HOT-287: Chief Scientist Report

Chief Scientist: Dan Sadler

R/V *Oceanus*
14-18 October, 2016

Cruise ID: OC1610A
Departed: 14 October at 0800 (HST)
Returned: 18 October at 0829
Vessel: R/V *Oceanus*

Master of the Vessel: Jeff Crews
OSU Marine Technician: Brandon D'Andrea

1. SCIENTIFIC OBJECTIVES

The objective of the cruise was to maintain a collection of hydrographic and biogeochemical data at the Hawaii Ocean Time-series (HOT) stations. Four stations were to 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 was to be occupied on October 14th 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 was to be occupied during October 15th to 17th.
3) Station 50, the site of WHOTS-13 Mooring (22° 47.24' N, 157° 54.45' W) was to be occupied on October 17th 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 was to be occupied on October 17th for about 2 hours..

Upon arrival to Station Kahe a 1300 lb weight-test cast to 1000 m, one CTD cast to 1000 m, and a Hyperpro cast were to be conducted on the afternoon of October 14th. The single CTD cast was to be conducted to collect a continuous profile of various physical and chemical parameters. Water samples were to be collected at discrete depths for biogeochemical measurements. After these operations were satisfactorily completed, the ship was to proceed to Station ALOHA

Upon arrival to Station ALOHA, the free-drifting sediment trap array was to be deployed. The sediment trap array was to stay in the water for about 53 hours. This was to be followed by a 1000 m CTD cast for preparation of the Primary Productivity Array. This cast was to be followed by the deployment of the free-drifting Primary Productivity Array to incubate *in situ* for 12 hours. A full-depth (~4740 m) CTD cast was to be conducted after the deployment of the Primary Production Array, followed by 1000 m CTD casts at strict 3 hour intervals for at least 36 hours for continuous and discrete data collection, ending with another full-depth CTD cast at 2300 on October 17th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on October 16th. The Gas Array was to be recovered on October 17th.

A plankton net was to be towed between 1000-1400, and 2200-0200 for 30 minute intervals on October 15th and 16th at Station ALOHA.

The Hyperpro (a profiling unit with one up-looking and one down-looking hyperspectral radiometer, a WET Labs ECO-BB2F triplet, temperature and conductivity sensors), was to be deployed on October 14th, 15th, and 17th.

A trace metal free sample was to be collected by the ATE sampler on October 16th at Station ALOHA.

After the 36 hour burst period of CTD work at Station ALOHA was accomplished, the ship was to transit to recover the floating Gas Array and the Sediment Trap Array on the morning of October 17th.

After recovering the arrays, the ship was to transit to Station ALOHA to conduct a two hour optics cast and then transit to Station 50 for a one-hour 200 m CTD yo-yo cast.

Once operations at Station ALOHA were complete, the ship was to transit to Station Kaena for a near bottom (~2500 m) CTD cast.

The following instruments were to collect data throughout the cruise: shipboard ADCP, thermosalinograph, fluorometer, and the ship's anemometer.

2. 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
Karin Björkman	Research Specialist	UH
Eric Shimabukura	Research Associate	UH/SCOPE
Greyson Adams	Research Associate	UH/SCOPE
Linde Berg	Graduate Student	Wageningen
Jefrey Snyder	Marine Technician	UH
Fernando Santiago-Mandujano	Research Associate	UH
Kellen Rosburg	Research Associate	UH
Robert (Walt) Deppe	Research Associate	UH
Brandon D'Andrea	Marine Technician	OS

3. GENERAL SUMMARY

Operations during the cruise were conducted as planned. Due to rough conditions, a third tagline was employed for deployment and recovery of the CTD from the side squirt boom. The OSU CTD primary salinity and oxygen sensors produced noisy data on the two deep casts. Secondary sensor data was clean. Three bottles failed to close on S2C2 due to rosette frame interference and low internal spring tension. Several bottles leaked when the vents were opened for sampling. Bottle salinities will help determine if the water in these bottles was compromised. The OSU marine tech adjusted the frame and spring tension before the second deep cast.

Two near bottom CTD casts and thirteen 1000 m CTD casts were completed at Station ALOHA. One 200 m yo-yo cast was conducted near the WHOTS mooring. One 1000 m CTD cast was conducted at Station Kahe and one near bottom CTD cast was conducted at Station Kaena.

