OCEAN DRILLING PROGRAM

LEG 113 SCIENTIFIC PROSPECTUS

WEDDELL SEA

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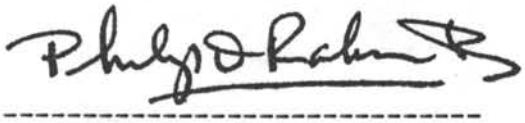

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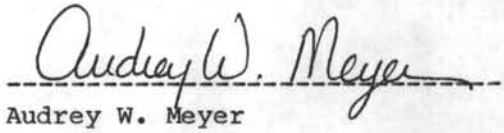

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INTRODUCTION

A better understanding of the history of Antarctica and the surrounding Southern Ocean over the past 100 Ma is central to the study of global paleoclimate, circulation and tectonic evolution. The continent lay originally within Gondwanaland but exactly where is not yet agreed. After break-up of Gondwanaland, Antarctica became increasingly isolated within an oceanic realm, and for the past 90 Ma has remained over the South geographic pole. Without doubt, the Antarctic region has played a major part in the general global cooling which took place during the same period: the high latitudes are particularly sensitive to climatic forcing, and house the powerful feedback mechanisms of ice and bottom water.

Despite the importance of the Antarctic region, the history of development of the present continental glaciation and of the distinct circum-Antarctic water masses since the mid-Cretaceous is very poorly known. In total, DSDP Legs 28 (Hayes, Frakes, et al., 1975) and 35 (Hollister, Craddock, et al., 1976) included only 3 continuously cored sites (all in terrigenous sections); no HPC or APC cores were collected. Only a handful of stable isotopic measurements have been collected from DSDP cores in the Antarctic region. Difficulties are also caused by the low diversity of high-latitude marine fauna and flora, leading to uncertain connections with low-latitude biostratigraphy. Additional samples and analyses from the Antarctic region are badly needed.

Leg 113 is scheduled to begin in Punta Arenas, Chile on 4 January 1987 and end in Port Stanley, Falkland Islands on 10 March 1987. During these 65 days, the plan is to drill at seven high-priority sites (W1, W2, and W4-W8; Figure 1), to examine the Cenozoic development of the present Antarctic water masses and continental glaciation. Because in a bad ice year some of these sites could be covered by pack-ice and may therefore be inaccessible, 4 additional contingency sites (W10-W13) have been identified.

Six of the seven prime sites (W1, W2, W5, W6, W7, and W8) form a "dipstick" depth transect of the Antarctic water masses, with present depths ranging from 640 m (W8) to 4670 m (W5). The seventh site (W4) has a complementary objective of examining the continental climate by sampling terrigenous sediments on the Antarctic continental slope. These seven sites have additional secondary objectives, in regional tectonics (W1, W2, W4, W8) and the study of gas hydrates (W7). Three of the 4 contingency sites also have paleoceanographic or biostratigraphic objectives, while the fourth (W10) is concerned with organic geochemical evolution in a high-productivity, high heatflow environment. In addition to the scientific program conducted on the JOIDES Resolution, two additional and complementary programs will be conducted on the ice picket vessel when weather and ice conditions permit: (1) a sediment flux study, using the short-term deployment of floating sediment traps, and (2) additional magnetic surveys.

OBJECTIVES

A. The Antarctic Water Masses and Paleoclimate.

The present-day Antarctic water masses are cold and circumpolar. They are sharply defined by the glaciated continent to the south and by the Antarctic Circumpolar Current (ACC) axis or Polar Front to the north (Figures 2 and 3). Additionally, the high latitudes are the source areas for the cold deep and bottom waters of the world's oceans. None of these characteristics, so fundamental to present-day circulation, are older than the Oligocene. We expect to see a pre-Oligocene regime of warmer high-latitude surface waters, a more gentle and continuous meridional temperature gradient, a warm-water (thermospheric) deep circulation, continental vegetation and much less continental ice, different erosional processes, less provincial and more diverse marine planktonic fauna and flora, and a deeper CCD. Understanding the interrelations between these variables, and their broader global significance, will be the primary objectives of Leg 113.

1. Shallow and Intermediate Waters. The present water mass structure (Figure 2), in which warm water extends no farther south than the Polar Front, appears to be constrained by the existence of the ACC. It is therefore unlikely to be older than the separation of the Antarctic Peninsula and South America, completing a circum-Antarctic deep-water pathway, probably during the earliest Miocene (Barker and Burrell, 1977, 1982; Figure 4). Although Leg 113 will not examine ACC development directly (unless site W11 is drilled), we can expect to see its effects, and to find that a quite different water mass structure existed during and prior to the Oligocene.

To observe this evolution, a suite of sites with different paleodepths will be drilled. Oxygen and carbon isotopic measurements on calcareous tests from the sites will allow us to examine paleotemperature, productivity and water mass exchange. At present, south of the ACC axis, the CCD rises abruptly to less than 800 m depth (Keaney, 1978), and pelagic sedimentation is essentially siliceous. Only one site (W8 at 640 m present depth) is well above the present CCD, but we expect the CCD to have risen with time through the Neogene. Therefore, and because of thermal subsidence, we should see a calcareous component, suitable for isotopic studies, progressively earlier at sites W7 (1300 m), W1 (2000 m), W2 (3000 m), W6 (3500 m), and even perhaps at W5 (now 4670 m) in the Eocene or Paleocene.

2. Antarctic Bottom Water (AABW). The transition from a warm global ocean (thermosphere) to a cold one (psychrosphere) came about because of changes at high latitudes, where all cold, intermediate deep and bottom waters are produced. Modern AABW is formed at high southern latitudes, but ranges as bottom water well north of the Equator. It is generally supposed that AABW formation, involving the production of a dense, cold brine beneath forming sea ice, first took place around Antarctica at the Eocene/Oligocene boundary (Benson, 1975; Shackleton and Kennett, 1975). This change has only been examined indirectly as yet: the isotopic measurements used were from sub-Antarctic sites at paleodepths above 1500 m. To some extent such a situation is inevitable since AABW itself dissolves $CaCO_3$. Attempts to study AABW onset directly by other means at basin sites at lower latitudes have been hindered by other parameters (e.g. tectonic barriers to circulation, other

water masses), obscuring the production signal. During Leg 113, AABW history will be examined at site W5 located in the Weddell Sea Basin close to the source of AABW.

3. Antarctic Climate and Ice Volume. Our present understanding of Antarctic glacial history is full of uncertainty and contradiction. Oxygen isotopes have been interpreted to imply the formation of substantial volumes of ice on Antarctica from the early Oligocene (Miller and Fairbanks, 1985) or the early Miocene (Savin et al., 1975; Shackleton and Kennett, 1975; Kennett, 1978). Debate continues as to whether large accumulations of ice existed on the Antarctic continent at any time prior to 15 Ma. This debate has major implications as it relates to our understanding of global climatic evolution during the entire Cenozoic. We know that sea level has fluctuated rather dramatically during the Cenozoic (Vail et al., 1977; Pitman, 1978). Mechanisms suggested for these fluctuations include glacio-eustacy, or ice-volume control. Interpretation of the oxygen isotope record in the world's oceans is based on the assumption that no extensive ice existed on any land mass in the past. However, if this assumption is not true, isotopic changes cannot be unambiguously interpreted as caused by changes in either ice volume or in seawater temperature. Since the Antarctic water masses lie directly at the continental margin where cold water is produced, a much smaller ambiguity should accompany Leg 113 results.

Leg 113 sampling will examine several other indicators of the glacial history of the Antarctic continent. Ice-rafted detritus should be seen at all sites. At site W4 we expect to see continental slope deposits, including a proximal record of pre-glacial continental vegetation, interbedded with or overlain by glacial tills bulldozed over the shelf edge by grounded ice. Site W5 should provide a similar, distal but more continuous record and the record of AABW production will reflect the seasonal formation of sea ice around the margin of the Weddell Sea.

B. Additional Studies: Regional Tectonics and Gas Hydrates.

For many purposes in paleoceanography, a precise paleo-depth estimate is needed, which usually means drilling to basement or a subaerial unconformity. Thus, the opportunity arises to obtain additional regional tectonic information. The most important such opportunity on Leg 113 will come at site W4, where the sediments overlie a "seaward-dipping reflector" sequence (Hinz and Krause, 1982) similar to the tholeiitic basalts drilled on the Voring Plateau during Leg 104 and beneath Hatton-Rockall Bank on Leg 81. These should provide a date for the initial opening of the Weddell Sea, and improved understanding of Gondwanaland break-up (Figure 5). Similar opportunities arise to find the ages of the back-arc extensional opening of Jane Basin, east of the South Orkney block (W8 or W7), and of Maud Rise basement (W1 or W2). Maud Rise was formed, most probably, by the interaction of a spreading ridge and a hotspot (e.g., Walvis Ridge and Rio Grande Rise, DSDP Legs 72 and 74) and may have been coeval with the Agulhas Plateau and NE Georgia Rise (to be drilled on Leg 114).

Reflection profiles near site W7 also show a prominent bottom-simulating reflector (BSR) suggesting the presence of gas hydrate. Drilling there provides the chance for further geophysical and geochemical investigations of

gas hydrate characteristics in a well-defined environment without interference with the primary objectives at the site.

DRILLING PLAN

Leg 113 sites form a loop (Figure 1) which will be traversed clockwise, drilling in approximate numerical and priority order. For sites W1 and W2 on Maud Rise, two alternate sites are prepared, each involving about a 400-m-thick pelagic section in 2000 m and 3000 m of water, respectively. Site W4 on the eastern margin of the Weddell Sea is the most southerly site and the most vulnerable to sea-ice cover at the intended time of drilling. To try to reduce this problem, 3 alternative locations have been surveyed: at each, a sequence of 2, 3, or 4 sites in combination will sample a thick (<1000 m) terrigenous section and presumed basaltic basement. Site W5 in the deep Weddell basin is also susceptible to sea-ice cover, and again a number of alternative locations have been selected where this thick, mixed distal turbidite and hemipelagic section can be drilled. Sites W6, W7, and W8 form a depth transect of the SE margin of the South Orkney microcontinent. The section at site W6 (3480 m) is largely hemipelagic, the others largely pelagic, down to the planned 500 m depth of drilling. Because of the clockwise surface-water circulation in the Weddell Sea, these sites are also susceptible to sea-ice cover under some circumstances. Drilling at <u>all</u> sites could be interrupted by the passage of icebergs across them, and an ice picket vessel has been chartered to help minimize this risk.

<u>Alternate Sites</u>. Because of the possible inaccessibility of 1 or more of the prime sites (W4 in particular), 4 additional contingency sites have been identified. Of these, site W10 in Bransfield Strait is a shallow APC site to examine hydrothermal and organic geochemical processes in a young, well-sedimented extensional basin. Site W11, on 28 Ma-old ocean floor in the lee of the Shackleton Fracture Zone in Drake Passage, is intended to examine the effects on sedimentation of the growth of the ACC. Sites W12 and W13 are APC holes on ocean floor east of the South Sandwich trench, to sample a high-resolution late Neogene biosiliceous record of paleo-circulation changes.

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TABLE 1
LEG 113 OCEAN DRILLING PROGRAM
WEDDELL SEA

Location of proposed sites

Site Number	Latitude	Longitude	Water Depth (Penetration)	Locality	Hole Type
W1A*	64°41'S	02°44'E	2120m (425m)	Maud Rise	Double APC/ XCB
W1B*	64°33'S	03°10'E	2100m (365m)	Maud Rise	Double APC/ XCB
W2A*	65°14'S	01°10'E	2900m (370m)	Maud Rise	Double APC/ XCB
W2B*	65°19'S	01°37'E	2850m (490m)	Maud Rise	Double APC/ XCB
W4 - Transect 0					
W4/1*	70°38'S	13°21'W	3000m (1100m)	Dronning Maud Land Margin	Rotary
W4/1Alt*	70°43'S	13°18'W	2850m (1170m)	Dronning Maud Land Margin	Rotary
W4/2	70°29'S	13°25'W	2780m (300m)	Dronning Maud Land Margin	APC/XCB
W4 - Transect I					
W4-I/1	70°44'S	14°18'W	2740m (520m)	Dronning Maud Land Margin	APC/XCB, Rotary
W4-I/2	70°43'S	14°15'W	3050m (400m)	Dronning Maud Land Margin	Rotary
W4-I/3	70°42.8'S	14°13'W	3400m (390m)	Dronning Maud Land Margin	Rotary

W4-I/4*	70°42.2'S	14°11'W	3660m (1000m)	Dronning Maud Land Margin	Rotary
W4 - Transect II					
W4-II/2*	70°00.0'S	08°41'W	2790m (350m)	Dronning Maud Land Margin	Rotary drill up to 50m basalt
W4-II/7	70°03.3'S	08°54'W	1750m (500m)	Dronning Maud Land Margin	APC/XCB, Rotary to overlap W4-II/8
W4-II/8	70°02.5'S	08°51'W	2070m (600m)	Dronning Maud Land Margin	Rotary to overlap W4-II/2
W5	66°51.5'S	33°27.0'W	4670m (900m)	Northern Weddell Basin	APC/XCB, Rotary
W5A	67°00.7'S	23°50.0'W	4880m (900m)	Northern Weddell Basin	APC/XCB, Rotary
W5B	62°01'S	03°42'W	5700m (800m)	NE Weddell Basin	APC/XCB, Rotary
W5C	61°00'S	01°35'W	5500m (250m)	NE Weddell Basin	APC/XCB
W5D	60°50'S	02°10'W	5750m (600m)	NE Weddell Basin	APC/XCB, Rotary
W5E	62°36'S	20°26'W	5400m (600m)	Northern Weddell Basin	APC/XCB, Rotary
W5F	62°50'S	20°45'W	5400m (850m)	Northern Weddell Basin	APC/XCB, Rotary
W6	61°47.3'S	40°07.0'W	3480m (500m)	Jane Basin, east of South Orkney Platform	Double APC/ XCB
W7	62°23.5'S	43°27.0'W	1310m (500m)	South Orkney Platform, South Scotia Ridge	Double APC/ XCB

W8	61°54.3'S	42°58.7'W	640m (500m)	South Orkney Platform, South Scotia Ridge	Double APC/ XCB
W8A	61°44.2'S	42°48.5'W	740m (500m)	South Orkney Platform, South Scotia Ridge	Double APC/ XCB
W10*	62°15.5'S	57°30.9'W	1985m (200m)	Bransfield Strait	Double APC
W11*	59°38.0'S	54°18.0'W	3650m (950m)	Southern Drake Passage	APC/XCB, Rotary
W12	60°28'S	21°37'W	4400m (180m)	East of S. Sandwich Island Arc	Double APC
W13	58°04'S	17°48'W	4600m (300m)	East of S. Sandwich Island Arc	Double APC/ XCB

*Basement Penetration

TABLE 2
LEG 113 OCEAN DRILLING PROGRAM
WEDDELL SEA

Site Operations and Occupation Schedule

Site	Location	Travel Time (Days)	Time on Site (Days)	Operations	Departure Date (Approximate)
	Punta Arenas				Jan. 4, 1987
		7.7			
W1B	64°33'S 03°10'E	-	3.3	Double APC, (to basement, no logging)	
					January 15
		0.4			
W2A	65°14'S 01°10'E	-	4.0	Double APC, (to basement, no logging)	
					January 19
		2.3			
W4/1	70°38'S 13°21'W	-	12.5	RCB (1000 m into basement, logging)	
W4/2	70°29'S 13°25'W	-	2.6	Single APC to 200 m (no basement, no logging)	
					February 6
		2.6			
W5	66°51'S 33°27.0'W	-	11.1	(RCB, logging)	
					February 20
		2.1			

W7	62°23.5'S 43°27'W	-	5.2	(Double APC, no basement, logging)	
					February 27
		0.2			
W6	61°47.3'S 40°07'W	-	4.4	(Single APC, no basement, no logging)	
					March 3
		0.2			
W8	61°54.3'S 42°58.7'W	-	2.8	(Double APC, no basement, no logging)	
					March 6
		3.2			
	Port Stanley				March 10,1987
Total Days		18.7	45.9		= 64.6

* Assuming great circle distance and travelling at 12 knots between port and the first and last sites and 8 knots between sites.

FIGURE CAPTIONS

Figure 1. Locations of proposed ODP Leg 113 drill sites with adjacent land and ice masses (dashed lines) and 3000 m bathymetric contour (from GEBCO series).

Figure 2. Temperature (^{o}C) section for October 1970 along longitude 115^{o}E from Gordon (1972a), with water masses interpreted by reference to Gordon (1967) and Gordon and Goldberg (1970). Annual average meridional transport values (x 10^{6} m^{3}/sec; shown in parantheses) from Gordon (1971). DSDP Sites 277, 279, and 281 (Kennett, Houtz, et al., 1975) projected onto section relative to Antarctic Convergence (Gordon, 1972a, b). Abbreviations are: ASW=Antarctic Surface Water, AIW=Antarctic Intermediate water, CDW=Circumpolar Deep Water, and AABW=Antarctic Bottom Water. (The top 1000m of the righthand scale is expanded, x 2.) (Barker and Burrell, 1982). Leg 113 will drill APC/XCB sites and obtain the first continuously cored pelagic sections south of the Antarctic Convergence (polar front).

Figure 3. Locations of the Antarctic Convergence and the Antarctic Divergence, and simplified biogenic sediment distribution in the Southern Ocean (data from Goodell, 1973 and Tolstikov 1966, plate 103; compiled by Barker and Burrell, 1982).

Figure 4. Southern Ocean reconstructions from the Cretaceous to the present. Continents are black, stippled areas are continental shelves, oceans are white, spreading ridges and fracture zones are jagged lines, and circulation directions are arrows (from Kennett, 1978).

(A) Reconstruction of the Southern Ocean at 65 Ma, about the time of the Cretaceous/Cenozoic boundary. Antarctica and Australia are joined as a single continent; South America and Antarctica are joined at the position of the present-day Drake Passage. The southern tip of India is visible in the southern Indian Ocean. Spreading ridges and connecting transform faults are shown as jagged lines. Reconstructions are compiled from those produced for different sectors by Weissel et al. (1977) and Sclater et al. (1977a, b).

(B) Reconstruction of the Southern Ocean and suggested bottom-water circulation at 53 Ma, during the early Eocene. A spreading ridge has formed between Australia and Antarctica heralding the beginning of northward drift of Australia. India has now moved northwards off the map projection. Spreading ridges and connecting transform faults are shown as jagged lines. Dashed lines in South Atlantic represent fracture zones. Reconstructions are compiled from those produced for different sectors by Weissel et al. (1977) and Sclater et al. (1977a, b).

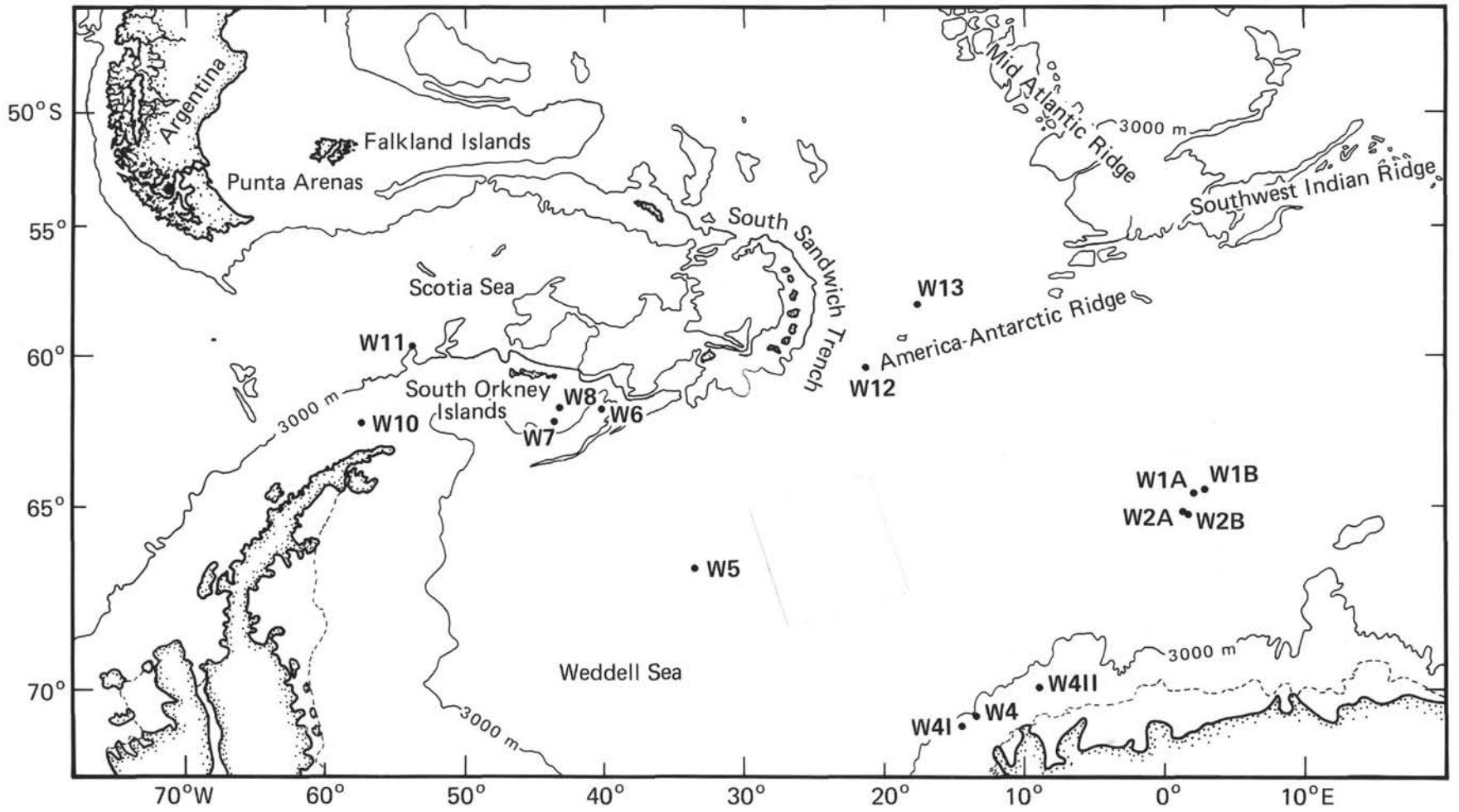
(C) Reconstruction of the Southern Ocean and suggested surface-water circulation at 36 Ma, during the earliest Oligocene. A substantial ocean has now formed between Australia and Antarctica, although the southward extension of the continental South Tasman Rise and

Tasmania continued to block deep circum-Antarctic flow between these two continents. The Drake Passage remains closed between South American and Antarctica. Spreading ridges and connecting transform faults are shown as jagged lines. A shallow, surface-water connection is established by this time over the South Tasman Rise, possibly leading to cooling and sea-ice formation in the Ross Sea region. Reconstructions are compiled from those produced for different sectors by Weissel et al. (1977) and Sclater et al. (1977a, b).

