OCEAN DRILLING PROGRAM

LEG 105 SCIENTIFIC PROSPECTUS

LABRADOR SEA - BAFFIN BAY

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INTRODUCTION

The Labrador Sea and Baffin Bay are small ocean basins that form a principal conduit between the Arctic and the western Atlantic Oceans. These basins have played important roles, not only in the exchange of waters between major oceans but also as the primary moisture sources and outlets for the three largest Late Cenozoic ice-sheets. Both of these basins have calcareous and siliceous microfossil records and therefore are uniquely suited for high latitude paleoceanographic study. Leg 105 of the Ocean Drilling Program will drill at several locations (two of which may be re-entry sites) during the late summer and early fall of 1985 in order to examine the tectonic and paleoceanographic evolution of the Labrador Sea and Baffin Bay.

Leg 105 is scheduled to sail from St. John's, Newfoundland, Canada, on August 26, 1985. The locations of the target sites are indicated in Figure 1. Drilling to early post-rift sediments in Baffin Bay will obtain a record of the development of this high latitude basin. Drilling to basement in the Labrador Sea will not only yield a nearly continuous Eocene-Oligocene section for paleoceanographic study, but will also place important constraints upon the sea floor spreading history of this region. The leg will end in St John's, Newfoundland, Canada on October 26, 1985.

PREVIOUS WORK

The exact chronology of sea floor spreading in the Labrador Sea is not clearly understood in spite of the numerous wells which have been drilled on the adjacent continental margins and the regional geophysical surveys which have been conducted in the basin. The geology of the adjacent Canadian shelf is well known from approximately 20 industry drill holes and extensive coverage by industry seismic data (Cutt and Laving, 1977; Umpleby, 1979; McWhae, 1981), but only six wells have been drilled on the Greenland margin. Multichannel seismic lines (Hinz et al., 1979) cross the northern Labrador Sea and tie the pre-Miocene stratigraphic sections in the shelf wells to deep basin seismostratigraphy. This stratigraphic framework is further constrained by an extensive grid of single channel seismic profiles in the deep basin. Detailed regional magnetic and gravity coverage has been completed during the last decade (Figure 2), and these data serve as the primary source of information regarding the geologic evolution of the Labrador Sea (Srivastava et al., 1981).

Interpretation of the available geophysical data is limited by the lack of deep basin geologic information. DSDP Leg 12 drilled three holes in the southern Labrador Sea which allowed a coarse stratigraphic framework of this basin to be developed (Laughton and Berggren et al., 1972). Of these, only Site 112 penetrated oceanic basement. Unfortunately, this site was drilled on a basement high, and it did not allow a first order dating of the seafloor spreading anomaly at this site. Hole 111 was drilled on Orphan Knoll at the base of the continental rise and bottomed in Late Jurassic sediments. Hole 113 was drilled in the north central Labrador Sea but the oldest sediments cored were only of Miocene age.

Based on the available data our understanding of the evolution of the Labrador Sea is as follows:

> During Late Cretaceous time, Greenland and Europe separated from North America and seafloor spreading began in the Labrador Sea. During this phase about two thirds of the Labrador Sea was formed, producing a sequence of anomalies (25-33) which lie on either side of the central zone of the Labrador Sea (Figures 2 and 3).
>
> The direction of spreading in the Labrador Sea as shown by magnetic and fracture zone trends changed at about anomaly 24 time. This change probably relates to the beginning of active seafloor spreading in the Norwegian Sea and to the pronounced volcanic activity in the Davis Strait/Greenland/Iceland/Faroe Ridge belt.
>
> After anomaly 20 time seafloor spreading in the Labrador Sea slowed down considerably and ultimately stopped prior to the formation of anomaly 13. This period is marked by a magnetically quiet zone in the central part of the Labrador Sea. The quiet zone is symmetrical about a pronounced gravity low, which has been interpreted as evidence for the presence of a median valley covered by more than 3 km of sediments.

Unlike the Labrador Sea, the evolution of Baffin Bay is poorly constrained. No wells have been drilled north of Davis Strait, although there is extensive industry seismic coverage of this area. Arguments concerning the mechanisms for the formation of Baffin Bay either through spreading (Keen and Keen, 1974; Keen and Pierce, 1982) or foundering (Grant, 1982) are thwarted by a lack of stratigraphic information in the form of continuous sections of Baffin Bay sediments. The presence of upper Cretaceous and Paleogene marine sediments in West Greenland and in the Canadian shelf provides hints regarding the timing of the opening, but the sense of movement is unconstrained.

Detailed magnetic measurements made in central Baffin Bay reveal the presence of magnetic lineations; a gravity low, similar to that observed over extinct ridges in the Labrador Sea, is also observed across this area. Interpretation of the spreading history is difficult because the magnetic anomalies are difficult to correlate over large distances (Jackson et al., 1979). In spite of the lack of direct evidence for sea floor spreading in this basin, some idea of the mode of origin may be obtained from rigid plate reconstructions of Greenland relative to North America based on the Labrador Sea data. Such reconstructions show a significant opening of Baffin Bay by Eocene time (Gradstein and Srivastava, 1980).

Sediment thicknesses in Baffin Bay are as great as 5000 m, thereby rendering basement inaccessible to drilling. Presumed syn-rift and early post-rift sediments, however, lie at subbottom depths of less than 1000 m in places. Recovery of Paleocene and Late Cretaceous sediments from such locations would provide information on the age and subsidence history of early post-rift sediments in Baffin Bay.

PALEOGENE PALEOCEANOGRAPHY

The early history of the Labrador Sea-Baffin Bay ocean basin is outlined in Figure 3 (Gradstein and Srivastava, 1980). A general history of the surface water distribution is known from the available data, but the details are poorly understood. Analog circulation experiments and reconstructions of a broad paleocirculation scenario through Cenozoic time favor poleward circulation through the Labrador Sea-Baffin Bay Seaway (Berggren and Hollister, 1974). This is supported by the presence of Campanian or Maastrichtian planktonic foraminifera in the Nugssuag shales in West Greenland which were brought by Atlantic rather than Arctic surface water. Additional micropaleontological data from these basins are needed to resolve the issue of surface flow through these basins and its dependence upon glacial-interglacial regimes.

Evidence of warm climatic conditions in the early to early-middle Eocene time is widespread in high latitudes around the North Atlantic. The most striking example of this is the vertebrate record of the Eureka Sound formation in Ellesmere Island, north of Baffin Bay. The data indicate that mean temperatures in the coldest month were above 10-12°C. These findings agree with the Paleogene paleobotanical records on Greenland, Svalbard and the Canadian Arctic Islands and with the northward shift of the low to mid-latitude micropaleontolgical record in the Atlantic Ocean and Labrador Sea in the early to early-middle Eocene. The available climatic record indicates that a major period of cooling occurred in middle Eocene to early Oligocene time with a pronounced temperature drop at the Eocene-Oligocene boundary, coinciding with the development of the psychrosphere.

The sparse drilling record available from Site 112 exhibits a dramatic change in the benthic biota from a diversified Eocene benthic agglutinated foraminiferal assemblage to an Oligocene calcareous assemblage (Figure 4; Miller et al., 1982). This faunal change occurs about 100 m below the prominent mid-sediment reflector which was originally identified as reflector R4. More recent seismic stratigraphic correlations suggest that this may actually be equivalent to reflector R3, which is observed in the Northeast Atlantic. A reflector which correlates with R4 apparently underlies R3 in the Labrador Sea but is poorly resolved at Site 112. The R4 horizon is believed to mark a major change in abyssal circulation (Roberts, 1975; Miller and Tucholke, 1983). Thus, detailed stratigraphic information across this interval is critical to refining our understanding of the onset of this circulation.

The wide occurrence of late Eocene to Oligocene hiatuses in the world oceans, particularly in the North Atlantic, has left this time interval poorly understood. DSDP Site 112 in the Labrador Sea may be inferred to have continuous deposition across the Eocene-Oligocene boundary, but coring gaps and poor placement for seismic correlation limit the paleoceanographical-geological interpretations of results from this Hole. A seismostratigraphical framework is particularly needed so that correlations can then be made from the Labrador Sea-Eirik Drifts to the shelf sequences. Presumed synchrony of seismic reflectors noted in this region could then be used to interpret the depositional history of the basin.

LATE CENOZOIC PALEOCEANOGRAPHY

The Labrador Sea and Baffin Bay are situated immediately next to three of the major northern hemisphere ice sheets of the Late Cenozoic. The high sedimentation rate records from these areas will provide high resolution chronostratigraphies documenting the changes in these ice masses with time. These records will permit direct comparison between the Late Cenozoic foraminiferal, isotopic, palynological, and ice-rafted debris records from the Arctic and North Atlantic Ocean and provide a good opportunity to study the inter-related effects between orbital forcing and the high latitude atmosphere-hydrosphere-cryosphere system.

