Hawaii Ocean Time-series
HOT-189 General Cruise Plan

Cruise ID: KOK 0703
Vessel: R/V *Ka'imikai-O-Kanaloa*, University of Hawaii
Master of the Vessel: Captain Ross Barnes
Chief Scientist: Eric Grabowski, University of Hawaii
OTG Marine Technicians: Steve Tottori, Steve Poulos

Loading: January 25, 2007 @ 1000 HST
Departure: January 29, 2007 @ 0900
Arrival: February 2, 2007 @ 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 and 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 and 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 and will be occupied on the 4th day of the cruise for about 2 hours.
6) An underwater bottom camera will be deployed in transit to Station ALOHA, at 21° 42.890'N, 158° 20.0'W, and retrieved at the end of the cruise, the deployment will take 30 minutes and the recovery operation will take approximately 2 hours.

1.1 SCIENTIFIC OPERATIONS

Station	Activities
Kahe (sta. 1)	Weight Cast, PRR cast, CTD cast (1000 m)
21° 42.890'N, 158° 20.0'W	Deployment and recovery of underwater camera
ALOHA (sta. 2)	Sediment traps, net tows, CTD operations, primary productivity measurements, gas array experiment, AC9/FRRf, misc. experiments.
MOSEAN mooring station (Sta. 51)	CTD cast (200 m).
WHOTS mooring station (Sta. 50)	CTD cast (200 m).
Kaena (sta. 6)	CTD cast (2400 m)

Underway/continuous	ADCP, thermosalinograph, fluorometry, meteorology

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Ken Doggett	Research Associate	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Eric Grabowski	Research Associate	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Claire Mahaffey	Research Specialist	UH/BEACH
Susan Curless	Research Associate	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Paul Lethaby	Research Associate	UH/PO
Fernando Santiago-Mandujano	Research Associate	UH/ PO
Jefrey Snyder	Marine Technician	UH/PO
John Yeh	Graduate Student	UH/PO
Steve Tottori	Marine Technician	OTG
Steve Poulos	Marine Technician	OTG
Darin Hayakawa	Graduate Student	UH/HIMB
Mike Strukel	Graduate Student	SIO/BEACH
Cynthia Peacock	Research Associate	UW/BEACH

3.0. SUMMARY SCHEDULE

19 January	Pre-cruise meeting 1030 hrs
25 January	Ship loading starting at 1000 hrs
29 January	Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0830.
29 January	Station 1 Kahe Pt. operations. Deployment of underwater camera.
29 Jan-2 Feb	Station ALOHA operations. Stations 51, 50 and 6 CTD casts. Recovery of underwater camera
02 February	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, a PRR cast (Sect. 4.2.8) will be conducted at this location in the afternoon of January 29. The CTD winch and crane will be required for these operations. After the operations are satisfactorily completed, the ship shall proceed to the camera deployment site.

4.1.1 Deployment of free vehicle baited camera

An underwater camera consisting of a surface mast assembly and frame with Benthos floats and acoustic releases will be deployed in transit to Station ALOHA, at 21^{o} 42.890'N, 158^{o} 20.0'W. We request the use of the A- frame for this operation and will also use the grey winch. This instrument will sink to the bottom of the ocean, where it will remain until it's retrieval at the end of the cruise. This operation will be conducted by John Yeh, and will take about 30min. 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, three 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 01833 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 commence CTD cast operations.

4.2.3 Gas Array deployment / recovery

Samples for the gas array will be collected from casts 1 and 2. At 0500 on Jan. 30, the gas array will be deployed at a location within Station ALOHA, which will be determined by local current conditions to be determined at ALOHA. 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 a ARGOS satellite transmitter (platform #08500), a strobe light and a radio transmitter (channel 69, 156.475MHz). 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 deployment of the gas array.

After the recovery of the gas array at 0700 on Jan. 31, the ship shall return to the center of Station ALOHA to continue with CTD cast operations.

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 4) 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.

4.2.5. Primary production experiment

Samples for the primary productivity experiment will be collected from the rosette (cast 10). Just before dawn (sunrise 0709 hrs on January 31), 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 one 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 (1821 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 and Mike Strukel will be in charge of these operations.

4.2.7. Automated Trace Element Sampler (ATE)

On January 31 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 winch.

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 February 1, 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 22º 45'N, 158º 6'W. After this cast, the ship shall transit to Station 50 to conduct one 200-m CTD cast. After operations at Station 51 are completed, the ship shall transit to Station 50.

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 22º 46.1'N, 157º 53.4'W. After this cast is completed, the ship shall transit to ALOHA for optic casts. After all optic casts have been completed the ship shall transit to Station Kaena.

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

A near-bottom CTD cast (~2500 m) will be conducted at this location in the evening of February 1, after which the ship shall transit to retrieve the underwater camera.

4.7 Recovery of free vehicle baited camera (21º 42.890'N, 158º 20.0'W)

The underwater camera deployed at the beginning of the cruise (Sec. 4.1.1), will be recovered in the evening of Feb. 1-2. The instrument's acoustic release will be triggered and the instrument will be retrieved when it reaches the surface. We request the use of the A-frame for this operation and will also use the grey winch. The instrument is equipped with a strobe light and radio transmitter (channel 73, 156.675 MHz and channel 71, 156.575 MHz). The time for this operation will be approximately 2 hours, after which the ship shall return to Snug harbor.

