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10. Data Report: Carbonate Mineralogy of Sites Drilled during Leg 182[1]

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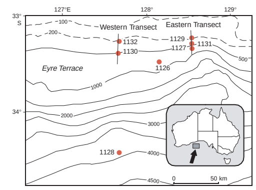
ABSTRACT

Carbonate mineralogy was determined on a total of 2845 samples from Sites 1126–1132 situated on the southern margin of the Australian continent. Five of these sites represent distal to proximal transects (Sites 1127–1131–1129 and 1132–1130), which penetrate principally Pleistocene-aged sediments. These sediments exhibit high concentrations of aragonite and high-Mg calcite (HMC) in shallow portions of the core, decreasing with depth. Dolomite was ubiquitous throughout these five cores and showed an inverse correlation in some instances with HMC. Sites 1126 and 1128 penetrated older strata and show lower concentrations of aragonite, HMC, and dolomite.

INTRODUCTION

This report provides the results of X-ray diffraction analyses of samples from seven sites cored during Leg 182 of the Ocean Drilling Program analyzed by six different principal investigators. The sites can be separated into three groups based on their geographical locality and the age of the sediments that they penetrated (Fig. F1). Sites 1127, 1131, and 1129 (the eastern transect) were drilled in water depths of 479.3, 332.4, and 202.4 m, respectively. They form a distal to proximal transect and penetrate a set of progradational sigmoidal clinoforms constituting Sequence 2, as defined by Feary and James (1998), and are Pliocene–Pleistocene in age (Shipboard Scientific Party, 2000). The oldest sediments penetrated were middle Eocene in age. Sites 1130 and 1132 were drilled in water depths of 487.8 and 218.3 m, respectively,

F1. Location map of Leg 182 sites, p. 5.



[1] Swart, P.K., James, N.P., Mallinson, D., Malone, M.J., Matsuda, H., and Simo, T., 2002. Data report: Carbonate mineralogy of sites drilled during Leg 182. *In* Hine, A.C., Feary, D.A., and Malone, M.J. (Eds.), *Proc. ODP, Sci. Results,* 182, 1–14 [Online]. Available from World Wide Web: <http://www-odp.tamu.edu/publications/182_SR/VOLUME/CHAPTERS/010.PDF>. [Cited YYYY-MM-DD]

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and also form a distal to proximal transect penetrating sediments as old as middle Eocene. Sites 1126 and 1128 were situated in deeper water, 783.8 and 3874.2 m, respectively. Cretaceous sediments were cored at Site 1126 and middle Eocene sediments at Site 1128 (Feary, Hine, Malone, et al., 2000).

ANALYTICAL METHODS

Samples were taken at a rate of approximately two per section throughout the cored material from Sites 1126–1132. Each of the principal investigators in this study was assigned one site, with the exception of Dave Mallinson, who analyzed Sites 1126 and 1128. Measurement of concentrations of aragonite, low-Mg calcite (LMC), high-Mg calcite (HMC), and dolomite was performed using a standard procedure and a set of standards distributed to all participants and prepared at the University of Miami (Table T1). The instruments used at each location are listed in Table T2. The purity of the composition of the end-members was verified prior to analysis, and each mixture was homogenized in a ball mill for a period of 10 min. The peak areas for each relevant mineral were determined by scanning a smear mount of the sample between 24° and 32°2θ (CuK$_\alpha$ radiation). The ratio of the peak areas for the appropriate peaks for aragonite, HMC, and dolomite were determined relative to LMC + HMC and correlated to the same ratio in the weighed components of each standard. If it is assumed that the sediment is composed only of dolomite, LMC, HMC, and aragonite, then Equation 1 is valid. Using the calibration between the measured area and the concentration of minerals in the standards, equation 1 can be solved:

$$D + A + LMC + HMC = 1. \quad (1)$$

RESULTS

Bulk mineralogical analyses have been compiled for seven sites drilled during Leg 182. These results are shown for the eastern and western transects in Figures F2, F3, F4, F5, F6, and F7. In addition, data for all sites are shown in Table T3. These data agree within 5% with the data generated on the *JOIDES Resolution* (Feary, Hine, Malone, et al., 2000).

