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TENTATIVE GLOMAR CHALLENGER SCHEDULE, LEGS 93-96

Leg	Departs	Departure Date	Total Days	Days Oper.	Days Steam.	Terminates at	Arrival Date	Port Days	Re-entry	Objective
93	Norfolk	03 May 83	46	43	03	Norfolk, Virginia	17 Jun 83	5	Yes	ENA 3 (W/O Logs)
94	Norfolk	23 Jun 83	56	33	23	St.Johns	18 Aug 83	3	No	NE Atlantic Paleo
95	St. Johns	21 Aug 83	36	25	11	Ft. Lauderdale, Fla.	26 Sep 83	3	No	N.J.Transect/ENA-3
96	Ft.Lauderdale	29 Sep 83	40	35	05	Galveston, Texas	08 Nov 83	13	No	Mississippi Fan

Compiled June 1983

SHIPBOARD SCIENTIFIC PARTIES

Leg 94

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G. Unsold	Sedimentologist	FRG - University of Kiel
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A. Palmer	Paleontologist (rads)	USA - Princeton University
M. Tarafa	Organic Geochemist	USA - Woods Hole, MA
Y. Nakamura	Organic/Inorganic Geochemist	Japan - University of Tokyo
R. Wilkens	Physcial Properties Specialist	USA - Mass. Inst. of Technology

DSDP Site Map Updated

Topography of the Oceans with Deep Sea Drilling Project sites now available through Leg 82. To request map contact:

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GLOMAR CHALLENGER OPERATIONS

CRUISE SUMMARIES

Leg 90 - Southwest Pacific

Leg 90 began 3 December 1982 in Noumea and ended 11 January 1983 in Wellington, New Zealand.

General Setting and Objectives

Leg 90 is one of several DSDP legs that have been set up to complement each other for global paleoceanographic investigations. Others are Leg 68 (Caribbean, Gulf of Panama), Legs 72-76 (South Atlantic), Leg 85 (eastern equatorial Pacific) and Leg 87 (northwest Pacific). All are aimed at the development of understanding of global paleoceanographic change and thus require continuous sequences exhibiting relatively high sedimentation rates. Sites are thus more often selected in areas exhibiting great sediment thickness rather than in thin sediment cover, as was the case in earlier days of deep sea drilling when basement rocks and overlying basal sediments were prime objectives. Furthermore a pair of HPC holes is taken at each location to provide a better chance of complete recovery of the sediment section for high resolution stratrigraphic and paleoceanographic work.

Leg 90 successfully obtained a traverse of high quality middle to late Cenozoic cores between equatorial and northern subantarctic water masses in the southwest Pacific (Fig. 1; Table 1). This suite of cores was obtained using the hydraulic piston corer (HPC) and the extended core barrel (XCB) systems in order to provide higher core recovery and better quality sections that are much less disturbed than standard rotary cores formerly obtained by DSDP. The XCB was first successfully used during Leg 90 and is a core barrel that extends several cm beyond the main rotary drill pipe bit, ensuring a less disturbed drilling environment ahead of the main water jets of the drill bit. It is used to core sediments after they have become too consolidated for use by the HPC. Most of the sites drilled during Leg 90 employed a combination of HPC and XCB and core recovery was both high (average of about 90%) and of good quality.

Seven main sites and one minor site were cored during Leg 90 (Fig. 1). An eighth site (Site 586) was drilled as the northern part of this same traverse during Leg 89, and will be incorporated in the Leg 90 report. The nine sites are placed along a latitudinal transect to obtain paleoceanographic records for a number of distinct water masses and to maximize ability to correlate across the wide latitudes between equatorial and subpolar regions.

The physical oceanography is still not well known for the modern southwest Pacific. Knox (1970) has summarized the position of the several surface water mass boundaries that occur in the region, that separate the distinctive surface water masses shown in Fig. 1. Latitudinal placement of the sites was made to provide stratigraphic sections in each of the water masses, with Site 586 being in the tropical waters, Site 587 at the edge of the warm subtropics, Sites 590 and 591 on the Subtropical Divergence in a transitional region located between warm subtropical and temperate areas, Sites 592 and 593 within temperate waters and Site 593 in northern Subantarctic waters immediately south of the Subtropical Convergence. All sites were located at water depths of between 1000 and 2200 m in areas that show simple pelagic sequences of calcareous sediments.

Previous rotary drilling in the region during Legs 21 and 29 demonstrated that the southwest Pacific is optimal for the study of relatively uncomplicated and continuously deposited carbonate sequences of Neogene age between the equator and the subantarctic region. Unlike nearly all other oceanic regions, shallow-water platforms extend latitudinally over vast distances providing an opportunity for drilling into oceanic pelagic sequences at shallow depths. These include Ontong-Java Plateau (Site 586) at the equator; Lord Howe Rise (Sites 587 through 592); the Challenger Plateau west of New Zealand (Site 593) and Chatham Rise east of New Zealand (Site 594).

The Lord Howe Rise is one of the major submarine topographic features of the southwest Pacific, extending northwards from central western New Zealand to its northern limits at Landsdowne Bank at about 20°S. The rise is about 200 km long and 30 km wide and its crest generally lies at water depths ranging from 750 to 1200 m deep. This rise is bounded to the west by the Lord Howe and Tasman Basins and to the east by New Caledonia Basin. According to Burns, Andrews et al. (1973) Jongsma and Mutter (1978) and Willcox et al. (1980), the crustal structure of the rise is continental in origin, with the eastern flank probably representing the ancient (pre- Maestrichtian) continental

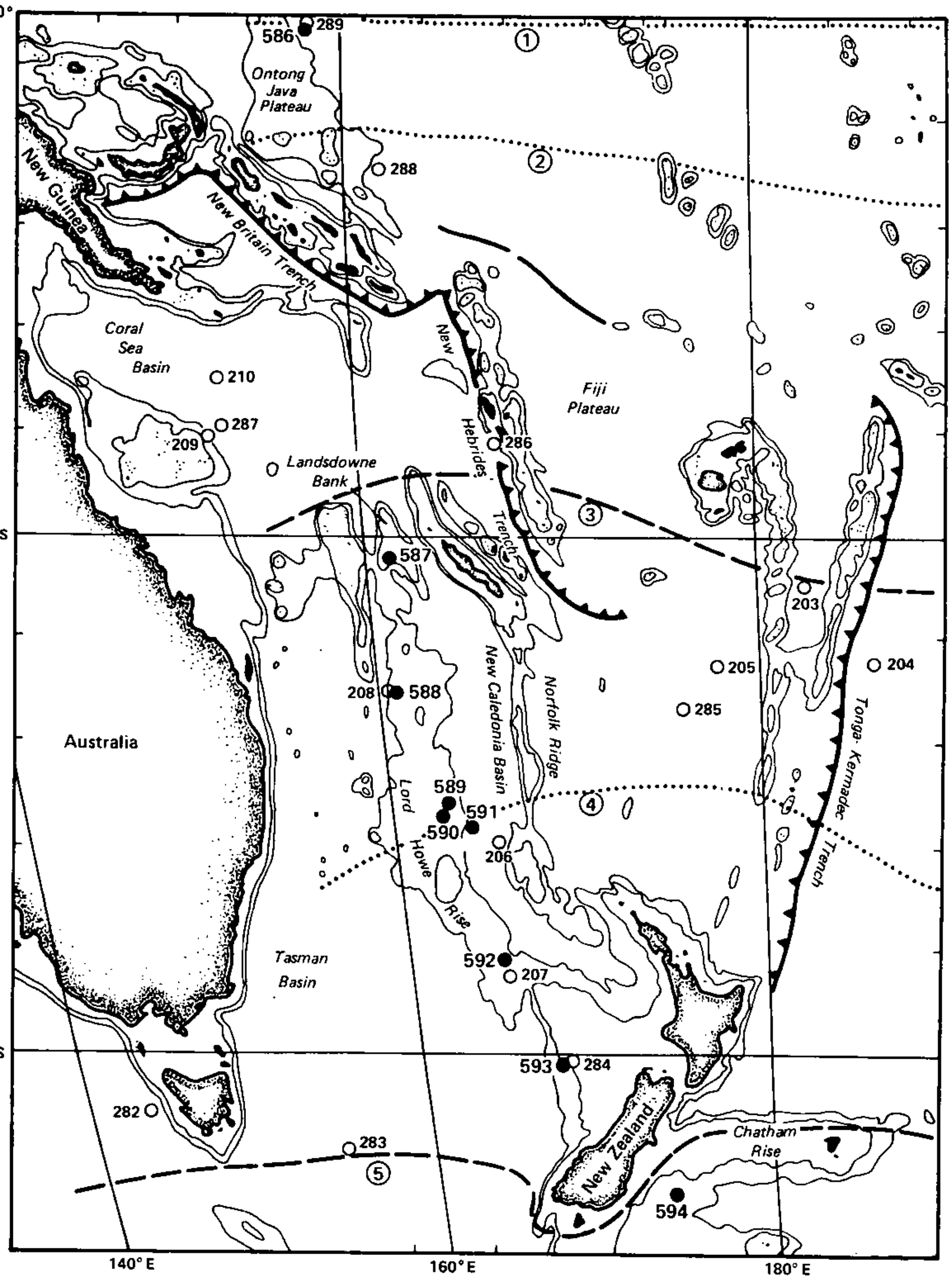

Figure 90-1. Leg 90 drill sites (solid circles) and other drill sites (open circles) plotted on generalized physiography (after Udintsev, 1963) of southwest Pacific (1 and 2 km depth contours); approximate water mass boundaries after Burkov, 1966, as follows: (1) Equatorial Divergence; (2) Southern Tropical Divergance; (3) Southern Tropical Convergence; (4) Subtropical Convergence.

"Australian-Antarctic Supercontinent". The known geologic record began in the Late Cretaceous (96 Ma) with the eruption of rhyolites possibly at or near sea level (McDougall and van der Lingen, 1974). During the Maestrichtian, silty claystone drilled at Site 207) was deposited in a shallow marine environemnt in the southern part of the rise. This was followed by subsidence to approximate present day upper bathyal depths in the early Eocene. In the northern part of the rise, oceanic biogenic sedimentation had commenced by the Late Cretaceous when the rise reached upper bathyal depths.

The paleoceanographic importance of Lord Howe Rise is that it provides an extremely long north-south trending shallow-water pedestal upon which lie pelagic sequences of Cenozoic age. Neogene sediments on the rise are carbonate oozes deposited above the foraminiferal lysocline and hence containing calcareous assemblages of excellent preservational character. Since the rise is surrounded by basins in an oceanic setting, there is little terrigenous sedimentary dilution in the Cenozoic section. The previous drilling showed that the Neogene and late Paleogene sequence contains very few hiatuses. This can be compared with the Paleogene which is much dissected by several hiatuses including the major regional unconformity associated with the Ecocene-Oligocene boundary (Kennett, 1972; Burns, Andrews et al., 1973). The Neogene sequences that lie on the Lord Howe Rise are therefore ideal for paleoceanographic investigations over a wide latitudinal range.

The sites on the Lord Howe Rise have experienced about 10° of northerly movement during the Neogene in association with movement of the Indian Plate (Sclater and Meinke, (1980). This northward movement from higher to lower latitutdes must have had an important effect upon paleobiogeography of the planktonic microfossil assemblages. This effect requires examination using the drilled cores.

In addition to the latitudinal traverse designed largely to study the history of surface water paleoceanographic change and related sediment history, the Lord Howe Rise also offers a good opportunity to drill a traverse of sites at different water depths for paleoceanographic studies within the vertical water column. Three closely adjacent sites now provide such a traverse. These are Site 590 ar 1295 m, Site 591 at 2131 m and Site 206 at 3196 m. These three sites, in combination, will provide the opportunity to carry out detailed studies of changes in the intermediate water masses between 1000 and 3000 m water depths.

Three previously drilled classical site were reoccupied to provide much higher quality Cenozoic sequences (Sites 289, 208 a 284) and a new site location close to Site 2?y. was also drilled.

Scientific investigations planned for Site 588 include the following:

1. High resolution Neogene biostratigraphy.
2. Latest Paleogene through Neogene paleoclimatic history and surface watar fluctuations in the region using stable isotopes and microfossils.
3. Cross-latitudinal biostratigraphic correlations between the sites.
4. Paleobiogeographic change of planktonic foraminifera and other microfossils in relation to paleoceanographic fluctuations and to the northward movement of the Lord Howe Rise during the Neogene.
5. Magnetostratigraphy of the cored sequences to enhance correlation and provide a geochronology.
6. Evolutionary studies of planktonic foraminifera to assist in evaluation different possible processes of evolution such as punctuated equilibrium vs. gradualism.
7. Benthic foraminiferal assemblage changes at these relatively shallow depths during the late Paleogene and Neogene to study paleobiogeography, taxonomic evolution and the history of vertical water mass changes at intermediate depths in the southwest Pacific.
8. Stable isotopic studies of vertical water mass structure.
9. History of eolian sedimentation related to the development of Australian dry climates and deserts. Leg 21 scientists discovered a minor wind-blowm quartz fraction in sediments younger than the middle Miocene of Site 208 inferred to have been derived from Australia. Quantitative studies will be carried out and compared with paleoclimatic data.
10. Diagenesis of sediments and other sedimentary investigations.
11. Physical properties of sediments including relations with seismic data.
12. Tephrochronolohy using volcanic ash layers.
13. A synthesis of all the above to better understand global paleoceanographic evolution and its causes.

SUMMARY OF MAIN OBSERVATIONS

South Pacific Traverse

Leg 90 obtained stratigraphic sections through the middle and late Cenozoic at 8 sites in the southwest Pacific (Sites 587 through 594), of which only one (Site 589) is of minor importance since it represents only a Quaternary section. In addition, for logistical reasons, Leg 89 cored and additional Site 586 at the equator (Ontong-Java Plateau) forming the northernmost limit of a latitudinal traverse. These sites (Fig. 1; Table 1) range from the equatorial to subantarctic water masses and include every major surface water mass between these regions. We also recovered sections to form a vertical traverse at mid latitudes from water depths of 1299 m (Site 590), 2131 m (Site 591) and 3196 m (Site 206 was drilled during Leg 21).

Core Recovery

Favorable conditions led to an extremely high rate of core recovery (3,700 m total), the highest for any drilling leg. The sediment recovered weighs 22 tons. Average core recovery for the entire leg was about 90 percent of the drilled section except for the last section in Subantarctic waters which recovered 60 percent. About 30,000 samples were taken for a wide range of investigations by both shipboard and other scientists. All this occured within a relatively short cruises of 38 days.

Almost all cores were taken using the hydraulic piston corer (HPC) followed by rotary coring using the extended core barrel (XCB). This represented the first sucessful use of the XCB whic saved much time since the system is compatible with the HPC and requires no tripping of the drill string. HPC cores were in all cases considerably longer than 200 m, made possible by the relatively soft ooze blanket of the shallow southeast Pacific region. The longest HPC sequence at Site 588 is an all time record penetration of 315 m. This penetrated a total of 17 m.y. from the Quaternary to the late early Miocene with excellent sediment recovery.

Core quality is sufficiently good using both the HPC and the XCB to assure high resolution stratigraphy for all of the middle and late Cenozoic sections obtained. Cores obtained using XCB are much less disturbed than standard rotary cores and much of the sediment column seems to be in place rather than vertically disturbed within each core.

Stratigraphic continuity

Detailed calcareous nannofossil biostratigraphy, supported by less detailed planktonic foraminiferal biostratigraphy (core catcher samples only) shows that all but two of the Neogene through late Oligocene sections appear to be completely continuous within the interval of core recovery (Figs. 2 and 3). Hiatuses common to large areas of the North Pacific appear to be absent here. Site 590 contains a 3m.y. hiatus centered at the early-middle Miocene boundary. Site 592 encountered the late Paleogene Tasman Sea regional unconformity (Fig. 3). In this site there is a 14.5 m.y. hiatus from the early Oligocene to the late early Miocene. We also penetrated to the regional unconformity at Site 588 (=Site 208) which exhibits a hiatus of 19 m.y. from the middle Eocene to the late Oligocene. These sections represest the most complete, coherent latitudinal traverse of Neogenen sections from equator to subpoles yet collected from the oceans.

Lithology

Almost all sediment cored during Leg 90 is rather monotonous light colored foraminifer bearing nannofossil ooze (chalk) to nannofossil ooze (chalk). Foraminifers generally range in amount from 5 to 15 percent with higher percentages during winnowed intervals. There is virtually no terrigenous sediment input apart from volcanic glass and very minor clay. Almost all of the sediment has been reduced and pyrite is common throughout. Siliceous biogenic material is usually absent and where present is in trace quantities and usually consists only of radiolarea and/or sponge spicules. Diatoms are rare in these sediments. Occasional and minor authigenic phases include celestite, chert and dolomite. Bioturbation ranges from surprisingly low in Site 588 to high in several of the sites. Laminae are almost always volcanic ash and provide a valuable measure for the amount of mechanical disturbance. Most are relatively sharp suggesting a minimal influence of bioturbation on core disturbance.

Paleobiogeography and biostratigraphy

The north-south traverse has provided an excellent suite of continuous Neogene calcareous sedimentary sections at shallow depths (1000 to 2200m) over a wide range of water mass conditions. The principal sites lie in the following present-day water masses (Fig. 1):

Site 586, equatorial, 29°84'S
Site 587, marginal tropics, 21°11. 87'S
Site 588, warm subtropics, 26°06.7'S
Site 590, transitional, 31°10'02'S
Site 591, transitional, 31°35.06'S
Site 592, northern temperate, 36°28.40'S

Site 593, southern temperate, 40°30.52'S
Site 594, northern subantarctic, 45°31.41'S

Because of the wide range of paleoenvironmental conditions, there are large paleogeographic differences in the planktonic foraminifer assemblages from north to south. A number of biostratigraphic zonations bave been used to cater for these changes. Existing schemes are adequate for biostratigraphic subdivisions except for a few minor modifications. The calcareous nannoplankton seems less influenced by changing watermasses than the planktonic formaninfera. Hence the existing nannoplankton zonal schemes are more widely applicable with changing latitude. Nevertheless subantarctic temperate and warmer areas show significant differences because at the higher latitudes the warm-loving Discoasters, Catinasters and Sphenoliths become rare or are missing in the latest Miocene/early Pliocene, middle Miocene and middle to late Oligocene. Biostratigraphic zonal resolution is thus reduced. The northward movement of the Indian Plate upon which most of the sites are located has also affected the planktonic microfossil paleobiogeography. This movement has amounted to 5-10° of latitude during the Neogene.

Radiolaria are abundant enough only in Eocene sediments and in the Neogene of Site 586 and 591 to provide potentially useful biostratigraphic information.

Microfossil Preservation

The preservation of planktonic foraminifer assemblages is excellent to good throughout all sections except in the lowermost part (earlier Miocene) of Site 590 and 591. These will provide a superb basis for future quantitative paleoceanographic and paleoclimatic work. Within the calcareous nannofossils, preservation varies with depth in the recovered cores reflecting diagenesis. In general Discoasters, Sphenoliths and the rod-shaped genus Triquetrorhabdulus are the first to show secondary calcite overgrowths. In most Leg 90 sites this begins as early as the early Pliocene probably due to the high sedimentation rate of biogenic calcium carbonate in this region during the early Pliocene. Heavy overcalcification occurs from the middle Miocene downwards, with Discoasters showing fused rays and crystal faces especially in indurated nannofossil oozes or chalks. At this level the coccoliths also show secondary calcite overgrowths. Deposition, however,

Table 90-1. Summary of Leg 90 drilling.

HOLE	DATES (1982/83)	LATITUDE	LONGITUDE	WATER DEPTH	PENETRATION	NO OF. CORES	METERS CORED	METERS RECOVERED	PERCENT OF RECOVERY
587	Dec. 3-5	21°11.87'S	161°19.99'E	1101m	147.0	17	147.0	88.81	60.4
588	Dec. 6-7	26°06.70'	161°13.6'	1533	245.7	26	236.00	220.76	93.5
588A	Dec. 8	26°06.70'	161°13.6'	1533	344.4	18	108.40	75.30	69.4
588B	Dec. 8-10	26°06.70'	161°13.6'	1533	277.4	31	277.4	255.87	92.2
588C	Dec. 10-11	26°06.70'	161°13.6'	1533	488.1	19	182.4	135.61	74.3
589	Dec. 12-13	30°42.72'	163°38.39'	1391	36.1	4	36.1	35.08	97.2
590	Dec. 15	31°10.02'	163°21.51'	1299	26.2	3	26.2	26.36	100
590A	Dec. 15-17	31°10.02'	163°21.51'	1299	280.8	27	254.6	224.17	88
590B	Dec. 17-19	31°10.02'	163°21.51'	1299	499.1	53	499.1	465.26	93.2
591	Dec. 19-20	31°35.06'	164°26.92'	2131	283.1	31	283.1	278.21	98.3
591A	Dec. 20-22	31°35.06'	164°26.92'	2131	284.6	30	284.60	233.15	81.9
591B	Dec. 23-24	31°35.06'	164°26.92'	2131	500.4	24	299.80	130.86	43.6
592	Dec. 25-27	36°28.40'	165°26.53'	1098	109.8	41	388.5	340.12	87.5
593	Dec. 28-30	40°30.47'	167°40.47'	1068	571.5	60	571.50	468.21	81.9
593A	Dec. 30-Jan 1	40°30.47'	167°40.47'	1068	496.8	27	257.30	227.71	88.5
594	Jan. 3-Jan 3	45°31.41'	174°56.88'	1204	505.1	53	505.1	299.72	59.3
594A	Jan. 6-Jan 7	45°31.41'	174°56.88'	1204	639.5	26	290.9	166.55	55
594B	Jan. 7-Jan 7	45°31.41'	174°56.88'	1204	1212.2	5	42.9	33.68	78

was well above the CCD and above the nannofossil lysocline since the assemblages contain fragile coccoliths in addition to the sturdy coccoliths and the Discoasters. In the Oligocene of Site 592, and in the late Eocene of Site 593 the preservation is somewhat improved regardless of the depth. In the first two cases a disconformity and in the latter a volcanic sequence was noted first above the intervals containing better preserved calcareous nannoplankton.

Paleomagnetic Stratigraphy

Objectives of the paleomagnetic study of Leg 90 sites are twofold: Firstly to provide a high resolution magnetic reversal stratigraphy for each site, and secondly to investigate the relationship between variations in magnetic properties of the sediments and other paleoenvironmentally sensitive parameters, notably carbonate content and stable isotope ratios.

High density sub-sampling (2 to 3 specimens per section) was performed on all cores recovered. Absolute orientation data was obtained on about two-thirds of these cores.

In all but a few zones the sediments recovered were very weakly magnetized (less than 0.5 Microgauss). The high noise level in the shipboard magnetometer (0.2 to 0.3 microgauss at 2^7 spins) combined with the rapid recovery of so much core made on-site production of magnetic stratigraphy impractical.

An oxidized gray-brown colored zone occurs in the upper few meters of sediment from each site. This was more strongly magnetized (1 to 5 microgauss) with normal directions close to the axial dipole field value for each site. Much of this primary signal is certainly lost during subsequent alteration in the underlying reducing environment. It is not yet known how much of this primary magnetization is destroyed, and whether a chemical remanance is acquired during the oxidation-reduction transition. The occurrence of alteration does not preclude a polarity stratigraphy, but does introduce and uncertainty in the time delay between deposition and acquisition of a stable remanance. Measurements made on the occa-sional zones of more strongly magnetized sediment lower in the sequences (e.g. Cores 503-41 to 45) did indicate that the sediments preserve a record of field reversals.

Due to the remarkably uniform character of the sequences, and the relatively high, continuous sedimentation rates at all sites, the prospects of satisfying the original objectives appear to be good.

Accumulation Rates

One of the surprises resulting from Leg 90 is the generally high sedimentation rates of biogenic carbonates within some time intervals. Rates of sedimentation range from a low as 7 m/m.y. in the late Eocene of Site 593 to as high as 131 m/m.y. in the late early Pliocene (NN13-NN15) interval of Site 591. Because of new computer facilities on the ship, it was possible to calculate mass accumulation rates for each time interval used in the sedimentation rate curves (Fig. 2). Ages of nannofossil boundaries (Neogene NN and Paleogene NP Zones) were used for the determination of sedimentation rates (Martini, 1976, 1980) with some minor improvements. These are shown in Figure 2. Wet bulk density GRAPE and water content data were used to calculate bulk accumulation rates. Because the calcium carbonate content of most cores is greater than 97%, the changes in mass accumulation represent changes in carbonate sedimentation. We have been able to make good intercore comparisons of accumulation rates for the Neogene (Fig. 2).

The early Miocene (23 to 16 Ma) exhibits average rates of accumulation that are rela-

Table 90-2. Leg 90 site data relating to ooze-chalk transformation.

Site Number	Water Depth (m)	Latitude	Subbottom Depth and Age of Ooze/Chalk Transform	Sedimentation Rate (m/ma.)
586	2207	0	282m, 10.8ma.	27m/ma.
588	1533	26 S.	260m, 12.2ma.	18m/ma.
590	1299	31 S.	275m, 8.0ma.	33m/ma.
591	2131	31.5 S.	290m, 8.8ma.	32m/ma.
592	1098	36.5 S.	275m, 16.5ma.	16m/ma.
593	1066	40.5 S.	462m, 22.0ma.	21m/ma.

tively unchanging. Rates show much more fluctuation beginning about 15 Ma and continuing to 10 Ma (middle Miocene). A major peak (up to 129 m/cm^2/ky) is centered at 12 m.y. The late Miocene (10 Ma to 4Ma) is marked by fairly constant and average rates of accumulation suggesting a rather uniform environment of deposition. At about 5 Ma near the Miocene/Pliocene boundary rates again increase, and between 4 and 3 Ma (late early Pliocene) there is a widespread, shortlived, remarkably high peak of accumulation rates up to 27 gm/cm^2/ky. We do not believe that this results from an artifact of the time scale because firstly it would require a major change in the time scale to substantially change the pattern of increased rates, and secondly relatively high rates have been reported elsewhere at this time such as in the Columbia Basin (Prell, Gardner, et al. 1982).

Accumulation rates during the late Pliocene were much reduced from early Pliocene values, but still higher than average Neogene rates. During the Quaternary, rates were quite variable between cores. They are very high in Site 587 due to downslope transport of bioclastic carbonate from the Landsdowne Bank probably during low stands of sea level. In most other sites the Quaternary exhibits much lower sedimentation rates. This is perhaps due to indceased winnowing at this time related to stimulated oceanic circulation. We believe that, for the most part, the Neogene accumulation rates in these sites (apart from Site 594) reflect actual changes in calcareous biogenic productivity. They are not due to dilution from non-carbonate sources since non-carbonate materials are unimportant. Further they do not reflect dissolution since the sites are located above the lysocline and show little dissolution other than that due to diagenesis. For a variety of reasons, we have also dismissed the possibility of the observed high rates being largely due to secondary material from winnowed areas. Such evidence includes

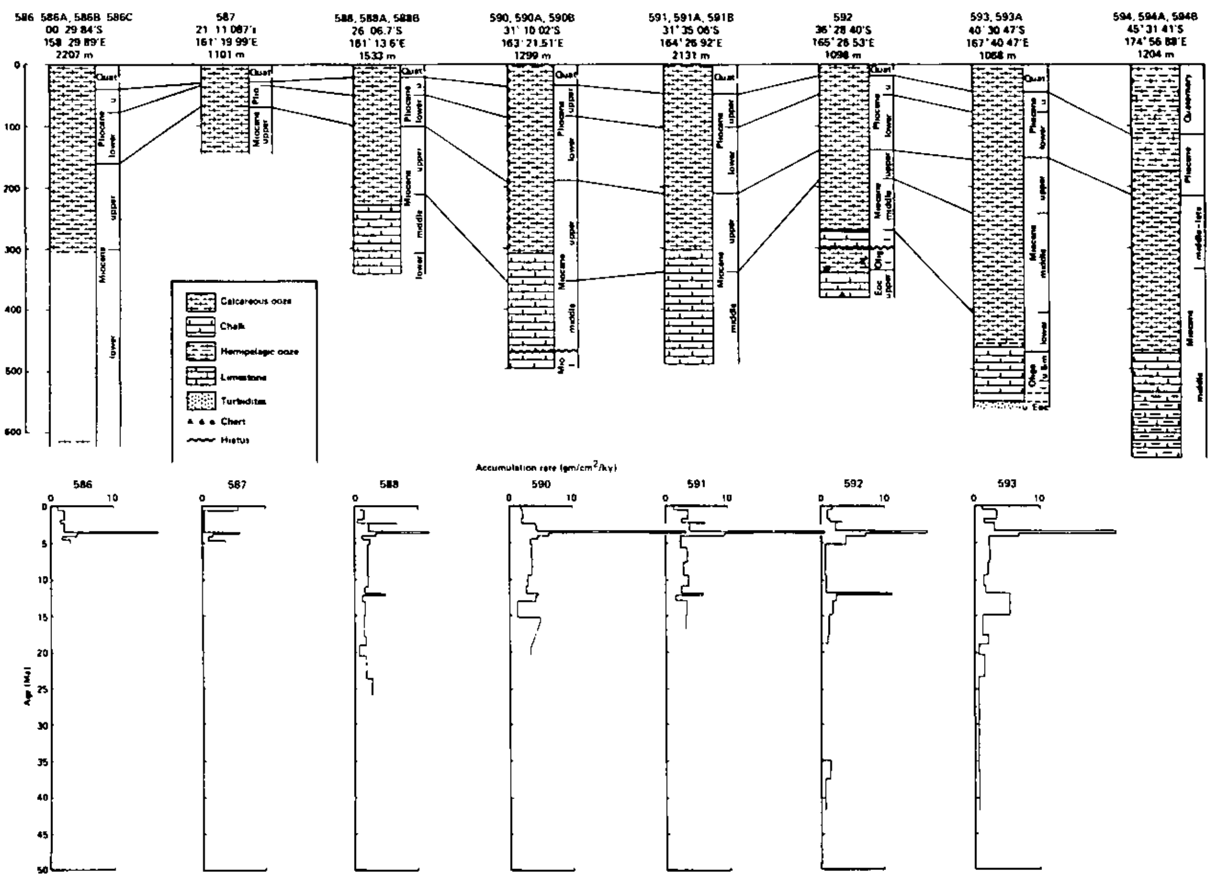

Figure 90-2. Lithology and stratigraphy and accumulation rates at Leg 90 drill sites. Accumulation rates were calculated and plotted using the new shipboard computer facilites.

geographic location of the sites, character of the seismic profiles and little evidence of reworking of microfossils. The paleoceanographic reason for such high productivity between 4 and 3 Ma is unclear since that seems to have been an interval of relatively warm, uniform paleoceanographic conditions prior to major Northern Hemisphere glaciation and ice sheet formation.

Sedimentation rates in the north-south transect are highest throughout the Neogene at latitudes of Sites 590 and 591 (about 30° to 31°S). It is possible that this increased biogenic productivity is related to the poorly known Subtropical Divergence that crosses the Tasman Sea at the latitude of these sites (Fig. 1). Rates are lower in sites to the north and to the south. It is perhaps not coincidental that strong currents were experienced during the drilling of Sites 590 and 591 which created positioning difficulties for the ship. This was also the case while drilling nearby Site 206 during Leg 21 in 1971.

Tephrochronology

Most sites contain layers of volcanic ash or altered volcanic ash, clearly visible because of the superior quality of the HPC and XCB sections. Sites that contain numerous such layers of Neogene age are Site 588, 590, 591 and 594. Numerous ash layers of latest Eocene-early Oligocene age were also found in Sites 592 and 293.

We were interested in determining the ages of the explosive volanicity from the tephochronology, since this has been previously observed to be episodic throughout the circum-Pacific region (Kennett et al., 1977). So far one site (Site 591) has been examined in some detail. Counts of ash layers were made in each of the drill holes, correlations made between the paired HPCs, and the data normalized for different rates of core recovery. Figure 4 is a plot of the number of ash layers per million years for Site 591, ranging in age from the late early Miocene (18 Ma) to the present-day. These data clearly show that there have been a number of episodes of volcanic explosivity separated by more quiescent intervals. Intervals of more active volcanism are as follows:

18 to 14 Ma: latest early Miocene to middle Miocene.
11 to 9 Ma: early late Miocene.
5 to 4 Ma: latest Miocene to early Pliocene.
3 to 0 Ma: late Pliocene to P.D.

Middle Miocene volcanic explosivity may be more extensive, but this is difficult to determine because of poor core recovery through this interval, even though we did make a core-recovery correction. The episodes of increased explosive volcanicity are separated by periods of relative quiescence which includes some of the Pliocene and much of the late Miocene. The most important episodes are centered at 1.8 to 0 Ma (Quaternary), 10 Ma (late Miocene) and 15 to 17 Ma (early to middle Miocene). One of the intervals of time most persistently containing ash is the Quaternary. The latest Miocene through early Pliocene episode is much less intense as is the late Pliocene. This explosive volcanic history is similar to trends previously compiled for the southwest Pacific region and is also similar to the trends exhibited in a global compilation (Kennett et al., 1977). As proposed by Kennett (1981) there is some relationship between these pulses and global paleoclimatic change, but the cause of such possible relations remains unclear. The sources of the volcanic ash layers have not been determined but, in the southern sites was almost certainly New Zealand.

Diagenesis of Leg 90 Carbonate Sediments

One of the important results of Leg 90 was the recovery of several continuous sections of very pure carbonate sediments from surficial unconsolidated oozes to buried chalks and occasional limestones. These sequences provide an excellent record of the diagenetic processes which characterize the ooze-chalk transformation. Preliminary shipboard observation relevant to the problem of carbonate lithification include: 1) the lithologic summaries 2) the biostratigraphic summaries, and 3) the measurements of physical properties. In addition a large number of interstitial water samples as well as sediment samples were taken for shorebased analyses to document this transformation. The major shipboard observations on carbonate diagenesis are summarized in Table 3 and in the following paragraphs.

The general trend of increasing lithification with increasing burial observed elsewhere (e.g. Schlanger and Douglas, 1974) is well substantiated. At five of the six useful sites on Leg 90, the depth of the ooze-chalk transformation averages 276 m with a total range of variation of only 30 m. The age of this transformation varies more widely from 8.0 Ma at Site 590 to 16.5 Ma at Site 592, averaging 11.3 Ma over the same five sites. Site 593 is exceptional. Ooze persists to a burial depth of 462 m and an age of 22 Ma. A second exception to the trend is the reversal in induration occuring between 305 and 345 m

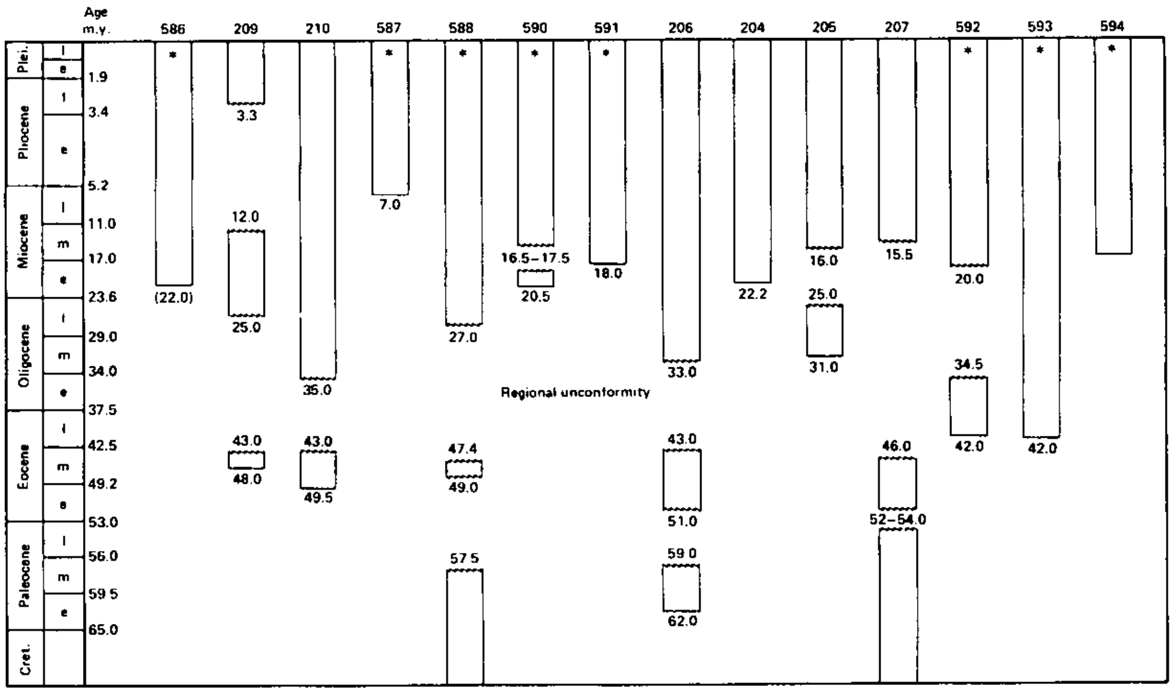

Figure 90-3. Age ranges of DSDP sites in the southwest Pacific. Sites drilled during Leg 90 are shown by asterisks (Site 586 was drilled during Leg 89). Chronology (Ma) is that assigned to calcareous nannofossil (NN and NP Zones) by Martini (1976, 1980).

s ub-bottom depth at Site 592. Oligocene nannofossil ooze underlies firm lower Miocene chalk. These two exceptions merit further discussion.

It has often been noted that Discoasters provide ideal nucleation sites for calcite overgrowth during diagenesis. A similar role is played by the Sphenoliths. Both of these nannoplankton were limited predominantly to warm waters, hence their abundance and diversity throughout temperate Site 593 and subantarctic Site 594 are low. The Oligocene ooze at Site 592 is likewise dominated by cold water taxa and the abundance of Discoasters and Sphenoliths is low. It is suggested that absence of these elements from the sediments forestalled calcite recrystallization. In general, high latitude pelagic caronate may remain oozes to deeper burial depths than those in lower latitudes.

An interesting sidelight related to carbonate recrystallization is the occurrence of celestite ($SrSo_4$) in Sites 590 (Cores 590B-18-4, 20-9, 23-6 and 27-4) and possibly Site 591. The celestite occurs in the form of nodules or burrow-shaped cylinders. Pore waters in rapidly-deposited pelagic carbonate sediments usually become enriched in dissolved strontium as a result of the recrystallization of biogenic calcite (Sr-enriched) to inorganic calcite (Sr-depleted). As long as microbial sulfate reduction is fairly unimportant, the ion activity product of celestite can be surpassed and it can precipitate.

Physical Properties

The extensive use of HPC's on Leg 90 encompassing an entire suite of transect sites yielded thousands of meters of relatively undisturbed, high quality sediments and provided an opportunity to observe and measure the physical properties of a calcareous ooze-chalk as a function of age and depth of burial. In general, lithification increases with age and depth, reflected by a gradual decline in porsity and a reciprocating rise in bulk density. Porosities range from 69 to 43%. Sonic velocity also increases gradually with depth and sharp deviations from this trend, usually associated with variations in bulk density, result in corresponding shifts in acoustic impedance. These can often be identified as reflecting horizon in the seismic profiling records. The reflector associated with the regional hiatus at Site 592 correlates with a paleoceanographic event as well.

Shear strength values increase only slightly with depth for approximately the initial 300 m of each site, after which they usually exhibit a sudden increase and by 360 m, values rise beyond the capability of the laboratory vane shear apparatus.

One of the more intriguing features of the physical properties data for this leg is contained in the porosity profile derived from Hole 593. After the expected decline in the upper 50 m, sediment porosity remains relatively constant over the following 300m and lithification resumes only beyond 350 m. Large increases in overburden stress seem to produce no significant compaction within the depth interval. This behavior is not evident at any of the other sites.

Eocene /Oligocene Boundary Events

Of particular interest are two complete sections over the Eocene/Oligocene boundary in Sites 592 and 593. This interval is of particular interest because it represents what appears to have been the most important paleoceanographic change in the Cenozoic. At that time, oxygen isotopic evidence indicates that the cold water of the oceans (psychroshpere) was generated perhaps as a result of a glacial threshold occurring in Antarctica. Related to this event was a significant drop of 2000 m in the calcium carbonate compensation depth, related oceanside lethofacies changes and important changes in the planktonic and benthic biota. Before Leg 90, a single continuous section existed in the South Pacific, Site 277, located in the subantarctic south of New Zealand. In all other sections the boundary had been removed due to erosion associated with the regional haitus of the southwest Pacific.

Site 592 offers a particularly fine, complete section in Cores 36 and 37. A distinct lithloogic change occurs near the level of extinction of Globigerinatheka index which is the foraminifer marker for the boundary in south temperate latitudes. The underlying late Eocene is represented by nannofossil chalks containing siliceous microfossils such as radiolaria and sponge spicules while the Oligocene is represented by surprisingly soft nannofossil ooze lacking biosiliceous material.

The extinction of Glogigerinatheka index, is in Core 592-36-3 between 90 and 64 cm. According to the nannoplankton the boundary at the extinction of D. saipanensis is in Core 592-37-2, between 5 to 6 and 33 to 34 cm. A similar sequence of extinctions of the two taxa was recorded at DSDP Site 277 drilled south of New Zealand (Kennett, Houtz et al., 1975).

A spectacular sequence over the Eocene/Oligocene boundry is also recorded at Site 593. There the boundary is marked by a remarkable 15 m sequence of dark volcanogenic proximal turbidited, debris flows and pyroclastic flows that are described in the next summary item. The Eocene/Oligocene boundary based on several planktonic foraminifer extinctions a few centimeters above the volcanic material. In contrast, the boundary, as defined by extinction of two calcareous nannoplankton species occurs at the base of the volcanic material. In Site 592, which contains an excellent extended sequence over the boundary the critical nannoplankton species also become extinct before the planktonic foraminifers by nearly 7 m. Therefore the Eocene/Oligocene boundary is slightly different when based on each microfossil group. Calculation of the sedimentation rate at Site 593 shows no obvious break over the boundary and the microfossil succession is interrupted. Therefore the volcanics were emplaced between the two defined boundaries and perhaps only a few thousand years before the planktonic foraminifer extinctions. A radiometric determination of the volcanic material should provide useful data concerning the age of the Eocene/Oligocene boundary. In addition a number of important changes in benthic foraminifera occur across the boundary.

One of the most remarkable aspects of this boundary is the extremely close chronology of the volcanic sequence with faunal extinction. The volcanogenic turbidite unit can be tentatively traced at least for several tens of miles to the north on the seismic profile. This unit also seems to be confined to a relatively short time interval since most of the remaining seismic section is marked by relative acoustic transparency. This interval seems to be a time of highly active volcanism in the New Zealand region based on land-based observations and the presence of abundant ash layers closer to the boundary at both Sites 592 and 593.

Volcanogenic Turbidites

The only non-carbonate lithologic unit drilled in the Leg 90 Tasman Sea sites was a 10 m thick section of grayish black to grayish green well lithified breccia, sandstone and mudstone, including possibly ash tuff, at 546 m sub-bottom depth at Site 593, Challenger Plateau. Initial observations suggest the volcanic components have a glassy rhyolite composition. The unit straddles the Eocene/-

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Oligocene boundary, with late Eocene nannofossil chalk below and early Oligocene nannofossil ooze above. It consists of at least 40 fining-upward subunits, typically 20 to 50 cm thick, several of which exhibit a partial Bouma sequence of sedimentary structures, dominantly divisions A, B and E. Deposition from proximal turbidites is suggested, although some of the coarser beds may be submarine pyroclastic flows. A possible source of the nearby "Lalitha Pinnacle" (shipboard name, a Sanskrit name meaning beautiful), a prominent buried conical reflector seen on seismic records. Numerous thin ash layers also occur in the late Eocene-early Oligocene carbonate sediments at this site and at Site 592 to the north. The evidence suggests a significant period of volcanic activity in the southeast Tasman Sea at this time.

