

TROPICAL ATMOSPHERE-OCEAN (TAO) PROGRAM
FINAL CRUISE REPORT
KA-10-03

Area: Equatorial Pacific between 9°N and 5°S latitude along 140°W Longitude and 8°S to 8°N Latitude along 125°W Longitude.

Itinerary:

KA-10-02 DEP *March 30, 2010, Honolulu, HI*

ARR *May 1, 2010, San Diego, CA*

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

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TAO Operations Manager

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TAO Cruise Objective and Plan:

The objective of this cruise was the maintenance of the TAO Array along the 125°W and 140°W meridians.

The scientific complement for the cruise embarked at *Honolulu, HI* on *March 29, 2010*. The ship departed on *March 30, 2010* and conducted operations as listed in Section 2.1. The ship arrived in *San Diego, CA* on *May 1, 2010*.

1.0 **PERSONNEL**

1.1 CRUISE LEAD AND PARTICIPATING SCIENTISTS:

Cruise Lead: Lex LeBlanc

Participating Scientists:

Name	Gender	Nationality	Affiliation
Lex LeBlanc	M	US	NOAA/NDBC
William Thompson	M	US	NOAA/NDBC
Casey Burge	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

Buoy Site: 9N 140W ATLAS	Mooring Depth: 4822m
Mooring Operation: Repair	Mooring ID#: PM838B
Deployed Location: 08 59.4N, 140 15.4W	Deployed Date: 8/30/2009
Visit Location: 09 00.12N, 140 15.66W	Visit Date: 4/5/2010
Previous Repair Date: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged/Fouled: None.	
Fishing/Vandalism: None	

General Comments: Replaced the rain gauge, the buoy was riding well in the water.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Rain Gauge	11/27/09	Erratic data.	

Buoy Site: 5N 140W, Refresh	Mooring Depth: 4485 m
Mooring Operation: Refresh Deployment	Mooring ID#: DM010
Deployed Location: 05 01.8N, 139 57.0W	Deployed Date: 4/7/2010
Pre-Deployment On Deck Instrument Failures: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: None	
General Comments: Routine deployment.	

Buoy Site: 5N 140W, ATLAS	Mooring Depth: 4483 m		
Mooring Operation: Recovery	Mooring ID#: PM783B		
Deployed Location: 04 58.5N, 139 57.5W	Deployed Date: 10/23/2008		
Recovered Location: 04 59.13N, 139 57.18W	Recovered Date: 4/7/2010		
Previous Repair Date: 9/1/2009			
Sensors/Equipment Lost at Sea: Sea Surface Conductivity/Temperature sensor, 2 spools nylon and acoustic release			
Sensors Damaged/Fouled: None			
Fishing/Vandalism: None			
Sensors/Tubes Downloaded: All sensors successfully downloaded.			
General Comments: Line cutter was used to recover mooring. The buoy was deployed over 520 days and was not transmitting via service Argos when recovered.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Buoy	12/22/09	Transmission failure.	

Buoy Site: 5N 140W, ATLAS	Mooring Depth: 4479 m
Mooring Operation: Deployment	Mooring ID#: PM891A
Deployed Location: 04 57.8N, 139 57.2W	Deployed Date: 04/08/2010
Pre-Deployment On Deck Instrument Failures: None.	
Sensors/Equipment Lost at Sea: None.	
Sensors Damaged During Deployment: None.	
General Comments: Routine deployment.	

Buoy Site: 2N 140W, ATLAS	Mooring Depth: 4370 m
Mooring Operation: Recovery	Mooring ID#: PM785B
Deployed Location: 01 58.5N, 140 00.3W	Deployed Date: 10/25/2008
Recovered Location: 01 58.69N, 140 01.165	Recovered Date: 4/8/2010

Previous Repair Date: 09/02/09			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing/Vandalism: None			
Sensors/Tubes Downloaded: All sensors successfully downloaded.			
General Comments: Five (5) fishing boats in the area no signs of damage due to fishing..			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Salinity	12/28/09	Data drifted too high.	

Buoy Site: 2N 140W, ATLAS		Mooring Depth: 4373 m	
Mooring Operation: Deployment		Mooring ID#: PM892A	
Deployed Location: 01 58.2N, 140 00.1W		Deployed Date: 04/09/2010	
Pre-Deployment On Deck Instrument Failures: None.			
Sensors/Equipment Lost at Sea: None.			
Sensors Damaged During Deployment: None.			
General Comments: Routine deployment.			

