

## **Hawaii Ocean Time-series HOT-209 General Cruise Plan**

Vessel: R/V *Kilo Moana*, University of Hawaii  
Master of the Vessel: Captain Brian Wehmeyer  
Chief Scientist: Paul Lethaby, University of Hawaii  
OTG Marine Technicians: Elly Speicher and Daniel Fitzgerald

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

Loading: February 15, 2009 @ 0900  
Departure: February 16, 2009 @ 0900  
Arrival: February 20, 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. 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 3 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 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> 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 4<sup>th</sup> 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 4<sup>th</sup> day of the cruise for about 2 hours.

### 1.1 SCIENTIFIC OPERATIONS

<u>Station</u>	<u>Activities</u>
Kahe (sta. 1)	Weight Cast, PRR cast, CTD cast (1000 m)Go-flo cast (40m), recover seaglider.
ALOHA (sta. 2)	Sediment traps, gas array, net tows, CTD operations, primary productivity measurements, AC9/FRRf, CTD winch pump cast, misc. experiments.
WHOTS mooring (Sta. 50)	CTD operations, CTD yo-yo cast (200 m).
Kaena (sta. 6)	CTD cast (2400 m)
Underway/continuous	ADCP, thermosalinograph, fluorometry, <i>p</i> CO <sub>2</sub> , meteorology

## 2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/Group
Kate Achilles	CMORE Educator	UH/CMORE
Dotty Bates	Volunteer	UH/PO
Matt Bauman	Graduate Student	URI
Michael Beman	Scientist	UH
Stephanie Betancourt	Teacher	UH/CMORE
Karin Björkman	Research Specialist	UH/BEACH
Shandy Buckley	Volunteer	UH/PO
Tara Clemente	Research Associate	UH/BEACH
Susan Curless	Research Associate	UH/BEACH
Ken Doggett	Research Associate	UH/BEACH
Dan Fitzgerald	Marine Technician	OTG
Eric Grabowski	Research Associate	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Paul Lethaby	Chief Scientist – Res. Assoc.	UH/PO
Binglin Li	Graduate Student	UH/BEACH
Chris Olivas	Teacher	UH/CMORE
Fernando Santiago-Mandujano	Research Associate	UH/PO
Christin Shacat	Research Associate	UH/PO
Justin Smith	Undergraduate Student	UH/PO
Elly Speicher	Marine Technician	OTG
Brett Updyke	Technician	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Kate Werner	Teacher	UH/CMORE
Jay Wheeler	Research Associate	UH/BEACH
Sam Wilson	Scientist	UH/CMORE
Michael Workman	Volunteer	UH/BEACH

## 3.0. SUMMARY SCHEDULE

10 February	Pre-cruise meeting MSB 307, 1030 hrs.
15 February	Ship loading starting at 0900 hrs
16 February	Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0800.
16 February	Station 1 Kahe Pt. operations.
16-19 February	Station ALOHA operations. Stations 50 and 6 CTD casts, CTD pump cast
20 February	Arrive 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, one go-flo cast to approx. 40m and a PRR cast (Sect. 4.2.7) will be conducted at this location in the afternoon of September 1st. The CTD winch and crane will be required for these operations. The go-flo cast will require use of the capstan and A-frame.

Following these operations a seaglider, which will be positioned nearby to Station Kahe, is to be recovered. We will require the use of the work boat, A-frame and winch for this operation. Transit time and recovery should take no more than 2 hours and will be coordinated by B. Watkins. After the seaglider is recovered, 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 (Sect. 4.2.2). Afterwards, 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, which will be determined by local current conditions to be decided 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 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 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 0702 hrs on February 17), 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 #'s 03028, 60482, 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 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 (1830 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 (**Eric Grabowski, Fernando S-Mandujano**).

#### 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 #'s 03028, 60482, emailing positions to [argosfix@km.soest.hawaii.edu](mailto:argosfix@km.soest.hawaii.edu), 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 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.

##### 4.2.6.1 Kate Achilles net tows

These surface net tows are hand-deployed off the stern for about 15-20 minute periods. One net tow is scheduled for 13:00 on February 17 but others may be introduced to the schedule at appropriate time slots. We request that the ship remain stationary during these tows. K. Achilles will be in charge of these net tows.

#### 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. Automated Trace Element Sampler (ATE)

On the 3<sup>rd</sup> 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 second deep 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 sediment trap array is recovered, the ship shall transit to recover the Gas Array. After the gas 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](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.

