

1 **Are glacials dry? Consequences for paleoclimatology and for greenhouse**
2 **warming (Supplementary Tables)**

3 Jacob Scheff*, Richard Seager, and Haibo Liu

4 *Lamont-Doherty Earth Observatory, Columbia University, Palisades, New York*

5 Sloan Coats

6 *Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder,*
7 *Colorado, and National Center for Atmospheric Research, Boulder, Colorado*

8 *Corresponding author address: Jacob Scheff, Lamont-Doherty Earth Observatory, 301F Oceanog-
9 raphy, 61 Route 9W - Box 1000, Palisades, NY 10964.

10 E-mail: jscheff@ldeo.columbia.edu

292 Table S1. African BIOME6000 Last Glacial Maximum pollen locations (longitude and latitude in decimal
293 degrees; elevation in m) and biome classifications from Elenga et al. (2000) ["E00"], with present natural biome
294 and present-to-LGM change assessment (section 2b of the main text). W codes for greener or "wetter-looking"
295 vegetation at the LGM than today, D for browner or "drier-looking" at the LGM than today, and N for no clear
296 signal. Lower-case letters indicate uncertain assessment due to inconclusive present-vegetation identification or
297 unclear biome-climate relationships; "u" codes for unknown and thus not plotted. See section 2b of the main
298 text.

Site name	Lon.	Lat.	Elev.	LGM vegetation	Present natural vegetation & sources	Change
Tibesti	18.50	21.00	1800	steppe	steppe; desert nearby (map in Jolly et al. 1998)	n
Bosumtwi	-1.33	6.53	100	steppe	tropical semi-evergreen broadleaf forest (E00; Maley 1991)	D
Barombi Mbo	9.40	4.67	300	tropical semi-evergreen broadleaf forest	tropical evergreen broadleaf forest (Maley 1991)	D
Cherangani Hill	35.47	1.00	2900	steppe	warm-temperate evergreen broadleaf and mixed forest (e.g. Kenya Forest Service 2015)	D
Sacred Lake	37.47	0.03	2400	xerophytic woods/scrub	warm-temperate evergreen broadleaf and mixed forest (E00)	d
Rutundu	37.32	-0.17	3140	xerophytic woods/scrub	warm-temperate evergreen broadleaf and mixed forest (E00)	d
Naivasha	36.33	-0.75	1890	steppe	tropical savanna; warm-temperate evergreen broadleaf and mixed forest nearby (Maitima 1991)	D
Ahakagyazi	29.90	-1.11	1830	xerophytic woods/scrub	warm-temperate evergreen broadleaf and mixed forest (Taylor 1990)	d
Muchoya	29.80	-1.28	2260	xerophytic woods/scrub	warm-temperate evergreen broadleaf and mixed forest (Taylor 1990)	d
Kamiranzovu	29.00	-2.33	1950	xerophytic woods/scrub	could not be obtained	u
Rusaka	29.62	-3.43	2070	xerophytic woods/scrub	warm-temperate evergreen broadleaf and mixed forest (Bonnefille et al. 1995)	d
Kashiru	29.57	-3.47	2240	xerophytic woods/scrub	warm-temperate evergreen broadleaf and mixed forest (Bonnefille and Rioulet 1988)	d
Ngamakala	15.38	-4.07	400	tropical semi-evergreen broadleaf forest	tropical savanna; tropical semi-evergreen broadleaf forest nearby (map in Jolly et al. 1998; Elenga et al. 1994)	w
Tanganyika Sd-24	29.37	-4.97	773	xerophytic woods/scrub	tropical deciduous broadleaf forest and woodland or tropical savanna (E00; Vincens 1993)	d
Tanganyika Mpu-12	30.62	-8.50	773	xerophytic woods/scrub	tropical deciduous broadleaf forest and woodland (map in Jolly et al. 1998; Vincens 1991)	d
Ishiba	31.74	-11.21	1500	xerophytic woods/scrub	tropical deciduous broadleaf forest and woodland (Livingstone 1971) or xerophytic woods/scrub (map in Jolly et al. 1998)	d
Torotorofotsy	48.50	-19.00	956	warm-temperate evergreen broadleaf and mixed forest	tropical evergreen broadleaf forest (Rakotondratsimba et al. 2013)	N
Tritrivakely	46.92	-19.93 ^a	1778	xerophytic woods/scrub	“sclerophyllous forest” (Gasse and Van Campo 1998)	d
Wonderkrater	28.75	-24.43	1100	steppe	xerophytic woods/scrub (map in Jolly et al. 1998; Scott 1982; Prentice et al. 2000)	D
Sossus Vlei	15.51	-25.30	750	steppe	desert (map in Jolly et al. 1998; Van Zinderen Bakker 1983)	W
Equus Cave	24.37	-27.85	1250	tropical savanna	tropical savanna (Scott 1987)	N
Elim	28.42	-28.49	1890	steppe	steppe (Scott 1989a)	N
Cornelia	28.42	-28.50	1800	steppe	steppe (Scott 1989b,a)	N
Pakhuis	19.04	-32.06	600	xerophytic woods/scrub	xerophytic woods/scrub (E00; Scott 1994)	N

^a Gasse and Van Campo (1998) and E00 incorrectly have -19.78.

299 Table S2. As Table S1, but for pan-Arctic ($> 55^{\circ}$ N) sites (Bigelow et al. 2003). Present natural vegetation
 300 is assumed to be forest or one of the shrub-tundras throughout (section 2b2 of the main text). Elevation is not
 301 available (n/a) for some sites.