Buoy Site: 0 140W, ATLAS		Mooring Depth: 4352m	
Mooring Operation: Repair		Mooring ID#: PM843B	
Deployed Location: 00 00.2S, 139 51.3W		Deployed Date: 9/04/2009	
Visit Location: 0 10.43N, 140 8.774W		Visit Date: 4/10/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: Rain Gauge.			
Fishing/Vandalism: There were paint scrapes on the buoy's hull.			
General Comments: Replaced the rain gauge, replaced the TC5 & TC10 on dive operation.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Buoy	1/30/10	Flagged as moved/off station.	

Buoy Site: 0 140W, Refresh		Mooring Depth: 4352 m	
Mooring Operation: Refresh Deployment		Mooring ID#: DM011A	
Deployed Location: 00 00.7S, 139 52.9'W		Deployed Date: 4/11/2010	
Pre-Deployment On Deck Instrument Failures: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged During Deployment: None			
General Comments: Deployed first Refresh Flux site buoy compared well with ships data and 0-140W Legacy buoy. Used Iridium transmits to verify buoy operations and not the RF transmitter.			

Buoy Site: 2S 140W, ATLAS		Mooring Depth: 4333 m	
Mooring Operation: Recovery		Mooring ID#: PM786a	
Deployed Location: 02 02.15S, 140 00.3W		Deployed Date: 10/28/2008	
Recovered Location: 02 01.9S, 140 01.0W		Recovered Date: 4/11/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: Rain gauge, T120, T140, T180, TP300, and TP500			
Sensors Damaged/Fouled: AT/RH damaged on recovery			
Fishing/Vandalism: Long line gear was recovered on the buoy, cuts were in the Nilspin			
Sensors/Tubes Downloaded: All sensors were downloaded successfully with the exception of T20 – no communications.			
General Comments: The release didn't communicate with the deck set. A line cutter was used, however, after one hour it failed to release. The Nilspin was then cut, losing the bottom two TP sensors and 6 spools of nylon.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Rain Gauge	10/25/09	Data stuck.	

Buoy Site: 2S 140W, ATLAS		Mooring Depth: 4331 m	
Mooring Operation: Deployment		Mooring ID#: PM893A	
Deployed Location: 02 2.0S, 139 59.8W		Deployed Date: 04/12/2010	
Pre-Deployment On Deck Instrument Failures: None.			
Sensors/Equipment Lost at Sea: None.			
Sensors Damaged During Deployment: None.			
General Comments: Routine deployment.			

Buoy Site: 5S 140W, ATLAS		Mooring Depth: 4235m	
Mooring Operation: Visit		Mooring ID#: PM845A	
Deployed Location: 05 00.1S, 139 54.1W		Deployed Date: 9/6/2009	
Visit Location: 04 59.94S, 139 55.29W		Visit Date: 4/12/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None.			
Fishing/Vandalism: None			
General Comments: Visit only. Buoy riding well in the water.			

Buoy Site: 5S-140W REFRESH		Mooring Depth: 4362m	
Mooring Operation: Repair		Mooring ID#: DM005B	
Deployed Location: 04 57.8S, 139 54.2W		Deployed Date: 9/05/2009	
Visit Location: 04 57.59S, 139 55.79W		Visit Date: 4/12/2010	

Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: AT/RH Replaced to correct high RH reading.			
Fishing/Vandalism: None			
General Comments: Buoy was riding well in water, and compared with ship's data and nearby Legacy buoy.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Relative Humidity	11/2/09	Data too high.	

Buoy Site: 8.5S 125W, Tsunami Buoy & BPR		Mooring Depth: 4450 m	
Mooring Operation: Recovery Buoy and BPR		Mooring ID#: 51406	
Deployed Location Buoy 08° 29' 04" S 125° 01' 11" W BPR 08° 29' 18" S 125° 01' 08" W		Deployed Date 18 May 2008	
Recovered Location: 08 29.07S, 125 01.183W		Recovered Date: 4/16/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing/Vandalism: None			
Sensors/Tubes Downloaded: Down loaded as per DART field service plan			
General Comments: Upper shackle missing cotter pin, 2 nd shackle corroded, water inside the buoy, one of the transducers plug was damaged. The buoy's anodes were 100% consumed on recovery.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

Buoy Site: 8.5S 125W, Tsunami Buoy & BPR		Mooring Depth: 4450 m	
Mooring Operation: Deployment, Tsunami Buoy & BPR		Mooring ID#: 51406	
Deployed Location: Buoy 08 28.82S, 125 01.608W BPR 08 28.72S, 125 01.732W		Deployed Date: 04/17/2010	
Pre-Deployment On Deck Instrument Failures: None.			
Sensors/Equipment Lost at Sea: None.			
Sensors Damaged During Deployment: None.			
General Comments: Triangulated the BPR (08° 28.80S, 125° 01.799W) depth of 4449m. The buoys data final scope = 0.977. Calculated distance between Buoy anchor drop and BPR 282 meters.			

