APRIL 1998
Data Submission to ODP Site Survey Panel

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

Volume 1

Priority 1 Drillsites
Site Descriptions and Maps

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REVISED AFTER EW9709

Introduction: Priority 1 Drillsites

CGISS Technical Report 98-02
Volume 1

PLANNED DRILLSITES FOR OCEAN DRILLING PROGRAM PROPOSAL 486, Paleogene Equatorial APC Transect Priority 1 Drillsites (~1 Leg Option): 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 geo-

logic 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. 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.

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 before being stored 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 locations 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.

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 sediments 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.

These observations, if substantiated by the proposed drilling, require a new oceanographic paradigm for the tropics of the early Paleogene. 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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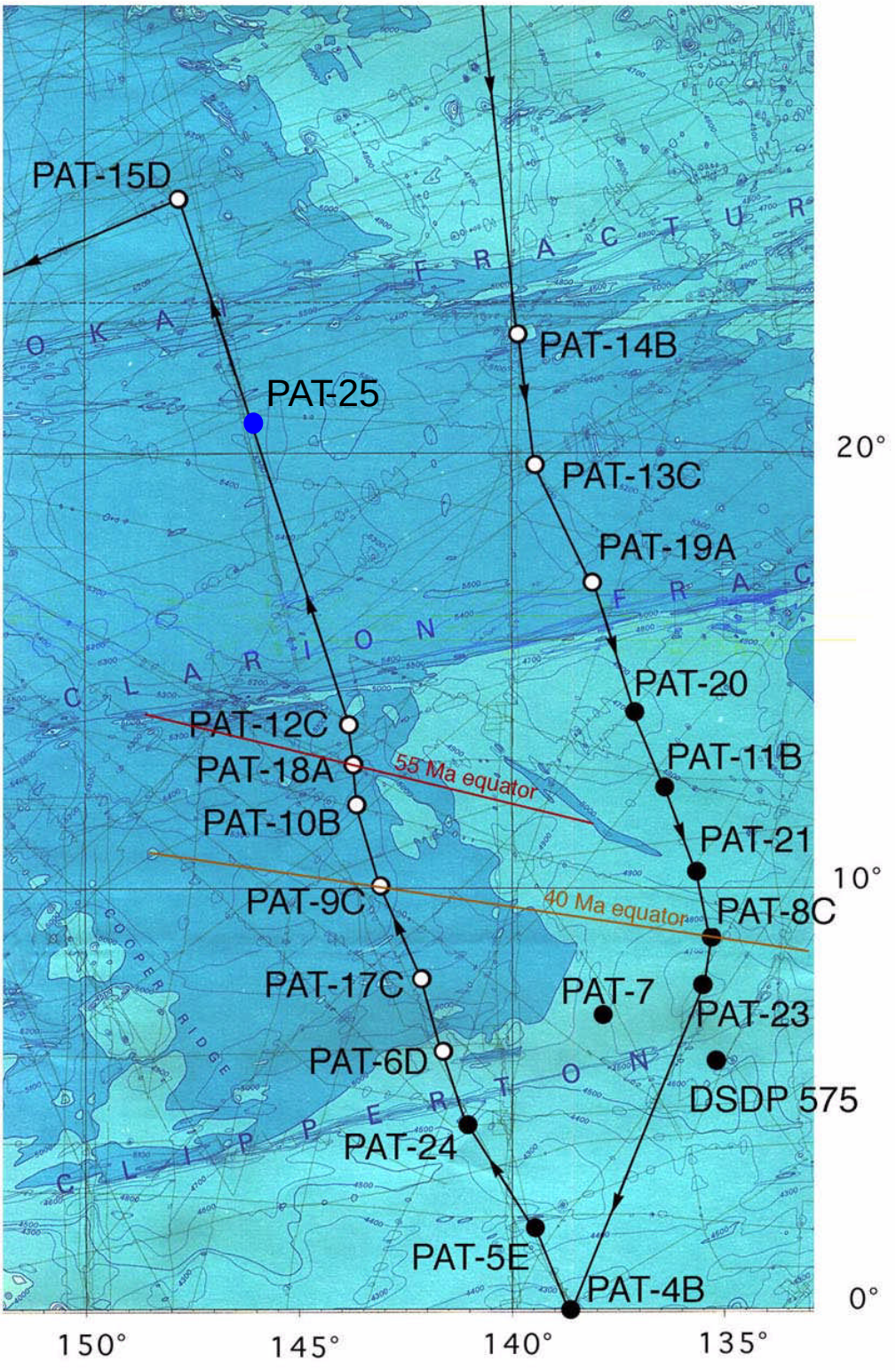
TABLE 1: PRIORITY 1 DRILLSITES
(1st LEG OF DRILLING)

SITE	*Paleolatitude 56 Ma*	*Paleolatitude 40 Ma*
PAT-6D	6.04°S	3.38°S
PAT-17C	4.83°S	1.93°S
PAT-9C	2.82°S	0.22°N
PAT-8C	———	0.03°N
PAT-10B	1.15°S	2.06°N
PAT-18A	0.29°S	2.96°N
PAT-12C	0.53°N	3.81°N
PAT-19A	4.93°N	7.56°N
PAT-13C	7.52°N	10.33°N
PAT-14A	10.29°N	13.32°N
PAT-15C	11.48°N	15.53°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.



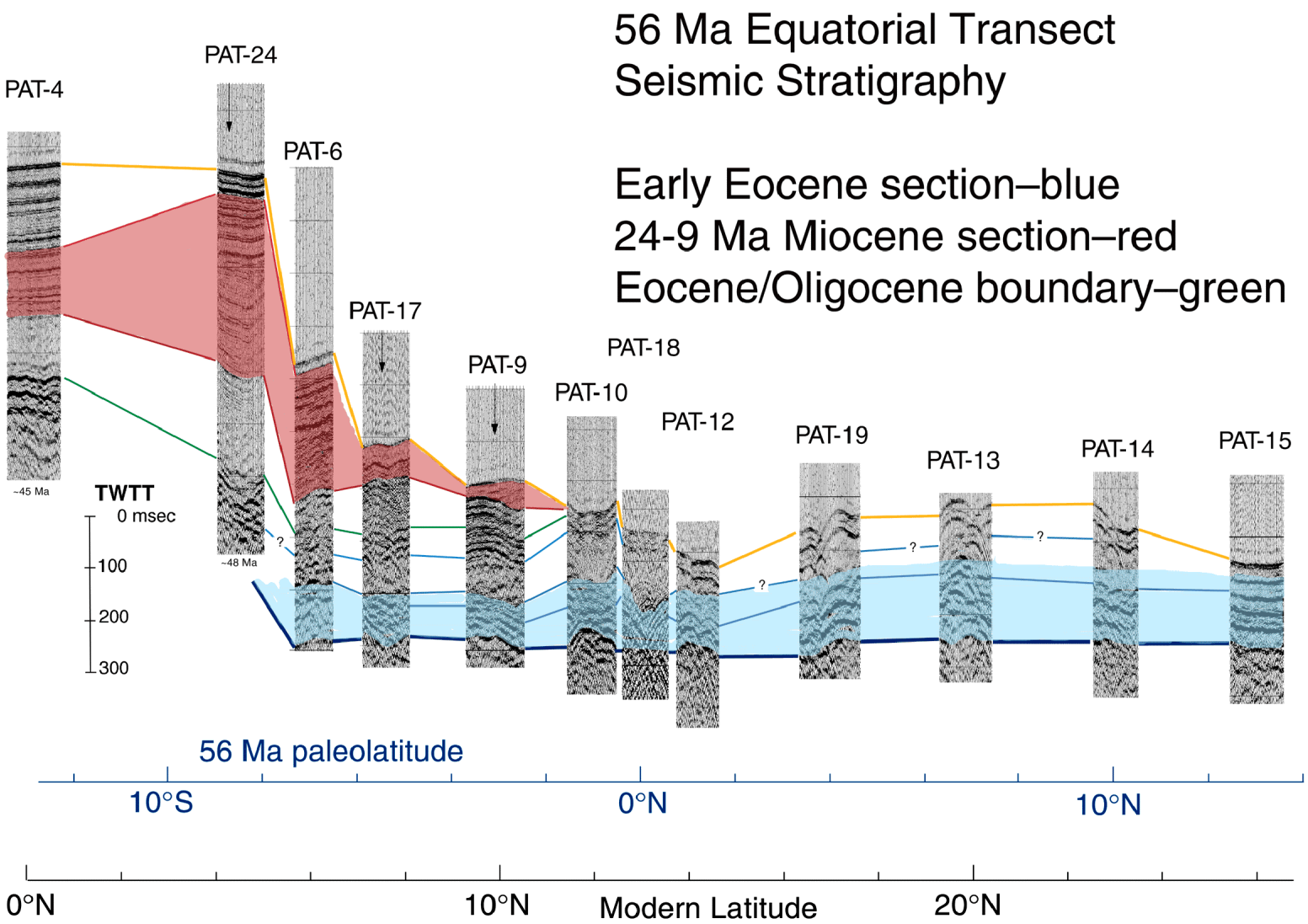


Figure Intro-2: Transect from the modern equator along the planned 56 Ma transect. All Priority 1 drillsites are shown as well as the Priority 2 sites PAT-24 and PAT-4B from the 40 Ma transect. The Miocene stratigraphy is based upon Mayer et al., 1985, constrained at the sediment surface by EW9709 piston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

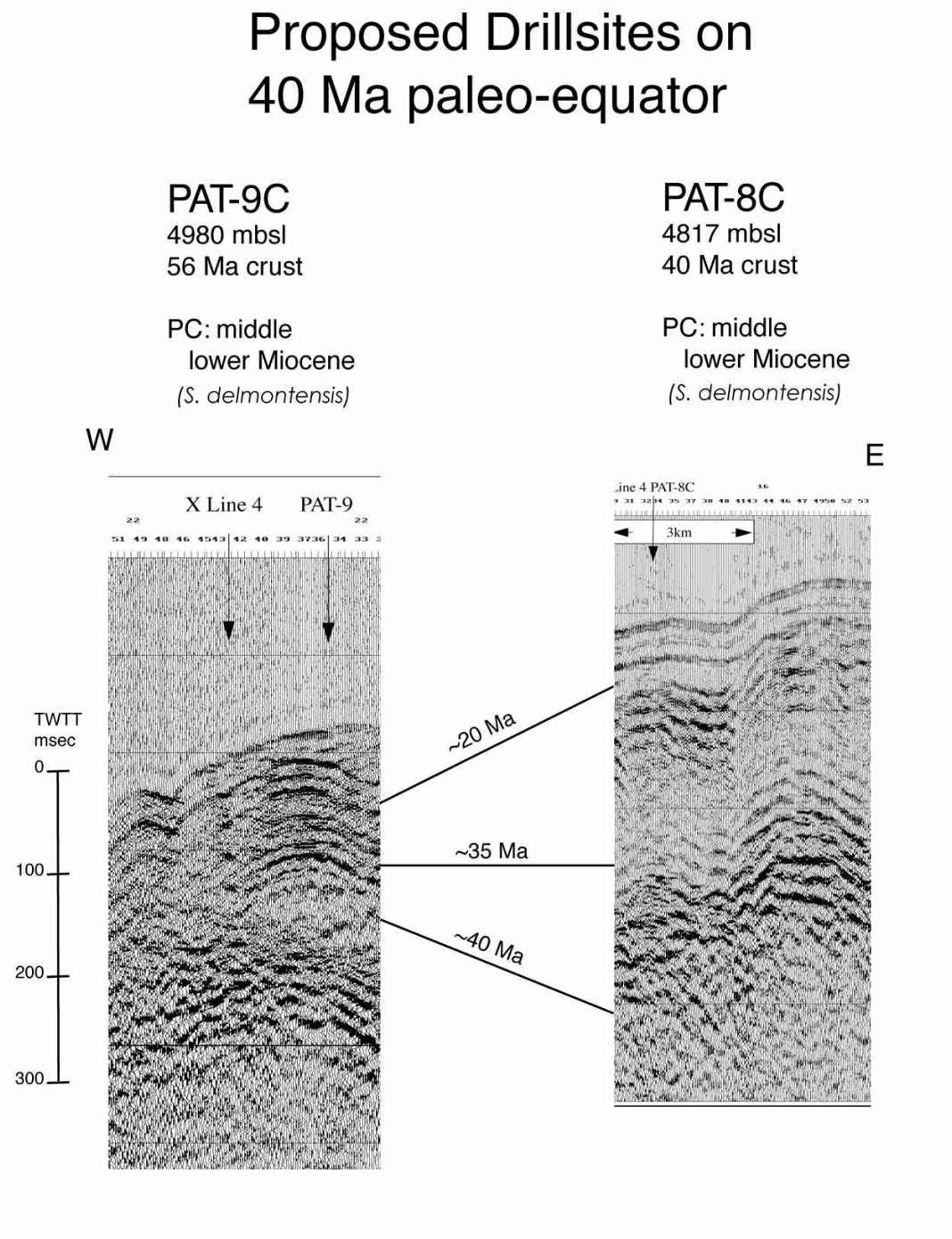


Figure Intro-3: Seismic sections from the two priority 1 drillsites that form a transect at the 40 Ma equator. PAT-8C, on ~40 Ma crust, was very near the risecrest and at a paleodepth of about 3000 m. PAT-9C, in contrast, was on crust that had subsided by 40 Ma to about 4100 m. The difference in thickness 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

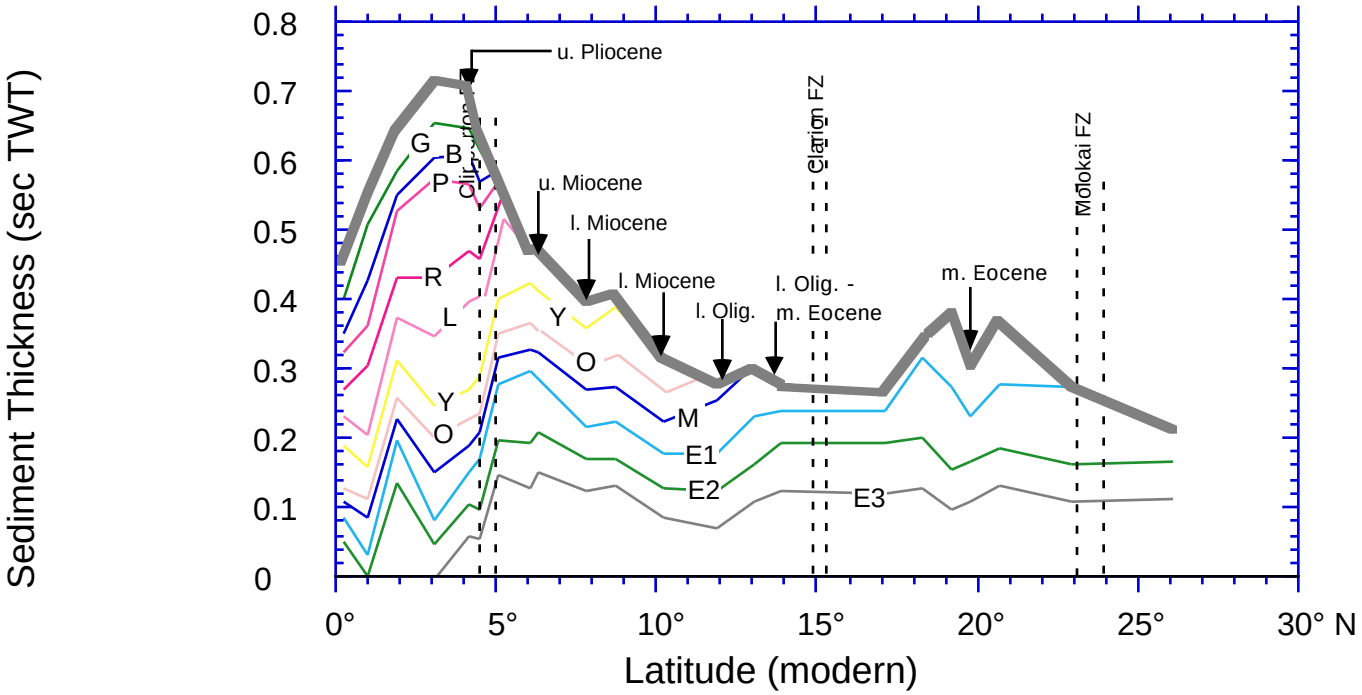


Figure Intro-4: Seismic horizons identified in a transect along crust of 56 Ma age from the Equator to approximately 26° N latitude. Horizons "G" through "O" are identified based on comparisons with the work of Mayer et al. (1985) in the equatorial Pacific. Horizons "M" through "E3" identified in this 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-6D (Central Equatorial Pacific, just N of the Clipperton FZ)

6° 18.042’ N, 141° 42.201’ W

SITE OBJECTIVES

PAT-6D is part of the Phase 1 (56Ma) transect to define early Eocene thermal maximum equatorial circulation and study its evolution as the world cools. It is the lowest priority of the primary drillsites to be drilled on the first leg of Paleogene drilling. Because of its southern equatorial location at 56 Ma, it will primarily monitor the South Equatorial Current in the early Eocene. It will also be used to study equatorial ocean circulation in the middle and late Eocene including deepwater flow and properties, and will, in concert with other drillsites, help define the CCD during the Eocene/Oligocene transition. This site will also be very useful for defining the CCD in the early and middle Miocene, since it went below the CCD around the middle/late Miocene boundary, based on our piston coring. At 56 Ma, the backtracked location was 6°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). At 40 Ma, the site was located at about 3° S, 113° W. PAT-6D crossed the equator at about 22 Ma.

GENERAL DESCRIPTION

PAT-6D is situated at the northern edge of the modern equatorial region, just north of the Clipperton Fracture Zone on a section of slightly upraised crust (Figure PAT6-1). We estimate age of basement to be about 57 Ma based upon dating of basement by previous drilling and by calculating 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) .

LITHOLOGIC DESCRIPTION

Nearest sediment core: EW9709 11PC 6° 19.800’N 141° 37.06’ W 4945 m 1674 cm sediment recovered

Core 11PC is a radiolarian ooze with a slight amount of carbonate in the lower four sections of the core (~1109-1674 cm). The oldest sediments recovered are from the upper part of the *D. pettersoni* zone (8.4-8.91 Ma). The top of section II (1373 cm) is within the *D. antepenultimus* zone (8.66-8.76 Ma). Sediments from the top of section IV through section VI (1109-808 cm) are within the *S. peregrina* zone (6.62-5.54 Ma). The sediments at the top of section VIII (510 cm) are from the *A. jenghesi* zone (3.89-4.15 Ma). The core catcher from the trigger weight (270 cm) is also from the *A. jenghesi* or possibly the *P. prismatium* zone (no younger than 1.74 Ma).

Nearest drillsite: DSDP Site 70, 6° 20.8'N 140° 21.72' W, 5059 mbsl, 388 m sediment, ending in middle Eocene Chert.

The sediment column at DSDP 70 shows how PAT-6D will be useful for defining the CCD in the Miocene, as well as for its Eocene objectives. Approximately 20 m of radiolarian ooze represent the upper Miocene to Holocene sediments, while the middle Miocene section has strong carbonate cyclicity between 20 and 40 mbsf. The lower Miocene extends to 112 mbsf. Lower Miocene and Oligocene sediments are carbonate-rich rad-nanno oozes, turning to chalk at about 175 mbsf. The upper Eocene section, below 320 mbsf, is a radiolarian ooze with little carbonate. Chert was first encountered at 330 mbsf (Hole 70A), and after a bit replacement, Hole 70B was drilled ahead to 383 mbsf without coring. Then, 5 meters of middle Eocene chert and siliceous limestone were drilled before the hole was abandoned.

SEISMIC INTERPRETATION

Primary Site (PAT-6D): EW9709 PAT6 seisline 5 JD004 07:27:11 gmt (SP2894)

Priority: 1.5
Crustal age: 57 Ma (?)
Location: 6° 18.042' N 141° 42.201' W
Site water depth: 4925 m (6.567 sec TWTT)
Sediment thickness: 0.456 sec (370 m)
Proposed Drilling Depth: 375 m

PAT-6D is located in flat surface topography. The abyssal hills oriented NNW have been filled in with 300-400 msec of sediment, damping out the basement relief. PAT-6D is located in one of the valleys, and was chosen because layering appeared coherent. Based upon the piston core dating, the first reflector we observe beneath the acoustically transparent sediments is probably the lm-P reflector of Mayer et al. (1985). The strong reflector a little over 100 msec TWTT beneath the sea floor may be equivalent eM-L, but if so it also appears to be an unconformity at PAT-6D, because it seems to be truncating the weaker reflectors just below. We interpret the Eocene section to begin at 319 msec TWTT bsf at the drillsite , where low frequency reflectors begin. The Eocene section is thicker than at PAT-24 and PAT-5, but this site is still significantly south of the Eocene equator and is not the best developed Eocene 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 have been used to pick the location of PAT-6D and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT6 seisline 1
EW9709 PAT6 seisline 2
EW9709 PAT6 seisline 3
EW9709 PAT6 seisline 4
EW9709 PAT6 seisline 5

3.5 Khz data:

EW9709 PAT6 35line 1
EW9709 PAT6 35line 2
EW9709 PAT6 35line 3
EW9709 PAT6 35line 4
EW9709 PAT6 35line 5

FIGURES

Fig PAT6-1: Location map for PAT-6D, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT6-2: Swathmap bathymetry for the PAT-6 region, from the EW9709 site survey. Proposed drill site is marked.

Fig PAT6-3: Seismic profile PAT6-seisline 5 across PAT-6D, from EW9709. Proposed drill site is marked.

Fig PAT6-4: 3.5 kHz subbottom profile PAT6-35line 5 across PAT-6D, from EW9709. Proposed drill site is marked

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Figure PAT6-1: Location map for PAT-6D on GEBCO bathymetry.

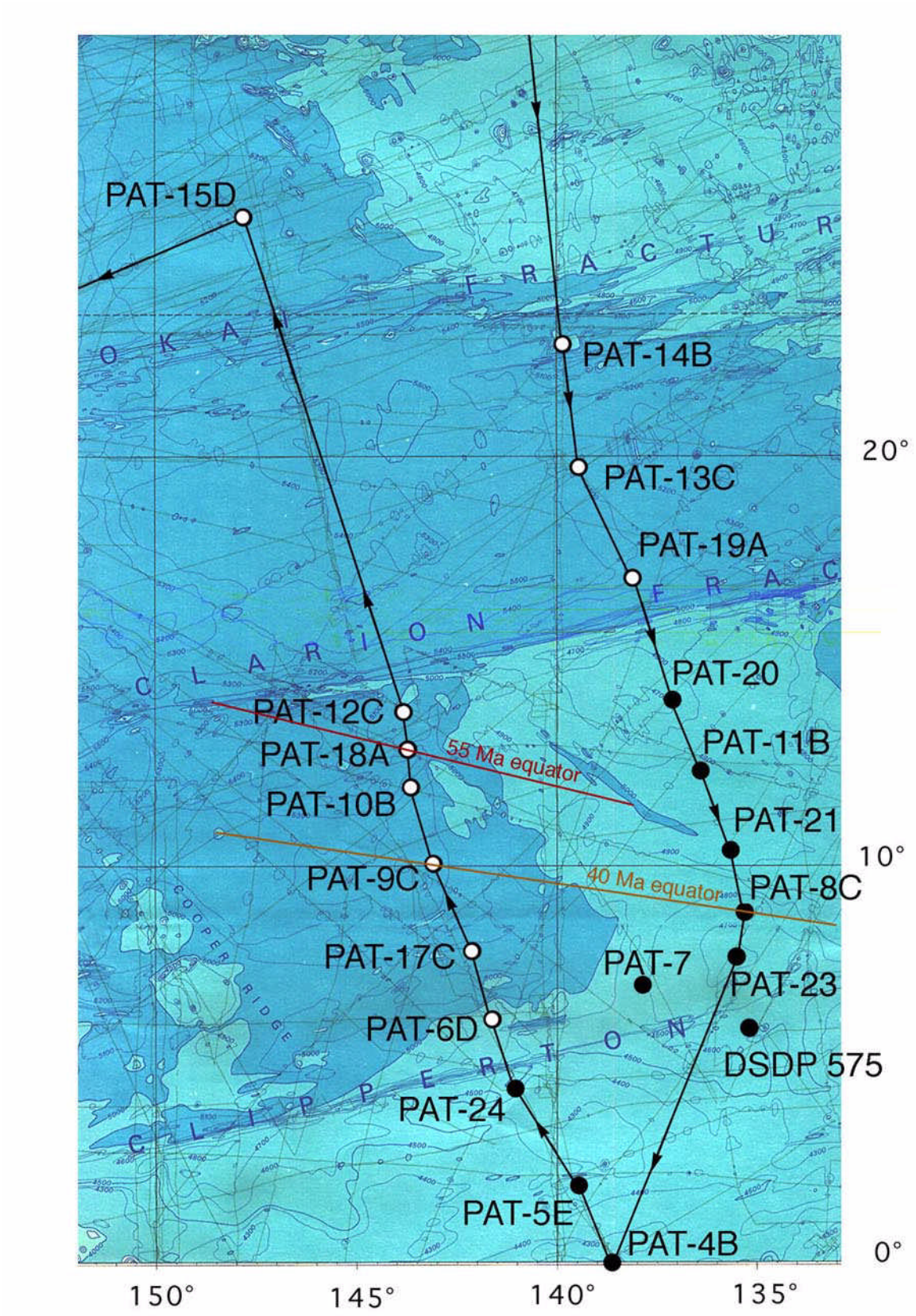


Figure PAT6-2: Swathmap bathymetry for the PAT-6D region, from the EW9709 site survey.

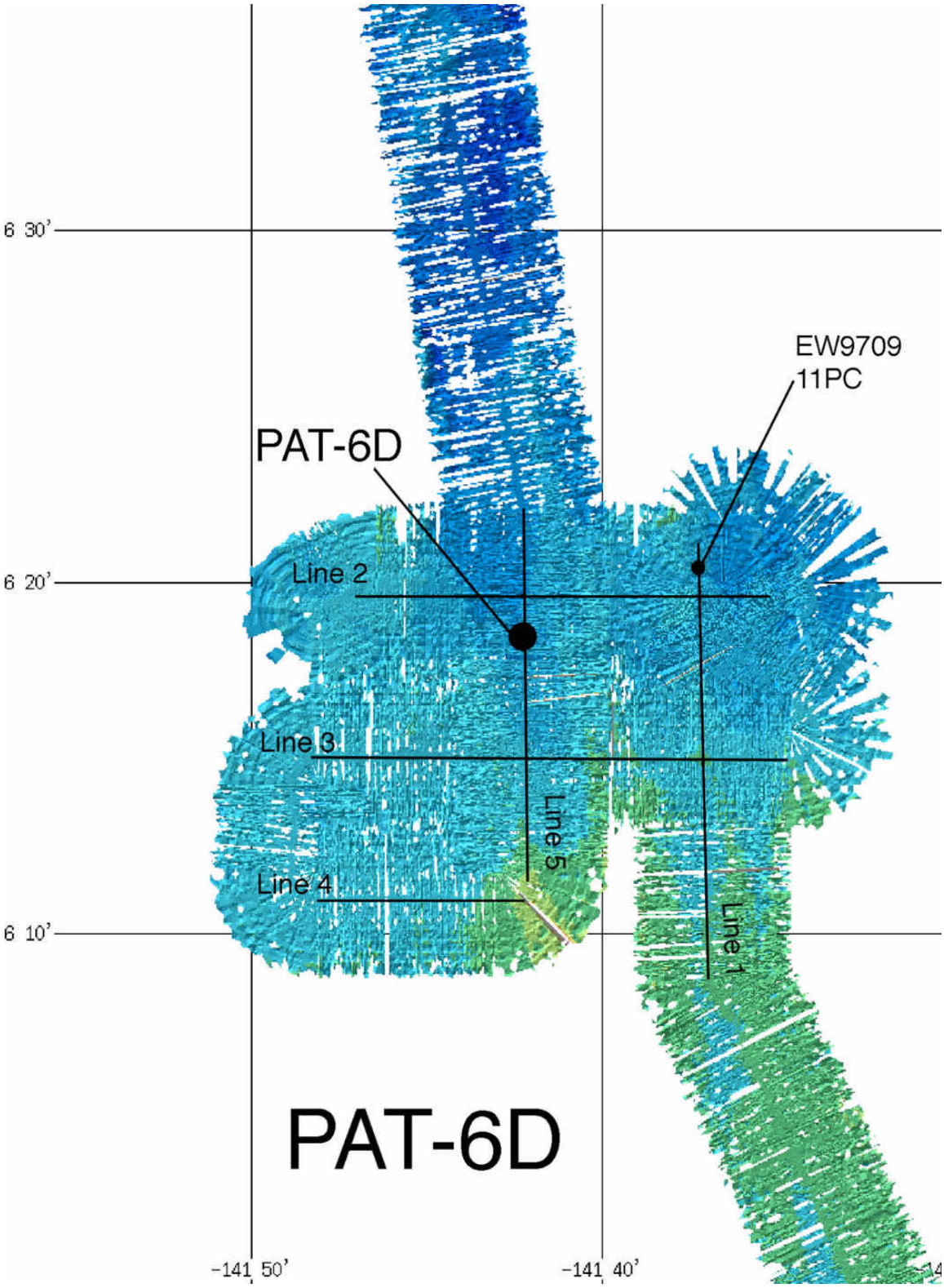


Figure PAT6-3: Northern part of Seismic profile PAT6-seisline 5 across PAT-6D, from the EW9709 site survey

