Table DR1: $U^{K'}_{37}$ and alkenone temperature data derived from sediment core SO201-2-85KL (57°30' N, 170° 24' E).

Depth (cm)	Age (ka)	$U^{K'}_{37}$	Alkenone temperature (°C)*	Depth (cm)	Age (ka)	$U^{K'}_{37}$	Alkenone temperature (°C)*	Depth (cm)	Age (ka)	$U^{K'}_{37}$	Alkenone temperature (°C)*
766	70.49	0.22	5.4	1090	102.78	0.30	7.9	1250	119.00	0.25	6.3
786	71.70	0.23	5.7	1091	102.91	0.24	6.0	1253	119.60	0.26	6.6
801	72.66	0.12	2.2	1093	103.18	traces	-	1256	120.20	0.29	7.5
811	73.38	0.23	5.5	1096	103.57	0.21	5.0	1260	121.00	0.28	7.3
831	74.82	0.25	6.2	1100	104.10	traces	-	1263	121.60	0.24	6.0
851	76.26	0.22	5.2	1101	104.18	traces	-	1266	122.20	0.25	6.3
871	77.50	traces	-	1103	104.34	0.21	5.1	1270	123.00	0.27	6.9
873	77.62	0.13	2.7	1111	104.98	traces	-	1273	123.60	0.26	6.6
883	78.59	0.24	5.8	1113	105.13	traces	-	1276	124.20	0.23	5.6
891	79.50	0.27	6.9	1120	105.69	0.24	5.9	1280	125.00	0.33	8.6
901	80.63	0.26	6.4	1121	105.77	0.31	8.2	1283	125.75	0.26	6.5
903	80.85	0.25	6.1	1123	105.93	0.32	8.2	1285	126.25	0.33	8.6
920	82.78	0.29	7.4	1126	106.17	0.27	6.8	1286	126.50	0.27	7.0
921	82.89	0.29	7.6	1131	106.57	0.26	6.7	1287	126.75	0.33	8.6
923	83.12	0.27	6.9	1133	106.73	0.32	8.4	1288	127.00	0.37	9.8
930	83.91	0.28	7.1	1140	107.28	0.23	5.7	1289	127.25	0.36	9.6
933	84.25	0.26	6.6	1141	107.36	0.29	7.4	1290	127.50	traces	-
940	84.93	0.24	6.0	1143	107.52	0.25	6.1	1293	128.25	traces	-
941	85.01	traces	-	1146	107.76	0.21	5.0	1295	128.75	traces	-
943	85.16	0.19	4.5	1150	108.07	0.26	6.6	1296	129.00	traces	-
950	85.70	traces	-	1151	108.14	traces	-	1298	129.50	traces	-
953	85.93	0.15	3.1	1153	108.28	0.26	6.4	1300	130.00	traces	-
956	86.16	traces	-	1156	108.50	traces	-	1303	130.30	0.23	5.7
960	86.47	traces	-	1160	108.78	traces	-	1305	130.50	0.21	5.2
961	86.55	traces	-	1161	108.85	traces	-	1306	130.60	0.22	5.3
963	86.70	traces	-	1163	108.99	0.19	4.3	1310	131.00	0.23	5.5
970	87.24	traces	-	1166	109.21	traces	-	1311	131.10	traces	-
973	87.47	traces	-	1170	109.49	traces	-	1313	131.30	0.20	4.7
980	88.23	0.22	5.4	1171	109.56	traces	-	1316	131.60	0.25	6.2
983	88.63	0.20	4.8	1172	109.63	traces	-	1321	132.07	0.19	4.3
990	89.57	0.23	5.7	1173	109.70	0.17	3.7	1322	132.13	0.28	7.0
993	89.97	0.25	6.1	1176	109.92	0.19	4.5	1323	132.20	0.26	6.6
1000	90.90	traces	-	1180	110.20	traces	-	1326	132.40	0.30	7.9
1001	91.03	traces	-	1181	110.30	traces	-	1331	132.73	traces	-
1003	91.30	traces	-	1183	110.51	0.20	4.8	1332	132.80	traces	-
1010	92.23	0.20	4.8	1186	110.82	0.18	4.0	1333	132.87	0.21	4.9
1013	92.62	0.21	5.0	1190	111.23	traces	-	1335	133.00	0.23	5.5
1021	93.68	traces	-	1191	111.34	traces	-	1336	133.07	0.22	5.5
1023	93.94	0.19	4.4	1193	111.54	0.19	4.5	1341	133.40	traces	-
1033	95.26	0.26	6.7	1196	111.85	0.22	5.4	1342	133.47	traces	-
1041	96.32	traces	-	1201	112.37	traces	-	1343	133.53	0.22	5.3
1051	97.64	traces	-	1203	112.58	0.21	5.1	1346	133.73	0.24	5.8
1052	97.77	0.28	7.1	1206	112.89	0.23	5.5	1351	134.07	0.22	5.3
1056	98.30	0.27	7.0	1211	113.41	0.26	6.6	1356	134.40	0.20	4.6
1060	98.82	traces	-	1213	113.62	0.26	6.5	1361	134.73	0.18	4.2
1061	98.96	traces	-	1215	113.84	0.23	5.6	1366	135.10	0.18	4.0
1063	99.22	traces	-	1216	113.94	traces	-	1371	135.58	traces	-
1066	99.62	traces	-	1223	114.69	0.23	5.7	1376	136.07	0.18	4.1
1070	100.14	traces	-	1225	114.94	traces	-	1386	137.04	0.21	5.1
1071	100.27	traces	-	1230	115.63	traces	-	1391	137.52	0.20	4.7
1073	100.54	0.31	8.0	1233	116.04	traces	-	1401	138.49	0.20	4.8
1076	100.93	0.31	8.1	1235	116.31	traces	-				
1080	101.46	0.30	7.8	1236	116.45	traces	-				

