Hawaii Ocean Time-series
HOT-204 General Cruise Plan

Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Brian Wehmeyer
Chief Scientist: Fernando Santiago-Mandujano, University of Hawaii
OTG Marine Technicians: Tim McGovern and Tobin Chen

Kilo Moana phone number: 842-9817, cell # 864-0065
Marine Center phone number: 842-9813

Loading: August 14, 2008 @ 1200
Departure: August 15, 2008 @ 0900
Arrival: August 19, 2008 @ 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. The following locations 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 22° 46'N, 157° 53.83'W will be occupied on the 4th day of the cruise for about one hour.
4) The deep moored sediment traps located at 22º 51.464'N, 157º 55.145'W will be recovered on the 4th day of the cruise. This operation will take about about 5 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 (sta. 50)	One one-hour CTD yo-yo cast (200 m).
Kaena (sta. 6)	CTD cast (2400 m)
Underway/continuous	ADCP, thermosalinograph, fluorometry, meteorology, pCO2

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Tara Clemente	Research Associate	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Eric Grabowski	Research Associate	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Binglin Li	Graduate Student	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Research Associate	UH/BEACH
Sam Wilson	Scientist	UH/CMORE
Blake Watkins	Marine Engineer	UH/BEACH
Jay Wheeler	Research Associate	UH/BEACH
Shandy Buckley	Undergrad Student	UH/PO
Michael Gray	Undergrad Student	UH/PO
Brooke Hoffman	Volunteer	PO
Paul Lethaby	Research Associate	UH/PO
Eric Liaw	High School Student	Punahou/PO
Christin Shacat	Research Associate	UH/PO
Fernando Santiago-Mandujano	Chief Scientist – Res. Assoc.	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Tobin Chen	Marine Technician	OTG
Tim McGovern	Marine Technician	OTG

3.0. SUMMARY SCHEDULE

7 August	Pre-cruise meeting, MSB 315, 1030 hrs
14 August	Ship loading starting at 1200 hrs
15 August	Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0800.
15 August	Station 1 Kahe Pt. operations.
16-18 August	Station ALOHA operations. Station 50 and Kaena CTD casts.
19 August	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 1000 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 the first cruise day. 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 (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 (Sect. 4.2.2). Afterwards, one 350-m and one 1000-m casts will be conducted before deploying the Primary Productivity array (Sect. 4.2.3). These operations will be followed by a near-bottom CTD cast.

4.2.2. Sediment trap array 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 the 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 03028, 60482), 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@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 Primary production experiment

Samples for the primary productivity experiment will be collected from the rosette. Before dawn (sunrise 0609 hrs on August 16), a 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 # 8500, emailing positions to argosfix@km.soest.hawaii.edu, password: argosfix), strobe lights and a radio transmitter (channel 69, 156.475 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 leader. The array will be recovered just at sunset (1903 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 (**Jefrey Snyder and Tara Clemente**).

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 the cast before deployment. 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.

4.2.6. 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 (between 1000 and 1400) and at midnight (between 2200 and 0200) on the second and third days (see schedule) with a total of seven 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.

4.2.9. Automated Trace Element Sampler (ATE)

On the 2nd day of the cruise, 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.

4.3 Floating sediment trap recovery

In the morning of the fourth cruise day, 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 recover the Gas Array. After the array is recovered, the ship shall transit to Station 50 to conduct one one-hour yo-yo CTD cast.

4.4 WHOTS Mooring (Station 50)

One one-hour 200-m CTD yo-yo cast will be conducted near the WHOTS mooring on the fourth cruise day. This cast should be conducted downwind, downcurrent, and at about 200 m from the mooring's buoy. The watch leader will determine the position of the buoy from the WHOTS web site (`http://ocelot.whoi.edu/projects/WHOTS/data/whots4_pos.txt`) and will give this information to the bridge. The nominal position of the mooring's anchor is 22° 46'N, 157° 53.83'W. After the cast is completed the ship shall transit to ALOHA to conduct one PRR cast, and two consecutive AC9/FRRf casts. After these operations are completed, the ship shall transit to the location of the deep moored sediment traps.