Site name	Lon.	Lat.	Elev.	LGM vegetation	Change
Cape Sabler 1	100.00	74.33	n/a	graminoid and forb tundra	D
Berelekyekh Section	145.00	70.58	20	erect dwarf-shrub tundra	N
Nedre Aerasvatn	19.07	69.75	35	cushion-forb tundra	u
Endlevatn	19.08	69.73	35	cushion-forb tundra	u
Ovre Aerasvatn	19.05	69.73	44	cushion-forb tundra	u
Ayakli	89.00	69.25	125	graminoid and forb tundra	D
Malaya Kheta	84.75	69.00	50	temperate grassland	D
Tukuto Lake	-157.05	68.50	541	prostrate dwarf-shrub tundra	N
Hanging Lake	-138.38	68.38	500	prostrate dwarf-shrub tundra	N
Krasivoe	161.74	68.30	47	graminoid and forb tundra	D
Kaiyak Lake	-161.42	68.15	190	graminoid and forb tundra	D
Bugutakh-1 Section	134.88	67.83	128	low and high shrub tundra	N
Bolvan Bog 1	48.72	67.73	160	graminoid and forb tundra	D
302 Rebel Lake	-149.80	67.42	914	graminoid and forb tundra	D
Ranger Lake	-153.65	67.15	820	graminoid and forb tundra	D
Squirrel Lake	-160.38	67.10	91	graminoid and forb tundra	D
Joe Lake	-157.22	66.77	183	graminoid and forb tundra	D
Tiinkdhul Lake	-143.15	66.58	189	graminoid and forb tundra	D
Eh'cho	-164.39	66.57	n/a	graminoid and forb tundra	D
Ulu	-164.39	66.57	n/a	graminoid and forb tundra	D
Egg 1	-164.45	66.56	n/a	graminoid and forb tundra	D
Rhonda 3	-164.46	66.56	n/a	graminoid and forb tundra	D
Plane	-164.40	66.48	n/a	graminoid and forb tundra	D
Tern	-164.39	66.47	n/a	graminoid and forb tundra	D
Reindeer I	-164.47	66.33	n/a	graminoid and forb tundra	D
Reindeer III	-164.47	66.33	n/a	graminoid and forb tundra	D
Reindeer II	-164.47	66.33	n/a	prostrate dwarf-shrub tundra	N

Site name	Lon.	Lat.	Elev.	LGM vegetation	Change
Sands of Time Lake	-147.55	66.30	230	erect dwarf-shrub tundra	N
Bering Land Bridge	-167.42	65.23	0	erect dwarf-shrub tundra	N
Smorodinovoye Lake	141.17	64.77	800	prostrate dwarf-shrub tundra	N
St. Lawrence Island Section 3	-171.50	63.75	0	erect dwarf-shrub tundra	N
Zagoskin Lake	-162.11	63.45	12	graminoid and forb tundra	D
Gytgykaii Lake	176.55	63.42	102	graminoid and forb tundra	D
Dima-2 Section	146.02	62.67	700	graminoid and forb tundra	D
Antifreeze Pond	-140.83	62.35	706	graminoid and forb tundra	D
Jack London (Magadan Oblast')	149.50	62.17	820	low and high shrub tundra	N
Elikchan Lake	151.88	60.75	810	graminoid and forb tundra	D
Alut Lake	152.31	60.30	480	graminoid and forb tundra	D
Ob' River at Kolpashevo	83.00	58.25	62	temperate grassland	D

303 Table S3. As Table S1, but for Australasia, Southeast Asia and the Pacific (Pickett et al. 2004) [“P04”]. At
 304 sites with multiple LGM biomes, we use the majority (following Bigelow et al. 2003) if there is one, and consider
 305 all equally if there is no majority.

Site name	Lon.	Lat.	Elev.	LGM vegetation	Present natural vegetation & sources	Change
Nong Pa Kho	102.93	17.10	175	tropical deciduous broadleaf forest and woodland	tropical semi-evergreen broadleaf forest (P04)	D
Danau Di Atas	100.76	-1.07	1535	warm-temperate rainforest	“lower montane rain forest” (Newsome 1988)	N
Lake Hordorli	140.60	-2.55	780	cool-temperate rainforest or wet sclerophyll forest	warm-temperate rainforest (P04)	d
Wanda	121.38	-2.55	445	tropical deciduous broadleaf forest and woodland	rainforest ^a (Hope 2001)	D
Sirunki Wabag (A16)	143.42	-5.40	2500	cool-temperate rainforest	rainforest (Walker and Flenley 1979)	N
Tugupugua (Core 1)	142.58	-5.67	2300	cool- or warm-temperate rainforest	cool-temperate rainforest (P04)	N
Haeapugua, Core 6	142.78	-5.83	1650	cool-temperate rainforest	warm-temperate rainforest (P04)	N
Aluaipugua (core 2)	143.15	-5.97	2750	cool-temperate rainforest	cool-temperate rainforest (P04)	N
Lembang Swamp/Panjairan	107.62	-6.74	1200	warm-temperate rainforest or xerophytic woods/scrub	tropical semi-evergreen or rain forest ^b (van der Kaars and Dam 1995)	u
306 Bandung DPDR-I	107.60	-6.84	661	tropical deciduous broadleaf forest and woodland	tropical semi-evergreen or rain forest ^b (van der Kaars and Dam 1995)	D
Bandung DPDR-II	107.73	-6.98	662	tropical deciduous broadleaf forest and woodland	tropical semi-evergreen or rain forest ^b (van der Kaars and Dam 1995)	D
Kosipe	147.20	-8.47	1960	cool-temperate rainforest	warm-temperate rainforest (P04)	N
Lynch’s Crater A	145.70	-17.37	760	tropical deciduous broadleaf forest and woodland	warm-temperate rainforest (Kershaw 1974)	D
Plum (Plum Swamp, Core 2)	166.62	-22.27	10	warm-temperate rainforest	tropical evergreen broadleaf forest ^c (Stevenson et al. 2001)	N
Lac Suprin	166.98	-22.30	235	tropical semi-evergreen broadleaf forest or warm-temperate rainforest	tropical evergreen broadleaf forest ^c (Stevenson et al. 2001)	d
N145	129.17	-31.62	100	xerophytic woods/scrub	xerophytic woods/scrub (Martin 1973)	N
Lake Banganup (BGP4)	115.82	-32.01	35	temperate sclerophyll woodland and shrubland	xerophytic woods/scrub or temperate sclerophyll woodland and shrubland (map in P04)	w
North Lake	115.82	-32.01	35	temperate sclerophyll woodland and shrubland	xerophytic woods/scrub or temperate sclerophyll woodland and shrubland (map in P04)	w
Bibra Lake (BL2)	115.83	-32.10	35	temperate sclerophyll woodland and shrubland	xerophytic woods/scrub or temperate sclerophyll woodland and shrubland (map in P04)	w

307 ^aP04 give tropical deciduous forest and woodland, based on use of “mixed forest” by Hope (2001). However, the latter clearly intends mixed
 308 angiosperm-gymnosperm (“mesophyll-microphyll,” etc., p. 131) rather than mixed evergreen-deciduous; the site precipitation is given as ≈ 2700
 309 mm yr⁻¹ with little seasonality.