(D) Reconstruction of the Southern Ocean and suggested bottom-water circulation at 21 Ma, about the time of the Paleogene/Neogene boundary. Australia and the South Tasman Rise are now well separated from Antarctica, and the Drake Passage is open. The movement of previously obstructing land masses has, by this time, allowed the formation of the Circum-Antarctic water-mass system, and bottom-water transportation south of the South Tasman Rise and through Drake Passage. Spreading ridges and connecting transform faults are shown as jagged lines. Reconstructions are completed from those produced for different sectors by Weissel et al. (1977) and Sclater et al. (1977a, b).

(E) Present-day Southern Ocean showing principal spreading centers and some principal avenues for bottom-water circulation. East and west Antarctica are now shown as a solid single continent because of presence of an ice-cap. Bathymetric lines represent the position of the outer continental shelf around continents and ridges (> 2 km) in oceanic areas. Jagged lines represent spreading centers and interconnecting transform faults. Reference sources are Heezen et al. (1972), Weissel et al. (1977), and Sclater et al. (1977a, b).

Figure 5. Gondwanaland reconstructions (from Norton 1982). (A) Approximately 115 Ma, (Anomaly M1); (B) Approximately 65 Ma, (Anomaly 28). The upper figure shows the likely original position (CC) adjacent to the Mozambique Ridge (MR) of the dipping reflector province to be drilled at Site W4.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Argentina
Falkland Islands
Punta Arenas
Scotia Sea
South Sandwich Trench
Mid Atlantic Ridge
3000 m
Southwest Indian Ridge
America-Antarctic Ridge
W13
W12
W11
W10
South Orkney Islands
W8
W6
W7
W1A
W1B
W2A
W2B
W5
Weddell Sea
W4II
W4I
W4

Figure 1.

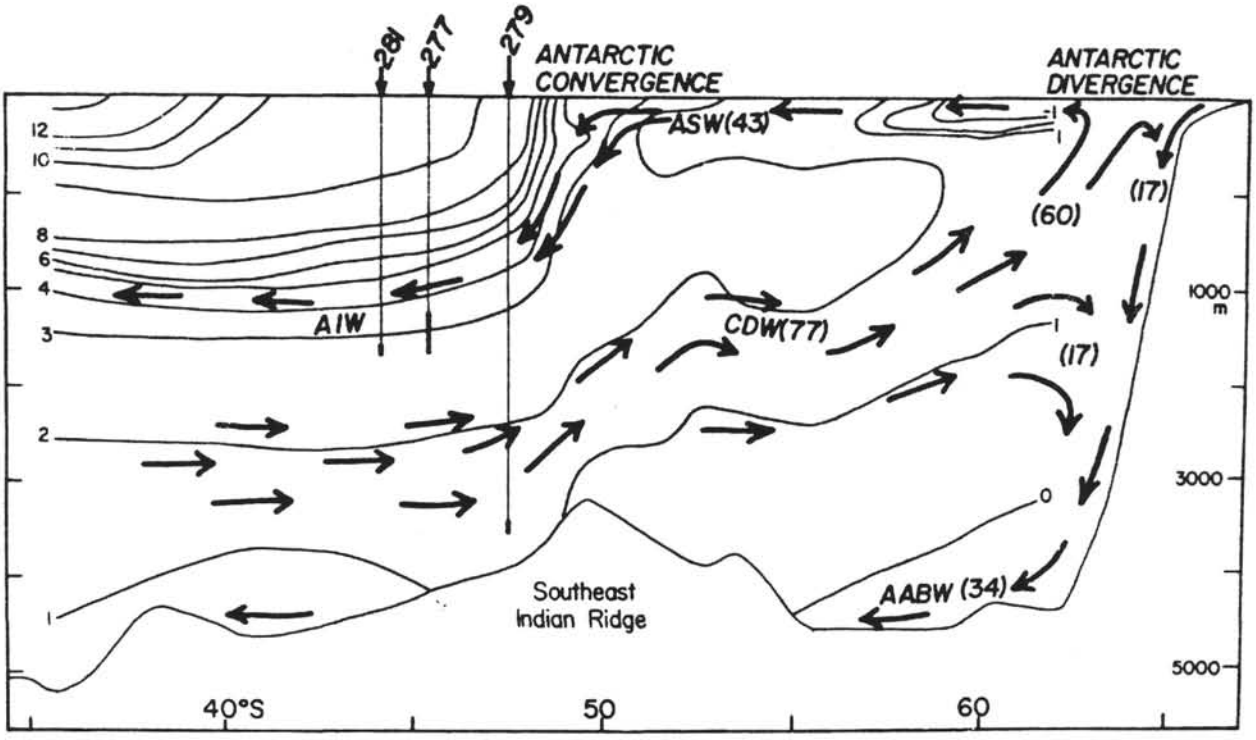

281
277
279
ANTARCTIC CONVERGENCE
ANTARCTIC DIVERGENCE
ASW(43)
(60)
(17)
12
10
8
6
4
3
2
1
AIW
CDW(77)
(17)
1000 m
3000
0
5000
Southeast Indian Ridge
AABW (34)
40°S
50
60

Figure 2.

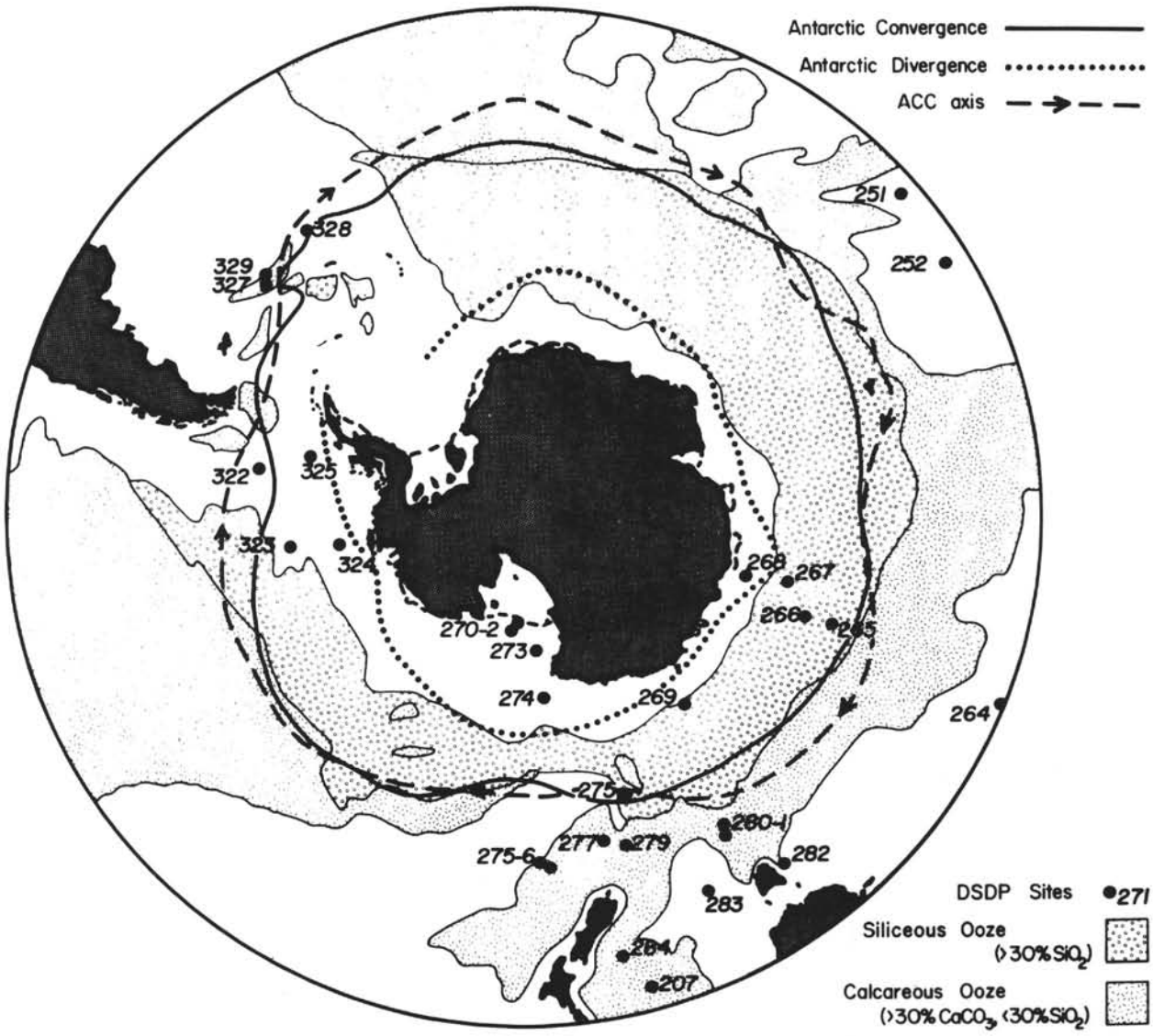

Antarctic Convergence
Antarctic Divergence
ACC axis
251
252
328
329
327
322
325
323
324
268
267
266
265
270-2
273
274
269
264
275
280-1
275-6
277
279
282
283
284
207
DSDP Sites ●271
Siliceous Ooze (>30% SiO2)
Calcareous Ooze (>30% CaCO3, <30% SiO2)

Figure 3.

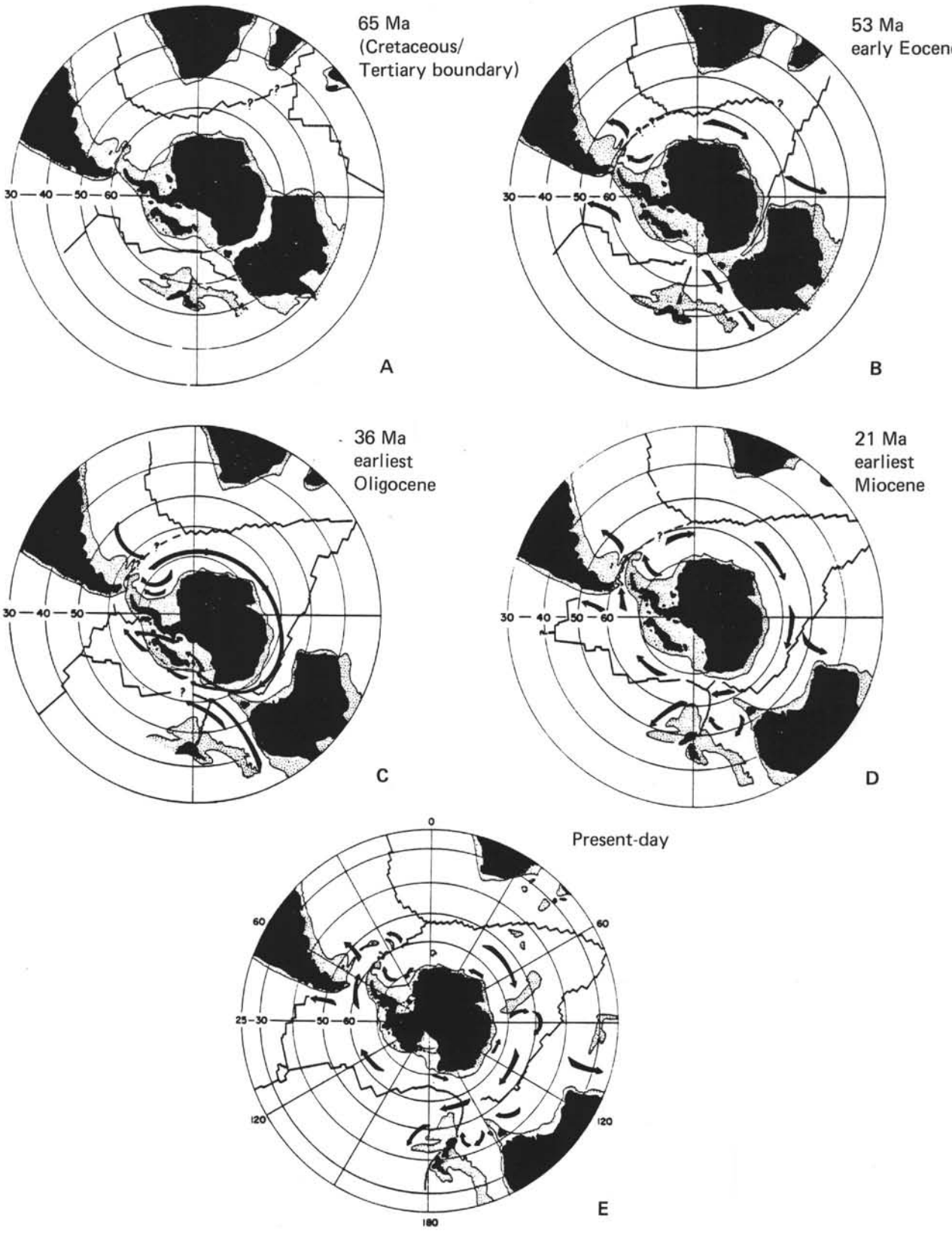

65 Ma
(Cretaceous/
Tertiary boundary)
30 — 40 — 50 — 60
A
53 Ma
early Eocene
30 — 40 — 50 — 60
B
36 Ma
earliest
Oligocene
30 — 40 — 50
C
21 Ma
earliest
Miocene
30 — 40 — 50 — 60
D
Present-day
0
60
60
25-30 — 50 — 60
120
120
180
E

Figure 4.

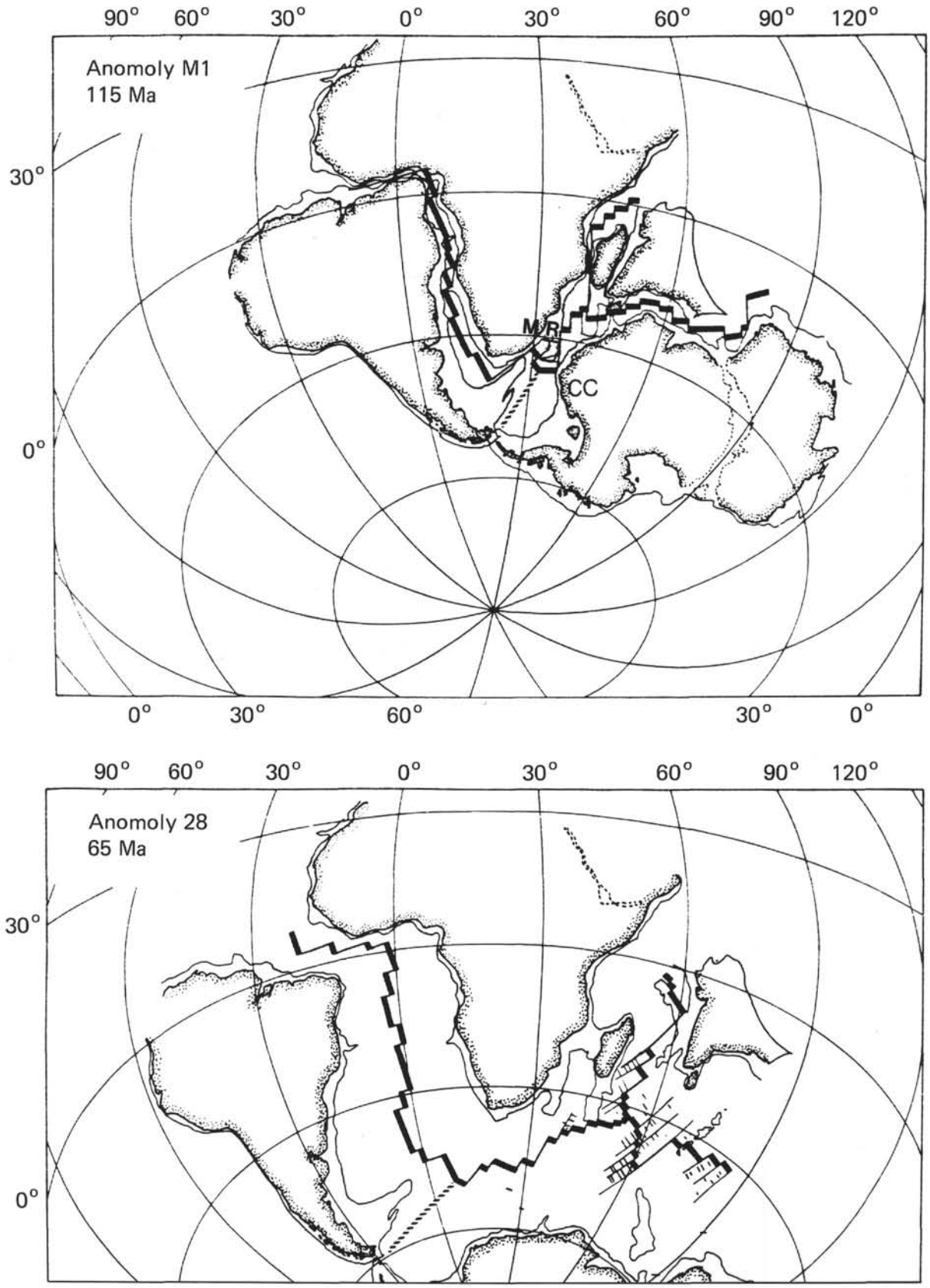

90° 60° 30° 0° 30° 60° 90° 120°
Anomoly M1
115 Ma
30°
0°
MR
CC
0° 30° 60° 30° 0°
90° 60° 30° 0° 30° 60° 90° 120°
Anomoly 28
65 Ma
30°
0°

Figure 5.

SITE NUMBER: W1A (Maud Rise)

POSITION: 64°41'S, 02°44'E

SEDIMENT THICKNESS: 375 m

WATER DEPTH: 2120 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: Double APC/XCB, approximately 425 m penetration.

SEISMIC RECORD: Norwegian ARE 85, Maud 3 SP 1000; BRG 86, lines 30-33.

LOGGING: None.

OBJECTIVES: Early Cenozoic - Late Mesozoic paleoenvironmental record and age of Maud Rise.

Obtain an Early Cenozoic and older biogenic carbonate section relatively free of dissolution effects and terrigenous influence for an oxygen isotope record and biogeographic studies. Determine glacial history. Part of 2-site vertical transect on the Maud Rise to study vertical water mass history. Single channel seismic profiles suggest unconformity between upper pelagic sequences and underlying sequence of lithified sediments or volcaniclastics.

SEDIMENT TYPE: Calcareous/siliceous pelagics, lower section unknown, likely E-type mid-ocean ridge basalt.

SITE NUMBER: W1B (Maud Rise)

POSITION: 64°33'S, 03°10'E

SEDIMENT THICKNESS: 310 m

WATER DEPTH: 2100 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: Double APC/XCB, approximately 365 m penetration.

SEISMIC RECORD: BRG-86-32, SP-420; Norwegian ARE 85 lines 1 to 3.

LOGGING: None.

OBJECTIVES: Early Cenozoic - Late Mesozoic paleoenvironmental record and age of Maud Rise.

Obtain an early Cenozoic and older biogenic carbonate section relatively free of dissolution effects and terrigenous influence for an oxygen isotope record and biogeographic studies. Determine glacial history. Part of 2-site vertical transect on the Maud Rise to study vertical water mass history. Single channel seismic profiles suggest unconformity between upper pelagic sequences and underlying sequence of lithified sediments or volcanoclastics.

SEDIMENT TYPE: Calcareous/siliceous pelagics (ooze, chalk, etc). Lower section unknown, but probably enriched mid-ocean ridge basalt.

SITE NUMBER: W2A (Maud Rise)

POSITION: 65°14'S, 01°10'E

SEDIMENT THICKNESS: 320 m

WATER DEPTH: 2900 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: Double APC/XCB, approximately 370 m penetration.

SEISMIC RECORD: Norwegian ARE 85, Maud 2, SP 870; BRG 86 lines.

LOGGING: None.

OBJECTIVES: W2A lies on Maud Rise, an isolated elevation in the Eastern Weddell Sea. Maud Rise is presumed to have an oceanic basement and, like similar features (Rio Grande Rise, Walvis Ridge, Legs 72 and 74), to have formed by the interaction of a spreading ridge with a hotspot.

Leg 113's interest in Maud Rise is as a "dipstick" into the paleo-ocean, away from terrigenous sediment sources and unstable sediments.

SEDIMENT TYPE: Calcareous/siliceous pelagics; lowest section unknown, probably enriched mid-ocean ridge basalt.

SITE NUMBER: W2B (Maud Rise)

POSITION: 65°19'S, 1°37'E

SEDIMENT THICKNESS: 440 M

WATER DEPTH: 2850 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: Double APC/XCB, approximately 490 m penetration.

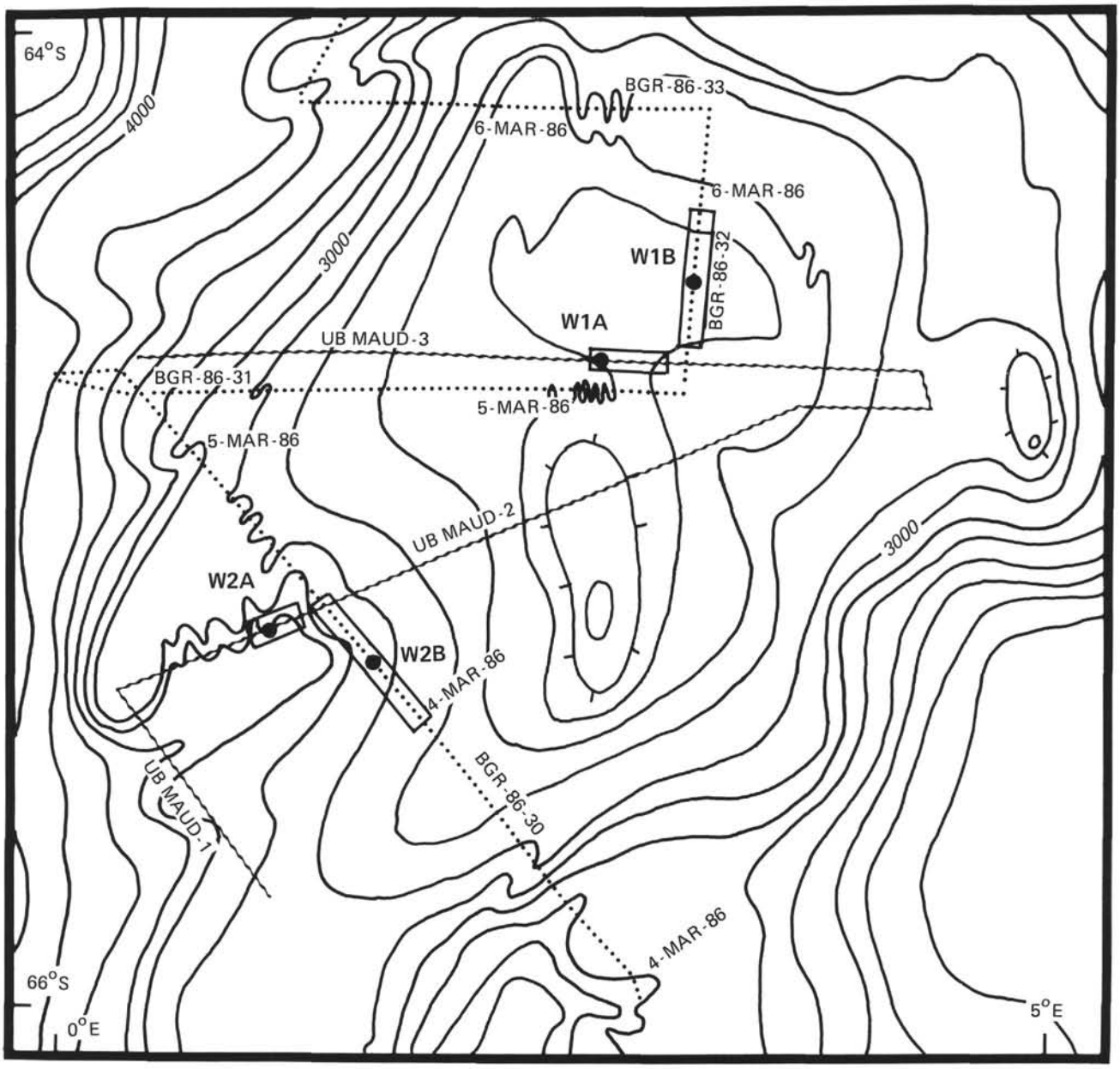
SEISMIC RECORD: BRG 86-30 SP 1700; Norwegian ARE 85 lines 1 to 3.

