

TROPICAL ATMOSPHERE-OCEAN (TAO) PROGRAM
FINAL CRUISE REPORT
KA-10-04

Area: Equatorial Pacific between 8°N and 8°S latitude along 110°W Longitude and 8°S to 8°N Latitude along 95°W Longitude.

Itinerary:

KA-10-04 DEP *July 9, 2010, San Diego, CA*
ARR *August 10, 2010, Manzanillo, MX*

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 lifecycles are up to 18 months to ensure at least one year of data collection can be completed.

TAO Project Points of Contact:

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TAO Cruise Objective and Plan:

The objective of this cruise was the maintenance of the TAO Array along the 110°W and 95°W meridians.

The scientific complement for the cruise embarked at *San Diego, CA* on *July 8, 2010*. The ship departed on *July 9, 2010* and conducted operations as listed in Section 2.1. The ship arrived in *Manzanillo, MX* on *August 10, 2010*.

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
William Thompson	M	US	NOAA/NDBC
Bryan Guchereau	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 110W	Mooring Depth: 4208m
Mooring Operation: Visit	Mooring ID#: PM881A
Deployed Location: 08 2.32N, 110 09.41W	Deployed Date: 3/11/2010
Visit Location: 08 03.408N, 110 07.663W	Visit Date: 7/17/2010
Sensors/Equipment Lost at Sea: None	
Sensors Damaged/Fouled: None	
Fishing Vandalism: None	
General Comments: Buoy riding slightly high in water.	

Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
			None

Buoy Site: 5N 110W		Mooring Depth: 4245m	
Mooring Operation: Recovery		Mooring ID#: PM882A	
Deployed Location: 04 59.623N, 110 04.292W		Deployed Date: 3/12/2010	
Recovered Location: 05 00.104N, 110 04.403W		Recovered Date: 7/18/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: Tube-728, AT/RH-104894, Anemometer-38165			
Sensors Damaged/Fouled: TP 10 had broken module mount.			
Fishing/Vandalism: Tower was missing			
Sensors/Tubes Downloaded: All subsurface sensors were downloaded successfully.			
General Comments: Buoy had been vandalized and the tower was missing.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Anemometer	6-12-2010	WSPD zeroed out	Tower was missing from buoy
Tube	6-14-2010	No transmits	Tower was missing from buoy

Buoy Site: 5N 110W		Mooring Depth: 4245m	
Mooring Operation: Deployment		Mooring ID#: PM910A	
Deployed Location: 04 59.39N, 110 04.42W		Deployed Date: 7/18/2010	
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 110W		Mooring Depth: 3773m	
Mooring Operation: Visit		Mooring ID#: PM884A	
Deployed Location: 02 02.473N, 110 01.563W		Deployed Date: 3/14/2010	
Visit Location: 02 03.454N, 110 02.300W		Visit Date: 7/19/2010	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing Vandalism: None			
General Comments: There was a 3 kt. Current upon arrival. Subsurface data was intermittent.			
Site Sensor Failures	Date Sensors Failed	Why Sensors	Field Service Observations

		Failed	
			None

Buoy Site: 0 110W		Mooring Depth: 3803m	
Mooring Operation: Recovery		Mooring ID#: PM885A	
Deployed Location: 00 00.07N, 109 54.34W		Deployed Date: 3/15/2010	
Recovered Location: 00 01.326N, 109 54.64W		Recovered Date: 7/21/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: Tube SN#600, AT/RH SN#133387, Anemometer SN#80480, Rain Gauge SN#1337, SW Radiation SN#35910, LW Radiation SN#35907, Barometer SN#14956, 140m T SN#13836, 180m T SN#14268, 300m TP SN#11953			
Sensors Damaged/Fouled: 13.3m TV was unplugged and connector was corroded. 48.3m TV was flooded.			
Fishing/Vandalism: Tower was missing			
Sensors/Tubes Downloaded: Subsurface only except TV SN#13903, T SN#13836, T SN#14268, TP SN#11953. All CHIPOD's were not download but redeployed.			
General Comments: Buoy had been vandalized and tower was missing, buoy hull was usable and redeployed with the spare PC02 system.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Tube	7/22/2010	Vandalism	Tower was missing from buoy
40m Salinity	3/22/10	Data too low	None

