

35. RESULTS OF X-RAY-MINERALOGY ANALYSES OF SAMPLES FROM DEEP SEA DRILLING PROJECT SITES 415 AND 416, MOROCCAN BASIN

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INTRODUCTION

X-ray-diffraction analyses of 164 samples were conducted on whole-rock samples (for determination of gross mineralogy) and on the carbonate-free fractions (for determination of the clay-mineral content). The analyses were carried out in the laboratory of the Société Nationale Elf-Aquitaine (Production) in Pau, France. Results are given in Tables 1 and 2 and in Figures 1, 2, and 3.

ANALYTICAL METHODS

Determinations of quartz, calcite, and dolomite contents were made from analysis of isogranular powder

(40 mm) of whole rock. The corresponding X-ray diffractograms were processed by computer and rendered as per cent weight of the whole rock.

Determinations of clay-mineral contents were made by analysis of the carbonate-free fraction of 5 mm or less. Kaolinite, illite, chlorite, attapulgite, and sepiolite contents were estimated in relative percentages from the heights and areas of the X-ray diffraction peaks. Opal-CT is also estimated in relative percentages, but the presence of clinoptilolite is only indicated by the notation "1."

TABLE 1
X-Ray-Mineralogy Data for Site 415

Sample (Interval in cm)	Sub-Bottom Depth (m)	Bulk X-Ray Mineralogy			X-Ray Mineralogy of the Clay Fraction								
		Qtz. (% of sample)	Calc.	Dolo.	Kaol.	Ill.	I.M.	Smect.	Chlor.	Attap.	Sepio.	Opal	Clinop.
415-1-1, 20-22	0.22	8	43	1	10	40	30		20				
1-2, 30-32	1.82	7	43	0	10	40	20		30				
1-3, 90-92	3.92	10	41	0	10	35	25		25		5		
1-4, 94-96	5.46	7	52	0	15	40	15		25		5		
1-5, 70-72	6.72	7	54	0	20	35	20		20		5		
1-6, 90-92	8.42	10	42	1	15	35	15	10	20		5		
2-1, 2-3	74.03	13	25	2	15	40	25		20				
2-1, 36-38	74.38	4	60	0	15	45	20		20				
2-2, 54-56	76.06	5	57	2	10	35		40	10		5		
3-1, 100-102	138.52	4	68	0	5	35		40	15		5		
3-2, 29-31	139.31	5	60	2	5	40		40	10		5		1
3-3, 32-34	140.84	5	54	3	5	35		45	10		5		
4-1, 11-13	207.13	5	68	2	5	50		35	10				
4-2, 27-29	208.79	15	24	2	10	25		60	5				
4-3, 128-131	211.31	6	26	3	5	45		30	15		5		
4-4, 94-96	212.46	13	39	2	5	35		45	10		5		
4-5, 125-126	214.26	8	66	0	5	38		50	5		2		
5-1, 84-86	274.36	9	48	2		30		60	5		5		
5-2, 30-32	275.32	10	37	2	5	25		60	5		5		
5-3, 105-107	277.57	5	61	1	5	27		60	3		5		
5-4, 89-91	278.91	5	52	0	3	30		60	2		5		
5-5, 58-60	280.10	8	45	1	5	30		60	5				
415A-5-1, 4-6	443.06	9	0	0				85			5		10
6-2, 28-30	454.80	5	65	0		5		85			10		
6-2, 137-139	455.39	2	62	4				65			20		15
7-1, 16-18	509.68	14	0	0	5	5		80			10		
8-1, 36-39	576.39	8	0	1	5	5		85			5		
8-2, 56-60	578.10	9	7	6		10		60			30		
8-CC, 18-20	579.20	2	75	0	5			90			5		
9-1, 82-84	643.34	5	35	1	10			85			5		
9-2, 111-114	645.14	4	36	0	10			85			5		
9-4, 0-2	647.02	5	32	1	10			80			5		
9-4, 94-96	647.96	9	13	2	3	5		80			2		10
9-5, 66-70	649.20	9	14	0	10	5		80			5		
10-1, 38-40	709.40	6	19	8	10	5		70			15		
10-CC, 3-5	712.05	5	34	14	10	5		80			5		
11-1, 24-26	794.76	7	22	3	10			85			5		
11-1, 57-59	759.09	3	63	2	10		5	85					
11-CC, 3-5	797.55	8	47	2	10		5	75			5		5
12-2, 38-40	881.90	8	21	0	5		3	90			2		
13-1, 132-135	957.35	9	9	43	5		6	85			2		2
13-2, 46-47	957.97	14	14	0	5		3	90			2		
14-1, 125-127	1033.27	8	5	0	15		5	80					
14-1, 137-139	1033.39	8	37	1	10		5	85					
15-1, 24-26	1041.76	12	13	3	10		5	85					
415B-2-1, 20-22	56.72	4	60	1	20	35	25		20				

