85/506

SOUTHERN OCEAN PANEL
Minutes of Meeting - April 22-24, 1985
University of Florida, Gainesville

Participants

John B. Anderson
Peter F. Barker
Brian Bornhold
P. Ciesielski
Henry J. B. Dick
David H. Elliot
Dieter Fuetterer
Louis Garrison
Dennis E. Hayes
James P. Kennett (Chairman)
Yngve Kristoffersen
John La Brecque
Lisa Tauxe
Jacques Wannasson
Jeff Weissel

The Chairman laid out the objectives for the meeting: to establish the order of priority for drilling sites in the Subantarctic of the South Atlantic, review the Weddell Sea leg sites in the light of 1984-85 austral season cruises, develop further the southern Indian Ocean leg(s), and start developing a list of possible objectives for the South Pacific.

The minutes of the previous meeting were approved.

A review of recent developments was given. The PCOM meeting in Virginia in April did not get around to considering Southern Ocean plans. The next PCOM meeting will probably fix the schedule of post-Weddell and pre-Kerguelen legs. PCOM is giving serious consideration to two high latitude southern Indian Ocean legs, with a crew and scientist change at Kerguelen Island (this requires transport by a vessel such as the Marion Dufresne from Reunion to Kerguelen). In a letter to the SOP, Roger Larson asked for plans, including drilling and coring times, for a single 70-day cruise and for a two leg cruise not to exceed a total of 120 days (120 days without refuelling exceeds the cruising capability of the JOIDES Resolution), for both the South Atlantic and Indian Ocean regions. PCOM deliberations suggest there will be 1-1/2 years of post-Weddell pre-Pacific drilling. This means that, with two Kerguelen Plateau legs, there are a maximum of eight legs which would have to accommodate the South Atlantic leg and all remaining Indian Ocean legs.

The panel rankings (SOHP, etc.) for the Indian Ocean sector were circulated. The tectonics panel (as reported by Weissel) lowered the Kerguelen Plateau Leg(s) to #7 on the grounds that basement drilling was not emphasized.

The SOP unanimously endorsed drilling to basement on the Kerguelen Plateau and regard that as a most important tectonic objective for the legs.

The SOHP panel has consistently given the South Atlantic Subantarctic (SASA) leg a low ranking, and it was reported (Tauxe) that

the reason is that it is a duplicate of the Southeast Indian Ridge. Consideration of the problem was deferred till later in the meeting.

The SOHP also ranked the Weddell leg sites (most important to least so) Maud Rise (W1, W2) - Margin site (W4) - Weddell Sea (W5) - Bransfield Strait (W10) - S. Orkneys (W6, 7, 8).

Weddell Sea Leg

Kennett — New site survey data will be reviewed, followed by selection of specific sites if new data so warrant, and site priority established.

Kristoffersen — NPI collected MCS data from the Filchner Ice Shelf region including the continental rise, and then from the Maud Rise where lines were run across W2, along a NE transect of the Rise, and then an E-W crossing of W1. Piston cores were obtained from good outcrops along moats. The upper transparent sediment package is apparently draped over older packages. Lavas may be present at or above the basement.

Barker — BAS cruises collected MCS data in the northern Weddell Sea (W5) and on the SE flank of the South Orkneys block (W6, W7, W8).

Anderson — USARP cruise collected single channel data from the West side of the South Orkneys block as well as many piston cores.

There was general discussion of objectives for the South Orkneys sites. The objectives are:

1) Water mass structure and history, and paleocirculation problems.

2) The record of glacial fluctuations as reflected in the IRD and its sources, the biogenic productivity and the siliceous biogenic evolution.

3) A possible high latitude carbonate site and therefore $\delta^{18}O$ record.

The Weddell Sea leg sites were reviewed and a ranking established:

1) Maud Rise (W1, W2)

2) Caird Coast (W4)

3) South Orkneys (W6, W7, W8)

4) Weddell Sea (W5)

Both the Bransfield Strait and Drake Passage sites (W10, W11 respectively) are regarded as much lower priority in terms of the overall objectives for the SOP. The panel slightly favored W11 over W10.

Barker strongly advocated drilling of W5 because it is the best site for ABW timing and fluctuations. Dick advocated drilling to basement, this being the only site where true ocean floor might be recovered on this leg.

Priorities for the South Orkneys were discussed in the light of available drilling time. The sense of the meeting was that the intermediate SOI site (W7) has a lower priority than the Weddell Sea site (W5), even though this detracts somewhat from the potential results to be derived from a transect in varying water depth (700 m, 1300 m, 3000 m) across the margin of the SOI block.

Fuetterer — Astrid Ridge (W3) needs further site surveys. The up-dip termination of reflectors means that the safety panel will require further surveys. W3 is needed as an alternate to W4 in case of bad ice conditions; other W4 site alternatives should be sought. BGR plans to investigate the Astrid Ridge and Caird Coase in the 85-86 season.

The Panel welcomes and strongly supports the BGR plans.

There was general discussion of the best way to run the Weddell Leg in light of the anticipated ice conditions (Caird Coast open in mid to late January and the South Orkneys region later). There is no doubt that the best cruise track would be clockwise from Punta Arenas to W1, W2 - W4 - W5 - W6, (W7), W8 to Port Stanley (65 days) or Cape Town (76 days). A clockwise track would give the most opportunity to achieve the highest priority sites which would be done early in the leg (W1, W2, W4).

The schedule for the leg was discussed at length. An anticlockwise leg taking in all sites (including Drake Passage and Bransfield Strait) would require 88 days. This schedule includes a minimum of logging and Double HPC only at W1, W2 and W8. If logging is required, site W5 will have to be dropped. The attached table gives the cruise schedule with termination at 1) Port Stanley, Falkland Islands and 2) Cape Town.