4.8 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.

4.9 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-place rosette, 24 12-l water sampling bottles, all spare parts
3. One HOT laboratory van with assorted equipment for radioisotope and general use
4. Distilled, deionized water and all required chemicals and isotopes
5. Storage van with assorted equipment (O2 deck)
6. Large vacuum waste container
7. Liquid nitrogen dewers
8. Drifting sediment trap array with strobe lights, satellite and radio transmitters, line, 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, 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. 400 lb weight.
21. Pertinent MSDS
22. Automated Trace Element Sampler (ATE)
23. Drifting gas array with light and radio transmitter, floats, weights, line, buoy, etc.

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

1. A-frame, trawl winch, starboard side crane

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
7. Space in hanger 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. Navlink2 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 24-place rosette, and 24 12-l water sampling bottles

Ship: R/V *Ka'Imikai O Kanaloa* **HOT 189 CTD CASTS** 29 Jan – 2 Feb, 2007

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), CM (3@30), Salts,	24	
s2c2	200 m	Gas Array (7@75, 100, 125) , CM (3@30), Salts,	24	
s2c3	200 m	CM(24@30m)	24	
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, Quay, DOC, Salts		24
s2c6	1000 m	ATP, Salts, MC (200,300,500,770), KB(100,125,150,200,300),MR(2@1000,2@500)	24	
s2c7	1000 m	PE, Salts, MC(5,25,45,75,100,125,150,175), KB(5,25,45,75)	24	
s2c8	1000 m	HPLC, Chl a, Slides, Salts,	22	
s2c9	1000 m(BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP, DOC, Keeling, Quay, Salts	23	
s2c10	1000 m	Primary Production, Salts	22	
s2c11	1000 m	Open,MR(1000,800,600,400,200,175,150,125,100,75,45,10)	15	
s2c12	1000 m	PSi, MC(5,25,45,75,100,125,150,175)	18	
s2c13	1000 m	MIT	16	
s2c14	1000 m	PC/PN, Salts	14	
s2c15	1000 m	PPO4, Salts	14	
s2c16	1000 m	PUR, Salts	16	
s2c17	4740 m (PO-3)	Oxygen, Salts, MC(1@1000,2000,3000,4000), MR(4000,3000,2000,1000,800,600,400,175,125,100,75,10)	24	
MOSEAN Mooring				
s51c1	200 m	Open	0	
WHOTS Mooring				
S50c1	200 m	Salts, JZ(1@75m)	3	
Kaena Point				
s6c1	2500 m	Open, Chl a, Salts	13	

SHIP R/V *Ka'Imikai O Kanaloa* HOT 189 DATE 29 Jan – 2 Feb, 2007

TIME	Mon. 1/29	Tue. 1/30	Wed. 1/31	Thur. 2/1	Fri. 2/2
0000					
0100		S2C1 Gas 1	Net Tow		Transit Snug
0200			S2C10 PP	Net Tow	
0300		S2C2 Gas 2		AC9/FRRF	
0400		S2C3 CM	S2C11 Open	Transit sed traps	
0500		Deploy gas array	Deploy PP array		
0600		S2C4 PO-1	Transit gas array	Recover traps	
0700			Recover gas array	Transit St. 51	
0800			S2C12 PSi	S51C1 MOSEAN	Arrive Snug offload
0900	Depart Snug			Transit St. 50	
1000		Net Tow	Net Tow	S50C1 WHOTS	
1100	Arrive Kahe(1130) Weight cast	S2C5 PO-2 (Begin 36 hr)	S2C13 MIT	PRR	
1200	PRR		PRR AC9/FRRF	AC9/FRRF	
1300	S1C1	Net Tow ATE	Net Tow	AC9/FRRF	
1400	Transit Camera	S2C6 ATP	S2C14 PC/PN	Transit Kaena	
1500					
1600	Deploy Camera				
1700	Transit ALOHA	S2C7 PE	S2C15 PPO4		
1800			Recover PP array		
1900					
2000		S2C8 HPLC	S2C16 PUR	S6C1 Kaena	
2100					
2200		Net Tow	Net Tow	Transit to Camera	
2300	Arrive ALOHA Deploy sed traps	S2C9 BEACH	S2C17 PO-3 (end 36 hours)	Recover Camera	

January 31: Sunrise 0709 Sunset 1821

6.0 HOT-189 Watch Schedule

0300-1500

Fernando S-Mandujano - Watch Leader
Jefrey Snyder – *Deck Boss*
Eric Grabowski – Chief Scientist- *alt water boss,alt tag*
Adriana Harlan – *Water Boss*
Ken Doggett - *Tag*
Lance Fujieki – *Tag*

1500-0300

Paul Lethaby –
John Yeh - *Tag*
Susan Curless – *Deck Boss, Water Boss*
Dan Sadler – Watch Leader – *Tag*

At Large

Claire Mahaffey
Blake Watkins
Mike Strukel
Cynthia Peacock
Darin Hayakawa

OTG

Steve Tottori
Steve Poulos