OCEAN DRILLING PROGRAM

LEG 129 PRELIMINARY REPORT

OLD PACIFIC CRUST

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SCIENTIFIC REPORT

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ABSTRACT

The main objective of Leg 129 was to recover Jurassic sediments and volcanic basement from the Pigafetta and East Mariana basins of the western Pacific. Six sites were selected as the primary targets, although operational and time constraints allowed drilling only three of them. One of these sites (801) yielded the first Jurassic samples ever recovered from the Pacific Ocean. These sediments give unique insight into the world's "superocean" of the Jurassic. Site 801 will also calibrate the oldest magnetic lineation patterns predicted to be Late to Middle Jurassic in age. All three sites sampled upper Lower and lower Upper Cretaceous volcanic materials that have been imaged with multichannel seismic surveys. All three sites also will provide geochemical reference sections for "input" to the western Pacific subduction zones and provide information on the crustal magnetization and paleolatitude of the Pacific plate in the Mesozoic. Finally, data from these sites will elucidate the physical state of some of the oldest sediments and crust remaining beneath the seafloor.

INTRODUCTION

The correlation of Mesozoic magnetic anomaly sequences in the Pacific Ocean by Larson and Chase (1972) indicates that the world's oldest ocean crust lies centered in the far western Pacific and that isochrons become concentrically younger in approximately radial fashion (Fig. 1). Recent magnetic anomaly mapping (Figs. 2, 3, and 4) has revealed the oldest part of this tectonic pattern and has extended the Mesozoic magnetic reversal time scale from M29 of Cande et al. (1978) to M37. The oldest M-lineations may have recorded the magnetic-reversal/seafloor-spreading history of the early Late Jurassic (165 Ma), which was preceded by a magnetic quiet zone ranging back to the Middle Jurassic (175 Ma).

The inference that the M17 and older isochrons coincide with Jurassic sediments and basement rocks is based entirely on conclusions drawn from geophysical data such as those just cited. Prior to Leg 129, no Jurassic material had ever been recovered from this region, whose size is approximately that of the contiguous United States or western Europe. Past attempts to drill and recover Jurassic sediments and basement rocks in this area have been frustrated by ubiquitous chert layers of generally Late Cretaceous age and by widespread, but probably not totally ubiquitous, volcanic material of late Early and early Late (hereinafter refered to as "middle") and Late Cretaceous age that blanketed much of the older strata in the area. These geologic units and the lack of multichannel seismic data to define their depths, thicknesses, and lateral boundaries have led to previous "blind drilling" on Jurassic basement locations (Fig. 1) that have all terminated in Cretaceous material of various types [cherts; Deep Sea Drilling Project (DSDP) Site 452 (Shipboard Scientific Party, 1981a); volcaniclastics, DSDP Sites 199 (Shipboard Scientific Party, 1973b) and 585 (Shipboard Scientific Party, 1986); basalt flows and sills, DSDP Sites 61 (Shipboard Scientific Party, 1971), 169 (Shipboard Scientific Party, 1973a), and 462 (Shipboard Scientific Party, 1981b)].

The recent magnetic anomaly mapping cited above, along with joint multichannel seismic expeditions by French and American investigators (Abrams et al., 1988), have led to a much better understanding of the tectonic and geologic history of the area. These investigations have also provided seismic imaging of drill sites in the Pigafetta and East Mariana basins , where Jurassic sediments and Jurassic oceanic crust were drilled and recovered on ODP Leg 129 with the advanced drilling technology aboard *JOIDES Resolution*.

OBJECTIVES OF THE PROPOSED DRILL SITES

Age Calibration of Jurassic Magnetic Reversals

The available magnetic and seismic data suggest that the Pigafetta and East Mariana basins are underlain by oceanic crust of Late Jurassic to probable Middle Jurassic age (Figs. 3, 4, and 5). The younger parts of the basins toward the northwest may be Kimmeridgian to Oxfordian (anomalies M22 to M25; Late Jurassic), whereas the middle parts may be Oxfordian to Callovian (anomalies M29 to M37), that is, ~160-165 Ma. Toward the southeast, within the Jurassic magnetic quiet zone, the crust may be as old as Bathonian to Bajocian (Middle Jurassic, ~165-175 Ma), a time of extremely frequent magnetic reversals (Steiner et al., 1987).

So far the oldest magnetic anomalies dated in the world oceans are M23 to M26 (Fig. 5), which have been sampled at two sites in the North Atlantic (DSDP Sites 100 and 105). Several sites on younger M-anomalies have yielded a reasonable calibration for the post-M25 anomaly sequence. Drilling in the area of older anomalies of the M-series offered an exceptional opportunity to extend the geomagnetic time scale further back into the Jurassic, and possibly to calibrate the series of reversals described from land sections (Steiner and Ogg, 1988).

Within the Jurassic quiet zone of Pigafetta Basin, Handschumacher et al. (1988) observed an important change in the character of the magnetic signature. Small-amplitude anomalies were observed on all aeromagnetic tracks that extend southeast of M37, but could not be correlated. Farther southeast of this magnetic quiet zone an abrupt change in amplitudes and regional field intensity was interpreted as a possible structural boundary roughly parallel to the isochrons. This area may represent the location of the original microplate from which the present-day Pacific plate evolved (Handschumacher et al, 1988). It is also possible that this area could mark the edge of the middle Cretaceous volcanic complex that extends farther south.

Drilling at the Pigafetta and East Mariana basin sites has allowed determination of the age of the older M-anomalies, determination of the age of the crust within the Jurassic quiet zone, and investigation of the nature of the crust in the magnetic high-amplitude low-regional-field area.

Jurassic Sediments and Early History of the Ocean

The main interest in Jurassic sediments from the Pacific is that they chronicle the paleoenvironment of the Jurassic superocean, which covered two-thirds of the Earth at that time, but for which we have no direct record. The only other samples of pelagic "deep-sea" Jurassic sediments come from Tethyan fold belts and DSDP sites in the proto-Atlantic, both of which correspond to relatively restricted marine conditions. Previous attempts to recover Jurassic sediments in the Pacific have failed. The most recent attempts were at locations where thick lava flows and sills of middle to Late Cretaceous age proved impossible to penetrate (DSDP Site 461, Nauru Basin), or where thick accumulations of volcaniclastic material had expanded the sedimentary section beyond the capabilities of the drillship (DSDP Site 585, East Mariana Basin). Multichannel seismic profiles reveal that this latter site probably was located in a fracture-zone trough next to closely adjacent seamounts and guyots that provided an anomalous thickness of volcaniclastic turbidites covering anomalously deep basement.

The sedimentary section depicted on seismic profiles through the Pigafetta Basin resembles that of the Ptolemy Basin located north of the Marcus-Wake swell, where DSDP

Site 307 was drilled to basement of Berriasian (earliest Cretaceous) age beneath 300 m of sediment on anomaly M21. The average sediment thickness in the East Mariana Basin is about 300-500 m, and there was a very good chance of obtaining sediments of Jurassic age. The main difference between the Leg 129 sites and those drilled previously, apart from the older age of the basal sediments, is the age of the chert layers. The chert was expected to be younger in the Pigafetta Basin and younger still in the East Mariana Basin because of the differences in time of equatorial crossing for the three areas (Lancelot and Larson, 1975). Sediment thicknesses and acoustic signatures appear compatible with this interpretation. We intended to sample Jurassic sediments in the area of the M-anomalies and within the Jurassic quiet zone, where no age determination can be made otherwise.

Geochemical Reference Sections

The proposed drilling locations also fulfilled in part objectives commonly referred to as "geochemical reference sections". These objectives include determining the composition of sediments and igneous ocean crust adjacent to a subduction zone for comparison with the geochemical characteristics of the neighboring arc volcanism. In the western Pacific the main variable on the "input" side of the geochemical reference equation may be the presence or absence of large volumes of middle Cretaceous volcanic material in the deep basins now being subducted. The petrology, igneous or sedimentary nature, and depth in section of this material would greatly affect the geochemical "output" signature at western Pacific island arcs. It probably would have much greater variability than the original Jurassic ocean crust and is much more accessible to the drill in the western Pacific. Also, drilling into basement in this region offered a unique opportunity to assess the *in-situ* physical properties of old oceanic crust created at a fast spreading center, because present tectonic models assume that the Pigafetta and East Mariana basins were both created at a 6-8- cm/yr spreading half-rate.

While none of the Leg 129 drilling sites in the Pigafetta or East Mariana basins are directly adjacent to their associated subduction zones, seismic profiles throughout both of these basins suggest that the sites have acoustic sections typical of each basin in question. It is unlikely that any significant diagenesis or other alteration will occur at these sites between now and their eventual subduction. Furthermore, all sites occur in fracture-zone-bounded "compartments" that extend to the western Pacific subduction zones. Thus the nature of the sedimentary and crustal sections can be related to those specific subduction zones and their associated backarc volcanism.

Cretaceous Volcanic Complex

It was probable that these sites would encounter material generated by the middle Cretaceous volcanic event, either as volcaniclastics or as solid sills and flows. However, multichannel seismic data and recent magnetic anomaly mapping allowed location of sites typical of large parts of the regional geology of those basins. We drilled through the middle Cretaceous volcanics to underlying seismic reflectors that may be older material. Sampling this middle Cretaceous volcanic complex provides additional understanding of the timing, dimensions, and petrology of this major igneous province. In addition, sampling the seismic stratigraphy at these locations will allow "calibration" of the seismic stratigraphy in large parts of both of these basins.

Crustal Magnetization and Paleolatitudes

In addition to what we consider to be the primary objectives (age of the oldest magnetic lineations and Jurassic paleoenvironments), a number of other objectives were met with these drill sites. Crust magnetization objectives also were within the scope of Leg

129 drilling. Paleolatitudes measured on basement rocks and logging measurements that recovered the complete remanent magnetization vector are also of prime interest. They will allow reconstruction of the latitudinal motion and rotation of the Pacific plate during the Jurassic. This latter point is especially important for modeling the overlying sedimentary stratigraphy that is very sensitive to crossings of the equatorial high-productivity zone.

