

TROPICAL ATMOSPHERE-OCEAN (TAO) PROGRAM  
FINAL CRUISE REPORT  
KA-08-05

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

Itinerary:

KA-08-05	<i>Honolulu, Hawaii</i>	DEP	<i>August 5, 2008</i>
	<i>Kwajalein, RMI</i>	ARR	<i>September 1, 2008</i>

**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 NOAA Ship RONALD H. BROWN. The buoy 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	TAO Operations Manager
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National Data Buoy Center	National Data Buoy Center
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TAO Cruise Objective and Plan:

The objective of this cruise was the maintenance of the TAO Array along the 155°W and 170°W meridians. The scientific complement for the cruise embarked at *Honolulu, HI* on **August 4, 2008**. The ship departed on **August 5, 2008** and conducted operations on the 155°W and 170°W lines as listed in Section 2.1. The ship arrived in Honolulu Hawaii on **September 1, 2008**.

## 1.0 PERSONNEL

### 1.1 CHIEF SCIENTIST AND PARTICIPATING SCIENTISTS:

Chief Scientist: Brian Lake

Participating Scientists:

Name	Gender	Nationality	Affiliation
Brian Lake	M	US	NOAA/NDBC
Rick Cole	M	US	NOAA/NDBC
William Thompson	M	US	NOAA/NDBC
Erich Reinecker	M	US	MBARI

## 2.0 OPERATIONS

### 2.1 TAO Data Recovery Summary

Mooring Operations were conducted from 8N 155W to 8S 155W and 8S 170W to 8N 170W. The following provides details on the data recovery efforts for the buoys serviced.

#### 8N 155W

<b>Buoy ID:</b> PM630A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5243 m	
<b>Deployed Location:</b> 7 58.4N 154 59.2W		<b>Recovery Location:</b> 7 58.0N 154 59.2W	
<b>Buoy Start Date:</b> 10/11/2006		<b>Buoy End Date:</b> 8/11/2008	
<b>Service Description:</b> Recover/Deploy, No comms with SSC & T25.			
Site Sensor Failures	Date Sensors Failed	Why sensors were failed	Field Service Observations
None			

#### 5N 155W

<b>Buoy ID:</b> PM721A	<b>Buoy Configuration:</b> Standard
<b>Buoy Type:</b> ATLAS	<b>Water Depth:</b> 4578 m

<b>Deployed Location:</b> 5 0.5N 15455.29W		<b>Visit Location:</b> 05 02.2N 154 56.3W	
<b>Buoy Start Date:</b> 2/7/08		<b>Buoy End Date:</b> Still Active	
<b>Service Description:</b> Visit. Buoy appears to be riding low in the water.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were failed</b>	<b>Field Service Observations</b>
None			

### 2N 155W

<b>Buoy ID:</b> PM722A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 4650 m	
<b>Deployed Location:</b> 1 58.475N 154 57.9W		<b>Visit Location:</b> 1 59.8N 154 58.9W	
<b>Buoy Start Date:</b> 2/08/2008		<b>Buoy End Date:</b> Still active	
<b>Service Description:</b> Visit. Good condition. Arrived outside transmit window.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were failed</b>	<b>Field Service Observations</b>
None			

### 0 155W

<b>Buoy ID:</b> PM688B		<b>Buoy Configuration:</b> CO2	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 4644 m	
<b>Deployed Location:</b> 0 0.27N 154 57.4W		<b>Recovery Location:</b> 0 04.85N 155 10.1W	
<b>Buoy Start Date:</b> 7/20/07		<b>Buoy End Date:</b> 8/14/08	
<b>Service Description:</b> Recovery/Deployment. No comms with TP300. Deployed buoy riding a bit low.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were failed</b>	<b>Field Service Observations</b>
AT/RH	10/4/07	Data too high	
Wind	10/17/07	Data zero'd out.	

### 2S 155W

<b>Buoy ID:</b> PM723A	<b>Buoy Configuration:</b> Standard
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<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 4988	
<b>Deployed Location:</b> 1 58.58N 155 0.02W		<b>Visit Location:</b> 1 58.7S 155 01.5W	
<b>Buoy Start Date:</b> 2/10/08		<b>Buoy End Date:</b> Still Active	
<b>Service Description:</b> Visit. Buoy riding a little low.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were failed</b>	<b>Field Service Observations</b>
None.			

### 5S 155W

<b>Buoy ID:</b> PM689A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5028 m	
<b>Deployed Location:</b> 4 59.395S 154 58.286W		<b>Recovery Location:</b> 4 59.35S 155 0.0W	
<b>Buoy Start Date:</b> 7/22/2007		<b>Buoy End Date:</b> 8/16/08	
<b>Service Description:</b> Recovery/Deployment. T150 lost with broken mount.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were Failed</b>	<b>Field Service Observations</b>
None.			

