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9. *DATA REPORT:* BENTHIC STABLE ISOTOPE DATA FROM SITES 1014 AND 1020 (0.6–1.2 MA)[1]

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ABSTRACT

Benthic foraminiferal stable isotope data are presented for Sites 1014 (Tanner Basin, 1176 m) and 1020 (Gorda Ridge, 3040 m) to constrain past changes in Pacific deep- and intermediate-water nutrient chemistry associated with the onset of large-amplitude 100-k.y. climate cycles after ~900 ka. The Site 1014 data were based on analyses of separate species of *Cibicidoides,* whereas only *Cibicidoides wuellerstorfi* was used to generate the Site 1020 record. The present data span 380–920 and 620–950 ka at Sites 1014 and 1020, respectively.

INTRODUCTION

The 1.2- to 0.6-Ma interval of Sites 1014 and 1020 was sampled at 25- and 30-cm intervals, respectively, from their respective composite spliced sections. This interval was selected to assess changes in deep and intermediate Pacific Ocean circulation associated with the onset of large 100-k.y. glacial–interglacial cycles near ~0.8–1.0 Ma. Site 1014 was drilled in the Tanner Basin (1176 m) and was selected in this study to monitor past changes in the $\delta^{13}C$ composition of Pacific intermediate waters ventilating the California Borderland basins. Site 1020 from the Gorda Ridge (3040 m) was selected for this study to monitor past variations in the $\delta^{13}C$ composition of northeast Pacific deep waters. Average sedimentation rates for the Brunhes Chron intervals of Sites 1014 and 1020 were 8 and 11 cm/k.y., respectively (using composite depths). These sampling densities were selected to produce a mean temporal resolution of 2.5–3.0 k.y. Samples were taken from the ~0.6- to ~1.2-Ma intervals of the shipboard composite splice for Sites 1014 (~35–95 meters composite depth [mcd]) and 1020 (~65.0–119.0 mcd).

METHODS

All samples were freeze dried, weighed, shaken 2 hr in a 4% Calgon solution, and then washed with deionized water through a 64-µm sieve; the coarse fraction was also dried at 50°C and weighed. Average weight percentages of the >64-µm fraction were generally low, averaging 6 wt% at Site 1014 and 1.5 wt% at Site 1020. Benthic foraminifers were picked for isotopic analysis from the >150-µm fraction. At Site 1014, specimens of *Cibicidoides wuellerstorfi* were very rare, so other *Cibicidoides* species were picked, including *C. pachyderma* and *C. mckannai* as well as *Planulina ariminensis.* Separate species of benthic foraminifers were analyzed at Site 1014 at 18 different levels to estimate possible interspecific $\delta^{18}O$ and $\delta^{13}C$ offsets. Interspecific $\delta^{18}O$ differences were negligible, and no systematic $\delta^{13}C$ offsets were observed between *C. wuellerstorfi, C. pachyderma, C. mckannai,* and *P. ariminensis.* It should be noted, however, that both *C. mckannai* and *C. pachyderma* $\delta^{13}C$ values were typically ~0.1‰–0.2‰ lighter than *C. wuellerstorfi* and *P. ariminensis,* but the data density was insufficient to reliably quantify systematic interspecific $\delta^{13}C$ offsets. Specimens of *C. wuellerstorfi* were common at Site 1020, and these were exclusively picked for isotopic analysis at this site. An average of 12 specimens was picked for analysis for each sample, although some samples yielded as few as 3–5 specimens, which were also analyzed.

Samples from Site 1014 were analyzed on the Woods Hole Oceanographic Institution Finnegan/MAT 252 mass spectrometer with the Kiel automated carbonate preparation device. Samples were not roasted before analysis. The external precision of the isotopic analyses was ±0.03‰ for $\delta^{13}C$ and ±0.07‰ for $\delta^{18}O$, based on more than 1200 measurements of NBS-19 standard. Samples from Site 1020 were analyzed on the new Lamont-Doherty Earth Observatory (LDEO) VG Optima mass spectrometer equipped with the automated multiprep carbonate preparation device that, like the Kiel device, also acidifies samples individually. The external precision for this instrument was ±0.05‰ for $\delta^{13}C$ and ±0.06‰ for $\delta^{18}O$, based on numerous analyses of NBS-19.