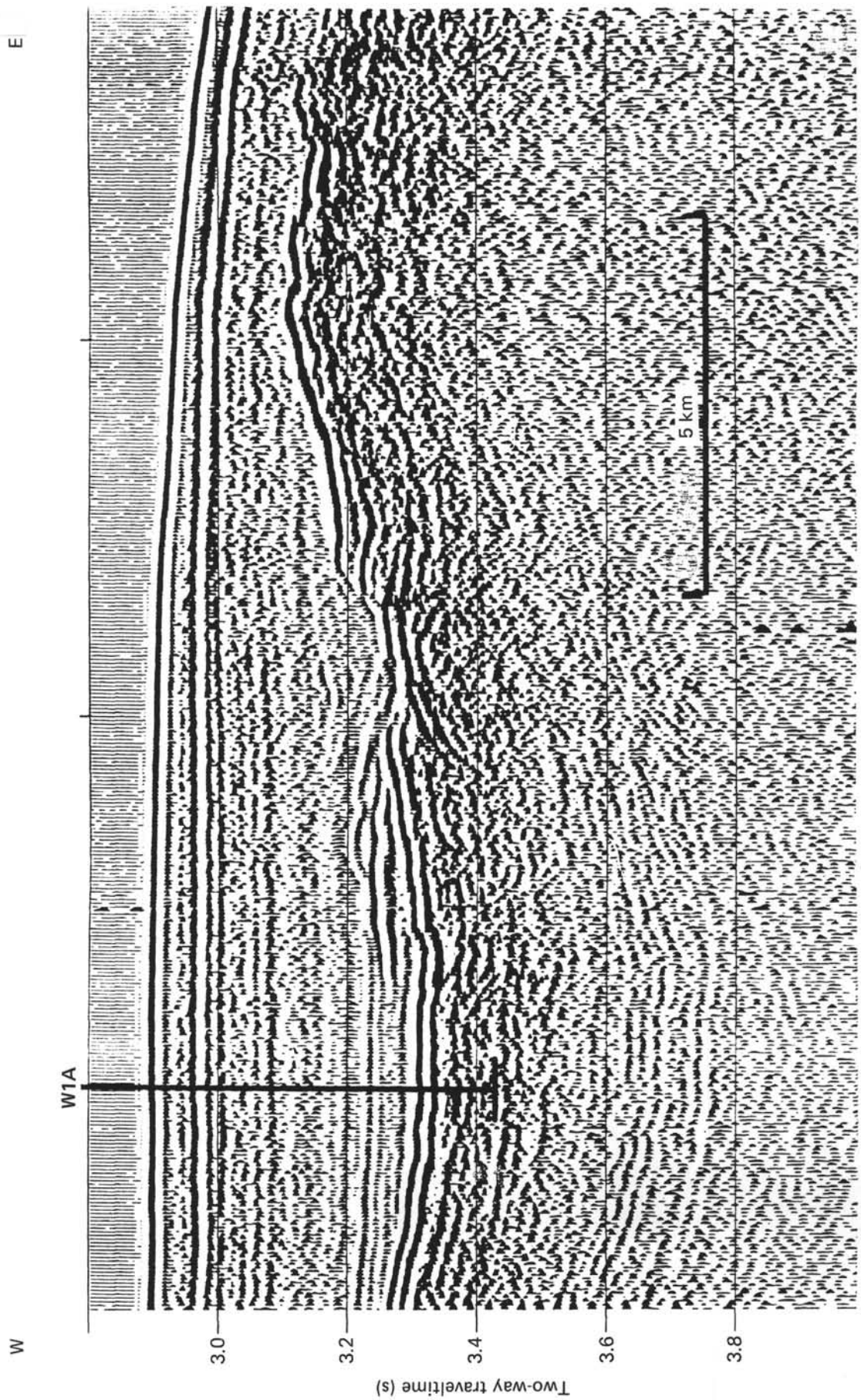
LOGGING: None.

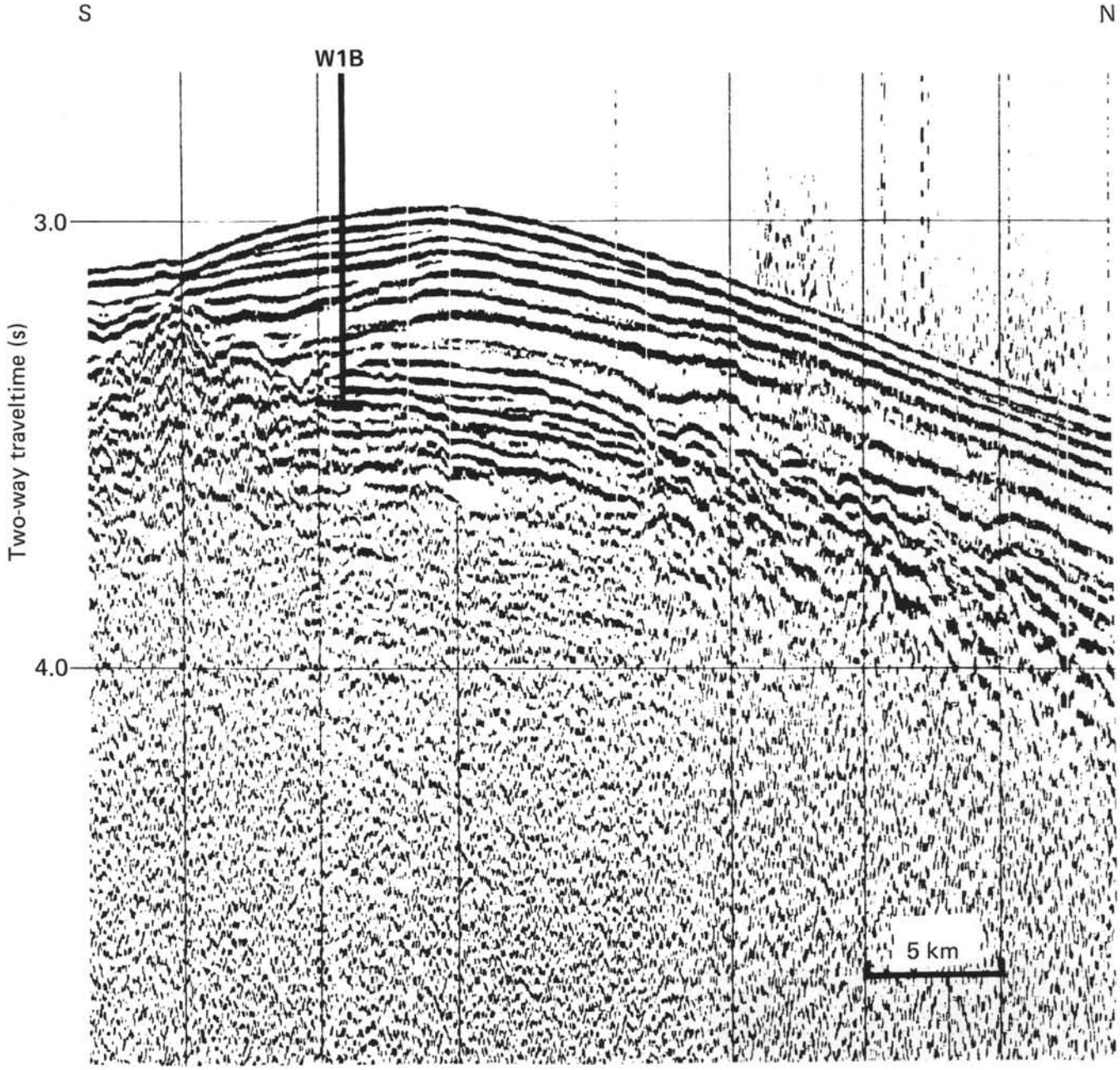
OBJECTIVES: W2B lies on Maud Rise, an isolated elevation in the Eastern Weddell Sea. Maud Rise is presumed to have an oceanic basement and, like similar features (Rio Grande Rise, Walvis Ridge, Legs 72 and 74), to have formed by the interaction of a spreading ridge with a hotspot.

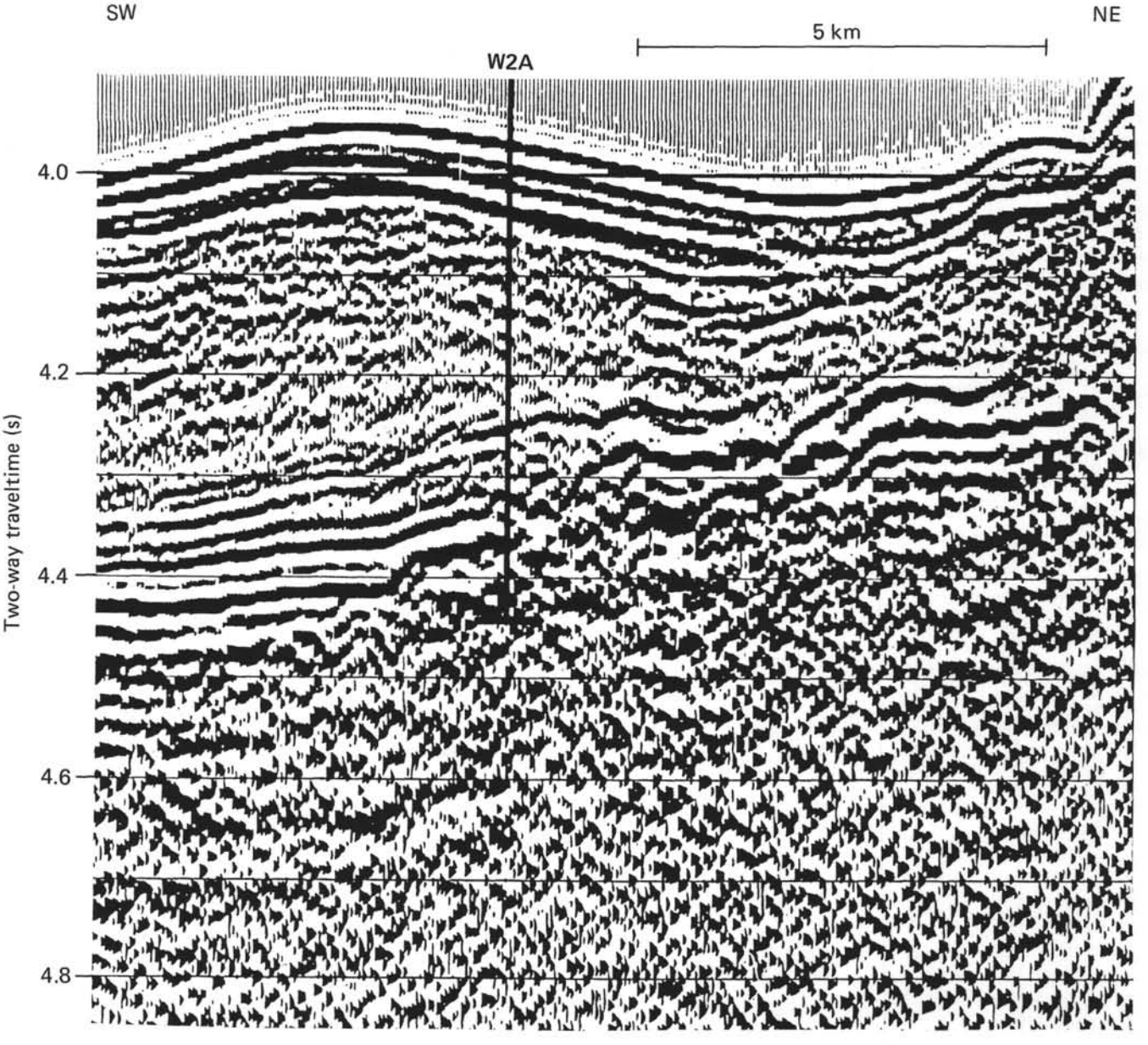
Leg 113's interest in Maud Rise is as a "dipstick" into the paleo-ocean, away from terrigenous sediment sources and unstable sediments.

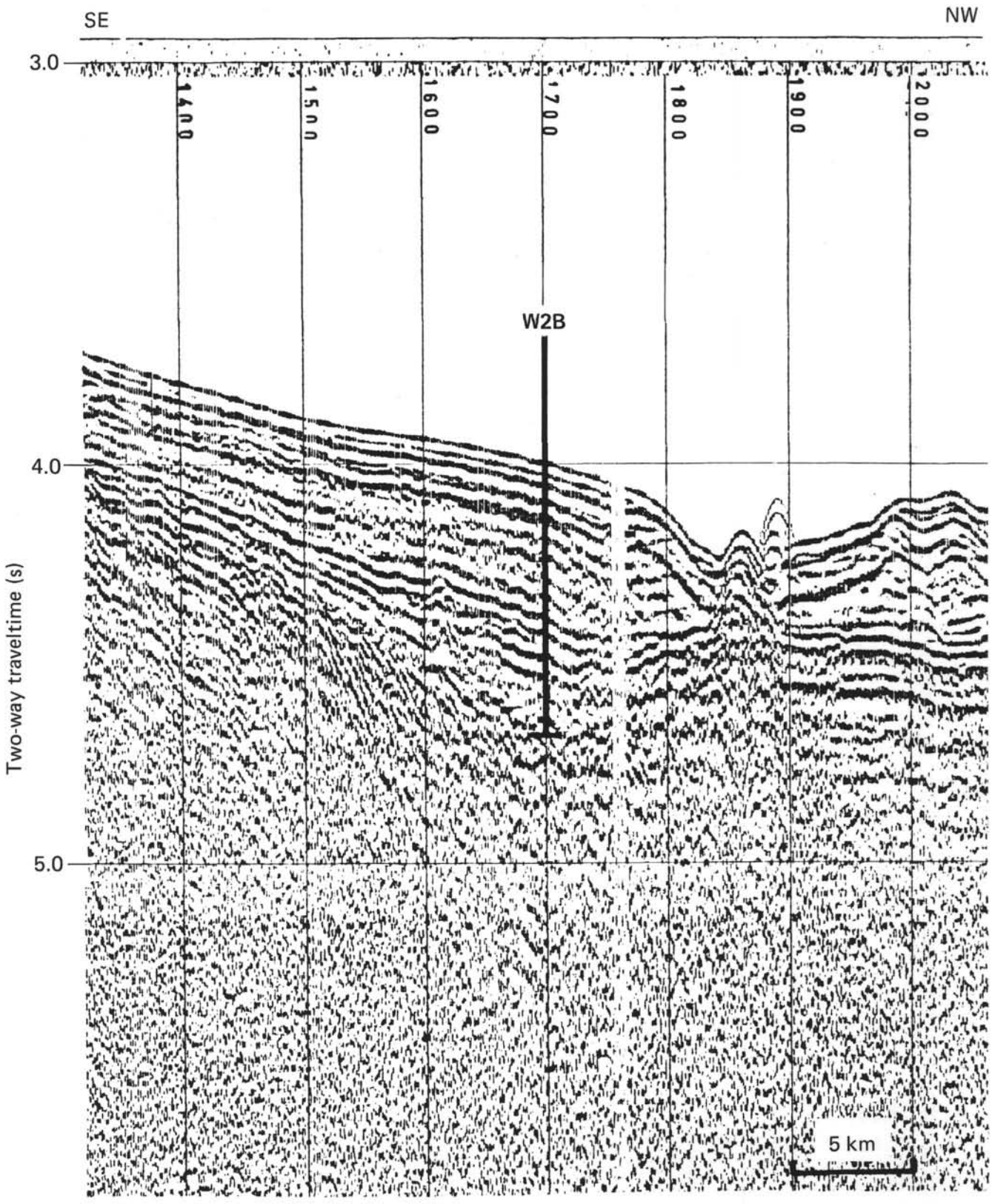
SEDIMENT TYPE: Calcareous/siliceous pelagics; lowest section unknown, unstable enriched mid-ocean ridge basalt.


64°S
4000
BGR-86-33
6-MAR-86
6-MAR-86
3000
W1B
BGR-86-32
W1A
UB MAUD-3
BGR-86-31
5-MAR-86
5-MAR-86
UB MAUD-2
3000
W2A
W2B
4-MAR-86
BGR-86-30
UB MAUD-1
4-MAR-86
66°S
0°E
5°E


E
W
W1A
5 km
3.0
3.2
3.4
3.6
3.8
Two-way traveltime (s)


S
N
W1B
3.0
4.0
Two-way traveltime (s)
5 km


SW
NE
5 km
W2A
4.0
4.2
4.4
4.6
4.8
Two-way traveltime (s)


SE
NW
3.0
4.0
5.0
Two-way traveltime (s)
1400
1500
1600
1700
1800
1900
2000
W2B
5 km

SITE NUMBER: W4/1 (Dronning Maud Land Margin)

POSITION: 70°38'S, 13°21'W

SEDIMENT THICKNESS: 1000 m

WATER DEPTH: 3000 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: Rotary, approximately 1100 m penetration.

SEISMIC RECORD: BGR 78-019, SP 820, and profiles from cruises BGR 78, BGR 86 NARE 79.

LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

OBJECTIVES: W4/1 lies on the eastern margin of the Weddell Sea. It is located on a bench on the continental slope, called the "Explora Wedge" (Hinz and Krause, 1982) and is considered to be a "seaward-dipping reflector" province (like the Voring Plateau - Leg 104 and Hatton-Rockall Bank - Leg 81).

Leg 113 has two main targets at W4:

(a) to date the dipping reflectors (presumed basalts) to help understand the earliest stages of Weddell Sea opening, and

(b) to examine the record of Antarctic terrestial vegetation in the overlying pre-glacial terrigenous sediments in order to understand the early stages of climatic deterioration which culminated in glaciation.

SEDIMENT TYPE: Continental slope sediments, turbidites, hemipelagic sediments, preglacial and glacial sediments, subaerial or shallow marine basalt within sediment interbeds.

SITE NUMBER: W4/1 Alt (Dronning Maud Land Margin)

POSITION: 70°43'S, 13°18'W

SEDIMENT THICKNESS: 1070 m

WATER DEPTH: 2850 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: Rotary, approximately 1170 m penetration.

SEISMIC RECORD: BGR 78-019, SP 960. Additional profiles from BGR 78, BGR 86, NARE 79 cruises.

LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

OBJECTIVES: W4/1 Alt lies on the eastern margin of the Weddell Sea. It is located on a bench on the continental slope, called the "Explora Wedge" (Hinz and Krause, 1982) and is considered to be a "seaward-dipping reflector" province (like the Voring Plateau - Leg 104 and Hatton-Rockall Bank - Leg 81).

Leg 113 has two main targets at W4:

(a) to date the dipping reflectors (presumed basalts) to help understand the earliest stages of Weddell Sea opening, and

(b) to examine the record of Antarctic terrestrial vegetation in the overlying pre-glacial terrigenous sediments in order to understand the early stages of climatic deterioration which culminated in glaciation.

SEDIMENT TYPE: Continental slope sediments, glacial sediments, preglacial turbidites, subaerial or shallow submarine basalt with thin sediment interbeds.

SITE NUMBER: W4/2 (Dronning Maud Land Margin)

POSITION: 70°29'S, 13°25'W

SEDIMENT THICKNESS: 1000 m

WATER DEPTH: 2780 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: APC/XCB, approximate penetration 300 m.

SEISMIC RECORD: BGR 78-019, SP 600. Additional profiles from BGR 78, BGR 86, NARE 79.

LOGGING: None.

OBJECTIVES: W4/2 lies on the eastern margin of the Weddell Sea. It is located on a bench on the continental slope, called the "Explora Wedge" (Hinz and Krause 1982) and is considered to be a "seaward-dipping reflector" province (like the Voring Plateau - Leg 104 and Hatton-Rockall Bank - Leg 81).

Leg 113 has two main targets at W4:

(a) to date the dipping reflectors (presumed basalts) to help understand the earliest stage of Weddell Sea opening, and

(b) to examine the record of Antarctic terrestial vegetation in the overlying pre-glacial terrigenous sediments in order to understand the early stages of climatic deterioration, which culminated in glaciation.

SEDIMENT TYPE: Terrigenous, hemipelagic, glacial-marine turbidites, pre-glacial turbidites.

SITE NUMBER: W4-I/1 (Dronning Maud Land Margin)

POSITION: 70°44'S, 14°18'W

SEDIMENT THICKNESS: 1800 m

WATER DEPTH: 2740 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: APC/XCB/Rotary, approximately 520 m penetration.

SEISMIC RECORD: BGR 86-07, SP 110. Additional profiles from BGR 78, BGR 86.

LOGGING: None.

OBJECTIVES: Age of "ocean-dipping reflector" sequence (Explora Wedge), hence earliest Gondwana breakup. Paleoenvironmental history of Antarctic margin.

Unknown Antarctic terrestrial environment (including pre-glacial to glacial change) through Late Mesozoic and Cenozoic, from overlying sediments. Comparison with N.W. Weddell (S. Orkney) sites.

SEDIMENT TYPE: Glacio-marine turbidites.

