Hawaii Ocean Time-series
HOT-206 General Cruise Plan
KM 0822

Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Ross Barnes
Chief Scientist: Eric Grabowski, University of Hawaii
OTG Marine Technicians: Kuhio Vellalos and Tobin Chen

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

Loading: November 26, 2008 @ 0900
Departure: November 29, 2008 @ 0900
Arrival: December 3, 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. Four 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 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) 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 cast, CTD cast (1000 m)
ALOHA (sta. 2)	Sediment traps, gas array, net tows, CTD operations, primary productivity measurements, AC9/FRRf, misc. experiments, and Sea Glider Operations.
WHOTS mooring station (Sta. 50)	One CTD cast (yo-yo to 200 m).
Kaena (sta. 6)	CTD cast (2400 m)
Underway/continuous	ADCP, thermosalinograph, fluorometry, meteorology, pCO_2

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Eric Grabowski	Chief Scientist – Res. Assoc.	UH/BEACH
Karin Björkman	Research Specialist	UH/BEACH
Susan Curless	Research Associate	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Binglin Li	Graduate Student	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Technician	UH/BEACH
Jay Wheeler	Research Associate	UH/BEACH
Sam Wilson	Scientist	UH/CMORE
Ken Doggett	Research Associate	UH/CMORE
Tara Clemente	Research Associate	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Solange Duhamel	Postdoc	UH/BEACH
Kathryn MacDonald	Volunteer	UH/BEACH
Fernando Santiago-Mandujano	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Paul Lethaby	Research Associate	UH/PO
Christin Shacat	Research Associate	UH/PO
Graham Dean	Volunteer	PO
Kuhio Vellalos	Marine Technician	OTG
Tobin Chen	Marine Technician	OTG

3.0. SUMMARY SCHEDULE

19 November	Pre-cruise meeting, MSB 307, 1030 hrs.
26 November	Ship loading starting at 0900 hrs.
29 November	Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0800.
29 November	Station 1 Kahe Pt. operations.
29 Nov-2 Dec	Station ALOHA operations. Station 50 and Kaena Pt. CTD cast
3 December	Arrive back to Snug harbor. ETA 0800 hrs, offload.

4.0. OPERATIONAL PLANS

4.1. Station Kahe (21°20.6'N, 158°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 November 29. 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°45'N, 158°W with 6 nm radius)

4.2.1. Upon arrival to Station ALOHA, the sediment traps will be deployed. After the sediment trap deployment is complete, one 200-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, to be determined enroute to ALOHA by local current conditions. 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 01833, 60483), 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 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. Before dawn (sunrise 0652 hrs on November 30), 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 two ARGOS satellite transmitters (platform #'s 03028, 60482), strobe lights and a radio transmitter (channel 68, 156.425 MHz). Position fixes of the array will be e-mailed to the ship (argosfix@km.soest.hawaii.edu, password: argosfix). 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 (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 will need the ship's CTD winch and crane for these operations. 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 (**Fernando Santiago-Mandujano, 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 cast 9. 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 # 01833, emailing positions to argosfix@km.soest.hawaii.edu, password: argosfix), a strobe light and a radio transmitter (channel 72, 156.625 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. 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 December 2, 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 conducrt one yo-yo CTD cast. After which time the ship shall transit to ALOHA to conduct one PRR cast, and two AC9/FRRf casts.

4.4 WHOTS Mooring (Station 50)

One 200-m CTD yo-yo cast with at least 6 full cycles will be conducted near the WHOTS mooring on December 2. This cast should be conducted downwind, downcurrent, and at about 200 m from the mooring. The nominal position of the mooring is 22° 46'N, 157° 53.83'W.

After these operations are completed, the ship will transit back inside the St. ALOHA circle to complete optical casts. Once those operations are complete, the ship will either attempt sea glider recovery or transit to Station Kaena.

4.5 Sea Glider Deployment and Recovery Operations

If weather permits, a Seaglider will be launched off of the stern using the A-frame. An iridium handset will be provided for communication between OTG and the glider pilots on island for use in this operation. Please turn on the ship location email broadcast. There are multiple time slots scheduled for these operations in case of inclement weather conditions or communication issues between land and sea based teams. If the Seaglider misbehaves the small boat will be launched to aid in the recovery operation.

