

HOT-212: Chief Scientist Report

Chief Scientist: Susan Curless

R/V Kilo Moana

July 2-6th, 2009

Cruise ID: KM0915

Departed: July 2, 2009 at 0900 (HST)

Returned: July 6, 2009 at 0800 (HST)

Vessel: *R/V Kilo Moana*

Operator: University of Hawaii

Master of the Vessel: Captain Brian Wehmeyer

Chief Scientist: Susan Curless

OTG Electronics/Deck Operations Technicians: Vic Polidoro and Kuhio Vellalos

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. Five 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 50, is the site of the WHOTS Mooring, located at 22° 46'N, 157° 53.83'W and was to be occupied on the 4th day of the cruise for about 1 hour.
- 4) A Deep Moored Fluorometer will be deployed at the northeastern edge of the ALOHA circle (target deployment site: 22°50.00N, 157°54.25W) on the 4th day of the cruise. This operation should take about 2.5 hours.
- 5) 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 July 2nd. 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, one 1000 m cast, to collect water for the Primary Production Array,

and another 200m CTD cast. 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 July 5th.

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

A plankton net was to be towed between near noon and midnight for 30 min intervals on July 3rd and July 4th at Station ALOHA.

A trace metal sampler was to be deployed on July 3rd to collect a trace metal clean surface seawater sample.

A Profiling Reflectance Radiometer (PRR) and the Hyperpro was to be deployed for half-hour periods near noon time on July 2nd, 4th and 5th.

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 July 4th and in the early morning and around noon on July 5th.

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 July 5th.

After recovering the arrays, the ship was to transit to Station 50 to conduct a one-hour 200m CTD yo-yo cast after which the ship was to re-position within Station ALOHA to conduct one 200m CTD cast, a PRR cast, and two AC9/FRRf casts.

After the PRR and AC9/FRRf operations were completed, the ship was to transit to the site designated for the Deep Moored Fluorometer deployment. Once the deployment of the fluorometer was complete, triangulation on the drop position was to be done.

When triangulation operations were complete, 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 including salinity and chlorophyll samples for calibration.

After Station Kaena operations for the cruise were complete, and the ship was to transit back to Snug Harbor.

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

2. SCIENCE PERSONNEL

Cruise Participant	Title	Affiliation
Tara Clemente	Research Associate	UH/BEACH
Susan Curless	Chief Scientist – Res. Assoc.	UH/BEACH
Eric Grabowski	Research Associate	UH/BEACH
Adriana Harlan	Research Associate	UH/BEACH
Binglin Li	Graduate Student	UH/BEACH
Dan Sadler	Research Associate	UH/BEACH
Brett Updyke	Technician	UH/BEACH
Jay Wheeler	Research Associate	UH/BEACH
Sam Wilson	Post-doc Scientist	UH/CMORE
Fernando Santiago-Mandujano	Research Associate	UH/PO
Paul Lethaby	Research Associate	UH/PO
Jefrey Snyder	Marine Technician	UH/PO
Ian Hawkins	Technician	UH/PO
Patricia Kassis	Volunteer	PO
Blake Watkins	Marine Engineer	UH/BEACH
Steve Caires	Volunteer	UH BEACH
Erin Allmann	Volunteer	BEACH
Alexia Syrmos	Intern	UH/BEACH
John Bullister	Scientist	PMEL
David Wisegarver	Scientist	PMEL
Corey Bryant	Intern	MATE/BEACH
Paul Berube	Post-doc Scientist	MIT/CMORE
Daniel Sher	Post-doc Scientist	MIT/CMORE
Libusha Kelly	Post-doc Scientist	MIT/CMORE
Christopher Pala	Journalist	BEACH
Vic Polidoro	Marine Technician	OTG
Kuhio Vellalos	Marine Technician	OTG

3. GENERAL SUMMARY

Operations during the cruise were conducted mostly as planned with minor delays due to ship equipment malfunctions.

The ship's CTD crane experienced a power outage that was determined to be a blown fuse, and ship's propulsion and DPS systems went off-line when power was lost to the bridge computers which control these systems.

Changing of transmission cables and CTD wire re-termination were performed by J.Snyder in efforts of fixing the transmission errors experienced at the console. High resistance was found on the hydrowire in the CTD junction box and was traced to a faulty slip ring. Once the connector was fixed, the errors went away.