Buoy Site: 8S 125W ATLAS		Mooring Depth: 4498 m	
Mooring Operation: Recovery		Mooring ID#: PM789A	
Deployed Location: 07 59.4S, 124 57.8W		Deployed Date: 11/8/2008	
Recovered Location: 07 59.21S, 124 57.82W		Recovered Date: 4/18/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: T180			
Sensors Damaged/Fouled: SSC, T20, T40, T60 fouled.			
Fishing/Vandalism: None			
Sensors/Tubes Not Downloaded: All sensors successfully downloaded with the exception of lost T180, sensor and TP300 – dead batteries.			
General Comments: Hybrid release failed lost 3 spools of nylon and the acoustic release.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
None			

Buoy Site: 8S 125W, ATLAS		Mooring Depth: 4511 m	
Mooring Operation: Deployment		Mooring ID#: PM894A	
Deployed Location: 07 59.8S, 124 58.8W		Deployed Date: 4/19/2010	
Pre-Deployment On Deck Instrument Failures: None.			
Sensors/Equipment Lost at Sea: None.			
Sensors Damaged During Deployment: None.			
General Comments: None			

Buoy Site: 5S 125W, ATLAS		Mooring Depth: 4543m	
Mooring Operation: Visit		Mooring ID#: PM847A	
Deployed Location: 04 59.7S, 124 55.5W		Deployed Date: 9/11/2009	
Visit Location: 04 59.3S, 124 56.6W		Visit Date: 4/19/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None.			
Fishing/Vandalism: None			
General Comments: Visit only. Buoy riding well in the water.			

Buoy Site: 2S 125W, ATLAS		Mooring Depth: 4757m	
Mooring Operation: Repair		Mooring ID#: PM848B	
Deployed Location: 02 02.3S, 124 53.5W		Deployed Date: 9/12/2009	
Visit Location: 02 01.9S, 124 54.5W		Visit Date: 4/20/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None.			
Fishing/Vandalism: None			

General Comments: Dive op to replace SSC sensor.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
SST	2/11/10	Erratic and missing data.	

Buoy Site: 0 125W ATLAS		Mooring Depth: 4763 m	
Mooring Operation: Recovery		Mooring ID#: PM790B	
Deployed Location: 00 10.75S, 124 23.5W		Deployed Date: 11/12/2008	
Recovered Location: None		Recovered Date: None	
Previous Repair Date: 9/13/2009			
Sensors/Equipment Lost at Sea: All equipment lost at sea, buoy not on station.			
Sensors Damaged/Fouled: N/A			
Fishing/Vandalism: None			
Sensors/Tubes Not Downloaded: All equipment lost at sea.			
General Comments: Acoustic release was horizontal, and 4 miles from deployment location.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Salinity	10/19/09	Data too low.	
Buoy	10/22/09	Transmission failure.	Horizontal release

Buoy Site: 0 125W ATLAS		Mooring Depth: 4787 m	
Mooring Operation: Deployment		Mooring ID#: PM895A	
Deployed Location: 00 11.09S, 124 23.59W		Deployed Date: 4/21/2010	
Pre-Deployment On Deck Instrument Failures: None.			
Sensors/Equipment Lost at Sea: None.			
Sensors Damaged During Deployment: None.			
General Comments: Refurbished DART release from BPR, ran out of fairings.			

Buoy Site: 2N 125W, ATLAS		Mooring Depth: 4709 m	
Mooring Operation: Visit		Mooring ID#: PM851A	
Deployed Location: 01 57.8N, 125 02.9W		Deployed Date: 9/15/2009	
Visit Location: 01 58.204N, 125 04.220W		Visit Date: 4/22/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None.			
Fishing/Vandalism: None			
General Comments: Visit only. Buoy riding well in the water.			