TABLE 2
X-Ray-Mineralogy Data for Site 416

Sample (Interval in cm)	Sub-Bottom Depth (m)	Bulk X-Ray Mineralogy			X-Ray Mineralogy of the Clay Fraction								
		Qtz. (% of sample)	Calc.	Dolo.	Kaol.	Ill.	I.M.	Smect.	Chlor.	Attap.	Sepio.	Opal	Clinop.
416A-1-1, 11-15	146.15	13	38	0	10	40		35	15				
1-1, 20-21	146.21	14	40	2	10	45	10	10	20	5			
1-1, 51-52	146.52	5	61	1	10	40	20		25	5			
1-1, 62-64	146.64	4	69	0	10	55	10		25				
1-1, 91-93	146.93	10	37	8	5	50		25	15	5			
2-1, 78-80	298.80	11	28	4	5	25		35	10	25			
2-1, 86-87	298.87	13	16	4	5	40	20		10	25			
2-2, 25-27	299.77	10	36	5	10	35		35	15	5			
2-2, 32-34	299.84	22	19	6	10	30		35	5	20			
2-4, 30-32	312.82	11	30	8		35		25	10	30			
2-4, 34-36	312.86	12	20	7		35		25	10	30			
3-3, 8-10	453.10	21	0	4	5	25		55	5	10			
3-3, 15-17	453.17	17	14	6	5	30		40	5	20			
3-3, 94-97	453.97	18	14	3		35		40	5	10			
5-1, 8-11	754.11	6	0	14						45	55		
6-1, 30-32	891.32	24	0	0	15	60	20		5				
6-1, 37-39	891.39	22	0	0	10	60	25		5				
6-3, 24-26	894.26	38	0	0	15	55	20		10				
6-3, 146-148	895.48	25	0	0	10	55	20		5	10			
7-1, 61-63	982.63	25	3	0	20	45	25		10				
7-3, 117-118	986.18	12	10	0	25	35		30	10				
9-2, 8-9	1179.04	26	17	0	20	40		35	5				
9-2, 11-12	1179.07	31	21	0	20	40	30		5	5			
9-2, 20-22	1179.17	41	19	0	20	25	20	20	10	5			
9-4, 40-41	1181.91	14	15	0	15	35	10	20	15	5			
9-4, 45-46	1181.96	43	12	0	20	30	10	30	10	5			
10-1, 48-51	1185.51	15	10	0	30	35	10	20		5			1
11-2, 40-41	1196.91	12	15	0	20	40	10	25	5				
11-2, 49-52	1197.02	14	4	0	20	40	10	25	5				
11-2, 63-65	1197.15	30	12	0	15	40	10	25	10				
12-1, 15-18	1204.18	11	5	0	10	10		75	5				
12-4, 48-50	1209.00	9	39	0	15	35	10	30	5	5			
12-4, 68-71	1209.21	42	14	1	20	35	15	20	5	5			
13-2, 43-47	1214.97	16	1	0	25	40	10	15	5	5			
13-2, 57-59	1215.09	9	13	0	30	40	20		5	5			
14-2, 42-44	1223.94	11	31	0	30	40	20		5	5			
14-2, 60-62	1224.12	15	2	0	15	40	30		15				
14-2, 65-66	1224.16	41	7	0	20	35	20		20	5			
16-1, 84-86	1243.86	28	0	0	15	35		35	10	5			
16-1, 129-131	1244.31	8	45	0	20	40		30	10	5			
16-1, 143-144	1244.44	34	22	2	25	35	30		10				
17-2, 65-67	1254.17	15	0	0	15	50	20		15				
17-2, 127-129	1254.71	10	29	0	25	40	30		5				
19-3, 5-7	1274.07	13	22	0	20	45	20	10	5				
19-3, 13-15	1274.15	13	0	0	20	35	10	25	5	5			
19-3, 34-36	1274.36	44	2	0	15	35	10	25	15				
19-3, 46-48	1274.48	13	9	0	20	35	25		15	5			
19-3, 49-51	1274.51	43	8	0	15	30	10	25	15	5			
21-1, 72-74	1290.74	15	2	0	15	30	40		10	5			
21-1, 106-108	1291.08	12	6	0	25	35	30		10				
21-3, 82-84	1293.84	9	38	0	25	35	20	10	5	5			
21-3, 127-129	1294.29	47	6	0	15	35		35	15				
21-5, 108-111	1297.11	9	36	0	20	40		35	5				
22-1, 124-125	1300.25	32	9	0	10	40		40	10				
22-1, 134-136	1300.36	9	48	0	20	35	10	30	5				
22-1, 140-142	1300.42	12	18	0	15	35	25	10	10	5			
22-2, 14-16	1300.66	14	5	0	15	40	20	15	10				
22-4, 125-127	1304.77	11	12	0	20	40	20		15	5			

