Integrated Ocean Drilling Program
Expedition 311 Scientific Prospectus Addendum

Cascadia Margin Gas Hydrates

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DISCLAIMER

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 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, Deputy Director of Science Services in consultation with IODP-MI.

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INTRODUCTION

Integrated Ocean Drilling Program (IODP) Expedition 311 was originally scheduled with 22 on site operational days. In May 2005 in response to a significant change on the IODP U.S. Implementing Organization (USIO) riserless vessel schedule, an additional 15 operational days was added to Expedition 311 "Cascadia Margin Gas Hydrates." The purpose of this addendum is to provide an updated operational and scientific plan for the expedition that accounts for the additional days that have been assigned to Expedition 311.

The revised schedule includes a port call in Astoria, Oregon (USA) on 16 September 2005 to embark the scientific party and a port call in Victoria, British Columbia (Canada) at the end of Expedition 311 on 28 October 2005. Expedition 311 is now scheduled to include a total of 37 operational days on site. The original operations plan, as described in the scientific prospectus for Expedition 311 (Collett, Reidel, Malone, and the Expedition 311 Project Team, 2005) included drilling and coring activities at five sites across the Northern Cascadia accretionary prism (table T1 in the original prospectus). The proposed Expedition 311 drill sites included a four-site transect identified by proposed Sites CAS-03B, CAS-02C, CAS-01B, and CAS-05D. The fifth drill site in the plan also included drilling an active cold vent identified as proposed Site CAS-06A.

REVISED OPERATIONS PLAN

As originally planned (table T1 in Collett, Reidel, Malone, and the Expedition 311 Project Team, 2005), this expedition was scheduled to carry out logging-while-drilling (LWD) and measurement-while-drilling (MWD) operations (drilling in Hole A) prior to coring each site (pending Environmental Pollution and Safety Panel approval). After completing the LWD/MWD logging program, the expedition was scheduled to conduct conventional and pressure-controlled coring operations (drilling in Hole B) at each of the sites drilled during the LWD/MWD campaign. The main change in the Expedition 311 science plan to accommodate for the addition of 15 operational days is the inclusion of a third special core and tool deployment hole (drilling in Hole C) at each of the five sites to be drilled during the expedition. Under the new operational plan for Expedition 311 (Table **T1**), Hole A at each site will be dedicated to the LWD/MWD operations, Hole B will be dedicated to "continuous" advanced piston corer/extended core barrel (APC/XCB) coring, with additional temperature measurements using the APC temperature (APCT) and Davis-Villinger Temperature-Pressure Probe (DVTPP) tools as well as monitoring pressure/temperature conditions of each core by deploying the APC methane (APCM) tool. The new Hole C at each site will be a dedicated "special tools hole" with a focus on pressure core deployments, special spot core requirements, and wireline logging and vertical seismic profile (VSP) deployments (Table **T1**).

The drilling schedule for Expedition 311 will be updated during the cruise to accommodate any unforeseen changes in the schedule. However, the new Hole C is mainly dedicated to pressure coring, with a total of six alternating deployments of the pressure coring sampler (PCS), HYACINTH pressure corer (HPC) and Fugro percussion corer (FPC) systems. Previous gas hydrate drilling has often been characterized by incomplete core recovery; thus, the addition of Hole C will allow us to include additional conventional APC/XCB spot coring in the to sample missed or poorly sampled intervals in Hole B. At this stage the total amount of additional coring required to fill gaps in the Hole B coring program is unknown. Based on experience gained during Ocean Drilling Program (ODP) Leg 204 off Oregon, we plan for an additional generic 100 m coring at each site during Expedition 311. Hole C, which is likely to be in better condition than the continuously cored Hole B, will also be wireline logged after coring operations are completed. Within the new operational plan, Hole B will also include limited pressure coring with three deployments of the PCS. These three PCS cores, along with the PCS cores from Hole C will be used for degassing experiments. The ability to use a three-hole rather than a two-hole strategy at each site will allow a more complete and continuous coring strategy and more judicious deployment of pressure coring systems based on knowledge gained in Holes A and B.