RESULTS

The raw $\delta^{18}O$ and $\delta^{13}C$ data for the sampled composite sections at Sites 1014 and 1020 are shown in Figure 1 and listed in Tables 1 and 2. Using preliminary magnetostratigraphic constraints, the $\delta^{18}O$ data for each site were correlated (Paillard et al., 1996) with the high-resolution benthic $\delta^{18}O$ record from Eastern Equatorial Pacific Site 849 (Mix et al., 1995). The orbital-scale correlations were straightforward at both sites and did not require large sedimentation-rate changes for either mean glacial or interglacial portions of the records. The records are incomplete because of the delays associated with the installation of the new LDEO mass spectrometer. Based on these correlations, the Site 1014 record extends from 380 to 920 ka, whereas the Site 1020 record extends from 620 to 950 ka (Fig. 2). Once completed, the isotopic analyses for Sites 1014 and 1020 will be used to assess changes in Pacific deep- and intermediate-water nutrient chemistry within the context of known benthic isotope data spanning the same interval (0.6–1.2 Ma) from Ocean Drilling Program (ODP) Leg 154 Sites 925 and 929 from the Ceara Rise (deMenocal et al., 1997).

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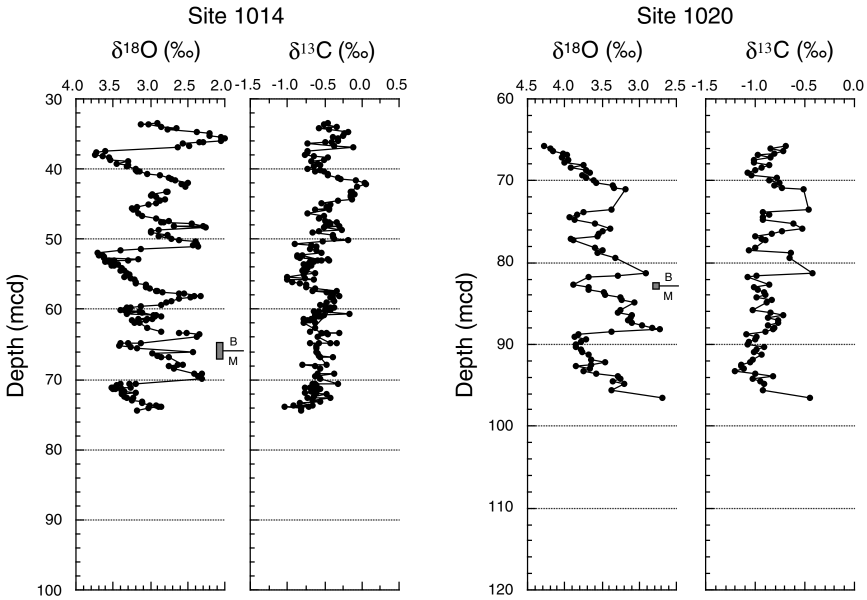

Figure 1. Benthic isotope data from Sites 1014 (Tanner Basin, 1176 m) and 1020 (Gorda Ridge, 3040 m). *Cibicidoides pachyderma, Cibicidoides mckannai,* and *Planulina ariminensis* were picked for analysis at Site 1014, whereas the Site 1020 record is based exclusively on analyses of *Cibicidoides wuellerstorfi.* The stratigraphic position of the Brunhes/Matuyama magnetic reversal is shown for each site. Data have not been corrected to seawater values.

Table 1. Benthic foraminiferal isotope data from Site 1014.

