HOT-214: Chief Scientist Report

Chief Scientist: Paul Lethaby

R/V Kilo Moana

August 17th – 21st, 2009

Cruise ID: KM0920
Departed: August 17, 2009 at 0900 (HST)
Returned: August 21, 2009 at 0800 (HST)
Vessel: ***R/V Kilo Moana***
Operator: University of Hawaii
Master of the Vessel: Captain Brian Wehmeyer
Chief Scientist: Paul Lethaby
OTG Electronics/Deck Operations Technicians: Dan Fitzgerald and Vic Polidoro

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 the first day of the cruise for about 2.5 hours.
2) Station 2, referred to as Station ALOHA (A Long Term Oligotrophic Habitat Assessment) 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 the 2nd, 3rd, and 4th days of the cruise.
3) Station 52, is the site of the WHOTS-6 Mooring, located at 22° 39.989'N, 157° 56.961'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 approximately 3 hours.

Upon arrival to Station Kahe a 1,300 lb. weight-test cast to 500 m, one CTD cast to 1000 m, a PRR cast, and a Hyperpro cast were to be conducted at this location on the afternoon of August 17th. The single CTD cast was to be conducted to collect continuous profiles 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 at Station ALOHA, the free-drifting sediment trap array was to be deployed. The sediment trap array was to stay in the water for about 52 hours. This was to be followed by one shallow CTD cast to 200 m and one 1000 m cast (to collect water for the Primary Production Array). These casts were to be followed by the deployment of the free-drifting Primary Productivity Array to incubate insitu 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 on August 20th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on August 19th. The Gas Array was to be recovered on August 20th.

A plankton net was to be towed between 1000 – 1400 and 2200 – 0200 for 30 min intervals on August 18th and August 19th at Station ALOHA.

Hand held net tows of various mesh sizes were to be conducted throughout the cruise off the stern of the ship.

A Profiling Reflectance Radiometer (PRR) and the Hyperpro were each to be deployed for half-hour periods near noon time on August 17th, 19th, and 20th.

A package including a Wet Labs AC9, a Chelsea Fast Repetition Rate Fluorometer (FRRf), and a SeaBird Seacat was to be used to profile the upper 200 m at Station ALOHA around noon time on August 19th and in the early morning and around noon on August 20th .

After the 36 hour burst period of CTD work at Station ALOHA was accomplished, the ship was to transit to recover the floating Sediment Trap array and the Gas Array on August 20th.

After recovering the arrays, the ship was to transit to Station 52 to conduct a one-hour 200 m CTD yo-yo cast after which the ship was to re-position within Station ALOHA to conduct two AC9/FRRf casts, one PRR cast, and a Hyperpro cast.

After the PRR, Hyperpro, and AC9/FRRf operations were completed, the ship was to transit to Station 6, referred to as Station Kaena where a near-bottom CTD cast (~2500 m) was to be conducted to collect salinity and chlorophyll samples for calibration.
After Station Kaena operations were complete, the ship was to transit back to Snug Harbor.

The following instruments were to collect data throughout the cruise: shipboard ADCP, thermosalinograph, underway fluorometer, meteorological suite, and the pCO2 system.

2. SCIENCE PERSONNEL

Cruise Participant	Title	Affiliation
Tara Clemente	Research Associate	UH/BEACH
Susan Curless	Research Associate	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Binglin Li	Graduate Student	UH/CMORE
Dan Sadler	Research Associate	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Jay Wheeler	Research Associate	UH/BEACH
Jane-Anne Sarver	Volunteer	UH/BEACH
Sam Wilson	Post-doc Scientist	UH/CMORE
Fernando Santiago-Mandujano	Research Associate	UH/PO
Paul Lethaby	Chief Scientist – Research Assoc.	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Mary-Margaret Murphy	Research Associate	UH/PO
Rebecca Mabardy	Undergraduate Student	UH/PO
Sarah Yasui	Undergraduate Student Assistant	UH/PO
Matt Archer	Graduate Intern	UH/PO
Scott Grant	Graduate Student	UH/CMORE
Jeff Krause	Post-doc Scientist	UCSB
Vic Polidoro	Marine Technician	OTG
Dan Fitzgerald	Marine Technician	OTG

3. GENERAL SUMMARY

Operations during the cruise were conducted as planned without any major delays. All objectives for HOT-214 were successfully completed.

There were some issues regarding the operation of the Appleton crane used for CTD deployments. Communication of these problems from the ship could have been much improved.

