362	16.90	-24.8	-5.5	0.7	305	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1451	16.92	-29.8	-5.6	0.7	306	Lipids
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	366	17.00	-25.8	-5.5	1.7	373	TOM
Jia et al. (2003; Table DR1, black carbon)	1054	17.08	-26.2	-5.5	2.1	407	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1452	17.09	-29.7	-5.5	0.6	303	Lipids
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	368	17.10	-25.2	-5.5	1.1	332	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	367	17.10	-24.9	-5.5	0.9	317	TOM
Uno et al. (2016; Table S5, >10 Ma)	1316	17.19	-32.4	-5.6	3.2	524	Lipids
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	369	17.20	-26.4	-5.6	2.2	417	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1453	17.26	-30.6	-5.7	1.3	344	Lipids
Fang et al. (2013; Supplemental file, Site	390	17.40	-24.9	-5.8	0.4	293	TOM

28, bulk TOM)							
Jia et al. (2003; Table DR1, black carbon)	1055	17.42	-25.6	-5.8	1.1	334	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1454	17.42	-29.2	-5.8	-0.2	260	Lipids
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	394	17.50	-25.1	-5.8	0.7	309	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	395	17.50	-25.1	-5.8	0.7	304	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	392	17.50	-25.0	-5.8	0.6	302	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	393	17.50	-24.8	-5.8	0.4	293	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	391	17.50	-24.6	-5.8	0.2	281	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	465	17.50	-24.0	-5.8	-0.4	253	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1455	17.58	-30.2	-5.8	0.8	313	Lipids
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	398	17.60	-25.2	-5.8	0.9	316	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	399	17.60	-25.2	-5.8	0.9	316	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	400	17.60	-25.2	-5.8	0.8	315	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	397	17.60	-25.0	-5.8	0.6	301	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	396	17.60	-24.1	-5.8	-0.3	255	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	466	17.60	-23.8	-5.8	-0.6	244	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	403	17.70	-26.2	-5.9	1.7	371	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	402	17.70	-24.8	-5.9	0.3	286	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	401	17.70	-24.7	-5.9	0.2	281	TOM
Fang et al. (2013; Supplemental file, Site	467	17.70	-24.6	-5.9	0.1	273	TOM

29, bulk TOM)							
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	468	17.70	-24.0	-5.9	-0.5	248	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	469	17.70	-23.8	-5.9	-0.7	240	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	470	17.70	-23.8	-5.9	-0.7	237	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1456	17.74	-29.9	-5.9	0.3	286	Lipids
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	405	17.80	-26.4	-6.0	1.8	378	TOM
Fang et al. (2013; Supplemental file, Site 28, bulk TOM)	404	17.80	-25.7	-6.0	1.1	330	TOM
Fang et al. (2013; Supplemental file, Site 29, bulk TOM)	471	17.80	-24.1	-6.0	-0.5	246	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	370	17.90	-26.5	-5.4	2.5	447	TOM
Fang et al. (2013; Supplemental file, Site 27, bulk TOM)	371	17.90	-25.9	-5.4	1.9	393	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1457	17.90	-29.3	-5.4	0.3	284	Lipids
Jia et al. (2003; Table DR1, black carbon)	1056	18.03	-28.1	-5.9	3.6	570	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1458	18.06	-29.5	-5.9	-0.1	267	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1459	18.21	-29.1	-5.9	-0.4	249	Lipids
Jia et al. (2003; Table DR1, black carbon)	1057	18.31	-27.0	-6.0	2.4	436	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1460	18.36	-29.2	-6.0	-0.4	252	Lipids
Jia et al. (2003; Table DR1, black carbon)	1058	18.37	-26.3	-6.0	1.7	372	TOM
Jia et al. (2003; Table DR1, black carbon)	1059	18.44	-25.9	-6.0	1.2	340	TOM
Jia et al. (2003; Table DR1, black carbon)	1060	18.51	-24.6	-6.0	0.0	272	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1461	18.51	-29.7	-6.0	0.1	275	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1462	18.66	-30.4	-5.8	1.0	328	Lipids

