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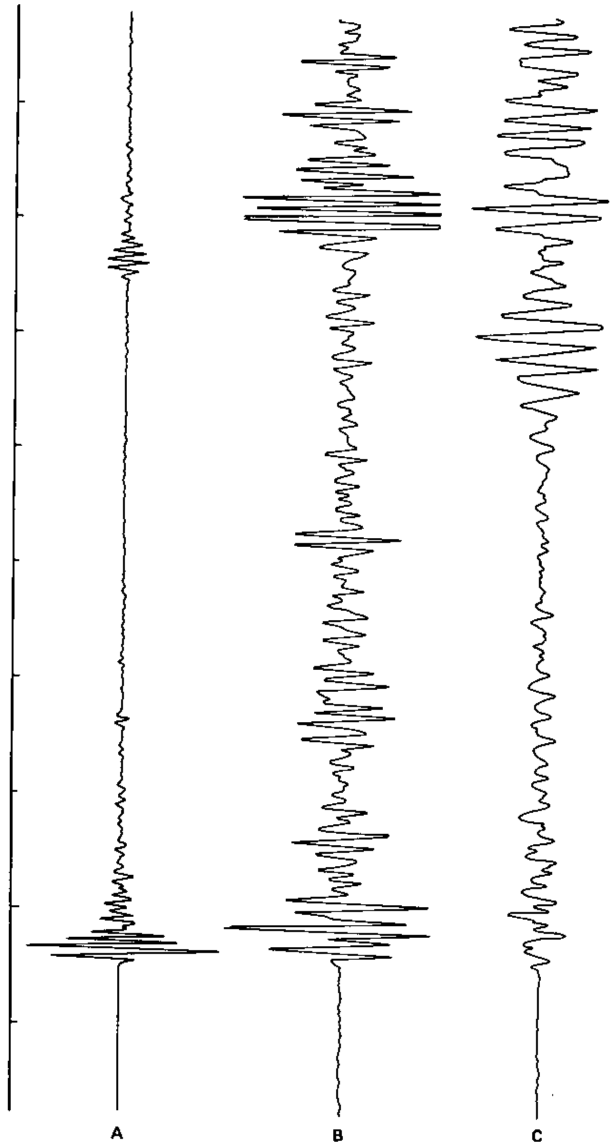

William Grosskopf and Charles Coker of Teledyne Geotech inspect the DARPA downhole seismometer package aboard *Glomar Challenger* during Leg 78B.

Cover: Seismic data recorded during Leg 78B on board *Glomar Challenger* from DARPA vertical component seismometer emplaced 608 meters below the seafloor in Hole 395A. Trace A represents the vertical incidence record obtained with a 1-lb charge; traces B and C were obtained using 5- and 130-lb charges detonated 10.4 and 44.8 km, respectively, from the site. All traces filtered through 2-10 Hz bandpass filter. Tick marks spaced at 1-sec intervals. Arrival at 6.0 seconds after first arrival in trace A represents the first multiple.

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TENTATIVE *GLOMAR CHALLENGER* SCHEDULE, LEGS 80-88[1]

Leg	Departs	Departure Date	Total Days	Days Opers.	Days Steaming	Terminates at	Arrival Date	Port Days	Re-entry	Objective
80	Brest, France	7 Jun 81	45	41	4	Southampton	22 Jul 81	5	No	Northern margin of Bay of Biscay
81	Southampton, U.K.	27 Jul 81	51	40	11	Azores	16 Sep 81	5	Possible	Rockall Bank
82	Punta Delgada, Azores	21 Sep 81	50	32	18	Balboa, Panama	10 Nov 81	5	No	North Atlantic Mantle Heterogeneity
83	Balboa, Panama	15 Nov 81	51	45	6	Balboa, Panama	5 Jan 82	5	Yes	Costa Rica Rift Deepen Hole 504B
84	Balboa, Panama	10 Jan 82	51	44	7	Manzanillo	2 Mar 82	5	Possible	Mid-America Trench
85	Manzanillo, Mexico	7 Mar 82	51	23	28	Honolulu	27 Apr 82	5	No	Equatorial Pacific Paleoenvironments
86	Honolulu, Hawaii	28 Apr 82	16	--	16	Yokohama, Japan	14 May 82	10		Transit — Bi-Annual Drydock
	Yokohama, Japan[2]	24 May 82	29	23	6	Yokohama, Japan	22 Jun 82	5	yes	Seismic Experiment
87	Yokohama, Japan	27 Jun 82	51	32	19	Hokodate, Japan	17 Aug 82	5	Yes	NW Pacific — Paleoenvironment[3]
88	Hakodate, Japan	22 Aug 82	51	47	4	Yokohama, Japan	12 Oct 82	5	Possible	Japan Trench

[1]Compiled 10 June 1981. Schedule is subject to change.
[2]Pick up scientific team.
[3]The JOIDES Planning Committee has not yet reviewed the scientific objectives of Leg 87.

SHIPBOARD SCIENTIFIC PARTIES

Leg 79

K. Hinz	Co-chief scientist	FRG - BGR
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L. Jansa	Sedimentologist	Canada - Geol. Surv.of Canada
J. Moore	Sedimentologist	USA - Univ. Montana
T. Steiger	Sedimentologist	FRG - Univ. Muenchen
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Leg 80

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R. Cunningham; Jr.	Organic geochemist	USA - Exxon
D. Waples	Organic geochemist	USA - Mobil
L. Montadert	Physical properties specialist	France - Inst. Francais du Petrole

Leg 81

D. Roberts	Co-chief scientist	UK - IOS
D. Schnitker	Co-chief scientist	USA - NSF

GLOMAR CHALLENGER OPERATIONS

CRUISE SUMMARIES

Leg 77 — The Gulf of Mexico[1]

Leg 77 began on 27 December 1980 in Ft. Lauderdale, Florida and ended on 30 January 1981 in San Juan, Puerto Rico. Eight holes, drilled at six sites in a small area of the southeastern Gulf of Mexico, achieved the principal objectives of the cruise.

Introduction

The history of the central North Atlantic is probably the best known of all ocean basins, but the origin and history of the neighboring Gulf of Mexico are still very much uncertain. Some geologists consider it the oldest ocean basin still in existence, while others doubt that it has proper oceanic crust. After a decade of extensive geophysical studies, however, recent opinions seem to converge on a model that calls for, (1) Triassic through middle Jurassic rifting and attenuation of continental crust, accompanied by mafic injections and deposition of salt in rift basins, (2) a brief episode of seafloor spreading in the late Jurassic, and (3) a long history of subsidence and deep-sea sedimentation which includes a major period of erosion and depositional change in the middle Cretaceous (Albian-Cenomanian). Extensive multichannel seismic surveys have shown that the deep reflectors in the western Gulf basin rise southeastward and come within reach of the *Glomar Challenger*'s drill string in the western approaches of the Straits of Florida. There it is possible to test at least part of the model.

Leg 77 was designed to penetrate the sedimentary sequence in the southeastern Gulf and also to reach basement. Because of block faulting and submarine erosion, different horizons of the sequence appear at various sub-bottom depths, but they have been correlated by a dense grid of seismic lines. Our strategy on Leg 77 was thus not to attempt deep penetration at one re-entry site but to drill two sets of single-bit holes. The first set, located on the flank of an erosional valley (Sites 535 and 540) was planned to examine the mid-Cretaceous unconformity and penetrate as deep as possible into the lower Cretaceous-Jurassic section below it. The second group of holes, located on high-standing fault blocks (Sites 536, 537, and 538) was planned to recover basement and its early sediment cover.

We drilled eight holes at six sites in a small area of the southeastern Gulf of Mexico. Drilling at Sites 535 and 540 encountered a continuous sequence that covers the interval from Berriasian to upper Miocene. Sites 536 through 538 penetrated pre-Mesozoic basement in two places and document, in shortened sections, the transition from terrestrial to shallow marine, and finally to deep-sea conditions.

Figures 77-1 and 77-2 show the location and a stratigraphic summary of the Leg 77 sites. Site data are summarized on Table 77-1.

Site 535

Site 535 is located near the axis of a submarine valley that cuts several hundred meters into Lower Cretaceous rocks and thus provides easy access to deep horizons. We observed the following stratigraphic sequence:

Unit I: 154 meters, Quaternary. Terrigenous muds with sparse layers of globigerinid-pteropod sand. The nannoflora contains abundant Campanian elements indicating outcrops or subcrops of Upper Cretaceous ooze nearby.

Unit II: 233 meters, lower to middle Albian. Medium-gray limestone with radiolarians, scarce nannoplankton and foraminifers; extremely homogeneous; laminated at the top, gradually passing into rhythmic alternations of lighter and darker bands, carbonaceous beds below; intercalation of coarse calcarenite with shallow-water debris at 187-211 meters. This unit's high rate of deposition suggests it received an additional contribution of neritic lime mud.

Units III, IV and V: 327 meters, middle Berriasian to lowermost Albian. Rhythmic alternation of light-colored, bioturbated limestone, darker laminated limestone and very dark carbonaceous marl, suggesting intermittent anaerobic conditions, probably coupled with fluctuations of plankton productivity. Abundant ammonites together with aptychi and well

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[1]From a preliminary Leg 77 report prepared by Richard T. Buffler, Wolfgang Schlager (co-chief scientists), Jay L. Bowdler, Pierre H. Cotillon, Robert B. Halley, Hajimu Kinoshita, Leslie B. Magoon, Charles L. McNulty, James W. Patton, Kenneth A. Pisciotto, Isabella Premoli-Silva, Otmara Avello Suarez, Margaret M. Testarmata, Richard V. Tyson and David K. Watkins.

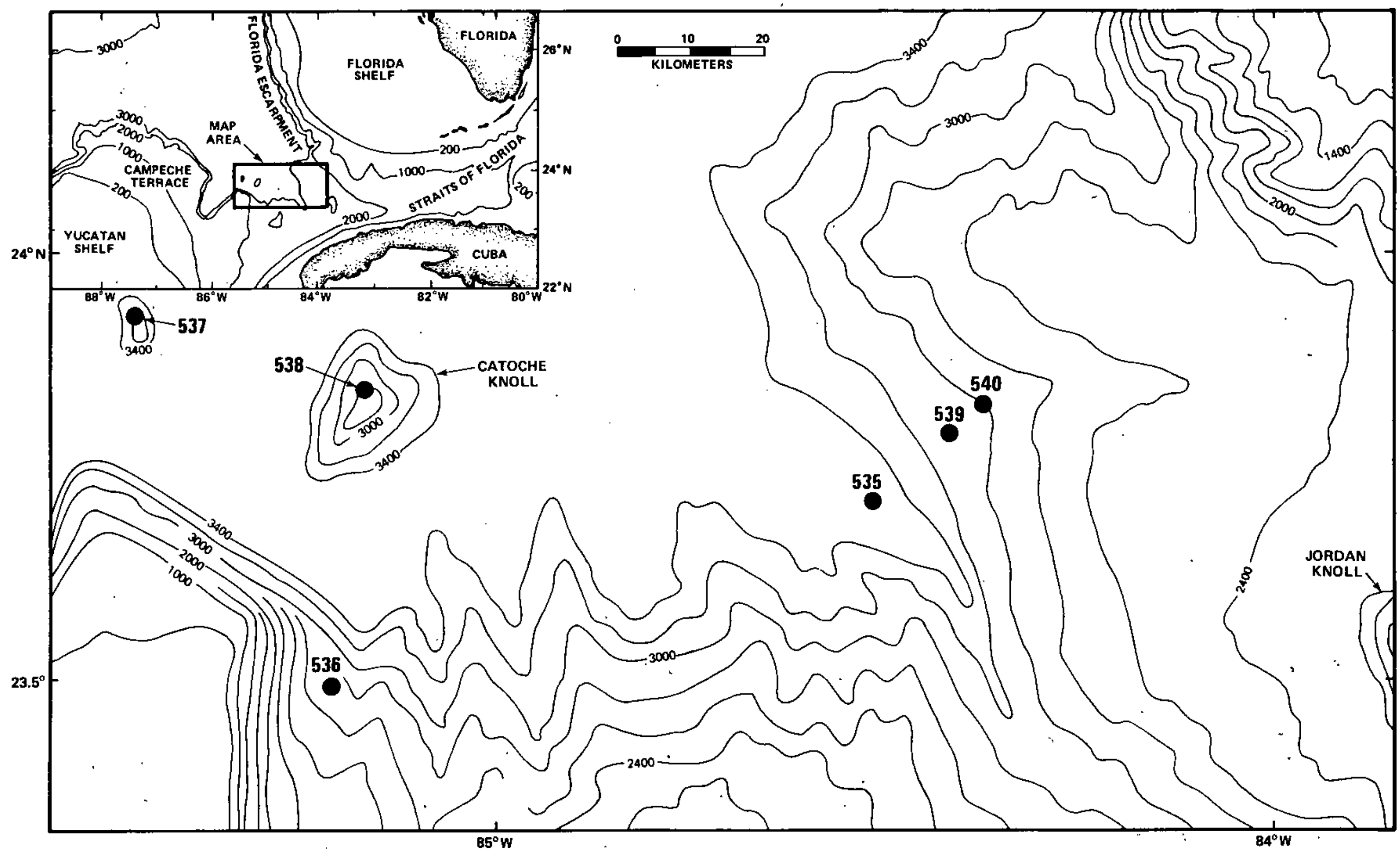

Figure 77-1. Location map of sites drilled during Leg 77. The bathymetric contours are in meters.

Table 77-1. Leg 77 Coring Summary

Hole	Dates (1980)	Latitude	Longitude	Water Depth[1] (m)	Sub-bottom Penetration (m)	No. of Cores	Meters Cored	Meters Recovered	Per Cent Recovery
535	29 Dec 80-8 Jan 81	23°42.48′N	84°30.97′W	3450	714.0	79	714.0	505.07	71
536	9-11 Jan	23°29.39′N	85°12.58′W	2790	213.0	23	213.0	65.73	31
537	11-13 Jan	23°56.01′N	85°27.62′W	3123	225.0	17	153.5	15.87	10
538	14 Jan	23°50.98′N	85°10.26′W	2820	6.0	1	6.0	5.15	86
538A	14-17 Jan	23°50.95′N	85°09.93′W	2742	332.5	36	332.5	137.67	41
539	18 Jan	23°47.34′N	84°25.19′W	3089	7.0	2	7.0	4.40	63
539A	18-19 Jan	23°47.20′N	84°25.19′W	3076	7.5	1	7.5	7.23	96
540	19-25 Jan	23°49.73′N	84°22.25′W	2926	745.5	79	745.5	335.75	45
						238	2179.0	1076.87	49

[1]Water depths from sea level.

preserved nannofloras suggest very weak carbonate dissolution. The lowermost 10 meters are mainly nodular cephalopod limestone with abundant hardgrounds. Dark marls throughout this unit are good, but immature, source rocks for hydrocarbons. Tar-filled fractures with a halo of oil stains in the 530-590 meter interval suggest upward migration from more mature source rocks deeper in the section.

Site 540

Site 540 is located on a gently dipping slope where erosion has removed most of the Neogene cover. We continuously cored a section of Albian to upper Miocene ooze, chalk and limestone.

Unit I: 4.5 meters, Quaternary. Nannofossil marl that forms a thin veneer on Tertiary erosional relief.

Unit II: 268 meters, middle Paleocene to Miocene. Unit II consists of nannofossil-foraminifer ooze, chalk, and marl with layers of volcanic ash. We subdivided it into *Subunit IIa*, a uniform sequence of ooze and chalk (upper Miocene), *Subunit IIb*, cyclic alternation of chalk and marl (upper Oligocene to middle Miocene), and *Subunit IIc* with lithologies as IIb but deformed by creep and slumping.

Unit III: 56 meters, upper Cenomanian(?) to upper Paleocene. The unit consists of 56 meters of chalk with slump folds and with large claystone and marl pebbles, capped by 3 meters of graded conglomerate and sandstone (mainly volcanic and limestone material). On the basis of depositional structures and textures, we interpret these beds as gravity flow deposits, transported by mud flows, debris flows and turbidity currents. Although genetically similar, the formation may straddle a gap of 30 million years, because the graded bed at the top was deposited during the late Paleocene whereas the pebbly chalks have so far yielded only late Cenomanian and older biota. (The absence of Upper Cretaceous sediments is a regional phenomenon that we disscuss below.)

Unit IV: 170 meters, upper Albian to lower Cenomanian. Rhythmic alternation of (1) light-colored, slightly siliceous bioturbated limestone containing radiolarians, and (2) dark, carbonaceous limestone. Nodules of black chert and shallow-water carbonate sand, and occasional pebbles occur throughout. The dark

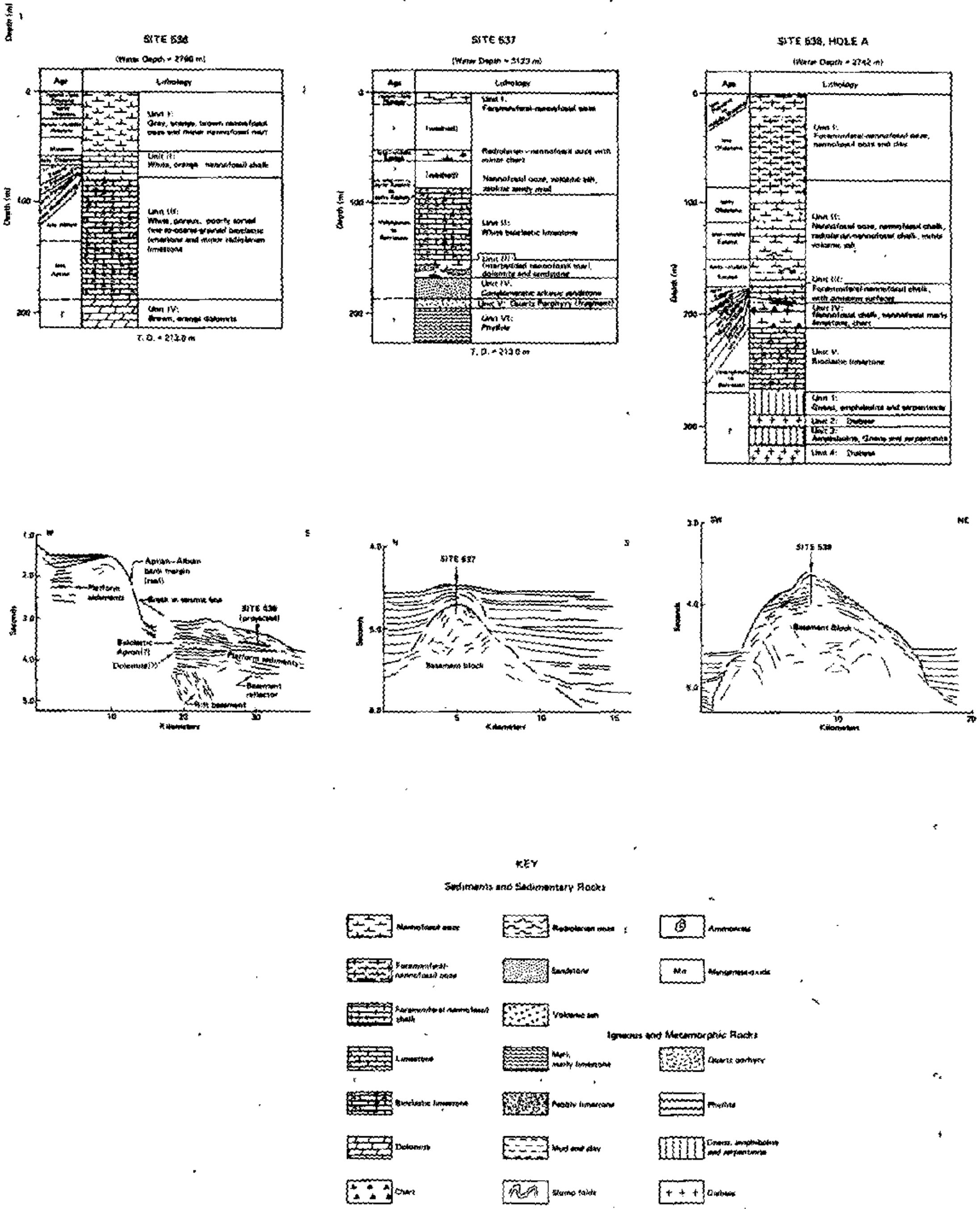

Figure 77-2. Stratigraphic summary and seismic profile sketches of Leg 77 drill sites.

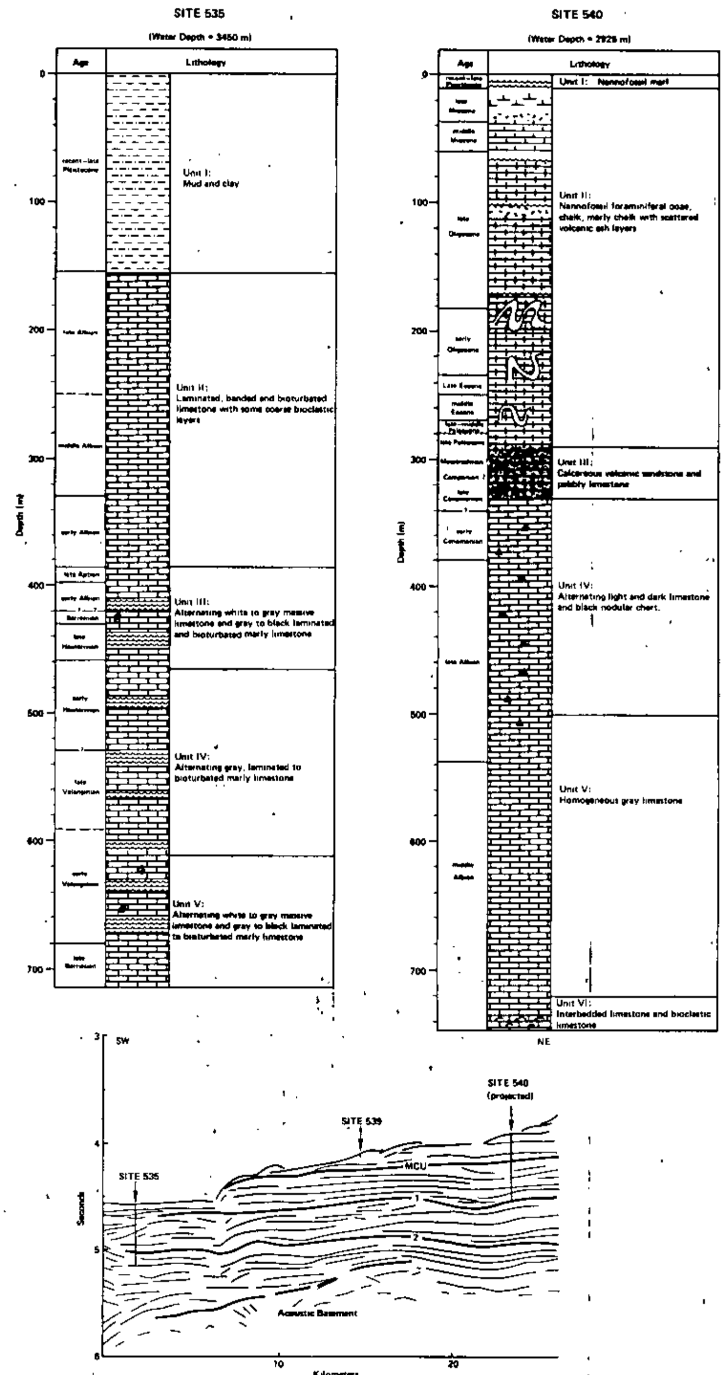

Figure 77-2 (continued)

carbonaceous limestone is a good, but immature source for hydrocarbons.

Unit V: 218.5 meters, middle to upper Albian. Lithologies are similar to those of Unit IV but the light-dark rhythmic alteration is more subdued. Uniform, indistinctly layered, barren limestones predominate. Chert is nearly absent and the pyrite content — of up to 8 per cent — causes conspicuous mottling.

Unit VI: 28.5 meters, middle Albian. Fine-grained, light and dark limestones as in Unit V plus coarse calcarenites with shallow-water skeletal carbonate debris; intensive bioturbation.

Stratigraphically, the sequence of Site 540 continues at Site 535. The lowermost 85 meters in Site 540 belong to the same biozone as the topmost 170 meters in Site 535. Lithology and seismic stratigraphy suggest that no physical overlap exists between the two sections but that the gap is probably less than 100 meters. Taken together, Sites 535 and 540 bracket seismic unconformity 1 (Fig. 77-2) and date it as middle Albian. The unconformity corresponds to the top of a unit of slumps and debris-flows with shallow-water carbonate material. Another seismic marker, the MCU or "mid-Cretaceous unconformity" which is widely mapped throughout the Gulf (Fig. 77-2), turns out to be a bundle of unconformities at Site 540, ranging in age from Cenomanian to Paleocene.

Site 536

Site 536 was the first of three short holes to be drilled into high-standing basement blocks. The site is located on a submarine ridge at the base of the Campeche Escarpment. Although we had to terminate drilling because of unstable hole conditions before definite basement was reached, we recovered a very interesting Tertiary-Cretaceous sequence with diverse lithologies.

Unit I and II: 80 meters, upper Maestrichtian to Holocene.

These units represent a condensed section of varicolored nannofossil ooze and chalk with intercalations of marl and volcanic ash. Sharp lithologic boundaries, missing biozones, abundant glauconite and very low overall accumulation rates suggest that the sequence was deposited under conditions of intermittent pelagic sedimentation, punctuated by hiatuses. This is compatible with the site's location on a topographic high. Despite the apparent breaks in the stratigraphic record, preliminary determinations of foraminifer zones suggest a relatively complete Cretaceous-Tertiary transition at this site.

Unit III: 104 meters, upper Aptian. White, porous limestone composed of shallow-water, skeletal sand and rubble and interbeds of pelagic chalk with radiolarians and pelagic foraminifers. The formation is interpreted as a submarine talus deposit at the foot of a 1000-meter high Cretaceous platform slope, which is represented today by the Campeche Escarpment five km west of the drill site.

Unit IV: 29 meters, age unknown. Dense, brown, marly dolomite with sucrosic, vuggy layers. Crinkled algal laminations, bird's eye vugs and skeletal sands with molds of mollusks suggest its deposition in a very shallow marine to intertidal environment. The rock is clearly a replacement of limestone. Its low porosity and high sonic velocity indicate it was subjected to deep-burial diagenesis. The rock contrasts sharply with the overlying Aptian limestone which argues for its considerably greater age, probably early Mesozoic or Paleozoic.

Site 537

Site 537 is on an isolated seamount that appears in seismic sections as the upper edge of a tilted basement block covered by a few hundred meters of sediment. Drilling confirmed this assumption. We were able to penetrate 225 meters of sedimentary section and also recover two cores in basement before caving forced us to abandon the hole. Originally, we planned to hydraulic piston core (HPC) the section of pelagic ooze and thus spot-cored down to 100 meters. The plans for piston coring were dropped, however, when hard ash layers, encountered at a shallow depth, made it unlikely that we would reach the pre-Eocene section with the HPC.

Unit I: 92.5 meters, Aptian to Pliocene. Pelagic ooze of a very different age and slightly different composition was included in this unit. We recovered only three cores which contained nannofossil-foraminifer ooze (lower Pliocene), radiolarian-nannofossil ooze (middle Eocene), nannofossil ooze with ash and zeolitic sandy mud (upper Cretaceous(?), Paleocene and lower Eocene) and nannofossil ooze and chalk (Aptian). As in Hole 536, the pelagic sequence reflects intermittent sedimentation beyond the reach of turbidity currents, with long hiatuses and slow rates of deposition.

Unit II: 57.5 meters, Berriasian to Valanginian. Lime-grainstone or packstone with lithoclasts and fragments of mollusks, corals, and echinoderms that suggest its formation on a shallow carbonate platform, but the common occurrence of calpionellids and nannoconids in the muddy matrix point to a pelagic depositional environment. It remains an open question whether or not the limestones represent an autochthonous cap of shallow-water deposits on the uplifted fault block or part of the talus apron at the foot of the Campeche Escarpment.

Unit III, IV and V: 47 meters, lowermost Cretaceous to upper Jurassic(?).

Unit III consists of sandy dolomitic marl and gray arkose. Ostracods, sparse foraminifers, and coal fragments indicate that the unit was deposited in a littoral environment. The underlying **Unit IV** and probably **Unit V** consist of poorly sorted, red arkoses and conglomerates with ash layers. Clasts include acid volcanic rocks, schist and granite. We interpret the rocks as very immature alluvial deposits close to a hinterland of mixed igneous and metamorphic terranes. Unit III through V mark the transition from terrestrial to marine conditions on this part of the ocean margin.

Unit VI: 19 meters, pre-Mesozoic. This unit consists of phyllite with thinly graded sand layers. Slight dynamic metamorphism and a dip of 10° clearly separate this rock from all overlying sediments. We consider this rock to be part of the pre-Mesozoic continental basement.

Site 538, Holes 538 and 538A

Hols 538 and 538A were drilled on Catoche Knoll, one of the highest topographic features in the area, alternatively considered an elevated basement block, a volcano, or a salt dome. Recent seismic surveys strongly support the fault-block origin. The site was difficult to spud but conditions improved deeper in the hole and we were able to drill 64 meters into basement.

Unit I and II: 173.5 meters, Eocene to Miocene. Foraminifer-nannofossil ooze, chalk, a few ash layers, abundant radiolarians in the Eocene. The sequence was deposied at highly variable rates that were highest in the late Oligocene.

Unit III: 16 meters, Santonian to upper Paleocene. This unit represents a condensed sequence of foraminifer-nannofossil ooze and chalk with numerous oxide-coated omission or hard-ground surfaces, and ash layers. In spite of very low rates of deposition we found little evidence for carbonate dissolution except in the upper Maestrichtian sequence.

Unit IV: 22 meters, upper Albian. Laminated limestone, dark, carbonaceous marl and black chert form the dominant lithologies of this unit and resemble rocks of comparable age recovered at Site 540. A few short isolated intervals of white, soft carbonatee ooze in the same cores are of the same age but contrast sharply in facies; they are nearly devoid of organic matter and show no diagenetic alteration.

Unit V: 57 meters, upper Berriasian to lower Valanginian. Oolitic-onkolitic limestone with shallow-water skeletal material and minor admixtures of planktonic elements (foraminifers, calpionellids).

The unit is very similar to Unit II at Site 537 and represents either an autochthonous carbonate platform or an uplifted part of the talus apron at the foot of the Campeche platform. On seismic lines, the reflector at top of the limestone appears completely flat over a domed basement reflector after correction is made for the velocity "pull up." This observation and the fact that the unit shows at least three biozones in normal succession weigh heavily in favor of its *in situ* origin. A thin layer of pelagic chalk immediately overlying basement rocks, however, indicates deep water conditions prior to uplift of the block into the photic zone.

Unit VI: 64 meters, age unknown. Granitic gneiss and amphibolite intruded by several generations of partly serpentinized diabase. Both metamorphic and igneous rocks are intensively faulted and sheared.

We interpret these rocks as pre-Mesozoic continental basement dissected by dikes or Mesozoic oceanic material, and consider the whole complex as an example of the transitional crust commonly postulated as having formed on rifted continental margins.

Summary

In looking back over this brief description of the main findings at each site, we realize that several major points are not covered because they require that several or all the sites be viewed together. Three such findings are as follows.

The lack of Upper Creraceous sediment. None of the sites drilled in the southeastern Gulf of Mexico contains more than a few meters of Upper Cretaceous sedimentary rock. At some sites rocks of this age are totally missing. In the western North Atlantic, too, Upper Cretaceous sequences are thin or missing. There the hiatus is easily explained by slow sedimentation below the CCD and subsequent extensive erosion during the Tertiary (Oligocene) by bottom currents. Neither of these explanations holds for the southeastern Gulf of Mexico. Erosion during the Tertiary in the drilled area did not affect the Cretaceous sequence because we recovered thick sections of Paleocene through Oligocene sediments at Sites 537, 538, and 540. We also see no evidence of approaching the CCD during the Late Cretaceous. The Albian-Cenomanian limestones at Site 540 are characterized by extremely high rates of carbonate deposition; thin intervals of Upper Cretaceous rocks at Site 540 and elsewhere in the southeastern Gulf represent a puzzle for which we have no definite explanation. Four factors may have acted singly or in conjunction with one another: (a) low plankton productivity in the Gulf basin, (b) low contribution of fine neritic carbonate from the shelves where the carbonate platforms were largely drowned in Albian-Cenomanian time, (c) episodic scouring by bottom currents that are commonly assumed to have intensified during the Late Cretaceous, and finally (d) décollement of the Upper Cretaceous sediment cover owing to tectonic movements during Maestrichtian, to Eocene time, possibly associated with an orogeny in Cuba.

Comparison with the western North Atlantic: Deposition in the two basins was very similar during the Neocomian with limestone being deposited (Blake-Bahama Formation) but the trends diverged from then on. The equivalent of the Atlantic Hatteras shale, deposited under anaerobic conditions below the CCD, is a thick sequence of limestone in the southeastern Gulf of Mexico, indicating deposition above the CCD, intermittent anaerobism and massive influx of neritic carbonate from the surrounding platforms. Whereas sedimentation in the Atlantic from the Early Cretaceous on became dominantly terrigenous, the eastern Gulf of Mexico remained a carbonate basin until the Tertiary when mountain building in the west changed the drainage pattern.

Origin of the Gulf of Mexico: Our findings on many points confirm the above-mentioned model of the origin of the Gulf. We found, for instance, "transitional" crust, evidence for rifting and block-faulting near sea level, followed by transition from shallow marine to pelagic conditions. However, we recognize a distinct [illegible] events to be younger than anticipated. The transition from terrestrial to marine sedimentation occurred approximately at the Cretaceous/Jurassic boundary rather than during the early Mesozoic. The two deepest seismic unconformities mapped so far were found to be Early Cretaceous, not Jurassic in age; some of the fault blocks do not seem to have subsided below the photic zone until well in the Early Cretaceous and block faulting persisted at least until the Late Cretaceous or early Tertiary. Additional shore-based work is planned to test whether the mafic intrusions at Site 538 are indeed of early Mesozoic age, as postulated, or if they, too, are younger.