310 ^bvan der Kaars and Dam (1995) are not explicit, but describe wetter forest types throughout their section 4 and give precipitation as ≈ 1700 mm
 311 yr⁻¹; it is also ≥ 50 mm month⁻¹ throughout the dry season (Rivas-Martínez and Rivas-Sáenz 2016).

312 ^cP04 give xerophytic woods/scrub, but Stevenson et al. (2001) show this is anthropogenic, and that evergreen closed forest would be natural in this
 313 region.

Site name	Lon.	Lat.	Elev.	LGM vegetation	Present natural vegetation & sources	Change
Lake George	149.42	-35.08	673	tropical evergreen broadleaf forest ^d	temperate sclerophyll woodland and shrubland (P04)	u
Crystal Bog 1	146.78	-36.73	1350	temperate sclerophyll woodland and shrubland	temperate sclerophyll woodland and shrubland; wet sclerophyll forest nearby ^e (map in P04; Kershaw 1998)	n
Lake Hill	147.93	-37.15	1300	xerophytic woods/scrub	temperate sclerophyll woodland and shrubland (P04)	D
Caledonia Fen	146.75	-37.33	1280	xerophytic woods/scrub	temperate sclerophyll woodland and shrubland; wet sclerophyll forest nearby (P04; Kershaw 1998)	D
Tom Burns, D	145.82	-37.39	1075	“tundra”	wet sclerophyll forest (McKenzie 1997)	u
Storm Creek	145.81	-37.44	1177	temperate sclerophyll woodland and shrubland	wet sclerophyll forest (McKenzie 1997)	D
Poley Creek	145.42	-37.50	750	temperate sclerophyll woodland and shrubland	wet sclerophyll forest; temperate sclerophyll woodland and shrubland nearby (map in P04; Kershaw 1998)	d
Wylie Swamp W3	140.30	-37.65	25	temperate sclerophyll woodland and shrubland	temperate sclerophyll woodland and shrubland (Dodson 1977)	N
Lake Turangmoro	142.75	-37.70	200	xerophytic woods/scrub	temperate sclerophyll woodland and shrubland ^e (map in P04; Crowley and Kershaw 1994)	D
Bullenmerri	143.12	-38.25	180	xerophytic woods/scrub	temperate sclerophyll woodland and shrubland (Dodson 1979)	D
Tower Hill NW Crater	142.37	-38.32	20	xerophytic woods/scrub	temperate sclerophyll woodland and shrubland (P04)	D
Lake Wangoom	142.60	-38.35	100	xerophytic woods/scrub	temperate sclerophyll woodland and shrubland (P04)	D

^dFollowing P04 (“extremely low pollen counts”) we omit this likely spurious LGM site.

^eP04 give xerophytic woods/scrub in their Table 1, but this appears erroneous given their vegetation map and the references cited here.

315 Table S4. As Table S1, but for China and neighboring maritime areas (Yu et al. 2000) [“Y00”]; (Harrison
 316 et al. 2001). Negative elevations are marine cores; “n/a” means not available.

Site name	Lon.	Lat.	Elev.	LGM vegetation	Present natural vegetation & sources	Change
Hulun Lake	116.50	48.90	650	steppe	steppe (map in Y00)	N
Chuangye	134.30	48.30	50	“tundra”	cold mixed forest (map in Y00)	u
Daluoba	88.00	48.00	2020	desert	“desert-steppe” (Y00)	d
Dalainuoer	116.60	43.20	1290	cold evergreen needleleaf forest	temperate deciduous broadleaf forest (Y00)	N
Nanshan	111.70	40.80	1063	steppe	steppe (Y00)	N
Wajianggou	112.50	40.50	1476	steppe	steppe; forest nearby (map in Y00)	n
Lop Nur K1	90.25	40.28	780	desert	desert (map in Y00)	N
Hahai-1	112.50	40.17	1200	steppe	steppe; forest nearby (map in Y00)	n
Beijing	116.42	40.00	100	desert	temperate deciduous broadleaf forest (map in Y00)	D
Bohai Sea Bc-1 Core	119.90	39.15	-27	desert	temperate deciduous broadleaf forest (map in Y00)	D
Kansu	75.01	39.12	1470	“tundra”	desert (Y00, top of p. 660)	u
Yellow Sea Station 01	123.40	39.00	-50	“tundra”	temperate deciduous broadleaf forest (maps in Y00 and Harrison et al. 2001)	u
317 Bohai Sea Bo41 Core	119.85	38.51	-28	desert	temperate deciduous broadleaf forest (map in Y00)	D
Bohai Sea 27	119.40	38.40	-25	steppe	temperate deciduous broadleaf forest (map in Y00)	D
Yangerzhuang	117.30	38.20	5	steppe	temperate deciduous broadleaf forest (map in Y00)	D
Mengcun	117.06	38.00	7	steppe	temperate deciduous broadleaf forest (map in Y00)	D
Beiyuan	104.90	36.20	1200	desert	steppe or temperate deciduous broadleaf forest (map in Y00)	D
Oki Island	133.24	36.18	n/a	cool mixed forest	warm-temperate evergreen broadleaf and mixed forest (map in Harrison et al. 2001)	N
Yellow Sea J-2 Core	120.50	36.05	-8	steppe	temperate deciduous broadleaf forest (map in Y00)	D
Jiuzhoutai	104.80	35.90	2136	steppe	steppe; temperate deciduous broadleaf forest nearby (map in Y00)	n
Fuxian	109.38	35.82	917	steppe	temperate deciduous broadleaf forest; steppe nearby (map in Y00)	d
Tianshuihai	79.40	35.01	4570	desert	desert (text of Y00), or possibly tundra (map in Y00)	n
Tianshuigou	109.73	34.87	360	desert	temperate deciduous broadleaf forest (map in Y00)	D
Kekexili	92.15	34.63	4690	desert	desert (text of Y00), or possibly tundra (map in Y00)	n
Weinan	109.50 ^a	34.40 ^a	650	steppe	temperate deciduous broadleaf forest (Sun et al. 1997, map in Y00)	D

