30. *DATA REPORT:* INDEX PROPERTIES, CALCIUM CARBONATE, AND OPAL CONTENT OF CORE 167-1016B-17H[1]

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INTRODUCTION

Physical properties measurements provide a relatively inexpensive and fast way to obtain high-resolution estimates of the variations in sedimentological properties. To better resolve the validity and cause of the geophysical signals measured by the Ocean Drilling Program (ODP) shipboard multisensor track (MST) instruments, 223 10-cm^3 core samples were collected at 4-cm intervals in Core 167-1016B-17H at the California Margin Conception Transect for the measurements of index properties, carbonate content, and opal content (Fig. 1). This core was chosen because hole-to-hole stratigraphic correlation of MST data suggested that Core 17H corresponds to a depth interval that displays the greatest range of amplitude of many physical properties.

METHODS OF ANALYSIS

Index Properties

Index properties measurements on Core 17H included bulk water content, dry water content, bulk density, grain density, dry density, porosity, and void ratio (Table 1). The measurements were collected on board ship following standard ODP procedures using the weight of the wet samples and the weight and volume of the dry samples (Lyle, Koizumi, Richter, et al., 1997).

Calcium Carbonate

The $CaCO_3$ content of the Core 17H samples was determined using the modified vacuum-gasometric technique method (Jones and Kaiteris, 1983). The samples were dried for 12 hr in a 110°C oven and then crushed. Approximately 150–200 mg of sample was weighed, and 3 cm^3 of 50% solution of phosphoric acid was used for analysis. A control sample consisting of pure calcium carbonate was analyzed every 10 samples, yielding an analytical precision of better than 2 wt%. The replicated analyses of 50 samples were performed in the Boise State University geochemistry laboratory (M. Lyle, pers. comm., 1998). The reproducibility of the measurements was within 1.5 wt% of the absolute value.

Opal

For biogenic opal extraction (Table 1), Mortlock and Froelich's technique was applied (Mortlock and Froelich, 1989), except that acetic acid buffered with sodium acetate was used instead of HCl to digest the carbonates, and the Si extraction was performed for 6 hr instead of 5 hr using hot Na_2CO_3 (D. Murray, pers. comm., 1997). Although samples were ground, there were diatom and radiolarian parts in the residues. This was quantified by sieving several leach residues at 38 µm, and the portion >38 µm was treated with a hot NaOH solution for 6 hr. Most of the biogenic Si was dissolved using the standard technique, but the remaining portion resulted in the small underestimation of the total opal content. The percent of underestimation of the total opal varies from 2.24 to 17.29 wt% with an average of 7.37% and is of a nonsystematic nature. This error has to be taken into consideration to use the data for quantitative studies (Table 2). The remaining sample residues were not sieved to avoid doubling the analytical time and cost.

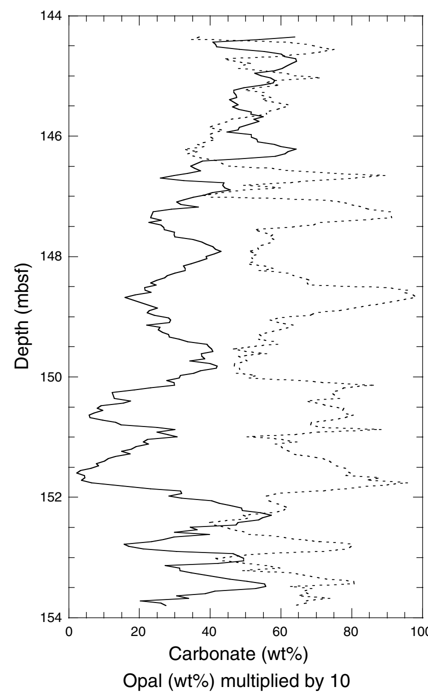

Figure 1. Calcium carbonate and opal content for Core 167-1016B-17H. Values of calcium carbonate content are reported in weight percent, and values of opal are in weight percent multiplied by 10. Solid line = calcium carbonate, dashed line = opal.

EVALUATION OF RESULTS

The calcite and opal content data together with MST and index properties measurements in Core 17H provide a very useful data set for the study, aiming toward a better understanding of how the changes in the sedimentation types are influencing the variations in physical properties of sediments. Core 17H was especially suited for this task because of high variability in physical properties. The intrinsic understanding of the relations between the sediment composition and phys-

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Table 1. Index properties, calcium carbonate content, and opal content for Core 167-1016B-17H.

