Hawaii Ocean Time-series
HOT-217 General Cruise Plan

Cruise ID: KOK0920
Vessel: R/V *Ka'Imikai-O-Kanaloa*, University of Hawaii
Master of the Vessel: Captain Ross Barnes
Chief Scientist: Fernando Santiago-Mandujano, University of Hawaii
OTG Marine Technicians: Victor Polidoro, Justin Smith

Marine Center phone number: 842-9813
KOK phone number: 842-9818
KOK Cell number: 722-0839

Loading: December 7, 2009.
Departure: December 8, 2009 @ **0800**
Arrival: December 12, 2009 @ 0800

1.0 SCIENTIFIC OBJECTIVES

The objective of the cruise is to maintain a collection of hydrographic and biogeochemical data at the Hawaii Ocean Time-series (HOT) stations. Four stations will be occupied during the cruise, in the following order:

1) Station 1, referred to as Station Kahe, is located at 21º 20.6'N, 158º 16.4'W and will be occupied on the first day of the cruise for about 2 hours.
2) Station 2, referred to as Station ALOHA is defined as a circle with a 6 nautical mile radius centered at 22º 45'N, 158ºW. This is the main HOT station and will be occupied during the 2nd, 3rd, and 4th days of the cruise.
3) Station 52, is the site of WHOTS Mooring, located at 22° 39.989'N, 157° 56.961'W will be occupied on the 4th day of the cruise for about one hour.
4) Station 6, referred to as Station Kaena, is located off Kaena Point at 21° 50.8'N, 158° 21.8'W will be occupied on the 4th day of the cruise for about 2 hours.

1.1 SCIENTIFIC OPERATIONS

Station	Activities
Kahe (sta. 1)	Weight Cast, PRR and Hyperpro cast, CTD cast (1000 m)
ALOHA (sta. 2)	Sediment traps, gas array, net tows, CTD operations, primary productivity measurements, AC9, misc. experiments.
WHOTS mooring station (Sta. 52)	Two CTD casts (yo-yo to 200 m and 200 m cast).
Kaena (sta. 6)	One CTD cast (near-bottom)
Underway/continuous	ADCP, thermosalinograph, fluorometry, meteorology

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
1. Karin Bjorkman	Marine Specialist	UH/BEACH
2. Daniela Bottjer	Post-Doc Scientist	UH/BEACH
3. Susan Curless	Research Associate	UH/BEACH
4. Lance Fujieki	Computer Specialist	UH/BEACH
5. Adriana Harlan	Research Associate	UH/BEACH
6. Binglin Li	Graduate Student	UH/BEACH
7. Dan Sadler	Research Associate	UH/BEACH
8. Brett Updyke	Research Associate	UH/BEACH
9. Donn Viviani	Graduate Student	UH/BEACH
10. Blake Watkins	Marine Engineer	UH/BEACH
11. John Fitzpatrick	Research Associate	UH/PO
12. Paul Lethaby	Research Associate	UH/PO
13. Corinne Pomerleau	Graduate Student	UH/PO
14. Fernando Santiago-Mandujano	Chief Scientist – Res. Assoc.	UH/PO
15. Jefrey Snyder	Marine Technician	UH/PO
16. Sarah Yasui	Undergrad Student Assistant	UH/PO
17. Ken Doggett	Research Associate	UH/CMORE
18. Janice Jones	Technician	UCSB
19. Vic Polidoro	Marine Technician	OTG
20. Justin Smith	Marine Technician	OTG

3.0. SUMMARY SCHEDULE

2 December	Pre-cruise meeting 1030 hrs.
7 December	Ship loading starting at 0900 hrs.
8 December	Depart from Snug harbor at 0800 hrs. Science personnel on-board by 0700.
8 December	Station 1 Kahe Pt. operations.
9-11 December	Station ALOHA operations. Station 52 CTD casts. Station Kaena CTD cast.
12 December	Arrive Snug harbor. ETA 0800 hrs, full offload

4.0. OPERATIONAL PLANS

4.1. Station Kahe (21^{o}20.6'N, 158^{o}16.4'W)

A 300 lb. weight-test cast, one CTD cast to 1000 m, and Hyperpro cast (Sect. 4.2.7) will be conducted at this location in the afternoon of the first cruise day. The CTD winch will be required for these operations. After the operations are satisfactorily completed, the ship shall proceed to Station ALOHA.

4.2. Station ALOHA (22^{o}45'N, 158^{o}W with 6 nm radius)

4.2.1. Upon arrival to Station ALOHA, the sediment traps will be deployed. Afterwards, two 200-m, and one 1000-m casts will be conducted before deploying the Primary Productivity array. These operations will be followed by a near-bottom CTD cast.