Jia et al. (2003; Table DR1, black carbon)	1061	18.73	-25.5	-6.0	0.9	316	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1463	18.80	-29.8	-6.1	0.1	275	Lipids
Zhou et al. (2017; Table S1, weighted mean values)	1464	18.94	-29.8	-6.2	-0.1	266	Lipids
Jia et al. (2003; Table DR1, black carbon)	1062	19.01	-26.5	-6.2	1.7	372	TOM
Zhou et al. (2017; Table S1, weighted mean values)	1465	19.08	-29.3	-6.1	-0.5	249	Lipids
Uno et al. (2016; Table S5, >10 Ma)	1317	19.18	-32.3	-6.0	2.7	466	Lipids
Jia et al. (2003; Table DR1, black carbon)	1063	19.24	-25.9	-6.0	1.3	346	TOM
Jia et al. (2003; Table DR1, black carbon)	1064	19.50	-25.2	-6.1	0.6	300	TOM
Johnson et al. (2009; Fig. 9, Early Miocene, bulk TOM)	1118	19.50	-25.3	-6.1	0.6	300	TOM
Saint-Germes et al. (2000; Fig. 2, continental organic matter)	1214	19.75	-24.8	-6.3	-0.1	263	TOM
Jia et al. (2003; Table DR1, black carbon)	1065	19.81	-21.8	-6.1	-2.9	163	TOM
Jia et al. (2003; Table DR1, black carbon)	1066	20.06	-24.9	-6.0	0.3	287	TOM
Jia et al. (2015; Table 1, n-C29)	123	20.10	-29.4	-6.0	-0.2	260	Lipids
Jia et al. (2015; Table 1, n-C29)	124	20.20	-30.0	-6.0	0.4	289	Lipids
Jia et al. (2003; Table DR1, black carbon)	1067	20.32	-24.5	-6.3	-0.4	252	TOM
Jia et al. (2015; Table 1, n-C29)	125	20.40	-29.2	-6.2	-0.6	241	Lipids
Jia et al. (2015; Table 1, n-C29)	126	20.50	-29.9	-6.2	0.1	276	Lipids
Jia et al. (2015; Table 1, n-C29)	127	20.70	-30.1	-6.1	0.4	291	Lipids
Jia et al. (2015; Table 1, n-C29)	128	20.80	-30.4	-6.0	0.8	311	Lipids
Jia et al. (2015; Table 1, n-C29)	129	20.90	-29.0	-6.0	-0.6	243	Lipids
Jia et al. (2015; Table 1, n-C29)	130	21.00	-30.8	-5.9	1.3	343	Lipids
Jia et al. (2003; Table DR1, black carbon)	1068	21.07	-25.7	-5.9	1.2	341	TOM
Jia et al. (2015; Table 1, n-C29)	131	21.10	-29.6	-5.9	0.1	276	Lipids
Jia et al. (2015; Table 1, n-C29)	132	21.30	-30.3	-5.9	0.8	313	Lipids
Jia et al. (2015; Table 1, n-C29)	133	21.40	-30.0	-6.0	0.4	292	Lipids
Jia et al. (2003; Table	1069	21.57	-25.2	-6.1	0.6	299	TOM