A second change to the original operations plan includes revision of the VSP strategy. Originally, a single zero-offset VSP was planned at proposed Site CAS-01B. The geophone spacing will be changed from the original 25 m to a more closely spaced 5 m interval. This will yield higher-resolution seismic data to better image details in the gas hydrate–bearing sedimentary section at proposed Site CAS-01B. Changing the VSP spacing to 5 m will add ~7 h to the original plan. If less time is available, a 10 m geophone spacing may be used, which would add only ~3 h to the project plan. A lower-priority addition to the VSP program is a possible VSP at proposed Site CAS-06A with 5 m geophone spacing. This second VSP at Site CAS-06A will add an additional 13 h to the original operational plan.

The third change to the Expedition 311 operational plan includes the addition of shallow (~18 m deep) dedicated microbiological core holes at proposed Sites CAS-06A and CAS-01B. The addition of two dedicated shallow microbiological core holes will give us an improved understanding of the three-dimensional aspects of microbiological system associated with the active cold vent at proposed Site CAS-06A and a regular background site (proposed Site CAS-01B). Furthermore, we will use Hole C to core the upper ~18 m at each other site (proposed Sites CAS-03B, CAS-02C, and CAS-05D) for dedicated microbiological sampling.

At the time the Expedition 311 *Scientific Prospectus* was published, funding for the third-party HYACINTH pressure coring system (HPC/FPC) and infrared (IR) and computed tomography (CT) core imaging was pending. Supplemental funding from the U.S. Department of Energy for these activities has been approved. A detailed operational plan for the IR core imaging system is being currently developed by Peter Schultheiss (Geotek) and Phil Long (PNNL). The HYACINTH pressure coring and IR core imaging programs will most likely follow our experience from ODP Leg 204 with modifications based on new experiences gained during the JIP cruise in the Gulf of Mexico earlier this year.

REFERENCES

Collett, T.S., Reidel, M., Malone, M.J., and the Expedition 311 Project Team, 2005. Cascadia margin gas hydrates. *IODP Sci. Prosp.,* 311. **doi:10.2204/iodp.sp.311.2005**

Table T1. Expedition 311 revised operations plan.

Proposed site	Location (latitude, longitude)	Seafloor depth (mbrf)	Operations description	Port call (days)	Transit (days)	Drilling/ coring (days)	Wireline logging (days)
Balboa, Panama			Start of Expedition 311	4.0	(In port)		
			Transit ~3800 nmi to Astoria, Oregon @ 10.5 kt		15.1		
Astoria, Oregon (USA)			Science Party boards ship in Astoria	2.0	(In port)		
			Transit ~206 nmi to Site CAS-03B @ 10.5 kt		0.8		
CAS-03B	48°37.058′ N, 127°02.413′ W	1791	Hole A: LWD/MWD to 300 mbsf (BSR @ ~230 mbsf)			1.4	
			DP move ~2.8 nmi to Site CAS-02C @ 1.0 kt		0.0		
CAS-02C	48°38.688′ N, 126°58.993′ W	2241	Hole A: LWD/MWD to 300 mbsf (BSR @ ~230 mbsf)			1.1	
			DP move ~5.7 nmi to Site CAS-01B @ 1.0 kt		0.2		
CAS-01B	48°41.884′ N, 126°51.924′ W	1336	Hole A: LWD/MWD to 380 mbsf (BSR@~215 mbsf)			1.2	
			DP move ~0.8 nmi to Site CAS-06A @ 1.0 kt		0.0		
CAS-06A	48°40.050′ N, 126°51.053′ W	1291	Hole A: LWD/MWD to 300 mbsf (BSR @ ~215 mbsf)			1.0	
			DP move ~9.9 nmi to Site CAS-05D @ 1.0 kt		0.4		
CAS-05D	48°47.367′ N, 126°40.717′ W	981	Hole A: LWD/MWD to 220 mbsf (BSR @ ~130 mbsf)			0.8	
			Hole B: APC/APCT to ~200 mbsf XCB/DVTP, PCS to TD @ 220 mbsf			2.2	
			Hole C: 2 APC cores, drill ahead XCB/half-cores to TD (220 mbsf) Pressure coring: PCS/HPC Logging: triple combo and FMS-sonic			2.5	0.4
			DP move ~9.9 nmi to Site CAS-06A @ 1.0 kt		0.4		
CAS-06A (Active Cold Vent)	48°40.050′ N, 126°51.053′ W	1291	Hole B: APC to ~15 mbsf (2 MBIO cores)			0.3	
			Hole C: APC to ~15 mbsf (2 MBIO cores)			0.1	
			Hole D: APC/APCT to ~200 mbsf XCB/DVTP, PCS to TD (300 mbsf)			2.3	
			Hole E: 2 APC cores, drill ahead XCB/half-cores to TD (300 mbsf) Pressure coring: PCS/HPC Logging: triple combo and FMS-sonic VSP: 5 m spacing (12 h)			2.9	1.0
			DP move ~0.8 nmi to Site CAS-01B @ 1.0 kt		0.1		
CAS-01B (Site 889)	48°41.884′ N, 126°51.924′ W	1336	Hole B: APC to ~15 mbsf (2 MBIO cores)			0.3	
			Hole C: APC to ~15 mbsf (2 MBIO cores)			0.1	
			Hole D: APC/APCT to ~200 mbsf XCB/DVTP, PCS to TD (350 mbsf)			2.6	
			Hole E: 2 APC cores, drill ahead XCB/half-cores to TD (350 mbsf) Pressure coring: PCS/HPC Logging: triple combo and FMS-sonic VSP: 5 m spacing (13 h)			3.1	1.0
			DP move ~5.7 nmi to Site CAS-02C @ 1.0 kt		0.3		

