## 28. INTERSTITIAL WATER STUDIES, DEEP SEA DRILLING PROJECT, LEG 75<sup>1</sup>

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### ABSTRACT

Interstitial water profiles obtained at Sites 530 and 532 of DSDP Leg 75 indicate complex concentration depth profiles resulting from diagenetic reactions taking place in the sediments. At both sites, large depletions in dissolved sulfate, resulting from bacterial sulfate reduction reactions, are accompanied by increased alkalinity values and also by increased dissolved ammonia concentrations. At Site 530, high sedimentation rates in the upper 200 m of the sediment column have led to a minimum in dissolved sulfate. Deep-seated reactions in basal sediments and/or basalts at this site cause downhole increases in dissolved calcium and decreases in dissolved magnesium. At Site 532, phosphate liberated by sulfate reduction has led to reaction with calcium ions to form authigenic Ca-phosphate minerals.

# INTRODUCTION

During Leg 75 of the Deep Sea Drilling Project (DSDP) two sites were drilled—Sites 530 and 532 which were sampled in great detail for interstitial waters. The drill sites are closely related to two sites occupied during Leg 40: Site 530 is 55 km NE of Site 363, at a water depth of 4629 m in the Angola Basin, and Site 532 is essentially a reoccupation of Site 362 of DSDP Leg 40.

Site 530 was piston cored to a depth of 180 m (Hole 530B) and rotary drilled to basement at 1103 m sub-bottom depth. Site 532 was piston cored to a depth of 300 m (Hole 532B); at this site a very detailed sampling program for interstitial waters was undertaken.

Both Sites 530 and 532 are characterized by very high sedimentation rates, especially in the younger sections, and this leads to complications in the interstitial water profiles as will be discussed.

## RESULTS

The shipboard data (pH, alkalinity, salinity, chloride, calcium, and magnesium) and the data obtained in our laboratory are presented in Table 1 and Figures 1, 2, and 3. Methods used were those described by Gieskes (1974), Gieskes and Lawrence (1976), and Gieskes and Johnson (1981).

## DISCUSSION

## Site 530

The upper 100 m (Units 1a, 1b) were deposited at rates in excess of 65 m/m.y. and consist of diatom-nannofossil marls and debris-flow deposits. Sedimentation rates in the lower lying lithologic units were much less.

Hole 530B (Fig. 1) indicates that sulfate reduction is an important process in the upper section of the sediment column. This is evident from the rapid decrease in dissolved sulfate, the increase in dissolved ammonia (maximum of 3.25 mM at 80 m), and the increase in alkalinity (maximum of 25 meg/dm3 at 80 m). Typically, the production of bicarbonate has led to the precipitation of calcium carbonate, thus causing the low concentrations of dissolved calcium in the upper 200 m. A rapid decrease in magnesium occurs which is not readily explained, but may be the result of processes involving the diagenesis of opaline silica (Kastner et al., 1977) or the formation of dolomite. Strontium concentrations increase rapidly below 40 m, probably as a result of carbonate diagenesis (Baker et al., 1982). Dissolved lithium appears to have a source in the lower lying sediments, i.e., in Unit 3 (Fig. 2). Data on dissolved silica indicate high concentrations, representative of those often found in siliceous sediments (Gieskes, 1981).

Holes 530 and 530A sampled the deeper section of Site 530, and the data indicate a well-established minimum in dissolved sulfate, located at about 200 m subbottom depth. This can be understood in terms of the higher sedimentation rates in the upper 200 m of the sediments, usually associated with increased levels of reactive organic carbon. With sedimentation rates of  $\sim$  50 m/m.y. in the upper 200 m of the sediment column the communication length for diffusion is between 100–150 m, and thus nonsteady-state dissolved sulfate profiles, especially as a result of higher sulfate reduction rates in the upper sediment column, are to be expected (Gieskes et al., 1978; Gieskes, 1981). The sulfate minimum is accompanied by an ammonia maximum as well as an alkalinity maximum.

