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2. Data Report: Late Pleistocene Biogenic Opal Data for Leg 177 Sites 1093 and 1094[1]

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INTRODUCTION

Sediments in the southeast Atlantic sector of the Southern Ocean were cored during Ocean Drilling Program (ODP) Leg 177 to study the paleoceanographic history of the Antarctic region on short (millennial) to long (Cenozoic) timescales. Seven sites were drilled along a north-south transect across the Antarctic Circumpolar Current (ACC) from 41° to 53°S. The general goals of Leg 177 were twofold: (1) to document the biostratigraphic, biogeographic, and paleoceanographic history of the Paleogene and early Neogene, a period marked by the establishment of the Antarctic cryosphere and the ACC, and (2) to target expanded sections of late Neogene sediments, which can be used to resolve the timing of Southern Hemisphere climatic events on orbital and suborbital time scales (Gersonde, Hodell, Blum, et al., 1999).

Closely spaced measurements of sedimentary physical properties were obtained from all cores recovered during Leg 177 using the ODP whole-round multisensor track. In addition, high-resolution diffuse color reflectance and resistivity measurements were collected on the Oregon State University Split Core Analysis Track. These whole-core and split-core measurements provide high-resolution proxy data sets for the estimation of biogenic and terrigenous mineralogy and mass flux. To assist investigators in calibrating these proxy data sets from sites located within the circum-Antarctic opal belt, samples from Sites 1093 (50°S) and 1094 (53°S) were analyzed for biogenic opal content.

[1]Janecek, T.R., 2001. Data report: Late Pleistocene biogenic opal data for Leg 177 Sites 1093 and 1094. *In* Gersonde, R., Hodell, D.A., and Blum, P. (Eds.), *Proc. ODP, Sci. Results,* 177, 1–5 [Online]. Available from World Wide Web: <http://www-odp.tamu.edu/publications/177_SR/VOLUME/CHAPTERS/SR177_02.PDF>. [Cited YYYY-MM-DD]
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METHODS

The biogenic opal data presented in this report were measured at the Lamont-Doherty Earth Observatory Marine Sediment Analysis Facility (LDEO-MSAF) using the reduction colorimetric technique described in Mortlock and Froelich (1989). A sample between 25 and 200 mg (depending on estimated opal and $CaCO_3$ content) is freeze dried, powdered, weighed, and placed in a 50-mL centrifuge tube. The sample is oxidized using 10% H_2O_2 solution to remove organic carbon and then decarbonated using 5 mL of 1-N HCL. Twenty milliliters of deionized water is added to each tube, the sample is centrifuged at 4500 rpm, and the supernatant discarded. A single-step extraction of Si is performed on the samples using 40 mL of 2-M Na_2CO_3 at 85°C for 5 hr. After centrifugation, 20 mL of the supernatant is transferred to a polyethelene vial. Dissolved silica is determined by amolybdate blue spectrometry. Absorbances are read at 812 nm using a Milton Roy Spectronic 501 spectrophotometer with a sipper flow-cell attachment.

Relative analytical precision, based upon hundreds of internal marine sediment standard analyses performed over many years at the MSAF, is ±4%. Relative analytical precision is reduced to ±8% for samples with low opal content (<15 wt%).

Results in this data report are presented as percent biogenic opal as estimated from the equation (from Mortlock and Froelich, 1989):

$$\text{opal (\%)} = 2.4 \times \text{Si}_{\text{opal}} \text{ (\%)}.$$

RESULTS

The results of the biogenic opal analyses are presented in Table **T1** and plotted vs. meters composite depth (mcd) in Figure **F1** (see the "Explanatory Notes" chapter in Gersonde, Hodell, Blum, et al. [1999] for a discussion of the meters composite depth scale and composite depth and splice construction). To facilitate comparison of opal data from the two sites, the mean composite depth for the top of the *Thalassiosira lentiginosa*/*Fragilariopsis kerguelensis* Subzone a (0.13 Ma) at Sites 1093 (33.7 mcd) and 1094 (27.03 mcd) and the top of the *R. constricta* Subzone b (0.24 Ma) at Site 1094 (47.10 mcd) (Zielinski and Gersonde, **Chap. 11,** this volume) are shown in Figure **F1.**

ACKNOWLEDGMENTS

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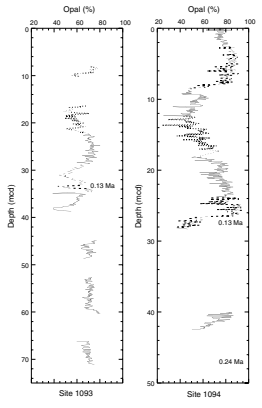
T1. Biogenic opal concentrations, Sites 1093 and 1094, p. 5.

