JOIDES PLANNING COMMITTEE MEETING
10-12 April 1987
Washington, D.C.

AGENDA

Attachments

Item C: BCOM REPORT

BUDGET COMMITTEE MEETING
25-26 February 1987
San Francisco, CA

The Budget Committee (BCOM) met on the 25th and 26th of February in San Francisco to discuss the FY88 draft program plan and budget. The BCOM has made recommendations to JOI based on the following suppositions:

a) The target base budget is $35.5 million dollars with enhancements of $1M, based on seven non-U.S. partner members.

b) The FY88 drilling program, as presented by PCOM, can be accomplished at this budget level.

c) The program presented by PCOM (which includes additional expenses for an ice support vessel and drilling one hard-rock site) is representative of the operations to be expected in a normal year.

d) A balance between FY88 objectives and long term objectives of the Ocean Drilling Program must be achieved in the budget process.

For future BCOM meetings the committee recommends that:

a. Copies of the PCOM plan summarized from the annual PCOM meeting and submitted to JOI should also be distributed to the BCOM in advance of their first meeting. [At this BCOM meeting a summary of PCOM's plans was presented orally.]

b. Provision for an additional BCOM meeting after the contractors respond to BCOM recommendations and before "administrative review" by NSF should be considered. This meeting would be held if there is a marked disagreement between BCOM recommendations and contractors budget adjustments.

c. In the future, the contractors are asked to present all budgets with the following information: the program plan budget, operating budget, (to include carryover from previous years), expenditures and carryovers from previously completed fiscal year (FY86); program plan and operating budget for the present fiscal year (FY87); and proposed budget for the upcoming fiscal year (FY88). This data should be arranged in seven vertical columns on each budget sheet.

Item C: BCOM Report (continued)

d. The draft program plan should be transmitted to the PCOM at their spring meeting.

e. The program plan budget should contain three primary elements:

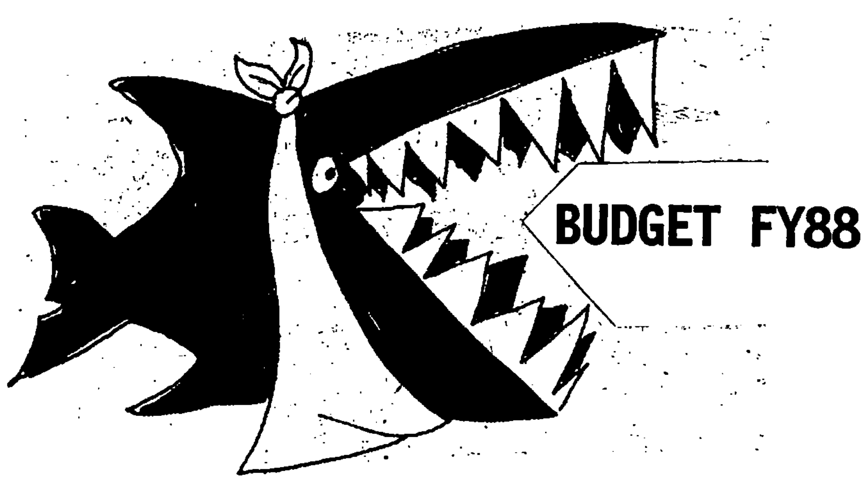
i) Standard Operating Expenses
ii) Special Operating Expenses
iii) Enhancements.

The Special Operating Expenses would include special operations cost such as ice support vessels; expenses associated with drilling in difficult formations (e.g. bare-rock drilling) and other "large ticket" items such as replacement drilling string. Any deferred expenses from previous years which may be included in this category should be noted.

The BCOM strongly recommends that the "base" budget be defined as the sum of both the standard operations + the special operations budget.

The BCOM feels that this budget breakdown provides a very useful management tool for planning, especially for the PCOM. The PCOM will have a better understanding of the impact of planning decisions and will provide better guidance on how many special operations should be considered within a fiscal year.

To achieve the budget target of $35.5M the BCOM has made specific recommendations to JOI which will be forwarded to the subcontractors. A full report of the BCOM meeting will be presented at the next EXCOM meeting.



Item H: INDIAN OCEAN PLANNING

1. **Legs 119 & 120: KERGUELEN** see report p. 27-33

For the moment the Kerguelen/Prydz Bay program is scheduled as Legs 119 & 120, beginning 7 December 1987 and ending 11 April 1988.

On request of PCOM, the Kerguelen WG met again (11-12 March). The main results are listed below:

* Regarding Prydz Bay, two (additional) parallel lines were made available by D.Falvey, BMR/Australia. The four proposed sites seem to be drillable. Implication: Ice boat needed.

* It is recommended that one site in the Southern Kerguelen be deepened to basement in order to achieve more basement objectives.

* Weather windows of Kerguelen and Prydz Bay do not necessarily match; at a given time either S-Kerguelen or Prydz Bay seem to be ice free. The optimal weather window for Prydz Bay is the second half of January through the first half of February. This is in conflict with the existing schedule. **[based on limited data]**

The Kerguelen WG recommends the following compromise, considered to best protect all objectives in these areas (R.Larson, who attended the K-WG meeting as PCOM liaison, may explain details):

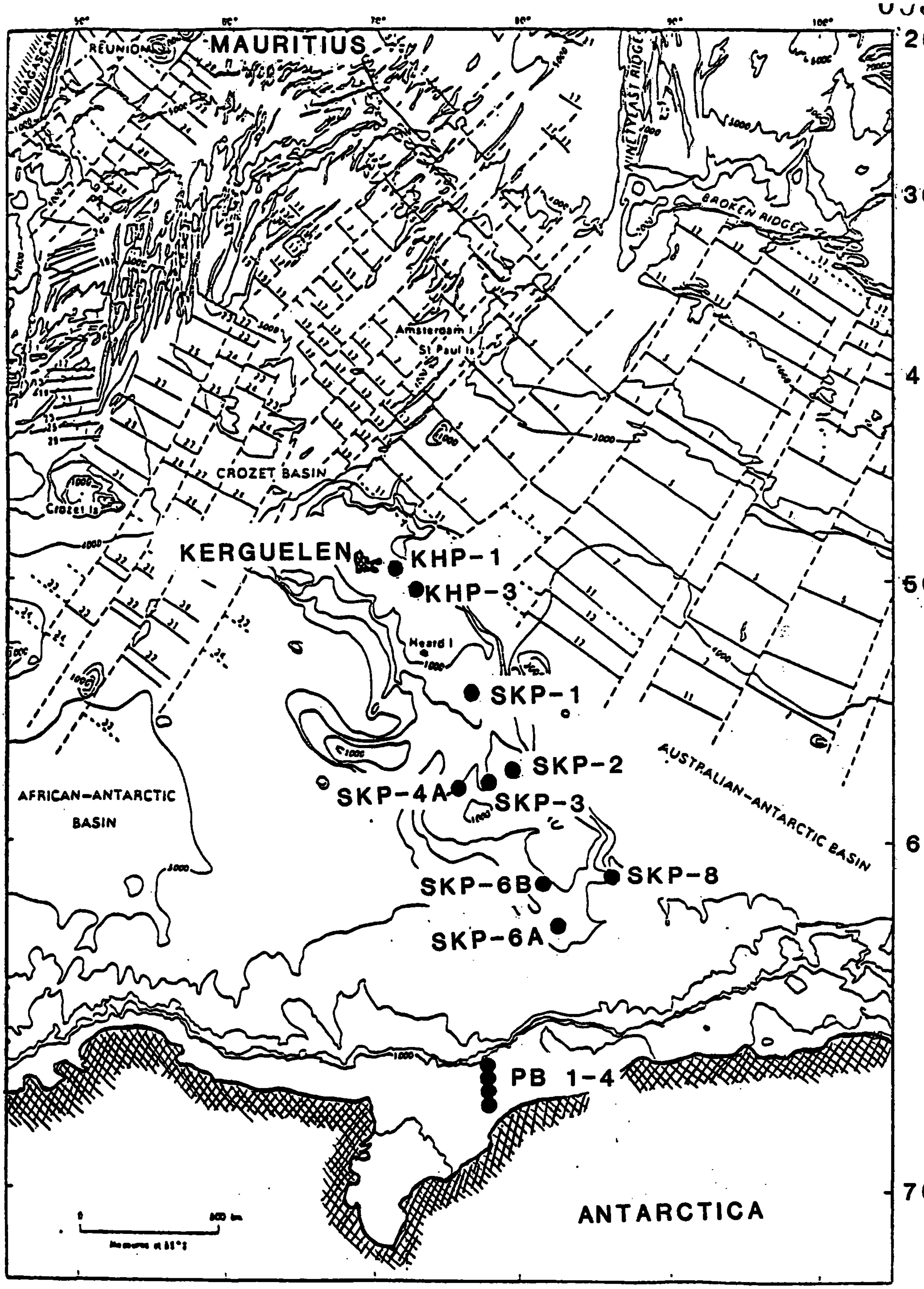
A. Delay the beginning of Kerguelen drilling by two weeks! [Note: Previous plans always considered the beginning of Kerguelen drilling as a fixpoint (early December)]

B. Leg 119 should consist of seven sites: two N-Kerguelen sites (KHP-1, KHP-3 re-entry), one Central-Kerguelen site (SKP-1 to basement) and the four Prydz Bay sites (which would be drilled in late January); drilling time approximately 40 days, total length of leg 65 days.

C. Leg 120 should consist of five S-Kerguelen sites (SKP-2, SKP-3 re-entry, SKP-4a re-entry, SKP-6a, SKP-8); drilling time 38.6 days, total length of leg 62 days.

PCOM IS ASKED TO:

i. DECIDE WHETHER OR NOT PRYDZ BAY SITES WILL/CAN BE PART OF THE KERGUELEN DRILLING. A DECISION ON AN ICE BOAT (WHICH IS REQUIRED FOR PRYDZ BAY) <u>CANNOT</u> BE POSTPONED



SITES RECOMMENDED BY THE KERGUELEN WORKING GROUP, 11.-12. MARCH 1987

Item H: Indian Ocean Planning (continued)

ii. REVIEW WHETHER THE KERGUELEN WG PROPOSAL IS ACCEPTABLE REGARDING:

(1) BALANCE OF OBJECTIVES
(2) LEG COMPOSITION AND LENGTH
(3) DELAYING THE BEGINNING OF KERGUELEN DRILLING BY TWO WEEKS

iii. DISCUSS HOW THE PROPOSED SHIFTING OF THE KERGUELEN DRILLING AFFECTS THE 'REST' OF THE INDIAN OCEAN PLANNING (two weeks 'gained' before the Kerguelen)

iv. [IF ACCEPTED] HOW THE TWO 'GAINED' WEEKS PRIOR TO THE BEGINNING OF KERGUELEN DRILLING COULD BEST BE USED

Options: add to SWIR; add two days to Leg 115 (see SOHP recommendations); lengthen Leg 116 to assure N90°E Ridge site; addition to Legs 115 & 116 would help Leg 117 with the monsoon season)

v. CONSIDER ICE BOAT SUPPORT FOR S-KERGUELEN (in addition to Prydz Bay!) AND ITS IMPACT ON THE BUDGET

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2. Leg 115: MASCARENE PLATEAU / CARBONATE DISSOLUTION (p.35-39)

Two co-chiefs have been named: **R.Duncan & J.Bachmann** (ESF)

Note: In Hawaii PCOM decided that Leg 115 will consist of three Mascarene Plateau sites (MP-1: Mascarene Plateau; MP-2: Cargados Bank; MP-3: Nazareth Bank) and a transect of four carbonate dissolution sites (CARB-1: 1600 m; CARB-2: 3000 m; CARB-3: 3800 m; CARB-4: 4600 m). The DROXLER site M-1 was considered to be a back-up site.

A. Regarding the Carbonate Dissolution Transect, SOHP has made the following recommendations:

* Sites CARB 2-4 should be shifted to shallower water depth (saves about one day drilling time)

* The Droxler site, MLD-2 (see page 37ff), should be added to the first priority objectives of the Carbonate Dissolution Transect (needs about two days drilling time, no steaming). Second priority is to add site MLD-1. Third priority is HPC at Mascarene Plateau site MP-1 at 18°S (200 m sediment)

Item H: Indian Ocean Planning (continued)

B. Since mid-March the British research vessel, HMS DARWIN, is conducting a site survey at the Mascarene Plateau; Bob Duncan is attending. According to his recent telexes to the JOIDES Office, moving sites CARB 2-4 to alternate sites would cause problems, as the survey encountered slumps and channels. (The site survey cruise will end about the time of the PCOM meeting; we hope that a summary of the results will be available at the meeting, see p. 35)

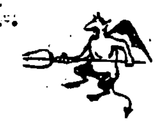
C. Comments of the IOP (which meets 31 March-1 April) on this leg might be available at the PCOM meeting.

D. There is a slight chance that PCOM will decide to delay the beginning of the Kerguelen drilling (see item H.4-6) by two weeks. If a few days could be added to this leg, SOHP's recommendations of first priority objectives (Droxler sites) could be incorporated.

PCOM IS ASKED TO:

i. CONSIDER POSSIBLE CHANGES TO LEG 115 PLAN AS DEFINED AT JANUARY PCOM MEETING (Leg starts 19 May 1987)

ii. MAKE SURE THAT CLEARANCES FOR THIS LEG ARE AVAILABLE. (Mascarene Plateau/Carbonate Dissolution Transect: Mauritius/Seychelles; Droxler sites: Maldives)



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3. **Leg 116: INTRAPLATE DEFORMATION & N90°E RIDGE**

Co-chiefs: **J.Cochran, D.Stow** (U.K.)

When preparing this agenda book, there is no new information on this leg. Recommendations from the IOP, which will meet 31 March-1 April, will be available at the PCOM meeting (Nick Pisias will act as PCOM liaison to that meeting).

If PCOM is going to delay the beginning of Kerguelen drilling, it might consider adding some time to this program. The Intraplate Deformation program itself is estimated to consume a total leg and extra time may be needed for the N90°E Ridge site.

PCOM IS ASKED TO:

i. MAKE FINAL DECISIONS ON THE SHAPE AND LENGTH OF LEG 116 AS THIS LEG WILL BEGIN <u>BEFORE</u> THE AUGUST PCOM MEETING!

Item H: Indian Ocean Planning (continued)

ii. DEFINE PRIORITIES, IF THE PROGRAM IS TOO LONG FOR THE EXISTING TIME FRAME

iii. CONSIDER ADDING SOME TIME TO LEG 116, IN CASE THE KERGUELEN PROGRAM IS DELAYED

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4. Leg 117: NEOGENE PACKAGE

Co-chiefs: **W.Prell, Niitsuma (J)**

Note: At its January meeting, PCOM defined this program as consisting of sites NP 1-7 (the Gulf of Aden site NP-8 was dropped because of time constraints): Sites NP 1-3 at Oman Margin; Sites NP 4- 6 at Owen Ridge; NP-7 at distal Indus Fan. Total length: 52 days (41 operational days, 11 transit days)

This program is in excellent shape. Updated information regarding this program may result from the IOP meeting. If PCOM is considering the addition of approximately one week to the two previous legs (Legs 115 & 116), the Neogene Package would also gain, as it would be moved further away from the monsoon season.

The safety review for this program is scheduled for one week after the April PCOM meeting.

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5. Leg 118: SOUTHWEST INDIAN RIDGE (SWIR)

Co-chiefs: **R.von Herzen, P.Robinson (C)**

The first priority has been defined by PCOM: median ridge site (site 4) within the fracture zone with deployment of a bare-rock guidebase (only proven site with ultramafics). The second priority is to pogo into the gravel pit; third priority is to drill the northern nodal basin site.

A. PCOM has asked the DMP to compose a logging program assuming considerable basement penetration. The time frame for the logging program is about 8 days. Detailed information about this logging program, as defined by DMP, will be available at the meeting (Marc Langseth is PCOM liaison to DMP).

Item H: Indian Ocean Planning (continued)

B. Assuming PCOM delays the beginning of the Kerguelen program, it might consider adding time to this program in order to enhance the chances of successful drilling, particularly as the deployment of a guide base consumes quite a lot of time (it is also expensive, and not included in the base budget).

PCOM IS ASKED TO:

i. DEFINE THE LENGTH OF LEG 118 (SWIR)

ii. REVIEW THE LOGGING PLAN FOR LEG 118 AS DEFINED BY DMP

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6. Leg 121: BROKEN RIDGE / N90°E RIDGE

New information an site recommendations will be available after the IOP meeting.

PCOM IS ASKED TO:

i. REVIEW IOP RECOMMENDATIONS FOR LEG 121 (BROKEN RIDGE/90°E RIDGE, EVENTUALLY PRIORITIZE THE SCIENCE PROGRAM

ii. RECOMMEND CO-CHIEFS FOR LEG 121 (see list p.11)

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7. Leg 122: EXMOUTH PLATEAU (see p.41-43, and SOHP mi

The SOHP recommends the following five sites as top priority for this leg: (see p.131)

EP-7: re-entry (to ensure achieving the lower section)
EP-6: deepen to 1200 m (makes it a re-entry site)
EP-2A: as proposed by IOP
EP-10A: as proposed by IOP (into Triassic)
EP-9B: as proposed by IOP

An update of IOP recommendations regarding extension of the Exmouth program to a full leg will be available after the IOP meeting.

Item H: Indian Ocean Planning (continued)

8. **Leg 123: ARGO ABYSSAL PLAIN**

A. At the January meeting, PCOM decided to make this a one site leg. The site should be deepened into basement in order to achieve the objectives of a geochemical reference site for the nearby volcanic arc of the Java-Sunda subduction zone.

B. SOHP confirms its previous view in favor of only one site (AAP-1B); double coring of Mesozoic sequence (Gradstein proposal) is considered of lower priority than any of the above mentioned Exmouth Plateau sites.

C. An update of IOP recommendations for the Argo Abyssal Plain will be available after the IOP meeting.

D. The detailed justification requested from LITHP for this site (regarding 'geochemical reference') will not be available for this meeting as the LITHP does not meet until mid-May! This information will be available for the August PCOM meeting!

PCOM IS ASKED TO:

i. DISCUSS THE RECOMMENDED SCIENCE PROGRAM FOR THE EXMOUTH PLATEAU AND DECIDE ON THE FINAL SHAPE OF THIS LEG. PRIORITIZE THE SITES (if possible)

ii. DISCUSS RECOMMENDATIONS FOR THE ARGO ABYSSAL PLAIN LEG TO DEFINE THE FRAME FOR THIS LEG

iii. IN CASE THE ARGO PROGRAM DOES NOT FILL ONE LEG: CONSIDER WHETHER SOME TIME MIGHT BE DEDICATED TO HIGH PRIORITY OBJECTIVES OF THE EXMOUTH PLATEAU WHICH DO NOT FIT INTO THE ONE EXMOUTH LEG (SOHP recommendations)

iv. CONSIDER THE IMPACT OF A POSSIBLE DELAY IN THE BEGINNING OF KERGUELEN DRILLING

Item H: Indian Ocean Planning (continued)

9. Co-Chief Recommendations for Indian Ocean Legs

Invited: Leg 119 (Kerguelen): Schlich (F), (Barron ??)

Kerguelen:

IOP	Berggren, Wise, J.Hayes, Schlich (F), Falvey (A), Perch-Nielsen (ESF), LeClaire (F), Schrader (now ESF), Coffin (A)
TECP	Schlich (F), Falvey (A); J.Anderson
LITHP	J.Mutter, R.Schlich, K.Hinz
SOP	120: Hinz, LeClaire, Segawa(J), Hayes, Mutter, Anderson, Webb, Barron, Elverhoi, Krashenninikov
SOHP	(S-Kerguelen): Anderson, Falvey(A), Thierstein(ESF)

Broken Ridge/90°E Ridge:

IOP	Sclater, Weissel, Duncan, Curray, J.Peirce (C), Herb (ESF)
TECP	Weissel, Duncan, Gradstein (C)
LITHP	(90°ER) Curray, Duncan, J.Peirce (C), Whitmarsh (UK)
SOHP	B.Haq

Exmouth Plateau:

IOP	J.Mutter, R.Larson, von Rad (FRG), N.Exon (A), Williamson (A);
TECP	von Rad (FRG), Gradstein (C), Exon (A)
SOHP	von Rad , Exon

Argo Abyssal Plain:

IOP	C.Langmuir, Gradstein (C), Ludden (C), Honnorez (F ?)
LITHP	C.Langmuir, J.Natland, F.Frey
SOHP	Gradstein, Buffler

ITEM I: WESTERN PACIFIC PLANNING (see p.45-87; 3.prospectus p.

PCOM asked WPAC to break the first nine programs of its prospectus into legs. WPAC followed these instructions; with the following (details see p.47/8):

1.	Banda	40 days
2.	Sunda	56
3.	Sulu /S.China Sea Basin	49
	Transit/Dry dock	14
4.	Bonin I	56
5.	Nankai (no geotech)	56
6.	Japan Sea (part 1)	56
7.	Japan Sea (part 2)	30
8.	Bonin II (1 diapir, 1 ref., 1 outer arc high)	56
	Guam [CEPAC program]	
9.	GBR	56
10.	Vanuatu (part 1)	39
11.	Vanuatu (part 2)	38
12.	Lau	56
		approx. 2 years

(Note: Recently conducted site surveys make Zenisu a much stronger program.)

** WPAC completed its third detailed prospectus, which you will find attached (p. __). Also attached are the minutes of the March WPAC meeting (p.45-59) and a history of WPAC planning (p.75-87).

WPAC is adopting the 2-meeting-per-year schedule; a third meeting is tentatively scheduled for June 87, but will only be held at the request of PCOM.

PCOM IS ASKED TO:

i. REVIEW WPAC'S BREAKDOWN OF PROGRAMS TO LEGS AND USE IT AS A BASIS FOR AN INITIAL WESTERN PACIFIC DRILLING SCHEDULE

ii. REVIEW WHETHER THERE ARE HIGH-RANKING CEPAC PROGRAMS THAT MIGHT BE INCORPORATED INTO THE SCHEDULE (CEPAC begins developing its first prospectus in March 87)

iii. DECIDE WHETHER WPAC WILL NEED TO MEET IN JUNE IN ORDER TO PROVIDE INPUT FOR THE AUGUST PCOM MEETING.

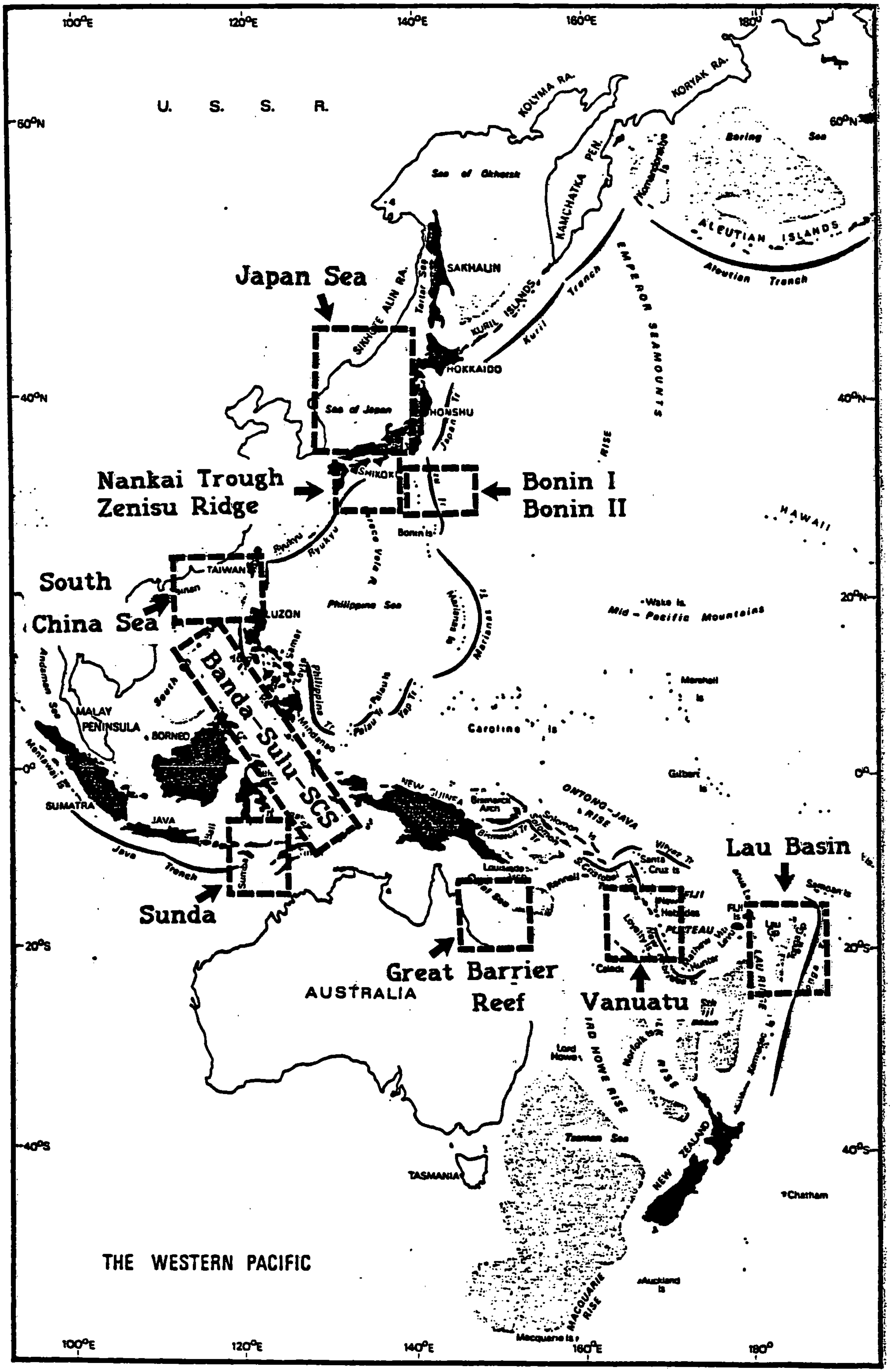
This is a preliminary drilling plan as worked out by the WPAC during its Tokyo meeting 2-4 March 1987 (Executive summary p.45):

Given a) an October 1 1988 start date, plus or minus one month, near Indonesia.
b) 56 day maximum legs with 5 port days between
c) the nine programs endorsed by PCOM in January
d) August-October typhoon season in Nankai-Bonin region

WPAC suggests the following drilling plan, which gets PCOM's "core" programs done early, leaving the greatest flexibility to plan the remaining programs.

Months	Starting Port	Program (Sites)	#Days Drill & Log	Transit	Total	Port
Oct-Nov 88	Jakarta/ Surabaya	Banda (1-3)	33	7	40	5
Nov 88- Jan 89	Ujung-Padang	Sunda	50	6	56	5
Jan-Mar 89	Ujung-Padang	Sulu (4,5)- SCS (7,9)	27 & 15	7	49	5
March	Manila	Drydock/Transit to Japan				
Apr-May	Yokohama	Bonin I (1,2,5A,5B)	51	4	55	5
June-July	Yokohama	Nankai (1,2)	53	3	56	5
Aug-Sept	Hakodate	Japan Sea I (1b,1d,1e,3a)	48	6	54	5
October	Niigata	Japan Sea II (2a,52)	25	5	30	5
Nov-Dec	Yokohama	Bonin II (6,7,8)	44	7	51	5
Jan-Feb 90	Guam	[CEPAC:OJP ?]			56	5
Mar-Apr	Cairns	Great Barrier Reef (1-5,9,10,12)	50	6	56	5
May-June	Noumea	Vanuatu I (DEZ 1-5)	37	2	39	5
June-July	Port Vila	Vanuatu II (IAB1+2,BAT2)	34	4	38	5
Aug-Sept	Suva	Lau-Tonga (2,3,6,7,1/4)	52	4	56	5
	Pago-Pago					

The Nankai/Bonin I legs are interchangeable; Bonin I was scheduled first to allow more time to develop tools for the Nankai program. Otherwise, the scheduling of legs between April and December 1989 is inflexible: the Japan Sea legs should be drilled during the August-October typhoon season for the Nankai-Bonin region. The 1990 schedule is flexible, and could accommodate an expanded WPAC program (Nankai Geotechnical, South China Margin and Zenisu are strong programs below the arbitrary 9 program cut-off). In this plan a western CEPAC leg (such as Ontong Java Plateau of Old Pacific crust) is inserted to minimize transit between Guam and Cairns. Scheduling the Great Barrier Reef leg in the Coral Sea cyclone season (March-April) is not desirable, but fine-tuning the 1990 schedule with so many other unknowns is unwarranted.


Japan Sea
Nankai Trough
Zenisu Ridge
Bonin I
Bonin II
South
China Sea
Banda-Sulu-SCS
Sunda
Great Barrier
Reef
Vanuatu
Lau Basin
AUSTRALIA
U. S. S. R.
THE WESTERN PACIFIC
100°E
120°E
140°E
160°E
180°
60°N
40°N
20°N
0°
20°S
40°S
SAKHALIN
HOKKAIDO
HONSHU
SHIKOKU
TAIWAN
LUZON
MALAY
PENINSULA
BORNEO
SUMATRA
JAVA
TASMANIA
NEW ZEALAND
KAMCHATKA PEN.
KURIL ISLANDS
ALEUTIAN ISLANDS
EMPEROR SEAMOUNTS
KORYAK RA.
KOLYMA RA.
Sea of Okhotsk
Sea of Japan
Philippine Sea
Caroline Is
Marshall Is
Gilbert Is
HAWAII
Wake Is.
Mid-Pacific Mountains
ONTONG-JAVA RISE
Java Trench
Aleutian Trench
Kuril Trench
Japan Tr
Ryukyu
Tasman Sea
Chatham
Auckland Is
Macquarie Is
MACQUARIE RISE
LORD HOWE RISE
FIJI
PLATEAU

ITEM J: CENTRAL AND EASTERN PACIFIC PLANNING

Note: At it's January meeting, PCOM asked the thematic panels to provide their input as to priority themes in the CEPAC region. The were also asked to review CEPAC's first list of ranked proposals to ensure an appropriate reflection of their thematic topics (see p. 89_ for CEPAC's November 86 proposal ranking). These efforts should provide guidance for CEPAC in writing its first prospectus which PCOM instructed CEPAC to provide before August 87.

An update from the 30-31 March CEPAC meeting (possibly draft prospectus) may be available at the PCOM meeting. B.Coulbourn attended the meeting as PCOM liaison.

SOHP has developed a preliminary ranking of themes for the Central and Eastern Pacific: (see p.135ff)

1. High resolution surface and bottom water Neogene history/paleoclimate
2. Anoxic events
3. Late Mesozoic-Paleogene high & low latitude paleoclimate
4. Old Pacific crust & Jurassic ocean
5. Fans
6. Atolls and guyots

Looking at the existing proposals and 'packages' and how they fit these themes, and also considering how well they are worked out and focussed, SOHP came up with the following preliminary ranking, forwarded to CEPAC for consideration:

I. Equatorial Pacific paleocean-environment
[1. E-Equatorial Pacific (221/E); 2. Ontong Java Plateau (142/E)]

II. Mesozoic-Paleogene paleocean
[Umnak Plateau, Bering Sea (229/E, 195/E); Sounder Ridge, Bering Sea (225/E, 195/E, 182/E); N. Pacific Gyre (199/E); S. Pacific (see workshop report); 'Atolls' (Guyots 260/E, 203/E)]

III. Old Pacific
[Nauru & E. Mariana Basins (261/E)]

IV. Anoxic
[Shatsky Rise (253/E)]

V. Atolls & Guyots
[Marshalls (202/E); Mid-Pacific (203/E); Ogasawara (260/D)]

VI. Fans
[Navy Fan (250/E); Baranoff Fan, Gulf of Alaska (192/E); Zodiak Fan (241/E)]

Item J: Central and Eastern Pacific Planning (continued)

SOHP's ranking of particular proposals resulted in the following list:

1.	(12)	E. Equatorial Pacific
2.	(11)	Bering Sea
3.	(10)	Old Pacific
4.	(9)	Ontong Java Plateau (transect)
5.	(8)	Shatsky Rise
6.	(7)	Navy Fan
7.	(5)	N. Pacific Gyre
8.	(4)	Gulf of California (diagenesis)
	(4)	Oregon upwelling
10.	(3)	Marshalls (atolls)
	(3)	California Margin Transect
	(3)	Ogasawara (seamount)
	(3)	Loisville Ridge (SW Pacific)
14.	(2)	Pacific guyots
	(2)	Peru margin (oceanography)
16.	(1)	Juan de Fuca (sedimented ridge)
	(1)	Oregon accretionary prism
	(1)	S. Pacific

LITHP and TECP have not met since the January PCOM meeting; their input will be available at the August meeting.

PCOM IS ASKED TO:

i. REVIEW THE UPDATED PROPOSAL RANKING/PROSPECTUS FROM CEPAC'S MOST RECENT MEETING IN TERMS OF APPROPRIATE REFLECTION OF THEMATIC PANEL INPUT (SOHP)

ii. PROVIDE GUIDANCE/ADVICE TO CEPAC FOR FURTHER PLANNING

iii. SPOT PROGRAM WHICH MIGHT BE INCORPORATED INTO THE WESTERN PACIFIC PRELIMINARY SHIP SCHEDULE

ITEM K: PCOM LIAISONS

1. At the Panel Chairmen's Meeting, held in Hawaii, the Chairmen endorsed the system of inter-panel liaisons and indicated an overall improvement in information flow. The panel chairmen did indicate **one exception** which urgently needs improvement (for at least some panels):

PCOM liaisons to the advisory panels !

2. Due to the rotation schedule, there are some new PCOM members who do not have liaison 'duties'. There are also some liaison positions which are uncovered.

3. At the recent SOHP meeting there were some problems with PCOM liaison. The PCOM Chairman flew to San Francisco for the second half of the meeting in order to assure PCOM liaison.

PCOM IS ASKED TO:

i. DISCUSS AND ADJUST LIAISON POSITIONS TO THE PANELS IN BEST ACCORDANCE WITH PCOM'S ACTUAL 'COMPOSITION' (Please find a discussion paper on the following page!)

ii. MAKE SURE THAT PCOM LIAISON TO CRUCIAL PANELS ARE COVERED!

iii. INSTRUCT ITS OWN MEMBERS TO TAKE THE LIAISON BUSINESS MORE SERIOUSLY (come prepared - report adequately!)

Item K: PCOM Liaisons (continued)

As a basis for discussion please consider the following combination of names and panels for PCOM liaison to the advisory panels. This list is based on the following criteria:

(1) One U.S. PCOM member (for meetings within the U.S.) and one non-U.S. PCOM member (for meetings outside the U.S.) as liaisons to one panel;

(2) PCOM chairman as liaison to the upcoming-area-of-interest panel (i.e. WPAC);

(3) liaison which reflects the PCOM members scientific 'specialty';

Panel list: LITHP, SOHP, TECP, ARP, CEPAC, IOP, SOP, WPAC, DMP, IHP, PPSP, SSP, TEDCOM

	Rotation Date	Present liaison (and other jobs)	Proposed new liaison
H.Beiersdorf	87	SOP	
(U.von Rad)	--		SOHP, IOP
G.Brass	91	-- (BCOM)	SOHP
J.-P.Cadet	--	ARP, IHP	ARP, IHP
B.Coulbourn	90	CEPAC, TECP	CEPAC
O.Eldholm	--	--	TECP
T.Francis	--	SSP, TEDCOM	SSP, TEDCOM
S.Gartner	89	IHP, SOHP	IHP
M.Kastner	89	IOP, SOHP	LITHP
M.Langseth	91	SOP	DMP, SSP
R.Larson	88	IOP (K-WG)	IOP, CEPAC
R.McDuff	88	DMP, LITHP	DMP, SOP
N.Pisias	90	PPSP, SSP (BCOM)	PPSP, WPAC (SOP)
P.Robinson	--	TECP	LITHP
D.Ross	--	--	ARP
T.Shipley	90	ARP, CEPAC	TECP
A.Taira	--	WPAC	WPAC

Listed the other way this version fits most of the above defined requirements:

LITHP:	Kastner / Robinson	WPAC:	Pisias / Taira
SOHP:	Brass / von Rad	DMP:	Langseth & McDuff
TECP:	Shipley / Eldholm	IHP:	Gartner / Cadet
ARP:	Ross / Cadet	PPSP:	Pisias
CEPAC:	Coulbourn & Larson	SSP:	Langseth / Francis
IOP:	Larson / von Rad	TEDCOM:	Francis
SOP:	McDuff & Pisias		

Item L: PRIORITIZATION OF DMP DEVELOPMENT RECOMMENDATIONS

[Note: This agenda item was not addressed at the January meeting.]

At PCOM's request, DMP identified the following areas where ODP should take action to develop new technologies for future use (see next page for details):

1. Physical Property Lab Upgrades (TAMU)
2. Wireline Re-entry
3. Fishing and Sidetracking Equipment (TAMU)
*4. Hardrock Drilling Technology (TAMU)
*5. Bare Rock Guide Bases (TAMU)
*6. High Temperature Logging
7. Long Term Observations

These items were mentioned in the DMP minutes, available as handouts at the last PCOM meeting. Due to time constraints resulting from rotating/circling WPAC discussion, PCOM did not discuss DMP's recommendations. Some key recommendations, however, were incorporated into the priority list which covered recommendations from the panels (marked with *).

As DMP input is of comparable important to that from the thematic panels, PCOM should carefully consider and review the panels recommendations.

PCOM IS ASKED TO:

i. DISCUSS, AND IF NECESSARY, PRIORITIZE DMP RECOMMENDATIONS REGARDING ENGINEERING DEVELOPMENT

ii. DEFINE THE IMPACT ON FUTURE PLANNING AND BUDGETING

ITEM L: Prioritization of DMP Development Recommendations (continued)

[Note: Following is an excerpt from November 86 DMP meeting minutes which were available as handouts at the January PCOM meeting.]

New Technology

In response to a request from PCOM, DMP identified seven areas in which major expenditures should be initiated in 1987 to develop or acquire new technology for future ODP use.

1. **Physical Property Lab Upgrades (TAMU)**
   Develop multi-function core logger, measure selected physical properties at elevated pressure and acquire capability to measure Rw*, Lg, cation exchange capability and bound water state in support of logging.
   (* Rw = formation water resistivity)

2. **Wireline Re-entry**
   Develop wireline re-entry to deploy and service borehole tools in the absence of the drillship.

3. **Fishing and Sidetracking Equipment (TAMU)**
   Acquire equipment (whipstocks, magnetic fishing gear, shaped charges) to clean or sidetrack Hole 504B so that it can be deepened to Layer 3.

4. **Hardrock Drilling Technology (TAMU)**
   Develop new technology to improve penetration and recovery.

5. **Bare Rock Guide Bases (TAMU)**
   Acquire three new guidebases by 1989 for Lau, Juan de Fuca and/or EPR drilling.

6. **High Temperature Logging**
   Develop integrated high temperature logging capability for use in Juan de Fuca, Gulf of California and EPR drilling using Japanese, U.S., French and German technology.

7. **Long Term Observations**
   Develop long-term observatory packages for use in ODP holes, perhaps as cooperative Japanese-U.S. venture.

ITEM M: PANEL MEMBERSHIP

1. LITHP: one open slot (sediment geochemist)

   Nominations: M.Lyle (OSU), M.Hoffert (F), W.Goodfellow (C)

2. SOHP:

   Rotating off: M.Arthur, B.Hay, L.Tauxe

   Nominations:
   Geochemist: S.Brassell, W.Dean, K.Kvenvolden
   Paleomagnetist: Channel, Kent, King, B.Karlin
   Oceanographer: J.Barron, W.Berger, , K.Miller, A.Mix, W.Schlager, R.Thunnel

3. DMP: 4 open slots

   Nominations:
   W.Givens (Mobil; nuclear logging)
   C.Sondergeld (AMOCO; physical properties, rock mechanics)
   R.Wiley (AMOCO; nuclear logging, quality control)
   A.Richards (FUGRO; geotechnical studies)

   and one of:

   N.Toksoz (MIT; log analysis)
   A.Cheng (MIT; velocity logging)
   R.Turpenning (MIT; VSP)
   R.Wilkens (MIT; log analysis)

4. CEPAC:

   Rotating off: J.Mammerickx

   Nominations: to be presented at meeting

5. IOP:

   Rotating Off: J.Curray, J.Sclater

   Nominations: to be presented at meeting

ITEM N: ARCTIC DRILLING (see also p.91ff)

The "International Arctic Drilling Technology Workshop" was held from 15-17 December, 1986; convenor: Steve Blasco (see attached report/summary p.91ff)

At it's last meeting PCOM decided to improve its background on this subject, as Arctic drilling is of interest for planning ODP drilling in the Pacific Ocean.

Dr. Leonard Johnson, Office of Naval Research, Washington D.C., has been invited (in place of Steve Blasco who is unable to attend) to give a short report on the scientific and technological topics of the workshop. Dr. Johnson will be available for discussion and questions.

ITEM O: ODP PROCEEDINGS

A. Citation of Proceedings

Recently, the first volume (part A) of the Proceedings of the ODP was published. At the January PCOM meeting a short but engaged discussion showed that the citation format did not have the full support of PCOM. As not all PCOM members had a chance to review the first published volume of the Proceedings, further discussions and a decision were postponed to the April PCOM meeting.

Therefore, at the last PCOM meeting the following motion was tabled and must be decided on at the upcoming meeting:

PCOM Motion:

> That the suggested citation for the initial ODP PROCEEDINGS follow the format developed for the DSDP Initial Reports, with the addition of the statement identifying the TAMU staff scientist as the volume's "editor" or "coordinator".

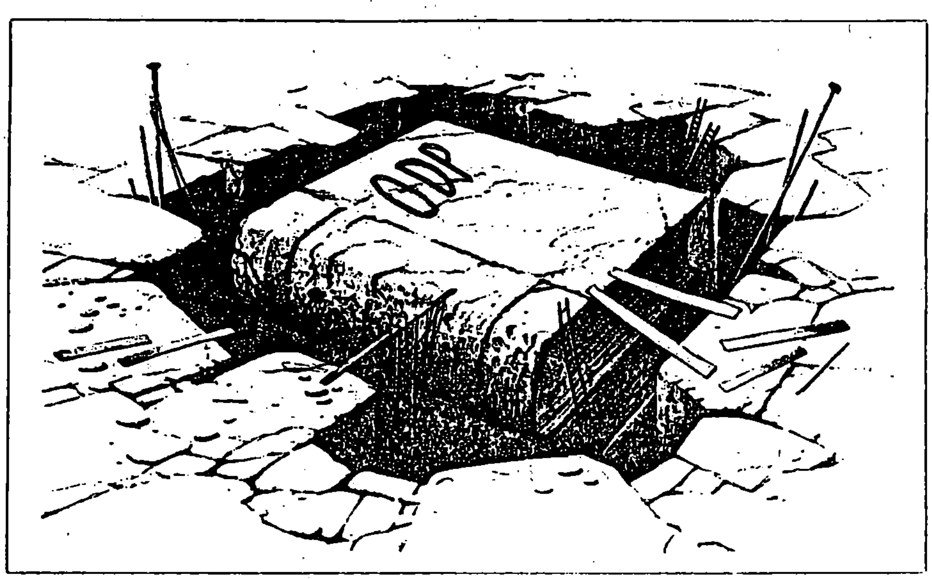
On the following page you will find three examples of citation, taken from DSDP Initial Reports and the first volume of the new ODP Proceedings:

Example A: IR, DSDP, vol.85
The co-chiefs are cited

Example B: IR, DSDP, vol.94
The co-chiefs and the staff scientist are cited

Example C: **ODP Proceedings, first volume**
The co-chiefs and the staff scientist are cited

As is shown in the upper portion of the examples, the front page mentions DSDP and TAMU staff scientists separately from the rest of the shipboard party. The name of the editor is also shown separately.



EXAMPLE A:

Larry Mayer, Fritz Theyer, John A. Barron, Dean A. Dunn, Tim Handyside, Scott Hills, Ian Jarvis, Catherine A. Nigrini, Nicklas C. Pisias, Annick Pujos, Tsunemasa Saito, Paul Stout, Ellen Thomas, Norbert Weinreich, and Roy H. Wilkens

SHIPBOARD SCIENCE REPRESENTATIVE

Ellen Thomas

EDITOR

Marian G. Bailey

It is recommended that reference to the whole or to part of this volume be made in one of the following forms, as appropriate:

Mayer, L., Theyer, F., et al., 19__. *Init. Repts. DSDP*, 85: Washington (U.S. Govt. Printing Office).

Miller, K. G., and Thomas, E., 19__. Late Eocene to Oligocene benthic foraminiferal isotopic record, Site 574, equatorial Pacific. *In* Mayer, L., Theyer, F., et al., *Init. Repts. DSDP*, 85: Washington (U.S. Govt. Printing Office), ___-___.

EXAMPLE B:

PARTICIPATING SCIENTISTS

William F. Ruddiman, Robert B. Kidd, Jack G. Baldauf, Bradford M. Clement, James F. Dolan, Margaret R. Eggers, Philip R. Hill, Lloyd D. Keigwin, Jr., Margie Mitchell, Isabelle Philipps, Frank Robinson, Sassan A. Salehipour, Toshiaki Takayama, Ellen Thomas, Gerhard Unsold, and Philip P. E. Weaver

SHIPBOARD SCIENCE REPRESENTATIVE

Ellen Thomas

EDITOR

Susan Orlofsky

It is recommended that reference to the whole or to part of this volume be made in one of the following forms, as appropriate:

Ruddiman, W. F., Kidd, R. B., Thomas, E., et al., 19__. *Init. Repts. DSDP*, 94: Washington (U.S. Govt. Printing Office).

Thomas, E., 19__. Late Oligocene to Recent benthic foraminifers from Deep Sea Drilling Project Sites 608 and 610, northeastern North Atlantic. *In* Ruddiman, W. F., Kidd, R. B., Thomas, E., et al., *Init. Repts. DSDP*, 94: Washington (U.S. Govt. Printing Office), ___-___.

EXAMPLE C:

James A. Austin, Jr., Wolfgang Schlager, Paul A. Comet, André Droxler, Gregor Eberli, Eric Fourcade, Raymond Freeman-Lynde, Craig S. Fulthorpe, Gill Harwood, Gerhard Kuhn, Dawn Lavoie, Mark Leckie, Allan J. Melillo, Arthur Moore, Henry T. Mullins, Christian Ravenne, William W. Sager, Peter Swart, Joost W. Verbeek, David K. Watkins, and Colin Williams

Participating Scientists

Amanda A. Palmer

Shipboard Science Representative

William D. Rose

Editor

It is recommended that reference to the whole or to part of this volume be made in one of the following forms, as appropriate:

Austin, J. A., Jr., Schlager, W., Palmer, A. A., et al., 1986. *Proc., Init. Repts. (Pt. A), ODP*, 101.

Sager, W. W., 1986. Magnetic-susceptibility measurements of metal contaminants in ODP Leg 101 cores. *In* Austin, J. A., Jr., Schlager, W., Palmer, A. A., et al., *Proc., Init. Repts. (Pt. A), ODP*, 101, ___-___.

Item O: ODP Proceedings (continued)

B. Incorporation of 'Auxiliary Science'

On Leg 113 (Weddelll Sea) the drillship was accompanied by an ice boat, the MAERSK MASTER, which was used to do some science (e.g. sediment traps) as long as it was not on duty for drillship support. PCOM decided that this 'ice boat science' is part of the scientific leg program. A similar situation may develop on one of the Kerguelen legs. A question arises as to how this 'auxiliary science' can be incorporated into the ODP Proceedings!

PCOM IS ASKED TO:

i. DECIDE HOW THE PROCEEDINGS SHOULD BE CITED - WITH OR WITHOUT TAMU STAFF SCIENTIST

- or -

WHETHER THIS QUESTION SHOULD BE LEFT TO THE DISCRETION OF THE CO-CHIEFS OF EACH PARTICULAR LEG

ii. DISCUSS HOW AUXILIARY SCIENCE SHOULD BE INCORPORATED INTO THE ODP PROCEEDINGS

ITEM H.1:

KERGUELEN WORKING GROUP
MARCH 11 AND 12, 1987

Present: W. L. Prell; R. Schlich; D. Falvey; D. Elliott; J. Anderson; R. Larson - PCOM Liaison; J. Mutter - Lithosphere Panel Liaison; C. Brunner - ODP Data Bank; J. Baldorf - TAMU Representative

Objectives

1. To evaluate the newly available Prydz Bay seismic data.
2. To evaluate the basement objectives for Kerguelen and expand if possible.
3. To evaluate the adequacy of site locations and depths for the water depth transect.
4. To update the drilling estimates and propose a program with Prydz Bay drilling and an alternate program without Prydz Bay drilling.

Findings and Recommendations

Prydz Bay. - The working group reviewed seismic lines BRM 19 and 23 and compared them to seismic line BRM 21, which was the basis for drilling proposals. We found the parallel lines were consistent with the structure observed on Line 21, and we identified no potential problems on the basis of these parallel lines. The working group also concluded that additional processing will not enhance these data because of the configuration in which they were collected.

On the basis of our review, we propose no changes in the general site locations or time allocations for Prydz Bay drilling. The objective is to make maximum use of the dipping reflectors to collect a complete stratigraphic section. Some adjustment of sites may be required upon more detailed study of the available data. The chief scientist should do this.

Basement Objectives

John Mutter reviewed the Lithospheric Panel's desires for Kerguelen drilling. In summary, they constitute one deep basement site (200-300 meters into basement) and basement recovery from both the southern and northern Kerguelen Plateau. On the basis of re-examination of records and further discussion, the working group proposes to deepen Site SKP-4a (on the southern Kerguelen) to include 200 meters of basement penetration. The working group also proposes to add Site SKP-1 (on the central Kerguelen Plateau) to insure basement recovery on the north-central Kerguelen block. With these additions, basement recovery should be guaranteed in the north-central (SKP-1) and the southern (SKP-4a, SKP-6a) Kerguelen Plateaus with possible recovery at KHP-3 (north) and SKP-3 (south).

Water Depth Transect

Review of the location and depth of proposed sites indicated that adequate coverage of water depths is available for the transect on the southern Kerguelen Plateau. However, Site SKP-8 or an equivalent site must be collected to maintain the depth profile.

Prydz Bay Alternate

The working group proposes Site SKP-6b as an alternate to Prydz Bay drilling. This alternate would be drilled if the planning PCOM decides not to go to Prydz Bay or if ice conditions prevent drilling in Prydz Bay. The site is an expanded Neogene/Paleogene sequence of sediments on the southern Kerguelen Plateau. We consider it comparable to many objectives in the original Prydz Bay drilling but without the possibility of the direct glacial evidence.

Proposed Drilling Plans

A location map of all sites is attached as Figure 1 and revised estimates for all sites are attached as Table 1. The working group proposes a rearrangement of sites and legs on the basis of available data on the ice free window for Prydz Bay. We understand that the last two weeks of January and the first two weeks of February are the optimum "ice free" windows for Prydz Bay. Our objectives are to maximize the weather window for the *total* Kerguelen drilling program and to place reentry sites on separate legs. Given these considerations, the working group proposes to combine the north Kerguelen and Prydz Bay sites on the first Kerguelen drilling leg and to delay the entire drilling program by one to two weeks depending on the best estimate of the Prydz Bay ice window. We note that this plan is predicated on Prydz Bay and is a compromise to fit both Prydz Bay and North Kerguelen into the available weather window. See attached Table 2 for specific sites, drilling times, and total leg estimates and Table 3 for a summary of site objectives.

The working group recommends extension of legs or unbalancing of legs to achieve the scientific objectives for the Kerguelen-Prydz Bay drilling program.

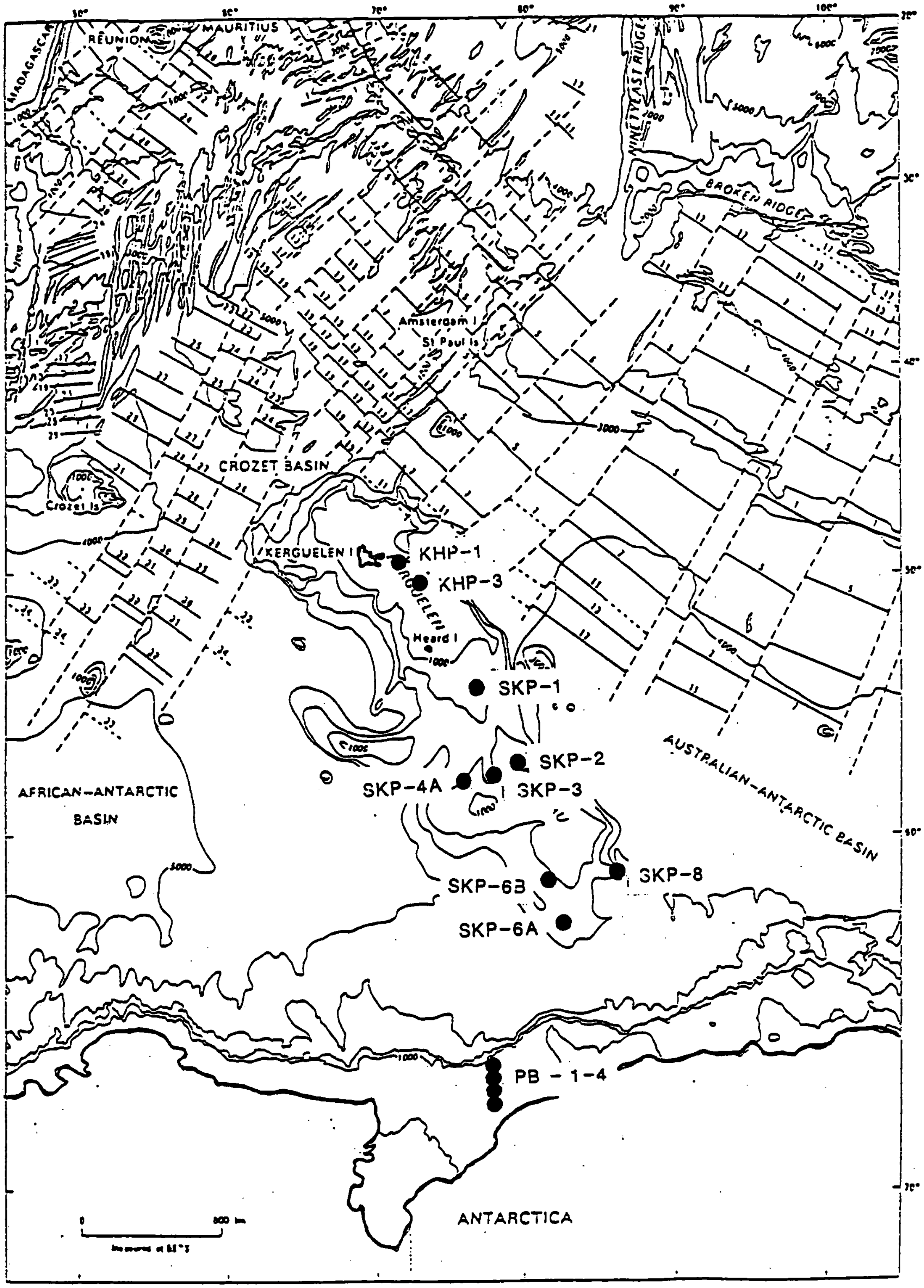

REUNION
MAURITIUS
MADAGASCAR
NINETYEAST RIDGE
BROKEN RIDGE
Amsterdam I
St Paul Is
CROZET BASIN
Crozet Is
KERGUELEN I
KHP-1
KHP-3
Heard I
SKP-1
SKP-2
SKP-3
SKP-4A
AFRICAN-ANTARCTIC
BASIN
AUSTRALIAN-ANTARCTIC BASIN
SKP-6B
SKP-8
SKP-6A
PB - 1-4
ANTARCTICA

FIGURE 1

TABLE 1

SCIENTIFIC PROGRAMS AND DRILLING ESTIMATES

Meridianal and Vertical Paleoceanographic Transect

SITE	LATITUDE S	LONGITUDE E	WATER DEPTH (m)	DRILLING DEPTH (m)	DRILLING TIME (days)	LOGGING TIME (days)	TOTAL TIME (days)
KHP-1	49°22'	71°39'	600	910	5.8	0.9	6.7
SKP-2	57°55'	79°55'	1500	700	4.1	0.9	5.0[1]
SKP-6B	61°34'	81°55'	2250	1000	12.0	0.9	13.0[1]
SKP-8	61°17'	86°46'	3900	500	4.9	1.1	6.0[2]
PB-1	67°00'	78°00'	800	500	2.4	0.8	3.2
PB-2	67°15'	78°00'	800	500	2.4	0.8	3.2
PB-3	67°30'	78°00'	800	500	2.4	0.8	3.2
PB-4	67°45'	78°00'	800	500	2.4	0.8	3.2

[1]If a free fall cone is required add about 14 HRS.
[2]If the RCB is required add 24 HRS for pipe trip and to drill to 400m.

Origin and Mesozoic-Paleogene Evolution of the Kerguelen Plateau

SITE	LATITUDE S	LONGITUDE E	WATER DEPTH (m)	DRILLING DEPTH (m)	DRILLING TIME (days)	LOGGING TIME (days)	TOTAL TIME (days)
KHP-3	50°14'	73°02'	750	1650	13.9	1.3	15.2[1,2,3]
SKP-1	54°49'	76°47'	1700	450	4.1	0.9	5.0[1]
SKP-3	58°07'	78°11'	1500	1300	8.5	1.0	9.5[1,2]
SKP-4A	58°43'	76°24'	1200	550	11.2	1.3	12.5[2]
SKP-6A	66°44'	83°05'	2300	500	4.3	1.3	5.6[1]

[1]Includes drilling 50 m into basement.
[2]Re-entry cone required
[3]Add about 1 day for VSP experiments
[4]If a free fall cone is required add about 14 HRS
[5]Includes drilling 350 m of sediment and 200 m into basement

TABLE 2
DRILLING PROGRAM

PROGRAM WITH PRYDZ BAY DRILLING

LEG 119

SITE	DRILLING TIME
KHP-1	6.7 Days
KHP-3	15.2 Days
SKP-1	5.0 Days
PB-1	3.2 Days
PB-2	3.2 Days
PB-3	3.2 Days
PB-4	3.2 Days

Drilling Time = 39.7 Days
Transit Time = 26.0 Days (10 kt)
Total 65.7 Days

Transit Time = 21.7 Days (12 kt)
Total 61.4 Days

LEG 120

SITE	DRILLING TIME
SKP-2	5.0 Days
SKP-3	9.5 Days
SKP-4A	12.5 Days
SKP-6A	5.6 Days
SKP-8	6.0 Days

Drilling Time = 38.6 Days
Transit Time = 24.0 Days (10 kt)
Total 62.6 Days

Transit Time = 19.4 Days (12 kt)
Total 58.0 Days

PROGRAM WITHOUT PRYDZ BAY DRILLING
(include SKP-6B)

LEG 119 (ALTERNATE)

SITE	DRILLING TIME
KHP-1	6.7 Days
KHP-3	15.2 Days
SKP-1	5.0 Days
SKP-6B	13.0 Days

Drilling Time = 39.9 Days
Transit Time = 22.3 Days (10 kt)
Total 62.2

Transit Time = 18.6 Days (12 kt)
Total 58.5 Days

LEG 120 (ALTERNATE)

SITE	DRILLING TIME
SKP-2	5.0 Days
SKP-3	9.5 Days
SKP-4A	12.5 Days
SKP-6A	5.6 Days
SKP-8	6.0 Days

Drilling Time = 38.6 Days
Transit Time = 24.0 Days (10 kt)
Total 62.6 Days

Transit Time = 19.4 Days (12 kt)
58.0 Days

TABLE 3

SUMMARY OF SITE OBJECTIVES

Neogene Paleoceanographic Sites (meridianal and Depth Transect)

KHP-1 (drill to 910 meters or destruction of bit). Objective is to recover predominantly Neogene and Paleogene stratigraphic section from the northern Kerguelen Plateau.

SKP-2 (drill to 700 meters). Objective is to obtain high resolution Neogene and Paleogene stratigraphic section for the southern Kerguelen Plateau. A key component of the meridianal paleoceanography transect.

SKP-6a (drill to 500 meters). Objective to obtain Neogene, Paleogene, and Cretaceous sediments and basement at the southern-most portion of the Kerguelen Plateau. This site also is located at 2300 meters water depth and is a component of both the meridianal and depth transects.

SKP-6b (alternate to Prydz Bay drilling - drill to 1000 meters or destruction of bit). Objective is to obtain an expanded Neogene, Paleogene, and Cretaceous stratigraphic section for the southern-most Kerguelen Plateau. The water depth of this site is 2250 meters so that it also forms part of the depth transect as well as the paleoceanographic meridianal transect.

SKP-8 (drill to 500 meters). The deepest site (3900 meters) at the southern-most Kerguelen area. A key component to the water depth paleoceanographic transect. Also has implications for bottom water transport.

PB-1 to 4 (drill to 500 meters). Objective of the Prydz Bay sites are to obtain as complete a stratigraphic section as possible of the dipping reflectors along the Antarctic margin. The sediments are thought to represent Neogene, Paleogene, and Cretaceous stratigraphy related to the climate and glaciation of Antarctica.

Paleogene - Mesozoic Stratigraphic Sites

KHP-3. A reentry site to be drilled to 1650 meters with recovery of basement if possible. Objectives at this site is to obtain an expanded Paleogene and Mesozoic stratigraphic section reflecting the early history of the Northern Kerguelen Plateau.

SKP-3. A reentry site to be drilled to 1300 meters with recovery of basement if possible. Major objective is to recover an expanded section of Paleogene and Cretaceous sediments reflecting the early history of the southern Kerguelen Plateau.

Both of these sites have stratigraphic and tectonic objectives related to the early history of Kerguelen Plateau and the evolution of Cretaceous and Paleogene climates.

Basement Sites

SKP-1 (drill to 450 meters). A basement site on the central Kerguelen Plateau designed to provide basement from the northern region of the Kerguelen Plateau. This site was added because basement could not be guaranteed at Site KHP-3.

SKP-4a. A reentry site to be drilled to 500 meters with at least 200 meters penetration of basement. This site provides the best opportunity to obtain extensive basement from the southern Kerguelen Plateau. Consensus was that basement from this area is more important to recover than basement from the Northern Kerguelen Plateau.

SKP-6a (drill to 500 meters). This site provides recovery of basement at the southern-most portion of the Kerguelen Plateau and is useful for dating the evolution of the Plateau.

LEG 115:

TELEX FROM BOB DUNCAN, ONBOARD HMS DARWIN, 23. MARCH 1987:

TLX 258707 JOID UR
FROM RRS CHARLES DARWIN 21ST MARCH 87 1600Z
VIA INDIAN OCEAN SATELLITE

ATTN NICK PISIAS, PCOM

SITE SURVEYS FOR LEG 115 NOW COMPLETE WITH SUITABLE 3.5 KHZ AND SCS CROSSING LINES. PREFERRED SITES ARE:-

CARB-1 AT 07-36S, 58-58.5E, WATER 1496M, SED 280M,
MP-3 AT 13-10S, 61-23E, WATER 2240M, SED 280M,
MP-2 AT 15-36.5S, 61-45.5E, WATER 2650M, SED 250M,
MP-1 AT 18-25.5S, 59-09E, WATER 2714M, SED 170M,

IN ADDITION DARWIN HAS RUN MCS LINE THRU MP-1. PLS INFORM TAMU OF SITES TO CALCULATE PRECISE DRILLING/LOGGING/TRANSIT TIMES. ALL THAT REMAINS IS PERMISSION FOR DRILLING. PLS ADVISE ON PROGRESS OR DEVELOPEMENTS.

BOB DUNCAN

LEG 115 SITES, AS DECIDED AT HAWAII PCOM MEETING:

Mascarene Plateau Drilling Program

Site - Location	Water Depth (m)	Penetration (m) Total	Bsm't	Operations	Time on site (day) Total	Logging
MP-1 Mascarene Plateau 18°45'S - 59°05'E	2000	250(?)	50	Rot. single bit to destruction	5.5	1.5
MP-2 Cargados Bank 15°30'S - 59°40'E	2500	350(?)	50	Rot. single bit to destruction	5.5	1.5
MP-3 Nazareth Bank 13°30'S - 61°30'E	2700	450(?)	50	Rot. single bit to destruction	6.5	1.5

Total times on site are only estimates. The logging includes standard and BHTV. The program (drilling and logging) requires 17 to 18 days on site

Carbonate Dissolution Profile

Site - Location	Water Depth (m)	Penetration (m) Total	Bsm't	Operations	Time on site (day) Total	logging
CARB-1 7°30'S - 59°00'E	1600	250	50(?)	Double HPC/ XCB Single bit(?)	2.5	-
CARB-2 4°00'S - 60°30'E	3000	250	-	Double HPC/ XCB	3.5	-
CARB-3 4°20'S - 60°50'E	3800	250	-	Double HPC/ XCB	3.5	-
CARB-4 2°12'S - 61°25'E	4600	250	-	Double HPC/ XCB	4.0	-

SOHP RECOMMENDATIONS FOR LEG 115:

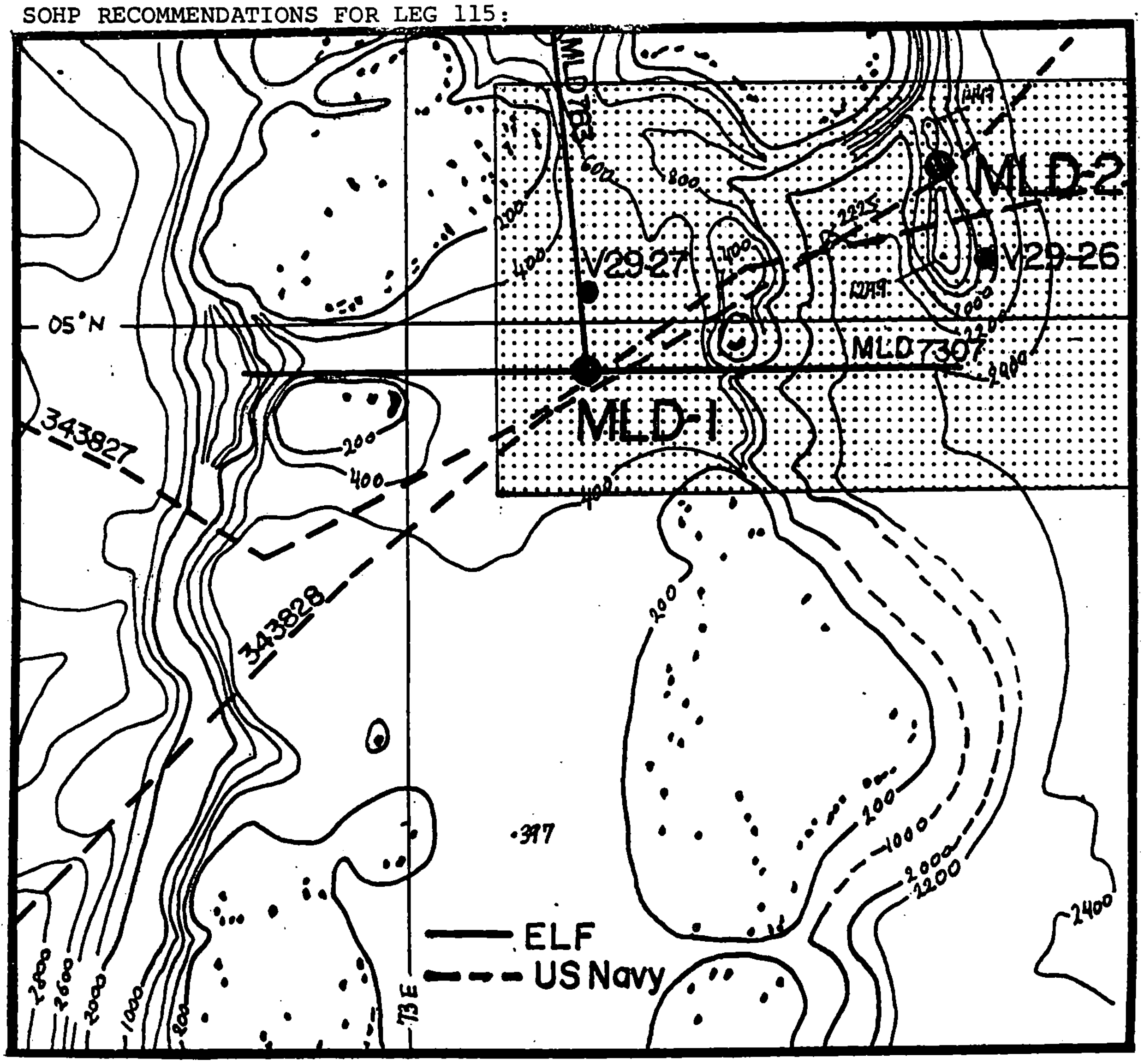


Figure 2:

Map of the northern part of the Maldives, at 5°N (Kardiva Channel).

Are shown location of: (1) the two multichannel seismic lines of Elf Aquitaine, as well as the two single channel seismic lines of U.S. Naval Oceanographic Office.
(2) the two proposed HPC/XCB sites MLD-1 and MLD-2.
(3) the two studied piston cores V29-27 and V29-26 (LDGO).

SITE	LOCATION	WATERDEPTH	CORE TYPE	PENETRATION	EST. SITE TIME
MLD-1	04°56.0'N 73°17.0'E	520 m	single HPC/ XCB	200-250 m	24 hours
MLD-2	05°12.5'N 73°44.0'N (E)	1500 m	single HPC/ XCB	150-200 m	36 hours
				TOTAL :	60 hours*

* incl. time for locating sites and transit between sites.

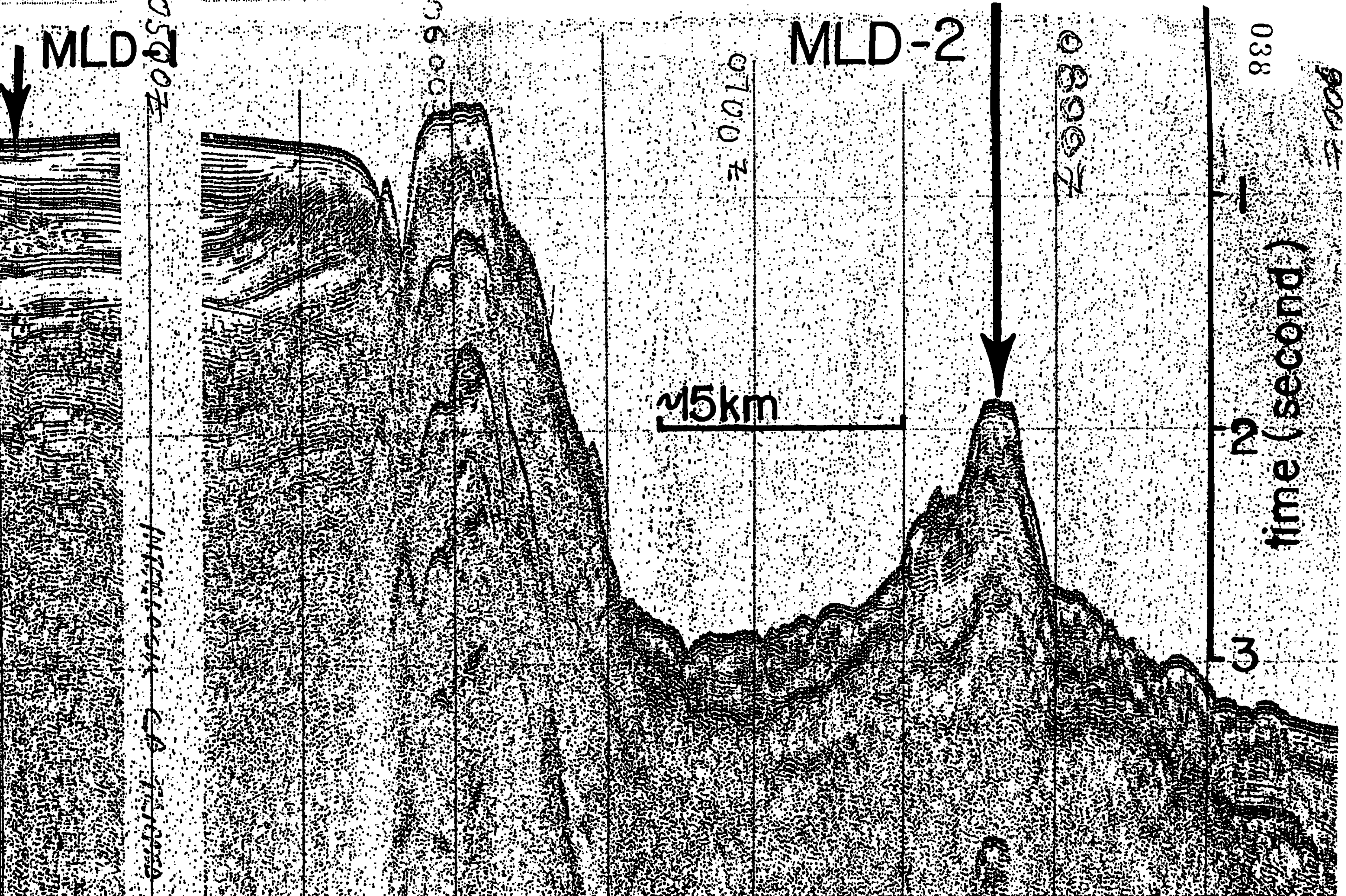


Figure 8: Location of HPC/XCB MLD-2 proposed site on single channel sparker seismic line 343828 (U.S. Navy Oceanographic Office). See location of the line in Figures 2 and 3.

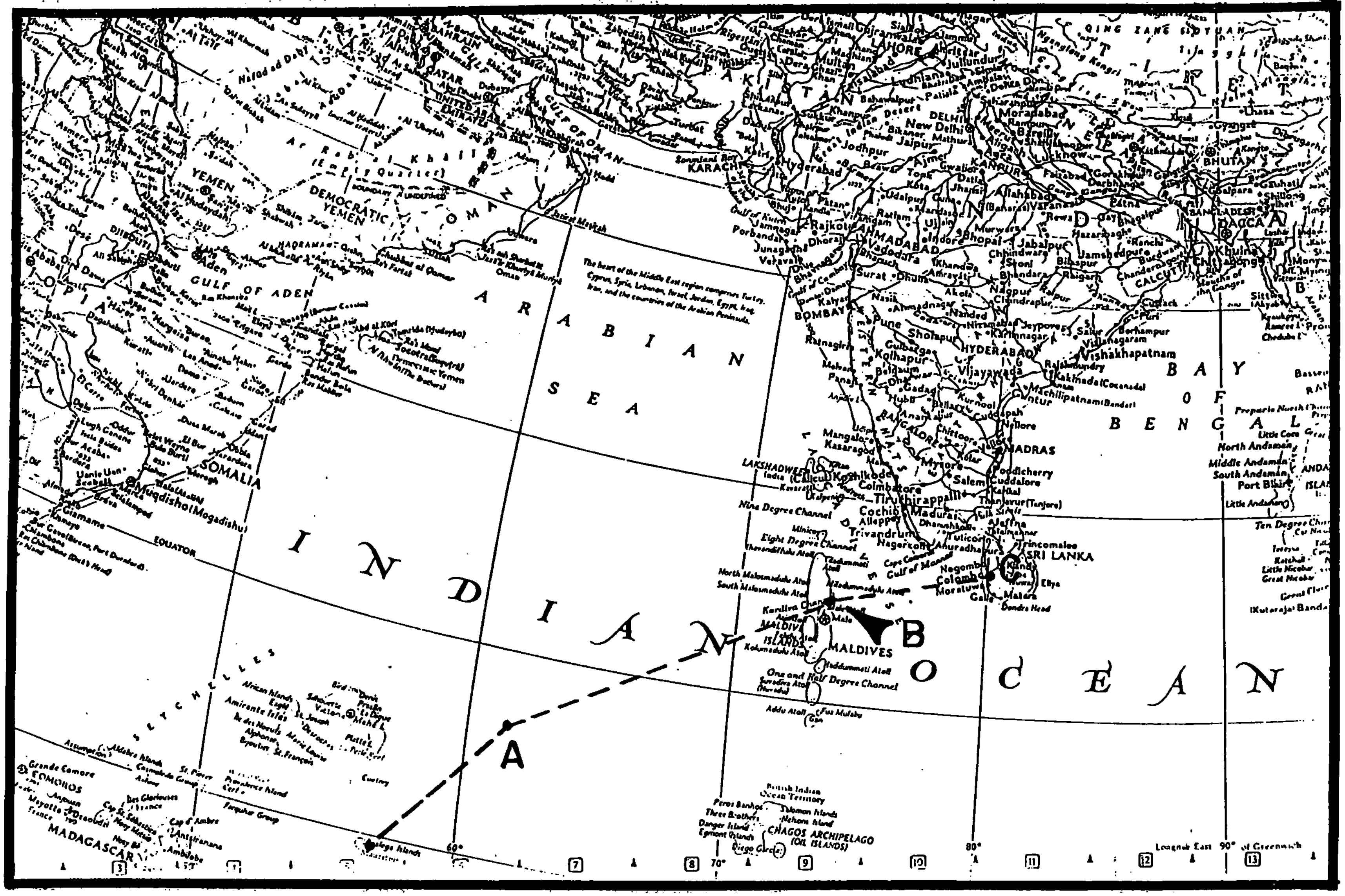
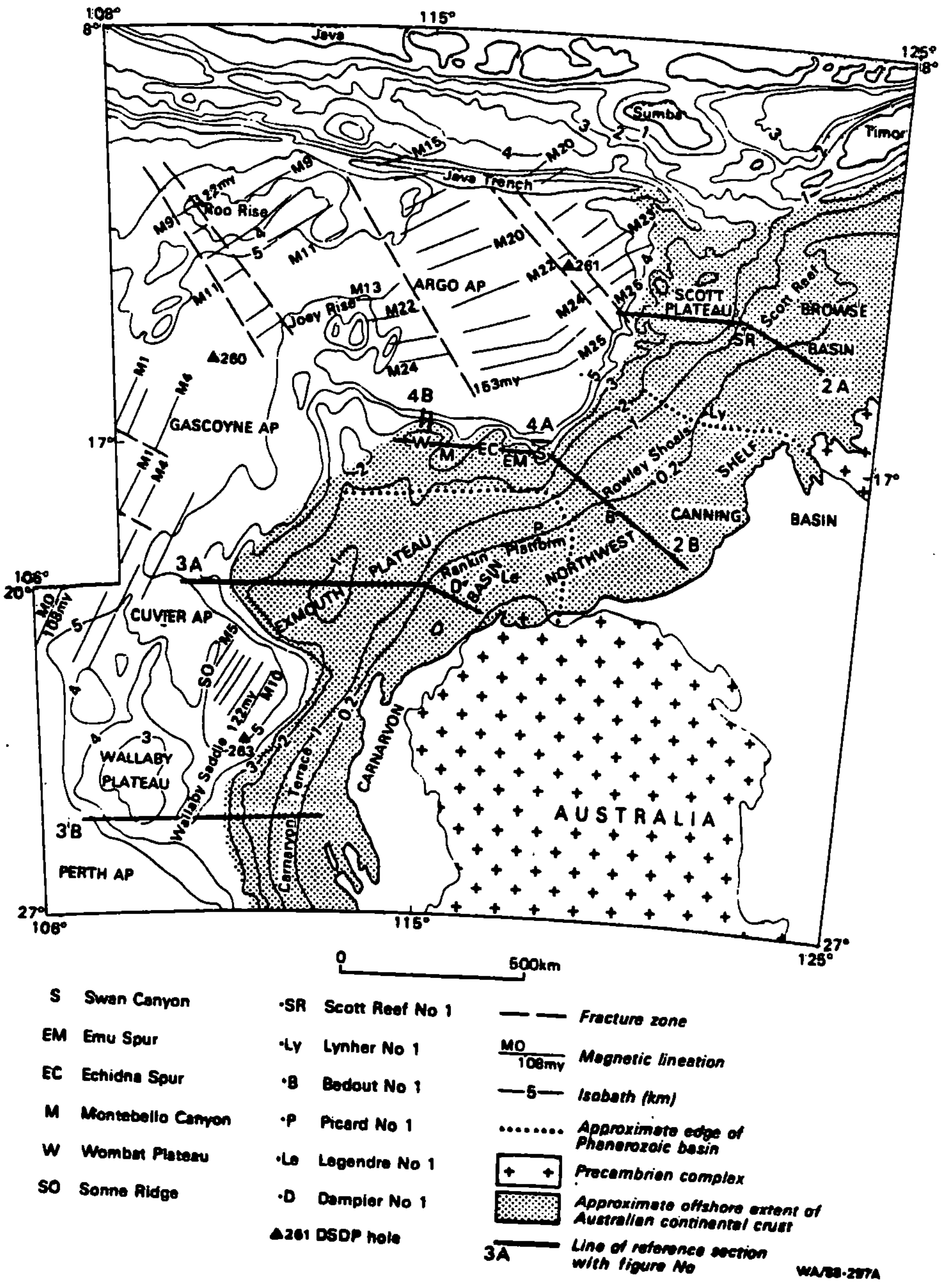
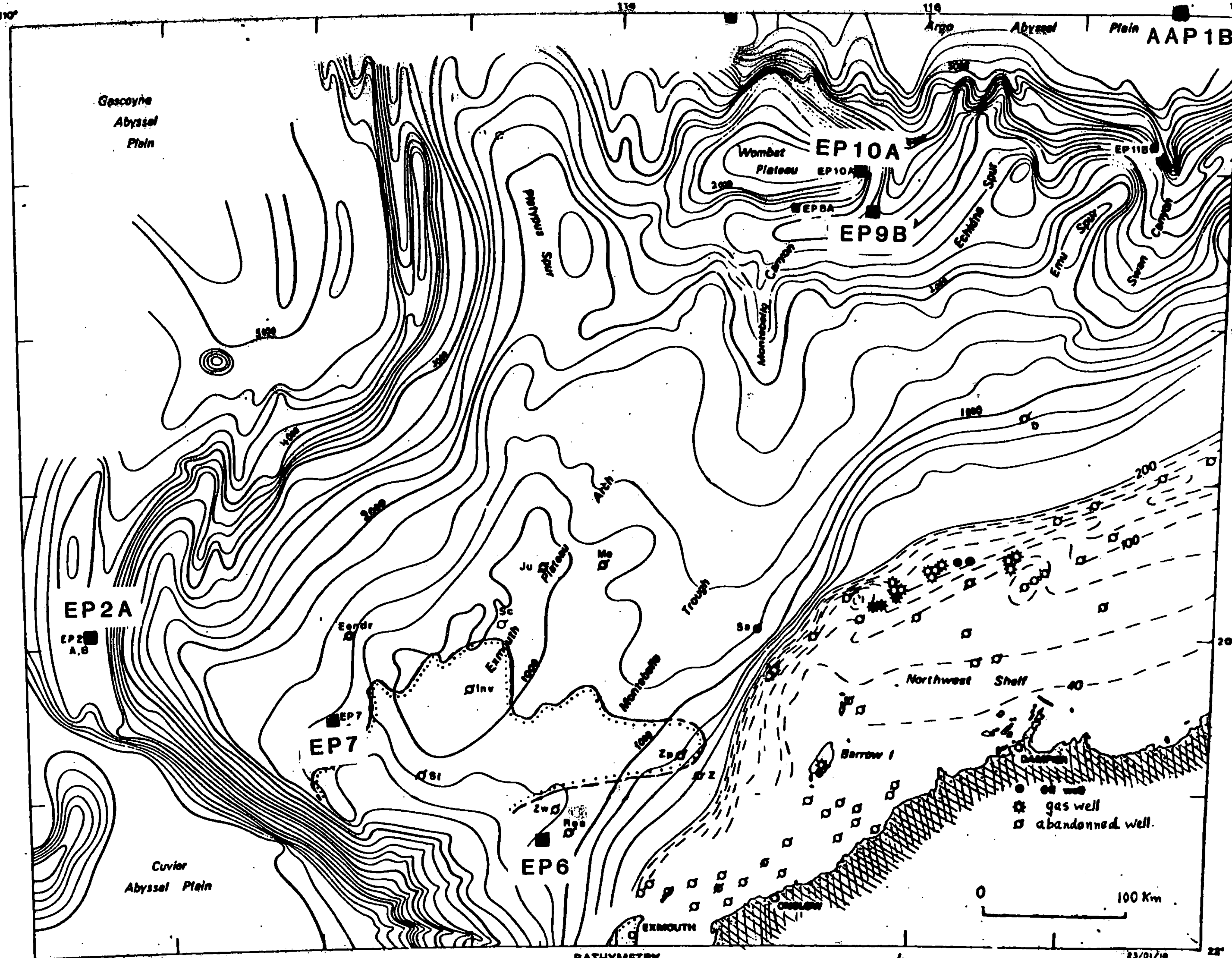


Figure 1: Map of the equatorial Indian Ocean showing the transit of D/V JOIDES RESOLUTION during Leg 115 from the zone of Peterson's HPC transect (A) to the final port of call in Colombo (Ceylon) (C), through the Kardiva Channel in the Maldives Archipelago zone where two HPC/XCB sites are proposed to be drilled (B).

REGIONAL GEOLOGICAL SETTING EXMOUTH PLATEAU/
ARGO ABYSSAL PLAIN
(taken from proposal 121/B)

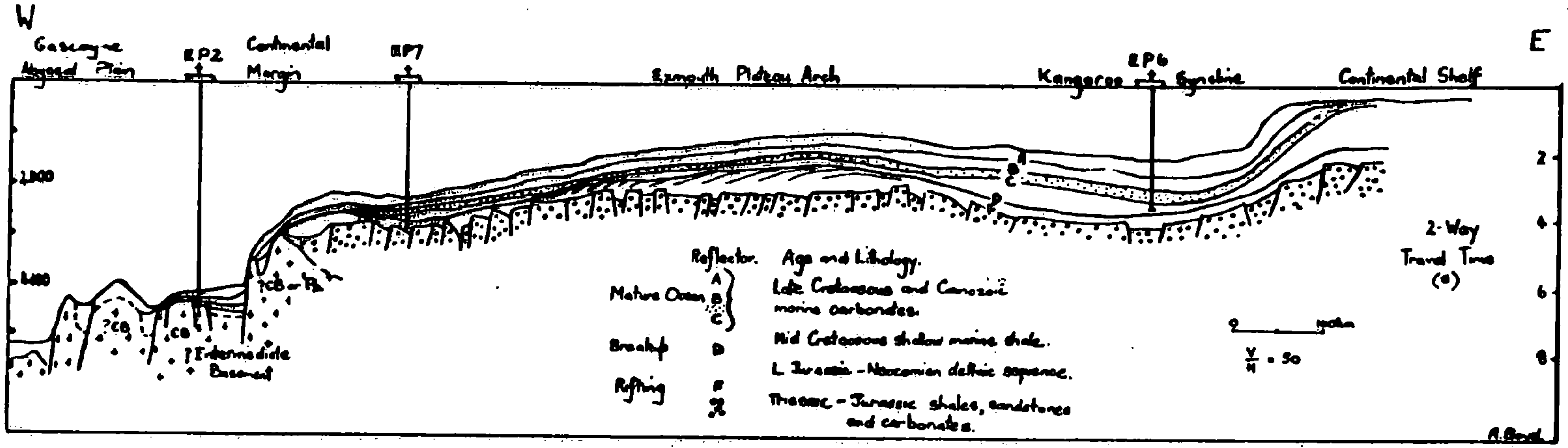




LEG 122 &123: EXMOUTH PLATEAU & ARGO ABYSSAL PLAIN

Barrow delta > 1000m thick

EXMOUTH PLATEAU:



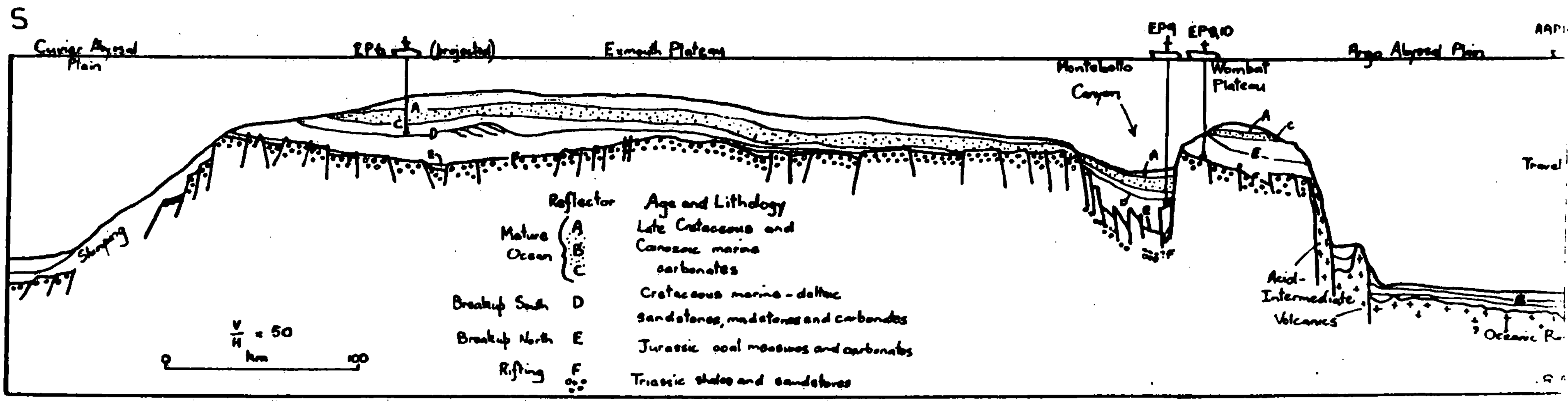


Fig. 4 Schematic cross-sections (N-S and E-W) across Exmouth Plateau and vicinity with location of proposed ODP Sites EP2,6,7,8,9,10 and AAP1B

EXECUTIVE SUMMARY
WPAC Panel Meeting
ORI, Tokyo, Japan
March 2-4, 1987

1. PCOM Report (A. Taira)

WPAC drilling to start about October 1988. PCOM accepts 9 program (11 leg) scenario, with 4 core programs (Banda - Sulu - South China Basins, Bonin-I, Japan Sea, Nankai Trough) for planning purposes. PCOM requests revised prospectus and leg-by-leg drilling plan, including engineering requirements.

Greg Moore approved as new member to replace Eli Silver.

2. LITHP Report (S. Scott)

LITHP's highest priorities are Bonin-I, Lau Basin, Bonin II-Mariana, Japan Sea. Investigating the interplay between volcanism and tectonics during early basin opening is LITHP's highest priority in the Lau Basin (sites LG2, LG3, LG6). Second priority is a deep crustal hole in the central basin (LG1); lowest priority is Valu Fa (LG4 & 5). In general, LITHP felt drilling in the Lau Basin should focus on a smaller number of objectives. NB. LITH didn't discuss/rank LG7 which was given a higher priority by WPAC than by the Lau working group.

LITHP strongly endorses the Langmuir-Natland proposal for a deep re-entry hole and several single-bit holes seaward of the Bonin-Mariana arcs, to serve as geochemical reference holes.

3. SSP Report (K. Suyehiro)

The only WPAC program with projected site survey needs is Lau Basin (sidescan + seismics). New WPAC watchdogs appointed.

4. TAMU Report (B. Taylor for L. Garrison)

-TEDCOM meeting with panel reps April 30-2 May: R. Hyndman to represent WPAC.
-Spring workshop on Riser Drilling: Panel identified SOHP objectives on continental margins and TECP objectives in accretionary prisms as potential sites for riser drilling in WPAC.
-JOIDES RESOLUTION dry dock (~10 days) due December 1989 - January 1990.
-GBR sites 1-3 are within Australian marine park: Falvey will make drilling application on our behalf.
-Scheduling Legs: Plan 56 days at sea followed by 5 days per port call. Don't squeeze things too tight. Legs >60 days "prohibited" under normal circumstances.

5. Paperwork

-The draft minutes of the December meeting were accepted with minor revisions.
-B. Taylor's "A Selective History of WPAC" was discussed and endorsed by the panel to be forwarded to PCOM.

6. WPAC Program Review/Prospectus Rewrite

Two days were spent reviewing and rewriting drafts of the third prospectus. Significant points include:

a) Organization: front matter to include a 2 page thematic overview, a table of contents with programs listed from north to south, and a table listing program priorities, drilling/logging times etc.

b) Japan ODP: requested to determine protocol to obtain permission to drill in leasehold areas (Japan Sea, Nankai Trough, Bonins) and to provide this information to L. Garrison (TAMU).

c) Japan Sea: J1b (700 m sediment, 100 m basement) and J2a (1370 m sediment, 20 m basement) should be planned as re-entry sites.

d) Nankai Trough: description of core program and geotechnical program to be integrated. Crossing MCS lines collected last November. Panel continues to endorse sites with thinnest likelihood of penetrating decollement and basement--which is necessary to map the flux of fluids.

e) Zenisu: new MCS profiles collected last November provide improved images of thrusting.

f) Refernce sites: LITHP and proponents desire 4 sites: --

(I) pelagic section and basement on earliest Cretaceous crust east of Bonins transect.
(II) pelagic section and basement on Jurassic crust east of Legs 59-60 Marianas transect.
(III) section through volcanogenic sediment apron of a large Cretaceous guyot.
(IV) shallow section and basement atop the guyot adjacent III above.

One of the first three sites is requested to be drilled at least 200 m into basement to determine whether the zone of oxidative alteration (rich in K, Rb etc.) is restricted to the top of basement.

The panel voted to retain only one shallow reference site (Bon 8) in its recommended program. Other sites could be drilled by CEPAC or during a 1990's return to WPAC. A summary of the complete program will be included in the prospectus. Bon 8 can be moved to the east onto well identified magnetic anomalies far away from fracture zones.

g) South China Basin: discussion of SCS1 vs. SCS9. SCS1 has the late Oligocene history of the basin which SCS9 does not. However, it would take a week longer to drill and might not reach basement (a critical objective). Also, SCS9 is on an agreed-upon magnetic anomaly (6). Panel concensus was to keep summary as it is pending input from SOHP and TECP.

h) Sunda: backarc thrusting inferred to be related to Australian continent collision. Forearc backthrusting is a fundamental tectonic process, not necessarily related to collision. Planned MCS surveys may not identify sites to investigate arc-continent-related mountain building.

i) Great Barrier Reef: WPAC followed SOHP endorsement of sites 1-5, 9-10, 12 with site NEA2 to be at least 800 m. A new proposal by Sangster et al. on Mississippi-Valley-Type (MVT) deposits was favourably reviewed, and a paragraph on this theme will be added to the GBR prospectus. MVT Pb-Zn deposits are formed in fringing reefs on basement highs adjacent basinal troughs dominated by siliclastic sediments. The GBR-Queensland Trough is purportedly an exact analog which can be used to understand the environment (fluids, porosity etc.) prior to ore mineralization. Compatable basin (source), slope (transport) and reef (deposition) sites are already proposed, but SOHP-endorsed sites are a continental slope transect whereas best MVT analogy is with a plateau slope transect. WPAC defers to SOHP for input.

j) Lau-Tonga: name changed to reflect significant forearc component. WPAC priorities are LG-2, 7, 3 and 6 (1/2 leg), with remainder of leg dedicated to young crustal drilling (at LG-1 and LG-4, dependent on site survey data to be acquired and on improved coring capability in young crust).

7. ODP Data Bank

To enable continued evaluation of proposals, proponents need to submit to Carl Brenner at LDGO sufficient data to justify each site scientifically and from the perspective of safety. The next SSP meeting is June 30, thus data have to be submitted no later than April.

8. Panel Membership

Several non-U.S. rotations appear about to occur. To provide continuity, planned U.S. rotations should be deferred. Ingle was asked, and agreed, to stay on the panel this year.

9. 1989 Drilling Plan

Given a) an October 1 1988 start date, plus or minus one month, near Indonesia.
b) 56 day maximum legs with 5 port days between
c) the nine programs endorsed by PCOM in January
d) August-October typhoon season in Nankai-Bonin region

WPAC suggests the following drilling plan, which gets PCOM's "core" programs done early, leaving the greatest flexibility to plan the remaining programs.

Months	Starting Port	Program (Sites)	Drill & Log	Transit	Total	Port
			#Days			
Oct-Nov 88	Jakarta/ Surabaya	Banda (1-3)	33	7	40	5
Nov 88- Jan 89	Ujung-Padang	Sunda	50	6	56	5
Jan-Mar 89	Ujung-Padang	Sulu (4,5)- SCS (7,9)	27 & 15	7	49	5
March	Manila	Drydock/Transit to Japan				
Apr-May	Yokohama	Bonin I (1,2,5A,5B)	51	4	55	5
June-July	Yokohama	Nankai (1,2)	53	3	56	5
Aug-Sept	Hakodate	Japan Sea I (1b,1d,1e,3a)	48	6	54	5
October	Niigata	Japan Sea II (2a,52)	25	5	30	5
Nov-Dec	Yokohama	Bonin II (6,7,8)	44	7	51	5
Jan-Feb 90	Guam	[CEPAC:OJP ?]			56	5
Mar-Apr	Cairns	Great Barrier Reef (1-5,9,10,12)	50	6	56	5
May-June	Noumea	Vanuatu I (DEZ 1-5)	37	2	39	5
June-July	Port Vila	Vanuatu II (IAB1+2,BAT2)	34	4	38	5
Aug-Sept	Suva	Lau-Tonga (2,3,6,7,1/4)	52	4	56	5
	Pago-Pago					

The Nankai/Bonin I legs are interchangeable; Bonin I was scheduled first to allow more time to develop tools for the Nankai program. Otherwise, the scheduling of legs between April and December 1989 is inflexible: the Japan Sea legs should be drilled during the August-October typhoon season for the Nankai-Bonin region. The 1990 schedule is flexible, and could accommodate an expanded WPAC program (Nankai Geotechnical, South China Margin and Zenisu are strong programs below the arbitrary 9 program cut-off). In this plan a western CEPAC leg (such as Ontong Java Plateau of Old Pacific crust) is inserted to minimize transit between Guam and Cairns. Scheduling the Great Barrier Reef leg in the Coral Sea cyclone season (March-April) is not desirable, but fine-tuning the 1990 schedule with so many other unknowns is unwarranted.

10. Engineering Development Priorities

a) Enhanced coring and recovery of (I) alternating hard/soft sediments and (II) unconsolidated coarse clastics. Required by all WPAC legs, Oct. 1988 or sooner.
b) Special tools for geotechnical and pore fluids programs: Sunda (Nov. 88), Nankai (June 89), Great Barrier Reef, Vanuatu.
c) Enhanced coring and recovery of young crustal rocks: Lau Basin (Aug. 90)

11. Next Meeting

PCOM should decide if WPAC meeting early June is required. Otherwise, only the early November meeting in London will be held.

DRAFT MINUTES
WESTERN PACIFIC REGIONAL PANEL MEETING
MARCH 2-4, 1987
OCEAN RESEARCH INSTITUTE
UNIVERSITY OF TOKYO
TOKYO JAPAN

Attendance: Taylor (Chair), Gill, Ingle, Rangin, Kudrass, Hyndman, Audley-Charles, Jongsma, Recy, Scott, Natland, Tamaki, Hawkins (LITHP), Saito (SOHP), Suyehiro (SSP), Nakamura(TECP), Taira (PCOM). Absent: Moore, Garrison (ODP)

Taylor called the meeting to order at 9:00 a.m. on 2 March, dispersed some documents, and summarized the meeting agenda - to revise the summaries for the third prospectus, translate the identified programs into legs, prepare a drilling schedule for the western Pacific through 1989, and identify those programs/legs having special engineering requirements.

1. REPORTS

PCOM Taira summarized the results of the January PCOM meeting in Honolulu. In the Indian Ocean, the Red Sea program was dropped because of clearance problems, and the Makran program was dropped because the planned site survey was not completed, and there has been no verification that paleontological control will be adequate. The programs in the western Pacific will probably begin in October, 1988, although this could vary by a month either way. PCOM approved, for planning purposes, a western Pacific campaign of the top 9 programs voted on at the last WPAC meeting, to be carried out in 11 legs. The additional 3 programs recommended by WPAC are to continue being developed. PCOM also identified four "core" programs, which seem most likely to be carried out, based on high ratings by WPAC and the thematic panels. These are 1) Bonin 1; 2) Nankai Trough; 3) Banda-Sulu-South China Sea; and 4) Japan Sea. Finally, PCOM restricted the number of meetings panels can hold to two per year, except when planning is in its most intensive phases.

ODP (summarized by Taylor and Taira). There will be extensive development of the Navidrill, which is expected to improve coring and recovery in fractured basalts as well as alternating hard-soft sequences, and a new pressure core barrel should be ready in late 1988. An idealized timetable for staffing of legs was presented, beginning with designation of co-chief scientists 12 months prior to sailing. Leg 113 (Weddell Sea) drilling is going well. There will be a scheduled dry-docking of JOIDES Resolution 12/88 or 1/89 (will affect western Pacific schedule). Legs are a nominal 56 days long (port-to-port), with no leg greater than 60 days.