Unit 3 (250–450 m) is characterized by red and green muds, with appreciable volcanic contributions. Dissolved silica values are low, indicating little contribution of biogenic silica. The profiles of dissolved lithium and potassium indicate a source for lithium, leading to a maximum in this zone, and a sink for potassium, perhaps as a result of uptake in clay minerals. No sink for magnesium is indicated by the dissolved magnesium profile.

<sup>&</sup>lt;sup>1</sup> Hay, W. W., Sibuet, J.-C., et al., *Init. Repts. DSDP*, 75: Washington (U.S. Govt, Printing Office).

Table 1. Interstitial water analyses, Leg 75.

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	, Si ) (μM)	NH4 (μM)	So <sub>4</sub> (mM)	K (mM)	Li (µM)	Sr (µM)	Cl (g/kg)	Mg (mM)	Ca (mM)	S (g/kg)	Alk. (meq/dm <sup>3</sup> )	pН	Sub-bottom depth (m)	Sample (interval in cm)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$														Hole 530
Hole S30A $ \begin{array}{ccccccccccccccccccccccccccccccccccc$	895	1407	5.0	10.7	88	166	23.49	39.7	5.50	33.0	16.32	7.54	124	2-6, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$														Hole 530A
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1227	1425	4.5	10.0	161	254	19.55	38.3	7.39	33.0	12.40	7.77	172	5-6, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	495	1113		6.95	158	197	19.55	38.3	8.09	32.2	6.79	7.44	219	10-6, 140-150
$\begin{array}{c} 205, 140-150 & 313 & 6.81 & 3.26 & 33.0 & 13.41 & 37.7 & 19.41 & 234 & 136 & 6.60 & 8.9 & 382 \\ 256, 140-150 & 406 & 6.81 & 1.96 & 33.0 & 23.61 & 29.8 & 19.11 & 320 & 160 & 2.90 & 17.1 & 377 \\ 304, 140-150 & 416 & 7.06 & 1.50 & 32.4 & 24.68 & 31.4 & 18.87 & 387 & 197 & 2.50 & - & 274 \\ 403, 140-150 & 500 & 7.58 & 1.46 & 34.1 & 21.77 & 36.2 & 19.78 & 387 & 197 & 2.50 & - & 346 \\ 601, 140-150 & 687 & 7.25 & 0.22 & 34.1 & 32.89 & 16.5 & 19.61 & 725 & 90 & 2.55 & 18.5 & 256 \\ 95.5, 140-150 & 687 & 7.25 & 0.22 & 34.1 & 32.89 & 16.5 & 19.61 & 725 & 90 & 2.55 & 18.5 & 256 \\ 99.4, 140-150 & 687 & 7.25 & 0.22 & 34.1 & 32.89 & 16.5 & 19.61 & 725 & 90 & 2.55 & 18.5 & 256 \\ 99.4, 140-150 & 687 & 7.47 & 19.95 & 34.4 & 6.74 & 46.6 & 19.46 & 81 & 53 & 8.46 & 8.4 & 2518 \\ 14.2, 140-150 & 57 & 7.57 & 12.3.8 & 33.3 & 5.61 & 41.2 & 19.46 & 81 & 53 & 8.46 & 8.4 & 2518 \\ 14.2, 140-150 & 57 & 7.57 & 24.02 & 32.7 & 2.66 & 38.5 & 19.66 & 79 & 11.34 & 7.4 & 3041 \\ 14.2, 140-150 & 154 & 7.65 & 12.53 & 33.6 & 4.88 & 40.3 & 19.69 & 178 & 50 & 17.3 & 7.352 \\ 25.2 & 140-150 & 154 & 7.64 & 18.0 & 32.2 & 5.23 & 31.3 & 19.63 & 177 & 98 & 570 & 3.8 & 332 \\ 32.1, 140-150 & 124 & 7.64 & 18.8 & 32.4 & 5.16 & 38.5 & 19.91 & 170 & 198 & 5.0 & 3.5 & 2344 \\ 33.2, 140-150 & 149 & 7.64 & 10.65 & 32.2 & 5.33 & 31.3 & 19.29 & 170 & 182 & 7.41 & 4.5 & 2209 \\ Hole 532 \\ \hline 3.44 & 0.15 & 1.47 & 7.48 & 10.56 & 32.2 & 5.33 & 31.3 & 19.29 & 170 & 182 & 7.41 & 4.5 & 2209 \\ Hole 532 \\ \hline 12.2, 140-150 & 164 & 6.93 & 19.81 & 32.4 & 6.65 & 27.9 & - & 298 & 208 & 8.87 & 3.9 & 5242 \\ 51.2, 140-150 & 17 & 7.52 & 19.63 & 32.7 & 7.06 & 36.9 & - & 195 & 12.3 & 6.83 & 7.2 & 7344 \\ 0.2, 143-150 & 164 & 6.93 & 19.81 & 32.4 & 6.65 & 27.9 & - & 298 & 208 & 