

Appendix A

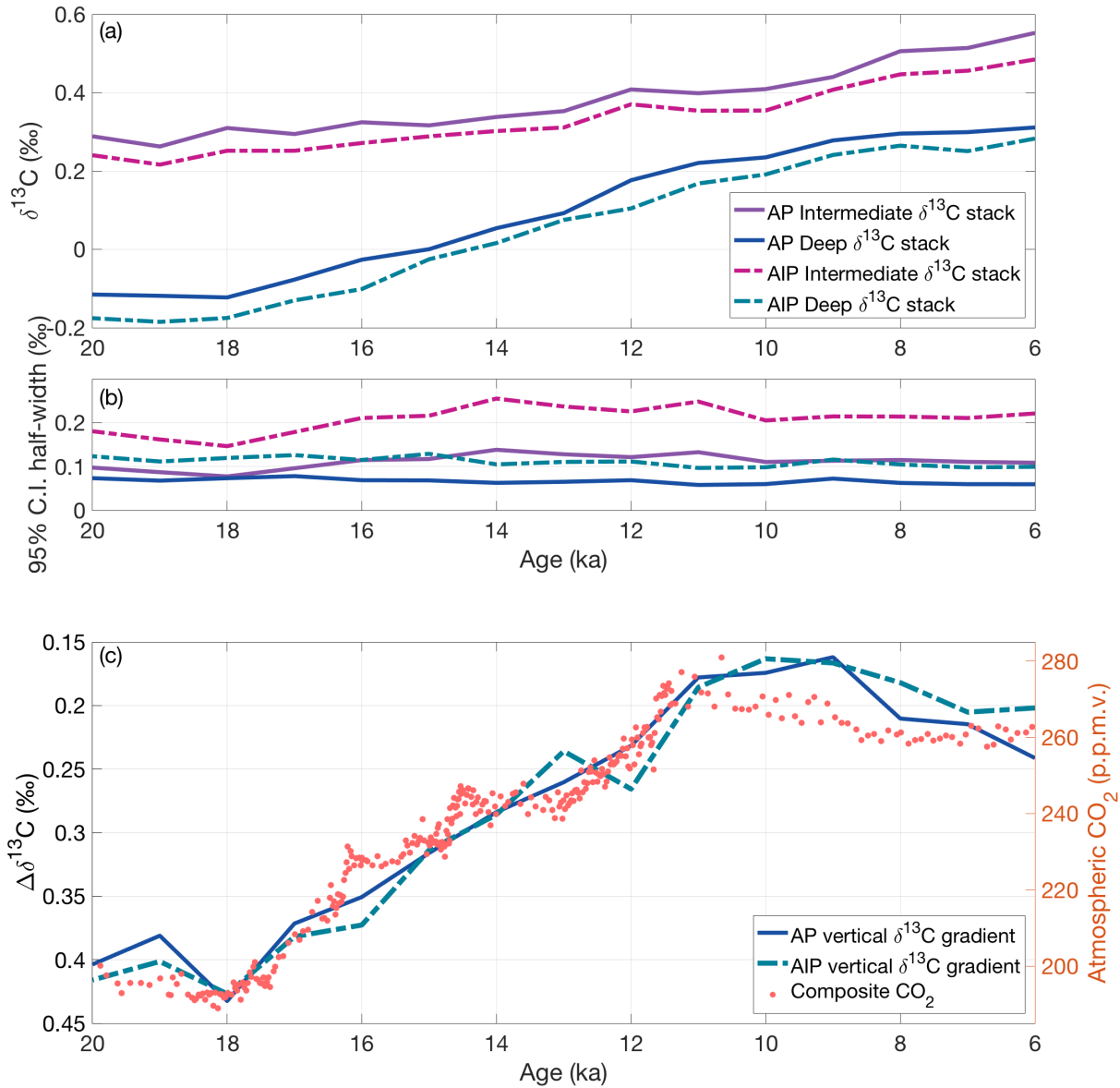


Figure A1. (A) Two versions of the deep and intermediate stacks with the AIP stacks plotted in dot-dashed lines, and AP stacks plotted in solid lines. (B) The 95% C.I. half-width for each stack in the legend in figure (A). (C) Comparison of CO₂ and both AP and AIP vertical $\delta^{13}\text{C}$ gradients. Both volume-weighted vertical gradients closely resemble the spliced atmospheric CO₂ records (red circles) (Marcott et al., 2014; Monnin et al., 2004), but the AIP $\delta^{13}\text{C}$ gradient (dashed green-blue line) is more noisy and slightly more depleted than the AP $\delta^{13}\text{C}$ gradient (solid blue line).

