

TROPICAL ATMOSPHERE-OCEAN (TAO) PROGRAM  
FINAL CRUISE REPORT  
KA-09-05

Area: Equatorial Pacific between 8°N and 8°S latitude along 155°W Longitude, 8°S to 8°N Latitude along 170°W Longitude and 8°N and 8°S latitude along 180° Longitude.

Itinerary:

KA-09-05 DEP *November 9, 2009, Honolulu, HI*

ARR *December 6, 2009, Honolulu, HI*

**CRUISE DESCRIPTION**

The Tropical Atmosphere Ocean (TAO) array consists of 70 buoys utilizing a taut line mooring configuration used to mount data collection sensors for climate research purposes. Fifteen buoys are serviced by JAMSTEC and the remaining 55 buoys from 95°W longitude to 165°E longitude are serviced by National Data Buoy Center (NDBC). Repair and maintenance of the buoys is performed by NDBC contracted personnel on an annual basis utilizing the NOAA Ship *Ka'imimoana* and other ships. The buoys' deployment lifecycle are up to 18 months to ensure at least one year of data collection can be completed.

TAO Project Points of Contact:

TAO Program Manager

Shannon McArthur

National Data Buoy Center

Building 1007

Stennis Space Center, MS 39529

228-688-2830

Email: [shannon.mcarthur@noaa.gov](mailto:shannon.mcarthur@noaa.gov)

TAO Operations Manager

Lex LeBlanc

National Data Buoy Center

Building 3203

Stennis Space Center, MS 39529

228-688-7465

Email: [lex.leblanc@noaa.gov](mailto:lex.leblanc@noaa.gov)

## TAO Cruise Objective and Plan:

The objective of this cruise was the maintenance of the TAO Array along the 155°W, the 170°W meridian and the 180°.

The scientific complement for the cruise embarked at *Honolulu, HI* on *November 8, 2009*. The ship departed on *November 9, 2009* and conducted operations as listed in Section 2.1. NOAA Ship *Ka'imimoana* arrived in *Honolulu, HI* on *December 6, 2009*.

## 1.0 PERSONNEL

### 1.1 CRUISE LEAD AND PARTICIPATING SCIENTISTS:

Cruise Lead: Aaron Boutwell

### Participating Scientists:

Name	Gender	Nationality	Affiliation
Aaron Boutwell	M	US	NOAA/NDBC
James Rauch	M	US	NOAA/NDBC
Alan Lossett	M	US	NOAA/NDBC

## 2.0 OPERATIONS

### 2.1 TAO Data Recovery Summary

Mooring Operations conducted are shown in the tables below. The following provides details on the data recovery efforts for the buoys serviced. All noted time in the summary reports is Coordinated Universal Time (UTC):

## Cruise Summary

<b>Buoy Site:</b> 5N 180W	<b>Mooring Depth:</b> 5212 m
<b>Mooring Operation:</b> Repair	<b>Mooring ID#:</b> PM778B
<b>Deployed Location:</b> 04 59.0N 179.53.7W	<b>Deployed Date:</b> 9/23/2008
<b>Repair Location:</b> 05 00.3N 179.53.8W	<b>Repaired Date:</b> 11/17/2009
<b>Sensors/Equipment Lost at Sea:</b> None	
<b>Sensors Damaged/Fouled:</b> N/A	
<b>Fishing Vandalism:</b> 1/2 inch line attached to tower leg	
<b>Sensors/Tubes Not Downloaded:</b> Data logger tube downloaded successfully.	

<b>General Comments:</b> Team Preformed a Tube Swap			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why Sensors Failed</b>	<b>Field Service Observations</b>
Tube	10/19/2009	Not transmitting	Buoy was on station but tube was not transmitting.