Site Survey Panel (summarized by Suyehiro). The panel covered the Indian Ocean at its last meeting in January. Panel "watchdogs" were assigned to western Pacific programs: 1) Banda-Sulu-SCS Basins - Heinrich Meyer (BGR); 2) Bonin 1 - Fred Duennebier (HIG); 3) Lau Basin

- Fred Duennebier (HIG); 4) Vanuatu - Alain Mauffret (France); 5) Japan Sea - Kensaku Tamaki (ORI; Japan); 6) Nankai - Kiyoshi Suyehiro (Japan); 7) Great Barrier Reef - Robert Kidd (UK); 8) Sunda - Birger Larsen (ESF); 9) Bonin II - Fred Duennebier (HIG); 10) Nankai Geotechnical - Kiyoshi Suyehiro (Japan); 11) South China Sea Margin - Steve Lewis (USGS); 12) Zenisu Ridge - Steve Lewis (USGS).

LITHP (Scott). LITHP's highest priorities in the western Pacific are Bonin I, Lau Basin, Bonin II - Marianas, and Japan Sea. In the Lau Basin, LITHP gives highest priority to sites LG2, LG3, and LG6. Second priority is a deep crustal hole in the central Lau Basin (LG1). Lowest priority is Valu Fa (LG4 and LG5). There are too many objectives recommended in the working group's report for a single leg. LITHP strongly endorsed the proposal to drill reference sites east of the Bonin-Mariana arcs.

2. MINUTES OF THE DECEMBER MEETING

The minutes of the December, 1986 meeting of WPAC at Stanford were approved with minor changes.

3. HISTORY OF WPAC

Taylor has prepared a summary of the history of the Western Pacific Regional Panel for distribution to PCOM and others. The objectives are 1) to present an outline of the development of plans for drilling, in response to proposals and other inputs at various times; 2) to compare rankings of thematic panels with those of WPAC; and 3) to document changes in panel membership. The panel suggested minor changes to the document, and requested that it be submitted to PCOM prior to their next meeting.

4. KINOSHITA PRESENTATION

The panel agreed to hear a presentation the following day by Dr. Kinoshita concerning the deployment of special downhole instruments in holes drilled in seismically active regions near Japan. (Dr. Kinoshita was prevented from making the presentation the following day because of illness).

5. THIRD PROSPECTUS

The panel discussed the organization of the third prospectus, and agreed that it should begin with a short thematic overview. Hyndman, Natland, Jongsma, and Tamaki were to prepare a draft for review by the end of the meeting. The programs will be listed north to south, beginning with the Japan Sea. There will be a table of contents, and a table giving priorities.

The panel spent the next day and a half going over the summaries provided by members for the prospectus.

A. Japan Sea

After raising several questions and making some comments, the panel agreed that the summary was too brief, and that items within it required more justification. Ingle, Rangin, and Scott were to assist Tamaki in modifying the summary. Tamaki noted an alternate site (J-3B) to investigate obduction in the NE Japan Sea. Information on this site is to be included in the summary. Natland recommended that J-2A, with 1370 m of sediment, be a mini-reentry target, as should be J-1b with 100 m of basement beneath 700 m sediment.

The question about drilling in leased areas (Yamato Rise) was raised. Taira thought there would be no problem, but the panel requests that the Japanese ODP organization provide TAMU with information on sites in leased areas, and the protocol for obtaining permission to drill in such areas.

B. Nankai

Two programs were considered in parallel, the hydrogeological program of Taira et al and the geotechnical program of Karig et al. The panel agreed that the objectives were so complementary that we should henceforth consider them to be a single program. Two options were considered: 12) a one-leg program in which a separate geotechnical hole would be sacrificed, but which nevertheless would combine as many ideas/approaches of the two proposals as possible; 2) a program of 1 1/2 legs in which the separate geotechnical hole would be drilled and all downhole programs achieved. The decision of whether to use NKT-1 as a geotechnical site, or a redrilled equivalent to DSDP 583, was postponed pending further consultation with proponents (see also item 12 below). Natland and Taylor pointed out that some basement should be cored at NKT-2 (at least 20 m). Hyndman and Taira were to work together on a joint summary incorporating these modifications.

C. Zenisu

NEW MCS profiles collected in November will be used to refine the proposal. Both the summary and the proposal need to emphasize what can be achieved with drilling. S. Scott will assist proponents in revision of the summary.

D. Bonins

Taylor summarized both Bonins I and II (apart from reference sites). Minor changes in the summary were recommended by panel members.

E. Reference Sites

There was no written summary considered, since it depended on panel recommendations on what to include. Natland emphasized the multi-theme objectives of interest to LITHP, CEPAC, SOHP, and DMP as well as WPAC, and outlined the reasons for a multi-hole program as follows:

1) it is necessary to obtain a normal pelagic section and uppermost basaltic basement east of the Bonins, to tie into the Bonins drilling transect;

2) it is necessary to obtain a similar section on older crust east of the Marianas to tie into the Legs 59 and 60 transect there;

3) it is necessary to obtain a section of the probably widespread Cretaceous volcanogenic sediments derived from one of the large guyots in the vicinity;

4) it is necessary to drill at least 200 m of basement at one of the above three locations to determine whether the zone of oxidative alteration (rich in K. Rb, etc.) is restricted to the top of basement (as it is at e.g. DSDP 504B, Costa Rica Rift, and DSDP 543, east of Guadaloupe, Lesser Antilles).

5) it is necessary to drill shallow sediments and obtain basement samples atop the guyot next to 3) above.

This program can be accomplished in four holes, rather than the five of the Langmuir/Natland proposal. A new mature proposal providing detailed justification for the four holes is in preparation.

The panel questioned the time it would take to do all this, especially after Taylor noted that thematic programs are assigned by PCOM to regions, to drill within the overall time-frames designated to the regional panels. Thus the time for this would come out of both WPAC and CEPAC allotments, depending on some proportion of the time devoted to thematic objectives pertinent to each. He asked whether it is strictly necessary to achieve the deep basement objective here rather than elsewhere, and thought that factors other than proximity to an island arc would be important in selecting the location of such a site. After discussion, the panel concensus was that, although reference sites are important, a major program of the type proposed should not be undertaken if it undermines other objectives which the panel gives higher priority, and specifically that a deep-penetration basement hole should not be drilled on WPAC time. Two votes were taken, one to consider whether to drill one or two shallow holes, or one deep hole (200 m into basement), the second whether to drill one shallow hole or one deep one. The results are listed below (proponents Natland and Taylor did not vote):

<u>Option-1</u>	<u>No. in Favor</u>
1 deep hole	3
1 shallow hole	5
2 shallow holes	2

<u>Option-2</u>	<u>No. in Favor</u>
1 deep hole	3
1 shallow hole	7

On this basis, the panel reduces by one the number of reference holes it recommended at its last meeting. Natland nevertheless was instructed to prepare a summary outlining objectives for all the drilling, but summarizing the panel's position. Tamaki recommended moving the position of BON-8 to the east, to a location on magnetic anomaly M-13 and away from a fracture zone identified in recent surveys. This was approved by the panel.

F. South China Sea Margins

Ingle summarized ocean history and paleoenvironmental objectives for this region, which complement the tectonic objectives of the current proposal. He emphasized that sedimentation occurred at all water levels under oxic conditions, a situation nearly unique in the oceans. Minor changes were suggested for the summary, and clearer figures requested. The question about drilling in leased areas was raised again for this program. Clearances will have to be worked out.

G. Banda-Sulu-South China Sea Basin

The summary is well prepared, although minor changes were suggested. Target SCS-7 can be moved to a location with thinner sediment cover, based on new profiler records; a new number is assigned to the new location - SCS-9. Rangin suggested that another hole be drilled nearby, but was soon dissuaded. There was discussion to drill SCS-1 rather than SCS-9. SCS-1 has thicker sediments, would take a week longer, and might not reach basement (a key objective here). It does have the late-Oligocene history of the basin, which SCS-9 does not. SCS-9, however, is on an agreed-upon magnetic anomaly (6). The panel concensus was to keep the summary as it is. Audley-Charles and Gill were assigned to assist with revising the summary, mainly adding a list of priorities for the drilling.

H. Sunda Backthrusting

Audley-Charles said that this program is missing a great opportunity to understand arc-continent collisions by not placing survey lines, then drill sites, nearer Timor, which is exceedingly well studied. Taylor explained that U.S. science-in-support-of-drilling does not fund site surveys, but well formulated scientific programs in regions of interest to the drilling community. The surveys are done for scientific reasons that may not be immediately related to ideal drilling requirements. The pending multi-channel program in the area did not have this particular objective, hence cannot be modified to survey nearer Timor. Rangin noted that the summary should state that the observed backthrusting is not necessarily related to collision. He and Audley-Charles were to make modifications to the summary.

I. Great Barrier Reef

Dr. Saito, representing SOHP, was in attendance. There appear to be too many sites, and SOHP is asked to prioritize them. Figures in the summary need work. The panel reinstated Site 2 as a deep hole. Audrey Meyer (ODP-TAMU) will be asked to update drilling time estimates.

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The panel considered a new proposal by Sangster et al on Mississippi-Valley-Type (MVT) deposits in relation to the Great Barrier Reef. Natland asked about the likelihood of getting information on actual ore deposition at the Great Barrier Reef. Scott responded that the actual chance of this was small, but that the Great Barrier Reef is the environment of this type of occurrence, and it is necessary to understand the properties of the precursor environment (fluids, porosity, etc.), before ore mineralization in analogs in the geological record can be understood. Taylor asked whether the objectives of the MVT proposal and the prior one on Great Barrier reef can be accomodated in the same holes. Scott replied yes, to some extent. The panel recommends that SOHP consider the proposal and give WPAC its evaluation. A paragraph on this needs to be added to the summary. Scott and Ingle will do this.

J. Vanuatu

The summary is in good order, and no major items were discussed. Minor changes were suggested to the text.

K. Lau/Tonga

Taylor recommended that henceforth this should be termed the Lau/Tonga program rather than the Lau Basin program, given that forearc sites are a significant component of the plan. Gill summarized the latest recommendations of the working group based on a developing survey data set (some of it ongoing), then considered the LITHP priorities. LITHP did not list LG-7 among its priorities. LG-1 will be moved to the west when new SeaBeam, 3.5 kHz, and dredging data from a German survey of von Stackelburg's arrive. The working group still recommends re-entry at both LG-1 and Valu-Fa (LG-4), and believes that the computations based on drilling, logging, and transit times will allow us to do this. In any case, the drilling proposed for LG-4 is dependent on still-pending survey results, thus it is premature to decide whether to drill one or two re-entry sites.

Rangin requested a summary cross section, and other comments, primarily about the figures, were raised. Hawkins and Gill are to revise the figures. Hawkins (LITHP liaison) was asked to convey to LITHP that LG-7 needs to be re-instated as a necessary contrast to LG-1 and LG-2.

Gill noted that Dave Scholl and colleagues at USGS favor a second hole on the Tongan forearc, to complement LG-6. The hole they suggest would wash down through sediments (by then already cored at LG-6) to explore the diversity of forearc basement. Taylor noted that there are obvious exposures of basement along the same MCS line that crosses LG-6, and that these could be dredged. On this basis, the panel did not approve drilling of a second hole in the forearc.

The panel priorities are thus LG-2, LG-7, LG-3, and LG-6 (a single site), which should take about half a leg. The remainder of the leg is to be devoted to young crustal drilling, and the decision about whether to drill at LG-1 alone or at both Lg-1 and LG-4 depends on acquisition of site survey information, hence need not be made now. There should be no bare-rock site.

ODP-TAMU is asked to provide tools for enhanced coring capability (faster drilling) in basement (to get the most out of two weeks drilling at each re-entry site, assuming that both are done).

6. DATA BANK

Carl Brenner (LDGO ODP Data Bank) has sent a letter to Taylor requesting proponents to get data into the data bank at Lamont. The Site Survey Panel will shortly begin to look at them. The data submitted need to be adequate to justify each site scientifically and from the perspective of safety. Entire surveys need not be submitted. The next SSP meeting is June 30, thus data have to be submitted no later than April.

Please send contributions to:
Carl Brenner
ODP Data Bank
Lamont-Doherty Geological Observatory
Palisades, NY 10964
USA

7. PANEL ROTATION

Several non-U.S. rotations appear about to occur, therefore the U.S. contingent should stay on, to provide panel continuity. Thus Taylor has asked Ingle to continue with the panel for at least two more meetings. Ingle consented to this.

8. DEFINING AND SCHEDULING OF LEGS

° For the purposes of planning, programs are listed below together with estimates of the time in days needed to accomplish each one, based on computations of Audrey Meyer (see minutes of the December meeting).

Program	Drilling plus Logging	Transit	Total
Banda (1-3)	33	7	40
(1) Sulu (4,5) and (2) S. China Sea basin	(1)27+(2)15	7	49
Bonin I (1,2,5A,5B)	51	4	55
Bonin II (6,7,8)	44	7	51
Lau/Tonga (2,3,6,7,1/4)	53	3	56**
Vanuatu	71	6	77
Japan Sea	71	9	80
Nankai			56**
Nankai Geotech			24
Great Barrier Reef (1-5,9,10,12)			56**
Sunda			56**
S. China Sea Margins			56**
Zenisu			28**

** precise legs or half legs

Preliminary considerations were 1) that the program on the ship's coming out of the Indian Ocean should begin with some portion of the Banda or Sunda drilling; 2) that both of those programs will be too long to combine in a single leg with a final Argo Abyssal Plain program in the Indian Ocean; 3) that some longer programs will have to be divided between two legs; and 4) that neither Nankai nor Bonins I should be drilled during typhoon season (August-September-October).

The Vanuatu program can be broken down scientifically into two leg portions, which can be differently staffed:

1) Sites DEZ 1-5 - 28.2 days coring, 8.9 days logging, 2 days transit, total 39 days, emphasis collision processes;

2) Sites BAT 2 and IAB 1 and 2 - 27 days coring, 6.4 days logging, 4 days transit, total 38 days, emphasis backarc processes.

Similarly, the Japan Sea Program can be divided scientifically into two leg portions, assuming that both J-1b and J-2A are re-entry sites. The first portion then combines J-1b (re-entry), J-1d, J-1e and J-3a and is 54 days long. These sites emphasize basin development and tectonic history. The second portion combines J-2a ((re-entry) and JS-2 and is 30 days long, with its emphasis paleoceanography and metallogeny in a backarc rift.

The strategy adopted in defining the schedule through 1989 was to get the "core" programs suggested by PCOM done early, leaving the greatest flexibility and time for planning the remainder of the drilling. The start date for the drilling is taken to be October 1, 1988, give or take one month. The tentative schedule is presented below.

Months	Port (start)	Program	Days
Oct-Nov 88	Jakarta / Surabaya	Banda or Sunda	(40+5)
Nov-Jan 89	Ujung-Padang	Sunda or Banda	(56+5)
Jan-Mar	Ujung-Padang	Sulu-SCS Basin	(49+5)
Mar	Manila	Drydock & Transit to Japan	
April-May	Yokohama	Bonin I	(55+5)
June-July	Yokohama	Nankai	(56+5)
Aug-Sept	Hakodate	Japan Sea 1	(54+5)
Oct	Niigata	Japan Sea 2	(30+5)
Nov-Dec	Yokohama	Bonin II	(51+5)
Jan 1990	Guam		

The generalized months given above were based on the October 1 start date, and time estimates from the previous table plus 5 port days, given in the Days column (transits were calculated from the ports listed here). The Nankai / Bonin I legs are interchangeable; Bonin I was scheduled first to allow more time to develop geotechnical tools for Nankai.

Note that Japan Sea legs 1 and 2 are explicitly set to be done during typhoon season, and cannot be shifted in this schedule. The ship must be on the west rather than the east side of Japan at this time (there is much smaller risk of typhoons in the Japan Sea).

In 1990, the ship may proceed east, for some CEPAC drilling, before proceeding south to Great Barrier Reef (Noumea), Vanuatu I (Port Vila), Vanuatu II (Suva) and Lau-Tonga in that order, ending in Samoa.

9. REVISION OF FORWARD TO PROSPECTUS

The panel reviewed the draft of the forward to the prospectus prepared by Hyndman, Natland, Jongsma, and Tamaki. Some panel members felt that too many thematic categories (9) had been listed. An alternative of four categories was suggested: 1) island arcs and forearcs; 2) mountain building/prisms; 3) backarc and marginal basins; and 4) sediments and ocean-history objectives. Taylor will collate all suggestions, and resolve the problem of 4 versus 9 categories.

10. NINE VERSUS ELEVEN LEGS

The number of legs totaled for 9 programs (counting Japan Sea 1 and 2 as 1 1/2, Vanuatu 1 and 2 as 1 1/2, and all others as 1) now equals 11; PCOM asked precisely for this (using total elapsed days, divided by 56, the total is 10.4). In a separate letter to Taylor, however, PCOM Chair Nick Pisias asked that options of both 9 and 11 legs be planned. This would require a new vote on priorities. Without additional thematic input, and a full program review, and with new survey information coming soon, the panel chose to defer voting on priorities at this meeting. The panel stands by the priorities established at its last meeting, and prefers that if PCOM insists on a program shorter than the 11 legs it requested, that programs be subtracted rather than all constricted into a tighter schedule. The Panel reminds PCOM that there are 12 programs with sound scientific justification, and that their 9-program cut-off (for planning purposes) is arbitrary. Additional presentations at this meeting have strengthened some of the 3 programs that are below this cut-off, and our past-meeting's ranking of them differs very little from some of the programs above the 9-leg cut-off. We urge consideration of the full 12 program campaign for the western Pacific, which we estimate will take 13-14 legs (to include Zenisu, the Nankai Geotechnical leg, South China Sea margins, and more reference sites).

11. ITEMS FOR ENGINEERING DEVELOPMENT

Enhanced coring capabilities in young crust (LG-1; LG-4)	Aug. 1990
Recovery of alternating hard and soft sediments (everywhere)	Oct. 1988 or sooner
Special tools for phys. props.	

pore fluids (Sunda, Nankai and Nankai Geotechnical, Great Barrier Reef; Vanuatu) — Nov. 1988- June 1989

Very deep holes (none >1500 m penetration) — no requirement

12. POSSIBLE NANKAI-ZENISU-GEOTECHNICAL WORKING GROUP

Taylor suggested that a more integrated plan for the Nankai-Zenisu-Geotechnical drilling could be prepared by a working group. A workshop dealing with some aspects of this has already occurred, and this will be a major aspect of the pending COSOD II conference. The panel predicts the need for such a working group, but defers making a recommendation until after COSOD II and additional site-survey workups are completed.

13. LIST OF CRUISES FORTHCOMING IN THE WESTERN PACIFIC

Taylor requested that panel members provide him with a list of cruises that will be taking place anywhere in the western Pacific region in the next year or so. This list is attached as an Appendix.

14. NEXT MEETING

The Panel leaves it to PCOM to decide if it should have three meetings this year (based on its recommendation that only two a year be held under normal circumstances). If so, the meetings now planned for June and November will be held. Otherwise, just the November meeting will be held in London, prior to the annual PCOM meeting.

15. THANKS TO HOSTS OF THIS MEETING

The panel wished to record its heartfelt thanks to the hosts of this meeting, Kensaru Tamaki and Asahiko Taira for the superlative support and help they and their staff provided, and their generous hospitality. One member noted that he expected never again to be served fish quite so fresh at a panel meeting.

16. ADJOURNMENT

Chairman Brian adjourned the meeting precisely at 3:00 p.m. on 4 March, 1987. Several members departed for a field trip to the Izu collision zone which (it can be recorded) was instructive and enjoyed by all.

WPAC CRUISES FUNDED

COUNTRY	SHIP	CO-CHIEF	AREA	TIME (87)	PROGRAM
USA	FRED MOORE	TAYLOR	BONINS	06/14 - 07/08	MCS
		SHIPLEY	NANKAI	07/13 - 07/28	MCS-ESP
		SILVER	SUNDA/BANDA	09/15 - 10/19	MCS/SCS
	ALVIN/AII	HUSSONG	MARIANA DIAPIRS	05/15 - 06/01	DIVES
		TAYLOR	BONIN RIFTS	07/14 - 08/01	DIVES, SEABEAM
FRANCE	JEAN CHARCOT	FOUCHET	LAU (VALU FA)	2 DAYS IN TRANSIT	SEABEAM
		DANIEL	VANUATU	04/11 - 04/27	MCS
	CORIOLIS	RECY	N. FIJI B./VANUATU	08/01 - 09/03	OBS-SCS
GERMANY	SONNE	V. STACKELBERG	LAU	FEB. & MAR.	HYDROTHERMAL
		HINZ	SULU-S. CHINA	APR. - JUL.	MCS & MGG
		DEGENS	CHINA MARGIN	AUG.	M. GEOL.
JAPAN	HAKUHO MARU	KOBAYASHI	OGASAWARA-W. PAC.	07/01 - 08/05	MGG
	TANSEI MARU	TAIRA	NANKAI	07/13 - 07/28	MCS-ESP
	HAKUREI MARU	YUASA	BONIN ARC/RIFTS	APRIL	HYDROTHERMAL
U.K.	DARWIN	MASSON	E. INDONESIA	FEB. - MAR. '88	GLORIA & MGG
		CRONAN*	LAU	MID-88	

*A decision on this and numerous other proposals for U.K. work in WPAC will be made by NERC on April 8.

WESTERN PACIFIC REGIONAL PANEL
13-15 December 1986
Stanford University, California

MEETING MINUTES

Attendance

B.Taylor, M.Audley-Charles, J.Gill, R.Hyndman, J.Ingle, D.Jongsma, J.Natland, C.Rangin, J.Recy, H.Schluter, S.Scott, E.Silver, K.Tamaki, D.Hayes (PCOM), N.Pisias (PCOM), J.Hawkins (LITHP), R.Sarg (SOHP), D.Howell (TECP), A.Mauffret (SSP), A.Meyer (TAMU), R.Jarrard (LDGO), C.Moss (JOIDES Office)

Introductions/Welcome

Panel members and guests introduced themselves and J.Ingle welcomed everyone to Stanford University. B.Taylor reviewed the agenda and the minutes of the past meeting and asked if there were any corrections or additions. There being none, the agenda and minutes were approved.

PCOM Report

N.Pisias reported that PCOM is generally pleased with the WPAC program. He emphasized the importance of thematic justification for programs considered by the panel and encouraged the consideration of programs which can be coordinated with CEPAC programs. A nine leg drilling program can be viewed as a guideline and PCOM needs to know which programs are considered important, what these programs represent in time, and what scientific objectives will be lost when cuts are made. It is also important to define any special technology problems or requirements which will impact the FY88 budget and planning process. Such requirements should be presented to the PCOM for their consideration at their January 1987 meeting.

N.Pisias also reported that the Indian Ocean program is up in the air. The SW Indian Ridge program may be postponed due to the need for guide base development. Makran site survey information is still unavailable due to the Darwin being unable to complete the survey cruise as scheduled. The planning structure must be careful in the future that immature proposals don't get so far in the planning process. Insufficient site survey data has resulted in legs dropping out with insufficient time to fully consider replacement programs.

TECP Report

D.Howell reported that the role of TECP has evolved from proposal reading/ranking to consideration of global problems/objectives and then deciding on best geographic location for addressing identified problems/objectives.

The three primary thematic objectives TECP would like to address in the western Pacific are:

1. Arc processes
2. Back-arc rifting
3. Collisional processes

With a limited amount of time in the western Pacific, TECP would like to deal with collision processes and leave passive margins for another area. TECP has been trying to get away from proposal evaluation and stay with identification of major thematic problems/questions. This has presented a problem: how can a more extensive collision drilling program be developed without good supporting proposals?

D.Howell reported that at its last meeting TECP prioritized western pacific programs in the following order:

1. Bonin transect
2. Nankai Trough
3. Japan Sea
4. Bonin-Marianas
5. Banda-Sulu-South China Basins
6. Vanuatu
7. Nankai physical properties (1/2 leg)
7. Lau Basin
8. Sunda backthrusting

Other programs of interest included a South China Sea margin, Zenisu Ridge, a second Vanuatu program, and a Bonin reference site.

In addressing accretionary margin objectives, Nankai is the preferred location. Other margins are too thick, and TECP is strongly supportive of the Nankai program. With respect to the South China Sea program TECP is concerned that deep structures are not well know, and that commercial and Chinese data are not yet available for this area.

With respect to the question of regional/thematic panel interaction, N.Pisias explained that ideally, thematic panels should consider global questions and identify the best locations to address them. Regional panels must then consider whether it is possible to address/achieve thematic objectives in their ocean.

LITHP Report

J.Hawkins reported that LITHP has focused primarily on the problems of crustal generation, aging and recycling, and has prioritized the programs which best address those issues. Based on these issues, LITHP has ranked the following programs as their top priorities for the western Pacific:

1. Bonins
2. Lau Basin system
3. Sea of Japan

LITHP feels that achieving a large latitudinal/longitudinal coverage is very important. The Bonin program fits well but planning efforts shouldn't focus entirely on this area.

Reference sites which address global recycling balances are also of great importance to LITHP. The Lau Basin system looks like a good program, however, LITHP recognizes that regional panels won't be very supportive of spending a lot of time on reference sites.

SOHP Report

R.Sarg reported that the WPAC programs were discussed with respect to SOHP thematic priorities with the following results:

The Great Barrier Reef seems to be an area which best addresses many of SOHP's global themes including: unconformities, sedimentary responses to changing sea level, shelf processes, changes in paleoclimate, tectonic and sedimentary history and diagenesis questions. The Sea of Japan program addresses SOHP priorities with respect the late Miocene/Holocene record, anoxic sedimentation and mixing processes. The South China Sea basin was ranked as a high priority program but SOHP feels the availability of commercial data is crucial to proceeding with this program. The Sulu Sea program addresses paleoceanographic and anoxic sedimentation objectives. SOHP also discussed the Bonin program which is generally supported, particularly Bonin I site 6.

With these thematic priorities in mind, SOHP has developed the following priority list with respect to WPAC programs:

1. Great Barrier Reef
2. Japan Sea
3. South China Sea Basin
4. Sulu Sea
5. Bonin site 6

DMP Report

R.Hyndman, who attended the last DMP meeting as a special WPAC liaison, reported that the DMP was enthusiastic about the Nankai physical properties "mini leg" and the long-term recording (re-entry) holes near Japan. Individual programs were not ranked by the DMP.

R.Jarrard reported that Lamont is conducting logging school meetings in ODP member countries. The schools have been well received and Lamont is hoping to conduct similar programs in the U.S.

SSP Report

A.Mauffret reported that the SSP has now assigned watchdogs for each of the WPAC programs currently under consideration. Standards for site survey summaries have been revised and will appear in the next JOIDES Journal.

Specific comments will be presented during leg discussions.

ODP/TAMU Report

A.Meyer reported on the results from Legs 110-112, and reviewed planning progress for Legs 113 and 114.

Leg 110:

Six sites (671-676) were completed on Leg 110. Sites 671 and 675 completely penetrated decollement surface between two oceanic plates. Limited logging success; packer was unsuccessful due to poor hole conditions.

Site 672 was a reference section 6 km east of decollement. Sites 673 and 674 (13 and 17 km west of decollement, respectively) show increased structural deformation, with major thrust zones dipping 15^{o} to west. Site 676, about 250 m west of deformation front, shows incipient stages of accretion.

Leg 111:

Hole 540B was deepened by 212.3 m to a total of 1562.3 mbsf in sheeted dike complex. Average recovery was 12.6%. The hole claimed parts of three coring assemblies with lots of fishing. Logging and downhole experiments were very successful. A diamond core bit, float valve, and part of a lower support bearing were left in the hole. Sites 677 and 678 were also completed.

Leg 112:

Leg 112 is still out. Ten sites (679-688) have been drilled, six of which were paleoceanographic sites (shallow water). On one hole 10 cores were recovered in 2 hours! Some cores are showing ages significantly younger than previously thought. A preliminary leg report should be out in a few weeks.

Future Legs:

Crew changes will take place at the Faulkland Islands. A picket boat is on its way for Leg 113, and the leg prospectus is out. After Leg 114 co-chiefs have been identified for four legs:

SWIR	von Herzen, Robinson
Red Sea	Cochran, Ganoch
Neogene I	Prell, Nitsuma
Makran	Leggett, Haq

Sudanese clearance has been received for the Red Sea leg, however there is still nothing from the Egyptians or Saudis. PCOM will make a final go/no go decision in January.

The issue of non-member country participation on WPAC legs was discussed. Panel members agreed it is important to keep planning information available to WPAC countries. The best way to do this is probably to communicate through regional secretariats and encourage proponents to include interested local scientists in their proposals to the greatest extent possible.

Program Revisions/New Proposals

Lau Basin

J.Gill reported on the progress of the Lau Basin ad hoc working group. The group met five weeks ago for a discussion of all available data. A six hole, single leg program was discussed, with each of the six holes having multiple objectives. An addition four holes were also considered. WPAC has previously reviewed eight of the ten holes discussed by the working group, however some of those eight holes have been slightly modified.

J.Gill outlined the primary thematic objectives of the Lau Basin program:

1. petrologic evolution of the basin
2. dynamics of arc rifting and backarc basin formation
3. evolution of a differentiated axial volcano (Valu Fa)
4. relationship between magmatism, regional tectonics and hydrothermal processes
5. forearc tectonic history
6. transect study of heat and fluid flow

The ad hoc group has reached a concensus that sites LG 1-6 are the most important in addressing these objectives. New information received since the groups last meeting now indicates that site 7 should be substituted for site 5. Sites 1 and 4 are re-entry holes and all holes except site 3 need significant basement penetration.

Gill recommended that the panel may want to consider a bare rock site at LG1 or LG4 as a separate objective. The working group worked on the basis of a one leg Lau Basin program and a bare rock hole could consume most of a one leg program on its own.

There are some site survey problems which will require dedicated site survey work. Seismic data in particular is inadequate. As the U.S. is not currently planning any work in the Lau Basin the program will have to depend on others for site survey data. The Sonne and the Charcot will both be in the area in 1987. The need to involve local scientists was reiterated.

Great Barrier Reef

R.Sarg reviewed revisions made to the Great Barrier Reef (GBR) program and conveyed SOHP's comments and recommendations.

SOHP considered this program in great detail and has recommended that sites 1-6, 9 and 10 represent the minimum program to adequately address the thematic problems of the area. SOHP feels the revised proposal addresses concerns expressed at last WPAC meeting, including time allocations, and reconsideration of sites which will more fully address tectonic problems.

The SOHP panel is very concerned that first 4 holes are too short and strongly recommend that site 2 be drilled to original depth of 1000 m. If site 2 is deepened 5-10 days drilling time should be added to the program.

SOHP priorities for this program are:

1. sites 1-6 as listed (w/site 2 extended to 1000 m)
2. sites 9 & 10 (Queensland Plateau)
3. sites 7, 8, 11

Priorities 1 & 2 are felt to be minimum package which can adequately address the program objectives.

SOHP recognizes that some holes may encounter resistance from PPSP but feel viable alternative sites can be found. S.Scott stated that a proposal from Canadian Geological Survey (just submitted to JOIDES Office) addresses hydrothermal processes in carbonate reefs.

A.Mauffret reported that the proposal has been revised since its last SSP review. Site survey information is far from satisfactory at the moment but the revised proposal should answer many questions.

The general question was raised as to guidelines for changing site/hole numbers. It was agreed that new holes should be newly numbered; old holes should maintain consistent numbering. It is the responsibility of proponents to submit proposals with properly numbered sites.

Woodlark Basin

S.Scott reviewed a new proposal for drilling in the Woodlark Basin. This new proposal addresses many of the same questions as the Red Sea and may be a good substitute.

The proponents feel site WWB1 is most important in achieving program objectives. The major problem with this site is that it is a bare rock hole, but it may be possible to get it done in half a leg. There is a need for seismic data. The PACLARK ship may be available in April 88. Seabeam is being sought through the Australian Navy and Papua New Guinea.

The panel felt the proposal is very immature in that large amounts of background and site survey data are needed before a drilling program can be considered in detail. The panel expressed concern about complexity of the area and preliminary nature of proposal.

A general discussion followed as to when the submission of new proposals should be cut off. It was agreed that the panel should maintain the largest amount of flexibility possible so PCOM can consider factors such as ship scheduling, weather, etc. Perhaps PCOM scheduling deadlines should be more strictly enforced.

Banda-Sulu-South China Sea Transect

H.Schluter and C.Rangin reviewed sites and objectives for the Sulu Sea transect.

In response to SOHP recommendations a new objective of obtaining a complete sedimentary sequence has been included in the program. This will require that about 1-3 days be added to the original time estimates. Other program objectives include: history of deformation, sedimentary sequence in an anoxic basin and back arc processes.

This area deals with complex collision of different terrains with subsided oceanic crust in the back-arc. Work on this environment (particularly at site S5) will apply to all surrounding seas/areas. Good onshore data is available.

The proponents feel a first priority package would include sites S5, S4 and S2. This package would address timing of the collision belt and the role of oceanic crust. A second priority is site P1 which would address local processes acting during collision. Based on timing constrains and the availability of data at the present time, site P1 can't be defended very aggressively.

The panel agreed that the S5, S4, S2 package includes very important sites and agrees that site P1 would be of lower priority.

A.Mauffret reported on site survey issues. Sites S2 and S5 look good, but site S4 has only 1 seismic line. H.Schluter reported that magnetic and gravity surveys are being arranged for site S4.

Ogasawara Plateau

K.Tamaki reviewed a new proposal for drilling the Ogasawara Plateau. Main program objectives include: paleo-oceanographic questions, origin of the seamount chain, and plateau collision processes. Some single channel seismics are available. More seismics were conducted this year but the data is not yet available.

The program does have three good objectives, although it appears proposal is not getting widespread support in its present form. It needs to be reviewed by SOHP; they should identify which sites are important to overall drilling program objectives. There is also some question as to whether this is most appropriate for review by CEPAC or WPAC panel.

The panel felt uncomfortable in ranking specific sites without CEPAC and SOHP input. The general concensus was that the proposal should be sent back to its proponents for additional data which would allow the identification of specific sites.

Specific actions:

1. Refer proposal to TECP, SOHP and CEPAC for their review and consideration, asking that their comments be conveyed back to WPAC.
2. Ask proponents to submit data which would allow identification of site(s) which could address items of particular interest, including:
    - internal structural fabric
    - young forearc volcanism
    - uplift/subsidence history

Japan Sea

K.Tamaki reviewed two proposals for the Japan Sea program. The first proposal includes new information relevant to sites on the Korean rise and in the Tsushima Basin. Additional site survey data is now available for sites KP1 and VB-1, both of which were previously dropped from consideration.

The main objective of this program is determination of the age of spreading in the Japan Sea. Tamaki feels the best site for achieving this objective is site J2a. Site KP1 would be a good site for paleoceanograhic objectives, and it is strongly endorsed by SOHP. Tamaki has discussed site KP1 with the proponents and conveyed the idea that its prime objective might be changed.

As there is only time for one hole to address rifting problems, site J2a seems to be the best one. Site JS2 appears to be a good site for paleoceanographic objectives as it has a good thick sediment sequence. Sites JS2 and KP1 can both address the same objectives. Site JS2 is more attractive because it does have multi-channel seismic data available.

The panel agreed that SOHP should be asked to compare the two sites for paleoceanographic objectives and that TECP should review the tectonic/rifting objectives.

The second proposal reviewed by Tamaki included some revisions but the panel agreed that the objectives of this proposal can be met by sites which have already been considered in greater detail. Sites previously considered also have much better data available.

Kuril Forearc

K.Tamaki reviewed a new proposal for drilling in the Kuril forearc. The primary objectives of this program are arc-arc collision/junction processes and shifting of plate boundaries.
WPAC previously discussed this proposal in detail. Previous discussions concluded that the area appeared too complex to address effectively with the data and time available. The same problem and sites are proposed: objectives have been clarified and supported with additional data.

Response to proponents: It is not clear what drilling will accomplish. There is a need for more interpretational work, better and deeper seismics, better images of structural problems. There is also a need for some sort of reference section for comparison.

Reference Sites

J.Natland reviewed a proposal for old Pacific reference site drilling which would encompass both WPAC and CEPAC regions. The program proposes reference geochemical sections which would address the following objectives:

1. obtain reference holes to extract as many end components as possible for isotope/geochemical study
2. holes of both arc systems (Bonin and Mariana)
3. picking up hole to determine summit type sediments

J.Gill stated that this proposal addresses a first order problem which can answer a lot of major questions. A general discussion followed as to specific sites, geochemical problems and animal husbandry. The panel agreed that the program objectives are primarily lithospheric, but that they do address a very global problem. It also seemed pretty clear that two holes are needed to achieve these objectives. The proposal includes one deep hole, and a pair of holes near the Marianas.

It was agreed that the proposal should be included in future scheduling decisions as well as in the rating/ranking process. The program appears to be a good cross-over package between WPAC and CEPAC areas.

Physical Properties

R.Hyndman reviewed two proposals for evaluation of physical properties in the Japan Trench area.

The first proposed the establishment of a long-term downhole recording "observatory" to monitor earthquake cycles and the nature of deformation processes. This is currently an immature proposal which would be most appropriately reviewed by the DMP before further WPAC consideration.

The second proposal addresses geotechnical evaluation of convergent zone processes including decollement penetration, deformation processes, and constraints on physical properties and fluid models.

Several critical questions were considered:

1. Need for dedicated hole
2. Need for separate mini-leg

Both aspects are included in the proposal; it appears sensible but not necessarily crucial for achievement of program objectives. Due to the need for a specific scientific team and the proximity to port, separate mini-leg would be useful if possible within time/expense constraints.

Six holes have been proposed on Nankai Trough and some of these have had to be cut. How do holes/objectives fit in with the others? How do they fit in with the timetable?

This proposal needs to be translated into reasonable/realistic drilling times. Is the technology available to successfully achieve this program? The panel agreed that later rating/ranking will determine how aggressively technological development should be pursued.

Vanuatu

J.Recy and C.Rangin reviewed revisions to the Vanuatu program. The primary objective is to investigate arc-ridge collision, specifically:

1. reference sites on the colliding ridge and guyot.
2. the composition and vertical tectonics of the narrow forearc
3. the tilting and folding of the adjacent intra-arc basin
4. the rifting of the arc along strike.
5. arc reversal

Sites of highest priority are two forearc pairs (DEZ 2-3 and DEZ 4-5) and two intra-arc basin sites (1AB1 & 2) and one back-arc site (BAT-2). Additional site surveys will be conducted next year and relocation of some sites may be appropriate at that time.

The program was previously cut to fit into a one leg schedule, based on the absence of good imaging data. Better data is now available and the panel now has the option of reconsidering the program.

Site DEZ6 objective is to date collision by drilling through wedge. The group reached a concensus on site DEZ6: Panel doesn't believe it is necessarily a fan, it could be accretionary. The panel will not continue to consider as proposed; rationale for this site is not accepted or supported by panel (new data makes model highly suspect).

Site DEZ5: possibly move eastward. DEZ1 was proposed as reference site for DEZ2 and was not intended to show deformation.

Discussion of differences/merits of DEZ2/3 and DEZ4/5 pairs. Additional site survey information will be available very soon. DEZ2 velocity calculation shows thickness of about 1.2 km. Will want some very good velocity information in order to thoroughly evaluate this area.

From current velocity information it is clear that site DEZ2 must be moved trenchward for continued consideration. Would like to see some dredging downslope from DEZ2.

South China Margin

D.Hayes presented revisions to the South China Margin proposal in response to a previous WPAC request. Specific sites and objectives were reviewed and a general discussion of the proposed model followed.

SOHP is interested in the South China Sea and feels a basin hole should be a minimum. If shelf holes are combined with industry data you could still provide a good deal of information. SOHP would like to see a more extensive South China Sea program.

With respect to this program, the panel feels the problem is well posed, a good data set is available, and the program has the support of at least one thematic panel. It appears to be as mature a proposal as others currently under serious consideration and the proponents have responded to WPAC's request for additional information. Panel agrees that this program should be put back on the list for formal voting rather than eliminating it from consideration.

Existing Programs

Sulu Negros

This program was not previously discussed in as much detail as other programs, sites are not as well defined. Panel doesn't feel as comfortable with sites as with other programs. Site P1: general review of proposal, sites and objectives. The program has two main objectives: tectonic collage processes and arc reversal.

WPAC/TECP both thematically interested in problems of arc reversal. Sulu 8 looks very interesting thematically, but would like to see more supporting data. Premature to consider site Sulu 8 at this time. Sites P1 and S8 shouldn't be included in the prospectus because they cannot be solidly supported at this time.

Is it appropriate to separate this program from Banda-Sulu-SCS program? Objectives seem compatible and supportive. A discussion followed as to possible combinations of Banda-Sulu-SCS and Sulu Negros programs. How can they be structured for evaluation? The panel voted on the question: Should site Sulu 2 be added to the Banda-Sulu-SCS package? (Yes 4, No 6)

Pending further site survey data, the Banda-Sulu-SCS package will stand as previously defined. Sulu Negros will be dropped from the prospectus until further supporting data is supplied by the proponents.

Bonins

B.Taylor reviewed the Bonin program and outlined time estimates for specific sites.

Site	Drilling	Logging	Total Days
Bonin-1	8.5	1.6	10.1
-2	16.2	1.3	17.5
-3	5.2	1.2	6.4
-4a,b	14.5	3.1	17.6
-5a,b	19.6	3.4	23
-6	21.5	2.5	24
-7	6.1	1.5	7.6
-8 (Ref. Site)	10-19.2	1.7	11.7-20.9
Mariana-2	8.9	1.6	10.5
-3	9.6	1.6	11.2
Reference (2 sites, no re-entry)	13 (each)	2 (each)	30

E.Silver chaired the discussion as to packaging the Bonin programs with B.Taylor and J.Natland abstaining from the discussion. Times given (including reference sites) add up to a three leg package. The alternative of separating the reference sites into a separate package/leg was discussed but did not receive great support from the panel. Panel members preferred to address arc problems and do two reference sites if possible. All agreed that the Bonin program should definitely keep to a two leg program.

In order to allow PCOM consideration, and evaluation of equivalent programs by the thematic panels, the program was broken into two packages. The Bonin I package now includes sites Bonin-1, -2, -5a, -5b, and -6. The Bonin II package now includes sites Bonin-7, -8, and the Mariana reference site. Final time estimates for the two programs are as follows:

	Bonin I	Bonin II
Days Drilling	66	29
Days Logging	8.5	5
Days in Transit	4	6
Total	78.5	40
Re-entry Sites	B-2, B-6	none

B.Taylor and J.Natland rejoined the meeting.

Site Survey Update

A.Mauffret reported that additional site survey data will be forthcoming in the coming year for the following programs:

Lau Basin: geological survey to be conducted by BGR
Great Barrier Reef: regional and site specific MCS
Japan Sea: regional and site specific MCS
Sunda: regional MCS
Vanuatu: regional and site specific MCS
Banda-Sulu-SCS: regional and site specific MCS and SCS
So. China Sea Margin: MCS data being processed
Bonin: regional MCS
Nankai: regional and site specific MCS
Zenisu: regional MCS

The DARWIN will be working throughout the southwest Pacific near southeast Asia. Work might include the Lau Basin and/or Woodlark Basin.

Program Evaluation

After discussing specific time requirements of each program panel members voted on the relative priorities of each program (several programs will require more than 1 leg to drill). Program proponents were not allowed to vote for their programs and the resulting priority list is as follows:

1. Banda-Sulu-South China Sea Basins
2. Bonin I
3. Lau Basin
4. Vanuatu
5. Japan Sea
6. Nankai
7. Great Barrier Reef
8. Sunda
9. Bonin II
10. Nankai Geotechnical "mini leg"
11. South China Sea Margin
12. Zenisu Ridge

A table which indicates specific drill sites and time estimates is attached. The panel will update its prospectus to reflect the above priorities prior to its next meeting. A revised prospectus will be made available for PCOM consideration at their spring 1987 meeting.

Engineering Developments

The panel agreed that the following engineering developments should be presented to PCOM for their consideration in the FY88 budget planning process (not in order of priority):

1. Navi-drill adaption to APC/XCB
2. Tools for Nankai Geotechnical program
3. Side entry sub
4. drill stem packer operation
5. capability of drilling coarse unconsolidated turbidites
6. recovery of fractured volcanic rocks

Other Business

1987 Meeting Schedule

The 1987 WPAC meeting schedule will be as follows:

2-4 March 1987, Tokyo, Japan or Noumea, New Caledonia
1-3 June 1987, Sidney, British Columbia or Corvallis, Oregon
2-4 November 1987, London or Bali

Membership Rotation

E.Silver will be rotating off the panel after this meeting. The panel thanked him for his service and wished him luck in his future endeavors. Nominations for his replacement are G.Moore and N.Lundberg. After the March 1987 meeting J.Ingle will rotate off the panel. Nominations for his replacement are B.Thunell and J.Barron. After June 1987 J.Recy will rotate off as the western pacific at-large representative. Nominations for his replacement are D.Tiffan and J.Danielle.

Proposal Evaluation

The panel concensus is to refuse consideration of proposals and revisions not submitted through the JOIDES Office. Proposals and revisions should be sent to Michael Wiedicke, c/o JOIDES Office, Oregon State University, College of Oceanography, Corvallis, OR 97331.

There being no further business the meeting was adjourned.

WPAC Program Priorities and Estimated Time Schedule

Priority / Program	Days Drilling	Days Logging	Special Experiments	Min. Transit	Total Days
1. Banda-Sulu-SCS Margin	62	11	—	10	83
2. Bonin I (1,2,5ab,6)	66	9	—	4	79
3. Lau Basin	48-50	6	1	3	58-60
4. Vanuatu	62	10	—	4	76
5. Japan Sea	53	11	3-5	5	72-74
6. Nankai	34-42	5	—	5	44-52
7. Great Barrier Reef	42-50	8-10	—	4	54-64
8. Sunda	39	11	—	5	55
9. Bonin II	29	5	—	6	40
10. Nankai Geotechnical	(23-25)		5	2	30-32
11. SCS Margin	43-58	7	—	4	54-69
12. Zenisu Ridge	19-20	6	1	2	28-29

A SELECTIVE HISTORY OF WPAC

1985
August - WPAC ranked 20 "legs" chosen from 60 proposals (see p. 7).

October - Taylor replaces Silver as chairman.

Fall - First input from thematic panels to WPAC.

- Great Barrier Reef and Sulu Transect proposals submitted.

1986 - PCOM request to develop 6, 9, and 12 leg scenarios.

January - Lanseth retires from WPAC, Audley-Charles (U.K.) and Sarg (SOHP) appointed.

February - WPAC responds to thematic panels, PCOM, and new proposals with 1st prospectus (see p. 5).

Spring - PCOM revises scheme of thematic-regional panel interaction, increases liaisons but restricts their vote. Requests 9 leg program with alternatives.

- Hessler (Can.) and Kagami (Japan) replaced by Scott and Tamaki, Jongsma (ESF) and Hyndman (m.a.l.) appointed.

- New Ontong Java, revised Sunda (backthrusting) and Vanuatu, and supplements to Japan Sea and Sulu, proposals submitted.

- Thematic panels respond to 1st prospectus and provide written explanations of their goals (Appendix A).

June - WPAC responds to Spring action and issues 2nd prospectus (see p. 3).

Fall - PCOM generally pleased with WPAC program...

- Gill appointed to WPAC; Leinen replaced by Hawkins as LITHP liaison.

- Thematic panels reaffirm their positions; TECP ranks 2nd prospectus legs.

- SOHP and proponents modify G.B.R. proposal; ad hoc Lau working group meets.

- Revised Lau Basin and Nankai Geotechnical, plus new Reference Sites, proposals submitted.

- TAMU and LDGO provide detailed revised time estimates for drilling and logging.

December - WPAC responds to Fall input and formulates 12 ranked "programs".

1987 - LITHP recommends Lau Basin program focussed on crustal evolution.

January - PCOM accepts WPAC 9 program (11 leg) scenario, with 4 core programs, "for planning purposes"; requests revised prospectus and leg-by-leg drilling plan.

- Silver retires from WPAC, replaced by Moore.

March - WPAC issues 3rd prospectus and 1989 drilling plan.

Brian Taylor
3/87

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WESTERN PACIFIC REGIONAL PANEL
13-15 December 1986
Stanford University, California

PCOM is generally pleased with the WPAC program. N.Pisias emphasized the importance of thematic justification for programs considered by the panel and encouraged the consideration of programs which can be coordinated with CEPAC programs. A nine leg drilling program can be viewed as a guideline and PCOM needs to know what programs are considered important, what these programs represent in time, and what scientific objectives will be lost when cuts are made.

TECP

1. Bonin transect
2. Nankai Trough
3. Japan Sea
4. Bonin-Marianas
5. Banda-Sulu - South China Basins
6. Vanuatu
7. Nankai physical properties (1/2 leg)
7. Lau Basin
8. Sunda backthrusting

LITHP

1. Bonins
2. Lau Basin system
3. Sea of Japan

+ Reference Sites

SOHP

1. Great Barrier Reef
2. Japan Sea
3. South China Sea
4. Sulu Sea
5. Bonin site 6

WPAC	Priority / Program	Days Drilling	Days Logging	Special Expts.	Min. Transit	Total Days
9.55	1. Banda-Sulu-SCS Basins	62	11	--	10	83
9.42	2. Bonin I (Bon 1,2,5A-B,6)	66	9	--	4	79
8.50	3. Lau Basin	48-50	6	1	3	58-60
7.92	4. Vanuatu	62	10	--	4	76
7.08	5. Japan Sea	53	11	3-5	5	72-74
6.69	6. Nankai	34-42	5	--	5	44-52
6.62	7. Great Barrier Reef	42-50	8-10	--	4	54-64
6.00	8. Sunda	39	11	--	5	55
5.91	9. Bonin II (Bon7 + 2 Ref)	29	5	--	6	40
5.85	10. Nankai Geotechnical	(23 - 25)		5	2	30-32
5.69	11. SCS Margin	43-58	7	--	4	54-69
3.42	12. Zenisu Ridge	19-20	6	1	2	28-29

Western Pacific Panel Meeting
June 19-21, 1986
Summary

PCOM's charge to the meeting was to devise a nine-leg drilling program, with alternates, for the western Pacific region. Input from the three thematic panels, together with 14 new/revised proposals, was presented and reviewed. The panel jointly revised the first WPAC drilling prospectus and agreed on 10 1/2 legs that can be strongly defended at this time. These legs were ranked by vote, and the resulting priority list is presented below

These results are VERY consistent with WPAC's previous rankings, even though the panel membership changed considerably, with only two exceptions:

a) the priority for drilling in the Sunda region rose considerably (10th to 3rd) following requested refocusing of proposal on collision tectonics rather than toe processes.
b) passive margin drilling in the South China Sea was removed from the priority list following specific criticisms by TECP (with which WPAC agrees), and pending significant revision (data and model updates) by proponents.

The panel expects the process of program redefinition to continue through 1987 as better proposals are received and better data syntheses and scientific models are reviewed.

THE SECOND PROSPECTUS FOR WESTERN PACIFIC DRILLING

Leg	Vote (11)	Thematic Blessings	Relevant Proposals	Site Survey Needs	Existing Data Workup	Cruises Scheduled (Proposed)
1. Bonin-1	9.8	LITHP,TECP Workshop	171, (83)	more MCS	JNOC MCS needed	ALVIN 7/87 GSJ 87 MGG (Taylor MCS)
2. Japan Sea	8.6	SOHP,LITHP TECP	51 + JTB	✓	✓	Shinkai 86 ORI 87 MGG
3. Sunda Backthrusting	7.6	TECP	242	more MCS	—	(Silver MCS)
4. Banda-Sulu-South China	7.2	SOHP,(TECP)	27,46, 82,131, 147,154	digital SCS (Banda)	—	(Silver SCS)
5. Bonin-Mariana-2	6.1	LITHP,TECP Workshop	171,172 (83)	more MCS Mariana SCS	✓	ALVIN 6/87 (Taylor MCS)
5. Great Barrier Reef	6.1	SOHP Workshop	206	crossing MCS	Co. MCS needed	BMR 6-9/87 MCS +
7. Nankai	6.0	TECP	50 128/F	✓	Japex MCS needed	ORI 86 MCS (Shipley 2-ship)
8. Lau Basin	5.8	LITHP, TECP Workshop	189,220 239	? First integrate 5 recent cruises		BGR 2-4/87 Cronan 87 (Hawkins)
9. Vanuatu	5.7	TECP Workshop	187 190	more MCS	migrate USGS MCS	French MCS
10. Zenisu (1/2)	5.1	(TECP)	163 177	more MCS	✓	ORI 86 MCS
11. Sulu-Negros	2.6	—	27 48	more MCS	migrate Fr. MCS	French MCS

4. REVIEW OF WPAC DRILLING PROSPECTUS June 1986

PCOM is happy with the length and type of information provided in WPAC's first drilling prospectus. They request that we revise it in light of the thematic panels' comments and additional proposals received, and that we provide them with a nine-leg drilling program with potential alternatives.

This was our first opportunity as a panel to jointly review the first prospectus, each section of which was largely written by individual proponents. The review proceeded semi-topically, dealing first with the marginal basins (Japan Sea, South China Sea, Sulu/Banda Sea), then Great Barrier Reef, then collision/accretion processes (Sunda, Zenisu, Nankai, Vanuatu, Louisville), then intra-oceanic arcs/back-arcs (Lau-Tonga, Bonin-Mariana), and finally with the Sulu transect.

4.1 Japan Sea

New summary distributed. Too many sites and days. Panel supports:

1. Age and nature of basement J1b, J1d, JS3a (east of JS-3)
2. Multi-rift opening (11.5, 7 and 7 days)
3. Obduction and its timing — J3a (9 days)
4. Sediment history (silled basin) — JS-2 (4.5 days)
5. Metallogeny and Yamato Rift — J2a (13 days)

(Proposed holes for fresh water diatoms and deep sea fans are not supported). Plan 6 holes, 52 days on site, in areas with no gas problem. Tamaki to revise summary accordingly.

4.2 South China Sea - Part I, Rifted Margin

TECP criticizes proposal as relying too heavily on McKenzie model (symetric thinning) to the exclusion of the Werniche model (assymetric detachment); no reference to conjugate margins. May be a good place to study ocean continental boundary and (conjugate) passive margin evolution — but we need to see well-processed MCS data. The proposal, as currently written, is out of date in terms of rifting models. There is nothing special about 30 my drift onset if Werniche rather than McKenzie model is appropriate. Proponents need to identify how propsed sites will distinguish between different models, not just details within one model. Return to proponents for significant revision.

South China Sea - Part II, Deep Basin

Need to know sediment history and age of basin. Propose to combine hole(s) in S. China Sea Basin, Sulu Basin, and Banda Basin in one leg.

4.3 Banda-Sulu-South China Sea

The interaction of the mosaic of microplates in SE Asia is the basis for many models of collage tectonics and terrain accretion. Better reconstructions provide new insights/ideas re processes.
Sulu-Celebes-Banda area is one of the two (proposed) 'trapped' basins best known in the world (other is Bering Sea). Important problem is geodynamics, for which we need basement ages, histories of volcanism and collisions (from sediments), etc. leading to an understanding of accretion of terrains, entrapment of marginal basins, relation to ophiolites on land. Drilling is the <u>only</u> way of solving the problem. A Banda-SCS transect of holes would also meet important SOHP objectives: record of northern hemisphere glaciation onset (SCS), oxygen minimum and silled basin sedimentation (Sulu), and interaction/closure of Indian-Pacific circulation (Banda). Sediments are very thick in Celebes (>1500 m) and water is very deep (5000 m), so drilling one hole would take most of a leg. <u>Decision</u>: No Celebes hole.
Plan: One hole each in Banda south, Banda ridges, Banda north, Sulu Basin, S. China Basin; 56 days on site. Preferred S. China Sea hole is #SCS7 (on magnetic anomaly 6). Silver and Rangin to revise summary emphasizing geodynamic aspects.

4.4 Great Barrier Reef

Revised summary distributed. Basically O.K., but panel concerned by drill time estimates (too low). Taylor to make minor revisions: add figures, note preference for less penetration rather than fewer sites (don't sacrifice transect).

4.5 COLLISION Objectives

Ontong Java - Solomons not further considered for reasons stated above.

Manila - Taiwan proposal/prospectus not acceptable in its present form (three transects each requiring approximately one leg to drill, focus on toe/forearc processes). As stated at our last meeting, the panel is interested in considering a revised proposal focusing on the collisional processes — as an alternate (addition?) to the Sunda-Timor area.

4.6 Sunda Backthrusting

New prospectus distributed, addressing three processes:

a) backarc thrusting (F sites) - panel agreement
b) thrusting of the forearc wedge back onto the arc (S sites, perhaps T sites)
c) mountain-building and unroofing (T sites)

Extensive discussion of S vs. T sites. Backarc thrusting and forearc backthrusting are considered global collision processes, which happen to be best imaged currently along the Savu-Flores transect. Backarc thrusting occurs north of Wetar and forearc backthrusting MAY occur east of Timor, but these areas are not seismically well imaged at present. Audley-Charles suggests that mountain-building as a result of arc-continent collision is better studied at the T sites which would not only provide a forearc vertical motion history but also a history of the uplift and erosion of Timor. The panel would like to see all three processes addressed, but the seven proposed holes would require 60 days on site, with minimal downhole measurements. An MCS site survey is proposed and the panel is prepared to forward the prospectus pending that information, but will ultimately have to reduce to five sites. Panel notes MCS cross lines will be required before drilling. Audley-Charles to send Silver and Taylor prospectus modifications dealing with Timor.

4.7 Zenisu Ridge

Existing seismic reflection data insufficient (for TECP and several WPAC members) to substantiate ocean-plate shortening, but MCS survey by Taira is scheduled for this year. Potentially exciting area re models of ophiolite emplacement.

Panel recommends Z1: local reference site (7 days)
Z2/3: dewatering, physical prop. (7 days) — NB. clams found at Z3.
Z4: nature of basement (3 days) - for ophiolite emplacement models
Z5: date uplift/tilting history (8 days)

25 days total drilling = 1/2 leg. Rangin to revise prospectus accordingly.

4.8 Nankai

Most exciting aspect is excellent seismic imaging of lower slope/toe processes (Sites 1-4). The rest of the forearc transect is no better imaged than many other areas. Drilling conditions at Nankai are not difficult says Coulbourn/Karig/Taira; Leg 87 problems due to typhoon. Pending evaluation of Barbados drilling (Leg 110) and Physical Properties Workshop, the panels priorities are: NKT1 — reference site and layer parallel shortening of trench sequence

NKT2 — 1700 m hole through decollement to oceanic basement

Drilling and logging these two holes could require one whole leg.

<u>ALERT TO TAMU</u>: Decollement to be penetrated is at ~6 km (in 4.6 km water)

NKT3 — imbricate thrust

NKT4 — lower slope basin backtilting above thrust

Taira/Tamaki to revise prospectus

4.9 Vanuatu

Lainen: LITHP prefers simple setting of Bonin transect to address backarc rifting and would deemphasize this aspect in Vanuatu unless significant differences (e.g. in geochemistry, structural and volcanic style, etc.) can be shown.
Panel chose Vanuatu region (Aoba Basin sites 1 and 2) to adress arc reversal (due to OJP collision?) rather than Solomons, but wants to see better MCS processing (velocity analysis, migration) to evaluate drilling the volcanoclastic wedges.
Primary focus of this area is DFZ collision. Two issues: (i) material transfer/structure evolution of forearc and (ii) coupling between collision and backarc extension. After extensive discussion, it was the panel's consensus that the time of initial collision was unlikely to be uniquely determined and therefore that issue (ii) be downplayed. Because the north DFZ causes little apparent disruption of the forearc, the panel preferred DFZ sites 4 and 5 over 1-3 to address issue (i).
CONSENSUS: Recy to revise prospectus to one leg, to include 2-3 forearc collision holes, IAB1 and 2, and two backarc holes. Panel requests to see migrated MCS lines and velocity data crossing all key sites.

4.10 Louisville Ridge/Tonga Forearc

Oblique convergence of Louisville Ridge and Tonga Trench. Probable accretion of Louisville Ridge under Tonga arc giving localized 2000 m uplift of arc. Seven holes to test hypothesis.
Objectives: (1) tectonic effect of subducting Louisville Ridge; (2) accretion on inner slope; history obtained from microfossils in sediments. Four holes located on MCS but three on SCS.
Is the proposal a better example of arc-ridge collision than Manila Trench? Yes, plate reconstructions are better known.
Biostratigraphy is possible in 0-3 m.y. time period, but a) it requires pelagic sediments (which may be diluted in the forearc clastics) and b) unless six sites are drilled the proponents say that they will have insufficient biostratigraphic resolution to solve the problem.
To distinguish along strike (ridge sweeping) from across strike vertical tectonics will require three <u>transects</u> of holes, linked by seismic stratigraphy (and there is no continuous forearc sedimentary cover).
CONSENSUS: Area insufficiently surveyed (needs extensive MCS grid linking at least three widely-spaced transects), and too many legs required to solve problem.

4.11 Lau-Tonga

See previous discussion of Hawkins, Cronan, and Bloomer-Fisher proposals.
Significant panel interest in Lau Basin but, like LITHP, consider data and models presented by existing proposals to be inadequate to define/evaluate specific sites. Given the extensive data sets recently (or about to be) collected by six geographically isolated institutes, we
REQUEST PCOM TO ESTABLISH A LAU BASIN WORKING GROUP.
Membership: Chairman should be WPAC panel member, not proponent but with local knowledge.

Members should be P.I.'s of the respective British, French, German, Japanese, Scripps and USGS data sets.

Suggested membership:		
	J. Gill (WPAC, UCSC, petrologist)	- Chair
	J. Hawkins (SIO, petrologist)	- or H. Craig
	Foucher (France, heat flow)	- or Sibuet or Maury
	J. Morton (USGS, MCS)	- or T. Vallier
	V. von Stackelberg (BGR, hydrothermal deposits	
	D. Cronan (U.K., metalliferous sediments)	- or R. White
	E. Honza (GSJ, geophysics)	- or T. Eguchi

<u>Charges:</u>

1) to integrate all the existing data, particularly petrology, bathymetry, magnetics, reflection seismics and heat flow.

2) to come back to us with a proposal for sites to address the problems of:

a) petrologic development of the Lau Basin, including transitions between lava types,
b) initial rifting
c) geothermal processes, and possibly
d) arc volcanic history (forearc site)

keeping in mind that we are not thinking of this as a leg for a bare rock hole

3) to do this in the context of one leg of drilling including downhole measurements, etc.

It is desireable for the first report of this group to be presented at our next (Nov/Dec?) meeting.

Lainen to revise existing Lau basin prospectus.

4.12 Bonin-Marianas

Four major objectives:
1) Backarc rifting (BON 1 & 2)
2) Forearc development (BON 3-6)
3) Serpentinite diapirs (BON 7, MAR 2 & 3)
4) Geochem. & SOHP reference site (BON 8)

Larson: Likely problems with drilling volcanoclastics? Tamaki: GSJ has had good experience with piston coring in Sumisu Rift. Taylor: Leg 60 had good drilling at sites 458 and 459 in Mariana forearc; BON 2 is isolated by rift edge uplift isolated from recent course arc volcanoclastics.
Panel: Are Mariana diapir holes really necessary? Taylor: Yes. Major omission (as unknown) from Leg 60 transect. Mariana diapirs bigger, more serpentinized (?), best studied, and in different position (near trench slope break) than Bonin lower slope diapirs.
Panel: Are all four Bonin forearc sites necessary; how can we meet essential goals while minimizing drilling time? Taylor: Lowest priority hole is Site 3 on the frontal arc high; next lowest is one of the two Mariana diapir holes, and third lowest is Site 4 on the upper forearc. Proposed MCS site survey is designed to define sites where objectives can be met in shorter drilling time. However, there is no way that all four objectives (or even three, if one of those is forearc developemtn) can be met in one leg. LITHP and TECP support two legs.
COMPROMISE: For voting on WPAC drilling priorities consider two legs:

Bonin Leg 1 = rifting and forearc objectives (sites 1, 2, 5A, 5B, 6 essential)

Bonin/Mariana Leg 2 = diapirs, reference site (and remaining forearc sites as time permits).

Taylor to modify prospectus to mention priorities and voting procedure. Pending SOHP reappraisal, Okada sites E and F are not a high priority and will not be included in prospectus.

4.13 Sulu Transect

For logistics reasons (imminent departure of 25% panel), the revision of this last prospectus was postponed until after the vote on the WPAC drilling program. It is included here for organizational simplicity.

Panel recommends refocussing of this prospectus on collision of Cagayan Ridge with Panay and, secondarily, Sulu Basin subduction at Negros Trench, with downplay of sites 6-8 looking at Sulu Arc and its possible reversal. Put in context of Philippine land geology and collage tectonics. Rangin to rewrite prospectus with input from Schluter.

5. VOTE ON WPAC DRILLING PROGRAM

Having reviewed the drilling prospectus for all areas (with the exception of the Sulu Transect noted above), and having agreed as a panel on the content of the drilling program in each area which we would support at this time, the 12 members of the panel then voted on their drilling priorities by ranking the 10 1/2 legs 1 through 11. Proponents of any leg, or portion thereof, could not vote for that leg, so each member's votes were reordered 11 through n + 1 (n = no. of non votes). The votes for each leg were first summed and then divided by the number who voted for that leg.

Western Pacific Panel Meeting
February 24-26, 1986
Summary

The principal business of the meeting was to reconcile the thematic priorities of the Lithosphere, Tectonics, and Sediment and Ocean-History Panels with existing proposals and the Western Pacific Panel's previous recommendations, made at the August, 1985 meeting. The results are set out in Table 1 (overpage), which assigns priorities on the basis of 6-, 9-, or 12-leg options, and gives a summary of panel endorsements. Strong emphasis is given programs in island arcs, forearcs, and back arcs, with targets in the Bonins, Vanuatu, and the Lau Basin. These have strong thematic support from several panels.

Mixed thematic and regional objectives are the basis for the recommended programs in the Banda-Sulu region and for the Japan Sea. The Great Barrier Reef is the principal thematic objective of SOHP in this region. Thematic objectives are the basis for the recommended programs in the South China Sea (passive margin evolution) and at Nankai (accretionary problems). WPAC gives these higher thematic priority than TECP, which preferred more emphasis on collisional problems. However, the data sets and proposals dealing with the particular collisional problems favored by TECP (Ontong-Java Plateau and the Louisville Ridge - Tongan collision) are not adequate to formulate a drilling program.

The rationale for specific recommendations concerning programs and time allocations is spelled out in item 5 of these minutes.

A FIRST PROSPECTUS FOR WESTERN PACIFIC DRILLING

Area[1]		Program Length (#Legs) 6	9	12	Thematic Blessings	Relevant Proposals	Site Survey Needs	Present Data Workup	Cruises Planned
Lau Basin	(8)	1	1	1	LITHP, TECP, Hawkins' workshop	BTB 189	zero-age survey	Integrate 5 recent cruises	--
Bonin-Mariana	(1) (13)	1	2	2	LITHP, TECP, Hawkins' workshop	83,171 /172	more MCS	JNOC MCS needed	ORI 7/86 Taylor MCS proposal ALVIN '87
Vanuatu	(6)	1	1	2	LITHP, TECP, Hawkins' workshop	187 190	more MCS	recent cruises	French MCS proposal
Sulu-Banda	(3)	1	1	1	SOHP, (TECP)	27,82 131,154	digital SCS (Banda)	✓	French MCS proposal Silver SCS proposal
Great Bar. Reef	(-)	0	1	1	SOHP, Carbonate Wksbop	206	✓	recent cruise	--
Japan Sea	(1)	1	1	1 1/2	SOHP, TECP-obduction	51+ JTB	✓	recent cruise	ORI 4-5/86 Shinkai'86
S. China Sea	(3)	?	1	1 1/2	SOHP	46,147 194,216	✓	recent cruises	--
Nankai	(5)	?[1]	1	1		50 128/F	✓	JAPEX MCS needed	ORI 12/86 Shipley 2-ship prop
Sunda	(10)	0	0	?		80 127	more MCS	x	Gloria 87/88
Manila Trench	(15)	0	0	?[1]		218	Taiwan MCS migrate MCS	x	Taiwan MCS '86
Zenisu	(9)					163 177	more MCS		ORI 8/86
Sulu Transect	(-)					27,48 82	more arc MCS		French MCS Proposal
Tonga Transect	(8)					26, 67	more MCS		
Downhole Experiments	(17)				DMP	155	site-specific surveys		

Notes 1. Numbers in parentheses give WPAC ranking at August 1985 meeting; dash means no equivalent proposal at that time.

2. Palawan (48/D) dropped from consideration: very deep targets, safety problems. Okinawa (7) dropped from consideration: low thematic panel interest, political problems. Ontong Java not considered: no proposal.

5. REVISED WPAC DRILLING PROGRAM FEBRUARY 1986

The second day's session was almost wholly devoted to reconciling the thematic priorities of the Lithosphere, Tectonics, and Sediment and Ocean History Panels with existing proposals and the Western Pacific Panel's previous recommendations, made at the August, 1985 meeting. The specific task set by PCOM was to recommend drilling programs for 6, 9, and 12 legs. The results are set out in Table 1, which gives the number of legs to be apportioned among the various programs under the three options, plus a summary of principal panel endorsements.

The list is divided into two principal groupings: those dealing largely with tectonic and lithospheric priorities, separated by the Great Barrier Reef (which is the principal priority of SOHP in the region) from those of mainly WPAC priority. The group of four above the GBR consists of objectives and targets which not only can be done well in the western Pacific, but can only be done in the western Pacific. The first three of these have strong thematic endorsements from LITHP and TECP, and are highly regarded by WPAC (Lau Basin, Bonins/Marianas, and Vanuatu). The fourth of these (Sulu-Banda) is a regional thematic problem (trapped marginal basins and fragmentation of those basins), but it has a strong endorsement from SOHP (silled basins and closure of the Pacific-Indian seaway) and has the advantage of sound proposals and a good foundation of survey data. WPAC advocates this program because the Sulu-Celebes-Banda area is a critical link between the Australian-Indonesian-Philippines collisions.

Below the Great Barrier Reef on the list is a group of which each has either strong regional or thematic interest, or both, but none of them have the out-and-out thematic endorsement of other panels. Of these, those which appear strongest on the basis of existing proposals, survey information, and thematic or regional interest are the Japan Sea, the passive-margin problem in the South China Sea, and the accretionary-wedge problem at Nankai. The problem of arc-continent collision may potentially be well addressed in the Manila Trench-Taiwan and the Sunda/Sumba areas, but the proposals for both of these areas now focus on the accretionary-wedge problem more than arc-continent collision. These conclude the list of programs allocated any time under the 6-, 9-, or 12-leg formats in Table 1.

Below these in Table 1 are a series of four unranked alternates, which could be incorporated into the program at the 12-leg level if one of the more highly ranked programs is not done for any reason. These are the Zenisu collision zone of Japan, a transect of holes across the Sulu Basin, Sulu arc, and Celebes Sea, a Tonga arc-forearc transect, and the four-plate downhole-instrumentation proposal off Japan.

Finally in Table 1 are programs excluded or dropped from consideration for lack of an adequate proposal or a combination of survey/political complexities. These include the Okinawa Trough, and a deep Palawan objective (both discussed below), and two collision-related problems strongly endorsed by TECP, the Ontong-Java Plateau, and the Tongan forearc-Louisville Ridge collision zone. Concerning collision-related problems, WPAC considered that only one of the three programs advocated by TECP, namely the collision zone of the d'Entrecasteaux Ridge with Vanuatu, has an adequate proposal and suite of survey data on which to plan a drilling program. There is no existing proposal to drill on the Ontong-Java Plateau proper, as advocated by TECP, and there is no site-specific proposal to drill the lower slope of the Tonga Trench to ascertain the mechanism or even verification of Louisville Ridge seamount accretion.

The apportionment of time under the 6-, 9-, and 12-leg formats proceeded in the following way. The first four regions on the list (above the Great Barrier Reef), and the Japan Sea (below it) should be allocated one leg apiece in a minimal (6-leg) western Pacific Program. One of the South China Sea passive-margin program or the Nankai accretionary program should have the remaining leg, but the Panel left it for future thematic/regional/survey considerations to judge which. In a 9-leg program, all 7 of these objectives plus the Great Barrier Reef should receive time, with an additional leg allocated to the multi-thematic Bonin/Marianas forearc-diapirs-arc-backarc complex of problems (including a deep penetration hole in at least one of these settings). This latter we believe is in accord with the strong thematic endorsement of this region from LITHP and TECP, as well as WPAC's thematic assessment.

In a 12-leg program, WPAC considers that additional time should be added to certain programs, rather than adding many additional programs. A leg should be added to the Vanuatu program (allowing time for both the collision problem and Coriolis trough backarc problem, as well as the arc-reversal problem, to be addressed). A half-leg addition apiece would ensure full value from the Japan Sea and South China margin programs. One additional program should be added, concerning the arc-continent collision problem at either Manila-Taiwan or Sunda-Sumba.

In reaching the above series of recommendations, some very specific endorsements and deletions require amplification.

1). The Great Barrrier Reef is a special category in that it is the foremost priority in the region for one panel (SOHP), but has no other thematic endorsements. The proposal at this stage is adequate as to sites proposed, but is weak in thematic documentation, which was provided at our meeting orally by Rick Sarg.

2). The Okinawa Trough was deleted from further consideration because the existing proposal calls for several very deep holes, additional site survey is required but probably will not happen, and there are political (EEZ-type) problems. The entire program seems too much to justify, and is not likely to happen. Apart from WPAC's interest, thematic endorsements are weak (both LITHP and TECP prefer simpler oceanic arc-backarc systems).

3). The South China Sea program endorsed here combines both the passive-margin objectives, and some of the targets in the basin. Lack of TECP endorsement was discussed extensively. WPAC concluded that the margin problem here offered a unique opportunity to evaluate subsidence/flexure/thermal models of passive margin evolution, and asks TECP to consider this again in light of the recently submitted proposal by Hayes and others.

4). The Nankai proposals endorsed here include a combination of dealing with the physical processes accompanying development of a decollement, and the more regional pattern of deformation associated with the entire accretionary complex. Advantages are that this may be the only place where a decollement can be reached in a turbidite sequence, and a truly superior set of MCS and other survey information has been obtained. Lack of endorsement by TECP (and their preference for Makran) is surprising. WPAC requests TECP to re-evaluate Nankai carefully in terms of their global perspective on accretionary problems, giving due weight to the survey information available, and the likelihood that coring/recovery and other technical advantages of JOIDES RESOLUTION will radically improve drilling results at Nankai compared with previous experience.

5). The Manila-Taiwan (newly submitted) and Sunda-Sumba proposals were evaluated particularly with regard to the thematic problem of arc-continent collision. TECP's recommendations focused on collisions involving seamounts, aseismic ridges, and large oceanic plateaus, but did not deal specifically with arc-continent collisions, which are as well represented in the western Pacific as the other types. WPAC asks TECP why arc-continent collisions are not more conspicuous in their thematic priorities. The two sets of proposals dealing with this problem actually focus more on deformation processes and fabric development in accretionary wedges. They need some re-direction. WPAC asks TECP to evaluate the existing Manila trench and Sumba proposals with respect to Nankai and other accretionary complexes in terms of thematic priorities. Silver, meanwhile, with a contribution from Audley-Charles, will revise the proposal for Sunda to focus more on the collision aspect. Regarding the Manila-Taiwan proposal, the tie to Taiwan is exciting, geophysical work to make that tie stronger is anticipated, and needs to be factored into a revised proposal. WPAC requests that this be done by Lewis, Hayes, Suppe et al. WPAC expects that one full leg will be needed to do either Manila-Taiwan or Sunda/Sumba.

6). Proposals concerning the possible overthrust of an arc onto a continental margin in the Palawan-Sulu Sea region were discussed. The problem has no thematic endorsement from other panels, hence has to be advocated from a regional perspective only. Excellent survey data exist, but the heart of the proposal concerns a very deep hole (>2,200 m) to penetrate an entire accretionary complex and reach a hoped-for carbonate platform. Given the restricted-basin setting of this hole, safety problems are such that a riser would probably be required for this drilling. While WPAC considered the Palawan region to be of interest for collisional processes, there was not unanimity concerning the interpretation of the deep carbonate reflection. No one voted in favor of the 2-km deep hole proposed at SULU-1."

As for the broader-brush Sulu transect (other, shallower holes across the Sulu arc and into the Celebes Sea), t... was split out from SULU-1 and placed as a possible alternate in Table 1.

7). A similar status was accorded the Zenisu project, which consists of drilling a complex arc-like ridge colliding with Japan (and causing Recent, even contemporary, deformation in the central part of Honshu). The principal objective is timing of deformation. Others include 1) evaluation of a new, nascent, subduction zone in the collision region; 2) the physical properties of deformed sediments; 3) the timing of tilting with respect to accretion; 4) the nature of the Zenisu Ridge; and 5) the transition in crustal types along the ridge (approaching Japan), and the different responses of those crustal types to collision. An ancillary objective is the history of the Kurishio current. WPAC asks TECP to give a reading on Zenisu. The principal argument for going there is that there appears to be an intracrustal thrust related to subduction, i.e. a thematic objective.

8). The Downhole-instrumentation project involves 4 holes, serviceable from Japan, perhaps even hardwired to Japan, to monitor plate deformation and seismicity in an area of multi-plate interaction. All four holes would have to be drilled substantially into basement. WPAC endorsed this as an alternate, provided a site-specific proposal can be generated, incorporating some of the sites (or proximity to sites) in the Nankai and Zenisu programs. An option (suggested by Langseth) is that a one-hole operation be considered as a start-up for this project.

9). Specifically concerning TECP's endorsements, WPAC emphasizes that most of the collision problems they favored cannot be approached at the present time through drilling, not only because pertinent proposals do not exist, but because present survey information does not lend itself to preparation of such proposals. Specifically, an adequate survey program for the Ontong-Java collision would have to include careful imaging of the sea-floor in the collision region (Sea-Beam or SeaMARC), as well as extend MCS coverage from the Plateau into the Solomon Islands region. Similarly, deformation (uplift) of the Tongan forearc, or portions thereof, by seamount accretion, would have to be documented more fully by a careful survey, including extensive dredging of relevant portions of the trench slope. Apart from that, there is little assurance that drilling into seamounts in a trench-slope setting is technically feasible, or would prove much.

Partly in place of such objectives, WPAC argues that outstanding thematic problems can be addressed in the South China Sea and at Nankai, and requests that TECP reconsider these, and in light of the above comments concerning inadequacy of proposals and surveys dealing with collision processes. (Point, Game, perhaps Set. Match still pending.)

10. One additional matter came to a vote. The question was, Should the Great Barrier Reef program be removed from the 9-leg format in order to include the presently proposed drilling at either Manila-Taiwan or Sunda-Sumba? The vote was: in favor, 2; opposed, 6; abstain, 4. Motion denied.

This concludes the summary of deliberations pertaining to Table 1.

EXECUTIVE SUMMARY OF WESTERN PACIFIC PANEL ACTIVITIES, 1985

There are now more than 60 proposals for drilling in the western Pacific. The panel evaluated each of these individually and then grouped the better ones into 20 "legs". The panel ranked the legs by allowing each of the 11 voting members to choose only 9 legs, with three legs each of highest (3), middle (2), and lower (1) priority. Panel members who were proponents of any leg, or portion thereof, were not allowed to vote for that leg (*). The results are tabulated below:

RANK	LEG	VOTES	(VOTE/11-*)
1	BONINS (Island arc rifting, arc & forearc evolution, diapirism)	* 3 3 3 3 3 2 2 1	2.0
1	JAPAN SEA (Continental back arc spreading, back arc thrusting, paleoceanography)	3 3 3 3 3 3 3 1	2.0
3	BANDA/SULU (Trapped marginal basins, silled basin paleoceanography)	* * 3 3 3 2 2 2 1	1.78
3	SOUTH CHINA SEA (Passive margin and marginal basin evolution)	* * 3 3 3 2 2 2 1	1.78
5	NANKAI (Accretionary processes)	3 3 2 2 2 2 2 1 1	1.64
6	VANUATU (Ridge collision, arc rifting, arc reversal)	* 3 3 3 2 2 1 1	1.5
7	OKINAWA-RYUKYU (Continental arc rifting, forearc tectonics)	3 3 3 3 2 1 1	1.45
8	LAU-TONGA (Back arc spreading, arc & forearc evolution, Louisville collision	3 2 2 2 1 1 1 1 1	1.27
9	ZENISU-SHIKOKU (Intraplate thrusting, back arc basin evolution)	* 3 2 2 1 1	0.9
10	SUNDA (Accretion vs. nonaccretion, slump fans, lower-slope basins)	* 3 3 1 1	0.8
11	SOLOMONS (Plateau collision, arc reversal, intra-arc basin evolution	2 2 1 1 1 1	0.73
12	KURIL-JAPAN TRENCH (Continental forearc evolution, arc-arc collision)	2 2 2 1	0.64
13	N. MARIANA (Island arc rifting, arc & forearc evolution, diapirism)	* 3 1 1	0.5
13	FOREARC DIAPIRS (Petrology, structure, hydrogeology: 19,26,31°N Mariana-Bonins)	* 3 2	0.5
15	VALU-FA (Zero-aged backarc spreading center)	2 1 1 1	0.45
15	MANILA-TAIWAN (Forearc basin evolution, accretionary processes)	2 2 1	0.45
17	CORAL SEA/G. B. REEF (Passive margin evolution, carbonate-epiclastic sedimentation)	2 1	0.27
17	TTT-SAGAMI TRENCH (Triple junction sedimentation, deformation & tectonics)	2 1	0.27
17	WPAC DOWNHOLE (Monitor 3-plate crustal deformation south of Tokyo)	2 1	0.27
20	LORD HOWE/NORFOLK/3 KINGS		0

Proposals Submitted to WPAC (3/87)

JAPAN SEA AND TRENCH (NORTHERN REGION)

REGION	PROPONENT	NUMBER
Japan Sea Tectonics	Tamaki et al.	51/D*
Japan Trench (TTT)	Ogawa/Fujioka	132/D
Hokkaido Forearc	Seno et al.	144/D*
Japan Sea (Toyama Fan)	Klein	146/D
Sagami Trough	Ogawa et al.	148/D
Japan Sea Active Spreading	Kimura et al.	149/D*
Japan Sea Mantle Plume	Wakita	151/D
Japan Sea Downhole	Suyehiro et al.	155/F*
Japan Sea Massive Sulphide	Urabe	156/D
Japan Sea Paleoceanography	Koizumi	157/D
Japan Sea and Forearc Sediments	Matsumoto/Minai	158/D
Japan/Kurile Trench	Jolivet et al.	164/D
Japan Sea Opening	Tatsumi et al.	166/D
Japan Sea Sediments (SiO_2)	Iijima et al.	168/D
Japan Trench Forearc	Otsuki	174/D
Japan Trench Inner Wall	Niitsuma/Saito	175/D
Japan Trench Triple Junction	Niitsuma	176/D
Japan Sea (Tsushima Basin)	Chough, et al.	198/D

NANKAI TROUGH TO MARIANAS

REGION	PROPONENT	NUMBER
Okinawa Transect	Letouzey et al.	29/D
Nankai Trough	Kagami/Taira et al.	50/D
Izu-Bonin Transect	Okada/Takayanagi	83/D*
(Nankai) Fabric	Karig	128/F*
Ryukyu Arc/Backarc	Ujiie et al.	145/D*
Downhole Transect	Kinoshita et al.	159/F
442B Downhole	Kinoshita et al.	161/F
Zenisu Ridge	Rangin et al.	163/D
Shikoku Basin	Chamot-Rooke/Le Pichon	165/D
Okinawa Trough	Uyeda et al.	167/D
Bonin System	Taylor	171/D*
Mariana Forearc/x chains	Fryer	172/D
Zenisu Ridge	Taira et al.	177/D
Nankai Trough	Shiki/Miyake	178/D
Daito Ridges	Tokuyama et al.	179/D
Kita-Amami Basin	Shiki	180/D
Ogasawara Forearc	Ishii	181/D
Northern Marianas	Flower/Rodolfo	HTB
Downhole Experiments	Kinoshita	222/F
Ogasawara Plateau	Saito et al	260/D
Reference Sites	Langmuir/Natland	267/F

NEW ZEALAND TO PAPUA NEW GUINEA (SOUTHERN REGION)

REGION	PROPONENT	NUMBER
New Hebrides	Recy et al. (ORSTOM)	25/D
Tonga/Kermadec	Pelletier/Dupont	26/D*
Southwest Pacific	Falvey	43/D
Solomon Sea	Milsom	52/D
Tonga/Lord Howe Rise	Falvey et al.	67/D
Australasia Super Proposal	Crook et al.	126/D
Northern New Zealand	Eade	130/D
Valu Fa Ridge, Lau Basin	Morton et al.	170/D
Papua New Guinea/Bismarck Sea	Exon et al.	184/D
New Hebrides	Taylor/Lawver	187/D
Tonga/Lau	Stevenson et al.	189/D
Vanuatu Collision	Fisher et al.	190/D*
Solomon Intra-arc Basin	Vedder/Bruns	191/D
Great Barrier Reef	Davies et al.	206/D*
Northern Lord Howe Rise	Mauffret/Mignot	217/D
Lau Basin	Hawkins	220/D
Ontong Java Plateau	Kroenke et al.	222/E
Solomon Sea	Honza et al.	235/D
Lau Basin	Cronan	239/D
Tonga Forearc	Bloomer/Fisher	243/D
W. Woodlark Basin	Scott et al	265/D
Lau Basin	Lau W. G.	266/D
GBR:MVT Deposits	Sangster et al.	268/D

INDONESIA - PHILIPPINES (CENTRAL REGION)

REGION	PROPONENT	NUMBER
Sulu Sea/Negros Trough	Rangin/Schluter	27/D*
South China Sea	Letouzey et al.	28/D
Sunda Straits	Huchon et al.	42/D
South China Sea	Hayes et al.	46/D*
Manila Trench	Lewis/Hayes	47/D
Palawan	Hinz et al.	48/D
Eastern Banda Arc	Schluter et al.	49/D
Sunda/Banda Arc	Karig/Moore	80/D
Sulu Sea	Thunell	82/D
Sumba Transition Zone	Reed et al.	127/D
Banda Sea	Silver	131/D
South China Sea	Wang et al.	147/D
Banda/Celebes/Sulu Seas	Hilde et al.	154/D
South China Sea	Liu et al.	194/D
South China Basin Axis	Pantot et al.	216/D
Manila Trench/Taiwan	Lewis et al.	218/D
Sunda Backthrusting	Silver/Reed	242/D

*Revised or supplemented

THEMATIC OBJECTIVES IN THE WESTERN PACIFIC
JOIDES Tectonics Panel
May 1986

At our February 1986 meeting, we recommended that drilling in the western Pacific be focused on three tectonic problems: the origin and evolution of island arcs; the nature of active collisions; and the development of back-arc basins. Of the myriad attractive tectonic problems that could be studied in this region, we selected these three because they meet the following criteria. First, they are clearly issues of global thematic importance. Second, we feel that the western Pacific is the best place in the world to address these particular issues. Finally, we feel that drilling alone can answer specific questions related to these tectonic problems.

The following remarks, presented from our global perspective as a thematic panel, summarize our reasons for advocating these objectives.

I. The Rationale for Island Arc Drilling in the Western Pacific

The origin and evolution of magma within the earth stand squarely at the heart of deciphering the evolution of Earth itself. Of all magmatic provinces, island arcs offer the best possible natural laboratory within which to decipher the physical and chemical evolution of magma. Unlike all other areas, the greatest depth of magma formation is limited to be at or above the subducting plate. Moreover, the source material is either normal mantle peridotite or subducted oceanic crust or mixtures thereof, and the thermal regime of the entire region is reflected in the heat transfer of magmatism itself. In addition, the timing of the events of subduction, incipient volcanism, volcanic-center migration, and magmatic flux provides truly fundamental constraints on the mechanics of separation and ascension of magma. Purely geochemical studies in the way of phase equilibria, bulk chemical composition, and isotopic signatures can only be understood when properly viewed through the context of the mechanics of magmatism. Island arcs offer our only hope of clearly understanding large scale magmatic processes. The arcs that are best suited to unravel such problems and that are accessible to drilling are in the western Pacific.

A detailed accounting through time of the mass and composition of all materials associated with arc evolution (magmatic flux, volatile flux, hydrothermal fluids in the forearc, and flux of downgoing oceanic crust and sediment) and also of the isostatic response of arcs on a regional basis provides the fundamental boundary conditions governing all arc processes. The most critical element of such a menu is time. Although old arcs span much time, their heavy blanket of sediments, pyroclastics, and lavas greatly obscures sampling this history. Arcs must be studied early in their evolution to answer most all of the important themes at issue.

Arcs of the critical age for analysis are Izu-Bonin, Mariana, Scotia, and Tonga-Kermadec. Accessibility and operating conditions essentially preclude Scotia, especially when considered in light of land-based follow-up studies. The overall Mariana-Bonin arc system is ideally suited to tackle nearly all of the essential problems, and Tonga covers what is left. Possibly only in studying the correlation between arc magma composition and downgoing plate composition does another arc, the Aleutians, offer a better perspective. What follows is a list of the principal thematic issues with a few words highlighting, where necessary, their importance and position within more global issues.

Themes in arcs and forearc regions

1) Arc evolution (structural, volcanic), beginning, timing, periodicity, magma transport
- Allows entire problem of magma production, mechanics of ascension, and wall rock chemical interaction to be assessed, and allows quantitative evolution of intimate coupling of downgoing plate and arc plate (i.e. segmentation, fracture zones, etc.).

2) Nature of arc igneous/metamorphic basement
- Are granodioritic plutons also characteristic of incipient volcanic fronts? Is the broad submarine arc ridge or welt of MORB type material produced during the initial breakoff and plumage of the lithosphere, or is it arc magma? What thermal regime is reflected in the metamorphic grade of these rocks?

3) Thermal regimes (isostatic response)

- The very major question of the deep thermal regime of subduction and magmatism can be largely answered by knowing the thermal regime of the forearc, and this couples with the visco-mechanical isostatic regime which further constrains the nature of the arc lithosphere.

4) Fluids, their budget and chemistry

- Do fluids from dehydration of the downgoing plate travel back up the oceanic crust and erupt in the forearc, carrying base metals stripped from the oceanic crust at high pressure? Are these the fluids that form forearc ore deposits?

5) Intra-arc structure (rotations, etc.)

- What are the timing and mechanics of major structural readjustments with the arc itself? Are these driven by regional or local forces?

6) Forearc dynamics, seamount offscraping, "cold volcanoes" (i.e. diapirs)

- Are cold forearc volcanoes a principal means of transporting and redistributing debris from the top side of the downgoing plate? What is the thermal-rheological regime associated with these features; what are the deformation rates; is the process selective of material type?

7) Boninites, relationship to ophiolites

- Are ophiolites sections shaved off in forearcs? Are boninites continually produced in the forearc region, or only early in arc development? Is there a progression from boninites to more typical arc magmas?

8) Relations of arc chemistry to plate chemistry

- Are regional variations in downgoing plate (oceanic crust ± sediment) chemical composition reflected in the composition of the lavas of the volcanic front?

9) Isostatic response of lithosphere to loading at different stages of arc/backarc evolution

- How thick is the arc lithosphere? Does it thin or thicken with time? Can the rates of isostatic adjustments of volcanic centers and arc crustal blocks be measured through sedimentation history and then be inverted to learn of lithosphere evolution?

II. The Rationale for Drilling along Collisional Plate Margins in the Western Pacific

A growing body of geologic data indicates that mountain systems along continental margins are composed of discrete fault-bounded, crustal fragments, commonly referred to as tectonostratigraphic terranes. These terranes may represent dislodged and repositioned pieces of the local continental margin, or they may be truly exotic fragments such as volcanic arcs, seamounts, and even slivers of distant continental margins. The accreted terranes are commonly surrounded by and immersed in a sedimentary melange, but deeper crustal exposures demonstrate discrete tectonic contacts between the crystalline bodies. Several lines of evidence can be interpreted to show that continents are growing at a rate of ca. 1 km^3/yr while continental accretion on a global scale is expanding continental margins at a rate of ca. 2.5 km^3/yr. The 1 km^3/yr of new growth represents the addition of first-cycle volcanic island arcs and seamounts while the remaining 1.5 km^3/yr constitutes the accretion of recycled continental debris (graywacke) and pelagic carbonate and chert.

The best area to study the processes of collision is in the western Pacific where young arcs with thin sediment carapaces are now colliding with a diverse array of oceanic features. Nowhere else are collision processes so clearly shown and so unobstructed by complicated tectonic relations or thick sediment cover. For geologists to understand continental growth and the dynamics within tectonic collages such as the Cordillera, Caledonides, and the collapsed Tethyan margin (to name but a few), it is critical to investigate a variety of accretionary settings in the western Pacific.

A complicated array of collision styles is exemplified in the western Pacific: (1) Ocean crust colliding with volcanic arcs (thin sediment cover as in Tonga, thick sediment cover as in New Zealand and Japan, and even active ridges as part of the ocean crust as in the Woodlark ridge/Solomon arc system); (2) Continent or continental fragments colliding with volcanic arcs (Palawan with Philippine archipelago, Australia with Timor); and (3) Ocean crust colliding with ocean crust (intraplate shortening as inferred for the Mussau and Zenisu ridges).

Attendant with these varying collision styles are a number of boundary conditions that are equally variable; (1) The angle of collision (perpendicular, oblique to almost parallel, e.g., on the southside of the Aleutians, the angle of collision covers the whole spectrum along strike, whereas, the New Hebrides arc shows principally orthogonal collisions, and the Tonga arc is affected largely by oblique subduction/collision); (2) The oceanic crust involved in the collision may be either old or young. (Off of Japan, Kuriles, and Tonga, the crust is old while along the south side of the Solomon arc, the crust is young.); (3) The shape of the so-called indentor may vary from linear (Louisville ridge) to broad and equant (Ontong Java) to a single seamount (Erimo); and (4) The crustal thickness of the indentor may be thin or thick (Loyalty ridge contrasted with Ontong Java). And finally, the stages of collision vary from incipient obduction such as Okushiri ridge to the opposite extreme where dispersion and crustal fragmentation prevail such as in the Banda Sea.

Understanding the kinematics and dynamics of these collisional processes will require a wide range of disciplines and research strategies. Nonetheless, ODP drilling is an appropriate tool to investigate a number of critical aspects of the collision process. Drilling:

1. Establishes whether or not parts of the colliding mass are accreted
2. Provides constraints on the timing of collision event(s)
3. Opens windows to appraise changes in physical properties and amounts of strain associated with a collision event
4. May reveal large-scale deformational features such as thrust faults
5. Makes it possible to observe varying stages of diagenesis or metamorphism related to collisions
6. Permits an opportunity to relate vertical tectonic responses to a collision event

From the multitude of possibilities to study collision phenomena in the western Pacific, we have selected four sites where we believe the prospects of good holes are combined with a range of targets covering many of the styles and boundary conditions discussed above. Our recommendations are:

1. D'ENTRECASTREAUX COLLIDING HEAD-ON WITH THE NEW HEBRIDES ARC
2. LOUISVILLE RIDGE SLIDING ALONG AND IMPINGING ON THE TONGA ARC
3. THE EFFECTS OF ONTONG JAVA AMALGAMATING WITH SOLOMON ARC
4. OKUSHIRI RIDGE OBDUCTING ONTO JAPAN

III. The Rationale for Drilling in Western Pacific Back-arc Basins

The global thematic issue that might profitably be addressed by drilling in back arc basins is lithospheric extension. Like continental rift zones and passive continental margins, back-arc basins originate through lithospheric extensional processes. An immediately obvious question is whether the extension of island arc lithosphere (ultimately to form a back-arc basin) differs significantly from extension of continental lithosphere (which may lead ultimately to normal seafloor spreading). ODP has drilled, or will drill, holes at a number of passive continental margins (New Jersey, Galicia, Norway, Exmouth Plateau) to focus on lithospheric extension problems, so it seems that extension of arc lithosphere is a novel problem that can be addressed by drilling in back-arc basins of the Western Pacific.

The whole issue of lithospheric extension has been revitalized recently, with the recognition by Wernicke and other structural geologists that large scale extension in the Basin-and-Range province is mainly accommodated by normal slip on low-angle detachment surfaces rather than by wholesale stretching and thinning of the lithosphere, a concept popularized by McKenzie. We now have two schools of thought with their proponents: Lithospheric extension via a simple shear (detachment) mechanism, and extension via pure shear (stretching and thinning). The most important difference between the two concepts is that the location of maximum thinning of the mantle is laterally offset from the location of maximum crustal thinning in the detachment model. A likely result is the development of asymmetric patterns of structure, sedimentation, heat flow, and gravity anomalies over the extended lithosphere that would be difficult to explain using a stretching and thinning model unless special conditions are assumed.

The Western Pacific provides a wealth of opportunity for studying extension of arc lithosphere with ODP drilling. Drilling establishes boundary conditions (timing, kinematics, temperatures) that are essential for developing or testing models of extension. Best results are likely in the simplest tectonic situations. For this reason we advocate drilling extensional domains in demonstrably intra-oceanic arcs. We are therefore limited to the following locations:

1) Bonin arc
2) Coriolis trough
} active island arc rift zones

3) Lau basin
4) Mariana trough
} Rifted arc fragments with active back-arc spreading

To be properly effective, ODP drilling must be preceded, or accompanied by thorough deeply-penetrating MCS surveys in order to examine whether master detachment surfaces are present in these extensional domains. Gravity, heatflow, and SeaBeam/Seamarc surveys may also be required to properly locate drill sites.

The detachment model also predicts surface, or near surface exposure of deep-seated rocks, which is consistent with the recovery of metavolcanic rocks and gabbros in the Mariana trough, and upper amphibolite grade mafic mylonite from the Sorol Trough (east of Yap Island). Thus if extension of arc lithosphere occurs by slip on detachment surfaces, a window into the plutonic foundation of island arcs may be available for drilling without requiring large amounts of penetration.

13. WPAC Panel Report

SOHP

The SOHP reiterates that its major global themes are:

1. Neogene-Quaternary high-resolution sealevel, paleoclimatic, bio-magnetochemostratigraphic records, global oceanic fluxes (carbonate, organic carbon, etc.), and land-sea interactions
2. Cretaceous-Neogene high-latitude paleoceanography-paleoclimatology and biotic evolution
3. Mesozoic-Cenozoic sea level changes, seismic stratigraphy, major global unconformities and global mass balances — deep stratigraphic tests. This is one of our major themes for the entire PROGRAM! Detailed proposal for additional sites is available.

We believe that many of these objectives can be addressed in several areas of the WPAC:
1 - In mixed carbonate/siliclastic province in a passive margin setting (e.g. Great Barrier Reef). Specific SOHP objectives addressed by drilling in this region include:

1 - Sea level controls on sedimentation,
2 - the effect of plate motions and subsidence cycles on sedimentation and paleoceanography,
3 - understanding of tectonic cycles in relation to sea level cycles,
4 - changes in paleoclimate related to plate position and the effect on sedimentation,
5 - slope/basin sedimentation - fans and lowstand deposits,
6 - basin fill history,
7 - Late Paleogene-Neogene paleoceanography,
8 - diagenetic history in a stratigraphic framework, and
9 - comparison of the history of a continental margin and an isolated plateau (Queensland Plateau).

2 - An isolated back arc-basin (e.g. Sea of Japan). Specific SOHP objectives are:

1 - sedimentary response to back arc tectonics
2 - sedimentary response to intensified upwelling
3 - history of organic carbon and productivity in a restricted basin - analogs to Cretaceous and Mesozoic
4 - effects of salinity changes on flora and fauna
5 - monitor of Asiatic continental climate and dust flux
6 - record of volcanism versus climate
7 - water mass history relative to sill depth

3 - A young passive margin with a thick sedimentary section (e.g. S. China Sea). Specific SOHP objectives include:

1 - ties between tectonism and eustasticy
2 - early opening and subsidence history for approximately 32 m.y. old basin
3 - development of passive margin basin facies
4 - history of oxygenated basin

SOHP views these three settings as a linked package. The examination and comparison of the sedimentary record in these three very different sedimentary basin environments provides a unique opportunity to evaluate the role of global sea level changes in controlling the sedimentary record.

4 - Additional themes that may be addressed in WPAC are: the drilling of oldest (Cretaceous) crust (e.g. Bonin Plateau) and the examination of a tropical silled basin (e.g. Sulu-Banda Sea). SOHP ranks these themes (using the already presented regional programs as:

1. Great Barrier Reef
2. Sea of Japan
3. S. China Sea
4. Bonin Plateau (probably CEPAC territory)
5. Sulu-Banda Sea

SOHP applauds the WPAC Panel for its use of thematic guidance in generating a 'straw man' drilling program. The 9-leg WPAC package proposed by the WPAC Panel acceptably addresses the major SOHP themes. They have demonstrated that the system can work.

