Hawaii Ocean Time-series
HOT-193 General Cruise Plan

Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Phil Smith
Chief Scientist: Fernando Santiago-Mandujano, University of Hawaii
OTG Marine Technicians: Tobin Chen and Daniel Fitzgerald

Loading: July 5, 2007.
Departure: July 6, 2007 @ 0900
Arrival: July10, 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. 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 50, is the site of the WHOTS Mooring, located at 22º 45.994'N, 157º 53.992'W will be occupied on the 4th day of the cruise for about 30 minutes.
4) A bottom moored sediment trap will be deployed at 22º 51.75'N, 157º 55.00'W on the 4th day of the cruise. This operation will take about 4 hours.

1.1 SCIENTIFIC OPERATIONS

Station	Activities
Kahe (sta. 1)	Weight Cast, PRR cast, CTD cast (1000 m)
ALOHA (sta. 2)	Sediment traps, gas array, net tows, CTD operations, primary productivity measurements, AC9/FRRf, misc. experiments.
WHOTS mooring station (Sta. 50)	Two CTD casts (200 m).
Sediment trap mooring	Sediment trap mooring deployment
Underway/continuous	ADCP, thermosalinograph, fluorometry, meteorology

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group

Lucas Beversdorf	Graduate Student	UH/BEACH
Susan Curless	Research Associate	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Adriana Harlan	Technician	UH/BEACH
Binglin Li	Graduate Student	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Donn Viviani	Graduate Student	UH/BEACH
Brett Updyke	Technician	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Paul Lethaby	Research Associate	UH/PO
Nancy Niklis	Volunteer	UH/PO
Nina Ribbat	Undergraduate Student	HPU/PO
Fernando Santiago-Mandujano	Chief Scientist – Res. Assoc.	UH/PO
Justin Smith	Undergraduate Student	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Lisa Tatsumi	Volunteer	UH/PO
Courage Elkshoulder	Intern	UH/CMORE
Joan Matsuzaki	Teacher	CMORE
Kim Weersing	CMORE Educator	UH/CMORE
Tracy Campbell	Technician	UH/Rappe
Brandon Carter	Scientist	UC Santa Cruz/Zehr
Tobin Chen	Marine Technician	OTG
Dan Fitzgerald	Marine Technician	OTG
Michael Plasker	Intern	MATE/OTG

3.0. SUMMARY SCHEDULE

29 June	Pre-cruise meeting 1100 hrs.
5 July	Ship loading starting at 0900 hrs
6 July	Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0800.
6 July	Station 1 Kahe Pt. operations.
6-10 July	Station ALOHA operations. Station 50 CTD casts. Sediment trap mooring deployment.
10 July	Arrive Snug harbor. ETA 0800 hrs, full offload

4.0. OPERATIONAL PLANS

4.1. Station Kahe (21º20.6'N, 158º16.4'W)

A 400 lb. weight-test cast, one CTD cast to 1000 m, and a PRR cast (Sect. 4.2.7) will be conducted at this location in the afternoon of July 6. The CTD winch and crane will be required for these operations. After the operations are satisfactorily completed, the ship shall proceed to Station ALOHA.

4.2. Station ALOHA (22º45'N, 158ºW 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. 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 A-frame and our Sea-Mac 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 (argosfix@km.soest.hawaii.edu, 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, 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 A-frame for the gas array deployment, and will also use the Sea-Mac winch. The array is equipped with one ARGOS satellite transmitter (platform # 08500, emailing positions to argosfix@km.soest.hawaii.edu, password: argosfix), a strobe light and a radio transmitter (channel 69, 156.475 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.

4.2.4. 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 gas 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 (Susan Curless, Jefrey Snyder).

4.2.5. Primary production experiment

Samples for the primary productivity experiment will be collected from the rosette. Before dawn (sunrise 0553 hrs on July 8), a second free drifting incubation array will be deployed from the stern. We request the use of the A-frame for this operation and will also use the Sea-Mac winch. The array is equipped with one ARGOS satellite transmitter (platform # 60481, emailing positions to argosfix@km.soest.hawaii.edu, 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 approximately 12-hour duration the array will be in the water. The array will be recovered just at sunset (1921 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. 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. Profiling Reflectance Radiometer (PRR).

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

4.2.8. 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. The A-frame and capstan will be needed for this operation.

4.3 Floating sediment trap recovery

In the morning of July 9, after the AC9/FRRf cast has been completed, we shall transit for the recovery of the floating sediment trap array. The A-frame and the Sea-Mac winch will be needed to retrieve the sediment trap array. After the array is recovered, the ship shall transit to Station 50 to conduct two CTD casts.

4.4 WHOTS Mooring (Station 50)

Two 200-m CTD casts will be conducted near the WHOTS mooring on July 9, one before the noontime optical casts operations, and one after. These casts should be conducted downwind, downcurrent, and at about 200 m from the mooring. The nominal position of the

mooring is 22º 45.994'N, 157º 53.992'W. After the second cast is completed, the ship shall transit to deploy the sediment trap mooring.