DR1, black carbon)							
Jia et al. (2015; Table 1, n-C29)	134	21.60	-30.2	-6.1	0.5	296	Lipids
Tipple and Pagani (2010; Table 1, n-C31)	1302	21.64	-29.7	-6.1	-0.1	267	Lipids
Jia et al. (2003; Table DR1, black carbon)	1070	21.69	-24.7	-6.1	0.0	269	TOM
Jia et al. (2015; Table 1, n-C29)	135	21.80	-30.8	-6.2	1.0	325	Lipids
Jia et al. (2003; Table DR1, black carbon)	1071	21.82	-25.1	-6.2	0.3	284	TOM
Tipple and Pagani (2010; Table 1, n-C31)	1303	21.85	-30.2	-6.2	0.4	291	Lipids
Jia et al. (2015; Table 1, n-C29)	136	21.90	-30.9	-6.2	1.1	329	Lipids
Jia et al. (2003; Table DR1, black carbon)	1072	21.94	-26.7	-6.2	1.9	387	TOM
Jia et al. (2015; Table 1, n-C29)	137	22.00	-28.6	-6.2	-1.2	217	Lipids
Jia et al. (2003; Table DR1, black carbon)	1073	22.05	-26.9	-6.2	2.1	407	TOM
Jia et al. (2003; Table DR1, black carbon)	1074	22.19	-25.6	-6.0	1.0	325	TOM
Jia et al. (2015; Table 1, n-C29)	138	22.20	-30.5	-5.9	1.0	323	Lipids
Jia et al. (2015; Table 1, n-C29)	139	22.30	-29.8	-5.8	0.4	293	Lipids
Jia et al. (2003; Table DR1, black carbon)	1075	22.30	-27.1	-5.8	2.7	464	TOM
Jia et al. (2015; Table 1, n-C29)	140	22.40	-30.6	-5.9	1.1	335	Lipids
Jia et al. (2003; Table DR1, black carbon)	1076	22.41	-24.6	-5.9	0.1	277	TOM
Jia et al. (2015; Table 1, n-C29)	141	22.50	-29.5	-6.0	-0.1	267	Lipids
Jia et al. (2003; Table DR1, black carbon)	1077	22.55	-27.0	-6.0	2.3	428	TOM
Jia et al. (2003; Table DR1, black carbon)	1078	22.66	-26.9	-5.6	2.7	467	TOM
Jia et al. (2015; Table 1, n-C29)	142	22.70	-29.7	-6.1	0.1	272	Lipids
Jia et al. (2015; Table 1, n-C29)	143	22.80	-30.8	-5.9	1.3	344	Lipids
Jia et al. (2003; Table DR1, black carbon)	1079	22.85	-26.8	-5.7	2.4	434	TOM
Jia et al. (2015; Table 1, n-C29)	144	22.90	-29.7	-5.6	0.5	296	Lipids
Jia et al. (2003; Table DR1, black carbon)	1080	22.91	-27.2	-5.6	3.1	506	TOM

SOM = soil organic matter

*Table and figure numbers refer to the cited reference from which the $\delta^{13}C_p$ data were compiled, not this study.

†Interpolated from Tipple et al. (2010).

§Calculated using Eqn. (2).

#Calculated using Eqn. (3).

TABLE S2. CO_2 ESTIMATES SMOOTHED WITH A LOWESS FIT.

		LOWESS fit*	
Age (Ma)	CO_2 (ppmv)	16^{th} percentile (ppmv)	84^{th} percentile (ppmv)
0.008	230	166	327
0.009	230	166	327
0.018	231	166	328
0.024	231	166	328
0.029	231	166	328
0.030	231	166	328
0.041	231	167	329
0.045	232	167	329
0.054	232	167	330
0.059	232	167	330
0.059	232	167	330
0.069	232	167	331
0.084	233	168	332
0.085	233	168	332
0.102	234	168	333
0.111	234	168	334
0.120	234	169	334
0.120	234	169	334
0.120	234	169	334
0.120	234	169	334
0.121	234	169	335
0.134	235	169	335
0.142	235	169	336
0.164	236	170	337
0.175	236	170	338
0.187	236	170	339
0.223	237	171	341
0.240	238	171	342
0.266	239	172	344
0.276	239	172	344
0.295	239	172	345
0.314	240	173	346
0.326	240	173	347
0.330	240	173	347
0.330	240	173	347
0.330	240	173	347
0.339	241	173	347
0.358	241	174	348
0.391	242	174	350

