

TROPICAL ATMOSPHERE-OCEAN (TAO) PROGRAM
FINAL CRUISE REPORT
KA-11-06

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-11-06 DEP *October 1, 2011, Honolulu, HI*
ARR *November 2, 2011, Pohnpei, FSM*

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.

NDBC Points of Contact:

NDBC Program Manager	NDBC Operations Manager
Steve Cucullu	Karen Grissom
National Data Buoy Center	National Data Buoy Center
Building 3203	Building 3203
Stennis Space Center, MS 39529	Stennis Space Center, MS 39529
228-688-1258	228-688-1325
Email: stephen.cucullu@noaa.gov	Email: karen.grissom@noaa.gov

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 **October 15, 2011**. The ship departed on **October 16, 2011** and conducted operations as listed in Section 2.1. The ship arrived in *Pohnpei, FSM* on **November 2, 2011** and the science party disembarked.

1.0 PERSONNEL

1.1 CRUISE LEAD AND PARTICIPATING SCIENTISTS:

Cruise Lead: Robert Koller

Participating Scientists:

Name	Gender	Nationality	Affiliation
Robert Koller	M	US	NOAA/NDBC
Alan Lossett	M	US	NOAA/NDBC
William Thompson	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 times in this summary report are Coordinated Universal Time (UTC):

Cruise Summary

Buoy Site: 8N 155W			
Mooring Operation: Recovery		Mooring ID#: PM928A	
Deployed Location: 7 58.054N 154 59.578W		Deployed Date: 9/6/2010	
Recovered Location: 7 59.506N 155 00.070W		Recovered Date: 10/5/2011	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: T25, T250			
Sensors Damaged/Fouled: None			
Fishing/Vandalism: None			
Sensors/Tubes Downloaded: All sensors downloaded successfully except T25, T250 and no comms with T75			
General Comments: None			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
T25	1/14/11	Data missing	Lost at Sea
T75	9/22/11	Data missing	No comms
T250	9/9/11	Data missing	Lost at Sea

Buoy Site: 8N 155W	Mooring Depth: 5240 m
Mooring Operation: Deployment	Mooring ID#: PM986A
Deployed Location: 7 59.23N 154 59.18W	Deployed Date: 10/6/2011
Pre-Deployment On Deck Instrument Failures: T150 failed on deck	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: None	
General Comments: All inductive sensors failed after deployment, possible nilspin problem.	

Buoy Site: 8N 155W Refresh			
Mooring Operation: Repair		Mooring ID#: DM017B	
Deployed Location: 7 56.4N 154 58.7W		Deployed Date: 1/22/2011	
Repair Location: 7 57.878N 154 59.235W		Repair Date: 10/6/2011	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: Wind sensor and stanchion.			
Fishing Vandalism: None			
General Comments: Hose clamp on stanchion failed, stanchion bent over damaging wind sensor.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
AT/RH	5/11/11	Drifted low	None
Winds	2/20/11	Erratic/low	Cable damaged, upper stanchion failure
SSC	6/23/11	Data spikes	N/A

Buoy Site: 5N 155W			
Mooring Operation: Visit		Mooring ID#: PM950A	
Deployed Location: 4 59.5N 154 57.3W		Deployed Date: 1/24/2011	
Visit Location: 5 01.21N 154 57.44W		Visit Date: 10/7/2011	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing Vandalism: None			
General Comments: None			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
N/A	N/A	N/A	None

Buoy Site: 2N 155W			
Mooring Operation: Recovery		Mooring ID#: PM929A	
Deployed Location: 1 59.102N 154 56.567W		Deployed Date: 9/8/2010	
Recovered Location: Lost at Sea		Recovered Date: N/A	
Previous Repair Date: 1/25/2011 Visit			
Sensors/Equipment Lost at Sea: All sensors and buoy hull.			
Sensors Damaged/Fouled: N/A			
Fishing/Vandalism: N/A			
Sensors/Tubes Downloaded: None			
General Comments: Buoy was not located. The acoustic release was on bottom at station and registered as vertical when pinged. No sign of buoy after release fired & position of release triangulated.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Buoy/Tube	9/21/11	Transmission failure	Lost at Sea

Buoy Site: 2N 155W		Mooring Depth: 4659 m	
Mooring Operation: Deployment		Mooring ID#: PM987A	
Deployed Location: 01 593.05N 154 57.45W		Deployed Date: 10/8/2011	
Pre-Deployment On Deck Instrument Failures: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged During Deployment: None			
General Comments: None			

Buoy Site: 0 155W			
Mooring Operation: Repair		Mooring ID#: PM951B	
Deployed Location: 0 00.22S 154 56.91W		Deployed Date: 1/26/2011	
Repair Location: 0 0.029N 154 57.151W		Repair Date: 10/9/2011	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing Vandalism: None			
General Comments: Buoy was slick from biofouling, CO2 system in good shape.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Salinity	1/26/11	Data values too low	SST was downloaded. Bat voltage 7.73
Wind	7/1/11	WDIR 90 degrees off	None