TABLE 2 - Continued

Sample (Interval in cm)	Sub-Bottom Depth (m)	Bulk X-Ray Mineralogy			X-Ray Mineralogy of the Clay Fraction								
		Qtz. (% of sample)	Calc. (% of sample)	Dolo. (% of sample)	Kaol.	Ill.	I.M.	Smect.	Chlor.	Attap.	Sepio.	Opal	Clinop.
416A-23-4, 31-33	1313.83	8	34	0	20	40	25	5	10				
23-4, 62-64	1314.14	15	9	0	20	40	30		10				
23-4, 78-80	1314.30	10	12	0	20	40	25		15				
23-5, 43-45	1315.45	42	5	0	10	35	15	25	10	5			
24-2, 109-111	1321.21	15	2	0	15	40	20	15	10				
24-3, 64-66	1322.26	13	6	0	25	45	20		15				
25-2, 21-23	1329.43	22	6	0	15	40	10	20	15				
25-2, 38-40	1329.60	10	6	0	20	40	15	10	10	5			
25-2, 85-87	1330.07	13	21	0	25	40	25		5	5			
25-2, 92-94	1330.14	16	6	0	10	45	30		10	5			
25-3, 34-36	1331.06	9	45	0	15	35	30		15	5			
25, CC	1336.00	10	14	0	20	40	15	15	10				
26-2, 71-73	1338.23	15	0	0	15	40	5	40	5				
26-3, 61-63	1339.63	13	7	0	20	40	20	10	10				
26-4, 1-3	1340.53	14	41	0	20	40	20	5	15				
27-1, 125-127	1347.27	21	2	0	15	45	15	10	15				
27-2, 56-58	1348.08	21	1	0	15	45	10	15	15				
27-2, 70-72	1348.22	12	17	0	15	40	15	15	15				
27-2, 96-97	1348.47	15	7	0	10	45	25	10	10				
27-3, 104-106	1350.06	10	30	0	25	45	20		10				
28-1, 53-55	1356.55	16	10	0	25	40	20		15				
28-1, 59-60	1356.60	25	11	0	20	40	25	5	10				
28-5, 99-100	1363.00	16	0	0	10	45	25	10	10				
28-5, 103-105	1363.05	18	1	0	20	50	20		10				
29-3, 50-52	1368.52	9	56	1	15	35	20	20	10				
29-4, 113-115	1370.65	21	1	0	10	40	20	20	10				
29-6, 68-70	1373.20	14	19	0	10	40	20	20	10				
30-4, 16-18	1379.68	15	2	0	10	35	20	25	10				
32-1, 52-53	1394.53	18	2	0	10	35	20	25	10				
34-1, 40-41	1407.41	15	1	0	10	40	20	20	10				
34-1, 129-130	1408.30	35	9	0	10	30	20	25	15				
36-1, 126-128	1426.28	18	3	0	15	35	25	15	10				
36-2, 114-116	1427.66	17	4	0	10	35	15	30	10				
36-3, 11-12	1428.12	4	61	3	15	40	10	20	15				
36-3, 13-14	1428.14	25	11	0	15	35	10	30	10				
38-1, 33-35	1445.35	4	54	5	15	40	10	20	15				
38-1, 46-47	1445.47	14	5	0	15	40	20	10	15				
38-1, 57-58	1445.58	11	12	0	20	35	20	30	5				
38-CC, 7-9	1450.00	25	38	2	20	40	20	10	10				
42-1, 14-16	1473.46	2	84	0	15	30	20	20	15				
42-3, 12-13	1476.43	5	64	0	15	35	20	25	5				
44-1, 52-54	1492.53	35	8	0	10	35		45	10				
44-1, 64-66	1492.65	25	2	0	5	30		60	5				
44-1, 99-101	1493.00	16	4	0	5	40	10	40	5				
45-1, 102-104	1502.04	18	10	0	15	35	10	30	10				
45-2, 114-116	1503.66	5	66	0	10	30	20	30	10				
47-2, 41-43	1521.93	7	56	0	10	35	20	30	5	5			
47-2, 99-101	1522.51	3	86	0	10	25	30	20	10	5			
47-3, 7-9	1523.09	34	7	0	15	35	10	30	10				
48-2, 5-7	1531.07	15	9	0	10	30	30	20	10				
48-4, 16-19	1534.19	11	14	0	10	40	20	15	15				
49-2, 111-113	1535.63	15	28	0	15	35	30	15	5				
50-1, 7-9	1548.69	19	4	0	10	25	20	30	10	5			
51-2, 22-24	1559.74	30	3	0	10	35	5	40	10				
51-2, 27-29	1559.79	17	3	0	15	30	15	20	15	5			
52-1, 3-5	1567.45	6	30	5	5	45	25		20	5			
52-1, 51-53	1567.93	29	5	0	15	35	10	30	10				
53-2, 55-57	1578.87	22	1	0	15	40	30	5	10				
53-2, 114-115	1579.45	17	3	0	15	45	10	10	15	5			
55-2, 16-18	1597.28	19	24	0	15	50	10	10	15				