Core, section interval (cm)	Depth (mbsf)	Bulk water content (%)	Dry water content (%)	Bulk density (g/cm^3)	Grain density (g/cm^3)	Dry density (g/cm^3)	Porosity (%)	Void ratio	$CaCO_3$ (wt%)	Opal (wt%)
17H-1, 6-8	144.36	40.75	68.77	1.63	2.77	0.97	65.02	1.86	63.93	3.69
17H-1, 10-12	144.40	39.92	66.44	1.64	2.74	0.99	63.98	1.78	53.99	3.48
17H-1, 14-16	144.44	42.32	73.37	1.60	2.74	0.92	66.23	1.96	40.83	6.04
17H-1, 18-20	144.48	40.86	69.10	1.62	2.71	0.96	64.60	1.82	41.59	6.72
17H-1, 22-24	144.52	41.29	70.34	1.61	2.69	0.94	64.86	1.85	41.91	7.06
17H-1, 26-28	144.56	40.29	67.46	1.61	2.63	0.96	63.37	1.73	48.27	7.51
17H-1, 30-32	144.60	39.96	66.55	1.65	2.76	0.99	64.19	1.79	55.37	7.21
17H-1, 34-36	144.64	39.73	65.92	1.64	2.73	0.99	63.68	1.75	60.18	6.75
17H-1, 38-40	144.68	38.99	63.91	1.65	2.71	1.01	62.87	1.69	61.07	5.91
17H-1, 42-44	144.72	37.71	60.54	1.69	2.77	1.05	62.05	1.63	64.20	4.40

This is a sample of the table that appears on the volume CD-ROM.

Table 2. Standard opal content measured by treatment with Na_2CO_3, opal content of the sieved residue measured by treatment with NaOH, and total opal content.

Core, section, interval (cm)	Opal: Na_2CO_3 (wt%)	Opal: NaOH (wt%)	Total opal (wt%)
167-1016B-			
17H-1, 6-8	3.69	0.14	3.82
17H-1, 10-12	3.48	0.08	3.56
17H-1, 14-16	6.04	0.18	6.23
17H-1, 18-20	6.72	0.38	7.09
17H-1, 22-24	7.06	0.40	7.46
17H-1, 26-28	7.51	0.54	8.04
17H-1, 30-32	7.21	0.57	7.78
17H-1, 34-36	6.75	0.73	7.48
17H-1, 38-40	5.91	0.80	6.71
17H-1, 42-44	4.40	0.41	4.81
17H-1, 46-48	4.71	0.46	5.17
17H-1, 50-52	5.14	0.55	5.69
17H-1, 54-56	4.85	0.43	5.28
17H-1, 58-60	4.81	0.55	5.36
17H-1, 62-64	5.46	0.80	6.25
17H-1, 66-68	6.13	1.28	7.40
17H-1, 70-72	6.39	0.93	7.32
17H-1, 74-76	7.13	0.65	7.78
17H-1, 78-80	5.78	0.30	6.08
17H-1, 82-84	5.56	0.37	5.93
17H-1, 86-88	5.96	0.27	6.24
17H-1, 90-92	5.30	0.20	5.50
17H-1, 94-96	4.98	0.24	5.22
17H-1, 98-100	5.53	0.42	5.95
17H-1, 102-104	5.44	0.38	5.82
17H-1, 106-108	5.72	0.65	6.38
17H-1, 110-112	5.46	0.65	6.11
17H-1, 118-120	6.25	0.50	6.75
17H-1, 122-124	6.14	0.39	6.52
17H-1, 126-128	5.89	0.28	6.17
17H-1, 130-132	5.57	0.43	6.01
17H-1, 134-136	5.60	0.47	6.08
17H-1, 138-140	5.09	0.33	5.42
17H-1, 142-144	4.55	0.25	4.80
17H-1, 146-148	4.52	0.18	4.70

ical properties may lead to the development of the regression equations that will allow us to estimate sediment content based on fast and relatively inexpensive petrophysical measurements. One must keep in mind that Core 17H is not a two- (opal and calcite) but a three-component system (calcite, opal, and clay), which makes future interpretations more difficult—yet also more interesting.

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