ODP SITE DESCRIPTIONS

Site 800
21°55.38' N, 152°19.32' E, water depth = 5686 m

Site 800 (proposed site PIG-1) is located in the northern Pigafetta Basin on magnetic anomaly lineation M33, 40 nmi northeast of Himu Seamount. Its presumed age is Jurassic, based on an extrapolation of the Japanese magnetic lineation pattern that is contained in the same spreading compartment to the northwest. Hole 800A consists of the following stratigraphic sequence (Fig. 6).

0-38 mbsf: Tertiary to Upper Campanian zeolitic brown clay.

38-78 mbsf: Upper Campanian to Turonian red chert and porcellanite corresponding to the top of the reverberant layer on seismic records.

78-229 mbsf: Cenomanian to Lower Albian gray chert and silicified limestone with increasing amounts of silicified limestone downsection, grading into some nannofossil chalk at the base of the sequence.

229-450 mbsf: Aptian volcaniclastics, well indurated and possibly emanating from Himu Seamount 40 nmi to the southwest that is radiometrically dated at 120 Ma (Aptian-Barremian), with scattered included radiolarites. The volcaniclastics contain spectacular turbidite and debris flow features including graded beds, cross-bedding, tear-up structures, and penecontemporaneous deformation.

450-498 mbsf: Hauterivian to Berriasian laminated claystone, red with scattered black banding and green reduction halos. Hard red chert occurs at the base of the sequence.

500-545 mbsf: Basaltic dolerite; massive, moderately coarse crystallization with no internal cooling unit boundaries. The basalt is more finely crystallized at its top. There was no glass or palagonite observed macroscopically, and large, elongate clinopyroxene crystals were present throughout. Relatively fresh, unweathered material was observed throughout except for the top 1 m. The basalt corresponds to a flat, high amplitude seismic reflector that is essentially acoustic basement in this area.

We terminated drilling operations at 545 mbsf owing to a tight spot in the hole at 350 mbsf that is probably related to swelling of clays in the volcaniclastic section. We conducted logging with standard tools in three runs from 45 to about 300 mbsf.

Site 801
18°38.54'N, 156°21.58'E, Water depth = 5682 m

After a 20-yr search, we have at last found the Jurassic Pacific. Site 801 (proposed site PIG-3A) lies in the central Pigafetta Basin on a magnetic quiet zone southeast of, and presumably older than, the M25-M37 magnetic lineation sequence. Holes 801A, 801B, and 801C consist of the following stratigraphic sequence (Fig. 7).

0-56 mbsf: Tertiary to Campanian, brown pelagic clay.

56-118 m: Campanian to Turonian brown chert and porcellanite.

118-310 mbsf: Cenomanian and Albian volcaniclastic turbidites with minor radiolarite near the base.

310-435 mbsf: Lower Cretaceous (Valanginian) to Upper Jurassic (Oxfordian) brown radiolarite with dark brown chert and abundant manganese.

435-453 mbsf: Middle Jurassic (Callovian) umber-colored radiolarite and claystone with strong hematite enrichment probably indicative of hydrothermal activity during or just after deposition. The oldest dated sediment is interbedded with the basalts in the underlying unit at 465 mbsf where the *T. conexa* zone of Matsuoka and Yao (1986) has been identified. This radiolarian assemblage is the same as the basal radiolarian sequence of DSDP Site 534 which was recalibrated by Baumgartner (1987) to lie at the ~170 Ma Callovian/Bathonian boundary. The absence of carbonate in this ridge-crest, equatorial-paleolatitude sedimentary facies suggests that the Late-Middle Jurassic superocean was characterized by carbonate production and/or preservation that were extremely low.

453-594 mbsf: Middle Jurassic basement. Interbedded basaltic sheet flows, thin sills, and silicified claystone are at the top of the sequence. Pillow basalts begin at 484 mbsf and exhibit concave pillow structures with chilled margins, variolitic textures, and microcrystalline interiors. A remarkable hydrothermal concretion occurs between 511 and 521 mbsf that is chrome yellow and silica cemented. It is underlain by pillow basalts that are extremely altered directly beneath the hydrothermal deposit and become fresher toward the bottom of the hole. These mainly extrusive volcanics are the first *in situ* Jurassic basement samples ever recovered from the Pacific Ocean.

We completed standard logging including a repeat run with the Formation Microscanner (FMS) from 56 to about 460 mbsf with the wire line heave compensator operating.

Site 802

12°05.78'N, 153°12.62'E, Water Depth = 5969 m

Site 802 (proposed site EMB-2A) is located in the central Mariana Basin, at the southeastern end of a magnetic lineation sequence partially identified to the northwest as M22 to M31, which predicts a Late Jurassic basement age. Extrusive basalt underlies Upper Aptian-Albian (Lower Cretaceous) claystones suggesting that the basement age should be revised upward by 60 m.y. at this location, or that original Jurassic basement, and perhaps a significant sedimentary section, has been covered by subsequent Cretaceous lava flows. The overlying sediment section consists mainly of redeposited material, suggesting massive lateral transport over long distances (>300 km) or unmapped large elevations in the more immediate vicinity. Hole 802A consists of the following stratigraphic sequence (Fig. 8).

0-15 mbsf: Neogene brown pelagic clay.

15-159 mbsf: Miocene tuff consisting of well-indurated and well-preserved hyaloclastites and volcaniclastic turbidites, presumably derived from the Caroline Island volcanic chain.

159-254 mbsf: Miocene to Eocene tuff, chalk, claystone, volcaniclastic turbidites, and debris flows, apparently all redeposited.

254-330 mbsf: Upper Paleocene nannofossil chalk.

330-348 mbsf: Maestrichtian zeolitic pelagic claystone.

348-460 mbsf: Campanian volcaniclastic turbidites with clay, claystone, silty claystone, porcellanite, and debris flows, mainly redeposited.

460-516 mbsf: Cenomanian to Upper Aptian-Albian brown claystone, calcareous claystone, radiolarian limestone, and volcaniclastic turbidites with wood fragments in the lowest 2 cores.

516-560 mbsf: Extrusive basalt, uniformly fine-grained with multiple cooling units and no included sediment. Sheet-flow volcanism with some evidence for pillow basalts is suggested. The chilled zone immediately below the sediment contact suggests that the uppermost basalts were recovered.

Standard logging was conducted over the interval from 110 to 320 mbsf after eliminating a bridge above this level and encountering another at its base. A vertical seismic experiment was attempted to test for seismic horizons deeper than the sampled Cretaceous basalts that might indicate underlying Jurassic strata. The experiment was unsuccessful because the tool became stuck in the hole, requiring the logging cable to be severed and terminating operations at this site.

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Table 1. Leg 129: Site Occupation Summary

Hole	Latitude (°N)	Longitude (°E)	Water Depth*	Number of Cores	Cored (m)	Recovered (m)	Percent Recovered	Total Penetration (m)
800A	21°55.38	152°19.32	5686	61	544.5	152.7	28.0	544.5
801A	18°38.57	156°21.57	5682	20	186.0	31.5	16.9	186.0
801B	19°38.52	156°21.58	5682	44	317.2	59.2	18.7	503.2
801C	18°38.54	156°21.59	5674	12	100.6	60.6	60.2	594.3
802A	12° 5.78	153°12.62	5969	62	559.8	165.0	29.5	559.8

* Depths are drill-pipe measurements corrected to sea level.