It was best if the Weddell Sea leg were followed by a Subantarctic leg ending in Port Stanley as this would mean less transit time to Cape Town. Much discussion followed and concluded by Hayes asking if the panel has really considered what information logging could actually provide that might be useful in the Antarctic and Subantarctic programs.

Weddell Sea Leg

		Water Depth	Penetration	Days	
Punta Arenas to W1, W2				8	Transit
	W1	2000 m	500 m	5.5	Double HPC, no logging
	W2	3000 m	500 m	6.5	Double HPC, no logging
W2 to W4				2.0	Transit
	W4	3000 m	900 m	8.5	No HPC
				0.5	Basement drilling
				1.0	Logging
	W4A	3000 m	300 m	3.0	No HPC, no logging
W4 to W5				2.0	Transit
	W5	5000 m	1000 m	12.0	No HPC, no logging Minimum basalt penetration
W3 to W6				2.0	Transit
	W6	3000 m	500 m	5.0	No Double HPC, no logging
	W7	1300 m	500 m	3.0	No Double HPC, no logging
	W8	700 m	500 m	3.0	Double HPC
				62.0	
W6 to Port Stanley				3.0	Transit
			Total	65.0	
or W6 to Cape Town				14.0	Transit
			Total	76.0	

NB: No allowance has been made for bad weather.

South Atlantic Subantarctic Leg

La Brecque

The history of subduction related to the North Scotia Ridge, NE Georgia Rise, etc. was reviewed, as well as the plate motions that governed the gateway for deep water flow into the South Atlantic.

General discussion of the objectives for the leg ensued and the consensus was that there are two important parts to the science. One a N-S traverse to link up with (and complete) a N-S traverse started with sites 513 and 514, and second a set of sites related to paleotectonics. The highest priorities were set at

SA2, SA3, SA7	N-S traverse and gateway
SA5W and SA8	paleotectonics

Another site for the traverse and gateway is SA1.

Other sites for the Tectonics and gateway are SA6, and SA9.

Ciesielski and La Brecque will write up the rationale and objectives for the Subantarctic Leg. This is given in Appendix I.

A schedule for a 50 day leg was discussed (on the assumption that a Weddell Sea Leg and a Subantarctic leg could not exceed 120 days). The leg would begin at Port Stanley and terminate at Cape Town. There would be no logging and minimal basement coring. This would allow 5 sites to be drilled (SA2, 3, 5W, 7, 8).

It was noted that the South Orkneys sites (W6, 7, 8) could be picked up on this leg if closed out on the Weddell Sea leg.

It was felt that minor additions and editorial changes should be made to the Atlantic Subantarctic Drilling Program. Hayes suggested adding a statement regarding the adequacy of or plans for site surveys (ACTION - Kennett and Ciesielski). The final document will be sent to PCOM and to the SOHP chairman with a request that SOHP panel members review it and respond to Arthur as to ranking before the next PCOM meeting. A covering letter will indicate that the document is intended to clarify earlier submissions and to correct apparent misunderstandings.

Subantarctic Leg

		Water Depth	Penetration	Days	
Port Stanley to SA 5W				4.0	Transit
	SA 5W	2000 m	800 m	5.5	
SA5W to SA2				2.0	Transit
	SA 2	4000 m	700 m	8.5	Double HPC.
SA2 to SA3				1.0	Transit
	SA 3	4300 m	500 m	7.5	Double HPC.
SA3 to SA7				3.0	Transit
	SA7	4300 m	700 m	7.0	
SA7 to SA8				0.5	Transit
	SA8	2500 m	500 m	5.0	Double HPC
SA8 to Cape Town				3.5	Transit
			Total	48.0	

No logging and only minimal basement penetration

In a letter to Kennett, Larson asked which drilling would have a higher priority for SOP, Subantarctic Indian Ocean or Subantarctic Atlantic Ocean. The panel voted 8 to 2 in favour of South Atlantic drilling.

Kennett — Proponents for the

Weddell Sea Leg: Fuetterer and Elliot
Subantarctic Leg: Ciesielski and La Brecque

Logging requirements

The question of the ODP Logging, Double HPC and basement penetration requirements was discussed at length before Hayes arrived and again in the light of his comments and advice.

Hayes — The question SOP has to address is, "What will those requirements cost in terms of the scientific objectives?" The onus is on the SOP to show that the best science comes from waiving the requirements. Internal relative priorities must be determined and the absolute importance of the sites established.

The SOP reached the view that the requirements are too onerous in the light of time limitations (max 70 days), the long transit times, and the number of sites necessary in order to meet the primary science objectives, and that a request be made for the requirements to be waived.

Kerguelen - E. Antarctica Leg(s)

The panel recognized two major problems in attempting to refine the legs for the southern Indian Ocean sector.

1) the inordinately long transit times from either Durban or Reunion to Kerguelen or Prydz Bay and from Kerguelen to Freemantle.

2) the lack of data for the southern Kerguelen Plateau (the Australians have run surveys this season (84-85) and the French will next season).

Garrison — The operating capabilities of the JOIDES Resolution impose certain constraints. The maximum length of a cruise without refuelling is 106 days, therefore two legs totalling 120 days requires refuelling at Kerguelen.

A crew and scientist change at Kerguelen would require a ship with a carrying capacity of 115 passengers. Extra fuel for the Resolution would be needed (about 100,000 gallons) and 25 tons of supplies.

Transit times are:

Reunion or Durban to Prydz Bay	12.5 days
Kerguelen I to Freemantle	9.5 days
Prydz Bay to Kerguelen I	6.5 days

Therefore

One 70 day leg = ~30 days transit + 40 days drilling

Two 52 day legs = ~34 days transit + 72 days drilling

Two 60 day legs = ~34 days transit + 86 days drilling

On the basis of available site data, two Kerguelen Plateau legs were developed.