4.2.2. Sediment trap deployment

Upon arrival to Station ALOHA, the floating sediment traps will be deployed at a location within Station ALOHA, which will be determined by local current conditions to be determined enroute to ALOHA. The array will be deployed from the stern using the small starboard crane and the Sea-Mac winch. After deployment we request that the Bridge verify that the radio transmitters are functioning and directionally correct.

The array will drift for about 53 hours before recovery. The array is equipped with 2 ARGOS satellite transmitters (platform #s 01833 and 60481), 2 strobe lights, and 2 radio transmitters (channel 72, 156.625 MHz). Daily positions of the array shall be transmitted by email directly to the ship (argosfix@satellite-email.com, password: argosfix), therefore the ship will **not** need to keep within site of the array until the time of the recovery. Assistance from the bridge is requested in plotting the drift track of the array. We request the use of the ship's radio direction finder for locating the array before recovery.

After deployment of the sediment trap array, we will continue with CTD cast operations to prepare water for the Primary Production Array.

4.2.3 Primary production experiment

Samples for the primary productivity experiment will be collected from the rosette (CTD cast 2). Before dawn (sunrise 0701 hrs on December 9), a free drifting incubation array will be deployed from the stern. We request the use of the small starboard crane for this operation and will also use the Sea-Mac winch. The array is equipped with two ARGOS satellite transmitters (platform #'s 03028, 60482, emailing positions to argosfix@satellite-email.com, password: argosfix), strobe lights and a radio transmitter (channel 68, 156.425 MHz). The **ship shall keep within site of the array** while performing CTD operations for the last 6 hours of the approximately 12-hour time the array will be in the water unless the array drifts outside of the ALOHA circle. If the array drifts out of the circle, the ship should return inside the circle to conduct CTD casts, and the monitoring of the array will be coordinated with the watch leaders (Dan Sadler, Paul Lethaby). The array will be recovered just at sunset (1748 hrs). CTD operations shall continue after recovery. All radioactive waste generated by the experiment shall be returned to the University of Hawaii. Only qualified personnel shall handle radioactive material.

4.2.4. Water column measurements

Vertical profiles of temperature, conductivity and dissolved oxygen will be made with an instrument package consisting of a Sea-Bird CTD attached to a 24-place rosette with 12 liter sampling bottles. We need the ship's CTD winch and crane for this operation. Water samples for biogeochemical measurements will also be collected on each cast. The cast after the deployment of the primary productivity array shall be made to the near bottom (approximately 4740 m). Following this cast, a series of 1000-m casts shall be made continuously every 3 hours for a 36-hour period, ending with a second near-bottom cast. It is highly desired that this burst sampling be done without interruption and we request the ship to maintain position within the

study area for that period of time, and repositioning to the center of the Station before each cast whenever possible.

Whenever pumping of the ship's tanks is needed, it must be conducted outside the circle that defines station ALOHA (Sect. 1.0). To avoid disruptions in the schedule, this operation should be coordinated with the chief scientist or the watch leaders (Dan Sadler, Paul Lethaby).

4.2.5. Gas Array deployment

A second free drifting incubation array will be deployed the third day of the cruise at ALOHA station. Samples for the gas array will be collected from CTD cast 10. We request the use of the small starboard crane for the gas array deployment, and will also use the Sea-Mac winch. The array is equipped with two ARGOS satellite transmitters (platform #'s 03028, 60482), emailing positions to argosfix@satellite-email.com, password: argosfix), a strobe light and a radio transmitter (channel 68, 156.425 MHz). The ship will **not** need to keep within sight of the array until the time of the recovery, approximately 24 hours after its deployment. CTD operations shall continue after the recovery.

4.2.6. Zoo net tows

A plankton net will be deployed from the stern and shall be towed for half-hour periods. Half-hour periods are scheduled at around noon and two consecutive half-hour periods at midnight on the second, third, and fourth days (see schedule) with a total of eight available slots to accommodate cancellations due to sea state or other unforeseen problems. The A-frame and capstan will be needed for this operation. B. Watkins will be in charge of these operations.

4.2.7. Hyperpro.

The Hyperpro is a profiling unit with one up-looking and one down-looking hyperspectral radiometer, a WET Labs ECO-BB2F triplet (measuring Chlorophyll-a fluorescence and backscattering in the blue and red wavelengths), temperature and conductivity sensors. This instrument also incorporates a ship mounted surface radiometer. Around noon on each day a Hyperpro will be deployed from the main deck using the small starboard crane. The instrument is hand-lowered and retrieved with assistance from the winch or capstan.

