

TROPICAL ATMOSPHERE-OCEAN (TAO) PROGRAM

FINAL CRUISE REPORT

KA-08-06

Area: Equatorial Pacific between 8°N and 8°S latitude along 165°E Longitude and 8°S to 8°N Latitude along 180° Longitude.

Itinerary:

KA-08-06      *Kwajalein, RMI*                      DEP    *September 5, 2008*  
                    *Honolulu, Hawaii*                      ARR    *September 30, 2008*

**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

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TAO Cruise Objective and Plan:

The objective of this cruise was the maintenance of the TAO Array along the 165°E and 180° meridians. The scientific complement for the cruise embarked at *Kwajalein, RMI* on *September 4, 2008*. The ship departed on *September 5, 2008* and conducted operations on the 165°E and 180° lines as listed in Section 2.1. The ship arrived in Honolulu Hawaii on *September 30, 2008*.

## 1.0 PERSONNEL

### 1.1 CHIEF SCIENTIST AND PARTICIPATING SCIENTISTS:

Chief Scientist: Jeffrey Wise

#### Participating Scientists:

Name	Gender	Nationality	Affiliation
Jeffrey Wise	M	US	NOAA/NDBC
James Hayden	M	US	NOAA/NDBC
Ryan Beets	M	US	NOAA/NDBC
David Rosenfield	M	US	USM

## 2.0 OPERATIONS

### 2.1 TAO Data Recovery Summary

Mooring Operations conducted are shown in the table below. Operations were conducted from 8N 165E to 8S 165E and 8S 180 to 8N 180). 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):

#### 8N 165E

<b>Buoy ID:</b> PM694A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5216 m	
<b>Deployed Location:</b> 8 02.09N 165 04.39E		<b>Recovery Location:</b> 8 02.0N 165 03.0W	
<b>Buoy Start Date:</b> 8/15/07		<b>Buoy End Date:</b> 9/16/08	
<b>Service Description:</b> Recovery/Deployment. Small amount of fishing line found between T3 and T4. Long liner gear wrapped around third spool of nylon.			
<b>Site Sensor</b>	<b>Date Sensors</b>	<b>Why sensors were</b>	<b>Field Service</b>

Failures	Failed	Failed	Observations
Rain	8/16/07	Erratic data	

### 5N 165E

<b>Buoy ID:</b> PM729A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 4779 m	
<b>Deployed Location:</b> 05 01.8N 165 01.1E		<b>Repair Location:</b> 05 02.2N 165 0.9E	
<b>Buoy Start Date:</b> 3/14/08		<b>Buoy End Date:</b> Still deployed	
<b>Service Description:</b> Repair. Exchanged rain gauge, downloaded tube.			
Site Sensor Failures	Date Sensors Failed	Why sensors were Failed	Field Service Observations
Rain	4/9/08	Erratic rain rate	

### 2N 165E

<b>Buoy ID:</b> PM695A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 4172 m	
<b>Deployed Location:</b> 1 59.9N 165 0.9E		<b>Visit Location:</b> 1 59.9N 165 0.2E	
<b>Buoy Start Date:</b> 8/17/07		<b>Buoy End Date:</b> Still active	
<b>Service Description:</b> Buoy riding well, no apparent damage. Light sea growth on buoy.			
Site Sensor Failures	Date Sensors Failed	Why sensors were Failed	Field Service Observations
None			

### 0 165E

<b>Buoy ID:</b> PM696B		<b>Buoy Configuration:</b> Flux	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 4407 m	
<b>Deployed Location:</b> 0 01.5N 165 02.58E		<b>Recovery Location:</b> None	
<b>Buoy Start Date:</b> 8/18/07		<b>Buoy End Date:</b> None	
<b>Service Description:</b> No recovery, buoy lost at sea.			
Site Sensor Failures	Date Sensors Failed	Why sensors were Failed	Field Service Observations
Mooring	3/23/08	Drift exceeded 6 nm	
Buoy	5/22/08	Drift outside watch grid	

Buoy	6/16/08	Transmission Failure	
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## 2S 165E

<b>Buoy ID:</b> PM730A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 4465 m	
<b>Deployed Location:</b> 2 0.5S 165 0.1E		<b>Repair Location:</b> 2 0.4S 164 58.8E	
<b>Buoy Start Date:</b> 3/17/08		<b>Buoy End Date:</b> Still deployed	
<b>Service Description:</b> Repair. Exchanged rain gauge.			
Site Sensor Failures	Date Sensors Failed	Why sensors were failed	Field Service Observations
Rain	8/29/08	0 rain w/ high % time raining	
TP500	3/17/08	Missing data since deployment	