F1. Biogenic opal concentrations vs. depth, p. 4.



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Mortlock, R.A., and Froelich, P.N., 1989. A simple method for the rapid determination of biogenic opal in pelagic marine sediments. *Deep Sea Res. Part A,* 36:1415–1426.

Figure F1. Biogenic opal concentrations vs. depth for Sites 1093 and 1094 (see the "Explanatory Notes" chapter in Gersonde, Hodell, Blum, et al. [1999] for details on the composite depth scale). For each site, Hole A = solid line, Hole B = dotted line, and Hole C = dashed line. The mean mcd depths are shown for the top of the *T. lentiginosa*/*F. kerguelensis* Subzone a (0.13 Ma) at Sites 1093 (33.7 mcd) and 1094 (27.03 mcd) and the top of the *R. constricta* Subzone b (0.24) at Site 1094 (47.10 mcd) (Zielinski and Gersonde, Chap. 11, this volume).

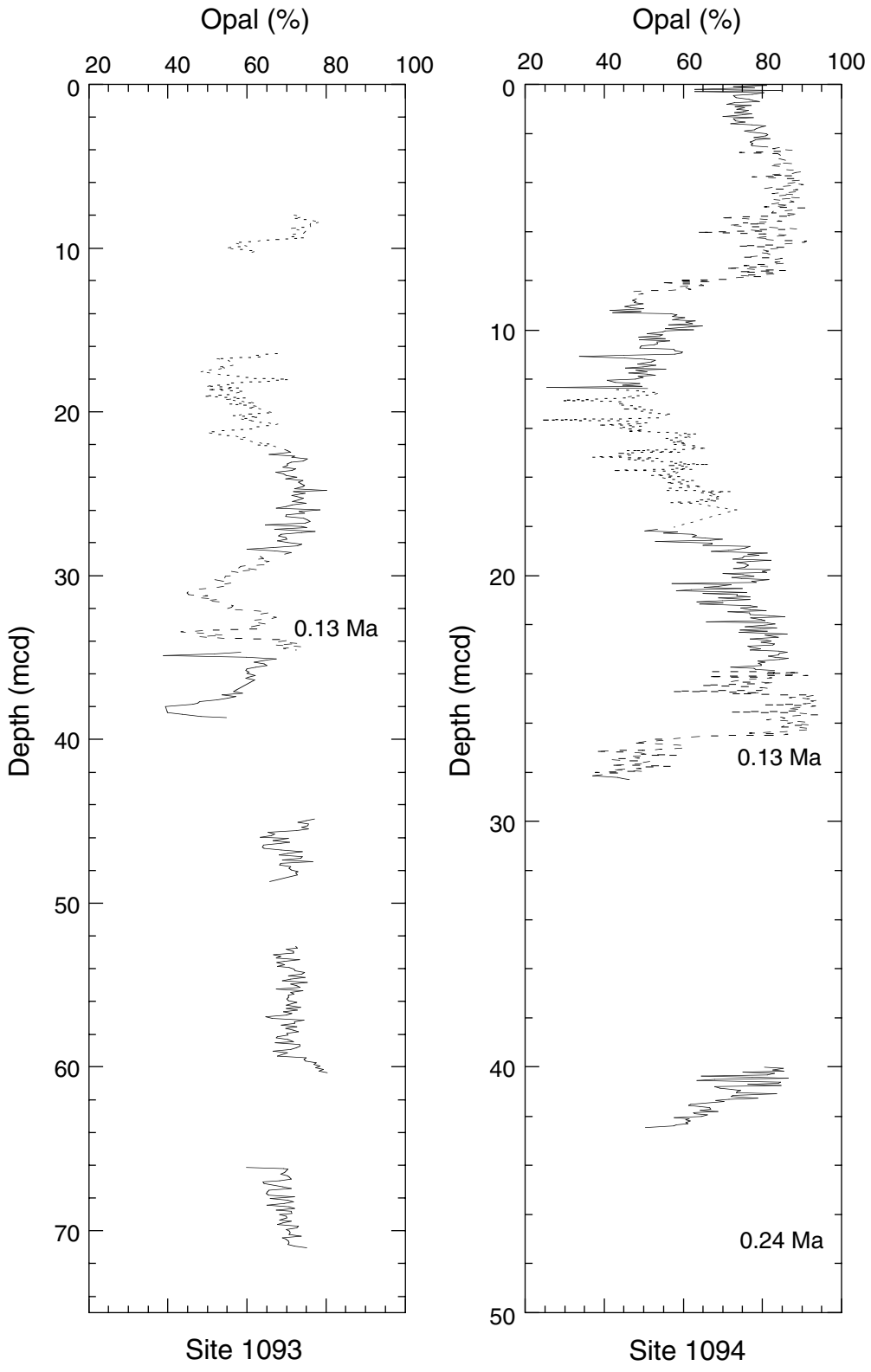

Table T1. Biogenic opal concentrations, Sites 1093 and 1094.