Regional Hitatus of Southwest Pacific

It is quite well documented that the ocean basins of the southwest Pacific are marked by numerous unconformities that cut the Paleogene sequence, while the Neogene sequence is largely complete. The best documented of the Paleogene unconforminities cuts much of the Oligocene and is commonly referred to as the regional unconformity (Fig. 3) (Burns, Andrews, 1973; Kennett et al., 1972) or the Marshall paraconformity (Carter, 1972). Only three Leg 90 sites drilled deep enough to potentially encounter the unconformity. Two of these (Sites 588 and 592) encountered the unconformity while in the other (Site 593) the unconformity is absent.

The hiatus at Site 592 is of interest because it ranges in age from the early of middle Oligocene to the early Miocene. Erosion at this site did not remove the Eocene/Oligocene boundary. The planktonic foraminifers suggest an age bracket for the hiatus in Site 592 of about 13 m.y. (i.e. between 31-32 Ma to 18-19 Ma. The calcareous nannofossils, on the other hand suggest a range of 15.5 m.y. between NP22 at 35 Ma and NN2 at 19.5 Ma.

The regional unconformity seems to have been formed by bottom water masses that flowed northwards through the Tasman Sea at times during the Paleogene. These water masses were activated by cooling that began at the beginning of the Oligocene (Kennett et al., 1972). The sequence at Site 592 is of significance because it shows that at least in that area, bottom water activation did not commence until within the Oligocene rather than at the boundary itself.

...absence of the unconformity in Site 593 on the Challenger Plateau suggests that the bottom currents that cut the hiatus did not extend that far to the east as previously suggested by Kennet et al. (1975) based on other sites in the New Zealand region.

The Oligocene/Miocene Boundary

Good quality transitional sequences occur within Sites 588 and 593. The boundary at Site 593 coincides with a more lithified chalky horizon within an otherwise monotonous sequence above and below. The significance of this lithologic change is unknown.

The Middle Miocene Glacial Event

The middle Miocene at 15 Ma through 13.5 Ma is marked by a major increase (1.5^{o}/oo) 0^{18}, considered by a number of writers (e.g. Shackleton and Kennett, 1975; Savin, 1977) to represent the major phase of ice buildup on Antarctica. The best documented record of this major global paleoclimatic event is in Site 289 on the Ontong-Java Plateau in the western equatorial Pacific (Woodruff et al., 1981). Two sites cored during Leg 90, Sites 588 and 593, contain high quality sections during the time of this event.

Site 593 is of particular interest because it contains a distinctive pale orange subunit (393.8 to 418 m) in what is otherwise identical in lithology to the surrounding subunits and interpreted to have represented oxidizing rather than post depositional reducing conditions. This subunit falls within the Praeorbulina glomerosa curva foraminiferal zone and hence is about 15 to 15.5 m.y. in age, and thus probably immediately precedes the time of major ice buildup in Antarctica. The event that caused the oxidized state of this subunit must have altered the balance between available dissolved oxygen supplied to the seafloor and available organic carbon supplied to the infauna and bacteria within the sediment. It is possible that there was a brief development of a water mass front not far to the south of Site 593 that produced intermediate waters sufficiently highly oxygenated to prevent post-depositional reduction within the sediments. In the present day, oxygen-charged Antarctic intermediate waters are produced at the Antarctic convergenece and flow towards the north at about 1000 m water depth. In this interval the character of the benthic foraminifer fauna remains surprisingly constant. Th... small, hispid uvigerinids, however, occur i... large numbers in Core 593-42,CC and may b... a reflection of increased oxygenation at the time. Also, a few new forms occur, includi... Melonis barleanum, Bolivina anastomosa, a...
The

Uvigerina auberiana.

The middle Miocene episode was relatively short lived because the sediment returns to a reduced state by about 15 m.y. The oxidized sediment layer may therefore represent a paleoceanographic change associated with the evolution of Antarctic glaciations. Coincidentally with the end of deposition of the oxidized subunit there occurred a sudden increase in sedimentation rates from 9.7 m/m.y. to 48.4 m/m.y. This increase may have resulted from increased biogenic productivity associated with stimulated cirulation related to Miocene glaciation.

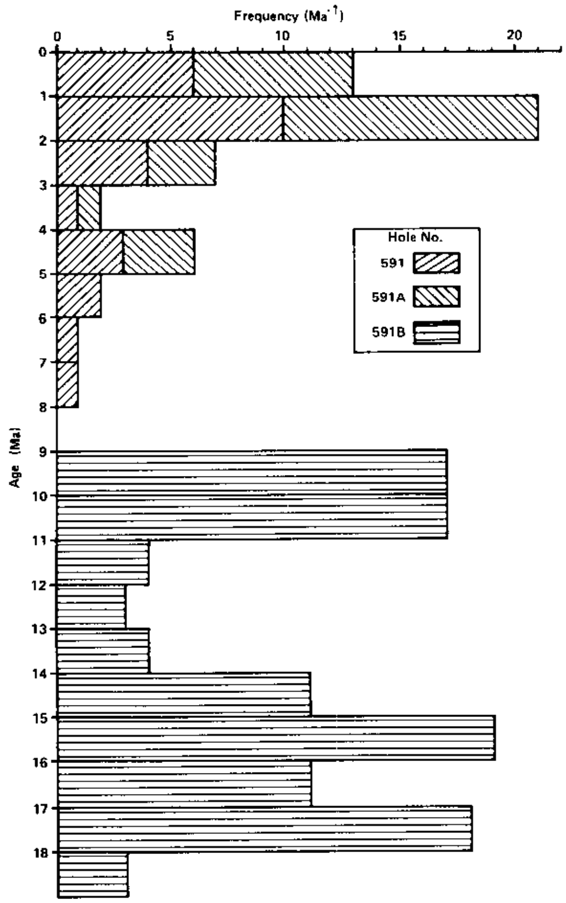

Figure 90-4. Histogram showing the frequency per m.y. of ash layers and divitrified ash layers at Site 591. Thickness of each layer is more than 1 mm against core recovery and typically several contimeters. Single, very thin laminae less than 1 mm in thickness were omitted. A careful correlation of layers between HPC Holes 591 and 591A (above) allowed a cumulative plot to be made without duplication of layers. Frequencies found in Holes 591 and 591A are differentiated in the histogram. Because of relatively poor core recovery in Hole 591B, a normalization for recovery was also made. Recovered section is shown in black at left.

Evolution

Leg 90 core material offers enormous potential for the study of evolutionary processes and modes using the foraminiferal sequences. The material is ideal, for instance, to examine evidence of gradualism and punctuated equilibria. This potential results from a number of factors:

1. Continuous, unbroken stratigraphic sequences of high quality using the HPC and XCB.

2. Enormous numbers of individual microfossils exhibiting high quality preservation.

3. High sedimentation rates over particular intervals and within certain sites.

4. Sufficient number of lineages which apparently intergrade in some fashion.

5 Latitudinal spread of sections for examination of effects of changing water masses and paleobiogeography.

Terminal Miocene Event

The well known terminal Miocene event and the Miocene/Pliocene boundary are well represented in all sites drilled during Leg 90. For the first time this includes sites in transitional waters (Sites 590 and 591). Previously this interval had been lost in unconformity at at these latitudes (Site 206). All of the sections were obtained using the HPC.

Planktonic foraminiferal faunas are invariably well preserved over this interval. Assemblages are typically cooler than in earlier parts of the Miocene and the early Pliocene. There is a reduction in diversity and specimen size associated with the cooling event.

Benthic foraminifers also respond to this event, with the appearance for the first time of the uvigerinids. These forms are present only during the Miocene and reappear again on a permanent basis in late Pliocene to Quaternary assemblages. Their temporary presence in the latest Miocene suggests that conditions resembling the glacials temporarily developed at that time. The uvigerinids are known to have appeared in increased abundances in many areas of the world's oceans in the latest Miocene in association with the C^{13} shift

(Keigwin, 1979) reflecting important paleoceanographic changes.

Mid Pliocene Events in Benthic Foraminifers

The transition from the early to the late Pliocene seems to include two major events in the Lord Howe Rise area, Tasman Sea. The first, which may be a regional event, is accumulation rate increase from approximately 5 $gm/cm^2/ky$ to 15-27 $gm/cm^2/ky$ at all sites. The event ranges in age from within Zone NN14 to within Zone NN15 approxi mately 3.7 to 3.5 Ma. This is followed by a second event 3.0 Ma when intense glaciation commenced in the northern hemisphere (Shackleton and Opdyke, 1974). The oxygen isotope changes associated with the increased glaciation correlates roughly with the base of Zone NN16.

During the time interval from Zones NN14 through NN16 which includes these two events, there are a large number of changes in benthic foraminifer faunas at all Leg 90 sites. Reconstruction of the patterns of foraminiferal change during this time is nevertheless made difficult by several factors:

1. Probable diachroneity of the zonal boundaries makes designation of the glacial interval uncertain;

2. differences in sedimentation rates through the supposed glacial interval results in compression of events at some sites thus obscuring the patterns and hampering inter-site comparison;

3. gradients in species abundances from north to south strongly influence the patterns. As a species decreases in abundance toward the south, it is less likely to change, but to be replaced in pattern by another species which is more abundant. Similarly, species abundant to the south are less likely to be seen in sites to the north.

4. gradients in species abundances through depth cause an analagous problem to (3) in pattern recognition between the shallow sites and the deeper Site 591.

5. changes in a species position along the north-south gradient through time alters its part in the pattern from one time to the next; thus the same species cannot necessarily be used to describe events separated in time.

Description of changes in species determinations thus required the recognition of bioprovinces through latitude. In the time interval from NN14-NN16 there is a strong similarity in faunas between Sites 587, 588, and 590, with an apparent boundary between this area and that of Sites 592 and 593 farther to the south. Sites 591, though located adjacent to Site 590, demonstrates species abundances and variations more similar to those at the shallow Sites 592 and 593.

Sedimentation Event

The sedimentation rate increase is signaled at Sites 588 and 590 by a large increase in the fine fraction of planktonic foraminifers; at Site 587, there is a noticeable increase in the amount and consistency of redeposited shallow water invertebrate remains and benthic foraminifera. Within this interval preservation improves markedly, the number of benthics increases, as does their diversity. Faunal changes are concentrated in three groups: the deep water indices, the miliolids, and the uvigerinids. Apparent upslope migration of two species characteristic of deep water sites, Melonis pompilioides and Nuttalites umbonifera, is accompanied by an increase in the miliolids, a decrease in the numbers and types of uvigerinids, and specifically of the form characteristic of upwelling areas, Rectuvigerina multistriata. A new uvigerinid is introduced - Uvigerina auberiana - which is usually found at the greatest or shallowest depths of the ocean.

Both the miliolids and U. auberiana are more characteristic of the most southerly, subantarctic Site 594. Their presence and the decrease in the uvigerinids suggests a change to more oxygenated or cooler water environment with lower nutrient availability. The apparent upslope migration of the deeper water forms corroborate this interpretation.

Preservation improves also at Sites 591, 592 and 593 during the sedimentation increase. At the two shallower sites there is an upslope appearance of Nuttalites umbonifera, a decrease in the uvigerinids, little change in the rectuvigerinids which are not common in this southerly area, little change in the miliolids which are always common in this area, but an increase in the numbers of cibicidids. Species of Osangularia, more common to the North, disappear entirely from this area. As at other shallow sites, there is a new uvigerinid, U. auberiana. At Site 591 the pattern is similar except that faunas contain larger percentages of several species which occur almost exclusively at the shallower water sites and the new uvigerinid, U. auberiana.

Although the change in species composition at the southerly and the deeper site are not identical to those at the northerly sites, nevertheless they suggest the same environmental alterations. The cibicidids and the decrease in the uvigerinids both suggest decreased nutrients, the upslope migration suggestions the presence of cooler waters, and the appearance of U. auberiana suggests both cooler and more oxygenated environments.

Mid Pliocene Glacial Event

Patterns of benthic change at the more northerly Sites 588 and 590 resemble those below with important exeptions. As before there is an apparent upslope appearance of M. pompilioides and N. umbonifera. Uvigerina auberiana makes a reappearance coincident with the final disappearance of all typically miocene (or older) uvigerinids and hopkinsinids. The late Neogene hispidocostate uvigerinids, some of which appeared temporarily in the latest Miocene, recolonize these shallower water sites and remain in abundance there through the remainder of the Neogene and Quaternary. Auxiliary changes include an increase in the amounts of Ehrenbergina pacifica and a switch from less to more ornamented forms of Cibicidiodes.

In the southerly sites and the deeper Site 591 a similar pattern emerges: N. umbonifera, Ehrenbergina, U. auberiana, and the hispidocostate uvigerinids all increase in importance, followed by an increase in the mioliolids, and in the numbers of Cibicides lobatulus at the shallower sites.

These data suggest a total reorganization of the upper 20,000 m of the oceanic water column. Since the changes in uvigerinids occur worldwide, the reorganization is apparently not a regional phenomenon. Although the patterns resemble those of the sedimentation event, the important differences are a temporary increase of N. umbonifera throughout all depths; and the permanent establishment of uvigerinids throughout the 2,000 meter range. These two changes indicate that cooler waters developed at both the shallower and deeper sites. And, perhaps more significantly, that the nutrient content of both deep and intermediate waters apparently increased and remained higher through the remainder of the late Cenozoic.

Late Neogene Glacial Episodes at Site 594

The late Neogene at Site 594 contains a large number of oscillations between hemipelagic and calcareous biogenic facies. The pelagic facies is blue gray and is mainly a foraminifer bearing nannofossil ooze with virtually no terrigenous sediment component. Biosiliceous components occur only in traces. The hemipelagic facies is mainly a green gray nannofossil breaing clayey silt, rich in mica, feldspar and well sorted quartz grains. Biosiliceous components are important. A large percent of the terrigenous component maybe wind blown. There were 25 major hemipelagic sediment episodes during the last 6 m.y. and numerous intermediate episodes. Individual oceanic to hemipelagic cycles range from 0.5 to 10 m in thickness. We interpret these sedimentary cycles as reflecting sea level oscillations with the hemipelagic facies being laid down during glacial low-stands of sea level.

Surface Oxidized Zone

Almost from the first HPC coring (Leg 68, Site 502), a surface oxidized zone above a dominantly reduced section has been frequently recovered by deep sea drilling. The surface oxidized zone is typically the upper 0.5 to 1.5 m but it has been reported up to 7 m (Leg 72, Site 516). The sequences rarely show oxidized sediments below the surface oxidized zone. A notable exception is Site 593. The facies of these cores with a surface oxidized zone is generally biogenic marls or oozes. However a few siliceous clays and biogenic muds have been described. Almost all the sites cored on Leg 90 have a surface oxidized zone resting directly on a reduced section. The surface oxidized zone is found in the North and South Atlantic, North, equatorial and South Pacific and at depths from just over 1000 m to greater that 6000 m.

The oxidized zone is not an oxidized crust, such as that described by McGeary and Damuth (1973?) nor an interbedded oxidized zone as described by Gardner et al (1982). The surface oxidized zone appears to be a redox front that represents the level below which aerobic combustion of organic matter by micro-organisms has depleted the available oxygen in the interstitial waters.

Preliminary Results

The following presents the initial summary and conclusions for each site of Leg 90. The at-sea scientific objectives were successfully completed for each of the sites except for Site 587. We were unable to obtain the Miocene sediments at this site because of the presence of calcareous turbidites transported from the nearby shallow water of Landsdowne Bank. A suitable Miocene section was obtained however. Also we lost the heat probe used with the HPC early in the expedition and that prevented heat flow measurements from being taken at three sites.

Site 587

Site 587, located on the southern slope of Landsdowne Bank in the southwest Pacific, was hydraulically piston cored 147 m into the late Miocene, but with good recovery only in the Pliocene. The section consists of one major facies - foraminifer bearing to foraminifer nannofossil ooze interbedded with a minor facies of coarse-grained sediment consisting of skeletal silty sands to skeletal sandy gravels. The coarse sediment facies is formed of redeposited sediments of shallow water origin, especially corals, bryozoa and shallow-water foraminifers from the photic zone. The distribution of sediment deposited from gravity flows suggests that these were deposited during low stands of sea level. Enhanced sediment gravity flows during low stands of sea level.

Although paleomagnetic data shows much scatter, the Kuster tool provided absolute azimuths which allowed magnetostratigraphic information to be gleaned from long-core measurements. A crude magnetostratigraphy was obtained which may help to resolve some conflicts in the biostratigraphy.

Three successful heat flow measurements provide a linear temperature profile of 5.47 degrees centigrade per 100 m.

Site 588

Site 588 on the northern Lord Howe Rise consists of four holes: Hole 588 which was continuously cored with the HPC from 0 to 236.0 m sub-bottom; Hole 588A was continuously cored with the HPC from 236.0 to 344.4 m; Hole 588B which was continuously cored with the HPC from 0 to 277.4 m; and Hole 588C was continuously cored with the rotary drill from 305.7 to 488.1 m sub-bottom. Site 588 is a continuously cored repetition of Site 208 in the warm subtropical water mass at 26°S.

The HPC sequence through carbonate sediments is a record penetration of 315 m, extending from the Quaternary to the late early Miocene at 17 Ma. (NN3- G. miozea Zones). The overlapping hydraulic piston cores effectively provide 100% recovery of this sequence. There is particularly good core quality in Miocene, much less so in Pliocene and especially in the Quaternary which is soupy. Carbonate fossil sequence is exquisite

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through Neogene but less so in Ologocene, Foraminiferal and calcareous nannofossil zone sequences are complete suggesting absence of hiatuses above late Oligocene (NP24).

Three sedimentary units are distinguished. An upper thin veneer (Unit I) of brownish more foraminiferal rich ooze in a more oxidized and winnowed environment. Almost all of the underlying sequence (Unit II) is a foraminier-bearing nannofossil ooze (or chalk). There are many thin volcanic ash layers through the Miocene sequence, occurring as singlets, doublets or triplets and with groups exhibiting quasi-regular periodicities in some intervals. Most are competely undisturbed by bioturbation, which in this site is unusually limited and an ineffective agent of sediment homogenization.

Iron sulfides persist through the section and have a close association with volcanic ash layers. The site terminated in middle Eocene siliceous-rich chalks and cherts.

Textbook examples of microfaults and slickensides in three late early Miocene cores in a zone between more plastic ooze above firmer chalks below. Surfaces are occasionally mineralized by iron sulfide and possibly rhodochrosite.

The uncorrected rate of sedimentation: lower Oligocene-early Miocene, 20.6 m/m.y.; early Miocene, 14.4; middle Miocene-early Pliocene, 17.4, lower Pliocene, 29.5; Quaternary, 12.2 m/m.y.

Site 589

The objectives of Site 589 are those that were eventually fulfilled at Site 590 which is slightly to the south on Lord Howe Rise. Failure of the shipboard positioning computer system took place after only four Quaternary hydraulic piston cores had been taken to a total sub-bottom depth of 36.1 m. The base of the section consists of a veneer (0-0.4 m) or orange colored foraminifer nannofossile ooze (Unit I) underlain by lighter colored Quaternary foraminifer nannofossil ooze (Unit II) to the base of the cored sequence. This unit exhibits alterations between lighter greenish intervals richer in volcanic ash to those of white to light gray ooze with less important ash. Foraminifera and calcareous nannofossils are well preserved.

Site 590

Site 590 situated on the crest and approximately half way down the Lord H-consists of three holes: Holt 590 which was continuously cored with the HPC to 26.2 m sub-bottom; Hole 590A which was continuously cored with the HPC from 26.2 5o 280.8 m sub-bottom; and Hole 590B which was continuously cored with the HPC from 0 to 250.7 m sub-bottom and rotary drilled with the extended core barrel (XCB) from 25.7 to 499.1 m sub-bottom. Cores recovered using the XCB are slightly to moderately disturbed and in many cases consist of biscuits of sediment in stratigraphic sequence but surrounded by soft ooze injected during the coring process. This represents the first successful use of the XCB and it proves to be a most useful new coring tool.

The section is made up of one lithostratigraphic unit respresented mostly by foraminifer bearing nannofossil ooze or foraminifer rich nannofossil ooze. The sequence is divided into five subunits based on changes in color, percentage of foraminifers, degree of bioturbation and degree of diagenesis. The upper two units contain more foraminifer-rich intervals due to increased winnowing that began about 3 Ma. The sequence contains only traces of nonbiogenic components but volcanic ash is quite persistent. Multiple light green laminae from early late Miocene to early Miocene are possibly altered volcanic ash layers. Biostratigraphic zonal sequences of transitional type occur with an important temperate component to assemblages. The zonal sequence is complete for basal middle Miocene (16.5 m.y.) to Quaternary. Hiatuses cut up the early Miocene.

The Site 590 section provides a superb sequence of pristine foraminifera during the last 15 m.y. and of calcareous nannofossils during the last 10 m.y. The Pliocene/Quaternary and Miocene/Pliocene boundaries are well represented and exhibit clear gradual evolutionary sequences within some lineages. The Miocene/Pliocene boundary sequence is missing in the nearby Site 206 sequence.

Remarkably high calcareous biogenic sedimentation rates occur for most of the Pliocene and for the middle and late Miocene. Rates (uncorrected for sediment porosity) are as follows for Hole 590B: Early Miocene (base NN2-topNN3) 14.4 m/m.y.; middle Miocene (to top NN7) 29.4 m/m.y.; middle/late Miocene-early Pliocene (to top NN13) 27.1 m/m.y.; early-late Pliocene (to top NN18) 52.4 m/m.y.; Quaternary, 17.2 m/m.y.

The seismic profile in the area shows no clear ponding of sediments for much of the sequence (except the Quaternary) or other evidence of sediment transport such as winnowing. Also the microfossil assemblages exhibit virtually no evidence of reworking. Therefore it is possible that the high sedimentation rates, which are spectacularly high in the Pliocene, are due to biogenic productivity. Drilling at Site 591 should assist in resolving the question of the cause of the very high sedimentation rates.

Site 591

Site 591, situated on a spur of Lord Howe Rise at a water depth of 2131 m, consists of three holes: Hole 591 was continuously cored with the HPC from 283.1 m sub-bottom; Hole 591A which was continuously cored with the HPC from 0 to 246.5 m and rotary cored with XCB from 246.5 m to 284.6 m; and Hole 591B which was continuously cored using conventional rotary coring from 270.6 m to 500.4 m sub-bottom. Cores recovered with the first HPC are relatively undisturbed; those using the second HPC are slightly more disturbed because of rough sea conditions. The cores recovered using conventional rotary coring exhibit mixed quality; quite disturbed in the upper part of the section but with a high percentage of recovery, with low recovery in the middle part of the sequence and good quality cores with high recovery rates in the lowest part of the sequence. The extended core barrel did not successfully function at this site.

The sequence is made up of one lithostratigraphic unit represented mostly by foraminifer-bearing nannofossil ooze or foraminifer rich nannofossil ooze. Site 591 is a continuous sequence from the late early Miocene (17 Ma) to the Quaternary. The HPC part of the seuqence is from early late Miocene (11 Ma) to the Quaternary. The HPC part of the sequence is from early late Miocene (11 Ma) to the Quaternary. The biostratigraphy is complete with no apparent hiatuses.

The sequence is divided into four subunits based on changes in color and the occurrence of foraminifer-richer layers. The sedimentary sequence is similar to that at Site 590 but there are even more spectacular sedimentation rates within the early Pliocene of 131 m/m.y. These high rates are due to high productivity of calcareous biogenic material and are now known in the late Neogene at three sites in this area (590, 591 and 206). It is possible that increased biogenic productivity is related to the poorly known Subtropical Divergence that crosses the Tasman Sea at the latitude of these three sites. Rates are much lower at the drilled sites to the north of Lord Howe Rise (Site 588) and to the south (Site 592). We have now dismissed the possibility of the high sedimentation rates in the Pliocene being due to secondary reworking of material from elsewhere. This is because of Site 591's isolated location near the crest of a spur of Lord Howe Rise and an absence of any clear reworked material in the section.

Diagenetic alternation of the microfossil sequence has proceeded in younger sediments than at Site 590, because of the higher sedimentation rates at Site 591. Foraminiferal recrystallization is already well advanced by the early middle Miocene, while calcareous nannofossils exhibit signs of overgrowths by the early Pliocene. The higher rates of sedimentation at Site 591 have allowed finer stratigraphic resolution than at Site 590. A number of evolutionary sequences within the planktonic foraminifera are clearly exhibited in this expanded sequence.

Site 591 provides excellent opportunities for high resolution microfossil and stable isotopic work in the late Miocene through Quaternary which is well preserved. Radiolarians, diatoms and silicoflagellates are found persistently but uncommonly throughout the entire section.

Benthic foraminifera are well represented in the late Miocene to Quaternary. Site 591 is intermediate in vertical depth profile (2131 m) between Sites 590 and 206. Benthic faunas typical of upwelling zones appear in the middle Miocene. Important faunal differences exist between Sites 591 and 590 reflecting different paleoceanographic histories at these different water depths. The paleoceanographic changes include both upward and downward migrations of some forms of benthic foraminifers.

Site 591 exhibits a valuable tephrochronology, based on many volcanic ash layers. There is an important Quaternary peak in activity, low activity in the Pliocene and late Miocene, high activity in the early late Miocene to late early Miocene. The mid Neogene peak may extend through the middle Miocene but in this interval there is poor core recovery.

Site 592

Site 592, near previous DSDP Site 207, was drilled on the southern Lord Howe Rise in relatively shallow water (1098 m). The site consists of one hole continuously cored with the HPC from 0 to 234.9 m sub-bottom and then with the extended core barrel from 234.9 to 388.5 m. The recovered section consists of only one lithostratigraphic unit that varies from foraminifer-bearing nannofossil ooze (chalk) to nannofossil ooze (chalk). The age of the section is from Quaternary to middle late Eocene (42 Ma). The bottom of the hole consists of 83.5 m of Paleogene ooze and chalk ranging in age from the late Eocene to the early Oligocene (35 Ma). The regional unconformity of the southwest Pacific separates the early Oligocene sediments from immediately overlying middle early Miocene sediments 18.5 Ma in age. The section is represented by high quality cores with almost complete recovery from the middle Miocene to Quaternary, recovered using the HPC and less complete but still highly recovered section at greater depths using the extended core barrel.

The section has been divided into two subunits: IA representing a veneer (0 to 0.3 m) of pale orange to pinkish gray foraminifer bearing nannofossil ooze within the oxidized zone near the seafloor, and IB representing the remainder of the section. There is good foraminifer preservation in the Neogene and Oligocene, while the nannofossils are only well preserved in the late Neogene and Oligocene. Radiolaria are present in small amounts only in the Eocene. The biostratigraphic sequences seem to be complete except for that part missing in the regional unconformity. Sedimentation rates range from lowest values (7 m/m.y.) in the late Eocene to highest values (92.5 m/m.y.) in the late early Pliocene. In general, sedimentation rates are much lower at Site 592 than in sites both to the north and south.

Of particular interest at this site is a fine complete boundary section between the Eocene and the Oligocene in Cores 592-36 and 37. No hiatus is present as in all other South Pacific sites except Site 277 in the Subantarctic area south of New Zealand. A distinct lithologic change occurs near the level of extinction of Globigerapsis index which is the foraminifer marker for the boundary in south temperate latitudes. The underlying late Eocene is represented by surprisingly soft nannofossil ooze lacking biosiliceous materials. The section provides good opportunities for high resolution stratigraphy across the boundary.

Volcanic ash layers or altered laminae occur in the Quarternary, early late Miocene (10 Ma) and through the Paleogene.

Good benthic foraminifer and ostracod assemblages occur throughout much of the sequence and exhibit changes at a number of levels associated with paleoceanographic events.

The Quaternary, as in a number of other sites is marked by much lower sedimentation rates of nearly 10 m/m.y. This is perhaps due to increased winnowing at this time related to stimulated oceanic circulation. A number of distinct, pale olive ash layers probably represent major volcanic events in New Zealand to the east. The Quaternary record terminates with a late Quaternary (0 to 0.3 m) pale orange to pinkish gray foraminifer bearing nanno ooze. This represents the zone of oxidation at and near the sediment water interface that occurs at almost all of the sites cored during Leg 90.

Site 593

Site 593 is locate on the Challenger Plateau a western extension of the New Zealand Plateau in a relatively shallow water depth of 1068 m. The western part of the Challenger Plateau provides a shallow-water pedestal 270 m distant from the nearest land mass of northern South Island, New Zealand. This setting has allowed the accumulation of an uncomplicated Paleogene-Neogene pelagic ooze sequence with virtually no terrigenous sedimentary influences. Site 593 is a reoccupation of Site 284, cored during Leg 29 of DSDP.

Site 593 consists of two holes continuously cored to a maximum sub-bottom depth of 571.5 m. Hole 593 was cored with the hydraulic piston corer (HPC) from 0 to 245.1 m sub-bottom and continued to a total depth of 571.5 m with the extended core barrel (XCB). Hole 593A was continuously cored with the HPC from 0 to 209.3 m sub-bottom, then washed down to 448.8 m and cored with the XCB to 496.8 m to recover the Oligocene-/Miocene transition. This interval was poorly cored in the first hole.

Site 593 is an apparently continuous stratigraphic sequence from the late Eocene (42 Ma) to the Quaternry and is considered as one lithologic unit.

The general facies is a foraminifer-bearing nannofossil ooze that grades into a nannofossil ooze and a nannofossil chalk with depth. Only traces of biosiliceous sediments occur in a few intervals. The section has been divided into 5 subunits: 1A of late Quaternary age representing a veneer (0 to 6 M) of yellow gray foraminifer-bearing nannofossil ooze within the oxidized zone near the seafloor; 1B, a thick (6 to 393 m) sequence of Quaternary-middle Miocene rather monotonous light-colored foraminifer-bearing nannofossil ooze to nannofossil ooze; 1C, a thin (393 to 418 m) early middle miocene oxidized sediment zone of pale orange color; 1C, a thick (418 to 545.5 m) sequence of nannofossil ooze of early middle Miocene to earliest Oligocene age; and 1E, a thin (545.5 to 571 m) sequence of lithified volcanogenic turbidite and pyroclastics emplaced at the Eocene/Oligocene boundary and probably derived from nearby "Lalitha Pinnacle". The volcanogenic rocks are underlain by nanno chalk at the base of the hole. This chalk contains many thin laminae of altered volcanic glass indicating an episode of active explosive volcanism.

Site 593 is a fine, complete stratigraphic succession in southern temperate waters with abundant, well preserved planktonic foraminifers except in the volcanogenic material. Calcareous nannofossils are abundant throughout but not well preserved below the Pliocene. An excellent succession of the benthic foraminifers is preserved.

Planktonic foraminiferal zonations are typically temperate in character. A number of calcareous nannofossil zones are missing because the warm-loving marker forms are rare or absent. All epoch boundaries are well represented for the Eocene/Oligocene to the Pliocene/Pleistocene boundaries. The Oligocene/Miocene boundary coicides with a more lithified ooze layer. The Eocene/Oligocene boundary coincides with the volocanogenic sequence (Subunit IE) with no apparent break in sedimentation. Evidence from the seismic profiles suggest that the volcanic rocks resulted from a single episode of submarine extrusion. These volcanics are approximately coeval with extensive volcanism in New Zealand, including the Deborah volcanics of S. Canterbury. A number volcanic pinnacles with seismic character similar to that of "Lalitha Pinnacle" occur over the Challenger Plateau indicating widespread volcanism at that time.

The middle Miocene oxidized ooze subunit (Subunit IC) was deposited between 15.5 and 15 Ma and this immediately precedes the time of major ice-sheet growth on Antarctica. It is therefore possible that it reflects important paleoceanographic changes at an oceanograhic front in the Southern Ocean tied to this glacial evolution. The oxidized sediment contains a temporary benthic foraminiferal fauna that is typical of oxygen-rich waters.

The late early Pliocene (4-3 m.y.) is marked, as in other Leg 90 sites, by an episode of extremely high sedimentation rate due to enhanced carbonate productivity.

Site 594

Site 594, is located at the southern margin of the Chatham Rise east of New Zealand's South Island, in a water depth of 1204 m. The site lies in the subantarctic water mass immediately south of the subtropical convergence, and is the southernmost of a series of sites forming a north-south transect. It is situated in a transitional region between oceanic and terrigenous influences, thus differing from all other sites on the southwest Pacific transect.

Site 594 consists of three holes cored to a maximum sub-bottom depth of 639 m. Close to complete core recovery was obtained from 0 to 297.5 sub-bottom depth (Holocene to latest Miocene) using the HPC to 130.7. The remaining section ws rather poorly recovered using the XCB.

The section appears to be almost continuous from the latest early Miocene to Holocene. A short hiatus may be associated with the Miocene/Pliocene boundary.

The sequences are assigned to two lithostratigraphic units, the lower one of which is subdivided into two sunbunits.

Unit I, of earliest Pliocene to Quaternary age, consists of an alternating sequence of pelagic and hemipelagic lithofacies generally defined by bluish gray and greenish gray colored sediment respectively.

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Leg 91 Tonga Trench

Leg 91 departed Wellington, New Zealand on 16 January 1983 and arrived at Papeete, Tahiti on 20 February 1983.

Introduction

Leg 91 was the second attempt in six months to place a seismometer package developed for the Defense Advanced Research Projects Agency (DARPA) of the United State government into a borehole drilled by GLOMAR CHALLENGER. The previous attempt, which took place during Leg 88 in the northwest Pacific in late summer 1982, was unsuccessful owing to difficulties in setting up the required re-entry cone on the seafloor. Leg 91 was scheduled on short notice following Leg 88. This time, the attempt would be made at low latitudes in the southern hemisphere summer, and near the Tonga Trench. Joining GLOMAR CHALLENGER in seismic experiments was R/V MELVILLE of Scripps Institution of Oceanography.

This preliminary report summarizes the results of the seismic experiments as well as the drilling that occurred during Leg 91. This time, the venture was successful and almost all scientific objectives were achieved. In this report, we describe the instruments and the experiments, summarize the results of coring at the two sites drilled in conjunction with the experiments, and present a preliminary evaluation of the seismic work based on data recorded on board GLOMAR CHALLENGER.

The Marine Seismic System

There are three principal components to the Marine Seismic System (MSS) which was designed and built for DARPA under the management of the Naval Ocean Research and Development Activity (NORDA). These are

1. A bore hole instrument package (BIP) constucted by Teledyne-Geotech, Inc of Garland, Texas. This contains the downhole seismometers, in actuality a three-component accelerometer.

2. A bottom-processing package (BPP) designed and constructed by the Defense Electronics Division of Gould, Inc., Glen Buurnie, Maryland. This is a medium-term recorking device which was designed to be linked by cable to the BIP and set onto the seafloor beside a hole in which the BIP is placed.

3. A deployment-retrieval system compatible with the BIP and BPP as well as GLOMAR CHALLENGER'S drilling and re-entry equipment. This was designed and constucted by Global Marine Development, Inc., of Irvine, California, with the exception of the installation recovery and reinstallation mooring, which was designed by the Naval Civil Engineering Laboratory in Port Hueneme, California.

A principal objective of Leg 91 was to test these three components, particularly the BPP and its deployment-retrieval system. The BIP had been successfully tested in DSDP Hole 395A in the North Atlantic during Leg 78A.

With this integrated system, three different seismic experiments could be performed. These were (1) a seismic refaction experiment, to determine the structure of the crust and upper mantle in the vicinity of the site; (2) a noise experiment, in which recording would take place at explicit periods when both GLOMAR CHALLENGER and MELVILLE would sit quietly in the water; and (3) a teleseismic experiment, in which ocean-bottom seismographs (OBS) depoyed by MELVILLE and the BIP would record earthquake arrivals of sufficient magnitude.

There were several advantages expected from doing combined OBS/BIP set of experiments. First, it would be possible to evaluate in detail the relative merit of the data recorded by OBS's sitting in soft mud on the seafloor and by seismometers well-coupled to hard rock in the much quieter environment to be found about 100 m down a borehole. There would also be greater resolution of crustal and upper mantle struture owing to the higher signal:noise ratio of the BIP data, the greater range of frequencies which could be evaluated because of this quieter environment, and the geometrical arrangement of the OBS's around the hole on the seafloor and the BIP implanted somewhat below them in the seabed. Finally, it would be possible to evaluate the complexities associated with seismic ray paths reaching the OBS's thtough and in some cases along the sediment-water interface. There would be no such problems with the BIP. These aspects of the combined OBS/BIP objectives are dealt with more completely in later sections of this report.

From the outset planning called for deployment of OBS's from MELVILLE near GLOMAR CHALLENGER several days before lowering the BIP into the re-entry cone and hole prepared for it. Once the BIP was in the hole, recording would begin on board GLOMAR

Table 91-1. Coring summary, Leg 91.

HOLE	DATES (1983)	LATITUDE	LONGITUDE	WATER DEPTH	PENETRATION	NO OF. CORES	METERS CORED	METERS RECOVERED	PERCENT OF RECOVERY
595	21-22 January	23°49.35'S	165°31.85'W	5596 m	32.5	1	0.5	0.10	20.0
595A	22-24 January	23°49.34'S	165°31.62'W	5614 m	88.5	12	88.5	37.47	42.3
595B	24 Jan.- 12 Feb.	23°49.34'S	165°31.61'W	5615 m	123.8	7	57.9	16.40	28.3
596	12-15 February	23°51.20'S	165°39.27'W	5701 m	76.1	9	76.1	38.95	51.2
596A	15 February	23°51.20'S	165°39.27'W	5701 m	70.0	1	4.0	8.46	211.5**
596B	15-16 February	23°51.20'S	165°39.27'W	5701 m	34.3	1	9.6	9.02	94.0
						31	236.6	110.40	46.7

* water depth from sea level

** HPC samples to basement, but over-cored by drawing in by suction a greater quantity of sediments from near the basement contact than the interval cored.

CHALLENGER via an electrical-mechanical (EM) Cable linked to the BIP. Up to six days of shooting by MELVILLE at various distances and using explosives of different sizes would be monitored by both the BIP and OBS's. Recording would also occur at a number of specified quiet intervals for the monitoring of ambient noise. Any significant earthquakes occuring in this period of time would also be sensed by the BIP and, if they occurred during a recording window, by the OBS's. After completion of the shooting, the EM cable linking the BIP to GOLMAR CHALLENGER would be attached to the BPP which in turn would be lowered to the seafloor to begin recording earthquakes continuously for a period of 45 days. MELVILLE, meanwhile, would retrieve it's OBS's, recover their seismic information, and then redeploy them in a new array at greater distances from the hole. They also were to record earthquakes for 45 days at which time MELVILLE would return the the area to retrieve all OBS's and the BIP.

It was the latter long-term experiment that figured principally in site selection. The site was chosen to provide the greatest range of teleseismic information from the Tonga subduction zone, one of the most active in the world and having the deepest focus earthquakes. Also of interest were localities of mid-plate seismicity associated with volcanism in French Polynesia. In particular, the site could not be too far from the Tonga Trench, in order that the instuments detect the widest spectrum of seismic waves, even small-magnitude events. Moreover, the site could not be too close to the Tonga Trench, in order that ray paths from seismic sources would provide an adequate sampling of the upper mantle between those sources and the site. Site selection was additionally constrained by the need to have an adequate thickness (about 100 m) of sediments to spud-in a drill string and place a re-entry cone onto the seafloor. Water depths had to be as shallow as possible in order to aviod drill string stress limitations, particularly while lowering the re-entry cone and casing, and washing them into the seabed. Potential targets were selected partly on the basis of how closely water depths approach 5500 m, which appeared on the basis of survey data to be the minimum in the area. Two principal targets were selected, with the shallower of the two chosen for predrilling survey by MELVILLE, which arrived on site about 30 hr. ahead of GLOMAR CHALLENGER. This target was indeed suitable for drilling, and became Site 595, where the MSS installation took place (Fig. 91-1).

The MSS deployment was conducted in several stages. Before it could take place, a pilot hole was necessary to establish whether basalts could be cored to sufficient depth to place the BIP into basement. The pilot hole, 595A, penetrated 70 m of sediment and 18 m of igneous basement without difficulty (see Table 91-1 for recovery data). Once the suitability of the site had been demonstrated, a re-entry cone was lowered to the seafloor, cased into basement, and a hole drilled 54 m into basement rocks (Table 91-1). This was

Table 91-2. Expected number of earthquakes during a 40-day recording peroid as a function of magnitude, depth, and distance from Site 3.

Depth Range (kms)	0-10°	10-20°	20-30°	30-50°	50-70°	>70°
0- 50	1*	1	1	3	5	15
	13**	7	9	-	-	-
50-300	1	<1	1	2	2	4
	7	4	6	-	-	-
>300	1	<1	<1	<1	<1	<1
	16	2	<1	-	-	-

*Upper figure is number of events with $m_b \geq 5.5$.
**Lower figure is number of events with $m_b \geq 4.5$ (statistics not compiled for $\Delta > 30°$).

Table 91-3. List of earthquakes recorded by the MSS (6-11 February 1983).

EVENT NUMBER	FIRST ARRIVAL TIME (GMT) D	HM	S	S-P TIME (s)	COMMENTS
1	37	1506	36	88	
2	38	1758	47	146?	Event with strong 2 Hz P. Signal on MPZ.
3	38	1826	03	124	Large event. MPZ signal throughout.
4	38	2321		86?	Small event.
5	39	0122		-	Possible local event.
6	39	0505	33	95	
7	39	0623	14	103	Small event.
7A	39	0700	09	80	
8	39	0707		80?	Small event.
9	39	0952	31	-	S only.
10	39	1036	04	85	Signal on MPZ.
11	39	1044	27	67?	
12	39	1050		132?	
13	39	1056		90	
14	39	1113	14	92	
15	39	1327	00	77	Poor clock trace.
16	39	1621	43	86	
17	39	1650	05	142	
18	39	1659	36	90	
19	39	1716	01	81	
20	39	1945	49	94	
21	39	1957	59	102	
22	39	2133	51	142	Signal on MPZ.
23	39	2304	20	92	
24	40	0334	43	16	
25	40	0338	27	146	
26	40	0628	00	91	
27	40	0756	12	106	
28	40	1010	33	115	
29	40	1040	27	16	Weak P.
30	40	1100	32	16	Weak P.
31	40	1114	51	16	Weak P.
32	40	1119	14	86	
33	40	1200	47	17	Very weak P.
34	40	1202	09	18	
35	40	1232	44	53	
36	40	1355	02	84	Weak event.
37	40	1429	42	94	
38	40	1433	00	85	Signal on MPZ.
39	40	1707	29	93	
40	40	1935	07	ca. 90	Very weak.
41	40	2213	42	81	Strong event, weak S.
42	40	2330	05	88	
43	41	0101	35	93	Strong event.
44	41	0341	23	143	Very weak event.
45	41	0351	47	91	Strong P, weak S.
46	41	0611	59	81	Weak S.
47	41	0631	32	88	
48	41	0759	54	91	
49	41	0809	54	91	
50	41	1050	06	91	
51	41	1139	45	112	
52	41	1423	31	104	Strong event. Signal on MPZ.
53	41	1450	34	97	
54	41	1712	21	84	
55	41	2032	11	84	Small event.
56	41	2141	06	88	Strong event.
57	41	2155	13	106	Small event.
58	41	2343	30	102	
59	42	0152	29	110	
60	42	0334	42	-	S only.
61	42	0410	43	86	Small P and S.
62	42	0809	33	75	Strong event.
63	42	0928	47	-	One phase, S or P.

