APRIL 1998
Data Submission to ODP Site Survey Panel

Planned Drillsites for
Ocean Drilling Program Proposal 486
A Paleogene Equatorial APC Transect

Volume 3

Priority 2 and 3 Drillsites
Site Descriptions and Maps

Mitchell Lyle
Center for Geophysical Investigation of the Shallow Subsurface (CGISS)
Boise State University
Boise, Idaho 83725

Theodore C. Moore, jr.
Center for Great Lakes and Aquatic Science
University of Michigan
2200 Bonisteel Rd
Ann Arbor, Michigan 48109

and

Lee Liberty
Center for Geophysical Investigation of the Shallow Subsurface (CGISS)
Boise State University
Boise, Idaho 83725

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April 1998 Submission
REVISED AFTER EW9709

Introduction: Volume 3

CGISS Technical Report 98-02
Volume 3

PLANNED DRILLSITES FOR OCEAN DRILLING PROGRAM PROPOSAL 486, Paleogene Equatorial APC Transect Priority 2 and 3 Drillsites: Descriptions and Site Maps

INTRODUCTION:

The Paleogene Equatorial transect has been designed to be a high resolution paleoceanographic study of the evolution of the equatorial Pacific current and wind system as the earth went from maximum Cenozoic warmth to initial Antarctic glaciations. Following the suggestions of SciCOM, we have divided the program into one leg of drilling devoted to a 56 Ma transect with one drillsite, PAT-8C, from the 40 Ma transect (Priority 1 drilling) and a leg devoted to a 40 Ma transect to study the Eocene/Oligocene transition (Priority 2 and 3 drilling). We have also divided the reports to SSP by a similar means: CGISS Technical Report 98-02 Volume 1 (Site Descriptions and Maps) and Volume 2 (Seismic Profiles) are devoted to priority 1 drilling, while priority 2 and 3 drillsites are described in Volume 3 (Site Descriptions and Maps) and Volume 4 (Seismic Profiles). We have kept the priority 2 and 3 drilling sites in this report for future reference and to provide maximum flexibility to the future co-chief scientists in case it is impossible to drill one of the primary drillsites.

All drillsites have been revised from the July 1997 data submission. The revisions are because of the data we collected on the site survey cruise EW9709 on the R/V Maurice Ewing from 12 December 1997 to 17 January 1998. The EW9709 site survey cruise completes the collection of site survey data for Proposal 486.

Site descriptions of the drillsites are arranged from south to north geographically, rather than numerically. The order is listed in the table of contents, and in Table 1.

BACKGROUND:

The complex system of equatorial currents is one of the most persistent and clear traces of wind-driven circulation in the oceans. The unequal hemispheric thermal gradients in the modern oceans have pushed the Inter-tropical Convergence Zone (ITCZ) north of the equator and given rise to a narrow band of equatorial upwelling. This zone of upwelling and high productivity results in a high flux of biogenic debris within 1.5°–2° of the geographic equator, with peak values restricted to an even narrower zone. In the Pacific Ocean the rain of this debris has built, over geologic time, a mound of almost pure calcareous and siliceous sediments stretching along the equatorial region and reaching a thickness of over 500 m.

The central equatorial Pacific is unique in the world's oceans in that the path of plate

motions carries this linear trace of equatorial upwelling and productivity northward with time (van Andel, 1974). There are two clear impacts of this northward plate motion: 1) the thickest part of the equatorial mound of biogenic sediment is displaced several degrees to the north of the equator and 2) sediments deposited a few tens of millions of years ago have moved completely out of the region of high sediment flux. This movement into regions of very low sediment accumulation (or even erosion) puts Paleogene equatorial sediments within the reach of the Ocean Drilling Program's APC/XCB technology. For the most part the sediments have never been subject to strong burial diagenesis and can be cored easily with little disturbance. Time intervals notorious for extensive chert formation (e.g. the middle Eocene) are more likely to contain only oozes because they have never been buried deeply.

Over the last decade APC/XCB technology has been used to recover continuous Neogene sediment sections from the equatorial Pacific and to trace the variations in equatorial upwelling and biogenic flux during the transition from a one-pole ice age to a two-pole ice age. They have revealed intervals of very high flux rates linked with oceanographic and climatic change. The completely recovered Neogene sections have also been used to integrate biostratigraphy and paleomagnetic stratigraphy and have permitted the establishment of an orbitally tuned time scale back to 14 Ma. We propose to take this coring technology back to the early Paleogene section, the time of the "hot house world".

PREVIOUS DRILLING:

Nearly thirty years ago, DSDP rotary drilling and coring of the central Pacific equatorial mound of sediments (DSDP Legs 8, 9, and 16) established the general pattern of equatorial sediment accumulation and plate migration through the Neogene and late Paleogene (e.g. van Andel et al. 1975; Leinen, 1979). However, the rotary coring technology available to these very early legs could not provide undisturbed sections or complete recovery and was utterly defeated by middle Eocene chert layers encountered in some of the more deeply buried sections. Thus, even the broad outlines of equatorial sediment accumulation in the middle Eocene and older sediments remain poorly defined. The complete recovery of undisturbed and largely unaltered sections in a transect of the Pacific Paleogene sediments has yet to be accomplished.

THE SCIENTIFIC PROBLEM:

We know that the climate of the very early Paleogene was markedly different from that of the rest of the Cenozoic. The very warm temperatures (~12°C) estimated for high latitudes and the relatively stable temperatures of the Eocene tropical regions have led us to confront the single greatest paradox of paleoclimate studies: if warmer high latitude climates depend on enhanced wind-driven ocean currents or wind-carried heat and moisture to transport heat to the poles, how can this transport have been maintained under the weaker pole-to-equator thermal gradients? Such a scenario should give rise to weaker winds and diminished wind-driven transport. It is a paradox that has defeated most mathematical models of global climate. If the dynamics of Eocene climate can be understood, we will gain a fundamental understanding of the physics of earth’s climate.

New data from the tropical oceans are necessary to define the climatic and oceanographic processes that caused Early Paleogene warmth. Measurement of tropical sea surface temperatures, for example, are an important way to distinguish between greenhouse -induced warming of the poles and warming by either atmospheric or oceanic heat transport Data on winds and currents are needed to partition heat transport between atmosphere and oceans. Finally, the pattern of tropical wind and ocean circulation is a key element of the global circulation. There are clear indications that these patterns may have been markedly different in the early Paleogene.

The ODP Paleogene Equatorial Transect (Proposal 486) has been designed to gain critical insights into the extremely warm climate of the early Paleogene and of the transition to glaciated conditions typical of the late Paleogene and Neogene. Specifically, we have proposed to

drill a transect of the world's most long-lived wind-driven current system, a system that contains the confluence of the northern and southern hemispheric winds, and a system whose pattern, strength, and biogenic productivity is linked to global climate patterns. The constructive criticisms and suggestions of the OHP, ESSEP, and SCICOM, as well as the recently completed site-survey cruise (EW9709), have been critical to the planning of this transect.

The drilling of an equatorial transect will provide better and more continuous records of sea surface and abyssal temperatures with which to assess stability of the water column and the magnitude of heat transfer out of the tropics. Changes in sea surface temperature and plankton communities across the transect will also provide important data concerning ocean circulation and the location and strength of the trade wind belts and ITCZ. The composition and rates of dust deposition will be used to locate both the ITCZ and the transition to the westerlies, while mass accumulation rates of biogenic debris will be used to assess the position and the strength of upwelling zones. Stable carbon isotopic data will be used to assess nutrient flows in the water column and will strongly constrain the global carbon cycle.

THE 40 Ma TRANSECT:

The 40 Ma transect (Priority 2 drilling) is designed to collect data within a critical climate transition: the transition from a non-glaciated world in the Middle Eocene to the development of the Antarctic ice cap near the Eocene/Oligocene boundary. The unequal cooling of the high latitudes highly disturbed the global climate and most probably altered oceanic circulation significantly. The Eocene/Oligocene transition is another important interval in which an understanding of the changes that took place will significantly improve our understanding of global climate processes in general. The 40 Ma transect is designed to study the evolution of tropical surface ocean circulation and wind patterns associated with the development of Antarctic glaciers, and to better understand how thermohaline circulation changed during this transition.

A second objective is to better understand the development of modern equatorial circulation. Successive drillsites in the transect were located at the equator from 40 Ma to the Holocene, and drilling this transect will allow the study of equatorial processes for this entire time interval.

EW9709 SITE SURVEY (DEC 1997–JAN 1998)

EW9709 (San Diego–Hawaii, December 1997 to January 1998) surveyed 21 possible drillsites and the transits between them with Hydrosweep swathmap bathymetry, 4-channel seismic reflection profiling, 3.5 kHz subbottom profiling and underway magnetics, all navigated with GPS. Within defined survey areas we digitally recorded the 3.5 kHz signal for future high resolution studies of the upper sediment column. We also recovered 14 piston cores and 6 gravity cores at 18 of the survey sites. The seismic data are archived at Boise State University, while swathmap bathymetry and basic cruise data are archived at Lamont Doherty Earth Observatory. The piston cores were transported to the Oregon State University Core Archive, where they will be opened, described, and scanned in June 1998 and then archived at that facility.

Our survey cruise continuously collected data along two transects of the northern tropical Pacific (Figure Intro-1) in order to best design a drilling transect across the Paleogene equatorial regions. Segments of these transects are combined to reconstruct two cross-sections: one of ~40 Ma (late middle Eocene) age and the other at ~56 Ma (late Paleocene). These transects were planned to follow the 57 Ma (An25r) or 41 Ma (An18r) ridge crest (where carbonate sediments will be better preserved). They span the time of maximum warmth, and extend through the cool-down of the "hothouse world", into the time of initial Antarctic glaciation. We chose the crustal age to be about 1 Myr older than the age of the first sediments of interest to avoid sediments with the largest hydrothermal component.

We compensated for the northerly drift of the equatorial region by surveying loca-

tions backtracked to equatorial paleolatitudes in a hotspot reference frame. We also investigated the effect of true polar wander (the shift of the earth's rotation pole through time; Besse and Courtillot, 1991, Steinberger and O'Connell, 1997) upon the estimated positions and found that at 56 Ma there is ~ 0.5° change in estimated paleolatitude along our transect. The direction of true polar wander is basically at right angles to the position of our transect and thus has little effect on paleolatitude in the central Pacific.

From this cruise, and as recommended by SCICOM, we have selected 11 first priority sites (to be completed in one ODP Leg) that will give us a latitudinal transect of the equator in the early Eocene and a depth transect at the equator during the mid to late Eocene (Figures Intro-1, Intro-2, Intro-3; Table 1). Second priority sites expand our understanding of conditions in the Late Eocene, and also define sedimentation in the early Neogene equatorial region. The 56 Ma equatorial transect spans from 12° N paleolatitude to 6° S and focuses three, first-priority sites within 2° of the paleoequator itself (Fig. 1, 2). This emphasis reflects our conviction that it is essential to accurately define the flux of biogenic debris within the extremely narrow equatorial zone of high productivity , the signature feature of tropical atmospheric and oceanic circulation through most of the Cenozoic. The 40 Ma transect (Priority 2 and 3 drilling) is similarly designed, but is aimed at the position of the 40 Ma equatorial region. Drilling this transect will also produce significant information about the CCD, since the 40 Ma drillsites are easily compared to the Priority 1 56 Ma drillsites. The 56 Ma drillsites are each about 1 km deeper than the 40 Ma transect of drillsites during the Eocene/Oligocene transition.

COMPARISONS BETWEEN SEISMIC PROFILES AND DRILLING

The collection of high-resolution seismic reflection data along the two EW9709 transects has given us valuable insights into the character of Paleogene deposition in the equatorial region and has led us to speculate that the patterns of sediment accumulation and biogenic flux were markedly different in the early Paleogene. We have tentatively correlated the seismic signature of the equatorial Pacific section in data collected during our recently completed cruise with that developed by Mayer and his co-workers (Mayer et al., 1985, 1986) from seismic, log, and biostratigraphic data in sites farther to the east. This correlation is based on the seismic character of the reflections themselves and is checked against the age of sediments recovered in piston cores during our cruise (Figure Intro-4) and in nearby DSDP drill sites. The seismic stratigraphy of Mayer et al. (1985, 1986) covers the Pleistocene to the uppermost Oligocene. We have tentatively extended this stratigraphy to the base of the sections imaged in our transects.

Our extension of this seismic stratigraphy and the exact ages of the reflecting horizons we have carried await the verification of the proposed drilling; however, assuming that the stratigraphic horizons and the ages we have assigned to them are even approximately correct we can make a few, rather startling, observations:

1) The equatorial mound of the lower Miocene sediments (as defined by Mayer et al., 1985) can be clearly seen in the seismic data; however, the "upper-middle Eocene" (M-E1) and "middle-early Eocene" (E1-acoustic basement) sedimentary packages show a very different pattern:
   a) The M-E1 package shows only a hint of thickening in the equatorial region , and
   b) the E1- basement package actually appears to be thicker 5°-10° degrees north and south of the equator than it does at the equator.
2) Cores taken on cruises to the tropical North Pacific, DSDP Site 40, and our site PAT–13C, have recovered middle Eocene radiolarian oozes at paleolatitudes of 7°- 8° N. Throughout the Neogene and into the Quaternary, sections at comparable paleolatitudes are typically devoid of siliceous microfossils or contain only sparse, highly corroded specimens.
3) Given that our assigned ages are approximately correct, the accumulation rates of sedi-

ments in the thicker lower Eocene sections of the 56 Ma transect are about the same as average accumulation rates calculated for Neogene and Quaternary sections.

Our stratigraphic interpretations must be verified by drilling; however, if they are proven to be approximately correct they will necessitate a revolution in our thinking about wind-driven circulation and productivity in the tropical oceans during times of extremely warm climates. The sections recovered in our proposed sites will help establish the patterns of biogenic sediment flux, the distribution patterns of planktonic assemblages, the accumulation patterns, size variation, and sources of wind-blown dust, and the isotopic compositions of benthic and planktonic (deep and shallow-living) organisms. With these data we should be able to develop a clearer understanding of tropical atmospheric and oceanic circulation during the extremely warm climate of the early Paleogene.

ANCILLARY BENEFITS OF DRILLING

In addition to the main focus of the proposed ODP Leg discussed above, there will be several ancillary benefits derived from the recovered sections:

1) Complete recovery of sections using multiple holes and APC/XCB coring techniques should vastly improve Paleogene biostratigraphy and chronostratigraphy. It will form a critical element in determining Paleogene mass accumulation rates.

2) The linking of seismic stratigraphy and the chronostratigraphy provided by the recovered sections will complement and extend the seismic stratigraphy developed by Mayer et al. (1985, 1986) and Bloomer et al. (1991). This will permit the development of a broad regional view of equatorial deposition constrained only by the extent and quality of seismic data coverage.

3) We should be able to map through time the latitudinal position of the change over between dust sourced from the Americas and that sourced from Asia. This, together with the pattern of dust flux rates and grain size variation is likely to be a valuable independent check on models of Paleogene atmospheric circulation.

4) Although we have selected sites to minimize encounters with chert layers, it is unlikely that we will avoid them altogether. The recovery and logging of sections containing chert and comparisons to equivalent intervals without chert at other sites will be an important step toward a better understanding of the pervasive occurrence of these cherts in the early and middle part of the Eocene. Coring and logging data, together with material recovered in this drilling transect, will provide important information on the timing and geochemical nature of these cherts.

5) Because the equatorial Pacific is the major region of carbonate burial in the abyssal Pacific Ocean, the transect will be important to develop the Paleogene mass balance of carbonates. Important new data will also be gathered to understand the shallow Eocene CCD, and whether production or dissolution were most important in shaping the change in the Eocene CCD with time.

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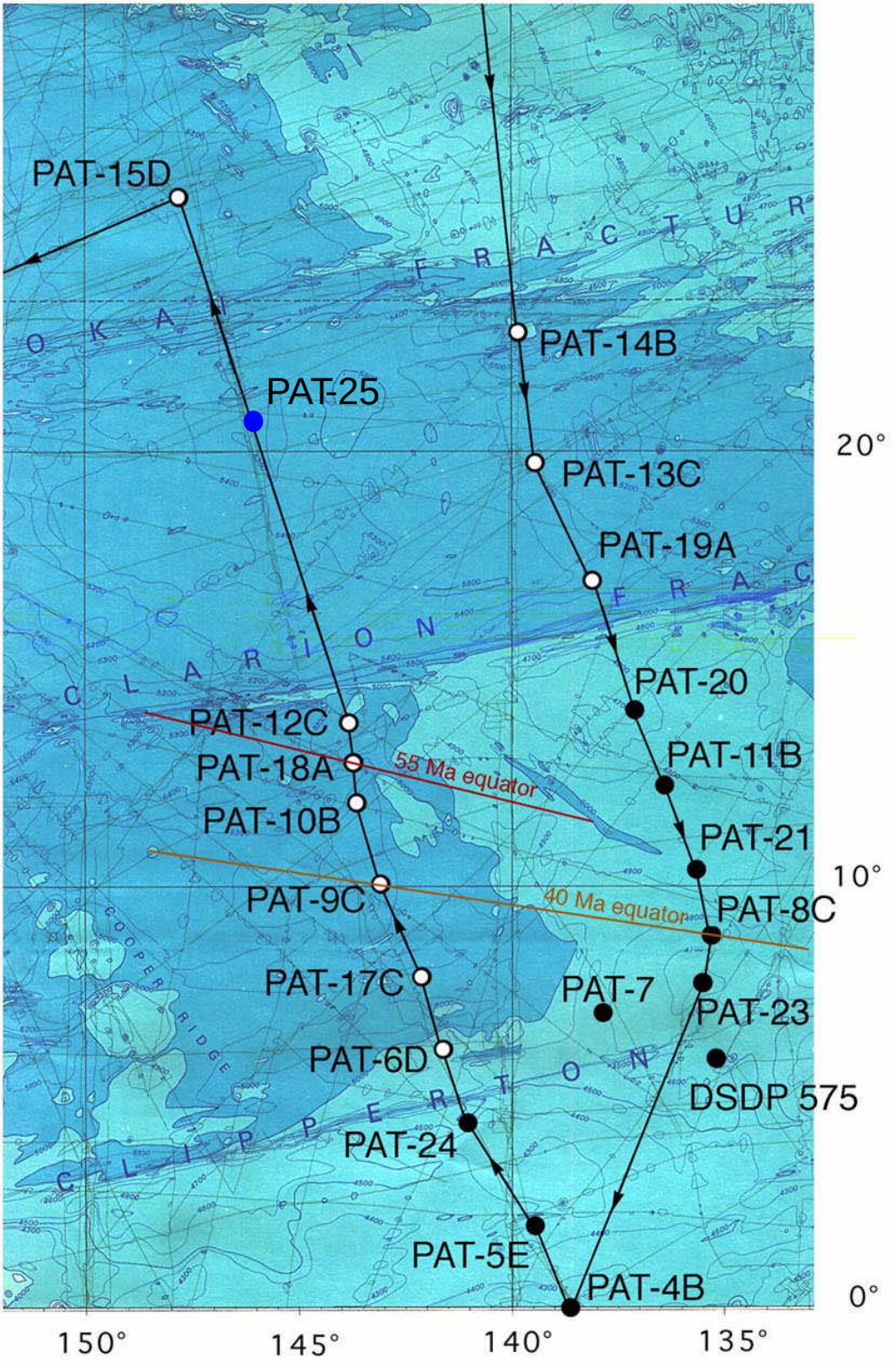
Table 2: PRIORITY 2 and 3 DRILLSITES

SITE	*Paleolatitude 56 Ma*	*Paleolatitude 40 Ma*
PAT-4B	———	9.24°S
PAT-5E	———	7.34°S
PAT-24	———	5.09°S
DSDP 575	———	2.92°S
PAT-7	———	2.03°S
PAT-23	———	1.17°S
PAT-21	———	1.31°N
PAT-11B	———	3.19°N
PAT-20	———	4.90°N
PAT-25	6.6 °N	10.3°N
PAT-22	———	23.8°N
PAT-16	19.3 °N	22.7°N

Figure Intro-1: Trackline map for the site survey cruise EW9709. The 56 Ma transect (all priority 1 drillsites) are marked by open circles. Closed circles are sites chosen to study the Eocene/Oligocene transition. Of these, only PAT-8C is a priority 1 drillsite. PAT-25 is a priority 3 late Cretaceous equatorial site, which will be used to study the CCD across the K/T boundary.



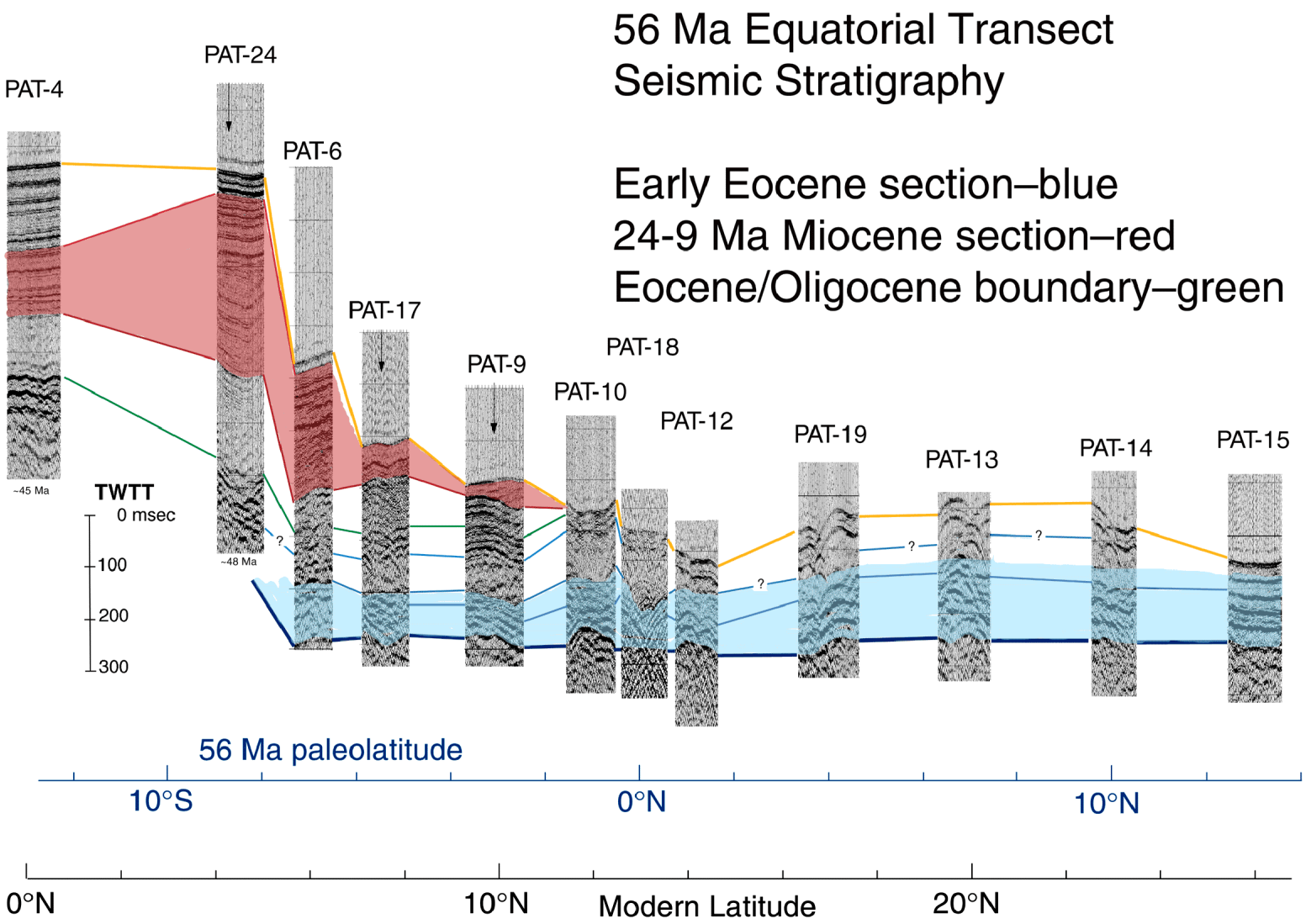


Figure Intro-2: Transect from the modern equator along the planned 56 Ma transect. All Priority 1 drillsites are shown as well as the Priority 2 sites PAT-24 and PAT-4B from the 40 Ma transect. The Miocene stratigraphy is based upon Mayer et al., 1985, constrained at the sediment surface by EW9709 piston cores. The Eocene seismic stratigraphy is based upon our best estimates but with no real age control.

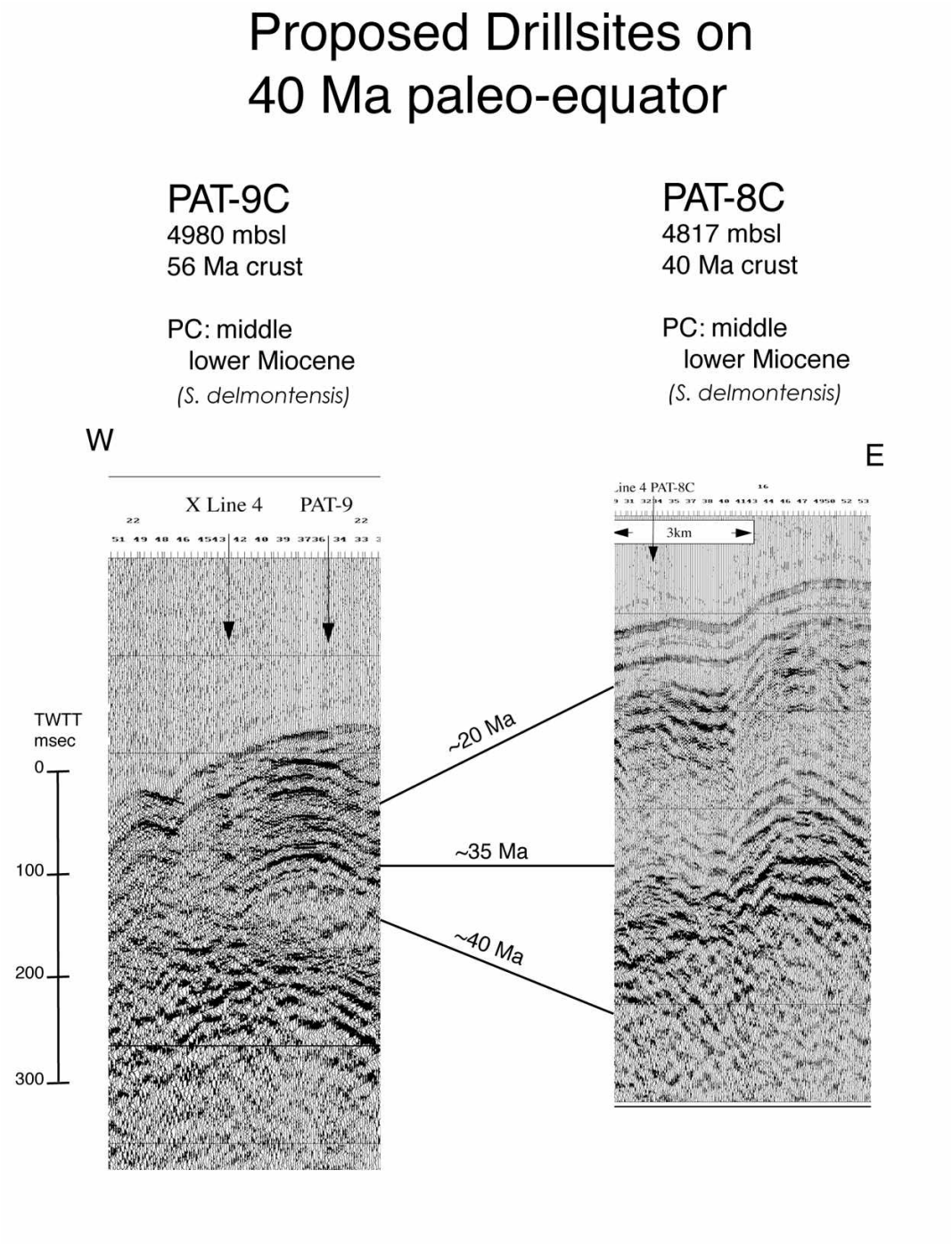


Figure Intro-3: Seismic sections from the two priority 1 drillsites that form a transect at the 40 Ma equator. PAT-8C, on ~40 Ma crust, was very near the risecrest and at a paleodepth of about 3000 m. PAT-9C, in contrast, was on crust that had subsided by 40 Ma to about 4100 m. The difference in thickness of the 40-20 Ma section represents a combination of carbonate dissolution and decrease in productivity going westward. Recovery of these sediment sections will better define the CCD and also recover high quality Middle Eocene to Miocene sediments

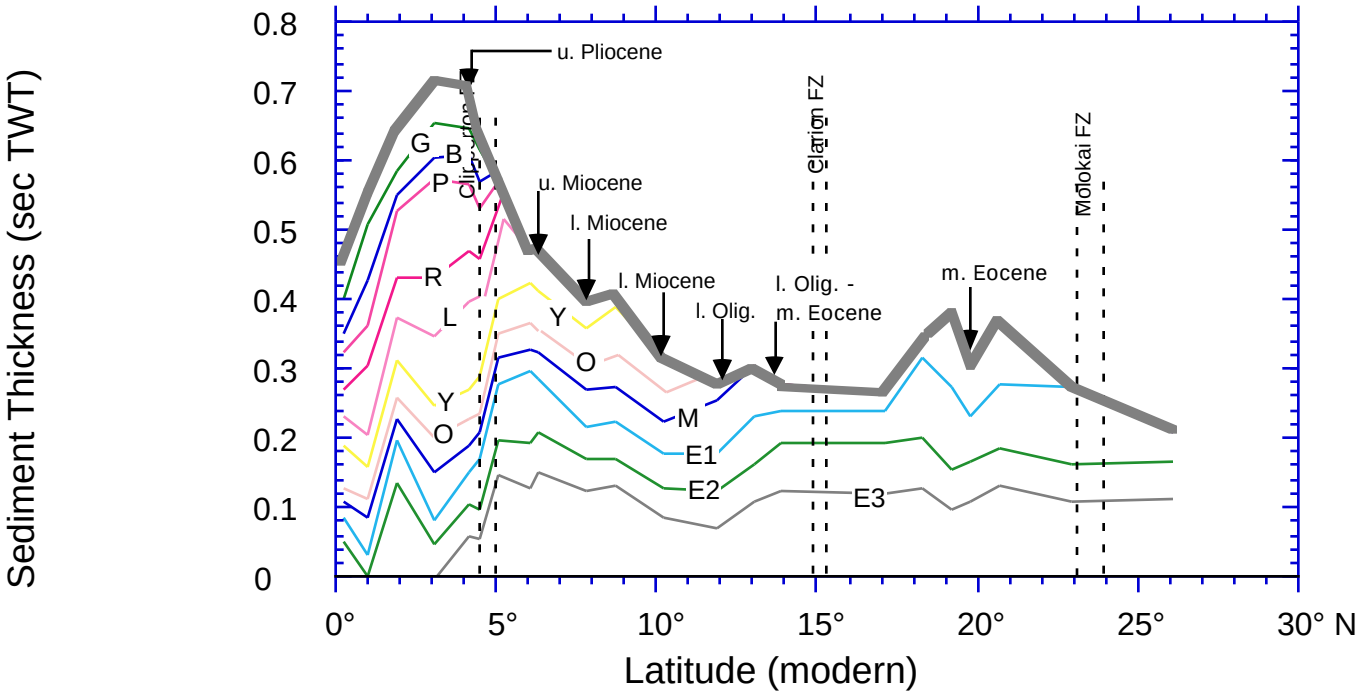


Figure Intro-4: Seismic horizons identified in a transect along crust of 56 Ma age from the Equator to approximately 26° N latitude. Horizons "G" through "O" are identified based on comparisons with the work of Mayer et al. (1985) in the equatorial Pacific. Horizons "M" through "E3" identified in this study. Arrows indicate locations and ages of near-surface sediments recovered at the base of piston cores taken along the transect and used to check our correlation with horizons identified in Mayer et al. (1985). Dashed vertical lines indicate the location of major fracture zones.

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SITE PAT-4B (Central Equatorial Pacific)

0° 00.000’ N; 138° 46.326’ W

SITE OBJECTIVES

PAT-4B is part of the Phase 2 (40 Ma) transect and will be one of the sites used to define equatorial Pacific circulation and sedimentation from the middle Eocene through the Eocene/Oligocene boundary. Its primary role will be to monitor the surface waters of the South Equatorial Current. Because of its position on the modern equator, it will also be used to define late Neogene equatorial circulation as well. At 40 Ma, the backtracked location was ~9° S, 109° W based upon a hotspot reference frame (Gripp and Gordon, 1990, for 0-5 Ma Pacific-hot spot rotation pole; Engebretson et al., 1985, for older poles). Because of its long distance from the 40 Ma equator, there is not a thick Eocene section here.

GENERAL DESCRIPTION

PAT-4B is situated just north of the Galapagos Fracture Zone, about 140 nautical miles NNW of DSDP Site 73 (Figure PAT4-1) . It is also located on the modern equator. Based on magnetic lineations, basement age at PAT-4B should be in magnetic chron 21, or about 47 Ma (Cande et al., 1989; timescale of Cande and Kent, 1995) . Because of its location at the southern edge of the Eocene equatorial region, the Eocene sediment column is relatively thin.

EW9709 Survey

PAT-4B was surveyed on 31 December 1997 with hydrosweep swathmap bathymetry, digital 3.5 kHz subbottom profiling and 80 c.i. watergun seismic reflection profiling aboard the R/V Ewing. The site was also piston cored. PAT-4B is almost flat, because the thick sediment cover has filled in most valleys and covered most abyssal hills and seamounts (Figure PAT4-2). One seamount barely pokes out above the sediment cover near the cross of lines 1 and 3. Sediment cover is typically 400-500 msec TWTT thick (about 340-420 m) and drape all but the most extreme topography.

LITHOLOGIC DESCRIPTION

Nearest sediment core: EW9709-9PC 00° 00.03’N, 138° 47.209’ W, 4322 m (uncorr.) 1354 cm.

The entire core is a carbonate ooze. The catcher sample appears to be from the *A. ypsilon* zone. The *S. universus* zone extends from 707–1051 cm, and the *C. tuberosa* zone can be found above 481 cm.

Nearby drillsite: DSDP 73 1°55’S 137°28’ W 4387 m water depth 302 m of sediment.

The sediment recovered at DSDP Site 73 consists of an upper repetitively-layered sequence of radiolarian-nannofossil and nannofossil-radiolarian oozes from the top of the middle Miocene to the present (0-74 mbsf), followed by a middle and lower Miocene section from 74-

175 mbsf. An Oligocene high carbonate sequence extends to 288 mbsf. The middle and upper Eocene sequence below (288-302 mbsf) consists of radiolarian-nannofossil oozes, becoming somewhat altered and silicified at the base of the section.

Nearby drillsite: DSDP 72 00° 26.49' N 138° 52.02' W 4326 mbsl ; 345 m sediment column (ended in Eocene chert).

The sediment recovered at DSDP Site 72 is a radiolarian-nannofossil ooze, with variable nannofossil content from 0-60 mbsf (recent-late Miocene), becoming a nannofossil ooze for the rest of the Neogene and Oligocene. The sediments abruptly turn to nanno-rad ooze at about the Eocene-Oligocene boundary. Chert was encountered shortly thereafter. All sediments except for the chert were deformed plastically by rotary drilling, suggesting that they could be cored with the APC.

SEISMIC INTERPRETATION

Primary Site (PAT-4B): EW9709 seisline 3, JD365 14:38:12 gmt

Priority: 2
Crustal age: 47 Ma
Location: 00° 00.000' N 138° 46.326' W
Site water depth: 4303 m (5.737 sec TWTT)
Sediment thickness: 0.477 sec (408 m)
Proposed Drilling Depth: 415 m

Based upon a correlation between the seismic section at PAT-4B and DSDP Site 574 synthetic seismograms (reflector O; Mayer et al., 1985), the Neogene section at PAT-4A is approximately 242 m thick (293 msec), while the Paleogene section occupies the remaining 166 m of the sediment column (Figure PAT4-3). We have chosen a spot with weaker than average 'chert reflectors' (strong, coherent, near-basement reflectors).

GEOLOGIC HAZARDS

There are no known geologic hazards--pelagic sediments over oceanic basalts.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 7/97

The following data from data archives have been used to pick the location of PAT-4B and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT4 seisline 1
EW9709 PAT4 seisline 2
EW9709 PAT4 seisline 3
EW9709 PAT4 seisline 4
EW9709 PAT4 seisline 5

3.5 kHz lines submitted

EW9709 PAT4 35line 1

EW9709 PAT4 35line 2
EW9709 PAT4 35line 3
EW9709 PAT4 35line 4
EW9709 PAT4 35line 5

FIGURES

Fig PAT4-1: Location map for PAT-4B, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT4-2: Swathmap bathymetry for the PAT-4 region, from the EW9709 site survey. Proposed drill site and seismic lines are marked.

Fig PAT4-3: Seismic profile PAT4-seisline 3 across PAT-4B, from EW9709. Proposed drill site is marked.

Fig PAT4-4: 3.5 kHz subbottom profile PAT4-35line 3 across PAT-4B, from EW9709. Proposed drill site is marked

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Gripp, A.E., and R.G. Gordon (1990). Current plate velocities relative to the hotspots incorporating the NUVEL-1 global plate motion model. *Geophys. Res. Lett., 17,* 1109-1112.

Mayer, L.A., T.H. Shipley, F. Theyer, R.H. Wilkens, and E.L. Winterer (1985) Seismic modeling and paleoceanography at Deep Sea Drilling Project Site 474. *Init Repts DSDP, 85,* Washington: US Gov't Printing Office, 947-970.

Shipley, T.H., E.L. Winterer, M. Goud, S.J. Hills, C.V. Metzler, C.K. Paull, and J.T. Shay (1985) Seabeam bathymetric and water-gun seismic surveys in the equatorial Pacific. *Init Repts DSDP, 85,* Washington: US Gov't Printing Office, 825-837.

Figure PAT4-1: Location map for PAT-4B, on GEBCO bathymetry

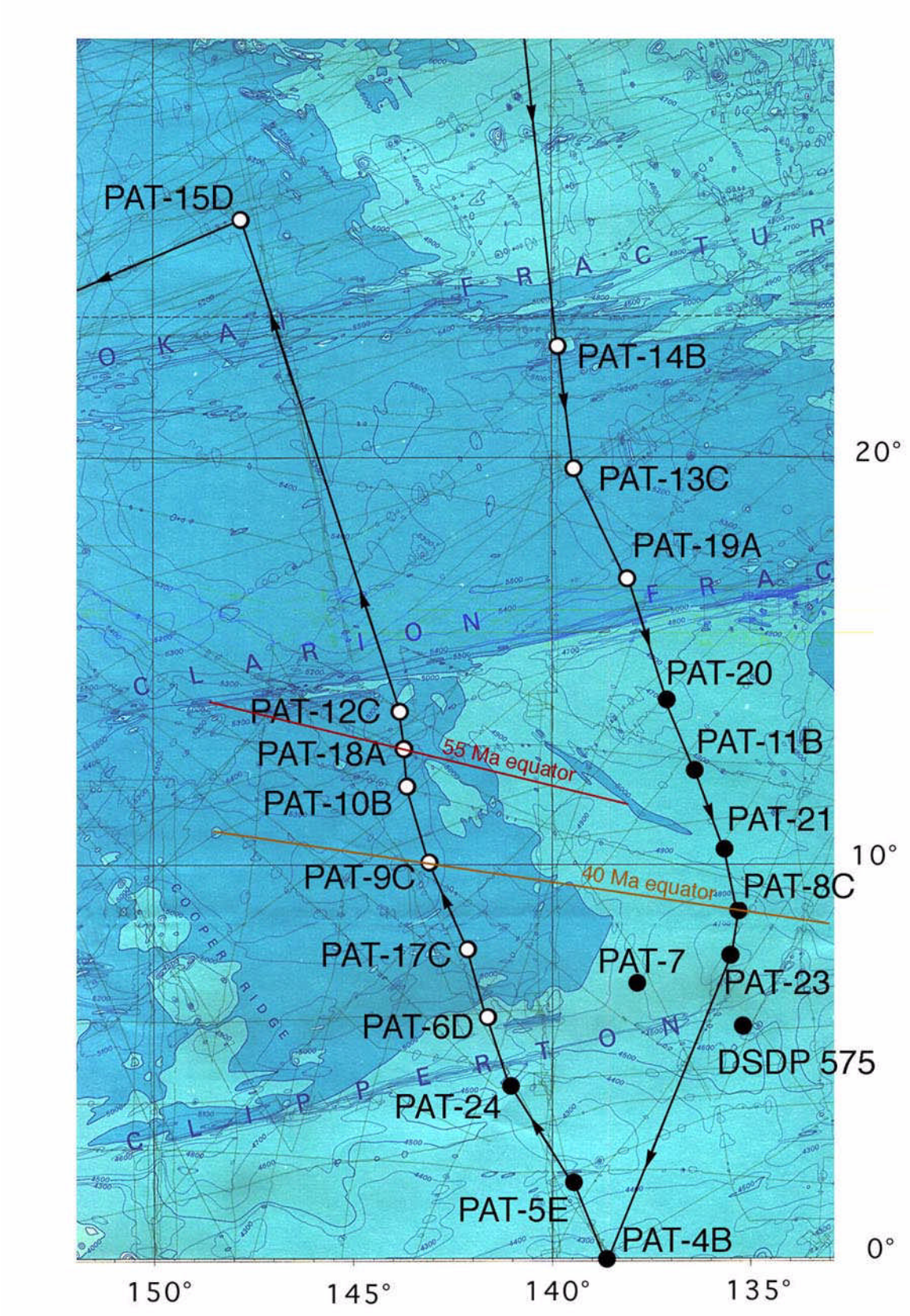


Figure PAT4-2: Swathmap bathymetry for the PAT-4B region, from the EW9709 site survey cruise.