SITE NUMBER: W4-I/2 (Dronning Maud Land Margin)

POSITION: 70°43'S, 14°15'W

SEDIMENT THICKNESS: 1500 m

WATER DEPTH: 3050 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: Rotary, approximately 400 m penetration.

SEISMIC RECORD: BGR 86-07, SP 110. Additional profiles from BGR 78, BGR 86, NARE 79.

LOGGING: None.

OBJECTIVES: Age of "ocean-dipping reflector" sequence (Explora Wedge), hence earliest Gondwana breakup. Paleoenvironmental history of Antarctic margin.

Unknown Antarctic terrestrial environment (including pre-glacial to glacial change) through Late Mesozoic and Cenozoic, from overlying sediments. Comparison with N.W. Weddell (S. Orkney) sites.

SEDIMENT TYPE: Glacial marine sediments and turbidites.

SITE NUMBER: W4-I/3 (Dronning Maud Land Margin)

POSITION: 70°42.8'S, 14°13'W

SEDIMENT THICKNESS: 1350 m

WATER DEPTH: 3400 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: Rotary; approximately 390 m penetration.

SEISMIC RECORD: BGR 86-07, SP 38. Additional profiles from BGR 78, BGR 86, NARE 79.

LOGGING: None.

OBJECTIVES: Age of "ocean-dipping reflector" sequence (Explora Wedge), hence earliest Gondwana breakup. Paleoenvironmental history of Antarctic margin.

Unknown Antarctic terrestrial environment (including pre-glacial to glacial change) through Late Mesozoic and Cenozoic, from overlying sediments. Comparison with N.W. Weddell (S. Orkney) sites.

SEDIMENT TYPE: Pre-glacial, fluvio-marine turbidites (Oligocene).

SITE NUMBER: W4-I/4 (Dronning Maud Land Margin)

POSITION: 70°42.2'S, 14°11'W SEDIMENT THICKNESS: 920 m

WATER DEPTH: 3660 m PRIORITY: I

PROPOSED DRILLING PROGRAM: Rotary; approximately 1000 m.

SEISMIC RECORD: BGR 86-07, SP 005. Additional profiles from cruises BGR 78, BGR 86, NARE 79.

LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

OBJECTIVES: Age of "ocean-dipping reflector" sequence (Explora Wedge), hence earliest Gondwana breakup. Paleoenvironmental history of Antarctic margin.

Unknown Antarctic terrestrial environment (including pre-glacial to glacial change) through Late Mesozoic and Cenozoic, from overlying sediments. Comparison with N.W. Weddell (S. Orkney) sites.

SEDIMENT TYPE: Fluvio-marine turbidites, underlain by subaerial/submarine lavas with thin sediment interbeds.

SITE NUMBER: W4-II/7 (Dronning Maud Land Margin)

POSITION: 70°03.3'S, 08°54'W

SEDIMENT THICKNESS: 1250 m

WATER DEPTH: 1750 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: APC/XCB/Rotary, to overlap W4II/8, approximately 500 m.

SEISMIC RECORD: BGR 86-25, SP 2110. Additional profiles from cruises, BGR 78, BGR 86, NARE 79.

LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

OBJECTIVES: Neogene paleoenvironmental history of the Antarctic margin. Drill to overlap with W4-II/8 and recover sediments near reflecting horizon U3, approximately 500 m.

SEDIMENT TYPE: Glacial-marine turbidites.

SITE NUMBER: W4-II/8 (Dronning Maud Land Margin)

POSITION: 70°02.5'S, 08°51'W SEDIMENT THICKNESS: 950 m

WATER DEPTH: 2070 m PRIORITY: I

PROPOSED DRILLING PROGRAM: Rotary to overlap W4-II/2, approximately 600 m.

SEISMIC RECORD: BGR 86-25, SP 2063. Additional profiles from cruises BGR 78, BGR 86.

LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

OBJECTIVES: Cretaceous(?) to Miocene paleoenvironmental history of Gondwanaland. Drill to penetrate reflector U5.

SEDIMENT TYPE: Glacial marine to fluvio-marine turbidites.

SITE NUMBER: W4-II/2 (Dronning Maud Land Margin)

POSITION: 70°00.0'S, 08°41'W

SEDIMENT THICKNESS: 250 m

WATER DEPTH: 2790 m

PRIORITY: I

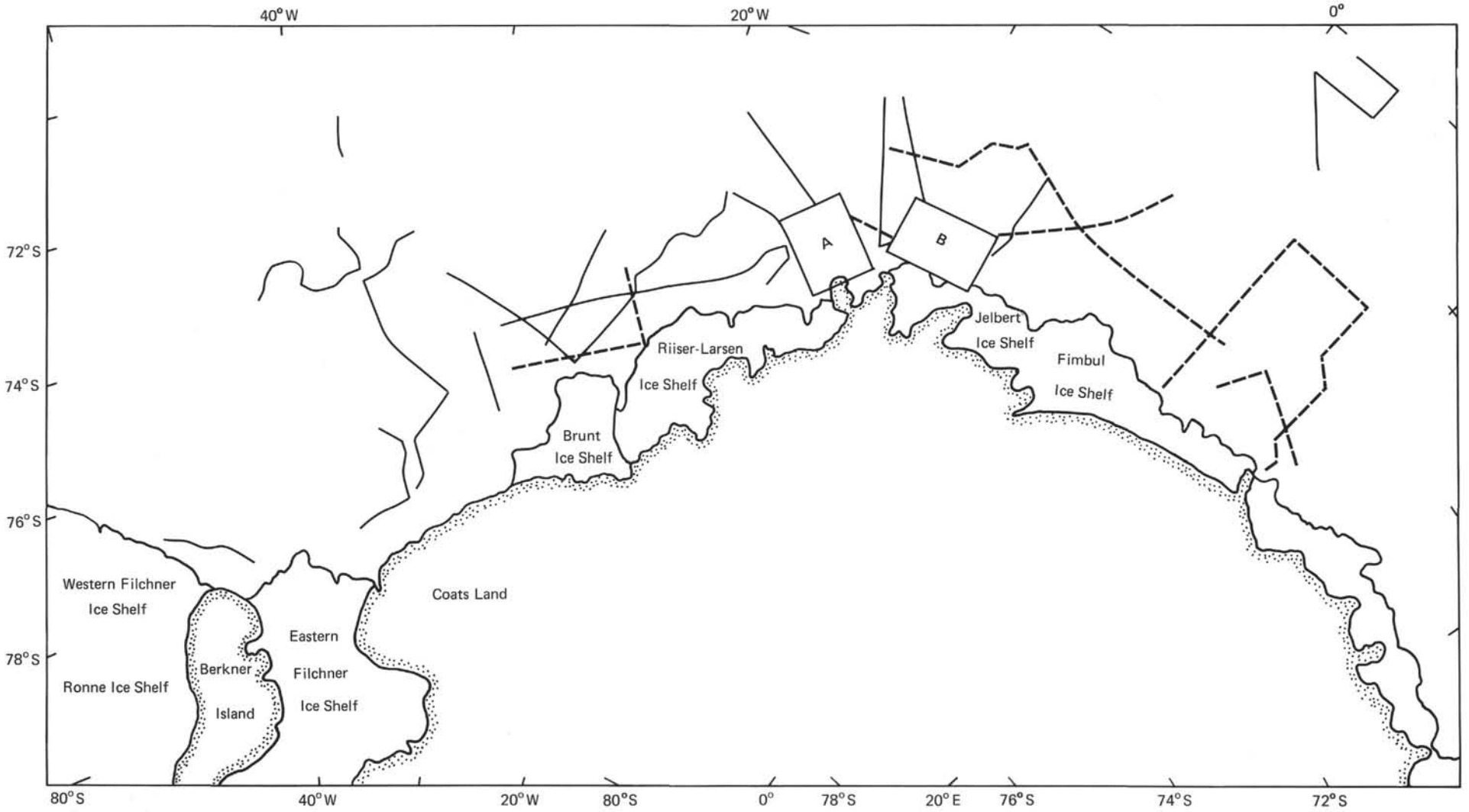
PROPOSED DRILLING PROGRAM: Rotary, including up to 50 m basalt, approximately 350 m penetration.

SEISMIC RECORD: BGR 86-25, SP 1915. Additional profiles from BGR 78, BGR 86, NARE 79.

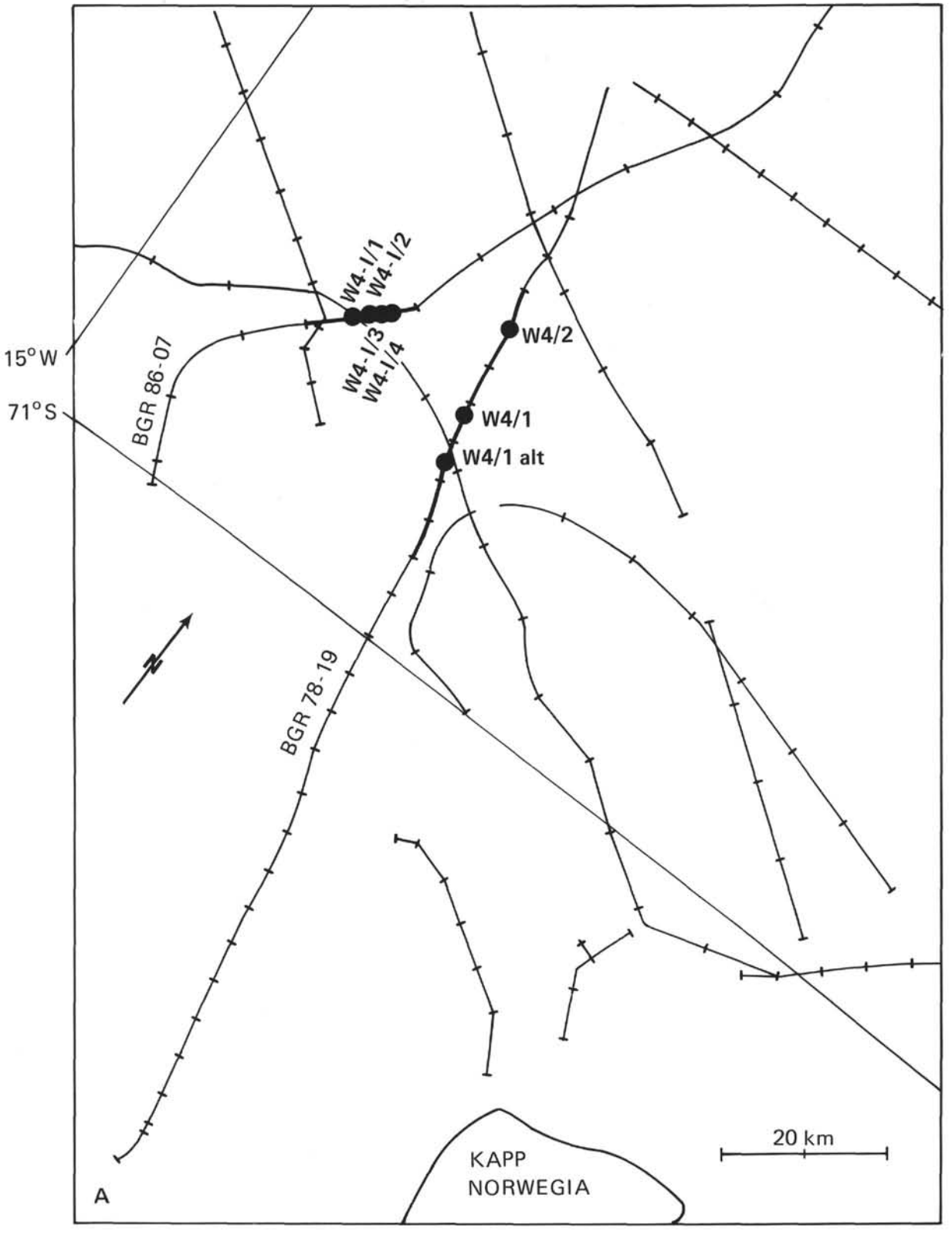
LOGGING: None.

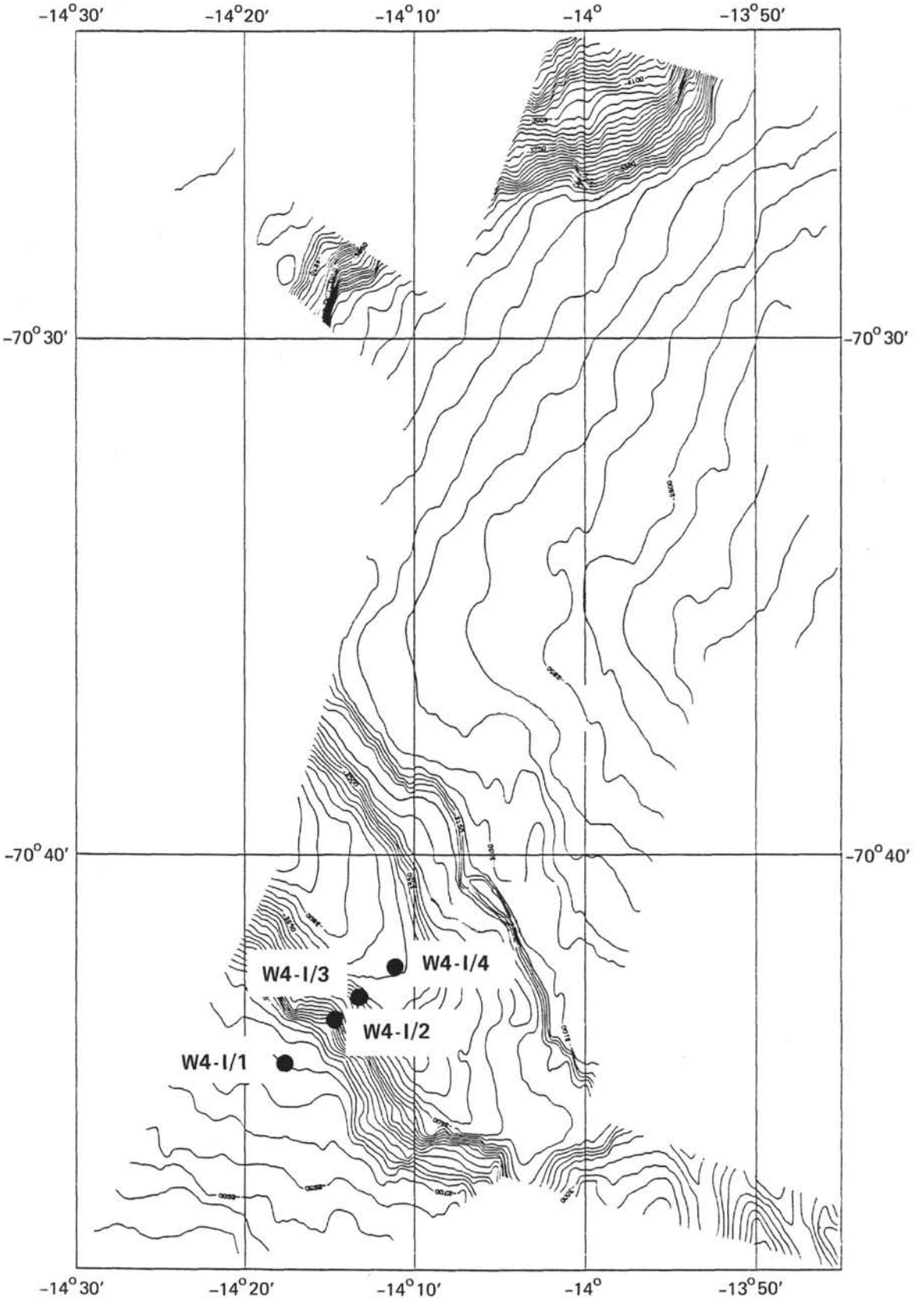
OBJECTIVES: Late Jurassic to Oligocene paleoenvironmental history of the Antarctic margin, age and composition of dipping reflectors (Explora Wedge). Hence, earliest Gondwanaland breakup.

SEDIMENT TYPE: Fluvio-marine turbidites, subaerial/shallow submarine basalts with interbedded volcaniclastic sediments.

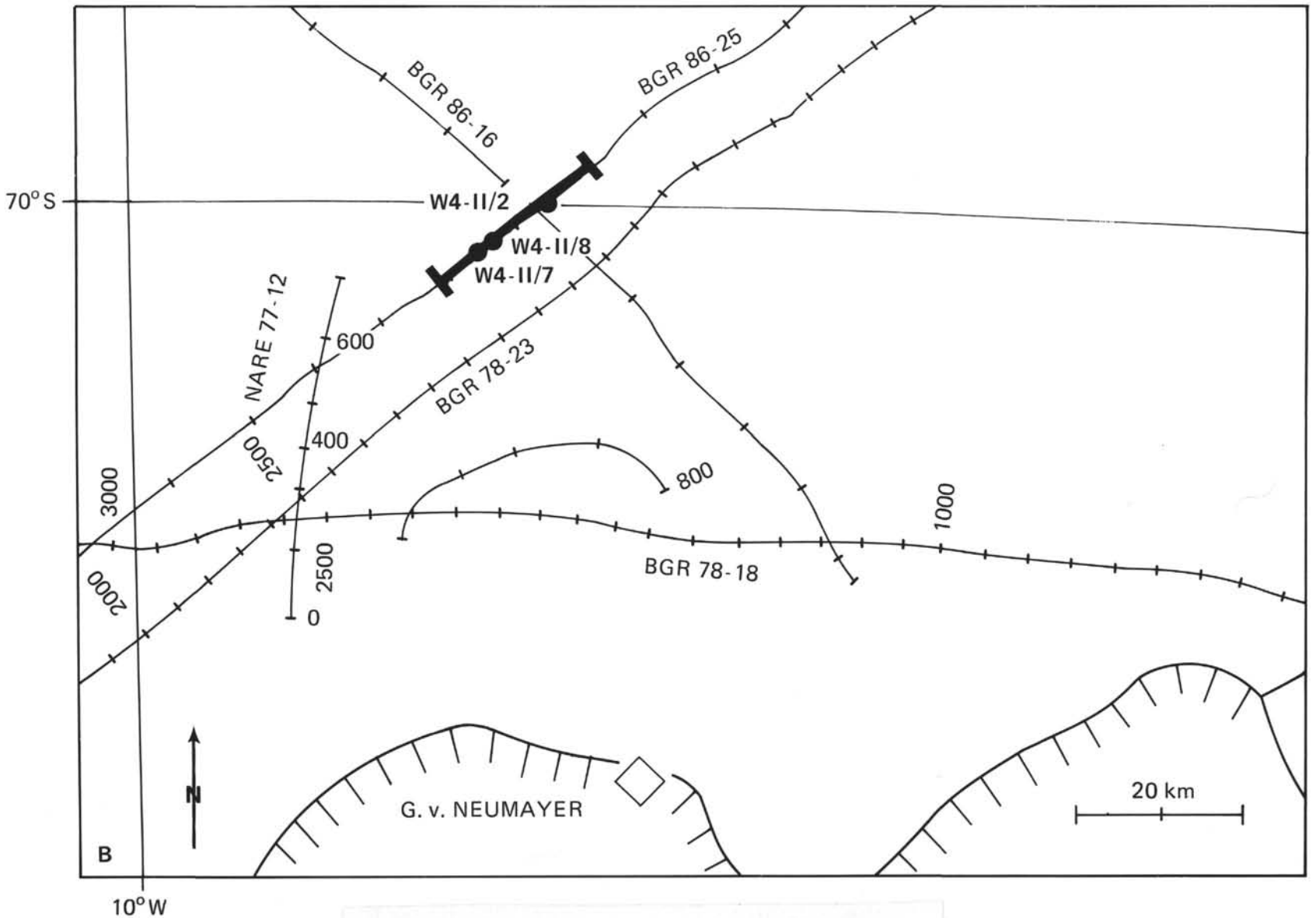


Antarctic continental margin showing ice masses and ship tracks. Inserts locate detailed ship tracks for W4 and W4-I Transects (A) and W4-II Transect (B).

