

## Hawaii Ocean Time-series HOT-212 Operational Cruise Plan

**Cruise ID:** KM 0915

**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 1, 2009 @ 0900

**Departure:** July 2, 2009 @ 0900

**Arrival:** July 6, 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 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 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) A Deep Moored Fluorometer will be deployed at the northeastern edge of the ALOHA circle (target deployment site: 22°50.00N, 157°54.25W) on the 4<sup>th</sup> day of the cruise. This operation should take about 2.5 hours.
- 5) 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 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)
ALOHA (sta. 2)	Sediment traps, gas array, net tows, CTD operations, primary productivity measurements, AC9/FRRf, misc. experiments.
WHOTS mooring station (Sta. 50)	One CTD cast (yo-yo to 200 m).
Deep Moored Fluorometer	Deploy Deep Moored Fluorometer
Kaena (sta. 6)	CTD cast (2400 m)
Underway/continuous	ADCP, thermosalinograph, fluorometry, meteorology

## 2.0. SCIENCE PERSONNEL

<b>Participant</b>	<b>Title</b>	<b>Affiliation/HOT Group</b>
Tara Clemente	Research Associate	UH/BEACH
Susan Curless	Chief Scientist – Res. Assoc.	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	Technician	UH/BEACH
Jay Wheeler	Research Associate	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	Technician	UH/PO
William Richardson	Volunteer	HCC/PO
Patricia Kassis	Volunteer	PO
Blake Watkins	Marine Engineer	UH/BEACH
Steve Cairns	Volunteer	UH BEACH
Erin Allmann	Volunteer	UH/BEACH
Alexia Syrmos	Intern	UH/BEACH
John Bullister	Scientist	PMEL
David Wisegarver	Scientist	PMEL
Corey Bryant	Intern	MATE/BEACH
Paul Berube	Post-doc Scientist	MIT/CMORE
Daniel Sher	Post-doc Scientist	MIT/CMORE
Libusha Kelly	Post-doc Scientist	MIT/CMORE
Christopher Pala	Journalist	BEACH
Vic Polidoro	Marine Technician	OTG
Kuhio Vellalos	Marine Technician	OTG

## 3.0. SUMMARY SCHEDULE

24 June	Pre-cruise meeting, MSB 307, 1030 hrs.
1 July	Ship loading starting at 0900 hrs.
2 July	Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0800.
2 July	Station 1 Kahe Point. operations.
3-5 July	Station ALOHA operations. Station 50, and deep moored fluorometer deployment
6 July	Station Kaena, and 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 and a PRR cast (Sect. 4.2.7) will be conducted at this location in the afternoon of July 2nd. 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 CTD 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](mailto: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 0553 hrs on July 3rd), 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](mailto: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 (1922 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](mailto: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 at around noon and midnight on the second, third, and fourth days of the cruise (see schedule). The A-frame and capstan will be needed for this operation. B. Watkins will be in charge of these operations.

#### 4.2.7. 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.

#### 4.2.8. 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 early morning of July 5th, after the pre-dawn 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.

#### 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 July 5<sup>th</sup>. 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 one PRR cast, two AC9/FRRf casts, and one 200m CTD cast. Once those operations are complete, the ship will transit to Station Kaena.

#### 4.5 Deep Moored Fluorometer Deployment (22° 50.00N, 157° 54.2W)

A fluorometer mooring will be deployed near the northeast section of the ALOHA Circle on the afternoon of July 5<sup>th</sup>. The ship's crane or the Sea-Mac winch with the A-frame will be needed to deploy the mooring's anchor using the tip plate. As time allows, a triangulation of the mooring will be conducted after the deployment with an acoustic transponder to determine the final resting position of the mooring. Blake Watkins will be in charge of this operation. After these operations are completed, the ship shall transit to Station Kaena.

#### 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 on the morning of July 6<sup>th</sup>, 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, $p\text{CO}_2$ system, and Fluorometer

The ship's thermosalinograph,  $p\text{CO}_2$  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 personnel 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 12L water sampling bottles, all spare parts
3. Two laboratory vans with assorted equipment for radioisotope and general use, and one clean CFC analysis van (Bullister's).
4. Distilled, deionized water and all required chemicals and isotopes
5. Storage van with assorted equipment (main deck)
6. Large vacuum waste containers
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

### 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 three vans, two general purpose lab vans, and Bullister CFC van
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 12L water sampling bottles (to be used as spare)
24. 1000 lb weight.
25. Remote CTD decibar pressure display in the winch operator cabin.
26. 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 212 CTD CASTS

