17. ACCUMULATION RATES IN LEG 74 SEDIMENTS[1]

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ABSTRACT

Accumulation rates for the five sites drilled during Leg 74 of the *Glomar Challenger* are presented on a common timescale based on calibration of datum levels to paleomagnetic records in Leg 74 sediments for the Paleogene, and a new compilation by Berggren et al. (in press, a), for the Neogene, and using the seafloor-spreading magnetic anomaly timescale of Kent (in press). We present data on accumulation of total sediment, of foraminifers, of the noncarbonate portion, and of fish teeth that give a history of productivity, winnowing, carbonate dissolution, and nonbiogenic input to what was then a part of the South Atlantic at about 30°S.

INTRODUCTION

One of the purposes of drilling the Leg 74 sites was to examine the impact on sediment accumulation of those factors that vary with water depth: that is, winnowing and carbonate dissolution. It is hoped that the sediments recovered will provide a fruitful source of material for many studies in this topic in future years. In this chapter we explore some of the possibilities.

This chapter was written by NJS. It is particularly dependent on the nannofossil biostratigraphy of Hélène Manivit and Ming Jiang and on the palaeomagnetic data of Alan Chave; because of the constraints of time, distance, and language, responsibility for errors in the final compilation must be borne by NJS.

TIMESCALE

Oligocene to Recent

Any comparative study of sediment accumulation rates rests heavily on the estimation of the age of the sediment at specified points. Early in compiling the data it became apparent that a realistic conclusion to this study would require an even more major attack on biostratigraphy and magnetostratigraphy than we could achieve with only five sites; at the same time, any study of sediment accumulation rates that is based solely on literature estimates of the ages of biostratigraphic boundaries starts too far out of date to be valuable. A preliminary version of the new timescale of Berggren et al. (in press, a and b) became available in time for this study. In part, this timescale is dependent on Leg 74 data; its chief distinguishing feature is that it is calibrated to the seafloor-spreading magnetic anomaly timescale throughout (although it will, of course, be modified over the next few years as more sections become available). Table 1 shows datum levels used for Sites 525 to 529, together with the ages assigned to each. Unless otherwise specified, the age is that taken from the preliminary version of Berggren et al. (in press).

For the Pliocene and Pleistocene, we have in part used the timescale of Backman and Shackleton (1981), which is based on quantitative biostratigraphy in equatorial Pacific cores Vema (V) 28–179 and V28–185. However, because Backman has a different concept of the NN15–NN16 boundary (Backman and Shackleton, 1981) than that adopted by Jiang and Gartner (this volume), we have retained the latter's age of 3.1 Ma for this boundary.

Cretaceous to Eocene

For this part of the record we had access to sufficient palaeomagnetic and biostratigraphic data to calibrate a timescale directly (and to provide critical data for Berggren et al., in press). The magnetic inclination data are shown in Figure 1 as a function of depth below the sediment/water interface. Our procedure was first to plot all magnetic and biostratigraphic data on a common timescale, that of Hardenbol and Berggren (1978), by assigning a depth to each nannofossil datum and assigning to this depth an age determined from Hardenbol and Berggren. We did not use foraminiferal datums at the same time, because it is difficult to use datums from two different microfossil groups. The reason is, primarily, that for a single fossil group any biases introduced, for any reason, will emerge as different age estimates for each datum. With more than one group, it would become necessary to work with intervals defined by a different fossil group at each end; many of these intervals would be assigned zero duration on the Hardenbol and Berggren (1978) timescale because in that study many boundary ages were rounded to the nearest million years. We chose to work with the nannofossil data first because the majority of the datums had been significantly more closely located in depth than had the foraminiferal datums.

[1] Moore, T. C., Jr., Rabinowitz, P. D., et al., *Init. Repts. DSDP*, 74: Washington (U.S. Govt. Printing Office).

[2] These are: T. C. Moore, Jr., P. D. Rabinowitz (Leg 74 co-chief scientists); A. Boersma, P. E. Borella, A. D. Chave, G. Duée, D. Fütterer, M.-J. Jiang, K. Kleinert, A. Lever, H. Manivit, S. O'Connell, and S. H. Richardson.

Table 1. Age control points for Leg 74 sites.

Depth	Age (Ma)	Datum
Site 525		
0	0	
9.30	1.90	NN18–NN19
18.26	3.10	NN15–NN16
32.60	3.60	NN12–NN13
47.82	4.50	NN12–NN13
57.00	5.00	Base *Ceratolithus acutus*
97.10	6.40	^{13}C "shift"
103.78	8.50	NN10–NN11
119.68	10.60	NN9–NN10
137.52	12.00	NN8–NN9
139.58	12.80	NN7–NN8
156.60	13.60	NN6–NN7
172.88	15.50	NN5–NN6
193.15	17.00	NN4–NN5
197.00	17.60	NN3–NN4
207.95	18.00	NN2–NN3
226.75	22.80	NN1–NN2
256.65	23.70	NP25–NN1 (top *Sphenolithus ciperoensis* and *Helicosphaera recta*)
278.60	25.30	NP24–NP25 (top *S. distentus*)
278.61	42.20	NP17–NP18 (base *Chiasmolithus oamaruensis*)
279.10	46.60	Top *C. gigas*
283.89	47.80	Base *C. gigas*
291.65	49.50	NP14–NP15 (base *Nannotetrina fulgens*)
310.55	52.60	NP-13–NP14 (base *Discoaster sublodoensis*)
329.55	54.00	NP12–NP13 (top *Tribrachiatus orthostylus*)
336.55	54.50	NP11–NP12 (base *Discoaster lodoensis*)
349.00	55.50	NP10–NP11 (top *T. contortus*)
372.61	56.30	Base *T. orthostylus*
372.90	56.40	NP9–NP10 (base *Campylosphaera dela*)
387.84	56.80	Base *T. contortus*
391.55	57.60	Top *Fasciculithus* spp.
401.88	59.00	NP8–NP9 (base *D. multiradiatus*)
413.13	60.10	NP7–NP8 (base *Heliolithus riedeli*)
419.63	60.50	NP6–NP7 (base *D. mohleri*)
428.35	61.60	NP5–NP6 (base *H. kleinpellii*)
433.95	62.00	NP4–NP5 (base *F. tympaniformis*)
443.81	64.29	Top Anomaly 28
447.03	65.12	Base Anomaly 28
447.91	65.50	Top Anomaly 29
450.99	66.17	Base Anomaly 29
451.71	66.46	Cretaceous/Tertiary boundary
456.69	66.74	Top Anomaly 30
475.15	68.42	Base Anomaly 30
476.50	68.52	Top Anomaly 31
489.26	69.40	Base Anomaly 31
519.95	71.37	Top Anomaly 32
Site 526		
0	0	
3.23	0.45	NN19–NN20
16.20	1.90	NN18–NN19
29.50	3.60	NN14–NN15
31.00	4.10	NN13–NN14
35.45	4.50	NN12–NN13
47.20	5.00	Base *C. acutus*
67.87	8.50	NN10–NN11
80.08	10.60	NN9–NN10
89.73	12.00	NN8–NN9
94.21	12.80	NN7–NN8
106.75	13.60	NN6–NN7
114.63	15.50	NN5–NN6
116.65	17.00	NN4–NN5
117.45	17.60	NN3–NN4
121.08	18.00	NN2–NN3
122.00	22.80	NN1–NN2
160.09	23.60	NP25–NN1 (top *S. ciperoensis & H. recta*)
170.20	28.10	NP24–NP25 (top *S. distentus*)
184.10	30.30	NP23–NP24 (base *S. ciperoensis*)
209.60	34.60	NP22–NP23 (top *Reticulofenestra umbilica*)
209.61	36.90	NP20–NP21 (top *D. barbadiensis* and *D. saipanensis*)
226.20	37.80	NP18–NP19 (base *Isthmolithus recurvus*)
Site 527		
0	0	
14.00	1.90	NN18–NN19
18.97	2.40	NN16–NN17
23.42	3.10	NN15–NN16
48.15	4.10	NN13–NN14
59.10	5.00	Base *C. acutus*
104.12	8.50	NN10–NN11
104.56	10.6	NN9–NN10
110.55	12.00	NN8–NN9
113.00	12.57	NN7–NN8
113.84	34.60	NP22–NP23 (top *R. umbilica*)
125.68	36.90	NP20–NP21 (top *D. barbadiensis* and *D. saipanensis*)
136.31	42.73	Base Anomaly 18
137.61	44.66	Top Anomaly 20
138.71	46.17	Base Anomaly 20
138.85	47.60	Top *Chiasmolithus gigas* (hiatus?)
140.77	47.80	Base *C. gigas*
143.45	48.75	Top Anomaly 21
148.09	50.34	Base Anomaly 21
153.59	51.95	Top Anomaly 22
154.73	52.62	Base Anomaly 22
163.88	54.70	Base Anomaly 23
Site 527 (Cont.)		
172.93	55.66	Top Anomaly 24b
219.87	58.94	Middle Anomaly 25
237.91	60.75	Base Anomaly 26
258.75	63.03	Top Anomaly 27
260.77	63.54	Base Anomaly 27
267.41	64.29	Top Anomaly 28
272.22	65.12	Base Anomaly 28
273.72	65.50	Top Anomaly 29
278.02	66.17	Base Anomaly 29
280.00	66.46	Cretaceous/Tertiary boundary
286.61	66.74	Top Anomaly 30
329.63	68.52	Base Anomaly 30
Site 528		
12.84	1.45	Top *Cyclococcolithus macintyrei*
19.70	1.90	NN18–NN19
27.85	3.10	NN15–NN16
46.30	3.60	NN14–NN15
54.58	4.10	NN13–NN14
55.60	4.50	NN12–NN13
55.61	5.00	Base *C. acutus*
102.85	8.50	NN10–NN11
108.90	10.60	NN9–NN10
115.34	12.00	NN8–NN9
117.69	12.80	NN7–NN8
118.50	13.60	NN6–NN7
118.51	16.50	NN5–NN6
132.20	17.00	NN4–NN5
132.74	17.60	NN3–NN4
145.21	18.00	NN2–NN3
149.11	20.45	Base Anomaly 6
153.21	21.16	Base younger normal of Anomaly 6A
170.96	25.50	Top Anomaly 7
182.06	28.15	Top Anomaly 9
190.36	31.23	Top Anomaly 11
201.36	32.90	Base Anomaly 12
221.83	35.29	Top Anomaly 13
226.03	35.87	Base Anomaly 13
226.99	36.90	NP20–NP21 (top *D. barbadiensis* and *D. saipanensis*)
238.13	40.20	NP17–NP18 (base *C. oamaruensis*)
248.59	46.17	Base Anomaly 20
253.50	47.80	Base *C. gigas*
257.05	48.75	Top Anomaly 21
258.24	50.34	Base Anomaly 21
261.40	52.29	Middle Anomaly 22
269.50	54.00	NP12–NP13 (top *T. orthostylus*)
277.81	55.14	Top Anomaly 24
284.80	55.40	NP11–NP12 (base *D. lodoensis*)
306.86	56.30	Base *T. orthostylus*
311.50	56.50	Base *D. diastypus*
313.20	57.60	Top *Fasciculithus* spp.
333.75	58.94	Middle Anomaly 25
346.70	61.00	NP5–NP7
379.70	62.00	NP4–NP5 (base *F. tympaniformis*)
391.58	63.03	Top Anomaly 27
395.20	64.90	NP2–NP3 (base *C. danicus*)
398.60	65.30	NP2a–NP2b
399.47	65.50	Top Anomaly 29
405.97	66.17	Base Anomaly 29
407.00	66.46	Cretaceous/Tertiary boundary
413.34	66.74	Top Anomaly 30
464.57	69.40	Base Anomaly 31
Site 529		
1.70	0.45	NN19–NN20
17.30	1.90	NN18–NN19
19.05	3.10	NN15–NN16
36.35	3.60	NN14–NN15
37.45	4.10	NN13–NN14
37.46	12.00	NN8–NN9
42.54	13.30	Mid NN7
55.25	15.50	NN5–NN6
56.43	17.00	NN4–NN5
69.73	17.60	NN3–NN4
74.05	18.00	NN2–NN3
82.05	22.80	NN1–NN1
118.55	23.60	NP25–NN1 (top *S. ciperoensis* and *H. recta*)
138.15	28.10	NP24–NP25 (top *S. distentus*)
162.55	34.60	NP22–NP23 (top *R. umbilica*)
186.07	35.10	NP21–NP22 (top *C. formosus*)
199.79	36.90	NP20–NP21 (top *D. barbadiensis* and *D. saipanensis*)
223.15	47.80	Base *C. gigas*
231.00	49.50	NP14–NP15 (base *N. fulgens*)
247.15	55.00	NP11–NP12 (base *D. lodoensis*)
264.50	56.30	NP9–NP10 (base *C. dela*)
273.25	59.00	NP8–NP9 (base *D. multiradiatus*)
314.75	60.10	NP7–NP8 (base *D. riedeli*)
319.80	60.50	NP6–NP7 (base *D. mohleri*)
323.95	60.75	Base Anomaly 26
331.90	61.60	NP5–NP6 (base *H. kleinpellii*)
348.70	62.00	NP4–NP5 (base *F. tympaniformis*)
372.80	64.90	NP2–NP3 (base *C. danicus*)
383.63	65.90	NP1–NP2 (base *C. tenuis*)
385.10	66.17	Base Anomaly 29
387.77	66.46	Cretaceous/Tertiary boundary
394.17	66.74?	Top Anomaly 30 (hiatus)

Note: The species used on this leg to define Paleogene zone boundaries are explicitly stated as they are not invariably those originally used by Martini (1971).

After these preliminary plots were made, it was easy to recognize many of the magnetic anomalies. The next step was to make adjustments to the timescale so as to bring the magnetic pattern into alignment with our chosen seafloor-spreading timescale, that of Kent (in press). Although earlier work by Chave (this volume) was based on the timescale in the elegant presentation of Ness et al. (1980), we became convinced that Kent (in press) had made significant improvements to the accuracy of the seafloor magnetic anomaly timescale. Several iterations were necessary before a consistent picture was obtained.

Table 2 gives the ages of nannofossil datums as estimated in each of Sites 525, 527, and 528 on the basis of interpolation between magnetostratigraphic horizons. For each of these datums, the figure finally adopted is also given.

There are several types of error involved in these estimates. First, we may have misidentified the reversals observed in the sediment. It is hoped that this does not apply to any reversal, but there are three regions of significant uncertainty. Around Anomalies 23 and 24, we encountered considerable difficulty in reaching a definite solution, and the problem was exacerbated by the obvious changes in sedimentation rate around that time. Second, none of the sites recovered a good fossiliferous late Eocene section, so that the timescale is poorly constrained in that region. Third, although the data from Site 528 contain several large gaps during the Oligocene, we believe that the majority of the horizons are correctly identified; however, the identification of Anomaly 6 in the Miocene may be incorrect. We have not taken account of the estimates based on this identification. It should be remarked, however, that the accumulation rate data for Site 528 have been compiled using these magnetic data and show a very smooth plot of both carbonate and noncarbonate accumulation. It is likely that the large excursions is accumulation rate in the other sites at about 22 Ma are an artifact resulting from an error in this part of the timescale; it is thus also likely that our age for the NN1/NN2 boundary is inappropriate.[3]

In general, magnetic reversals are located in the core to within about 10 cm, but the true uncertainty in the depth at which the reversal was present in the undisturbed sediment may be several meters in situations where recovery was poor. A good example is the Eocene/Oligocene boundary at Site 528. The boundary is close to the top of Core 528-13 and is nominally only 96 cm below the base of Anomaly 13, which is within Core 528-12. However, recovery in Core 13 was only about 3 m, so that the true position of the boundary may have been several meters below Anomaly 13. In this case, the age estimated would have been consistent with that given by Berggren et al. (in press, b), which in turn is based on Italian sections (Lowrie et al., 1982) and on DSDP Site 522 (Poore et al., in press; Tauxe et al., in press).

In most cases these problems are more important sources of uncertainty than of error in locating the nannofossil horizons, which have mostly been positioned to within one or two meters in the cores (although, again, the true uncertainty in the position of the datum in the

Table 2. Ages of nannofossil datum levels for Leg 74, estimated by interpolation between magnetic datums.

Datum	Depth in Hole (m)	Age derived from Depth in this Site	Age Used (estimate based on data from all sites)
Site 525			
Base *Cruciplacolithus tenuis*	449.30	65.80	65.90
Base *C. primus*	451.00	66.17	66.10
Cretaceous/Tertiary*	451.71	66.33 (down)	66.46
Cretaceous/Tertiary*	451.71	66.29 (up)	66.46
Base *Micula murus*	465.76	67.57	67.5
Base *Lithraphidites quadratus*	483.50	69.00	69.0
Top *Quadrum trifidum*	521.50	71.47	71.5
Site 527			
Base *Nannotetrina fulgens*	146.02	49.56	49.5
Base *Discoaster sublodoensis*	152.74	51.68	51.7
Top *Tribrachiatus orthostylus*	160.34	53.90	54.0
Base *D. lodoensis*	170.50	55.40	55.4
Base *T. orthostylus*	182.34	56.32	56.3
Top *T. contortus*	182.34	56.32	56.3
Base *Campylosphaera dela*	182.34	56.32	56.4
Base *D. diastypus*	189.00	56.78	56.5
Base *T. contortus*	189.00	56.78	56.8
Top *Fasciculithus* spp.	201.05	57.63	57.6
Top *Ericsonia robusta*	213.80	58.52	58.6
Base *D. multiradiatus*	220.75	59.03	59.0
Base *Heliolithus riedeli*	231.96	60.15	60.1
Base *D. mohleri*	235.08	60.47	60.5
Base *H. kleinpellii*	245.43	61.57	61.6
Base *F. tympaniformis*	249.78	62.05	62.0
Base *Ellipsolithus macellus*	258.03	62.95	63.0
Base *Chiasmolithus danicus*	271.10	64.93	64.9
Base NP2B	272.85	65.28	65.25
Base *Cruciplacolithus tenuis*	276.19	65.89	65.9
Base *C. primus*	277.75	66.13	66.10
Cretaceous/Tertiary*	280.00	66.47 (down)	66.46
Cretaceous/Tertiary*	280.00	66.48 (up)	66.46
Base *M. murus*	303.50	67.44	67.5
Site 528			
Base NN2	146.70	20.03	22.80
Top *Sphenolithus ciperoensis*	169.60	25.60	23.6
Top *Helicosphaera recta*	169.60	25.60	23.6
Top *S. distentus*	179.20	28.20	28.1
Base *S. ciperoensis*	187.90	30.56	30.3
Top *R. umbilica*	203.60	33.16	34.6
Top *Cyclococcolithus formosus*	215.20	34.52	35.1
Top *D. barbadiensis*	226.90	36.14	36.9
Top *D. saipanensis*	226.90	36.14	36.9
Base *Nannotetrina fulgens*	257.60	49.49	49.5
Top *T. orthostylus*	269.50	53.95	54.0
Base *D. lodoensis*	284.80	54.82	55.4
Top *T. contortus*	303.00	55.87	56.3
Base *T. orthostylus*	306.80	56.08	56.3
Base *C. dela*	311.50	56.50	56.4
Base *D. diastypus*	311.50	56.50	56.5
Top *Fasciculithus* spp.	313.20	57.60	57.6
Top *E. robusta*	329.10	58.64	58.6
Base *D. multiradiatus*	334.10	58.97	59.0
Base *D. mohleri*	346.70	59.87	60.5
Base *H. kleinpellii*	346.70	59.87	61.6
Base *F. tympaniformis*	379.70	62.24	62.0
Base *E. macellus*	390.50	63.01	63.0
Base *C. danicus*	395.20	64.20	64.9
Base NP2b	398.60	65.23	65.25
Base *C. tenuis*	404.20	65.99	65.90
Base *C. primus*	405.00	66.07	66.10
Cretaceous/Tertiary*		66.28 (down)	66.46
Cretaceous/Tertiary*		66.41 (up)	66.46

Note: * = Shipboard determination of the boundary. See Manivit (this volume) for detailed discussion.

[3] After this work was completed, NJS became aware that there were difficulties in recognizing *Discoaster druggi*, the marker for the NN1/NN2 boundary, in Leg 74 sites (Jiang and Gartner, this vol.). This probably accounts for the difficulty we encountered in reconciling the positions of the boundary in the sites with the age assigned by Berggren et al. (in press, a).