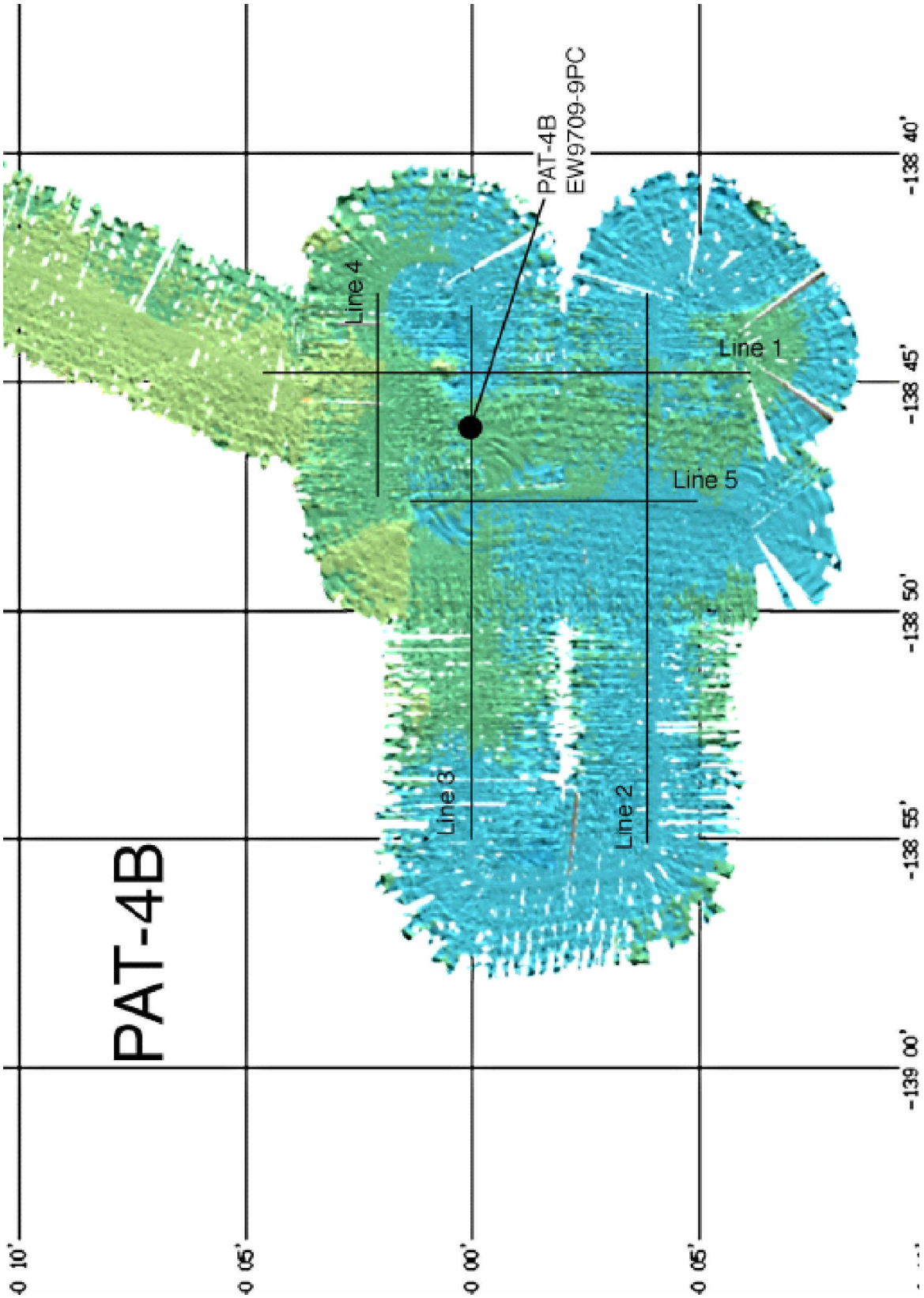


Figure PAT4-3: The seismic profile PAT4-seisline 3 across PAT-4B.

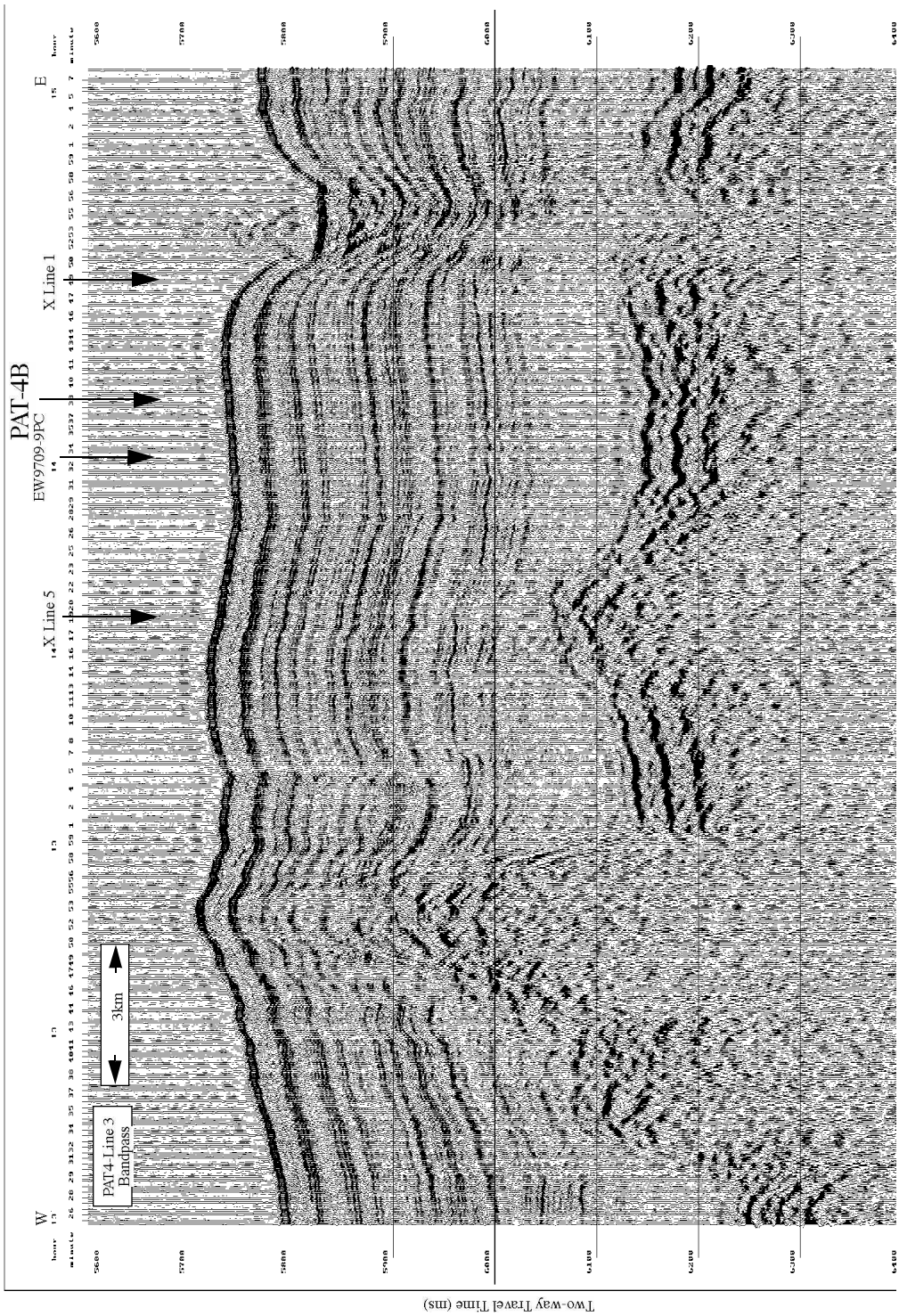
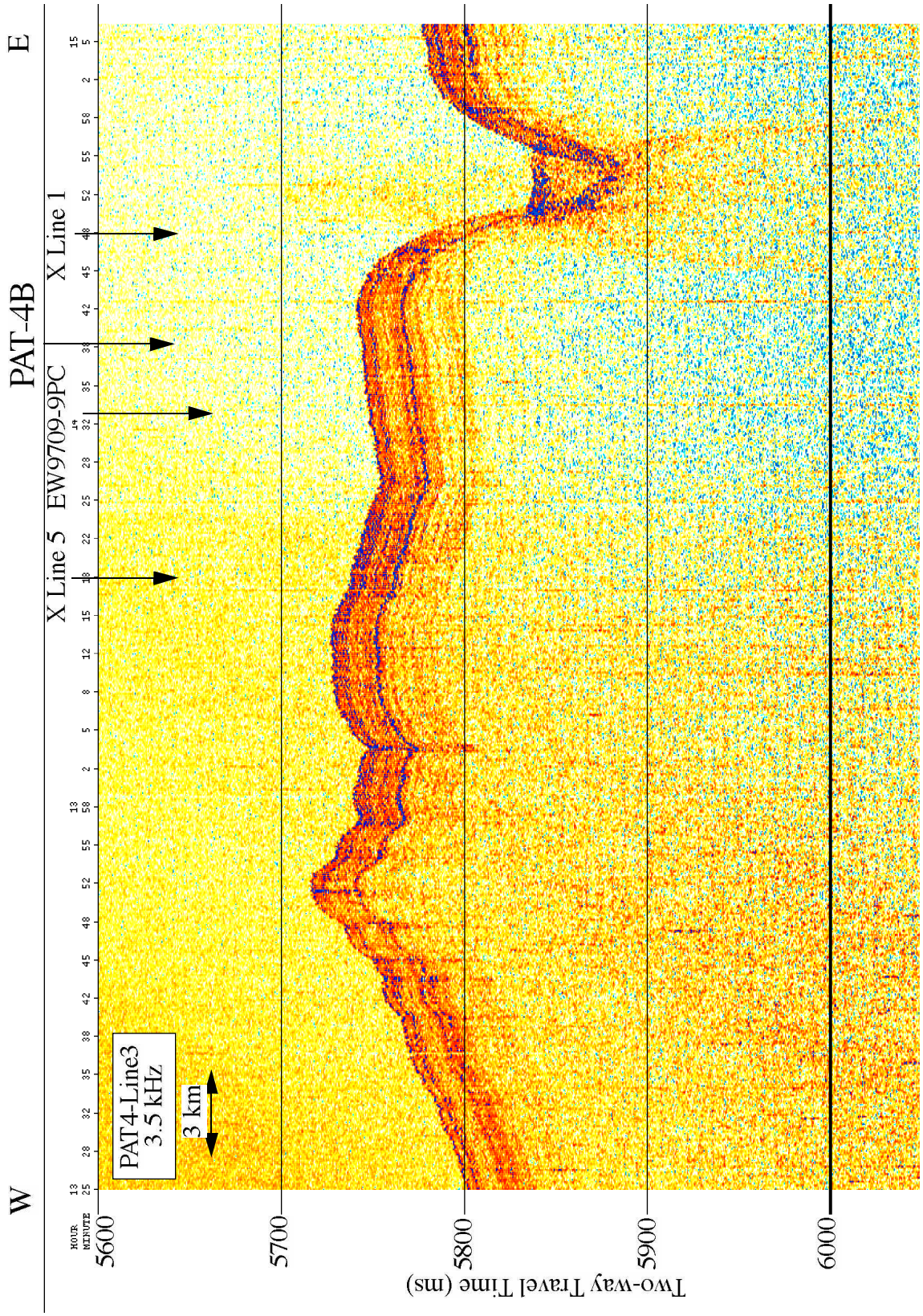


Figure PAT4-4: The 3.5 kHz subbottom profile PAT4-35line 3 across PAT-4B, from EW9709.



ODP Site Description Forms:

Page 1 - General Site Information

Please fill out information in all gray boxes

New **Revised**

Section A: Proposal Information

Title of Proposal	Paleocene Equatorial Pacific APC Transect
Proposal Number:	486-Rev2
Date Form Submitted:	15 March 1998
Site Specific Objectives (Must include general objectives in proposal)	Eocene-Oligocene Transition monitor south equatorial current during the transition and the development of modern equatorial circultion system during the Neogene
List Previous Drilling in Area:	DSDP Site 73

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-4B (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)		Area or Location:	Central Pacific Ocean
Latitude:	Deg: 00	Min: 00.000N	Jurisdiction:	none
Longitude:	Deg: 138	Min: 46.326W	Distance to Land:	>1000 km
Priority of Site:	Primary: 2	Alt:	Water Depth:	4303 m (5.737 sec)

Section C: Operational Information

	Sediments.What is the total sed. thickness? 408 m	Basement		
Proposed Penetration (m)	408 meters	4.5 meters		
General Lithologies:	carbonates and siliceous ooze	MORB		
Coring Plan (circle):	1-2-3-APC VPC* XCB MDCB* PCS RCB Re-entry HRGB * Systems Currently Under Development			
Logging Plan:	Standard Tools		Special Tools	LWD
	Triple-Combo: Neutron-Porosity, Litho-Density, Natural Gamma Ray, Resistivity-Induction	FMS-Sonic: Acoustic, FMS	Borehole Televiewer, Geochemical, Resistivity-Laterolog, High Temperature, Magnetic/Susceptibility	Density-Neutron, Resitivity-Gamma Ray
Estimated days:	Drilling/Coring: 7.6 days	Logging: 1 day	Total On-Site: 8.6 days	
Hazards/ Weather	*List possible hazards due to ice, hydrocarbons, dumpsites, cables, etc.* none		*What is your Weather Window?* all year	

Instructions:

Please fill out these forms for each site that you are proposing to drill, including as much detail as possible. The following table describes the purpose of each page, what information is needed, and when each page should be submitted.

Page	Information needed	Used By	When to submit	Contact for more information
1	General Info. about proposals, site location and basic operational needs	JOIDES Office, Data Bank, Logging Group, ODP/TAMU, SSP, PPSP	When submitting preliminary proposal and when updating site information.	JOIDES Office email: joides@whoi.edu www: http://www.whoi.edu/joides/
2	Information regarding site survey data available and to-be-collected	JOIDES Office, Data Bank, SSP, PPSP	When submitting full proposal and when updating site survey information	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
3	Detailed Logging Plan	JOIDES Office, Logging Group, ODP/TAMU	When submitting full proposal and when updating logging plan	ODP-LDEO Wireline Logging Services email: borehole@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/BRG/brg_home.html
4	Lithologic Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
5	Pollution and Safety Hazard Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/

ODP Site Description Forms:

Page 2 - Site Survey Detail

Please fill out information in all gray boxes

New **Revised**

Proposal #: 486-Rev2	Site #: PAT-4B	Date Form Submitted: 15 March 1998

	Data Type	SSP Requir-ements	Exists In DB	Details of available data and data that are still to be collected
1	High resolution seismic reflection	X		Primary Line(s): Location of Site on line (SP or Time only) EW9709 seisline 3, 1997 JD365 14:38:12 gmt, SP2037 Crossing Lines(s):
2	Deep Penetration seismic reflection			Primary Line(s): Location of Site on line (SP or Time only) Crossing Lines(s):
3	Seismic Velocity◊			
4	Seismic Grid	Y		EW9709 PAT-4 survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709 PAT-4 survey
7	Swath bathymetry	Y		EW9709 PAT-4 survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709 PAT-4 survey
11b	Gravity			
12	Sediment cores	X		EW9709-9PC
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709 PAT-4 survey
17	Other			

SSP Classification of Site:	SSP Watchdog:	Date of Last Review:
SSP Comments:		

X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites; R=required for re-entry sites; T=required for high temperature environments; ◊Accurate velocity information is required for holes deeper than 400m.

ODP Site Description Forms: Page 3 - Detailed Logging Plan

New **Revised**

Proposal #:486-Rev2	Site #: PAT-4B	Date Form Submitted: 15 March 1998
Water Depth (m): 4303	Sed. Penetration (m): 408	Basement Penetration (m): 5

Do you need to use the conical side-entry sub (CSES) at this site? Yes No X

Are high temperatures expected at this site? Yes No X

Are there any other special requirements for logging at this site? Yes No X Standard logging suite

If "Yes" Please describe requirements: _____

What do you estimate the total logging time for this site to be: 1.0 days

Measurement Type	Scientific Objective	Relevance (1=high, 3=Low)
Neutron-Porosity		
Litho-Density		
Natural Gamma Ray		
Resistivity-Induction		
Acoustic		
FMS		
BHTV		
Resistivity-Laterolog		
Magnetic/Susceptibility		
Density-Neutron (LWD)		
Resitivity-Gamma Ray (LWD)		
Other: Special tools (CORK, PACKER, VSP, PCS, FWS, WSP		

For help in determining logging times, please contact the ODP-LDEO Wireline Logging Services group at:

borehole@ldeo.columbia.edu
http://www.ldeo.columbia.edu/BRG/brg_home.html
Phone/Fax: (914) 365-8674 / (914) 365-3182

Note: Sites with greater than 400 m of penetration or significant basement penetration require deployment of standard toolstrings.

ODP Site Description Forms: Page 4 - Pollution & Safety Hazard Summary

Please fill out information in all gray boxes **New** **Revised**

Proposal #: 486-Rev2	Site #: PAT-4B	Date Form Submitted: 15 March 1998

1	Summary of Operations at site: (Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on page 3.)	Triple APC/XCB to basement, MDCB 4.5 m into basement, log with standard logging suite
2	Based on Previous DSDP/ODP drilling, list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock:	NONE
3	From Available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydrocarbon-bearing deposits.	NONE
4	Are there any indications of gas hydrates at this location?	NO
5	Are there reasons to expect hydrocarbon accumulations at this site? Please give details.	NO
6	What "special" precautions will be taken during drilling?	NONE
7	What abandonment procedures do you plan to follow:	STANDARD
8	Please list other natural or man-made hazards which may effect ship's operations: (e.g. ice, currents, cables)	NONE
9	Summary: What do you consider the major risks in drilling at this site?	UV Exposure

ODP Site Description Forms: Page 5 - Lithologic Summary

New **Revised**

Proposal #: 486 Rev2	Site #: PAT-4B	Date Form Submitted: 15 March 1998

Sub-bottom depth (m)	Key reflectors, Unconformities, faults, etc	Age	Assumed velocity (km/sec)	Lithology	Paleo-environment	Ave. rate of sediment accumulation (m/My)	Comments
0-113		Late Miocene to Recent (0 to 10 Ma)	1.56	carbonates and siliceous ooze	equatorial high productivity zone	11 m/myr	
113-242	lM-P	Early to Middle Miocene (10-25 Ma)	1.7	carbonates, siliceous oozes	equatorial circulation system	8 m/myr	
242-408	eM-O	Oligocene to Early Eocene (25-47 Ma)	1.75	Carbonates to silicified carbonates and chalks	edge of S. Pacific gyre	7 m/myr	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-5E (Central Equatorial Pacific)

2° 00.988’ N, 139° 27.065’ W

SITE OBJECTIVES

PAT-5E is part of the Phase 2 transect and will be one of the sites used to define equatorial circulation and sedimentation from the middle Eocene through the Eocene/Oligocene boundary. Its primary role will be to monitor the surface waters of the South Equatorial Current. It will also be used to monitor bottom waters generated in the Antarctic. At 40 Ma, the backtracked location was 5° S, 110° W based upon a hotspot reference frame (Gripp and Gordon, 1990, for 0-5 Ma Pacific-hot spot rotation pole; Engebretson et al., 1985, for older poles). Because PAT-5E was in an equatorial position at approximately 8 Ma, the site will also be useful for the study of late Miocene equatorial processes.

GENERAL DESCRIPTION

PAT-5E is situated in the modern equatorial region near the crest of the modern equatorial sediment bulge (Figure PAT5-1). Consequently, it has one of the thickest sediment sections of any of the proposed sites. It is also located in the middle of three seamounts. Based on magnetic lineations, basement age at PAT-5E should be in magnetic chron 22, or about 49 Ma (Cande et al., 1989; timescale of Cande and Kent, 1995) . Backtracking using a Pacific-hotspot rotation pole indicates that PAT-5E crossed the equator at 8 Ma.

EW9709 SURVEY

PAT-5E was surveyed on 1 January 1998 with hydrosweep swathmap bathymetry, digital 3.5 kHz subbottom profiling and 80 c.i. watergun seismic reflection profiling aboard the R/V Ewing. The site was also piston cored . PAT-5E is located near the crest of the equatorial sediment bulge. It was also chosen near a seamount from Leg 85 Ariadne site survey data (Shipley et al., 1985) in order to thin the Late Neogene sediment column. The swathmap bathymetry (Figure PAT5-2) indicate that the chosen location for PAT-5E is surrounded by at least 3 seamounts, even though the site position is about 15 km from the nearest seamount. Typical sediment thickness at PAT-5E is about 500-600 msec TWTT. We expected the Paleogene section to be thin, since the site was located at the southern edge of the tropical region, 5° S, at 40 Ma. The section below reflector em-O (Mayer et al., 1985) is 160 msec thick at the drillsite, or about 147 m of sediment.

LITHOLOGIC DESCRIPTION

Nearest DSDP drillsite: DSDP 72 00° 26.49’ N 138° 52.02’ W 4326 mbsl ; 345 m sediment column (ended in Eocene chert).

The sediment recovered at DSDP Site 72 is a radiolarian-nannofossil ooze, with variable nanno-

fossil content from 0-60 mbsf (recent-late Miocene), becoming a nannofossil ooze for the rest of the Neogene and Oligocene. The sediments abruptly turn to nanno-rad ooze at about the Eocene-Oligocene boundary. Chert was encountered shortly thereafter. All sediments except for the chert were deformed plastically by rotary drilling, suggesting that they could be cored with the APC.

SEISMIC INTERPRETATION

Primary Site (PAT-5E): EW9709 PAT5 seisline 3 19:26:49 gmt JD 001 1998 (SP 1863)

Priority: 2
Crustal age: 49 Ma
Location: 2° 00.988' N 139° 27.065' W
Site water depth: 4430 m (5.907 sec TWTT)
Sediment thickness: 0.608 sec (514 m)
Proposed Drilling Depth: 519 m

PAT-5E has a late Neogene section that is thinner than normal for the region (Figure PAT5-3), but below exhibits the classic equatorial reflection sequence described in Mayer et al., 1985. The Miocene section is particularly well-developed. The Paleogene section is thin and sometimes hard to resolve because of the thickness of the overlying sediments and the topography of the basement. We picked PAT-5E to be located where reflectors above basement are not strong, in order to avoid cherts.

GEOLOGIC HAZARDS

There are no known geologic hazards--pelagic sediments over oceanic basalts.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 3/98

The following data from EW9709 have been used to pick the location of PAT-5E and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT5 seisline 1
EW9709 PAT5 seisline 2
EW9709 PAT5 seisline 3
EW9709 PAT5 seisline 4
EW9709 PAT5 seisline 5
EW9709 PAT5 seisline 6

3.5 kHz data:

EW9709 PAT5 35line 1
EW9709 PAT5 35line 2
EW9709 PAT5 35line 3
EW9709 PAT5 35line 4
EW9709 PAT5 35line 5
EW9709 PAT5 35line 6

FIGURES

Fig PAT5-1: Location map for PAT-5E, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT5-2: Swathmap bathymetry for the PAT-5 region, from the EW9709 site survey. Proposed drill site is marked.

Fig PAT5-3: Seismic profile PAT5-seisline 3 across PAT-5E, from EW9709. Proposed drill site is marked.

Fig PAT5-4: 3.5 kHz subbottom profile PAT5-35line 3 across PAT-5E, from EW9709. Proposed drill site is marked

REFERENCES

Engebretson, D.C., A. Cox, and R. G. Gordon (1985) Relative motions between oceanic and continental plates in the Pacific basin. *Geol. Soc. Amer. Special Paper 206*.

Gripp, A.E., and R.G. Gordon (1990). Current plate velocities relative to the hotspots incorporating the NUVEL-1 global plate motion model. *Geophys. Res. Lett., 17*, 1109-1112.

Cande, S.C., J.L. LaBrecque, R.L. Larson, W.C. Pitman III, X. Golovchenko, and W.F. Haxby (1989) Magnetic lineations of the world's ocean basins. *American Association of Petroleum Geologists Map Series.*

Cande, S.C., and D.V. Kent (1995) Revised calibration of the geomagnetic polarity timescale for the Late Cretaceous and Cenozoic. *J. Geophys. Res., 100*, 6093-6095.

Mayer, L.A., T.H. Shipley, F. Theyer, R.H. Wilkens, and E.L. Winterer (1985) Seismic modeling and paleoceanography at Deep Sea Drilling Project Site 474. *Init Repts DSDP, 85*, Washington: US Gov't Printing Office, 947-970.

Shipley, T.H., E.L. Winterer, M. Goud, S.J. Hills, C.V. Metzler, C.K. Paull, and J.T. Shay (1985) Seabeam bathymetric and water-gun seismic surveys in the equatorial Pacific. *Init Repts DSDP, 85*, Washington: US Gov't Printing Office, 825-837.

Figure PAT5-1: Location map for PAT-5E on GEBCO bathymetry

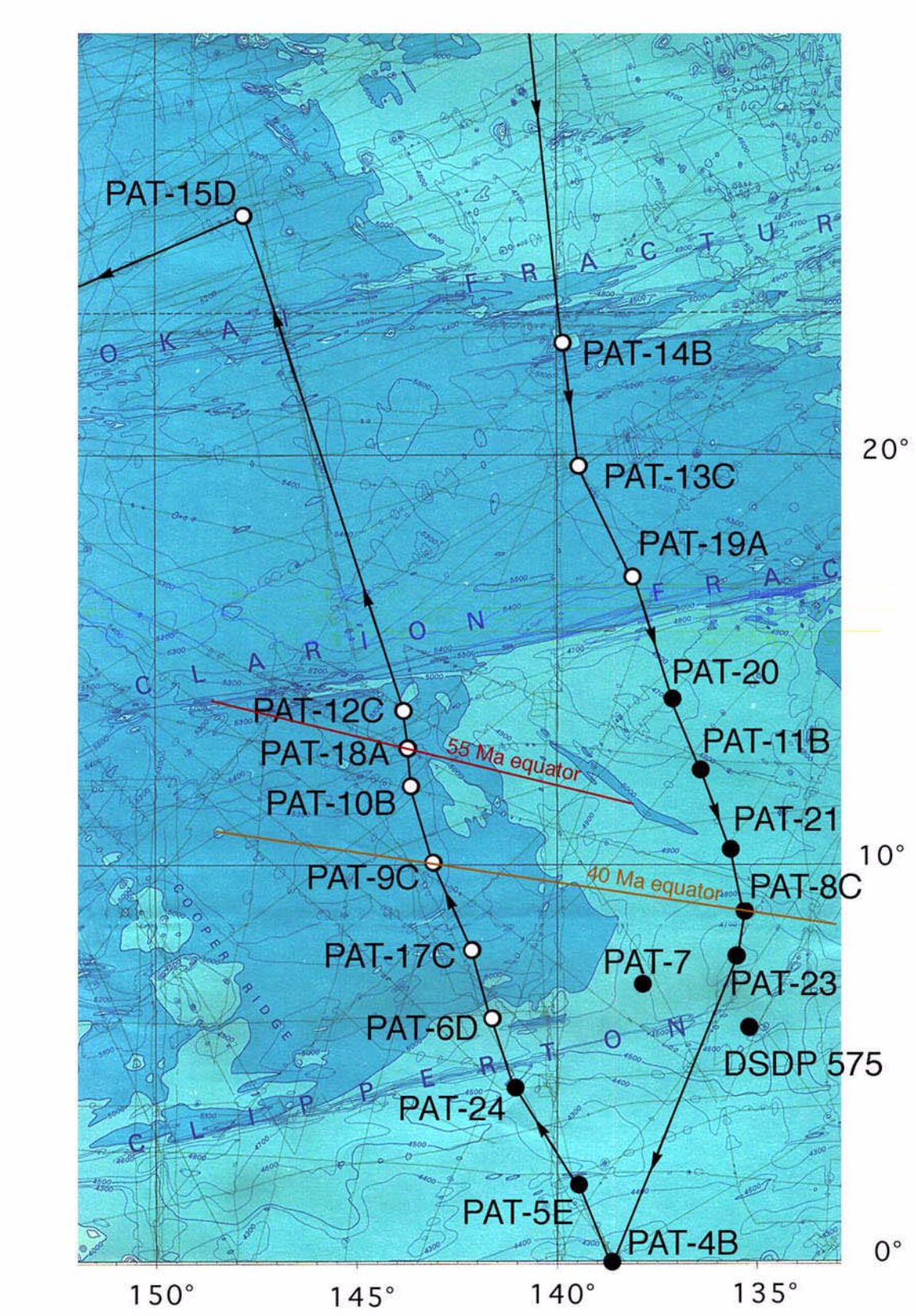


Figure PAT5-2: Swathmap bathymetry for the PAT-5E region from the EW9709 site survey.

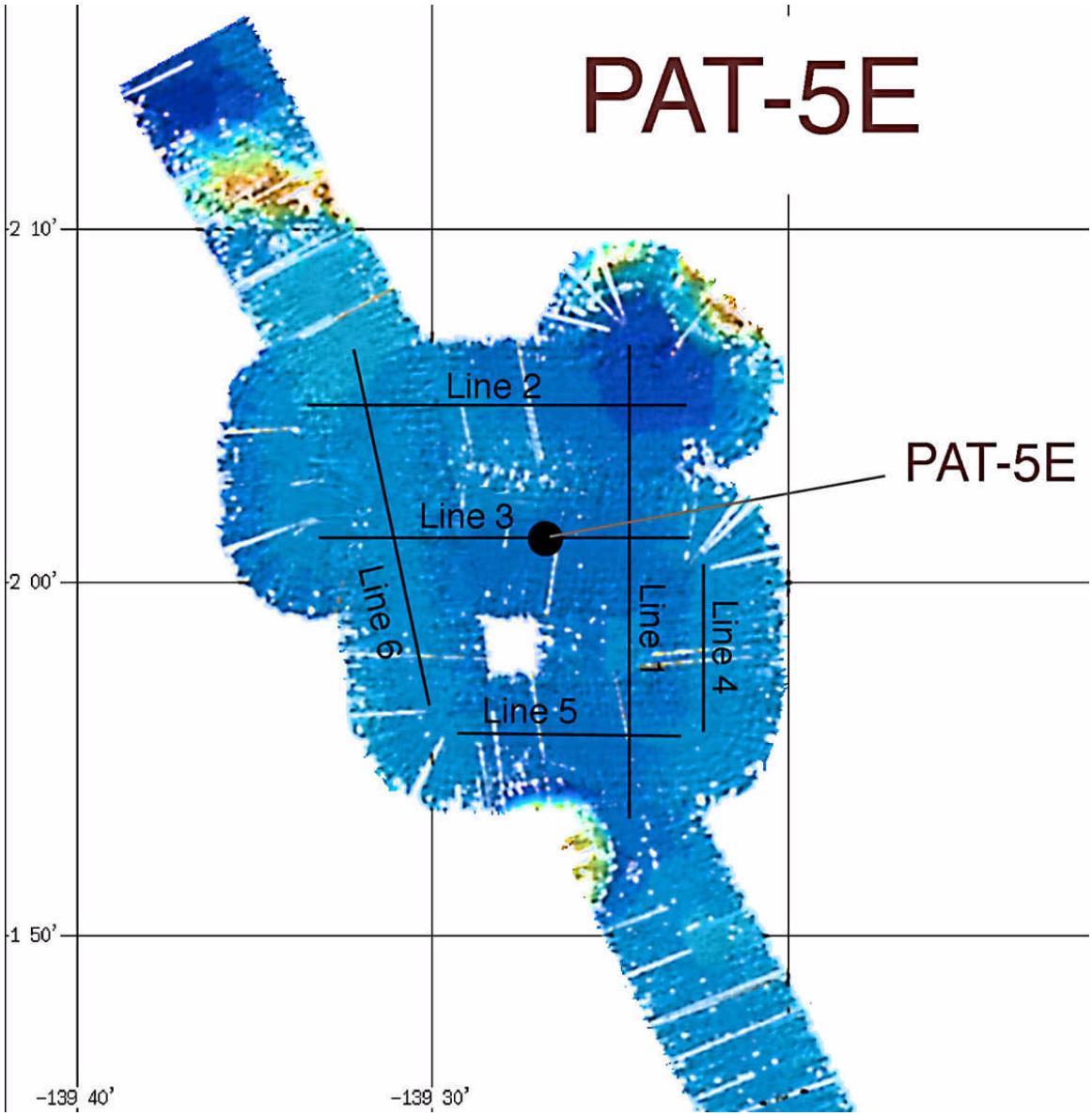


Figure PAT5-3: The seismic profile PAT5-seisline 3 across PAT-5E, from EW9709.

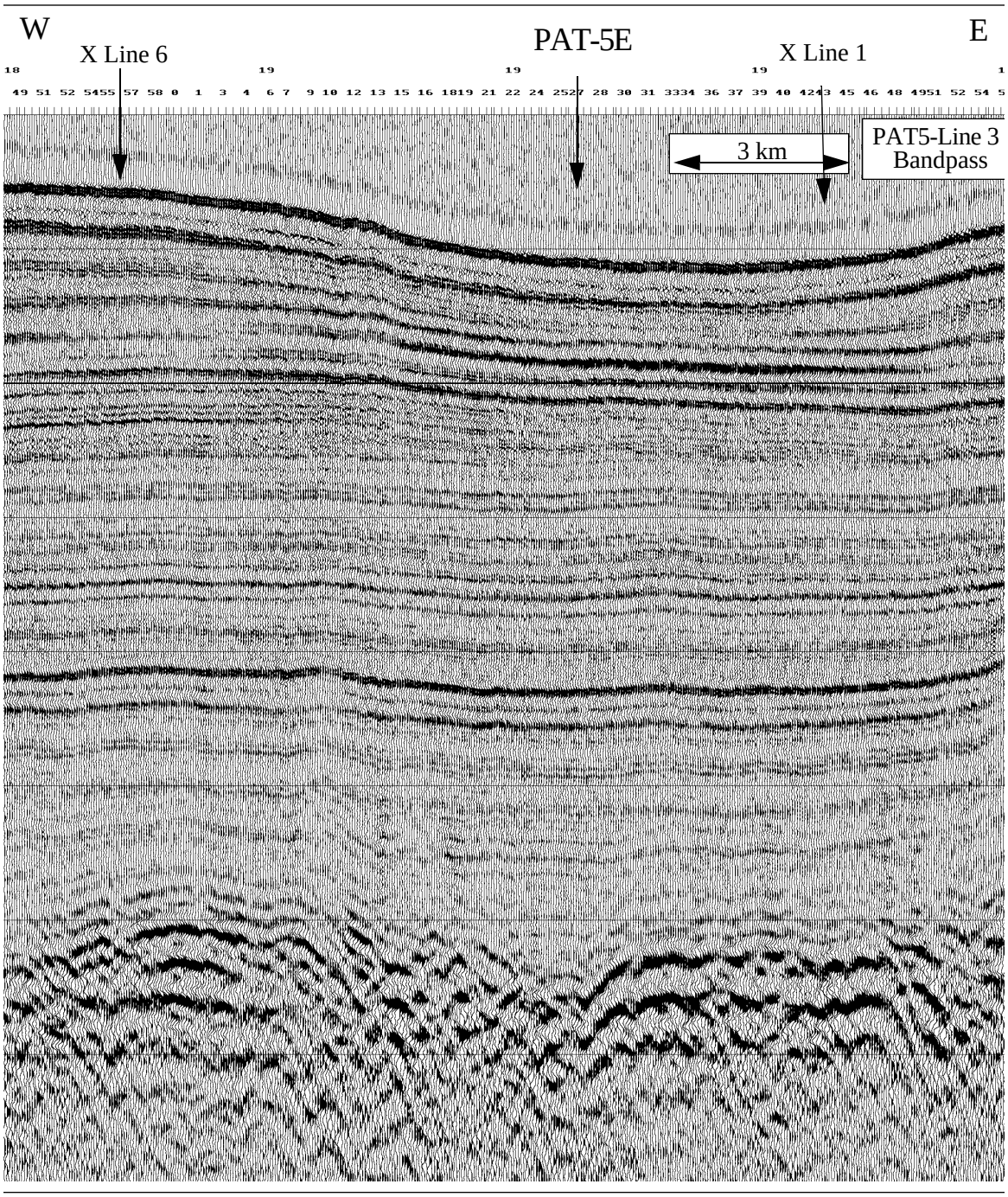
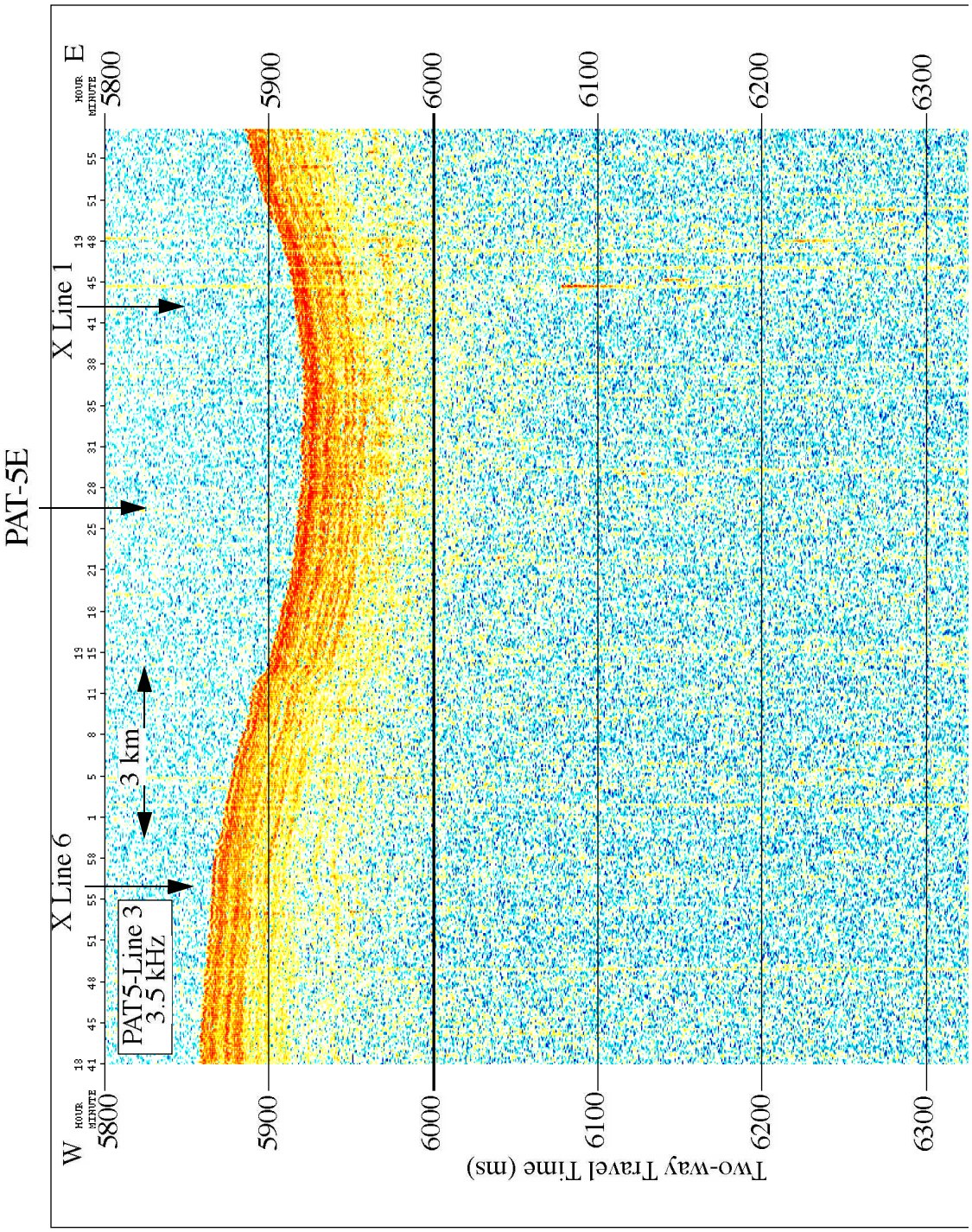


Figure PAT5-4: The 3.5 kHz subbottom profile PAT5-35line 3 across PAT-5E, from EW9709.



ODP Site Description Forms:

Page 1 - General Site Information

Please fill out information in all gray boxes

New **Revised**

Section A: Proposal Information

Title of Proposal	Paleocene Equatorial Pacific APC Transect
Proposal Number:	486-Rev2
Date Form Submitted:	15 March 1998
Site Specific Objectives (Must include general objectives in proposal)	Equatorial ocean circulation Eocene/Oligocene transition (40 Ma transect) S. Equatorial Current strength and latitudinal extent. CCD changes Miocene-Eocene
List Previous Drilling in Area:	DSDP 72

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-5E	If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #	Area or Location:	Central Pacific Ocean
Latitude:	Deg: 2	Min: 00.988	Jurisdiction:	none
Longitude:	Deg: 139	Min: 27.065	Distance to Land:	>1000 km
Priority of Site:	Primary: 2	Alt:	Water Depth:	4430 m (uncorr.; 5.907 sec TWTT)

Section C: Operational Information

	Sediments. What is the total sed. thickness? 514 m	Basement
Proposed Penetration (m)	514 m	5 m
General Lithologies:	siliceous carbonate ooze and chalk	MORB

Coring Plan (circle): 1-2-3-APC VPC* XCB MDCB* PCS RCB Re-entry HRGB

** Systems Currently Under Development*

Logging Plan: standard ODP logs	Standard Tools		Special Tools	LWD
	Triple-Combo Neutron-Porosity Litho-Density Natural Gamma Ray Resistivity-Induction	FMS-Sonic Acoustic FMS	Borehole Televiewer Geochemical Resistivity-Laterolog High Temperature Magnetic/Susceptibility	Density-Neutron Resitivity-Gamma Ray

Estimated days:	Drilling/Coring: 9.3	Logging: 1.2	Total On-Site: 10.5
Hazards/ Weather	*List possible hazards due to ice, hydrocarbons, dumpsites, cables, etc.* none		*What is your Weather Window?* all year

Instructions:

Please fill out these forms for each site that you are proposing to drill, including as much detail as possible. The following table describes the purpose of each page, what information is needed, and when each page should be submitted.

Page	Information needed	Used By	When to submit	Contact for more information
1	General Info. about proposals, site location and basic operational needs	JOIDES Office, Data Bank, Logging Group, ODP/TAMU, SSP, PPSP	When submitting preliminary proposal and when updating site information.	JOIDES Office email: joides@whoi.edu www: http://www.whoi.edu/joides/
2	Information regarding site survey data available and to-be-collected	JOIDES Office, Data Bank, SSP, PPSP	When submitting full proposal and when updating site survey information	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
3	Detailed Logging Plan	JOIDES Office, Logging Group, ODP/TAMU	When submitting full proposal and when updating logging plan	ODP-LDEO Wireline Logging Services email: borehole@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/BRG/brg_home.html
4	Lithologic Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
5	Pollution and Safety Hazard Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/

ODP Site Description Forms:

Page 2 - Site Survey Detail

Please fill out information in all gray boxes

New **Revised**

Proposal #: 486-Rev2	Site #: PAT-5E	Date Form Submitted: 15 March 1998

	Data Type	SSP Requir-ements	Exists In DB	Details of available data and data that are still to be collected
1	High resolution seismic reflection	X		Primary Line(s): (Location of Site on line (SP or Time only)) EW9709 PAT5-seisline 3 19:26:43 gmt JD 001 1998 (SP 1863) Crossing Lines(s): EW9709 PAT5-seisline 1
2	Deep Penetration seismic reflection			Primary Line(s): (Location of Site on line (SP or Time only)) Crossing Lines(s):
3	Seismic Velocity◊			
4	Seismic Grid	Y		EW9709
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		(Location of Site on line (Time)) EW9709 PAT5-35line 3
7	Swath bathymetry	Y		EW9709
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709
11b	Gravity			
12	Sediment cores	X		DSDP 72
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709
17	Other			

SSP Classification of Site:	SSP Watchdog:	Date of Last Review:
SSP Comments:		

X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites; R=required for re-entry sites; T=required for high temperature environments; ◊Accurate velocity information is required for holes deeper than 400m.

ODP Site Description Forms: Page 3 - Detailed Logging Plan

New **Revised**

Proposal #:486-Rev2	Site #: PAT-5E	Date Form Submitted: 15 March 1998
Water Depth (m): 4432	Sed. Penetration (m): 514	Basement Penetration (m): 5

Do you need to use the conical side-entry sub (CSES) at this site? Yes No X

Are high temperatures expected at this site? Yes No X

Are there any other special requirements for logging at this site? Yes No X Standard logging suite

If "Yes" Please describe requirements: _____

What do you estimate the total logging time for this site to be: _____

Measurement Type	Scientific Objective	Relevance (1=high, 3=Low)
Neutron-Porosity		
Litho-Density		
Natural Gamma Ray		
Resistivity-Induction		
Acoustic		
FMS		
BHTV		
Resistivity-Laterolog		
Magnetic/Susceptibility		
Density-Neutron (LWD)		
Resitivity-Gamma Ray (LWD)		
Other: Special tools (CORK, PACKER, VSP, PCS, FWS, WSP		

For help in determining logging times, please contact the ODP-LDEO Wireline Logging Services group at:

borehole@ldeo.columbia.edu
http://www.ldeo.columbia.edu/BRG/brg_home.html
Phone/Fax: (914) 365-8674 / (914) 365-3182

Note: Sites with greater than 400 m of penetration or significant basement penetration require deployment of standard toolstrings.

