

Integrated Ocean Drilling Program Expedition 337 Scientific Prospectus Addendum

Deep Coalbed Biosphere off Shimokita

Microbial processes and hydrocarbon system associated with deeply buried coalbed in the ocean

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This IODP *Scientific Prospectus* is based on precruise Science Advisory Structure panel discussions and scientific input from the designated Co-Chief Scientists on behalf of the drilling proponents. During the course of the cruise, actual site operations may indicate to the Co-Chief Scientists, the Expedition Project Manager, and the Operations Superintendent that it would be scientifically or operationally advantageous to amend the plan detailed in this prospectus. It should be understood that any proposed changes to the science deliverables outlined in the plan presented here are contingent upon the approval of the CDEX Science Operator Science Manager in consultation with IODP-MI.

Abstract

Integrated Ocean Drilling Program (IODP) Expedition 337, originally scheduled for 15 March–21 May 2011, was postponed because of the earthquake in Japan on 11 March 2011. This addendum to the Expedition 337 *Scientific Prospectus* presents revised schedule and operations information for the rescheduled expedition, which will drill and study the deep coalbed biosphere off the Shimokita Peninsula in the northwestern Pacific using the D/V *Chikyu*. This expedition aims to extend the maximum penetration of scientific ocean drilling to over 2200 meters below seafloor and will explore the microbial ecosystem associated with a deeply buried coalbed (i.e., a habitat that had never been accessed by previous scientific ocean drilling).

Introduction

Marine subsurface hydrocarbon reservoirs and the associated microbial life in continental margin sediments are among the least characterized Earth systems that can be accessed by scientific ocean drilling. Expedition 337 will drill and study the hydrocarbon system associated with a deeply buried coalbed off the Shimokita Peninsula in the northwestern Pacific by coring to 2200 meters below seafloor (mbsf) using the riser drilling system of the *Chikyu*. This project aims explore the microbial ecosystem associated with the deep coalbed in oceanic sediments, a habitat that has not been accessed by previous scientific ocean drilling. Hence, the study area is an ideal natural subsurface laboratory to study the deep carbon cycle and the deep biosphere.

Schedule for Expedition 337

Integrated Ocean Drilling Program (IODP) Expedition 337 is based on drilling Proposal 745-CPP (available at www.iodp.org/700/). At the time of publication of this *Scientific Prospectus*, the expedition is scheduled to depart Hachinohe, Japan, on 11 July 2012 after five days of port call and arrive at Shingu, Japan, on 15 September 2012. A total of 62 days will be available for the drilling, coring, and downhole measurements described in this prospectus (Table T1) (for the current detailed schedule, see www.iodp.org/expeditions/).

Changes to the drilling and coring plan

The Hybrid-Pressure Core Sampler (PCS) will not be used to retrieve methane hydrate-bearing sediments from shallow sedimentary sections under in situ pressure conditions. Planned coring at Site C9001 with the hybrid-PCS will not be conducted, and formation temperatures will not be taken at that site with the Advanced Piston Corer Temperature Tool (APCT-3). A revised operations schedule is shown in Table T2.

Changes to the analytical plan

Paleomagnetic measurements will not be conducted on board the *Chikyu* during Expedition 337. In addition, *P*-wave velocity, gamma density, and X-ray CT scans will not be conducted on high-pressure cores, and in situ chemical composition and concentrations of free hydrocarbon gas will not be conducted using the Pressure Core Analysis and Transfer System (PCATS).

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Table T1. Projected coring depth intervals, Expedition 337.

Hole	Depth (mbsf)		Length (m)	Drilling method	Coring method	Expected sedimentary age and lithologic characteristics
	Start	End				
A	670.0	679.5	9.5	Riser	RCB	Upper Pliocene hemipelagic mud
	820.0	829.5	9.5	Riser	RCB	Middle Pliocene hemipelagic mud
	970.0	979.5	9.5	Riser	RCB	Lower Pliocene hemipelagic mud
	1120.0	1129.5	9.5	Riser	RCB	Pliocene–Miocene unconformity
	1270.0	1279.5	9.5	Riser	RCB	Miocene–Oligocene hemipelagic mud
	1370.0	1379.5	9.5	Riser	RCB	Oligocene hemipelagic mud
	1470.0	1479.5	9.5	Riser	RCB	Oligocene sandstone
	1581.5	1648.0	9.5 (×7)	Riser	RCB	Oligocene sandstone
	1648.0	1675.0	27.0	Riser	LDC	Oligocene–Eocene unconformity
	1770.0	1789.0	9.5 (×2)	Riser	RCB	Eocene lacustrine mud
	1870.0	1889.0	9.5 (×2)	Riser	RCB	Eocene lacustrine mud
	1933.0	1990.0	9.5 (×6)	Riser	RCB	Eocene lignite
	1990.0	2044.0	27.0 (×2)	Riser	LDC	Eocene lignite
	2140.0	2149.5	9.5	Riser	RCB	Eocene lacustrine mud
	2190.5	2200.0	9.5	Riser	RCB	Eocene lacustrine mud

RCB = rotary core barrel, LDC = large diameter coring.

Table T2. Planned operations and schedule, Expedition 337.