4.2.8. ACS/AC9/FRRf/LISST

An optical package including a Wet Labs AC9 that measures water column spectral absorption and attenuation at nine wavelengths, a Chelsea Fast Repetition Rate Fluorometer (FRRf), a SeaBird Seacat with temperature, conductivity, fluorometer, and pressure sensors, and a LISST particle size and distribution analyzer will be deployed to a target depth of 200 m at a constant speed of 10 m/min during the downcast and upcast. The A-frame and capstan will be needed for this operation. We request to use a line marked at 200 m.

4.4 WHOTS Mooring (Station 52)

One 200-m CTD yo-yo cast will be conducted near the WHOTS mooring the 4th cruise day, before the noontime optical casts operations. The cast should be conducted downwind, downcurrent, and at about 200 m from the mooring. The nominal position of the mooring's anchor is 22° 39.989'N, 157° 56.961'W. After the CTD yo-yo cast is completed, the ship will transit back inside the St. ALOHA circle to complete optical casts. Once those operations are

complete a 200 m CTD cast will be conducted near the WHOTS mooring, after which the ship will transit to Station Kaena.

4.5 Station Kaena (21° 50.8'N, 158° 21.8'W)

A near-bottom CTD cast (~2500 m) will be conducted at this location in the evening of the 4th cruise day, after which the ship shall return to Snug Harbor.

4.6 Acoustic Doppler Current Profiler

The ship's acoustic Doppler current profiler (ADCP) will be in operation during the duration of the cruise. The OTG electronics technician will be in charge of the ADCP system.

4.7 Thermosalinograph and Fluorometer

The ship's thermosalinograph and fluorometer sampling the uncontaminated seawater supply system will be in operation during the duration of the cruise while the ship is outside of Snug harbor. Salinity samples to calibrate the thermosalinograph will be taken from the intake hose at 4-hour intervals throughout the duration of the cruise by the science personnel. The OTG electronics technician will be in charge of the thermosalinograph and fluorometer operations.

5.0 EQUIPMENT

5.1 The HOT science party shall be bringing the following

1. Seabird CTD system, all sensors, deck boxes and computer CTD acquisition systems
2. Rosette and 24 12-l water sampling bottles, all spare parts
3. Two laboratory van with assorted equipment for radioisotope and general use (main deck and O2 deck).
4. Distilled, deionized water and all required chemicals and isotopes
5. Equipment van with assorted equipment (O2 deck)
6. Large vacuum waste container
7. Liquid nitrogen dewer
8. Drifting sediment trap array with strobe lights, satellite and radio transmitters, floats, weights
9. Kevlar line, polypropylene line
10. Sediment traps and crosses
11. Drifting primary production array and gas array with light and radio transmitter, floats, weights, polypro. Line, spare buoy, etc.
12. PRR, Hyperpro, AC-9 and other optical measuring instruments.
13. Oxygen titration system
14. Plankton nets and towing lines
15. Desktop and laptop personal computers
16. Assorted tools
17. All required sampling bottles.
18. Deck incubation system
20. Pertinent MSDS

5.2. We will need the use of the following ship's equipment:

1. A-frame
2. A-frame block assembly
3. CTD winch with conducting wire for CTD
4. Electric power for winches (440 VAC three phase at 10 amps) and vans (208 VAC single phase at 60 amps for labvan, 110 VAC 10 amps for equipment van)
5. Radio direction finder
6. Space on the main deck for one lab van
7. Space on upper deck for one equipment van port side, and one lab van starboard side
8. Space on upper deck for incubator
9. Hand-held VHF transceivers
10. Precision depth recorder
11. Shackles, sheaves, hooks and lines
12. Shipboard Acoustic Doppler Current Profiler
13. Thermosalinograph and Fluorometer
14. Copy machine
15. Grappling hooks and line
16. Navlink2 PC or equivalent in the Rock Lab
17. Running fresh water and seawater, hoses
18. Electronic mail system
19. GPS system
20. Uncontaminated seawater supply
21. Small capstan (~ 10 m/min)
22. Underway/on-station data **acquisition** system for meteorological instruments, ADCP, thermosalinograph, fluorometer
23. 300 lb weight.
24. 24-place rosette, 24 12-l water sampling bottles (to be used as spare)
25. DI water
26. Freezers, refrigerators, and -80
27. Monitor display of GPS position in the Rock Lab

