Hawaii Ocean Time-series
HOT-284 Operational Cruise Plan

Cruise ID: OC1605B
Vessel: R/V Oceanus, Oregon State University
Master of the Vessel: Brian Wilson
Chief Scientist: Dan Sadler, University of Hawaii
Marine Technician: Croy Carlin

Marine Center phone number: 842-9813
Oceanus Cell number: 541-961-0593
Oceanus Satellite Phone Numbers: 011-881-641-413-524

Loading: May 26, 2016 @ 0900
Departure: May 27, 2016 @ 0800 (Science personnel on board by 0700).
Arrival: May 31, 2016 @ 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 May 27th 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 May 28-30th.
3) Station 52, the site of WHOTS-12 Mooring (anchor position 22° 40.061’ N, 157° 56.9654’ W) will be occupied on for about one hour on May 30th.
4) The Deep Trap Deployment Site is located at 22° 51'N, 157° 54'W and will be occupied on May 30th for about 6 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, optics casts, misc. experiments.
WHOTS mooring station (Sta. 52)	One CTD cast (yo-yo to 200 m), surface instrument intercomparisons.
Deep Trap Deployment Site	Deployment and triangulation of deep moored sediment traps.
Underway/continuous	ADCP, thermosalinograph, fluorometry, meteorology

2.0. SCIENCE PERSONNEL

Participant	Title	Affiliation
Alex Nelson	Research Associate	UH
Dan Sadler	Research Associate	UH
Brenner Wai	Research Associate	UH
Susan Curless	Research Associate	UH
Blake Watkins	Marine Engineer	UH
Brie Maillot	Technician	UH
Tara Clemente	Research Associate	UH/SCOPE
Greyson Adams	Research Associate	UH/SCOPE
Eric Welsh	Undergraduate	UH
Jefrey Snyder	Marine Technician	UH
Fernando Santiago-Mandujano	Research Associate	UH
Kellen Rosburg	Research Associate	UH
Robert (Walt) Deppe	Research Associate	UH
Croy Carlin	Marine Technician	OSU

3.0. SUMMARY SCHEDULE

16 May	Pre-cruise planning meeting 1300 hrs, Moore Conference Center, CMH
26 May	Ship loading at 0900 hrs.
27 May	Depart from Snug harbor at 0800 hrs. **Science personnel on-board by 0700.**
28-30 May	Station ALOHA operations. Station 52 CTD yo-yo cast, Station Kaena
31 May	Arrive back to Snug Harbor. Full offload.

4.0. OPERATIONAL PLANS

4.1. Station Kahe (21°20.6'N, 158°16.4'W)

A 500 lb. 1000 m weight-test cast, one CTD cast to 1000 m and a Hyperpro cast (Sect. 4.2.7) will be conducted at this location on May 27th. The Trawl winch and stern A-frame will be required for these operations. After the operations are satisfactorily completed, the ship shall proceed to Station ALOHA.

4.1.2 SLDMB Deployments

The SLDMB drifters are for mapping eddy formations off the west side of Oahu. Three drifters will be deployed by hand at one minute intervals after leaving Station Kahe for Station ALOHA. The ship's speed can be up to 5 knots during deployment as the drifters are deployed.

4.2. Station ALOHA (22°45'N, 158°W with 6 nm radius)

4.2.1. On arrival at Station ALOHA, the sediment traps will be deployed (Sect. 4.2.2). After the sediment trap deployment is complete, 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 in route to ALOHA by local current conditions. The array will be deployed through the stern A-frame using the small crane and the Sea-Mac winch.

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 3028, 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@kok.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 0557 hrs on May 28th), a free drifting incubation array will be through the stern A-frame using the small crane and the Sea-Mac winch. The array is equipped with two ARGOS satellite transmitters, (platform #'s 60484, 84857) strobe lights and a radio transmitter (channel 74: 156.725 MHz). Positions of the array will be emailed to argosfix@kok.soest.hawaii.edu, password: argosfix. 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 (1900 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 trawl winch and A-frame for these operations. Water samples for biogeochemical measurements will 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 **(Jefrey Snyder, Susan Curless)**.