Hole 595B, and it was in this hole that the BIP was placed.

This was followed by the seismic experiments which were recorded for a period of 5 days using equipment in specially equipped vans on the deck of GLOMAR CHALLENGER. Seismic events (explosions and earthquakes) sensed by the BIP were transmitted to these vans via the EM cable. After the five days, the EM cable was switched to the BPP and it, in turn, was lowered to the seafloor for 45 days of teleseismic recording. The retrival system for the BPP was then set into place. Two additional days remained for coring operations, which were used to obtain a carefully cored sediment section at a new site, 596, about 8 km to the west, beyond the range where coring noise might trigger recording in the OBS's deployed by MELVILLE, also for 45 days of teleseismic monitoring. Late in March, MELVILLE returned to the area to pick up the BPP and the OBS's. At that time, the BPP was discovered to have flooded after 40 hr. of recording on the seafloor. All the OBS's performed flawlessly. Once the BPP was on deck, the BIP was linked by the EM cable to on-deck recording devices, and was still operational. About 8 hr. of recording and some additional noise experimets were completed at that time. The following sections summarize results from GLOMAR CHALLENGER only.

Sediment Coring Results

Prior to Leg 91, the age of the crust we planned to drill was not known. Distances from active spreading centers, and from identified magnetic anomalies to the north and east, as well as the water depth, all indicated a Mesozoic age. During Leg 91, however, a resolution of the magnetic anomalies near Site 595 was obtained, and it seemed on this interpretation that the age of basement was very old indeed. Site 595 is on magnetic Anomaly M-29, which is Jurassic (Callovian) in age, or about 150 Ma. The site, which was selected exclusively to maximize the results

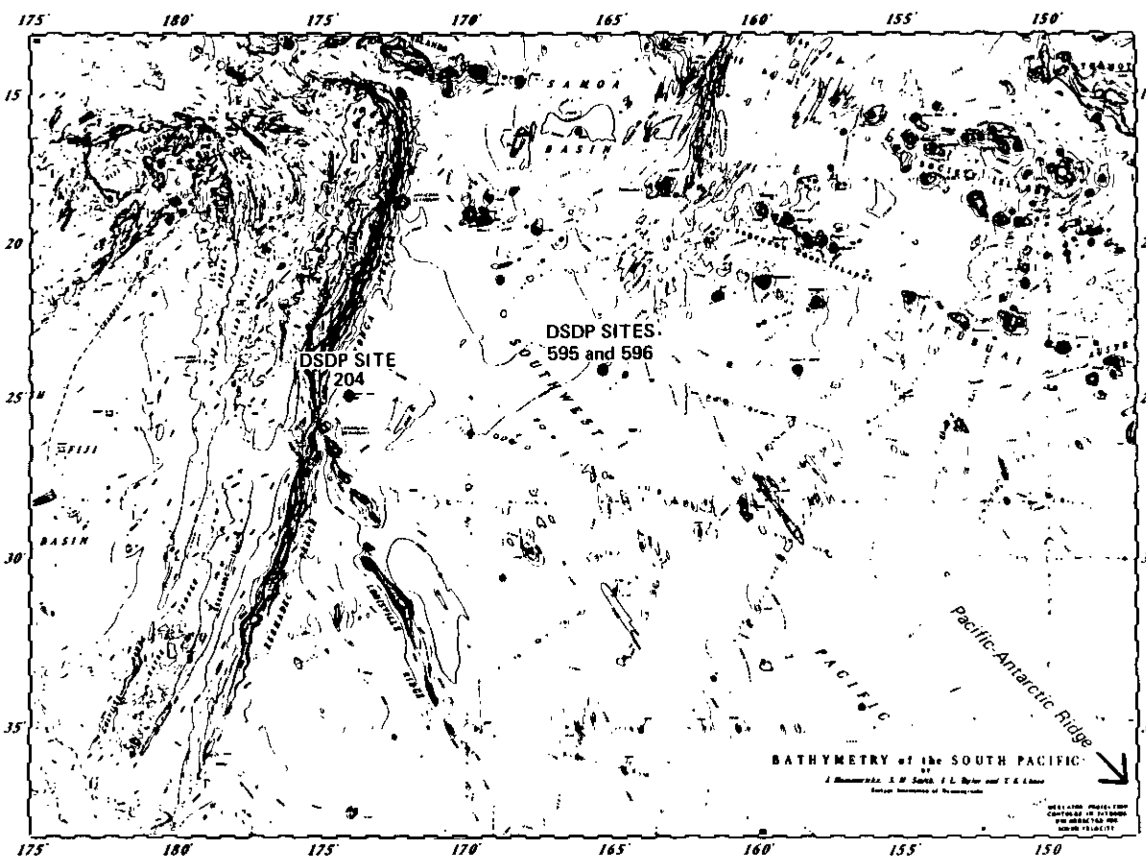


Figure 91-1. Location of DSDP Sites 595 and 596 in the southwest Pacific Ocean. Also shown is the location of Site 204, drilled during Leg 21.

of the seismic experimets, inadvertently was placed on one of the oldest pieces of ocean crust in the Pacific. As Leg 91 sailed without a paleontologist, we await shore-based determination of the age of the oldest sediments cored above the basalts. If the Jurassic age is borne out, then Site 595 is the first in the Pacific to reach ocean crust produced at a spreading center of Jurassic age, and the sediments recovered reflect paleoenvironmental conditions in the Jurassic world ocean. Recovery of such sediments has been a long-standing objective of the Deep Sea Drilling Project, and several previous legs have been devoted to attaining this goal, but without success. Thus a substantial bonus to the seismic experiments is that, entirely fortuitously, we achieved the long-sought objective of bringing Jurassic sediments up rom the seabed in the Pacific.

Whether a Jurassic age is substantiated biostratigraphically or by further work on the magnetic anomalies, the sediments record at Sites 595 and 596 have some remarkable characteristics. First, at both sites they are very thin, only 70 m. Sedimentation rates thus have average less than 0.5, Ma, assuming a basement age of 150 Ma. Secondly, the sediments are predominantly pelagic clay in the upper 30-40 m, and metalliferous and locally cherty below this down to basement. Apart from a few stringers of porcellanite and chert in these lower sediments, they are almost coimpletely devoid of a biogenic sediment component. Biogenic carbonates are absent and there are only rare molds of agglutinated benthic foraminifers.

Figure 91-2 summarizes the lithologic sequence of sediments cored at both Sites 595 and 596. Most are dusky reddish brown to black, reflecting high abundances of amorphous iron oxides and manganese oxides. Whether these are principally hydrogenous (adsorbed from seawater) or metalliferous (produced by seafloor hydrothermal activity) is difficult to say. However, the core just above basement in Hole 596A is almost exlusively iron- and manganese- bearing amorphous oxides, and is probably metalliferous.

But the singular aspect of these sediments is their low abundance of biogenic material. Even the few cherty intervals, which represent deposition of radiolarians, did little to accelerate sediment accumulation rates. From the time the ocean crust in this area of the Pacific was created, it has moved by seafloor spreading beneath a sterile sea, one far from continental detrital sediment sources, and evidently also one well removed from areas of even weakly productive surface waters in the oceans.

Igneous Rocks

Basalts were obtained with good recovery in two holes at Site 595 (Fig. 91-3), and a small amount was also cored at Site 596. The recovery allows evaluation of the alteration of the rocks to a degree not previously possible using younger rocks drilled from crust produced at fast-spreading ridges.

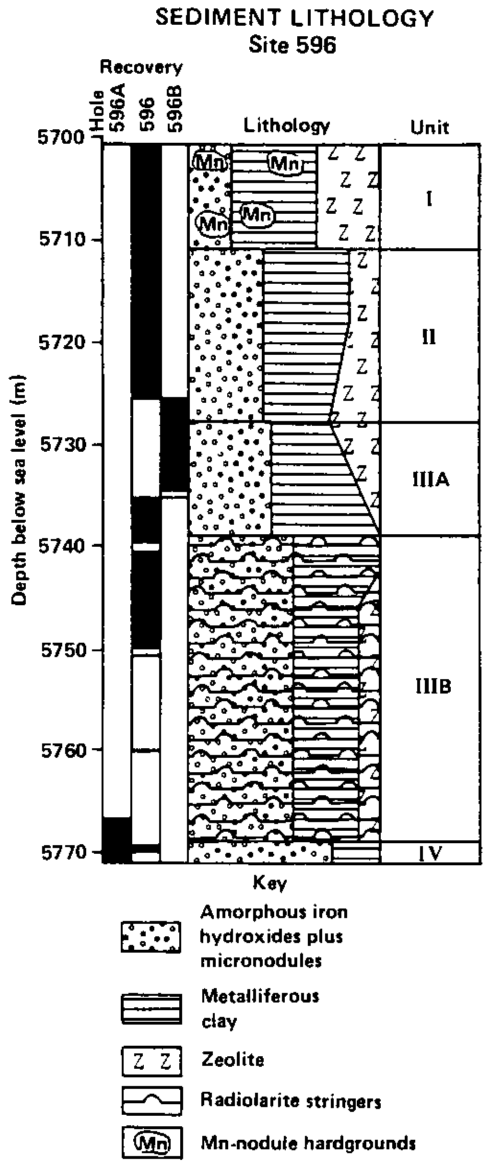


Figure 91-2. Summary of sediment lithology, Site 596.

In Holes 595A and 596B, three petrographically distinct rock types, chiefly pillow lavas, were cored. On the basis of thin sections, we tentatively term the rocks andesite, tholeiitic ferrobasalt, and very sparsely phyric olivine tholeiite, in order of depth. The latter rock type has a distinctly mottled appearance in many specimens, reflecting development of a particular type of texture, termed "variolitic" on Figure 91-3, quite common among the quickly cooled lavas of the deep seafloor. All of the rock types are consistent with a ridge-crest origin, and the ferrobasalt and andesite are quite fractionated lava types more typically found on fast than on slow spreading ridges.

All of the rocks have remarkable dark alteration halos, or bands and these are intimately related to the vein minerals which line fractures next to the halos. Cross-cutting relationships in the veins allow the following sequence of vein mineralization to be determined.

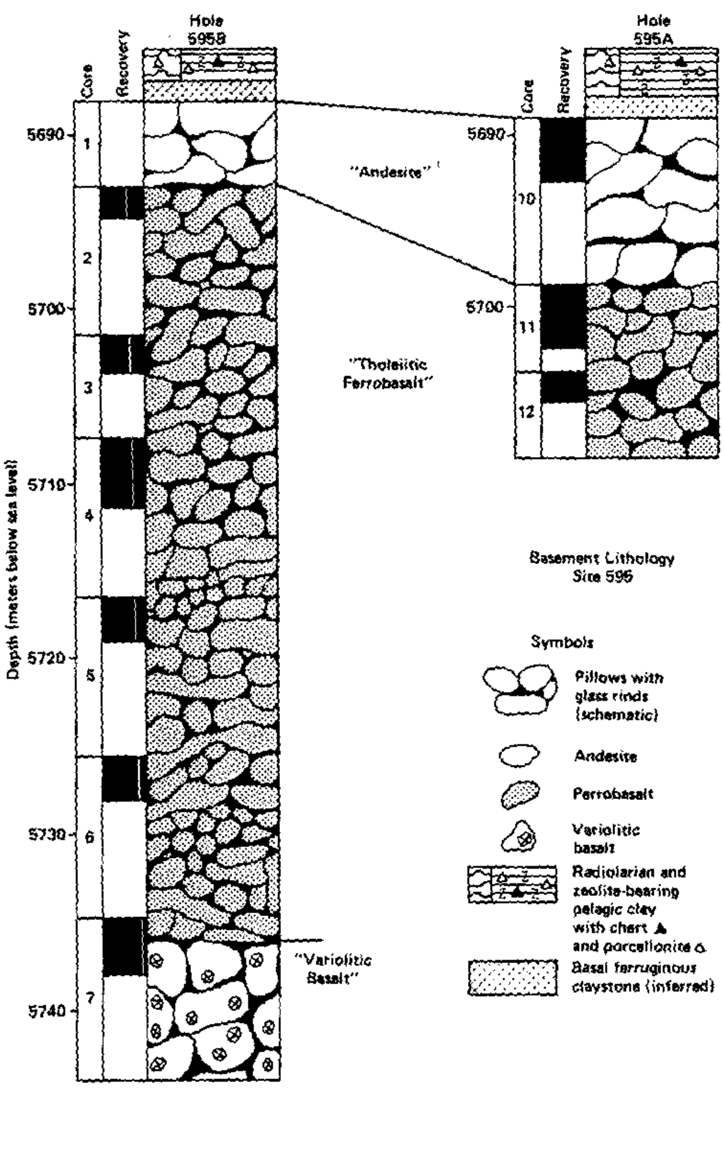


Figure 91-3. Summary of basement lithology, Holes 595A and 596 B.

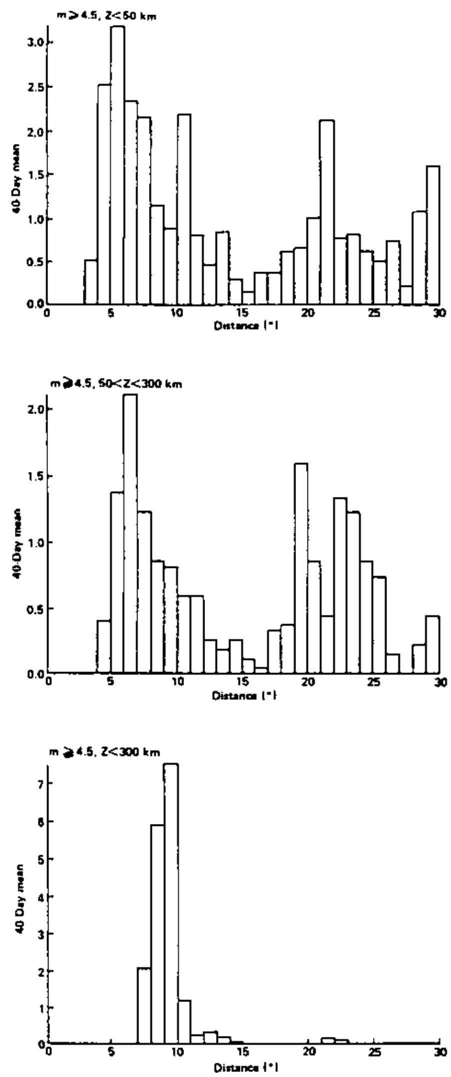


Figure 91-4. Number of earthquakes with body-wave magnitude greater than 4.5 expected in a typical 40-day period as a function of depth and epicentral distance from Site 3, an alternate drilling target about 150 km west of DSDP Site 595. Means were computed from 27 forty-day intervals in the period 1977-1979 using the seismicity catalogued on PDE tapes. Histogram interval is 1°.

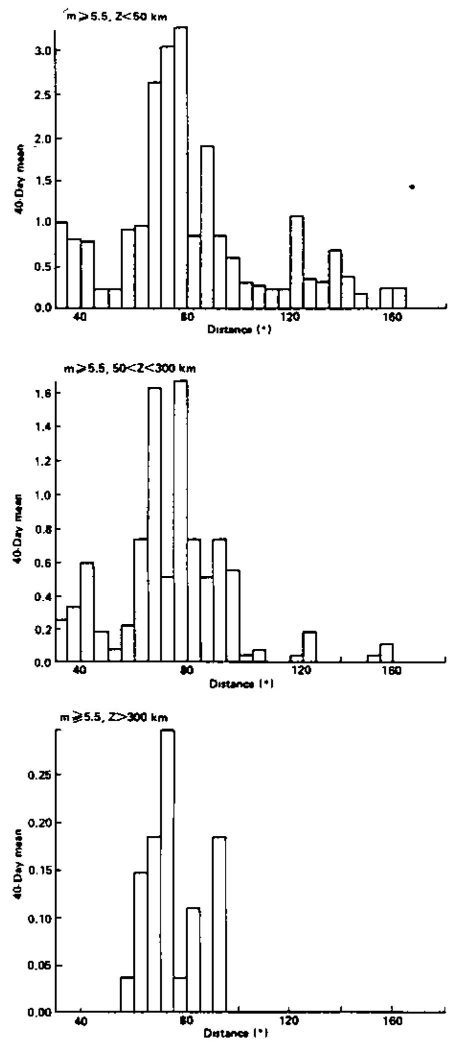


Figure 91-5. Number of earthquakes with body-wave magnitude greater than 5.5 expected in a typical 40-day period as a function of depth and epicentral distance from Site 3. Means were computed from 27 forty-day intervals in the period 1977-1979 using the seismicity catalogued on PDE tapes. Histogram interval is 5°

1. Fe- and Mn-oxyhydroxides;

2. green clays;

3. Fe- and Mn-oxyhydroxides again;

4. carbonates (aragonite and calcite, probably in that order). All these stages of vein mineralization were followed by a final stage in which vein mineralization was minor;

5. pervasive alteration of remaining umaltered rock to pale gold clay minerals.

The remarkable feature of the alteration sequence is that not all of the lavas experienced each stage. The olivine tholeiite and ferrobasalt experienced Stages 1-5, but the andesite only experienced Stages 3-5. It is thus likely that Stages 1 and 2 occurred before eruption of the andesite, probably very close to the rise axis. Tentatively, based on the compositions of the vein minerals and their relationship to alteration halos, Stages 1-3 were probably hydrothermal in nature, with the iron oxyhydroxide veins representing counterparts of ferromanganous hydrothermal sediments such as are typically found on rise crests, and which were cored as well in the sediments of Sites 595 and 596. Another unusual feature of the rocks is that each episode of vein mineralization was preceded or accompanied by development of new fractures in the rocks. It seems possible that formation of the fractures and the veining are directly related, and that this may have something to do with the intensity of hydrothermal activity at the rise crest where these basalts erupted.

Summary of the MSS Seismic Experiment

Background

The Marine Seismic System (MSS) has as its ultimate objective the discrimination of large manmade explosions from natural seismicity.

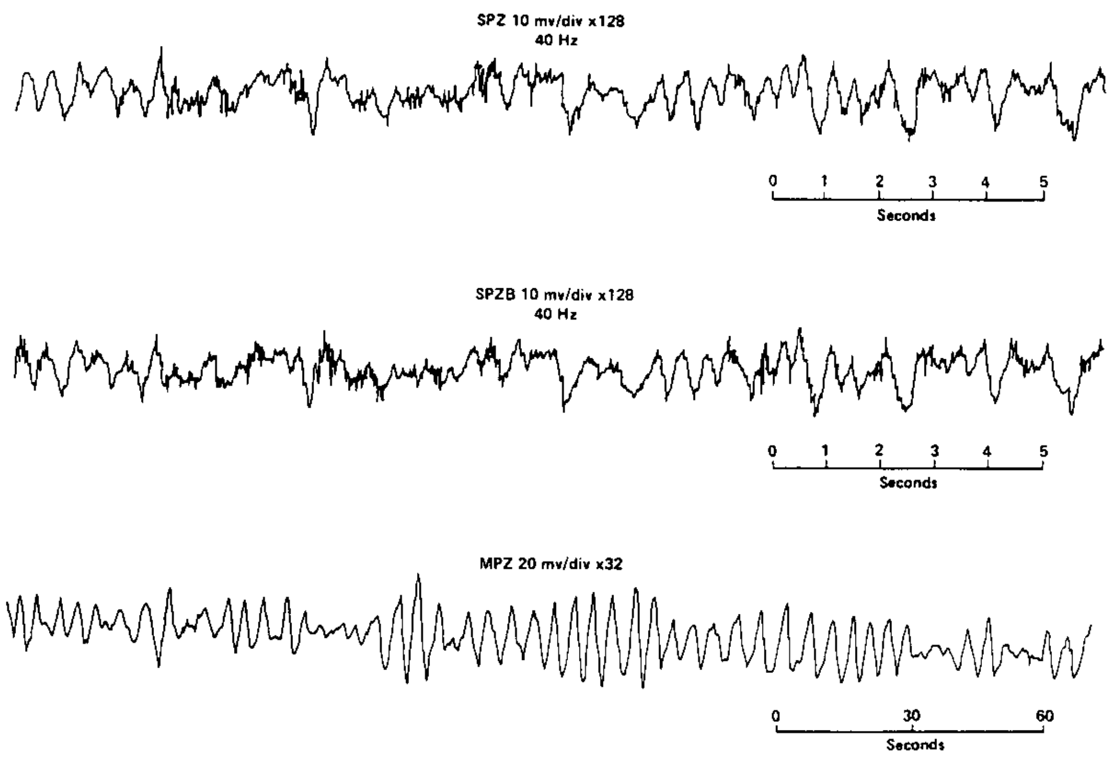


Figure 91-6. Comparison of noise on the two short-period vertical channels with the mid-period vertical channel. Note similarity in wave lengths (between 0.5 and 1.53) for the two short period channels and the longer wave length (about 4.5 s, relative to scale) of the mid-period vertical channel.

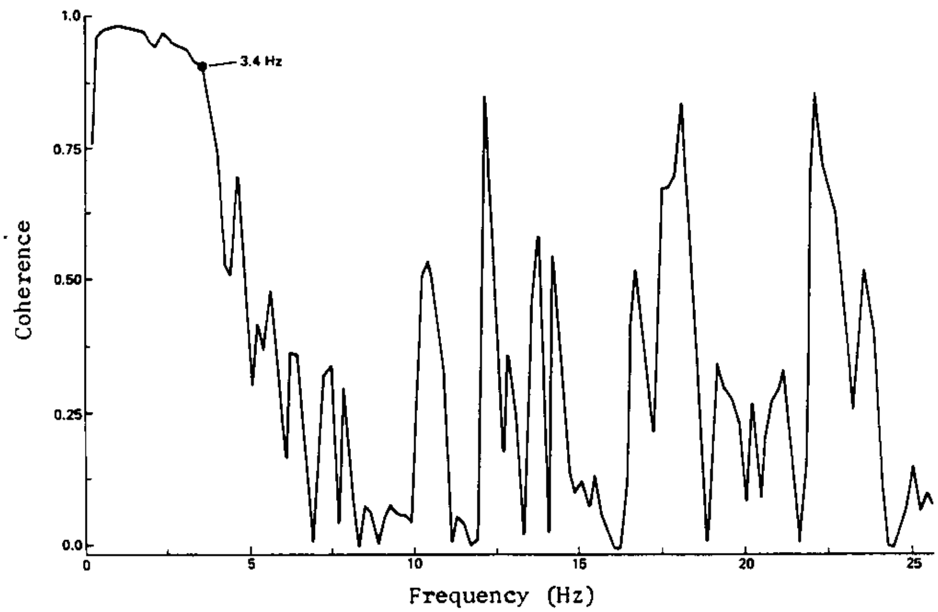
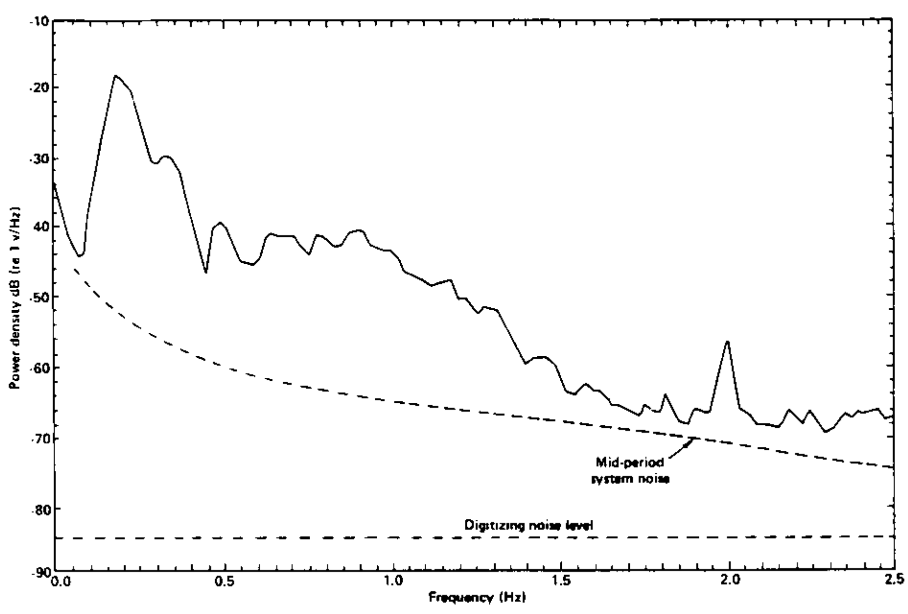


Figure 91-7. Short-period channel coherence, highest between 0.3 and 3.4 Hz.



91-8. Example of noise spectrum sampled at 40 Hz for mid-period channels, MSS experiment Leg 91. Note lack of symmetry of peaks about Nyquist frequency of 2.0 Hz, indicating minimal aliasing.

Two decades ago another project with the same objective (supported by the then Advanced Research Projects Agency (ARPA)) developed and used ocean-bottom seismographs (OBS). This project foundered because noise levels on the ocean-floor were higher than expected and no quieter than many sites on land. The MSS is radically different in that downhole sensors are used which are implaced at least several tens of meters into volcanic basement. Microseismic noise, which is the principal component of 10 to 0.1 Hz ambient noise in the ocean, travels as Scholte waves (a type of Rayleigh wave) along the water-sediment interface. Thus the deeper the seismic sensors can be emplaced beneath the seabed, the quieter the expected ambient noise. Therefore a key to the MSS successfully reaching it's objectives is the attainment of low ambient, and system, noise levels. MSS data are likely to have two further advantages over OBS data. Firstly, coupling of the seismic sensors to the earth should be firm and predictable. Secondly, by situating the sensors below the sediment-basement interface, complexities in the seismograms, caused by compressional to shear wave converted phases, should be avoided.

As the main part of the step-by-step testing and development of the MSS several trials have been conducted at sea using the D/V GLOMAR CHALLENGER during Legs 78A, 88, and 91 to drill the hole, or use a pre-existing hole, and emplace the sensor package. Leg 91 was the second occasion on which the borehole package of the MSS has been successfully deployed and the first time that the BPP has been emplaced on the seabed.

Objectives of the Seismic Experiments.

The objective of the Leg 91 seismic experiment was to obtain digital recordings of the downhole triaxial seismometer package (the BIP) and to compare these data with four-component broad band seismograms digitally recorded by OBS's at the water-sediment interface adjacent to the borehole. Such a comparison is needed to assess the performance of the MSS. The three parts of the experiments were each capable of satisfying important scientific and engineering objectives.

1. Ambient Noise Study. The comparison of ambient noise recorded by OBS's at the sediment-water interface with MSS recordings in the volcanic basement was planned to permit a quantitative assessment of the noise reduction as a function of frequency, attainable by downhole instrumentation. The MELVILLE was to deploy an array of six OBS's to investigate the frequency-wave number characteristics of seafloor noise at the MSS site. Each OBS would digitally record the three components of inertial motion and one component of pressure at 128 samples per second. The data returned by this array would permit the identification of noise sources and the modes of noise propagation. No comparable set of deep-ocean noise data has been collected previously; hence this experiment was expected to gain fundamental insight into the mechanisms of noise generation and propagation. In particular, it would permit a test of local noise generation models.

2. Seismic Refraction Study. The MELVILLE planned to shoot a star pattern of eight 50-km-long refraction lines convergent at the MSS site. In addition, two perpendicular lines were to be shot to 150 km horizontal range. From these data, the seismic structure of the crust at Site 595 and local variations in the vicinity of the site would be determined. By densely shooting to both the MSS and the OBS array over short baselines, very high structural resolution was expected to be obtained in the vicinity of the hole. Because the crossover from crustal first-arrivals to mantle first-arrivals typically occurs at distances on the order of 30 km, all lines would yield information of the structure of the uppermost mantle, in particular on mantle anisotropy. The two longer lines would permit an investigation of the degree of anisotropy to a depth of a few tens of kilometers. The refraction experiment would also provide the data needed to orient the horizontal-component seismometers of the MSS and OBS's and to compare the signal:noise ratio at the seafloor with that below the sediments.

3. Regional and Teleseismic Earthquake Study. Throughout the period that the MSS sensor package was emplaced down hole, and connected to GLOMAR CHALLENGER, continous recordings were to be made on board. Thus constant monitoring of natural seismicity would be possible. This was to continue with recording made by the seabed Bottom Processing Package, for 45-days after the bore hole package was to be disconnected from GLOMAR CHALLENGER. At the end of the refraction experiment the MELVILLE would also redeploy the OBS array in an extended configuration for the passive (triggered) recording of regional and teleseismic signals during the 45-day period of recording by the Bottom Processing Package.

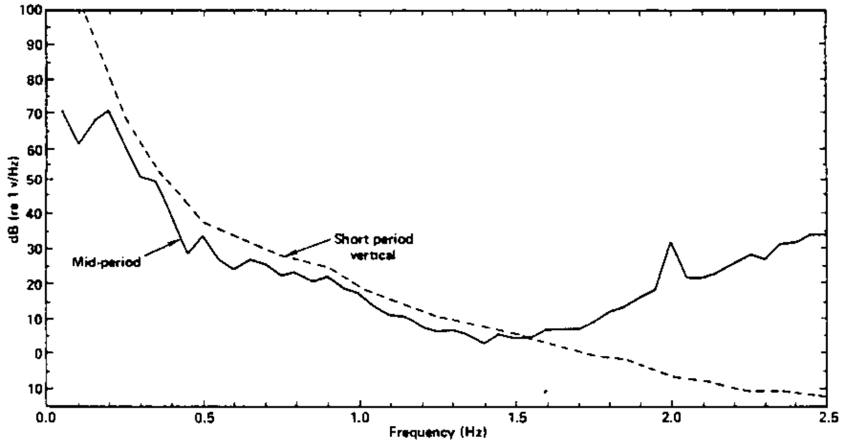


Figure 91-9. Example of computed noise spectra for short- and mid period channels sampled at 80 Hz and 40 Hz, respectively, MSS experiment, Leg 91. The SPZ spectrum is smoother than the MPE spectrum because of its coarser frequency resolution. Note that the spectra are parallel between 0.25 and 1.5 Hz, but that outside this range system noise on one channel or the other causes the spectra to diverge.

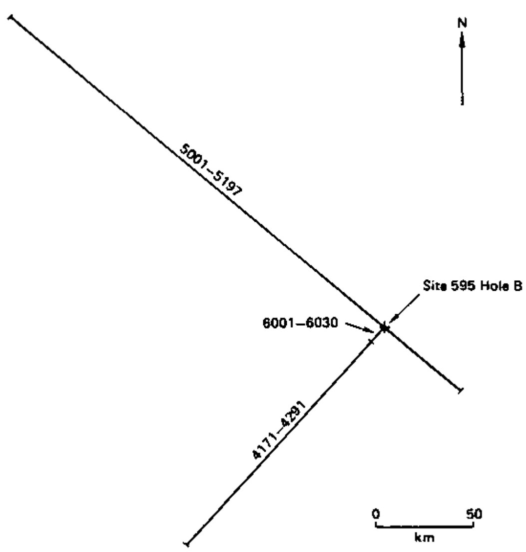


Figure 91-10. Orientation of the two long refraction lines completed by R/V MELVILLE during Leg 91 while recording from the BIP in Hole 595B was taking place on board GLOMAR CHALLENGER. Numbers indicate shots.

The number of earthquakes expected to occur as a function of distance, depth and magnitude is shown in Table 91-2 and Figures 91-4 and 91-5. It was estimated that a minimum of 45 events would be "captured" by the OBS triggering algorithm in a typical 45-day recording interval while the continuous MSS recordings would enable the detection of many more (smaller) events. A comparison of the signal quality and signal:noise ratio between the MSS and OBS sites would thus be possible for events at a variety of distances and depths.

Preliminary Results of the Experiment

Ambient Noise Study

The combined observations of ambient noise made during Leg 91 by the OBS array and the downhole seismometer package provide unique insight into the mechanism of noise generation and propagation at and near the seafloor. This section sketches the results of a first analysis of the MSS noise data.

The primary seismic sensors of the MSDSD consisted of a triaxial set of accelerometers, each of which drives both a mid-period (MP), and a short-period (SP), channel sampled 4 and 40 times persecond, respectively. There is also a redundant vertical (Z) sensor, designated as SPZB, which drives only an SP channel. Either of the SPZ channels may be sampled 80 times per second, but to the exclusion of the other. The Z and E ("EAST") sensors appeared to operate well throughout the period of shipboard MSS recording, but the horizontal sensor designated as "NORTH" malfunctioned and could not be used for quantitative analysis of noise.

The BIP rests unclamped at the bottom of Hole 595B. A cable isolator at the head of the BIP was disabled and not used because the tight coiling of the cable it required caused cracking of the outer insulation. Approximately km of EM cable payed out on the ocean floor in the vicinity of Hole 595B appeared to be effective in isolating the BIP from cable motion.

Noise data from the SP channels sampled at 40 Hz were dominated by energy between 0.5 and 1.5 s, although an ever-present background at 20 Hz was frequently of comparable magnitude. The MP channels were dominated by 4-5 s energy (Fig.91-6). The performance of the SPZ channels was assessed from their mutual coherence. Output from these channels were passed through a spectrum analyzer, which computed both coherence and power spectra. (Fig. 91-7).

The symmetry of the coherence and power spectra about the Nyquist frequency at 20 Hz is due to aliasing which caused the folding back of energy at frequencies greater than the Nyquist into those less than it. Aliasing is the result of an insufficiently high sampling rate, insufficient filtering of energy above the Nyquist frequency, or both. The displacement response of the SP channel at the Nyquist frequency is down only 2 dB from the peak response at 16 Hz. At the higher sampling rate of 80 s^{-1} the response at the Nyquist frequency is down 6 dB from the peak,j and the data do not have an aliased appearance, i.e. a drastic change of amplitude at each sample. Although 80 Hz sampling obviates aliasing of the noise data, it may not be sufficient if signal levels are high above the Nyquist frequency, as they may be for close-range refraction shots.

The MP channels are not troubled by aliasing; spectra from these channels do not desplay obvious symmetry about the Nyquist frequncy of 2 Hz (Fig. 91-8), where the displacement response is down 15 dB from the peak at 1.2 Hz. Also shown with the MP power spectrum are estimates of system noise and digitizing noise. MP spectral values between 0.1 and 1.5 Hz are well above these levels.

Rough power density spectra were computed based on graphical measurements for samples of MPE and SPZ (sampled at 80 Hz) data collected one .day apart. A comparison of the corrected values of these two channels is shown in Figure 91-9. The apparent smoothness of the SPZ spectrum with respect to the MPE spectrum is due do coarser frequency resolution. Between 1.25 and 1.5 Hz, the spectra are roughly parallel, decreasing monotonically with frequency. This suggests that the SPZ channel reliably represents ground motion over this band, which is consistent with the high coherence between SPZ and SPZB over the same band. The departures of the spectra outside of this band are probably due to the dominance of system noise on the SPZ channel below 1.2 Hz, and on the MPE channel above 1.5 Hz. The maximum of the MPE spectrum, at 0.22 Hz , is the microseismic peak. A value on the order of 75 dB (re 1 nm/Hz**0.5) at the peak for the vertical component is consistent with both MPE values and the root mean square estimate for a half-octave band width.

Ship-generated acoustic noise was deteted by the MSS. Peaks above 10 Hz in Figure 91-7, particularly near 10 and 20 Hz, have been oberved during borehole seismometer deployments on Legs 78B and 88 as well. Diagnostic interrogation of the OBSs deployed by MELVILLE revealed a very high noise level (measured by a long-term average of least-counts) in the vicinity of GLOMAR CHALLENGER. It is known that some ship noise is screw-generated, and so noise was measured during four instances with the dynamic positioning system (DPS) of GLOMAR CHALLENGER shut down; in these cases, the thrusters and main screws were stationary in the water. The output of the SPZ channel, sampled at 80 Hz, clearly shows a decrease of 20 Hz energy approximately 4 s after the DPS was off, which is consistent with the water depth of 5.5 km and an acoustic wave speed of 1.5 km/s. Notches in the spectrum obtained during the silent period, which are absent at other times, appear at 10.4, 20.0, and 20.8 Hz, apparently frequencies at which screw motion injects energy. However, the same spectrum still shows substantial evergy near 10 and 20 Hz. There is therefore a host of acoustical noise generators aboard GLOMAR CHALLENGER.

Preliminary analysis of Leg 91 MSS noise data suggests that ground motion is reliably represented in the S data between 0.2-3.3 Hz, and in the MP data between 0.15-1.4 Hz. Noise levels at frequencies above 1 Hz are similar to those observed by two other borehole seismometers, but appear to be on the order of 10 dB higher at the microseismic peak at 0.2 Hz.

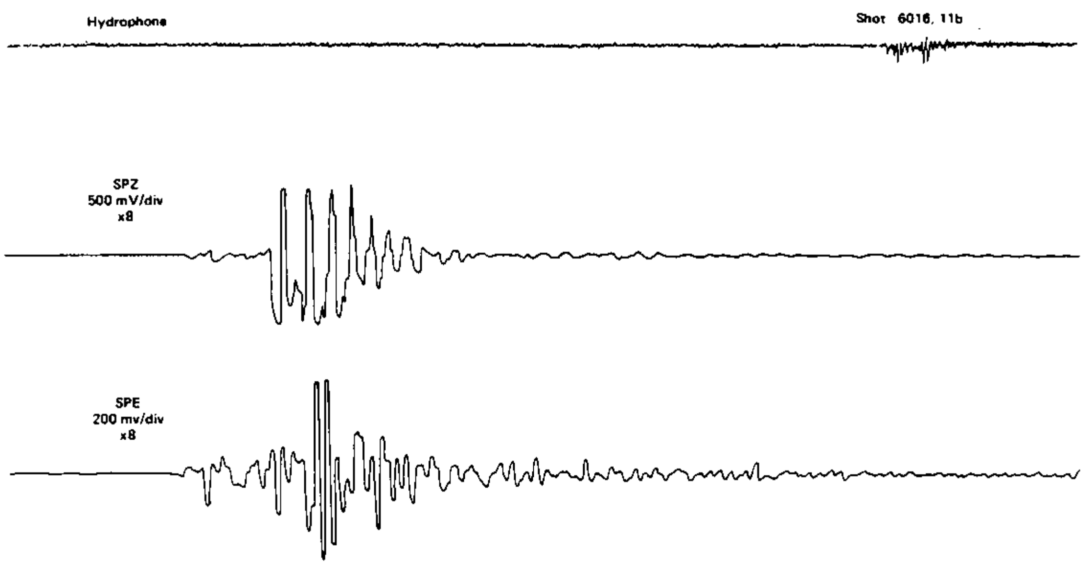


Figure 91-11. Comparison of arrival times and wave forms of the water wave (hydrophone channel) and refracted waves recorded on the short-period vertical (SPZ) and short-period east-west (SPE) channels of the BIP, shot 6016, fired near GLOMAR CHALLENGER on the southwest refraction line of Figure 91-10.

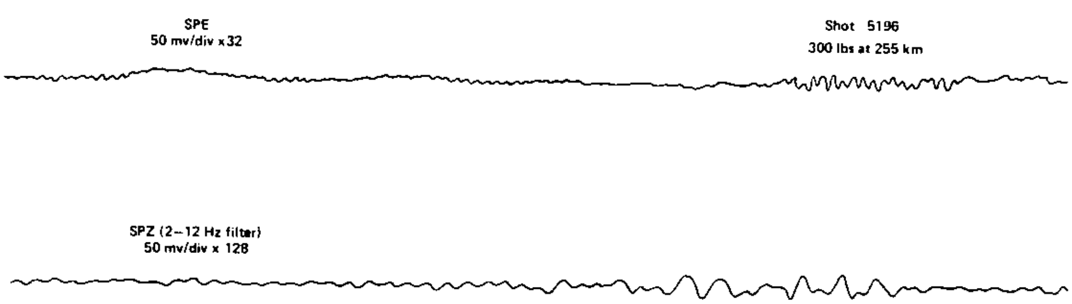


Figure 91-12. Comparison of the short-period east-west (SPE) and short-period vertical (SPZ) signals measured by the BIP from 300-lb. shot 5196, which was fired 255 km from GLOMAR CHALLENGER on the northwest refraction line of Figure 91-10.

Seismic Refraction Profiles

While in the vicinity of Site 595, R/V MELVILLE shot five seismic refraction profiles, with shots varying in size from 0.5 to 136 kg (1 to 300 lb.). Although the shooting program was carried out by MELVILLE essentially as planned, only about half the shots were detected by the MSS and recorded on board D/V GLOMAR CHALLENGER. The lost shots were the result of delays arising from technical problems with the electromechanical cable in the isolator at the top of the BIP followed by a 17 hr. wait for suitably calm weather for re-entering the hole. The MSS recorded three series of shots (making a total of 348 shots) comprising essentially two unreversed refraction profiles (Fig. 91-10). Line 4, which actually consisted of 151 shots of Series 4 and 6, extended about 150 km southwest of Site 595. Line 5 was a split profile shot from southeast to northwest. The southeast part of the profile was about 50 km long while the northwest limb was extended to a range of about 260 km.

The shots fired by MELVILLE were effectively of two types. Firstly, 1, 2 or 3 lb. charges of DuPont heavy duty primers were fired within 30 km of Site 595. Normally these charges were suspended at 10 m depth and initiated with slow-burning underwater fuse; in the vicinity of GLOMAR CHALLENGER, however, the floats were not used for safety reasons and the shots were detonated at about 35 m. These shots were fired every 3 min. at a speed of about 3 knots. The second type of shot consisted of charges of 13.6 to 136 kg (30 to 300 lb.) of Tovex also initiated by slow-burning fuse. These shots were fired at speeds between 6 and 12 knots depending on charge size.

The shots were recorded by the BIP at a depth of 124 below the seafloor and 54 m into volcanic basement. Due to last minute technical problems the clamping pawls and stabilizing rollers in the isolator at the top of the BIP were removed. Thus the BIP was coupled to the solid earth only by its own mass (1500 kg).

Although all four seismic accelerometers (Although strictly speaking the MSS measures and records ground accelerations the four sensors in the BIP ill subsequently be referenced to as seismometers in this section.) were functioning when the BIP left the deck of GLOMAR CHALLENGER, unfortunately the north horizontal seismometer failed to settle down after the BIP reached the bottom of the hole. Consequently, both the short-period north and mid-period north channels were adversely affected by frequent bursts of spiky noise. These noises appeared to increase as time went on. Thus the poor quality of the north seismometer data will probably prevent the orientation of that seismometer from being determined. Nevertheless, it may eventually be possible to determine the orientation of the horizontal seismometers, at least approximately, by the signals from different azimuths from shots (and earthquakes) sensed by the east seismometer. Continuous digital tape recordings of all the seismic signals from the BIP in the period 1058Z/037-1000Z/042 were made on board ship while the BIP was on the bottom of Hole 595B and connected to GLOMAR CHALLENGER by the EM cable.