318 ^aY00 have longitude 112.35 and latitude 41.30, but Sun et al. (1997) clearly locate the site near Xi’an, at the given coordinates.
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Site name	Lon.	Lat.	Elev.	LGM vegetation	Present natural vegetation & sources	Change
Beizhuangcun-2	109.54	34.37	490	steppe	temperate deciduous broadleaf forest (map in Y00)	D
Yellow Sea Qc2	122.30	34.30	-49	steppe	temperate deciduous broadleaf forest or warm-temperate evergreen broadleaf and mixed forest (map in Y00)	D
Ruoergai ^b	102.31	33.54	3396	steppe	steppe (e.g. Brierley et al. 2016)	N
Wasong	101.52	33.20	3490	cool mixed forest	warm-temperate evergreen broadleaf and mixed forest; steppe nearby (map in Y00)	n
Puzhen	118.39	32.08	15	steppe	warm-temperate evergreen broadleaf and mixed forest or temperate deciduous broadleaf forest (map in Y00)	D
Zhabuye	84.07	31.48	4421	steppe	steppe (text of Y00), or possibly tundra (map in Y00)	n
Suzhou	120.60	31.30	2	desert	warm-temperate evergreen broadleaf and mixed forest (map in Y00)	D
East China Sea Ch1 Core	122.50	31.17	-24	temperate deciduous broadleaf forest	warm-temperate evergreen broadleaf and mixed forest (map in Y00)	N
Jiangnan Plain	112.20	31.10	50	steppe	warm-temperate evergreen broadleaf and mixed forest (map in Y00)	D
Erhai (Z18)	100.16	25.83	1984	cool mixed forest	warm-temperate evergreen broadleaf and mixed forest (map in Y00)	N
Erhai (Z27)	100.26	25.20	1700	warm-temperate evergreen broadleaf and mixed forest	warm-temperate evergreen broadleaf and mixed forest (map in Y00)	N
Bailiangdong2	109.40	24.33	97	cool mixed forest	warm-temperate evergreen broadleaf and mixed forest or tropical evergreen broadleaf forest (map in Y00)	N
Toushe Lake	120.90	23.82	650	warm-temperate evergreen broadleaf and mixed forest	warm-temperate evergreen broadleaf and mixed forest or tropical evergreen broadleaf forest (map in Y00)	N
Hanjiang-CH2	116.80	23.48	5	warm-temperate evergreen broadleaf and mixed forest	tropical evergreen broadleaf forest (map in Y00)	N
Zhujiang delta PK16	113.72	22.73	15	warm-temperate evergreen broadleaf and mixed forest	tropical evergreen broadleaf forest (map in Y00)	N
Manxi (Core M)	100.57	22.08	1202	warm-temperate evergreen broadleaf and mixed forest	tropical evergreen or semi-evergreen broadleaf forest (map in Y00)	N
Zhujiang delta PK19	113.30	21.80	6	warm-temperate evergreen broadleaf and mixed forest	tropical evergreen broadleaf forest (map in Y00)	N
Leizhou Core TY1	110.33	20.33	90	warm-temperate evergreen broadleaf and mixed forest	tropical evergreen broadleaf forest (map in Y00)	N
NS87-8COS3,4	116.10	7.80	-833	tropical semi-evergreen broadleaf forest	tropical evergreen broadleaf forest (e.g. Collins et al. 1991, p. 202)	D
NS87-11COS2,3	114.20	7.00	0	tropical semi-evergreen broadleaf forest	tropical evergreen broadleaf forest (e.g. Collins et al. 1991, p. 202)	D

^bY00 have Nuoergai.

Table S5. As Table S1, but for Europe south of 55°N and the Middle East (Elenga et al. 2000).

Site name	Lon.	Lat.	Elev.	LGM vegetation	Present natural vegetation & sources	Change
La Grande Pile	6.50	47.73	330	steppe	temperate deciduous broadleaf forest (map in Prentice et al. 1996)	D
Les Echets	4.89	45.67	267	steppe	temperate deciduous broadleaf forest (map in Prentice et al. 1996)	D
Le Bouchet	3.67	44.89	1200	steppe	temperate deciduous broadleaf forest (map in Prentice et al. 1996)	D
Biscaye	-0.17	43.27	410	steppe	temperate deciduous broadleaf forest (map in Prentice et al. 1996)	D
Lourdes	-0.17	43.17	430	steppe	temperate deciduous broadleaf forest (map in Prentice et al. 1996)	D
Ajo	-6.15	43.05	1570	steppe	temperate deciduous broadleaf forest ^a (Watts 1986)	D
Banyoles	2.75	42.13	173	steppe	warm-temperate evergreen broadleaf and mixed forest (Pérez-Obiol and Julià 1994)	D
Castiglione	12.75	41.89	44	steppe	warm-temperate evergreen broadleaf and mixed forest (Follieri et al. 1988)	D
Tenaghi Philippon	24.30	41.17	50	steppe	xerophytic woods/scrub; temperate deciduous broadleaf forest nearby (Wijmstra 1969; Van Zeist and Bottema 1982)	D
Monticchio	15.60	40.94	530	steppe	temperate deciduous broadleaf forest (Watts 1985)	D
Khimaditis	21.58	40.61	560	steppe	temperate deciduous or warm-temperate evergreen broadleaf and mixed forest (Bottema 1974)	D
Ioannina	20.73	39.76	469	steppe	temperate deciduous broadleaf forest (Van Zeist and Bottema 1982)	D
Xinias	22.26	39.05	500	steppe	temperate deciduous broadleaf forest (Bottema 1979)	D
Karamik Batakligi	30.80	38.42	1000	steppe	temperate “forest-steppe” or forest (van Zeist et al. 1975)	D
Sögüt Gölü	29.88	37.05	1400	steppe	cool evergreen needleleaf forest (van Zeist et al. 1975; Van Zeist and Bottema 1982)	D
Padul	-3.67	37.00	785	steppe	xerophytic woods/scrub or warm-temperate evergreen broadleaf and mixed forest (Florschütz et al. 1971)	D
Ghab	35.30	35.68	300	steppe	“forest” and steppe both nearby (Van Zeist and Bottema 1982)	d
Zeribar	46.11	35.53	1300	steppe	temperate deciduous broadleaf forest (van Zeist and Bottema 1977)	D