8.87 & 3.9 & 5242 \\ 51.2, 140-150 & 17 & 7.59 & 4.322 & 8.31 & 7.06 & 35.2 & 10.71 & 53.8 & 18.77 & 12.2 & 50 & 9.28 & 28.4 & 398 \\ 62.1 40-150 & 17 & 7.59 & 4.30 & 35.2 & 10.73 & 53.8 & 130 & 59 & 10.64 & 23.3 & 719 \\ 12.2, 140-150 & 17 & 7.59 & 4.30 & 35.2 & 10.52 & 57.7 & 10.50 & 11.24 & 31.0 & 328 \\ 4.2, 140-150 & $	5 118	871.5	_	6.65	136	167	19.31	37.6	8.13	32.4	2.19	7.52	265	15-5, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	82	582	8.9	6.60	136	234	19.41	37.7	13.41	33.0	3.26	6.81	313	20-5, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	10/	378	17.1	3.00	145	2/5	18.07	30.5	22 61	31.9	2.32	6.91	362	25-6, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	107	274		2.50	197	387	18.87	31.4	24 68	32.4	1.50	7.06	400	35-4, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	781	252	20.4	4.20	133	387	19.78	36.2	21.77	34.1	1.46	7.58	500	40-3, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	375	340	—	2.86	97	593	19.75	29.1	24.42	34.1	0.92	7.64	594	50-3, 110-120
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	122	250	18.5	2.55	90	725	19.61	16.5	32.89	34.1	0.22	7.25	687	60-1, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-	_	—	1.39	100	735	18.93	15.8	87.70	31.9	—	-	965	89-5, 140-150
$ \begin{array}{c} \mbod { Flow 50908} \\ \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	_		-	1.39	182	630	18.33	13.1	43.55	31.4	_	_	1050	99-4, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	10.2101	1-1-12	1010-1127 T	W5 045075		102.740	1112 March	51 N 24 M P						Hole 530B
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	759	1550	20.9	10.72	48	96	19.46	52.4	6.93	35.2	12.53	7.65	14	4-2, 143-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	181	2518	8.4	8.40	53	124	19.46	40.6	6.74	34.4	19.95	7.47	35	9-2, 143-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	916	3252	7.4	9.07	69	178	19.40	41.2	5.03 4.88	33.5	23.38	7.35	83	20.2 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	974	3238	3.8	9.70	69	186	19.39	38.5	5.69	32.7	20.82	7.41	106	26-2, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	970	2934	3.5	8.20	98	177	19.63	37.1	5.12	32.4	14.81	7.64	124	32-1, 140-150
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	875	2559	3.6	10.0	120	170	19.29	31.3	5.33	32.2	10.56	7.48	149	38-2, 140-150
Hole 532 3.4, 0-11 8 7.01 2.23 35.5 10.73 49.8 - 104 47 6.90 30.0 40 1.2-2, 140-150 51 7.52 13.22 34.4 9.00 41.1 - 134 70 7.17 15.0 2198 31-2, 140-150 130 7.27 19.88 32.2 8.31 27.8 - 234 163 10.29 2.9 4421 40-2, 143-150 164 6.93 19.81 32.4 6.65 27.9 - 298 208 8.87 3.9 5242 51-2, 140-150 211 7.92 19.47 33.0 9.57 24.7 - 351 267 10.60 3.9 550 Hole 532B 2-2, 140-150 17 7.69 4.20 35.2 10.71 53.8 18.77 122 50 9.28 28.4 398 6-2, 140-150 25 7.46 4.96 35.2 10.22 53.7 19.92 124 51 8.27 31.0 510 8-2, 140-150 34 7.53 7.49 35.2 9.35 54.2 19.68 126 58 11.44 - 958 10-2, 140-150 43 7.49 9.96 35.2 8.88 52.2 19.41 129 59 10.61 24.3 1322 12-1, 140-150 52 7.34 12.34 35.2 7.28 50.8 19.78 130 59 10.64 23.3 179 10-2, 140-150 61 7.52 7.34 12.34 35.2 7.28 50.8 19.78 130 59 10.64 23.3 179 10-2, 140-150 61 7.52 13.5 34.3 7.06 46.9 19.98 134 79 9.84 - 2133 16-2, 140-150 67 7.52 18.98 33.3 