HOT-216: Chief Scientist Report

Chief Scientist: Paul Lethaby

R/V Ka'Imakai-O-Kanaloa

November 2nd – 6th, 2009

Cruise ID: **KOK0917**
Departed: November 02, 2009 at 0900 (HST)
Returned: November 06, 2009 at 0800 (HST)
Vessel: ***R/V Ka'Imakai-O-Kanaloa***
Operator: University of Hawaii
Master of the Vessel: Captain Ross Barnes
Chief Scientist: Paul Lethaby
OTG Electronics/Deck Operations Technicians: Elly Speicher 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 3 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° 39.99'N, 157° 56.96'W will be occupied on the 4th day of the cruise for about two hours.
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 500 lb. weight-test cast to 1000 m, one CTD cast to 1000 m, and a Hyperpro cast were to be conducted at this location on the afternoon of the first day. 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 November 5th.

Another free-drifting array (Gas Array) was to be deployed for 24 hours for incubation experiments on November 4th. The Gas Array was to be recovered on November 5th.

A plankton net was to be towed between 1000 – 1400 and 2200 – 0200 for 30 min intervals on November 3rd and November 4th at Station ALOHA.

A Hyperpro profiling instrument was to be deployed for half-hour periods near noon time on November 2nd, 4th, and 5th.

A package including a Wet Labs AC9, a Chelsea Fast Repetition Rate Fluorometer (FRRf), a SeaBird Seacat, and a LISST particle size and distribution analyzer was to be used to profile the upper 200 m at Station ALOHA around noon time on November 4th and in the early morning and around noon on November 5th.

An automated trace element sampler (ATE) was to be deployed to a depth of 10 m for 30 minutes in the afternoon of November 3rd.

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 November 5th.

After recovering the arrays, the ship was to transit to recover the sea glider. Once the sea glider was recovered the ship was to re-position within Station ALOHA to conduct an AC9/FRRf/LISST cast, followed by a Hyperpro cast.

The ship was then to transit to Station 52 to conduct one 200 m cast and one one-hour 200 m CTD yo-yo cast.

An ARGO float was to be deployed at station ALOHA once all other operations were completed.

After the ARGO float is deployed 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, and meteorological suite.

2. SCIENCE PERSONNEL

Participant	Title	Affiliation
Susan Curless	Research Associate	UH/BEACH
Lance Fujieki	Computer Specialist	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Technician	UH/BEACH
Blake Watkins	Marine Engineer	UH/BEACH
Paul Lethaby	Chief Scientist – Research Assoc.	UH/PO
Nancy Niklis	Research Associate	UH/PO
Fernando Santiago-Mandujano	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Sarah Yasui	Undergraduate Student Assistant	UH/PO
Ken Doggett	Research Associate	UH/CMORE
Solange Duhamel	Post-doc Scientist	UH/CMORE
Don Viviani	Graduate Student	UH/CMORE
Jeff Krause	Post-doc Scientist	UCSB
John Bullister	Scientist	PMEL
Dave Wisegarver	Technician	PMEL
Anill Rick Rupan	Research Engineer	UW
Qian Li	Graduate Student	UH
Elly Speicher	Marine Technician	OTG
Vic Polidoro	Marine Technician	OTG

3. GENERAL SUMMARY

Operations during the cruise were conducted as planned without any major delays. All objectives for HOT-216 were successfully completed. There were some technical problems with one of the ship's generators. A total shut down was planned in order to resolve the problem and science activities in the labs were halted for 15mins. The engineers however were able to fix the generator before the planned shutdown and science was able to continue.

One 1000 m CTD cast was conducted at Station Kahe. Twelve 1000 m CTD casts, two 200 m, and two deep casts were conducted at Station ALOHA. Two 200 m CTD casts were conducted near the WHOTS mooring (Station 52), the second cast being a one hour yo-yo cast. One near-bottom CTD cast was conducted at Station Kaena.

The array of floating sediment traps, the gas array, and the primary production array were deployed and recovered without any major incidents. All arrays drifted to the north-west, with the sediment trap and gas array being recovered 10 miles and 8 miles, respectively from the center of ALOHA.

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

The Hyperpro was deployed three times around noon.

The optical package ACS/AC9/FRRf/LISST was deployed twice during the cruise.

The ATE sampler was deployed and upon recovery was found to have failed to open.

The sea glider was recovered from its holding position 1.5 miles to the north east of the center. The glider had been operating in a shallow virtual mooring mode in this location. Prior to recovery it was instructed to remain at the surface. The ship was then able to maneuver alongside the glider positioning it at the starboard side towards the stern. A lasso was put over its lifting points and it was brought aboard using the small crane and winch.

An ARGO float was deployed on leaving station ALOHA successfully. The float was hand deployed from the rear quarter. Once the ship has slowed down the float was lowered to the sea surface and a slip line released as the ship moved forward slowly.