### 8S 155W

<b>Buoy ID:</b> PM724B		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5331 m	
<b>Deployed Location:</b> 8 15.72S 155 1.03W		<b>Repair Location:</b> 8 16.45S 155 2.0W	
<b>Buoy Start Date:</b> 2/12/07		<b>Buoy End Date:</b> Still Active	
<b>Service Description:</b> Repair. Good buoy condition. AT/RH swap, tube dump.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were Failed</b>	<b>Field Service Observations</b>
AT/RH	3/12/08	Reporting 0 degrees.	

### 8S 170W

<b>Buoy ID:</b> PM725A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5371 m	
<b>Deployed Location:</b> 7 58.52S 170 1.7W		<b>Repair Location</b> 8 15.72S 155 0.03W	
<b>Buoy Start Date:</b> 2/23/08		<b>End Date:</b> Still Active	

<b>Service Description:</b> Skipped due to time constraints.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were failed</b>	<b>Field Service Observations</b>
None.			

### 5S 170W

<b>Buoy ID:</b> PM726A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5430 m	
<b>Deployed Location:</b> 4 59.99S 170 1.04W		<b>Deployed Location:</b> 4 59.99S 170 1.04W	
<b>Buoy Start Date:</b>		<b>Buoy End Date:</b> Still Active	
<b>Service Description:</b> Skipped due to time constraints.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were failed</b>	<b>Field Service Observations</b>
None.			

### 2S 170W

<b>Buoy ID:</b> PM727B		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 4842 m	
<b>Deployed Location:</b> 2 9.7S 170 0.74W		<b>Repair Location:</b> 2 10.9S 170 01.6W	
<b>Buoy Start Date:</b> 2/25/08		<b>Buoy End Date:</b> Still Active	
<b>Service Description:</b> Repair. Swap of 25m T sensor. No comms with sensor, No CTD Cast due to diagnostics being performed on CTD wire.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were failed</b>	<b>Field Service Observations</b>
None.			

### 0 170W

<b>Buoy ID:</b> PM691B		<b>Buoy Configuration:</b> Flux/CO2	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5602 m	
<b>Deployed Location:</b> 0 2.445 S 170 03.064 W		<b>Recovered Location:</b> 0 3.8S 170 04.0W	
<b>Buoy Start Date:</b> 8/22/08		<b>Buoy End Date:</b> 8/22/08	
<b>Service Description:</b> Recovery/Deployment. Recovered equilibrator tube bent.			
<b>Site Sensor</b>	<b>Date Sensors</b>	<b>Why sensors were</b>	<b>Field Service</b>

<b>Failures</b>	<b>Failed</b>	<b>failed</b>	<b>Observations</b>
SW Rad	7/31/07	Data too low, close to 0	

### 0 170W ADCP

<b>Buoy ID:</b> KA013		<b>Buoy Configuration:</b> Narrow Band	
<b>Buoy Type:</b> Subsurface		<b>Water Depth:</b> 5433 m	
<b>Deployed Location:</b> 0 00.06 S 169 44.64 W		<b>Recovered Location:</b> NA	
<b>Recovered Buoy Start Date:</b> NA		<b>Recovered Buoy End Date:</b> NA	
<b>Service Description:</b> Deployment only.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were failed</b>	<b>Field Service Observations</b>
None			

### 2N 170W

<b>Buoy ID:</b> PM692B		<b>Buoy Configuration:</b> CO2	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5387 m	
<b>Deployed Location:</b> 2 00.8N 170 01.1W		<b>Recovered Location:</b> 2 1.0N 170 00.9W	
<b>Buoy Start Date:</b> 8/1/07		<b>Buoy End Date:</b> 8/24/08	
<b>Service Description:</b> Recovery/Deployment. No transmit received from buoy on recovery. T100 lost.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were Failed</b>	<b>Field Service Observations</b>
AT/RH	10/26/07	Erratic spiking	

### 5N 170W

<b>Buoy ID:</b> PM728A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5789 m	
<b>Deployed Location:</b> 5 0.1N 169 58.7W		<b>Visit Location:</b> 5 0.3N 169 58.7W	
<b>Buoy Start Date:</b> 2/28/08		<b>Buoy End Date:</b> Still Active	
<b>Service Description:</b> Visit. Good condition. Buoy riding high, little growth.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were Failed</b>	<b>Field Service Observations</b>
Wind	8/22/08	WDIR off ~90 degrees	

## 8N 170W

<b>Buoy ID:</b> PM766A	<b>Buoy Configuration:</b> Standard
<b>Buoy Type:</b> ATLAS	<b>Water Depth:</b> 5542 m
<b>Deployed Location:</b> 8 00.2N 170 0.4W	<b>Deployed Location:</b> 8 00.2N 170 0.4W
<b>Buoy Start Date:</b> 8/26/08	<b>Buoy End Date:</b> Still Active
<b>Service Description:</b> Deployment only.	