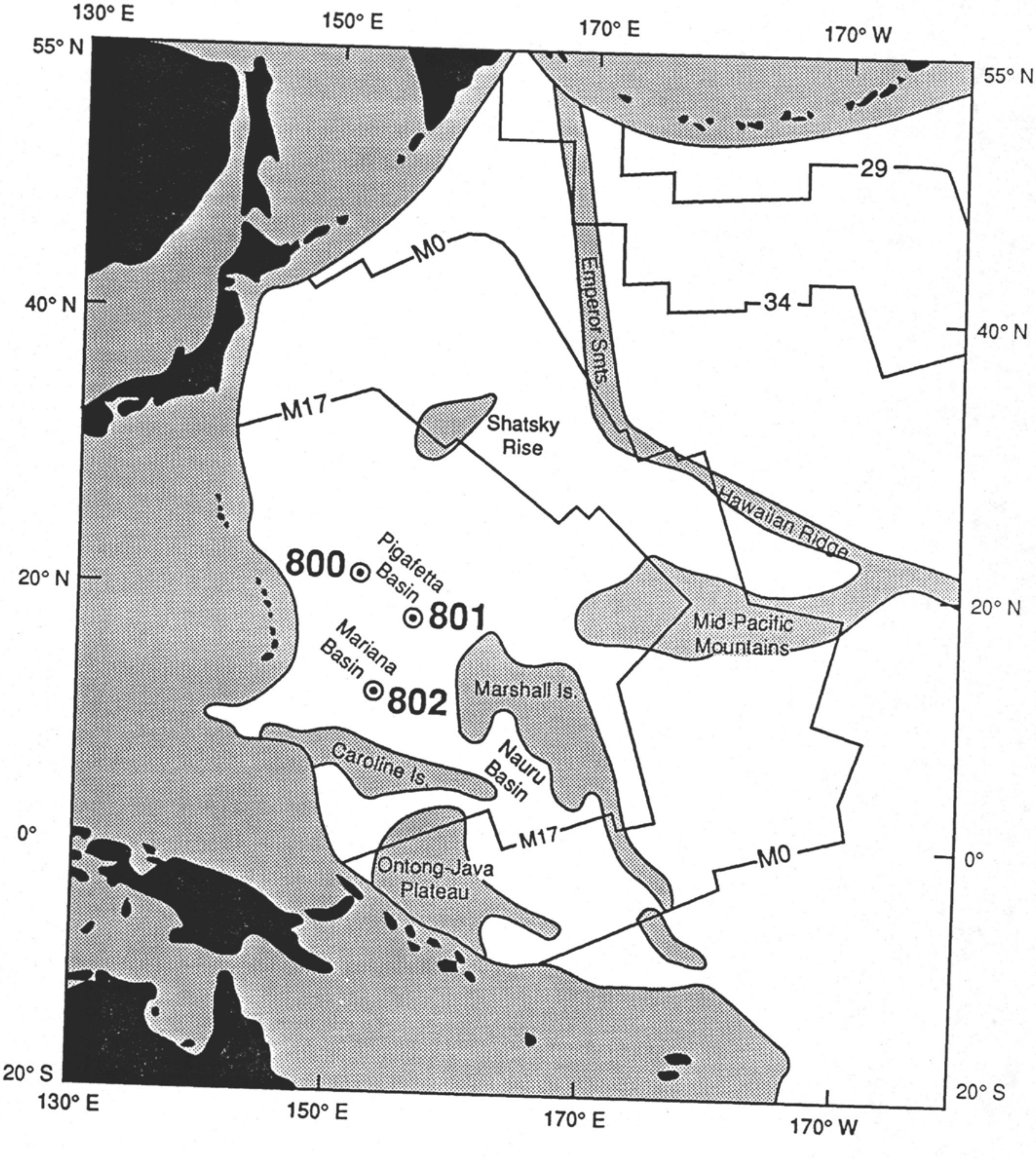


Figure 1. Bedrock isochrons determined from magnetic anomaly lineation mapping on the Pacific plate (from Larson et al., 1985) superimposed on groups of islands, atolls, and guyots in the western Pacific Ocean. Circles denote locations of ODP Leg 129 Sites 800, 801, and 802.

Figure 2. Magnetic lineations in the western Pacific, compiled by R. L. Larson.

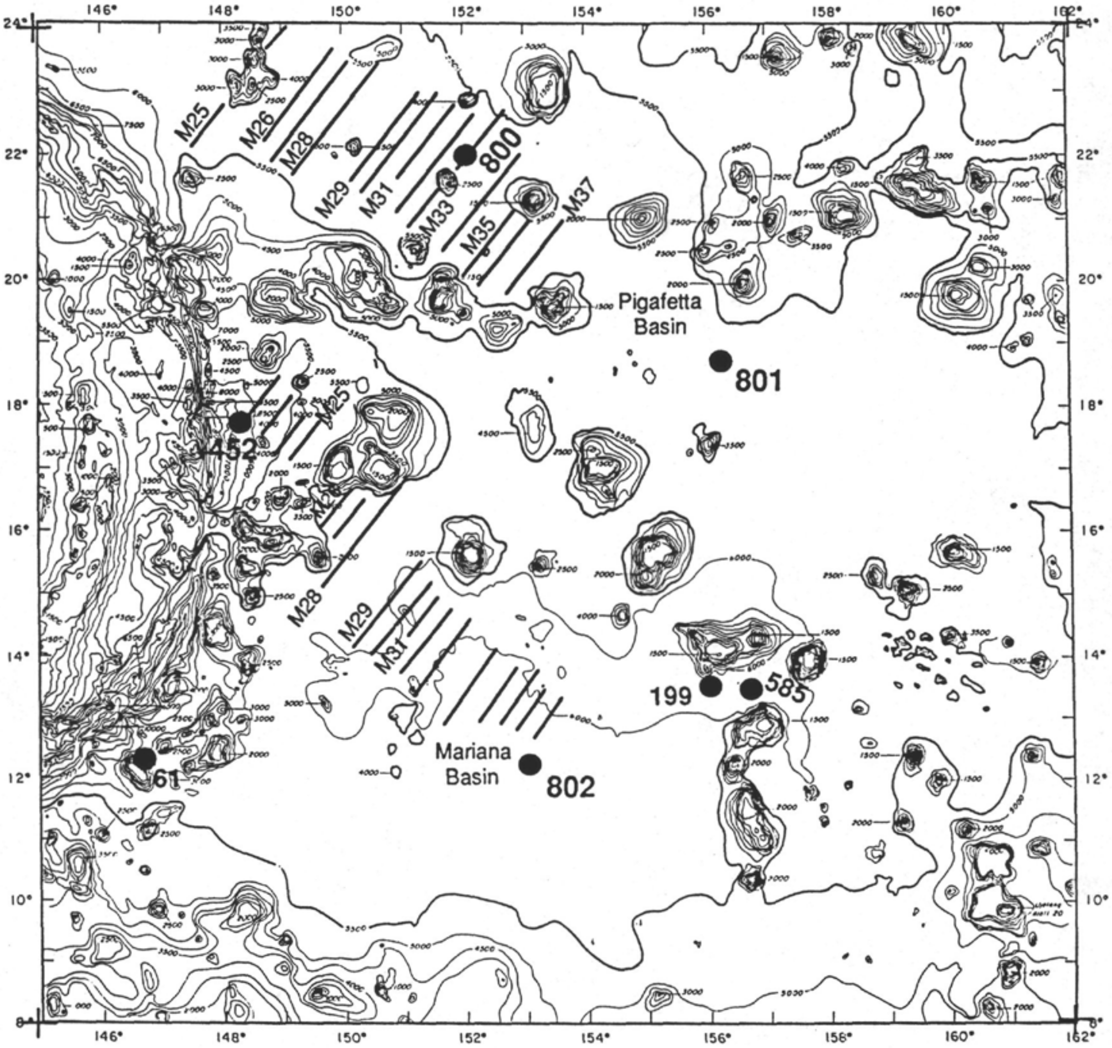


Figure 3. ODP site locations superimposed on Jurassic magnetic lineations and regional bathymetry (in meters, from Carl Brenner, personal communication) of the East Mariana and Pigafetta basins. Only the sites located in the deep basins of the western Pacific are shown.

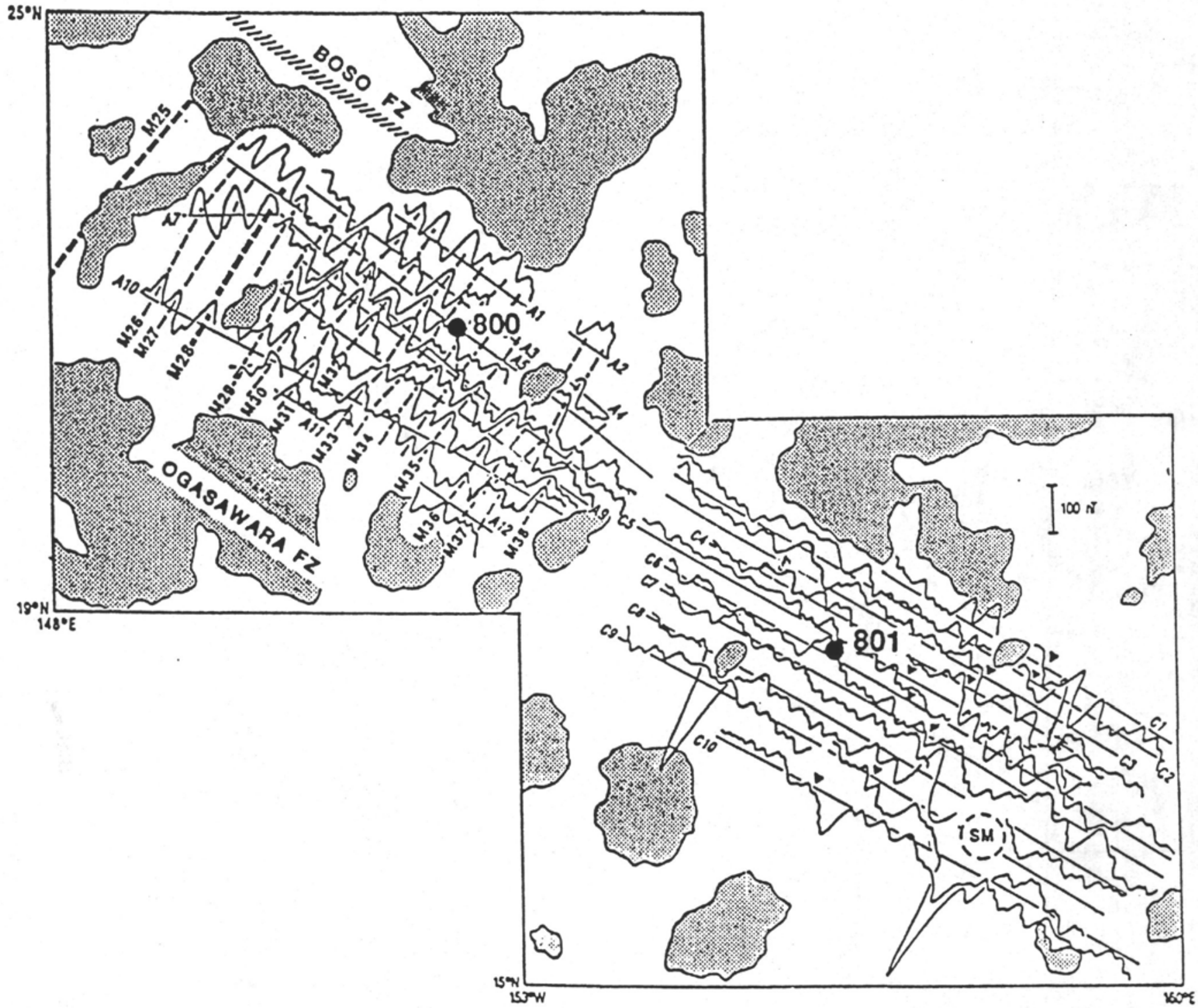


Figure 4. Aeromagnetic anomaly profiles across Pigafetta Basin from Handschumacher et al. (1988), showing the locations of ODP Sites 800 and 801. Note low amplitude of magnetic anomaly lineations (<100 nT). Also note that numbering of M-sequence from M29 to M38 is one number larger for each lineation here than in other places in this report because we believe that M30 of Handschumacher et al. (1988) correlates with M29 of Cande et al. (1978). Triangles in the Jurassic quiet zone show where individual anomaly profiles become disturbed to the southeast.