*SST (°C) Uk'37 = 0.033T + 0.044

1081	101.59	traces	-	1240	117.00	traces	-	(Müller et al., 1998)
1083	101.86	0.24	6.0	1243	117.60	0.25	6.2	
1086	102.25	0.20	4.7	1246	118.20	0.24	6.0	

Table DR2: IP_{25} sea-ice biomarker data derived from sediment core SO201-2-85KL (57°30' N, 170° 24' E).

Depth (cm)	Age (ka)	IP_{25} (µg/gSed)	IP_{25} (µg/gTOC)	Depth (cm)	Age (ka)	IP_{25} (µg/gSed)	IP_{25} (µg/gTOC)
766	70.49	traces	traces	1133	106.73	0.0037	0.4315
786	71.70	0.0061	0.5056	1140	107.28	0.0022	0.1773
801	72.66	0.0066	0.9991	1141	107.36	traces	traces
811	73.38	0.0034	0.5338	1143	107.52	no IP_{25}	no IP_{25}
831	74.82	0.0042	0.5974	1150	108.07	0.0063	1.0508
851	76.26	0.0025	0.2312	1151	108.14	0.0084	1.0439
871	77.50	0.0021	0.2953	1153	108.28	0.0154	1.8597
891	79.50	0.0048	0.5037	1160	108.78	0.0090	1.5760
901	80.63	0.0032	0.2987	1161	108.85	0.0070	1.2100
920	82.78	0.0038	0.3830	1170	109.49	0.0089	1.6456
921	82.89	0.0042	0.3292	1171	109.56	0.0087	1.6420
930	83.91	0.0032	0.2803	1172	109.63	0.0055	1.0289
940	84.93	0.0064	0.5747	1173	109.70	0.0073	1.4361
941	85.01	0.0056	0.5623	1180	110.20	0.0084	1.5219
950	85.70	0.0028	0.3554	1181	110.30	0.0065	1.1837
956	86.16	0.0059	0.7918	1190	111.23	0.0004	0.0457
960	86.47	0.0060	0.8552	1191	111.34	0.0080	1.3841
961	86.55	0.0051	0.5911	1201	112.37	0.0055	0.6935
970	87.24	0.0063	0.8375	1211	113.41	0.0035	0.5362
973	87.47	0.0080	1.1750	1225	114.94	0.0086	0.9902
980	88.23	0.0061	0.6669	1230	115.63	no IP_{25}	no IP_{25}
981	88.37	0.0079	0.6479	1235	116.31	0.0098	1.2501
990	89.57	0.0055	0.5593	1240	117.00	0.0080	0.9257
1000	90.90	0.0060	0.7555	1250	119.00	0.0024	0.1868
1001	91.03	0.0052	0.6477	1251	119.20	0.0026	0.2632
1010	92.23	0.0103	1.4525	1260	121.00	traces	traces
1021	93.68	no IP_{25}	no IP_{25}	1270	123.00	no IP_{25}	no IP_{25}
1041	96.32	0.0051	0.5791	1271	123.20	0.0015	0.1493
1051	97.64	0.0066	0.8702	1280	125.00	no IP_{25}	no IP_{25}
1056	98.30	0.0081	1.1389	1287	126.75	no IP_{25}	no IP_{25}
1060	98.82	0.0089	0.9871	1288	127.00	no IP_{25}	no IP_{25}
1061	98.96	0.0055	0.5461	1289	127.25	no IP_{25}	no IP_{25}
1063	99.22	0.0083	0.9198	1290	127.50	no IP_{25}	no IP_{25}
1066	99.62	0.0056	0.6719	1298	129.50	no IP_{25}	no IP_{25}
1070	100.14	0.0061	0.7313	1300	130.00	no IP_{25}	no IP_{25}
1071	100.27	0.0061	0.7162	1303	130.30	0.0033	0.5354
1073	100.54	0.0051	0.6368	1305	130.50	0.0030	0.5252
1080	101.46	0.0039	1.0866	1306	130.60	0.0026	0.4904
1081	101.59	0.0044	0.5447	1310	131.00	0.0028	0.4761
1083	101.86	traces	traces	1316	131.60	0.0027	0.5465
1086	102.25	0.0097	1.1564	1322	132.13	0.0028	0.5586
1090	102.78	0.0112	1.4581	1323	132.20	0.0030	0.5807
1091	102.91	0.0113	1.2790	1326	132.40	0.0020	0.3528
1101	104.18	0.0065	0.6791	1336	133.07	0.0028	0.3505
1103	104.34	0.0039	0.6779	1343	133.53	0.0044	0.7725
1113	105.13	0.0063	0.9336	1346	133.73	0.0046	0.9117
1120	105.69	0.0043	0.5341	1356	134.40	0.0047	0.5213
1121	105.77	traces	traces	1366	135.10	0.0061	0.9192
1123	105.93	0.0047	0.5745	1386	137.04	0.0049	0.5557
1126	106.17	0.0058	0.7217	1401	138.49	0.0059	0.7432