LITHOSPHERE PANEL MEETING

10-11 April 1986
University of Washington, Seattle

EXECUTIVE SUMMARY

(4) WESTERN PACIFIC

(a) The major thematic problems LITHP would like to see addressed in the Western Pacific are:

1) Geochemical evolution of back-arc basin crust.
2) History of arc magmatism.
3) Forearc basement composition and vertical tectonics.
4) Geochemical mass balances at convergent margins.
5) Ophiolite comparison.

- these problems must be addressed at more than one arc-trench system.

(b) A minimum of five legs are required to meet lithospheric objectives in the Western Pacific: 2 legs in the Mariana/Bonins (forearc). 1 leg in both the Lau Basin and Japan Sea (back-arc basins, marginal seas) and 1 leg devoted to drilling reference holes into basement seaward of the Mariana and Izu-Bonin trenches (geochemical mass balance).

5. WESTERN PACIFIC

5.1 General Discussion

Jim Hawkins presented an excellent overview of the major scientific problems at western Pacific arc-trench-backarc basin systems. These include (1) geochemical evolution of back-arc basin crust and hydrothermal processes, (2) the history of arc magmatism, and (3) the nature of igneous basement in forearcs and their vertical tectonic history. He emphasized the importance of looking at more than one arc-trench system and focussing on the important processes, rather than concentrating on a single geographic transect.

Of particular interest in back-arc basins is the temporal and spatial relationship of MORB, back-arc basin and island arc basalts. In the Lau Basin the arc to back-arc and back-arc to MORB transitions in the evolution of this basin have been mapped out in a general way by dredging. The merits of dredging vs. drilling in addressing this problem were extensively discussed by the panel as well as different drilling strategies (a single reentry hole vs. a large number of limited penetration pogo holes). The consensus was that drilling is an effective tool for defining the early opening history of back-arc basins and the basement composition at the margins of the basin. It is also essential in getting at the vertical stratigraphy of igneous activity. Extensive pre-drilling dredging and Sea Beam surveying will be useful in choosing specific drilling targets. The Lau Basin is an attractive target because of the extensive survey work already completed there. The Bonin Basin and possibly the Coriolos Trough are interesting as examples of the early stages of back-arc basin spreading. Sediment ponds of sufficient thickness exist close to the center of the Lau Basin so that bare-rock drilling will not be required.

Several important problems were identified in the forearc region that can only be attacked by drilling. These include the nature of igneous basement, the vertical tectonics of the forearc region, and the history of arc magmatism. Another attractive drilling objective is the large diapiric structures identified in both the Bonin and Mariana forearcs. Both the Bonin and Mariana forearcs offer important drilling targets and because of the variability in structure and tectonic history, LITHP strongly recommends both be drilled.

Another aspect of drilling at convergent margins championed by Charlie Langmuir is the establishment of reference holes on the incoming plate which include as complete recovery as possible of the entire sedimentary section and substantial penetration into basaltic basement (>100 m). Knowledge of the composition of subducted crust is critical for models of arc petrogenesis and for a general understanding of mantle and crustal evolution. For example, there are substantial chemical differences between recent lavas erupted in the Mariana and Izu-Bonin arcs that may be related to differences in the chemical composition of the sediments and crust being subducted. A reference hole seaward of each arc-trench system studied will provide the constraints needed to begin to examine this geochemical mass balance. LITHP strongly endorses this aspect of drilling at convergent margins.

5.2 Specific Recommendations

Margaret Leinen reviewed the 6, 9, and 12 leg scenarios developed at the last meeting of the WPAC panel. The thematic interests mentioned above are well-represented in their proposed program. LITHP also strongly endorses drilling in the Lau Basin, in the Mariana-Bonin forearc and in the Japan Sea. Drilling in the Coriolos Trough of the Vanuatu (New Hebrides) arc may also be of interest to LITHP as an example of early back-arc basin development, but more information is needed on the geochemistry of the lavas from this basin and their similarity with the Bonin Trough. LITHP does not highly rate Sulu-Banda, South China Sea, or Nankai Trough drilling.

LITHP believes a minimum of 2 legs is required in the Mariana-Bonin areas to achieve lithospheric objectives. In the 6-leg WPAC scenario we thus favor a second Mariana-Bonin leg over Sulu-Banda. A leg (or parts of 2 legs) is required to drill reference holes seaward of the Izu-Bonin and Mariana trenches (a proposal for this drilling will be submitted by Langmuir et al. in the very near future). LITHP rates this effort very highly, above Nankai Trough/South China Sea or Japan Sea in the WPAC 6-leg scenario. Finally, at least 1 leg should be dedicated to the Lau Basin.

In summary, a minimum of 5 legs is required to meet lithosphere objectives in the western Pacific. They are (in order of priority):

Mariana-Bonin	2 legs
Lau Basin	1 leg
Reference Drill Holes	1 leg
Japan Sea	1 leg

- if a sixth leg is available LITHP favors Vanuatu (Coriolos Trough).

JOIDES Tectonics Panel Meeting
University of Washington
Seattle, Washington
5-6 June 1986

2.4 WPAC

Nakamura reviewed the WPAC recommendations for drilling plans in the Western Pacific, using the tabulation provided in the minutes of the WPAC Miami meeting and the "First Prospectus for Western Pacific Drilling" which Cowan distributed at this meeting. He asked us to address specifically the questions posed to TECP in the minutes concerning drilling proposals for Nankai, Japan Sea, S. China Sea, and Zenisu.

3. WESTERN PACIFIC DRILLING PLAN

Both PCOM and WPAC want our reaction to the 9-leg drilling plan proposed by WPAC and adopted by PCOM subject to evaluation by the thematic panels. In addition, WPAC asked in their minutes that we reconsider Japan Sea, S. China Sea, proposals concerning arc-continent collisions, Zenisu, and Nankai, and by implication, give a thematic blessing or explain why we do not. Cowan proposed that each target or proposal as listed above be discussed in turn in the context of a general thematic issue (back-arc basins, collision, clastic-dominated accretionary prisms). In each case, relevant proposals were summarized and reviewed at length. Below is a brief summary of key points raised about each target, followed by a synopsis of our general views and recommendations on the entire science plan.

3.1 Japan Sea

The key proposal by Tamaki et al. was reviewed, and Nakamura presented recently acquired detailed magnetic data. They reveal coherent magnetic anomalies that will undoubtedly prove useful for tectonic reconstructions if they can be dated. There is still controversy about when and how fast the Japan Sea opened, and about the significance of peculiar crustal thicknesses in oceanic basins.

3.2 South China Sea

Two proposals were summarized and discussed extensively: one by Hayes et al. dealing with the general problem of evolution of passive margins, and a French proposal for dating oceanic crust in the central part of the Sea to elucidate its kinematic history. There was widespread concern that the Hayes proposal is not specific enough about which models for extension or for the thermomechanical evolution of passive margins will be tested by drilling. Moreover, it was not clear how data from only the northern margin of the basin could be used to evaluate models. More information on the conjugate margin and its possible bearing on the problem is required. Substantial interest in the kinematic history of spreading in a "dead" basin was expressed.

3.3 Collisions

Howell first reviewed our rationale for endorsing this general issue. Although we suggested some possible drilling targets at our Miami meeting, we hoped (and still do) that proposals concerning a variety of possible examples will be continuously evaluated. Cowan asked Silver to summarize another example of a collision-related process in the eastern Sunda system involving backthrusting of accreted material and backarc thrusting. He plans to revise his existing Sunda proposal to focus on these more explicitly collision-related problems. Other examples of collisions that were discussed include the Ogasawara Plateau, Louisville Ridge, Taiwan/Manila trench, and Palawan-Sulu Sea.

We discussed the Kroenke et al. proposal (received after the February Miami meeting) for the Ontong-Java plateau. Most of the sites are devoted to establishing the nature and origin of the basement - questions definitely worth pursuing. Only one site, OJ-6, is supposed to address the effects of collision by drilling through a thrust along which part of the plateau was emplaced onto the arc massif. The panel felt that the seismic data in the proposal do not adequately define either the overall tectonic setting of OJ-6 or the putative thrust.

3.4 Zenisu Ridge

On Friday morning, we continued with a thorough review of this target. Although there was a general acceptance of Zenisu Ridge as an example of intraplate shortening of oceanic crust and of possible incipient subduction (in front of an active trench), a couple of panel members felt that the available seismic records, as presented in the drilling proposals, do not convincingly document that shortening has occurred. Further discussion centered on whether drilling the tilted sediments on the west (back) side of the ridge could successfully date the history of uplift.

3.5 Nankai trough

It was pointed out that the Nankai accretionary prism is an example of the general category of "clastic-dominated prisms" which form where thick (about 2 km or greater) sections of hemipelagites and turbidites are partly scraped off along a decollement. There was extensive discussion about where the origin and evolution of such prisms rank in our overall thematic priorities. Nankai is exceptionally well surveyed and can be tied into an on-land subduction complex. We debated whether drilling should be focused near the toe and aimed at reaching the decollement at all costs, or whether an upslope transect should be included. It was repeatedly mentioned that Nankai is one of several clastic prisms in the entire Pacific region and must be compared with Manila, Aleutians, and Cascadia.

After the review summarized above, Cowan asked each panel member in turn to comment on: (1) Whether the nine-leg science plan, as adopted by WPAC and PCOM, satisfactorily address the three key thematic objectives outlined in our recent position paper; and (2) His views on the thematic interest and priority of the specific targets discussed above.

Below is the Chairman's distillation of these individual comments.

TECP EVALUATION OF SPECIFIC LEGS (AS REQUESTED BY WPAC):

a. JAPAN SEA: Our consensus is that the drilling as outlined in the prospectus will contribute important information on the evolution of marginal basins in general, and further insight into obduction. Drilling results can be usefully compared to those from another marginal sea formed by fast, diachronous rifting of continental crust, the Tyrrhenian Sea. It is still unclear how recently acquired magnetic data may modify models for fast opening in concert with rotation of the Japanese Islands.

b. SOUTH CHINA SEA: In our opinion, the Hayes proposal does not explicitly state which models of lithospheric extension or of thermomechanical evolution of passive margins can be tested, nor does it sufficiently describe how data acquired from the proposed transect can uniquely test such models. We do feel, however, that drilling in the South China Sea may profitably address thematic issues (e.g. lithospheric extension) if more data from the Southern conjugate margin are integrated into the proposal. It is arguable whether the continent-ocean boundary is definable or accessible to the drill in the region. If it is, its nature (composition, structure, physical properties) is of interest. A minority feels that drilling ocean crust in the center of the basin is of interest from a kinematic standpoint.

c. NANKAI: The panel feels that drilling on this well-surveyed margin may contribute important insights into the development of clastic-dominated accretionary prisms. In this regard, it is essential that every effort be expended to penetrate through the decollement into the sediments being subducted. Remaining drilling time might then be apportioned among the fore-arc basin sites. Pending the results of the upcoming workshop on physical properties, a minority feel that the main thrust of the leg should be downhole measurements in a lower-slope site. The panel recognizes that Nankai is very similar to the clastic-dominated Cascadia prism, on which deep decollement-penetrating holes have been recommended. At this point, TECP strongly endorses such deep holes in prisms, and for this reason we downgrade the proposed conventional transect of shallow holes along the Manila trench.

d. ZENISU: An opportunity to document a possible example of ocean-plate shortening seaward of an active trench. Seismic reflection data in the proposal do not substantiate the shortening hypothesis; better records imaging the underthrust oceanic crust are required. Dating the uplift, using tilted sediments on its western flank, is the most important objective.

TECP EVALUATION OF GENERAL SCIENCE PLAN:

The nine-leg program as it stands partially addresses TECP's key thematic interests in the region. The Bonin-Mariana and Vanuatu legs especially are well designed and relevant to arc, back-arc, forearc, and collisional problems. There are three less satisfactory aspects of the plan. First, it does not sufficiently attack the general problem of collision. Collision-related objectives are included in only the Vanuatu and Japan Sea legs (D'Entrecasteaux and Okushiri targets, respectively). Second, the drilling in Lau Basin is chiefly devoted to petrological and geochemical questions and doesn't address tectonic issues such as extension, the nature and evolution of arc foundations, and collision (Louisville Ridge). Third, a better case needs to be made for how proposed drilling in the South China Sea relates to the kinematics and mechanics of extension. Of the four legs discussed above, this one has the lowest priority from a thematic standpoint; Japan Sea and Nankai the highest.

TECP requests that WPAC re-evaluate existing proposals that treat collisional processes and consider expanding existing legs or adding new legs to fully address the problem. Specifically we ask WPAC to reconsider the Louisville Ridge or Ogasawara plateau collisions. Also, the forthcoming proposal by Silver for the E. Sunda area will need to be considered for addition. Most important, TECP views Ontong-Java as an attractive place to identify the basement of an important oceanic plateau and possibly to study a major collision. We ask WPAC to evaluate Ontong-Java on both accounts, although the existing proposal needs to be revised to include better documentation of collisional structures that are accessible to the drill.

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CEPAC MEETING, ANN ARBOR 20-22 OCT. 1986:

Ranking of top - scored drilling proposals:

No.	Proposal No.	Description	Score
1.	232E	JdFuca middle valley, sedimeted zero age crust	1.10
2.	199E	N-Pacific subantartic gyre, paleocean-environ	1.45
3.	-203E	Guyots, central Pacific	1.50
	-222E	Ontong Java, sediment hist., crustal origin	1.50
5.	76E	13 N fast EPR spreading center	1.60
6.	195E	Bering Sea Paleocean-environ	1.75
7.	253E	Black shales, Shatsky Rise	1.78
8.	202E	Marshals, guyots/atoll pairs	1.80
9.	-233E	Oregon accretionary processes	1.90
	-231E	N-Pacific crustal reconstruction	1.90
11.	142E	Ontong Java depth traverse	2.04
12.	237E	Vancouver margin, decollement zone	2.20
13.	3E	Hawaiin crustal flexure	2.23
14.	258E	Galapagos Ridge stockwork	2.27
15.	37E	Costa Rica underplating	2.41
16.	-221E	Equator. Pacific, L.Cenozoic paeocean-environ	2.50
	-182E	Sounder Ridge, test Bering Sea entrap origin	2.50
18.	248E	Ontong Java deep crustal test	2.55
19.	213E	Aleutian clastic wedge, rapid rate accretion	2.60
20.	214E	Aleutian forearc evolut., backstopping geometry	2.65
21.	250E	Navy fan lithofacies	2.68
22.	225E	Sounder Ridge, tectonic evolut. Bering Sea	2.70
23.	234E	Alaska accretion - modelling	2.77
24.	247E	NE Pacific paeocean-environ	2.90
25.	8E	Chile triple junction, ridge-trench collision	2.93

Note: see also CEPACs ranking of 'drilling packages' next page

CEPAC MEETING, ANN ARBOR 20-22 OCT. 1986:

CEPAC named 'drilling packages' to more clearly define and combine high ranking thematic objectives with inclusive regional grouping (each panel member was allowed to select 7 packages):

Ranking		Drilling Packages	Number of votes received (11 voting members)
1.		Atolls and guyots	11
2.	-	N-Pac paleocean & plate reconstr.	10
	-	Ontong Java general	10
4.	-	Zero-age barerock crust	8
	-	Sedimented zero-age crust JdFuca	8
6.		Old Pacific (E.Cret - Jura)	7
7.		Bering Sea paleocean-environ	6
8.	-	Lith flexure	3
	-	Costa Rica underplating	3
	-	South Pacific tect - sed	3
11.		Aleutian/Alaskan convergence/accretion	2
12.	-	Cascadia accretion/convergence	1
	-	Gulf of Alaska terranes	1

<u>no votes for</u>:

- Equatorial Pac paleocean-environm
- Sedimentary processes
- Chile triple juntion
- California margin tect

Note: An updated ranking list / eventually a draft prospectus for CEPAC will be available at the PCOM meeting !

INTERNATIONAL ARCTIC DRILLING TECHNOLOGY WORKSHOP

INTRODUCTION:

The tectonic evolution of the Arctic Basins, their geological history and the impact of the Arctic Ocean on global ocean circulation and climatic history will only be resolved by the drilling of strategic shallow and deep boreholes in the Arctic offshore. Key elements that must be in place before initiating such a program include the documentation of a strong scientific rationale, the specification of appropriate drilling technologies, and the acquisition of adequate regional and site related geophysical data. The scientific rationale is in draft and a workshop on geophysical data acquisition is planned for the near future.

The workshop held at BIO in December 1986 addressed the issue of defining the drilling technologies required to meet the scientific objectives specified for the shelves, margins, ridges, and seamounts of the Arctic Basin. The workshop objectives were threefold:

1. To gain an appreciation and assessment of existing drilling technologies developed for commercial operations in the Arctic.

2. To determine the degree to which these technologies can be utilized to meet specific scientific objectives.

3. To define if any short term or long term technological developments were needed to ensure the achievement of the scientific objectives.

TECHNICAL REQUIREMENTS:

The requirements specified at the outset of the discussions to satisfy the scientific objectives included the need for:

1. Continuous coring providing the recovery of relatively undisturbed samples.

2. Continuous, high-resolution well logging whenever and wherever required.

3. Drilling in water depths ranging from 10m - 4000m.

4. Reaching target depths of 100 to 1000m below seabed.

5. Operating within the landfast, shearzone, and polar pack ice conditions of the high Arctic.

OPERATIONAL CONSIDERATIONS

The Arctic will impose several operational constraints upon the program which will need to be considered.

1. LOGISTICS:

Depending on the drilling technology employed, the following logistical elements must be considered:

a. Base camp for scientific and technical personnel and equipment including servicing facilities for drilling rig and other scientific investigations.

b. Transportation for personnel, equipment, fuel, and food, including airstrip construction and maintenance and servicing facilities for helicopter and fixed wing aircraft.

c. Storage of fuel, drillpipe, and drilling muds (if required)

d. Communications

e. Medical services

f. Navigation instrumentation for locating the camp and positioning the rig.

2. ICE MANAGEMENT:

Depending on the nature of the drilling system employed, this could take the form of icebreaker support vessels or equipment to develop and maintain ice platforms or to construct protective berms or rubble fields.

3. ICE LOADS:

Depending on whether the drilling system is directly exposed to ice loading or protected by a surrounding berm, the structure must be able to withstand the static and dynamic, global and local ice loads that may vary from a few hundred PSI to several thousand tons.

The value used in the design of offshore structures for use in the Beaufort Sea is 300 psi. this is the maximum pressure that ice is assumed to be able to exert on a structure. It is also close to the crushing strength of sea ice, and offshore engineers tend to feel that the figure is unrealistically high, since other failure mechanisms in a converging icefield will relieve the stress before the ultimate crushing stress is reached. However, it is used as a conservative design value. A real maximum that a ship might experience is more likely to lie in the range 100-200 psi.

4. LATERAL MOTION:

The maximum acceptable horizontal or lateral movement allowed during the drilling of a particular hole appears to be about five percent of the total water depth below the rig. This could vary slightly with water depth and drilling equipment.

5. DRILLING HAZARDS:

Drilling hazards that must be considered in the selection of prospective sites include: ice scouring by sea-ice (damage of seabed installations); permafrost degradation during drilling; hydrate decomposition; overpressured water zones; shallow gas and potential hydrocarbon traps. In general, the risk of encountering hazardous or unacceptable conditions decreases with increasing water depth, particularly beyond the shelf. Shallow holes of less than 500 to 1000m are also less problematic.

Selected sites must satisfy the scrutiny of the JOIDES and ODP Safety Panels as well as any national safety regulations before approval is granted. However, it should be noted that Arctic conditions will restrict the site surveys in comparison to more temperate areas.

In addition, regulatory and environmental protection agencies guidelines and requirements must be met for shallow wells on the continental margin. Sufficient evidence to document minimum hazard risk in order to minimize or eliminate the need for risers, blowout preventors, relief wells, and oil spill contingency planning will be needed.

6. ODP TECHNOLOGY:

The adaptation of ODP technologies including the hydraulic piston corer (APC), the extended core barrel and high resolution well log tools to existing Arctic drill rigs is sound possibility. It is therefore proposed to use ODP techonology for scientific drilling.

EXISTING TECHNOLOGIES

BOTTOM COUPLED

This method is practical only at very shallow depths (less than 60 meters water depth). Cost is about 1 m per day. It is our opinion that drilling in these shallow depths can be accomplished more cost effectively by shallow drilling methods either by ship or occupying abandoned gravel islands or other platforms of opportunity.

ICE (THICKENED)

This method appears to be useable in shorefast ice and pack ice. It is not certain if thickened sea ice could resist forces in the shear zone. It should fare relatively well in the central pack but under compressive strains may break up. This method could be used on selected sea ice which is well located scientifically. There are some drawbacks however. It will be an expensive project as C-130 support will be required and accomplished in Pan Arctic style will take approximately 6 months to set up and drill a deep hole; approximately 80 C-130 fights are required to establish the drilling station. In the interim the ice station may well have drifted away from the selected target.

DRILL SHIP

If a light ice year is utilized the GLOMAR RESOLUTION could drill the Alaskan/Canadian Beaufort and Norwegian Greenland sites on the shelf and slope. Existing ice reinforced vessels would be a more certain investment and if modified for continuous coring could satisfy the scientific objectives under any but the heaviest ice years. Present ice drilling ships cannot operate in greater than 4/10 ice with a 2 foot thickness.

In the pack ice a modified barge such as the round-bottomed Gulf KULLUK or an ice strengthened round bottom vessel such as a modified GLOMAR CHALLENGER would be the best because they would offer the flexibility of mobility under power and/or tow when ice conditions permit plus providing a state of the art drilling rig. An attendant icebreaker would be desirable for safety in relocation or maintaining station. Major relocation would probably require the use of the proposed class 7 Canadian ice breaker or a Soviet platform.

Depth of coring would be dependent on ice motion but could be multi-pipe during quiet conditions. Preliminary ice drift data suggest that coring in the pack ice will be possible 25% of the time for multi-pipe holes.

SHALLOW DRILLING

Shallow drilling is a cost effective method to obtain both stratigraphic and paleoceanographic data from the upper 120 m. If sites are carefully selected it should be possible to avoid the thick Plio-Pleistocene overburden and drill into older Cenozoic sequences. It is envisioned these sites can be from various platforms of opportunity including ships, ice and either man made or natural islands. Some of the potential Beaufort Sea sites scientific objectives can be satisfied by this method.

FROZEN IN BARGE

Drilling barges frozen into the sea ice have some potential capability as drilling ships; however, they lack mobility and must drift with the sea ice. Mobility to reach identified targets is mandatory and may be satisfied by icebreaker towing. It would be anticipated that a small icebreaker would be needed to accompany the barge. A rounded hull will be necessary so that ice forces cannot build up to crushing levels.

ODP - GLOMAR RESOLUTION

GLOMAR RESOLUTION has the capability to drill the Beaufort and Yermak proposed sites if ice conditions are light. It is suggested that PCOM include appropriate sites when the vessel is in the geographic area in case favorable ice conditions exist.

PERSPECTIVES OF ARCTIC DEEP-SEA DRILLING

The documentation presented in the previous chapters demonstrates clearly that Arctic deep-sea drilling is technically feasible with available technology, even though it will involve considerable expense and the organization of a large international effort.

The establishment of a permanently manned scientific station from which the drilling operations can be carried out, will doubtless also attract many other types of investigations which will profit from the logistics of the drilling operations. One might anticipate "piggy-back" programs such as Arctic marine biology dynamics, physical and chemical oceanography, aural studies and glaciology, ice and ship engineering.

In this section we will develop a scenario for Arctic deep-sea drilling based on existing technology and concepts as described in the accompanying technical chapters. We will also indicate the requirements for monetary support as far as presently possible:

I. It is proposed to commemorate the famous Norwegian F. Nansen's FRAM drift which was conducted during 1893-1896 and which has shown that the entire Arctic pack ice moves clockwise as part of a gigantic gyre. Innovative thinking and F. Nansen's courageous personal effort led to the construction of the famous polar research vessel FRAM. It is our proposal that Arctic deep-sea drilling would be carried out in celebration and honor of the centennial of this singular event. Thus, the program would be known as Centennial of Nansen's Transpolar Drift (COND). The DRIFT STATION will be occupied in the years 1993-1996 and will represent a daring, international and interdisciplinary effort to carry out research in the Arctic truly worthy of the great F. Nansen.

II. The central effort of the station will consist of the deep-sea drilling effort which will require the following: 1) Arctic deep-sea drilling will require the establishment of major multi-year program of field operations to drill a series of bore holes along a drift tract covering all major structural units of the Arctic deep-sea basins. The drilling program will have to be accompanied by a major effort of scientific analyses on the drilling platform (something like on the JOIDES RESOLUTION, but a bit more modest) and of shorebased studies which, however, will not be described in this document. 2) It is proposed to use a drilling platform which will follow the Arctic pack ice drift for long time spans; however, the unpredictability of this drift requires that the drilling rig is mobile that it can be relocated during the summer thaw in the case of unfavorable drift routes. 3) Water depths of site locations can vary between 500m and 3500m, penetration into sediment and basement will not exceed 500 - 1000m so that a drill string of 4500m maximum length (plus spares) will be required. 4) The adaptation and use of ODP-coring techniques is proposed with continuous coring of sediments and basement is required. 5) The safety problems in the Arctic deep-sea basins are assumed to be minimal; therefore, drilling without a riser system and without blow/out preventer is proposed. 6) The facilities of the drill platform will also be used to house a large variety of other scientific programs which will benefit from the logistics of the station.

The drilling rig and the lab facilities require use of a platform or an ice-reenforced ship which are presently readily available (expected expense on the order of 15-30m $US as capital investment, or daily rates of presently 65 k $US). Canadian (expected to be available in 1993) or Russian ice-breakers (presently in existence) will allow to assist in relocating the drilling platform in the case of unfavorable drift by the enveloping ice pack. A smaller ice breaker will have to accompany the drilling platform/ship at all times for safety reasons (daily rates of approximately 5 k or less; reduced crew, only stand by). It is proposed that both units are brought simultaneously into the western Arctic basin, probably through the Bering Strait, that they are frozen into the ice pack and that they are allowed to follow the drift of the Arctic ice pack across the Arctic basin. A 3-4 year period is presently deemed sufficient for this effort.

The personnel of the entire station will have to be exchanged at least every 2-3 months (we envision 4 legs per year). Crew change can be organized by aircraft which will require construction of an airstrip close to the station (also maintenance for supplying the station). All included the station should house 100-150 people (all included) who will have to be exchanged.

TABLE I

Platform	Capability Coring	Other	Cost Appro.	Limitations
A. Bottom Coupled	continuous if ODP technology used	deep holes possible limited to one hole	1 m per day	very high cost 60 m maximum depth of water
B. Ice (thickened)	continuous if ODP technology is used in existing rigs	deep holes possible	21-23 m per core	limited mobility via air high logistic and support cost summer operations might be difficult
C. Drill ship	continuous if ODP technology is used in existing ships	most reasonable in both cost and is reaching science objectives limited mobility	30-60 m per year with ice breaker	require ice breaker support rounded hull to minimize ice pressures
D. Shallow drilling	continuous	Ship ice or land mounted	8,500 a day	depth limited (60 m) 120 m core length
E. Frozen in barge	continuous if ODP technology is used	deep holes possible	40 m per year without ice breaker	lack of mobility unless round hull is used subject to ice crushing ice breaker escort required
F. ODP	continuous with well logging		32.5 m per year	cannot work in even loose ice

ARCTIC DRILLING SCIENTIFIC RATIONALE

J.Thiede [1]
P.Mudie [2]
L.Johnson [3]

1 Geologisch-Palaeontologisches Institut
Christian Albrechts Universitaet
Olshausenstr. 40
D-2300 Kiel 1, F.R.Germany

2 Atlantic Geoscience Centre
Bedford Institute
Dartmouth, Nova Scotia
Canada

3 Geophysical Sciences
Office of Naval Research
Arlington
VA 22217-5000
U.S.A.

INTRODUCTION

Importance of the Arctic

Knowledge of the Arctic Ocean is important for more than just solving regional problems in that it is linked to the evolution of the adjacent oceanic basins as well as adjacent continents. An understanding of past and present plate movements in the Arctic will be required before a complete model of late Mesozoic and Cenozoic northern hemisphere plate motions can be achieved. These motions and the structure, paleontology, and paleoenvironment of the Phanerozoic sedimentary rock sequences of the circum-polar regions and its continental shelves are highly relevant to the exploration for hydrocarbons.

Today's polar oceans represent unique environments because of their cold hydrospheres and because of the ice caps on adjacent land masses. These environments are the result of a long-term climate change since the end of the Mesozoic and short-term, recurring climate shifts between late Cenozoic glacials and interglacials. Studies of the marine depositional environments and sediments of the polar oceans which record this evolution, have provided very important but fragmentary data to describe the onset of the cold polar climate since late Eocene/Oligocene time and the response of faunas and flora to the cold temperatures. The evolution of the cold hydrospheres have also had a tremendous impact on the hydrography of the world's oceans because as the surface waters of the polar oceans cool, they sink and flow equatorward to fill all major deep-sea basins. The climatic evolution in the polar regions is therefore global in it's impact, for both the responses and dynamics of the world's oceans and atmosphere as well as for the biosphere. To trace this evolution from its probable onset in the late Mesozoic to the present is a first order geoscientific problem which can only be solved by studying the history of the polar oceans. The sediment record of the southen oceans is quite well known from long piston cores and drill samples from the DSDP. The Arctic however is much less well known (Thiede and Johnson, 1983).

Paleo-oceanography

High latitude polar regions of the Earth have experienced cold, cool and temperate paleoclimates in the course of their geological history, but they have probably always been colder than low latitude continents and oceans. Extreme climates which led to the development of extensive frozen regions at high latitudes can, however, only be documented for a few, relatively short intervals of the Earth's history which apparently have been separated by long time spans with little or no ice (Frakes, 1979). The youngest one of these developments, the Cenozoic evolution of glacial-type climates during the past 30-40 Ma, was different from the preceding ones. Climatically isolated land areas and ocean basins were generated by plate tectonic processes both on the southern and northern hemispheres which experienced repeatedly the effects of glaciations. For all scenarios of glacial-type climates older than the Cenozoic, we have only been able to document unipolar glaciation because the opposite high latitude area was situated in wide deep ocean basins, probably kept relatively ice-free because of the advection of warmer surface waters from lower latitudes.

Despite the apparent similarity of Quaternary high latitude paleoclimates, the development of glacial-type paleoceanographies of the northern and southern polar ocean have revealed important differences. Our understanding of Cenozoic southern hemisphere paleoclimates and paleoceanography is much more advanced than it is for the northern hemisphere. It is particularly intriguing that the presently available data suggest that the southern hemisphere may have become cold more than 20 my earlier than its northern counterpart.

There are numerous reasons why it has been so much more difficult to achieve progress in studying the Late Mesozoic and Cenozoic history of the northern polar oceans. The prominent major obstacles have been 1) the difficulty in obtaining deep-sea sediment cores which could be dated easily and efficiently by means of presently available stratigraphic methods and dating techniques, and 2) the lack of sufficient sample material documenting the early phase (e.g. Pre-Pliocene) of the development of cold surface waters in the Arctic Ocean proper. In Fig.1 we have compiled evidence from all presently available deep-sea sediment cores from the Arctic Ocean proper, and it is immediately clear that this attempt to synthesize properties and changes of the Late Mesozoic and Cenozoic depositional environments of the northern polar oceans is highly fragmentary.

Available samples and data

After Scandinavian scientists recovered and described the first deep-sea sediment samples from the Arctic Ocean proper (Boggild, 1906), great progress has only been achieved over the past two decades. American expeditions from ice-islands sampled the central Arctic region (Fig. 5, Clark et al., 1980). the Canadians launched the CESAR and LOREX expeditions (Jackson et al., 1985; Morris et al., 1985). The Eurasia Basin was sampled in the 1980's by the Swedish YMER-80 expedition (Bostrom & Thiede, 1981 and 1984), the FRAM-I and FRAM-IV ice-islands (Kristoffersen, 1979), the Norwegian RV POLARSERKEL expedition (Markussen et al., 1982) and finally the W. German expeditions on RV POLARSTERN (Augstein at al., 1984).

The greatest number of sediment cores from the Amerasian Basin were obtained from ice-island T-3. Some 580 cores were collected and curated at the University of Wisconsin, Madison. Miscellaneous cores were also taken from T-3 during the time of its occupancy (1954-1974) by the Lamont group, and these cores now reside at the Lamont-Doherty Geological Observatory, Palisades, New York.The Canadian CESAR project (Jackson et al., 1985) recovered 16 sediment cores from the drifting ice-pack during the spring of 1983. The Lomonosov Ridge and Makarov Basin cores have a similar but different lithologic sequence to that of the Alpha Ridge. Sediment of the Fram basin includes turbidites and glacial-marine sediment and has not been studied. Tentative correlation of the cores from the Lomonosov Ridge and Makarov Basin with those of the Alpha Ridge (Morris et al., 1985) indicates that the cores are Upper Pleistocene (730 Ka) but more detailed chronostratigraphic studies are required to provide a detailed correlation of lithostratigraphic units.

The sediment cores collected so far from the Eastern Arctic Basin comprise without exception Upper Cenozoic, probably Quaternary deposits (Markussen et al., 1985; Zahn et al., 1985) which resemble in general characteristics those of the Central and Western Arctic basins (Clark et al., 1980).

In total these core collections contain several hundred sediment cores of lengths varying between a few centimeters to about 10 meters of Neogene and Quaternary sediments, but there are only 4 cores from older deposits. The T-3 ice-island colletion includes two cores with Cretaceous sediments and one core with Paleogene biosiliceous ooze (Kitchell & Clark, 1982; Clark and Byers, 1984). The CESAR expedition succeeded in recovering one Upper Cretaceous laminated diatomite (Mudie & Blasco, 1985, Figs. 1 and 2).

PRESENT KNOWLEDGE

Late Mesozoic

The oldest well-dated sediment recovered from the Arctic Ocean is Upper Cretaceous (Campanian) black mud which was found in a core about 100 km shoreward of younger Mesozoic cores on the Alpha Ridge (Fig. 3). The black mud has a 15% organic carbon content and carbon isotopes indicate that most of the material is terrestrial plant debris and marine polynomorphs which have undergone only minor diagenetic alteration (Clark and Byers, 1984). Alpha Ridge was probably emergent in the Mesozoic in the same manner as present day Iceland (Jackson et al., 1986) and thus shallow water deposits might be expected.

Slightly younger Upper Cretaceous biogenic silica has been identified in three cores. (Figs. 2 and 3) from the Alpha Ridge. The sediment consists of diatoms, silicoflagellates, ebridians and archaemonids with densities up to 400 X 10^6 specimens/g of bulk sediment. This abundance equals or exceeds that reported from areas of oceanic upwelling in the Gulf of California, the coast of S.W. Africa and the Antarctic Convergence (Kitchell and Clark 1982). The sediment has little or no terrestrial component, lacks borrowing and is laminated.

The biosiliceous sediment of core 6 of the CESAR project (Figs. 2 and 3) (Mudie and Blasco 1985) has very well defined laminae. Both light and dark colored layers are characterized by a diverse silicons phytoplankton (diatoms and silicoflagellates) and there is not evidence of size-sorting which would indicated bottom current winnowing or gravity-flow deposition (Dabros and Mudie, 1985). The only consistent difference between light and dark colored layers is in the amount of iron hydroxide particulates which are more abundant in the dark layers. If these layers are seasonal then the sedimentation rate could exceed 50m/Ka. Even in up welling areas this seems excessive and therefore the layers may represent productivity cycles responding to the longer periods of orbital forcing (Kitchell and Clark, 1982).

Early Cenozoic Paleoenvironments

The upper part of the siliceous sediments in CESAR core 6 and one of the T-3 cores contains biogenic siliceous microfossils and polynomorphs of Eocene age (Bukry, 1984, Mudie, 1985). Although it is possible that upwelling was continuous from at least Late Cretaceous through the middle Eocene, no record of undisturbed earliest Cenozoic sediment has been recovered to confirm this possibility. Except the presence of glendonites (R. Spielhagen, pers. comm. 1985) and the occurrence of possibly ice-rafted coarse clastics (Dalland, 1976) in the Paleogene sequence of Svalbard there is no evidence of glaciation or ice formation. The Paleocene-Eocene floras of the Arctic Ocean and surrounding land as well as the vertebrate fauna reported to date (Hickey at al., 1983) support he idea of moderate climate with perhaps a shorter and much warmer winter than that of the present. The late Eocene-Oligocene flora of the Beaufort Sea, however, indicates a severe climatic cooling in the late Paleogene (Norris, 1983).

Late Cenozoic

Post-Eocene to pre-Upper Miocene sediment has not been identified in the central Arctic Ocean deep sea. In the context of the Earth's climate, this is the interval when apparently glaciation was initiated in high latitudes and a strong thermal gradient developed both in oceans and atmosphere. This transition cannot be documented in the Arctic proper, but evidence for the commencement of northern hemisphere glacial climates at approximately the same time has developed from interpretation of the world ocean ^{18}O record and palynological sequences in the Sverdrup

Basin (Norris, 1985). The upper Cenozoic sediment record of the central Arctic Ocean documents only glacial depositional environments.

Scientific Questions

As is evident, one of the first order unsolved questions in earth sciences is the paleo-oceanographic and paleoclimatic evolution of the northern polar deep-sea basins. As noted some progress has been achieved over the past 20 years with expeditions from ice stations and ice reinforced research vessels in obtaining numerous although relatively short, sediment cores. These samples document an ice free, highly productive warm Arctic deep sea influenced by intensive seasonal fauna and flora changes for the Mesosoic and Early Cenozoic (approximately 70-40 myB.P.), and an ice covered cold glacial type Arctic Ocean for the latest Cenozoic (past 5 my). No data exists for the intervening interval. It is presently believed that, in the course of the development of Cenozoic glacial type conditions, the southern hemisphere had already cooled 25-35 myB.P. while northern hemisphere glacial type environments can only be documented for the youngest geologic past. We do not know how and when the Arctic Ocean ice cover developed, or how it behaved in response to late Cenozoic glacial-interglacial climatic fluctuation. Biostratigraphic type sections are required for both the eastern and western Arctic. There are indications of significant differences in rates of sedimentation, and possibly onset of climatic deterioration. Alpha and Lomonosov Ridges in the past were a greater barrier to free circulation; however their effects and rate of subsidence are unknown.

The following are the first order of paleoclimatic scientific questions that must be addressed in both the eastern and western Arctic.

1) Characterization of the pre-Glacial Arctic deep-sea paleo-environment;
2) Timing and characteristics of initial climatic cooling and glaciation;
3) Timing, magnitude and periodicity of high amplitude late Cenozoic climatic oscillations and resultant ice sheets both terrestial and marine;
4) Paleo-oceanographic and paleontologic (both fauna and flora) responses to climatic change and suspected oscillatory periods.

In addition to paleoclimatic and stratigraphic issues there are significant structural and tectonic Arctic issues.

Drill samples from Alpha Ridge are required to determine if it is really an alkalic basaltic structure as suggested by one sample obtained during CESAR (Von Wagoner & Robinson, 1985) and the age of the basement rocks. Likewise, Lomonosov Ridge rocks are assumed to be a rifted sliver of the Barents/Kara sea margin but there is no direct proof. Chukchi Plateau and associated borderland highs are totally unknown as to whether they are continental or oceanic. This is a critical feature in any reconstruction. Morris Jessup Rise and Yermak Plateau have never been sampled, but at least in the case of Yermak Plateau, they are assumed to be partially stretched continental crust and part oceanic basalt resulting from hot spot activity. The Lincoln Sea is totally unknown but is a key area where the Lomonosov and Alpha Ridges meet the continents in an unknown way, and secondly where the Nares Strait joins the Arctic. This latter junction bears directly on the controversy of whether Nares Strait is a transform along which Greenland slide as Baffin Bay opened, and on the evolution of ocean corridors linking the North Atlantic and Arctic biogeographical provinces. The continental margins of east Greenland and Svalbard are both in certain regions suspected rifted and sheared with structural targets present to define the timing and evolution as well as when free circulation existed with the Arctic Ocean commenced.

Approach

In order to address the foregoing scientific issues long cores (at least 200-300 m in length) are required. The problems of Arctic drilling and the attendent site surveys are non-trivial and will pose a significant challenge. The technical feasibility and site survey problem will be treated in a separate chapters in detail.

There are certain options.

1) Utilize an ice island such as Hobson's Choice as a platform;
2) utilize multi-year floating sea ice suitably thickened and smoothed;
3) utilize an existing drilling ship either frozen into the ice pack to drift passively or use icebreakers to reposition to drill specific targets.

5) use JOIDES RESOLUTION for selected Beaufort and Greenland Sea sites.

Site selection will pose a problem. One approach would be to use a sea ice camp in the vicinity of previous geophysical surveys namely T-3, LOREX and/or CESAR. The 1987 deep penetration by the Polarstern may yield a promising site, which could be returned to. Alternatives if a drifting platform is utilized site surveys could be accomplished ahead of the drift.

In reality arctic drilling will probably be approached in a step fashion with the easiest and least expensive targets attempted first.

Summary

Mesozoic and Paleogene Arctic Ocean sediment cores, consisting of Campanian black muds and uppermost Cretaceous and Paleogene siliceous oozes, document a relatively warm, northern polar deep-sea basin. It is not clear if the entire Arctic Ocean was an area of high organiz productivity or only parts of the western Alpha Ridge.

All upper Cenozoic Arctic Ocean deep-sea sediment cores document a cold, more or less ice-covered northern polar deep-sea basin, which occasionally received large amounts of ice-rafted coarse terrigenous sediment components from the adjacent continents. Sedimentation rates in the Eastern Arctic are on the order of 1-3 cm/Ka. In the central Arctic they reached rates of 1-3 mm/Ka.

There is no doubt that the Arctic Ocean has been ice-covered during the Plistocene glacials and interglacials although the extent, completeness and thickness of the ice-cover is presently unknown for the does Neogene sediment. The lack of samples covering the time span from Early Eocene to Late Miocene also prevents a more precise definition of the advent of northern glacial-type climates.

Recommendations

Major progress in our understanding of Arctic Ocean paleo-oceanography can only be achieved if the following means will be available, which are not as much a question of available methodology as a question of financial resources and international resolve to act on these needs.

Deep-sea drilling either from the ice or from a floating platform to obtain long large diameter, continuous sediment cores from few, carefully selected sites with site surveys.

The history of the northern polar deep-sea water masses is one of the last, almost completely unsolved epics of paleo-oceanography. Its detailed understanding will have wide implications for many fields of marine and continental geosciences and climatic research.

Major advances can be made in understanding the structure and genesis of the Arctic Basin if the major physiographic features can be sampled to determine their physical characteristics, time and mode or origin.

Figure Captions

Fig. 1 Temporal coverage and composition of all presently available Arctic deep-sea cores (compiled from various sources).

Fig. 2 Physiographic provinces of the Arctic and location of early Cenozoic/Late Mesozoic cores.

Fig. 3 Stratigraphy of the early Cenozoic/Late Mesozoic cores from Mudie et al 1986.

Augstein, E., Hempel, G., Schwarz, J., Thiede, J. and Weigel, W., 1984. Die Expedition ARKTIS II des FS 'Polarstern' 1984; Berichte zur Polarforschung, v. 20, 192 pp.

Blasco, S. M., Bornhold, B. D., and Lewis, C. F. M., 1979. Preliminary results of surficial geology and geomorphological studies of the Lomonosov Ridge, Central Arctic Basin, Geological Survey of Canada Paper 79-10; p. 73- .

Boggild, O. B., 1906. On the Bottom Deposits of the North Polar Seas; Scientific Results of the Norwegian North Polar Expedition 1893-1896, v. 5, p. 1-62.

Bostrom, K. and Thiede, J., 1981. Marin geologi och geofysik i Arktiska oceanenproblem och preliminaera resultat; YMER Aarsbok 1981, p. 90-109.

Bostrom, K. and Thiede, J., 1984. Swedish Arctic Expedition. Cruise report for Marine Geology and Geophysics. Sediment core descriptions; Meddelelser Stockholms Universitetets Geoelogiska Institutionen, v. 260, 123 p.

Bukry, D., 1984. Paleogene Paleocenography of the Arctic Ocean is Constrained by the Middle or Late Eocene Age of USGS core Fl-422; Evidence form Silicoflagellates; Geology, v. 12, p. 199-201.

Clark, D. L. and Byers, C. W., 1984. Cretaceous Carbon-rich Sediment from the Central Arctic Ocean; Geological Society of America Abstracts, v. 16 (6), p. 472.

Clark, D. L., Whitman, R. R., Morgan, K. A. and Mackey, S. D., 1980. Stratigraphy and Glacial Marine Sediments of the Amerasian Basin, Central Arctic Ocean; Geological Society of America Special Paper, v. 181, 57 p.

Dabros, M. J. and Mudie, P. J. 1985. GSC Report of Activities v. 85.

Dalland, A., 1976. Erratic Clasts in the Lower Tertiary Deposits of Svalbard: Evidence of Transport by Winter Ice; Norsk Polarinstitutt Aarbok, p. 151-165.

Frakes, L. A., 1979. Climates Throughout Geologic Times; 310 p., (Elsevier Publishing Company) New York.

Hickey, L. J., West, R. M., Dawson, M. R., and Choi, D. K., 1983. Arctic Terrestrial Biota: Paleomagnetic Evidence of Age Disparity with Mid-northern Latitudes during the Late Cretaceous and Early Tertiary; Science, v. 221, p. 1153-1156.

Jackson, R., Forsyth, D. A. and Johnson, G. L., 1986, in press. Summary of Arctic Geophysics; Journal of Geodynamics

Kitchell, J. A. and Clark, D. L., 1982. Late Cretaceous-Palaeogene Palaeogeography and Palaeocirculation: Evidence of North Polar Upwelling; Palaeography, Palaeoclimatology, Palaeoecology, v. 40, p. 135-165.

Kristoffersen, Y., 1985, in press. The Arctic Ocean: Outline of the Submarine Geology and Geologic Evolution of a Polar Region; Geofysiske Publikasjoner, Det norske vitenskapsakademi, Oslo.

Markussen, B., Lovlie, R. and Thiede, J., 1982. FRAM-I. Senkvartaere avsentninger i den ostlige delen av Polhavet (Framstredet); Institutt for geologi Oslo, Intern skriftserie, v. 40, 29 p.

Markussen, B., Zahn, R. and Thiede, J., 1985. Late Quaternary Sedimentation in the Eastern Arctic Basin. Stratigraphy and Depositional Environment; Palaeogeography, Palaeoclimatology Palaeoecology, v. 50, p. 271-284.

Morris, T. H., Clark, D. L. and Blasco, S. M., 1985. Sediments of the Lomonosov Ridge and Makarov Basin: A Pleistocene Stratigraphy for the North Pole; Geological Society of America Bulletin, v. 96, p. 901-910

Mudie, P. J. 1985. The Palynology of the CESAR cover. Geol. Sur. Canada. Pages 84-22; p. 149-174.

Mudie, P. J. and Blasco, S. M., 1985. Lithostratigraphy of the CESAR cores. Geological Survey of Canada Paper 84-22; p. 59-99.

Mudie, P. J., Stoffyn-Egli, P., and Van Wagoner, N. A. 1986. Geological constraints for tectonic models of the Alpha Ridge. In: L. Johnson and K. Kaminuma (eds), Polar Geophysics. Journal of Geodynamics, v. 6.

Norris, G. 1982. Spore-pollen evidence for early Oligocene high latitude cooling episode in Northern Canada, Nature v. 297, p. 387-389.

Thiede, J. and Johnson, G.L., 1983. Arctic Sciences: A Whither the Ocean Sciences, International Workshop on Marine Geosciences, Heidelberg (FRG) IUGS, Commission of Marine Geology; p. 59-74

Thiede, J., Clark, D. L. and Herman, Y., 1987, in press. Late Mesozoic and Cenozoic Palaeoceanography of Northern Polar Oceans, DNAG Arctic Vol. A. Grantz, L. Johnson and W. Sweeney, eds.

Van Wagoner, N. A. and Robinson, P. T., 1985. Petrology and Geochemistry of a CESAR Bedrock Sample: Implications for the Origin of the Alpha Ridge. Geological Survey of Canada Paper 8422; p. 47-57.

Zahn, R., Markussen, B. and Thiede, J., 1985. Stable isotope data and depositional environments in the Late Quaternary Arctic Ocean; Nature, Vol. 314, p. 433-435.

Figure 1.

Representation of age span of Arctic cores. Modified from Thiede and Johnson 1983.

Figure 2.

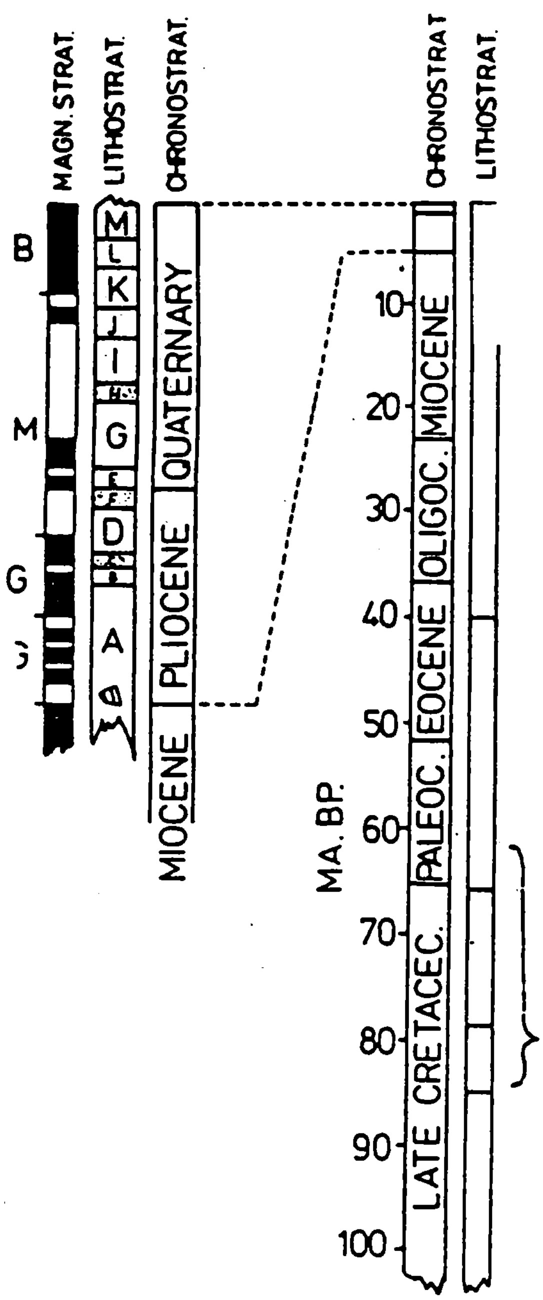
Location of Arctic cores with sediment older than Eocene. From Mudie et al 1986.

Figure 3.

Stratigraphy of Arctic cores with sediment older than Eocene. From Mudie et at 1986.

SEDIMENTS AND HISTORY OF THE ARCTIC OCEAN:

TEMPORAL DOCUMENTATION



<u>Numerous cores:</u>
Fossil-rich and -poor layers of clays with ice-rafted debris. Episodic ice-free?

?

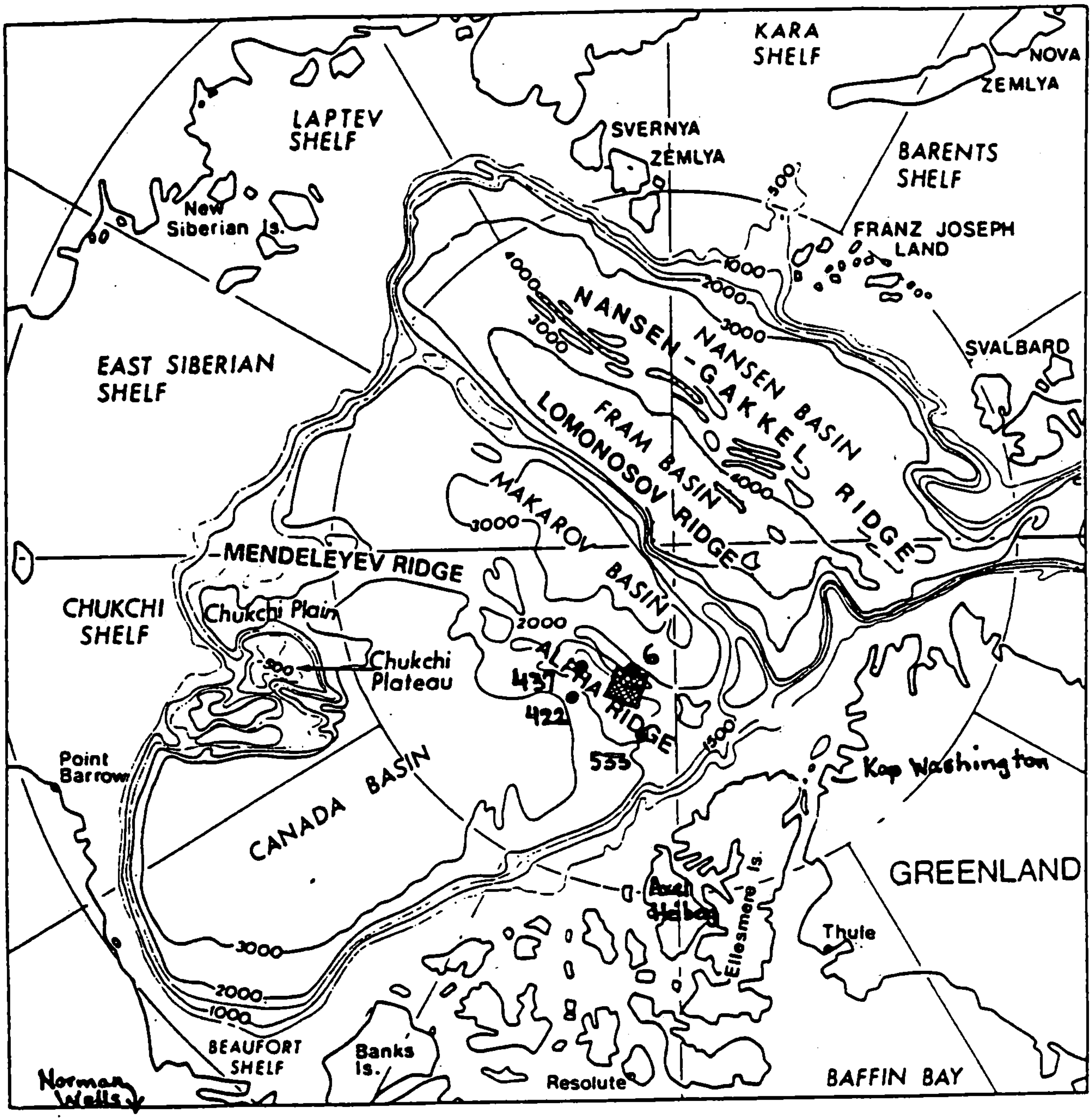
<u>One core:</u>
Orange yellow sediment with silicoflagellates and diatoms. Affinities to temperate floras. FL422

<u>One core:</u>
Orange yellow sediment with silicoflagellates and diatoms. FL437

<u>One core</u>: Approx. 2m of laminated diatom size. CESAR6

<u>One core:</u>
Black mud with marine dinoflagellates and terrestrial plant debris. FL533

?


KARA SHELF
NOVA ZEMLYA
LAPTEV SHELF
SVERNYA ZEMLYA
BARENTS SHELF
New Siberian Is.
FRANZ JOSEPH LAND
EAST SIBERIAN SHELF
SVALBARD
NANSEN BASIN
NANSEN-GAKKEL RIDGE
FRAM BASIN
LOMONOSOV RIDGE
MAKAROV BASIN
MENDELEYEV RIDGE
CHUKCHI SHELF
Chukchi Plain
Chukchi Plateau
ALPHA RIDGE
6
437
422
533
Point Barrow
CANADA BASIN
Kap Washington
GREENLAND
Axel Heiberg
Ellesmere Is.
Thule
BEAUFORT SHELF
Banks Is.
Resolute
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500
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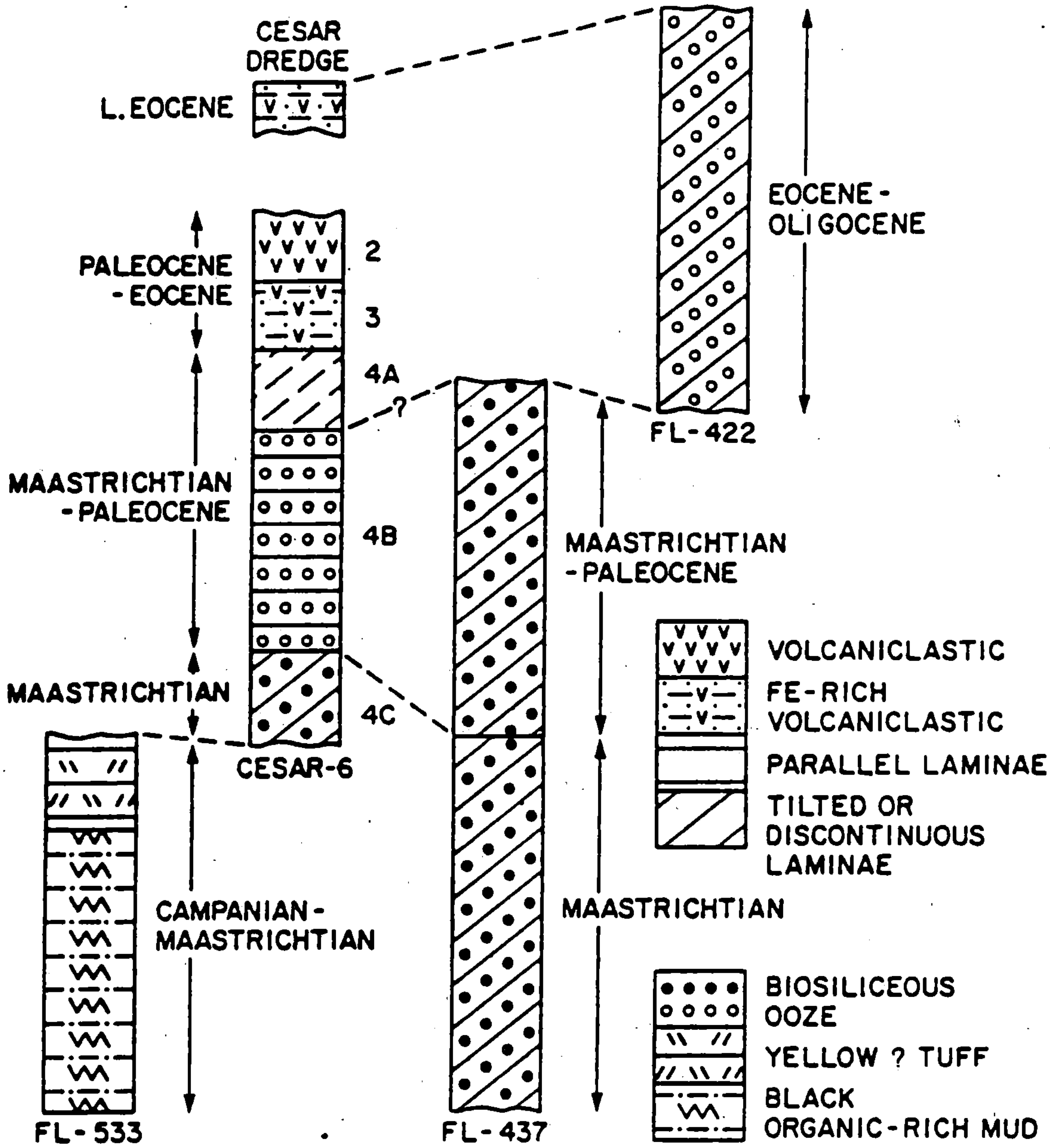
CESAR DREDGE
L. EOCENE
PALEOCENE - EOCENE
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MAASTRICHTIAN - PALEOCENE
4B
MAASTRICHTIAN
4C
CESAR-6
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FL-422
MAASTRICHTIAN - PALEOCENE
MAASTRICHTIAN
FL-437
CAMPANIAN - MAASTRICHTIAN
FL-533
VOLCANICLASTIC
FE-RICH VOLCANICLASTIC
PARALLEL LAMINAE
TILTED OR DISCONTINUOUS LAMINAE
BIOSILICEOUS OOZE
YELLOW ? TUFF
BLACK ORGANIC-RICH MUD

SITE SURVEY FOR ARCTIC DRILLING

MARGINAL REGIONS

BEAUFORT SHELF

This geographic region although ice infested can be worked by geophysical vessels. There are also commercial wells available in many locales to provide stratigraphic data. For the proposed sites adequate geophysical data are or can be made available.

YERMAK PLATEAU

During favorable ice years multi-channel data can be obtained to provide an adequate basis for a site survey. All proposed drill sites have some multi-channel reflection data except - - -.

DEEP ARCTIC

Specific Sites
One option is to drill only where adequate data now exists such as regions covered by CESAR or LOREX seismic reflection and retraction date.

Second option is to develop new technologies to do site surveys where the ice cover precludes ship operations.

One approach is to utilize existing methods for obtaining seismic reflection data for an icebreaker in pack ice. In summer 1988 the USGS/ONR will sponsor a cruise to the Chukchi Plateau. It is hoped that seismic reflection can be obtained by towing a sled containing an air gun and a short receiver stream from a single fixed submerged body. The tow body would be coupled by a rigid hollow member to the hull and pass through the ice/water interface with the contained cables. The unit would be placed far enough aft to preclude tangling of the hydrophone streamer and ships screws if the vessel backs down.

Geophysical drones are a distinct possibility. Drones for physical oceanography are now under development. A sub set of these could be equipped with a streamer array (very thin wire). Sound sources could be chemical set to detonate at depth or impulsive. A study to determine which is most power effective would be required.

The ultimate would be a manned submarine equipped for geophysical work. The high cost will probably preclude this option.

FREE DRIFT

If the drilling vessel drifts with the pack ice an "in house" site survey capability will be needed. Some salient features might include:

* An array of hydrophones or sonobuoys, linked to the ship by hard wire or radio, and deployed through the ice, would symmetrically surround the drilling platform. The effective radial distance from the drilling

platform would be the equivalent of about one to several days common drift distance. A common sound source, probably an air gun, would be employed. Drift rates are slow, so even at a very slow pulse repetition rate, sectors of the array could be sequentially or simultaneously recorded, giving a set of continuous recordings, each with its directionality. The pulse repetition rate could be linked to drift rate or distance traversed. Although direction of drift can change, the ice pack does not rotate significantly, thus the directionality of the array could remain relatively stable for long periods. Range between sensors should be internally calibrated as needed. The array could be established, maintained and repaired with vehicular or helicopter support. The multiplicity of the array offers some redundancy, in case of partial failure.

* Opposite ends of the array or purposeful extensions, or even a satellite array, beyond that needed for the site survey function, could give substantial aperture for deep penetration reflection or refraction study. * A hull-mounted sub-bottom profiler would give information directly beneath the drilling platform, particularly in the detail of the upper 100-200 meters of sediment.

* Geophysical work could be linked to the drilling program only by the potential logistic support from the platform, such as refraction lines across major geological features within reach of the drift track.

EXECUTIVE SUMMARY

Arctic drilling for geoscientific investigation is clearly feasible as the requisite technology has been developed both in industry and the ODP program. There are two basic approaches which are recommended:

I. The Beaufort Sea shallow holes on the shelf are feasible by a number of methods. The most economic for paleoceanographic and shallow stratigraphy studies might be occupation of abandoned islands for shallow drilling. Given a light ice year all the identified sites can be reached by the GLOMAR RESOLUTION and/or by existing industry vessels drilling platforms.

II. The deeper sites both in regard to water depth and distance from land are a more formidable challenge but clearly within grasp of the present technology. The best approach for this situation is a ship/platform which would be largely frozen in the ice pack but with the capability to reposition when ice conditions are permitted. A rounded hull to minimize ice pressure and warm water lubrication of the hull are important considerations. With patience and an icebreaker escort it is likely a number of specific sites could be sampled. It is considered this would be preferable to a random track which would result from a passive freeze in.

Draft Minutes
Sediments and Ocean History Panel

United States Geological Survey
Palo Alto, California
March 9, 10 and 11, 1987

Members present:

L. Mayer (Canada), Chairman
M. Arthur (URI)
A. Droxler (Rice U.)
R. Garrison (UCSC)
W. Hay (U. of Colorado)
P. Meyers (U. of Michigan)
R. Stein (Germany)
W. Normark (USGS)
I. Premoli Silva (ESF)
I. Saito (Japan)
R. Sarg (Exxon)
A. Schaaf (France)
N. Shackleton (England)

In attendance:

J. Barron (USGS)
J. Ingle (WPAC)
R. Jarrard (LDGO - logging)
M. Wiedicke (JOIDES office)
N. Pisias (PCOM) - Days 2 & 3
W. Sliter (CEPAC)
E. Taylor (TAMU)

Absent:

M. Goldhaber (USGS)
R. Embley (NOAA)
L. Tauxe (SIO)

1. <u>Opening Remarks and Approval of Previous Minutes:</u>

1.1 The meeting began at 8:45 after a 15 minute wait for a PCOM liaison to appear. When it was confirmed that there was no PCOM liaison in town, the meeting was called to order and new members (R. Stein) and liaisons (Sliter) were introduced.

1.2 Minutes of 20 - 21 October meeting were accepted.

1.3 At this point, the Chairman related his limited understanding of the PCOM liaison situation - Gartner in Texas having only received his tickets that morning - Kastner in La Jolla having classes to teach and expecting Gartner to attend. <u>The SOHP is greatly distressed by the failure of a PCOM liaison to appear. With PCOM - Panel communication so critical, it is outrageous to conduct a meeting with no PCOM representation. Clearly a formal mechanism of assigning a PCOM liaison to a meeting is in order.</u>

2. <u>Liaison Reports</u>:

2.1 PCOM Report (M. Wiedicke)

In the absence of a PCOM representative, M. Wiedicke kindly agreed to review the results of the January PCOM meeting. In particular, he reviewed those legs of most interest to SOHP:

1 - Indian Ocean scheduling decisions:
  a - Red Sea, Makran dropped
  b - SWIR leg delayed to allow time for guide-base construction
  c - 2 legs scheduled for Argo/Exmouth

2 - Leg 114 - dropped requirement to pick up W-7
  - prioritized sites as SA2, SA3, SA8, SA5 and required Navidrill testing

3 - Leg 115 - Carbonate Saturation Profile and Mascarene Plateau added
  Co-Chiefs - Duncan and Bachmann
  Site Surveys underway

4 - Leg 117 - All in order
  Co-Chiefs - Prell and Niitsuma

5 - Leg 118/119 - Prydz Bay in jeopardy due to lack of survey data
  - Kerguelen Working Group meeting next week

<u>The SOHP reiterates its strong support for the Prydz Bay sites and urges PCOM to do all in its power to see that the appropriate site survey data is processed and made available.</u>

6 - Exmouth/Argo - 2 legs scheduled
  - PCOM requests input from SOHP as to priorities for drilling

7 - WPAC - four core programs (Banda-Sulu; Bonin 1; Japan Sea; Nankai) and a nine leg program established

8 - CEPAC - SOHP must provide input to CEPAC and respond to CEPAC first prospectus

9 - PCOM - will meet regularly in April, August and December

10 - Panels should meet only twice per year unless more meetings are requested by PCOM

The SOHP (and especially the Chairman) applauds the two meeting per year directive (with flexibility) and will seek to generate a long-term regular meeting schedule (See below).

2.2 TAMU Report (E. Taylor)

- Report on 112 - extremely successful - most exciting result the discovery of brines. B. Garrison confirmed success of leg from SOHP point of view.

- Leg 113 - Maud Rise results look good. Orkney Plateau transect suffered from lack of carbonate.

- Leg 114 - Three primary sites - SA2, SA3, SA8.
New Co-Chief: Kristoferson with Ciesielski.
Navidrill tests.

- A brief outline of Indian Ocean schedule, co-chiefs and TAMU representatives was presented.

2.3 Logging Report (R. Jarrard)

A report on the current status of wireline logging was presented as well as some recent results particularly relevant to SOHP interests (i.e. determination of Milankovitch cycles).

The availability of log data was questioned and R. Jarrard responded that paper, binary and card image data is available from LDGO 1 year post cruise. LDGO will also make available log analysis software.

The SOHP has been and continues to be extremely supportive of logging efforts. In addition to those items discussed we would also like to see:
1 - downhole susceptibility measurements
2 - presentation of log data on barrel sheets (this information will be passed on to IHP)
3 - increased effort to log upper 100 m of section (through the pipe or alternative methods).

3. SOHP Engineering Priorities:

The SOHP short term engineering priorities previously established were reviewed and opened for discussion:
1 - complete recovery in
a - sandy sediments

b - gassy sediments
c - mixed lithologies (i.e. chert problem)

2 - pressure core barrel
3 - high temperature sampling
4 - continuous core color logging

In light of the successful and exciting wireline logging results, the need for equivalent capabilities on cores was pointed out. In particular, the SOHP recommends that efforts be directed to improving or developing a suite of laboratory tools that can provide continuous measurements of:

1. density, porosity (GRAPE)
2. sonic velocity, attenuation (p-wave logger)
3. susceptibility
4. natural gamma-ray
5. resistivity
6. color (i.e. Chase photographic system or Holman et al digital scanner)
7. texture, grain size, mineralogy (i.e. U. of Colorado laser scanner)

SOHP also recommends that any continuous core data collected also be presented on the barrel sheets. We realize that the barrel sheets may become unwieldy and that perhaps other means of presentation (i.e. microfiche) may become necessary but we believe that it is incumbent upon the project to present data in the most useful format possible.

Based on the discussion, SOHP now ranks its short term engineering priorities as:

1 - continuous core recovery (sands, gas, mixed lithologies)
2 - continuous core logging
3 - pressure core barrel
4 - high temperature sampling

Our long term priorities remain:

1 - ability to drill deep (2500-3000 m) stable holes
2 - ability to drill through salt

Andre Droxler will represent SOHP at the May TEDCOM meeting in College Station.

4. Sampling Strategy:

The request from PCOM to respond to Biju-Duval's letter prompted a discussion of sampling philosophy and strategy. While the exact nature of the request was not perfectly clear, the SOHP offers the following recommendations:

General Statement on Thematic Sampling:

By their nature, the problems represented under the SOHP mandate represent, for the most part, questions of global significance. Thus, there is a good chance of recovering material important to SOHP themes on almost every leg. Despite this fact, we are uncomfortable with the idea of providing a generalized set of sampling guidelines that would be carried from one leg to another for the fear that such guidelines would be blindly followed without proper regard for the specific problems to be addressed at a particular site. Instead we suggest that in the course of proposal and program review, each thematic panel take special note of sampling and staffing needs and make specific recommendations on a leg by leg basis.

Two areas of specific concern - Geochemistry and Physical Properties - where whole-round samples are often necessary were raised:

> The SOHP appreciates the need for whole-round sampling for certain measurements but is not satisfied with the present policy of routine whole core sampling. We recommend that:
>
> 1 - the best solution to sampling that needs whole-round sections is a dedicated extra hole.
>
> 2 - where dedicated extra cores are not possible, we suggest:
>
>> a - the need for whole-round sampling be demonstrated and justified on a hole by hole basis. To monitor these requests as well as to make recommendations with regard to sampling and staffing, we recommend the establishment of two small working groups - a geochemistry working group under the auspices of SOHP and a physical property working group under the auspices of DMP. The policy for these working groups would be established by the parent panel and PCOM. The working groups could make their decisions by mail or phone and thus require no meetings. For the geochemistry working group we propose the following members: Kay Emeis (TAMU)
>> Keith Kvenvolden (USGS)
>> Phil Meyers (U. of Michigan, SOHP)
>> Martin Goldhaber (USGS-SOHP)
>> Joris Geiskes (SIO)
>> W. Dean (USGS)
>
> Recommendations on sampling strategy:

In addition SOHP makes the following general recommendations on sampling strategy:

1 - More flexibility needs to be given to co-chiefs and scientific party

2 - Coordinated sampling and sample-sharing is essential. Shore-based investigators should attempt to incorporate shipboard scientific party in their requests whenever possible.

3 - The shipboard scientific party must retain highest priority in terms of sample requests. 'Manifest sample requests' encourage coordinated sampling programs but should be approved only when there is not considerable overlap with shipboard scientific party interests and with the expressed consent of the shipboard scientific party.

4 - Approved sample requests should be processed in a timely manner.

5 - The review of sampling requests should include the option of deferring some sampling to the core repository.

5. <u>New Panel Proposal:</u>

Keith Kvenvolden made a brief presentation regarding the establishment of a new panel on diagenesis and lithification.

The SOHP defers all such decisions to PCOM but recommends that many of the concerns raised can be addressed by the small working group proposed above.

6. <u>Letter from G. Jenkins:</u>

The letter from Graham Jenkins (UK) criticizing SOHP's handling of microfossil problems (Appendix A) was discussed and found inappropriate. The Chairman's response (Appendix A) was endorsed.

7. <u>PANCHM Meeting:</u>

L. Mayer reported on the annual PANCHM meeting in Hawaii. Key issues raised were:

1 - Effectiveness of liaison structure - working better between panels, still major problem with PCOM liaisons (as evident at this meeting)

2 - Panels will strive for regular meeting schedules

3 - General agreement among panels with regard to engineering priorities - Panel Chairman will provide supplemental information to TEDCOM

4 - COSOD II - general concern over lack of openness of COSOD II and early preclusive of many topics -

The SOHP shares these concerns. A glaring example is the apparent lack of any venue at COSOD II to discuss problems of sedimentary processes and deep sea fans.

5 - Circumnavigation - concern over the inability to do necessary science because of constraints to move on to next region -

The SOHP shares these concerns and urges PCOM and COSOD II to re-evaluate the circumnavigation philosophy and permit the time necessary to complete the best science.

8. **Sediment Classification Scheme:**

The SOHP has been asked to review the final modifications by von Rad and TAMU to the sediment classification scheme. In as much as SOHP has not received revisions from either von Rad or TAMU, no action can be taken.

10 March 1987 - N. Pisias arrives as PCOM liaison.

A discussion of the problems with PCOM liaison ensued with the hope that the PCOM Chairman could find some means of resolving the issue.

9. **Regional Panel Reports:**

9.1 INDIAN OCEAN (B. Hay)

The results of the IOP meeting were presented. In as much as this meeting predated the PCOM meeting, many of the IOP suggestions were superceded by PCOM actions. The SOHP then turned its attention to outstanding Indian Ocean issues:

Leg 115 - Carbonate Saturation Profile:

The SOHP is delighted to see this program included in Leg 115. After reviewing the suggested sites, we make the following comments:

1 - The primary objective of the saturation profile is a depth transect of 4 HPC sites. We support the co-chief's suggestion that three of the sites be located somewhat shallower and recommend that -

a - the 4600 m site be located at 4000 m
b - the 3800 m site be located at 3200 m
c - the 3000 m site be located at 2700 m

d - the 1600 m site remain at 1600 m
This saves approximately 27 hours of drilling time.

Andre Droxler has obtained new seismic data in Maldives that indicates viable targets at MLD-2 and MLD-1. Piston cores in the vicinity of MLD-2 show strong cyclic variations in aragonite and carbonate content that appear to reflect glacial/interglacial changes. Based on this new evidence, the SOHP recommends that the 27 hours saved by shoaling the carbonate saturation sites be allocated to coring at MLD-2.

Thus the SOHP makes the following recommendations for the Carbonate Saturation Profile part of Leg 115:

1 - Within the time constraints already established for the Carbonate Saturation Profile program, we recommend a core program consisting of:
- **a - the four carbonate saturation sites at shallower depths**
- **b - Site MLD-2**

2 - If further time is available we recommend (in order of priority):
- **a - MLD-1**
- **b - HPC at MP-1**

VOTE: 10 in favor, 2 opposed.

Rationale:
The 4 carbonate saturation sites are necessary to address the critical questions of the history of ocean chemistry, climate and deep-water circulation. Site MLD-2 has the potential of providing insight into the origin of the aragonite signal (i.e. is it a dissolution or platform input signal). Piston cores in the vicinity of MLD-1 show no aragonite signal but an HPC may address the question of platform drowning. We rank the HPC at MP-1 lowest priority because at this time we have no idea whether there is any sediment there or what its state is. We understand that by retaining an HPC at MP-1 as a priority, we create a difficult logistical problem (it will be drilled way before the carbonate saturation sites). We do this so as not to preclude the option (should the co-chiefs find themselves ahead of schedule) but emphasize its relative ranking and the fact that

we would rather not see an HPC at MP-1 at the expense of MLD-2.

Exmouth/Argo:

Given the directive of one leg at EXMOUTH and one leg at ARGO, the SOHP re-evaluated its priorities for drilling in the region.

The SOHP views the Exmouth/Argo package as the first series of sites that directly meet many of the objectives of our Deep Stratigraphic Test concept. This concept, a series of globally distributed deep stratigraphic test holes aimed at addressing questions of seal level history, sediment supply, passive margin subsidence, margin/basin fractionation, and black shale formation, has been and continues to be a primary objective of the SOHP. To meet these objectives, the SOHP suggests a series of sites that will result in near complete recovery of Triassic syn-rift to Quaternary sediments on this region.

Our highest priority site has been EP-5 on top of the Exmouth Plateau but discussions between our watchdog and the site proponents have convinced us that safety problems for this site are unsurmountable.

The SOHP thus recommends the following sites in order of priority for an Exmouth Plateau leg.

			WD	PEN
1.	EP-7	As outlined in von Rad proposal but with re-entry	1365m	990m
2.	EP-10A	As outlined in von Rad proposal	2050m	980m
3.	EP-2A	As outlined in von Rad proposal to basement	4050m	800m
4.	EP-6	To 1200m with re-entry?	1250m	1200m
5.	EP-9B	As proposed	3320m	600m

Rationale:

The Exmouth Plateau provides a unique opportunity to look at the evolution of a starved sediment margin in a region that has an excellent seismic data base and complementary industry data.

EP-7 - is primary site on Exmouth Plateau. It should provide a Neogene to Upper Jurassic section suitable for sea level studies, Cretaceous to Cenozoic paleoceanography and sedimentation history and differential studies. To assure success at this critical site, we recommend it be a re-entry site.

EP-10A - provides the best opportunity to sample Triassic pre- and syn-rift sediments, the breakup unconformity and to look at young ocean development.

EP-2A - provides the opportunity to sample transitional crust near ocean-continent boundary. We choose EP-2A above EP-2B so as to sample Triassic syn-rift fill.

EP-6 - provides a complement to EP-7 from other side of Plateau. Suggest extension to approximately 1200 m subbottom. Re-entry cone if necessary but not critical.

EP-9B - complements EP-10A for post Neocomian to Quaternary history of margin.

A full logging program is required for each of these sites.

The SOHP vote for a five site Exmouth program (not leg) with above prioritization: UNANIMOUS.

Argo:

The SOHP reviewed the proposals for Argo Abyssal Plain drilling and does not modify its original statement that most of the SOHP's objectives as well as the objectives of the 'geochemical reference section' can be met at one carefully drilled site - AAP-1B.

While careful review of drilling times necessary for these programs is essential, the SOHP recommends a two leg program consisting of Sites EP-7, EP-10A, EP-2A, EP-6, EP-9B and AAP-1B (not prioritized).

INDIAN OCEAN LEG CO-CHIEF RECOMMENDATIONS:

The SOHP recommends the following people as Co-chiefs for relevant Indian Ocean legs:

S. Kerguelen: H. Thierstein, J. Anderson

Exmouth: von Rad
Argo: Gradstein, Buffler
Broken Ridge: B. Haq

9.2 WPAC (J. Ingle):

J. Ingle presented a summary of the WPAC Panel's meeting in Tokyo. The program is falling into place and almost all sites have some potential paleoceanographic interest. The WPAC Panel is working with an 11 leg program consisting of (not presented as legs): (in order of priority)

1. Banda-Sulu-South China Seas basins
2. Bonin I
3. Lau Basin
4. Vanuatu
5. Japan Sea
6. Nankai Trough
7. Great Barrier Reef
8. Sunda
9. Bonin II
10. Nankai geotechnical "mini-leg"
11. South China Sea margin
12. Zenisu Ridge

The PCOM selected four programs as 'core programs': Banda-Sulu-S. CHina Sea; Bonin I; Japan Sea and Nankai.

<u>The SOHP is incredulous over the absence of the Great Barrier Reef program from the list of core programs. It has been and remains as our highest priority program in WPAC. The proposed program represents an opportunity to drill in a unique depositional setting where the interplay of subsidence, sea level, sediment supply and the resulting facies patterns/seismic stratigraphy can be examined on a mixed carbonate-siliclastic margin and on an adjacent isolated shallow carbonate plateau at the same latitude.</u>

There are no explanations of why it was dropped in the PCOM minutes. How can a panel respond if the rationale behind decisions is not presented?

When the Panel calmed down, discussion of WPAC issues continued.

GREAT BARRIER REEF:

T. Saito (WPAC liaison at last meeting) presented WPAC's discussion of the Jansa et al. lead-zinc ore deposition proposal. It appears that the sites proposed (The MVT sites) are not compatible with the high priority sites proposed by SOHP: (NEA-1 - 5, 8, 9, 12) except for NEA-12.

The SOHP supports the concept of testing the GBR as an analogy to the Mississippi Valley mineralization province but feels that the MVT sites are not well enough documented to warrant the relocation or deletion of the NEA sites. Of particular concern to SOHP is the apparent weakness of the analogy between GBR and the Mississippi Valley ores which are thought to originate from a black shale source. In addition, the Mississippi Valley's continental heat flow gradients are probably much higher than those at the GBR.

Therefore, the SOHP encourages the program to be conducted at the existing sites, but cannot justify relocation of the sites based on the available information.
The Chairman has spoken to P. Davies, GBR proponent. Davies says that there should be no problem with permission to drill in the National Park for shallow sites and that deep site will be located outside of Park bounds. All drilling time estimates have been recalculated using TAMU's latest guidelines. We will ask Davies to officially transmit this information to PCOM and TAMU.

SOUTH CHINA SEA:

T. Ingle presented a recently revised proposal for a transect of sites across the South China Sea Margin (Hayes). The present WPAC core S. China Sea program (Banda-Sulu-South China Ses) calls for 1 - 2 basin sites that will sample no older than Oligocene-Miocene. These sites will address problems of:

1 - date of opening
2 - paleoceanographic effects of cessation of Indian/Pacific interchange
3 - evolution of deep water circulation patterns
4 - enhanced climatic record
5 - history of siliclastic-oxic basin

but only for the post-Oligocene.

The margin transect proposal would provide a complete sedimentary history of the basin in addition to sampling oceanic and transitional crust. With industry data, a basin history from the strand line to the deep basin will be possible. In addition, the transect should provide insight into intermediate water mass history. Finally the SCS margin transect allows comparison of an oxic siliclastic basin with a series of WPAC basins with very different sediment input: Great Barrier (Coral Sea) - mixed siliclastic-oxic; Sulu Sea - carbonate-anoxic; and Japan Sea - silted anoxic-oxic-mixed siliclastic and siliceous bioclastic).

Based on these conclusions, the SOHP supports the SCS margin transect program. Our overall ranking of WPAC-SOHP programs is:

1. Great Barrier Reef
2. Japan Sea
3. South China Sea Basin
4. Sulu Sea
5. South China Sea Margin Transect

VOTE: 12 for, 1 against.

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9.3 CEPAC:

The third day of the SOHP meeting was devoted entirely to discussions of CEPAC objectives and priorities. The discussion began with a review of SOHP's previously (and hastily) established themes for CEPAC drilling:

1 - PALEOSECS (high-to-low-latitude and depth transects)
2 - Old Pacific Crust
3 - Atolls and Guyots
4 - Episodicity of Volcanism
5 - Fans and Sedimentary Processes
6 - Fluid Circulation (hydrothermal processes, etc.)

It was apparent that some of these themes -- especially the top priority PALEOSECS theme -- were too broad and unfocussed to provide useful direction to the CEPAC Panel. A rather free-form discussion ensued with numerous Pacific-specific problems outlined. These included:

- silica uptake and deposition in the N. Pacific
- CCD history of the N. Pacific
- Gateways: Bering Sea, Atlantic and Indian Ocean connections
- organic matter - upwelling history

- evolution of biota in Pacific and relationship to in-place high latitude fauna
- low latitude temperature and bottom water history
- Eastern boundary currents and relationship to terrestrial climate

In order to focus our discussion, Bill Sliter was asked to present the CEPAC Panel's preliminary packages and ranking. We would respond to this, note any important gaps and oversights and then use this as a guide to formulate more focussed themes.

The CEPAC preliminary prospectus consisted of:

		CEPAC Rank
1)	Juan de Fuca (232 E)	3
2)	N. Pacific Gyre (199E)	2
3)	Pacific Guyots (203E)	1
4)	Ontong Java Plateau (222E)	2
5)	EPR (76E)	3
6)	Bering Sea (195E)	5
7)	Shatsky (253E)	2
8)	Marshalls (202E)	1
9)	Old Pacific (262E)	4
10)	Oregon Accretionary Prism (233E)	8
11)	N P Magnetic Quiet Zone (231E)	2
12)	Ontong Java Transect (142E)	2
13)	Hawaii Moat (31E)	6
14)	Vancouver Island (237E)	0

Those of direct SOHP interest are:

1) N. Pacific Gyre
2) Ontong Java Plateau
3) Bering Sea
4) Shatsky
5) Marshalls
6) Old Pacific

Of some interest are:

7) Pacific Guyots
8) Juan de Fuca
9) Oregon Accretionary Prism

The programs of interest to SOHP and included on the CEPAC program were discussed:

1. N. Pacific Gyre (199E)
   - evolution of siliceous sedimentation in N. Pacific

- relationship to Antarctic glaciation (global silica budget);
- Cenozoic history of aeolian sedimentation
- paleoenvironment of N. Pacific - Milankovitch cycles over Neogene interval of global cooling
- evolution/paleobiology of subarctic gyre species

The SOHP wonders if many of these questions can be addresses in Bering Sea. In many cases, sites further North would better address objectives (i.e. Sounder Ridge). Could any of these objectives be combined with NP MQZ program?

2. O. J. Plateau (depth transect) (142E)
   - vertical oceanic gradients and their linkage to climate parameters, bottom and intermediate water properties
   - high-resolution stratigraphic records across intervals of fundamental paleoceanographic change (global hiatuses)
   - nature and role of carbonate dissolution - CO_2 budgets
   - nature of deep-sea seismic signal and relationship to sea level signal
   - correlation with margin transects (basin-shelf fractionation) and global network of equatorial depth transects (basin-basin fractionation)

   The SOHP strongly supports this program though they would like to see the proposal better documented. This program is very complementary to Eq Pacific Paleoenviroment program (221E) - see below.

3. Bering Sea (182E, 195E)
   - one of few sites available for Cretaceous-Paleogene high northern latitude pelagic record
   - water mass exchanges with Arctic Ocean through time
   - areal extent of Cretaceous black shales
   - nature of Cretaceous-Paleogene high latitude climate
   - evolution of faunal assemblages - radiation of species

   The SOHP supports these programs and has listed the Sounder Ridge as one of its highest priority Deep Stratigraphic Test sites. Our only concern is uncertainty of basement ages in region.

4. Shatsky
   - anoxic history in low latitude ocean basin

- history of productivity, upwelling, volcanism
- paleodepth of low oxygen water masses
- paleomag studies, spreading rates, plate evolution
- transitional ocean (early Jurassic) - major climate change

The SOHP strongly supports this program. Problem is technical one. Must be able to drill through mixed lithologies to address objectives.

5. Marshalls and Pacific Guyots:
- Eocene-Cretaceous (?) reefs
- volcanic history
- subsidence patterns and sea level history
- why atoll vs guyot
- plate motions

The Panel believes that atoll and guyot drilling can be extremely important to SOHP objectives, particularly in terms of establishing sea level histories, in establishing continuous paleoclimatic record (pre Neogene) from low latitude (must be pieced together), examining diagenesis as a function of sea level fluctuations, volcanic episodicity and early Cretaceous to Recent shallow water biota. To address these problems, we urge that the sites drilled be:

- continuous pelagic sequences
- above CCD
- not too deeply buried

Examples: Harrie, Sylvania, Horizon, Ogasawara

6. Old Pacific Crust (261E)
- age and nature of Mid Cretaceous volcanic crust
- age and paleoenvironment of underlying (Jurassic-E. Cretaceous) sediment
- calibration of Mesozoic magnetic lineation correlation

This program offers the only opportunity to look at an open ocean record for the Cretaceous and thus is of extreme importance to the SOHP. The success of this program depends on site surveys that show windows through the volcanic event and a drillstring capable of withstanding severe conditions imposed by the program.

The following gaps in the CEPAC program were identified and discussed:

1 Equatorial Pacific Late Paleoenvironments (221E)
- focuses on equatorial current system and relationship to thermocline
- examines several time scales - Milankovitch cycles and Neogene events
- addresses questions of dissolution vs erosion vs productivity and relevance to global hiatuses, Isthmus os Panama closing
- excellent complement to Peru Margin studies and O.J. Plateau transect (deep and intermediate water story)

Strong SOHP support for this program.

2 Ogasawara Plateau (260D)
- comparisons between guyot and seamount development
- development stages of reefal communities (Jurassic? - Cretaceous)
- diagenesis studies
- Paleogene carbonate sequences

General support but some questions of appropriateness of sites - section is thin.

3 Peru Margin - B. Garrison suggested a return to Peru Margin - problems to be addressed include:
- upwelling history - longer than thought- land evidence shows Oligocene/Eocene events
- Milankovitch/phosphorite cycles
- brine story - implications for diagenesis

SOHP very enthused about Leg 112 results and not opposed to further drilling but feels that it is necessary for Leg 112 results to have public dissemination and for land studies to develop further before more serious consideration.

4 Gulf of California (257E)
- Cenozoic sediments and diagenesis with respect to heat flows

Guaymus Basin already examined (Site 498). Regional studies are necessary before further drilling. Problem might be better examined at Juan de Fuca Ridge.

5 California Margin Transects
- history of California Current system
- timing of onset of diatom deposition
- development of seasonality
- response of current system to N. hemisphere

glaciation
- hiatus development
- improved paleomag and tephrachronology

Can be combined with tectonic (248E) and Navy Fan proposals. Potentially serious problems with paleomag. General support but needs careful identification of useful sites.

6 South Pacific
- South Pacific is important in terms of high latitude paleoceanography and as comparison to N. Pacific high latitude sites. We encourage proposals especially for pre-Neogene sections (Louisville Ridge?)

7 N.E. Pacific upwelling (247E)
- high latitude reference biostratigraphic studies
- paleoceanography of California Current
- N. Pacific bottom water history
- long term hydrothermal history
- history of aeolian sediments and hemipelagic deposition
- age, composition, history of seamount chains

This program is certainly relevant to SOHP interests but needs to be better focused and developed to demonstrate feasibility of fulfilling objectives.

8 Fans and Sedimentary Processes
- find modern analogs to important ancient deposits
- test models for fan development
- relationship of turbidite deposition to tectonic and sea level history

SOHP is generally supportive of efforts to see problems of fans addressed. Some technical difficulties exist and some debate among proponents about which fan is best to drill. A careful drilling strategy must be developed.

Based on these discussions, SOHP ranked all discussed programs:

Rank	Votes	Theme
1	12	Equatorial Pacific
2	11	Bering Sea

3	10	Old Pacific
4	9	Ontong Java Plateau (Transect)
5	8	Shatsky Rise
6	7	Navy Fan
7	5	N. Pacific Gyre
8	4	Gulf of California (diagenesis)
	4	Oregon upwelling
10	3	Marshalls (atolls)
	3	California margin transect
	3	Ogasawara (seamount)
	3	Louisville Ridge (SW Pacific)
14	2	Pacific guyots
	2	Peru margin (oceanography)
16	1	Juan de Fuca (sedimented ridge)
	1	Oregon accretionary prism
	1	S. Pacific

And established a set of CEPAC-specific themes to guide future CEPAC planning (in order of priority)

1. Pacific Neogene Paleoenvironment:
   High resolution surface and bottom water Neogene history of the Pacific and its relationship to paleoclimate, sea level, and tectonic events -
   Example programs: - Eq Pacific Paleoenvironments (221E); O.J. Depth Transect (142E)

2. Mesozoic-Paleogene Pacific Paleoceanography:
   Evolution of late Mesozoic through Paleogene paleoclimates in high and low latitudes -
   Example programs: - Sounder Ridge-Unmak Plateau (195E, 182E); Atolls (some N. Pacific Gyre sites)

3. Old Pacific Crust:
   A look at Cretaceous open ocean
   Example program: - Mariana/Nauru Basin (261E)

4. Anoxic events:
   Time stratigraphy, distribution and significance of oceanic carbon in low latitude open ocean settings. Correlation with other Cretaceous anoxic events, role of black shales in global carbon cycles; importance of carbon preservation vs productivity; effect of volcanism and role of bathymetry and climate in developing upwelling.
   Example program: - Shatsky Rise (253E)

5. Atolls and Guyots:
   Drowning history, sea level and subsidence curves; continuous pre-Neogene paleoclimatic record from

low latitudes; early Cretaceous to Recent shallow water biota; diagenesis as function of seal level history and volcanic episodicity.

Example program: - (Ogasawara (260D), Marshalls, Pacific Guyots, 202E, 203E)

6. Fans and Sedimentary Processes:
Modern analogs to ancient deposits; test models for fan development; relationship of turbidite deposition to tectonic and sea level history.

Example programs: - Navy Fan (250E), Zodiak Fan (241E), Monterey Fan

The rationale for this ranking can be found in the discussions of individual programs. The SOHP emphasizes that these are its highest ranked themes for CEPAC drilling and that we would like to see each of these issues addressed in the Pacific. We are very concerned about the time constraints placed on the Pacific program and ask PCOM to seriously consider the time allotted to Pacific drilling.

10. Rotations and Liaisons:

Bill Hay, Lisa Tauxe and Mike Arthur are scheduled to rotate off.

R. Stein has replaced M. Sarnthein for this meeting and may become the regular German member.

The Panel thanks Lisa, Bill, Mike A. and Mike S. for their efforts. We have enjoyed their presence and have greatly benefitted from their wisdom.

The following names were suggested as replacements:

Paleomag: Jim Channel, Dennis Kent, Bob Karlin, John King

Paleoceanographers: Wolf Berger, John Barron, Bob Thunnell, Ken Miller

Geochemists: Walt Dean, Simon Brassell

The Chairman has asked the members rotating off to continue full participation until PCOM has officially replaced them.

Liaisons:

Mike Arthur will go to Evanston, Ill. CEPAC meeting in place of Tsuni Saito.

Phil Meyers will serve as both SOP and ARP liaison at the WHOI South Atlantic meeting.

11. <u>Meeting Schedule:</u>

The SOHP will try to meet regularly each year in mid-September and the end of February/early March.

Our next meeting will be in the 29 August - 4 September time period.

First choice for location: Tokyo
Second choice: Milan

MEMORANDUM:

FOR: JOIDES Planning Committee

THROUGH: Miriam Kastner

FROM: Keith A. Kvenvolden

SUBJECT: Need for a new JOIDES Advisory Panel

After a lot of thought during the past two years, I am convinced that planning for Legs for the Ocean Drilling Program is seriously flawed by the lack of specific considerations of the important geologic processes of diagenesis and lithification. I recommend that a new thematic panel be established with the possible title 'Diagenesis and Lithification Panel'. This panel, composed of sedimentologists and geochemists, both inorganic and organic, would be responsible for coordinating and planning those legs where diagenesis and the transformation of sediments into rocks is an important issue.

Having participated in Legs 104 and 112 of the Ocean Drilling Program, I have had an opportunity to see how the system is working and a chance to formulate some ideas of how the system might be improved. Leg 112, in particular, was instructive because many of the important discoveries came in the areas of calcification, dolomitization, and phosphatization--processes all involving diagenesis and lithification. Fortunately on this leg there was strong inorganic geochemical input which provided the major clues to understanding these various lithification processes. I have wondered what would have happened if this strong support had not been available. It is obvious to me that the project would have lost valuable knowledge, and Leg 112 would not have been as successful as it was. The reason this leg had good chemical support for the study of diagenesis and lithification was because of a strong interest by the scientific community in the Peru margin and a co-chief scientist with direct interest in these kinds of problems. But I wonder about future legs! Have the problems of diagenesis and lithification been considered adequately? I believe they have not.

For example, Leg 113 has begun without a strong inorganic geochemical program although I understand there is on the staff a sedimentologist with some interest in inorganic geochemistry. Yet Leg 113 is in a part of the world where there could be major scientific advances in our knowledge of diagenesis and lithification if the right questions are asked and the right analyses done carefully. It appears to me that the planning for this leg was so strongly skewed toward paleoenvironmental concerns that other aspects of geology were not given appropriate consideration. I was shocked to hear, for example, that initially no logging was contemplated for this leg. I don't know how that problem was finally solved, but I believe that logging is very important especially in new areas such as offshore Antarctica.

Right now I am not so concerned with what is currently being done in the Ocean Drilling Program; I am more concerned with what isn't being done, and the data and knowledge that is missed or ignored because the right questions are not asked or the right analyses are not being done. Leg planning seems too much influenced by the interests of the co-chief scientists. There needs to be a better balance. Diagenesis and lithification are too important in earth sciences to leave to chance in the planning process. I believe that these considerations are as important as ocean lithosphere, sediment and ocean history, and tectonics. Certainly the making of rocks is one thing that geology is all about.

I believe that an advisory panel on Diagenesis and Lithification would significantly augment he Ocean Drilling Program and aid in assuring that important aspects of the earth sciences are covered during the planning process. I visualize that this new panel would be composed of at least two sedimentologists, two inorganic geochemists, and two organic geochemists along with appropriate liaison members. Ideally all panel members would have a global perspective of their respective disciplines. The panel would consider proposed areas of drilling in light of studies in diagenesis and lithification, and would formulate proposals for drilling where new knowledge of transformation processes could be obtained. I believe that the nature of this new panel's theme is sufficiently important to merit full panel status. A working group of the Sediment and Ocean History Panel is an option, but it is one I personally do not favor.

I urge you to consider seriously this proposal. I am certain that things have and are falling through the cracks during the planning stages because those interested in the processes altering sediments and the processes leading to the formation of sedimentary rocks have not been properly included. A positive way to augment the scientific part of the Ocean Drilling Program is to establish a panel which would provide a focal point for a large community of earth scientists who are interested in diagenesis and lithification.

EXECUTIVE SUMMARY

Site Survey Panel Meeting, Jan. 13-13, 1987,
Lamont, Palisades, N.Y.

Note: This summary was written on Feb. 5 and includes with the perspective of the PCOM meeting and some subesquent conversations included. Item numbers refer to full minutes.

3(A) Sub-Antarctic (Leg 114)

The near surface resolution of some of the POLAR DUKE data could be improved with the application of decon on Board. The SSP recommends that selected tapes be carried to the RESOLUTION for this purpose. Advance coordination with TAMU is necessary.

The SSP can accept moving sites SA-2 and SA-5 a few miles in order to avoid clearance problems if the RESOLUTION seismic data is tied into the existing site survey grid.

3(B) Makran

PCOM has decided to drop this program from the drilling schedule.

3(C) Intraplate Deformation (Leg 116)

The sites need to be chosen ASAP. The data are adequate for site survey purposes, but the resolution of the fault planes could be improved by the application of SCS decon and migration. Possible dating problems need to be documented.

3(D) Broken Ridge (part of Leg 121)

Data excellent. Sites need to be chosen ASAP.

3(E) Mascarene Plateau (part of Leg 115)

PCOM approved drilling on the presumption that the site survey data will be straightforward. A combined safety/site survey review of the site survey data is tentatively scheduled for OSU in April.

3(F) SWIR (Leg 118)

All sites except SWIR IV are adequately documented, assuming that the RESOLUTION will do a TV survey for the bare rock sites before attempting to set the guide base or try a bare rock spud. PCOM approved SWIR II (median ridge) as the first priority.

3(G) Neogene I (Leg 117)

Data excellent. Sites need to be chosen ASAP. French data on the Indus Fan need to be integrated into the data set before that site is chosen.

3(H) Neogene II (Carbonate Dissolution) (part of Leg 115)

Data adequate for Neogene objectives.

3(J) Prydz Bay

SSP is still uncomfortable with drilling on a single line without any cores in vicinity. Falvey will bring additional lines to the IOP meeting at College Station in March. PPSP review needed by next PCOM.

3(K) N. Ninetyeast Ridge

Data adequate. When this single site will fit into the drilling schedule. Specific site needs to be chosen ASAP to allow logistic planning of various schedule options.

3(L,M) The remaining Indian Ocean drilling plans will be reviewed in detail at the SSP meeting.

4. WPAC

All WPAC high priority drilling packages have adequate site surveys done or scheduled except for the Lau Basin.