^aThe site is actually located in alpine meadow with forest nearby, but the pollen is clearly sampling the latter (Watts 1986).

320 Table S6. As Table S1, but for Japan (Takahara et al. 2000). Present natural vegetation is taken to be warm-
 321 temperate to cool-temperate forest throughout (Takahara et al. 2000).

Site name	Lon.	Lat.	Elev.	LGM vegetation	Change
Kenbuchi	142.40	44.10	135	cold evergreen needleleaf forest	N
Furano Basin	142.40	43.40	173	cold evergreen needleleaf forest	N
Dekijima	140.30	40.90	0	cool mixed forest	N
Ukinuma	140.40	38.50	86	cold evergreen needleleaf forest	N
Kawadoi	140.30	38.10	300	cool mixed forest	N
Hoshojiri	140.10	37.60	530	cool mixed forest	N
Lake Kizaki	137.80	36.60	764	cool mixed forest	N
Shimo-Oshima	140.10	36.10	30	cool mixed forest	N
Ooahara	138.20	35.90	1800	cool mixed forest	N
Ofuke	135.20	35.70	550	cool mixed forest	N
Lake Mikata	135.90	35.60	0	cool mixed forest	N
Iwaya	135.90	35.50	20	cool mixed forest	N
Hosoike	134.10	35.40	970	cool mixed forest	N
Ohnuma	134.60	35.40	610	temperate deciduous broadleaf forest	N
Ubuka	131.60	34.50	390	cool mixed forest	N

Table S7. As Table A1, but for Latin America (Marchant et al. 2009) [“M09”].

Site name	Lon.	Lat.	Elev.	LGM vegetation	Present natural vegetation & sources	Change
Lake Pátzcuaro	-101.58	19.58	2044	warm-temperate mixed forest	warm-temperate mixed forest (table and text in M09)	N
Chalco Lake	-99.00	19.50	2240	warm-temperate mixed forest	warm-temperate mixed forest (table and text in M09)	N
Lake Texcoco	-99.12	19.44	2330	warm-temperate mixed forest	warm-temperate mixed forest (table and text in M09)	N
Lago Quexil	-89.88	16.92	110	warm-temperate mixed forest	tropical semi-evergreen broadleaf forest (Leyden 1984, table in M09)	N
La Chonta	-83.95 ^a	9.68 ^a	2310	warm-temperate mixed forest	cool-temperate rainforest (Hooghiemstra et al. 1992, table in M09)	D
El Valle	-80.13 ^b	8.61 ^b	500	tropical deciduous broadleaf forest and woodland	tropical semi-evergreen broadleaf forest (table and text in M09)	D
Fúquene II	-73.87	5.50	2580	cool-temperate rainforest	cool mixed forest (table in M09; van Geel and van der Hammen 1973)	N
ODP site 932	-47.03	5.18	0	tropical semi-evergreen broadleaf forest	tropical evergreen broadleaf forest (table and map ^c in M09)	D
Agua Blanca	-74.17 ^d	5.00	3250	cool grass shrubland	cool mixed forest (table in M09; Helmens and Kuhry 1986)	d
Herrera	-73.91	5.00	2000	cool-temperate rainforest	cool mixed forest (table and map in M09)	N
Ciudad Universitaria X	-74.18	4.75 ^e	2560	warm-temperate mixed forest	cool mixed forest (table and map in M09)	N
El Piñal	-70.40	4.09	185	tropical deciduous broadleaf forest and woodland	tropical deciduous broadleaf forest and woodland (table and map in M09)	N
Lagoa das Patas	-66.68	0.26	300	warm-temperate rainforest	tropical evergreen broadleaf forest (table and map in M09)	N
La Pata	-66.66	0.25	300	warm-temperate rainforest	tropical evergreen broadleaf forest (table and map in M09)	N
Lagoa de Caço	-43.43	-2.97 ^f	120 ^f	steppe	tropical deciduous broadleaf forest and woodland (table and map in M09)	D

^aM09 have longitude -82.00 and latitude 8.00, but this is in the ocean off Panama; above coordinates in Costa Rica were determined from Fig. 1 of Hooghiemstra et al. (1992).

^bM09 have longitude -79.78 and latitude 8.43, but this is also in the ocean; above coordinates were determined from Fig. 1 of Bush and Colinvaux (1990).

^cPollen in this offshore core is derived from Amazon River sediment (Haberle and Maslin 1999), so we used the general Amazon basin area on the M09 map.

^dM09 have -74.45, but this is incompatible with the elevation; the above longitude was determined from Fig. 1 of Helmens and Kuhry (1986).

^eM09 have -4.75, incompatible with the elevation; but van der Hammen and Gonzalez (1960) clearly locate this site in Bogotá, Colombia, in the northern hemisphere. Marchant et al. (2004) confirm +4.75.

^fM09 have latitude -22.97 and elevation 5 m, on the southeast coast of Brazil, but Ledru et al. (2001) clearly locate this site near the *north* coast of Brazil and give the above coordinates.