Leg 78A[1], Eastern Caribbean Sea

Leg 78A began on 11 February 1981 in San Juan, Puerto Rico and ended at that port on 12 March 1981. Six holes drilled at three sites on the edge of the Barbados Ridge complex and adjacent Atlantic crust recovered 841 meters of Upper Cretaceous to Quaternary sediments.

During Leg 78A we drilled three sites, two (Sites 541 and 542) into the seaward edge of the Barbados Ridge complex, and one (Site 543) into the adjacent Atlantic oceanic crust. At Site 543, the drill penetrated 411 meters of Quaternary to Upper Cretaceous hemipelagic calcareous to clayey pelagic sediments that overlie basaltic oceanic crust. This sequence records the birth and sedimentary evolution of an oceanic crustal sequence overprinted by a Neogene influx of ash and detrital clay from the Lesser Antilles Arc. At Sites 541 and 542, we penetrated 560 and 325 meters, respectively, of Neogene hemipelagic to pelagic sediments lithologically and paleontologically identical to the younger sediments at Site 543. Thus such deposits at Site 541 and 542 are apparently scraped off the down-going plate as previously inferred from seismic data. A repetition of Pliocene and Miocene sediments at Site 541 documents the occurrence of major thrust or reverse faulting during the initial period of offscraping. Although the offscraped terrane is acoustically chaotic, drilling documented that it is coherent, though faulted, folded and thickened. (Table 1 summarizes the coring operations.)

---

[1]From a preliminary report prepared by Bernard Biju-Duval, J. Casey Moore (co-chief scientists), James Bergen, Grant Blackinton, George Claypool, Darrel Cowan, Frederick Duennebier, Rodolfo Guerra, Christoph Hemleben, Donald Hussong, Michael Marlow, James Natland, Carol Pudsey, G. Renz, Marc Tardy, Mark Willis, Douglas Wilson, and Audrey Wright.

Table 78A-1. Leg 78A Coring Summary

Hole	Dates (1980)	Latitude	Longitude	Water[1] Depth (m)	Sub-bottom Penetration (m)	No. of Cores	Meters Cored	Meters Recovered	Per Cent Recovery
541	13-21 Feb	15°31.201′N	58°43.663′W	4940	459	50	459.0	400.8	87.3
542	21-22 Feb	15°31.184′N	58°42.787′W	5016	240	7	66.50	52.6	79.0
542A	22-23 Feb	15°31.174′N	58°42.802′W	5016	325.5	12	114.0	90.0	79.1
542B	24-27 Feb	15°31.198′N	58°42.793′W	5016	325.5	0	0	0	0
543	28 Feb - 3 Mar	15°42.726′N	58°39.243′W	5633	332	34	324.0	228.4	70.5
543A	3-9 Mar	15°42.738′N	58°39.216′W	5633	455	16	142.5	69.4	48.7

[1]Water depths from sea level.

The structural fabric of the offscraped deposits at Sites 541 and 542 is disharmonic and the sediments were probably deposited along a décollement, and are underlain by an acoustically layered sequence, suggesting subduction of the latter. Cores recovered from the possible décollement surface at both Sites 541 and 542 show scaly foliation, disruption, and locally resemble fault gouge. An inadvertent packer experiment in the possible décollement zone measured lithostatic fluid pressures which probably facilitate the selective subduction of the pelagic sediments beneath the offscraped deposits. A transition from smectite to radiolarian mud with associated increases in density and strength probably accounts for the initiation of décollement formation during underthrusting of the oceanic sedimentary section.

INTRODUCTION[2]

The imbricate-thrust model provided a timely conceptualization of subduction-zone structure in the early to mid 1970's. This model has been used widely to interpret geophysical data from modern convergent margins as well as to interpret structural profiles from supposed ancient equivalents. DSDP drilling has critically tested the imbricate-thrusting concept along transects across Pacific subduction zones. Landward of the Middle America Trench off southern Mexico drilling has indeed documented the progressive accretion of trench deposits much as predicted by the imbricate thrust model. Southward along the trench, however, large-scale sediment subduction apparently is occurring simultaneously. Tectonic hypotheses combining sediment subduction, subduction erosion, and accretion have been invoked to explain results of DSDP transects across convergent margins in the western Pacific. Clearly the diversity of tectonic regimes acting on modern convergent margins requires processes other than accretion and imbricate thrusting. We need to develop a range of tectonic models to interpret effectively new observations from both modern and ancient subduction complexes. The factors causing certain convergent margins to be dominated by sediment subduction or offscraping remain elusive and controversial.

Modern subduction zones constitute the best regions to test tectonic processes and to develop suitable models as their setting is unequivocal. These regions are best studied by combining geophysics, surface sampling, high-resolution bathymetric surveys, and drilling. Here we report the results of drilling across the intra-oceanic Lesser Antilles Arc and associated subduction complex.

[2]The authors have referred to the work of many other people. The Leg 78A Preliminary Report, available from the Deep Sea Drilling Project, contains an expanded discussion and a complete list of references.

REGIONAL SETTING

The Lesser Antilles intra-oceanic arc is flanked on the west by the Grenada Basin, a possible back-arc basin and to the west by Atlantic oceanic crust (Figure 78A-1). The oceanic crust underthrusts the arc at 2 cm/yr in a westerly direction and can be traced seismically to a depth of about 200 km. The forearc of the Lesser Antilles consists of the Barbados Ridge complex which is a probable accretionary terrane and the Tobago and Barbados troughs. The major forearc basin, the Tobago Trough and its nothward continuation the Lesser Antilles Trough, includes more than 4 km of fill which to the east becomes progressively more deformed and acoustically incorporated into the Barbados Ridge. The Lesser Antilles volcanic arc is currently active and the oldest

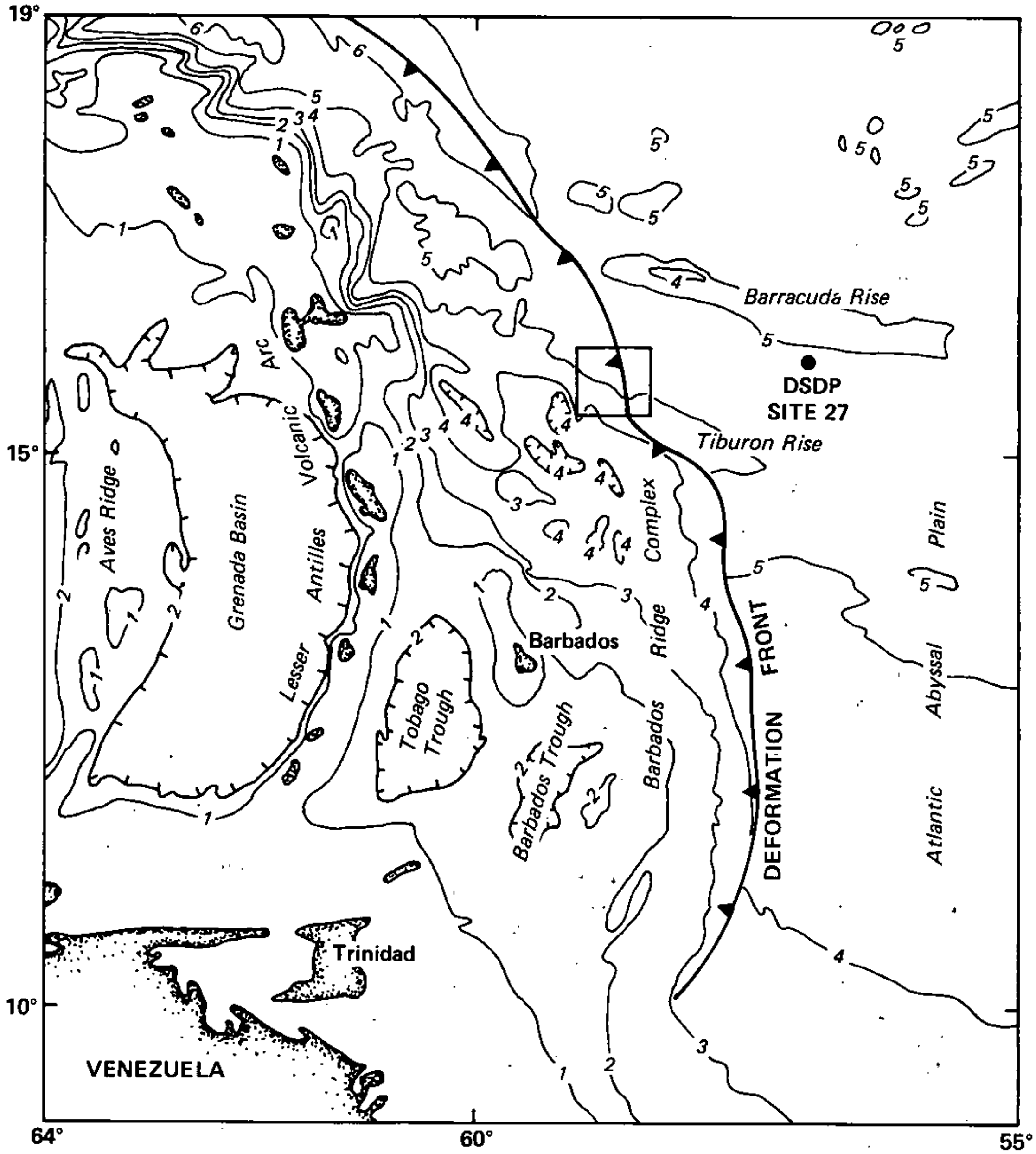

Figure 78A-1. Regional map of the Eastern Caribbean. Note position of deformation front defining eastward boundary of the Barbados Ridge complex and Tiburon Rise underthrusting deformation front near Sites 541, 542 and 543. The water depth contours is in kilometers.

volcanic rocks are dated stratigraphically as Eocene. North of Dominica Island the arc splits into: (1) an eastern Eocene-lower Miocene arc capped with Oligocene and Miocene sedimentary deposits and (the Limestone Caribbees), (2) an inner western post-Miocene volcanic arc. The outer Desirade Island east of Guadalupe has Mesozoic (ca. 145 m.y.) spilites and keratophyres which have been interpreted as fragments of the ocean crust upon which the Lesser Antilles arc has been built.

The Lesser Antilles forearc narrows from about 450 km in the south to less than 150 km in the north; the width in the vicinity of the Leg 78A transect is about 260 km. The seaward boundary of the forearc is marked not by a trench, but by a deformation front characterized by folding and thrust faulting. Large-scale folds and associated thrusts define the deformation front to the east of the Island of Barbados. In the Leg 78A drilling area to the north, this structural boundary is characterized by an acoustically chaotic sediment wedge which overlies, possibly along a décollement, a layered sequence that in turn lies on the oceanic basement (Fig. 78A-2) The acoustically layered sequence can be traced beneath the acoustically chaotic rocks up to 30 km landward of the deformation front. The acoustically chaotic material has been interpreted both as a large gravity slide or as an offscraped deep-sea deposit. The lack of resolved structure in the acoustically chaotic unit may be owing to smaller-scale deformation than that evident on profiles to the south.

The sediment on the Atlantic Abyssal Plain at the deformation front ranges in thickness

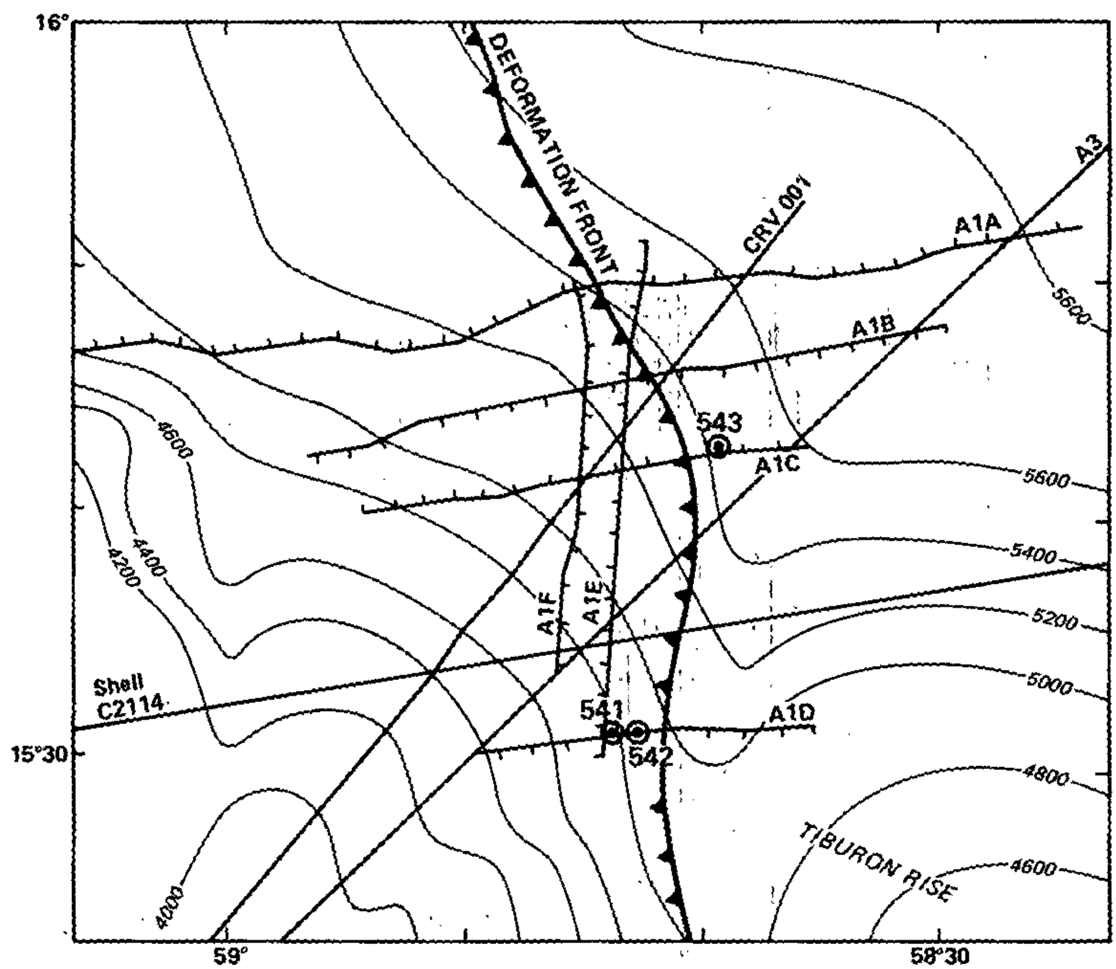

Figure 78A-2. Detailed site location map. Note position of deformation front and location of seismic reflection lines used for site survey.

from more than 4 km in the south to about 700 meters in the Leg 78A area. To the south the Cenozoic sediments are probably transported laterally from South America parallel to the deformation of the Barbados Ridge complex, the oldest sediments could have been deposited pre-Late Cretaceous. To the north the incoming sediment pile was probably desposited during the Late Cretaceous - to Quaternary. Both greater distance from the source and the damming effects of the Tiburon and Barracuda rises acount for the decreasing sediment thickness to the north. Prior existence and accretion of thicker sediments to the south may account for the broad forearc in this region.

A few square kilometers of highly deformed terrigenous Eocene and pelagic Eocene to Miocene deposits on the island of Barbados are interpreted as formed by a major gravity slide or the offscraped sediments of an earlier phase of accretion.

OBJECTIVES

The acoustic definition of a seaward-thinning chaotic unit superimposed on a tabular layered unit over oceanic basement constitutes an outstanding and long recognized feature of the Barbados Ridge complex (Fig. 78A-2) The plate-tectonic interpretation of the above suggests that the chaotic unit was scraped off and the underlying acoustically layered sequence was selectively subducted. If, in fact, the sedimentary section is being both partially scraped off and partially subducted, we may ask, what controls this contrasting behavior? Certainly the position of the apparently offscraped sediment at the top of the oceanic sediment pile favors its accretion. The scraping of trench fill at some subduction zones may be facilitated by décollement development on underlying weak hemipelagic mud accumulated on the outer slope. Similarly the diagenetically mature biogenic rocks at the base of the oceanic sediment column may show greater density and strength than the overlying hemipelagic and trench deposits and thereby facilitate selective subduction of the former and offscraping of the latter. Understanding why sediments are subducted or accreted critically bears on problems such as the dominance of terrigenous deposits and paucity of pelagic rocks in supposed ancient subduction complexes.

As mentioned above, the deformation front of the Barbados Ridge complex shows a structural transition from large-scale folds and thrust faults in the south to the acoustic chaos in the north near the Leg 78A area. Changes in nature, compaction and thus physical properties of the sediments, which are essentially pelagic to the north and considerably enriched in fine-grained thick sediments to the south could explain this difference in structure. The main goal of our drilling was to document the nature of the acoustically chaotic unit so that more precise comparisons could be made to the structural style of rocks to the south, and to test whether the acoustically chaotic sequence had been scraped off. We hoped to sample the acoustically chaotic and layered units completely to document differences in structural fabric, composition and physical properties that might account for their contrasting behavior. The composition of the acoustically layered sequence is of particular interest as it may be deeply subducted and become involved in island arc magma genesis.

DRILLING RESULTS

We drilled three sites on Leg 78A: two sites (541 and 542) at the seaward margin of the deformation front were drilled to investigate the provenance and structure of acoustically chaotic sediments. A third, Site 543, on the adjacent oceanic plate provided a reference section of sediments entering the subduction zone. The drilling results are reviewed below, not in numerical order, but from the most seaward to the most landward site. Figure 78A-3 shows the lithology on structure of the Leg 78A cores.

Site 543

Site 543 is located on the Tiburon Rise, 3.5 km seaward of the deformation front of the Barbados Ridge complex. Here we penetrated a 411 meter sequence of hemipelagic and pelagic sediments and 44 meters of basaltic basement.

The recent sediments consist of ashy mud to a depth of 8 meters at Site 543. The underlying sediment to 68.5 meters is Pleistocene to lower Pliocene ashy nannofossil mud which is transitional to a unit of lower Pliocene to lower Miocene mud and ashy mud that extends to 174 meters sub-bottom. Radiolarian clay with local ash layers near the top, and with manganese stains below, occurs from 174 to 322 meters sub-bottom spanning the lower Miocene to lower Eocene, respectively. Zeolitic clay/claystone is present from 322 to 379 meters sub-bottom and overlies a Maestrichtian to Campanian basal calcareous, ferruginous claystone that contacts basalt at 409 meters. Plagioclase and plagioclase-olivine phyric pillow basalts extend to a total depth of 455 meters.

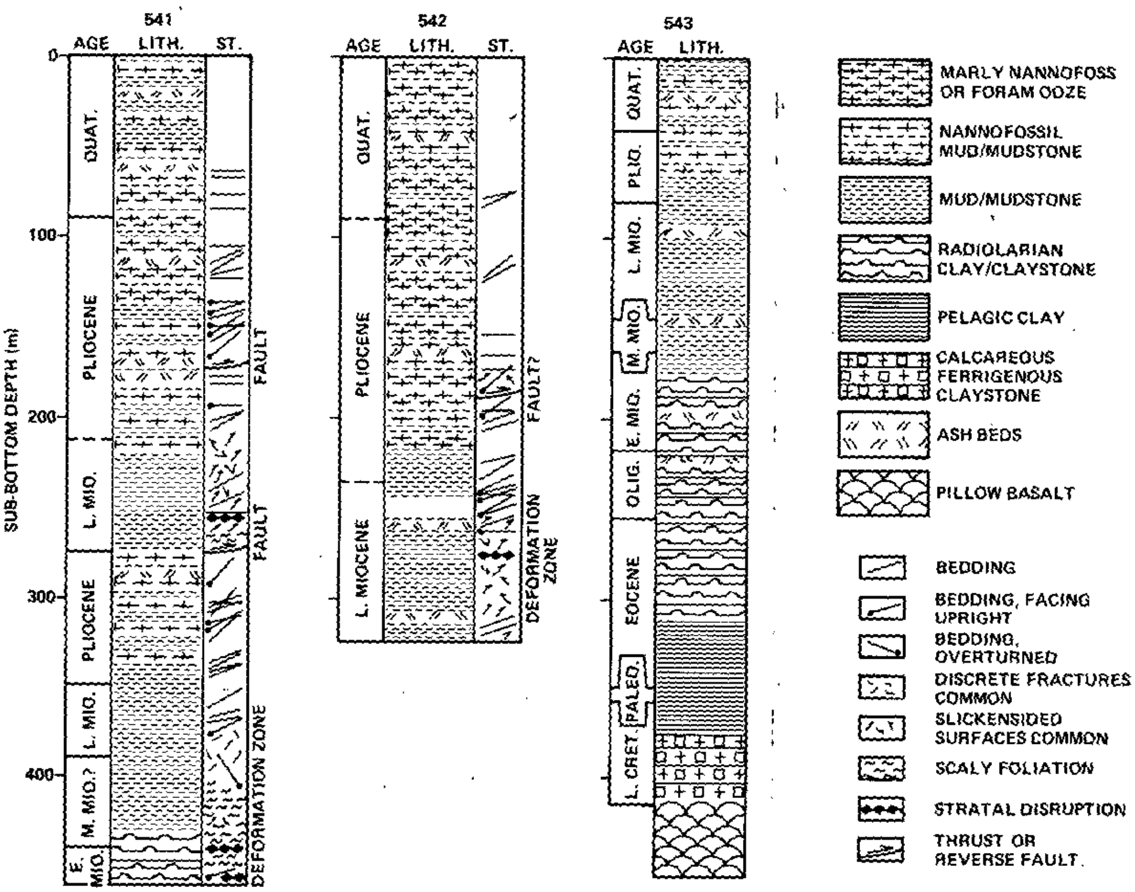

Figure 78A-3. Lithostratigraphy and structural geology at Sites 541, 542 and 543.

The lithology at Site 543 records the birth and evolution of an oceanic crustal sequence with its progressive movement towards the Lesser Antilles Arc. The pillow basalts recovered at the base of Site 543 are typical of those found at the Mid-Atlantic Ridge and they are succeeded by ferrugious sediments commonly formed during hydrothermal activity at ridges. The claystone and zeolitic clay/claystone and manganese-rich radiolarian clay record slow sedimentation under open-ocean conditions, removed from any significant terrigenous or volcanic source. Notable contributions of ash first occurred in the Oligocene and increased through the Neogene suggesting the site's increasing proximity to the Lesser Antilles Arc. The carbonate content and occurrence of nannofossils and foraminifers suggest that Site 543 was above the CCD during the Late Cretaceous and the early Pliocene to Pleistocene. Site 543 never emerged above the lysocline, except possibly for a brief period in the Pleistocene.

The structural features in the cores from Site 543 are principally induced by drilling. As such, these features provide an excellent reference section and allow separation of drilling induced and natural structures in the tectonically deformed sequences at Sites 541 and 542. Notably, the clay-rich sediments from 125 to 191 meters and 315 to 380 meters at Site 543 are more easily deformed by drilling than the radiolarian-bearing sediments separating them suggesting that the former may constitute favored zones for décollement when this oceanic section is underthrust beneath the trench slope.

At Site 543, sonic velocity increased uniformly with depth in the sedimentary section. Density and porosity sharply increased and decreased, respectively, at 180 to 200 meters. An increase in shear strength also occurs at this interval. This marked variation in physical properties correlates with the transition from mud to radiolarian mudstone ...

...ension of the reflector separating the apparently offscraped and subducted units to the west.

We emplaced a downhole seismometer with temperature and tilt recorders in the basaltic basement at Site 543. The instrument remained in the hole while part of a seismic refraction experiment was conducted. We had to retrieve the downhole instrument, however, when the seismometer malfunctioned and prevented deployment of the long-term recording package on the sea floor.

Site 542

Site 542, between Site 541 and the deformation front of the Barbados Ridge complex in 5026 meters of water, comprises three holes: 542, 542A and 542B. We drilled Hole 542A to a total sub-bottom depth of 323.5 meters and penetrated through Pleistocene to upper Miocene sediments. We recovered several cores in washed intervals above 202 meters and continously cored from 202 to 323.5 meters. Quaternary-Pliocene marly nannofossil ooze and foraminifer-nannofossil ooze persisted until 240 meters, below which we cored about 83 meters of upper Miocene mud. The repetition of a nannofossil zone indicates a small-scale reverse fault in lower Pleiocene sediments between 190 and 202 meters.

The sediments cored at Site 542 were deposited in a hemipelagic to pelagic environment. They lack terrigenous turbidites but contain foraminifer-nannofossil gravity flows. We saw no reworked shallow water foraminifer assemblages; apparently the whole Quaternary and Pliocene section was deposited between the lysocline and CCD. The absence or rare occurrence of upper Miocene planktonic forms, which are poorly preserved, as well as the very low (or zero) carbonate content in the sediments indicate their deposition near or below the CCD during this period; the observed variations in calcareous fossil content could be a result of the worldwide change of CCD but we cannot discount variations caused by vertical motions linked with the offscraping/subduction process.

A significant influx of ash during the Pleistocene and early Pliocene documents the volcanic activity of the recent Lesser Artilles Arc.

The extremely low levels of C_2-C_6 hydrocarbons are consistent with the low values of organic content in the sediment.

The strata dip from horizontal to 40° (average: 16°-17°) in the two holes, 542 and 542A. Below 249.5 meters to total depth we encountered a zone of structural disruption with inclined bedding, semi-penetrative internal deformation, polished and slickensided surfaces, and scaly foliation. These features suggest the proximity of a major fault. As at Site 541 (see below), smectite is more abundant in this deformed interval. A general deterioration of hole conditions and poor recovery in this zone reinforce the comparison. In an attempt to prevent hole collapse, we emplaced drill-in casing in the shear zone in Hole 542B. Although we were unable to release the bit and drill ahead the sticking of the casing resulted in an inadvertent packer experiment that recorded pressures in excess of 300 psi over hydrostatic pressure. This pressure approximates the local lithostatic load and probably facilitates subduction of the acoustically layered sequence. A slight increase in the water content and porosity in deposits in the basal shear zone probably reflects the excess pore water pressure. This basal shear zone, both here and at Site 541, correlates in depth with the boundary between the acoustically chaotic and layered sequences observed in the seismic records. The continuous reflector at the top of the acoustically layered unit dips gently (3°) beneath the acoustically chaotic unit. The high-angle dips observed in the cores demonstrate a disharmonic contact, probably a décollement, between acoustically chaotic and acoustically coherent sediments. Ignoring minor stratigraphic inversion in the upper part of the section, the complete Quaternary to upper Miocene sequence is similar to the lower tectonic unit observed at Site 541 (see below) beneath the reverse fault at 276 meters. The décollement and offscraping of sediment appears to occur at the same stratigraphic level (late or middle(?) Miocene).

Site 541

Site 541 is 3.5 km west of the deformation front of the Barbados Ridge complex in 4940 meters of water. Here, we penetrated to a total of 459 meters sub-bottom through a section of Quaternary to lower Miocene sequence.

The cored section consists of 215 meters of Quaternary to upper Miocene nannofossil mud, marly nannofossil ooze, and marly foraminifer ooze underlain by 6 meters of upper Miocene mud. Below 172 meters the repetition of a nannofossil ooze and a distinctive set of ash beds indicates a tectonic inversion. The upper Miocene mud is slickensided, becoming intensely scaly with depth and is disrupted at 276 meters where it overlies ...

nannofossil mud along a thrust or reverse fault. Below 276 meters the upper Pliocene nannofossil mud is underlain by upper to middle(?) Miocene mud which in turn overlies lower Miocene radiolarian mudstone.

Overall, the Pliocene to Quaternary deposits cored at Site 541 accumulated in a hemipelagic to pelagic setting at a modest sedimentation rate of 35 to 45 m/m.y. Deposition was interrupted only by the occasional influx of ash and the down-slope transport of foraminifer-rich turbidites. The sedimentation rate of the Miocene mud was about 15 m/m.y. or less. The clay mineralogy, as determined by x-ray diffraction, indicates that sediments came from mixed volcanic and continental terrigenous sources. The lack of terrigenous turbidites suggests that the section of Site 541 accumulated on a topographic high, possibly the Tiburon Rise. Owing to repetition by faulting at 276 meters the sequence at Site 541 records two down-section transitions from an environment at or near the lysocline during the Pliocene, to one at or below the CCD during the late Miocene. Time-correlative sediments in the upper tectonic unit (above 276 meters) accumulated in slightly shallower water than those in the lower unit (below 276 meters). Temporal variations in the CCD recorded in both units may principally stem from its Miocene shallowing though we cannot discount independent vertical tectonic motions.

The commonly occurring ash beds of the cored section provide an historical record of the recent arc volcanism and a precise correlation tool. The abundance of ash beds suggests a climax in eruptive activity in the early Pliocene, followed by a lull in the late Pliocene culminating with a renewed burst of activity in the Quaternary. The repetition of a distinctive ash-bed sequence at 154-157 and 173-176 meters supports our view that thrust or reverse faulting is recorded at 172 meters.

Inclined beds occur throughout the entire section below 125 meters; true dips range up to 45° with the exception of one overturned bed. Scaly foliation and stratal disruption occur in association with the documented reverse fault and are intensely developed in the shear zone at the base of the hole. High concentrations of smectite distinguish the basal shear zone, the beds adjacent to the thrust or reverse fault at 276 meters, and the small-scale reverse or thrust fault at 172 meters. The stratal disruption and scaly fabrics characteristic of mudstones above the major reverse fault at 276 meters contrast with the general lack of pervasive fabrics in the underlying nannofossil mud. Movement along this fault must post date the early late Pliocene — the age of the youngest sediment of the lower slice. Fracturing, intense scaly foliation and stratal disruption characterize cores that locally resemble fault gouge within 100 meters of total depth at Site 541. This concentrated deformation zone may reflect proximity to a décollement separating offscraped and subducted rocks. The lack of documented middle Miocene sediment at the base of the hole could be caused by structural attenuation in the basal shear zone or a hiatus or condensed section.

Seismic reflection profiles through Site 541 reveal an acoustically chaotic unit overlying a layered sequence. Shipboard velocity measurements suggest drilling penetrated just through the chaotic unit. The sheared lower Miocene radiolalarian mudstone below 450 meters at Site 541 may correspond to a prominent reflector at the top of the layered sequence. Velocity-density data reveal no impedance contrasts across the faults at 172 and 276 meters.

Extremely low levels of hydrocarbon gases (parts per billion) occur in cores from Site 541. Most samples show full range of C_2-C_6 hydrocarbons and C_1- C_2 ratios varying from 10 to 20:1 suggesting *in situ* thermogenic generation of the hydrocarbons. The rate of increase of C_2- C_6 with depth suggest a moderate geothermal gradient. Similarly heat probe and down-hole temperature logs indicate anomalously high termperatures at shallow depths.

SEDIMENTATION RATES

Sedimentation rates , calculated from biostratigraphic age versus depth data, are meaningful even without corrections for consolidation and tectonic overprinting (Table 78A-2, Figure 78A-4). Essential points are as follows:

- The uniform values recorded in upper Miocene rocks support the other lithologic and paleontologic correlations between the sections at Sites 541-543, that is, it is plausible that they were deposited at about the same depth and place on the ocean before deformation occurred.
- Sedimentation rates in the Pliocene and Quaternary sequences at Sites 541 and 542 are approximately twice those of the Tiburon Rise at Site 543. The higher rates at Sites 541 and 542 can be explained by: (1) deposition in slightly shallower water with preservation of a greater percentage of

Table 78A-2. Leg 78A Sedimentation Rates

	Meters/m.y.			
	541A[a]	541[b]	542	543
Quaternary	40		50-60[b]	20
Pliocene	< 43[b]		< 46[b]	13-15
Late Miocene	< 12-13[c]	13[c]	< 14[c]	14-15
Middle Miocene		0[d]		6-7
Early Miocene		?		7
Oligocene				2.5
Late Eocene				7 } 7.6
Middle Eocene				1.4 } 7.6
Early Eocene				17 } 7.6
Paleocene				0[e]
Late Cretaceous				> 2.3

[a]distinction of the two tectonic units
[b]probably higher because of small stratigraphic inversions and dipping beds
[c]probably higher because of dipping and folded beds
[d]probably missing or thinned in the décollement
[e]not recovered — hiatus(?)

calcareous microfossils, (2) a greater percentage of foraminifer gravity flows in sediments of Sites 541 and 542 owing to proximity to the trench slope, and (3) tectonic thickening west of the deformation front owing to folding, faulting, and layer-parallel shortening.

- We recovered no diagnostic fossils of middle Miocene at Site 541. Their absence may be the result of a hiatus or tectonic thinning of the section in the basal deformation zone at this site.
- Sedimentation rates in the pre-Miocene rocks are low (< 7 m/m.y.) except for a brief interval in the early Eocene. We recovered no Paleocene fossils, suggesting a hiatus or a period of very slow deposition well below the CCD during this interval. The seismic data support the presence of hiatuses in the lower portion of the stratigraphic section as pinch-outs are common.

CONCLUSIONS

Offscraping and Subduction

Owing to the stratigraphic repetition at Site 541 our drilling at three sites actually penetrated four Neogene sections. Three occur landward of the deformation front of the Barbados Ridge complex and one is at the reference site seaward of the deformation front. Two sections include rocks as old as lower Miocene. Overall, the sediment types, vertical sequences, and depositional environments landward of the deformation front (Site 541 and 542) are very similar to those sampled at the reference site (Site 543), arguing for offscraping of the former. The similarity of vertical sequences at Sites 541 and 543 is especially telling; each section shows transitions from lower Miocene radiolarian mud to barren mud in the lower to middle Miocene and to calcareous mud or ooze in the upper Miocene or Pliocene. The latter transition is recorded also at Site 542. At all sites the Pleistocene and Pliocene deposits accumulated between the lysocline and CCD and the Miocene sediments were deposited principally below the CCD. Small differences in water depths since the Miocene, variations in the amounts of foraminifer-rich gravity flows, and differences in apparent sedimentation rates since the Miocene probably reflect variations in the geography of the oceanic plate, proximity of each of the sections to the deformation front, and structural modifications during offscraping.