4.5. Deep moored sediment traps (22^{o} 51.464'N, 157^{o} 55.145'W)

This mooring will be retrieved from this location in the evening of the fourth cruise day, the operation will take about 5 hours. These are the details of the operation.

Arrive at location, approx. 22^{o} 51.464'N, 157^{o} 55.145'W

Transducer will go over side and releases will be woken up. After communicating, release codes will be sent. Ship will standby and move up current slightly, waiting for flotation to surface, approx 50 min. Beacon unit has strobe and radio transmitter, RF is channel 72, 156.625MHz.

Line will be led through A-frame for lifting flotation cluster onto deck. A-frame operator will be needed. Once flotation has been secured, recovery of mooring will commence and will be taken up on the Seamac winch. Sequence will be:

- 650m line recover
- trap #716 recover
- 20m line recover
- 8 floats recover
- 1200m line recover
- trap #715 recover
- 700m line recover
- 16 floats and tri-float with beacons recover

RELEASE CODES FOR UNITS 620, 622

ENABLE: 1A, 3A

RELEASE: 1B, 3B

Equipment/Tools Needed:

DS-7000 deck unit with codes for releases
Blue Seamac winch
Stopper lines with blocks on deck

Deck cleats for stopper lines
Dikes and cotter pins
Hammer and punch
Chain hooks and Crosby clips
Tag lines
2 adjustable wrenches for ½" and 5/8" shackles
Quick release and large snatch block, with capstan and line
Wire baskets for flotation
Tie down straps for all gear
Sample stowing supplies

After the recovery is 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, Fluorometer and pCO2 system

The ship's thermosalinograph, fluorometer, and pCO2 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.

4.8. Magnetometer

The ship's magnetometer will be deployed two times during the cruise. The first deployment will be during the transit to Station ALOHA on the first cruise day and the second will be during the transit to Station Kaena on the fourth cruise day. It will take roughly 10 minutes to deploy and recover this instrument. The magnetometer needs to be deployed before the ship reaches cruising speed. OTG personnel will be in charge of this operation. They will notify the watch leader when the magnetometer is deployed and recovered.

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 vans with assorted equipment for radioisotope and general use
4. Distilled, deionized water and all required chemicals and isotopes
5. Equipment 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. 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
19. Pertinent MSDS

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, 3 phase, 60 Amp breaker, 440 VAC, 3 phase, 10 Amp) 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 equipment van
7. Space on upper deck for two lab vans port side
8. Space on upper deck for incubators
9. Hand-held VHF transceivers
10. Precision depth recorder
11. Shackles, sheaves, hooks and lines
12. Shipboard Acoustic Doppler Current Profiler
13. Thermosalinograph, *p*CO2 system, 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, *p*CO2
23. OTG's 24-place rosette, and 24 12-l water sampling bottles (to be used as spare)
24. Pinger (to be used as spare)
25. 1000 lb weight.
26. Remote CTD decibar pressure display in the winch operator cabin.
27. Large Sea-Mac winch (Mod. 1025 EHS). 60 Amp Hubbel plug/connector (440 VAC, 3 phase, 60 Amp breaker)
28. Hydrophone/transducer for communication with sediment trap mooring acoustic release.