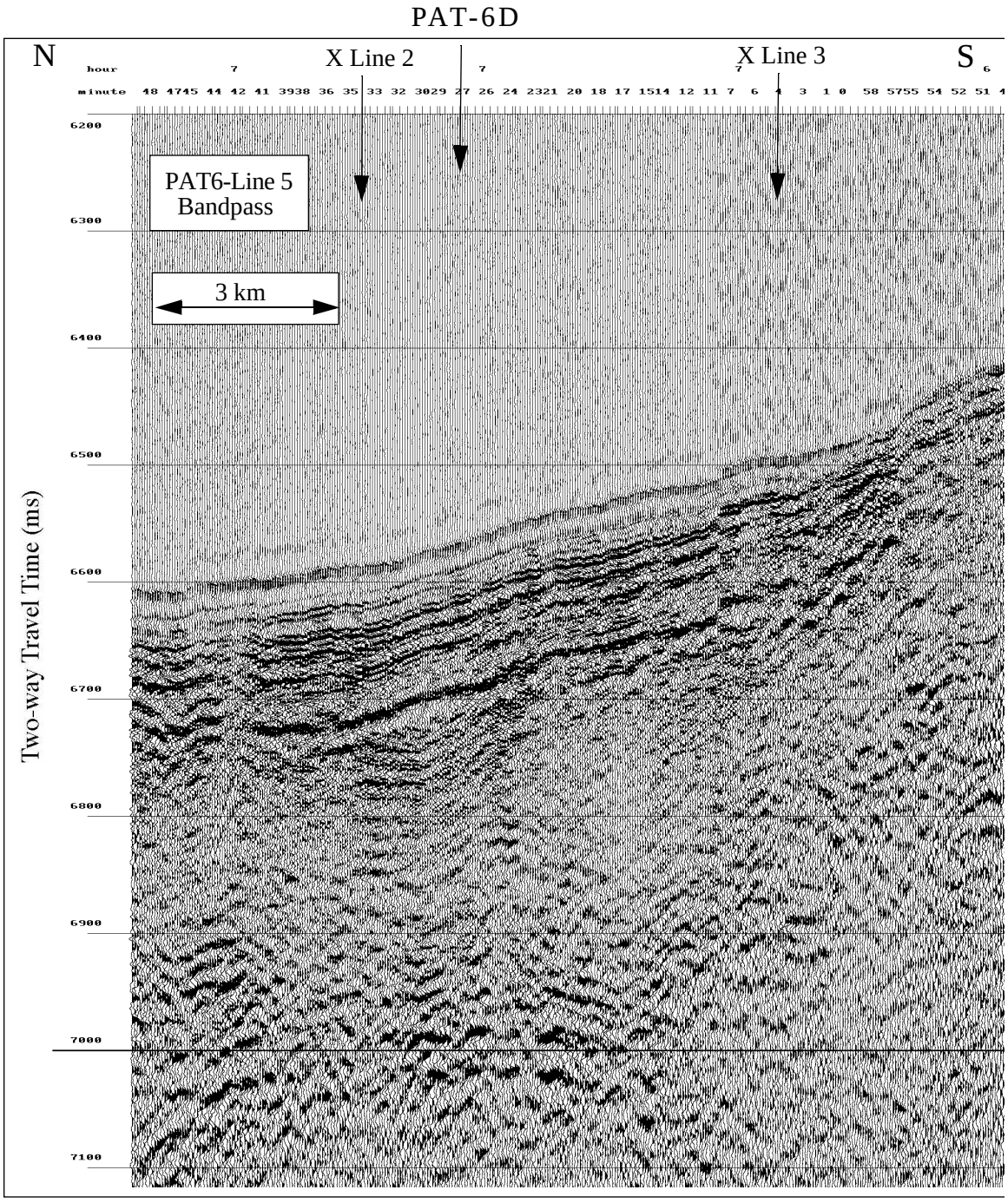
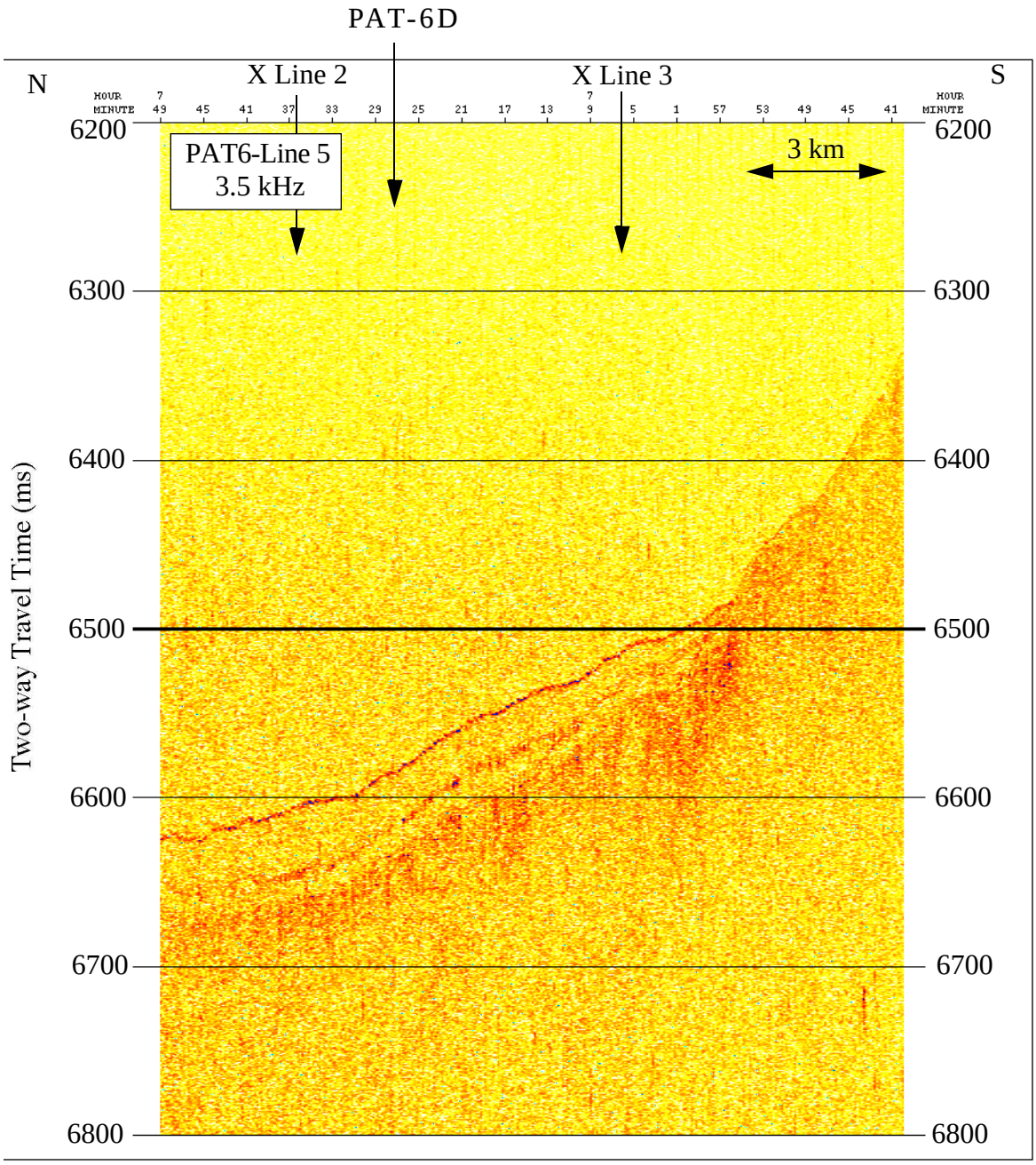


Figure PAT6-4: 3.5 kHz subbottom profile PAT6-35line 5 across PAT-6D, from EW9709.



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 thermal maximum monitor South Equatorial Current system during P/E, deep water flow patterns, and paleo-CCD
List Previous Drilling in Area:	DSDP Site 70

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-6D (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)		Area or Location:	Central Pacific Ocean
Latitude:	Deg: 6	Min: 18.042N	Jurisdiction:	none
Longitude:	Deg: 141	Min: 42.201W	Distance to Land:	>1000 km
Priority of Site:	Primary: 1.5	Alt:	Water Depth:	4925 meters (6.567 sec)

Section C: Operational Information

	Sediments.What is the total sed. thickness? 370 m	Basement
Proposed Penetration (m)	370 meters	4.5 meters
General Lithologies:	siliceous and 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
	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:
	6.8 days	1.0 days	7.8 days

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

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-6D	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 PAT6 seisline 5, JD004, 07:27:11 gmt (SP2894) 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-6 survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709 PAT-6 survey
7	Swath bathymetry	Y		EW9709 PAT-6 survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709 PAT-6 survey
11b	Gravity			
12	Sediment cores	X		EW9709-11PC (16.7 meters)
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709 PAT-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-6D	Date Form Submitted: 15 March 1998
Water Depth (m): 4925	Sed. Penetration (m): 370	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-6D	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-6D	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
0-20		upper Mioc. to Recent	1.56	radiolarian ooze and red clay	near edge of central gyre	1.5 m/my	
20-164		lower to mid Mioc.	1.56	carbonate and radiolarian ooze	equatorial current system	10 m/my	
164-253		Oligocene	1.65	carbonate ooze	equatorial current system	10 m/my	
253-370		Eocene	1.7	siliceous ooze, carbonate ooze/chalk	equatorial current system	6 m/my	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-17C (Central Pacific, between Clipperton and Clarion FZ)

7° 48.001’ N, 142° 00.854’ W

SITE OBJECTIVES

PAT-17C is part of the Phase 1 (56 Ma transect) to define early Eocene equatorial circulation during the thermal maximum and study its evolution as the world cooled. It will also be used to study equatorial ocean circulation in the middle and late Eocene including deepwater flow and properties, and will help define the CCD during the Eocene/ Oligocene transition and near the Oligocene/Miocene boundary. Based on the piston core, it probably goes below the CCD after the earliest Miocene. At 56 Ma, the backtracked location was 5°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). At 40 Ma, the site was located at about 2° S, 113° W. PAT-17C crossed the equator at 29 Ma.

GENERAL DESCRIPTION

PAT-17C should have been situated underneath the South Equatorial Current in the Early Eocene, and crossed the equator at about 29 Ma . We estimate age of basement to be about 57 Ma based upon dating of basement by previous drilling and by calculating 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-17C was surveyed on 4/5 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-17C is located on abyssal hills striking NNW with basement relief subdued by relatively thick sediment cover (approximately 300 msec, or about 250 m; Figures PAT17-1 and PAT17-2).

LITHOLOGIC DESCRIPTION

Nearest sediment core: EW9709-12PC 07° 45.902’N 141° 56.017’ W, 5025 m 1296 cm sediment recovered.

The top of the piston core contained two small manganese nodules. Section VIII (132 cm)-- dark reddish brown radiolarian clay, poor preservation of radiolaria, from middle to upper *D. alata* zone (basal middle Miocene). Section VI (430 cm) Reddish brown radiolarian ooze from the basal *D. alata* zone (basal middle Miocene, *D. dentata* and *C. costata* also present). Section IV (730 cm) Light brown radiolarian ooze from the *C. costata* zone (uppermost lower Miocene). Section II (996 cm) reddish brown radiolarian ooze from the *S. wolfii* zone (lower Miocene). Core catcher (1300 cm) Calcareous radiolarian

ooze from the *S. delmontensis* zone (middle part of the lower Miocene).

Nearest drillsite: DSDP Site 70, 6° 20.8'N 140° 21.72' W, 5059 mbsl, 388 m sediment, ending in middle Eocene Chert.

The sediment column at DSDP 70 shows how PAT-17 will be useful for defining the CCD in the Miocene, as well as for its Eocene objectives. Approximately 20 m of radiolarian ooze represent the upper Miocene to Holocene sediments, while the middle Miocene section has strong carbonate cyclicity between 20 and 40 mbsf. Lower Miocene and Oligocene sediments are carbonate-rich rad-nanno oozes, turning to chalk at about 175 mbsf. The upper Eocene section, below 320 mbsf, is a radiolarian ooze with little carbonate. Chert was first encountered at 330 mbsf (Hole 70A), and after a bit replacement, Hole 70B was drilled ahead to 383 mbsf without coring. Then, 5 meters of middle Eocene chert and siliceous limestone were drilled before the hole was abandoned.

SEISMIC INTERPRETATION

Primary Site (PAT-17C): EW9709 PAT17 seisline 3 JD005 05:17:05 gmt (SP 2201)

Priority: 1
Crustal age: 57 Ma (?)
Location: 7° 48.001' N 142° 00.854' W
Site water depth: 5039 m (6.718 sec TWTT)
Sediment thickness: 0.393 sec (316 m)
Proposed Drilling Depth: 321 m

PAT17C is sited in abyssal hill topography typically buried under about 250 m of early Miocene to Paleocene sediments. At the proposed drillsite itself there are 393 msec TWTT, or about 316 m of sediment. Based upon the piston core, the upper reflectors at the site are mid-early Miocene in age, equivalent to the age of the reflector eM-Y of Mayer et al. (1985). Below the high frequency early Miocene reflectors is a quiet interval followed by a low frequency high amplitude reflector set that we have assumed to be Late Eocene (Figure PAT17-3). Another quiet interval follows and finally above basement is a highly reflective sequence which we believe are partially lithified or carbonate-rich early Eocene sediments. Basement , or at least the last coherent reflector, appears approximately 30 msec below the last of the lower sequence. We chose the position of PAT-17C in a position where the lowest reflector is more clear and the reflectors above are coherent but not as strong as elsewhere at the site.

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 have been used to pick the location of PAT-*** and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT17 seisline 1
EW9709 PAT17 seisline 2
EW9709 PAT17 seisline 3
EW9709 PAT17 seisline 4
EW9709 PAT17 seisline 5

3.5 Khz data:

EW9709 PAT17 35line 1
EW9709 PAT17 35line 2
EW9709 PAT17 35line 3
EW9709 PAT17 35line 4
EW9709 PAT17 35line 5

FIGURES

Fig PAT17-1: Location map for PAT-17C, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT17-2: Swathmap bathymetry for the PAT-17 region, from the EW9709 site survey. Proposed drill site is marked.

Fig PAT17-3: Bandpass-filtered seismic reflection profile PAT17-seisline 3 across PAT-17C, from EW9709. Proposed drill site is marked.

Fig PAT17-4: 3.5 kHz subbottom profile PAT17-35line 3 across PAT-17, 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 PAT17-1: Location map for PAT-17C, on GEBCO bathymetry

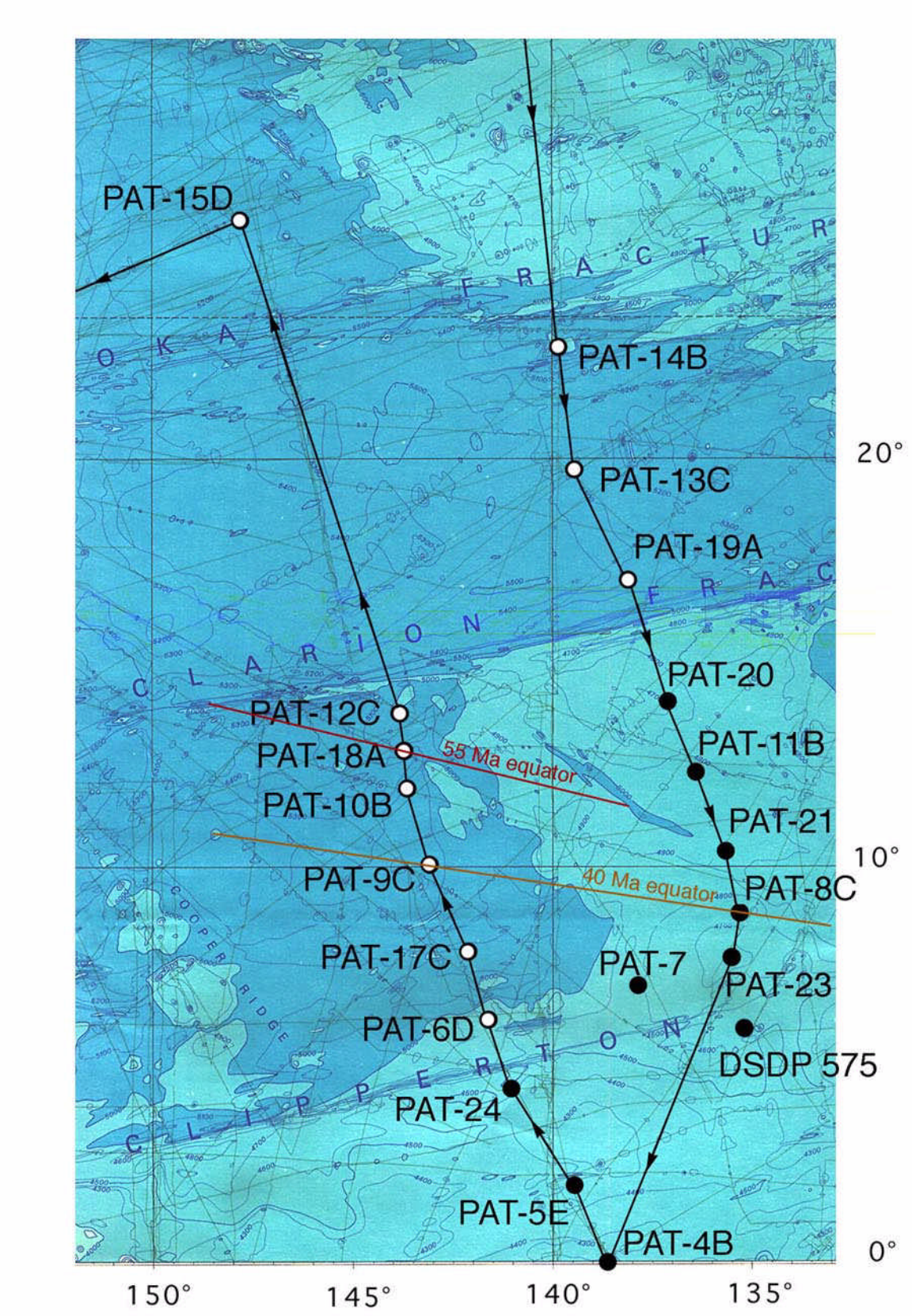


Figure PAT17-2: Swathmap bathymetry for the PAT-17C region from the EW9709 site survey cruise.

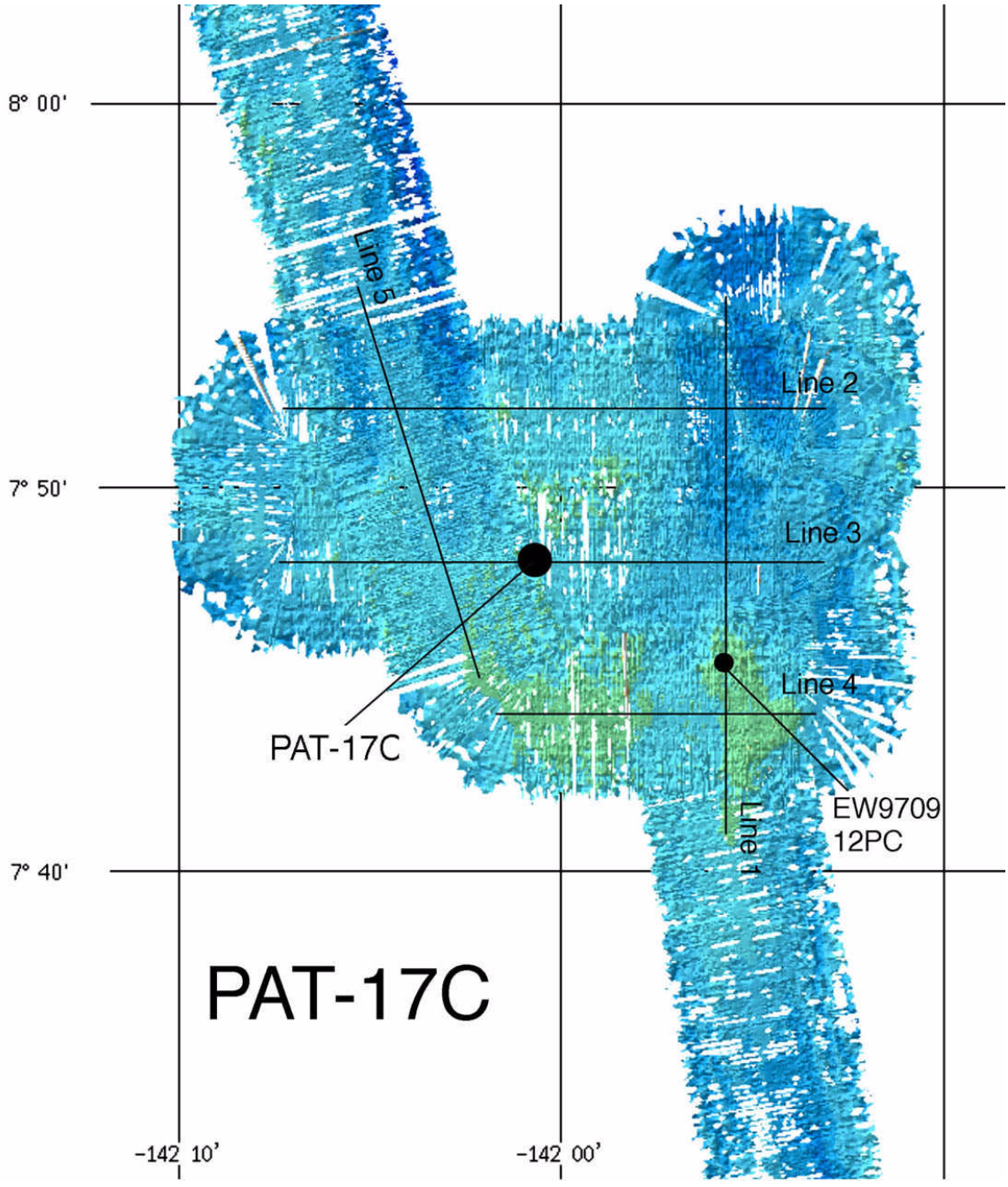


Figure PAT17-3: Bandpass-filtered seismic reflection profile PAT17-seisline 3 across PAT-17C, from the EW9709 survey

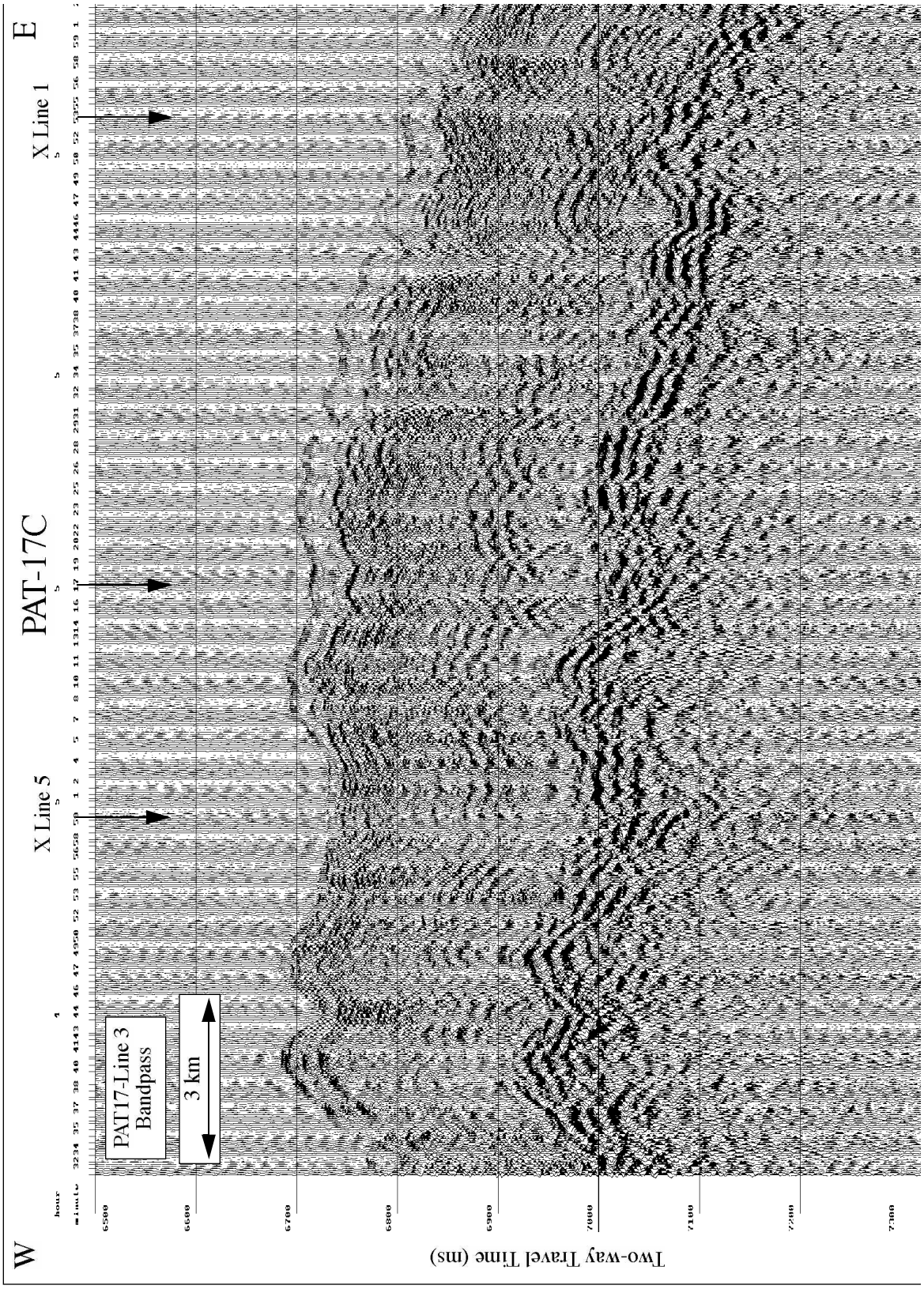
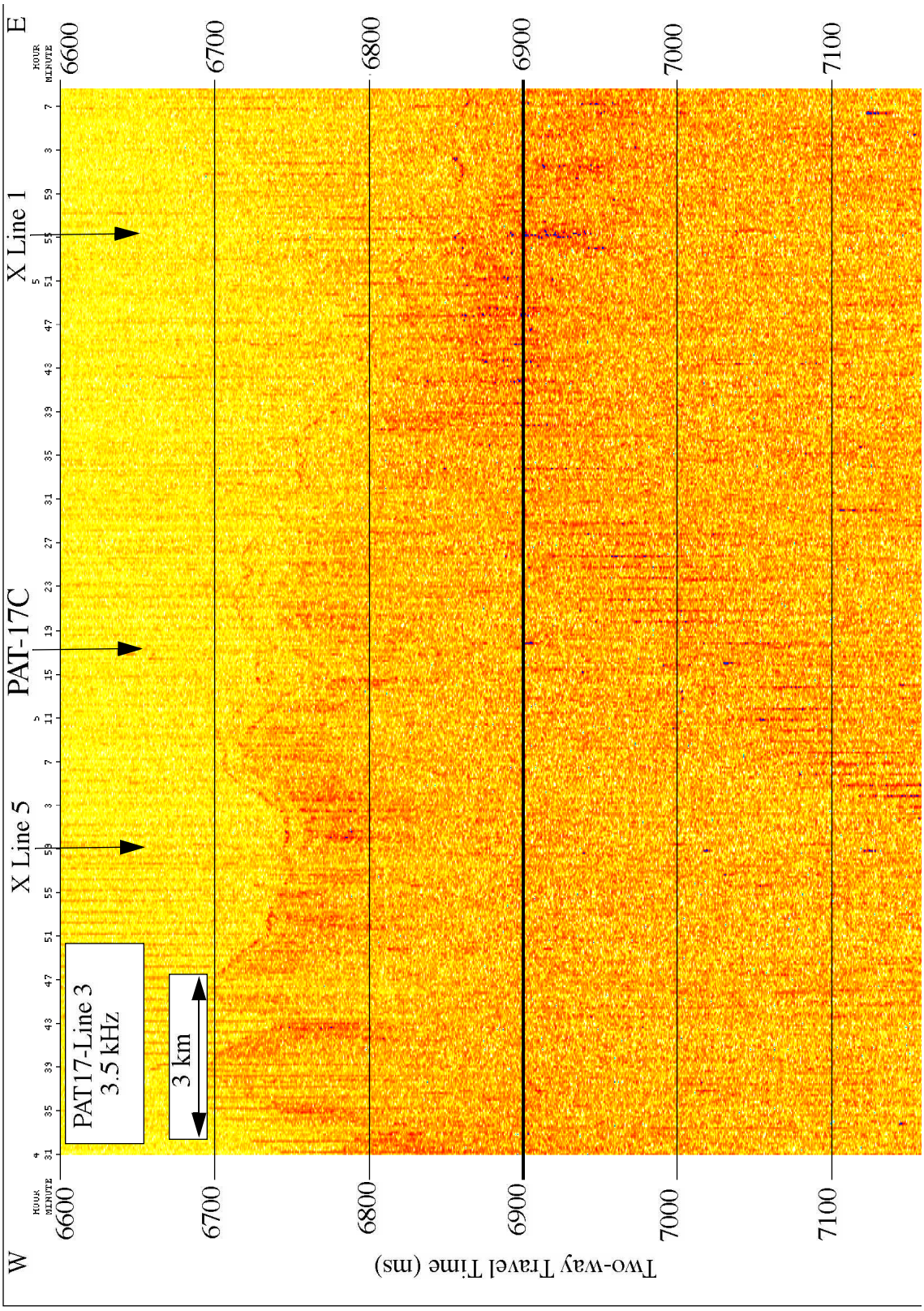


Figure PAT17-4: 3.5 kHz profile PAT17-35line 3 across PAT-17C, from the EW9709 survey



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 March 1998
Site Specific Objectives (Must include general objectives in proposal)	Eocene thermal maximum define equatorial circulation system, boundary and evolution of the SEC, deep water properties, and paleo-CCD
List Previous Drilling in Area:	DSDP Site 70

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-17C (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)		Area or Location:	Central Pacific Ocean
Latitude:	Deg: 7	Min: 48.001N	Jurisdiction:	none
Longitude:	Deg: 142	Min: 00.854W	Distance to Land:	>1000 km
Priority of Site:	Primary: 1	Alt:	Water Depth:	5039 meters (6.718 sec)

Section C: Operational Information

	Sediments.What is the total sed. thickness? 316 m	Basement
Proposed Penetration (m)	316 meters	4.5 meters
General Lithologies:	carbonate 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:	Logging:	Total On-Site:
	6.0 days	1.0 days	7.0 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-17C	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 PAT17 seisline 3, JD005, 05:17:05 gmt 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-17 survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709 PAT-17 survey
7	Swath bathymetry	Y		EW9709 PAT-17 survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709 PAT-17 survey
11b	Gravity			
12	Sediment cores	X		EW9709 12PC (12.96 meters)
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709 PAT-17 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-17C	Date Form Submitted: 15 March 1998
Water Depth (m): 5039	Sed. Penetration (m): 316	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-17C	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-17C	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
0-52		Miocene to Recent	1.56	siliceous carbonate ooze	near equatorial circulation system	3 m/my	
52-133		Oligocene	1.56	carbonate ooze, radiolarian ooze	equatorial circulation system	4 m/my	
133-316		Eocene	1.65	siliceous ooze and carbonates	equatorial current system	8 m/my	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-9C (Central Pacific, between Clipperton and Clarion FZ)

10° 02.984’ N, 142° 41.014’ W

SITE OBJECTIVES

PAT-9C is part of the Phase 1 (56 Ma transect) to define early Eocene equatorial circulation during the early Cenozoic thermal maximum, and to study the evolution of equatorial circulation as the world cooled. It will also be used to study equatorial ocean circulation in the middle and late Eocene including deepwater flow and properties, and will be used to define the CCD during the Eocene/Oligocene transition. One of the high priorities of drilling will be to compare PAT-9C to PAT-8C. Both were on the equator at 40 Ma, but PAT-9C was about 1100 m deeper. They will best illuminate CCD changes in the middle and late Eocene. At 56 Ma, the backtracked location was 3°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). At 40 Ma, the site was located at about 0° N, 114° W.

GENERAL DESCRIPTION

PAT-9C should have been situated underneath the South Equatorial Current in the Early Eocene, and crossed the equator at about 40-41 Ma. It is located between the Clipperton and Clarion Fracture Zones in a region known to have little sediment deposition in the Neogene (Figure PAT9-1). 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) . Crustal age was estimated using data from the DSDP Sites in the region.

EW9709 SURVEY

PAT-9C was surveyed and piston cored on 5-6 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. PAT-9C is located near a small seamount in classic abyssal hill topography, with the abyssal hills striking NNW (Figure PAT9-2). Sediment cover seems relatively uniform, ~250-300 msec TWTT (Figure PAT9-3) or about 200-250 m of sediment.

LITHOLOGIC DESCRIPTION

Nearest sediment core: EW9709-13PC 10° 10.604’ N, 142° 49.48’ W 5148 m. recovered 1647 cm sediment

Sediment at the base of the recovered section is a very firm reddish brown radiolarian clay. This clay contained radiolaria from the *S. delmontensis* zone (middle Lower Miocene). Samples above the core catcher (1346 cm and 1082 cm) showed a decreasing degree of preservation with no clear indication of containing radiolaria from a younger

zone. Samples from section VI (781 cm) and VIII (486 cm) were of a more dark chocolate brown and contained only clay aggregates and fish teeth in the coarse fraction. A small sample from the outer nose cone of the core appears to have been taken during pullout and contains a late Quaternary assemblage (*C. tuberosa* zone) with a few reworked radiolaria from the upper Pliocene and lower Miocene.