The acoustically chaotic terrane sampled landward of the deformation front apparently represents offscraped upper Miocene and younger oceanic deposits. Correlation of seismic reflection profiles with drilling results indicates that the lower Miocene radiolarian claystone at the base of Site 541 constitutes the top of the acoustically layered sequence beneath the offscraped deposits. At Site 543 sampling of the sediments correlative to the acoustically layered rocks indicates they range from lower Miocene-Eocene radiolarian clay through Eocene-Paleocene(?) pelagic clay to a basal Upper Cretaceous ferruginous calcareous claystone. This Cretaceous to lower Miocene sequence constitutes that material being selectively subducted beneath the offscraped deposits and can be traced acoustically 30 km landward of the deformation front. Beyond this point the acoustically layered sequence could be either accreted or more deeply subducted together with the oceanic crust.

Style of Tectonic Deformation

Defining the style of deformation in the Leg 78A area is essential if we are ever to compare this known tectonic setting to possible ancient equivalents. The chaotic acoustic nature of the offscraped terrane belies its substantially

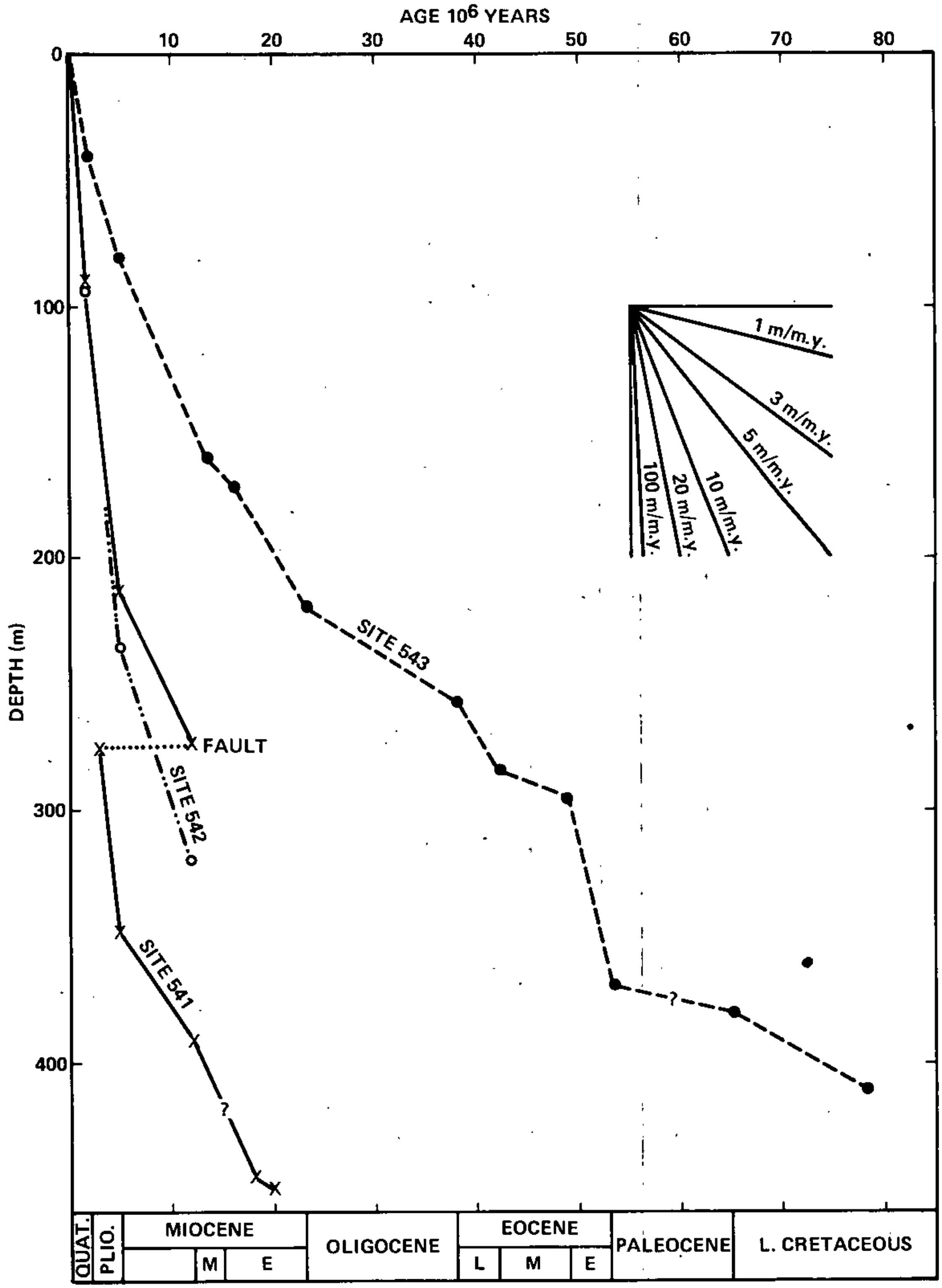

Figure 78A-4. Sedimentation rates at Sites 541, 542 and 543. Note relatively high rates of sedimentation during Quaternary-Pliocene-late Miocene times and low rates from early Miocene to Cretaceous, excepting the lower Eocene.

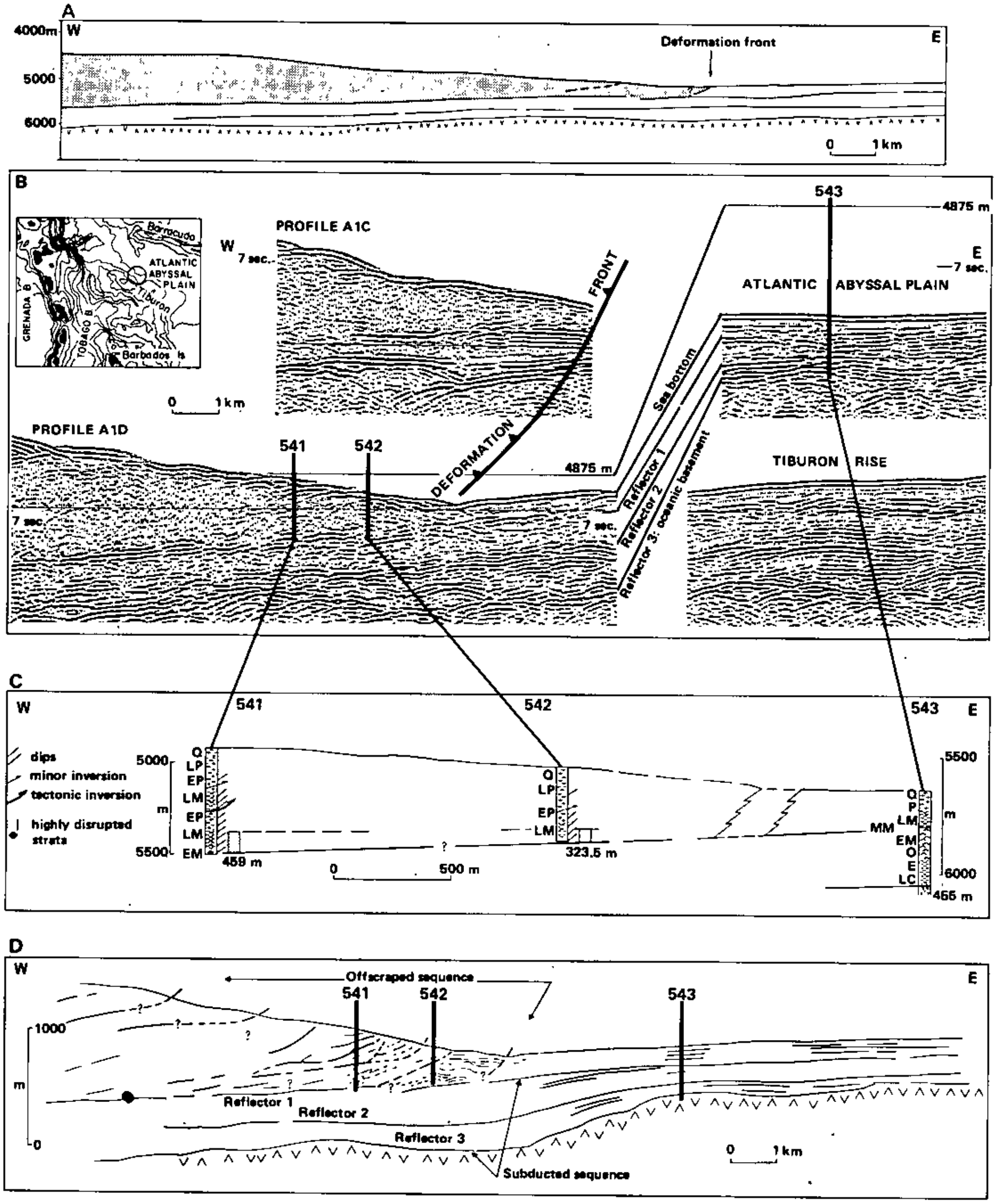

Figure 78A-5. Tectonic summary: offscraping and selective subduction of oceanic sequences.

- True scale cross-section along profile A1D. Note the gentle seaward slope of the sea bottom near the deformation front and the gentle landward dip of the subducted sequence.
- Seismic profiles A1C and A1D and location of Sites 543, 541 and 542. Note the prominent reflector just below the "chaotic" seismic sequence which corresponds to the top of the subducted sequence. Note also the thinning of the sedimentary sequence in the Atlantic Abyssal Plain sequence to the north of Tiburon Rise near Site 543.
- Lithostratigraphy and structural geology of the cored section at Sites 541, 542 and 543.
- Composite interpretive cross-section from seismic lines (A1C and A1D) and drilling results. Cross-section extends from the Atlantic Abyssal Plain into the deformed prism. Note the great thickness of deformed sediments to the westward that implies several tectonically superimposed sequences which may have been subject to large motions relative to the subducted sequence.

coherent, though faulted, folded, and thickened stratigraphy (Fig. 78A-5). The most conspicuous element of the offscraped rocks is reverse or thrust faulting. Bedding dips to 40° may reflect both folding and faulting. While discontinous seismic reflectors suggest low angle faulting, overturned folding is seemingly uncommon as only one overturned bed was documented at both Sites 541 and 542. Scaly foliation, slickensides, and stratal disruption occurs with modest intensity above the major thrust at Site 541 and conspicuously within the deformation zones at the base of Sites 541 and 542.

The thicknesses of post-lower Miocene sequences at Sites 541 and 542 are greater than their equivalents on the Tiburon Rise. In part the thickening can be explained by greater calcareous gravity-flow deposition on or at the base of the slope. Additionally, substantial thickening must result from layer-parallel shortening, folding, and irresolvable reverse or thrust faulting.

The thrust or reverse faulting, the relatively steep dips, and the acoustic chaos of the offscraped deposits suggests a disharmonic contact and décollement with the underlying acoustically layered sequence. The presence of a décollement is further supported by the deformation zone observed at the basal contact of the offscraped rocks at Sites 541 and 542. The mechanical feasibility of subducting acoustically layered sediments beneath offscraped sediments is indicated by the apparent lithostatic fluid pressures at the structural boundary of these contrasting units. Physical properties data indicate that initial localization of the décollement may be caused by a small increase in density and shear strength over a transition from clay to radiolarian-bearing clay as seen at Site 543. Both the major thrust at Site 541 and the probable décollement appear to be localized in plastic clay rich in middle to upper Miocene smectite.

Leg 78B[1]

Downhole Experiments, North Atlantic

Leg 78B began 14 March 1981 in San Juan, Puerto Rico and ended in Las Palmas, Canary Islands on 9 April 1981. All downhole experiments were made in Hole 395A, previously drilled during Leg 45.

Introduction

Scientists on Leg 78B successfully carried out an integrated program of downhole logging and experiments in Hole 395A, a re-entry hole which had been drilled more than 500 meters into the oceanic crust during DSDP Leg 45. We located and re-entered the hole very quickly using only satellite and bathymetric navigation. The hole proved to be open and clean to within 50 meters of the deepest penetration on Leg 45 where caving had forced termination of drilling. All of the downhole tools passed freely up and down the open hole. The results from Leg 78B confirm that many of the holes previously drilled by the Deep Sea Drilling Project may be re-entered more or less at will to conduct experiments or to emplace instruments. The results further suggest that wireline re-entry might be possible from other than drilling ships. Figure 78B-1 shows the location of Hole 395A and Table 78B-1 and Figure 78B-2 summarize the Leg 78B experiments.

Heat Flow and Temperature Logging

We made extensive downhole temperature measurements to determine the temperature structure in Hole 395A, which had remained undisturbed for 5 years, and from this, attempted to infer the thermal structure and hydrothermal circulation pattern in the surrounding oceanic crust. The temperature data (Fig. 78B-3) suggest that Hole 395A has been subjected to continuing downflow of water since it was drilled 5 years ago. The upper 250 meters of the hole was virtually isothermal at 2.5°C (the bottom water temperature). This

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[1]Abridged from a preliminary Leg 78B report prepared by Roy D. Hyndman and Matthew H. Salisbury (co-chief scientists), Alan Ballard, Keir Becker, Charles Coker, Jerome Denis, Paul Donahoe, Steven Dye, William Grosskopf, Steve Hickman, Randy Jacobsen, Elmer Kaiser, Marcus Langseth, Mark Mathews, Doug McGowan, Carl Mulcahy, Vladislav Nechoroshkov, Vladimir Ponomarev, Joseph Svitek, and Robert Wallerstadt.

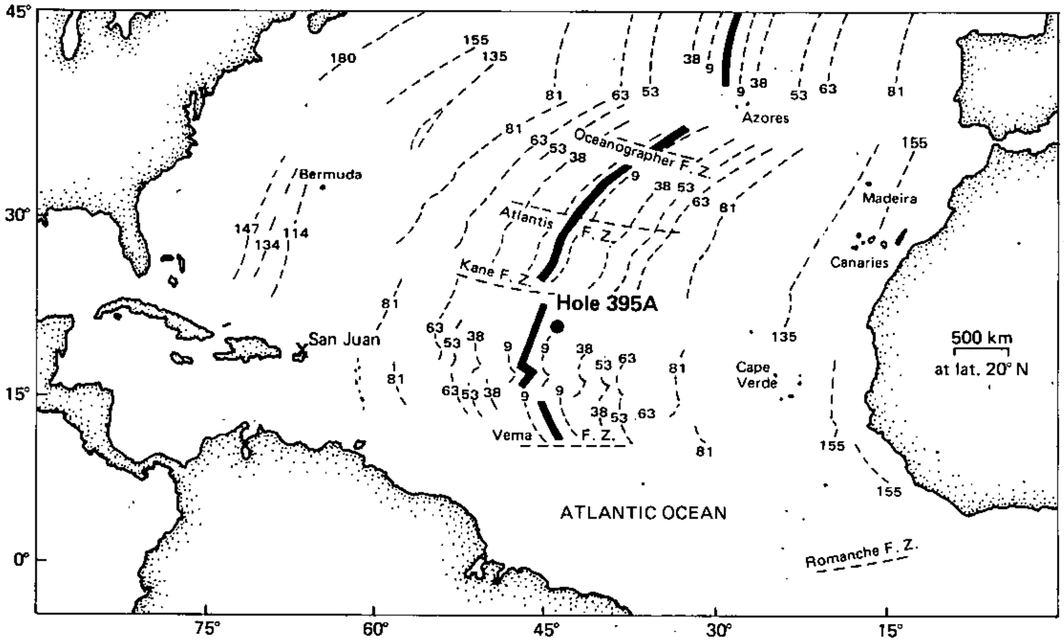

Figure 78B-1. Location of Hole 395A.

requires a downward flow of water at a rate of at least 25 m/hr (1700 liters/hr) driven by subhydrostatic formation pressures. Between 250 and 500 meters, the increasing temperature gradient indicates that the downward flow in the hole decreases by gradual loss of water into the formation. The process is similar to that occurring in Hole 504B on the Costa Rica Rift, although in that hole the water escaped into a much thinner horizon. Repeated temperature measurements showed that the pumping of seawater into the upper 100 meters of Hole 395A increased the flow down the hole and into the formation to depths of 500 meters sub-bottom. We infer that the formation above 500 meters is highly permeable. We detected no evidence of significant flow below 500 meters and estimated that the *in situ* formation temperature near 600 meters was 22°C before the Leg 78B disturbance. The packer test confirms that the walls of the bottom portion of the hole are nearly impermeable. The 22° temperature is higher than that predicted from the heat flow measured in the surface sediments, but lower than that from theoretical lithospheric heat-flow models. This suggests that the upper crust is cooled either by lateral flow from nearby outcrops or by cool water drawn down through the sediments themselves. In either case, lateral heat transfer through a zone of permeable crustal rocks between 250 and 500 meters depth must be significant at the site.

Downhole Logging

Since downhole logging was first begun on the *Glomar Challenger* only four major basement holes (Holes 396B, 417D, 462A and 504B) have been logged. One of the prime objectives of Leg 78B was to add to the data by acquiring a complete set of logs in Hole 395A — the deepest open hole in the Atlantic, and one of those penetrating the youngest crust.

Although the hole was enlarged by washouts and cave-ins throughout much of its length, the deep investigation (laterolog) and sled tools (the density and caliper logs) worked well throughout the section. As might be expected, the sonic velocity tool worked well where the hole was to guage (in the lower 150 meter and intermittently at higher levels) but gave unreliable results where it could not be centralized owing to an oversized hole. The natural gamma log was of little value because its sensitivity was too low for the very low radioactive element concentrations in the oceanic basalts. The neutron log was only of fair quality throughout because of its short spacing.

In general, the logs confirmed the lithology described by the Leg 45 scientific party and can be used to refine the boundaries between individual units. The massive basalts from 173-194 meters sub-bottom have high, almost intrinsic densities (2.8 g/cm^3) and the pillow basalts constituting most of the remainder of

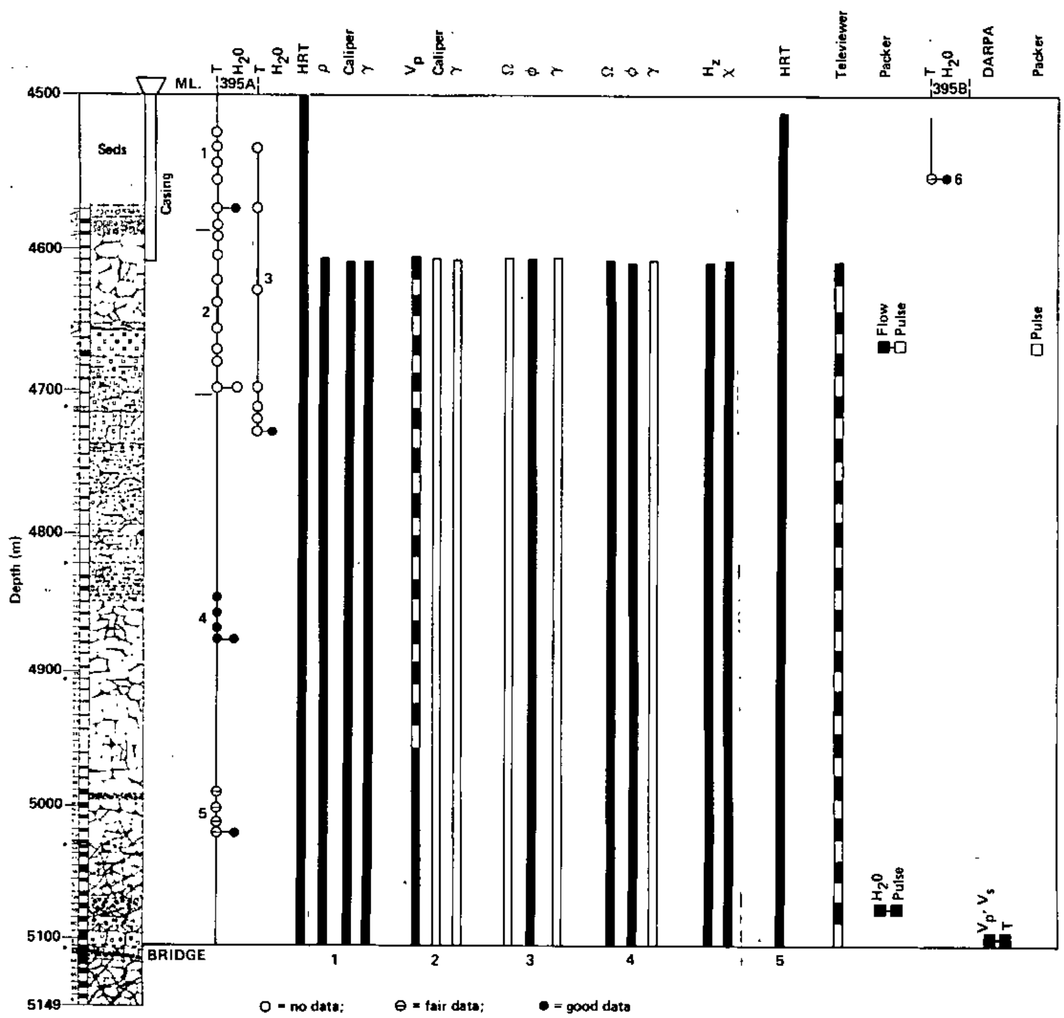

Figure 78B-2. Hole 395A operations summary.

the section have variable and generally low formation densities (2.4-2.7 g/cm^3) and generally low velocities ranging up to 5.4 km/sec. An exception is a dense, low porosity zone near the bottom of the hole which has a high velocity. Similarly, the uncorrected resistivities recorded from the massive basalts are quite high (200-300 ohm-m), whereas those of the pillow basalts rarely exceed 70 ohm-m, except near the base of the hole where the resistivity rises sharply to values as high as 700-1000 ohm-m. Inasmuch as the temperature increases with depth near the bottom of the hole but the density remains fairly constant, this resistivity increase may reflect an increase in alteration, and thus a decrease in pore interconnection, or in pore fluid salinity.

Soviet Magnetometer

The Soviet downhole magnetometer was first used in Hole 504B (Leg 69), but because the basement section examined at that site had formed so quickly, it included only one reversal near the top of the sequence and displayed little petrologic variation, making it ill-suited to the investigation. Hole 395A offered considerably more promise, as the Leg 45 drilling showed it to contain at least one unit composed of serpentinized peridotite and also to record several reversals.

Both predictions were dramatically confirmed on Leg 78B. We logged two distinct, high susceptibility zones between 167 and 173 meters and between 194 and 202 meters with the magnetic susceptibility tool. The upper zone coincides with an interval described by the Leg 45 scientific party as a serpentinite-bearing breccia. The lower interval was not recovered on Leg 45 but, on the basis of the logs, is undoubtedly composed of the same material.

Although the hole was too nearly vertical for the horizontal field components to be measured (the tool requires a departure from the vertical of 2° or more), the vertical component of the magnetic field was successfully logged throughout the hole. As predicted, we detected two distinct reversals, one at 255 (Figure 78B-4) and one at 560 meters sub-bottom; the polarities were consistent with the reversal stratigraphy measured in the core.

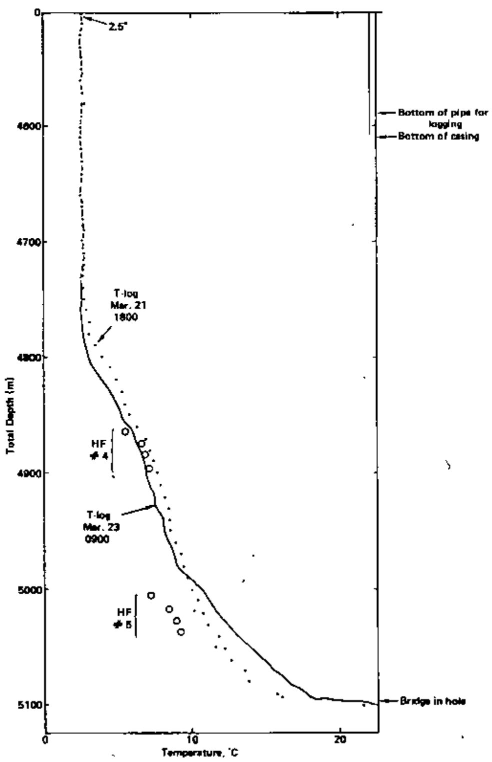

Figure 78B-3. Temperature data from Site 395A.

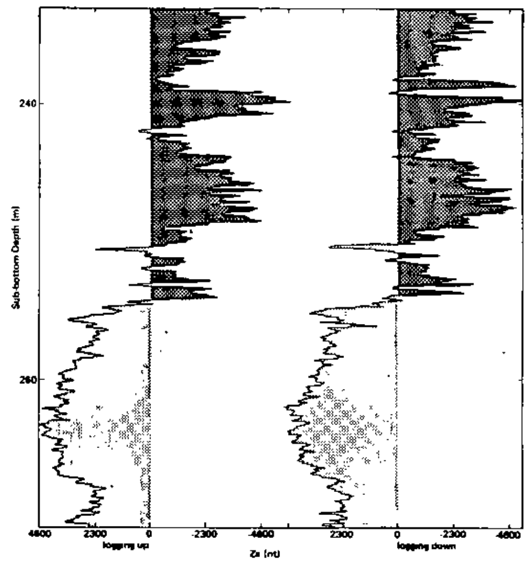

Figure 78B-4. Portion of downhole magnetometer log (vertical component) from Hole 395A showing reversal at 255 meters sub-bottom.

Table 78B-1. Operations Summary of Leg 78B Experiments

Tools Run	Sub-bottom Interval (m)	Data Quality
Temperature probe; water sampler	29 - 105; 105	none; good
Temperature probe; water sampler	105 - 219; 219	poor; none
Temperature probe; water sampler	2 - 248; 248	none; good
Temperature probe; water sampler	371 - 400; 400	good; good
Temperature probe; water sampler	514 - 543; 543	fair; good
Temperature log	0 - 609	good
Temperature log (repeat)	72 - 609	good
Density; caliper; natural gamma log	112 - 609	good;good;good
Velocity; caliper; natural gamma log	112 - 609	fair;none;none
Laterolog; porosity; natural gamma log	112 - 609	poor;good;poor
Laterolog; porosity; natural gamma log	112 - 609	good;good;poor
Soviet magnetometer: field intensity log	112 - 609	good
Soviet magnetometer: susceptibility log	112 - 609	good;good;poor

Borehole Televiewer

The borehole televiewer provides a continuous, oriented sonic image of the wall of the hole that can be used to define (a) lithologic units, the form, orientation and vertical distribution of natural discontinuities (e.g., fractures, pillows, and flow contacts), (b) irregularities produced in the hole wall by drilling, and (c) fractures induced by hydraulic fracturing. The borehole televiewer data on Hole 395A was of only moderate quality because of ship motion and a malfunction of the tool that reduced the scan rate. Further on-shore processing, including a transducer-to-wall-travel-time display, should increase the value of the data. The shipboard records, however, provide an excellent record of the texture and geometry of the hole wall which is highly irregular. Washouts within the hole are clearly evident on the log as large sections with virtually no wall echo and as small streaks and patches that probably record holes or cracks in the wall. In general, the acoustic reflectivity varies inversely with hole size as revealed by the caliper log. Where the hole is close to gauge, the results correlate with the lithology. We found the televiewer log particularly useful for locating the best zones within the hole for the packer emplacement.

Packer Experiment

We conducted two packer experiments during Leg 78B to measure the *in situ* permeability and pore pressures at Site 395A for comparison with the results obtained in the Pacific during Leg 69. The first experiment, conducted in massive pillow basalts near the bottom of the hole, was successful, but the second, conducted near the top, was only partially successful.

We found the permeabillity of the formation below the deeper station to be $(2.6 \pm 0.7) \times 10^{-6}$ Darcies from a negative pressure pulse test and $(8.6 \pm 1.7) \times 10^{-6}$ Darcies from a positive pulse test (induced respectively by opening the water sample and by setting the safety go-devil). The difference may reflect the opening of fractures and thus a temporary increase of permeability from the positive pulse. These permeabilities are four orders of magnitude lower than those measured on Leg 69 but are within the range found by measurements in crystalline rock on land. If this low permeability is pervasive, it places strong constraints on vertical convective hydrothermal heat transfer in young oceanic crust. Although the packer tests conducted near the top of the hole were largely unsuccessful in measuring permeability, the data did suggest that the permeability in the middle to upper part of the hole is very high. The upper packer test also successfully measured the formation aquifer pressure in the high permeability zone. The pressure was about 1.5 bars (150 kPa) below hydrostatic pressure, which corroborates the heat-flow data indicating a downward flow of water in the hole.

In addition to these experiments, we attempted to measure the *in situ* tectonic stress in the formation near the bottom of the hole by means of the hydrofracture technique. We pumped seawater into the hole to a pressure of 152 bars (61 bars above the lithostat) but failed to produce a fracture. The test did, however, confirm that the formation is extremely tight.

Water Chemistry

Leg 78B offered a unique opportunity to sample *in situ* water from the oceanic crust inasmuch as Hole 395A had remained undisturbed for five years. Because study of the hole-water chemistry would show any pronounced upward or downward movement of water in the hole, we collected five water samples in the hole, four of them before the hole was otherwise disturbed. We found that the water chemistry in the hole was little different from that of seawater. An exception was the deepest sample taken near the bottom which was depleted in magnesium, presumably by basalt alteration. These data support the conclusion gained from the temperature and packer measurements, that sea water has been flowing down the hole except near the bottom where the water is stagnant because the hole penetrates a zone of low permeability. A pore-water sample taken at a depth of 70 meters in a hole 100 meters northwest of Hole 395A has a composition similar to seawater, which is consistent with our view that water has been drawn down through the sediments.

DARPA/NORDA Seismometer

The DARPA/NORDA seismometer experiment was highly successful. It demonstrated that emplacing large instrument-packages in deep-sea drill holes is reasonable and showed the value of such installations by acquiring a unique set of seismic refraction data during a two-ship experiment with the USNS *Lynch*. The instrument package deployment was planned in considerable detail before Leg 78B but some significant modifications were made during the leg on the recommendation of the *Challenger* drilling and operations personnel.

The operation went smoothly, particularly in view of the number of untried procedures involed. We detected no indications of EM-cable/drill-pipe entanglement. Re-entry was achieved without difficulty and the instrument and its cable were successfully released from the drill pipe. The only potentially serious problem was that the re-entry stinger bent upon, or after, re-entry and almost prevented the subsequent release of the EM cable. The accelerations measured in the instrument during several phases of the deployment reached 5 g. This is well within the limit of the instrument design (10 g), but we recommend that ways to reduce the maximum acceleration be further investigated.

We have little doubt that this technique can successfully used to deploy similar instrument packages in the future. It should be noted, however, that weather and sea conditions were ideal during this deployment; rougher seas would make the operation much more difficult. A number of improvements to the equipment and procedures resulted from the Leg 78B test that should facilitate future deployments.

The background noise level recorded by the downhole seismometer was very low except for a continuous background of microseisms occurring in a narrow frequency band near 0.5 Hz. Outside this band, the noise levels were 10 db lower. The background level did not change when the *Challenger* was allowed to drift away from the hole, thus ship noise is probably not significant. We did, however, detect some indication that the microseism amplitude increased as the sea state worsened toward the end of the 24-hour recording period.

During the two-ship experiment, the *Lynch* fired a total of 113 shots ranging in size from 0.5 to 120 kg at ranges up to 65 km from the site. In addition to displaying good first arrivals, the records show clear secondary arrivals with little of the complexity and long reverberation caused by converted phases, surface waves, and channeled waves that contaminate ocean bottom seismometer records. The quality of the data is generally excellent; the only important limitation was that the frequency response of the system was limited to below 10 Hz. When analyzed, the records should provide new and very detailed information on the velocity structure of young oceanic crust.

In addition to the refraction data obtained during the shooting experiment, the seismometer recorded two small earthquakes during the 24-hour observation period. The earthquakes probably emanated from the nearby Mid-Atlantic Ridge or the Kane fracture zone.

Integration of Main Results

We group the principal results of Leg 78B into three categories: (1) detailed definition of the lithology in the section penetrated by the hole, (2) *in situ* bulk physical properties, and (3) hydrogeology of the oceanic crust near the site.

1. The downhole logs individually and collectively permit very precise location and definition of most of the units defined by the Leg 45 scientists on the basis of chemistry and petrology. Two striking intervals defined by the logs are the pair of 10-meter thick massive units near the top of the basement section between 173 to 194 meters sub-bottom. Coring on Leg 45 showed that a thin serpentinite cobble unit lies just above this section; the logs show that a similar unit which was not sampled may occur just below this sequence. In addition, the logs all show a massive sequence near the bottom of the hole where the sample data indicate that the crack and pore spaces are filled with alteration products and the resistivity log suggests a lessened interconnection of the pore spaces. In addition, the magnetic log provides particularly good data, permitting us to delineate the intervals of normally and reversely magnetized rocks.