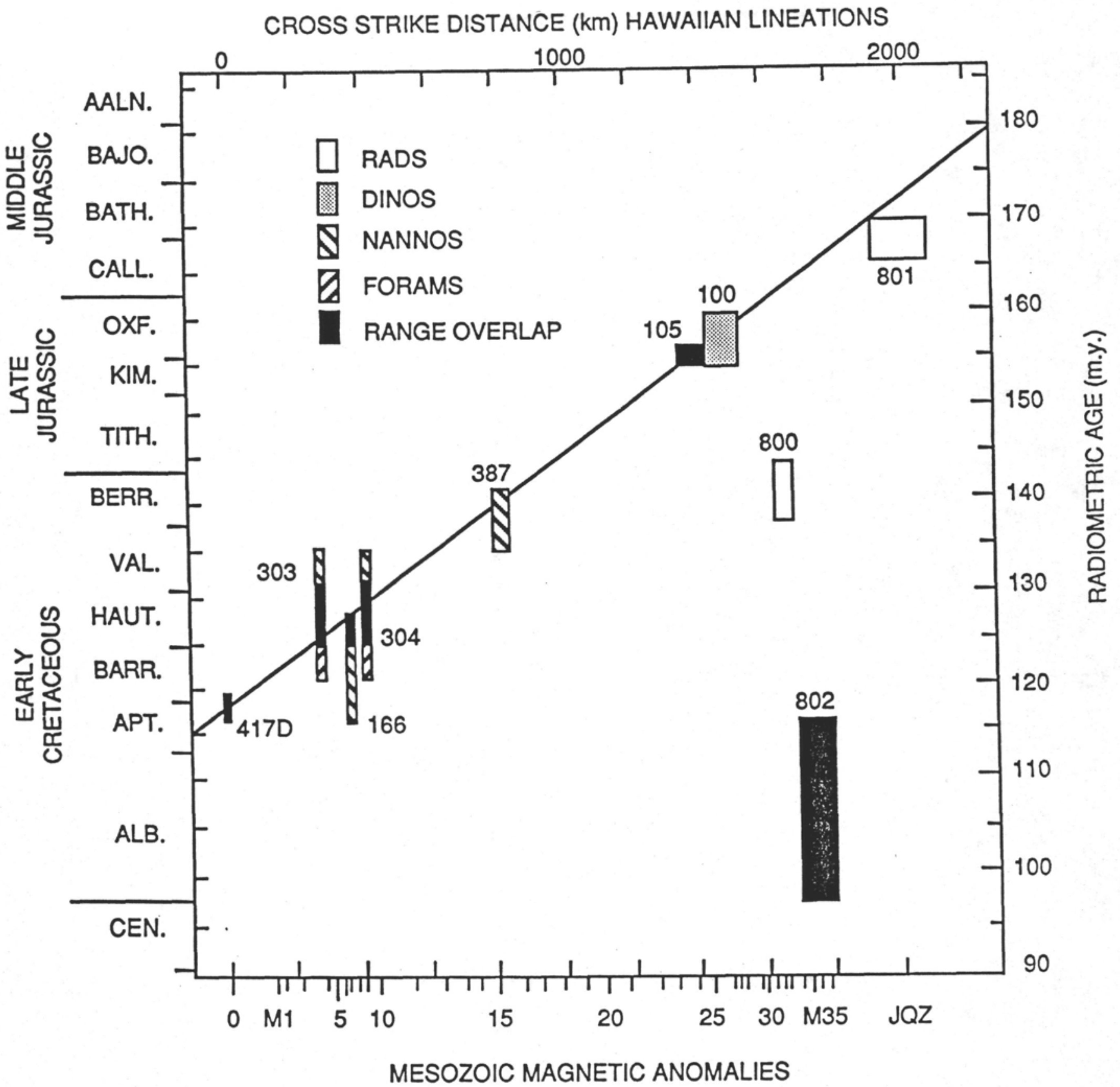


Figure 5. Time calibration plot of the Mesozoic magnetic anomalies MO to M37 and the preceding magnetic quiet zone. Magnetic anomalies plotted as distance across the Hawaiian lineations for M0 to M25. M25 to M37 normalized to that parameter. Geologic time scale and radiometric ages from Harland et al. (1982), modified by Kent and Gradstein (1985) at the Tithonian/Kimmeridgian boundary. Oldest paleontological ages in various DSDP and ODP holes shown as rectangles. Vertical lengths of paleontological age ranges taken from DSDP *Initial Reports* except for Site 100 (Zotto et al., 1987) and 105 (Gradstein and Sheridan, 1983). Horizontal lengths show magnetic age ranges from Larson and Hilde (1975) for DSDP Sites 303, 304, 166, 100, and 105, and from DSDP *Initial Reports* for Sites 387 and 417. ODP Sites 800, 801, and 802 show paleontological ages from this report. Magnetic age ranges determined by R. L. Larson.

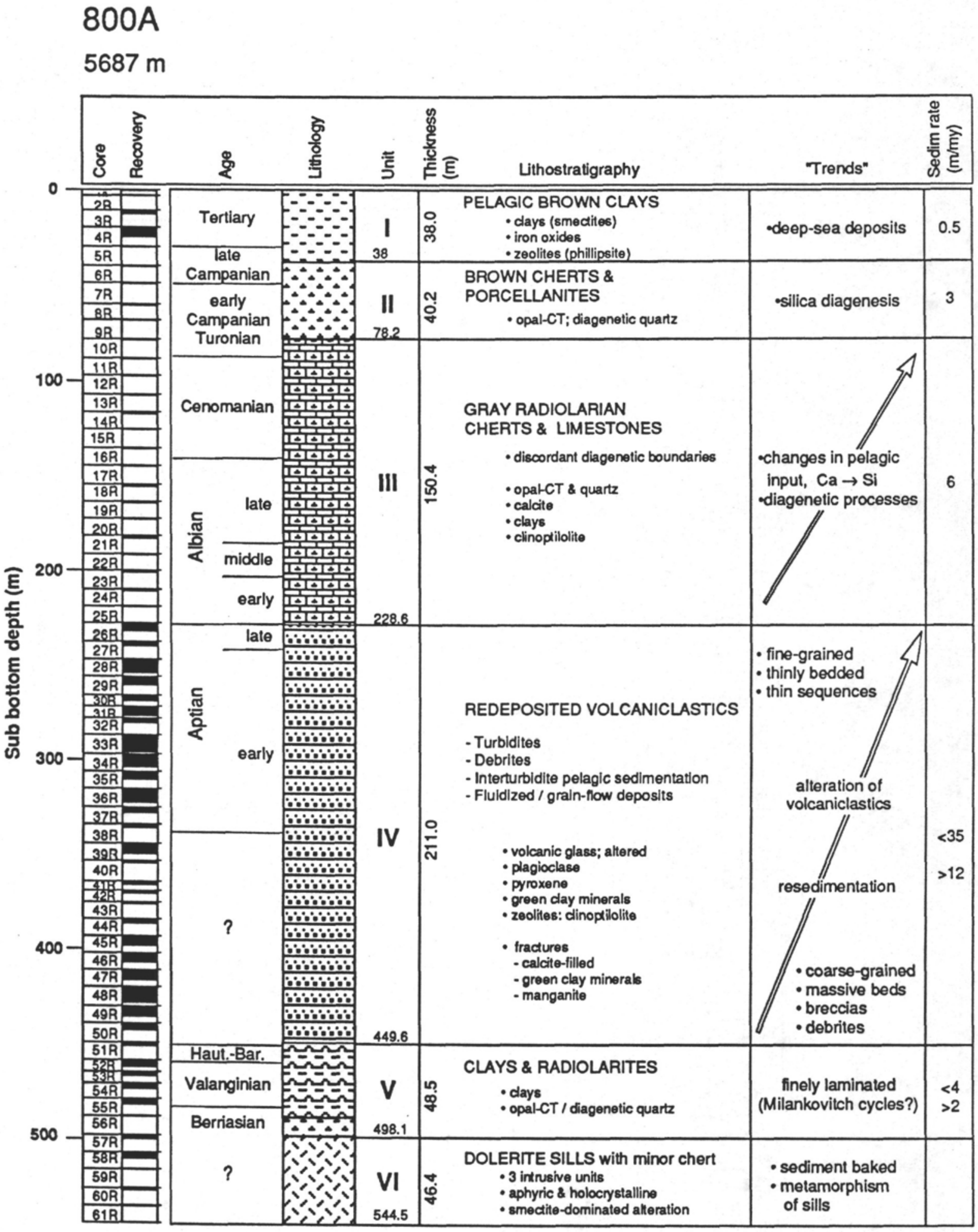


Figure 6. Stratigraphy of Hole 800A.

