Hawaii Ocean Time-series
HOT-238 Draft Cruise Plan

Cruise ID: KM 11-31
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Richard Meyer
Chief Scientist: Craig Nosse, University of Hawaii
OTG Marine Technicians: Ben Colello and Kuhio Vellalos

Kilo Moana phone number: 842-9817, cell # 864-0065, satellite # 001-870-336-956510
Marine Center phone number: 842-9813

Loading: December 17, 2011@0900 (Large starboard side specific items will be loaded Dec. 16)
Departure: December 18, 2011 @0900 (Science personnel on board by 0800).
Arrival: December 22, 2011 @ 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, the site of WHOTS-8 Mooring (anchor position: 22°40.1572'N, 157°57.0225'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 2 hours.

1.1 SCIENTIFIC OPERATIONS

Station	Activities
Kahe (sta. 1)	Weight Cast, Hyperpro cast, CTD cast (1000 m)
ALOHA (sta. 2)	Sediment traps, gas array, net tows, CTD operations, primary productivity measurements, ACS/AC9/FRRf, misc. experiments.
WHOTS mooring station (Sta. 52)	One CTD cast (yo-yo to 200 m), surface instrument intercomparisons.
Kaena (sta. 6)	One CTD cast (near bottom)
Underway/continuous	ADCP, thermosalinograph, pCO2 system, fluorometry, and meteorology.

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation/HOT Group
Susan Curless	Research Associate	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Research Associate	UH/BEACH
Donn Viviani	Graduate Student	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Benjamin Rubin	Intern	UH/CMORE
Daniela del Valle	Postdoctoral Researcher	UH/CMORE
Sandra Martinez-Garcia	Postdoctoral Researcher	UH/CMORE
Sam Wilson	Postdoctoral Researcher	UH/CMORE
Sara Thomas	Graduate Student	UH/CMORE
Brenner Wai	Graduate Student	UH/CMORE
Jefrey Snyder	Marine Technician	UH/PO
Cameron Fumar	Research Associate	UH/PO
Craig Nosse	Research Associate	UH/PO
Joseph Gum	Research Technician	UH/PO
Branden Obra	Research Technician	UH/PO
Colette Kerry	Graduate Student	UH/PO
Byron Blomquist	Associate Researcher	UH
Bettina Voelker	Researcher	Colo – Mines
Robin Schneider	Graduate Student	Colo – Mines
Ben Colello	Marine Technician	OTG
Kuhio Vellalos	Marine Technician	OTG

3.0. SUMMARY SCHEDULE

12 December	Pre-cruise planning meeting 1300 hrs.
16 December	Large starboard side specific items to be loaded.
17 December	Ship loading at 0900 hrs.
18 December	Depart from Snug harbor at 0900 hrs. **Science personnel on-board by 0800.**
18 December	Station 1 Kahe Pt. operations.
18 - 21 December	Station ALOHA operations. Station 52 CTD yo-yo cast, Station Kaena
22 December	Arrive back to Snug Harbor. 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 Hyperpro cast (Sect. 4.2.7) will be conducted at this location on December 18th. The A-frame, CTD crane and CTD winch will be required for these operations.

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, one 200-m CTD cast and one 1000-m CTD 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, to be determined enroute to ALOHA by local current conditions (see the Station ALOHA Nowcast/Forecast at http://aloha.manoa.hawaii.edu under "Operations"). The array will be deployed from the stern, using the A-frame and 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 60484, 84857), 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 and other experiments.

4.2.3 Primary Production experiment

Samples for the primary productivity experiment will be collected from the rosette. Before dawn (sunrise 0703 hrs on December 19th), 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 3028, 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 (1754 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 Bullister sampling bottles. We will need the ship's CTD crane and winch for these operations. Water samples for biogeochemical measurements will be collected on each CTD 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. 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 **(Jefrey Snyder, Brett Updyke)**.

4.2.5. Gas Array deployment

A second free drifting incubation array will be deployed the third day of the cruise at Station ALOHA. Samples for the gas array will be collected from Station 2 CTD cast 9. 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 3028, 60482), emailing positions to 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 25 hours after its deployment. Assistance from the Bridge is requested in plotting the drift track of the array.

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 midnight on the second and third days (see schedule) for a total of six slots. The A-frame and capstan will be needed for this operation. B. Watkins will be in charge of these operations.

4.2.7. Hyperpro

The Hyperpro is a profiling unit with one up-looking and one down-looking hyperspectral radiometer, a WET Labs ECO-BB2F triplet (measuring Chlorophyll-a fluorescence and backscattering in the blue and red wavelengths), temperature and conductivity sensors. This instrument also incorporates a ship mounted surface radiometer. Around noon on the first, second and fourth days, the Hyperpro will be deployed from the stern through a small block hung from the A-frame. The instrument is hand-lowered and retrieved with assistance from the winch.

4.2.8. ACS/AC9/FRRf/LISST

An optical package including a Wet Labs AC9 that measures water column spectral absorption and attenuation at nine wavelengths, a Chelsea Fast Repetition Rate Fluorometer (FRRf), a SeaBird Seacat with temperature, conductivity, fluorometer, and pressure sensors, and a LISST particle size and distribution analyzer will be deployed two times during the cruise.

