Hawaii Ocean Time-series
HOT-203 General Cruise Plan

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: Kuhio Vellalos and Tobin Chen

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

Loading: July 24, 2008 @ 0900
Departure: July 25, 2008 @ 0900
Arrival: July 29, 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. Three 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.

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.
WHOTS mooring station (Sta. 50)	One CTD cast (200 m).
Underway/continuous	ADCP, *p*CO2, thermosalinograph, fluorometry, meteorology

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Matthew Church	Scientist	UH/BEACH
Tara Clemente	Research Associate	UH/BEACH
Susan Curless	Chief Scientist – Res. Assoc.	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	Research Associate	UH/BEACH
Brenner Wai	Intern	UH/CMORE
Sam Wilson	Scientist	UH/CMORE
Jay Wheeler	Research Associate	UH/BEACH
Paul Lethaby	Research Associate	UH/PO
Fernando Santiago-Mandujano	Research Associate	UH/PO
Christin Shacat	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Gayle Philip	Volunteer	UH/PO
Eric Liaw	Volunteer	UH/PO
Erica Goetze	Scientist	UH
Jamie Becker	Graduate Student	CMORE
Mar Nieto-Cid	Scientist	CMORE
Darin Hayakawa	Technician	UH/Rappe
Kuhio Vellalos	Marine Technician	OTG
Tobin Chen	Marine Technician	OTG

3.0. SUMMARY SCHEDULE

17 July	Pre-cruise meeting, MSB 315, 1030hrs
24 July	Ship loading starting at 0900 hrs
25 July	Depart from Snug harbor at 0900 hrs. Science personnel on-board by 0800.
25 July	Station 1 Kahe Pt. operations.
25-28 July	Station ALOHA operations. Station 50 and Sea Glider Recovery.
29 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 and a PRR cast (Sect. 4.2.7) will be conducted at this location in the afternoon of July 25th. 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 200m casts and one 1000-m cast 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 determined 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 03028, 60482), 2 strobe lights, and 2 radio transmitters (channel 68, 156.425 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 0601 hrs on July 26), 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 # 01833, emailing positions to 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 last 6 hours of the approximately 12-hour time the array will be in the water. The array will be recovered just at sunset (1916 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 cast 10. 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. Zooplankton 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 (between 1000 and 1400) and around midnight (between 2200 and 0200) 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. E. Goetze 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 July 28, 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.

4.4. WHOTS Mooring (Station 50)

One 200-m CTD yo-yo cast will be conducted near the WHOTS mooring on July 28th. These casts 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 completing the yo-yo cast, the ship shall then transit to Station ALOHA to conduct one PRR cast, and two AC9/FRRf casts, and a 3000m CTD cast. After these operations are complete, the ship shall begin the recovery attempt on Sea Glider #146.

4.5. Sea Glider #146 Recovery

Sea Glider #146 is operating close to the eastern edge of the WHOTS mooring watch circle under diminished battery power. It has become necessary to retrieve Glider #146 before the battery fails. If weather permits, the small boat will need to be launched and used to retrieve the glider. An iridium handset will be provided for communication between OTG and the glider pilots for use in this operation. After the recovery of the Sea Glider is complete, the testing of the winch-pump system shall begin.

4.6. Winch-Pump System Testing

The winchpump system consists of a 15 hp winch and a 400 m cable. Within the cable, an inner tube pumps water directly on-board the ship, using a submersible pump and motor. The package that goes into the water (consisting of the submersible pump and small CTD package) has a total weight of 300-400 lbs and is attached to the 'wet-end' of the cable. The testing will consist of lowering the package into the water at 50 m increments to a maximum depth 200 m. We will test the CTD communications and also test the submersible pump. This involves turning it on and measuring the water flow on the deck-end. We will also do a Mega ohm test of the cable when it is submerged.