0.420	242	175	351
0.420	242	175	351
0.420	242	175	351
0.420	242	175	351
0.426	243	175	351
0.463	243	175	353
0.474	244	175	353
0.500	244	176	354
0.514	244	176	355
0.540	245	176	356
0.551	245	176	357
0.572	246	177	357
0.580	246	177	358
0.615	247	178	360
0.644	248	178	362
0.655	248	179	363
0.666	249	179	363
0.681	249	179	364
0.711	249	179	364
0.712	249	179	364
0.719	250	180	365
0.756	250	180	366
0.758	250	180	366
0.780	251	180	366
0.780	251	180	366
0.792	250	180	366
0.806	251	180	366
0.855	251	180	365
0.870	251	180	365
0.905	250	180	364
0.906	250	180	364
0.933	250	180	364
0.950	250	180	363
0.950	250	180	363
0.958	250	180	363
0.968	249	179	362
1.012	248	178	359
1.014	248	178	359
1.014	248	178	358
1.067	246	177	354
1.070	246	177	354
1.076	246	177	354
1.117	243	175	349

1.123	243	175	348
1.160	243	175	347
1.160	243	175	347
1.160	243	175	347
1.181	243	175	347
1.212	242	174	344
1.230	242	174	344
1.230	242	174	344
1.230	242	174	344
1.230	242	174	344
1.230	242	174	344
1.241	242	174	344
1.259	241	174	343
1.261	241	174	343
1.280	241	174	343
1.280	241	174	343
1.302	241	174	343
1.310	241	174	343
1.310	241	174	343
1.310	241	174	343
1.310	241	174	343
1.310	241	174	343
1.310	241	174	343
1.319	241	174	343
1.340	241	174	342
1.360	241	174	342
1.360	241	174	342
1.364	241	174	342
1.390	242	174	342
1.390	242	174	342
1.390	242	174	342
1.390	242	174	342
1.393	242	174	342
1.428	242	174	342
1.432	242	174	342
1.440	242	174	342
1.443	242	174	342
1.480	241	174	341
1.480	241	174	341
1.505	241	174	341
1.520	241	174	340
1.532	241	174	340
1.545	241	174	340

1.560	241	174	340
1.560	241	174	340
1.560	241	174	340
1.604	241	174	340
1.633	241	174	340
1.640	241	174	340
1.640	241	174	340
1.640	241	174	340
1.640	241	174	340
1.702	241	174	341
1.730	242	174	341
1.735	242	174	341
1.737	242	174	341
1.751	242	175	341
1.785	242	175	341
1.820	242	175	341
1.820	242	175	341
1.820	242	175	341
1.820	242	175	341
1.838	242	175	341
1.879	242	175	341
1.940	242	174	341
1.940	242	174	341
1.940	242	174	341
1.940	242	174	341
1.941	242	174	341
1.975	242	175	341
2.011	242	175	343
2.041	243	175	344
2.045	243	175	344
2.120	244	176	347
2.120	244	176	347
2.120	244	176	347
2.120	244	176	347
2.120	244	176	347
2.130	244	176	347
2.140	244	176	347
2.140	244	176	347
2.140	244	176	347
2.140	244	176	347
2.143	244	176	347
2.149	244	176	348
2.160	245	176	348

2.200	245	176	349
2.200	245	176	349
2.200	245	176	349
2.200	245	176	349
2.207	245	177	349
2.230	246	177	350
2.254	246	177	351
2.260	246	177	351
2.260	246	177	351
2.260	246	177	351
2.260	246	177	351
2.270	246	177	352
2.282	246	177	352
2.340	247	178	354
2.340	247	178	354
2.340	247	178	354
2.371	247	178	354
2.390	247	178	354
2.427	247	178	353
2.436	247	178	353
2.450	247	177	353
2.467	247	177	353
2.480	247	177	353
2.483	246	177	353
2.487	246	177	352
2.523	246	177	351
2.549	246	176	351
2.550	245	176	351
2.560	245	176	351
2.560	245	176	351
2.560	245	176	351
2.560	245	176	351
2.560	245	176	351
2.575	245	176	350
2.580	245	176	350
2.607	245	176	350
2.617	245	176	350
2.660	245	176	350
2.683	245	176	350
2.700	246	177	351
2.780	247	177	352
2.792	247	177	353
2.901	249	179	356