Tuned age (ka)	Hole	Core, section, interval (cm)	Depth (mbsf)	Depth (mcd)	Species	$\delta^{13}C$	$\delta^{18}O$
386.3	1014B	5H-1, 60-65	32.30	33.42	*C. mckannai*	–0.458	2.912
388.6	1014B	5H-1, 85-90	32.55	33.67	*C. wuellerstorfi*	–0.508	3.130
390.9	1014B	5H-1, 110-115	32.80	33.92	*C. mckannai*	–0.335	2.858
393.1	1014B	5H-1, 135-140	33.05	34.17	*C. mckannai*	–0.578	2.659
395.4	1014B	5H-2, 10-15	33.30	34.42	*C. mckannai*	–0.434	2.775
397.7	1014B	5H-2, 35-40	33.55	34.67	*C. mckannai*	–0.187	2.370
399.9	1014B	5H-2, 60-65	33.80	34.92	*C. mckannai*	–0.229	2.201
402.2	1014B	5H-2, 85-90	34.05	35.17	*C. mckannai*	–0.253	2.214
405.2	1014B	5H-2, 110-115	34.30	35.42	*C. mckannai*	–0.397	2.052
408.2	1014B	5H-2, 135-140	34.55	35.67	*C. mckannai*	–0.329	2.004
411.2	1014B	5H-3, 10-15	34.80	35.92	*C. mckannai*	–0.327	2.058
414.2	1014B	5H-3, 35-40	35.05	36.17	*C. mckannai*	–0.411	2.285
417.2	1014B	5H-3, 60-65	35.30	36.42	*C. mckannai*	–0.731	2.567
420.2	1014B	5H-3, 85-90	35.55	36.67	*P. ariminensis*	–0.379	2.483
423.1	1014B	5H-3, 110-115	35.80	36.92	*C. mckannai*	–0.107	2.639
429.1	1014B	5H-4, 10-15	36.30	37.42	*C. mckannai*	–0.736	3.604
432.1	1014B	5H-4, 35-40	36.55	37.67	*C. mckannai*	–0.736	3.722
435.1	1014B	5H-4, 60-65	36.80	37.92	*C. mckannai*	–0.772	3.748
438.9	1014B	5H-4, 85-90	37.05	38.17	*C. mckannai*	–0.642	3.642
442.7	1014B	5H-4, 110-115	37.30	38.42	*C. mckannai*	–0.453	3.552
446.4	1014B	5H-4, 135-140	37.55	38.67	*C. mckannai*	–0.517	3.532
450.2	1014B	5H-5, 10-15	37.80	38.92	*P. ariminensis*	–0.672	3.299
454.0	1014B	5H-5, 35-40	38.05	39.17	*C. mckannai*	–0.589	3.459
457.8	1014B	5H-5, 60-65	38.30	39.42	*C. mckannai*	–0.552	3.298
461.5	1014B	5H-5, 85-90	38.55	39.67	*C. mckannai*	–0.644	3.312
465.3	1014B	5H-5, 110-115	38.80	39.92	*C. mckannai*	–0.725	3.206
469.1	1014B	5H-5, 135-140	39.05	40.17	*C. mckannai*	–0.559	3.200
472.9	1014B	5H-6, 10-15	39.30	40.42	*C. mckannai*	–0.503	3.178
476.6	1014B	5H-6, 35-40	39.55	40.67	*C. mckannai*	–0.455	3.043
480.4	1014B	5H-6, 60-65	39.80	40.92	*C. mckannai*	–0.454	2.877
484.2	1014B	5H-6, 85-90	40.05	41.17	*C. mckannai*	–0.312	2.759
488.0	1014B	5H-6, 110-115	40.30	41.42	*C. mckannai*	–0.289	2.725
491.7	1014B	5H-6, 135-140	40.55	41.67	*C. mckannai*	–0.073	2.661
502.4	1014B	5H-CC, 10-15	41.34	42.46	*C. mckannai*	–0.060	2.527
513.0	1014B	6H-1, 10-15	41.30	43.30	*C. mckannai*	–0.153	2.768
516.3	1014B	6H-1, 35-40	41.55	43.55	*C. mckannai*	–0.105	2.983
519.0	1014B	6H-1, 60-65	41.80	43.80	*C. mckannai*	–0.152	2.996
522.7	1014B	6H-1, 85-90	42.05	44.05	*C. mckannai*	–0.150	2.920
525.8	1014B	6H-1, 110-115	42.30	44.30	*C. mckannai*	–0.131	2.810
529.0	1014B	6H-1, 135-140	42.55	44.55	*C. mckannai*	–0.321	2.880
533.0	1014B	6H-2, 10-15	42.86	44.86	*C. mckannai*	–0.541	2.920
536.2	1014B	6H-2, 35-40	43.11	45.11	*C. mckannai*	–0.421	3.026
539.4	1014B	6H-2, 60-65	43.36	45.36	*C. mckannai*	–0.470	3.187
542.5	1014B	6H-2, 85-90	43.61	45.61	*C. mckannai*	–0.445	3.249