ODP Site Description Forms: Page 4 - Pollution & Safety Hazard Summary

Please fill out information in all gray boxes **New** **Revised**

Proposal #: 486-Rev2	Site #: PAT-5E	Date Form Submitted: 15 March 1998

1	Summary of Operations at site: (Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on page 3.)	Triple APC/XCB to basement, MDCB 4.5 m into basement, log with standard logging suite
2	Based on Previous DSDP/ODP drilling, list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock:	NONE
3	From Available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydrocarbon-bearing deposits.	NONE
4	Are there any indications of gas hydrates at this location?	NO
5	Are there reasons to expect hydrocarbon accumulations at this site? Please give details.	NO
6	What "special" precautions will be taken during drilling?	NONE
7	What abandonment procedures do you plan to follow:	STANDARD
8	Please list other natural or man-made hazards which may effect ship's operations: (e.g. ice, currents, cables)	NONE
9	Summary: What do you consider the major risks in drilling at this site?	NONE

ODP Site Description Forms: Page 5 - Lithologic Summary

New **Revised**

Proposal #: 486 Rev2	Site #: PAT-5E	Date Form Submitted: 15 March 1998

Sub-bottom depth (m)	Key reflec-tors, Uncon-formities, faults, etc	Age	Assumed velocity (km/sec)	Lithology	Paleo-environment	Ave. rate of sediment accumula-tion (m/My)	Comments
0-85		Late Miocene–recent 0 – 10 Ma	1.60	siliceous carbonate oozes	equaotrial circula-tion system	9 m/Myr	
85 – 367	lM-P	early Miocene–Late Miocen10-25 Ma	1.65	siliceous carbonate oozes and chalks	equatorial circula-tion system	19 m/Myr	
367-459	eM-O	Oligocene-Eocene 25-48 Ma	1.8	siliceous carbonate chalks and cherts (?)	abyssal pelagic	6 m/Myr	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-24 (Central Eq. Pacific, just S of Clipperton FZ)

4° 28.008' N, 140° 51.050' W

SITE OBJECTIVES

PAT-24 is part of the Phase 2 (40 Ma) transect and will be one of the sites used to define equatorial circulation and sedimentation from the middle Eocene through the Eocene/Oligocene boundary. Its primary role will be to monitor the surface waters of the South Equatorial Current. It will also be used to monitor bottom waters generated in the Antarctic and is a shallow site to measure changes in the CCD. At 40 Ma, the backtracked location was 5° S, 111° W based upon a hotspot reference frame (Gripp and Gordon, 1990, for 0-5 Ma Pacific-hot spot rotation pole; Engebretson et al., 1985, for older poles). Because PAT-24 was in an equatorial position at approximately 15 Ma, the site will also be useful to study middle Miocene equatorial processes.

GENERAL DESCRIPTION

PAT-24 is situated just south of the Clipperton Fracture Zone near the crest of the modern equatorial sediment bulge (Figure PAT24-1). Consequently, it has one of the thickest sediment sections of any of the proposed sites. Based on magnetic lineations, basement age at PAT-24 should be in magnetic chron 22 or 23, or about 50 Ma (Cande et al., 1989; timescale of Cande and Kent, 1995) . Backtracking using a Pacific-hotspot rotation pole indicates that PAT-24 crossed the equator at 15 Ma.

EW9709 SURVEY

PAT-24 was surveyed on 2 January 1998 with hydrosweep swathmap bathymetry, digital 3.5 kHz subbottom profiling and 80 c.i. watergun seismic reflection profiling aboard the R/V Ewing. The site was also piston cored. PAT-24 is located near the crest of the equatorial sediment bulge, just south of the Clipperton Fracture Zone. PAT-24 is relatively flat and also relatively shallow for the central Pacific Ocean. The only feature that shows up in the bathymetric survey is a NE-trending scarp, roughly parallel to the strike of the Clipperton Fracture Zone. The site also has occasional shallow 'pockmarks' (e.g. near the S end of Line 5) of unknown origin. They are not related to any obvious basement topography, but seem to be found near the scarp.

We expected the Paleogene section to be thin, since the site was located at the southern edge of the tropical region, 5° S, at 40 Ma. The section below reflector em-O (Mayer et al., 1985) is 70 msec thick at the drillsite, equivalent to about 60 m of sediment.

LITHOLOGIC DESCRIPTION

Nearest sediment core: EW9709-10PC 4° 26.967'N 140° 50.875' W 4384 m 1618 cm sediment recovery

Core 10 PC penetrated a dominantly carbonate ooze, but with well preserved radiolaria throughout the section. The sediments of the core catcher were mid-Pliocene in age, the *A. jenghsi* zone (2.69-3.80 Ma). The top of section II (1316 cm) was from the *P. prismatium* zone of the upper

Pliocene (1.77-2.4 Ma). The sediments from the top of section IV (1050 cm) are basal Quaternary (*A. angulare* zone, 1.21-1.77 Ma). Sediments from the top of section VI (748 cm) are from the *A. ypsilon* zone (near the Brunhes/Matuyama boundary). The shallowest shipboard sample (452 cm) is from the mid-Brunhes *S. universus* zone (0.46-0.61 Ma).

Nearest DSDP drillsite: DSDP 71 4° 28.28' N, 140° 18.91' W 4419 mbsl; 558 m of sediment above upper Eocene chert.

The sediment recovered at DSDP 71 is a classic Neogene and upper Paleogene equatorial carbonate section. The upper Miocene-recent section (0-44 mbsf) is marked by lower carbonate contents and interbeeded nanno-rad ooze with rad-nanno oozes. The middle Miocene-Oligocene section (44-~540 mbsf) is more carbonate-rich, with occasional cherts in the Oligocene interval. Below 436 mbsf Site 71 was spot-cored and little information is available about the sediment column. Upper Eocene limestones and cherts start at about 554 mbsf. Site 71 was terminated because of time considerations.

SEISMIC INTERPRETATION

Primary Site (PAT-24): EW9709 PAT24 seisline 5 21:50:29 gmt JD 002 1998 (SP 2673)

Priority: 2
Crustal age: 50 Ma
Location: 4° 28.008' N 140° 51.050' W
Site water depth: 4364 m (5.819 sec TWTT)
Sediment thickness: 0.639 sec (540 m)
Proposed Drilling Depth: 545 m

PAT-24 has a thick early/middle Miocene sequence, based on correlation to the reflectors of Mayer et al. (1985; Figure PAT24-3), which is understandable considering that the site was at the equator at 15 Ma. The Paleogene section is thin and sometimes hard to resolve because of the thickness of the overlying sediments and the topography of the basement. We picked PAT-24 to be located where near-basement reflectors are not strong to avoid cherts as much as possible.

GEOLOGIC HAZARDS

There are no known geologic hazards--pelagic sediments over oceanic basalts.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 3/98

The following data from EW9709 have been used to pick the location of PAT-24 and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT24 seisline 1
EW9709 PAT24 seisline 2
EW9709 PAT24 seisline 3
EW9709 PAT24 seisline 4
EW9709 PAT24 seisline 5

3.5 kHz data:

EW9709 PAT24 35line 1
EW9709 PAT24 35line 2
EW9709 PAT24 35line 3
EW9709 PAT24 35line 4
EW9709 PAT24 35line 5

FIGURES

Fig PAT24-1: Location map for PAT-24, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT24-2: Swathmap bathymetry for the PAT-24 region, from the EW9709 site survey. Proposed drill site is marked.

Fig PAT24-3: Seismic profile PAT24-seisline 5 across PAT-24, from EW9709. Proposed drill site is marked.

Fig PAT24-4: 3.5 kHz subbottom profile PAT24-35line 5 across PAT-24, from EW9709. Proposed drill site is marked

REFERENCES

Engebretson, D.C., A. Cox, and R. G. Gordon (1985) Relative motions between oceanic and continental plates in the Pacific basin. *Geol. Soc. Amer. Special Paper 206.*

Gripp, A.E., and R.G. Gordon (1990). Current plate velocities relative to the hotspots incorporating the NUVEL-1 global plate motion model. *Geophys. Res. Lett., 17,* 1109-1112.

Cande, S.C., J.L. LaBrecque, R.L. Larson, W.C. Pitman III, X. Golovchenko, and W.F. Haxby (1989) Magnetic lineations of the world's ocean basins. *American Association of Petroleum Geologists Map Series.*

Cande, S.C., and D.V. Kent (1995) Revised calibration of the geomagnetic polarity timescale for the Late Cretaceous and Cenozoic. *J. Geophys. Res., 100,* 6093-6095.

Mayer, L.A., T.H. Shipley, F. Theyer, R.H. Wilkens, and E.L. Winterer (1985) Seismic modeling and paleoceanography at Deep Sea Drilling Project Site 474. *Init Repts DSDP, 85,* Washington: US Gov't Printing Office, 947-970.

Shipley, T.H., E.L. Winterer, M. Goud, S.J. Hills, C.V. Metzler, C.K. Paull, and J.T. Shay (1985) Seabeam bathymetric and water-gun seismic surveys in the equatorial Pacific. *Init Repts DSDP, 85,* Washington: US Gov't Printing Office, 825-837.

Figure PAT24-1: Location map for PAT-24 on GEBCO bathymetry.

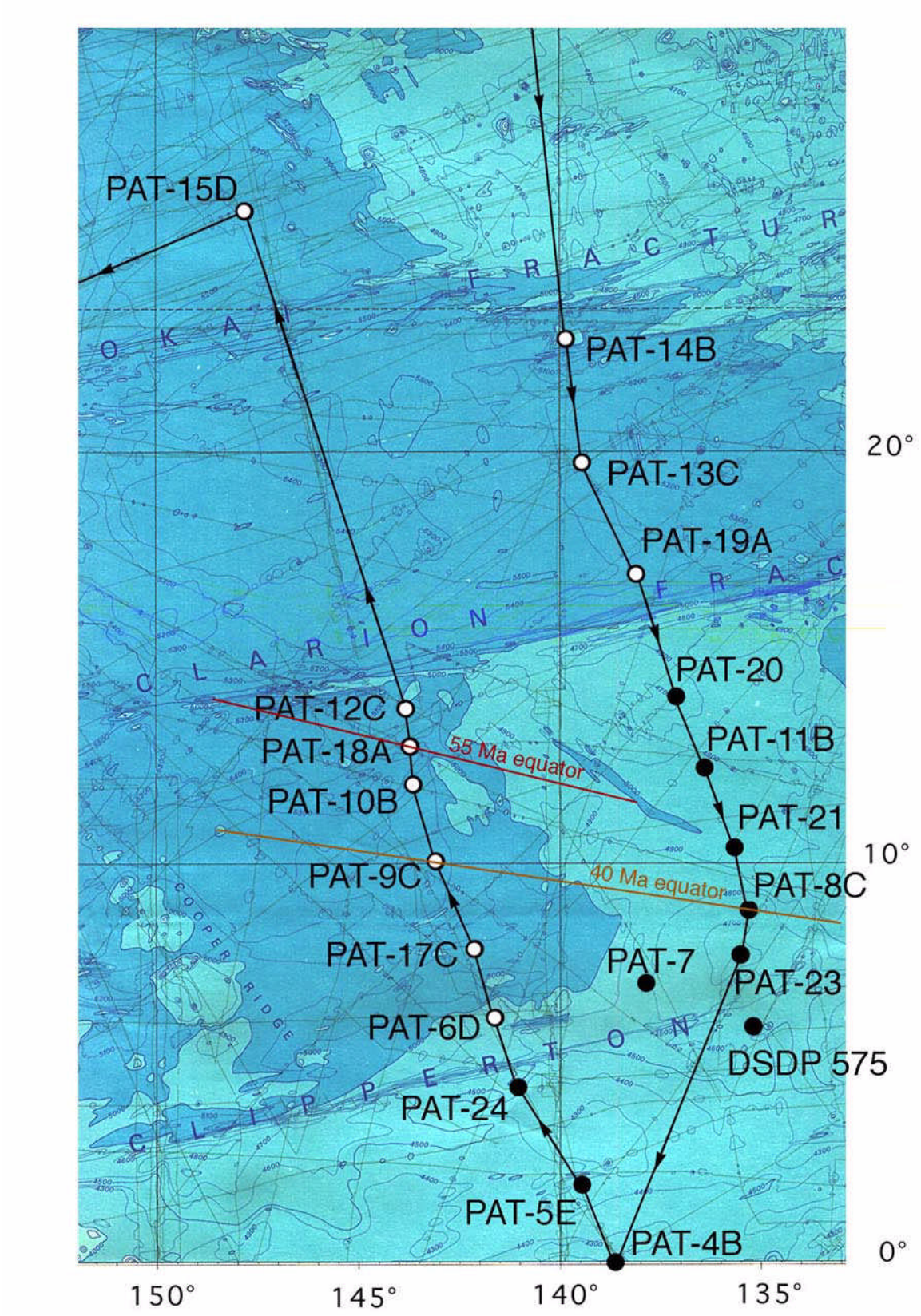


Figure PAT24-2: Swathmap bathymetry for the PAT-24 region from the EW9709 site survey.

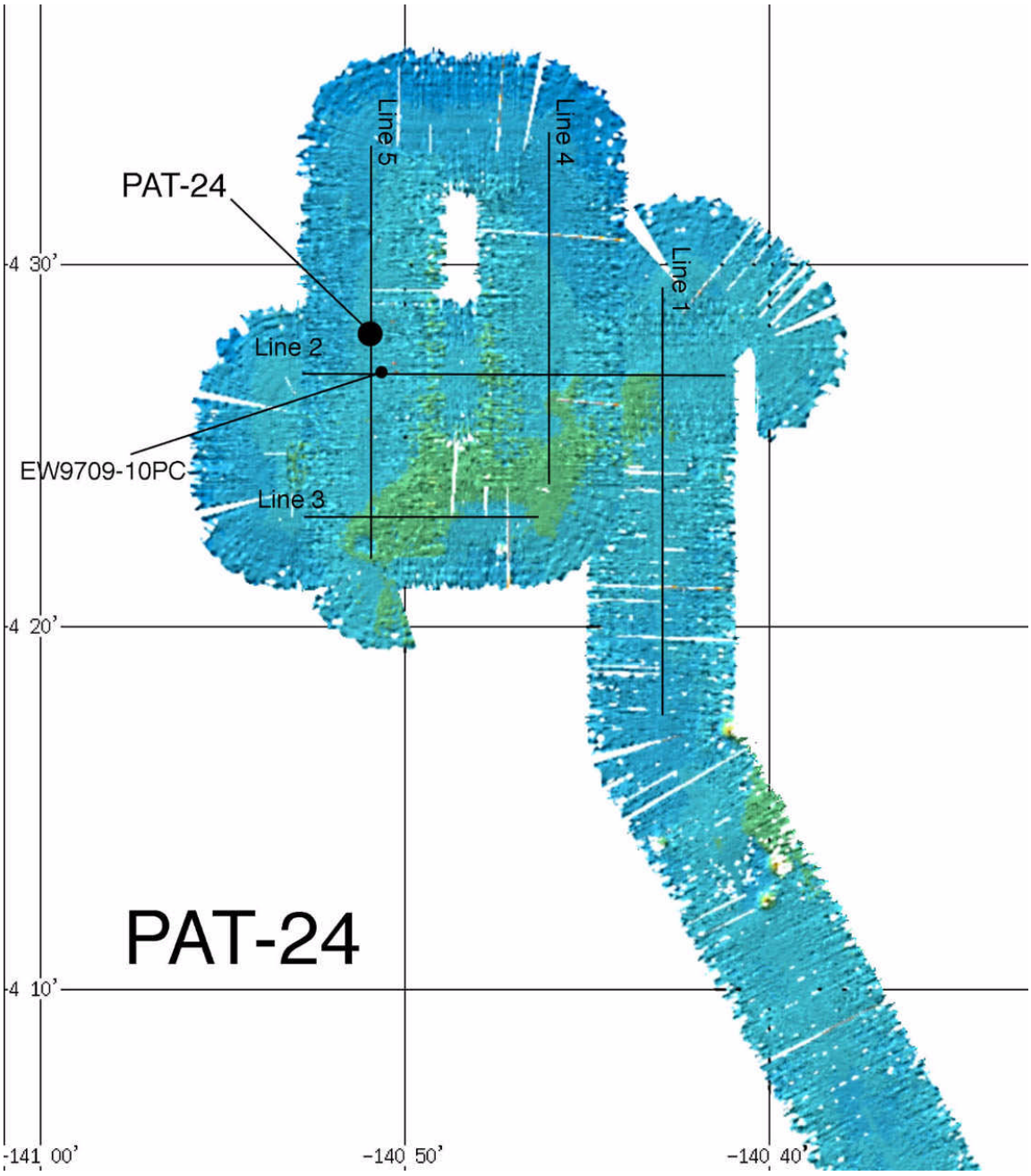


Figure PAT24-3: Seismic profile PAT24-seisline 5 across the proposed drillsite, from EW9709.

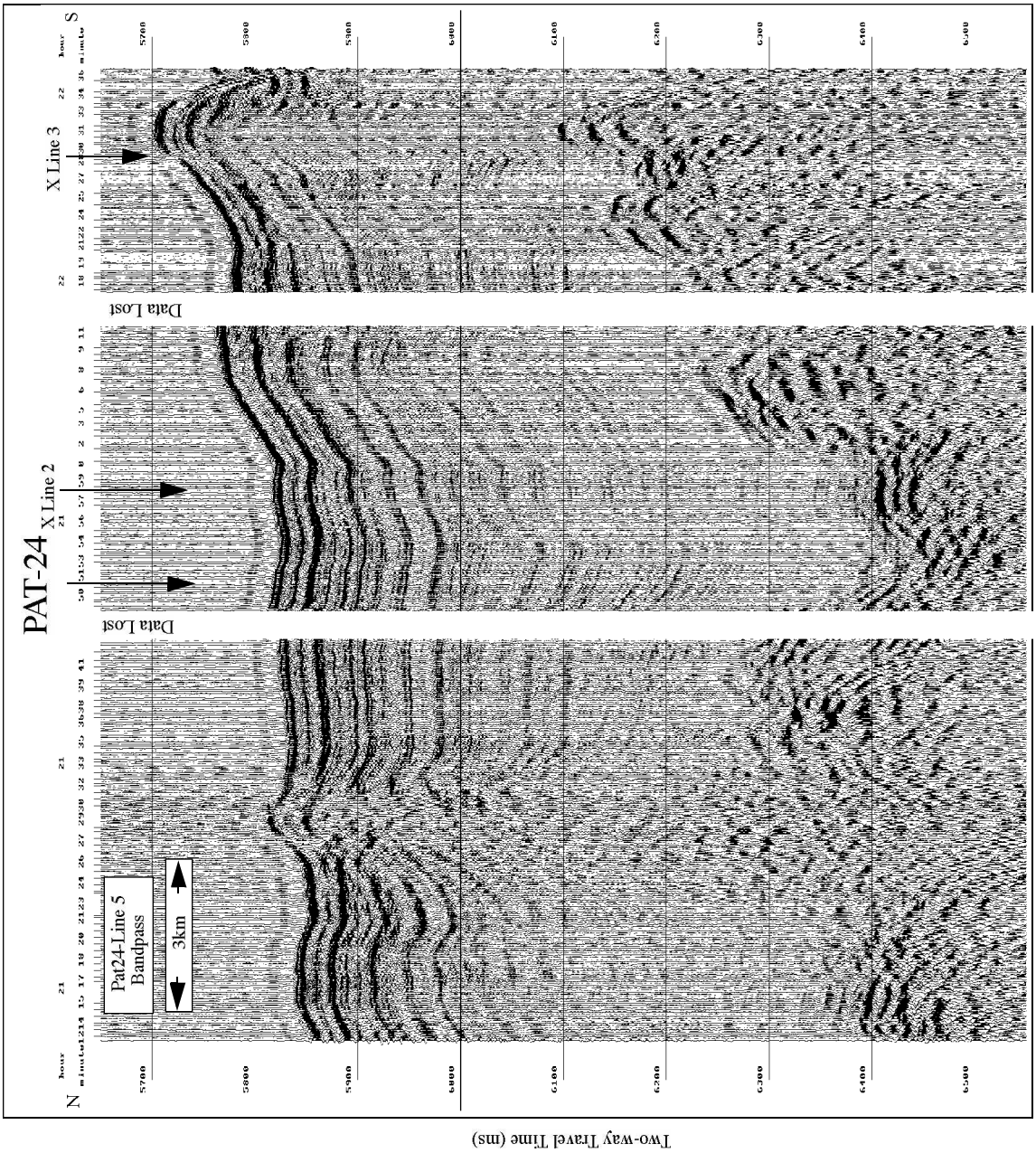
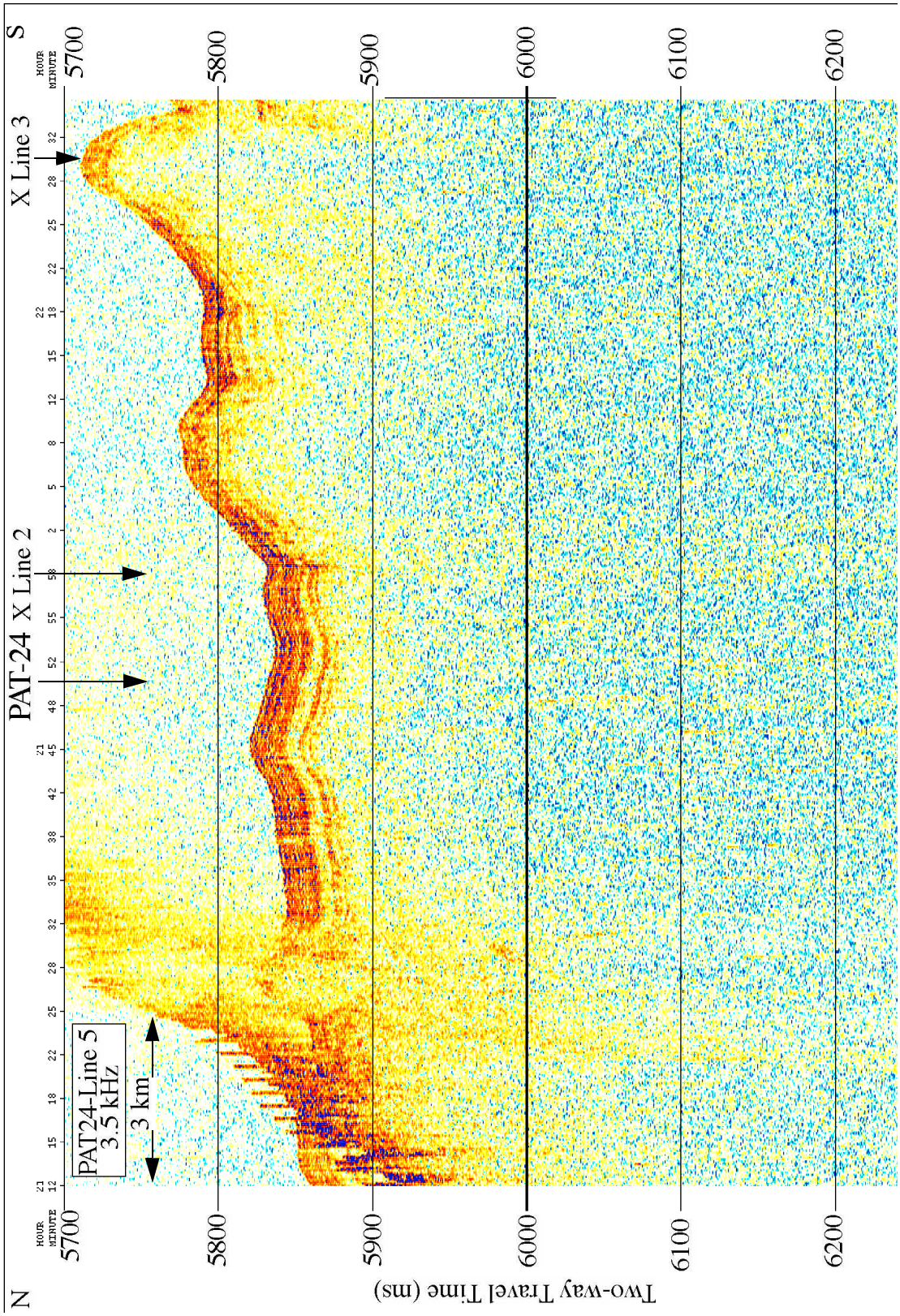


Figure PAT24-4: The 3.5 kHz profile PAT24-35line 5 across PAT-24, from EW9709



ODP Site Description Forms:

Page 1 - General Site Information

Please fill out information in all gray boxes

New **Revised**

Section A: Proposal Information

Title of Proposal	Paleocene Equatorial Pacific APC Transect
Proposal Number:	486-Rev2
Date Form Submitted:	15 March 1998
Site Specific Objectives (Must include general objectives in proposal)	Eocene-Oligocene Transition monitor South Equatorial Current system and changes in the paleo-CCD
List Previous Drilling in Area:	DSDP Site 71

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-24 (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)		Area or Location:	Central Pacific Ocean
Latitude:	Deg: 4	Min: 28.008N	Jurisdiction:	none
Longitude:	Deg: 140	Min: 51.050W	Distance to Land:	>1000 km
Priority of Site:	Primary: 2	Alt:	Water Depth:	4364 meters (5.819 sec)

Section C: Operational Information

	Sediments. What is the total sed. thickness? 540 m	Basement
Proposed Penetration (m)	540 m	4.5 m
General Lithologies:	calcareous ooze	MORB

Coring Plan (circle): 1-2-3-APC VPC* XCB MDCB* PCS RCB Re-entry HRGB

** Systems Currently Under Development*

Logging Plan:	Standard Tools		Special Tools	LWD
	Triple-Combo Neutron-Porosity Litho-Density Natural Gamma Ray Resistivity-Induction	FMS-Sonic Acoustic FMS	Borehole Televiewer Geochemical Resistivity-Laterolog High Temperature Magnetic/Susceptibility	Density-Neutron Resitivity-Gamma Ray

Estimated days:	Drilling/Coring:	Logging:	Total On-Site:
	9.6 days	1.2 days	10.8 days

Hazards/ Weather	*List possible hazards due to ice, hydrocarbons, dumpsites, cables, etc.*	*What is your Weather Window?*
	none	all year, every day, any hour

Instructions:

Please fill out these forms for each site that you are proposing to drill, including as much detail as possible. The following table describes the purpose of each page, what information is needed, and when each page should be submitted.

Page	Information needed	Used By	When to submit	Contact for more information
1	General Info. about proposals, site location and basic operational needs	JOIDES Office, Data Bank, Logging Group, ODP/TAMU, SSP, PPSP	When submitting preliminary proposal and when updating site information.	JOIDES Office email: joides@whoi.edu www: http://www.whoi.edu/joides/
2	Information regarding site survey data available and to-be-collected	JOIDES Office, Data Bank, SSP, PPSP	When submitting full proposal and when updating site survey information	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
3	Detailed Logging Plan	JOIDES Office, Logging Group, ODP/TAMU	When submitting full proposal and when updating logging plan	ODP-LDEO Wireline Logging Services email: borehole@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/BRG/brg_home.html
4	Lithologic Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
5	Pollution and Safety Hazard Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/

ODP Site Description Forms:

Page 2 - Site Survey Detail

Please fill out information in all gray boxes

New **Revised**

Proposal #: 486-Rev2	Site #: PAT-24	Date Form Submitted: 15 March 1998

	Data Type	SSP Requir-ements	Exists In DB	Details of available data and data that are still to be collected
1	High resolution seismic reflection	X		Primary Line(s): Location of Site on line (SP or Time only) EW9709 PAT 24, seisline 5, 21:50:29 gmt, JD 002 (SP2673) Crossing Lines(s):
2	Deep Penetration seismic reflection			Primary Line(s): Location of Site on line (SP or Time only) Crossing Lines(s):
3	Seismic Velocity◊			
4	Seismic Grid	Y		EW9709 PAT-24 survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709 PAT-24 survey
7	Swath bathymetry	Y		EW9709 PAT-24 survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709 PAT-24 survey
11b	Gravity			
12	Sediment cores	X		EW9709-10PC, 16.2 meters length
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709 PAT-24 survey
17	Other			

SSP Classification of Site:	SSP Watchdog:	Date of Last Review:
SSP Comments:		

X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites; R=required for re-entry sites; T=required for high temperature environments; ◊Accurate velocity information is required for holes deeper than 400m.

ODP Site Description Forms: Page 3 - Detailed Logging Plan

New **Revised**

Proposal #:486-Rev2	Site #: PAT-24	Date Form Submitted: 15 March 1998
Water Depth (m): 4364	Sed. Penetration (m): 540	Basement Penetration (m): 5

Do you need to use the conical side-entry sub (CSES) at this site? Yes No X

Are high temperatures expected at this site? Yes No X

Are there any other special requirements for logging at this site? Yes No X Standard logging suite

If "Yes" Please describe requirements: _____

What do you estimate the total logging time for this site to be: 1.2 days

Measurement Type	Scientific Objective	Relevance (1=high, 3=Low)
Neutron-Porosity		
Litho-Density		
Natural Gamma Ray		
Resistivity-Induction		
Acoustic		
FMS		
BHTV		
Resistivity-Laterolog		
Magnetic/Susceptibility		
Density-Neutron (LWD)		
Resitivity-Gamma Ray (LWD)		
Other: Special tools (CORK, PACKER, VSP, PCS, FWS, WSP		

For help in determining logging times, please contact the ODP-LDEO Wireline Logging Services group at:

borehole@ldeo.columbia.edu
http://www.ldeo.columbia.edu/BRG/brg_home.html
Phone/Fax: (914) 365-8674 / (914) 365-3182

Note: Sites with greater than 400 m of penetration or significant basement penetration require deployment of standard toolstrings.

ODP Site Description Forms: Page 4 - Pollution & Safety Hazard Summary

Please fill out information in all gray boxes **New** **Revised**

Proposal #: 486-Rev2	Site #: PAT-24	Date Form Submitted: 15 March 1998

1	Summary of Operations at site: (Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on page 3.)	Triple APC/XCB to basement, MDCB 4.5 m into basement, log with standard logging suite
2	Based on Previous DSDP/ODP drilling, list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock:	NONE
3	From Available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydrocarbon-bearing deposits.	NONE
4	Are there any indications of gas hydrates at this location?	NO
5	Are there reasons to expect hydrocarbon accumulations at this site? Please give details.	NO
6	What "special" precautions will be taken during drilling?	NONE
7	What abandonment procedures do you plan to follow:	STANDARD
8	Please list other natural or man-made hazards which may effect ship's operations: (e.g. ice, currents, cables)	NONE
9	Summary: What do you consider the major risks in drilling at this site?	NONE

ODP Site Description Forms:

Page 5 - Lithologic Summary

New **Revised**

Proposal #: 486 Rev2	Site #: PAT-24	Date Form Submitted: 15 March 1998

Sub-bottom depth (m)	Key reflec-tors, Uncon-formities, faults, etc	Age	Assumed velocity (km/sec)	Lithology	Paleo-environment	Ave. rate of sediment accumula-tion (m/My)	Comments
0-356		Miocene to Recent	1.65	carbonate ooze	equatorial circula-tion system	15 m/my	
356-478		Oligocene	1.75	carbonate ooze	equatorial current system	6 m/my	
478-540		Eocene	1.8	carbonate chalk	equatorial current system	6 m/my	

April 1998 Submission

SITE DSDP 575 (just S of Clipperton FZ, Central Pacific)

5° 51.00'N, 135° 02.16' W

SITE OBJECTIVES

DSDP Site 575 is the 3°S site on the Phase 2 (40 Ma) transect. It has remained in the equatorial region (from 3°S to 3°N) since the crust there was formed about 42 Ma until the Middle-Late Miocene transition, about 9 Ma. For this reason it will prove to be a very useful site for defining both Paleogene and Neogene equatorial circulation. The primary role of DSDP 575 will be to monitor the South Equatorial Current and to monitor equatorial productivity in the late Paleogene. It will also be used to monitor bottom waters generated in the Antarctic and changes in CCD. At 40 Ma, the backtracked location was 3° S, 106° W based upon a hotspot reference frame (Gripp and Gordon, 1990, for 0-5 Ma Pacific-hot spot rotation pole; Engebretson et al., 1985, for older poles). DSDP 575 crossed the equator at about 23 Ma.

GENERAL DESCRIPTION

DSDP 575 is situated about 1 degree south of the Clipperton Fracture Zone in the central tropical Pacific (Fig PAT8-1). It is located near the equatorial depositional maximum, so it has one of the thickest sediment sections of any of our proposed drillsites. We estimate age of basement to be about 42 Ma based upon published magnetic lineations and ages (Cande et al., 1989) and basement ages from previous drilling.

LITHOLOGIC DESCRIPTION

Nearest sediment core: DSDP Site 575

Site 575 was drilled on DSDP Leg 85, but was abandoned for lack of time at 208 mbsf, in the earliest Miocene. The lower 280 meters of Paleogene section have never been sampled. The upper 32 m of sediment are a cyclic unit that was deposited since 9-10 Ma, after Site 575 left the equatorial region, at an average sedimentation rate of 3 m/Myr. The equatorial sediments below 32 mbsf are deposited much more quickly, at sedimentation rates that range between 15 and 20 m/Myr (Mayer, Theyer, et al., 1985). The middle and lower Miocene sediments are nannofossil, foram, and siliceous oozes.

SEISMIC INTERPRETATION

Primary Site (DSDP Site 575): Figure 2, Site 575 (Mayer, Theyer, et al., 1985, p. 333)

Priority: 2
Crustal age: 42 Ma
Location: 5° 51.00' N 135° 02.16' W
Site water depth: 4552 m
Sediment thickness: 0.590 sec (489 m)
Proposed Drilling Depth: 494 m

DSDP 575 is located about 10 km S of a seamount over acoustically well-stratified sediments in a region where basement relief is minimal (Figures 575-2 and575-3).

GEOLOGIC HAZARDS

There are no known geologic hazards--pelagic sediments over oceanic basalts.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

FIGURES

Fig 575-1: Location map for DSDP 575, on GEBCO bathymetry. Proposed drill site is marked.

Fig 575-2: Swathmap bathymetry for the DSDP 575 region, from the Ariadne site survey (Mayer, Theyer, et al., 1985).

Fig 575-3: Seismic profile A–A' from the DSDP leg 85 Ariadne site survey (Mayer, Theyer, et al., 1985, p. 333). Proposed drill site is marked.

REFERENCES

Engebretson, D.C., A. Cox, and R. G. Gordon (1985) Relative motions between oceanic and continental plates in the Pacific basin. *Geol. Soc. Amer. Special Paper 206.*

Gripp, A.E., and R.G. Gordon (1990). Current plate velocities relative to the hotspots incorporating the NUVEL-1 global plate motion model. *Geophys. Res. Lett., 17*, 1109-1112.

Cande, S.C., J.L. LaBrecque, R.L. Larson, W.C. Pitman III, X. Golovchenko, and W.F. Haxby (1989) Magnetic lineations of the world's ocean basins. *American Association of Petroleum Geologists Map Series.*

Cande, S.C., and D.V. Kent (1995) Revised calibration of the geomagnetic polarity timescale for the Late Cretaceous and Cenozoic. *J. Geophys. Res., 100*, 6093-6095.

Mayer, L.A., T.H. Shipley, F. Theyer, R.H. Wilkens, and E.L. Winterer (1985) Seismic modeling and paleoceanography at Deep Sea Drilling Project Site 474. *Init Repts DSDP, 85*, Washington: US Gov't Printing Office, 947-970.

Mayer, L.A., F. Theyer, and the shipboard scientific party (1985). *Init Repts DSDP, 85*, Washington: US Gov't Printing Office.

Shipley, T.H., E.L. Winterer, M. Goud, S.J. Hills, C.V. Metzler, C.K. Paull, and J.T. Shay (1985) Seabeam bathymetric and water-gun seismic surveys in the equatorial Pacific. *Init Repts DSDP, 85*, Washington: US Gov't Printing Office, 825-837.

Figure 575-1: Location map for DSDP Site 575 on GEBCO bathymetry.

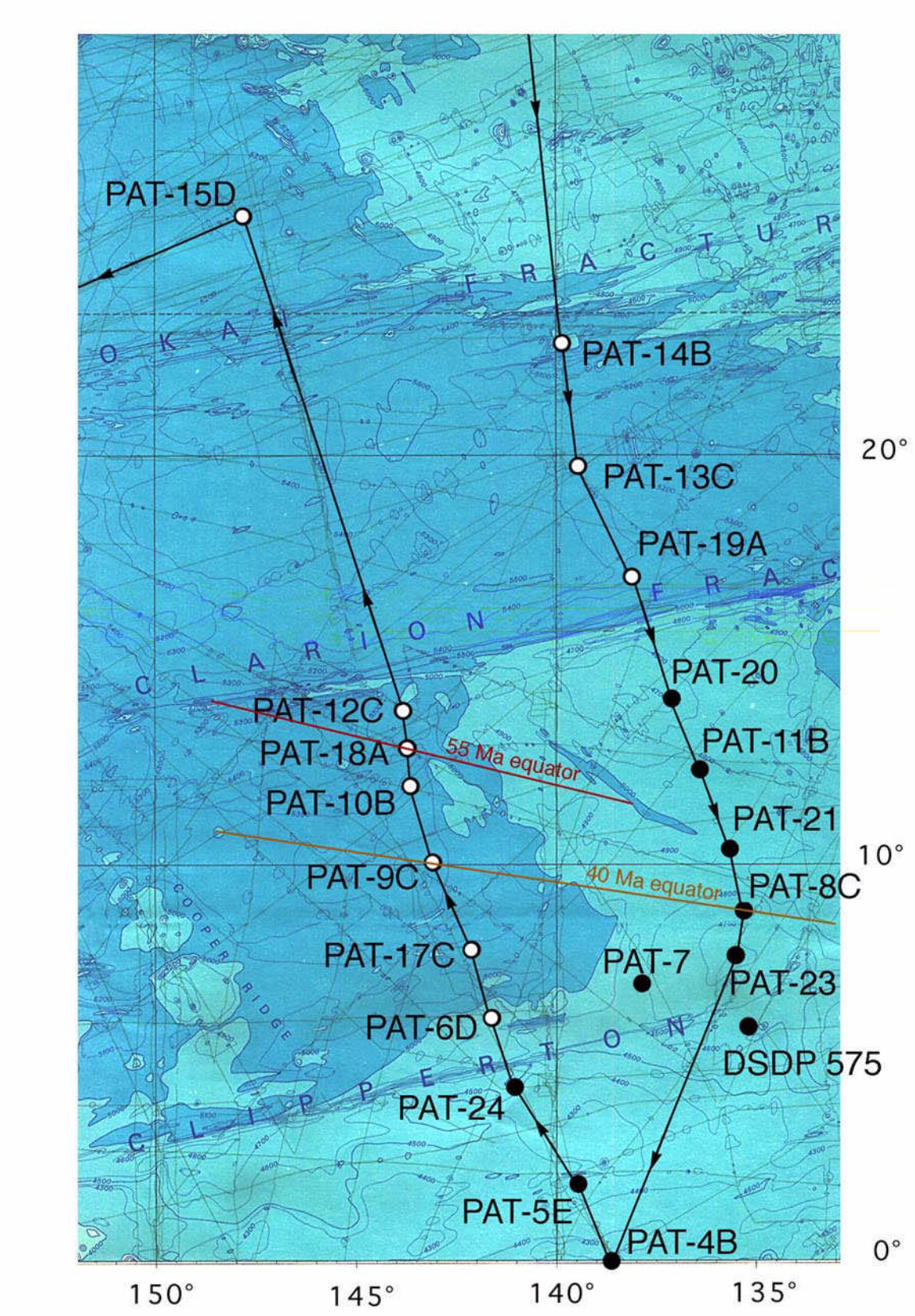


Figure 575-2: Swathmap bathymetry for the DSDP 575 region, from the Ariadne site survey.

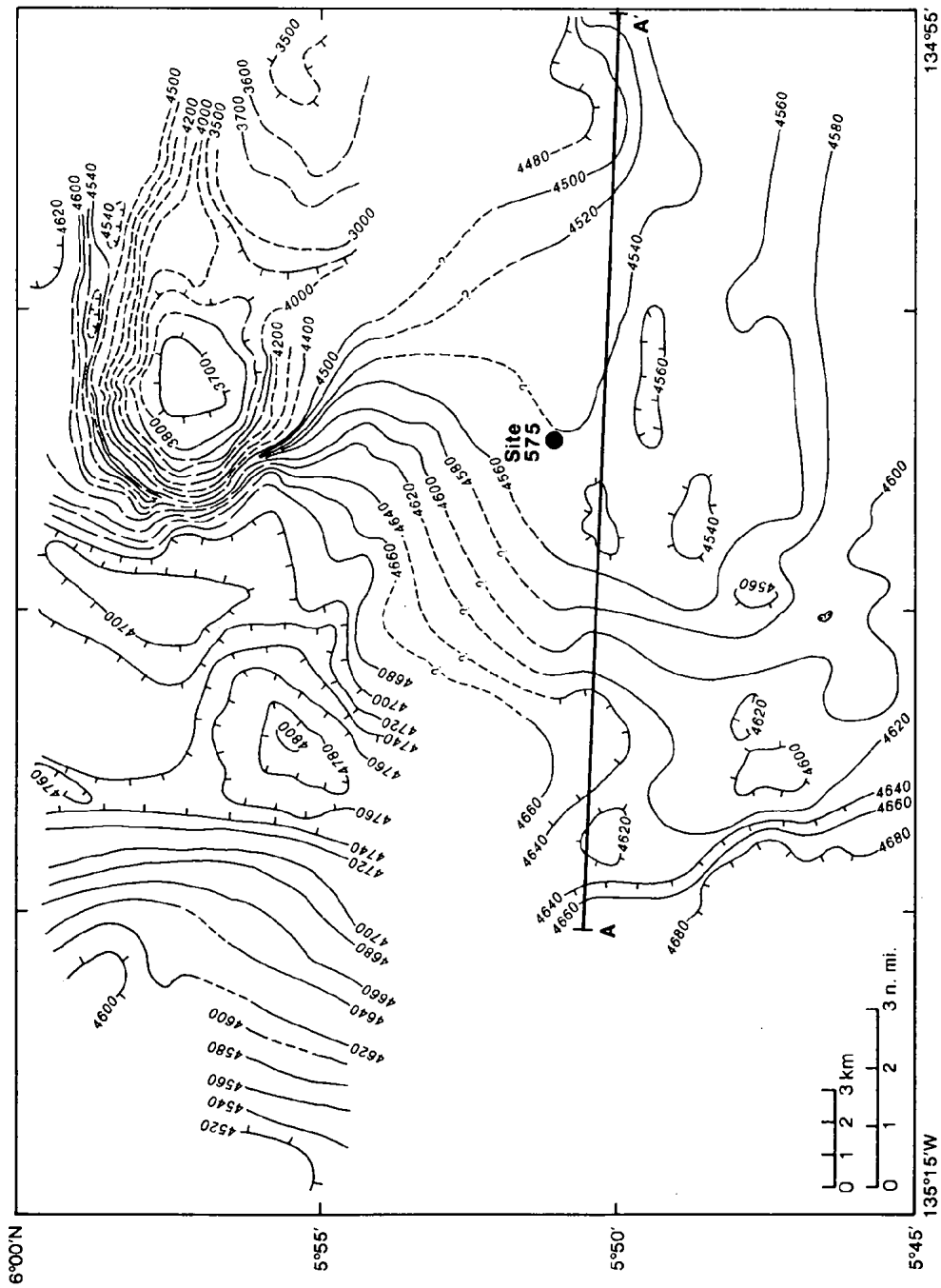
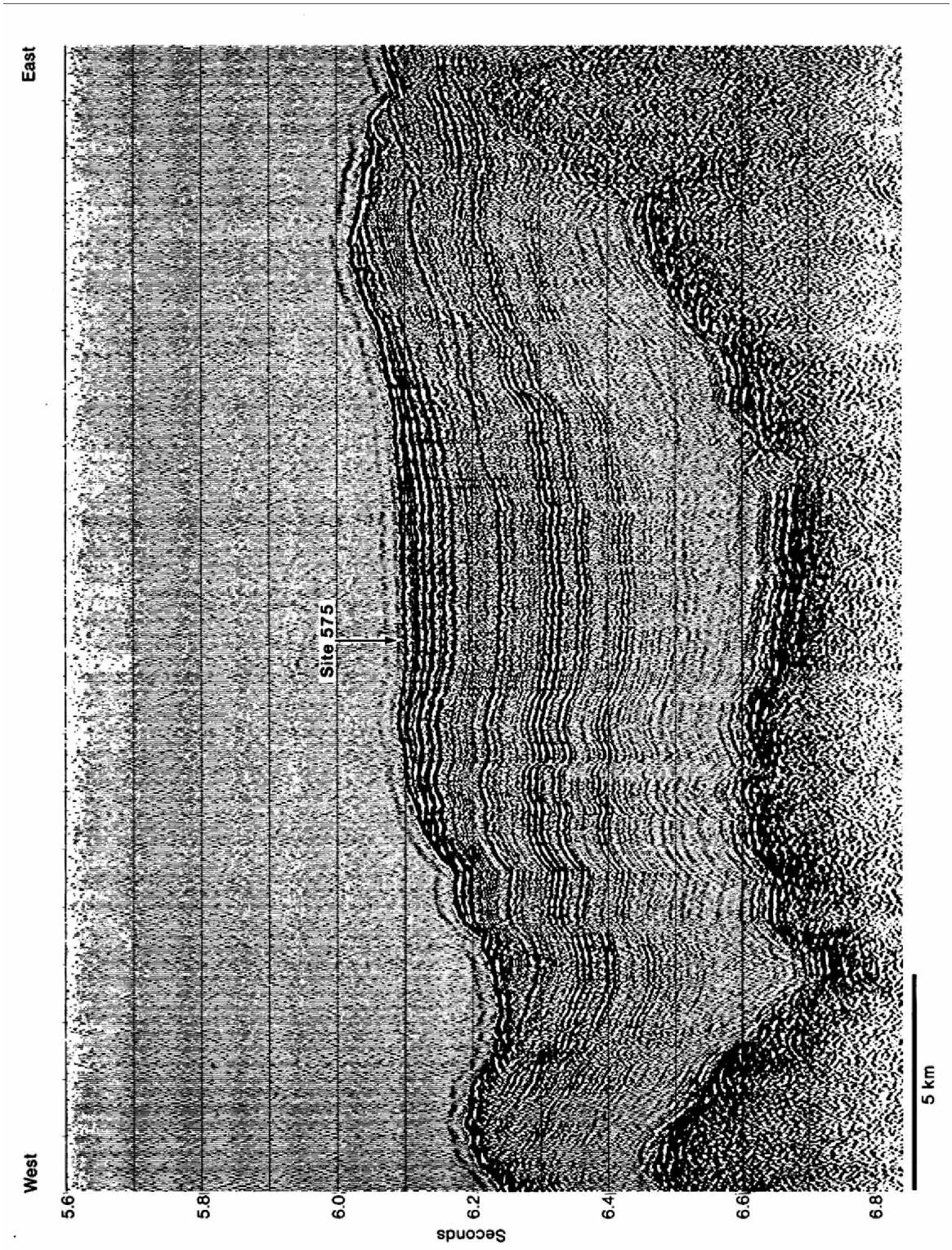


Figure 1. Bathymetry at Site 575 (20-m contour interval; 100-m contour interval for depths < 4500 m). Uncorrected water depth (velocity = 1.5 km/s) of site is 4528 m. Corrected water depth is 4536 m. Profile A–A' is the seismic profile shown in Figure 2.