Two more cruise are scheduled in the Lau Basin, and close liaison between th Germans and French is needed to insure maximum utility. A French SCS line linking LG-1,2 and 7 is needed (a request has been forwarded to Cadet to facilitate this). Sidescan data would help sort out the tectonics here, but none is planned. The Lau Basin will be discussed further at the next SSP meeting.

6. The next SSP meeting is scheduled for June 30-July 4 in Copenhagen. A second meeting is tentatively scheduled for late November.

OCEAN DRILLING PROGRAM

SITE SURVEY PANEL MINUTES

ACTION ITEMS

Lamont-Doherty Geological Observatory

Palisades, New York

January 13-14, 1987

ACTION: Brenner forward Sub-Antarctic core summaries to TAMU. LaBrecque deposit data at Data Bank ASAP for preparation of safety package.

ACTION: Leggett/While send accurate navigation, additional SCS lines, and proposed site location for the Makran by courier to PCOM meeting in Hawaii. Expedite additional processing and arrange for further review. Coordinate with Data Bank for deposition of all relevant data ASAP.

ACTION: Weissel ask D. Johnson (WHOI) regarding a written summary of Pleistocene dating problems at the Intraplate Deformation sites. Deposit data with Data Bank ASAP as the Safety Package needs to be prepared soon.

ACTION: Weissel/Mountain deposit Broken Ridge site survey data at Data Bank once processing is completed.

ACTION: Dick and Brenner coordinate depositing SWIR site survey data with the Data Bank.

ACTION: Brenner/Mauffret expedite transfer of the French watergun records on the Indus Fan to the Data Bank to provide maximum choices for site selection.

Prell/Mountain and Brenner coordinate depositing Neogene site survey data with the Data Bank.

ACTION: Peirce draft letter to Australians for Pisias to sign on behalf of ODP if a positive drilling decision is made.

ACTION ITEMS
Page 2

ACTION: Larsen/Meyer invite von Rad to next meeting for presentation of Argo/Exmouth data. Peirce include von Rad on list of invitees.

ACTION: Duennebier contact Gill to ask for a Lau Basin report for the next SSP meeting and to try to arrange for a proponent to attend. Pass name of attendee to Peirce to include in list of guests requested at next meeting.

ACTION: Suyehiro include a thorough discussion of shallow gas problem in his next report on the Japan Sea.

ACTION: Suyehiro continue to push for release of JNOC 55 data set in Nankai Trough. Prepare full report on BSR situation at NKT-2.

ACTION: Peirce talk to Taylor regarding plans/hopes for this area (done in Honolulu) and write Fabvey for a copy of Australian cruise plans. Weidicke send Peirce/Kidd/Brenner copies of new proposal.

ACTION: Peirce write Pautot regarding data quality for sites SCS-1 and 2.

ACTION: Peirce contact Scott for more information.

ACTION: Larsen contact P. Henry at JOI regarding arrangements. Peirce write to Pisias in March to firmly schedule meeting.

ACTION: Peirce write Pisias to have Suyehiro invited to WPAC meeting as SSP liaison.

ACTION: Peirce write Pisas to have Brenner invited to next CEPAC meeting as liaison.

OCEAN DRILLING PROGRAM

SITE SURVEY PANEL MINUTES

Lamont-Doherty Geological Observatory

Palisades, New York

January 13-14, 1987

Present:
John Peirce* (Chairman, Canada)
Fred Duennebier* (USA)
John Jones* (UK, Alternate for Kidd)
Birger Larsen* (ESF)
Steve Lewis* (USA)
Alain Mauffret* (France)
Heinrich Meyer* (Germany)
Kiyoshi Suyehiro* (Japan)
Sunit Addy (NSF-MGG)
Carl Brenner (ODP Data Bank)
Dick Buffler (NSF-ODP)
Audrey Meyer (TAMU)
Nick Pisias (Chairman, PCOM)

Guests:
Henry Dick (WHOI; SWIR)
Denny Hayes (Lamont; PCOM)
Rich Jarrard (Lamont; ODP Logging Group)
John LaBrecque (Lamont; Leg 114)
John Ladd (Lamont; ODP Data Bank P.I.)
Marc Langseth (Lamont; ex-SSP for SWIR)
Greg Mountain (Lamont; Neogene I, Broken Ridge)
Warren Prell (Brown; Neogene I)
Carol Raymond (Lamont; Leg 114)
Jeff Weissel (Lamont; Intraplate Deformation and Broken Ridge)

*Panel Members

1 - **PRELIMINARY MATTERS**

Denny Hayes welcomed the panel to Lamont. The Chairman welcomed Heinrich Meyer (Germany) and Steve Lewis (USA) as new panel members. The minutes from the Villefranche meeting were approved without change.

2 - **REPORTS**

Nick Pisias briefly summarized the status of planning for the eastern Indian Ocean. Carl Brenner briefly summarized the last IOP meeting in Miami.

3 - **SITE SURVEY ASSESSMENTS AND UPDATES**

The SSP notes that the excellent seismic reflection data from the Sub-Antarctic, Interplate Deformation, Broken Ridge, and Neogene 1 site surveys were all obtained with water guns and recorded digitally. The resolution, clarity and penetration available from these data with little or no processing provide excellent information to fulfill site survey requirements.

3 (A) **Sub-Antarctic** (Leg 114)

John LaBrecque and Carol Raymond presented the site survey data from the POLAR DUKE (SA-2, 3, 5, 6) and CONRAD (SA-7, 8). The site survey data are excellent. There are some problems with channels and possible deep diapirs near site SA-8, but there appears to be room to avoid these constraints. There is a small problem with lack of near surface resolution due to an apparent bubble pulse on the POLAR DUKE data. The SSP recommends that every effort be made to carry selected POLAR DUKE tapes to the RESOLUTION for application of decon on board. Advance coordination with TAMU is needed for this effort to be successful.

There are potential clearance problems with sites SA-2 and 5. The SSP can accept moving these sites a few miles on the basis of RESOLUTION data provided that there are seismic ties to the existing site surveys. The available core summaries need to be forwarded to TAMU.

ACTION: Brenner forward Sub-Antarctic core summaries to TAMU. LaBrecque deposit data at Data Bank ASAP for preparation of safety package.

3 (B) **Makran**

John Jones presented very preliminary data from the December DARWIN cruise. One 400 km MCS profile was shot just east of

62°45'E (a limit set by the Pakistan Navy after three weeks of last minute delays). This line is on the eastern edge of the earlier British SCS survey and seaward of the Marathon MCS coverage.

The British expect the tapes to arrive at the end of January, with MCS processing to be complete by the end of March by GECO.

The Makran data package in its present form is totally inadequate but all the essential elements appear to be present if the processing results can be reviewed before the next PCOM meeting (probably week of March 30).

Deconvolution, migration, and a depth section (preferably at moderate vertical exaggeration) are needed. Sites must be chosen on cross lines, and the SCS data must be displayed at the same scales as the MCS data. Sites could be chosen west of the MCS line if continuity of structure can be demonstrated.

A detailed bathymetric map and a BSR structure map near all proposed sites are highly desirable.

A core location map is needed. None of the core material has been looked at although a question exists as to the datability of the expected section. This question needs to be addressed.

The results of this additional work need to be reviewed by members of the SSP and PPSP prior to the next PCOM meeting.

ACTION: Leggett/While send accurate navigation, additional SCS lines, and proposed site location for the Makran by courier to PCOM meeting in Hawaii. Expedite additional processing and arrange for further review. Coordinate with Data Bank for deposition of all relevant data ASAP.

Note: No additional informtion received in Hawaii. PCOM voted to drop Makran from drilling schedule.

3 (C) <u>Intraplate Deformation</u>

Jeff Weissel presented the site survey, which is just to the northeast of his earlier data. Forty bottom navigated heat flow stations show high and variable heat flow, but no non-linear gradients were observed. Two fault blocks are present - one is slightly elevated above the surrounding sea floor and the other is just visible on the 3.5 kHz data.

There is no straightforward correlation between heat flow and structure.

The site survey data are excellent and adequate for drilling. However, it is still not possible to resolve the thrust faults as precisely as is desirable. SCS decon and migration, using estimated velocities, is recommended over the selected drilling sites in order to improve resolution of the fault planes.

A summary of available core material is needed to clarify possible dating problems in the Pleistocene.

ACTION: Weissel ask D. Johnson (WHOI) regarding a written summary of Pleistocene dating problems at the Intraplate Deformation sites. Deposit data with Data Bank ASAP as the Safety Package needs to be prepared soon.

3 (D) **Broken Ridge**

Jeff Weissel and Greg Mountain presented the CONRAD site survey data. In order to discriminate between active and passive rifting models it will be necessary to define the age and facies of the youngest prerift section, as compared to the age and facies of the oldest postrift section. An active rifting model implies uplift predates extension while a passive rifting model implies that uplift is syn- or post-extension.

The site survey data are excellent. No problems are anticipated with site selection. From a site survey perspective, there is no need to position sites directly on cross lines given the excellent grid of data available, but PPSP may feel differently.

ACTION: Weissel/Mountain deposit Broken Ridge site survey data at Data Bank once processing is completed.

3 (E) **Mascarene Plateau**

No new additional information since the April SSP meeting. Data are limited to sparse, good quality SCS. Any drilling plans for Leg 115 will have to be predicated on a successful site survey being completed only about a month before the leg starts. There cannot be any meaningful review in such a short time frame.

Note: Pisias and Peirce agreed on a PPSP meeting with SSP representation (Lewis?) at OSU in April.

3 (F) SWIR

Henry Dick presented the SWIR site survey data.

The site survey has excellent Seabeam and magnetics data (although the correct interpretation of the magnetic annomalies older than 5 is debatable). The seismic coverage is adequate, but it is unfortunate that there are no deep source 3.5 kHz records. There are no photographs or sidescan data. The heat flow data are few and erratically distributed. There is an extensive and well documented dredge collection, and cores were taken in the critical places.

SWIR I (gravel pits)

Beacon left on medial high. Two cores of gravel; trigger cores were pelagic ooze. The surveys are adequate for the attempt at pogo drilling, but the risks of gravelly sediments must be assumed. There is enough sediment to set a reentry core if the initially encountered drilling conditions indicate that to be desirable. The nature of the sediments cannot be determined from the 12 kHz core record as the gain was set too high.

SWIR II (median ridge) and SWIR III (nodal basin)

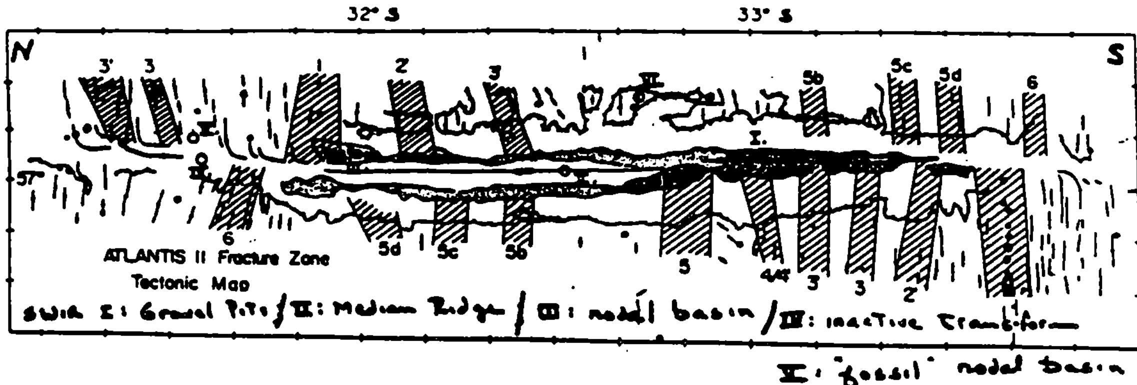
Bare rock sites. The available site survey data are inadequate for bare rock drilling, with or without the guide base, until there has been an extensive TV survey by the RESOLUTION. No beacons have been set, but the sites should be easily found as there are large and the bathymetric signatures are unambiguous.

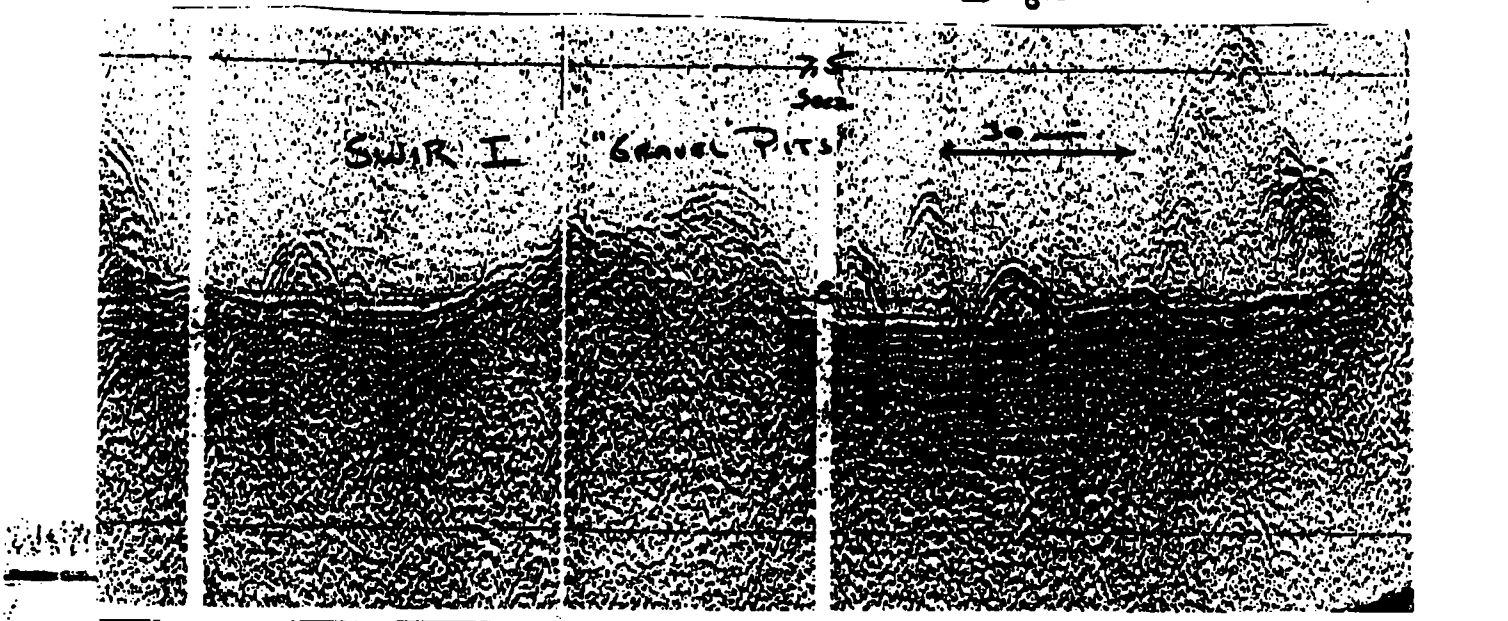
SWIR IV (inactive transform)

The site survey dta at this site are inadequate without a TV survey by the RESOLUTION. The seismic records are ambiguous and sufficient sediment thickness for a normal spud-in cannot be clearly demonstrated.

SWIR V (fossil nodal basin and adjacent bench)

There is well defined and adequate sediment for spudding into both the fossil nodal basin and the adjacent bench (Figure 1). There are 8 heat flow measurements on the bench. There is no beacon, but the site should be easily recoverable because of its unique bathymetric signature.


32° S
33° S
N
S
ATLANTIS II Fracture Zone
Tectonic Map
57° E
SWIR I: Gravel Pits / II: Median Ridge / III: nodal basin / IV: inactive Transform
V: "fossil" nodal basin


SWIR I "Gravel Pits"

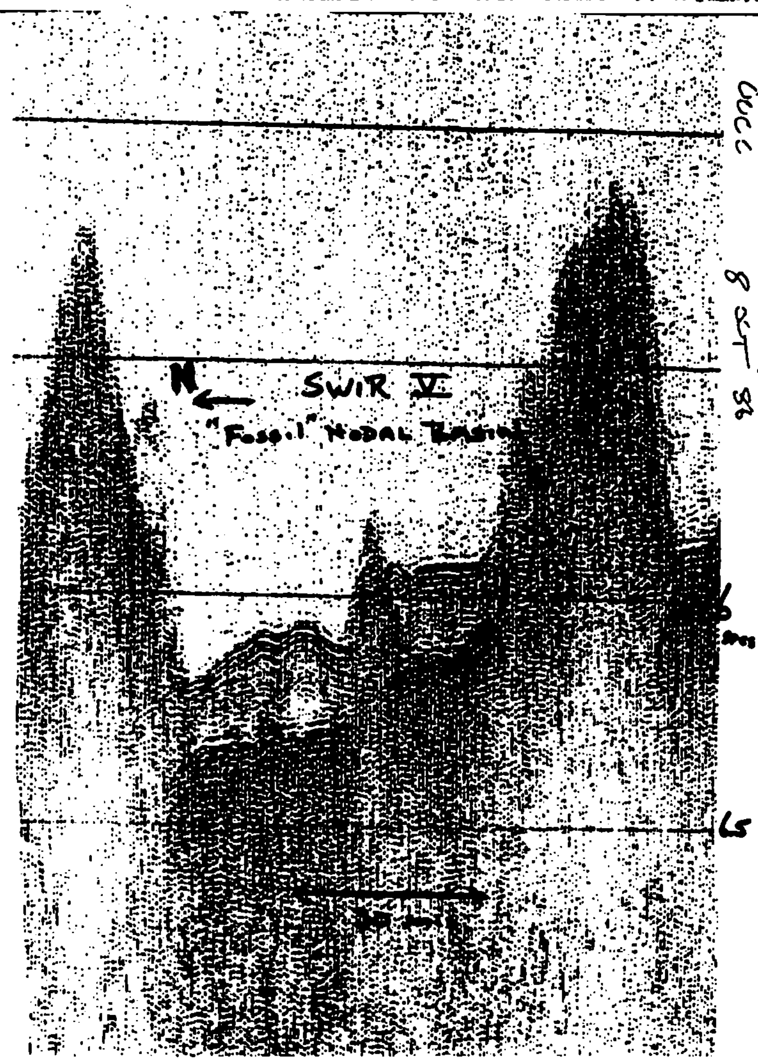

N
SWIR V
"Fossil" Nodal Basin
8 Oct 86

Fig. 1

SWIR VI (Shallow bench, east wall)

This site is presumed to be covered by a carbonate "pavement" and must be considered a bare rock site. Site survey data are inadequate for a bare rock site without a TV survey.

The SSP notes that there may be AABW flow along the floor of the fracture zone. This may cause some winnowing of the sediments. Moderate bottom currents should be anticipated as a possibility during precise drill string work such as TV surveys. There are no heat flow data in a position to confirm the existence of AABW.

ACTION: Dick and Brenner coordinate depositing SWIR site survey data with the Data Bank.

3 (G) Neogene I

Warren Prell and Greg Mountain presented the site survey data. The site survey package is comprehensive and demonstrates clearly the amount of scientific gain afforded by a well planned, well funded, and well executed site survey.

There are some diapirs structures on the Oman margin in the O_2 minimum zone which may be of concern to PPSP. However, the sites are located in downdip locations on crosslines. There is adequate information for the PPSP to evaluate.

The watergun lines over the Indus Fan site area provide ample choices for a site location which minimizes the possibility of intersecting burried or surface channels. There are additional French watergun records in the area which were specifically collected by Drose (Villefranche) par site selection.

ACTION: Brenner/Mauffret expedite transfer of the French watergun records on the Indus Fan to the Data Bank to provide maximum choices for site selection.

Prell/Mountain and Brenner coordinate depositing Neogene site survey data with the Data Bank.

3 (H) Neogene II

Sites CARB 1-4 are adequately supported by site survey data for Neogene objectives. However, the SSP reiterrates that the basement objectives once discussed for CARB-1 are not supported by the data as basement is not visible on the available seismic line (see p.7 of the Villefranche SSP minutes).

The shallow Maldive site proposed by Droxler is adequately surveyed (Vema 2902, 20 Dec. at 1230). There is a 12 m core near the site and two others nearby.

3 (I) **Gulf of Aden**

There is one site on the available data with enough sediment section to meet the objectives of the proposal. That site is on a crossing of Conrad 9/10 and Verma 33-6 lines. There is a core nearby. Water depth is about 2100 m and sediment thickness is about 700 m.

3 (J) **Prydz Bay**

The SSP still feels that the site survey data are inadequate for drilling according to normal ODP standards. However, recognizing the extreme scientific importance of the proposed drilling and accepting PPSP's acceptance of the line as being adequate, PCOM may wish to make a conscious decision to drill on inadequate data.

If drilling goes ahead all involved should recognize that there is no firm evidence to indicate true dip or the age of the section to be drilled.

The SSP strongly recommends that processed copies of lines 31, 19, 23 and 33 (adjacent lines) and the unnumbered oblique cross line shown in Figure 2 of the published paper (if seismic data exist on it) be requested from the Australians ASAP. Reprocessing all the lines (including line 21 along which the sites are proposed) with a tailored AGC filter would help define the section immediately above the first multiple. There is serious question as to whether the Australians have the resources ($ or people) to do this in the timely fashion needed.

ACTION: Peirce draft letter to Australians for Pisias to sign on behalf of ODP if a positive drilling decision is made.

Note: Falvey has promised Pisias that he will bring single channel monitor records of the above lines to the next IOP meeting and to arrange for them to go to the Data Bank.

3 (K) **Northern Ninetyeast Ridge**

Peirce presented the preliminary data package sent by Curray. There is adequate site survey data from which to choose a specific site for the northern Ninetyeast Ridge. The site proponents need to clarify the specific site locations as soon as the southern Ninetyeast Ridge data are synthesized.

3 (L) **Argo-Exmouth**

Discussion was deferred until the next meeting because of lack of time.

ACTION: Larsen/Meyer invite von Rad to next meeting for presentation of Argo/Exmouth data. Peirce include von Rad on list of invitees.

3 (M) **Kerguelen**

A full review is scheduled for the next meeting. Schlich has promised Peirce that full scale processed sections for N. Kerguelen will be sent to Data Bank this month.

4 - **WPAC DISCUSSIONS**

Mauffret reported on the last WPAC meeting which he attended as SSP liaison. Some reassignment of SSP "watchdog" responsibilities was made to balance the work load. Notes on the discussions regarding these items are presented in order of WPAC priority, although that was not the chronological order in which they were discussed. The SSP watchdogs are shown in parentheses.

(1) Banda-Sulu-S. China Sea Transect (H. Meyer)

Sulu-4 must be surveyed. Germans (Hinz, BGA) plan to do so in April-June, 1987.

Silver's site survey for the Banda Sea is definitely scheduled for Fall, 1987, on the R/V Moore.

(2) Bonin I (Duennebier)

See attached site survey matrix. Site surveys in hand or planned.

(3) Lau Basin (Duennebier)

The present state of the site survey data is inadequate for drilling. Sites LG-4 and possibly LG-5 are the only locations drillable on the present data. The SSP welcomes the new synthesis proposal as a clarification of the scientific problems. However, it notes that there are many outstanding site survey requirements (see attached matrix), and it is unaware of any site survey plans other than those noted thereon. Of particular note is the need for side scan data,

TARGET SITE:	Bonin 1 (reentry)	Bonin 2 (reentry)	Bonin 5a	Bonin 5b	Bonin 6 (reentry)
Environment water depth:	2270m	1100m	2700m	3400m	2850m
sed. thick:	850m	500m	>1500m	900m	950m
penetration:	870m	700m	950m	950m	1100m
TECHNIQUE					
1. Deep penetration SCS	GSJ (Geological Survey of Japan)	GSJ	HIG & JNOC	HIG & JNOC	LDGO
2. High resolution SCS					
3. MCS with velocities	JNOC (Japan National Oil Co.) also ~~JNOC~~ GSJ	JNOC	JNOC	JNOC	JNOC & LDGO
4. Seismic data on cross lines	will be done by July 1987, for all sites by Taylor, HIG, JNOC R/V Fred Moore MCS				
5. Seismic refraction	profile at 32°N across arc, Honza and Tamaki, 1985				
6. 3.5 kHz	GSJ & HIG	GSJ & HIG	GSJ & HIG	GSJ & HIG	GSJ & HIG
7. multi-beam bathymetry	SASS, Bay St. Louis, & SeaMARC II, HIG				
8. Sidescan sonar:					
A - shallow	SeaMARC II, HIG	SeaMARC II, HIG	SeaMARC II, HIG	SeaMARC II, HIG	SeaMARC II, HIG
B - deep-towed					
9. Heat flow	GSJ	GSJ	GSJ	GSJ	GSJ
10. Magnetics	GSJ & HIG	GSJ & HIG	GSJ & HIG	GSJ & HIG	GSJ & HIG
11. Coring: A - paleoenvironmental B - geotechnical	cores available (GSJ?), tech work needs to be done for reentry info.				NO CORES - must do for reentry
12. Dredging					
13. Photography	ALVIN DIVES Spring '97				
14. Current meter					

Table 1: Site Survey Matrix, BONIN 1, (update: 1/87)

ORI (Ocean Research Inst) Hakuho Maru, Six weeks, July '87

TARGET SITE:	Bonin 7	Bonin 8	Mariana Ref Hole (near DSDP 452) Langmuir & Natland
water depth:	4650m	6000m	?
sed. thick:	200m (see Taylor p. 9)	500m	?
penetration:	600m	600m	?
TECHNIQUE			
1. Deep penetration SCS	GSJ (Geological Survey of Japan) & HIG	GSJ	?
2. High resolution SCS			
3. MCS with velocities	LDGO and JNOC (Japan National Oil Co.)	LDGO	?
4. Seismic data on cross lines	will be done by July 1987 by Taylor, HIG		?
5. Seismic refraction	profile at 32°N across arc, Honza and Tamaki, 1985		
6. 3.5 kHz	HIG	HIG	
7. multi-beam bathymetry	SASS, Bay St. Louis	SASS, Bay St. Louis	
8. Sidescan sonar:			
A - shallow	SeaMARC II, HIG		
B - deep-towed			
9. Heat flow			
10. Magnetics	HIG	HIG	
11. Coring: A - paleoenvironmental B - geotechnical			
12. Dredging	ALVIN in area in 1987, but sites too deep for dive		
13. Photography			
14. Current meter			

Table 1: Site Survey Matrix, BONIN 2, (update: 1/87)

TABLE 1: SITE SURVEY MATRIX, LAU BASIN (update: 2/87)

TARGET SITE:	LG-1	LG-2	LG-3	LG-4	LG-5	LG-6
Environment:	E/F	E	D	E/F	E	D/E
Water Depth:	2200m	2200m	750m	2400m	2500m	4500-5000m
Sed. Thick:	50m	300m	>1500m	50m	300m	200-500m
Penetration:	500m	400m	500m	350m	350m	400-500m
TECHNIQUE						
1. Deep penetration SCS	SIO	SIO	USGS?	USGS?	IFREMER	USGS?
2. High Resolution SCS	needed	needed			desirable	
3. MCS with velocities			USGS	USGS		USGS & industry
4. Seismic data on cross lines		needed	USGS? needed			USGS? needed
5. Seismic refraction		SIO & HIG	sonobuoy? USGS?			
6. 3.5 kHz		SIO & HIG	USGS?	USGS	IFMER?	USGS?
7. Multi-beam Bathymetry	SIO SONNE'87	needed	needed	BGR & IFREMER	IFMER	
8. Sidescan sonar: a) shallow b) deep-towed	needed needed	needed		desirable	needed	
9. Heat flow	needed				requested SONNE or CHARCOT'87, DARWIN'88	
10. Magnetics	SIO & BGR	SIO & HIG	USGS?		IFRMER	USGS?
11. Coring: a) paleoenvironmental b) geotechnical	SIO	Imp.Col.,	USGS?	needed		
12. Dredging	SIO	SIO & HIG	USGS?	BER/USGS		USGS?
13. Photography	needed?			desirable		
14. Current meter						

CRUISES PLANNED: Sonne, 1987; Charcot, 1987; Darwin, 1988(?).

especially at site LG-1, as well as a SCS profile linking sites LG-1, 2, and 7.

ACTION: Duennebier contact Gill to ask for a Lau Basin report for the next SSP meeting and to try to arrange for a proponent to attend. Pass name of attendee to Peirce to include in list of guests requested at next meeting.

(4) Vanuatu (Mauffret)

The USGS MCS lines in the d'Entrecasteaux region have been migrated. Analysis of semblance plots indicate high velocities and a section which is too thick to allow the drilling objectives to be met.

The French MCS cruise on the Charcot (scheduled for May) will be in this area instead of the Coriolis Trough in order to try to define a new site.

(5) Japan Sea (Suyehiro)

Fewer reentry sites are required than were indicated earlier on the site proposals.

Apparently the shallow gas problem is related to a seismically transparent diatomaceous layer. The strategy to avoid shallow gas is to plan to penetrate this layer when it is not in a sealed position.

ACTION: Suyehiro include a thorough discussion of shallow gas problem in his next report on the Japan Sea.

(6) Nankai (Suyehiro)

The JNOC 55 data set will be made available, but it is not yet available. The feeling is that there is no BSR problem at NKT-2.

ACTION: Suyehiro continue to push for release of JNOC 55 data set in Nankai Trough. Prepare full report on BSR situation at NKT-2.

(7) Great Barrier Reef (Kidd)

Sarg (Exxon) showed a new MCS line at WPAC meeting. The Australians are planning a new MCS survey this summer, but we are unaware of the specifics.

The SSP reiterates its negative assessment of the current data base (p.13 of Villefranche minutes). The SSP has not yet seen the revised proposal.

ACTION: Peirce talk to Taylor regarding plans/hopes for this area (done in Honolulu) and write Fabvey for a copy of Australian cruise plans. Weidicke send Peirce/Kidd/Brenner copies of new proposal.

(8) Sunda Back Thrusting (Larsen)

The Silver site survey is definitely scheduled for Fall '87 on the R/V Moore.

(9) Bonin II (Duennebier)

See attached matrix. Site surveys in hand or planned.

(10) Nankai Geotech Mini leg (Suyehiro)

No comments. Will be discussed more fully at next SSP meeting.

(11) S. China Sea Margin (Lewis)

The two ship ESP data are only 20% processed. Rumour has it that industry data may be released through Hsu (ETH).

ACTION: Peirce write Pautot regarding data quality for sites SCS-1 and 2.

(12) Zenisu Ridge (Lewis)

Japanese MCS is planned.

(13) New Proposals

(a) Woodlark Basin. Apparently there is some chance of an Australian site survey with Scott (Canada).

ACTION: Peirce contact Scott for more information.

(b) Ogasawra Plateau (intersection of Bonin and Marianas Trenches). SAS bathymetry exists. Japanese survey (MCS, gravity, magnetics) scheduled for 1988.

(c) Kuril TTT Triple Junction. MCS and side scan data are needed to support this.

(14) Additional Site Surveys

(a) Nauru Basin/old Pacific - French and/or American MCS survey planned, (Schlich and Larson).

(b) Early 88 GLORIA surveys. There is talk of GLORIA surveys being run in the Philippines, Timor Sea and/or Lau Basin areas circa February, 1988. Nothing firm is scheduled.

5 - **UNDERWAY GEOPHYSICS TRIALS ON LEG 112 T**

The weather on Leg 112 T precluded any significant tests. A winch was rigged amidships to tow the 3.5-kHz towfish 120 feet from the ship's wake though bad weather prevented deployment of the towfish from this winch, ODP hopes to test it during Leg 113. Comparisons were made of the ODP Teledyne streamer and a pre-amp-equipped L-DGO streamer; both streamers produced similar records to 12 knots (the fastest transit speed during 112 T due to the weather).

6- **UPCOMING MEETINGS**

(a) SSP

The next SSP meeting is tentatively scheduled for Copenhagen for June 30 - July 4, 1987. Birger Larsen will host the meeting. A tentative agenda is attached as Appendix A.

The next SSP meeting after that is tentatively planned for late November, early December in Hawaii in order to allow for easy liaison with the WPAC chairman.

ACTION: Larsen contact P. Henry at JOI regarding arrangements. Peirce write to Pisias in March to firmly schedule meeting.

(b) WPAC

The next WPAC meeting is scheduled for early March in either Tokyo or Noumea. Suyehiro will attend as SSP liaison.

ACTION: Peirce write Pisias to have Suyehiro invited to WPAC meeting as SSP liaison.

(c) CEPAC

The next CEPAC meeting is scheduled at Northwestern on March 30-31. Brenner will attend as SSP liaison.

ACTION: Peirce write Pisas to have Brenner invited to next CEPAC meeting as liaison.

(d) Mascarene Plateau date review

Presuming that this will occur in Corvallis or Denver, the SSP plans to send Lewis as their representative.

7 - **SHIP SCHEDULES**

The Canadian and U.S. ship schedules are attached as Appendices B and C for information.

8 - **SSP ANNUAL REPORT**

The annual report of the SSP Chairman to PCOM is attached as Appendix D for information.

APPENDIX A

TENTATIVE AGENDA

SSP MEETING

COPENHAGEN, DENMARK

JUNE 30 - JULY 3, 1987

1. Preliminary Matters
   Introductions, schedules, minutes, etc.

2. Reports

   a) PCOM (Francis)
   b) Operator (A. Meyer)
   c) IOP (?)
   d) WPAC (Suyehiro)
   e) Drilling Engineering Workshop (A. Meyer ?)

3. Site Survey Assessments

   a) Report on Mascarene Plateau (Lewis)
   b) Kerguelen N & S (?)
   c) Ninetyeast Ridge South (Peirce)
   d) Argo/Exmouth (Larsen and von Rad)
   e) Lau Basin (?)

4. Review of WPAC drilling proposals.

5. New Chairman in 1988.

6. Upcoming Meetings and Liaisons.

1987 CANADIAN SHIP SCHEDULE
Cruises of Interest to ODP

Where	When	Who	What	Ship
PACIFIC:				
Juan de Fuca R.	4/20–5/3 (10/16–12/6 alt. schedule)	Clowes	Seismic refefraction	TULLY
Vancouver Island	5/4–24	Rohr, Yorath	Seismic, coring	TULLY
Juan de Fuca R.	5/25–6/7	Franklin	Camera, drilling, dredging	TULLY
Vancouver Island	6/8–6/21	Davis/Law	Heat flow, electrical resistivity	TULLY
NE Pacific	8/10–30	Bornhold	Seismic, dredging	PARIZEAU
ATLANTIC:				
Laurentian Fan	April	Piper	Testing of URI long coring facility	HUDSON
NE Grand Banks	5/15–6/7	C. Keen	OBS Refraction Deep SCS	HUDSON

POC: Michael Rawson
Lamont-Doherty Geological Observatory
Columbia University
Palisades, N.Y. 10964
Tel: (914) 359-2900 x367

Revised
December 1, 1986

Appendix C

R/V ROBERT D. CONRAD

Operations Schedule for Period 04 Jan 1987 through 31 Dec 1987

DATES	PROGRAM AND LEG	AGENCY DAYS AT SEA
Oceanographic Research	Katz (28-01)	NSF (F)
Dep: 04 Jan 87 Rio de Janeiro	Equatorial Atlantic	23 Days
Arr: 27 Jan 87 Recife	Mooring Recovery	
Oceanographic Research	Fleming (28-02)	ONR/NRL
Dep: 31 Jan 87 Recife	Fox, Cande	35 Days
Arr: 07 Mar 87 Montevideo	S. Atlantic	(SB) (F)
Oceanographic Research	Whitworth (28-03)	NSF (F)
Dep: 11 Mar 87 Montevideo	South Atlantic	35 Days
Arr: 15 Apr 87 Montevideo	CTD, Mooring Recovery	
Oceanographic Research	Flood (28-04)	ONR (F)
Dep: 19 Apr 87 Montevideo	South Atlantic	35 Days
Arr: 24 May 87 Rio de Janeiro	Argentine Basin Sediments	(SB)
Transit	Transit (28-05)	NSF/ONR
Dep: 28 May 87 Rio de Janeiro		5 Days
Arr: 01 Jun 87 Recife		
Oceanographic Research	Schilling (28-06)	NSF (F)
Dep: 03 Jun 87 Recife	Equatorial Atlantic	34 Days
Arr: 07 Jul 87 Fortaleza	MAR-Petrology	(SB)
Transit	Transit (28-07)	NSF
Dep: 10 Jul 87 Fortaleza		10 Days
Arr: 20 Jul 87 San Juan		
Maintenance & Sea Trials	Maintenance NSF	
INSERV Inspection & Installation of MCS Equipment		15 Days
Oceanographic Research	(28-08)	PFS (P)
Dep: 05 Aug 87 San Juan	North Atlantic	26 Days
Arr: 31 Aug 87 Valencia	Cable Survey (pending)	(SB)
Oceanographic Research	Watts (28-09)	NSF (F)
Dep: 04 Sep 87 Valencia	Valencia Basin	30 Days
Arr: 04 Oct 87 Gibralter	2-Ship MCS w/French	
Oceanographic Research	(28-10)	
Dep: 08 Oct 87 Gibralter	TRANSIT	15 Days
Arr: 23 Oct 87 Bermuda		
Oceanographic Research	Detrick (28-11)	NSF (F)
Dep: 27 Oct 87 Bermuda	Bermuda Basin	34 Days
Arr: 20 Nov 87 San Juan	MCS (2-Ship Ops)	
Transit	(28-12)	
Dep: 23 Nov 87 San Juan	USGS/and or Cable Survey	35 Days
Arr: 28 Dec 87 Panama	Gulf of Mexico/Caribbean	
	(Tentative)	

DATES	PROGRAM AND LEG	AGENCY DAYS AT SEA
Oceanographic Research	Purdy (29-01)	NSF (F)
Dep: 02 Jan 88 Panama	EPR/13 N.	25 DAYS
Arr: 27 Jan 88 Panama	OBS, Seismic Survey	(SB)
Oceanographic Research	(29-02)	NSF
Dep: 31 Jan 88 Panama	TRANSIT	10 Days
Arr: 10 Feb 88 Valpariso		
Oceanographic Research	Cande (29-03)	NSF (F)
Dep: 14 Feb 88 Valpariso	Chile Ridge/Trench	36 Days
Arr: 22 Mar 88 Puntarenas	MCS & MGG Survey	

ENDEAVOR
OPS SCHEDULE FOR PERIOD
1 JAN 87 - 31 DEC 87

OCEANOGRAPHIC RESEARCH	SANFORD	NSF
DEP: 03 JAN 87 NARRAGANSETT		(F)
ARR: 23 JAN 87 NARRAGANSETT	W. N. ATLANTIC	21
OCEANOGRAPHIC RESEARCH	WATTS	ONR/NSF
DEP: 28 JAN 87 NARRAGANSETT		
ARR: 06 FEB 87 NARRAGANSETT	HATTERAS	7/3
TRANSIT		NSF
DEP: 10 FEB 87 NARRAGANSETT		
ARR: 22 FEB 87 FORTALEZA	TRANSIT	13
OCEANOGRAPHIC RESEARCH	SCHILLING	NSF
DEP: 25 FEB 87 FORTALEZA		(F)
ARR: 26 MAR 87 BARBADOS	EQUATOR	30
TRANSIT		NSF
DEP: 29 MAR 87 BARBADOS		
ARR: 04 APR 87 NARRAGANSETT	TRANSIT	7
OCEANOGRAPHIC RESEARCH	CAMMEN	NSF
DEP: 07 APR 87 NARRAGANSETT		(F)
ARR: 10 APR 87 NARRAGANSETT	GULF OF MAINE	4
OCEANOGRAPHIC RESEARCH	WINN	NSF
DEP: 14 APR 87 NARRAGANSETT		
ARR: 04 MAY 87 NARRAGANSETT	W. NO. ATLANTIC	21
OCEANOGRAPHIC RESEARCH	MARRA	ONR
DEP: 10 MAY 87 NARRAGANSETT		(F)
ARR: 28 MAY 87 NARRAGANSETT	W. NO. ATLANTIC	19
OCEANOGRAPHIC RESEARCH	HOUGHTON	NSF
DEP: 18 JUN 87 NARRAGANSETT		
ARR: 29 JUN 87 NARRAGANSETT	W. NO. ATLANTIC	20
OCEANOGRAPHIC RESEARCH	COLWELL/GRIMES	NSF
DEP: 02 JUL 87 NARRAGANSETT		(1)
ARR: 16 JUL 87 NARRAGANSETT	W. NO. ATLANTIC	15

OCEANOGRAPHIC RESEARCH DEP: 12 AUG 87 NARRAGANSETT ARR: 28 AUG 87 NARRAGANSETT	SWIFT/CASE W. NO. ATLANTIC	ONR (F) 17
OCEANOGRAPHIC RESEARCH DEP: 31 AUG 87 NARRAGANSETT ARR: 09 SEP 87 NARRAGANSETT	DAVIS W. NO. ATLANTIC	NSF 10
OCEANOGRAPHIC RESEARCH DEP: 12 SEP 87 NARRAGANSETT ARR: 18 SEP 87 NARRAGANSETT	LEVINE W. NO. ATLANTIC	NUSC 7
OCEANOGRAPHIC RESEARCH DEP: 04 OCT 87 NARRAGANSETT ARR: 17 OCT 87 NARRAGANSETT	ROSSBY W. NO. ATLANTIC	ONR (F) 14
OCEANOGRAPHIC RESEARCH DEP: 22 OCT 87 NARRAGANSETT ARR: 31 OCT 87 NARRAGANSETT	BISCAYNE W. NO. ATLANTIC	DOE (F) 10
TRANSIT DEP: 05 NOV 87 NARRAGANSETT ARR: 11 NOV 87 SAN JUAN	 TRANSIT	NSF 7
OCEANOGRAPHIC RESEARCH DEP: 14 NOV 87 SAN JUAN ARR: 03 DEC 87 FORTALEZA	WATERBURY CARIBBEAN	NSF 20
OCEANOGRAPHIC RESEARCH DEP: 05 DEC 87 FORTALEZA ARR: 24 DEC 87 FORTALEZA	GARZOLI/KATZ EQUATOR	NSF (F) 20

KNORR

OPS SCHEDULE FOR PERIOD
01 JAN 87 - 31 DEC 87

OCEANOGRAPHIC RESEARCH DEP: 03 JAN 87 WOODS HOLE ARR: 23 JAN 87 WOODS HOLE	WIEBE W. NO. ATLANTIC	NSF 21
OCEANOGRAPHIC RESEARCH DEP: 13 FEB 87 WOODS HOLE ARR: 12 MAR 87 WOODS HOLE	BALLARD W. NO. ATLANTIC	NSF/NSF 8/20
TRANSIT DEP: 22 MAR 87 WOODS HOLE ARR: 10 APR 87 PIRAEUS	TRANSIT	NSF 21
OCEANOGRAPHIC RESEARCH DEP: 13 APR 87 PIRAEUS ARR: 02 MAY 87 ISTANBUL	YENTSCH (BLOS) E. MEDITERRANEAN	NSF 22
OCEANOGRAPHIC RESEARCH DEP: 05 MAY 87 ISTANBUL ARR: 20 MAY 87 ISTANBUL	JANNASCH BLACK SEA	NSF 18
OCEANOGRAPHIC RESEARCH DEP: 23 MAY 87 ISTANBUL ARR: 15 JUN 87 ISTANBUL	HONJO BLACK SEA	NSF 26
OCEANOGRAPHIC RESEARCH DEP: 18 JUN 87 ISTANBUL ARR: 01 JUL 87 ISTANBUL	MURRAY (UW) BLACK SEA	NSF 15
OCEANOGRAPHIC RESEARCH DEP: 03 JUL 87 ISTANBUL ARR: 16 JUL 87 ISTANBUL	MURRAY (UW) BLACK SEA	NSF 16
OCEANOGRAPHIC RESEARCH DEP: 19 JUL 87 ISTANBUL ARR: 02 AUG 87 ISTANBUL	WATSON BLACK SEA	NSF 18
OCEANOGRAPHIC RESEARCH DEP: 06 AUG 87 ISTANBUL ARR: 20 AUG 87	MILLIMAN BLACK SEA	NSF 19

OCEANOGRAPHIC RESEARCH DEP: 23 AUG 87 ISTANBUL ARR: 11 SEP 87 PIRAEUS	YENTSCH (BLOS) E. MEDITERRANEAN	NSF 22
OCEANOGRAPHIC RESEARCH DEP: 14 SEP 87 PIREAUS ARR: 24 SEP 87 PALERMO	EDMOND (MIT) E. MEDITERRANEAN	NSF 13
TRANSIT DEP: 27 SEP 87 PALERMO ARR: 03 OCT 87 CANARY ISLANDS	TRANSIT	NSF 7
OUT OF SERVICE DEP: 04 OCT 87 CANARY ISLANDS ARR: 17 OCT 87 CANARY ISLANDS	SHIPYARD	
TRANSIT DEP: 18 OCT 87 CANARY ISLANDS ARR: 23 OCT 87 DAKAR	TRANSIT	NSF 10
OCEANOGRAPHIC RESEARCH DEP: 28 OCT 87 DAKAR ARR: 23 NOV 87 DAKAR	SMITHIE (LDGO) SO. ATLANTIC	NSF 31
OCEANOGRAPHIC RESEARCH DEP: 28 NOV 87 DAKAR ARR: 22 DEC 87 RIO	SMITHIE (LDGO) SO. ATLANTIC	NSF 34

MOANA WAVE

OPS SCHEDULE FOR PERIOD
01 JAN 87 - 31 DEC 87

OCEANOGRAPHIC RESEARCH DEP: 29 NOV 86 HONOLULU ARR: 05 JAN 87 ACAPULCO	MACDONALD	ONR (F) 87:5
OCEANOGRAPHIC RESEARCH DEP: 09 JAN 87 ACAPULCO ARR: 13 FEB 87 EASTER ISLAND	MACDONALD	NSF (F) 36
OCEANOGRAPHIC RESEARCH DEP: 17 FEB 87 EASTER ISLAND ARR: 16 MAR 87 EASTER ISLAND	SINTON	NSF (F)
OCEANOGRAPHIC RESEARCH DEP: 20 MAR 87 EASTER ISLAND ARR: 28 APR 87 CALLAO	HEY	NSF (F) 40
OCEANOGRAPHIC RESEARCH DEP: 02 MAY 87 CALLAO ARR: 15 MAY 87 CALLAO	FARRINGTON	NSF (F) 14
OCEANOGRAPHIC RESEARCH DEP: 19 MAY 87 CALLAO ARR: 18 JUN 87 GUAYAQUIL	MOBERLY	NSF (F) 31
OCEANOGRAPHIC RESEARCH DEP: 23 JUN 87 GUAYAQUIL ARR: 20 JUL 87 PANAMA	FORNARI	NSF (F) 28
OCEANOGRAPHIC RESEARCH DEP: 24 JUL 87 PANAMA ARR: 21 SEP 87 TAHITI	RISER	NSF (F) 60
OCEANOGRAPHIC RESEARCH DEP: 25 SEP 87 TAHITI ARR: 18 OCT 87 PAGO PAGO	COULBOURN	AID (F) 24
OCEANOGRAPHIC RESEARCH DEP: 21 OCT 87 PAGO PAGO ARR: 10 NOV 87 SUVA	KROENKE	AID (F) 21

OCEANOGRAPHIC RESEARCH DEP: 14 NOV 87 SUVA ARR: 04 DEC 87 PORT VILA		IFREMER (P) 21
OCEANOGRAPHIC RESEARCH DEP: 08 DEC 87 PORT VILA ARR: 08 JAN 88 MAJURO	SCHLANGER	NSF 87:24

THOMAS WASHINGTON

OPS SCHEDULE FOR PERIOD
01 JAN 87 - 31 DEC 87

OPEN DEP: 07 JAN 87 SAN DIEGO ARR: 06 FEB 87 SAN DIEGO	OPEN	
OCEANOGRAPHIC RESEARCH DEP: 14 FEB 87 SAN DIEGO ARR: 22 MAR 87 PAPEETE	WINTERER SEABEAM-GRAVITY EQUATOR - LINE ISLANDS	ONR/UC (F) 34/5
OCEANOGRAPHIC RESEARCH DEP: 27 MAR 87 PAPEETE ARR: 22 APR 87 PAPEETE	KEELING/MCNUTT/NATLAND SEABEAM-GRAVITY MARQUESAS FAN	NSF (F) 30
OCEANOGRAPHIC RESEARCH DEP: 26 APR 87 PAPEETE ARR: 24 MAY 87 TONGA	WHITE (UK) SEABEAM-GRAVITY LAU BASIN	NSF (F) 32
OCEANOGRAPHIC RESEARCH DEP: 28 MAY 87 TONGA ARR: 23 JUN 87 TONGA	DORMAN OBS LAU BASIN	NSF (S) 30
OCEANOGRAPHIC RESEARCH DEP: 27 JUN 87 TONGA ARR: 17 JUL 87 TONGA	BLOOMER/FISHER SEABEAM TONGA TRENCH	NSF (S) 23
OCEANOGRAPHIC RESEARCH DEP: 18 JUL 87 TONGA ARR: 27 JUL 87 TONGA	DORMAN RECOVER OBS LAU BASIN	NSF (S) 10
OCEANOGRAPHIC RESEARCH DEP: 30 JUL 87 TONGA ARR: 27 AUG 87 SUVA	HAWKINS SEABEAM LAU BASIN	NSF/ODP (S) 32
TRANSIT DEP: 30 AUG 87 SUVA ARR: 12 SEP 87 PALAU	TRANSIT	NSF 15
OCEANOGRAPHIC RESEARCH DEP: 15 SEP 87 PALAU ARR: 13 OCT 87 MANILA	LEWIS (LDGO) SEABEAM MANILA TRENCH	NSF (S) 32

OCEANOGRAPHIC RESEARCH DEP: 16 OCT 87 MANILA ARR: 06 NOV 87 AMBON	SILVER (UCSC) SEISMICS BANDA SEA	NSF/ODP (S) 24
OCEANOGRAPHIC RESEARCH DEP: 09 NOV 87 AMBON ARR: 30 NOV 87 FREMANTLE	SILVER BANDA SEA	NSF/ODP (S) 24
OCEANOGRAPHIC RESEARCH DEP: 03 DEC 87 FREMANTLE ARR: 31 DEC 87 MELBOURNE	CHRISTIE DREDGING 50S-AUSTRALIA	NSF (S) 32

ANNUAL REPORT OF THE SITE SURVEY PANEL

The SSP has met three times since the 1986 ODP Annual Meeting - in Victoria (April), Villefranche (Nov.) and Palisades (Jan.).

The SSP is pleased with the quality of the recently completed site surveys. We feel that that the additional scientific understanding provided by these new data sets has underlined the importance of good site survey data more successfully than any amount of rhetoric could have done. The catch-up game which has dogged the Indian Ocean planning is nearly over, and we feel that site survey planning will soon be on a reasonable schedule with sufficient advance time for the first time in the history of deep sea drilling.

The SSP's watchdog system for drilling proposals and the revised Site Survey Data Standards matrix seem to be working well. From our perspective we have adequate liaison with other panels.

The ODP Databank has operated at the same level of activity in FY 86 as in FY 85. However, the Databank, and in particular Carl Brenner, have played an increasingly key role in facilitating the work of the SSP. The Site Survey Panel is particularly pleased that the funding of the Databank for 1987 is at a reasonable level. There continue to be problems from time to time in receiving critical data packages in the Databank, but these seem to becoming less frequent.

Our meetings for 1987 are tentatively scheduled for June 30 - July 3 (Copenhagen) to review Kerguelen and the eastern Indian Ocean in detail and to go through WPAC plans again. In early December we plan a second meeting to review completed WPAC site surveys in detail and to look ahead to CEPAC site survey status.

Respectfully submitted,

John W. Peirce
SSP Chairman
January 16, 1987

JOIDES PLANNING COMMITTEE MEETING
19-23 January 1987
Hawaii Institute of Geophysics

MEETING MINUTES

Members:

N.Pisias (Chairman) - Oregon State University
G.Brass - University of Miami
J-P.Cadet - France
W.Coulbourn - University of Hawaii
O.Eldholm - ESF Consortium
T.Francis - United Kingdom
S.Gartner - Texas A&M University
D.Hayes - Lamont-Doherty Geological Observatory
M.Kastner - Scripps Institution of Oceanography
R.Larson - University of Rhode Island
R.McDuff - University of Washington (21-23 January)
P.Robinson - Canada
T.Shipley - University of Texas
A.Taira - Japan
B.Tucholke (for D.Ross) - Woods Hole Oceanographic Institution
U.von Rad - Federal Republic of Germany

Liaisons:

R.Buffler - National Science Foundation
T.Pyle - Joint Oceanographic Institutions, Inc.
L.Garrison - Science Operator (ODP/TAMU)
R.Jarrard - Wireline Logging Services (ODP/LDGO)

Panel/Committee Chairmen:

D.Appleman - Information Handling Panel
J.Austin - Atlantic Regional Panel
P.Ciesielski (for P.Barker) - Southern Oceans Regional Panel
G.Claypool - Pollution Prevention & Safety Panel
D.Cowan - Tectonics Panel
R.Detrick - Lithosphere Panel
J.Jarry - Technology & Engineering Development Committee
L.Mayer - Sediments & Ocean History Panel
J.Peirce - Site Survey Panel
S.Schlanger - Central & Eastern Pacific Regional Panel
R.Schlich - Indian Ocean Regional Panel
B.Taylor - Western Pacific Regional Panel
P.Worthington - Downhole Measurements Panel

Guests / Observers:

C.Moore - Leg 110 Co-chief Scientist
K.Becker - Leg 111 Co-chief Scientist
R.von Huene - Leg 112 Co-chief Scientist

R.Moberly - University of Hawaii
B.Harding - Science Operator (ODP/TAMU)
A.Meyers - Science Operator (ODP/TAMU)
E.Kappel - Joint Oceanographic Institutions, Inc.
D.Steere - Underseas Drilling, Inc. (SEDCO)

JOIDES Office:

M.Wiedicke - Non-U.S. Liaison/Executive Assistant
S.Stambaugh - Science Coordinator
C.Moss - Office Coordinator

623 INTRODUCTION AND OPENING REMARKS

N. Pisias, PCOM Chairman, convened the 19-23 January 1987 annual meeting of the JOIDES Planning Committee, held in Honolulu, Hawaii, and hosted by the Hawaii Institute of Geophysics. Participants were welcomed by W. Coulbourn, the HIG representative to PCOM.

N. Pisias introduced G. Brass, former NSF liaison to PCOM, as the new voting member from the University of Miami as well as B. Tucholke, the alternate for D. Ross at WHOI. New panel chairmen introduced were P. Worthington (DMP), S. Schlanger (CEPAC), Larry Mayer (SOHP), and R. Detrick (LITHP). P. Ciesielski was introduced as alternate for SOP Chairman P. Barker who was then at sea on Leg 113. R. Buffler, the new NSF liaison, was introduced.

Guests from Texas included B. Harding, TAMU Chief Engineer, A. Meyer, TAMU Manager of Science Operations and D. Steere, representing Underseas Drilling Inc. (SEDCO). Pisias introduced co-chiefs Casey Moore from U.C.-Santa Cruz (Leg 110), Keir Becker from U. of Miami (Leg 111) and Roland von Huene from the USGS-Menlo Park (Leg 112).

Ralph Moberly, from the Hawaii Institute of Geophysics, was introduced as an observer to the meeting. Pisias also introduced the new JOIDES Planning Office staff: Michael Wiedicke, executive assistant/non-U.S. liaison, Sharmon Stambaugh, science coordinator and Cherry Moss, JOIDES office coordinator.

624 ADOPTION OF MEETING AGENDA

Pisias clarified the agenda by noting that "Item T: New ODP Sediment Classification " was not included on the agenda outline and that Item U should now read "Future Meeting Schedule and Item V should read "Other Business".

PCOM Motion:

The agenda for the Annual Meeting be adopted, with the corrections forwarded by the PCOM Chairman. (motion Larson, second Brass)

Vote: 15 for, 0 against, 0 abstain

625 APPROVAL OF PCOM MINUTES

M. Kastner noted the following correction to the minutes:

Page 33, line 22: "organic geochemist" should read "inorganic"

PCOM Motion:
Minutes of the 11-15 August 1986 Planning Committee meeting held in Corner Brook, Newfoundland, are approved, with the corrections forwarded at this meeting to be included. (motion Larson, second Brass)

Vote: 15 for, 0 against, 0 abstain

626 EXCOM REPORT

N. Pisias was in attendance at the 15-16 October 1986 meeting and reported on those EXCOM decisions of importance to this PCOM meeting (see page 3 of the agenda book for a summary).

Pisias noted that R.Buffler would update PCOM on the membership status of the U.S.S.R. and that it appeared the Soviets would sign the MOU in February. The USSR did not send a representative to this meeting as anticipated.

Purchase of the wireline packer was approved by EXCOM and Pisias reported that the order was placed in early January.

Pisias noted that the new budget process approved at the EXCOM meeting would be tested at this meeting; PCOM would have the opportunity to give major input to the FY88 engineering development. Because PCOM is now to give NSF advice on the budget in December, the scheduling of future PCOM meetings will be affected.

627 RED SEA CLEARANCE

At the Corner Brook meeting, PCOM deferred decision on the Red Sea program until this meeting. EXCOM accepted this decision. The JOI Board of Governors has since met and endorsed EXCOM's view not to accept conditions clearly outside ODP standards.

Current clearance status reported by Pisias was:
1) No clearance as yet from the Saudi government, and
2) Unacceptable clearance conditions from the Egyptian officials.

PCOM Motion:

The Red Sea program should be removed from the JOIDES RESOLUTION operations schedule. (motion Kastner, second Brass)

Discussion:

L. Garrison discussed the conditions sought by the Egyptians. They included clearance negotiations well in advance of drilling operations to be held in Cairo, participation of Egyptian scientists and liaisons, the custody of all samples, with results to be reported to ODP, and custody of the original data tapes, again, with copies of results available afterwards to ODP.

Garrison said that without the time to negotiate with Egypt and the lack of clearance from the Saudi government, planning for Leg 116 must go forward.

Robinson reiterated that the conditions had not been met and the vote was called.

Vote: 15 for, 0 against, 0 abstain

628 NSF REPORT

R. Buffler reported for NSF; a written summary appears as Appendix A.

Buffler said that two representatives from the Soviet Academy of Sciences were currently in Washington, D.C. to discuss the signing of the MOU for ODP membership and the schedule of payments.

The enhancements to the FY87 base budget Of $34,280,000 totaled $1,002,000. Buffler noted that enhancements were contingent on Soviet membership. Comparisons of the FY86 and FY87 budgets showed that PCOM's requests for increases in publication and engineering development had been met. NSF will now require more lead time for budgeting as reflected in the new budget procedures adopted by EXCOM. A written document on FY88 priorities to JOI will be required from PCOM.

The target figure for the FY88 budget (which assumes seven non-U.S. members) is a two-level one: a base budget of $35.5M (an increase of $1.2 from FY87) and an enhanced budget of $36.5M.

The new drilling schedule presented by Buffler differs slightly from the current PCOM mandate which is to provide a one-year drilling schedule and a three-year general track for the ship. "Firm planning", as described in the new drilling timetable, should cover the FY88 Program Plan, in order to provide lead time for new proposals. First priority will be given to Central

Pacific proposals.

Buffler announced that he will leave his NSF post in September of 1987 and that the NSF will seek a permanent liaison for the position.

The status of a Canadian/Australian consortium was reported by P. Robinson. Australia is close to achieving a one-third subscription arrangement with Canada and negotiations are still in progress pending funding from several government branches, chiefly the Bureau of Mineral Resources.

629 JOINT OCEANOGRAPHIC INSTITUTIONS, INC. REPORT

FY88 PROGRAM PLAN

T. Pyle reported that the FY87 Program Plan and base budget have been approved. The FY87 budget represents and increase in $1.77M over the FY86 budget. The enhancements for FY87 ($.72M to TAMU, $.094M to LDGO and $.188 to JOI/JOIDES) are on hold pending membership of the USSR. TAMU's enhancements include drilling supplies, engineering personnel to work on developments such as riser drilling, additional SEDCO crew and extension of the ice boat for Leg 114. LDGO's major enhancements are for digital conversion of the BHTV and increases for databank activities. The JOI/JOIDES increases are for developing the international program (as recommended by EXCOM) and for automatic data processing equipment.

The new budget meets EXCOM and PCOM objectives, but allows for few contingencies. Engineering priorities have been realigned at TAMU with an emphasis on drilling hard rock. Pyle announced that the panel chairmen would receive a 50% increase for operational expenses for a total of $1500 per year. A drilling program calendar for 1987, which reflects PCOM's involvement in the budget, appears as Appendix B.

Pyle expanded on the international program; an international project specialist, hired through JOI and reporting to him, would focus on the role of the international partners. The $50K approved by EXCOM for Third World participation is to include shipboard time as well as project activities at TAMU; the program is still being defined.

FY88 PROJECTIONS

Pyle reported that the new budget schedule will be tight and will involve interaction with BCOM, a new committee. NSF target budgets were presented; a base budget of $35.5M and an enhanced budget of $36.5M are projected. Pyle suggested that a further level in the program plan may be necessary to cover major capital investments for engineering development; a separate NSF proposal for such work could accomplish this.

Other items which may impact the FY88 budget include costs associated with COSOD II, increases for Part B publications (about $500K), potential replacement of the drillstring ($400 K), ice boats needed for high-latitude legs ($2M estimated), the guidebase for SWIR drilling ($250K) and other, less predictable increases (day rates, Schlumberger rates, logging enhancements, e.g.)

Pyle said that the enhancements reflected PCOM's prioritizations with the exception of the international program, which EXCOM placed as a higher priority. He emphasized that the enhancements were "all-or-nothing" contingent on Soviet membership.

FY89 PRIORITIES

Pyle said that the scheduling for FY89 will improve with the earlier input from PCOM (December). The NSF budget is an unknown, but a suggestion for doubling of the NSF contributions by FY92 has been favorably received. Publication costs will continue to increase as well as possible costs for drillstring replacement.

Discussion:

B. Harding (TAMU) mentioned that now was the time to purchase oilfield goods due to the industry downturn. He recommended buying about 10,000 feet of pipe this year and again next year.

High latitude drilling and its budgetary impact were discussed. Pyle responded that a "steady state" program would not normally include high-latitude drilling, and discussions on whether budget planning should include at least one "big ticket" item (e.g. ice-boat support or guidebases) ensued. Larson commented that Legs 104-105. Legs 113-114 and the Kerguelen programs all needed and will need iceboat support, and with Soviet involvement, more may be planned. R. Buffler (NSF) said that the NSF budget figures showed only a steady-state program with an increase for inflation (about 4%).

Robinson suggested that items that are crucial for the success of the program be budgeted in and that PCOM must develop programs in advance for them. L. Garrison said that TAMU has had to budget in "unknowns" such as the guidebase for SWIR. D.Hayes remarked that the Weddell Sea and Kerguelen programs had been on the drilling schedule for a long time and that the budgeting process should not include these high latitude, high-tech programs as add-ons. Pyle closed the discussion by noting that some items, such as publications, should not be considered enhancements. Factors other than engineering developments will make an impact on future budgets. He also clarified that the increase in support for panel chairmen extended to non-U.S. as well as U.S. chairmen.

630 SCIENCE OPERATOR REPORT

L. Garrison gave an update on the status of the JOIDES RESOLUTION (Leg 113) including ice reports. Auxiliary science on the MAERSK MASTER (magnetic lines and floating sediment trap experiments) has been successful. The first core was drilled on 16 January and the W1 site was drilled to 300m before impenetrable chert was encountered (target depth was 400-450 m).

Garrison reported on the plans at TAMU for the end of Leg 113; a chartered 747 will bring freight and crew from Houston to the Falklands. The status of the rechartering of the ice patrol boat had not been decided although ice reports indicate that it will be needed at Sites SA5 and SA2.

The status of the cryogenic magnetometer, not available for Leg 113 due to rapid boil-off problems, is uncertain; it is scheduled for use on Leg 114 although careful shipping will be necessary to avoid repeated damage of the instrument.

The results of the pressure core barrel (PCB) workshop were discussed; no FY87 funds were budgeted for the PCB but a working model is projected for late 1988 by TAMU engineers. To conclude, Garrison reported that new preliminary drilling time estimates had been mailed out; also, the new ODP building at TAMU was dedicated in late November.

P. Robinson reported that Canadian scientists may have difficulty getting ODP support for the cost of the charter flight to Leg 114; Garrison said cost figures would soon be available. T.Francis asked about the testing of the high-speed seismic streamer; A. Meyer (TAMU) said that it had not been tested on the transit leg due to slow speeds, but would be tested during Leg 113.

SCIENCE OPERATOR - ENGINEERING REPORT

B.Harding, Chief Engineer at TAMU, gave the report.

Navi-drill Development:

The Navi-drill testing in Celle, FRG, should be finished in late January; it has successfully drilled with diamond shoes into poured concrete and greywacke and should be operational for Leg 114. Frederich Young, the FRG exchange engineer for the project, will go out on Leg 114.

Prototypes for Lockable Flappers:

Harding reported that Dave Huey, TAMU engineer, was out with Leg 113 testing flapper locks which will allow logging through the XCB bit.

New Drill Bits:

Nine 7/8 inch XCB diamond bits from two manufacturers are being tested (about $30K contracted). Failure analysis on the diamond bits used on Leg 111 are in progress.

Side-entry Sub:

Only one side-entry sub built to LDGO specifications is available; the sub has helped with bridging problems, but it is still hard to get the logging tool to the bottom of a hole.

High-temperature Drilling:

Harding explained the $135K budgeted in FY87 for this project; TAMU budgets six months ahead of a given fiscal year and then breaks down the project to appropriate cost catagories. He said that clear directives for FY88 were needed from this meeting because the high-temperature work was based on having the Red Sea leg. The $135K was reassigned so that $45K went to the Los Alamos lab to develop code for drilling in hydrothermal areas and to analyze steam flash problems. Their 350°C code is being rewritten to 500°C. Bit seals and core liner are in-house development programs for high-temperature drilling.

Guidebase Development:

Development for the guidebase includes ordering additional jars and working on safe deployment of the equipment; the work can be finished by the end of May if needed by then.

The reprogramming of the $135K budgeted for high-temperature drilling was not a short-term priority for the Red Sea leg, Harding said. The program should be ready, if needed, for the Lau Basin drilling in 1989. Problems with drilling chert on the Kerguelen legs was discussed. Harding said that XCB cutting shoes were not designed for these hard materials and that the Navi-drill should help. Land testing of the Navi-drill was strongly recommended; S. Schlanger suggested a location on the French coast as a good analogue for the alternating soft layers/chert problem. Schlich stressed the objectives of the Kerguelen Jurassic/Cretaceous sites and basement problems could not be addressed unless the recovery in such lithologies improves. Kastner added that the COSOD II Steering Committee sees this as a major problem as well.

LEG 110 REPORT

Casey Moore, co-chief scientist on Leg 110, reported on the program in the Barbados forearc area. Three packages were drilled: the deformation front, an oceanic plate reference site and upslope (to see the continental evolution of off-scraped sites). Sites near the toe of the deformation front, 671-676, included the previous 78A site. Site 671 penetrated through the accreted stack, into the decollement zone and into a sand layer. Similar scaley mudstones had stopped drilling on the previous leg. The Oligocene section below the decollement was drilled 150m until an unexpected sand layer stopped drilling. The oceanic reference site (672) still showed geochemical anomalies and evidence of fluid movements along fracture/permeable zones; therefore, six km seaward of the deformation zone was not far enough out for the geochemical reference site. Good biostratigraphy was obtained and large-scale deformation (overturning, folded imbricates cut by faults) was seen, especially at Site 674, which was drilled well onto the accretionary prism.

Interstitial water results indicated that low chloride concentrations and enhanced methane concentrations were associated with the decollement zone as well as the underlying sandstones. These anomalies extended to the zone of "future decollement" and the sandstone layers in Site 672. These results suggest that lateral advection of low-chloride fluids contianing a small therogenic methane component occurs along the decollement and the underlying sandstones. These fluids probably originate from farther west onto the accretionary complex as a result of dewatering reactions. Low chloride zones in Site 674 show potential advection along recent faults, and at a depth of 30 m the chloride anomaly is associated with a temperature anomaly.

In summary, drilling on Leg 110:

* penetrated the decollement
* confirmed fluid flow and deformation well-seaward of the accretionary wedge
* specified the geometry of the fluid conduits

Goals for future research should be to specify the geologic framework for the deformation front and to constrain the structural and hydrologic processes involved. Moore added that the development of workable logging tools and downhole instruments such as packers will be important for these kinds of problems.

LEG 111 REPORT

Keir Becker, co-chief, reported on Leg 111, the main objective of which was to deepen Hole 504B. Coring operations on the hole and problems encountered have bearing on the future of hard-rock drilling, Becker said. Sites 677 and 678 were drilled to measure different heat flow regimes near the spreading axis; these sites also yielded continuous Pleistocene records (677) and hydrothermal circulation data (678).

Hole 504B was deepened about 200 m into the sheeted dike section from the previous Leg 83 drilling to a total depth of 1562 mbsf. Continuous temperature logs confirmed conduction deep into the hole and pore water analyses showed deviations from seawater composition; some slow convection of fluids within the borehole had occurred. Permeability measurements yielded values in the sheeted dikes similar to those of the pillow lavas at Layer 2B. The logging program at 504B was very successful, with excellent results from vertical seismic profiling (which suggest that Layer 3 may be a few hundred meters below the present hole).

Becker covered the operations problems at 504B. During the five days of logging, the hydraulic arm of the Schlumberger water sampler broke off and had to be milled out. Bit failures occurred after 15 rotating hours due to torquing and junk in the hole. The stabilizers wore off the bottom hole assembly and roller cones were repeatedly lost from the steel bits. The fishing/milling operations on the hole were partially successful and the diamond coring bit was tried. The diamond bit did not advance the bit and the inner core barrel were both lost, although the core barrel was recovered after four days of fishing. The BHA showed a clean break with no rotation on the bit, suggesting a large pressure surge.

Discussion:

B. Harding said that drilling a new hole at the 504B site would take almost a full leg of drilling. Becker reported about 13% recovery at 504B; contributing factors to the poor recovery were: junk in the hole, the problem of flushing cuttings from a deep hole, the release of formation stresses in new cored section and the characteristics of the formation itself. The recovery from Leg 83 was bad even without junk in the hole and the better heave compensation with the RESOLUTION tripled the penetration rate on this leg.

Becker reported that several core liners collapsed which is probably related to high temperatures (150-160°C). Harding addressed the cuttings problem and said that TAMU is looking at using a pack-off assembly around the drillstring to improve pumping rates; a diverter plug would be set inside the re-entry cone and the hole itself would act as a riser. Harding said that they did not have appropriate fishing tools for the diamond bit on Leg 111 and the best re-entry attempt would be to set an explosion to break up the bit into smaller sections , then magnetically fish.

LEG 112 REPORT

Roland von Huene, co-chief on Leg 112, reported on the Peru Margin drilling and upwelling studies. Fifty-one days were spent at sea and almost five kilometers of core was recovered on this leg.

The major scientific results of this leg were: determination of the extent of continental crust toward the Peru Trench; evidence for the impact of the Nazca Ridge; a five-million year record of coastal upwelling; evidence for intense carbon-fueled early diagenesis and for an open geochemical system with fluid movement.

Two transects across the margin were drilled. The northern transect was drilled to test the extent of continental crust and to constrain timing on tectonic events. Although basement was not drilled , biostratigraphy results showed the section was deposited in shallow water during the Eocene and contains an extensive mid-Miocene section (not Oligocene as was indicated by industry wells). The accretionary area was drilled about one kilometer from the transition zone; materials as old as late Miocene were drilled in the accretionary complex . In the Quaternary section upslope, less compressional deformation was evident.

The southern transect across the lower slope of Lima Basin and into the Salaverry Basin again missed basement penetration; an important upper to mid-Miocene hiatus was drilled which dates a major unconformity beneath the Lima Basin. At several sites, including site 679, fluid escape structures indicate physical signs of large-scale fluid migration.

The chemical/paleoceanographic results are promising. The Lima, Trujillo and Pisco Basins drilling resulted in records of primary upwelling sequences containing cycles of sea level and upwelling fluctuations. Major Pleistocene cycles were identified. Intense early diagenesis (dolomites, phosphates and calcite) and evidence of brine incursions indicated an intense open chemical system. M.Kastner gave further details on the Leg 112 geochemistry results. On the basis of the chemical analyses of interstitial waters at the ten sites drilled in the Peru Continental Margin, Leg 112, two major distinct geochemical environments, designating different oceanograhic-sedimentologic-tectonic systems, have been observed. They are: (1) the shallower water (150 to 450 m) shelf to upper slope sites (sites 680, 681, 684, 686, and 687) controlled by a saline brine plus bacterially-mediated organic matter degradation reactions, and (2) the deeper water (3050 to 5100 m) mid- to lower slope sites (sites 682, 683, 685, and 688) dominated by bacterially-mediated organic matter degadation reactions and gas hydrates formation. The unique tectonic setting at teh shallower wate site (site 679, 451 m) drilled in the 11°S E-W transect prevented the brine from influencing its geochemistry; the signal of a fresh water lens, in the Middle to lower Upper Miocene sandy-silty section, has thus not been erased.

At site 608, below 370 m depth, chemical concentrations and gradients are distinct from the upper zone, signified especially by Cl^-, Ca^{2+}, and silica concentration profiles. The Cl^- freshening spike, most probably indicates dilution with fresh water from dewatering of an accretionary complex or of underplated sediments.

Problems with the leg reported by R. von Huene were: difficulties in the flow of core description and sampling due to the long time required to bring core to equilibrium to get thermoconductivity measurements, inability to combine resistivity/sonic/thermal tools, the lack of caliper tools to measure cross-sectional shape of the hole and the loss of the in situ pressure tool.

Discussion:

Von Huene said that the upper Miocene/Quaternary hiatus was associated with the subduction of the Nazca Ridge; the missing Oligocene section marked the present subduction in the Sierra de Blanca. Core recovery for the leg was 50-60%. Those holes below 400 m which were not logged had technical problems (see Wireline Logging Services report).

Kastner reported that the in situ water sampler worked well only in soft sediments and that a different tool might be necessary to better sample indurated sediments.

631 WIRELINE LOGGING SERVICES REPORT

R.Jarrard reported for the Borehole Research Group, LDGO. Recent logging services developments and recommendations were presented:

1) Moving to all-digital tools for downhole measurements, was recommended in order to cut down time in the borehole.
2) A microsensitivity tool is advised for Leg 117 (Milankovitch cycles) as an interim solution to a high-resolution dipmeter. Four-arm calipers to measure stress directions are also recommended.
3) The wireline packer approved by EXCOM should undergo testing before routine use.
4) For SWIR, a three-component magnetometer and additional televiewer are recommended.

LEG RESULTS

Jarrard reported on the scientific results from Legs 110-112. He noted that PCOM had set aside logging time on Legs 110 and 112, but it was not all completed. The bridge problems on Leg 110 were the worst encountered; the new mud program and the side-wall entry sub will help improve this problem on future legs, although the sub was not tested on Leg 112.

On Leg 111, the logging of Hole 504B both before and after deepening was important as core recovery was low. The repeat formation tester had three trials but did not meet ODP requirements. The dual lateral resistivity tool worked well in the hard, fractured rocks. The geochemical combo results have produced a continuous geochemical vs. depth record. New Schlumberger programs will allow accurate weight percentages to be calculated (although the sediments of Leg 112 will provide a more useful test of their accuracy than the basalts).

The standard logs were run on Leg 112 at Sites 679 and 685. The fine-scale cyclical nature of the sediments was detected at site 679 as well as a major hard streak (at about 260 mbsf). The change in resistivity and density, as well as precipitated uranium at the streak, indicate a major permeability barrier.

FY88 BUDGET PRIORITIES

FY88 priorities for purchase and development include:

1) A third wireline packer	$80K
2) A high-resolution dipmeter	$150K
3) A second digital televiewer	$94K
4) High-temperature logging	?
5) Measurement while drilling	$100K (first year)
6) Terralog workstations or in-house software	$180K

An approximate 3% increase in Sclumberger rates is projected. The priority list takes DMP and other panels' views into account.

Discussion:

The shortened logging program on Leg 112 was discussed. Jarrard asked whether major changes in objectives should be cleared through the PCOM Chairman. Francis pointed out that the cruise co-chiefs knew from the outset that the leg would be shortened due to increased time in port. Garrison said that the Science Operator is under contract to carry out PCOM directives which state that all holes deeper than 400 m be logged. M.Kastner added that most scientists need education on the value of logs as they have increased in scientific return since DSDP. Von Huene reported poor hole conditions at Site 683 and a near loss of tools at Hole 685 during Leg 112.

Jarrard asked for contingency plans for logging on Legs 113 and 114 and for better communications with the co-chiefs.

PCOM discussed logging though the pipe with radioactive tools and whether it presented safety problems. Jarrard responded that lower quality, but still substantial logs can be achieved safely and that they should be run. Brass added that safety is not as big a problem as is logging while not rotating, thus risking the loss of tools.

The discussion ended with the following:

PCOM Motion:

PCOM reiterates the requirement that all loggable holes deeper than 400m be logged. Any deviation from this requirement must be approved by the TAMU operations manager. (motion Robinson, second Larson)

Vote: 15 for, 0 against, 0 abstain

632 ANNUAL REPORTS FROM PANEL CHAIRMEN

Below are the highlights of the Panel and Committee Chairmen reports. The recommendations from the panel chairmen on engineering development priorities are included in Table 1.

REPORT OF THE LITHOSPHERE PANEL

R.Detrick, Chairman, reported for the LITHP. Based on the experience of Legs 106, 109 and 111, together with LITHP drilling objectives, the panel has stressed a need for:

- a substantial, long-term commitment from ODP to develop new engineering techniques to improve penetration and recovery rates when drilling in young crustal rocks
- development of drilling and logging tools capable of operating in high temperature (>300°) conditions
- a recognition in the planning process that drilling crustal objectives will take time to achieve; ODP must be prepared to dedicate multiple legs to a single objective or even a single site

Recommendations for the Indian Ocean Program:

The LITHP has two major objectives for the SWIR program: to obtain a relatively deep hole into lower crustal and upper mantle rocks and to define crustal structures at oceanic fracture zones.

Other LITHP interests in the Indian Ocean are the Ninetyeast Ridge program, Kerguelen and the Mascarene Plateau.

Recommendations for the Western/Central Pacific Program:

In the current WPAC prospectus, the panel has ranked Bonin I, Bonin-Mariana II, the Lau Basin and the Japan Sea as the highest priority legs. LITHP's major emphases in the Central and Eastern Pacific are:

- magmatic and thermal processes at mid-ocean ridges (EPR, Juan de Fuca/Gorda Ridge and Gulf of California sites)
- deeper structure and composition of oceanic crust and upper mantle (fast-spreading crust, fracture zones)

REPORT OF THE TECTONICS PANEL

D.Cowan, Chairman, reported on the panel's major issues for 1986.

Western Pacific Program:

Thematic priorities outlined were:

- back-arc basins (early rifting)
- arc evolution (vertical histories, diapirs)
- collisions

The TECP has reviewed the second WPAC prospectus and ranked the proposals in a nine-leg program as follows:

1. Bonin I
2. Nankai
3. Japan Sea
4. Bonin-Mariana II
5. Banda-Sulu-S. China Sea basins
6. Vanuatu
7. Lau Basin
7. Nankai physical properties
8. Sunda backthrusting

The fourth-ranked program has changed in scope, with reduction of diapir drilling, since the last review and TECP is not sure it now meets original panel priorities.

Central and Eastern Pacific Program:

Mature problems in the area with thematic interests that can be addressed by drilling include:

- dating oceanic crust; kinematics
- vertical displacements and flexure
- ridge trench interactions
- geochemistry of arcs and descending crust
- subduction rates

Problems seen by the panel as needing more definition include oceanic plateaus, structures in oceanic crust and deformation and physical properties deep in accretionary prisms.

The panel strongly endorses geochemical reference holes; several shallow holes (20-30 m) into basement rather than single deep holes are favored.

REPORT OF THE SEDIMENT AND OCEAN HISTORY PANEL

L. Mayer, Chairman, reported for SOHP and suggested to PCOM that the mandate for the panel, being very broad, might require changes in the panel structure or additional members in the future. He also said that the liaison system works well only with strong and outspoken membership.

Major SOHP themes from 1985 and through 1988 include:

1. Cretaceous-Neogene, high latitude paleoclimate problems

2. A paleo-upwelling program (PUP)
3. A deep stratigraphic test program

SOHP Summary of the Indian Ocean Program:

The panel's emphasis and site priorities include

1. Kerguelen-Prydz Bay: late Mesozoic paleo-climate/marine environment, migration of the Polar Front.

2. Neogene I: As it addresses the Indus Fan/uplift of the Himalayas and monsoon histories.

3. Argo Basin/Exmouth Plateau: As a suitable area for a deep stratigraphic test site.

SOHP Summaries of the Western Pacific Program:

Regional objectives and priorities for SOHP include

1. Mixed carbonate/siliciclastic province in a passive margin setting (the Great Barrier Reef program).
2. An isolated back-arc basin (Sea of Japan).
3. Young, passive margin with a sedimentary basin (S. China Sea)
4. Bonin I (to study the effects of the ridge on history of bottom water circulation)

SOHP Summaries of the Central Pacific Program:

Drilling objectives, suggested approaches and site criteria include:

1. High-low latitude and depth transect of sites with shallow burial, carbonate, low paleolatitude and continuous sections; oceanic plateaus area are primary targets
2. Old Pacific crust (pre M-25) for open ocean records from the Jurassic and Cretaceous
3. Atolls
4. Episodicity of volcanism to see relationships with spreading rates and climatic change
5. Fans and depositional processes
6. Fluid circulation studies: rock/seawater interactions and geochemical mass balances

REPORT OF THE DOWNHOLE MEASUREMENT PANEL

P.Worthington, the new Chairman for DMP, reported for the panel, with input from M. Salisbury, who could not attend due to illness.

Worthington asked PCOM to consider panel replacements from outside of the oil industry. He outlined the DMP philosophy on logging/downhole experimentation:

- properly executed logs, apart from the core measurements, provide the only continuous record of a site

- an ODP hole is not an objective in itself, but a scientific legacy

Enhancements and Recommended Tools:

Worthington presented a list of recommended enhancements to the program which included:

- acquiring a four-arm slimline formation microscanner
- acquiring software to read neutron activation data
- putting Terralog processing stations in ODP member countries for regional databases
- acquiring a back-up multichannel sonic tool

Recommendations for new technology included:

- upgrading the physical properties lab
- developing wireline re-entry capabilities
- acquiring fishing/side-tracking gear
- improving penetration/recovery in hard rock
- acquiring three new guidebases by 1989 for Lau Basin, Juan de Fuca and EPR drilling)
- developing high temperature logging capabilities
- developing long-term observatory packages

Worthington recommended that PCOM/DMP should develop a policy for reoccupation of holes and that the recommendations from the USSAC workshop on physical properties be implemented.

Current and Future Trends:

Worthington said that current thrusts for the program include nuclear spectroscopy, formation imaging, packers and measurements during drilling. Future trends include a "new stratigraphy" which will synthesize core and log measurements. Other suggested developments include in situ geochemical analyses and multisensor imaging of sedimentary facies. Vertical seismic profiling is underutilized in the program.

PCOM commended past DMP Chairman, Matt Salisbury, for his effective chairmanship of the panel.

REPORT OF THE INDIAN OCEAN PANEL

R.Schlich, Chairman, opened his remarks with a schedule of membership rotations which comply with PCOM's recommendations of replacements.

Western Indian Ocean Drilling:

Schlich said that over a hundred drilling proposals had been reviewed; the planned programs include:

1. Southwest Indian Ridge: maximum drilling effort on the ridgecrest recommended; recent Seabeam data should improve guidebase deployment.
2. Neogene: proposes a seven-site transect across the Oman Margin, Owen Ridge and Indus Fan; excellent SCS data available.
3. Makran: only a single seismic line is available thus making data interpretation difficult.
4. Carbonate dissolution profile: four sites are proposed with possible basement objectives at the CARB-1 site; site survey from March HMS DARWIN cruise is needed.
5. Mascarene Plateau: LITHP support for the program; will provide information on plate kinematics/age progressions. Site survey data will be available in March, 1987.
6. Kerguelen program: IOP in agreement with Kerguelen working group on site selection. Southern leg data need additional interpretation and additional basement objectives need to be better addressed.

Eastern Indian Ocean Program:

Schlich summarized the panel's views as follows:

1. The Intraplate Deformation objectives can be met with five sites, and may be a full-leg program.
2. The Broken Ridge transect has good recent site surveys and can be drilled in less than one leg.
3. Ninetyeast Ridge depth transect will be substituted by the Carbonate Saturation Profile package; the program should yield data complementary to DSDP sites including basement ones.
4. Exmouth Plateau: presently consists of four sites, with trade-offs of EP7 and EP5 being discussed.
5. Argo Abyssal Plain: sites AAP1B and AAP-2 (double-cored in the lower sediments), with about 50 m of basement penetration recommended. A single deep hole might be considered.

REPORT OF THE SOUTHERN OCEAN PANEL

P.Ciesielski (Alternate) reported for P.Barker (Chairman) who was at sea with Leg 113. Details of Leg 113 and 114 and of the Kerguelen Working Group (K-WG) were deferred to subsequent agenda items. SOP is concerned with clearance to drill SA2 and SA5 on Leg 114 as well as the obligation of 114 to complete the Leg 113 objective at Site W7.

Indian Ocean Program:

SOP endorses the K-WG report but would like a latitudinal/depth transect preserved in the final plans. Drilling the Antarctic margin is a high priority, even with site survey problems with Prydz Bay.

Pacific/Antarctic Margin Drilling:

Ciesielski reminded PCOM and the other panels of the importance of S. Pacific drilling in fulfilling COSOD objectives and for understanding global systems. The panel would like to see the Ross Sea drilled, and if possible, a combination of proposals for drilling south of Australia to get a viable program there.

REPORT OF THE WESTERN PACIFIC PANEL

B.Taylor, Chairman, reported on the panel's progress in defining the program in the Western Pacific. A second drilling prospectus was developed with input from the thematic panels and from TAMU and LDGO (for drilling and logging time estimates). A third prospectus will be available for the next PCOM meeting. Changes in the second prospectus include: a combined Banda-Sulu-S.China Sea basins program, a reduced number of sites from the Bonins program and more consideration of reference sites. The priority list for the WPAC program is:

1. Banda-Sulu-South China Seas basins
2. Bonin I
3. Lau Basin
4. Vanuatu
5. Japan Sea
6. Nankai Trough
7. Great Barrier Reef
8. Sunda
9. Bonin II
10. Nankai geotechnical "mini-leg"
11. South China Sea margin
12. Zenisu Ridge

Taylor emphasized that the first nine programs do not represent nine legs. He said that exchange with the thematic panel has resulted in compromises to accommodate their objectives.

In ranking the programs, Taylor noted that programs 9 through 11 were similarly ranked by the panel. Site surveys are still pending and the ranking was based on available data. Crustal characteristics/ages in SE Asia are important problems as well as evolution of the basins for the program. The Japan Sea drilling has been highly ranked by all thematic panels and the Lau Basin, even without site surveys available, has been a priority program for WPAC. Taylor proposed a clock-wise track through the N. Pacific, then proceeding to a southern route, possibly integrating CEPAC programs.

In conclusion, Taylor asked PCOM to reconsider the total of three years allotted to Pacific drilling in reference to the COSOD circumnavigation objective.

REPORT OF THE CENTRAL AND EASTERN PACIFIC PANEL

S.Schlanger, Chairman, reported that his panel expects additional proposals before a final ranking from CEPAC. The drilling packages in Appendix C represent a provisional plan.

Of particular note in the program are:

- the addition of a program to investigate old Pacific crust Mesozoic sediments and the basalts of the Nauru and Mariana basins.

- good recovery through chert/chalk/limestone will be needed for many CEPAC programs.

- the flexure proposal on the Hawaii moat will require deep holes with detailed biostratigraphic resolution.

- the East Pacific Rise drilling has CEPAC support, but the three legs proposed are biasing the workload of the CEPAC program

In response to Schlanger's concerns on the EPR drilling, a suggestion to spread out the drilling as was done with 504B was forwarded. Schlanger concluded by noting that the Southern Pacific and Gulf of California workshops are expected to generate additional proposals; he added that a site survey summary was in preparation.

REPORT OF THE ATLANTIC REGIONAL PANEL

J.Austin, Chairman, reported a decrease in activity for the panel because of regional studies elsewhere for ODP and asked PCOM to address the issue of panel membership during the "off-season". He recommended workshops as a way to keep panel interest up as well as to encourage international participation; the forthcoming South Atlantic workshop (USSAC-funded) has had excellent response from South American and African scientists. Workshops on Caribbean, N. Atlantic/Arctic, Mediterranean and Central Atlantic drilling are planned, although non-U.S. workshops are not funded by USSAC.

REPORT OF THE TECHNOLOGY AND ENGINEERING DEVELOPMENT COMMITTEE

J.Jarry, Chairman, reported that the panel has toured the JOIDES Resolution and TAMU facilities in the past year in order to open up exchanges with the engineering and operations staff. TEDCOM has designated working groups to monitor progress and act as technical support in the following areas:

- high-temperature drilling
- hard and fractured rock drilling

- drilling in pressured areas (well control and riser drilling)

To address the high-temperature problems, industry contacts are being encouraged (e.g.Los Alamos Laboratory) and for hard rock drilling, the addition of a TEDCOM member from the mining industry is recommended.

Jarry discussed the ODP research and development budget and TEDCOM has recommended that a general increase of 33% toward R&D be made in the coming six years. TEDCOM seeks increased communications with the panels and TAMU engineers; the panel encourages joint meetings, attendance of panel chairmen at TEDCOM meetings and workshops. TEDCOM has also recommended that a SEDCO engineer attend its meetings as a permanent observer.

REPORT OF THE INFORMATION HANDLING PANEL

D.Appleman, Chairman, reported that the final publications from DSDP were proceeding well. Micropaleontological reference centers have been set up for DSDP samples (Appendix D).

The IHP has considered sampling policy and guidelines on core distribution to give to cruise scientific parties. Appleman emphasized that the policy should lend archival value to ODP cores and not hinder science.

Appleman reported that the ODP Proceedings (Part A) were out for Legs 101-102; logging results were not reproduced alongside the barrel sheets to avoid bad correlations and to reduce volume costs. The ODP Databases are now a higher priority for the TAMU programming staff and PC-disk and remote accessing capabilities are being developed.

As Appleman is retiring from the IHP, N. Pisias concluded the report by thanking him for his service to the panel beginning with DSDP Leg 1. (T.Moore will next chair the panel.)

REPORT OF THE POLLUTION PREVENTION AND SAFETY PANEL

G.Claypool, Chairman, reported that the safety review for Leg 114 was near completion. In the future, PPSP would like site survey data well in advance of actual drilling. He said that the Prydz Bay site survey had been reviewed by three panel members: problems existed but a drilling strategy could probably be developed.

As Claypool will step down from the panel chairmanship after PPSP's next meeting, N. Pisias expressed PCOM's thanks for his service to ODP.

REPORT OF THE SITE SURVEY PANEL

J.Peirce, Chairman, reported that the panels has been generally pleased with the quality of site surveys in the past year. He said the "catch-up" game in the Indian Ocean is almost over and observed that in the Western Pacific, surveys have been scheduled well in advance. Other issues discussed included:

-the watchdog system is working well for most programs
-the SSP matrix is serving a useful communications function with the panels
-the ODP Databank is becoming more important to SSP activities and Carl Brenner in particular has helped communications

Indian Ocean Program:

Peirce outlined the site surveys for the program. Of note are:

- SWIR: Excellent Seabeam data available for the median ridge, but the SSP cannot approve the proposed site on the inactive transform fault
- Mascarene Plateau: new SCS data should be available by April
- Sites have not been picked for the Intraplate/Broken Ridge programs
- Prydz Bay: site surveys are inadequate; SSP requests that the Australian seismic lines be reprocessed.

Other SSP Reviews:

Peirce summarized the Western Pacific site surveys and all are in place or funded with the exception of the Lau Basin, where side-scan data are also recommended. A MCS survey is planned on the Great Barrier Reef this summer and proponents are being asked to identify problems with drilling in a national park. A written report of SSP activities for the year is attached as Appendix E.

633 COSOD II REPORT

M.Kastner, a COSOD II Steering Committee member, reported. She had specific timetables and questions to forward to PCOM from X.Le Pichon, Steering Committee Chairman. Discussions at the meeting on the accomplishments and future developments of ODP included 1) whether routine penetration in zero-aged crust would be attained in the next two years; and 2) whether diversifying platforms is possible, taking into consideration that riser drilling may not be as expensive as industry-grade if adapted for the ODP.

The working groups and set up of the conference are described in a handout from Le Pichon (Appendix F). The emphasis for the working groups is that they should be process-oriented and interdisciplinary; they should relate ODP to other global programs (e.g. continental drilling) if possible. The five working groups (9-10 participants each) are to prepare position papers and select candidates to COSOD II. Fifty slots have been set aside for administrative scientists to participate. Kastner prepared a breakdown of working group participation by country (Appendix G).

The specific concerns of Le Pichon for PCOM to address were:

1) TAMU has contacted Le Pichon about authorship of two technology papers. They feel the one on logging should be done by LDGO. For the second, PCOM is asked to contact IFREMER on coordinating a white paper on independent platforms for HPC.
2) NSF would like to send five scientists, not to be included in the 150 allotted for U.S. participation.
3) COSOD needs direction on how to handle Soviet participation as they were not represented in working group membership.
4) If working groups ask for administrative support funds, what is available?

Discussion:

T. Pyle said that $50K was given to LePichon to support COSOD-related administrative services. Discussions by PCOM on the meeting arrangement included:

* whether the "invitation-only" arrangement gives the impression of a "closed shop" and how international access to the program will be achieved.
* whether the meeting set up will get technical people involved other than in presenting papers.
* LDGO (Jarrard) said that the Downhole Measurement Panel should prepare the logging paper and Worthington has agreed to do so.
* Some PCOM representatives were concerned that advertisement for participation did not reach journals in their countries.
* Kastner said that the national representatives of the working groups would filter the applications to achieve the proper quotas.

N. Pisias said that the ESF at EXCOM had indicated that the meeting facility could hold additional Soviet participants; O. Eldholm confirmed that the Steering Committee could accommodate up to 40 additional participants.

PCOM Consensus:

The PCOM Chairman will answer Le Pichon that additional spaces could be made available through the ESF host for Soviet participation at COSOD II.

P.Worthington said that DMP will do the white paper on logging; Pisias agreed that a DMP member should orally report to COSOD and Worthington agreed to do so. Questions were raised on the "fate " of the white papers; PCOM generally agreed that they should be included in the proceedings of COSOD II. If ODP data is used in preparing them, the "one-year" rule should apply. The HPC white paper was discussed and the following consensus resulted:

PCOM Consensus:

The PCOM Chairman will write Le Pichon with the advice that a broad, multiple-platform white paper should be coordinated through IFREMER. This should include input on risers, support vessels, and TAMU/Arctic drilling workshop information.

In conclusion, E. Kappel said that Le Pichon understands that each country should be responsible for working group expenses. Kastner said Le Pichon would copy and distribute the white papers.

634 PANEL CHAIRMEN'S MEETING REPORT

B. Taylor, Chairman of the Panel Chairmen's meeting, reported. An Executive Summary of the meeting is attached as Appendix H. The engineering priorities developed at this meeting are also included in Table 1. Taylor emphasized the improved recovery in alternating hard/soft lithologies as needing increased engineering emphasis, and Navi-drill/APC/XCB development was encouraged. The circumnavigation issue was also of prime importance to the panels.

Discussion:

Taylor discussed the number and scheduling of panel meetings so that PCOM gets relevant information in time for its meetings (particularly for IOP/WPAC/CEPAC and the three thematic panels). Pisias noted that the minutes of panel meeting should not reach the JOIDES office right before PCOM,if possible ; joint meetings are also important, as well as good minutes, for critical meetings.

635 PCOM EXECUTIVE SESSION

PCOM discussed the protocol for inviting panel chairmen to attend PCOM meetings. Although the value of having the chairman available to answer questions was acknowledged, problems arise when the chairmen are proponents and co-chiefs of upcoming legs. Also, the panel chairmen, at their meeting, discussed the importance of knowing how PCOM arrives at decisions; this is not always reflected in the PCOM minutes.

As this PCOM meeting involved establishing the Indian Ocean program, some members said that R.Schlich's presence would be important. The input from service panels was also viewed as important at PCOM. The need for better PCOM liaison, as suggested by the panels, was acknowledged. It was agreed that a general policy was needed and the following motion was forwarded:

ENGINEERING PRIORITIES

	LITHP	TECP	SOHP	DMP	SOP	IOP	WPAC	CEPAC
A. Young crustal drilling (Navidrill/XCB/APC)	X			X	X	(X)	X	X
B. High temperature drilling and logging	X		X	X			(X)	
C. In situ pore pressure, permeability (packers)		X					X	
D. In situ physical properties		X					X	
E. Pressure core barrel, gassy sediments		X	X			X	X	
F. Recovery in alternating hard/soft sedimentary sequences		X	X		X	X	X	X
G. Coarse grained, unconsolidated sediments		X	X		X	X	X	
H. Rotary/SCB/APC improvements			X		X			
I. Bare rock guide base (mini cones)	X			X		X		X
J. Deep stable holes (2-3 km)			X					

Table 1. Engineering Priorities identified by Panel Chairmen at the FY87 Annual Chairmen's Meeting.

Note:

A. Combinations of items in order to timetable and need for specific programs, NOT by priority:
1. F & G
2. C + D + E
3. A + B + I

B. Specific legs which will need the above items:
- Lau Basin (A, B)
- Nankai, Sunda, Vanuatu (C, D, E)
- Exmouth Plateau (E)
- Kerguelen Program (F, G)
- East Pacific Rise (A, B, I)

C. PCOM Concnensus: That A + F are needed as the highest prioirty, but the other times should also be addressed.

PCOM Motion:
At future Annual Planning Committee meeting, all panel chairmen should be invited to attend the entire meeting. (motion Kastner, second Robinson)

Discussion:

P.Robinson said that inviting panel chairmen at least once a year would increase interaction; PCOM could also invite particular chairmen as a resource at other meetings. Some PCOM members said that having the panel chairmen as advocates does not necessarily reflect the entire panel's views. Pisias said that it is often harder for the regional panels to be as impartial for their programs as it is for the thematic panels. The discussions ended with the following amended motion:

Motion Amendment:
At the next annual meeting, the panel chairmen are welcome to attend the entire meeting as informational resources; they will not participate after the Annual Chairmen's Report unless specifically requested by the PCOM Chairman. (amendment Kastner, second Robinson)

Vote: 15 for, 1 against, 0 abstain

PCOM decided that panel chairmen were welcome to attend the remainder of the present meeting and respond to questions as directed by the Chairman.

636 QUICK FUSE PLANNING

N.Pisias introduced this item by noting that the schedule in the Indian Ocean is constrained by the 10 May 1987 end of Leg 114 and the fixed date of December 6 for the start of Leg 119 (due to weather window). In addition, the program for the Neogene I would suffer if set in monsoon season (2 June at the latest and through 10 September).

LEG 113/114 PLANNING

PCOM reassessed the requirement that Leg 114 complete the Leg 113 objective at Site W7. Both SOP and SOHP had recommended this and both later reversed the decision. Larson (SOP liaison at their last meeting) said that the scientific rationale for placing the 113 objective higher than the 114 program was not overwhelming. In addition, TAMU logistics would be stressed an extra $150K would be needed for iceboat support.

O.Eldholm pointed out that the two panels reversed themselves based on new site survey data. Gartner added that Sites W6, W7 and W8 were all part of a "package" and drilling W7 would only partially solve the problem; the Leg 114 program is a coherent package as it now stood. Larson discussed the over-thickened sedimentary sequences and the icy conditions anticipated for Leg 114. He agreed that Leg 114 should pursue their program in all the available days. The following motion was then forwarded:

PCOM Motion:
PCOM rescinds the requirement that Leg 114 complete the Leg 113 objectives at Site W7. (motion Brass, second Hayes)

Vote: 15 for, 0 against, 1 abstain

LEG 114 PLANNING

L.Garrison reported on clearance problems. Some sites (some SA5 and SA2) are within the 200 mile zone; the British foreign office said that clearance could probably be granted, but the U.S.State Dept. has advised against drilling within the zone. The RESOLUTION could run out the seismic line on SA2, but it would risk delaying the ship, plus require PPSP approval.

SOP had asked for four sites which will require eight days more than the projected 56 days for the leg. L.Garrison said that under SEDCO contractual obligations, Leg 114 could have no more than 59 days. Approximately three days are required for Navi-drill testing. Pisias noted that about six days could be saved if the SA2 site were drilled into thinner section although logging and basement objectives would have to be dropped. SOHP had previously agreed not to drop the SA2 site.