545.7	1014B	6H-2, 110-115	43.86	45.86	*C. mckannai*	–0.621	3.192
552.1	1014B	6H-3, 10-15	44.36	46.36	*C. mckannai*	–0.731	3.161
555.3	1014B	6H-3, 35-40	44.61	46.61	*C. mckannai*	–0.513	3.106
561.7	1014B	6H-3, 85-90	45.11	47.11	*C. mckannai*	–0.582	2.922
564.9	1014B	6H-3, 110-115	45.36	47.36	*C. mckannai*	–0.488	2.749
568.0	1014B	6H-3, 135-140	45.61	47.61	*C. mckannai*	–0.331	2.820
571.2	1014B	6H-4, 10-15	45.86	47.86	*C. mckannai*	–0.422	2.448
574.4	1014B	6H-4, 35-40	46.11	48.11	*C. mckannai*	–0.490	2.295
577.6	1014B	6H-4, 60-65	46.36	48.36	*C. mckannai*	–0.513	2.254
582.6	1014B	6H-4, 85-90	46.61	48.61	*C. mckannai*	–0.276	2.884
587.6	1014B	6H-4, 110-115	46.86	48.86	*C. mckannai*	–0.584	2.996
592.1	1014B	6H-4, 135-140	47.11	49.11	*C. mckannai*	–0.655	2.994
596.7	1014B	6H-5, 10-15	47.36	49.36	*C. mckannai*	–0.395	2.765
601.2	1014B	6H-5, 35-40	47.61	49.61	*C. mckannai*	–0.397	2.887
605.8	1014B	6H-5, 60-65	47.86	49.86	*C. mckannai*	–0.364	2.724
610.3	1014B	6H-5, 85-90	48.11	50.11	*P. ariminensis*	–0.186	2.625
613.3	1014B	6H-5, 110-115	48.36	50.36	*C. mckannai*	–0.518	2.400
616.3	1014B	6H-5, 135-140	48.61	50.61	*C. mckannai*	–0.894	2.384
619.3	1014B	6H-6, 10-15	48.86	50.86	*C. mckannai*	–0.674	2.424
622.3	1014B	6H-6, 35-40	49.11	51.11	*C. mckannai*	–0.614	2.353
625.3	1014B	6H-6, 60-65	49.36	51.36	*C. mckannai*	–0.694	3.132
628.4	1014B	6H-6, 85-90	49.61	51.61	*C. mckannai*	–0.617	3.404
631.4	1014B	6H-6, 110-115	49.86	51.86	*C. mckannai*	–0.541	3.704
635.9	1014D	6H-5, 85-90	51.36	52.28	*C. mckannai*	–0.801	3.647
636.7	1014B	6H-7, 10-15	50.36	52.36	*C. mckannai*	–0.868	3.692
638.4	1014D	6H-5, 110-115	51.61	52.53	*C. mckannai*	–0.862	3.618
639.2	1014B	6H-7, 35-40	50.61	52.61	*C. mckannai*	–0.834	3.633
641.6	1014B	6H-7, 60-65	50.86	52.86	*C. mckannai*	–0.454	3.163
643.3	1014D	6H-6, 10-15	52.11	53.03	*C. mckannai*	–0.586	3.557
643.7	1014B	6H-CC, 10-15	51.07	53.07	*C. mckannai*	–0.435	3.304
645.8	1014D	6H-6, 35-40	52.36	53.28	*C. mckannai*	–0.650	3.517
646.0	1014B	7H-1, 10-15	50.80	53.30	*C. mckannai*	–0.690	3.559
648.3	1014D	6H-6, 60-65	52.61	53.53	*C. mckannai*	–0.785	3.491
648.5	1014B	7H-1, 35-40	51.05	53.55	*C. mckannai*	–0.735	3.435
650.8	1014D	6H-6, 85-90	52.86	53.78	*C. mckannai*	–0.756	3.491
651.0	1014B	7H-1, 60-65	51.30	53.80	*C. mckannai*	–0.674	3.519
653.4	1014B	7H-1, 85-90	51.55	54.05	*C. mckannai*	–0.723	3.388
655.9	1014B	7H-1, 110-115	51.80	54.30	*C. mckannai*	–0.781	3.387
658.4	1014B	7H-1, 135-140	52.05	54.55	*C. mckannai*	–0.803	3.395
660.9	1014B	7H-2, 10-15	52.30	54.80	*C. mckannai*	–0.635	3.316
663.4	1014B	7H-2, 35-40	52.55	55.05	*C. mckannai*	–0.782	3.279
665.8	1014B	7H-2, 60-65	52.80	55.30	*C. mckannai*	–0.996	3.348
668.3	1014B	7H-2, 85-90	53.05	55.55	*C. mckannai*	–0.762	3.261
670.8	1014B	7H-2, 110-115	53.30	55.80	*C. pachyderma*	–0.642	3.209
673.3	1014B	7H-2, 135-140	53.55	56.05	*C. mckannai*	–0.940	3.199