5.00 40.8 19.34 173 82 11.15 8.3 043 22-1, 140-150 69 7.48 14.68 33.8 5.02 44.0 19.88 147 81 12.62 13.1 1258 18-1, 140-150 78 7.45 16.34 34.1 4.89 43.8 19.41 151 89 10.97 - 2273 20-1, 140-150 87 7.52 18.98 33.3 5.00 40.8 19.34 173 82 11.15 8.3 043 22-1, 140-150 78 7.45 16.34 34.1 4.89 43.8 19.41 151 89 10.97 - 2245 18-2, 140-150 17 7.52 18.64 33.7 5.02 43.0 19.88 147 81 12.62 13.1 1258 18-1, 140-150 78 7.45 16.34 34.1 4.89 43.8 19.41 151 89 10.97 - 2245 20-1, 140-150 87 7.52 18.98 33.3 5.00 40.8 19.34 173 82 11.15 8.3 043 22-1, 140-150 157 7.38 17.93 33.0 5.04 48.19.34 173 82 11.15 8.3 043 22-2, 140-150 157 7.38 17.93 33.0 5.04 43.0 19.88 13.47 19.13 13.1 2584 18-4, 140-150 157 7.52 18.64 32.7 5.24 32.2 18.97 198 139 11.13 7.3 4130 30-2, 143-150 121 7.52 18.64 33.7 5.24 32.2 18.97 198 139 11.13 7.3 4130 30-2, 143-150 154 7.67 18.83 32.4 6.00 30.9 19.14 274 188 10.87 - 5264 33-3, 0-006 162 7.7 71.80 32.4 5.20 32.3 19.21 195 132 11.75 - 4126 23-2, 140-150 138 7.45 20.46 33.0 6.28 30.9 19.17 235 129 10.02 - 4851 34-2, 140-150 170 7.67 18.13 31.9 6.24 29.1 19.54 242 160 11.47 - 5338 42-2, 140-150 170 7.67 18.13 31.9 6.24 29.1 1	787	2209	4.5	7.41	142	170	19.49	35.6	6.35	32.2	10.66	7.47	172	46-1, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$														Hole 532
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	44	40	30.0	6.90	47	104		49.8	10.73	35.5	2.23	7.01	8	3-4, 0-11
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	782	2198	15.0	7.17	70	134		41.1	9.00	34.4	13.22	7.52	51	12-2, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	893	3784	7.2	6.83	123	195		36.9	7.06	32.7	19.35	7.20	90	21-2, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	800	4421	2.9	10.29	163	234	-	27.8	8.31	32.2	19.88	7.27	130	31-2, 140-150
Hole 532B           2-2, 140-150         8         7.61         3.76         34.9         10.82         54.2         18.83         104         50         11.24         31.0         328           4-2, 140-150         17         7.69         4.20         35.2         10.71         53.8         18.77         122         50         9.28         28.4         398           6-2, 140-150         25         7.46         4.96         35.2         10.22         53.7         19.92         124         51         8.27         31.0         510           8-2, 140-150         34         7.53         7.49         35.2         9.35         54.2         19.68         126         58         11.44          958           10-2, 140-150         52         7.34         12.34         35.2         7.28         50.8         19.78         130         59         10.61         24.3         1719           14-2, 140-150         61         7.52         13.55         34.3         7.06         46.9         19.88         147         81         12.62         13.1         254           14-140-150         78         7.49         16.34         34.1	657	5505	3.9	10.60	208	351	_	24.7	9.57	33.0	19.81	7.92	211	51-2, 143-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$														Hole 532B
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	512	328	31.0	11.24	50	104	18.83	54.2	10.82	34.9	3.76	7.61	8	2-2, 140-150