2. The individual logs and downhole measurements provide data on *in situ* bulk physical properties. We cannot obtain such data from the cores because of a serious sample bias and because of the small size of the laboratory samples. We found the density, velocity, and resistivity of the upper oceanic crust to depend primarily on the ratio of the basalt matrix to the formation fluid (i.e., the porosity) and secondarily on the form — particularly the degree of interconnection — of the porosity. Only to a limited degree are these properties influenced by the basalt matrix or pore fluid composition. Thus, when core recovery is limited to the more massive rocks, the data taken from sample measurements is seriously biased toward excessively low porosities, high densities, high velocities and high resistivities. For example, the discrepancy between sample velocities and regional seismic refraction values is well documented. The logging data clearly shows that this results from a sample bias in the recovered core which

gives a an excessively high mean velocity. In general, the logs and regional geophysical measurements suggest similar average physical properties, whereas the sample results differ, indicating extensive porosity on a scale of up to 10's of centimeters in the upper oceanic crust. Porosity is the key variable controlling most physical property measurements.

The average porosity in Hole 395A, on the basis of downhole measurements, ranges from an estimated minimum of between 5 to 10 per cent to over 40 per cent, with a very rough average of 20 per cent down the hole. The sample porosity averages about 5 per cent and does not vary significantly down the hole. From this we infer that the larger-scale porosity contained in drained pillows and flows, flow breccia, talus, and fractures ranges from nearly zero to over 25 per cent with a very rough average of 15 to 20 per cent. The porosity decreases markedly near the bottom of the hole. More accurate estimates will be possible following quantitative analyses of the logs.

3. We directed a major effort during Leg 78B toward defining and understanding the hydrogeology of the oceanic crust. On the basis of the data from the packer experiments and various downhole logs, we have defined a regime in which water has been moving down Hole 395A for the past five years in response to a slightly subhydrostatic pressure in the upper crust. This behavior is similar to that inferred for four other previously drilled crustal holes. The water disperses into a 350-meter thick, highly permeable zone penetrated by the upper part of the hole. The nearly impermeable zone at the bottom of the hole, however, blocks further vertical fluid transport. The estimated formation temperature near the bottom of the hole is higher than predicted from the surface heat flow, indicating that before the hole had been drilled a significant part of the heat from the deeper crust had been transported laterally in the permeable uppermost crust. Water may also have been drawn down through the sediments. Because of the very low permeability at the bottom of the hole, we suggest caution in using a very high permeability in developing models for hydrothermal circulation deep in the oceanic crust. Although we failed to hydraulically fracture the formation, the packer test near the bottom of the hole clearly demonstrates that conducting *in situ* hydrofracture stress measurements in the oceanic crust is possible.

Although we were not able to run the large-scale resistivity experiment because of faulty leads, and deteriorating weather prevented us from determining the permeability at the top of the section, and from completing a hydrofracture experiment at the base, we completed nearly all of the Leg 78B objectives within a very short time. Clearly, even the uncorrected logs may be used to distinguish individual lithologic units, and once corrected they may be used to determine the *in situ* properties of the crust. By means of the packer experiment and downhole temperature and chemical studies, we have been able to determine the temperature structure of the upper levels of the crust and have inferred the water circulation pattern at the site. Finally, and perhaps most importantly, the success of the DARPA/NORDA experiment has far-reaching implications in that it opens up the seafloor to long-term borehole scientific observations.

SITE SUMMARIES

Leg 79, Mazagan Plateau

Co-chief scientists: Karl Hinz and Edward L. Winterer.

Site 544 (MAZ-3)

Latitude: 33°46.13'N
Longitude: 09°24.29'W
Water Depth: 3666 meters (Hole 544)
3607 meters (Hole 544A)

A single core taken at **Hole 544** (0-5 m) is Pleistocene foraminifer-nannofossil ooze. The rotary-cored section at **Hole 544A** comprises four units: Unit one is lower Pleistocene to lower middle Miocene (N9) 0-102 meters below seafloor is yellow-brown foraminifer-nannofossil ooze. This unit includes a hiatus spanning 8-13 m.y.B.P.

Unit two, 102-107 meters below the seafloor is lower Miocene (N7) greenish gray, clayey nannofossil foraminifer ooze, with glauconite and Fe/Mn crusts and micronodules.

Unit three, 107-109 meters below the seafloor, is pale red-brown mottled limestone with subordinate grainstone ...

contains abundant cyanobacterial coatings on bioclasts. The limestone contains *protoglobigerina*, thin-shelled pelagic mollusks and ammonites, plus a rich benthic fauna including *Pentacrinis*, ostracods, small gastropods, miliolids, sponge fragments, serpulids, and bryozoans. It also includes hard grounds with borings and encrusting fauna. The limestone appears to be upper Dogger to lower Malm, but shore-based ammonite work is required for a reliable age designation. The rocks closely resemble Oxfordian limestone dredged from the Mazagan escarpment (euphotic zone facies).

Unit four, 139-193 meters below seafloor (total depth) is leucocratic gneiss with cataclastic flaser textures and subhorizontal foliation.

Hole 544B is at the same location as 544A, but was cored with the hydraulic piston corer from 0-39 meters below seafloor to total depth. A good lower Pleistocene to upper Miocene section was recovered with abundant and well preserved foraminifers and nannofossils, but no radiolarians. We obtained good paleomagnetic samples.

Site 545 (MAZ-4)

Latitude: 33°39.9′N
Longitude: 09°21.9′W
Water Depth: 3150 meters

Hole 545 was drilled at the foot of the Mazagan escarpment to a sub-bottom depth of 701 meters. From 0-86 meters, the section consists of lower Pleistocene, clayey foraminifer nannofossil ooze. From 86-180 meters, the seidments consist of firm Miocene to Pliocene clayey nannofossil ooze with a few layers of breccia and Jurassic carbonate platform clasts. This unit rests unconformably on a lower to middle Miocene greenish clayey radiolarian-bearing nannofossil chalk which lies between 180-253 meters sub-bottom. This, in turn, lies unconformably on a upper Cenomanian through lower Aptian/upper Barremian green nannofossil claystone between 253-531 meters. This unit displays slump folds and microfaults and is cut by low angle sliding surfaces which cause both stratigraphic repetition and omission. The lowest few meters of the unit consist of dolomitized lower Aptian nannofossil chalk which rests unconformably on an upper to middle Jurassic brecciated, dolomitized limestone between 531-635 meters. The limestone has iron-stained fissure fillings and features such as coral debris, algal fragments, oolites, miliolids, mollusks and echinoderms suggesting its deposition in high-energy shallow water environments. The unit grades downward into a dolomitized sandy limestone between 635-701 meters which contains ammonites, angular quartz, and fresh feldspar. The last core contains 90 per cent terrigenous components.

Drilling stopped because the bit would not turn. After about 80 hours of rotation, the bit had lost all four cones, leaving only jagged, twisted cone supports.

Site 546 (MAZ-10)

Latitude: 33°46.7′N
Longitude: 09°33.9′W
Water Depth: 3992 meters

Hole 546 was drilled on the first structural high seaward of the sialic horst drilled at Site 544. The deepest reflector crops out on the flank of the high, less than one km from the drill site. The section from 0-134 meters consists of Pleistocene to upper Miocene foraminifer-nannofossil ooze. This rests unconformably on a stiff middle Miocene glauconite-bearing layer composed of greenish clayey nannofossil ooze and red-brown clay. Between 147-149 meters, the sediments consist of greenish and grayish red sandy claystone with layers rich in gypsum crystals. The greenish layers contain lower Cretaceous and upper Jurassic radiolalrians, lower Cretaceous nannofossils and middle Miocene radiolarians, foraminifers, and nannofossils. Between 149-156.5 meters, the sediments consist of a barren, grayish red, gypsum-bearing claystone.

The base of the section, from 156.5-192 meters, consists of halite banded with grayish red, grayish green and gray clayey streaks and cut by veins and layers of anhydrite. Some of the halite crystals are 1 cm in diameter. Recovery in the salt was 68 per cent and the average diameter of the core was 4 cm. The interstitial water salinity increased steadily from 34 to 217 per mil in the section above the halite but no dissolved hydrocarbons were detected and nothing resembling typical caprock was encountered.

Site 547 (MAZ-9)

Latitude: 33°46.8′N
Longitude: 09°21′W
Water Depth: 3940.5 meters

Site 547 was drilled as a re-entry site on a buried basement high to the west of the Mazagan Escarpment off Morocco. The following lithologic section was recovered:

0-141 meters: Quaternary to upper Miocene (N23-N17), pale yellowish brown foraminifer nannofossil ooze and nannofossil ooze resting unconformably on a layer of middle to lower

Miocene (N15-N4) greenish gray nannofossil ooze between 14 and 205 meters. 205-225 meters: upper Eocene greenish gray, slightly clayey nannofossil ooze to chalk resting unconformably on an upper Eocene greenish gray, siliceous clayey nannofossil chalk between 225 and 269 meters. The upper Eocene sediments contain common porcelanite nodules, sheared and contorted bedding and intraformation breccia layers, as well as resedimented Eocene, Paleocene and Cretaceous fossils, of which the latter are common. 269-355 meters: lower Eocene (P7) to lower Paleocene (P1) greenish gray, clayey, siliceous cherty nannofossil chalk. These flows are probably lower Paleocene (P1) but the most common material is reworked Maestrichtian. The debris flows rest unconformably on middle to late Cenomanian through upper Allbian sediments composed of grayish green nannofossil-bearing claystone and mudstone with intraformational mudstone conglomerate layers which lie between 422 and 773 meters. 733-775 meters: greenish gray claystone, plae greenish white micritic limestone and limestone pebble beds. Foraminifers in the claystone suggest this unit is lower Cretaceous (Valanginian-Aptian); calpionellids in the pebble beds suggest that it is upper Tithonian age. 775-847.8 meters: Kimmeridgian (or older), red and green, nodular, aptychus limestone and limestone pebble and breccia beds with *Saccocoma* in the upper part of the interval and abundant *Posidonia* in the lower part. 847.8-891 meters: dark gray shale with clasts of micritic limestone grading downward into pale brown to grayish red calcareous claystone with nodules of dense micrites. 891-932.5 meters: grayish black silty shale alternating with beds of light olive gray micritic limestone, pebbly limestone and dolomite. Limestone breccia, conglomerates and nodular limestone overlie a stromatolitic bed near the base. 932.5-1030 meters: gray and grayish red sandy mudstone with 2 to 5 cm thick sandier intervals. Minor composite granules of quartz and feldspar and small gypsum veins occur locally. Clasts of sandy mudstone and muddy dolomite are present. Dolomite, dolomitic limestone and sandy granules and pebbles are very abundant. The unit was probably deposited in a continental environment dominated by a granitic source terrain.

At 1030 meters depth, the bit would not rotate when more than 20,000 pounds of weight was applied. Because there was no time left for a fourth re-entry and because we did not want to risk leaving cones in the hole, we abandoned Hole 547B. After completing a seismic reflection survey linking Sites 544, 545, 546 and 547, the *Glomar Challenger* left for Lisbon.

PLANNED CHALLENGER DRILLING

Leg 80, Goban Spur

Brest, France to Southampton, England, 5 June to 20 July 1981. Co-chief scientists: Pierre Charles deGraciansky and C. Wylie Poag.

Introduction

The chief goal of Leg 80 is to sample the crystalline basement and the pre-, syn-, and postrift sedimentary rocks along a transect that crosses the continent-ocean boundary (Fig. 80-1). The region selected for this transect is the Goban Spur, which protrudes into the West European Basin as a gently sloping ridge separating the Porcupine Sea Bight from the Armorican Margin Basin of the Bay of Biscay. The continental crust is a series of rotated Hercynian fault-block basins filled with Jurassic and Lower Cretaceous(?) synrift epicontinental(?) and shallow marine sediments (Fig. 80-2). A relatively thin veneer (<1000 m) of Upper Cretaceous and Cenozoic marine deposits here allows penetration to Hercynian basement with single-bit holes. On the oceanic crust, an 800-meter sequence of Upper Cretaceous to Holocene deep-water ooze, mud, chalk, and turbidite rests on basaltic basement. Here, also, the entire sedimentary section can be penetrated without requiring re-entry.

A secondary goal of this leg will be, if time allows, to re-occupy DSDP-IPOD Site 400 (Leg 48) on the Trevelyan Plateau (Fig. 80-1) and to core shallow-water Jurassic or Lower Cretaceous(?) rocks beneath the postrift unconformity.

Crystalline Basement

At the foot of the Goban Spur, basement is recognied on seismic reflection profiles by the hyperbolic diffractions so typical of extrusive basaltic basement. In contrast, the continental basement beneath the Goban Spur consists of a complex of horsts and half grabens (Fig. 80-2). Tilting and rotation of these blocks originally formed a varied relief of sharp ridges and narrow basins, interspersed among flat horizontal surfaces. Dredging in the Goban Spur area has recovered granitic and metamorphic rocks of Hercynian origin that are believed to represent the crystalline basement. We plan to sample the crystalline basement at each Goban Spur drill site.

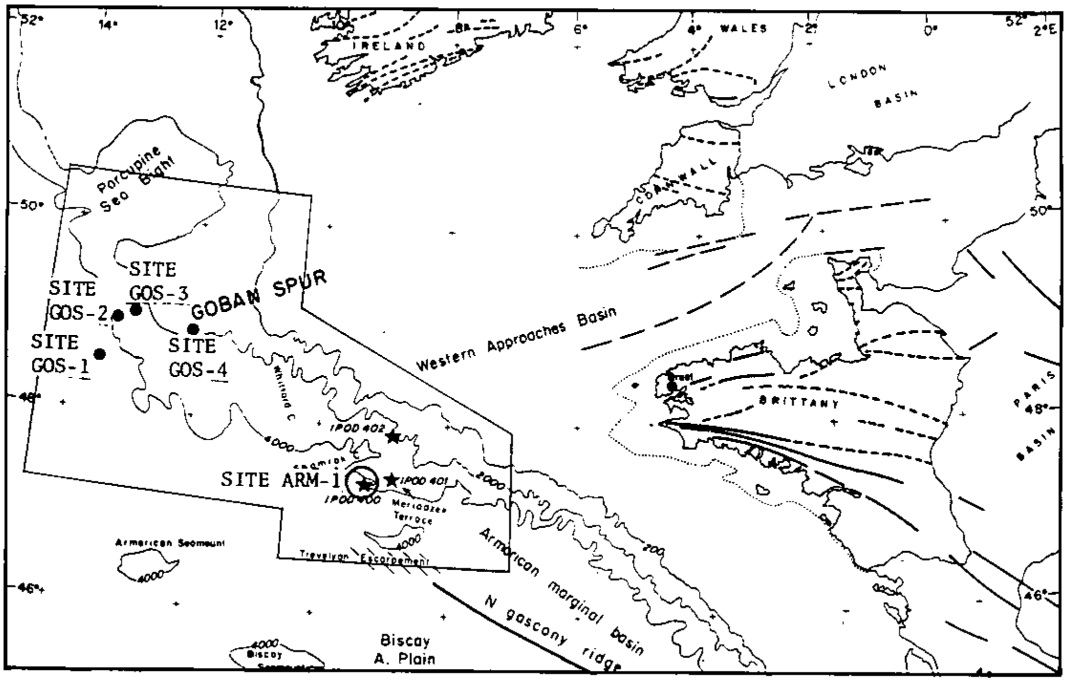

Figure 80-1. Location of proposed Leg 80 Sites and DSDP Leg 48 Sites (after L. Montadert and D. G. Roberts, Initial Reports of the Deep Sea Drilling Project, v. 48).

Prerift Sedimentary Rocks

Shallow-water carbonates and sandstones of probable Carboniferous age have been dredged in the Goban Spur region. This suggests that we may be able to sample prerift sedimentary strata at some of our drill sites.

Synrift Sedimentary Rocks

Filling the half grabens and covering some of the lowest horst blocks are strata which, on the basis of seismic reflectors, converge toward the crests of the horst blocks. This convergence indicates that these strata accumulated while the blocks were tilting and their deposition is believed to have taken place chiefly in epicontinental and shallow marine environments during the Jurassic and Early Cretaceous.

When the rifting phase terminated, subaerial and submarine processes eroded the exposed and shallow-water synrift basins and truncated the crests of some horst blocks. The seismic reflector that marks this unconformity can be traced to within a few kilometers of the continent/ocean boundary beneath the Goban Spur. At nearby Site 401 (Fig. 80-1), this unconformity separates upper Aptian shelf chalks from upper Jurassic and lowermost Cretaceous(?) shallow-water carbonates. We hope to obtain additional dates and to document the environments on either side of the unconformity.

Postrift Sedimentary Rocks

Because postrift marine deposition took place on an eroded surface of considerable relief, the thickness of the Upper Cretaceous-Cenozoic veneer is highly variable. In fact, some horsts are entirely bare of postrift sediments. However, in the deeper-water basins, postrift sediments supercede synrift sediments with no perceptible change in seismic character. Nevertheless, several widespread seismic unconformities appear within the postrift section and have been documented in drill holes nearby (e.g., Site 400). Three unconformities are of particular interest: (1) that separating Upper Cretaceous chalk from Aptian-Albian "black shale"; (2) that separating Paleogene strata from Upper Cretaceous strata; and (3) that separating Oligocene deposits from Eocene to Upper Cretaceous deposits. We hope to accurately date these and other unconformities and to determine the nature of their origin, especially their possible relationships to sea level changes.

Scientific Objectives

By placing the GOS-I, -II, -III, and -IV holes (Fig. 80-1) along a transect across the continent/ocean boundary in the sediment-starved Goban Spur region, we hope to achieve the following objectives:

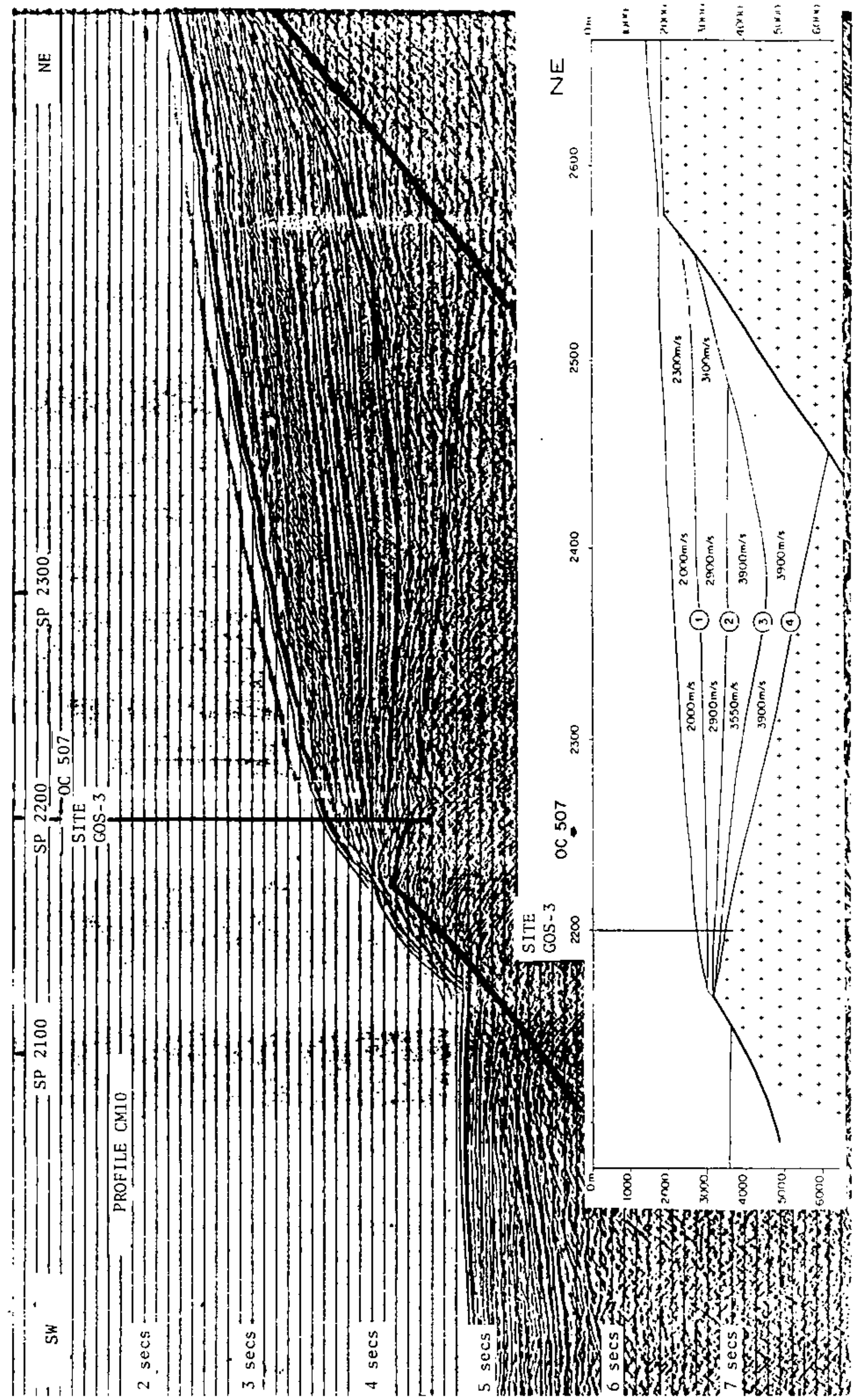

Figure 80-2. Seismic profile and reconstructed section across Site GOS-III (scale 1 x 1).

- Establish the geologic ages, depositional environments, and subsidence rates of the major phases of development of the continental margin and its boundary with the oceanic crust.
- Determine the duration of rifting, the amount of topographic relief at the close of rifting, and the age and nature of the "postrift unconformity."
- Document the age and nature of significant postrift chronostratigraphic boundaries, especially the Cretaceous/Tertiary and Eocene/Oligocene contacts.
- Establish the age and nature of prominent seismic unconformities and assess their relationships to basin subsidence, global sea-level changes, and tectonism.
- Analyze the effects of changing oceanographic conditions, water depths, climates, rates of subsidence, and rates of sediment contribution, upon the composition, accumulation, diagenesis, and erosion of continental margin sediments.
- Determine the heat flow rates and thermal regime of this margin and further assess the nature of crustal thinning near the continent/ocean boundary.
- Compare and correlate the geologic and geophysical record of this continental margin with the known record from other continental margins, from the deep-sea, and from the adjacent European land mass. (*Pierre Charles deGraciansky and C. Wylie Poag*)

Leg 81, Rockall Plateau

Southampton, England to St. John's, 18 September 1981 to 10 November 1981. Co-chief scientists: David G. Roberts and Detmar Schnitker.

During Leg 81 a transect of five holes will be drilled across the southwest margin of the Rockall Plateau microcontinent (Fig. 81-1) to document the history of rifting and subsidence and the effects of changing ocean circulation on the Tertiary sediment of the margin. Absence of thick sediments offers the opportunity to define the evolution of a rifted margin differing

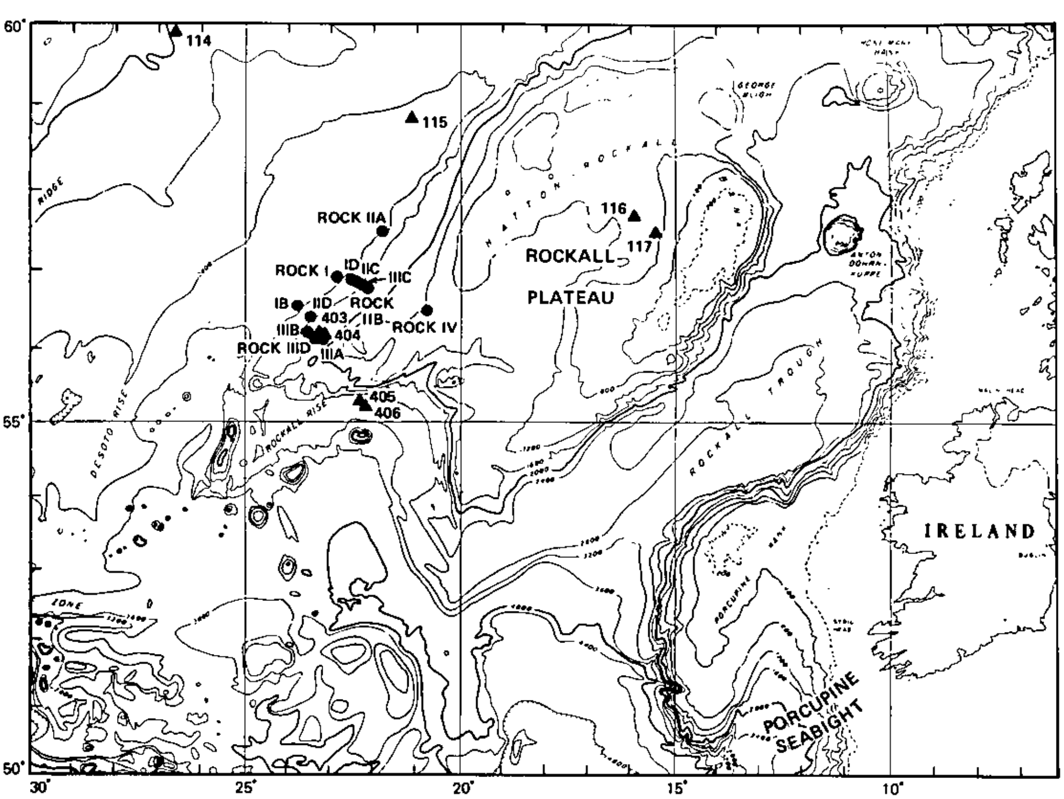

Figure 81-1. Proposed Leg 81 sites.

in several important respects to that of Biscay, scheduled for drilling during Leg 80. The Rockall margin is characterized by the absence of the classical tilted block structure exemplified by Biscay and Galicia. Seismic profiles have shown instead a thick sequence of oceanward dipping reflectors, separated from adjacent ocean crust by an outer high of variable relief. Anomalously dipping intra-basement reflectors also characterize the ocean crust. Closely comparable structures have been observed off Southeast Greenland, the Voring Plateau and the Lofoten Basin, and resemble the deeply buried rift structures off eastern North America, southwest Africa, and southern Australia. Results from Leg 81 may contribute greatly to understanding the early evolution of this type of margin. Furthermore, drilling the post-lower Eocene may provide an invaluable biostratigraphic and lithostratigraphic record of the profound effects of Tertiary changes in climate and ocean circulation at a fairly high latitude.

In drilling this sequence of holes, we will attempt to document the transition from the oldest ocean crust through to relatively shallow continental crust on the Hatton Bank. The ROCK-I group of sites is located on the oldest ocean crust (53 m.y. old). In this area we will use the hydraulic piston corer to refusal to obtain Neogene and upper Paleogene sediments for environmental studies. We will then use the rotary drill to penetrate the ocean crust with the objectives of establishing the depth, and the precise nature of both the earliest oceanic crust and the intra-basement reflectors.

East of ROCK-I, the ROCK-II group of sites is located on the outer high which we believe occurs along the transitional zone between the ocean crust to the west and the sequence of dipping reflectors to the east. Drilling at site ROCK-II will explore the nature of the basement in this zone and the subsidence history of the outer high.

Two sites (ROCK-IIIA and III-D; Fig. 81-2) are planned east of the outer high to explore the nature of the dipping reflectors in the Edoras Basin. During Leg 48, Sites 403 and 404 were drilled in this basin but just failed to reach the dipping reflectors although shallow-water marine sediments were recovered which pre-date the oldest ocean crust. Although the dipping reflectors, apparently record a progradational sequence, the drilling here will attempt to establish the precise composition of these dipping reflectors, and in turn the environment in which they were deposited. The determination of the rate of the later syn-rift subsidence here will be of especial interest as will the environmental studies of Neogene sediments recovered by the hydraulic piston corer. The final site, ROCK-IV, is situated on Hatton Bank. Drilling here is intended to establish the history of subsidence of a site located on the 25-km thick continental crust and to identify the underlying basement.

Collectively, the sites are planned to investigate the variation in subsidence history from oceanic crust through thinned continental crust to thick continental crust. We plan to conduct heat-flow measurements for each hole and to comprehensively log all holes. The drilling program includes a number of contingency sites which would investigate North Atlantic paleoenvironmental questions — such as the migration of the Gulf Stream — in the event we encounter major technical problems at the principal Rockall sites. (*D. G. Roberts*)

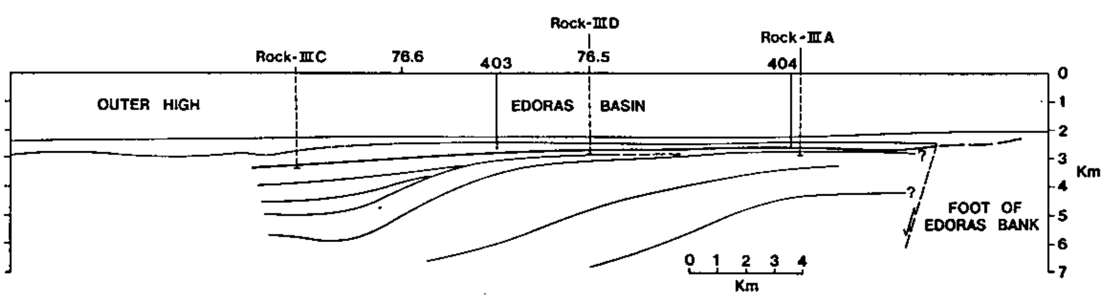

Figure 81-2. Leg 81 (ROCK-III) sites plotted on graphic interpretation of Line IPOD 76-8.

DEEP SEA DRILLING PROJECT

SCIENCE OPERATIONS

Overview

The past few months have been characterized by exceptionally rewarding scientific returns. *Glomar Challenger* has operated in a remarkably smooth fashion within very tight schedule constraints and the scientific achievements have been particularly satisfying. Detailed reports for each cruise are described elsewhere in this issue and I only summarize here the most outstanding results.

Passive Margins and the Mesozoic Evolution of the Atlantic

Following the success of Leg 76, during which a multiple re-entry site drilled in the Blake-Bahama Basin reached, for the first time, middle upper Jurassic (Callovian) sediments resting on oceanic crust, drilling was aimed more specifically at structural targets on the southeastern margin of the Gulf of Mexico (Leg 77) and off northwest Africa (Leg 79). In both areas structural highs near the base of the continental slope were found to consist of faulted continental, or possibly, transitional crust. In addition, drilling in the Gulf of Mexico demonstrated the extension into this area of Mesozoic deep-sea facies very similar to those found in the central Atlantic. One particularly interesting result of drilling off Morocco (Leg 79), underway at the time of this writing, is to have confirmed the occurrence of salt domes in the deep sea just seaward of the faulted blocks of continental crust.

Mechanism of Subduction

Drilling near the foot of the Barbados Ridge (Leg 78A) succeeded for the first time in providing direct evidence for accretion in an active margin. Sediment in the vicinity of the subduction plane exhbits foliation structures indicative of intense shearing. At the same level a major increase in pore pressure resulted in a flow of warm water into the hole.

Downhole Experiments at the Mid-Atlantic Ridge Crest

Hole 395A was re-entered five years after it has been drilled and was found to be clear of cavings almost to its bottom. Highly successful experiments in that hole consisted of logging, magnetometry (with a Russian magnetometer), sonic scanning of the well with a borehole televiewer, study of fluid circulation in the oceanic crust with the help of a packer. In addition, as a test for experiments to be performed in the Northwest Pacific during 1982, a highly sensitive seismometer was lowered into the hole and it successfully recorded both natural events and explosions fired from a surface vessel.

The success of these experiments leads the Project to consider very favorably new developments in downhole instrumentation for the future and a comprehensive re-examination of our logging program.

Problems, New Equipment, Procedures, and Orientation

Glomar Challenger Performance

We experienced a series of problems with *Challenger*'s engines and generators that developed after the Norfolk dry-dock period last fall, but since that time the ship has performed remarkably well. During Leg 78B water seeped into the stern thrusters, but was kept at a relatively low level (3%). We have found the newly designed seals installed on the bow thrusters to be completely satisfactory. As a preventive measure the ship will spend two days in dry-dock in Lisbon following Leg 79 so that the same kind of seal may be installed in the stern thrusters. All in all, the operation of the ship has been very satisfactory and its record is as good as, if not better than, it was some five years ago.

Logging: A New Start

In the past, logging has been one of the most frustrating operations in the entire program. The ratio of scientific returns per financial investment has been extremely low. Reasons are many, and certainly the principal one is that logging open holes in the sorts of rocks that we are coring has not yet been mastered by companies using "tools of the trade."

We have recently launched a new approach in which specific problems posed by our particular type of operation will be addressed as a new research program in a cooperative effort between DSDP engineers and a major logging company. Instead of being handled separately from coring and downhole instrumentation programs, logging will be closely integrated as a research operation within the rest of our scientific program. New tools may have to be developed and DSDP personnel will also play a more direct role in operations onboard ship, and in defining priorities that follow more closely scientific needs. In summary, routine logging will be replaced by research-related logging. If this effort does not yield positive results we will then need to reconsider the entire logging program. JOIDES panels and individual scientists will be asked to be very specific in their appraisals and recommendations regarding logging; each proponent must seriously consider the specific returns and problems to be solved in any given hole before advocating logging, and conversely, other scientists will need to become more familiar with the potential of logging so that they will volunteer ship's time for these operations.

Upgrading the *Glomar Challenger*'s Seismic System

We plan to install a high-resolution seismic system on *Glomar Challenger* as soon as is feasible. DSDP is monitoring tests conducted on other Scripps oceanographic vessels and plans to purchase the new equipment in three steps. First we will acquire a digital recording unit which, when hooked to the shipboard computer, will allow onboard signal processing. Then we will add a new source (probably a water gun) and finally a deep-water hydrophone to the system. The latter will allow for near-bottom recording when lowered to the end of the drill pipe. This will significantly increase the resolution and allow shipboard scientists to better match seismic records with the lithologies observed in the cores.

Shipboard Computer

The plan to acquire a shipboard computer, which we initiated more than a year ago, has suffered setbacks within the last few months during our struggle to fit growing equipment and operational needs into a shrinking budget. We were in the process of ordering the computer last February when strong pressure to purchase logging for Leg 79 changed, once again, our previously established priorities. We lost on both counts, however, when despite extraordinary efforts and expense on the part of Schlumberger and DSDP, the logging equipment could not reach the ship within the exceedingly short time available. We now hope to purchase the computer sometime next fall.