Figure 575-3: The seismic profile A–A' across DSDP Site 575



ODP Site Description Forms:

Page 1 - General Site Information

Please fill out information in all gray boxes

New **Revised**

Section A: Proposal Information

Title of Proposal	Paleocene Equatorial Pacific APC Transect
Proposal Number:	486-Rev2
Date Form Submitted:	15 March 1998
Site Specific Objectives (Must include general objectives in proposal)	40 Ma equatorial circulation (3°S paleolatitude).—S Eq Current Early Miocene equatorial upwelling (0°S paleolatitude at 23 Ma) Transition from greenhouse to icehouse world
List Previous Drilling in Area:	DSDP 575

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	DSDP 575 (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)		Area or Location:	Central Pacific Ocean
Latitude:	Deg: 05°	Min: 51.00' N	Jurisdiction:	none
Longitude:	Deg: 135°	Min: 02.16' W	Distance to Land:	>1000 km
Priority of Site:	Primary: 2	Alt:	Water Depth:	4536 m

Section C: Operational Information

	Sediments.What is the total sed. thickness? 489	Basement
Proposed Penetration (m)	489 m	4.5 m
General Lithologies:	carbonates, siliceous carbonates, chalks	MORB

Coring Plan (circle): 1-2-3-APC VPC* XCB MDCB* PCS RCB Re-entry HRGB

** Systems Currently Under Development*

Logging Plan:	Standard Tools		Special Tools	LWD
Standard logging suite	Triple-Combo Neutron-Porosity Litho-Density Natural Gamma Ray Resistivity-Induction	FMS-Sonic Acoustic FMS	Borehole Televiewer Geochemical Resistivity-Laterolog High Temperature Magnetic/Susceptibility	Density-Neutron Resitivity-Gamma Ray

Estimated days:		
Drilling/Coring: 8.8	Logging: 1.2	Total On-Site: 10

Hazards/ Weather		
List possible hazards due to ice, hydrocarbons, dumpsites, cables, etc.	*What is your Weather Window?*	
none	all year	

Instructions:

Please fill out these forms for each site that you are proposing to drill, including as much detail as possible. The following table describes the purpose of each page, what information is needed, and when each page should be submitted.

Page	Information needed	Used By	When to submit	Contact for more information
1	General Info. about proposals, site location and basic operational needs	JOIDES Office, Data Bank, Logging Group, ODP/TAMU, SSP, PPSP	When submitting preliminary proposal and when updating site information.	JOIDES Office email: joides@whoi.edu www: http://www.whoi.edu/joides/
2	Information regarding site survey data available and to-be-collected	JOIDES Office, Data Bank, SSP, PPSP	When submitting full proposal and when updating site survey information	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
3	Detailed Logging Plan	JOIDES Office, Logging Group, ODP/TAMU	When submitting full proposal and when updating logging plan	ODP-LDEO Wireline Logging Services email: borehole@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/BRG/brg_home.html
4	Lithologic Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
5	Pollution and Safety Hazard Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/

ODP Site Description Forms:

Please fill out information in all gray boxes

Page 2 - Site Survey Detail

New **Revised**

Proposal #: 486-Rev2	Site #: DSDP 575	Date Form Submitted: 15 March 1998

	Data Type	SSP Requir-ements	Exists In DB	Details of available data and data that are still to be collected
1	High resolution seismic reflection	X		Primary Line(s): Location of Site on line (SP or Time only) Ariadne Site Survey (DSDP Init Repts, 85, 832-833) Crossing Lines(s):
2	Deep Penetration seismic reflection			Primary Line(s): Location of Site on line (SP or Time only) Crossing Lines(s):
3	Seismic Velocity◊			
4	Seismic Grid	Y		
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) DSDP 85, Ariadne Site Survey
7	Swath bathymetry	Y		Ariadne Site Survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		
11b	Gravity			
12	Sediment cores	X		DSDP 575 (208 mbsf)
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		
17	Other			

SSP Classification of Site:	SSP Watchdog:	Date of Last Review:
SSP Comments:		

X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites; R=required for re-entry sites; T=required for high temperature environments; ◊Accurate velocity information is required for holes deeper than 400m.

ODP Site Description Forms: Page 3 - Detailed Logging Plan

New **Revised**

Proposal #:486-Rev2	Site #: DSDP 575	Date Form Submitted: 15 March 1998
Water Depth (m): 4536 m	Sed. Penetration (m): 489	Basement Penetration (m): 5

Do you need to use the conical side-entry sub (CSES) at this site? Yes No X

Are high temperatures expected at this site? Yes No X

Are there any other special requirements for logging at this site? Yes No X Standard logging suite

If "Yes" Please describe requirements: _____

What do you estimate the total logging time for this site to be: _____

Measurement Type	Scientific Objective	Relevance (1=high, 3=Low)
Neutron-Porosity		
Litho-Density		
Natural Gamma Ray		
Resistivity-Induction		
Acoustic		
FMS		
BHTV		
Resistivity-Laterolog		
Magnetic/Susceptibility		
Density-Neutron (LWD)		
Resitivity-Gamma Ray (LWD)		
Other: Special tools (CORK, PACKER, VSP, PCS, FWS, WSP		

For help in determining logging times, please contact the ODP-LDEO Wireline Logging Services group at: borehole@ldeo.columbia.edu http://www.ldeo.columbia.edu/BRG/brg_home.html Phone/Fax: (914) 365-8674 / (914) 365-3182	Note: Sites with greater than 400 m of penetration or significant basement penetration require deployment of standard toolstrings.

ODP Site Description Forms: Page 4 - Pollution & Safety Hazard Summary

Please fill out information in all gray boxes **New** **Revised**

Proposal #: 486-Rev2	Site #: DSDP 575	Date Form Submitted: 15 March 1998

1	Summary of Operations at site: (Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on page 3.)	Triple APC/XCB to basement, MDCB 4.5 m into basement, log with standard logging suite
2	Based on Previous DSDP/ODP drilling, list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock:	NONE
3	From Available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydrocarbon-bearing deposits.	NONE
4	Are there any indications of gas hydrates at this location?	NO
5	Are there reasons to expect hydrocarbon accumulations at this site? Please give details.	NO
6	What "special" precautions will be taken during drilling?	NONE
7	What abandonment procedures do you plan to follow:	STANDARD
8	Please list other natural or man-made hazards which may effect ship's operations: (e.g. ice, currents, cables)	NONE
9	Summary: What do you consider the major risks in drilling at this site?	NONE

ODP Site Description Forms: **Page 5 - Lithologic Summary**

New **Revised**

Proposal #: 486 Rev2	Site #: DSDP 575	Date Form Submitted: 15 March 1998

Sub-bottom depth (m)	Key reflectors, Unconformities, faults, etc	Age	Assumed velocity (km/sec)	Lithology	Paleo-environment	Ave. rate of sediment accumulation (m/My)	Comments
0-208	sed surface	0-23 Ma recent to earliest Miocene	1.60	Siliceous calcareous oozes, becoming more carbonate-rich with depth	equatorial high productivity region	9m/myr	
208-340	-O reflector	23-34 Ma Oligocene	1.65	carbonate oozes, locally siliceous	equatorial high productivity region	12 m/myr	
340-489		34-42 Ma Late-Middle Eocene	1.75	carbonate and siliceous oozes and silicified chalks; perhaps cherts	equatorial high productivity region	19 m/myr	

April 1998 Submission

Last Revision of Site Information: 6/97

SITE PAT-7 (Central Pacific, between Clipperton and Clarion FZ)

7° 08.496'N, 137° 44.004'W

SITE OBJECTIVES

PAT-7 is part of the Phase 2 transect and will be one of the sites used to define equatorial circulation and sedimentation from the middle Eocene through the Eocene/Oligocene boundary. Its primary role will be to monitor the surface waters of the South Equatorial Current just south of the equator, which it crossed at 28 Ma. It will also be used to monitor bottom waters generated in the Antarctic. Paired with PAT-23 and DSDP 575, it will be used to monitor CCD changes in the Middle and Late Eocene. At 40 Ma, the backtracked location was 2°S, 109° W based upon a hotspot reference frame (Gripp and Gordon, 1990, for 0-5 Ma Pacific-hot spot rotation pole; Engebretson et al., 1985, for older poles). PAT-7 was at the equator at about 28 Ma.

GENERAL DESCRIPTION

PAT-7 is situated about a degree north of the Clipperton Fracture Zone in the central tropical Pacific (Fig PAT7-1). Based on poorly defined magnetic lineations north of the Clipperton FZ, basement age at PAT-7 should be in magnetic chron 20, or about 43 Ma (Cande et al., 1989; timescale of Cande and Kent, 1995) . This site was surveyed for possible drilling on DSDP Leg 85 (EQ-6, Shipley et al., 1985).

LITHOLOGIC DESCRIPTION

Nearest Sediment Core: DSDP Site 161, 10° 14.25'N, 139° 57.21' W, 4939 mbsl, 245 m sediment.

The sediment recovered at DSDP Site 161 is marked by a hiatus from the early Miocene to the recent (2 m of radiolarian clay). the Oligocene carbonate section starts at about 18 mbsf and continues to about 200 mbsf. Below 155 mbsf, the carbonate ooze has lithified to chalk. The Eocene section extends from 200-245 mbsf, and is marked by late-middle Eocene 'radiolarites, locally calcareous'. Although these radiolarites were indurated, no chert was encountered.

SEISMIC INTERPRETATION

Primary Site (PAT-7): Ariadne 1 1018Z, 21 Jan 1982

Priority: 2
Crustal age: 43 Ma (?)
Location: 7° 08.496' N 137° 44.004' W
Site water depth: 4733 m (6.311 sec TWTT)
Sediment thickness: 0.379 sec (302 m)
Proposed Drilling Depth: 307 m

The Ariadne seismic survey was recorded digitally, and we have reprocessed the seismic section

and are shown here as Figures PAT7-4 (main line), and PAT7-5 (cross line). The displayed figures have been deconvolved using spectral whitening and migrated. Lines simply reprocessed by band-pass filtering have also been sent to the data bank.

We believe that the Oligocene/Miocene boundary occurs roughly 100 msec below the sediment surface at PAT-7, while Eocene sediments occupy roughly the last 100 msec of the sediment column, or a thickness of about 80-90 m. The relatively thick Oligocene section is due to the sites passage under the equator at about 28 Ma.

GEOLOGIC HAZARDS

There are no known geologic hazards--pelagic sediments over oceanic basalts.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 7/97

The following data from data archives have been used to pick the location of PAT-7 and are being submitted in this package:
Seismic Lines submitted:
Main Line
DB8539-- Ariadne 1 21 Jan 1982 1001Z to 1126Z

Reprocessed Ariadne 1 21 Jan 1982 1004Z to 1143Z, A) bandpass filtered 30-150 Hz, B) spectrally whitened and migrated with stolt migration

Cross Line
DB8538-- Ariadne 1 21 Jan 1982 1321Z to 1520Z

Reprocessed Ariadne 1 1400Z to 1539Z, A) bandpass filtered 30-150 Hz, B) spectrally whitened and migrated with stolt migration

FIGURES

Fig PAT7-1: Location map for PAT-7, on GEBCO bathymetry. Proposed drill site is marked.
Fig PAT7-2: EQ-6 survey of Shipley et al, 1985. The main line shown in figure PAT7-3 and its cross shown in figure PAT7-4 are marked.
Fig PAT7-3: Main seismic profile across PAT-7, from Ariadne leg 1, and reprocessed from the digital data. The signal has been spectrally whitened and migrated. Proposed drill site is marked.
ig PAT7-4: Crossline profile across PAT-7, from Ariadne leg 1, and reprocessed from the digital data. The signal has been spectrally whitened and migrated. Proposed drill site is marked.

REFERENCES

Engebretson, D.C., A. Cox, and R. G. Gordon (1985) Relative motions between oceanic and continental plates in the Pacific basin. *Geol. Soc. Amer. Special Paper 206.*
Gripp, A.E., and R.G. Gordon (1990). Current plate velocities relative to the hotspots incorporat-

ing the NUVEL-1 global plate motion model. *Geophys. Res. Lett., 17*, 1109-1112.

Cande, S.C., J.L. LaBrecque, R.L. Larson, W.C. Pitman III, X. Golovchenko, and W.F. Haxby (1989) Magnetic lineations of the world's ocean basins. *American Association of Petroleum Geologists Map Series.*

Cande, S.C., and D.V. Kent (1995) Revised calibration of the geomagnetic polarity timescale for the Late Cretaceous and Cenozoic. *J. Geophys. Res., 100*, 6093-6095.

Mayer, L.A., T.H. Shipley, F. Theyer, R.H. Wilkens, and E.L. Winterer (1985) Seismic modeling and paleoceanography at Deep Sea Drilling Project Site 474. *Init Repts DSDP, 85*, Washington: US Gov't Printing Office, 947-970.

Shipley, T.H., E.L. Winterer, M. Goud, S.J. Hills, C.V. Metzler, C.K. Paull, and J.T. Shay (1985) Seabeam bathymetric and water-gun seismic surveys in the equatorial Pacific. *Init Repts DSDP, 85*, Washington: US Gov't Printing Office, 825-837.

Figure PAT7-1: Location map for PAT-7, on GEBCO bathymetry.

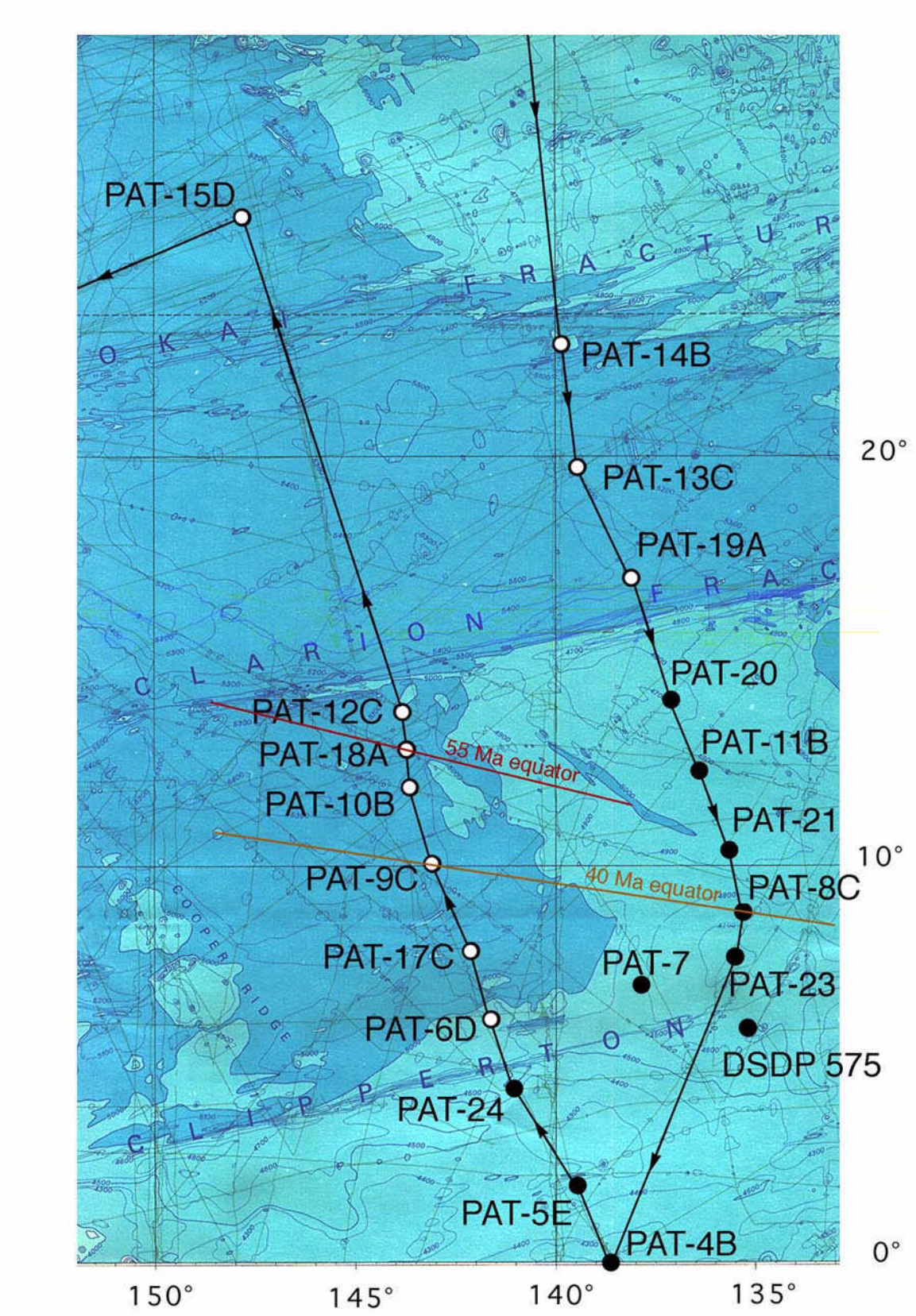
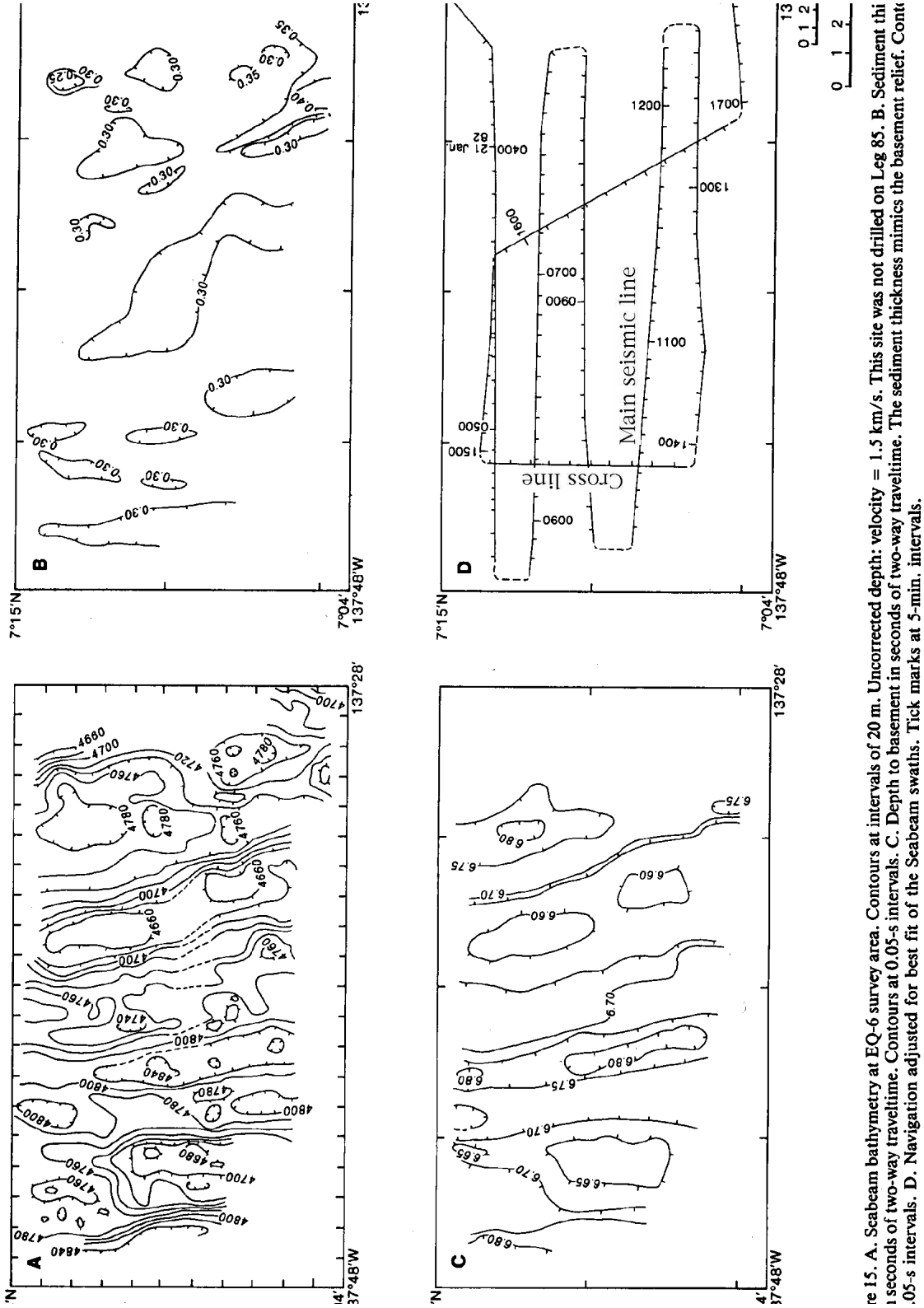


Figure PAT7-2: Trackline and bathymetric maps of the PAT-7 regions, from the Ariadne 1 survey (Shipley et al., 1985) Main and crosslines are marked.



re 15. A. Seabeam bathymetry at EQ-6 survey area. Contours at intervals of 20 m. Uncorrected depth: velocity = 1.5 km/s. This site was not drilled on Leg 85. B. Sediment thi
1 seconds of two-way traveltime. Contours at 0.05-s intervals. C. Depth to basement in seconds of two-way traveltime. The sediment thickness mimics the basement relief. Cont
.05-s intervals. D. Navigation adjusted for best fit of the Seabeam swaths. Tick marks at 5-min. intervals.

Figure PAT7-3: Main seismic line through PAT-7, spectrally whitened and migrated.

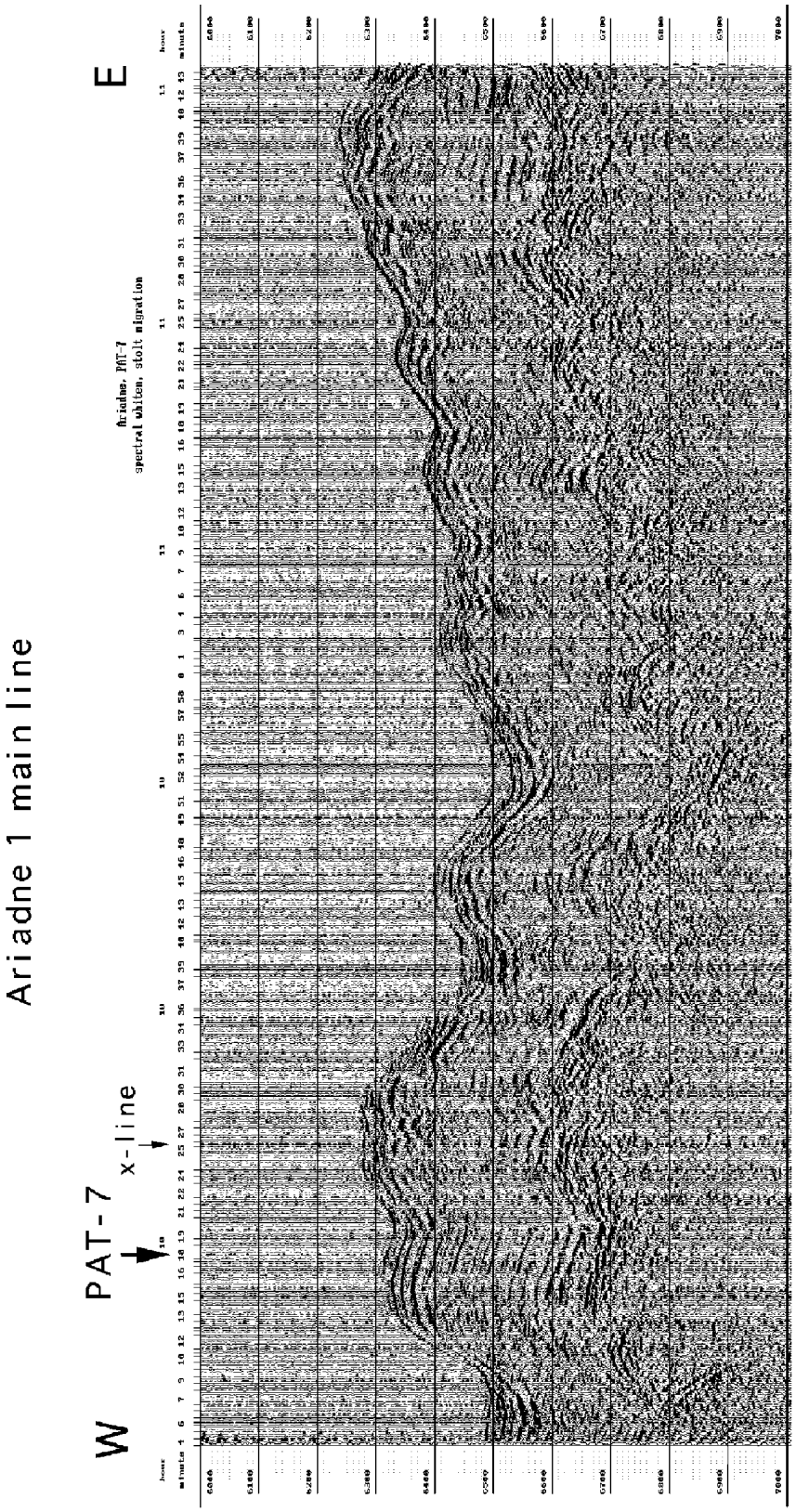
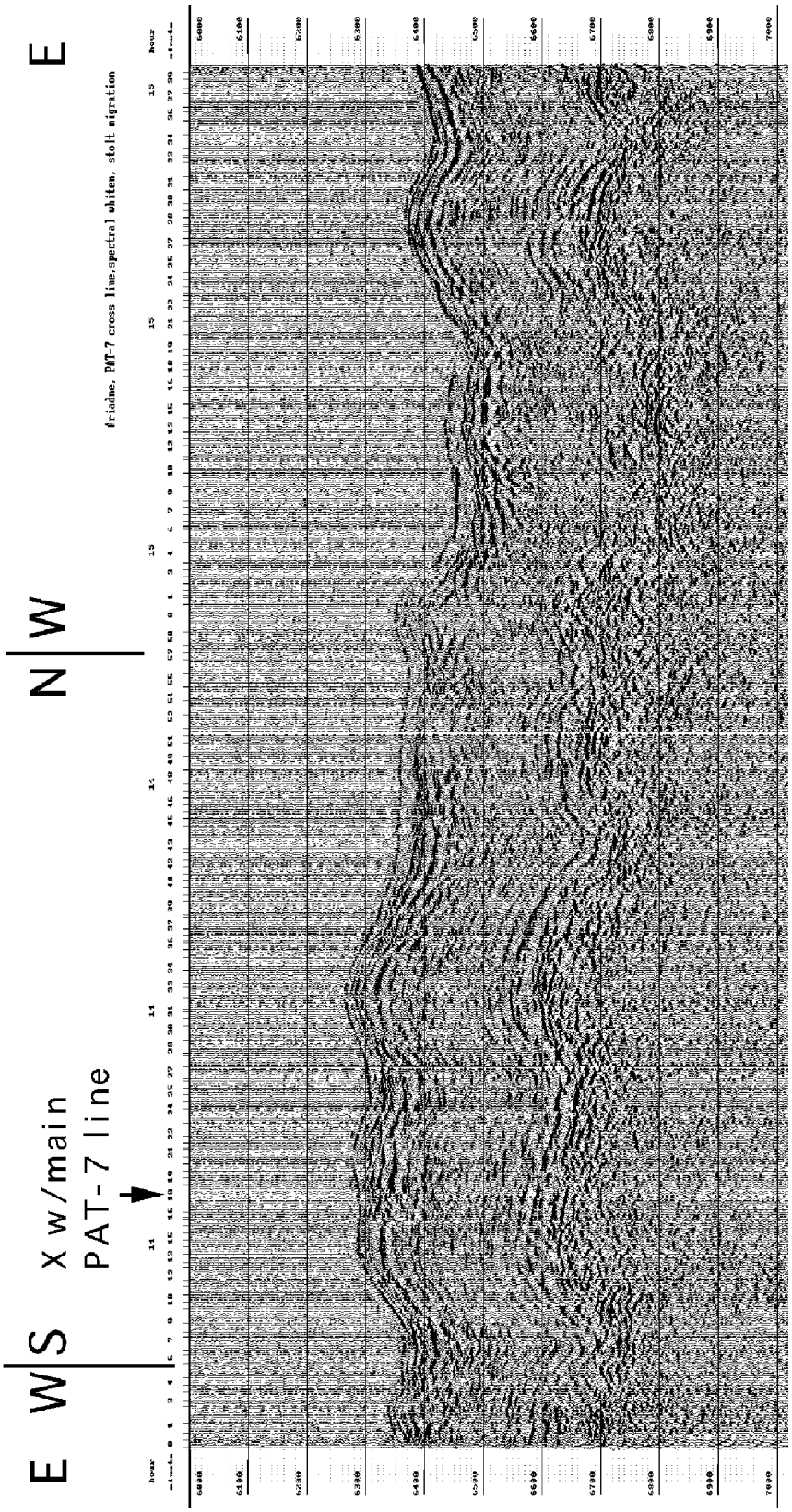


Figure PAT7-4: Cross line through PAT-7, spectrally whitened and migrated.



ODP Site Description Forms:

Page 1 - General Site Information

Please fill out information in all gray boxes

New **Revised**

Section A: Proposal Information

Title of Proposal	Paleogene Equatorial Pacific APC Transect
Proposal Number:	486-Rev2
Date Form Submitted:	15 March 1998
Site Specific Objectives (Must include general objectives in proposal)	Eocene/Oligocene Transition (40 Ma transect) equatorial circulation, SEC strength and position, CCD, bottom water formation
List Previous Drilling in Area:	DSDP 161

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-7	If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #	Area or Location:	Central Pacific Ocean
Latitude °N:	Deg: 7	Min: 08.496	Jurisdiction:	none
Longitude °W:	Deg: 137	Min: 44.004	Distance to Land:	>1000 km
Priority of Site:	Primary: 2	Alt:	Water Depth:	4733 m (uncorr.; 6.311 sec TWTT))

Section C: Operational Information

	Sediments.What is the total sed. thickness? 315 m	Basement
Proposed Penetration (m)	315 m	4.5 m
General Lithologies:	rad. clay, calc. rad ooze, foram ooze	MORB

Coring Plan (circle): 1-2-3-APC VPC* XCB MDCB* PCS RCB Re-entry HRGB

** Systems Currently Under Development*

Logging Plan: standard tool strings	Standard Tools		Special Tools	LWD
	Triple-Combo Neutron-Porosity Litho-Density Natural Gamma Ray Resistivity-Induction	FMS-Sonic Acoustic FMS	Borehole Televiewer Geochemical Resistivity-Laterolog High Temperature Magnetic/Susceptibility	Density-Neutron Resitivity-Gamma Ray

Estimated days:	Drilling/Coring:6.0	Logging:1.0	Total On-Site: 7.0
Hazards/ Weather	*List possible hazards due to ice, hydrocarbons, dumpsites, cables, etc.* none		*What is your Weather Window?* all year

Instructions:

Please fill out these forms for each site that you are proposing to drill, including as much detail as possible. The following table describes the purpose of each page, what information is needed, and when each page should be submitted.

Page	Information needed	Used By	When to submit	Contact for more information
1	General Info. about proposals, site location and basic operational needs	JOIDES Office, Data Bank, Logging Group, ODP/TAMU, SSP, PPSP	When submitting preliminary proposal and when updating site information.	JOIDES Office email: joides@whoi.edu www: http://www.whoi.edu/joides/
2	Information regarding site survey data available and to-be-collected	JOIDES Office, Data Bank, SSP, PPSP	When submitting full proposal and when updating site survey information	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
3	Detailed Logging Plan	JOIDES Office, Logging Group, ODP/TAMU	When submitting full proposal and when updating logging plan	ODP-LDEO Wireline Logging Services email: borehole@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/BRG/brg_home.html
4	Lithologic Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
5	Pollution and Safety Hazard Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/

ODP Site Description Forms:

Please fill out information in all gray boxes

Page 2 - Site Survey Detail

New **Revised**

Proposal #: 486-Rev2	Site #: PAT-7	Date Form Submitted: 15 March 1998

	Data Type	SSP Requir-ements	Exists In DB	Details of available data and data that are still to be collected
1	High resolution seismic reflection	X		Primary Line(s): Location of Site on line (SP or Time only) Ariadne 1 EQ-6 survey (1018 hrs 1/21/82) Crossing Lines(s):
2	Deep Penetration seismic reflection			Primary Line(s): Location of Site on line (SP or Time only) Crossing Lines(s):
3	Seismic Velocity◊			
4	Seismic Grid	Y		Ariadne 1 EQ-6 survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) Ariadne 1 EQ-6 survey
7	Swath bathymetry	Y		Ariadne 1 EQ-6 survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		
11b	Gravity			
12	Sediment cores	X		
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		Ariadne 1 EQ-6 survey
17	Other			

SSP Classification of Site:	SSP Watchdog:	Date of Last Review:
SSP Comments:		

X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites; R=required for re-entry sites; T=required for high temperature environments; ◊Accurate velocity information is required for holes deeper than 400m.

ODP Site Description Forms: Page 3 - Detailed Logging Plan

New **Revised**

Proposal #:486-Rev2	Site #: PAT-7	Date Form Submitted: 15 March 1998
Water Depth (m): 4733 (uncorr.)	Sed. Penetration (m): 315	Basement Penetration (m): 5

Do you need to use the conical side-entry sub (CSES) at this site? Yes No X

Are high temperatures expected at this site? Yes No X

Are there any other special requirements for logging at this site? Yes No X Standard logging suite

If "Yes" Please describe requirements: _____

What do you estimate the total logging time for this site to be: 1 day

Measurement Type	Scientific Objective	Relevance (1=high, 3=Low)
Neutron-Porosity		
Litho-Density		
Natural Gamma Ray		
Resistivity-Induction		
Acoustic		
FMS		
BHTV		
Resistivity-Laterolog		
Magnetic/Susceptibility		
Density-Neutron (LWD)		
Resitivity-Gamma Ray (LWD)		
Other: Special tools (CORK, PACKER, VSP, PCS, FWS, WSP		

For help in determining logging times, please contact the ODP-LDEO Wireline Logging Services group at:

borehole@ldeo.columbia.edu
http://www.ldeo.columbia.edu/BRG/brg_home.html
Phone/Fax: (914) 365-8674 / (914) 365-3182

Note: Sites with greater than 400 m of penetration or significant basement penetration require deployment of standard toolstrings.

ODP Site Description Forms: Page 4 - Pollution & Safety Hazard Summary

Please fill out information in all gray boxes **New** **Revised**

Proposal #: 486-Rev2	Site #: PAT-7	Date Form Submitted: 15 March 1998

1	Summary of Operations at site: (Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on page 3.)	Triple APC/XCB to basement, MDCB 4.5 m into basement, log with standard suite
2	Based on Previous DSDP/ODP drilling, list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock:	NONE
3	From Available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydrocarbon-bearing deposits.	NONE
4	Are there any indications of gas hydrates at this location?	NO
5	Are there reasons to expect hydrocarbon accumulations at this site? Please give details.	NO
6	What "special" precautions will be taken during drilling?	NONE
7	What abandonment procedures do you plan to follow:	STANDARD
8	Please list other natural or man-made hazards which may effect ship's operations: (e.g. ice, currents, cables)	NONE
9	Summary: What do you consider the major risks in drilling at this site?	NONE

ODP Site Description Forms:

Page 5 - Lithologic Summary

New **Revised**

Proposal #: 486 Rev2	Site #: PAT-7	Date Form Submitted: 15 March 1998

Sub-bottom depth (m)	Key reflectors, Unconformities, faults, etc	Age	Assumed velocity (km/sec)	Lithology	Paleo-environment	Ave. rate of sediment accumulation (m/My)	Comments
0-100		Recent-early Miocene	1.6	carbonate oozes with radiolarian clays and oozes	abyssal pelagic	4 m/Myr	
100-187		Oligocene ?	1.65	carbonates	abyssal pelagic	9 m/Myr	
187-315		Middle - Late Eocene	1.7	calcareous radiolarian oozes and carbonates	abyssal pelagic equatorial high productivity region	11 m/Myr	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-23 (just N of Clipperton FZ, Central Pacific)

7° 41.690'N, 135° 32.693' W

SITE OBJECTIVES

PAT-23 is the 1°S site on the Phase 2 (40 Ma) transect. PAT-23, along with PAT-8C and PAT-21, are of high priority to define equatorial circulation and upwelling from the middle Eocene through the Eocene/Oligocene boundary. The three sites will provide a measure of the gradient of upwelling away from the equator and will allow for some level of error in location of the 40 Ma equatorial position while still being able to measure equatorial processes with confidence. The primary role of PAT-23 will be to monitor equatorial upwelling and evolution of the South Equatorial Current. It will also be used to monitor bottom waters generated in the Antarctic and changes in CCD. At 40 Ma, the backtracked location was 1° S, 107° W based upon a hotspot reference frame (Gripp and Gordon, 1990, for 0-5 Ma Pacific-hot spot rotation pole; Engebretson et al., 1985, for older poles). PAT-23 crossed the equator at about 32 Ma.

GENERAL DESCRIPTION

PAT-23 is situated about 2 degrees north of the Clipperton Fracture Zone in the central tropical Pacific (Fig PAT8-1). It is on a basement swell at 135° W where the Clipperton Fracture Zone bends because of a plate reorganization. We estimate age of basement to be about 40 Ma based upon dating of basement by previous drilling and by assuming spreading rates. No reliable magnetic anomaly data are available between the Clipperton and Clarion Fracture Zones because the crust was formed near the Eocene magnetic equator (Cande et al., 1989) .

EW9709 Survey

PAT-23 was surveyed December 28 1997 with hydrosweep swathmap bathymetry, digital 3.5 kHz subbottom profiling and 80 c.i. watergun seismic reflection profiling aboard the R/V Ewing. The site was also piston cored . PAT-23, while in a region of abyssal hills, has two tectonic fabrics (Fig PAT23-2). The main abyssal fabric continues to strike NNW, while cross-cutting lineations strike to the NNE, at an angle of about 30° to the abyssal hills. This is similar to PAT-8C, 1° to the north. We assume that this grain is related in some way to the plate reorganization that changed the strike of the Clipperton Fracture Zone. The 'bend' in the Clipperton Fracture Zone occurs at 135° W. Sediment thickness at the site is consistently about 350-400 msec TWTT (about 300 m of sediment), with thickening of both the Neogene and Paleogene units from PAT-8 (based on correlation with Mayer et al., 1985, seismic stratigraphy of Site 574). Other evidence that the suficial hiatus becomes younger as the modern equator is approached comes from the piston core. The surficial radiolarian clay at PAT-23 is from near the Late/Middle Miocene boundary, while PAT-8 is middle Miocene and PAT-21 is early Miocene.

LITHOLOGIC DESCRIPTION

Nearest sediment core: EW9709-8P 7° 41.967' N, 135° 32.608' W, 4712 m (uncorr.) 1460 cm sediment.

The top of PC8 is a dark reddish brown radiolarian clay from the *D. petterssoni* zone. Below 1157 cm, the core recovered calcareous radiolarian ooze of the middle Miocene *D. alata* zone.

SEISMIC INTERPRETATION

Primary Site (PAT-23): EW9709 PAT23 seisline 5, 1997 JD 362 22:44:05Z (SP 3042), just S of cross with PAT23 seisline 2

Priority: 2
Crustal age: 40 Ma (?)
Location: 7° 41.690' N 135° 32.693' W
Site water depth: 4699 m (6.265 sec TWTT)
Sediment thickness: 0.400 sec (340 m)
Proposed Drilling Depth: 345 m

PAT-23 was chosen just south of the intersection of PAT23 seisline 5 and PAT23 seisline 2 because of relatively flat surface topography, in a relatively large basin (Figure PAT8-3). This region is also relatively removed from the seamount in the NE corner of the survey. . The 3.5 kHz lines (Figure PAT8-4) show a thin acoustically transparent layer that probably equates with the radiolarian clay in the top 11 m of the piston core.