Core, section, interval (cm)	Depth (mbsf)	Offset (m)	Depth (mcd)	Opal (%)
177-1093A-				
3H-2, 140-142	20.90	1.38	22.28	69.50
3H-3, 0-2	21.00	1.38	22.38	70.29
3H-3, 10-12	21.10	1.38	22.48	71.06
3H-3, 20-22	21.20	1.38	22.58	65.67
3H-3, 30-32	21.30	1.38	22.68	72.04
3H-3, 40-42	21.40	1.38	22.78	71.35
3H-3, 50-52	21.50	1.38	22.88	75.29
3H-3, 60-62	21.60	1.38	22.98	74.13
3H-3, 70-73	21.70	1.38	23.08	71.27
3H-3, 81-83	21.81	1.38	23.19	70.18
3H-3, 90-92	21.90	1.38	23.28	70.15
3H-3, 99-103	21.99	1.38	23.37	69.12
3H-3, 110-112	22.10	1.38	23.48	72.32
3H-3, 120-122	22.20	1.38	23.58	71.34
3H-3, 130-132	22.30	1.38	23.68	67.27
3H-3, 140-142	22.40	1.38	23.78	69.21
3H-4, 0-2	22.50	1.38	23.88	69.96
3H-4, 10-12	22.60	1.38	23.98	72.65
3H-4, 20-22	22.70	1.38	24.08	69.74
3H-4, 30-32	22.80	1.38	24.18	74.13
3H-4, 40-42	22.90	1.38	24.28	73.09
3H-4, 50-52	23.00	1.38	24.38	73.66
3H-4, 60-62	23.10	1.38	24.48	74.64
3H-4, 69-72	23.19	1.38	24.57	74.18
3H-4, 80-82	23.30	1.38	24.68	72.03
3H-4, 90-92	23.40	1.38	24.78	80.15
3H-4, 99-102	23.49	1.38	24.87	71.69
3H-4, 110-112	23.60	1.38	24.98	74.81
3H-4, 120-122	23.70	1.38	25.08	71.33
3H-4, 130-132	23.80	1.38	25.18	72.60
3H-4, 140-142	23.90	1.38	25.28	74.36
3H-5, 0-2	24.00	1.38	25.38	73.03
3H-5, 10-12	24.10	1.38	25.48	71.51
3H-5, 20-22	24.20	1.38	25.58	74.92
3H-5, 30-32	24.30	1.38	25.68	71.49
3H-5, 40-42	24.40	1.38	25.78	69.98
3H-5, 50-52	24.50	1.38	25.88	67.47
3H-5, 60-62	24.60	1.38	25.98	78.50
3H-5, 69-72	24.69	1.38	26.07	73.16
3H-5, 79-82	24.79	1.38	26.17	74.53
3H-5, 90-92	24.90	1.38	26.28	69.94
3H-5, 100-102	25.00	1.38	26.38	69.81
3H-5, 110-112	25.10	1.38	26.48	74.35
3H-5, 120-122	25.20	1.38	26.58	75.30
3H-5, 130-132	25.30	1.38	26.68	75.99
3H-5, 140-142	25.40	1.38	26.78	74.79
3H-6, 0-2	25.50	1.38	26.88	64.61
3H-6, 10-12	25.60	1.38	26.98	73.85
3H-6, 20-22	25.70	1.38	27.08	75.07
3H-6, 30-32	25.80	1.38	27.18	67.02
3H-6, 40-42	25.90	1.38	27.28	77.24
3H-6, 50-52	26.00	1.38	27.38	73.85
3H-6, 60-62	26.10	1.38	27.48	68.67
3H-6, 70-72	26.20	1.38	27.58	67.90
3H-6, 80-82	26.30	1.38	27.68	69.72
3H-6, 90-92	26.40	1.38	27.78	70.03
3H-6, 100-102	26.50	1.38	27.88	67.81
3H-6, 110-112	26.60	1.38	27.98	70.43
3H-6, 120-122	26.70	1.38	28.08	73.88
3H-6, 130-132	26.80	1.38	28.18	72.78
3H-6, 140-142	26.90	1.38	28.28	66.62
3H-7 0-2	27.00	1.38	28.38	60.01
3H-7 10-12	27.10	1.38	28.48	66.94
3H-7 20-22	27.20	1.38	28.58	71.27
3H-7 30-32	27.30	1.38	28.68	69.49
4H-3, 20-22	30.70	3.98	34.68	58.40
4H-3, 30-32	30.80	3.98	34.78	51.73
4H-3, 40-42	30.90	3.98	34.88	38.86
4H-3, 50-53	31.00	3.98	34.98	59.81
4H-3, 60-62	31.10	3.98	35.08	67.38