Two distinct models of the timing, driving mechanism and magnitude of the most recent glacial-interglacial climatic oscillations have recently been proposed. Each model was developed based on observations from individual ocean basins. The North Atlantic Model is based on deep-sea foram isotopic and biostratigraphic data (Ruddiman and McIntyre, 1981). It postulates a slow build-up of ice sheets followed by a rapid ice sheet disintegration triggered by iceberg calving and marine drawdown. This process results in the classic sawtooth shaped oxygen isotope curve (Figure 5A). The Arctic Model is largely based on dated organic material from raised marine deposits from Greenland and Canadian Arctic Islands (Andrews et al., 1983). This model postulates a very rapid build-up of ice sheets and an equally rapid disintegration. This model produces the "hummocky" record similar to that shown in Figure 5B.

Results from the study of deep-sea piston cores from 65 N in Davis Strait (Figure 6) show that this region registers a higher amplitude isotope signal for the stage 5/6 transition than the Norwegian Sea and that the light isotopic stages show a rectangular rather than saw-tooth pattern (Aksu, 1983). This suggests that the Labrador Sea record includes a high resolution regional isotopic signal in addition to a global meltwater signal and supports the Arctic Model of glaciation. The record of pollen influxes from the core, however, support the North Atlantic Model (Figure 7; Mudie and Short, 1984). Continuously cored deep-sea sediments from the Labrador Sea and Baffin Bay are an essential requirement for testing these controversial theories.

SUMMARY OF DRILLING OBJECTIVES

Despite extensive geophysical surveys, many basic geological questions regarding the evolution of the Labrador Sea and Baffin Bay remain unanswered. For example, uncertainty exists in the timing of opening and the spreading history of this part of the North Atlantic. Drilling to basement at Site LA-5 will allow first-order dating of the magnetic anomaly sequence, and thereby resolve much of the uncertainty in the timing of seafloor spreading in this region.

Baffin Bay contains one of the few passive margins where syn-rift and early post-rift sediments are accessible by drilling. Combined with the results obtained from Leg 103 drilling on the Galicia Margin, drilling Site

BB-3B to 2000 m sub-bottom depth will provide knowledge of the depositional environment and age of these sediments, which is important for modeling the tectonic history and associated crustal movements of passive margins in general.

The Labrador Sea and Baffin Bay contain high sedimentation rate sections which allow a number of critical paleoceanographic questions to be addressed. During Cretaceous through Eocene time the Labrador Sea and Baffin Bay were a corridor for the exchange of Arctic and Atlantic waters, but the exact configuration and paleobathymetric regime of this ocean seaway is not well known. Additional micropaleontologic data from the Labrador Sea and Baffin Bay sites will help distinguish between models of the surface water circulation.

The development of more vigorous deep circulation resulted in pronounced changes in the drift sedimentation in the North Atlantic and also caused a benthic faunal turnover at the Eocene/Oligocene boundary. Continuous coring at Sites LA-5 and BB-3B will allow the style and rate of change from pre-drift to drift deposition and the evidence for global late Eocene-Oligocene cooling to be studied.

The relatively small volume of the high latitude Labrador Sea and Baffin Bay (2/10th that of the Greenland-Norwegian Sea) appears to account for the high amplitude oxygen isotope and palynological signals recorded in piston cores (Aksu, 1983). The Labrador Sea and Baffin Bay are the major moisture sources to the Laurentide and Greenland-Innuitian ice sheets and also lie adjacent to their major outlets. These seas span the critical range of latitudes (55°N to 70°N) over which the dominant frequencies in insolation responses are predicted to change from 23,000 to 41,000 years. Hence, a continuous Late Cenozoic section from this area should allow testing of diverse theories regarding the causes of glaciation and the driving forces behind glacial-interglacial cycles.

Micropaleontologic studies of continuously cored sediments from these basins will examine the evolutionary responses of marine organisms to rapid and extreme environmental changes both in the Late Cenozoic section and also at the Eocene/Oligocene event.

Finally, the relatively small size of both the Labrador Sea and Baffin Bay, and the availability of data from wells on the continental shelf and slope, should make this a fruitful area for sediment budget studies related to sea level change, subsidence, paleocirculation changes and glaciation.

Drilling at target sites in the Labrador Sea and Baffin Bay (Figure 1) is planned to address these problems. Because of the uncertainty caused by the weather conditions in these basins, a number of alternate sites have been chosen that will allow the prime objectives of this leg to be met if the first priority sites cannot be drilled to completion. The objectives available at Sites BB-3B and LA-5 may be supplemented or substituted for by drilling at Sites LA-5A, LA-9, and LA-2A.

Site BB-3B is located in western Baffin Bay on the lower slope at a water depth of 2090 m (Figure 8). This site will provide a high latitude Eocene/Oligocene paleoceanographic record. The age and depositional environment of older sediments from this site will provide the first information on the style of early post-rift tectonics in Baffin Bay.

Site LA-5 is located off the Eirik Ridge at a water depth of 3350 m (Figure 9). Combined with the results from Site BB-3B this site will provide a high latitude framework for the Eocene through Oligocene cooling which led to the drastic biota and sedimentary change at the Eocene/Oligocene boundary. Drilling into basement on magnetic anomaly 23/24 will lead to a first order age calibration of the anomaly record in the Labrador Sea.

The Miocene/Eocene boundary occurs at 650-700 m subbottom depth at Site LA-5A (water depth 3463 m), which is approximately 27 km northeast of Site LA-5 (Figure 10). Combined with LA-9 this site forms an alternate to LA-5.

Site LA-9 (water depth 3867 m) is located between the Gloria Drift and the North Atlantic Mid-ocean Channel and will yield a predominantly hemipelagic record with minimal effects of carbonate diagenesis, thereby allowing a stable isotopic record of the last 10 m.y. to be obtained. Drilling through the sediments overlying the basement of anomaly 24 age will date two major mid-sediment reflectors, which are believed to be equivalent to reflectors R3 (mid-Oligocene) and R4 (upper Eocene to lowermost Oligocene) (Figure 11). This should establish a firm seismic stratigraphic framework for the Gloria Drift to the north.

Drilling at Site LA-2A, in the western Labrador Sea to the east of Saglek Bank, will extend the paleoceanographic transect established by BB-3B and LA-9 (Figure 12). This site will allow differentiation between the North Atlantic and Arctic models of glaciation-deglaciation.

Drilling Site BB-3B in Baffin Bay is given top priority for this leg although access to this site will be controlled by the amount of sea ice coverage in Baffin Bay. Leg 105 is scheduled to coincide with the ideal weather window for drilling in this area; however, the precise timing of when the sea ice will clear cannot be determined far in advance. Thus, four different drilling plans have been developed to optimize the use of the ship to meet the priorities for drilling in this area.

Based on data from the last ten years, it appears unlikely that Baffin Bay will be free of ice by the start of Leg 105. However, if it is, the JOIDES Resolution will proceed directly to Site BB-3B and return to the Labrador Sea after 25 days of operations. If the sea ice has not cleared by the start of the leg, the ship will begin drilling at Site LA-5. The remainder of the schedule will be dependent upon when the ice clears. These schedule options are outlined in Table 1 with the ultimate case (Option 4) being that Baffin Bay never clears. Option 2 is considered to be the most likely scenario for Leg 105.

LEG 105 OCEAN DRILLING PROGRAM
Labrador Sea - Baffin Bay
Location of Proposed Sites

Site Number	Latitude	Longitude	Water Depth	Max. Penetr.	Operations	Objectives
BB-3B	70°27'N	64°39'W	2090m	2000m	HPC/XCB re-entry	Sample sedimentary section for high latitude Eocene-Oligocene paleoceanogrphy. Sample early post-rift sediments.
LA-5	58°03'N	48°24'W	3400m	1475m	HPC re-entry	Sample sedimentary section for Eocene-Oligocene paleoceanography. Sample basement for for age calibration of magnetic anomalies.
LA-5A*	58°12.5'N	48°21.6'W	3463m	700m	HPC/XCB	Date drift deposits of Eirik Ridge. Sample high latitude section for Eocene-Oligocene paleoceanography.
LA-9*	53°19.0'N	45°16.0'W	3950m	850m	HPC/XCB	Date drift deposits of Gloria Drift. Sample basement for age calibration of magnetic anomalies.
LA-2A*	57°41.8'N	54°12.0'W	3300m	700m	HPC/XCB	Sample sedimentary section for E-W paleoceanographic transect.

