

## Hawaii Ocean Time-series HOT-182 General Cruise Plan

Vessel: R/V *Kilo Moana*, University of Hawaii  
Master of the Vessel: Captain Rick Myers  
Chief Scientist: Fernando Santiago-Mandujano, University of Hawaii  
OTG Marine Technicians: Dan Fitzgerald, Gabe Foreman

Loading: June 9, 2006 @ 1000 HST  
Departure: June 12, 2006 @ 0900  
Arrival: June 16, 2006 @ 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 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° 46.1'N, 157° 53.4'W will be occupied on the 4<sup>th</sup> day of the cruise for about 30 minutes.
- 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)<br>ALOHA (sta. 2)    | Weight Cast, PRR cast, CTD cast (1000 m)<br>Sediment traps, net tows, CTD operations, primary productivity measurements, AC9/FRRf, misc. experiments. |
| WHOTS mooring station<br>(Sta. 50) | CTD cast (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              |

|                             |                         |          |
|-----------------------------|-------------------------|----------|
| Susan Curless               | Research Associate      | UH/BEACH |
| Ken Doggett                 | Research Associate      | UH/BEACH |
| Dan Fitzgerald              | Marine Technician       | OTG      |
| Gabe Foreman                | Marine Technician       | OTG      |
| Lance Fujieki               | Computer Specialist     | UH/BEACH |
| Eric Grabowski              | Research Associate      | UH/BEACH |
| Adriana Harlan              | Technician              | UH/BEACH |
| Paul Lethaby                | Research Associate      | UH/PO    |
| Claire Mahaffey             | Postdoctoral Researcher | UH/BEACH |
| Matthew Markley             | Undergraduate Student   | UH/PO    |
| Amanda Pontius              | Graduate Student        | UH/BEACH |
| Fernando Santiago-Mandujano | Research Associate      | UH/ PO   |
| Jefrey Snyder               | Marine Technician       | UH/PO    |
| Donn Viviani                | Graduate Student        | UH/BEACH |
| Blake Watkins               | Marine Engineer         | UH/BEACH |
| Doug White                  | Research Associate      | UH/BEACH |
| John Yeh                    | Graduate Student        | UH/PO    |

### 3.0. SUMMARY SCHEDULE

|            |                                                                          |
|------------|--------------------------------------------------------------------------|
| 6 June     | Pre-cruise meeting                                                       |
| 9 June     | Ship loading starting at 1000 hrs                                        |
| 12 June    | Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0830. |
| 12 June    | Station 1 Kahe Pt. operations.                                           |
| 13-15 June | Station ALOHA operations. Stations 50 and 6 CTD casts.                   |
| 16 June    | 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 400 lb. weight-test cast, one CTD cast to 1000 m, and a PRR cast (Sect. 4.2.8) will be conducted at this location in the afternoon of June 12. 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. Afterwards, two 200-m casts will be conducted before deploying the Gas array. These operations will be followed by a near-bottom CTD cast.

#### 4.2.2. Sediment trap 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 our 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 01325 and 03028, sending positions to [argosfix@km.soest.hawaii.edu](mailto:argosfix@km.soest.hawaii.edu), password: argosfix), 2 strobe lights, and 2 radio transmitters (channel 74, 156.725 MHz). Daily positions of the array shall be transmitted by email directly to the ship, 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 Gas Array deployment

Samples for the gas array will be collected from casts 1 and 2. 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, sending positions to [argosfix@km.soest.hawaii.edu](mailto: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.

#### 4.2.4. 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 gas array (cast 3) 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, Karin Bjorkman).

#### 4.2.5. Primary production experiment

Samples for the primary productivity experiment will be collected from the rosette (cast 9). Just before dawn (sunrise 0549 hrs on June 14), a second 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 # 60481, sending positions to [argosfix@km.soest.hawaii.edu](mailto:argosfix@km.soest.hawaii.edu), password: argosfix), strobe lights

and a radio transmitter (channel 72, 156.625 MHz). The ship shall keep within site of the array while performing CTD operations for the approximately 12-hour duration the array will be in the water. The array will be recovered just at sunset (1914 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.

#### 4.2.6. Plankton net tows

Two types of net tows will be conducted during the cruise

##### 4.2.6.1. Zoo net tows

These are our standard HOT zooplankton tows. Plankton nets 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.