Each deployment will consist of two up and two down profiles to a target depth of 200 m at a constant speed of 10 m/min during both the downcast and upcast. An instrument soaking period at just below the surface will be required between the two profiles. The A-frame and capstan will be needed for this operation

4.2.9. 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, weighing 5 lbs.

4.3 Floating sediment trap recovery

In the early morning of December 21st, 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 52 and conduct one 200 m yo-yo cast.

4.4 Station 52 - WHOTS-8 Mooring

The anchor position of the WHOTS-8 mooring is 22°40.1572'N, 157°57.0225'W. The watch circle of the buoy is about 2 nautical miles. Generally, the buoy stays on the edge of the watch circle. The buoy can be detected via radar in good weather conditions but is harder to detect with larger sea states.

4.4.1 CTD yo-yo cast (subsurface instrument intercomparison)

One 200-m CTD yo-yo cast with at least 6 full cycles will be conducted near the WHOTS mooring on December 21st for subsurface instrument intercomparison. This cast should be conducted downwind, down current, and about 200 m from the mooring.

4.4.2 Surface instrument intercomparison

While on station, the ship's meteorological system shall be in operation for surface instrument intercomparisons with the WHOTS mooring.

Once the yo-yo cast is completed, the ship shall transit to Station ALOHA to conduct one AC9/FRRf cast, one Hyperpro cast and one 200 m CTD cast. If the mooring is positioned such that it is within the Station ALOHA circle, these operations can be performed as close to the WHOTS mooring as safely possible to extend the surface instrument intercomparison.

4.5 Trace metal free Go-Flo cast

After Station 52 operations and final optics (AC9 and Hyperpro) work are complete, a trace metal free Go-Flo cast (with three 8 L bottles) shall be conducted through the A-frame. The trace metal free block (with accompanying wire readout), trace metal free line and Sea-Mac winch are requested for this operation.

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 in the evening of December 21st. Once the CTD cast is complete, the ship shall return to Snug Harbor.

4.7 MAPCO2 System

A MAPCO2 system shall be mounted on the rail of the O-2 deck towards the port stern. The MAPCO2 system will need to be supplied with underway seawater which will be accessed from the same outlet providing water to the incubators.

4.8 Carbon monoxide flux measurements

An aluminum mast shall be installed on the port bow of the ship (similar installation performed during 2009 WHOTS cruise aboard R/V *Kilo Moana*). Signal cables will be run between a CO analyzer on the mast and equipment in the IMET lab in the port bow. An air pump will also be installed (and secured) on deck for the system.

4.9 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 technicians will be in charge of the ADCP system.

4.10 Thermosalinograph, pCO_2 system, Fluorometer, and meteorological system

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 ship's meteorological system shall be in operation throughout the cruise. Access to real-time underway data

through the ship's network will be required. The OTG technicians will be in charge of the thermosalinograph, pCO_2 system, Fluorometer, and meteorological suite 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 Bullister sampling bottles, and all associated spare parts
3. One 20 ft. laboratory van with assorted equipment for radioisotope and general use (Van #23)
4. One 12 ft. equipment van ("Blue" Van)
5. Distilled, deionized water and all required chemicals and isotopes
6. Large vacuum waste container
7. Liquid nitrogen dewar
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. Hyperpro 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. 15-16 deg Incubator Chamber
21. 8 L Go-Flo bottles
22. MAPCO2 system

5.2 We will need the use of the following ship's equipment:

1. OTG Radioisotope van
2. A-frame
3. A-frame block assembly
4. Caley winch and crane with conducting wire for CTD
5. Electric power for winches (440 VAC, 3 phase, 60 Amp breaker) and vans (208 VAC single phase at 60 amps for lab van, 110 VAC 10 amps for equipment van)
6. Radio direction finder
7. Space on the main deck for one equipment van
8. Space on upper deck for two laboratory vans
9. Space on upper deck for incubators
10. Hand-held VHF transceivers
11. Precision depth recorder
12. Shackles, sheaves, hooks and lines
13. Shipboard Acoustic Doppler Current Profiler
14. Thermosalinograph, *p*CO2 system, and Fluorometer
15. Meteorological suite
16. Copy machine
17. Grappling hooks and line

18. Laptop with Nobeltec charting software and GPS feed
19. Running fresh water and seawater hoses
20. Electronic mail system
21. GPS system
22. Uncontaminated seawater supply
23. Small capstan (~ 10 m/min)
24. Underway/on-station data acquisition system for meteorological instruments, ADCP, thermosalinograph, fluorometer, pCO_2 and access to real-time data through the network.
25. OTG's 24-place rosette, and 24 12-l water sampling bottles (to be used as spare)
26. 1000 lb weight.
27. Large Sea-Mac winch (Mod. 1025 EHS). 60 Amp Hubbel plug/connector (440 VAC, 3 phase, 60 Amp breaker)
28. Trace metal free block (with accompanying wire readout) and trace metal free line