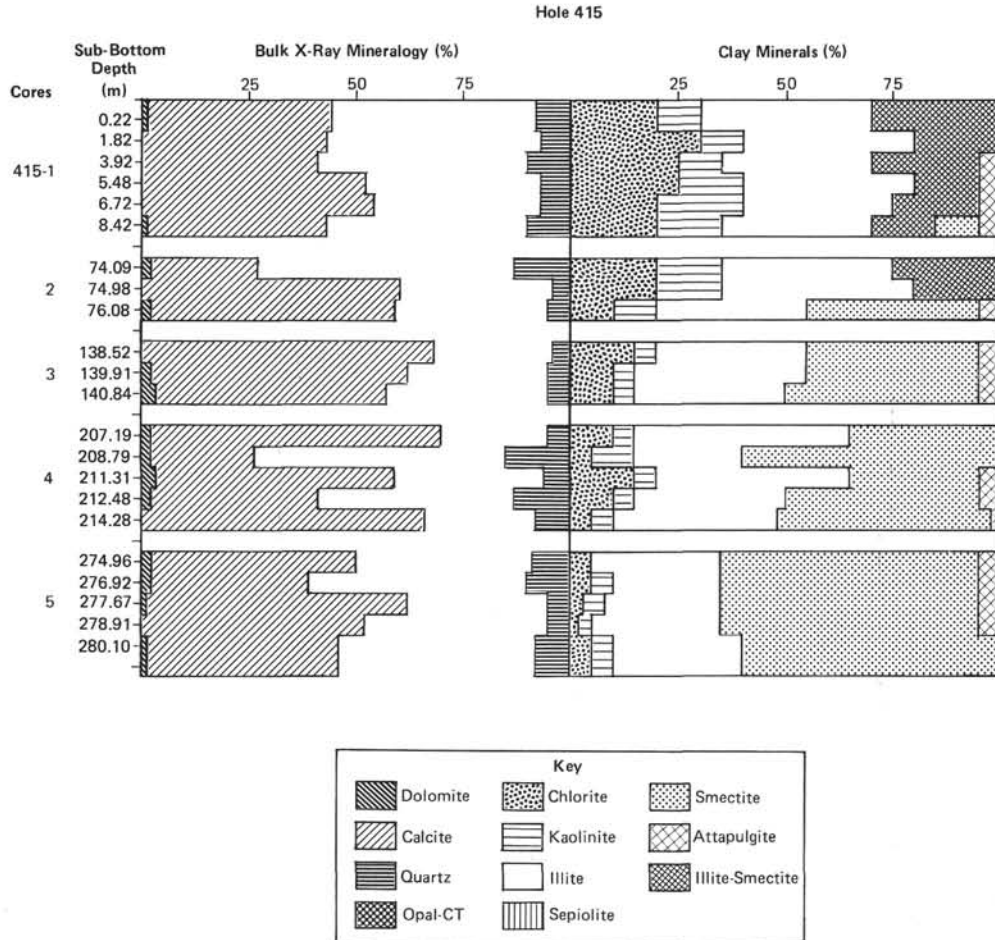


Figure 1. Graphic plot of X-ray-mineralogy data for samples from Hole 415.