<b>Buoy Site:</b> 2N 180W		<b>Mooring Depth:</b> 5446m	
<b>Mooring Operation:</b> Visit		<b>Mooring ID#:</b> PM776B	
<b>Deployed Location:</b> 02 00.93N 179 47.61W		<b>Deployed Date:</b> 06/30/2009	
<b>Repair Location:</b> 02 01.5N 179 49.0W		<b>Repaired Date:</b> 11/18/2009	
<b>Sensors/Equipment Lost at Sea:</b> None			
<b>Sensors Damaged/Fouled:</b> None			
<b>Fishing Vandalism:</b> None.			
<b>Sensors/Tubes Not Downloaded:</b> None			
<b>General Comments:</b> No damage on buoy and riding well in water			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why Sensors Failed</b>	<b>Field Service Observations</b>

<b>Buoy Site:</b> 0 180W		<b>Mooring Depth:</b> 5393m	
<b>Mooring Operation:</b> Deployment		<b>Mooring ID#:</b> PM864A	
<b>Deployed Location:</b> 00 01.375N 179 54.41W		<b>Deployed Date:</b> 11/18/2009	
<b>Pre-Deployment On Deck Instrument Failures:</b> None			
<b>Sensors/Equipment Lost at Sea:</b> None			
<b>Sensors Damaged During Deployment:</b> None			
<b>General Comments:</b> None			

<b>Buoy Site:</b> 2S 180W		<b>Mooring Depth:</b> 5338m	
<b>Mooring Operation:</b> Recovery		<b>Mooring ID#:</b> PM827A	
<b>Deployed Location:</b> 01 59.5S 179 53.3W		<b>Deployed Date:</b> 06/29/2009	
<b>Recovered Location:</b> None		<b>Recovered Date:</b> 11/19/2009	
<b>Previous Repair Date:</b> None			
<b>Sensors/Equipment Lost at Sea:</b> NDBC Equipment: Buoy: THN-016 Release SN# 020991 PMEL Equipment: tube:529 AT/RH:34267 Wind:63920 SSC:14328 T1:13519 T2:13520 T3:13521 T4:13524 T5:13833 T6:14690 T7:13691 T8:14692 T9:14763 T10:14764			
<b>Sensors Damaged/Fouled:</b> N/A			
<b>Fishing/Vandalism:</b> Buoy Lost at Sea.			
<b>Sensors/Tubes Downloaded:</b> None			
<b>General Comments:</b> Buoy Lost at Sea.			

Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Tube	7/28/2009	Not transmitting.	None

<b>Buoy Site:</b> 2S 180W	<b>Mooring Depth:</b> 5367m
<b>Mooring Operation:</b> Deployment	<b>Mooring ID#:</b> PM865A
<b>Deployed Location:</b> 02 00.1S 179 55.0E	<b>Deployed Date:</b> 11/19/2009
<b>Pre-Deployment On Deck Instrument Failures:</b> None	
<b>Sensors/Equipment Lost at Sea:</b> None	
<b>Sensors Damaged During Deployment:</b> None	
<b>General Comments:</b> None	

<b>Buoy Site:</b> 8S 170W	<b>Mooring Depth:</b> 5374m		
<b>Mooring Operation:</b> Visit	<b>Mooring ID#:</b> PM815A		
<b>Deployed Location:</b> 08 00.2S 170 00.4W	<b>Deployed Date:</b> 05/28/2009		
<b>Repair Location:</b> 07 58.5S 170 01.6W	<b>Repaired Date:</b> 11/22/2009		
<b>Sensors/Equipment Lost at Sea:</b> None			
<b>Sensors Damaged/Fouled:</b> Tube not transmitting			
<b>Fishing Vandalism:</b> None.			
<b>Sensors/Tubes Not Downloaded:</b> None			
<b>General Comments:</b> No damage on buoy and riding well in water			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

<b>Buoy Site:</b> 5S 170W Refresh	<b>Mooring Depth:</b> 5418m		
<b>Mooring Operation:</b> Repair	<b>Mooring ID#:</b> DM001B		
<b>Deployed Location:</b> 04 58.3S 169 57.1W	<b>Deployed Date:</b> 05/29/2009		
<b>Repair Location:</b> 04 58.3S 169 57.1W	<b>Repaired Date:</b> 11/23/2009		
<b>Sensors/Equipment Lost at Sea:</b> None			
<b>Sensors Damaged/Fouled:</b> Tube not transmitting			
<b>Fishing Vandalism:</b> None			
<b>Sensors/Tubes Not Downloaded:</b> Tube not down loaded			
<b>General Comments:</b> Team Performed a Tube Swap			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Tube	10/23/2009	Not transmitting	Buoy was on station but tube was not