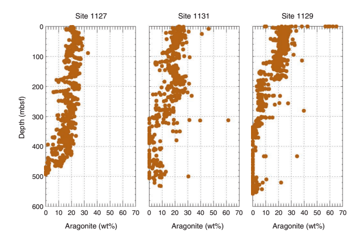
ACKNOWLEDGMENTS

We would like to thank the scientific staff and crew of the *JOIDES Resolution.* In addition, the following persons are acknowledged: Corey Schroeder and Greta Mackenzie (University of Miami), John Stanley (University of Adelaide), Anne Ebenreiter (University of Wisconsin), and Naoaki Hashimoto and Takeshi Anai (Kumamoto University).This research used samples and/or data provided by the Ocean Drilling Program (ODP). ODP is sponsored by the U.S. National Science Foundation (NSF) and participating countries under management of Joint Oceanographic Institutions (JOI), Inc. Funding for this research was provided to Peter Swart, Mitch Malone, Toni Simo, and David Mallinson from

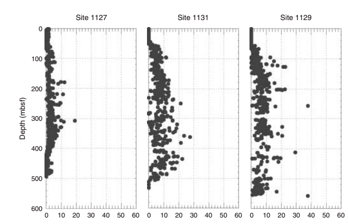
T1. Minerals used in standards, p. 12.

T2. Instruments used in this study, p. 13.

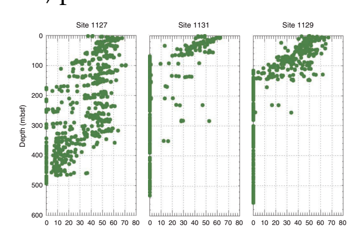
F2. Aragonite at Sites 1127, 1131, and 1129, p. 6.



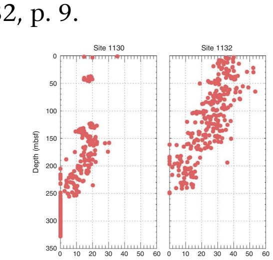
F3. Dolomite at Sites 1127, 1131, and 1129, p. 7.



F4. HMC at Sites 1127, 1131, and 1129, p. 8.

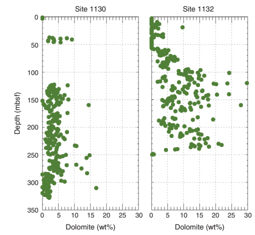


F5. Aragonite at Sites 1130 and 1132, p. 9.

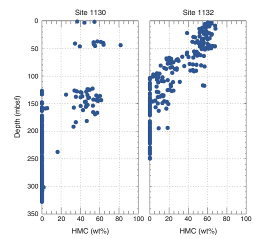


JOI/USSP. Noel James was supported by the Natural Sciences and Engineering Research Council of Canada.

F6. Dolomite at Sites 1130 and 1132, p. 10.



F7. HMC at Sites 1130 and 1132, p. 11.



T3. Aragonite, LMC, HMC, and dolomite, p. 14.

REFERENCES

Feary, D.A., Hine, A.C., Malone, M.J., et al., 2000. *Proc. ODP, Init. Repts.,* 182 [CD-ROM]. Available from: Ocean Drilling Program, Texas A&M University, College Station, TX 77845-9547, U.S.A.

Feary, D.A., and James, N.P., 1998. Seismic stratigraphy and geological evolution of the Cenozoic, cool-water Eucla Platform, Great Australian Bight. *AAPG Bull.,* 82:792–816.

Shipboard Scientific Party, 2000. Site 1127. *In* Feary, D.A., Hine, A.C., Malone, M.J., et al., *Proc. ODP, Init. Repts.,* 182, 1–90 [CD-ROM]. Available from: Ocean Drilling Program, Texas A&M University, College Station, TX 77845-9547, U.S.A.

Figure F1. Location map of sites drilled during Leg 182 and analyzed in this study.

