Hawaii Ocean Time-series
HOT-185 General Cruise Plan

Cruise ID: KOK 0608
Vessel: R/V *Ka'imikai-O-Kanaloa*, University of Hawaii
Master of the Vessel: Captain Ross Barnes
Chief Scientist: Paul Lethaby, University of Hawaii
OTG Marine Technicians: Tim McGovern, Steve Poulos

Loading: September 13, 2006 @ 0900 HST
Departure: September 14, 2006 @ 0800
Arrival: September 18, 2006 @ 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. Five stations will be occupied during the cruise, in the following order:

1) Station 1, referred to as Station Kahe, is located at 21° 20.6'N, 158° 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 22° 45'N, 158°W. This is the main HOT station and will be occupied during the 2nd, 3rd, and 4th days of the cruise.
3) Station 51, is the site of the MOSEAN Mooring, located at 22° 45'N, 158° 6'W will be occupied on the 4th day of the cruise for about 30 minutes.
4) Station 50, is the site of the WHOTS Mooring, located at 22° 46.1'N, 157° 53.4'W will be occupied on the 4th day of the cruise for about 30 minutes.
5) 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.

In addition two autonomous gliders will be deployed in transit to Station ALOHA on September 14, at 1700h, and on September 17. The deployment is expected to take 2 hours.

1.1 SCIENTIFIC OPERATIONS

Station	Activities
Kahe (sta. 1)	Weight Cast, PRR cast, CTD cast (1000 m)
Transit to ALOHA	Deployment of glider #1
ALOHA (sta. 2)	Sediment traps, net tows, CTD operations, primary productivity measurements, AC9/FRRf, deployment of glider #2, misc. experiments.
MOSEAN mooring station (Sta. 51)	CTD cast (200 m).
WHOTS mooring station (Sta. 50)	CTD cast (200 m).
Underway/continuous	ADCP, thermosalinograph, fluorometry, meteorology

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Karin Björkman	Research Specialist	UH/BEACH
Susan Curless	Research Associate	UH/BEACH
Ken Doggett	Research Associate	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Eric Grabowski	Research Associate	UH/BEACH
Elizabeth Hambleton	Technician	UH/HIMB
Paul Lethaby	Research Associate	UH/PO
Fernando Santiago-Mandujano	Research Associate	UH/ PO
Justin Smith	Undergraduate Student	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Steve Tottori	Electronics Technician	UH/HRMG
Blake Watkins	Marine Engineer	UH/BEACH
Doug White	Research Associate	UH/BEACH
John Yeh	Graduate Student	UH/PO

3.0. SUMMARY SCHEDULE

08 September	Pre-cruise meeting
13 September	Ship loading starting at 0900 hrs
14 September	Depart from Snug harbor at 0800 hrs. Science personnel on-board by 0730.
14 September	Station 1 Kahe Pt. operations. Deployment of glider.
15-17 September	Station ALOHA operations. Deployment of glider. Stations 51 and 50 CTD casts.
18 September	Arrive back to 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 400 lb. weight-test cast, one CTD cast to 1000 m, and a PRR cast (Sect. 4.2.8) will be conducted at this location in the afternoon of September 14. The CTD winch and crane will be required for these operations. After the operations are satisfactorily completed, the ship shall proceed to deploy the first glider.

4.1.1 Deployment of gliders

Two autonomous gliders will be deployed during the cruise. The first is to be deployed in transit to Station ALOHA on September 14, stopping the ship at 1600h making use of available daylight. The second will be deployed after we recover the sediment trap array on September 17. We request the use of the small crane for this operation. The instruments are to be controlled by pilots back at UH where they will make some test dives close to the ship before travelling in a direction towards Station ALOHA. It is intended that the gliders will occupy Station ALOHA once the ship has left the area at the end of the cruise. We request that the small boat be available to recover the gliders if they encounter technical problems and have to be recovered before the last day at ALOHA. The deployment will be conducted by S. Tottori and D. White, and it will take 2 hours in total, 20-30 minutes to deploy and approx. 1.5 hours to perform test dives near the ship. After this, 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 casts will be conducted before deploying the Gas array, 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 side using the small crane and our small grey winch. Power requirement for the winch is 440 VAC, three phase at 10 amps. 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 01325 and 03028), 2 strobe lights, and 2 radio transmitters (channel 74, 156.725 MHz). Daily positions of the array shall be transmitted by email directly to the ship, 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, the ship shall return to the center of Station ALOHA to continue with CTD cast operations.

4.2.3 Gas Array deployment

Samples for the gas array will be collected from casts 1 and 2. We request the use of the small crane for the gas array deployment, and will also use the small grey winch. The array is equipped with one ARGOS satellite transmitter (platform # 08500), a strobe light and a radio transmitter (channel 69). 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.

