

Integrated Ocean Drilling Program Expedition 346 Scientific Prospectus Addendum

Asian Monsoon

Onset and evolution of millennial-scale variability of the Asian monsoon and its possible relation with Himalaya and Tibetan Plateau uplift

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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 Staff Scientist/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 IODP-USIO Science Services, TAMU, Director in consultation with IODP-MI.

Introduction

Following review of the proposed drill sites for Expedition 346 during the 14th meeting of the Integrated Ocean Drilling Program (IODP) Environmental Protection and Safety Panel (EPSP) (8–9 April 2013), several adjustments to site locations and penetration depths were recommended and approved by the EPSP. A summary of these changes is as follows:

- Penetration depths of proposed Sites YB-1, YB-2, YB-3, Y-1, JB-1, JB-3, UB-1, and ECS-1B were extended by 50 m to ensure recovery of the targeted age sections.
- Alternate proposed Site ECS-1A was not approved. EPSP recommended moving this alternate site to a new location, in particular at the crossing point of seismic KY07-04 Lines 1 and 7.
- Proponents provided a new alternate proposed site, Site ECS-1C, at the location recommended by EPSP.
- Alternate proposed Site ECS-1C was approved by EPSP as proposed.

The present addendum provides new site summary sheets for alternate proposed Site ECS-1C, including location and seismic figures, and a revised operations strategy. All other details contained within the Expedition 346 *Scientific Prospectus* published by IODP-Management International in January 2013 remain the same (Tada et al., 2013).

Operations plan/Drilling strategy

Expedition 346 aims to achieve an ambitious coring program that prioritizes eight primary sites and two alternate sites in 316–3435 m water depth (Tables T1, T2). Eight of the sites are in Japanese and Korean territorial waters in the Japan Sea and two are in Japanese waters in the East China Sea (Fig. F1). The final operations plan and number of sites to be cored is contingent upon the R/V *JOIDES Resolution* operations schedule, operational risks (see below), and the outcome of requests for territorial permission to occupy these sites. Of particular relevance is the planned ~13–14 day transit from Valdez, Alaska (USA), prior to beginning coring operations in the Japan Sea. Should ship speed be less than the estimated average of 10.5 kt, the drilling schedule could be significantly impacted.

Coring strategy will consist of advanced piston corer (APC) coring using nonmagnetic core barrels in three holes (A, B, and C) at each site to ~200 meters below seafloor (mbsf) or APC refusal, with the exception of proposed Site JB-1, which has slightly

shallower depth objectives (150 mbsf). As described below and pending further discussions, at this point only cores in Hole A at each site will be oriented.

For planning purposes, the APC refusal depth is estimated at 200 mbsf, although we anticipate that this may be exceeded at some of the more mud rich sites with target depths greater than 200 mbsf. APC refusal is conventionally defined in two ways: (1) a complete stroke (as determined from the standpipe pressure after the shot) is not achieved because the formation is too hard and (2) excess force (>100,000 lb) is required to pull the core barrel out of the formation because the sediment is too cohesive or “sticky.” In cases where a significant stroke can be achieved but excessive force cannot retrieve the barrel, the core barrel can be “drilled over” (i.e., after the inner core barrel is successfully shot into the formation, the bit is advanced to some depth to free the APC barrel). When APC refusal occurs in a hole before the target depth is reached, the extended core barrel (XCB) technique may be used to advance the hole.

The target depth at five of the primary proposed sites (Y-1 [450 mbsf], YB-1 [500 mbsf], YB-2 [400 mbsf], UB-1 [285 mbsf], and ECS-1B [800 mbsf]) is greater than the APC refusal depth. The deeper sections will be advanced by XCB coring on one or two of the holes, time permitting. If the target depth at proposed Site ECS-1B cannot be reached by XCB coring, rotary core barrel coring may be employed, time permitting, to reach 800 mbsf. Rotary coring will allow penetration through a significant portion of the Pliocene and possibly into the upper Miocene at proposed Site Y-1 (see Table T2 for operations details per site). Triple-APC holes will allow us to build a composite stratigraphic section at each site for the upper ~200 mbsf.