S. Kerguelen - E. Antarctic Margin Leg

The Southern Kerguelen Leg would include the Antarctic Margin transect (K1-4), an AABW site (K11), and three sites giving a minimum of depth coverage (K5, K12) together with stratigrahic coverage (K7, K12) including basement penetration (at K7).

Northern Kerguelen Leg

The northern Kerguelen Leg was developed on the basis of the Schlich proposal which was transmitted by Wannasson. Four of the sites were selected on the recent French MCS track data and the other two on the South East Indian Ocean Ridge transect. The Kerguelen Plateau (Heard Plateau) sites were selected to cover the stratigraphy and reflectors identified in the MCS data: Neogene and sediment packages S1 and S2 at site KHP1; Eocene to Cretaceous and sediment packages I1 and top of I2 at site KHP3 alt; Paleocene to basement and package I2 at site KMP4 alt. A deep water Neogene site near the base of the Plateau and at the southern end of the transect at site KHP5 alt, and sites S8b and S8d on the Kerguelen-Broken Ridge transect.

There was discussion of whether it would not be better, from the point of view of the history of the Kerguelen Plateau region, to drop the traverse sites S8b and S8d in favor of K10 and an additional site, adjacent and at greater water depth, in order to provide a more complete coverage of the vertical and horizontal changes in water masses with time.

S. Kerguelen Leg

		Water Depth	Penetration	Days	
Transit to Prydz Bay (Antarctica)				12.5	Transit
	K 1-4			18.0	Total.
K4 - K5		--	--	1.75	Transit
	K5	2850 m	550 m	7.5	
K5 to K11				0.25	Transit
	K11	3840 m	500	8.00	
K11 to K12				1.25	Transit
	K12	1610 m	500 m	6.5	Double HPC
K12 to K7				0.5	Transit
	K7	1090 m	1000 m	7.0	Basement
K7 to Kerguelen I.				2.5	Transit
				65.75	
	Less logging time			8	
	Cruise length without logging			58	days

Northern Kerguelen Leg

		Water Depth	Penetration	Days	
Kerguelen I to KHP1				0.5	Transit
	KHP1	660 m	900 m	6.0	Double HPC
KHP1 to KHP4 alt				0.25	Transit
	KHP4 alt	990 m	700 m	5.00	
KHP4 alt to KHP 3 alt				0.75	Transit
	KHP3 alt	750 m	700 m	6.0	
KHP3 alt to KHP5 alt				0.5	Transit
	KHP5 alt	2310 m	750 m	7.5	
KHP5 alt to S8b				2.0	Transit
	S8b	3135 m	600 m	6.5	
S8b to S8d				2.0	Transit
	S8d	3500 m	700 m	8.0	
S8d to Freemantle				8.0	Transit
				53.0	
	Less logging time			6.0	
	Cruise length without logging			47.0 Days	

The SOP agreed unanimously that PCOM should be requested to plan for the start of drilling at Prydz Bay or the southern Kerguelen Plateau on January 1st, 1988.

Subantarctic Indian Ocean Objectives

The panel reviewed the results of the letter ballot which had been sent to panel members earlier in the spring concerning the ranking of sites in the southern Indian Ocean. The results of the ballot were:

(i) Very high priority placed on Kerguelen to Broken Ridge Transect.

(ii) Adelie Land (though it was recognized that it was located far to the east).

(iii) Crozet Plateau and fracture zones.

(iv) Agulhas Plateau.

(v) "Cold Spot."

Hayes suggested that these priorities, as presented in the letter to Larson, be clarified. (ACTION - Kennett).

Kennett pointed out that the program followed the Indian Ocean is far from established and although there is a tendency to think only in terms of proceeding north of Australia into the western Pacific, the SOP should keep Adelie Coast and the "Cold Spot" as objectives to provide PCOM with alternatives. Hayes pointed out that PCOM was leaning very strongly towards an exit from the Indian Ocean north of Australia because:

(i) no other panels were pushing for southwest Pacific drilling;

(ii) the priority for western Pacific drilling was north of the equator. Kennett pointed out that after 5 years of drilling it was possible (in the most extreme case) that there would have been only two legs drilled in the Southern Hemisphere - Weddell Sea and Kerguelen.

The panel discussed the following new proposals:

(i) Agulhas Plateau - French proposal;

(ii) Fracture zone drilling - Dick;

(iii) Adelie Coast - Wanasson;

(iv) the Australian proposals in Subantarctic areas.

Australian Proposals

It was questioned whether the panel should discuss the Australian sites adjacent to Tasmania and in the Australian Bight. Hayes indicated that the panel should not worry too much about the geographic setting but rather the appropriateness of the objectives to topics that concern the SOP. Fuetterer indicated that Australian Bight drilling was important to establish the time of separation of Australia and Antarctica and that this aspect was better addressed off Australia. Anderson agreed but suggested that other objectives (e.g. Neogene) could be addressed better, on the Antarctic margin. Weissel had reservations about drilling a thick Neogene succession and trying to address early rifting problems at the same site.

Agulhas Plateau

It was pointed out that the Indian Ocean Panel was sent a copy of the Agulhas Plateau proposal and that this drilling could be added to a leg leaving from Cape Town. Weissel pointed out that the IOP ranked one Agulhas site as 14th and two sites 18th in their priority list. Barker felt that the SOP should encourage drilling in the Subantarctic South Atlantic particularly with respect to the Paleogene history. Ciesielski pointed out that the numerous hiatuses would pose problems and that for Neogene water mass studies, Crozet Plateau was more promising than Agulhas.