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 CTD cast 8. The gas array will be deployed from the stern rail using the small crane and the Sea-Mac winch. The array is equipped with two ARGOS satellite transmitters (platform #'s 60484, 84857), emailing positions to argosfix@kok.soest.hawaii.edu, password: argosfix), a strobe light and a radio transmitter (channel 74: 156.725 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. 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 and midnight on the second, third, and fourth days (see

schedule) for a total of six slots. The A-frame and small 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, and 1400 on the second and fourth days, the Hyperpro will be deployed from the stern through a small block hung from the A-frame. The instrument is lowered and retrieved by hand. Each deployment will consist of three profiles before the instrument is retrieved.

4.2.8. Optics

An optical package including a Wet Labs ACS that measures water column spectral absorption and attenuation, 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 side A-frame and hydro wire will be needed for this operation.

4.3. Gas Array and floating Sediment trap recovery

In the morning of May 30th, after the optics cast has been completed, the ship shall transit for the recovery of the Gas Array. The stern A-frame and the Sea-Mac winch will be needed to retrieve the sediment trap array. After the Gas Array is recovered, the ship shall transit to recover the floating sediment trap array. After the sediment traps are recovered, the ship shall transit to Station ALOHA for an AC9/FRRf cast. Once the optics work is complete, the ship shall transit to Station 52 and conduct one 200 m CTD yo-yo cast.

4.4 Station 52 - WHOTS-12 Mooring

The anchor position of the WHOTS-12 mooring is 22° 40.061’ N, 157° 56.9654’ 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 5 full cycles will be conducted near the WHOTS mooring on May 30th 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, a Hyperpro cast will be conducted within the circle that defines Station ALOHA.

4.5. Deep Moored Sediment Trap Deployment (22° 51'N, 157° 54'W)

The Deep Moored Sediment Traps will be deployed at this location. Deployment should take 2 hours and an additional 2 hours are scheduled for acoustically mapping the location of the anchor. Once the anchor location is mapped, 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 technicians 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 OSU 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. One 20 ft. laboratory vans (#23) with assorted equipment for radioisotope and general use.
4. Distilled, deionized water and all required chemicals and isotopes
5. Large vacuum waste containers
6. Liquid nitrogen dewar
7. Drifting sediment trap array with strobe lights, satellite and radio transmitters, floats, weights
8. Polypropylene line
9. Sediment traps and crosses
10. Drifting primary production array and gas array with light and radio transmitter, floats, weights, polypropylene line, spare buoy, etc.
11. Hyperpro and other optical measuring instruments.
12. Oxygen titration system
13. Plankton nets and towing lines
14. Desktop and laptop personal computers
15. Assorted tools
16. All required sampling bottles
17. One 12 ft. blue equipment van
18. Pertinent MSDS
19. Chest Freezer (22 cubic inch)
20. ~1300 lb test weight
21. Deep moored sediment trap array. Including 4 x 4' steel baskets with floatation, 2 Paraflux type sediment traps. 2500 lb. anchor weight.
22. Seamac winch. 4'x 6' bolt pattern. 4700 lb.
23. Spare OTG 24-place rosette, and 24 12-l water sampling bottles.
24. Deck Incubator on 4'x4' containment pallet with hoses and fittings.
25. Pallet Jack

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

1. A-frame
2. A-frame block assembly
3. 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 lab van, 110 VAC 10 amps for equipment van)
5. Radio direction finder
6. -20 Freezer
7. Space for two vans **(#23 and blue equipment van)**
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. Underway/on-station data acquisition system for meteorological instruments, ADCP, thermosalinograph, fluorometer.
22. Remote CTD dbar pressure display in the winch operator area.
23. Monitor displaying ship coordinates, bottom depth and GMT.
24. -80 Freezer
25. Refrigerator