According to the current operations plan, Expedition 346 will core ~6820 m of sediment and potentially recover ~6060 m of core. Considering the significant transit time at the beginning of the expedition (~2 weeks), this coring schedule within the remaining 6 weeks of the expedition is indeed ambitious and will require tight operational planning and flexibility. The estimate of the amount of core recovered is based on 100% recovery with the APC system and 65% recovery with the XCB system.

Reference

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Table T1. Primary and alternate proposed sites, Expedition 346.

Site	Latitude	Longitude	Water depth (m)	Penetration depth (mbsf)	Comments
Primary:					
YB-1	35°57.92'N	134°26.06'E	316	550	Shallow water; very gassy (H ₂ S) sediment possible Inside Japan's EEZ; may not be approved Pleistocene sediment
YB-2 (798)	37°02.00'N	134°48.00'E	930	450	Gassy (H ₂ S) sediment possible Pliocene sediment
YR-1	39°29.44'N	134°26.55'E	1917	500	Miocene to Pleistocene sediment
JB-1 (794)	40°11.40'N	138°13.90'E	2811	200	Pliocene sediment
JB-2	41°41.95'N	139°04.98'E	1785	250	Pliocene sediment
JB-3 (795)	43°45.99'N	138°49.99'E	3435	250	Pliocene sediment
UB-1	37°54.16'N	131°32.25'E	1064	335	Gassy (H ₂ S) sediment possible Miocene to Pleistocene sediment
ECS-1B	31°40.64'N	129°02.00'E	746	850	Gassy sediment possible
Alternate:					
YB-3 (797)	38°37.00'N	134°32.00'E	2874	250	Pliocene sediment
ECS-1C*	31°37.04'N	128°59.85'E	735	500	Gassy sediment possible Pliocene sediment

All penetration depths shown have been approved by the Environmental Protection and Safety Panel. Gassy to very gassy sediments may be found at shallower sites (<1500 m water depth). Previously drilled Ocean Drilling Program (ODP) sites numbers are in parentheses. ODP Site 795 is 40 km northeast of proposed Site JB-3. ODP Hole 794A penetrated 351.3 mbsf; Hole 794D penetrated 733.5 mbsf. ODP Hole 797C penetrated 900 mbsf. ODP Hole 798B penetrated 517.9 mbsf. ODP Hole 795B penetrated 762.2 mbsf. EEZ = Exclusive Economic Zone.

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Table T2. Expedition 346 Asian Monsoon (Proposal P605-Full 2) final operations plan summary, optimized for 61 days.