* Alternate sites

OPTION 1

(If Baffin Bay clears by August 26)

Location	Transit Time	Drilling Time	Date
St. John's (depart)			26 Aug 1985
	6		
BB-3B (arrive)			1 Sept
(depart)		25	27 Sept
	3.5		
LA-5A (arrive)			30 Sept
(depart)		12	12 Oct
	1.3		
LA-9 (arrive)			13 Oct
(depart)		11	24 Oct
	2.0		
St John's (arrive)			26 Oct
	12.8	48	
			Total = 61 days

OPTION 2

(If Baffin Bay clears by Sept. 5)

Location	Transit Time	Drilling Time	Date
St. John's (depart)			26 Aug 85
	2		
LA-5A (arrive)			28 Aug
(depart)		12	8 Sept
	3.5		
BB-3B (arrive)			11 Sept
(depart)		25	6 Oct
	5		
LA-9 (arrive)			11 Oct
(depart)		12	24 Oct
	1.5		
St. John's (arrive)			26 Oct
	12	49	
			Total = 61 days

OPTION 3

(If Baffin Bay opens between Sept. 9 and Sept. 21)

Location	Transit Time	Drilling Time	Date
St. John's (depart)			26 Aug 1985
	2.7		
LA-5 (arrive)			29 Aug
(depart)		24	22 Sept
	3.5		
BB-3B (arrive)			26 Sept
(depart)		25	21 Oct
	6.0		
St.John's (arrive)			26 Oct
	12.2	49	

Total = 61.2 days

OPTION 4

(If Baffin Bay never clears)

Location	Transit Time	Drilling Time	Date
St.John's (depart)			26 Aug 1985
	2.5		
LA-5 (arrive)			29 Aug
(depart)		28	26 Sept
	1.3		
LA-9 (arrive)			27 Sept
(depart)		12.5	9 Oct
	1.7		
LA-2A (arrive)			11 Oct
(depart)		12.5	23 Oct
	2.5		
St. John's (arrive)			26 Oct
	8.0	53	

Total = 61 days

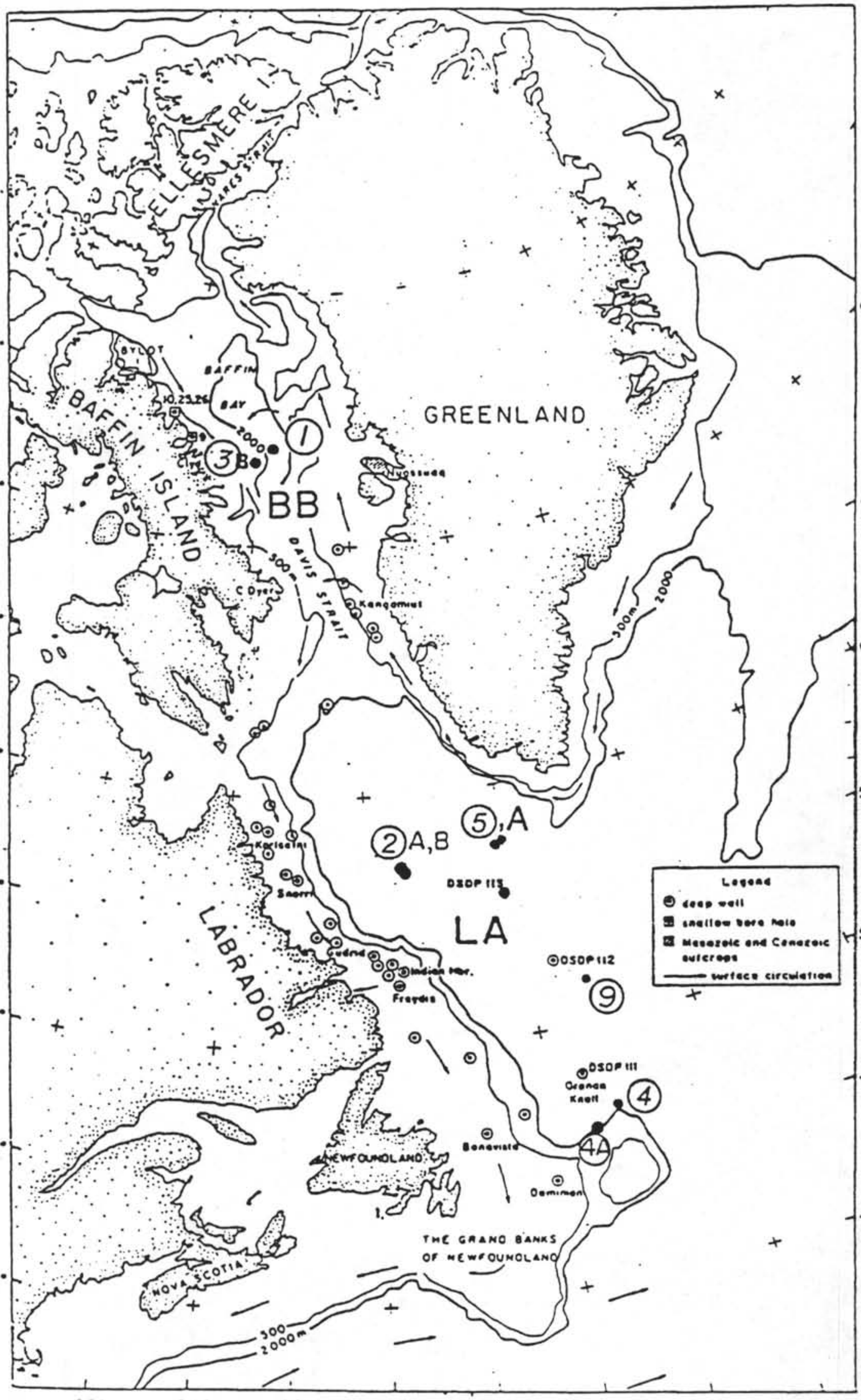

FIGURE 1: Location of proposed Labrador Sea and Baffin Bay sites.

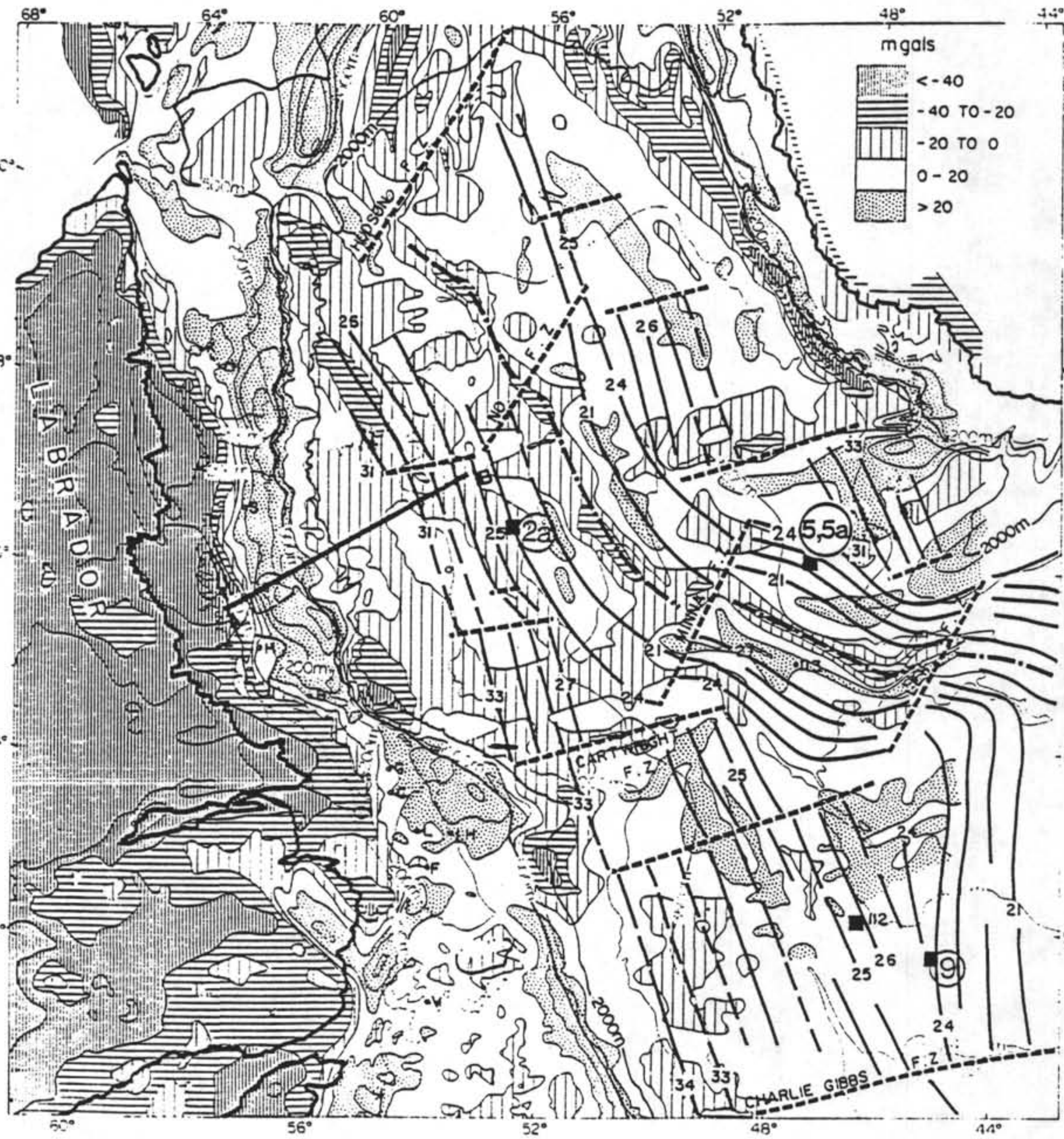

FIGURE 2: Magnetic lineations in the Labrador Sea, superimposed on gravity map.