Ship: R/V Oceanus HOT 284 CTD CASTS **Date: May 27-31, 2015**

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	1000 m	Primary Production, Salts	22
s2c2	4740 m (PO-1)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts	24
s2c3	1000 m (PO-2)	O_2, Temp, DOC, DIC/Alk, Nuts, Salts	24
s2c4	1000 m	PC/PN, DNA(1@5,25,45,75), Salts	18
s2c5	1000 m	PPO4, SF-S(1@5, 25), Salts	16
s2c6	1000 m (BEACH)	O_2, Temp, DIC/Alk, Nuts, LLN, LLP, DOC, Keeling, Quay, Salts, SF-S(1@5,pb@25)	24
s2c7	1000 m	PUR, SF-S(1@5, 25), DNA(1@,100,125,150,175), Salts	16
s2c8	1000 m	Gas Array(3@5,25,45,75,100,125), SF-S(1@5, 25), Salts	22
s2c9	1000 m	DNA(1@200,225,250,275), SF-S(1@5, 25), Salts	8
s2c10	1000 m	PSi, SF-S(1@5, 25), KW-B(1@5,25,45), Salts	14
s2c11	1000 m	SF-S(1@5, 25), Salinity Std(6@1020), Salts	10
s2c12	1000 m	ATP, DNA(2@300,400,500,770), SF-S(1@5, 25), Salts	21
s2c13	1000 m	MC(1@5,25,45,75,100,125,150,175), SW(pb MC,1@700), SF-S(1@5, 25), Salts	13
s2c14	1000 m	HPLC, Chl a, Slides, Salts	22
s2c15	4740 m (PO-3)	Oxygen, DNA(1@1000,2000,3000,4000), Salts	15
WHOTS Mooring			
s52c1	200 m yo-yo	DIC/TA(1@5), KW-B(1@5,25,45), SW(6@25), Salts	10

MC=Matt Church, **SW**=Sam Wilson, **SF-S=**Sara Ferrón-Smith,
KW-B=Kate Watkins-Brandt,

Ship: R/V Oceanus HOT 284 Date: May 27-31, 2015

TIME	Fri. 5/27	Sat. 5/28	Sun. 5/29	Mon. 5/30	Tue. 5/31
0000		Arrive ALOHA (0000) Deploy Traps			
0100					
0200		S2C1 PP	S2C8 Gas		
0300				Optics	
0400		Deploy PP Array	Deploy Gas Array		
0500		S2C2 PO-1	S2C9 Open	Transit gas array	
0600				Recover gas array Transit sed traps	
0700				Recover traps	
0800	Depart Snug		S2C10 PSi	Transit ALOHA	Arrive Snug Off Load
0900					
1000	Arrive Kahe (11:00)		Net Tow	Optics	
1100	Weight cast	S2C3 PO-2 (Begin 36 hr)	S2C11 Open		
1200	Hyperpro S1C1 Kahe	Net Tow	Net Tow	Transit St. 52 S52C1 WHOTS	
1300		Hyperpro		Hyperpro	
1400	Transit ALOHA (deploy drifters)	S2C4 PC/PN	S2C12 ATP	Transit to Mooring	
1500				Deployment Site Deploy Bottom	
1600				Moored Sediment Traps	
1700		S2C5 PPO4	S2C13 Open		
1800				Triangulate Anchor	
1900		Recover PP array			
2000		S2C6 BEACH	S2C14 HPLC	Transit Snug	
2100					
2200		Net Tow Net Tow	Net Tow		
2300		S2C7 PUR	S2C15 PO-3 (end 36 hours)		

May 28th: Sunrise 0555, Sunset 1903

6.0 HOT-284 Watch Schedule

0300-1500

Alex Nelson – *Water Boss*
Dan Sadler – Chief Scientist – *Alt. Tag*
Brenner Wai – *Tag*
Walt Deppe - *Console*
Jefrey Snyder – Watch Leader - *Tag*

1500-0300

Brie Maillot – *Water Boss*
Susan Curless – Watch Leader
Kellen Rosburg– *Console*
Fernando Santiago-Mandujano — *Tag*

0900-2100

Eric Welsh

At Large

Blake Watkins
Greyson Adams – *Alt. Tag*
Tara Clemente – *Alt. Tag*

OSU Marine Tech

Croy Carlin