Options outlined by P. Ciesielski to save time were presented by Pisias: not drill basement, not log holes, not double APC.

Larson and Robinson said that fewer sites should be drilled, with logging and basement objectives to remain in the program. The Paleocene gateway problem could be solved with one deep and one shallow site; a program of Sites SA8, SA2 and SA3 would accomplish this. SOHP's prioritization of sites was: SA8, SA2, SA3 and SA5 (a back-arc site the same age as SA2).

Garrison reviewed the drilling estimates for the proposed sites: SA3 = 10 days, SA8 = 9.4 days and SA5 = 9 days, SA2 = 11 days (16 if XCB included); 23 days transit time is needed.

The discussions concluded with the following:

PCOM Motion:
Leg 114 is required to log, penetrate basement and test the Navi-drill; if any site is dropped to fit the time available (59 days), it must be SA5. (motion Larson, second Gartner)

Vote: 16 for, 0 against, 0 abstain

LEG 115 PLANNING AND REMAINING INDIAN OCEAN PROGRAM

Robinson opened the discussion by noting that the site survey for

Makran has problems; he suggested dropping the program as the reprocessed data will arrive too late (late March).

Francis said that by relocating SWIR from Leg 115, the Makran program has suffered. The planning for the leg assumed it would occur in the second half of 1987. PCOM discussed whether the sediments could be dated with sufficient resolution to accomplish the scientific objectives of the leg; available cores from the area have not yet been analyzed. Francis proposed an alternate shiptrack: do Broken Ridge and the Ninetyeast Ridge, then place the Makran program after the Intraplate and Neogene I programs.

Larson (IOP liaison) said that the IOP has always been reticent toward Makran. The Mascarene Plateau and carbonate dissolution profile (Neogene II) have consistently been rated higher priority. The Makran program would suffer if drilled during the monsoon and the faults could not be dated without good biostratigraphy. He proposed the following:

<u>PCOM Motion</u>:

> To constitute Leg 115 as a combination of the carbonate dissolution profile and the Mascarene Plateau basement penetration as outlined in the last Indian Ocean Panel prospectus. (motion Larson, second Brass)

Discussion:

PCOM determined that the Francis proposal would require an additional half-leg for transit time. Hayes suggested that PCOM not vote on a "piecemeal" basis, but rather on candidate schedules. PCOM looked at the "strawman" schedule included in the agenda packet, excluding the Red Sea program at Leg 116 (Appendix I). Garrison added that for the limited time available in the Leg 115 slot, only a few programs were possible (Mascarene, Neogene II, Makran).

Pisias said a major delay involved the SWIR program. The Navi-drill could not be sufficiently tested on Leg 114 for 115. Francis pointed out that with the Red Sea program dropping out, nine legs were supposedly sufficient to complete the remaining program. Pisias (TECP liaison at their last meeting) said that the panel was not enthusiastic about Makran. He noted that PCOM should identify the most valuable science supported by the Panels.

Garrison presented a simplified version of the best logistics scenario, with the assumption that SWIR and Neogene I would be at the end of the program. It was in good agreement with the "strawman" schedule.

Robinson suggested that Larson's original motion be amended to accept the "strawman" schedule. J.P. Cadet added that the carbonate saturation profile is an exciting problem and Mascarene is also good science; he supported Robinson's suggestion.

Motion Amendment:

To constitute Leg 115 as a combination of the carbonate dissolution profile and the Mascarene Plateau basement penetration as outlined in the last Indian Ocean Panel prospectus and to accept the program through Leg 118 as outlined in the schedule presented by Pisias. (amend Larson, second Brass)

Vote: 13 for, 2 against, 1 abstain

637 LONG-TERM PLANNING

TAMU REPORT ON LONG-TERM ENGINEERING DEVELOPMENTS

B.Harding reported earlier in the agenda due to his travel schedule.

Harding reported that $459K had been budgeted in the current fiscal year for engineering studies; six full-time engineers work on development, with two assigned to the hard-rock problem.

In the mining coring system development, TAMU is working with DOSSEC, Longyear and other international continental drilling efforts such as the Swedish deep gas hole. This work was not originally in the FY87 budget and TAMU has requested that more funds be assigned for hard rock drilling in the FY88 budget.
Short-term Priorities:

Engineering developments needed in the next two years include:

1) Navi-drill
2) Pressure core barrel
3) A drill string inspection tool
4) Revision of the 110 packer and testing of a rotatable one
5) High temperature drilling

Longer term priorities needed in more that two years included:

1) Mining technology systems
2) Drill bit development
3) 9-1/2 inch coring motors for bare-rock drilling

An interim report on the mining drilling system will be made available to the JOIDES office soon.

Guidebase Deployment:

A total of $552K is projected for guidebase deployment, although extra modifications to the televiewer system may not be needed. Additional items needed for deployment will include casing, tilt beacons, bits and drilling jars. The postponement of the SWIR leg was advisable not just for budgetary reasons, but because

TAMU needs information on the size of holes and what kind of bits will be needed.

Discussion:

Harding said the message was clear that land testing for chert/unconsolidated sediment drilling is needed. Harding discussed the fishing attempts on Leg 111. He said that it was hard to predict what kind of tools would be needed on a given cruise; some tools are modified on the leg itself. Such tools are more important on deep penetration legs, whereas they fall to a lower priority other ones.

636 QUICK FUSE PLANNING (Continued)

LEG 115 PLANNING

PCOM discussed the objectives and time estimates for the Carbonate Dissolution Profile (CDP) and Mascarene Plateau. The CDP program would require almost 14 days to double HPC the planned four holes (250 m each). SOHP had requested the addition of the shallow M1 site (Droxler site). The estimates include the basement objective for the CARB-1 site. The time estimate for the MP 1-3 sites on the Mascarene Plateau (single rotary cored), without logging, was 29.3 days. Transit time was estimated at 9 days.

Larson proposed that the requirement for the Mascarene Plateau sites be for 50m penetration into basement plus the standard Schlumberger logs. If time permitted, basement objectives at CARB1 as a last priority was also proposed. He also suggested the M1 site be carried through safety review but not be considered part of the primary program.

PCOM Consensus:

> Leg 115 will consist of the Mascarene Plateau program (sites MP1-3) to include standard Schlumberger logs and the Carbonate Dissolution Profile (sites CARB 1-4). Site CARB 1 has the option to penetrate basement and no CDP sites are required to be logged. The M1 (Droxler) site will be a back-up site.

Pisias noted that the program is well balanced; Neogene I gets as much time as possible and the ship will reach Kerguelen in enough time. L. Garrison mentioned that the Mascarene Plateau will need clearance; the CARB sites do not require clearance.

Leg 115 Co-chief Recommendations:

PCOM reviewed the agenda book list compiled from the panel suggestions for co-chiefs and added its recommendations. As SOHP had not recommended co-chiefs, L. Garrison asked for their input and for Japanese or German co-chief recommendations, if possible. PCOM agreed that a non-prioritized, alphabetical list of co-chiefs for this and other legs would appear in the minutes.

Co-chief recommendations forwarded to the Science Operator for the Mascarene Plateau/CDP program, and for other Indian Ocean programs, are listed in Appendix J.

LEG 116 PLANNING

N.Pisias ("watchdog" for the Intraplate Deformation program) reported that IOP recommends a full-leg, five site program; excellent sites surveys exist from J. Weissel but sites have not yet been picked. Garrison said that TAMU could not wait for another IOP meeting as the leg is in June; he suggested getting co-chiefs selected, then have them coordinate site selection with Weissel as soon as possible for PPSP review.

Co-chief recommendations for the Intraplate Leg (116) appear in Appendix J.

Garrison said that 48 days were available for the leg if the N. Ninetyeast Ridge (6°N) site, which needed about 9.5 days, were to be included. Kastner pointed out that the original schedule was for 42 days. Hayes said that in the absence of further information, PCOM should keep to the Science Operator's schedule for the leg.

(Note: In Leg 122 planning, the N. Ninetyeast Ridge site was included as part of Leg 116.)

LEG 117 PLANNING

The Oman Margin/Owen Ridge/Indus Fan program (formerly the Neogene I) constitutes this leg. N.Pisias said that the leg is scheduled to begin 26 August with 41 operational days. According to the IOP prospectus, in dropping the Gulf of Aden site, 41 days of drilling and logging would be required. A.Meyer said it would require 33.2 days to drill all sites (including the Gulf of Aden) and 11 days for logging, for a total estimate of 44.2 operational days.

L.Garrison said that if one Indus Cone site and the Gulf of Aden one were dropped, 41 operational days would be available. Larson proposed to drill as set forth in the IOP prospectus, with the elimination of NP-8 (Gulf of Aden) plus keeping the option of logging the shallow Oman margin transect (NP 1 - 3).

A.Meyer said that NP 1-7 would require 39 days, 11 of which would be for logging. She said that the two additional days may not be enough to fully accomplish the planned VSP experiments.

<u>PCOM Consensus</u>:

Leg 117 will have 41 operational days and will consist of sites NP1-NP7.

Some discussion followed on the deepening of the Owen Ridge site to basement, and it was left as a secondary objective for the leg.

LEG 118 PLANNING

Larson, IOP liaison, opened the discussions, and showed a sketch of the possible sites for the Southwest Indian Ridge program (Appendix K). The IOP has recommended a single deep hole at Site 4 (on the median ridge), with the "gravel pit" site as a back-up. LITHP's first priority is the gravel pit transect. The difference of opinions is based on logistics as up to 15 days are required to set the guidebase. Dredge samples of ultramafics have been recovered only at the median ridge.

R.McDuff (LITHP liaison) said that the panel wants the gravel pit site because: 1) logistic considerations and 2) the median ridge is a zone of overprinting slip deformation possibly greater than at the "pogo" (gravel pit) site.

L.Garrison said that the gravel pit option would still require that the guidebase be onboard wasting space and requiring supplies for the leg.

Several PCOM members did not find the petrologic objectives of the leg compelling. Garrison said that the arguments should rest on the science but TAMU wants the experience in guidebase spud-ins. He said 36 operational days are available, with 12-15 needed to set the guidebase. DMP has asked for 8 days for technical programs (packer, borehole televiewer, heat flow). Jarrard added that assuming a deep hole is accomplished, more than the standard Schlumberger runs would be desirable. An off-set VSP experiment would take almost 10 days.

PCOM concluded the discussions with the following:

<u>PCOM Consensus:</u>

Leg 118's first priority is to set the guidebase at the median ridge site (Site 4); the second priority is to pogo into the gravel pit; the third priority is to drill the northern nodal basin site. Eight days should be allowed for logging experiments with the understanding that a more specific program for logging will be determined.

LEG 119/120 PLANNING (KERGUELEN PROGRAM)

N.Pisias opened the discussion by stating the Prydz Bay program deserves consideration but that PPSP approval is uncertain. Larson added that at least the original monitor records from adjacent seismic lines, as well as good navigation charts, are needed.

Drilling and logging times for the legs were discussed.

L.Garrison said that 61 days (including 14 transit days) are available; 39 operational days are available for Leg 120.

R.Larson said that three sites to basement seemed sufficient, but that the Kerguelen Working Group (K-WG) needs to address basement objectives further. N.Pisias said that R.Schlich is concerned that the K-WG be given more information on Prydz Bay objectives; Pisias suggested that the K-WG meet with a LITHP member (possibly J.Mutter) to better define basement objectives.

PCOM Consensus:

The Kerguelen Working Group is to meet before the next PCOM meeting, and to report at the next PCOM meeting with scenarios both with and without Prydz Bay drilling, plus additional information on basement drilling.

Hayes said that getting available Russian data from Prydz Bay may be a problem and that reprocessing the available Australian/French data may only improve resolution in the shallower sections. Pisias agreed to contact D.Falvey for the Australian monitor records. L.Garrison added that TAMU needs to know soon about ice boat procurement.

PCOM Consensus:

At the next PCOM meeting a decision will be made on whether or not Prydz Bay will be included in the Kerguelen program, if the PPSP has not had a chance to review it.

Kerguelen co-chief recommendations are listed in Appendix J. The ODP operations schedule for Legs 114-120, as defined by PCOM, appears as Appendix L.

The prospect of Australian and perhaps Russian participation on the leg was discussed. The site selection for the leg is charged to the IOP (as there is no major proponent) using input from the K-WG. PCOM requested that a Science Operator representative attend the IOP meeting to make the Kerguelen drilling calculations. Pisias was to request a site survey report from the panel. The leg did not appear to need any special technological developments.

638 FURTHER INDIAN OCEAN PLANNING

LEG 121 PLANNING - BROKEN RIDGE PROGRAM

R.Larson reported that good site surveys exist for this leg. The Ninetyeast Ridge drilling on the two southern sites are scheduled with Broken Ridge and the northern sites with the Argo Abyssal Plain (AAP) drilling. [Subsequently, PCOM added the northern Ninetyeast Ridge site to the Intraplate Deformation leg (116).]

LEG 122/123 PLANNING - EXMOUTH PLATEAU/ARGO ABYSSAL PLAIN

Exmouth Plateau:

S.Gartner, program "watchdog", reported that two sites for a deep stratigraphic test are proposed, one at the Exmouth Plateau and one on the Argo Abyssal Plain. SOHP's primary site is EP-5. SOHP cannot justify the second site for double coring as proposed (AAP - Gradstein proposal). R.Larson reported that the IOP would like the EP-5 site drilled, but it has not been approved by the PPSP. SOHP's alternate site is a slightly shifted EP-7 site.

Pisias suggested that moving the EP-7 site to a deeper, thicker section and adding the EP-6 site would gain more time for the leg. A 41 day program has been recommended by the IOP.

PCOM Consensus:

PCOM's recommendation to the Indian Ocean Panel is to plan a full leg on the Exmouth Plateau and to consider SOHP's recommendations for the Exmouth sites.

Argo Abyssal Plain:

Robinson indicated that PCOM should consider geochemical reference holes and how to translate a single basement hole to solving a mass balance geochemical solution. The effects of zone alteration may not make a single hole "representative". The LITHP has requested a single deep hole. Garrison indicated that 2 deep holes might require more than one leg.

PCOM Consensus:

The Argo Abyssal Plain program will consist of one re-entry hole with significant basement penetration.

Geochemical Reference Sites:

Hayes requested justification for the AAP site as a reference site for the subduction process and products. He said that similar candidate sites will come on future legs. Robinson said that the LITHP has asked for a deep reference site in the Bonins as well but that the AAP site across an arc/forearc section would be valuable. Larson added that the stratigraphic section above basement was worth drilling on the AAP site and would not be offered in the Bonins.

Kastner asked for a general statement from SOHP/LITHP on reference sites based not on the logistics of the ship, but as a scientific concept. Pisias agreed to go to LITHP for a more detailed justification for the AAP site.

Ninetyeast Ridge:

The drilling requirements for the Ninetyeast Ridge sites were discussed with about eight days estimated to drill the northern Ninetyeast Ridge. Larson suggested leaving the AAP drilling as a single leg and "shoe-horning" the N90°E Ridge into the Intraplate

Deformation leg (Leg 116); the site also would involve extra transit time.

PCOM Consensus:
The North Ninetyeast Ridge site will be included on the Intraplate Deformation leg (116).

637 LONG-TERM PLANNING (Continued)

WESTERN PACIFIC PLANNING

A.Taira prefaced the Western Pacific plan with information on weather windows for the Japan Sea (January-February are bad) and Nankai/Bonins (typhoons peak in August and September). Pisias added that this problem may make interweaving appropriate CEPAC programs necessary.

Splitting the East Pacific Rise (EPR) into multiple legs was discussed for logistics and to take advantage of guidebase engineering developments between cruises. Garrison said that the program should identify CEPAC targets as logistical costs could be reduced if coordinated properly.

Pisias cited several considerations for setting up the Western Pacific program including: 1) the potential problem of inserting immature CEPAC programs in too early in their planning, and 2) the possibility of USSR membership. WPAC has proposed a clockwise track through the western Pacific (see map as Appendix M). The number of legs for the program is not yet determined, nor the transit times required.

Robinson was satisfied with WPAC proposal review and proposed to accept the nine highest-ranking programs for planning purposes. PCOM discussed the rankings of the thematic panels for WPAC programs and the site survey needs. Some members wanted a better review of the scientific priorities before assigning legs. Garrison pointed out the need to soon begin engineering, clearance and logistics work. Cadet mentioned the possible impact of COSOD II to the program.

Larson proposed that PCOM specify several programs that are highly supported by the panels as a "core program" and suggested it include: Bonin I, Nankai (accretionary wedge), Japan Sea, Banda-Sulu-South China Sea, and the Great Barrier Reef. Pisias noted the five programs will probably need more than five legs. There was some concern that the above program did not satisfy TECP collision tectonics interests. Robinson added that the panel chairmen are all concerned with whether the second circumnavigation will occur and advised concentrating on nine programs of thematically-driven science. Kastner pointed out that for a total three-year program in the W.Pacific, the number of CEPAC programs might be affected.

<u>PCOM Motion</u>:

WPAC and the thematic panels are directed to develop a nine-leg program for planning purposes in terms of a detailed prospectus (goals, timetables) to present to PCOM at the April meeting. (motion Robinson, second Brass)

Vote not called; see subsequent motion

Discussion:

von Rad commented that WPAC had already provided two prospectuses; Pisias added that such a request would not get needed information to the Science Operator until April.

The relative merits of a 7, 9 or 11 program prospectus were discussed. B.Taylor said that his panel defined programs instead of legs at PCOM's direction in order to thoroughly look at the science proposed. He said the third WPAC prospectus would detail drilling times and that 6, 9 and 12-leg scenarios had already been provided. He maintained that WPAC would continue to keep the top seven programs; only Sunda and Zenisu may change with additional site survey data.

<u>PCOM Motion</u>:

That PCOM accept, for planning purposes, the first nine programs proposed by WPAC for the Western Pacific;

WPAC is directed to prepare a detailed prospectus for each program and to translate these into tentative legs;

The other three programs should continue to be developed and considered as possible alternatives. (motion Robinson, second Coulbourn)

Discussion:

PCOM reviewed the five core programs proposed by Larson which were thought too extensive and the following amendment was forwarded:

<u>Motion Amendment</u>:

The four programs, Banda-Sulu-South China Sea Basin, Bonin I, Japan Sea and Nankai, should be included as a core program for the western Pacific. (amend Larson, second Taira)

Vote to amend motion: 15 for, 1 against, 0 abstain

Vote: 15 for, 1 against, 0 abstain

<u>PCOM Motion</u>:

That PCOM no longer accept the three year program as the limit in the Pacific for planning purposes. (motion

Robinson, second Kastner)

Vote: 6 for, 9 against, 0 abstain

CENTRAL PACIFIC PLANNING

Discussions on the Central Pacific program were opened by Pisias who noted that the CEPAC planning process had included joint meetings for interaction with thematic panels. He proposed the following guidelines:

The thematic panels are instructed to examine the proposals that have been considered and ranked by CEPAC and begin to evaluate how well they address their thematic objectives. The thematic panels are also asked to identify important thematic issues which may not have been addressed in the CEPAC proposal list.

CEPAC is asked to continue evaluating proposals which are approaching maturity and are of major thematic interest so that PCOM can begin to identify potential CEPAC programs to be included within the schedule for the WPAC area.

Hayes said that CEPAC surveys would largely be done in 1988. Pisias reiterated that CEPAC needs guidance for the number of legs they can expect.

PCOM Motion:
That PCOM reaffirm its advice to CEPAC and the thematic panels that one and one-half years be used for planning purposes as the general time frame for the CEPAC drilling plans. (motion Larson, second Brass)

Discussion:

Larson said that a three-year program had been set up and a extension of four months on the WPAC program would shorten the CEPAC program. PCOM discussed the impact of East Pacific Rise drilling and the following amendment was proposed for Larson's previous motion:

Motion Amendment:
CEPAC shall include scenarios with and without a three-leg East Pacific Rise program. (amend Kastner, second Larson)

Vote to amend motion: 4 for, 10 against, 2 abstain

Vote: 10 for, 5 against, 1 abstain

Discussion:

Robinson said that CEPAC should put together a program similar to the level of WPAC's, then refer it to the thematic panels. Shipley asked for clearer rankings by CEPAC.

PCOM Motion:

To accept the instructions formulated by the PCOM Chairman for CEPAC direction. (motion Robinson, second McDuff)

Discussion:

Hayes asked that CEPAC be instructed to put together packages supported by proposals as some targets listed had none. Pisias suggested substituting "proposals" for "programs" in his instructions. Kastner asked if the thematic panel were to deal with proposals from CEPAC of whether they should identify other themes from the scientific community. Pisias said that there should be proposals to support the science. A vote was called to accept the Chairman's amended instructions to CEPAC:

Motion Amendment:

The thematic panels are instructed to examine the proposals that have been considered and ranked by CEPAC and begin to evaluate how well they address their thematic objectives. The thematic panels are also asked to identify important thematic issues which may not have been addressed in the CEPAC proposal list. (amend Robinson, second McDuff)

Vote: 16 for, 0 against, 0 abstain

Motion Amendment:

CEPAC is asked to continue evaluating proposals which are approaching maturity and are of major thematic interest so that PCOM can begin to identify potential CEPAC programs to be included within the schedule for the WPAC area. (amend Pisias, second Kastner)

Vote: 16 for, 0 against, 0 abstain

Pisias said he would also instruct the panels to have an initial prospectus ready before the August PCOM meeting, with rankings/priorities identified as a possible core program.

LONG-TERM ENGINEERING PRIORITIES

The engineering priorities list developed at the Panel Chairmen's Meeting (18 January 1987) was discussed. Pisias said that PCOM should tell JOI how to prioritize the items for the budget.

Francis was concerned that the Navi-drill, scheduled for testing on Leg 114, be ready for SWIR.

Garrison said that TAMU can not do everything on the list without an increase in budget/personnel. Items should be selected for importance to upcoming legs. Although PCOM generally focussed on the Navi-drill, Pisias underscored the need for hard/soft rock recovery as the Navi-drill may not be the ultimate solution. Land testing of the Navi-drill was encouraged.

Robinson endorsed TEDCOM's recommendation to increase the engineering budget; Pyle responded that necessary cuts in other programs would have to be identified as well.

Garrison said that TAMU has many on-going, lower-level projects that are general drilling upgrades which do not relate directly to the high-priority scientific objectives.

Larson and Cadet asked for TAMU to present an explanation of how its budget will address the engineering priorities at the next PCOM meeting. Pisias also asked Taylor to include technical requirements in the next WPAC prospectus.

The specific programs for which engineering priorities were identified by PCOM appear in Table 1. PCOM concluded with the following:

PCOM Consensus:

PCOM identifies "young crustal drilling (Navi-drill/XCB/APC) and "recovery in alternating hard/soft sedimentary sequences" as the highest priority engineering developments, although others identified at the January 1987 Annual Meeting should be addressed.

639 BUDGET COMMITTEE MEMBERSHIP

PCOM membership to the new Budget Committee consists of the Chairman and one other U.S. member. The following nomination was forwarded:

PCOM Motion:

Larson nominated his eminent and substantial colleague, Garrett Brass, from the University of Miami, as PCOM's second member to BCOM. Brass's recent past experience in budget construction and review at the National Science Foundation, coupled with his intimate knowledge of the scientific goals of the program, make him the ideal individual to review program plans that propose to turn money into science. (motion Larson, second Kastner)

Initially speechless, Brass indicated his willingness to serve.

Vote: 15 for, 0 against, 1 abstain

640 TEDCOM ROLE IN ENGINEERING DEVELOPMENT

Francis (TEDCOM liaison) reported results from the last TEDCOM meeting. Well control drilling was discussed but remains poorly defined; TAMU has asked for specific sites and the conditions expected at them (weather, water depth, currents, properties of the lithologies, etc.) in order to seek engineering solutions. Garrison said it would be helpful for a selected group of scientists to attend the upcoming riser drilling workshop.

Pisias said that TEDCOM needs to respond to the specific requirements set forth by the advisory structure, not define its own engineering interests. PCOM generally agreed that TEDCOM is a resource for TAMU engineers.

Larson said that TEDCOM are not users, but industry engineers; therefore, no conflicts of interest will arise. Francis concluded by stating that TEDCOM's recommendation to increase the engineering budget was a result of careful review by its members.

641 SAMPLING STRATEGY

This item was placed on the agenda in response to concerns on thematic sampling strategy (expressed by B.Biju-Duval at the October 1986 EXCOM meeting).

J.P. Cadet said that Biju-Duval is concerned that panels have a strategy, including one for logging, for each leg. Co-chiefs should review it to see that it satisfies the main objectives for the leg.

PCOM generally agreed that the thematic panels be precise about the sampling for each leg and that the shipboard party be chosen with that strategy in mind. Pisias agreed to take his response to Biju-Duval (Appendix N) to EXCOM as PCOM concluded that it addressed the issue properly.

642 UNSOLICITED PROPOSALS/LOBBYING/CONFLICTS OF INTEREST

CO-CHIEF SELECTION

Pisias added this item to get PCOM's guidance on lobbying and selection of co-chiefs from with the JOIDES advisory structure.

(P.Robinson left the meeting for this discussion.)

Tucholke said that is not clear, outside of PCOM and some panels, how co-chiefs are selected. He added that site survey scientists have been "locked out" of the co-chief scientist slot. This may impair how those outside ODP view the system.

Hayes proposed that the procedure for co-chief selection appear in the JOIDES Journal. Pisias agreed to coordinate such an article; it would be circulated to PCOM and TAMU for their input.

(A copy of the article, as submitted to the February 1987 Journal is attached as Appendix O.)

UNSOLICITED PROPOSALS/COMMUNICATIONS

Panel chairmen have asked how they should respond to unsolicited letters and other input. Panel chairmen have been advised to use discretion on unsolicited proposals (those not channeled through the JOIDES Office).

CITATION OF ODP PROCEEDINGS (PART A)

Discussions during the report from the IHP on the citation of the ODP Proceedings (Part A) resulted in the following:

PCOM Motion:

That the suggested citation for the initial ODP Proceedings follow the format developed for the DSDP Initial Reports with the addition of a statement identifying the TAMU staff scientist as the volume's "Editor" or "Coordinator". (motion Larson, second Brass)

Discussion:

Coulbourn said that the policy varied by volume in the latter days of the DSDP. A. Meyer said that during the DSDP, co-chiefs had the option to include the staff scientist. Eldholm suggested postponing the vote until the next PCOM meeting so that the precise guidelines for DSDP citation could be presented.

PCOM Motion:

The Larson motion on ODP Proceedings (Part A) citation is tabled until the next PCOM meeting in order that specific examples can be presented. (motion Hayes, second McDuff)

Vote: 11 for, 5 against, 1 abstain

POLICY FOR PROVIDING SAMPLES TO LAND-BASED SCIENTISTS

Pisias expressed concern that land-based science not duplicate efforts onboard the RESOLUTION. Brass said that co-chiefs have discretion for allowing such efforts; he supported the 12-month moritorium on distribution of samples to shorebased labs. Francis said that the "consortium" approach for non-ODP science was valuable; he said fresh samples are often needed for geochemistry and other work and the 12-month rule would inhibit good science. Pisias reiterated that a problem exists if the science duplicated ship-based work and that often, few technicians are available to prepare the samples.

A. Meyer said the sampling plan is prepared by the co-chiefs; although she did not know the specifications on the Leg 112 distribution of samples to the British consortium, some co-chiefs have felt pressure from such requests.

Pisias was satisfied that a policy was in place but that PCOM's concern should be noted.

643 PANEL MEMBERSHIP

APPROVAL OF NEW PANEL MEMBERS

SOP: S. Cande (LDGO) will be invited to fill J. LaBreque's slot
TEDCOM: P.Stanton (EXCOM) and W. Svendson (Longyear) will be asked to join.
WPAC: G. Moore (Tulsa) is nominated for E. Silver's slot
ARP: Either C.Keen (Atlantic Geosciences Centre) or D.Sawyer (UTIG) will be invited to replace J. Mutter

FRG PANEL REPRESENTATION

U. von Rad reported on panel membership status for the F.R.G.

IOP: von Rad will be replaced by H. Backer
SSP: Meyer is the new member
WPAC: H.R. Kudrass is replacing Schluter
PCOM: Beiersdorf will attend the next PCOM; von Rad will be PCOM representative thereafter

REGIONAL PANEL STATUS

The concerns of J.Austin on the status of inactive regional panels (those in whose area the RESOLUTION is not scheduled to drill for some years) prompted two motions from U. von Rad:

PCOM Motion:
In order to reduce the enormous strain on budget and time on the panel and liaison members, I move that the regional panels and subject panels should not meet more often than two times per year, unless there is an explicit demand by the PCOM (Chairman) for a third meeting. Panel chairmen should consider other means of communication such as letter voting, telemail, phoning (increased panel chairman budget?) to make sure that their important input reaches PCOM in case they do not meet directly before a PCOM meeting. (motion von Rad, second Kastner)

Discussion:

B.Taylor, the lone attending panel chairman, was asked to contribute. He emphasized that the panels wanted their meeting schedules to coordinate with the PCOM meeting schedule. Two meetings per year for the regional panels whose area the ship is headed would not be too few. Robinson said that having panel meetings close to PCOM makes assimilating all the data difficult at PCOM meetings. The non-U.S. partners agreed that sending liaisons and panel members to many meetings was a financial burden. Flexibility in best handling the panel meeting schedules was encouraged by PCOM.

Vote: 16 for, 0 against, 0 abstain

PCOM Motion:
Regional panels should be dissolved or reduced to a core panel not meeting more than once per 18 months one year after the last leg has been drilled in that region. (motion von Rad, no second)

Discussion:

PCOM felt von Rad's first motion sufficiently dealt with "inactive" panels. For the immediate situation with the ARP, PCOM agreed that the panel meeting could coincide with the South Atlantic drilling workshop.

Straw Vote: 0 for, 15 against, 1 abstain

644 NEW ODP SEDIMENT CLASSIFICATION

SOHP had made recommendations to the revised ODP sediment classification. von Rad said that his contacts, in general, agreed with the SOHP suggestions; a clearer tabulation of the classification is also needed. Kastner suggested that PCOM vote to accept the classification after these revisions have been incorporated. TAMU will be asked to send the revised document to SOHP for review.

645 FUTURE MEETING SCHEDULE

Pisias asked that the meeting schedule coordinate with the new budget process and the following dates were found acceptable:

10-12 April 1987	College Station, TX
26-28 August 1987	Japan
30 Nov - 4 Dec 1987	Oregon

[Note: The April meeting was subsequently moved to Washington, DC.]

646 OTHER BUSINESS

CRUISE STAFFING

A. Meyer discussed cruise staffing procedures . If the USSR joins ODP, the number of onboard scientists will potentially increase to 28 per cruise. The average number per cruise has been 21 through Leg 112, but the increase could probably be accommodated. Meyer presented charts and tables showing the balance by participating countries through Leg 114 Appendix P) TAMU has asked PCOM to nominate co-chiefs 12-14 months ahead of the leg so that staffing con proceed smoothly. An "ideal" timetable for cruise participation was presented (Appendix Q). Meyer specifically asked for non-U.S. nominees for Leg 115-118 and for U.S. applicants for Legs 115 and 116.

ARCTIC DRILLING

An Arctic Working Group has been suggested with an emphasis on margin drilling as a way to increase ODP interest in these areas. PCOM requests that a participant from the recently convened workshop on Arctic drilling present a report at the next PCOM meeting,

DENNY HAYES

PCOM Motion:

That PCOM thank Dennis Hayes for his service as Lamont's PCOM member throughout the lifetime of ODP and during the closing years of DSDP. His broad knowledge of the Earth Sciences, corporate memory of JOIDES, and mission-oriented approach to planning have been of great value to the Committee's planning efforts. (motion Larson, second Brass)

Vote: 15 for, 0 against, 1 abstain

D. Hayes abstains due to conflict of interest; afterwards he expressed his appreciation and gratitude.

There being no further business to consider, the meeting was adjourned.

<u>NSF Report</u> to PCOM Meeting, January 19-23, 1987

1. USSR Status--NSF has not signed a formal MOU with the USSR Academy of Sciences yet. The delay has been caused by unexpected administrative requirements and approvals. Drs. N.A. Bogdanov and V.A. Stepanov are meeting with NSF staff this week to discuss the MOU dual language requirements, starting date for participation, and payment schedule. The MOU will probably be signed in Moscow in early February 1987.

2. NSF approved a FY 1987 Program Plan base budget of $34,280,000, plus enhancements totaling $1,002,000. The base budget is allocated as follows:

TAMU	--	$30,100,000
LDGO	--	2,750,000
JOI	--	1,430,000

See the attached diagrams for a breakdown of the 1987 base budget plus comparisons with FY 1986.

3. Due to concerns of NSF, ODP Council, and EXCOM regarding the needs for better long range planning, EXCOM has adopted new procedures and timetables for development of the Program Plan. This procedure requires for the first time a written document from PCOM to JOI/EXCOM/NSF outlining a science program and technology requirements. As part of this new procedure NSF is to provide a target budget figure to JOI/JOIDES in January. The target figure provided for the FY 1988 Plan is a two-level figure, which includes a base level figure of $35.5 million, a $1.2 million increase over the FY 1987 base level. A second level of $36.5 million also can be presented as an enhanced budget that builds on the base program.

4. In keeping with the new procedures and timetable, it is suggested that PCOM consider a revised schedule for planning drilling legs. A possible approach is illustrated on the attached diagram which provides for:

A. A "locked-in" drilling schedule for the rest of the fiscal year (January-September);

B. A firm drilling schedule for the next fiscal year, to be included in the next year's Program Plan;

C. A semi-firm but flexible drilling program for the following fiscal year; and

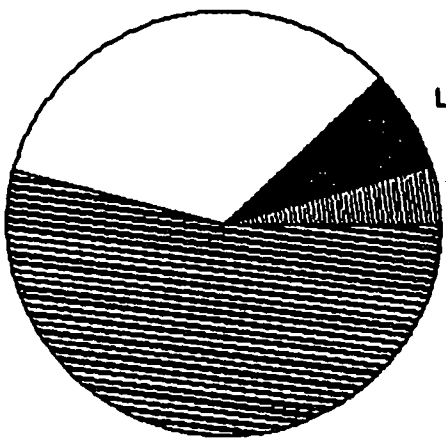
D. A general ship track for the third fiscal year.

This provides a more comprehensive, step wise drilling schedule out to 3 1/2 years ahead of the ship. PCOM might consider reexamining this issue, re-phrasing this part of their mandate, and presenting it to EXCOM.

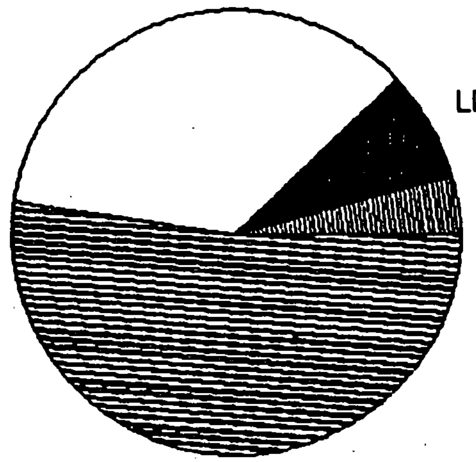
5. A summary of NSF/ODP U.S. Science Activities will be published in the January 27 issue of EOS. NSF/ODP has funded four 1987 field programs in the western Pacific (Sunda/Banda; Old Pacific; Bonins, and Nankai) and two out-year field programs (Hawaiian Moat and Chili Triple Junction). We are now soliciting proposals for field programs in the central and eastern Pacific. This is a major commitment to having scientific field programs help lead the scientific direction of the drilling program well in advance of the drillship.

6. Two positions will be available at the NSF/ODP office in Washington. The Program Director job will be made a permanent position beginning September 1, 1987, while the Associate Program Director for Science (open now) will remain a rotating position.

Ocean Drilling Program
FY 86-87
Cost Comparisons



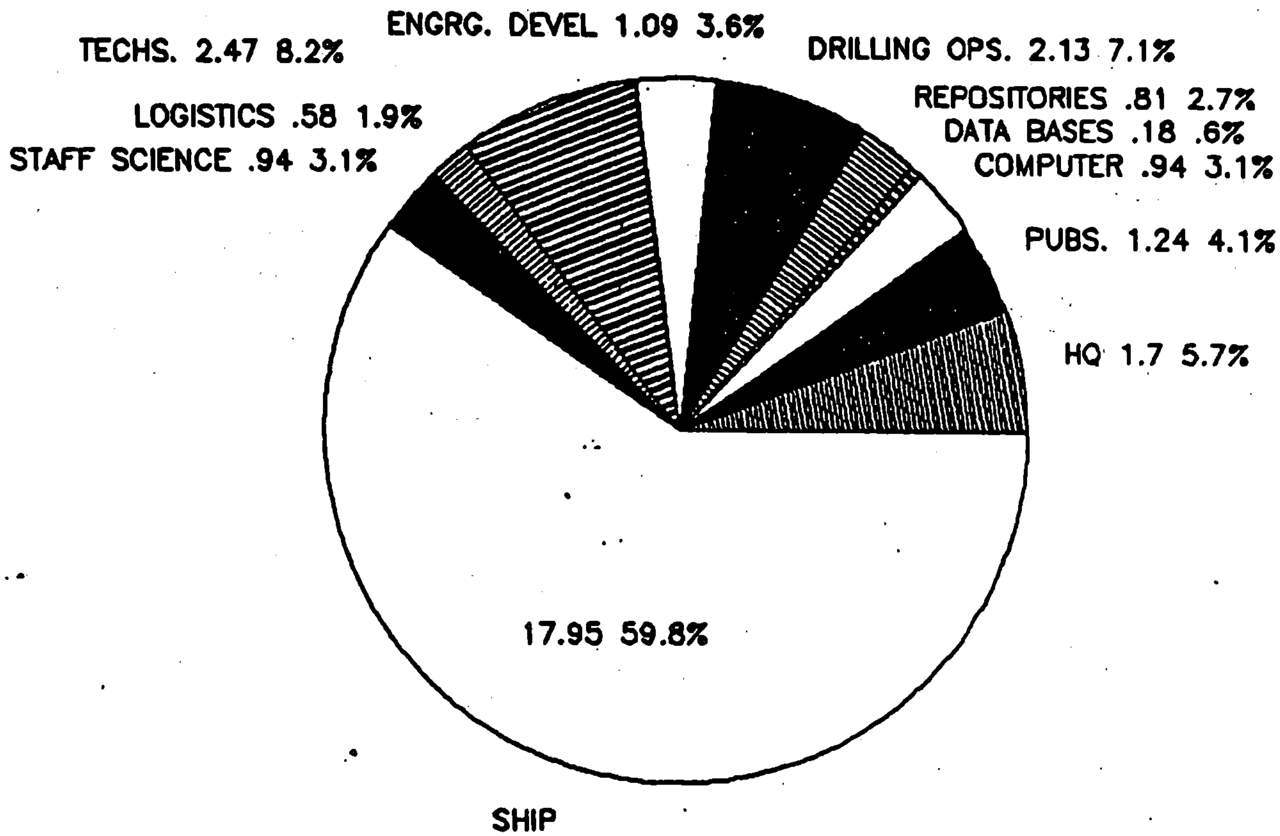
FY 86 - $32.51 mill



FY 87 - $34.28 mill

FY-87 W/O ENHANC.;WBSPIE67.CHT

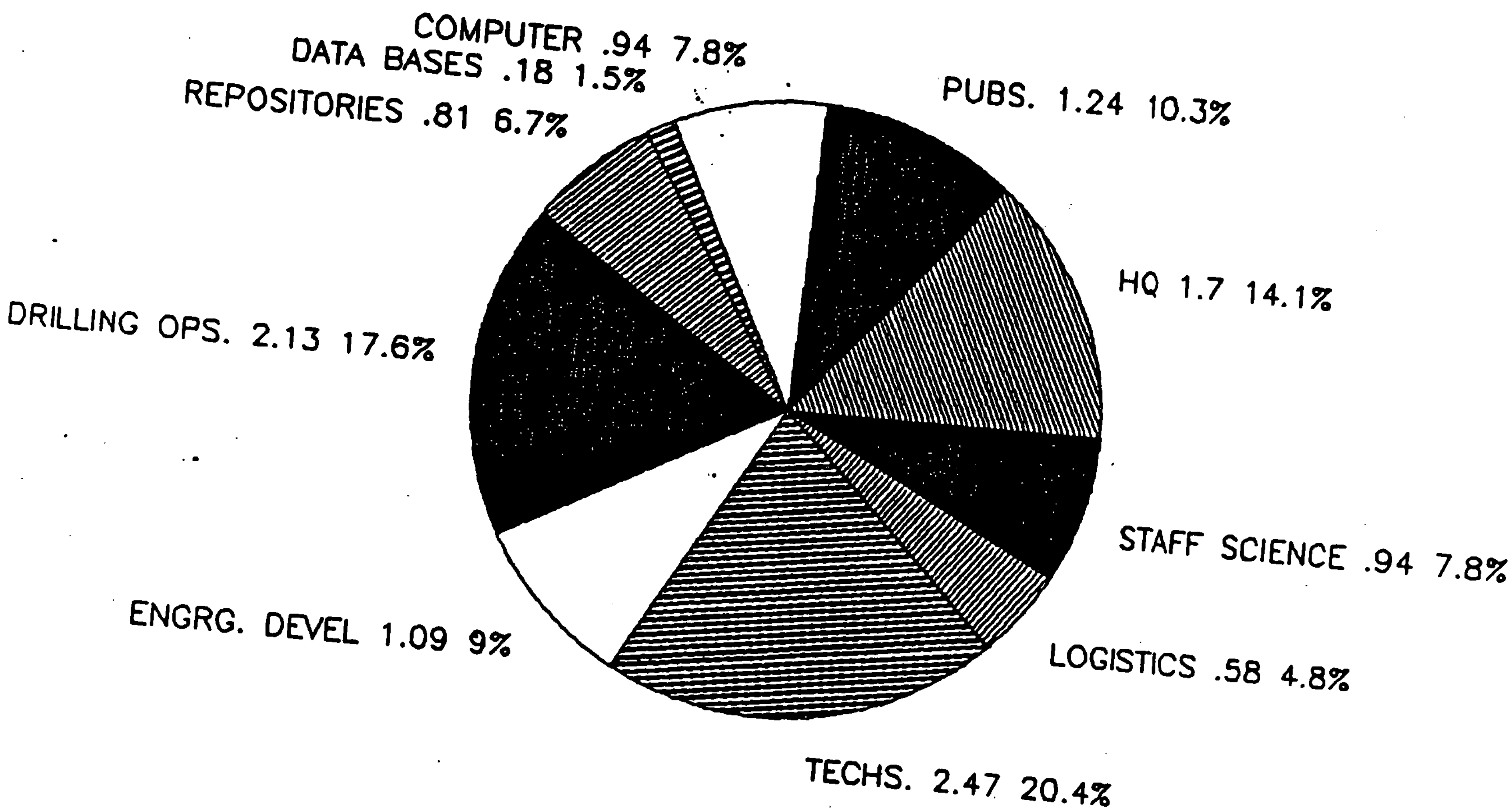
TAMU–ODP
FY 87 Budget



FY87 TOTAL= $30.10 Mill

$ IN MILLIONS U.S.

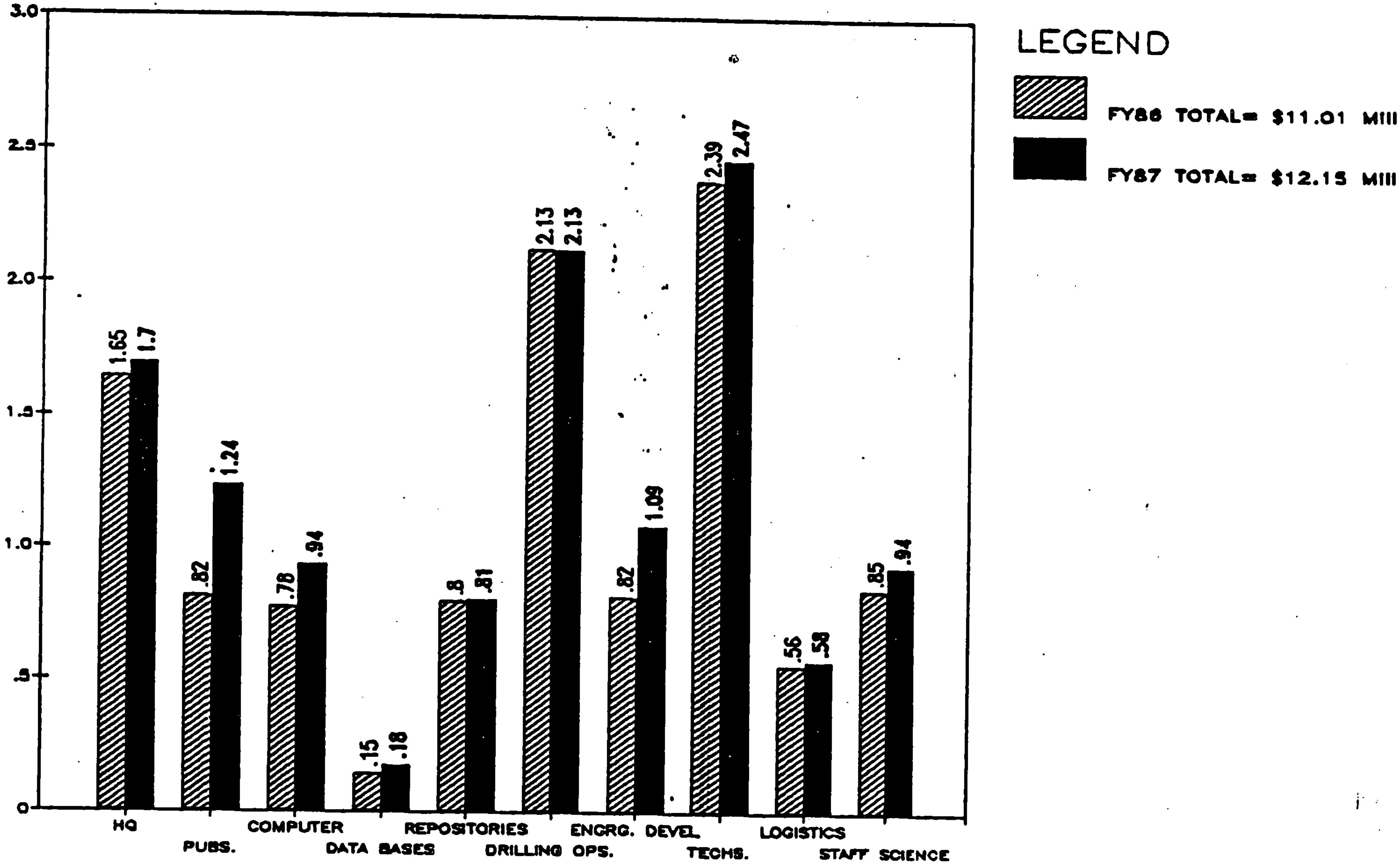
TAMU-ODP
FY 87 Budget



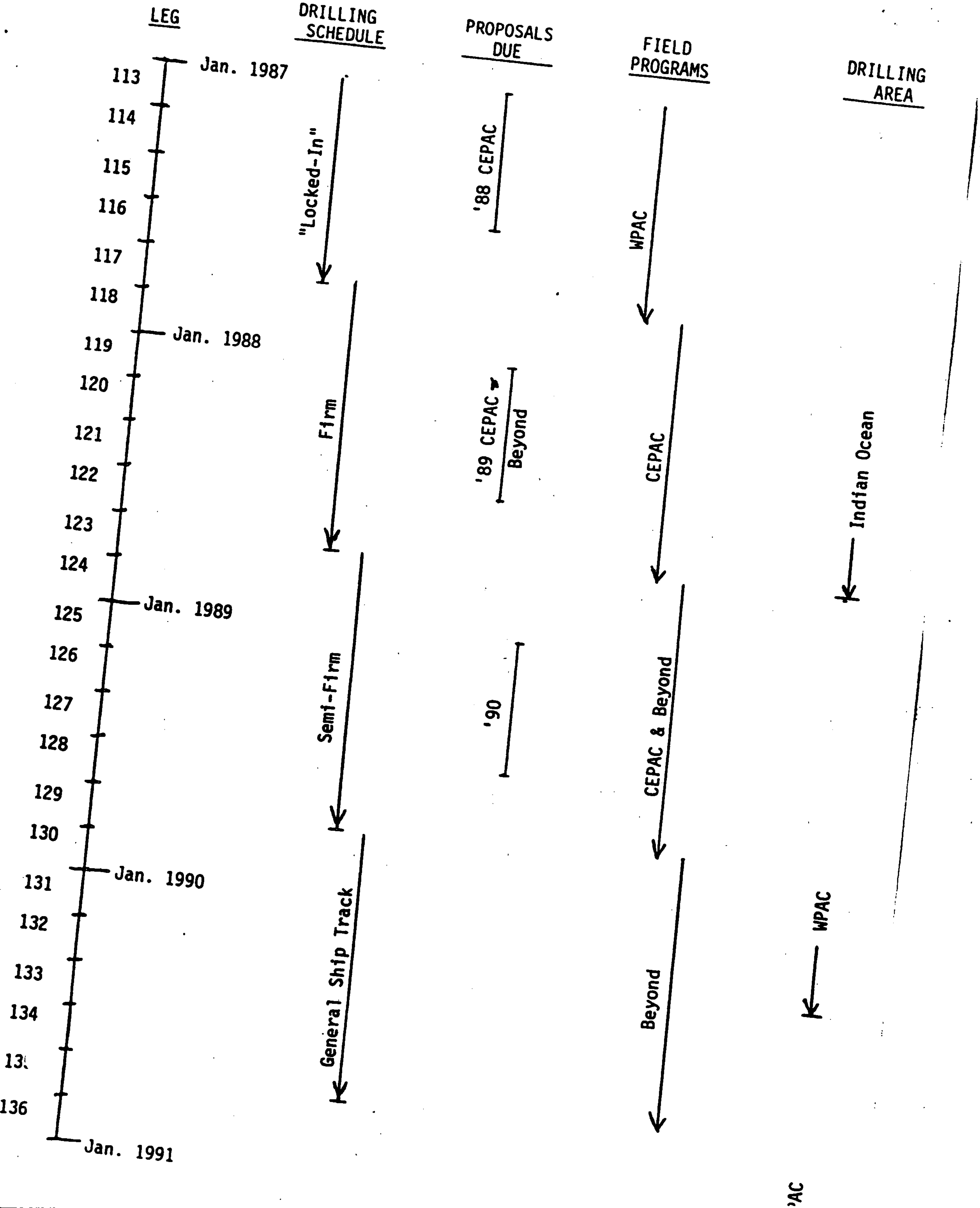
FY87 TOTAL= $12.15 Mill

$ IN MILLIONS U.S.; ship costs removed

TAMU-ODP
FY 86-87
Cost Comparisons



$ IN MILLIONS U.S.; ship costs rer ved


LEG
DRILLING SCHEDULE
PROPOSALS DUE
FIELD PROGRAMS
DRILLING AREA
Jan. 1987
113
114
115
116
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118
Jan. 1988
119
120
121
122
123
124
Jan. 1989
125
126
127
128
129
130
Jan. 1990
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132
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134
136
Jan. 1991
"Locked-In"
Firm
Semi-Firm
General Ship Track
'88 CEPAC
'89 CEPAC → Beyond
'90
WPAC
CEPAC
CEPAC & Beyond
Beyond
Indian Ocean
WPAC

DRILLING PROGRAM CALENDAR (1987)

ODP		MEETINGS	
January	**1987**		
7	NSF budget target to JOI/JOIDES	5-6	Logging school (UK)
19-23	PCOM	6-7	LITHP
29	FY88 PCOM recommendations to JOI, including:	12-13	Logging school (Fr)
	1) scientific advice	12-14	CEPAC/TECP
	2) 3-year review of technology/eng. devel.	13-14	SSP
	3) leg by leg schedule for at least 1 yr ahead	15-16	Logging school (FRG)
February			
~~1st week?~~ 2nd wk?	MOU signing in Moscow		
5-6	JOI and subcontractors meet to draft response		
12	JOI outline to NSF/JOIDES BCOM	18-20	IHP
24	BCOM "meeting by telemail or conference call		
March			
3	BCOM recommendations to JOI	9-11	SOHP
18	Subcontractors drafts to JOI	26-27	Co-Chiefs
April			
1	first draft of PP to NSF for admin. review		
3	NSF comments to JOI		
8	JOI revisions to NSF		
? ~~1st week~~	PCOM		
15	JOI plan and NSF comments to JOIDES/ODPC	(???)	NAS meeting on lith fm.
27	BCOM preview of PP		
28-30	EXCOM/ODPC- review of PP- if necessary, delegates further action to BCOM		
May			
15	Final BCOM recommendations, if necessary, to JOI/NSF	4-7	OTC
29	NSF final guidance to JOI		
June			
July			
1	JOI submits final PP to NSF	1-3	CEPAC
		6-9	COSOD II
August			
3	NSF executes contract		
17-21	PCOM meeting-- JOI briefs PCOM on FY88 PP		
September		9-11	IHP
30	End of FY 87	28-1Oct.	OCEANS 87
October			
1	Beginning of FY 88		
6-9	EXCOM/ODPC		
14	EXCOM advice to PCOM		
December			
1-4	PCOM	7-11	AGU
10	FY89 PCOM recommendations to JOI		

Revised 12/30/86

APPENDIX B

CEPAC RANKING OF DRILLING PROGRAMS

CEPAC named 'drilling packages' to more clearly define and combine high ranking thematic objectives with inclusive regional grouping (each panel member was allowed to select 7 packages):

Ranking		Drilling Packages	Number of votes received (11 voting members)
1.		Atolls and guyots	11
2.	-	N-Pac paleocean & plate reconstr.	10
	-	Ontong Java general	10
4.	-	Zero-age barerock crust	8
	-	Sedimented zero-age crust JdFuca	8
6.		Old Pacific (E.Cret - Jura)	7
7.		Bering Sea paleocean-environ	6
8.	-	Lith flexure	3
	-	Costa Rica underplating	3
	-	South Pacific tect - sed	3
11.		Aleutian/Alaskan convergence/accretion	2
12.	-	Cascadia accretion/convergence	1
	-	Gulf of Alaska terranes	1

<u>no votes for</u>:

- Equatorial Pac paleocean-environment
- Sedimentary processes
- Chile triple junction
- California margin tectonics

CURATORS OF DSDP MICROPALEONTOLOGICAL REFERENCE CENTERS

Ocean Drilling Program

Dr. Russ Merrill
Ocean Drilling Program
Oceanography
Texas A&M University Research
Park
77843
1000 Discovery Drive
College Station, TX 77840

U.S. Gulf Coast

Dr. Stefan Gartner
Department of

Texas A&M University
College Station, TX

U.S. West Coast

Dr. W.R. Riedel
Scripps Institution of
Oceanography
University of California,
San Diego
La Jolla, CA 92093

U.S. East Coast

The Curator
Lamont-Doherty Geological
Observatory
Columbia University
Palisades, NY 10964

New Zealand

Dr. Tony Edwards
New Zealand Geological Survey
Department of Scientific &
Industrial Research
P.O. Box 30368
Lower Hutt, New Zealand

U.S.S.R.

Dr. Ivan A. Basov
Institute of Lithosphere
Staromonet 22
Moscow 109180, U.S.S.R.

Japan

Dr. Y. Tanimura
Department of Earth Sciences
National Science Museum
3-23-1 Hyakunin-cho
Tokyo, 160 Japan

Europe

Dr. J.B. Saunders
Natural History Museum
CH-4001, Basel
Switzerland

ANNUAL REPORT OF THE SITE SURVEY PANEL

The SSP has met three times since the 1986 ODP Annual Meeting - in Victoria (April), Villefranche (Nov.) and Palisades (Jan.).

The SSP is pleased with the quality of the recently completed site surveys. We feel that that the additional scientific understanding provided by these new data sets has underlined the importance of good site survey data more successfully than any amount of rhetoric could have done. The catch-up game which has dogged the Indian Ocean planning is nearly over, and we feel that site survey planning will soon be on a reasonable schedule with sufficient advance time for the first time in the history of deep sea drilling.

The SSP's watchdog system for drilling proposals and the revised Site Survey Data Standards matrix seem to be working well. From our perspective we have adequate liaison with other panels.

The ODP Databank has operated at the same level of activity in FY 86 as in FY 85. However, the Databank, and in particular Carl Brenner, have played an increasingly key role in facilitating the work of the SSP. The Site Survey Panel is particularly pleased that the funding of the Databank for 1987 is at a reasonable level. There continue to be problems from time to time in receiving critical data packages in the Databank, but these seem to becoming less frequent.

Our meetings for 1987 are tentatively scheduled for June 30 - July 3 (Copenhagen) to review Kerguelen and the eastern Indian Ocean in detail and to go through WPAC plans again. In early December we plan a second meeting to review completed WPAC site surveys in detail and to look ahead to CEPAC site survey status.

Respectfully submitted,

John W. Peirce
SSP Chairman
January 16, 1987

FOR INFORMATION

"Paper to be included in next JOIDES Journal"

COSOD II

The Second Conference on Scientific Ocean Drilling will be hosted in Strasbourg, France, next July 6-8, 1987, by the European Scientific Foundation. During these three days, 350 scientists from the world scientific community at large will try to focus on the most significant problems which might be investigated by scientific ocean drilling in the 1990's. "The prime objective of COSOD II, as defined by the Planning Committee of JOIDES, is to make recommendations for future scientific and technological objectives for the Ocean Drilling Program, bearing in mind the scientific and technical progress of the ODP to date. As part of this charge, special attention will be given to the development of scientific programs within the ODP".

Why did the Executive Committee of JOIDES decide to convene such a conference ? After all, gathering 350 scientists from all over the world in Strasbourg is expensive. Why did JOIDES not simply rely on the expertise of its own well trained advisory structure ? The answer of course is that COSOD II is a consultation by JOIDES of the world scientific community. The mandate of the Conference in Strasbourg will not be to draft a detailed drilling plan for the 1990's. This will eventually be done later by people having a high level of expertise in scientific ocean drilling such as those who participate in the present JOIDES advisory structure. Rather, the scientists present in Strasbourg will try to identify the most significant scientific problems within the Earth Sciences at large to the solutions of which scientific drilling might contribute. One of the outcomes of such an exercise would be to evaluate the relative importance of ocean drilling as a scientific tool with respect to other exploration technologies and to propose scientific programs which might combine

APPENDIX F

drilling to these other technologies. It will of course be very important for the participants to be aware of possible drilling technological developments for the 1990's such as riser capabilities, independant less expensive HPC drilling platforms, improved logging, hydrothermal drilling capabilities at greater than 300°c and more efficient drilling and coring within very young oceanic basalts, cherts, talus type deposits, etc...

It is clearly impossible to discuss the possible contribution of ocean drilling to Solid Earth Sciences in the 1990's without reference to present accomplishments of the ocean drilling program. Thus it will be necessary to evaluate how the top priority scientific program recommendations made by COSOD I for the 1981-1991 decade compare with existing problems in the Solid Earth Ocean Sciences to-day and how successful has been ODP in implementing these recommendations.

The preparation of COSOD II was entrusted to a Steering Committee of twelve members who met in Strasbourg from September 30 to October 2, 1986. The Committee decided that the best format for the Conference would consist of five parallel workshops, each run as a Penrose-type conference. The focus will be on significant scientific problems and, for this reason, the workshops will be established along thematic rather than diciplinary lines. The five topics chosen are the following :

1) Global environmental changes
2) Mantle-crust interactions
3) Fluid circulation and global geochemical budget
4) Brittle and ductile deformation of the lithosphere
5) Evolution and extinction of oceanic biota.

The Committee did realize that scientists presently involved in ODP might have felt more confortable with five disciplinary workshops exhaustively covering the field related to ocean drilling. However, it deliberately choose to focus instead the Conference on scientific problems, hoping that the topics chosen each cover a sufficiently broad range of exciting problems to be of interest to the world scientific community.

Notice that there is no technological workshop. This of course does not imply that future technological evolution is not important for these debates. On the contrary, it is so important that it was felt that the corresponding technological information should be made available to each workshop. Accordingly, technological white papers have been requested from JOIDES concerning the following topics :

1) Use of riser for scientific drilling with study of possible renting of existing platforms.
2) Use of an independant smaller HPC platform
3) Bare rock drilling
4) Hot rock drilling
5) Logging
6) Drilling in difficult formations (broken rocks, cherts, etc...)

The Steering Committee felt that a significant development in the drilling program might come from a diversification of the drilling platforms, as indicated by items 1 and 2 above. Having to move a single platform throughout the world ocean introduces very severe constraints in the present drilling program and greater flexibility in this domain would obviously be welcome !

To prepare the Conference, the Steering Committee established five working groups, each covering one of the five topics. Each working group will investigate the contents of the topics it is in charge of and prepare a position paper focusing on important scientific debates which can be addressed by scientific ocean drilling, bearing in mind possible technological developments, possible diversification of drilling platforms and liaison with other scientific programs. It is hoped that the position papers will be drafted in time for mailing to the workshop participants prior to COSOD II.

It will also be the responsability of the working groups to organize the debates in the corresponding conference workshops and to incorporate the conclusions of the debates within the final reports which will be used by the Steering Committee for its recommendations to JOIDES.

How will the 350 scientists participating to COSOD II be selected ? A system of quotas has been established which includes 150 US scientists, 30 for each of the six other members of ODP and 20 for nations outside ODP. These will be selected among scientists who have applied to participate in the Conference, listing two workshops in order of preference, according to their scientific expertise. The selection for the attendance to each workshop will be made under the responsability of the chairman of the corresponding working group, or the basis of scientific balance, in relation with the Steering Committee members who will keep track of the proper ODP member balance. Roughly speaking, one would expect six scientists from each non US members, 30 scientists from the US and four scientists from non-member nations, as an average, for each workshop of 70 scientists. It is hoped that this rather complex selective system will insure both adequate worldwide scientific expertise and proper participation of all members of ODP.

Who will pay for the participation of scientists to the Conference ? Selected scientists should seek support from their national funding agencies which, for countries members of ODP, will have been kept informed about the whole selection process through their corresponding Steering Committee members.

The five working groups have now been selected and are starting to work on their position papers. In addition, it is hoped that the scientific communities of each member country of ODP will independently begin to reflect on possible contributions of their representative scientists to the COSOD Conference. The game is wide open and the ball is now in the field of the world scientific community. We, in the Steering Committee, all hope that it will bounce back in Strasbourg and look forward to three days of exciting and intense debates there.

Xavier LE PICHON

Chairman COSOD II Steering Committee

MEMBERSHIP DISTRIBUTION IN WORKING GROUPS
(Including Steering Committee Representatives)

	US	F	UK	FRG	C	J	ESF	Total
GLOBAL CHANGES	4	1	1	1	1		2	10
MANTLE & CRUST	5	1	1	1	1	1		10
FLUID CIRCULATION	5	1	1		1	1		9
BRITTLE & DUCTILE DEFORMATION	4	1		1	1	1	1	9
EVOLUTION & EXTINCTION	4	1	1	1		1	1	9
Total	22	5	4	4	4	4	4	47

WORKING GROUP CHAIRMEN

2 US: J.Imbrie, C.Langmuir

1 F: A.Nicolas

1 UK: G.Westbrook

1 ESF: H.Thierstein

PANEL CHAIRMAN'S MEETING II
18 January 1987
Hawaii Institute of Geophysics

EXECUTIVE SUMMARY

ATTENDANCE

B.Taylor, Western Pacific Panel, meeting Chairman
D.Appleman, Information Handling Panel
J.Austin, Atlantic Regional Panel
P.Ciesielski (for P.Barker), Southern Oceans Panel
G.Claypool, Pollution Prevention & Safety Panel
D.Cowan, Tectonics Panel
R.Detrick, Lithosphere Panel
J.Jarry, Technology & Engineering Development Committee
L.Mayer, Sediments and Ocean History Panel
J.Peirce, Site Survey Panel
S.Schlanger, Central & Eastern Pacific Panel
R.Schlich, Indian Ocean Panel
P.Worthington, Downhole Measurements Panel
N.Pisias, Planning Committee

PANEL STRUCTURE AND LIAISON

1. Effectiveness of Liaison Structure

Changes to panel liaison structure and procedure by PCOM following the first Panel Chairman's meeting have resulted in better inter-panel liaison. Liaison to and from PCOM has not improved and is often unsatisfactory. To help alleviate panel/PCOM liaison problems, PCOM should consider inviting some panel chairmen to key PCOM meetings as an informational resource.

The people in the ODP structure determine whether it works well or not. Panel membership, particularly liaison membership, is of critical importance and persons taking on liaison responsibilities should realize the importance of their role. Ineffective panel membership and liaison should be resolved by panel chairmen.

2. Regional vs. Thematic Planning

Panel chairmen remain divided on the issue of planning by regional versus thematic themes. The fundamental problem is how to provide PCOM with adequate, but not overwhelming, data on which to base informed decisions. The present structure can be made to work and has the advantage of several independent evaluations of proposals.

3. Inter-Panel Communication

Panels and PCOM need to explain in their minutes the rationale for their decisions, and these should remain consistent. Panel chairmen should make more of an effort to produce thorough and timely minutes and to see that they are properly distributed.

TEDCOM has official liaison only with PCOM. Other communication between TEDCOM and other panels is solely via panel minutes, technical workshops and TAMU. Panel chairmen should receive TAMU monthly reports of engineering status and developments.

Regional panels eagerly await the distribution of thematic panel "white papers".

4. Unsolicited Communications

Unsolicited communications to panels should come via the JOIDES Office. Panels generally will not consider late proposals or unsolicited communications, but may do so at the chairman's discretion.

5. Meeting Schedule

Efficient scheduling of panel meeting requires consistent scheduling of PCOM meeting dates. Regional panels will try to meet at least one month prior to PCOM, and thematic panels at least two months prior to PCOM.

LONG RANGE SCIENTIFIC AND LOGISTICAL PLANNING

1. COSOD II

Several members expressed concern at the apparent lack of continuity of COSOD II "working groups/broad themes" with respect to COSOD I or the present thematic panel structure. There was some question as to whether the intent is to add to, or cover all, thematic issues. Sy Schlanger, a participant in the COSOD II planning committee, resonded that COSOD II:

a. was mandated by JOIDES as an independent 5 year review of future ODP drilling;
b. will not review the ODP planning structure, but will consider multiple drilling platforms;
c. has 5 broad themes that can accomodate almost any issue; and
d. will have approximately 400 people meeting over 3 days: a broad perspective involving the scientific community at-large.

2. Circumnavigation

Although circumnavigation is part of COSOD I and the ODP program, the strong concensus is that through the end of Indian Ocean program too much will have been attempted in too little time. Insufficient time is being allocated to address fundamental scientific objectives along the regional path of the ship.

PCOM should allocate sufficient time to solve scientific problems. The panel chairmen feel that if insufficient time is available to thoroughly address the scientific objectives of a program, fewer objectives should be attempted, or more time should be allocated in a region. The long term value of the drilling program is being undermined because important experiments, logging and additional drilling are being cut out due to minimal time planning.

A seven year (minimum) first circumnavigation will not allow a second circumnavigation during a 10 year program, especially if new technology (e.g. riser drilling) is used in the second phase.

ENGINEERING DEVELOPMENTS

Engineering and technical priorities for individual panels were reviewed. The panel chairmen recognize the need for, and plan to provide via the JOIDES Office, more detailed input to TEDCOM and TAMU concerning the four areas of highest priority (not listed in order of priority):

1.a. Drilling young and/or fractured basement
  b. Drilling/logging in high temperature and corrosive environments
  c. Guide base development

LITHP has already made suggestions to TAMU regarding item 1.a., and DMP has already addressed logging in item 1.b. R.Detrick and LITHP will provide a summary of significant parameters affecting items 1.a-1.c.

2.a. Packers for measuring in situ pore pressure and permeability
  b. Tools to measure in situ physical properties
  c. Development of pressure core barrels and the ability to handle gassy sediments

D.Cowan and TECP will abstract information from the Cornell Workshop Report and Karig.

3.a. Drilling deep (2-3 km) holes

L.Mayer will provide a SOHP report which is already completed. TEDCOM is considering six alternatives.

4.a. Drilling and recovering alternating hard/soft sediments (e.g. chert/chert sequences)

b. Drilling and recovering unconsolidated clastics turbidites/volcaniclastics/glacial marine sediments

S.Schlanger will summarize information pertinent to item 4.a., L.Mayer will address item 4.b. Development of a compatible Navidrill/XCB/APC combination may help resolve item 4.

OTHER BUSINESS

1. Program Status

Possible drilling scenarios in the Indian Ocean and Western Pacific were discussed for informational purposes. Potential high priority programs in the western CEPAC region were noted.

2. JOIDES Office Support

Panel chairmen request a JOIDES Office secretary to attend panel meetings whenever possible. Most chairmen are unable to run a meeting, participate in discussions, and take coherent minutes at the same time. Experience has shown that very few scientists in the panel structure take good minutes and that rotating the responsibility produces highly variable results. Accurate, concise and timely minutes, as well as executive summaries, are a key element to an effective panel structure.

3. Panel Operating Expenses

Panel chairmen note with appreciation the recent increase to $1500 in their annual JOIDES allocation for operating expenses. They hope that future increases will allow actual reimbursement for costs incurred by busy panels.

4. Next Meeting

Panel chairmen feel that an annual meeting, held in conjunction with the PCOM annual meeting, will be sufficient to provide PCOM with input on panel structure and related issues.

STRAW-MAN 1987 - SCHEDULE FOR THE INDIAN OCEAN:

15 MAR 10 MAY (Mauritius)	114: Subantarctic	
15 MAY JUN (Colombo)	115: Carbonate Dissolution Profile Mascarene *2	If Neogene II is drilled than duplication of 2 sites of 90 ER (sites 3,4)
JUL AUG (? Karatchi)	116: Intraplate	IOP recommends Intraplate as full leg: Then N-site of 90 ER not drilled
SEP mid OCT (? Mauritius)	117: Neogene I	
mid OCT NOV (Mauritius)	118: SWIR	
6 DEC 6 FEB (Mauritius)	119: Kerguelen I	

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*1 Note: MCS site survey in Nov/Dec 86 delayed/cancelled! No timely SSP review! Contingency plan needed!

*2 Note: Site survey in March 87! No more PCOM meeting! Contingency plan is needed!

PCOM AND PANEL CO-CHIEF RECOMMENDATIONS FOR INDIAN OCEAN LEGS

LEG 115: (Mascarene Plateau/Carbonate Dissolution Profile)

Bachmann (U.K.), Baxter (U.K.), Curry, Duncan, Fisher, Peterson, Shackleton (U.K.), Thierstein (ESF), Vincent (F)

LEG 116: (Intraplate Deformation/N. Ninetyeast Ridge)

Cochran, Curry, Herb (ESF), Leggett (U.K.), Luyendyk, McCave (U.K.), Segawa (J), Sclater, Scrutten (U.K.)

LEG 117: (Neogene I)

Already selected: Prell, Nijitsuma (J)

LEG 118: (SWIR)

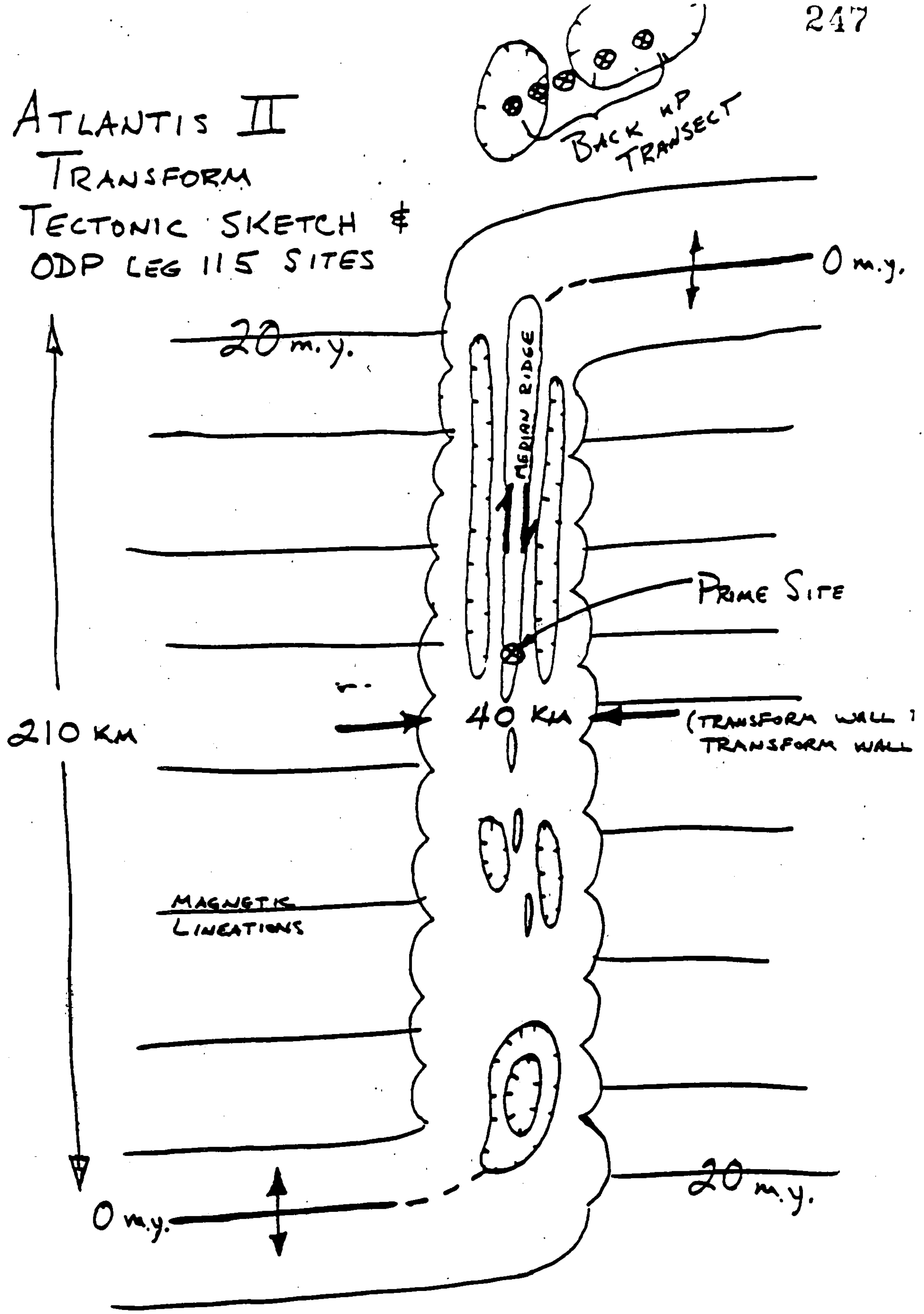
Already selected: Robinson, von Herzen

LEG 119: (Kerguelen North)

Anderson, Barron, Berggren, Elverhol, Hayes, Hsu (ESF), Krashinnenikov (USSR), Keller, LeClair (F), Mutter, Perch-Nielsen (ESF), Schich (F), Schrader (ESF), Thierstein (ESF), Webb, Wise

LEG 120: (Kerguelen South)

All those listed for Leg 120 with the addition of Hinz (FRG) and Segawa (J)


ATLANTIS II
TRANSFORM
TECTONIC SKETCH &
ODP LEG 115 SITES
BACK UP TRANSECT
0 m.y.
20 m.y.
MEDIAN RIDGE
PRIME SITE
210 KM
40 KM
(TRANSFORM WALL
TRANSFORM WALL
MAGNETIC
LINEATIONS
0 m.y.
20 m.y.

JOIDES RESOLUTION OPERATIONS SCHEDULE

Legs 114 - 120

LEG	AREA	DEPARTS		ARRIVES		IN PORT
		LOCATION	DATE	DESTINATION	DATE	
114	Subantarctic	Falkland Islands	16 March	Mauritius	14 May	14-18 May
115	Mascarene Plateau Carbonate Dissolution Profile	Mauritius	19 May	Colombo	29 June	29 June - 3 July
116	Intraplate Deformation and N90°E Ridge	Colombo	4 July	Karachi	21 August	21-25 August
117	Neogene Package	Karachi	26 August	Mauritius	16 October	16-20 October
118	Southwest Indian Ridge	Mauritius	21 October	Mauritius	2 December	2-6 December
119	Kerguelen (north)	Mauritius	7 December	Mauritius	6 February	6-10 February
120	Kerguelen (south)	Mauritius	11 February	Freemantle	11 April	11-15 April

APPENDIX L

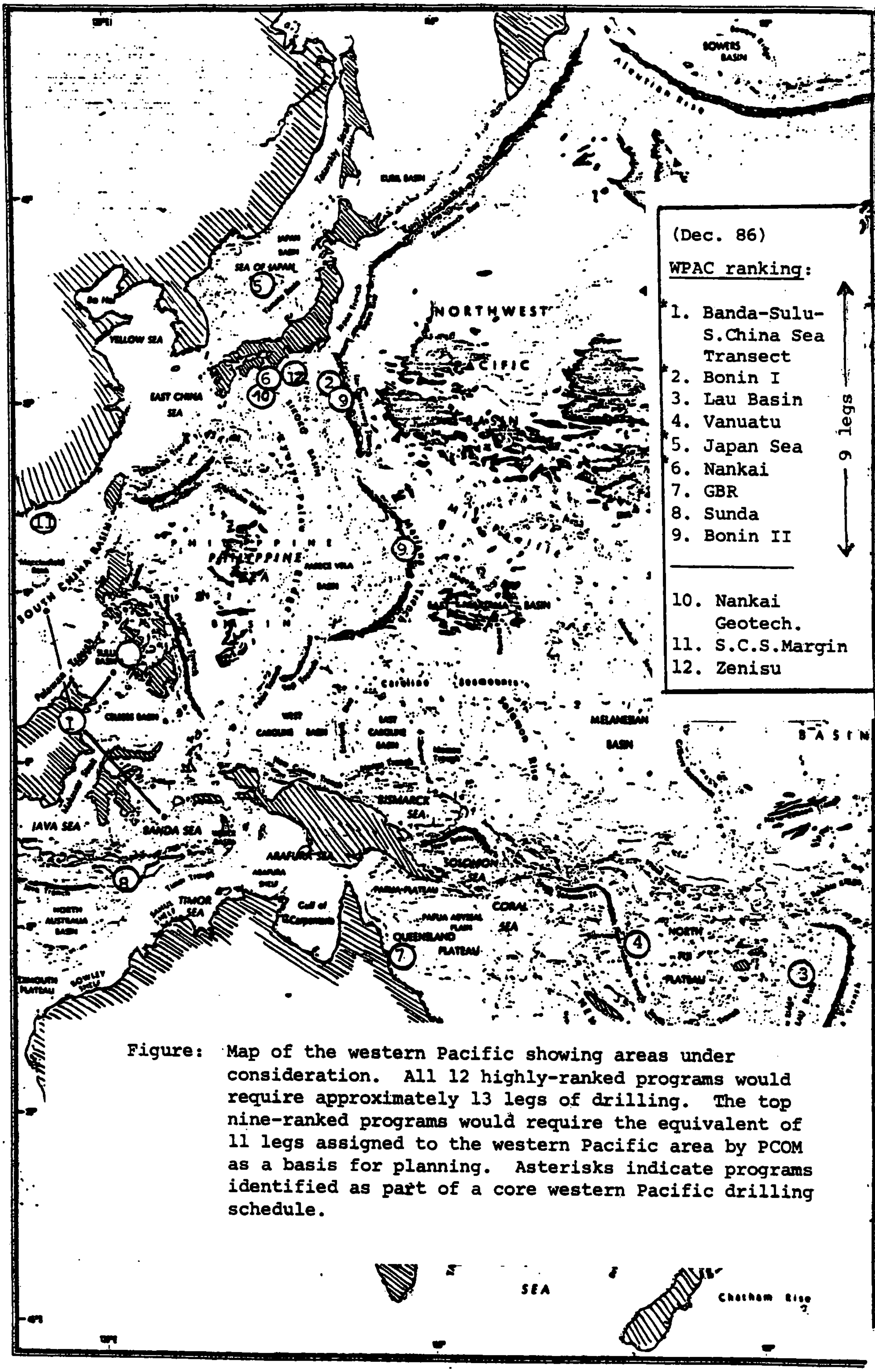


Figure: Map of the western Pacific showing areas under consideration. All 12 highly-ranked programs would require approximately 13 legs of drilling. The top nine-ranked programs would require the equivalent of 11 legs assigned to the western Pacific area by PCOM as a basis for planning. Asterisks indicate programs identified as part of a core western Pacific drilling schedule.

APPENDIX M

JOIDES Planning Office

College of Oceanography
Oregon State University
Corvallis, OR 97331
Telephone: 503-754-2600

3 December 1986

Dr. Bernard Biju-Duval
IFREMER
66, Avenue d'Iena
Paris 75116
FRANCE

Dr. Biju-Duval,

After reviewing the EXCOM minutes and my notes from the Victoria meeting, I think we have an idea of what your request is concerning sampling strategies. What I propose to ask the thematic panels is that they make recommendations on scientific problems that go beyond the initial priorities of the drilling legs; that they examine problems that can be addressed by multiple legs either in terms of planning multiple legs or defining possible problems that can be addressed in concert with previous drilling; and that they make recommendations as to the sampling strategy that may be used to address these problems. In addition, in their recommendations concerning specific drilling legs, the thematic panels identify possible sampling strategies and the types of measurements which are necessary for addressing the objectives of a leg. This information would be useful to the Science Operators in their role of inviting participating scientist and would provide input to co-chief scientist as to the types of additional scientific questions that their leg could potentially address.

This, I think, is the nature of your request. At the present time I would leave it in this more generic form so that the thematic panels can give input on how they may view their role in defining scientific problems and the necessary sampling strategies. Please let me know if this is a correct interpretation of your comments and if so I can bring this up at the next PCOM meeting and forward the request to the thematic panels. I would appreciate your quick response so we can formulate this item for the PCOM agenda, which will be mailed 19 December.

Sincerely,

Nicklas G. Pisias
Chairman JOIDES Planning Committee

OCEAN DRILLING PROGRAM

APPENDIX N

IFREMER

Paris, December 23, 1986

Dr. Nicklas G. Pisias
Chairman, JOIDES Planning Committee
JOIDES Planning Office
College of Oceanography
Oregon State University
Corvallis, OR 97331
Etats-Unis

86-1080
RECEIVED DEC 2 9 1986

Dear colleague,

Thank you for your letter of Dec. 3 : I think we are now very near of what I asked at the last EXCOM meeting.

As I said several times the role of thematic panels is to examine problems in their global aspects and not only leg by leg. So your proposal to the PCOM seems to me very adequate. Indeed the definition of cross-leg sampling strategies can be asked to the thematic panels prior to the invitation of the scientists. So co-chiefs as well as science operator may use this information after approval by PCOM.

I also agree you will bring this up at the next PCOM meeting in a very general approach.

I apologize for answering so late but your letter arrived to me on December 16.

Sincerely yours,

B. Biju-Duval

Bernard BIJU-DUVAL

copie : J.P. Cadet

CO-CHIEF SELECTION PROCESS FOR ODP CRUISES

With the move of the JOIDES Planning Office to Oregon State University, we have received a number of questions and concerns about procedures of the Planning Committee. One such question addresses the selection process of co-chief scientists. We felt that it may be appropriate to use the JOIDES Journal to state some of the existing PCOM policies on co-chief selection.

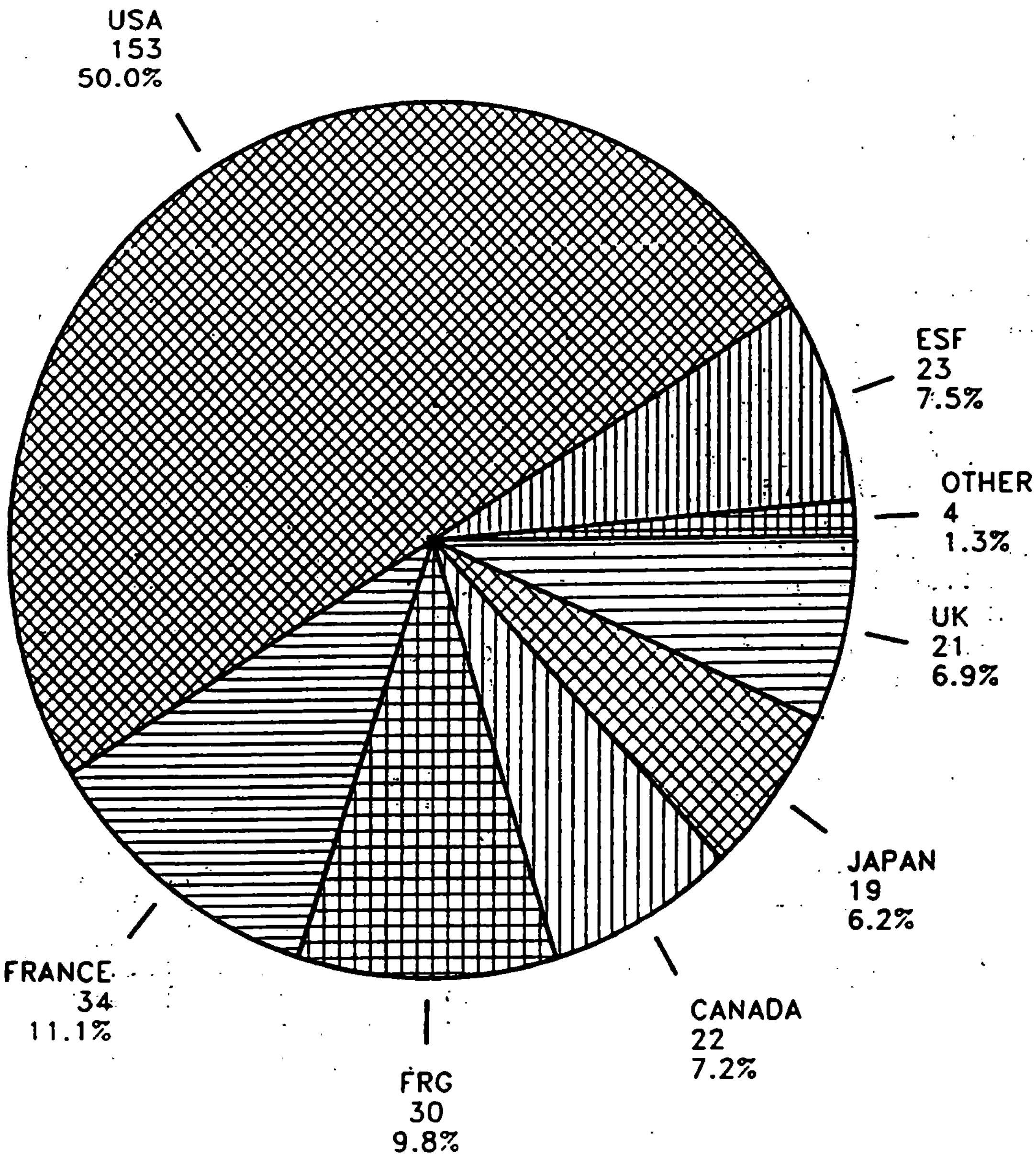
There are two contractual obligations in the co-chief selection process. First, the Science Operator, Texas A&M University, has the final responsibility for selecting all scientific staff which will participate on a particular leg. Secondly, the "Memorandum of Understanding" (MOU) signed by all members states that, on average, each non-U.S. member should have one co-chief position in a year.

The co-chiefs are selected by the Science Operator from a list of names forwarded by the Planning Committee. This list comes from input by the advisory panels, names suggested by non-U.S. science advisory committees and other names suggested by PCOM. The list may also include people who have expressed an interest in participating as a co-chief on a particular leg. In providing advice to the Science Operator, PCOM identifies names of original proponents, scientists who carried out site surveys, scientists with major interest in the region to be drilled, and those with expertise in the problems being addressed by the particular leg. In addition, PCOM may identify names of those who have been co-chiefs a number of times in order to bring attention to new people on the list who have not had the opportunity to participate in the program as a co-chief scientist.

The responsibilities of co-chief scientists include overseeing a shipboard staff of nearly 50 people and the successful completion of a multi-million dollar cruise (including the ultimate publication of both data and scientific reports). The co-chief selection process is intended to select those who have the experience, maturity, and scientific expertise to coordinate and conduct the scientific program assigned to each leg. As many legs have been developed from combinations of proposals and different data sources, and because of the obligations stated in the MOU, it is not possible, to guarantee that all proponents will be selected to serve as co-chief scientists.

OCEAN DRILLING PROGRAM PARTICIPATION BY COUNTRY

LEGS 101 - 114



APPENDIX P

PARTICIPANT TALLY BY COUNTRY

LEG	USA	FRANCE	FRG	CANADA	JAPAN	UK	ESF	TOTAL	CO-CHIEFS' NAMES
101	15	2	1	0	0	2	2	22	Austin/Schlager
102	13	1	2	0	0	0	1	17	Salisbury/Scott
103	12	4	1	2	1	0	3	23	Boillot/Winterer
104	11	2	4	2	0	1	6	26	Eldholm/Thiede
105	12	3	2	5	0	0	2	24	Arthur/Srivastava
106	8	1	2	1	2	0	0	14	Detrick/Honnorez
END OF YR 1:	71	13	12	10	3	3	14	126	
107	9	4	2	0	2	1	3	21	Kastens/J.Mascle
108	9	3	3	0	2	3	1	21	Ruddiman/Sarnthein
109	7	4	3	1	2	1	0	18	Bryan/Juteau
110	12	4	1	2	2	2	0	23	A.Mascle/Moore
111	12	2	2	2	4	2	0	24	Becker/Sakai
112	12	2	2	3	2	3	0	24(+4)	Suess/vonHuene
END OF YR 2:	61	19	13	8	14	12	4	135	
113	12	1	3	2	1	4	2	25	Barker/Kennett
114	9	1	2	2	1	2	3	20	Ciesielski/LaBrecque
SWIR	2			1					Robinson/vonHerzen
REDSEA	1	1							Cochran/Guennoc
NEOI	1				1				Niitsuma/Prell
MAKRAN	1					1			Haq/Leggett

Note: Beginning of new member country participation indicated by underline.

CO-CHIEF TALLY BY COUNTRY

LEG	USA	FRANCE	FRG	CANADA	new members			CO-CHIEFS' NAMES
101	2							Austin/Schlager
102	2							Salisbury/Scott
103	1	1						Boillot/Winterer
104			1				1	Eldholm/Thiede
105	1			1	JAPAN	UK		Arthur/Srivastava
106	2							Detrick/Honnorez
107	1	1						Kastens/J. Mascle
108	1		1					Ruddiman/Sarnthein
109	1	1					ESF	Bryan/Juteau
110	1	1						A. Mascle/Moore
111	1				1			Becker/Sakai
112	2							Suess/vonHuene
END OF YR 2:	15	4	2	1	1	0	1	
113	1					1		Barker/Kennett
114	2							Ciesielski/LaBrecque
SWIR	1			1				Robinson/vonHerzen
REDSEA	1	1						Cochran/Guennoc
NEOI	1				1			Niitsuma/Prell
MAKRAN	1					1		Haq/Leggett
END OF YR 3:	22	5	2	2	2	2	1	

Note: Beginning of new member country participation indicated by underline.

"NORMAL" (IDEAL ?) STAFFING TIMETABLE

12 MONTHS PRECRUISE: - INVITE CO-CHIEFS
- DISCUSS SPECIALTY BALANCES

→ GET NOMINEES ←

10 MONTHS PRECRUISE: - START INVITING SHIPBOARD "CORE"

8 MONTHS PRECRUISE: - BULK OF INVITATIONS SENT

4 MONTHS PRE CRUISE: - STAFFING DONE

3-4 MONTHS PRE-CRUISE: - PRECRUISE COCHIEF MEETING
- PROSPECTUS

2 MONTHS PRE-CRUISE: - SAMPLE REQUESTS IN

APPENDIX Q

THE THIRD PROSPECTUS FOR WESTERN PACIFIC DRILLING

The ODP Western Pacific Panel at its March, 1987 meeting produced the following Drilling Prospectus having considered over 80 proposals from the scientific community together with input from ODP Thematic Panels on the major scientific problems that should be addressed in the region. The Planning Committee instructed that problems of global rather than local importance were to be emphasized, and at its January, 1987 meeting gave general endorsement, for planning purposes, to nine programs (11 legs) of the previous WPAC prospectus.

The western Pacific region constitutes a complex zone between the major Pacific, Australian and Asian plates and includes numerous arcs, back arc basins and collision zones. It may be compared to the early stages of formation of geological belts such as now preserved in the Alps, Himalayas and North America Cordillera. In addition to the major geoscientific problems listed below, a number of the drilling targets will provide information of global economic and/or social relevance, related to understanding the environments and processes in which sulphide mineral deposits form, petroleum accumulates and earthquakes are generated.

The proposed drilling targets address a wide range of scientific problems, and usually individual holes have more than one objective. The major thematic problems are listed below, along with the relevant western Pacific programs.

1. Island arc/forearc processes (Bonin, Vanuatu, Lau-Tonga)
   a. initiation and tectonic/stratigraphic development
   b. magma gensis and subduction mass balance

2. Mountain building and terrane accretion processes
   a. accretionary prisms (Nankai)
   b. collisions: arc-continent (Sunda)
      arc-ridge and arc reversal (Vanuatu)
      obduction (Japan Sea, Zenisu)

3. Formation of marginal basins
   a. magma genesis and geodynamics of back arc rifting (Japan Sea, Bonin, Vanuatu, Lau-Tonga)
   b. entrapment? (Banda-Sulu-South China Basins)
   c. passive margin evolution (South China margin)

4. Paleoceanography and sediment history (Great Barrier Reef and marginal basin programs)
   a. effect of global events on marginal basin water mass, faunal and depositional history.
      - including gateway closure between the Indian and Pacific Oceans.
   b. comparative basin stratigraphy: carbonate, siliciclastic and pelagic lithofacies patterns, anoxic vs oxic facies development, tectonic vs enstatic control.
   c. regional Cenozoic biostratigraphy and paleoclimate - including the effects of Himalayan uplift.

5. Hydrothermal processes and sulphide deposit formation (Japan Sea, Bonin rifts, Great Barrier Reef, Lau Basin)

To maximize the scientific return of WPAC drilling, engineering developments are needed to:

1. Enhance coring rates and recovery in:
   a. alternating hard and soft sediments and;
   b. course unconsolidated sediments; needed for all programs, by October 1988.

2. Provide special tools for geotechnical and pore fluid measurements; needed for Sunda (Nov. '88), Nankai especially (June '89), Great Barrier Reef and Vanuatu.

3. Enhance coring rates and recovery in young crust; needed for Lau Basin (Aug. '90).

TABLE OF CONTENTS

PANEL RANKINGS OF WPAC PROGRAM (12/86)

TECP

1. Bonin Transect
2. Nankai Trough
3. Japan Sea
4. Bonin-Marianas
5. Banda-Sulu-South China Basins
6. Vanuatu
7. Nankai physical properties (1/2 leg)
8. Lau Basin
9. Sunda Backthrusting

LITHP

1. Bonins
2. Lau Basin System
3. Sea of Japan
+ Reference Sites

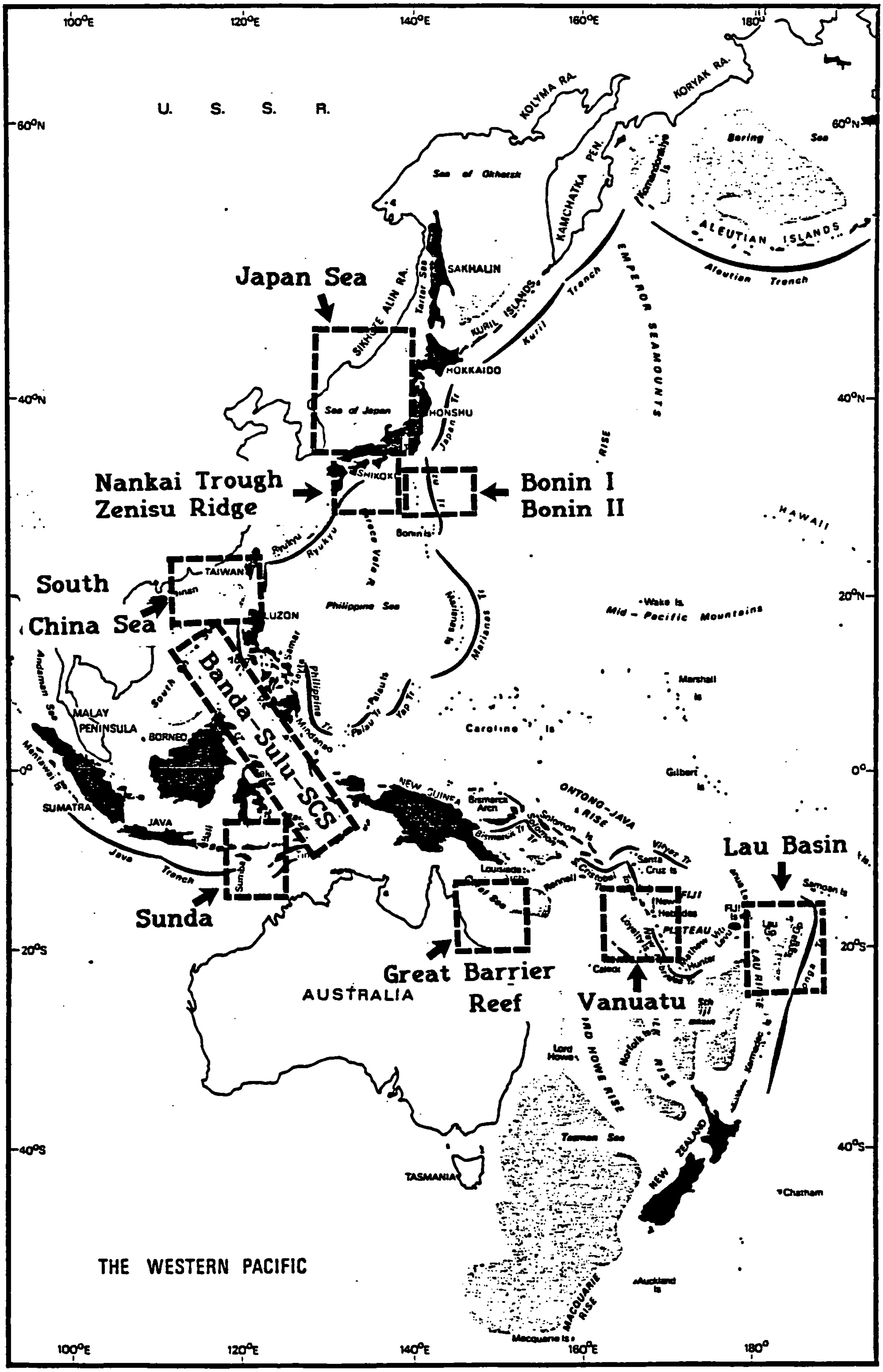
SOHP

1. Great Barrier Reef
2. Japan Sea
3. South China Sea
4. Sulu Sea
5. Bonin Site 6

WPAC

Priority/Program	Days Drilling	Days Logging	Special Expts.	Min. Transit	Total Days*
1. Banda-Sulu-SCS Basins	62	11	--	10	83
2. Bonin I (Bon 1.2, 5A-B, 6)	66	9	--	4	79
3. Lau Basin	48-50	6	1	3	58-60
4. Vanuatu	62	10	--	4	76
5. Japan Sea	53	11	3-5	5	72-74
6. Nankai	34-42	5	--	5	44-52
7. Great Barrier Reef	42-50	8-10	--	4	54-64
8. Sunda	39	11	--	5	55
9. Bonin II (Bon7 + 2 Ref)	29	5	--	6	40
10. Nankai Geotechnical	(23-25)		5	2	30-32
11. SCS Margin	43-58	7	--	4	54-69
12. Zenisu Ridge	19-20	6	1	2	28-29

* The estimated times in this prospectus are slightly revised from those of the December meeting.


100°E
120°E
140°E
160°E
180°
60°N
40°N
20°N
0°
20°S
40°S
U. S. S. R.
Japan Sea
Nankai Trough
Zenisu Ridge
Bonin I
Bonin II
South
China Sea
Banda-Sulu-SCS
Sunda
Great Barrier
Reef
Vanuatu
Lau Basin
SAKHALIN
HOKKAIDO
HONSHU
TAIWAN
LUZON
MALAY
PENINSULA
BORNEO
SUMATRA
JAVA
AUSTRALIA
TASMANIA
NEW ZEALAND
Sea of Okhotsk
Sea of Japan
Philippine Sea
KAMCHATKA PEN.
KOLYMA RA.
KORYAK RA.
ALEUTIAN ISLANDS
Aleutian Trench
KURIL ISLANDS
Kuril Trench
EMPEROR SEAMOUNTS
Mid - Pacific Mountains
Caroline Is
Marshall Is
Gilbert Is
ONTONG-JAVA RISE
Tasman Sea
MACQUARIE RISE
THE WESTERN PACIFIC

SUMMARY OF THE JAPAN SEA DRILLING PROGRAM

Introduction

The Japan Sea is one of the largest and best known back-arc basins of the Western Pacific region and is thought to have formed by multi-axial rifting of a former continental arc. The sea consists of several deep basins with established oceanic basement separated by ridges of continental crust. Intensive geophysical and marine geologic studies of the Japan Sea, together with information from petroleum exploration, onshore geologic studies, and previous deep sea drilling (DSDP Leg 31) form an unusually rich data base for evaluation of back-arc basin evolution. A series of six ODP drill sites is proposed herein to evaluate the timing and character of basin development including holes aimed at obtaining underlying basement rocks. The overall goals of this drilling program include the documentation of both the tectonic and paleooceanographic development of the Japan Sea in terms of the objectives outlined below.