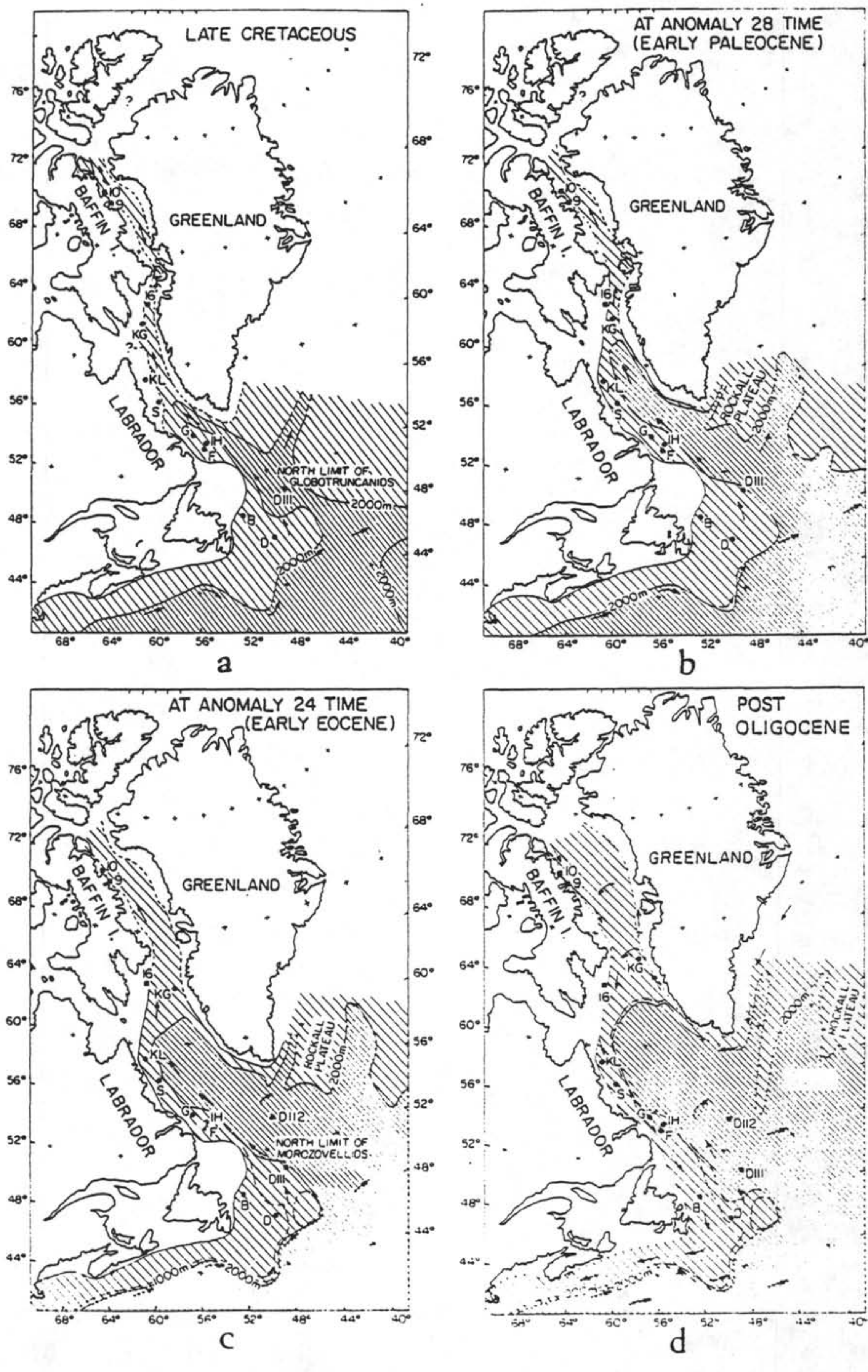

FIGURE 3: Paleocirculation patterns during opening of the Labrador Sea.

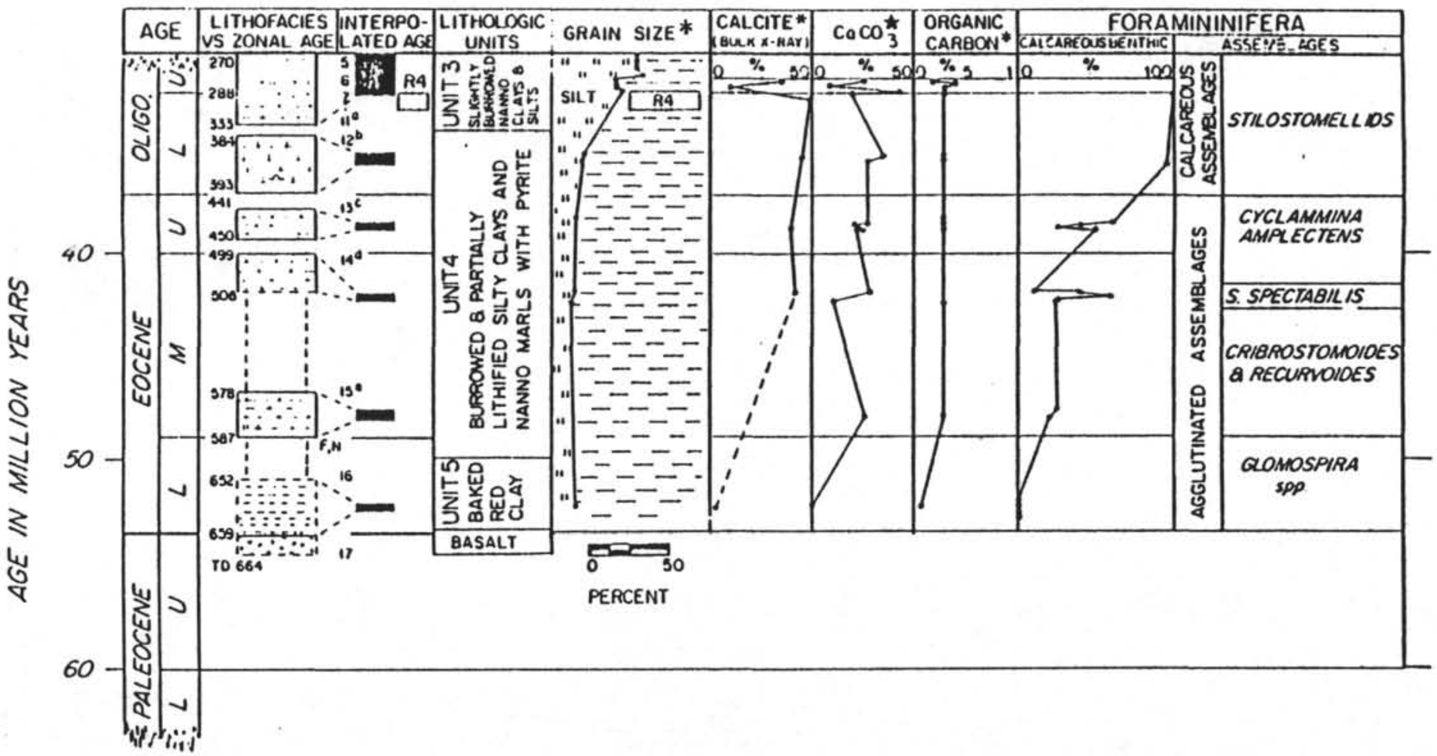

FIGURE 4:

DSDP Site 112. Lithofacies symbols as in text-figure 2. Interpolated ages determined using a 15 m/my sedimentation rate assuming core 13 and core 15 lie in the middle of zones NP19 and P10, respectively. Correlation of reflector R4 shown by cross-hatched areas.

[a,b] *E. obruta, E. subdistícha* Zone—K. Perch-Nielsen (NP21, e. Oligo.); *H. reticulata* Zone—D. Bukry (NP22, e. Oligo).

[c] *I. recurvus* s.l. Zone—K. Perch-Nielsen (NP19, late Eocene); *D. barbadiensis* Zone—D. Bukry (late Eocene).

[d] *D. tani nodifer* s.l. Zone—K. Perch-Nielsen (NP16, middle Eocene); *D. barbadiensis* Zone—D. Bukry (late Eocene); NP17 M.-P. Aubry (middle Eocene).

[e] P10, this paper; *D. sublodoensis* Zone—K. Perch-Nielsen, D. Bukry (NP14, middle Eocene).

*G. W. Bode and R. E. Boyce, in: Laughton, Berggren, et al., 1972.

•Pow-Foong Fan and I. Zemmels, in: Laughton, Berggren, et al., 1972.