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 a sequence with upper to middle Eocene 'radiolarites, locally calcareous'. Although these radiolarites were indurated, no chert was encountered.

SEISMIC INTERPRETATION

Primary Site (PAT-9C): EW9709 seisline 1 22:34:09 JD005 1998

Priority: 1
Crustal age: 57 Ma (?)
Location: 10° 02.984' N 142° 41.014' W
Site water depth: 4980 m (6.640 sec TWTT)
Sediment thickness: 0.341 sec (282 m)
Proposed Drilling Depth: 287 m

The location of PAT-9C was chosen along the first seismic reflection line at PAT-9C (Figures PAT9-2 and PAT9-3). This line is running subparallel to one of the abyssal hill crests, and the site is found where the track is sufficiently far from the crest of the hill to make out coherent reflectors. There can be seen a surface following reflector which probably marks the red clay section followed by a sequence of lower Miocene reflectors. The sequence of reflectiors centered at 6800 msec is the sequence we believe is the Eocene/Oligocene boundary sequence. Below is a quiet zone followed by a stronger series of reflectors near basement, which we believe is due to higher carbonate contents or partial lithification.

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 have been used to pick the location of PAT-9C and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT9 seisline 1
EW9709 PAT9 seisline 2
EW9709 PAT9 seisline 3

EW9709 PAT9 seisline 4
EW9709 PAT9 seisline 5

3.5 Khz data:

EW9709 PAT9 35line 1
EW9709 PAT9 35line 2
EW9709 PAT9 35line 3
EW9709 PAT9 35line 4
EW9709 PAT9 35line 5

FIGURES

Fig PAT9-1: Location map for PAT-9C, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT9-2: Swathmap bathymetry for the PAT-9 region, from the EW9709 site survey. Proposed drill site is marked.

Fig PAT9-3: Seismic profile PAT9-seisline 1 across PAT-9C, from EW9709. Proposed drill site is marked.

Fig PAT9-4: 3.5 kHz subbottom profile PAT9-35line 1 across PAT-9, 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 PAT9-1: Location map for PAT-9C on GEBCO bathymetry

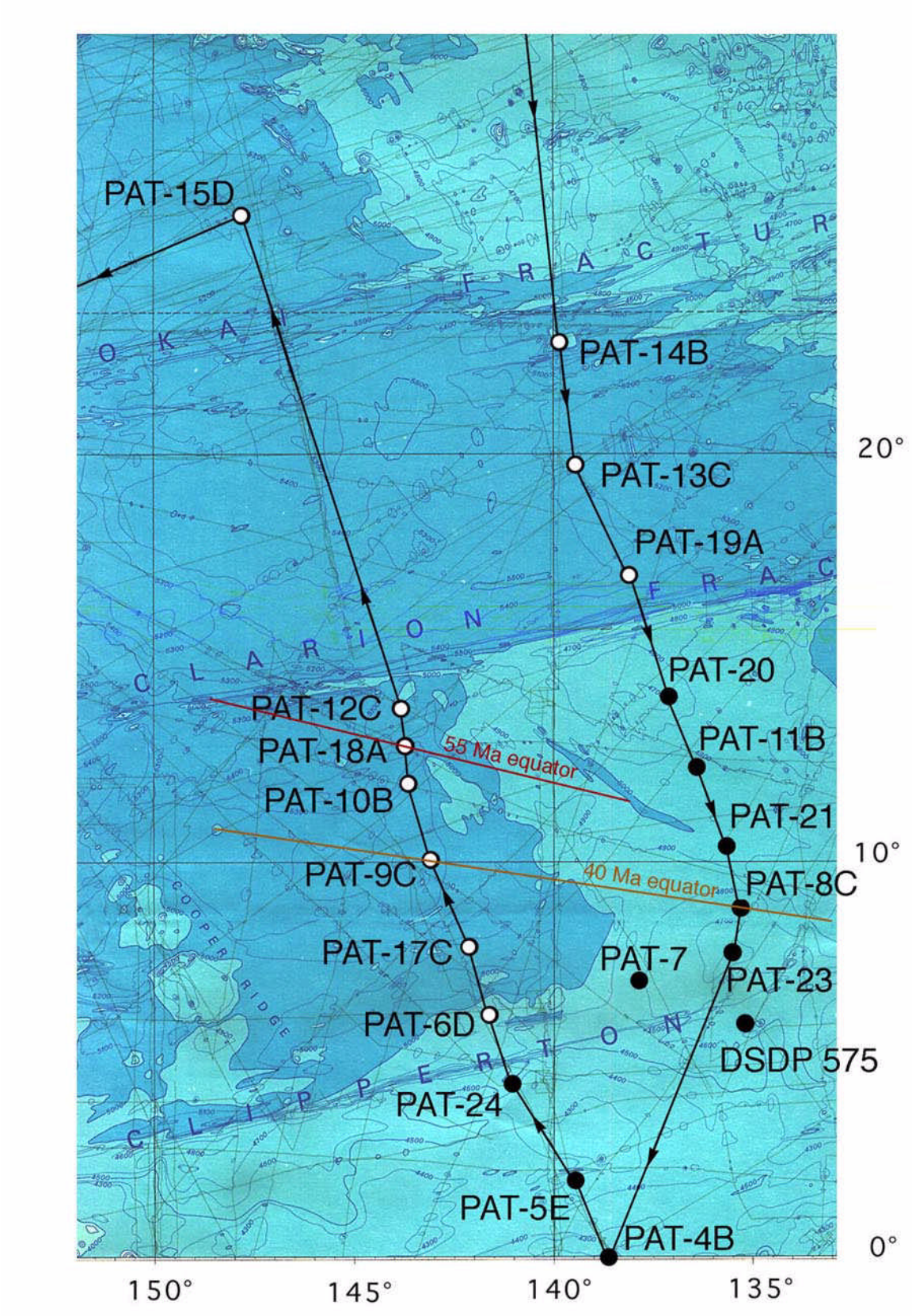


Figure PAT9-2: Swathmap bathymetry for the PAT-9C region from the EW9709 survey.

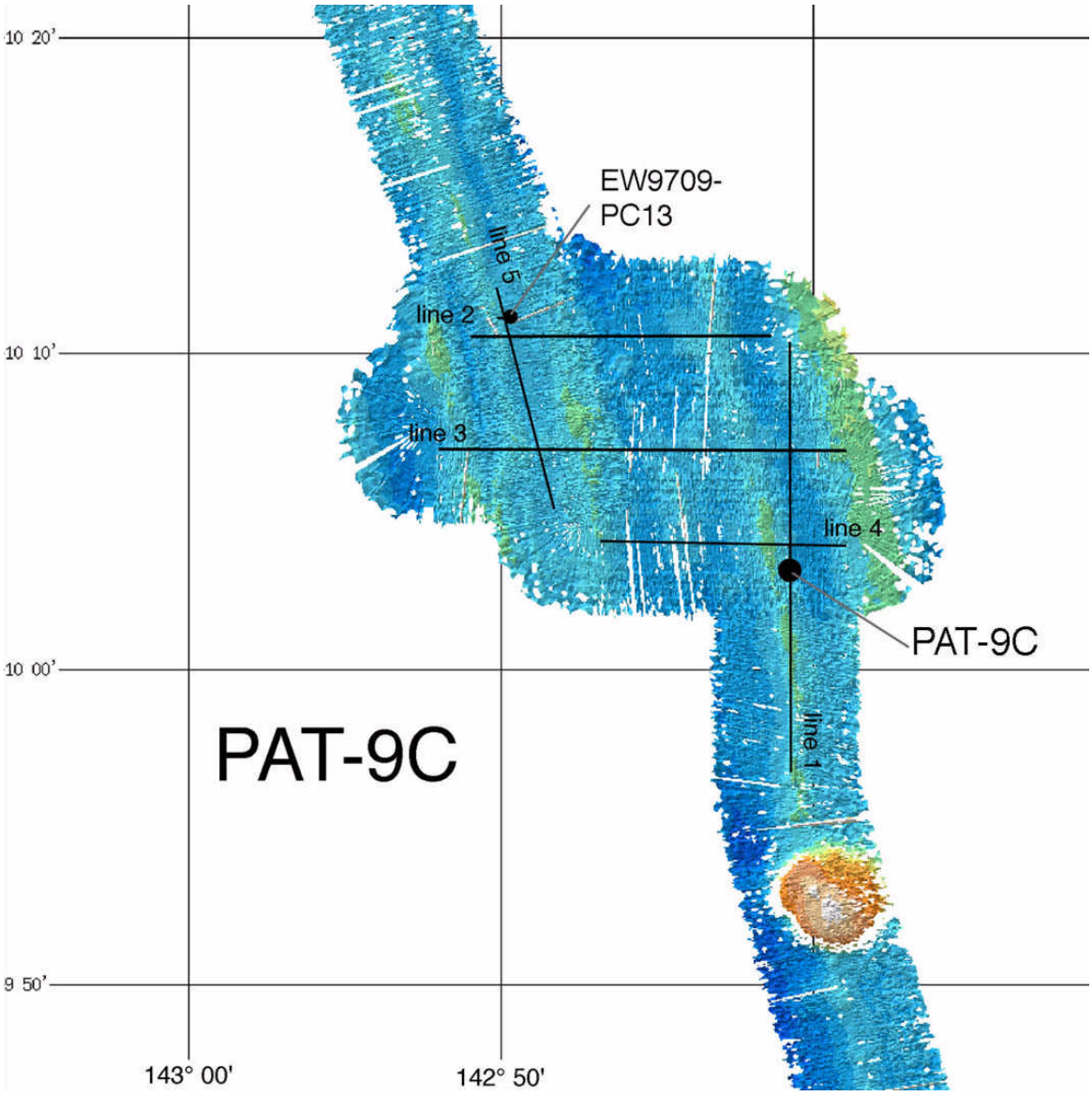


Figure PAT9-3: Seismic profile PAT9 seisline 1 across PAT-9C, from EW9709.

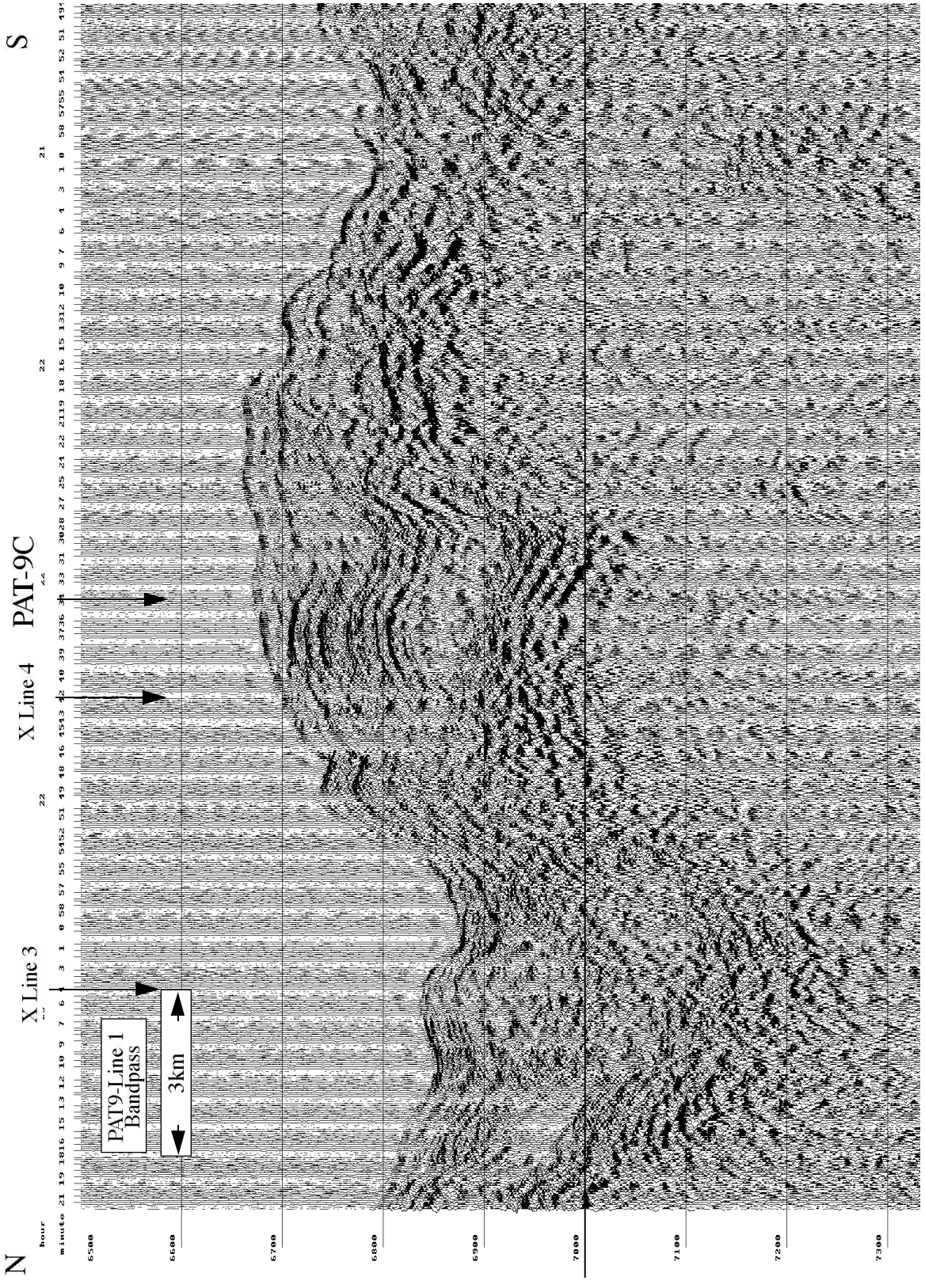
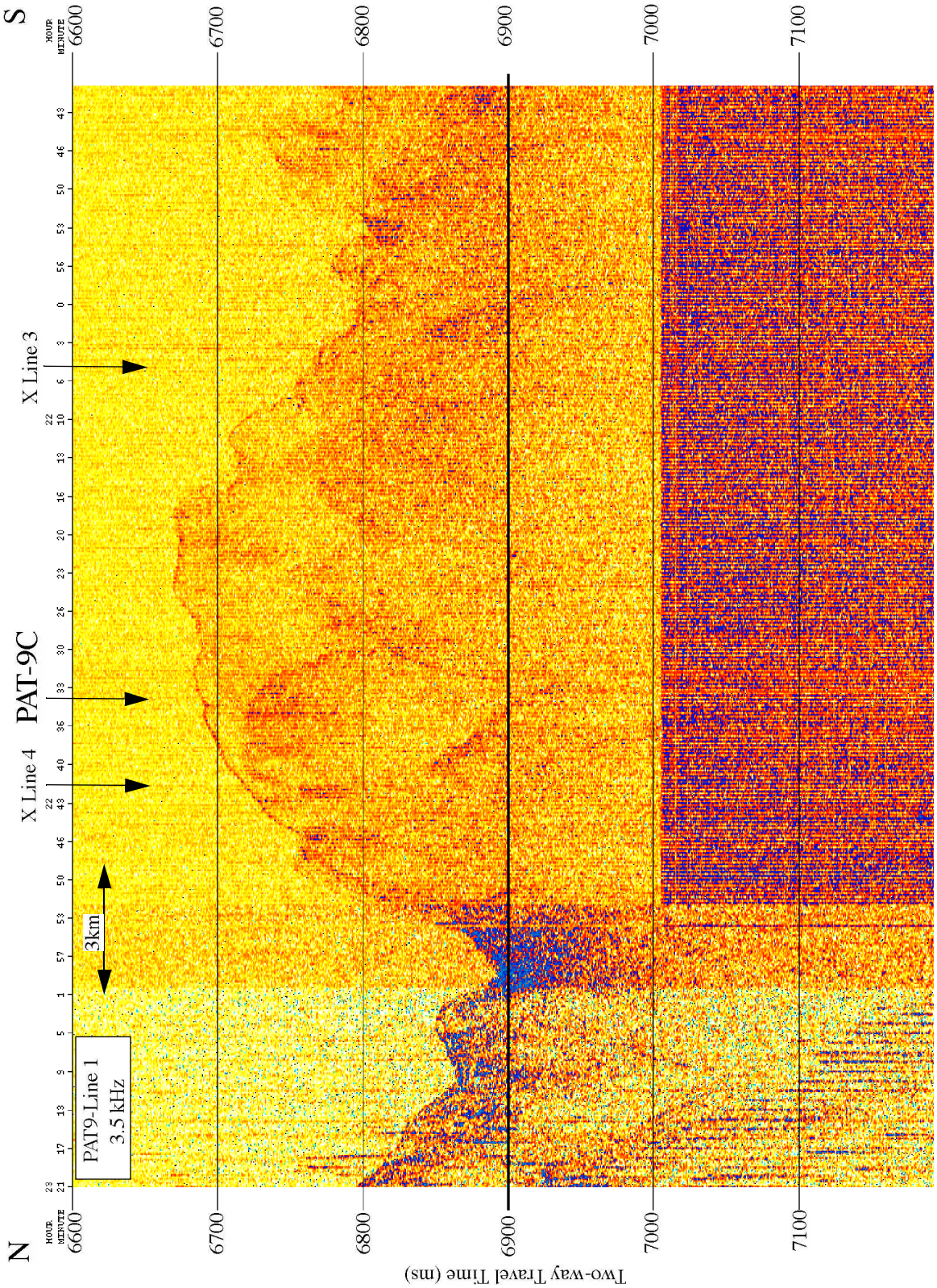


Figure PAT9-4: 3.5 kHz subbottom profile PAT9-35line 1 across PAT-9C, from EW9709.



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 Thermal Maximum define characteristics of equatorial circulation system, deep water flow, and paleo-CCD
List Previous Drilling in Area:	DSDP Site 161

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-9C (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: 02.984	Jurisdiction:	none
Longitude:	Deg: 142	Min: 41.014	Distance to Land:	>1000 km
Priority of Site:	Primary: 1	Alt:	Water Depth:	4980 meters (6.640 sec)

Section C: Operational Information

	Sediments. What is the total sed. thickness? 282 m	Basement
Proposed Penetration (m)	282 meters	4.5 meters
General Lithologies:	siliceous clay and siliceous 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
	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:
	5.4 days	1.0 days	6.4 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:

Please fill out information in all gray boxes

Page 2 - Site Survey Detail

New **Revised**

Proposal #: 486-Rev2	Site #: PAT-9C	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 PAT9 seisline 1, JD005, 22:34:09 gmt 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-9C survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709 PAT-9C survey
7	Swath bathymetry	Y		EW9709 PAT-9C survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709 PAT-9C survey
11b	Gravity			
12	Sediment cores	X		EW9709-13PC, 16.47 meters length
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709 PAT-9C 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-9C	Date Form Submitted: 15 March 1998
Water Depth (m): 4980	Sed. Penetration (m): 282	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-9C	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-9C	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
0-73		Miocene(?) to Recent	1.56	radiolarian clay	central gyre	3 m/my	
73-106		Oligocene	1.65	carbonates	equatorial current system	5 m/my	
106-282		Eocene	1.7	siliceous carbonates and chalk	equatorial current system	8.5 m/my	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-8C (Central Pacific, between Clipperton and Clarion FZ)

8° 53.003'N, 135° 21.986' W

SITE OBJECTIVES

PAT-8C is the only Priority 1 drillsite on the Phase 2 (40 Ma) transect. Both it and PAT-9C were at the equator at 40 Ma. It will be used to define equatorial circulation and upwelling from the middle Eocene through the Eocene/Oligocene boundary. Its primary role 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, through comparisons with PAT-9C. At 40 Ma, the backtracked location was 0° N, 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).

GENERAL DESCRIPTION

PAT-8C is situated about 3 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-8C 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-8C, while in a region of abyssal hills, has two tectonic fabrics (Fig PAT8-2). 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. We assume that this grain is related in some way to the plate reorganization that changed the strike of the Clipperton Fracture Zone. Sediment thickness at the site is consistently about 250-300 msec, with both Paleogene and Neogene units thickening (based on correlation with Mayer et al., 1985, seismic stratigraphy of Site 574). The piston core data indicates that the sediments below the surficial red clay are getting younger at the more southern sites--the youngest biostratigraphic zone is middle Miocene here as compared to early Miocene at PAT-21.

LITHOLOGIC DESCRIPTION

Nearest sediment core: EW9709-7P 8° 47.658' N, 135° 21.985' W, 4777 m (uncorr.) 1597 cm sediment.

The piston core and trigger weight core catchers collected calcareous radiolarian clay,

while other samples at section ends are reddish brown radiolarian clay. We presume that the upper sediments at PAT-8B are primarily radiolarian clays with some calcareous layers. The oldest radiolarian zone recovered is *S. delmontensis* zone, from the middle part of the lower Miocene. The top of section II (1295 cm) had radiolaria of the *S. wolffii* zone. Radiolaria from the top of section IV to the top of section VI (727-1030 cm) are from the *C. costata* zone (the uppermost part of the lower Miocene). A sample from the top of section VIII (429 cm) is from the *D. alata* zone, representing the lower part of the middle Miocene.

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 a sequence with upper to middle Eocene 'radiolarites, locally calcareous'. Although these radiolarites were indurated, no chert was encountered.

SEISMIC INTERPRETATION

Primary Site (PAT-8C): EW9709 PAT8 seisline 1, 1997 JD361 16:34:15 gmt, SP 195 (cross with PAT8 seisline 4)

Priority: 1
Crustal age: 40 Ma (?)
Location: 8° 53.003' N 135° 21.986' W
Site water depth: 4817 m (6.423 sec TWTT)
Sediment thickness: 0.344 sec (283 m)
Proposed Drilling Depth: 288 m

PAT-8C was chosen at the intersection of PAT8 seisline 1 and PAT8 seisline 4 because of relatively flat surface topography, in a relatively large basin and because the deeper reflectors were not as strong as in some parts of the survey area (Figure PAT8-3). minimizing the likelihood of drilling chert. The 3.5 kHz lines (Figure PAT8-4) show that the area is covered with a relatively thick (20-40 msec) acoustically transparent layer.

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 PAT8 seisline 1
EW9709 PAT8 seisline 2

EW9709 PAT8 seisline 3
EW9709 PAT8 seisline 4
EW9709 PAT8 seisline 5

3.5 kHz lines submitted:

EW9709 PAT8 35line 1
EW9709 PAT8 35line 2
EW9709 PAT8 35line 3
EW9709 PAT8 35line 4
EW9709 PAT8 35line 5

FIGURES

Fig PAT8-1: Location map for PAT-8C, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT8-2: Swathmap bathymetry for the PAT-8C region, from the EW9709 site survey. Proposed drill site is marked.

Fig PAT8-3: Seismic profile PAT8-seisline 1 across PAT-8C, from EW9709. Proposed drill site is marked.

Fig PAT8-4: 3.5 kHz subbottom profile PAT8-35line 1 across PAT-8C, 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.

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Figure PAT8-1: Location map for PAT-8C on GEBCO bathymetry.

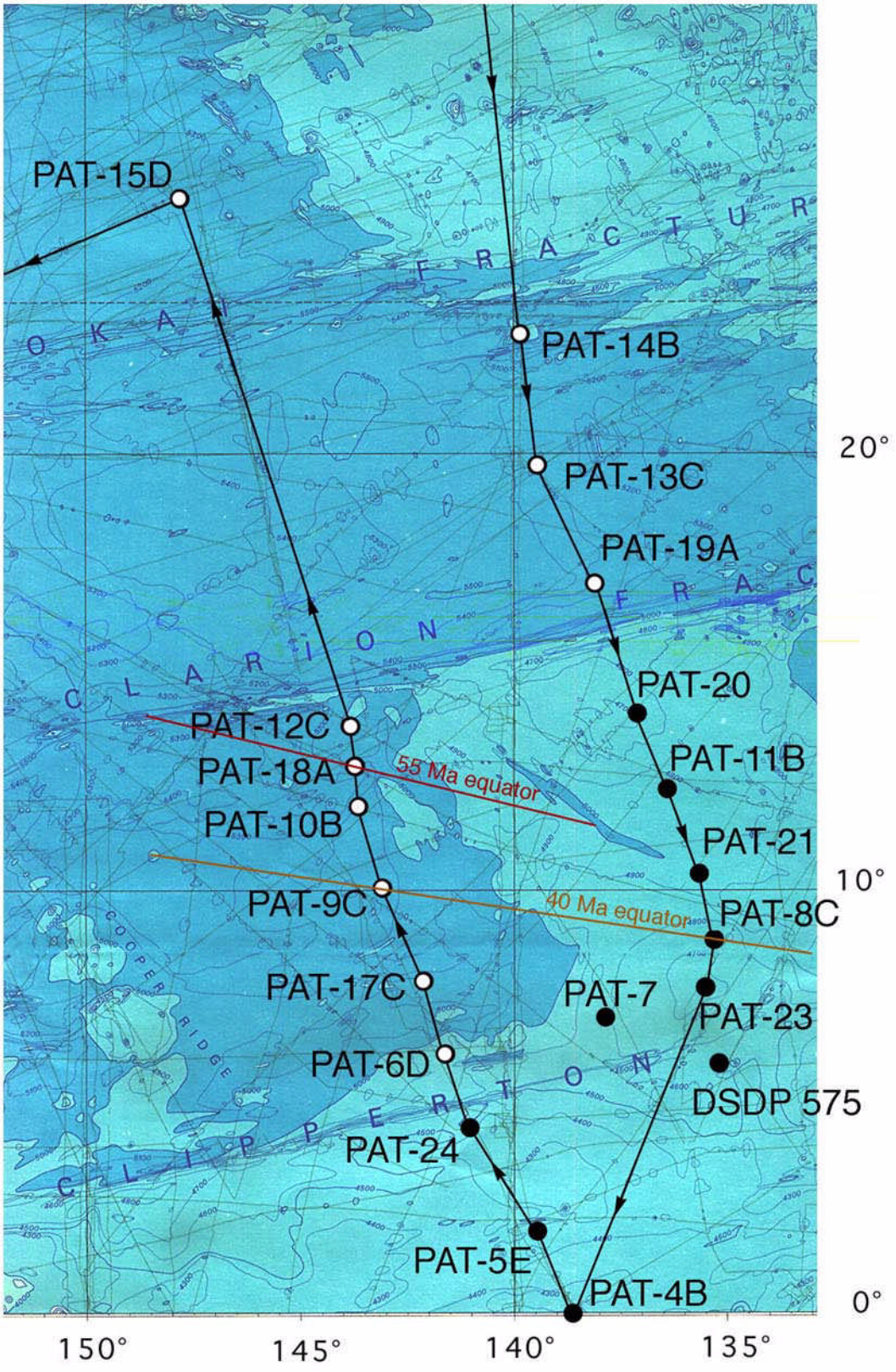


Figure PAT8-2: Swathmap bathymetry in the region surrounding PAT-8C, from the EW9709 site survey cruise.

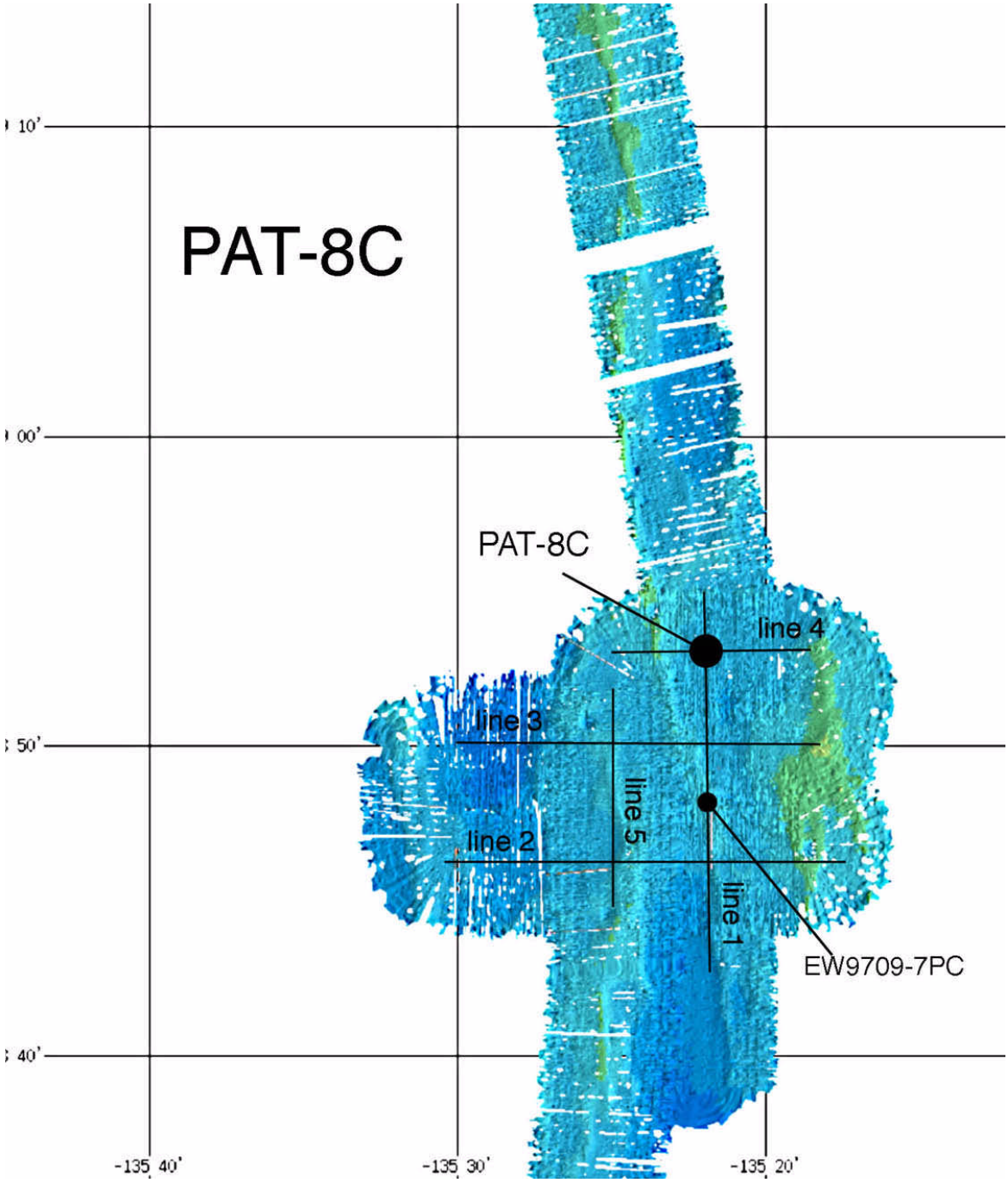


Figure PAT8-3: The seismic profile PAT8-seisline 1 across the proposed location of PAT-8C.