##### 4.2.6.2. Claire net tows

These tows are hand-deployed off the stern for about half-hour periods, about two times during the cruise. We request that the ship remain stationary during these tows. C. Mahaffey will be in charge of these net tows.

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

On June 13 at 1330, 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).

Around noon on each day a profiling reflectance radiometer will be deployed from the main deck using the main crane. The instrument is hand-lowered and retrieved with assistance from the capstan.

#### 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

On June 15, after the second deep cast at Station ALOHA has been completed, we shall transit for the recovery of the floating sediment trap array. The main crane and the Sea-Mac winch will be needed to retrieve the sediment trap array. After the array is recovered, the ship shall transit to Station ALOHA to continue operations. After operations at ALOHA are completed, the ship shall transit to Station 50 to conduct one 200 m CTD cast.

#### 4.4 WHOTS Mooring (Station 50)

One 200-m CTD cast will be conducted near the WHOTS mooring. The cast should be conducted downwind, downcurrent, and at about 200 m from the mooring. The nominal position of the mooring is 22° 46.1'N, 157° 53.4'W. After this cast is completed, the ship shall transit to Station Kaena to conduct one CTD cast.

#### 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 June 15, 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 and Fluorometer

The ship's thermosalinograph 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 operation.

## 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. Four 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 dewers
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 with light and radio transmitter, floats, weights, polypro. Line, spare buoy, etc.
12. PRR, AC-9/FRRf and other optical measuring instruments.
13. Sea-Mac winch (440 VAC, 3 phase at 10 amps) and Kevlar line
14. Oxygen titration system
15. Plankton nets and towing lines
16. Desktop and laptop personal computers
17. Assorted tools
18. All required sampling bottles.
19. Deck incubation system
20. 400 lb weight.

21. Pertinent MSDS
22. Automated Trace Element Sampler (ATE)

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 three phase at 10 amps) and vans (208 VAC single phase at 30 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 the upper deck for two lab vans
8. Hand-held VHF transceivers
9. Precision depth recorder
10. Shackles, sheaves, hooks and lines
11. Shipboard Acoustic Doppler Current Profiler
12. Thermosalinograph and Fluorometer
13. Copy machine
14. Grappling hooks and line
15. Navlink2 PC or equivalent
16. Running fresh water and seawater, hoses
17. Electronic mail system
18. GPS system
19. Uncontaminated seawater supply
20. Capstan
21. Underway/on-station data acquisition system for meteorological instruments, ADCP, thermosalinograph, fluorometer
22. OTG's 24-place rosette, and 24 12-l water sampling bottles

Ship: R/V *KILO MOANA***HOT 182 CTD CASTS** 12 – 16 June, 2006

| 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, Salts | 24       |
| <b><u>Station ALOHA</u></b> |               |                                                                                       |          |
| s2c1                        | 200 m         | Gas Array (7@5, 25, 45), Salts,                                                       | 21       |
| s2c2                        | 200 m         | Gas Array (7@75, 100, 125) , Salts,                                                   | 21       |
| s2c3                        | 4740 m (PO-1) | O <sub>2</sub> , Temp, DOC, DIC/Alk, Nuts, Salts                                      | 24       |
| s2c4                        | 1000 m (PO-2) | O <sub>2</sub> , Temp, Nuts, DIC/Alk, Quay, DOC, Salts                                | 24       |
| s2c5                        | 1000 m        | ATP, Salts, MC (200,300,500,770), KB(100,125,150,175)                                 | 19       |
| s2c6                        | 1000 m        | PE, Salts, MC(5,25,45,75,100,125,150,175), KB(5,25,45,75)                             | 24       |
| s2c7                        | 1000 m        | HPLC, Chl a, Salts,                                                                   | 22       |
| s2c8                        | 1000 m(BEACH) | O <sub>2</sub> , Temp, DIC/Alk, Nuts, LLN, LLP, DOC, Keeling, Quay, Salts             | 23       |
| s2c9                        | 1000 m        | Primary Production, CM ( <a href="#">2@750</a> ), Salts                               | 24       |
| s2c10                       | 1000 m        | Open, CM(16@30)                                                                       | 16       |
| s2c11                       | 1000 m        | Open, PO Salinity Substandard (6@1020)                                                | 9        |
| s2c12                       | 1000 m        | PSi, MC(5,25,45,75,100,125,150,175)                                                   | 18       |
| s2c13                       | 1000 m        | PC/PN, Salts                                                                          | 14       |
| s2c14                       | 1000 m        | PPO <sub>4</sub> , Salts                                                              | 14       |
| s2c15                       | 1000 m        | Open, CM(11@30,1@750), ,BW Slides                                                     | 19       |
| s2c16                       | 4740 m (PO-3) | Oxygen, Salts, MC(1@1000,2000,3000,4000),MC(pb), PUR,KD(pb)                           | 24       |
| s2c17                       | 1000 m        | Salts, CM(8@30)                                                                       | 8        |
| s2c18                       | 200 m         | MIT, ZJ                                                                               | 14       |
| <b><u>WHOTS Mooring</u></b> |               |                                                                                       |          |
| S50c1                       | 200 m         | Salts, LB(4@5), MC(1@5,25,45)                                                         | 7        |
| <b><u>Kaena Point</u></b>   |               |                                                                                       |          |
| s6c1                        | 2500 m        | Open, Chl a, Salts                                                                    | 13       |