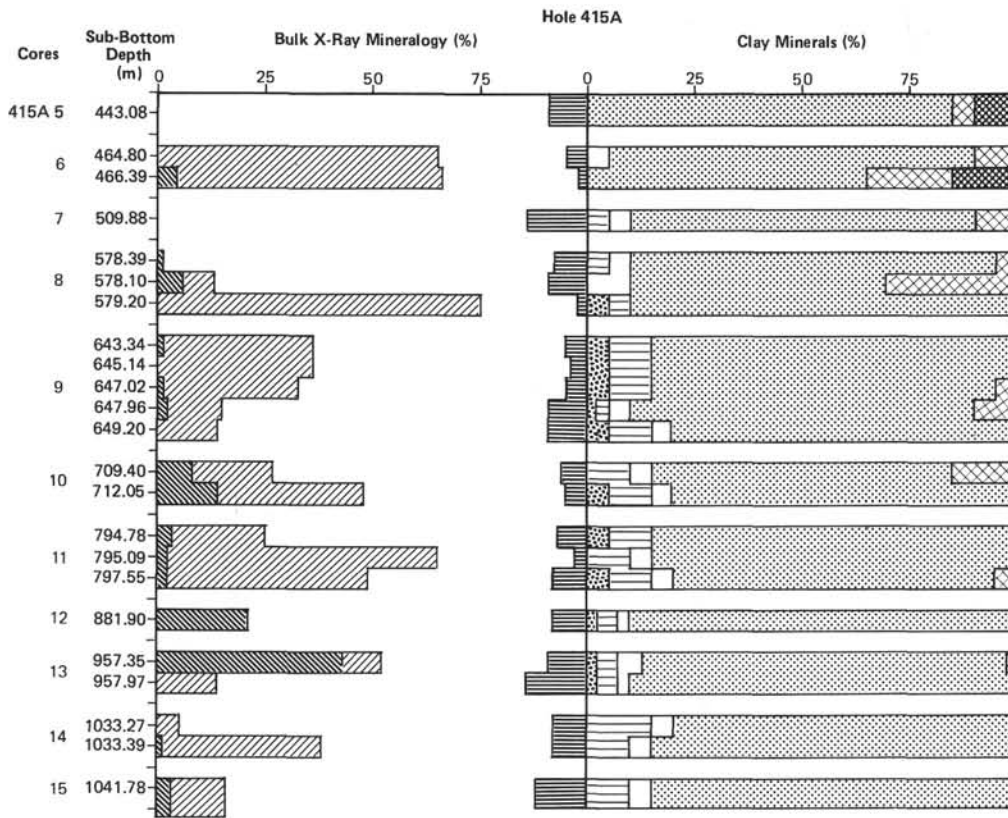


Figure 2. Graphic plot of X-ray-mineralogy data for samples from Hole 415A. Symbols as in Figure 1.