In seismic refraction experiments involving OBS's, similar to the experiment described above, the horizontal range from shot to OBS is normally calculated from the travel time of water-borne phases. This is a far more accurate method than relying on the ship's track based on transit satellite fixes and dead reckoning and routinely allows range estimates with a precision of better than 50 m. It is not immediately apparent that a down hole seismometer will sense such water-borne phases. A phase with an apparent velocity of about 1.5 km s^{-1} was seen in Leg 88 downhole seismometer data but it is not known how this phase traveled from the seabed to the downhole seismometer. Further, the relatively low sampling rate of the MSS during Leg 91 (normally 40 samples s^{-1}) means that the onset of the relatively high frequency water wave cannot be read with the precision ($\pm$ 0.01 s) usually employed. For the above reasons we decided to record water waves with a hydrophone suspended beneath GLOMAR CHALLENGER. The ship's position, and that of the shot, could then be related to the re-entry cone and BIP using GLOMAR CHALLENGER'S dynamic positioning system. Each range was calculated with a computer program which effectively traces a set of rays through the sea until one is found which gives the correct travel time.

Good results were obtained with the short-period vertical and short-period east channels of the MSS and with the hydrophone (at 10-15 m depth) for all three series of shots. Particularly clean, uncluttered MSS seismograms were obtained, with individual phases (such as super-critical reflections and secondary refracted waves) appearing to be distinct from each other. The small (1, 2 or 3 lb.) shots gave first arrivals with excellent signal:noise ratios in the range 0-10 km (Fig.

91-11) and even out to 30 km. The MSS was stretched to its limit, however, when 136 kg (300 lb.) shots were fired out to a range of 260 km, a region in which the oceanic upper mantle typically produes very weak compressional first arrivals (Fig. 91-12).

The large amount of high quality explosion data recorded by the MSS when integrated with the even more voluminous data recorded by the OBS's, will provide a very valuable data set with which to characterize old oceanic lithosphere formed at a fast-spreading accreting plate boundary.

Regional and Teleseismic Earthquakes

From about 1120Z on 6 February 1983 to 1000Z, 11 February, almost continuous slow-speed strip chart records of unfiltered signals from the BIP were recorded on board GLOMAR CHALLENGER. This period included shots fired during seismic refracion lines 4, 5, and 6. There were also breaks in chart recording due to sensor calibration sessions, troubleshooting of the equipment and other tests. The short-period vertical (SPZ) and short-period east (SPE) channels were displayed on all the chart records. The third recorder channel was occupied by the short-period north (SPN) trace initially but after this sensor had clearly become seismically ineffective, its trace was replaced by either the mid-period vertical (MPZ) or the mid-period east (MPE) traces. The fourth channel normally displayed the clock trace.

Some 64 events, all apparently

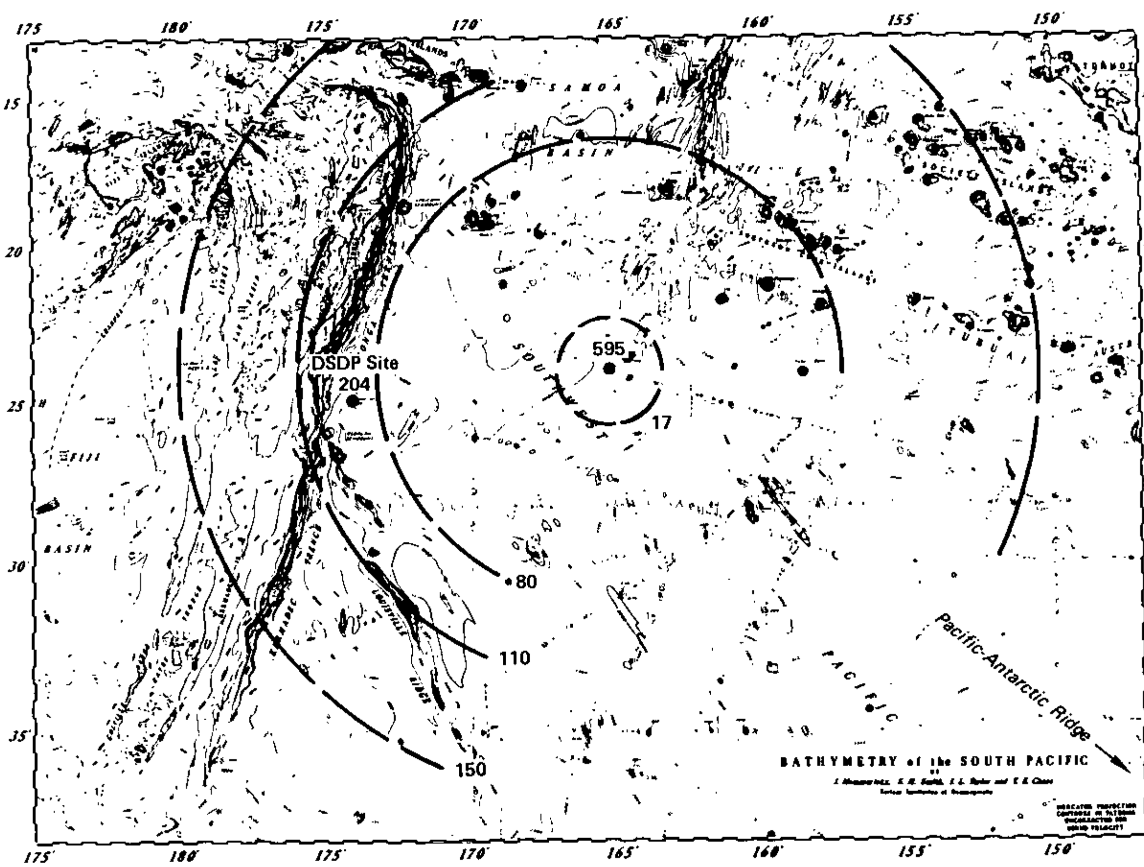


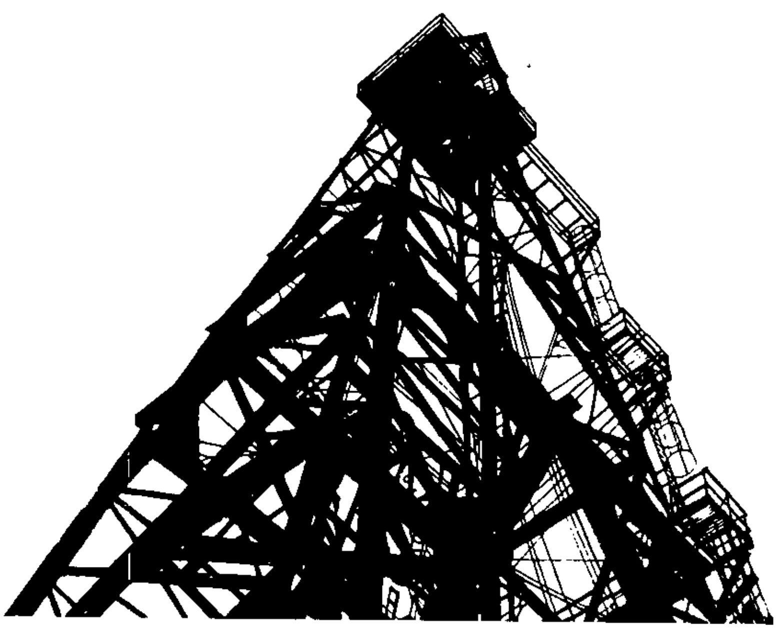
Figure 91-13. Circles of equal shear-minus-principal wave travel time (neglecting adjustment for mercator projection) for teleseismic events reaching the BIP at Site 595 during recording on board GLOMAR CHALLENGER. Some local events about 17 s away were recorded as well as events between 80-110 s. The latter probably had sources west of the Tonga Trench in the inclined seismic zone dipping to the west beneath the Lau Basin. However, earthquakes in the Society, Cook and Austral chains cannot be excluded as sources for some of the events.

earthquakes, were recorded in the above period (Table 91-3). Events were normally listed only when a clear P and S phase could be distinguished. Until about 0600Z, 6 February 1983, rather low gains were employed on the chart records so that ony the largest events may have been noted up to this time. Thereafter the number of events occurring in any 6-hr. period varied between 2 and 9. In the 72-hr. period from 0600Z on 6 February to 0600Z on 11 February, 56 events were detected which, in view of time lost to test procedures, indicate a detection rate by the MSS of close to one event per hour. Only a small proportion of events, but apparently the most energetic, gave rise to signals on the MPZ channel. These signals correspond broadly to the main P and S phases on the short-period traces. No surface waves were evident on the MPZ trace.

In a histogram of all the S-P times two clear peaks can be seen in the ranges 10-20 and 80-110's. The peak with the smaller S-P time results from six events with S-P values between 16 and 18 s, five of which occurred within an 82-min. period on Day 040 (Table 91-3). These events typically have a weak P phase on the SPZ trace. The other histogram peak is broader, mainly with S-P values between 80 and 110 s, and the events comprising this peak occurred throughout the recording period. The cut-off below about 80 s, is sharp, whereas the distribution "tails off" at larger S-P times.

For simplicity in calculating the distance of the above events from Site 595, we shall use and S-P velocity of 10.0 km s^{-1}. This might correspond, for example, to upper mantle P and S velocities of 8.2 and 4.5 km s^{-1}, respectively. Thus the events corresponding to the 17 s S-P peak have epicenters between 160 and 180 km from Site 595 (Fig. 91-13). No epicenters have previously been reported within this region, as far as we know. It can only be speculated which bathymetric features, if any, are associated with these epicenters. However, the east-northeast extension of an east-northeast/west-southwest linear trough centered about 180 n. mi. southwest of Site 595 or the westward extension of the Austral Frature Zone, from 155°W longitude, both of which would pass through the region south of Site 595, might be associated with these epicenters.

The events with S-P times of 80-110 s lie between 800 and 1100 km from Site 595 (Fig. 91-13). It is almost certainly significant that the seaward wall of the closest part of the Tonga Trench lies about 800 km west-northwest of the site. Many of the events from more than 800 km away are expected to have originated in the highly seismically active Tonga, and perhaps Kermadec, subduction zones. However, epicenters in the less active zone between the southern Cook Islands and the Society Islands cannot be ruled out without studying station records from that region.



PLANNED CHALLENGER DRILLING

Leg 93 - Site ENA-3 Eastern North American Basin

Balboa, Panama to Norfolk, Virginia, 20 April to 18 June 1983. Co-chief scientists: J.E. Van Hinte and S. Wise.

Introduction

The eastern North American Basin (Fig. 1) has been studied longer and with perhaps greater care by marine gophysicists than any other basin in the world. The reasons for this attention are numerous and compelling: along its western margin, where the basin meets the lower continental slope, the sediments range in age from Recent to perhaps as old as Middle Jurassic, making them among the oldest in the present-day ocean basins. Seismic records reveal that the section is quite complex, with numerous, well-defined reflectors which can be traced across most of the basin (Fig. 2). Near the base of the slope, however, the records show a marked midlevel unconformity (A^u) of probable Oligocene age overlain by a thick section of current-deposited sediments containing sediment waves and probable turbidites. These sediment waves suggest that deposition along the western margin of the basin was perturbed by strong geostrophic currents in the Oligocene which decreased in intensity during the Neogene. Finally, the basement itself displays evidence of anomalous magnetization (the Jurassic quiet zone) and a subtle reorganization of spreading between Anomalies M25 and M23.

Site ENA-3D

When it was recognized that a single, carefully placed hole in the North American Basin might sample a nearly complete section dating from shortly after the initial opening of the Atlantic to the present and that the section would record the response of the basin to its enlargement and deepening through seafloor spreading and crustal cooling, to the influx of sediments from the crest and to the major current reorganization which took place during the Oligocene, the JOIDES Passive Margin Panel recommended that a hole be drilled to Jurassic basement in deep water near the western edge of the basin if a site could be identified in which the youngest Jurassic reflector, J_1, and the underlying basement were within reach of the <u>Challenger's</u> 6800 m drill string. After an extensive multichannel survey by the R/V <u>Knorr</u> in 1980, a site (ENA-3D) was identified at the distal end of the New Jersey Transect which met these criteria (Table 1). The site is located in 4616 m of water at the boundary between the lower continental rise terrace and

Table 1.

Leg 93 Sites

Site	Priority	Location	Water Depth (m)	Distance From Nearest Land (n.mi.)	Jurisdiction	Penetration (m)	Objectives
ENA-3D	1	35°30'N, 70°02'W	4616	265	International	1840	Sample Jurassic sediments and crust; determine age and lithology of J_1, β, A*, A^u and X Reflectors, correlate with detailed seismic stratigraphy experiments; compare sediment facies with those on continental slope.
NJ-8	2	38°42'N 71°02'W	3000	146	United States	800	Sample basement of buried seamount to determine origin of Jurassic inner magnetic quiet zone; determine age of seamount and subsidence history and spreading rates in quiet zone from overlying sediments.
NJ-9	3	37°01'N 66°55.5'W	4988	298	International	300	Date A^u abyssal-current erosion event along eastern North American Margin.

:diment
xhibits continental rise hills (Fig. 3). The
nd (2) ɩhic sequence (Fig. 4) can be divided
wo-thi ɩtly into two intervals: (1) pre-
exhibit A^u: roughly the lower one-third of the
ɩt column, which for the most part
s fairly flat-lying internal reflectors;
) post-Horizon A^u: roughly the upper
irds of the sediment column, usually
ɩting (from the base) chaotic sedimentary sequences, migrating sediment waves, ponded turbidites (lower continental rise terrace only). The J_1 Reflector which onlaps a northwest-southeast trending basement high just to the east (Fig. 5), lies at an estimated sub-bottom depth of 1664 m and the basement lies at 1814 m, or a total depth of 6430 m. The basement itself predates Anomaly M25 and is presumed to be Callovian in age (Fig. 6).

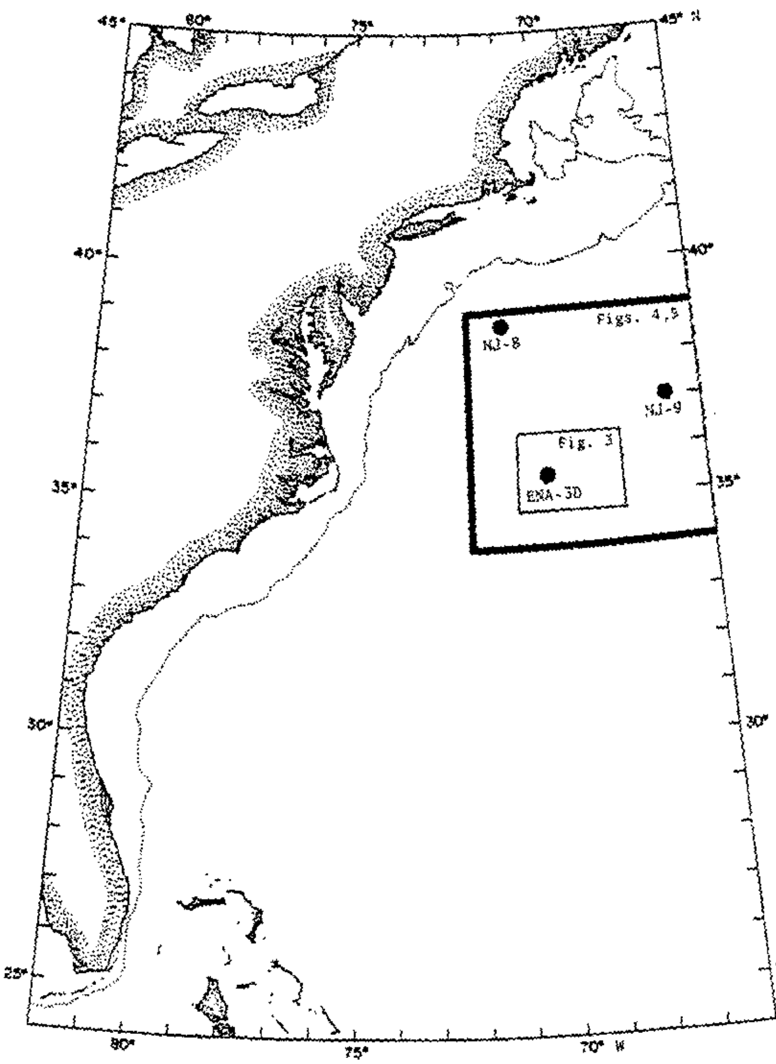


Figure 93-1. Map showing location of prime Site ENA-3 and alternate Sites

Table 2.

Leg 93 Site Occupation Schedule.

Site	Location	Transit Time (days)	Time on Site (days)	Departure Date
DEPART:	Norfolk, Virginia			3 May 1983
		1.5		
ENA-3D	35°30'N, 70°02'W		43*	16 June 1983
		1.5		
ARRIVE:	Norfolk, Virginia			18 June 1983
	Alternate Sites			
NJ-8	38°42'N, 71°02'W		6.5	
NJ-9	37°01'N, 66°55.5'W		4.3	

*Drilling will be continued on Leg 95 if the hole is not completed on Leg 93.

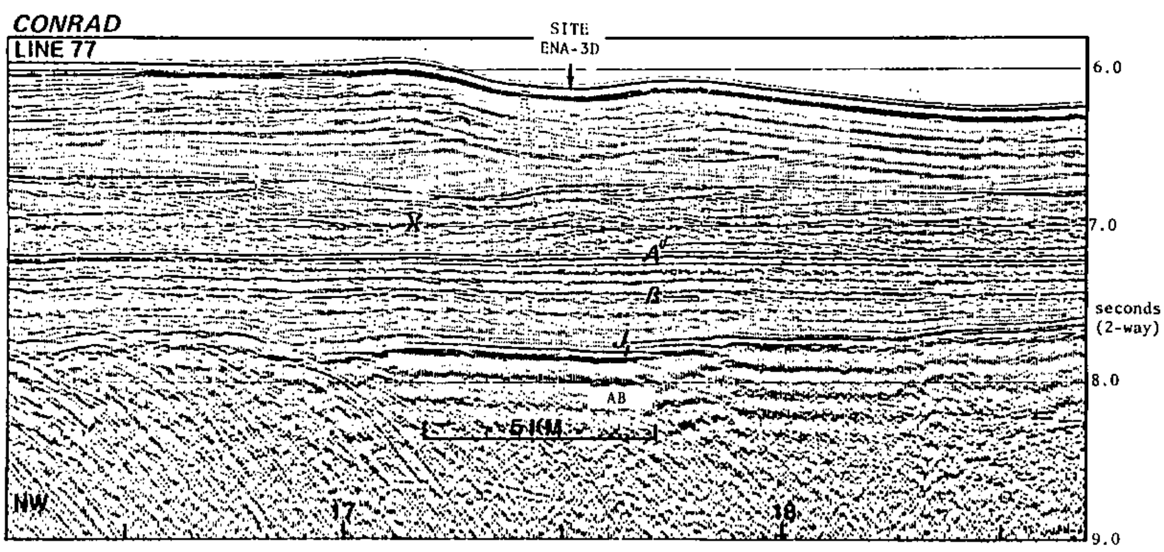


Figure 93-2. Multichannel seismic relfection profile showing location of Site ENA-3D, R/V Conrad 21, Leg 1, MCS line 77, 23 September 1977, 1731 hr. X, A^U, and J, represent prominent reflectors. AB represents acoustic basement.

The principal objectives of drilling at Site ENA-3, as set forth by the Passive Margin Panel, are: (1) to sample and identify the several prominent seismic reflectors in the Cretaceous and Cenozoic sedimentary section (ß, A*, A^u and X); (2) to sample as much of the upper sedimentary section as possible with the HPC in order to understand the active current-controlled depositional processes which predominated in the area throughout much of the Neogene; (3) to determine the age and nature of Reflector J_1; (4) to determine the age and nature of the oldest sediment deposited on oceanic crust at a location landward of Site 105 and not situated on a prominent basement high.

To accomplish these objectives in the limited time available on Leg 93 (Table 2) a re-entry cone will be set and the hole will be washed and spot-cored to the A^u conformity. A high resolution stratigraphy experiment will be conducted over the hole during Leg 94 and the hole will be logged on Leg 95. If the basement objective is not met on Leg 93 because of time constraints, the drilling will be completed on Leg 95 at the expense of the lower priority sites on the New Jersey Transect.

Alternate Sites

If the objectives cannot be reached and the hole has to be terminated prematurely due to drilling difficulties, two alternate sites, NJ-8 and NJ-9, have been proposed in the same area.

The first, NJ-8, is located over a buried basement knoll in the vicinity of the Hudson Canyon (Figs. 1, 5 and 7). From seismic data collected by the R/V Knorr, it appears that the deeper Middle and Upper Jurassic reflecting horizons, J_2 and J_1, are onlapping the base of the knoll, implying that it was an island or seamount in the Jurassic North

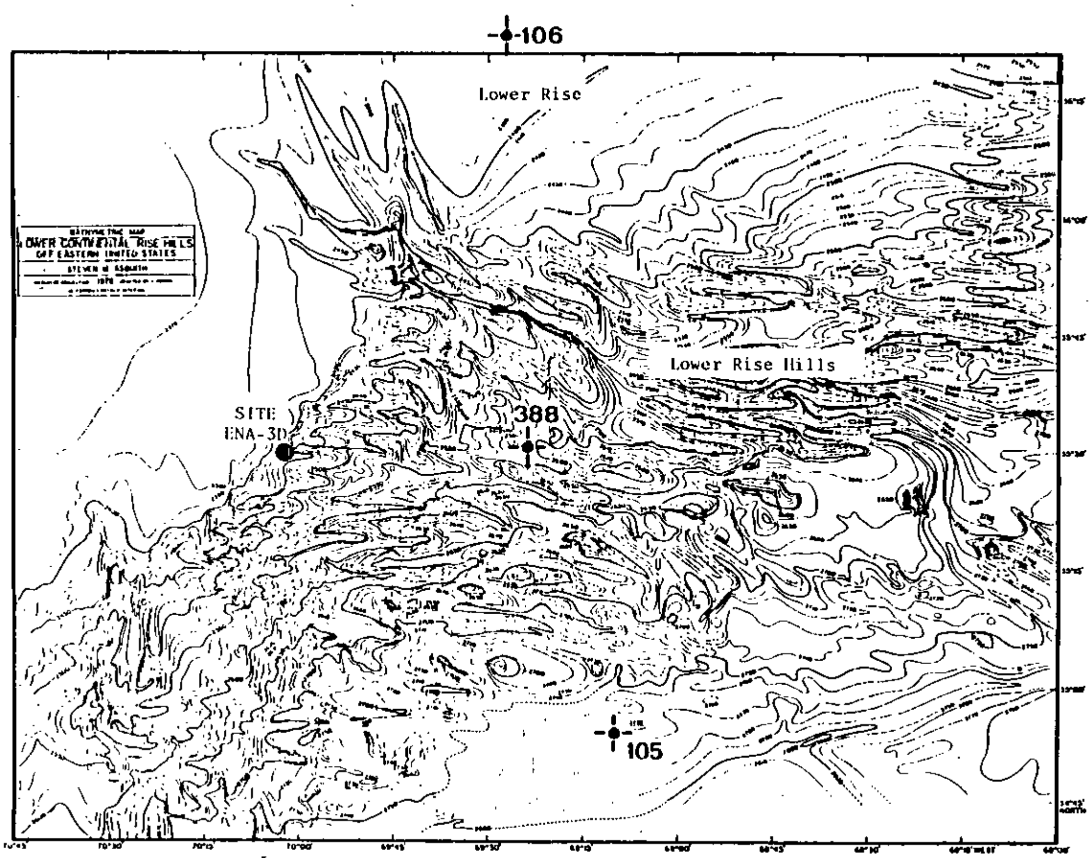


Figure 93-3. Bathymetric map showing location of Site ENA-3D along boundary between the lower continental rise terrace and the lower continental rise abyssal hills. Also shown are locations of previous DSDP sites in the area.

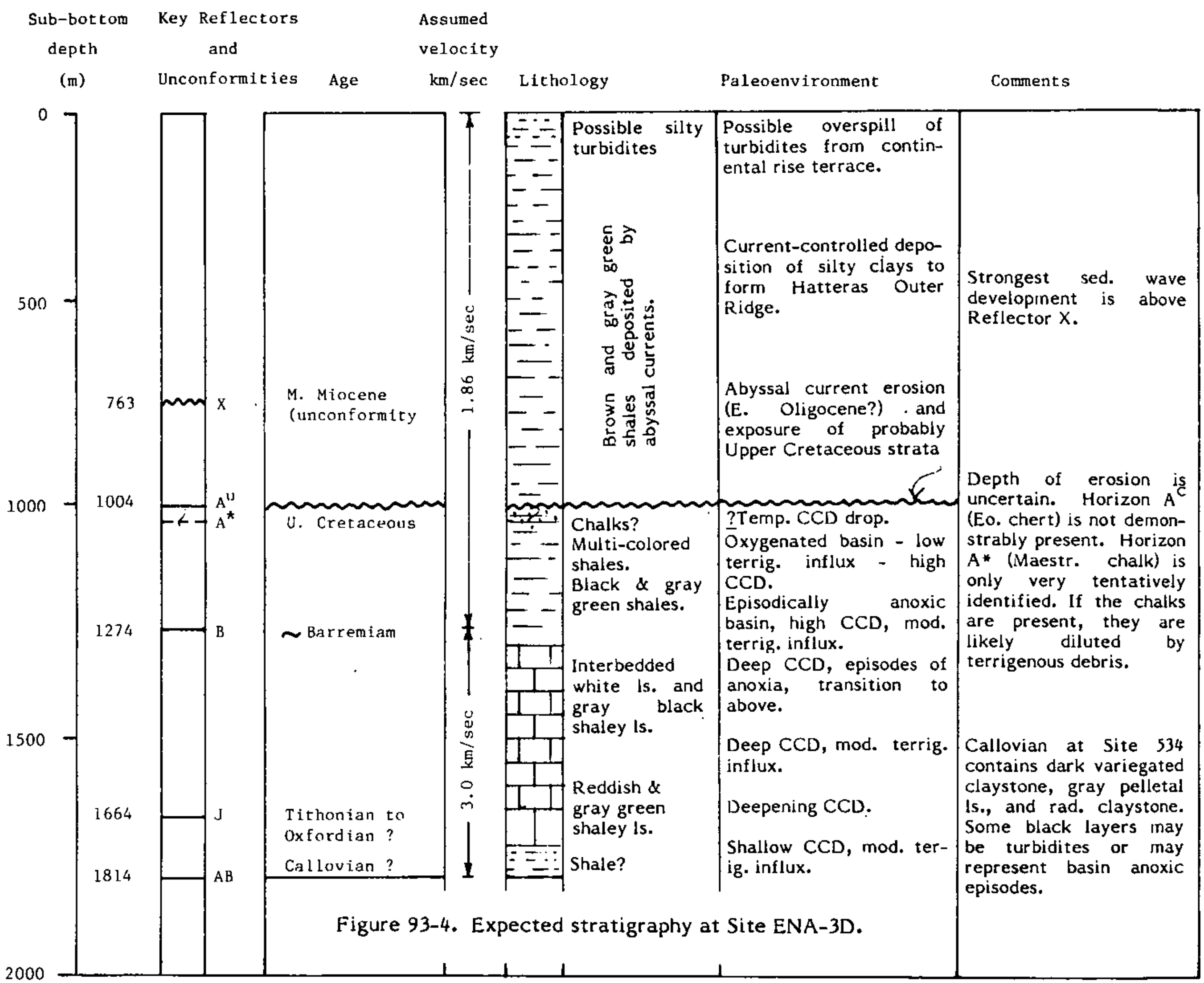


Figure 93-4. Expected stratigraphy at Site ENA-3D.

Atlantic Ocean. There is some suggestion on the Knorr profile that the knoll is locally flat-topped and that a sedimentary cover might exist on top of the knoll. this sediemntary cover might include Jurassic shallow water sediments deposited on the séamount as it subsided from near sea level.

Another unusual feature of the knoll is that it produces a relatively small magnetic anomaly (less than 150 nT). A basaltic body of this size would normally produce an anomaly of 500-800 nT. This suggests that the knoll could be a granitic block left behind during a spreading center shift accompanying the Jurassic breakup of North America and Africa. Such an interpretation would be consistent with other geophysical data from this part of the Jurassic inner magnetic quiet zone which suggests that the knoll is part of a buried linear ridge found midway between the Blake Spur and East Coast Magnetic anomalies.

Whatever the origin of the knoll, drilling a Site NJ-8 should provide a sample of Jurassic basement from the inner magnetic quiet zone. Whether basaltic or granitic, the composition of the sample should give an explanation for the lack of magnetic anomalies in the quiet zone. Other objectives at the site will be to sample the sediments overlying the knoll in order to determine its subsidence history and precise age. From the age, it should be possible to determine quiet zone spreading rates.

The objective at the second alternate site, NJ-9, is to examine the timing of the major event of abyssal-current erosion that formed seismic Horizon A^u along the eastern margin of North America. It is thought that the abyssal circulation history includes an erosional phase (early Oligocene according to Tucholke and Miller; middle Oligocene according to Vail), and transportational phase

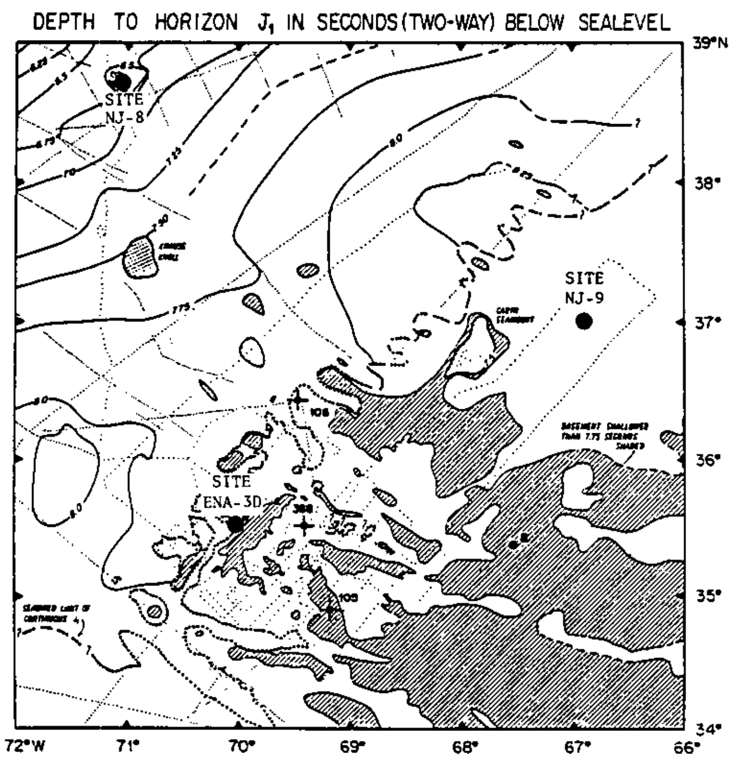


Figure 93-5. Location of Site ENA-3D and alternate Sites NJ-8 and NJ-9 with respect to basement high (hachures) and seaward limit of J_1 reflector.

(remainder of the Oligocene), and a depositional phase (commencing in the early Miocene) as circulation intensity decreased. Site NJ-9 is located on LDGO multichannel line 147 at the eastern perimeter of the zone where Horizon A^u can be defined by truncation of the underlying reflectors and onlap of the overlying reflectors (Fig. 8). Minimal erosion should have occurred at this site so that an older limit can be placed on the age of current erosion.

Site ENA-3D (North Amercan Basin)

Position: 35°30'N, 70°02'W
Water Depth: 4616 m
Sediment Thickness: 1815 m
Priority: 1

Proposed Drilling Program: Wash and rotary drill pilot hole. Set re-entry cone and 500 m of casing; wash and spot core to just above Horizon A^u (1 km); continuously core into basement; stabilize hole for continued drilling and/or logging on Leg 95; HPC and/or rotary drill section above Horizon A^u if time available.

Objectives: 1) Determine nature of Jurassic sediments and basement; 2) determine age and nature of J_1, β, A*, A^u and X reflectors in the North American Basin. Correlate results with downhole logs and detailed seismic site; 3) compare sediment facies with slope facies drilled along the New Jersey Transect on Leg 95.

Heat Flow: Yes   Logging: Yes (on Leg 95)

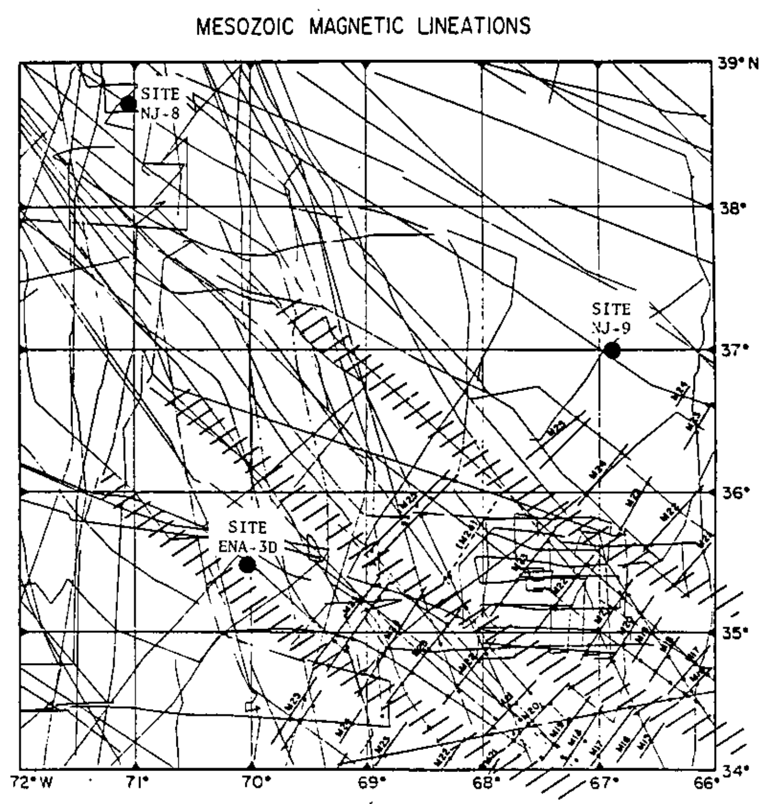


Figure 93-6. Location of Site ENA-3D and alternate sites NJ-8 and NJ-9 with respect to fracture zones (hachures) and magnetic anomalies.

Seismic Profile: R/V Conrad 21, Leg 1, MCS line 77, 23 September 1977, 1731 hr.; R/V Knorr 80, MSC regional surveys; R/V Fay regional surveys.

Expected Lithology:

0-1004 m: Lower Miocene through Quaternary brown and gray green shales deposited above the A^u unconformity by abyssal currents. Silty turbidites possible at the top of the section.

1004-1274 m: Barremian through Upper Cretaceous black, gray green and multicolored shales. A thin unit of Maestrichtian chalk may be present below the A^u unconformity.

1274-1664 m: Tithonian-Oxfordian(?) through Barremian limestone and shaley limestone.

1664-1814 m: Callovian(?) shale grading upward through Tithonian-Oxfordian(?) shaley limestone.

>1814 m: Jurassic (Callovian?) basalt.

Site NJ-8 (Hudson Canyon)

Position: 38°42'N, 71°02'W
Water Depth: 3000 m
Sediment Thickness: 750 m
Priority: 2

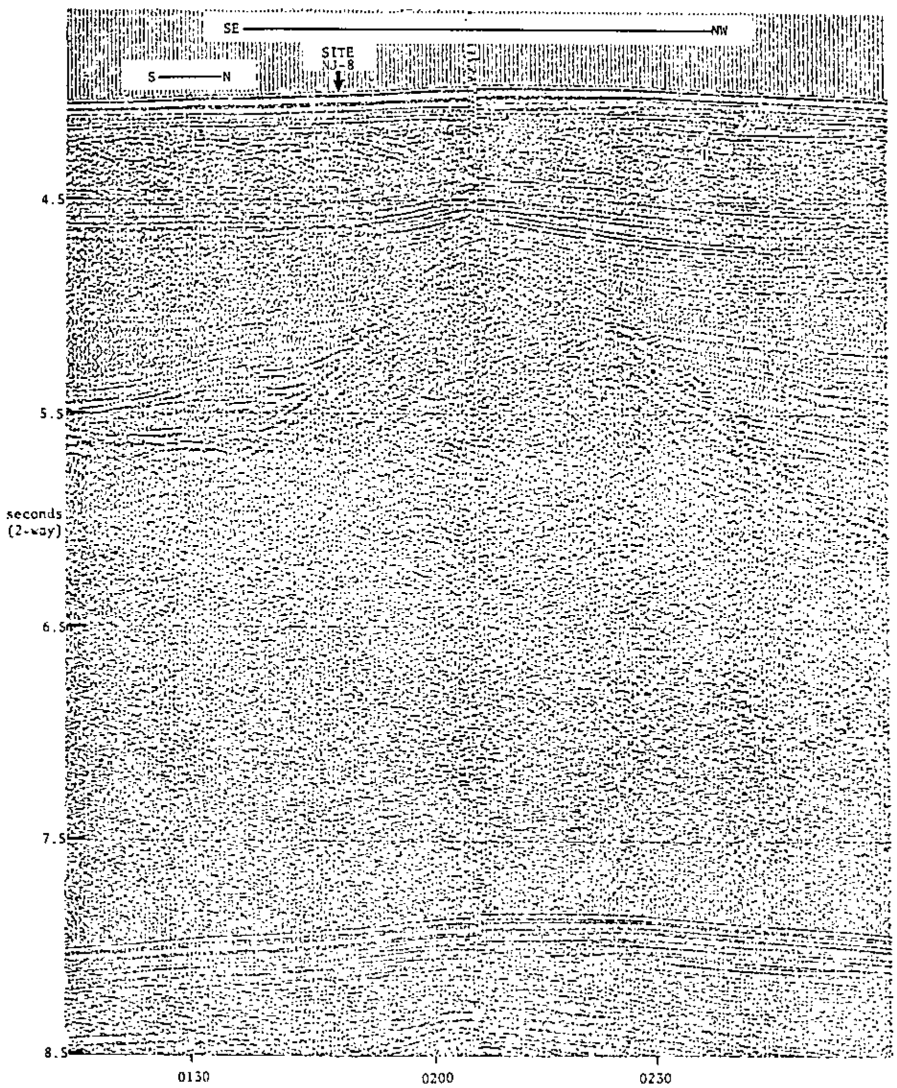


Figure 93-7. Multichannel seismic reflection profile showing location of alternate Site NJ-8. R/V Knorr 80, 16 August 1980.

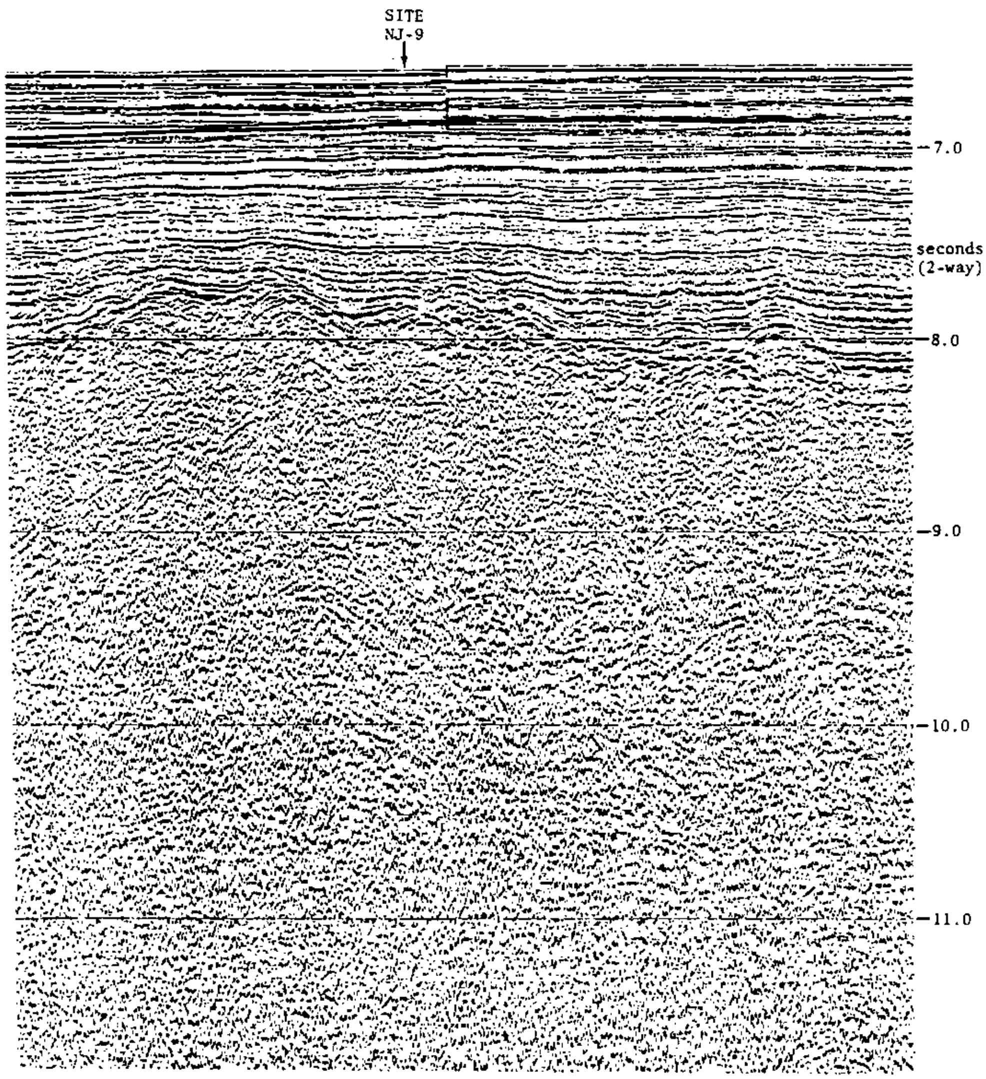


Figure 93-8. Multichannel seismic reflection profile showing location of alternate Site NJ-9. R/V Conrad, MCS line 147, 26 June 1978, 0000 hr. The subhorizontal line at 0.3 s is the A^u unconformity. The faint vertical line is a recording error.

Proposed Drilling Program: Core continuously into basement.

Objectives: 1) Sample basement of buried seamount in Jurassic inner magnetic quiet zone to determine origin of low amplitude Jurassic anomalies; 2) determine the spreading rate and subsidence history of the quiet zone from the age and nature of the sediments overlying the seamount.

Heat Flow: Yes Logging: Yes

Seismic Profile: R/V Knorr 80, 16 August 1980, 0210 hr.; R/V Gyre 81-13, line 1B, 25 August 1981, 2315 hr.; R/V Conrad 21-01, 19 September 1977, 2000-2200 hr.

Expected Lithology:

0-750 m: Neogene pelagics overlying(?) a thin cap of possible shallow water limestones of Cretaceous-Jurassic age.

>750 m: Basalt or granite.

Site NJ-9 (North American Basin)

Position: 37°01'N, 66°55.5'W
Water Depth: 4988 m
Sediment Thickness: 1300 m
Priority: 3

Proposed Drilling Program: Continuous HPC-XCB coring to Horizon A^u.

Objectives: Date the A^u abyssal-current erosion event along the eastern margin of North America.

Heat Flow: Yes Logging: No

Seismic Profile: R/V Conrad, MCS line 147, 26 June 1978, 0000 hr.; Historical survey lines of R/V Vema, R/V Conrad.

Expected Lithology:

0-160 m: Upper Pliocene(?) through Quaternary silty turbidites.

160-256 m: Lower to middle Miocene(?) current-deposited clays.

>256 m: Upper Eocene(?) biosiliceous clays and cryptically graded, fine-grained turbidites.