Site name	Lon.	Lat.	Elev.	LGM vegetation	Present natural vegetation & sources	Change
Carajas	-50.42 ^g	-6.33 ^g	750 ^h	tropical semi-evergreen broadleaf forest	tropical semi-evergreen broadleaf forest ⁱ (Absy et al. 1991, table in M09)	N
Katira	-63.00	-9.00	150 ^h	tropical deciduous broadleaf forest and woodland	tropical evergreen broadleaf forest (van der Hammen and Absy 1994)	D
Laguna Junin 2	-76.18	-11.00	4100	cool grass shrubland	cool grass shrubland (table and map in M09)	N
Laguna Bella Vista	-61.56	-13.58	225 ^j	tropical deciduous broadleaf forest and woodland	tropical evergreen broadleaf forest (Mayle et al. 2000)	D
Laguna Chaplin	-61.05	-14.50	225 ^j	tropical semi-evergreen broadleaf forest	tropical evergreen broadleaf forest (Mayle et al. 2000)	D
Aguas Emendadas	-47.58	-15.56	1100 ^k	cool grass shrubland	tropical deciduous broadleaf forest and woodland (table and map in M09)	d
Lake Huinamarca	-69.00	-16.50	3765	cool grassland	cool grass shrubland (table and map in M09)	u
Crominia	-49.45	-17.28	700 ^k	tropical deciduous broadleaf forest and woodland	tropical deciduous broadleaf forest and woodland (table and map in M09; Salgado-Labouriau et al. 1998)	N
Wasa Mayu	-65.91	-17.54	2720	steppe	could not be obtained ^l	u
Salitre	-46.78	-19.00	970 ^m	cool grass shrubland	tropical semi-evergreen broadleaf forest and tropical deciduous broadleaf forest and woodland (Ledru et al. 1996, map in M09)	d
Morro de Itapeva	-45.53 ⁿ	-22.78	1850	cool grass shrubland	warm-temperate rainforest (Behling 1997, table in M09)	d
Rano Aroui	-109.40	-27.08	425	warm-temperate rainforest	tropical evergreen or semi-evergreen broadleaf forest (Flenley et al. 1991)	n
Rano Raraku Bore 3	-109.28	-27.16	75	tropical deciduous broadleaf forest and woodland	tropical evergreen or semi-evergreen broadleaf forest (Flenley et al. 1991)	D
Puerto Octay PM13	-72.90	-40.93	120	cool mixed forest	cool-temperate rainforest (table and map in M09)	N
Laguna Lofel	-74.43	-44.85	50	cool grass shrubland	cool-temperate rainforest (table and map in M09)	d
Laguna Lincoln	-74.07	-45.34	50	cool grass shrubland	cool-temperate rainforest (table and map in M09)	d
Laguna Stibnite	-74.38	-46.43	50	cool grass shrubland	cool-temperate rainforest (table and map in M09)	d
Laguna Six Minutes	-74.33	-46.43	50	cool-temperate rainforest	cool-temperate rainforest (table and map in M09)	N
Punta Arenas	-70.97	-53.15	75	cool grass shrubland	cool-temperate rainforest (table and map in M09)	d

^gM09 have longitude -48.00 and latitude -5.00, but Absy et al. (1991) give the above coordinates, which match their site description much better.

^hM09 erroneously have these two elevations transposed with each other.

ⁱThe site is located in edaphic savanna with forest nearby, but the pollen is clearly sampling the latter (Absy et al. 1991).

^jM09 have 750 m, but Fig. 1 of Mayle et al. (2000) and its caption imply 200-250 m.

^kM09 have 200 m, but this is incompatible with the location (Salgado-Labouriau et al. 1998); above elevation was determined using Google Maps.

^lTable and map in M09 disagree with each other, and reference cited in M09 does not mention the site. Also, the name appears to refer to a river well east of the given location, with its westernmost source at longitude -65.51 and latitude -17.43; the given coordinates instead correspond to Laguna Carmen (e.g. http://www.lib.utexas.edu/maps/jog/latin_america/se-20-5-punata-bolivia-1999.pdf).

^mM09 have 1050 m, but Ledru et al. (1996) give the above elevation.

ⁿM09 have -45.63, but this is incompatible with the elevation; Behling (1997) gives the above longitude.

323 Table S8. As Table S1, but for the former Soviet Union and Mongolia (Tarasov et al. 2000) [“T00”]. Present
 324 natural vegetation is from Table 1 of T00 throughout. Four sites from T00 are not included here because they
 325 were re-analyzed by Bigelow et al. (2003); these are listed in Table S2 instead.

Site name	Lon.	Lat.	Elev.	LGM vegetation	Present natural vegetation	Change
Igarskaya Ob	65.75	66.50	42	“tundra”	cold evergreen needleleaf forest	u
Nadymkaya Ob	70.75	66.33	45	“tundra”	cold evergreen needleleaf forest	u
Mega	65.75	65.00	45	steppe	cold evergreen needleleaf forest	D
Tugiyany	66.00	64.75	47	“tundra”	cold evergreen needleleaf forest	u
Puchka ^a	39.33	59.70	125	“tundra”	cool evergreen needleleaf forest	u
Demyanskoe	69.75	59.67	65	steppe	cold evergreen needleleaf forest	D
Alymka ^a	68.89	59.04	50	“tundra”	cold evergreen needleleaf forest	u
Zagvozdino	71.02	57.92	60	steppe	cold evergreen needleleaf forest	D
Skorodum	71.13	57.83	57	“tundra”	cold evergreen needleleaf forest	u
Chulym	84.00	57.75	75	“tundra”	cold evergreen needleleaf forest	u
Lipovka	63.67	57.75	65	cold evergreen needleleaf forest	cool evergreen needleleaf forest	N
Krivosheino	84.00	57.50	100	steppe	cold evergreen needleleaf forest	D
326 Skv-469	68.17	57.25	75	cold evergreen needleleaf forest	cool evergreen needleleaf forest	N
Sakhta	39.58	56.92	137	“tundra”	cool mixed forest	u
Fabrika 1 Maya	37.19	56.37	128	steppe	cool mixed forest	D
Voronovo	84.00	56.00	62	steppe	cold evergreen needleleaf forest	D
Prizhim	57.58	55.17	350	steppe	cool mixed forest	D
Serpievskaya	57.67	55.10	350	steppe	cool mixed forest	D
Krasnyi Yar	83.00	55.00	105	steppe	cold deciduous forest	D
Chumysh-Kutmanovo	83.85	53.82	550	steppe	cold evergreen needleleaf forest	D
Kalistratiha	82.25	53.50	n/a	steppe	cold deciduous forest	D
Belovo	83.75	53.00	n/a	steppe	cold deciduous forest	D
Isha	87.06	52.16	400	steppe	cold evergreen needleleaf forest	D
Tsagan-Mort-Nur	99.45	51.21	1539	cold evergreen needleleaf forest	cold evergreen needleleaf forest	N
Korman	27.17	48.92	100	steppe	temperate deciduous broadleaf forest	D