One 500 m weight cast was performed with a 1,300 lb. weight and one 1000 m CTD cast was conducted at Station Kahe (1). Two near-bottom deep casts, eleven 1000 m, four 200 m, and one 78 dbar CTD casts were conducted at Station ALOHA (2). One, one hour 200m yo-yo cast was conducted near the WHOTS mooring (Station 50). One near bottom cast was conducted at Station Kaena (6).

One of the 1000 m CTD casts of the 36 hour burst period was cancelled and water needs were shifted to other casts to accommodate the time needed to re-terminate the CTD wire. During one of the 1000 m CTD casts of the 36 hour burst period the ship lost propulsion and DPS capabilities with the CTD at 87 dbar. The CTD was recovered and then re-deployed about 30 minutes later once manual control to the ship's propulsion systems was obtained.

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 northwest.

Five net tows were successfully completed, two were conducted during the day, and three during the night. One day time net-tow was cancelled due to the blown fuse on the CTD crane which caused schedule delays beyond the net tow timing window of 1000-1400.

Ten hand net tows were conducted off the stern.

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

The ATE deployment was cancelled on July 3rd due to communication issues between the computer and the sampler. Communication between the instrument and computer was established later in the cruise and on July 5th an ATE deployment was attempted. Upon recovery, it was found that sample collection was unfortunately not successful.

The underway fluorometer did not work properly throughout the duration of the cruise.

The ADCP, pCO₂ system, thermosalinograph, and the ship's two anemometers ran without interruption throughout the cruise.

Winds were from the east between 10-12 knots during the course of the cruise with seas of 2-3ft.

We arrived at Snug Harbor for off-loading on July 6th, at 0815 (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. They were very flexible in receiving changes to our operational schedule. 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)

July 2nd, 2009

0900- Depart Snug Harbor
0940- Science party briefing and safety meeting
1020- Abandon ship and fire drills
1200- Arrive Station Kahe
1215- Weight Cast
1220- Problems with CTD crane potentially due to a blown fuse
1235- Crane working again, engineers report that they didn't change a fuse but went through the fuse bank taking them out and putting them back in which seemed to fix the problem, but no new fuses were actually put onto the crane.
1310- end of weight cast
1320- PRR cast
1354- Hyperpro cast
1418- S1C1
1550- End of cast, transit to ALOHA
1600- Deployment of magnetometer
2335- Magnetometer recovered

July 3rd, 2009

0002- Start of sediment trap deployment
0019- Sediment traps in the water
0026- Array released 22 45.050'N 158 2.027'W
0105- S2C1- primary oxygen and conductivity sensors very noisy on trace, sensors flushed with seawater
0218- S2C2- sensors still noisy, cable connection checked and pump checked
0417- S2C3- sensors noisy, pump replaced after further testing determined the pump to be faulty, and the ISUS was removed for the deep cast
0459- Deployment of the primary production array. Release position 22 45.46'N, 158 0.9'W NNW current of approx 1kt in upper 50m according to ADCP data
0520- Transit to pump ship's tanks
0648- S2C4
1023- end of cast
1030- net tow
1115- Transit to pump ship's tanks
1239- S2C5
1315- Hand net tow of stern
1330- Hand net recovered

1340- hand net tow
1428- End of S2C5
1440- hand net tow (B.Li)
1600- S2C6 There were many transmission errors while the CTD was lifted off the deck and into the water. Once the package reached 10m, the errors stopped, but it was decided that in efforts of fixing the errors it was time to re-terminate the wire.
To compensate for re-termination time and to maintain our schedule and collection of core analyses, the PC/PN and PPO4 sampling was combined on cast 6 and cast 7 was canceled. Ancillary water on both casts was shifted to casts later in the cruise when possible and in some cases canceled. 50m of wire was spooled off and cut, 9967m remains on the drum.
1707- hand net tow (S.Wilson)
1724- end of cast, transit to pump ships tanks
1941- Recovery of Primary Production Array 22 47.701'N 158 1.821'W
1956- S2C7 BEACH cast; 1 error at 6dbar, no errors on down cast, or during recovery.
2020- hand net tow
2306- S2C8