			transmitting
--	--	--	--------------

<b>Buoy Site:</b> 5S 170W		<b>Mooring Depth:</b> 5396m	
<b>Mooring Operation:</b> Visit		<b>Mooring ID#:</b> PM816A	
<b>Deployed Location:</b> 05 00.0S 169 59.5W		<b>Deployed Date:</b> 05/30/2009	
<b>Repair Location:</b> 4 59.9S 170 01.2W		<b>Repaired Date:</b> 11/23/2009	
<b>Sensors/Equipment Lost at Sea:</b> None			
<b>Sensors Damaged/Fouled:</b> None			
<b>Fishing Vandalism:</b> None.			
<b>Sensors/Tubes Not Downloaded:</b> None			
<b>General Comments:</b> No damage on buoy and riding well in water			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why Sensors Failed</b>	<b>Field Service Observations</b>

<b>Buoy Site:</b> 8S 155W		<b>Mooring Depth:</b> N/A	
<b>Mooring Operation:</b> Recovery		<b>Mooring ID#:</b> PM814A	
<b>Deployed Location:</b> 08 15.730S 154 59.550W		<b>Deployed Date:</b> 5/16/2009	
<b>Recovered Location:</b> 08 39.2S 159 41.9W		<b>Recovered Date:</b> 11/26/2009	
<b>Previous Repair Date:</b> None			
<b>Sensors/Equipment Lost at Sea:</b> Release SN# 33044, PMEL T10 Sensor SN# 13816			
<b>Sensors Damaged/Fouled:</b> None			
<b>Fishing/Vandalism:</b> None			
<b>Sensors/Tubes Downloaded:</b> Tube and all subsurface sensors downloaded except, T10, T3 was downloaded but lost its data during the process.			
<b>General Comments:</b> Nilspin was parted at about 425 m.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why Sensors Failed</b>	<b>Field Service Observations</b>

<b>Buoy Site:</b> 8S 155W		<b>Mooring Depth:</b> 5338m	
<b>Mooring Operation:</b> Deployment		<b>Mooring ID#:</b> PM814B	
<b>Deployed Location:</b> 08 15.426S 154 59.537W		<b>Deployed Date:</b> 11/29/2009	
<b>Pre-Deployment On Deck Instrument Failures:</b> SSC was not reporting any data, T3 was acting strange during the data download and could not be trusted to redeploy.			
<b>Sensors/Equipment Lost at Sea:</b> Release SN# 025943			
<b>Sensors Damaged During Deployment:</b> None			
<b>General Comments:</b> upon deployment the mooring failed in the 7 <sup>th</sup> spool of nylon and was adrift. We recovered the buoy once more and redeployed. This failure is the cause of the lost release.			

<b>Buoy Site:</b> 5S 155W		<b>Mooring Depth:</b> 4982m	
<b>Mooring Operation:</b> Visit		<b>Mooring ID#:</b> PM760A	
<b>Deployed Location:</b> 04 59.395S 154 58.286W		<b>Deployed Date:</b> 08/17/2008	
<b>Repair Location:</b> 4 59.708S 154 59.817W		<b>Repaired Date:</b> 11-29-2009	
<b>Sensors/Equipment Lost at Sea:</b> None			
<b>Sensors Damaged/Fouled:</b> None			
<b>Fishing Vandalism:</b> None.			
<b>Sensors/Tubes Not Downloaded:</b> None			
<b>General Comments:</b> No damage on buoy and riding well in water			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why Sensors Failed</b>	<b>Field Service Observations</b>

<b>Buoy Site:</b> 00 155W		<b>Mooring Depth:</b> 4174m	
<b>Mooring Operation:</b> Visit		<b>Mooring ID#:</b> PM758A	
<b>Deployed Location:</b> 00 00.632N 154 58.197W		<b>Deployed Date:</b> 08/15/2008	
<b>Repair Location:</b> 00 01.172S 154 58.232W		<b>Repaired Date:</b> 12-1-2009	
<b>Sensors/Equipment Lost at Sea:</b> None			
<b>Sensors Damaged/Fouled:</b> None			
<b>Fishing Vandalism:</b> None.			
<b>Sensors/Tubes Not Downloaded:</b> None			
<b>General Comments:</b> No damage on buoy and riding a little low in water			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why Sensors Failed</b>	<b>Field Service Observations</b>

## 2.2 CTD Casts Completed

A Sea-Bird 911plus CTD with dual temperature and conductivity sensors was provided by the NMAO. Temperature and conductivity sensors are calibrated yearly at Sea-Bird and sent in for diagnostics as necessary. A Sea-Bird 12-position carousel and twelve 5-liter Niskin bottles were used to collect water samples for the analysis of salinity.