4.2.4. 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 boom for this operation. Water samples

for biogeochemical measurements will also be collected on each cast. The cast after the deployment of the gas array (cast 3) 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 (Eric Grabowski, Susan Curless).

4.2.5. Primary production experiment

Samples for the primary productivity experiment will be collected from the rosette (cast 9). Just before dawn (sunrise 0619 hrs on September 16), a second free drifting incubation array will be deployed from the stern. We request the use of the small crane for this operation and will also use the small grey winch. The array is equipped with ARGOS satellite transmitter (platform # 60481), strobe lights and a radio transmitter (channel 72, 156.625 MHz). The ship shall keep within site of the array while performing CTD operations for the approximately 12-hour duration the array will be in the water. The array will be recovered just at sunset (1834 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.

4.2.6. Plankton net tows

Plankton nets 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 ship's overhead winch will be needed for this operation. B. Watkins will be in charge of these operations.

4.2.7. Automated Trace Element Sampler (ATE)

On September 15 at 1330, the ATE will be hand deployed off the back deck to a depth of 10 m. The ATE will be recovered after 30 minutes in the water. The ATE is approximately 1' tall and 4'' in diameter, weighting 5 lbs.

4.2.8. Profiling Reflectance Radiometer (PRR).

Around noon on each day a profiling reflectance radiometer will be deployed from the main deck using the main crane. The instrument is hand-lowered and retrieved with assistance from the capstan.

4.2.9. AC9/FRRf

The Wet Labs AC9 is an optical instrument that measures water column spectral absorption and attenuation at nine wavelengths. The AC9 package also includes a Fast Repetition Rate Fluorometer (FRRf), and a Sea-Bird Seacat with temperature, conductivity, fluorometer, and pressure sensors. The package will be deployed to a target depth of 250 m at a

constant speed of 10 m/min during the downcast and upcast. We request the use of the ship's overhead winch and A-frame for this operation.

4.3 Floating sediment trap recovery

On September 17, after the second deep cast and other operations at Station ALOHA have been completed, we shall transit for the recovery of the floating sediment trap array. The small crane and the small grey winch will be needed to retrieve the sediment trap array. After the array is recovered, the ship shall transit to Station 51 to conduct a 200-m CTD cast.

4.4 MOSEAN Mooring (Station 51)

A 200-m CTD cast will be conducted near the MOSEAN mooring. The cast should be conducted downwind, downcurrent, and at about 200 m from the mooring. The nominal position of the mooring is 22^{o} 45'N, 158^{o} 6'W. After this cast, the ship shall transit to Station ALOHA to continue operations. After operations at ALOHA are completed, the ship shall transit to Station 50 to conduct one 200 m CTD cast.

4.5 WHOTS Mooring (Station 50)

One 200-m CTD cast will be conducted near the WHOTS mooring. The cast should be conducted downwind, downcurrent, and at about 200 m from the mooring. The nominal position of the mooring is 22^{o} 46.1'N, 157^{o} 53.4'W. After this cast is completed, the ship shall transit to Kaena

4.6 Station Kaena (21^{o} 50.8'N, 158^{o} 21.8'W)

A near-bottom CTD cast (~2500 m) will be conducted at this location in the evening of December 15, after which the ship shall return to Snug harbor.

4.7 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.

4.8 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 operation.

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. 24 12-l water sampling bottles, all spare parts
3. Two laboratory vans with assorted equipment for radioisotope and general use
4. Distilled, deionized water and all required chemicals and isotopes
5. Storage van with assorted equipment (02 deck)

6. Large vacuum waste container
7. Liquid nitrogen dewers
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 with light and radio transmitter, floats, weights, polypro. Line, spare buoy, etc.
12. PRR, AC-9/FRRf and other optical measuring instruments.
13. Small grey winch (440 VAC, 3 phase at 10 amps) and Kevlar line
14. Oxygen titration system
15. Plankton nets and towing lines
16. Desktop and laptop personal computers
17. Assorted tools
18. All required sampling bottles.
19. Deck incubation system
20. Pertinent MSDS
21. Automated Trace Element Sampler (ATE)