GEOLOGIC HAZARDS

There are no known geologic hazards--pelagic sediments over oceanic basalts.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA from EW9709

seismic lines submitted:

EW9709 PAT23 seisline 1
EW9709 PAT23 seisline 2
EW9709 PAT23 seisline 3
EW9709 PAT23 seisline 4
EW9709 PAT23 seisline 5

3.5 kHz lines submitted:

EW9709 PAT23 35line 1
EW9709 PAT23 35line 2
EW9709 PAT23 35line 3
EW9709 PAT23 35line 4
EW9709 PAT23 35line 5

FIGURES

Fig PAT23-1: Location map for PAT-23, on GEBCO bathymetry. Proposed drill site is marked.
Fig PAT23-2: Swathmap bathymetry for the PAT-23 region, from the EW9709 site survey. Proposed drill site is marked.
Fig PAT23-3: Seismic profile PAT23-seisline 5 across PAT-23, from EW9709. Proposed drill site

is marked.

Fig PAT23-4: 3.5 kHz subbottom profile PAT23-35line 5 across PAT-23, from EW9709. Proposed drill site is marked

REFERENCES

Engebretson, D.C., A. Cox, and R. G. Gordon (1985) Relative motions between oceanic and continental plates in the Pacific basin. *Geol. Soc. Amer. Special Paper 206.*

Gripp, A.E., and R.G. Gordon (1990). Current plate velocities relative to the hotspots incorporating the NUVEL-1 global plate motion model. *Geophys. Res. Lett., 17,* 1109-1112.

Cande, S.C., J.L. LaBrecque, R.L. Larson, W.C. Pitman III, X. Golovchenko, and W.F. Haxby (1989) Magnetic lineations of the world's ocean basins. *American Association of Petroleum Geologists Map Series.*

Cande, S.C., and D.V. Kent (1995) Revised calibration of the geomagnetic polarity timescale for the Late Cretaceous and Cenozoic. *J. Geophys. Res., 100,* 6093-6095.

Mayer, L.A., T.H. Shipley, F. Theyer, R.H. Wilkens, and E.L. Winterer (1985) Seismic modeling and paleoceanography at Deep Sea Drilling Project Site 474. *Init Repts DSDP, 85*, Washington: US Gov't Printing Office, 947-970.

Shipley, T.H., E.L. Winterer, M. Goud, S.J. Hills, C.V. Metzler, C.K. Paull, and J.T. Shay (1985) Seabeam bathymetric and water-gun seismic surveys in the equatorial Pacific. *Init Repts DSDP, 85*, Washington: US Gov't Printing Office, 825-837.

Figure PAT23-1: Location map for PAT-23 on GEBCO bathymetry.

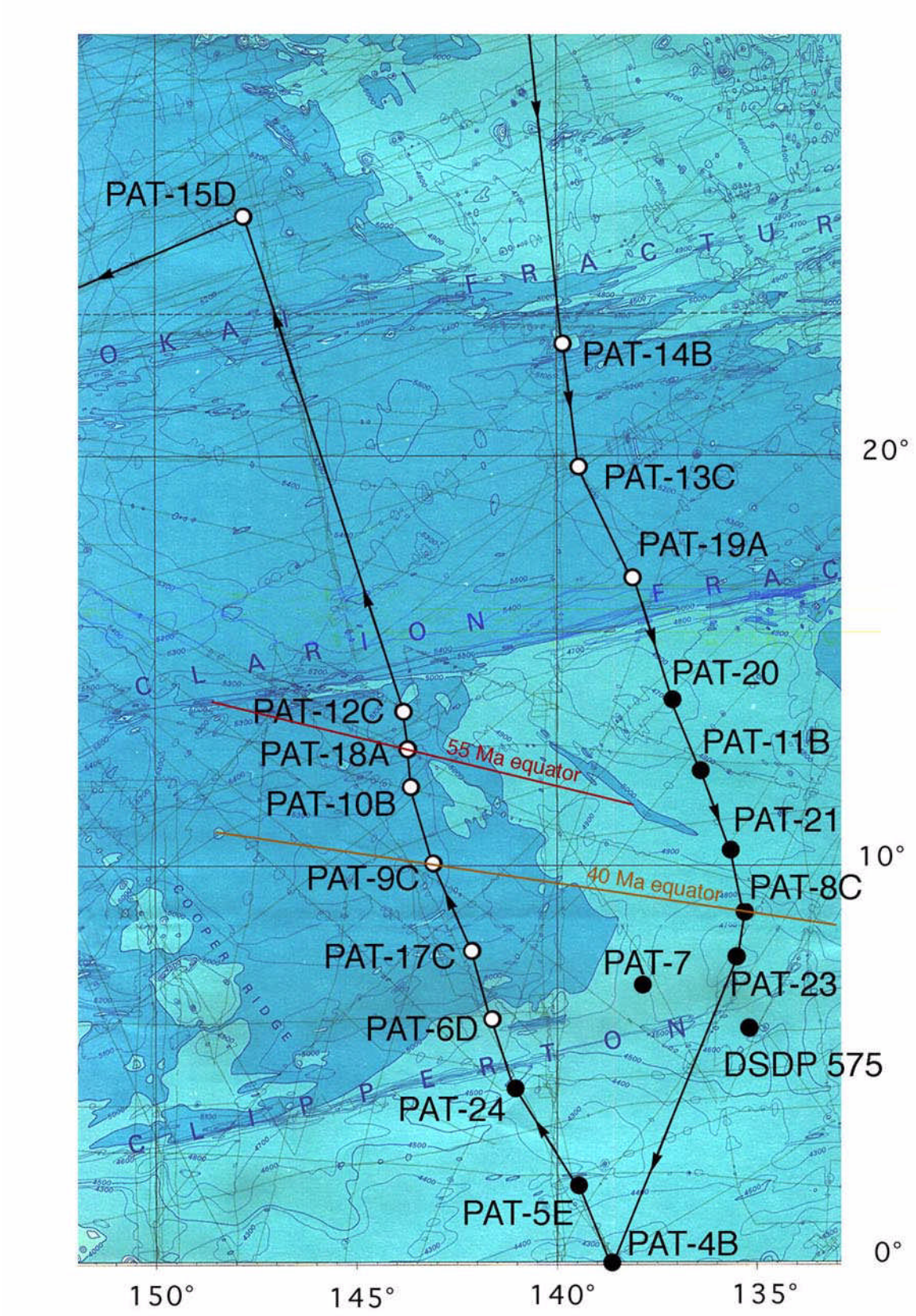


Figure PAT23-2: Swathmap bathymetry for the PAT-23 region, from the EW9709 site survey.

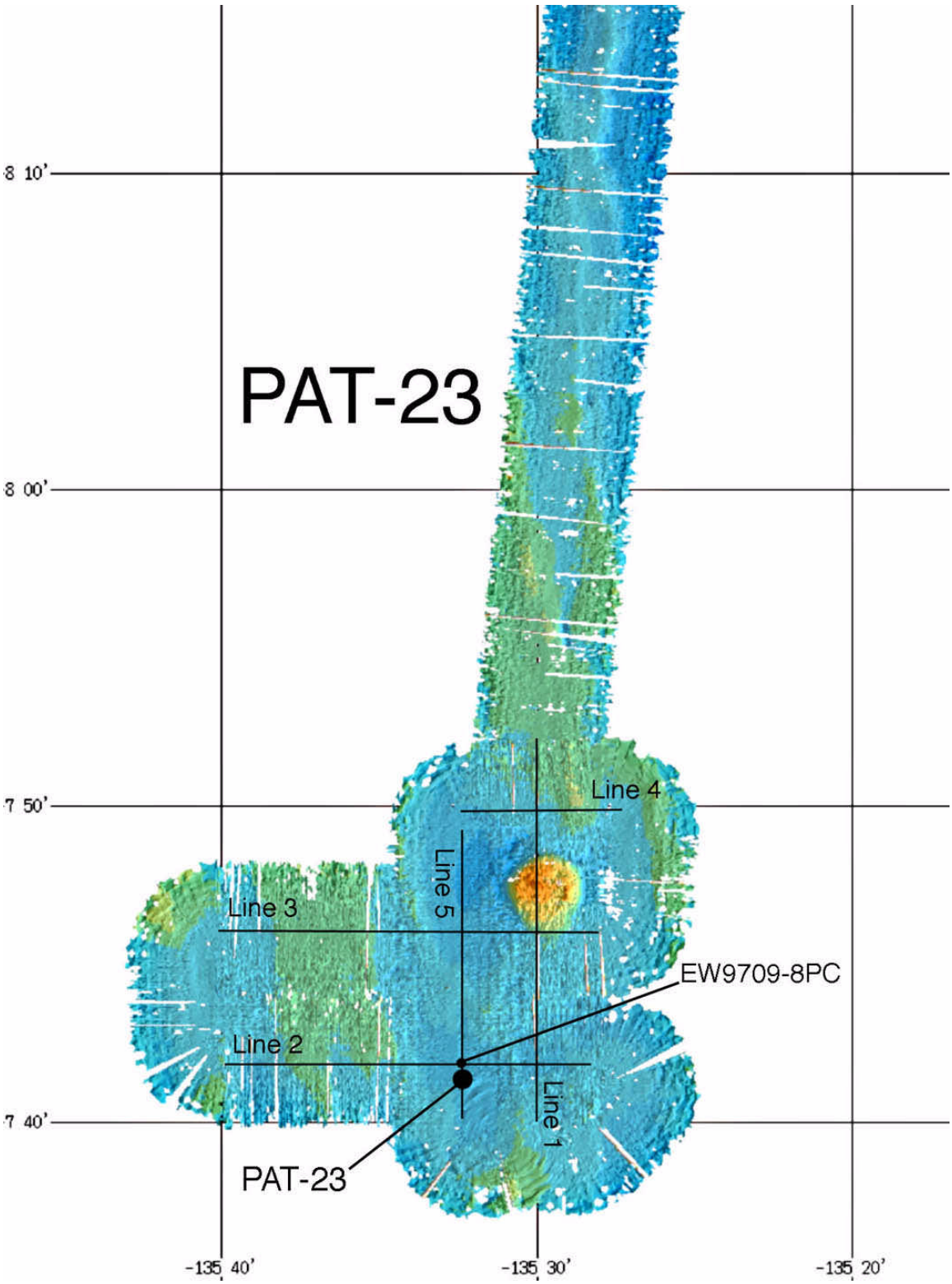


Figure PAT23-3: The seismic profile PAT23-seisline 5 across PAT-23, from EW9709.

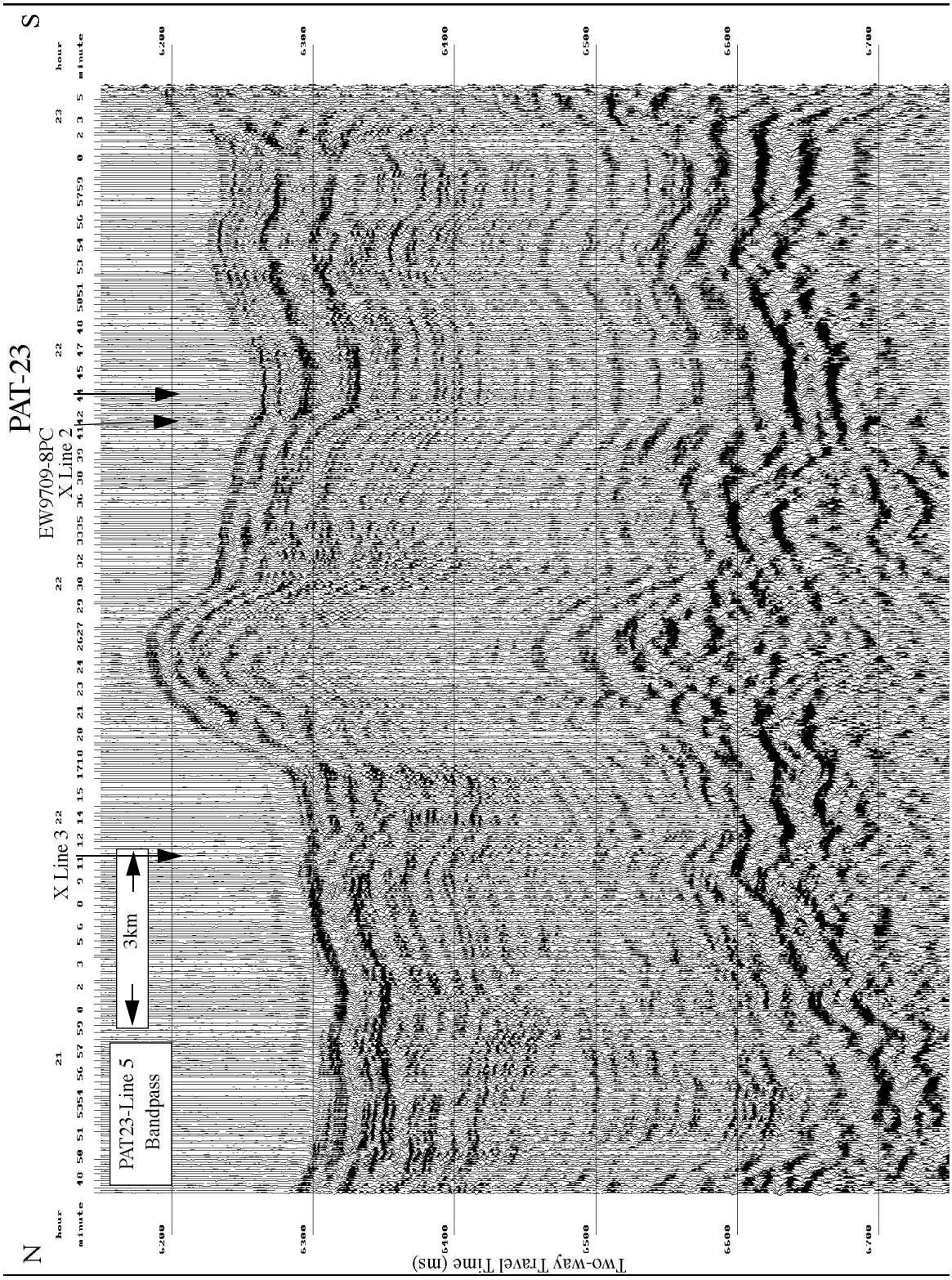
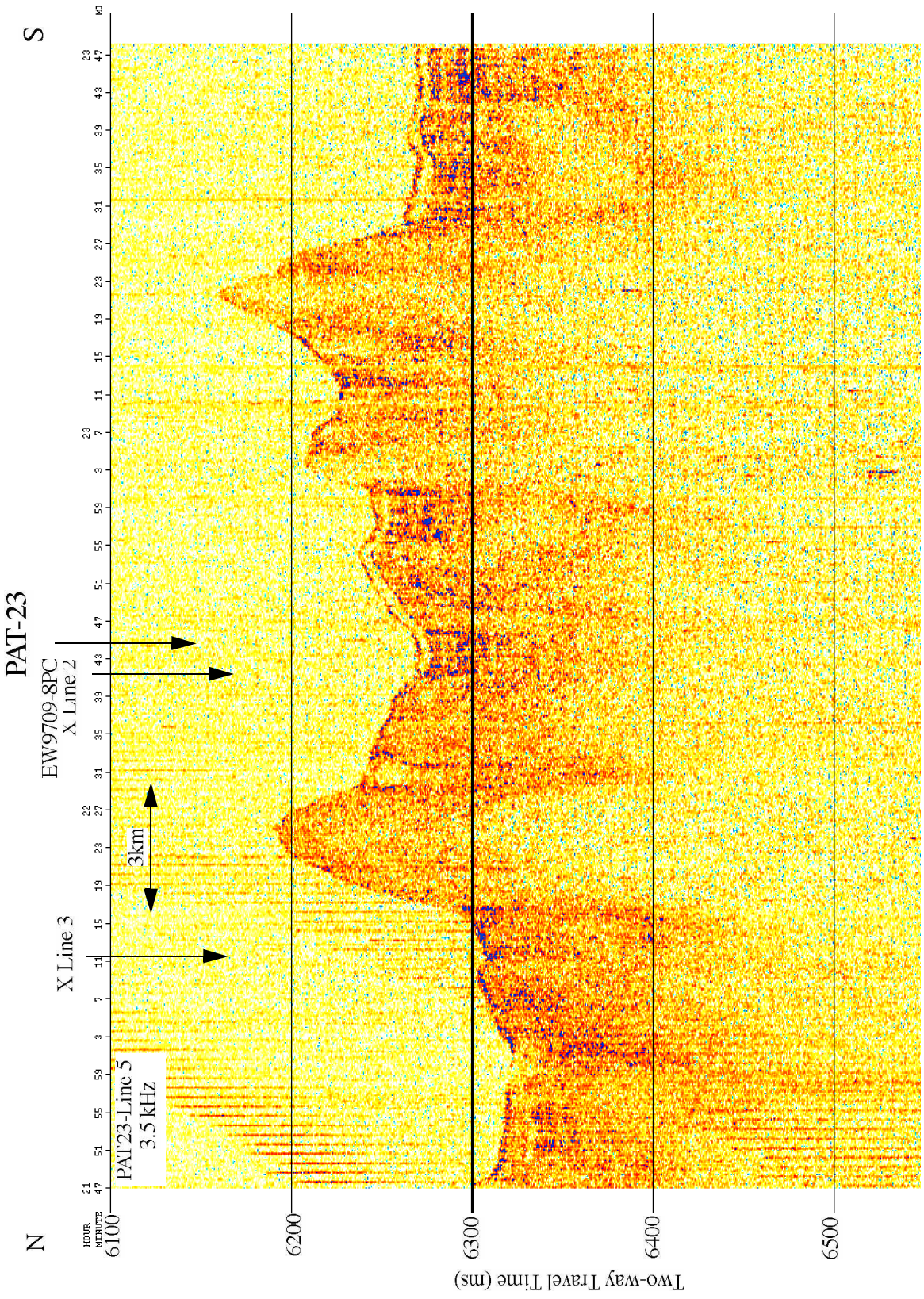


Figure PAT23-4: The 3.5 kHz subbottom profile PAT23-35line 5 across PAT23, from EW9709.



ODP Site Description Forms:

Page 1 - General Site Information

Please fill out information in all gray boxes

New **Revised**

Section A: Proposal Information

Title of Proposal	Paleocene Equatorial Pacific APC Transect
Proposal Number:	486-Rev2
Date Form Submitted:	15 March 1998
Site Specific Objectives (Must include general objectives in proposal)	Eocene/Oligocene Transition (40 Ma transect) equatorial circulation, SEC strength and position, CCD, bottom water formation
List Previous Drilling in Area:	DSDP 575 (Neogene section only)

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-23	If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #	Area or Location:	Central Pacific Ocean
Latitude °N:	Deg: 7	Min: 41.690	Jurisdiction:	none
Longitude °W:	Deg: 135	Min: 32,693	Distance to Land:	>1000 km
Priority of Site:	Primary: 2	Alt:	Water Depth:	4699 m (uncorr.; 6.265 sec TWTT))

Section C: Operational Information

	Sediments. What is the total sed. thickness? 340 m	Basement
Proposed Penetration (m)	340 m	4.5 m
General Lithologies:	rad. clay, calc. rad ooze, foram ooze	MORB

Coring Plan (circle): 1-2-3-APC VPC* XCB MDCB* PCS RCB Re-entry HRGB

** Systems Currently Under Development*

Logging Plan: standard tool strings	Standard Tools		Special Tools	LWD
	Triple-Combo Neutron-Porosity Litho-Density Natural Gamma Ray Resistivity-Induction	FMS-Sonic Acoustic FMS	Borehole Televiewer Geochemical Resistivity-Laterolog High Temperature Magnetic/Susceptibility	Density-Neutron Resitivity-Gamma Ray

Estimated days:	Drilling/Coring: 5.9	Logging: 1.0	Total On-Site: 6.9
Hazards/ Weather	*List possible hazards due to ice, hydrocarbons, dumpsites, cables, etc.* none		*What is your Weather Window?* all year

Instructions:

Please fill out these forms for each site that you are proposing to drill, including as much detail as possible. The following table describes the purpose of each page, what information is needed, and when each page should be submitted.

Page	Information needed	Used By	When to submit	Contact for more information
1	General Info. about proposals, site location and basic operational needs	JOIDES Office, Data Bank, Logging Group, ODP/TAMU, SSP, PPSP	When submitting preliminary proposal and when updating site information.	JOIDES Office email: joides@whoi.edu www: http://www.whoi.edu/joides/
2	Information regarding site survey data available and to-be-collected	JOIDES Office, Data Bank, SSP, PPSP	When submitting full proposal and when updating site survey information	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
3	Detailed Logging Plan	JOIDES Office, Logging Group, ODP/TAMU	When submitting full proposal and when updating logging plan	ODP-LDEO Wireline Logging Services email: borehole@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/BRG/brg_home.html
4	Lithologic Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
5	Pollution and Safety Hazard Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/

ODP Site Description Forms:

Page 2 - Site Survey Detail

Please fill out information in all gray boxes

New **Revised**

Proposal #: 486-Rev2	Site #: PAT-23	Date Form Submitted: 15 March 1998

	Data Type	SSP Requir-ements	Exists In DB	Details of available data and data that are still to be collected
1	High resolution seismic reflection	X		Primary Line(s): Location of Site on line (SP or Time only) EW9709 PAT23 seisline 5 22:44:05 gmt JD362 , SP 3042 Crossing Lines(s): EW9709 PAT23 seisline 2
2	Deep Penetration seismic reflection			Primary Line(s): Location of Site on line (SP or Time only) Crossing Lines(s):
3	Seismic Velocity◊			
4	Seismic Grid	Y		EW9709
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709 35line 5 and EW9709 35line 2
7	Swath bathymetry	Y		EW9709
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709
11b	Gravity			
12	Sediment cores	X		EW9709 8PC
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709
17	Other			

SSP Classification of Site:	SSP Watchdog:	Date of Last Review:
SSP Comments:		

X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites; R=required for re-entry sites; T=required for high temperature environments; ◊Accurate velocity information is required for holes deeper than 400m.

ODP Site Description Forms: Page 3 - Detailed Logging Plan

New **Revised**

Proposal #:486-Rev2	Site #: PAT-23	Date Form Submitted: 15 March 1998
Water Depth (m): 4696 (uncorr.)	Sed. Penetration (m): 340	Basement Penetration (m): 5

Do you need to use the conical side-entry sub (CSES) at this site? Yes No X

Are high temperatures expected at this site? Yes No X

Are there any other special requirements for logging at this site? Yes No X Standard logging suite

If "Yes" Please describe requirements: _____

What do you estimate the total logging time for this site to be: 1 day

Measurement Type	Scientific Objective	Relevance (1=high, 3=Low)
Neutron-Porosity		
Litho-Density		
Natural Gamma Ray		
Resistivity-Induction		
Acoustic		
FMS		
BHTV		
Resistivity-Laterolog		
Magnetic/Susceptibility		
Density-Neutron (LWD)		
Resitivity-Gamma Ray (LWD)		
Other: Special tools (CORK, PACKER, VSP, PCS, FWS, WSP		

For help in determining logging times, please contact the ODP-LDEO Wireline Logging Services group at:

borehole@ldeo.columbia.edu
http://www.ldeo.columbia.edu/BRG/brg_home.html
Phone/Fax: (914) 365-8674 / (914) 365-3182

Note: Sites with greater than 400 m of penetration or significant basement penetration require deployment of standard toolstrings.

ODP Site Description Forms: Page 4 - Pollution & Safety Hazard Summary

Please fill out information in all gray boxes **New** **Revised**

Proposal #: 486-Rev2	Site #: PAT-23	Date Form Submitted: 15 March 1998

1	Summary of Operations at site: (Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on page 3.)	Triple APC/XCB to basement, MDCB 4.5 m into basement, log with standard suite
2	Based on Previous DSDP/ODP drilling, list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock:	NONE
3	From Available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydrocarbon-bearing deposits.	NONE
4	Are there any indications of gas hydrates at this location?	NO
5	Are there reasons to expect hydrocarbon accumulations at this site? Please give details.	NO
6	What "special" precautions will be taken during drilling?	NONE
7	What abandonment procedures do you plan to follow:	STANDARD
8	Please list other natural or man-made hazards which may effect ship's operations: (e.g. ice, currents, cables)	NONE
9	Summary: What do you consider the major risks in drilling at this site?	NONE

ODP Site Description Forms: Page 5 - Lithologic Summary

New **Revised**

Proposal #: 486 Rev2	Site #: PAT-23	Date Form Submitted: 15 March 1998

Sub-bottom depth (m)	Key reflectors, Unconformities, faults, etc	Age	Assumed velocity (km/sec)	Lithology	Paleo-environment	Ave. rate of sediment accumulation (m/My)	Comments
0-122		Recent-early Miocene	1.60	radiolarian clays and calc. rad. oozes	abyssal pelagic	5 m/Myr	
122-205		Oligocene ?	1.70	carbonates	abyssal pelagic equatorial high productivity region	9 m/Myr	
205-340		Middle - Late Eocene	1.80	calcareous radiolarian oozes and carbonates, and silicified chalks	abyssal pelagic equatorial high productivity region	23 m/Myr	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-21 (Central Pacific, between Clipperton and Clarion FZ)

10° 12.185’ N, 135° 31.994’W

SITE OBJECTIVES

PAT-21 is the 1° N site of the Phase 2 (40 Ma) transect and will be one of the sites used to define equatorial circulation and sedimentation from the middle Eocene through the Eocene/Oligocene boundary. Its primary role will be to monitor divergence at the equator and to define the northern edge of the South Equatorial Current. It will also be used to monitor bottom waters generated in the Antarctic and to monitor CCD changes. At 40 Ma, the backtracked location was 1°N, 108° W based upon a hotspot reference frame (Gripp and Gordon, 1990, for 0-5 Ma Pacific-hot spot rotation pole; Engebretson et al., 1985, for older poles).

GENERAL DESCRIPTION

PAT-21 is situated between the Clipperton and Clarion Fracture Zones, in abyssal hill topography (Figure PAT21-1). Sediment deposition was almost nil after the early Miocene because of a shallowing CCD and because the site was situated about 5 degrees north of the equator by then. We estimate age of basement to be about 40 Ma based upon dating of basement by previous drilling and by assuming spreading rates. No reliable magnetic anomaly data are available between the Clipperton and Clarion Fracture Zones because the crust was formed near the Eocene magnetic equator (Cande et al., 1989) .

EW9709 Survey

PAT-21 was surveyed in December 1997 with Hydrosweep swathmap bathymetry, digital 3.5 kHz subbottom profiling and 80 c.i. watergun seismic reflection profiling aboard the R/V Ewing. The site was also piston cored. PAT-21 is located in abyssal hill topography striking NNE with a wavelength of roughly 10 km (Figure PAT21-2). Maximum relief in the survey region is about 150 m. Sediment cover is in the range of 200-300 msec (160-240 m). The drillsite was chosen along the first survey line, which ran roughly down the middle of one of the abyssal valleys. We avoided the highest amplitude reflectors above basement to minimize the likelihood of hitting chert.

LITHOLOGIC DESCRIPTION

Nearest Sediment Core: EW9709-6PC 10° 15.094’ N, 135° 35.989’ W, 4892 m (uncorr) 1428 cm.

EW9709-6PC recovered lower Miocene radiolarian clays, with some calcareous radiolarian ooze. The core catcher sampled the lower Miocene *C. tetrapera/S.delmontensis* zone, while 3 m further up core the sediments are from the *S. delmontensis/S. wolffii* zone. Orospaerid fragments are common in all the lower sediment samples. The top 10 m of

sediment are red clays with no fossils, only clay aggregates.

SEISMIC INTERPRETATION

Primary Site (PAT-21): EW9709 PAT21 seisline 1 1997 JD360 19:35:18 gmt, SP 497.

Priority: 2
Crustal age: 40 Ma (?)
Location: 10° 12.224' N 135° 31.992' W
Site water depth: 4914 m (uncorr.; 6.552 sec TWTT)
Sediment thickness: 0.281 sec (226 m)
Proposed Drilling Depth: 231 m

PAT-21 was chosen in a graben with relatively thick sediment and flat topography. Based upon dates from the piston core and seismic character, we interpret the upper high frequency reflectors in the upper 40 msec of the sediment column to be the eM-Y and eM-O reflector sequence (Mayer et al., 1985). We believe that the high amplitude low frequency reflector sequence beginning about 6739 msec TWTT and extending to the basement is Eocene. Similar reflectors are found at the base of Site 574, which drilled Late Eocene age basement.

GEOLOGIC HAZARDS

There are no known geologic hazards--pelagic sediments over oceanic basalts.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 3/98

The following EW9709 data are being submitted:

seismic data :

PAT21 seisline 1
PAT21 seisline 2
PAT21 seisline 3
PAT21 seisline 4
PAT21 seisline 5
PAT21 seisline 6

3.5 kHz data:

PAT21 35line 1
PAT21 35line 2
PAT21 35line 3
PAT21 35line 4
PAT21 35line 5
PAT21 35line 6

FIGURES

Fig PAT21-1: Location map for PAT-21, on GEBCO bathymetry. Proposed drill site is marked.
Fig PAT21-2: Swathmap bathymetry for the PAT-21 region, from the EW9709 site survey. Proposed drill site is marked.
Fig PAT21-3: Seismic profile PAT21-seisline 1 across PAT-21, from EW9709. Proposed drill site

is marked.

Fig PAT21-4: 3.5 kHZ subbottom profile PAT21-35line 3 across PAT-21, from EW9709. Proposed drill site is marked

REFERENCES

Cande, S.C., J.L. LaBrecque, R.L. Larson, W.C. Pitman III, X. Golovchenko, and W.F. Haxby (1989) Magnetic lineations of the world's ocean basins. *American Association of Petroleum Geologists Map Series.*

Cande, S.C., and D.V. Kent (1995) Revised calibration of the geomagnetic polarity timescale for the Late Cretaceous and Cenozoic. *J. Geophys. Res., 100,* 6093-6095.

Engebretson, D.C., A. Cox, and R. G. Gordon (1985) Relative motions between oceanic and continental plates in the Pacific basin. *Geol. Soc. Amer. Special Paper 206.*

Gripp, A.E., and R.G. Gordon (1990). Current plate velocities relative to the hotspots incorporating the NUVEL-1 global plate motion model. *Geophys. Res. Lett., 17,* 1109-1112.

Mayer, L. A., T. H. Shipley, F. Theyer, R.H. Wilkens, and E. L. Winterer (1985) Seismic modeling and paleoceanography at Deep Sea Drilling Project Site 574. *in* Mayer, L., Theyer, F. et al. Init Repts DSDP, 85: Washington (US Gov't Printing Office) 947-970.

Figure PAT21-1: Location map for PAT-21 on GEBCO bathymetry.

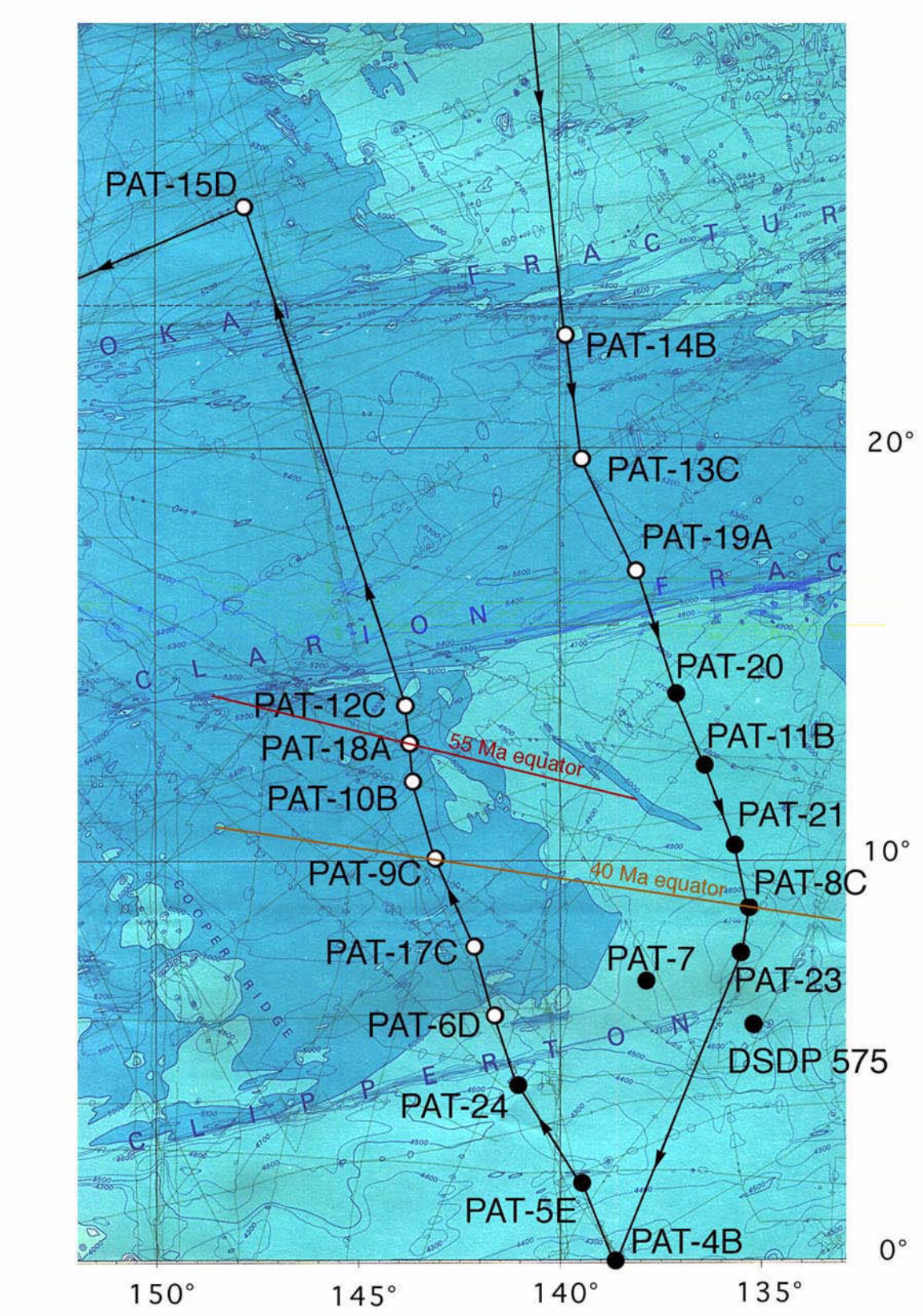


Figure PAT21-2: Swathmap bathymetry for the PAT-21 region, from the EW9709 site survey cruise.

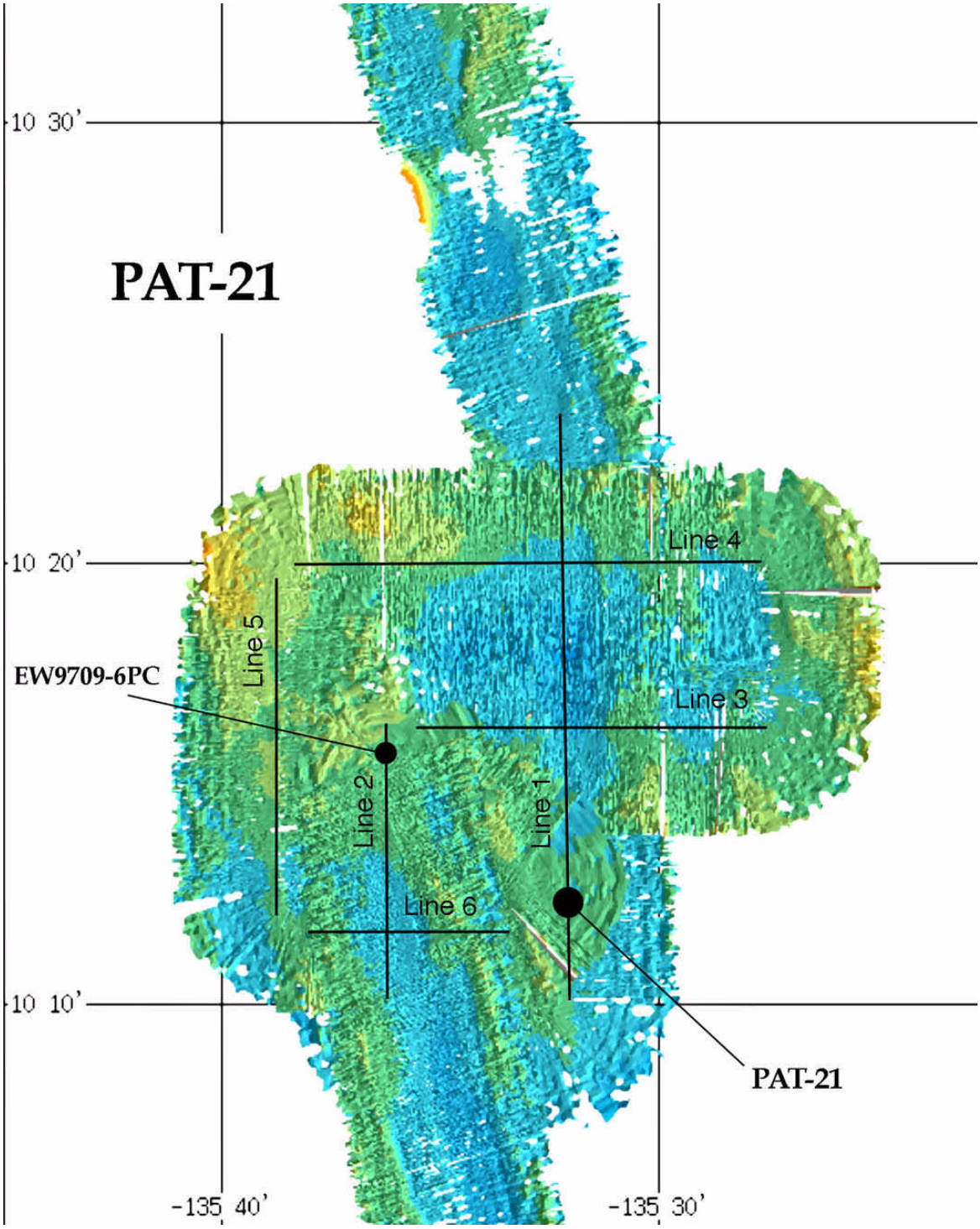


Figure PAT21-3: The seismic profile PAT21-seisline 1 across PAT-21, from EW9709.

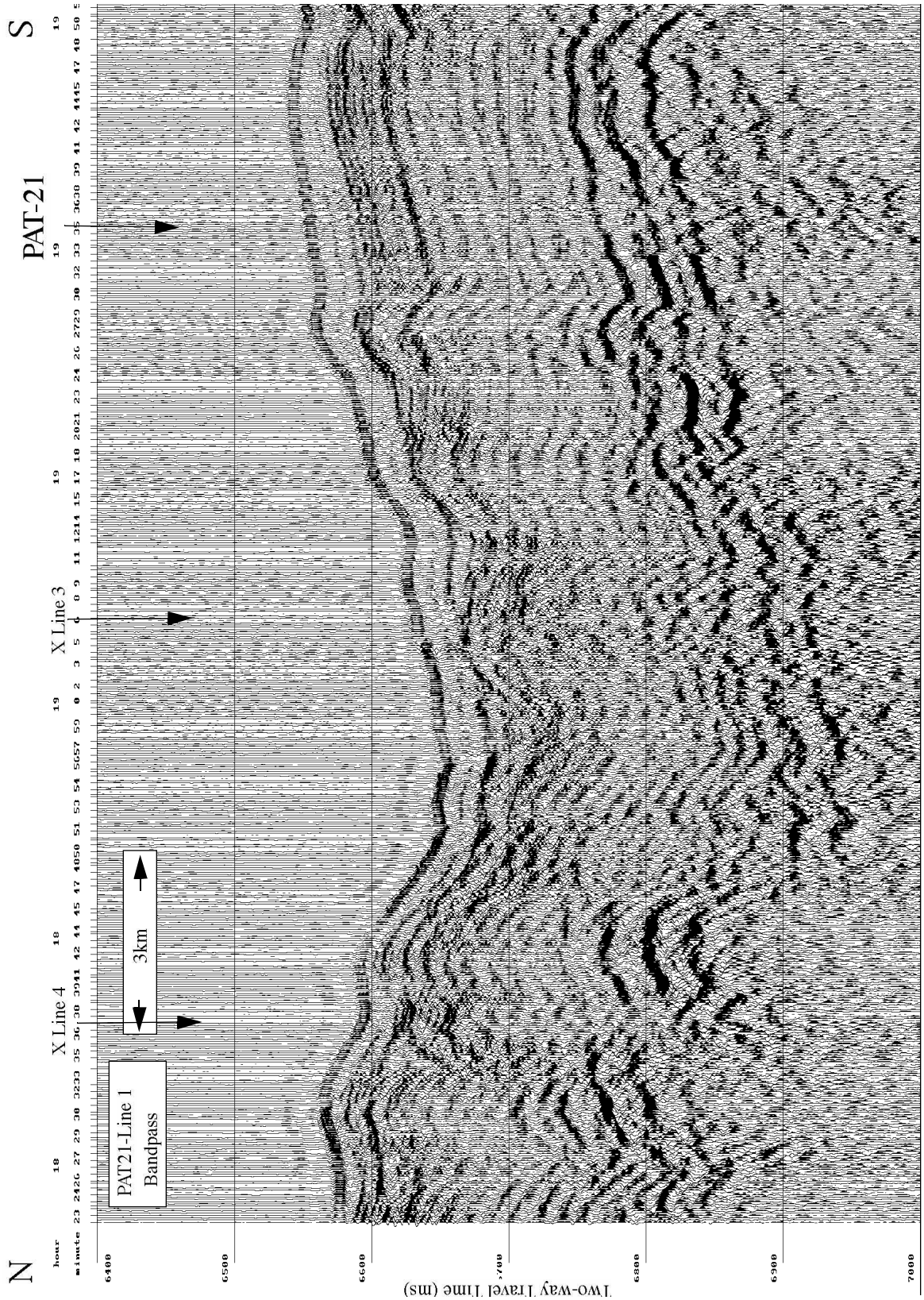
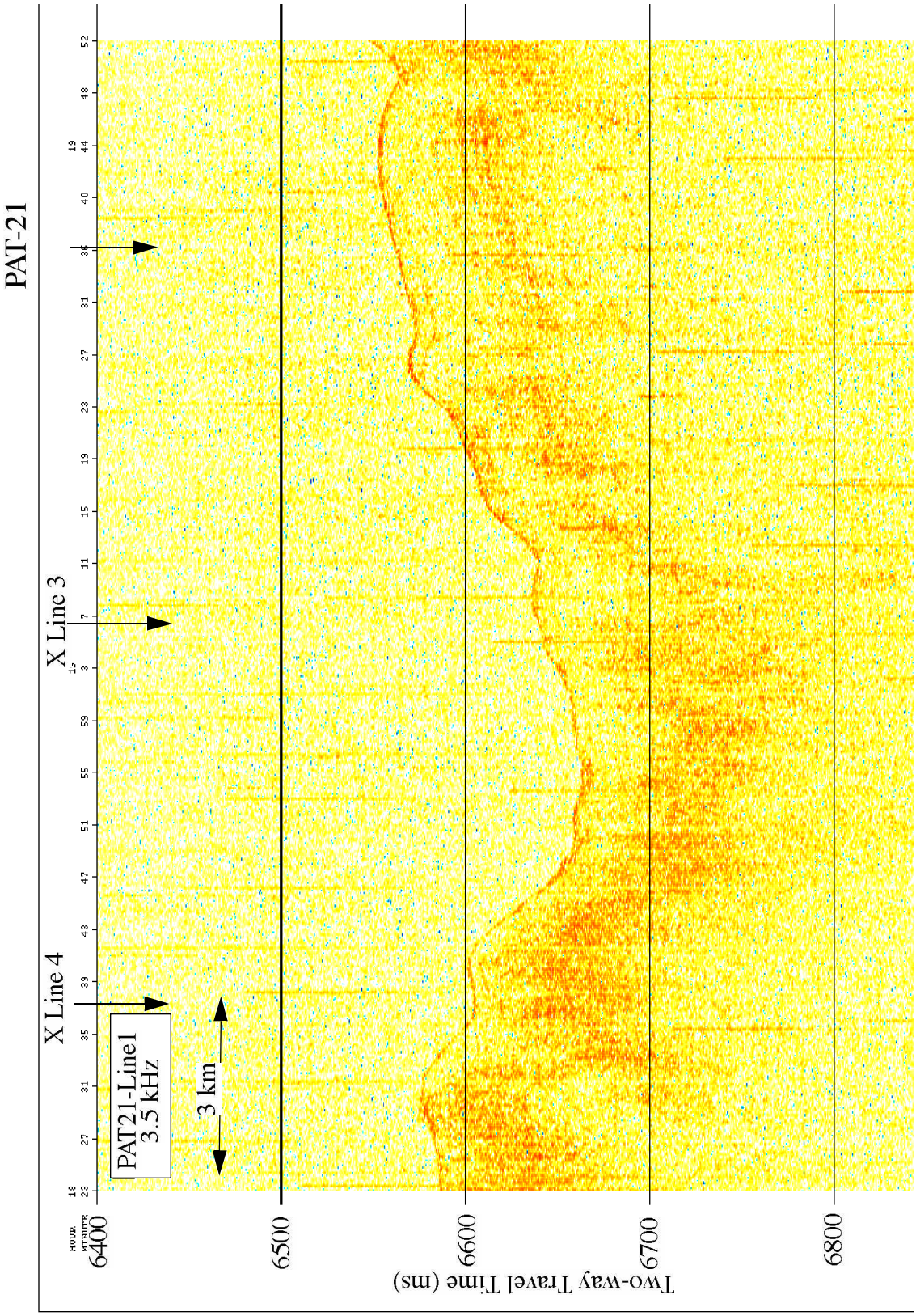


Figure PAT21-4: The 3.5 kHz subbottom profile PAT21-35line 1 across PAt-21, from EW9709



ODP Site Description Forms:

Page 1 - General Site Information

Please fill out information in all gray boxes

New **Revised**

Section A: Proposal Information

Title of Proposal	Paleocene Equatorial Pacific APC Transect
Proposal Number:	486-Rev2
Date Form Submitted:	15 March 1998
Site Specific Objectives (Must include general objectives in proposal)	Paleogene-Neogene Transition monitor changes in equatorial devergent upwelling/productivity, define the northern edge of SEC and changes in paleo-CCD.
List Previous Drilling in Area:	DSDP Site 161 (>250 km away)

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-21 (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)		Area or Location:	Central Pacific Ocean
Latitude:	Deg: 10	Min: 12.185 N	Jurisdiction:	none
Longitude:	Deg: 135	Min: 31.994 W	Distance to Land:	>1000 km
Priority of Site:	Primary: 2	Alt:	Water Depth:	4914 m (uncorr; 6.552 sec)

Section C: Operational Information

	Sediments.What is the total sed. thickness? 226 m	Basement
Proposed Penetration (m)	226 meters	4.5 meters
General Lithologies:	radiolarian clay, calcareous rad ooze	MORB

Coring Plan (circle): 1-2-3-APC VPC* XCB MDCB* PCS RCB Re-entry HRGB

** Systems Currently Under Development*

Logging Plan:	Standard Tools		Special Tools	LWD
	Triple-Combo Neutron-Porosity Litho-Density Natural Gamma Ray Resistivity-Induction	FMS-Sonic Acoustic FMS	Borehole Televiewer Geochemical Resistivity-Laterolog High Temperature Magnetic/Susceptibility	Density-Neutron Resitivity-Gamma Ray

Quad Combo

Estimated days:	Drilling/Coring:	Logging:	Total On-Site:
	4.3 days	0.5 days	4.8 days

Hazards/ Weather	*List possible hazards due to ice, hydrocarbons, dumpsites, cables, etc.*	*What is your Weather Window?*
	none	all year

Instructions:

Please fill out these forms for each site that you are proposing to drill, including as much detail as possible. The following table describes the purpose of each page, what information is needed, and when each page should be submitted.