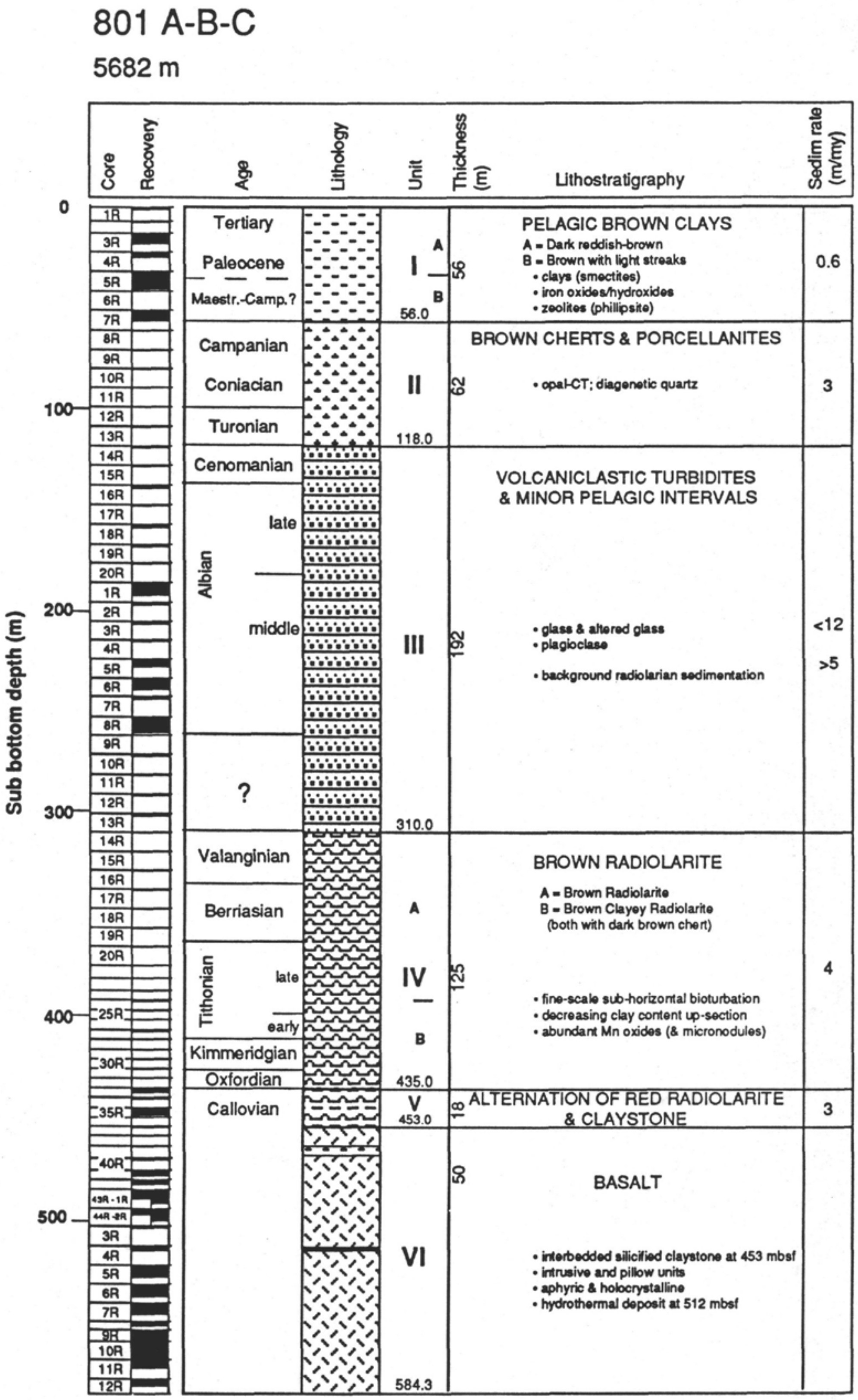


Figure 7. Stratigraphy of Holes 801A, 801B, and 801C.

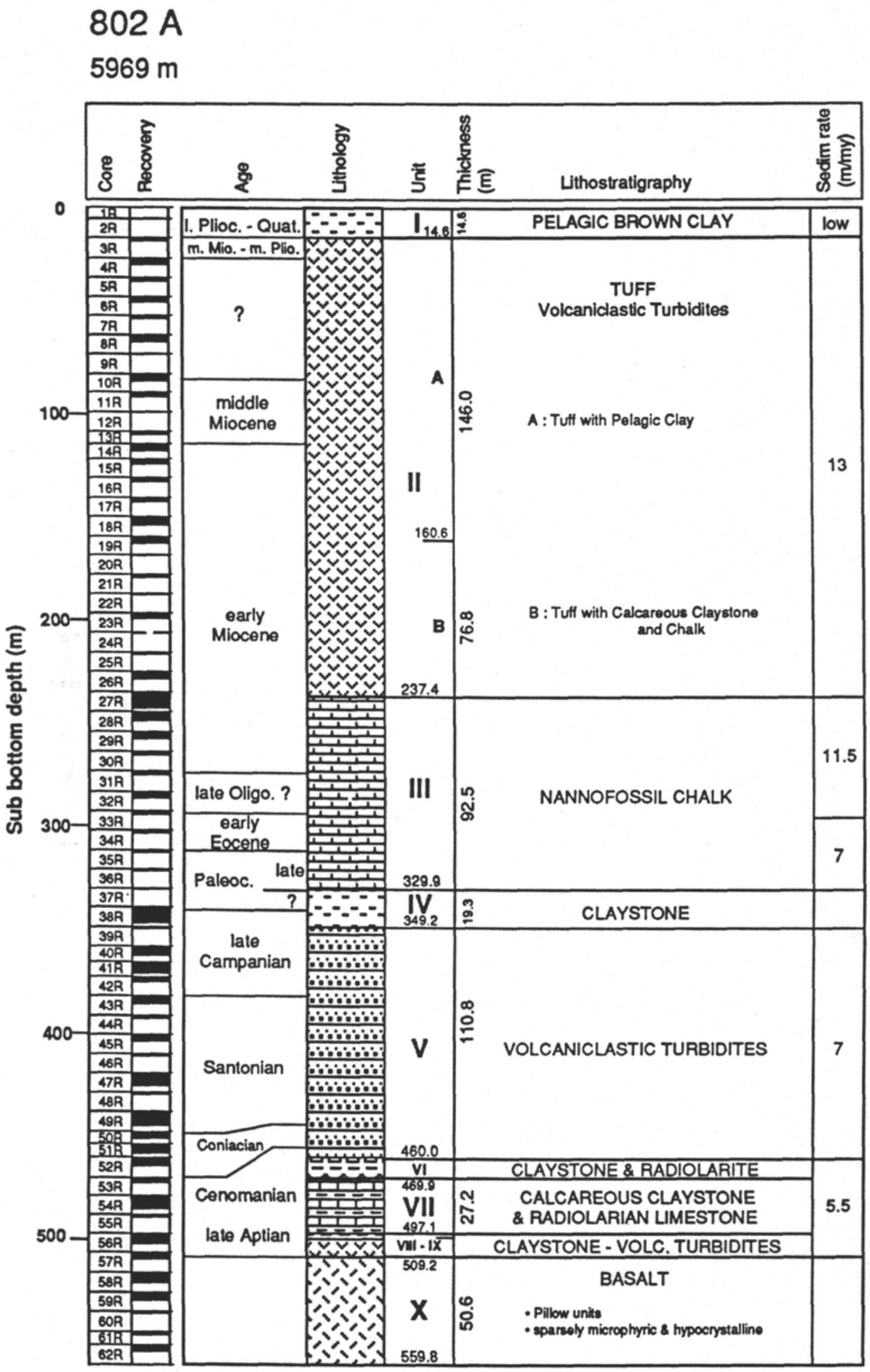


Figure 8. Stratigraphy of Hole 802A.

OPERATIONS SYNOPSIS

The ODP Operations and Engineering personnel aboard *JOIDES Resolution* for Leg 129 were:

Operations Superintendent:	Glen Foss
Special Tools Engineer:	Pat Thompson
Schlumberger Engineer:	William Coates

GUAM TO GUAM
20 NOVEMBER 1989 TO 19 JANUARY 1990

OVERVIEW

Leg 129 of the Ocean Drilling Program was dedicated to the investigation of the oldest rocks of the Pacific Ocean. Three sites were drilled in the central Pacific area--two in the Pigafetta Basin (Sites 800 and 801) and one in the East Mariana Basin (Site 802).

The basic drilling/coring plan was similar at all sites, with the rotary core barrel (RCB) system used to core through the sediment section and to sample basement basalt. On the basis of the single-bit hole findings, one of the Pigafetta sites was to become a full reentry site with penetration of at least 100 m into basement.

Hole 800A was cored through 500 m of sediments and about 45 m into dolerite "sills" before drilling operations had to be stopped because of adverse hole conditions in the sediment section. The bit was released above the unstable zone and a suite of three logs was recorded over the upper 300 m.

Hole 801A was cored to 186 mbsf. Operations were terminated when routine measurements indicated excessive hole angle. The respud, Hole 801B, was drilled to the depth of 801A before coring recommenced. Volcanic and siliceous sediments were cored in to basement at 453 mbsf. After 51 m of basement penetration, single-bit objectives were declared complete and the site was chosen for the reentry installation. Three successful logging runs were made from just above the sediment/basement contact. A full reentry cone assembly with 16 inch casing to 5 mbsf and 11-3/4 inch casing to 482 mbsf was installed in Hole 801C. When the hole had been cored to 81 m below the casing shoe, three pieces of a failed bit had to be fished from the hole. An additional 31 m was then cored, with the hole left as an open "laboratory" facility.

Hole 802A was RCB-cored to basalt at 516 mbsf. Hole trouble from unstable basal sediments was overcome to core to the fulfillment of scientific objectives at 560 mbsf. Bridging in the hole limited logging to the interval above 320 mbsf. A vertical seismic profile (VSP) was attempted but was thwarted by a stuck geophone tool, which eventually was recovered.

Operational highlights of Leg 129 included coring of the oldest oceanic sedimentary and basement rocks of the Pacific at Site 801, the deepest water ODP operations to date at Site 802, successful penetration of thick chert sections at Sites 800 and 801, and two successful fishing operations to recover a VSP tool and core-bit parts.

GUAM PORT CALL

Leg 129 began officially when *JOIDES Resolution* dropped anchor in the approaches to Apra Harbor at 1000 UTC 20 November 1989. Port-call activities began immediately as the crew started making up new drill pipe into stands. Customs and immigration formalities also were handled during the night. The vessel moved to a dockside berth at 0900 hr local time the next morning for completion of crew-change and loading/off-loading activities. All scheduled work items were completed by the afternoon of 22 November, and final preparations for departure were made as soon as the last crew member boarded the ship. The final line was cast off at 0915 UTC 22 November.