3.012	252	181	361
3.043	253	182	363
3.090	255	183	365
3.110	256	184	366
3.120	256	184	367
3.130	256	184	367
3.140	257	185	368
3.160	257	185	369
3.170	258	185	369
3.180	258	185	370
3.189	258	186	370
3.270	260	187	373
3.404	264	190	379
3.420	264	190	380
3.460	265	191	381
3.480	266	191	382
3.550	268	193	385
3.574	268	193	386
3.689	272	196	393
3.721	273	196	395
3.804	275	198	398
3.880	276	198	400
3.890	276	198	400
3.920	276	198	400
3.950	276	198	400
3.970	276	198	400
3.990	275	198	400
4.003	275	198	399
4.020	275	198	399
4.037	275	197	398
4.040	275	197	398
4.110	273	196	396
4.130	273	196	395
4.140	273	196	395
4.155	273	196	395
4.273	271	195	393
4.279	271	195	393
4.392	271	195	393
4.512	273	196	395
4.610	273	196	396
4.632	273	196	396
4.730	272	195	394
4.750	271	195	393

4.753	271	195	393
4.790	270	194	392
4.860	269	193	389
4.875	269	193	389
4.882	268	193	389
4.998	266	191	386
5.053	264	190	382
5.121	263	189	380
5.210	260	187	376
5.245	259	186	373
5.250	259	186	374
5.258	259	186	373
5.310	257	185	370
5.340	256	184	368
5.350	256	184	367
5.370	256	184	367
5.380	256	184	367
5.390	256	184	367
5.420	255	183	366
5.444	254	183	364
5.460	253	182	362
5.496	253	182	362
5.510	253	182	362
5.546	252	182	361
5.622	251	181	357
5.649	251	181	357
5.720	249	179	353
5.750	249	179	353
5.820	248	179	351
6.005	251	181	356
6.021	252	182	357
6.134	255	184	362
6.160	256	185	364
6.170	256	185	364
6.203	257	186	366
6.264	260	187	370
6.300	261	189	373
6.300	261	189	373
6.300	261	189	373
6.300	261	189	373
6.300	261	189	373
6.300	261	189	373
6.300	261	189	373

6.300	261	189	373
6.300	261	189	373
6.300	261	189	373
6.300	261	189	373
6.300	261	189	373
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6.300	261	189	373
6.300	261	189	373
6.300	261	189	373
6.300	261	189	373
6.300	261	189	373
6.394	266	192	381
6.427	267	193	384
6.460	269	194	386
6.470	269	194	387
6.490	269	194	387

6.500	269	194	388
6.520	270	195	388
6.520	270	195	388
6.526	270	195	389
6.530	270	195	389
6.540	270	195	389
6.550	270	195	389
6.550	270	195	389
6.609	271	196	391
6.658	272	196	392
6.790	274	197	395
6.790	274	197	395
6.924	276	199	398
7.003	277	199	399
7.058	277	200	401
7.181	279	201	403
7.193	279	201	404
7.323	281	202	407
7.328	281	202	407
7.340	281	202	407
7.340	281	202	407
7.350	281	202	408
7.360	281	202	408
7.370	281	202	408
7.380	282	202	408
7.380	282	202	408
7.400	282	203	408
7.414	282	203	409
7.420	282	203	409
7.420	282	203	409
7.440	283	203	410
7.460	283	203	411
7.465	283	204	411
7.470	283	204	411
7.476	283	204	412
7.480	284	204	412
7.600	287	206	419
7.602	287	206	419
7.724	291	209	425
7.739	291	209	426
7.873	293	210	430
7.878	293	211	430
7.997	295	212	433