Table 1 (continued).

Tuned age (ka)	Hole	Core, section, interval (cm)	Depth (mbsf)	Depth (mcd)	Species	$\delta^{13}C$	$\delta^{18}O$
675.8	1014B	7H-3, 10-15	53.80	56.30	*C. mckannai*	–0.832	3.194
678.2	1014B	7H-3, 35-40	54.05	56.55	*C. mckannai*	–0.755	3.064
680.7	1014B	7H-3, 60-65	54.30	56.80	*C. mckannai*	–0.741	3.053
683.2	1014B	7H-3, 85-90	54.55	57.05	*C. mckannai*	–0.625	3.012
685.7	1014B	7H-3, 110-115	54.80	57.30	*P. ariminensis*	–0.340	2.917
688.1	1014B	7H-3, 135-140	55.05	57.55	*C. mckannai*	–0.479	2.831
690.6	1014B	7H-4, 10-15	55.30	57.80	*C. pachyderma*	–0.401	2.609
693.1	1014B	7H-4, 35-40	55.55	58.05	*P. ariminensis*	–0.304	2.318
694.7	1014B	7H-4, 60-65	55.80	58.30	*C. mckannai*	–0.419	2.470
696.4	1014B	7H-4, 85-90	56.05	58.55	*C. mckannai*	–0.384	2.614
698.0	1014B	7H-4, 110-115	56.30	58.80	*C. mckannai*	–0.377	2.719
699.7	1014B	7H-4, 135-140	56.55	59.05	*C. mckannai*	–0.477	2.790
701.3	1014B	7H-5, 10-15	56.80	59.30	*C. mckannai*	–0.562	2.853
702.9	1014B	7H-5, 35-40	57.05	59.55	*C. mckannai*	–0.499	3.126
704.6	1014B	7H-5, 60-65	57.30	59.80	*P. ariminensis*	–0.375	3.259
706.2	1014B	7H-5, 85-90	57.55	60.05	*C. mckannai*	–0.483	3.345
706.4	1014A	8X-3, 10-15	57.41	60.08	*C. mckannai*	–0.423	3.402
711.2	1014B	7H-5, 110-115	57.80	60.30	*C. mckannai*	–0.641	3.296
711.8	1014A	8X-3, 35-40	57.66	60.33	*C. mckannai*	–0.576	3.140
716.6	1014B	7H-5, 135-140	58.05	60.55	*C. mckannai*	–0.623	3.120
717.2	1014A	8X-3, 60-65	57.91	60.58	*C. mckannai*	–0.163	3.314
722.0	1014B	7H-6, 10-15	58.30	60.80	*C. mckannai*	–0.501	2.964
722.6	1014A	8X-3, 85-90	58.16	60.83	*C. mckannai*	–0.630	2.932
727.4	1014B	7H-6, 35-40	58.55	61.05	*C. mckannai*	–0.606	2.858
728.0	1014A	8X-3, 110-115	58.41	61.08	*C. mckannai*	–0.540	2.939
731.8	1014B	7H-6, 60-65	58.80	61.30	*C. pachyderma*	–0.687	3.157
732.3	1014A	8X-3, 135-140	58.66	61.33	*C. mckannai*	–0.780	2.983
736.5	1014A	8X-4, 10-15	58.91	61.58	*C. mckannai*	–0.729	3.245
737.2	1014B	7H-7, 10-15	59.12	61.62	*C. mckannai*	–0.704	3.066
740.8	1014A	8X-4, 35-40	59.16	61.83	*C. mckannai*	–0.787	3.212
741.5	1014B	7H-7, 35-40	59.37	61.87	*C. mckannai*	–0.623	3.148
754.2	1014B	7H-7, 110-115	60.12	62.62	*P. ariminensis*	–0.635	3.051
765.5	1014B	7H-CC, 10-15	60.62	63.12	*C. mckannai*	–0.695	2.862
772.2	1014B	8H-1, 135-140	61.55	63.36	*C. pachyderma*	–0.544	2.615
779.2	1014B	8H-2, 10-15	61.80	63.61	*C. mckannai*	–0.459	2.343
786.2	1014B	8H-2, 35-40	62.05	63.86	*C. mckannai*	–0.600	2.384
793.4	1014B	8H-2, 135-140	63.05	64.86	*P. ariminensis*	–0.426	3.122
795.2	1014B	8H-3, 10-15	63.30	65.11	*C. mckannai*	–0.619	3.413
798.9	1014B	8H-3, 35-40	63.55	65.36	*C. mckannai*	–0.619	3.260
802.5	1014B	8H-3, 60-65	63.80	65.61	*C. mckannai*	–0.619	3.180
809.8	1014B	8H-3, 110-115	64.30	66.11	*C. mckannai*	–0.618	2.431
813.4	1014B	8H-3, 135-140	64.55	66.36	*C. mckannai*	–0.599	2.979
817.1	1014B	8H-4, 10-15	64.80	66.61	*C. mckannai*	–0.578	2.904
820.7	1014B	8H-4, 35-40	65.05	66.86	*P. ariminensis*	–0.384	2.861
835.3	1014B	8H-4, 135-140	66.05	67.86	*P. ariminensis*	–0.479	2.557
839.0	1014B	8H-5, 10-15	66.30	68.11	*C. mckannai*	–0.625	2.760
842.6	1014B	8H-5, 35-40	66.55	68.36	*C. mckannai*	–0.559	2.691
853.6	1014B	8H-5, 110-115	67.30	69.11	*C. mckannai*	–0.596	2.405
860.9	1014B	8H-6, 10-15	67.80	69.61	*C. mckannai*	–0.634	2.356
864.5	1014B	8H-6, 35-40	68.05	69.86	*C. mckannai*	–0.563	2.315
869.7	1014B	8H-6, 110-115	68.80	70.61	*P. ariminensis*	–0.313	3.190
869.9	1014A	9X-4, 10-15	68.61	70.64	*C. mckannai*	–0.632	3.410
873.6	1014A	9X-4, 35-40	68.86	70.89	*C. mckannai*	–0.614	3.455
876.8	1014B	8H-7, 10-15	69.30	71.11	*P. ariminensis*	–0.760	3.264
878.0	1014A	9X-4, 60-65	69.16	71.19	*C. mckannai*	–0.659	3.525
880.9	1014B	8H-7, 38-43	69.58	71.39	*C. mckannai*	–0.670	3.464
884.5	1014A	9X-4, 110-115	69.61	71.64	*C. mckannai*	–0.677	3.360
884.7	1014B	8H-CC, 10-15	69.84	71.65	*C. mckannai*	–0.629	3.393
888.2	1014A	9X-4, 135-140	69.86	71.89	*P. ariminensis*	–0.768	3.193
888.3	1014B	8H-CC, 35-40	70.09	71.90	*C. mckannai*	–0.610	3.374
890.3	1014A	9X-5, 10-15	70.11	72.14	*C. mckannai*	–0.481	3.381
892.4	1014A	9X-5, 35-40	70.36	72.39	*C. mckannai*	–0.637	3.350
894.5	1014A	9X-5, 60-65	70.61	72.64	*C. mckannai*	–0.727	3.310
896.6	1014A	9X-5, 85-90	70.86	72.89	*C. mckannai*	–0.659	3.243
898.7	1014A	9X-5, 110-115	71.11	73.14	*C. wuellerstorfi*	–0.566	3.110
900.8	1014A	9X-5, 135-140	71.36	73.39	*C. mckannai*	–0.829	3.109
902.9	1014A	9X-6, 10-15	71.61	73.64	*C. mckannai*	–0.656	3.013
905.0	1014A	9X-6, 35-40	71.86	73.89	*C. wuellerstorfi*	–0.719	2.854
910.5	1014A	9X-6, 60-65	72.11	74.14	*C. mckannai*	–0.817	3.033
916.0	1014A	9X-6, 85-90	72.36	74.39	*C. mckannai*	–0.813	3.175