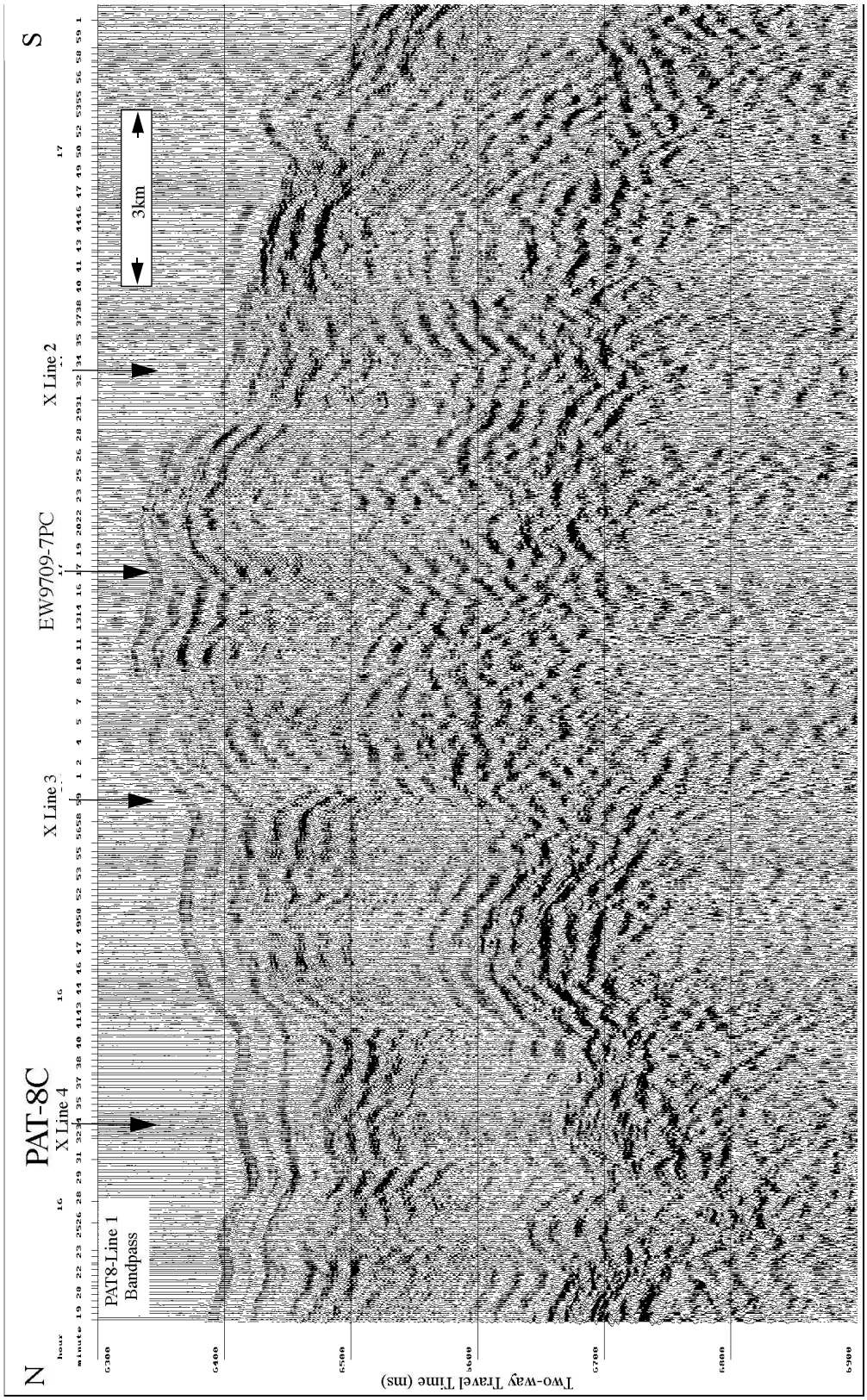
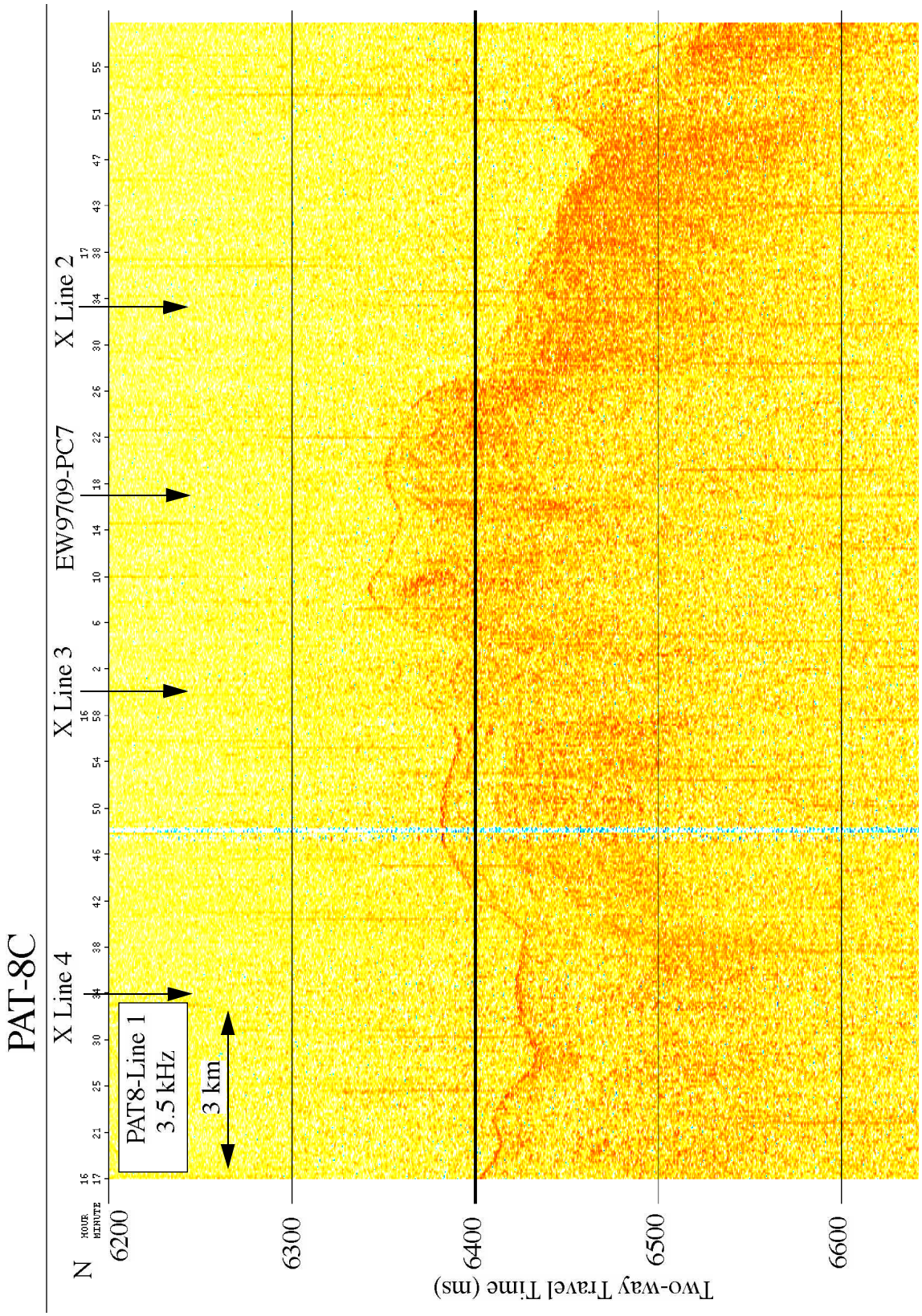


Figure PAT8-4: The 3.5 kHz subbottom profile PAT8-35line 1 across the proposed location of PAT-8C.



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 define equatorial circulation and upwelling/productivity, monitor development and evolution of the SEC, and record changes in the paleo-CCD
List Previous Drilling in Area:	DSDP 161

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-8C (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)		Area or Location:	Central Pacific Ocean
Latitude:	Deg: 8	Min: 53.003N	Jurisdiction:	none
Longitude:	Deg: 135	Min: 21.896W	Distance to Land:	>1000 km
Priority of Site:	Primary: 1	Alt:	Water Depth:	4817 meters (6.423 sec)

Section C: Operational Information

	Sediments.What is the total sed. thickness? 283 m	Basement
Proposed Penetration (m)	283 meters (0.344 sec)	4.5 meters
General Lithologies:	radiolarian clay, siliceous 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
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:
	5.4 days	1.0 day	6.4 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-8C	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 PAT8 seisline 1, 1997 JD361 16:34:15, SP 195 Crossing Lines(s): EW9709 PAT8 seisline 4 (shot pt 2431)
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-PAT8 survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709-PAT8 survey
7	Swath bathymetry	Y		EW9709-PAT8 survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709-PAT8 survey
11b	Gravity			
12	Sediment cores	X		EW9709-7PC (1597 cm)
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-8C	Date Form Submitted: 15 March 1998
Water Depth (m): 4817	Sed. Penetration (m): 283	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 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-8C	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, logging 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-8C	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
0-56m		Miocene to Recent	1.55	Radiolarian Clay	near edge of equatorial circulation	2 m/my	
70-183		Oligocene?.	1.65	carbonates	equatorial current system	14 m/my	
183-283		Eocene to early Olig.?	1.7	carbonates and siliceous carbonates	equatorial high productivity zone	17 m/my	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-10B (Central Pacific, between Clipperton and Clarion FZ)

12° 01.999’ N, 143° 41.572’ W

SITE OBJECTIVES

PAT-10B will be drilled as part of the Phase 1 (56 Ma transect) to define early Eocene equatorial circulation and study how ocean circulation evolved as the world cooled from the Paleocene thermal maximum. It will also be used to study equatorial ocean circulation in the middle and late Eocene including deepwater flow and properties, as well as define the CCD during the Eocene/Oligocene transition. At 56 Ma, the backtracked location was 1°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). At 40 Ma, the site was located at about 2° N, 115° W, and it crossed the equator at about 50 Ma. The site’s near-equatorial position in the early Eocene will be important to define the strength of equatorial upwelling and define the evolution of the South Equatroial Current.

GENERAL DESCRIPTION

PAT-10B should have been situated underneath the South Equatorial Current in the Early Eocene, and crossed the equator at about 50 Ma .It is located between the Clipperton and Clarion Fracture Zones in a region known to have little sediment deposition in the late Neogene (Figure PAT10-1). 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). Crustal age was estimated using data from the DSDP Sites in the region.

EW9709 SURVEY

PAT-10B was surveyed on 7 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-10B is located in classic abyssal hill terrain (Figure PAT10-2), typically buried beneath about 200 msec TWTT sediment cover (~150 m; Figure PAT10-3). Orientation on the abyssal hill topography is NNW, and the typical wavelength between hills is about 10 km. Small eruptive centers, much smaller than seamounts, occur occasionally and are the only complexity to the bathymetry.

LITHOLOGIC DESCRIPTION

Nearest sediment core: EW9709-14PC 12° 02.067’ N, 143° 41.974’ W 5178 m, 1116 cm of recovered sediment.

Core 14PC was shorter than our average core and terminated in a calcareous radiolarian ooze. A fragmented Mn crust was found at the top of the core. At section breaks the sediment was reddish brown radiolarian clay. The catcher sample is a calcareous radiolarian ooze. Top of Section IV to top of Section VI (248-549 cm): lower part of the *D. ateuchus* zone (mid Oligocene) based on a poorly preserved assemblage. Also containing rare

reworked upper Eocene species and abundant Orosphaerid fragments. Top of section II (815 cm): poorly preserved assemblage no younger than the D. ateuchus zone and possibly as old as the *T. tuberosa* zone. Core catcher: a calcareous radiolarian ooze with moderate preservaton of the specimens. The sample comes from the upper part of the *T. tuberosa* zone (early Oligocene in age).

Nearest drillsite: DSDP Site 162 14° 52.19' N, 140° 02.61' W, 4854 mbsl 153 m sediment thickness.

Site 162 experiences a hiatus from the early Oligocene to the Holocene. The remainder of the Oligocene can be found between 0 and 36 mbsf. Carbonate is low in the Oligocene, and virtually disappears in the earliest Oligocene sediments. There is a relatively small (~15 m thick) late Eocene section , also with very little carbonate and an extensive middle Eocene more carbonate-rich section. The basal sediments at 150 mbsf are early to early-middle Eocene in age, based on nannofossils.

SEISMIC INTERPRETATION

Primary Site (PAT-10B): EW9709 PAT10 seisline 6 JD007 11:16:01 gmt (SP 4025)

Priority: 1
Crustal age: 57 Ma (?)
Location: 12° 01.999' N 143° 41.572' W
Site water depth: 5147 m (6.863 sec TWTT)
Sediment thickness: 0.230 sec (183 m)
Proposed Drilling Depth: 188 m

Based upon the seismic reflection sections, PAT-10B is covered with a uniform sediment cover. The top set of reflectors in the sediment column is probably more than just the signature of the outgoing pulse, but layering can only occasionally be seen on the 3.5 kHz data. The middle part of the sediment section is acoustically transparent but the lower ~100 msec TWTT has distinct reflectors. We believe that this sequence is the basal more carbonate-rich early Eocene sequence. The near-surface reflectors may be equivalent to the Eocene/Oligocene boundary sequence that we have observed at other proposed drillsites (e.g. in the middle of the sedimentary section at PAT-17).

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 have been used to pick the location of PAT-*** and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT10 seisline 1
EW9709 PAT10 seisline 2
EW9709 PAT10 seisline 3
EW9709 PAT10 seisline 4
EW9709 PAT10 seisline 5

EW9709 PAT10 seisline 6
EW9709 PAT10 seisline 7

3.5 Khz data:

EW9709 PAT10 35line 1
EW9709 PAT10 35line 2
EW9709 PAT10 35line 3
EW9709 PAT10 35line 4
EW9709 PAT10 35line 5
EW9709 PAT10 35line 6
EW9709 PAT10 35line 7

FIGURES

Fig PAT10-1: Location map for PAT-10B, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT10-2: Swathmap bathymetry for the PAT-10B region, from the EW9709 site survey. Proposed drill site is marked.

Fig PAT10-3: Seismic profile PAT10-seisline 6 across PAT-10B, from EW9709. Proposed drill site is marked.

Fig PAT10-4: 3.5 kHz subbottom profile PAT10-35line 6 across PAT-10B, 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 PAT10-1: Location map for PAT-10B on GEBCO bathymetry

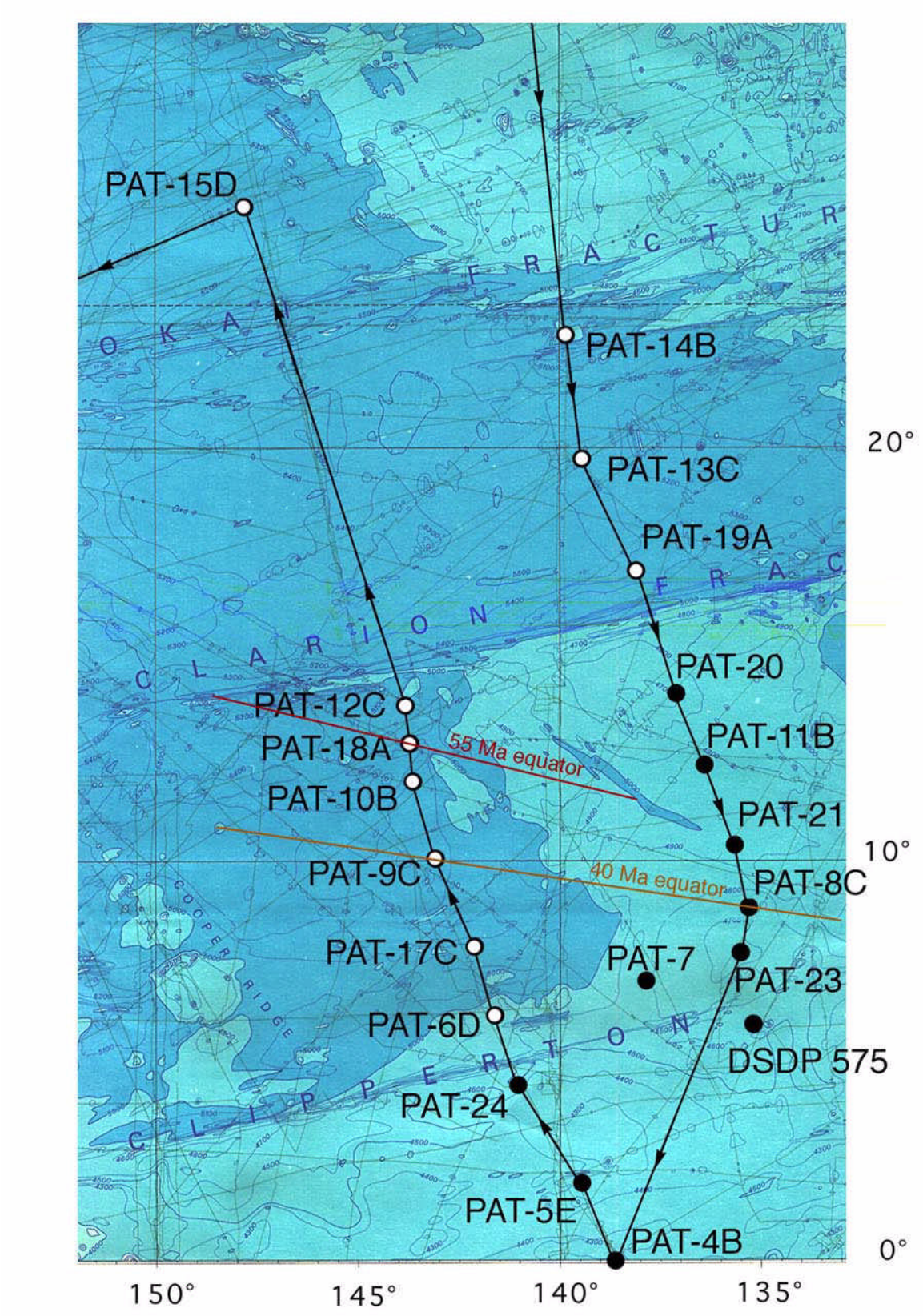


Fig PAT10-2: Swathmap bathymetry for the PAT-10B region, from the EW9709 site survey. Proposed drill site is marked.

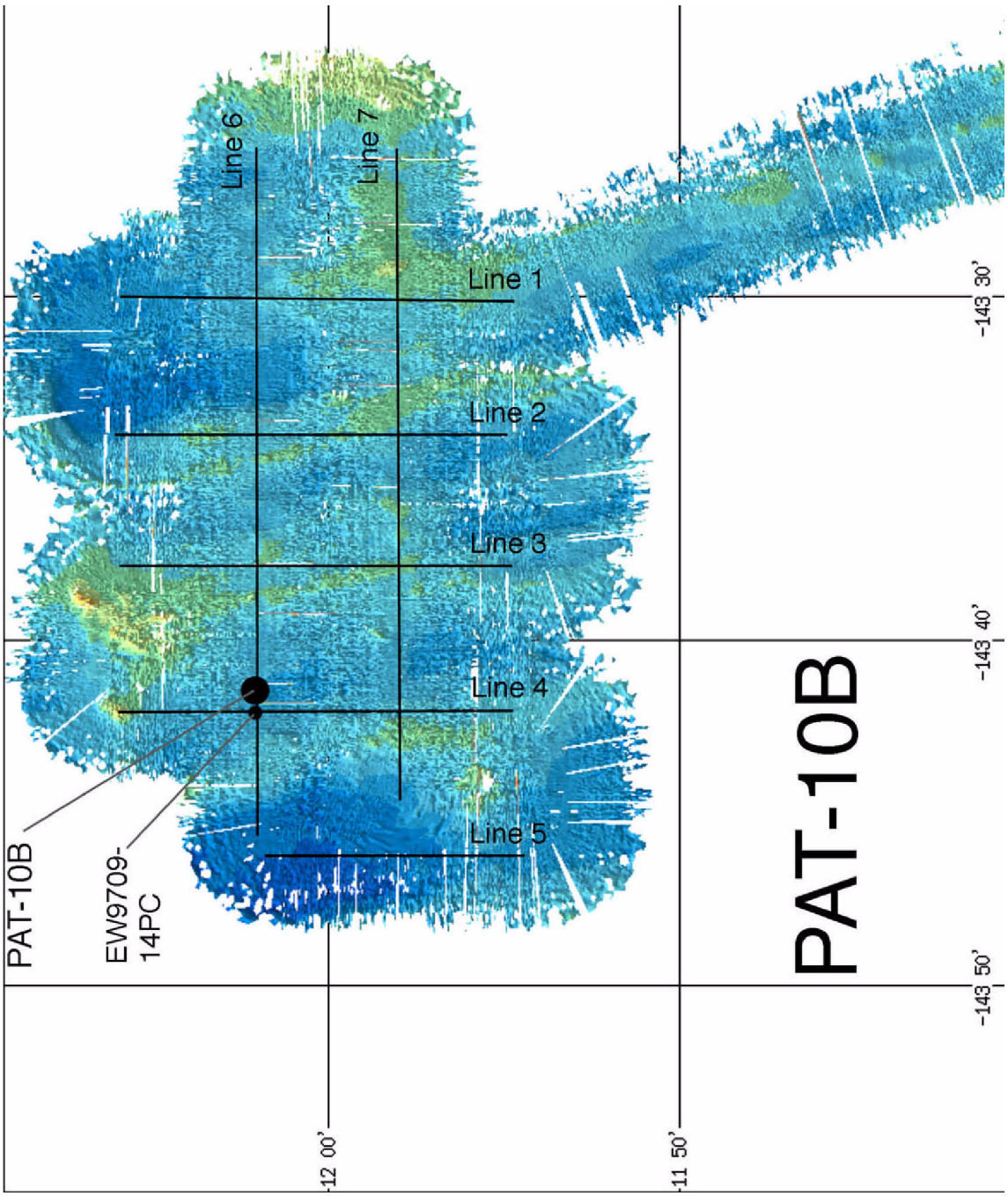


Fig PAT10-3: Seismic profile PAT10-seisline 6 across PAT-10B, from EW9709. Proposed drill site is marked.

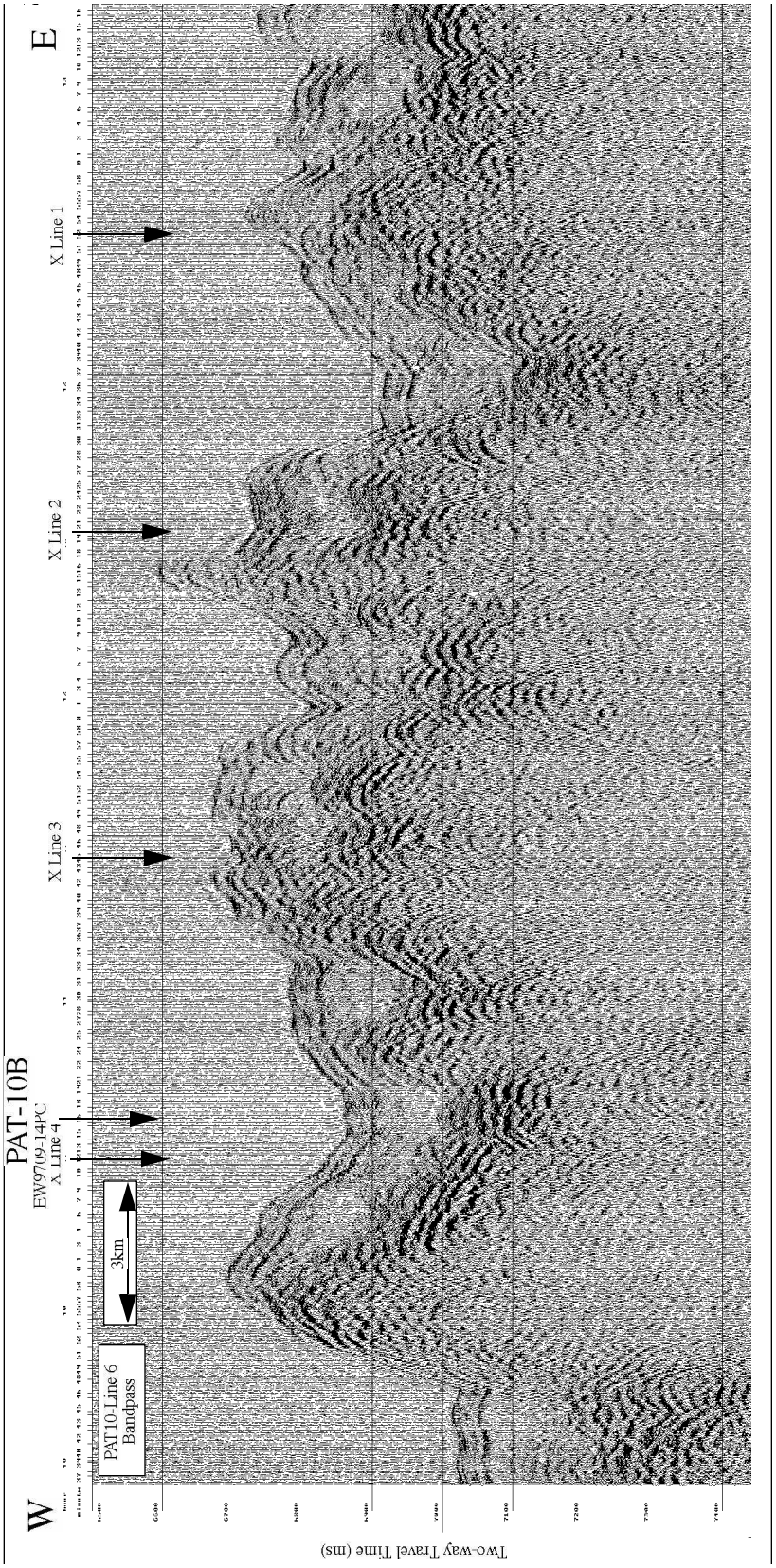
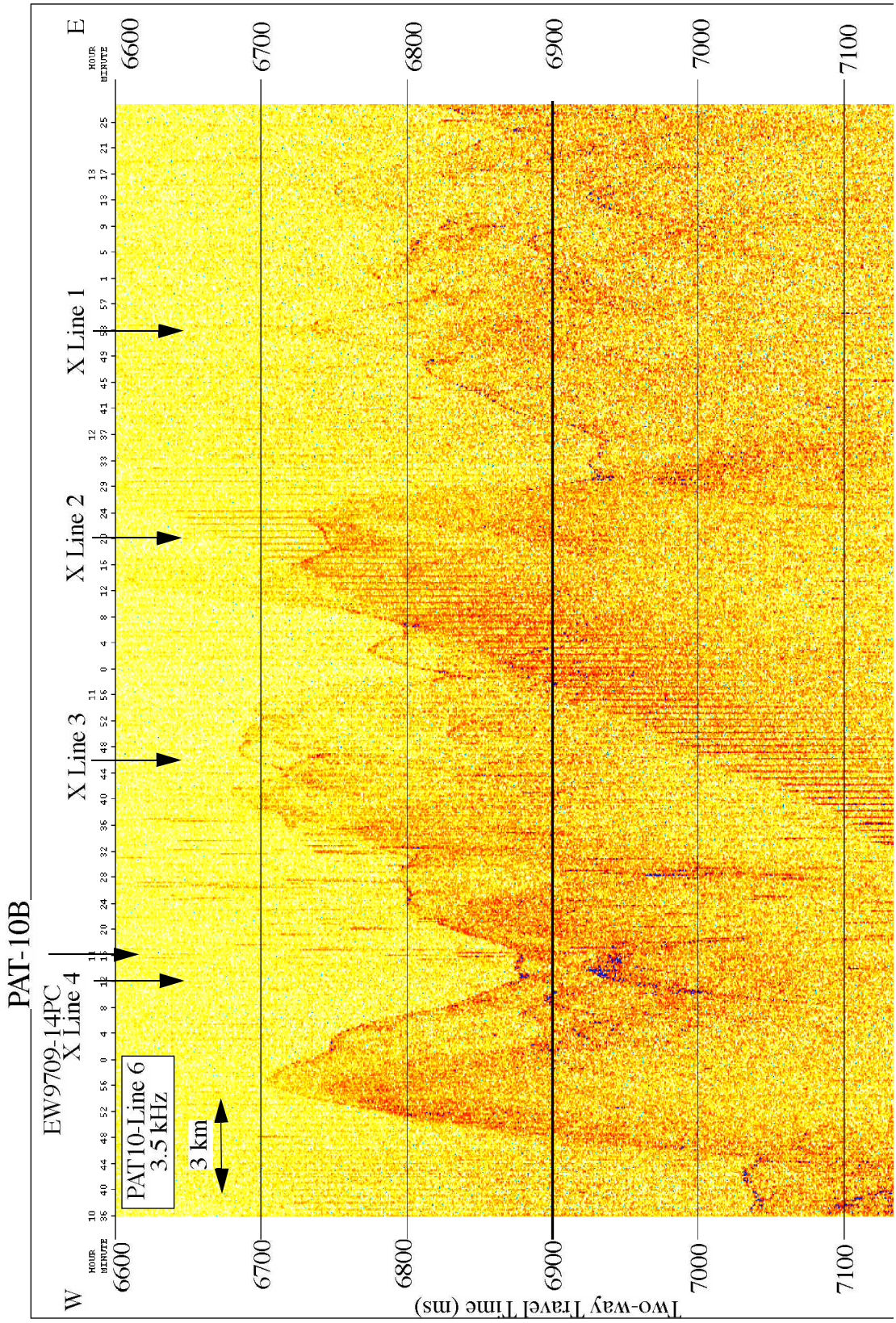


Fig PAT10-4: 3.5 kHz subbottom profile PAT10-35line 6 across PAT-10B, from EW9709. Proposed drill site is marked



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 define equatorial circulation and changes in deep water flow properties
List Previous Drilling in Area:	DSDP Site 162

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-10B	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: 01.999N	Jurisdiction:	none
Longitude:	Deg: 143	Min: 41.572W	Distance to Land:	>1000 km
Priority of Site:	Primary: 1	Alt:	Water Depth:	5147 m (6.863 sec)

Section C: Operational Information

	Sediments.What is the total sed. thickness? 183 m		Basement	
Proposed Penetration (m)	183 meters		4.5 meters	
General Lithologies:	siliceous clay, calcareous 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: 3.8 days	Logging: 0.5	Total On-Site: 4.3 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:

Please fill out information in all gray boxes

Page 2 - Site Survey Detail

New **Revised**

Proposal #: 486-Rev2	Site #: PAT-10B	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 PAT10 seisline 6, JD007, 11:16:01 gmt 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 PAT10 survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709 PAT10 survey
7	Swath bathymetry	Y		EW9709 PAT10 survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709 PAT10 survey
11b	Gravity			
12	Sediment cores	X		EW9709 14PC (11.16 m length)
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709 PAT10 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-10B	Date Form Submitted: 15 March 1998
Water Depth (m): 5147	Sed. Penetration (m): 183	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 only 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-10B	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 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-10B	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
0-30(?)		Oligocene to Recent	1.55	siliceous clay	near edge of central gyre	1 m/my	
30-105		Eocene	1.55	radiolarian clays and oozes	equatorial circulation system	5 m/my	
105-183		Early Eocene	1.65	calcarous siliceous ooze	equatorial circulation system	13 m/my	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-18A (Central Pacific, between Clipperton and Clarion FZ)

12° 57.032'N, 143° 49.249'W

SITE OBJECTIVES

PAT-18A is part of the Phase 1 (56 Ma) transect and was at the equator at 56 Ma. It is of high priority and will be needed to define equatorial circulation and upwelling in the early Eocene. Its primary role 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 to study the changes of the CCD from the Eocene to the Oligocene. At 56 Ma, the backtracked location was 0° N, 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), while at 40 Ma, the site was located 3° N, 116° W.

GENERAL DESCRIPTION

PAT-18 is situated about 2 degrees south of the Clarion Fracture Zone in the central tropical Pacific (Fig PAT18-1) in a region known to have little sediment deposition in the Neogene. 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). Crustal age was estimated based upon extrapolation of regional DSDP crustal ages.

EW9709 SURVEY

PAT-18A was surveyed on 08 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, but the piston core was lost while trying to recover it. PAT-18A is located just north of a major uncharted fracture zone which we propose to call the Mahi Mahi Fracture Zone (Figure PAT18-2). Relief across Mahi Mahi FZ in our survey area is about 1 km, and it trends parallel to Clarion FZ to the north. Almost all of the topography between PAT-10 and PAT-18 is disturbed, probably more reliably indicating the size of the fracture zone influence. Despite the bathymetric disturbance, we found an excellent drillsite about 15 km north of Mahi Mahi FZ in a gentle valley in the abyssal hill topography leading NNW.