8.017	295	212	433
8.059	296	212	434
8.121	296	213	435
8.260	298	214	438
8.301	299	214	439
8.310	299	214	440
8.350	299	215	441
8.383	300	215	442
8.439	301	216	444
8.465	302	216	445
8.600	304	218	450
8.600	304	218	450
8.600	304	218	450
8.600	304	218	450
8.600	304	218	450
8.600	304	218	450
8.600	304	218	450
8.600	304	218	450
8.600	304	218	450
8.600	304	218	450
8.630	304	218	451
8.670	304	218	452
8.694	304	218	452
8.730	305	218	452
8.760	305	218	453
8.810	305	218	453
8.910	304	218	452
8.990	304	218	452
9.030	304	218	452
9.050	304	218	452
9.167	303	217	451
9.416	302	216	449
9.464	302	216	449
9.662	301	216	449
9.828	301	216	449
9.907	301	216	450
9.983	301	216	450
10.080	301	215	450
10.113	301	215	450
10.149	301	215	450
10.242	301	215	450
10.398	302	216	451
10.535	302	216	453

10.614	302	216	453
10.626	302	216	453
10.693	302	216	453
10.862	303	216	454
11.031	304	217	456
11.095	304	217	456
11.233	305	218	458
11.327	306	219	460
11.392	307	220	462
11.552	309	221	464
11.556	309	221	464
11.711	310	222	466
11.720	310	222	466
11.783	311	222	467
12.007	311	223	467
12.094	311	223	467
12.230	312	223	468
12.407	315	225	473
12.450	316	226	475
12.669	322	230	485
12.717	323	231	486
13.000	327	234	493
13.000	327	234	493
13.000	327	234	493
13.000	327	234	493
13.000	327	234	493
13.000	327	234	493
13.000	327	234	493
13.000	327	234	493
13.000	327	234	493
13.099	328	235	494
13.100	328	235	494
13.100	328	235	494
13.100	328	235	494
13.160	328	235	493
13.200	328	235	493
13.200	328	235	493
13.200	328	235	493
13.200	328	235	493
13.300	328	235	493
13.300	328	235	493
13.300	328	235	493
13.300	328	235	493

13.300	328	235	493
13.300	328	235	493
13.300	328	235	493
13.400	328	235	492
13.400	328	235	492
13.400	328	235	492
13.400	328	235	492
13.400	328	235	492
13.480	327	234	490
13.500	327	234	490
13.500	327	234	490
13.500	327	234	490
13.500	327	234	490
13.500	327	234	490
13.520	327	234	490
13.592	326	234	488
13.600	326	233	488
13.600	326	233	488
13.600	326	233	488
13.600	326	233	488
13.600	326	233	488
13.600	326	233	488
13.600	326	233	488
13.600	326	233	488
13.600	326	233	488
13.700	325	233	486
13.700	325	233	486
13.700	325	233	486
13.800	323	232	483
13.914	321	230	479
13.930	321	230	478
13.933	320	230	478
14.000	319	229	476
14.136	317	227	472
14.200	316	226	471
14.303	314	225	467
14.337	314	225	469
14.500	314	225	471
14.535	314	225	471
14.600	314	224	471
14.628	313	224	469
14.700	315	225	474
14.732	316	226	476

14.800	316	226	477
14.800	316	226	477
14.800	316	226	477
14.813	316	226	477
14.893	319	227	482
14.900	319	227	483
14.900	319	227	483
14.900	319	227	483
14.900	319	227	483
14.900	319	227	483
14.900	319	227	483
14.900	319	227	483
14.900	319	227	483
14.926	320	228	485
15.000	321	229	488
15.000	321	229	488
15.000	321	229	488
15.100	324	231	495
15.100	324	231	495
15.100	324	231	495
15.119	325	231	496
15.143	326	232	498
15.200	327	233	501
15.274	329	234	506
15.300	330	234	508
15.300	330	234	508
15.300	330	234	508
15.309	331	235	508
15.390	333	236	514
15.400	334	237	515
15.404	333	236	515
15.460	335	237	519
15.497	336	238	520
15.500	336	238	520
15.500	336	238	520
15.500	336	238	520
15.510	336	238	521
15.550	337	239	523
15.557	337	239	523
15.600	338	239	526
15.600	338	239	526
15.660	339	240	527
15.682	339	240	528