Additional source information for published data used in this manuscript:

Figure 2:

NGRIP ice core data:

The dataset is available at Nature web page (doi:10.1038/nature02805)

Original reference:
Andersen, K. K., Azuma, N., Barnola, J. M., Bigler, M., Biscaye, P., Caillon, N., Chappellaz, J., Clausen, H. B., DahlJensen, D., Fischer, H., Fluckiger, J., Fritzsche, D., Fujii, Y., Goto-Azuma, K., Gronvold, K., Gundestrup, N. S., Hansson, M., Huber, C., Hvidberg, C. S., Johnsen, S. J., Jonsell, U., Jouzel, J., Kipfstuhl, S., Landais, A., Leuenberger, M., Lorrain, R., Masson-Delmotte, V., Miller, H., Motoyama, H., Narita, H., Popp, T., Rasmussen, S. O., Raynaud, D., Rothlisberger, R., Ruth, U., Samyn, D., Schwander, J., Shoji, H., Siggard-Andersen, M. L., Steffensen, J. P., Stocker, T., Sveinbjornsdottir, A. E., Svensson, A., Takata, M., Tison, J. L., Thorsteinsson, T., Watanabe, O., Wilhelms, F., White, J. W. C., and Project, N. G. I. C., 2004, High-resolution record of Northern Hemisphere climate extending into the last interglacial period: Nature, v. 431, no. 7005, p. 147-151.

Sanbao speleothem records:

The dataset is available at Nature web page (doi:10.1038/nature06692)

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Wang, Y. J., Cheng, H., Edwards, R. L., Kong, X. G., Shao, X. H., Chen, S. T., Wu, J. Y., Jiang, X. Y., Wang, X. F., and An, Z. S., 2008, Millennial- and orbital-scale changes in the East Asian monsoon over the past 224,000 years: Nature, v. 451, no. 7182, p. 1090-1093.

SO201-2-85KL (color b* oxygen isotope data):

The data are available via the PANGAEA Data Publisher for Earth & Environmental Science (http://doi.pangaea.de/10.1594/PANGAEA.786307).

Original reference:
Riethdorf, J. R., Nürnberg, D., Max, L., Tiedemann, R., Gorbarenko, S. A., and Malakhov, M. I., 2013, Millennial-scale variability of marine productivity and terrigenous matter supply in the western Bering Sea over the past 180 kyr: Climate of the Past, v. 9, p. 1345-1373.

Figure 3:

ODP Site 980 (IRD and carbon isotope data):

The dataset is available at World Data Center for Paleoclimatology, Boulder and NOAA Paleoclimatology Program
ftp://ftp.ncdc.noaa.gov/pub/data/paleo/paleocean/by_contributor/mcmanus1999/readme_mcmanus1999.txt

Original reference:
McManus, J.F., Oppo, D.W., and Cullen, J.L., 2001, ODP 980 Isotope and IRD Data, IGBP PAGES/World Data Center A for Paleoclimatology Data Contribution Series #2001-065. NOAA/NGDC Paleoclimatology Program, Boulder CO, USA.

El´gygytgyn temperature data:

The dataset is available at Science web page
www.sciencemag.org/cgi/content/full/science.1222135/DC1

Original reference:
Melles, M., Brigham-Grette, J., Minyuk, P. S., Nowaczyk, N. R., Wennrich, V., DeConto, R. M., Anderson, P. M., Andreev, A. A., Coletti, A., Cook, T. L., Haltia-Hovi, E., Kukkonen, M., Lozhkin, A. V., Rosen, P., Tarasov, P., Vogel, H., and Wagner, B., 2012, 2.8 Million Years of Arctic Climate Change from Lake El'gygytgyn, NE Russia: Science, v. 337, no. 6092, p. 315-320.