Tectonic overview

Several models have been proposed to explain the spreading history of the Japan Sea. Some authors have argued for a double scissor-shaped opening accommodating clockwise rotation of Southwest Japan and counterclockwise rotation of Northeast Japan deduced from paleomagnetic data. Others have discussed development of this basin in terms of pull-apart basins or as a consequence of northward retreat of the Amurian plate during Cenozoic time, due to collision between India and Eurasia. In any event, better constraints on the age of rifting of the Japan Sea will help understand the kinematics of the entire region and the complex interrelationships between the Pacific and North American plates during Cenozoic time.

Age of Opening

The magnetic anomaly lineations in the Japan Sea are not easily identified. Moreover, oceanic basement was not reached in previous drilling DSDP Leg 31. Alternately, high and uniform values of heat flow in the sea suggest opening occurred prior to 20 m.y.B.P. Onshore data around the margins of the Japan Sea indicate that the main stage of opening probably took place during the late Oligocene-early Miocene (?). Rapid subsidence of basin margins apparently continued into the mid Miocene. Subsequent oceanic spreading led to a major plate boundary reorganization, inducing incipient composition within the Yamato Basin and potential obduction of young oceanic crust. Drilling into the Japan Sea will clearly help to document the age and nature of the Yamato Basin and its multiple rifting history and the obduction of oceanic crust along its eastern flank. Drilling in this same area will also provide insights into both the paleooceanography of the sea and details of the stratigraphy and petrology of a failed rift system.

Drilling Objectives

1. Nature and age of the basement of the basins (Sites J1b, J1d, J1e)
Recent refraction data with 20 OBS in the Yamato Basin revealed anomalously thick oceanic crust (twice the thickness of normal oceanic crust). A recent detailed geomagnetic survey of the Japan Basin mapped a complex pseudofault pattern suggesting frequent ridge propagation during spreading of the basin. Drilling to basement will clearly assist in dating this newly mapped set of magnetic anomaly lineations as well as providing hard evidence of the anomalous oceanic crust known in this area. On a large scale, basement penetration will also provide critical constraints on timing of regional reconstruction of East Asia. Finally, drilling at proposed sites J1b, J1d, and J1e will also allow evaluation of fast spreading of the Japan Sea suggested by paleomagnetic data from onshore site in Southwestern Japan.

2. Style of multiple rifting (Sites J2a, J1b, J1d, J1e)
Back-arc extension tectonics of the continental arc, associated with multiple rifting, complex pseudofault pattern, continental crustal extension, anomalously thick oceanic crustal structure, and contamination of MORB volcanism with arc volcanism, are comparatively studied with the Atlantic type extension tectonics.

3. Obduction of oceanic crust (Site J3a)
Cumulative evidence all indicates that the EURA-NOAM plate boundary shifted to the western margin of the Japan Sea during Quaternary time effectively transferring NE Japan to NOAM. Seismic reflection profiles in the eastern Yamato Basin illustrate that incipient obduction as well as subduction of oceanic crust is ongoing along this new plate boundary which shifted from the central Hokkaido suture line. Drilling at proposed Site J3a is aimed at constraining the timing of initiation of this convergence and yielding data regarding the origin of ophiolites and obduction of oceanic crust.

4. Paleooceanography (Site JS-2)
Stratigraphic columns to be sampled at all six proposed ODP drilling sites in the Japan Sea will yield important new faunal, isotopic, and lithologic data regarding the water mass and sediment history of the sea. Available onshore data and the results of previous DSDP Leg 31 drilling demonstrate that the sea experienced a basic three-fold evolution from anoxic, to suboxic, to fully oxic state accompanied by deposition of distinctive litho-facies including Miocene laminated diatomaceous muds and genetically related porcellanites as well as thick Plio-Pleistocene siliciclastic silts and sands. Results of ODP drilling shows allow effects of local tectonic control on basin sills to be separated from effects of global eustatic and climatic events. Similarly, quantitative faunal and floral analysis are expected to provide new insights regarding variations in rates of productivity, intensity of oxygen minima, and origin of deep, intermediate and surface water masses within the sea. In particular, proposed ODP Site JS-2, located on a local high above the basin CCD is aimed at yielding a detailed faunal and isotopic record of paleoclimatic-paleooceanogrphic events within the sea during the critical late Miocene period of intensified vertical circulation and lowered sea levels. Quantitative faunal analysis at all sites are expected to yield data on rates and mode of basin subsidence.

5. Metallogeny in a failed back-arc rift (Site J2a)

Ancient massive sulfide deposits now being mined on land have formed in failed rifts within continental margins, arcs and back-arcs. Different types of deposits form in this setting according to the nature of the materials that fill the rift, e.g. "Kuroko-type" deposits associated with rhyolites or "shale hosted" type associated with clastic sediments. The Kitayamato Trough is a heavily sedimented failed rift within the Yamato Bank, a fragment of continental crust formed by back-arc rifting during the Oligo-Miocene. This Trough represents an ideal setting for massive sulfide mineralization of either the Kuroko or shale-hosted type, depending on the amount of felsic volcanism attending the rifting. Drilling this site to the basement will furthen our understanding of ore genesis in back-arc environments and permit a comparison with similar environments now on land. A probable composition is with the Green Tuff Belt of Japan which is thought to be a failed rift. The Green Tuff Belt hosts a large number of Kuroko-type massive sulfide ores which are regarded world-wide to be the "type" massive sulfide deposits in felsic volcanic rocks.

Objectives of the down hole experiments

1. Vertical seismic profiling experiment at site J1b will present critical data for addressing the anomalously thick oceanic crust of the Yamato Basin.
2. In-situ measurements of the direction of the stress field with abundant earthquake mechanism solution in the Japan Sea will greatly improve the study of the stress field along developing new EURA-NOAM plate boundary.
3. Heat flow measurements in the bore hole will address the problem of the heat generation in the sedimentary column in the basin area that have been long controversial.

Shallow gas problem

A safety problem to be carefully considered before drilling of the Japan Sea is ethane gas production associated with Miocene diatomaceous muds. During previous DSDP Leg 31 drilling both sites 299 in the Yamato Baisn and Site 301 in the Japan Basin were abandoned before reaching basement due to ethane gas production (Karig and Ingle, 1975).

The gas charged layer is thought to have occurred in the lowermost horizons of Plio-Pleistocene turbidites immediately overlying organic-rich diatomaceous pelagic muds. This latter unit is a wide spread and easily identified layer throughout much of the sea and equivalent to the Onnagawa and Funakawa Formations of northern Honshu. The ethane gas is assumed to be generated within the largely Miocene diatomaceous sediments by high heat flow and ultimately trapped in alternating sand and clays of the basal Plio-Pleistocene turbidite facies. We have identified this latter horizon on seismic profiles as an acoustically stratified layer with reflective low frequency bands. Proposed ODP siteswere selected in areas where the presumed gas charged layer is absent. In this regard , it is particularly significant that drilling at DSDP Site 302 reached basement without encountering ethane gas although it penetrated the lower diatomaceous layer.

List of planned drilling sites and estimated drilling days of the Japan Sea

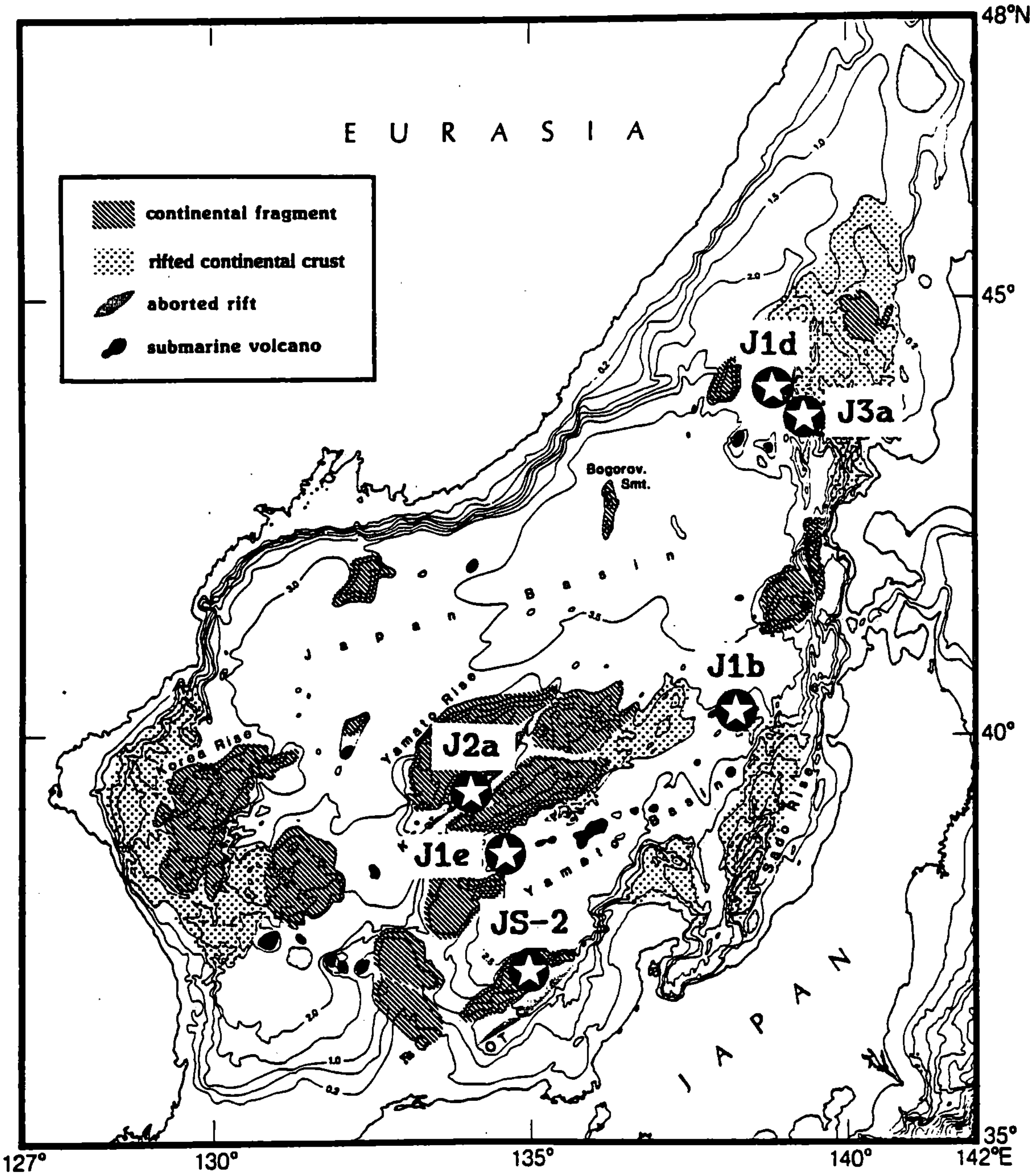
Japan Sea I (Basin Drilling/Tectonics)

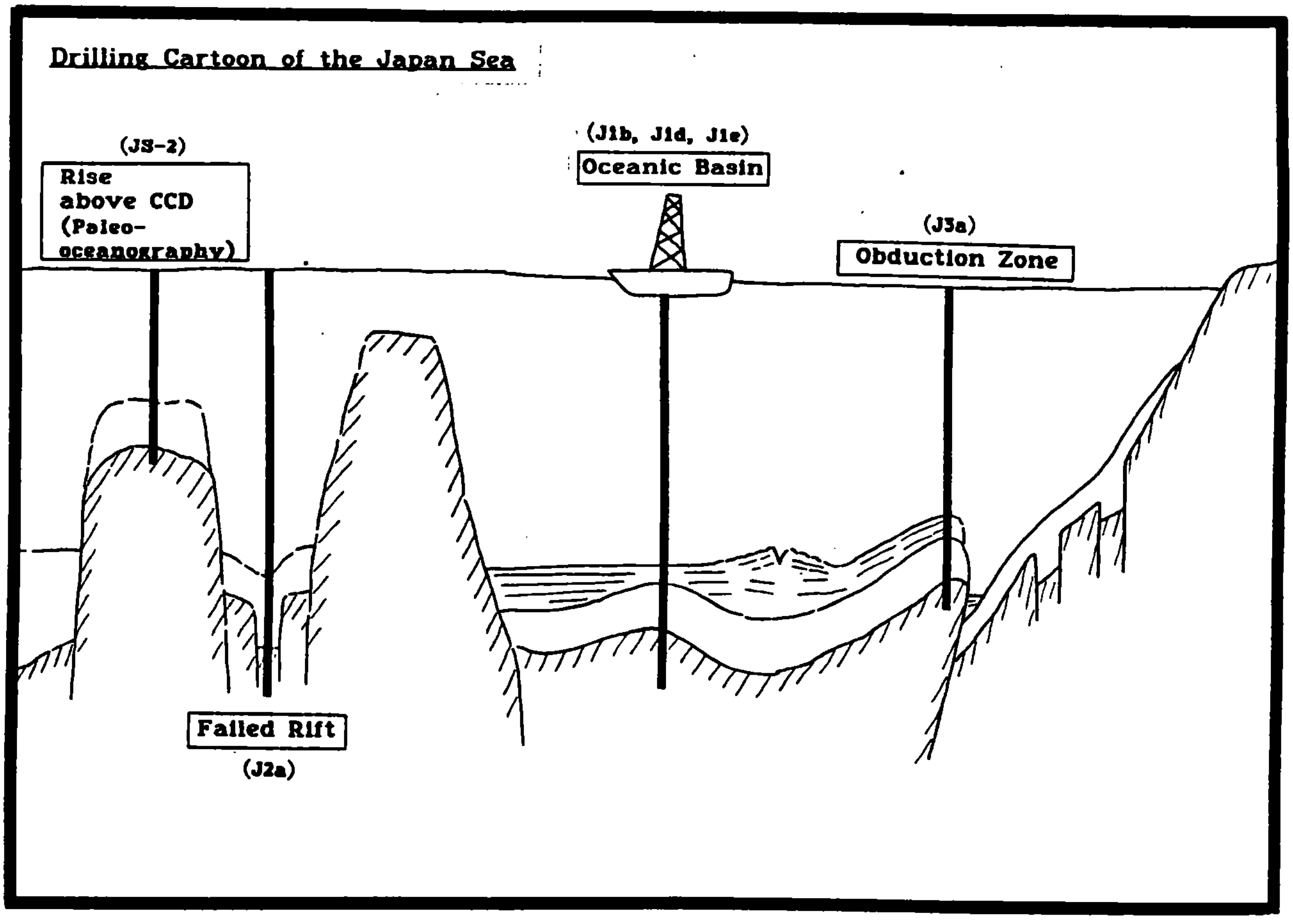
Site No.	Hole Type	Position Lat.	Lon.	W.D. (m)	Sed. Penet. (m)	Base Penet. (m)	Drill Time (days)	Log. Time (days)	Transit (days)
							(from Yokohama)		2.9
J1b	APC/XCB(Reentry)	40°14.5'N	138°15.1'E	2780	700	100	15.8	6.5(incl. VSP)	
									0.8
J1e	APC;RCB	38°37'N	134°33'E	2890	830	50	9.4	2.0	
									0.4
J3a	APC;RCB	43°50.7'N	139°09.0'E	2040	700	30	6.6	1.7	
									0.3
J1d	RCB	44°00.2'N	138°48.6'E	3170	350	30	4.7	1.5	
							(to Niigata)		1.4
						Total:	36.5	11.7	5.8
						Grand Total:		54.0 days	

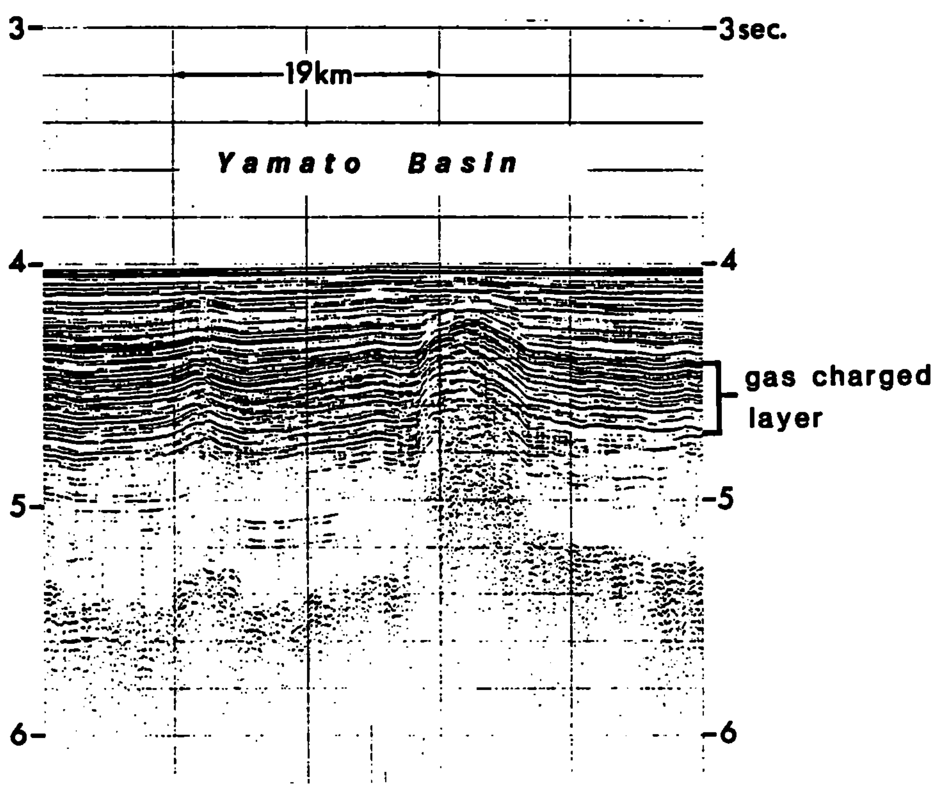
Japan Sea II (Rise Drilling/Paleoenvironment & Metallogeny)

Site No.	Hole Type	Position Lat.	Lon.	W.D. (m)	Sed. Penet. (m)	Base Penet. (m)	Drill Time (days)	Log. Time (days)	Transit (days)
							(from Niigata)		0.9
J2a	APC/XCB(Reentry)	39°14.4'N	133°50.9'E	2050	1370	20	17.7	2.0	
									0.6
JS-2	APC/XCB;APC	37°05'N	134°45'E	998	600	0	3.8	1.2	
							(to Yokohama)		3.8
						Total:	21.5	3.2	5.3
						Grand Total:		30.0 days	

Planned Drilling Sites in the Japan Sea

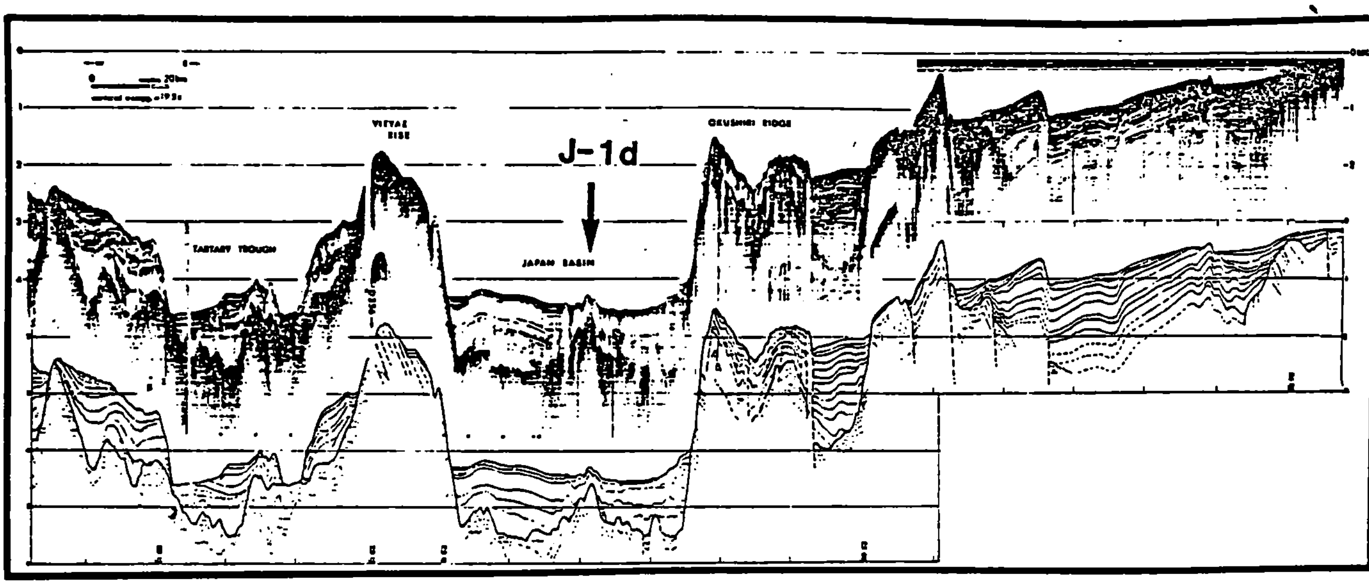


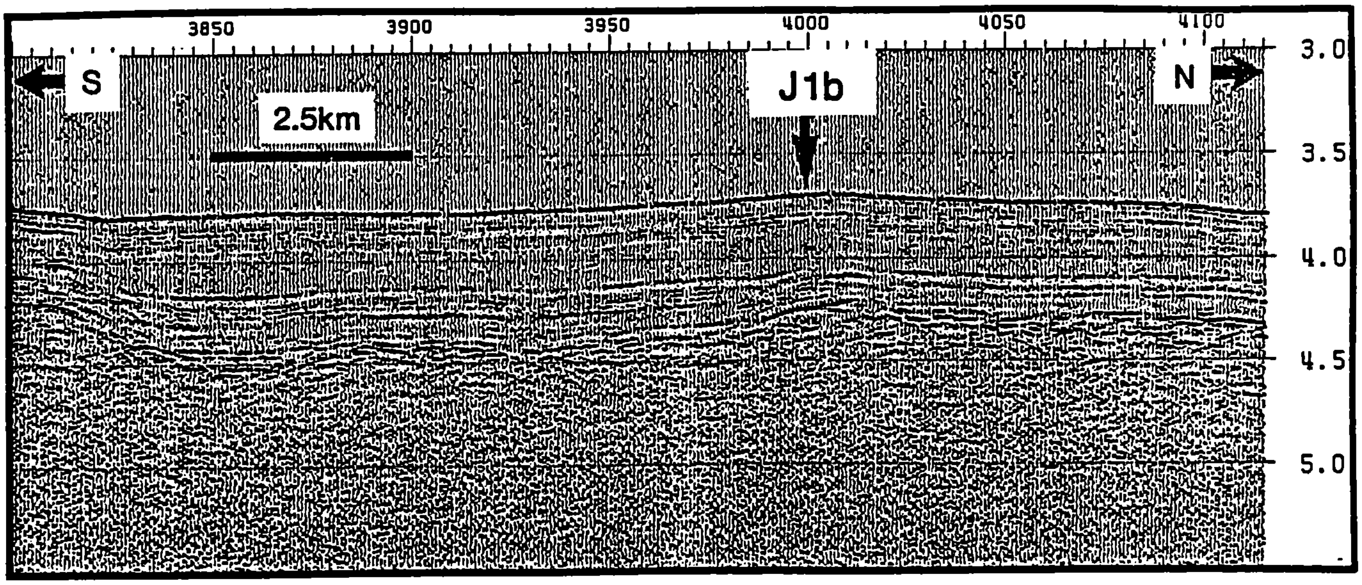


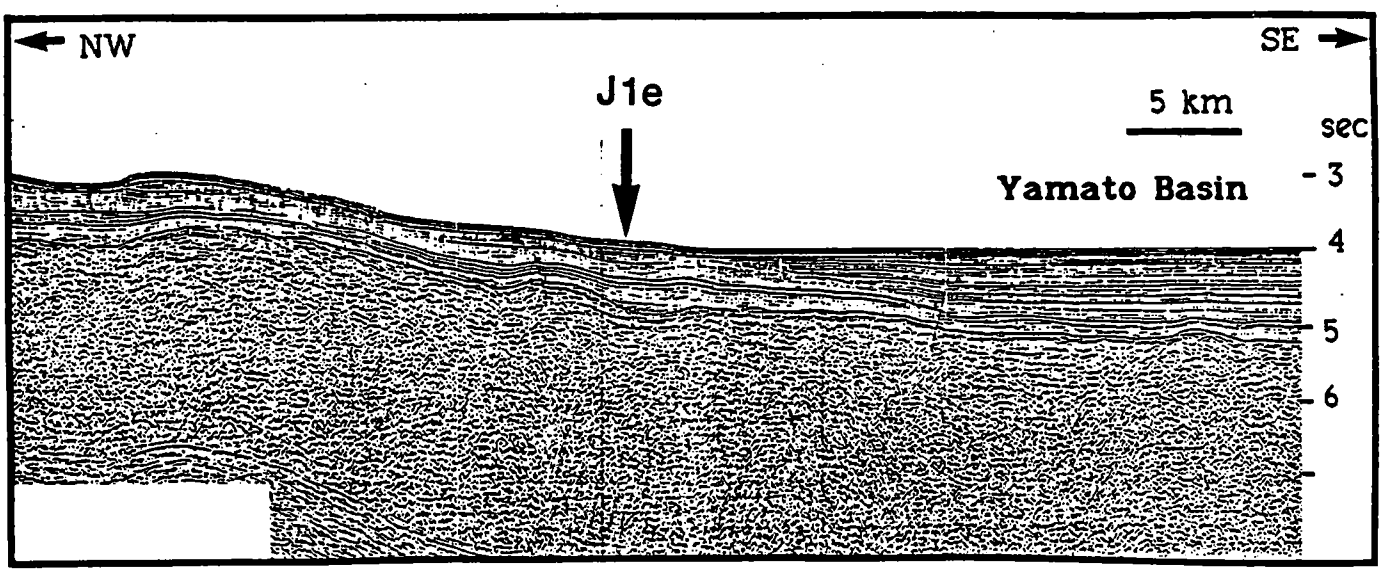


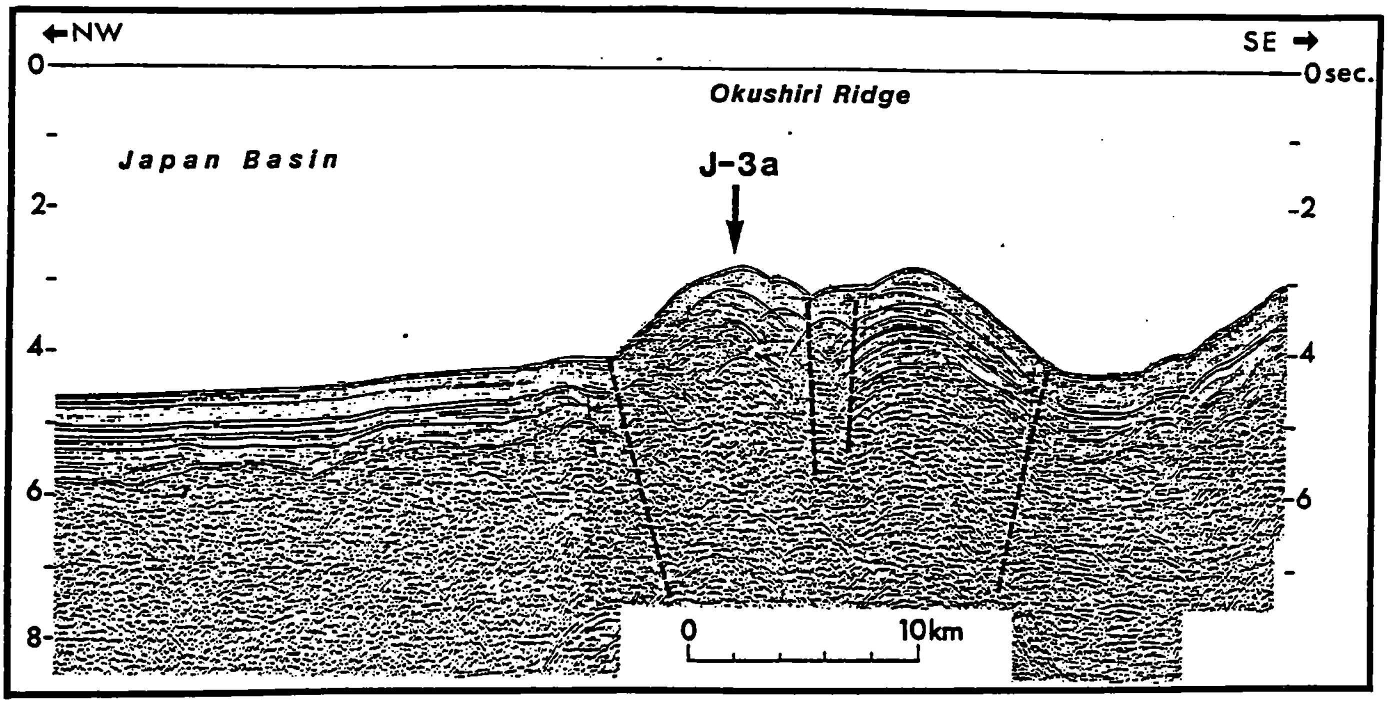
Gas charged horizon in the Yamato Basin. The horizon is characterized by bands of low frequency reflectors.

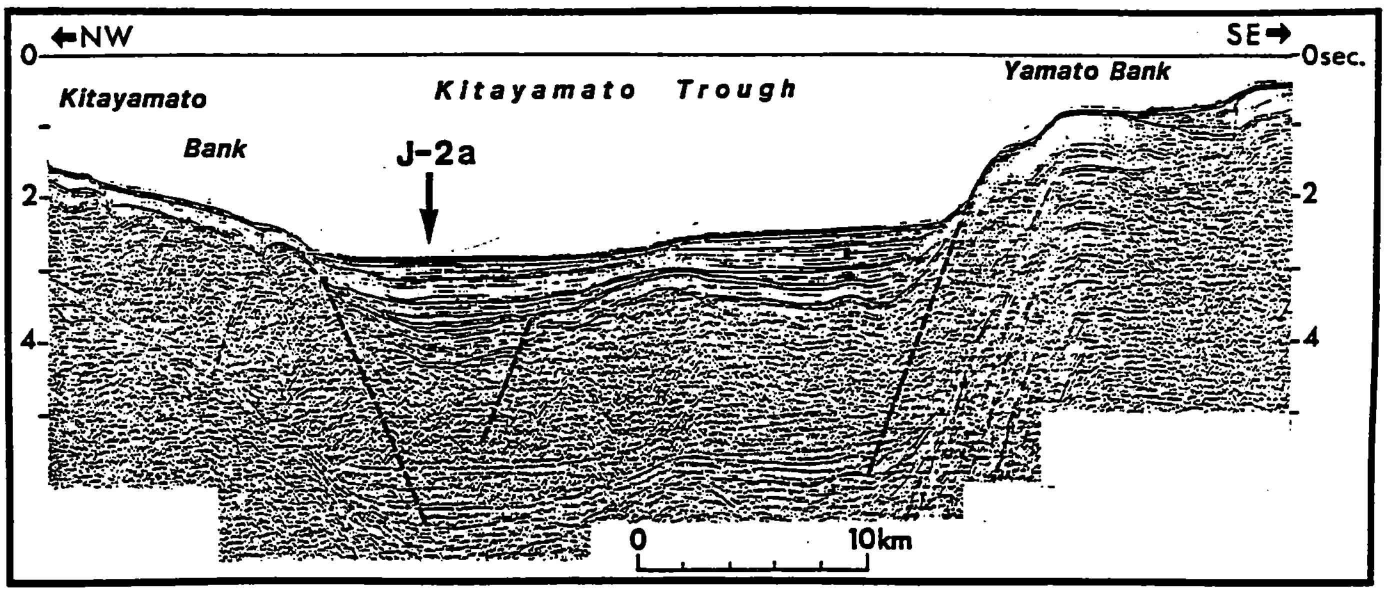
9

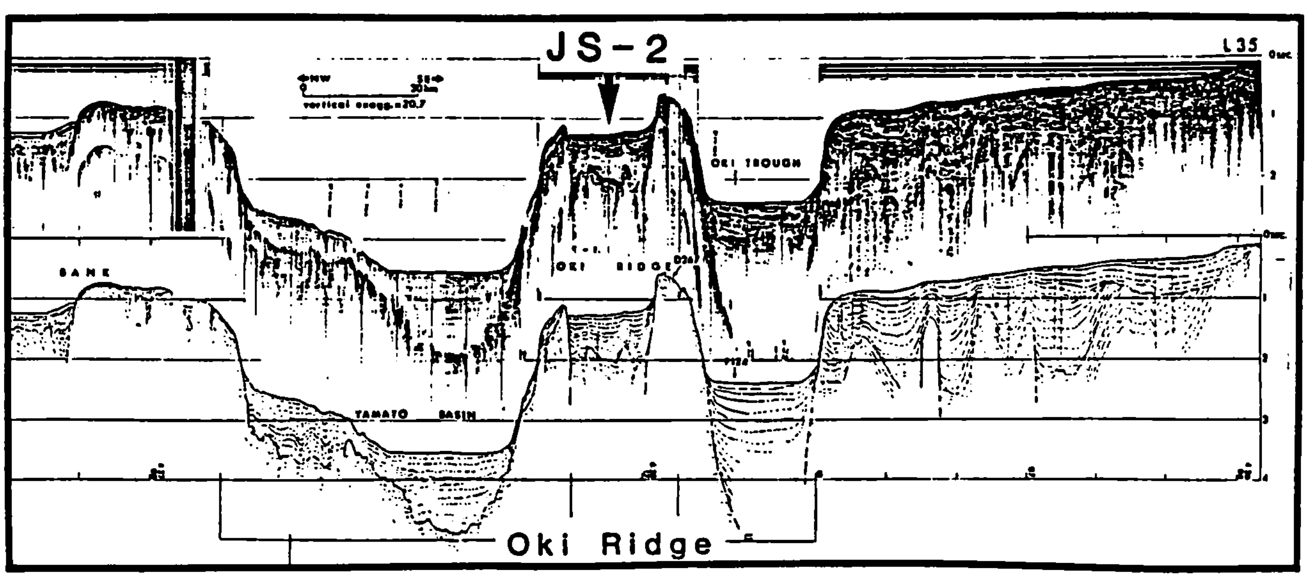

J-1d
JAPAN BASIN


3850
3900
3950
4000
4050
4100
S
N
J1b
2.5km
3.0
3.5
4.0
4.5
5.0


NW
SE
J1e
5 km
sec
Yamato Basin
3
4
5
6


←NW
SE →
0
0 sec.
Okushiri Ridge
Japan Basin
J-3a
2-
-2
4-
-4
6-
-6
8-
0
10km


←NW
SE→
0
0 sec.
Kitayamato
Bank
Kitayamato Trough
Yamato Bank
J-2a
2
-2
4
-4
0
10km


JS-2
L35
OKI TROUGH
OKI RIDGE
BANK
Oki Ridge

II

SUMMARY OF ZENISU RIDGE DRILLING PROGRAM
- Study of Intra-oceanic Plate Deformation due to Collision -

A remarkable example of intra-oceanic plate shortening related to the collision of an island arc is occuring to the eastern sideof the Nankai Trough. The objectives of this program is to study the timing and nature of this deformation and related hydrogeologic phenomena.

GEODYNAMIC SETTING.

The Zenisu Ridge is a WSW-ENE trending linear structure located seaward of the Nankai trough, at the western edge of the Izu-Bonin arc.

From the morphological point of view, this ridge is vanishing progressively to the west, where it diasppears within the Shikoku basin. To the east, this ridge connects progressively with the Izu-Bonin ridge.

The structure of the Zenisu is characterized by a NW dipping monocline and fault bounded on its southeastern flank, being itself bordered by a sediment filled trough, called the Zenisu Basin. The sediments covering the ridge correspond generally to transparent seismic sequences, suggesting a hemipelagic origin, and are very similar to the seismic sequences recognized to the west on the top of the oceanic crust of Shikoku Basin. Magnetic anomalies trending NW-SE were recognized across the ridge and gravity analysis suggests an oceanic origin for this western part of the ridge. This NW-SE direction is fairly consistent with the magnetic lineations related to the first stage of Shikoku basin opening.

The tectonic framework of this ridge is controlled by N 60E trending low dipping faults and associated folds which are concentrated along the steep SE ridge and into the Zenisu basin. Here, sediments (partly basin fill sediments and partly hemipelagic sequence) are folded and accreted by thrust faults to the base of the ridge together with a large offset of oceanic crust suggestive of deep-seated intra-oceanic plate deformation.

The Zenisu Ridge appears as an oceanic crustal slab, dipping to the NW, with accreting clastic sediments at its base, which accomodates part of the convergence motion between Japan and the Philippine Sea plate. It can be considered as a classical example of intra-oceanic accretion.

On-land geology to the north of Zenisu strongly suggests that this type of deformation occured in ancient time. Progradation of an accreted arc massif, fringed by trough-fill sequence is recognized, suggesting a progressive retreat of convergent boundary since middle Miocene.

DRILLING OBJECTIVES

The deformation at the Zenisu ridge has been thoroghly documented by MCS, SCS, Seabeam and manned submersible observations. Drilling in this area could provide important information about such intra-oceanic deformation processes, marked by intense dewatering of sediments, water diagenesis,

organic matter maturation where development of benthic communities was observed by diving (KAIKO Program).
The objectives for drilling include:

1. To test the age and rate of tilting along the nothwestern slope of Zenisu ridge, by dating the observed unconformity and sedimentary facies. Because the Zenisu basin is filled by volcani-clastic turbidites, uplift and tilting by compressin should produce a fining upward sequence from turbidite to hemipelagite cover. On-land geology suggests that the Izu collision which might have triggered this intra-oceanic deformation occured one million years ago. Thus it will be possible to obtain important information on how the collision of arc massif is related to the ocenic plate deformation, what is the rate of deformation and how fast this intra-oceanic thrust was emplaced?

2. To check the nature of the basement of western Zenisu ridge, supposed to represent the oldest part of Shikoku basin oceanic crust.

3. To study the deformed sediments present along the South-eastern slope of Zenisu ridge and their dewatering stage. One site is proposed in the place where benthic communities were encountered during Kaiko diving Project. A comparison of the chemistry of the fluid produced by intraplate deformation with that of accretionary prism (i.e. Nankai) should produce an important data base for the nature of fluids in an oceanic regime.

SITE SURVEYS

A multichannel seismic survey was conducted with the R.V. Hakuho Maru (A. Taira, chief scientist) during November 1986. On basis of this new data, new sites will be presented in the final proposals, but will not differ thematically as well as in penetration depth than the sites proposed here.

Figure 1. Sketch of plate boundaries and geotectonic framework of Japanese Islands. Note that the collision of Izu-Ogasawara(Bonin) arc produced a bend in structural trend of the Honshu arc and an intraplate deformation within the Philippine Sea Plate.

Figure 2. Geotectonic framework of Izu collision zone and location of Zenisu Ridge. (Zenisu Trough=Zenisu Basin=South Zenisu Trough).

Figure 3. Sea Beam map of the Zenisu Ridge and location of proposed sites.

Figure 4. Tectonic map of the Zenisu Rdige.

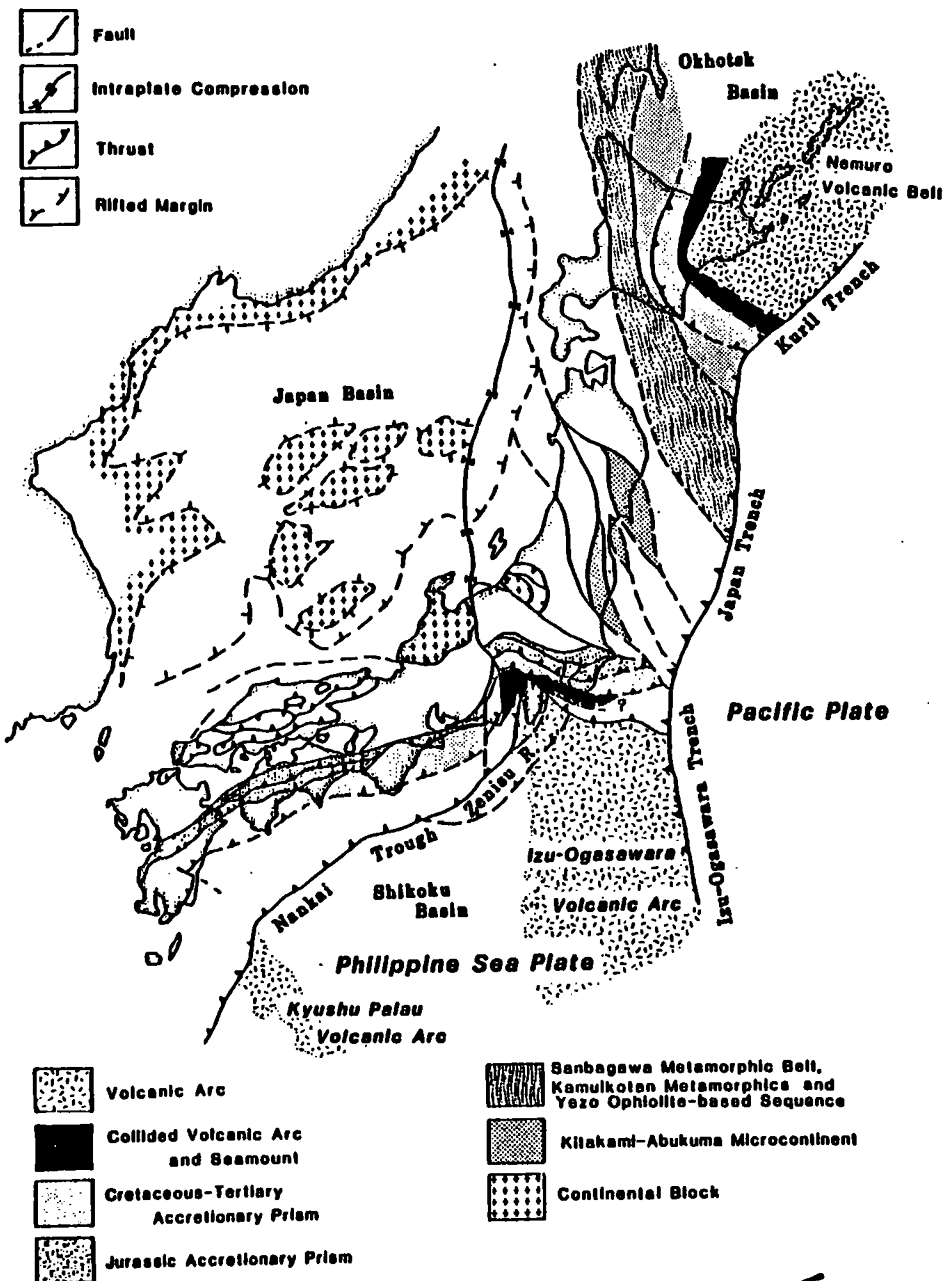
Figure 5. Tectonic interpretation of Zenisu Ridge.

Figure 6. On-board monitor of MCS line across A-A'(see Fig.3).

Site	Location	W.D. (m)	Penetration (m)	EDT* (day)	Expected Geology & Reason for drilling
ZE1	137 28'E 32 55'N	4250	450	4.5	Turbidites and hemipelagite. Nature and age of the Zenisu basin.
ZE3	137 26'E 33 00'N	4150	450	4.7	Indurated hemipelagic muds. In situ pore water sampling for inorganic and organic analysis.
ZE4	137 48'E 33 04'N	3150	450 (50m, basement)	4.9	Hemipelagite, turbidite (or tuffaceous layers and lavas: oceancic basement). Establish nature and age of the crust.
ZE5	137 44'E 33 25'N	4100	650	6.6	Turbidite and hemipelagite. Age and rate of bsement filling - document the change of sedimentation.

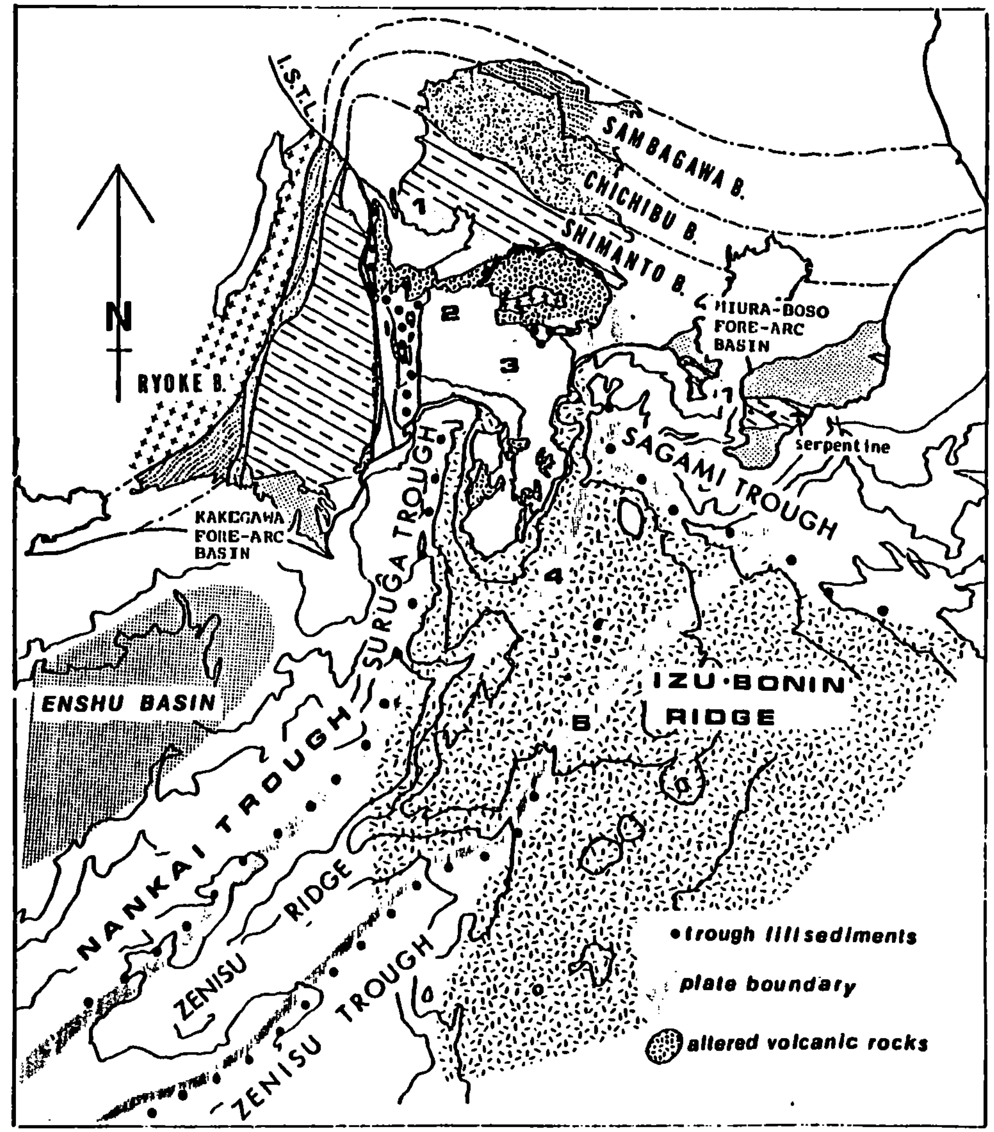
* without logging

Total Drilling Time:	20.7 days
Total logging:	6 days
Transits :	2 days
Grand Total :	28.7 days



Fault
Intraplate Compression
Thrust
Rifted Margin
Okhotsk Basin
Nemuro Volcanic Belt
Kuril Trench
Japan Basin
Japan Trench
Pacific Plate
Zenisu R.
Nankai Trough
Shikoku Basin
Izu-Ogasawara Volcanic Arc
Izu-Ogasawara Trench
Philippine Sea Plate
Kyushu Palau Volcanic Arc
Volcanic Arc
Collided Volcanic Arc and Seamount
Cretaceous-Tertiary Accretionary Prism
Jurassic Accretionary Prism
Sanbagawa Metamorphic Belt, Kamuikotan Metamorphics and Yezo Ophiolite-based Sequence
Kitakami-Abukuma Microcontinent
Continental Block

Fig. 1



N
I.S.T.L.
SAMBAGAWA B.
CHICHIBU B.
SHIMANTO B.
RYOKE B.
MIURA-BOSO FORE-ARC BASIN
serpentine
SAGAMI TROUGH
KAKEGAWA FORE-ARC BASIN
SURUGA TROUGH
ENSHU BASIN
IZU·BONIN RIDGE
NANKAI TROUGH
ZENISU RIDGE
ZENISU TROUGH
• trough fill sediments
plate boundary
altered volcanic rocks

Fig. 2

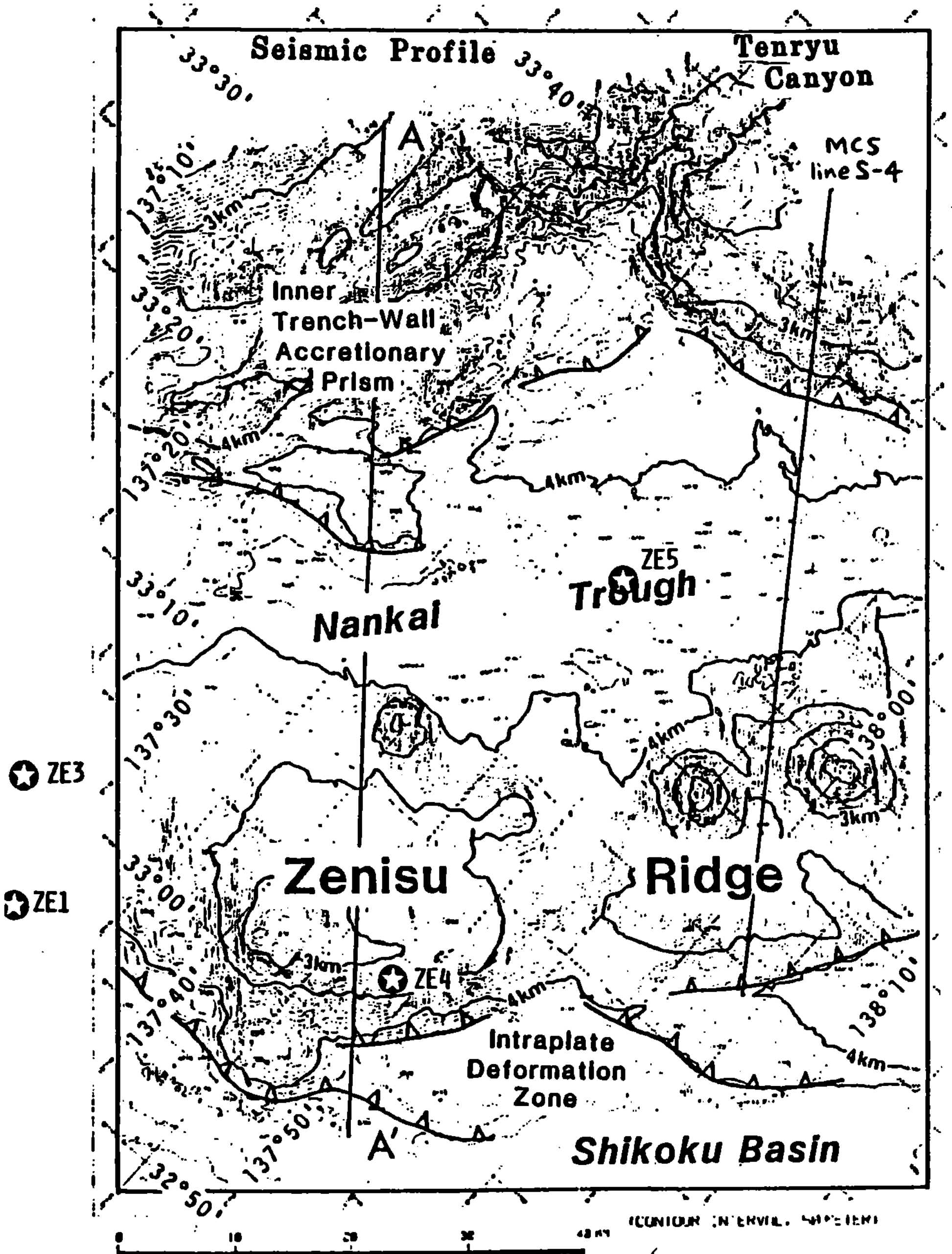


Fig. 3

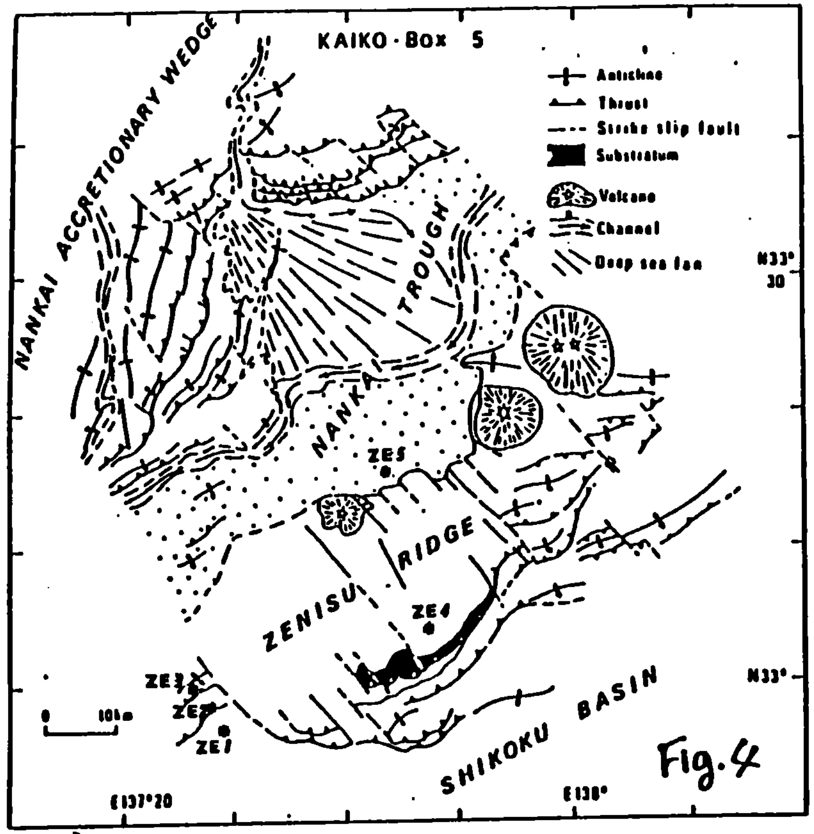


Fig. 4

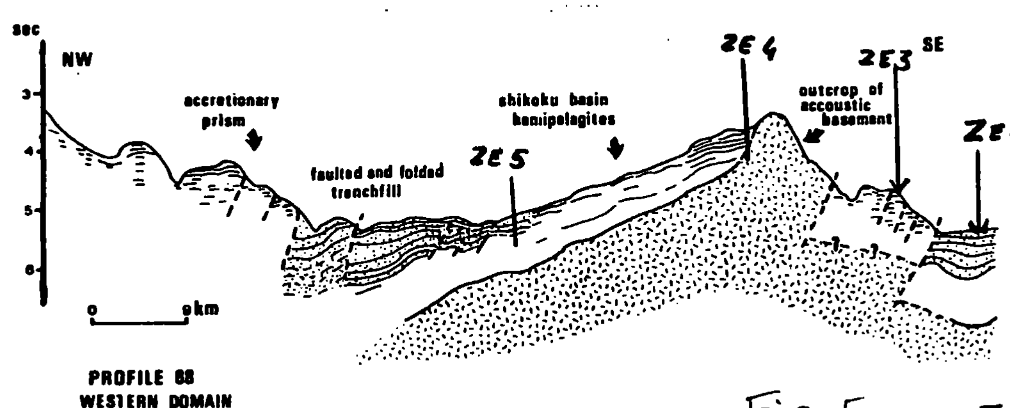
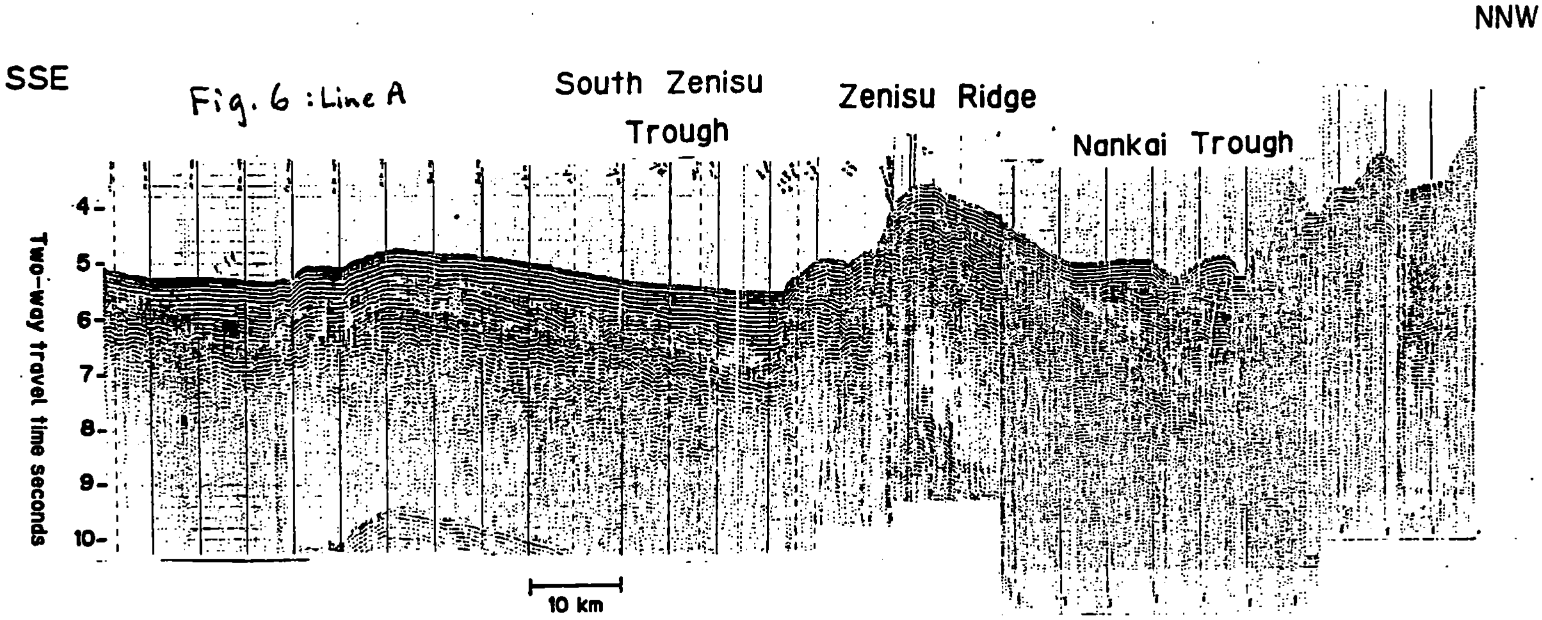


Fig. 5



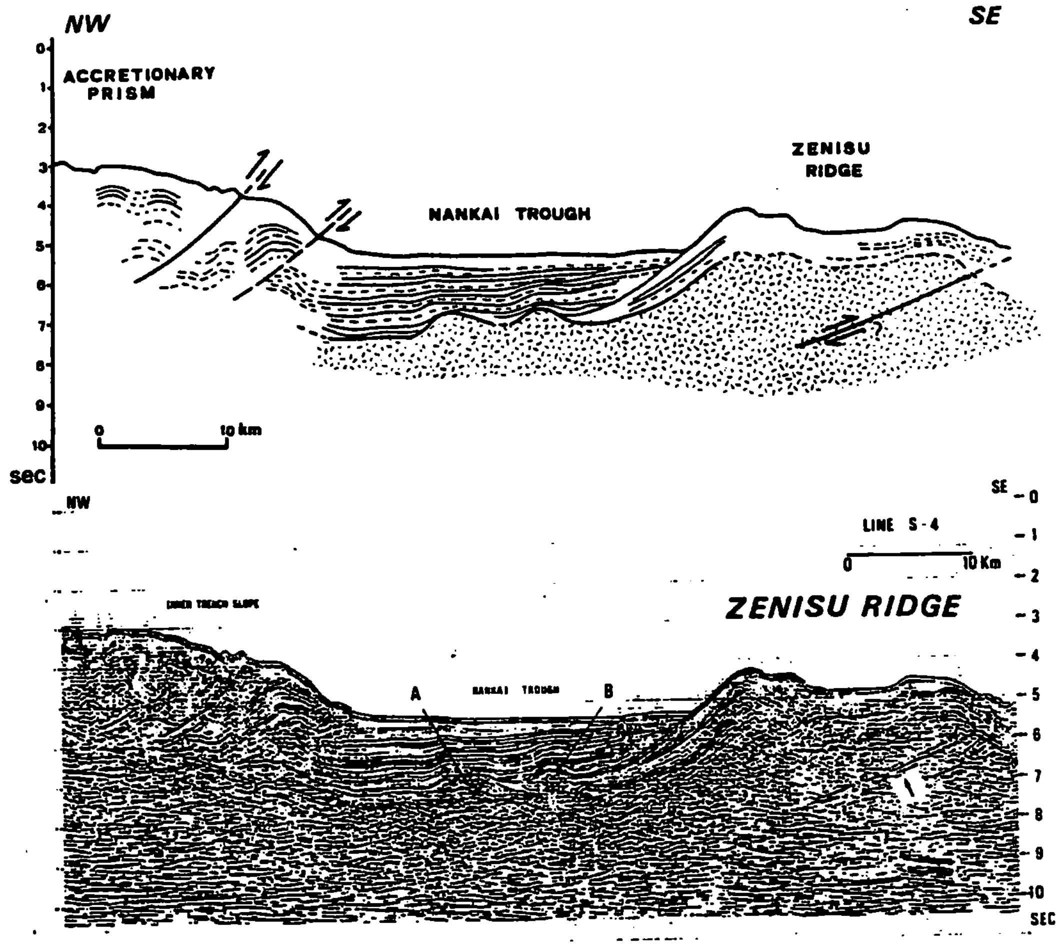


Fig. 7 : MCS line S-4 with interpretation

SUMMARY OF PROPOSED NANKAI TROUGH DRILLING AND GEOTECHNICAL PROGRAM

INTRODUCTION

Two types of drilling programs are proposed for the Nankai Trough to study processes within the toe of subduction zone sedimentary prisms.

a) Two holes. Sampling and measurement (approx 1 leg) of a hole through the major thrust decollement near the toe of the accretionary wedge, with an associated reference hole just seaward of the trench. Hydrogeology is emphasized.

b) Geotechnical hole (approx 1/2 leg). A single hole through the decollement dedicated to geotechnical measurements, in addition and adjacent to the above hole (or to a previous hole to the south). In-site measurement of physical properties and deformation processes are emphasized. Limited coring is proposed.

In addition, there have been general proposals for important long term downhole recording of earthquake related processes (perhaps 1/2 leg for emplacement if no new holes). Site specific proposals have not yet been received for the latter and they are not included below.

The objectives are not restricted to this location, but Nankai appears to be the most suitable of the West Pacific convergence zones. It represents the important class of thick clastic wedge convergence zones, and as such is complemetary to what has been done at the Barbados trench where pelagic mud is dominant . The Nankai area is also tectonically and structurally relatively simple and it is extremely well studied including some previous drilling, excellent multichanel data, documented vents showing fluid circulation, and detailed heat flow data. Previous drilling suggests reasonably stable hole conditions.

There are two sedimentary sequences on the incoming plate, an upper thick Pleistocene-Recent turbidite unit overlying a Plio-Oligocene hemipelagic unit. The decollement is developed in the upper part of the hemipelagic unit.

OBJECTIVES

The goal of the proposed Nankai Trough drilling and downhole measurement programs is to determine how deformation takes place in a subduction zone sedimentary prism, and the fluids and physical properties that control the defomation process. This includes determining why at some zones there is primarly accretion while there is erosion at others, why forearc uplift or subsidence occurs, and the nature of earthquake processes. Geomechanical models require a knowledge of the sediment deformation behaviour as it is chemically and physically consolidated and indurated with time, depth and position, and whether deformation takes place plastically, or through brittle fractures, Brittle deformation may be regionally distributed or on a few major faults. Dewatering and fluid flow must play a major role in the consolidation and deformation processes.

SOME PRIMARY MEASUREMENTS

1. Porosity - directly related to strength and to consolidation history, and closely related to other physical properties such as permeability, seismic velocity, density, thermal properties, electrical resistivity etc. Estimates of both intergranular and fracture porosity are needed. Porosity is to be measured both in-situ through a variety of downhole logs (intergranular and fracture) and in the laboratory on core samples (generally only intergranular).

2. Permeability - pore and fracture fluids play a critical role in accretionary wedge processes, and their movement is controlled by the permeability. Both intergranular and fracture permeabitily must be estimated. Permeability is a critical parameter to be measured downhole with newly developed and refined tools. Intergranular permeability is also to be measured in the laboratory.

3. Mechanical Properties and State - provide constraints on the geometry of deformation and on its nature ie. effective stress state and mechanical modulii properties (shear strength, cohesion and coefficient of friction). Some stress data is to be obtained inhole from borehole televiewer and "breakouts" (hole ellipticity), and pore pressure measurements with packer and "probe hole" instrument (see below) and some from laboratory measurements including fracture orientation and the anisotropic strain relaxation technique. Core orientation is important. Mechanical properties are to be obtained in-situ (see below) and by laboratory measurements (whole core proposed from geotechnical hole see below).

4. Seismic Velocity - (including anisotropy)- is related to many physical properties and processes. Velocity is the best method by which properties at depths beyond the reach of the drill may be estimated. Velocities are to be measured by downhole logs, and in the laboratory (allows determination of temperature and pressure dependence.) A variety of seismic experiments may also be carried out with recording in the hole and shooting at the surface (ie. "vertical seismic profile" proposed for this hole) that give information in the region surrouding and below the depth of the hole.

5. Temperature and Thermal Properties - temperature is a critical parameter for physical and chemical alteration processes within the sedimentary prism, for deliniating fluid motion, and for deformation models. Heat flow measurements provide the primary constraint on models for deep temperature. Data is to be obtained through the APC (VonHerzen) temperature tool, the downhole sediment probe, and through continuous temperature logging (corrected for drilling disturbance). Thermal conductivity is to be measured on cores in the

laboratory.

6. <u>Fluid Geochemistry</u> - provides valuable clues as to the nature of fluid flow in the accretionary prism including the flow paths amd depths of origin. Fluid geochemistry also provides information on alteration processes. Fluid samples are to be obtained by the downhole probe (Barnes tool), by packer sampling and by laboratory sampling from cores.

PROPOSED PROGRAM

a) A primary program of a single hole through the decollement to basement NKT-2, along with reference hole NKT-1. The area of 583 is an alternate.

This program involves complete core sampling and a basic suite of downhole logs and measurements. Specific problems to be addressed are the hydrology and fluid chemistry of the prism toe and decollement ; structural development of imbricate thrusts and diffuse deformation zones penetrated ; state of sediments beneath the decollement . A succesful program will require close integration of core analysis including laboratory measurements, downhole physical properties and state measurements (including regular logging), and of subduction zone sediment wedge deformation and hydrogeology models.

b) An additional dedicated hole is proposed at site 583 or NKT-2 focused on in-situ downhole geotechnical measurements, a unique new concept for ODP holes. Both sites have advantages, but present analysis argues for NKT-2 because of its shallower depth to the decollement (approx.1000 vs 1600m) (the times below are for the former). Primarily non-core drilling with some cores (approx.every 30m) for whloe round laboratory geotechnical measurements is proposed. The previous adjacent hole will have been continuously cored. The primary objective is to obtain mechanical (geotechnical) properties downhole under in-situ conditions, supplemented by pore pressure, and temperature and in-situ stress measurements and pore fluid sampling.

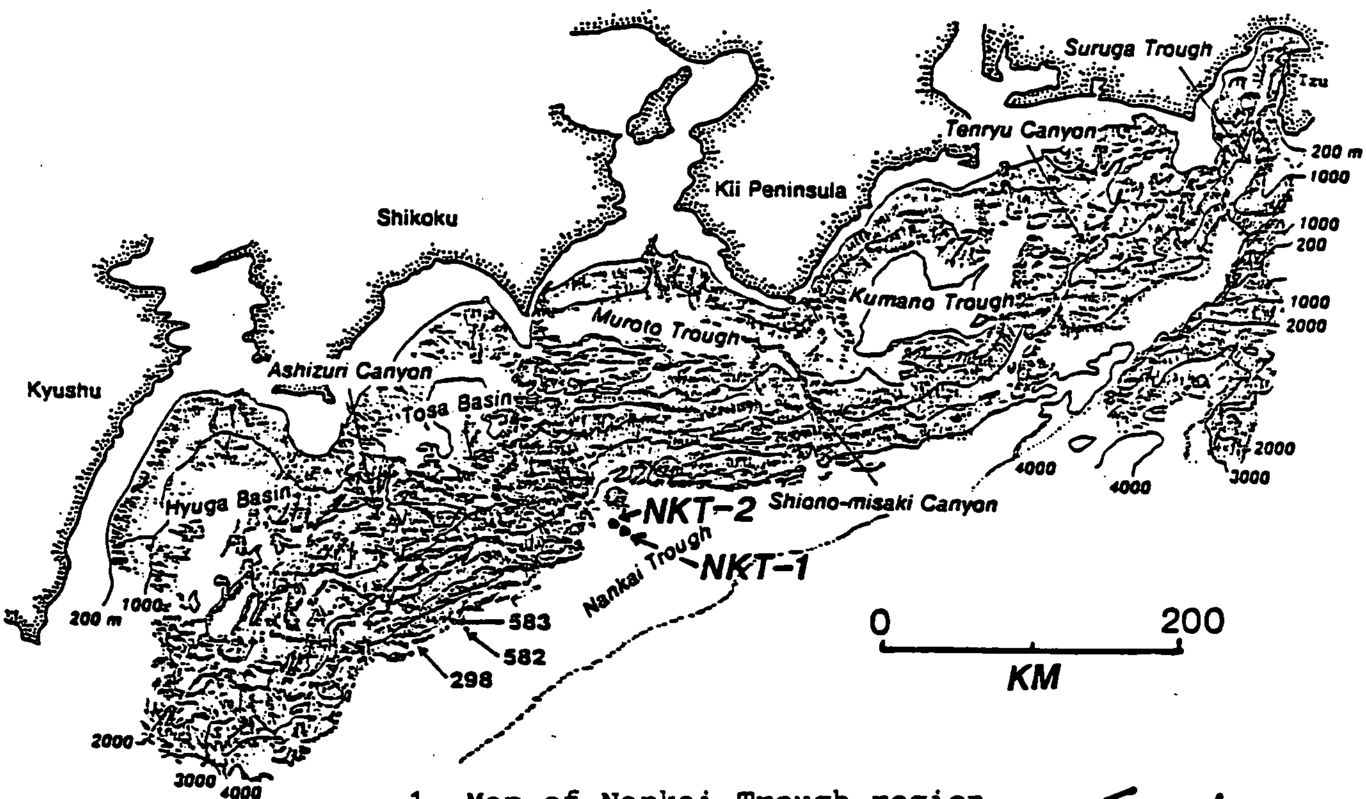
SPECIAL TOOLS AND MEASUREMENTS

The basic two hole program ("a" above) requires a very comprehensive suite of downhole logs, including televiewers, packers, pore fluid samples, temperature probes, multichannel seismic tool etc. a 4-arm caliper is desirable.

The additional special geotechnical hole ("b"above) has a primary development requirement of a small diameter hole ("probe hole") to be drilled ahead of the main bit by a Navidrill type system as is now being developed. It must be possible to keep this hole free from cuttings to allow instrument insertion. Probe hole measurements would include mechanical properties, pore fluid and temperature.

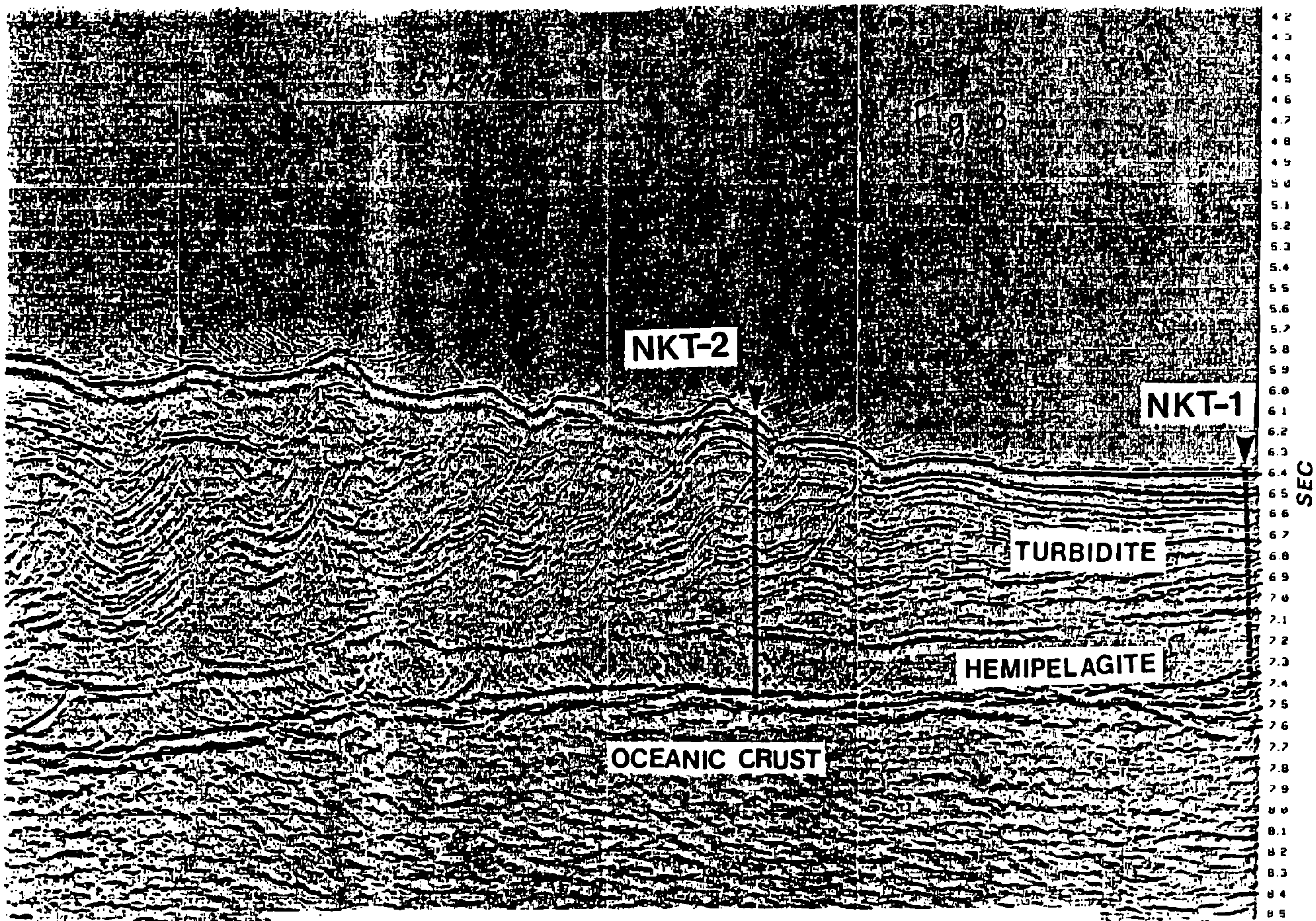
Summary of Proposed Sites

	Program A		Program B(Geotech)
Site No.	NKT-1	NKT-2	NKT-2 or New 583
Hole Type	APC(to 200m) RCB(to 900m)	APC/XCB(to 1000m) Rentry(to 1300m)	APC/XCB(to 1000m) Rentry(to 1300m)
Latitude& Longitude	32°58' 134°58'	32°23' 134°56'	31°50' 133°51'
Water Depth	4803m	4730m	4630m
Sediment Penetration	900m	1300m	1300m
Basement Penetration	0m	0m	0m
Drilling Time	12 days	22 days	16 days (spot drilling)
Logging Time	5 days	10 days	10 days
Special Experiment	2 days	3 days	6
Transit Time	1.5 days (Tokyo to Site)	1.5 days (Tokyo to Site)	1.5 days (Tokyo to Site)
Total Days	20.5 days	36.5 days	33.5 days



1. Map of Nankai Trough region

Fig. 1



3. Multichannel section across NKT-1 and NKT-2.

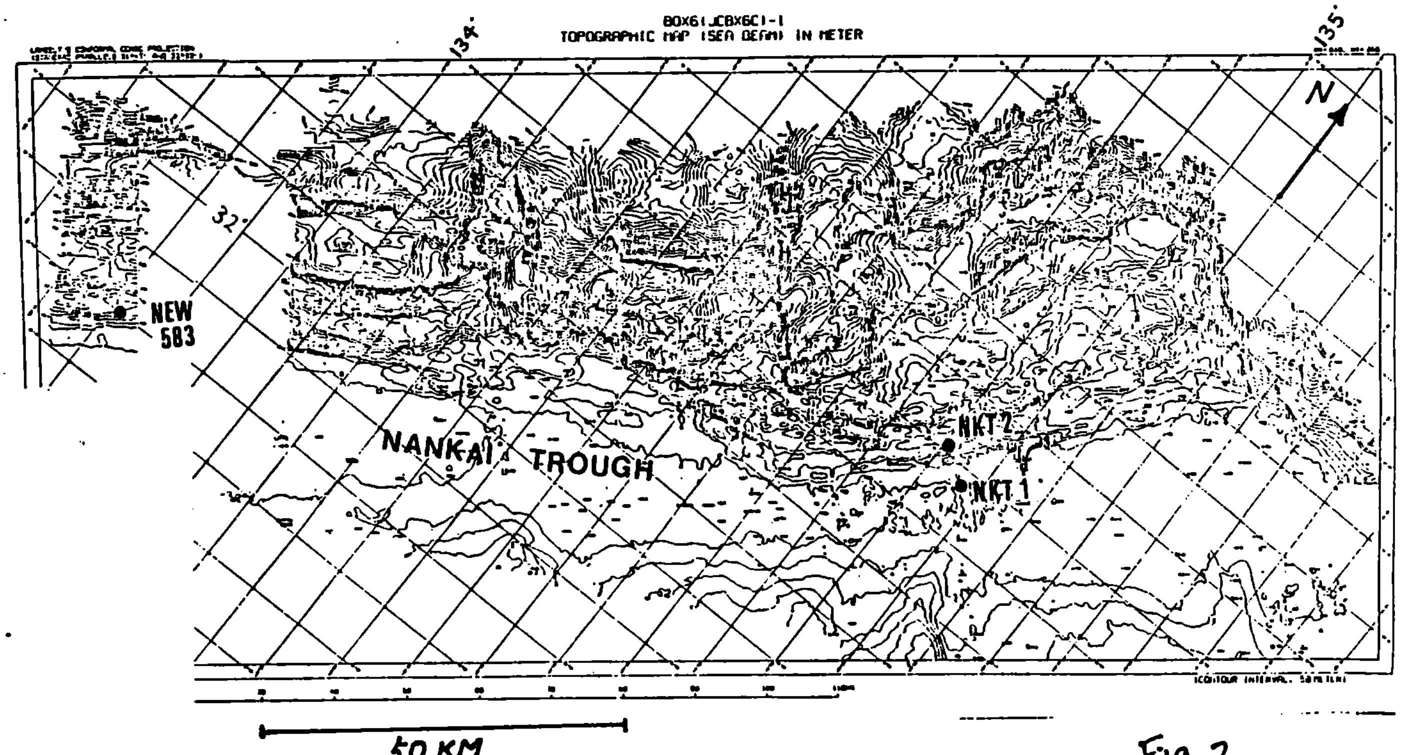
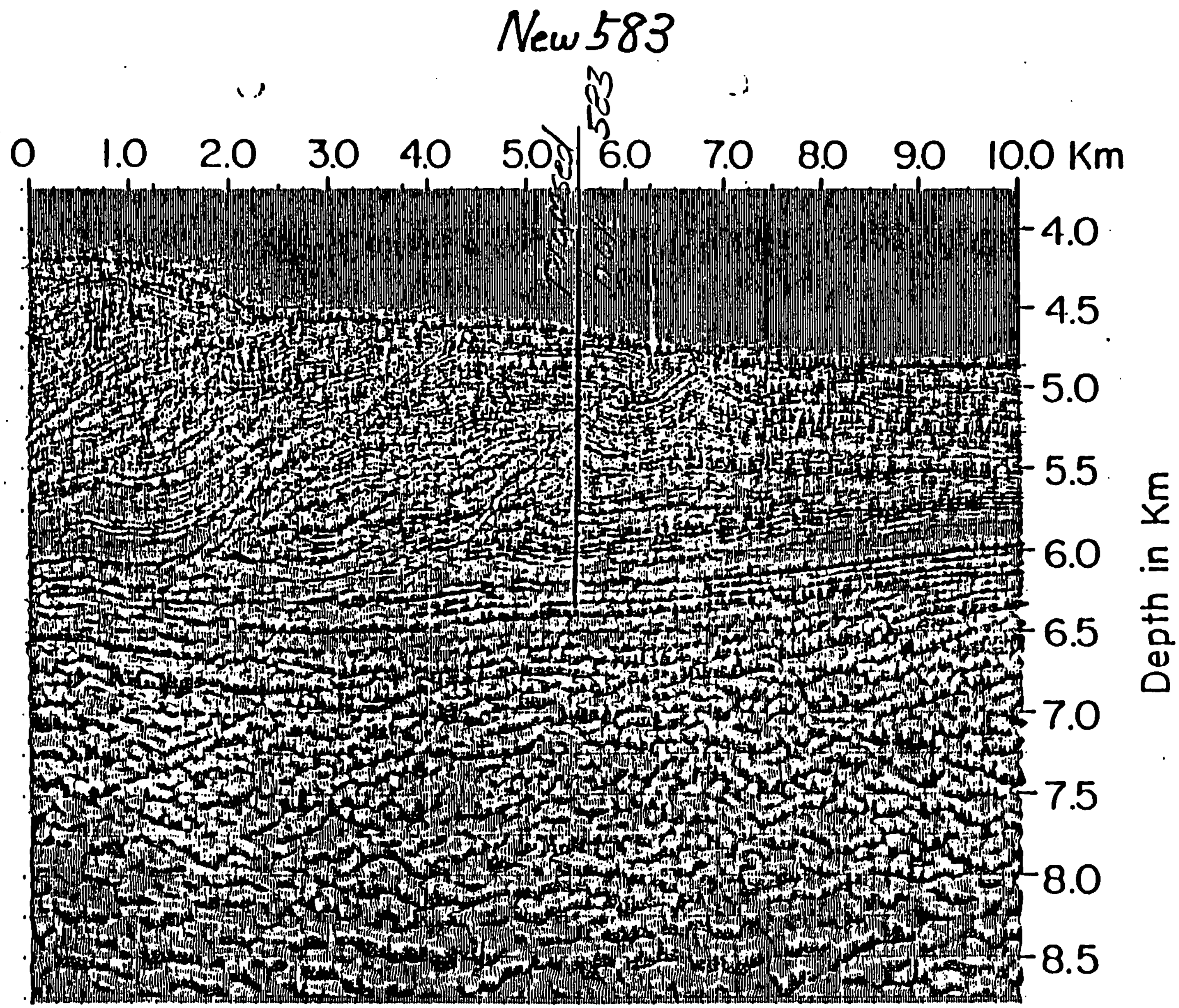


Fig. 2

2. Sea-Beam map of Nankai Trough covering NKT-1, NKT-2, and 583 regions.



4. Multichannel section across site 583.

Fig. 4

SUMMARY OF THE BONIN DRILLING PROGRAM

Addressing Processes of Intra-Oceanic Arc-Trench Development:
1) Arc Rifting: Nascent Backarc Basins
2) Arc/Forearc Magmatism, Structure, Stratigraphy and Vertical Tectonics
3) Outer Forearc Serpentinite Diapirism

TECTONIC SETTING

Subduction of Pacific lithosphere beneath the West Philippine Basin began in the Early Eocene, and through the Early Oligocene formed an intra-oceanic volcanic arc and a 200-km-wide forearc of arc volcanic material (tholeiites and boninites), possibly superimposed on previous oceanic crust. Mid-Oligocene rifting split the arc and late Oligocene-Early Miocene back-arc spreading in the Parece Vela and Shikoku Basins isolated the remnant arc (Palau-Kyushu Ridge) from the active Bonin-Mariana arc and forearc. The rifting and initial spreading was time transgressive, starting in the center of the Parece Vela Basin and at the northern end of the Shikoku Basin, resulting in the bowed and V'd shape of those basins, respectively. This process is being repeated. The southern part of the arc split again in the Late Miocene, and 6 to 8 my of seafloor spreading in the Mariana Trough has isolated the active Mariana arc from, and increased its curvature with respect to, the remnant West Mariana Ridge. Spreading in the Mariana Trough may be propogating to the north. In contrast, the Izu-Bonin arc is still in the rifting stage of backarc basin formation and is undergoing extension along most of its length. The major zone of rifting is immediately west of the active volcanic chain, but some arc volcanoes near 29°N are surrounded by grabens. Volcanism is continuing along both the active and "remnant" arcs. Volcanic centers have also developed in the rift basins. Their chemistry indicates a basalt-andesite-rhyodacite association, with the basalts having similar major and trace-element compositions to Mariana Trough tholeiites. The backarc rifts are semi-continuous along strike, being segmented by structural highs and chains of submarine volcanoes extending westwards from the island volcanoes.

The difference in arc/back-arc evolution between the Mariana and Bonin systems has produced corresponding differences in their forearcs. The Bonin forearc has experienced little structural disruption since its inception. A broad forearc basin has accumulated volcaniclastic and hemipelagic sediments behind an outer-arc high. The onlap of strata onto this high, together with Eocene shallow-water fossils found on the Bonin islands, indicates that it has been a relative structural high since early in the history of the arc. A mature, dendritic, submarine canyon system has developed by mass wasting and headward erosion, incising many deep canyons across the forearc, cutting as much as 1 km into the 1.5 to 4 km thick sedimentary section. In contrast, the Mariana forearc has not behaved as a rigid plate, but has undergone extension tangential to its curvature. This has produced radial fractures and, together with the disruption caused by numerous seamounts on the subducting plate, easy pathways for diapiric intrusions of serpentinised mafic/ultramafics of arc affinity. Eruption of these diapirs onto the seafloor, together with uplift of forearc material due to their subsurface intrusion, has formed a broad zone of forearc seamounts (up to 2500 m high and 30 km in diameter) 50 to 120 km from the trench axis. In the Bonins chloritised/serpentinised mafic/ultramafics occur along a narrow zone which controls the location of a lower-slope terrace. This zone appears to be the oceanic forearc analog of overpressured dewatering zones in accretionary sedimentary wedges. Possibly because most of the sediment has slumped off the trench inner wall, the large forearc canyons die out on the middle slope and do not cut across the lower-slope terrace. Only very minor, and probably ephemeral, accretionary complexes occur at the base of the inner wall of both the Bonin and Mariana trenches.

SITE RATIONALE

Investigating the processes of intra-oceanic arc-trench development in the same region has obvious logistic and scientific benefits. Several factors combine to make the Bonins the best of all the western Pacific locations in which to address these processes. They include (1) the present density of marine geological and geophysical information, (2) the plans for additional multidisciplinary surveys, (3) certain unique geological factors such as the presence of large submarine canyons and the Bonin Islands (a subaerial outer-arc high), and (4) the inherent simplicity of the system (continuous subduction since the Eocene without major collisions or arc reversal). However, the largest and best studied serpentinite diapirs occur in the Mariana forearc, and two sites in this two-leg drilling program are proposed there.

BONIN SITES 1 and 2 are located in the graben and on the bounding horst, respectively, of the active Sumisu rift, and seek to determine the:
1) differential uplift/subsidence history of the central graben and bounding tilted arc block, and whether this is compatible with stretching or detachment models of extensional tectonics.
2) duration of rifting.
3) nature of syn-rift volcanism and sedimentation, whether arc volcanism is continuous or interrupted by rifting, and when the extrusion of back-arc type basalts began.
4) extent and chemistry of hydrothermal circulation in a tectonic and petrologic setting similar to that of Kuroko-type massive sulphide deposits.
5) nature of the rift basement.
6) nature of the arc basement between (and isolated from the pyroclastic deposits of) major arc volcanoes. [Consider the limitation to our knowledge of continental arcs if we were restricted to exposures in the top 1000 m of only the largest stratovolcanoes.]

BONIN SITES 3-6 are located in the forearc near 32°N; BON3 on the frontal arc high, BON4 on the inner and BON5 at the center of the upper-slope basin, and BON6 on the outer-arc high. These sites were chosen to determine the:
1) uplift/subsidence history across the forearc (using backstripping techniques on cored/logged holes and seismic stratigraphic analysis of interconnecting MCS profiles) to provide information on forearc flexure and basin development, as well as the extent of tectonic erosion. We do not know whether the frontal arc and outer-arc high develop by igneous construction or differential uplift, whether the upper-slope basin between them is due to forearc spreading or differential subsidence, or whether flexural loading by either arc volcanoes or by coupling with the subducting plate is an important process. For example, the seismic stratigraphy laps onto and reverses dip over the frontal arc high. Is this due to an original Eocene volcanic high. to mid-Oligocene rifting of the arc, or to Plio/Pleistocene volcanic loads on the fractured (by rifting) edge of the forearc?

2) forearc stratigraphy, to ascertain (a) the sedimentology, depositional environment and paleoceanography, and (b) the variations in intensity and chemistry (boninitic, tholeiitic, calc-alkaline, rhyo-dacitic, alkaline) of arc volcanism over time, and the correlation of these variations with periods of arc rifting, backarc spreading and varying subduction rate.
3) nature of igneous basement forming the frontal arc, outer-arc high and beneath the intervening forearc basin (which has never been sampled) to answer questions concerning the initial stages of arc volcanism and the formation of a 200 km wide arc-type forearc massif (were the frontal arc and outer-arc high formerly contiguous and subsequently separated by forearc spreading, were they built separately but near synchronously on former West Philippine Basin oceanic crust, or are they part of a continuous Eocene arc volcanic province, possibly with overprints of later forearc volcanism?).
4) micro-structural deformation as well as the large scale rotation/translation of the forearc. Paleomagnetic studies of the Bonin Islands suggest 90° clockwise rotation and 20°N translation since the Eocene, which has major implications for reconstructions of the Philippine and surrounding plates.

BONIN SITE 7 & MARIANA SITES 2 & 3 are located on forearc seamounts; BON7 on the flank of a dome along the Bonin lower trench-slope terrace, MAR2 on the flank of Pacman seamount near the Mariana trench slope break (a large diapir which has breached the surface and erupted serpentinite flows), and MAR3 on a nearby conical seamount interpreted to represent an updomed forearc sequence resulting from subsurface emplacement of a diapir.

Forearc diapirs were first recognized AFTER the last round of western Pacific drilling. The proposed drill sites, in three different structural settings, seek to determine the
1) timing of emplacement: ongoing, dormant, Oligocene? -- from the stratigraphy of the flows and intercalated sediments on the flanks of the seamounts, and from the history of tectonic uplift above the subsurface intrusion.
2) emplacement mechanism: diapirs of serpentinite with entrained wall rock in the Marianas vs. completely remobilized outer forearc in the Bonins?; and the internal structures (fracture patterns, flow structures) of the seamounts.
3) extent of fluid circulation through the outer forearc and the chemistry of the fluids (from the subducting plate, overlying lithosphere, circulating seawater?).
4) conditions at depth in the outer forearc from the igneous and metamorphic petrology of the lower crustal rocks.

Forearc diapirism may provide a model for emplacing some alpine-type ultramafic bodies common in accreted terranes pre- rather than syn/post-collision.

BONIN SITE 8 is located on the outer trench flexural bulge of the Pacific Plate near magnetic anomaly M15. Drilling objectives include:
1) a reference site for geochemical mass balance calculations: to what extent does subducted material influence the chemistry of arc and rift volcanism?
2) to determine changes in the Tertiary bottom currents, whether these caused the regional hiatuses in NW Pacific sedimentation and, by comparison with the Bonin arc/forearc sites, to what extent the Bonin-Mariana arc served as a barrier to divide the bottom currents.
3) to determine the earliest Cretaceous stratigraphy and crustal petrology (i.e., to penetrate the late Cretaceous cherts for the first time).

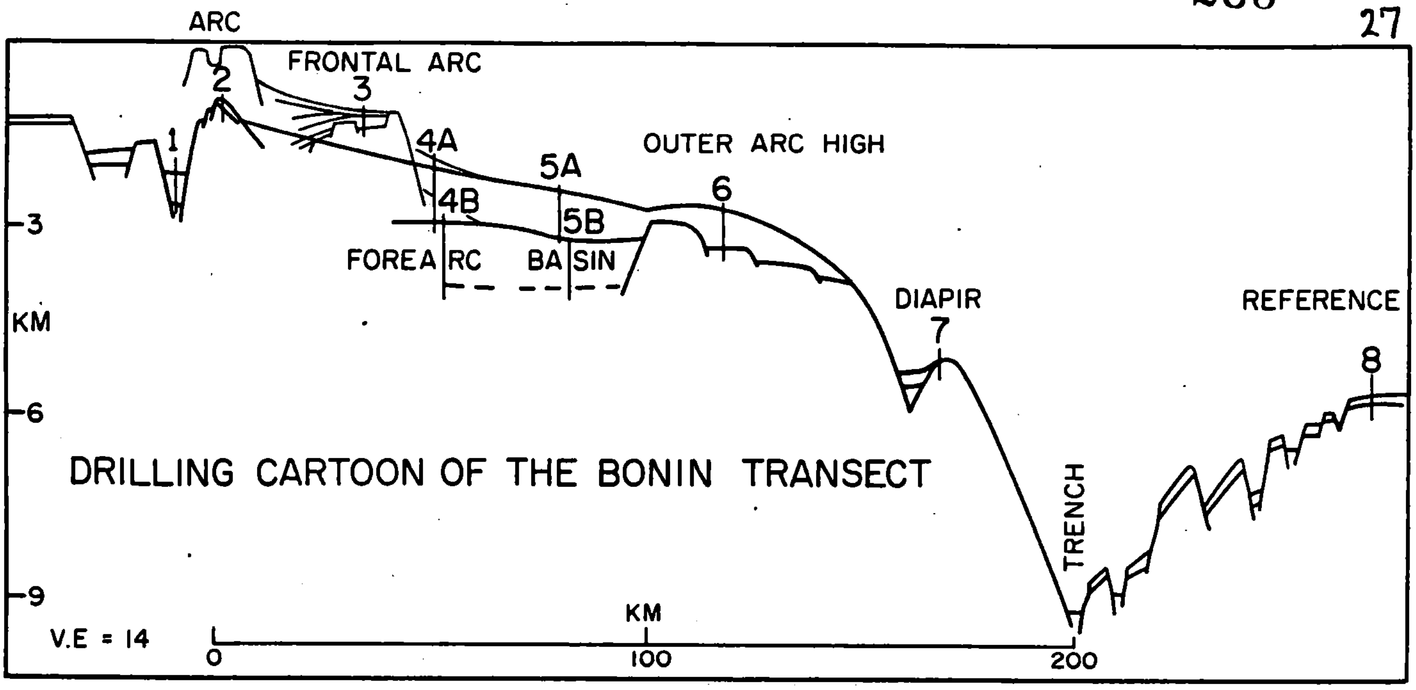
SITE SUMMARY

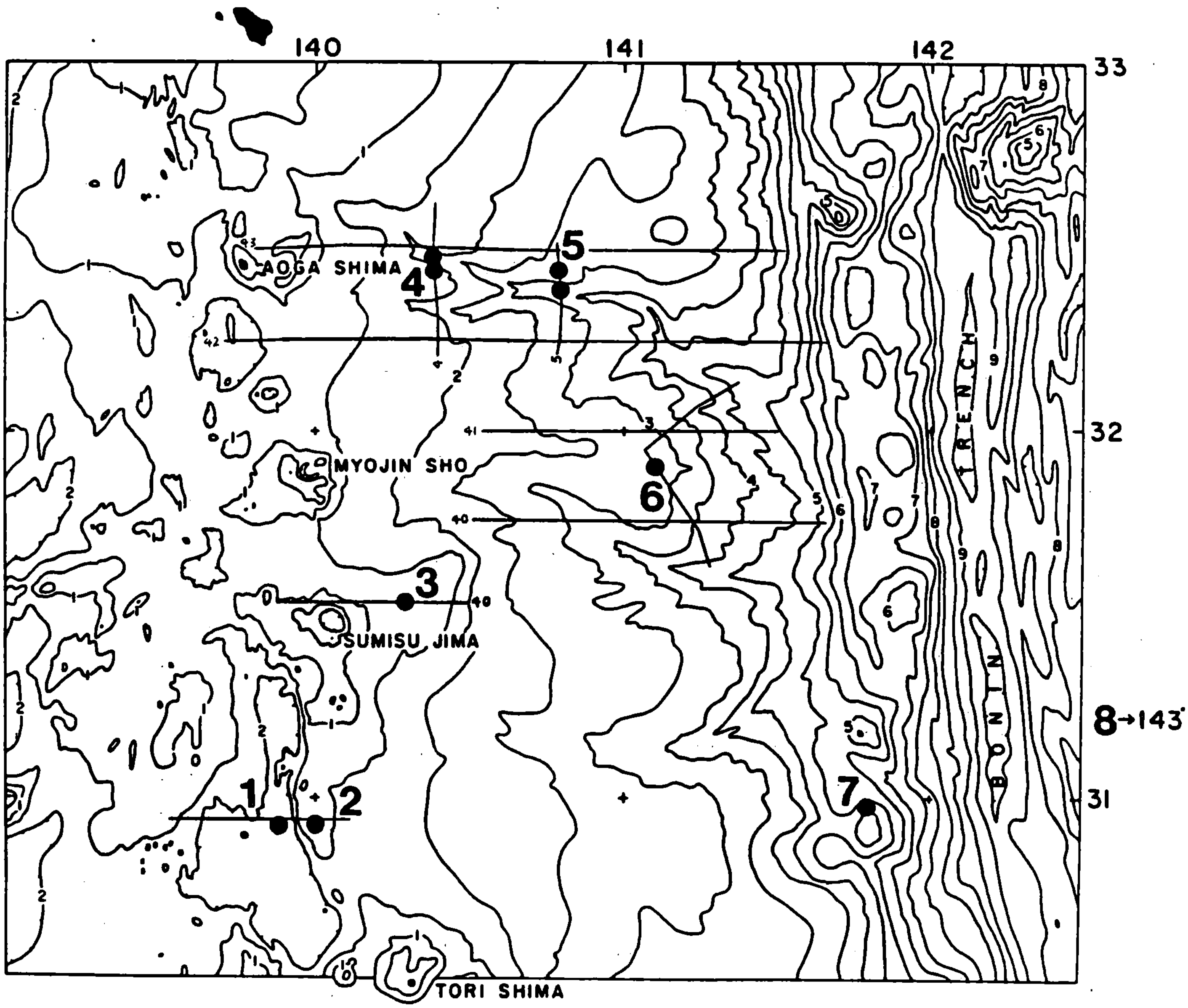
The sites that we propose to be drilled in the Bonins represent a compromise between deep basement and complete stratigraphic objectives. They were chosen from an extensive data base that needs some additional close-spaced MCS profiles. Twelve ALVIN dives in the Sumisu Rift are scheduled for July 1987, and 2000 nm of 48-fold MCS will be collected in June-July 1987. The additional MCS should be able to identify sites where shorter holes can meet the objectives (especially for forearc sites 4 and 5). The Mariana sites are extensively surveyed but need better seismic reflection data. Fourteen ALVIN dives are scheduled for May 1987. Nine of the twelve holes are in water depths less than 4000 m (average - 2400 m) which should result in very good biostratigraphy. The principal proposals on which this summary is based are #171 for the Bonins, with sections on paleoceanography from #83, and #172 for the Marianas.