It was decided that a new priority listing of Subantarctic objectives should be prepared, separating out the Crozet Plateau from fracture zone drilling. A revised priority listing is as follows:

(i) Subantarctic Atlantic Ocean.

(ii) Kerguelen-Broken Ridge Transect.

(iii) Adelie Coast.

(iv) Fracture Zone drilling.

(v) Agulhas Plateau.

(vi) Crozet Plateau.

(vii) "Cold Spot."

It was pointed out that the SOHP was under the impression that the Adelie Coast drilling would duplicate the Prydz Bay objectives. This misconception is to be corrected. (ACTION - Anderson and Wannesson).

Anderson agreed to request site survey data from the Australians for Amery Basin (ACTION - Anderson). The panel agreed to endorse any plans for acquisition of additional survey data in the Amery Basin area.

South Pacific Objectives

Kennett pointed out that it was important for the panel to generate objectives in the South Pacific even if they are for very long-term planning. It was pointed out that the South Pacific has been extremely neglected by previous drilling.

The following list of "Major Drillable Concepts," not in any order of priority, was prepared by the panel:

(i) Adelie margin.

(ii) "Cold Spot."

(iii) Ross Sea - East-West Antarctic rifting history.
- Paleogene - Cretaceous paleoenvironments.
- history of uplift of Transantarctic Mountains.

(iv) Eltanin Fracture Zone - large offset, fast slipping fracture zone.

(v) Louisville Ridge - Is it a "hot spot" or is it fracture zone controlled?

(vi) West Antarctic - Bounty Trough conjugate.
- West Antarctic ice sheet history and Mesozoic rifting history.

(vii) West Antarctic Margin - Tectonic development.

(viii) Chile Current evolution - South American climate.

(ix) Chile Triple Junction.

(x) N-S Transect for paleoceanography.

(xi) Tasmanian Seaway evolution.

(xii) Deep/shallow basin seismic stratigraphy - denudation - western Tasman Basin.

(xiv) South New Zealand - seismic stratigraphy - Campbell Plateau, Bounty Trough area.

(xv) North Island - tephrochronology, Cenozoic record.

(xvi) Campbell Plateau - rifted margin, oceanward of base of scarp.

Future Activities for South Pacific Planning

It was suggested that: (i) input from outside the panel be sought as soon as possible; (ii) ideas be solicited through advertisements, perhaps in EOS, Geology and Nature; and (iii) a workshop follow. It was generally agreed that an advertisement, sponsored by the SOP, should solicit proposals for mid-to high latitude drilling in the South Pacific and announce that a workshop would be held in spring 1986. An attempt would be made to get proposals before the next SOP meeting.

The workshop would be open to all international participants. Funding would be sought from USSAC to cover the organization of the meeting and the costs of U.S. participants; foreign participants would have to pay own expenses.

The organizers of this workshop are: Ciesielski, Weissel and Anderson. Each country would be contacted so that their committees could find participants to make proposals and attend the workshop. (ACTION - Ciesielski, Anderson, Weissel).

The date for the workshop is tentatively set for mid to late April, 1986.

Other Business

The question of presenting SOP concerns at SOHP meetings was raised. Kennett agreed to ask Arthur about the next SOHP meeting and who should represent SOP. (ACTION - Kennett).

It was suggested that there be better liaison between the SOP and the lithosphere panel. (ACTION - Kennett to approach Larson).

Next Meeting

September 23-25, 1985 - Woods Hole Oceanographic Institution.

R. Schlich should be invited to attend this meeting.

Appendix I

SOP Panel Meeting
Gainesville, Fla.
April 24, 1985

ATLANTIC SUBANTARCTIC DRILLING PROGRAM: Summary of major objectives

The Subantarctic Mid-latitude Drilling Program (MLDP) sites address a number of tectonic and paleoenvironmental objectives of wide-ranging importance. The SOP has carefully considered the merits of this suite of sites in the context of ODP contributions to a regional and global history of paleoenvironmental and tectonic development. This document is meant to distill the objectives of the suite of sites. The MLDP incorporates the following objectives:

1. Determine the paleoenvironmental evolution from the Late Cretaceous to modern ocean for the critical passageway linking the South Atlantic and Weddell Basins.

2. Complete a mapping of the Middle-Late Cenozoic Polar Front and surface water mass migrations in this sector; a program begun by IPOD.

3. Test and extend a plate tectonic model based on marine data and Seasat imagery for the development of the North Scotia Ridge and the Andean Orogeny.

4. Examine the development of oceanic crust along a flow line from the generation of dual aseismic ridges at pseudofaults to steady state seafloor spreading.

All sites have multiple objectives within this plan.

MAJOR OBJECTIVES:

1. Determine the paleoenvironmental evolution from the Late Cretaceous to modern ocean for the critical passageway linking the South Atlantic and Weddell Basins:

The Subantarctic region is of critical importance for an understanding of paleoenvironmental interaction between the Weddell and Atlantic basin to the north. The tectonic development in the Subantarctic region during the Cretaceous and Paleogene profoundly restricted deep and intermediate water mass connections between the southern and northern areas. (Figure 1 displays the Santonian reconstruction of the Atlantic sector while Figure 2 displays the Eocene reconstruction of the proposed drilling region.) Continual expansion of this gateway by seafloor spreading resulted from the subsidence of the adjacent ridges and seafloor

spreading, but the interbasin connections remained relatively shallow through much of the Paleogene. Sites SA3 and SA7 were selected on Late Eocene ocean crust. The sedimentary sequences in these two locations is expected to provide a history of the re-establishment of intermediate to deep water mass connections between the Weddell and Atlantic Basins during the middle Cenozoic. This history is expected to provide an important basis to interpret South Atlantic basinal sediments of Eocene and Oligocene age.