Note: *C. = Cibicidoides, P. = Planulina*.

Table 2. Benthic foraminiferal isotope data from Hole 1020C.

Tuned age (ka)	Core, section, interval (cm)	Depth (mbsf)	Species	$\delta^{13}C$	$\delta^{18}O$
623.3	8H-1, 10-15	61.40	*C. wuellerstorfi*	–0.694	4.276
633.4	8H-1, 40-45	61.70	*C. wuellerstorfi*	–0.847	4.189
636.5	8H-1, 70-75	62.00	*C. wuellerstorfi*	–0.720	4.155
639.6	8H-1, 100-105	62.30	*C. wuellerstorfi*	–0.808	4.026
642.7	8H-1, 130-135	62.60	*C. wuellerstorfi*	–0.969	3.964
645.7	8H-2, 10-15	62.90	*C. wuellerstorfi*	–0.846	4.036
648.8	8H-2, 40-45	63.20	*C. wuellerstorfi*	–1.015	3.947
651.9	8H-2, 70-75	63.50	*C. wuellerstorfi*	–1.010	3.998
655.0	8H-2, 100-105	63.80	*C. wuellerstorfi*	–0.857	3.751
658.1	8H-2, 130-135	64.10	*C. wuellerstorfi*	–0.937	3.917
661.2	8H-3, 10-15	64.40	*C. wuellerstorfi*	–1.005	3.722
664.2	8H-3, 40-45	64.70	*C. wuellerstorfi*	–1.076	3.666
667.3	8H-3, 70-75	65.00	*C. wuellerstorfi*	–1.040	3.764
670.4	8H-3, 100-105	65.30	*C. wuellerstorfi*	–0.778	3.716
673.5	8H-3, 130-135	65.60	*C. wuellerstorfi*	–0.858	3.619
676.6	8H-4, 10-15	65.90	*C. wuellerstorfi*	–0.754	3.583
679.7	8H-4, 40-45	66.20	*C. wuellerstorfi*	–0.806	3.360
682.8	8H-4, 70-75	66.50	*C. wuellerstorfi*	–0.731	3.342
685.8	8H-4, 100-105	66.80	*C. wuellerstorfi*	–0.610	3.257
709.0	8H-6, 40-45	69.20	*C. wuellerstorfi*	–0.466	3.366
711.9	8H-6, 70-75	69.50	*C. wuellerstorfi*	–0.971	3.745
714.8	8H-6, 100-105	69.80	*C. wuellerstorfi*	–0.855	3.842
717.7	8H-6, 130-135	70.10	*C. wuellerstorfi*	–0.927	3.933
720.6	8H-7, 10-15	70.40	*C. wuellerstorfi*	–0.919	3.864
726.3	8H-7, 69-74	70.99	*C. wuellerstorfi*	–0.619	3.591
731.4	9H-1, 10-15	70.90	*C. wuellerstorfi*	–0.526	3.388
734.3	9H-1, 40-45	71.20	*C. wuellerstorfi*	–0.725	3.494
737.2	9H-1, 70-75	71.50	*C. wuellerstorfi*	–0.831	3.551
740.1	9H-1, 100-105	71.80	*C. wuellerstorfi*	–1.001	3.564
743.0	9H-1, 130-135	72.10	*C. wuellerstorfi*	–0.937	3.922
745.9	9H-2, 10-15	72.40	*C. wuellerstorfi*	–0.892	3.890
754.6	9H-2, 100-105	73.30	*C. wuellerstorfi*	–0.994	3.601
757.5	9H-2, 130-135	73.60	*C. wuellerstorfi*	–1.060	3.497
760.4	9H-3, 10-15	73.90	*C. wuellerstorfi*	–0.644	3.568
766.1	9H-3, 70-75	74.50	*C. wuellerstorfi*	–0.657	3.319
783.5	9H-4, 100-105	76.30	*C. wuellerstorfi*	–0.420	2.920
787.0	9H-4, 130-135	76.60	*C. wuellerstorfi*	–0.984	3.289
790.5	9H-5, 10-15	76.90	*C. wuellerstorfi*	–1.077	3.684