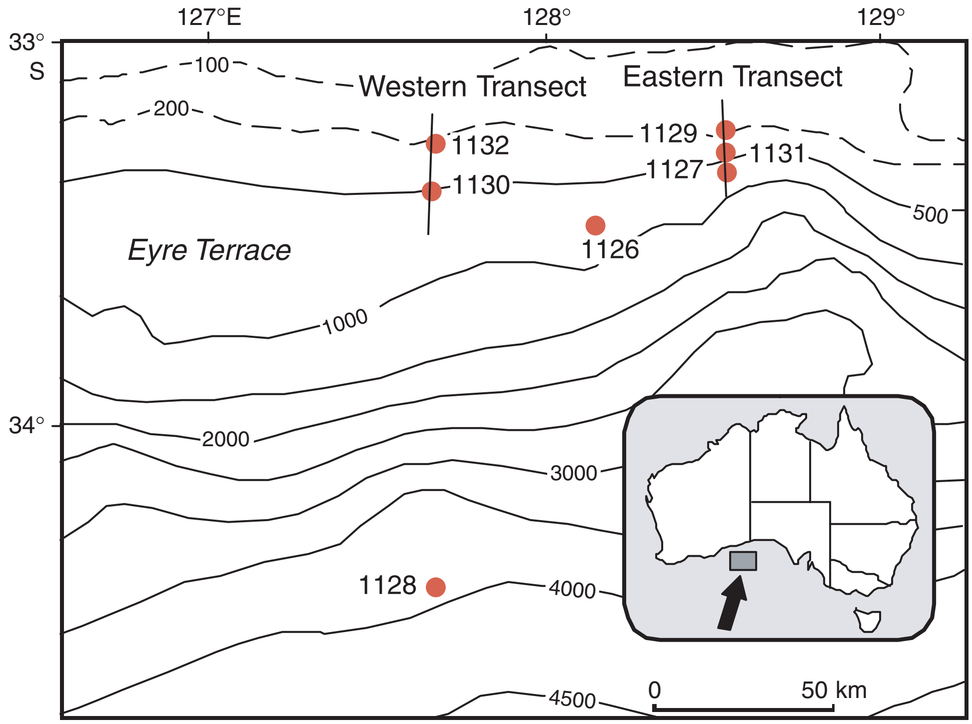


Figure F2. Variations in the concentration of aragonite at Sites 1127, 1131, and 1129.

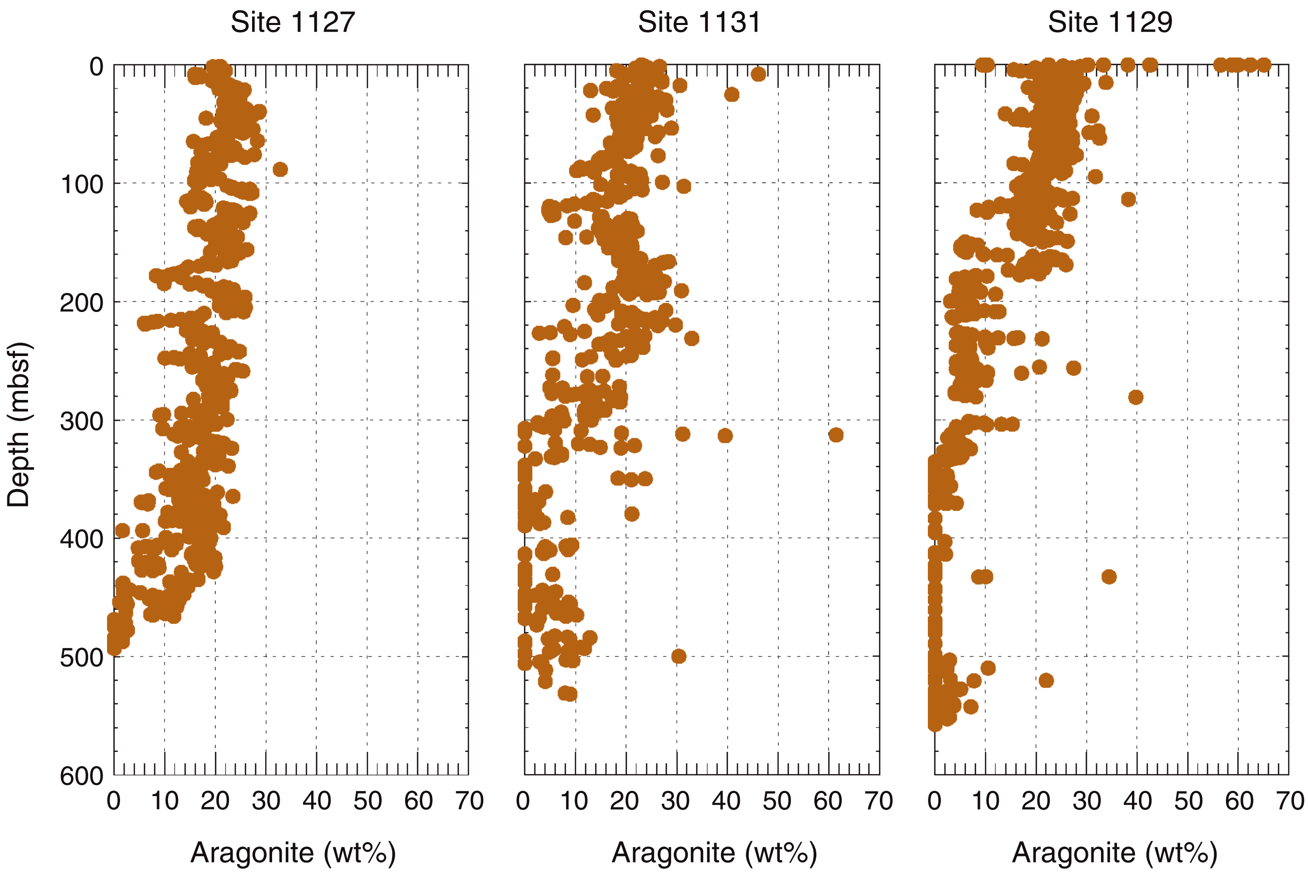


Figure F3. Variations in the concentration of dolomite at Sites 1127, 1131, and 1129.