The shipboard computer will be a multi-task system. One of its primary functions will be to process gas chromatography data in real time in order to ensure safer hydrocarbon monitoring while coring. In addition, it will allow processing, archiving, and plotting of a number of data acquired onboard during drilling and sampling operations. Shipboard scientists will be able to quickly and efficiently plot physical properties, logging results, lithology, stratigraphy, and other information, against penetration depth and correlate various other data, at a single site or between sites. The computer will certainly improve our present data acquisition methods, ensure more accurate recording of observations, and reduce paperwork for shipboard scientists. Finally, it will be used for real-time processing (deconvolution) of the single-channel seismic (underway and near-bottom) data.

Future Science Planning

Short-Term Planning (FY 1981)

The present (FY 1981) drilling program which primarily focuses on the study of paleoenvironments and passive margins in the Atlantic Ocean will terminate in October 1981. Of the last three cruises of this phase; two will be devoted to the early evolution of passive margins of the eastern North Atlantic (Bay of Biscay and Rockall Bank areas). The final cruise will comprise a transect of shallow crustal sites parallel to the axis of the Mid-Atlantic Ridge. Drilling is planned to determine the relationship between the chemical composition of the igneous effusions making up the top of the oceanic crust and establish possible heterogeneities in the composition of the mantle. This latter cruise (Leg 82) represents a significant departure from previous plans that called for drilling a passive margin transect off the coast of New Jersey. This change of plans was made necessary by slippage in the ship's schedule during the past year that called for a better integration of the remainder of the present phase into the newly developed 1982-83 program.

Long-Term Planning

The two-year program proposed by the JOIDES Planning Committee will begin in October 1981 with Leg 83 when *Glomar Challenger* enters the Pacific. Scheduling of various cruises is now underway and a first model plan will be submitted to the Planning
next July. A

first year of the program is given elsewhere in this issue.

In conjunction with longer-term planning, DSDP is following closely the work of the various JOIDES panels which are currently preparing a 5-year drilling program. This program will certainly necessitate a major refurbishment of *Glomar Challenger* and development of new technology and tools. We must anticipate some of these needs very early in order to guide the engineers in establishing priorities and developing the proper tools and methods. As an example, DSDP is already running preliminary studies on improving hole stability, drilling on bare hardrock, well instrumentation, wireline re-entry, deploying a 9-km drill string, and, improving positioning and large-diameter coring. We will discuss the highlights of these plans at the Conference on scientific Ocean Drilling next fall. (*Yves Lancelot, DSDP Chief Scientist*)

SCIENCE SERVICES

Overview

Timely Publications

The time needed to publish a single volume of the *Initial Reports* continues to be the object of an endless and sometimes bitter debate. Reasons for delays are multiple, and optimum production time still remains to be clearly defined. Each volume of the initial report series is a compromise between timely publication and good science — and each volume is a battle to produce. We have no doubt that the problem lies in our failure to obtain manuscripts from authors in a timely fashion. In order to speed up production we have decided to better utilize the first year that follows each cruise. Site chapters, which remain the essential core of each volume will be given highest priority just after each cruise. Each post-cruise meeting will be held no sooner than 6 months and no later than 8 months after the cruise. It will be clearly labeled as a site-chapter-production meeting, and will be held at DSDP headquarters in order to gain benefits from the assistance of the DSDP staff. Site chapter manuscripts, written primarily on board the ship, and amended and reviewed during the post-cruise meeting will be handed to DSDP at the end of such meetings and will not be subject to subsequent revision. New interpretations can still appear in the second part of each volume together with necessary explanations. This new policy should bring *initial* reporting back to its original intent without sacrificing the good and interpretive science that will appear in Part II of each volume.. Certainly firm deadlines can be more easily established and enforced by DSDP once the Project receives the site chapters.

User's Guide

The three functions of the Science Services Department are to (1) publish cruise reports (Initial Core Descriptions, Initial Reports, and other reports), (2) archive core material and distribute samples to qualified investigators, and (3) archive, process, and distribute large amounts of other data acquired either at sea or following subsequent analyses conducted on shore.

Experience has shown that many members of the scientific community do not know how these services may be obtained. DSDP has begun work on producing a brochure that will serve as a user's guide through these services. Budget constraints have delayed its production but work should resume beginning early next fall. (*Yves Lancelot, DSDP Chief Scientist*).

Volume Production

Initial Reports

The *Initial Reports* of the Deep Sea Drilling Project, Volumes 1-59 are published. We expect subsequent volumes to appear according to the following schedule.

Volume	Camera-ready Copy to G.P.O.	Expected Publication Date
61 (N. Pacific)	May 1981	August 1981
62 (N. Pacific)	Jul 1981	October 1981
63 (N. Pacific)	Jun 1981	August 1981

We are also working on Volumes 60, and 64-66. Although subject to change, we currently plan to prepare the camera-ready copy for these volumes in the following sequence: Volume 66 (West Pacific), 60 (South Philippine Sea), 64 (Gulf of California) and 65 (Gulf of California).

DSDP does not handle sales of the Initial Reports volumes. To obtain price lists, order forms or other information regarding purchase of the *Initial Reports*, contact:

The Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

Initial Core Descriptions

We have completed the *Initial Core Descriptions* (ICDs) for Legs 27-74. The ICDs contain graphic core descriptions and primary site data (latitude, longitude, water depth). DSDP distributes them to institutions and libraries throughout the world for reference during the interim following the cruise and before the *Initial Reports* are available. We generally complete the ICD's within ten months following the cruise. (*Marianna Lee, Publications Manager*)

Errata to Volumes 1-44

Errata for the Initial Reports Volumes 1-44 are now available. DSDP will automatically distribute the errata lists, compiled and stapled by volume, to institutions in the U.S. and in the IPOD countries, which routinely receive the Initial Reports. Individuals may receive errata upon request to:

Barbara Pinkston
Science Services
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093

(*Ed.*)

Information Handling

The DSDP Information Handling Group has amassed a large collection of geologic data which it makes available to qualified scientists. In addition to processing data, the group has also developed various tools (both automated and manual) to assist researchers in locating and displaying data relevant to their studies.

In Progress

Work is now underway to encode and process the visual core descriptions and the smear-slide descriptions for Legs 45 and beyond. (Those for Legs 1-44 have been complete for several years). The smear-slide file will be expanded to include the sample depth and the sample age (where determined). This change will standardize the smear slide file (to the other DSDP prime data), thereby enhancing its utility.

Paleontologic Data Base

Data are currently available from thity-eight legs (340 sites), representing about 85 per cent of the Tertiary paleontologic data for Legs 1-44. The glossary contains approximately 9200 elements from 25 fossil group and then by DSDP leg number so that we can present research results as either formated listings or as range charts. We encourage requests for paleontologic data. Requests will help us to structure the data base so that it can best serve the needs of paleontologists.

New Data Base

The hard rock minor-element chemical analyses file contains minor and trace element analyses of igneous and metamorphic rocks and of a small number of sedimentary rocks composed of volcanic material. The file contains 3500 analyses. Data are currently available for Legs 13-19, 22-26, 28-34, 36-39, 41-42A, 45-46, 49, 51-62, 65. No data are available for Legs 1-12, 20-21, 27 and 35. No hard rocks were drilled during Legs 47-48. This data base complements the hard rock major-element chemical-analyses file which has been available for nearly a year.

Non-U.S. Data Repositories

IPOD-members France and the U.S.S.R. now have their own DSDP data repositories. Over the past two years we have been transferring data (via magnetic tape) to the Computer Center at the Geological Institute of the U.S.S.R. Academy of Sciences, Moscow, and to the Centre Oceanologique de Bretagne, Brest, France. These two centers hold DSDP prime and processed data which their staffs can now independently access and analyze. We plan to continue the transfer data to these centers as an ongoing project.

Data Distribution Policy

The DSDP/NSF Sample Distribution Policy restricts the release of most scientific data gathered aboard *Glomar Challenger* to members of the respective shipboard scientific parties until two months after publication of the Initial Core Descriptions. The preliminary report on underway data, containing only track charts and data indexes, however, is immediately available to any interested scientist. (A reimbursement charge will be assessed for handling and reproduction if costs exceed $50.00.)

Address your requests for information or data to:

Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093

(*Nancy Freelander, DSDP Information Handling Group*).

Core Repositories

Samples Available

Samples from DSDP Legs 1-73 are now available to qualified investigators for study resulting in published papers. We encourage potential investigators wishing samples to first obtain a sample request form and statement of the DSDP/NSF sample distribution policy statement from the DSDP curator. Write:

The Curator
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093
(*W. Mills, Acting DSDP Assistant Curator*)

Special Frozen Samples Available to Organic Geochemists

Scientists aboard the *Glomar Challenger* collected a 235-meter core of marine sediment specifically for geochemical study. This core, obtained with the hydraulic piston corer from Site 532 (Leg 75), was frozen immediately upon its retrieval to preserve its organic geochemical properties. DSDP Site 532, drilled in the South Atlantic under the Benguela upwelling system, is a re-occupation of DSDP Site 362 of Leg 40.

The organic carbon content in this bioturbated core ranges between 1 and 6 per cent and appears to fluctuate markedly on a time-scale of 20,000 to 50,000 years. The lowest values occur in deeper sediments, and they generally are higher in younger sediments, reflecting an intensification of upwelling conditions at this location. An organic carbon maximum in upper Pliocene sediments records stronger upwelling conditions during that time.

Samples from the frozen core are being made available prior to the normal one-year waiting period, so that the ephemeral geochemical properties can be adequately studied.

The shipboard party obtained two other cores at this site which are the subjects of numerous paleontological, sedimentological, geochemical, and geophysical studies. The information from these current investigations, combined with earlier studies from DSDP Leg 40 and from the nearby Walvis Bay-Namibian shelf area, provide an interpretation background not often available to geochemists studying core materials.

Investigators wishing to receive frozen samples from this unique sediment core should send a brief (300 word) description of the proposed study and their sample requirements to the Organic Geochemistry Advisory Panel (c/o B. Simoneit, address below), which will advise the DSDP Curator on the distribution of samples. Indicate on a DSDP sample request form the number of desired samples, their spacing by centimeter-interval in the core-sections, and the minimum volume of each sample adequate for the study.

For further details or questions about the chemistry of the frozen material please contact Dr. Philip A. Meyers (Leg 75, shipboard organic geochemist), Oceanography Program, Department of Atmospheric and Oceanic Science, The University of Michigan, 2455 Hayward, Ann Arbor, MI 48109, USA.

Return proposals and sample requirements to Dr. Bernd R. T. Simoneit, Institute of Geophysics and Planetary Physics, University of California, Los Angeles, CA 90024, USA, who will transmit them to the DSDP curator. (*B. Simoneit, Chairman, Organic Geochemistry Panel*)

ENGINEERING DEVELOPMENTS

Variable-Length Hydraulic Piston Corer (VL/HPC)

Deployment of the newly developed VL/HPC remains scheduled for Leg 80 in June 1981. We have incorporated several prototype design innovations, listed below, which we hope will prove to be successful. The core-barrel length will be adjustable from 3.5 to 9.5 meter in 1.5-meter increments. We have also:

- Extended the catcher sub to allow for the use of both dog and flapper type core catchers simultaneously.
- Added a quick-disconnect assembly just above the core barrel which should allow its more efficient and safer shipboard handling.
- Included a new shear-pin assembly to allow faster operations and increased reliability and repeatability of shearing pressures.
- Incorporated a quick-release piston-head assembly in an attempt to provide a faster means of changing piston head seals.
- Developed an "absolute" core orientation system which should be much less sensitive to sea state and the resultant vessel motion.

The VL/HPC is designed to be compatible with the extended core barrel (XCB) coring system. Our intent is that when both of these units are deployed, the most favorable coring system will be available from mudline to basement without requiring a trip of the drill string.

Extended Core Barrel (XCB)

Deployment of the XCB is scheduled for September 1981 on Leg 82. We plan to conduct drilling tests of the system during the week of May 4, 1981 in Salt Lake City. Some of the technical objectives to be implemented by the prototype XCB coring system are as follows:

- The XCB is designed to continue drilling from that point at which hydraulic piston coring operations are terminated. Changing from VL/HPC to XCB operations should not require a trip of the drill string.
- The XCB may be deployed as a rotating core barrel with a free floating core liner or as a non-rotating core barrel with a clutch drive. The drive assembly becomes engaged only when the formation is too stiff to core without rotation of the cutting structure.
- The XCB cutting structure will utilize experimental polycrystalline (artificial diamond) cutting elements.
- The XCB has a cutting shoe designed to cut and recover the core ahead of the core bit in an attempt to avoid disturbance owing to circulation within the drill string.
- The XCB is designed to recover the sediment/basement interface. We hope that the XCB will do a more effective job of recovering interbedded hard and soft formations without loss of the softer material, but have not, as yet, proven this capability.

The Wireline Re-entry

The DSDP engineering group has begun to study the feasibility of, and the preliminary design work for, a wireline re-entry system. This capability would allow *Glomar Challenger* as well as other oceanographic vessels to downhole instrument packages of up to 8″ diameter and other logging gear.

Hydraulic Piston Corer/Heat Flow Measurements

DSDP engineers are also designing a new cutting shoe to accept a miniature self-contained heat-flow probe and recorder. The electronics package is to be provided by Woods Hole Oceanographic Institution and measures approximately 3″ x 3/16″ x 1″.

Pore Water Sampler/Pressure Measurements

The DSDP logistics department is studying a means to modify the pore-water sampler so that it will also measure formation (pore water) pressure. A commercial, off-the-shelf pressure sensor and recorder may be integrated into the system with only minor modifications.

(M. A. Storms and D. Cameron DSDP Development Engineering Department)

The Pressure Core Barrel: A Special Report

Deep Sea Drilling Project engineers and scientists successfully tested a new coring system during Leg 76 which will substantially enhance the scientific value of certain cores taken by the *Glomar Challenger*. The tool is a unique wireline retrievable pressure core barrel (PCB), now operational after several years of development.

Introduction

Marine geophysicists have for many years noted that seismic reflectors in certain areas of the ocean floor do not relate directly to known or inferred stratigraphy of the area. In many cases the reflectors parallel the bottom topography, and are now commonly called bottom-simulating-reflectors (BSRs). Coring these reflectors has revealed neither density nor lithologic changes sufficient to explain their presence, and thus geologists have looked for other solutions to the problem.

Methane gas commonly occurs in the sediments at the approximate BSR horizons, and because the temperature and depth conditions favor the formation of certain types of natural gas hydrates, scientists have postulated that the anomalous reflectors are caused by zones of interstitial gas hydrates.

The gas hydrates, which exist as a solid *in situ*, quickly change to methane and water as pressures diminish during core retrieval. Consequently, no *direct* evidence was previously available to confirm the presence of gas hydrates (clathrates) in certain areas of the ocean.

The possible presence of gas hydrates, and their geochemistry has increasingly intrigued marine geologists, both as a potential source of hydrocarbons and as a potential hazard to offshore drilling.

Deep Sea Drilling developed the pressure-core barrel (PCB) to recover cores at near *in situ* pressures to inhibit or prevent phase changes normally accompanying core recovery.

History of Development

DSDP tested a prototype PCB during Leg 42B (1975) with limited success. On the basis of those tests the DSDP Engineering Department extensively modified the tool, producing a second model which was tested on Legs 62, 64, 72 and 74. During this series of tests, the developers evolved a dependable ball-valve seal and exhaust-vent seal.

One problem remained, however; the ball closure, vent, and release mechanisms sporadically tripped prematurely. The solution was not simple, but the problem was ultimately traced to the shear pins which, by increasing pull on the wire line, should have sheared and thus triggered (a) the ball closure, (b) vent, and (c) release mechanisms in three steps. The shear pins, however, became weakened during the trip down the pipe and upon impact with the bit, sheared prematurely causing tool release before closure of the ball valve.

The latest version of the PCB incorporated, instead of shear pins, a system combining a collet, ball locks, and disk springs which is less vulnerable to rough handling and heavy impacts.

Successful Test

The PCB was successfully tested during Leg 76 on the Blake-Bahama Outer Ridge off the East Coast of the United States (Hole 533A). The tool can be used during standard coring operations with only slight modification to the coring assembly and is operational to any depths to which the *Challenger* can drill, but at depths greater than 10,000, ft excess pressure (> 5000 psi) is vented off. This capability allows geochemists to sample methane hydrates (clathrates) which, on the basis of high pressure and low temperature prevailing at certain depths, and the presence of bottom-simulating reflectors, have been presumed to exist. In normal coring, gas hydrates would disintegrate as pressure is released during core retrieval.

Inorganic geochemists will also benefit from the tool. Pore water samples can now be recovered at *in situ* pressures allowing pressure-sensitive reactions between pore fluids and inorganic material to be measured.

The shipboard scientists had predicted the presence of methane hydrates here on the basis of bottom-simulating seismic reflectors which cross-cut bedding planes at that site. They attempted to collect five PCB cores at Site 533A, in 3184 meters of water. Four attempts resulted in full recovery under pressures of up to 4700 psi. All cores were recovered from the upper 234 meters of sediment.

Utilizing the PCB, the Leg 76 shipboard geochemists were able to establish beyond a reasonable doubt that gas hydrates do exist under the Blake-Bahama Outer Ridge. (See also Leg 76 report, in JOIDES Journal, Vol. VII, No. 1, February 1981.)

The Wire-line Pressure Core Barrel (Mod III) — How It Works

The PCB consists of a high-pressure wireline core barrel terminating in a 2 ¼″ diameter ball valve assembly at the lower end, and an exhaust vent/pressure relief/sampling mechanism at the upper end. The PCB is dropped down the drill string to latch in at the bit. After the core is cut a retrieving tool is lowered down the pipe by wireline to latch on to the PCB. The force of the wireline pull against the latched-in PCB mechanically activates a series of mechanisms which shift closed the ball valve and the exhaust vent, and finally unlatch the tool. (See also Fig. DSDP-1). As the tool is retrieved, a pressure relief valve maintains internal pressure at no more than 5000 psi by venting nitrogen from a precharged floating piston accumulator in-line between it and the sample chamber.

Figure DSDP-1. Tom Witte, DSDP marine technician (left), and Don Cameron, co-designer of the pressure core barrel, hold the ball-valve section. The ball mechanism is encapsulated within two split halves of the pressure core barrel.

Once on deck the pressure and temperature of the core are immediately monitored, and the pressurized gas and fluids are withdrawn under controlled conditions.

The pressure core barrel permits recovery of 6.0 meters of pressurized core and 1.8 meter of non-pressurized core. The PCB core diameter is 5.72 cm compared to the standard core diameter of 6.35 cm.

The unique wireline retrieval system allows several pressurized cores to be collected while coring progressively in the same drill hole. More conventional pressure-coring systems require a complete round trip with the drill string for each core.

Specifications

Figure DSDP-2 diagramatically shows the wireline pressure core barrel.

Operating Pressure. A pressure relief valve maintains the system at or below 5,000 psi independent of the hydrostatic pressure encountered.

Safety. Internal burst (yield) strength of the system is 20,000 psi. The factor of safety is 4:1 at the 5,000 psi operating pressure. A burst disk will rupture at 7,000-8,000 psi in case the pressure relief valve fails.

Core Diameter. 5.72 cm in diameter (instead of 6.35 cm for standard coring system).

NOTE: A special core bit is used in the pressure coring program. The core diameter will be the same for drilling the entire site including all that for standard non-pressurized wireline coring.

Core Length. Approximately 1.8 meters of non-pressurized core and approximately 5.48 meters of pressurized core can be recovered.

Sampling. A sampling port (0.25 NPT) is provided in the sampling assembly near the upper end of the PCB to enable sampling of liberated gases while on deck.

Pressure and temperature may be measured immediately without opening the pressurized core barrel. Pressure is monitored through a pressure transducer and temperature is monitored through a "blind port" filled with a heat sink compound which allows insertion of a temperature probe.

Barrel Length. The space out length of the PCB is the same as the standard wireline coring assembly of 34 feet 0.10 inches.

Core Liner. The PCB utilizes the same butyrate core liner as the standard coring system. The 1.8 meters of unpressurized core is not recovered in a liner.

Re-Entry. DSDP has developed a small diameter re-entry scanning sonar tool to protrude through the smaller PCB bit; thus the two systems are compatible.

Water Depth. The PCB can operate safely in 20,000-foot water depths. All excess internal pressure above operating pressure is automatically vented off as the barrel is retrieved.

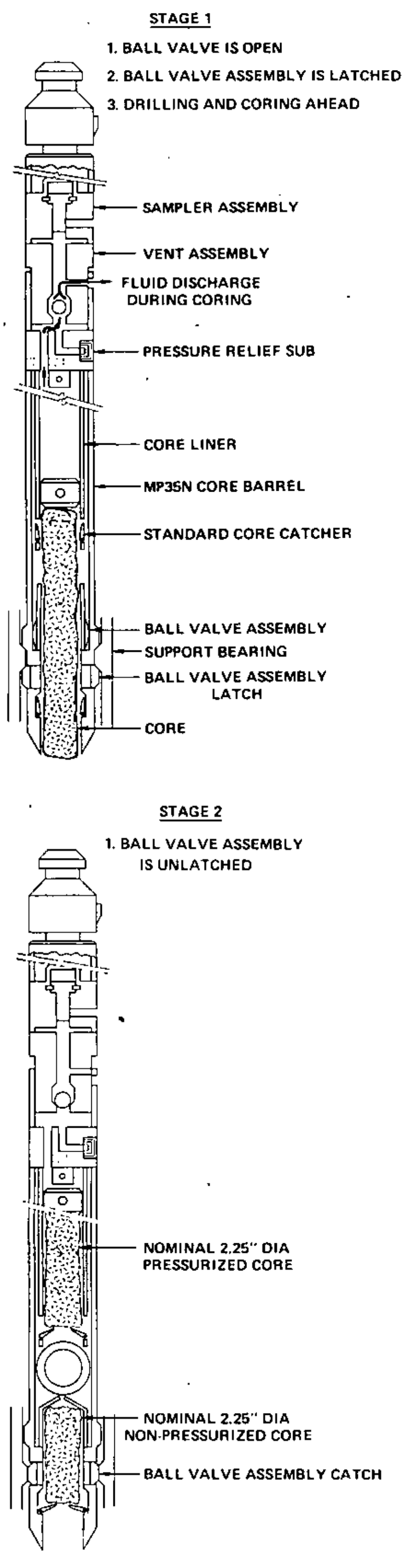

Figure DSDP-2. Graphic diagram of the wireline PCB (model III).

Operating Time. Operating time for the PCB is comparable to that of the standard wireline coring system for a limited number of runs. If more than four runs per site are required additional time — 2-5 hours — is required to redress the tool. Handling time on deck is a function of the required scientific program.

Theory of Operation. Unlike the standard core barrel, the PCB latches in under the support bearing located just above the drill bit. After the core is drilled, a wireline is sent down to retrieve the tool. A pressure seal is effected by rotating a ball valve at the lower end, and shifting close an exhause vent at the upper end, of the core. Each of these mechanisms is activated by a wireline pull at somewhat less force than required to unlatch the tool from the support bearing. The resistance of the latch can be adjusted by altering the configuration of a stack of disk springs. The force needed to unlatch the PCB has ranged from 2000 to 6000 pounds over the wireline weight.

PERSONNEL BRIEFS

Stan Serocki returned to the Deep Sea Drilling Project to resume his position as **head of Development Engineering.**

Valdemar (Swede) Larson formally Head of Development Engineering has resigned owing to poor health.

Chuck Adelseck, formerly a DSDP staff scientist and participant on board *Glomar Challenger* Legs 56, 62, and 68, joined McClelland Engineers (Ventura, California) on 1 June 1981 as a project manager/senior geologist.

Kenneth Pisciotto, DSDP staff scientist will leave the project 30 June 1981 to join Sohio Petroleum in San Francisco.

Linda Garifal, has resigned as DSDP Assistant Curator. **Bill Mills** is Acting Assistant Curator until her position is filled.

• • •

The Deep Sea Drilling Project is currently accepting applications for **Associate Chief Scientist for Science Services**, **Assistant Curator**, and **three sea-going Staff Scientist** positions.

JOINT OCEANOGRAPHIC INSTITUTIONS, INC.

OCEAN MARGIN DRILLING PROGRAM

The Ocean Margin Drilling (OMD) Science Advisory Committee met in January, 1981, and again in mid April. Between these meetings the OMD Executive Committee has been meeting monthly.

Our principal accomplishment of the past four months has been the establishment of a schedule and flow chart for future development of the OMDP science program. This calls for preparation of an *initial science plan* in the fall of 1981. This document will set forth objectives, describe necessary studies and establish a framework for future activities. The committee will prepare *an updated science plan* in the spring of 1982 to describe in further detail required studies and other activities, including schedules and budget estimates. Preparation of the updated science plan will mark the conclusion of the initial planning phase of the OMD science plan. Following this, regional and site-specific surveys will begin in summer 1982.

Each of the regional planning advisory committees (PACs) have now met at least once. At their meetings, the PACs have selected chairmen and mapped out a strategy for the future and reviewed progress on the regional syntheses projects. An essential component of planning will be a series of workshops in August. These workshops will involve PAC members, regional synthesis groups, representatives of industry and others. The goals of the workshops are to define the remining scientific problems in the regions of concern to each Planning Advisory Committee, establish why these problems are important (i.e., of more than local significance), and establish what studies are needed to solve them, and where, if any, deep holes should be drilled.

Despite a slow start and problems associated with the contracts for the regional syntheses, progress to date has been very encouraging and we are confident that the goal of having working copies of the synthesis maps available for use in the PAC summer workshops will be achieved.

With regard to engineering, on March 23, 1981, the NSF issued a request for proposals for the systems integration contractor for OMDP. The systems integration contractor will be responsible for design, conversion, and operation of the drilling platform for the Ocean Margin Drilling Program. Proposals are due in late June, and we anticipate that a contract award will be made before the end of fiscal 1981.

The OMDP directory referred to in the February issue of the *JOIDES Journal* is now available. Copies have been sent to each of the JOIDES Planning Committee members. Additional copies are available from:

Joint Oceanographic Institutions, Inc.
2600 Virginia Avenue, N.W. Washington, D.C. 20037

(*T. Davies, Chief Scientist, OMD*)

IPOD SITE-SURVEY DATA BANK

The IPOD Site-Survey Data Bank at Lamont-Doherty Geological Observatory has recently (January-April 1981) received the following data.

- Track Chart of USGS seismic lines in the Georgia Embayment, from W. Dillon, U.S. Geological Survey (USGS).
- Navigation chart of *Fay* 019 tracks, Charlston to Norfolk, 1976, from N. Bailey (USGS).
- Thirty-five sepia ozalids of multichannel seismic lines from the Straits of Florida (SF1A-SF25), taken on *Fred H. Moore* cruise 3, Leg 1, from R. Buffler, University of Texas Marine Science Institute (UTMSI).
- Sepia ozalids of multichannel lines taken in the area of AT-1 by *Ida Green*, from UTMSI.
- Twenty-three multichannel seismic profiles for lines AM-1, AM-2, and AM-3 taken on *Fred H. Moore* cruise 1-03 in the Cape Basin, from James Austin (UTMSI).
- Open File Report 79-578 seismic data (microfilm), *Fay* 20 and 21 on the Atlantic continental slope and rise north of Hatteras, from National Geophysical and Solar Terrestrial Data Center (GSDC) in Colorado.
- Open File Report 79-580 seismic data (microfilm) and site-scan sonar taken on R/V *Oceanus* on the Middle Atlantic shelf area, from NGSDC.

- Open File Report 80-93-seismic data (microfilm) taken by *Gilliss* cruise GS7903-4 on the Baltimore Canyon outer continental shelf, from NGSDC.
- Open File Report 80-935-seismic data taken from *Columbus Iselin* cruise C17807-1 on the Baltimore Canyon outer shelf, from NGSDC.
- Lease sale 62 and 62A, Gulf of Mexico: seismic data (microfilm and microfiche), navigation map and computer tape of navigation, from NGSDC.
- Lease sale 56, Georgia Embayment: Geophysical data (microfilm), shot-point location maps with annotated bathymetry, and computer tape of navigation, from NGSDC.
- Seismic profiler records (microfilm) from *Glomar Challenger* Legs 47-50, from B. Long (DSDP).

Carl Brenner, Data Bank Curator, is investigating procedures to publish a volume containing Atlantic site-survey data. The volume will contain geophysical and geological data collected for the IPOD site-survey program between 1975 and 1978 for the central Atlantic Ocean. The volume is planned to be the first in a series which will eventually include data from the North and South Atlantic and Pacific oceans.

JOI SITE SURVEY PLANNING COMMITTEE

LeRoy M. Dorman, Chairman

The JOI Site Survey Planning Committee met 2-3 April 1981 at Scripps Institution of Oceanography.

Review of Responses to Request for Proposals

The JOI Site Survey Planning Committee reviewed responses to a request for proposals (RFPs) distributed in February 1981. A subcommittee composed of all SSPC members except those from institutions submitting proposals evaluated the proposals received. Its results are summarized as follows.

Hydrogeology. This portion of the RFP elicited two formal proposals, one from Lamont-Doherty Geological Observatory/University of Rhode Island and one from Scripps Institution of Oceanography. The review panel found highly desirable elements in both of these proposals and suggested that they be combined. It gave first priority for accomplishment to heat-flow work, sediment chemistry, and profiling, and second priority to the deep-tow work because of the high cost of ship time and personnel. The subcommittee recommended that more heat-flow -- about twice as much as was proposed by either group -- be accomplished and recommended use of the R/V *Washington* because the Seabeam system is available on this vessel. Specifically desirable programs are Seabeam, profiling and heat-flow determinations from SIO, heat-flow and coring from L-DGO, and chemistry from URI. The subcommittee recommended a combined budget level of $871 thousand, using 45 days of ship time (including time in port). The ship-day figure presumes Tahiti is one of the ports used.

The original scheduling of the hydrogeology leg limited the potential pool of respondents. The JOI administration felt that NSF would require formal modification of the RFP, the JOI will ciculate a letter requesting letters of intent. If responses are received they will be compared with the existing hydrogeology proposals (or their successors). The committee hopes that a final decision can be made without holding an additional meeting.

Old Pacific. This portion of the RFP produced only one proposal, that from the Hawaii Institute of Geophysics with a supplementary section from SIO for single-channel digital reflection profiling. The subcommittee recommends that the HIG/SIO proposal be funded with the following modifications. Eliminate the ocean-bottom seismic work and most explosives for the refraction work. Use instead watergun repetitive sources to achieve broad-band souce spectra. The recommended funding level is $309 thousand which would include ship's time, as proposed, to HIG, and $80 thousand to SIO.

Equatorial Pacific. The committee received one proposal addressing this area from SIO. The subcommittee recommended support but recommended that the cruise terminate in Tahiti, saving about five days of ship's time days. The recommended funding level is $550 thousand and includes 35 ship days. The committee noted the combined use of waterguns make it desirable to consider their purchase instead of their lease.

Other Business

ENA-8 Survey. The Site Survey committee discussed a possible survey of ENA-8. R. Sheridan (Chairman, JOIDES Passive Margin Panel) had suggested that the lines between

ENA-3 and Site 534 be considered as an alternative to the ENA-8 work. The committee concluded that in light of its lower priority and inasmuch as the site would not be drilled in the near future, it would be unresponsive to the overall needs of the drilling program should it continue to support the ENA-8 surveys. The SSPC recommended, therefore, that the survey be held in abeyance and the funds be transferred into the current year's funding to enable support of surveys for the three areas for which proposals have been received.

Challenger Seismic System

Funds have been allocated to purchase an upgraded seismic system for *Glomar Challenger.* The committee discussed improvement in *Challenger* survey capability and proposed several items.

a. a near-bottom hydrophone which could be used with or without the drill string.

b. a watergun to augment the airguns currently used.

c. digital recording and processing capability. This could most economically be accomplished in conjunction with the general purpose computer proposed for the *Challenger* — especially so if the general purpose computer is one for which digital signal handling software were already available.

1982-83 Program

Although survey requirements for the 1982-83 program are not well defined, a request for surveys in the SW Pacific (three hydraulic piston-core sites) exists. The Mississippi fan may require work, depending on how the problem is defined.

FOCUS

REPORT FROM THE COSOD STEERING COMMITTEE

The Steering Committee for the Conference on Scientific Ocean Drilling (COSOD) met in Rhode Island on 21-22 May. The members of the committee, selected by the JOIDES Executive Committee, are R. Larson, URI, Chairman; J. Aubouin, France; D. Baker, U. of Washington; H. Beiersdorf, Germany; R. Coleman, Stanford Univ.; T. Edgar, USGS; R. Garrels, U. of South Florida, H. Gould, Exxon Production Research Co.; C. Harrison, J. Hays, L-DGO; K. Kobayashi, Japan; D. Matthews (United Kingdom); J. Maxwell, U. of Texas, and Y. Neprochnov, USSR.

Drs. Baker, Edgar, Garrels, Kobayashi and Matthews were unable to attend. J. Knauss, URI, and R. White, United Kingdom, substituted for Baker and Matthews, respectively, bringing the panel of voting members to eleven out of fourteen.

T. Davies, OMDP, W. Hay, JOI Inc., B. Haq, NSF, Y. Lancelot, DSDP, and A. Pokryshkin, USSR also attended the meeting as observers.