Sediment Paleomagnetism Data Now Available

The sediment paleomagnetism data base contains shipboard paleomagnetic measurements taken by the discrete-sample spinner magnetometer, the alternating-field demagnetizer and the long-core spinner magnetometer. The file is restricted to paleomagnetic measurements of cores recovered by the hydraulic piston corer. The long-core spinner-magnetometer sediment-paleomagnetism file is complete with measurements from DSDP Legs 68, 70-72 and 75. Discrete-sample spinner magnetometer sediment-paleomagnetism data are available for DSDP Legs 71-73 and 75.

Address requests for these data to:

Donna Hawkins
Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093
Tel: (714) 452-3526

DSDP Site Map Updated

Topography of the Oceans with Deep Sea Drilling Project sites now available through Leg 82. To request map contact:

Barbara J. Long
Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093
Tel: (714) 452-3506

Leg 94 - Northeast Atlantic Ocean

Norfolk, Virginia to St. Johns, Newfoundland, 23 June to 18 August 1983. Co-chief scientists: R.B. Kidd and W.F. Ruddiman.

Introduction

During Leg 94, a transect of six holes aligned in a south-southwest/north-northeast direction will be drilled on the east flank of the Mid-Atlantic Ridge from 37° to 53°N (Fig. 1). The principal objective of this transect is to document the magnitude and spectral character of the surface-ocean response to high-latitude climatic change in the northern hemisphere during the Neogene. Changes in the modes of oceanic response in this highly sensitive region will be traced from the well-documented late Quaternary record back into times of different climatic boundary conditions (no northern hemisphere ice sheets, and open Panamanian Isthmus, a closed Gibraltar Isthmus, a smaller Antarctic ice sheet). Ancillary paleoclimatic objectives include the recovery of both a faunal and an isotopic record of deep-water variations at water depths ranging from 2393 to 3871 m.

Other targets sought in conjunction with the basic paleoclimatic objectives include: (1) the tectonic history of the King's Trough complex on the east flank of the Mid-Atlantic Ridge, and (2) the Neogene History of sediment deposition on the Feni Drift in Rockall Trough. In addition, rotary or XCB drilling at Site 3A below the late Neogene hydraulic piston coring objectives will help to fill gaps in the global DSDP stratigraphic array of Eocene-Oligocene sediment cores. Leg 94 will begin in late June 1983 and terminate in mid-August 1983. The cruise plan includes 23 days for transit and 33 days of drilling for a total of 56 days for the leg.

Safety Pollution Considerations.

Previous drilling in the region has not revealed the presence of any significant hydrocarbons, due both to the pelagic nature, deep-water origin, and young age of the sediments. Organic carbon contents are typical of deep-sea pelagic sediments (0-3%).

Objectives

1. Neogene Paleoclimatology

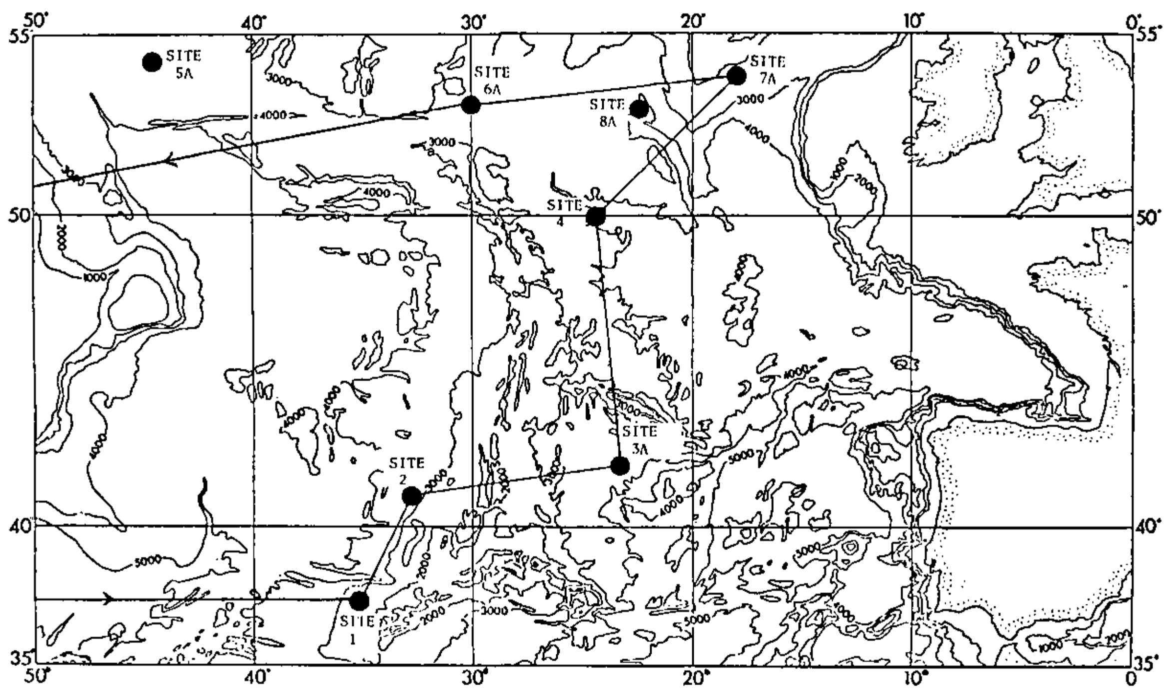


Figure 94-1. Leg 94 track and sites.

The surface North Atlantic from 40° to 50°N has been the most thermally reactive oceanic area in the world during the late Quaternary. It experienced glacial-interglacial oscillations of sea-surface temperature (SST) in excess of 12°C (Fig. 2). The frequency characteristics of this response change dramatically across the 1800 km span of latitudes to be cored on Leg 94. South of 45°N, the dominant periodicities have been 23,000 and 100,000 yr.; north of that latitude, they are 100,000 and 41,000 yr. (Figs. 2 and 3). The concentrations of spectral power in the SST records at these three orbital frequencies are as high as any observed on the face of the earth.

The North Atlantic is a region critically located for climatic interactions, both with the surrounding ice-age ice sheets and with the overlying atmosphere. Several climatic theories call on this part of the ocean for important feedback interactions that amplify global climatic changes initially driven by orbital variations.

The interactions and feedbacks typical of the last several hundred thousand years of the Quaternary can be expected to have been different in the geologic past, both during the smaller pre-Brunhes oscillations of the northern hemisphere ice sheets and during the early Pliocene and late Miocene ice-free conditions in the northern hemisphere. This leg is designed to detect both the changes in boundary conditions (ice-sheet size, as determined from oxygen isotopes and ice-rafted detritus) and in oceanic response (as determined from planktonic microfossils).

The six-core transect shown in Figure 1 is positioned in such a way as to span the major part of the region of large-scale ice-age thermal response (Fig. 2). The three southern cores are in the region now dominated by the 23,000 and 100,000 yr. response, with the amplitude building from around 6°C at the southernmost site (Site 1) to over 12°C at the next two sites to the north (Sites 2 and 3A). The three northernmost sites are in regions now dominated by 100,000 and 41,000 yr.

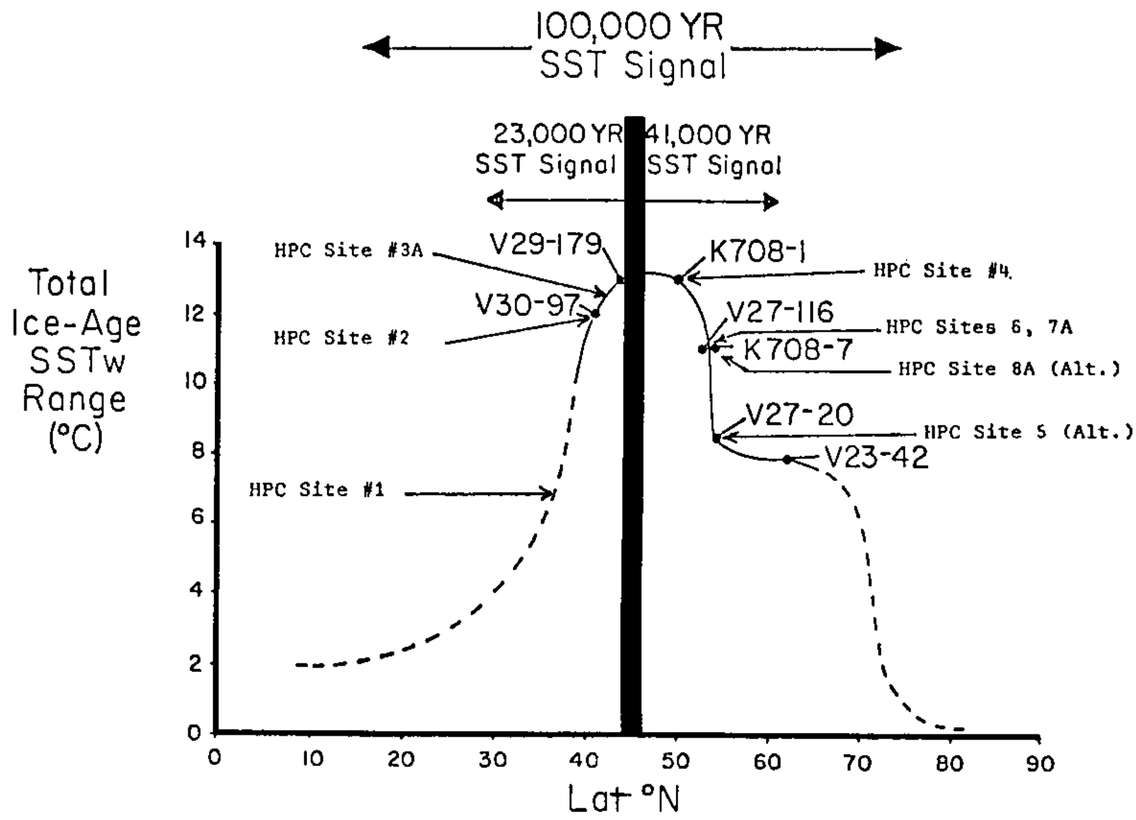


Figure 94-2. Placement of Leg 94 HPC sites along north-south transect showing: (1) total amplitude of glacial-interglacial sea-surface temperature change during the late Quaternary (Brunhes Epoch); and (2) relative apportioning of that change among the three orbital periodicites (23,000 yr.; 41,000 yr.; and 100,000 yr.) that dominate these records.

Table 1. Proposed sites for Leg 94.

Site	Priority	Location	Water Depth (m)	Distance From Land (n.mi.)	Nearest Land	Penetration (m)	Objectives
1	1	37°17.4'N, 35°11.9'W	3198	210	Greenland	450	Neogene paleoenvironment.
2	1	41°00'N, 32°56'W	3371	240	Azores	500	Neogene paleoenvironment.
3A	1	42°05.9'N, 23°31.0'W	3540	260	Azores	600	Neogene paleoenvironment; Paleogene stratigraphy and tectonic history.
4	1	49°52.3'N, 24°15'W	3871	450	Ireland	500	Neogene paleoenvironment.
5A	2	54°00'N, 46°12'W	3510	360	Greenland	500	Neogene paleoenvironment.
6A	1	52°50'N, 30°20'W	3202	650	Greenland	600	Neogene paleoenvironment.
7A	1	53°46'N, 18°00'W	2331	300	Ireland	500	Neogene paleoenvironment and drift-building history.
8A	2	52°45'N, 22°33'W	4009	375	Ireland	450	Neogene paleoenvironment.

Table 2. Leg 94 site occupation schedule.

Site	Location	Transit Time (days)	Time on Site (days)	Departure Date
DEPART:	Norfolk, Virginia			23 June 1983
		9.4		
1	37°17.4'N, 35°11.9'W		4.7	7 July
		1.2		
2	41°00'N, 32°56'W		5.7	14 July
		2.2		
3A	42°05.9'N, 23°31.0'W		6.6	23 July
		2.0		
4	49°52.3'N, 24°15'W		5.7	30 July
		1.6		
7A	53°46'N, 18°00'W		4.2	5 August
		2.1		
6A	52°50'N, 30°20'W		6.0	13 August
		4.6		
ARRIVE:	St. Johns, Newfoundland			18 August 1983

Alternate Sites

Site	Location	Transit Time (days)	Time on Site (days)	Departure Date
5A	54°00'N, 46°12'W		5.7	
8A	52°45'N, 22°33'W		5.7	

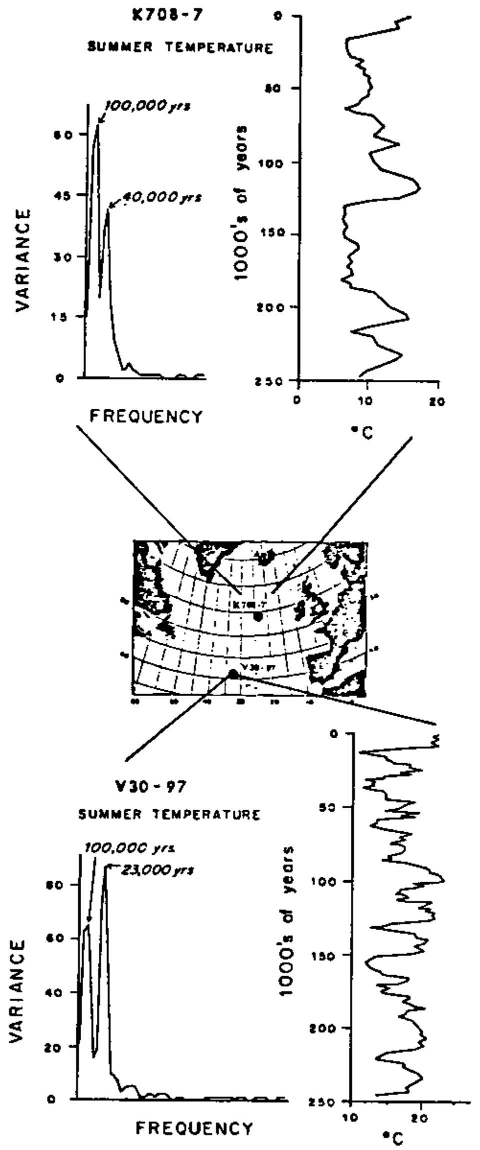


Figure 94-3. Late Quaternary SST frequency response in piston cores V30-97 (HPC Site 2) and K708-7 (near HPC Site 6A).

cycles, with the largest amplitude (13°C) at Site 4 (49°52'N) and somewhat diminished amplitudes at Sites 6 and 7 farther to the north.

Because of the thick sequences of carbonate ooze (and interbedded glacial marine sediments) deposited at rapid rates (30-100m/m.y.) in the area, this leg will also retrieve a valuable record of late Neogene stratigraphy, with one site (Site 3A) reaching back to Eocene sediments. Finally, with coring across a 1000 km long transect and over a water depth range of 1500 m, these sediments should contain significant information on deep-water flow based on $\delta^{18}O$, $\delta^{13}C$ and benthonic foraminiferal assemblages. Four holes are situated on the eastern flank of the Mid-Atlantic Ridge and two on the west (Fig. 1).

2. Tectonic History of King's Trough

Site 3A is located near the King's Trough complex, a positive bathymetric region marked by a long chain of parallel ridges and basins (Fig. 1). The most plausible of several hypotheses put forward to explain this feature invokes: (1) initial formation of the crust 52 m.y. ago as an aseismic ridge on a portion of the Mid-Atlantic Ridge made anomalously shallow by the presence of a hot spot; (2) a sudden uplift of 2 km roughly 32 m.y. ago; (3) rifting with extensional downdropping of 2-4 km roughly 16 to 20 m.y. ago, and (4) normal subsidence to the present.

Continuous coring at Site 3A on the western flank of King's Trough away from the region of vertical tectonics will recover a stratigraphic sequence in which nearby volcanic episodes and tectonically produced hiatuses can be detected. This will provide a comprehensive stratigraphy into which dredge and rock core data obtained in the central tectonic zone can be placed.

3. Sediment Deposition on Feni Drift

No hydraulic piston core suitable for high-resolution stratigraphy has yet been taken from a region of strongly positive sediment accumulation controlled by bottom currents site 7A, located on the Feni Drift in Rockall Trough, will recover a Miocene-to-Quaternary sequence of current-deposited sediments which should improve the present constraints on the date of initiation of drift sedimentation in the area. It should also permit detection of hiatuses due to accelerated bottom flow. Because of the location of the site in the northeastern extreme of the North Atlantic, the record of bottom-current strength obtained should be largely a record of Norwegian Sea Bottom water overflow.

Site 1 (DSDP Site 335, west flank Mid-Atlantic Ridge)

Postition 37°17.4'N, 35°11.9'W
Water Depth: 3189 m
Sediment Thickness: 700 m
Priority: 1

Proposed Drilling Program: Double hydraulic piston core to refusal; XCB to 450 m.

Objectives: Detailed paleoenvironemtnal history of the late Neogene, including changes in surface- and deep-water circulation. This site anchors the southern end of the Leg 94 transect in the northern subtropical gyre.

Heat Flow: Yes Well Logging: No

Seismic Data: DSDP Leg 37 air gun record, 18 July 1974, 025Z (see Fig. 3).

Sediment Types: 0-450 m: Quaternary to Miocene carbonate oozes.

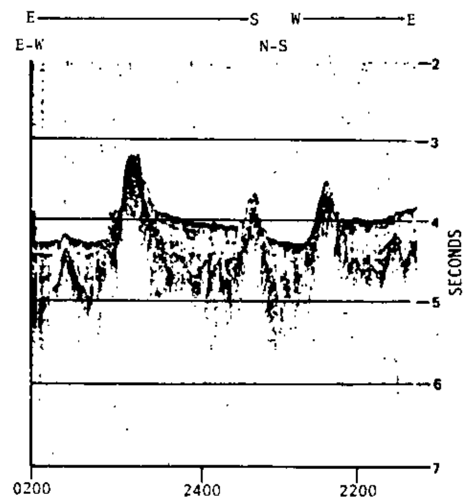


Figure 94-3a. Seismic record at Site 1, DSDP Leg 37, 18 July 1974.

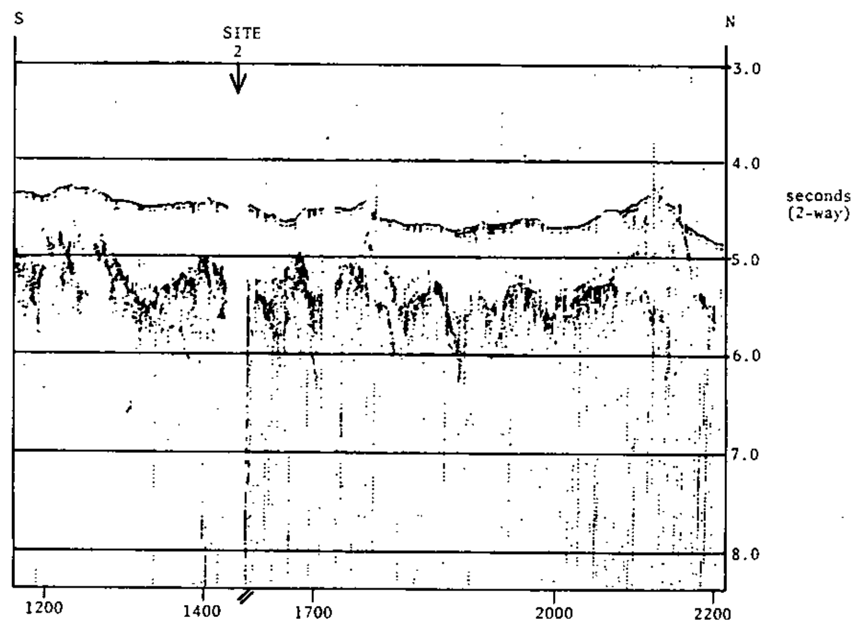


Figure 94-4. Air gun record at Site 2, LDGO V30.

Site 2 (West Flank, Mid Atlantic Ridge)

Position: 41°00'N, 32°56'N
Water Depth: 3371 m
Sediment Thickness: 800 m
Priority: 1

Proposed Drilling Program: Double hydraulic piston core to refusal; XCB to 500 m.

Objectives: Detailed paleoenvironmental history of the late Neogene, including changes in surface- and deep-water circulation. This site is situated beneath the "mid-latitude" region of strongest 23,000-yr. SST response in the late Quaternary record.

Heat Flow: Yes   Well Logging: No

Seismic Data: LDGO V30 air gun record, 28 May 1973, 1410Z (see Fig. 4).

Sediment Types:

0-∿100 m: layered carbonate oozes and glacial marine sediments.

>∿100 m: carbonate oozes and marls and pelagic clays.

Site 3A (West Flank of King's Trough)

Position: 42°05.9'N, 23°31.0'W
Water Depth: 3540 m
Sediment Thickness: 800 m
Priority: 1

Proposed Drilling Program: Double hydraulic piston core to refusal; XCB to basement.

Objectives: Detailed paleoenvironmental history of the late Neogene, including changes in surface- and deep-water circulation. Detailed stratigraphic record for use as a reference section for tectonic events in the King's Trough area.

Heat Flow: Yes   Well Logging: No

Seismic Data: R/V Farnella 9 March 1982, 0315 hr. (see Fig. 5).

Sediment Types:

0-∿300 m: Quaternary to late Miocene foraminiferal-nannofossil ooze.

∿300-700 m: mid-Miocene to Eocene chalks, with a major volcanogenic component in the late Oligocene to early Miocene.

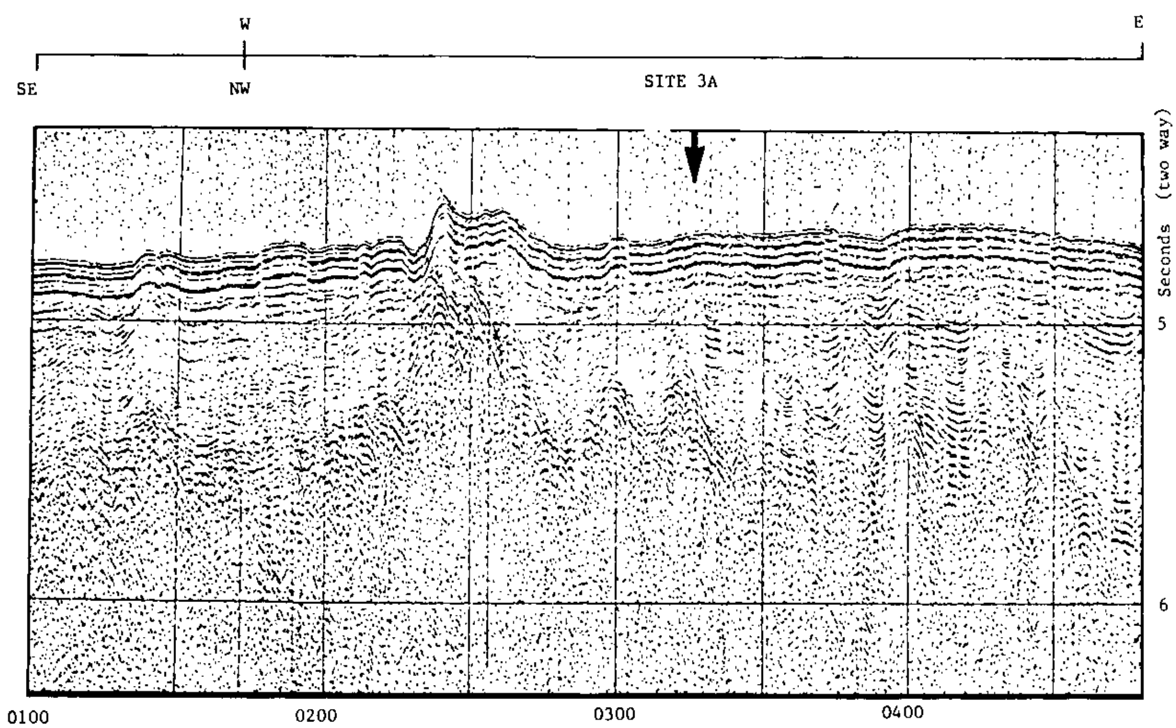


Figure 94-5. Air gun record at Site 3A, Farnella 9 March 1982.

Site 4 (East Flank, Mid-Atlantic Ridge)

Position: 49°52.3'N, 24°15'W
Water Depth: 3871 m
Sediment Thickness: 700 m
Priority: 1

Proposed Drilling Program: Double hydraulic piston core to refusal; XCB to 500 m.

Objectives: Detailed paleoenviromental history of the late Neogene, including changes in surface- and deep-water circulation. This site is located in the middle to high latitude region of maximum late Quaternary SST response and maximum input of ice-rafted debris (for detection of glacial initiation).

Heat Flow: Yes Well Logging: No

Seismic Data: LDGO V23 air gun record, 20 October 1966, 1225Z (see Fig. 6).

Sediment types:

0-300 m: layered carbonate oozes and glacial marine sediments

300-500 m: carbonate oozes and marls and pelagic clays.

Site 5A (Lower West Flank, Reykjanes Ridge near Gloria Drift)

Position: 54°00'N, 46°12'W
Water Depth: 3510 m
Sediment Thickness: 1100
Priority: 1

Proposed Drilling Program: Double hydraulic piston core to refusal; XCB to 500 m.

Objectives: Detailed paleoenvironmental history of the late Neogene, including changes in surface- and deep-water circulation. This alternate site would recover a record of surface water changes well to the north and west of the main transect and in a region where polar front mirgrations are considered likely to have occurred during pre-Quaternary times. It will also retrieve a record of bottom-water changes in the western basin.

Heat Flow: Yes Well Logging: No

Seismic Data: LDGO V27 air gun record, 3 July 1969, 1020Z (see Fig. 7); DSDP Leg 12 air gun record.

Sediment Types: 0-500 m: Slightly calcareous silty and sandy clays, largely pelagic in origin but with some bottom-current redistribution.

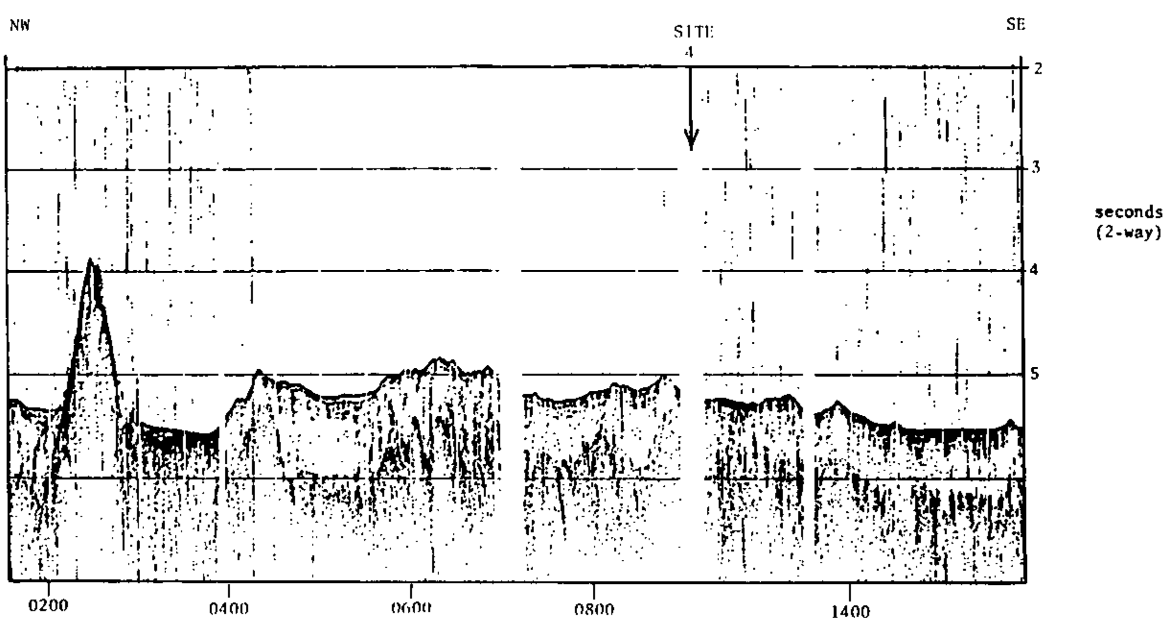


Figure 94-6. Air gun record at Site 4, LDGO V23, 20 October 1966.

Site 6A (East Flank, Reykjanes Ridge)

Position: 52°50'N, 30°20'W
Water Depth: 3202 m
Sediment Thickness: >1000 m
Priority: 1

Proposed Drilling Program: Double hydraulic piston core to refusal; XCB to 600 m.

Objectives: Detailed paleoenvironmental history of the late Neogene, including changes in surface- and deep-water circulation. This site anchors the northwest or high-latitude end of the Leg 94 transect and is located in a region of strong 40,000-yr. SST periodicity in the late Quaternary. It also will record the deep-water overflow history linked to the Iceland-Faeroe Ridge.

Heat Flow: Yes. Well Logging: No.

Seismic Data: LDGO V27 air gun record, 3 October 1969, 2145A (see Fig. 8).

Sediment Types:

0-100 m: layered nannofossil marls and glacial marine-contourite silts with a significant siliceous component.

100-600 m: pelagic nannofossil marls and silty clays.

Site 7A (Crest of Feni Drift)

Position: 53°46'N, 18°00'W
Water Depth: 2331 m
Sediment Thickness: >200 m.
Priority: 1

Proposed Drilling Program: Double hydraulic piston core to refusal; XCB to 500 m.

Objectives: Very detailed paleoenvironmental history of the late Neogene, including changes in surface- and deep-water circulation. This

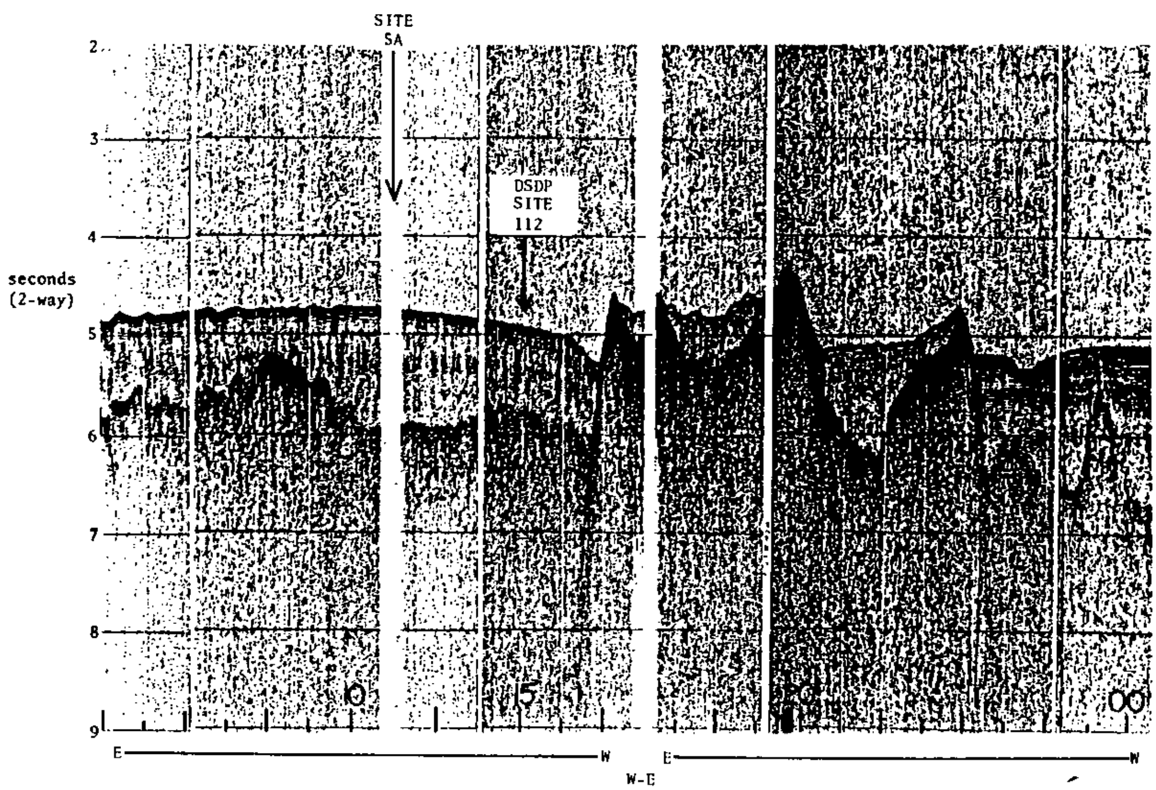


Figure 94-7. Air gun record at Site 5A, LDGO V27, 3 July 1969.

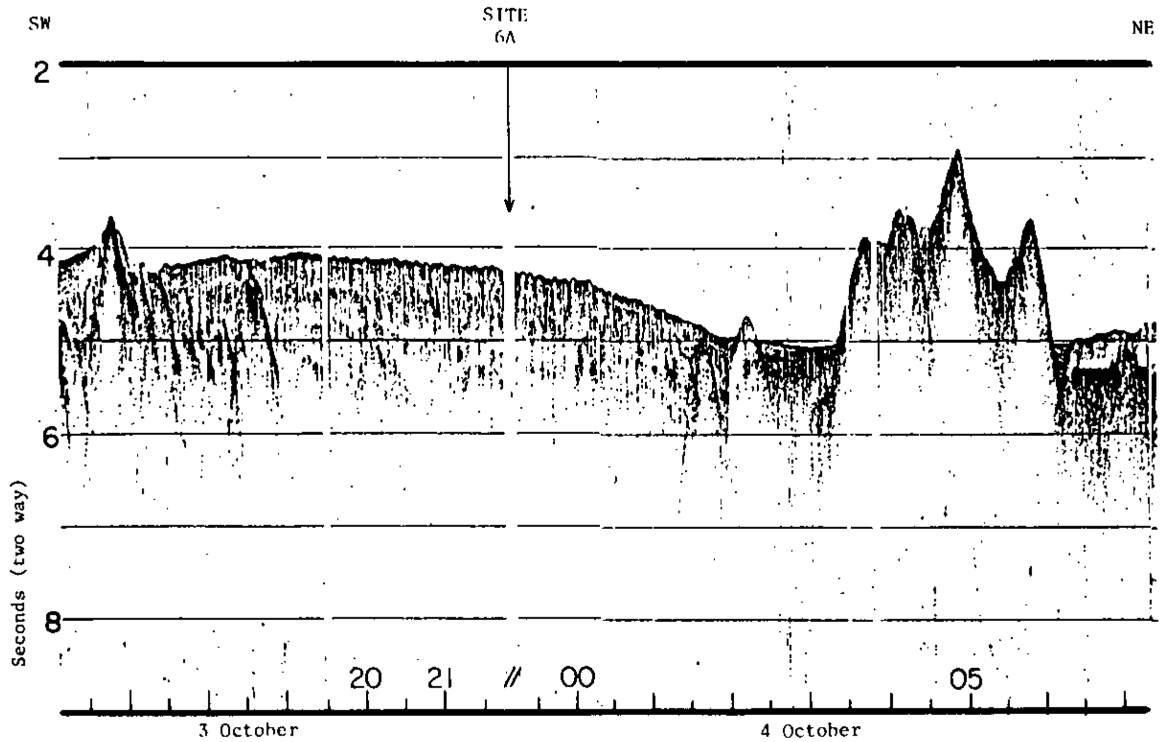


Figure 94-8. Seismic record at Site 6A, LDGO V27, 3 October 1969.

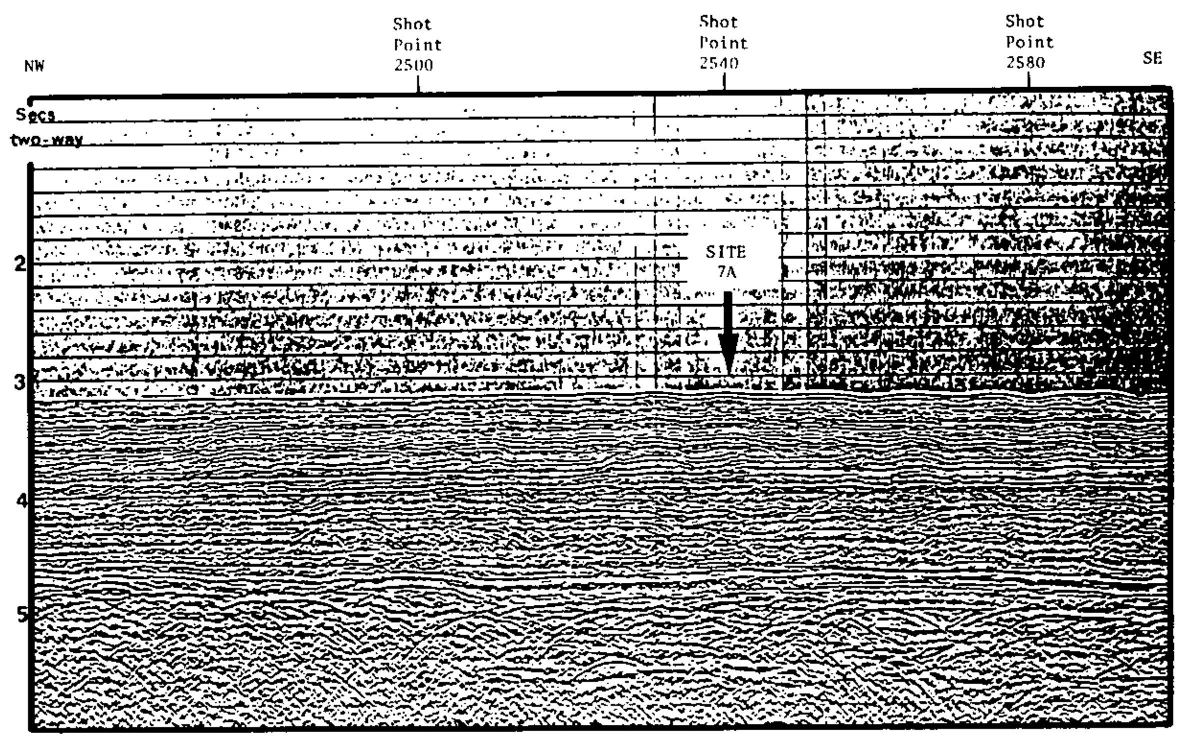


Figure 94-9. Multichannel seismic record at Site 7A, WI-32, July 1979.

site will; monitor warm currents along the coast of Europe. It also provides surface-water response and will record the isotopic and faunal response to deepwater overflow from the Norwegian Sea through the Faeroe-Shetland Channel.

Heat Flow: Yes. Well Logging: No.

Seismic Data: Multichannel record WI-32 (see Fig. 9), July 1979, short point 2540.

Sediment Types: 0-500 m: pelagic carbonate oozes, marls and clays.

Site 8A (East Flank, Mid-Atlantic Ridge)

Position: 52°45'N, 22°33'W
Water Depth: 4009 m
Sediment Thickness: 1200 m
Priority: 2

Proposed Drilling Program: Double hydraulic piston core to refusal; XCB to 450 m.

Objectives: Detailed paleonenvironmental history of the late Neogene, including changes in surface- and deep-water circulation. This site would anchor the northern end of the HPC transect in the region of strong 41,000-Yr. response in the Quaternary SST records. It is an alternate to Site 6 if time constraints develop late in the leg, but it lacks the siliceous record at Site 6.

Heat Flow: Yes. Well Logging: No.

Seismic Data: Navoceano K708 air gun record (see Fig. 10).

Sediment Types:

0-100 m: layered carbonate oozes and glacial marine sediments.

100-450 m: carbonate oozes and marls.

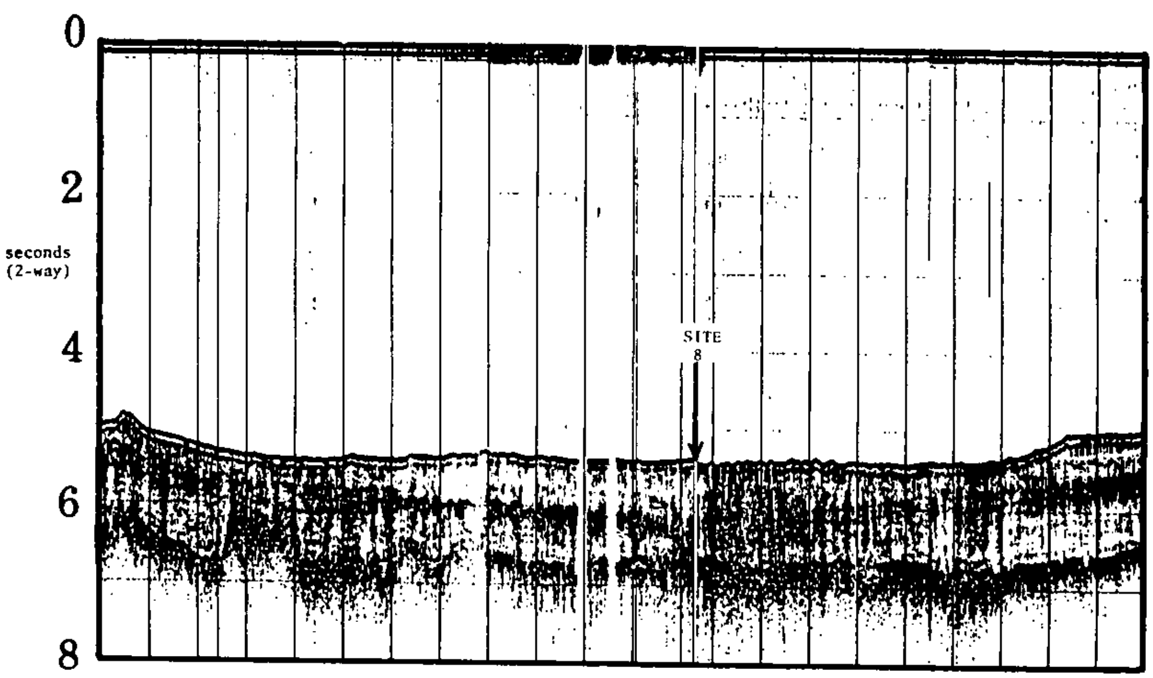


Figure 94-10. Seismic record at Site 8A, Navoceano K708.

DEEP SEA DRILLING PROJECT

INFORMATION HANDLING GROUP

Background

The DSDP data bank is a dynamic library of information. As the Project has expanded so have the areas of responsibility of the DSDP Information Handling Group (IHG). Not only has the volume of data multiplied, but the kinds of data and information handled have also increased. The IHG manages all aspects of routine collection, storage, and retrieval of data, in addition to specialized areas of scientific interest which require computer-assisted technology. The development of tools and technology onboard Glomar CHALLENGER has required development of new software to integrate the resulting data in a harmonious fashion with other DSDP departments, creating programs to enhance their operations with greater efficiency and reliability. We have three primary goals in this work: (1) to preserve the data collected by DSDP operations for future use; (2) to make data readily available to qualified scientists upon request; and (3) to provide advice and assistance by means of computer reduction and display of data to contributors to the Initial Reports.

Data Availability

The DSDP Sample Distribution Policy restricts the release of scientific data gathered aboard GLOMAR CHALLENGER to those immediate members of the respective shipboard scientific party for a 12-month period following completion of the cruise. This policy excludes the Preliminary Report on underway data containing track charts and data indexes; these data have immediate unlimited distribution. DSDP may require reimbursement for expenses if a data request costs more than $50.

Table DSDP-1 summarizes and categorizes the data. With the exception of the seismic data, which are available only on microfilm or hardcopy, all data are stored and are available on magnetic tape and microfilm. Investigators can also obtain copies of the original data (shipboard forms) on microfilm, or they can view them at DSDP headquarters at Scripps Institution of Oceanography or at Lamont-Doherty Geological Observatory.

A major work effort towards updating the data bases for visual core descriptions, smear slide descriptions, and paleontology is in its final stage of completion. We will soon have computer-generated lithological classifications (output from JOIDESSCREEN program) through Leg 75.