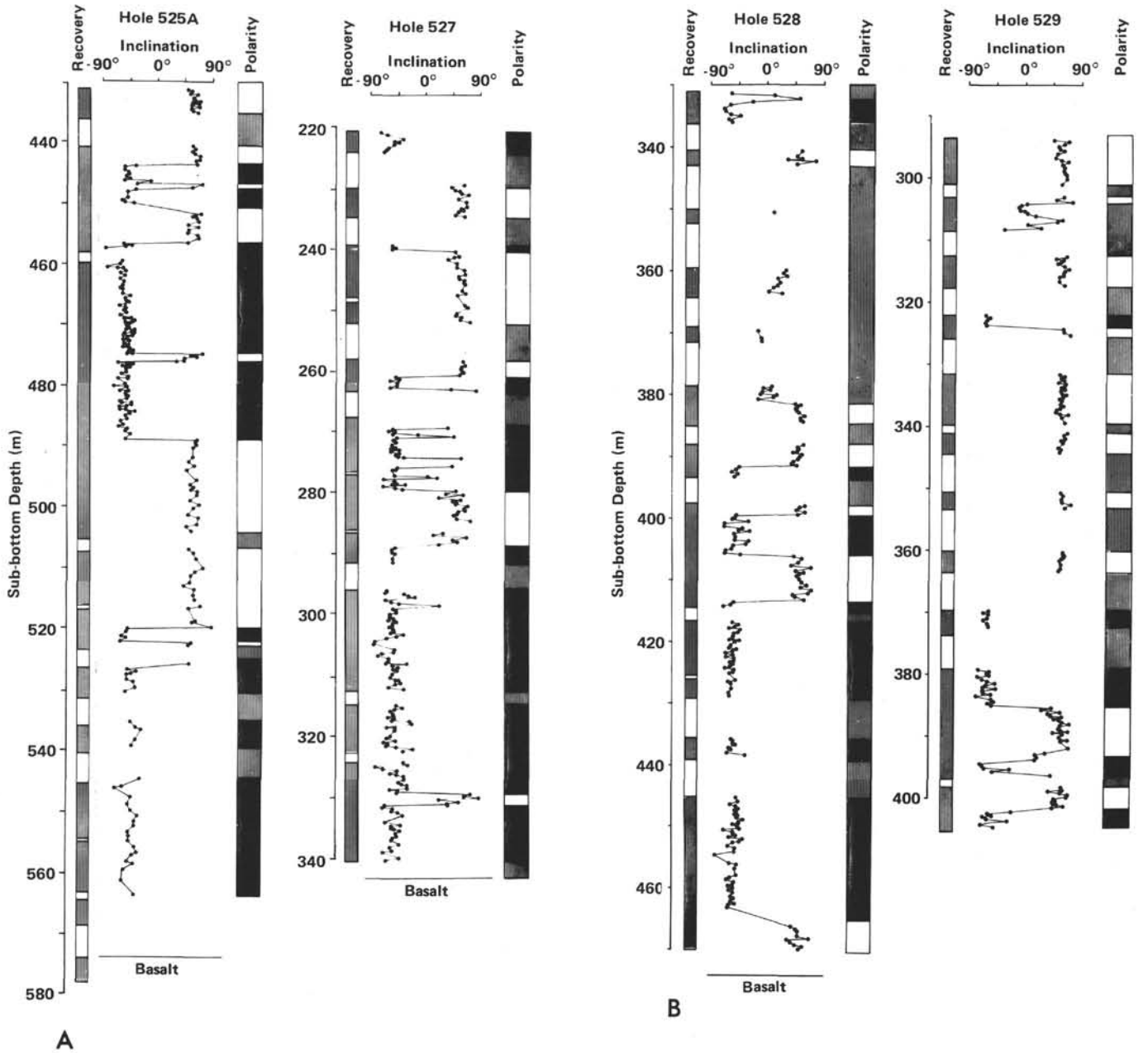

Figure 1. Magnetic inclination data plotted as a function of depth in hole. A. Hole 525A and lower part of Hole 527. B. Lower part of Hole 528 and Hole 529. C. Upper parts of Holes 527 and 528. The raw data for these figures are available from DSDP. For details of measurements, see Chave (this volume). (Black, normal; white, reversed; lines, no data [disturbed or unrecovered] or not interpreted [low inclination].)

sediment is always greater than the uncertainty in its location within a core).

Despite the range of preservational states, we consider that the nannofossil datums used are probably applied rather consistently among sites. However, there may well be inconsistencies in relation to other workers and other regions, and these may affect the applicability to our work of age estimates given by Berggren et al. (in press, a and b).

Finally, all datums that do not coincide with magnetic reversals (and any datum which appears to coincide with a reversal should be regarded with scepticism because of the risk that the two are brought together at a hiatus) have to be dated on the assumption of uniform sediment accumulation between two magnetic reversals. Dating of events in the long reversed interval between Anomalies 24 and 25 must be regarded as speculative at present, since accumulation rates were clearly changing rapidly during this interesting interval.

The Cretaceous/Tertiary boundary has been the subject of detailed studies (Manivit, this volume). We have made an attempt to estimate the age of this horizon as precisely as possible. It is clear that at all sites there is a major sedimentation change at this boundary, so that we have made independent estimates of its age by extrapolating upward, using boundaries of Anomaly 30 and below, and downward, using Anomaly 29. For consistency, we have used the shipboard position of the

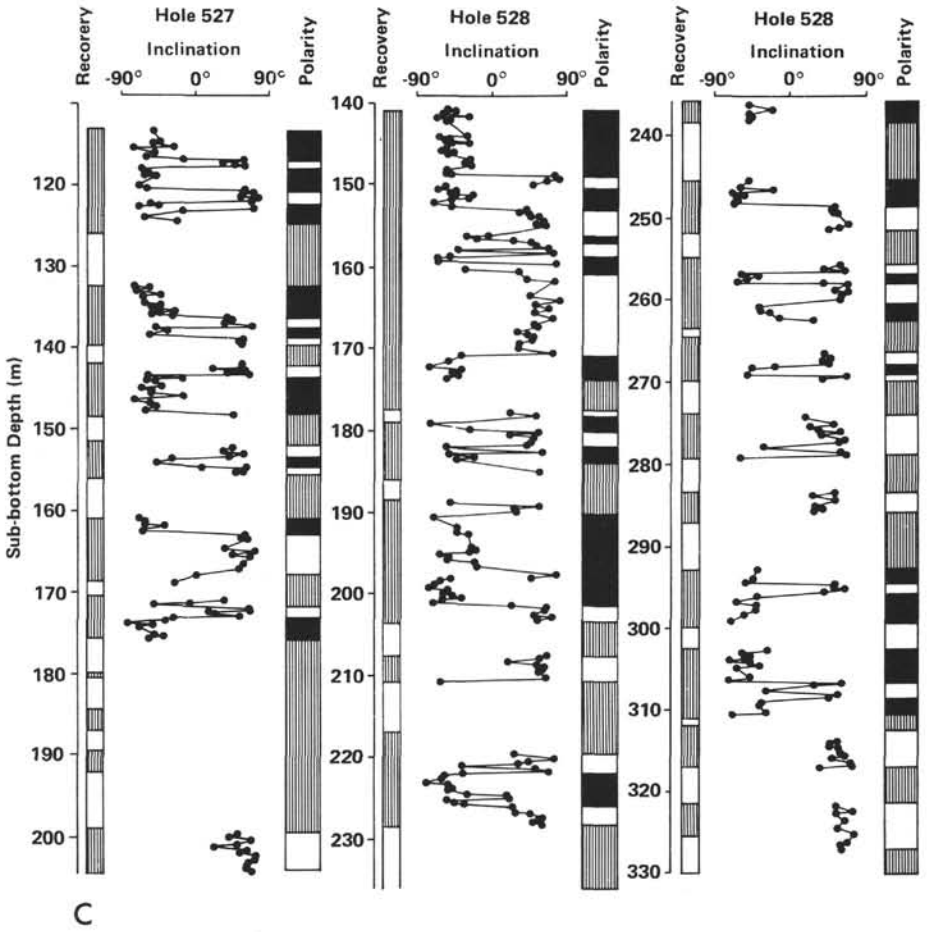

Figure 1. (Continued).

"sedimentological boundary" rather than involving ourselves in the finest points of biostratigraphy. It will be seen from Table 2 that the estimates for the boundary vary from ~66.3 to ~66.5 Ma. We have adopted a value of 66.46 Ma, the mean of two estimates from Site 527 and one from Site 528. We show later that Site 525 experienced considerable winnowing, which may reduce the reliability of its estimates; moreover, the lowermost Danian at that site is represented by about 1 m of drilling breccia. In Hole 528, the lowermost Danian shows rather irregular sedimentation and is regarded as less trustworthy. The accumulation rate data for noncarbonate sediments actually show a slight rise in the interval between 67 and 66.46 Ma when we use this figure. This rise is probably an artifact, but experiments with a slightly younger age generated other anomalous results and we believe that 66.46 Ma is the best figure that can be derived from the present data. It is very important for future studies around this boundary that seafloor-spreading timescales do not introduce a change in the spreading rate at this time and, furthermore, that as modifications are made (as they surely will be), a clear perspective is kept on the relationship between the boundary and the magnetic reversals.

Figure 2 shows the inferred positions of normal and reversed sedimentary sections for each site. The first point that should be made is that the position of Anomalies 27 to 30 is quite unambiguous (Chave, this volume). Equally, the calibration to these anomalies of the biostratigraphic datums agrees well with previous work in the Gubbio section (Lowrie and Alvarez, 1977; Roggenthen and Napoleone, 1977). A consistent position for Anomaly 26 is found in Sites 527 and 529, and one for Anomaly 25 in Sites 527 and 528. The thickness of sediment representing Anomaly 26 is rather small; for Anomaly 25 it is good.

When we come to Anomaly 24 the situation is less clear. According to the interpretation we have adopted, Sites 527 and 528 both preserve parts of Anomalies 23 and 24. The internal consistency between the two sites is acceptable, but changes in sedimentation rate are required. On the other hand, since both seafloor-spreading rates and true accumulation rates were varying around that time, it will be a few years before we have a clear understanding of this interval.

A key to the correct interpretation of the middle Eocene sequence is the identification of Anomaly 21 in Core 527-17. On Leg 73, Site 523 was drilled on Anomaly 21 as determined by seafloor magnetic data, and drilling was terminated above the base of the section in a reversed interval which is very reasonably interpreted as that between Anomalies 20 and 21 (Tauxe et al., in press). This reversed interval encompasses the *Chiasmolithus gigas* Subzone of Bukry (1975), which Jan Back-

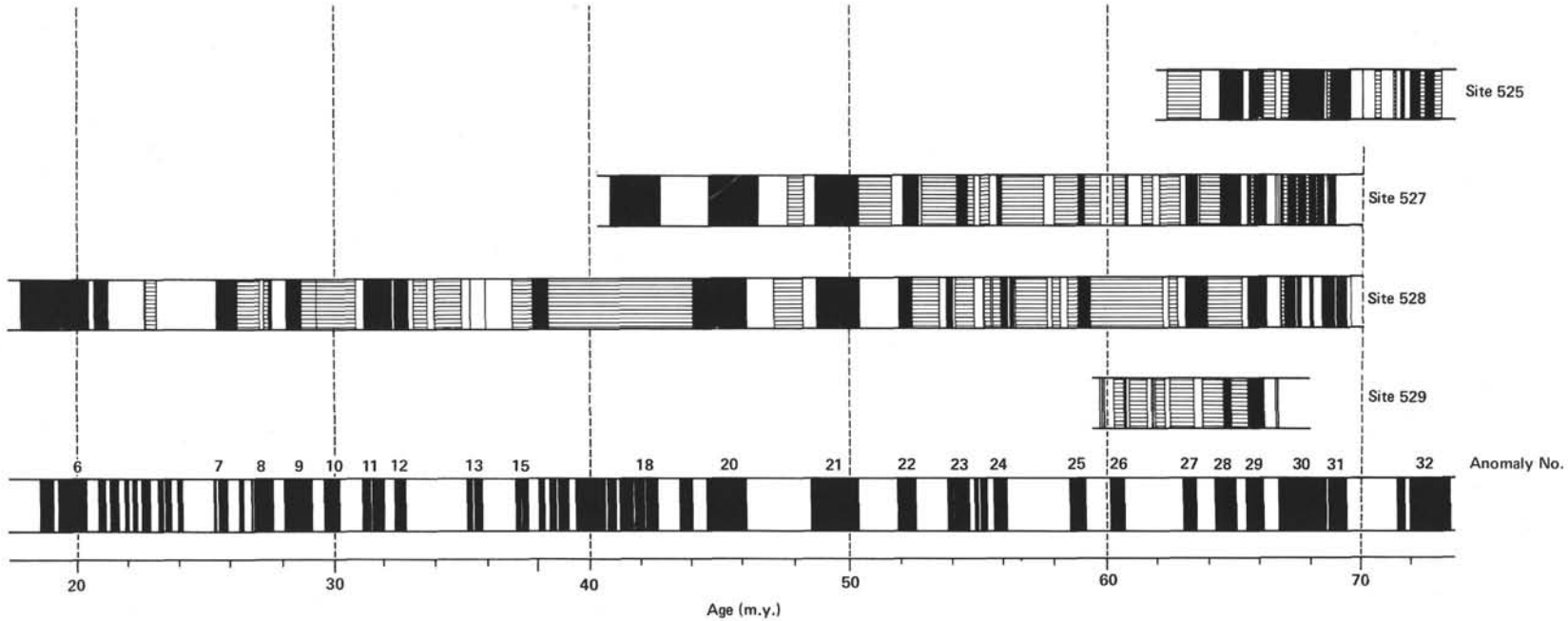

Figure 2. Interpreted magnetic data for Sites 525, 527, 528, and 529, plotted against inferred age. The magnetic reversal boundaries have been assigned ages from Kent (in press). All control points used are listed in Table 1. For comparison, the complete record as dated by Kent (in press) is indicated at the bottom of the figure. (Black, normal; white, reversed; lines, no data [disturbed or unrecovered] or not interpreted [low inclination].)

man (pers. comm., 1982) has found to be entirely contained by the reversed interval between Cores 16 and 17 in Site 527. Thus despite the spotty recovery of Anomalies 23 and 24 we are confident that the identification of the magnetostratigraphy up to Anomaly 20 is correct. By referring to the data in Tauxe et al. (in press) it is also possible to identify the anomalies in the Oligocene with reasonable confidence, although other interpretations of the sequence are possible.

ACCUMULATION RATES

Figure 3 shows accumulation rates for Sites 525 to 529 using the timescales discussed above (from Table 3). All data are in g/cm^2 per 10^3 y., using shipboard density data. In view of the scattered measurements of wet-water content and bulk density, averages were taken over several cores at a time. It should be remarked that uncertainties from this source are very small compared with all others entering in this chapter. Generally gravimetric data were used in preference to GRAPE data.

Accumulation rates have been expressed over million-year intervals. Since the ages of biostratigraphic datums have not been rounded to the nearest million years, as was general practice until recently, the procedure adopted has the advantage of slightly reducing the random fluctuations in apparent accumulation rate that arise from the uncertainty in the positioning of each datum. Because we have no good evidence for major sedimentological changes at any boundary except at the end of the Cretaceous, there is no advantage to be

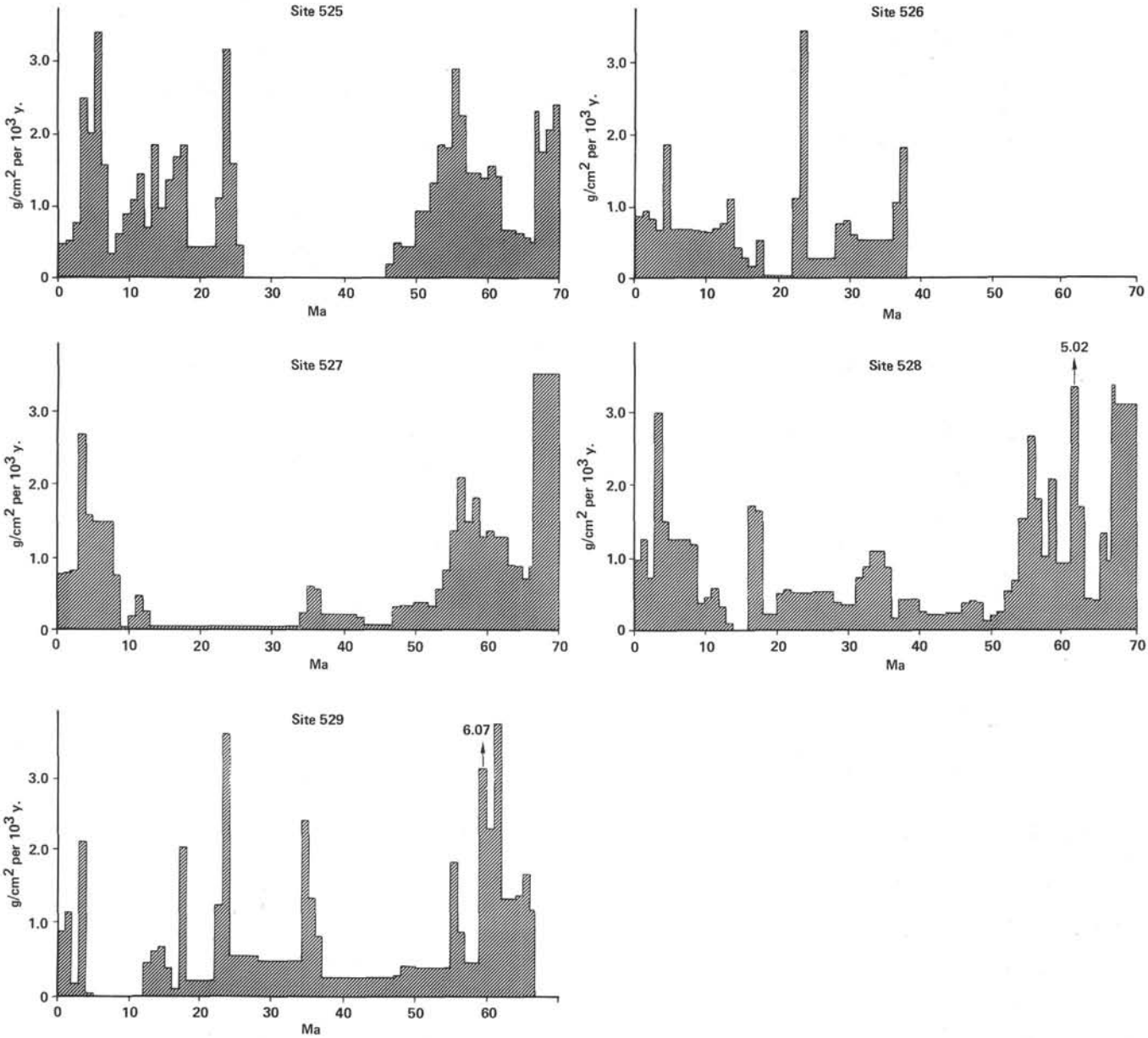

Figure 3. Accumulation rates for Sites 525–529 estimated in million-year increments. Age control points are from Table 1. For Site 528, the off-scale value is due to slumping. At Site 529, slumping was noted in several intervals in addition to the one that shows off-scale.

Table 3. Depth (in m) of interpolated m.y. points in Leg 74 sites, using Table 1 controls.