The ADCP, thermosalinograph, fluorometer, and the ship's meteorological system ran without interruption throughout the cruise.

Winds were from the east to north-east between 20 – 25 knots gusting to 30 knots for the first three days of the cruise. Winds died down to 15 – 20 knots during the last day. Seas were 5 – 7 ft from the north-east with a large 6 – 8 ft swell from the north-west.

We arrived at Snug Harbor for off-loading on November 6th, at 0735 (HST).

Changed operations due to time constraints:
Station ALOHA: S2C2 was conducted to 200 m instead of the planned 1000 m to make up time in the schedule.

Added operations:
A deep moored thermistor string's acoustic released was ranged on the morning of November 5th. A response from the acoustic release was received.

4. R/V KA'IMAKAI-O-KANALOA, OFFICERS AND CREW, TECHNICAL SUPPORT

The R/V Ka'Imikai-O-Kanaloa continues to maintain excellent ship support for our work. The Captain and ship's crew were most helpful and accommodating throughout the cruise. 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)

30 October, 2009: Loading Day
The lab vans, winches, and scientific equipment were loaded this day.

02 November, 2009
0900 Departed from Snug harbor
0930 Abandon ship and fire drills, followed by safety briefing and science meeting
1200 Arrive at Station KAHE
1210 1000 m weight cast
1235 Hyperpro cast
1331 Station 1 cast 1 (1000 m)
0305 Transit to Station ALOHA

03 November, 2009
0115 Arrive Station ALOHA
0153 Sediment trap array deployed 22° 45.38'N 158° 02.45'W
0225 Station 2 cast 1 (200 m)
0345 Station 2 cast 2 (200 m)
0552 Primary production array deployed 22° 46.37'N 157° 59.90'W
0616 Station 2 cast 3 (~4740 m)
1020 Net tow
Ship generator problem resolved.
1224 Station 2 cast 4 (1000 m) – Start 36 hour burst sample period.
1335 Net tow
1415 ATE sampler deployed – failed to open
1444 Station 2 cast 5 (1000 m)
1655 Station 2 cast 6 (1000 m)
1855 Primary production array recovered 22° 47.85'N 158° 02.83'W
1959 Station 2 cast 7 (1000 m)
2215 Net tow
2313 Station 2 cast 8 (1000 m)

04 November, 2009
0100 Net tow

0158 Station 2 cast 9 (1000 m)
0430 Gas array deployed 22° 46.48'N 158° 00.87'W
0500 Station 2 Cast 10 (1000 m)
0757 Station 2 Cast 11 (1000 m)
1000 Net Tow
1055 Station 2 Cast 12 (1000 m)
1200 Hyperpro cast - Cast was repeated as first cast was not deep enough.
1255 Trouble shooting AC9
1310 ACS/AC9/FRRf/LISST cast
1402 Station 2 Cast 13 (1000 m)
1659 Station 2 Cast 14 (1000 m)
1958 Station 2 Cast 15 (1000 m)
2200 Net Tow
2303 Station 2 Cast 16 (~4740 m) - End of 36 hour burst sample period.

05 November, 2009
0305 AC9/FRRf/LISST cast
0400 Transit to recover sediment trap
0630 Recovered Sediment trap array 22° 50.04'N 158° 09.60'W
0735 Recovered Gas array 22° 51.10'N 158° 05.78'W
0945 Sea Glider recovered 22° 46.75'N 157° 59.01'W
1030 Ranged on deep moored thermistor string 23° 43.99'N 158° 01.08'W
1145 ACS/AC9/Frrf/LISST cast
1300 Hyperpro cast was repeated as first cast was not deep enough.
1403 Station 52 Cast 1 (200 m cast)
1515 Station 52 Cast 2 (200 m yo-yo cast)
1700 Deployed ARGO float at southern edge of ALOHA circle 22° 39.60'N 157° 59.00'W
1710 Transit to Station Kaena
2249 Station 6 Cast 1 (2400 m)

06 November, 2009
0045 Transit to Snug Harbor
0735 Arrive at Snug Harbor for 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
John Bullister	CFC and SF6 tracer saturation levels in the water column	PMEL
Additional programs:		
Dave Karl (via Sam Wilson)	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide	UH/CMORE
Dave Karl (via Solange Duhamel)	Alkaline phosphatase activity characterization	UH/CMORE
Dave Karl	Sea glider	UH/CMORE
Dave Karl (via Ken Doggett)	Flow sorting of radiolabeled prochlorococcus.	Moor
Dave Karl (via Ken Doggett)	RNA/DNA sample collection.	UH/CMORE
Qian Li/ Guangyi Wang	Abundance and spatial diversity of mycoplankton in the water column	UH
Steve Riser/Rick Rupan	ARGO float	UW