4.6 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 December 1, 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, pCO_2 system, and Fluorometer

The ship's thermosalinograph, pCO_2 system 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 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 (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 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
20. Iridium handset and other pertinent items needed for sea glider operations.

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) 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 two lab vans port side, and OTG van starboard 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, pCO_2 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, pCO_2
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. OTG Lab Van
29. Ship's location email broadcast

Ship: R/V *KILO MOANA* HOT 206 CTD CASTS Nov.29-Dec.3, 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	200 m	CMORE(5@25, 5@45, 5@75)	15
s2c2	1000 m	Primary Production, Salts, SW (1@25, 1@125), MB(pb on all depths), KB(pb PPdepths 150,175)	24
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, DOC, Salts	24
s2c5	1000 m	PC/PN, SW(1@5,25,45,75,100,125,150,175), BL(1@25,45), Salts	24
s2c6	1000 m	PPO4, DS(1@1000,750), Salts	18
s2c7	1000 m (BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP,DOC, Keeling, Quay, 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	CMORE(5@125,5@200), PO(6@1000), Salts	18
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(1@75,DCM)(3@175),Salts	21
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	22
s2c15	1000 m	HPLC, Chl a, Slides, Salts	22
s2c16	4740 m (PO-3)	Oxygen, MC(1000,2000,3000,4000), Salts SW(1@4000,3000,2000,1000,800,600,400,175,125,100,75,10)	24
WHOTS Mooring			
S50c1	200 m yo-yo	BC (1@DCM,70,40,15), BL(3@ 5,25,45,75,100,125,150)	24
Kaena			
S6c1	2400 m	Chl, Salts	13

SHIP R/V *KILO MOANA* HOT 206 Date: Nov. 29 – Dec. 3, 2008

TIME	Sat.. 11/29	Sun.. 11/30	Mon. 12/1	Tues. 12/2	Wed.. 12/3
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 sed traps	
0600			ATE	Transit gas array	
0700			*Deploy Seaglider*	Recover gas array	
0800			S2C11 PSi	Transit St. 50	Arrive Snug
0900	Depart Snug			S50C1	
1000		Net Tow	Net Tow		
1100	Arrive Kahe (11:30) Weight cast	S2C4 PO-2 (Begin 36 hr)	S2C12 MIT	*Sea Glider Ops*	
1200	PRR	Net Tow	PRR AC9/FRRF	PRR AC9/FRRF	
1300	S1C1	*Deploy Seaglider*	Net Tow	AC9/FRRF	
1400		S2C5 PC/PN	S2C13 ATP	*Sea Glider Ops*	
1500	Transit ALOHA		*Deploy Seaglider*		
1600		S2C6 PPO4	*Seaglider Ops.*	Transit St. Kaena	
1700		Recover PP array	S2C14 PE		
1800					
1900					
2000		S2C7 BEACH	S2C15 HPLC		
2100				S6C1	
2200		Net Tow	Net Tow		
2300	Arrive ALOHA Deploy sed traps	S2C8 PUR	S2C16 PO-3 (end 36 hours)	Transit Snug	

November 30: Sunrise 0652 Sunset 1748

6.0 HOT-206 Watch Schedule

0300-1500

Adriana Harlan **-** *Water Boss*
Lance Fujieki *–Tag*
Jay Wheeler*– Alt Tag*
Eric Grabowski - Chief Scientist
Kathryn MacDonald
Fernando Santiago-Mandujano– Watch Leader- *Console*
Jefrey Snyder- *Tag*
Graham Dean

1500-0300

Karin Björkman *–Alt Tag*
Susan Curless *– Water Boss*
Dan Sadler *– Tag*
Tara Clemente - Watch Leader
Paul Lethaby - *Console*
Christin Shacat **-** *Tag*

At Large

Blake Watkins
Ken Doggett
Brett Updyke - *Alt Tag*
Binglin Li
Sam Wilson - *Alt Tag*
Solange Duhamel

OTG

Kuhio Vellalos
Tobin Chen