The effect of this system may be considered in the light of the teleconnective theory of Johnson where a modification of flow in a critical region will effect the environment of a distant region. The interbasin passageway is critical since all bottom water which enters the South Atlantic from the Weddell must pass through this passageway. Present day flow is strongly affected by the regional morphology. We therefore expect that the influence of the regional relief will increase at earlier periods in the basin's history. The age and subsidence history of the aseisimic ridges are exact analogues of the Greenland-Iceland-Faroes Ridge and are no less important than the latter features in understanding the development of Atlantic-Weddell-Indian paleoenvironment.

In total, the program provides three shallow water, one intermediate and four deep water sites for monitoring the vertical development of the water mass through time for the Subantarctic. These sites will provide a unique opportunity to interpret the development of Subantarctic vertical water mass structure because of the significant depth variation in the suite of sites.

Piston cores indicate that we will obtain Messinian carbonates from SA6, the only such site in the Southern Ocean. Because of a severe hiatus, much of the Paleogene and Late Cretaceous sediments from the Falkland Plateau DSDP sites are missing. Because of the different setting of sites SA6 and SA8, we hope to extend Paleogene carbonate sampling to the Late Maastrichtian. It is hoped that further drilling will provide carbonate sediments for stable isotopic analysis. Sites SA5W, SA5E, SA6, SA8 and SA9 are expected to provide a Late Creatceous to Miocene carbonate record. Deep water sites SA1-3, SA7, SA9 will recover Eocene to Oligocene carbonate.

2. Map the development of the Polar Front and surface water mass migrations:

Sites SA1-SA3 represent a southward extension of the longitudinal traverse begun with DSDP sites 513 and 514. The traverse is intended to monitor the development and migration of surface water masses and the migrational history of the Polar Front. The long standing program with

the South Atlantic working group and the OMD working group is continued by this panel. A continuation of the work already begun is essential to determing the development of mid-latitude water masses and the long and short term migrations of the Polar Front and surface water masses.

3. Test and extend a plate tectonic model based on marine data and Seasat imagery for the development for the North Scotia Ridge and the Andean Orogeny:

The Andean Orogeny generated a Mid-Cretaceous accretionary prism which extends 2000 km from Tierra del Fuego to South Georgia. Figure 3 displays the geometry of a model which predicts the 1000 km of convergence between the Malvinas Plate and the South American Plate. This model could explain the Andean Orogeny and link the North Scotia ridge sediments to Weddell Basin development. The MLDP would provide the important link between marine data sets and land geology.

Success in the MLDP effort will provide a critical link between terrestrial geologic observations and Weddell Basin development. According to the model to be tested, the sediments of the North Scotia Ridge are accreted from the opposing (northern) flank of a spreading center which generated the present day Weddell seafloor. In other words sediments now accreted in the North Scotia Ridge could represent deep water equivalents of the Falkland Plateau sequences recovered by DSDP sites 327, 329, 330, 511, 512 and the sedimentary sequences on the opposing basin margin of the sediments to be acquired by the Southern Weddell drilling.

The crucial test in linking the Malvinas plate model to the Andean Orogeny is the development of a time scale for subduction at the Northeast Georgia Rise. This time scale could then be compared to the timing of geologic events observed in the southern Andean Cordillera. Both sites SA5-W and SA5-E are required to unequically achieve these objectives. Drilling is the only means to develop this time scale.

4. Examine the development of oceanic crust along a flow line from the generation of dual aseismic ridges at pseudofaults to steady state seafloor spreading:

Figure 3 display the Middle Eocene location of the Islas Orcadas and Meteor Rises. These aseismic ridges are direct analogues of the Walvis Ridge-Rio Grande Ridge system. Leg 73 observed the connection between the development of the Walvis-Rio Grande system and the development of pseudofaults at propagating rifts. Subsequent aeromagnetic and ships surveys have substantiated the models. The Islas Orcadas and Meteor Rises are also generated at the pseudofaults of a

propagating rift. The Walvis ridge was drilled by DSDP Leg 74 on the Walvis Ridge transect. Sites SA6,SA3,SA7,SA8 will provide another data set analogous to the Walvis Ridge Leg 74 transect in order to monitor the development of the magma chamber along a flow line.