Table A1. Supplemental table of the name, location, region, and reference for each record in this compilation

Core Name	Lat	Lon	Depth (m)	Region	Reference
EW9209-1JPC	5.9	-44.2	4056	LDNA	Curry and Oppo (1997)
GeoB7920-2	20.8	-18.6	2278	UDNA	Tjallingii et al. (2008)
GeoB9508-5	14.5	-17.9	2384	UDNA	Mulitza et al. (2008)
GeoB9526	12.4	-18.1	3223	UDNA	Zarriess and Mackensen (2011)
GIK17049-6	55.3	-26.7	3331	UDNA	Jung and Sarnthein (2003)
GIK17051	56.2	-31.9	2295	UDNA	Sarnthein et al. (1994)
GIK23415-9	53.2	-19.2	2472	UDNA	Weinelt et al. (2003)
KF13	37.6	-31.8	2690	UDNA	Richter (1998)
MD95-2040	40.6	-9.9	2465	UDNA	Voelker and de Abreu (2011)
MD99-2334	37.8	-10.2	3146	UDNA	Skinner and Shackleton (2004)
NA87-22	55.5	-14.7	2161	UDNA	Duplessy et al. (1992)
ODP658C	20.8	-18.6	2274	UDNA	Woodruff and Chambers (1991)
ODP980	55.5	-14.7	2168	UDNA	Oppo et al. (2006)
SU90-03	40.1	-32	2475	UDNA	Cortijo et al. (1999)
V29-202	61	-21	2658	UDNA	Oppo and Lehman (1995)
ENO66-16	5.5	-21.1	3152	UDNA	Oppo and Fairbanks (1987)
ENO66-21	4.2	-21.6	3995	UDNA	Oppo and Fairbanks (1987)
ENO66-26	3.1	-20	4745	LDNA	Oppo and Fairbanks (1987)
ENO66-32	2.5	-19.7	4998	LDNA	Oppo and Fairbanks (1987)
ENO66-36	4.3	-20.2	4095	LDNA	Oppo and Fairbanks (1987)
ENO66-38	4.9	-20.5	2931	UDNA	Oppo and Fairbanks (1987)
ENO66-44	5.3	-21.7	3428	UDNA	Oppo and Fairbanks (1987)
GeoB1101	1.7	-10.9	4588	LDNA	Bickert and Wefer (1996)
GeoB4216	30.6	-12.4	2324	UDNA	Freudenthal et al. (2002)
GIK12328-5	21.2	-18.6	2778	UDNA	Sarnthein et al. (1994)
GIK12347-2	15.8	-17.9	2576	UDNA	Sarnthein et al. (1994)
GIK12379-3	23.1	-17.8	2136	UDNA	Sarnthein et al. (1994)
GIK12392-1	25.2	-16.9	2573	UDNA	Sarnthein et al. (1994)
GIK15612-2	44.4	-26.5	3050	UDNA	Sarnthein et al. (1994)
GIK15669	34.9	-7.8	2022	UDNA	Sarnthein et al. (1994)
GIK15672	34.9	-8.1	2460	UDNA	Sarnthein et al. (1994)
GIK16402	14.4	-20.5	4202	LDNA	Sarnthein et al. (1994)
GIK17055-1	48.2	-27.1	2558	UDNA	Sarnthein et al. (1994)
GIK23414-9	53.5	-20.3	2196	UDNA	Sarnthein et al. (1994)
GIK23416-4	51.6	-20	3616	UDNA	Jung and Sarnthein et al. (1994)
GIK23417-1	50.7	-19.4	3850	UDNA	Jung and Sarnthein (2004)