Prospectus Site No.	Location (Latitude Longitude)	Seafloor Depth (mbrf)	Operations Description	Transit (days)	Drilling Coring (days)	Log (days)
Valdez, Alaska			Begin Expedition	5.0	Port Call Days	
Transit ~3413 nmi to JB-3 (old JS-5B) @ 10.5 kts (17 hr/0.7 days of time lost due to time change between Valdez and Site JB-3) ¹				14.3		
JB-3	43° 45.99' N	3446	Hole A - APC to ~200 mbsf w/APCT3 measurements		1.8	
(old JS-5B)	138° 49.99' E		Hole B - APC to ~200 mbsf		1.1	
EPSP 250 mbsf			Hole C - APC/XCB to 200 mbsf		1.4	
ODP 795			Sub-Total Days On-Site: 4.3			
Transit ~125 nmi to JB-2 (old JS-4) @ 10.5 kts				0.5		
JB-2	41° 41.95' N	1796	Hole A - APC to ~200 mbsf w/APCT3 measurements		1.1	
(old JS-4)	139° 4.98' E		Hole B - APC to ~200 mbsf		0.7	
EPSP 250 mbsf			Hole C - APC/XCB to 200 mbsf and Log w/triple combo and FMS-Sonic		1.0	0.6
			Sub-Total Days On-Site: 3.4			
Transit ~98 nmi to JB-1 (old JS-7B) @ 10.5				0.4		
JB-1	41° 11.40' N	2822	Hole A - APC to ~150 mbsf w/APCT3 measurements		1.3	
(old JS-7B)	138° 13.90' E		Hole B - APC to ~150 mbsf		0.7	
EPSP 200 mbsf			Hole C - APC/XCB to 150 mbsf		1.0	
ODP 794			Sub-Total Days On-Site: 3.0			
Transit ~180 nmi to YR-1 (old JS-3B) @ 10.5				0.7		
YR-1	39° 29.44' N	1928	Hole A - APC to ~200 mbsf w/APCT3 measurements		1.3	
(old JS-3B)	134° 26.55' E		Hole B - APC/XCB to ~450 mbsf		2.1	
EPSP 500 mbsf			Hole C - APC/XCB to 450 mbsf, WL log with Triple Combo & FMS-Sonic		2.3	1.0
			Sub-Total Days On-Site: 6.7			
Transit ~148 nmi to YB-2 (old JS-1) @ 10.5				0.6		
YB-2	37° 2.00' N	941	Hole A - APC/XCB to ~200 mbsf w/APCT3 measurements		1.0	
(old JS-1)	134° 48.00' E		Hole B - APC/XCB to ~200 mbsf		0.6	
EPSP 450 mbsf			Hole C - APC/XCB to 400 mbsf		1.6	
ODP 798			Sub-Total Days On-Site: 3.2			
Transit ~66 nmi to YB-1 (old JS-10B) @ 10.5				0.3		
YB-1	35° 57.92' N	327	Hole A - APC to ~200 mbsf w/APCT3 measurements		0.8	
(old JS-10B)	134° 26.06' E		Hole B - APC to ~200 mbsf		0.4	
EPSP 550 mbsf			Hole C - APC/XCB to 500 mbsf, WL log with Triple Combo & FMS-Sonic		1.6	1.0
			Sub-Total Days On-Site: 3.8			
Transit ~181 nmi to UB-1 (old JS-11C) @ 10.5				0.7		
UB-1	37° 54.16' N	1075	Hole A - APC to ~200 mbsf w/APCT3 measurements		1.0	
(old JS-11C)	131° 32.25' E		Hole B - APC/XCB to ~285 mbsf		1.0	
EPSP 335 mbsf			Hole C - APC/XCB to 285 mbsf, WL log with Triple Combo & FMS-Sonic		1.2	0.7
			Sub-Total Days On-Site: 4.0			
Transit ~397nmi to ECS-1C @ 10.5				1.6		
ECS-1B	31° 40.64' N	757	Hole A - APC to ~200 mbsf w/APCT3 measurements		0.9	
EPSP 850 mbsf	129° 02.00' E		Hole B - APC/XCB to 800 mbsf, WL log with Triple Combo & FMS-Sonic		3.1	1.3
			Hole C - APC/XCB to ~600 mbsf (remaining time dependent)		2.4	
			Sub-Total Days On-Site: 7.8			
Transit ~220 nmi to Busan Pilot Station @ 10.5				0.9		
Busan, South Korea			End Expedition	19.8	31.6	4.6
Port Call Days:		5.0	Sub-Total On-Site Days:		36.2	
Sub-Total Transit Days:		19.8	Total Operating Days:		56.0	
Total Expedition Days:		61.0				

Footnotes: 1-Sea floor depth equals water depth plus ~11.0 m to dual elevator stool at rig floor
2-Valdez, Alaska is GMT-8 and Site JB-3 is GMT +9

EPSP = Environmental Protection and Safety Panel. APC = advanced piston corer, XCB = extended core barrel, APCT3 = advanced piston corer temperature tool, triple combo = triple combination tool string, FMS-sonic = Formation MicroScanner-sonic tool string.

Figure F1. Expedition 346 revised site locations in the Japan and East China Seas.