The hard rock minor- and major-chemical analyses files continue to be modified and updated as more data is published and coded. The hard rock paleomagnetics data base is now available upon request for those legs specified in Table DSDP-2.

Logging data were collected on selected legs. These data are available on magnetic tape or analog strip charts for Legs 60, 61, 63-65, 67, 68, 70-76 and 78; analog records are only available for Legs 66 and 69; magnetic tapes are available for selected sites from Legs 46, 48, 50 51, 52 and 57.

Data Handling and Retrieval Tools

The special reference files (Sitesummary, Guide, Ageprofile, and Coredepth, see Table DSDP-2) are used independently and in coordination with other files in (a) multi-step searches, and (b) generation of standard files with assigned ages (from Ageprofile) and/or sub-bottom depths (from Coredepth).

The Sitesummary file contains key data for each hole including drilling statistics, site location, age of sediments, presence of basement sediment and hard rock descriptions. The file is continually updated from data reported in DSDP Initial Reports, Hole Summaries, and Initial Core Descriptions.

The Guide (to DSDP cores) also summarizes data published in the Initial Reports (Legs 1-34)[1], but in a different format than in the Sitesummary file. It comprises thirty categories of data which summarize the characteristics of each core. The Guides are available on microfiche and magnetic tape. All of these files can be accessed by DATAWINDOW - DSDP's principal program for the retrieval and display of data.

DATAWINDOW transfers data between tape and disk storage, updates tapes, corrects records, and monitors the tape status within a tape series (storage unit for our data base files). Access is accomplished through

[1]DSDP is no longer encoding for the Guides.

Table DSDP-1.

DEEP SEA DRILLING PROJECT - DATA BASE STATUS
Physical Properties, Quantitative and Analytical Core Data

DATA FILE	LEGS	COMMENTS
Carbon-carbonate (shore lab)	1-79	No data for Legs 46, 72
Grain-size (sand-silt-clay) (shore lab)	1-76	No data for Leg 16. Legs 64 & 65 not yet available.
G.R.A.P.E. (gamma ray attenuation porosity evaluator) (shipboard measurements, processed and edited onshore)	1-87	No data collected on Leg 46. Leg 45 GRAPE is not complete.
Hard Rock Major-Element Chemical Analyses (prime and onshore labs)	13-19, 22-30, 32-39, 41, 42A, 43, 45-46, 49, 51-55, 58-65, 68-70.	No data for Legs: 1-12, 20-21, 31, 40, 42B, 44, 47-48, 50, 56-57. Includes igneous and metamorphic rock and sediment composed of volcanic material.
Hard Rock Minor-Element Chemical Analyses (prime and onshore labs)	13-19, 22-26, 28-34, 36-39, 41-42A, 43, 45-56, 49, 51-55, 58-65, 68-70	No data for Legs: 1-12, 20-21, 27, 35, 40, 42B, 44, 47-48, 50, 56. Same set of data source as major-element file.
Hard Rock Paleomagnetics	14-16, 19, 23, 25-29, 32-34, 37-38, 41-43, 45-46, 49, 51-55, 58-66, 70.	No data for Legs: 1-13, 17-18, 20-22, 24, 30-31, 35-36, 39, 40, 47-48, 50, 56-57.
Sonic Velocity (shipboard, Hamilton Frame)	3-90	Leg 71 not completed.
Water Content (shipboard lab)	1-88	No data for Leg 41
Long-core Spinner Magnetometer Sediment Paleo-magnetics	68, 70-72, 75	From hydraulic piston cores. This is a CLOSED data base due to rust contamination of cores and sediment disturbance.

Table DSDP-1 (continued)

DEEP SEA DRILLING PROJECT - DATA BASE STATUS
Physical Properties, Qualitative and Analytical Core Data

DATA FILE	LEGS	COMMENTS
Discrete Sample Magnetics, sediment	71-73, 75	From hydraulic piston cores.
Alternating Field Demagnetization	72, 73, 79	From hydraulic piston cores.

Lithological and Stratigraphic Core Data

DATA FILE	LEGS	COMMENTS
Paleontology (onshore labs)	1-44, 54-58	From Initial Reports. Includes 10,000 species from 24 bug groups.
SCREEN	1-44	Output from JOIDESSCREEN. Computer-generated lithological classification includes basic composition data, average density, and age of layer.
Smear Slide Descriptions	1-81	Shipboard observations.
Thin Sections	49 only	Legs 37, 45, 46, 51-55, 57-64 keypunched.
Visual Core Descriptions	1-73	Shipboard observations.

independent easily modifiable data dictionaries which the program references in both its interactive and batch modes of operation. Individual requests can easily be constructed using DATAWINDOW's versatile search commands. Through DATAWINDOW, investigators can search the data bases by leg(s), site(s), ocean area(s), and age(s), in addition (or linked) to specific elements stored in each data base.

Areas of Support and Endeavor

The DSDP programming staff continues to provide the engineering group with mathematical and computer support for advanced engineering data collection (shipboard), reduction, and analysis.

Requesting Information or Data

We encourage researchers to use all these extensive data systems described above. Address your requests for information or data to:

Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
(Tel: (619) 452-3526.

(Nancy Freelander, DSDP Information Handling Group, June, 1983).

CORE REPOSITORIES

Samples from DSDP Legs 1-86 are available to investigators for studies which will result in published papers. We encourage investigators who desire samples to obtain a statement of the NSF/DSDP sample distribution policy and a sample request form from the DSDP Curator before submitting requests. (A statement of the sample distribution policy also appears in the Initial Reports and in the Initial Core Descriptions.) We ask that requests for samples be as specific as possible. Requestors should specify the hole, core, section, interval in centimeters measured from the top of each section, and sample volume in cubic centimeters. Refer to the graphic core descriptions in the Initial Reports and/or the Initial Core Descriptions for core details.

Samples for research which will be reported in publications other than the Initial Reports cannot be distributed until one year after the completion of a cruise or two months after publication of the Initial Core Descriptions for the cruise, whichever occurs sooner. Beginning with Leg 76, the Initial Core Descriptions are available only in microfiche. This change in production format does not affect the sample distribution policy.

The DSDP Curator can approve many standard requests in his own office, but requests for material of particularly high interest (e.g., certain hydraulic piston cores, key stratigraphic boundaries) or for large volumes of material must be forwarded by the Curator to the NSF Sample Distribution Panel for review and approval.

Cores form the Atlantic and Antarctic oceans and the Mediterranean and Black seas (Legs 1-4, 10-15, 28, 29, 35-53 71-82, and 93) are at the East Coast Repository at the Lamont-Doherty Geological Observatory. Cores from the Pacific and Indian oceans and the Red Sea (Legs 5-9, 16-27, 30-34, 54-70, and 83-92) are at the West Coast Repository at the Scripps Institution of Oceanography. Due to a lack of core storage space at the West Coast Repository, only the work halves of the cores from Legs 87-92 are racked and accessible to the scientific community. The archive halves are still in their shipping boxes and inaccessible and will remain so until temporary or permanent storage becomes available. The thin sections and smear slides from a particular cruise are stored at the same repository as the cores from that cruise. Photographs of all cores and prime data and publication from all legs are kept at each repository. Frozen samples (collected specifically for organic geochemical analyses), interstitial water samples, and gas samples from all DSDP legs are kept at the West Coast Repository. Interested scientists may view the cores, core photographs, or other associated data at either repository by making arrangements in advance with the Curator. Investigators wishing to visit the West Coast Repository are urged to request appointments well in advance because the repository is currently booked with visitors three to four months ahead.

Please address your questions or sample requests to:

The Curator
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
University of California, San Diego
La Jolla, CA 92093
Tel. (619) 452-3528

(Amy B. Altman, DSDP Assistant Curator).

Table DSDP-2

DEEP SEA DRILLING PROJECT - DATA BASE STATUS
Underway Data

DATA FILE	LEGS	COMMENTS
Bathymetry	7-9, 13-56, 61-80	
	7-9, 12-80	
	3-80	
	1-80	Seismic data available only in hardcopy or microfilm.
Merged format files (MDG77)	1-80	
SPECIAL REFERENCE FILES		
Sitesummary	1-87	Hole oriented. Regularly updated.
DSDP/Guide	1-34	Core oriented. Microfiche or tape.
Ageprofile	1-86	Hole, core, section. From biostratigraphy.
Coredepth	1-91	Hole-core. Primary reference tool.
AIDS TO RESEARCH		
Datawindow		Search & retrieval program, data base maintenance.
Mudpak		Plotting program, handles multiple parameters.
Maps		Topographic maps with DSDP sites.
DASI/Inquiry		DSDP affiliated scientists & institutions searchable.
Keyword Index-Search		Constructed from bibliography & sample request files. Searchable keywords & site numbers.
Sample Records		Point data inventory.
Data Data		Series of informal specific memoranda containing detailed descriptions of procedures and capabilities of the IHG.

JOINT OCEANOGRAPHIC INSTITUTIONS, INC.

REPORT FROM JOI INC.

JOI Site Survey Program

With resolution of NSF's FY 83 funding by Congress, funds are now available to undertake the Peru-Chile Site Survey, previously approved by the Site Survey Planning Committee to JOI. While the original schedule provided for field work to be undertaken in August of 1983, the delay in receiving funds forced cancellation of ship time scheduled by Hawaii Institute of Geophysics (HIG). The anticipated new date is August-September 1984.

The field work portion of the Morocco Site Survey was completed on June 24, 1983. Dennis Hayes was joined by James Austin, University of Texas, aboard the R/V Conrad to direct the work. Phil Rabinowitz had originally been scheduled to share principal investigator responsibilities, but his extensive involvement in the Advanced Ocean Drilling Program planning activities at Texas A & M University forced his withdrawal.

Publication planning of the folio of Atlantic Site Surveys is currently underway, following the preparation of camera-ready copy and illustrations by the DSDP/SIO. Publication should be completed this summer.

Advanced Ocean Drilling Program - FY 84

The Congress has passed and President Reagan has signed the NSF Appropriation Bill which includes start-up funding for AODP.

IPOD SITE SURVEY DATA BANK

The IPOD Site Survey Data Bank at Lamont-Doherty Geological Observatory has recently (February-June 1983) received the following data:

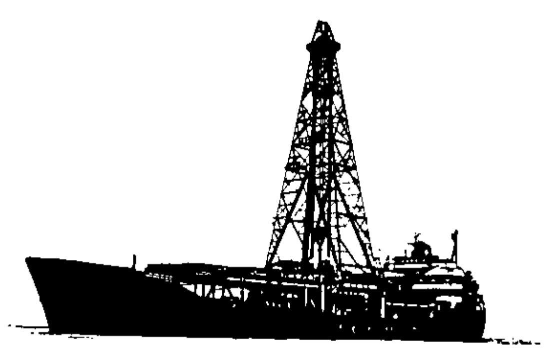
-Geologic maps of the Japan and Okhotsk Seas, the Central Japan Sea, S. Japan Sea and Tsushima Straits, N. Ogasawara Arc, and S. Ogasawara and N. Mariana Arcs, from S. Nagumo, U. of Tokyo.

-Data from Conrad cruise 2312 (IPOD Site Survey, Mississippi Fan, Leg 96). Included are a cruise report, side-scan sonar mosaic (lower fan channel termination survey), bound books of side scan and sub-bottom profiles, single channel digitally recorded and processed watergun seismic profiles and digital tape of navigation merged with underway geophysics, from A. Shor, L-DGO.

-Final cruise report and microfilmed seismic reflection and processed dual channel reflection-records from Ariadne cruise 1 (IPOD Site Survey, Mississippi Fan, Leg 96), from T. Shipley, UTMSI.

-High resolution seismic records from Conrad cruise 2312 (IPOD Site Survey, Mississippi Fan, Leg 96), from S. O'Connell, L-DGO.

-Microfilm of GLORIA side-scan data collected aboard DESV Starella on the continental slope and rise of Western North Atlantic, from U.S.G.S.



FOCUS

LETTER FROM THE PLANNING COMMITTEE CHAIRMAN

The Advanced Ocean Drilling Program (AODP) is moving ahead rapidly. On 30-31 March, the Board of Governors of JOI Inc. selected Texas A & M University as the science operator of the new drilling project and submitted its choice to Dr. Edward Knapp, Director of NSF. The AODP management proposal, the result of the joint efforts of many people at JOI, Texas A & M, L-DGO, USGS, etc., was approved by the JOI Board of Governors on 8 July and mailed to NSF on 15 July . The U.S. Administration has approved the Advanced Ocean Drilling Program, and a request to spend an additional $4.5M on ocean drilling in FY 1983 and $26.3M in FY 1984 is expected to be approved soon by the U.S. Congress. Texas A & M is working on the request for proposal for the AODP drilling ship. As PCOM chairman, I was in Washington, D.C. several times during the past four months to give an opinion on various points of the management proposal and the drillship RFP.

In the meantime, PCOM has finalized the scientific advisory structure of the new drilling program. It includes three "Thematic Panels" (Ocean Lithosphere, Tectonics, and Ocean Sediments and History) to replace the four DSDP "major panels". The old "Regional Working Groups" will be reorganized and upgraded to panels. The "Discipline Panels" will be disbanded but the "Service Panels" are maintained in the new structure. A special panel will be created entitled the "Technological Development Committee". The new panel will be responsible for planning and supervising the development of new drilling equipment and will help JOI and the Science Operator write RFP's leading to development of the required tools and techniques. New mandates for all panels and the Planning Committee have been drafted and will be complete after some input by EXCOM, which will also determine the size of the membership for the panels, and the term of membership for the PCOM. The AODP scientific advisory structure will be submitted for approval to the EXCOM at its 30 August-1 September meeting in Swindon, England.

Finally, at its last meeting in Morpeth, the PCOM established the general ship track for the first 12 months of the new drilling vessel and proposed a tentative schedule based on a starting date of October 1984 (see minutes in this issue of the Journal).

So much for the good news - now the bad news: a 6,220 m long drill string was lost during the drilling of the ENA3 site on Leg 93. As Junior Wheeler, the drilling superintendent of the CHALLENGER would say, "Oh, well! You win some, and you lose some."

REPORT FROM NSF

Office of Scientific Ocean Drilling

Status of AODP

With the strong recommendation from the Scientific Advisory Group of Crustal studies that Scientific Ocean Drilling be continued, the AODP is in its final stages of approval in the Executive and Legislative branches of Government. Funds for continuing DSDP through FY 1983 and for the preparation and planning of the AODP and geophysical site surveys and investigations were recently reprogrammed.

NSF received a proposal from Joint Oceanographic Institutions, Inc. (JOI), to administer the AODP. JOI, Inc. proposes to subcontract out science operations, logging, and site surveys (see report from JOI, Inc., this issue).

Annual IPOD Meeting and Prospective New Members for AODP

The annual IPOD meeting was held in Easton, Maryland on April 21, 1983 with representatives from 11 countries in attendance. In addition to the present IPOD members (United Kingdom, Germany, France and Japan), Canada, Australia and a European consortium group (under the European Science Council) expressed a strong interest in joining as candidate members. Brazil also expressed interest in forming a consortium.

It was announced at the meeting that Jaccques Debyser (France), and Noriyuki Nasu (Japan) are retiring in the near future from active service in IPOD. They have been with IPOD since its beginning and will be deeply missed. Our very best to them in their future endeavors.

Other News

Allen Shinn, Director of OSOD, has left to take on other responsibilities within NSF. Although he is gone, his continued presence at

NSF and his experience and knowledge of OSOD affairs will provide a reservoir of information to the scientific ocean drilling community. M. Grant Gross, Director, Division of Ocean Sciences, has assumed the responsibilities of acting Director of OSOD until OSOD is reorganized into the Ocean Science Division.

Herman Zimmerman from Union College, New York, will be the new program associate assigned to attend the JOIDES Scientific Panel meetings and act as Liaison between NSF and the JOIDES community. Dr. Zimmerman has Been very active in the past, both with the DSDP and NSF. (Peter Borella, Office of Scientific Ocean Drilling, July 12, 1983)

Shipboard Organic Geochemistry Guide/Handbook

Prepared by the JOIDES Advisory Panel on Organic Geochemistry, Berndt R. T. Simoneit, Chairman.

Copies available from:

Science Operations
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3503

RECENT JOIDES PANEL AND COMMITTEE MEETINGS

November 1982	8-9	Sedimentary Petrology and Physical Properties Panel (DSDP)
	10-11	Executive Committee (U of Texas at Austin)
January 1983	5-8	Active Margin Panel (SIO)
	6-7	Information Handling Panel (DSDP)
	10-11	Ocean Crust Panel (SIO)
	20-22	Ocean Paleoenvironment Panel (USC)
	21	Pollution Prevention and Safety Panel (SIO)
	21-22	Site Survey Panel (SIO)
	25-28	Planning Committee (San Francisco)
April 1983	19-20	Executive Committee Meeting (Easton, MD)
June 1983	1-3	Planning Committee (Morpeth, England)

FUTURE JOIDES PANEL AND COMMITTEE MEETINGS

July 1983	27-28	Inorganic Geochemistry Panel (SIO)
August 1983	24-26	Ocean Crust Panel (Halifax, N.S.)
	25-26	Ocean Paleoenvironment Panel (URI)
	30-31	Executive Committee (Swindon, England)
September 1983	13-15	Planning Committee (U of Washington, Seattle)
		Passive Margin Panel (Date and place to be determined)
November 1983	9-10	Executive Committee (Texas A & M)

JOIDES COMMITTEE AND PANEL REPORTS

EXECUTIVE COMMITTEE

Alan Berman, Chairman

Note: Excerpts from the **draft** minutes of the 19-20 April 1983 meeting at Easton, MD appear below. Excerpts from the minutes of the previous EXCOM meeting (10-11 November 1982) follow.

JOI Board of Governors Report

R. Heath, JOI BOG chairman, reported on the 30-31 March 1983 BOG meeting. He reviewed events leading to the establishment of an Advanced Ocean Drilling Program management structure under JOI Inc.

Earlier discussions between NSF and the Office of Science and Technology Policy (OSTP) revealed that OSTP: a) was concerned about the cost of Explorer conversion; b) felt that management of AODP should reside outside of the Foundation; and c) expressed concern that the AODP budget should reflect science priorities within the context of crustal studies.

E. Knapp, Director of NSF, then asked an ad hoc committee chaired by C. Drake to advise NSF in a budgetary context on the role of AODP in crustal studies.

At the January 1982 PCOM meeting, A. Shinn (NSF) informed PCOM that SEDCO had proposed a long-term lease of the SEDCO 472 drilling ship as the AODP drilling platform. The SEDCO platform would cost about the same as the Challenger to operate, but has additional capability including a riser system.

The ad hoc committee reported to the Director that a commercial drilling platform such as the SEDCO 472 was the preferred AODP drilling platform.

On 4 March 1983 JOI sent a letter to the Director of NSF offering to manage the new program. The Director agreed to consider a proposal from JOI as stated in a letter dated 18 March from the Director of NSF to JOI. JOI-BOG met 30-31 March and decided on the following:

Texas A & M - science operator and oversee ship operations.
L-DGO - geophysics data base, including data from drillship; oversee routine logging.
JOI appointed panel - safety reviews.
U. Texas (Institute for Geophysics) - secretariat for US science planning.
WHOI - oversee new instrumentation development
JOI - oversee contracts for shore based analyses, site surveys.
The JOIDES Office would rotate among US members except for the science operator.

Discussion:

The following comments were made during a brief discussion:

- A performance requirement for the drilling vessel is needed soon so that JOIDES can produce an RFP for a drilling platform.

- JOI BOG prefers that JOI remain a "compact" contractual organization with the role of assuring that JOIDES recommendations are implemented.

National Science Foundation Report

A. Shinn reported for the National Science Foundation.

After the November 1982 EXCOM meeting, the Administration made an internal decision not to fund Explorer in FY 1984. The budget submitted by NSF was based on a continuation of Challenger without non-US participation.

$26.3M was requested for "ocean drilling" in FY 1984.

It was assumed that the request would be modified after the ad hoc committee report. The $26.3M request represented about a large increase over the FY 1983 request ($14.0M).

Termination of the Lockheed contract by NSF led to a proposal from SEDCO to provide the drilling platform. The SEDCO information was then presented to the ad hoc committee which endorsed the "3rd" option.

The commercial drillship option was well received at NSF. Concerns at NSF about assuming a management role would be relieved by having JOI administer the project. NSF feels that the AODP ship should be secured under contract as soon as possible; the current favorable lease rates are dependent on the offshore market activity and are thus subject to change at any time. NSF position at this time is that the Foundation is receptive to a proposal from JOI on behalf of the scientific community to run the AODP. It would send such a proposal out for review.

The reprogramming for $4.5M of FY 1983 funds has not yet been approved by OSTP/-OMB. The funds would be used in part for DSDP and for AODP. It is expected that Congress will soon release the funds shortly after the OMB approves the request.

NSF Regorganization

Effective 31 January 1983, the Office of Scientific Ocean Drilling (OSOD) became part of the Astronomical, Atmospheric, Earth and Ocean Sciences (AAEO). OSOD is now a separate administrative unit within AAEO. In a further reorganization expected by early summer, OSOD will probably become a section within the Ocean Sciences Division. Ian Mac-Gregor, formerly with OSOD, is now Deputy Director of the Division of Earth Sciences.

Deep Sea Drilling Project Report

M. Peterson reported for the Deep Sea Drilling Project.

A $365K credit from Global Marine was returned to NSF to cover printing costs for the Initial Reports.

This year's budget is $22.0M which includes added funds for DARPA. At this time DSDP does not have a contract extension to cover the additional drilling time.

Leg 89 (Old Pacific)

At the last meeting, EXCOM was informed that this was a deep reentry site with potential risk to the drill string. EXCOM passed a resolution endorsing the planned drilling and noting that risk was involved in reaching the objectives. On-site measurements of strain and loss of the heave compensator resulted in a decision not to attempt reentry.

Leg 91 (Tonga Trench)

A record 3.7 km of core was recovered. The extended core barrel functioned very well and good quality cores were retrieved. The Eocene/Oligocene boundary on the Lord Howe Rise was penetrated. Abundant ash layers were present and were correlatable between holes. Results will have application to the orogenic history of New Zealand.

Leg 92 (Hydrogeology)

The installation of the DARPA seismometer was successful and a recording package was recovered later.

Leg 93 (ENA-3)

This leg is now underway. Early results look promising. Hole 504B was reentered for seismic, heat flow and pore water studies.

DSDP has developed a fly-in reentry, but this system has not yet been tested.

Plans are to improve the HPC and to increase the reliability of the core orientation device. The new device also records core rotation during shooting. The core barrel has been modified to decrease rotation.

Other developments include a pore pressure monitoring system and a core splitter which is now on board.

A subcontract to develop bare rock drilling capability has produced encouraging design concepts.

The Challenger program will be phased out next November but core curating, printing and related tasks will continue beyond that date.

Discussion:

J. Bowman (UK) - If Challenger is a viable option for the AODP platform, then demobilization will result in a loss of funds if Challenger is to be used again.

J. Debyser (France) - The possibility that Explorer will not be the AODP drilling platform alters France's position on the selection of a drillship. France has assumed that Explorer was to be the platform and was in agreement with that choice. If a third option exists, then France would like the opportunity to compete in the bid process and propose the Pelican as the AODP platform. A metting should be organizaed as soon as possible to discuss the requirements of the AODP ship. France's commitment to the project may depend on open competition for the drillship.

A. Berman - Normal rules of procurement are likely to apply in the selection of the drilling platform. A bidders' list is assembled and a pre-bid conference is held before an RFP is issued.

A. Shinn - The normal rules of procurement may be followed but it would be advantageous to arrange an informal meeting among interested parties to get more information on available ships. The meeting would also help communicate the specifications required to achieve the scientific goals.

J. Debyser- Such a meeting should be held soon so that France can decide on a firm commitment to AODP.

Planning Committee Report

J. Honnorez, Planning Committee chairman, reported. (Excerpts from the minutes of that meeting appear in this issue of the Journal.)

AODP Science Advisory Structure

A preliminary advisory structure and terms of reference have been formulated. An 8-page document describing the advisory structure was sent to a PCOM subcommittee for review, and after review will be sent to all PCOM members. The proposed structure will then be discussed and modified at the next PCOM meeting (1-3 June, U.K.).

(J. Honnorez then briefly described the functions of the science advisory structure and the flow of proposals through the structure.)

The new science advisory structure was designed to eliminate some of the problems identified with the old structure. Existing problems include

a) lack of communication among panels. The new structure has fewer panels with some cross-over of membership.

b) PCOM members involved in proposal review and eventually as co-chief scientists on drilling legs. The new structure would place most of the burden of proposal review outside of PCOM so that PCOM could concentrate more on strategic planning.

c) view of the scientific community that JOIDES is a closed system. COSOD conferences would ensure access to AODP. Proposal flow (Fig. 1) has safeguards so that drilling proposals do not get "lost between the cracks".

Discussion lead to the following consensus:

Although some problems may exist with the current advisory structure, the new structure is not an ideal replacement. The problem of strategic planning has not been adequately addressed. Ad hoc task groups may have too much authority and perhaps should only recommend to PCOM. PCOM should continue discussions on the new advisory structure and present a more refined version to EXCOM.

Member Country Reports

United Kingdom

J. Bowman reported.

UK awareness of DSDP has increased. During the past year UK scientists have participated on several DSDP legs. There has also been a corresponding increase in shore-based research, relating primarily to Leg 80 and 81 results. DSDP results are also being used increasingly in teaching.

The present UK involvement in AODP planning is acceptable from the UK point of view. The Coordinating Committee met only once last year; that meeting resulted in a revised advisory structure for AODP. A concern is the lack of an Industrial Liaison panel in the new advisory structure.

J. Bowman has replaced Sir Peter Kent as the EXCOM representative. Continuation of the UK in AODP is not without some difficulty. A more precise program must be known before funds are released and a definite commitment is made.

France

J. Debyser reported.

Many papers dealing with IPOD marine geology were presented at the annual Geological Society meeting. A bilateral agreement between France and Germany has been concluded relating to submersible diving on the Magasin escarpment. An objective is to add to Leg 79 results.

France has allotted about $1M for laboratory work and cruises relating to DSDP; that is about the same as the previous year. Final discussions are underway for the J.Charcot to circumnavigate the world, probably beginning next January. Surveys for AODP will be part of the cruise. The decision on France's commitment to AODP will be made after the program is more defined (choice of ship, advisory structure, etc.).

Germany

H. Durbaum reported.

A colloquium on DSDP results and samples was held 10 days ago. Interest in the project is high in Germany. Strong support exists in the Science Foundation for continued involvement in the project. About DM 2M has been made available for related proposals.

The Meteor may be terminated at the end of 1984; no decision on a replacement has been made. Future problems may exist for site surveys.

Japan

N. Nasu reported.

Challenger worked in Japanese waters during Leg 87 (Japan Trench and Nankai Trough). New results include well preserved ash layers in basin sediments which are correlatable between holes, and evidence for at least two types of subduction (gravity faults without development of an accretionary wedge vs. smooth subduction, numerous fractures and an accretionary wedge).

The number of Japanese scientists interested in deep ocean drilling is increasing. Although strong support for ocean drilling exists, the Ministry of Finance must be convinced of the value of the program. A 3200 ton displacement research vessel will perform a post-cruise (Leg 87) survey during June/July. A new vessel with multichannel seismic survey capability is planned. The new vessel would be available for surveys outside of Japanese waters.

A. Berman asked observer country representatives for comments.

Canada

M. Keen reported.

Canada has the Memorandum of Understanding, but participation in AODP is still unofficial. The Geological Association of Canada will meet in two weeks and will organize the Canadian planning committee for ocean drilling.

During 1984-85 Canada and France will participate in submersible dives off the Canadian coast. Also a joint study with NOAA on the west shelf may lead to potential AODP sites.

Canada may participate as a candidate member until October 1985, at which time she will become a full member.

After discussion relating to potential AODP member countries, the Executive Committee adopted the following resolution:

The Executive Committee specifically endorses negotiation of suitable memoranda of understanding between the National Science Foundation and appropriate science agencies in Australia, New Zealand, Canada, and interested European countries represented by the European Science Foundation or other appropriate body. The Executive Committee recognizes that the agreements may provide for regular or candidate membership, either singly or in consortium, under the terms approved by the Executive Committee at its meeting on May 21-22, 1983.

Performance Specifications for AODP Platform

(A. Berman added this item to the agenda in response to a request from J. Debyser and other EXCOM members that the AODP drilling platform specifications and selection process be discussed).

Consensus:

It was agreed that tenders should be sought from ship operators based on scientific specifications drawn from the COSOD report. The specifications should include a riser facility. It was further agreed that the scientific specifications should be drawn up by the following subcommittee, to report by 1 June 1983:

J. Baker (Chairman)
J. Steele
A. Laughton (or T. Francis)
J. Honnorez
with S. Gartner as the Texas A&M observer

It was confirmed that JOI would arrange a bidders conference as soon as possible thereafter.

JOI Board of Governors Selection of a Science Operator for AODP non-US Participation

(A. Berman distributed copies of a cablegram from J. Aubouin, chairman of the French Scientific IPOD Committee, questioning the selection of a science operator without the consultation of JOIDES.)

J. Debyser (France) - The recent selection of a science operator by JOI-BOG should be viewed in a historical context. France joined IPOD when a science operator (SIO) had already been selected by the US, and France then participated in important decisions through the science advisory structure. As a JOIDES member, France expects to participate in all important decisions. The recent selection of a science operator was made without input from non-US members, therefore they cannot be considered full members. The operating structure is as important to the success of AODP as is the science advisory structure. The international character of the project is in question.

France is concerned because of its interest in the selection of a drilling platform. It is also concerned about the selection of a new science operator because of the need for an experienced institution to assemble the new project within a relatively short time frame.

J. Bowman (UK) - The United Kingdom and other non-US members enter the project through arrangements with NSF. The Foundation has a good reputation in running large science projects. It is important for UK funding agencies to deal with a reputable organization such as NSF. Although the selection of a science operator is considered to be a US matter, the UK considers peer review as an important part of any selection process. Therefore the relationship between JOI and NSF will be monitored by the UK. The UK does not wish to get involved in US decisions and will accept those decisions if safeguards (such as peer review) are part of the decision process.

N. Nasu (Japan) - Japan shares the concerns expressed by the French representative. Japan is not a member of JOI and therefore was not able to participate in the selection of a science operator. Japan had confidence in the program under SIO and would like to know the reasons for the change of science operator from SIO to Texas A & M.

H. Durbaum (FRG) - The concerns of the role of JOI in the project were expressed at the Kyoto, Japan EXCOM meeting (1-2 September 1982). Germany was satisfied with SIO and sees potential difficulty in a new science operator organizing AODP in a short time frame. The decision, however, is considered to be US concern and need not involve Germany.

R. Heath (JOI-BOG chairman) - The participation of non-US members in the project is the same as in the past. The relationship between NSF and the non-US partners assumes an oversight róle of NSF. Drilling proposals are subject to peer review by NSF.

JOI-BOG's unilateral decision to designate a science operator was based in part on political considerations; there was some concern that the future of deep sea drilling was in jeopardy. No prior constraints existed on the selection of an institution as science operator. The decision was made on the basis of what was best for the project.

J. Debyser - EXCOM has in the past discussed the possibility of forming a "JOI - International". JOI was presented as a contractual entity for US institutions. Some assurance must be given non-US members that they will be included in important future decisions.

A. Shinn (NSF) - The new NSF director (Dr. E. Knapp) and the Administration represent a new philosophy on the management of large programs: that NSF should be responsive to the scientific community (NSF should receive proposals generated by the community); NSF should not develop proposals.

The position of NSF is that JOI represents the scientific community, even though JOI represents only US institutions. The management of the program is national, as NSF is the majority partner. Science aspects of the program, however, are international. Thus, scientific proposals can get non-US peer review.

NSF has no political constraints on participation in the management structure; all institutions are equally eligible.

<u>**Consensus:**</u>

EXCOM reflected its concern that all members should participate in AODP decisions in the following motion:

Whereas the proposed Advanced Ocean Drilling Program has been designated as an international project with non-US participant organizations contributing scientifically and financially in a significant way, and whereas the Director of NSF has indicated his willingness to consider a proposal from JOI Inc. for the scientific management of the AODP:

EXCOM requests that the general principle of peer review by NSF be applied to the proposal which JOI Inc. is expected to submit. To ensure the full participation of the non-US partners in the project, EXCOM requests that the peer review process specifically include non-US representatives of the IPOD community.

Report from the AODP Science Operator

W. Merrell (Texas A & M) reported.

W. Rabinowitz is acting project leader and S. Gartner is acting chief scientist. They have been relieved of all research duties and have already started writing the AODP proposal.

A new building for housing the AODP office and core storage facilities is now being designed.

The project will be administered through the Texas A & M Research Foundation and the Texas Engineering Experiment Station.

Immediate tasks are to write the proposal this summer and to have an RFP for the drill platform in June. The estimated time table is: responses to the RFP will require 1.5 months, approval by September, vessel contracted by December 1983, and start drilling in October 1984.

Consensus:

Texas A & M should compile a preliminary progress schedule, distribute the schedule to EXCOM members, and inform EXCOM upon completion of each major task leading to realization of AODP drilling.

Resolution:

The JOIDES Office will rotate biannually among participating US institutions except for the science operator. The JOIDES Office will be responsible for the JOIDES Journal. JOI Inc. will provide logistical support and travel arrangements.

Ocean/Continental Drilling Program

J. Honnorez reported that at the 25-28 January 1983 PCOM meeting in San Francisco, the exchange of liaison members with continental drilling committees was discussed. PCOM felt that such exchange/coordination already existed in non-US member countries, and that coordination between ocean and continental drilling should be promoted. J. Hays (NSF director for Earth Sciences) suggested to J. Honnorez that more coordination would be viewed favorably at NSF. Honnorez will meet with R. Andrews of the National Academy of Sciences later this week to try to arrange for the exchange of liaison members on the pertinent US panels.

EXECUTIVE COMMITTEE

Alan Berman, Chairman

The Executive Committee met 10-11 November 1982 at the University of Texas at Austin.

National Science Foundation Report

FY 1983 Budget

Administration request to Congress:
$14.0M CHALLENGER
0 EXPLORER ($9M for EXPLORER within other portions of NSF budget)

House action:
$12.0M CHALLENGER
11.0M EXPLORER

Senate action:
$14.0M CHALLENGER
0 EXPLORER

House/Senate compromise
$12.0M CHALLENGER
0 EXPLORER

Following the House/Senate compromise, the administration requested reprogramming of funds to continue the contract with Lockheed Missiles & Space Co. Congress approved $2.0M for CHALLENGER and $2.50 for EXPLORER (Lockheed contract).

FY 1984 Budget

The Administration's decision on the FY 1984 budget will be made within the next few weeks.

Discussion:

The EXCOM discussed the consequences of distributing $9M for EXPLORER to other NSF Directorates. Representative comments follow.

Part of the scientific community is under the impression that support for deep sea drilling is consuming other (non-drilling) NSF funds.

A problem of perception regarding drilling funds exists in some NSF Directorates, for example Biological and Behavioral Sciences (BBS). The total NSF budget had a 9% increase; Ocean Sciences had a 7% increase, but if the $3M for EXPLORER is removed, then the Ocean Science increase is only 3%. Part of the problem is that the 3% increase is not sufficient to maintain the programs and therefore the community as a whole is affected.

Although $3M was spread among 4 Directorates, there is a fear that the entire amount will be drawn from the Ocean Science budget.

A need exists for better information about the ocean drilling project. Earth scientists at NSF should be made aware of spin-off funds for site surveys, syntheses, research grants, etc.

Better "public relations" between the ocean drilling project and the community is needed.

Versailles Working Group Meeting

The Versailles Meeting took place in Paris on 24 October 1982. Attendees were senior science officers of several western European nations, Canada and the United States. At that conference the US presented only one proposal - for deep sea drilling. A neutral position on the choice of ship (CHALLENGER or EXPLORER) was maintained. All other countries expressed an interest in the proposal, indicating that it will be included on the final list of science proposals.

DARPA Leg 88

A. Shinn commented that the DARPA portion of Leg 88 did not achieve its goals. More time in the NW Pacific was requested by DARPA, but then a decision was made to request a new leg. The new leg (91) will be paid for by DARPA. There will be no time or cost impact on the remaining program. DARPA will also pay for equipment lost of Leg 88.

EXPLORER Ice Capabilities

EXPLORER will not be an ice-breaking ship but could be modified to meet ABS ice class "C" standards. This may not be worth doing as the increase in capability is not great. It is difficult to determine what type of ice conditions EXPLORER can be exposed to.

Naval architectural firms and Eaton Industries will review the design to ensure that all specifications are met.

Deep Sea Drilling Project

M. Peterson reported for DSDP.

Leg 88 (DARPA)

The Marine Seismic System (MSS) was not deployed, although the HIG was installed. Weather was a problem and so were drilling conditions. Chert was encountered at the bottom of the hole so the casing required for the MSS was unable to be set.

Between 20 September and 6 October CHALLENGER was in drydock, out for sea trials, back in port, then out to sea again. Extensive service was performed during the yard period. The stern and bow thrusters were serviced; DC generator 9B was rebuilt, failed during sea trials, had the bearings replaced, then failed again. A generator has been reassigned, but at present no back-up exists. Other work involved the crown block, traveling block, derrick, and the rebuilding of cranes. CHALLENGER also took on fuel and new drill pipe.

Usable pipe now on CHALLENGER is 36,520 ft. Pipe on board includes 562 new joints, 445 premium grade joints and 165 joints showing some shoulder damage and in need of reworking.

Leg 89 (Old Pacific)

This leg was under operational constraints and did not include reentry. Weather was good but not good enough to reach all objectives.

At site 585 the core barrel jammed in the first hole at 741 m. During further drilling to 900 m the bit failed. The 9 sec reflector was reached which consisted of volcanic clastics and some carbonate debris. Logging was not possible because of bad weather. A good set of cores was recovered including about 20 m of oil shales representing the Cenomanian/Turonian anoxic event.

Leg 91 (Tonga Trench)

NSF and DARPA are in the final stages of negotiating an agreement on the new DARPA leg. Bill Menard and Jim Natland will be the co-chief scientists. The Tonga Trench is a better site to achieve the DARPA objectives.

DSDP Program Plan

A $22.2M Program Plan budget has been resubmitted and is under review by NSF. A supplemental request for $575K has also been submitted to NSF to back up operations and replace losses (logging tools, casings, etc.). At present an adequate supply (4) reentry cones are on board.

Planning Committee Report

J. Honnorez (PCOM Chairman) reported on the 6-8 October Planning Committee meeting. (The minutes of that meeting appear in the February 1983 issue of the JOIDES Journal.)

Member Country Reports

France

J. Debyser reported. No new information. France has a positive attitude toward the new drilling program but is waiting for an NSF decision in January.

United Kingdom

A. Mayer reported. The coordinating Committee of the U.K. has met to review the general science situation; the results of the Versailles Conference will influence the direction of future research.

The Research Council budget has been reviewed. Concern exists about the future of AODP.

Federal Republic of Germany

H. Durbaum reported. A report will be made during the next meeting. The recent change in government in Germany may lead to changes in science policy. The retirement of the head of the "Science Foundation" at the end of this year will mean the loss of a strong supporter of the ocean drilling program.

Canada

M. Keen reported. The draft Memorandum of Understanding between Canada and NSF is under review. Participation in AODP should result in more Canadian support for marine geology in general. Important issues include continental/marine geology relationships, the Law of the Sea treaty, defining the shelf edge, and offshore hydrocarbon deposits.

Discussion:

J. Honnorez informed EXCOM that a letter had been received from Australian science authorities requesting permission to send a observer to the PCOM meetings, and that JOIDES has sent an invitation and copies of past meeting minutes.

A. Berman asked A. Shinn if it would be appropriate to invite observers to EXCOM meetings; Shinn replied that observers should be invited.

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A. Shinn - The potential Eurc as a consortium lacks one person who woulSF is willing to organize the interest of indivbasic countries into a unified program. J. Honn suggested that NSF contact Kurt Bostı head of the Swedish NSF. A Mayer suggeolve that the "European Science Foudnation" aling coordinating body, but added that the EShinn interested mainly in the coordination of ba be science.,

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M. Keen - It may be possible to involnn Lesser Developed Countries in the drillii program through the US-AID program. A shir remarked that such involvement would not b favored by the Administration. J. Debyser fel that involving LDC's at this time would caus too many problems in planning AODP. A. Shinn agreed.

Advanced Ocean Drilling Program - Advisory Structure

An issue paper on the AODP management structure by A. Mayer (UK), J. Debyser (France) and H. Durbaum (FRG) was distributed to the EXCOM for discussion. The issue paper resulted from a recent meeting of European IPOD members.

At the request of A. Berman, EXCOM chairman, the concerns of the European members and the resulting document were summarized by A. Mayer as follows:

-the proposed new advisory structure was formulated without constraints of the existing advisory strucutre.

-a prime consideration in the new structure is that the scientific community drives the drilling project.

-an AODP "Council" would be created, where each funding agency would have direct communication with NSF.

-the Planning Committee would be the main scientific management committee directing the project; the strengthened role of the PCOM may require frequent meetings (4 meetings/yr?).

-concern over the present roles of the Executive and Planning Committees resulted in changes whereby the Planning Committee would assume more of an EXCOM function in scientific matters, and the EXCOM would be more concerned with long-term strategy and be called the "Strategy Committee"

-a "Science Advisory Contractor" is required to service the advisory committees, and a JOIDES Office in support of the Planning committee chairman is also needed. Three possibilities are: 1) the science operator can be contracted for this function; 2) contract a separate institution; 3) a rotating contract to a US JOIDES institution for both the JOIDES Office and the science advisory function. (This option is preferred.)

-venues of meeting, although a detail, are considered to be important. Meetings should be held at the JOIDES Office or occasionally in Wahsington, DC.

-each member country will cover the travel costs of its representative to the meetings.

Discussion:

The issue paper was discussed at length by the Executive Committee. The following items identify the primary changes to the proposed AODP management structure. In general the changes reflect a consensus at the time discussion terminated, although not all members were in agreement on particular issues.

Consensus:

1. The AODP Council will be made up of representatives of NSF and non-US funding agencies. The Council will concern itself with funding agency problems and political and administrative management problems.

2. The Executive Committee, primarily composed of heads of institutions, will remain in the structure with some modification of its role. It will oversee PCOM decisions and will be concerned primarily with matters of management and program policy. EXCOM will not concern itself with short term science decisions and other matters in the realm of PCOM.

3. The Planning Committee will be responsible for science decisions and will drive the drilling project through the Science Operator; it will also provide scientific expertise on matters of ocean drilling to teh NSF. The Planning Committee will be more independent from EXCOM in science matters than in the previous management structure.

4. The National Science Foundnation, as owner of the drilling platform, will have direct communication with the ship operator on matters relating to the material condition of the ship.

5. JOI will remain within the AODP management structure to satisfy contractual, liability and other legal requirements of US institutions, and to provide the contractual channel for support of JOIDES.

6. The practice of holding JOIDES meetings within non-US member countries will be maintained.

PLANNING COMMITTEE

J. Honnorez, Chairman

Note: Excerpts from the **draft** minutes of the 1-3 June 1983 meeting at Morpeth, England appear below. Excerpts from the minutes of the previous PCOM meeting (25-28 January 1983) follow.