Age (m.y.)	Site 525	Site 526	Site 527	Site 528	Site 529
1	4.89	8.15	7.37	8.86	7.62
2	10.05	16.98	14.99	20.38	17.43
3	17.51	24.81	22.78	27.17	18.90
4	39.36	30.70	45.68	52.92	37.23
5	57.00	47.20	59.10	65.65	37.45
6	85.64	53.11	71.96	76.28	37.45
7	98.93	59.01	84.83	86.91	37.45
8	101.98	64.92	97.69	97.54	37.45
9	107.35	70.78	104.22	10.29	37.46
10	115.06	76.59	104.43	107.17	37.46
11	124.78	82.84	106.27	110.74	37.46
12	137.52	89.73	110.55	115.34	37.46
13	143.83	97.34	113.02	117.89	41.37
14	160.03	108.41	113.05	118.50	46.58
15	168.60	112.56	113.09	118.50	52.36
16	179.64	115.30	113.13	118.51	55.64
17	193.15	116.65	113.17	132.20	56.43
18	207.95	121.08	113.21	145.21	74.05
19	211.87	121.27	113.25	146.80	75.72
20	215.78	121.46	113.28	148.39	77.38
21	219.70	121.65	113.32	152.29	79.05
22	223.62	121.85	113.36	156.65	80.72
23	233.69	131.52	113.40	160.74	91.17
24	260.77	160.99	113.44	164.83	120.29
25	274.48	163.24	113.47	168.92	124.65
26	278.60	165.48	113.51	173.05	129.00
27		167.73	113.55	177.24	133.36
28		169.98	113.59	181.43	137.71
29		175.89	113.63	184.35	141.53
30		182.20	113.66	187.05	145.28
31		186.93	113.70	189.74	149.04
32		190.98	113.74	195.43	152.79
33		195.03	113.78	212.22	156.54
34		199.08	113.82	210.78	160.30
35		203.12	115.90	219.35	181.37
36		207.17	121.05	226.15	192.93
37		215.13	125.86	227.33	200.00
38		228.97	127.69	230.70	202.15
39			129.51	234.08	204.29
40			131.33	237.45	206.43
41			133.16	239.53	208.58
42	278.61		134.98	241.28	210.72
43	279.04		136.45	243.04	212.86
44	278.82		136.97	244.79	215.01
45	278.93		137.49	246.54	217.15
46	297.04		138.02	248.29	219.29
47	280.70		138.54	251.09	221.44
48	284.60		141.33	254.25	223.86
49	288.12		144.18	257.24	227.43
50	291.65		147.10	257.99	231.00
51	298.92		150.34	259.31	234.23
52	306.19		153.68	260.93	237.46
53	315.98		156.40	264.76	240.69
54	329.55		160.80	269.50	243.92
55	342.77		166.71	280.43	247.15
56	363.94		177.80	299.51	260.50
57	380.41		192.11	312.27	266.77
58	391.15		206.42	319.33	270.01
59	401.88		220.47	334.13	273.25
60	412.11		230.43	340.41	310.98
61	423.59		240.20	346.70	325.30
62	433.95		249.34	379.70	348.70
63	438.16		258.48	390.60	357.01
64	442.56		264.84	393.40	365.32
65	446.56		271.52	398.05	373.88
66	450.21		276.93	404.32	384.37
66.46	451.71		280.00	407.00	387.77
67	459.55		292.89	418.35	
68	470.53		317.06	437.61	
69	483.46		341.23	456.87	
70	498.61		365.40	476.13	

Note: Since these are m.y. intervals, the difference between adjacent depths is identical with the mean accumulation rate over that interval.

gained by estimating accumulation rates zone by zone. At this latter boundary an extra division has been inserted at 66.46 Ma, because it is certain that there was a change in accumulation rate more or less precisely associated with that boundary (Chave, this vol.).

Noncarbonate Accumulation Rates

In Appendix A the shipboard carbonate data are assigned ages on the basis of the control points in Table 1. For each site these data are shown as a function of age in Figure 4, which gives a general idea of changing dissolution at the various sites. For every million-year increment in which one or more shipboard carbonate determinations has been made, the accumulation of the noncarbonate fraction was determined by multiplying total accumulation by the noncarbonate fraction. These data are given in Table 4. Where no determination was available, an estimate was made on the basis of nearby values if this seemed appropriate. Figure 5 shows the noncarbonate accumulation averaged for all sites over each million-year increment. It should be noted that here and elsewhere we have not taken account of zeros in taking the mean. Our aim is to obtain the best estimate of the noncarbonate flux; if one intends to compile an ocean budget one must take account of hiatuses in a rather different manner. For the Plio-Pleistocene, the average accumulation rate is 0.055 g/cm^2 per 10^3 y.; for the Miocene, it is 0.047, for the Oligocene, 0.058, and for the Eocene, 0.055. These figures are essentially indistinguishable, which is surprising in the light of the recent global compilation of Al accumulation by Donnelly (1982), which shows a significant increase in the late Neogene. Although taking shorter time intervals suggests changes in the noncarbonate accumulation rate, it is quite possible that these are all artifacts of errors in the timescale.

Two potentially very interesting episodes are the apparent rises in noncarbonate accumulation between 13 and 11 Ma in Site 527, and between 36 and 34 Ma. Both of these may be associated with glaciation in Antarctica. The first episode, in the Miocene, is critically dependent on the ages of the limits of Zones NN8 and NN9. The limits assigned are 12.8 to 12.0 Ma and 12.0 to 10.6 Ma. During this interval the CCD deepened briefly from a position between 4000 and 4400 m to about 4400 m, permitting the identification of key nannofossil species in Hole 527 sediment (Jiang and Gartner, this volume); however, in such dissolved material this estimate of accumulation rate remains hazardous. The episode of higher noncarbonate accumulation in the early Oligocene is controlled by the limits of Anomaly 13 in Site 528 sediments, as well as by nannofossils at Sites 529 and 527; in Hole 527, the presence of normal magnetization in Core 14 is inconsistent with the biostratigraphic age assignment, so the estimate may be unreliable. More work should be done to ascertain whether these peaks in noncarbonate accumulation are real, or whether they are artifacts caused by the difficulties that have been mentioned earlier.

Within the Eocene, there is apparently a contrast between lower noncarbonate accumulation in the lower and middle Eocene, and higher accumulation in the upper Eocene. This indication should be treated with caution, because the age controls used for the late Eocene are subject to considerable uncertainties at present. At the same time it is interesting, because superficially it appears that the late Eocene is missing through erosion at all sites. On the other hand, the sediment recovered is all very low in carbonate, and the quantity of noncarbonate turns out to be more than enough to imply that in reality accumulation at Sites 529, 528, and 527 was continuous. Since there is certainly no late Eocene sedi-

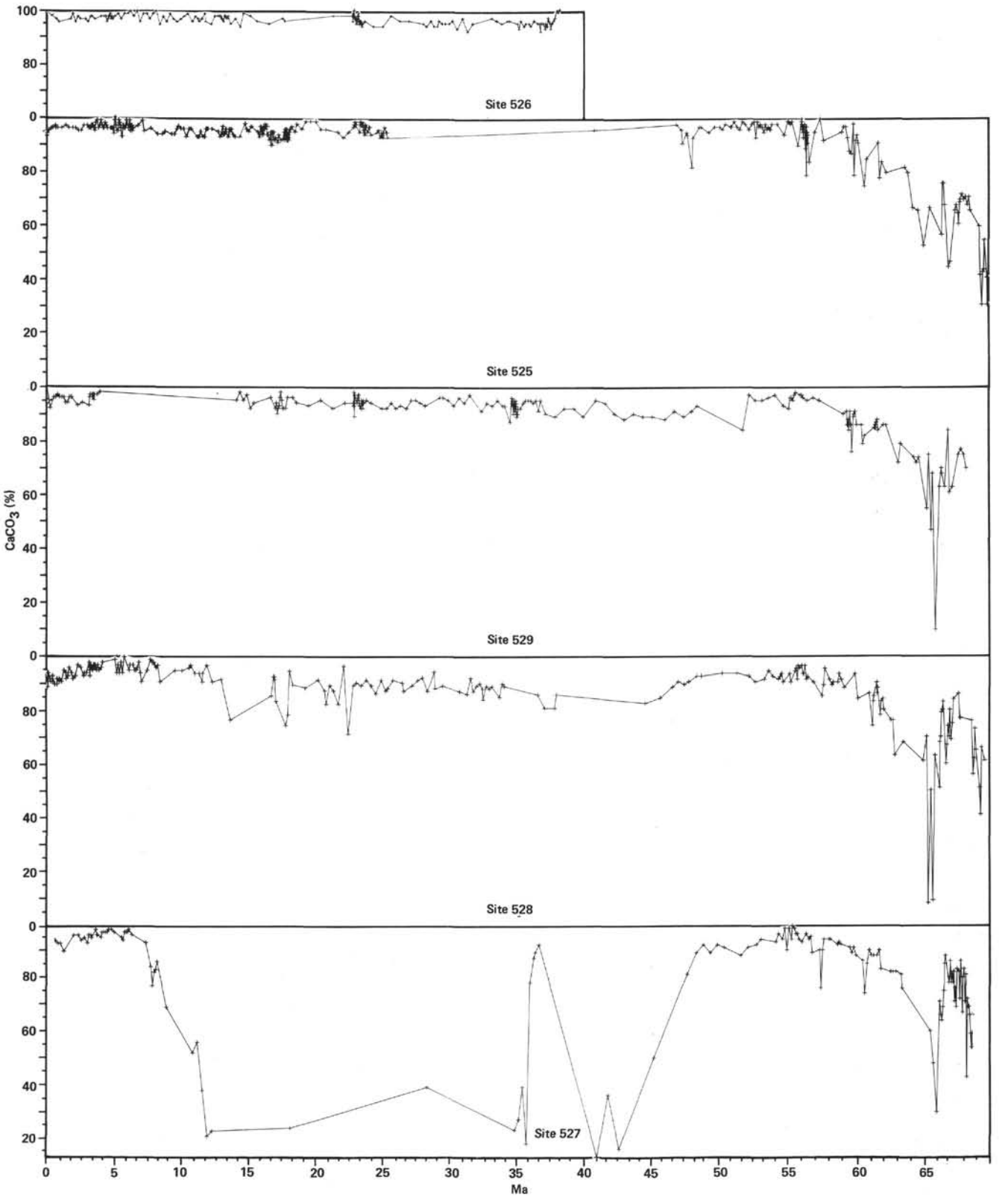

Figure 4. Carbonate content for Leg 74 sites, plotted against age using the control points of Table 1. The carbonate data are from shipboard measurements.

Table 4. Accumulation rates (g/cm^2 per 10^3 y.) of noncarbonate fraction in Leg 74 sites.

Time Increment (m.y.)	Site 526	Site 525	Site 529	Site 528	Site 527	Mean Accumulation
0–1	0.030	0.022	0.045	0.094	0.051	0.048
1–2	0.028	0.020	0.058	0.096	0.067	0.054
2–3	0.021	0.033	0.012	0.048	0.038	0.030
3–4	0.018	0.085	0.075	0.151	0.116	0.089
4–5	0.044	0.070	H	0.045	0.048	0.052
5–6	0.011	0.112	H	0.055	0.059	0.059
6–7	0.005	0.055	H	0.071	0.094	0.056
7–8	0.013	0.012	H	0.045	0.237	0.077
8–9	0.018	0.036	H	0.074	0.156	0.071
9–10	0.018	0.042	H	0.022	H	0.027
10–11	0.016	0.052	H	0.024	0.096	0.047
11–12	0.019	0.081	H	0.041	0.288	0.11
12–13	0.020	0.040	0.02*	0.030	0.207	0.063
13–14	0.033	0.096	0.03*		H	0.053
14–15	0.014	0.044	0.034		H	0.031
15–16	0.008	0.065	0.030		H	0.034
16–17	0.008	0.101	0.004		H	0.038
17–18	0.018	0.122	0.103		H	0.081
18–19	0.001*	0.016	0.008		H	0.005
19–20	0.001*	0.005	0.01*		H	0.003
20–21	0.001*	0.018	0.010	0.062	H	0.023
21–22	0.001*	0.023	0.017	0.064	H	0.026
22–23	0.021	0.037	0.095	0.043	H	0.049
23–24	0.132	0.98	0.235	0.051	H	0.129
24–25	0.015	0.089	0.04*	0.058	H	0.051
25–26	0.010	H	0.043	0.060	H	0.038
26–27	0.010	H	0.033	0.051	H	0.031
27–28	0.010	H	0.033	0.051	H	0.031
28–29	0.038	H	0.02*	0.037	H	0.032
29–30	0.039	H	0.022	0.037	H	0.033
30–31	0.031	H	0.026	0.044	H	0.034
31–32	0.026	H	0.019	0.082	H	0.046
32–33	0.03*	H	0.035	0.104	H	0.056
33–34	0.020	H	0.030	0.125	H	0.058
34–35	0.020	H	0.169	0.1*	0.19	0.12
35–36	0.026	H	0.067	0.1*	0.43	0.16
36–37	0.055	H	0.048	0.02	0.075	0.050
37–38	0.089	H	0.026	0.073	0.14*	0.082
38–39		H	0.02*	0.04*	0.15*	0.07*
39–40		H	0.02*	0.04*	0.15*	0.07*
40–41		H	0.02*	0.04*	0.18	0.08*
41–42		H	0.02*	0.04*	0.14	0.07*
42–43		H	0.02*	0.04*	0.14	0.07*
43–44		H	0.02*	0.04*	0.03*	0.03*
44–45		H	0.02*	0.037	0.03*	0.03*
45–46		H	0.02*	0.036	0.031	0.03
46–47		0.004	0.023	0.035	0.03*	0.023
47–48		0.043	0.03*	0.037	0.061	0.043
48–49		0.020	0.03*	0.025	0.031	0.027
49–50		0.018	0.03*	0.005*	0.032	0.021
50–51		0.029	0.03*	0.011	0.034	0.026
51–52		0.021	0.03*	0.014	0.046	0.038
52–53		0.040	0.031	0.042	0.027	0.035
53–54		0.060	0.016	0.044	0.034	0.039
54–55		0.072	0.027	0.114	0.039	0.063
55–56		0.087	0.064	0.148	0.060	0.090
56–57		0.124	0.032	0.107	0.142	0.101
57–58		0.063	0.025	0.091	0.187	0.092
58–59		0.08*	0.03*	0.173	0.119	0.101
59–60		0.090	S	0.083	0.119	0.097
60–61		0.22	S	0.09	0.21	0.17
61–62		0.22	S	S	0.19	0.20
62–63		0.12	0.19	S	0.23	0.12
63–64		0.12	0.34	0.14	0.18	0.20
64–65		0.19	0.37	0.14*	0.24*	0.24
65–66		0.23	0.66	0.78	0.32	0.50
66–66.46		0.10	0.43	0.39	0.43	0.34
66.46–67		0.54	H	0.86	0.89	0.76
67–68		0.68	H	0.71	0.75	0.71
68–69		0.63	H	0.90	1.11	0.88
69–70		1.37	H	1.20		1.29

Note: * = estimates in time increments for which no carbonate data are available; figure has been interpolated from nearby values; H = increments during which site is reported to have experienced a hiatus in accumulation; S = presence of a significant amount of slumped material.

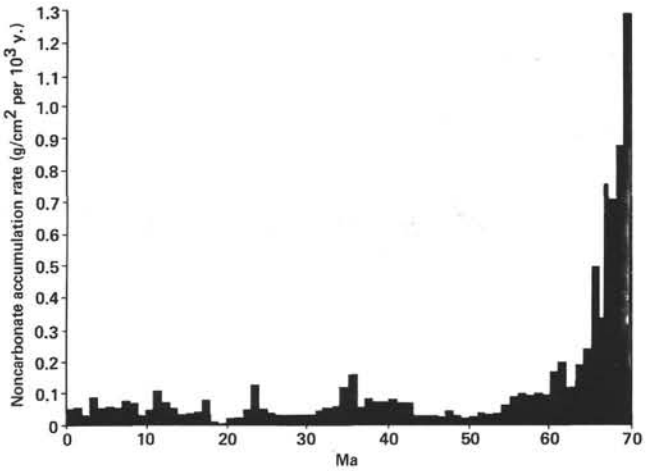

Figure 5. Average accumulation rate of the noncarbonate content at Sites 525–529, obtained from the total accumulation rate and the noncarbonate percentage (from Table 4).

ment preserved at the shallower Site 525, which must have been eroded, we do not know what the nannofossil rain rate was during this interval. Presumably as a result of dissolution, the actual average nannofossil accumulation was very low (approximately 0.2 g/cm^2 per 10^3 y.) at Sites 529, 528, and 527, and it is impossible to deduce what proportion of the nannofossils falling from the photic zone this represents.

In the Palaeocene and Maestrichtian, noncarbonate input was presumably enhanced by proximity to the ridge crest, since noncarbonate accumulation fell rather smoothly from over 1 g/cm^2 per 10^3 y. between 70 and 69 Ma to the "steady-state" value of about 0.06 g/cm^2 per 10^3 y. in the Eocene (Figure 5).

An examination of the noncarbonate accumulation rate for each site reveals an increase from the shallower to the deeper sites. The mean noncarbonate accumulation at Site 526 at 1000 m water depth is about 0.25 g/cm^2 per 10^3 y.; at the intermediate Sites 525 and 529, at 2500 and 3000 m, the mean is about 0.45g/cm^2 per 10^3 y., and in the deeper Sites 528 and 527 at 4000 and 4400 m, the mean is about 0.6 g/cm^2 per 10^3 y. Recent work on the accumulation on sediment traps (Honjo et al., 1982) deployed at different depths shows a similar increase with depth in the accumulation of the terrigenous flux.

Nannofossil and Foraminiferal Accumulation Rates

For every million-year increment from which one or more sample has been sieved either in Cambridge (NJS) or in Kiel (DF), a separation was made to show the accumulation of sediment > and < 63 μm. The data are shown in Appendix B as a function of estimated age, using the control points in Table 1. Figure 6 shows the coarse-fraction percentage as a function of age for each site and like Figure 4 gives a rough picture of dissolution history. The coarse fraction is essentially 100% foraminifers in virtually all samples. A few samples in the lowest parts of Sites 525 and 528 are too lithified to make a useful separation, so that the high values should be disregarded. We have assumed that the noncarbonate

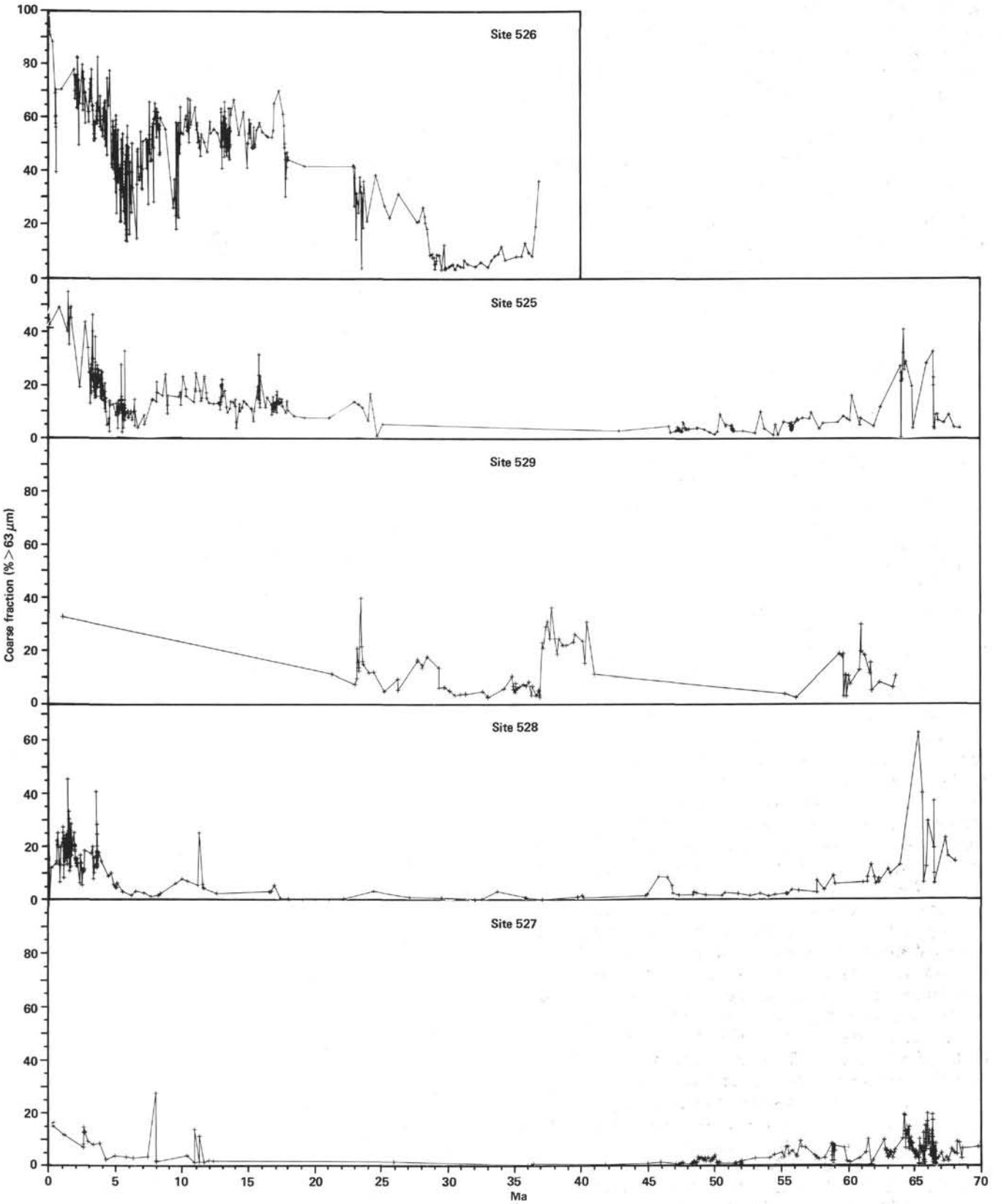

Figure 6. Percentage of the coarse fraction (>63 μm) at Leg 74 sites. The data are from Borella (this volume) and from measurements made in Cambridge and aboard ship by Shackleton (Table 3). Estimated age derived from Table 1.

portion is all in the fine fraction and have estimated nannofossil accumulation as total fine-fraction accumulation minus noncarbonate accumulation. Examination of smear slides shows that in the shallowest site, 526, the fine fraction contains a significant proportion of small foraminifers and foraminiferal fragments, so that the true nannofossil accumulation at Site 526 is even less than indicated. Fine-fraction carbonate accumulation rates are given in Table 5 (by subtracting the coarse-fraction rate from the total carbonate rate), and coarse-fraction rates in Table 6. Since dissolution varies considerably, it was not considered useful to interpolate values for Table 6, although interpolated coarse-fraction values were in some cases (marked with asterisks) used for Table 5. (Since the coarse fraction seldom exceeds 10% in much of the record, an estimated figure does not contribute much uncertainty to the estimate of the fine fraction.)