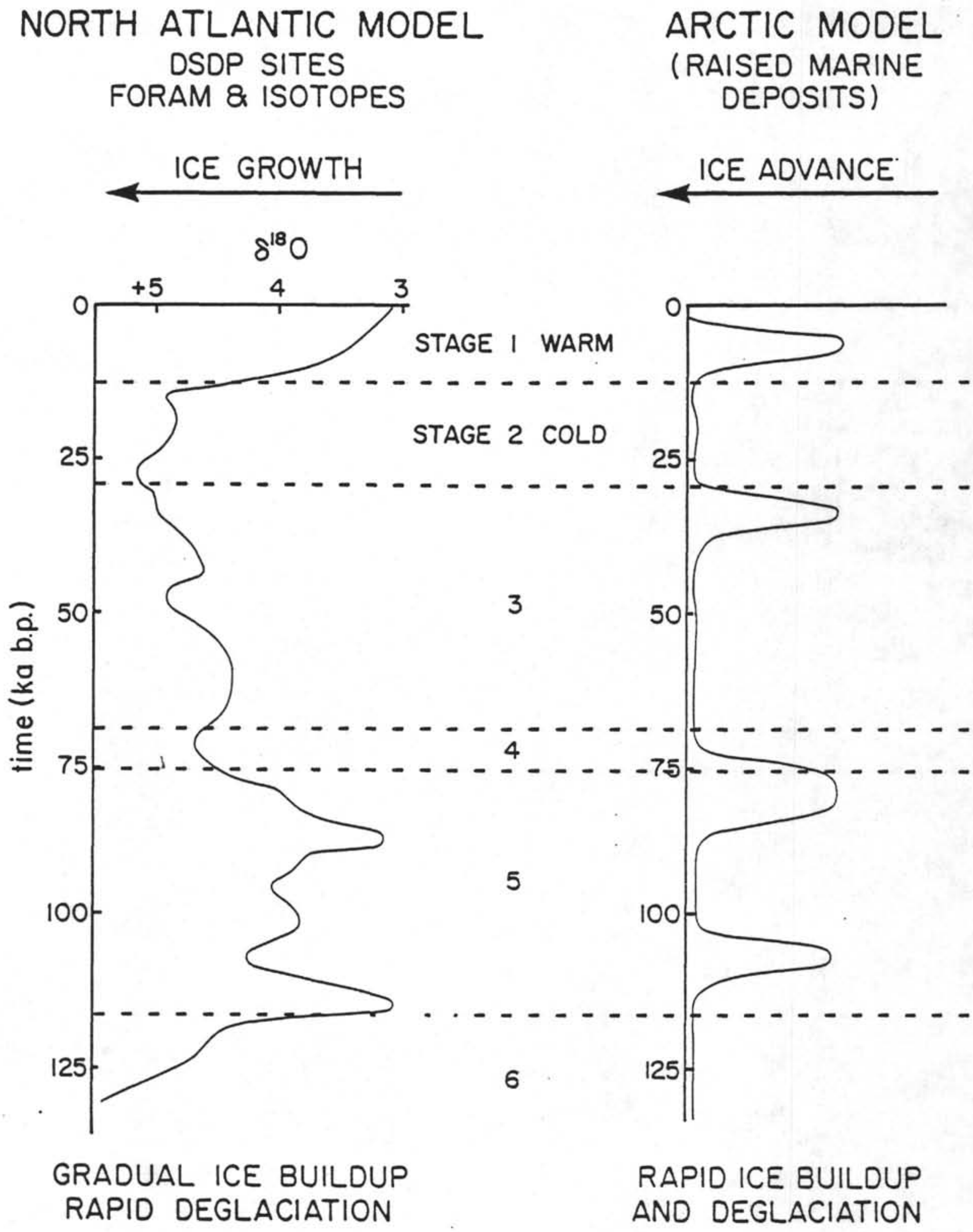

FIGURE 5: Basis for different models of Northern Hemisphere icesheet growth and decay: a) sawtooth δO-18 (ice volume) records for the North Atlantic (from Ruddiman and McIntyre, 1981); and b) discrete clusters of dates for raised marine deposits in the Hudson Bay lowlands 55 to 60° degrees north (Andrew <u>et al.</u>, 1983).

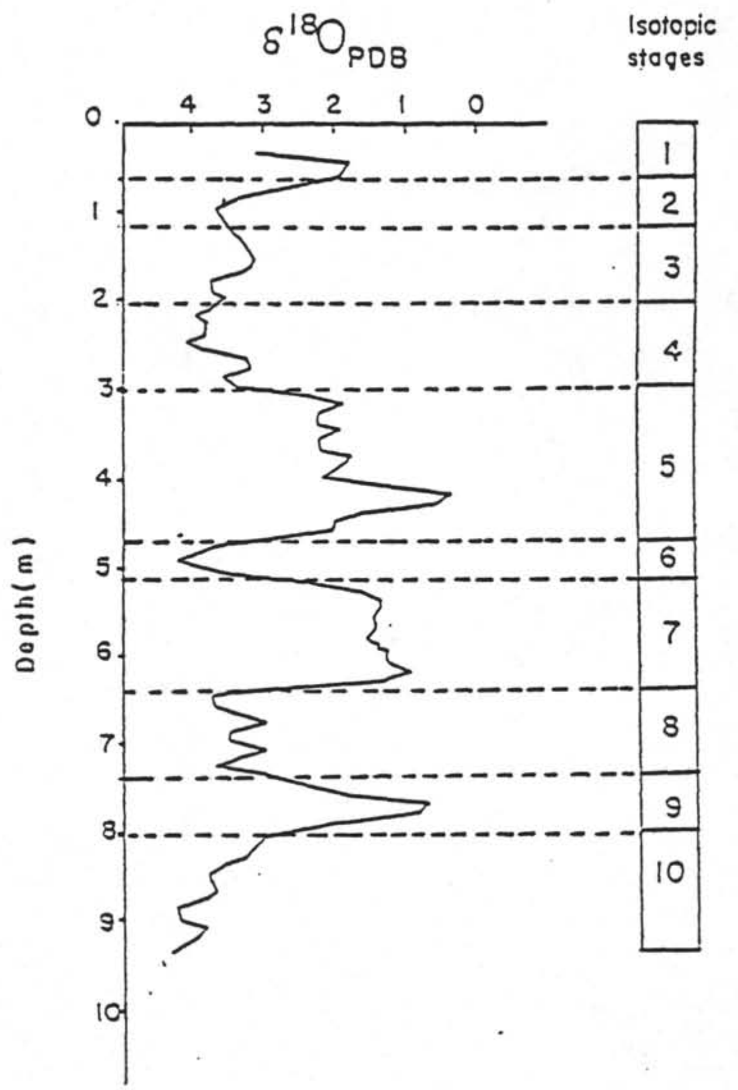

FIGURE 6: Oxygen isotope record for planktonic foraminifera in core HU 77-027027 from Davis Strait, 66°N. Similar curves are found for other cores from 64°-70° (from Aksu, 1983).