Deep Sea Drilling Project Report

Y. Lancelot reported that he was informed the previous evening of the loss of the drill string which parted at the Kelly cock sub immediately below the Power sub. About 6220 m of premium grade pipe were lost; 550 m of premium grade pipe remain on board CHALL ENGER and 3100 m of grade 2 pipe are available in Houston. The remaining drilling program can be completed using the grade 2 pipe at the bottom of the drill string. A reevaluation of drilling targets is now in progress and will lead to revised objectives for Leg 93. CHALLENGER is due in port 18 June, so time is available to drill two of the New Jersey Transect holes.

Leg 93

ENA-3 was reentered and drilled to 1576 m penetration. Early in the drilling, the bit became stuck in the hole and the core and casing were abandoned. Drilling was started again using the last cone on board and 500 m of casing. Some heaving clays sensitive to fresh water were encountered.

Discussion

A brief discussion revealed that the Planning Committee was in unanimous agreement that CHALLENGER should drill the high priority New Jersey Transect sites.

Leg 91 (Tonga Trench)

Drilling in 6500 m water depth to emplace the MSS system penetrated 40-50 m into basement. About 20 m of overlying sediment was encountered indicating about a 1.5 m/my sedimentation rate. The upper 30-40 m of sediment are pelagic clays and the lower sediments contain some chert. Basement is basalt, andesitic at the surface and foliated below, with an interesting relationship between hydrothermal alteration and fractures.

The DARPA seismic experiment was successful. The MSS was emplaced 124 m below the sea floor, 50 m into the basalt. The instrument was not clamped in the hole. Ambient noise (from the ship) was low. A series of good reference profiles were obtained with assistance from MELVILLE. Sixty-four natural seismic events were recorded in 72 hrs (real time). Most events are thought to be associated with the Tonga and Kermadec trenches, and some events with other sites. Communication among DARPA, DSDP and other groups during the cruise followed DSDP procedures.

Leg 92 (Hydrogeology)

Nineteen holes at 6 sites were cored using the variable length HPC and the extended core barrel system. Downhole experiments (no coring) were performed in 3 holes. Holes 600, 601 and 602 have less sediment cover than expected (0-25 m of nanno-ooze and red clay) which resulted in some difficulty. The interstitial pore water study was successful but did not conclusively demonstrate advection. Heat flow studies indicate moderate heat flow rates at most sites. At site 597 calipers were used to determine placement of the packer; two runs of the borehole televiewer were made. A temperature probe of the upper 100 m of basement at Hole 504B revealed that the downhole flow measured during Leg 83 (25 m/hr) has slowed to 2-3 m/hr.

Leg 94 (NE Atlantic Paleo)

The leg will consist of 5 or 6 sites. All sites have been reviewed for safety and approved. Staffing is complete; co-chief scientists are R. Kidd and W. Ruddiman.

Leg 95 (NJ Transect/Log ENA3)

All sites have been approved. Co-chief scientists are W. Poag and A. Watts.

Leg 96 (Mississippi Fan)

Leg 96 consists of two half-legs and will begin in Fort Lauderdale, FL and terminate in Galveston, TX. Co-chief scientists are A. Bouma and J. Coleman. Some scientific staff will change after the first half-leg. The leg will be staffed by academic scientists from several institutions as well as with oil industry personnel.

Sites in the upper fan have not yet been approved. Drilling will begin in the lower fan and it is anticipated that the mid fan, upper fan and Orca Basin may pose some safety problems. Guidelines for drilling in the gas areas are now being prepared by L. Garrison (Safety Panel) and G. Claypool (DSDP).

Presentation - Leg 96

W. Bryant (Texas A & M) then discussed the drilling objectives and used a series of ilustrations to acquaint the PCOM with the general structure and morphology of the Mississippi Fan. The area has been surveyed using GLORIA and SEAMARK and much multichannel seismic data are available.

Discussion

The following concerns were raised by the PCOM during a brief discussion:

- all the drill sites are related to the lobe channel; other fan structures appear to be neglected.

- the ability of the HPC to core sand is unknown.

- safety considerations may result in cancellation of some of the sites.

Consensus:

More drill sites should be identified. Some sites should be located away from the main channel.

(J. Honnorez, PCOM chairman, will inform the Leg 96 proponents of PCOM's recommendations.)

National Science Foundation Report

S. Toye reported for the Foundation and distributed a letter from A. Shinn (then Director, NSF Office for Scientific Ocean Drilling) informing EXCOM and PCOM that the Administration has approved the Advanced Ocean Drilling Program (AODP). A request to spend an additional \$4.5M on ocean drilling in FY 1983 and \$26.3M in FY 1984 is pending in Congress and is expected to be approved without difficulty.

Immediate budgetary problems are the following:

a) The FY 1983 budget is on hold resulting in a \$2M shortfall for DSDP and no funds for AODP planning. The \$4.5M request for FY 1983 will provide \$2.5M for AODP and \$2.0M for DSDP; thus FY 1983 will be completed without curtailment of any programs. About \$0.5M will also be made available from cancellation of EXPLORER engineering contracts.

b) The FY 1984 budget will be considered this summer. The original \$26.3M request has been reduced to \$11.0 by the House of Representatives; the Senate will introduce a bill this week to increase the amount to the original request of \$26.3M, then meet in conference with the House to determine the final amount. It is expected that the project will receive \$26.3M from the NSF request, \$2.0M from DARPA and \$1.2M from the IPOD countries.

S. Toye then presented FY 1984 and future budgets breakdown shown below (dollars in millions).

	1984	1985 & Beyond
Challenger Ops	\$ 3.7	\$ 0
New Ship Ops	3.1	21.8
DSDP Science	3.4	0
AODP Science	3.5	7.2
Total "Program Costs"	\$13.7	\$29.0
U.S. Science Program	5.2	7.0
Design & Construction	10.6	0
Total	\$29.5	\$36.0

IPOD Meeting (S. Toye continued)

The 8th annual IPOD meeting was held in Easton, MD after the 19-20 April Executive Committee meeting. It was attended by observers from potential member countries. Australia and New Zealand, however, did not attend. Many European countries are faced with the problem of insufficient funds and an insufficient number of scientists to support the program. JOIDES would consider a consortium of several countries, but only one class of memberhsip. At present Canada is the most likely candidate for membership; negotiations are in the final stages.

The Memoranda of Understanding (MOUs) for AODP reflect the following considerations:

- regular or candidate membership during the interim period
- a long term commitment in principle (10 yrs) to the project
- participation in the scientific planning through JOIDES
- financial arrangements
- the AODP council will replace the IPOD council
- participation levels

The financial terms covered by the MOU include:

- "Program Costs"
- Planning Year: \$200K per member
- Operational Years: \$2.5 Million in FY 1985 (Annual adjustment in proportion to drilling costs)
- Termination Clause: One year's notice.
- Participant travel and support paid by each country.

JOIDES will be responsible for science planning and direction. Each member will be represented in the JOIDES advisory structure. The budget will be determined by NSF with advice from JOIDES. The program will be managed by the science operator. The AODP council will provide consultative advice on financial and administrative matters.

Executive Committee Report

J. Honnorez reported on the last EXCOM meeting, 19-20 April 1983, in Easton, MD. (Items from the draft minutes of that meeting are included in this issue of the Journal and will not be repeated here.)

Discussion

J. Aubouin (France) - Selection of the science operator was an important decision which was made without participation of the non-US members. It is an improvement that the AODP proposal to NSF will involve non-US review.

J. Cann (UK) - The UK recognizes that some decisions must be within the US. The US should recognize, however, that exclusion of non-US members may cause problems for those members.

J. Clotworthy (JOI) - A tentative schedule of events leading to submission of the AODP proposal to NSF is as follows:

3 May - The EXCOM subcommittee to determine the AODP drilling platform specifications met at the JOI offices in Washington, DC. (A preliminary report of that meeting was distributed by Clotworthy.)

18 May - JOI hosted a meeting of AODP participating organizations to define the AODP proposal. Participants included J. Honnorez (JOIDES), S. Gartner, P. Rabinowitz and W. Merrell (Science Operator), and R. Anderson (logging).

20 May - A preliminary proposal describing the AODP management structure was sent to NSF.

8 July - JOI-BOG will meet to review the proposal.

K. Crook (Australia) - Australia as a full member would expect to contribute fully to AODP (for example, could do some logging); therefore, the proposal should be as open as possible.

D. Heinrichs (NSF) - The proposal submitted by JOI will be reviewed and suggestions for changes will be considered.

S. Toye (NSF) - The focus of review will be on institutional structures and suggestions for improvement will be welcomed.

R. Moberly - PCOM has made a recommendation that logging be contracted to a commercial logger. How does the JOIDES advice enter the JOI structure? (J. Honnorez then distributed a letter to the PCOM from R. Anderson (L-DGO) providing plans for AODP logging services).

Discussion shifted to AODP core repository and curation:

J. Honnorez - PCOM must decide if the present procedures for core storage and curation are adequate. He then appointed a subcommittee consisting of R. Moberly, J. Aubouin, J. Creager and H. Schrader. The following motion resulted:

1. The existing sample distribution policy should be adopted without substantial change.

2. One core curator should be in charge, regardless of the number of repositories.

3. One core repository having a convenient location should house all existing and future cores.

4. Initial Core Descriptions should be reinstated.

5. HPC cores should be routinely x-radiographed and videotaped.

6. Sample distribution should be accomplished within 2 months of receipt of request.

D. Heinrichs - It is the intent of NSF to ensure that the cores will be cared for now and in the future.

J. Honnorez read a letter from M. Peterson (DSDP) informing PCOM of recent upgrading of core storage facilities and curating at SIO. The letter is attached as Appendix H.

E. Winterer - SIO_2 has made an offer to JOI to construct 6000 ft^2 of core storage facility for Pacific cores. The offer was rejected by JOI.

AODP Science Operator

S. Gartner (Texas A & M), acting AODP chief scientist, reported on the science operator status.

Texas A & M was designated the science operator by the JOI Board of Governors under the following conditions:

1. Three or four faculty positions funded by the University will be dedicated to AODP.

2. Facilities for core storage, associated laboratories and offices will be constructed.

3. Costs during the transition will be covered.

4. The Science Operator services will be provided at an overhead rate at least as favorable to NSF as the DSDP/SIO overhead rate.

The conditions were approved by the Board of Regents of Texas A & M University. P. Rabinowitz is acting project director, S. Gartner is acting chief scientist, and W. Merrell is Principal Investigator.

The RFP for ship operator is being assembled by Doty Associates, a consulting engineering firm with EXPLORER experience. A first draft of the RFP has been completed. It is expected that the ship will be selected by November 1983.

A proposal evaluation team has been assembled. The team will review the RFP, then review the proposals in response to the RFP. The best proposals will be selected and the selected responders will then be asked to submit a "best and final" offer.

Discussion:

H. Schrader - Who are the review team members? S. Gartner - They will remain anonymous at this time in order to preserve their impartiality.

J. Honnorez - How will the science operator organization differ from DSDP? S. Gartner - It will be similar. A difference is that the "service functions" (accounting, etc.) will be handled by Research Foundation personnel attached to the project.

J. Honnorez - What will be the duration of each leg? S. Gartner -Following the specifications set forth in the subcommittee report (Appendix E), each leg will be 56-65 days long.

S. Gartner (Texas A & M) raised the issue of having a 35-40 ft. launch on the drilling vessel which could be useful in seismic, geophysical and other experiments. PCOM discussed the matter and considered past use of a launch aboard CHALLENGER, safety factors, potential use, maintenance, etc., and arrived at the following consensus:

Consensus:

The AODP vessel should not be equipped with a conventional launch, but should carry a large inflatable (Zodiac-type) craft.

Potential AODP Member Country Reports

Australia (K. Crook reported).

The AODP membership for Australia is hopeful but not certain. A letter from the Ministry of Science on 26 January informed COGS that a decision was reached not to seek funding for AODP membership. A recent change in government, however, resulted in a public platform which included a statement to "support geoscience, especially ocean science."

Canada (B. Bornholt reported).

Final negotiations on the MOU between NSF and the Canadian Bureau of Engergy and Mines will occur next week. The Canadian Geoscience Committee has been asked to set up an advisory structure for participation in AODP. M. Keen is acting chairman. A planning document is expected by October. Full membership at $2.5M will be difficult and Canada may consider a consortium.

Discussion

J. Honnorez - The EXCOM resolution endorses negotiations for New Zealand participation in AODP. PCOM may wish to invite N.Z. to attend JOIDES meetings. The following motion resulted:

PCOM moves that New Zealand and other potential members be invited to participate as observers in JOIDES meetings.

Advanced Ocean Drilling Program: First Year

J. Honnorez reminded PCOM that:

- October 1984 is the scheduled start date for AODP, although January 1985 appears more realistic.

- The first year ship track and targets should be decided now. Six legs of 60 days duration should be planned.

- PCOM may decide on either an east coast or west coast start.

- All potential AODP drilling platforms can transit the Panama Canal.

The Planning Committee then considered the drilling targets derived from previous planning (see p. 63, Oct. 1982 JOIDES Journal, and p. 37 Draft Minutes, 25-28 January PCOM meeting); Juan de Fuca was added to the previous list.

Consensus:

The Gulf of Mexico and the Bahamas should be the first two legs of the AODP, the Yucatan Basin may be included as part of the Gulf of Mexico leg if permission is obtained from Mexico and Cuba. Barbados will be the third leg.

Consensus:

Proceed to the North Atlantic after Barbados. Postpone drilling the Weddell Sea until January 1987. After N. Atlantic drilling, proceed to the eastern Pacific.

Table A.

SHIP TRACK 1984-1987

1984	Oct	Gulf of Mexico	1985	Dec	Mediterranean Sea (or
	Nov	"	1986	Jan	Equa. Fracture Zone, Amazon Fan)
	Dec	Bahamas		Feb	NW Africa
1985	Jan	"		Mar	"
	Feb	Barbados (T)		Apr	Costa Rica/Venezuela
	Mar	"		May	/Colombia (T)
	Apr	Mid Atl. Ridge (T+)		Jun	Hole 504B
	May	"		Jul	"
	Jun	Labrador Sea		Aug	Peru Trench (T)
	Jul	"		Sep	"
	Aug	Norwegian Sea		Oct	Chile (triple junction)
	Sep	"		Nov	"
	Oct	Mediterannean Sea		Dec	Weddell Sea
	Nov	"	1987	Jan	"

Note: First 6 legs are definite. First 18 months require consideration.

(T = technically difficult)

The Planning Committee then adopted the following motions, based on Table A.

The PCOM adopts the ship route indicated in Table A, which shows a Gulf of Mexico start, a clockwise transit of the North Atlantic, the Mediterranean Sea, passage throug the Panama Canal, and a southward transit along the west coast of South America to the Weddell Sea.

The PCOM adopts the first six legs of Table A as a basis for planning the first year of the AODP, assuming an October 1984 start.

The list of targets between the Norwegian Sea and the Weddell Sea of Table A and a bare-rock East Pacific Rise target are the areas for which site surveys will be required in the near future.

Prioritization of Site Surveys/Syntheses

The Planning Committee briefly reviewed the site survey requirements of the drilling targets listed in Table A.

Summary of Site survey requirements

Surveys are needed for the following priority areas:

Gulf of Mexico	Chile Triple Junction
Mid Atlantic Ridge	(?) Bahamas
Labrador Sea	(?) Eq. Fracture Zone
Costa Rica	(?) Venezuela Basin

(?) Mediterranean

PLANNING COMMITTEE

J. Honnorez, Chairman

(Note: The following items are from the minutes of the 25-28 January 1983 Planning Committee Meeting in San Francisco. That meeting was attended by the chairpersons of the JOIDES advisory panels; summaries of their reports are included.)

National Science Foundation Report

A. Shinn (NSF) reported for the Foundation.

The NSF Office of Scientific Ocean Dril-Drilling (OSOD), until recently a part of the Office of the Director, has been reorganized and is again part of Astronomical, Atmospheric, Earth and Ocean Sciences (AAEO). Francis Johnson, the current Assistant Director for AAEO, will soon assume a university position. No successor has been named.

A. Knapp, recently appointed Director of NSF, supports the ocean drilling program without bias toward a particular drilling platform (CHALLENGER, EXPLORER or other). He assumed the directorship in Nov. 1982 and was asked by the U. S. Government Office of Management and Budget (OMB) to make recommendations regarding the FY 1984 budget. After briefing on ocean drilling by OSOD, Dr. Knapp requested additional information through an ad hoc committee. The committee will examine crustal drilling within the scope of reasonable cost and budgetary constraints. The committee will meet 3-4 February 1983, and present their finding to the Director by April. The membership of the committee is as follows:

Dr. Charles L. Drake, Chairman (Dartmouth College)
Dr. Donald L. Anderson (California Institute of Technology)
Dr. Kevin C. Burke (SUNY at Albany)
Dr. William R. Dickinson (University of Arizona)
Dr. John Hower (University of Illinois, Urbana)
Dr. John Imbrie (Brown University)
Dr. John A. Knauss (University of Rhode Island)
Dr. Jack E. Oliver (Cornell University)
Dr. Cecil B. Raleigh (Lamont-Doherty Geological Observatory)
Dr. Francis G. Stehli (Case Western Reserve University)
Dr. Derek Spencer (Woods Hole Oceanographic Institute)
Mr. W. Edward Bingman (Shell Oil Company, Houston)
Dr. Eugene Seibold (Deutsche Forschungsgemeinschaft)
Dr. Robert H. Rutford (University of Texas, Dallas)
Dr. Myron K. Horn (Cities Service Co., Tulsa)

Many members of the committee have been associated with drilling. Their recommendations and priorities will be considered to be representative of the scientific community as a whole. The establishment of priorities with broad support from the community is required to avoid political problems which may be associated with long-term expensive programs.

Rumors now circulating concerning the unavailability of EXPLORER are unfounded.

FY 1983 budget problem:

Possible cuts in the drilling program result from a \$2M shortfall in income. The National Science Board has approved spending up to \$27.0M. The minimum budget is considered to be \$25.2M.

\$25.2M = Budget
\$22.2M Scripps/DSDP
2.5M JOI
0.5M NSF (printing)
\$25.5M Minimum Budget

\$23.2M = Income
\$14.0M NSF appropriation
8.0M NSF/IPOD funds
1.2M Carry over, other agency
\$23.3M Available Funds

As a result of the shortfall, NSF has requested program cuts: \$0.25M from JOI (AODP planning); \$1.1M (Peru-Chile survey, decision deferred until June 1983); \$0.75M DSDP. Scripps planned to terminate the Schlumberger logging contract for a savings of \$0.6M but NSF did not favor termination of the logging contract. NSF prefers to postpone printing of some or all Initial Reports until October, resulting in a savings of up to \$0.4M. Scripps would thus have to make cuts for \$0.35M (\$0.75M - \$0.4M). The proposed cuts will be discussed in more detail later as a separate agenda item.

Ocean Crust Panel

P. Robinson, OCP panel chairman, reported.

Legs 85 and 87-90 either did not have basement objectives or experienced problems resulting in failure to reach basement. Leg 91, now underway, does not have significant basement objectives.

Legs 92, 93 and 95 are considered important for logging. The Ocean Crust Panel strongly recommends that logging be part of the drilling program on those legs. A limited logging program would be preferable to no logging. OCP also feels that timely publication of the Initial Reports is an important part of the drilling program. The panel would prefer a delay in the Morocco survey if cuts are required.

The panel is also concerned about the basement objectives of Leg 92 (Hydrogeology). Present plans are to penetrate 100 m into basement at site HY-1. OCP requests that drilling be extended for 2-3 days to allow 200 m penetration if the rate of penetration and recovery are favorable.

P. Robinson summarized OCP recommendations for the AODP advisory panel structure, and presented the panel's prioritization of drilling objectives for AODP.

The OCP has developed the following priorities for the first phase of AODP:

1. Return to Hole 504B and deepen the hole to at least 2 km.

2. Make every effort to develop bare rock drilling capability. If this capability is available, our second priority is deep drilling at the EPR axis at 13°N (priority 2a) and at the Mid-Atlantic Ridge axis in the FAMOUS-AMAR area (priority 2b).

3. Our next priority (4) is drilling a transect across the Mariana Arc with emphasis on two deep holes, one each in the arc and back arc areas.

4. Priority 5 is drilling in and adjacent to the Kane Fracture Zone.

5. Priority 6 is deep drilling in the Red Sea to investiate hydrothermal systems and metallogenesis.

6. Investigation of the Cape Verde or Canary Island hotspot is priority 7.

7. Priorty 8 is to study crustal aging processes by completing transects in the western North Atlantic.

Ocean Paleoenvironment Panel

M. Arthur, OPP chairman, reported.

Leg 85 (Equatorial Pacific Paleoenvironment) is considered a moderate success because several problems were experienced and only 5 of the original 11 sites were drilled. Primary problems were:

1. Time constraints resulting from the added DARPA leg.
2. Time loss because of the heat flow program.
3. Failure of the magnetic orientation device.

Leg 86 (NW Pacific Paleoenvironment). Most of the drilling objectives were achieved, although one site (NW-9) was not reached. Problems encountered were:

1. Time constraints precluded HPC or double HPC at some sites.
2. Slow underway speed because of weather and currents.
3. Loss of one day due to DSDP failure to consider Int. Date Line crossing.
4. Some core deformation due to ship heave during HPC.

Leg 89 (Old Pacific Paleoenvironment). Considered to be a moderate success even if the primary objective was not achieved. A lack of communication between DSDP and the co-chief scientists existed regarding reentry. (Discussed later as a separate agenda item, page ??).

Leg 90 (SW Pacific Paleoenvironment). A very successful leg; excellent weather conditions prevailed and the extended core barrel helped achieve good core recovery. One concern of the panel regarding leg 90 is the large number (30,000) shipboard samples taken during the cruise.

OPP is pleased that the Orca Basin is included in Leg 96 (Mississippi Fan).

OPP made the following recommendations to the Planning Committee:

Shipboard Sampling and Core Curation

Recommendation 1a: The Ocean Paleoenvironment Panel has two concerns: first, there appears to be excessive shipboard sampling. The purpose of shipboard sampling is only to aid in the preparation of the Initial Reports. Excessive sampling will result in either delays of report preparation or waste of valuable material or both, not to mention the consumption of time and manpower aboard ship which could be better spent. We urge the Planning Committee, as we have urged repeatedly in the past, to impress upon shipboard parties the need for restraint in shipboard sampling.

Recommendation 1b: Second we are concerned that insufficient priority is being given to curating the core collection. One of the primary objectives of the drilling program is to gather ocean sedimentary sequences and oceanic crustal rocks that will be available for scientific inquiry not only by this generation of scientists but future generations as well. DSDP archives now contain material from more than 90 legs of CHALLENGER. These cores are an invaluable and irreplaceable research medium. They deserve now and in the future careful handling and storage, which now seem to be lacking because of funding constraints.

Publication of Initial Report Volumes

Recommendation 2: The DSDP Initial Reports volumes are now a major element of the visibility of our scientific program and one of the few tangible rewards for Shipboard Scientist participation. It is therefore the unanimous recommendation of the OPP that there be no further delay in printing and dissemination of Initial Reports volumes, and we even encourage DSDP to seek ways to speed publication without loss of quality. We do not consider the publication budget an appropriate place to accommodate funding shortfalls.

AODP Panel Structure

Recommendation 3a: OPP recommends that thematic panels be maintained as the primary panels reporting directly to the PCOM; and

Recommendation 3b: that regional working groups be created as needed, but that they report through the thematic panels. We emphasize particularly that there should be a mechanism for the formation of working groups other than those having solely regional interest (e.g. time slices, unconformities and seismic stratigraphy, etc.) and that their efforts be properly funded.

M. Arthur then summarized information related to a 1 year and an 8 year drilling program (see Tables 1-4).

SUMMARY OF 1 YEAR OPP CHALLENGER PROGRAM

	REGION	NUMBER OF SITES	TYPE DRILLING	ESTIMATED OPERATIONS DAYS
	1) Equatorial N. Atlantic (Mar)	3	HPC	9
	2) NW African margin	7	HPC/XCB	24
	3) Iberian margin (Galicia)	2	HPC/XCB	7
NORTH ATLANTIC	4) Blake-Bahama Outer Ridge	3	HPC	6
	5) Caicos Ridge	2	HPC	5
	6) Peru Margin	5	HPC/XCB	21
			TOTAL	72 DAYS

SUMMARY OF PROPOSED FIRST-PRIORITY OPP 2 YEAR AODP DRILLING PLAN

North Atlantic

AREA OR THEME	OBJECTIVES	NUMBER OF SITES	TYPE* OF DRILLING	GENERAL LOCATION	ESTIMATED PENETRATION	OPERATIONS DAYS	TOTALS
Equatorial Atlantic	1 N. and S. Atlantic Junction and water mass exchange	1	HPC/XCB	Demerara Rise	1500m	20	
		2	HPC	Dem. Rise Transect	300+m ea.	10	
		3	HPC	Liberian Cont. R.	1000+m ea.	30	
	2 Equatorial productivity history	1	HPC	M.A.R.	300m	5	
	3 Bottom-water circulation and Chemistry	2	HPC	Romanche F.Z.	500m ea.	10	
		2	HPC	Sierra Leone Rise	500m ea.	10	
							85 Days OPs 7 Days Transit 92 Days Total
Circum-Sahara	1 Upwelling and sediment eolian dust flux	4	HPC/XCB	NW AFr. continental rise-slope transect	500m ea.	24	
							24 Days OPs 4 Days Transit 28 Days Total
Eastern N. Atlantic Drift Anatomy and Bottom-water Circulation	1 Gulf of Cadiz drift	2	HPC/XCB	Gulf Cadiz	500m ea.	6	
	2 Galicia drift	2	HPC/XCB	Galicia	700m ea.	9	
	3 Bay of Biscay drift	2	HPC/XCB	Bay of Biscay	500m ea.	6	
	4 Feni drift (anatomy)	6	HPC/XCB	N. North Atlantic	300m ea.	12	
							33 Days OPs 7 Days Transit 40 Days Total

Total N. Atlantic Time 160 Days
(ca. 3 Legs)

Pacific

AREA OR THEME	OBJECTIVES	NUMBER OF SITES	TYPE* OF DRILLING	GENERAL LOCATION	ESTIMATED PENETRATION	OPERATIONS DAYS	TOTALS
Peru-Chile Margin [First Priority]	1 upwelling sediment flux, upwelling vs. climate, history of Oxygen-minimum zone	6	HPC/XCB	Peru continental slope (depth and lateral transect)	500+m ea.	20	
Oregon Washington Margin [second priority]	1 upwelling sediment flux, coupling of marine-continental climate and sediment supply	4	HPC/XCB	Continental slope to rise (vertical transect)	500+m ea	12	

36 Days OPs Total
18 Days Transit

East Pacific Margins 54 Days Total

Southern Ocean

AREA OR THEME	OBJECTIVES	NUMBER OF SITES	TYPE* OF DRILLING	GENERAL LOCATION	ESTIMATED PENETRATION	OPERATIONS DAYS	TOTALS
Agulhas Plateau	1 Circum-polar connections and circulation, gateways (and water mass properties) (Ceno-Mesozoic)	3	HPC/XCB	Agulhas Plat. (w/depth transect)	500-1000m ea.	20	
Polar Front	1 high latitude climate and polar front fluctuations (Neogene)	2	HPC	MAR, ca. 50°S	300+m	10	
Maud Rise	1 vertical gradients at high latitude near continental margin (Cenozoic)	2	HPC/XCB	Maud Rise	500+m	10	
Weddell Sea	1 high latitude glaciation history, deep-water circulation, biotic history, vertical gradients (Ceno-Mesoz.)	3	HPC/XCB	Weddel Sea and Continental Margin	700+m	21	

61 Days OPs Total
30 Days Transit

Southern Ocean 91 Days Total

Active Margin Panel

D. Hussong, AMP chairman, reported.

During the past year there have been two CHALLENGER drilling legs on active margins (Leg 84 on the Middle American Trench and Leg 87 on the Japan Trench and Nankai Trough) and two meetings of the AMP (4-5 March 1982 and 5-8 January 1983). The AMP also prepared and submitted to JOIDES in April 1982 a White Paper on active margin drilling objectives.

Leg 84. This leg concentrated on the fore-arc region off Guatemala, successfully sampling ophiolite suite rocks from all sites where acoustic basement was penetrated. The results indicate that the Guatemala margin has not been subject to extensive accretion during the Cenozoic, although older periods of accretion may have occurred. The Guatemala fore-arc seems to be composed of the same rocks as the adjacent continent.

The gas hydrate investigations during Leg 84 were particularly valuable; clathrate samples were obtained at several sites. The clathrates were analyzed aboard ship and were also stored in frozen and pressurized vials for continued onshore studies. Visible hydrates were found in the fractured mudstone and tuffaceous sand beds. Continuous monitoring during drilling ensured safe drilling above the BSR in gas hydrate regions.

Leg 87. The first portion of this leg was devoted to a transect across the Nankai Trough along a Japanese MCS profile which showed dramatic landward dipping reflections interpreted at imbricate thrusts in the fore-arc. The principle drilling objective, to penetrate the thrusts and to study facies changes and changes in physical properties as trench fill sediments are incorporated into the accretionary prism, was only partly accomplished. Shallow objectives, particularly with the HPC, were successful. The thrust plane was never penetrated due to mechanical drilling problems and bad weather. Logging was unsuccessful due to repeated bit release failure. Hole conditions were generally good, and the co-Chiefs feel that geologic conditions were favorable for full completion of the objectives.

The second portion of Leg 87 was in the Japan Trench. A major objective of this drilling was to verify and extend the story of tectonic erosion and vertical motion for this margin derived from Legs 56 and 57. Deep penetration (900 m) was attained. Although the jury is still out on these results (the post-cruise meeting was held in early January 1983), the preliminary interpretation reported to the AMP was that no paleontologic evidence of vertical movement, and no evidence of subsided Oyashio land mass, was obtained from the drilling. Bit release failure again thwarted attempts at logging.

The co-chiefs noted that high resolution seismic (high-frequency) profiles and swath-map bathymetric control (such as SEABEAM or SEAMARC II) were not available for site selection of this leg. This meant that they were working with a simplified and very two-dimensional model of structurally complex regions. They strongly recommended that future active margin drilling be based on surveys that include swath-map bathymetry and high resolution seismic data.

4-5 March 1982 Meeting

This meeting was devoted largely to planning for Leg 87, review of the "White Paper", and discussion of future site survey needs.

5-8 January 1983 meeting

The major task of this relatively long meeting was to thoroughly review the principle drilling objectives and strategies of the AMP and to review all target regions in light of those goals. Due to the uncertainties in plans for the future drilling program, we considered several alternatives:

A. **Drilling to October 1983 only:** Although we realize that this drilling plan is complete, we discussed a very high priority target that can be attained in relatively short time (14 days) and therefore should be considered as a contingency site. We recommend two holes, with HPC followed by driling to 500-700 m, upslope on the accretionary Barbados fore-arch complex sampled by holes 541 and 542. These holes will further define the internal structure of the subduction complex, possibly penetrate numerous imbricated thrust faults, and measure the rate of accretion. They also could provide measurements of fluid pressure and temperature across and within accretionary complex. The overall objective of the drilling will be to define the uplift history of this accretionary complex. No site surveys are needed.

B. **One-year extension, CHALLENGER-type drilling:**

1. The highest priority is for a full leg

devoted to target sites B1-3 (in the CAR 1 region) near the Leg 78A sites and B-4 on the lower slope of the inner wall of the Barbados fore-arc. Sites B1-3 are a more extensive approach to the objectives for 1983 drilling described above. The Barbados sites have very thick sediments, so will provide a picture of only very recent deformation processes. They benefit, however, from having easily definable terrigenous trench-fill sediments derived from South America that can be readily differentiated from slope deposits in the fore-arc. This will enhance the oportunity to document uplift of thrust packets in the accretionary prism. The general objectives of all the Lesser Antilles region drilling remains as described for the CAR 1 sites above. No site surveys are needed for these sites.

2. Middle America Trench, offshore Costa Rica: The AMP raised the priority of this region (described in a memo from R. Buffler to the PCOM on 16 December 1982) because it is well-surveyed, clearly has many typical geologic features of active margins, and is close enough to be logistically feasible for a short extension. Oceanic sediments are apparently being subducted without disturbance beneath slope apron sediments prior to possible incorporation into a small accretionary complex. The onshore geology is well known. Site survey data are in good shape, although we would like to have a swath-map bathymetric survey in the areas as well as heat flow measurements to satisfy possible safety considerations (no BSR is observed).

C. **First 2-1/2 Years of AODP** (in appropriate order of priority):

Pacific:

1) Peru Trench (9^{o}-12^{o}S): This area has been proposed and described many times in the past. The drilling objectives and sites survey requirements remain the same, and the region continues to have highest priority. A full leg is required.

2) Costa Rica: As described above, one leg.

3) South Chile: The triple junction where the South Chile Rise is being subducted represents a collision process that may be fairly common in the gologic record but that has not been studied in detail. This margin is a good place to go because the collision is oblique and thus can be sampled at various stages. The effects of the collision may include uplift followed by subsidence, regional metamorphism from elevated heat flow, igneous intrusions in the fore-arc, cessation of arc volcanism, acidic volcanism near the trench axis, and rapid tectonic erosion of the continental margin.

The South Chile region will need extensive site surveying, including MCS profiling and swath-mapping. A full drilling leg is required.

Atlantic Ocean:

1) Barbados transect: as described for one-year extension.

2) Hellenic Trench: collision zone that has been proposed in the past. Objectives remain the same, site surveys that are needed will be accomplished by the French in 1984. One full leg is required.

Antarctic:

One full leg has highest priority in the Antarctic. It will include two fore-arc sites on the South Sandwich Trench (one on the older, well-developed northern fore-arc and one on the apprently recently formed southern fore-arc), and a couple of shallow holes to study back-arc rifting and possible anomalous volcanism in the Bransfield Straight.

The fore-arc sites shouls have adequate site survey data collected mainly by the British by winter 1984-85. Swath-mapping (15 days) in the region would also be very desirable for effective site location, but will not be a safety requirement.

No site surveys are needed for the Bransfield Strait sites.

Future Panels:

The AMP reviewed the various proposals for an advisory panel structure for AODP. We support having a PCOM with more policy responsibiltiy, as proposed. The AMP is, however, concerned that the thermatic panels should retain a body with the present orientation of the AMP toward tectonic processes. Particularly after the long review of active margin drilling results and future objectives, the AMP noted that there is slowly evolving a sense of coherence and some systematic relationships in active margins that must be pursued. We are concerned that this thrust not be diluted by the AODP panel structure. In essence, then, we would favor retaining a panel with the same thematic interests as the present AMP.

The last PCOM minutes suggested that

some AODP working groups be established immediately. If this is done, we make the following nominations:

E. Pacific (to 140°W): L. Kulm, J.C. More, D. Cowan
S. Atlantic: P. Barker
N. Atlantic: none
Atl. margin (Caribbean): A. Mascle, G. Westbrook, J. Ladd
Atl. margin (Med.): J. Mascle
Atl. margin (G. of Mex.): none

In general we would recommend that each Working Group have a member who is also on the major thematic panel for the region.

Since this meeting was likely the last of the AMP, no changes in panel membership were discussed. If the drilling program is extended for a short time (such as one year), we recommend retaining this panel as is for the probable one more meeting.

PASSIVE MARGIN PANEL

D. Roberts, PMP chairman, reported.

The panel considered drilling priorities for both a 1 year and and 8 year program.

1 Year Program:

Caribbean(Highest priority)
Norway
Mediterranean
Galicia
Morocco (Lowest Priority)

8 Year Program:

Atlantic:	Weddell Sea Norwegian Sea	1st Priority
	Caribbean Grand Banks Eq. Fracture Zones Mediterranean	2nd Priority
	Galicia Morocco	3rd Priority
Austral Sea:	Weddell Sea	1st Priority
	S. Australia Ross Sea	2nd Priority
	Malvinas/Falkland Is. Fracture Zone	3rd Priority
Pacific	S. China Sea W. Australia	1st Priority
	Gulf. of Calif. E. China Sea West Coast Fans	2nd Priority
	Bering Sea Coral Sea	3rd Priority

Future Advisory Structure, PMP Recommendations:

- Active and Passive Margin Panels should be separate.
- Thematic panels should be composed of mixed disciplines to increase effectiveness.
- Working Groups should be staffed primarily with thematic panel members.
- Industry membership on panels is advantageous because of access to unpublished data.

PMP Actions and Motions

1. The PMP recommends to PCOM that logging in FY 83 should have higher priority than the site surveys off Peru-Chile and Morocco. The PCOM is further asked to note that logging is essential to the scientific objectives and value of the sites proposed for the New Jersey transect, ENA-3 and the Gulf of Mexico.

2. The PMP also moved that logging on the New Jersey transect and ENA-3 are of equal high priority for in the first case the study of sea level changes from the interrelationship of sheet wells and the seismic stratigraphy of the North American Basin in the latter. Priority of logging in the Gulf of Mexico fan area is not downgraded by this statement as funding for logging is understood to be reasonably assured for that leg.

3. The PMP recommends to PCOM that a dipmeter is included in addition to the standard logging suite for ENA-3, the Gulf of Mexico and the New Jersey transect.

4. The PMP, regretting that only 35 days are now available for the Gulf of Mexico, requests that extra time be made available for this leg.

5. The PMP recommends that the program drop Orca-2 and MF-8 and that MF-1 and MF-10 receive a lower priority and that the remaining sites be adopted. The PMP recommends that the co-chief adopt a policy of short offset HPC to examine detailed facies

variations across the channel, scrollbars, etc. This may be done at the expense of the lower priority sites but not at the expense of Orca-1.

6. The PMP recommends that in the event of no time being available, site MF-1 may be dropped from the program and Orca-1 will receive a higher priority than short-offsets in the MF5-6 group of sites.

7. The PMP recommends that a site near MF-13 on the lower fan be double HPC'd for geotechnical pruposes. The sites has been shifted from MF-8 into an area of better seismic and sonar control.

8. The PMP recommends the following revised priorities and scenarios for the New Jersey transect:

Priority 1 -	NJ2
Priority 2 -	NJ4
Priority 3 -	NJ1
Priority 4 -	NJ3

9. The PMP recommends that the lowest priority site be deleted from the program to allow more drilling of ENA-3 to complete resite. The PMP also noted that the current schedule does not in any event allow drilling of this site (NJ3).

10. The PMP also noted that release of NJ-3 will only add an extra 3 days of drilling at ENA-3. In the event that extra time is required at ENA-3, NJ-2 and NJ-4 only will be drilled.

11. The PMP expressed to PCOM strong concern that these high priority legs, already deferred to the end of the program, have now been reduced to untolerably short lengths. Further delays in the program should not be allowed to impact further on these legs. The PMP requests PCOM make every effort to restore the DARPA days to these legs and not subtract further days from these legs to provide additional days to legs earlier in the program.

12. The PMP recommends that Greg Mountain be considered as an alternate co-chief to A. B. Watts in the event of non-availability.

13. The PMP recommends to PCOM/DSDP that every effort be made to insure staffing with top benthic micropalaeontologists.

14. The PMP recommends to PCOM that any additional time to comlete ENA-3 should be done as part of the ENA-3 logging operations possibly scheduled for Leg 95 for fiscal reasons by DSDP.

15. The PMP recommends that in the event of non-completion of ENA-3 in the allotted time, and if the objectives are within reasonable reach, additional days may be taken from the New Jersey leg.

16. The PMP recommends to PCOM that ENA-3 adopt the following drilling policy: drill pilot hole to 500 m with ECB (this figure to be left to co-chiefs/Ops. Manager), set reentry cone/casing, wash to 900 m (100 m above AU), drill to basement, log, drilling missing section afterward.

Sedimentary Petrology and Physical Properties Panel

G. Klein, SP4 chairman, reported.

Current Drilling Activity

Recommendation #1. Drill three HPC Dedicated Geotechnical Cores during Leg 96 in the Mississippi Cone. (W. Bryant invited to coordinate this activity).

Future Panel Structure:

Recommendation #2. A thematic panel on sedimentary sequences should be established.

Recommendation #3. Items dealing with Physical Properties Research, planning, and methodology should be handled by a special panel dealing with technical developments, engineering and downhole measurements.

Recommendation #4. PCOM should consider an annual combined meeting of all thematic panels.

Recommendation #5. Establishment of specific task forces or working groups, as discussed by PCOM (6-8 Oct. 82 meeting), is endorsed.

Recommendation #6. AODP should circulate a notice with a Request for Proposals for Drill sites to be submitted six months before such an annual meeting of thematic panels for review by these panels.

SP4 Recommendation for Post-1983 AODP Drilling, Two-year Program:

Atlantic

1. Granada Basin turbidites and Lesser Antilles fore-arc facies.
2. Slides and Lower Continental Rise turbidites.

3. Amazon Cone.
4. Tephrochronology, Western Gulf of Mexico

Weddell Sea

1. Fate of eroded sediments

Pacific

1. Anoxic sediments
2. Deepen Site 504B
3. Navy Fan
4. Tephrochronology, Panama Basin

Other matters:

a. Sediment classification - In process of being reviewed. Need for new classification, but not same as Dean Committee recommended.

b. Establishment of special Working Group, R. Carlson Chairman, charged to plan research program for Physical Properties for Post-1983 program. Evaluation of shipboard physical properties procedures - report critical. Need more technical assistance aboard ship. AODP - better long-range planning for physical properties research.

c. Design changes for EXPLORER forwarded through channels.

d. Analysis of HPC penetration (PCOM request): HPC does not compact sediment samples seriously. HPC sample quality is high.

e. Curatorial matters - backlog:

Recommendation #7. Additional space and staff be added to alleviate backlog problems.

Recommendation #8. DSDP reconfirm priority on sample requests for shipboard and shorebased scientists meeting Initial Report deadlines.

Recommendation #9. DSDP accommodate as much as possible by giving higher priority to those investigators wishing to undertake own sampling at repositories.

f. Dissolved Working Group on Long-Range Plans because full panel assumed these duties.

g. Technical Manual has been edited; paste-ups were completed. Typesetting is underway and manuscript will go to press in early February.

Inorganic Geochemistry Panel

M. Kastner, IGP chairperson, reported.

Loss of logging on Leg 92 is a loss of science. PCOM should consider that it may be more realistic to scratch the leg and distribute the time to other legs to maximize the science. On the other hand, an addition of 1 or 2 days to a leg may result in a dramatic increase in results. For example, more geochemical data are available if a hole is cored to basement rather than stopping at a particular level of interest.

IGP was pleased that the Orca Basin will be part of Leg 96. (J. Honnorez noted that a firm decision has not yet been made.)

IGP is interested in processes rather than in specific sites. Examples are:

1. Interaction between exogenic and endogenic cycles.
2. Old basins (how long do convection systems exist?).
3. Organic matter/sediment/seawater interactions.
4. Diagenetic processes.
5. Paleo-oceanographic processes (geochemical fingerprints of changes in climate, sea level, circulation, etc.).

Future drilling sites:

Geochemical objectives could be part of other panel cruises but ideal targets are:

Mediterranean:

HPC sampling of complete Pleistocene sections.

Sapropel in eastern basin.

Pore water response to Messinian salts.

Pore water chemistry beneath various hardgrounds.

S. Atlantic:

Benguela Current - detailed history by HPC.

NW Africa, sepiolite/palygorskite problem.

Cretaceous ocean basin.

Namibia (or Peru) transect for Si-C-P distribution; slope dolomites; history of Peru Current.

Horizon "A" for chert diagenesis.

Pacific:

Peru margin - slope dolomites, history of Peru Current.