Ship: R/V *KILO MOANA* **HOT 238 CTD CASTS** **Date: December 18-22, 2011**

Cast		Samples	#Bottles
Kahe Pt.			
s1c1	1000 m	O_2, Temp, DIC/Alk, Nuts, Chl a, LLN, LLP, DOC, FCM, Salts	24
Station ALOHA			
s2c1	200 m	CMORE(5@25,5@45,5@75), BV(pb CMORE depths), ST(9@200)	24
s2c2	1000 m	Primary Production, DV(pb PP depths), SMG(pb PP depths, 1@500,O2min,1000), Salts	24
s2c3	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts	24
s2c4	1000 m (PO-2)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts	24
s2c5	1000 m	PC/PN, SMG(1@5,25,45,75,100,125,150, 175, 500,O2min,1000), Salts	24
s2c6	1000 m	PPO4, DdV(1@25), ST(1@150,200,225,250,350,400,450,500), Salts	23
s2c7	1000 m (BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP, DOC, Keeling, Quay, Salts	23
s2c8	1000 m	PUR, DdV(1@25), Salts	11
s2c9	1000 m	Gas Array(2@5,2@25,2@45,2@75,2@ 100, 2@125), SW(8@25), Salts	22
s2c10	1000 m	CMORE(5@500, 5@770, 5@1000), BV(pb CMORE depths), DV(6@25), Salts	24
s2c11	1000 m	PSi, MC(1@5,25,45,75,100,125,150,175), SMG(pb MC depths, 1@500, O2min, 1000), DV(1@25), Salts	21
s2c12	1000 m	CMORE (5@125, 5@200), BV(pb CMORE depths), DV(1@100) DdV(1@25), ST(1@550,600,650,700,770,800,900,1000), Salts	23
s2c13	1000 m	ATP, MC(1@200,300,500,770), Salts SW(1@200,300,400,500, 600,700,800,900,1000)	23
s2c14	1000 m	PE, MC(5,25,45,75,100,125,150,175), SW(pb MC), SMG(pb MC depths, 1@500, O2min,1000), Salts	24
s2c15	1000 m	HPLC, Chl a, Slides, DdV(1@25), Salts	23
s2c16	4740 m (PO-3)	Oxygen, MC(1@1000,2000,3000,4000), BW(7@150), Salts	19
WHOTS Mooring			
s52c1	200 m yo-yo	SMG(1@5,25,45,75,100,125,150, 175, 500,O2min,1000)	11
Kaena			
s6c1	2400 m	Chl, Salts	13

MC=Matt Church, **SW**=Sam Wilson, **DV=**Donn Viviani, **SMG=**Sandra Martinez-Garcia, **DdV**=Daniela del Valle, **ST**=Sara Thomas, **BW**=Brenner Wai, **BV**=Bettina Voelker

Ship: R/V *KILO MOANA* HOT 238 Date: December 18-22, 2011

TIME	Sun. 12/18	Mon. 12/19	Tue. 12/20	Wed. 12/21	Thu. 12/22
0000		S2C1	Net Tow		
0100					
0200		S2C2 PP	S2C9 Gas	AC9/FRRF	
0300					
0400		Deploy PP Array	Deploy Gas Array		
0500		S2C3 PO-1	S2C10 Open	Transit sed traps	
0600				Recover traps Transit gas array	
0700				Recover gas array	
0800			S2C11 PSi	Transit St. 52	Arrive Snug
0900	Depart Snug			S52C1 WHOTS	
1000		Net Tow	Net Tow	Transit St. ALOHA	
1100	Arrive Kahe (11:30) Weight cast	S2C4 PO-2 (Begin 36 hr)	S2C12 Open	Hyperpro AC9/FRRF	
1200	Hyperpro	Hyperpro	Net Tow		
1300	S1C1 Kahe	ATE			
1400		S2C5 PC/PN	S2C13 ATP	Go-Flo Cast	
1500	Transit ALOHA			Transit St. Kaena	
1600		S2C6 PPO4			
1700		Recover PP array	S2C14 PE		
1800					
1900					
2000		S2C7 BEACH	S2C15 HPLC		
2100				S6C1 Kaena	
2200		Net Tow	Net Tow		
2300	Arrive ALOHA Deploy sed traps	S2C8 PUR	S2C16 PO-3 (end 36 hours)	Transit Snug	

December 19th: Sunrise 0703, Sunset 1754

6.0 HOT-238 Watch Schedule

0300-1500

Adriana Harlan **–** *Water Boss*
Dan Sadler – *Alt. Tag*
Benjamin Rubin – *Tag*
Cameron Fumar– *Console*
Jefrey Snyder–Watch Leader – *Tag*
Colette Kerry – *Alt. Tag*

1500-0300

Susan Curless – *Water Boss*
Brett Updyke – Watch Leader **-** *Tag*
Craig Nosse – Chief Scientist – *Alt. Tag*
Joseph Gum – *Console*
Branden Obra – *Tag*

At Large

Blake Watkins
Donn Viviani
Bettina Voelker
Robin Schneider
Sandra Martinez-Garcia
Daniela del Valle
Brenner Wai
Sara Thomas
Byron Blomquist
Sam Wilson

OTG

Ben Colello
Kuhio Vellalos