## 5S 165E

<b>Buoy ID:</b> PM697B		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 2511 m	
<b>Deployed Location:</b> 4 59.5S 165 11.8E		<b>Recovery Location:</b> 4 59.0S 165 8.7E	
<b>Buoy Start Date:</b> 8/20/2007		<b>Buoy End Date:</b> 9/11/2008	
<b>Service Description:</b> Massive amount of long liner gear attached to mooring, fishing floats attached to buoy. There was a cut in Nilspin right below T4.			
Site Sensor Failures	Date Sensors Failed	Why sensors were failed	Field Service Observations
T150	11/08/07	Missing data	

## 8S 165E

<b>Buoy ID:</b> PM731A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 3883 m	
<b>Deployed Location:</b> 8 01.9S 164 47.0E		<b>Repair Location:</b> 8 02.2S 164 47.0E	
<b>Buoy Start Date:</b> 3/19/08		<b>Buoy End Date:</b> 9/13/08	
<b>Service Description:</b> Repair. Exchanged the rain gauge and downloaded tube data. Divers exchanged SSC sensor and cable.			
Site Sensor Failures	Date Sensors Failed	Why sensors were Failed	Field Service Observations

Salinity	4/8/08	Data drifting too low	
Rain	4/25/08	High rain rate w/ 0 std dev	

### 8S 180

<b>Buoy ID:</b> PM732A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5538 m	
<b>Deployed Location:</b> 7 58.9S 179 50.9W		<b>Repair Location:</b> 7 59.3S 179 51.3W	
<b>Buoy Start Date:</b> 3/23/08		<b>Buoy End Date:</b> Still deployed	
<b>Service Description:</b> Repair. Downloaded tube data. Divers exchanged SSC sensor.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were Failed</b>	<b>Field Service Observations</b>
SSC	7/23/08	Missing data	

### 5S 180

<b>Buoy ID:</b> PM698A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5651 m	
<b>Deployed Location:</b> 4 59.31S 179 53.8W		<b>Recovery Location:</b> 4 58.9S 179 54.57W	
<b>Buoy Start Date:</b> 8/26/07		<b>Buoy End Date:</b> 9/17/08	
<b>Service Description:</b> Fishing float found 200m from buoy. T25 – TP500 lost at sea. Sent 2 line cutters down, both failed to cut the mooring.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were Failed</b>	<b>Field Service Observations</b>
T125-TP500	11/4/08	Very Intermittent to missing data	

### 2S 180

<b>Buoy ID:</b> PM733A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5333 m	
<b>Deployed Location:</b> 1 59.6S 179 52.4W		<b>Recovered Location:</b> 1 59.4S 179 53.5W	
<b>Buoy Start Date:</b> 3/26/08		<b>Buoy End Date:</b> Still deployed	
<b>Service Description:</b> Repair. SSC swapped by divers and the tube was downloaded. Divers changed SSC cable. There was a lot of growth on buoy.			
<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>
Salinity	8/10/08	Erratic data	
TP500	11/6/08	Missing data	

### 0 180

<b>Buoy ID:</b> PM699B		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5401 m	
<b>Deployed Location:</b> 0 1.17N 179 54.21W		<b>Recovery Location:</b> 0 1.0N 179 55.2W	
<b>Buoy Start Date:</b> 8/28/07		<b>Buoy End Date:</b> 9/19/08	
<b>Service Description:</b> Recovery/Deployment. Found that the rain gauge was hanging with no nuts. The rain gauge was hanging on about a 50 degree lean. Data from this sensor would have probably under reported rain rate in this orientation.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were Failed</b>	<b>Field Service Observations</b>
T200	2/28/08	Missing data	

### 2N 180

<b>Buoy ID:</b> PM700B		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5508 m	
<b>Deployed Location:</b> 2 1.1N 179 47.4W		<b>Recovery Location:</b> 2 1.18N 179 49.9W	
<b>Buoy Start Date:</b> 8/29/07		<b>Buoy End Date:</b> 9/21/08	
<b>Service Description:</b> Recovery/Deployment. No recovery problems or comments.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were Failed</b>	<b>Field Service Observations</b>
AT/RH	4/20/08	Reporting 0 degrees	
T150	2/12/08	Slid down to 200m	

### 5N 180

<b>Buoy ID:</b> PM701A		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5658 m	
<b>Deployed Location:</b> 5 0.15N 179 54.16W		<b>Recovery Location:</b> 5 0.3N 179 55.1W	
<b>Buoy Start Date:</b> 8/30/07		<b>Buoy End Date:</b> 9/22/08	
<b>Service Description:</b> Recovery/ Deployment. There was a fishing float attached to the mooring. Plus long-linear gear throughout nilspin. TP10 lost at sea. Unusually large number of records for T7.			