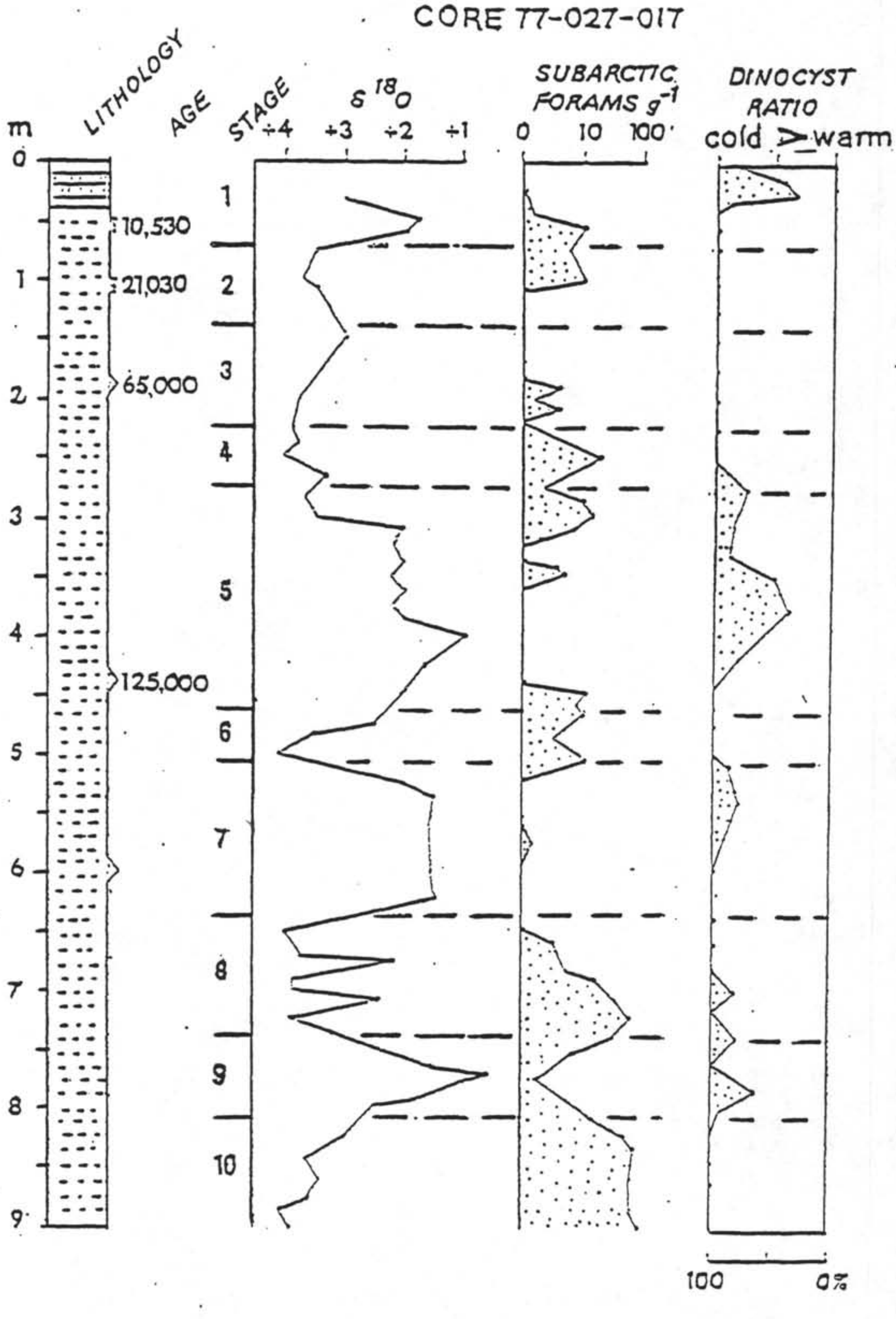

FIGURE 7:

Graphs showing the direct relationship between light isotopic stages and ratio of arctic to subarctic dinoflagellate cysts in core HU77-027-17 and the inverse relationship of subarctic planktonic foraminifera which probably reflects calcite dissolution during light isotope stages (from Mudie and Short, 1984).

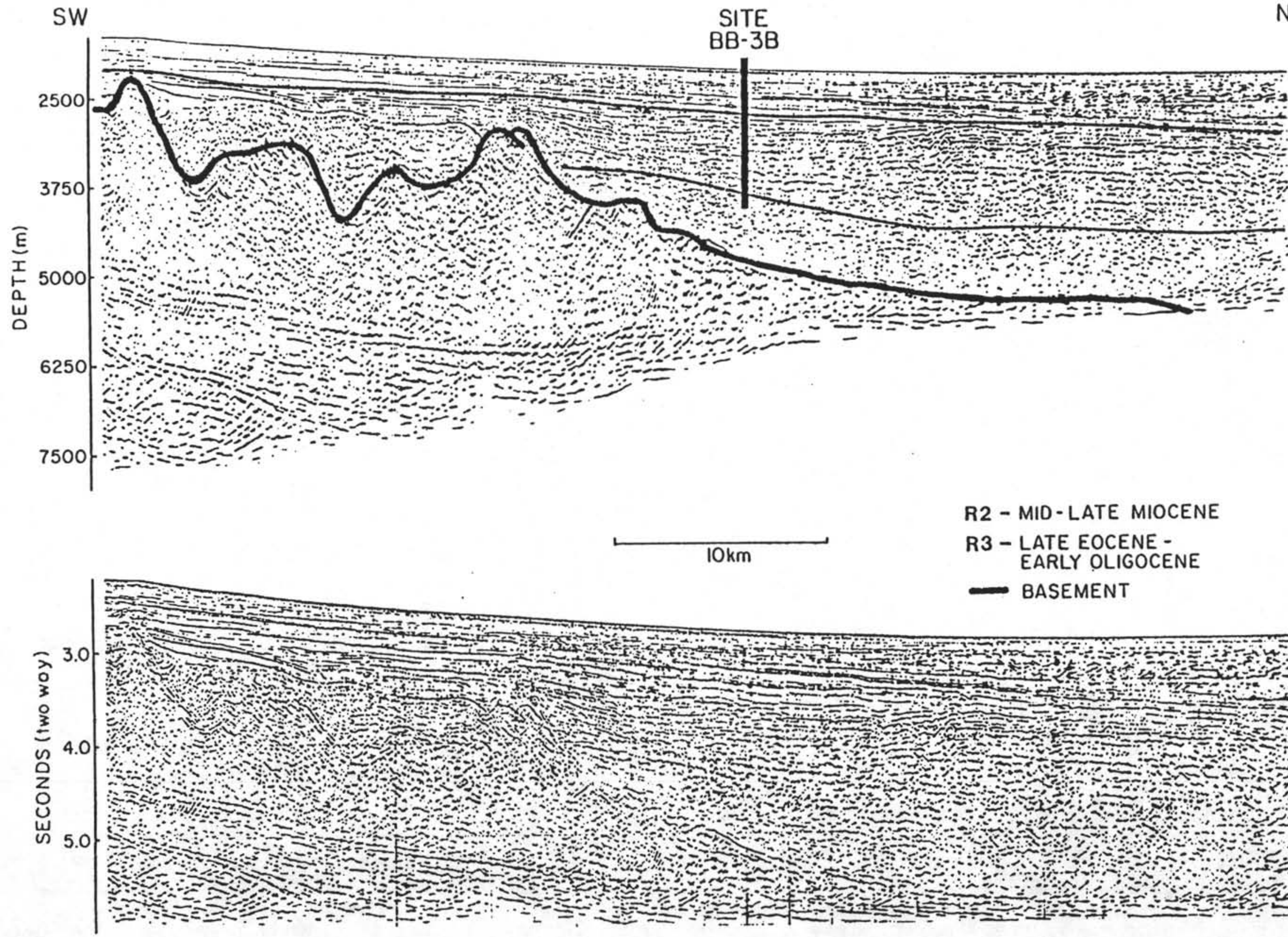

FIGURE 8: Segment of seismic profile BE-74-5 showing location of Site BB-3B.

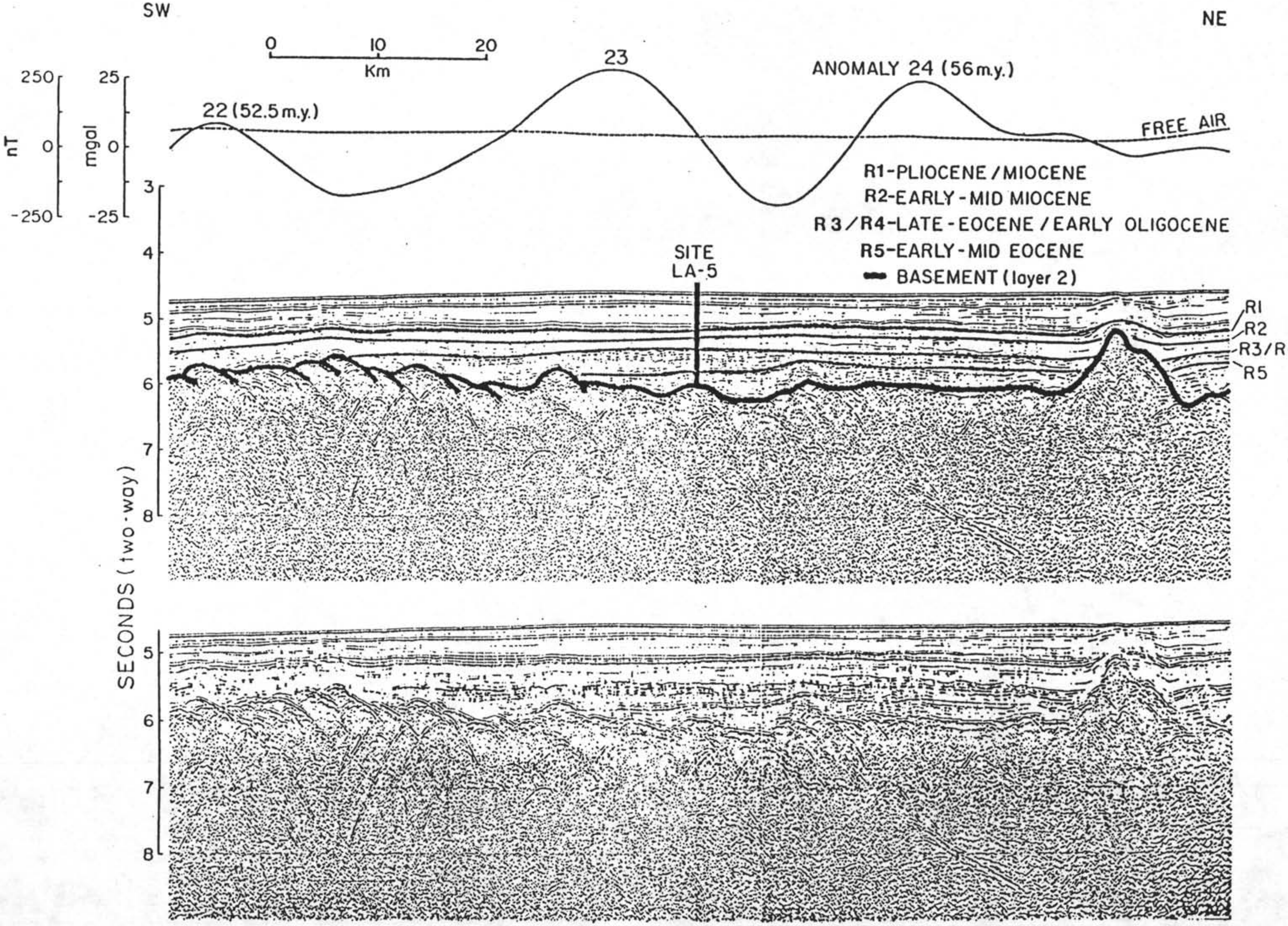

FIGURE 9: Segment of seismic profile BGR-2 showing location of Site LA-5.