Organic chemical fluxes.

California or Gulf of California - dolomite problem.

East Pacific Rise, pore water advection.
Marianas hydrothermal area.
Juan de Fuca Ridge sediments.

Antarctic:
Deep coring for diagenetic and paleo-oceanographic studies.

A primary concern of IGP is that new technology and instrumentation are needed to achieve AODP geochemical objectives:

1. Improved HPC is essential (uncompacted cores are required).
2. Improved in situ pore fluid samples.
3. Efficient packers; need pristine pore waters in large vol
4. Continuous permeability/porosity monitoring.
5. In situ redox potential measurements.
6. Ability to sample hot fluids "on line".
7. Bare rock and high temperature drilling capability.

Future panel structure:

IGP would like to meet after Leg 92 (Hydrogeology) in May or June of 1983.

Thematic panel structure is a good idea; multidisciplinary panels should mean more interaction. The members of Regional panels or working groups should be flexible and should include thematic panel members.

Hydrogeology Working Group

R. Anderson, HWG chairman, reported.

The Hydrogeology Working Group has a specific charge to develop a set of in situ experiments to define the chemistry and physics of a hydrothermal system. The problem is 3-dimensional and can be viewed as defining the "plumbing", chemistry and temperature of the ridge, flank and basin. The required tools are : hot (300 C-400 C) rock drilling capability; bare rock drilling; 3-D geophysics; and downhole probes (pumps, analyzers, samplers).

Target areas:

	CHALLENGER	EXPLORER
Ridge	504B, Juan de Fuca	E.Pac.Rise 14°N
Flank	Equatorial Pacific	Indian Ocean
Basin	Nares	Old Pacific

Leg 92 (Hydrogeology):

The hydrothermal problem will be examined in 2 systems - sediments and rock. Extensive geophysical data are required for proper site selection and multiple drill holes are needed. Leg 92 will compare results from 504B and Site 395 (Atl.). Time constraints will pose a problem in drilling through Layers 2A (fractured) and 2B (pillow basalts). Logging is essential; funds for downhole experiments should be segregated from operational expenses.

Downhole Measurements Panel

R. von Herzen, DMP chairman, reported.

The panel last met in May 1982 and the minutes of that meeting appear in the June issue of the JOIDES Journal. They will not be repeated here.

DMP recommends logging for all legs and additional measurements on specific legs. Logging need not be performed by a commercial firm (Schlumberger) which provides some information of little scientific interest. Taped digital data can only be analyzed at Schlumberger. DMP thinks more useful logs would result from a scientist-run program.

The panel has not been very active since Leg 84. The HIG seismometer performed well on the DARPA Leg 88; results are being analyzed by Fred Duennebier. Leg 91 (Tonga Trench) may provide good data from an active seismic region. HPC temperature measurements were made on Leg 86 and are now being processed. Legs 87, 89 and 90 also provided some measurements.

Sites considered for future measurements are Holes 417D (709 m deep) and 418A (868 m) which lack good logs. These are deep holes in old crust and could be compared to Hole 504B in young crust.

Stratigraphic Correlations Panel

R. Poore, SCP chairman, reported.

Panel members were polled by telephone for ideas concerning target areas for AODP and the AODP advisory structure. The panel consensus for future drilling was mainly to fill in existing gaps in the stratigraphic record. Six targets were identified:

1. NW Atlantic, 50 N - 37 W, near DSDP Site 112 (late Neogene).
2. West of FAMOUS site.
3. Subtropical Atlantic, 30 N.
4. N. Gulf of Mexico, new sites 94 and 95.
5. Sierra Leone Rise.
6. Vorning Plateau (Eocene-Miocene silicious section).

Recommendations for the AODP advisory structure are:

1. Agree with PCOM that the number of panels should be minimal.
2. "Sedimentary sequence" and "Geologic History" panels appear to be the same; suggest they be combined into one panel.

Information Handling Panel

D. Appleman, IHP chairman, reported.

The Information Handling Panel met on 6-7 January 1983 at DSDP, La Jolla. The principal recommendations of the Panel are summarized here in brief.

1. The draft proposal for post-drilling activities of Science Services be adopted in the event of termination of drilling, or in modified form in the event of a drilling hiatus followed by an Advanced Ocean Drilling Program as discussed in our report.

2. The role of scientific data management, publications, and sample curation be specifically included in planning for the structure of the AODP.

3. The experience and expertise of the present Information Handling Group be fully utilized in planning and implementation of these functions in the AODP.

4. An information handling advisory group be maintained during a phase-down or drilling hiatus.

5. An information handling advisory group be an integral permanent part of the AODP advisory structure.

6. Greater use be made of the National Geophysical Data Center to disseminate and service requests for stable data bases.

7. A bibliographic reference data base to the Initial Reports be prepared.

8. The publication of the Initial Reports continue in a timely mannner and without compromising quality.

Organic Geochemistry Panel

B. Simoneit, OGP chairman, reported.

Distribution of Samples

Distribution of samples for shore-based organic geochemistry studies are as follows:

Leg 75, 523B piston core - B. Simoneit assisted DSDP in sample distribution to Oremland, Morris, Meyers, Suess, Brassell, Degens, van Vleet and Simoneit. A symposium is planned to present these results about one year hence.

Leg 83 - no OG frozen samples taken onboard.
Leg 84 - Cunningham, Exxon, 24
Leg 85 - no OB frozen samples taken onboard
Leg 86 - Simoneit, OSU, 6
Leg 87 - no requests
Leg 88 - no OG frozen samples taken onboard.

Capillary gas chromotography

R. Schaefer, organic geochemist onboard for Leg 89, installed and tested a fused silica capillary GC column for C_1 - C_6 hydrocarbon analysis. The experienmtal details are reported in the Leg 89 shipboard report. This system is suitable for shipboard gas analysis; however, for a "foolproof", mechanically stable system additional dvelopment would be necessary. The main advantage of the setup is the simplicity of the peak integration in terms of definition of baseline and the actual separation efficientcy. Also olefins can be resolved. R. Schaefer also assisted T. Birtley (Systems Programmer) with the connection of the gas chromatographs (Carle and HP.P) to the HP-1000 computer in terms of the necessary software. In this context several test-runs on the chromatographs were made, and he explained the detailed on how to use external standardization methods.

AODP Advisory Structure

The OGP strongly recommends that an Organic Geochemistry Advisory Panel be retained during the drilling hiatus and for the Advanced Ocean Drilling Program. This would provide continuity for the continuing shore-based organic geochemical research efforts in the USA and abroad, and additionally provide expertise for the various planning committees and other advisory panels for the future.

Site Survey Panel

J. Jones, SSP chairman, reported.

(A series of maps were used to show the status of site surveys world wide and to identify sites mentioned in the COSOD document and 8 year plan where surveys will be required. Copies of the maps appeared in the Feburary 1983 issue of the JOIDES Journal.)

National site survey activity over the past year and in the planning stages are:

	Last Year	Future Planned
Germany	Equat. Pacific S. China Sea	Norwegian Sea Weddell Sea Coral Sea W. Pacific Trench
France	N.W. Morocco	Caribbean Sea 504B Chile/Peru Tr. Japan Trench
U.K.	Gardar Drift(OPP Site 6) Goban Spur Site Madeira/Cape Verde Basin	Weddell Sea Scotia Arc Indus Cone Equat.Atl./ Caribbean
Japan	Bering Trench	Sea of Japan Weddell Sea W. Pacific
USA	Eq. Pacific Mississippi Fan	Morocco Peru/Chile(?)

The 8 year plan proposes 41 areas which require site surveys, or 4-5 surveys per year. High resolution surveys are required for 29 areas.

Industrial Liaison Panel

W. Roberts, ILP chairman, reported.

JOIDES has not made much use of ILP, primarily because DSDP/IPOD has advanced beyond industry capabilities and because JOIDES objectives differ from those of industry. This panel could be eliminated from the AODP structure without harm, as industry advice would still be available when needed.

Pollution Prevention and Safety panel

L. Garrison, PPSP chairman, reported.

Future Drilling Program:

The safety review procedures have evolved with the program. These will improve along with further improvements in the data base and site surveys. The panel does not see a need for a new type of safety review program, but does have some recommendations:

1. More high resolution surveys to define reflectors in the upper 500-700 m.

2. Line density in surveys is important to PPSP; the panel should be con-sulted when surveys are planned.

3. Good velocity information is required.

4. Regional background and good paleoenvironmental definition are also required.

5. Timeliness of site surveys to allow adequate time for review of data.

6. Early involvement of Safety Panel.

7. Panel composition (expertise of members) should remain as is.

8. Panel will be available during the hiatus if needed.

Deep Sea Drilling Program

Y. Lancelot, DSDP Chief Scientist, reported.

Recent Operations:

Leg 89 (Old Pacific). Problem with lack of communication between DSDP and the co-chief scientists, R. Moberly and S. Schlanger, concerning reentry. (A letter from the co-chief scientists explaining the problem was written while on board the CHALLENGER and sent to the PCOM chairman. Moberly and Schlanger requested that it be circulated to the Planning Committee and discussed at this meeting.

Y. Lancelot - During the 6-8 October 82 PCOM meeting the committee was advised that Leg 89 would be operating in marginal conditions due to the long drill string. Stress curves were shown but the final stress analyses were not available at that time. Conditions would be critical during 3 phases of drilling: 1) when lowering the cone, 2) with a full drill string prior to addition of heavy weall pipe, and 3) while drilling into hard rock. Decisions regarding drilling would have to be made in real time when other factors (weather, etc.) could be taken into account. The plan was to hold a meeting at DSDP before departing for the ship, but the meeting was not held because of the early departure of personnel for Yokohama and financial constraints. A meeting was held at Yokohama. Moberly and Schlanger called Y. Lancelot from Japan to clarify the no-reentry decision. DSDP personnel Y. Lancelot, M. Peterson and B. Robson met the following day and advised the co-chief scientists that a reentry decision would be made at sea when stress readings, weather and other factors would be known. During drilling the core barrel jammed at 764 m resulting in loss of the 1st hole. Weight indicator measurements were in excess of calculated values and at that time a decision against reentry was made. A factor in the decision was the unavailability of the heave compensator which had been misadjusted at Yokahama. Another attempt was made to reach Jurassic rocks with a single bit hole; the bit was lost a 892 m in Aptian rocks.PCOM was aware that reaching the objective on Leg 89 was a gamble. DSDP was dismayed at the letter and would rather consider that a joint effort between DSDP and the co-chief scientists to reach the objective had failed.

J. Honnorez - When was the decision not to reenter made? Y. Lancelot -at DSDP during the drilling.

B. Robson (DSDP) continued:

The pilot hole indicated that reentry would not be possible, considering bit motion and weight at the top of the drill string. New, heavy-walled joints were used (able to tolerate more bending), as well as the piccolo. The heave compensator was refeurbished at Yokohama, at which time the pressure was set too low (heave compensator maintenance is part of the Global Marine contract -not DSDP). DSDP calculations of yield strength of the drilling string were made using the manufacturer's yield point figures. DSDP operational constraints allow actual stress to be 90% of the minimum yield stress.

(B. Robson then displayed several graphs representing the calculated yield point of the drill string under various operating conditions).

Curves showed that the loss of the heave compensator is critical to operating above the curve (pipe will fail) or below the curve (pipe will not fail). The dynamic stress curve indicated that at 21,000 ft. the yield point would have been far exceeded (stress = 34,000 psi). The stress meter indicated that the pipe should have failed; no explanation why it did not fail. Some joints were removed and will be analyzed for strain.

DSDP Report Continued (Y. Lancelot):

Leg 90 (Southwest Pacific) was a complete success with all objectives achieved. The Neogene/Paleogene boundary was cored at 3 sites. The extended core barrel worked well and good cores (to 500 m) were recovered.

Leg 91 (ENA-13) is now underway. The pilot hole has encountered chert which was unanticipated.

Science Services (R. Merrill reported):

Science services has 3 functions: 1) Publications, 2) Core Repositories, and 3) Data Handling.

Publications: Vol. 70 of the Initial Reports has been shipped; Vol. 69 will be completed in 2 weeks. At least 5 more volumes are scheduled to be completed this year. The increase in the completion rate of Initial Reports is due primarily to increased pressure on authors to contribute reports in a timely manner, and to increased output at DSDP.

Core Repository: All existing facilities are SIO are now filled with cores; a refrigerated storage area is now under construction to house Leg 90 cores on a temporary basis. Space is not available for the examination of cores and sample requests are being delayed becouse of a lack of personnel. The east coast repository (L-DGO) is not yet filled and can accommodate the Atlantic cores to be drilled during legs 93-96. A record keeping system should be set up to document the history of each core.

Data Handling: The shipboard computer has been implemented on CHALLENGER. Additional space and personnel are required aboard CHALLENGER to make more efficient use of the computer; for example, a specialist should be on board to instruct people at sea in the use of the computer.

Assuming a halt in drilling operations in October 1983, the following would be in effect:

- about 20 volumes of the Initial Reports would be in various stages of completion;

- the Information Handling Group would still have a normal workload;

- core repositories would be processing cores.

Another 2 or 3 years will be required to prepare a cumulative index for the Initial Reports. The workload of the Information Handling Group and the core repositories would taper off in about 5 years. Aprroximately 5 years of core maintenance work is needed at the west coast repository and 1½ years at the east coast repository.

In the long term, publications would shut down in 1987 or 1988, and the cores will have been transferred to a long-term repository.

Budget Cuts

Y. Lancelot - DSDP has been requested by NSF to accommodate a cut of $750K. This cut comes at a time when DSDP is already operating without adequate funds, resulting in low morale and potential loss of services.

A decision was made to terminate the subcontract from Scripps to Schlumberger for logging services for a savings of $300K. DSDP was unable to identify other cuts to reach the $750K figure, other than to lay off about 22 DSDP personnel.

Discussions with Schlumberger indicated that even if the contract were terminated a reduced logging program would be possible for the remaining CHALLENGER legs. One problem is that the equipment would be removed at Wellington, N.Z. (port call between Legs 90 and 91) and could not be put back on board in time for Leg 92 (Hydrogeology). It will be necessary to reschedule the remaining legs in order to reinstate a reduced logging program (logging legs would be consecutive). The plan is:

N. Atlantic Paleoenvironment
ENA-3 (drill hole - port - log hole)
New Jersey Transect
Mississippi Fan.

Logging for 69 days would cost $300K vs. $615K for a full logging program.

Alternate logging:

R. Anderson (L-DGO) presented to PCOM a proposal to log the remaining legs of the IPOD program and made a brief presentation:

L-DGO, under a subcontract to the USGS, can do the logging required for the remaining CHALLENGER program. It can offer better service than Schlumberger in areas of data interpretation and presentation of results. It admittedly cannot compete with Schlumberger in equipment reliability. The L-DGO proposal would also require rescheduling of the remaining legs.

A borehole televiewer would be used in ENA-3 and in the Gulf of Mexico to provide information not available from Schlumberger. (A videotape of a borehole televiewer record was shown.) Some tools will have to be purchased; the tools would not be as reliable as Schlumberger tools but more science will result. A logging engineer will have to be hired and we will try to have a scientist interested in logging on board.

Discussion resulted in the following motions:

The Planning Committee restates that logging of certain holes is of primary scientific importance. In FY 1983 these holes are ENA-3, the New Jersey transect holes and the Mississippi Fan holes. It recommends that the high quality and reliability of standard tools are of the first importance, and thus recommends a reactivation of the Schlumberger contract. The additional logging experiments such as that proposed by Lamont-Doherty Geological Observatory are considered to be of very high scientific priority and should be supported if further money becomes available. The PCOM strongly feels that the recent restrictions on NSF funding for the present drilling program have substantially jeopardized the scientific return from it.

The planning Committee recommends that NSF arrange for printing of Vol. 69 of the Initial Reports as soon as received from DSDP and that one other volume (whichever arrives first) also be printed. The remaining Initial Reports are to be printed as soon as sufficient funds are available.

CHALLENGER Program

(Background: A JOIDES ad hoc committee met 17 Aug. 1982 to evaluate site survey data and identify drilling targets for Leg 92. Members of the ad hoc committee were: C. Harrison (RSMAS), chairman; M. Kastner, IGP chairperson; R. Anderson, HWG chairman; M. Leinen, co-chief scientist Leg 92; R. von Herzen, co-chief scientist Leg 92 - since withdrawn; M. Bender (URI); M. Hobart (L-

DGO); and J. Natland (DSDP). The ad hoc committee recommended replacing the 2.5 my site with a return to 504B. R. von Herzen then declined to be co-chief scientist for that leg and D. Rea became co-chief scientist. At the 6-8 Oct. 1982 PCOM meeting, PCOM invited R. Stephen (WHOI) and M. Bender (URI) to present arguments for a return to 504B. PCOM then decided to have Hole 504B as Leg 92 objective.)

Leg 92 (Hydrogeology). M. Kastner, IGP chairperson reported. The original set of objectives were revised to maximize the science resulting from the cruise.

Original objectives: Transect the E. Pacific Rise at 15 °S to sample crust of 4 ages (2.5 my, 5 my, 10 my and 20 my old crust). HPC at each site to the 1st reflector, then drill to basement. The 20 my site was to be a reentry hole for downhole experiments. The 2.5 my site was included, leaving 3 sites. Hole 504B was then added for water analysis and other studies. The 20 my site, however, turned out to have an age of 30.5 my and to be actually a fossil segment of the Galapagos Ridge, not East Pacific Rise crust. Of the original 4 transect sites, 2 remain. Leg 92 thus has 3 objectives: 1) the original transect, 2) hole 504B, and 3) 30.5 my hole for hydrogeology studies.

More time is requested for the 30.5 my hole; one or both of the other objectives could be eliminated. An additional ½ day at the 2.5 my sites would allow us to reach basement.

PCOM consensus:

A minimum of 9 days should be spent at Hole 504B, 4.5 days at the 5 my site and 6.4 days at the 10 my site in addition to the associated transit time. The remaining days should be used at the discretion of the co-chief scientists. Contingency plans should consider HPC in maximum heat flow area (Conrad survey data should be aboard during Leg 92.)

D. Roberts reported and requested that **Leg 93** (ENA-3), **Leg 95** (New Jersey Transect), **Leg 96** (Mississippi Fan) be presented as a package.

Leg 93 (ENA-3): Target is the J-1 reflector and the age of basement. The hole represents the most seaward part of the ENA-3 transect. 1800 m penetration is planned and it is expected that the entire leg will be consumed in reaching the objective. Contingency targets are: 1) NJ-9, 2) date the AU unconformity, and 3) sea mount age. The priority is ENA-3. Passive Margin Panel recommends using some of Leg 95 time if required, even if only 2 holes of the New Jersey transect (Leg 95) can be drilled.

Leg 93 co-chief scientists are J. Van Hinte (confirmed) and possibly J. Ewing (Gulf R & D, Pearl River, NY).

Leg 96 (Mississippi Fan). Passive Margin Panel recommends the following changes:
- drop sites Orca 2 and MF-8
- lower the priority of MF-1 and MF-10
- adapt the short offset HPC.

PMP also felt that Orca-1 must be retained and that MF-1 could be dropped if time is unavailable. Logging is important. PCOM is urged to recommend that a dip meter be included. Co-chief scientists are A. Bouma (Gulf) and J. Coleman (LSU).

Discussion and comments:

Y. Lancelot - DSDP requests PCOM guidance on depth of drilling as much gas is expected at the drill sites. Is authorization required from a US agency to drill the Mississippi Fan and the New Jersey transect? Based on PMP recommendations, some of the holes have been rescheduled.

PCOM consensus:

Rescheduling of Leg 96 sites is recommended, if it does not interefere with staffing of the co-chief scientists. Authorization to drill is not required, but the USGS should be notified by DSDP in writing of the planned drilling well in advance of actual drilling.

Leg 94 (N. Atlantic Transect). (M. Arthur was unable to attend this portion of the PCOM meeting and requested that J. Honnorez present the following status report of Leg 94.)

The OPP reiterates that the amount of time available for drilling and transit time is critical, as well as having the proper "weather window". We have recalculated the operations time and 36 days is a realistic estimate to meet all objectives. We would like to drill the proposed sites essentially from south to north (1-2-3-4-7-6). Sites 2, 4, and 6 are highest priority to complete the primary objectives. All of our objectives are in Neogene and only one of our sites, (3) in Kings Trough, involves basement penetration; this is a lower priority objective. Since the time to achieve our objectives is tight, we would not entertain any deeper objectives, except possibly at site 7 where Paleocene lavas apparently underlie the site.

Site	Water Depth(m)	OPP Objective(m)	T.D.(m)
1	3198	450	750
2	3371	500	800
3	3520	600	600
4	3871	500	700
5	3200	600	1080
6	2393	315	630

Staffing: W. Ruddiman (L-DGO) has been invited as co-chief scientist. PCOM proposed R. Kidd (U.K.) as the other co-chief scientist.

Prospective AODP Member Country Reports

Canada (R. Hyndman reported.)

Canada has sent a letter of intent to participate in AODP and a Memorandum of Understanding between the US and Canada is now being discussed. The scientific community is looking forward to formal participation in the ocean drilling program, and to providing input during the planning stage.

Potential problems for Canada in respect to AODP membership are the continued financial problems in NSF, the possibility of CHALLENGER as the AODP drilling platform, and any other significant change in the program as it was originally presented to Canada. Some lack of credibility still exists from the Ocean Margin Drilling program experience. The ability to make a scientific case for sites of interest to Canada (Labrador Sea, Juan de Fuca ridge, Grand Banks, etc.) is important for Canadian participation; thus a drilling platform for AODP which can operate at high latitudes is important.

Funds for Canadian participation come from a federal agency, the Dept. of Energy, Mines and Resources. Particpation in EXCOM will come from that agency; other participation will come from the scientific community. At present funds for travel and participation at JOIDES Meetings are being sought. Proposals for ocean drilling related science are in competition with proposals from other areas of science; no special drilling fund exists.

Canada has 7 deep water vessels available for site surveys in or near Canadian waters. These vessels are avilable at no charge to Canadian universities. Major Canadian participation in AODP site surveys is anticipated. Ships are usually scheduled 6-12 months in advance. Additional data are available from the oil industry through an "open file" agreement.

J. Honnorez - Requested that Canada should begin to consider representatives to the JOIDES panels.

New Zealand. (Gerrit van der Lingen reported.)

At least 10 New Zealand scientists have participated in IPOD cruises, and New Zealanders were present at the November 1981 COSOD conference and EXCOM meeting.

Recently I. MacGregor (NSF) visited and presented several talks to various groups regarding AODP. Also, CHALLENGER visited Wellington in mid-January 1983 and several New Zealand scientists toured the ship and later attended a US Embassy reception; the CHALLENGER visit resulted in much favorable press covereage of ocean drilling.

At present, New Zealand's participation in AODP depends in part on Australia. A potential problem is the current lack of a choice of drilling platform if no decision is reached within 3 months, then some momentum for New Zealand participation would be lost.

New Zealand plans to have its own advisory structure to look at areas and assemble all available data. An ocean going vessel is available, but it is not equipped with multi-channel seismic gear.

Australia (Keith A. W. Crook reported.)

A proposal for full Candidate Membership of AODP from 1983 has been put forward by the Consortium for Ocean Geosciences (COGS), which is a university and not a governmental organization. The proposal is with the Minister for Science and Technology who referred it to the Australian Marine Sciences & Technologies Advisory Committee (AMSTAC) for advice. AMSTAC's report is not public. In a letter to COGS the Minister has acknowledged that the high scientific merit of AODP is not in question but that careful consideration of funding priorities will be required. COGS has geared on the assumption that there will be problems with funding. An early February appointment with the Minister has been requested. A request for $250K will be made to cover full Candidate Membership and associated travel.

The Bureau of Mineral Resources, which is the lead agency-designate, is strongly supportive of Australian participation in AODP. BMR has a resources-oriented brief. It is not well placed to argue a case for funding support of a fundamental science program.

Preliminary consideration is being given to the site survey implications of the drilling proposals contained in COGS Publication No. 1.

Australian-New Zealand cooperation in ocean drilling has been envisaged from the beginning. The form of this has cooperation yet to be determined. The New Zealand proposal for joint Candidate Membership of AODP has yet to be considered by COGS and the Australian Government. It may prove to be very timely.

For Australia, the first priority drilling targets in the region are, I believe, those on the Australian continental margin. Antarctic margin sites are presently topical in relation to Antarctic Treaty negotiation.

COGS recognizes that early Australian participation in the ADOP planning process is essential if Australia is to make the input appropriate to the program. This point has been argued to the Australian Government as justification for an early in-principle decision in favour of AODP Candidate Membership.

The question of Australian membership after 1985 has been separated from the Candidate Membership proposal on two grounds: review by the Australian Science & Technology Council (ASTEC) would be required, and this could not be undertaken in a timely fashion; information needed to answer questions ASTEC will ask can only be obtained by participating as a Candidate Member.

An AODP ship-track for the first 2½ years which is remote from targets of immediate interest to Australia will not help promote Australian participation. Australia looks forward to becoming a Candidate Member so that she may participate in the AODP planning process.

Tentative AODP Drilling Plan - Initial One or Two Years

As a part of the continuing planning for the post-1983 drilling program the PCOM has expanded the initial list of work areas (first identified by PCOM at its 7-9 July 1982 meeting and shown as table 3, p. 63, JOIDES Journal Oct. 1982) which contains important and plausible drilling targets for the first year or two of the AODP. This list is not viewed as an exhaustive one - additional work areas can be added where justified. The primary criteria for inclusion at this time are:

1. Broad consenses regarding the importance of the scientific problems to be addressed.

2. Availability of suitable data synthesis, regional and site specific surveys.

3. Availability of required drilling technology.

Consideration of the relative priorities of these candidate drilling targets (and of others to be identified by the future ADOP advisory structure) as well as proposals of specific initial ship tracks and schedules remains open pending constraints on a starting port and advice from all AODP participants.

AODP Drilling Platform - 3rd Option:

A. Shinn - Until very recently the cost of a commercial drilling ship has been double the cost of either CHALLENGER or EXPLORER. Recent changes in the demand for offshore drilling ships have been reflected in the lease price. At present the cost of long-term leasing of a commercial drilling platform has been competitive with CHALLENGER and EXPLORER.

A proposal had recently been received from SEDCO offering a commercial ocean drilling vessel, the SEDCO-472, for long-term lease to NSF as the AODP platform.

Lease rates of similar vessels have been in the range of $70-90K/day (vs. approximately $30-35K/day for CHALLENGER or EXPLORER. Recent changes in the off-shore drilling market have resulted in a drastic reduction in lease rates. The SEDCO proposal offers the SEDCO-472 for a basic rate of approximately $35K/day for 10 years. Thus the SEDCO-472 is a viable option as an AODP platform.

Principal dimensions and characteristics of the CHALLENGER, EXPLORER, and SEDCO-472 are as follows:

	CHALLENGER	SEDCO-472	EXPLORER
Length	400 ft	470 ft	617 ft
Beam	65 ft	70 ft	116 ft
Operating Draft	22 ft	25 ft	30 ft
Operating Displacement	10,600 tons	16,700 tons	44,400 tons
Installed Power	7,700 KW	14,700 KW	27,500 KW
Speed	12 Kts.	14 Kts	10 Kts
Crew	45	55	55
Scientific Party	29	50	50
Quarters	74	116	150
Liveability	poor	fair-good	excellent

Characteristics of the three ships which affect their ability to drill the more difficult scientific targets may be summarized as follows:

	CHALLENGER	SEDCO-472	EXPLORER
Drill String	23,000 ft	30,000 ft	33,000 ft
Heave Compensation	good	good	good
Mud/Cement Systems	limited	good	good
Casing Storage	limited	good	good
Riser & BOP	no	6,000 ft+	maybe someday
Weather Limits for drilling	less than other ships, but not precisely known	45 kts wind 15/26 ft seas 2.5 kt current	45 kts wind 15/26 ft seas 2.5 kt current
Sea Keeping	good	good+	excellent
High Latitude Capability	fair	fair-good	good
Lab. Space	4,500 ft2	9,000 ft2	19,000 ft2

The daily operating and capital costs associated with each ship may be summarized as follows (1983 dollars):

	CHALLENGER	SEDCO-472	EXPLORER
Day Rate	$33,600	$32,200	$33,600
Fuel @ $320/ton	3,520	5,400	7,200
Fuel Type	Diesel	Diesel	Heavy Oil
Other Costs	12,200	12,200	11,800
Total	$49,320	$49,800	$52,600
Budget Estimate	$53K/day	$53K/day	$57K/day
Capital Investment	$11M	$10M	$90M

In general, the SEDCO 472 is about 60 percent larger than CHALLENGER, but less than half the size of EXPLORER. Its size offers a significant advantage in accommodations and carrying capacity over CHALLENGER, but does now allow the really excellent laboratory arrangements possible on EXPLORER, or the greatly improved living space and the capacity for future growth possible on EXPLORER. Contrary to EXPLORER, SEDCO-472 could pass through the Panama Canal.

Consensus:

The Planning Committee was favorably impressed with the SEDCO-472 as a possible AODP drilling platform. It considered the potential use of the SEDCO-472 in a riser mode as an added advantage not present in either CHALLENGER or EXPLORER, and the fact that SEDCO-472 could navigate through the Panama Canal.

Future Advisory Structure for AODP

(At the 6-8 October 1982 PCOM meeting the future advisory stucture was discussed, and J. Cann was requested to write a sample mandate for the advisory panels. The sample mandate follows.)

1. The AODP volcanism, metamorphism, hydrothermalism and diagenesis panel (VHMD) is concerned with the following problem areas:

a. Processes of submarine volcanology, intrusion and plutonism; crustal construction at spreading axes; petrology, geochemistry, mineralogy, and magnetic and other physical properties of igneous and metamorphic rocks from the ocean floor, from seamounts, from oceanic plateaux, from volcanic arcs and from basin adjacent to volcanic arcs.

b. Processes of submarine hydrothermal circulation; petrology, geochemistry and mineralogy of hydrothermally altered rocks and hydrothermal deposits from the ocean floor; geochemistry and physical properties of hydrothermal solutions.

c. Processes of submarine diagenesis; geochemistry of pore waters from sediments and hard rocks; petrology, geochemistry and mineralogy of diagenetically altered sediments and hard rocks.

2. The VHMD panel will be responsible for planning and drilling of sites concerned with these problem areas at the following levels:

a. long-range identification of objectives and contribution to research proposals for future drilling operations;

b. selection of target areas within which these objectives can be met;

c. helping the site survey organization to plan surveys of the target areas;

d. identification of proponents or working groups for particular target areas;

e. selection of sites for location of drill holes wtihin the target areas so that objectives can be reached;

f. advice to the Project chief scientist on the selection of co-chief scientists and other scientists;

g. encouragement of specific shore-based laboratory work on the samples recovered by drilling;

h. advice to the Project curator on the handling of recovered samples;

i. advice to the Planning Committee and the Project chief scientist on provision of equipment for use on the drilling ship and in shore laboratories run by DSDP;

j. coordination of plans for down-hole experiments in projected holes.

3. In the course of the work specified in paragraph 2 the VHMD panel will maintain the closest contact with the appropriate regional panels, in particular during planning of survey work and site selection. The formation of joint working groups will often be appropriate and is encouraged.

4. The VHMD panel is reponsible to the AODP planning committee and will respond directly to request from it, as well as reporting to it on a regular basis.

5. The VHMD panel will act as a means of disseminating and correlating information in the appropriate problem areas by:

a. receiving reports from co-chief scientists on the progress with shore-based research on samples;

b. encouraging and sponsoring symposia at which the results of drilling will be discussed;

c. publishing progress reports in the open literature to inform and encourage participation in the Project.

Discussion:

Extensive discussion of the AODP advisory structure eventually resulted in two proposed structures, one of which would be selected by PCOM as a tentative advisory structure.

The following advisory structures were presented to PCOM :

(D. Hayes/Y. Lancelot version). Prioritization of drilling objectives should be achieved in the following way:

"Each thematic panel will identify drilling priorities within the scope of its mandate. The prioritized drilling objectives will be brought to the appropriate regional panel, which will recommend to the Planning Committee the relative priorities and identify opportunities to optimize the overall drilling effectiveness within its region of interest.

Both sets of priorities will be presented directly to the Planning Committee which will endorse or modify as appropriate the scientific drilling program presented by each regional panel, and furthermore will ensure that a proper balance is maintained among the various regions and themes."

(J. Cann version). The AODP advisory structure will contain a Planning Committee and a number of panels of different kinds:

a. thematic panels, concerned primarily with problems regardless of regions

b. regional panels, concerned primarily with the geology and geophysics of specific areas in relation to drilling. Their activity will be more or less intense as appropriate.

c. an engineering and technology panel

d. service panels, providing specific services to the project.

Drilling proposals will be made by any proponents from the scientific community either to the thematic panels or the regional panels as appropriate. After detailed interaction between panels of both kinds and by the creation of working groups charged with developing specific drilling proposals, both thematic and regional panels will present highly prioritized drilling proposals to the Planning Committee for integration into an overall program. Membership of both kinds of panels will have only a limited degree of overlap."

An informal vote for selection of one of the advisory structures resulted in the following resolution:

J. Cann's version of the AODP advisory structure is adopted by the Planning Committee as the initial advisory structure.

G. van der Lingen (N.Z.) Supports J. Cann's version of the advisory structure adopted by PCOM.

K. Crook (Aust.) The adopted advisory structure is acceptable to Australia.

Other Business

Ocean/Continental Drilling Liaison

J. Honnorez requested that PCOM consider the exchange of liaison members with the various continental drilling committees. Consideration of ocean and continental drilling would result in better science and more efficient scientific and budget planning.

Recipients of DSDP Samples and Data

Remember to send five reprints of any paper you have published using data or samples collected by or in conjunction with the Deep Sea Drilling Project to the DSDP Curator.

Curator
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093

Major- and Minor-Element Analyses

Major- and Minor-Element Analyses for igneous rocks are now available as listings or for computer searches. Both shipboard and shore laboratory data are included for DSDP Legs 13-62 and Legs 63-65. For information contact:

Donna Hawkins
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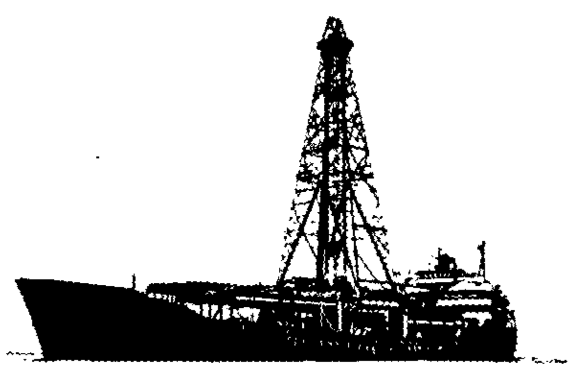
PCOM received from the Australian and New Zealand observers the following status list of future drilling targets in the Australasian region, based on COGS Publication No. 1.

Location	Weather	Site Survey	Regional Synthesis	Engrg. Tech.Dev.	Panel
Antarctic Margin (Ross Sea Prydz Bay)	S. Summer	?	OK	Safety?	OPP-PMP
Tonga/Kermadec /Kikurangi/ Fiordland Transects	-	OK (in part)	OK	-	AMP-OCP
Southern Australian Margin	-	NO	OK?	-	PMP-SP4
Kerguelen	S. Summer	NO	NO	-	OPP-PMP
Western Australian Margin	-	OK	OK	-	OPP-PMP
Banda Collision Zone	-	?	OK	-	AMP
Woodlark/ Solomons	-	Prob.OK	OK	-	AMP-OCP
Lord Howe Rise Margins	-	OK?	OK	-	PMP
Campbell Plateau Margins	-	OK?	OK	-	PMP



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Note: The JOIDES committees, panels and working groups are being reorganized for the Advanced Ocean Drilling Project and will appear in the next issue of the Journal. See the previous issue of the Journal (Vol. IX, No. 1, February 1983, pp. 91-104) for a more complete list.

DEEP SEA DRILLING PROJECT

LITERATURE AND SAMPLE INVESTIGATION

SEARCH REQUEST FORM

Any interested researcher may request a bibliographic search. Routine searches with printed results are done free of charge. Keyword searches will be done on two data files:

1. PUBLISHED PAPER FILE contains data on:

   a. Journal reprints received from authors in Curator's office (we have not exhaustively searched the literature for all DSDP related papers). Over 700 papers are indexed.

   b. Chapters (excluding Introduction and Site Chapters) from Initial Report Volumes 1-3, 6, 9, 10, 12, 13, 19, 22 and 24-33. (We are currently adding other published volumes.)

2. SAMPLE INVESTIGATION FILE contains data on:

   a. Abstracts of proposed sample investigations intended for journal publication. Over 2000 sample investigations are indexed.

LIST OF KEYWORDS AND/OR SITE NUMBERS you are interested in searching.

(NOTE: Keywords can be linked, such as RADS at SITE 380 or CLAY MINERALS in the SEA OF JAPAN.) List your own words if you do not see the exact keywords that are of interest to you.

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SEND SEARCH RESULTS TO:

Name ____________________________ Date ____________

Address ____________________________

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Send search request to:

Trudy Wood, Science Services Office
Deep Sea Drilling Project, A-031
University of California, San Diego
La Jolla, California 92093

11/82

KEYWORDS FOR DSDP LITERATURE AND SAMPLE INVESTIGATION SEARCHES
(searchable keywords are capitalized and underlined)

I. *VIEWPOINT OF STUDY*

Qualities:

a) Composition
   1) SEDIMENT CONSTITUENT ANALYSIS
   2) CHEMICAL COMPOSITION
   3) MINERAL COMPOSITION
b) TEXTURE (grain size, fabric)
c) Structure
   1) CRYSTAL STRUCTURES
   2) PRIMARY STRUCTURES
   3) SECONDARY STRUCTURES
d) Form or shape
   1) ORGANIC MORPHOLOGY
   2) INORGANIC MORPHOLOGY
   3) TOPOGRAPHY
   4) GEOMETRY (rock unit form)
e) COLOR
f) PHYSICAL PROPERTIES (in general)
   1) DENSITY
   2) ELECTRICAL PROPERTIES
   3) MAGNETIC PROPERTIES
   4) OPTICAL PROPERTIES
   5) POROSITY
   6) RADIATION
   7) SONIC PROPERTIES
   8) SHEAR STRENGTH (stresses, etc.)
   9) THERMAL PROPERTIES
   10) WATER CONTENT
   11) OTHER PHYSICAL PROPERTIES

Occurrences:

a) Space distribution
   1) GEOGRAPHIC DISTRIBUTION
b) Time distribution
   1) ABSOLUTE AGE
   2) Relative Age - STRATIGRAPHY
c) Numbers distribution - ABUNDANCES

Processes:

a) ALTERATION PROCESSES
b) CHEMICAL PROCESSES
c) EVOLUTION
d) IGNEOUS PROCESSES
e) MINERAL PROCESSES
f) SEDIMENT PROCESSES
g) TECTONIC PROCESSES

Relationships:

a) TAXONOMY
b) ENVIRONMENT

Synthesis studies:

a) SYNTHESIS

General studies:

a) CHEMISTRY
b) GEOPHYSICS
c) MINERALOGY
d) PALEONTOLOGY
e) PETROLOGY
f) PHYSICAL OCEANOGRAPHY
g) SEDIMENTOLOGY
h) SITE SURVEYS

II. *GEOGRAPHIC AREA*

ANTARCTIC OCEAN
ARCTIC OCEAN
(Arctic) NORWEGIAN-GREENLAND SEA
ATLANTIC OCEAN - EAST
ATLANTIC OCEAN - WEST
(Atlantic) MID-ATLANTIC RIDGE
BLACK SEA
CARIBBEAN SEA
GULF OF MEXICO
INDIAN OCEAN
MEDITERRANEAN SEA
PACIFIC OCEAN
(Pacific) BERING SEA
(Pacific) CORAL SEA
(Pacific) PHILIPPINE SEA
(Pacific) SEA OF JAPAN
(Pacific) TASMAN SEA
(Pacific) GULF OF CALIFORNIA
RED SEA

III. *AGES*

QUATERNARY
   1) HOLOCENE
   2) PLEISTOCENE
TERTIARY
   1) PLIOCENE
   2) MIOCENE
   3) OLIGOCENE
   4) EOCENE
   5) PALEOCENE
CRETACEOUS
JURASSIC
TRIASSIC
PALEOZOIC
PRECAMBRIAN

IV. *DSDP SITE NUMBERS*

ALL DSDP SITE NUMBERS ARE SEARCHABLE.

V. MATERIAL USED AS OBJECT OF STUDY

Water column:

a) WATER COLUMN
b) PLANKTON

Sea floor and ocean crust:

a) WATER-SEDIMENT INTERFACE
b) FOSSILS (in general)
   1) DIATOMS
   2) DINOFLAGELLATES
   3) EBRIDIANS
   4) FORAMINIFERA
   5) ICHTHYOLITHS
   6) MOLLUSCS
   7) NANNOFOSSILS
   8) OSTRACODS
   9) PALYNOMORPHS
   10) RADIOLARIA
   11) SILICOFLAGELLATES
   12) OTHER FOSSILS
c) MINERALS (in general)
   1) NON-SILICATE MINERALS
      a) CARBONATES
      b) HALIDES
      c) HYDROXIDES
      d) OXIDES
      e) PHOSPHATES
      f) SULFATES
      g) SULFIDES
   2) SILICATE MINERALS
      a) CLAY MINERALS
      b) ZEOLITES
      c) SILICA MINERALS
d) SEDIMENTS AND/OR SEDIMENTARY ROCKS
   1) CARBONACEOUS
   2) CARBONATE
   3) CLAY
   4) EVAPORITES
   5) METALLIFEROUS
   6) PHOSPHATIC
   7) SILICEOUS
   8) TERRIGENOUS
   9) VOLCANICS, ASHES
e) METAMORPHIC ROCKS
f) IGNEOUS ROCKS
   1) GABBRO CLAN, BASALTS
   2) GRANITE CLAN
   3) DIORITE, MONZONITE, SYENITE CLANS
   4) LAMPROPHYRES
   5) PYROCLASTICS
   6) ULTRAMAFIC CLAN
g) Other components
   1) CHEMICAL ELEMENTS
   2) HYDROTHERMAL DEPOSITS
   3) INTERSTITIAL GAS
   4) INTERSTITIAL WATER
   5) EXTRA-TERRESTRIAL MATERIAL
   6) ORGANIC CARBONS
h) Other features
   1) TOTAL STRATIGRAPHIC COLUMN
   2) REFLECTOR
   3) HORIZON
   4) UNDERSEA FEATURES (basins, ridges, trenches, etc.)

V. MATERIAL USED AS OBJECT OF STUDY (Cont'd.)

i) Data used for study
   1) BATHYMETRY
   2) MAGNETICS
   3) NAVIGATION
   4) SEISMIC PROFILES
   5) WELL LOGS
   6) SITE SURVEYS
   7) IGNEOUS ROCK DATA
   8) PALEO/BIOSTRAT DATA
   9) SMEAR SLIDE DESCRIPTIONS
   10) VISUAL CORE DESCRIPTIONS
   11) CARBON-CARBONATE ANALYSES
   12) GRAVIMETRIC CHEMISTRY DATA
   13) GRAIN SIZE
   14) SONIC VELOCITY
   15) G.R.A.P.E. DATA
   16) X-RAY MINERALOGY
   17) INTERSTITIAL WATER DATA
   18) THERMAL CONDUCTIVITY
   19) LITHOLOGIC AGE DATA
   20) OTHER DATA

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