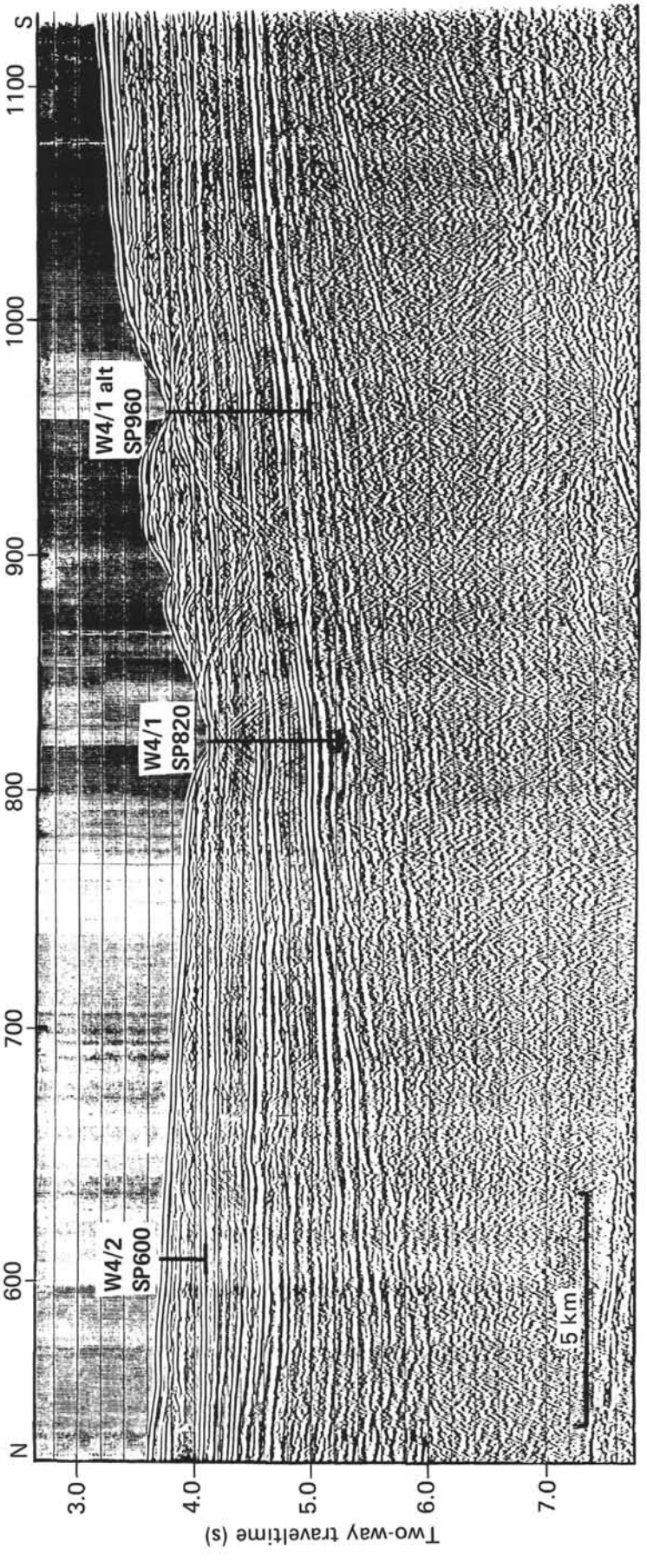

W4-I/1
W4-I/2
W4-I/3
W4-I/4
W4/2
W4/1
W4/1 alt
15°W
71°S
BGR 86-07
BGR 78-19
20 km
KAPP
NORWEGIA
A

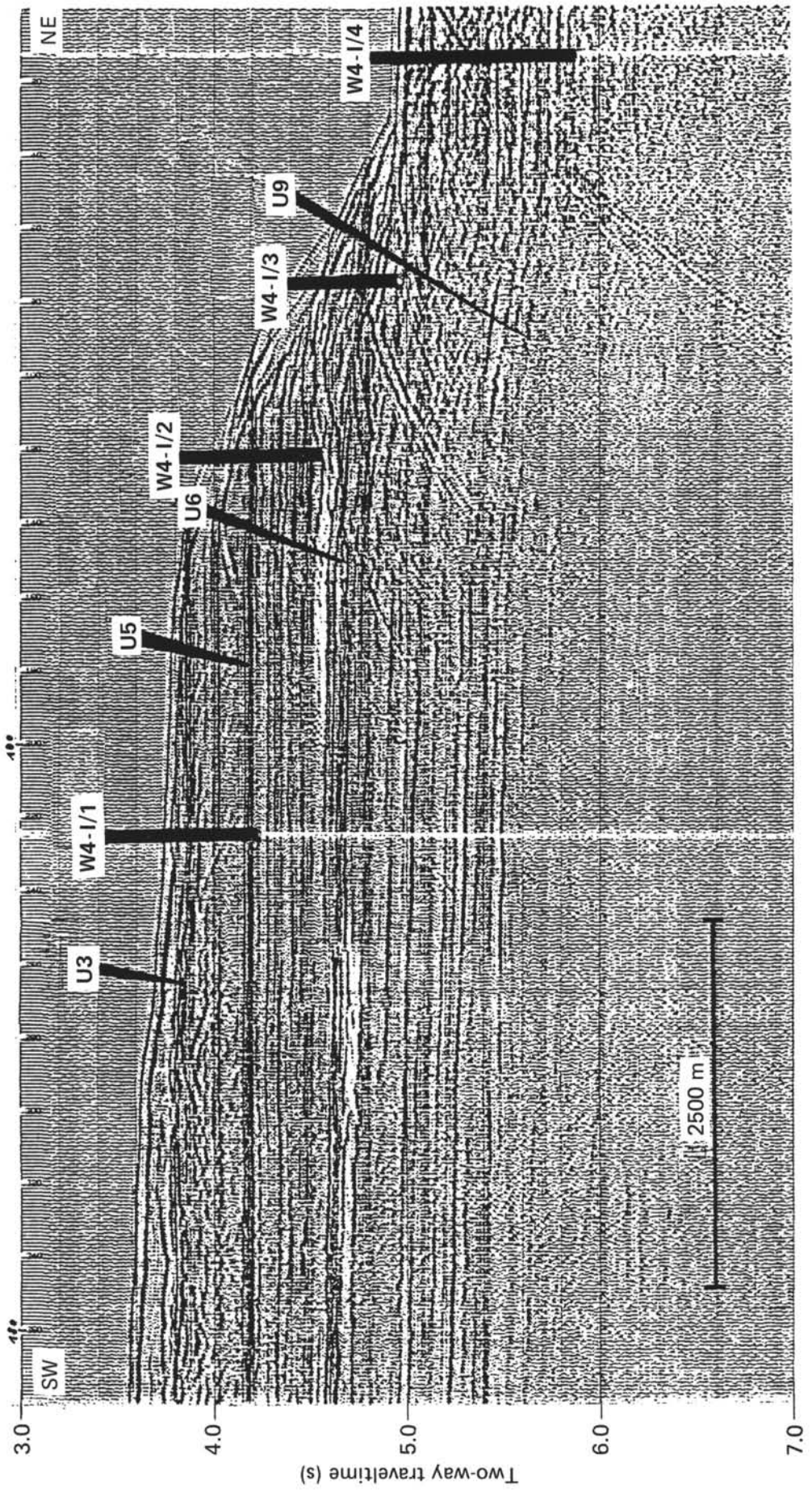


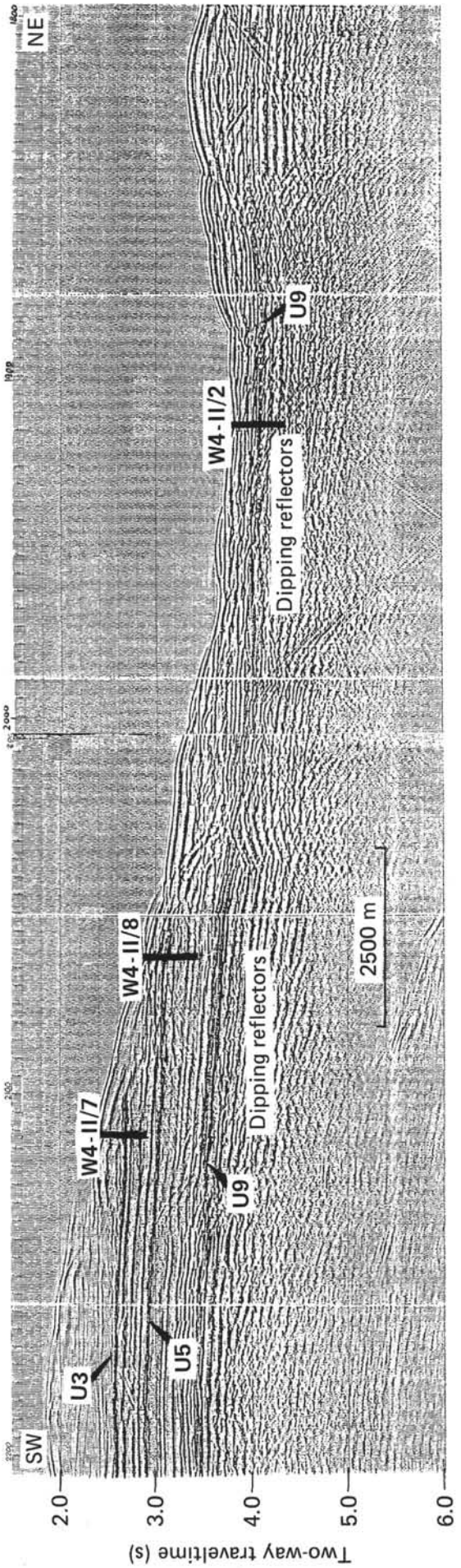
Sea Beam bathymetric map from W4-I Transect area (from Polarstern, 1985/86).



Ship tracks and site locations for the W4-II Transect. Location of figure is shown as Insert B in Antarctic continental margin figure.


S
1100
1000
900
800
700
600
N
W4/1 alt
SP960
W4/1
SP820
W4/2
SP600
5 km
3.0
4.0
5.0
6.0
7.0
Two-way traveltime (s)


NE
SW
W4-I/4
U9
W4-I/3
W4-I/2
U6
U5
W4-I/1
U3
2500 m
3.0
4.0
5.0
6.0
7.0
Two-way traveltime (s)


SW
NE
U3
U5
U9
U9
W4-II/7
W4-II/8
W4-II/2
Dipping reflectors
Dipping reflectors
2500 m
2.0
3.0
4.0
5.0
6.0
Two-way traveltime (s)

SITE NUMBER: W5 (Northern Weddell Basin)

POSITION: 66°51.5'S, 33°27.0'W SEDIMENT THICKNESS: 1060 m

WATER DEPTH: 4670 m PRIORITY: I

PROPOSED DRILLING PROGRAM: APC/XCB/Rotary approximately 900 m penetration.

SEISMIC RECORD: UK (BAS/Birmingham) line AMG 845-15, SP1 2400. Additional MCS data, BGR 78, single channel BRAN 778, 101277, I01578.

LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

OBJECTIVES: W5 lies in the deep Weddell Basin. It has two aims. First, as the deepest component of the depth transect it will examine the history of bottom water production, particularly the origin of the present-day Weddell Sea Bottom Water. Second, through distal turbidites, the site will provide a more continuous record of continental glaciation and pre-glacial vegetation than at any of the other sites, which all lie near the higher-energy basin margins.

SEDIMENT TYPE: Hemipelagic and distal turbidite succession deposited at moderate rates (10-15 m/Ma).

SITE NUMBER: W5A (Northern Weddell Basin)

POSITION: 67°00.7'S, 23°50.0'W

SEDIMENT THICKNESS: 1120 m

WATER DEPTH: 4880 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: APC/XCB/Rotary/Approximately 900 m penetration.

SEISMIC RECORD: BGR 78-002 SP 13440. Additional profiles from AMG 845 (MCS), BRAN 778, ISL 1277, ISL 1578 (single channel).

LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

OBJECTIVES: W5 lies in the deep Weddell Basin. It has two aims. First, as the deepest component of the depth transect it will examine the history of bottom water production, particularly the origin of the present-day Weddell Sea Bottom Water. Second, through distal turbidites, the site will provide a record of continental glaciation and pre-glacial vegetation more continuous than at any of the other sites, which all lie near the higher-energy basin margins.

SEDIMENT TYPE: Paleocene to Holocene distal turbidites and hemipelagic clays and silts, claystones, and siltstones. Late Cretaceous to Paleocene calcareous claystones.

SITE NUMBER: W5B (NE Weddell Basin)

POSITION: 62°01'S, 03°42'W

SEDIMENT THICKNESS:

WATER DEPTH: 5700 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: XCB/APC/Rotary approximately 800 m penetration.

SEISMIC RECORD: IO 1578, 2 Feb 1978 @ 1800.

LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

OBJECTIVES: W5 lies in the deep Weddell Basin. It has two aims. First, as the deepest component of the depth transect it will examine the history of bottom water production, particularly the origin of the present-day Weddell Sea Bottom Water. Second, through distal turbidites, the site will provide a more continuous record of continental glaciation and pre-glacial vegetation than at any of the other sites, which all lie near the higher-energy basin margins.

SEDIMENT TYPE: Distal turbidites in upper section, pelagic (?) lower section.

SITE NUMBER: W5C (NE Weddell Basin)

POSITION: 61°00'S, 01°35'W

SEDIMENT THICKNESS: 250 m

WATER DEPTH: 5500 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: APC/XCB, approximately 250 m penetration.

SEISMIC RECORD: IO 1578.

LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

OBJECTIVES: W5 lies in the deep Weddell Basin. It has two aims. First, as the deepest component of the depth transect it will examine the history of bottom water production, particularly the origin of the present-day Weddell Sea Bottom Water. Secondly, through distal turbidites, the site will provide a more continuous record of continental glaciation and pre-glacial vegetation than at any of the other sites, which all lie near the higher-energy basin margins.

SEDIMENT TYPE: Distal turbidites and pelagics.

SITE NUMBER: W5D (NE Weddell Basin)

POSITION: 60°50'S, 02°10'W

SEDIMENT THICKNESS: 600 m

WATER DEPTH: 5750 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: APC/XCB/Rotary, approximately 600 m penetration.

SEISMIC RECORD: IO 1578.

LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

OBJECTIVES: W5 lies in the deep Weddell Basin. It has two aims. First, as the deepest component of the depth transect it will examine the history of bottom water production, particularly the origin of the present-day Weddell Sea Bottom Water. Second, through distal turbidites, the site will provide a more continuous record of continental glaciation and pre-glacial vegetation than at any of the other sites, which all lie near the higher-energy basin margins.

SEDIMENT TYPE: Distal turbidite and hemipelagic sediments.

SITE NUMBER: W5E (Northern Weddell Basin)

POSITION: 62°36'S, 20°26'W

SEDIMENT THICKNESS: 600 m

WATER DEPTH: 5400 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: APC/XCB/Rotary, approximately 600 m penetration.

SEISMIC RECORD: IO 1578.

LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

OBJECTIVES: W5 lies in the deep Weddell Basin. It has two aims. First, as the deepest component of the depth transect it will examine the history of bottom water production, particularly the origin of the present-day Weddell Sea Bottom Water. Second, through distal turbidites, the site will provide a more continuous record of continental glaciation and pre-glacial vegetation than at any of the other sites, which all lie near the higher-energy basin margins.

SEDIMENT TYPE: Hemipelagic and distal turbidite sediments.

SITE NUMBER: W5F (Northern Weddell Basin)

POSITION: 62°50'S, 20°45'W

SEDIMENT THICKNESS: 850 m

WATER DEPTH: 5400 m

PRIORITY: I

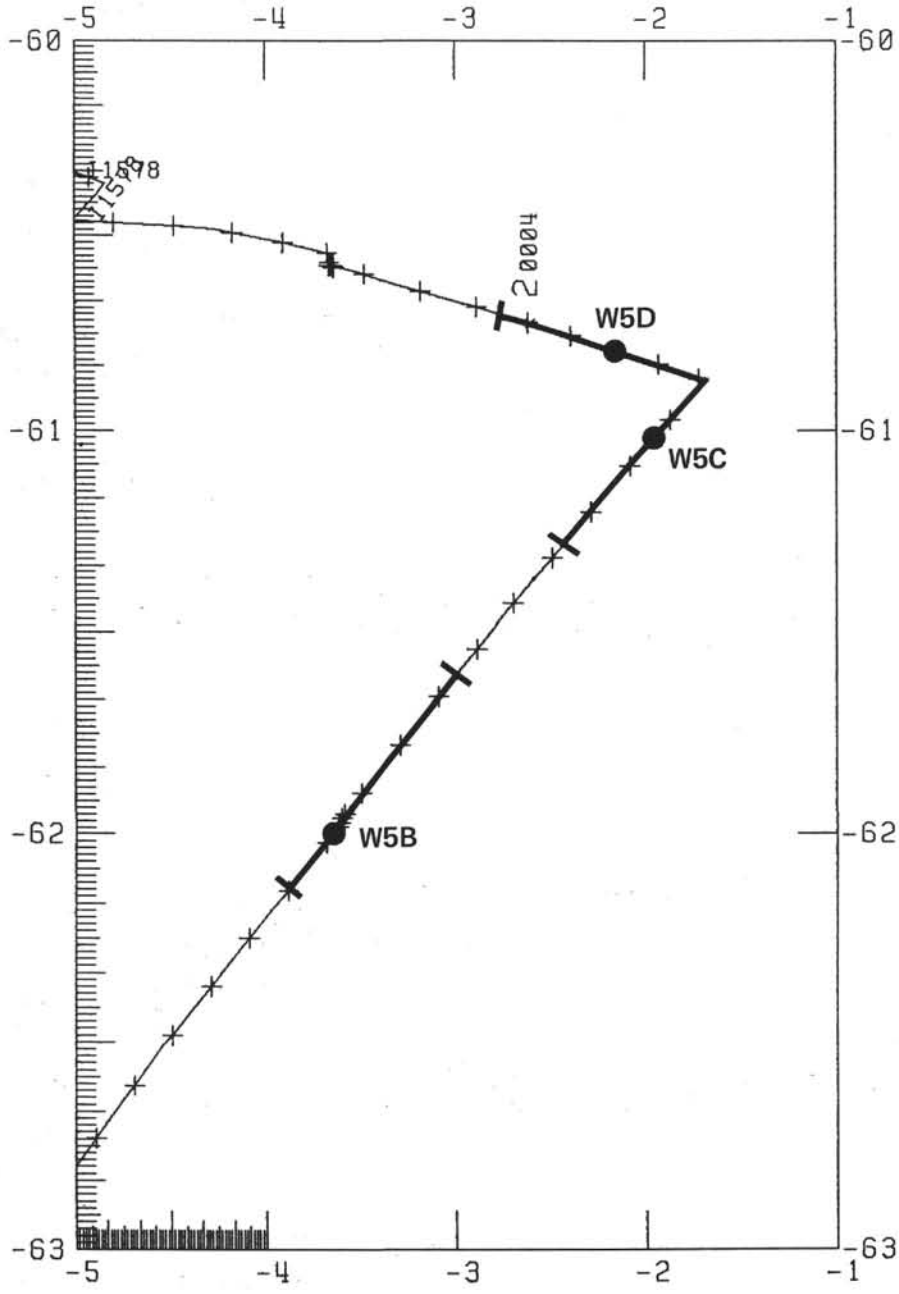
PROPOSED DRILLING PROGRAM: APC/XCB/Rotary, approximately 850 m penetration.

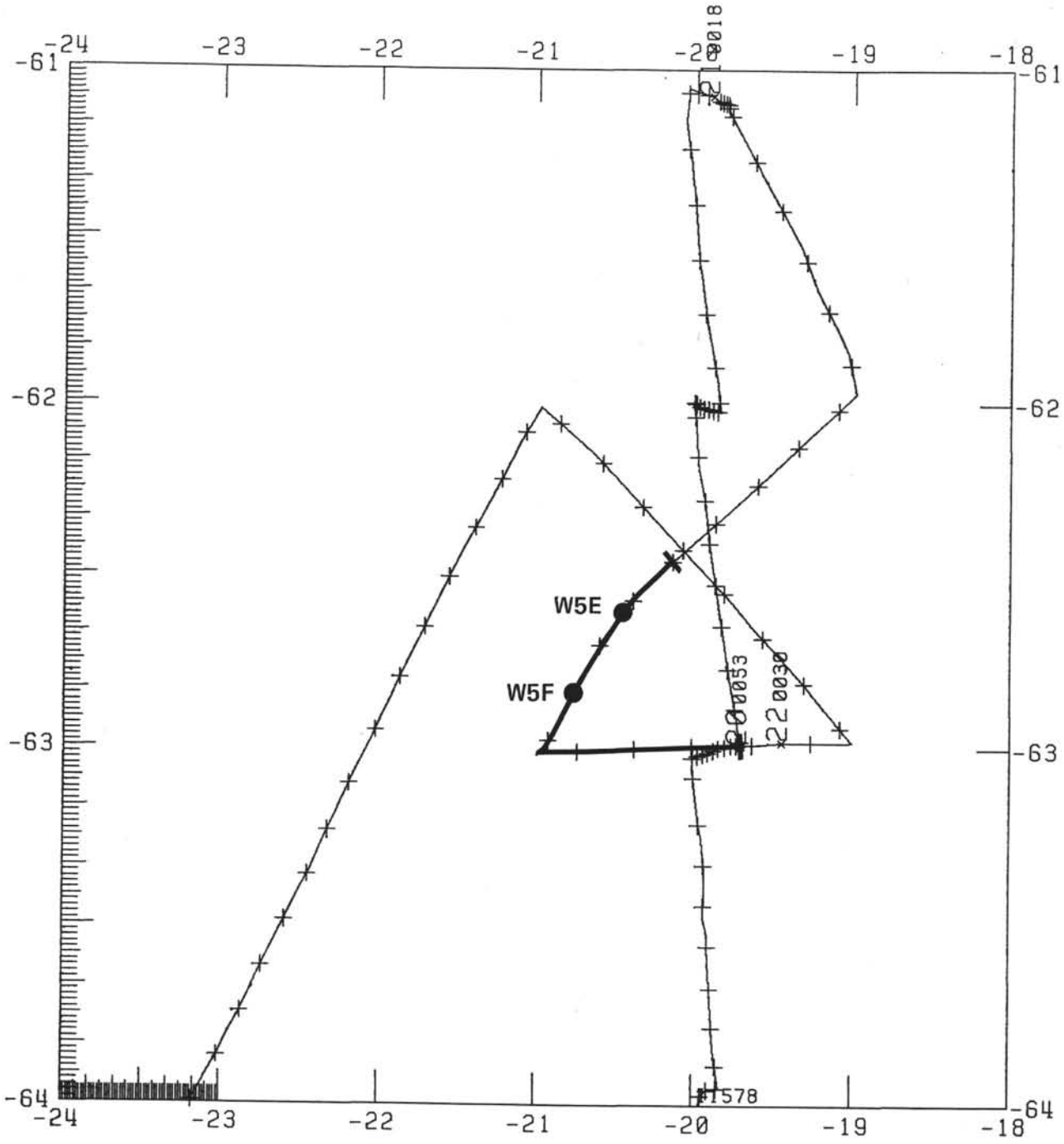
SEISMIC RECORD: IO 1578.