Figure 7 shows the accumulation rate of the coarse fraction and of the carbonate fine fraction, averaged in million-year increments, at each site. This figure contains information on the history of production rates of foraminifers and coccoliths as a function of time. It also contains information on the changing vertical gradient of calcite dissolution and winnowing, which may be deduced from differences among sites in the accumulation rates of each component.

Table 5 also illustrates the effect of winnowing on the shallower sites. Column 7 ("deep mean") shows the mean nannofossil accumulation rate over the deeper sites. For the Neogene, this represents the average for Sites 525, 529, 528, and 527 (values severely affected by dissolution are neglected). For the Paleogene, this column encompasses Sites 529, 528, and 527. The last column shows the ratio of nannofossil accumulation in the shallowest site to this mean. From the Oligocene up to the present the shallowest site is 526; in the earlier part of the record, when Site 526 was probably near or above sea level, it is Site 525. For the Neogene, the ratio averages about 0.35, and for the Oligocene about 0.8; although Site 526 was shallower early in the Oligocene, winnowing only began to have a really significant effect later in the Oligocene, probably at about 28 Ma.

It appears that Site 525 experienced considerable winnowing in the Maestrichtian and early Paleocene, with a sudden decrease in winnowing at 62 Ma. Over this interval, the nannofossil accumulation at Site 525 was about half the mean for the deeper sites. During the remainder of the Paleocene there is little difference among sites, but in the Eocene the nannofossil accumulation is actually higher at Site 525 than in the deeper sites. Although there were some foraminifers preserved even in Site 527, it seems that dissolution was taking its toll on the nannofossils. In view of the prevalence of slumping, little work has been done on Site 529, and it is not certain that the nannofossils were being significantly dissolved at this site. Certainly, there was a typical nannofossil dissolution loss of the order of 50% at Sites 528 and 527 in the Eocene.

Figure 8 shows the accumulation rate of foraminifers versus paleo-water depth for a few selected intervals.

Table 5. Accumulation rate of the nannofossil fraction in Leg 74 sites.

Time Increment (m.y.)	Site 526	Site 525	Site 529	Site 528	Site 527	Deep Mean[a]	Shallow/ Deep[b]
0–1	0.25	0.26	0.78	0.71	0.60	0.59	0.42
1–2	0.21	0.51	0.97	0.89	0.63	0.75	0.28
2–3	0.23	0.51	0.14*	0.60	0.68	0.48	0.48
3–4	0.23	1.84	1.79	2.33	2.36	2.08	0.11
4–5	0.84	1.69	H	1.33	1.48	1.50	0.56
5–6	0.40	2.91	H	1.12	1.37	1.80	0.22
6–7	0.39	1.38	H	1.14	1.39	1.30	0.30
7–8	0.31	0.31	H	1.15	1.19	0.88	0.35
8–9	0.28	0.50	H	1.08	0.58	0.72	0.39
9–10	0.35	0.74	H	0.31	D	0.52	0.67
10–11	0.24	0.85	H	0.40	0.09	0.58	0.41
11–12	0.31	1.12	H	0.49	0.17	0.81	0.38
12–13	0.33	0.56	0.39*	2.28	0.06	1.08	0.31
13–14	0.48	1.52	0.53*		H	1.03	0.47
14–15	0.20	0.83	0.60		H	0.72	0.28
15–16	0.12	1.09	0.32*		H	0.72	0.17
16–17	0.06	1.38	0.1*		H	0.74	0.08
17–18	0.24	1.48	1.84		H	1.66	0.14
18–19	0.01*	0.39	0.2*		H	0.29	0.03
19–20	0.01*	0.41	0.2*		H	0.31	0.03
20–21	0.01*	0.40	0.2*	0.43*	H	0.34	0.03
21–22	0.01	0.40	0.2*	0.49*	H	0.36	0.03
22–23	0.73	0.94	1.07	0.47*	H	0.83	0.88
23–24	2.38	2.74	2.72	0.45*	H	1.97	1.2
24–25	0.14	1.36	0.44*	0.43	H	0.74	0.19
25–26	0.18	0.43	0.47	0.46*	H	0.45	0.40
26–27	0.17	H	0.46	0.46*	H	0.46	0.37
27–28	0.20	H	0.42	0.47	H	0.45	0.44
28–29	0.60	H	0.36*	0.32*	H	0.34	1.8
29–30	0.69	H	0.42	0.30	H	0.36	1.9
30–31	0.53	H	0.42	0.30*	H	0.36	1.5
31–32	0.45	H	0.43	0.73	H	0.58	0.78
32–33	0.44	H	0.41	0.74	H	0.58	0.76
33–34	0.45	H	0.41*	0.94	H	0.68	0.66
34–35	0.42	H	2.09	0.94	0.16*	1.51	0.28
35–36	0.88	H	1.18	0.72*	0.52*	0.81	1.1
36–37	1.22	H	0.72	0.12*	0.48	0.44	2.8
37–38		H	0.15	0.35*	0.05*		
38–39		H	0.17	0.35*	0.05*		
39–40		H	0.2*	0.2*	0.05*		
40–41		H	0.2*	0.2*	0.05*		
41–42		H	0.2*	0.2*	0.05*		
42–43		H	0.2*	0.2*	0.05*		
43–44		H	0.2*	0.2*	0.03*		
44–45		H	0.2*	0.2*	0.03*		
45–46		H	0.2*	0.2*	0.03*		
46–47		0.21	0.2*	0.31	0.03	0.25	0.8
47–48		0.45	0.21*	0.35	0.26	0.27	1.7
48–49		0.42	0.3*	0.33	0.29	0.31	1.4
49–50		0.43	0.3*	0.10	0.30	0.23	1.9
50–51		0.87	0.3*	0.17	0.34	0.27	3.2
51–52		0.90	0.3*	0.21	0.34	0.28	3.2
52–53		1.25	0.3*	0.48	0.28	0.35	3.6
53–54		1.70	0.3*	0.60	0.52	0.47	3.6
54–55		1.69	0.3*	1.38	0.75	0.81	2.1
55–56		2.69	1.77	2.43	1.25	1.82	1.5
56–57		1.98	0.86	1.61	1.86	1.44	1.4
57–58		1.31	0.4*	0.86	1.26	0.84	1.6
58–59		1.30	0.4*	1.76	1.61	1.26	1.0
59–60		1.21	S	0.74	1.03	0.87	1.4
60–61		1.21	S	0.74*	1.13	0.94	1.3
61–62		1.13	S	S	1.04	1.04	1.1
62–63		0.49	1.23	1.21	0.98	1.14	0.4
63–64		0.38	1.23	0.23	0.68	0.71	0.5
64–65		0.31	0.9*	0.21*	0.54	0.55	0.6
65–66		0.19	0.9*	0.14	0.34	0.46	0.4
66–66.46		0.29	0.7*	0.27	0.36	0.44	0.7
66.46–67		1.63		2.22	2.48	2.35	0.7
67–68		0.95		1.75	2.68	2.2	0.4
68–69		1.24		0.75	2.22	1.49	0.8

Note: This accumulation rate is obtained as (total accumulation rate) – (coarse-fraction accumulation rate) – (noncarbonate accumulation rate). * = estimate where coarse-fraction and/or carbonate data are missing; figure has been interpolated from neighboring values. H = hiatus; S = presence of a significant amount of slumped material.

[a] Mean nannofossil accumulation rate over the deeper sites (see text for further explanation).

[b] Ratio of nannofossil accumulation in the shallowest site to the deep mean (see text for further explanation).

Table 6. Accumulation rate (g/cm^2 per 10^3 y.) of the foraminiferal fraction (>63 μm).

Time Increment (m.y.)	Site 526	Site 525	Site 529	Site 528	Site 527
0–1	0.58	0.23	0.064	0.17	0.116
1–2	0.69	0.24	0.12	0.27	0.093
2–3	0.57	0.24		0.093	0.090
3–4	0.41	0.56	0.27	0.53	0.227
4–5	0.97	0.25	H	0.11	0.051
5–6	0.25	0.39	H	0.059	0.052
6–7	0.26	0.14	H	0.032	0.046
7–8	0.34	0.04	H	0.025	0.053
8–9	0.36	0.10	H	0.023	0.014
9–10	0.28	0.14	H	0.026	H
10–11	0.37	0.21	H	0.032	0.005
11–12	0.36	0.25	H	0.053	0.008
12–13	0.41	0.12	0.046	0.007	0.005
13–14	0.60	0.23			H
14–15	0.21	0.11	0.048		H
15–16	0.15	0.22			H
16–17	0.09	0.21		0.062	H
17–18	0.25	0.25	0.12	0.007	H
18–19	0.01*	0.04			H
19–20	0.01	0.03			H
20–21	0.01*	0.03			H
21–22	0.01*	0.03	0.02		H
22–23	0.36	0.15	0.09		H
23–24	0.88	0.33	0.65		H
24–25	0.10	0.14	0.063	0.016	H
25–26	0.068	0.03	0.026		H
26–27	0.081	H	0.040		H
27–28	0.053	H	0.087	0.004	H
28–29	0.089	H	0.075		H
29–30	0.044	H	0.029	0.002	H
30–31	0.025	H	0.020		H
31–32	0.021	H	0.018	0.001	H
32–33	0.019	H	0.016	0.001	
33–34	0.035	H		0.033	
34–35	0.033	H	0.162		
35–36	0.046	H	0.084	0.007	
36–37	0.089	H	0.038		0.002
37–38	0.47	H	0.068	0.0004	
38–39		H	0.055		
39–40		H	0.061		
40–41		H	0.050		
41–42		H			
42–43		H			
43–44		H			
44–45		H			
45–46		H			0.0005
46–47		0.007			
47–48		0.019			0.002
48–49		0.018			0.005
49–50		0.014		0.002	0.008
50–51		0.045		0.004	0.005
51–52		0.035		0.005	0.003
52–53		0.049		0.008	0.003
53–54		0.10		0.016	0.014
54–55		0.05		0.026	0.026
55–56		0.12	0.066	0.072	0.070
56–57		0.16	0.01	0.062	0.120
57–58		0.10		0.050	0.042
58–59		0.09		0.134	0.088
59–60		0.10		0.052	0.070
60–61		0.14			0.023
61–62		0.07			0.052
62–63		0.08	0.11	0.12	0.074
63–64		0.19	0.11	0.049	0.035
64–65		0.14			0.085
65–66		0.16		(0.40)	0.041
66–66.46		0.13		(0.27)	0.080
66.46–67		0.16	H	(0.28)	0.115
67–68		0.13	H	(0.61)	0.102
68–69		0.20	H	(1.4)	(0.194)

Note: Figures in brackets are probably invalid because sediment is partially lithified. H = hiatus. * = interpolated values for the % > 63 μm. A blank is left where it was judged that an interpolated value would not be sufficiently accurate.

This figure illustrates the fact that the total flux of material from the surface layers is not generally recorded at any site. The foraminiferal flux is best recorded at the shallow Site 526, but the nannofossil flux is best recorded at an intermediate site, one that is well above the CCD to avoid dissolution effects, but away from topographic highs to avoid winnowing. Thus in attempting to estimate the total amount of internal carbonate recycling in the ocean that results from the precipitation of calcite in surface waters and its dissolution in deeper waters, one needs data from several water depths. The Leg 74 sites constitute a unique data set for such studies.

It is interesting to observe in Figure 8 the enormous loss of foraminifers between the shallowest Site 526 and Site 525; although the seafloor at Site 525 is well above the lysocline as generally understood, it has experienced about 50% loss of the foraminiferal flux by dissolution. To examine this feature, several samples were sieved further into size classes, showing that it was mainly the very small foraminifers that accumulated at Site 526 but were dissolved on the seafloor at Site 525.

In their classic study of carbonate distribution and dissolution in the equatorial Pacific, van Andel et al. (1975) were obliged to assume that the carbonate rain rate was well estimated by the accumulation rate at the site of their shallowest cores. The present data suggest that the true carbonate rain rate must have been higher. If half the foraminiferal rain rate in the South Atlantic (CCD about 4400 m) is dissolved at 2500 m, the loss must be considerably greater at that depth in the Pacific.

Winnowing

Our data indicate a gradual increase with depth in the accumulation rate of both the fine fraction and the noncarbonate fraction. These figures may be compared with the data obtained by Honjo et al. (1982) from sediment trap studies. In addition, however, the fine-fraction accumulation rate in Site 526 is very considerably reduced by comparison with the deeper sites; this we interpret as the result of winnowing. It seems that the magnitude is underestimated by our crude methods, since an examination of the fine fraction from Site 526 reveals that it contains a large proportion of whole and broken very small foraminifers, so that the coccolith accumulation is even less than indicated by the <63 μm accumulation.

Fish Tooth Accumulation

It is clear from this discussion that if dissolution is pervasive at almost all depths, even when the CCD is very deep, then it is difficult to use foraminiferal accumulation as a measure of marine productivity even when relatively shallow sites are available. For this reason, we have experimented with measuring the accumulation rate of fish teeth. Fish teeth (or ichthyoliths) are very resistant to solution, and indeed are now used as a biostratigraphic tool in red clay sequences (Doyle and Riedel, 1978). We were intrigued to notice the large fluctuations in ichthyolith accumulation during the Paleogene in the study of Core GPC5 (Doyle and Riedel, 1978), and we wondered whether this reflected changes in productivity rather than only resulting from the geo-

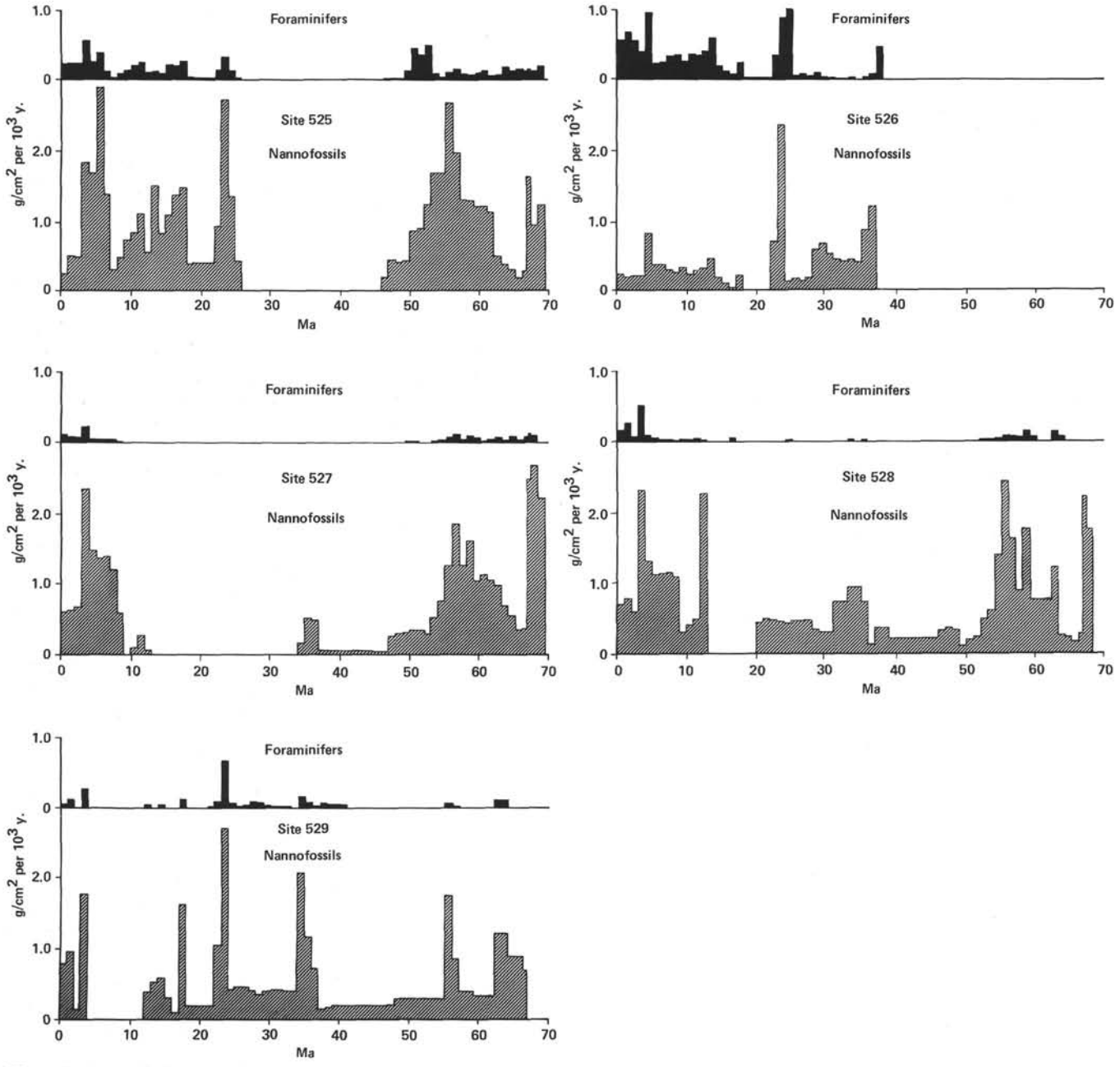

Figure 7. Accumulation rate of the foraminiferal fraction (>63 μm; above) and the nannofossil fraction (<63 μm, minus noncarbonate; below) at Leg 74 sites. Data from Appendix A.

graphical motion of the coring site, as Doyle and Riedel believed.

In Leg 74 samples, ichthyoliths were picked from the >63 μm fraction in samples washed for oxygen isotope studies. The majority of specimens are smaller than 250 μm, whereas the majority of foraminifers used for isotope analysis are larger. To utilize the material most effectively, our procedure was to search for ichthyoliths among the foraminifers in the >250 μm fraction so as to preserve the foraminifers for future use, and to dissolve the foraminifers in the finer size fraction using acetic acid, since seeking fish teeth in this size fraction proved impossibly slow. Table 7 gives the total counts, the number/g sediment, and the estimated accumulation rates; Table 8 shows the accumulation averaged in million-year increments. Figure 9 shows accumulation of ichthyoliths in million-year increments. Comparing Figure 9 with Figure 7, which shows accumulation rates of other components over the same time intervals, it is clear that the estimation of fish-tooth accumulation provides a very powerful tool for measuring productivity in a manner unaffected by carbonate dissolution.