During the previous cruise (km0919) the boom extension was slipping when the crane was knuckled down and the boom was in a vertical position. This could be compensated for by the crane operator moving in the boom occasionally but operating in this way presented a safety risk for those personnel on the deck involved with the deployment and recovery of the CTD package. As a result the boom was restrained at the fully in position using chain binders so that operations could continue until the ship returned to harbor and repairs could be made. Engineers were unable to remove parts of the crane as planned on August 15th and we were informed that the crane could be used if the boom were welded in a fixed position. It was decided that that should be in the fully out position to provide some room between the CTD rosette and the side of the ship as swell was anticipated from tropical storm Guillermo which was due to pass 400 miles to the north of Station ALOHA.

On the morning of departure, science was briefed that the crane boom had not been welded in place and that a valve had been replaced during work carried out over the weekend. Assurances from the Captain were given that although the boom would still slip slightly when in the vertical position there was no chance that it could fall out as there were shims inside the boom casing that would prevent this. Tests were carried out at Station Kahe using a test weight and the slippage was controlled by the crane operator.

Upon arrival at Station ALOHA the Captain informed the Chief Scientist that the Chief Engineer insisted on placing a preventer system on the boom in order to prevent the boom from falling out of the boom casing. Unless a preventer was installed he would condemn the use of the crane. As this was very late notice (the first CTD cast was due in 30 minutes), a decision to use the crane as had been used during the previous cruise, with the boom secured in the fully in position with chain binders, was made until the following day. This would allow time for the boom to be welded in the fully out position and minimally impact the science schedule.

By the next day the plan had changed and the boom was to be extended to the fully out position before the crane was swung with the wire whip being used as a safety preventer. This system took some extra time before and after each CTD cast but did not impact the cruise schedule adversely.

Once all objectives were completed at Station ALOHA, extra time was utilized to occupy two additional stations (Stations 10 and 11) on the return transit to Station Kaena. An anti-cyclonic eddy was centered over station ALOHA and the stations were included to provide a transect across this feature.

One 1000 m CTD cast was conducted at Station Kahe. Thirteen 1000 m CTD casts, one 200 m, and two deep casts were conducted at Station ALOHA. One 500 m CTD yo-yo cast was conducted near the WHOTS mooring (Station 52). One 400 m cast and one 1000 m cast were conducted at Stations 10 and 11 respectively on the return transit. One near-bottom CTD cast was conducted at Station Kaena.

CTD profiling speeds were reduced due to the large swell present from tropical storm Guillermo.

The array of floating sediment traps, the gas array, and the primary production array were deployed and recovered without any major incidents. All arrays did not drift far, with the sediment trap array being recovered just over 6 miles to the north west of the center of ALOHA. The primary production and gas array were both recovered inside the circle.

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

Two hand deployed net tows were conducted off the stern.

The PRR and the Hyperpro were each deployed three times around noon.

The Seapoint underway fluorometer normally used on the *Kilo Moana* had been replaced with a Turner fluorometer and functioned correctly throughout the cruise.

The ADCP, pCO2 system, and the ship's meteorological system ran without interruption throughout the cruise. The valve to thermosalinograph was found to be closed during the beginning of the cruise and was opened at 1300 HST on the 17th August after noting that the recorded temperatures were too low.

Tropical Storm Guillermo was due to pass approximately 400 miles to the north of the Hawaii Islands and was being monitored closely during the course of the cruise. Winds were from the east between 10 – 15 knots increasing to 15 – 20 knots toward the last day of the cruise with seas of 3 – 7 ft and a moderate swell from the north east.

We arrived at Snug Harbor for off-loading on August 21st, at 0800 (HST).

4. R/V KILO MOANA, OFFICERS AND CREW, TECHNICAL SUPPORT

The R/V Kilo Moana continues to maintain excellent ship support for our work. The Captain and ship's crew were most helpful and accommodating throughout the cruise. The bridge was very flexible in receiving changes to our operational schedule after the ship's equipment failures occurred. Throughout our cruise, the entire crew showed enthusiasm, concern, and dedication to our scientific mission.

Technical support during this cruise was excellent. OTG personnel were available at any time to assist in our work and helped keep operations running smoothly.

5. DAILY REPORT OF ACTIVITIES (HST)

August 14, 2009: Pre loading day

Crane pick operations were carried out this day to help facilitate a planned tour of the ship by Senator Inouye the following day. Most heavy items (lab vans, winch and capstan) were already on-board the ship following the previous cruise. Items loaded this day included the CTD rosette, blue equipment van, gas cylinders, AC9/Frrf package and net tow equipment.