<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were Failed</b>	<b>Field Service Observations</b>
Salinity	7/19/08	Data too high	
T100	8/30/07	Missing data	
T125	2/9/08	Missing data	

## 8N 180

<b>Buoy ID:</b> PM693B		<b>Buoy Configuration:</b> Standard	
<b>Buoy Type:</b> ATLAS		<b>Water Depth:</b> 5950 m	
<b>Deployed Location:</b> 7 59.7N 179 52.6W		<b>Visit Location:</b> 7 59.9N 179 52.4W	
<b>Buoy Start Date:</b> 8/6/07		<b>Buoy End Date:</b> Still deployed	
<b>Service Description:</b> Buoy riding well, all appears normal.			
<b>Site Sensor Failures</b>	<b>Date Sensors Failed</b>	<b>Why sensors were Failed</b>	<b>Field Service Observations</b>
TP300	4/15/08	Missing data	

## 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.

The following outlines the CTD casts completed during the cruise:

<b>CTD Operations</b>		
<b>Site</b>	<b>Date</b>	<b>Comments</b>
8N 165E	9/7/2008	3000 m
7N 165E	9/7/2008	1000 m
6N 165E	9/7/2008	1000 m
5N 165E	9/8/2008	1000 m
4N 165E	9/8/2008	1000 m
3N 165E	9/8/2008	1000 m
2.5N 165E	9/9/2008	1000 m
2N 165E	9/9/2008	1000 m
1.5N 165E	9/9/2008	1000 m
1N 165E	9/9/2008	1000 m

0.5N 165E	9/9/2008	1000 m
0S 165E	9/10/2008	3000 m
0.5S 165E	9/10/2008	1000 m
1S 165E	9/10/2008	1000 m
1.5S 165E	9/10/2008	1000 m
2S 165E	9/10/2008	1000 m
2.5S 165E	9/11/2008	1000 m
3S 165E	9/11/2008	1000 m
4S 165E	9/11/2008	1000 m
5S 165E	9/12/2008	1000 m
6S 165E	9/12/2008	1000 m
7S 165E	9/12/2008	1000 m
8S 165E	9/13/2008	3000 m
8S 180	9/16/2008	3000 m
7S 180	9/17/2008	1000 m
6S 180	9/17/2008	1000 m
5S 180	9/18/2008	1000 m
4S 180	9/18/2008	1000 m
3S 180	9/18/2008	1000 m
2.5S 180	9/18/2008	1000 m
2S 180	9/19/2008	1000 m
1.5S 180	9/19/2008	1000 m
1S 180	9/19/2008	1000 m
0.5S 180	9/19/2008	1000 m
0N 180	9/20/2008	3000 m
0.5N 180	9/20/2008	1000 m
1N 180	9/20/2008	1000 m
1.5N 180	9/20/2008	1000 m
2N 180	9/21/2008	1000 m
2.5N 180	9/22/2008	1000 m
3N 180	9/22/2008	1000 m
4N 180	9/22/2008	1000 m
5N 180	9/23/2008	1000 m
6N 180	9/23/2008	1000 m
7N 180	9/23/2008	1000 m
8N 180	9/24/2008	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



Eight 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)

The following outlines the Argo floats deployed during the cruise:

ARGO Floats		
Site	Date	Comments
0558.727N 16501.578E	9/7/2008	
0400.640N 16501.911E	9/8/2008	
0158.843N 16501.267E	9/9/2008	
0000.765S 16502.824E	9/10/2008	
0157.203S 17953.635W	9/19/2008	
0003.780N 17954.796W	9/20/2008	
0201.391N 17947.713W	9/21/2008	
1429.653N 16918.761W	9/27/2008	

Atlantic Oceanographic and Meteorological Laboratory (AMOL) Surface Drifting Floats

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 Drifting floats deployed during this cruise:

AOML Floats		
Site	Date	Comments
0500.156N 16501.619E	9/8/2008	
0300.446N 16502.277E	9/8/2008	
0000.863S 16502.872E	9/10/2008	
0301.103S 16503.661E	9/11/2008	
0459.570S 16509.224E	9/12/2008	
0455.799S 17953.187W	9/18/2008	
0259.549S 17953.150W	9/18/2008	

0003.894N	17954.802W	9/20/2008	
0301.441N	17951.179W	9/22/2008	
0501.323N	17953.674W	9/23/2008	

PCO2 and Nitrate Mapping System and Nutrient Samples

Twenty-seven 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)