4.5 Sediment trap mooring deployment (22º 51.75'N, 157º 55.00'W)

A bottom moored sediment trap will be deployed at this location in the evening of July 9. The ship's crane or trawl winch wire with the A-frame will be needed to deploy the mooring's anchor. A triangulation of the mooring will be conducted after the deployment with an acoustic transponder to determine it's position. B. Watkins will be in charge of this operation. After these operations are completed, 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. One 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 (main 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, AC-9/FRRf and other optical measuring instruments.
13. Sea-Mac 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. Flow cytometer to be installed on the ship's Rad van
22. Sediment Trap and its mooring equipment including floats, acoustic releases, anchor, etc.

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

1. A-frame
2. A-frame block assembly
3. Appleton crane and 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 storage van
7. Space on upper deck for one lab van port 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
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. OTG's 24-place rosette, and 24 12-l water sampling bottles (to be used as spare)
24. OTG Seabird CTD (to be used as spare)
25. Pinger (to be used as spare)
26. 1000 lb weight.
27. Ship's Rad van on the starboard side
28. The ship's crane or the trawl winch wire with the A-frame, to deploy the mooring's anchor.

Ship: R/V *KILO MOANA* HOT 193 CTD CASTS 6 – 10 July, 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), LB (3@5), Salts	24
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	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), MR(2@1000, 2@500), Quay (100,125,150 200,300), Salts	24
s2c6	1000 m	PE, Salts, MC(5,25,45,75,100,125,150,175), Quay (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(1000,800,600,400,200,175,150,125,100,75,45,10), Salts	14
s2c11	1000 m	PSi, MC(5,25,45,75,100,125,150,175) BL(3@25, 3@45), Salts	24
s2c12	1000 m	MIT, CMORE(5@500), Salts	21
s2c13	1000 m	PC/PN, CMORE (5@ 770), Salts	14
s2c14	1000 m	PPO4, Salts	14
s2c15	1000 m	PUR, CMORE (5@1000, 5@200), Salts	24
s2c16	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), Salts	24
WHOTS Mooring			
S50c1	200 m	CMORE (5@75, 5@125)	10
S50c2	200 m	CMORE (5@25, 5@45), LB (7@5)	17

SHIP R/V *KILO MOANA* HOT 193 Date 6 – 10 July, 2007

TIME	Fri. 7/6	Sat. 7/7	Sun. 7/8	Mon. 7/9	Tue. 7/10
0000		S2C1 Gas 1			
0100		S2C2 Gas 2	Net Tow		
0200			S2C9 PP	Net Tow	
0300				AC9/FRRF	
0400		Deploy gas array	S2C10 Open	Transit sed traps	
0500		S2C3 PO-1	Deploy PP array		
0600			Transit gas array	Recover traps	
0700			Recover gas array	Transit St. 50	
0800			S2C11 PSi		Arrive Snug offload
0900	Depart Snug			S50C1 WHOTS	
1000		Net Tow	Net Tow	AC9/FRRF	
1100	Arrive Kahe (11:30) Weight cast	S2C4 PO-2 (Begin 36 hr)	S2C12 MIT	AC9/FRRF	
1200	PRR	ATE	PRR AC9/FRRF	PRR S50C2	
1300	S1C1	Net Tow	Net Tow	Transit mooring Deploy sed trap	
1400	Transit ALOHA	S2C5 ATP	S2C13 PC/PN	mooring	
1500					
1600					
1700		S2C6 PE	S2C14 PPO4	Transit Snug	
1800					
1900			Recover PP array		
2000		S2C7 HPLC	S2C15 PUR		
2100					
2200		Net Tow	Net Tow		
2300	Arrive ALOHA Deploy sed traps	S2C8 BEACH	S2C16 PO-3 (end 36 hours)		

July 8: Sunrise 0553 Sunset 1921

6.0 HOT-193 Watch Schedule

0300-1500

Adriana Harlan - *Water Boss*
Lance Fujieki – - *Alt Water Boss, Alt Tag*
Binglin Li - *Tag*
Jefrey Snyder - Watch Leader - *Tag*
Fernando Santiago-Mandujano - Chief Scientist, *Console*
Lisa Tatsumi

1500-0300

Susan Curless - Watch Leader - *Water Boss*
Donn Viviani - *Alt Tag*
Brett Updyke – *Tag*
Paul Lethaby - *Console*
Justin Smith - *Tag*
Nina Ribatt

0900-2100

Dan Sadler
Nancy Niklis

At Large

Blake Watkins
Lucas Beversdorf
Brandon Carter
Kim Weersing
Joan Matsuzaki
Courage Elkshoulder
Tracy Campbell

OTG

Tobin Chen
Dan Fitzgerald
Michael Plasker