15.683	339	240	528
15.700	340	240	529
15.700	340	240	529
15.700	340	240	529
15.710	340	240	529
15.800	341	241	532
15.800	341	241	532
15.800	341	241	532
15.803	341	241	532
15.866	341	241	531
15.900	341	241	532
15.900	341	241	532
15.900	341	241	532
15.950	342	241	533
15.960	342	242	533
16.000	342	242	534
16.030	342	242	534
16.048	342	242	534
16.072	343	242	535
16.090	343	242	535
16.152	343	242	535
16.227	343	242	534
16.234	343	242	533
16.304	342	242	532
16.404	341	242	529
16.450	341	241	527
16.466	340	241	526
16.550	339	240	522
16.579	338	240	521
16.600	338	240	520
16.710	334	237	513
16.752	333	237	510
16.798	332	236	508
16.800	332	236	508
16.800	332	236	508
16.800	332	236	508
16.800	332	236	508
16.800	332	236	508
16.820	332	236	507
16.890	331	235	504
16.900	330	235	504
16.900	330	235	504
16.900	330	235	504

16.900	330	235	504
16.900	330	235	504
16.900	330	235	504
16.922	330	235	503
17.000	329	234	500
17.082	327	233	497
17.091	327	233	497
17.100	327	233	496
17.100	327	233	496
17.190	326	232	494
17.200	326	232	493
17.257	325	232	492
17.400	323	231	488
17.419	323	230	488
17.421	323	230	488
17.500	322	230	486
17.500	322	230	486
17.500	322	230	486
17.500	322	230	486
17.500	322	230	486
17.500	322	230	486
17.583	321	229	484
17.600	321	229	483
17.600	321	229	483
17.600	321	229	483
17.600	321	229	483
17.600	321	229	483
17.600	321	229	483
17.700	320	229	482
17.700	320	229	482
17.700	320	229	482
17.700	320	229	482
17.700	320	229	482
17.700	320	229	482
17.700	320	229	482
17.743	320	229	482
17.800	320	228	481
17.800	320	228	481
17.800	320	228	481
17.900	319	228	480
17.900	319	228	480
17.901	319	228	480
18.031	318	227	477

18.056	318	227	477
18.209	315	225	472
18.312	313	224	469
18.361	312	223	467
18.371	312	223	467
18.442	311	222	464
18.507	309	221	461
18.509	309	221	461
18.656	306	219	456
18.733	305	218	454
18.801	304	218	452
18.943	303	217	449
19.012	302	216	448
19.084	301	216	447
19.180	301	215	445
19.243	300	215	444
19.496	299	214	442
19.500	299	214	442
19.750	300	215	443
19.808	301	215	444
20.062	303	217	449
20.100	304	217	450
20.200	305	218	452
20.315	307	220	456
20.400	308	220	458
20.500	309	221	460
20.700	312	223	465
20.800	313	224	467
20.900	314	224	470
21.000	315	225	472
21.071	316	226	474
21.100	316	226	474
21.300	319	227	479
21.400	320	228	481
21.573	322	230	486
21.600	322	230	486
21.640	323	230	487
21.686	323	231	489
21.800	325	232	491
21.824	325	232	492
21.850	326	232	493
21.900	326	233	494
21.937	327	233	495

22.000	328	234	497
22.049	328	234	498
22.188	330	235	502
22.200	331	236	503
22.300	332	237	506
22.301	332	237	506
22.400	334	238	509
22.413	334	238	509
22.500	335	239	512
22.548	336	239	513
22.660	338	240	517
22.700	339	241	518
22.800	340	242	522
22.852	341	243	524
22.900	342	243	525
22.912	342	243	526

91 *weight = 0.15

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