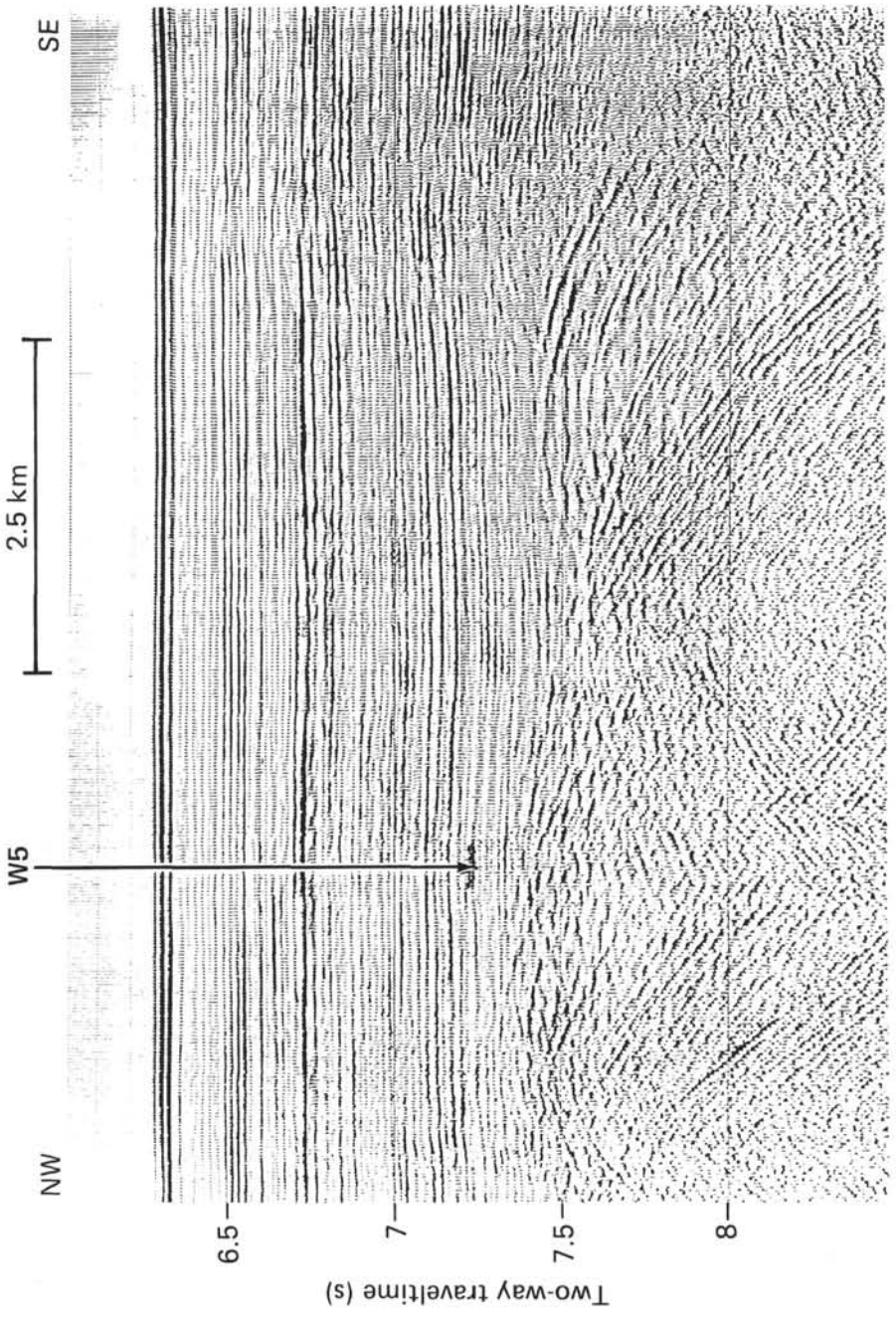
LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

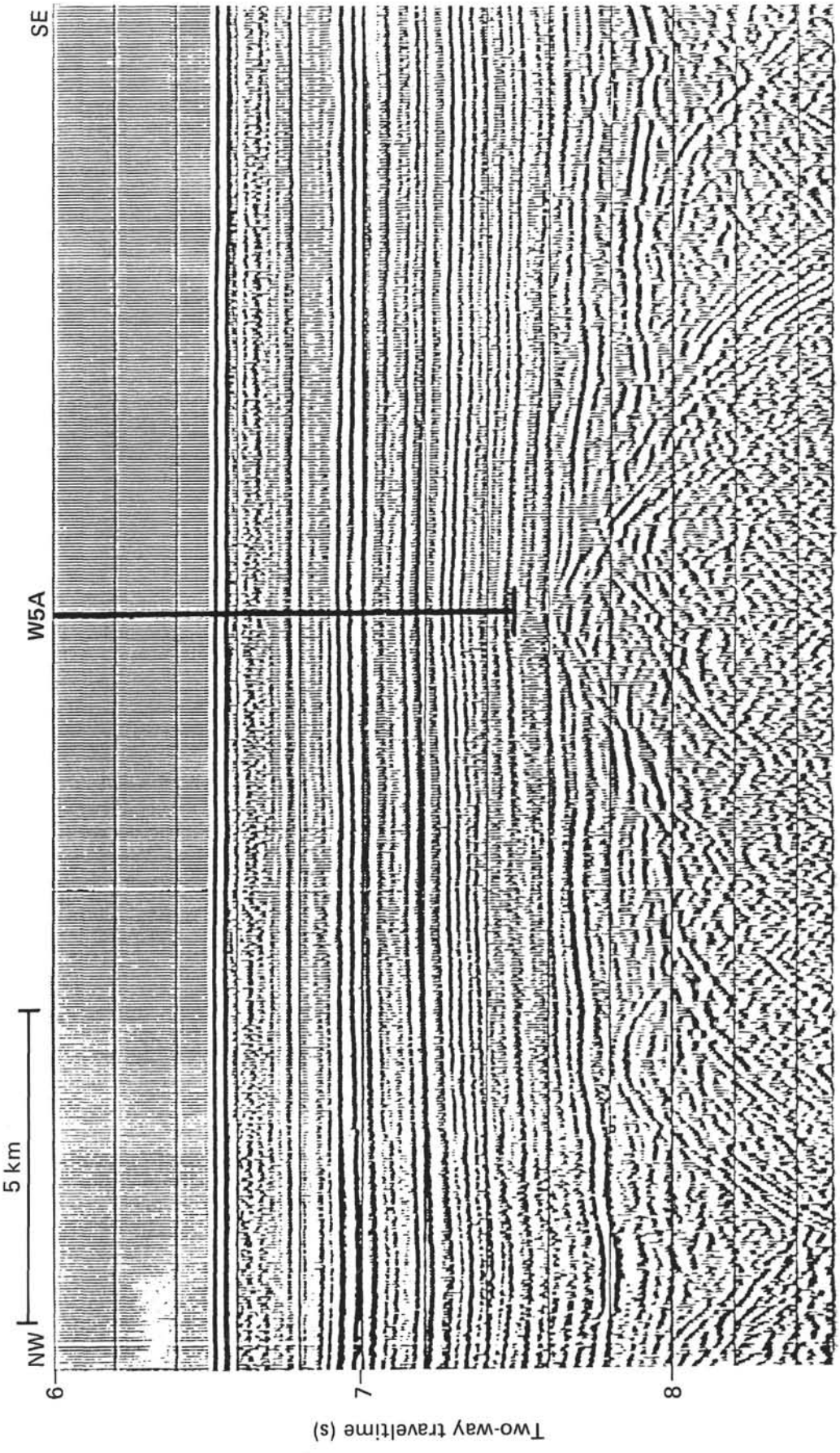
OBJECTIVES: W5 lies in the deep Weddell Basin. It has two aims. First, as the deepest component of the depth transect it will examine the history of bottom water production, particularly the origin of the present-day Weddell Sea Bottom Water. Second, through distal turbidites, the site will provide a more continuous record of continental glaciation and pre-glacial vegetation than at any of the other sites, which all lie near the higher-energy basin margins.

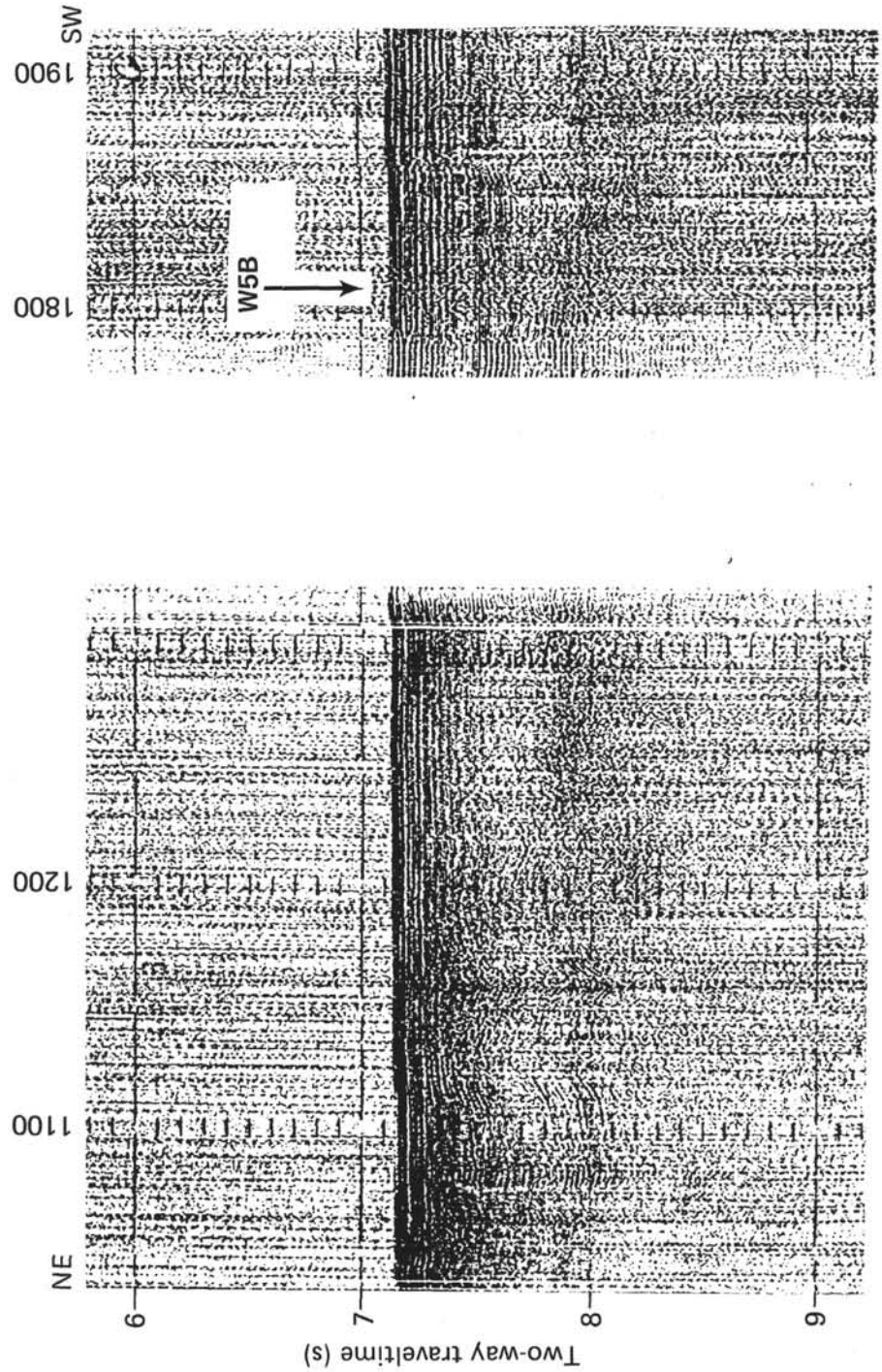
SEDIMENT TYPE: Hemipelagic and distal turbidites.

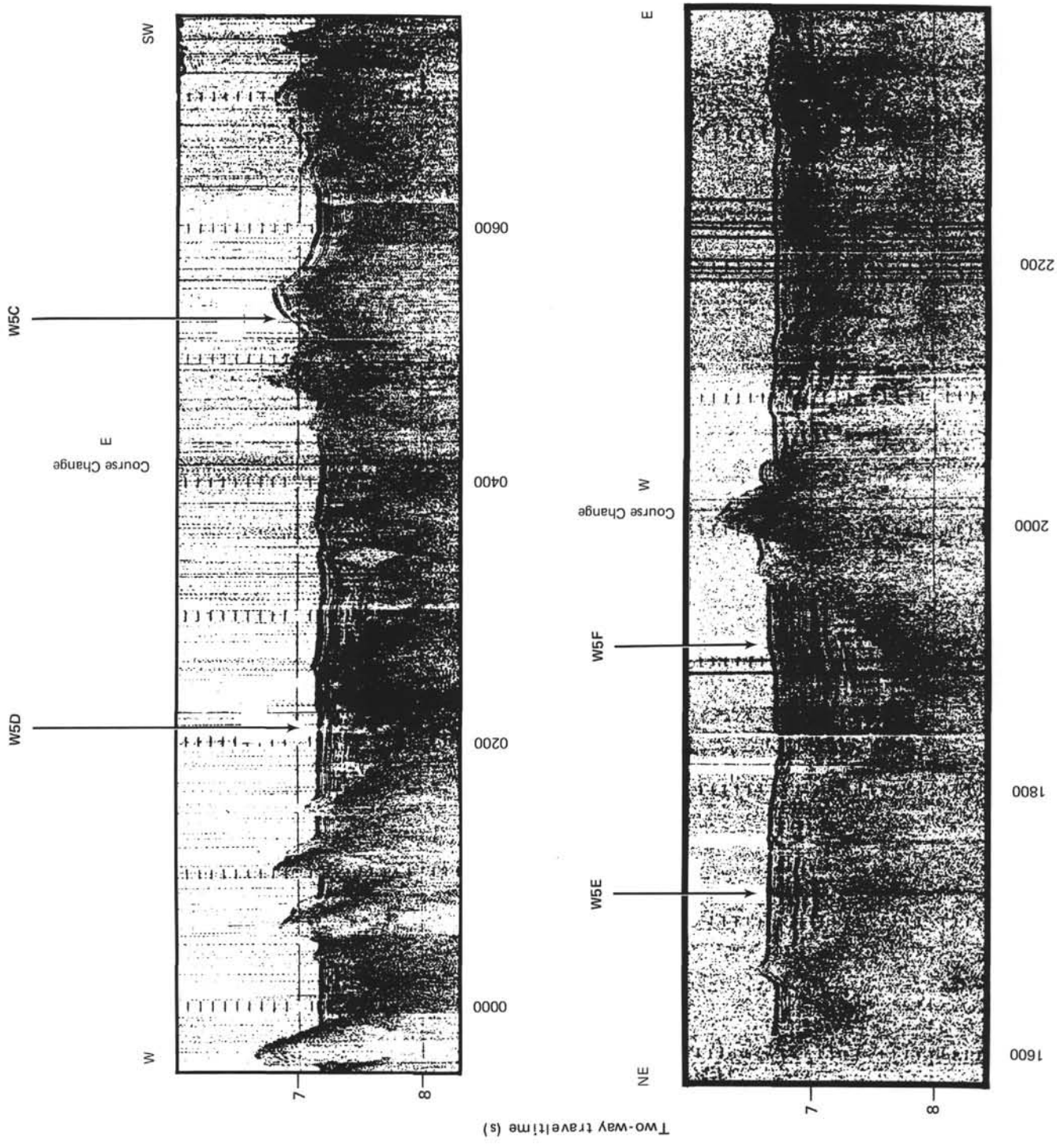

-5
-4
-3
-2
-1
-60
-61
-62
-63
W5D
W5C
W5B


-24
-23
-22
-21
-20
-19
-18
-61
-62
-63
-64
W5E
W5F
1578


SE
NW
2.5 km
W5
6.5
7
7.5
8
Two-way traveltime (s)


NW
5 km
W5A
SE
6
7
8
Two-way traveltime (s)


SW
1900
1800
W5B
1200
1100
NE
6
7
8
9
Two-way traveltime (s)


W5C
W5D
W5E
W5F
Course Change
Course Change
SW
W
NE
E
0000
0200
0400
0600
1600
1800
2000
2200
7
8
Two-way traveltime (s)

SITE NUMBER: W6 (Jane Basin, east of S. Orkney Platform)

POSITION: 61°47.3'S, 40°07.0'W

SEDIMENT THICKNESS: 1200 m

WATER DEPTH: 3480 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: Double APC/XCB, approximately 500 m penetration.

SEISMIC RECORD: UK (BAS/Birmingham) BRAN 790 line E (single-channel). Additional profiles BRAN 790, but no crossline.

LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

OBJECTIVES: Examine the deep-water (AABW) circulation history of the region.

This site is located so as to be within the western boundary of contour-following, deep water (AABW) circulation in the Weddell Basin. It was chosen to examine the vertical position of deep-contour following currents and the evidence for significant velocity fluctuations. The Neogene-Quaternary glacial history of the region will also be studied.

SEDIMENT TYPE: Bio-siliceous hemipelagic and pelagic clays, claystones and volcaniclastic turbidites.

SITE NUMBER: W7 (S. Orkney Platform, S. Scotia Ridge)

POSITION: 62°23.5'S, 43°27.0'W

SEDIMENT THICKNESS: 4000 m

WATER DEPTH: 1310 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: Double APC/XCB, approximately 500 m penetration.

SESMIC RECORD: MCS line AMG 845-18, SP 1720. Additional MCS profiles AM G845, single channel BRAN 790, SHACK 801.

LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

OBJECTIVES: Determination of Antarctic vertical water mass structure; glacial history of region.

This site is the intermediate depth component (1700-2500m) of a three site transect down the flank of the S. Orkney Platform between 500 and 3500 m. The site (and transect) objectives are: 1) a late Paleogene (?)-Neogene record of vertical water mass characteristics; 2) biostratigraphy, biogeography, and evolution of high Antarctic faunas and floras; and 3) glacial fluctuations along the West Antarctic margin. In addition, a BSR suggests the presence of a clathrate.

SEDIMENT TYPE: Biogenic ooze, chalk with glacial dropstones, volcaniclastics, terrigenous sediments.

SITE NUMBER: W8 (S. Orkney Platform, S. Scotia Ridge)

POSITION: 61°54.3'S, 42° 58.7'W

SEDIMENT THICKNESS: 1050 m

WATER DEPTH: 640 m

PRIORITY: I

PROPOSED DRILLING PROGRAM: Double APC/XCB to 500 m.

SEISMIC RECORD: AMG 845-18, SP 365 (0315/064). Crossed BRAN 790 line F. Additional Profiles AMG 845 (MCS) and BRAN 790, SHACK 801 (single channel).

LOGGING: Standard Schlumberger logs, 2 runs, seismic stratigraphy tool and geochemical tool.

OBJECTIVES: Examination of Antarctic vertical water mass structure; glacial history of region.

This site is the shallowest in a transect of 3 sites situated to determine variations in the level of key water masses (Antarctic Shelf Water, Circumpolar (Warm) Deep Water, Antarctic Bottom Water). It is situated above the shallowest level of the CCD, and may therefore provide a relatively continuous carbonate record. The Quaternary-Pliocene (?) glacial history of the Antarctic Peninsula will also be investigated. Local ice sheets existed on the plateau, most likely during Plio-Pleistocene time (local ice sheets were situated on the nearby South Shetland Islands on at least two occasions during the Plio-Pleistocene). A datable glacial record of these events would also be of value.

SEDIMENT TYPE: Calcareous/siliceous ooze and clay with dropstones, and volcaniclastic turbidites.

SITE NUMBER: W8A (S. Orkney Platform, S. Scotia Ridge)

POSITION: 61°44.2'S, 42°48.5'W

SEDIMENT THICKNESS: 2600 m

WATER DEPTH: 740 m

PRIORITY: I

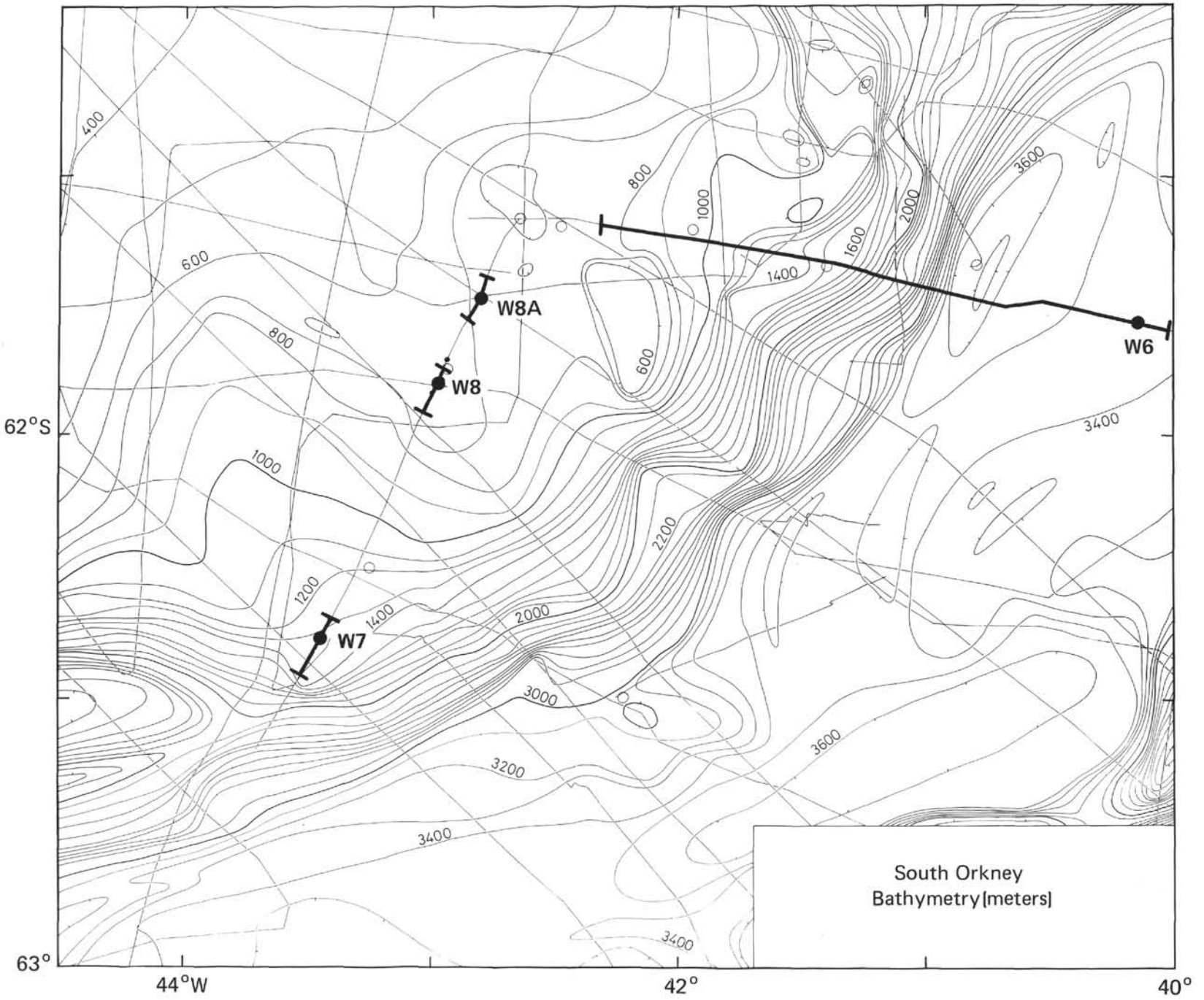
PROPOSED DRILLING PROGRAM: Double APC, XCB, approximately 500 m penetration.