The plan is to deploy the system over the port side using a block suspended from the American crane. D. Sadler and S. Wilson will be in charge of these operations. Power requirements are 3-phase, 440 VAC, and 10 Amps. After these operations are completed, the ship shall begin transiting 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 and extra rosette cage
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, 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

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, one OTG rad 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. One SBE43 CTD oxygen sensor (to be used as spare)

Ship: R/V *KILO MOANA* HOT 203 CTD CASTS July 25 – July 29, 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	200m	CMORE(5@25, 5@45, 5@75), JB(9@5)	24
s2c2	200m	MC (tbd)	24
s2c3	1000 m	Primary Production, Salts, SW (1@25, 1@125), MB(pb on all depths)	24
s2c4	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts	24
s2c5	1000 m (PO-2)	O_2, Temp, Nuts, DIC/Alk, DOC, Salts	24
s2c6	1000 m	PC/PN, SW(1@5,25,45,75,100,125,150,175), Salts	22
s2c7	1000 m	PPO4, BL(2@45,75,100,125,150), Salts	24
s2c8	1000 m (BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP,DOC, Keeling, Quay, Salts	23
s2c9	1000 m	PUR, CMORE(5@1000, 5@770, 5@500), Salts	24
s2c10	1000 m	Gas Array (2@125,100) (3@5,25,45,75) MB (1@175,150,125,100,75,45,25,5)	24
s2c11	1000 m	Open, MR(1000,800,600,400,200,175,150,125,100,75,45,10) CMORE(5@125, 5@200), 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, JB(4@300), BL(2@5, 2@25), 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	23
s2c16	1000 m	HPLC, Chl a, Slides, Salts	22
s2c17	4740 m (PO-3)	Oxygen, MC(1000,2000,3000,4000), Salts MR(4000,3000,2000,1000,800,600,400,175,125,100,75,10)	24
s2c18	3000 m	JB(8@3000), BL(1@5,25,45,75,100,125,150)	15
WHOTS Mooring			
s50c1	200 m yo-yo	Salts	2
Kaena			
s6c1	2400 m	Chl, Salts	13

SHIP R/V *KILO MOANA* HOT 203 Date: July 25 – July 29, 2008

TIME	Fri. 7/25	Sat. 7/26	Sun. 7/27	Mon. 7/28	Tue. 7/29
0000		S2C1	Net Tow		
0100		S2C2	Net Tow		
0200		S2C3 PP	S2C10 Gas		
0300				AC9/FRRF	
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 Transit St. 50	Arrive Snug
0900	Depart Snug				
1000		Net Tow	Net Tow	S50C1	
1100	Arrive Kahe (11:30) Weight cast	S2C5 PO-2 (Begin 36 hr)	S2C13 MIT	PRR AC9/FRRF	
1200	PRR	Net Tow	PRR AC9/FRRF	AC9/FRRF	
1300	S1C1	ATE	Net Tow	S2C18	
1400		S2C6 PC/PN	S2C14 ATP		
1500	Transit ALOHA				
1600				Begin Sea Glider Ops	
1700		S2C7 PPO4	S2C15 PE		
1800				Winch Pump Testing	
1900		Recover PP array			
2000		S2C8 BEACH	S2C16 HPLC	Transit Snug	
2100					
2200	Arrive ALOHA	Net Tow	Net Tow		
2300	Deploy sed traps	S2C9 PUR	S2C17 PO-3 (end 36 hours)		

July 26: Sunrise 0601 Sunset 1916

6.0 HOT-203 Watch Schedule

0300-1500

Adriana Harlan - *Water Boss*
Lance Fujieki - *Tag*
Tara Clemente- *Alt tag, alt water boss*
Fernando Santiago-Mandujano- Watch Leader -*Console*
Jefrey Snyder- *Tag*
Eric Liaw

1500-0300

Susan Curless – Chief Scientist - *Water Boss*
Dan Sadler – *Tag, alt water boss*
Jay Wheeler - *Tag*
Paul Lethaby - Watch Leader - *Console*
Christin Shacat – *Alt tag*
Gayle Philip

At Large

Matt Church
Brenner Wai
Brett Updyke
Binglin Li
Sam Wilson
Erica Goetze
Mar Nieto-Cid
Jamie Becker
Darin Hayakawa

OTG

Kuhio Vellalos
Tobin Chen