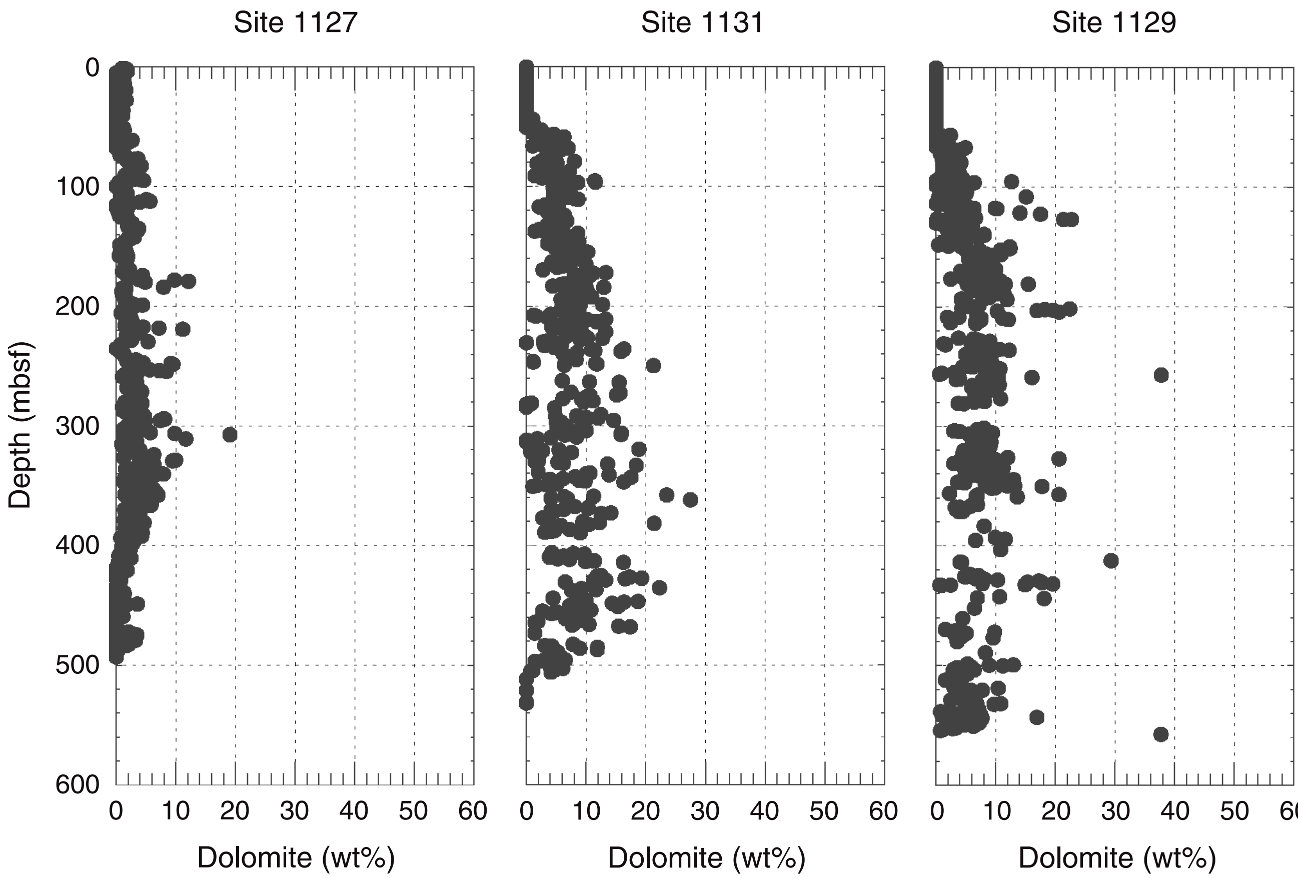


Figure F4. Variations in the concentration of high-Mg calcite (HMC) at Sites 1127, 1131, and 1129.