Buoy Site: 0 110W		Mooring Depth: 3805m	
Mooring Operation: Deployment		Mooring ID#: PM911A	
Deployed Location: 00 00.138N, 109 53.903W		Deployed Date: 7/22/2010	
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 110W ADCP		Mooring Depth: 3826m	
Mooring Operation: Recovery		Mooring ID#: EA017	
Deployed Location: 00 00.48N, 109 57.45W		Deployed Date: 9/20/2009	
Recovered Location: 00 00.48N 109 57.45W		Recovered Date: 7/20/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing/Vandalism: None			

Sensors/Tubes Downloaded: All sensors downloaded successfully.			
General Comments:			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

Buoy Site: 0 110W ADCP	Mooring Depth: 3840m
Mooring Operation: Deployment	Mooring ID#: EA018
Deployed Location: 00 00.35N, 109 56.66W	Deployed Date: 7/21/2010
Pre-Deployment On Deck Instrument Failures: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: None	
General Comments: Routine deployment.	

Buoy Site: 2S 110W	Mooring Depth: 3915m		
Mooring Operation: Recovery	Mooring ID#: PM855A		
Deployed Location: 02 00.864S, 109 59.001W	Deployed Date: 3/16/2010		
Recovered Location: None	Recovered Date: 7/22/2010		
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: Tube SN#609, AT/RH SN#91572, Anemometer SN#88417, SSC SN#15049, 20m T SN#14709, 40m T SN#14710, 60m T SN#14711, 80m T SN#14973, 100m T SN# 14974, 120m T SN#14975, 140m T SN#14976, 180m T SN#14977, 300m TP SN#15123, 500m TP SN#15124.			
Sensors Damaged/Fouled: None.			
Fishing/Vandalism: Buoy was missing.			
Sensors/Tubes Downloaded: No sensors downloaded, buoy lost at sea.			
General Comments:			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

Buoy Site: 2S 110W	Mooring Depth: 3926m
Mooring Operation: Deployment	Mooring ID#: PM912A
Deployed Location: 02 1.8S, 109 58.1W	Deployed Date: 7/22/2010
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 110W		Mooring Depth: 3625m	
Mooring Operation: Recovery		Mooring ID#: PM 797C	
Deployed Location: 04 59.154S 109 59.494W		Deployed Date: 12/25/2008	
Recovered Location: None		Recovered Date: None	
Previous Repair Date: 9/21/2009, 3/17/2010			
Sensors/Equipment Lost at Sea: Buoy adrift and still transmitting positions			
Sensors Damaged/Fouled: No sensors recovered.			
Fishing/Vandalism: Buoy was adrift.			
Sensors/Tubes Downloaded: No sensors were downloaded.			
General Comments:			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

Buoy Site: 5S 110W		Mooring Depth: 3615m	
Mooring Operation: Deployment		Mooring ID#: PM913A	
Deployed Location: 04 59.472S, 109 58.945W		Deployed Date: 7/24/2010	
Pre-Deployment On Deck Instrument Failures: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged During Deployment: None			
General Comments: Routine deployment.			

Buoy Site: 8S 110W		Mooring Depth: 3414m	
Mooring Operation: Visit		Mooring ID#: PM887A	
Deployed Location: 7 59.283S, 110 04.597W		Deployed Date: 3/18/2010	
Visit Location: 07 59.6S, 110 04.8W		Visit Date: 7/25/2010	
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
			None

Buoy Site: 8S 95W		Mooring Depth: 3977m	
Mooring Operation: Recovery		Mooring ID#: PM856A	
Deployed Location: 07 58.710S, 95 15.629W		Deployed Date: 9/25/2009	
Recovered Location: 07 59.194S, 95 15.567W		Recovered Date: 7/29/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: Fouled sensors at: SSC SN#14908, 20m T SN#13033, 40m T SN#13034, 60m T SN#13035, 80m T SN#13057. 180m T SN#13066 had a broken mount. 120m T SN#13059 was flooded.			
Fishing/Vandalism: None			
Sensors/Tubes Downloaded: All downloaded successfully except 120m T SN#13059			
General Comments: None			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
T120	3/12/10	Data missing	Sensor flooded