Site #	Lat.(^{o}N)	Long.(^{o}E)	W.D.(m)	Penetration Sed.	Penetration Bsmt.	Site Time* (days) Drill	Log	Total
BON1	30°55'	139°53'	2270	850	50	8.5	1.6	10.1
BON2	30°55'	140°00'	1100	500	200	16.2	1.3	17.5
BON3	31°22'	140°17.4'	1250	600	50	5.2	1.2	6.4
BON4A	32°26.5'	140°22.5'	1820	700	—	4.9	1.4	6.3
BON4B	32°28.6'	140°22.5'	2420	950	50	9.6	1.7	11.3
BON5A	32°26'	140°47'	2700	950	--	8.7	1.7	10.4
BON5B	32°23'	140°48'	3400	900	50	10.9	1.7	12.6
BON6	31°54'	141°06'	2850	950	150	21.5	2.5	24.0
BON7	30°58'	141°48'	4650	500		6.1	1.5	7.6
BON8	31°18'	142°54'	6000	500	20	10.0	1.7	11.7
MAR2	19°20'	146°54'	3700	700		8.9	1.6	10.5
MAR3	19°30'	146°41'	4200	700		9.6	1.6	11.2

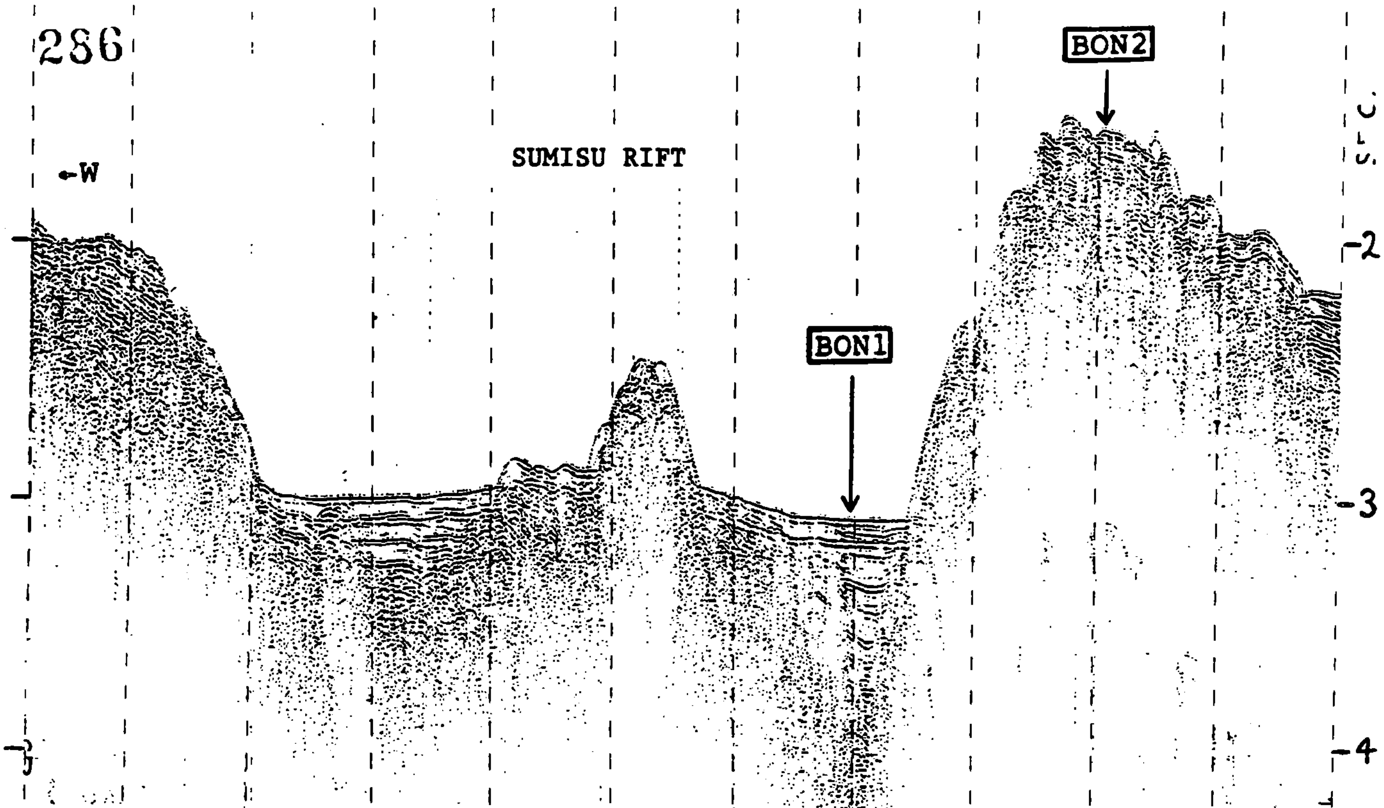
*Time estimates assume APC/rotary coring, with re-entry cones at sites 2 and 6 only and no special experiments.

WPAC ranked proposed Bonin-Mariana drilling by considering two programs (page 1): Bonin Leg 1 = rifting and forearc objectives (sites 1, 2, 5A, 5B, and 6) with 4 days transit totals 79 days. Bonin/Mariana Leg 2 = diapir and reference sites (BON7, BON8 and MAR ref.) total 41 days, without re-entry sites and with 7 days transit.

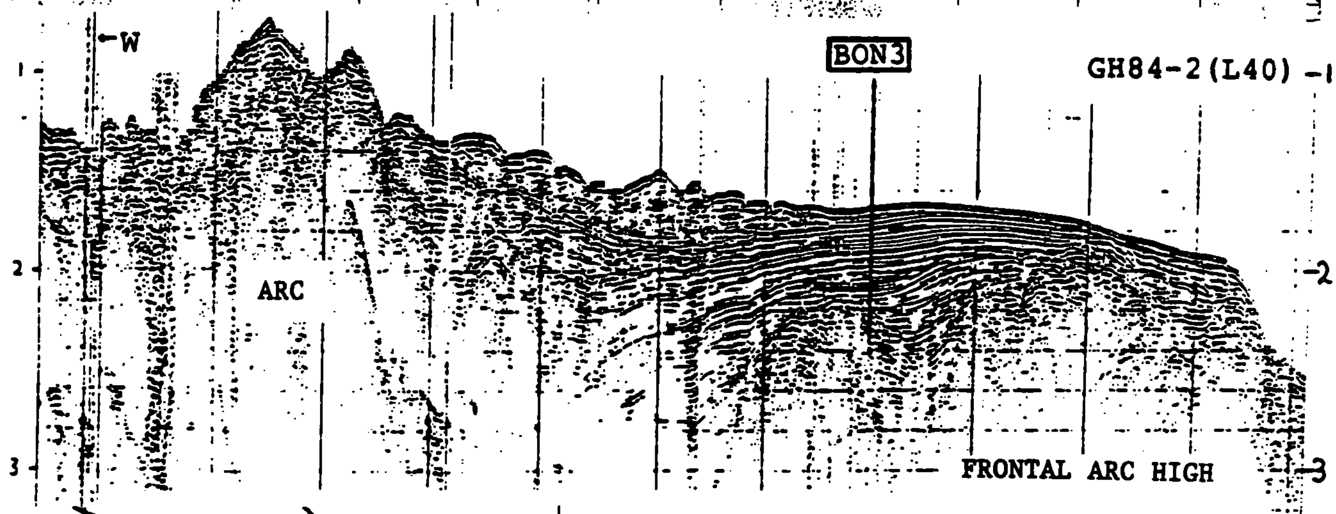




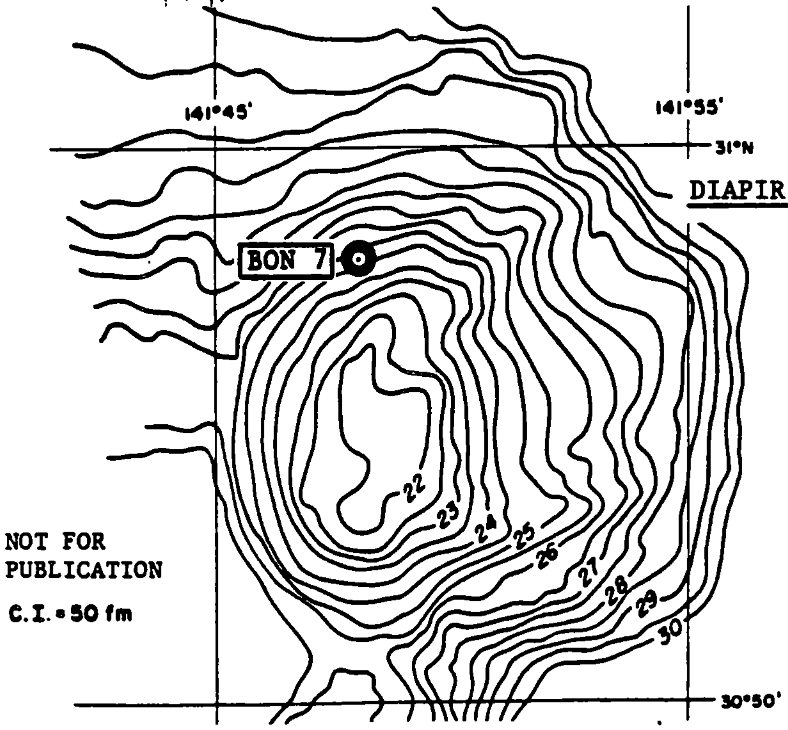
Location of proposed Bonin sites 1-8 and associated tracks of seismic profiles.



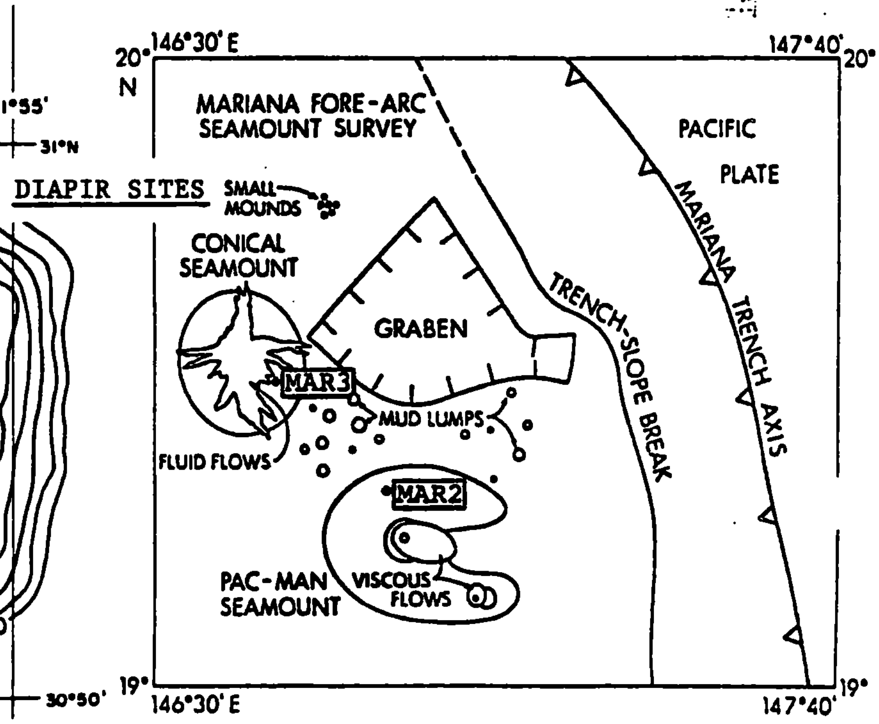
BON2
←W
SUMISU RIFT
BON1
-2
-3
-4



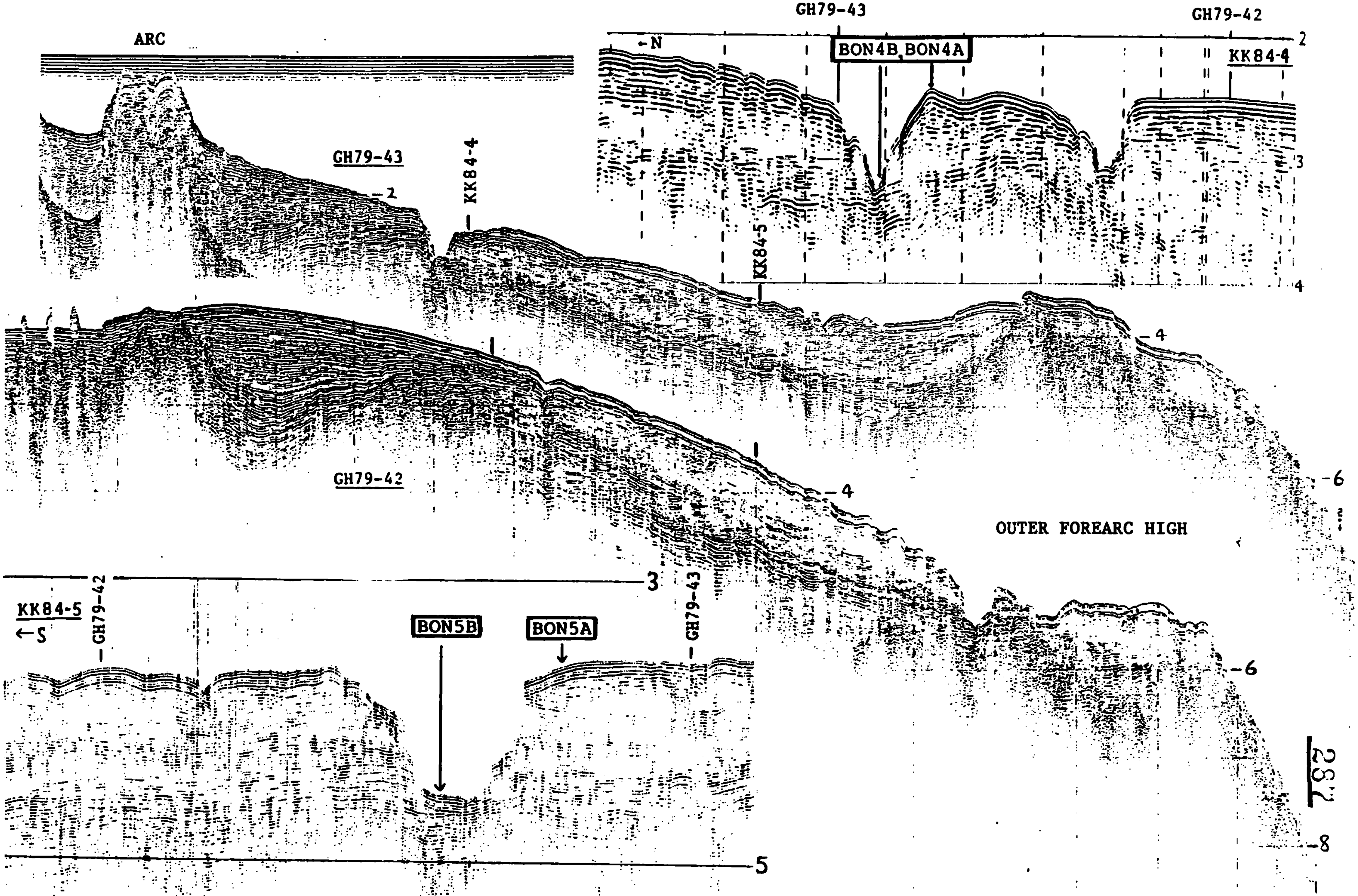
←W
BON3
GH84-2(L40)
1
2
3
-1
-2
-3
ARC
FRONTAL ARC HIGH



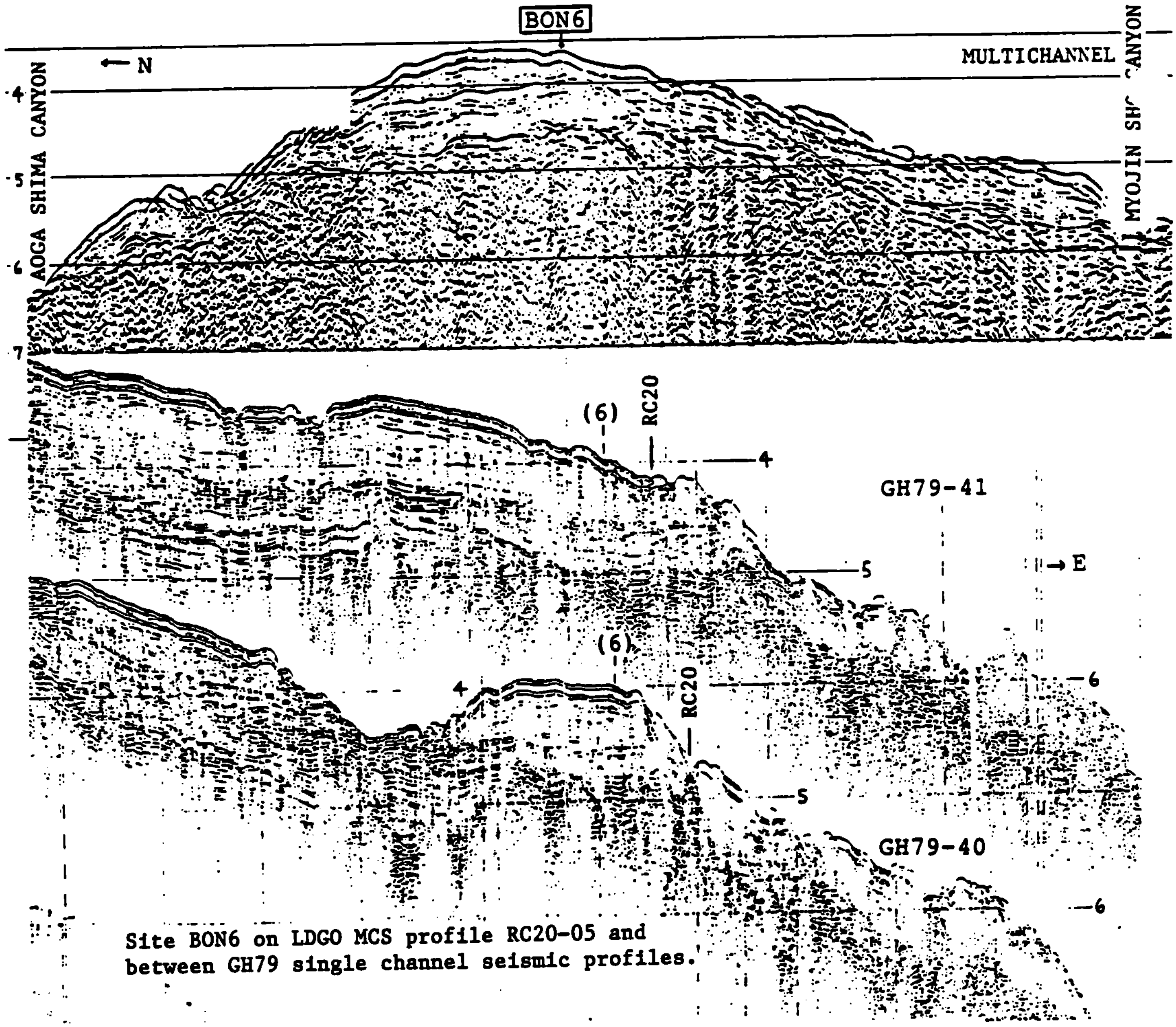
141°45'
141°55'
31°N
30°50'
BON 7
22
23
24
25
26
27
28
29
30
NOT FOR PUBLICATION
C.I. = 50 fm



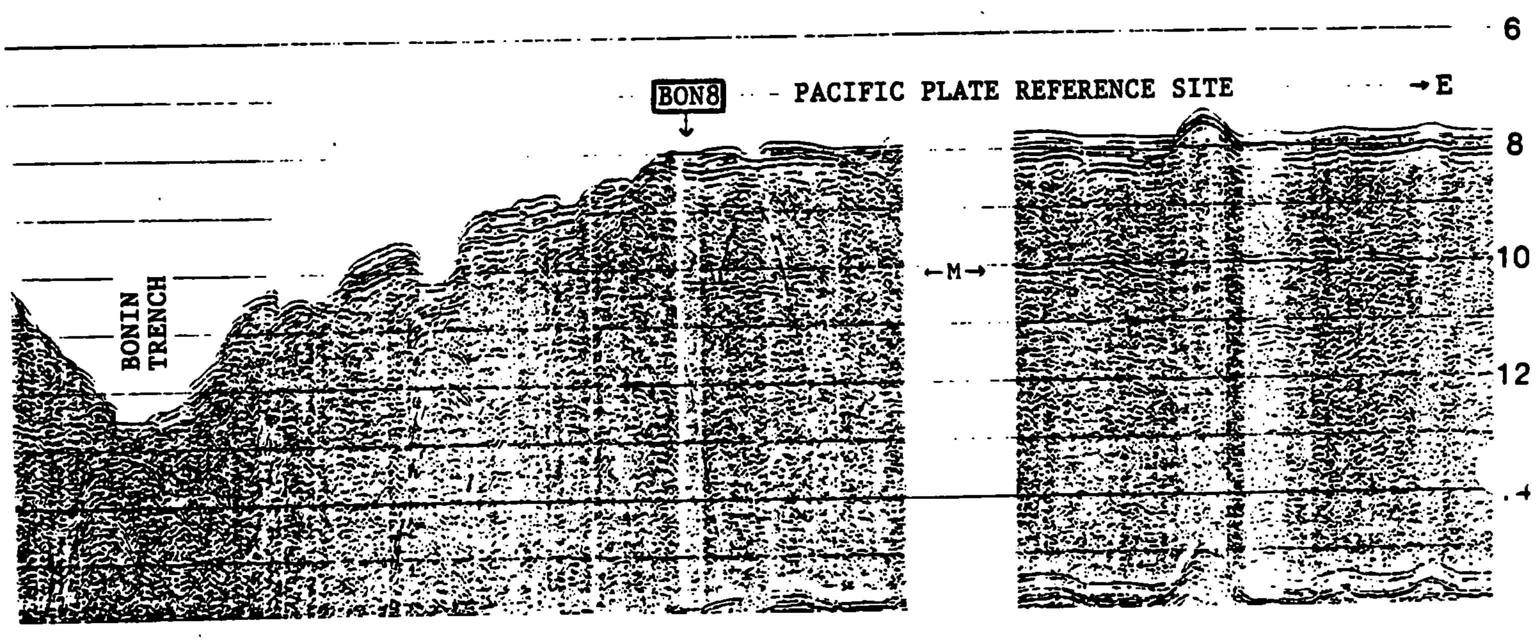
DIAPIR SITES
20° N
146°30' E
147°40'
20°
19°
146°30' E
147°40'
19°
MARIANA FORE-ARC SEAMOUNT SURVEY
PACIFIC PLATE
SMALL MOUNDS
CONICAL SEAMOUNT
GRABEN
TRENCH-SLOPE BREAK
MARIANA TRENCH AXIS
MAR3
MUD LUMPS
FLUID FLOWS
MAR2
PAC-MAN SEAMOUNT
VISCOUS FLOWS



Location of sites 4A, 4B, 5A, 5B on N-S KK84 profiles between E-W GH79 profiles.



Site BON6 on LDGO MCS profile RC20-05 and between GH79 single channel seismic profiles.



REFERENCE SITES

Introduction

Reference sites are designed to core sedimentary and igneous rocks on incoming plates next to trenches for comparison to the compositions of lavas from the adjacent arcs. The cored materials are plausibly similar to recently subducted materials that may be providing components to the arc magmas. Such components should have isotopic or other geochemical characteristics which can be identified in the lava compositions, and then be used in models of petrogenesis. It is important to understand the degree to which subducted sediments and ocean crust become involved in arc magmas because everything that is not scraped off, underplated, or incorporated into magmas returns to the mantle. The quantity and compositions of such materials returned to the mantle through geological time may be significant; accurate assessment of this will bear directly on application of mass balances to models of crustal differentiation.

The usual approach to either the arc-magma petrogenesis problem or the question of mass balances is to consider trace elements and isotopes as geochemical tracers. One may, for example, use them to determine the proportions of components that are involved in arc parental magmas by mixing. Another important application is to subject the materials cored to varieties of high-pressure, high-temperature experiments, in order to establish phase controls on melting, and the distribution coefficients at elevated pressures of both trace and major elements.

Ideally, it is necessary to establish the influence of ocean crust and the different types of sediments that may be subducting in different settings. Carbonates may be particularly abundant in one place, diatomaceous oozes in another, and continent-derived clastic materials in yet another. Since the distribution of various types of sediments on ocean crust varies from one place to the next, and can be gradational adjacent to a given island arc, two sorts of strategies for drilling reference sites might be considered. The first would be to sample more-or-less type sections, and then consider their hypothetical influences on arc magmas in general. The second is to consider actual differences in isotopic/geochemical characteristics of lavas of different arcs, or along individual arcs, and suppose that these might be related directly to compositions of materials recently subducted.

An example of the latter approach is the Lesser Antilles, where lavas show the clear isotopic imprint (Sr and Pb) of continent-derived clastic sediments, which flood the trench from southerly sources in South America. The isotopic effect diminishes to the north (White and Dupre, 1986) where the clastic wedge thins, and only a predominantly marine pelagic section is underthrusting the toe of the Barbados Ridge (DSDP 543; Natland et al., 1984; White et al., 1985),

The Lesser Antilles represent the only serious application of a reference site (DSDP 543) to the question of arc magma compositions.

Many intra-oceanic arcs, however, lack a thick offshore clastic wedge (or any wedge at all), and the question is, are these arcs, too, influenced by subducting sediments, but of radically different composition?

The Western Pacific: Different Sediments Have to be Involved

The western Pacific basin has had a rather unique sedimentary history which contrasts greatly with North Atlantic sea floor near the Lesser Antilles. All portions of the Pacific plate now approaching trenches in the western Pacific are Mesozoic in age. The sedimentary history of the region is dominated by pelagic, biogenic, and local (within-plate) erosional/magmatic processes acting on ocean islands and seamounts. Moreover, drilling at about a dozen sites shows that post-Cretaceous sedimentation has been virtually non-existent (Figure 1). Only about 10 m of Neogene sediments overlie Campanian cherts at DSDP 452, east of the Mariana Trench (Hussong, Uyeda et al., 1982). Thus any signature of subducted sediments in the arc lavas should be primarily that of Mesozoic sediments and their underlying ocean crust. This explains, for example, both the lack of offscraped sediments in the Mariana Trench, and the lack of a Beryllium-10 anomaly (which can be produced only by contamination with very young sediments) in Mariana arc lavas (Woodhead and Fraser, 1985).

A preliminary assessment of sediments and sedimentary rocks cored at various Deep Sea Drilling Project (DSDP) sites in the region strongly indicates that their isotopic and trace-element characteristics are dominated by the attributes of materials contributed from Mesozoic ocean-island sources, chiefly tholeiitic and alkalic basalts. This is illustrated for Pb isotopes in Figure 2, where compositions of sediments from DSDP 452, 462 (Nauru Basin), and 585 (Mariana Basin) are compared to lavas from various modern islands. Coarse volcanogenic sediments from DSDP 585 were produced by subaerial erosion of a dominantly tholeiitic source (Floyd, 1986) which isotopically compares to subalkaline lavas of Easter Island. Finer-grained sediments, including "pelagic" claystones have a more alkalic provenance (Viereck et al., 1986) and are similar isotopically to strongly radiogenic Samoan post-erosional lavas (Woodhead and Fraser, 1985; Wright and White, 1987).

Lavas of the Mariana arc show an apparent slight enrichment in radiogenic Pb in the direction of the fine-grained sediments (Figure 2), and differ from typical abyssal tholeiites on the one hand, and Mariana Trough backarc basalts on the other. This is taken by Woodhead and Fraser (1985) to represent the influence of subducted sediments on the arc lavas. The influence is subtle, if indeed it can be said to be discernable in Pb isotopes at all. More certain are slight enrichments in radiogenic Sr isotopes (Figure 3) which Stern (1982) attributed to ocean-island-type mantle sources, and which he described as increasingly apparent in arc magmas proceeding around the southwest tier of the Pacific rim from the Marianas toward the Tonga arc. The question now is, are there truly primary differences in the mantle sources, or are we seeing the consequences of subduction of sediments derived from distinctly enriched ocean-island sources? This is not a trivial question inasmuch as Mesozoic volcanogenic sediments are unusually abundant in that region of the Pacific now approaching trenches, rivalling in thickness (in those places where they have been cored; e.g. DSDP 462 and 585) the section of sediments now underthrusting the Lesser Antilles. The more subtle isotopic signature of the Mariana arc lavas may have to do with the basaltic (rather than granodioritic) provenance of subducting sediments.

Influence of the Ocean Crust: a Question

The role of the ocean crust is usually thought to involve its serving as a reservoir for fluids and (in alteration minerals) large-ion-lithophile (LIL) elements (K, Rb, Ba, Cs, etc.) and high 87Sr/86Sr (introduced by seawater). These may innoculate mantle sources of arc magmas following subduction, although some petrologists argue that arc andesites may also originate by partial melting of eclogite, to which subducted ocean crust basalts should transform with pressure.

The potential role of the LIL elements is deduced from the perception that dredged basalts (and many cored basalts) are usually enriched in these elements by secondary processes. This, however, is based on recovery from bare-rock exposures or thinly sedimented drill sites. A few holes have been drilled into crust with a widespread sediment blanket, however, and these give a different impression. At DSDP 543 off the Lesser Antilles, for example, K-enriched altered rock only exists in the very top few meters of basement; below this, non-oxidative alteration (mainly to the K-poor clay mineral saponite, plus pyrite), has actually depleted the basalts in LIL elements, in many cases to abundances lower than in unaltered glass (Natland et al., 1984). Sr- and Pb isotope abundances of DSDP 543 basalts are interpreted to be those of unaltered depleted abyssal tholeiites (White and Dupre, 1985). However, the samples analyzed came from intervals in the core dominated by non-oxidative alteration to a saponite-dominated mineral assemblage, and which typically contain about 40% of clay minerals (Natland et al., 1984); no fresh glass was measured for isotopes. In general, non-oxidative alteration to produce primarily saponite (at low temperature) or chlorite (at higher temperature) should have these effects, and such minerals are characteristic of secondary assemblages formed by continued circulation of basement formation fluids under thick sediment blankets (e.g. DSDP 418 and 504B), where access to oxygenated bottom waters did not exist. In the NW Pacific, such an assemblage occurs in the top few meters of Mesozoic basalt at DSDP 581 (drilled during Legs 86 and 88).

A serious question thus exists concerning whether subducting ocean crust can be, or typically is, a significant potential source of LIL elements to arc magmas. Given the typical thicknesses of the basaltic layer, a few meters of K-enriched basalts at the top may not compensate for a pervasive depletion below. Of course this will be a function of such factors as the shallow thermal structure (affecting the extrusive portion of the crust) of spreading ridges, and the particular sedimentary history that influenced that thermal structure. This is why it is essential to drill to significant depths beneath sediments in reference sites. The western Pacific, moreover, represents a type of crust (produced at a rapidly-spreading ridge) which we have never sampled to more than 50 m before, and it had an utterly unknown sedimentary (thus thermal) history after it formed.

Recommendations of Proponents

Reference holes may be used as a specific control on the Mariana/Bonin arcs, but also can be integrated with regional aspects of reference-site geochemistry between there and Tonga by using such sites as DSDP 462, 581, and 585 (already mentioned), Site 595 near the Tonga Trench, and surface sediment cores in existing collections. Obviously, though, all the potential inputs to subduction adjacent to a given arc cannot be sampled in a single hole. Next to the Mariana and Bonin arcs, a minimum of four holes is required:

1) a hole (BON-8) to sample sediments and Mesozoic crust (anomaly M-13) east of the Bonin arc, to link with the transect of holes in the Bonin I program, and which would sample a normal thickness of sediments presumably dominated by pelagic components;

2) a similar hole (MAR-4, equivalent to DSDP 452) on older Mesozoic ocean crust (anomaly M-25) east of the Mariana arc, to link with the transect of holes drilled during Legs 59 and 60, and which would also sample a normal thickness of sediments entering the Mariana Trench;

3) a hole (MAR-5) into a distal portion of the volcaniclastic apron adjacent to one of the large seamounts now entering the Mariana trench, and hopefully into the ocean crust beneath;

4) a hole (MAR-6) into the summit region of that same seamount, to sample shallow-water sediments that might be a significant portion of thicker portions of the proximal sedimentary apron, and Cretaceous ocean-island basement beneath.

One of holes 1-3 (probably BON-8) needs to be a re-entry site, in order to sample at least 200 m of ocean-ridge basement, which should give some sense of the alteration profile in basalts of this type of crust.

Complementary Programs

The holes recommended complement a number of long-standing scientific objectives which can be approached through drilling. Foremost among these is a deep hole into old crust produced at a rapidly-spreading ridge. Drilling in the eastern Pacific has thus far failed to produce an adequate reference section of ocean crust relevant to interpretation of seismic refraction results or crustal magnetics. Placing such a hole in the far western Pacific on a well-defined magnetic anomaly would meet these objectives, and optimize the chance for deep penetration, on the assumption that a thick sediment section combined with a long history of alteration and diagenesis would "heal" the extensive fracturing that plagued the previous drilling. For general lithospheric objectives, this hole is called DeepPac-1 on the Site Proposal Summary Form; it may be placed at BON-8.

Next, the suite of holes proposed here would complement other proposed drilling to study 1) old Pacific crustal and sedimentary history; 2) plate motions; 3) the timing and causes of Cretaceous reef-extinction events; and 4) the timing, age-progression, and general geochemistry of seamount (hot-spot) volcanism in the Mesozoic. Specifically, the holes in the volcaniclastic apron and summit region of a seamount in the Magellans chain would provide a necessary latitudinal contrast to drilling proposed in the Japanese (Geisha) and Wake Seamounts, in order to test whether Cretaceous reef extinctions were synchronous (hence related to regional or global factors), or not synchronous (and thus related to latitudinal climatic factors; see drilling proposal by Winterer, Natland and Sager). Since there are no large seamounts directly east of the Bonin arc, holes designated for these objectives are east of the Marianas.

Recommendations of the Western Pacific Regional Panel

At its March meeting in Tokyo, the WPAC Panel recommended drilling one reference hole adjacent to the Bonin arc (Bon-8) and not extending this beyond a single bit's penetration into basement. The primary consideration here was the tentative limitation in time (9 programs in 11 legs, or perhaps less) within which PCOM allowed WPAC to frame its program. The Panel felt that devoting any more time to objectives on the Pacific plate, particularly a deep penetration into ocean crust, would undermine its own priorities in the arc, backarc, and marginal basins of the western Pacific. Calculations of drilling time suggest that half a leg would be needed to devote to two single-bit holes into basement adjacent to both the Bonin and Mariana arcs, and that only a full leg would accomodate all the objectives mentioned above.

The previous sections of this summary have outlined the general rationale for a multi-hole effort adjacent to these two arcs. The immediately previous section listed relationships to other objectives. The full proposal documents objectives which should be important not just to WPAC, but to LITHP, DMP, CEPAC, and SOHP as well. Probably the single most time-consuming objective will be the deep penetration into basement, a long-standing Ocean Crust Panel and LITHP objective, and which LITHP probably should sponsor, if not here, than somewhere in old crust in the western Pacific. There are good reasons, however, listed above, to tie this drilling to a reference site. In all, the combined set of objectives, bearing on so many aspects of evolution of western Pacific island arcs, Mesozoic ocean crust, and sedimentary history, is worthy of a leg of drilling, sponsored by several panels.

References

Floyd, P., 1986. Geochemistry and provenance of basaltic clasts within volcaniclastic debris flows, East Mariana Basin, Deep Sea Drilling Project Site 585. In Moberly, R., Schlanger, S., et al., Init. Repts. DSDP, 89: Washington (U.S. Gov't. Printing Office), 449-457.

Hussong, D.M., Uyeda, S. et al. (1982). Init. Repts. DSDP, 60: Washington (U.S. Gov't. Printing Office).

Natland, J.H., Tarney, J., Marsh, N.G., Melson, W.G., and O'Hearn, T., 1984. Compositions, stratigraphy, and alteration of pillow basalts, Deep Sea Drilling Project Hole 543A, near the Barbados Ridge. In Biju-Duval, B., Moore, J.C., et al., Init. Repts. DSDP, 78A: Washington (U.S. Gov't. Printing Office), 393-399.

Stern, R.J., 1982. Strontium isotopes from circum-Pacific intra-oceanic island arcs and marginal basins: Reagional variations and implications for magmagenesis. Geol. Soc. Amer. Bull., 93: 477-486.

Viereck, L.G., Simon, M., and Schmincke, H.-U., 1986. Primary composition, alteration, and origin of Cretaceous volcaniclastic rocks, East Mariana Basin (Site 585, Leg 89). In Moberly, R., Schlanger, S., et al., Init. Repts. DSDP, 89: Washington (U.S. Gov't. Printing Office), 529-553.

White, W.M., and Dupre, B., 1986. Sediment subduction and magma genesis in the Lesser Antilles: Isotopic and trace element constraints. J. Geophys. Res., 91: 5927- .

_____, _____, and Vidal, P., 1985. Isotope and trace element geochemistry of sediments from the Barbados Ridge - Demerara Plain region, Atlantic Ocean. Geochim. Cosmochim. Acta, 49: 1875-1885.

Woodhead, J.D., and Fraser, D.G., 1985. Pb, Sr, and 10Be isotopic studies of volcanic rocks from the Northern Mariana Islands. Implications for magma agenesis and crystal recycling in the western Pacific. Geochim. Cosmochim. Acta, 49: 1925-1930.

Wright, E., and White, W.M., 1987. The origin of Samoa: New evidence from Sr, Nd, and Pb isotopes. Earth Planet. Sci. Lett., 81: 151-162.

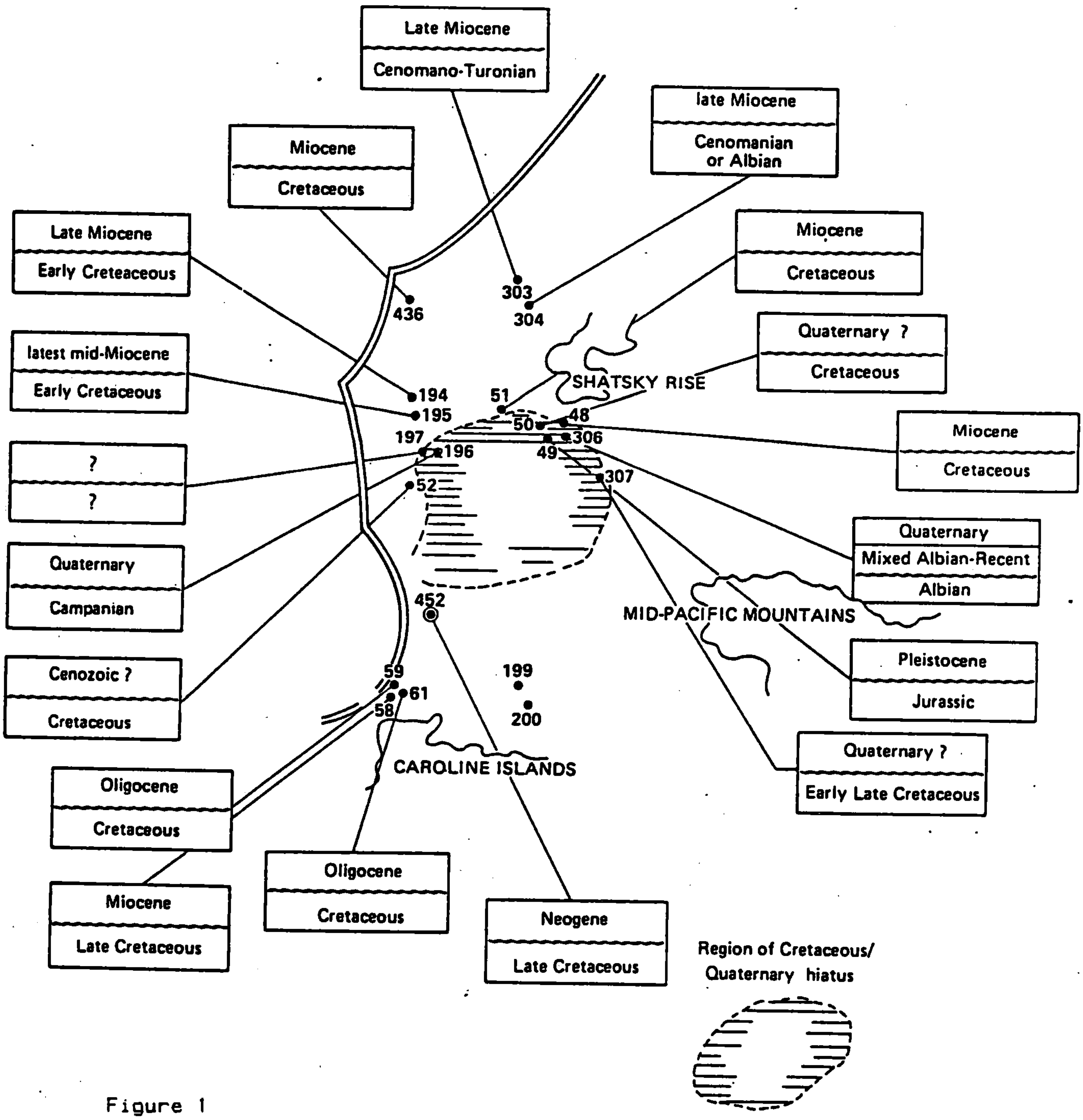


Figure 1

Stratigraphic relationships in DSDP drill sites in the northwest Pacific, indicating duration of intervals of near non-deposition since the Cretaceous. From Site 452 Report in Hussong, Uyeda et al (1982).

Except for site 436, all of these sites were spot cored, and only sites 197, 303, 304 and 307 reached basement.

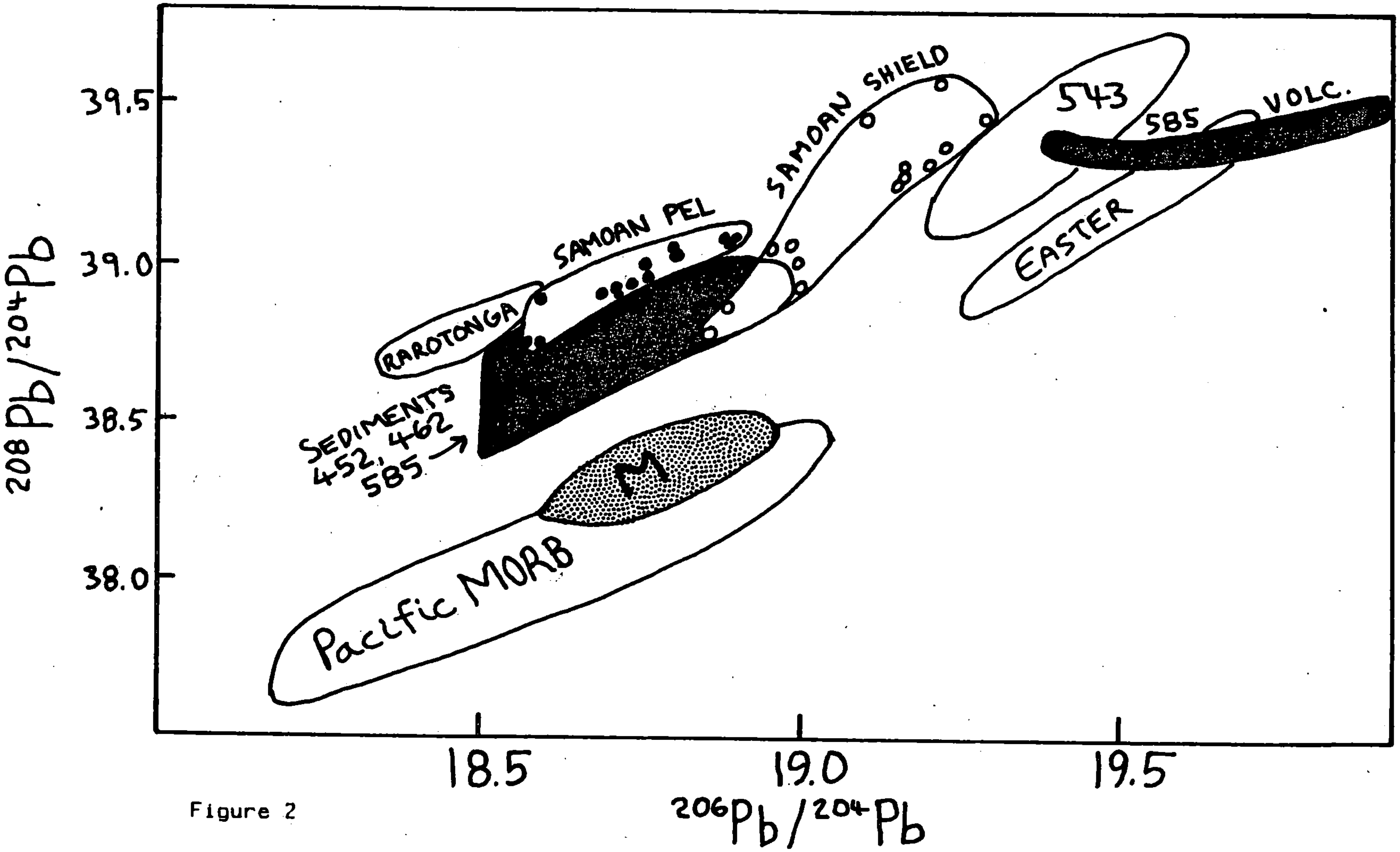


Figure 2

207Pb/204Pb versus 206Pb/204Pb in Mariana arc lavas compared with those in sedimentary rocks from the western Pacific, Samoan and other island basaltic lavas, and Pacific abyssal tholeiites (from Woodhead and Fraser, 1985). Stippled field labeled M is for Mariana arc lavas; others are as indicated in the figure. Fields for Easter Island, Rarotonga, and Samoa are from Wright and White (1987). Separate fields for Samoan shield tholeiitic and alkalic olivine basalts (open circles) and post-erosional lavas (filled circles) are shown. Also indicated are fields for DSDP 5434 "underthrust" sediments near Guadeloupe Island, Lesser Antilles (White et al., 1985) and Lesser Antilles lavas (White and Dupre, 1986).

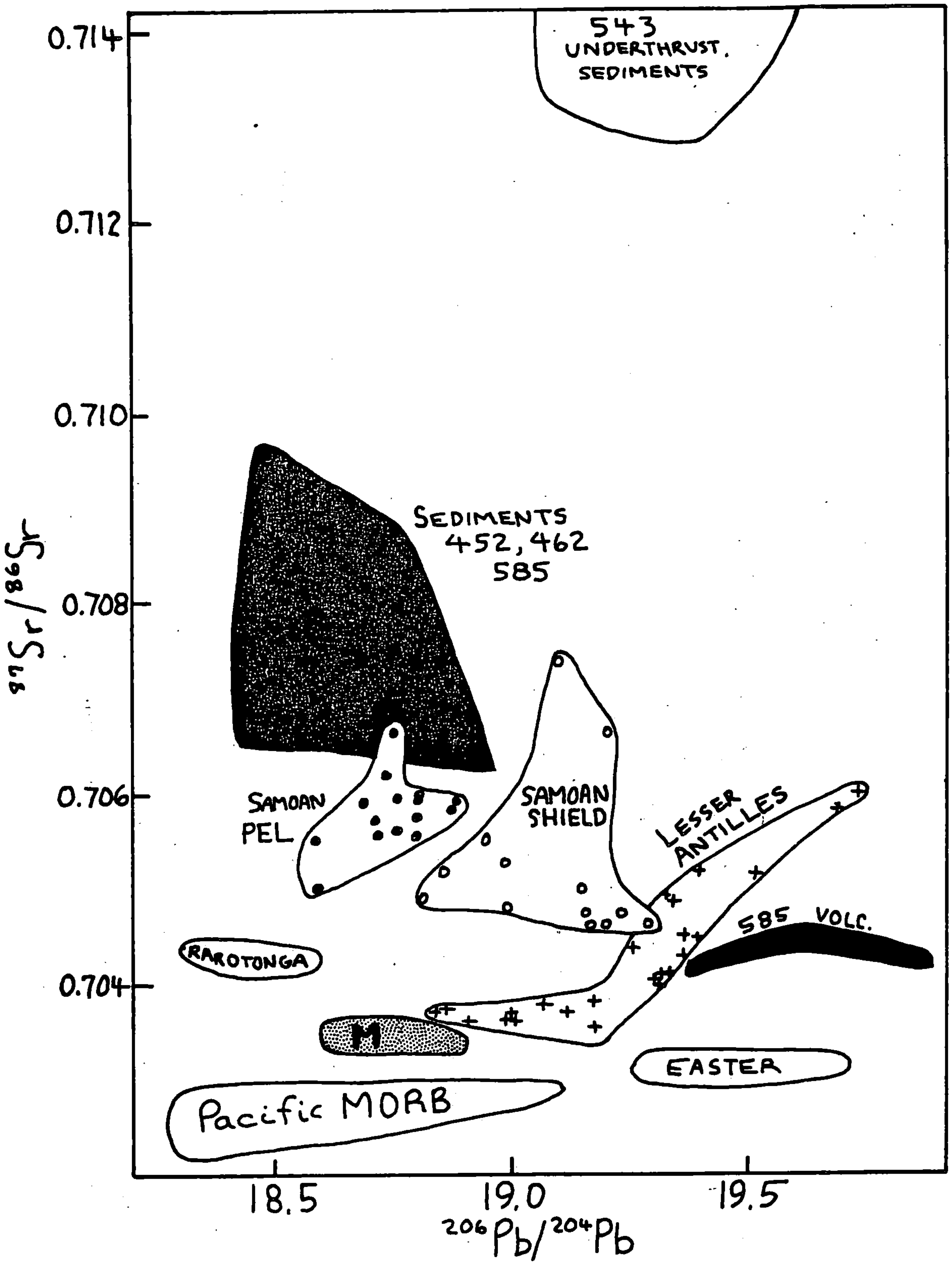


Figure 3

87Sr/86Sr versus 206Pb/204Pb in Mariana arc lavass compared with those in sedimentary rocks from the western Pacific, Samoan and other island basaltic lavas, Pacific abyssal tholeiites, lavas from the Lesser Antilles, and DSDP 543 "underthrust" sediments. Symbols, data sources are as in Figure 2.

SUMMARY OF THE SOUTH CHINA SEA MARGIN TRANSECT

INTRODUCTION AND OBJECTIVES

The northern margin of the South China Sea offers an exceptionally well constrained setting in which to document the tectonic, depositional, and paleoceanographic development of a young "Atlantic-type" marginal basin. Moreover, the South China Sea constitutes one of the four major marginal basins of the Western Pacific region and hence has played a significant role in dictating the timing and mode of water mass, faunal, and climatic evolution of this region including the cessation of communication between the Indian and Pacific oceans. A transect of ODP holes across the northern margin of the South China Sea is proposed to fully develope this history and to analyze the sedimentary and crustal processes driving rifted margin evolution. More specifically, our objectives require drilling four holes along a single transect (near 116° - 118° E) in the area of the margin that is both relatively simple and very well known from the existing geophysical data base (Figure 1).

East trending magnetic lineations identified in the eastern half of the South China Sea date sea floor spreading and basin formation as mid Oligocene through Early Miocene (32 to ca. 17 m.y.B.P.). The basin is bounded by passive margins both north and south with the northern continental margin covered with a thick and growing blanket of dominantly siliciclastic sediments which extend out onto the deep basin plain (Figures 2 and 3). In turn, seismic profiles illustrate that the proposed transect of ODP holes across the northern margin will allow scrutiny of shelf, slope, and basin plain sequences representing the entire history of basin formation--including sampling of underlying transitional and oceanic crust (Figures 2 and 3). Importantly, commercial bore holes penetrate the inner shelf in this same area, effectively extending the proposed ODP transect onto an area of established continental crust. Information from these latter holes, together with data to be garnered from the four-hole ODP transect and proposed deep basin sites to the south, clearly present a special opportunity to hindcast the full spectrum of tectonic, eustatic, depositional, and paleoceanographic events characterizing the evolution of the South China Sea basin across an entire margin segment encompassing continental, transitional, and oceanic crust (Figures 1, 2, and 3).

Thus, the northern margin of the South China Sea stands as an excellent area to (1) investigate the processes of early rifting, subsidence, and sedimentation of passive continental margins in general, (2) examine the changing patterns of sedimentation (including unconformities) across a young, evolving continental margin, (3) obtain quantitative faunal, isotopic, and sedimentologic evidence of variations in basin paleoenvironments (including sea level changes) and the history of an oxic basin as opposed to the silled anoxic history of the adjacent Sulu Sea, (4) test the validity of existing thermodynamic models of rifting in a place where the parameters of such models either have been or can be measured directly because of the youth of the basin, (5) provide tectonic constraints to help isolate the effects of rifting from the subsequent collisional processes that also occurred to the south along the conjugate margin segment, and (6) identify the petrology of the crystalline basement across the continent-to-ocean transect.

TECTONIC PERSPECTIVE AND SUPPORTING DATA BASE

The South China Sea is uniquely well suited for studying models of continental margin evolution because; (a) it is old enough not to have been affected by the complex, unquantifiable initial extension processes and tectonic conditions,

(b) it is young enough to still exhibit observable differences in its subsidence and associated thermal history as predicted by different crustal extension models, and (c) it provides an opportunity to study ties betweeneustacy and tectonism in a relatively simple setting.

In the South China Sea, all of the crucial pieces of supporting geophysical data have been collected to test existing passive margin models that predict the relationships between rifting/drifting, subsidence/uplift, sedimentation/seismic sequences, and thermal history/hydrocarbon maturation. The available data include; (1) excellent regional MCS coverage of the margin (Figure 3), (2) excellent single channel seismic and underway geophysics for the deep basin, (3) deep seismic crustal thickness data (to MOHO), and (4) detailed heat flow measurements along selected margin transects, including the proposed drilling transect across the northern margin (Figure 4).

PALEOCEANOGRAPHIC AND SEDIMENT HISTORY OBJECTIVES

Sedimentary environments represented within the South China Sea margin transect likely include syn-rift non-marine and shallow marine units, alternating siliciclastic and carbonate bank shelf-edge facies, upper and mid-slope oxygen minima facies of organic-rich muds, as well as intercalated fine grained basin plain pelagic and terrigenous units. The relatively rapid rates of sediment sccumulation in this setting suggest that all of these depositional sequences will contain rich microfossil assemblages of both planktonic and benthic origin. Thus, one of the prime goals in studying these sequences will be to establish high resolution biostratigraphic control which will subsequently provide the chronostratigraphic framework with which to evaluate margin geohistory, rates of sediment accumulation, dating of unconformities, and correlation of deep ocean and marginal events during basin evolution. In particular, studies of neritic and bathyal benthic foraminifera within these deposits can be used to decipher climatically and tectonically induced variations in water mass evolution and faunal migration as well as providing constraints on paleodepths and rates of margin subsidence. Similarly, the thick margin sequences should provide expanded paleoclimatic records based upon both isotopic (O^{18}, C^{13}) and quantitative faunal analysis.

One of the major sediment and ocean history goals of Western Pacific ODP drilling is the comparative study of the paleoceanographic and depositional histories of contrasting marginal basins of similar age. Of equal interest is the impact of global climatic events on marginal basin stratigraphies. The South China Sea margin transect and proposed deep basin sites to the south are expected to yield an unusually complete history of an oxic basin in a dominantly terrigenous siliciclastic province forming one end member of a series of marginal basin stratigraphies to be analyzed within; (1) the Great Barrier Reef mixed siliciclastic and carbonate margin setting, (2) the silled anoxic-suboxic Sulu Sea in a dominantly carbonate province, and (3) the alternating silled anoxic to fully oxic history of the Sea of Japan and associated variations of terrigenous, volcanogenic, and biosiliceous (diatom) regimes dominating depositional facies within this high latitude basin. Thus, the importance of the South China Sea margin transect is enhanced in the context of basin deposystems analysis planned for this region.

SUMMARY

The proposed South China Sea four-hole margin transect is unique in that it addresses an unusually broad spectrum of issues from a variety of perspectives, including;

(1) Thematic problems including paleoceanographic, sediment, and tectonic evolution of young passive margins,

(2) Regional problems including (a) the timing, duration, and nature of rifting/drifting processes within a presumably a pre-existing Andean-type terrane wherein microcontinental blocks (e.g. northern Palawan, Reed Bank) were moved southward from their original Paleogene positions during early rifting, (b) the role of the South China Sea in controlling paleoceanographic and tectonic development of adjacent marginal basins (e.g. Sulu Sea, Celebes Sea), and (c) the regional stratigraphy and biostratigraphy of Southeast Asia,

(3) Comparative studies of the evolution of three marginal basins in the Western Pacific including the Coral Sea (Great Barrier Reef), Sea of Japan, and the South China Sea from the Paleogene to present. Such comparisons are particularly crucial for separating the stratigraphic effects of tectonism versus eustacy and for identifying the paleoceanographic influences on depositional environments within the complex mosaic of marginal seas, arcs, and allocthonous terranes of Southeast Asia which form clear analogues to many ancient marginal basin sequences of Mesozoic, Paleozoic, and later pre-Cambrian age.

Proposed Holes	Relative Priority	Water Depth	Sediment Thickness	Penetration	Estimated Drilling	Logging	Total Days
SCS 1 (RCB)	2	3650m	1200m	1250m (into basement - ocean crust	14.7	2.0	16.7
SCS 2 (HPC+ XCB)	1	3150m	1000m	(into basement; transitional crust)	11.4	1.8	13.2
SCS 3	1	2060m	1200m	(into basement; transitional crust)	11.3	1.8	13.1
SCS 4	2	750m	2000m	(to 1000m)	5.7	1.4	7.1
					43.1	7.0	50.1

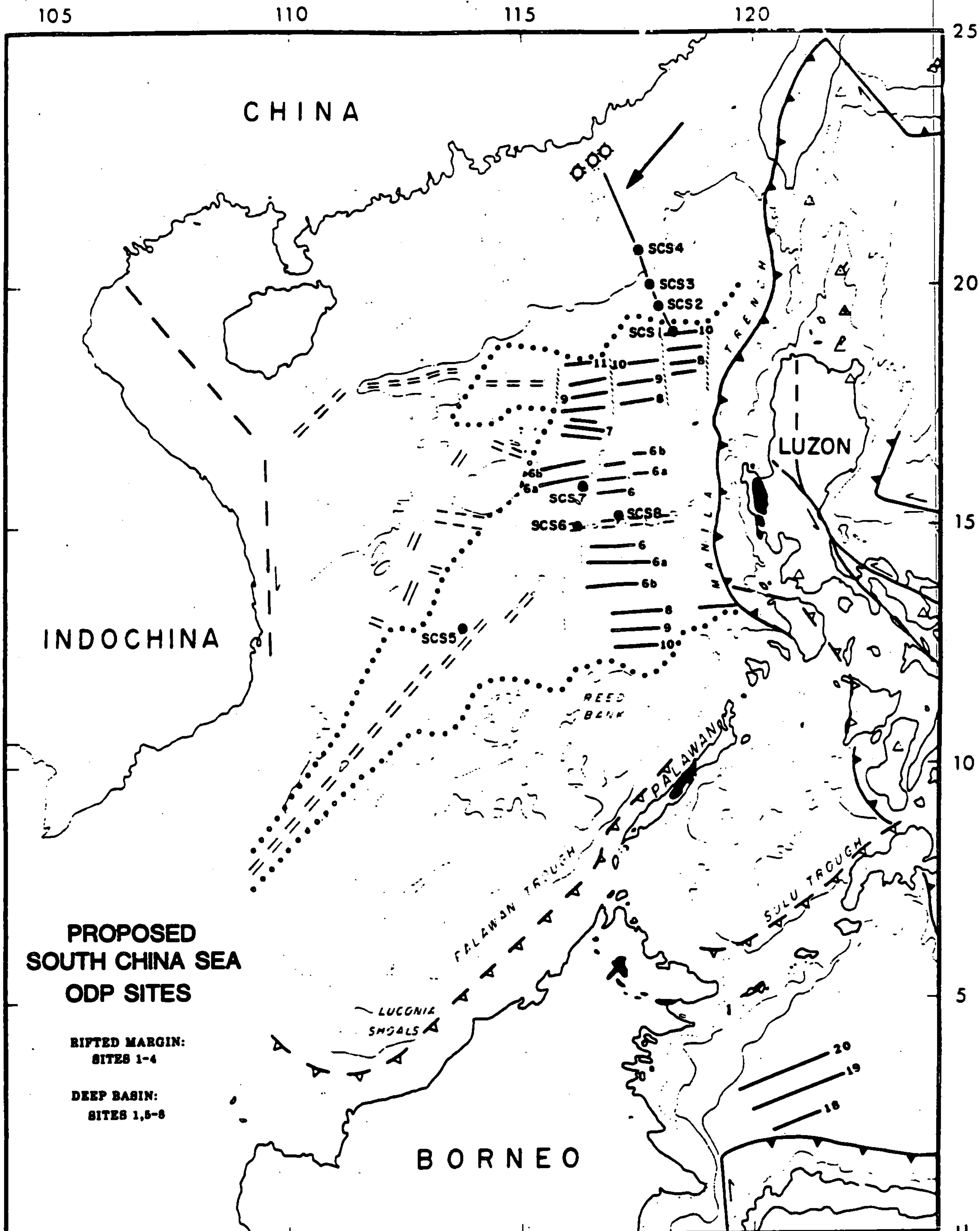


Figure 1. Major tectonic elements and magnetic lineaments in the South China Sea region. Proposed ODP sites (labelled SCS 1-4) along a margin transect (arrow) and location of key industry wells are shown. See Figures 2 and 3 for sections along the transect.

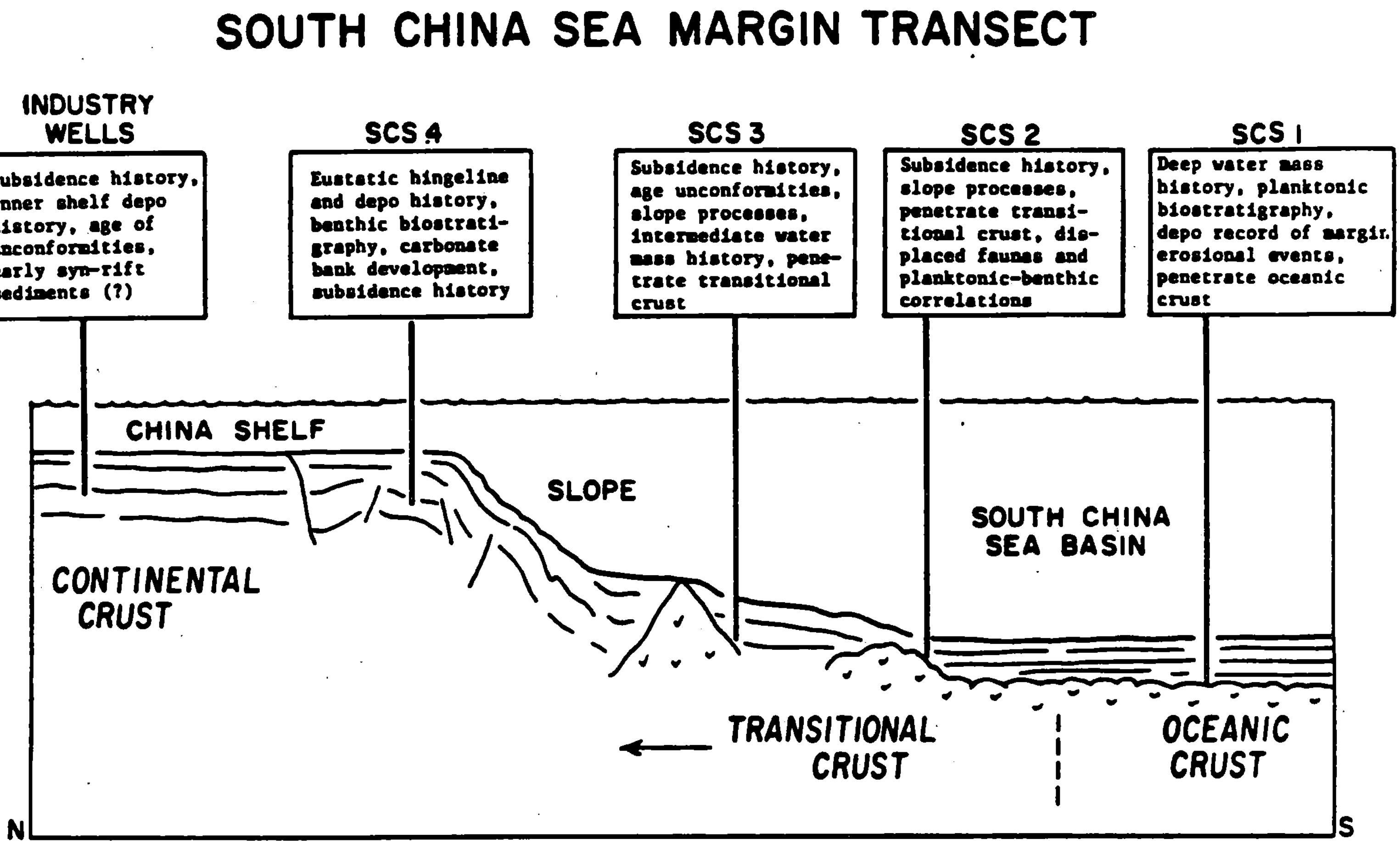


Figure 2. Cartoon along proposed margin drilling transect showing idealized location of sites and key drilling objectives; see Figure 3 for MCS profile from which this illustration was derived.

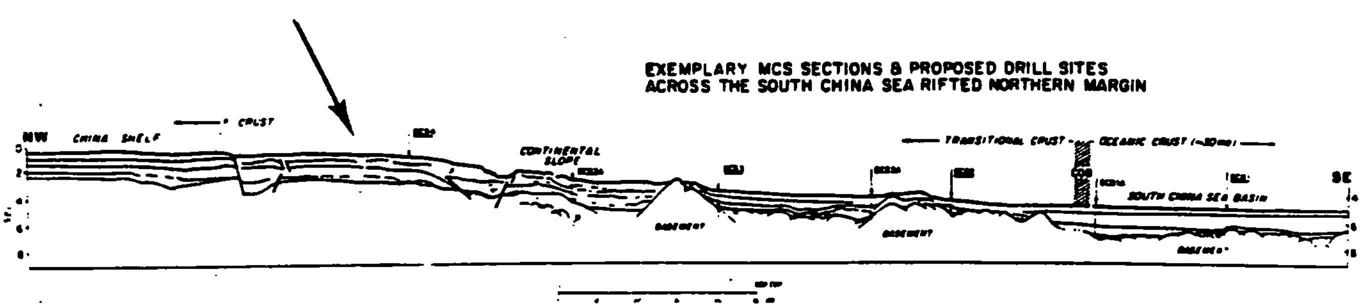


Figure 3. Line drawing of conventional MCS (CDP) profile along the proposed margin drilling transect. Locations of 4 prime sites and 3 alternate sites are indicated. The industry wells lay ca. 100 km NW of this section.

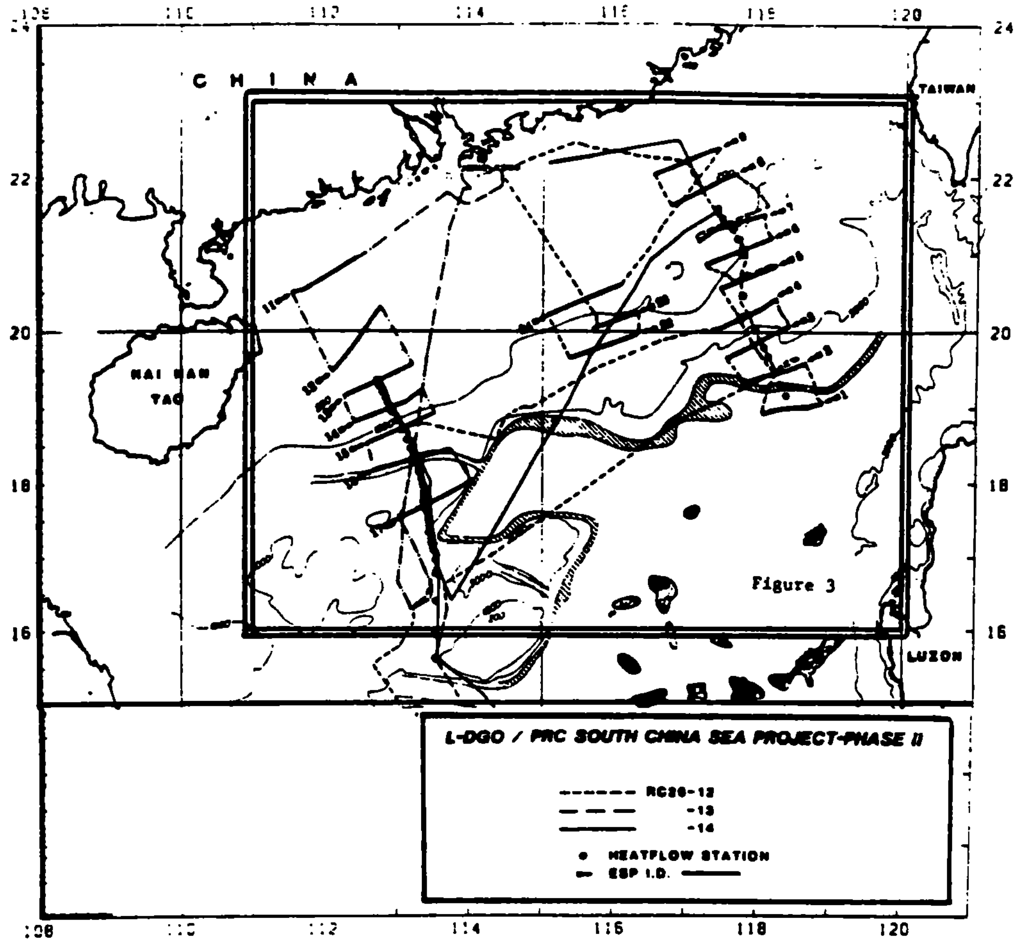


Figure 4. 1985 LDGO WACDP, ESP seismic and heat flow data across the northern rifted margin of the South China Sea.

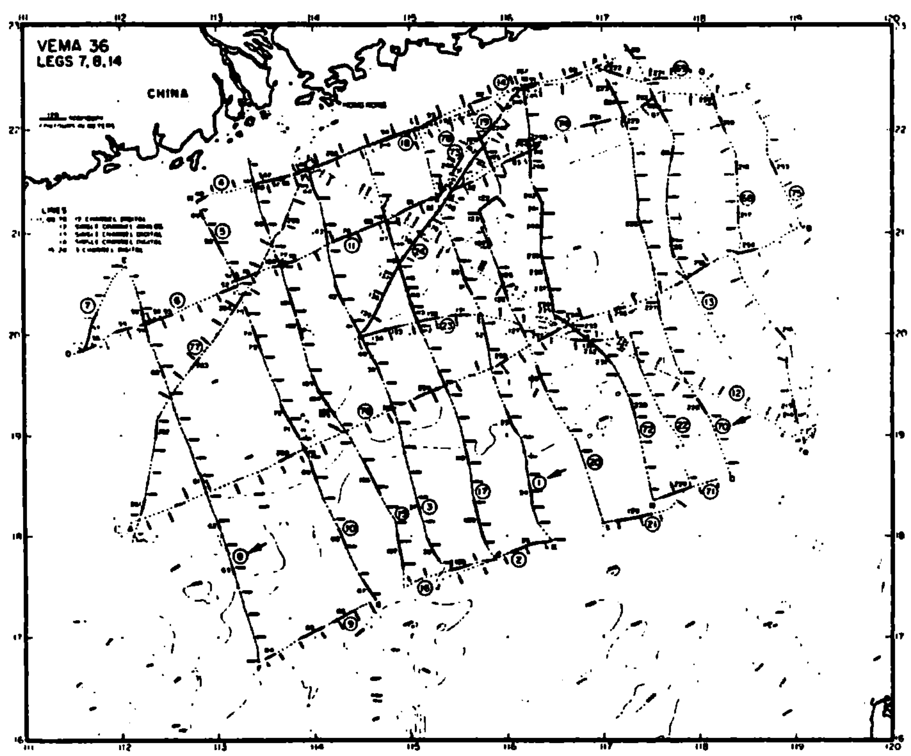


Figure 5. 1979-80 L-DGO MCS data across the northern rifted margin of the South China Sea.

THE BANDA, SULU, SOUTH CHINA SEAS TRANSECT

The Banda, Sulu, and South China Seas (Fig. 1A) preserve a history of sediment accumulation, volcanic activity, and deformation. Two very different kinds of processes may have led to the formation of these basins: entrapment of Mesozoic oceanic crust, or Paleogene-Neogene back-arc spreading. Drilling is intended to investigate the role of these processes, and to study the changing paleoenvironment of these basins during their tectonic evolution. (The Celebes Sea is another such basin whose origin and history are unknown but which has too thick a sedimentary cover and too little geophysical data at present on which to base a drilling program.)

The **Banda Sea** occupies a critical position in the complex convergent zone between Australia, SE Asia, and the Philippine Sea plate. Determination of the stratigraphies and basement ages of the Banda Sea will help to discriminate between different evolutionary models which have been proposed. If the basement is Mesozoic it could indicate entrapment of Indian Ocean crust; a Paleogene age might be viewed as trapped Philippine Sea crust; and a Neogene basement could be interpreted as the result of Banda backarc spreading. All of these possibilities and their paleoenvironmental consequences also will be investigated by studying the sediment history, and comparing these results with those in the Indian ocean (Argo abyssal plain) and the Philippine Sea. The possibility that both entrapment of Mesozoic ocean crust and Neogene rifting have occurred in the Banda Sea has influenced selection of the drilling sites.

The north and south Banda basins (Fig. 1D), attain water depths in excess of 5 km, have low average heat flow, and have up to 1 km of sediment cover, which suggests that they are trapped, older oceanic crust. The northeast part of the Banda Sea, however, has shallower water depths, thinner sediment cover, high heat flow, and complex NE trending ridges (Fig. 2C). Dredging of these ridges yielded continental margin rocks that may be correlated with those of northern Irian Jaya, Buru, Seram, or Timor. Geophysical studies of the ridges indicate that they are cut by a series of NE trending faults. The basins between the ridges, especially Lucipara basin, may be young rift basins, and drilling there could record their rift history.

The drilling program consists of sites in the north (BANDA 2) and south (BANDA 1) Banda basins and the Lucipara basin (BANDA 3) to determine the age and stratigraphic history of each region. Stratigraphy of the lower sections in the north and south Banda basins will test for similarity or difference in origin, and will be compared with the site in the Sulu sea, described below, as well as the Argo abyssal plain and the Philippine sea basin. The Neogene sections will provide a wealth of information on changes in paleoceanography as the Indian and Pacific ocean circulation systems were isolated, on the volcanic history of the eastern Sunda arc, and on the timing and history of rifting and emplacement of the ridges. The site in Lucipara basin (BANDA 3) may have the most complete Neogene sedimentary record because it is above the CCD. It will date the post-rifitng pelagic sequence and will attempt to sample basement. Preliminary predictions are a pelagic sequence overlying late middle Miocene ocean crust, or material similar to the Lucipara, Rama, and Sinta ridges (Fig. 2C).

A complex set of collision zones involving the Sulu volcanic arc, Cagayan Ridge, the ophiolites of SW Palawan, Panay, and Sabah, and the continental fragment terrane of NE Palawan, surrounds the **Sulu sea.** The SE part consists of undeformed oceanic crust, the presence of which has been interpreted in several ways:

1) The SE Sulu and Banda seas may be trapped Indian Ocean crust. Drilling SUL 5 in conjunction with the sites in the Banda sea could test this hypothesis. If it is correct, the stratigraphy of the basins should be similar prior to plate breakup. In addition, this oceanic crust could have been the source for the numerous Cretaceous ophiolitic complexes, incorporated into the Neogene orogenic belt exposed around the Sulu sea, and a direct comparison could be made between oceanic crust and ophiolites.

2) Alternatively, the SE Sulu sea may be a Neogene oceanic basin created by rifting and spreading during collision of the Cagayan Ridge with the continental margin of the South China Sea. The age of the initial stage of opening could be obtained by drilling site SUL 4 where pre-rift, syn-rift, and post-rift sequences should be present.

Paleoceanographic objectives in the Sulu sea are focused on the anoxic and suboxic sedimentary record known to exist in this silled marginal sea. Insights into the depositional and paleoceanographic evolution of the Sulu sea will have important implications for the interpretation of analogous Mesozoic and early Tertiary basins which evolved in a similar carbonate-rich equatorial setting.

The history of opening of the **South China sea** remains uncertain because the presently accepted age of spreading (32-17 Ma) is controlled mainly by magnetic anomalies which are often incompletely displayed in small basins. With our present state of knowledge, the most generally accepted view is that a pattern of E-trending anomalies (11-6) was followed in time by a young set trending N60E, suggesting a probable change in the the spreading regime. Does this timing correspond to a regional kinematic change occurring throughout the western Pacific? Drilling is necessary to establish the age and history of opening of the basin, including spreading reorganization and cessation at the axis of the basin. Drilling here and in the Sulu sea will also tell us how these processes are influenced by the initial collision of Palawan with the Philippine arc. Thus drilling in both the South China and Sulu seas can provide important constraints on the geodynamic evolution of this large area of the western Pacific region.

We propose two sites in the South China sea. One site is located in a thick sequence of pelagic sediments lying above the postulated E-trending magnetic anomaly 6, which predates the inferred reorganization of spreading. Anomaly 6 is easy to identify and its confirmation could be used to calibrate the magnetic pattern in the basin. The second site is located at the axis of the basin and, therefore, could provide the timing of cessation of spreading. This site will penetrate a few hundred meters of sediment before reaching basement, and a few days devoted to this problem should be sufficient to solve it.

EXISTING DATA BASE AND REQUIREMENTS

Abundant analog single channel seismic profiles have been taken in the Banda sea by a number of institutions, and a cruise is planned on the R/V Fred Moore during October 1987 to obtain digital single channel data in this region. The existing single channel data are sufficient to define the basement problems (where drilling could answer the questions of the age and origin of the basins), and the processed digital data will be used to establish regional stratigraphies and to imaging the structure of the Banda ridges.

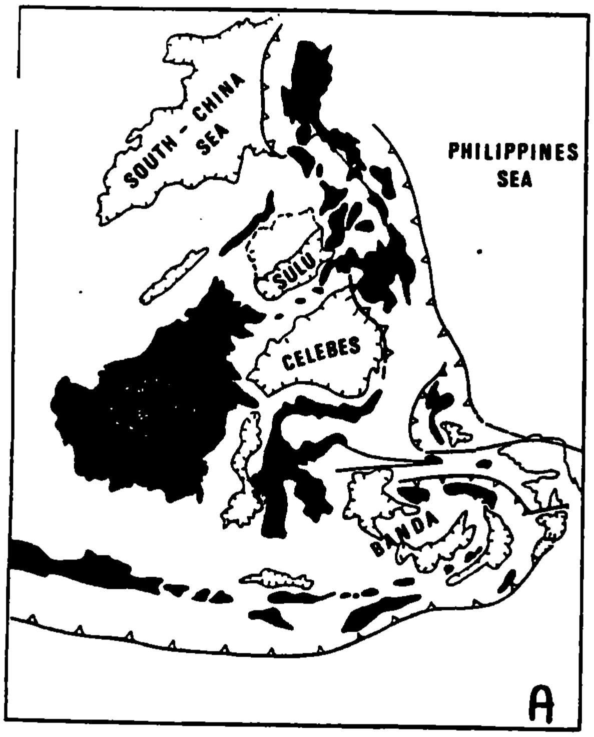
Abundant geophysical information is available for the Sulu sea, and these appear sufficient for site selection and interpretation. However, the Germans plan further multichannel studies in the Sulu sea and on its margins during Spring, 1987.

The south China sea also has abundant data, both on its margins and within the central part of the basin. SeaBeam has been used to map the postulated young rift within the basin.

SUMMARY OF PROPOSED BANDA SEA, SULU SEA, AND SOUTH CHINA SEA SITES

SITE #	LAT / LONG	WATER DEPTH	SEDIMENT THICKNESS	DRILLING DAYS	LOGGING DAYS	TOTAL DAYS
BNDA 1	6.5 S / 128.0 E	4600M	800M	10.8	1.8	12.6
	Assumed Lithology: Upper part: Mixture of pelagic and volcaniclastic sediments; Lower part: Nannoplankton ooze and claystone					
BNDA 2	4.4 S / 125.2 E	4800M	800M	10.8	2.3	13.1
	Assumed Lithology: Upper part: Pelagic ooze and mudstone; Lower part: Claystone and nannoplankton ooze					
BNDA 3	5.0 S / 127.0 E	3400M	500M	5.8	1.4	7.2
	Assumed Lithology: Pelagic ooze and mudstone					
Total Banda Sea Site Days						33
SUL 4	9.1 N / 125.4 E	3300M	550M	7.9	1.0	8.9
	Assumed Lithology: Upper part: Hemipelagic/pelagic mudstones / shale / ooze; Lower part: sand-silt-mudstones					
SUL 5	7.8 N / 121.2 E	4300M	1200M	16.6	2.1	18.7
	Assumed Lithology: Upper part: pelagic ooze / mud; Central part: mudstones / shales; Lower part: sand-silt-mudstone					
SCS 5	13.0 N / 113.7 E	4000M	200M	3.5	--	3.5
	Assumed Lithology: Upper part: pelagic ooze/mud; Lower part: sand-silt-mudstone					
SCS 9	16.25 N / 117.8 E	4200M	500M	7.1	1.6	8.7
	Assumed Lithology: Upper part: Hemipelagic / pelagic mudstones / shales / ooze; Lower part: sand-silt-mudstones					
Total Sulu - SCS site time						40

All sites are sediment sites. All plan to penetrate into basement to the extent of the life of a single bit.



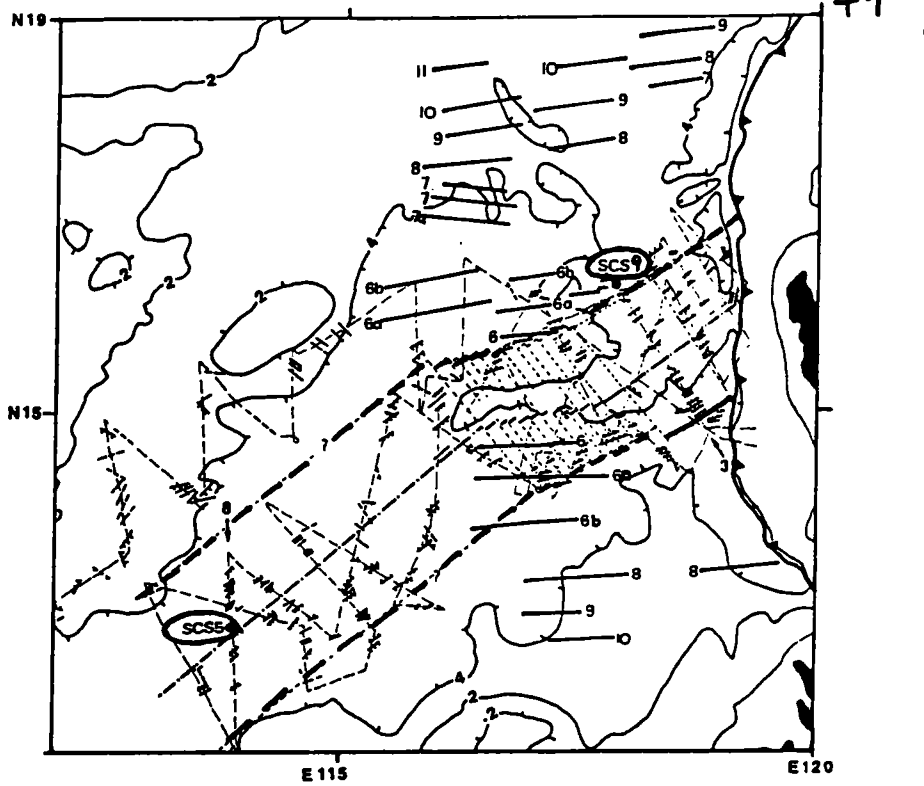
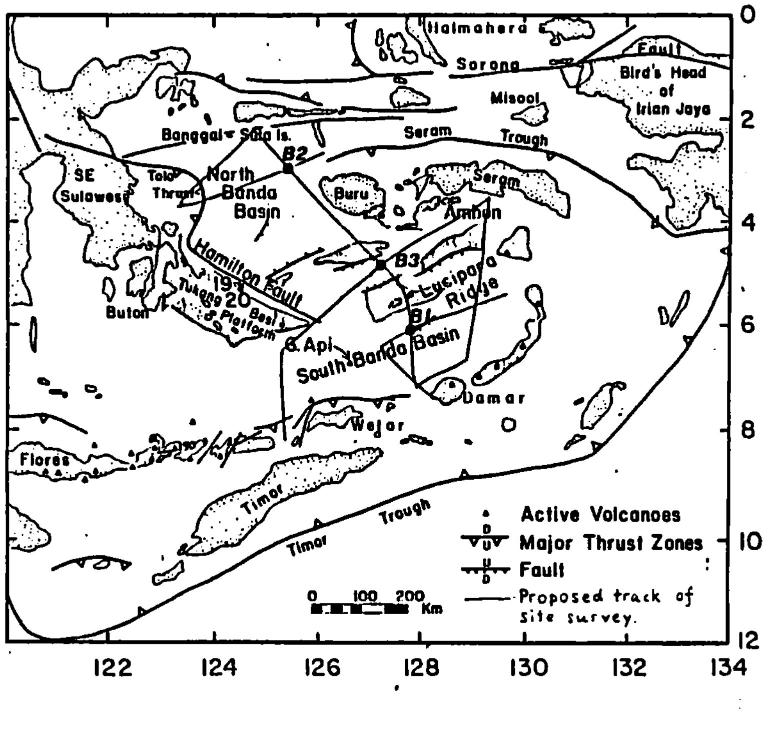


Fig. 2 Strikes and dips of major faults derived from combined analysis of seabeam and seismic reflection records. Dotted lines represent RV *Jean Charcot* profiles. Profiles 3 and 8 (Fig. 3) are indicated. Box B marks an area with denser seabeam coverage. Thin contours represent major seamounts (Scarborough chain). Thick dashed lines indicate outer limit of zone with predominant N50° E-trending scarps, and inferred transverse fault zones between 116 and 118° E. Dash-dot line outlines probable location of spreading axis.

B



D

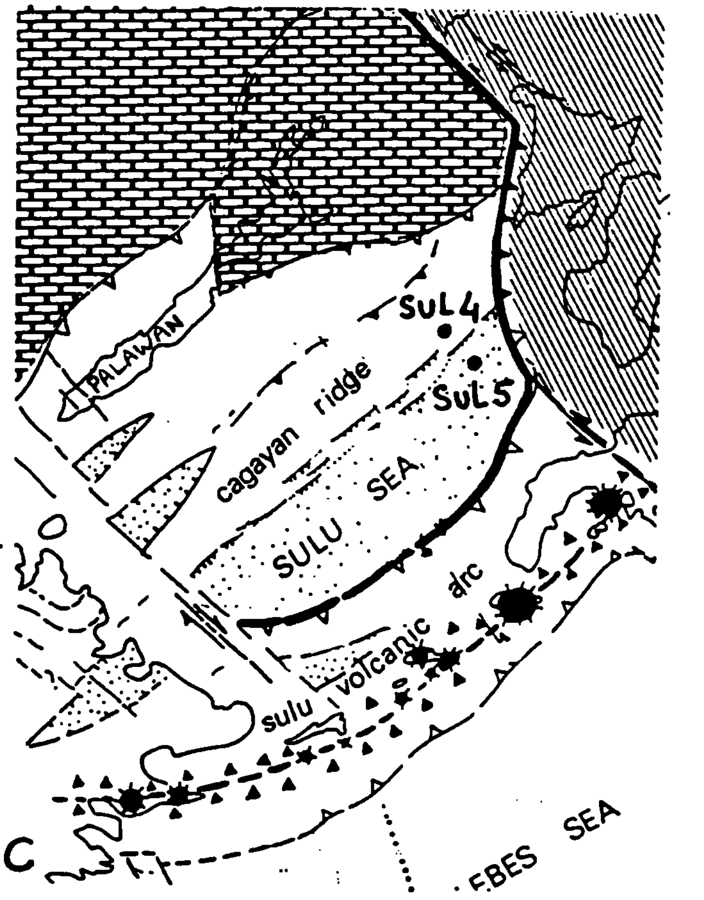


Fig. 1 : A : location map ; B : South China Sea axis showing N60E fault scarps, and out of axis N80E magnetic anomalies ; C : Sulu Sea oceanic crust ; oceanic crust of SE Sulu basin and coeval secondary basins are shown by dots. D : structural sketch map of the Banda basin.

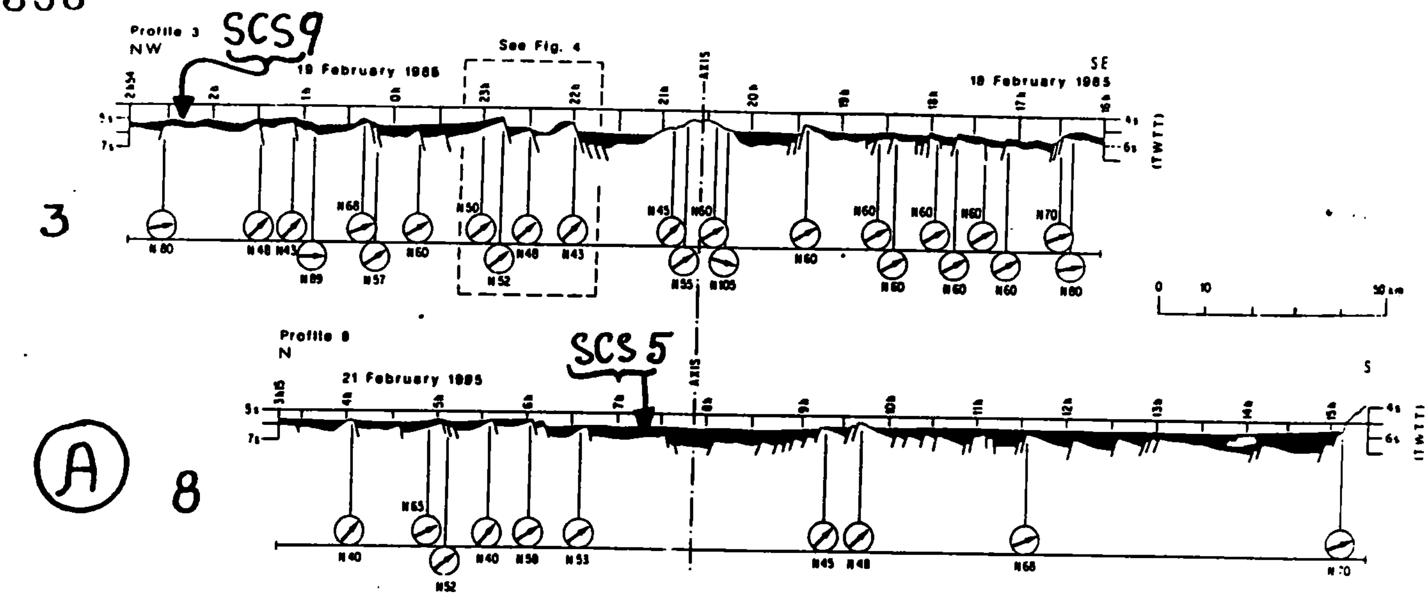
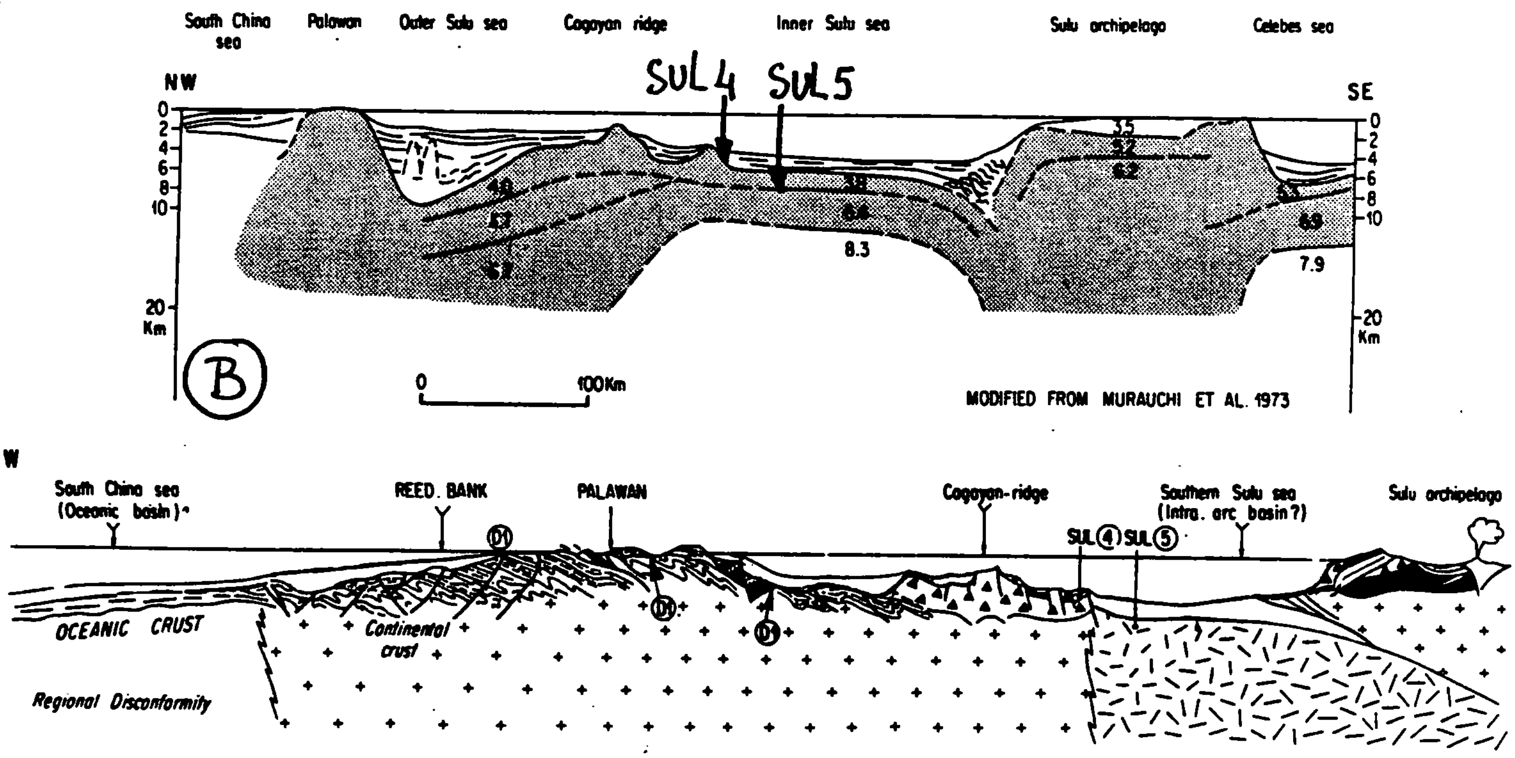


Fig. 3 Schematic sections drawn from single-channel seismic profiles 3 and 8 (sediment cover in black), and orientation of fault scarps (arrows) seen on corresponding seabeam records. TWTT, two-way travel time.



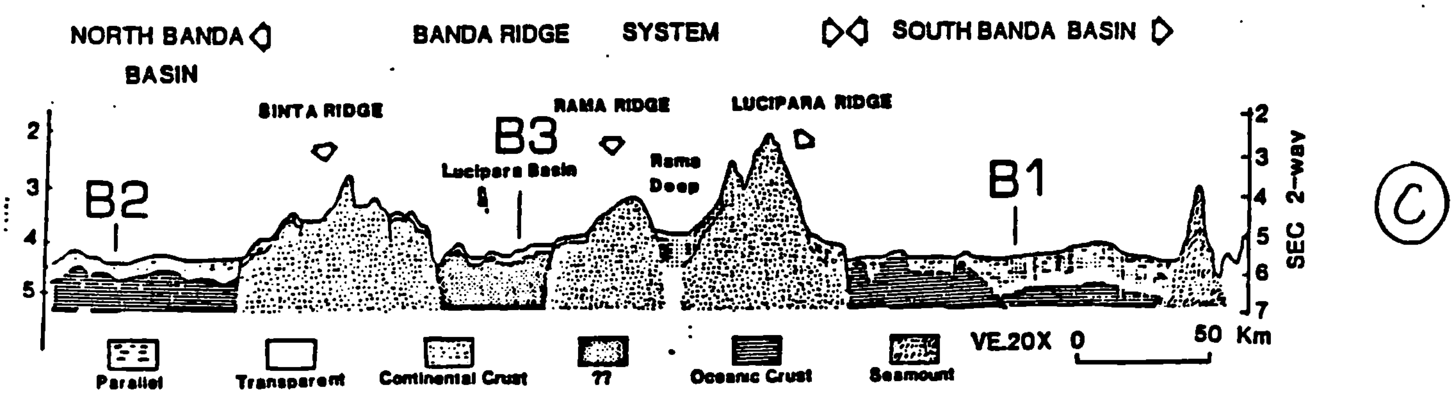


Fig. 2 : Cross section of South China Sea (A) ; Sulu Sea (B) and Banda Sea (C).

Summary of Drilling Objectives for the Eastern Sunda Arc-Continent Collision Zone

TECTONIC SETTING

The collision between the Australian continent and the eastern Sunda arc has progressed to the stage where continental margin crust underlies the forearc in the western part, near Sumba island, and continental crust underlies the forearc beneath Timor island (Fig. 1). The young collision is associated with significant uplift of both accretionay wedge (exposed as the islands of Sawu, Timor, and others around the Banda arc to Serám) and forearc basement (exposed on Sumba island), backthrusting of the wedge over the forearc basin, and backarc thrusting along the north of slope of the arc. Backthrusting of accretionary wedge material over the forearc basin is observed in a number of convergent zones, both collisional and non-collisional, such as the Barbados accretionary complex, the Mediterannean ridge, Nias island in western Indonesia, the Ladakh region of the Himalayas, Taiwan, northern Panama, northern Venezuela, and southern Hispaniola. We are concerned with the sequence and magnitude of backthrusting and backarc thrusting, and the processes responsible for uplift of the forearc.

We hypothesize that collision will reactivate or initiate backthrusting between the accretionary wedge and the forearc basin, and geophysical data in the eastern Sunda arc tend to support this contention. We wish to date the inception of backarc thrusting, to compare with backthrusting within the forearc. We also propose to test whether the uplift of Sumba results from crustal duplexing, the passage of a marginal plateau, or the docking of a microcontinent, or whether it results from deformation within the backstop. These alternatives should show different uplift histories on the Sumba ridge.

PROPOSED DRILLING PROGRAM

The proposed drilling program (Figures 2-5) includes:

1) Drilling just behind the thrust in the forearc basin province (sites S1 and T1). This should provide data on the vertical motions of the forearc associated with backthrusting, which we predict to be negative (subsidence). Sites S1 and T1 will be additionally affected by the uplift of the Sumba ridge and the eastern counterpart of the Kisar ridge. These sites will provide stratigraphic data on the history of volcanism of the arc and its relation to forearc and backarc tectonism. They will also provide definitive tests of the basement rocks of the forearc and their relationship with thrust sheets on Timor and Sawu islands. Finally, the sites will give detailed histories of the uplift of Timor and Sawu islands, which are closely tied to collision by the Australian continental margin. Presently available geophysical data are adequate to define the locations of suitable sites for these objectives, but further MCS work is planned for 1987.

2) Drilling on the accretionary wedge near the backthrust (sites S2 and T2) will test whether forearc basin and basement material are incorporated into the rear of the accretionary wedge. We feel that it will also provide data on the timing of initiation of accretion at the toe of the wedge, based on results of physical modeling and interpretation of seismic data from other regions. Existing seismic data are not sufficiently good to define final sites, however, and these sites will depend on obtaining high

quality seismic reflection data.

3) Drilling on the Sumba ridge will allow us to distinguish several different models for the uplift of the forearc basement. One or more episodes of rapid uplift would be consistent with an origin by crustal duplexing beneath the Sumba ridge. Slow, steady uplift would suggest sediment duplexing at depth, continual deformation of the backstop, or slow changes in the thermal regime beneath the forearc. Rapid uplift followed by subsidence would support a model of subduction of a small marginal plateau. Docking of a microcontinent should not necessarily require vertical movement, but sutures should be evident on the margins of such a block.

4) Drilling beyond the toe (F1) and at the rear (F2) of the small accretionary wedge in the zone of back arc thrusting behind the island of Flores (Figs. 2 and 4) is designed to determine the age of initiation of backarc thrusting by two methods. The first is by dating the oldest accreted material in the rear of the wedge at F2, and the second is by determining the history of vertical motions of the lower plate (F1). We will use these results to establish coupling between the collisional effects in the forearc to those in the backarc, and we will address the question of whether or not backthrusting and backarc thrusting are sequential phenomena.