	536	398	28.4	9.28	50	122	18.77	53.8	10.71	35.2	4.20	7.69	17	4-2, 140-150
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	565	510	31.0	8.27	51	124	19.92	53.7	10.22	35.2	4.96	7.46	25	6-2, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	687	958	_	11.44	58	126	19.68	54.2	9.35	35.2	7.49	7.53	34	8-2, 140-150
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	700	1322	24.3	10.61	59	129	19.41	52.2	8.08	35.2	9.96	7.49	43	10-2, 140-150
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	832	1719	23.3	10.64	59	130	19.78	50.8	7.28	35.2	12.34	7.34	52	12-1, 140-150
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	/01	2153	12.1	9.84	91	134	19.98	40.9	7.06	34.3	13.55	7.52	61	14-2, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	788	2757		10.97	89	151	19.00	43.8	4.89	34 1	16 34	7 49	78	18-1 140-150
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	839	3043	8.3	11.15	82	173	19.34	40.8	5.00	33.3	18.98	7.52	87	20-1, 140-150
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	840	3241	_	9.07	118	184	19.14	36.7	4.94	33.0	18.61	7.51	96	22-1, 140-150
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	829	2889	4.9	11.04	124	184	19.41	35.1	5.04	33.0	17.93	7.38	105	24-2, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	786	4126	-	11.75	132	195	19.21	32.3	5.20	32.4	15.20	7.54	113	26-3, 140-150
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	831	4130	7.3	11.13	139	198	18.97	32.2	5.24	32.7	18.64	7.52	121	28-2, 140-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	812	4955	9.4	10.07	138	196	19.17	31.7	4.98	33.0	18.20	7.39	129	30-2, 143-150
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	801	4031	73	11 81	129	233	19.17	30.9	5.12	33.0	20.40	7.45	138	32-2, 140-150
38-3, 0-006         162         7.7         17.80         32.2         5.77         33.7         20.12         272         196         10.86         9.4         5609           40-2, 140-150         170         7.67         18.13         31.9         6.24         29.1         19.54         284         216         11.47         —         5358           42-2, 140-150         177         7.31         11.06         31.9         5.41         24.6         19.51         219         234         15.17         6.7         5061           44-2, 140-150         177         7.31         11.06         31.9         5.41         24.6         19.51         219         234         15.17         6.7         5061           44-2, 140-150         176         7.68         17.42         32.4         6.94         28.3         19.34         302         265         8.49         9.3         6873           47-2, 140-150         196         7.68         17.42         32.4         6.94         28.3         19.34         302         265         8.49         9.3         6873	804	5264	-	10.87	188	274	19.14	30.9	6.00	32.4	18.83	7.67	154	36-2 143-150