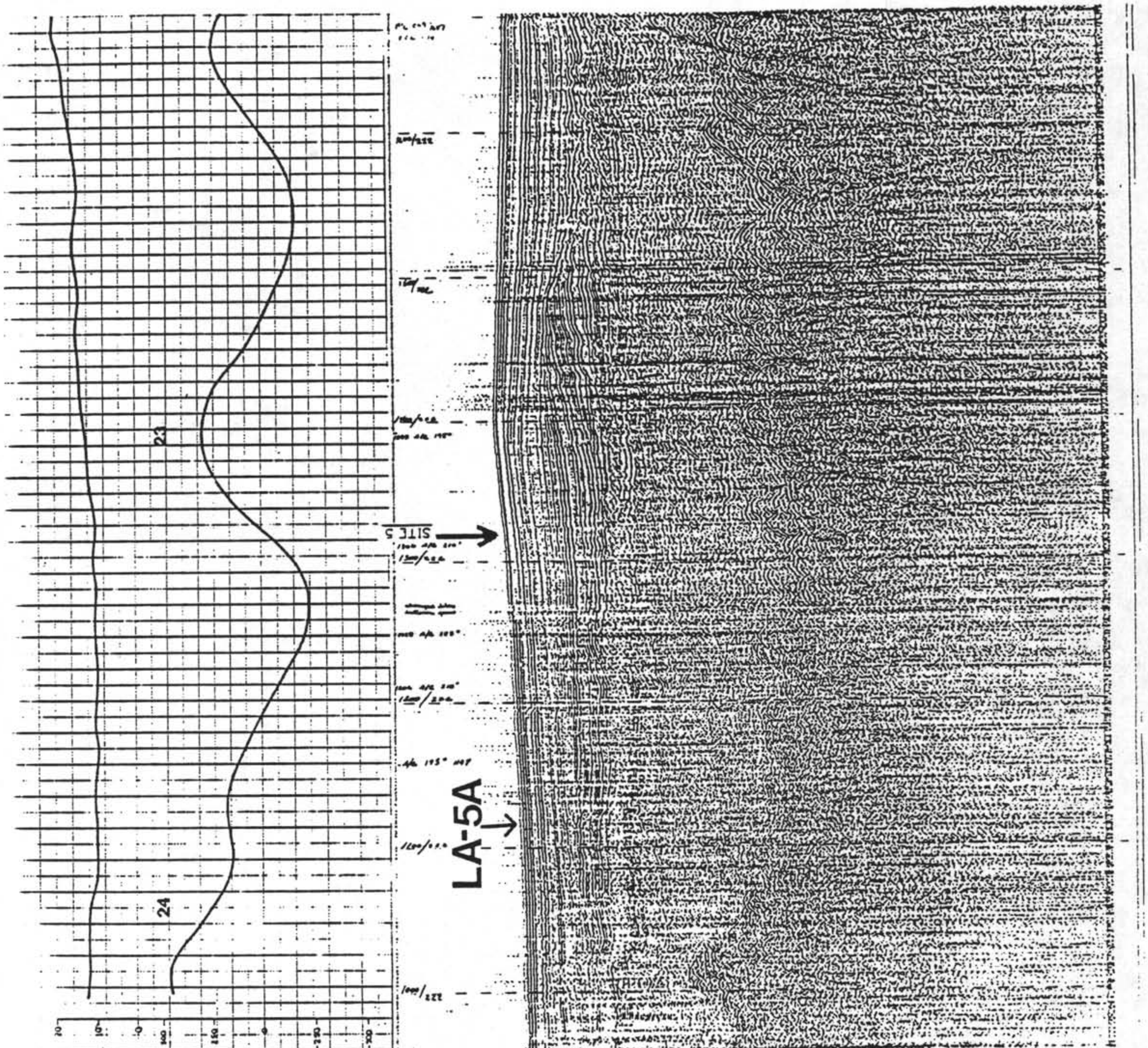

FIGURE 10: Segment of Hudson line 14 showing location of Site LA-5A.

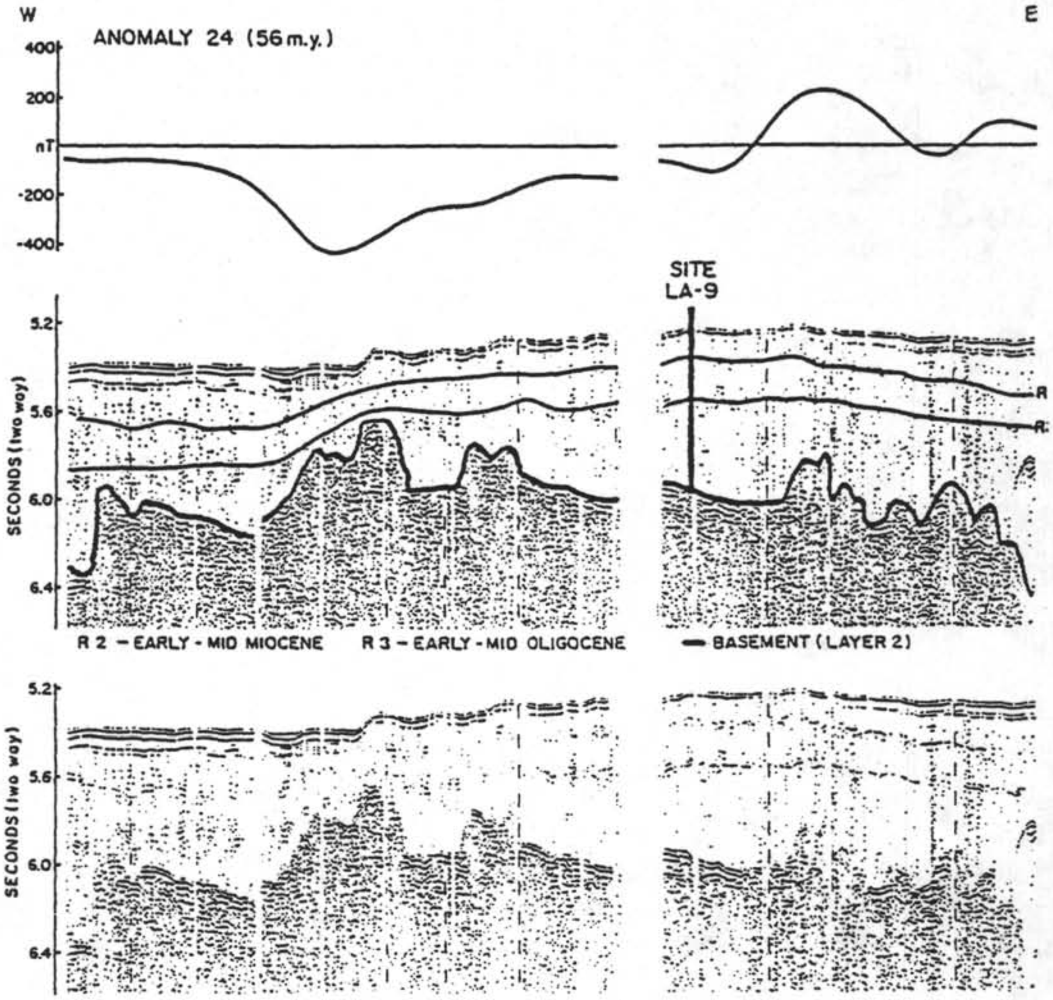

FIGURE 11: Segment of line HD84-034, line 14 showing location of Site LA-9.