After the eleventh CTD cast, the CTD winch controller had mechanical problems that could not be repaired at sea. Therefore, only 11 CTD casts were performed on this cruise.

The following outlines the CTD casts completed during the cruise:

<b>CTD Operations</b>			
<b>Nominal Position</b>	<b>Date</b>	<b>Cast #</b>	<b>Comments</b>
5N 180	11/17/2009	KA50011	1000 m
4N 180	11/17/2009	KA50021	1000 m
3N 180	11/17/2009	KA50031	1000 m
2N 180	11/18/2009	KA50041	1000 m
1N 180	11/18/2009	KA50051	1000 m
0 180	11/18/2009	KA50061	1000 m
2n 180	11/19/2009	KA50071	1000 m
8S 170W	11/22/2009	KA50081	1000 m
7S 170W	11/22/2009	KA50091	1000 m
6S 170W	11/23/2009	KA50101	1000 m
5S 170W	11/23/2009	KA50111	1000 m
8S 155W	11/28/2009	KA50121	3000 m
0 155W	12/1/2009	KA50131	3000 m

### 2.3 Ancillary Science Projects Completed on the Cruise

The following outlines the ancillary science work performed in conjunction with the TAO operations on the cruise:

#### Pacific Marine Environmental Laboratory (PMEL) Argo Profiling CTD Floats

Three Argo floats were scheduled for deployment on this cruise. The chief scientist verified and briefed the Operations Officer on the deployment positions prior to the start of the cruise. All Argo Float deployments were completed as scheduled.

Questions concerning ARGO Floats should be directed to:

Gregory Johnson, NOAA/PMEL  
 Tel: (206) 526-6806  
 E-mail: [pmel\\_floats@noaa.gov](mailto:pmel_floats@noaa.gov)

or

Elizabeth Steffen, NOAA/PMEL  
 Tel: (206) 526-6747  
 E-mail: [pmel\\_floats@noaa.gov](mailto:pmel_floats@noaa.gov)

No Argo floats were deployed on this cruise.

#### Atlantic Oceanographic and Meteorological Laboratory (AMOL) Surface Drifting Floats

Twelve AOML Surface Drifters were scheduled for deployment on this cruise. The chief scientist verified and briefed the Operations Officer on the deployment positions prior to the start of the cruise. All AOML Surface Drifter deployments were completed as scheduled.

Questions concerning AOML Surface Drifters should be directed to:

Shaun Dolk, NOAA/AOML  
Global Drifter Center,  
Tel: (305) 361-4546  
Fax: (305) 361-4436  
E-mail: [shaun.dolk@noaa.gov](mailto:shaun.dolk@noaa.gov)

The following outlines the AOML Drifting floats deployed during this cruise:

<b>AOML Floats</b>			
<b>Coordinates</b>	<b>Date</b>	<b>SN#</b>	<b>Comments</b>
1822.016N 16200.021W	11/11/2009	90393	
1525.186N 16603.339W	11/13/2009	90394	
1231.148N 16958.911W	11/14/2009	90391	
0502.348N 17954.134W	11/17/2009	90392	
0328.871N 17950.547W	11/17/2009	90390	
0201.288N 17949.945W	11/18/2009	90388	
0001.872S 17955.244W	11/18/2009	90386	
0158.284S 17952.386W	11/19/2009	90389	
0309.868S 17601.171W	11/20/2009	90387	
0607.158S 17201.484W	11/22/2009	90385	

#### PCO2 and Nitrate Mapping System and Nutrient Samples

Thirteen (13) 30ml water samples were collected on this cruise. The chief scientist verified and briefed the Operations Officer on the specifications of the water samples to be collected during CTD casts prior to the start of the cruise. All water samples were collected as scheduled.

Questions concerning Nutrient Samples should be directed to:

Cathy Cosca  
NOAA/PMEL  
7600 Sand Point Way NE  
Seattle, Washington 98115  
Tel: (206) 526-6183  
E-mail: [cathy.cosca@noaa.gov](mailto:cathy.cosca@noaa.gov)