Existing Geophysical Data and Proposed MCS Survey

Most of the existing (available) geophysical data in the Sunda arc region are summarized in Figure 6. These data are of variable quality, ranging from single channel analog seismic reflection data to 24 channel, small source multichannel seismic data. The latter are all industry reconnaissance data, most of which have had only preliminary processing. Our best data are large source (550 and 1100 in^3) air-gun lines that were acquired digitally and processed through migration (Fig. 3 is a good example). We have proposed a large source 96-channel seismic survey for 1987 (Fig. 5) as a field experiment in preparation for the drilling program proposed here. That survey would provide a foundation for the drilling program, and the multitude of data shown in Figure 6 could be used for precise site definition and safety evaluation.

SUMMARY OF PROPOSED SITES (Includes Logging Times)

SITE #	LAT (S) LONG (E)	DEPTH	PENETRATION	DRILLING DAYS	LOGGING DAYS	TOTAL DAYS
S1	10.3 S 121.2 E	1500m	1000m	5.2	1.9	7.1
S2	10.7 S 121.0 E	1100m	800m	5.1	2.3	7.4
S3	10.1 S 121.3 E	750m	1100m	6.4	1.7	8.1
F1	7.7 S 120.2 E	4900m	800m	10.7	1.8	12.5
F2	8.0 S 120.2 E	4000m	1000m	11.7	2.7	14.4
TOTAL TIME FOR SITES S1, S2, S3, F1, F2						**49.5 DAYS**
ALTERNATE SITES						
T1	8.0 S 128.2 E	2500m	600m	5.5	1.7	7.2
T2	8.1 S 128.2 E	2250m	700m	6.0	1.4	7.4
TOTAL TIME FOR ALTERNATE SITES T1, T2						**14.6 DAYS**

Estimated site lithologies

S1	0 - 450 m	Distal Turbidites
	450 - 700 m	Pelagic carbonates
	700 - 1000 m	Pre-Tertiary Forearc basement
S2	0 - 800 m	Imbricated thrust blocks and scaley clay matrix
S3	0 - 500 m	Hemipelagic slope facies and uplifted distal turbidite facies
	500 - 800 m	Upper Miocene pelagic sediments
	800 - 1100	Lower Tertiary clastic and volcanic rocks
F1	0 - 200 m	Distal Turbidite facies
	200 - 800 m	Interbedded pelagic and carbonate clastic facies
F2	0 - 200 m	Slope basin strata; possibly volcaniclastic
	200 - 1000 m	Backthrust accretionary wedge material; interbedded pelagics and volcaniclastics
T1	0 - 400 m	Slope basin; interbedded volcaniclastic and clastic facies
	400 - 600 m	Forearc basement rocks
T2	0 - 450 m	Slope basin; may be similar to upper part of T1
	450 - 700 m	Deformed accretionary wedge and forearc basin material

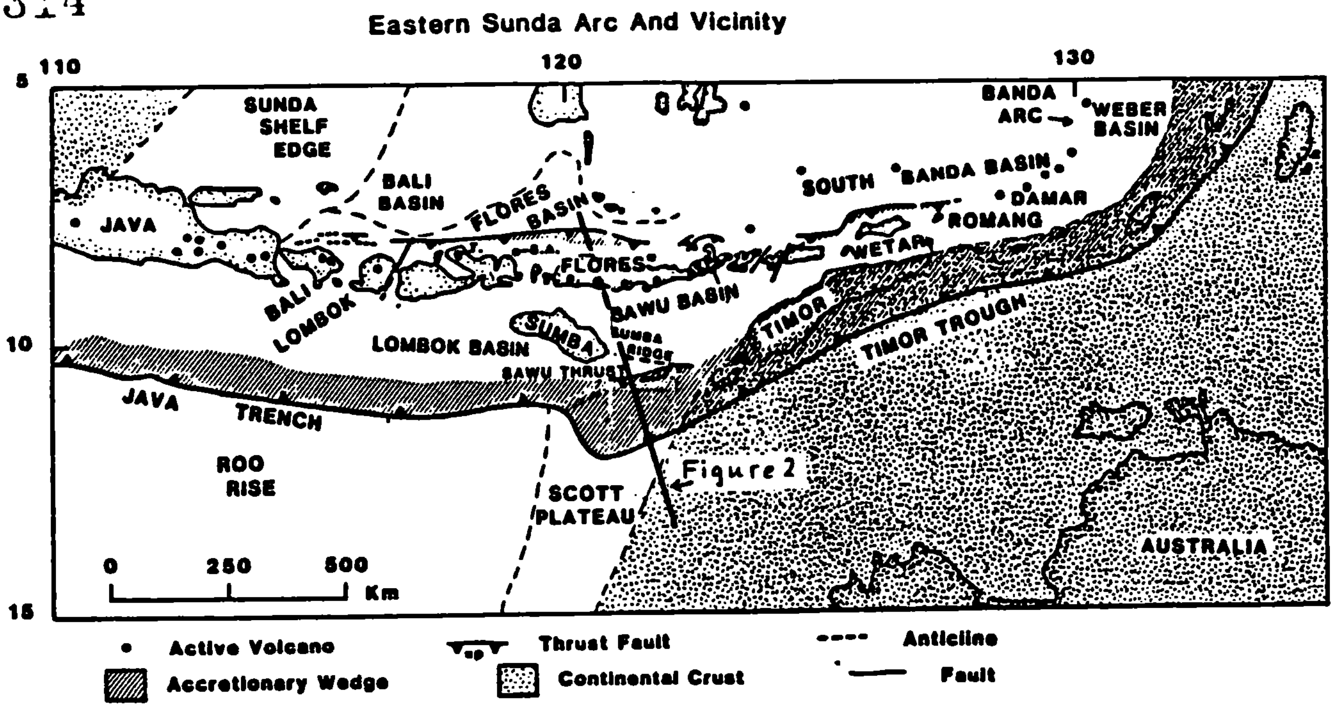


Figure 1. Map of the eastern Sunda arc region, showing locations of the major geographic features and of Figure 2.

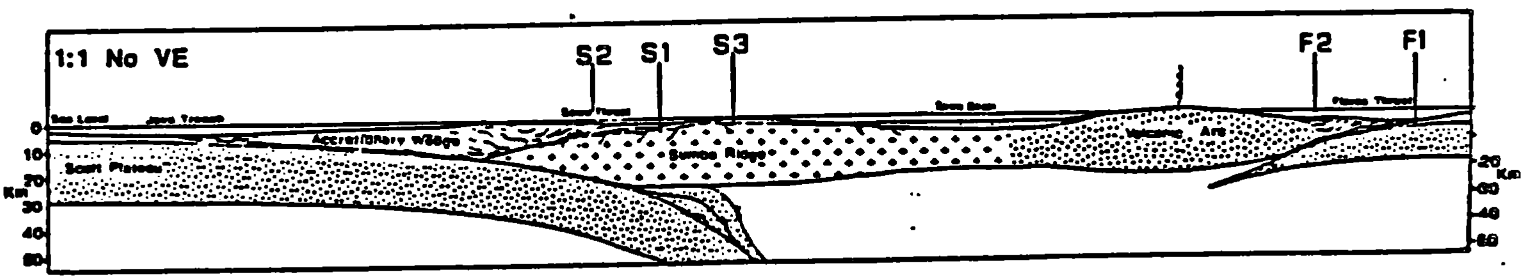
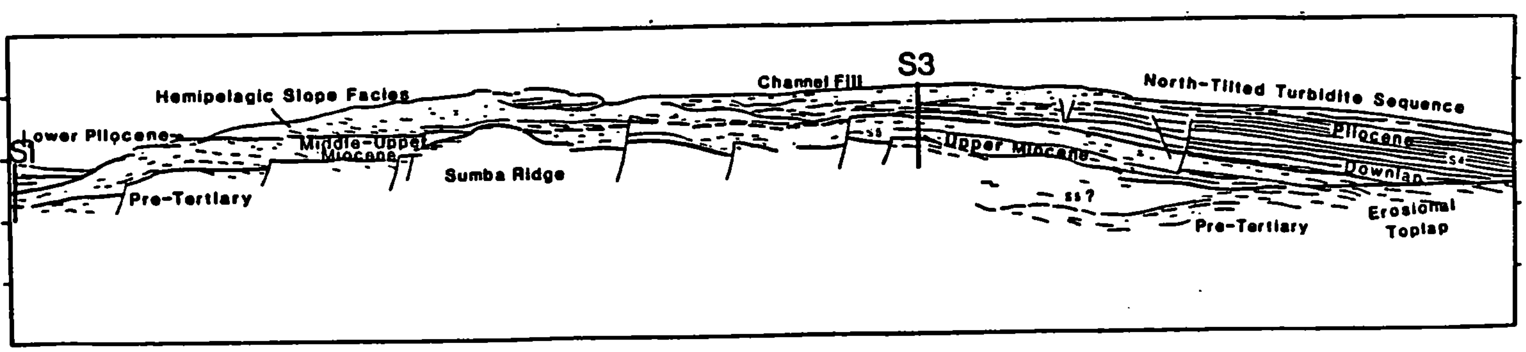


Figure 2. Interpreted crustal cross section across the eastern Sunda arc system, shown with no vertical exaggeration. Shown also are proposed drill sites S1, S2, S3, F1, and F2. Note hypothetical crustal duplex beneath S1 and S3.



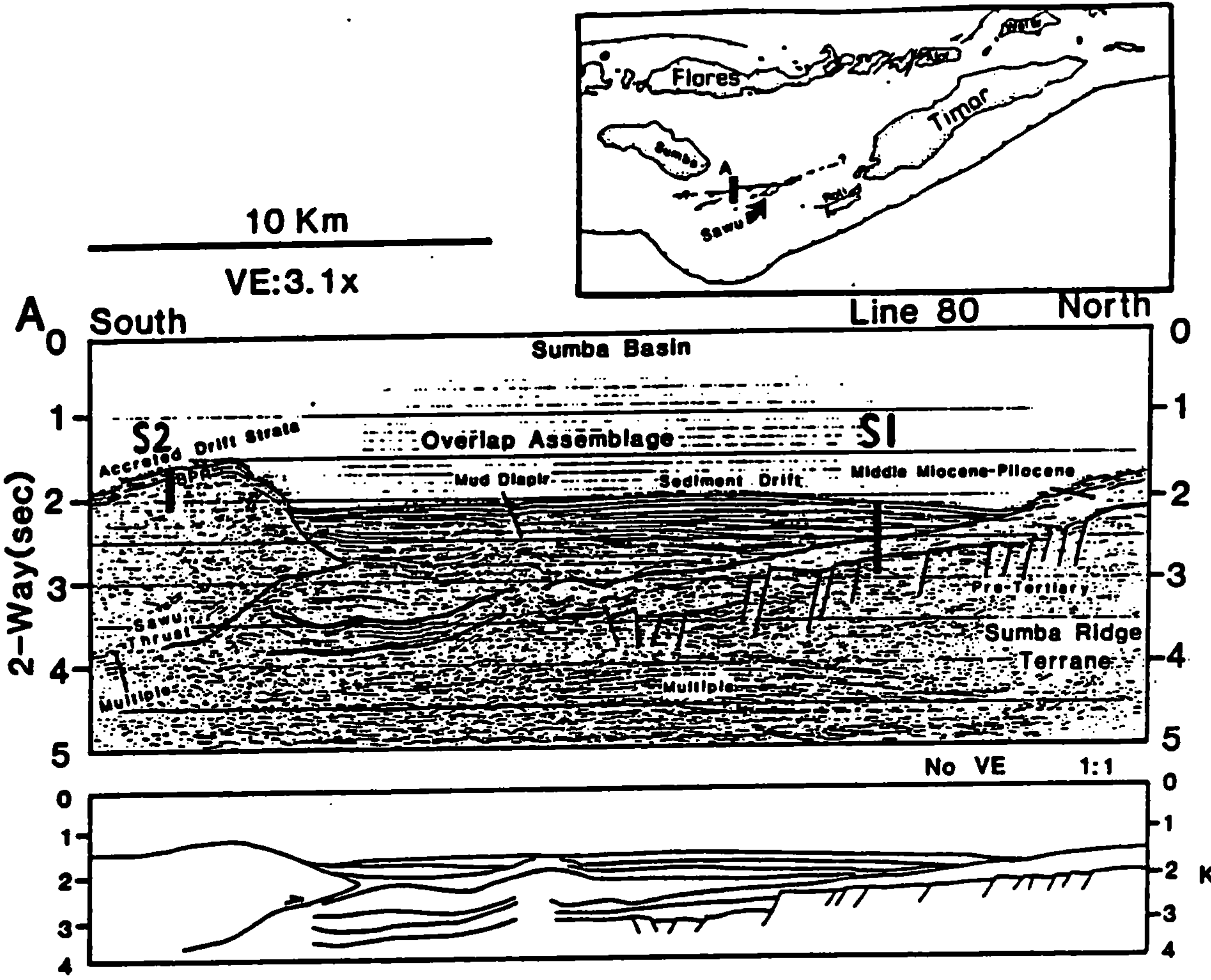


Figure 3. Migrated, digital single channel seismic profile across the Sawu thrust (modified from Reed et al., 1986), between Sawu and Sumba islands. Inset shows locations of profile and of Sawu island. Preliminary proposed drilling sites S1 and S2 shown also.

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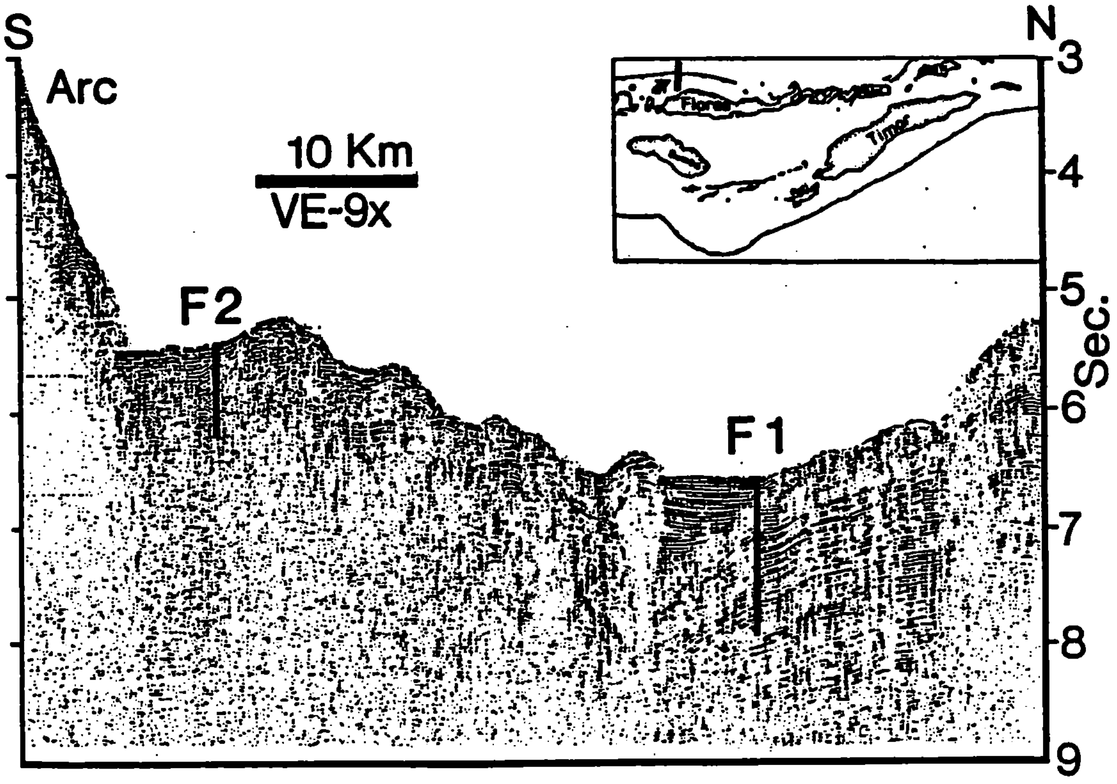


Figure 4. Seismic profile across the backarc thrust belt north of Flores Island, eastern Indonesia (see inset for location). Loactions of proposed drilling sites F1 and F2 shown also.

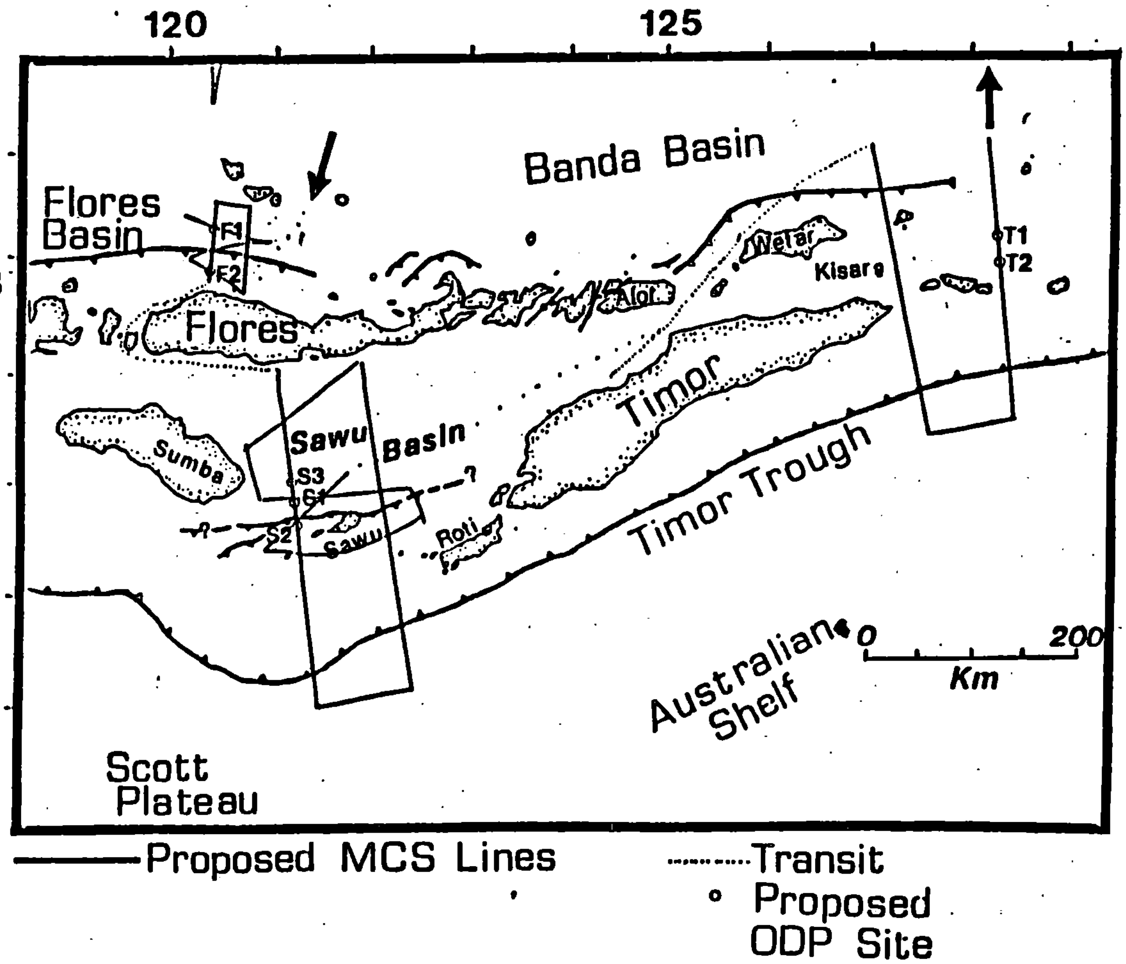


Figure 5. Map of eastern Sunda arc region, showing locations of proposed multichannel seismic profiles and proposed drilling sites.

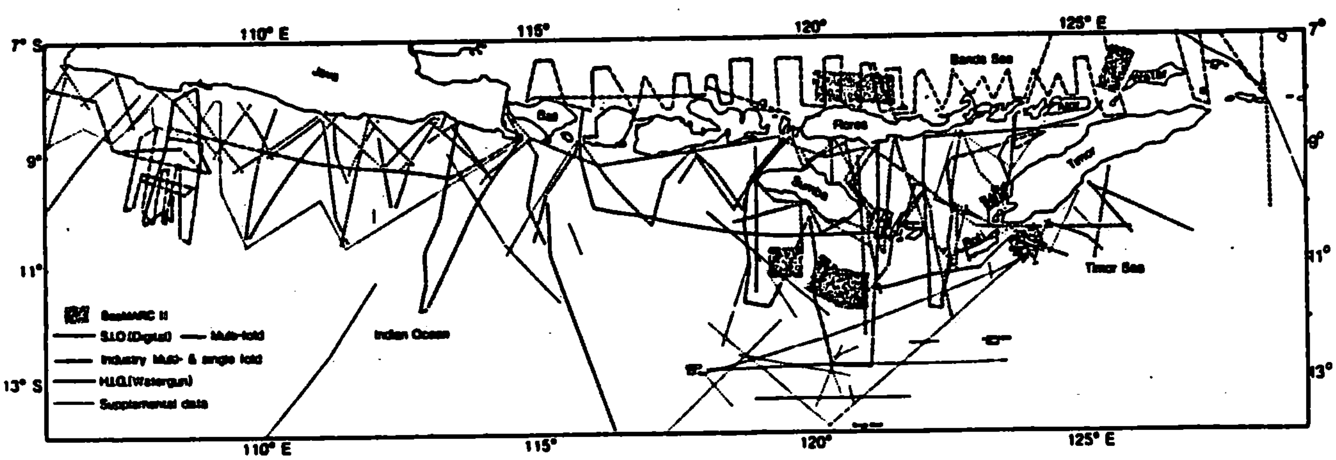


Figure 6. Locations of geophysical tracks in the eastern Sunda arc region. Specific cruises and sources are explained at lower left of diagram. Shaded regions showing SeaMARC II coverage also contain seismic profiles at a spacing too close to resolve in this figure.

Great Barrier Reef - Queensland Trough
ODP Leg Summary

The Great Barrier Reef - Queensland Trough province is composed of mixed reefal carbonate/siliciclastic shelf sediment thought to be principally controlled by climate, and relative sea level. During periods of low sea level, deltaic progradation occurred at the shelf edge accompanied by fan deposition on the mid- and lower slope. The oldest sedimentary sequences beneath the shelf occur eastwards of a major fault zone lying beneath the middle shelf, and forming the western boundary of the Queensland trough rift basin. An interpreted basal Late Cretaceous rift-fill sequence containing volcanics is overlain by a marine onlap facies interpreted to be Paleocene to Late Eocene in age. These strata are in turn overlain by oblique, complex sigmoid-oblique and sigmoid progradational facies of probable Late Oligocene, Late Miocene, and Plio-Pleistocene ages (Symonds, 1983).

Along the Central Great Barrier Reef continental margin, reef facies was established during the Pleistocene. The reefs grew on siliciclastic fluviatile and deltaic sediments during periods of high sea level, and were subaerially eroded during the intervening periods of low sea level. There is clear latitudinal variation in the nature and timing of reef growth. The reef is thicker in the north and has a multi-phase growth. In addition, side scan sonar profiles of the upper slope of the Great Barrier Reef have identified shelf parallel drowned reefs which are, apparently, low sea level analogues of the present outer barrier (P. Davies, written pers. comm., 1986). The earliest reef growth in the region probably began on basement highs on the Queensland Plateau in the Early to Middle Eocene (Pinchin and Hudspeth, 1975) although some consider that reef growth did not commence until the Late Oligocene and Early Miocene following stabilization of an equational circulation pattern (Taylor and Falvey, 1977). Reef growth today covers almost one-quarter of surface of the Queensland Plateau and the areas of buried reefs indicate this may have been even greater in the past.

In the Queensland Trough distinct seismic packages are identified and tied to major sea level oscillations. The eastern margin of the Queensland Trough is carbonate dominated and sediments have two sources: reef derived material from the Plateau area and planktonic material. Dredging of a series of seamount-like features in the Trough at depths down to 1200 m indicate a shallow water reefal origin for the seamounts and rapid subsidence rates (Plio-Pleistocene rates of 100-500 m per MY) for the Queensland Trough (P. Davies, written pers. comm., 1986).

The Great Barrier Reef area is an excellent example of a mixed carbonate/siliciclastic province in a passive margin setting. This area can provide important facies and stratigraphic models for understanding ocean history, the evolution of passive margins and ancient carbonate depositional systems.

The Great Barrier Reef is also a natural laboratory for studying the depositional and diagenetic environment of host rocks for ancient stratabound Mississppi Valley-type lead-zinc ores in carbonate rocks. By drilling the Queensland Trough, fore-reef slope and fore-reef edge, benchmark data can be acquired on rocks, minerals and fluids in a modern reef environment for comparison with similar data on ancient land-based mineral districts which will assist exploration geologists in recognizing ore-related phenomena. Specifically useful information which can be obtained only by drilling are early carbonate diagenesis, chemistry of pore fluids and H_2S generation in the reef, aquifer hydrodynamics in the siliciclastics underlying the fore-reef slope and sedimentary geochemistry of metals in the basinal source region.

The following objectives have been identified and would be addressed by ODP drilling on the slope of the Great Barrier Reef and in Queensland Trough:

(1) Sea level controls on sedimentation,
(2) the effect of plate motions and subsidence cycles on sedimentation and paleoceanography,
(3) an understanding of tectonic cycles in relation to sea level cycles.
(4) changes in paleoclimate related to plate position and the effect on sedimentation.
(5) slope/basin sedimentation - fans and lowstand deposits.
(6) basin fill history,
(7) Late Paleogene-Neogene paleoceanography.
(8) diagenetic history in a stratigraphic framework, and
(9) comparison of the history of a continental margin and an isolated plateau (Queensland Plateau).
(10) diagenesis of mixed carbonate/siliciclastic and pure carbonate sequences under an undersaturated ocean regime significantly different to that in the Carribean and Indian Ocean.
(11) depositional and diagenetic environment of carbonates which are comparable to host rocks for ancient lead-zinc orebodies.

In addition, a transect in this region would be able to be tied to a shallow-water continental shelf program, which the Australian Bureau of Mineral Resources has undertaken.

The immediate goal is a transect of eight holes. One hole would be in the slope area to drill the paleoshelf deposits and toe-of-slope carbonate detritus (NEA1). One hole would be at the paleoshelf margin for sediment history and slope deposition (NEA2). Two holes would be located to drill the toe-of-slope to basin transition, and the older Queensland Trough sediments (NEA3, 4). A fifth hole would be drilled in the central Trough for a basinal reference section, paleoceanography, and basin history (NEA5). Two holes are located on the southwestern margin of the Queensland Plateau to investigate the subsidence history of the Plateau and the periplatform sediment cycles (NEA9, 10). A final hole (NEA12) will test the older Tertiary depositional sequences to complete the basin fill history.

For holes NEA 1, 2, 3, 4, 5, 9 and 10, the total drilling and logging time is 39.5 days. If site NEA 2 is deepened to 800 m as SOHP has suggested, than the total drilling and logging time is 44.5 days. If site 12 is defined as the "deep" stratigraphic test, then the total drilling and logging time is 54 days.

References

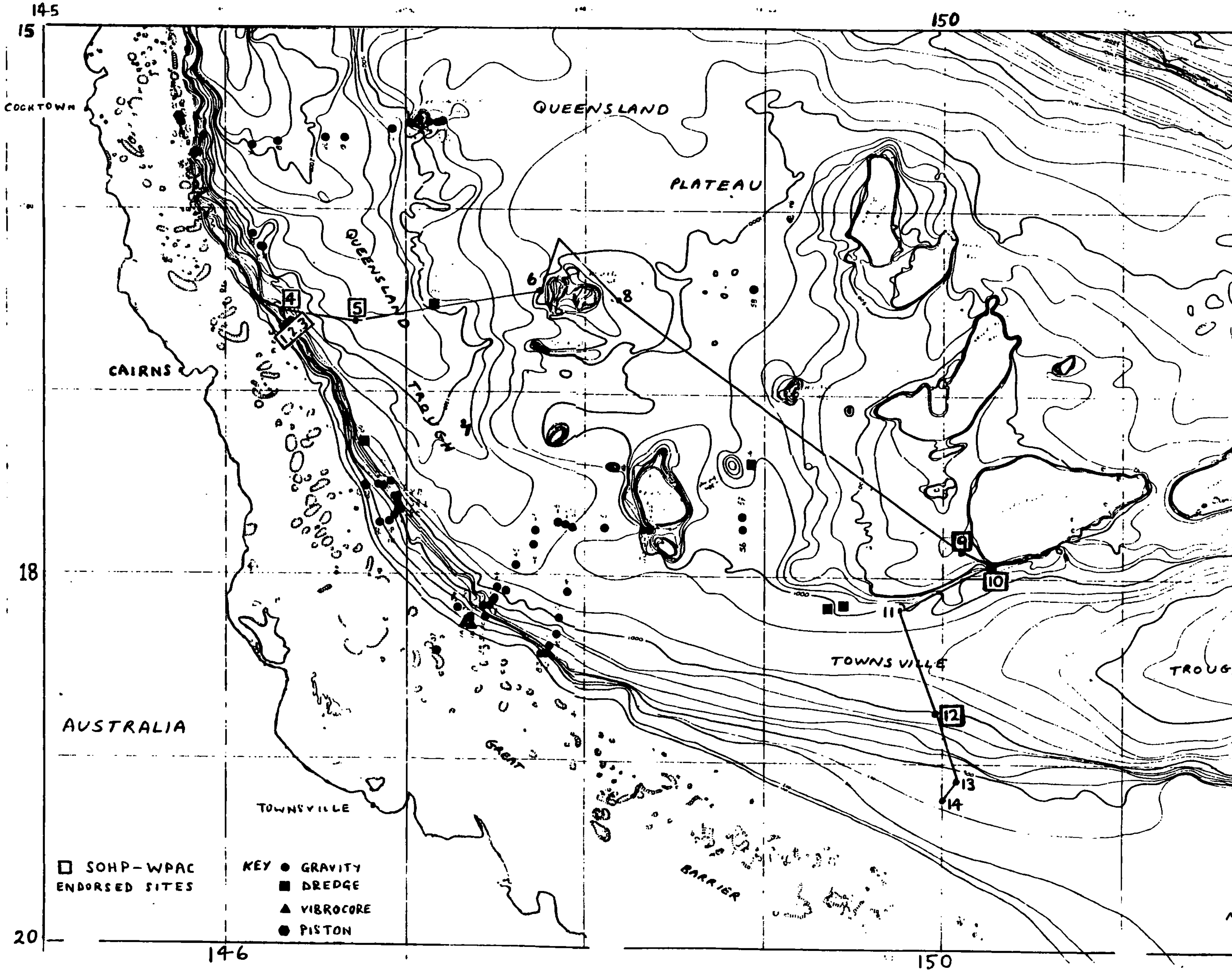
Pinchin J. and Hudspeth, J. W., 1975, The Queensland Trough - its petroleum potential based on some recent geophysical results: APEA Jour., v. 15, p. 21-31.

Symonds, P. A., 1983, Relation between continental shelf and margin development - central and northern Great Barrier Reef; in, Baker, J. T. et et. (eds.), Proc. Great Barrier Reef

Taylor, L. W. H., and Falvey, D. A., 1977, Queensland Plateau and Coral Sea Basin - Stratigraphy, structure and tectonics: APEA Jour., v. 17, p.13-29.

Site Name	Hole Type	Location	W.D. (m)	Penetration (m)	E.D.T. Days	E.L.T. Days	Transit Days	Expected Lithology	Assumed Av. Penetration rate m/hr
NEA1	APC/XCB	16° 38.7'S 146° 18.5'E	218	500	2.6	1.0		Siliciclastics with one 50 m bed of carbonates	20
NEA2	APC/XCB	16° 38.2'S 146° 18.5'E	285	800	3.5	1.4		As above	20
NEA3	APC/XCB	16° 37.5'S 146° 19.2'E	412	300	2.0	0.9		Siliciclastics	20
NEA4	APC/XCB	16° 26'S 146° 14'E	956	450	2.2	1.2		Siliciclastics	20
NEA5	APC/XCB (800) RCB (100)	16° 37'S 146° 44'E	1620	900	8.5-12.5	1.5		Mixed siliciclastic and pelagic carbonates	20 (800) 10
NEA6	APC/XCB	16° 27'S 147° 46'E	1050	300	2.5	0.9		As above	10
NEA7	APC/XCB (300) RCB	17° 09'S 147° 19'E	1450	760	9 - 10.3	1.3		Carbonates	20 5 (mounds)
NEA8	APC/XCB	16° 30'S 148° 11'E	1000	300	2.0	0.9		periplatform ooze	20
NEA9	APC/XCB	17° 52'S 150° 07'E	400	300	2.0	0.9		periplatform ooze	20
NEA10	APC/XCB RCB	17° 55'S 150° 15'E	487	250	9.0	0.8	28 hrs	carbonates	2
NEA11	RCB	18° 8.6'S 149° 46.2'E	990	750	8.5-10.0	1.3		pelagic and reef to bank carbonates	20 (p) 5 (r&b)
NEA12	RCB	18° 44'S 149° 58.8'E	915	1000	9-13	1.5		mixed siliclastics and carbonates	20
NEA13	APC/XCB RCB	19° 11'S 150° 0.5'E	420	400	5-6	0.9		pelagics over ?reef/bank carbonates	20 (p) 5 (r&b)
NEA14	APC/XCB RCB	19° 11'S 150° 01'E	420	350	5-6	0.9		pelagic over ?reef/bank carbonates	20 (p) 5 (r&b)
						Total	38 hrs @ 10 kts		

WPAC followed SOHP's recommendations to drill sites 1-5, 9, 10, 12 which total 45 to 53 days drilling & logging.


145
150
15
COCKTOWN
QUEENSLAND
PLATEAU
QUEENSLAND
TROUGH
CAIRNS
4
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18
TOWNSVILLE
TROUGH
AUSTRALIA
GREAT
BARRIER
TOWNSVILLE
□ SOHP-WPAC
ENDORSED SITES
KEY ● GRAVITY
■ DREDGE
▲ VIBROCORE
● PISTON
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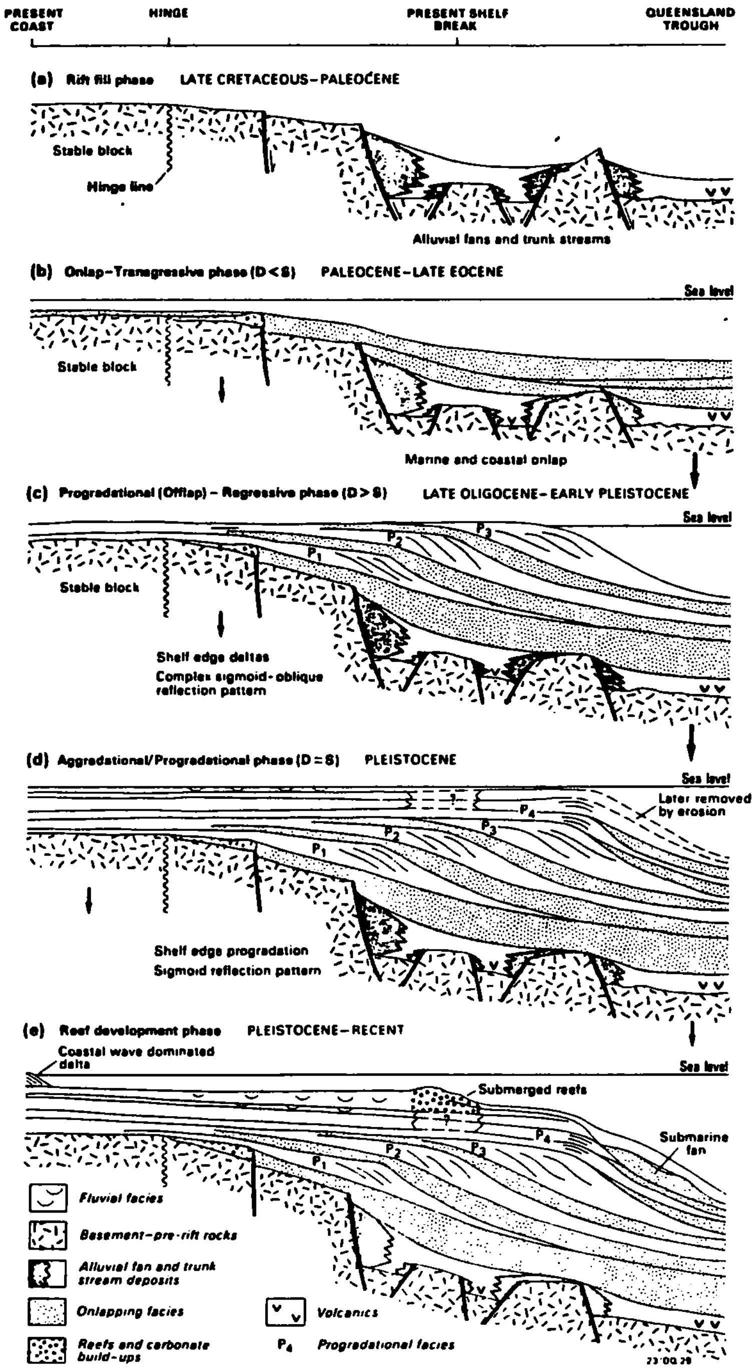
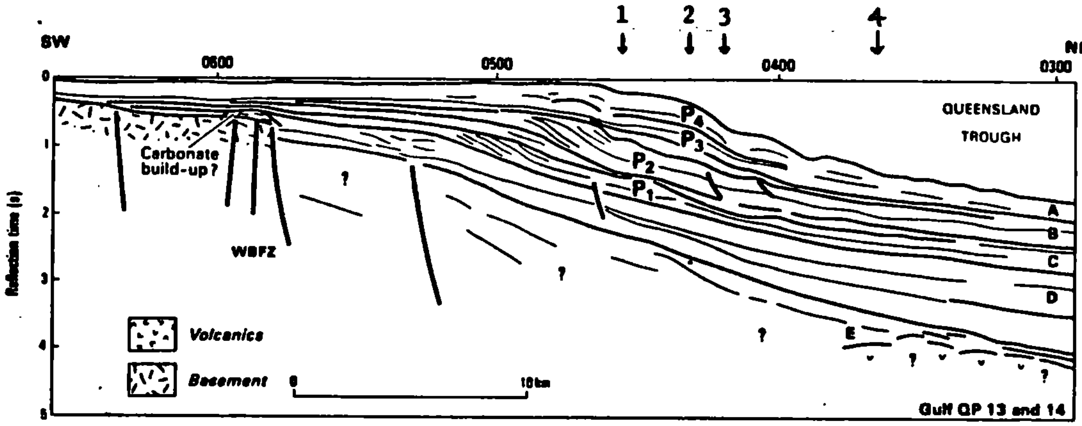
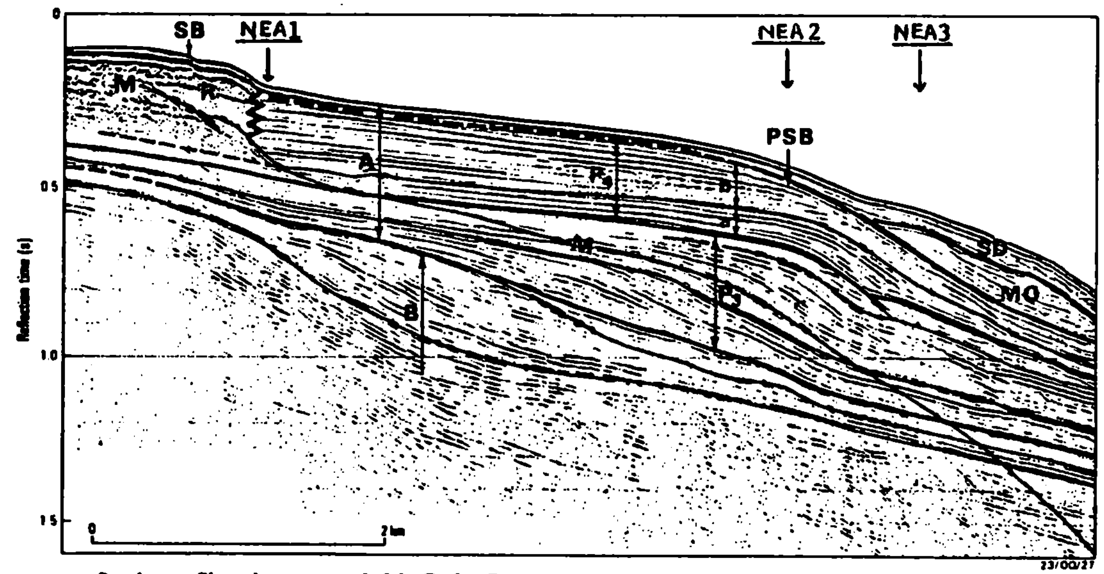


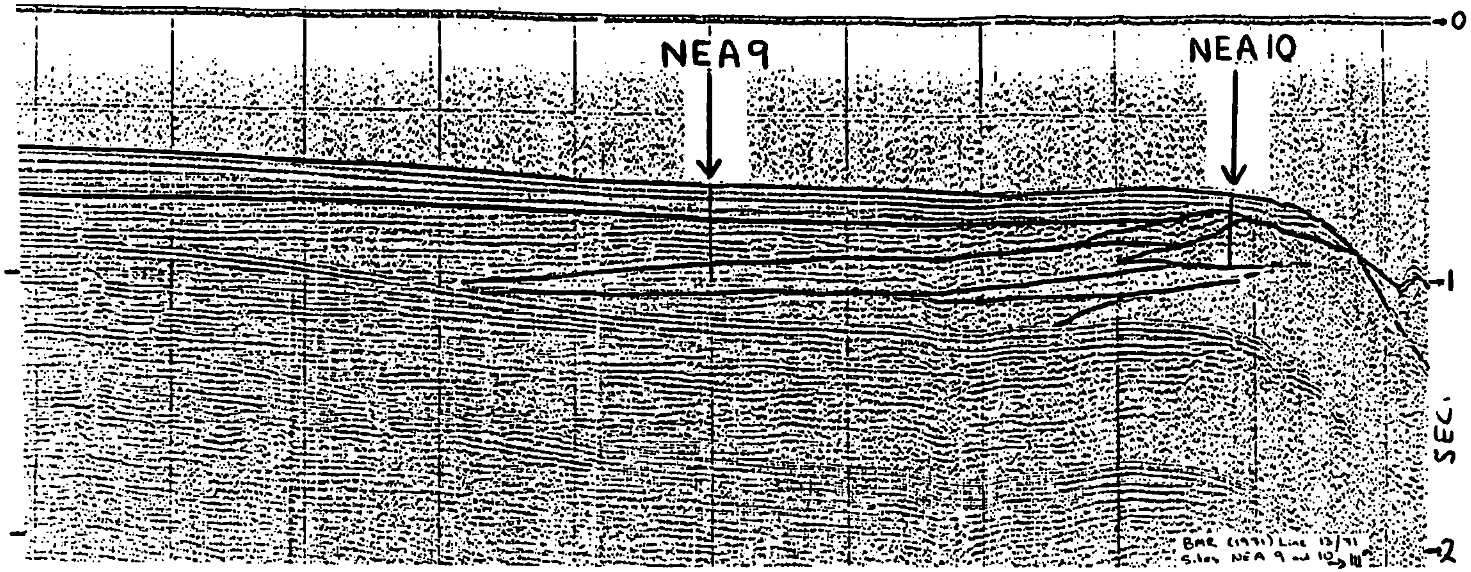
Conceptual evolutionary scheme for the development of the continental shelf in the central Great Barrier Reef Province.
D and S indicate the relationship between deposition (sediment supply) and subsidence (relative rise in sea level). The vertical arrows indicate the relative amounts of subsidence across the area.

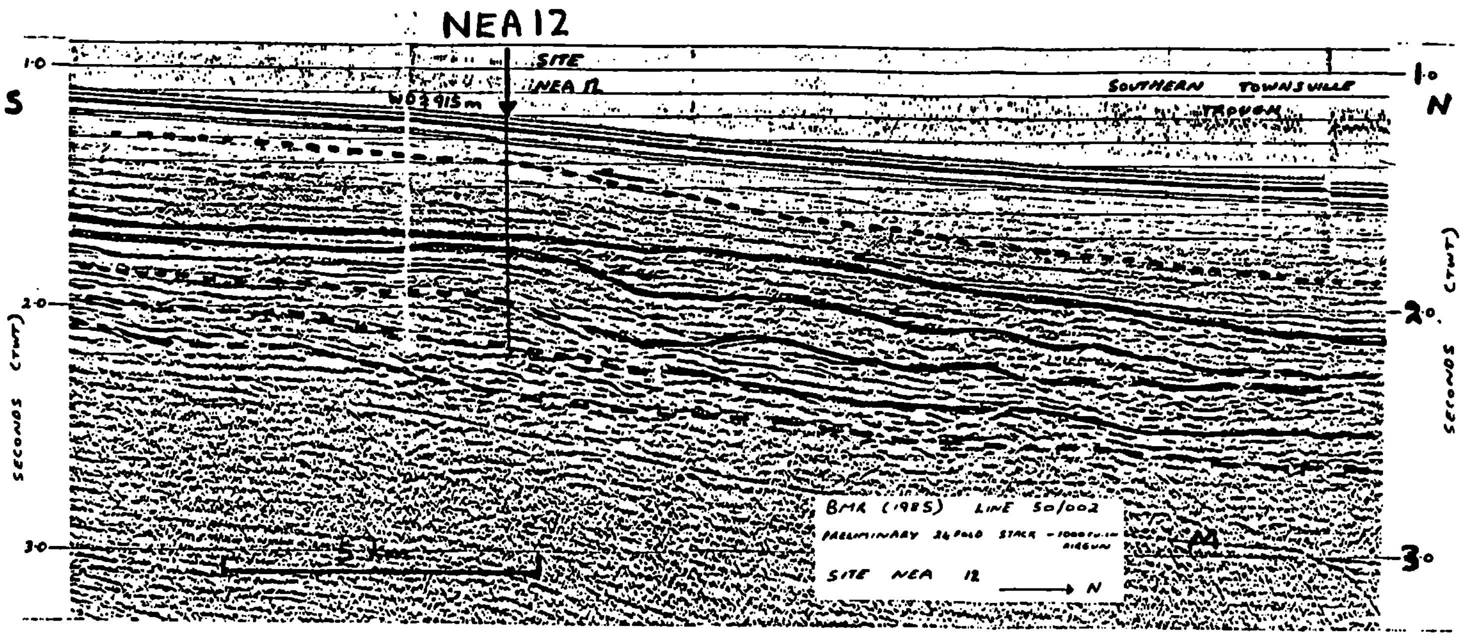


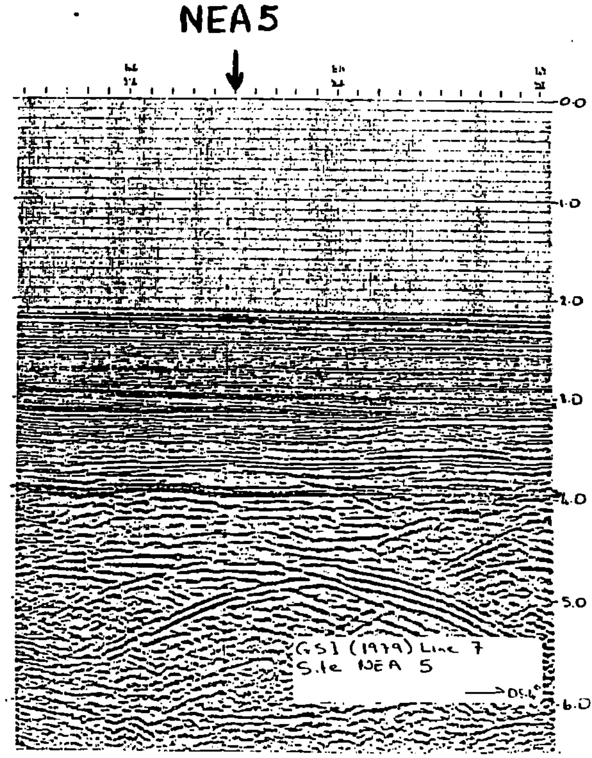
Interpretation of processed Gulf seismic profile: Grafton Passage transect. The major seismic sequences (A, B, C, D, E), and progradational phases (P1, P2, P3, P4) are labelled. WBFZ is the western boundary fault zone of the Queensland Trough rift basin.



Sparker profile at the eastern end of the Grafton Passage transect.
Amplitude-corrected, 12-fold stacked section. Shows prograding, mounded onlap (MO), sheet-drape (SD) and reef facies (R). Note the amount of shelf outbuilding and the relative positions of the present-day shelf break (SB) and the Pleistocene palaeoshelf break (PSB). Major seismic sequences (A, B) and progradational phases (P3, P4) are labelled. P4 has been subdivided into seismic facies units 4a and 4b. M is the first water-bottom multiple.


NEA9
NEA10
0
1
2
SEC.
BMR (1971) Line 13/71
Sites NEA 9 and 10


NEA12
SITE
NEA 12
SOUTHERN TOWNSVILLE
TROUGH
S
N
1.0
2.0
3.0
SECONDS (TWT)
BMR (1985) LINE 50/002
PRELIMINARY 24 FOLD STACK
SITE NEA 12
N
5 Km


NEA5
0.0
1.0
2.0
3.0
4.0
5.0
6.0
GSI (1979) Line 7
Site NEA 5

SUMMARY OF THE NEW HEBRIDES (VANUATU) DRILLING PROGRAM: REVISED JANUARY 1987

This summary presents the principal objectives selected by the West Pacific Panel from two separate proposals (Taylor, JOI, Inc. #187; Fisher et al., JOI, Inc. #190) concerning ODP drilling in the New Hebrides arc. To achieve these objectives the West Pacific Panel recommends a combined drilling and logging time of 72 days.

TECTONIC SETTING

During late Miocene through early Pliocene time the New Hebrides island arc apparently underwent a reversal in arc polarity, after which the Australia-India plate began to underthrust the arc from the west at a rate of at least 10 cm/yr. Since this polarity reversal, extensional back-arc troughs formed that probably are still in an early stage of rifting. The d'Entrecasteaux zone (DEZ) encompasses two east-trending aseismic ridges that tower over the Australia-India plate, and the rapid convergence between this plate and the arc carried the DEZ eastward to collide with the central arc. This collision appears to have exerted profound influence on arc evolution in that islands perched close to the trench rose at anomalously rapid rates. Furthermore, the collision occurs directly west of the intra-arc Aoba basin, which is much deeper than any other basin in this arc. The collision also locally deformed the forearc, suppressed back-arc rifting, and may have facilitated the eruption of picrite, a primitive lava restricted in outcrop to this collision zone. Clearly, much of the unusual morphology and structure of the central arc as well as the distribution and rates of vertical deformation and the historical seismicity pattern have been strongly influenced by the collision of the DEZ with the arc.

OBJECTIVES

The principal objectives of the proposed drilling include the study of arc processes involved in arc-ridge collision, back-arc rifting, subduction-polarity reversal, and the formation of intra-arc basins. A great advantage to drilling in the New Hebrides arc is that these wide ranging objectives can be investigated within a small geographic area by astutely chosen drill sites. The drill sites provide a transect completely across the arc, with one or more sites planned for each major tectonic subdivision of the arc. The transect will allow us to find out which tectonic events had arcwide consequences. Moreover, most proposed sites will contribute information concerning at least two of the four principal objectives.

Arc-Ridge collision

The DEZ-arc collision is the prime focus of our drilling proposal. Drill sites within the collision zone are designed to determine what influence ridge composition and structure exert on the style of accretion and type of arc structures produced during collision. Sites DEZ-1, DEZ-2, and DEZ-3 are located where the north ridge of the DEZ and arc collide. Site DEZ-1 will provide a critical reference section of north-ridge rocks so that we will be able to recognize these rocks in other drill holes. Site DEZ-2 will penetrate the lowermost accretionary wedge, the interplate thrust fault, and the north ridge itself. This site will show whether north-ridge rocks have been accreted onto the arc as well as the age and mechanical properties of rocks where, despite the great relief of the subducted ridge, the collision has

caused little forearc deformation. Site DEZ-3 is located on a bathymetric high just west of Espiritu Santo Island along the strike of the north ridge of the DEZ. The main purpose for drilling at this site is to test whether
1) the high is an uplifted horst of frontal arc material
or 2) large blocks of north-ridge rock have been accreted to the arc.

Drill sites DEZ-4 and DEZ-5 are located where a guyot has collided with the arc, causing considerable forearc deformation. Site DEZ-4 will penetrate imbricated arc rocks to test whether these rocks are part of an uplifted old accretionary wedge, recently accreted guyot rocks, or island-arc basement. Site DEZ-5 will show the lithology, age, paleobathymetry, and mechanical properties of the guyot. We will contrast the results obtained from drilling near the guyot with those obtained near the north ridge to determine why arc structures induced by the collision are so different. We want to determine the rate of uplift of the accretionary wedge and compare this rate to the rate at which onshore areas emerged. This emergence occurred synchronously with collision, and onshore areas rose at Holocene rates exceeding 5mm/yr.

Intra-Arc Basins

The purpose for drilling in the Aoba Basin is to investigate how arc-ridge collision affected the development of intra-arc basins and the evolution of the magmatic arc. In addition, volcanic ash within basin rocks may contain a record of the hypothesized reversal in arc polarity.

Site IAB-1 is located within the center of the Aoba Basin, which lies beneath significantly deeper water than does any other basin near the summit of this arc. Crucial information to be obtained at this site includes the age of a major unconformity that, we believe, correlates with the onset of arc-ridge collision and will provide one of the better estimates of when this onset occurred. The chemistry of Quaternary volcanic ashes may show whether the magmatic arc has been affected by subduction of the DEZ.

Site IAB-2a or IAB-2b will be located along the eastern flank of the Aoba Basin where basin rocks include two unconformities. The shallower one will show when the back-arc area was deformed, possibly as a direct result of the collision. The deeper unconformity lies along the top of the oldest basin rocks, and drilling at this site will show the late Cenozoic evolution of the magmatic arc. We want to determine whether the chemistry of volcanic ash shows that the magmatic arc was affected by the arc polarity change.

Back-arc troughs

The purpose of drilling in the back-arc troughs is to show the range in chemical composition and eruptive sequence of volcanic rocks that fill grabens that are in an early stage of development.

Although the back-arc troughs lie east of the present volcanic line, fresh basalt and volcanic glass have been dredged from the bottom of the troughs, suggesting that these features are young. The chemical composition of dreged samples shows that the rocks are intermediate between arc basalt and back-arc basin basalt. We propose to drill where the chemistry and volcanic stratigraphy in an incipient rift can be determined. We will drill only one of the three sites listed in Table 1 (BAT-1a, 1b, or 2). The choice will be made after more seismic reflection and chemical data are available.

SITE SURVEY DATA: EXISTING AND PLANNED

A large data base, assembled by the USGS and ORSTOM, includes single-channel and multichannel seismic sections, refraction profiles, as well as magnetic, gravity, dredge, bathymetric, and onshore geologic and geophysical data. Migrated multichannel seismic data have been used to locate proposed drill sites in the collision zone and Aoba basin. Seabeam, single-channel seismic, and dredge data collected aboard the R/V J. Charcot in late 1985 provide excellent bathymetric control for choosing sites within the collision zone and the back-arc troughs. In 1986, ORSTOM and the University of Texas conducted OBS refraction surveys over these troughs and the Aoba basin. In April, 1987, ORSTOM will conduct a multichannel seismic survey in the New Hebrides arc to aid site selection.

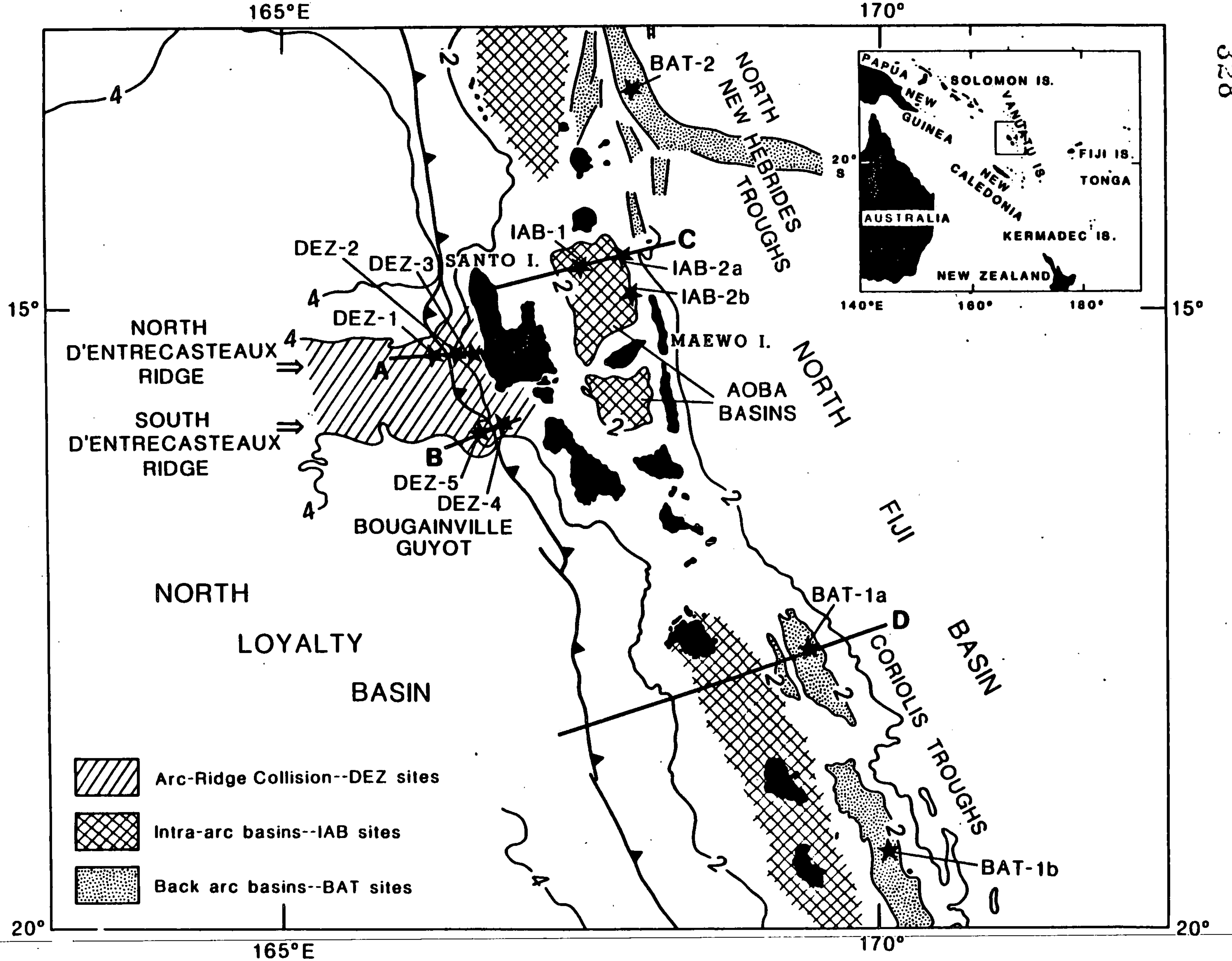
Site #	LAT (°S)	LON (°E)	Water Depth (m)	Penetration Sediment (m)	Penetration Basement (m)	Drilling Time (Days)**	Logging Time (Days)***
DEZ-1	15°20.5'	166°16.5'	2500	200	100	3.0	1.3
DEZ-2	15°19.2'	166°21.7'	2130	900	100	9.0	2.2
DEZ-3	15°20.7'	166°30.5'	500	800	0	4.7	1.7
DEZ-4	15°57'	166°47.5'	900	1000	0	7.2	2.0
DEZ-5	16°01'	166°40.5'	1100	700	50	4.3	1.7
* BAT-1a	17°49.8'	169°20.5'	2600				
* BAT-1b	19°44.8'	170°11.3'	3300	600	100	7.0	1.9
* BAT-2	13°15'	167°57'	2550				
IAB-1a	14°47.5'	167°35'	3075	1000	0	10.4	2.3
* IAB-2a	14°38.3'	167°55'	2600	1000	0		
* IAB-2b	14°50.2'	167°55.5'	2400	1000	0	9.6	2.2
					Total:	55.2	15.3

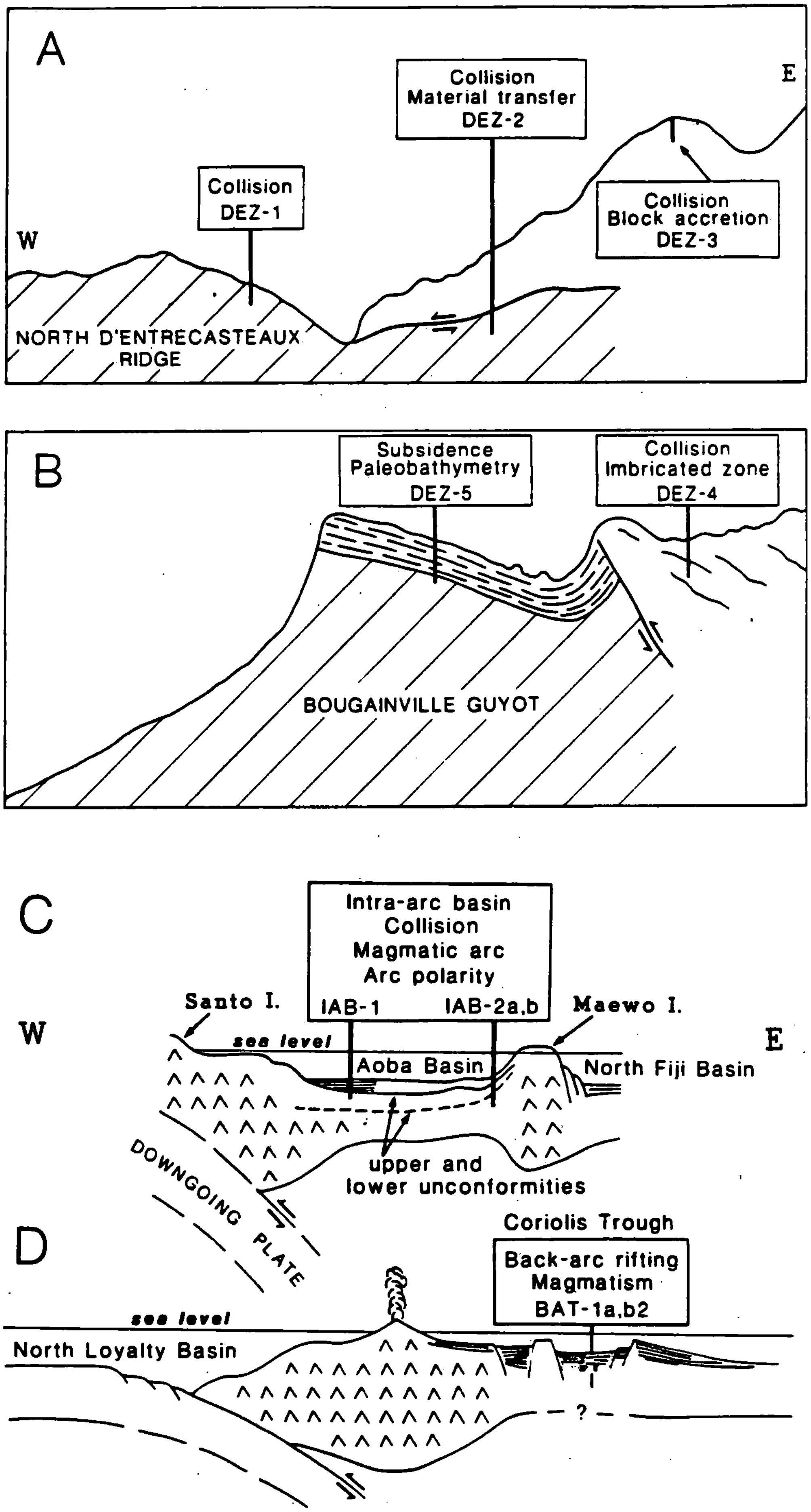
Total transit time
Noumea to Fiji: 5.5

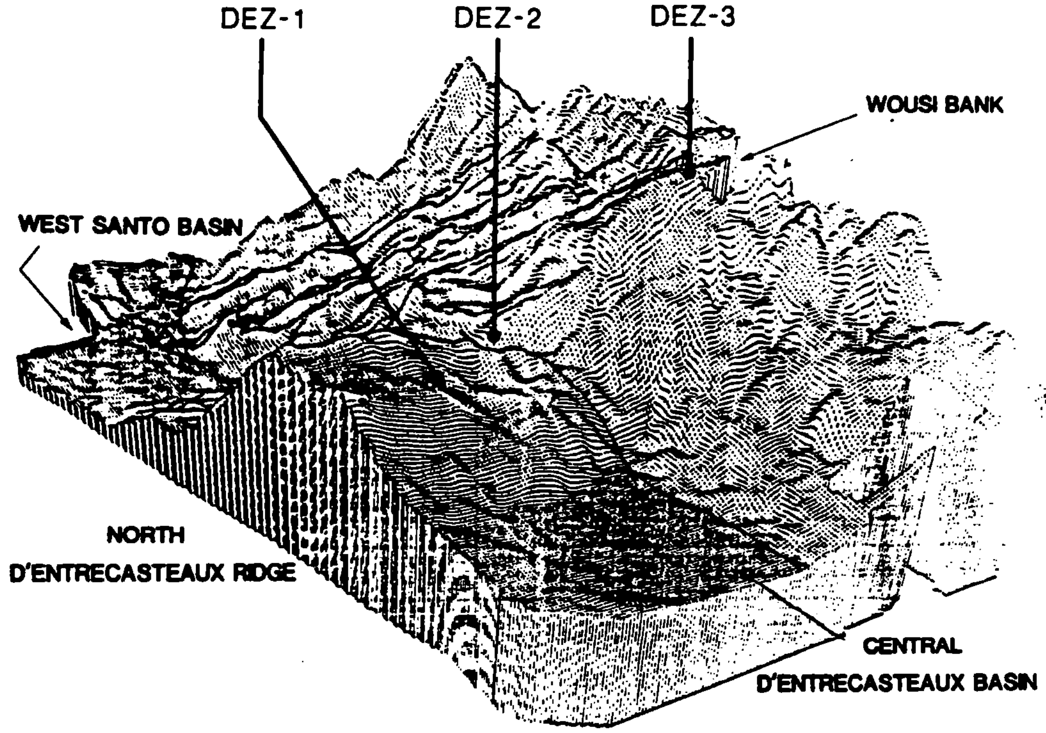
* Only one site will be drilled. GRAND TOTAL: 76 days

** Drilling time estimates are based on Preliminary Time Estimates For Coring Operations, ODP Technical Note n. 1, December, 1986, and on discussion with Roland von Huene about drilling in accretionary wedges.

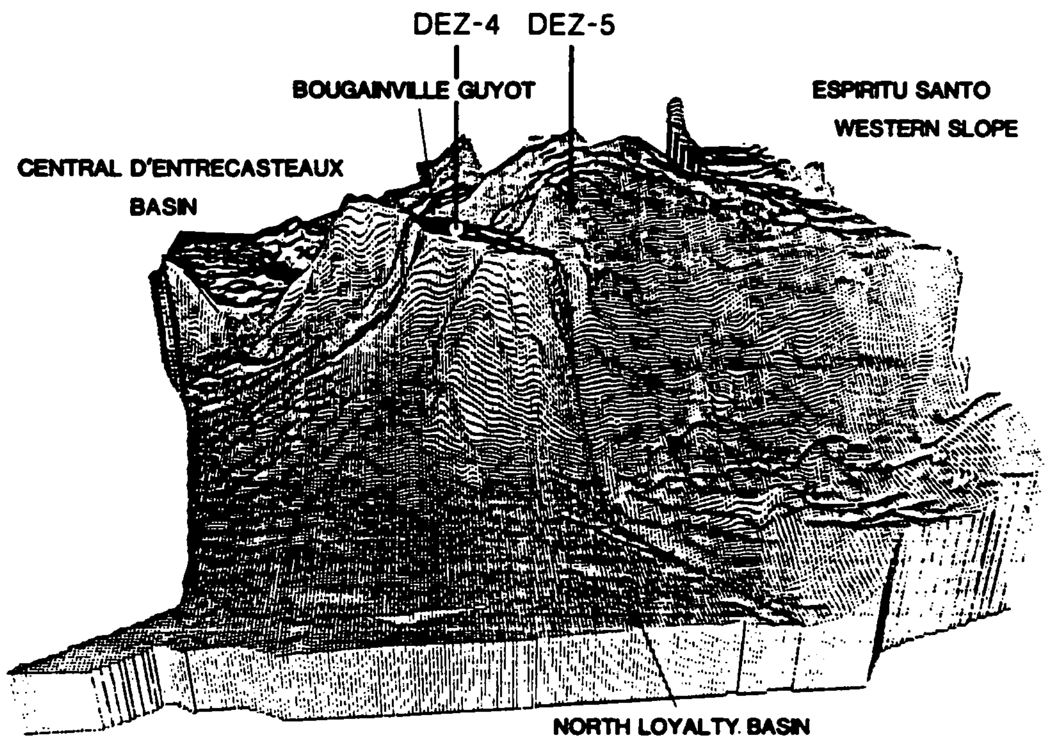
*** Logging time includes time for seismic stratigraphic/geochemical combination, lithoporosity, and borehole televiewer.


165°E
170°
15°
20°
NORTH D'ENTRECASTEAUX RIDGE
SOUTH D'ENTRECASTEAUX RIDGE
BOUGAINVILLE GUYOT
NORTH LOYALTY BASIN
SANTO I.
MAEWO I.
AOBA BASINS
NORTH NEW HEBRIDES TROUGHS
NORTH FIJI BASIN
CORIOLIS TROUGHS
DEZ-1
DEZ-2
DEZ-3
DEZ-4
DEZ-5
IAB-1
IAB-2a
IAB-2b
BAT-1a
BAT-1b
BAT-2
A
B
C
D
2
4
PAPUA NEW GUINEA
SOLOMON IS.
VANUATU IS.
FIJI IS.
TONGA
NEW CALEDONIA
AUSTRALIA
KERMADEC IS.
NEW ZEALAND
20° S
140°E
160°
180°
Arc-Ridge Collision--DEZ sites
Intra-arc basins--IAB sites
Back arc basins--BAT sites


A
W
E
Collision
Material transfer
DEZ-2
Collision
DEZ-1
Collision
Block accretion
DEZ-3
NORTH D'ENTRECASTEAUX
RIDGE
B
Subsidence
Paleobathymetry
DEZ-5
Collision
Imbricated zone
DEZ-4
BOUGAINVILLE GUYOT
C
W
E
Intra-arc basin
Collision
Magmatic arc
Arc polarity
Santo I.
IAB-1
IAB-2a,b
Maewo I.
sea level
Aoba Basin
North Fiji Basin
upper and
lower unconformities
DOWNGOING PLATE
D
Coriolis Trough
Back-arc rifting
Magmatism
BAT-1a,b2
sea level
North Loyalty Basin
?



Seabeam data over the North d'Entrecasteaux Ridge-arc collision zone



Seabeam data over the Bougainville Guyot-arc collision zone

LAU BASIN-TONGA

The Lau Basin is an actively spreading backarc basin behind the Tonga Arc. It was the first such basin to be recognized some two decades ago, yet has continued to yield valuable perspectives into the diverse processes of crustal formation at oceanic convergent plate boundaries because it has been studied recently by researchers from five ODP member nations. This drilling program is the result of collaboration between these national groups, and is their unanimous recommendation.

The central Lau basin currently produces N-MORB-type basalts at an intermediate spreading rate (5-6 cm/yr^{-1}), which locally are overlain by sediments in which the accumulation rate of hydrothermally-derived elements is as high as near the East Pacific Rise. In contrast, the basin's western margin is underlain by older basalts which, although more similar in composition to those of island arcs, are less so than the basalts which were erupted on the adjacent remnant arc during or just before the initial opening of the basin 3 to 5 Ma ago. Recent accumulation rates of hydrothermal metals in sediments near the margin are only about 25% of those near the spreading axis. Farther south, the present spreading axis lies only 50 km behind the volcanic arc, and is characterized by a 200 km-long volcanic ridge (Valu Fa) which is made of basic to acid andesites and underlain at some 3.5 km by a seismically-identified magma chamber.

The six-hole Lau Basin drilling program provides opportunity to investigate a mature backarc basin which is well enough known that fundamental processes of crustal generation can be studied in detail. These processes include changes in the composition of both basement basalt and overlying sediment during opening of a backarc basin, and the relationship of each to the basin's tectonic history; the time-transgressive character of basin opening and its relationship to the magmatic evolution and vertical tectonic history of the adjacent arc; the geochemically distinctive and widespread volcanism which forms the basement of oceanic island arcs; and the petrologic, metallogenic, and hydrothermal character of one of the largest and most differentiated active volcanic features known on the seafloor, Valu Fa Ridge.

Four of the sites (LG2,3,6,7) constitute a half-leg core program. The scientific justification of the other two (LG1 in MORB-like basalts in the central basin, and LG4 on or near Valu Fa Ridge) is just as strong as for the core program, but although neither is a bare-rock site both require drilling in young volcanic rocks. Because of the technical problems of core recovery at such sites, and because site survey work at both is continuing during the first half of 1987, we defer judgment about whether to drill at both sites or just one. Under favorable conditions, it may be posible to answer the first-order questions posed below, and to leave a re-entry cone for future re-investigations, at both sites in the other half of one leg.

1. Petrological evolution of the basin

Temporal variation in the composition of basement basalts is one objective of sites LG1, LG2, and LG7 located on crust expected to be 0.5-1.0 to 3-5 Ma old along a common flow-line at about 19°S. Basalts dredged from the LG1 area, just west of the present spreading axis, are N-MORB-types (Figs. 1, 2). In contrast, basalts from the LG2 area in the western basin margin are more like those of island arcs in general, but less so than the coeval basalts of the Lau Ridge in particular. That is, they are like Mariana Trough basalts in composition. If the basement at the LG2 site is older than 3 Ma, then it formed at the same time as arc-type volcanism on the Lau Ridge. Site LG7 lies between these areas of known difference in basement basalt type. This difference, together with the tight stratigraphic and geochemical control on volcanism of the now-remnant arc, is what makes the LG1-7-2 transect a unique drilling target because such control is not available for any other backarc basin. Comparison of the volcanic stratigraphy between the sites will test whether basalt heterogeneity is as great in one place as is the apparent difference between sites of different age, and will test whether the change from arc-like to N-MORB chemistry is sharp, gradational, or cyclical. This, in turn, will inform dynamical models of the evolution of the mantle wedge during arc rifting, and models of geochemical recycling through arc-backarc couples. Site LG1 also is designed as a reference re-entry hole in a backarc basin suitable for long-term downhole experiments and deep drilling in <1 Ma-old basaltic crust.

2. Geodynamics of arc rifting and backarc basin formation

Geodynamic aspects of backarc basin formation which can be studied only by drilling include the age of basin inception, the vertical motions of the arc before and after rifting, and the extent to which volcanism is synchronous in both arc and backarc. These are the objectives of sites LG2,7, 3, and 6. The magnetic anomaly patterns in the basin have too little long-range order to yield firm estimates of the age(s) of, or rate fluctuations during, its opening. Current estimates are that the basin began to be floored by oceanic crust 3 to 5 MA ago, perhaps propogating southward. The four sites listed have been designed to determine the age of opening at two latitudes 400 km apart by using the age of the oldest sediment on the earliest crust (LG2 ± 7) and the age of uplift of the proto-arc (LG 3 ± LG6) (Fig. 3a). The rates of differential uplift and subsidence of the arc and basin also can be evaluated at these sites, thanks to the good local biostratigraphic control which is available for Upper Miocene to Pleistocene sediments; this may test stretching versus detachment models of basin formation. Finally, the age of inception and the subsequent history of Tofua Arc volcanism can be evaluated at proximal site LG3 (Fig. 3a), and distal sites LG2, 7, and 6, and compared to the history inferred for the basin.

3. Relationships between magmatism, tectonics, and hydrothermal metal accumulation

Accumulation rates of hydrothermal metals in recent sediments in the central Lau Basin are comparable to those near the East Pacific Rise, but drop off exponentially toward the basin's margins. The LG1-7-2 transect is designed to evaluate how these rates change with time (i.e., as a site moves away from the spreading center), and whether perturbations in rates can be correlated between sites and, hence, to basinal tectonic history. Studies of East Pacific Rise cores (DSDP 92) have demonstrated on the basis of sediment chemistry that there have been several periods of anomalously high hydrothermal activity during the last 30 Ma which are thought to be related to periods of enhanced volcanic activity due to reorganization of plate boundaries. Similar results for Lau will contribute to the geodynamic objectives discussed above, and to the hydrothermal mineralization studies at Valu Fa discussed below.

4. Basement and Tectonic history of the forearc

The pre-Lau Basin volcanic basement and/or lower crust of the Tonga forearc is one objective of site LG6, located on the trench-slope break (Fig. 3b,c). In addition to offering a distal sedimentary record of the arc's response to basin formation, and of the preceding arc volcanism, this hole will explore the nature and latitude of origin of the Eocene basement which is common to most western Pacific arcs. Tholeiitic to boninitic basement rocks crop out in Tonga and Fiji and have been dredged on the Tongan forearc. They are scarce, and less is known about them than about those of the Bonin and Mariana forearcs to which they will be compared. The age and composition of basement rocks not only are important for understanding the crucial early processes of crustal formation in oceanic island arcs, but also for predicting the effects of crustal interaction during initial marginal basin magmatism (item 1 above).

5. Petrology, metallogenesis, and hydrothermal effects of a large active differentiated submarine volcano

Site LG4 investigates one of the largest active submarine volcanic edifices known: Valu Fa Ridge (Fig. 4). This portion of the basin's current spreading center lies only about 50 km behind the volcanic arc. It is characterized by fresh andesite for almost 200 km along strike and by a seismically-visible magma chamber at 3.5 km below the seafloor for at least half this distance. Discovery of this feature is especially important in light of the ubiquity of silicic rocks in modern backarc basins (e.g., near site BON1) and in many ophiolites, and their potential relationship to metallic ore deposits. Phanerozoic volcanogenic massive sulfide deposits in silicic rocks, including some of the world's largest Cu-Zn-Pb-Ag-Au ore bodies (e.g., Rio Tinto, Bathurst), are thought to have formed in such environments. Drilling will permit study of the petrological evolution of the uppermost part of the volcano, study of the relationships between depth and style of hydrothermal mineralization which is known to exist from dredging, and preliminary study of the heat and fluid flow in porous volcanic rocks above a differentiated magma chamber of known depth. This site is an oceanic equivalent of the drilling projects in continental rhyolites of the USA, comparisons to which will clarify differences in metallogeny between submarine and subaerial environments. Also, it is a felsic analogue to the drilling planned at zero-age spreading centers in the eastern Pacific, permitting comparison of the effects of different wall-rocks and magmatic volatile budgets on hydrothermal fluid geochemistry and mineral paragenesis.

Additional survey work is necessary for sites LG1,2,4, and 7. This will be done during 1987-88 cruises of the Sonne, Charcot, and Darwin.

Site#	Type	Lat.(°N)	Long.(°W)	W.D.(m)	Penetration(m) Sed*	Bsmt	Time(d) Drill	Log
LG1	APC/RCB (re-entry)	18°45′	176°45′	2400	100	120	12	2
LG2	APC/RCB	18°45′	177°45′	2600	300	50	6	1
LG3	APC	22°10	175°42′	750	500	--	4	1
LG4	APC/RCB (re-entry)	22°22′	176°39′	2400	100	120	12	2
LG6	APC/RCB	22°00′	174°30′	4500	500	50	8	1
LG7	APC/RCB	18°45′	177°10′	2400	150	50	3	1
							45	+ 8

* Sediments are hemipelagics and volcaniclastics

= 53d

Transit Time (Suva-Pago Pago) = 3d

TOTAL TIME: = 56d

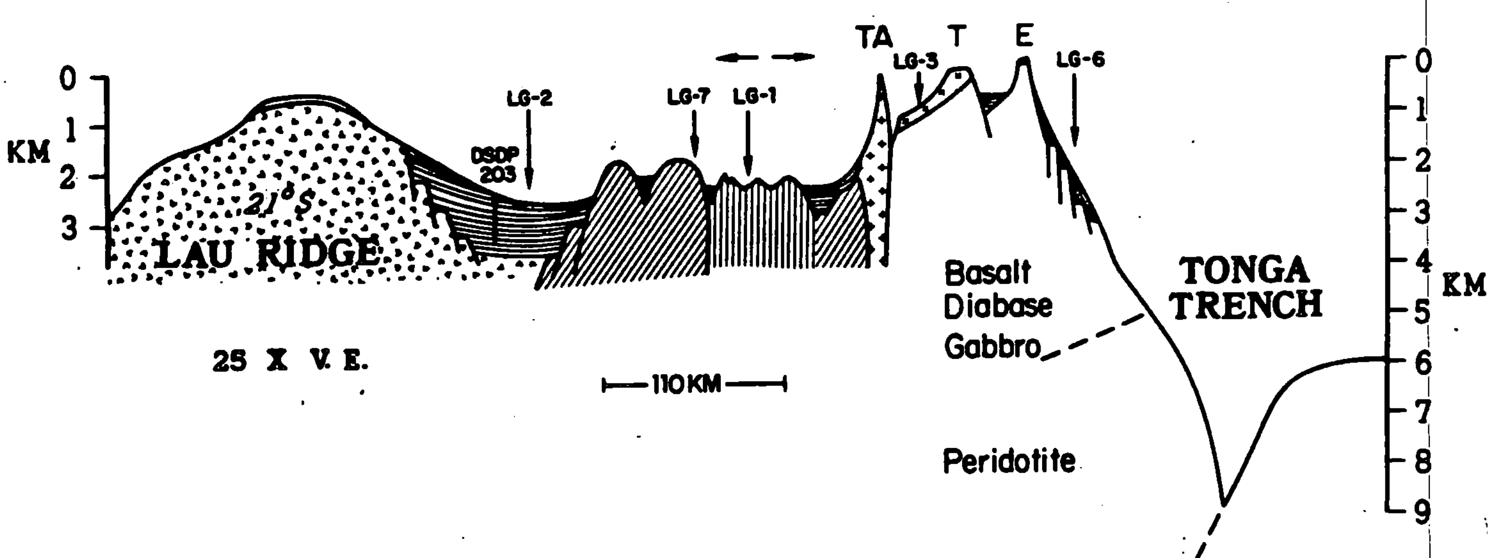


Fig. 1a. Cross-section sketch of Lau Basin and Tonga Trench showing distribution of rock types and morphology. Proposed drill sites, and DSDP site 203, are projected onto this section.

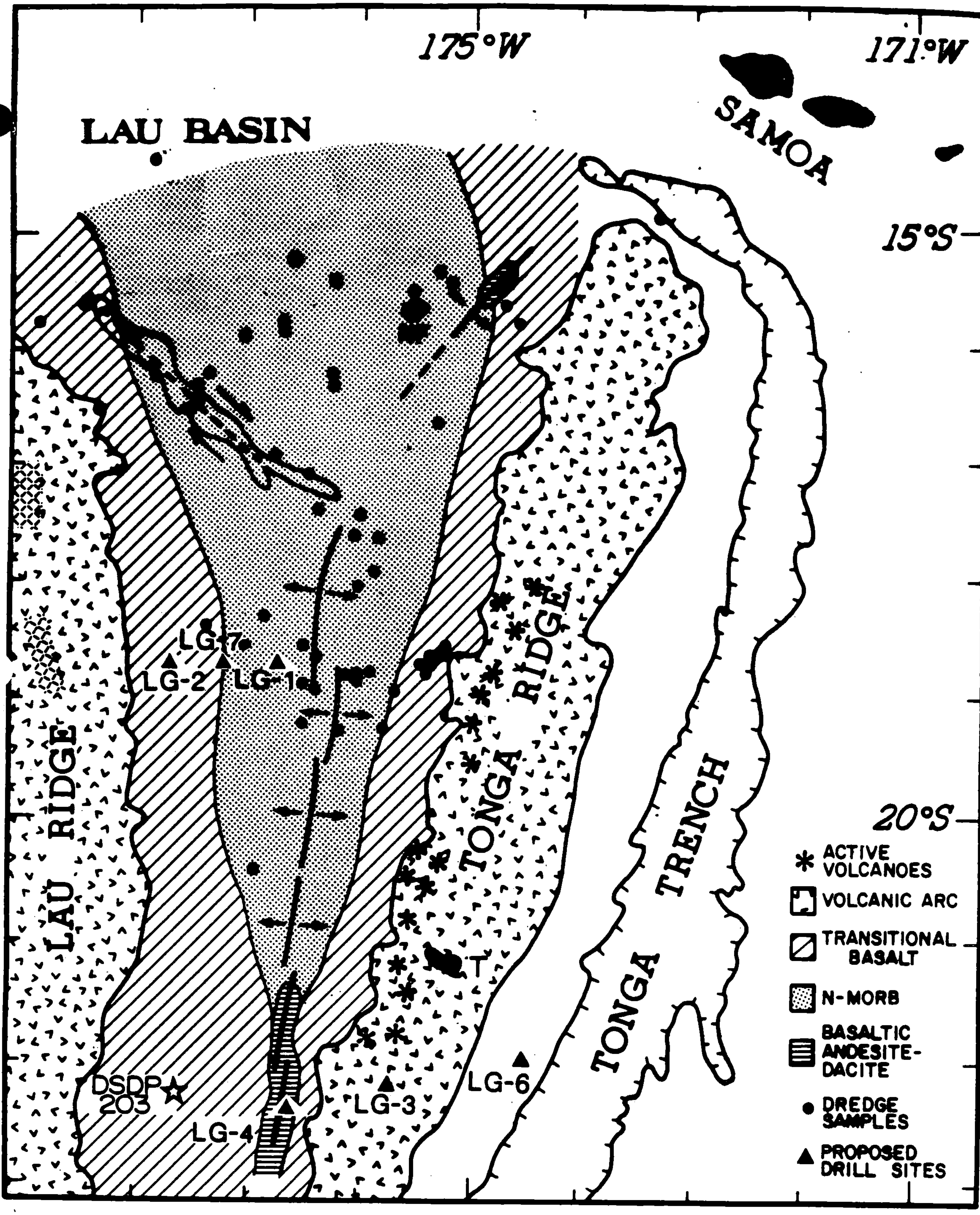
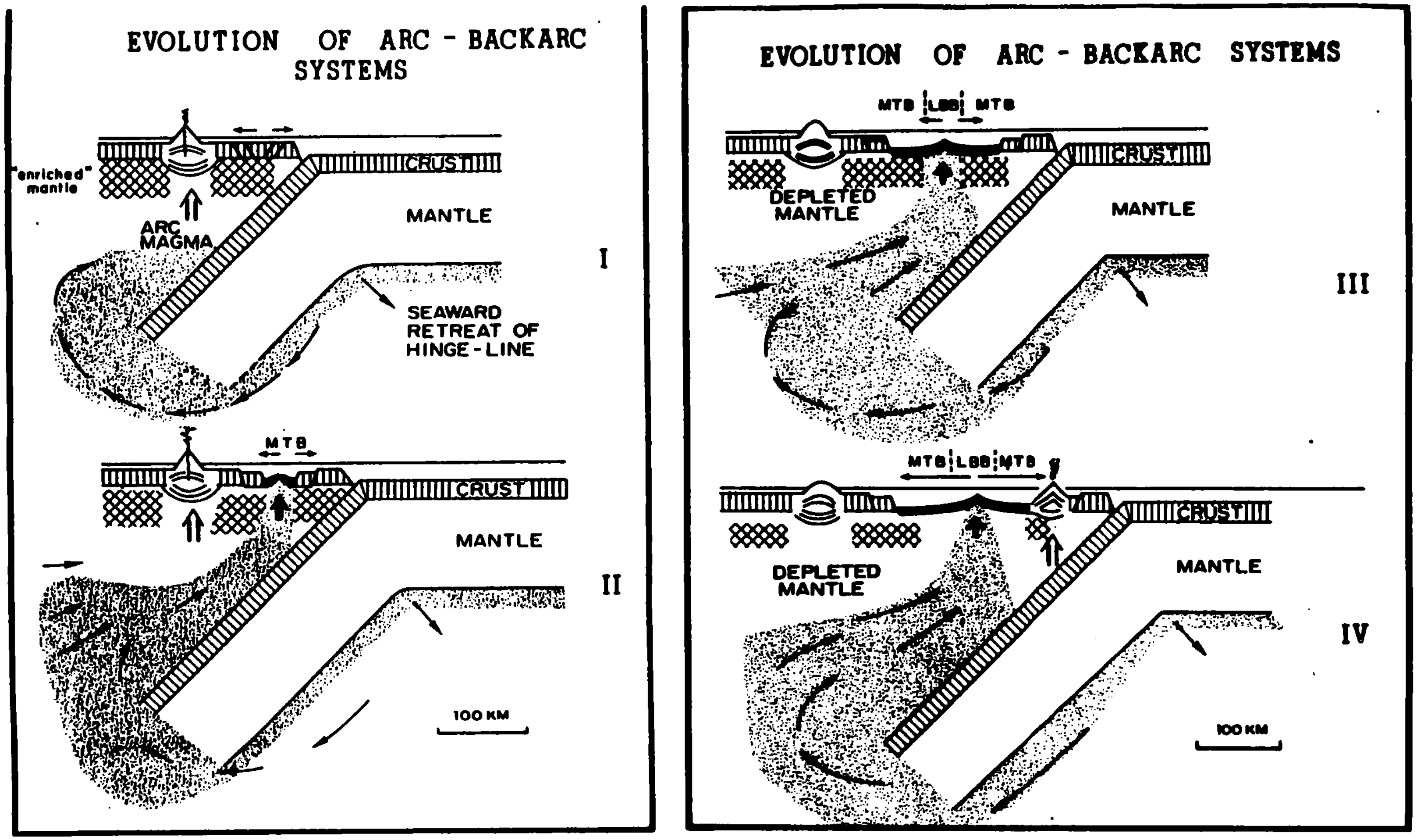


Fig. 1b. Sketch map of Lau Basin showing distribution of rock types and dredge sites. DSDP site 203 is shown as a star and proposed drill sites LG-1 to LG-7 are shown as triangles. Areas on Lau Ridge with 3-5 Ma basalts are shown in hatched pattern. The transitional basalts resemble Mariana Trough basalt and are enriched in alkalis, alkaline earths and water relative to MORB.



Model to explain the evolution of back arc basins and the compositional zonation of back arc basin crust. (I) Initial stage of evolution showing the convergent plate margin, the active volcanic arc, and the forearc. The forearc is under extensional stress due to the "rollback" of the trench hingeline. The cross-hatched area under the arc and forearc represents mantle that has been partly depleted in its "basaltic" components but variably enriched in water and large ionic-radius lithophile (LIL) elements derived from subducted oceanic crust. The stippled pattern and the curved arrows represent deep mantle convective flow driven by the seaward retreat of the subducted plate. The mantle counterflow causes thermal upwelling in the forearc and causes the forearc extension. Heavy lines in the forearc crust represent normal fault planes that form half-grabens as the forearc is dilated. (II) This view represents a more advanced stage of forearc extension. Rising mantle diapirs (solid arrow) have partly melted to form MORB-like basalt in the rifted region. These melts have been modified by zone-refining processes that enrich them in water and LIL components derived from the enriched upper mantle. The basalt is comparable to the Mariana Trough-type basalt (MTB). (III) Continued extension of the forearc causes new ocean crust to form due to fractional melting of the rising mantle diapir. Inflow of "new" mantle, and eruption of basalt through upper mantle and deep crust depleted in the enriched material, allows eruption of basalt more like normal MORB, e.g., Lau Basin-type basalt (LBB). The volcanic island arc has become inactive because the geometry of the subduction system has been changed due to the seaward retreat of the subduction zone. Note that this model requires that there is a break in arc volcanism during the early stages of "back arc" basin evolution. (IV) A new volcanic arc has formed on the outer edges of the zone of extension. It is superposed on, or replaces, part of the back arc basin crust. The active arc is not a fragment split off from the older (remnant) arc. The configuration shown here is similar to the Lau Basin in which the back arc crust is zoned from MTB to LBB basalt. In the Mariana Trough the new arc formed at a stage equivalent to stage II above. The geometric arrangement of arcs and the new oceanic crust make the latter a true "back arc" basin. A more detailed explanation of the model for tectonic evolution shown here, and the field evidence to support it, is given by *Hawkin[illegible] [illegible]l.* [1984].

from Hawkins and Melchior, 1985.

FI[illegible]

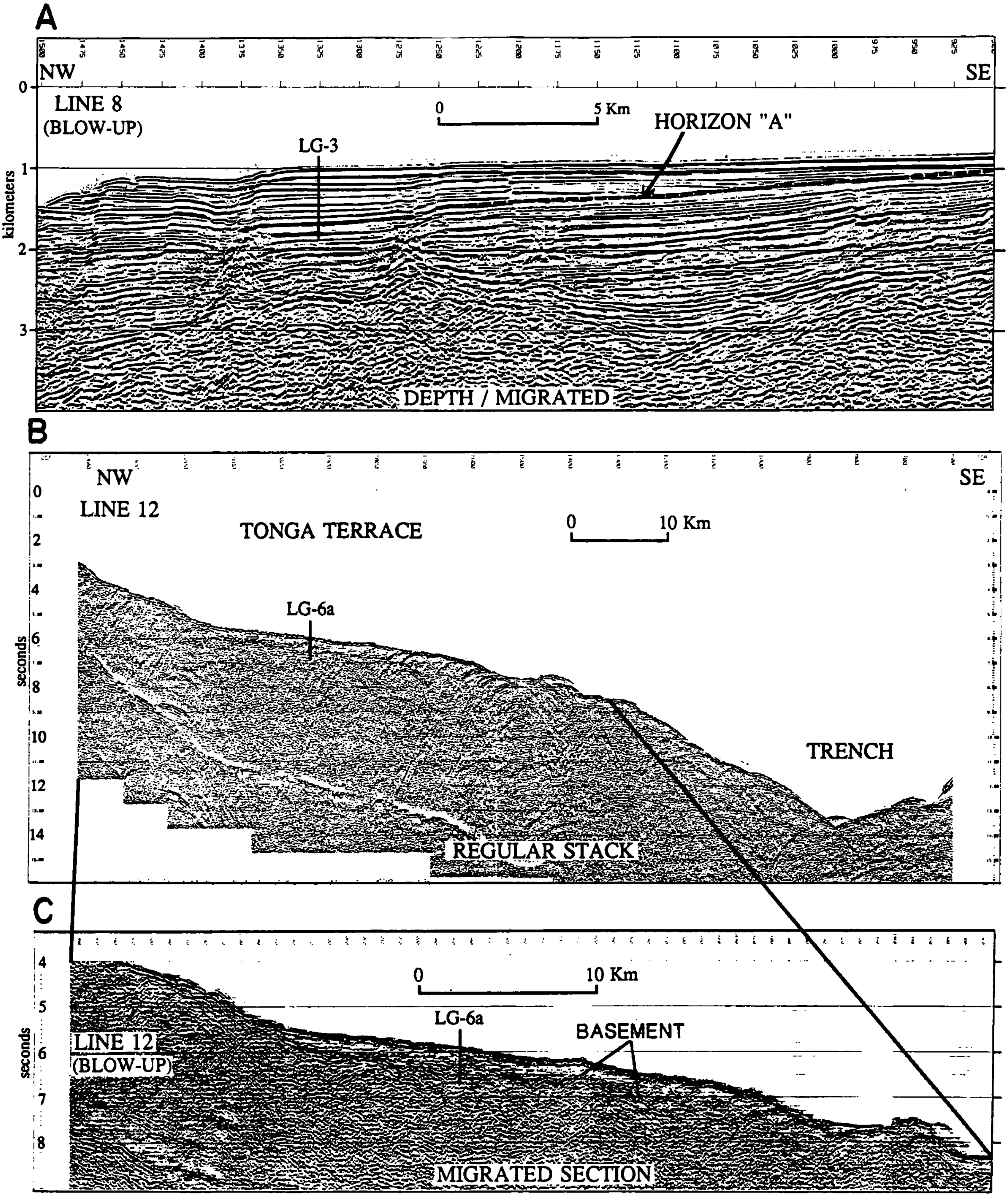


Figure 3. (A) Depth migrated MCS line (USGS line 8) at a possible site for LG-3. Horizon "A" is the unconformity interpreted as reflecting arc inflation before initial rifting. Sediment above it record initiation of post-rifting arc volcanism. (B) Regular stack of MCS line (USGS line 12) at a possible site of LG-6. "Basement" is interpreted as Eocene tholeiitic and boninitic lavas and dikes. (C) Migrated time section blow-up of the above.

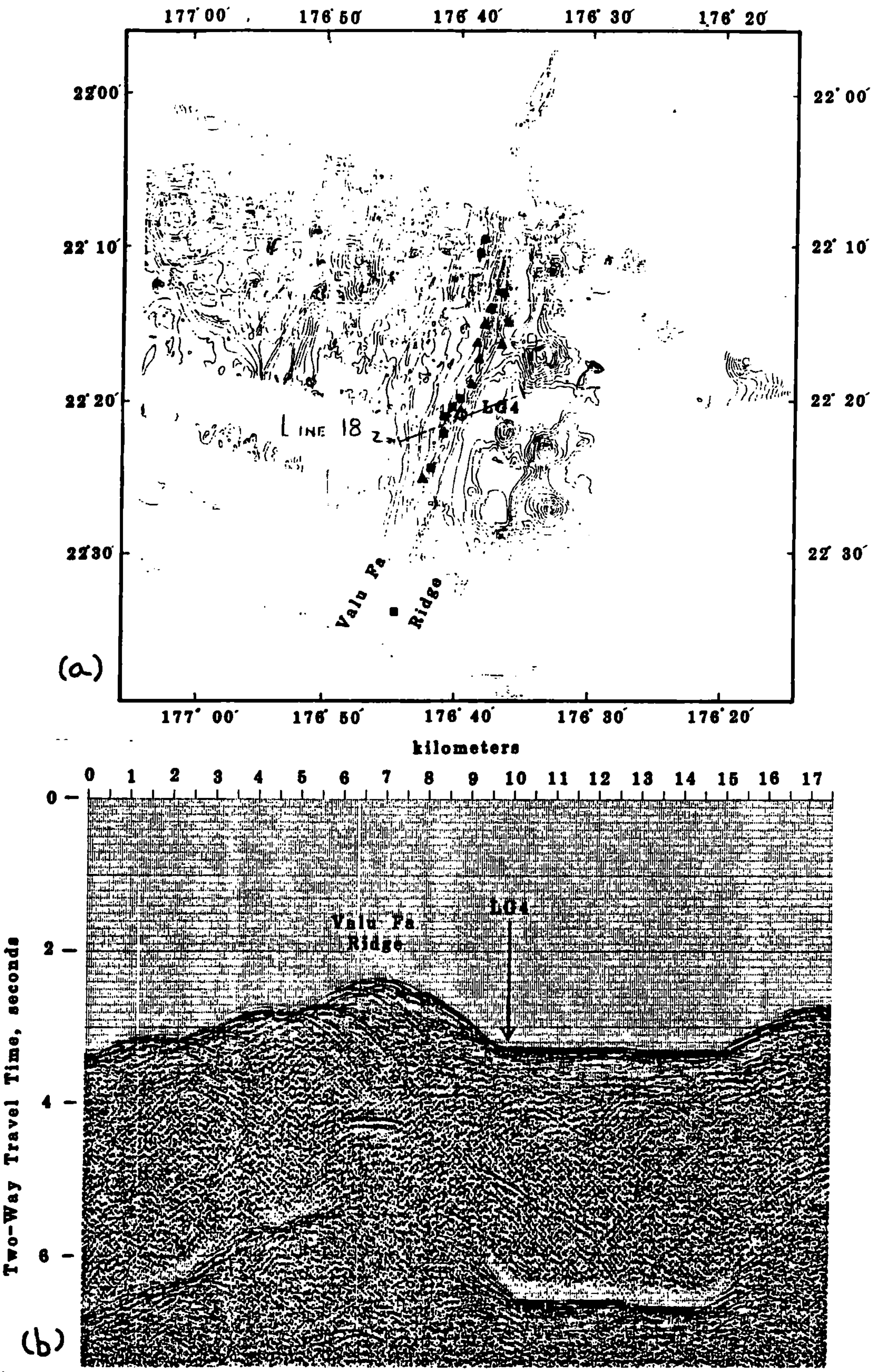


Figure 4. (a) Seabeam map and (b) MCS line (USGS line 18) showing a possible site of LG4 adjacent to Valu Fa Ridge. On (a), the location of dredged tholeiitic basalt is shown by circles, basic andesite (53-57% SiO_2) by squares, and acid andesites (57-63% SiO_2) by triangles. On (b), the bright reflector about 1.4 sec beneath the ridge crest is interpreted as the magma chamber roof. The site will be in sufficiently thick sediment as close to the ridge crest as possible.