August 15, 2009: Loading Day

The remaining equipment and hand carried items were loaded this day. Between 10:00am and 11:00am Senator Inouye toured the ship.

August 17, 2009:

0900 Departed from Snug harbor.
0945 Safety briefing and science meeting followed by abandon ship and fire drills.
1200 Arrived at Kahe Station. 1300 lb weight cast to 500 m with 3 deployment/recovery cycles to test the Appleton crane boom extension.
1300 PRR cast
1320 Hyperpro cast
1340 Station 1 Cast 1, 1000 m CTD cast
1520 Transit to Station ALOHA – Deployed magnetometer
2300 Arrive Station ALOHA
2350 Sediment trap array deployed 22 43.912'N 157 59.990'W

18 August 2009:

0025 Station 2 Cast 1, 200 m CTD cast
0142 Station 2 Cast 2, 1000 m CTD cast
0419 Primary Production array deployed 22 44.68'N 157 59.56'W
0430 Transit to pump ships tanks
0547 Station 2 Cast 3, deep CTD cast

0930 Transit to pump ships tanks
1100 Net tow
1134 Station 2 Cast 4, 1000 m CTD cast – Start 36 hour burst sample period
1330 Net tow
1430 Station 2 Cast 5, 1000 m CTD cast
1620 Transit to pump ships tanks
1746 Station 2 Cast 6, 1000 m CTD cast
1958 Primary production array recovered 22 45.829'N 158 0.771'W
2020 Station 2 Cast 7, 1000 m CTD cast
2204 Net tow
2306 Station 2 Cast 8, 1000 m CTD cast

19 August 2009:

0100 Net tow
0155 Station 2 Cast 9, 1000 m CTD cast
0415 Gas array deployed 22 45.02'N 158 1.65'W
0450 Station 2 Cast 10, 1000 m CTD cast
0615 Transit to pump ships tanks
0753 Station 2 Cast 11, 1000 m CTD cast
1008 Net Tow
1056 Station 2 Cast 12, 1000 m CTD cast
1230 PRR cast
1255 Hyperpro cast
1325 AC9/FRRf cast
1419 Station 2 Cast 13, 1000 m CTD cast
1615 Transit to pump ships tanks
1708 Station 2 Cast 14, 1000 m CTD cast
1951 Station 2 Cast 15, 1000 m CTD cast
2200 Net Tow
2314 Station 2 Cast 16, deep CTD cast – End of 36 hour burst period

20 August 2009:

0339 AC9/FRRf cast
0440 Transit to recover sediment trap
0612 Recovered Sediment trap array 22 49.50'N 158 4.60'W
0649 Recovered Gas array 22 44.92'N 158 2.40'W
0821 Station 52 Cast 1, 500 m yo-yo CTD cast
0856 Hand deployed surface net tow (S. Wilson)
1041 AC9/FRRf cast
1215 AC9/FRRf cast
1255 PRR cast
1320 Hyperpro cast
1322 Hand deployed surface net tow (B. Li)
1340 Transit to Station 10

1540 Station 10 Cast 1, 400 m CTD cast
1650 Transit to Station 11
1834 Station 11 Cast 1, 1000 m CTD cast
2000 Transit to Station Kaena
2142 Station 6 Cast 1, 2400 m CTD cast

21 August 2009:

0020 Transit to Snug Harbor – Deployed magnetometer
0800 Arrived at Snug Harbor. Full offload

HOT program sub-components

Investigator	Project	Institution
Matt Church	Core Biogeochemistry	UH
Roger Lukas	Hydrography	UH
Mike Landry	Zooplankton dynamics	SIO
Ricardo Letelier	Optical measurements	OSU
Ancillary programs:		
Charles Keeling	CO_2 dynamics and intercalibration	SIO
Paul Quay	$DI^{13}C$	UW
Penny Chisholm	Prochlorococcus population dynamics	MIT
Matt Church	Diversity and activities of nitrogen-fixing microorganisms	UH
Various CMORE PI's	Microbial RNA/DNA collection	UH/CMORE
Mark Brzezinski	Silica production and dissolution rate measurements	UCSB
Additional programs:		
Dave Karl (via Sam Wilson)	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide	UH
Scott Grant	Testing preservation/freezing techniques on metagenomic samples from the upper water column	UH