Page	Information needed	Used By	When to submit	Contact for more information
1	General Info. about proposals, site location and basic operational needs	JOIDES Office, Data Bank, Logging Group, ODP/TAMU, SSP, PPSP	When submitting preliminary proposal and when updating site information.	JOIDES Office email: joides@whoi.edu www: http://www.whoi.edu/joides/
2	Information regarding site survey data available and to-be-collected	JOIDES Office, Data Bank, SSP, PPSP	When submitting full proposal and when updating site survey information	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
3	Detailed Logging Plan	JOIDES Office, Logging Group, ODP/TAMU	When submitting full proposal and when updating logging plan	ODP-LDEO Wireline Logging Services email: borehole@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/BRG/brg_home.html
4	Lithologic Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
5	Pollution and Safety Hazard Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/

ODP Site Description Forms:

Page 2 - Site Survey Detail

Please fill out information in all gray boxes

New **Revised**

Proposal #: 486-Rev2	Site #: PAT-21	Date Form Submitted: 15 March 1998

	Data Type	SSP Requir-ements	Exists In DB	Details of available data and data that are still to be collected
1	High resolution seismic reflection	X		Primary Line(s): Location of Site on line (SP or Time only) EW9709 PAT21 siesline 1 1997 JD360 19:35:18, SP 497 Crossing Lines(s):
2	Deep Penetration seismic reflection			Primary Line(s): Location of Site on line (SP or Time only) Crossing Lines(s):
3	Seismic Velocity◊			
4	Seismic Grid	Y		EW9709 PAT-21 survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709 PAT-21 survey
7	Swath bathymetry	Y		EW9709 PAT-21 survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709 PAT-21 survey
11b	Gravity			
12	Sediment cores	X		EW9709-6PC
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709 PAT-21 survey
17	Other			

SSP Classification of Site:	SSP Watchdog:	Date of Last Review:
SSP Comments:		

X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites; R=required for re-entry sites; T=required for high temperature environments; ◊Accurate velocity information is required for holes deeper than 400m.

ODP Site Description Forms: Page 3 - Detailed Logging Plan

New **Revised**

Proposal #:486-Rev2	Site #: PAT-21	Date Form Submitted: 15 March 1998
Water Depth (m): 4850	Sed. Penetration (m): 226	Basement Penetration (m): 5

Do you need to use the conical side-entry sub (CSES) at this site? Yes No X

Are high temperatures expected at this site? Yes No X

Are there any other special requirements for logging at this site? Yes No X Quad combo

If "Yes" Please describe requirements: _____

What do you estimate the total logging time for this site to be: 0.5 days

Measurement Type	Scientific Objective	Relevance (1=high, 3=Low)
Neutron-Porosity		
Litho-Density		
Natural Gamma Ray		
Resistivity-Induction		
Acoustic		
FMS		
BHTV		
Resistivity-Laterolog		
Magnetic/Susceptibility		
Density-Neutron (LWD)		
Resitivity-Gamma Ray (LWD)		
Other: Special tools (CORK, PACKER, VSP, PCS, FWS, WSP		

For help in determining logging times, please contact the ODP-LDEO Wireline Logging Services group at:

borehole@ldeo.columbia.edu
http://www.ldeo.columbia.edu/BRG/brg_home.html
Phone/Fax: (914) 365-8674 / (914) 365-3182

Note: Sites with greater than 400 m of penetration or significant basement penetration require deployment of standard toolstrings.

ODP Site Description Forms: Page 4 - Pollution & Safety Hazard Summary

Please fill out information in all gray boxes **New** **Revised**

Proposal #: 486-Rev2	Site #: PAT-21	Date Form Submitted: 15 March 1998

1	Summary of Operations at site: (Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on page 3.)	Triple APC/XCB to basement, MDCB 4.5 m into basement, log with Quad Combo
2	Based on Previous DSDP/ODP drilling, list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock:	NONE
3	From Available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydro-carbon-bearing deposits.	NONE
4	Are there any indications of gas hydrates at this location?	NO
5	Are there reasons to expect hydrocarbon accumulations at this site? Please give details.	NO
6	What "special" precautions will be taken during drilling?	NONE
7	What abandonment procedures do you plan to follow:	STANDARD
8	Please list other natural or man-made hazards which may effect ship's operations: (e.g. ice, currents, cables)	NONE
9	Summary: What do you con-sider the major risks in drilling at this site?	NONE

ODP Site Description Forms: **Page 5 - Lithologic Summary**

New **Revised**

Proposal #: 486 Rev2	Site #: PAT-21	Date Form Submitted: 15 March 1998

Sub-bottom depth (m)	Key reflectors, Unconformities, faults, etc	Age	Assumed velocity (km/sec)	Lithology	Paleo-environment	Ave. rate of sediment accumulation (m/My)	Comments
0-61	eM-O	Miocene to Recent	1.56	siliceous clays and siliceous carbonates	equatorial current system	2 m/my	
61-148?		Oligocene	1.60	carbonates	equatorial current system	10 m/my	
148-226		middle and upper Eoc.	1.65	siliceous carbonates	equatorial high productivity zone	13 m/my	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-11B (Central Pacific, between Clipperton and Clarion FZ)

12° 10.417’ N, 136° 00.956’W

SITE OBJECTIVES

PAT-11B is the 3° N site of the Phase 2 (40 Ma) transect and will be one of the sites used to define equatorial circulation and sedimentation from the middle Eocene through the Eocene/Oligocene boundary. Its primary role will be to monitor the surface waters of the boundary between the South Equatorial Current and the North Equatorial Countercurrent. It will also be used to monitor bottom waters generated in the Antarctic and to monitor CCD changes. At 40 Ma, the backtracked location was 3°N, 108° W based upon a hotspot reference frame (Gripp and Gordon, 1990, for 0-5 Ma Pacific-hot spot rotation pole; Engebretson et al., 1985, for older poles).

GENERAL DESCRIPTION

PAT-11B is situated between the Clipperton and Clarion Fracture Zones, in abyssal hill topography (Figure PAT11-1). The region has basically a hiatus in sediment deposition after the early Miocene because it is below the CCD. We estimated age of basement to be about 40 Ma based upon dating of basement by previous drilling and by assuming spreading rates. No reliable magnetic anomaly data are available between the Clipperton and Clarion Fracture Zones because the crust was formed near the Eocene magnetic equator (Cande et al., 1989) .

EW9709 Survey

PAT-11B was surveyed in December 1997 with hydrosweep swathmap bathymetry, digital 3.5 kHz subbottom profiling and 80 c.i. watergun seismic reflection profiling aboard the R/V Ewing. The site was also piston cored. PAT-11B is located in abyssal hill topography striking NNE with a wavelength of roughly 15-20 km (Figure PAT11-2). Bathymetric relief is somewhat higher than at PAT-20, being on the order of 250 m between hills and valleys. Sediment cover is in the range of 150-250 msec (120-200 m) and thins over rapid topographic changes. The site we chose is within a small graben on one of the abyssal hills. Line 3 was run along strike in this graben (Figure PAT11-3). It shows the low frequency reflectors near the bottom of the section which we interpret to be the Eocene section. We chose PAT-11B in a spot where these reflectors had lower amplitude to avoid possible cherts.

LITHOLOGIC DESCRIPTION

Nearest Sediment Core: EW9709-5PC 12° 13.52’ N, 136° 01.55’ W, 4960 m (uncorr) 1168 cm.

EW9709-5PC recovered Mn nodules at the top of the core. The sediment is very firm,

grading from calcareous radiolarian ooze at the base to radiolarian clay at the top. The core catcher sample is from the earliest Miocene *L. elongata* zone. Overlying sections contain the younger *C. tetrapera* and *S. delmontensis* zones. Radiolaria in the uppermost section are almost totally dissolved. The lowermost sections are not rich in carbonate and the upper 3 m almost totally lack carbonate.

Nearest Drillsite: DSDP Site 161, 10° 14.25'N, 139° 57.21' W, 4939 mbsl, 245 m sediment.

The sediment recovered at DSDP Site 161 is marked by a hiatus from the early Miocene to the recent (2 m of radiolarian clay). the Oligocene carbonate section starts at about 18 mbsf and continues to about 200 mbsf. Below 155 mbsf, the carbonate ooze has lithified to chalk. The Eocene section extends from 200-245 mbsf, and is marked by late-middle Eocene 'radiolarites, locally calcareous'. Although these radiolarites were indurated, no chert was encountered.

SEISMIC INTERPRETATION

Primary Site (PAT-11B): EW9709 PAT11 seisline 3, 1997 JD360 00:48:02 gmt, SP2571.

Priority: 2
Crustal age: 40 Ma (?)
Location: 12° 10.417' N 136° 00.956' W
Site water depth: 4946 m (6.595 sec TWTT)
Sediment thickness: 0.243 sec (199 m)
Proposed Drilling Depth: 204 m

PAT-11B was chosen in a small graben with relatively thick sediment and flat topography. Based upon dates from the piston core and seismic character, we interpret the high frequency reflectors in the upper 40 msec of the sediment column to be the eM-Y and eM-O reflector sequence (Mayer et al., 1985). We believe that the low frequency reflector sequence beginning about 6690 msec and extending to basement is Eocene. Similar reflectors are found at the base of Site 574, which drilled Late Eocene age basement.

GEOLOGIC HAZARDS

There are no known geologic hazards--pelagic sediments over oceanic basalts.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 3/98

The following data from data archives have been used to pick the location of PAT-20 and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT-11 seisline 1
EW9709 PAT-11 seisline 2
EW9709 PAT-11 seisline 3

3.5 Khz data:

EW9709 PAT-11 35line 1

EW9709 PAT-11 35line 2
EW9709 PAT-11 35line 3

FIGURES

Fig PAT11-1: Location map for PAT-11B, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT11-2: Swathmap bathymetry for the PAT-11 region, from the EW9709 site survey. Proposed drill site is marked.

Fig PAT11-3: Seismic profile PAT11-seisline 3 across PAT-11, from EW9709. Proposed drill site is marked.

Fig PAT11-4: Seismic profile PAT11-35line 3 across PAT-11, from EW9709. Proposed drill site is marked

REFERENCES

Cande, S.C., J.L. LaBrecque, R.L. Larson, W.C. Pitman III, X. Golovchenko, and W.F. Haxby (1989) Magnetic lineations of the world's ocean basins. *American Association of Petroleum Geologists Map Series.*

Cande, S.C., and D.V. Kent (1995) Revised calibration of the geomagnetic polarity timescale for the Late Cretaceous and Cenozoic. *J. Geophys. Res., 100,* 6093-6095.

Engebretson, D.C., A. Cox, and R. G. Gordon (1985) Relative motions between oceanic and continental plates in the Pacific basin. *Geol. Soc. Amer. Special Paper 206.*

Gripp, A.E., and R.G. Gordon (1990). Current plate velocities relative to the hotspots incorporating the NUVEL-1 global plate motion model. *Geophys. Res. Lett., 17,* 1109-1112.

Mayer, L. A., T. H. Shipley, F. Theyer, R.H. Wilkens, and E. L. Winterer (1985) Seismic modeling and paleoceanography at Deep Sea Drilling Project Site 574. *in* Mayer, L., Theyer, F. et al. Init Repts DSDP, 85: Washington (US Gov't Printing Office) 947-970.

Figure PAT11-1: Location map for PAT-11B, on GEBCO bathymetry

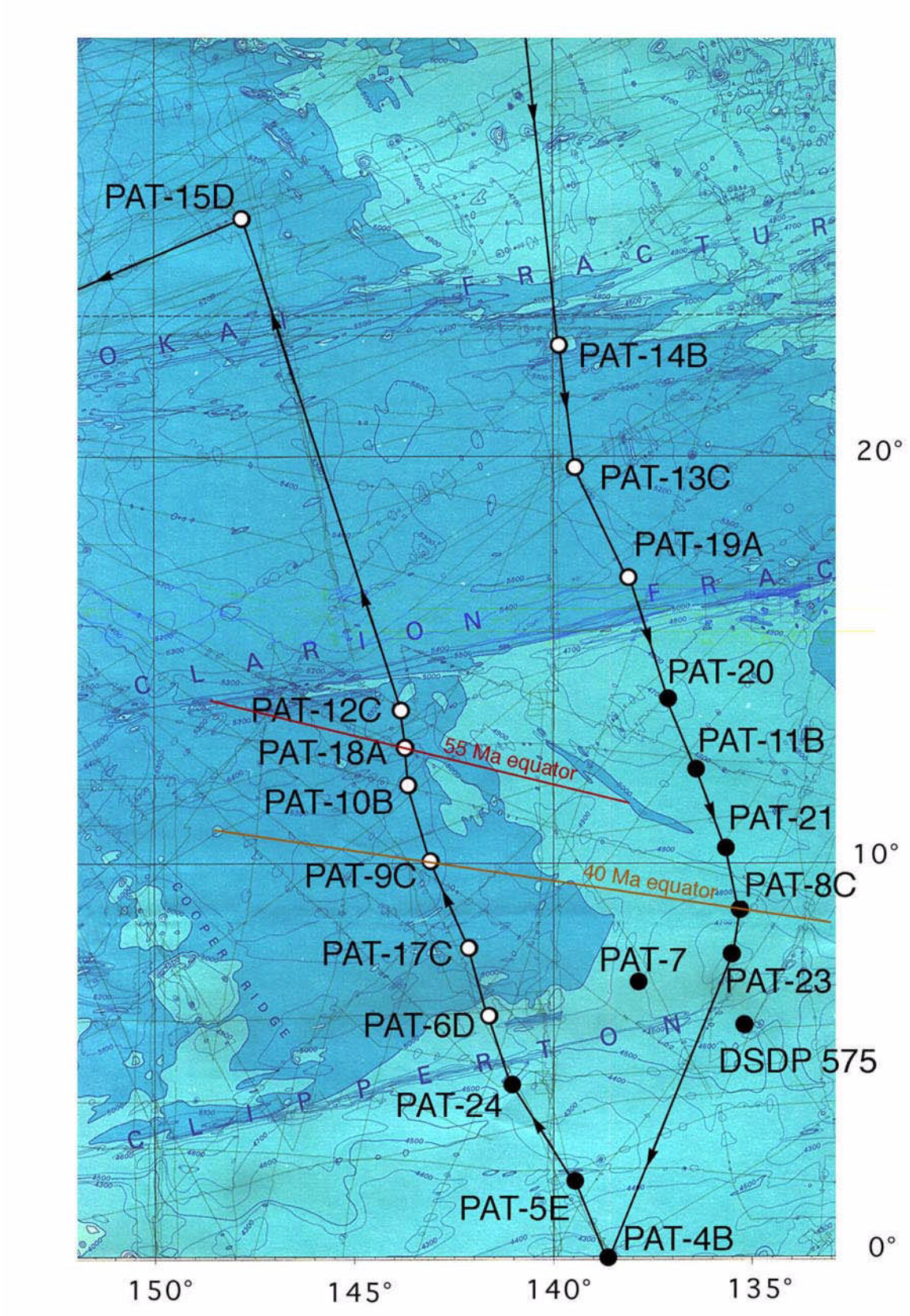


Figure PAT11-2: Swathmap bathymetry for the PAT-11B region, from the EW9709 site survey cruise.

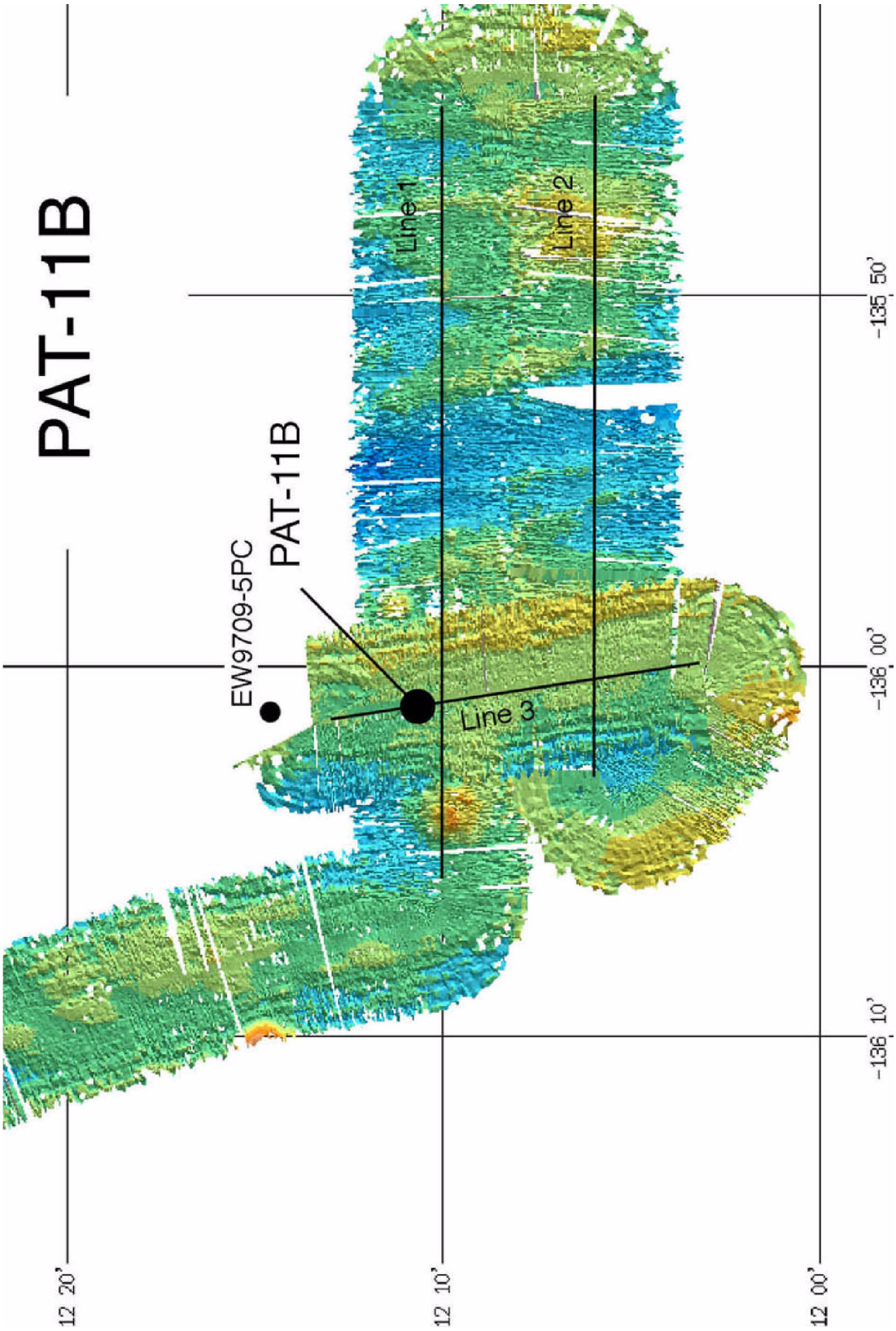


Figure PAT11-3: The seismic profile PAT11-seisline 3, from EW9709.

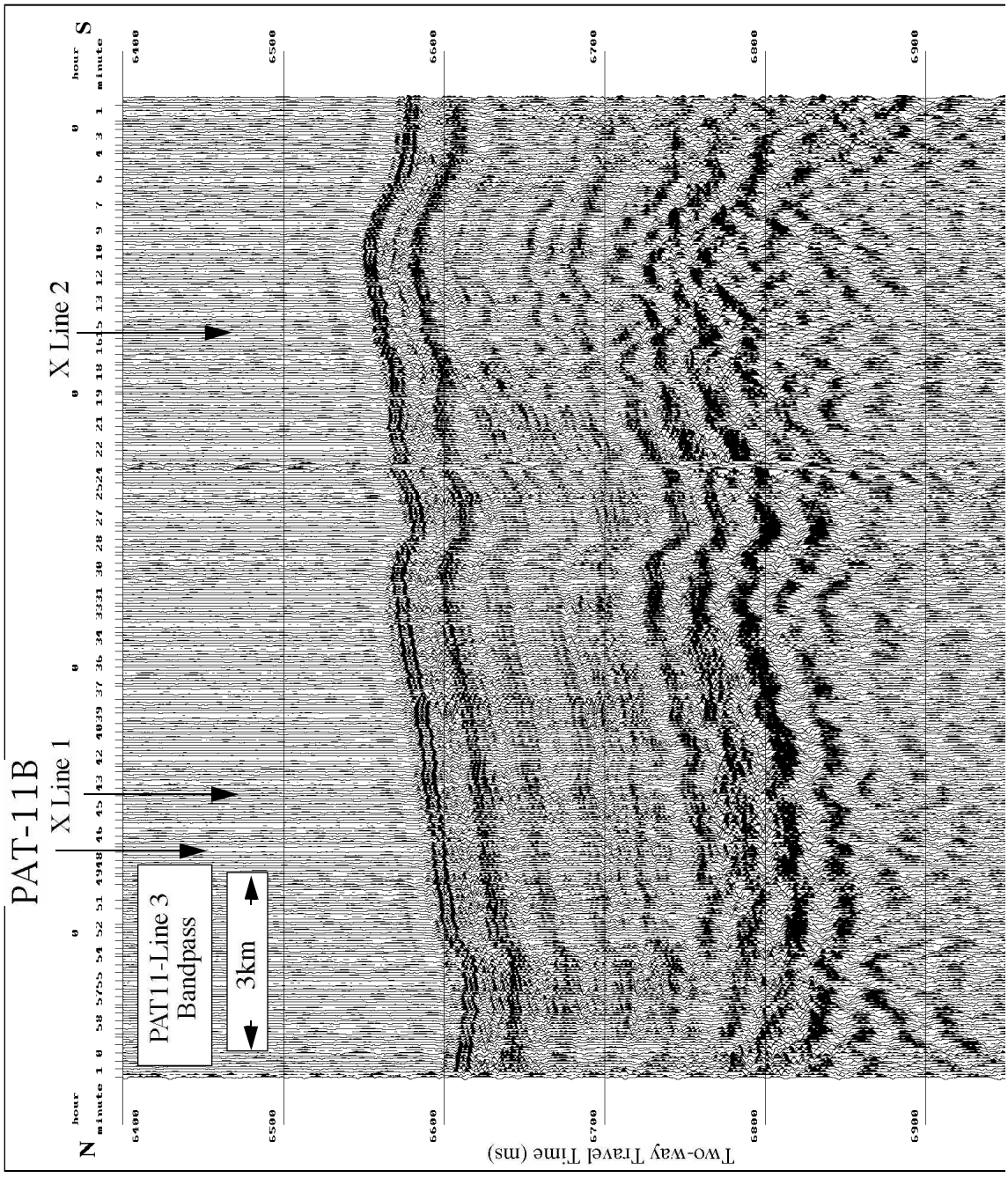
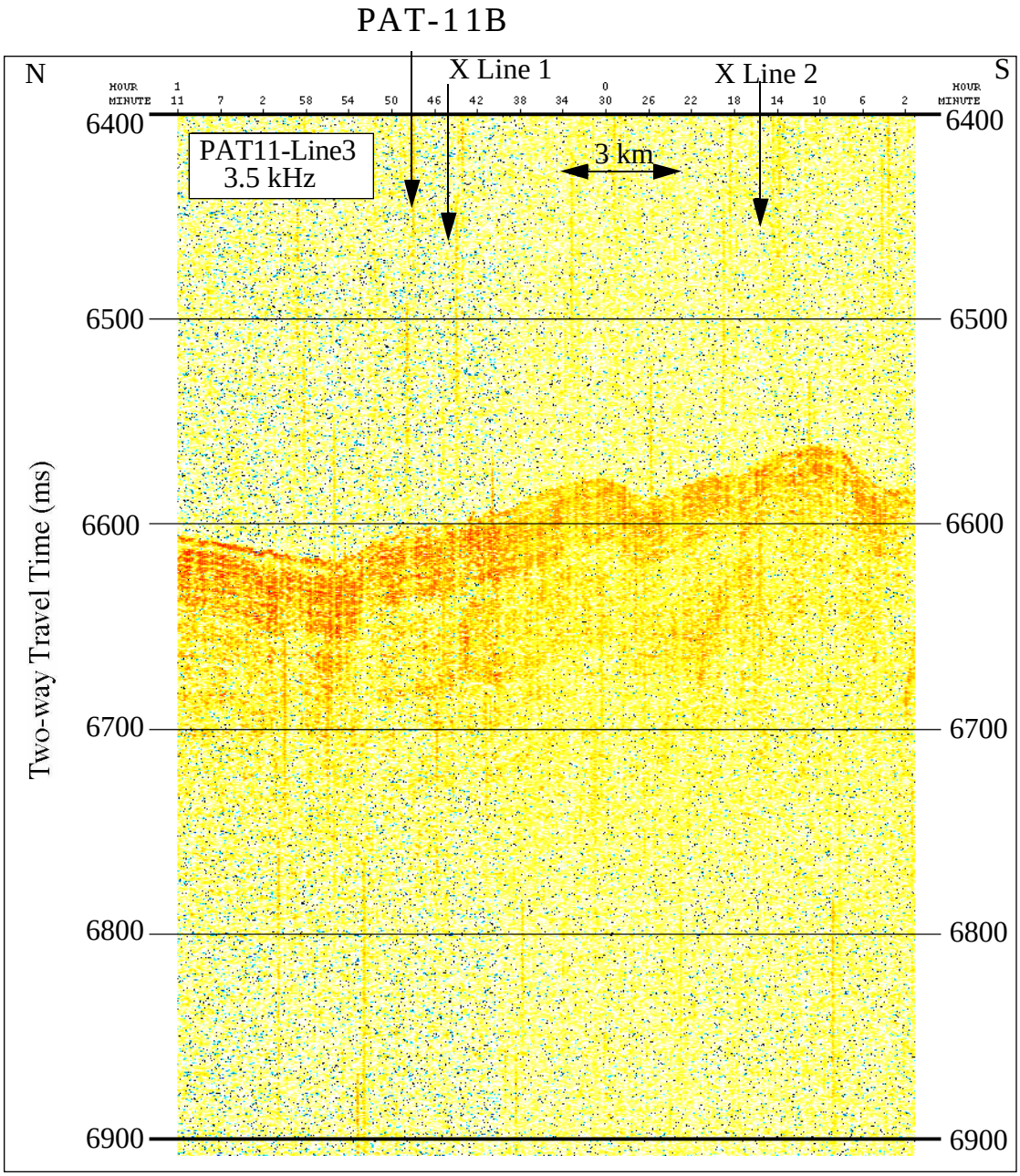


Figure PAT11-4: The 3.5 kHz subbottom profile PAT11-35line 3 across PAT-11B, from EW9709.



ODP Site Description Forms:

Page 1 - General Site Information

Please fill out information in all gray boxes

New **Revised**

Section A: Proposal Information

Title of Proposal	Paleocene Equatorial Pacific APC Transect
Proposal Number:	486-Rev2
Date Form Submitted:	15 March 1998
Site Specific Objectives (Must include general objectives in proposal)	Eocene to Oligocene Transition (40 Ma transect) define equatorial circulation pattern, boundary between SEC and ECC, and monitor changes in paleo-CCD
List Previous Drilling in Area:	DSDP Sites 161, 162 (>250 km away)

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-11B (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)		Area or Location:	Central Pacific Ocean
Latitude:	Deg: 12	Min: 10.417N	Jurisdiction:	none
Longitude:	Deg: 136	Min: 00.956W	Distance to Land:	>1000 km
Priority of Site:	Primary: 2	Alt:	Water Depth:	4946 m (6.595 sec)

Section C: Operational Information

	Sediments.What is the total sed. thickness? 199 m	Basement		
Proposed Penetration (m)	199 meters	4.5 meters		
General Lithologies:	calcareous radilarian ooze, rad. clay	MORB		
Coring Plan (circle):	1-2-3-APC VPC* XCB MDCB* PCS RCB Re-entry HRGB ** Systems Currently Under Development*			
Logging Plan:	Standard Tools		Special Tools	LWD
Quad combo	Triple-Combo: Neutron-Porosity, Litho-Density, Natural Gamma Ray, Resistivity-Induction	FMS-Sonic: Acoustic, FMS	Borehole Televiewer, Geochemical, Resistivity-Laterolog, High Temperature, Magnetic/Susceptibility	Density-Neutron, Resitivity-Gamma Ray
Estimated days:	Drilling/Coring: 4.0	Logging: 0.5 days	Total On-Site: 4.5	
Hazards/ Weather	*List possible hazards due to ice, hydrocarbons, dumpsites, cables, etc.* none		*What is your Weather Window?* all year	

Instructions:

Please fill out these forms for each site that you are proposing to drill, including as much detail as possible. The following table describes the purpose of each page, what information is needed, and when each page should be submitted.

Page	Information needed	Used By	When to submit	Contact for more information
1	General Info. about proposals, site location and basic operational needs	JOIDES Office, Data Bank, Logging Group, ODP/TAMU, SSP, PPSP	When submitting preliminary proposal and when updating site information.	JOIDES Office email: joides@whoi.edu www: http://www.whoi.edu/joides/
2	Information regarding site survey data available and to-be-collected	JOIDES Office, Data Bank, SSP, PPSP	When submitting full proposal and when updating site survey information	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
3	Detailed Logging Plan	JOIDES Office, Logging Group, ODP/TAMU	When submitting full proposal and when updating logging plan	ODP-LDEO Wireline Logging Services email: borehole@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/BRG/brg_home.html
4	Lithologic Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
5	Pollution and Safety Hazard Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/

ODP Site Description Forms:

Page 2 - Site Survey Detail

Please fill out information in all gray boxes

New **Revised**

Proposal #: 486-Rev2	Site #: PAT-11B	Date Form Submitted: 15 March 1998

	Data Type	SSP Requir-ements	Exists In DB	Details of available data and data that are still to be collected
1	High resolution seismic reflection	X		Primary Line(s): Location of Site on line (SP or Time only) EW9709 PAT11 seisline 3, 1997 JD360 00:48:02, SP 2571 Crossing Lines(s):
2	Deep Penetration seismic reflection			Primary Line(s): Location of Site on line (SP or Time only) Crossing Lines(s):
3	Seismic Velocity◊			
4	Seismic Grid	Y		PAT-11B survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) PAT-11B survey
7	Swath bathymetry	Y		PAT-11B survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		PAT-11B survey
11b	Gravity			
12	Sediment cores	X		EW9709-5PC
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		PAT-11B survey
17	Other			

SSP Classification of Site:	SSP Watchdog:	Date of Last Review:
SSP Comments:		

X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites; R=required for re-entry sites; T=required for high temperature environments; ◊Accurate velocity information is required for holes deeper than 400m.

ODP Site Description Forms: Page 3 - Detailed Logging Plan

New **Revised**

Proposal #:486-Rev2	Site #: PAT-11B	Date Form Submitted: 15 March 1998
Water Depth (m): 4946 m	Sed. Penetration (m): 199 m	Basement Penetration (m): 5 m

Do you need to use the conical side-entry sub (CSES) at this site? Yes No X

Are high temperatures expected at this site? Yes No X

Are there any other special requirements for logging at this site? Yes No X Quad combo

If "Yes" Please describe requirements: _____

What do you estimate the total logging time for this site to be: 0.5 days

Measurement Type	Scientific Objective	Relevance (1=high, 3=Low)
Neutron-Porosity		
Litho-Density		
Natural Gamma Ray		
Resistivity-Induction		
Acoustic		
FMS		
BHTV		
Resistivity-Laterolog		
Magnetic/Susceptibility		
Density-Neutron (LWD)		
Resitivity-Gamma Ray (LWD)		
Other: Special tools (CORK, PACKER, VSP, PCS, FWS, WSP		

For help in determining logging times, please contact the ODP-LDEO Wireline Logging Services group at:

borehole@ldeo.columbia.edu
http://www.ldeo.columbia.edu/BRG/brg_home.html
Phone/Fax: (914) 365-8674 / (914) 365-3182

Note: Sites with greater than 400 m of penetration or significant basement penetration require deployment of standard toolstrings.

ODP Site Description Forms: Page 4 - Pollution & Safety Hazard Summary

Please fill out information in all gray boxes **New** **Revised**

Proposal #: 486-Rev2	Site #: PAT-11B	Date Form Submitted: 15 March 1998

1	Summary of Operations at site: (Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on page 3.)	Triple APC/XCB to basement, MDCB 4.5 m into basement, log with Quad combo
2	Based on Previous DSDP/ODP drilling, list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock:	NONE
3	From Available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydro-carbon-bearing deposits.	NONE
4	Are there any indications of gas hydrates at this location?	NO
5	Are there reasons to expect hydrocarbon accumulations at this site? Please give details.	NO
6	What "special" precautions will be taken during drilling?	NONE
7	What abandonment procedures do you plan to follow:	STANDARD
8	Please list other natural or man-made hazards which may effect ship's operations: (e.g. ice, currents, cables)	NONE
9	Summary: What do you con-sider the major risks in drilling at this site?	NONE

ODP Site Description Forms: **Page 5 - Lithologic Summary**

New **Revised**

Proposal #: 486 Rev2	Site #: PAT-11B	Date Form Submitted: 15 March 1998

Sub-bottom depth (m)	Key reflectors, Unconformities, faults, etc	Age	Assumed velocity (km/sec)	Lithology	Paleo-environment	Ave. rate of sediment accumulation (m/My)	Comments
0-4 m‘		mid Mioc. to Recent	1.52	radiolarian clay	near edge of tropical current system	0.2 m/my	
4-26		lower Mioc.	1.52	calcareous radiolarian ooze	equatorial current system	3 m/my	
26-77		Oligocene	1.56	siliceous carbonates	equatorial high productivity zone	6 m/my	
77-199		Eocene	1.65	siliceous carbonates	equatorial high productivity zone	19 m/my	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-20 (Central Tropical Pacific, between Clipperton and Clarion FZ)

13° 59.996'N, 136° 47.998' W

SITE OBJECTIVES

PAT-20 is part of the Phase 2 (40 Ma) transect and will be one of the sites used to define equatorial circulation and sedimentation from the middle Eocene through the Eocene/Oligocene boundary. Its primary role will be to monitor the surface waters of the North Equatorial Current near the probable transition between the NEC and the North Equatorial Countercurrent. It will also be used to monitor bottom waters generated in the Antarctic. At 40 Ma, the backtracked location was 5°N, 109° W based upon a hotspot reference frame (Gripp and Gordon, 1990, for 0-5 Ma Pacific-hot spot rotation pole; Engebretson et al., 1985, for older poles). The site will also be used to monitor CCD changes during the Eocene-Oligocene transition. For CCD studies it is mostly closely paired with PAT12C from the phase 1 transect.

GENERAL DESCRIPTION

PAT-20 is situated on a regional swell between the Clipperton and Clarion Fracture Zones. Bathymetry at the site is typical of abyssal hills, and has been smoothed by the ~140 m of sediment typicallying covering basement. We estimated age of basement to be about 40 Ma based upon dating of basement by previous drilling and by assuming spreading rates. No reliable magnetic anomaly data are available between the Clipperton and Clarion Fracture Zones because the crust was formed near the Eocene magnetic equator (Cande et al., 1989) .

EW9709 Survey

PAT-20 was surveyed December 24 1997 with hydrosweep swathmap bathymetry, digital 3.5 kHz subbottom profiling and 80 c.i. watergun seismic reflection profiling aboard the R/V Ewing. PAT-20 is one of the flattest sites surveyed, with relief over the whole survey less than 150 m. Abyssal hills strike to the NNW, so the highest frequency topographic structure is observed on E-W tracklines. PAT-20 was not piston cored on EW9709.

LITHOLOGIC DESCRIPTION

Nearest Sediment Core: DSDP Site 161, 10° 14.25'N, 139° 57.21' W, 4939 mbsl, 245 m sediment.

The sediment recovered at DSDP Site 161 is marked by a hiatus from the early Miocene to the recent (2 m of radiolarian clay). the Oligocene carbonate section starts at about 18 mbsf and continues to about 200 mbsf. Below 155 mbsf, the carbonate ooze has lithified to chalk. The Eocene section extends from 200-245 mbsf, and is marked by late-middle Eocene 'radiolarites, locally calcareous'. Although these radiolarites were indurated, no chert was encountered.

SEISMIC INTERPRETATION

Primary Site (PAT-20): EW9709 seisline 3 JD 359 02:23:43 gmt (SP2298; Cross with EW9709 seisline 1)

Priority: 2
Crustal age: 40 Ma (?)
Location: 13°59.996' N 136° 47.999' W
Site water depth: 4643 m (6.19 sec TWTT)
Sediment thickness: 0.200 sec (161 m)
Proposed Drilling Depth: 166 m

PAT-20 was chosen to fulfill two criteria -- to be away from disturbed sedimentary sections near the ridge in the eastern part of the survey area, and to be where the deepest 3.5 kHz reflector is weakest. Examination of the seismic lines shows that this reflector does not correspond to basement but to hard sediments 40-50 msec above basement. We assume that this is a lithified or carbonate-rich lower sediment section, perhaps chert. The cross of lines 1 and 3 had these two features.

GEOLOGIC HAZARDS

There are no known geologic hazards--pelagic sediments over oceanic basalts.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 3/98

The following data from data archives have been used to pick the location of PAT-20 and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT-20 seisline 1
EW9709 PAT-20 seisline 2
EW9709 PAT-20 seisline 3
EW9709 PAT-20 seisline 4
EW9709 PAT-20 seisline 5

3.5 Khz data:

EW9709 PAT-20 35line 1
EW9709 PAT-20 35line 2
EW9709 PAT-20 35line 3
EW9709 PAT-20 35line 4
EW9709 PAT-20 35line 5

FIGURES

Fig PAT20-1: Location map for PAT-20, on GEBCO bathymetry. Proposed drill site is marked.
Fig PAT20-2: Swathmap bathymetry for the PAT-20 region, from the EW9709 site survey. Proposed drill site is marked.
Fig PAT20-3: Seismic profile PAT20-seisline 3 across PAT-20, from EW9709. Proposed drill site

is marked.

Fig PAT20-4: Seismic profile PAT20-35line 3 across PAT-20, from EW9709. Proposed drill site is marked

REFERENCES

Engebretson, D.C., A. Cox, and R. G. Gordon (1985) Relative motions between oceanic and continental plates in the Pacific basin. *Geol. Soc. Amer. Special Paper 206.*

Gripp, A.E., and R.G. Gordon (1990). Current plate velocities relative to the hotspots incorporating the NUVEL-1 global plate motion model. *Geophys. Res. Lett., 17,* 1109-1112.

Cande, S.C., J.L. LaBrecque, R.L. Larson, W.C. Pitman III, X. Golovchenko, and W.F. Haxby (1989) Magnetic lineations of the world's ocean basins. *American Association of Petroleum Geologists Map Series.*

Cande, S.C., and D.V. Kent (1995) Revised calibration of the geomagnetic polarity timescale for the Late Cretaceous and Cenozoic. *J. Geophys. Res., 100,* 6093-6095.

Figure PAT20-1: Location map for PAT-20 on GEBCO bathymetry.