Proposed site	Location (latitude, longitude)	Seafloor depth (mbrf)	Operations description	Port call (days)	Transit (days)	Drilling/ coring (days)	Wireline logging (days)
CAS-02C	48°38.688′ N, 126°58.993′ W	2241	Hole B: APC/APCT to ~200 mbsf XCB/DVTP, PCS to TD (300 mbsf)			2.9	
(First Slope Basin)			Hole C: 2 APC cores, drill ahead XCB/half-cores to TD (300 mbsf) Pressure coring: PCS/HPC Logging: triple combo and FMS-sonic			3.1	0.5
			DP move ~2.8 nmi to Site CAS-03B @ 1.0 kt		0.1		
CAS-03B	48°37.058′ N, 127°02.413′ W	1791	Hole B: APC/APCT to ~200 mbsf XCB/DVTP, PCS to TD (300 mbsf)			2.7	
			Hole C: 2 APC cores, drill ahead XCB/half-cores to TD (300 mbsf) Pressure coring: PCS/HPC Logging: triple combo and FMS-sonic			3.0	0.5
			Transit ~134.0 nmi to Victoria @ 10.5 kt		0.6		
Victoria, B.C., Canada			End of Expedition 311		18.0	33.6	3.4
			Subtotal transit time:		18.0		
			Subtotal on site time:		37.0		
			Total operating days:		55.0		
			Total expedition including 6.0 days of port call(s):		61.0		

Notes: DP = dynamic positioning. LWD = logging while drilling, MWD = measurement while drilling. BSR = bottom-simulating reflector, TD = total depth. APC = advanced piston corer, XCB = extended core barrel. APCT = APC temperature tool, DVTP = Davis-Villinger Temperature Probe. PCS = pressure coring sampler, HPC = HYACINTH pressure corer. Triple combo = triple combination tool string, FMS = Formation MicroScanner. VSP = vertical seismic profile. MBIO = microbiology sample. Seafloor depth is prospectus water depth + 11.0 m adjustment from water line to rig floor (i.e., drillers depth). Astoria is shown as a 2 day port call due to timing of port entry (crossing the Columbia Bar) and possibly increasing loading issues. Each deep cored hole has 16 h contingency to allow for hole instability, H_2S, and hydrate handling slow-downs.