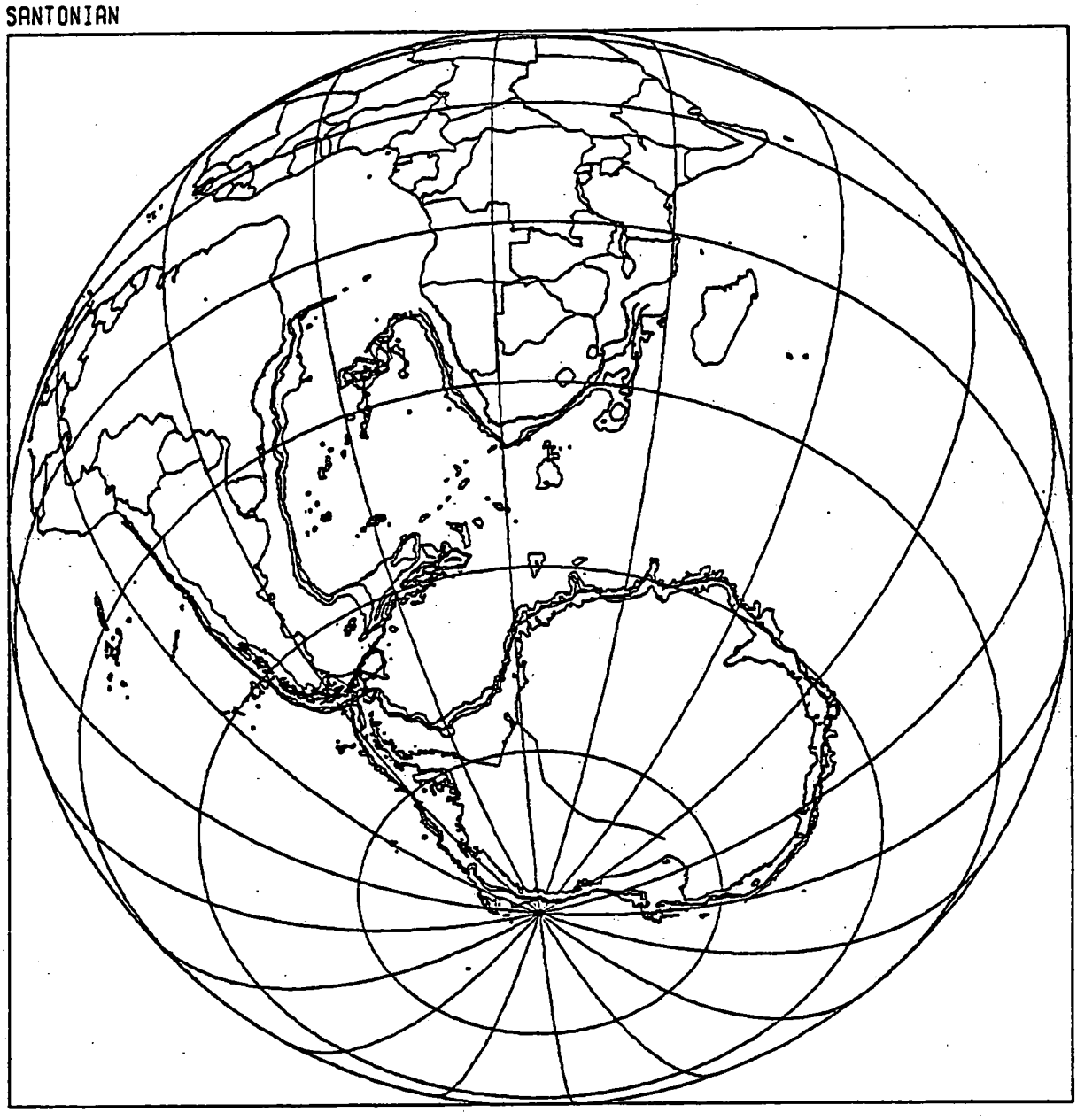
FIGURE CAPTIONS:

Figure 1: Reconstruction of the Antarctic Atlantic sector according to Norton and Sclater,1979. Reconstruction is with respect to Africa in its present day position. Age of the reconstruction is the Santonian-Campanian boundary or magnetic chron C34.

Figure 2: Reconstruction of the Subantarctic sites for the Middle Eocene. Spreading center locations based on magnetic anomaly location and Seasat gravity field. Supporting data is presented in the OMD Region 13 synthesis.

Figure 3: Detail of Figure 1 at the Campanian-Santonian boundary (Chron C34). Spreading center location determined from magnetic anomaly locations. Convergence vectors show direction and total motion for Chrons C34 and C31 based on the poles of rotation determined from LaBrecque and Hayes, 1979 and Ladd, 1975. Base of the convergence vectors plotted along the North Scotia Ridge and the N.E. Georgia Rise. Note that total convergence may have reached 1000 km near Tierra del Fuego from Santonian to Maestrichtian time. Polarity of the subduction zone was likely southward dipping along the North Scotia Ridge and westward facing along the N.E. Georgia Rise.

Figure 1.