SITE 800--NORTHWESTERN PIGAFETTA BASIN

Proposed site PIG-1 lay about 670 nmi northeast of Guam. The transit was slowed by stiff northeast trade winds. The first positioning beacon of Leg 129 was launched at 1245 UTC 25 November.

Hole 800A

As Site 800 was a potential reentry site, a jet-in test for conductor casing point followed the "mud-line" core taken for seafloor depth determination. The sea-floor depth was determined to be 5697 m from the driller's datum.

Continuous RCB coring then commenced from 1 mbsf (5698 mbrf). Reddish-brown clay with interbedded porcellanite and chert was cored with poor recovery to about 70 mbsf. The chert then became interbedded with siliceous chalky limestone. Volcaniclastic turbidites were cored below about 220 mbsf, but much of the material was siliceous and/or calcareous and quite hard. At about 450 mbsf, the volcanics gave way to pelagic claystones with chert. Massive basaltic rocks were encountered at about 500 mbsf. Core recovery for the hole averaged 28%.

Deteriorating hole conditions forced cessation of coring about 45 m into the basalt/dolerite, which was considered to be a sill. Because of apparent swelling clays in the volcanic sequence, the hole was constricting on the drill string at about 350 mbsf.

The bit was pulled above the trouble zone and released for logging. A successful suite of three logs was then recorded in the upper portion of the hole.

SITE 801--CENTRAL PIGAFETTA BASIN

Proposed site PIG-3A was located about 300 nmi southeast of Site 800. The transit was made at 11.4 kt, a short preliminary survey was made, and a beacon was dropped at 1600 UTC 6 December.

Hole 801A

After two beacon failures, an adjustment in site position, and two unsuccessful spud attempts, Hole 801A was officially spudded at 1030 UTC 7 December at 5693 mbrf.

A jet-in test was again necessary to determine the conductor casing point for the planned reentry cone. The bit was jetted quite easily to solid resistance at 53 mbsf before it was repositioned for the continuation of coring operations.

The soft upper clay and ooze sediments were cored to the first hard (porcellanite) layer at 53 mbsf. WSTP heat-flow measurements were attempted at 22 and 41 mbsf, but both were unsuccessful owing to a faulty thermistor. The interbedded soft clay and porcellanite/chert interval persisted to about 120 mbsf, where the lithology gave way to fine-grained volcanogenic turbidites.

Coring was terminated at 186 mbsf because hole angle had built to 8-1/4°.

Hole 801B

The new hole was spudded at 0945 UTC 9 December. Drilling to core point at 186 mbsf was slowed because of the hard chert at shallow depths. Two multishot surveys confirmed that hole deviation was acceptable.

Continuous coring then resumed in the volcaniclastic turbidite sequence. The volcanics gave way to chert, pelagic claystone and radiolarite at about 310 mbsf. Core recovery remained poor throughout the section. At about 420 mbsf, the chert component decreased and recovery improved in red claystones and radiolarites. Basaltic rock was encountered at

453 mbsf. The basalt was intercalated with hard, massive chert and soft claystone beds for about 15 m. Coring continued in massive basalt to 503 mbsf, where the objectives of the single-bit exploratory hole were considered to be fulfilled. Average core recovery for Hole 801B was 19%.

The hole was then prepared for logging and a suite of three successful logs was run from the base of the sediment section.

Hole 801C

The reentry cone and five joints of conductor casing were assembled and attached to the BHA. Hole 801C was spudded at 1645 hr 17 December. The casing shoe was jetted to 5736 mbrf where the assembly was released.

The 14-3/4 in hole was then drilled to a total depth at 6176 mbrf, about 24 m into basalt. Drilling parameters indicated gravelly and unstable material in the lower 30 m of the sediment section.

Following a short trip and mud sweeps, the drill string was tripped for the surface casing string. The string of 35 joints of 11-3/4 in casing was run to reentry depth with two interruptions for problems with reentry equipment.

Following reentry, the casing was lowered into the hole without incident until resistance was encountered at a depth corresponding to the sediment/basalt contact. While observing the reentry via the TV, the casing was worked for 3-1/2 hours in an attempt to lower the string through the bridge. As the casing was slowly worked into the hole, the drill pipe was carefully rotated to ease the casing past the obstruction. The TV coaxial cable immediately parted and the Vibration Isolated Television (VIT), Sonar Tool, Telemetry Pod, and five kilometers of cable fell to the seabed.

As no action could be taken at the time to save the equipment, the original plan of latching, releasing, and cementing the casing was followed. When release had been verified, the casing was cemented into place.

The broken cable did not become fouled with the drill string and neither the cable nor the VIT was recovered. With the VIT probably remaining in the reentry cone and reentry capability reduced to sonar only, the most viable operational plan was to drill a single-bit site while awaiting the emergency transport of a new TV camera.

SITE 802--EAST MARIANA BASIN

Hole 802A

Hole 802A was spudded at 1300 UTC on Christmas Day at the ODP-record seafloor depth of 5980 m below driller's datum. Only 20 m of soft clay was cored before indurated volcanogenic sediments were encountered. Coring progress was slowed considerably until sufficient drill-collar weight could be applied to the bit.

Coring continued through a variety of sediment types with a good rate of penetration (ROP) and hole conditions. Core recovery was also somewhat better than at the previous sites, apparently owing to a reduction in the chert component. Basalt was reached at 516 mbsf. Hole problems, apparently originating in a rubble zone just above the basalt contact, began immediately. The hole was eventually cleaned up enough to permit achievement of the scientific drilling objective at 560 mbsf.

The logging operation was not so fortunate, and hole bridging limited the interval of the three standard logs to the section from about 98-320 mbsf. A vertical seismic profile (VSP) attempt followed the logging operation. After background-noise problems had been solved, recording had just begun when the geophone tool became stuck in the hole.

The VSP tool was recovered with the drill string by means of the Kinley wireline crimper/cutter technique. No further operations were attempted at Site 802 because a replacement underwater TV camera had been received via a chartered vessel, and the work at Site 801 had higher scientific priority.

SITE 801 (RETURN)

The automatic-station-keeping (ASK) system was able to detect weak signals from the beacons dropped earlier at Site 801 and to take an initial position on them before a fresh beacon was dropped. A new coaxial cable had been installed on the reentry winch during the transit. The first operation upon arrival at the site was to run the cable (without the VIT) to about 5500 m for detorquing purposes. The BHA was inspected electromagnetically during that period.

An attempt then was made to recover the lost VIT frame by means of a specially fabricated grapple on the end of the drill string. With the grapple just above the seafloor, the new VIT, with TV and sonar, was lowered to inspect the reentry cone and search for the frame and/or lost cable. Although the lost frame had been expected to appear nestled in the reentry cone, the cone was observed to be absolutely clear and clean. Several hours of searching failed to locate the missing frame and cable anywhere in the immediate area and search efforts were abandoned.

After a round trip for an RCB BHA, the cone was reentered, and the cement shoe and plug were drilled out. Continuous RCB coring operations commenced at 0500 UTC 9 January. The core bit failed catastrophically after 35 rotating hr with good hole conditions and core recovery, leaving three cutters in the hole.

A single round trip/reentry with a reverse-circulation fishing junk basket was sufficient to recover all but minor fragments of the junk. The final core bit then was tripped into the hole and the remaining operating time of the leg was used in coring to 131 m into basement.

Hole 801C was left clean and open for future investigations. *JOIDES Resolution* departed Site 801 at 2115 UTC 15 January and arrived in Guam on 18 January to conclude Leg 129.

OCEAN DRILLING PROGRAM
SITE SUMMARY REPORT
LEG 129

HOLE	LATITUDE	LONGITUDE	WATER DEPTH (M)	NUMBER OF CORES	INTERVAL CORED (M)	RECOVERED CORE (M)	PERCENT RECOVERED	INTERVAL DRILLED (M)	TOTAL PENETRATION (M)	TIME (HRS)
800A	21-55.38N	152-19.32E	5697.0	61	544.5	152.7	28.0	.0	544.5	235.75
	SITE TOTALS:			61	544.5	152.7	28.0	.0	544.5	235.75
801A	18-38.57N	156-21.57E	5693.0	20	186.0	31.5	16.9	.0	186.0	58.00
801B	18-38.52N	156-21.58E	5693.0	44	317.2	59.2	18.7	186.0	503.2	176.75
801C	18-38.54N	156-21.59E	5685.0	12	100.6	60.6	60.2	493.7	594.3	386.00
	SITE TOTALS:			76	603.8	151.3	25.1	679.7	1283.5	620.75
802A	12-05.78N	153-12.62E	5980.0	62	559.8	165.0	29.5	.0	559.8	253.75
	SITE TOTALS:			62	559.8	165.0	29.5	.0	559.8	253.75
	LEG TOTALS:			199	1708.1	469.0	27.5	679.7	2387.8	1110.25