LITHOLOGIC DESCRIPTION

Nearest Sediment Core: no EW9709 core. PC16 lost while trying to pull out.

Nearest drillsite: DSDP Site 162 14° 52.19' N, 140° 02.61' W, 4854 mbsl.
153 m sediment thickness.

Site 162 experiences a hiatus from the early Oligocene to the Holocene. The remainder of the Oligocene can be found between 0 and 36 mbsf. Carbonate is low in the Oligocene, and virtually disappears in the earliest Oligocene sediments. There is a relatively small (~15 m thick) late Eocene section , also with very little carbonate and an extensive middle Eocene more carbonate-rich section. The basal sediments at 150 mbsf are early to early-

middle Eocene in age, based on nannofossils. PAT-18A, because it is almost 4° to the west, should have late Paleocene-age basal sediments.

SEISMIC INTERPRETATION

Primary Site (PAT-18A): EW9709 PAT18 seisline 6 JD008 20:32:57 gmt (SP 3472)

Priority: 1
Crustal age: 57 Ma (?)
Location: 12° 57.032' N 143° 49.249' W
Site water depth: 5058 m (6.744 sec TWTT)
Sediment thickness: 0.292 sec (232 m)
Proposed Drilling Depth: 237 m

Once away from the disturbed topography at the fracture zone we found moderately thick sediment cover everywhere. We chose PAT-18A to be in a somewhat thicker sediment section in the westernmost valley. The sediments at PAT-18A are 232 m thick, and can roughly divided in two. The upper unit has few if any reflectors and is 164 m (210 msec TWTT) thick. The lower unit is about 67 m thick (82 msec TWTT) and is distinctly more reflective. We interpret this unit to be more carbonate-rich (higher acoustic impedance) than the unit above.

GEOLOGIC HAZARDS

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

OTHER HAZARDS

EW9709-PC16 was lost during pullout at a position of 12° 56.987' W, 143° 43.973' W. We also lost about 2.5 km of deep-sea wire attached to the core. This area should be avoided for drilling.

SUBMITTED DATA, 3/98

The following data have been used to pick the location of PAT-18A and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT18 seisline 1
EW9709 PAT18 seisline 2
EW9709 PAT18 seisline 3
EW9709 PAT18 seisline 4
EW9709 PAT18 seisline 5
EW9709 PAT18 seisline 6
EW9709 PAT18 seisline 7

3.5 kHz data:

EW9709 PAT18 35line 1
EW9709 PAT18 35line 2
EW9709 PAT18 35line 3
EW9709 PAT18 35line 4
EW9709 PAT18 35line 5
EW9709 PAT18 35line 6
EW9709 PAT18 35line 7

FIGURES

Fig PAT18-1: Location map for PAT-18A, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT18-2: Swathmap bathymetry for the PAT-18 region, from the EW9709 site survey. Proposed drill site is marked.

Fig PAT18-3: Seismic profile PAT18-seisline 6 across PAT-18A, from EW9709. Proposed drill site is marked.

Fig PAT18-4: 3.5 kHz subbottom profile PAT18-35line 6 across PAT-18A, 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 PAT18-1: Location map for PAT-18A on GEBCO bathymetry

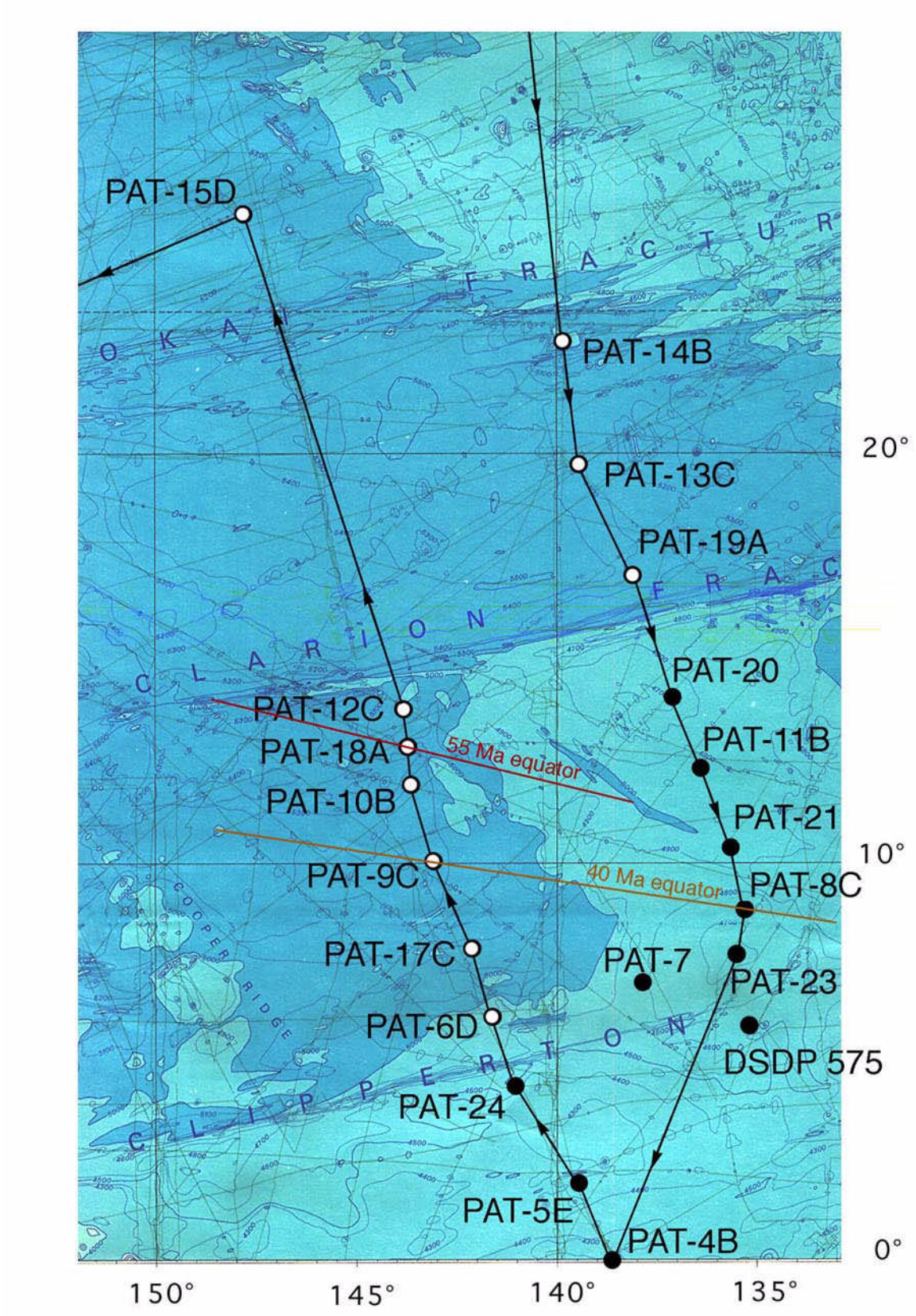


Figure PAT18-2: Swathmap bathymetry for the PAT-18A region from the EW9709 survey.

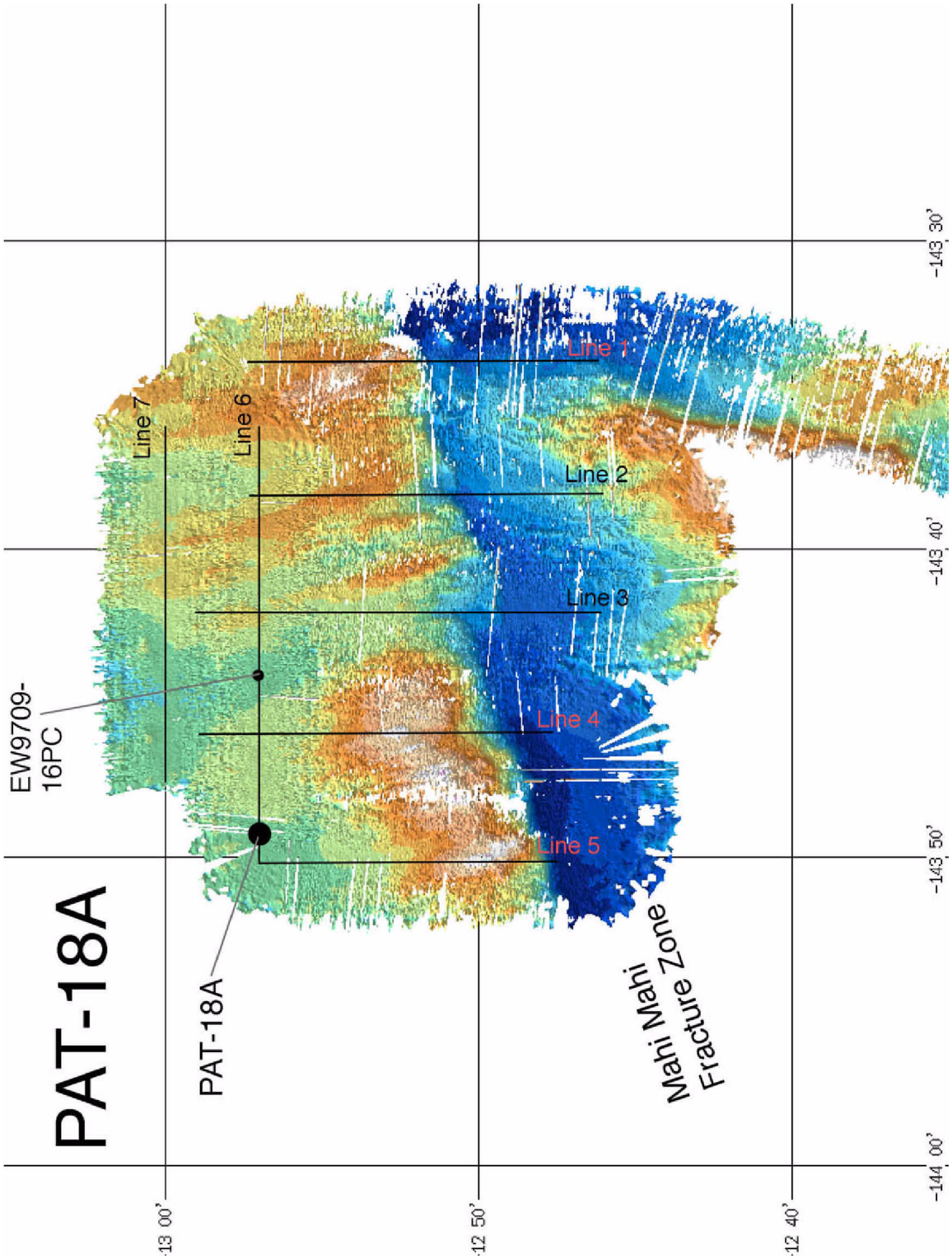


Figure PAT18-3: Seismic profile PAT18 seisline 6 across PAT-18A

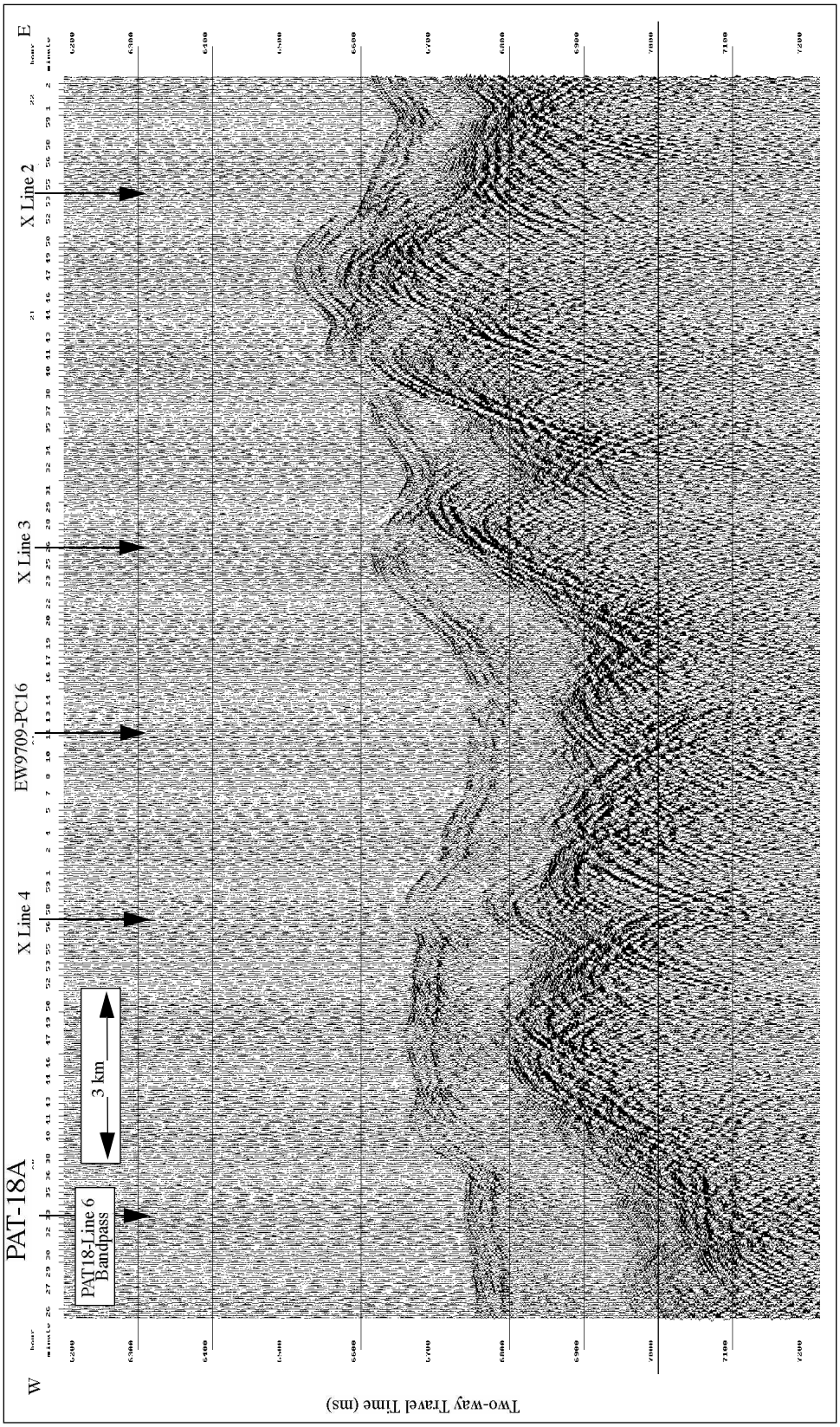
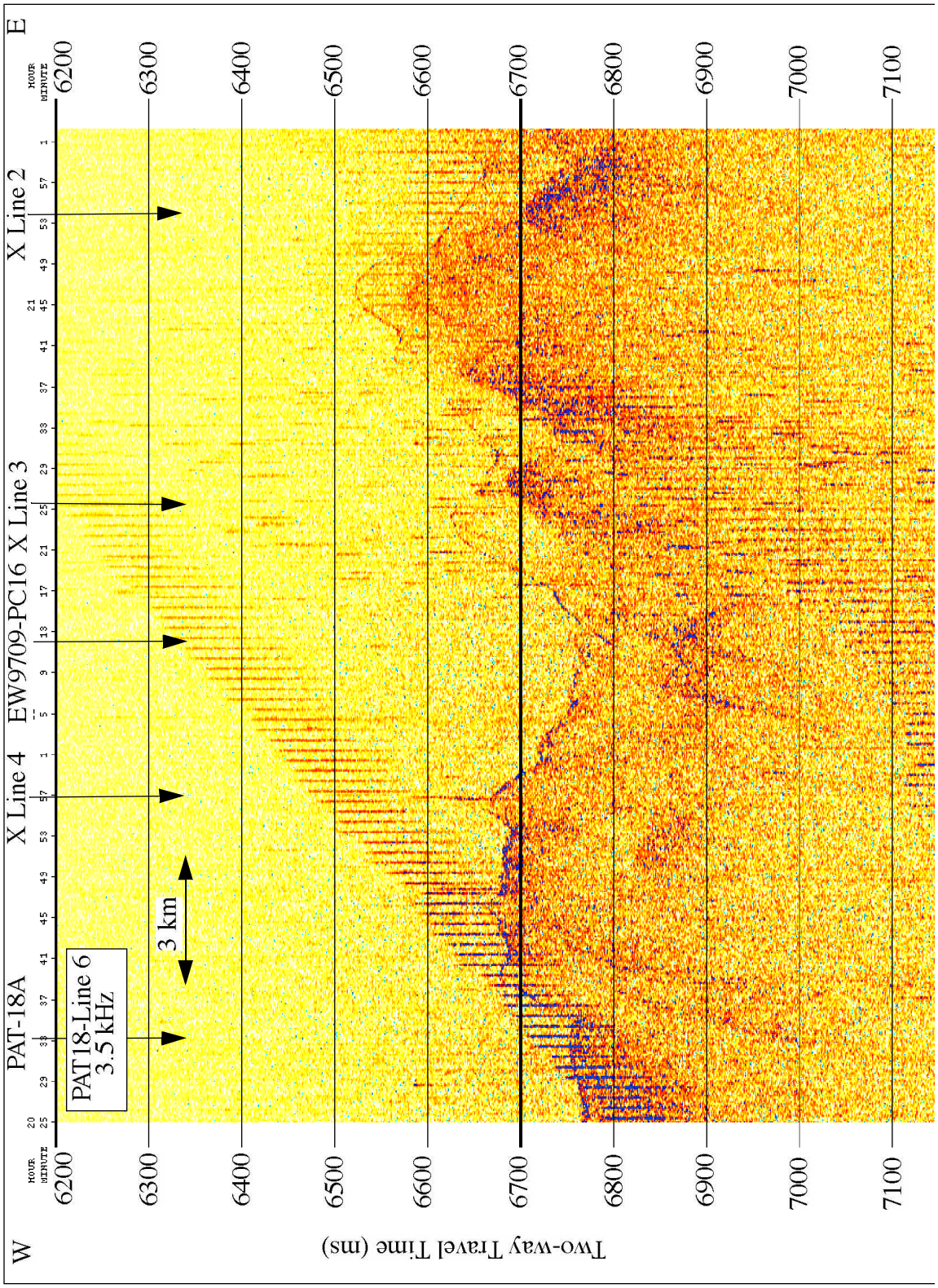


Figure PAT18-4: 3.5 kHz subbottom profile PAT18-35line 6 across PAT-18A



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 define equatorial circulation and productivity, monitor deepwater flow properties, paleo-CCD
List Previous Drilling in Area:	DSDP Site 162

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-18A (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: 57.032N	Jurisdiction:	none
Longitude:	Deg: 143	Min: 49.249W	Distance to Land:	>1000 km
Priority of Site:	Primary: 1	Alt:	Water Depth:	5058 meters (6.744 sec)

Section C: Operational Information

	Sediments. What is the total sed. thickness? 232 m		Basement	
Proposed Penetration (m)	232 meters		4.5 meters	
General Lithologies:	siliceous clay, calcareous 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: 4.6	Logging: 1.0	Total On-Site: 5.6	
Hazards/ Weather	*List possible hazards due to ice, hydrocarbons, dumpsites, cables, etc.* 2500 m of cable w/ piston core assembly lost near 12°56.987'N, 143°43.973'W		*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-18A	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 PAT18 seisline 6, JD008, 20:22:57 gmt 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-18 survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709 PAT-18 survey
7	Swath bathymetry	Y		EW9709 PAT-18 survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709 PAT-18 survey
11b	Gravity			
12	Sediment cores	X		EW9709 PC16 (unfortunately, it's still stuck in the bottom)
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709 PAT-18 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 spe-

cific 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-18A	Date Form Submitted: 15 March 1998
Water Depth (m): 5058	Sed. Penetration (m): 232	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-18A	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)	EW9709 PC16 lost during site survey cruise with 2.5 km of wire rope at 12°56.987' N, 143° 43.973' W
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-18A	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
0-164		Eocene to Recent	1.56	siliceous ooze, siliceous clay	near edge of central gyre	3 m/my	
164-232		Paleoc. to early Eoc.	1.65	calcareous radiolarian ooze	equatorial circulation system	11 m/my	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-12C (Central Pacific between Clipperton and Clarion FZ)

13° 48.977'N, 143° 53.348'W

SITE OBJECTIVES

PAT-12C will be drilled as part of the Phase 1 (56 Ma) transect. It will be used to define the northern boundary of the South Equatorial Current and to define the extent of upwelling at the early Eocene equator. It will also help define tropical current structure and sedimentation in the middle and late Eocene as well. PAT-12C will also be used to monitor bottom waters generated in the Antarctic and changes in CCD through the Paleogene. At 56 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 1° N, 111° W. At 40 Ma, the site was located at about 4° N, 116° W. Because of its position, PAT-12C will also help to monitor the position of the ITCZ in the Late Eocene and perhaps early Oligocene.

GENERAL DESCRIPTION

PAT-12C is situated about a degree south of the Clarion Fracture Zone in abyssal hill terrain typical of the Central Pacific. The region between the Clipperton and Clarion Fracture zones is known to have a hiatus for much of the Neogene caused by a deepening CCD. 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). Crustal age was estimated based upon extrapolation of regional DSDP crustal ages.

EW9709 SURVEY

PAT-12C was surveyed on 9-10 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 gravity cored. PAT-12C is located in abyssal hills striking toward the NNW. The abyssal hills have two wavelength scales– about 15 km and about 3 km. The site is everywhere covered with sediments, about 150-200 msec TWTT (120-160 m).

LITHOLOGIC DESCRIPTION

Nearest sediment core: EW9709-17GC 13° 48.796'N, 143° 47.945' W, 5084 m; 276 cm sediment recovered

The core catcher sample from 17GC contained yellowish brown sediment and a moderately to poorly preserved reworked radiolarian assemblage. The most abundant forms derived from the upper part of the middle Eocene (*P. mitra* through *P. goetheana* zones). with some rarer specimens from the lower Oligocene to upper Eocene. Finally there was a trace amount of specimens from the mid to upper Miocene. The sample from the top of section II (29 cm) is more dark grayish brown in color but was very similar to the catcher

sample in terms of the dominant middle Eocene forms present; however there were no identifiable lower Oligocene or mid to upper Miocene forms. Instead ther were trace amounts of Quaternary radiolarian fauna. Our interpretation of these samples is that the catcher sample represents sediment possibly deposited in the mid to late Miocene along with reworked middle Eocene to lower Oligocene sediments. The sample from 29 cm represents almost the same reworked middle Eocene assemblages (with no lower Oligocene or mid Miocene present) redeposited in the Quaternary.

Nearest drillsite: DSDP Site 162 14° 52.19' N, 140° 02.61' W, 4854 mbsl. 153 m sediment thickness.

Site 162 experiences a hiatus from the early Oligocene to the Holocene. The remainder of the Oligocene can be found between 0 and 36 mbsf. Carbonate is low in the Oligocene, and virtually disappears in the earliest Oligocene sediments. There is a relatively small (~15 m thick) late Eocene section , also with very little carbonate and an extensive middle Eocene more carbonate-rich section. The basal sediments at 150 mbsf are early to early-middle Eocene in age, based on nannofossils.

SEISMIC INTERPRETATION

Primary Site (PAT-12C): EW9709 PAT12 seisline 6 JD010 13:02:06 gmt, shot 3678

Priority: 1
Crustal age: 57 Ma (?)
Location: 13° 48.977' N 143° 53.348' W
Site water depth: 4965 m (6.620 sec TWTT)
Sediment thickness: 0.182 sec (141 m)
Proposed Drilling Depth: 146 m

PAT-12C was chosen along the crest of an abyssal hill on PAT12 seisline 6. It was chosen here because the sediment was typical in thickness and both sediments and basement were well-imaged. The sediment column is about 140 m thick and vaguely layered throughout. We assume, based on the gravity coring, that beneath a thin red clay section there lies a lower Oligocene/upper Eocene to uppermost Paleocene section. We observe no strong sediment reflectors near basement and believe that the sediments remain oozes to 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 have been used to pick the location of PAT-12C and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT12 seisline 1
EW9709 PAT12 seisline 2
EW9709 PAT12 seisline 3

EW9709 PAT12 seisline 4
EW9709 PAT12 seisline 5
EW9709 PAT12 seisline 6
EW9709 PAT12 seisline 7
EW9709 PAT12 seisline 8

3.5 kHz data:

EW9709 PAT12 35line 1
EW9709 PAT12 35line 2
EW9709 PAT12 35line 3
EW9709 PAT12 35line 4
EW9709 PAT12 35line 5
EW9709 PAT12 35line 6
EW9709 PAT12 35line 7
EW9709 PAT12 35line 8

FIGURES

Fig PAT12-1: Location map for PAT-12C, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT12-2: Swathmap bathymetry for the PAT-12C region, from the EW9709 site survey. Proposed drill site is marked.

Fig PAT12-3: Seismic profile PAT12-seisline 6 across PAT-12C, from EW9709. Proposed drill site is marked.

Fig PAT12-4: 3.5 kHz subbottom profile PAT12-35line 6 across PAT-12C, 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 PAT12-1: Location map for PAT-12C on GEBCO bathymetry region. Proposed drillsite is marked

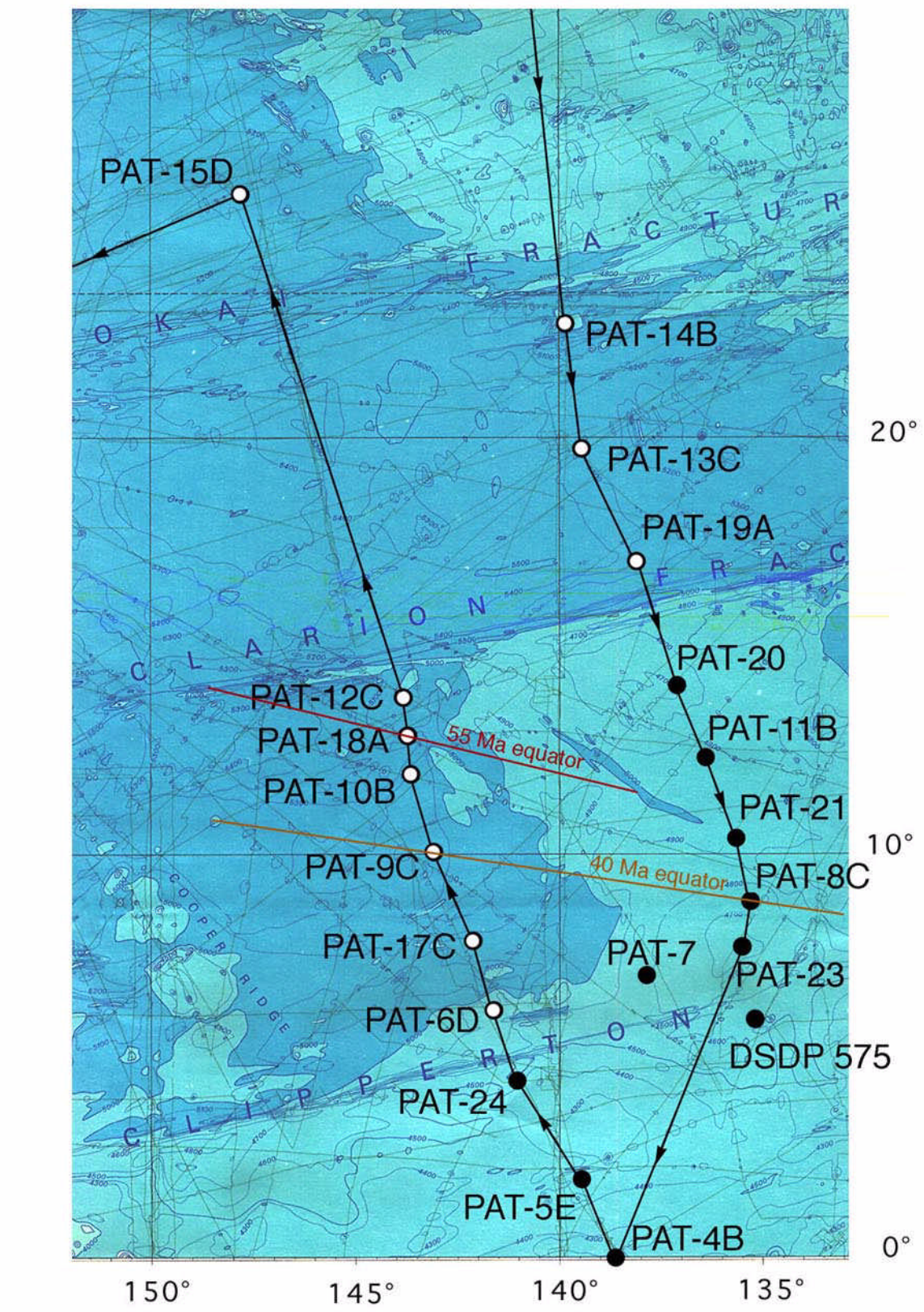


Figure PAT12-2: EW9709 swathmap bathymetry for the PAT-12C region. Proposed drillsite is marked

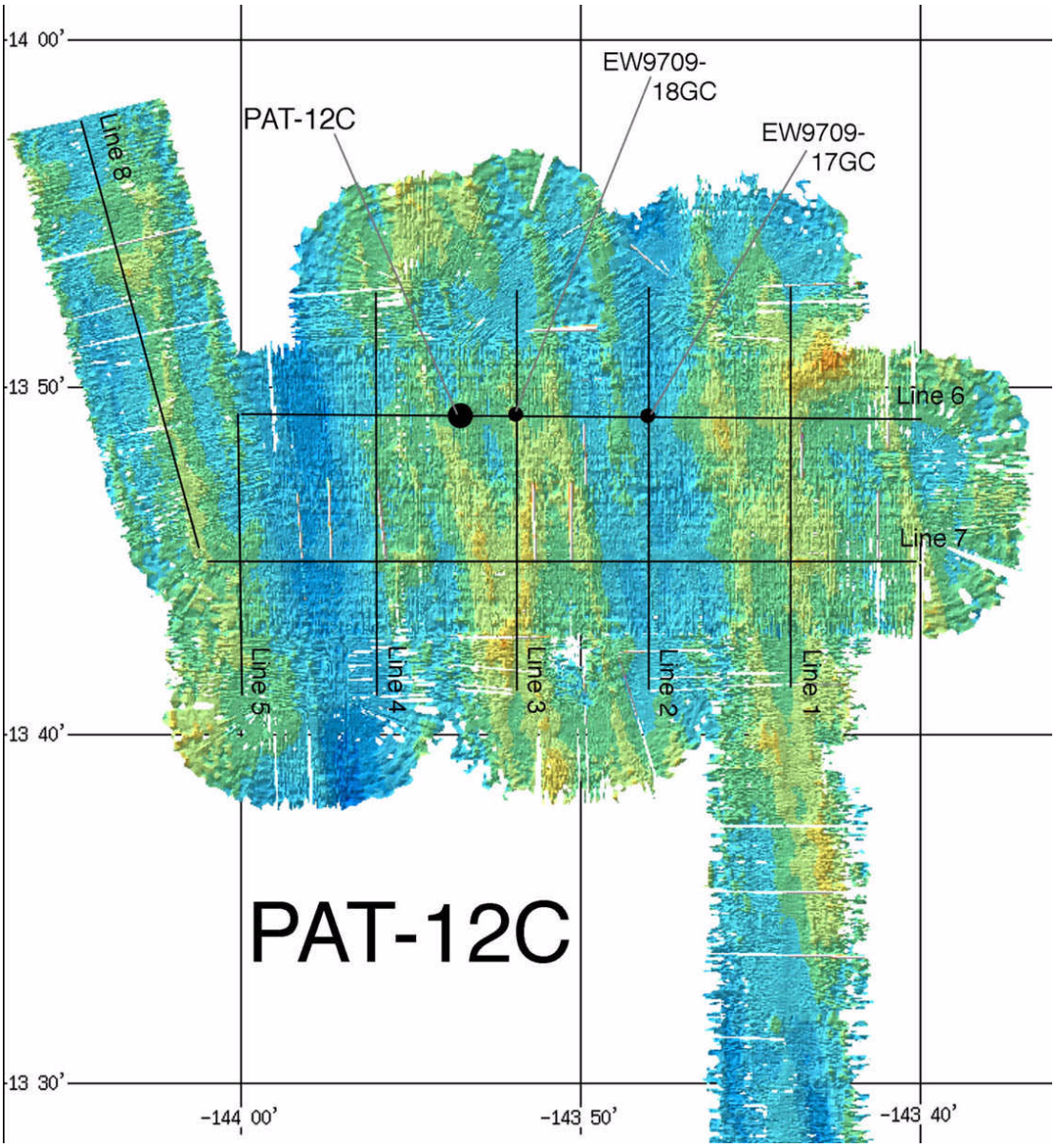


Figure PAT12-3: Part of seismic line PAT12 seisline 6, showing position of PAT-12C