Buoy Site: 5N 125W ATLAS		Mooring Depth: 4373 m	
Mooring Operation: Recovery		Mooring ID#: PM852A	

Deployed Location: 05 04.9N 124 52.7W		Deployed Date: 9/16/2009	
Recovered Location: 05 05.192N 124 52.402W		Recovered Date: 4/23/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None.			
Sensors Damaged/Fouled: N/A			
Fishing/Vandalism: None			
Sensors/Tubes Not Downloaded: All sensors downloaded successfully except T14773 – no communications.			
General Comments: One spool of nylon has a strand cut.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
None			

Buoy Site: 5N 125W, ATLAS		Mooring Depth: 4404 m	
Mooring Operation: Deployment		Mooring ID#: PM896A	
Deployed Location: 05 04.450N, 124 56.651W		Deployed Date: 4/23/2010	
Pre-Deployment On Deck Instrument Failures: None			
Sensors/Equipment Lost at Sea: None.			
Sensors Damaged During Deployment: Wind sensor 70 degrees from ship observations			
General Comments: Replaced the wind sensor after deployment. Due to limits in available nylon we deployed with a butt splice in the #3 spool approximately 100m from the end of the spool.			

Mooring Operation: Recovery DART (adrift)		Mooring ID#: 43413	
Deployed Location: 10 50.4N, 100 5.1W		Deployed Date: 10/20/2009	
Recovered Location: 07 11.68N, 122 28.92W		Recovered Date: 04/24/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: N/A			
Fishing/Vandalism: None			
Sensors/Tubes Not Downloaded: N/A			
General Comments: Mooring failed in first shackle of lower Nilspin			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
	01/12/2010	Buoy adrift	

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
08 58.997N	140 16.263W	4/3/10	None	Test cast, 1000 m
08 58.997N	140 16.263W	4/5/10	KA30011	3000 m
08 01.355N	140 10.346W	4/6/10	KA30021	1000 m
07 00.531N	140 05.650W	4/6/10	KA30031	1000 m
06 00.062N	140 02.270W	4/6/10	KA30041	1000 m
04 58.086N	140 04.455W	4/7/10	KA30051	1000 m
04 00.028N	140 00.614W	4/8/10	KA30061	1000 m
03 00.603N	140 00.193W	4/8/10	KA30071	1000 m
01 59.020N	140 01.101W	4/9/10	KA30082	1000 m
01 00.911N	140 06.292W	4/10/10	KA30091	1000 m
00 12.968N	140 08.824W	4/10/10	KA30101	3000 m
00 13.614N	140 08.404W	4/10/10	KA30111	1000 m
00 59.825S	140 05.790W	4/11/10	KA30121	1000 m
02 03.445S	140 00.428W	4/12/10	KA30131	1000 m
02 59.644S	140 00.183W	4/12/10	KA30141	1000 m
03 59.341S	139 57.600W	4/12/10	KA30151	1000 m
04 59.517S	139 56.904W	4/13/10	KA30161	1000 m
07 58.801S	125 02.734W	4/18/10	KA30171	1000 m
06 59.735S	124 57.929W	4/19/10	KA30181	1000 m
05 59.558S	124 57.659W	4/19/10	KA30191	1000 m
04 57.970S	124 57.093W	4/19/10	KA30201	1000 m
04 00.014S	124 56.541W	4/20/10	KA30212	1000 m
03 00.308S	124 55.734W	4/20/10	KA30221	1000 m
02 00.201S	124 55.088W	4/20/10	KA03231	1000 m
01 00.255S	124 39.233W	4/21/10	KA30241	1000 m
00 09.377S	124 26.092W	4/21/10	KA30251	3000 m
0008.079S	12425.553W	4/21/10	KA30261	1000 m
01 00.888N	124 47.843W	4/22/10	KA30271	1000 m
01 58.878N	125 05.606W	4/22/10	KA30281	1000 m
02 57.532N	125 00.397W	4/22/10	KA30291	1000 m
04 00.569N	124 55.379W	4/23/10	KA30301	1000 m
05 04.494N	124 49.761W	4/23/10	KA30311	1000 m
05 58.508N	123 53.179W	4/24/10	KA30321	1000 m
07 00.334N	122 40.548W	4/24/10	KA30331	1000 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

Six 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

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
04 58.222S	139 55.168W	4/13/2010	90552	
04 57.617S	124 57.462W	4/19/2010	90554	
01 59.895S	124 55.001W	4/20/2010	90553	
00 10.691S	124 23.553W	4/21/2010	90551	
01 58.204N	125 05.810W	4/22/2010	90547	
05 04.678N	124 56.296W	4/23/2010	90550	

Atlantic Oceanographic and Meteorological Laboratory (AOML) Surface Drifting Floats

Five 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,
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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
04 57.376N	139 58.334W	4/8/2010	90545	
01 42.419N	140 02.641W	4/9/2010	90546	
00 01.040N	139 52.777W	4/11/2010	90547	
02 01.857S	140 02.016W	4/11/2010	90548	
02 03.364S	140 00.500W	4/12/2010	90549	