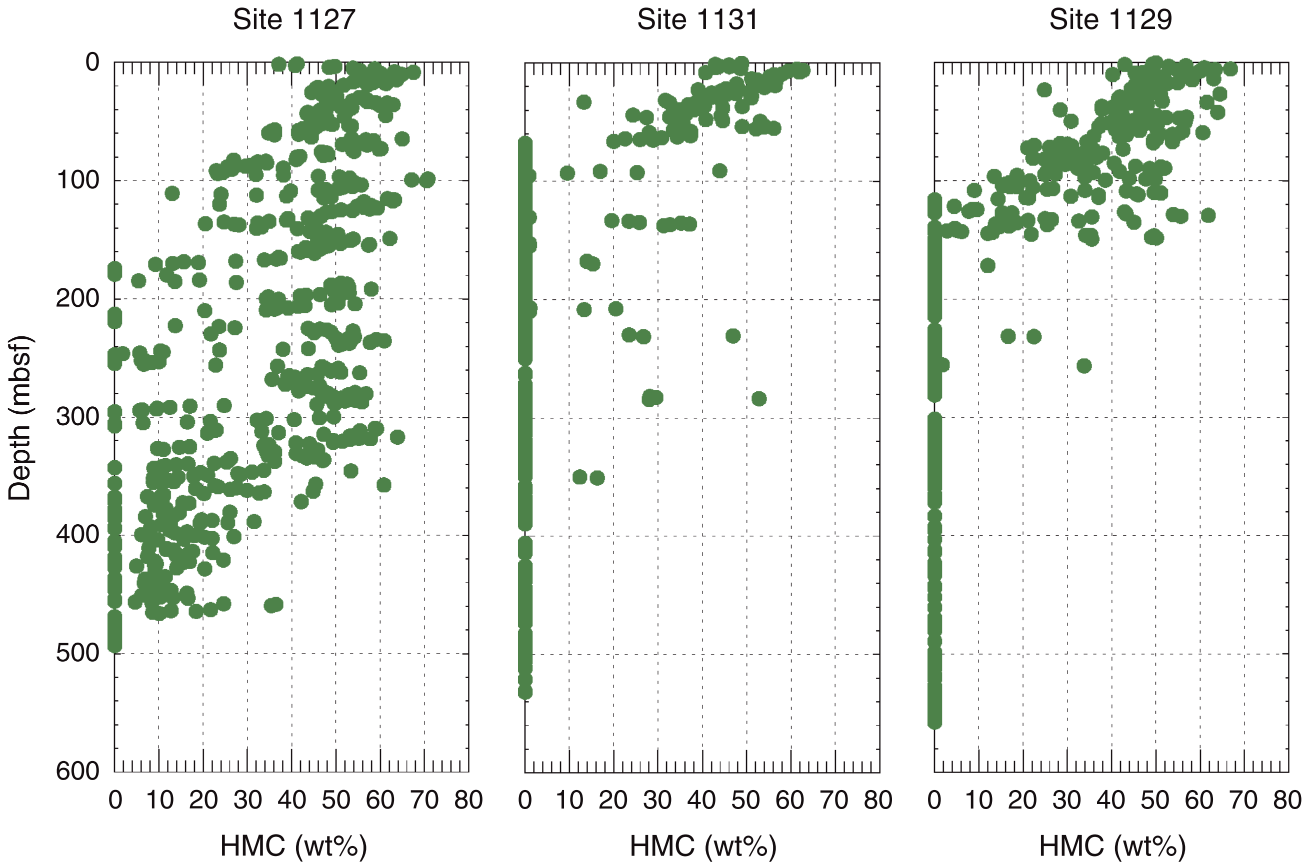


Figure F5. Variations in the concentration of aragonite at Sites 1130 and 1132.