OCEAN DRILLING PROGRAM
OPERATIONS RESUME
LEG 129

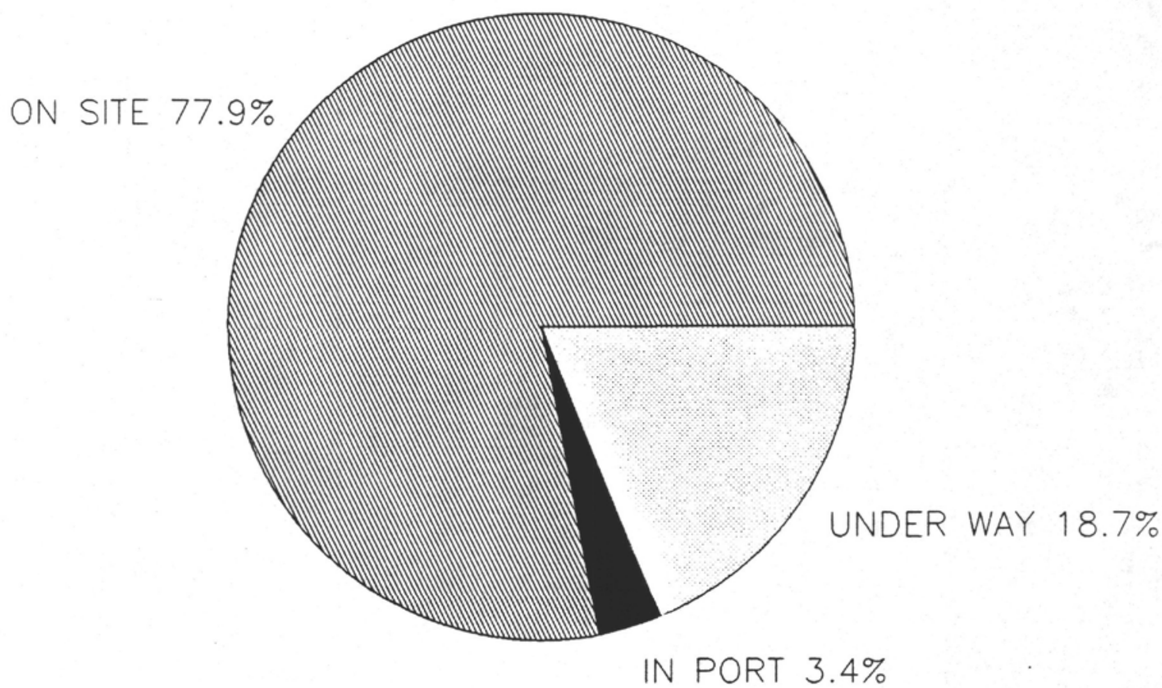
Total Days (20 November 1989 - 19 January 1990)	59.4
Total Days in Port	2.0
Total Days Under Way	11.1
Total Days on Site	46.3

Trip Time	9.4
Coring Time	21.5
Drilling Time	2.1
Logging/Downhole Science Time	4.6
Reentry/Casing Time	3.2
Mechanical Repair Time (Contractor)	0.1
Stuck Pipe & Hole Trouble	1.3
Fishing & Remedial Time	2.8
Other	1.3

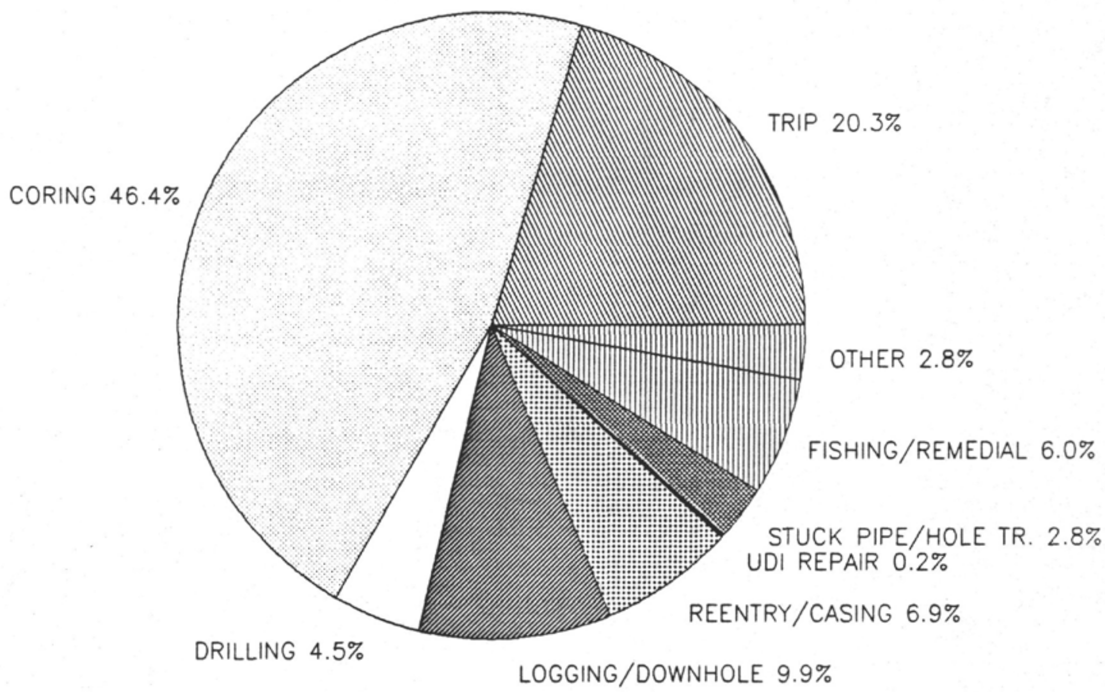
Total Distance Traveled (nautical miles)	2675*
Average Speed (knots)	10.4*
Number of Sites	3
Number of Holes	5
Total Interval Cored (m)	1707.8
Total Core Recovery (m)	469.0
Percent Core Recovered	27.5
Total Interval Drilled (m)	680.0
Total Penetration (m)	2387.8
Maximum Penetration (m)	594.3
Maximum Water Depth (m from drilling datum)	5980.0
Minimum Water Depth (m from drilling datum)	5685.0

* ESTIMATED

LEG 129
TOTAL TIME DISTRIBUTION



LEG 129
ON SITE TIME DISTRIBUTION



TECHNICAL REPORT

The ODP Technical and Logistics personnel aboard JOIDES Resolution for Leg 129 of the Ocean Drilling Program were:

Laboratory Officer:	Brad Julson
Assistant Laboratory Officer:	Joe Powers
Yeoperson:	Jo Claesgens
Curatorial Representative:	John Miller
Computer System Manager:	Edwin Garrett
Electronics Technicians:	Jim Briggs Dave Erickson
Photographer:	John Tenison
Chemistry Technicians:	Scott Chaffey Valerie Clark
Marine Technicians:	Dan Bontempo Joe DeMorett Susan Erb Kuro Kuroki Kathe Lighty Michael Moore Joan Perry
Graphics Illustrator:	Lisa Tirey

INTRODUCTION

Leg 129 officially began when the ship anchored in Guam harbor at 2000 hr on November 20, 1989. The ship had just finished a drydock in Singapore and a transit to Guam. During the transit, the ship encountered a cyclone with winds near 100 kt. The storm proved that all modifications made during the drydock were done properly.

SINGAPORE SHIPYARD

The ship was in drydock for about two weeks in Singapore. Many major modifications were made to the ship and laboratories despite marginal living and working conditions. All planned modifications were completed as scheduled despite the 95°-105°F heat with 100% humidity, lack of air conditioning and electricity and only one toilet. One job required the technicians to pull cables near the ceiling in the engine room, where the temperature was 150°F!

The months of planning and preparation by the ODP Logistics & Technical Support Group, Engineering, and Computer Services Group for the first dry docking of the *JOIDES Resolution* were evident by the success of all tasks completed which including: furniture installation, modifications to laboratory equipment and furniture arrangements, modification to the sonar dome, preparation for the installation of a doppler sonar speed log, installation of new air conditioners in the computer user room and underway geophysics lab, a motor generator set, Macintosh computers, laser printers and an optical scanner, and an AppleTalk network.

New furniture was installed in all the labs on the bridge deck of the laboratory module, thus completing the laboratory furniture upgrade that began one year ago on Leg 124E. In addition to the new furniture, most of the pressboard/formica countertops were replaced with two inch maple countertops (the remaining pressboard countertops will be replaced in the near future). The existing maple countertops were stripped to bare wood, sanded, and refinished. After the furniture installation was complete and equipment relocated in the labs, the bridge and foc's'le decks were repainted. Lab touch-up painting was completed as necessary.

The core splitting table in the cutting room was sent to a Singapore fiberglass shop where the table was first repaired and then given two layers of fiberglass. Major repairs were made to the splitting room joiner panels where corrosion had destroyed panel support along the base plates. One half of the splitting room flooring material was replaced in order to regrade the floor for more efficient water drainage.

The description bench was moved one foot to the port side to allow more room for the sedimentologists to describe cores and use microscopes. The photo table was moved forward 18 inches to eliminate a shadow on the core photographs. As a result, the close up copy table was relocated from the forward bulkhead to the starboard bulkhead. Also, the smear slide station and particle size analyzer were relocated aft on the starboard bench between the description and sampling benches.

A raised tile floor, similar to the floor in the computer user room, was installed in the underway geophysics lab. This flooring, complete with closed cable ways, allows for easier future cable runs and cleaner signal paths. Equipment racks and furniture were reinstalled in a more efficient configuration for scientists and technicians working together in the lab. An air conditioner was installed in the SEDCO warehouse which vents cold air to the underway geophysics lab. A leak was discovered in the Freon coils. When repaired, this unit should provide enough cold air to solve the overheating conditions in the underway lab during tropical legs.

The four-thousand-pound sonar dome was removed from the hull by divers prior to Leg 128. The dome was shipped to Singapore and modified by a machine shop to accept a 10-kw, 3.5-kHz sonar transducer. The new transducer replaces the 2-kw, twelve-bottle array originally installed in the dome. Preliminary reports claim that the new transducer is far superior to the original transducer array.

A fourteen-inch gate valve was reconditioned in preparation for the installation of a doppler speed log. Besides reconditioning, a six-foot pipe-spool extension was added to the gate valve. The doppler sonar transducer would have been installed, but the transducer stem was broken during shipment to Singapore. A surveyor transferred the centerline mark of the ship's hull to the gate valve hull opening so that alignment of the transducer will be possible at a later date.

A major dry dock project was the removal of the Koomey pump that made room for the relocation of the Cyberex power conditioner, which in turn made room for the installation of a Computer Power Products motor generator set. This involved two major cuts in the hull, heavy crane lifts of delicate equipment, five cable runs from the Koomey room to the engine room, and major rewiring to the labstack regulated power system. The end result is that the primary supply of labstack regulated power is now the motor generator set, with the Cyberex acting as an immediate backup in case the motor generator fails. The Cyberex is still backed up by a battery supply.