4H-3, 69-72	31.19	3.98	35.17	64.97
4H-3, 79-82	31.29	3.98	35.27	61.89
4H-3, 90-92	31.40	3.98	35.38	64.37
4H-3, 100-102	31.50	3.98	35.48	65.07
4H-3, 110-112	31.60	3.98	35.58	62.24
4H-3, 120-122	31.70	3.98	35.68	59.93
4H-3, 130-132	31.80	3.98	35.78	59.68
4H-3, 140-142	31.90	3.98	35.88	60.60
4H-4, 0-2	32.00	3.98	35.98	60.04
4H-4, 10-12	32.10	3.98	36.08	62.13
4H-4, 20-22	32.20	3.98	36.18	60.37
4H-4, 30-32	32.30	3.98	36.28	59.68
4H-4, 40-42	32.40	3.98	36.38	61.95
4H-4, 100-102	33.00	3.98	36.98	57.31
4H-4, 110-112	33.10	3.98	37.08	56.71
4H-4, 120-122	33.20	3.98	37.18	58.93
4H-4, 130-132	33.30	3.98	37.28	53.69
4H-4, 140-142	33.40	3.98	37.38	57.29
4H-5, 0-2	33.50	3.98	37.48	55.05
4H-5, 10-12	33.60	3.98	37.58	52.46
4H-5, 20-22	33.70	3.98	37.68	48.04
4H-5, 30-32	33.80	3.98	37.78	47.45
4H-5, 39-42	33.89	3.98	37.87	46.22
4H-5, 50-52	34.00	3.98	37.98	39.37
4H-5, 80-82	34.30	3.98	38.28	39.91
4H-5, 90-92	34.40	3.98	38.38	39.96
4H-5, 100-102	34.50	3.98	38.48	43.62
4H-5, 110-112	34.60	3.98	38.58	48.46
4H-5, 120-122	34.70	3.98	38.68	54.86
5H-4, 0-2	41.50	3.36	44.86	77.14
5H-4, 10-12	41.60	3.36	44.96	75.03
5H-4, 20-22	41.70	3.36	45.06	72.93
5H-4, 30-32	41.80	3.36	45.16	75.54
5H-4, 40-42	41.90	3.36	45.26	75.46
5H-4, 50-52	42.00	3.36	45.36	73.94
5H-4, 60-62	42.10	3.36	45.46	75.53
5H-4, 70-73	42.20	3.36	45.56	72.52
5H-4, 80-82.5	42.30	3.36	45.66	65.39
5H-4, 90-92	42.40	3.36	45.76	67.04
5H-4, 100-102	42.50	3.36	45.86	66.15
5H-4, 110-112	42.60	3.36	45.96	63.34
5H-4, 120-122	42.70	3.36	46.06	70.55
5H-4, 130-132	42.80	3.36	46.16	66.52
5H-4, 140-142	42.90	3.36	46.26	70.84
5H-5, 0-2	43.00	3.36	46.36	68.55
5H-5, 10-12	43.10	3.36	46.46	64.21
5H-5, 20-22	43.20	3.36	46.56	63.97
5H-5, 30-32	43.30	3.36	46.66	64.37
5H-5, 40-42	43.40	3.36	46.76	68.66
5H-5, 50-52	43.50	3.36	46.86	74.03
5H-5, 60-62	43.60	3.36	46.96	70.36
5H-5, 70-73	43.70	3.36	47.06	68.17
5H-5, 80-82	43.80	3.36	47.16	74.06
5H-5, 90-92	43.90	3.36	47.26	73.57
5H-5, 100-102	44.00	3.36	47.36	69.02

Notes: Both the standard ODP mbsf depth and shipboard mcd depth scales are presented here. The offset column denotes the amount (in meters) each sample was shifted to align samples between different holes (see the "Explanatory Notes" chapter in Gersonde, Hodell, Blum, et. al. [1999] for details on the mcd scale and composite core construction). Ages datums are presented in Zielinski and Gersonde, **Chap. 11,** this volume. Data are overspecified for calculation purposes. For true analytical precision, see the text. Only a portion of this table appears here. The complete table is available in **ASCII format.**