Hawaii Ocean Time-series
HOT-213 Operational Cruise Plan

Cruise ID: KM 0918
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Brian Wehmeyer
Chief Scientist: Susan Curless, University of Hawaii
OTG Marine Technicians: Vic Polidoro and Kuhio Vellalos

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

Loading: July 22, 2009 @ 0900
Departure: July 23, 2009 @ 0900
Arrival: July 27, 2009 @ 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 52, is the site of the WHOTS-6 Mooring, located at 22° 39.989'N, 157° 56.961'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 and will be occupied on the 4th day of the cruise for about 3 hours.

1.1 SCIENTIFIC OPERATIONS

Station	Activities
Kahe (sta. 1)	Weight Cast, PRR cast, Hyperpro 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. 52)	One CTD cast (yo-yo to 200 m).
Kaena (sta. 6)	CTD cast (2400 m)
Underway/continuous	ADCP, thermosalinograph, fluorometry, meteorology

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Karin Björkman	Research Specialist	UH/BEACH
Tara Clemente	Research Associate	UH/BEACH
Susan Curless	Chief Scientist – Res. Assoc.	UH/BEACH
Ken Doggett	Research Associate	UH/CMORE
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	Research Associate	UH/CMORE
Blake Watkins	Marine Engineer	UH/BEACH
Sam Wilson	Post-doc Scientist	UH/CMORE
Fernando Santiago-Mandujano	Research Associate	UH/PO
Paul Lethaby	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Ian Hawkins	Research Associate	UH/PO
Cameron Fumar	Undergraduate Student	UH/PO
Joseph Gum	Undergraduate Student Intern	UH/PO
Kate Achilles	Marine Educator	UH/CMORE
Martha Akina	Teacher	CMORE
Bonnie McCann	Teacher	CMORE
Scott Percival	Teacher	CMORE
Chris Bowler	Scientist	ENS/BEACH
Janice Jones	Technician	UCSB
John Dore	Scientist	MSU/BEACH
Rachel Foster	Scientist	UCSC/CMORE
Vic Polidoro	Marine Technician	OTG
Kuhio Vellalos	Marine Technician	OTG

3.0. SUMMARY SCHEDULE

15 July	Pre-cruise meeting, MSB 307, 1300 hrs.
22 July	Ship loading starting at 0900 hrs.
23 July	Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0800.
23 July	Station 1 Kahe Pt. operations.
23-26 July	Station ALOHA operations. Station 52 and Kaena CTD casts.
27 July	Arrive back to Snug harbor. ETA 0800 hrs, full 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, a PRR cast and a Hyperpro cast (Sect. 4.2.7) will be conducted at this location on July 23rd. 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, two 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, 60481), 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 Productivity Array.

4.2.3 Primary production experiment

Samples for the primary productivity experiment will be collected from the rosette. Before dawn (sunrise 0600 hrs on July 24th), 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, emailing positions to argosfix@satellite-email.com, 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 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 (1917 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, Paul Lethaby)**.

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 CTD cast 10. We request the use of the small starboard crane for the gas array deployment, and will also use the Sea-Mac winch. The array is equipped with two ARGOS satellite transmitters (platform #'s 03028, 60482), emailing positions to argosfix@satellite-email.com, password: argosfix), a strobe light and a radio transmitter (channel 68, 156.425 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 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.

4.2.6.1 Hand net tows

The hand held surface net tows will be deployed off the stern for about 15-20 minutes at various times during the cruise. The ships deck equipment is not needed for this operation. We request that the ship remain stationary during these tows. Kate Achilles, Binglin Li, Chris Bowler, Sam Wilson and Rachel Foster will all be conducting these tows.

4.2.7. 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.

4.2.8. Profiling Reflectance Radiometer (PRR) and Hyperpro

Around noon on the first, third and fourth days, 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. Once the PRR cast is complete, the Hyperpro will be deployed and recovered in the same manner as the PRR.

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

4.3 Floating sediment trap recovery

In the morning of July 26th, 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 ALOHA to conduct one PRR cast, and two AC9/FRRf casts, after which the ship shall transit to Station 52 to conduct one CTD cast.

4.4 WHOTS-6 Mooring (Station 52)

One 200-m CTD yo-yo cast with at least 6 full cycles will be conducted near the WHOTS mooring on July 26th. This cast should be conducted downwind, downcurrent, and about 200 m from the mooring. The nominal position of the mooring is 22°39.989'N, 157°56.961'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 Sea Glider deployment operations shall commence.

4.5 Sea Glider #147 Deployment

Two hours of time has been scheduled for this operation. Approximately 30 minutes will be needed to deploy Sea Glider #147 using the winch and the ship's A frame. Once the glider is in the water, it will conduct a shallow test dive (~30 min) and call its operational status into the command center.

It is requested that during the test dive, the ship stays close to the deployment site until the status of the glider has been confirmed to be operational. One hour has been scheduled for small boat operations for the recovery of the glider should it malfunction during the test dive.

After sea glider operations are complete, the ship shall then transit to Station 6, refered to as Station Kaena.