The lack of similarity between the ichthyolith accumulation and that of the noncarbonate component shows conclusively that the ichthyolith curve is not a dissolution artifact. Comparison with the foraminiferal accumulation at the shallowest Site 525 shows a good relationship, but even at this site dissolution destroys the

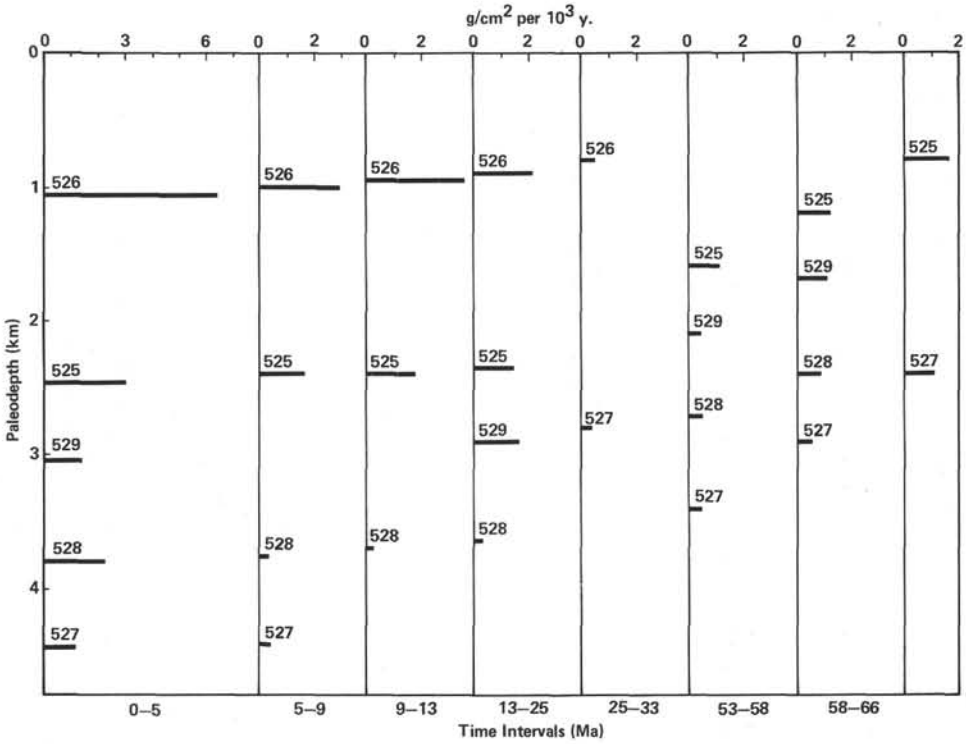

Figure 8. Accumulation of foraminiferal component as a function of paleodepth for the Leg 74 region. For each site the data from Figure 7 and Appendix A are averaged over convenient intervals and plotted at approximately the paleodepth occupied by the site over that interval.

relationship as we come up through the middle Eocene. However, the record of ichthyolith accumulation does resemble that of nannofossil accumulation, suggesting that it is productivity, rather than deep-water chemistry, that controls the carbonate record. We believe that this shows a very promising opening for future work by making possible some estimate of marine productivity that is not biased by carbonate dissolution.

CONCLUSIONS

Accumulation of foraminiferal material, nannofossils, fish teeth, and noncarbonate residue were studied in the five sites drilled during Leg 74, on the premise that these sites monitor accumulation at different depths (and in different water masses) with identical rain rates from the surface. Accumulations have been computed in million-year intervals, which are certainly too short in relation to the limitations of present-day chronostratigraphy and drilling techniques in parts of the column; nevertheless, the results show that this resolution is both close to being attainable in much of the Cenozoic, and necessary for the portrayal of the timescale of change. In the earlier Paleogene in particular, accumulation rates were changing rapidly enough that a coarser resolution would conceal much of the picture.

At the Leg 74 Sites, noncarbonate input (in g/cm^2 per 10^3 y.) fell smoothly from over 1 when the sites were close to the ridge crest 70 Ma, to about 0.03 in the Eocene and Oligocene, rising slightly in the late Neogene to an average of about 0.06. The number of fish teeth accumulating per cm^2/10^3 y. (averaged over million-year intervals) was about 2.7 in the late Maestrichtian, falling to 0.3 in the early Danian, rising to a maximum of 5.5 in the early Eocene, and falling to another minimum with typical values around 0.7 in the middle Eocene. Accumulation of carbonate (in g/cm^2 per 10^3 y.) follows a similar pattern: nannofossil carbonate accumulation rates were about 2 in the Maestrichtian and at the early Eocene peak, falling below 0.7 in the early Danian and below 0.4 in the middle Eocene. Although the effect of increasing carbonate dissolution through the Eocene is clearly recorded by the comparison between accumulation rates of foraminiferal and nannofossil carbonate at different paleodepths, the fish-tooth data show that the underlying cause is changing productivity rather than changing ocean deep-water chemistry.

Because of the lack of palaeomagnetic control on the Neogene sections drilled, accumulation-rate data are less reliable; some features are probably artifacts of the timescale employed. A peak in noncarbonate accumulation at about 13 Ma may result from Antarctic glaciation at that time. Late Neogene noncarbonate accumulation did not rise to the same extent as would be expected on the basis of global compilations.

Foraminiferal accumulation rates were studied at all sites. A consistent feature of the later Neogene is that about half the foraminiferal flux is dissolved at 2500 m, although this is well above the so-called lysocline; thus the concept of a foraminiferal lysocline is not supported by accumulation data. Nannofossil accumulation data show that winnowing has been very important at Site 526 (about 1 km depths) since some time in the mid-late Oligocene but that it was not during the earlier Oligocene. Winnowing has also affected Site 525 (about

Table 7. Accumulation of fish teeth in Maestrichtian to middle Eocene sediments at Site 527.

Sub-bottom Depth (m)	Total No. Teeth	Dry Wt. Raw Sediment (g)	No. Teeth/ g Sediment	Accumulation Rate	
				Sediment[a] (g/cm^2 per 10^3 y.)	Fish Teeth (N/cm^2 per 10^3 y.)
138.71	74	14.58	5.08	0.323	1.64
142.27	23	10.30	2.23	0.329	0.73
143.77	24	12.35	1.94	0.329	0.64
146.77	26	11.57	2.25	0.339	0.76
152.28	4	7.85	0.51	0.386	0.20
153.78	35	15.07	2.32	0.316	0.73
156.78	29	9.25	3.14	0.563	2.37
161.50	29	12.51	2.32	0.756	1.75
167.50	15	8.67	1.73	1.374	2.38
168.91	73	14.27	5.12	1.374	7.03
171.71	23	13.71	1.68	1.374	2.31
175.65	19	11.23	1.69	1.374	2.32
180.17	24	11.95	2.01	2.118	4.26
184.71	34	10.68	3.18	2.118	6.74
199.81	8	11.69	0.68	1.494	1.02
204.31	24	14.85	1.62	1.494	2.42
218.14	6	5.65	1.06	1.832	1.94
218.34	7	7.51	0.93	1.832	1.70
218.63	13	7.90	1.65	1.832	3.02
220.21	13	8.26	1.57	1.832	2.88
221.11	21	8.02	2.62	1.276	3.34
227.85	20	12.19	1.64	1.276	2.09
232.15	10	12.61	0.79	1.366	1.08
239.21	16	9.97	1.60	1.366	2.19
243.71	10	8.85	1.13	1.280	1.45
245.21	24	14.65	1.64	1.280	2.10
256.31	17	8.82	1.93	1.280	2.47
260.17	14	9.49	1.48	0.891	1.31
261.10	10	8.38	1.19	0.891	1.06
266.35	20	11.09	1.80	0.869	1.56
267.79	18	7.56	2.38	0.869	2.07
269.44	13	11.80	1.10	0.869	0.96
271.11	26	15.25	1.70	0.869	1.48
272.35	10	15.62	0.64	0.703	0.45
276.21	1	2.98	0.34	0.703	0.24
277.42	8	8.83	0.91	0.868	0.79
277.94	10	7.22	1.39	0.868	1.20
278.35	4	7.31	0.55	0.868	0.47
279.06	13	7.46	1.74	0.868	1.51
279.71	8	4.46	1.26	0.868	1.09
280.68	6	4.00	1.50	3.485	5.23
281.40	1	3.52	0.28	3.528	0.99
294.66	14	14.85	0.94	3.528	3.32
304.34	8	12.39	0.65	3.528	2.29
313.84	9	12.56	0.72	3.528	2.54
323.31	2	9.84	0.20	3.528	0.71
332.81	5	10.64	0.47	3.528	1.66

[a] From Table 3 and bulk density data.

Table 8. Accumulation rate (in m.y. increments) of fish teeth at Site 527.

Time Increment (m.y.)	Accumulation Rate (N/cm^2 per 10^3 y.)
47–48	0.31
48–49	0.64
49–50	0.76
51–52	0.20
52–53	0.73
53–54	2.37
54–55	1.75
55–56	3.51
56–57	5.5
57–58	1.7
58–59	2.4
59–60	2.7
60–61	1.6
61–62	1.8
62–63	2.47
63–64	1.2
64–65	1.5
65–66	0.35
66–66.46	1.01
66.46–67	3.1
67–68	2.7
68–69	1.2

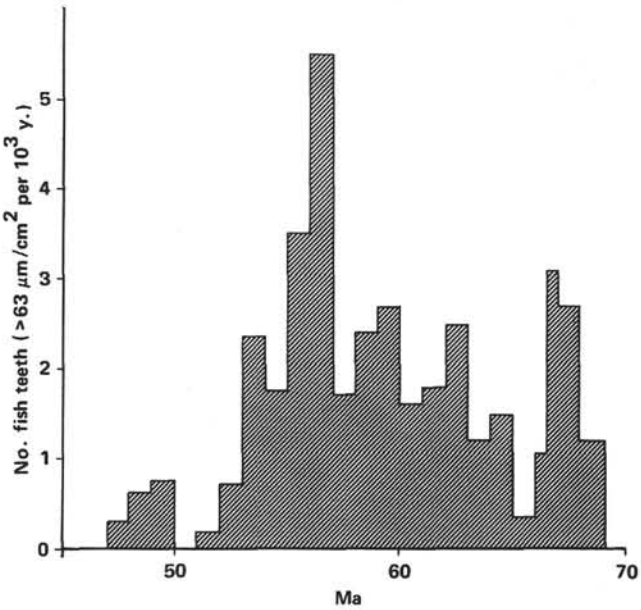

Figure 9. Accumulation of fish teeth (ichthyoliths) in the >63 μm fraction at Site 527. Data from Tables 7 and 8.

2.5 km depths) since the late Pliocene as well as in the Maestrichtian and Danian, when this site was at about 1 km depth.

Precise biostratigraphy is essential for the further development of chronostratigraphy. Without chronostratigraphy, the fascinating study of changes in the productivity and budget of the ocean are impossible, and this study shows what a dramatic story is to be found in the accumulation history of the oceans. It is very much to be hoped that further drilling cruises will be as well designed to tackle this topic as Leg 74 was.

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APPENDIX A
Carbonate Percentages and Ages (estimated from the control points in Table 1), Leg 74

Sub-bottom Depth (m)	Age (Ma)	Carbonate (%)
Hole 525A		
0.09	0.018	94
0.61	0.125	95
1.59	0.325	96
2.11	0.431	96
3.09	0.631	97
3.21	0.656	96
3.91	0.799	96
5.41	1.105	96
6.91	1.412	97
7.99	1.632	96
9.49	1.925	96
10.99	2.126	96
12.61	2.343	95
14.11	2.544	95
15.61	2.745	97
17.55	3.005	97
19.05	3.128	96
22.00	3.230	96
23.50	3.283	96
24.36	3.313	97
26.10	3.373	97
27.60	3.426	97
29.10	3.478	96
30.96	3.543	96
31.61	3.565	95
33.11	3.630	98
35.06	3.745	99
36.56	3.834	96
38.06	3.923	97
39.56	4.012	99
41.07	4.101	97
42.57	4.190	96
43.18	4.226	96
44.68	4.314	98
46.18	4.403	97
47.58	4.486	96
51.95	4.725	96
53.45	4.807	96
54.95	4.888	96
56.35	4.965	94
57.85	5.030	99
59.35	5.082	100
60.75	5.131	97
62.25	5.183	95
65.14	5.284	95
66.64	5.337	99
68.14	5.389	98
69.55	5.438	97
71.05	5.491	96
72.55	5.543	93
74.06	5.596	93
75.56	5.648	97
75.84	5.658	97
78.41	5.747	96
79.91	5.800	96
81.41	5.852	97
82.98	5.907	99
87.25	6.056	96
89.71	6.142	99
91.66	6.210	95
93.16	6.262	97
94.66	6.315	97
95.19	6.333	95
96.69	6.386	96
98.19	6.758	97
99.21	7.092	99
99.59	7.217	95
101.09	7.709	96
102.59	8.201	94
103.99	8.564	94
105.49	8.758	95
109.34	9.258	94
110.84	9.453	94
112.25	9.636	96
113.06	9.741	97
114.56	9.935	96
116.06	10.130	96
117.69	10.342	93
119.19	10.536	96
120.69	10.679	96
126.76	11.156	93
128.26	11.273	93
129.76	11.391	95
131.85	11.555	93
133.35	11.673	93
134.85	11.790	96
135.10	11.810	96
136.60	11.928	96
138.10	12.225	96
139.30	12.691	95
140.57	12.847	93
142.07	12.917	94
144.21	13.018	97
145.71	13.088	94
146.62	13.131	94
148.97	13.241	96
Hole 525A (Cont.)		
149.35	13.259	95
153.11	13.436	93
154.73	13.512	96
155.31	13.539	95
157.06	13.654	96
158.15	13.781	94
159.65	13.956	93
162.53	14.292	93
165.94	14.690	98
166.79	14.789	96
168.29	14.964	95
169.80	15.141	97
174.73	15.637	95
176.23	15.748	93
177.54	15.845	97
179.01	15.954	94
179.04	15.956	96
180.51	16.065	94
180.54	16.067	97
181.93	16.170	96
182.46	16.209	98
183.95	16.319	97
184.12	16.332	94
184.81	16.383	94
186.31	16.494	92
187.81	16.605	95
188.01	16.620	90
189.05	16.697	90
189.31	16.716	95
190.55	16.808	95
190.81	16.827	92
192.05	16.919	92
192.47	16.950	93
193.97	17.128	91
194.31	17.181	94
195.47	17.362	92
196.36	17.500	92
197.31	17.611	95
197.76	17.628	92
198.81	17.666	96
199.26	17.683	92
200.31	17.721	94
201.17	17.752	95
201.81	17.776	96
202.67	17.807	92
203.10	17.823	92
204.10	17.859	92
204.17	17.862	94
205.60	17.914	93
206.56	17.949	92
207.10	17.969	95
208.06	18.028	96
208.60	18.166	97
209.56	18.411	95
210.10	18.549	98
211.60	18.932	96
212.71	19.215	99
214.21	19.598	99
215.71	19.981	99
217.21	20.364	96
218.71	20.747	96
222.21	21.641	95
223.71	22.024	93
225.21	22.407	95
226.71	22.790	97
228.21	22.844	98
229.71	22.889	99
231.21	22.934	98
241.21	23.235	95
242.71	23.280	99
244.21	23.326	98
245.71	23.371	99
247.21	23.416	98
248.71	23.461	98
250.21	23.506	97
250.71	23.521	96
252.21	23.566	95
253.71	23.611	94
255.21	23.657	98
256.71	23.704	97
258.21	23.814	95
259.71	23.923	97
260.21	23.959	97
261.71	24.069	94
268.11	24.535	95
269.71	24.652	96
271.21	24.761	93
272.68	24.868	95
272.71	24.871	94
274.18	24.978	93
274.21	24.980	95
275.71	25.089	97
277.52	25.221	95
278.02	25.258	95
278.46	25.290	93
278.65	40.720	96
Hole 525A (Cont.)		
280.01	46.828	98
281.51	47.204	96
281.75	47.264	91
283.01	47.580	95
283.25	47.640	94
284.51	47.976	82
284.75	48.044	93
286.47	48.531	97
286.90	48.653	97
288.94	49.232	95
290.44	49.657	97
291.94	50.040	97
293.44	50.246	96
294.94	50.453	98
297.94	50.865	97
298.23	50.905	97
299.73	51.112	99
301.23	51.318	97
302.73	51.524	96
304.23	51.731	99
305.73	51.937	98
307.72	52.211	96
309.22	52.417	98
310.72	52.613	99
312.22	52.723	93
313.72	52.834	99
315.22	52.944	97
316.72	53.055	98
317.43	53.107	97
318.93	53.217	97
320.43	53.328	95
321.93	53.439	98
323.43	53.549	96
324.93	53.660	97
326.43	53.770	96
326.93	53.807	96
328.43	53.917	98
331.43	54.322	98
334.43	54.837	94
335.93	55.094	99
336.43	55.179	99
337.93	55.300	98
339.43	55.408	99
345.78	55.867	90
351.68	56.124	99
353.18	56.137	99
354.68	56.150	100
355.25	56.155	98
356.75	56.169	97
358.25	56.182	97
359.75	56.195	96
361.25	56.208	97
366.30	56.253	95
367.80	56.266	93
369.30	56.280	97
370.80	56.293	97
372.30	56.353	98
374.21	56.417	89
375.71	56.438	93
377.21	56.458	97
378.71	56.478	79
380.21	56.498	97
381.71	56.518	93
383.71	56.544	95
385.21	56.564	91
386.71	56.584	94
388.21	56.690	84
389.71	57.099	95
391.21	57.507	100
392.71	57.757	92
402.73	59.083	95
404.21	59.228	97
405.71	59.374	97
407.21	59.521	93
408.71	59.668	88
410.21	59.814	87
411.71	59.961	98
412.21	60.010	79
413.71	60.136	92
415.21	60.228	94
416.69	60.319	91
421.69	60.760	75
423.19	60.949	85
431.19	61.803	91
432.69	61.910	78
434.19	62.056	84
435.69	62.404	80
441.61	63.779	82
442.58	64.004	80
444.09	64.362	67
445.59	64.749	66
447.21	65.198	53
448.50	65.628	67
452.71	66.516	57
453.68	66.571	76
455.12	66.652	76
Hole 525A (Cont.)		
456.58	66.734	68
460.11	67.051	45
461.48	67.176	47
465.00	67.496	66
466.08	67.595	68
467.58	67.731	65
468.16	67.784	61
469.07	67.867	69
469.44	67.900	70
470.68	68.013	72
472.31	68.162	70
473.93	68.309	71
475.43	68.441	68
476.93	68.550	71
478.26	68.641	66
488.16	69.324	60
489.77	69.433	42
491.25	69.528	31
492.75	69.624	43
493.90	69.698	44
494.40	69.730	55
497.58	69.934	41
497.71	69.942	31
499.20	70.038	28
500.66	70.132	36
502.21	70.231	41
503.71	70.328	51
507.23	70.553	43
508.86	70.658	22
510.15	70.741	39
511.78	70.846	10
513.17	70.935	36
514.76	71.037	31
516.69	71.161	21
518.16	71.255	14
520.03	71.375	10
521.31	71.457	28
522.68	71.545	60
527.16	71.833	61
528.09	71.893	42
529.18	71.962	64
530.92	72.074	63
535.99	72.400	38
537.49	72.496	61
538.68	72.572	41
548.48	73.201	30
561.31	74.025	64
Hole 526A		
6.31	0.794	97
7.90	0.972	96
15.56	1.828	97
17.06	2.010	99
18.56	2.202	96
19.97	2.382	98
21.47	2.574	97
24.37	2.944	97
25.87	3.136	96
27.37	3.328	98
28.11	3.422	98
29.61	3.637	97
31.11	4.110	98
33.41	4.317	98
34.91	4.451	98
36.41	4.541	96
38.02	4.609	97
39.52	4.673	98
41.02	4.737	98
42.20	4.787	99
43.70	4.851	97
45.20	4.915	98
46.41	4.966	97
47.91	5.120	98
49.46	5.383	99
50.66	5.586	97
52.16	5.840	99
53.66	6.094	99
54.78	6.284	100
56.28	6.537	98
57.84	6.802	100
59.01	7.000	96
60.51	7.254	99
62.01	7.508	99
63.24	7.716	97
64.74	7.970	99
66.24	8.224	100
67.68	8.468	95
69.18	8.725	98
70.68	8.983	96
72.09	9.226	99
73.59	9.484	97
75.09	9.742	96
76.71	10.020	97
78.21	10.278	98
79.71	10.536	99

Appendix A. (Continued).