327 ^aThese sites were LGM macrofossils, rather than pollen (T00).

Site name	Lon.	Lat.	Elev.	LGM vegetation	Present natural vegetation	Change
Molodova V	27.08	48.92	100	steppe	temperate deciduous broadleaf forest	D
Hoton-Nur	88.30	48.67	2083	steppe	steppe	N
Anetovka II (E-28)	31.10	47.65	100	steppe	steppe	N
Kerulen	111.27	47.52	900	steppe	steppe	N
Veselo-Voznesenskoe	38.35	47.17	38	cold evergreen needleleaf forest	steppe	W
Apiancha	41.25	42.97	450	cool evergreen needleleaf forest	temperate deciduous broadleaf forest	N
Sukhumi	40.93	42.92	2.7	cool evergreen needleleaf forest	warm-temperate evergreen broadleaf and mixed forest	N
Kobuleti	41.77	41.90	1.5	cool mixed forest	warm-temperate evergreen broadleaf and mixed forest	N
Manavi	45.45	41.70	400	steppe	steppe	N
Chatyrkel'-Dal'nee	75.30	40.72	3530	desert	steppe	D
Chatyrkel'-Kokaigyr	75.30	40.72	3530	steppe	steppe	N
Karakul'-Aisberg	73.50	39.50	3914	steppe	steppe	N

329 Table S9. As Table S1, but for the western United States (Thompson and Anderson 2000) [“TA00”]. “P”
 330 codes for pollen site; “M” for packrat-midden (macrofossil) site.

Site name	Type	Lon.	Lat.	Elev.	LGM vegetation	Present natural vegetation & sources	Change
Bogachiel River Site	P	-124.33	47.88	533	steppe	cool evergreen needleleaf forest (map in TA00)	D
Hoh Bog	P	-124.25	47.75	n/a	“tundra”	cool evergreen needleleaf forest (map in TA00)	u
Kalaloch	P	-124.33	47.55	35	steppe	cool evergreen needleleaf forest (map in TA00)	D
Mineral Lake	P	-122.20	46.73	436	steppe	cool evergreen needleleaf forest (map in TA00)	D
Davis Lake	P	-122.25	46.58	282	steppe	cool evergreen needleleaf forest (map in TA00)	D
Carp Lake	P	-120.88	45.92	714	steppe	cool evergreen needleleaf forest (Barnosky 1985)	D
Fargher Lake	P	-122.52	45.88	n/a	cool evergreen needleleaf forest	cool evergreen needleleaf forest (map in TA00)	N
Battle Ground Lake	P	-122.48	45.67	300	steppe	cool evergreen needleleaf forest (map in TA00)	D
Little Lake, Oregon	P	-123.58	44.17	217	cool evergreen needleleaf forest	cool evergreen needleleaf forest (map in TA00)	N
Hedrick Pond	P	-110.60	43.75	2073	temperate evergreen needleleaf open woodland	cool evergreen needleleaf forest with steppe (Whitlock 1993, map in TA00)	u
331 Gray’s Lake	P	-111.58	43.00	1946	temperate evergreen needleleaf open woodland	cool evergreen needleleaf forest with steppe (Beiswenger 1991)	u
Ruby Marshes	P	-115.48	40.13 ^a	1818	temperate evergreen needleleaf open woodland	steppe; temperate evergreen needleleaf open woodland nearby (TA00; Thompson 1992)	w
Devlins Park	P	-105.55	40.02	2953	temperate evergreen needleleaf open woodland	cool evergreen needleleaf forest (Legg and Baker 1980, map in TA00)	D
Streamview	M	-114.10	39.33	1860	temperate evergreen needleleaf open woodland	temperate evergreen needleleaf open woodland; steppe nearby (map in TA00)	n
Bechan Cave	P	-111.00	38.00	1370	temperate evergreen needleleaf open woodland	open woodland; desert nearby (Davis et al. 1984)	n
Molas Lake	P	-107.68	37.75	3200	temperate evergreen needleleaf open woodland	cool evergreen needleleaf forest (map in TA00)	D
Nichols Meadow	P	-119.57	37.43	1509	temperate evergreen needleleaf open woodland	cool evergreen needleleaf forest (Koehler and Anderson 1994, map in TA00)	D
Kings Canyon	M	-118.80	36.80	1270	xerophytic woods/scrub	xerophytic woods/scrub (Cole 1983)	N
Eyrie	M	-115.28	36.63	1855	temperate evergreen needleleaf open woodland	temperate evergreen needleleaf open woodland; desert nearby (map in TA00)	n
Flaherty Mesa	M	-115.25	36.48	1770	temperate evergreen needleleaf open woodland	temperate evergreen needleleaf open woodland; desert nearby (map in TA00)	n
Willow Wash	M	-115.25	36.47	1585	temperate evergreen needleleaf open woodland	temperate evergreen needleleaf open woodland; desert nearby (map in TA00)	n

332 ^aTA00 have 41.13, northeast of Elko, Nevada; but Thompson (1992) clearly locates the site southeast of that town. Above latitude was determined
 333 from Fig. 1 of Thompson (1992).
 334