#### 4.5 CTD pump cast

A CTD and pump cast will be conducted on the fourth cruise day after operations at ALOHA have been completed. The system is designed to pump water from up to 500 m deep and consists of a winch with a hose/cable and a submersible pump. The pump will be deployed over the stern through a block held aloft by the crane. Operations are schedule for 1.5 – 2 hours. We request the use of the port side crane to hold the block. Power requirements for the winch are 3 phase 440 VAC and 10 Amps. S. Wilson will be in charge of these operations. After these operations are completed the ship shall transit to Station Kaena.

#### 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 pCO<sub>2</sub> system

The ship's thermosalinograph, fluorometer, and pCO<sub>2</sub> 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. 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
20. 1 liter Go-Flo bottle
21. CTD pump winch (3 phase 440 VAC 10 Amp)

### 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, and one on the 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,  $p\text{CO}_2$  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,  $p\text{CO}_2$
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. Ship's location email broadcast

Cast	Depth	Samples	#Bottles
<b><u>Kahe Pt.</u></b>			
s1c1	1000 m	O <sub>2</sub> , Temp, DIC/Alk, Nuts, Chl a, LLN, LLPO <sub>4</sub> , DOC, FCM, KA(sample remaining water), Salts	24
<b><u>Station ALOHA</u></b>			
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)	24
s2c3	4740 m (PO-1)	O <sub>2</sub> , Temp, DOC, DIC/Alk, Nuts, Salts, KA (pbO <sub>2</sub> )	24
s2c4	1000 m (PO-2)	O <sub>2</sub> , 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	22
s2c6	1000 m	PPO <sub>4</sub> , Salts	16
s2c7	1000 m (BEACH)	O <sub>2</sub> , 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), MikeB(2@150), Salts, DR(4@5)	20
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) KA (pb MC)	24
s2c12	1000 m	MIT, BL(1@75, DCM)(3@175), MikeB(2@200), 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,	22
s2c15	1000 m	HPLC, Chl a, Slides, Salts	22
s2c16	4740 m (PO-3)	O <sub>2</sub> , DR(4@3500), Salts, MattB(1@4500,4000,3500,3500,3000,2500,2000,1500,1500,1000,100,50) MattB(pbO <sub>2</sub> samples,4800,4000,3000,2000,Salmin)	24
<b><u>WHOTS Mooring</u></b>			
S50c1	200 m yo-yo	BC (1@DCM,70,40,15), BL(3@5,25,45,75,100,125,150)	24
<b><u>Kaena</u></b>			
S6c1	2400 m	Chl, Salts	13



**SHIP R/V KILO MOANA      HOT 209      Date February 16-20, 2009**

TIME	Monday 2/16	Tuesday 2/17	Wednesday 2/18	Thursday 2/19	Friday 2/20
0000		S2C1			
0100		S2C2 PP	Net Tow		
0200			S2C9 Gas		
0300					
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	
1200	PRR	Net Tow	PRR		
1300	S1C1	KA Net tow	Net Tow	Deploy CTDpump	
1400	Go-flo cast Transit to Seaglider	S2C5 PC/PN	S2C13 ATP		
1500	Recover Seaglider				
1600	Transit ALOHA	S2C6 PPO4		Transit St. Kaena	
1700			S2C14 PE		
1800		Recover PP array			
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	

**February 17: Sunrise 0702 Sunset 1830**

## 6.0 HOT-209 Watch Schedule

### **0300-1500**

Eric Grabowski - Watch Leader/ *Alt Tag*

Tara Clemente- *Water Boss*

Jay Wheeler- *Tag*

Michael Workman - *Alt Tag*

Christin Shacat – *Console*

Paul Lethaby – Chief Scientist - *Tag*

Shandy Buckley

### **1500-0300**

Karin Björkman – *Alt Tag*

Adriana Harlan - *Tag*

Susan Curless- *Water Boss*

Fernando Santiago-Mandujano - Watch Leader/ *Console*

Justin Smith - *Tag*

Dotty Bates

### **0900-2100**

Matt Baumann

### **At Large**

Blake Watkins

Ken Doggett

Brett Updyke - *Alt Tag*

Binglin Li

Sam Wilson - *Alt Tag*

Kate Achilles

Kate Werner

Stephanie Betancourt

Chris Olivas

Michael Bemen

### **OTG**

Elly Spiecher

Dan Fitzgerald