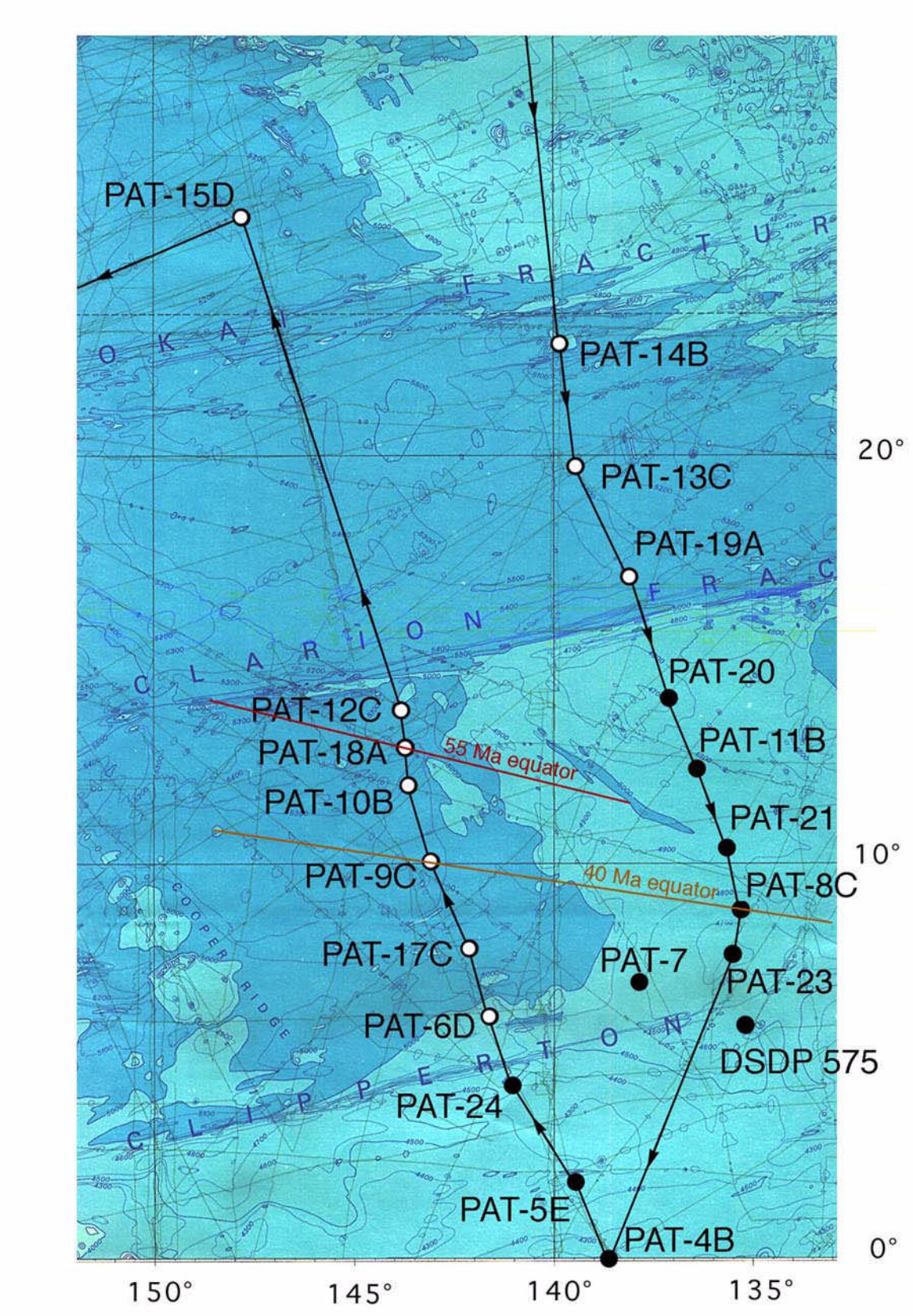


Figure PAT20-2: Swathmap bathymetry in the PAT-20 region, from the EW9709 site survey cruise.

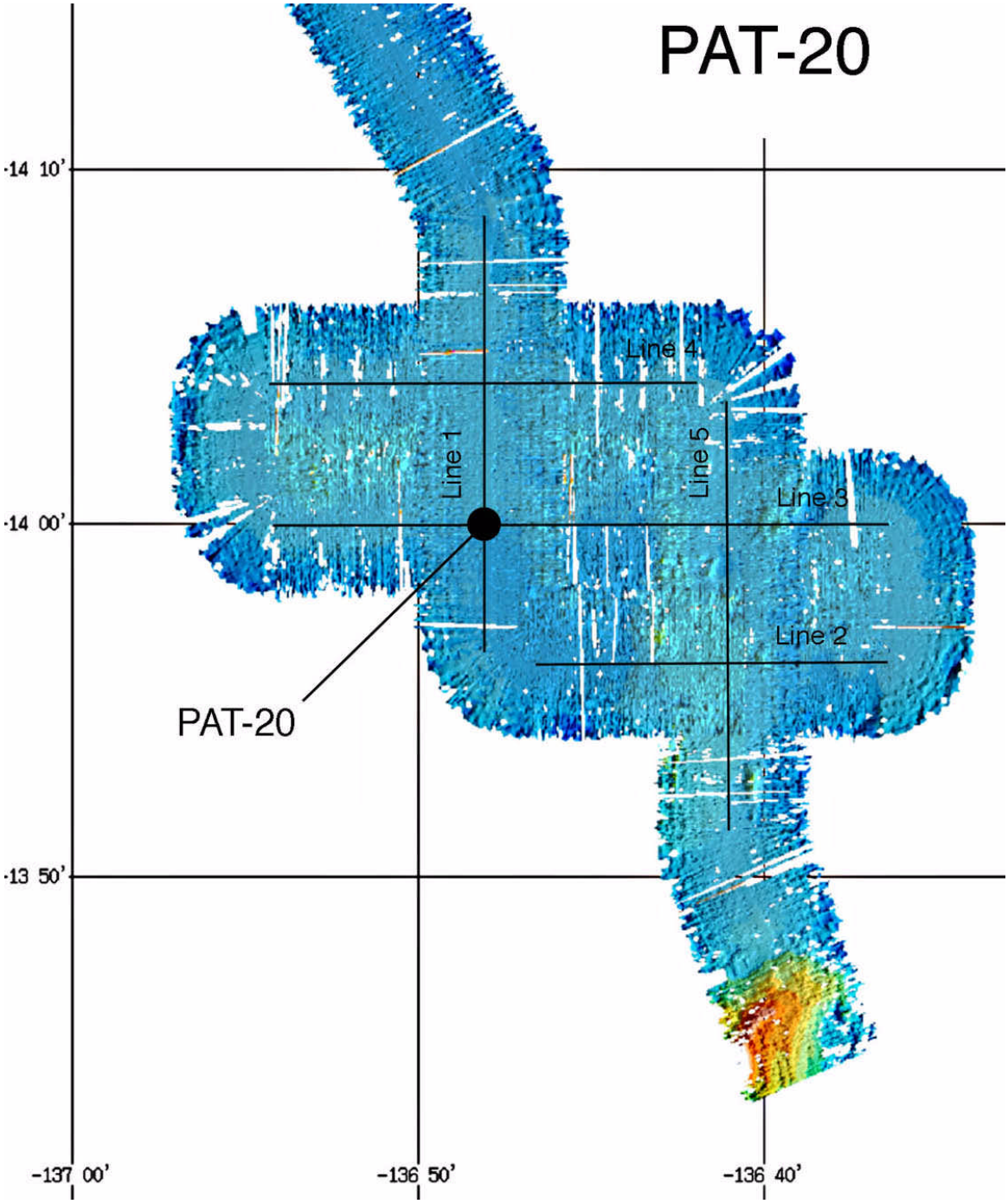


Figure PAT20-3: Western part of the seismic profile PAT20-seisline 3, across the proposed drillsite, from EW9709.

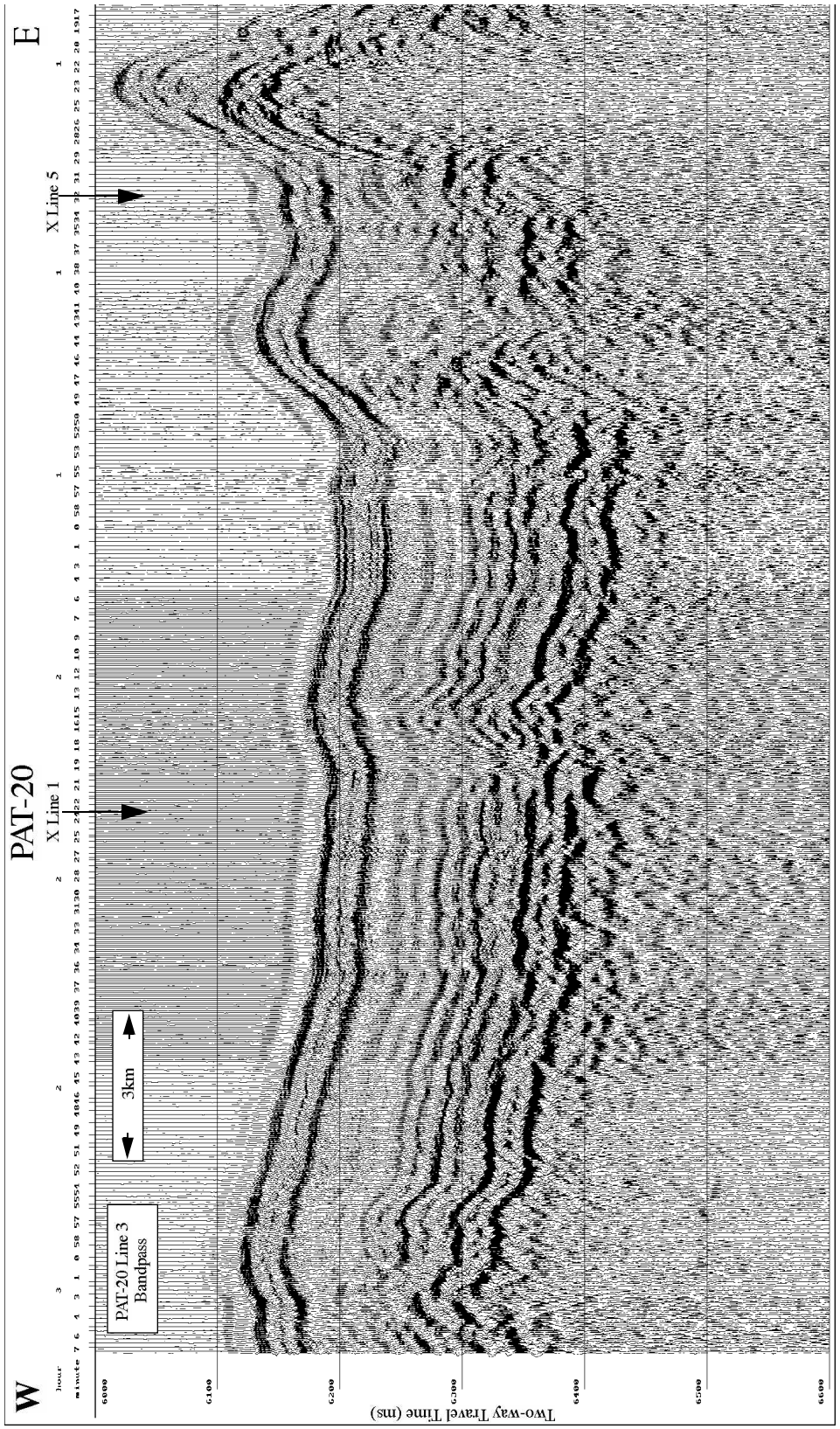
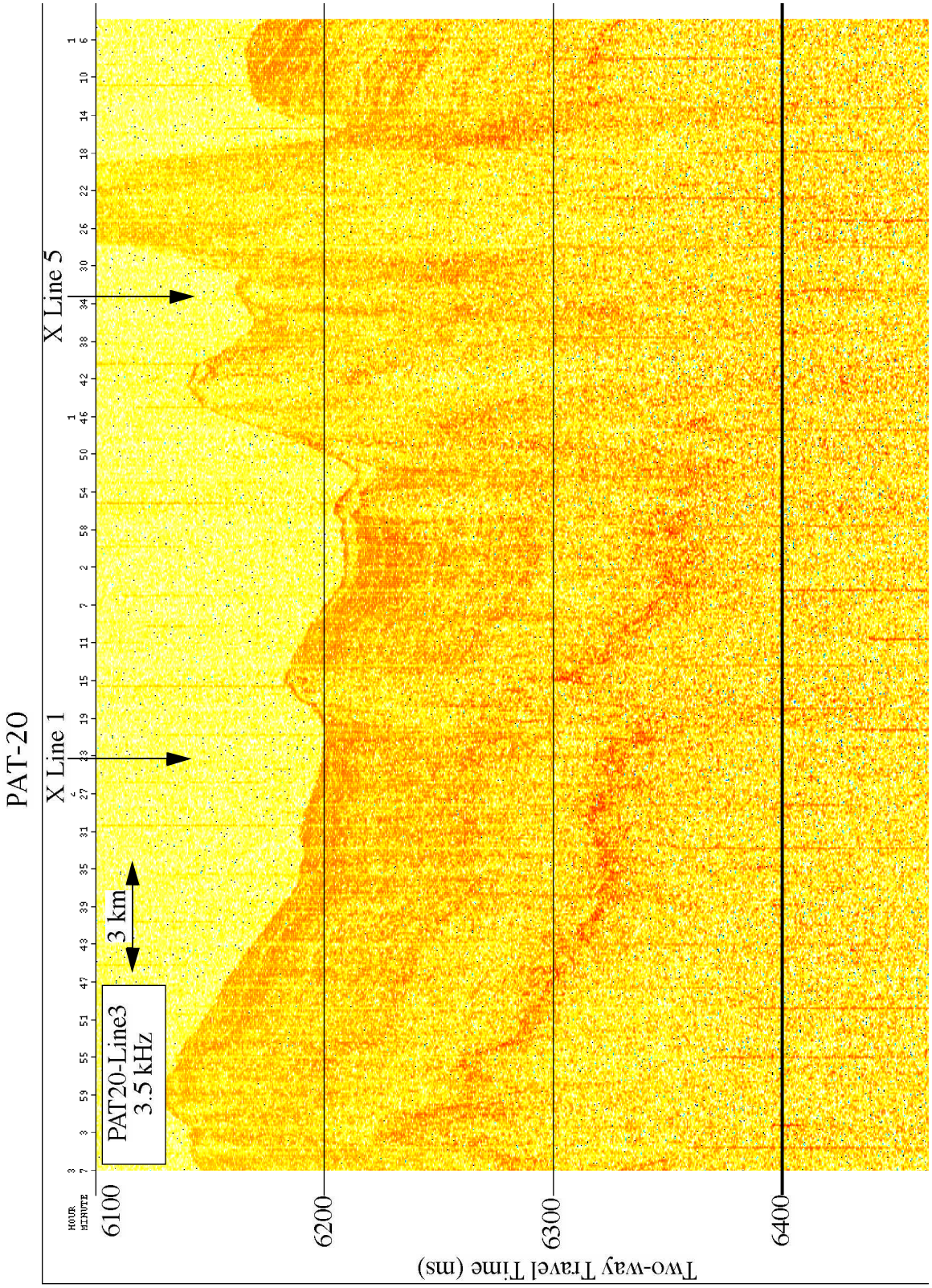


Figure PAT20-4: The 3.5 kHz subbottom profile PAT20-35line 3 across PAT-20, from EW9709.



ODP Site Description Forms:

Page 1 - General Site Information

Please fill out information in all gray boxes

New **Revised**

Section A: Proposal Information

Title of Proposal	Paleocene Equatorial Pacific APC Transect
Proposal Number:	486-Rev2
Date Form Submitted:	15 March 1998
Site Specific Objectives (Must include general objectives in proposal)	Eocene-Oligocene transition (40 Ma transect) Monitor NEC/NECC during Eocene/Oligocene transition, changes in CCD
List Previous Drilling in Area:	DSDP 161

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-20 (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)		Area or Location:	Pacific Ocean, Clipperton/Clarion FZ
Latitude:	Deg: 13	Min:59.996	Jurisdiction:	none
Longitude:	Deg: 136	Min: 47.998	Distance to Land:	>1000 km
Priority of Site:	Primary: 2	Alt:	Water Depth:	4643 m (6.19 sec TWTT)

Section C: Operational Information

	Sediments. What is the total sed. thickness? 161 m	Basement
Proposed Penetration (m)	161 m	4.5 m
General Lithologies:	siliceous clay, siliceous carbonate ooze	MORB

Coring Plan (circle): 1-2-3-APC VPC* XCB MDCB* PCS RCB Re-entry HRGB

** Systems Currently Under Development*

Logging Plan:	Standard Tools		Special Tools	LWD
Quad Combo	Triple-Combo Neutron-Porosity Litho-Density Natural Gamma Ray Resistivity-Induction	FMS-Sonic Acoustic FMS	Borehole Televiewer Geochemical Resistivity-Laterolog High Temperature Magnetic/Susceptibility	Density-Neutron Resitivity-Gamma Ray

Estimated days:	Drilling/Coring: 3.4	Logging: 0.5	Total On-Site: 3.9
Hazards/ Weather	*List possible hazards due to ice, hydrocarbons, dumpsites, cables, etc.* none		*What is your Weather Window?* all year

Instructions:

Please fill out these forms for each site that you are proposing to drill, including as much detail as possible. The following table describes the purpose of each page, what information is needed, and when each page should be submitted.

Page	Information needed	Used By	When to submit	Contact for more information
1	General Info. about proposals, site location and basic operational needs	JOIDES Office, Data Bank, Logging Group, ODP/TAMU, SSP, PPSP	When submitting preliminary proposal and when updating site information.	JOIDES Office email: joides@whoi.edu www: http://www.whoi.edu/joides/
2	Information regarding site survey data available and to-be-collected	JOIDES Office, Data Bank, SSP, PPSP	When submitting full proposal and when updating site survey information	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
3	Detailed Logging Plan	JOIDES Office, Logging Group, ODP/TAMU	When submitting full proposal and when updating logging plan	ODP-LDEO Wireline Logging Services email: borehole@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/BRG/brg_home.html
4	Lithologic Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
5	Pollution and Safety Hazard Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/

ODP Site Description Forms:

Page 2 - Site Survey Detail

Please fill out information in all gray boxes

New **Revised**

Proposal #: 486-Rev2	Site #: PAT-20	Date Form Submitted: 15 March 1998

	Data Type	SSP Requir-ements	Exists In DB	Details of available data and data that are still to be collected
1	High resolution seismic reflection	X		Primary Line(s): (Location of Site on line (SP or Time only)) EW9709 PAT20-seisline 3 1997 JD 359 02:23:43 gmt (SP2298) Crossing Lines(s): EW9709 PAT20-seisline 1
2	Deep Penetration seismic reflection			Primary Line(s): (Location of Site on line (SP or Time only)) Crossing Lines(s):
3	Seismic Velocity◊			
4	Seismic Grid	Y		EW9709 PAT-20 Survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		(Location of Site on line (Time)) EW9709 PAT-20 35line 3 and PAT20-35line 1
7	Swath bathymetry	Y		EW9709 PAT-20 Survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709 PAT-20 Survey
11b	Gravity			
12	Sediment cores	X		DSDP Site 161
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709 PAT-20 Survey
17	Other			

SSP Classification of Site:	SSP Watchdog:	Date of Last Review:
SSP Comments:		

X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites; R=required for re-entry sites; T=required for high temperature environments; ◊Accurate velocity information is required for holes deeper than 400m.

ODP Site Description Forms: Page 3 - Detailed Logging Plan

New **Revised**

Proposal #:486-Rev2	Site #: PAT-20	Date Form Submitted: 15 March 1998
Water Depth (m): 4643 uncorr.	Sed. Penetration (m): 161	Basement Penetration (m): 5

Do you need to use the conical side-entry sub (CSES) at this site? Yes No X

Are high temperatures expected at this site? Yes No X

Are there any other special requirements for logging at this site? Yes No X Quad combo

If "Yes" Please describe requirements: _____

What do you estimate the total logging time for this site to be: 0.5 days

Measurement Type	Scientific Objective	Relevance (1=high, 3=Low)
Neutron-Porosity		
Litho-Density		
Natural Gamma Ray		
Resistivity-Induction		
Acoustic		
FMS		
BHTV		
Resistivity-Laterolog		
Magnetic/Susceptibility		
Density-Neutron (LWD)		
Resitivity-Gamma Ray (LWD)		
Other: Special tools (CORK, PACKER, VSP, PCS, FWS, WSP		

For help in determining logging times, please contact the ODP-LDEO Wireline Logging Services group at:

borehole@ldeo.columbia.edu
http://www.ldeo.columbia.edu/BRG/brg_home.html
Phone/Fax: (914) 365-8674 / (914) 365-3182

Note: Sites with greater than 400 m of penetration or significant basement penetration require deployment of standard toolstrings.

ODP Site Description Forms: Page 4 - Pollution & Safety Hazard Summary

Please fill out information in all gray boxes **New** **Revised**

Proposal #: 486-Rev2	Site #: PAT-20	Date Form Submitted: 15 March 1998

1	Summary of Operations at site: (Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on page 3.)	Triple APC/XCB to basement, MDCB 4.5 m into basement, log with Quad combo
2	Based on Previous DSDP/ODP drilling, list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock:	NONE
3	From Available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydro-carbon-bearing deposits.	NONE
4	Are there any indications of gas hydrates at this location?	NO
5	Are there reasons to expect hydrocarbon accumulations at this site? Please give details.	NO
6	What "special" precautions will be taken during drilling?	NONE
7	What abandonment procedures do you plan to follow:	STANDARD
8	Please list other natural or man-made hazards which may effect ship's operations: (e.g. ice, currents, cables)	NONE
9	Summary: What do you con-sider the major risks in drilling at this site?	NONE

ODP Site Description Forms: Page 5 - Lithologic Summary

New **Revised**

Proposal #: 486 Rev2	Site #: PAT-20	Date Form Submitted: 15 March 1998

Sub-bottom depth (m)	Key reflectors, Unconformities, faults, etc	Age	Assumed velocity (km/sec)	Lithology	Paleo-environment	Ave. rate of sediment accumulation (m/My)	Comments
0-60 m		early Olig. to Recent	1.56	Red Clay, radiolarian clay, and siliceous carbonates	abyssal gyre	2 m/my	
60-161		Late to Middle Eocene	1.65	siliceous carbonates, carbonates, chalks and perhaps cherts.	edge of equatorial high productivity zone	17 m/my	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-25 (N. Central Pacific, between Clarion and Molokai FZ)

20° 38.002’ N, 146° 04.643’ W

SITE OBJECTIVES

PAT-25 is a priority 3 drillsite and is included here primarily so that researchers will be aware that there is potential for drilling a late Cretaceous equatorial transect. We passed the position of PAT-25 while in transit between PAT-12 and PAT-15. Traveling north across the Clarion Fracture Zone we transitted from Paleocene crust to late Cretaceous, in the early part of Anomaly 33 (roughly 76 Ma). We passed a significant sedimentary deposit at the PAT-25 location and did a small survey to determine its extent. If drilled, it would be used to study equatorial circulation in the late Cretaceous to compare with the Paleogene interval. It would also be used to give more two dimensional coverage in the Paleogene, and it will be compared to PAT-13 to study CCD changes in the Paleocene and early Eocene. PAT-13 is located at an equivalent paleolatitude, but was over 1 km shallower at 56 Ma. At 40 Ma, PAT-25 was at 10°N, while at 56 Ma it was located at 7°N. At 76 Ma, PAT-25 was at 2°N based upon a hotspot reference frame (Gripp and Gordon, 1990, for 0-5 Ma Pacific-hot spot rotation pole; Engebretson et al., 1985, for older poles).

GENERAL DESCRIPTION

PAT-25 is situated between the Clarion and Molokai Fracture Zones. (Figure PAT25-1) . Based on magnetic lineations, basement age at PAT-25 should be in the younger part of anomaly AN33, or about 76 Ma (Cande et al., 1989; timescale of Cande and Kent, 1995) .

LITHOLOGIC DESCRIPTION

Nearest Sediment Core: DSDP Site 40, 19° 47.57’N 139°54.08’W, 5176 mbsl, 156 m of sediment cored, basement not reached.

DSDP 40 drilled in a thick sediment packet near a seamount, but terminated in chert at 156 mbsf in early Eocene cherts. The sediments are zeolitic red clays from 0-10 mbsf, radiolarian oozes from 10-143 mbsf, and a calcareous (?) ooze-chert unit below.

SEISMIC INTERPRETATION

Primary Site (PAT-25): EW9709 1998 JD012 16:38:22 gmt (SP15368)

Priority: 3
Crustal age: 76 Ma
Location: 20° 38.002’ N 146° 04.643’ W
Site water depth: 5276 m (uncorr; 7.035 sec TWTT)
Sediment thickness: 0.263 sec (217 m)
Proposed Drilling Depth: 222 m

PAT-25 is located in relatively gentle abyssal hill topography in between the Clarion and Molokai Fracture Zones. The section is thicker than average in this region, but the thickening seems associated with the upper part of the sediment section.

GEOLOGIC HAZARDS

There are no known geologic hazards--pelagic sediments over oceanic basalts.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 3/98

The following data from data archives have been used to pick the location of PAT-25 and are being submitted in this package:

seismic reflection data:

PAT25-seisline 1
PAT25-seisline 2
PAT25-seisline 3

EW9709 SURVEY, 12/97, R/V EWING

PAT-25 was crossed during the transit from PAT-12 to PAT-15, and happened to be in an almost optimum location for a late Cretaceous equatorial transect.

FIGURES

Fig PAT25-1: Location map for PAT-25, on GEBCO bathymetry. Proposed drill site is marked.
Fig PAT25-2: Swathmap bathymetry in the vicinity of PAT-25.
Fig PAT25-3: 4-channel seismic profile across PAT-25, from EW9709. Proposed drill site is marked

REFERENCES

Engebretson, D.C., A. Cox, and R. G. Gordon (1985) Relative motions between oceanic and continental plates in the Pacific basin. *Geol. Soc. Amer. Special Paper 206.*

Gripp, A.E., and R.G. Gordon (1990). Current plate velocities relative to the hotspots incorporating the NUVEL-1 global plate motion model. *Geophys. Res. Lett., 17,* 1109-1112.

Cande, S.C., J.L. LaBrecque, R.L. Larson, W.C. Pitman III, X. Golovchenko, and W.F. Haxby (1989) Magnetic lineations of the world's ocean basins. *American Association of Petroleum Geologists Map Series.*

Cande, S.C., and D.V. Kent (1995) Revised calibration of the geomagnetic polarity timescale for the Late Cretaceous and Cenozoic. *J. Geophys. Res., 100,* 6093-6095.

Figure PAT25-1: Location map for PAT-25, on GEBCO bathymetry.

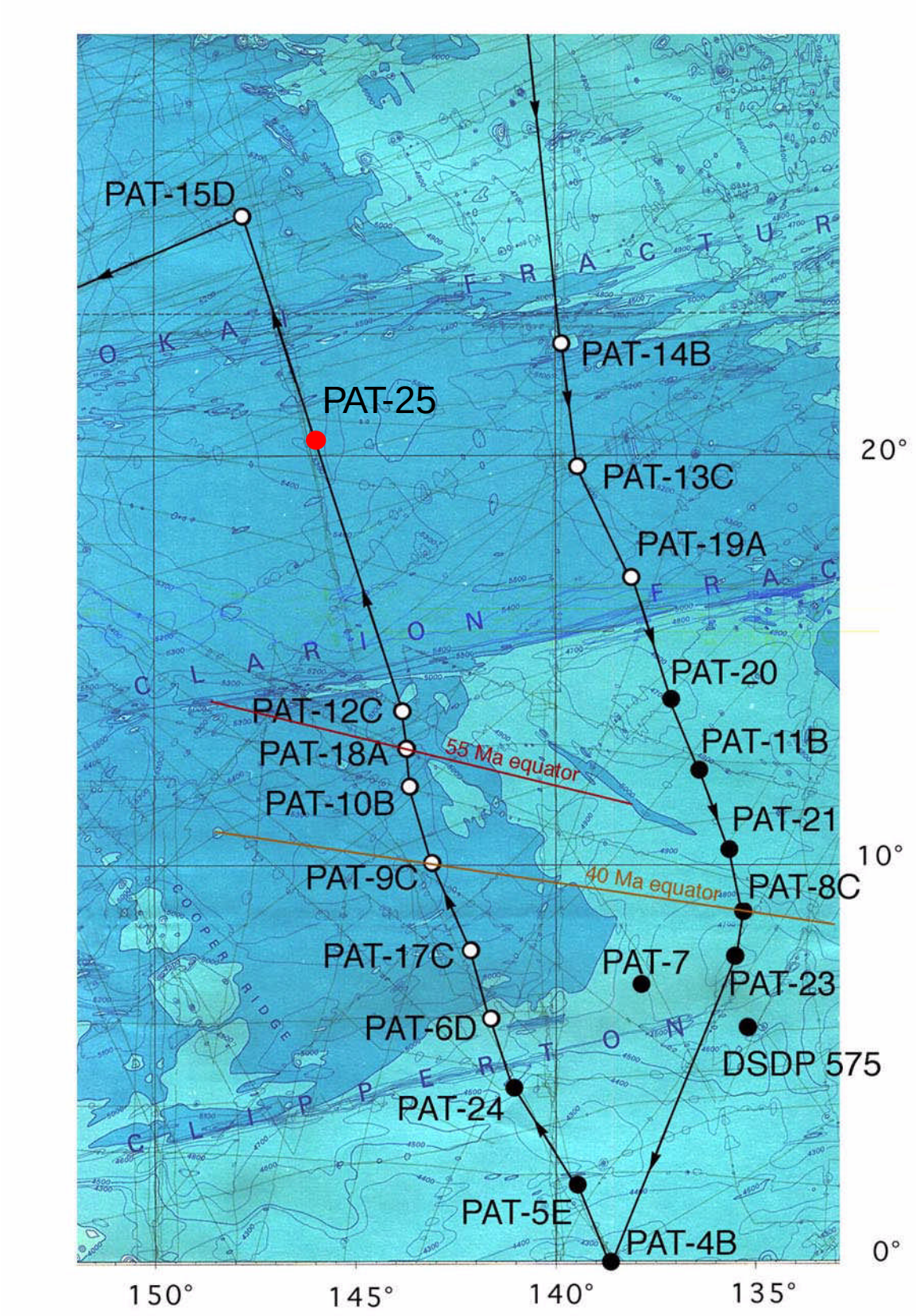


Figure PAT25-2: Swathmap bathymetry across PAT-25, from the EW9709 site survey cruise.

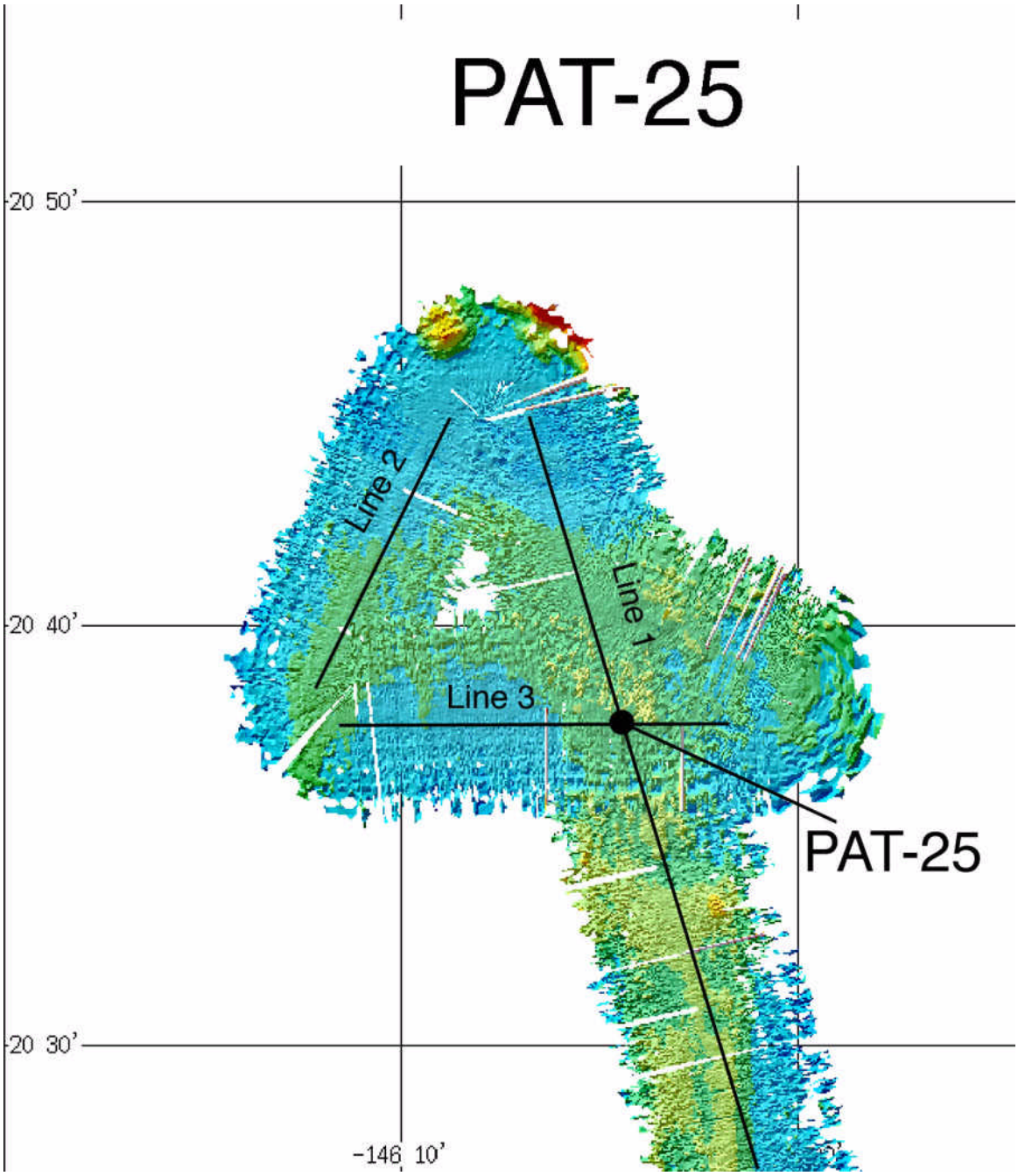
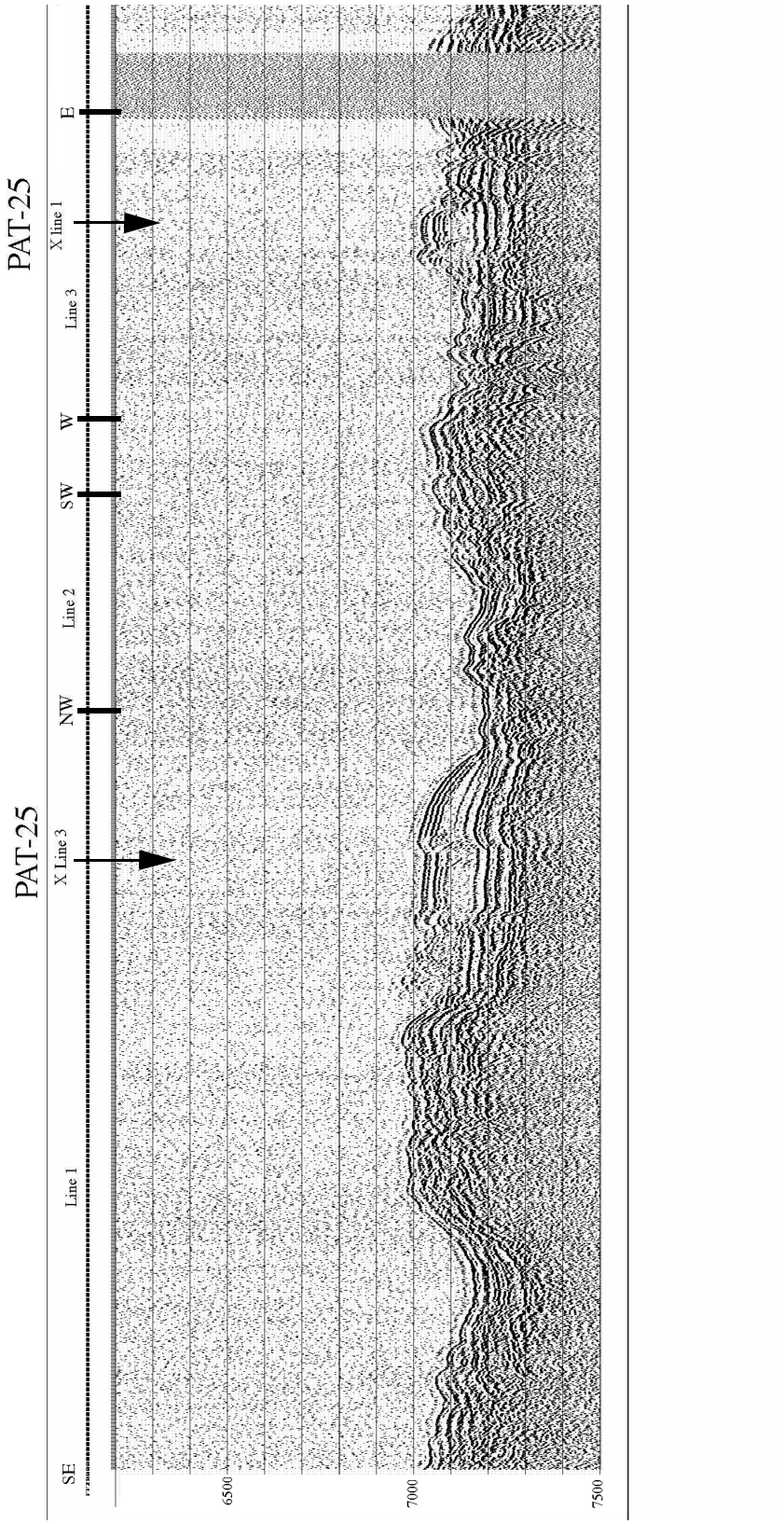


Figure PAT25-3: The 4-channel seismic survey across PAT-25, from the EW9709 Site Survey.



ODP Site Description Forms:

Page 1 - General Site Information

Please fill out information in all gray boxes

New **Revised**

Section A: Proposal Information

Title of Proposal	Paleocene Equatorial Pacific APC Transect
Proposal Number:	486-Rev2
Date Form Submitted:	15 April 1998
Site Specific Objectives (Must include general objectives in proposal)	Late Cretaceous equatorial circulation early Paleogene North Pacific CCD
List Previous Drilling in Area:	DSDP 40 (> 600 km to the east)

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-25	If site is a reoccupation of an old DSDP/ ODP Site, Please include former Site #	Area or Location:	Central Pacific Ocean
Latitude: N	Deg: 20	Min: 38.002 N	Jurisdiction:	none
Longitude: W	Deg: 146	Min: 04.643	Distance to Land:	>1000 km
Priority of Site:	Primary: 3	Alt:	Water Depth:	5276 m (uncorr.; 7.035 sec)

Section C: Operational Information

	Sediments.What is the total sed. thickness? 217 m	Basement
Proposed Penetration (m)	217 m	4.5
General Lithologies:	red clays overlying siliceous oozes and carbonates	MORB
Coring Plan (circle):	1-2-3-APC VPC* XCB MDCB* PCS RCB Re-entry HRGB ** Systems Currently Under Development*	

Logging Plan:	Standard Tools		Special Tools	LWD
Standard Logging Suite	Triple-Combo Neutron-Porosity Litho-Density Natural Gamma Ray Resistivity-Induction	FMS-Sonic Acoustic FMS	Borehole Televiewer Geochemical Resistivity-Laterolog High Temperature Magnetic/Susceptibility	Density-Neutron Resitivity-Gamma Ray

Estimated days:	Drilling/Coring:	Logging:	Total On-Site:
	4.3	1.0	5.3
Hazards/ Weather	*List possible hazards due to ice, hydrocarbons, dumpsites, cables, etc.* northern winter storms		*What is your Weather Window?* *all year*

Instructions:

Please fill out these forms for each site that you are proposing to drill, including as much detail as possible. The following table describes the purpose of each page, what information is needed, and when each page should be submitted.

Page	Information needed	Used By	When to submit	Contact for more information
1	General Info. about proposals, site location and basic operational needs	JOIDES Office, Data Bank, Logging Group, ODP/TAMU, SSP, PPSP	When submitting preliminary proposal and when updating site information.	JOIDES Office email: joides@whoi.edu www: http://www.whoi.edu/joides/
2	Information regarding site survey data available and to-be-collected	JOIDES Office, Data Bank, SSP, PPSP	When submitting full proposal and when updating site survey information	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
3	Detailed Logging Plan	JOIDES Office, Logging Group, ODP/ TAMU	When submitting full proposal and when updating logging plan	ODP-LDEO Wireline Logging Services email: borehole@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/BRG/brg_home.html
4	Lithologic Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
5	Pollution and Safety Hazard Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/

ODP Site Description Forms:

Page 2 - Site Survey Detail

Please fill out information in all gray boxes

New **Revised**

Proposal #: 486-Rev2	Site #:PAT-25	Date Form Submitted: 15 April 1998

	Data Type	SSP Requir-ements	Exists In DB	Details of available data and data that are still to be collected
1	High resolution seismic reflection	X		Primary Line(s): Location of Site on line (SP or Time only) EW9709 PAT25 seisline 1, 1998 JD012 16:38:22 (SP 15368) Crossing Lines(s): EW9709 PAT25-seisline 3
2	Deep Penetration seismic reflection			Primary Line(s): Location of Site on line (SP or Time only) Crossing Lines(s):
3	Seismic Velocity◊			
4	Seismic Grid	Y		
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709
7	Swath bathymetry	Y		EW9709
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		
11b	Gravity			
12	Sediment cores	X		
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		GPS EW9709
17	Other			

SSP Classification of Site:	SSP Watchdog:	Date of Last Review:
SSP Comments:		

X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites; R=required for re-entry sites; T=required for high temperature environments; ◊Accurate velocity information is required for holes deeper than 400m.

ODP Site Description Forms:

Page 3 - Detailed Logging Plan

New **Revised**

Proposal #:486-Rev2	Site #: PAT-25	Date Form Submitted: 15 April 1998
Water Depth (m): 4861	Sed. Penetration (m): 217	Basement Penetration (m): 5

Do you need to use the conical side-entry sub (CSES) at this site? Yes No X

Are high temperatures expected at this site? Yes No X

Are there any other special requirements for logging at this site? Yes No X Standard logging suite

If "Yes" Please describe requirements:

_____

What do you estimate the total logging time for this site to be: ____1 day_____

Measurement Type	Scientific Objective	Relevance (1=high, 3=Low)
Neutron-Porosity		
Litho-Density		
Natural Gamma Ray		
Resistivity-Induction		
Acoustic		
FMS		
BHTV		
Resistivity-Laterolog		
Magnetic/Susceptibility		
Density-Neutron (LWD)		
Resitivity-Gamma Ray (LWD)		
Other: Special tools (CORK, PACKER, VSP, PCS, FWS, WSP		

For help in determining logging times, please contact the ODP-LDEO Wireline Logging Services group at:

borehole@ldeo.columbia.edu
http://www.ldeo.columbia.edu/BRG/brg_home.html
Phone/Fax: (914) 365-8674 / (914) 365-3182

Note: Sites with greater than 400 m of penetration or significant basement penetration require deployment of standard tool-strings.

ODP Site Description Forms: Page 4 - Pollution & Safety Hazard Summary

Please fill out information in all gray boxes **New** **Revised**

Proposal #: 486-Rev2	Site #: PAT-25	Date Form Submitted: 15 April 1998

1	Summary of Operations at site: (Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on page 3.)	Triple APC/XCB to basement, MDCB one core into basement, log with standard logging suite
2	Based on Previous DSDP/ODP drilling, list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock:	NONE
3	From Available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydrocarbon-bearing deposits.	NONE
4	Are there any indications of gas hydrates at this location?	NO
5	Are there reasons to expect hydrocarbon accumulations at this site? Please give details.	NO
6	What "special" precautions will be taken during drilling?	NONE
7	What abandonment procedures do you plan to follow:	STANDARD
8	Please list other natural or manmade hazards which may effect ship's operations: (e.g. ice, currents, cables)	NONE
9	Summary: What do you consider the major risks in drilling at this site?	NONE

ODP Site Description Forms:

Page 5 - Lithologic Summary

New **Revised**

Proposal #: 486-Rev2	Site #: PAT-25	Date Form Submitted: 15 April 1998

Sub-bottom depth (m)	Key reflectors, Unconformities, faults, etc		Age	Assumed velocity (km/sec)	Lithology	Paleo-environment	Ave. rate of sediment accumulation (m/My)	Comments
0-129			Cenozoic	1.56	red clays, siliceous oozes, with occasional carbonates	central gyre	2 m/Myr	
129-217			Late Cretaceous	1.80	siliceous carbonates, carbonate oozes, and chalk	equatorial current system	8 m/Myr	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-22 (North Central Pacific)

32° 29.924’ N, 132° 33.109’

SITE OBJECTIVES

PAT-22 is the northernmost site of the Phase 2 transect and will be one of the sites used to define equatorial circulation and sedimentation from the middle Eocene through the Eocene/Oligocene boundary. Its primary role will be to define the southern border of the North Pacific westerly winds. It is located on magnetic anomaly AN17, or on crust with an age of about 38 Ma. At 38 Ma, the backtracked location was 24°N, 109° W based upon a hotspot reference frame (Gripp and Gordon, 1990, for 0-5 Ma Pacific-hot spot rotation pole; Engebretson et al., 1985, for older poles).