Site name	Type	Lon.	Lat.	Elev.	LGM vegetation	Present natural vegetation & sources	Change
Nankoweap	M	-111.95	36.25	2020	cool evergreen needleleaf forest	temperate evergreen needleleaf open woodland (Cole 1982)	W
Dead Man Lake	P	-108.95	36.24	2780	temperate evergreen needleleaf open woodland	cool evergreen needleleaf forest; temperate evergreen needleleaf open woodland nearby (Wright et al. 1973, map in TA00)	d
Chuar Valley	M	-111.92	36.17	1770 ^b	cool mixed forest or temperate evergreen needleleaf open woodland	temperate evergreen needleleaf open woodland ^b (Cole 1982)	w
Rampart Cave	M	-113.93	36.10	535	temperate evergreen needleleaf open woodland	desert (map in TA00; Mead and Phillips 1981)	W
Vulture Canyon	M	-113.93	36.10	645	temperate evergreen needleleaf open woodland	desert (map in TA00; Mead and Phillips 1981)	W
Hance Canyon	M	-111.97	36.03	1200	temperate evergreen needleleaf open woodland	desert (Cole 1982, TA00)	W
Horseshoe Mesa	M	-111.98	36.03	1100	xerophytic woods/scrub	desert (TA00)	W
Jacob Lake	P	-110.83	34.33	2285	temperate evergreen needleleaf open woodland	cool evergreen needleleaf forest; temperate evergreen needleleaf open woodland nearby (Jacobs 1983, map in TA00)	d
Potato Lake	P	-111.50	34.08	2222	temperate evergreen needleleaf open woodland	cool evergreen needleleaf forest; temperate evergreen needleleaf open woodland nearby (Anderson 1993, map in TA00)	d
Hay Lake, Arizona	P	-109.43	34.00	2780	temperate evergreen needleleaf open woodland	cool evergreen needleleaf forest; temperate evergreen needleleaf open woodland nearby (Jacobs 1985, map in TA00)	d
Mayberry Well	P	-108.30	33.70	2080	temperate evergreen needleleaf open woodland	steppe, temperate evergreen needleleaf open woodland, or cool evergreen needleleaf forest (map in TA00)	u
Big Boy	M	-105.92	32.83	1555	temperate evergreen needleleaf open woodland	desert (Van Devender et al. 1984)	W
Pontatoc Ridge	M	-110.88	32.35	1463	temperate evergreen needleleaf open woodland	“open oak woodland” or “desert grassland” (Whittaker and Niering 1965; Niering and Lowe 1984)	n

^bElevation from TA00. The online BIOME6000 table has 1430 m, which would be almost in desert according to Cole (1982), but the metadata in TA00 and in the table seem to match sites 3 and 4 from Cole (1982), which are also listed as 1770 m.

Table S10. As Table S1, but for the eastern United States and southern Canada (Williams et al. 2000) [“W00”].

Site name	Lon.	Lat.	Elev.	LGM vegetation	Present natural vegetation & sources	Change
Chalmers Bog	-114.42	50.62	1306	steppe	cool evergreen needleleaf forest (Mott and Jackson 1982)	D
Wolf Creek	-94.12	46.12	375	steppe	cool mixed forest (Birks 1976)	D
Conklin Quarry	-91.55	41.68	213	cold evergreen needleleaf forest	tallgrass prairie and temperate deciduous broadleaf forest (Küchler 1964; Chapman et al. 2002)	w
Francis Lake II	-74.85	40.98	189	cold evergreen needleleaf forest	temperate forest (e.g. Küchler 1964)	N
Buckle’s Bog	-79.27	39.57	814	cool mixed forest	temperate forest (e.g. Küchler 1964)	N
Cheyenne Bottoms	-98.67	38.47	547	temperate evergreen needleleaf open woodland	steppe (Fredlund 1995)	W
Ninepen 24	-75.28	38.30	15	cold evergreen needleleaf forest	temperate forest (e.g. Küchler 1964)	N
Boney Springs (terrace sample)	-93.37	38.10	61	cold evergreen needleleaf forest	temperate deciduous broadleaf forest and tallgrass prairie (King 1973)	w
Jackson Pond	-85.72	37.45	212	cool mixed forest	temperate forest (e.g. Küchler 1964)	N
Powers Fort Swale	-90.58	36.60	91	cool mixed forest	temperate deciduous broadleaf forest (Royall et al. 1991)	N
Rockyhock Bay	-76.68	36.17	6	cool evergreen needleleaf forest	temperate forest (e.g. Küchler 1964)	N
Anderson Pond	-85.50	36.03	305	cool mixed forest	temperate forest (e.g. Küchler 1964)	N
Nonconnah Creek-1	-89.92	35.08	79	cool mixed forest	temperate forest (e.g. Küchler 1964)	N
Pigeon Marsh	-85.17	34.67	630	cool mixed forest	temperate forest (e.g. Küchler 1964)	N
Singletary Lake	-78.50	34.50	18	cool mixed forest	temperate forest (e.g. Küchler 1964)	N
Quicksand Pond	-84.87	34.33	285	cool mixed forest	temperate forest (e.g. Küchler 1964)	N
Bob Black Pond	-84.87	34.32	285	cold evergreen needleleaf forest	temperate forest (e.g. Küchler 1964)	N
White Pond	-80.78	34.17	90	temperate evergreen needleleaf open woodland	temperate forest (e.g. Küchler 1964)	D
Clear Pond, South Carolina	-78.95	33.80	10	temperate evergreen needleleaf open woodland	temperate forest (e.g. Küchler 1964)	D
Rayburn Salt Dome	-93.17	32.47	61	warm-temperate evergreen broadleaf and mixed forest	temperate forest (e.g. Küchler 1964)	N
Camel Lake	-85.02	30.27	20	warm-temperate evergreen broadleaf and mixed forest	temperate forest (e.g. Küchler 1964)	N
Sheelar Lake	-82.00	29.52	51	temperate evergreen needleleaf open woodland	temperate forest (e.g. Küchler 1964)	D
Lake Tulane	-81.50	27.58	36	temperate evergreen needleleaf open woodland	temperate forest (e.g. Küchler 1964)	D

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