40-2, 140-150         170         7.67         18.13         31.9         6.24         29.1         19.54         284         216         11.47         —         5358           42-2, 140-150         177         7.31         11.06         31.9         5.41         24.6         19.51         219         234         15.17         6.7         5061           44-2, 140-150         177         7.54         18.65         32.2         6.31         30.9         19.34         279         203         11.42         -         5649           47-2, 140-150         196         7.68         17.42         32.4         6.94         28.3         19.34         302         265         8.49         9.3         6873	753	5609	9.4	10.86	196	272	20.12	33.7	5.77	32.2	17.80	7.7	162	38-3, 0-006
42-2, 140-150         177         7.31         11.06         31.9         5.41         24.6         19.51         219         234         15.17         6.7         5061           44-2, 140-150         184         7.54         18.65         32.2         6.31         30.9         19.34         279         203         11.42         —         5649           47-2, 140-150         196         7.68         17.42         32.4         6.94         28.3         19.34         302         265         8.49         9.3         6873	757	5358	-	11.47	216	284	19.54	29.1	6.24	31.9	18.13	7.67	170	40-2, 140-150
44-2, 140-150 184 7.54 18.65 32.2 6.31 30.9 19.34 279 203 11.42 - 5649 47-2, 140-150 196 7.68 17.42 32.4 6.94 28.3 19.34 302 265 8.49 9.3 6873	349	5061	6.7	15.17	234	219	19.51	24.6	5.41	31.9	11.06	7.31	177	42-2, 140-150
47-2, 140-150 196 7.68 17.42 32.4 6.94 28.3 19.34 302 265 8.49 9.3 6873	831	5649	-	11.42	203	279	19.34	30.9	6.31	32.2	18.65	7.54	184	44-2, 140-150
	673	6873	9.3	8.49	265	302	19.34	28.3	6.94	32.4	17.42	7.68	196	47-2, 140-150
50-2, 140-150 208 7.48 13.84 32.2 7.18 24.4 19.44 274 279 12.14 - 5716	512	5/16		12.14	279	274	19.44	24.4	7.18	32.2	13.84	7.48	208	50-2, 140-150
52-2, $140-150$ 210 1.14 11.50 $52.2$ 1.20 21.8 19.21 520 268 10.05 9.3 6100 54.5 140-150 274 7.67 17.86 32.4 7.50 28.4 16.37 366 274 10.40 6061	725	5061	9.3	10.03	200	366	19.21	27.8	7 50	32.4	17.30	7.67	210	54-2, 140-150
56-2 140-150 232 7.82 16.01 32.7 7.43 27.7 19.68 366 27.4 10.82 9.2 6458	764	6458	9.2	10.82	274	366	19.68	27.7	7.43	32.7	16.01	7.82	232	56-2, 140-150
59-2, 140-150 243 7.65 15.51 32.2 7.18 27.0 19.51 375 292 10.86 - 6209	726	6209	_	10.86	292	375	19.51	27.0	7.18	32.2	15.51	7.65	243	59-2, 140-150
61-2, 140-150 251 7.48 12.24 32.2 5.57 26.0 19.41 325 294 8.05 8.9 6858	452	6858	8.9	8.05	294	325	19.41	26.0	5.57	32.2	12.24	7.48	251	61-2, 140-150
63-2, 140-150 258 7.55 12.39 32.2 6.98 26.4 19.17 365 297 9.45 - 6230	527	6230	-	9.45	297	365	19.17	26.4	6.98	32.2	12.39	7.55	258	63-2, 140-150
65-2, 140-150 264 7.69 13.70 32.4 7.71 26.8 19.61 377 295 8.24 8.9 6011	678	6011	8.9	8.24	295	377	19.61	26.8	7.71	32.4	13.70	7.69	264	65-2, 140-150
67-2, 140-150 271 7.66 11.98 32.2 5.63 26.2 19.44 376 312 8.95 - 6272	457	6272		8.95	312	376	19.44	26.2	5.63	32.2	11.98	7.66	271	67-2, 140-150
69-2, 140-150 279 7.59 9.70 32.2 4.94 26.2 19.88 364 291 - 6.7 6591	363	6591	6.7	10.66	291	364	19.88	26.2	4.94	32.2	9.70	7.59	279	69-2, 140-150
71 + 1, 140 + 150 285 $7.57$ 10.41 $31.9$ 5.57 25.9 19.14 $316$ 285 10.55 - 5000 72 1 140 160 200 7 84 15 56 241 7.59 294 10.57 204 56 260 75 2600	303	3500	7.0	8 00	263	310	19.14	25.9	5.57	31.9	10.41	7.57	285	71-1, 140-150