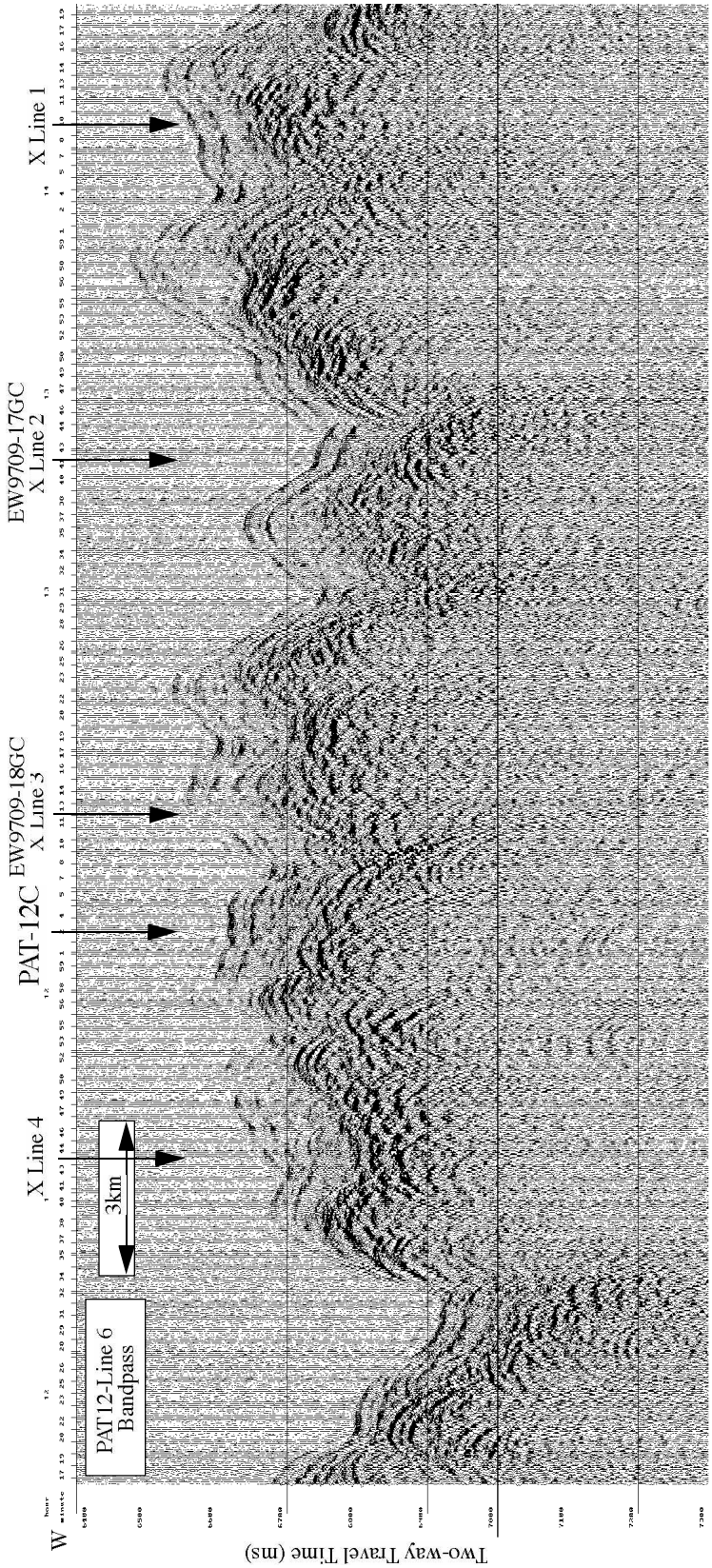
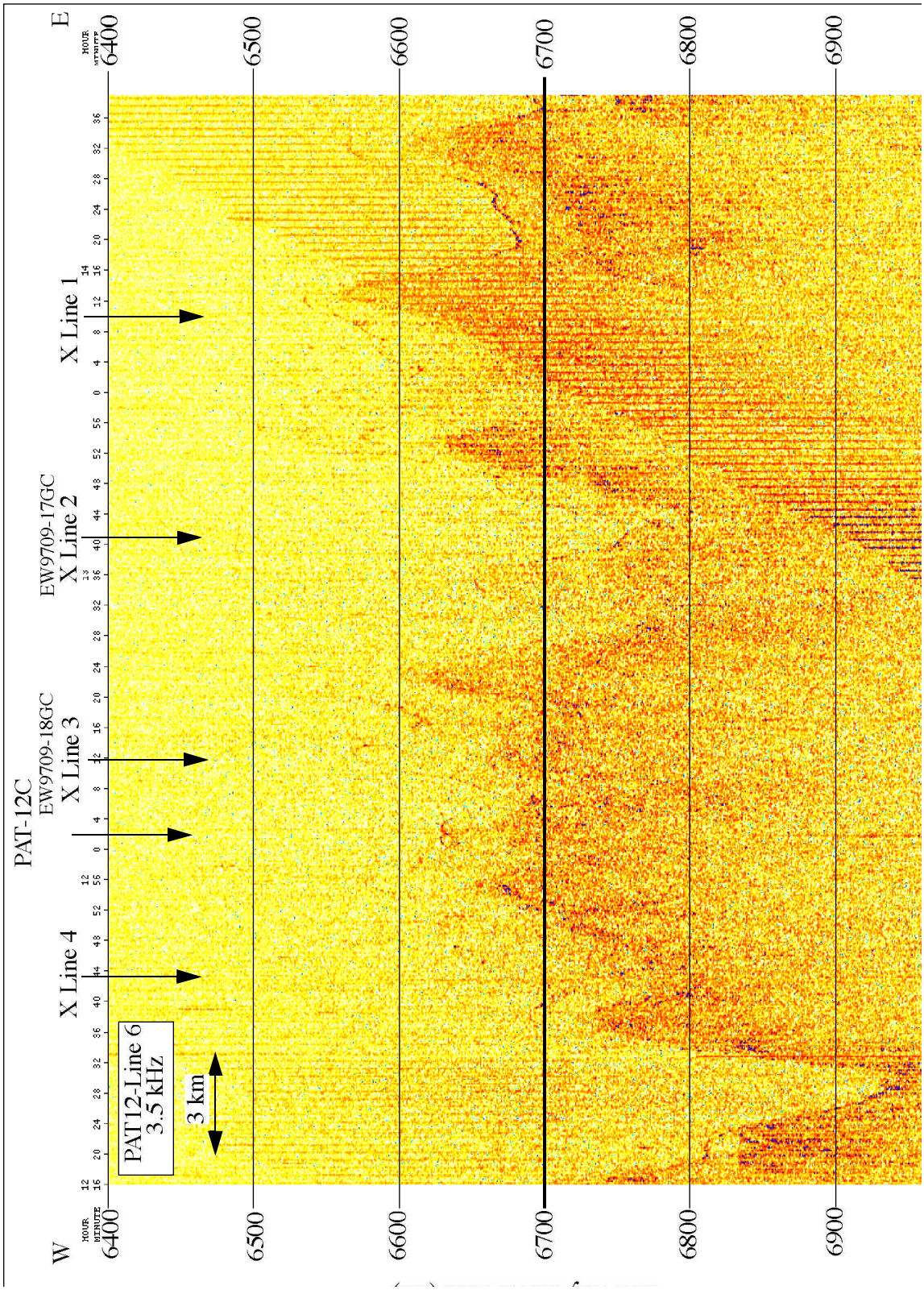


Figure PAT12-4: PAT12-35line 6. 3.5 kHz subbottom profile across PAT-12C.



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 define pattern structure of equatorial current system and equatorial upwelling, monitor deep water flow properties, paleo-CCD, and ITCZ
List Previous Drilling in Area:	DSDP Site 162

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-12C (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)		Area or Location:	Central Pacific Ocean
Latitude:	Deg: 13	Min: 48.977N	Jurisdiction:	none
Longitude:	Deg: 143	Min: 53.348W	Distance to Land:	>1000 km
Priority of Site:	Primary: 1	Alt:	Water Depth:	4965 m (6.620 sec)

Section C: Operational Information

	Sediments. What is the total sed. thickness? 141 m	Basement
Proposed Penetration (m)	141 meters	4.5 meters
General Lithologies:	siliceous clay 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:	Logging:	Total On-Site:
	3.0 days	none	3.0 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:

Please fill out information in all gray boxes

Page 2 - Site Survey Detail

New **Revised**

Proposal #: 486-Rev2	Site #: PAT-12C	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 PAT12 seisline 6, JD010, 13:02:06 gmt 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 PAT12 survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709 PAT12 survey
7	Swath bathymetry	Y		EW9709 PAT12 survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709 PAT12 survey
11b	Gravity			
12	Sediment cores	X		EW9709-17GC (276 cm length)
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709 PAT12 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-12C	Date Form Submitted: 15 March 1998
Water Depth (m): 4965	Sed. Penetration (m): 141	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 no logging

If "Yes" Please describe requirements: _____

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

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-12C	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
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-12C	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
0-26		Middle Eocene to Recent	1.52	radiolarian clays,	tropical, near central gyre	2 m/my	
26-141		Paleocene to Middle Eocene	1.56	radiolarian clays, siliceous oozes with carbonate	near equatorial circulation system	10 m/my	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-19A (Central Tropical Pacific, just N of Clarion FZ)

16° 51.989'N, 138° 06.000' W

SITE OBJECTIVES

PAT-19A will be drilled as part of the Phase 1 (56 Ma) transect. It will be important define the North Equatorial Current/North Equatorial Countercurrent boundary and it will partly define middle and late Eocene CCD. It will also better define the Middle Eocene radiolarian bloom noted at PAT-13 and DSDP Site 40 and will be used to define the shift in ITCZ through the Paleogene by following the change in aeolian dust composition and flux through time. At 56 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 5° N, 106° W. At 40 Ma, the site was located at about 8° N, 111° W.

GENERAL DESCRIPTION

PAT-19 is about a degree north of the Clarion Fracture Zone on abyssal hill topography typical of the central Pacific (Figure PAT19-1). Based on magnetic lineations, basement age at PAT-19 should be in magnetic chron 25R, or about 57 Ma (Cande et al., 1989; timescale of Cande and Kent, 1995) .

EW9709 Survey

PAT-19A was surveyed 23 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. The average water depth at PAT-19A is greater than 5 km, and its position has always been well north of the equator. Consequently most of the sediment section has little or no carbonate. This fits with the site survey data--the sea floor return from all acoustic devices was weak, even though all the terrain at PAT-19 was covered by more than 100 msec TWTT sediment cover.

The overall bathymetry is typical of abyssal hills, lineated to the NNW (Figure PAT19-2). The abyssal hills have a relief of about 200 m. Two seamounts were discovered during the site survey, one on the approach to the site and one on the northern edge of the survey area.

LITHOLOGIC DESCRIPTION

Nearest Sediment Core: EW9709-4PC 16° 52.027'N, 138° 05.964' W, 5340 m (uncorr.) 1526 cm.

The sediment recovered in the piston core EW9709-4PC is red clay with abundant to rare zeolite crystals throughout the section. Age of the lowermost sediment is uncertain.

SEISMIC INTERPRETATION

Primary Site (PAT-19A): EW9709 PAT19-seisline 5 cross with PAT19-seisline2; SP3164, JD357 20:33:02

Priority: 1
Crustal age: 57 Ma
Location: 16° 51.994 N 138° 06.001' W
Site water depth: 5291 m (7.055 sec TWTT)
Sediment thickness: 0.216 sec (164 m)
Proposed Drilling Depth: 169 m

PAT-19A is located on abyssal hills oriented along a NNW strike. The site is thus similar to PAT-13 except that it is covered by somewhat more sediment. The rapid bathymetric changes made for large numbers of side echos. The sediment column consists of a weakly reflective upper unit which we believe is composed of clays and radiolarian oozes, and a more highly reflective basal unit, which may either be partly lithified or much more carbonate-rich. The 3.5 kHz was difficult to interpret because of ambient noise from 3-4 m seas, large numbers of side echos, and a very soft bottom. We could only get a return from the 12 kHz pinger on the piston core when it was within 300 m of the sea floor.

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-19A and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT19-seisline 1
EW9709 PAT19-seisline 2
EW9709 PAT19-seisline 3
EW9709 PAT19-seisline 4
EW9709 PAT19-seisline 5
EW9709 PAT19-seisline 6

3.5 Khz data submitted:

EW9709 PAT19-35line 1
EW9709 PAT19-35line 2
EW9709 PAT19-35line 3
EW9709 PAT19-35line 4
EW9709 PAT19-35line 5
EW9709 PAT19-35line 6

FIGURES

Fig PAT19-1: Location map for PAT-19A, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT19-2: Swathmap bathymetry for the PAT-19 region, from the EW9709 site survey. Proposed drill site is marked.

Fig PAT19-3: Seismic profile PAT19-seisline 5 across PAT-19A, from EW9709. Proposed drill site is marked.

Fig PAT19-4: Seismic profile PAT19-35line5 across PAT-19A, 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 PAT19-1: Location map for PAT-19A on GEBCO bathymetry

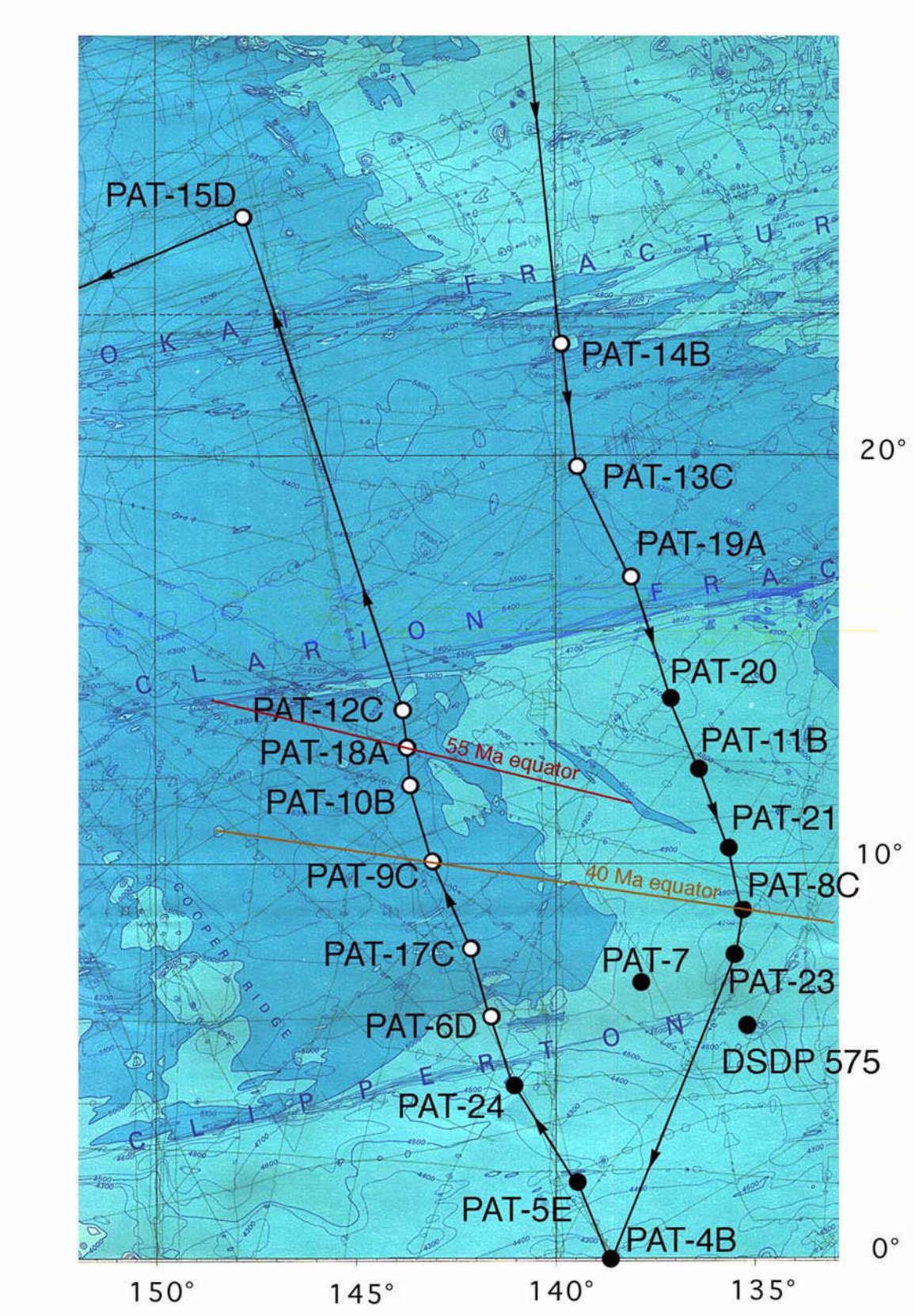


Figure PAT19-2: EW9709 swathmap bathymetry for the PAT-19A region. Proposed drillsite is marked

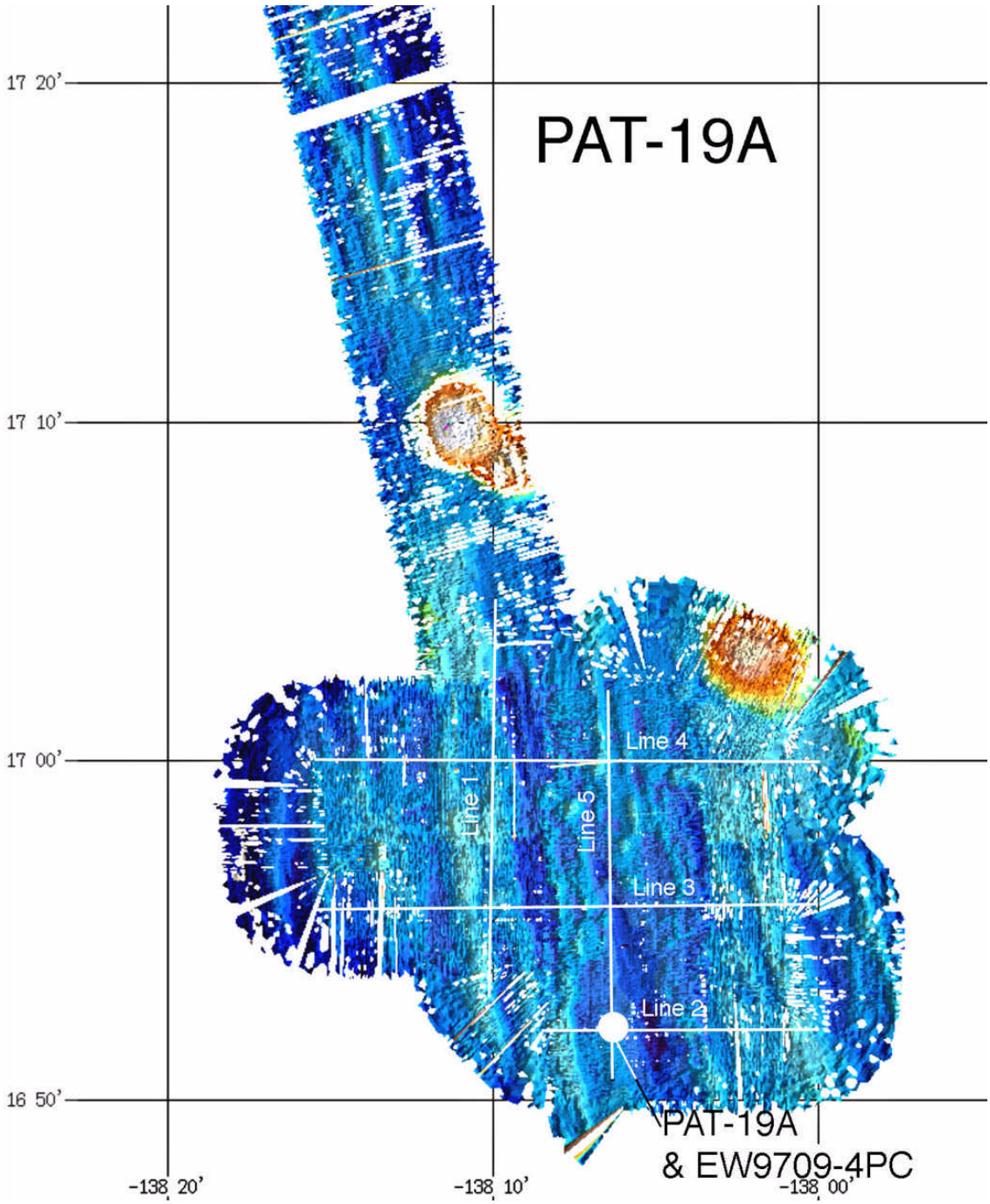


Figure PAT19-3: Seismic profile PAT19-seisline 5 across PAT-19A from EW9709

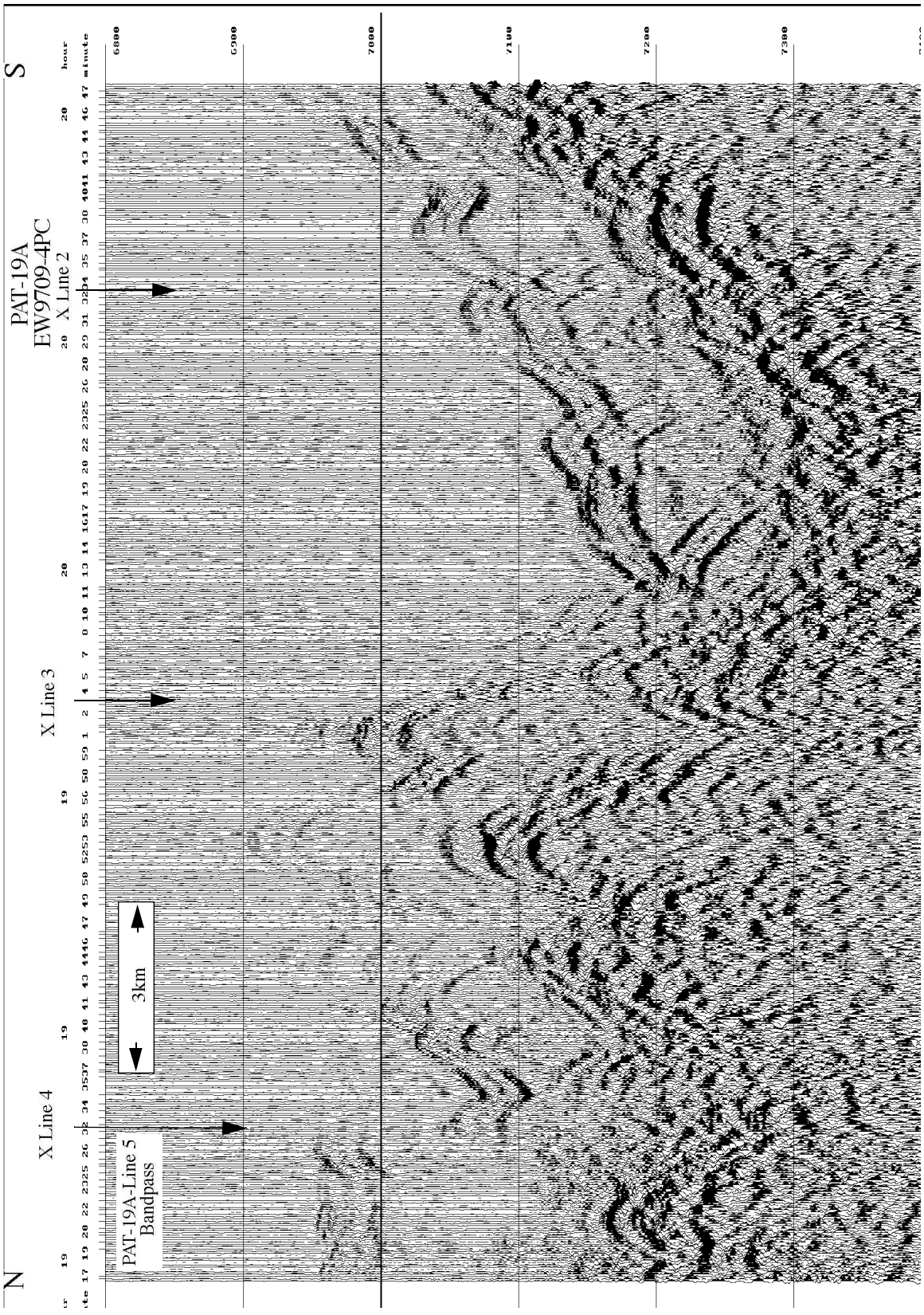
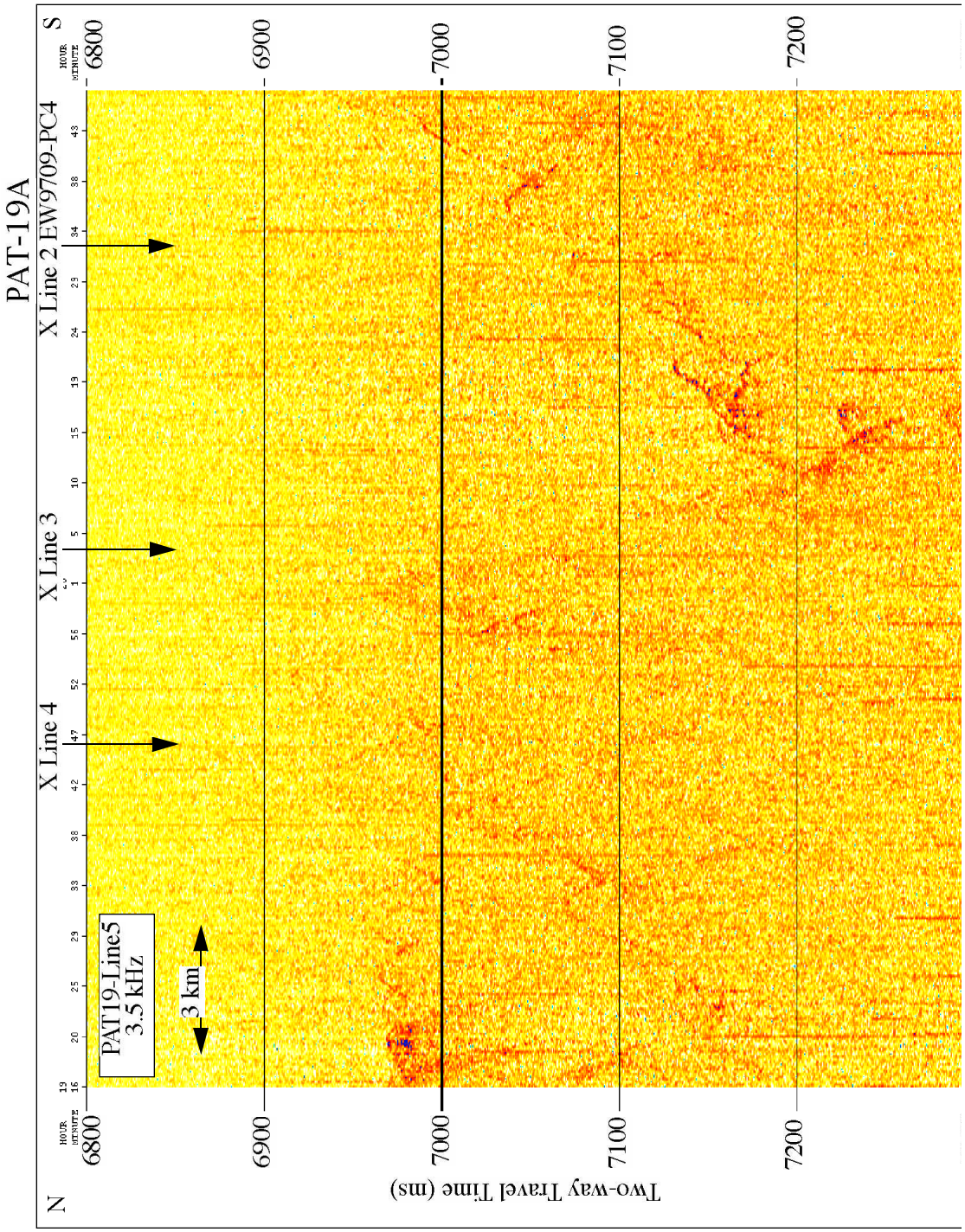


Figure PAT19-4: 3.5 kHz profile PAT19-35line 5 across PAT-19A



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 maximum warmth (56 Ma): this site will help define latitudinal position of the ITCZ, boundary between North Equatorial and Equatorial Counter Currents, depth of middle and late Eoceane CCD, and Middle Eocene biogenic bloom
List Previous Drilling in Area:	DSDP 40

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-19A (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)		Area or Location:	Central Pacific Ocean
Latitude:	Deg: 16	Min: 51.989 N	Jurisdiction:	none
Longitude:	Deg: 138	Min: 06.000 W	Distance to Land:	>1000 km
Priority of Site:	Primary: 1	Alt:	Water Depth:	5291 m (7.055 sec)

Section C: Operational Information

	Sediments.What is the total sed. thickness? 164m		Basement	
Proposed Penetration (m)	164 meters		4.5 meters	
General Lithologies:	red clay, radiolarian 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
NONE	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: 3.5 days	Logging: 0.5 days	Total On-Site: 3.9 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-19A	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 PAT19-seisline 5 Crossing Lines(s): EW9709 PAT19-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		PAT19 survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		(Location of Site on line (Time)) PAT19 survey
7	Swath bathymetry	Y		PAT19 survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		PAT19 survey
11b	Gravity			
12	Sediment cores	X		EW9709-4PC
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		PAT19 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 #: PAT19A	Date Form Submitted: 15 March 1998
Water Depth (m): 5291	Sed. Penetration (m): 164	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 only

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 #: PAT19A	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 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 #: PAT19A	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 - 25(?)		Eocene.(?) to Recent	1.52	Red Clay w/ zeo-lites	abyssal gyre	1 m/my	
25(?)-164		Paleocene to Eocene.(?)	1.52	Radiolarian Ooze, with carbonate	northern portion of equatorial current system	13 m/my	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-13C (Central Tropical Pacific, between Clarion and Molokai FZ)

19° 46.024’ N, 138° 55.056’ W

SITE OBJECTIVES

PAT-13C will be drilled as part of the Phase 1 (56 Ma) transect (Figure PAT13-1). It will be used primarily to define tropical current structure and sedimentation in the early and middle Eocene, although the lack of carbonate above the lower Eocene will make it difficult to perform high resolution paleoceanographic studies. It will also help define the shift in ITCZ through the Paleogene by following the change in aeolian dust composition and flux through time. One of the important discoveries of the site survey cruise is the presence of an almost pure biogenic sediment, a radiolarian ooze, deposited when the site was more than 8° north of the equator. This type of deposition has no analog in modern sediments and appears to be an important feature of the middle and early Eocene. Part of the objectives of drilling will be to better understand the conditions that formed the radiolarian ooze. At 56 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 8° N, 109° W. At 40 Ma, the site was located at about 10° N, 113° W.