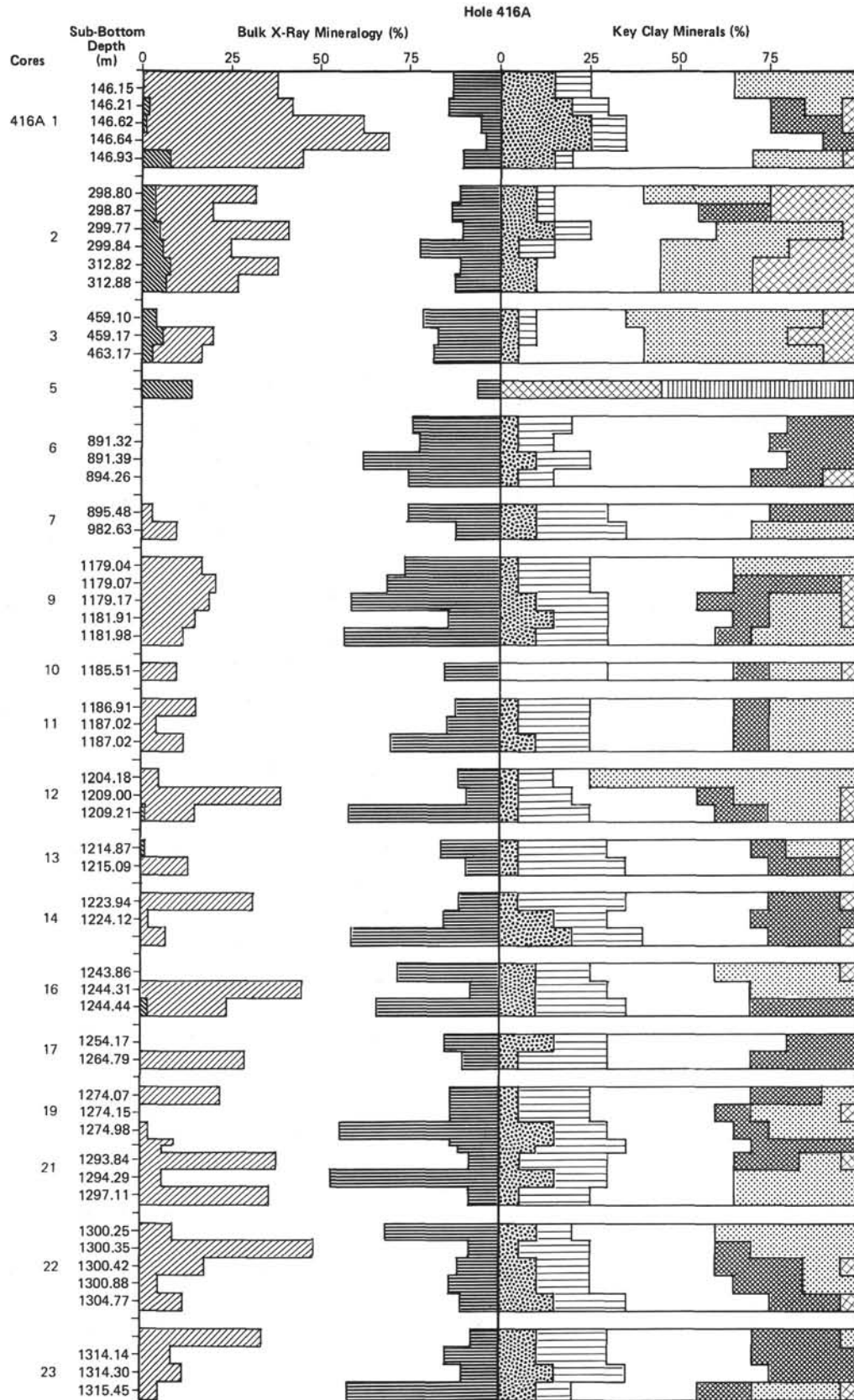


Figure 3. Graphic plot of X-ray-mineralogy data for samples from Hole 416A. Symbols as in Figure 1.