4.5 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 July 26th, after which 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, 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, and the Flow Cytometry Van.
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 one 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, *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, 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)

Ship: R/V *KILO MOANA* **HOT 213 CTD CASTS** **July 23 – July 27, 2009**

Cast		Samples	#Bottles
Kahe Pt.			
s1c1	1000 m	O_2, Temp, DIC/Alk, Nuts, Chl a, LLN, $LLPO_4$, DOC, FCM, KA(pb all depths), Salts	24
Station ALOHA			
s2c1	200 m	CMORE(5@25, 5@45, 5@75), RF(1@5,15,25), SW(4@5)	22
s2c2	1000 m	Primary Production, Salts, SW (2@150), MB(pb on all depths), KB(pb PPdepths)	24
s2c3	200 m	RF (11@tbd), BL(9@ tbd)	20
s2c4	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, KA(pb oxygen), Salts	24
s2c5	1000 m (PO-2)	O_2, Temp, Nuts, DIC/Alk, DOC, Salts	24
s2c6	1000 m	PC/PN, SW(1@5,15,25,35,45,55,75,100,125,150), Salts	24
s2c7	1000 m	PPO4, Salts, BL(2@25, 2@45), CB (2@MLD,DCM)	22
s2c8	1000 m (BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP,DOC, Keeling, Quay, Salts, JD(pb 12 depths)	23
s2c9	1000 m	PUR, CMORE(5@1000,5@770,5@500), Salts	24
s2c10	1000 m	Gas Array (2@5,25,45,75,100,125), MB(1@175,150,125,100,75,45,25,5) SW(2@10)	24
s2c11	1000 m	CMORE(5@125,5@200), Salts JD(1@80,90,100,110,120,140,160,180,200,250,300,400)	24
s2c12	1000 m	PSi, MC(5,25,45,75,100,125,150,175), Salts SW(1@15,35,55,65,85,110),SW(pbMC), KA(pbMC)	24
s2c13	1000 m	MIT, CB(2@DCM,MLD), Salts, BL(2@75, 2@125)	19
s2c14	1000 m	ATP, SW(1@200,300,400,500, 600,700,800,900,1000), MC(200,300,500,770), Salts	24
s2c15	1000 m	PE, MC(5,25,45,75,100,125,150,175), SW(pb MC), Salts	22
s2c16	1000 m	HPLC, Chl a, Slides, JM(1@500), Salts	23
s2c17	4740 m (PO-3)	Oxygen, MC(1000,2000,3000,4000), RF(11@tbd), Salts	23
WHOTS Mooring			
S50c1	200 m yo-yo	BL(3@ 5,25,45,75,100,125,150,175)	24
Kaena			
S6c1	2400 m	Chl, Salts	13

JD=John Dore, **MC**=Matt Church, **SW**=Sam Wilson, **JM**=Jennifer McKay, **BL**=Binglin Li, **RF**=Rachel Foster, **KA**= Kate Achilles, **CB**=Chris Bowler, **KB**= Karin Björkman, **MB=**Mark Brzezinski

SHIP R/V *KILO MOANA* HOT 213 Date: July 23 – July 27, 2009

TIME	Thur. 7/23	Fri. 7/24	Sat. 7/25	Sun. 7/26	Mon. 7/27
0000		S2C1			
0100		S2C2 PP	Net Tow		
0200			S2C10 Gas		
0300		S2C3		AC9/FRRF	
0400		Deploy PP Array	Deploy Gas Array	Transit sed traps	
0500		S2C4 PO-1	S2C11 Open	Recover traps Transit gas array	
0600				Recover gas array	
0700				Transit St. 52	
0800			S2C12 PSi	S52C1 WHOTS	Arrive Snug
0900	Depart Snug			Transit St. ALOHA	
1000		Net Tow	Net Tow	AC9/FRRF	
1100	Kahe Weight cast	S2C5 PO-2 (Begin 36 hr)	S2C13 MIT	AC9/FRRF	
1200	PRR	Net Tow	PRR Hyperpro	PRR Hyperpro	
1300	Hyperpro S1C1	KA hand net tow ATE	AC9/FRRF	Deploy Sea Glider	
1400	Transit ALOHA	S2C6 PC/PN	S2C14 ATP		
1500				Transit St. Kaena	
1600		S2C7 PPO4			
1700		Recover PP array	S2C15 PE		
1800					
1900					
2000		S2C8 BEACH	S2C16 HPLC		
2100				S6C1	
2200		Net Tow	Net Tow		
2300	Arrive ALOHA Deploy sed traps	S2C9 PUR	S2C17 PO-3 (end 36 hours)	Transit Snug	

July 24: Sunrise 0600, Sunset 1917

6.0 HOT-213 Watch Schedule

0300-1500

Adriana Harlan - *Water Boss*
Dan Sadler – *Tag*
Lance Fujieki – *Alt Tag*
Fernando Santiago-Mandujano - Watch Leader- *Console*
Jefrey Snyder – *Tag*
Joseph Gum – *Alt Tag*

1500-0300

Susan Curless – Chief Scientist - *Water Boss*
Karin Björkman –*Tag*
Paul Lethaby - Watch Leader - *Console*
Ian Hawkins – *Tag*
Cameron Fumar – *Alt Tag*

0900-2100

Tara Clemente - *Alt Tag*

At Large

Brett Updyke - *Alt Tag*
Binglin Li
Blake Watkins
Ken Doggett
Sam Wilson - *Alt Tag*
Kate Achilles
Martha Akina
Scott Percival
Bonnie McCann
John Dore
Janice Jones
Chris Bowler
Rachel Foster

OTG

Kuhio Vellalos
Vic Polidoro