## 8N 180W

<b>Buoy ID:</b> PM693B	<b>Buoy Configuration:</b> Standard		
<b>Buoy Type:</b> ATLAS	<b>Water Depth:</b> 5987 m		
<b>Deployed Location:</b> 7 59.7N 179 52.66W	<b>Visit Location:</b> 7 59.3N 179 53.5W		
<b>Buoy Start Date:</b> 8/6/07	<b>Buoy End Date:</b> Still Active		
<b>Service Description:</b> Visit. Buoy out of transmit window on arrival. Good condition, riding well.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were failed</b>	<b>Field Service Observations</b>
Rain	12/11/07	Low Rain rate w/ high rain percentage	

### 2.2 CTD Casts Completed

A Sea-Bird 911plus CTD with dual temperature and conductivity sensors was provided by the program. Temperature and conductivity sensors are calibrated yearly at Sea-Bird and sent in for diagnostics as necessary. A Sea-Bird 24-position carousel and twenty four 5-liter Niskin bottles were used to collect water samples for the analysis of salinity.

The following outlines the CTD casts completed during the cruise:

<b>CTD Operations</b>		
<b>Site</b>	<b>Date</b>	<b>Comments</b>
8N 155W	3/12/08	3000 m
7N 155W	3/12/08	1000 m
6N 155W	3/12/08	1000 m
5N 155W	3/13/08	1000 m
4N 155W	3/14/08	1000 m
3N 155W	3/14/08	1000 m
2N 155W	3/14/08	1000 m
1N 155W	3/14/08	1000 m
0 155W	3/15/08	3000 m

1S 155W	3/16/08	1000 m
2S 155W	3/16/08	1000 m
4S 155W	3/17/08	1000 m
5S 155W	3/17/08	1000 m
6S 155W	3/17/08	1000 m
7S 155W	3/18/08	1000 m
8S 155W	3/18/08	3000 m
8S 170W	8/22/08	3000 m
7S 170W	8/23/08	1000 m
6S 170W	8/23/08	1000 m
5S 170W	8/23/08	1000 m
4S 170W	8/24/08	1000 m
3S 170W	8/25/08	1000 m
2S 170W	8/25/08	1000 m
1S 170W	3/26/08	1000 m
0 170W	3/26/08	3000 m
1N 170W	3/26/08	1000 m
2N 170W	3/27/08	1000 m
3N 170W	3/27/08	1000 m
4N 170W	3/27/08	1000 m
5N 170W	3/28/08	1000 m
6N 170W	3/28/08	1000 m
7N 170W	3/28/08	1000 m
8N 170W	3/29/08	1000 m

The following outlines the scheduled CTD casts not completed and why:

The all half degree CTD's scheduled (between 3N & 3S on each meridian) along with the CTD at 3S 155W were not completed in order to save operational time need for other operations.

### 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:

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

One Argo floats was 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)



<b>ARGO Floats</b>		
<b>Site</b>	<b>Date</b>	<b>Comments</b>
8-08S 172-59E	3/21/08	

### 2.32 Atlantic Oceanographic and Meteorological Laboratory (AOML) Surface Drifters

Ten 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 Surface Drifters deployed during the cruise track:

<b>AOML Floats</b>		
<b>Site</b>	<b>Date</b>	<b>Comments</b>
5N 155W	3/13/08	
2N 65E	3/14/08	
0 155W	3/15/08	
2S 155W	3/16/08	
5S 155W	3/17/08	
5S 170W	3/23/08	
2S 170W	3/25/08	
0 170W	3/26/08	
2N 170W	3/27/08	
5N 170W	3/28/08	

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

Thirty four 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)

### 2.34 Monterey Bay Aquarium Research Institute (MBARI) Chlorophyll and Nutrients

#### Monterey Bay Aquarium Research Institute (MBARI) Chlorophyll and Nutrients

Phytoplankton biomass samples consisting of chlorophyll extractions and nutrients samples were collected from CTD rosette at 0, 10, 25, 40, 60, 100, 150, and 200 m. MBARI CO<sub>2</sub> instrumentation was recovered and deployed at 0 155W and 2N 170W. The chief scientist verified and briefed the Operations Officer on the additional build efforts for the MBARI buoys prior to the start of the cruise.

The contact for this project is:

Dr. Francisco Chavez

Monterey Bay Aquarium Research Institute

□ 7700 Sandholdt Road □ Moss Landing, CA 95039

□ Phone: (831) 775-1709 □

Fax: (831) 775-1620

□ email: [chfr@mbari.org](mailto:chfr@mbari.org)

#### CO<sub>2</sub> Instrumentation on TAO moorings

The buoy at 0 155W has mounted CO<sub>2</sub> sensors to provide high-resolution time-series measurements of atmospheric boundary layer and surface ocean CO<sub>2</sub> partial pressure (pCO<sub>2</sub>). The chief scientist verified and briefed the Operations Officer on the additional build efforts for the CO<sub>2</sub> buoys prior to the start of the cruise.

Questions concerning CO<sub>2</sub> measurement data should be directed to:

Chris Sabine, NOAA/PMEL

7600 Sand Point Way NE

Seattle, Washington 98115

Tel: (206) 526-4809

E-mail: [Chris.Sabine@noaa.gov](mailto:Chris.Sabine@noaa.gov)

Richard Feely, NOAA/PMEL

7600 Sand Point Way NE

Seattle, Washington 98115

Tel: (206) 526-6214

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