Buoy Site: 2S 155W			
Mooring Operation: Recovery		Mooring ID#: PM930A	
Deployed Location: 1 58.505S 154 59.671W		Deployed Date: 9/11/2010	
Recovered Location: 1 59.035S 155 0.924W		Recovered Date: 10/10/2011	
Previous Repair Date: 1/26/2011 Visit			
Sensors/Equipment Lost at Sea: T250, TP500			
Sensors Damaged/Fouled: T150 broken mount, T200 Long line gear			
Fishing/Vandalism: long line gear on T250, and its mount jammed under T200 sensor			
Sensors/Tubes Downloaded: All sensors downloaded successfully except T250 & TP500			
General Comments: Long line gear probable cause of lost sensors			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
T250	11/12/10	Data missing	Lost at Sea
TP500	2/21/11	Data missing	Lost at Sea

Buoy Site: 2S 155W		Mooring Depth: 4991 m	
Mooring Operation: Deployment		Mooring ID#: PM988A	
Deployed Location: 1 58.89S 154 59.6W		Deployed Date: 10/11/2011	
Pre-Deployment On Deck Instrument Failures: AT/RH, changed before deployment			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged During Deployment: None			
General Comments: Tube encountered a memory storage problem, reset before deployment			

Buoy Site: 5S 155W			
Mooring Operation: Repair		Mooring ID#: PM952B	
Deployed Location: 4 59.0S 154 59.0W		Deployed Date: 1/28/2011	
Repair Location: 4 59.3S 155 0.1W		Repair Date: 10/11/2011	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing Vandalism: None			
General Comments: Wind sensor was found to be out by 180 degrees and replaced			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
SSC	9/8/11	Data drifted too high	Originally a visit only changed to a repair for SST.
Wind	Unknown	180 degrees out	180 degrees out during Flyby

Buoy Site: 8S 155W			
Mooring Operation: Recovery		Mooring ID#: PM931A	
Deployed Location: 8 15.6S 155 0.61W		Deployed Date: 9/13/2010	
Recovered Location: 8 14.77S 155 0.36W		Recovered Date: 10/12/2011	
Previous Repair Date: 1/29/2011 Visit			
Sensors/Equipment Lost at Sea: Acoustic release			
Sensors Damaged/Fouled: SSC, T25 fouled			
Fishing/Vandalism: None			
Sensors/Tubes Downloaded: All sensors downloaded successfully.			
General Comments: Acoustic release responded to commands but did not appear to have released. Cut mooring with line cutter. Recovered 4.5 spools of line, approximately 2250 meters of nylon.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
N/A	N/A	N/A	Line cutter used after tension rose to unsafe levels.

Buoy Site: 8S 155WRefresh		Mooring Depth: 5332 m	
Mooring Operation: Deployment		Mooring ID#: DM025a	
Deployed Location: 8 15.406S 155 0.0478W		Deployed Date: 10/13/11	
Pre-Deployment On Deck Instrument Failures: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged During Deployment: None			
General Comments: None.			

Buoy Site: 5S 170W			
Mooring Operation: Recovery		Mooring ID#: PM932B	
Deployed Location: 4 59.620S 170 0.579W		Deployed Date: 9/18/2010	
Recovered Location: 4 59.407S70 1.638W		Recovered Date: 10/16/2011	
Previous Repair Date: 2/3/2011			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: T125, T200 broken mounts, SSC, T25 and T50 fouled			
Fishing/Vandalism: Cuts in wire at T75, T150 and T300			
Sensors/Tubes Downloaded: All sensors downloaded successfully except T75 and T100, which had dead batteries.			
General Comments: None			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service

			Observations
T75	2/13/11	Data missing	Dead batteries
T100	9/20/11	Data missing	Dead batteries

Buoy Site: 5S 170W	Mooring Depth: 5420 m
Mooring Operation: Deployment	Mooring ID#: PM989A
Deployed Location: 4 59.515S 170 0.45W	Deployed Date: 10/17/2011
Pre-Deployment On Deck Instrument Failures: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: None	
General Comments: None	

Buoy Site: 2S 170W			
Mooring Operation: Recovery		Mooring ID#: PM933A	
Deployed Location: 2 10.123S 170 0.317W		Deployed Date: 9/20/2010	
Recovered Location: 2 10.4S 170 0.14W		Recovered Date: 10/18/2011	
Previous Repair Date: 2/4/2011 Visit			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: SSC, T25 And T50 fouled. T300 broken mount sensor still attached			
Fishing/Vandalism: Fishing line on the sensor at 100m, and fishing line entangled in nylon on the 3 rd spool.			
Sensors/Tubes Downloaded: All sensors downloaded successfully except T75 and T300, which had dead batteries.			
General Comments: None			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
T75	2/19/11	Data missing	Dead batteries
TP300	6/26/11	Data missing	Dead batteries