Pursuant to the terms of reference for the conference (see "Letter to the JOIDES community," E. L. Winterer, JOIDES Journal, February 1981), the Steering Committee selected five working groups to examine the following topics:

I. Origin and Evolution of the Oceanic Crust
II. Origin and Evolution of Marine Sedimentary Sequences
III. Tectonic Evolution of Continental Margins
IV. Causes of Long-term Changes in the Oceans, Atmosphere, Cryosphere, Biosphere, and Magnetic Field
V. Tools, Techniques, and Associated Studies

The working groups, each consisting of six scientists, will be asked to submit White Papers addressing the question of how the state of knowledge in a given topic can be advanced by drilling. The committee nominated members of the international scientific community to serve on the working groups. As of this writing (28 May 1981) the specific membership has not been confirmed.

The Conference on Scientific Ocean Drilling is scheduled for 16-18 November 1981, in Austin, Texas, and will be open to the general scientific community. The Steering Committee plans the conference to be as responsive as possible to the ideas of the scientific community as a whole. The committee encourages suggestions and ideas which bear on the future of scientific ocean drilling. Ideas relating specifically to the above topics should be submitted as soon as possible, so that they may be forwarded to the appropriate working groups. More general suggestions, or ideas relating to other topics, are welcome at any time preceding the conference.

Please send entries to:

Dr. Roger L. Larson, Chairman
COSOD Steering Committee
Graduate School of Oceanography
University of Rhode Island
Kingston, RI 02881
Tel: (401) 792-6153

Obtain further information about meeting logistics and travel arrangements from:

Ms. Doris Rucker
Joint Oceanographic Institutions, Inc.
2600 Virginia Avenue, Suite 512
Washington, DC 20037
Tel: (202) 333-8276

Publications

The DSDP Curator has supplied this list of recent publications. If you have published a paper using data or samples collected by, or in conjunction with, the Deep Sea Drilling Project, please send five reprints of it to the Curator, Deep Sea Drilling Project, A-031, La Jolla, CA 92093.

Anonymous, 1981. Mid-Jurassic rocks cored off Florida by the *Challenger. Geotimes*, April 1981, v. 26, no. 4, p. 15-16.

Basov, V. A., (ed.), 1980. Stratigrafiya i Paleogeografiya Severnoi Atlantiki v Melovom Periode (Leningrad. Nauchno-Issledovatelskii Institute Geologie Arktiki, Ministerstva Geologii USSR.

Dean, Walter E., James V. Gardner and Pavel Cepek, 1981. Tertiary carbonate-dissolution cycles on the Sierra Leone rise, eastern Equatorial Atlantic Ocean. *Marine Geology*, v. 39, p. 81-101.

Donn, W. L. and D. Ninkovich, 1981. Rate of Cenozoic explosive volcanism in the North Atlantic Ocean inferred from deep sea cores. *Jour. Geophys. Res.*, v. 85, no. B10, p: 5455-5460.

Greathouse, Lee, April 1981. New target: continent building from the ocean floor. *Geotimes*, v. 26, no. 4, p. 14-15.

Haq, Bilal U., 1980. Biogeographic history of Miocene calcareous nannoplankton and paleoceanography of the Atlantic Ocean. *Micropaleontology*, v. 26, n. 4, p. 414-443.

Haq, Bilal U., T. R. Worsley, L. H. Burckle, R. G. Douglas, L. D. Keigsin, Jr., N. D. Opdyke, S. M. Savin, M. A. Sommer, II, E. Vincent and F. Woodruff, 1980. Late Miocene marine carbon-isotopic shift and synchroneity of some phytoplanktonic biostratigraphic events. *Geology*, v. 8, p. 427-431.

Keigwin, L. D., Jr., 1980. Paleoceanographic change in the Pacific at the Eocene-Oligocene boundary. *Nature*, v. 287, no. 5784, p. 722-725.

Keller, Gerta, 1981. Early to middle Miocene planktonic foraminiferal datum levels of the equatorial and subtropical Pacific. *Micropaleontology*, v. 26, no. 4, p. 372-391.

McKirdy, David M. and Peter J. Cook, 1980. Organic geochemistry of Pliocene-Pleistocene calcareous sediments, DSDP Site 262, Timor Trough. *Amer. Assn. Petroleum Geol. Bull.*, v. 64, no. 12, p. 2118-2138.

Natland, James, 1981. Combinations of new technology yielded rich results. *Geotimes*, v. 26, no. 2, p. 21-22.

Thiede, Jorn, Torleiv Agdestein and Jan Erik Strand 1980. Depth distribution of calcareous sedimens in the Mesozoic and Cenozoic North Atlantic Ocean. *Earth Planet. Sci. Lett.*, v. 47, p. 416-422.

Thiede, Jorn, Torleiv Agdestein and Jan Erik Strand, 1980. Temporal and spatial variations of the Upper Mesozoic and Cenozoic sediment flux to the deep North Atlantic Ocean. *Marine Geology*, v. 36, p. M11-M19.

Thierstein, H. R., 1980. Cretaceous oceanic catastrophism. *Paleobiology*, v. 6, no. 3, p. 244-247.

Thierstein, H. R., 1980. Selective dissolution of late Cretaceous and earliest Tertiary calcareous nannofossils: experimental evidence. *Cretaceous Research*, v. 2, p. 165-176.

Van de Meent, Dik, Stephen C. Brown, R. Paul Philip and Bernd R. T. Simoneit, 1980. Pyrolysis-high resolution gas chromatography and pyrolysis gas chromatography-mass spectrometry of kerogens and kerogen precursors. *Geochim. Cosmochim. Acta*, v. 44, no. 7, p. 999-1013.

Zdorovenin, V. V. and V. S. Shcherbakov, 1980. Materials of the World Data Center B. The data system of the Deep Sea Drilling Project. Soviet Geophysical Committee, Acad. of Sciences, USSR, Moscow, p. 1-54.

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 Leg 65. For information contact:

Donna Hawkins
Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093

Paleontologic data from Initial Reports of Deep Sea Drilling Projects Volumes 1-34 are now available for computer searches. The system includes all fossil groups cited in these volumes. For information contact:

Lillian Musich
Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093

APPROVED JOIDES PANEL MEETINGS

	COMMITTEE / PANEL	Jan 1981	Feb 1981	Mar 1981	Apr 1981	May 1981	June 1981	July 1981	Aug 1981	Sept 1981	Oct 1981	Nov 1981	Dec 1981
	Executive Committee (EXCOM)			19-20 SIO					12-14 Hannover				3-4 San Francisco
	Planning Committee (PCOM)		24-27 SIO					8-10 Hannover				11-13 Corvallis	
SUBJECT / AREA	Ocean Crust Panel (OCP)			30-31 U. Rhode Is.	1								
SUBJECT / AREA	Ocean Margin (Active) Panel (AMP)				7-9 Menlo Park								
SUBJECT / AREA	Ocean Margin (Passive) Panel (PMP)	17-19 Galveston					18-20 Univ. Delaware						
SUBJECT / AREA	Ocean Paleoenvironment Panel (OPP)		4-5 Bermuda										
DISCIPLINE	Inorganic Geochemistry Panel (IGP)												
DISCIPLINE	Organic Geochemistry Panel (OGP)												
DISCIPLINE	Sedimentary Petrology & Physical Properties Panel (SP^4)												
DISCIPLINE	Stratigraphic Correlations Panel (SCP)					6-8 SIO							
OPERATIONS	Downhole Measurements Panel (DMP)				30 HIG	1							
OPERATIONS	Industrial Liaison Panel (ILP)												
OPERATIONS	Information Handling Panel (IHP)	15-16 SIO											
OPERATIONS	Pollution Prevention & Safety Panel (PPSP)			10-11 SIO		21-22 WHOI							
OPERATIONS	Site Surveying Panel (SSP)					14-15 L-DGO							
	Others											16-18 Austin	COSOD
	Working Group (Mesozoic)	20 SIO*	3 Bermuda*				1-2 Menlo Park	AMP *ad hoc* Committee (NW Pac.)	AMP *ad hoc* Committee (NW Pac.)	AMP *ad hoc* Committee (NW Pac.)			

*in part

JOIDES COMMITTEE AND PANEL REPORTS

We have extracted items from either the *draft* minutes of recent JOIDES committee and panel meetings or from brief summaries provided by panel chairmen. We omitted items reported elsewhere in the JOIDES Journal (e.g. NSF, DSDP, and OMDP, panel reports and/or certain items of limited interest.

EXECUTIVE COMMITTEE

William A. Nierenberg, Chairman

The Executive Committee (EXCOM) met 19-20 February 1981 at Scripps Institution of Oceanography. The following includes items from the *draft* minutes of that meeting.

National Science Foundation Report

P. Wilkniss (NSF) reported for the National Science Foundation.

Budgets

FY 1981. DSDP-IPOD has not been subjected to budget cuts for FY 1981, but owing to increased *Glomar Challenger* operating expenses, general inflation and large unexpected expenditures (e.g., an *ad valorem* tax on ship's repairs) DSDP will need to make adjustments in the budget and can expect the remainder of FY 1981 to be fiscally constrained.

FY 1982. The current administration has cut the NSF budget across the board. The Carter budget was $1.35 billion; the Reagan budget is $1.03 billion — $320 million less. Cuts have been most severe in "soft science" such as biological, behaviorial, and social sciences. Some programs have been cut entirely to allow others to continue. The Ocean Margin Drilling Program (OMDP) was also cut by $4 million. (Funds for long-term procurement items, which were more difficult to defend in the FY '82 budget, were those eliminated.). Budgets of the National Oceanic and Atmospheric Administration and the U.S. Geological Survey have also been severely reduced.

In view of the serious budgetary constrictions, the DSDP-IPOD program fared exceedingly well. Its success may be credited in large measure to the international charter of the program, and the real sense of international cooperation it embodies.

To date, of the $26 million requested by the National Science Board for the 1982 program, NSF has committed its full $14 million, and other U.S. agencies have committed $1.3 million of the $2 million needed. Owing to the large budget cuts, the U.S. Geological Survey cannot contribute as hoped, which accounts for the $0.7 million shortfall in the other U.S. agency contribution.

Division of Ocean Drilling

NSF has now established the new Division of Ocean Drilling Programs under which the DSDP-IPOD and OMDP programs fall. Peter Wilkniss is division director and Ian MacGregor has been offered the position of chief scientist.

Australian Visit

A delegation comprising R. Brett (NSF), P. Wilkniss (NSF), M. Peterson (DSDP/JOIDES), and B. Lewis (JOI) attended a workshop in Canberra to discuss Australian membership in JOIDES. P. Wilkniss reported that it was an excellent experience and complimented the Australian scientists on their well organized meeting and united support of membership. NSF encourages expanded JOIDES membership, recognizing the value of both additional funds and new ideas. (Australian membership is discussed further below.)

COSOD

The Foundation feels the proposed Conference on Scientific Ocean Drilling must be broadly based; it should address ocean drilling in a global context and include non-U.S. participation. (See also below.)

Ocean Margin Drilling Program

The U.S. will not invite non-U.S. participation in the OMDP at this time. Development of the OMDP is very complex, involving negotiations between U.S. universities, industry, and government agencies — all within the context of a new congress and presidential administration. NSF expects to continue the general information exchange, and encourages interest in the program, but cannot at present take official steps to invite non-U.S. partners.

DARPA

NSF is nearly ready to make final a contractual agreement with DARPA for the NW Pacific operation. The contract will contain clauses to protect SIO and DSDP. Development of the downhole instrument package will cost about $9 million.

Deep Sea Drilling Project Report

M. Peterson reported for the Deep Sea Drilling Project.

Budgets

FY 1981

Built-in escalating prices, a major cost increase from the drilling subcontractor (Global Marine), and the *ad valorem* tax have seriously cut into 1981 budgeted funds. (The *ad valorem* tax claims up to 50 per cent of the cost of ship's repair upon return of a U.S. ship to a U.S. port following its repair in a foreign port. The tax may cost DSDP $170 thousand for the 1979 Norfolk port call and $26-27 thousand for a 1976 San Juan port call.)

DSDP is attempting to preserve the logging program and NSF has orally assured the project that if DSDP defers publication of two initial report volumes until FY '82, additional funds can be made available for FY '81 operations. This will help fund logging during Legs 80 and 81, but not during Leg 79.

Discussion

Members of the EXCOM expressed concern about the lack of logging on Leg 79. N. Bogdanov noted that Soviet logging tools may be available for Leg 81 — possibly releasing some funds for Leg 79 logging. M. Peterson agreed to investigate the possibility of using Soviet logging tools. The EXCOM discussed the problem further under Leg 79 drilling below.

FY 1982

NSF has requested $22.5 million for DSDP operations during FY 1982.

Operations

Leg 77

Leg 77 was scientifically very successful. The drill sampled strata which suggest formation of the Gulf of Mexico was later than the opening of the North Atlantic.

On the other hand, poor communication with the ship, posed a problem for DSDP during Leg 77. Drilling encountered tar-filled cracks and although the shipboard scientists judged the hydrocarbon to be immature, Safety Panel members questioned whether the shipboard party could make that judgement with the equipment and data available onboard. The problems were exacerbated by poor ship-to-shore communication. DSDP will submit a more complete report from the cruise co-chief scientists at the next Planning and Executive committee meetings.

Leg 78A

Leg 78A successfully drilled into the thrust zones presumed to overlie the subducted sediments. Coring recovered scaly, foliated claystone and documented a stratigraphic inversion. Despite three attempts to drill deeper, fractured and sheared rock collapsed into the hole and forced its abandonment. Attempts to case the hole with drill-in-casing failed when the bit-release mechanism would not work. The casing, however, *was* successfully "drilled in." The operation also created an accidental packer experiment which indicated a downhole pressure in excess of 250kg/cm^2 psi over hydrostatic pressure.

The Dunnebier downhole seismic experiment at the oceanic reference site was not successful; although operational on deck, the seismometer did not record properly downhole.

Leg 78B

At the time of the Executive Committee meeting, *Glomar Challenger* had just located the cone and re-entered Hole 395. (The cone was set and the hole originally drilled 5 years ago.) DARPA will test the design of its downhole emplacement system here.

(More detailed Leg 78A results are given above, under Glomar Challenger operations.)

Planning Committee Report

E. Winterer reported for the Planning Committee which met at Scripps Institution of Oceanography, 24-27 February 1981.

Panel Reports

The JOIDES panel chairmen attended the February Planning Committee meeting and relayed summaries of their panel's past year's activities and/or items requiring PCOM/EXCOM action. E. Winterer relayed items of interest to the EXCOM from the panel reports.

(These are reported in the Planning Committee or Panel minutes below, and except in cases in which the Executive Committee passed a motion or resolution, are not reiterated here.)

Information Handling Panel

France and the Soviet Union have recently established JOIDES/DSDP data centers. The Planning Committee supports the centers and adopted the following resolution:

> The Planning Committee recognizes the efforts of Soviet and French scientists to establish a working DSDP data base. Already beneficial results have been seen and further dissemination of information should be encouraged. Significant additional benefits will accrue from cooperative consideration of problems within the data base by personnel of the three active groups.

The Executive Committee unanimously endorsed the Planning Committee resolution.

Membership — All Panels

The Executive Committee approved all Planning Committee recommendations on panel membership.

The Executive Committee, however, in discussing the membership, especially that pertaining to the Passive Margin Panel, carefully considered the overall composition of panels in an attempt to establish a good balance for planning beyond 1983. The EXCOM considered whether the Passive Margin panel membership should reflect interests in the current N. Atlantic drilling programs or whether it should identify *new problems* to be addressed in the next 10 years. The passive margin drilling is currently trying to test existing hypotheses, but inasmuch as *Glomar Challenger* cannot penetrate deeply enough to sample crucial horizons beneath thick sediments, more thinly sedimented margins have been drilled.

Should the PMP emphasize drilling deep structures or the study of sedimentary processes (slope stability, erosion, slope-rise construction fan formation and migration)? Some EXCOM members viewed the long-term focus for *Challenger* drilling should be toward more shallow objectives (i.e., address sedimentary processes) presuming that the Ocean Margin Drilling Program using *Glomar Explorer* would address the deeper drilling.

The EXCOM did not resolve the question of the desirable degree of overlap between *Challenger*- and *Explorer*-type drilling, but stressed the need to select panel members with a view toward future planning.

E. Winterer also noted that the non-U.S. members are designated to serve on specific panels by their respective agencies and urged the non-U.S. people responsible for delegating members to help ensure a proper balance on the various JOIDES panels.

E. Winterer also reported that Jose Honnorez will replace Wayne Bock as alternate to the Planning Committee — from the University of Miami.

FY 1981 Drilling (North Atlantic)

Leg 79

E. Winterer briefly described the objectives of the Moroccan (Mazagan) drilling, referring to the maps and discussion in the *JOIDES Journal* (February 1981, p. 40-43). The sequence of holes on the Mazagan Escarpment and Plateau is planned to document the Jurassic environments of rifting and early subsidence history of a passive margin segment bordering on the proto-Atlantic. The Safety Panel has approved the Mazagan sites. Co-chief scientists for the cruise are K. Hinz and E. Winterer.

Discussion — Leg 79 Logging

The EXCOM continued its earlier discussion concerning logging on Leg 79. The German and United Kingdom members expressed particular concern that current plans excluded logging during that leg.

M. Peterson and Y. Lancelot reiterated that NSF had not allocated additional funds to cover costs of increased *Challenger* operation. Only by deferring payment of fuel costs and publication of two Initial Report volumes could sufficient funds be found to log *two legs.* DSDP is not satisfied with the results produced by the current logging contractor and chose to log Legs 80 and 81 because the sites are better suited to logging. If DSDP is to log Leg 79, some major aspect of the DSDP program would have to be sacrificed to cover expenses. M. Peterson also indicated that very little time was available for mobilization in Las Palmas.

Following upon these discussions and a meeting among P. Wilkniss, A. McLerran and M. Peterson, P. Wilkniss (NSF) announced that "logging shall be done on Legs 79, 80 and 81."

W. Nierenberg also suggested that he (Nierenberg) appoint a 4-5 person *ad hoc* committee to review the objectives of the logging programs from a new perspective and submit these recommendations by mid-September. H. Durbaum noted that an European committee may also choose to review the logging program, but would not support a hiatus in logging.

Leg 80 (Bay of Biscay)

Leg 80 is planned to study the rifting and subsidence history of a passive margin. Drilling will sample a complete sequence from pre-rift sediments (ARM-1) to younger sediments reachable by a transect of successively higher blocks.

The Safety Panel has approved drilling at ARM-1 (with certain restrictions). Earlier, some question existed as to whether or not ARM-1 would be approved. The Safety Panel also approved GOS-I, -II, -IIA, -IIIA, -IV, -IVB, -IVC and -IVD (some sites with restrictions). The co-chief scientists for Leg 80 are P. deGraciansky and C. W. Poag.

Leg 81 (Rockall Bank)

The Safety Panel has approved all the Rockall Bank sites. co-chief scientists for Leg 81 are D. Roberts and D. Schnitker

Leg 82 (New Jersey Transect)

The PCOM scheduled Leg 82 to drill the New Jersey Transect — a five-hole transect on the continental slope and rise to penetrate Tertiary and Upper Cretaceous unconformities. A major objective is to test the validity of the Vail sea-level-rise curve.[1]

Site ENA-3 drilling, which originally was scheduled for Leg 82, is scheduled for drilling in the spring of 1983.

FY 1982-83 Drilling

Acting on instructions from the Executive Committee, the Planning Committee developed a 24-month drilling plan during its October meeting. Members later learned that the hydrogeology sites along 15°S (Pacific) required a more elaborate site survey, including detailed heat-flow data. At its February 1981 meeting, the PCOM developed a new, somewhat more compact schedule with a counterclockwise ship's track, thus placing the hydrogeology leg later in the program. (See PCOM-Table 1, below.) The PCOM recognizes that the schedule is not completely realistic in that equal time is not alloted to each leg, and that insufficient port and "contingency time" is planned. The schedule is proposed as a general working model with the understanding that details would be worked out later.

This schedule differs from the October schedule in that (a) it places the N.W. African drilling last, (b) eliminates the N.W. Pacific leg owing to its lesser priority within the Ocean Paleoenvironment Panel, and (c) compresses the drilling in the area of Japan, but allows ample time for drilling the Japanese Trench.

E. Winterer outlined the proposed ship's track, gave a brief description of the scientific objectives at each site and explained the PCOM's rationale in developing the schedule. (Details appear in the 24-27 February 1981 PCOM minutes, below).

Discussion

Following extensive discussion, and in response to an objection raised by N. Bogdanov, **the EXCOM directed the PCOM chairman to work toward restoring a N.W. Pacific leg in the 1981-83 Challenger schedule**. Winterer asked N. Bogdanov to help him assure that a good scientific plans with adequate and appropriate profiler records be presented for review to the appropriate panels (Ocean Paleoenvironment/Active Margin panels).

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[1]Leg 82 has since been rescheduled to drill the North Atlantic crust.

In considering the larger problem — that of satisfying the scientific objectives of all the JOIDES members — the Executive Committee took the **position that only within the context of a long-term program, one not less than 5 years duration**, could JOIDES address the many scientific objections.

(See also resolution adopted under Increased International Participation, below.)

Post-1983 Drilling

The Planning Committee, acting on a mandate from the Executive Committee, began to plan post-1983 drilling. The PCOM asked the JOIDES Panel Chairmen to define scientific problems and recommend ways to attack them and to frame their planning and resultant white papers in terms appropriate for inclusion in the proposal to NSF and also for consideration at the proposed Conference on Scientific Ocean Drilling. E. Winterer, with the help of the Planning Committee and Panel chairmen, will use the white papers to create a 5-year drilling proposal to be submitted to NSF in November or December of 1981.

The PCOM developed and distributed a set of guidelines to aid panels and working groups in developing their white papers and drilling proposals. The resulting white papers will also be submitted to COSOD working groups and will presumably form a part of the reports presented at the COSOD meetings.

Conference on Scientific Ocean Drilling

Background and Discussion

Following upon the discussion regarding JOIDES long-term planning, E. Winterer reviewed the status of the Conference on Scientific Ocean Drilling (COSOD). During the November 1980 meeting in Atlanta, the Executive Committee recognized the value of organizing such a conference and appointed a committee, chaired by M. Talwani, to recommend how it should be organized.

M. Talwani subsequently prepared and distributed the report of his committee for review at the present meeting. The Talwani report noted that "the conference will examine how the planning for drilling and associated scientific programs can be organized and coordinated to attack the most important scientific problems in the most orderly and productive way."

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The Executive Committee, followin ergent Talwani committee recommendations, ution organize the conference around scientific tec- including subsidence, diagenesis, ocean mate, deep tectonics, diapirism, hydrogeo continental break-up, collision and subduc in seismic stratigraphy, processes at conver ber, boundaries, chemical structure and evolu a of oceanic crust, mid-plate volcanism and t will tonism, and sedimentary processes. ls,

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It will appoint a steering committee, which te turn will appoint small, probably 3-membe topic-oriented working groups, each with designated leader. The working groups wil receive contributions from JOIDES panels, independent groups, and/or individual scientists and will use them to prepare their White Papers.

The final conference report would contain a brief general report and recommendations parepared by the entire Steering Committee, plus the White Papers — including additional ideas and discussion generated at the conference.

Discussion

The necessity to submit a proposal to NSF by November of 1981 for post-1983 drilling, places a severe time constraint on organizing and convening COSOD — inasmuch as any long-term drilling proposal must be responsive to the conclusions, and therefore await the outcome, of COSOD. Members expressed concern that scheduling COSOD for October 1981 might result in the conclusions of the conference being viewed as simply an extension of the current program. Members were also concerned that the less than a full degree of planning would result in a premature proposal.

The EXCOM recognized that the JOIDES must go ahead with long-term planning (a draft for post-1983 proposal) *before* the result of COSOD are known, but that the final JOIDES proposals must incorporate results of the conference. At the same time, the COSOD report would be expected to contain many JOIDES documents. Organizationally, however, the JOIDES planning and COSOD planning structures are independent.

Despite the problems in convening an early COSOD the EXCOM generally agreed that time constraints imposed by the NSF budgeting process required that the COSOD [illegible] held in the fall of [illegible]

Following discussion, the Executive Committee unanimously **adopted the COSOD committee report as terms of reference for the Conference on Scientific Ocean Drilling (COSOD)** and selected nominees to its steering committee, (see also report in FOCUS, below).

Increased International Participation

Australia

M. Peterson (representing DSDP) and P. Wilkniss (NSF) reported on a workshop-meeting held 10-12 March in Canberra, Australia to address the topic "Australia and Ocean Drilling." R. Brett (NSF) and B. Lewis (JOI) also attended.

The Australian Consortium for Ocean Geosciences (Peter Cook, Chairman) invited the U.S. representatives to participate in the workshop, sponsored jointly with the Australian Marine Science and Technology Advisory Committee.

M. Peterson reported that the meetings were highly worthwhile and that the enthusiastic Australian group expressed a truly united interest amongst the Australian scientists. The coalition comprises all major universities, government, and industry.

Kenneth Richards (Production Manager ESSO-Australia) encouraged participation in JOIDES and said he would encourage ESSO to contribute funds to the Australian effort. (Australia, however, would join as a National governmental partner — not in coalition with ESSO; the funding acquisition would be an internal arrangement.)

The Australian Bureau of Mineral Resources (BMR) may also participate, perhaps as the lead agency. Although a government agency, the BMR and academic scientists cooperate closely and BMR could be expected to represent the academic scientific community.

The talks resulted in a strong recommendation from the Australians to the Australian government to seek full membership in JOIDES and to participate in the DSDP-IPOD program. They expressed interest in both local scientific problems as well as more broad-scale global science. Their primary interest is a better understanding of passive margins, but the Australians are also interested in active-margin problems, especially in the southwest Pacific and they hope to be involved in future planning.

Discussion

Members of the Executive Committee reiterated that while they strongly support inclusion of new members in JOIDES and welcome Australia, expanded membership posed certain problems which must be clearly understood. A particular problem is that even the present drilling program cannot easily be accommodated within the time available. Additions of new members, who will expect some flexibility in the program, will require further adjustments on the part of the existing members. The EXCOM also noted that the invitation to Australia would be made with the understanding that that nation would join as a *full member* and also reiterated that JOIDES supports JOIDES supports *scientific* ocean drilling and would not allow deflecting this mission toward more economic goals.

In reviewing membership, the EXCOM recognized the need for viewing expanded membership in conjunction with a longer-term program. Only in this way could interests of the present and potential partners best be served without dilution of the scientific content of the program.

Following discussion, the Executive Committee adopted the following resolution.

> **The Executive Committee recognizes the advantages of an expanded membership of IPOD; at the same time it realizes that the accommodation of the interests of such an expanded membership will require longer-term planning than is at present possible. Accordingly we recommend that the future program of ocean drilling be planned and approved for a period of not less than five years.**

Addressing specifically the Australian membership, that Executive Committee approved the following resolution.

> **In view of the enthusiastic and well organized interest of the Australian earth scientists, as represented in a recent workshop on scientific ocean drilling sponsored through the Consortium for Ocean Geosciences of Australian Universities (COGS), and in view of the recommendations formally adopted at that workshop, the JOIDES Executive Comm...**

a. **to instruct its Chairman, on behalf of the Executive Committee, to write to the COGS Executive inviting Australia to nominate an organization to become a member of JOIDES, to express the general conditions of membership in JOIDES, and to extend an offer of observer status at JOIDES Planning and Executive committee meetings in the immediate future.**

b. **to request the following information be sent to the COGS Executive for his internal information and use**

- **DSDP - 20 additional copies of Proposal UCSD-1734**

- **JOI Inc. Office - 6 copies of the FUSOD report.**

c. **to encourage Australian national efforts to obtain support for their participation.**

Following on the above resolution, The Executive Committee **approved the text of a letter to be sent to Dr. Peter Cook, Chairman of the Corsortium of Ocean Geosciences of Australian Universities.**

Canada

During a meeting held 23 October 1980 in Toronto, attended by representatives from JOI and JOIDES, and Canadian universities and government agencies, the Canadians expressed an interest in joining the Ocean Margin and/or JOIDES drilling programs. At that time non-U.S. participation in the OMDP was an open question and the Canadians expressed particular interest in joining that program — especially in participating during its developmental phase in order to share in the technology.

At the present meeting, the Executive Committee discussed the possibility that the Canadians might also be prepared formally to join JOIDES, but had no unambiguous indication of their interest. Following discussion, the EXCOM instructed its chairman to write the appropriate Canadian representative inquiring whether Canada was prepared to receive an invitation to JOIDES similar to that sent to the Australian.

The Netherlands

A delegation comprising F. Johnson (NSF), P. Wilkniss (NSF), E. Winterer (JOIDES) and W. Hay (JOI) will meet 3 April 1981 with representatives from the Dutch Academy of Sciences and interested scientists to discuss possible membership in JOIDES. E. Winterer will report on the results of the discussions at the next Executive Committee meeting.

Other Items Not Covered Above

A Special Thanks

The Executive Committee extended its best wishes and its sincere gratitude to Peter Twinn, who will be retiring shortly, and who was attending his last Executive Committee meeting. W. Nierenberg noted that throughout its 16-year history the JOIDES/DSDP program had received strong support from the United Kingdom and that Peter Twinn was instrumental in the early discussions leading to formation of the International Phase of Ocean Drilling. The Executive Committee recognizes Peter Twinn's great contribution to both JOIDES and the scientific community in general and wishes him every success in his future endeavors.

Microfossil Reference Centers

E. Winterer reported that W. Riedel (DSDP curator) saw no particular objection to L-DGO's proposal to serve as a microfossil reference center, provided that its establishment did not exclude another east coast institution from also serving in that capacity.

N. Bogdanov also offered the USSR Academy of Sciences as a site for a microfossil reference center.

Owing to the late hour, the EXCOM tabled discussion on the reference centers until the next (Hannover) meeting.

Future Meetings

The Executive Committee will next meet 12-14 August 1981 at the Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover, F.R.G.

PLANNING COMMITTEE

Edward L. Winterer, Chairman

The Planning Committee met 24-27 February 1981 at Scripps Institution of Oceanography in La Jolla, California. We compiled extensive minutes but owing to space restrictions, included here only the parts pertaining to future planning. Many other items, e.g., North Atlantic drilling plans, recent *Challenger* operations, DSDP report, and certain panel reports appear elsewhere in this issue.

FY 1982-83 Drilling

Introduction

Following upon the National Science Board's approval, in principle, of a 2-year *Glomar Challenger* drilling program, E. Winterer prepared a revised 2-year trial schedule (distributed as a handout during the Planning Committee meeting). The schedule differed from that proposed at the October PCOM meeting in that the ship progresses in a counter-clockwise direction around the Pacific. This places the hydrogeology leg later in the program, thereby allowing sufficient time to survey the 15°S (Pacific) region adequately. In preparing the trial schedule, Winterer assigned no value judgement to the drilling objectives; he subtracted the total number of steaming days required to reach the sites from the 2 years and divided the remainder by the number of legs, giving a result of 35 on-site days for each leg. The schedule, although not completely realistic, was submitted simply as *another schedule* to serve as a basis for discussion. The PCOM was charged with developing a 2-year schedule before the end of the meeting so that planning could proceed.

Review of Proposed Drilling Program

Each of the chairmen of the JOIDES subject panels reviewed his panel's proposed drilling programs for consideration in the final 1982-83 drilling plan.

Ocean Paleoenvironment Panel

R. Douglas reported on discussions at the recent OPP meeting during which the OPP objectives were refined. The OPP program comprises four legs in the Pacific: Equatorial, Southwest, Central ("old"), and Northwest Pacific.

1. *Equatorial Pacific* — coring with the HPC would sample Neogene sediments deposited at high rates in low latitudes to study ocean climate oscillations and patterns of carbonate dissolution. Data would complement those of the North Atlantic transect.

Nine sites were defined between the equator and 15°N and 155°-110°W. The sites were originally selected on the premise that the hydraulic piston corer could penetrate only to 100 meters. They were thus located on erosional surfaces of the Equatorial bulge. Because the HPC later tested to 200 meters, the Panel moved the transect slightly eastward to penetrate a thicker, more complete sedimentary section, and cut the list of sites to eight.

The N-S transect would sample the record of changes in the equatorial upwelling and current systems by recovery of sediment deposited during different ages as the plate passed beneath the zone of highest productivity.

The OPP defines six primary and two alternate sites. *All sites would be drilled to basement,* if time permits.

Site	Approx. Location	Approx. Water Depth (m)
EQ-1	4.5°N, 115°W	3800
EQ-2	2.5°S, 136°W	4400
EQ-3	0.5°N, 133°W	4400
EQ-4	4°N, 133.5°W	4400
EQ-5	6°N, 133.5°W	4400
EQ-6	7.5°N, 138°W	4400
EQ-7	2°N, 125°W	4700
EQ-8	10°N, 136.5°W	4400

Site Survey - All equatorial Pacific sites are located on existing seismic lines, but more detailed bathymetric and seismic control is needed. The Panel hopes that additional surveys will be conducted.

2. *Southwest Pacific*

Of the seven sites selected all but site SW-3 are high priority. The transect is planned to study oceanographic conditions during the Cenozoic, and will also establish biostratigraphic correlation of well preserved Cenozoic microfossil assemblages from the subantarctic to equatorial water masses.

SW-1 - West of New Zealand, south of the Chatham Rise, to study the fluctuations of the subantarctic currents during the Miocene.

SW-2 - Near DSDP 284, to study relationships between cool temperate fluctuations.

SW-3 - Near DSDP 207, to study relationships between cool temperate fluctuations.

SW-4, -5, -6 - near DSDP 206, to form a transect down the Lord Howe Rise.

SW-7 - Near DSDP 208, to study the record of subtropical and tropical water masses.

SW-8 - Dampier Ridge, to study the record of subtropical and tropical water masses.

SW-9 - Near DSDP 289, to study the record of subtropical and tropical water masses.

More sites are planned than can be drilled during one leg. The OPP would prefer not to drill sites to basement, but retain some drilling at all sites if time constraints dictated such a choice be made.

3. *Northwest Pacific*

a. Three sites were proposed on the Japanese margin to examine major fluctuations in currents and climates.