SHIP R/V *KILO MOANA*

## HOT 182

Date 12 – 16 June, 2006

| TIME | Mon. 6/12                        | Tue. 6/13                  | Wed. 6/14                    | Thur. 6/15          | Fri. 6/16           |
|------|----------------------------------|----------------------------|------------------------------|---------------------|---------------------|
| 0000 |                                  | S2C1 Gas 1                 |                              |                     |                     |
| 0100 |                                  | S2C2 Gas 2                 | Net Tow                      |                     |                     |
| 0200 |                                  |                            | S2C9 PP                      | Net Tow             |                     |
| 0300 |                                  |                            |                              | AC9/FRRF            |                     |
| 0400 |                                  | Deploy gas array           | S2C10 Open                   | Transit sed traps   |                     |
| 0500 |                                  | S2C3 PO-1                  | Deploy PP array              |                     |                     |
| 0600 |                                  |                            | Transit gas array            | Recover traps       |                     |
| 0700 |                                  |                            | Recover gas array            | Transit ALOHA       |                     |
| 0800 |                                  |                            | S2C11 Open                   |                     | Arrive Snug offload |
| 0900 | Depart Snug                      |                            |                              | S2C17               |                     |
| 1000 |                                  | Net Tow                    | Net Tow                      |                     |                     |
| 1100 | Arrive Kahe                      | S2C4 PO-2<br>(Begin 36 hr) | S2C12 Psi                    | S2C18 MIT/ZJ        |                     |
| 1200 | Weight cast<br>PRR               |                            | PRR<br>AC9/FRRF              | PRR<br>AC9/FRRF     |                     |
| 1300 | S1C1                             | Net Tow<br>ATE             |                              | AC9/FRRF            |                     |
| 1400 | Transit ALOHA                    | S2C5 ATP                   | Net Tow<br>S2C13 PC/PN       |                     |                     |
| 1500 |                                  |                            |                              | Transit St. 50      |                     |
| 1600 |                                  | Claire Net                 |                              | S50C1<br>Claire Net |                     |
| 1700 |                                  | S2C6 PE                    | S2C14 PPO4                   | Transit St. Kaena   |                     |
| 1800 |                                  |                            |                              |                     |                     |
| 1900 |                                  |                            | Recover PP array             |                     |                     |
| 2000 |                                  | S2C7 HPLC                  | S2C15 Open                   |                     |                     |
| 2100 |                                  |                            |                              | S6C1                |                     |
| 2200 |                                  | Net Tow                    | Net Tow                      |                     |                     |
| 2300 | Arrive ALOHA<br>Deploy sed traps | S2C8 BEACH                 | S2C16 PO-3<br>(end 36 hours) | Transit Snug        |                     |

June 14: Sunrise 0549 Sunset 1914



## 6.0 HOT-182 Watch Schedule

### **0300-1500**

Fernando S-Mandujano – Chief Scientist  
Jefrey Snyder - Tag  
Matthew Markley  
Eric Grabowski – Watch Leader – Water Boss  
Lance Fujieki – Alt. Tag  
Ken Doggett - Tag  
Adriana Harlan – Alt. Water Boss  
Donn Viviani

### **1500-0300**

Paul Lethaby  
John Yeh - Tag  
Amanda Pontius  
Karin Björkman - Watch Leader – Alt Tag  
Susan Curless  
Doug White - Tag

### **2200-1000**

Blake Watkins

### **At Large**

Claire Mahaffey

### **OTG**

Dan Fitzgerald  
Gabe Foreman