July 4, 2009

0100- net tow
0200- S2C9
0330- Transit to pump ships tanks
0450- deploy gas array 22 46.5'N 158 1.63'W
0510- S2C10
0612- end of cast
0758- S2C11
0811- Ship propulsion issues due to power loss on bridge, CTD was in water at 87 dbar.
0813- end of cast, CTD on board and no bottles fired
0844- begin S2C12, consecutive numbers on casts maintained since data was collected on previous attempt at full profile. Ship lost DPS system, cast was completed on manual steering to hold station.
0943- error on CTD while at 5m
0944- end of cast
1000- Transit to pump ship's tanks
1045- net tow
1120- S2C13
1210- hand net tow
1233- end of cast, one error when cast was recovered
1245- PRR
1310- Hyperpro
1335- AC9/FRRf
1432- S2C14 -30 errors before the cast was deployed, 2 errors while in the water at 6 dbar
1555- end of cast
-High resistance on the hydrowire was found in the CTD junction box and was traced to the slip ring. A connector was fixed, and readings went back to 1 ohm with 330 ohm total resistivity.
1709- S2C15

-ISUS dropped to zero on upcast at 800 dbar, and intermittent throughout the rest of the cast.
1833- end of cast, transit to pump ship's tanks

1953- S2C16

-ISUS to zero on upcast at 500 dbar, and intermittent throughout the rest of the cast.

2101- end of cast

2200- net tow

2318- S2C17- PO 2nd Deep

July 5, 2009

0305- end of deep cast

0315- AC9/FRRf

0415- transit to pump ship's tanks

0510- Recovery of Sediment Traps 22 50.13'N 158 6.45'W, 7.8nm from the center of ALOHA

0531- array on deck

0600- Recovery of the Gas Array 22 49.09'N 158 4.38'W

0613- Completed Recovery

0620- Transit to WHOTS mooring

0758- S2C18 200m from WHOTS mooring

0808- hand net

0834- S50C1, 5 cycles

1029- end of cast

1045- AC9/FRRf

1100- hand net tow (S.Wilson)

1145- AC9/FRRf

1230- PRR

1234- hand net tow (S.Wilson)

1245- Hyperpro

1315- hand net tow (B.Li)

1435- Start of mooring deployment

1520- Deep Moored Fluorometer deployed 22 50.001'N, 157 54.51'W -benthic release codes were checked by J.Snyder and confirmed to be different than the WHOTS mooring.

1545- ATE -communication was made with the instrument and it was thought that the sampler would work, but upon recovery it was shown that the deployment was not successful in collecting a sample.

1630- Triangulation of Mooring Position Started

1653- Transit to Station Kaena

1700- Magnetometer deployed

2230- Magnetometer recovered

2245- S6C1- Kaena Point cast

July 6, 2009

0058- End of Cast

0100- Transit to Snug Harbor

HOT program sub-components:

Investigator:

Dave Karl
Roger Lukas
Bob Bidigare
Mike Landry
Mark Abbott/Ricardo Letelier

Project/Institution:

Core Biogeochemistry/UH
Hydrography/UH
HPLC pigments/UH
Zooplankton dynamics/UH
Optical measurements/OSU

Ancillary programs:

Investigator:

Charles Keeling
Paul Quay
Penny Chisholm
Zehr/Church/Montoya

Various CMORE PI's
Mark Brzezinski

Bullister/Wisegarver

Project/Institution:

CO2 dynamics and intercalibration/SIO
DI13C
Prochlorococcus population dynamics/MIT
Diversity and activities of nitrogen-fixing
microorganisms/UH
Microbial RNA/DNA collection/CMORE
Silica production and dissolution rate
measurements/UCSB
CFC and SF6 tracer saturation levels in the water
column/PMEL

Additional programs:

Investigator:

Edward Boyle
Sam Wilson

Solange Duhamel

Paul Berube/Daniel Sher/Libusha Kelly

Yajaun Lin

Project/Institution:

Trace metals/MIT
Reduced gases in the upper ocean: The cycling
of methane, sulfide and nitrous oxide/CMORE/UH
The role of alkaline phosphatase activity in DOP
utilization in the NPSG/CMORE/UH
Isolation of novel co-occurring Prochlorococcus,
Synechococcus, heterotrophic microorganisms and
bacteriophage from the photic zone.
Method testing new reverse transcription method
for Prochlorococcus.