Buoy Site: 8S 95W		Mooring Depth: 3973m	
Mooring Operation: Deployment		Mooring ID#: PM915A	
Deployed Location: 08 01.874S, 95 14.967W		Deployed Date: 7/29/2010	
Pre-Deployment On Deck Instrument Failures: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged During Deployment: None			
General Comments: None			

Buoy Site: 5S 95W		Mooring Depth: 3836m	
Mooring Operation: Recovery		Mooring ID#: PM857B	
Deployed Location: 05 04.3S, 95 04.05W		Deployed Date: 9/27/2009	
Recovered Location: 05 01.777S, 95 09.620W		Recovered Date: 7/30/2010	
Previous Repair Date: 3/23/2010			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: Fouled Sensors: SSC SN#14420 (Repair), SSC SN#11153 (Original), 20m T SN#13428, 40m T SN#12081, 60m T SN#13430, 80m T SN#12890. Sensors with Broken Mounts: 100m T SN#12891, 180m T SN#12938.			
Fishing/Vandalism: Long line gear tangled in bridle			
Sensors/Tubes Downloaded: All sensors downloaded successfully except SSC SN#14420			
General Comments: None			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

Buoy Site: 5S 95W	Mooring Depth: 3935m
Mooring Operation: Deployment	Mooring ID#: PM917A
Deployed Location: 05 04.9S, 95 03.4W	Deployed Date: 7/30/2010
Pre-Deployment On Deck Instrument Failures: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: None	
General Comments: Routine deployment.	

Buoy Site: 2S 95W	Mooring Depth: 3440m		
Mooring Operation: Recovery	Mooring ID#: PM858A		
Deployed Location: 02 01.09S, 95 10.94W	Deployed Date: 9/28/2009		
Recovered Location: 01 57.109S, 95 24.544W	Recovered Date: 7/31/2010		
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: Fouled Sensors: SSC SN#11741, 20m T SN#14443, 40m T SN#12598, 60m T SN#14444, 80m T SN#13082 also had a broken mount.			
Fishing/Vandalism: Tow-line was attached to tower.			
Sensors/Tubes Downloaded: All sensors downloaded successfully except 40m T SN#12598, Battery was dead.			
General Comments:			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
T40	5/2/10	Data missing	Dead battery

Buoy Site: 2S 95W	Mooring Depth: 3439m
Mooring Operation: Deployment	Mooring ID#: PM918A
Deployed Location: 01 59.4S, 95 10.5W	Deployed Date: 8/1/2010
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 95W	Mooring Depth: 3313m
Mooring Operation: Recovery	Mooring ID#: PM 888A
Deployed Location: 00 00.545S, 94 59.28W	Deployed Date: 3/24/2010
Recovered Location: None, buoy lost at sea	Recovered Date: 8/2/2010
Previous Repair Date: None	
Sensors/Equipment Lost at Sea: Payload SN#641, AT/RH SN#34277, Wind SN#63912, Rain Gauge SN#1334, SSC SN#14071, 20m T SN#14121, 40m T SN#14122, 60m T SN#14123, 80m T SN#14124, 100m T SN#14125, 120m T SN#14138, 140m T SN#14142, 180m T SN#14177,	

300m TP SN#14391, 500m TP SN#14392.			
Sensors Damaged/Fouled: None			
Fishing/Vandalism: Buoy lost at sea.			
Sensors/Tubes Downloaded: No sensors were downloaded.			
General Comments: None			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

Buoy Site: 0 95W	Mooring Depth: 3317m
Mooring Operation: Deployment	Mooring ID#: PM920A
Deployed Location: 0 00.702S, 94 58.980W	Deployed Date: 8/2/2010
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 95W	Mooring Depth: 3089m		
Mooring Operation: Visit	Mooring ID#: PM889A		
Deployed Location: 01 59.47N, 95 18.87W	Deployed Date: 3/25/2010		
Visit Location: 01 59.358N, 95 19.617W	Visit Date: 8/3/2010		
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing Vandalism: None			
General Comments: Buoy was riding a little low in the water.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
			N/A

Buoy Site: 5N 95W	Mooring Depth: 3559m
Mooring Operation: Recovery	Mooring ID#: PM802B
Deployed Location: 04 58.191N, 94 58.461W	Deployed Date: 1/5/2009
Recovered Location: 04 58.398N, 94 58.698W	Recovered Date: 8/4/2010
Previous Repair Date: 3/26/2010	
Sensors/Equipment Lost at Sea: Tube SN#510, AT/RH SN#56608, Wind SN#80500, Rain Gage SN#731, 120m T SN#13669, 140m T SN#13670, 180m T SN#13689.	
Sensors Damaged/Fouled: 20m T SN#13246 was fouled.	
Fishing/Vandalism: Tower was missing.	
Sensors/Tubes Downloaded: All subsurface sensors were downloaded successfully.	