Core Name	Lat	Lon	Depth (m)	Region	Reference
GIK23418-8	52.6	-20.3	2841	UDNA	Jung and Sarnthein (2004)
IODP-U1308	49.9	-24.2	3900	UDNA	Hodell et al. (2008)
KNR110-50	4.9	-43.2	3995	UDNA	Curry et al. (1988)
KNR110-55	4.9	-42.9	4556	LDNA	Curry et al. (1988)
KNR110-58	4.8	-43	4341	LDNA	Curry et al. (1988)
KNR110-66	4.6	-43.4	3547	UDNA	Curry et al. (1988)
KNR110-71	4.4	-43.7	3164	UDNA	Curry et al. (1988)
KNR110-75	4.3	-43.4	3063	UDNA	Curry et al. (1988)
KNR110-82	4.3	-43.5	2816	UDNA	Curry et al. (1988)
KNR110-91	4.8	-43.3	3810	UDNA	Curry et al. (1988)
MD95-2039	40.6	-10.4	3381	UDNA	Schönfeld et al. (2003)
ODP928	5.5	-43.8	4012	LDNA	Curry and Oppo (2005)
SU90-39	52.5	-22	3955	UDNA	Chapman and Shackleton (1998)
V22-197	14.2	-18.6	3167	UDNA	Boyle (1992)
V23-81	54.3	-16.8	2393	UDNA	Veum et al. (1992)
V25-59	1.4	-33.5	3824	UDNA	Bertram et al. (1995)
V30-49	18.4	-21.1	3093	UDNA	Boyle (1992); Martin and Lea (1998)
CH73-139	54.7	-16.4	2209	UDNA	Bickert and Mackensen (2003)
CHN82-24	43.5	-30.7	3070	UDNA	Boyle and Keigwin (1985)
GIK13521	3	-22	4504	LDNA	Sarnthein et al. (1994)
GIK16415	9.6	-19.1	3841	UDNA	Sarnthein et al. (1994)
GIK17050	55.5	-27.9	2795	UDNA	Sarnthein et al. (1994)
HM52-43	63.5	-0.7	2781	UDNA	Veum et al. (1992)
GeoB1041	-3.5	-7.6	4033	DSA	Mackensen and Bickert (1999)
GeoB1112	-5.8	-10.8	3125	DSA	Mackensen and Bickert (1999)
GeoB1117	-3.8	-14.9	3984	DSA	Mackensen and Bickert (1999)
GeoB1118	-3.6	-16.4	4675	DSA	Mackensen and Bickert (1999)
GeoB1211	-24.5	7.5	4089	DSA	Bickert and Wefer (1999)
GeoB1214	-24.7	7.2	3210	DSA	Bickert and Wefer (1999)
GeoB1710	-23.4	11.7	2987	DSA	Schmiedl and Mackensen (1997)
MD07-3076	-44.2	-14.2	3770	DSA	Skinner et al. (2010)
ODP1089	-40.9	9.9	4621	DSA	Hodell et al. (2001)
ODP1090	-42.9	8.9	3702	DSA	Venz and Hodell (2002)
PS2498	-44.2	-14.2	3783	DSA	Hodell et al. (2003)
RC13-228	-22.3	11.2	3204	DSA	Boyle (1992)
V29-135	-19.7	8.88	2675	DSA	Sarnthein et al. (1994)
V30-40	0.2	-23.2	3706	DSA	Oppo and Fairbanks (1987)

Core Name	Lat	Lon	Depth (m)	Region	Reference
DSDP502	11.5	-79.4	1800	INA	Demenocal et al. (1992)
GeoB6718	52.2	-12.8	900	INA	Rüggeberg et al. (2005)
GIK15666-6	34.9	-7.1	803	INA	Sarnthein et al. (1994)
GIK16006-1	29.3	-11.5	796	INA	Sarnthein et al. (1994)
GIK16017	21.3	-17.8	812	INA	Sarnthein et al. (1994)
OCE205-103GGC	26.1	-78.1	965	INA	Slowey and Curry (1995)
GeoB4240	28.9	-13.2	1358	INA	Freudenthal et al. (2002)
GIK11944-2	35.6	-8.1	1765	INA	Weinelt and Sarnthein (2003)
GIK16004	29.9	-10.7	1512	INA	Sarnthein et al. (1994)
GIK16030	21.2	-18.1	1500	INA	Sarnthein et al. (1994)
GIK23419	54.9	-19.8	1491	INA	Sarnthein et al. (1994)
GIK23519	64.8	-29.6	1893	INA	Millo et al. (2006)
M35003-4	12.1	-61.2	1299	INA	Zahn and Stüber (2002)
ODP982	57.5	-15.9	1134	INA	Venz et al. (1999); Venz and Hodell (2002)
ODP983	60.4	-23.6	1984	INA	Mc Intyre et al. (1999); Raymo et al. (2004)
ODP984	61	-24	1650	INA	Raymo et al. (2004)
V28-127	11.7	-80.1	1750	INA	Oppo and Fairbanks (1990)
V28-14	64.8	-29.7	1855	INA	Boyle (1992)
RC16-84	-26.7	-43.3	2438	ISA	Oppo and Horowitz (2000)
V24-253	-26.9	-44.7	2069	ISA	Oppo and Horowitz (2000)
CHN115-70	-29.9	-35.6	2340	ISA	Curry and Lohmann (1982)
MD96-2080	-36.3	19.5	2488	ISA	Martínez-Méndez et al. (2008)
ODP1088	-41.1	13.6	2082	ISA	Hodell et al. (2003)
GeoB3104	-3.7	-37.7	767	ISA	Arz et al. (1999)
BT4	-4	10	1000	ISA	Oppo and Fairbanks (1989)
KNR159-36	-27.5	-46.5	1268	ISA	Oppo and Horowitz, 2000
RC16-119	-27.7	-46.5	1567	ISA	Oppo and Horowitz (2000)
GeoB3004	14.6	52.9	1803	II	Schmiedl and Mackensen (2006)
MD01-2378	-13.1	121.8	1783	II	Xu et al. (2008)
Orgon4-KS8	23.5	59.2	2900	DI	Sirocko (1994)
SO42-74KL	14.3	57.3	3212	DI	Sirocko et al. (1993)
MD97-2151	8.7	109.9	1598	IP	Wei et al. (2006)
FR97-GC12	-23.6	153.8	990	IP	Bostock et al. (2004)
V19-27	-0.5	-82.1	1373	IP	Mix et al. (1991)
EW9504-05	32.5	-118.1	1818	IP	Stott et al. (2000)
GIK17961-2	8.5	112.3	1795	IP	Wang et al. (1999)
MD97-2120	-45.5	174.9	1210	IP	Pahnke and Zahn (2005)