800.9	9H-5, 100-105	77.80	*C. wuellerstorfi*	–0.861	3.882
804.4	9H-5, 130-135	78.10	*C. wuellerstorfi*	–1.017	3.677
807.9	9H-6, 10-15	78.40	*C. wuellerstorfi*	–0.979	3.678
811.4	9H-6, 40-45	78.70	*C. wuellerstorfi*	–0.907	3.470
814.8	9H-6, 70-75	79.00	*C. wuellerstorfi*	–0.892	3.457
818.3	9H-6, 100-105	79.30	*C. wuellerstorfi*	–0.987	3.259
821.8	9H-6, 130-135	79.60	*C. wuellerstorfi*	–0.834	3.229
825.3	9H-7, 10-15	79.90	*C. wuellerstorfi*	–0.887	3.060
836.6	10H-1, 100-105	81.30	*C. wuellerstorfi*	–1.025	3.255
840.1	10H-1, 130-135	81.60	*C. wuellerstorfi*	–0.851	3.290
843.6	10H-2, 10-15	81.90	*C. wuellerstorfi*	–0.714	3.100
847.1	10H-2, 40-45	82.20	*C. wuellerstorfi*	–0.878	3.116
850.6	10H-2, 70-75	82.50	*C. wuellerstorfi*	–0.763	3.158
854.0	10H-2, 100-105	82.80	*C. wuellerstorfi*	–0.774	3.102
857.5	10H-2, 130-135	83.10	*C. wuellerstorfi*	–0.873	2.957
861.0	10H-3, 10-15	83.40	*C. wuellerstorfi*	–0.812	2.818
864.5	10H-3, 40-45	83.70	*C. wuellerstorfi*	–0.820	2.717
867.6	10H-3, 70-75	84.00	*C. wuellerstorfi*	–0.897	3.378
870.7	10H-3, 100-105	84.30	*C. wuellerstorfi*	–1.096	3.815
873.8	10H-3, 130-135	84.60	*C. wuellerstorfi*	–0.986	3.872
877.0	10H-4, 10-15	84.90	*C. wuellerstorfi*	–0.995	3.721
880.1	10H-4, 40-45	85.20	*C. wuellerstorfi*	–1.060	3.783
883.2	10H-4, 70-75	85.50	*C. wuellerstorfi*	–1.083	3.844
886.3	10H-4, 100-105	85.80	*C. wuellerstorfi*	–0.913	3.855
889.4	10H-4, 130-135	86.10	*C. wuellerstorfi*	–0.988	3.789
892.5	10H-5, 10-15	86.40	*C. wuellerstorfi*	–1.013	3.770
895.7	10H-5, 40-45	86.70	*C. wuellerstorfi*	–0.942	3.683
901.9	10H-5, 100-105	87.30	*C. wuellerstorfi*	–1.029	3.646
905.0	10H-5, 130-135	87.60	*C. wuellerstorfi*	–1.055	3.460
908.1	10H-6, 10-15	87.90	*C. wuellerstorfi*	–1.140	3.655
911.3	10H-6, 40-45	88.20	*C. wuellerstorfi*	–1.146	3.844
914.4	10H-6, 70-75	88.50	*C. wuellerstorfi*	–1.121	3.672
917.5	10H-6, 100-105	88.80	*C. wuellerstorfi*	–1.207	3.743
920.7	10H-6, 130-135	89.10	*C. wuellerstorfi*	–1.001	3.572
923.8	10H-7, 10-15	89.40	*C. wuellerstorfi*	–0.815	3.282
926.9	10H-7, 40-45	89.70	*C. wuellerstorfi*	–1.025	3.249
930.1	10H-7, 70-75	90.00	*C. wuellerstorfi*	–0.954	3.364
932.7	10H-0, 10-15	90.25	*C. wuellerstorfi*	–0.916	3.198
941.5	11H-1, 10-15	89.90	*C. wuellerstorfi*	–0.929	3.369
950.9	11H-1, 100-105	90.80	*C. wuellerstorfi*	–0.453	2.684