NW-2 - lower priority
NW-3 - off Japan (Japanese proposed site D).
NW-4 - off Japan (Japanese proposed site F).

Drilling these sites (in shallow water) would help establish the history of movements of the front between the Oyashio and Kuroshio currents and history of volcanic events on the Japanese arc.

b. N-S transect comprising four sites:

NW-5 - Near DSDP 303, DARPA area 1.
NW-6
NW-7 - Near DSDP 304
NW-8 - "Southern Site" to monitor history of jet stream contribution to the ocean basin.

All sites would be cored with the hydraulic piston corer.

c. The OPP gave two other sites a lower priority:

NW-9A - Hess Rise (Cretaceous/Tetiary boundary)
NW 10 - Bering Sea, Mesozoic section.

The N.W. Pacific sites, although posing interesting science in their own right, are not part of the integrated 3-area program in the equatorial, southwest and western (old) Pacific.

4. *Central (Old) Pacific*

S. Schlanger and R. Larson presented the scientific program developed by the OPP Mesozoic Working Group for drilling Jurassic sediments in the Central Pacific.

Earlier drilling in the Pacific failed to reach the Jurassic sediments thought to record environments of the Mesozoic superocean. Drilling at Site 462 could not penetrate sills there but focussed attention on another major problem — the nature, extent, and chronology of Cretaceous mid-plate volcanism.

The proposed drilling would address problems of reconstructing oceanographic and environmental changes as a single supercontinent (and superocean) fragmented into several continents and several oceans. It would also study the mechanisms, and influences of mid-plate volcanism, and the influence of vertical tectonics on Mesozoic environments — i.e., sea level changes, and bathymetry. The interpretation of calcium carbonate compensation depths depends on reliable reconstructions of vertical tectonics.

The proposed sites are:

MZP-1[1] (west of Majuro Atoll) — to drill the Majuro fan which contains debris from several atolls. Better control on the age of volcanic edifices in the Marshall-Gilbert-Ellice chain would help resolve whether or not the chain was formed over a hot spot.

MZP-2 (DSDP 462, Nauru Basin) — Reenter the hole (cone is in place) and penetrate the sill/flow complex to study the vertical motion in the Nauru Basin and sample Jurassic "superocean" sediments below.

MZP-3 ("Belly Button" Site, N.E. part of Mariana Basin) — Continuously core through Jurassic sediments to the ocean crust in the oldest part of the Pacific Ocean.

Additional site surveys are required to find a "window" through the mid-plate volcanic rocks.

MZP-4 (DSDP 199, Mariana Basin) — Set re-entry cone and continuously core through mid-plate sills and flows and oldest sediments, to oceanic basement. Hole 199 penetrated to 450 meters sub-bottom ending in Campanian sediments, but profiler records show that several hundred meters of older sediments lie between the total depth penetrated at Site 199 and acoustic basement.

MZP-5 (west of Mariana Basin) — Continuously core through pelagic ooze and chalk to Cretaceous(?) reef and into "edifice" basalt to reconstruct Cenozoic oceanographic and subsidence history, volcanic chronology of edifice building, and Cretaceous(?) reef development.

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[1]MZP = Mesozoic Pacific

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MZP-2, -3, -4 are first priority sites: MZP-1, -5 are second priority sites.

Ocean Crust Panel

J. Fox presented the Ocean Crust Panel's program.

1. *Hydrogeology.* A white paper containing a proposal to drill a transect across the East Pacific Rise at 15° south[2], and a proposal to NSF for hydrogeology experiments contain details[3] of the proposed hydrogeology experiment, strongly supported by the Inorganic Geochemistry and Ocean Crust Panel.

The program would require at least one re-entry plus three other holes drilled at varying distances from the ridge crest.

The transect would lead to a better understanding of the interaction between ocean water and ocean crust. At 15°S, spreading rates are near maximum levels — allowing for study at a fast-accreting plate edge. The hydrothermal contribution to sediments at 15°S may be as high as 80 per cent; the panels are interested not only in extracting data on chemical compositions of pore fluids, but also in establishing how the hydrothermal contributions vary away from the ridge crest.

2. *Costa Rica Rift (old Site 504)* — Return to Site 504 to drill deep into the oceanic crust. Hole 504 was abandoned because of lack of time. Hole conditions were excellent and returning to the site offers an excellent opportunity to penetrate a major velocity discontinuity (5 km/sec to 6 km/sec) and to conduct good downhole logging experiments.

3. *Crustal Heterogeneity* — Fox presented the arguments for drilling in the N.W. Atlantic at the October 1981 PCOM meeting. (See February 1981 JOIDES Journal.)

Active Margin Panel

R. von Huene reviewed the Active Margin Panel priorities.

1. *Middle America* - (a) Return to near Hole 494 on the toe of the slope off Guatemala and (b) drill a hole in the Oaxacan Margin to learn about dynamics of accretion along this convergent margin. Earlier drilling during Legs 66 and 67 encountered gassy sand beds and the deeper objectives were not reached. Thus the complex accretionary history could not be unravelled. The AMP recommends drilling a hole offset from original sites in an area with fewer, thinner sand beds. Evidence suggests that the sand source is local. Drilling the site requires better survey data. Von Huene is attempting to get funds from JOI to have existing UTMSI lines reprocessed to enhance the upper part of the section which contain gas hydrates.

2. *Japan Trench* — The AMP unanimously favors drilling in the Japan Trench to study the structure and evolution of a fore-arc region. Three mechanisms could have caused the uplift and subsidence discovered on Legs 56 and 57:

a. A spreading ocean ridge collided with the margin,

b. Subduction slowed or halted.

c. Tectonic erosion of the toe of the margin, which may have been much farther seaward.

Drilling would obtain information along the seaward edge of the margin to place constraints on the models.

Drilling would require (a) one hole to maximum depth at Site 440 in 4000 meters of water; 12 days on site, (b) a second hole near Site 435 in 3500 meters water depth, to 1200-1400 meters sub-bottom; 12 days on site. Neither hole would be a re-entry site.

d. **Nankai Trough** — The AMP proposes three sites in the Nankai Trough to study the subduction zone there: a single oceanward reference site and two sites at the foot of the margin. Drilling would require 19 days on site.

Drilling the Japan Trench/Nankai Trough would require a leg of about 51-days including steaming time.

3. *DARPA sites* - Of the sites proposed by DARPA, the Active Margin Panel prefers site 3 off Kamchatka (first choice) and Site 1A, near Site 303 (second choice). The Panel, however, is not far enough along in their planning to be too specific.

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[2]Hydrothermal sedimentation in the South Pacific — a proposed transect across the East Pacific Rise at 15°S by Joris Gieskes, Chairman, Inorganic Geochemitry Panel.

[3]Hydrogeology experiments on D/V *Glomar Challenger* in 1981-83, Principal Investigator, Roger N. Anderson.

Winterer relayed that he had urged DARPA to consider sites farther south and closer to Hakodate to tie into the Japanese ocean-bottom seismic systems, and to minimize steaming time on any mini-leg.

Passive Margin Panel

R. Sheridan reported the Passive Margin Panel priorities. (The following is extracted from several discussions during the PCOM meeting.)

1. *New Jersey Margin* — A 5-hole transect in relatively shallow water to penetrate Tertiary and upper Cretaceous unconformities. A major objective would be to test the Vail sea-level curve and reconcile the presence of deep-water strata (recognized on the basis of planktonic foraminifers) during a supposed low-stand of sea level. (Details of the proposed drilling are contained in "Transect Across the New Jersey Slope and Rise," a drilling proposal prepared by C. W. Poag, P. C. Valentine, and J. A. Grow, and distributed during the PCOM meeting.)

Heat flow measurements and gas hydrate studies would be conducted during the transect, if possible.

2. *Gulf of Mexico* — to core the Mississippi fan with the hydraulic piston corer to provide a 3-dimensional picture of fan structure and development.

3. *ENA-3* (continenal rise off Delaware) — to core continuously to the J^1 horizon and relate the stratigraphy to the deep Blake-Bahama Basin site (534). The proposed site, in 4700 meters of water, may require drilling to 1500-1600 meters sub-bottom. Consequently, the PMP proposed devoting an entire leg to drilling this site, rather than combining it with drilling ENA-8. ENA-3 is a high-priority PMP site.

4. *N. African Margin* — to study the climatic evolution of the North Atlantic.

The Passive Margin Panel also defined topical priorities as follows:

Fans — 1 leg
New Jersey transect — 1 leg
Slides — ½ leg
Sediment drift — ½ leg
Clathrates — ½ leg

The Passive Margin Panel noted many targets had not been scheduled during the current or 1981-83 drilling and recommended that an additional leg be assigned to realize these objectives.

Proposed 1982-83 Drilling Schedule

The PCOM views scientific planning for the future as its most important function. Members discussed the many aspects and ramifications of arriving at the optimum program. Because the many excellent programs proposed have been somewhat expanded as the panels went about their detailed planning, they cannot all be accommodated now even within a full two-year program.

The proposed model schedule for 1981-83 drilling shown as Table PCOM-1 was developed on the basis of the following rationale.

- Key programs in high latitudes, i.e. the S.W. Pacific paleoenvironment, N.W. Atlantic paleoenvironment, DARPA must be maintained and result in fixed points around which the remainder of the scheduling must work.
- The schedule must preserve a balance between the Atlantic and Pacific Ocean.
- Programs were assigned relative weights on the basis of broad scientific interest.
- Weather was considered; the panel did not want to compromise the New Jersey transect because of bad weather and so moved it to the first leg of the program (September-October).[4] Drilling ENA-3 was then moved to spring of 1983.
- Because survey data for the Mississippi Fans (Gulf of Mexico Leg) is not yet ready, the PCOM placed the crustal heterogeneity leg second (November of 1981). The PCOM recognizes that the crustal drilling will take place in a time of potentially bad weather, but drilling can proceed at that time of the year, and this seemed the best solution in forming the overall plan.
- The proposed drilling is somewhat compressed in the area of Japan, but ample time is allowed for the Japanese Trench drilling.
- The N.W. Pacific leg was dropped, because the OPP objectives here were not of quite so high a priority as their objectives in other areas. Some OPP data will be retrieved during coring at the DARPA site.

[4]The New Jersey Transect was subsequently postponed until 1983.

TABLE 1. Proposed Model Schedule, 1981-83 Drilling

Leg	Objective	Beginning Date	Beginning Port	Steaming Days	Port Days	Drilling Days	Total[1] Days
82	New Jersey margin	18 Sep 81	St. Johns	8	5	43	56
83	Geochem. transect	13 Nov 81	Norfolk	14	5	33	52
84	Costa Rica Rift	4 Jan 82	Panama	3	4	35	42
85	Middle America Trench	15 Feb 82	Panama	7	5	33	45
86	Equatorial Pacific	1 Apr 82	Acapulco	24	5	35	64
87	Transit + DARPA	4 Jun 82	Honolulu	24	4	12	39
88	Japan Trench	13 Jul 82	Hakodate	6	5	52	63
89	Old Pacific	14 Sep 82	Tokyo	10	5	71 (89–90)	105 (89–90)
90	SW Pacific		Rabaul	14	5		
90T	Transit	28 Dec 82	Wellington	10	1	0	11
91	Hydrogeology	8 Jan 83	Papeete	22	5	35	62
92	Gulf of Mexico	11 Mar 83	Panama	10	5	35	50
93	ENA-3	30 Apr 83	Norfolk	5	4	47	56
94	N. Atlantic Paleoenv.	25 Jun 83	Azores	22	5	81 (94–95)	120 (94–95)
95	N. W. Africa	23 Oct 83	Dakar	12	-		

[1]Includes port time.

- The PCOM grouped legs addressing similar objectives (and proposed by the same panel) so that in case of slippage in scheduled drilling, priorities could be traded-off among proponents of 2 or 3 adjacent legs and not passed on to legs dedicated to other major objectives.
- The schedule allows for some extra days but does not allow specifically for extra days in port for repairs.

Most members of the PCOM view the proposed schedule as a very good balanced program, but recognized that it would require certain adjustments.

D. Hayes noted that although it was a balanced schedule, he felt it to be unrealistic. Too much was being attempted in too short a time. Not enough "yard" and "contingency time" had been scheduled which would result once again in compromising scientific programs to meet port schedules.

Lancelot and Peterson (DSDP) noted that the irregular cruise lengths (especially Legs 86, 87 and 88) posed problems with GMI crew staffing, but that they were surmountable.

L. Nikitin expressed disappointment that the N.W. Pacific program had been eliminated.

Following discussion, the Planning Committee accepted the model schedule and charged the PCOM chairman (E. Winterer) and DSDP chief scientist (Y. Lancelot) with modifying its details as necessary and appropriate.

Members of the PCOM further noted that the schedule will allow planning to continue at least through the Panama port call and parts of the program can still be removed if this seems necessary at a later time.

Post-1983 Drilling

INTRODUCTION

E. Winterer reported that at their last meeting (November 1980) and in conjunction with discussions concerning a proposed Conference on Scientific Ocean Drilling (COSOD), the Executive Committee directed planning groups to address long-term planning immediately. Members of the EXCOM suggested a 5-year plan to alleviate the problems and increased expense that shorter programs create.

Winterer asked the PCOM to address the question of long-term planning for ocean drilling. He suggested the PCOM treat the first discussion of post-1983 drilling as an open forum. The PCOM should consider all things possible, but should then shape its thinking and drilling proposals to fit within the developing COSOD (Conference on Scientific Ocean Drilling) framework. He suggested that the discussion be organized so that a concrete plan emerges. Time is short, so whatever JOIDES proposes it must propose soon. JOIDES must stay in contact both internally and with the appropriate agencies (JOI, NSF).

CONFERENCE ON SCIENTIFIC OCEAN DRILLING (COSOD)

The Planning Committee continues to support a conference to redefine scientific goals and re-evaluate the direction of ocean drilling (COSOD). The committee views development of long-term plans and COSOD as closely tied and sees a parallel development of both long-range plans (developed in the form of a white paper) and contributions to the conference.

The EXCOM's *ad hoc* committee to recommend a structure and schedule for COSOD noted that the conference would address "How can planning for drilling and associated scientific programs be organized and coordinated to attack the most important scientific problems in the most orderly and productive way." It further recommended the conference be organized around the study of 8 to 10 major topics (e.g., subsidence, diagenesis, ocean climate, rifting, diapirism, hydrogeology, continental tectonics, physical properties of the earth, and seismic stratigraphy), but also considering present and future drilling technology, and advances in other types of sampling. The EXCOM will appoint a steering committee to oversee the conference, which will, in turn, appoint 3-person working groups to prepare papers on each topic.

Members of the Planning Committee noted that perhaps the National Academy of Sciences could still be involved in COSOD through members on the steering committee. The PCOM does not want the conference perceived as having only a self-serving.

The conference is scheduled for fall 1981.

DISCUSSION AND RESOLUTION

The Planning Committee in resolving how to organize the post-1983 planning discussed (a) how to coordinate JOIDES planning with COSOD, (b) what constraints should be considered in developing the Panel white papers (c) how to define and the address problems, and (d) how to effect communication among the principals.

Following considerable discussion, Planning Committee accepted the following resolution.

The Planning Committee, in recognition of the Executive Committee's request for a review of scientific problems that may require drilling after 1983, and of our own committee's desire for a conference on drilling to resolve associated scientific problems, asks its Chairman to take the foll steps that would lead to a 5-year post-1983 prop

1. Notify NSF, the COSOD Steering Commi and OMD of our intent.

2. Provide guidelines (see discussion) JOIDES panels for the preparation and transmi of advice (before the July PCOM meeting).

The guidelines to the panels are:

1. Tasks

a. To rewrite the White Papers. These should be open ended and embody broad concepts. They should be related to associated science and stress ways in which such science can be addressed with ocean drilling.

b. To translate White Paper goals into a concrete and specific 5-year proposal for drilling.

2. Timetable

a. Draft papers and proposals from panels due in JOIDES office on June 1, 1981, so that a draft combined proposal can be studied by the PCOM at its July 8-10 meeting in Hannover. There will be time for revisions and refinements later, but we need enough by June to put together the major elements into an outline.

b. By late summer the PCOM will need more advanced versions of the white papers for inclusion in the set of documents that COSOD will examine at its fall meeting.

c. The PCOM plans to have the drilling proposal in final form, virtually ready for submittal to NSF, by the time of the EXCOM meeting in early December, 1981.

3. Communications

Major panels should meet well before July and establish an efficient communications system. (The OPP has recently met; the OCP, AMP and PMP are scheduled to meet in March, April, and June, respectively.) Much of the work will probably have to be done through the mails. Panel chairman should keep in touch with one another.

Consider arranging an open (perhaps evening) session at a pre-existing conference (AGU? AAPG?) to communicate ideas with the broader scientific community.

4. General Advice

a. Aim for a 5-year program; conse… consider long-term…

b. Assume no political or geographic restrictions. (Although high latitudes pose certain logistical problems, drilling there is not excluded from consideration.)

c. Assume no drilling platform restrictions or other research vessel restriction. On the other hand, *Challenger* is the most likely vehicle for the near-term future.

d. Avoid projects which would create undue safety (pollution) risks.

e. Consider regional drilling — programs where the drilling platform would operate in a restricted area for a longer time. Also consider returning to a site with special-purpose tools (e.g. downhole instruments) for specific studies.

f. Bear in mind possible modifications to *Glomar Challenger.* (Copies of F. MacTernan's memo of 23 February 1981 detailing possible modifications to *Challenger* were distributed at the meeting.)

g. Tie planning into technical feasibility. On the basis of what technology is available now or will be in the future.

5. Relation to COSOD: Focus white papers and drilling proposals toward our JOIDES 5-year program, but be prepared to modify proposals on the basis of the COSOD recommendations. Include discussion of general site-survey requirements in the white paper; include more specific site survey plan in the drilling proposal. Include in the White Papers discussions (as appropriate) of the COSOD topics.

6. JOIDES planning structure:

   Consider the need to alter the structure of the planning groups to parallel changes in focus, as the body of scientific information increases.

The Planning Committee chairman will relay guidelines to the subject panel chairmen per resolution above.

Items from Panel Reports

The following include some specific recommendations the PCOM made in conjunction with reports made by panel chairmen (ed).

OCEAN CRUST PANEL

The Ocean Crust Panel is disappointed that the *Geotimes* article which previously was published soon after a cruise and covered its most significant aspects, is no longer published. The GSA article, while useful, is too detailed and appears after too long a time following the cruise. The OCP urges that the *Geotimes* article somehow be reinstated.

Y. Lancelot reported that DSDP completely agrees and has arranged with *Geotimes* to publish a short article containing news or highlights of each leg. The articles will be shorter than those published earlier and will more closely conform to the news magazine format of *Geotimes*, but the article preparation is now back in the hands of the shipboard party. In addition, those legs that have not been discussed in *Geotimes* will be summarized in an article covering the last year of drilling. The *Geotimes* coverage will begin again with Leg 76.

The Planning Committee urged DSDP to ensure that at the very least the stratigraphic columns from each cruise be included in *Geotimes.*

PASSIVE MARGIN PANEL

The Passive Margin Panel proposed establishing three working groups: Deep Sea Fan, Slump, and Drift Working Groups.

The *Deep Sea Fan Working Group* would address drilling the Mississippi fan for the current 1982-83 program and would also consider more open-ended programs — drilling on end-member type fans of various kinds — for post-1983 drilling.

The Slump Working Group would identify different end-member types of slumps and would design a drilling program comprising 5 or 6 holes on a single slump. It would also develop downhole experiments to address the problem of slump development.

The Drift Working Group would design a program comprising 5-6 holes (using both the hydraulic piston and rotary coring) to test sediment drift hyypotheses.

The Planning Committee noted that it need not specificly approve creation of a working group. The guidelines to establish a working group are (a) the group is sponsored by a panel, (b) a member from the parent panel chairs the group, and (c) it does not cost anything to function. The Passive Margin Panel is free to create working groups as it see fit.

SITE SURVEY PANEL

Communications

In response to continued problems of communications between subject panels and the JOIDES Site Survey Panel, the Planning Committee informally agreed to the following statement.

> Recognizing a continuing inadequacy in the communications and the definition of responsibilities regarding evaluation of existing and required site surveys, the PCOM offers the following clarification:
>
> The *primary* responsibility for identifying, collecting and evaluating existing data rests with the site proponent(s) designated by the "parent" subject panel. The proponent should seek advice from the Chairman of the JOIDES Site Survey Panel (or his appointed deputy) and obtain reasonable assistance from the JOIDES Data Bank.
>
> Prior to a Site Survey Panel meeting, the proponent should submit to the SSP for review a concise summary of the existing data and a commentary on additional surveying needs. This action should precede the date of anticipated drilling by a minimum of 18-24 months.
>
> The JOIDES Site Survey Panel will identify any additional or modified surveying requirements. The Site Survey Panel will assign responsibilities (among the JOIDES member countries) and identify the opportunities for implementing the needed surveys.
>
> Results of the surveys should be reviewed by representatives of the Site Survey Panel, the surveying Principal Investigator and the site proponent(s) to evaluate the adequacy of the total survey data.
>
> Results of these deliberations are then reported by the proponent back to his parent subject panel for re-evaluation of site priorities.

SITE SURVEY PANEL

High-Resolution Seismic System

Following discussion in conjunction with the Site Survey Panel report and in order to clrify a recommendation made at a previous PCOM meeting, the Planning Committee recommended that **the DSDP chief scientist acquire a state-of-art, high-resolution seismic system for use aboard Glomar Challenger, and that Challenger be equipped with a hydrophone which can be lowered from the drill string and held near the seafloor while the ship maneuvers in a pattern near the drill hole, thereby upgrading the Challenger systems as proposed in the JOI budget request.**

INFORMATION HANDLING PANEL

Following discussion concerning the establishment of non-U.S. data centers at the Bureau Nationale des Donn•'ees Oceaniques (France) and at the Academy of Sciences in Moscow and the USSR Ministry of Geology in Gelendjih, the PCOM adopted the following resolution.

The Planning Committee recognizes the efforts of Soviet and French scientists to establish working DSDP data bases. Already, beneficial results have been seen and further dissemination of information should be encouraged. Significant additional benefits will accrue from cooperative consideration of data base problems by personnel of the three active groups.

Future Meetings

The Planning Committee will next meet,

8-10 July 1981
Bundesanstalt für Geowissenschaften und Rohstoffe
Federal Republic of Germany
Hannover, FRG
(Helmut Beiersdorf - Coordinator)

It will hold its fall 1981 meeting,

11-13 November 1981
Salishan Meeting Center
Near Oregon State University
Corvallis, Oregon
(John B. Corliss - Coordinator)

Special Frozen Samples from Site 532 available for Organic Geochemistry studies.

See section under Core Repositories for more details.

ACTIVE MARGIN PANEL

Roland von Huene, Chairman

The Active Margin Panel (AMP) last met 7-9 April 1981 at the U.S. Geological Survey's Deer Creek facility in Menlo Park, California. The following includes items from that meeting.

1981-83 Drilling Plans

Barbados Area

C. Moore reported to the panel on the Leg 78A drilling. Although the drill failed to penetrate completely to basement as was originally planned, the leg was successful in penetrating to the master thrust or décollement which was found to be within the sediment section rather than at the top of the igneous ocean crust. The principal results of Leg 78A include: (1) documentation of simultaneous offscraping and sediment subduction, (2) biostratigraphic resolution of thrust faults in the offscraped deposits, (3) measurement of high lithostatic fluid pressure in the shear zone separating offscraped and subducted rocks, and anomalously high fluid temperatures. (*See also Cruise Summaries, above.*)

Following upon the Leg 78A drilling, the leg co-chief scientists proposed making a transect across the Barbados area, as has been done elsewhere. A transect here would be particularly rewarding because the fossil record here is sufficiently complete for good time resolution, rates of sedimentation are low, and hydrocarbon development is minor. A relatively long history of sediment deformation could be discerned with *Challenger* drilling prior to the proposed *Explorer* (OMDP) drilling. The Active Margin Panel endorsed this suggestion and has **given drilling in the Barbados area a high priority.** The Leg 78A drilling in the Barbados area was curtailed owing to logistical needs and bad luck experienced when the drill-in casing failed to release. Much scientific information remains to be gained by *Challenger* drilling and the AMP recommends that the area be considered for a contingency site for the 81-83 period.

Middle America

R. von Huene, C. Moore, and T. Shipley presented data and background on the Middle American sites. Because the presence of gas hydrates prevented Leg 67 drilling from achieving its main objectives the problems to be addressed by drilling off Guatemala remain basically unchanged. Enough drilling was accomplished on Leg 67, however, to cause the shipboard party to question previous interpretation of the history of this convergent margin. The data, however, are incomplete and do not constrain alternative hypotheses. The proponents identified two sites off Guatemala, which have no gas hydrates, and a third site generally located in the mid-slope area. Because gas hydrates could pose a problem in this area, site location and the drilling strategy must be closely coordinated with the Pollution Prevention and Safety Panel.

C. Moore and T. Shipley presented data and justification for two sites along the Oaxaca transect to investigate the history of the transition zone and processes of underplating. At Site 490, which previously penetrated the transition zone, the base of gas hydrate zone was penetrated but only one small piece of "dirty ice" was recovered. Thus, the AMP believes the gas hydrates should not pose large problems here.

K. Kvenvolden reviewed gas hydrate occurrences and presented a good case to investigate, rather than to avoid, them. The development of hydrate in deep marine environments is world wide, and much can yet be learned from the Deep Sea Drilling sampling.

L. Garrison presented the Safety Panel position and requirements for safe drilling in hydrated areas. The Active Margin and Safety panels will work together to select appropriate sites as more data became available.

The Active Margin Panel established the following priorities for the Middle American drilling.

Priority	Area	Proponent
1.	Guatemala mid-slope (GUA-2 or -8)	R. von Huene
2.	Deepen Hole 494A	R. von Huene
3.	Oaxaca transition (Site 490)	C. Moore
4.	Guatemala-9A	R. von Huene
5.	Oaxaca mid-slope	T. Shipley

In the context of the general 1981-83 plan, the consequences of circling the Pacific in a counter-clockwise loop diminishes the amount of pre-drilling site surveying possible for the Middle American Sites. The high-resolution seismic and Seabeam data will not be available prior to drilling and reprocessing of the original multichannel seismic data must be accomplished about one year sooner than planned. The AMP must also accelerate development of a strategy for dealing with the gas hydrate problems jointly with the Safety Panel. The problem is not that the pre-drilling site surveys are inadequate for drilling safely but that 6 months after the presently scheduled drilling, *a great deal more data* will be available for optimum site selection.

The Mid-America working group will meet after the Guatemalan seismic data are reprocessed to make final site selection and to work with the Safety Panel.

Japan Trench

K. Nakamura presented the views of the Japanese IPOD committee with regard to the Japan Trench drilling. The Active Margin Panel agreed with the selections by the Japanese committee and discussed the spectacular seismic records presented. The Panel decided that the sites across the Nankai Trough should be along one line and consist of a seaward reference (1B), slope toe (2B), upslope (4B), and forearc (3A).

The Japan Trench priorities are:

1. NK-2B
2. NK-1B
3. NK-4A
4. NK-3A

} Proponent — K. Nakamura

Site NK-3A will also serve as the Ocean Paleoenvironment Panel's site NW-2.

Northeast Pacific

The Planning Committee chairman had asked the Active Margin Panel to suggest sites in the northeast Pacific for drilling during the 1981-83 program. The AMP asked the newly formed North Pacific - Bering Working Group to present the most scientifically rewarding single site they had considered. In addition, V. Dimitriev presented the USSR scientific priorities. The North Pacific group selected a site on Sounder Ridge in the Bering Sea and the USSR scientists selected a site on Shatsky Rise. Owing to the very short notice regarding this item V. Dmitriev was unable to present seismic and geologic data. Thus, after considerable discussion, the panel requested that an *ad hoc* group resolve the question of scientific priority and consider the data for all candidate sites.[1]

Post-1983 Planning

The Active Margin Panel deliberated upon its two parallel tasks: (1) to write a White Paper, and (2) to construct a 5-year active-margin program. The Panel discussed many topics including a new document by the North Pacific - Bering working group which describes sites where objectives cut across those developed by the main topical panels. It ultimately agreed to retain the set topical framework it had developed over the past three years and to update it as needed. Thus the White Paper and the 83-89 proposal are an amplification and an extension of the panel's deliberations since its 1979 Toronto meeting.

The Post-1983 Active Margin program was thus cast into the earlier matrix with a reprioritization of the topic areas (Table AMP-1).

Table-AMP-1. Prioritization of AMP 83-89 Target Areas, April, 1981

Area	**Main Objectives**					**Proponent**
	A	**B**	**C**	**D**	**E**	
Mariana	x		x			Hussong
Peru	x	x				Hussong
Barbados	x	x				Cadet
New Hebrides	x		x			Karig
Japan Sea			x	x		Nakamura
Sunda		x				Karig
Bering Sea				x		von Huene
Hellenic Trench					x	Cadet
S. Chile	x	x				Barker
Aleutian	x	x				von Huene
Makran-Oman					x	Barker

Main Objectives:
A. Structural evolution of the forearc region.
B. Sedimentary sequences in modern trench and deep forearc basins.
C. Evolution of island arc magmatism.
D. Evolution of backarc basins.
E. Evolution of collision margins.

[1]An *ad hoc* Working Group meeting to review the North Pacific drilling is scheduled for 1-3 July in Menlo Park.

Not contained in the matrix, however, are many of the North Pacific-Bering Working Group sites which do not fit the topical mandate of the Active Margin Panel. The working group has completed a proposal addressing regional problems of the north Pacific that rank scientifically with the subject panels proposed problems. However, because the focus is regional rather than topical, the panel found it difficult to rank one with the other. Suggested sites in the Bering Sea and Aleutian Trench address topical interests of Active Margin, Ocean Paleoenvironment, Ocean Crust, Sedimentary Petrology, and Organic Geochemistry panels. In addition, they address a regional problem such as the history of North America plate movement. Although the proposed sites are of interest to a subject panel, they rank lower than sites selected by the panel from a strict topical viewpoint. Consequently, because of their intra-topical nature, the AMP will forward the North Pacific working group sites separately. This is in line with the Planning Committee desire for sites with multiple objectives.

The Active Margin panel is now engaged in preparing their White Paper. R. von Huene will assemble the parts into a first draft by 1 June 1981.

Other Business

Don Hussong will become the Chairman of the Active Margin Panel at the next Panel meeting. R. von Huene will coordinate the work on the Panel white paper and will serve on the panel for one more year.

Next Meeting

The Active Margin Panel tentatively plans to meet next 10-12 November 1981.

PASSIVE MARGIN PANEL

Robert E. Sheridan, Chairman

The Passive Margin Panel last met 17-19 January 1981 at the University of Texas Marine Science Institute in Galveston. We have included only the sections from those minutes dealing with drilling beyond the current (FY '81) program.

FY 1982-83 Program

The Passive Margin Panel has formed several *ad hoc* working groups to address key sedimentary processes.

Fans

A. Bouma noted that the problems of fans are well documented in the 1981-83 drilling proposal. However, geologists know very little about fans in a three-dimensional sense. There is no link between ancient fans and present deep-sea fans and no predictive model is available for use in petroleum exploration. Fan types include large (e.g. Mississippi Fan), small high sand types, migrating channel types (e.g. Cap Ferret Fan), trench fans, trench slope fans, ice-channel fans. Well documented examples are the Mississippi Fan, Navy, Astoria and Monterey Fans, Aleutian Fan, and Cap Ferret Fan.

The *ad hoc* group felt the ideal approach to studying the Mississippi Fan was to acquire additional seismic lines to identify lobes, and the upper, middle, and lower fan environments, then to conduct a short survey to identify the site from *Glomar Challenger* and to control the beacon position. The major objectives would be to map regional seismic horizons at the base of the lobe, as well as channels, levees, and overbank deposits within the lobe. Eight fan environments are important: channel levee, proximal channel, mud fan, suprafan lobe, distal fan, interchannel deposits, mid-fan, and fan margin. Most can be found in two or three holes but coring the type facies several times is important to establish variability. A tentative program would require: upper fan (2-3 holes), mid fan (4 holes), lower fan (2 holes).

The Passive Margin Panel recommended that the Cap Ferret Fan should be developed by the working group for drilling during a N.E. Atlantic leg.

It also supported the Bouma proposal and the concept of groups of sites. The PMP wishes to emphasize to the Planning Committee the economic and scientific importance of fans and recommends that the Mississippi Fan be drilled during Leg 92.

Slope Processes and Stratigraphy

The sites would aim to study facies changes in relation to sea level changes and hiatuses. Consequently continuous coring is vital and downhole heat-flow measurements would also be needed. Drilling at site ASP-15 encountered hypersaline brines so inorganic/organic geochemical studies would also be important.

The panel emphasized the importance of hiatuses and the role of benthic facies and biostratigraphy for assessing depth changes and also noted that these sites are valuable for the study of the Gulf Stream and for the correlation of sequence boundaries from the shelf to the deep sea.

Blake-Bahama Outer Ridge

To study this sediment drift, HPC holes on either side of a sediment wave, on the opposite side of the drift crest and down current would be desirable. The Panel agreed to form a working group to prepare a drilling proposal as a contingency for the New Jersey sites. Proposed membership is Tucholke (Chairman), Flood, Hollister, Costecki, Stow. These sites would occupy about two-thirds of a leg. The balance of the leg could include CT-2 and a clathrate site.

Slump (Bryant, Garrison)

The panel recommended the slope off New Jersey as the best area to study slumps. A minimum of five sites that penetrate the slide plane is required and about 20 days would be needed. The available *in situ* stress/strain measurements are inadequate, however, and W. Bryant and A. Bouma suggested that SP^4 should form a working group that would document the state-of-the-art on downhole geotechnical instrumentation. The group should be made aware of the strong PMP interest.