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

1. A-frame and trawl winch
2. A-frame block assembly
3. Markey 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 30 amps for labvan, 110 VAC 10 amps for equipment van)
5. Radio direction finder
6. Space on the 02 deck for one storage van and one lab van
7. Space on the main deck for one lab van
8. Hand-held VHF transceivers
9. Precision depth recorder
10. Shackles, sheaves, hooks and lines
11. Shipboard Acoustic Doppler Current Profiler
12. Thermosalinograph and Fluorometer
13. Copy machine
14. Grappling hooks and line
15. Nobeltec PC or equivalent
16. Running fresh water and seawater, hoses
17. Electronic mail system
18. GPS system
19. Uncontaminated seawater supply
20. Small Capstan (~10m/min)
21. Underway/on-station data acquisition system for meteorological instruments, ADCP, thermosalinograph, fluorometer
22. OTG’s Seapoint Fluorometer
23. OTG’s 400 lb weight.
23. Small boat

Ship: R/V *Ka'Imikai O Kanaloa* **HOT 185 CTD CASTS** 14 – 18 September, 2006

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	Gas Array (7@5, 25, 45), Salts,	21
s2c2	200 m	Gas Array (7@75, 100, 125),MR(2@45), Salts	23
s2c3	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts, Telu(pb @4800,3800,3200,2800,1800)	24
s2c4	1000 m (PO-2)	O_2, Temp, Nuts, DIC/Alk, Quay, DOC, Salts	24
s2c5	1000 m	ATP, Salts, MC (200,300,500,770), KB(100,125,150,200,300) MR(2@1000,2@500)	24
s2c6	1000 m	PE, Salts, MC(5,25,45,75,100,125,150,175), KB(5,25,45,75)	24
s2c7	1000 m	HPLC, Chl a, Slides, Salts,	22
s2c8	1000 m(BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP, DOC, Keeling, Quay, Salts	23
s2c9	1000 m	Primary Production, Salts	22
s2c10	1000 m	Open, MR	15
s2c11	1000 m	Open, MC(5,25,45,75,100,125,150,175) Telu (10,50,100,200,500,1000)	16
s2c12	1000 m	MIT	14
s2c13	1000 m	PC/PN, Salts	14
s2c14	1000 m	PPO4, Salts	14
s2c15	1000 m	SC(2@250), Salts, PUR	16
s2c16	4740 m (PO-3)	Oxygen, Salts, MC(1@1000,2000,3000,4000), SC(PB@4000), MR	24
s2c17	200 m	PSi, ZJ	22
MOSEAN Mooring			
s51c1	200 m	Open	0
WHOTS Mooring			
S50c1	200 m	KD(1@45,75,100,125,150), Salts	5
Kaena Point	s6c1	2500 m Open, Chl a, Salts	13

SHIP R/V *Ka'Imikai O Kanaloa* HOT 185 DATE 14 – 18 Sept, 2006

TIME	Thur. 9/14	Fri. 9/15	Sat. 9/16	Sun. 9/17	Mon. 9/18
0000		Deploy sed traps			Transit Snug
0100		S2C1 Gas 1	Net Tow		
0200			S2C9 PP	Net Tow	
0300		S2C2 Gas 2		AC9/FRRF	
0400			S2C10 Open	Transit sed traps	
0500		Deploy gas array	Deploy PP array	Recover traps	
0600		S2C3 PO-1	Transit gas array	Deploy glider #2	
0700			Recover gas array		
0800	Depart Snug		S2C11 Open	Transit St. 51	Arrive Snug offload
0900				S51C1 MOSEAN	
1000	Arrive Kahe (1030) Weight cast	Net Tow	Net Tow	Transit ALOHA	
1100	PRR S1C1	S2C4 PO-2 (Begin 36 hr)	S2C12 MIT	S2C17 PSi/ZJ	
1200	Transit ALOHA		PRR AC9/FRRF	PRR AC9/FRRF	
1300		Net Tow ATE	Net Tow	AC9/FRRF	
1400		S2C5 ATP	S2C13 PC/PN	Transit St. 50	
1500				S50C1 WHOTS	
1600	Deploy glider #1			Transit Kaena	
1700	Continue ALOHA	S2C6 PE	S2C14 PPO4		
1800			Recover PP array		
1900					
2000		S2C7 HPLC	S2C15 Open		
2100					
2200		Net Tow	Net Tow	S6C1 Kaena	
2300	Arrive ALOHA	S2C8 BEACH	S2C16 PO-3 (end 36 hours)		

September 16: Sunrise 0619 Sunset 1834

6.0 HOT-185 Watch Schedule

0300-1500

Fernando S-Mandujano
Jefrey Snyder
Eric Grabowski – Watch Leader
Ken Doggett
Lance Fujieki

1500-0300

Paul Lethaby – Chief Scientist
John Yeh
Karin Björkman
Susan Curless - Watch Leader
Doug White

At Large

Steve Tottori
Justin Smith
Blake Watkins
Elizabeth Hambleton

OTG

Tim McGovern
Steve Poulos