The Floating Sediment Traps, Primary Production Array, and Gas Array were all deployed and recovered successfully.

Six net tows were completed successfully; three during the day, and three during the night.

Three Hyperpro casts (three cycles each) were successfully completed.

The ATE was successfully deployed on October 16th.

Four optics casts were performed on October 17th. Two at night and two during the day.

The underway thermosalinograph system, the underway fluorometer, and the ADCP functioned correctly during the cruise.

The ship's anemometer ran without interruption during the cruise.

Winds during the cruise were 15-25 knots with six to eight foot seas. Skies were mostly clear with 10-20% cloud cover. Rain squalls were common at night.

4. R/V *Oceanus* OFFICERS AND CREW, TECHNICAL SUPPORT

The R/V *Oceanus* delivered excellent support for our work. Captain Jeff Crew and the ship's crew showed flexibility, enthusiasm, concern, and dedication to our scientific mission.

Technical support during this cruise was also excellent. Marine Technician Brandon D'Andrea was available to assist in our work during the cruise. We appreciate his help readying the OSU CTD for the two deep casts off the stern.

We also appreciate the good food provided throughout the cruise. Many in the science party commented that the meals on the Oceanus are the best in the fleet.

5. DAILY REPORT OF ACTIVITIES (HST)

13 October 2016

1400 Pre-cruise meeting on bridge to go over schedule and familiarize crew with deployment procedures.

14 October 2016

0710 Abandon ship, fire drills, science meeting, safety briefing
0805 Depart Pier 35
1040 Arrive Station Kahe
1049 Start weight cast to 1000m
1133 End weight cast, weight recovered
1142 Start Hyperpro 21° 20.617'1N, 158° 16.367'W
1217 End Hyperpro
1230 No CTD data after weight cast. Found open connection at slip rings. Fixed and continued
1305 Start S1C1 ctd cast to 1000 dbar
1424 End ctd cast
1435 Transit to Station ALOHA

2310 Arrive Station ALOHA

15 October 2016

0022 Deployed Sediment Traps 22° 49.96'N, 158° 3.30'W
0156 Start S2C1 ctd cast to 1000 dbar
0307 End ctd cast
0415 Begin PP array deployed at 22° 45.934'N, 158° 2.171'W
0436 PP array deployed at 22° 45.007°N, 158° 2.148'W
0502 Start S2C2 ctd cast to bottom using OSU 12 place rosette off stern
0519 Restarted cast on acquisition computer, enabled manual con and col in "configure inputs" beforehand. Turned pumps on and began cast as normal.
0658 9m off bottom at 22° 44.999'N, 157° 59.999'W
0850 End ctd cast. Bottles 10,11,12 did not close. Bottles 1,6,8 leaking from bottom cap when vent opened.
1052 Start S2C3 ctd cast to 1000 dbar
1217 End ctd cast
1230 Start net tow at 22° 45.03'N, 15°∞ 59.96'W
1303 End of net tow
1311 Hyperpro at 22° 45.22'N, 157° 59.83'W
1406 End Hyperpro at 22° 45.226'N, 157° 59.868'W
1410 Start S2C4 ctd cast to 1000 dbar
1527 End ctd cast
1657 Start S2C5 ctd cast to 1000 dbar
1810 End of cast. No water for salinity left in bottle 8
1929 Recovery of PP array 22° 41.972'N, 158° 8.964'W
1949 End of PP recovery. Transit to St. ALOHA
2018 Start S2C6 ctd cast to 1000 dbar
2139 End of cast
2205 Start net tow
2234 End net tow
2237 Start net tow
2305 End net tow
2317 Start S2C7 ctd cast to 1000 dbar

16 October 2016

0024 End of cast
0155 Start S2C8 ctd to 1000 dbar
0254 End of cast
0420 Begin gas array deployment at 22° 45.237'N, 157° 59.844'W
0444 Gas array released at 22° 45.298'N, 157° 59.720'W
0506 Start S2C9 ctd cast to 1000 dbar
0607 End of cast
0758 Start S2C10 ctd cast to 1000 dbar
0911 End of cast
1000 Start net tow at 22° 45.586'N, 157° 58.198'W
1025 End net tow at 22° 45.852'N, 157° 58.0478'W
1032 start ATE cast at 22° 45.837'N, 157° 58.034'W
1103 Start S2C11 ctd cast to 1000 dbar
1205 End ctd cast
1230 Net tow at 22° 45.9'N, 157° 58.1'W