The Passive Margin Panel agreed the following site of priorities:

1.	New Jersey holes	1 leg
2.	Clathrates	½ leg
3.	Sediment drifts	½ leg
4.	Slides	½ leg
5.	Fans	1 leg

Other Targets

The Panel reviewed some of the targets not addressed during the earlier phases of IPOD and omitted from the 81-83 phase. These included the Laurentian Cone, the Scotian margin, site ENA-8, the Norwegian Greenland Sea, Labrador Sea, anoxic basins, fracture zones, shear margins, Caribbean drilling (e.g., Yucatan Basin, Columbia Basin, Venezuela Basin), and Galicia Bank. After some discussion, the Passive Margin Panel agreed to the following statement.

The Passive Margin Panel having reviewed candidate sites to study sedimentary processes and their effect on the development of stratigraphic sequenes considers that the two legs allocated to the PMP in the 81-83 program are inadequate to address problem definition especially in view of the upcoming *Explorer* program. The Panel considers that an extra leg is necessary to fulfull the minimum requirements of the proposed PMP program in the 1981-83 period. The PMP wishes to stress that more studies of fans and the sedimentary sequence-hiatus problem already proposed are projects of fundamental science and furthermore are absolutely essential to an Ocean Margin Drilling Program.

Post-1983 Program

The Passive Margin Panel will write a White Paper dealing with post-1983 drilling programs. The Panel will develop drilling proposals around subjects and will serve as a contribution to the COSOD Conference scheduled for fall 1981.

The Panel isolated from main subjects and formed groups to prepare sections for the White Paper as follows:

1. Subsidence and subsidence mechanisms — A. Artemjev, R. Sheridan and J. Grow

2. Timing of rifting in relation to continental break-up and the continent/ocean transition — D. Roberts and L. Montadert

3. Sedimentary processes and facies models — B. Tucholke, A. Bouma, and J. Thiede

4. Global stratigraphic cyclicity — R. Vail, S. Snelson, and J. Thiede

OCEAN PALEOENVIRONMENT PANEL

Robert G. Douglas, Chairman

The Ocean Paleoenvironment Panel last met 4-5 February 1981 at the Bermuda Biological Station, St. Johns, Bermuda. Key items from the minutes of that meeting are summarized below.

1981 Drilling

W. Ruddiman presented proposed of sites to address paleoenvironmental problems which are expected to serve as alternative drilling locations during the current North Atlantic drilling. The scientific goals of these sites do not match those of the passive margin drilling program, but sites are located close to the track lines of currently established legs. The proposed alternative sites are mostly located on a north-south traverse in the central north Atlantic; one site is in the Leg 79 area near Europe and one in the southern Labrador Sea. The primary objectives of these sites are to obtain hydraulic piston cores through the Neogene sediments to monitor oceanographic fluctuations. Because most of the sites bottom in Paleogene basement, they would also provide a basis for paleogene oceanographic investigations.

1982-83 Drilling (Pacific Legs)

Hydrogeology Transect: M. Leinen led the discussion on the proposed transect in the 17° — 19°S area of the east Pacific. The cruise objectives include studies of metalliferous sediments, authigenic processes, red clays, aeolian sedimentation, and hydrothermal circulation. The sites selected must be (1) close to a fast spreading center; (2) south of 13°S to ensure that the ocean crust has been generated from the same ridge segment, (3) in an area of minimum biogenic sediment contribution: that is away from the area of high rates of biogenic sedimentation associated with the equatorial zone. A large biogenic contribution dilutes the metalliferous sediments and leads to greater diagenesis, and (4) in an area of thin sediment cover over entire region to maintain uniform hydrothermal flux.

Four areas have been identified on crust of 2 to 25 million years in age, but the panel cannot propose specific sites until the area is surveyed, including heat flow surveys. The site surveys must also include piston coring for pore water and heat-flow determinations. Inasmuch as the site must be surveyed, the panel deems it desirable to drill this leg in the latter part of the Pacific drilling program.

Equatorial Pacific Transect: R. Douglas led the discussion on the Equatorial Pacific drilling. The major objectives of drilling this group of sites is to obtain a high-resolution stratigraphic record across the highly productive equatorial biogenic belt in a general north to south traverse. The sites must be located on the late Eocene basement isochron to avoid middle Eocene cherts and yet allow sampling of the Eocene/Oligocene boundary. Drilling here will allow intercalibration of paleomagnetic stratigraphy, biostratigraphy, and biogenic sedimentation rates. The Ocean Paleoenvironment Panel (OPP) proposes that six primary sites be logged and that the others not be logged. Site locations are as follows:

EQ-1, 4.5°N, 115.5°W — in the area of heat-flow studies by R. von Herzen. The Ocean Paleoenvironment Panel supports drilling in this location because it should provide a high quality, hydraulic piston cores through a Neogene interval with a high sedimentation rate.

EQ-2, 2.5°S, 136°W — DSDP Site 73 (*Conrad* 10 and *Challenger* Leg 9).

EQ-3 — DSDP Site 77 (*Conrad* 10, and *Challenger* Leg 9).

EQ-4, 40°N, 133.5°W — (*Conrad* 20, *Conrad* 15, and *Rise* 3).

EQ-5, 6°N, 135.5°W — (*Conrad* 15).

EQ-6, 7.5°N, 138°W — (*Conrad* 20).

EQ-7, 2°N, 125°W — (*Vema* 24). Drilling this site would help to define the Cenozoic CCD history.

EQ-8, 10°N, 136.5°W — (*Conrad* 12 and *Vema* 21). To obtain a stratigraphic sequence to the north of the equatorial biogenic sediment bulge.

The OPP assembled an informal equatorial Pacific Working Group to complete the site selection process comprising M. Leinen, B. Haq, and C. Adelseck. The group will assemble existing site-survey information (*Conrad, Vema* and *Challenger* cruises) and present preliminary site locations by early April.

Southwest Pacific Transect: J. Kennett led the discussion on the southwest Pacific transect. He proposed nine sites to obtain a traverse in several water masses between the Subantarctic region and the equator. Such a sequence will provide data about the Cenozoic (especially Neogene) oceanographic history across a wide sweep of latitudes. A depth traverse (1000 to 2000 m) to study stable isotopes, similar to that conducted on the Walvis Ridge, is planned.

SW-1 — Subantarctic ~45°S, east of South Island, New Zealand in Bounty Trough, south of Chatham Rise to study subantarctic paleoceanography and tephrochronology. Hydraulic piston cores would be taken deeply as the Safety Panel allows; the basement is almost certainly continental. High priority.

SW-2 — cool temperate 40.5°S, Challenger Plateau close to Site 284. Plans are to hydraulic piston core to lower Miocene, then drill as deeply as allowed by the Safety Panel. High Priority.

SW-3 — cool temperate 35°52'S, close to Site 207 (southern Lord Howe Rise) but moved to area of expanded section. Sampling the Neogene sequence is important but we would also hope to sample the Paleocene sequence. The basement is probably Cretaceous. Lower priority.

SW-5,6 — transitional water mass to the west of Site 206 (32°40'S) on the Lord Howe Rise. Drilling in this region is critical for correlating temperate and warm subtropical paleoceanographic history. The depth traverse is proposed from 900 to 2200 meters to collect samples for stable isotope studies. One site would be drilled to basement; the Paleogene would be penetrated in two sites. **The OPP would prefer to have the area surveyed.** High priority.

SW-7 — warm subtropical water mass (26°06'S). *Challenger* would re-occupy Site 208 to hydraulic piston core the upper Oligocene to Recent sequence. High priority.

SW-8 — Pivotal area between tropical and subtropical water masses (~20 to 21°S). Although little seismic profile information is available drilling the Dampier Ridge is a possibility. A site survey would be needed here. Drilling would be to basement. High priority.

SW-9 — tropical, on equator. Re-occupy Site 289 to hydraulic piston core the neogene section only. High priority.

Owing to weather constraints in drilling the temperate and transitional sites, the OPP prefers drilling these sites during February and March beginning at the higher latitudes. SW-9 would probably be drilled during the following leg.

Western Pacific Mesozoic Environments

S. Schlanger led the discussion on the Western Pacific drilling to study Mesozoic vieronments and mid-plate volcanism.

A primary objective of this leg would be to obtain Jurassic sediments below volcanic extrusions and sills. **Site surveys are required to resolve the stratigraphy of the volcanic sills and flows. Because of an expected shortage in drilling time the OPP recommends that continuous coring be waived at a number of sites.**

Northwest Pacific

Y. Takayanagi and R. von Huene led the discussion and reviewed the drilling on the Japan margin — a largely non-accretionary margin. A major question is why the region continued to subside throughout the Cenozoic, and drilling is required to understand vertical tectonism at the edge of the margin. The data obtained will help to constrain existing models which include tectonic erosion vs. thermally induced uplift and subsidence. The panel also proposes drilling a known accretionary prism off Japan. Y. Takayanagi presented data on a series of possible sites addressing two primary purposes: to study (1) the fluctuations in the Oyashio and Kuroshio currents and (2) the history of seamounts arriving at the Japan trench. Following considerable discussion and given the constraints of drilling time, the OPP assigned the following priorities. Numbered sites are those that appeared in the original proposal.

High priority: 3, 4 (or d, f), 5, 6, 7, 8.

Low priority: 9 (Hess Rise), 10 (Bering Sea), g.

Lowest priority: a, b, c, d, h — all of which are located on seamounts. Because these areas have normally been for long periods below the CCD, hiatuses and severe dissolution of calcareous microfossils have left an incomplete stratigraphic record.

The OPP strongly endorses the location of the DARPA site near DSDP 303 (DARPA site-1 area), inasmuch as drilling here should provide a stratigraphic sequence to monitor the history of the subarctic surface water and siliceous biogenic productivity. A site here would supplement a north-south traverse of sites (5, 6 and 7) located to study fluctuations in the subarctic front and productivity history.

The panel places a low priority on Site 10 in the Bering Sea only because of logistical reasons. The panel considers the site to have high scientific merit for studying high latitude paleoceanography. R. von Huene suggested a future leg in the Bering Sea, following the DARPA leg, combining paleoenvironmental and active margin interests.

COSOD

R. Douglas relayed guidelines for white papers for the Conference on Scientific Ocean Drilling (COSOD), scheduled for fall 1981. The panel, in lengthy discussions, defined the most significant paleoceanographic problems which can be resolved by deep-sea drilling. The panel designated W. Ruddiman (Neogene topics), J. Kennett (Paleogene topics) and S. Schlanger (Mesozoic topics) to compile the results of the discussions. R. Douglas will integrate the three reports which will ultimately become the Ocean Paleoenvironment Panel's White Paper and their contribution to the Conference on Scientific Ocean Drilling.

Other Business

The Ocean Paleoenvironment Panel urged the DSDP Chief Scientist to expedite routine sample distribution from the Project's repositories.

W. Berger, W. Ruddiman, and W. Sliter have left the Ocean Paleoenvironment Panel. The Panel expressed its sincere appreciation to these people for their valuable contributions to the deep-sea drilling program.

The OPP tentatively plans to meet next 21-22 October in Los Angeles, California.

ORGANIC GEOCHEMISTRY PANEL

Bernd R. Simoneit, Chairman

The Organic Geochemistry Panel (OGP) last met 22-24 August 1980 at the New England Center for Continuing Education in Deerhorn, New Hampshire. The following summarizes some items from that meeting.

- The Organic Geochemistry Panel continues to maintain and update a list of organic geochemists recommended for participation on *Glomar Challenger.*
- The Panel, at present, has two versions of the Shipboard Organic Geochemistry Guide and Handbook. The chairman has received further comments and feedback from other organic geochemists who have participated onboard *Challenger.* B. Simoneit, P. Meyers and K. Kvenvolden will combine and update both versions. B. Simoneit will submit a retyped version to DSDP which will copy and distribute the handbook.
- B. Simoneit and P. Meyers (Organic Geochemists, Leg 75) will advise the scientific community of the possibility to contribute a report on hydraulic piston core from Hole 532 to the Initial Reports by means of a short news item for GCA and *Geotimes* with details of recommended sampling procedure and report deadlines.
- The OGP has no immediate changes in panel membership. The timetable for panel rotation is B. Tissot — 1981, G. Eglinton and J. Erdman — 1982, E. Baker and K. Kvenvolden — 1983.
- Frozen samples for contributions to the initial reports have been distributed up to Leg 72; samples from Legs 73-75 will be distributed in the very near future.

Organic geochemists are investigating lipids, pigments, porphyrins, amino acids, hydrocarbon gases, carbohyderates, pyrolysis and other kerogens, elemental composition, stable isotope composition to assess paleoenvironments, maturation, thermal effects, source rocks and general organic geochemistry. The number of investigators and investigations is increasing, especially on legs addressing organic geochemistry problems. This has introduced some duplication of effort, whereby two laboratories carry out the same analyses on the same samples. The OGP asks the Planning Committee to consider staggering sample distribution in order to minimize excessive duplicate analyses and to maximize sample distribution.

SEDIMENTARY PETROLOGY AND PHYSICAL PROPERTIES PANEL

Adrian Richards, Chairman

The Sedimentary Petrology and Physical Properties Panel (SP^4) last met 3-4 October 1980 at the U.S. Geological Survey in Denver, Colorado. The following summary was presented at the February 1981 Planning Committee meeting.

- The SP^4 sampling of a special hydraulic piston core from Site 532 was very successful. Fifteen investigators attended the "sampling party" at L-DGO. The SP^4 commends the East Coast Repository Staff for its excellent work in conjunction with the sampling.
- The SP^4 would like to obtain another core for special sedimentary petrology studies from the New Jersey transect leg. (The PCOM took no action on this request during the February meeting and the New Jersey transect leg was subsequently postponed until Spring 1983.)

- The panel noted it needs more feedback from DSDP. The SP[4] asked DSDP do examine the resolution of the GRAPE relative to the speed of GRAPE analyses over a year ago and has not yet received a response. The SP[4] has JOIDES overview responsibility for DSDP-developed gear relevant to SP[4] activities. To ensure better communications and information transfer the panel suggests that R. Bennett serve as liaison between the SP[4] and the DSDP Engineering group.
- The SP[4] had suggested that it also have a liaison person on several other panels. Chairmen of the other JOIDES panels agreed to establishing an informal (primarily telephone and letter) liaison, but owing to present size of panels and consideration of additional travel costs, they could not promote a full-time SP[4] attendee. G. Klein will provide informal liaison to the Passive Margin Panel; M. Arthur will provide liaison to the Ocean Paleoenvironment Panel.
- The SP[4] will form an *ad hoc* committee to learn if state-of-the-art tools are available for *in situ* measurements and will report its findings to the Downhole Measurements Panel.
- The SP[4] urges the expeditious publication of the Sedimentary Petrology Technical Manual.
- The SP[4] recommended that a mechanism be established to describe cores unopened on board *Challenger.* (During the Planning Committee meeting E. Winterer noted that such a mechanism already exists. The repository staff describes some cores; for others, a shipboard scientist or DSDP staff representative completes the "shipboard" descriptions.)

INFORMATION HANDLING PANEL

Daniel E. Appleman, Chairman

The Information Handling Panel last met 15-16 January 1981 at Scripps Institution of Oceanography, La Jolla, California. The following is a brief summary of items addressed at that meeting.

The Information Handling Panel (IHP) noted that,

- A multi-year committment of support for the DSDP Information Handling Group, past the termination of drilling, is essential for an orderly phase-down and suggested minimum goals.
- Additional effort should be made to ensure that shipboard core samples for different types of analyses are taken from the same level, to minimize correlation problems experienced by users of the data bases.
- The Planning Committee should be asked to urge increased support by member countries of the foreign data centers which have been established.
- The Planning Committee should be asked to facilitate the establishment of the Micropaleontology Reference Centers by appointing a small working group and allowing it to meet once or twice a year.
- The Planning Committee and SP[4] Panel should make a final decision on the future of the Sedimentary Petrology Techniques Manual, in view of the fact that only nine out of 30 proposed manuscripts hve been received, and the publication date proposed by SP[4] is December 1981.

POLLUTION PREVENTION AND SAFETY PANEL

Louis E. Garrison, Chairman

The Pollution Prevention and Safety Panel (PPSP) met 10-11 March at Scripps Institution of Oceanography to review sites for Legs 80 and 81 and alternative sites for Legs 79-82.

Safety Review Leg 79 - Alternative Site

Alternative OPP Site 79-1: Approved as proposed.

Safety Review, Leg 80 (Goban Spur)

ARM-1: Approved as proposed, but total sub-bottom penetration is limited to 1350 meters. Intermittent coring is permitted only in the upper 777 meters, and continuous coring is required below that level. Shipboard scientists are urged to exercise special care in monitoring hydrocarbons as coring nears the unconformity at the top of the rotated fault block. The shallow-water deposits expected to lie below this unconformity may be penetrated to only 100 meters even though the approved 1350-meter total depth may not have been reached.

GOS-I: Approved as proposed.

GOS-II: Approved as proposed.

GOS-IIA: Approved as proposed.

GOS-III: The Safety Panel withheld approval at the proposed site pending the circulation to panel members of a migrated section. Available data suggest that pinchouts could be encountered in the Lower Cretaceous/Jurassic epicontinental sediments overlying basement. If further data processing shows that the beds in question outcrop up dip, the panel will reconsider the site.[1]

GOS-IIIA: Approved for drilling to basement, GOS-IIIA is located on shot point 2185 on seismic line CM-10. Drilling here would avoid possibility of penetrating a pinchout structure. (See GOS-III above.)

GOS-IV: Approved but location should be moved to shot point 1450 on seismic line OC202 in order to avoid a possible closure.

GOS-IVD: Approved to basement as an alternative to GOS-IV; the site is located at shot point 1950 on seismic line CM 18.

GOS-IVA: Disapproved. A potential for drainage from a thick down-dip sequence into tilted and truncated beds with good sealing conditions exists at this site.

GOS-IVB: Approved for penetration limited to 50 meters below the Albian unconformity or to a total depth of 1350 meters, whichever is reached first. (Two Panel members did not approve this site.)

GOS-IVC: Approved for penetration limited to 50 meters below the Albian unconformity or to a total depth of 1000 meters, whichever is reached first. (One Panel member did not approve this site.)

GC-1: Approved for hydraulic piston coring to refusal depth.

GC-2: Approved for hydraulic piston coring to refusal depth.

Safety Review, Leg 81 (Rockall Bank)

ROCK-I: Approved as proposed.

ROCK-IA: Approved as proposed.

ROCK-IB: Approved as proposed.

ROCK-IC: Approved as proposed.

ROCK-IIA: Approved as proposed.

ROCK-IIB: Approved as proposed.

ROCK-IIC: Approved as proposed.

ROCK-IID: Approved as proposed.

ROCK-IIIA: Approved as proposed.

ROCK-IIIB: Approved as proposed.

ROCK-IIIC: Approved as proposed.

ROCK-IIID: Approved as proposed.

ROCK-IV: Approved as proposed.

Alternative OPP Site 81-1: Approved as proposed.

Alternative OPP site 81-2: Approved as proposed.

Safety Review Leg 82 (Western North Atlantic)[2]

ENA-8: Data were insufficient for a safety evaluation of this site. In such a geologically complex region, the Panel felt that additional site survey information should be developed, and that a location with thinner cover over the "U" unconformity would improve the safety aspects.

Alternative OPP Site 82-1: Approved as proposed.

Alternative OPP Site 82-2: Approved as proposed.

The safety Panel also discussed suggested ways to improve the recently revised Safety Review Check sheets. (The Check Sheets serve as a guide to proponents in seeking safety approval for specific sites. The Panel further recommended that proponents at future reviews provide a statement summarizing the scientific objectives of their cruises and sites, and include structural and isopach maps for all continental margin sites and others where such data exist.

The Pollution Prevention and Safety Panel will next meet 21-22 May 1981 at Woods Hole Oceanographic Institution.

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In a separate report to the Planning Committee, Lou Garrison noted that during the past year (not including the March 10th meeting) the JOIDES Safety Panel has reviewed a total of 59 sites; it approved 38 sites as proposed, 14 sites with some restrictions or modifications, and disapproved 4 sites.

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[1]Following circulation of a migrated version of profile CM-10 (by P. deGraciansky after the meeting) the Safety Panel recommended moving GOS-III to shot point 2000 to avoid a small closure at the original site.

[2]Leg 82 has been rescheduled to drill the ocean crust in the North Atlantic. The Safety Panel will nonetheless review the North Atlantic sites during its May meetinf at Woods Hole.

DOWNHOLE MEASUREMENTS PANEL

Roy D. Hyndman, Chairman

The Downhole Measurements Panel (DMP) last met 30 April - 1 May 1981 in Honolulu, Hawaii. The following includes selected items from that meeting.

DSDP Logging Contract

M. Salisbury reported on a proposed contract with Schlumberger for logging on Leg 79 and subsequent legs. Logging was planned for Leg 79 but was not conducted because owing to a strike in France the operating console did not arrive in Las Palmas in time for the leg. The new (tentatively selected) tools will include (a) a long-spaced sonic tool with 8-, 10- and 12-ft path lengths (the Gerhardt-Owens tool was 2-ft); it probably will have full wave recording with shipboard editing capabilities, (b) a 3-arm caliper, (c) SGT natural gamma-spectral tool, (d) CNL compensated neutron porosity logging tool, (e) DLL dual laterolog — three with 24-inch resolution, (f) SFL spherically focused dual induction logging tool, (g) HRT high-resolution temperature tool, (h) PFS 650 cc pore fluid sampler, (i) FGT-C gamma back-scatter lithology tool (may be a poor density tool, and (j) flow meter. Acquisition of an FDC compensated density tool was proposed but appears not to have been immediately available.

The Downhole Measurements Panel noted that the long-spaced sonic tool is an excellent addition and a standard BHC short-space sonic tool would be much preferable to the 3-arm. The spectral gamma tool may be a valuable addition, permitting quantitative estimates of uranium, thorium, and potassium. In many deep-sea formations, however, the concentrations of these elements may be too low for useful results. The flow meter could be very valuable but its sensitivity may be too low to resolve the rates so far inferred in DSDP holes. A good density tool is very important; the Gerhardt-Owens tool was very good.

In House Logging

The Panel discussed at length the feasibility and desirability of an in-house logging facility at the Deep Sea Drilling Project. The main advantages are reduced cost, better continuity and closer control of operating personnel and equipment, as well as and greater flexibility in use and calibration of the tool, and a higher degree of quality control. DSDP would also be able to select the most appropriate tools for DSDP holes and develop handling proced and new or experimental tools. Panel mem noted that the DSDP shipboard technic were already operating, or have operated assistance from the shipboard scientists, number of special tools such as temperature probe, the pore-water sampler, downhole magnetometer, the televiewer, long-spaced resistivity tool and downho seismometers.

The main disadvantages to in-house loggin are the difficulty of obtaining the best tools which normally are only available on contract basis and/or through hiring good logging engineers. Logging engineers are in particularly short supply at present and command very high salaries.

The Downhole Measurement Panel recommends (1) **that DSDP should have an expanded downhole instrument team to take over the routine downhole measurements (heat probe, porewater sampling) and acquire or develop special logging tools such as the televiewer and (2) that the Project set up an in-house logging facility, perhaps contracting the basic logging tools and console recording unit but not the operating personnel.**

Logging contractors will provide equipment and may also provide appropriate programs. The Panel suggests that the initial staff comprise one analyst-manager and two operators who may be log engineers. (*See also item under SCIENCE OPERATIONS elsewhere in ths issue.*)

Logging Tool Heave Compensation

The Panel recognizes that tool oscillation generated by ship heave is a serious problem. Although the problem is not too serious for many of the standard tools, it very much degrades the borehole televiewer and downhole magnetometer data. Use of tools capable of faster logging rates (e.g. 9 rev. per sec. instead of a normal 3 rev. per sec. televiewer) would improve the data, but incorporation of a heave compensation system is really needed. It may be possible to compensate the cable along with the drill string using the present system (and keeping the pipe stationary will limit hole damage) but this requires considerable time and effort to install and remove. The cable alone can probably be compensated more easily, and the Panel asked DSDP to investigate such a system.

Improvement of Logs

The Panel

concern over the limited number and often poor quality of the logs which have been obtained from the *Challenger.* Part of the problem lies in logging tool failures, in bit-release failure, and in the drill string becoming stuck in the hole before logging is attempted. Most of the problems, however, lie in poor hole conditions. Inasmuch as mud cannot be circulated to maintain a stable hole condition, the Panel recommends that the Project investigate logging with through-bit tools during drilling of deep holes, and logging with the bit release system outside of the hole, between re-entry attempts. Data can then be obtained before the hole deteriorates and before the pipe becomes stuck. To facilitate quick limited logging, a simpler, preferably permanent, system of log sheaves is also needed.

Longer-spacing tools with higher energy sources need to be developed to cope with enlarged holes.

Downhole Tools

- T. Francis and A. Jageler discussed the **ELREC extended lateral range electrical conductivity tool.** It was developed by Art Kuches of Cornell University and uses a current source and magnetic detection to examine lateral conductivity variations or inhomogeneities.
- T. Francis indicated that the long-space electrical experiment — is now fairly routine and the tool should be operated by Project personnel. It only needs a new cable.
- **The Soviet magnetometer** will be available in the near future along with Soviet scientist operators.
- The Panel agreed that DSDP should give high priority to acquiring a **televiewer** (costing about $40K). In the future the televiewer should be modified for low as well as high frequency use to permit acoustic mapping of the formation some distance from the borehole. Heave compensation is needed for high quality data.

Areas of Possible Downhole Experiments and Measurements

- Nauru Basin
- East Pacific Rise
- Costa Rica Rift — mini-leg to deepen Hole 504B on return from Pacific Drilling (not at time of deepening) to conduct crustal hydrogeology, geotechnical, and downhole seismometer experiments. About two weeks on site are required.

  The Panel gives top priority to these experiments.
- Northwest Pacific DARPA site — a number of downhole measurements is desirable here.
- CAR-1 — instrumentation for subduction zone thrust.
- Japan trench — possible instrumentation of holes by the Japanese, i.e., seismometer, tilt, and strain meters.

Wireline Re-Entry

The Panel discussed the need to fully utilize previously drilled holes and recommended that the Planning Committee serve as the agency coordinating hole use by the various oceanographic ships utilizing wireline re-entry techniques.

Because of the feasibility of wireline re-entry the panel also questioned whether re-entry cones (perhaps light inexpensive models) should be set for single-bit holes to allow logging at a later date.

NSF and ONR Funding for Downhole Measurements

D. Hussong outlined a proposal by M. Langseth to revamp the heat-flow program with updated heat probes and conductivity equipment. A service could be provided for data reduction. Another proposal by R. Anderson for hydrogeologic measurements including use of the packer and a televiewer has been submitted. Possible study areas are a hydrothermal leg on the East Pacific Rise, Nauru Basin, N.W. Pacific DARPA leg and the deepened Costa Rica rift crustal hole. F. Duennebier also plans to deploy another downhole seismograph.

White Paper

The Downhole Measurements Panel devoted a day to preparing a White Paper addressing planning for a 5-year program.

Next Meeting

The Panel tentatively plans to meet next 29-30 April 1982.

HYDROGEOLOGY WORKING GROUP

Roger Anderson, Chairman

The Hydrogeology Working Group held its first meeting on 9 December 1980 at the American Geophysical Union meeting in San Francisco. The following is a report of that meeting.

Background

On 15 October 1980, the JOIDES Planning Committee appointed a working group to coordinate a major new thrust of the drilling program during 1981-83. The charge of that group is to *promote the study of sea-floor water circulation and its consequences.* The working group is to develop an ongoing program of thermal measurements and pore-water sampling (to be carried out on nearly all DSDP legs) and develop specialized experimental programs for certain legs.

Tasks

During its open meeting, the Hydrogeology Working Group identified three specific tasks.

Thermal measurements. Funding will be sought for construction of a new geothermal probe compatible with the hydraulic piston corer so that essentially continuous temperature measurements in the sediment column can be obtained at each HPC site. Additionally, a renewal of current funding will be sought for reduction and analysis of temperature logging data as well as the Tokyo-probe results during 1981-83.

Geochemical sampling using the Barnes sediment probe, the packer sampler, and if possible, a new wireline straddle-packer sampler currently under development at AMOCO Research. Sampling should take place on all hydrogeology-targeted legs in the 1981-83 drilling program.

Permeability, pore pressure, natural fracture distribution and fine-scale sonic velocity logging experiments. The Working Group recommended that all these experiments be conducted on all hydrogeology legs. This is over and above the standard geophysical logging program currently carried out by DSDP.

Records and samples from these three tasks would be made available to anyone in the scientific community who requests them.

The group assigned responsibility for seeking funding and implementing these three tasks to three subgroups:

- Thermal measurements: R. Von Herzen and M. Langseth
- Geochemical analysis: R. McDuff, M. Bender, M. Mottl, J. Gieskes
- Geochemical sampling: Barnes for his probe R. Anderson, M. Zoback for packer and wireline packer
- Physical Properties: R. Anderson and M. Zoback

Development of a Hydrogeology Working Hypothesis

In order to understand the circulation of sea water beneath the sea floor on the flanks of mid-ocean ridges, we must construct a reasonable working hypothesis to assure that the most important aspects controlling that flow are measured. The circulation of sea water in the oceanic crust is a complex physical-chemical convection system in a multi-layered porous and fractured medium.

The sedimentary layer, and possibly the surface flow basalts of layer 2A, are several orders of magnitude more impermeable than the pillow basalts and dikes of layers 2 and 2A. Simple modeling of two planar layers shows that four factors directly control the physical dimensions and form of convection cells. They are the sediment thickness, the aspect ratio of the cells, and the permeability of sediment and rock layers. The drill-hole offers the only medium now available to directly measure the **permeability** of the sedimentary and basaltic layers and determine how they vary areally and with depth. **Temperature** measurements directly define the form of circulation. **Geochemical** analyses of sedimentary and oceanic crustal pore fluids directly define the chemical interaction of the oceans with the lithosphere.

The Hydrogeology Working Group has identified several legs of the *Glomar Challenger* during which it hopes to conduct a coordinated suite of experiments designed to measure temperature, pore pressure, permeability, fracture and void distribution. Experiments here would indicate how these properties vary with depth and age and how they correlate with seismic velocity, the degree of alteration, and the form and vigor of convection in the oceanic crust. The hydrogeology experimental objectives, and the legs during which they would be conducted are as follows:

15°S Hydrogeology Transect — A geochemical transect from the East Pacific Rise to Tahiti:

One re-entry hole in 20-million year-old crust to maximum crustal depth plus at least three single-bit HPC holes to bit destruction in young basalt. Temperature, wireline geochemical sampling in HPC holes plus full suite of packer flow tests in re-entry hole to document variation with age and depth of physical properties and chemical in young, fast spreading seafloor.

NAURU Basin: Deep re-entry of 160-million-year-old Pacific plate. Full suite of packer flow, temperature, and sampling tests to document physical and chemical properties of some of the oldest oceanic crust remaining in the ocean basins.

Northwest Pacific: Re-entry hole to emplace DARPA seismometer. Complete suite of hydrogeology experiments in a hole in which a long-term seismometer will be left behind. Experiments here provide an excellent opportunity to relate large-scale seismic properties to fine-scale hydrological variations downhole.

Equatorial Pacific: North-south transect across the equatorial sedimentary bulge. Temperature and wireline sampling in HPC holes. No packer. Investigators will contrast data with those from the sea floor of the same age with a thin sediment cover at 15°S, plus an area of known convection occurring through sediment column.

Costa Rica Rift: Return to deepen Hole 504B, hopefully into layer 3 gabbros. Complete hydrogeology experiments including packer.

Approximately one week of *Challenger* time on station will be required on each of the above legs to conduct the hydrogeology experiments.

Proposals

Proposals to fund the geochemical and physical property experiments have been submitted to NSF and ONR. They specifically request funding for the following experiments:

- Flow tests using a drill-stem packer to measure *in situ* permeability and pore pressures of the oceanic crust.
- Geochemical sampling of formation pore waters using the drill-string packer and sampler.
- Borehole televiewer runs down all logged holes of hydrogeology legs to map fracture distribution and lithostratigraphy.
- Closely spaced multichannel acoustic velocity logging, using a new tool to map Vp and Vs velocity variations on a scale small enough to 'see' into fracture and void units mapped by the borehole televiewer.

Additionally, R. Von Herzen and M. Langseth are seeking funds from industry for construction of a new temperature instrument to be housed in the *wall* of the core cutter of the hydraulic piston corer. The instrument will make synchronous HPC and temperature sampling possible. The development phase should span the two years of the current program, so von Herzen and Langseth have also submitted an extension for their current DSDP thermal sampling program to NSF.

Site Survey Requirements

A site survey is required *before* the Hydrogeology leg at 15°S begins. To ensure best results, *Challenger* should drill on upwelling limbs of convection cells on the East Pacific Rise flank. In order to map the hydrology and geochemistry of convective motion prior to site selection, surface heat-flow, and geochemical sampling in at least 20-30 mile boxes about each general site will be required. The JOI Site-Survey Planning Committee has issued an RFP for this work. (See also report of the JOI Site-Survey Committee, above.)

Long-term Program

The Hydrogeology Working Group plans to write a White Paper outlining a long-term hydrogeology program to be conducted from a deep-sea drilling ship. It will consider the possibilities of drilling (a) into hard rock, (b) into young basalt, and/or (c) beyond 10,000 meters sub-bottom, by some platform, and whether or not penetration of hydrothermal systems in the third dimension would be possible and would yield major new information about the physical and chemical interaction of the oceans with the oceanic crust and sediments.

We urge panel chairmen to prepare summarized meeting reports specifically for the JOIDES Journal. Most complete panel minutes are too long for inclusion in the Journal. Conversely, simple outlines leave much to be desired and editor-extracted minutes may not report all items of interest.

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