Note: *C.* = *Cibicidoides.*

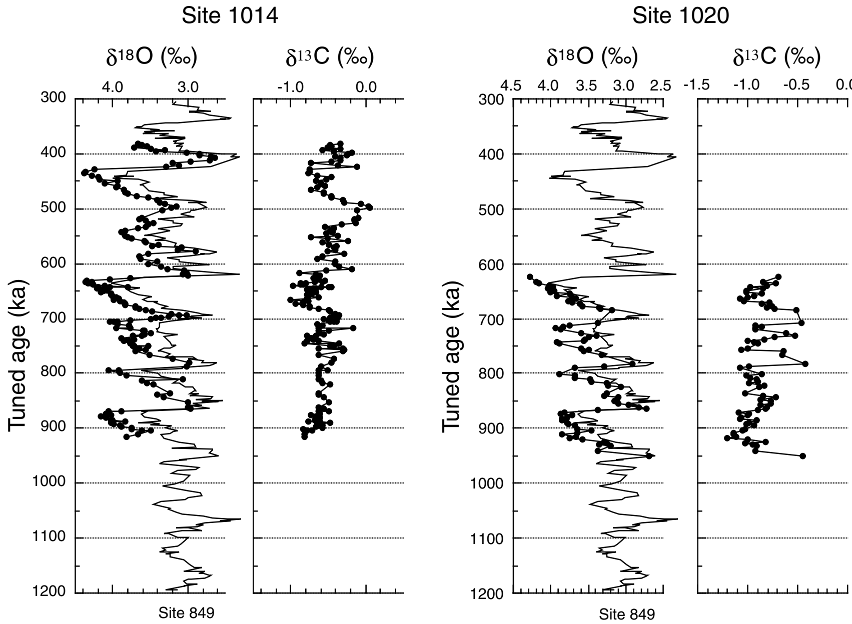

Figure 2. Isotopic time series for Sites 1014 and 1020, based on correlation with the Site 849 benthic isotope record from the Eastern Equatorial Pacific (shown by thin solid line; Mix et al., 1995). Based on these correlations, the Site 1014 record extends from 380 to 920 ka, and the Site 1020 record extends from 620 to 950 ka. Work in progress will complete the samples spanning the 0.6- to 1.2-Ma interval at both sites.