GENERAL DESCRIPTION

PAT-13C is situated between the Clarion and Molokai Fracture Zones on abyssal hill topography typical of the central Pacific (Figure PAT13-2). Based on magnetic lineations, basement age at PAT-13B should be in magnetic chron 25R, or about 57 Ma (Cande et al., 1989; timescale of Cande and Kent, 1995) . Based upon the RC11-10 profile along 140° N, PAT-13C lies at the northern edge of the equatorial sediment bulge. Average sediment thickness at the site is significantly greater than to the north of the Murray Fracture Zone, averaging about 150-200 msec TWTT (~120 m).

EW9709 Survey

PAT-13C was surveyed on 22 December 1997 as part of the EW9709 site survey cruise. The area was chosen without benefit of prior tracklines. Our primary criteria was to site it upon magnetic chron 25R. PAT-13C has classic abyssal hill topography (Figure PAT13-2), and sediment cover is sufficiently thin that all seismic lines have an abundance of side echos. The high numbers of side echos can make it difficult to pick out the sediment column in analog records. Proessing helps to bring out the sediment column (Figures PAT13-3 and PAT13-4). Typically we observed ~150 msec TWTT sediment cover over a higher amplitude reflector sequence near basement, presumably carbonate-rich or partly lithified sediments.

LITHOLOGIC DESCRIPTION

Nearest Sediment Core: EW9709-3PC 19° 46.042'N 130° 54.954'W 5139 m (uncorr.) 1424 cm.

The sediment recovered in the piston core EW9709-3PC proved to be similar in general lithology to DSDP Site 40, 1 degree to the west. The upper part of the section is a zeolitic red clay with reworked radiolaria to at least the top of section VII (406 cm). By the top of section III (996 cm), however, the sediments are a radiolarian ooze with a well-preserved middle Eocene fauna. DSDP 40 collected a 10 m red clay interval over 140 m of Eocene age radiolarian ooze. The two sites indicate a regional environment at the edge of the Eocene equatorial region highly productive to radiolaria. This environment does not seem to have a modern analog.

Nearest drillsite: 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 early Eocene chert at 156 mbsf. 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-13C): EW9709 seisline 4, 0602 hrs GMT, Xline EW9709 seisline 6 09:13:49 gmt, SP 3687

Priority: 1
Crustal Age: 57 Ma
Location: 19° 46.024 N 138° 55.056' W
Site water depth: 5083 m (6.777 sec TWTT)
Sediment thickness: 0.192 sec (150 m)
Proposed Drilling Depth: 155 m

PAT-13 has fairly subdued but broken up topography typical of abyssal hills. Total change in relief over the entire survey site is less than 300 m, although changes of greater than 100 m in a kilometer were not uncommon. Side echos from the relatively rough seafloor made it difficult to pick out sediment from the analog records. 3-4 meter seas also raised the noise level on the 3.5 kHz data, making it harder to interpret than at other sites. Nevertheless, the processed seismic data reveals 150-200 msec TWTT of sediment throughout the area (Figure PAT13-3). We chose PAT-13C at the cross of lines 1, 4, and 6 because it had 192 msec of sediment (150 m) and a relatively clear 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-13C and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT13-seisline 1
EW9709 PAT13-seisline 2
EW9709 PAT13-seisline 3
EW9709 PAT13-seisline 4
EW9709 PAT13-seisline 5
EW9709 PAT13-seisline 6
EW9709 PAT13D-JD356 2100-2200 hrs GMT

3.5 Khz data: Cruise, time start, time end,

EW9709 PAT13-35line1
EW9709 PAT13-35line2
EW9709 PAT13-35line3
EW9709 PAT13-35line4
EW9709 PAT13-35line5
EW9709 PAT13-35line6

FIGURES

Fig PAT13-1: Location map for PAT-13C, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT13-2: Hydrosweep swathmap bathymetry from the EW9709 site survey cruise. Proposed drillsite is marked.

Fig PAT13-3: EW9709 seismic profile across PAT-13C (Line PAT13-seisLine 4). PAT-13C is located at the cross of lines 1,4, and 6.

Fig PAT13-4: 3.5 kHz profile across PAT-13C (Line PAT13-35-line4). 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 PAT13-1: Regional bathymetric map showing PAT-13C and other EW9709 surveyed sites.

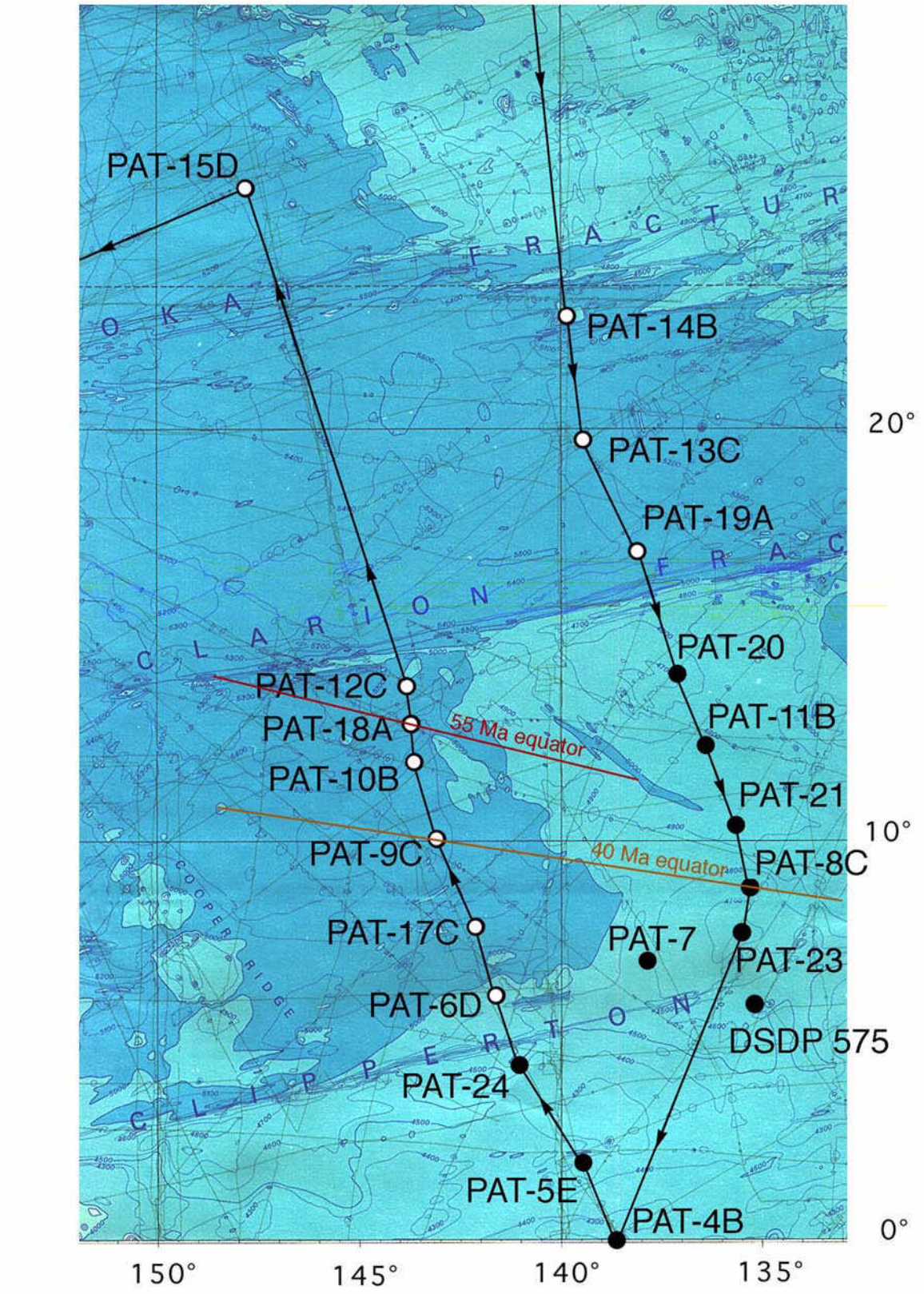


Figure PAT13-2: Swathmap bathymetry around PAT-13C from EW9709 Site Survey

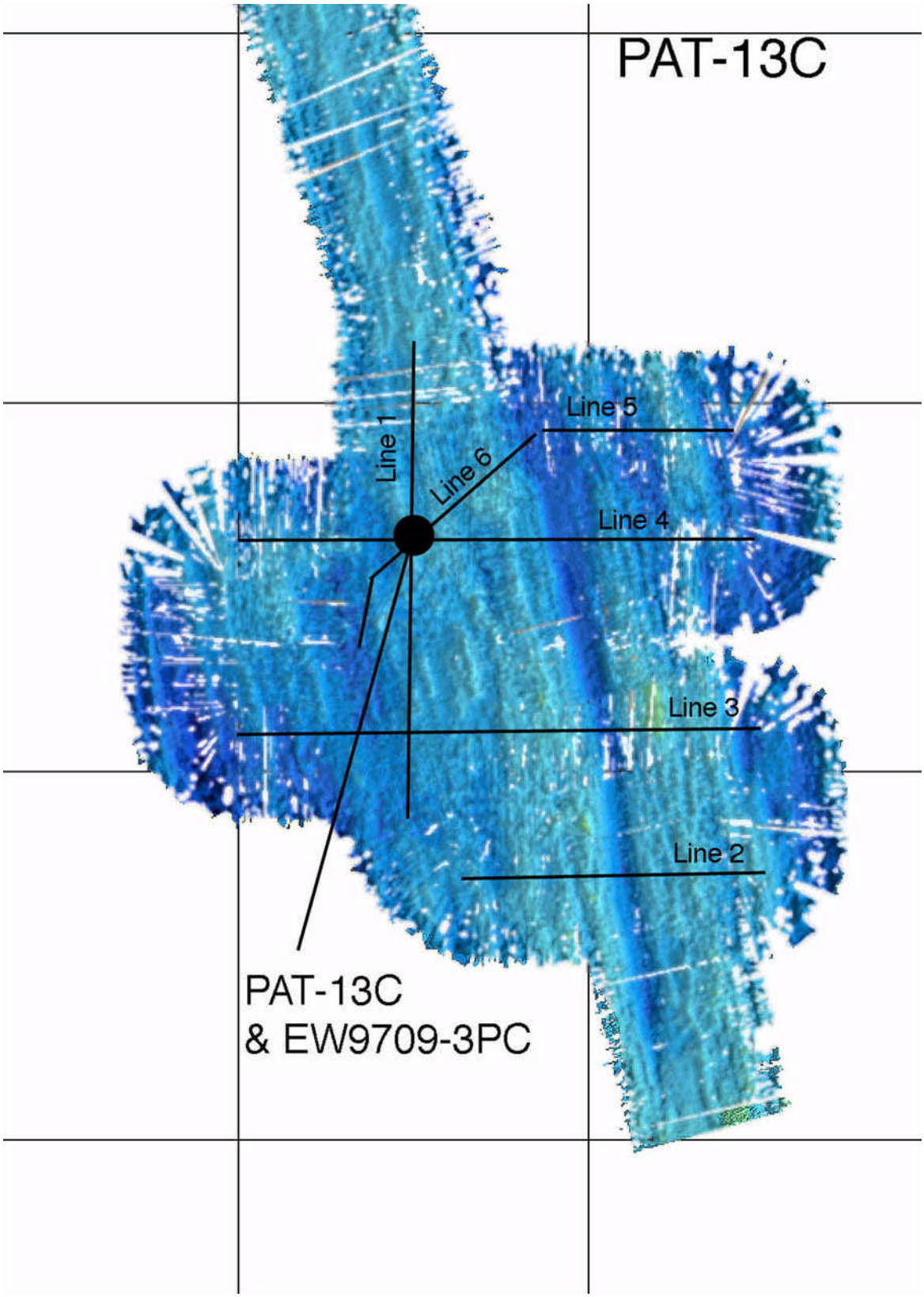


Figure PAT13-3: EW9709 PAT13-seisline4 showing proposed PAT-13C drillsite.

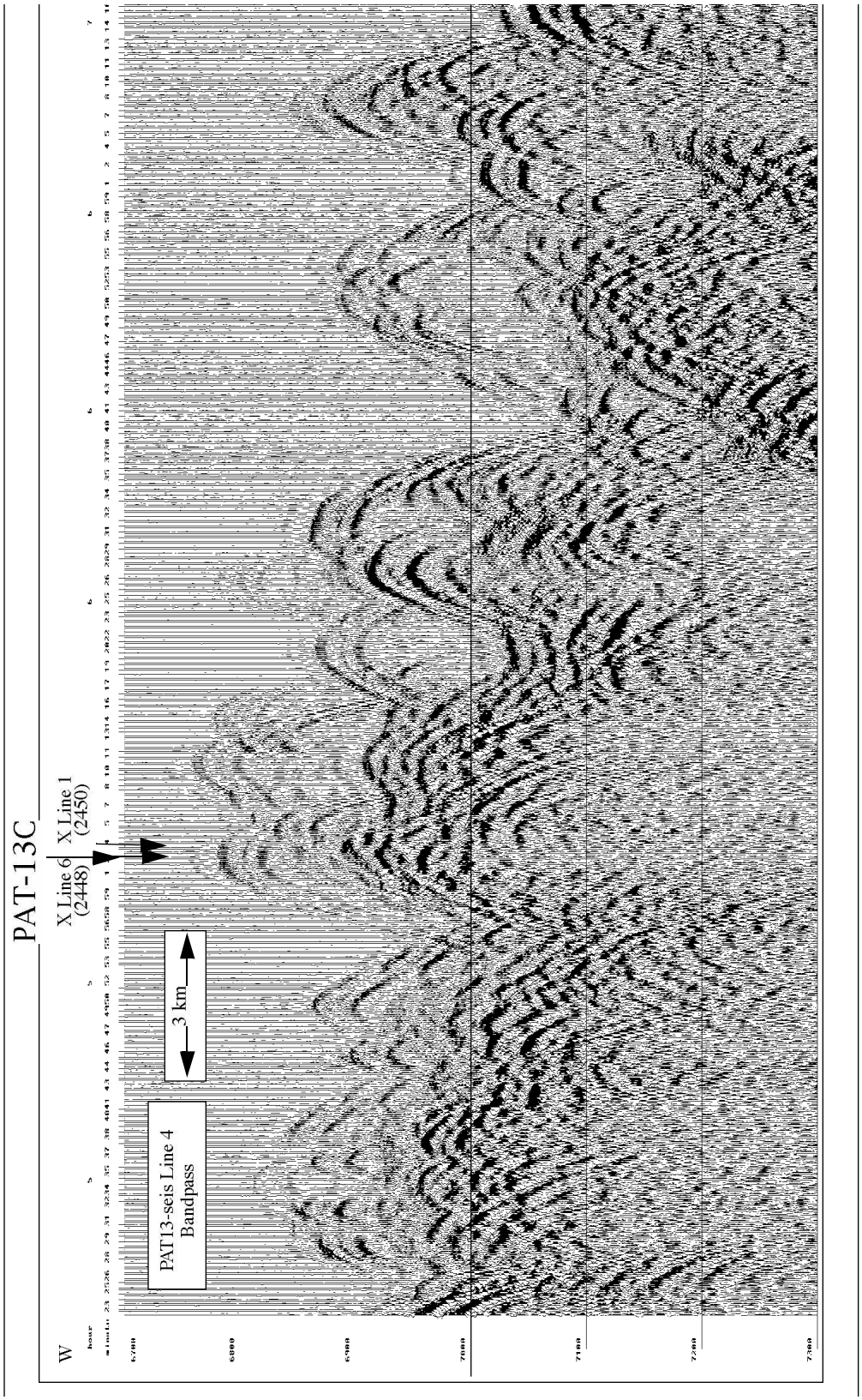
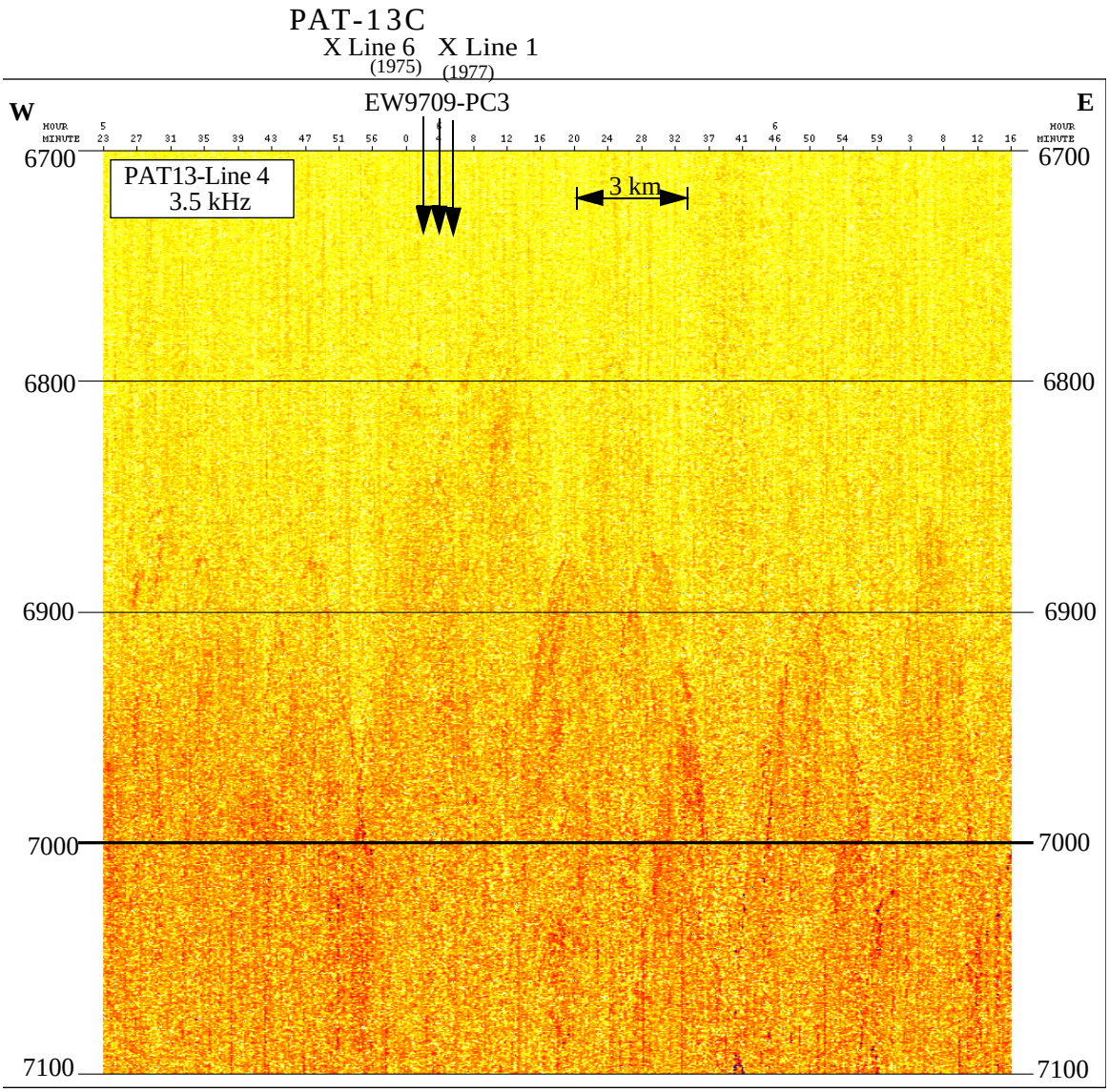


Figure PAT13-4: 3.5 kHz subbottom profile across PAT-13C (line PAT13-35line 4).



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 maximu (56 Ma) Paleogene position of ITCZ, northern boundary of Equatorial Counter Current, general characteristics of equatorial Pacific paleoproductivity
List Previous Drilling in Area:	DSDP Site 40

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-13C (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)	Area or Location:	Central Pacific Ocean
Latitude:	Deg: 19 Min: 46.024N	Jurisdiction:	none
Longitude:	Deg: 138 Min: 55.056W	Distance to Land:	>1000 km
Priority of Site:	Primary: 1 Alt:	Water Depth:	5083 m (6.777 sec)

Section C: Operational Information

	Sediments.What is the total sed. thickness? 150 m	Basement
Proposed Penetration (m)	150 meters	4.5 meters
General Lithologies:	zeolitic red clay overlying radiolarian ooze	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:	Logging:	Total On-Site:
	3.3 days	0	3.3 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-13C	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 PAT13-seisline 6 sp 3687 Crossing Lines(s): EW9709 PAT13-seisline 4 (sp 2450)
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-13 survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709 PAT-13 xline 4 (ping 1976), xline 6 (ping 2852)
7	Swath bathymetry	Y		EW9709 PAT-13 survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709 PAT-13 survey
11b	Gravity			
12	Sediment cores	X		EW9709-3PC
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709 PAT-13 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-13C	Date Form Submitted: 15 March 1998
Water Depth (m): 5083	Sed. Penetration (m): 150	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 No logging planned

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-13C	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
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-13C	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
0-4 m		Eocene? to Recent	1.56	zeolitic red clay	central gyre	0.1 m/myr	
4-150 m		Paleocene to Eocene. ?	1.56	radiolarian ooze,with variable carbonates toward base	edge of paleoequa-torial high produc-tivity zone	15 m/myr	

April 1998 Submission
*****REVISED AFTER EW9709*****

SITE PAT-14B (Central Tropical Pacific, S. of Molokai FZ)

22° 55.163’ °N, 140° 00.997’ W

SITE OBJECTIVES

PAT-14B will be drilled as part of the Phase 1 (56 Ma) transect. It 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 the North Equatorial Current and sedimentation in the middle and late Eocene as well, although the probable-lack of carbonate above the lower Eocene will preclude high resolution paleoceanographic studies. At 56 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 10° N, 109° W. At 40 Ma, the site was located at about 13° N, 113° W.

GENERAL DESCRIPTION

PAT-14B is situated on a small abyssal rise just south of the Molokai Fracture Zone (Figure PAT14-1). Based on magnetic lineations, basement age at PAT-14B should be in the early part of anomaly An26R, or about 60 Ma (Cande et al., 1989; timescale of Cande and Kent, 1995) .

EW9709 Survey

PAT-14B 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-14B is located on a small rise just north of a parasitic transform fault associated with the Molokai Fracture Zone (Figure PAT14-2). The block on which PAT-14B has been uplifted slightly, but it still exhibits strong abyssal hill topography. The relief is sufficient to typically give strong side echos in both the 3.5 kHz and the seismic reflection data. It was still possible to ascertain that sediment cover over most of the area is consistently about 150-200 msec thick (~80-120 m of sediment). The sediment column is marked by a strong reflector at 30-40 msec which typically stopped further 3.5 kHz signal penetration. We presume that the 30 msec reflector marks a transition between red clays and an older more lithified sediment section, perhaps with carbonates.

LITHOLOGIC DESCRIPTION

Nearest Sediment Core: W9709-2PC 22° 55.541’ °N 140° 00.595’ W 4883 m water depth(uncorr.). 1560 cm of sediment.

The sediment recovered in the piston core EW9709-2PC is all red clay, rapidly changing from a light brown in the upper sediment column to a dark chocolate brown typical of metalliferous sediments. The lowermost sediments are relatively dry with a hackly fracture.

The sediment is a fine-grained clay with fish teeth but few other fossils. There are relatively large amounts of zeolites throughout. Coarse fractions are typically dominated by zeolites.

SEISMIC INTERPRETATION

Primary Site (PAT-14B): Cross of PAT14-seisline1 and PAT14-seisline5, SP 4162 JD354 17:09:04 gmt

Priority: 1
Age of Crust: 60 Ma
Location: 22° 55.163' N 140° 00.997' W
Site water depth: 4859 m (6.478 sec TWTT)
Sediment thickness: 0.180 sec (140 m)
Proposed Drilling Depth: 145 m

PAT-14B is located at the cross of seismic lines 1 and 5, and was chosen over a more coherent section to the north because the basement reflector was weaker (Figure PAT14-3. Our primary concern is to find sites away from cherts. The most distinctive seismic feature at PAT-14, besides basement, is a reflector at 30-40 msec below the sea floor which prevented further penetration of the 3.5 kHz signal (Figure PAT14-4). A middle section of sediments is faintly layered, followed by a strongly reflective basal 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-14B and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT14-seisline1
EW9709 PAT14-seisline2
EW9709 PAT14-seisline3
EW9709 PAT14-seisline4
EW9709 PAT14-seisline5

3.5 Khz data:

EW9709 PAT14-35line1
EW9709 PAT14-35line2
EW9709 PAT14-35line3
EW9709 PAT14-35line4
EW9709 PAT14-35line5

FIGURES

Fig PAT14-1: Location map for PAT-14B, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT14-2: Swath bathymetric map for PAT-14B, showing topographic relief around the proposed drillsite.

Fig PAT14-3: 4-channel seismic reflection profile through the proposed PAT-14B drillsite.

Fig PAT14-4: 3.5 kHz subbottom profile across the PAT-14B14B drillsite. Proposed drill site is marked. The site is marked by an acoustically transparent upper sediment layer 30-40 msec thick.

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 PAT14-1 Regional bathymetric map with PAT sites.

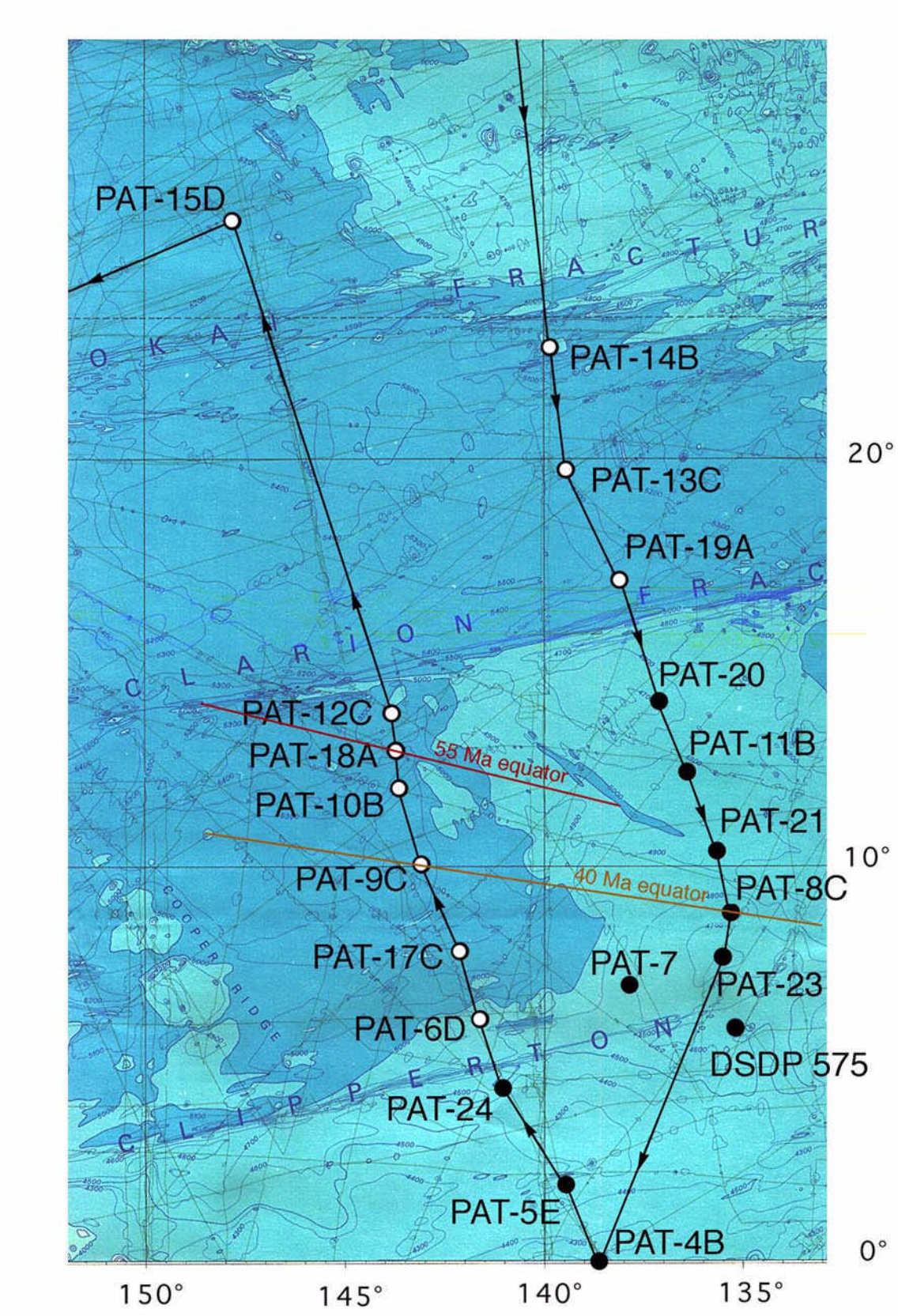


Figure PAT14-2: Swath Bathymetric map for PAT-14B showing bathymetry around the proposed drillsite

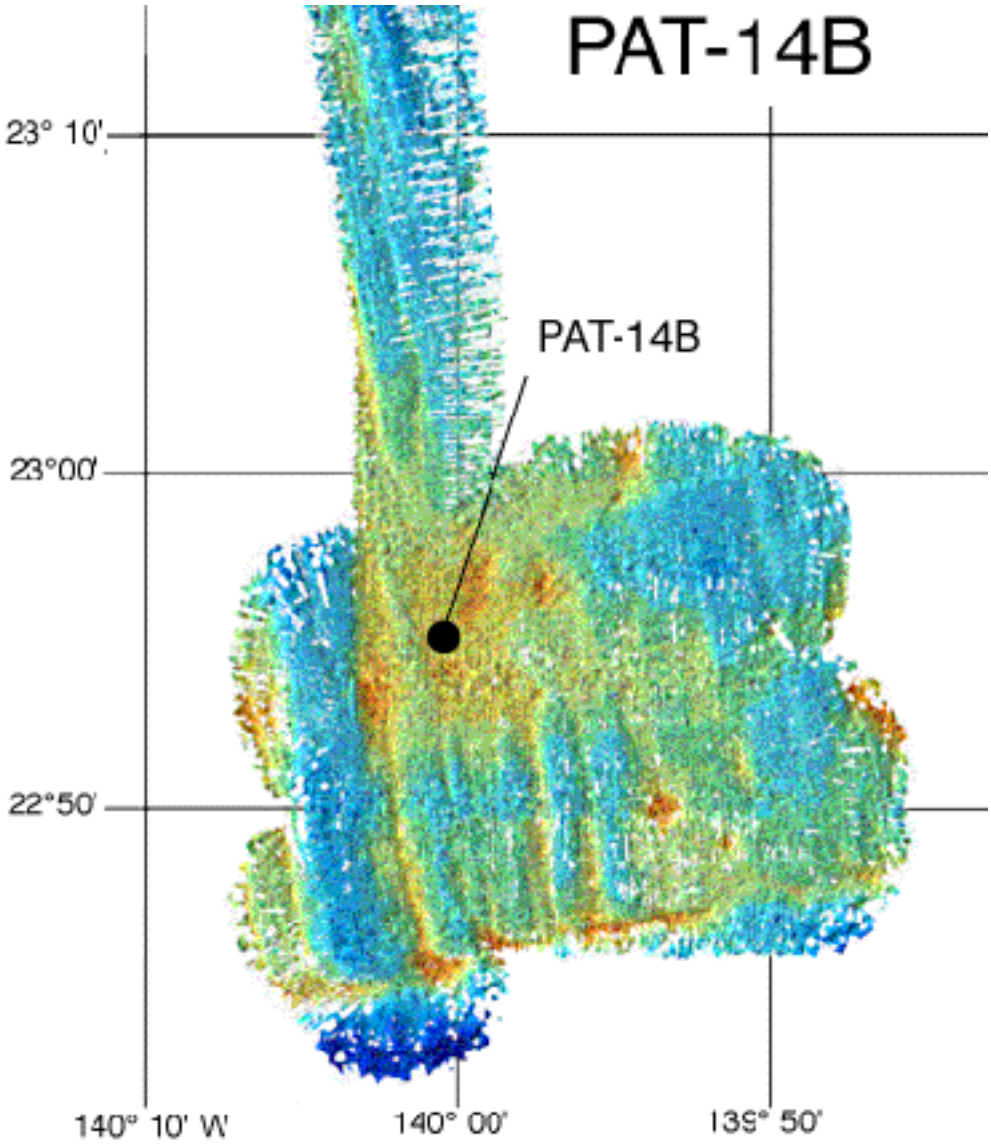


Figure PAT14-3: 4-channel seismic profile through PAT-14B (Seisline 5)