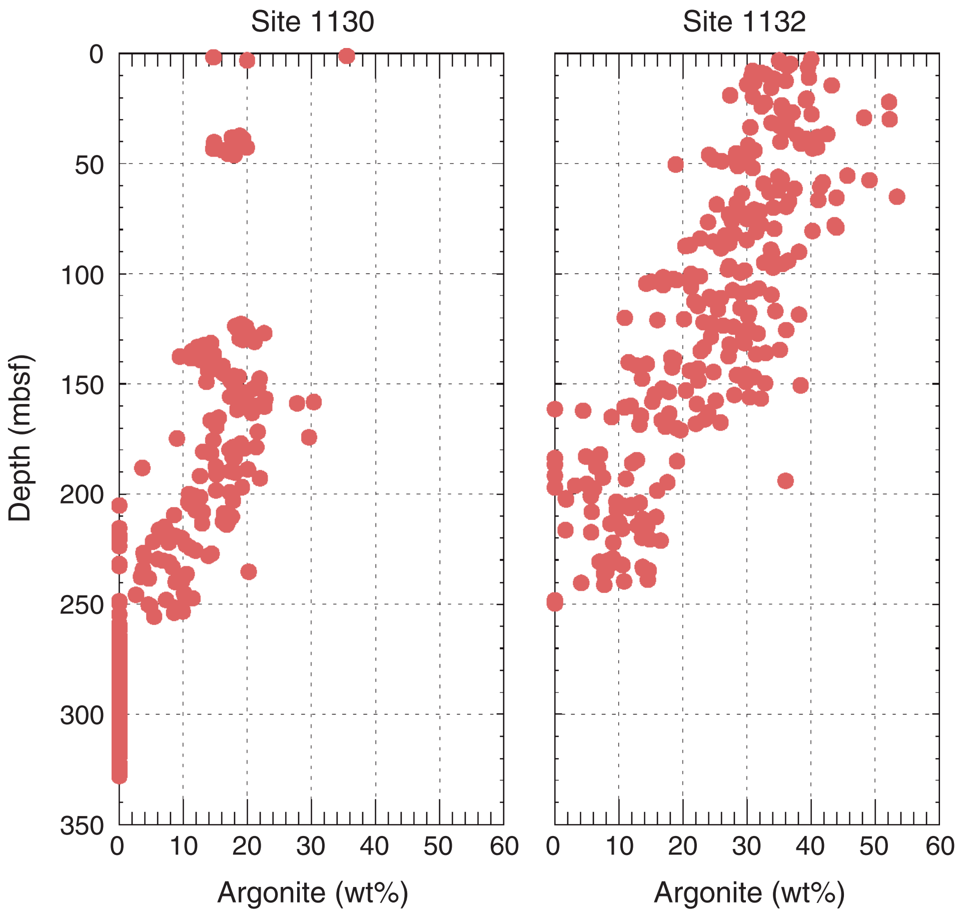


Figure F6. Variations in the concentration of dolomite at Sites 1130 and 1132.

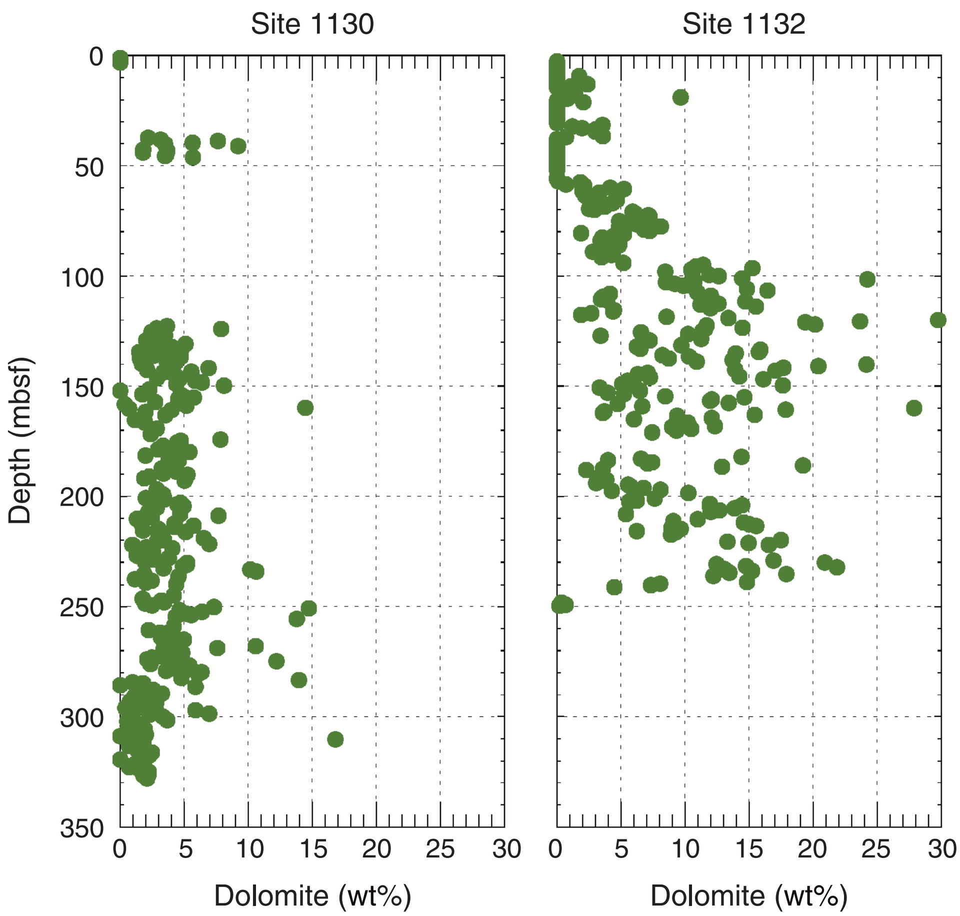


Figure F7. Variations in the concentration of high-Mg calcite (HMC) at Sites 1130 and 1132.