Deep Coalbed Biosphere off Shimokita

Water Depth : 1,180m
 Total Depth : 2,200mbsf
 (3,380mMSL)

Re-entry to C9001, which was drilled and suspended in 2006

* 36" Conductor at 55.5mbsf.
 * 20" CSG at 511mbsf.
 * 12-1/4" hole was drilled to 647mbsf below 20" CSG shoe

Lithology			Casing	Coring	Operation	Days	Sub Total	Cummulative																		
(mbsf)	(mMSL)	W.D 1,180m	(Depth : mbsf)				(days)	days																		
1.0																										
Move to Shimokita from Hachinohe																										
0	1,180		36" Plug back CMT 55.5m		1) Preparation for Spud ROV Seafloor Survey, Deploy Transponders, Retrieve the Corrosion cap by ROV (Meanwhile preparation for running BOP & Riser)	3.0																				
500	1,680	Unit F: Quaternary 898 (0.370 mbsf)	20" hole 511m		2) Run BOP & Riser Run BOP & Riser Land & Test BOP	4.0	3.0	3.0																		
		Unit E: Pliocene				1.0	5.0	8.0																		
1,000	2,180	1,110 mbsf	12-1/4" hole 647mbsf		3) Set 13-3/8" CSG M/up & run 17-1/2" DOC ass'y, Displace hole with mud, DOC to 647m (TD), POOH Drill w/center bit & Cut RCB core from 647m to 1220m (4runs/38m core by RCB/535m drill with center bit) W-Log #1 (include Wiper Trip before logging, VSI) Run 17-1/2" Open hole Ass'y, Open hole to 1220m Wiper Trip, Run & Cement 13-3/8" CSG	2.0																				
		Unit D: Miocene - Oligocene	13-3/8" 1220m			3.5																				
1,500	2,680					3.0																				
		Unit C: Eocene				2.0	14.5	22.5	62.0																	
2,000	3,180	1,660 mbsf			4) Set 9-5/8" CSG M/up & run 12-1/4" drilling ass'y, DOC, Run LOT Drill w/center bit, Cut core with RCB from 1220m to 1648m (10runs/95m core by RCB/333m drill with center bit) Cut 8-1/2" core with industrial core system from 1648 to 1675m (27m) Open 10-5/8" hole to 1675m, Drill & cut with RCB from 1675m to 1990m (10runs/95m core by RCB/220m open and drill with center bit) Cut 8-1/2" core with industrial core system from 1990 to 2044m (54m) Open 10-5/8" hole to 1675m, Drill & cut with RCB from 2044m to 2200m (TD) (2runs/19m core by RCB/137m open and drill with center bit) W-Log #2 (include Wiper Trip, VSI) Plug and abandon hole	1.5																				
		Intercalations of lignite 1,930 - 2,100 mbsf				4.0																				
2,500	3,680	TD 2,200mbsf (3,380mMSL)	10-5/8" Open Hole 2200m			3.0																				
		Clay/Claystone Silt/Siltstone Sand/Sandstone Ash/Tuff Lignite/Coal				1.0	25.5	48.0																		
					5) Suspend Hole Retrieve BOP & Riser Set Corrosion Cap, Retrieve Transponders	5.0																				
						1.0	6.0	54.0																		
					7) Contingency	8.0																				
<table border="0"> <tr> <td colspan="4"><u>Contingency Break down</u></td> </tr> <tr> <td>Equipment Downtime</td> <td>4.0</td> <td>8%</td> <td>of operation time</td> </tr> <tr> <td>Wait on Weather</td> <td>4.0</td> <td>8%</td> <td>of operation time</td> </tr> <tr> <td>Total</td> <td>8.0</td> <td>days</td> <td></td> </tr> </table>						<u>Contingency Break down</u>				Equipment Downtime	4.0	8%	of operation time	Wait on Weather	4.0	8%	of operation time	Total	8.0	days						
<u>Contingency Break down</u>																										
Equipment Downtime	4.0	8%	of operation time																							
Wait on Weather	4.0	8%	of operation time																							
Total	8.0	days																								
Transit from Shimokita site to Shingu									4.0																	
Total days								67.0																		

CSG = casing, ROV = remotely operated vehicle, BOP = blowout preventer, DOC = drill out cement, TD = total depth, POOH = pull out of hole. RCB = rotary core barrel, BHA = bottom-hole assembly. VSP = vertical seismic profile, LOT = leak-off test.

Site summary

Site C9001

Priority:	Primary
Position:	41°10.5983'N, 142°12.0328'E
Water depth (m):	1180
Target drilling depth (mbsf):	2200
Approved maximum penetration (mbsf):	2500
Survey coverage (track map; seismic profile):	Primary lines: ODSRW03H-81~87 Crossing lines: ODSRW03H-B1~B7
Objective:	Exploration of coalbed-hydrocarbon system and deep biosphere
Drilling program:	Riser: 647–2200 mbsf
Logging program:	<ol style="list-style-type: none"> 1. High-Resolution Laterolog Array (HRLA) 2. Platform Express (PEX) and Hostile Environment Natural Gamma Ray Sonde (HNGS) 3. Fullbore Formation MicroImager (FMI) and Dipole Sonic Imager (DSI) 4. Versatile Seismic Imager (VSI) for check shot 5. Combinable Magnetic Resonance (CMR) tool 6. Modular Formation Dynamics Tester (MDT) using Quicksilver Probe and InSitu Fluid Analyzer (IFA) 7. Mechanical Sidewall Coring Tool (MSCT) 650–1220 mbsf: Numbers 1–4 1220–2200 mbsf: Numbers 1–7
Nature of rock anticipated:	Hemipelagic silty clay, conglomerate, lacustrine sandstone, mudstone, and lignite coal

Expedition scientists and scientific participants

The current list of participants for Expedition 337 can be found at www.jamstec.go.jp/chikyuu/eng/Expedition/index.html.