HOT-217 Cast Sheet

Cast		Samples	#Bottles
Kahe Pt.			
s1c1	1000 m	O_2, Temp, DIC/Alk, Nuts, Chl a, LLN, $LLPO_4$, DOC, FCM, Salts	24
Station ALOHA			
s2c1	200 m	CMORE(5@25,5@45,5@75), KD(1@45), BL(6@25)	22
s2c2	1000 m	Primary Production, MB(pb on all depths), Salts	22
s2c3	200 m	DB(18@5)	18
s2c4	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts	24
s2c5	1000 m (PO-2)	O_2, Temp, Nuts, DIC/Alk, DOC, Salts	24
s2c6	1000 m	PC/PN, BL(1@25,1@45), Salts	16
s2c7	1000 m	PPO4, Salts	14
s2c8	1000 m (BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP,DOC, Keeling, Quay, Salts KB(pb@5,45,75,100,150)	23
s2c9	1000 m	PUR, CMORE(5@1000,5@770,5@500), Salts	24
s2c10	1000 m	Gas Array (2@5,25,45,75,100,125), MB(1@175,150,125,100,75,45,25,5), Salts	22
s2c11	1000 m	CMORE(5@125,5@200),DV(2@25), PO(6@1000), Salts	20
s2c12	1000 m	PSi, MC(5,25,45,75,100,125,150,175), Salts	18
s2c13	1000 m	MIT, BC(1@15,40,70), BL(1@75, 125), Salts	15
s2c14	1000 m	ATP, SW(1@200,300,400,500, 600,700,800,900,1000), MC(200,300,500,770), Salts	23
s2c15	1000 m	PE, MC(5,25,45,75,100,125,150,175), SW(pb MC), Salts	22
s2c16	1000 m	HPLC, Chl a, Slides, Salts	22
s2c17	4740 m (PO-3)	Oxygen, MC(1000,2000,3000,4000), DV(1@4800), KD(1@25,1@125), JW(1@4000), Salts	16
WHOTS Mooring			
S52c1	200 m yo-yo	DV(16@25), KD(1@25,125), BC(1@15,40,70)	21
S52c2	200 m	BL[3@(5,25,45,75,100,125,150,175)]	24
Kaena			
S6c1	2400 m	Chl, Salts	13

MC=Matt Church, **SW**=Sam Wilson, **MB=**Mark Brzezinski, **DV**=Donn Viviani, **BU**=Brett Updyke, **BC**=Brandon Carter, **BL**=Binglin Li, **KD**=Ken Doggett, **DB**=Daniela Bottjer, **JW**=Jay Wheeler

SHIP R/V *K-O-K* HOT 217 Date 8-12 December, 2009

TIME	Tue. 12/8	Wed. 12/9	Thu. 12/10	Fri. 12/11	Sat. 12/12
0000		Arrive ALOHA Deploy sed traps			
0100		S2C1	Net Tow		
0200		S2C2 PP	S2C10 Gas		
0300		S2C3		AC9	
0400		Deploy PP array	Deploy Gas Array	Transit Sed Traps	
0500		S2C4 PO-1	S2C11 Open		
0600				Recover traps	
0700				Transit gas array	
0800	Depart Snug		S2C12 PSi	Recover gas array	Arrive Snug offload
0900				Transit Sta. 52	
1000	Arrive Kahe (10:30) Weight cast	Net Tow	Net Tow	S52C1 WHOTS	
1100	Hyperpro	S2C5 PO-2 (Begin 36 hr)	S2C13 MIT		
1200	S1C1		Hyperpro AC9	Hyperpro	
1300	Transit ALOHA	Net Tow	Net Tow	AC9	
1400		S2C6 PC/PN	S2C14 ATP	S52C2	
1500				Transit Sta. Kaena	
1600		S2C7 PPO4			
1700			S2C15 PE		
1800		Recover PP array			
1900					
2000		S2C8 BEACH	S2C16 HPLC		
2100				S6C1	
2200		Net Tow	Net Tow		
2300		S2C9 PUR	S2C17 PO-3 (end 36 hours)	Transit Snug	

December 9: Sunrise 0701 Sunset 1748

6.0 HOT-217 Watch Schedule

0300-1500

Adriana Harlan - *Water Boss*
Dan Sadler**– -** Watch Leader - *Alt Water Boss, Alt Tag*
Lance Fujieki - *Tag*
Jefrey Snyder**–** *Tag*
Fernando Santiago-Mandujano - Chief Scientist, *Console*
Corinne Pomerleau *– Alt Tag*

1500-0300

Susan Curless - *Water Boss – Alt Tag*
Brett Updyke *Alt Water Boss - Tag*
Paul Lethaby - Watch Leader - *Console*
John Fitzpatrick - *Tag*
Sarah Yasui

At Large

Karin Bjorkman
Daniela Bottjer
Ken Doggett
Janice Jones
Binglin Li
Donn Viviani
Blake Watkins

OTG

Vic Polidoro – *Deck Boss*
Justin Smith – *Deck Boss*