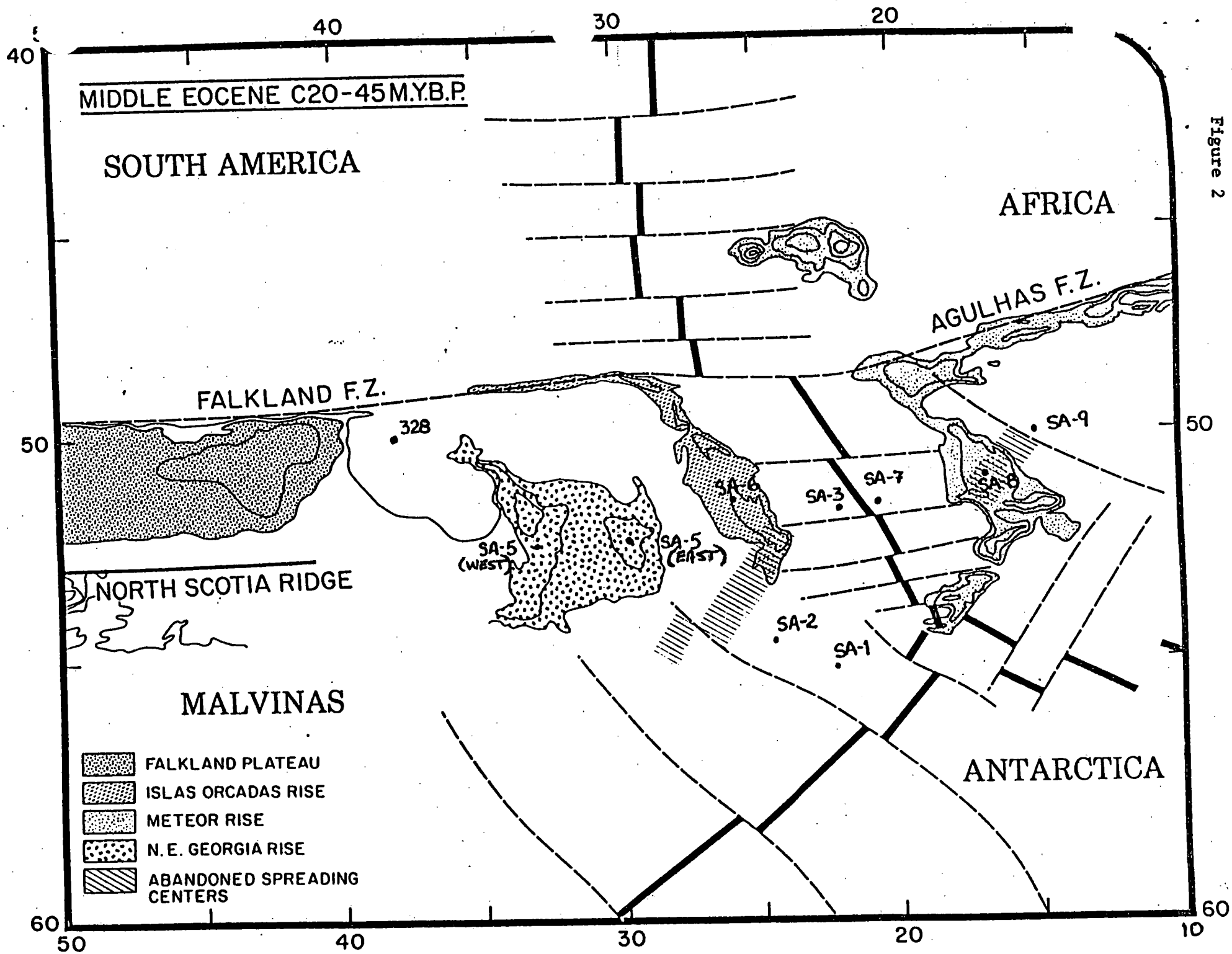

MIDDLE EOCENE C20-45 M.Y.B.P.
SOUTH AMERICA
AFRICA
AGULHAS F.Z.
FALKLAND F.Z.
328
SA-9
SA-8
SA-7
SA-6
SA-3
SA-5 (WEST)
SA-5 (EAST)
NORTH SCOTIA RIDGE
SA-2
SA-1
MALVINAS
ANTARCTICA
FALKLAND PLATEAU
ISLAS ORCADAS RISE
METEOR RISE
N.E. GEORGIA RISE
ABANDONED SPREADING CENTERS
40
30
20
50
60
10