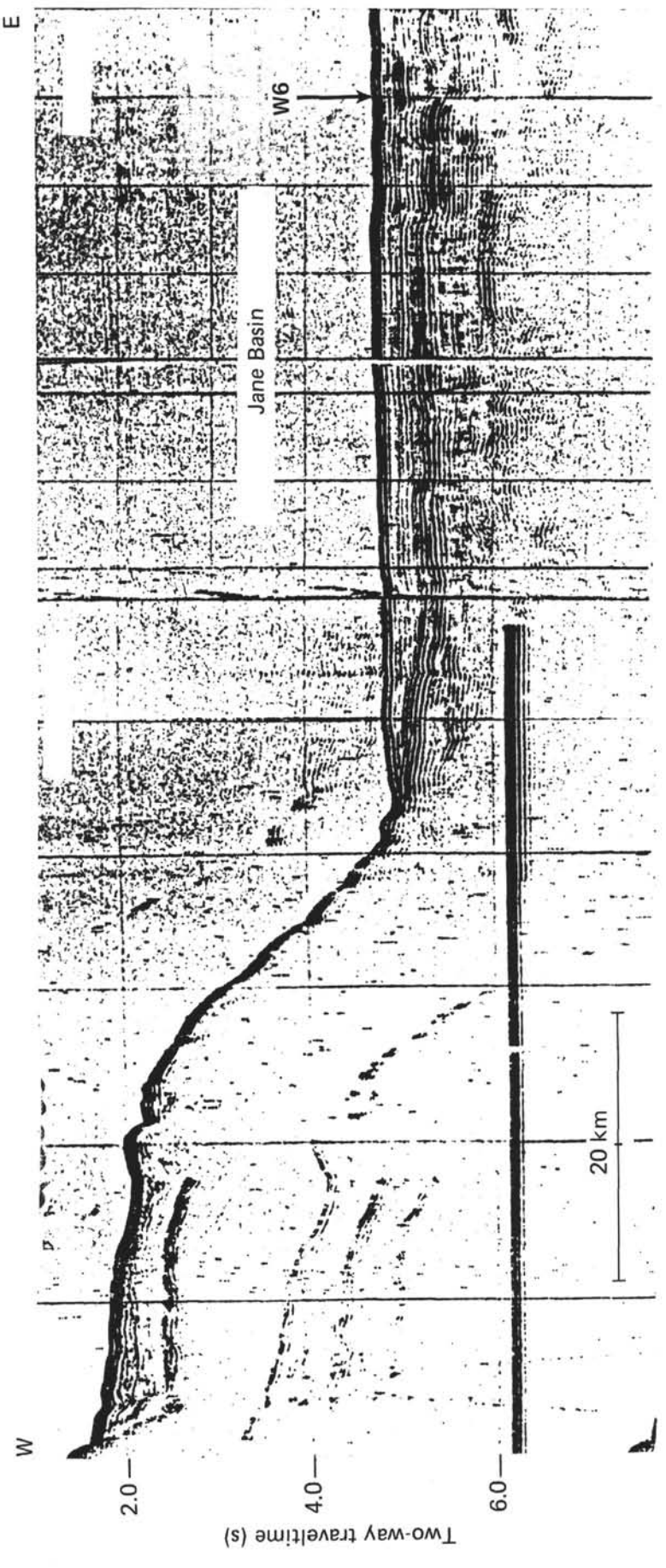
SEISMIC RECORD: AMC-845-018, SP 072 (0123/064). Crosses BRAN 790 Line L. Additional MCS AMG 845, single-channel BRAN 790, SHACK 801.

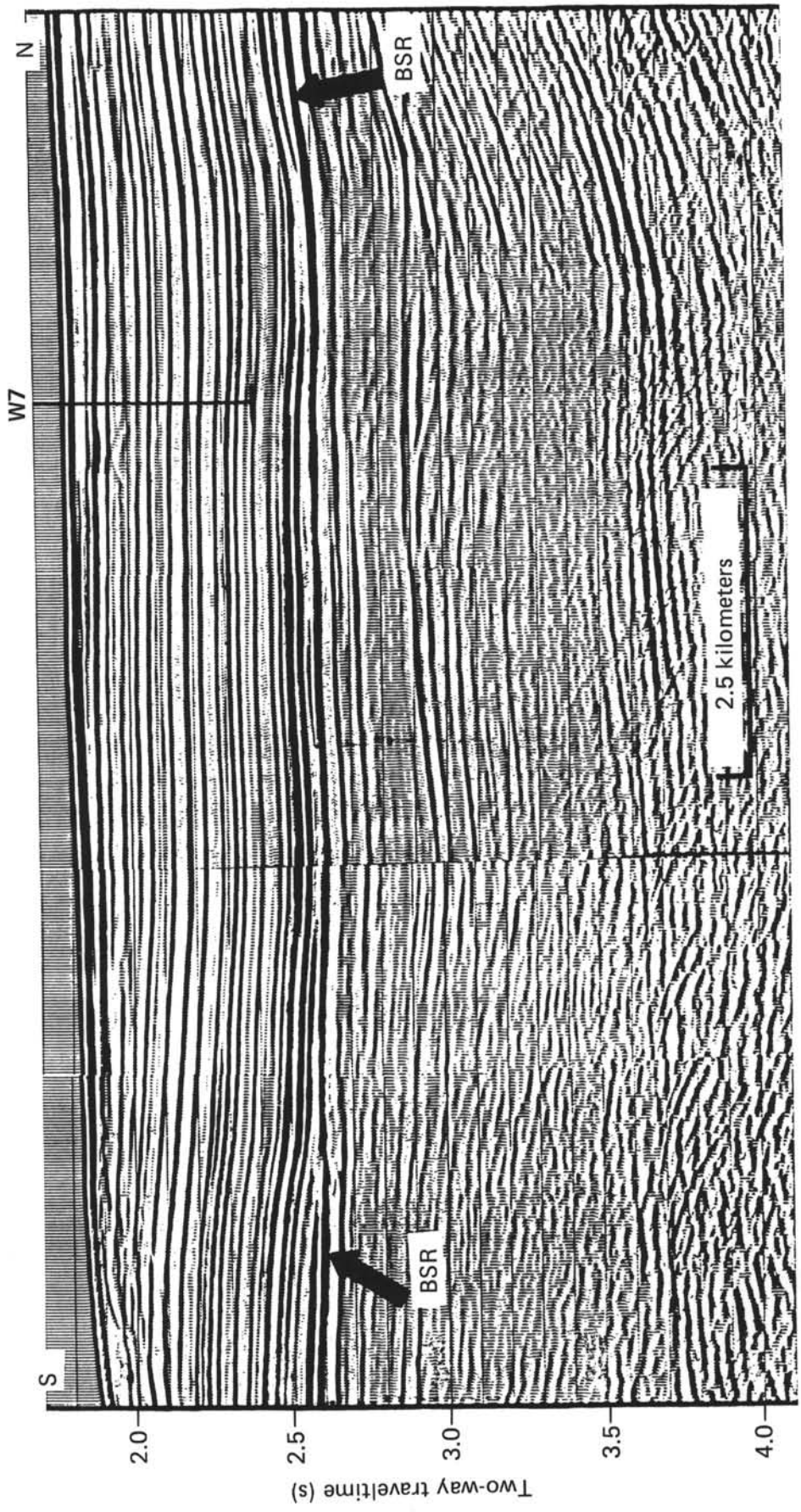
LOGGING: None.

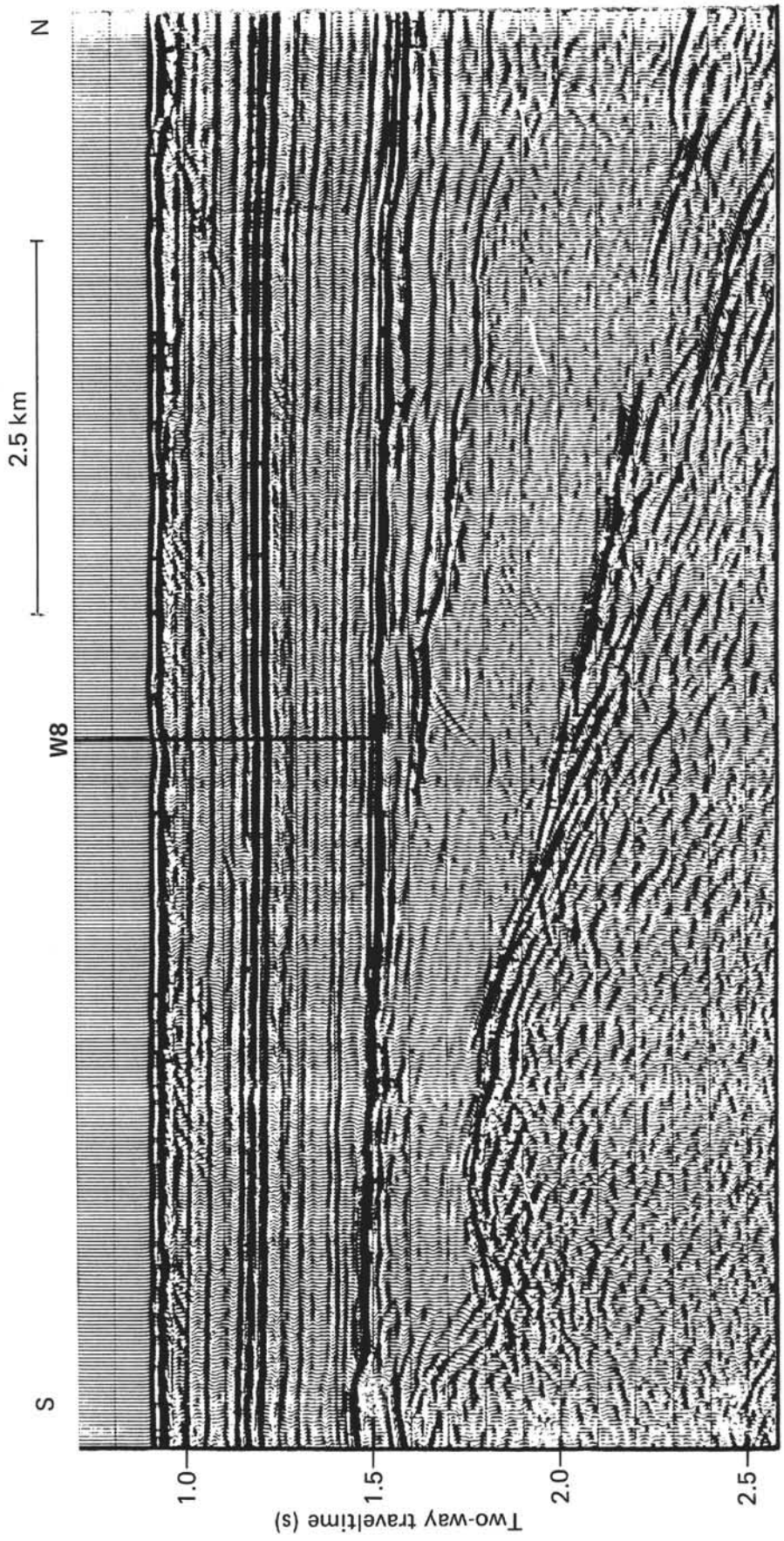
OBJECTIVES: The South Orkney micro-continent is virtually all margin, in the sense that block faulting associated with extension on both its eastern and its western margins (30 to 40 Ma) permeates virtually the entire area of the micro-continent. A prominent break-up unconformity is widespread. Drilling at W7 and W8 is intended to sample the essentially pelagic section above "the break-up unconformity" on the eastern margin, but to drill to the unconformity at least one site, to improve tectonic constraints on paleo-depth calculations.

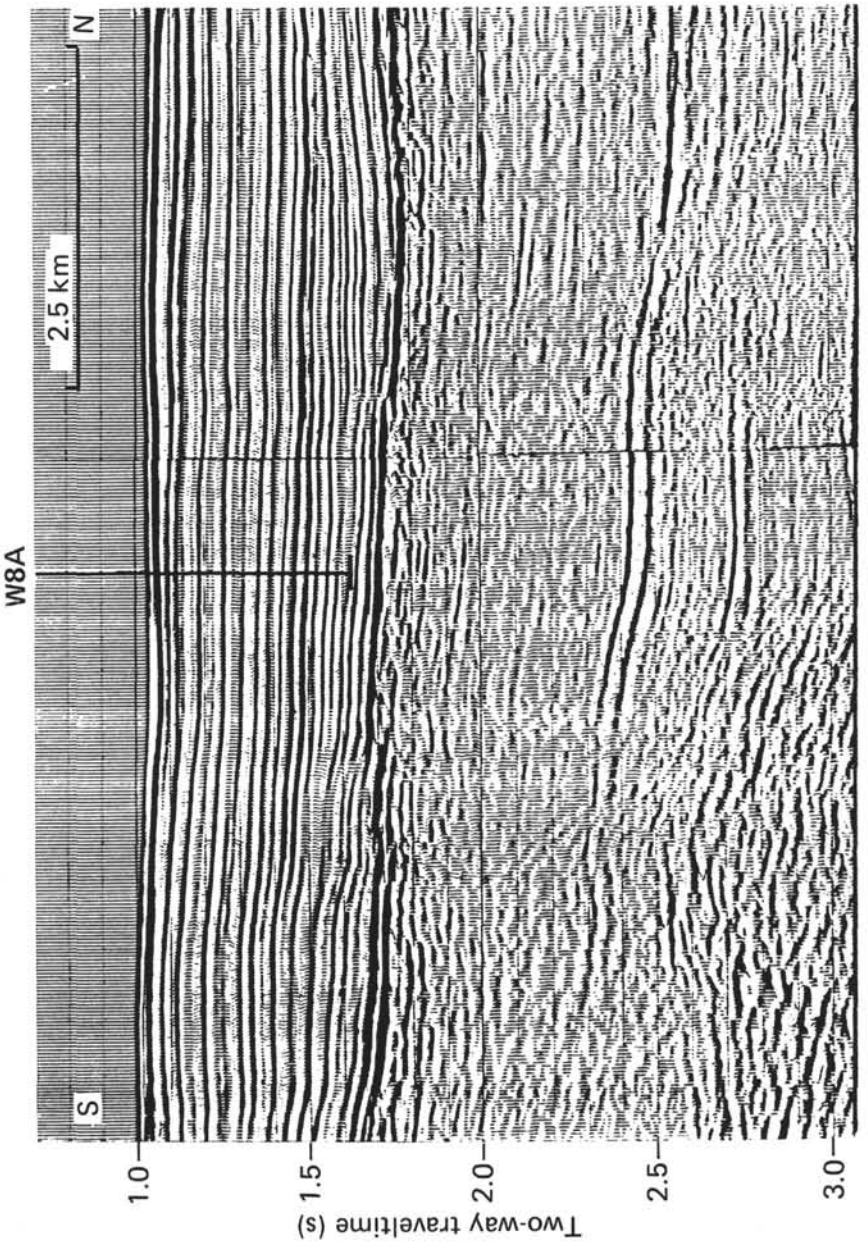
SEDIMENT TYPE: Calcareous/siliceous ooze and clay, chalk, claystone, etc.


W8A
W8
W7
W6
400
600
800
1000
1200
1400
1600
2000
2200
3000
3200
3400
3600
62°S
63°
44°W
42°
40°
South Orkney
Bathymetry (meters)


E
W6
Jane Basin
20 km
W
2.0
4.0
6.0
Two-way traveltime (s)


N
S
W7
BSR
BSR
2.5 kilometers
2.0
2.5
3.0
3.5
4.0
Two-way traveltime (s)


S
W8
N
2.5 km
1.0
1.5
2.0
2.5
Two-way traveltime (s)


S
N
2.5 km
W8A
1.0
1.5
2.0
2.5
3.0
Two-way traveltime (s)

SITE NUMBER: W10 (Bransfield Strait)

POSITION: 62°15.5'S, 57°30.9'W

SEDIMENT THICKNESS: 400-600 m

WATER DEPTH: 1985 m

PROIRITY: I

PROPOSED DRILLING PROGRAM: Double APC to 200 m.

SEISMIC RECORD: Single channel seismic lines ANT 10, 8a, 9a, 9c, 3.5 kHz survey (OSV/Kiel/AWI).

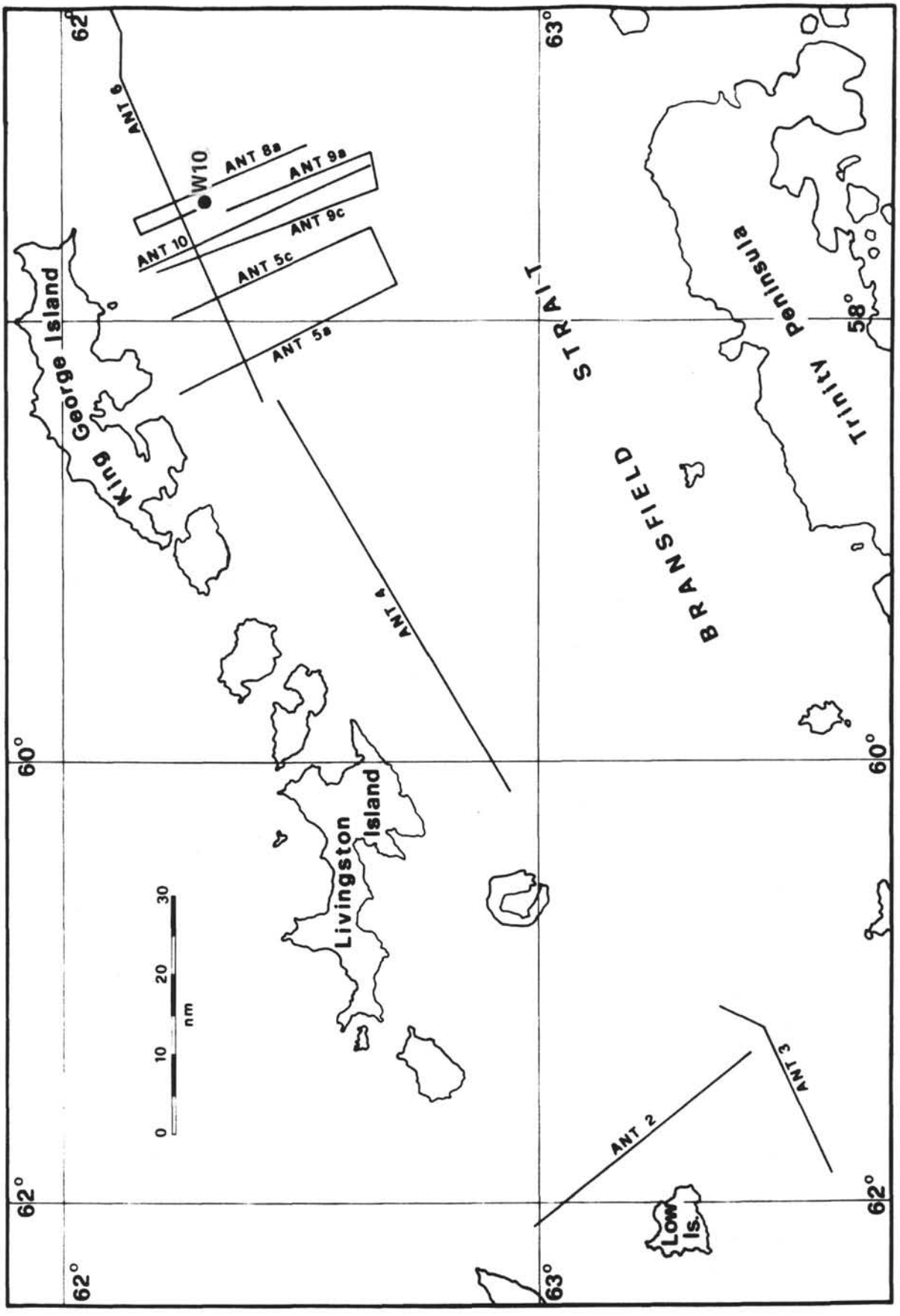
LOGGING: None.

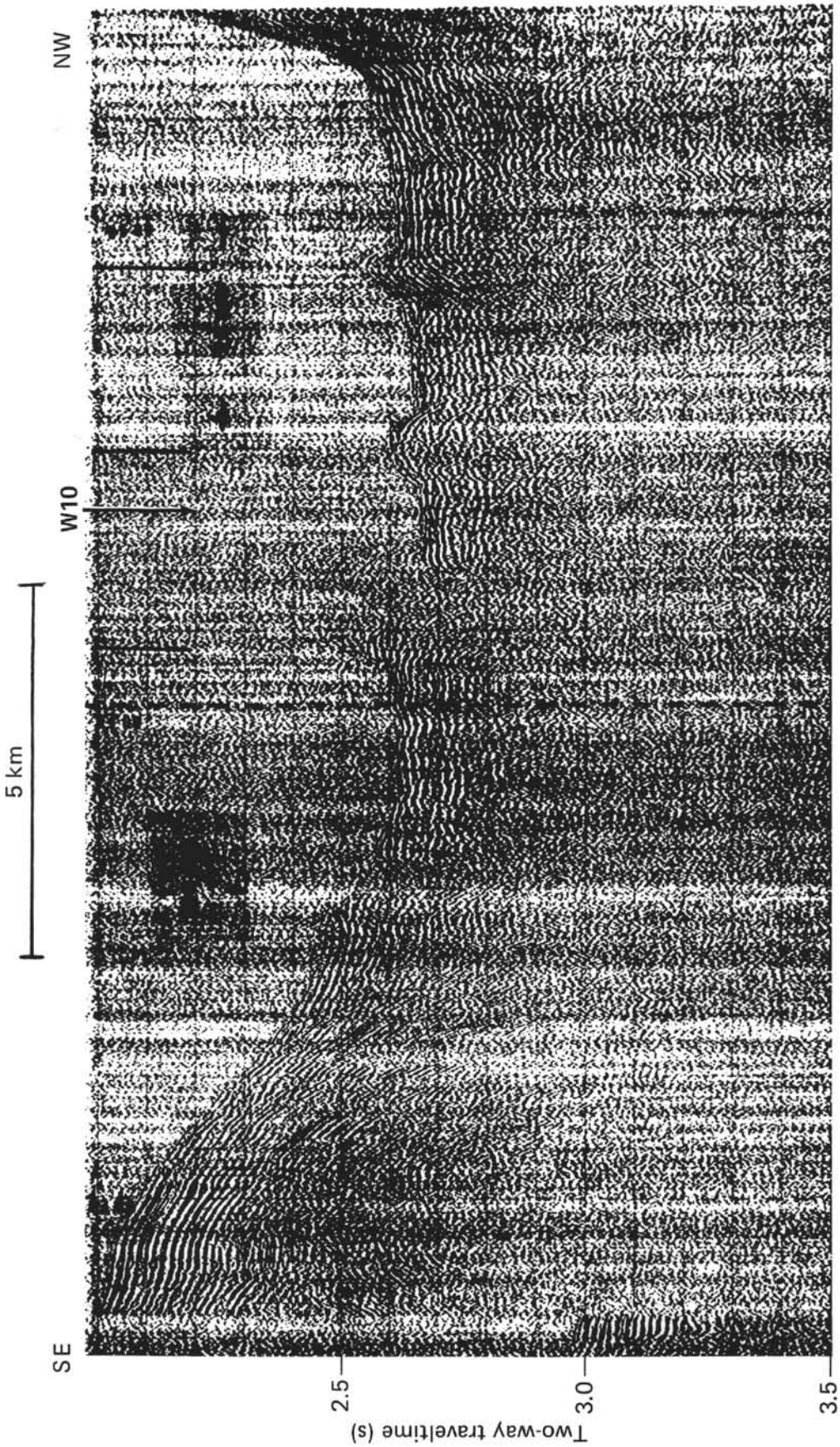
OBJECTIVES: Sedimentation and geochemistry of a high-latitude backarc basin.