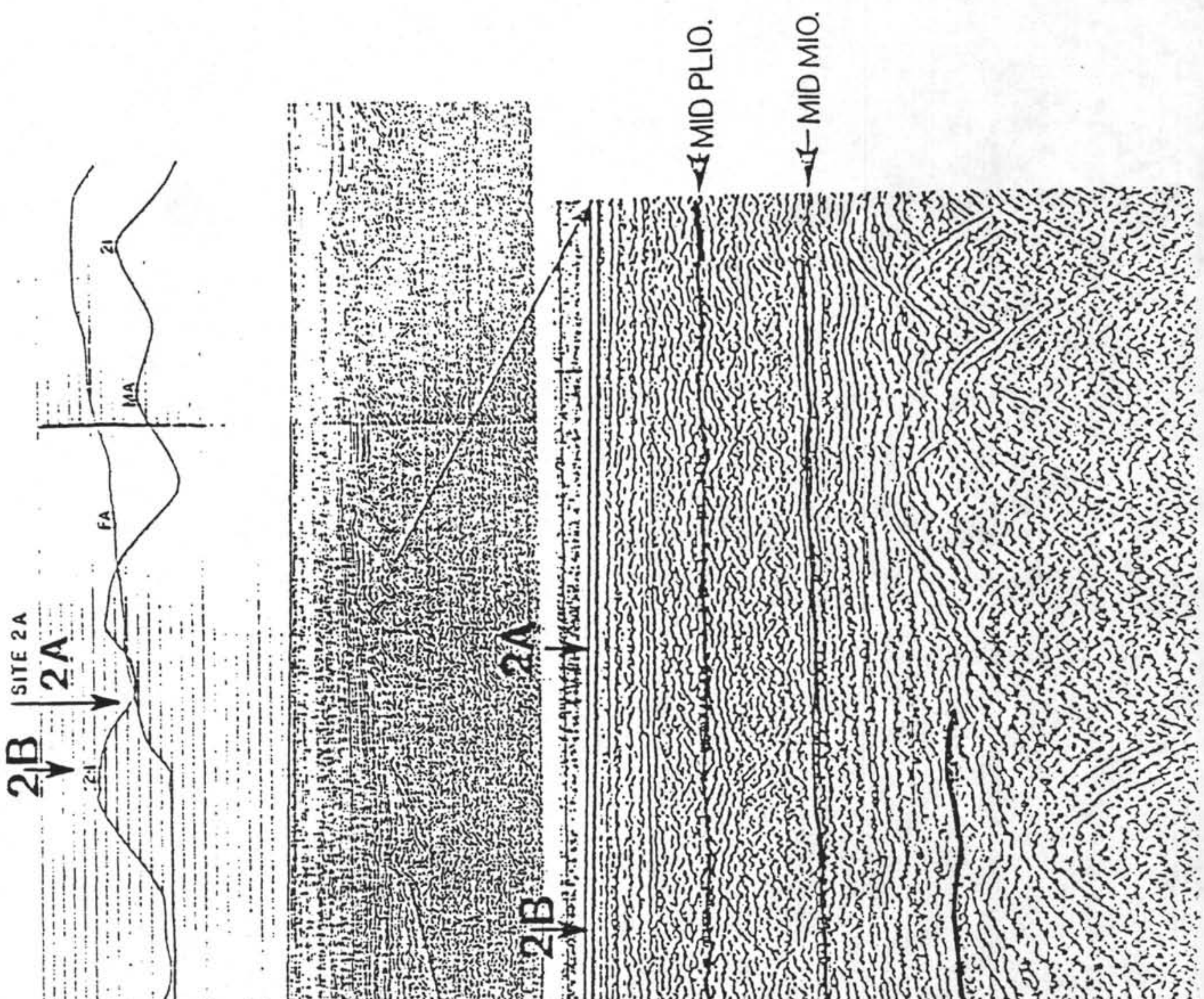

FIGURE 12: Segment of seismic profile BGR-17 showing position of Site LA-2A.

SITE NUMBER: BB-3B (Western Baffin Bay, lower slope-rise)

POSITION: 70°27'N 64°39'W SEDIMENT THICKNESS: 2350 m

WATER DEPTH: 2090 m PRIORITY: 1

PROPOSED DRILLING PROGRAM:

Exploratory and re-entry holes. HPC/XCB to 700 m and rotary core to 2000 m. Continuous coring to target.

SEISMIC RECORD:

Multichannel seismic line BE 74-51, SP 511. Site BB-3B lies 15 km east of the crossing with multichannel seismic line BE 75-101. Reference: Eureka Exploration, Baffin Enterprise, shot by GSI, COGLA Report 1975 No. 528-09-12-00009; Petro-Canada Exploration, shot by GSI.

HEAT FLOW: No

LOGGING: Yes

OBJECTIVES:

Sample sedimentary section for high-latitude Eocene-Oligocene paleoceanography. Sample early post-rift sediments.

SEDIMENT TYPE:

Hemipelagic to pelagic muds, ice-rafted gravelly, sandy muds (for Neogene section), silts and silty oozes probably in Oligocene.

SITE NUMBER: LA-5 (Southwest of Eirik Ridge, east-central Labrador Sea)

POSITION: 58°03'N 48°24'W SEDIMENT THICKNESS: 1486 m

WATER DEPTH: 3350 m PRIORITY: 1

PROPOSED DRILLING PROGRAM:

Exploratory and re-entry holes. Double HPC to 250 m, XCB to 450 m, rotary coring to basement. Continuous coring to target.

SEISMIC RECORD:

Seismic lines: BGR multichannel 2, SP 3910; with ties to BGR multichannel 1, 3, 17 (Hinz et al., 1979) and Eglof and Johnson (1975) line 3. Sonobuoy 3/77 was shot over proposed site. Late Cenozoic seismostratigraphy from Myers (1984). Many single channel seismic profiles from HD84-030 cruise.

DSDP Sites: 112 and 113.

HEAT FLOW: Yes

LOGGING: Yes

OBJECTIVES:

Sample sedimentary section for Eocene-Oligocene paleoceanography. Sample basement for age calibration of magnetic anomalies.

SEDIMENT TYPE:

Contourites, hemipelagic silts, and terrigenous silts and clays, overlying nannofossil silt, clay and ooze with minor siliceous ooze, overlying nannofossil clays.

SITE NUMBER: LA-5A (Southwest of Eirik Ridge, east-central Labrador Sea)

POSITION: 58°12.5'N
48°21.6'W

SEDIMENT THICKNESS: 1400 m

WATER DEPTH: 3463 m

PRIORITY: 2 (Alternate Site)

PROPOSED DRILLING PROGRAM:

Double HPC to 250 m, XCB to 410 m, rotary core to 709 m.

SEISMIC RECORD:

Seismic lines: Located at the intersection of HUDSON line 14 at 1110Z, day 222, and line 12 at 1755Z, day 221.

DSDP sites: 112, 113.

HEAT FLOW: Yes

LOGGING: Yes

OBJECTIVES:

Date drift deposits of Eirik Ridge. Sample high-latitude section for Eocene-Oligocene paleoceanography.

SEDIMENT TYPE:

Same as LA-5.

SITE NUMBER: LA-9 (Southern Central Labrador Sea, southwest of Gloria Drift and northeast of NAMOC spillover turbidites. Located near anomaly 24 southwest of the Labrador Sea triple junction)

POSITION: 53°19'N 45°16'W SEDIMENT THICKNESS: 800 m

WATER DEPTH: 3867 m PRIORITY: 2 (Alternate site)

PROPOSED DRILLING PROGRAM:

Double HPC to 250 m, XCB to 450 m, rotary drilling to basement or life of bit. Continuous coring.

SEISMIC RECORD:

Located on HD84-030, line 4, 1600Z on day 215. This profile is representative of a number of single channel profiles which lie in the vicinity of this site. Line 8 crosses the site at 0700Z, day 217.

HEAT FLOW: Yes

LOGGING: Yes

OBJECTIVES:

Date drift deposits of Gloria Drift. Sample basement for age calibration of magnetic anomalies.

SEDIMENT TYPE:

Hemipelagic Pleistocene silts and muds. Pelagic-hemipelagic Mio-Pliocene mud, Oligocene to lower Pliocene nannofossil clays and silts and silty oozes probably siliceous in the Oligocene/lower (middle?) Miocene; Eocene nannofossil clays.

SITE NUMBER: LA-2A (Labrador Basin, western side, east of Saglek Bank)

POSITION: 57°40.8'N
54°12'W

SEDIMENT THICKNESS: 1760 m

WATER DEPTH: 3300 m

PRIORITY: 2 (Alternate site)

PROPOSED DRILLING PROGRAM:

Double HPC to 250 m, XCB to 450 m, rotary drilling to 903 m. Continuous coring to target or life of single bit.

SEISMIC RECORD:

Multichannel seismic line BGR-17, SP 6480; crossing with MINNA line 15 at 1012Z, day 196; also 19 km northwest of the crossing with Vema line V1716 at 2320Z, day 89. Late Cenozoic seismostratigraphy from Myers (1984). Geological data from DSDP Site 112 (Laughton et al., 1972); Labrador Shelf exploratory wells Eastern Snorri and Bjarni (Umpleby, 1979; COGLA, open files).

HEAT FLOW: Yes

LOGGING: Yes

OBJECTIVES:

Sample sedimentary section for east-west paleoceanographic transect.

SEDIMENT TYPE:

Contourite, pelagic/hemipelagic mud with minor turbidites (early Pliocene-Pleistocene) overlying pelagic/hemipelagic carbonate-rich sediments, probably Miocene or early Pliocene in age.

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