July 2-6th, 2009

Cast	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, JB(pb oxygen/DIC), Salts	24
<b><u>Station ALOHA</u></b>		
s2c1	200 m CMORE(5@25, 5@45, 5@75), TC(2@30,1@tbd), BL(3@25,3@45)	24
s2c2	1000 m Primary Production, Salts, SW(1@25, 1@125), MB(pb on all depths)	24
s2c3	200m PB (6@ 5,75,DCM,200)	24
s2c4	4740 m (PO-1) O <sub>2</sub> , Temp, DOC, DIC/Alk, Nuts, JB(pb oxygen/DIC), Salts	24
s2c5	1000 m (PO-2) O <sub>2</sub> , Temp, Nuts, DIC/Alk, DOC, JB(pb oxygen/DIC), Salts	24
s2c6	1000 m PC/PN, SW(1@5,25,45,75,100,125,150,175), Salts	22
s2c7	1000 m PPO <sub>4</sub> , TC(10@tbd), Salts	24
s2c8	1000 m (BEACH) O <sub>2</sub> , Temp, DIC/Alk, Nuts, LLN, LLP, DOC, Keeling, Quay, JB(pb oxygen/DIC), Salts	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), Salts	22
s2c11	1000 m Open, CMORE(5@125,5@200), BL(12@tbd), Salts	24
s2c12	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
s2c13	1000 m MIT, TC(8@tbd) Salts	24
s2c14	1000 m ATP, MC(200,300,500,770), SW (1@200,300,400,500, 600,700,800,900,1000), Salts	24
s2c15	1000 m PE, MC(5,25,45,75,100,125,150,175), SW(pb MC), Salts SD(1@1000 and pb MC 5,25,45,75,100,125)	23
s2c16	1000 m HPLC, Chl a, Slides, JM(1@500), Salts	23
s2c17	4740 m (PO-3) Oxygen, MC(1000,2000,3000,4000), BL(3@75,125) Salts	18
s2c18	200m PB(24@tbd)	24
<b><u>WHOTS Mooring</u></b>		
S50c1	200 m yo-yo BL(3@ 5,25,45,75,100,125,150,175)	24
<b><u>Kaena</u></b>		
S6c1	2400 m Chl, Salts	13

SW=Sam Wilson, PB=Paul Berube, JB=John Bullister, MB=Mark Brzezinski, BL=Binglin Li,  
MC=Matt Church, JM=Jennifer McKay, TC=Tara Clemente, SD= Solange Duhamel



TIME	Thur. 7/2	Fri. 7/3	Sat. 7/4	Sun. 7/5	Mon. 7/6
0000		S2C1			S6C1
0100		S2C2 PP	Net Tow		
0200			S2C10 Gas		
0300		S2C3		AC9/FRRF	Transit Snug
0400		Deploy PP Array	Deploy Gas Array	Transit sed traps	
0500		S2C4 PO-1	S2C11 Open		
0600				Recover traps	
0700				Transit gas array	
0800			S2C12 PSi	Recover gas array	Arrive Snug
0900	Depart Snug			Transit St. 50	
1000		Net Tow	Net Tow	S50C1 WHOTS	
1100	Arrive Kahe (11:30) Weight cast	S2C5 PO-2 (Begin 36 hr)	S2C13 MIT	Transit St. ALOHA S2C18	
1200	PRR	Net Tow	PRR Hyperpro	PRR AC9/FRRF	
1300	Hyperpro S1C1	ATE	AC9/FRRF	AC9/FRRF	
1400		S2C6 PC/PN	S2C14 ATP	Transit mooring site	
1500	Transit ALOHA			Deploy fluorometer	
1600					
1700		S2C7 PPO4	S2C15 PE	Transit St. Kaena	
1800					
1900		Recover PP array			
2000		S2C8 BEACH	S2C16 HPLC		
2100					
2200		Net Tow	Net Tow		
2300	Arrive ALOHA Deploy sed traps	S2C9 PUR	S2C17 PO-3 (end 36 hours)		

**July 3: Sunrise 0553 Sunset 1922**

## 6.0 HOT-212 Watch Schedule

### **0300-1500**

Adriana Harlan - *Water Boss*

Eric Grabowski - *Tag*

Dan Sadler - *Alt Tag, Alt Water Boss, ISUS*

Corey Bryant - *Alt Tag*

Fernando Santiago-Mandujano - *Watch Leader- Console*

Jefrey Snyder - *Tag*

William Richardson - *Alt Tag*

### **1500-0300**

Susan Curless - *Chief Scientist - Water Boss*

Jay Wheeler - *Tag, ISUS*

Erin Allmann - *Alt Tag*

Paul Lethaby - *Watch Leader- Console*

Patricia Kassis - *Alt Tag*

Ian Hawkins - *Tag*

### **0900-2100**

Steve Caires

Christopher Pala

Tara Clemente

Alexia Syrmos

### **At Large**

Brett Updyke - *Alt Tag*

Binglin Li

Blake Watkins

Sam Wilson - *Alt Tag*

Daniel Sher

Paul Berube

Libusha Kelly

John Bullister

David Wisegarver

### **OTG**

Vic Polidoro

Kuhio Vellalos