1302 End net tow
1356 Start S2C12 ctd cast to 1000 dbar
1304 End of cast
1657 Start S2C13 ctd cast to 1000 dbar
1811 End of cast
1954 Start S2C14 ctd cast to 1000 dbar
2115 End of cast
2209 Start net tow. CTD wire kinked while preparing for net tow.
2234 End net tow
2244 Raining on station
2300 Start S2C15 ctd cast near bottom using OSU ctd/rosette, HOT deck box. Had to use config without GPS because gps was disconnected inadvertently. Location of deployment 22° 45.001'N, 157° 59.991'W. Primary salinity showing very noisy values below 100 dbar. Secondary looks ok. Same with oxygen.

17 October 2016

0048 10 m off bottom 22° 44.988'N, 157° 57.997'W
0222 End of cast. Bottle 6 and 8 leaking badly on recovery from bottom cap.
0321 Start optics at 22° 45.014'N, 158° 0.063'W
0409 Recover optics
0417 Start optics at 22° 45.077'N, 157° 59.900'W
0505 End optics at 22° 45.65'N, 157° 59.870'W
0521 Transit to gas array
0640 Arrive at gas array. 22° 36.65'N, 158° 11.71'W
0648 Start GA recovery at 22° 36.626'N, 158° 11.564'W
0703 End GA recovery at 22° 36.590'N, 158° 11.394'W
0708 Transit to sediment traps
0841 Start sediment trap recovery at 22° 40.821'N, 158° 28.300'W
0900 End sediment trap recovery
0905 Transit to St. ALOHA
1055 Start optics at 22° 44.365'N, 158° 5.233'W
1204 Optics recovered
1206 Optics redeployed
1259 Transit toward WHOTS buoy
1335 Hyperpro at 22° 44.72'N, 158° 1.47'W
ISUS removed from CTD package
1402 Wind speed - gyro seems to get frozen for a few minutes, wind speed - adu5 seems to be ok
1408 End of Hyperpro
1412 Transit to WHOTS buoy
1522 Start S50C1 ctd yoyo to 250 dbar to include secondary DCM
1537 CTD at 250 m. Secondary fluorescence max at about 210 dbar
1548 End cycle 1, start cycle 2
1602 At 5 dbar. End cycle 2, start cycle 3
1609 At 250 dbar
1615 At 5 dbar, end cycle 3, start cycle 4
1622 At 250 dbar. Glitches in primary salinity, but not in secondary
1633 End of cast. Raining on station.
1654 Transit to Kaena Sta.
2242 Start S6C1 ctd cast to near-bottom ~2500 dbar
2345 15 m off bottom

18 October 2016

0046 End of cast
0101 Transit to Pier 35
0839 "All fast" at Pier 35

6. HOT program sub-components:

Investigator	Project	Institution
Dave Karl	Core Biogeochemistry	UH
John Dore	Biogeochemistry QA/QC	MSU
Roger Lukas	Hydrography	UH
Mike Landry	Zooplankton dynamics	SIO
Ricardo Letelier	Optical measurements	OSU
Ancillary programs:		
Andrew Dickson	CO_2 dynamics and inter-calibration	SIO
Paul Quay	$DI^{13}C$	UW
Matt Church	SCOPE: Diversity and activities of nitrogen-fixing microorganisms	UM
Sam Wilson	SCOPE: Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide	UH
Sara Ferron-Smith	SCOPE: Determination of net community production from the diurnal variability of O2/Argon ratios	UH
Ed DeLong	SCOPE: DNA collection	UH
Dave Caron	SCOPE: DNA collection	USC
Dan Repeta	SCOPE: DNA collection	WHOI
Angel White	SCOPE: Diazotroph microscopy sampling	OSU
Tim Burrell	Water column respiration experiments	UH
Chris Schvarcz	Water for CMORE Hale Phytoplankton Culture Collection	UH