Note: Dash = data not available.

Below Unit 3 the profile of dissolved calcium indicates a source of calcium in the deeper section of the sediment column, perhaps in the carbonate layers or in the underlying basement. For dissolved magnesium the situation is less clear, with possible uptake both in the sediments (dolomitization?) and in the underlying basalts. Dissolved strontium has a significant source in Unit 5, which is characterized by calcareous sediments and limestones. At great depth dissolved strontium values again decrease.

In general the dissolved constituents of the interstitial waters recovered from Site 530 sediments indicate a complex set of reactions reflecting the variable lithological features of the sediments. Biogenic sulfate reduc-



Figure 1. Interstitial water data, Hole 530B. Unit 1a: Diatom-nannofossil marl and ooze; debris-flow deposits—~65 m/m.y. Unit 1b: Diatom ooze and debris-flow deposits—~65 m/m.y. Unit 2: Nanno-fossil clay, marl, and ooze; debris-flow deposits—~20 m/m.y.

tion processes in the upper sediment column cause complex nonsteady state profiles in dissolved sulfate, ammonia, alkalinity, and calcium.

## Site 532

Site 532 was essentially a reoccupation of Site 362 on the Walvis Ridge. Only the upper 300 m of this site were sampled, but very detailed sampling allowed a detailed determination of the interstitial water profiles. Sedimentation rates have varied between 40 and 50 m/m.y., and the sediments consist mostly of nannofossil marls (Fig. 3).

The alkalinity profile shows a broad maximum of  $\sim 20 \text{ meg/dm}^3$  between 80-200 m. Dissolved sulfate shows a minimum located at the base of Unit 1b (diatom-nannofossil marl). This minimum is not reflected in the dissolved ammonia profile. Methane gas levels (not reported here) only become significant below 120 m, i.e., below the sulfate minimum. Dissolved ammonia has its main source at  $\sim 250$  m, with high production in the methane zones (120-250 m). Alkalinity increases, causing authigenic apatite (c.f., site summary) and calcium carbonate precipitation and consequently a decrease in dissolved calcium. Dissolved magnesium appears to have a sink in Unit 1b. Perhaps the decrease in magnesium is the result of partial dolomitization of carbonates in the low sulfate zone at  $\sim 100$  m. Both dissolved lithium and dissolved strontium have sources at ~280 m. However, the nature of these sources remains unclear, though carbonate recrystallization reactions are the most likely source of dissolved strontium. The data for dissolved potassium show little trend and are too scattered to suggest any possible significant variability downhole. Data on dissolved chloride are not precise enough to confirm the gradual downhole increase in dissolved chloride that characterized Site 362, particularly below a depth of  $\sim 300$  m (Sotelo and Gieskes, 1978). Agreement between alkalinity, dissolved calcium, and dissolved magnesium profiles obtained in Site 362 (Sotelo and Gieskes, 1978) and in Site 532 is very good.

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Figure 2. Interstitial water data, Hole 530A. Unit 1: Diatom-nannofossil oozes, marls, and debris-flow deposits—~65 m/m.y. Unit 2: Nannofossil clay, marl, and ooze; debris-flow deposits—~20 m/m.y. Unit 3: Red and green mud—~9 m/m.y.; Unit 4: Multicolored mudstone, marlstone, chalk, and clastic limestone—~5 m/m.y. Unit 5a: Mudstone, marlstone, limestone, -15 m/m.y. Unit 5b: Mudstone, marlstone, limestone, and siliciclastic sandstone—~38 m/m.y. Unit 5c: Mudstone, marlstone, calcareous siliclastic sandstone—~11 m/m.y. Unit 6: Glauconitic sandstone—~20 m/m.y. Unit 7: Claystone, sandstone—~31 m/m.y. Unit 8: Claystone, marlstone, black shales—~9 m/m.y. Unit 9: Basalt.



Figure 3. Interstitial water chemistry, Site 532. Unit 1a: Foram-nannofossil marl and ooze—~41 m/m.y. Unit 1b: Diatom-nannofossil marl—~52 m/m.y. Unit 1c: Nannofossil marl—~40 m/m.y.