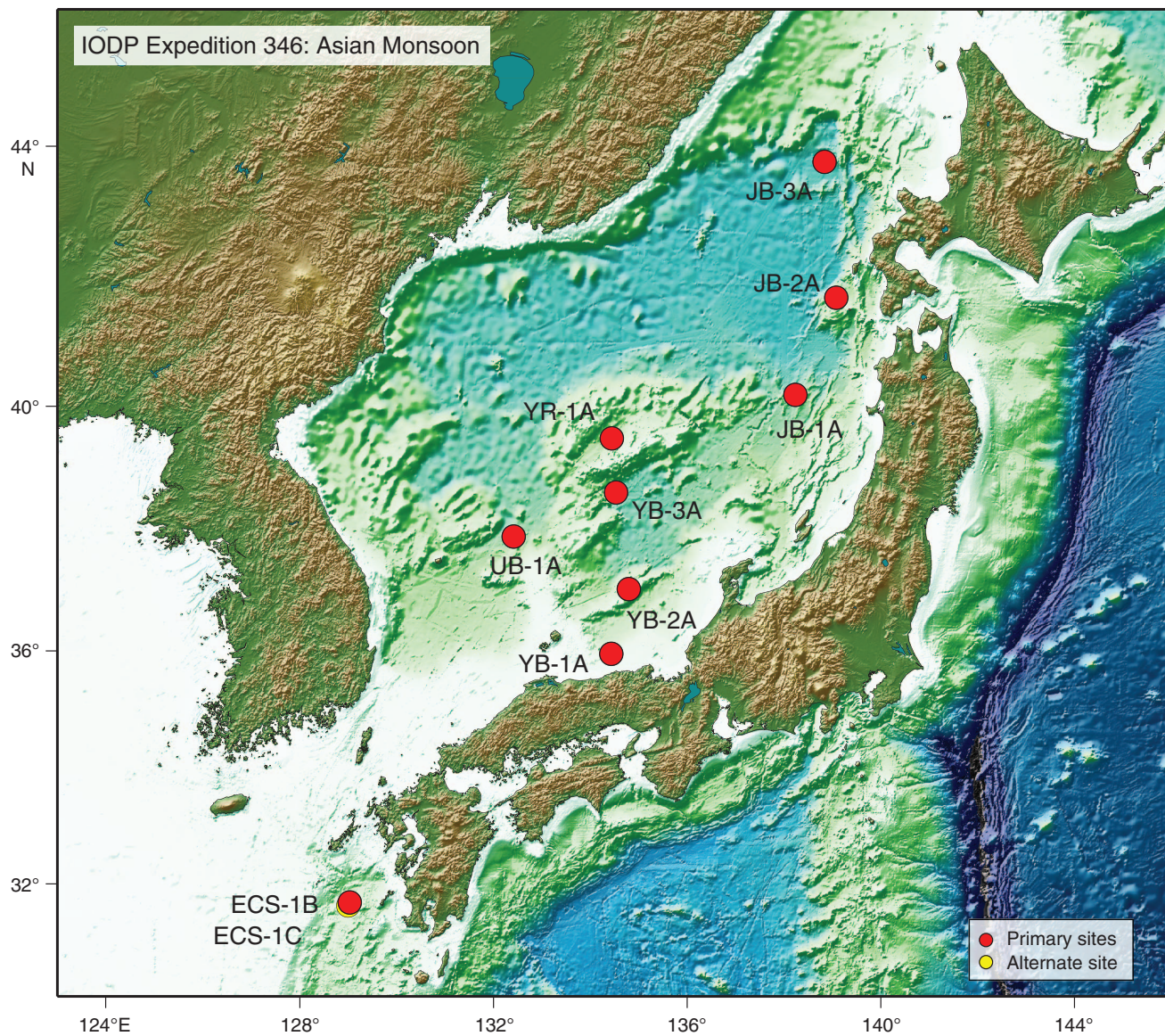


Figure F2. Bathymetric sketch of proposed alternate Site ECS-1C in the East China Sea and KY07-04 Line 1 and KY07-04 Line 7 seismic profiles.