Buoy Site: 2S 170W Refresh	
Mooring Operation: Repair	Mooring ID#: DM018B
Deployed Location: 2 09.1S 170 0.59W	Deployed Date: 2/4/2011
Repair Location: 2 10.2S 170 1.6W	Repair Date: 10/18/2011
Sensors/Equipment Lost at Sea: None	
Sensors Damaged/Fouled: None	
Fishing Vandalism: None	
General Comments: Replaced AT/RH	

Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
AT/RH	5/28/11	Data too low/high	None

Buoy Site: 0 170W			
Mooring Operation: Visit		Mooring ID#: PM954A	
Deployed Location: 0 0.75S 170 2.82W		Deployed Date: 2/5/2011	
Visit Location: 0 2.194S 170 3.117W		Visit Date: 10/19/2011	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing Vandalism: None			
General Comments: Buoy in good shape			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
N/A	N/A	N/A	None

Buoy Site: 0 170W ADCP	
Mooring Operation: Recovery	Mooring ID#: KA015
Deployed Location: 0 0.250S 169 44.093W	Deployed Date: 9/21/2010
Recovered Location: 0 0.112S 169 44.162W	Recovered Date: 10/19/2011
Previous Repair Date: N/A	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged/Fouled: None	
Fishing/Vandalism: None	
Sensors/Tubes Downloaded: Unable to download TP, CTD not downloaded, comm. cable not available.	
General Comments: TP presented multiple download errors	

Buoy Site: 0 170W ADCP		Mooring Depth: 5433 m	
Mooring Operation: Deployment		Mooring ID#: KA016	
Deployed Location: 0 0.229S 169 44.534W		Deployed Date: 10/19/2011	
Pre-Deployment On Deck Instrument Failures: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged During Deployment: None			
General Comments: None			

Buoy Site: 2N 170W			
Mooring Operation: Recovery		Mooring ID#: PM955A	
Deployed Location: 2 02.11N 170 2.20W		Deployed Date: 2/6/2011	
Recovered Location: 2 12.362N 171 18.548W		Recovered Date: 10/21/2011	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: SSC, T25 and T50 fouled. Only the base remained of the anemometer.			
Fishing/Vandalism: Wind sensor damaged			
Sensors/Tubes Downloaded: All sensors successfully downloaded			
General Comments: Nylon parted approximately 350 meters below Nilspin.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Winds	4/21/11	WDIR 90 degrees off	Upper section lost, Buoy adrift

Buoy Site: 2N 170WRefresh			
Mooring Operation: Recovery		Mooring ID#: DM012B	
Deployed Location: 1 58.227N 170 1.536W		Deployed Date: 9/22/2010	
Recovered Location: 1 59.720N 170 3.640W		Recovered Date: 10/20/2011	
Previous Repair Date: 2/5/2011			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: SSC, T25, and T50 fouled			
Fishing/Vandalism: Fishing line at T125			
Sensors/Tubes Downloaded: All sensors downloaded successfully.			
General Comments: None			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
None	N/A	N/A	None

Buoy Site: 2N 170W Refresh		Mooring Depth: 5396 m	
Mooring Operation: Deployment		Mooring ID#: DM026a	
Deployed Location: 1 58.094N 170 01.89W		Deployed Date: 10/20/2011	
Pre-Deployment On Deck Instrument Failures: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged During Deployment: None			
General Comments: Tube iridium transmissions failed, deployed new-style iridium modem			

here.

Buoy Site: 5N 170W			
Mooring Operation: Recovery		Mooring ID#: PM934B	
Deployed Location: 4 59.9N 170 0.340W		Deployed Date: 9/24/2010	
Recovered Location: 5 1.452N 169 58.903W		Recovered Date: 10/22/2011	
Previous Repair Date: 2/7/2011			
Sensors/Equipment Lost at Sea: T125, T150 and T200			
Sensors Damaged/Fouled: SSC, T25 and T50 fouled			
Fishing/Vandalism: fishing gear at 200m			
Sensors/Tubes Downloaded: All sensors downloaded successfully except T125, T150 and T200			
General Comments: 200m sensor mount pushed up to 150m by fishing gear			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
T125	1/11/11	Data missing	Lost at Sea
T150	1/11/11	Data missing	Lost at Sea
T200	9/23/11	Data missing	Lost at Sea
Wind	4/10/11	WDIR 30-40 degrees off	None