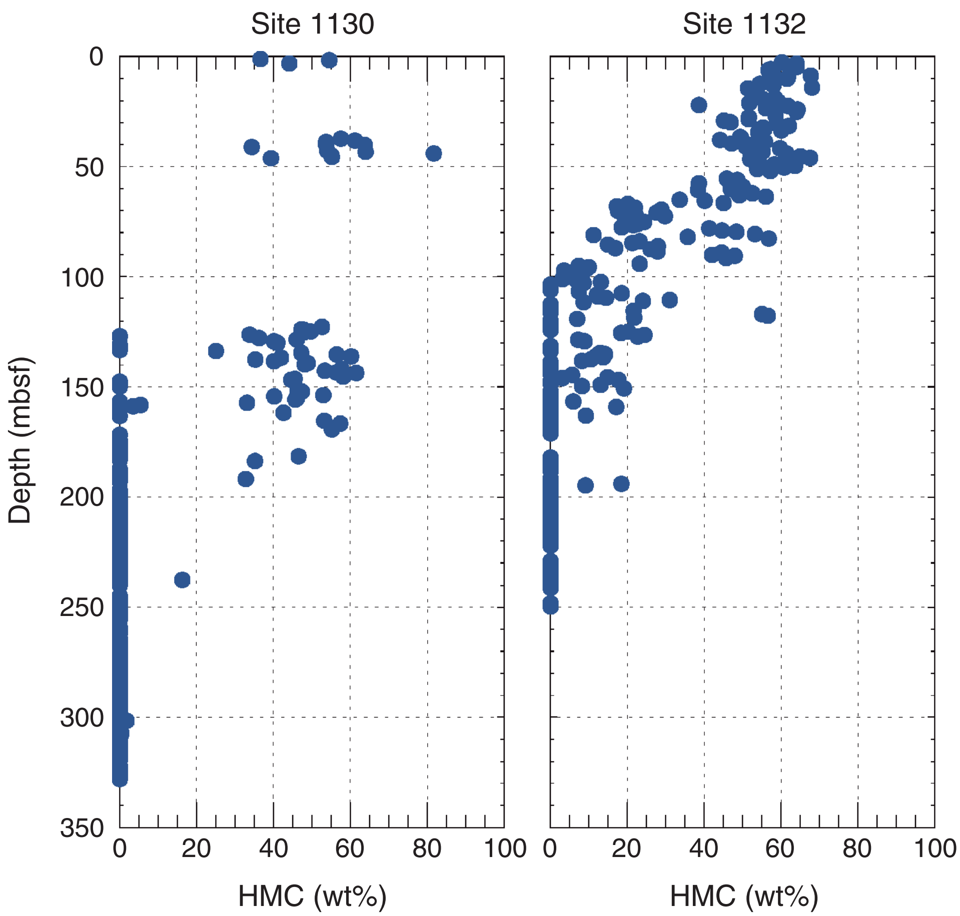


Table T1. Concentration of minerals used in standards measured by all participants in this study.

Standard	Aragonite (wt%)	Low-Mg calcite (wt%)	High-Mg calcite (wt%)	Dolomite (wt%)
1	40	30	10	20
2	10	60	50	25
3	30	40	10	20
4	60	20	10	10
5	60	20	20	0

Table T2. Type of instrument used in this study.

Investigator	Instrument	Number of samples	Site
Peter Swart	Scintag XDS 2000	479	1131
Toni Simo	Scintag	241	1130
Mitchell Malone	Rigaku D-Max 111V-B	585	1129
Noel James	Philips PW1050	584	1127
Hiroki Matsuda	Rigaku SG-7	264	1132
David Mallinson	Scintag XDS 2000	286	1126
		406	1128

Table T3. Concentrations of aragonite, low-Mg calcite, high-Mg calcite, and dolomite for Sites 1126, 1127, 1128, 1129, 1130, 1131, and 1132.