Figure 2

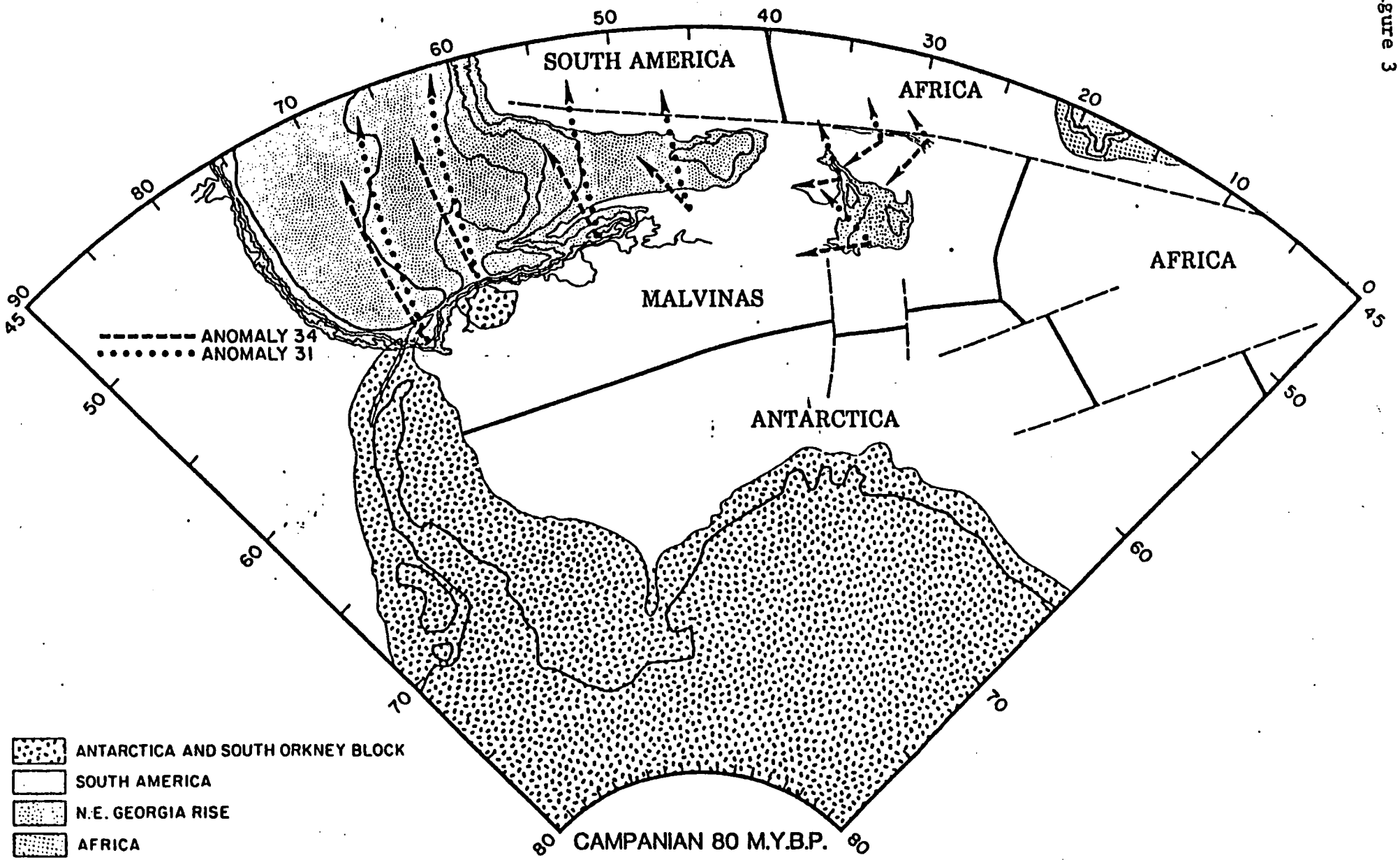
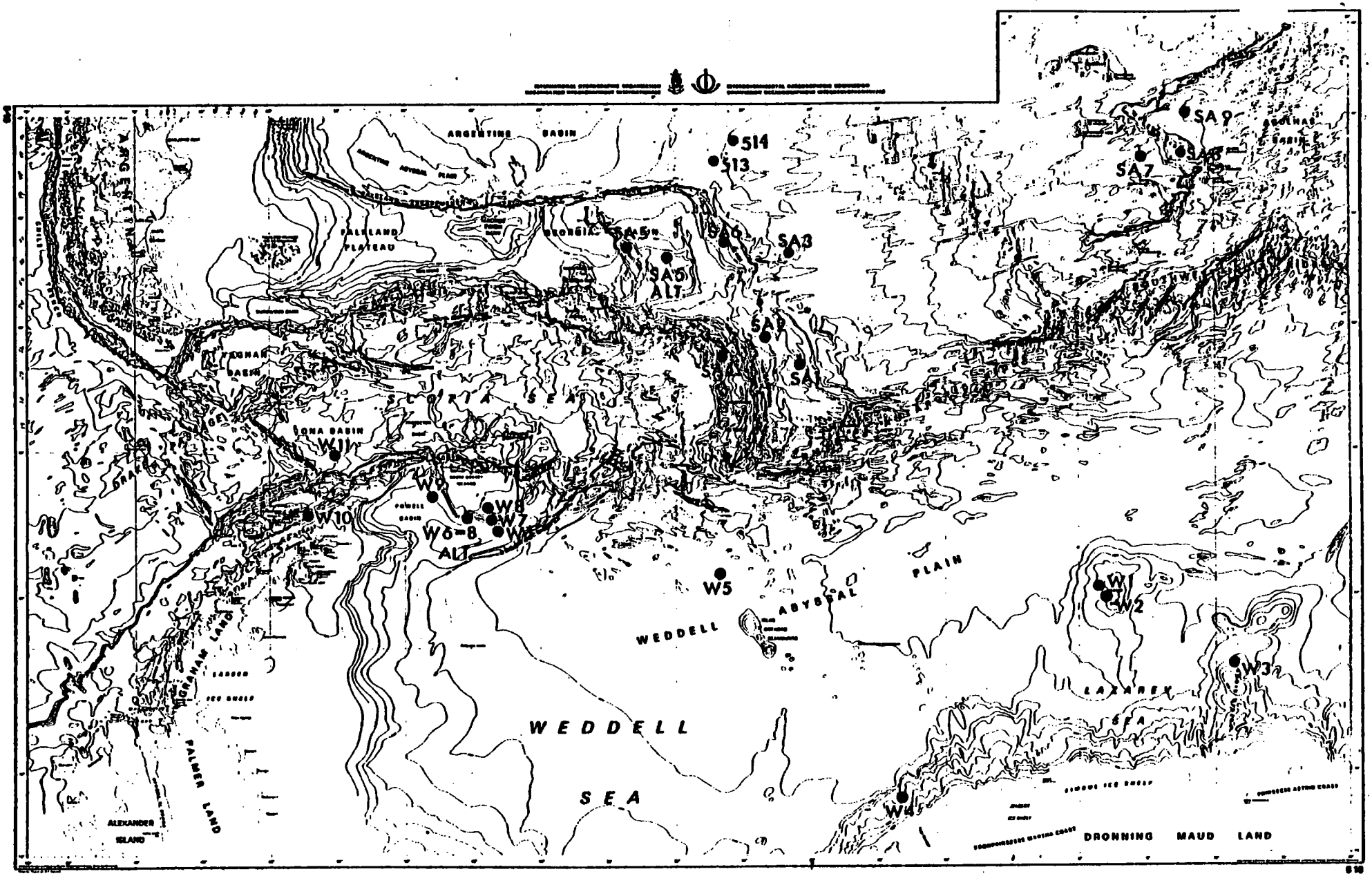

SOUTH AMERICA
AFRICA
AFRICA
MALVINAS
ANTARCTICA
ANOMALY 34
ANOMALY 31
ANTARCTICA AND SOUTH ORKNEY BLOCK
SOUTH AMERICA
N.E. GEORGIA RISE
AFRICA
CAMPANIAN 80 M.Y.B.P.

Figure 3



GENERAL BATHYMETRIC CHART OF THE OCEANS (GEBCO)

CARTE GÉNÉRALE BATHYMÉTRIQUE DES OCÉANS (GEBCO)

Recent Piston Coring - Sth Orkney Platform

A recent site survey cruise (by Peter Barker) to the Orkney Platform region recovered piston cores from the vicinity of Weddell sites W6-W8. These cores were taken from the apex of the platform to the base of the slope (3500 m) and cores located at all three proposed sites. Basal sediment ages are Brunhes to upper Matuyama, indicating the absence of major surface sediment erosion and the likely presence of a nearly complete Quaternary record.

Diatom preservation on the slope of the platform is fair to good. Ample pelagic species are present for sufficient age control. Diatom preservation is excellent in a sample examined, from the deepest core at 3500 m. Reworked microfossils are rare in all cores, suggesting minimal downslope transport (mass wasting) which might degrade the quality of W6-W8 Quaternary sections.