Sub-bottom Depth (m)	Age (Ma)	Carbonate (%)
Hole 526A (Cont.)		
82.10	10.893	96
83.60	11.111	98
85.10	11.328	97
85.51	11.388	96
87.01	11.605	97
88.51	11.823	99
88.90	11.880	96
91.40	12.298	95
92.90	12.566	98
94.13	12.786	98
95.63	12.891	98
97.13	12.986	98
98.63	13.082	97
99.16	13.116	97
100.66	13.211	96
102.16	13.307	98
103.06	13.365	98
104.56	13.460	97
106.06	13.556	98
107.33	13.740	95
108.83	14.102	97
110.35	14.468	94
111.33	14.704	99
113.43	15.211	98
114.93	15.723	96
116.11	16.599	95
117.61	17.618	97
119.14	17.786	96
121.73	21.391	98
123.23	22.826	98
124.73	22.857	98
125.08	22.865	96
126.58	22.896	99
128.08	22.928	98
129.35	22.954	100
130.85	22.986	98
132.35	23.017	97
134.14	23.055	97
135.24	23.078	97
136.74	23.110	95
138.13	23.139	97
139.63	23.170	95
141.13	23.202	96
142.55	23.232	97
142.63	23.233	98
144.33	23.269	98
145.83	23.300	99
147.22	23.330	95
148.72	23.361	96
150.22	23.393	95
151.63	23.422	96
153.13	23.454	96
154.63	23.485	95
156.02	23.515	95
157.52	23.546	94
159.02	23.578	95
160.43	23.751	96
161.93	24.419	94
163.43	25.087	94
164.83	25.710	98
166.33	26.377	96
167.83	27.045	96
170.30	28.116	95
171.80	28.353	94
173.91	28.687	96
175.41	28.925	94
176.91	29.162	94
177.69	29.285	96
179.19	29.523	95
180.69	29.760	95
182.43	30.036	95
183.93	30.273	96
185.43	30.629	93
187.04	31.026	97
188.54	31.397	92
190.04	31.768	95
195.81	33.193	97
197.31	33.564	96
198.81	33.934	95
200.61	34.379	96
201.11	34.502	96
203.61	35.120	95
204.03	35.224	93
204.54	35.350	96
205.53	35.594	94
206.04	35.720	95
207.03	35.965	95
207.54	36.091	94
208.53	36.336	96
210.03	36.631	95
211.53	36.740	95
212.83	36.833	92
213.03	36.848	95
214.33	36.942	95
215.83	37.050	95
217.41	37.165	93
218.03	37.209	95
218.91	37.273	94
219.53	37.318	94
220.41	37.381	97
221.03	37.426	96
222.53	37.535	95
223.03	37.571	93
224.03	37.643	95
224.53	37.679	95
226.19	37.799	96
227.53	37.896	97
229.03	38.005	100
230.53	38.113	99
232.53	38.258	100
Hole 527		
0.46	0.062	88
1.96	0.266	95
3.46	0.470	97
4.96	0.673	94
6.46	0.877	93
7.71	1.046	93
9.47	1.285	90
15.40	2.041	96
18.64	2.367	96
20.14	2.584	94
21.64	2.820	95
23.14	3.056	93
24.64	3.149	96
28.15	3.291	96
29.65	3.352	95
37.72	3.678	98
39.22	3.739	96
40.72	3.800	96
47.15	4.060	95
48.65	4.141	97
50.15	4.264	97
51.65	4.388	97
53.15	4.511	97
54.65	4.634	98
56.91	4.820	98
59.60	5.039	97
66.61	5.584	95
68.11	5.700	94
69.61	5.817	97
71.11	5.934	97
72.61	6.050	97
73.67	6.133	98
76.67	6.366	96
89.89	7.394	93
94.61	7.761	84
96.11	7.877	77
97.61	7.994	82
99.11	8.111	83
100.61	8.227	86
104.21	8.930	69
105.71	10.869	52
107.21	11.219	56
108.71	11.570	38
110.21	11.921	21
111.71	12.270	23
113.21	18.078	24
113.60	28.306	39
115.10	34.845	23
116.60	35.136	27
118.10	35.428	39
119.60	35.719	18
121.10	36.010	78
122.60	36.302	87
123.11	36.401	89
124.61	36.692	92
133.09	40.964	13
134.59	41.787	36
136.09	42.609	16
137.59	45.184	50
139.09	47.625	81
142.20	48.307	89
143.70	48.836	92
145.20	49.350	89
146.70	49.864	92
148.20	50.372	91
152.41	51.605	88
153.91	52.138	91
155.41	52.775	92
156.91	53.116	94
161.81	54.229	93
162.68	54.427	96
164.18	54.732	94
165.68	54.891	98
167.18	55.050	90
168.68	55.209	98
170.47	55.399	94
170.99	55.454	99
172.49	55.613	98
173.99	55.734	96
175.49	55.839	96
176.99	55.944	94
180.21	56.169	93
184.64	56.478	96
187.64	56.688	94
189.66	56.829	95
191.16	56.934	89
199.19	57.495	90
200.61	57.594	76
202.11	57.699	90
203.61	57.804	94
208.71	58.160	94
210.21	58.265	94
218.11	58.817	92
219.61	58.922	93
221.25	59.078	92
227.71	59.727	91
229.07	59.863	89
230.57	60.014	91
232.16	60.173	88
237.20	60.679	86
238.60	60.825	74
240.21	61.002	85
241.72	61.167	90
243.18	61.327	88
244.63	61.485	88
246.92	61.736	88
248.42	61.900	90
249.74	62.044	83
256.20	62.751	82
257.70	62.915	82
259.20	63.144	82
260.70	63.522	81
261.31	63.601	76
275.05	65.707	60
276.55	65.941	48
278.05	66.174	30
279.64	66.407	71
281.14	66.508	66
282.64	66.572	64
284.63	66.656	69
286.13	66.720	75
287.63	66.782	85
289.13	66.844	88
294.85	67.081	78
296.35	67.143	80
297.85	67.205	86
299.35	67.267	78
300.85	67.329	81
302.35	67.391	78
303.81	67.452	82
305.31	67.514	71
306.81	67.576	76
308.31	67.638	69
309.81	67.700	83
313.61	67.857	82
315.11	67.919	72
316.61	67.981	86
318.11	68.043	80
319.61	68.105	67
320.58	68.146	80
322.64	68.231	83
324.43	68.305	71
325.93	68.367	81
327.35	68.426	43
328.75	68.484	72
330.32	68.549	69
331.69	68.605	69
332.89	68.655	66
334.16	68.707	59
336.03	68.785	54
336.97	68.824	66
Hole 528		
0.11	0.012	88
0.34	0.038	93
1.61	0.182	91
1.85	0.209	90
3.08	0.348	90
3.11	0.351	92
4.58	0.517	89
4.61	0.521	89
6.08	0.687	89
6.11	0.690	91
7.58	0.856	90
7.60	0.858	91
7.66	0.865	91
9.16	1.034	90
10.66	1.204	94
12.04	1.360	93
12.16	1.373	91
13.54	1.496	92
15.04	1.594	95
17.76	1.773	93
19.26	1.871	91
20.76	2.056	92
22.00	2.239	96
23.50	2.460	95
25.00	2.680	92
25.35	2.732	93
26.39	2.885	93
27.87	3.101	97
29.06	3.133	94
29.33	3.140	92
30.83	3.181	95
32.35	3.222	96
33.83	3.262	95
35.24	3.300	95
36.74	3.341	94
38.23	3.381	95
38.27	3.382	95
39.73	3.422	96
41.23	3.463	96
42.61	3.500	95
44.11	3.541	96
45.61	3.581	95
47.01	3.643	94
48.51	3.733	96
50.01	3.824	94
52.78	3.991	95
54.28	4.082	97
55.78	5.010	98
57.46	5.134	93
58.74	5.229	96
60.17	5.335	93
61.67	5.446	97
63.17	5.558	93
64.91	5.687	99
69.96	6.061	94
70.70	6.116	96
73.83	6.348	96
75.33	6.459	94
76.83	6.571	94
78.10	6.665	95
79.60	6.776	97
81.10	6.887	93
82.31	6.977	90
87.91	7.392	94
91.19	7.635	98
92.69	7.747	97
94.19	7.858	97
95.50	7.955	96
97.00	8.066	95
98.50	8.177	96
100.90	8.355	90
105.60	9.455	94
107.10	9.975	94
108.60	10.496	95
108.96	10.613	96
110.46	10.939	93
111.96	11.265	93
113.01	11.493	90
113.11	11.515	93
114.51	11.820	96
116.01	12.228	90
117.78	12.889	91
118.49	13.590	76
122.25	16.637	85
126.21	16.781	92
127.71	16.836	92
128.55	16.867	91
131.61	16.978	83
136.11	17.708	74
141.05	17.867	78
144.05	17.963	94
145.55	18.214	89
147.05	19.156	88
148.55	20.098	91
150.05	20.613	87
150.64	20.715	82
152.14	20.975	89
153.64	21.265	87
155.14	21.632	82
156.64	21.999	96
158.14	22.365	71
159.64	22.732	89
160.51	22.945	90
162.01	23.312	89
163.51	23.678	91
165.01	24.045	89
166.51	24.412	86
168.01	24.779	91
169.51	25.145	87
170.11	25.292	88
171.61	25.655	91
174.61	26.371	90
175.11	26.491	87
177.61	27.088	89
179.37	27.508	91
180.87	27.866	92
182.37	28.265	87
183.66	28.744	94
183.87	28.822	88
185.37	29.378	89
188.85	30.670	87
190.35	31.226	86
191.85	31.456	92
193.35	31.684	87

Appendix A. (Continued).

Sub-bottom Depth (m)	Age (Ma)	Carbonate (%)
Hole 528 (Cont.)		
194.85	31.912	89
196.35	32.139	90
197.85	32.367	88
198.14	32.411	84
199.64	32.639	89
201.14	32.867	88
202.64	33.049	89
207.66	33.636	85
209.16	33.811	90
210.66	33.986	89
226.61	36.492	86
228.16	37.000	81
236.76	37.737	81
237.60	37.875	86
246.34	44.472	83
247.84	45.604	85
249.59	46.502	89
250.81	46.907	91
252.16	47.355	90
253.18	47.694	91
255.33	48.290	93
256.62	48.635	93
258.12	50.180	94
259.76	51.278	94
261.22	52.179	93
263.12	52.653	91
266.31	53.327	92
267.81	53.643	95
269.31	53.960	93
274.31	54.377	92
275.81	54.495	93
277.31	54.613	94
278.81	54.730	91
285.16	55.218	94
286.66	55.293	91
293.35	55.626	95
294.85	55.701	96
296.35	55.776	92
297.85	55.851	97
299.35	55.926	96
303.14	56.114	97
304.64	56.189	94
306.14	56.264	94
307.64	56.350	97
309.14	56.447	92
310.64	56.544	93
312.14	56.976	91
313.64	57.629	86
315.14	57.727	90
316.64	57.824	96
321.75	58.158	92
324.75	58.353	90
326.25	58.451	91
331.35	58.784	91
332.85	58.881	94
334.35	59.035	92
335.85	59.274	89
340.78	60.058	94
342.28	60.297	85
351.20	61.136	87
359.59	61.391	75
361.09	61.436	84
362.59	61.482	86
369.17	61.681	91
370.67	61.726	87
371.48	61.751	89
378.55	61.965	79
380.05	62.032	84
381.55	62.170	85
382.05	62.216	81
388.09	62.770	77
389.68	62.916	77
391.10	63.046	64
392.80	63.700	69
397.74	65.199	62
399.34	65.470	71
400.65	65.622	9
402.23	65.784	51
404.08	65.975	10
405.24	66.095	64
407.02	66.461	52
407.11	66.465	69
408.61	66.531	71
410.11	66.597	80
411.61	66.664	81
413.11	66.730	84
417.01	66.931	61
418.51	67.008	68
420.01	67.086	75
421.51	67.164	71
423.01	67.242	81
424.51	67.320	70
426.60	67.428	76
428.39	67.521	85
436.02	67.918	87
437.52	67.995	78
438.52	68.047	78
454.70	68.888	77
456.61	68.987	57
458.30	69.074	63
459.61	69.142	74
461.06	69.218	66
466.21	69.485	52
467.71	69.563	42
469.42	69.652	67
473.85	69.882	62
Hole 529		
0.97	0.257	92
2.47	0.522	96
3.97	0.661	96
5.47	0.800	97
6.97	0.940	96
8.86	1.116	96
10.36	1.255	96
11.86	1.394	94
13.36	1.534	94
14.86	1.673	96
16.36	1.813	96
17.86	2.284	93
18.36	2.627	94
19.86	3.123	93
21.36	3.167	96
22.86	3.210	97
27.62	3.348	97
29.12	3.391	96
30.62	3.434	97
32.12	3.478	95
33.62	3.521	97
36.62	3.723	97
37.11	3.945	98
47.16	14.100	95
48.65	14.358	98
50.16	14.619	95
51.66	14.879	97
53.16	15.138	92
54.66	15.398	94
56.16	16.657	96
56.71	17.013	92
58.21	17.080	94
59.71	17.148	90
61.21	17.216	92
62.71	17.283	93
64.21	17.351	96
65.53	17.411	98
67.03	17.478	95
68.53	17.546	92
70.03	17.628	92
71.53	17.767	92
73.03	17.906	96
74.53	18.288	96
75.03	18.588	94
76.53	19.488	93
78.03	20.388	95
79.53	21.288	92
81.03	22.188	94
82.53	22.811	94
84.03	11.843	93
84.91	22.863	98
86.41	22.896	89
87.91	22.928	97
95.39	23.092	94
96.89	23.125	95
98.39	23.158	96
99.89	23.191	97
101.39	23.224	97
102.89	23.257	94
104.81	23.299	93
109.31	23.397	92
110.81	23.430	95
112.31	23.463	94
113.41	23.487	94
114.91	23.520	92
116.41	23.553	95
117.91	23.586	94
119.41	23.797	95
120.91	24.142	94
124.41	24.945	92
125.91	25.290	92
127.41	25.634	94
128.91	25.979	92
130.41	26.323	93
132.41	26.782	92
133.91	27.127	95
135.41	27.471	95
136.91	27.815	94
138.41	28.169	93
142.55	29.272	96
143.41	29.501	96
144.91	29.901	95
146.41	30.300	93
147.91	30.700	96
149.41	31.100	94
150.91	31.499	97
154.18	32.370	91
155.68	32.770	94
157.18	33.169	93
158.68	33.569	95
160.18	33.969	93
160.68	34.102	93
162.18	34.501	87
163.68	34.624	96
165.18	34.656	94
166.68	34.688	95
168.18	34.720	93
170.31	34.765	90
171.81	34.797	95
173.31	34.829	94
174.81	34.861	92
176.31	34.893	91
177.81	34.924	95
179.31	34.956	93
179.86	34.968	94
181.31	34.999	89
182.86	35.032	90
184.36	35.064	90
185.86	35.096	92
187.36	35.269	92
188.86	35.466	94
190.25	35.648	95
191.75	35.845	95
193.25	36.042	95
194.75	36.239	94
196.25	36.436	95
197.79	36.638	91
198.84	36.775	95
200.34	37.157	90
201.84	37.857	89
203.34	38.556	92
204.84	39.256	92
206.34	39.956	89
208.34	40.890	95
209.84	41.589	94
211.34	42.289	90
212.84	42.989	88
214.34	43.689	90
215.84	44.389	89
217.34	45.089	89
219.34	46.022	88
220.84	46.722	91
222.34	47.422	89
223.84	47.993	91
225.34	48.414	93
236.58	51.797	84
238.08	52.280	97
239.58	52.763	95
241.08	53.246	95
242.58	53.729	96
244.08	54.212	97
246.05	54.846	93
247.55	55.228	92
249.05	55.331	96
250.55	55.435	96
252.05	55.539	95
253.55	55.643	97
255.05	55.746	98
260.01	56.089	97
261.51	56.193	97
263.01	56.297	96
265.17	56.599	95
266.67	57.045	96
268.17	57.490	95
284.31	59.293	90
293.91	59.548	91
295.10	59.579	86
296.69	59.621	86
298.07	59.658	88
299.57	59.698	84
303.05	59.790	91
304.58	59.830	86
306.08	59.870	86
307.58	59.910	76
312.57	60.042	89
314.07	60.082	90
315.57	60.165	91
317.07	60.284	86
322.03	60.634	86
323.53	60.725	79
325.03	60.865	82
332.21	61.607	85
333.71	61.643	85
335.21	61.679	86
336.71	61.715	85
338.10	61.748	87
341.42	61.827	88
342.92	61.862	84
351.01	62.278	86
352.51	62.458	86
360.12	63.374	72
361.62	63.555	79
369.70	64.527	74
371.20	64.707	72
372.70	64.888	74
379.11	65.483	55
380.72	65.631	75
382.62	65.807	47
383.71	65.911	68
385.56	66.161	10
387.54	66.429	63
388.68	66.583	70
388.92	66.616	68
390.52	66.832	63
392.52	67.103	84
393.09	67.180	61
394.71	67.399	63
398.11	67.859	75
399.61	68.062	77
401.11	68.264	75
402.61	68.467	70

APPENDIX B
Percentage of Sediment >63 μm at Leg 74 Sites[a]