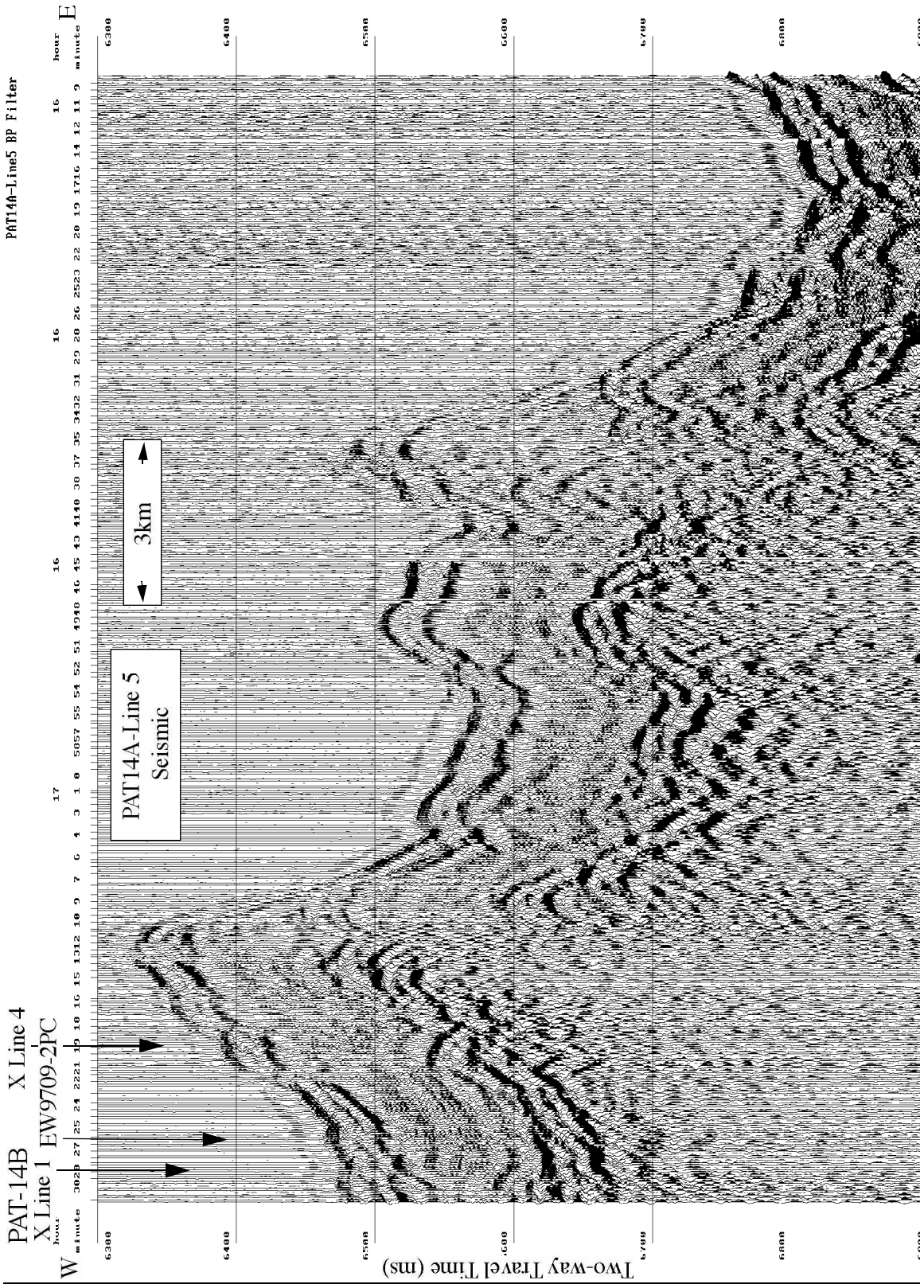
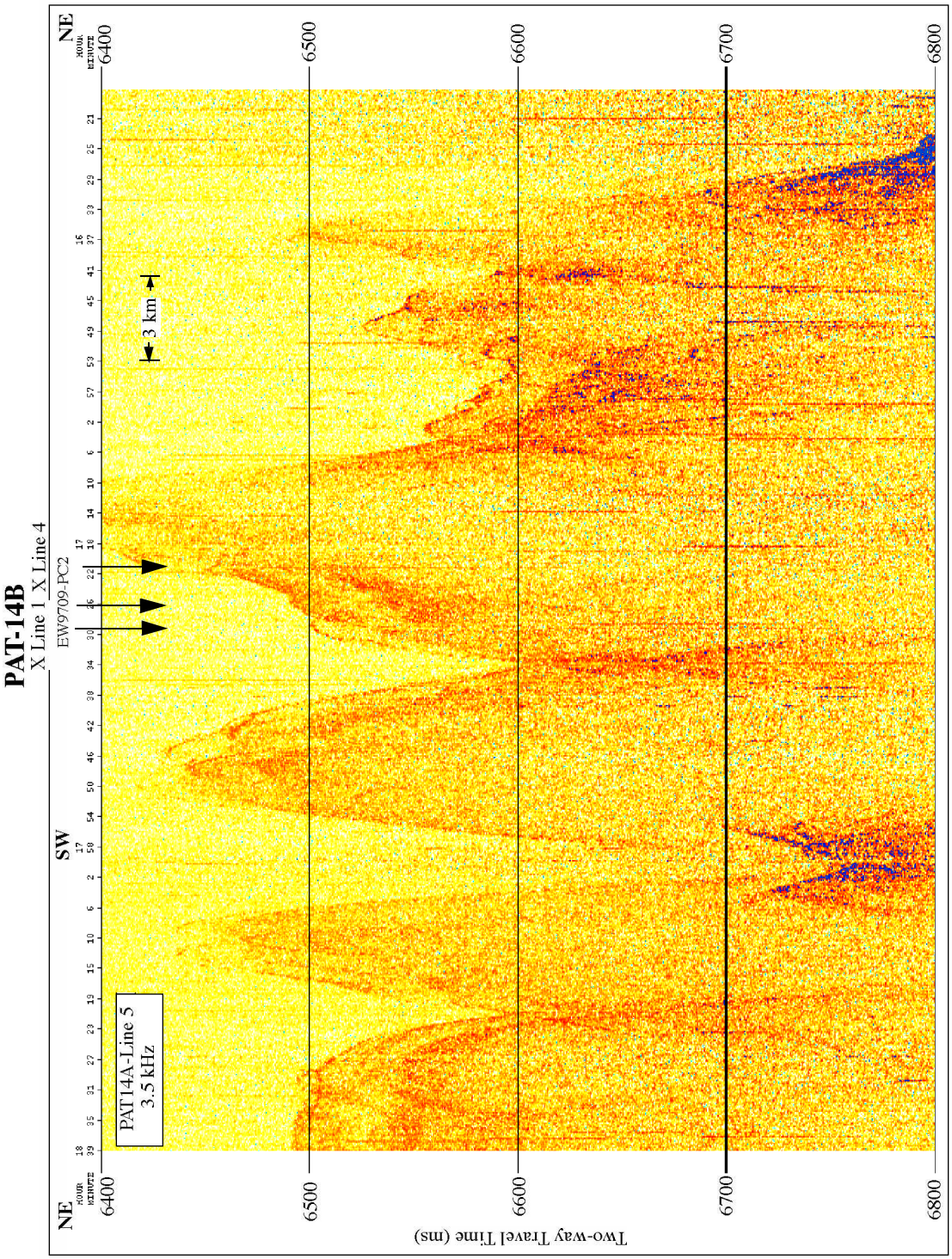


Figure PAT14-4: 3.5 kHz subbottom profile through PAT-14B



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 of southern boundary of tradewinds, position of ITCZ
List Previous Drilling in Area:	none

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-14B (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)		Area or Location:	Central Pacific Ocean
Latitude:	Deg: 22	Min: 55.163	Jurisdiction:	none
Longitude:	Deg: 140	Min: 00.997	Distance to Land:	>1000 km
Priority of Site:	Primary: 1	Alt:	Water Depth:	4859 m (6.478 sec)

Section C: Operational Information

	Sediments. What is the total sed. thickness? 140	Basement
Proposed Penetration (m)	140 m	4.5 m
General Lithologies:	red clays, possibly with basal 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:	Logging:	Total On-Site:
	3.2	0	3.2

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-14B	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 PAT14-seisline 5, SP 4162 17:09:04 gmt JD154 Crossing Lines(s): EW9709 PAT14-seisline 1, SP 508
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-14 survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709 PAT14-35line 1 ping 387
7	Swath bathymetry	Y		EW9709 PAT-14 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		EW9709-2PC
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709 PAT-14 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-14B	Date Form Submitted: 15 March 1998
Water Depth (m):4894 m	Sed. Penetration (m):152	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 No logging planned

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-14B	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, MDCB 4.5 m into 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 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-14B	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
0-26 m		Eocene? to Recent	1.52	zeolitic red clay	central gyre	1 m/myr	
26-140 m		Paleocene-Eocene?	1.56	radiolarian clay, radiolarian ooze, and carbonates	edge of equatorial high productivity zone	12 m/myr	

April 1998 Submission
REVISED AFTER EW9709

SITE PAT-15D (Central Pacific Ocean, N. of Molokai FZ)

26° 01.682'N, 147° 55.995'W

SITE OBJECTIVES

PAT-15D will be drilled as part of the Phase 1 (56 Ma) transect. It 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 Equatorial Current and North Pacific subtropical gyre processes, although the lack of carbonate above the lower Eocene will preclude high resolution paleoceanographic studies. At 56 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 about 11° N, 117° W. At 40 Ma, the site was located at about 16° N, 121° W.

GENERAL DESCRIPTION

PAT-15D is situated north of the Molokai Fracture Zone in subtropical N. Pacific gyre (Figure PAT15-1). It is located in abyssal hill topography in an area of thin but continuous sediment cover. Based on magnetic lineations, basement age at PAT-15D should be in the youngest part of anomaly An26R, or about 58 Ma (Cande et al., 1989; timescale of Cande and Kent, 1995) .

EW9709 SURVEY

PAT-15D was surveyed on 14 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 (Figure PAT15-2). The site was also gravity cored . PAT-15D is located in abyssal hills striking toward the NNW. The site is everywhere covered with sediments, about 100-150 msec TWTT thick(80-120 m).

LITHOLOGIC DESCRIPTION

Nearest sediment core: EW9709 22GC 26° 03.845'N 148° 00.213'W 5316 m 280 cm sediment recovered.

Core 22 GC is a brown clay containing few zeolite crystals, abundant fish debris and no other fossils.

Nearest drillsite: 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 early Eocene cherts at 156 mbsf. 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-15D): EW9709 PAT15 seisline 4 JD014 15:29:09 gmt, shot 2534

Priority: 1
Crustal Age: 58 Ma
Location: 26° 01.682' N 147° 55.995' W
Site water depth: 5359 m (7.145 sec TWTT)
Sediment thickness: 0.158 sec TWTT (123 m)
Proposed Drilling Depth: 128 m

PAT15D was chosen on seismic line 4 because the section is well-resolved here, the basement is well-defined, yet the reflections of the units above basement seem slightly weaker. The site is on one of the abyssal hills and covered with well-layered sediments 158 msec thick. The section we propose to drill is typical of the entire survey region.

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 have been used to pick the location of PAT-12C and are being submitted in this package:

Seismic Lines submitted:

EW9709 PAT15 seisline 1
EW9709 PAT15 seisline 2
EW9709 PAT15 seisline 3
EW9709 PAT15 seisline 4
EW9709 PAT15 seisline 5
EW9709 PAT15 seisline 6
EW9709 PAT15 seisline 7

3.5 kHz data:

EW9709 PAT15 35line 1
EW9709 PAT15 35line 2
EW9709 PAT15 35line 3
EW9709 PAT15 35line 4
EW9709 PAT15 35line 5
EW9709 PAT15 35line 6
EW9709 PAT15 35line 7

FIGURES

Fig PAT15-1: Location map for PAT-15D, on GEBCO bathymetry. Proposed drill site is marked.

Fig PAT15-2: Swathmap bathymetry for the PAT-15D region, from the EW9709 site survey. Proposed drill site is marked.

Fig PAT15-3: Seismic profile PAT15-seisline 4 across PAT-15D, from EW9709. Proposed drill site is marked.

Fig PAT15-4: 3.5 kHz subbottom profile PAT15-35line 4 across PAT-15D, 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.

Fig PAT15-1. Location of PAT-15D with EW9709 trackline

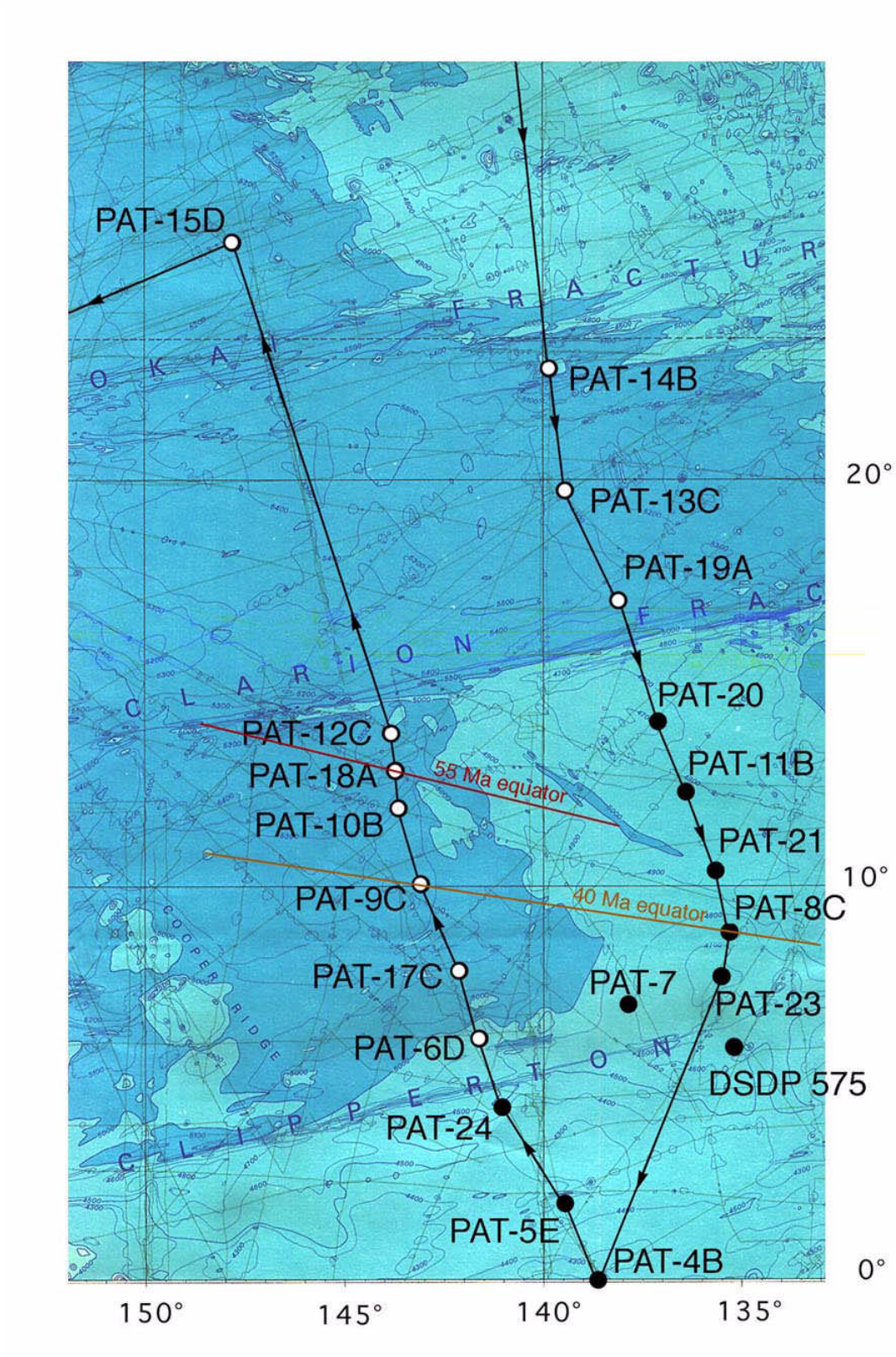


Fig PAT15-2. Swathmap Bathymetry for PAT-15D from EW9709

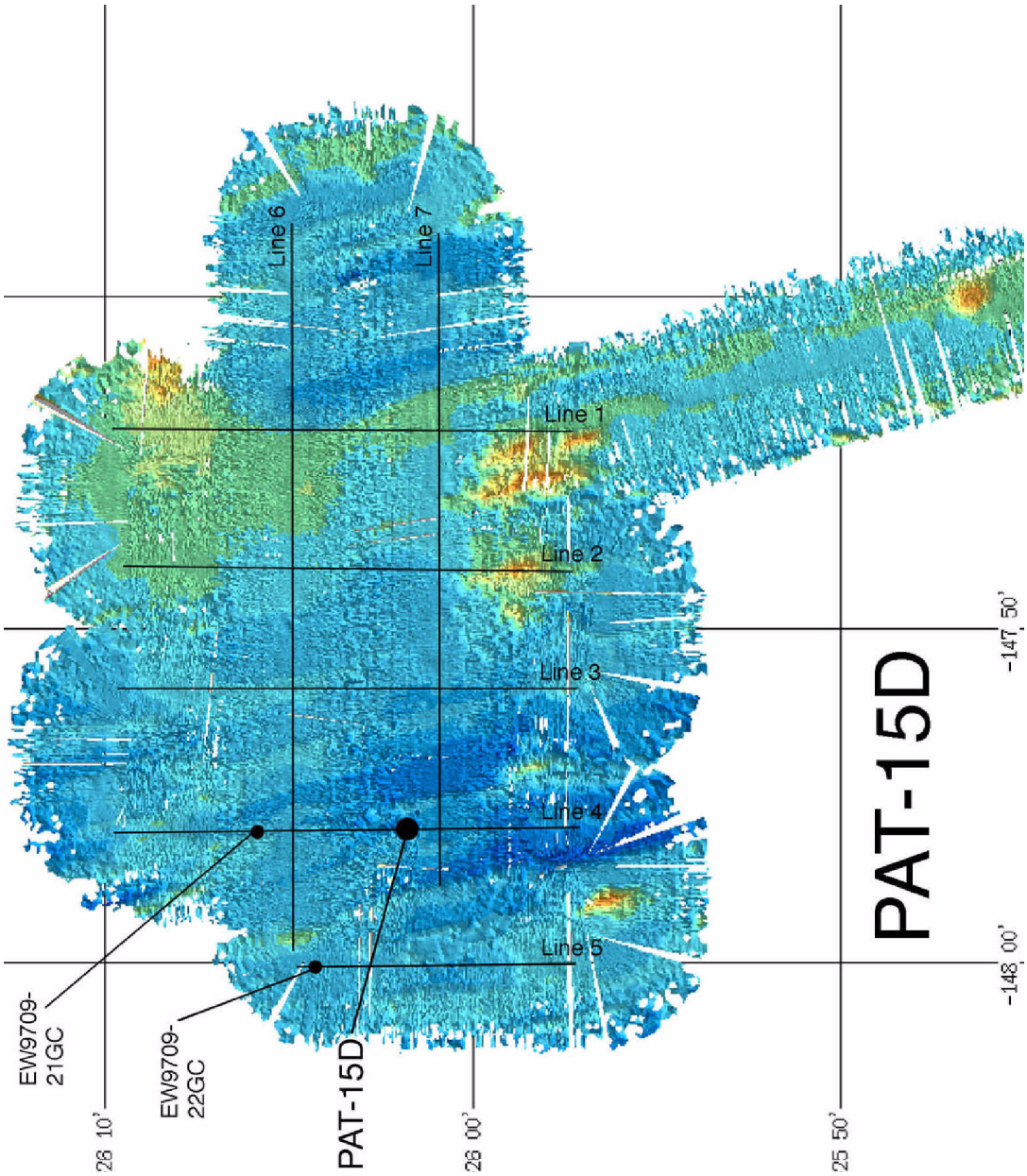


Fig PAT15-3. EW9709 PAT15 seisline 4 showing PAT15-D

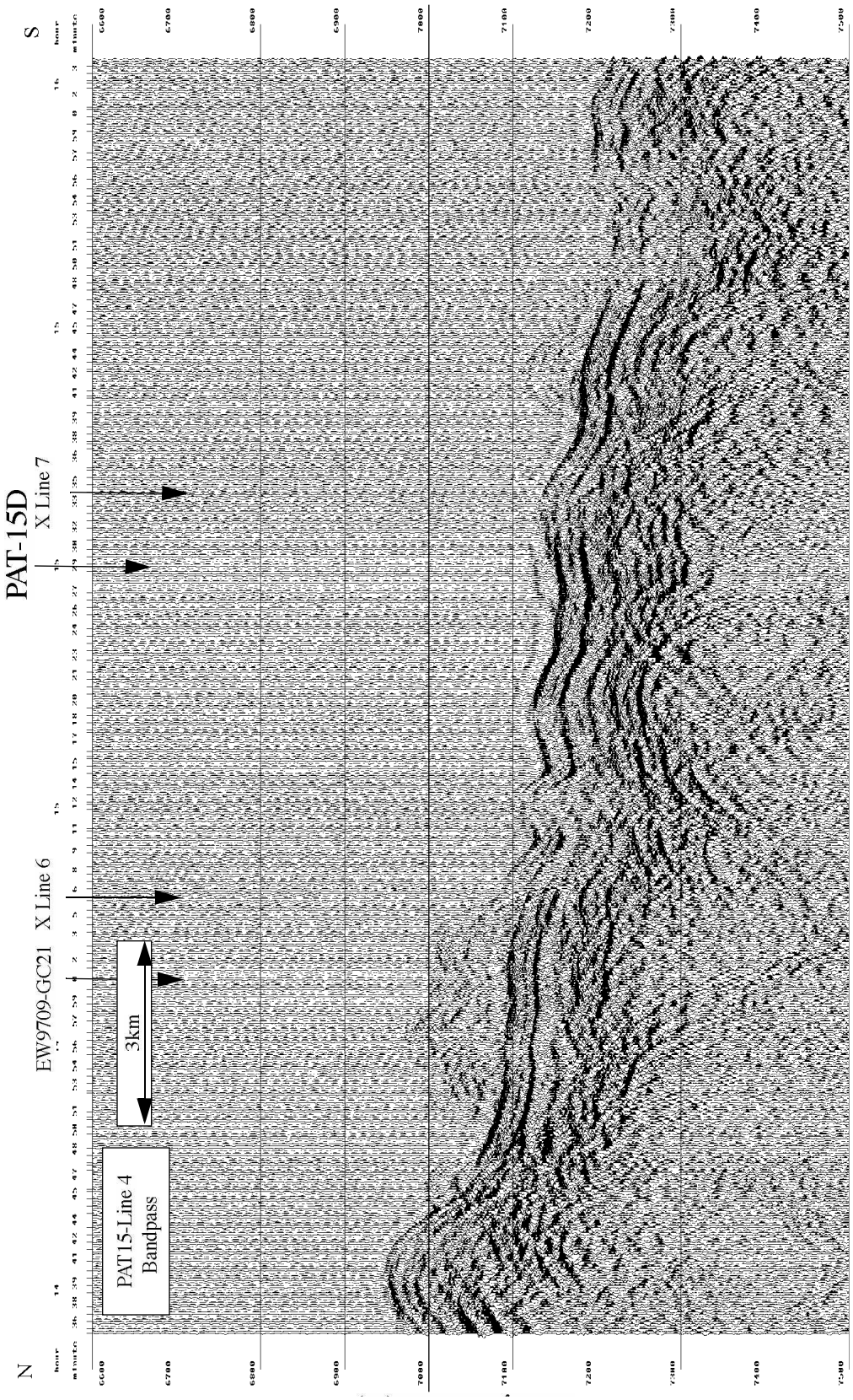
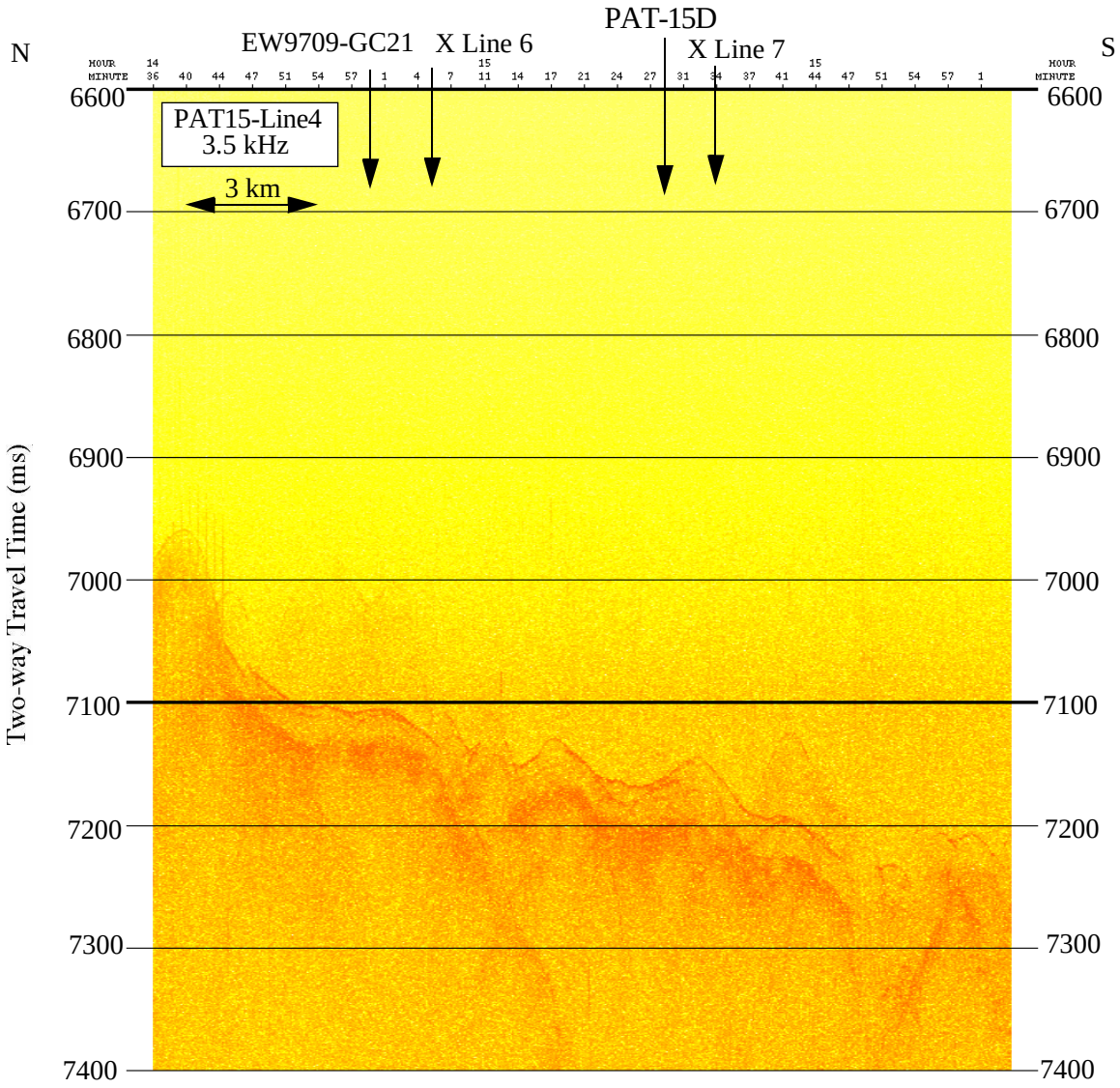


Figure PAT15-4: 3.5 kHz line 4 through PAT-15D, from EW9709



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 Thermal Maximum define equatorial current system (NEC), paleoposition of the ITCZ
List Previous Drilling in Area:	DSDP 40

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)	PAT-15D (If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #)		Area or Location:	Central Pacific Ocean
Latitude:	Deg: 26	Min:1.682N	Jurisdiction:	none
Longitude:	Deg: 147	Min: 55.995W	Distance to Land:	>1000 km
Priority of Site:	Primary: 1	Alt:	Water Depth:	5359 m (7.145 sec)

Section C: Operational Information

	Sediments.What is the total sed. thickness? 123 m		Basement	
Proposed Penetration (m)	123 meters		4.5 meters	
General Lithologies:	red clay, radiolarian ooze		MORB	
Coring Plan (circle):	1-2-3-APC VPC* XCB MDCB* PCS RCB Re-entry HRGB ** Systems Currently Under Development*			
Logging Plan: No logging planned	Standard Tools Triple-Combo: Neutron-Porosity, Litho-Density, Natural Gamma Ray, Resistivity-Induction	FMS-Sonic: Acoustic, FMS	Special Tools Borehole Televiewer, Geochemical, Resistivity-Laterolog, High Temperature, Magnetic/Susceptibility	LWD Density-Neutron, Resitivity-Gamma Ray
Estimated days:	Drilling/Coring: 2.8 days	Logging: none	Total On-Site: 2.8 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-15D	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 PAT15, seisline 4, JD014, 15:29:09 gmt (SP2534) Crossing Lines(s): EW9709 PAT15 seisline 7
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-15 survey
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz	X		Location of Site on line (Time) EW9709 PAT-15 survey
7	Swath bathymetry	Y		EW9709 PAT-15 survey
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics	Y		EW9709 PAT-15 survey
11b	Gravity			
12	Sediment cores	X		EW9709 22GC
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation	X		EW9709 PAT-15 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-15D	Date Form Submitted: 15 March 1998
Water Depth (m): 5291	Sed. Penetration (m): 123	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** **no logging**

If "Yes" Please describe requirements: _____

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

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-15D	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
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-15D	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
0-10		Eocene to Recent	1.56	red clay, radiolarian ooze	central gyre	0.5 m/my	
10-123		Eocene to Paleocene	1.56	radiolarian clays and oozes, calcareous toward basement	central gyre and-northern edge of equatorial circlation system	6 m/my	