Site	Hole	Core	Type	Section	Top	Depth (mbsf)	Aragonite (wt%)	LMC (wt%)	HMC (wt%)	Dolomite (wt%)
1126	B	1	H	1	20	0.20	21.12	44.79	34.09	0.00
1126	B	1	H	1	25	0.25	19.93	40.92	39.15	0.00
1126	B	1	H	1	100	1.00	17.11	30.72	52.17	0.00
1126	B	1	H	2	20	1.70	22.89	22.33	54.78	0.00
1126	B	1	H	2	100	2.50	21.49	23.75	54.75	0.00
1126	B	1	H	3	20	3.20	22.60	22.23	55.17	0.00
1126	B	1	H	3	100	4.00	22.89	23.66	53.45	0.00
1126	B	1	H	4	20	4.70	25.76	39.63	34.61	0.00
1126	B	1	H	4	25	4.75	20.40	40.30	39.30	0.00
1126	B	1	H	4	100	5.50	29.98	49.37	20.65	0.00
1126	B	1	H	5	20	6.20	24.70	75.30	0.00	0.00
1126	B	2	H	1	20	6.70	21.64	38.98	39.38	0.00
1126	B	2	H	1	25	6.75	18.79	38.16	43.05	0.00
1126	B	2	H	1	99	7.49	26.07	43.86	30.06	0.00
1126	B	2	H	2	20	8.20	17.26	38.59	44.15	0.00
1126	B	2	H	2	99	8.99	19.77	53.36	26.87	0.00
1126	B	2	H	3	20	9.70	19.84	80.16	0.00	0.00
1126	B	2	H	3	99	10.49	21.42	78.58	0.00	0.00
1126	B	2	H	4	20	11.20	15.92	84.08	0.00	0.00
1126	B	2	H	4	25	11.25	16.07	83.93	0.00	0.00
1126	B	2	H	4	99	11.99	9.08	90.92	0.00	0.00
1126	B	2	H	5	20	12.70	14.38	61.11	24.50	0.00
1126	B	2	H	5	99	13.49	22.00	46.29	28.66	3.06
1126	B	2	H	6	20	14.20	21.29	78.71	0.00	0.00
1126	B	2	H	6	99	14.99	19.13	80.87	0.00	0.00
1126	B	3	H	1	20	16.20	13.54	84.78	0.00	1.69
1126	B	3	H	1	29	16.29	8.09	91.91	0.00	0.00
1126	B	3	H	1	99	16.99	24.28	45.09	30.63	0.00
1126	B	3	H	2	20	17.70	16.40	83.60	0.00	0.00
1126	B	3	H	2	100	18.50	27.48	72.52	0.00	0.00
1126	B	3	H	3	20	19.20	17.12	82.88	0.00	0.00
1126	B	3	H	3	100	20.00	24.72	75.28	0.00	0.00
1126	B	3	H	4	20	20.70	20.22	43.62	36.16	0.00
1126	B	3	H	4	24	20.74	18.84	43.75	37.41	0.00
1126	B	3	H	4	100	21.50	26.44	73.56	0.00	0.00
1126	B	3	H	5	20	22.20	22.31	77.69	0.00	0.00
1126	B	3	H	5	100	23.00	26.11	73.89	0.00	0.00
1126	B	3	H	6	20	23.70	14.62	85.38	0.00	0.00
1126	B	3	H	6	100	24.50	25.36	74.64	0.00	0.00
1126	B	3	H	7	19	25.19	17.01	82.99	0.00	0.00
1126	B	4	H	1	20	25.70	23.24	76.76	0.00	0.00
1126	B	4	H	1	25	25.75	23.36	76.64	0.00	0.00
1126	B	4	H	1	100	26.50	22.93	75.84	0.00	1.23
1126	B	4	H	2	20	27.20	18.70	42.99	38.31	0.00
1126	B	4	H	2	100	28.00	24.25	75.75	0.00	0.00
1126	B	4	H	3	20	28.70	24.69	72.71	0.00	2.60
1126	B	4	H	3	100	29.50	11.92	88.08	0.00	0.00
1126	B	4	H	4	20	30.20	0.00	100.00	0.00	0.00
1126	B	4	H	4	25	30.25	0.00	100.00	0.00	0.00
1126	B	4	H	4	100	31.00	17.22	82.78	0.00	0.00
1126	B	4	H	5	20	31.70	20.73	79.27	0.00	0.00
1126	B	4	H	5	100	32.50	0.00	100.00	0.00	0.00
1126	B	4	H	6	20	33.20	13.28	86.72	0.00	0.00
1126	B	4	H	6	100	34.00	19.80	80.20	0.00	0.00
1126	B	4	H	7	20	34.70	0.00	100.00	0.00	0.00
1126	B	5	H	1	20	35.20	15.66	84.34	0.00	0.00
1126	B	5	H	1	25	35.25	20.56	79.44	0.00	0.00
1126	B	5	H	1	100	36.00	15.72	84.28	0.00	0.00
1126	B	5	H	2	20	36.70	18.86	79.70	0.00	1.44
1126	B	5	H	2	100	37.50	20.77	79.23	0.00	0.00
1126	B	5	H	3	20	38.20	9.33	90.67	0.00	0.00
1126	B	5	H	3	100	39.00	20.91	79.09	0.00	0.00
1126	B	5	H	3	145	39.45	0.00	100.00	0.00	0.00

Note: Only a portion of this table appears here. The complete table is available in ASCII.