Twelve Macintosh computers, four laserwriters, a scanner, and an AppleTalk network were added to the ship's computer environment. AppleTalk and Ethernet cables were run to the ship's bridge and foc's'le decks with taps dropped to the Operation Superintendent's office, Lab Officer's office, Co-Chief's office, and library. This network, as configured, makes it possible for Macs and IBMs to share a common directory on the VAX and also allows access by all Macs and IBMs on the network to use any of the laserprinters located in the library, Co-Chief's office, core lab, and user room.

The large McIntyre air conditioning unit in the computer user room was removed and replaced by a Birdwell unit with a smaller footprint. Enough space was gained by this change for the addition of two microcomputer stations. Unfortunately the noise made by the new unit is comparable to the McIntyre unit. On Leg 129 the space gained used for an experimental art station, on loan from the ODP art department.

All the shipboard microscopes were off loaded at the beginning of dry dock and serviced by the Singapore Zeiss representative.

The tasks summarized above were completed during the transit from Pusan, South Korea to Singapore, the dry dock period in Singapore and the transit to Guam. In retrospect, the projects were completed quite successfully, but not without considerable frustration during the dry dock period when there was no air-conditioning, no potable water, no on-the-ship sanitary facilities, no meal service and only emergency generator power available.

PORT CALL, GUAM

The ship arrived in Guam at 2000 hr on 19 January but was required to remain at anchorage until the morning of 20 January when a dock became available. All freight shipments were loaded/unloaded by the offgoing crew. The oncoming Leg 129 technical crew arrived at the ship on the morning of 21 January for crossover. The ship sailed at 1915 hr on 22 January, after all planned portcall activities were completed.

UNDER WAY

The underway geophysics (U/W) lab underwent extensive modification during the drydock and, as expected, problems were encountered when the equipment was put back on line. It took a number of hours to get the entire lab functional. The Raytheon 3.5-kHz transceiver had been changed to a 10-kw Edo system during drydock. The transducer and mount required modification before installation in the sonar pod, which is suspended under the ship. This system provided good data: in 6000 m of water, chert layers could easily be seen beneath the sea floor. Problems with the magnetometer were rectified and it gave a great signal that was useful in mapping magnetic lineation patterns in this region. One of the Masscomp computers experienced problems so the spare Masscomp was used to collect data for the rest of the leg. A map case and light table were added to the U/W lab.

The stem of the new Doppler Sonar was received damaged and was not installed during drydock. It was returned for repairs and will be re-installed at a later date.

The 80 in^3 guns worked well all leg. A repaired hydrophone array was installed on the starboard winch.

The SIOSEIS program was used to process seismic data. The site-location averaging program was refined and a users' manual was written for this program. At Site 802 we rigged up the 400 in^3 gun for a downhole VSP experiment. The gun worked well but the downhole tool experienced problems with its clamping mechanism.

LABORATORY OPERATIONS

Bridge Deck

After standing idle and being subjected to high temperatures during shipyard work, the instruments required considerable time and effort to become operational. In the physical properties area, the multisensor track (MST) was especially troublesome.

Extensive troubleshooting pinpointed the problem as having too many characters in a number of fields in the parameter file. This and other minor problems with the MST were corrected and the unit ran well. The two-minute GRAPE procedure was used extensively on harder materials, and observed density values correlated well with those obtained from index-properties measurements. The pycnometer could not be used with cherts but worked well with lithified rock, giving good data. Its accuracy was enhanced by machining the cylindrical metal sleeves that slide into the cells. A new user-friendly thermal conductivity program was used this leg. A new water bath for half-space measurement was constructed. Needles were set in slabs of epoxy so that three samples can now be run at once. The slabs also permit larger samples to be run.

Entire sedimentary sections were analyzed in the cryogenic magnetometer. Toward the end of the leg basalt samples were run. Their large signal (compared with that of the sediment sections) caused the SQUID to react too quickly and counts may have been lost. This will be investigated further.

There are now one Macintosh II and one IBM-PC-clone for scientists to use near the core description table.

Water used for splitting cores was extremely hot during the cruise. This was attributed to elevated ocean temperatures.

Seventeen downhole multishot orientation surveys of drift angle were taken.

<u>Fo'c'sle Deck</u>

The chemistry lab was not used as heavily as on other legs. A new 386 PC was installed and used for CHEMDB and as a terminal for the HP1000 and the VAX. A file transfer method was developed using Mobius to transfer files from the HP1000 through the 386 to the VAX. A system was developed to store the 3393 integrator methods in the HP150 microcomputers. The integrators are now connected to the computer through a three-way switching box so that methods can be retrieved and down loaded to the integrators in the event of a volatile memory loss. A barcode reader was also installed and methods were developed that will be implemented at a future time. This system will allow a barcode label to be printed when a sample is taken at the sampling table. The label will be scanned into programs in the other labs as the sample is analyzed. This will speed up data entry and should cut down on data-entry errors. A borrowed titanium squeezer was used to see if it would reduce contamination in pore water samples when testing for trace metals. A new alkalinity program was tested and installed. This program will be transferred to an IBM-PC/XT and is more user friendly than the program now in use. The Acetylene gas safety alarm system was tested and recalibrated with a standard gas.

The X-ray lab equipment experienced problems after the shipyard work. We suspect that these instruments are more sensitive than others to heat, and the high temperatures and dirty air of the shipyard probably contributed to hardware problems. Physical problems with the X-ray fluorescence (XRF) equipment were solved, but software problems persisted during calibration and no XRF data were collected during the cruise. The XRD was used and good data were recorded. Transparencies were made of standards to help scientists identify peaks in the sample runs.

The thin section lab was very busy and 200 thin sections were produced. The technicians were challengedwith making impregnations of chert, chalk and clay, often all in the same sample and slide.

Two scientists required hydrofluoric acid in order to process their paleontological samples, and the hydrofluoric hood was used exclusively for their samples. New safety guidelines were implemented, and burn-treatment procedures were reviewed in case of an emergency.

Main Deck

There were many changes in the computer area. A new air handler was installed in the user room which created enough new space for two additional computer user stations. The addition of new MACs and laserwriters was well received by shipboard scientists. The MACs were placed throughout the lab stack and most scientists now have the choice of using a MAC or a PC. A "local area network" was extended throughout the labstack in the shipyard and now PCs and MACs can store and retrieve data using the VAX "disc" as if it were a local disc. Files can be sent to any printer from any computer. An Apple scanner was installed, making it possible to digitize pictures or text.

The curatorial representative was kept busy, with over 3600 samples taken. He also assisted one of the scientists in X-ray radiological work on selected cores. The curatorial procedures cookbook was updated.

The yeoperson now has software in her office that can switch files between PC- and MAC- formatted diskettes quickly. This allows the scientific party to submit reports in either format, and she can make the conversion when she files are processed.

Upper 'Tween Deck

The photo lab functioned well, without major problems. The new photo tech learned his job quickly and provided needed support. A Barnstead water purification system was added to the lab at the shipyard, easing the load on the chem lab water system.

The ET's were especially busy this leg repairing reentry cameras, completing sonar maintenance, and rebuilding and assembling a new VIT system. A junction box was installed in the ET shop for the Doppler sonar tool. The Borehole Research Group's wireline heave compensator experienced problems with a rod position encoder. There was some confusion concerning responsibility for maintenance of the wireline heave compensator, i.e., who is responsible for mechanical and electrical problems. Responsibilities are now clearly defined.

New Items

A graphics illustrator sailed on Leg 129 to determine whether it is desirable to work on barrel sheets and complete them in "real time" at sea. In theory, barrel sheets produced on a special computer by the graphics illustrator would be returned to the scientists immediately, so that the shipboard party could speed up production by completing corrections at sea.

The ODP data librarian sailed as a technician; in addition to regular core lab duties, she completed an inventory of shipboard data forms, eliminating those that are no longer needed. She upgraded many of the shipboard databases and educated the scientists and technicians as to what happens to data once it arrives at ODP. She also discussed how scientists may request information from the ODP data bank.

Miscellaneous

The storekeeper was kept busy cleaning up after the shipyard and reorganizing storage areas. A major inventory (physical count) was completed for all the storage areas in an effort to correct inventories and resupply stocks depleted during the shipyard work.

A new gas-bottle storage rack on top of the core lab roof was fabricated and installed. This rack makes it safer and easier to move and store flammable-gas bottles.

The floors of the hold, lower-tween and upper-tween landings were cleaned and painted. The shelves and floor boards in the solvent locker were cleaned and all the solvent bottles were cleaned and had new permanent labels attached.

Safety

The Marine Emergency Technical Squad (METS) trained with SEDCO personnel during fire drills. Material Safety Data Sheets were distributed to all labs. A six-volume set of the "Compendium of Safety Data Sheets for Research and Industrial Chemicals" is now located on the ship. The technicians also received safety training in accordance with the Texas Hazardous Communication Act.

LABORATORY STATISTICS: LEG 129

GENERAL STATS:	
SITES	3
HOLES	5
INTERVAL CORED(meters)	1708.1
CORE RECOVERED(meters)	469.0
NUMBER OF CORES	199
NUMBER OF SAMPLES	3627
SAMPLES ANALYZED:	
XRD	91
INORGANIC CARBON	259
TOTAL CARBON-CNS	74
GAS (HEAD SPACE)	55
WATER SAMPLES	34
ATOMIC ABSORPTION ANALYSIS	136
MST (SUSCEPTIBILITY)	241
INDEX PROPERTIES	236
THERMAL CONDUCTIVITY	214
VELOCITY	234
2-MINUTE GRAPE	222
WHOLE CORE PASS THRU CRYOMAG	254
THIN SECTIONS	200
DOWNHOLE TOOLS:	
HEAT FLOW RUNS	2
UNDERWAY GEOPHYSICS	
BATHYMETRIC DATA:	2639 nmi
MAGNETICS DATA:	2206 nmi
SEISMIC SURVEY:	151 nmi