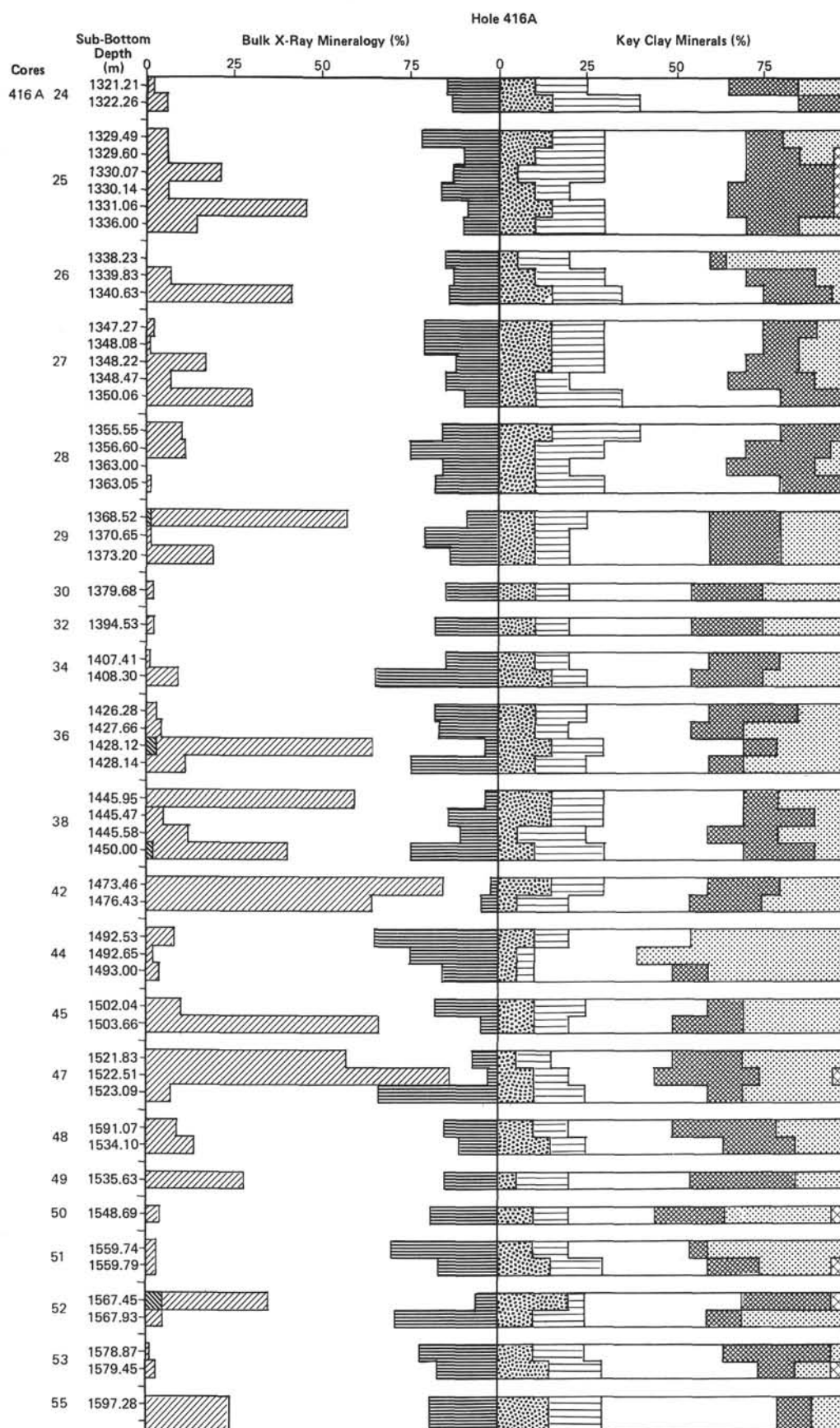


Figure 3. (Continued).