GENERAL DESCRIPTION

PAT-22 is situated just south of the Murray Fracture Zone due west of San Diego, California (Figure PAT22-1) . Based on magnetic lineations, basement age at PAT-22 should be in anomaly AN17, or about 38 Ma (Cande et al., 1989; timescale of Cande and Kent, 1995) .

LITHOLOGIC DESCRIPTION

Nearest Sediment Core: DSDP 172 31° 32.33N 133° 22.36’W 4767 m, 24 meters of sediment

The sediment recovered in DSDP 172 is lower Oligocene to Recent zeolitic red clays, with some nannofossil ooze right above the basement contact. DSDP 172 is located on about magnetic anomaly AN15, or on basement formed at the Eocene/Oligocene boundary, 35 Ma.

SEISMIC INTERPRETATION

Primary Site (PAT-22): EW9709 2015 gmt 12/15/97

Priority: 3
Crustal age: 38 Ma
Location: 32° 29.924’ N 132° 33.109’ W
Site water depth: 4861 m (6.48 sec TWTT)
Sediment thickness: 0.040 sec (30 m)
Proposed Drilling Depth: 30 m

PAT-22 is located on a flat basin with uniform sediment cover 40 msec thick just south of the Murray Fracture Zone (Figure PAT22-2). The 3.5 kHz profile clearly defines the basement, as well as two distinct reflectors in the lower half of the sediment column.

GEOLOGIC HAZARDS

There are no known geologic hazards--pelagic sediments over oceanic basalts.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 3/98

The following data from data archives have been used to pick the location of PAT-22 and

are being submitted in this package:

3.5 Khz data:
PAT22-35line 1

EW9709 SURVEY, 12/97, R/V EWING

PAT-22 was crossed during the transit from San Diego to PAT-16, and happened to be in an almost optimum location for the 40 Ma transect.

FIGURES

Fig PAT22-1: Location map for PAT-22, on GEBCO bathymetry. Proposed drill site is marked.
Fig PAT22-2: Swathmap bathymetry in the vicinity of PAT-22.
Fig PAT22-3: 3.5 kHz seismic profile across PAT-22, from EW9709. Proposed drill site is marked

REFERENCES

Engebretson, D.C., A. Cox, and R. G. Gordon (1985) Relative motions between oceanic and continental plates in the Pacific basin. *Geol. Soc. Amer. Special Paper 206.*

Gripp, A.E., and R.G. Gordon (1990). Current plate velocities relative to the hotspots incorporating the NUVEL-1 global plate motion model. *Geophys. Res. Lett., 17*, 1109-1112.

Cande, S.C., J.L. LaBrecque, R.L. Larson, W.C. Pitman III, X. Golovchenko, and W.F. Haxby (1989) Magnetic lineations of the world's ocean basins. *American Association of Petroleum Geologists Map Series.*

Cande, S.C., and D.V. Kent (1995) Revised calibration of the geomagnetic polarity timescale for the Late Cretaceous and Cenozoic. *J. Geophys. Res., 100*, 6093-6095.

Figure PAT22-1: Location map for PAT-22, on GEBCO bathymetry.

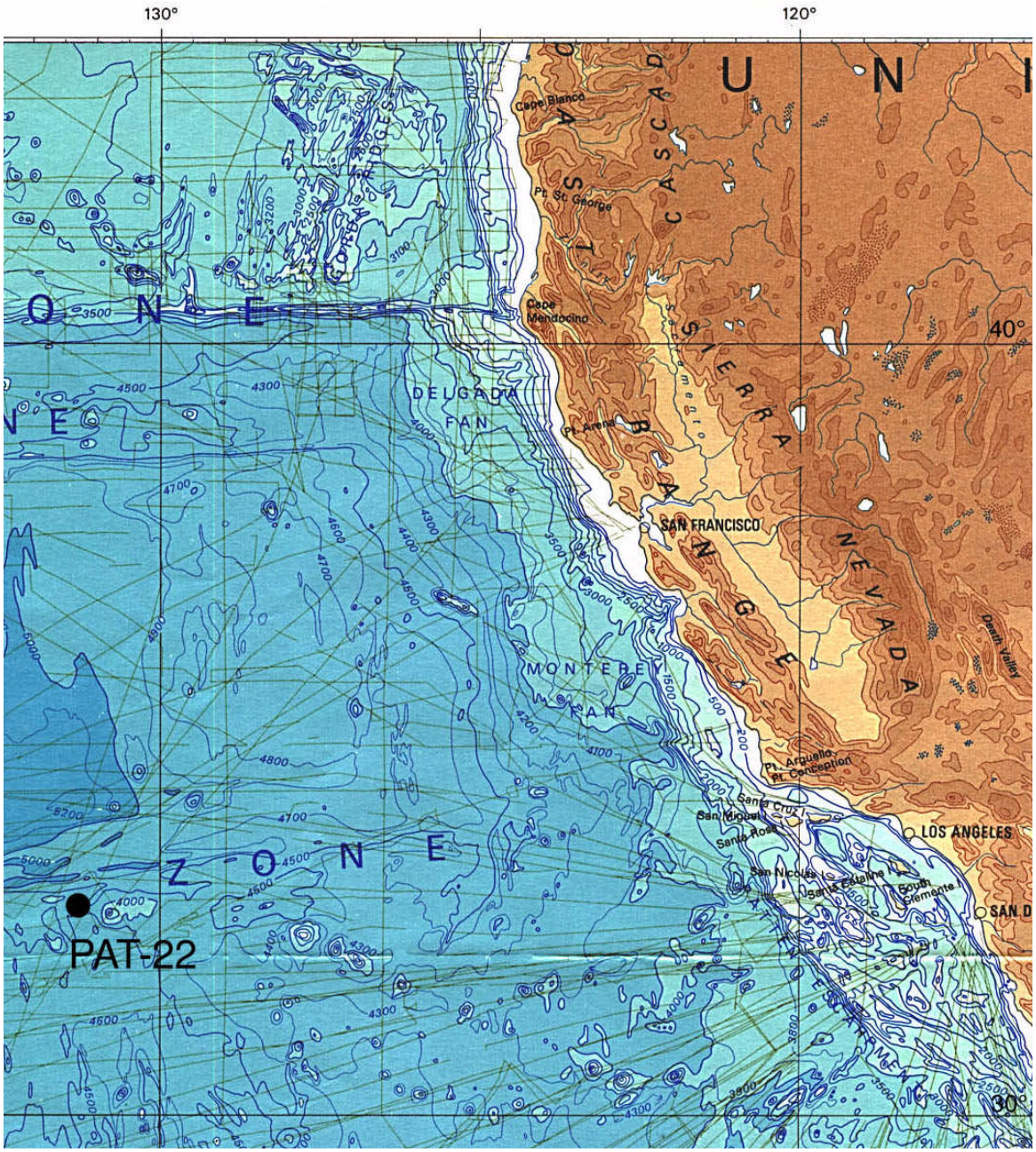


Figure PAT22-2: Swathmap bathymetry across PAT-22, from the EW9709 site survey cruise.

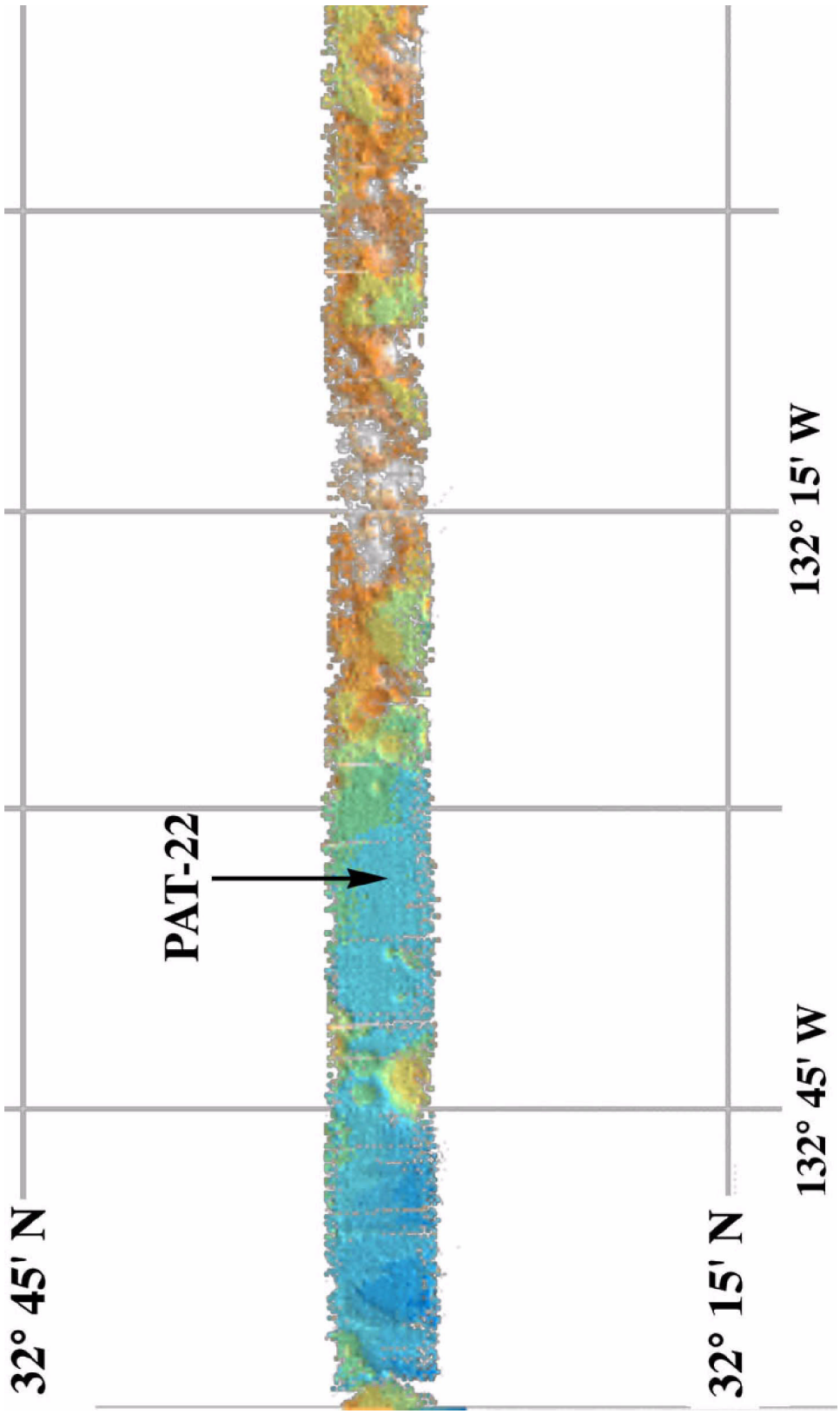
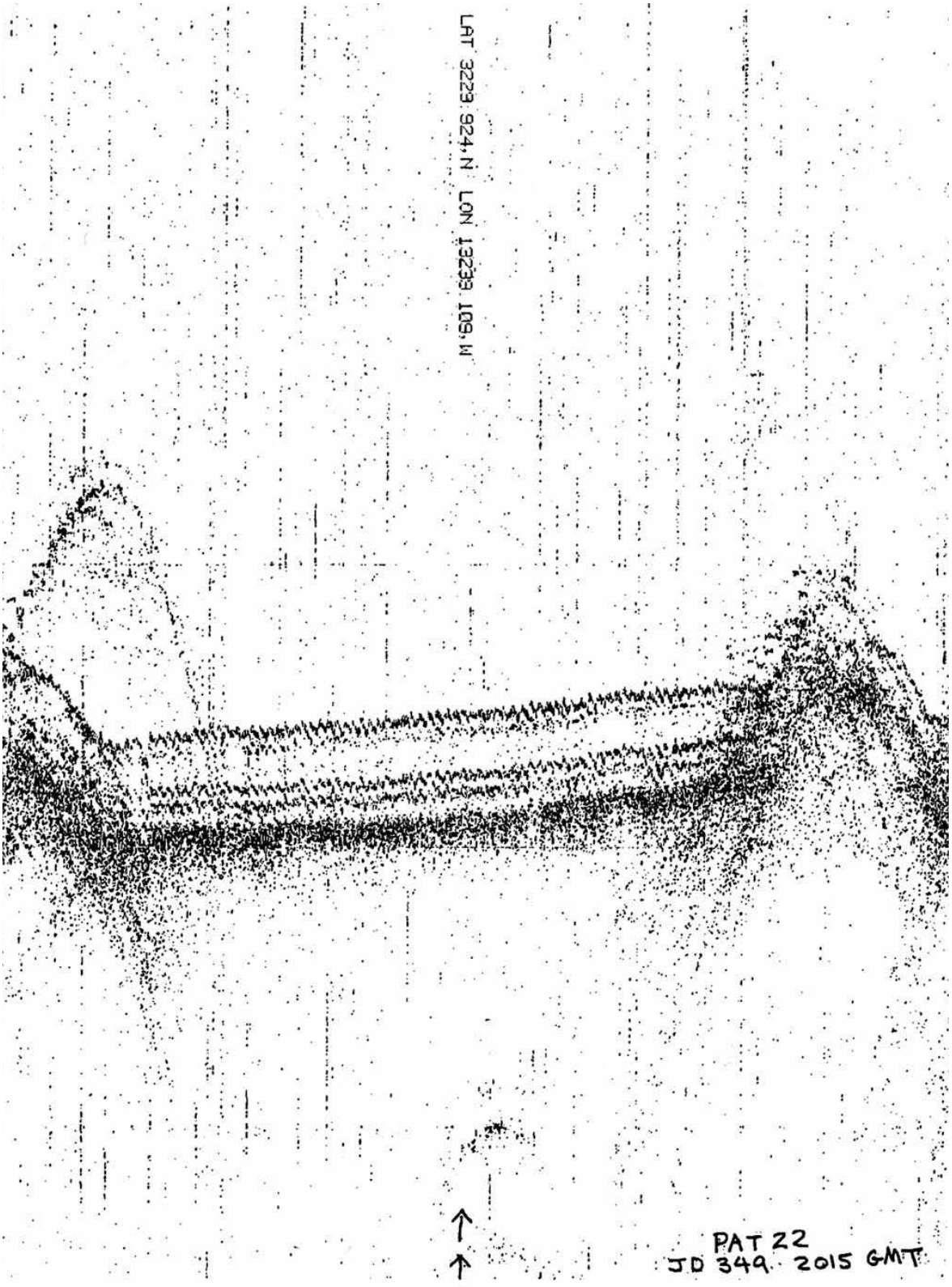


Figure PAT22-3: 3.5 kHz subbottom profile across PAT-22, from EW9709



ODP Site Description Forms:

Page 1 - General Site Information

Please fill out information in all gray boxes

New **Revised**

Section A: Proposal Information

Title of Proposal	Paleocene Equatorial Pacific APC Transect
Proposal Number:	486-Rev2
Date Form Submitted:	15 March 1998
Site Specific Objectives (Must include general objectives in proposal)	40Ma-30 Ma Eocene-Oligocene Climate transition: Latitudinal position of westerlies and ITCZ North Pacific CCD
List Previous Drilling in Area:	DSDP 172

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-22	If site is a reoccupation of an old DSDP/ ODP Site, Please include former Site #	Area or Location:	Central Pacific Ocean
Latitude: N	Deg: 32	Min: 29.924 N	Jurisdiction:	none
Longitude: W	Deg: 132	Min: 33.109	Distance to Land:	>1000 km
Priority of Site:	Primary: 3	Alt:	Water Depth:	4861 m

Section C: Operational Information

	Sediments.What is the total sed. thickness? 30 m		Basement	
Proposed Penetration (m)	30 m		0	
General Lithologies:	red clays with occasional carbonates		MORB	
Coring Plan (circle):	1-2-3-APC VPC* XCB MDCB* PCS RCB Re-entry HRGB * Systems Currently Under Development			
Logging Plan: NONE	Standard Tools		Special Tools	LWD
	Triple-Combo Neutron-Porosity Litho-Density Natural Gamma Ray Resistivity-Induction	FMS-Sonic Acoustic FMS	Borehole Televiewer Geochemical Resistivity-Laterolog High Temperature Magnetic/Susceptibility	Density-Neutron Resitivity-Gamma Ray
Estimated days:	Drilling/Coring: 1.2	Logging: 0	Total On-Site: 1.2	
Hazards/ Weather	*List possible hazards due to ice, hydrocarbons, dumpsites, cables, etc.* northern winter storms		*What is your Weather Window?* *all year*	

Instructions:

Please fill out these forms for each site that you are proposing to drill, including as much detail as possible. The following table describes the purpose of each page, what information is needed, and when each page should be submitted.

Page	Information needed	Used By	When to submit	Contact for more information
1	General Info. about proposals, site location and basic operational needs	JOIDES Office, Data Bank, Logging Group, ODP/TAMU, SSP, PPSP	When submitting preliminary proposal and when updating site information.	JOIDES Office email: joides@whoi.edu www: http://www.whoi.edu/joides/
2	Information regarding site survey data available and to-be-collected	JOIDES Office, Data Bank, SSP, PPSP	When submitting full proposal and when updating site survey information	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
3	Detailed Logging Plan	JOIDES Office, Logging Group, ODP/ TAMU	When submitting full proposal and when updating logging plan	ODP-LDEO Wireline Logging Services email: borehole@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/BRG/brg_home.html
4	Lithologic Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
5	Pollution and Safety Hazard Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/

ODP Site Description Forms:

Page 2 - Site Survey Detail

Please fill out information in all gray boxes

New **Revised**

Proposal #: 486-Rev2	Site #:PAT-22	Date Form Submitted: 15 March 1998

	Data Type	SSP Requir-ements	Exists In DB	Details of available data and data that are still to be collected
1	High resolution seismic reflection	X		Primary Line(s): Location of Site on line (SP or Time only) EW9709 2015 gmt 12/15/97 (3.5 kHz) Crossing Lines(s):
2	Deep Penetration seismic reflection			Primary Line(s): Location of Site on line (SP or Time only) Crossing Lines(s):
3	Seismic Velocity◊			
4	Seismic Grid	Y		
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) see above
7	Swath bathymetry	Y		EW9709 2015 gmt 12/15/97
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		
11b	Gravity			
12	Sediment cores	X		
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		GPS EW9709 2015 gmt 12/15/97
17	Other			

SSP Classification of Site:	SSP Watchdog:	Date of Last Review:
SSP Comments:		

X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites; R=required for re-entry sites; T=required for high temperature environments; ◊Accurate velocity information is required for holes deeper than 400m.

ODP Site Description Forms:

Page 3 - Detailed Logging Plan

New **Revised**

Proposal #:486-Rev2	Site #: PAT-22	Date Form Submitted: 15 March 1998
Water Depth (m): 4861	Sed. Penetration (m): 30	Basement Penetration (m): 0

Do you need to use the conical side-entry sub (CSES) at this site? Yes No X

Are high temperatures expected at this site? Yes No X

Are there any other special requirements for logging at this site? Yes No X No logging planned

If "Yes" Please describe requirements:

_____

What do you estimate the total logging time for this site to be: ____0 Hours__ _____

Measurement Type	Scientific Objective	Relevance (1=high, 3=Low)
Neutron-Porosity		
Litho-Density		
Natural Gamma Ray		
Resistivity-Induction		
Acoustic		
FMS		
BHTV		
Resistivity-Laterolog		
Magnetic/Susceptibility		
Density-Neutron (LWD)		
Resitivity-Gamma Ray (LWD)		
Other: Special tools (CORK, PACKER, VSP, PCS, FWS, WSP		

For help in determining logging times, please contact the ODP-LDEO Wireline Logging Services group at:

borehole@ldeo.columbia.edu
http://www.ldeo.columbia.edu/BRG/brg_home.html
Phone/Fax: (914) 365-8674 / (914) 365-3182

Note: Sites with greater than 400 m of penetration or significant basement penetration require deployment of standard tool-strings.

ODP Site Description Forms: Page 4 - Pollution & Safety Hazard Summary

Please fill out information in all gray boxes **New** **Revised**

Proposal #: 486-Rev2	Site #: PAT-22	Date Form Submitted: 15 March 1998

1	Summary of Operations at site: (Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on page 3.)	Triple APC to basement
2	Based on Previous DSDP/ODP drilling, list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock:	NONE
3	From Available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydrocarbon-bearing deposits.	NONE
4	Are there any indications of gas hydrates at this location?	NO
5	Are there reasons to expect hydrocarbon accumulations at this site? Please give details.	NO
6	What "special" precautions will be taken during drilling?	NONE
7	What abandonment procedures do you plan to follow:	STANDARD
8	Please list other natural or manmade hazards which may effect ship's operations: (e.g. ice, currents, cables)	NONE
9	Summary: What do you consider the major risks in drilling at this site?	NONE

ODP Site Description Forms:

Page 5 - Lithologic Summary

New **Revised**

Proposal #: 486-Rev2	Site #: PAT-22	Date Form Submitted: 15 March 1998

Sub-bottom depth (m)	Key reflectors, Unconformities, faults, etc	Age	Assumed velocity (km/sec)	Lithology	Paleo-environment	Ave. rate of sediment accumulation (m/My)	Comments
0 to 30		0-38 Ma	1.52	red clay with occasional carbonates	central gyre	0.8 m/Myr	
				MORB			

April 1998 Submission

EW9709 Revised Site

SITE PAT-16A (N. Central Pacific, between Pioneer and Murray FZ)

32° 32.506’ N, 141° 12.221’ W

SITE OBJECTIVES

PAT-16A is part of the Phase 1 (56 Ma) transect. It has a low priority because the site survey piston core EW9709-1PC sampled almost the entire sediment column. PAT-16A will be used primarily to define the shift in ITCZ through the Paleogene by following the change in aeolian dust composition and flux through time. It will also help define North Pacific subtropical gyre processes, although the lack of microfossils above the lowermost Eocene will preclude most paleoceanographic studies. At 55 Ma, the backtracked location based upon a hotspot reference frame (Gripp and Gordon, 1990, for 0-5 Ma Pacific-hot spot rotation pole; Engebretson et al., 1985, for older poles) was 23° N, 114° W. At 40 Ma, the site was located at about 26° N, 116° W.

GENERAL DESCRIPTION,

PAT-16A is situated on abyssal hill topography between the Pioneer and Murray Fracture Zones (Figure PAT16A-2). Based on magnetic lineations, basement age at PAT-16A is in Anomaly 25R, or about 57 Ma (Cande et al., 1989; timescale of Cande and Kent, 1995) . The detailed survey of the site revealed abyssal hill topography trending NNW, with a small seamount in the northeast corner of the survey area. PAT-16A was located in the SW corner of the survey, away from the seamount and where sediments are consistently thicker.

LITHOLOGIC DESCRIPTION

Nearest Sediment Core: EW9709-PC1, 1099 cm; 32° 32.500’ N; 141° 12.194’ W, 5123 m (uncorr.)

Sediments recovered in EW9709-PC1 are classic red clays, very fine-grained with common zeolites. The top of the core is light brown, but darkens to a dark chocolate brown at the base presumably because of hydrothermal FeMn oxyhydroxide deposition.

SEISMIC INTERPRETATION

Primary Site (PAT-16A): EW9709 PAT16A-line4 ping 3411, JD351 18:23:27 gmt

Priority: 3
Crustal age: 57 Ma
Location: 32° 32.506’ N 141° 12.221’ W
Site water depth: 5123 m (6.831 sec TWTT)
Sediment thickness: 0.016 sec (12 m)
Proposed Drilling Depth: 12 m

PAT-16A has classic abyssal hill topography, covered by a thin veneer of sediment

10-20 msec thick. The site location was chosen here because the area is relatively flat and consistently has the thickest sediments in the survey area (Figures PAT16A-2, PAT16A-3)

GEOLOGIC HAZARDS

There are no known geologic hazards--pelagic sediments over oceanic basalts.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

FIGURES

Fig PAT16A-1: Location map for PAT-16A, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT16A-2: EW9709A survey of the PAT-16A region.

Fig PAT16A-3: N-S digital 3.5 kHz line through proposed drillsite (EW9709-line4).

REFERENCES

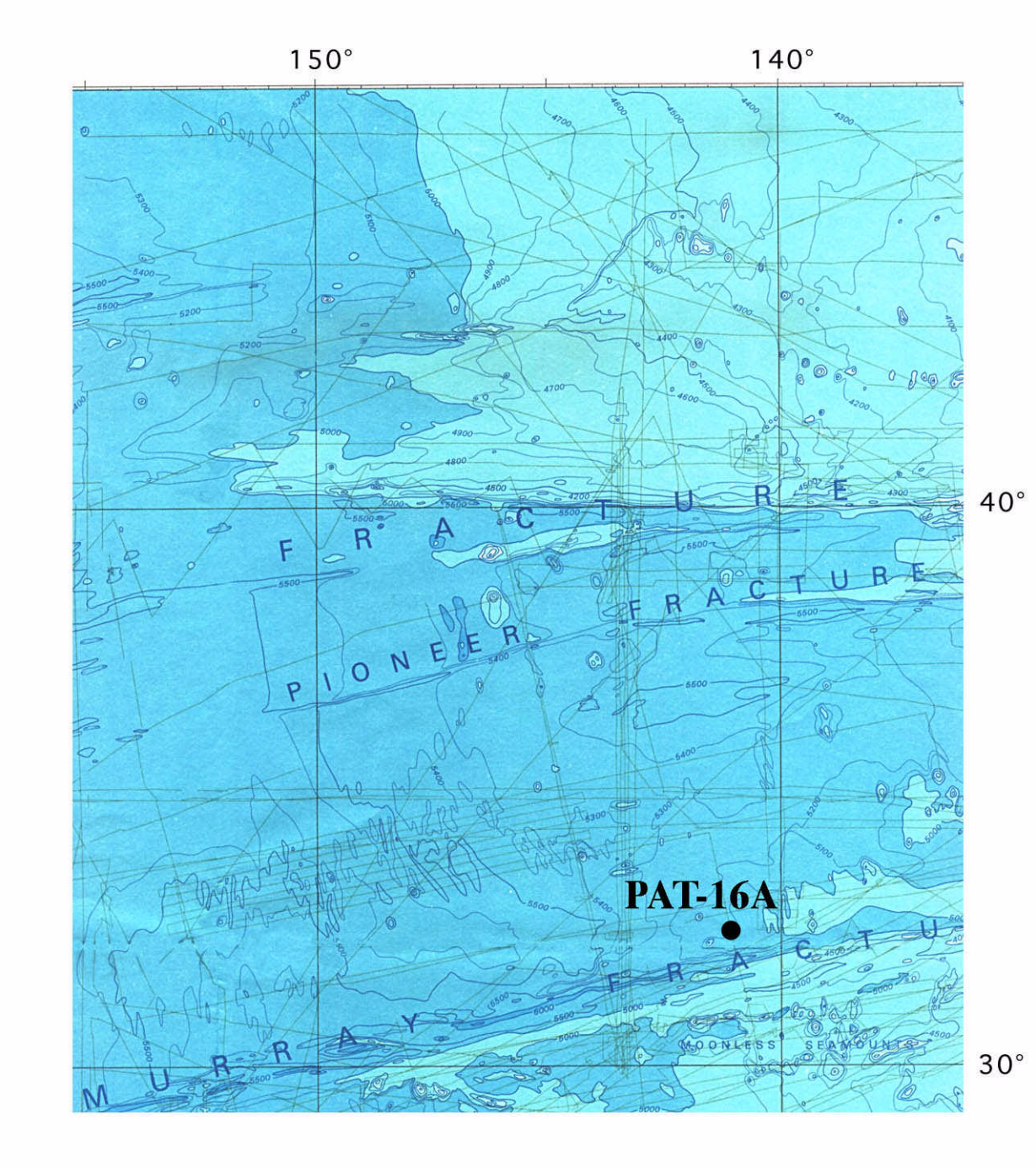
Engebretson, D.C., A. Cox, and R. G. Gordon (1985) Relative motions between oceanic and continental plates in the Pacific basin. *Geol. Soc. Amer. Special Paper 206.*

Gripp, A.E., and R.G. Gordon (1990). Current plate velocities relative to the hotspots incorporating the NUVEL-1 global plate motion model. *Geophys. Res. Lett., 17,* 1109-1112.

Cande, S.C., J.L. LaBrecque, R.L. Larson, W.C. Pitman III, X. Golovchenko, and W.F. Haxby (1989) Magnetic lineations of the world's ocean basins. *American Association of Petroleum Geologists Map Series.*

Cande, S.C., and D.V. Kent (1995) Revised calibration of the geomagnetic polarity timescale for the Late Cretaceous and Cenozoic. *J. Geophys. Res., 100,* 6093-6095.

Figure PAT16A-1: Regional GEBCO bathymetry near PAT-16A



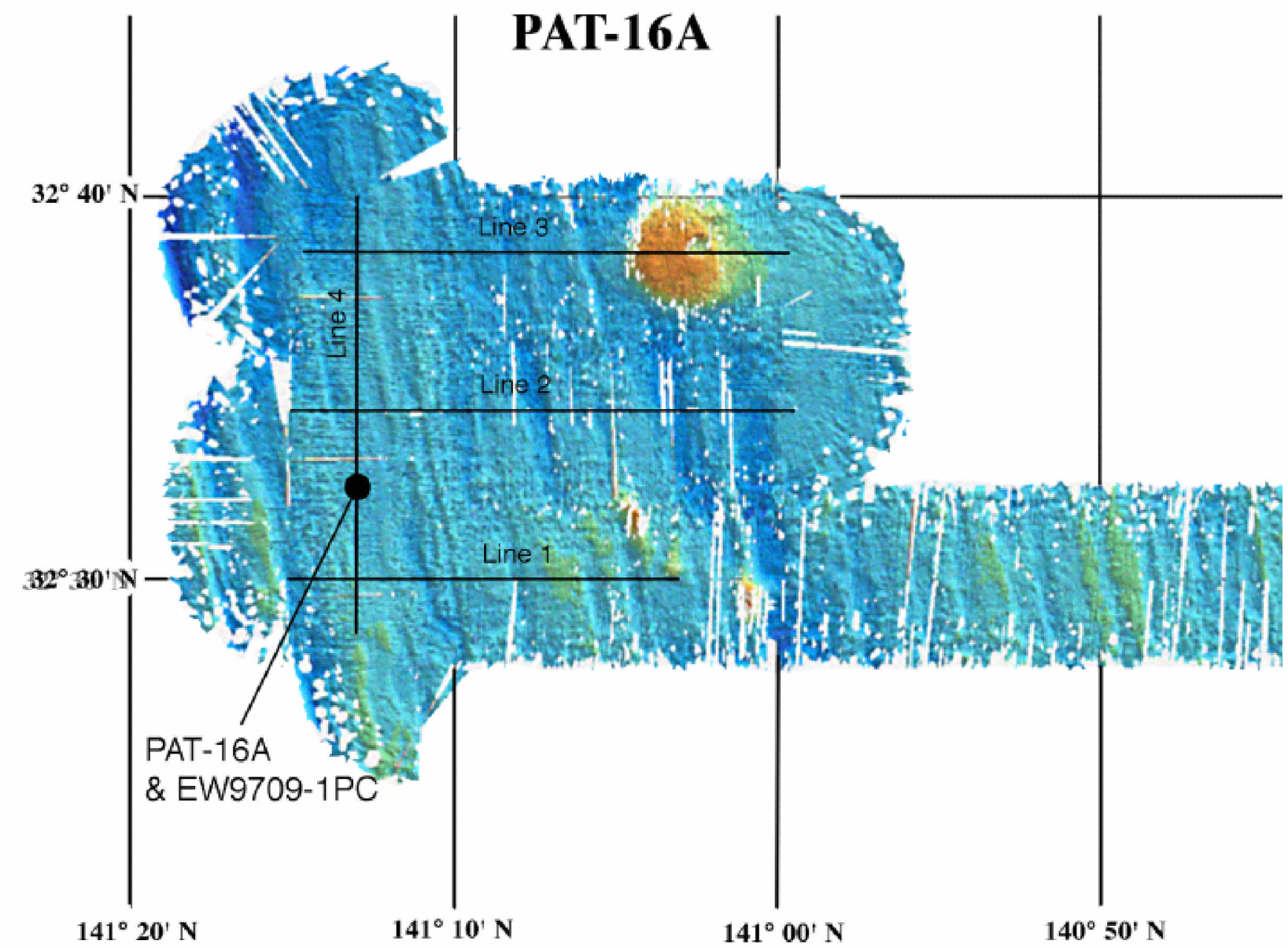
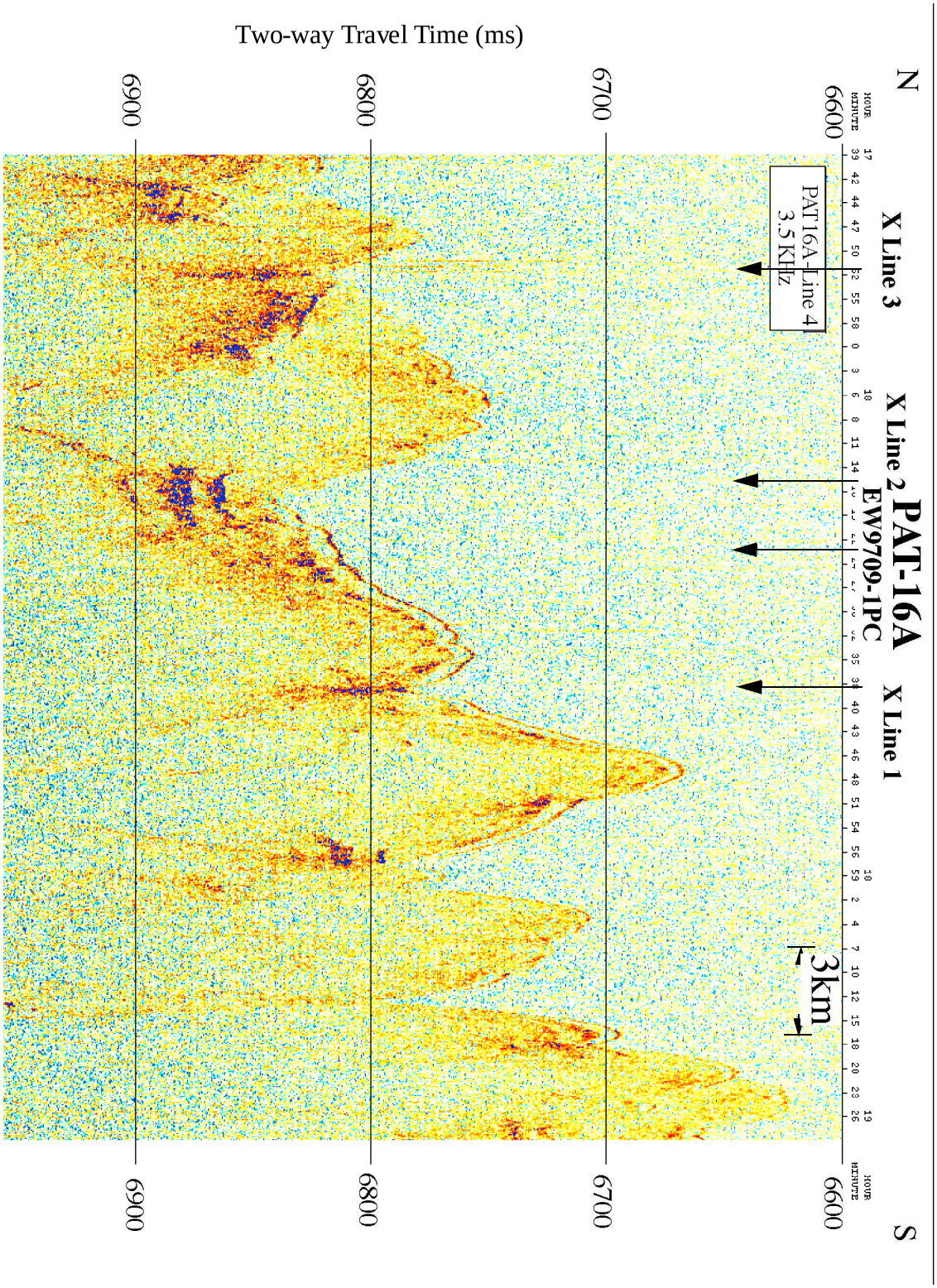


Fig PAT16A-2: Swathmap bathymetry of Site Pat-16A taken Dec 17 1997 on EW9709

Figure PAT16A-3: EW9709-line 4, digitally recorded 3.5 kHz data. Site of PAT16A is at the EW9709-1PC core site



ODP Site Description Forms:

Page 1 - General Site Information

Please fill out information in all gray boxes

New **Revised**

Section A: Proposal Information

Title of Proposal	Paleocene Equatorial Pacific APC Transect
Proposal Number:	486-Rev2
Date Form Submitted:	15 March 1998
Site Specific Objectives (Must include general objectives in proposal)	Eocene thermal maximum (55 Ma) Location and strength of westerlies
List Previous Drilling in Area:	DSDP 39

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-16A (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)		Area or Location:	Central Pacific Ocean
Latitude:	Deg: 32	Min: 32.506	Jurisdiction:	none
Longitude:	Deg: 141	Min: 12.221	Distance to Land:	>1000 km
Priority of Site:	Primary: 3	Alt:	Water Depth:	5123 m (uncorr.; 6.831 sec)

Section C: Operational Information

	Sediments. What is the total sed. thickness? 12 m	Basement
Proposed Penetration (m)	12 m	0
General Lithologies:	red clay	MORB

Coring Plan (circle): 1-2-3-APC VPC* XCB MDCB* PCS RCB Re-entry HRGB

** Systems Currently Under Development*

Logging Plan:	Standard Tools		Special Tools	LWD
	Triple-Combo Neutron-Porosity Litho-Density Natural Gamma Ray Resistivity-Induction	FMS-Sonic Acoustic FMS	Borehole Televiewer Geochemical Resistivity-Laterolog High Temperature Magnetic/Susceptibility	Density-Neutron Resitivity-Gamma Ray

Estimated days:	Drilling/Coring:	Logging:	Total On-Site:
	0.7	0	0.7

Hazards/ Weather	*List possible hazards due to ice, hydrocarbons, dumpsites, cables, etc.*	What is your Weather Window?
	none	all year

Instructions:

Please fill out these forms for each site that you are proposing to drill, including as much detail as possible. The following table describes the purpose of each page, what information is needed, and when each page should be submitted.

Page	Information needed	Used By	When to submit	Contact for more information
1	General Info. about proposals, site location and basic operational needs	JOIDES Office, Data Bank, Logging Group, ODP/TAMU, SSP, PPSP	When submitting preliminary proposal and when updating site information.	JOIDES Office email: joides@whoi.edu www: http://www.whoi.edu/joides/
2	Information regarding site survey data available and to-be-collected	JOIDES Office, Data Bank, SSP, PPSP	When submitting full proposal and when updating site survey information	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
3	Detailed Logging Plan	JOIDES Office, Logging Group, ODP/TAMU	When submitting full proposal and when updating logging plan	ODP-LDEO Wireline Logging Services email: borehole@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/BRG/brg_home.html
4	Lithologic Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
5	Pollution and Safety Hazard Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/

ODP Site Description Forms:

Page 2 - Site Survey Detail

Please fill out information in all gray boxes

New **Revised**

Proposal #: 486-Rev2	Site #:	Date Form Submitted: 15 March 1998

	Data Type	SSP Requir-ements	Exists In DB	Details of available data and data that are still to be collected
1	High resolution seismic reflection	X		Primary Line(s): Location of Site on line (SP or Time only) Crossing Lines(s):
2	Deep Penetration seismic reflection			Primary Line(s): Location of Site on line (SP or Time only) Crossing Lines(s):
3	Seismic Velocity◊			
4	Seismic Grid	Y		EW9709 PAT-16A survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) digitally recorded; EW9709 PAT16A-line 4, ping 3411
7	Swath bathymetry	Y		EW9709
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		
11b	Gravity			
12	Sediment cores	X		EW9709-PC1
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		
17	Other			

SSP Classification of Site:	SSP Watchdog:	Date of Last Review:
SSP Comments:		

X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites; R=required for re-entry sites; T=required for high temperature environments; ◊Accurate velocity information is required for holes deeper than 400m.

ODP Site Description Forms: Page 3 - Detailed Logging Plan

New **Revised**

Proposal #:486-Rev2	Site #: PAT-16	Date Form Submitted: 15 March 1998
Water Depth (m): 5123 (uncorr.)	Sed. Penetration (m): 12 m	Basement Penetration (m): 0

Do you need to use the conical side-entry sub (CSES) at this site? Yes No X
Are high temperatures expected at this site? Yes No X
Are there any other special requirements for logging at this site? Yes No X

If "Yes" Please describe requirements: _____

What do you estimate the total logging time for this site to be: _____0 hours_____

Measurement Type	Scientific Objective	Relevance (1=high, 3=Low)
Neutron-Porosity		
Litho-Density		
Natural Gamma Ray		
Resistivity-Induction		
Acoustic		
FMS		
BHTV		
Resistivity-Laterolog		
Magnetic/Susceptibility		
Density-Neutron (LWD)		
Resitivity-Gamma Ray (LWD)		
Other: Special tools (CORK, PACKER, VSP, PCS, FWS, WSP		

For help in determining logging times, please contact the ODP-LDEO Wireline Logging Services group at:

borehole@ldeo.columbia.edu
http://www.ldeo.columbia.edu/BRG/brg_home.html
Phone/Fax: (914) 365-8674 / (914) 365-3182

Note: Sites with greater than 400 m of penetration or significant basement penetration require deployment of standard toolstrings.

ODP Site Description Forms: Page 4 - Pollution & Safety Hazard Summary

Please fill out information in all gray boxes **New** **Revised**

Proposal #: 486-Rev2	Site #: PAT-16A	Date Form Submitted: 15 March 1998

1	Summary of Operations at site: (Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on page 3.)	Triple APC to refusal
2	Based on Previous DSDP/ODP drilling, list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock:	NONE
3	From Available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydrocarbon-bearing deposits.	NONE
4	Are there any indications of gas hydrates at this location?	NO
5	Are there reasons to expect hydrocarbon accumulations at this site? Please give details.	NO
6	What "special" precautions will be taken during drilling?	NONE
7	What abandonment procedures do you plan to follow:	STANDARD
8	Please list other natural or man-made hazards which may effect ship's operations: (e.g. ice, currents, cables)	NONE
9	Summary: What do you consider the major risks in drilling at this site?	NONE

ODP Site Description Forms: **Page 5 - Lithologic Summary**

New **Revised**

Proposal #: 486 Rev2	Site #: PAT-16A	Date Form Submitted: 15 March 1998

Sub-bottom depth (m)	Key reflec-tors, Uncon-formities, faults, etc	Age	Assumed velocity (km/sec)	Lithology	Paleo-environment	Ave. rate of sediment accumula-tion (m/My)	Comments
0 to 12 m	none	0-57 Ma	1.52	red clay	pelagic gyre	0.2 m/myr	