Sub-bottom Depth (m)	Age (Ma)[b]	Sediment (%)
Site 525		
0.06	0.012	42.6
3.50	0.715	49.1
6.61	1.350	40.1
6.81	1.391	54.9
7.01	1.432	42.8
7.21	1.473	35.2
7.41	1.514	45.1
7.61	1.555	48.6
7.81	1.596	49.3
7.90	1.614	45.2
12.00	2.262	19.2
15.20	2.690	43.6
16.70	2.891	33.9
17.41	2.986	24.6
17.61	3.013	24.8
17.81	3.040	13.2
18.51	3.109	27.6
18.71	3.116	26.3
18.91	3.123	21.9
19.11	3.130	17.0
19.31	3.137	25.6
19.51	3.144	22.2
19.80	3.154	23.1
22.20	3.237	46.4
22.40	3.244	30.0
22.71	3.255	40.2
22.91	3.262	29.7
23.11	3.269	22.9
23.31	3.276	22.3
23.51	3.283	19.3
23.71	3.290	23.7
23.91	3.297	21.3
24.21	3.307	24.2
24.41	3.314	17.8
24.60	3.321	22.8
26.61	3.391	15.2
26.81	3.398	18.9
27.11	3.409	25.9
27.31	3.416	25.9
27.51	3.423	16.2
27.71	3.429	28.6
27.91	3.436	20.7
28.11	3.443	38.1
28.31	3.450	22.9
28.61	3.461	24.0
28.81	3.468	23.8
29.01	3.475	20.9
29.60	3.495	15.7
32.31	3.590	27.4
32.51	3.597	26.0
32.71	3.607	19.2
33.01	3.624	21.0
33.50	3.653	20.8
33.81	3.672	25.6
35.91	3.796	19.0
36.11	3.808	15.8
36.31	3.819	23.8
36.51	3.831	15.8
36.71	3.843	15.0
36.91	3.855	19.9
37.11	3.867	25.3
37.41	3.884	17.7
37.61	3.896	17.3
37.81	3.908	22.3
38.01	3.920	17.1
38.21	3.932	14.5
38.60	3.955	24.8
38.81	3.967	19.5
39.01	3.979	16.2
39.81	4.026	19.5
40.31	4.056	16.8
40.51	4.068	14.1
40.71	4.080	14.2
41.51	4.127	11.2
41.81	4.145	20.6
42.01	4.156	17.5
42.21	4.168	15.1
42.41	4.180	13.7
42.61	4.192	14.9
42.90	4.209	10.0
44.41	4.298	5.0
45.91	4.387	5.5
46.61	4.428	7.4
47.41	4.476	2.6
47.60	4.487	13.3
47.60	4.487	14.1
48.30	4.526	12.4
52.56	4.758	12.8
56.30	4.962	8.7
57.61	5.021	13.1
59.11	5.074	8.6
60.01	5.105	3.8
60.40	5.119	11.7
61.71	5.164	14.1
62.31	5.185	12.1
63.01	5.210	9.5
Site 525 (Cont.)		
63.40	5.223	10.1
66.71	5.339	14.5
66.81	5.342	13.0
66.91	5.346	14.4
66.91	5.346	10.8
67.11	5.353	14.0
67.51	5.367	15.7
67.71	5.374	27.6
67.91	5.381	14.1
68.21	5.391	11.2
68.61	5.405	14.6
68.81	5.412	13.0
69.01	5.419	10.9
69.21	5.426	11.2
69.41	5.433	2.4
69.50	5.436	9.4
70.21	5.461	11.2
70.41	5.468	11.2
70.61	5.475	10.3
71.11	5.493	9.4
71.31	5.500	12.3
71.51	5.507	12.5
71.71	5.514	10.9
71.91	5.521	7.2
72.11	5.528	8.2
72.31	5.535	3.9
72.61	5.545	10.2
72.81	5.552	9.9
73.01	5.559	9.8
74.11	5.597	12.6
74.31	5.604	11.5
74.73	5.619	12.3
74.94	5.626	14.4
75.14	5.633	6.8
75.41	5.643	32.7
75.61	5.650	11.3
75.81	5.657	11.3
75.90	5.660	8.5
79.71	5.793	9.6
81.01	5.838	10.2
82.30	5.883	10.1
82.40	5.887	7.9
82.88	5.904	7.7
87.90	6.079	10.2
88.01	6.083	9.5
90.60	6.173	6.9
94.31	6.303	10.0
96.21	6.369	14.6
96.38	6.375	4.8
96.70	6.386	10.2
97.71	6.600	4.0
99.20	7.089	8.7
99.21	7.092	5.2
100.99	7.676	14.4
101.18	7.739	14.6
102.00	8.008	13.8
102.11	8.044	21.1
102.17	8.064	17.2
103.40	8.467	16.0
105.01	8.696	24.0
106.10	8.837	9.3
106.21	8.852	12.4
106.40	8.876	16.0
112.50	9.668	15.5
113.61	9.812	17.2
113.81	9.838	12.5
115.11	10.007	23.1
116.81	10.228	18.3
116.90	10.239	15.8
112.61	10.830	13.6
123.91	10.932	18.5
124.11	10.948	17.7
124.60	10.986	24.4
128.51	11.293	17.7
129.36	11.360	14.0
130.10	11.418	15.1
132.61	11.615	23.2
132.71	11.623	22.3
134.50	11.763	17.0
134.66	11.776	15.0
134.82	11.788	15.0
137.20	11.975	13.2
138.30	12.303	12.9
139.18	12.645	13.2
139.41	12.734	13.3
139.61	12.801	10.8
139.81	12.811	13.6
140.01	12.820	12.6
140.41	12.839	15.3
140.71	12.853	14.5
140.91	12.863	13.7
141.11	12.872	19.2
141.31	12.881	19.8
141.51	12.891	20.0
142.21	12.924	19.5
142.41	12.933	20.3
Site 525 (Cont.)		
142.61	12.942	18.7
142.81	12.952	22.0
143.01	12.961	22.0
143.21	12.971	16.0
143.30	12.975	15.8
146.60	13.130	17.8
149.56	13.269	11.7
151.12	13.342	9.6
154.97	13.523	11.2
156.20	13.581	13.8
157.91	13.753	13.6
159.41	13.928	12.0
159.41	13.928	14.5
160.00	13.997	6.1
160.11	14.010	3.9
162.21	14.255	12.8
162.31	14.266	10.0
163.81	14.441	11.6
164.90	14.569	14.0
166.61	14.768	12.9
169.80	15.141	10.9
169.90	15.152	11.3
171.20	15.304	6.4
171.60	15.351	10.2
174.61	15.628	19.3
174.71	15.635	15.0
174.71	15.635	15.0
174.91	15.650	15.3
174.91	15.650	15.3
175.11	15.665	16.0
175.31	15.680	18.0
175.31	15.680	18.0
175.51	15.695	23.6
175.51	15.695	18.0
175.81	15.717	31.3
175.81	15.717	31.4
176.01	15.732	18.0
176.01	15.732	18.1
176.21	15.746	18.0
176.21	15.746	14.4
176.41	15.761	13.3
176.41	15.761	13.3
176.80	15.790	11.6
177.01	15.806	23.3
182.40	16.204	11.6
184.00	16.323	15.3
188.51	16.657	12.6
188.71	16.671	8.9
189.11	16.701	12.6
189.31	16.716	10.8
189.51	16.731	12.3
189.91	16.760	12.9
190.11	16.775	15.5
190.31	16.790	12.3
190.61	16.812	9.9
190.81	16.827	11.2
191.01	16.842	12.3
191.21	16.856	13.1
191.41	16.871	13.2
191.61	16.886	12.9
191.80	16.900	11.7
192.31	16.938	10.6
192.51	16.953	11.5
192.71	16.967	12.4
192.91	16.982	13.1
193.11	16.997	13.7
193.41	17.041	16.3
193.50	17.055	9.7
193.61	17.072	17.6
193.81	17.103	13.7
194.01	17.134	13.8
194.21	17.165	13.0
194.41	17.196	13.0
194.61	17.228	15.0
194.91	17.274	13.3
195.11	17.305	13.0
195.51	17.368	13.7
195.71	17.399	13.7
195.91	17.430	14.7
196.20	17.475	12.1
200.60	17.732	9.6
203.00	17.819	13.9
205.00	17.892	10.5
209.40	18.370	8.3
212.50	19.162	7.7
219.70	21.000	7.7
230.50	22.913	13.7
241.10	23.232	12.7
250.60	23.518	11.6
260.10	23.951	6.6
262.40	24.119	16.7
269.30	24.622	0.9
275.20	25.052	5.4
278.70	42.843	2.9
279.10	46.600	4.6
279.63	46.733	2.2
Site 525 (Cont.)		
281.10	47.101	2.7
281.72	47.256	3.4
281.74	47.261	4.3
281.92	47.306	3.6
282.11	47.354	3.1
282.21	47.379	3.9
282.51	47.454	2.8
282.60	47.477	2.8
282.91	47.554	2.9
283.10	47.602	2.6
283.32	47.657	4.0
283.32	47.657	6.3
283.66	47.742	5.6
284.00	47.831	4.1
284.10	47.860	3.4
284.38	47.939	3.6
284.56	47.990	3.5
284.97	48.106	3.5
285.00	48.115	3.7
287.10	48.710	3.9
287.30	48.767	4.1
289.01	49.252	3.5
290.51	49.677	2.4
292.01	50.050	1.6
293.50	50.255	2.7
295.01	50.462	9.1
298.00	50.874	4.7
298.10	50.887	5.4
301.19	51.312	4.7
301.29	51.326	3.8
301.39	51.340	5.2
301.49	51.354	4.1
301.59	51.367	3.2
301.69	51.381	3.9
301.79	51.395	3.6
301.99	51.422	3.3
302.09	51.436	3.6
302.19	51.450	3.0
302.29	51.464	3.0
302.39	51.477	2.8
307.50	52.180	2.9
317.10	53.083	2.1
322.79	53.502	10.1
326.60	53.783	3.8
336.10	54.468	1.4
337.85	54.604	5.3
340.30	54.801	1.4
345.70	55.235	6.4
354.07	55.670	5.7
355.10	55.704	4.7
358.19	55.808	3.4
358.29	55.811	3.3
358.39	55.814	3.1
358.49	55.818	3.8
358.59	55.821	3.7
358.69	55.824	6.1
358.79	55.828	3.8
358.89	55.831	4.0
358.99	55.834	4.0
359.09	55.838	4.0
359.19	55.841	4.2
359.29	55.844	4.4
359.39	55.848	5.3
359.49	55.851	3.4
359.59	55.854	3.8
361.80	55.928	4.5
367.07	56.105	6.3
371.57	56.255	7.5
372.80	56.297	6.8
376.57	56.642	7.8
382.09	57.156	7.5
383.50	57.288	9.8
390.09	57.902	3.8
393.10	58.182	5.9
404.59	59.265	6.2
409.09	59.705	8.5
412.10	59.999	7.5
414.71	60.197	6.9
417.20	60.350	16.1
423.21	60.952	5.2
423.50	60.988	7.7
433.72	61.984	4.7
436.10	62.499	11.9
442.50	63.986	27.3
442.70	64.032	21.4
442.77	64.048	0.7
442.79	64.053	24.7
442.90	64.079	21.8
443.10	64.125	22.4
443.30	64.172	32.2
443.49	64.216	41.0
443.80	64.288	25.9
444.00	64.339	28.0
444.20	64.390	28.9
446.00	64.854	19.6
446.30	64.932	4.0

Appendix B. (Continued).

Sub-bottom Depth (m)	Age (Ma)[b]	Sediment (%)
Site 525 (Cont.)		
449.90	65.933	28.3
451.65	66.436	32.7
451.73	66.461	20.0
451.86	66.468	22.9
452.48	66.503	4.4
453.13	66.540	3.8
454.90	66.639	9.1
456.98	66.766	9.2
457.50	66.814	7.0
462.30	67.251	6.1
466.55	67.637	9.1
470.91	68.034	4.4
475.84	68.471	4.1
478.50	68.658	20.1
497.60	69.935	60.6
Site 526		
0.71	0.099	91.5
1.94	0.270	89.0
3.10	0.432	69.7
3.14	0.437	58.3
3.19	0.444	60.8
3.25	0.452	56.9
3.30	0.458	61.3
3.38	0.467	40.1
3.50	0.480	71.0
7.10	0.883	71.1
15.71	1.845	78.6
15.91	1.868	76.6
16.11	1.890	70.5
16.20	1.900	67.6
16.31	1.914	76.0
16.91	1.991	76.3
17.11	2.016	69.4
17.31	2.042	64.3
17.51	2.067	64.0
17.70	2.092	76.6
17.71	2.093	83.3
17.93	2.121	82.9
18.11	2.144	74.3
18.31	2.170	50.3
18.51	2.195	74.5
18.71	2.221	68.2
18.88	2.243	65.8
20.71	2.476	80.4
20.75	2.482	65.5
20.91	2.502	63.2
21.11	2.528	77.6
21.31	2.553	75.2
21.71	2.604	74.7
21.91	2.630	70.1
22.25	2.673	58.4
22.31	2.681	69.7
24.01	2.898	62.6
24.26	2.930	58.9
24.31	2.937	62.7
24.91	3.013	71.0
25.11	3.039	66.6
25.31	3.064	73.4
25.51	3.090	74.9
25.71	3.116	72.7
25.76	3.122	67.9
25.91	3.141	75.0
26.11	3.167	78.7
26.31	3.192	65.0
26.51	3.218	63.3
26.71	3.243	65.0
26.91	3.269	57.9
27.11	3.295	52.6
27.26	3.314	51.8
27.31	3.320	54.5
27.51	3.346	59.0
27.71	3.371	52.6
27.91	3.397	52.8
28.11	3.422	58.2
28.81	3.512	61.1
28.91	3.525	65.9
29.01	3.537	63.0
29.11	3.550	58.3
29.20	3.562	59.2
29.36	3.582	59.8
29.60	3.633	83.3
29.71	3.670	64.0
29.79	3.697	64.0
29.90	3.733	62.7
29.99	3.763	57.2
30.10	3.800	68.6
30.20	3.833	61.0
30.31	3.870	56.0
30.52	3.940	55.9
30.61	3.970	53.5
30.70	4.000	59.7
30.80	4.033	63.9
30.89	4.063	60.0
31.11	4.110	66.0
31.21	4.119	61.0
31.30	4.127	53.5
Site 526 (Cont.)		
31.41	4.137	61.2
31.49	4.144	52.5
31.60	4.154	58.9
31.71	4.164	66.9
31.81	4.173	50.0
32.01	4.191	55.4
32.11	4.200	52.6
32.20	4.208	62.7
33.05	4.284	46.5
33.66	4.339	75.3
34.55	4.419	64.9
36.05	4.526	78.2
38.02	4.609	43.1
39.52	4.673	41.8
41.02	4.737	59.2
41.31	4.749	54.4
41.42	4.754	57.1
41.52	4.758	51.9
41.75	4.768	57.0
41.91	4.775	54.0
42.10	4.783	51.5
42.31	4.792	45.1
42.51	4.800	41.0
42.66	4.807	49.3
43.39	4.838	55.3
44.31	4.877	37.5
44.42	4.882	51.4
44.50	4.885	42.9
44.70	4.894	50.7
44.90	4.902	55.5
44.89	4.902	44.4
45.10	4.911	50.7
45.30	4.919	46.0
45.50	4.928	39.6
45.62	4.933	32.5
46.39	4.966	59.6
46.51	4.971	51.4
46.61	4.975	57.9
46.71	4.979	61.3
46.80	4.983	24.6
47.00	4.991	50.0
47.07	4.994	49.4
47.14	4.997	54.5
47.31	5.019	38.4
47.40	5.034	42.9
47.52	5.054	48.4
47.57	5.063	42.5
47.71	5.086	37.5
47.80	5.102	36.1
47.89	5.117	55.9
47.91	5.120	41.5
48.00	5.135	37.1
48.11	5.154	38.7
48.20	5.169	39.3
48.40	5.203	40.2
48.64	5.244	41.4
48.70	5.254	21.3
48.81	5.273	33.5
48.90	5.288	33.5
49.01	5.306	41.3
49.07	5.317	21.6
49.22	5.342	42.8
49.30	5.356	39.9
49.39	5.371	52.2
49.41	5.374	48.8
49.50	5.389	32.6
49.61	5.408	41.3
49.70	5.423	47.5
49.81	5.442	46.9
49.90	5.457	49.0
49.99	5.472	54.4
50.01	5.476	32.9
50.11	5.493	30.6
50.21	5.510	34.2
50.31	5.527	25.4
50.41	5.544	31.1
50.51	5.560	31.5
50.71	5.594	20.8
50.81	5.611	32.8
50.91	5.628	35.6
51.01	5.645	44.0
51.11	5.662	39.3
51.21	5.679	14.3
51.21	5.679	42.8
51.31	5.696	36.5
51.41	5.713	46.5
51.51	5.730	50.0
51.61	5.747	16.5
51.61	5.747	18.4
51.61	5.747	18.4
51.71	5.764	45.2
51.71	5.764	46.4
51.80	5.779	14.0
51.81	5.781	14.0
52.00	5.813	39.8
52.01	5.814	39.8
52.01	5.814	53.1
Site 526 (Cont.)		
52.11	5.831	57.4
52.20	5.847	45.2
52.21	5.848	48.7
52.40	5.881	46.4
52.41	5.882	46.4
52.60	5.914	49.4
52.61	5.916	49.4
52.80	5.948	16.7
52.81	5.950	16.7
53.10	5.999	43.7
53.11	6.001	43.7
53.30	6.033	28.6
53.31	6.035	28.6
53,50	6.067	34.3
53.51	6.068	34.3
53.70	6.101	24.9
53.71	6.102	24.9
53.90	6.134	40.0
53.91	6.136	40.0
54.10	6.168	50.8
54.11	6.170	50.8
54.30	6.202	34.1
54.31	6.204	34.1
56.03	6.495	15.1
56.20	6.524	35.4
56.40	6.558	47.8
56.60	6.592	48.7
56.82	6.629	42.0
57.00	6.659	37.0
57.26	6.703	38.1
57.53	6.749	37.0
57.70	6.778	39.4
57.90	6.812	55.2
58.10	6.846	42.2
58.30	6.880	34.0
58.50	6.913	33.5
58.70	6.947	41.2
58.85	6.973	51.5
60.40	7.235	52.4
60.60	7.269	41.4
60.80	7.303	51.3
61.00	7.337	48.0
61.20	7.371	28.0
61.40	7.404	51.9
61.60	7.438	47.2
61.66	7.448	48.5
61.76	7.465	54.0
61.90	7.489	66.3
62.10	7.523	46.9
62.30	7.557	44.1
52.50	7.591	44.3
62.70	7.625	44.7
62.90	7.658	52.3
63.10	7.692	57.0
63.16	7.702	50.4
63.26	7.719	49.8
63.40	7.743	51.5
63.41	7.745	58.2
63.41	7.745	58.2
63.60	7.777	28.8
63.60	7.777	49.1
63.61	7.779	49.1
63.80	7.811	60.0
63.81	7.813	60.0
64.00	7.845	59.7
64.01	7.846	59.7
64.20	7.879	62.7
64.21	7.880	62.7
64.40	7.912	65.7
64.41	7.914	65.7
64.60	7.946	60.4
64.80	7.980	57.9
64.80	7.980	57.9
65.00	8.014	53.1
65.01	8.016	63.7
65.01	8.016	53.1
65.20	8.048	58.3
65.21	8.050	58.3
54.40	8.082	57.1
65.41	8.083	57.1
65.60	8.116	62.4
65.61	8.117	62.4
65.80	8.149	55.8
65.81	8.151	55.8
66.00	8.183	57.5
66.01	8.185	57.5
66.15	8.209	56.1
66.16	8.210	56.1
66.30	8.234	46.5
66.30	8.234	46.5
66.50	8.268	47.3
66.50	8.268	47.3
66.51	8.270	57.3
66.61	8.287	60.4
66.70	8.302	60.1
66.70	8.302	60.1
68.97	8.689	55.9
Site 526 (Cont.)		
72.21	9.246	26.5
72.41	9.281	29.9
72.61	9.315	29.7
72.81	9.350	37.1
73.01	9.384	29.8
73.21	9.418	23.6
73.41	9.453	18.5
73.61	9.487	58.5
73.85	9.529	23.6
74.01	9.556	57.7
74.08	9.568	52.2
74.38	9.620	54.5
74.51	9.642	22.8
74.71	9.676	58.4
75.11	9.745	46.9
75.29	9.776	50.5
75.48	9.809	58.4
75.51	9.814	64.3
75.68	9.843	54.5
75.90	9.881	54.7
76.71	10.020	54.1
77.61	10.175	59.7
78.01	10.244	61.0
78.21	10.278	56.9
78.41	10.313	55.4
78.61	10.347	55.5
78.81	10.382	67.5
79.21	10.450	51.0
79.41	10.485	56.5
79.61	10.519	62.2
79.81	10.554	66.9
80.01	10.588	57.6
82.41	10.938	64.2
83.01	11.025	55.8
83.21	11.054	57.3
83.41	11.083	58.3
83.61	11.112	51.0
83.81	11.141	54.6
84.21	11.199	52.9
84.41	11.228	49.0
84.61	11.257	51.6
85.01	11.315	45.9
85.57	11.396	54.0
87.07	11.614	51.0
88.57	11.832	47.4
90.01	12.050	58.7
90.21	12.086	54.3
91.61	12.336	55.9
93.21	12.621	54.4
95.31	12.870	49.7
95.61	12.889	63.6
95.81	12.902	62.3
96.01	12.915	49.1
96.21	12.928	58.4
96.41	12.940	41.2
96.61	12.953	49.6
96.81	12.966	55.8
97.11	12.985	56.2
97.31	12.998	52.0
97.51	13.011	54.8
97.71	13.023	58.4
98.11	13.049	60.8
98.49	13.073	56.3
98.71	13.087	55.0
98.91	13.100	53.0
99.11	13.113	45.5
99.31	13.125	56.0
99.51	13.138	60.5
99.81	13.157	66.2
100.11	13.176	62.5
100.31	13.189	49.5
100.71	13.215	60.0
101.11	13.240	47.6
101.61	13.272	57.7
101.91	13.291	46.1
103.00	13.361	48.2
103.01	13.361	48.2
103.21	13.374	55.3
103.20	13.374	55.3
103.40	13.386	55.6
103.41	13.387	53.5
103.60	13.399	49.3
103.61	13.400	49.3
103.80	13.412	49.5
103.81	13.412	49.5
104.01	13.425	53.9
104.00	13.425	53.9
104.20	13.437	55.7
104.21	13.438	55.7
104.50	13.456	45.5
104.51	13.457	45.5
104.70	13.469	63.6
104.71	13.470	63.7
104.91	13.483	55.3
104.91	13.483	55.6
105.10	13.495	56.4
105.11	13.495	56.4

Appendix B. (Continued).