Buoy Site: 5N 170W		Mooring Depth: 5767 m	
Mooring Operation: Deployment		Mooring ID#: PM990A	
Deployed Location: 5 0.745N 170 0.97W		Deployed Date: 10/22/2011	
Pre-Deployment On Deck Instrument Failures: Data logger tube, replaced for deployment			
Sensors Damaged During Deployment: None			
General Comments: Used spare tube			

Buoy Site: 8N 170W			
Mooring Operation: Repair		Mooring ID#: PM956B	
Deployed Location: 8 0.05N 170 2.21W		Deployed Date: 2/9/2011	
Repair Location: 7 59.85N 170 2.520W		Repaired Date: 10/23/2011	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing Vandalism: None			
Sensors/Tubes Not Downloaded: Unable to download T25 sensor due to dead batteries.			
General Comments: Dive op to replace 25m sensor			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
T25	2/10/11	Data missing	Dead batteries

Buoy Site: 8N 180			
Mooring Operation: Visit		Mooring ID#: PM941B	
Deployed Location: 8 0.61N 179 47.07W		Deployed Date: 10/28/2010	
Visit Location: 7 58.9N 179 51.81W		Visit Date: 10/26/2011	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing Vandalism: None			
General Comments: Buoy riding well.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
N/A			

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:

CTD Operations			
Coordinates	Date	Cast #	Comments
0800.265N 15502.402W	10/5/2011	KA60011	3000 m
0700.033N 15457.731W	10/7/2011	KA60021	1000 m
0600.517N 15457.434W	10/7/2011	KA60031	1000 m
0502.831N 15457.700W	10/7/2011	KA60041	1000 m
0400.132N 15457.874W	10/7/2011	KA60051	1000 m
0300.468N 15458.122W	10/8/2011	KA60061	1000 m
0201.782N 15458.909W	10/8/2011	KA60071	1000 m
0100.460N 15458.171W	10/9/2011	KA60081	1000 m
0002.363N 15457.875W	10/9/2011	KA60091	3000 m
0059.525S 15459.419W	10/10/2011	KA60101	1000 m
0157.920S 15502.825W	10/10/2011	KA60111	1000 m
0257.854S 15505.580W	10/11/2011	KA60121	1000 m
0400.350S 15501.623W	10/11/2011	KA60131	1000 m
0459.180S 15501.906W	10/11/2011	KA60141	1000 m
0559.942S 15500.742W	10/12/2011	KA60151	1000 m
0700.092S 15501.041W	10/12/2011	KA60161	1000 m

0815.939S 15502.611W	10/13/2011	KA60171	3000 m
0457.395S 17001.429W	10/17/2011	KA60181	3000 m
0359.943S 17001.827W	10/17/2011	KA60191	1000 m
0300.104S 17001.694W	10/17/2011	KA60201	1000 m
0213.181S 17004.284W	10/18/2011	KA60211	1000 m
0058.909S 16951.581W	10/18/2011	KA60221	1000 m
0002.215S 16945.464W	10/19/2011	KA60231	1000 m
0100.143N 17003.040W	10/19/2011	KA60241	1000 m
0203.405N 17010.977W	10/20/2011	KA60251	1000 m
0402.968N 17026.667W	10/21/2011	KA60261	1000 m
0504.782N 17002.585W	10/22/2011	KA60271	1000 m
0600.327N 16959.459W	10/23/2011	KA60281	1000 m
0700.279N 17000.894W	10/23/2011	KA60291	1000 m
0801.168N 16959.222W	10/24/2011	KA60301	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 (3) Argo float 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

or

Elizabeth Steffen, NOAA/PMEL
 Tel: (206) 526-6747
 E-mail: pmel_floats@noaa.gov

The following outlines the Argo floats deployed during the cruise:

ARGO Floats			
Coordinates	Date	SN#	Comments
0002.159S 16945.599W	10/19/2011	5287	
0100.365N 17003.049W	10/19/2011	5283	
0212.091N 17118.371W	10/21/2011	3634	

Atlantic Oceanographic and Meteorological Laboratory (AMOL) Surface Drifting Floats

Twelve (12) 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

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

AOML Floats				
Coordinates		Date	SN#	Comments
0400.088N	15457.827W	10/7/2011	36591	
0158.921N	15457.434W	10/9/2011	36603	
0000.522N	15457.840W	10/9/2011	36588	
0000.498N	15457.846W	10/9/2011	36602	
0158.771S	15459.718W	10/11/2011	36604	
0400.941S	15501.634W	10/11/2011	36567	
0400.139S	17002.071W	10/17/2011	36542	
0213.273S	17004.317W	10/18/2011	36535	
0002.197S	16945.525W	10/19/2011	36507	
0002.197S	16945.525W	10/19/2011	36594	
0158.358N	17002.229W	10/20/2011	36613	
0403.383N	17026.336W	10/21/2011	36728	