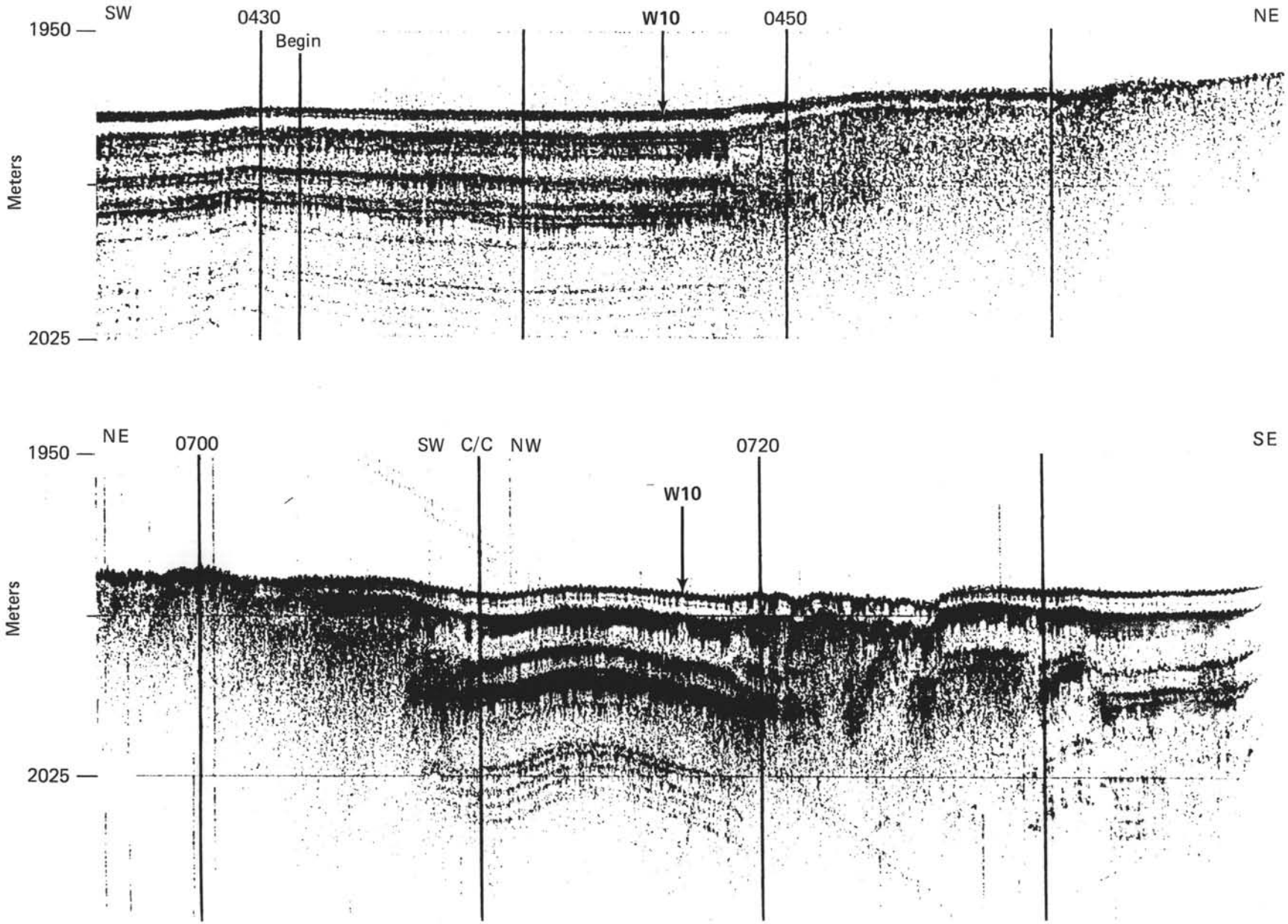
Quaternary sedimentation:
- potentially high resolution glacial-interglacial record.
- changes in geochemical signals due to oxygen fluctuations and basin circulation.

Geochemistry:
- authigenic hexahydrate formation/transformation as index for water depth, glacial marine, and high productivity sedimentation.
- maturation of marine organics associated with backarc volcanism.

SEDIMENT TYPE: Unconsolidated turbidites bedded with sparse pelagic units, basement volcanic sills and/or volcaniclastics.


62°
63°
60°
58°
ANT 6
W10
ANT 8a
ANT 9a
ANT 9c
ANT 10
ANT 5c
ANT 5a
ANT 4
ANT 3
ANT 2
King George Island
Livingston Island
Low Is.
STRAIT
BRANSFIELD
Trinity Peninsula
0
10
20
30
nm


NW
W10
SE
5 km
2.5
3.0
3.5
Two-way traveltime (s)


SW
0430
Begin
W10
0450
NE
1950
2025
Meters
NE
0700
SW C/C NW
0720
W10
SE
1950
2025
Meters

SITE NUMBER: W11 (Southern Drake Passage)

POSITION: 59°38.0'S, 54°18.0'W SEDIMENT THICKNESS: 905 m

WATER DEPTH: 3650 m PRIORITY: II

PROPOSED DRILLING PROGRAM: APC, XCB, Rotary, approximately 950 m penetration.

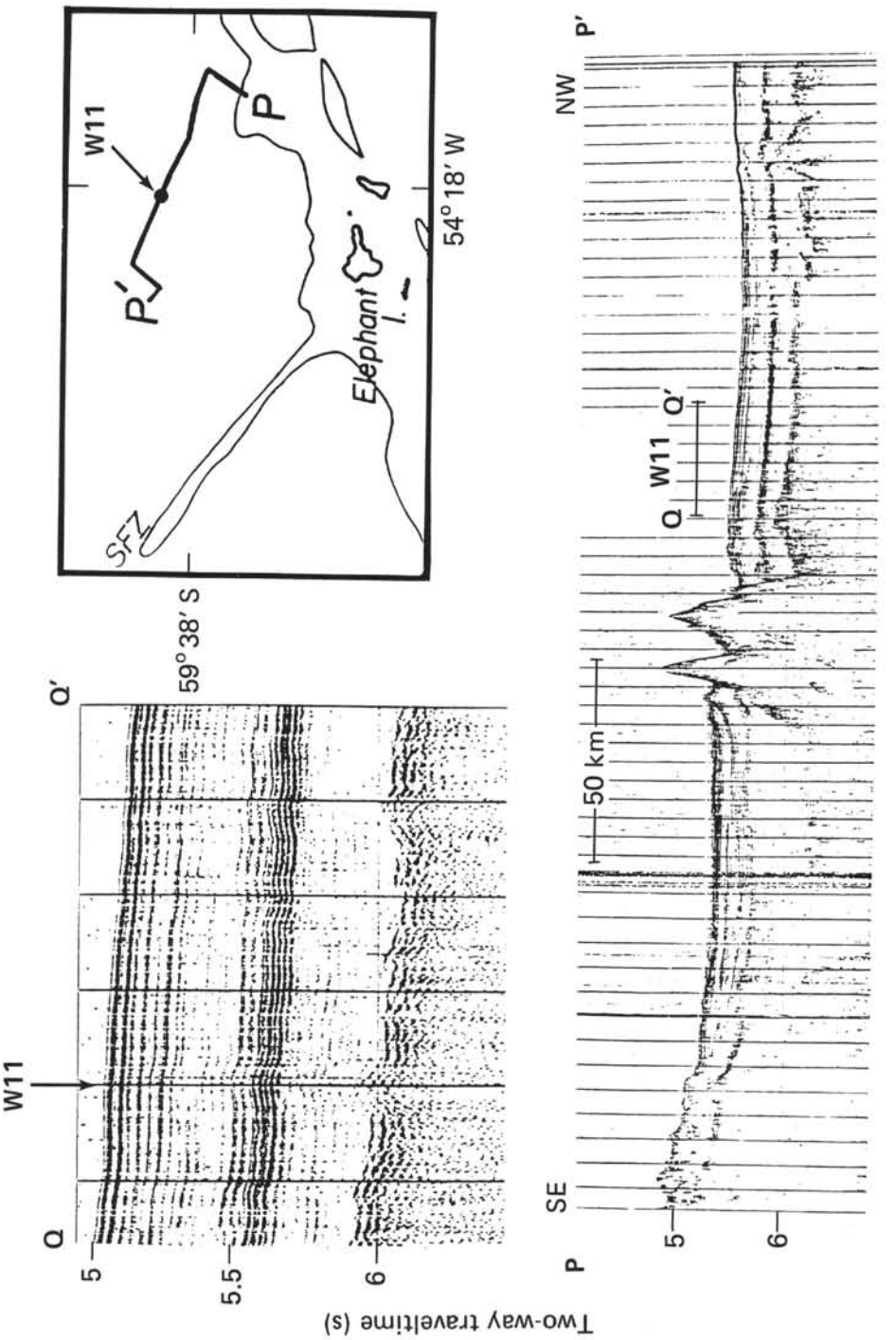
SEISMIC RECORD: Shackleton 756 (0630/016/76) single channel.

LOGGING: Standard Schlumberger logging suite.

OBJECTIVES: Paleoceanography and sediment history related to Drake Passage opening in Middle Cenozoic. Siliceous biogenic record.

To examine a well-bedded (bio-siliceous) section in the lee of the southern ridge of the Shackleton Fracture Zone. This section spans the estimated time of opening of a deep water gap (circum-polar current) in the Drake Passage. Basement age is probably 29 Ma; the age of development of the deep gap is considered to be 23.5±2.5 Ma. The sequence will provide a paleoceanographic history for the Neogene through this gateway, and a siliceous biostratigraphic sequence in Antarctic surface waters.

SEDIMENT TYPE: Diatomaceous clay, siliceous claystone, basalt.


W11
P'
P
SFZ
Elephant I.
54° 18' W
59° 38' S
Q'
Q
W11
5
5.5
6
Two-way traveltime (s)
NW
P'
Q
W11
Q'
50 km
SE
P
5
6

SITE NUMBER: W12 (E. of S. Sandwich Island Arc)

POSITION: 60°28'S, 21°37'W

SEDIMENT THICKNESS: 180 m

WATER DEPTH: 4400 m

PRIORITY: II

PROPOSED DRILLING PROGRAM: Double APC, approximately 180 m penetration.

SEISMIC RECORD: IO 1678.

LOGGING: None.

OBJECTIVES: Site W12 is a back-up site in the event of bad weather or ice conditions. It is a high-siliceous productivity zone and will offer a high-resolution, Neogene sediment record for the early Miocene-Quaternary. The major objective of this site is to provide a high-resolution record of sea ice and paleoceanography based on assemblage and lithologic variations.

SEDIMENT TYPE: Hemipelagic volcanic ash.

SITE NUMBER: W13 (E. of S. Sandwich Island Arc)

POSITION: 58°04'S, 17°48'W

SEDIMENT THICKNESS: 300 m

WATER DEPTH: 4600 m

PRIORITY: II

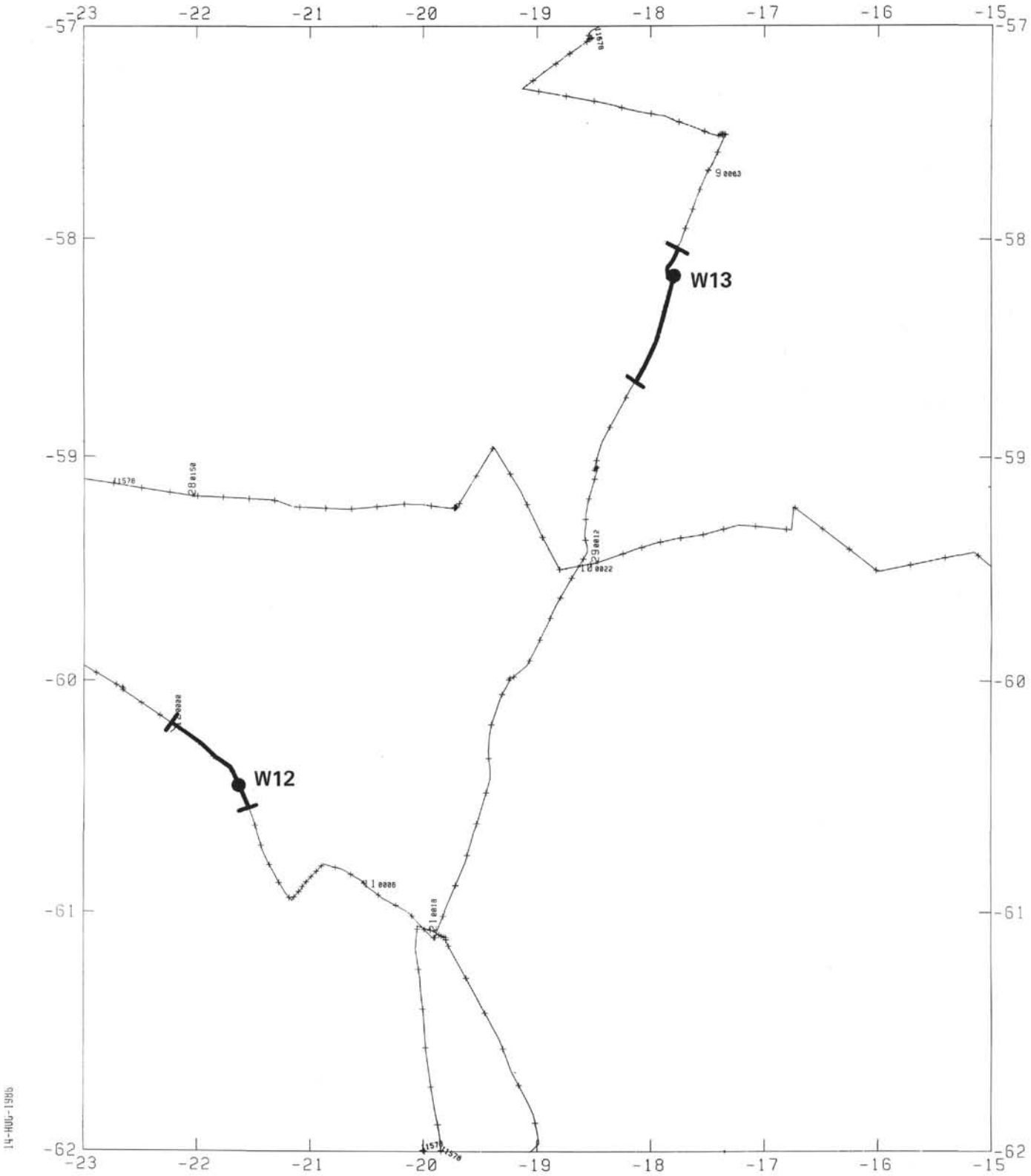
PROPOSED DRILLING PROGRAM: Double APC, XCB, approximately 300 m penetration.

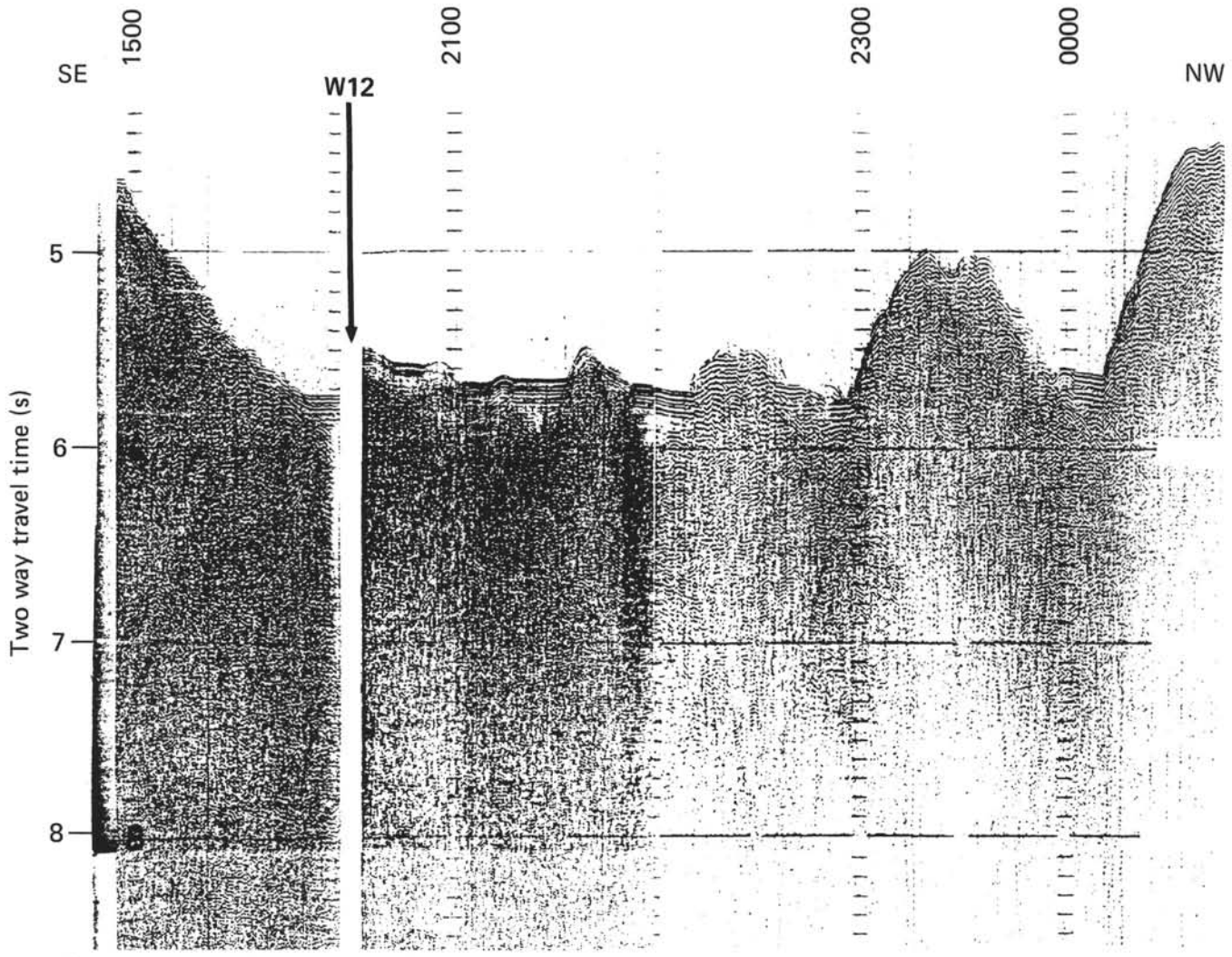
SEISMIC RECORD: IO 1678.

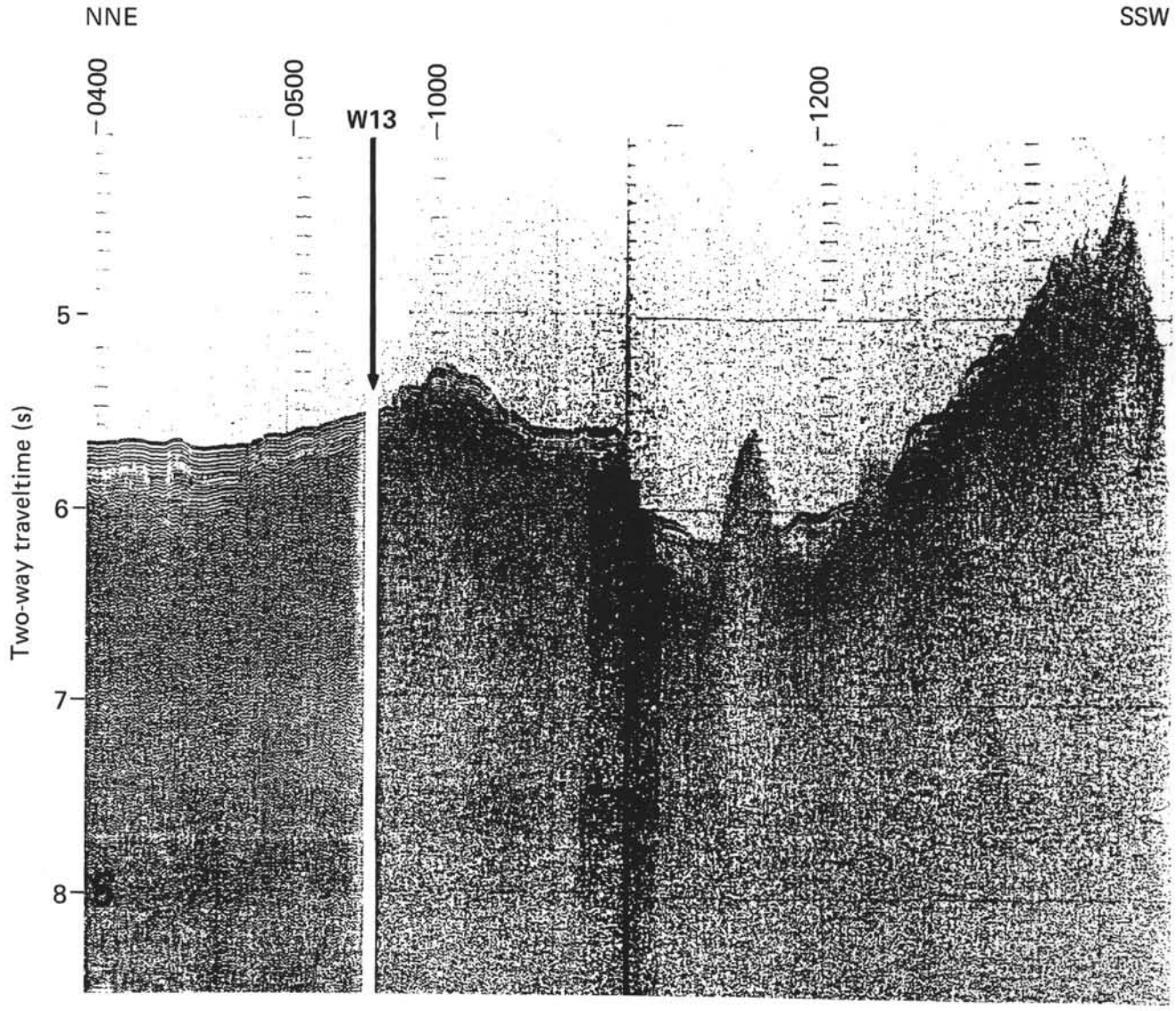
LOGGING: None.

OBJECTIVES: Sites W13 is a back-up site in the event of bad weather or ice conditions. The site is a high-siliceous productivity zone and will offer a high-resolution Neogene sediment record for the early Miocene-Quaternary. The major objective of this site is to provide a high-resolution record of sea ice and paleoceanography, based on assemblage and lithologic variations.

SEDIMENT TYPE: Hemipelagic volcanic ash.


-23
-22
-21
-20
-19
-18
-17
-16
-15
-57
-58
-59
-60
-61
-62
W13
W12
14-AUG-1995


SE
1500
W12
2100
2300
0000
NW
5
6
7
8
Two way travel time (s)


NNE
SSW
0400
0500
W13
1000
1200
5
6
7
8
Two-way traveltime (s)

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