Core Name	Lat	Lon	Depth (m)	Region	Reference
NGC102	32.3	157.9	2612	DP	Ohkushi et al. (2003)
ODP807A	3.6	156.6	2804	DP	Zhang et al. (2007)
ODP846	-3.1	-90.8	3296	DP	Mix et al. (1995); Shackleton et al. (1995)
RC13-110	-0.1	-95.7	3231	DP	Mix et al. (1991)
RC13-114	-1.7	-103.6	3436	DP	Marchitto et al. (2005)
V24-109	0.4	158.8	2367	DP	Shackleton et al. (1992)
ODP1143	9.4	113.3	2772	DP	Tian et al. (2002)

Table A2. Correlation coefficients and p-values between records. The upper rows are the raw data, and the bottom rows are the pre-whitened to account for autocorrelated time series. To investigate possible leads/lags between records, we shift the atmospheric CO₂ record in 100-year increments relative to the $\delta^{13}\text{C}$ stacks and, for brevity, list only the best correlations. All p-values account for reduction in degrees of freedom due to either pre-whitening and/or time shifting.

Record 1	Record 2	CO ₂ time shift (years)	r ²	
CO ₂	API $\Delta\delta^{13}\text{C}_{I-D}$	0	-0.97	
CO ₂	API $\Delta\delta^{13}\text{C}_{I-D}$	+1000	-0.99	
CO ₂	AP $\Delta\delta^{13}\text{C}_{I-D}$	0	-0.98	
CO ₂	AP $\Delta\delta^{13}\text{C}_{I-D}$	+600	-0.98	
CO ₂	$\Delta\delta^{13}\text{C}_{(INA/2)-DP}$	0	-0.98	
CO ₂	$\Delta\delta^{13}\text{C}_{(INA/2)-DP}$	-200	-0.98	
CO ₂	Global $\delta^{13}\text{C}$ stack	0	0.93	
CO ₂	Global $\delta^{13}\text{C}$ stack	+1000	0.95	
Record 1	Record 2	CO ₂ time shift (years)	Pre-whitened r ²	Pre-whitened p-value
CO ₂	API $\Delta\delta^{13}\text{C}_{I-D}$	0	-0.39	0.08
CO ₂	API $\Delta\delta^{13}\text{C}_{I-D}$	+900	-0.80	0.0003
CO ₂	AP $\Delta\delta^{13}\text{C}_{I-D}$	0	-0.70	0.002
CO ₂	AP $\Delta\delta^{13}\text{C}_{I-D}$	+300	-0.73	0.002
CO ₂	$\Delta\delta^{13}\text{C}_{(INA/2)-DP}$	0	-0.79	0.0002
CO ₂	$\Delta\delta^{13}\text{C}_{(INA/2)-DP}$	-200	-0.82	0.0002
CO ₂	Global $\delta^{13}\text{C}$ stack	0	0.20	0.24
CO ₂	Global $\delta^{13}\text{C}$ stack	-500	0.36	0.11

Competing interests. The authors declare that they have no conflict of interest.

Acknowledgements. We acknowledge the following colleagues whose advice and input substantially improved drafts of this manuscript: David Lea, Syee Weldeab, Jake Gebbie, Andy Ridgwell, and James Rae. Funding for this work came from NSF grants MGG 0926735 and CDI 1125181.

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