Ship: R/V *KILO MOANA* HOT 204 CTD CASTS August 15 – August 19 2008

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	200m	CMORE(5@25, 5@45, 5@75), BL(5,25,45,75,100,125,150)	22
s2c2	1000 m	Primary Production, Salts, SW (1@25, 1@125), MB(pb on all depths)	24
s2c3	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts Kitack (pb@4800,4500,4200,3800,3400, 3000,2600, 2200,2000, 1800,1600,1400,1200)	24
s2c4	1000 m (PO-2)	O_2, Temp, Nuts, DIC/Alk, DOC, Salts Kitack (pb at 9 depths)	24
s2c5	1000 m	PC/PN, SW(1@5,25,45,75,100,125,150,175), Salts	22
s2c6	1000 m	PPO4, BL(2@45,75,100,125,150), Salts	24
s2c7	1000 m (BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP,DOC, Keeling, Quay, Kitack (pb@1020,O2-min,S-min,200,175,150,125,100,75, 45,25,5), Salts	23
s2c8	1000 m	PUR, CMORE(5@1000, 5@770, 5@500), Salts	24
s2c9	1000 m	Gas Array (2@125,100) (3@5,25,45,75) MB (1@175,150,125,100,75,45,25,5)	24
s2c10	1000 m	Open, CMORE(5@125, 5@200), Salts	12
s2c11	1000 m	PSi, MC(5,25,45,75,100,125,150,175), Salts SW(1@5,25,45,75,100,125),SW(pbMC@150,175),	24
s2c12	1000 m	MIT, BL(5,25,45,75,100,125,150), Salts	23
s2c13	1000 m	ATP, MC(200,300,500,770), SW(1@200,300,400,500, 600,700,800,900,1000), Salts	24
s2c14	1000 m	PE, MC(5,25,45,75,100,125,150,175), SW(pb MC), Salts	23
s2c15	1000 m	HPLC, Chl a, Slides, Salts	22
s2c16	4740 m (PO-3)	Oxygen, MC(1000,2000,3000,4000), Salts	12
WHOTS Mooring			
s50c1	200 m yo-yo	Brandon Carter (15, 40, 70, DCM). BL(5,25,45,75,100,125,150)	11

SHIP R/V *KILO MOANA* HOT 204 Date August 15-19, 2008

TIME	Fri. 8/15	Sat. 8/16	Sun. 8/17	Mon. 8/18	Tue. 8/19
0000		S2C1			
0100		S2C2 PP	Net Tow		
0200			S2C9 Gas		
0300				AC9/FRRF	
0400		Deploy PP Array	Deploy Gas Array	Transit sed traps	
0500		S2C3 PO-1	S2C10 Open	Recover traps	
0600				Transit gas array	
0700				Recover gas array	
0800			S2C11 PSi	Transit St 50	Arrive Snug
0900	Depart Snug		ATE		
1000		Net Tow	Net Tow	S50C1	
1100	Arrive Kahe (11:30) Weight cast	S2C4 PO-2 (Begin 36 hr)	S2C12 MIT	PRR AC9/FRRF	
1200	PRR	Net Tow	PRR AC9/FRRF	AC9/FRRF	
1300	S1C1		Net Tow	Transit Sed trap array	
1400	Transit ALOHA deploy magnetometer	S2C5 PC/PN	S2C13 ATP	Recover Sediment	
1500				trap array	
1600					
1700		S2C6 PPO4	S2C14 PE		
1800					
1900		Recover PP array		deploy magnetometer Transit Snug	
2000		S2C7 BEACH	S2C15 HPLC		
2100					
2200	Recover magnetometer	Net Tow	Net Tow		
2300	Arrive ALOHA Deploy sed traps	S2C8 PUR	S2C16 PO-3 (end 36 hours)		

August 16: Sunrise 0609 Sunset 1903

6.0 HOT-204 Watch Schedule

0300-1500

Eric Grabowski - *Tag*
Adriana Harlan - *Water Boss*
Lance Fujieki - *alt water boss*
Jefrey Snyder– Watch Leader - *Tag*
Christin Shacat – *Console*
Shandy Buckley

1500-0300

Tara Clemente – Watch Leader - *Water Boss*
Jay Wheeler –*Tag - alt water boss*
Dan Sadler – *altTag*
Fernando Santiago-Mandujano - Chief Scientist - *Console*
Paul Lethaby - *Console- Tag*
Michael Gray
Brooke Hoffman

At Large

Sam Wilson
Blake Watkins
Brett Updyke
Binglin Li
Eric Liaw

OTG

Tim McGovern
Tobin Chen