Sub-bottom Depth (m)	Age (Ma)[b]	Sediment (%)
Site 526 (Cont.)		
105.30	13.507	44.6
105.31	13.508	44.6
105.50	13.520	54.9
105.51	13.521	54.9
105.70	13.533	55.3
105.71	13.534	55.3
106.00	13.552	49.2
106.01	13.553	49.2
106.20	13.565	50.1
106.21	13.566	50.1
106.40	13.578	55.2
106.41	13.578	55.2
106.60	13.590	63.6
106.61	13.591	63.6
106.80	13.612	61.3
106.81	14.614	61.3
107.81	13.856	66.9
109.31	14.217	53.7
110.81	14.579	62.3
111.91	14.844	41.4
112.01	14.868	50.6
112.21	14.916	50.5
112.41	14.965	54.3
112.61	15.013	59.4
112.81	15.061	52.6
113.01	15.109	57.9
113.41	15.206	48.9
113.51	15.230	49.0
113.81	15.302	48.7
114.01	15.351	56.6
113.21	15.399	50.0
114.41	15.447	49.2
114.71	15.559	55.5
114.91	15.708	56.7
115.01	15.782	58.3
115.31	16.005	54.7
115.71	16.302	53.4
115.91	16.450	52.8
116.27	16.718	52.8
116.41	16.822	55.4
116.51	16.896	65.4
117.01	17.270	70.1
117.40	17.563	61.4
117.70	17.628	57.1
117.90	17.650	48.9
118.10	17.672	50.4
118.30	17.694	44.4
118.50	17.716	30.5
118.70	17.738	46.7
118.90	17.760	37.3
119.40	17.815	41.5
119.60	17.837	44.2
119.80	17.859	47.1
120.00	17.881	44.2
120.20	17.903	45.3
120.60	17.947	44.3
121.31	19.200	41.8
122.81	22.817	41.7
124.31	22.849	42.1
126.77	22.900	26.8
128.27	22.932	37.4
129.65	22.961	41.2
131.53	23.000	31.4
132.65	23.024	14.2
135.74	23.089	31.6
137.24	23.120	28.6
140.06	23.179	27.7
141.56	23.211	24.2
147.34	23.332	37.6
148.84	23.364	32.1
150.36	23.396	34.1
151.71	23.424	3.5
153.21	23.456	25.0
154.71	23.487	31.6
156.02	23.515	38.8
157.52	23.546	18.6
160.11	23.609	36.0
160.65	23.849	21.0
162.15	24.517	38.3
163.65	25.185	26.8
164.51	25.567	22.3
166.01	26.235	31.3
169.20	27.655	20.6
169.50	27.788	21.0
170.20	28.100	26.1
171.00	28.227	22.7
171.20	28.258	20.4
172.02	28.388	18.1
173.40	28.606	8.2
174.40	28.765	8.7
174.54	28.787	7.3
175.31	28.909	7.4
175.50	28.939	4.8
175.70	28.971	3.0
176.10	29.034	5.1
176.40	29.081	6.2
176.60	29.113	8.5
Site 526 (Cont.)		
177.71	29.289	8.1
177.80	29.303	8.2
178.81	29.463	2.8
180.11	29.668	12.0
180.50	29.730	2.8
180.71	29.763	3.2
180.80	29.778	3.6
182.20	29.999	3.7
183.20	30.158	4.3
184.20	30.318	4.8
185.19	30.494	2.8
186.20	30.674	4.7
187.46	30.899	3.9
188.70	31.119	3.7
188.96	31.166	6.3
190.46	31.433	4.8
193.69	32.008	3.9
196.00	32.420	5.5
199.00	32.954	3.7
200.40	33.204	6.2
201.90	33.471	7.9
203.38	33.735	8.6
204.76	33.981	11.4
206.26	34.248	6.3
211.00	35.092	7.6
213.21	35.486	7.7
214.71	35.753	12.7
216.21	36.020	9.1
217.71	36.288	7.7
219.21	36.555	18.8
220.71	36.822	35.8
Site 527		
3.38	0.310	15.2
9.55	1.140	11.8
20.06	2.571	7.1
20.16	2.587	8.3
20.26	2.603	14.7
20.46	2.634	12.6
20.56	2.650	12.8
20.66	2.666	13.2
22.20	2.908	9.3
28.70	3.314	8.2
40.60	3.795	8.6
50.10	4.260	2.5
58.35	4.938	3.9
69.19	5.784	3.5
75.94	6.309	3.1
89.90	7.394	3.6
98.10	8.032	27.6
98.10	8.032	2.1
98.30	8.048	1.7
104.51	10.361	4.0
106.01	10.939	1.4
106.01	10.939	13.9
107.51	11.289	1.6
107.51	11.289	11.4
109.01	11.640	1.5
110.51	11.991	2.1
112.01	12.340	1.9
113.51	25.945	1.5
121.15	36.020	0.1
122.65	36.311	0.2
123.48	36.473	0.6
134.71	41.852	0.2
137.51	45.031	0.6
138.01	45.989	1.0
138.61	47.140	0.4
138.71	47.332	0.3
138.81	47.523	0.8
139.23	47.640	1.0
139.45	47.662	0.6
142.27	48.332	0.4
142.31	48.346	0.7
142.48	48.406	0.9
142.71	48.488	1.4
142.88	48.548	1.2
143.11	48.629	0.7
143.29	48.693	1.1
143.61	48.805	3.0
143.77	48.860	2.1
143.81	48.873	2.5
144.21	49.010	2.8
144.52	49.117	2.5
144.79	49.209	1.7
145.11	49.319	2.8
145.31	49.387	1.5
145.76	49.542	2.8
146.28	49.720	1.3
146.61	49.833	2.5
146.77	49.888	1.9
147.02	49.973	2.7
147.09	49.997	3.0
147.33	50.080	3.6
147.68	50.199	1.0
147.93	50.285	0.7
148.24	50.384	1.2
Site 527 (Cont.)		
148.27	50.393	0.6
152.26	51.561	0.5
152.28	51.567	0.6
152.56	51.648	0.8
153.60	51.956	1.2
153.70	52.015	0.3
153.78	52.062	0.8
153.80	52.073	1.5
156.78	53.086	2.5
161.50	54.159	2.6
163.07	54.516	3.8
167.50	55.084	4.6
168.91	55.234	2.9
170.50	55.402	6.6
171.70	55.530	6.9
172.29	55.592	4.0
175.65	55.850	5.3
180.17	56.166	3.5
180.40	56.182	3.0
184.71	56.483	9.0
185.90	56.566	6.7
189.85	56.842	6.5
199.81	57.538	3.5
202.24	57.708	2.7
204.31	57.853	2.2
210.50	58.285	2.6
218.14	58.819	8.0
218.30	58.830	1.5
218.34	58.833	4.9
218.63	58.853	3.5
219.38	58.906	7.6
219.72	58.930	7.4
219.89	58.942	5.9
220.21	58.974	1.6
220.74	59.027	7.0
220.98	59.051	5.3
221.11	59.064	7.1
227.85	59.741	6.5
229.98	59.954	1.4
232.14	60.171	0.9
239.21	60.892	2.4
243.71	61.385	4.7
245.21	61.549	9.7
247.08	61.753	0.2
248.46	61.904	1.7
256.21	62.752	9.4
256.81	62.818	5.9
257.13	62.853	5.3
257.56	62.900	5.3
257.87	62.934	5.2
258.11	62.960	5.4
258.17	62.967	4.0
258.63	63.017	2.9
258.87	63.060	2.7
259.26	63.159	3.3
259.47	63.212	4.9
259.60	63.245	4.6
259.60	63.245	4.2
260.22	63.401	2.5
260.64	63.507	4.5
260.91	63.556	5.5
266.35	64.170	9.8
267.31	64.279	18.8
267.51	64.307	18.3
267.72	64.343	12.6
267.79	64.356	11.2
267.82	64.361	6.2
267.92	64.378	12.5
268.11	64.411	12.2
268.41	64.463	10.6
268.68	64.509	12.5
268.92	64.551	13.0
269.10	64.582	9.5
269.35	64.625	5.7
269.44	64.640	14.1
269.54	64.658	8.2
269.71	64.687	6.4
269.89	64.718	8.7
270.10	64.754	7.5
270.31	64.790	10.0
270.50	64.823	5.6
270.71	64.859	7.7
270.89	64.890	8.0
271.07	64.922	5.0
271.11	64.928	5.7
271.46	64.989	4.8
271.71	65.032	4.4
271.92	65.068	3.6
272.14	65.106	2.4
272.30	65.140	5.0
272.51	65.193	4.3
272.71	65.244	2.9
272.91	65.295	3.2
273.22	65.373	0.2
273.25	65.381	2.3
273.44	65.429	9.5
273.61	65.472	6.7
Site 527 (Cont.)		
273.82	65.516	4.2
274.01	65.545	5.7
274.20	65.575	6.2
274.41	65.607	6.3
275.14	65.721	0.6
275.15	65.723	11.8
275.25	65.738	1.4
275.28	65.743	4.8
275.32	65.749	4.7
275.36	65.756	1.5
275.52	65.780	1.4
275.71	65.810	0.6
276.07	65.866	14.6
276.21	65.888	6.6
276.21	65.888	8.1
276.28	65.899	9.3
276.49	65.932	5.6
276.55	65.941	11.7
276.74	65.971	14.3
276.92	65.999	16.1
277.11	66.028	19.1
277.22	66.045	10.3
277.42	66.076	7.4
277.73	66.125	8.2
277.94	66.158	12.6
278.28	66.208	5.4
278.35	66.218	3.3
278.81	66.286	3.4
279.06	66.322	11.2
279.28	66.355	12.5
279.45	66.379	8.2
279.48	66.384	4.7
279.65	66.409	18.7
279.72	66.419	10.1
279.80	66.431	16.6
279.87	66.441	0.6
279.92	66.448	4.4
280.11	66.465	2.9
280.19	66.468	5.2
280.19	66.468	3.5
280.29	66.472	3.5
280.50	66.481	3.5
280.51	66.482	3.2
280.51	66.482	2.5
280.69	66.489	3.3
280.81	66.494	4.7
280.81	66.494	1.4
280.86	66.496	2.9
281.11	66.507	4.7
281.20	66.511	4.1
281.39	66.519	6.7
281.41	66.520	4.8
281.60	66.528	2.3
281.71	66.532	2.1
281.81	66.537	0.6
282.01	66.545	5.5
282.21	66.554	1.6
282.21	66.554	1.9
282.41	66.562	5.0
282.62	66.571	2.2
282.70	66.574	3.5
283.14	66.593	4.5
283.32	66.601	0.5
284.20	66.638	7.8
285.10	66.676	0.1
285.16	66.679	1.6
289.40	66.855	2.5
294.66	67.073	4.2
298.58	67.235	1.0
304.33	67.473	2.6
307.50	67.604	1.2
313.81	67.865	5.7
317.99	68.038	4.4
322.90	68.242	3.8
323.30	68.258	8.4
327.01	68.412	8.1
331.72	68.606	2.2
332.80	68.651	5.9
361.56	69.841	6.6
Site 528		
1.10	0.124	12.3
4.54	0.513	14.0
4.87	0.550	14.8
4.94	0.558	22.5
5.34	0.603	20.9
5.57	0.629	25.4
5.95	0.672	19.9
6.56	0.741	13.9
6.76	0.763	13.3
6.86	0.775	7.0
7.56	0.854	20.2
8.87	1.002	21.9
8.87	1.002	21.9
8.95	1.011	25.6
8.95	1.011	25.6
8.95	1.011	25.6

Appendix B. (Continued).

Sub-bottom Depth (m)	Age (Ma)[b]	Sediment (%)
Site 528 (Cont.)		
9.05	1.022	27.6
9.05	1.022	27.6
9.15	1.033	21.3
9.15	1.033	21.3
9.35	1.056	13.2
9.35	1.056	13.2
9.44	1.066	8.6
9.45	1.067	8.6
9.55	1.078	23.4
9.55	1.078	23.4
9.75	1.101	22.9
9.75	1.101	22.9
9.95	1.124	15.7
9.95	1.124	15.7
10.05	1.135	18.6
10.05	1.135	18.6
10.15	1.146	14.8
10.15	1.146	14.8
10.25	1.158	19.8
10.25	1.158	19.8
10.35	1.169	19.6
10.35	1.169	19.6
10.45	1.180	22.4
10.45	1.180	21.8
10.55	1.191	20.2
10.55	1.191	20.2
10.62	1.199	16.2
10.62	1.199	16.2
10.75	1.214	23.1
10.75	1.214	23.1
10.83	1.223	20.5
10.85	1.225	20.5
10.95	1.237	17.6
10.95	1.237	17.6
10.96	1.238	17.4
11.03	1.246	24.6
11.05	1.248	24.5
11.15	1.259	24.6
11.15	1.259	24.6
11.25	1.270	20.9
11.25	1.270	20.9
11.35	1.282	23.0
11.55	1.304	24.5
11.55	1.304	24.5
11.64	1.314	18.0
11.65	1.316	18.0
11.75	1.327	13.6
11.75	1.327	13.6
11.85	1.338	20.1
11.85	1.338	20.2
11.95	1.349	23.8
12.15	1.372	19.8
12.35	1.395	16.6
12.35	1.395	25.0
12.55	1.417	45.6
12.65	1.429	26.0
12.73	1.438	24.6
13.15	1.470	33.5
13.35	1.483	30.6
13.55	1.497	11.1
13.75	1.510	22.6
13.86	1.517	24.3
13.95	1.523	18.2
14.05	1.529	28.7
14.15	1.536	22.1
14.35	1.549	20.3
14.75	1.575	26.3
14.95	1.588	12.7
15.05	1.595	18.8
15.18	1.603	21.2
15.25	1.608	20.1
15.35	1.615	19.5
15.75	1.641	28.8
15.86	1.648	23.2
15.95	1.654	17.0
16.15	1.667	19.1
19.15	1.864	25.5
19.26	1.871	20.7
19.46	1.884	20.1
19.55	1.890	21.0
19.65	1.897	20.5
Site 528 (Cont.)		
19.75	1.907	19.1
19.85	1.922	18.4
19.95	1.937	15.9
20.05	1.952	16.0
20.15	1.966	15.0
20.26	1.982	15.3
20.49	2.016	14.2
20.53	2.022	13.7
20.65	2.040	12.9
20.85	2.069	15.7
22.15	2.261	6.6
22.55	2.320	17.0
22.75	2.349	13.9
22.75	2.349	13.9
22.95	2.379	14.1
23.35	2.437	5.8
23.65	2.482	11.6
23.65	2.482	11.6
23.75	2.496	11.0
23.75	2.496	11.0
24.05	2.540	10.7
24.25	2.570	11.3
24.45	2.599	11.8
24.68	2.633	18.7
28.70	3.123	17.7
32.90	3.237	20.3
34.85	3.290	8.2
35.96	3.320	16.0
36.66	3.339	10.5
37.80	3.370	12.9
42.20	3.489	13.4
43.55	3.525	18.5
43.95	3.536	12.3
44.15	3.542	16.5
44.25	3.544	16.1
44.35	3.547	40.9
44.45	3.550	17.0
44.55	3.553	17.9
44.75	3.558	13.6
45.15	3.569	13.7
45.25	3.572	20.5
45.35	3.574	28.6
45.56	3.580	24.9
46.10	3.595	12.9
48.01	3.703	18.0
51.01	3.884	14.7
55.33	4.394	9.1
57.79	4.609	10.3
61.56	4.797	5.9
64.09	4.922	5.0
65.70	5.005	4.8
66.23	5.055	6.5
70.66	5.471	3.2
77.64	6.128	1.8
81.10	6.454	3.4
87.60	7.065	2.7
93.20	7.592	1.3
98.76	8.115	1.8
99.10	8.147	1.7
100.70	8.298	2.4
105.55	9.437	6.2
106.99	9.937	7.9
108.08	10.315	7.1
111.30	11.122	5.5
111.95	11.263	25.2
112.95	11.480	5.8
113.15	11.524	4.6
113.24	11.543	4.3
116.91	12.534	2.3
118.90	16.514	3.1
119.15	16.523	2.8
122.25	16.637	3.2
128.70	16.872	5.4
132.50	17.333	0.4
143.10	17.932	0.3
157.03	22.094	0.3
166.20	24.336	3.1
177.50	27.061	0.8
185.60	29.464	0.6
195.10	31.950	0.2
Site 528 (Cont.)		
198.70	32.496	0.2
207.94	33.668	3.1
225.41	35.784	0.9
225.67	35.820	0.6
227.50	37.051	0.1
227.54	37.063	0.1
236.40	39.688	1.1
236.48	39.711	1.0
237.60	40.043	1.6
237.98	40.156	0.8
246.18	44.794	1.5
246.40	44.920	2.0
247.90	45.776	8.6
249.40	46.439	8.4
250.44	46.784	5.2
250.60	46.837	2.4
252.00	47.302	1.8
255.51	48.338	1.9
255.80	48.415	3.0
256.61	48.632	2.5
257.47	49.311	1.8
258.51	50.507	1.6
258.90	50.747	2.7
260.51	51.741	2.3
263.01	52.630	1.6
266.60	53.388	2.4
269.70	54.018	1.4
275.00	54.503	2.0
284.11	55.337	2.4
284.30	55.354	2.2
285.74	55.438	2.3
294.00	55.775	3.8
306.46	56.284	3.5
313.96	57.650	2.8
314.02	57.653	7.3
322.58	58.212	3.8
333.11	58.898	9.1
334.30	59.027	6.0
350.78	61.124	6.6
361.50	61.448	6.8
361.98	61.463	8.6
370.74	61.728	13.3
379.13	61.983	8.5
380.52	62.075	6.2
383.05	62.307	8.1
383.07	62.309	6.6
390.77	63.016	11.6
391.72	63.160	9.9
393.21	63.905	13.3
398.53	65.292	62.7
400.31	65.587	40.1
401.32	65.691	6.7
403.16	65.880	12.6
404.38	66.006	29.6
407.00	66.460	19.6
407.00	66.460	37.2
407.42	66.479	10.0
408.00	66.504	6.4
424.48	67.318	23.4
428.37	67.520	16.6
438.85	68.065	14.5
453.55	68.828	73.5
Site 529		
7.61	0.999	32.8
79.39	21.204	11.1
88.89	22.950	7.3
95.39	23.092	9.6
96.89	23.125	20.6
99.89	23.191	15.5
101.31	23.222	13.4
102.81	23.255	12.2
109.31	23.397	39.6
112.31	23.463	21.3
115.81	23.540	15.8
117.31	23.573	14.7
120.31	24.004	11.5
121.81	24.348	11.8
125.31	25.152	4.8
129.80	26.183	9.4
Site 529 (Cont.)		
129.81	26.185	5.3
136.31	27.678	15.9
136.31	27.678	16.5
137.81	28.022	14.4
137.81	28.022	13.4
139.31	28.409	17.6
139.31	28.409	17.6
142.61	29.288	13.3
142.61	29.288	6.1
144.11	29.688	6.3
144.11	29.688	6.3
145.61	30.087	5.0
145.61	30.087	4.9
147.11	30.487	3.3
148.61	30.886	3.6
150.11	31.286	3.9
150.11	31.286	3.7
154.91	32.565	4.7
156.41	32.964	2.8
156.41	32.964	2.5
160.91	34.163	5.7
170.73	34.774	10.3
175.23	34.870	6.7
176.73	34.901	5.6
176.73	34.901	5.4
182.13	35.016	4.3
183.63	35.048	7.8
185.13	35.080	5.5
186.63	35.173	5.9
188.13	35.370	6.5
190.21	35.643	7.4
191.71	35.840	6.8
193.21	36.037	8.3
194.71	36.234	3.3
195.23	36.302	6.7
197.42	36.589	3.1
198.78	36.767	5.0
198.99	36.795	5.0
199.19	36.821	3.4
199.49	36.861	2.6
200.13	37.059	22.8
200.29	37.133	20.7
200.77	37.357	28.8
201.00	37.465	30.7
201.38	37.642	24.3
201.63	37.759	36.0
202.19	38.020	24.2
202.57	38.197	18.4
202.83	38.318	24.3
203.50	38.631	21.6
203.52	38.640	21.8
204.00	38.864	21.7
205.19	39.420	23.0
205.38	39.508	25.9
206.69	40.120	23.2
207.00	40.264	15.0
207.34	40.423	30.5
208.53	40.978	10.9
250.91	55.282	3.6
262.26	56.132	2.2
287.10	59.367	18.5
295.56	59.591	17.4
298.58	59.671	18.4
300.07	59.711	2.8
305.08	59.844	10.4
306.65	59.885	10.3
308.17	59.926	2.7
314.55	60.095	10.1
315.81	60.184	7.3
324.29	60.908	12.4
325.57	61.025	29.5
325.59	61.026	19.3
328.56	61.296	17.8
335.07	61.675	11.1
338.01	61.745	15.1
341.14	61.820	4.9
352.09	62.408	7.9
360.30	63.396	6.1
362.02	63.603	10.1

[a] Data from both Cambridge (NJS) and Keil (DF).
[b] Age estimated by interpolation between control levels for Table 1.