General Comments: None			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Tube	7/17/10	No transmits	Tower missing
T120	12/12/09	Data missing	Lost at sea
T140	7/5/09	Data missing	Lost at sea
T180	6/27/10	Data missing	Lost at sea

Buoy Site: 5N 95W	Mooring Depth: 3563m
Mooring Operation: Deployment	Mooring ID#: PM922A
Deployed Location: 04 58.0N, 94 59.3W	Deployed Date: 8/4/2010
Pre-Deployment On Deck Instrument Failures: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: None	
General Comments: None	

Buoy Site: 8N 95W	Mooring Depth: 3653m		
Mooring Operation: Recovery	Mooring ID#: PM890A		
Deployed Location: 08 02.875N, 94 56.562W	Deployed Date: 3/27/2010		
Recovered Location: 08 03.456N, 94 55.470W	Recovered Date: 8/5/2010		
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: Tube SN#496, AT/RH SN#112231, Wind SN#80474, Rain Gage SN#892, 180m T SN#14251.			
Sensors Damaged/Fouled: SSC SN#14129 and 20m T SN#14190 were fouled.			
Fishing/Vandalism: Tower was missing, cuts in Nilspin and fishing line on 20m sensor			
Sensors/Tubes Downloaded: All subsurface sensors were downloaded successfully except 20m T SN#14190 due to dead battery.			
General Comments: Tower missing.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Tube	5/9/10	No transmits	Tower missing
Rain	5/2/10	Data too low	Tower missing
Wind	5/1/10	WSPD too low	Tower missing
T180	After 5/9/10	-	Lost at sea
T20	After 5/9/10	-	Dead battery

Buoy Site: 8N 95W	Mooring Depth: 3652m
Mooring Operation: Deployment	Mooring ID#: PM923A
Deployed Location: 08 03.2N, 94 56.7W	Deployed Date: 8/6/2010

Pre-Deployment On Deck Instrument Failures: None
Sensors/Equipment Lost at Sea: None
Sensors Damaged During Deployment: None
General Comments: None

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
0759.895N	11006.337W	7/17/2010	KA40011	3000 m
0700.213N	11007.450W	7/17/2010	KA40021	1000 m
0559.820N	11005.756W	7/17/2010	KA40031	1000 m
0459.802N	11004.476W	7/18/2010	KA40041	1000 m
0400.567N	11004.132W	7/19/2010	KA40051	1000 m
0300.907N	11003.907W	7/19/2010	KA40061	1000 m
0204.126N	11005.298W	7/19/2010	KA40071	1000 m
0101.384N	10958.693W	7/20/2010	KA40081	1000 m
0000.127S	10959.452W	7/21/2010	KA40091	1000 m
0100.222S	10958.323W	7/22/2010	KA40101	1000 m
0202.457S	10959.614W	7/23/2010	KA40111	1000 m
0259.812S	11000.032W	7/23/2010	KA40121	1000 m
0359.943S	11000.175W	7/23/2010	KA40131	1000 m
0459.767S	11000.093W	7/24/2010	KA40141	1000 m
0559.675S	11002.309W	7/24/2010	KA40151	1000 m
0659.599S	11003.445W	7/24/2010	KA40161	1000 m
0757.468S	11002.687W	7/25/2010	KA40171	3000 m
0759.126S	09515.927W	7/29/2010	KA40181	3000 m
0700.074S	09511.690W	7/30/2010	KA40191	1000 m
0559.686S	09508.217W	7/30/2010	KA40201	1000 m
0505.956S	09504.448W	7/30/2010	KA40211	1000 m
0359.800S	09511.628W	7/31/2010	KA40221	1000 m
0300.557S	09517.538W	7/31/2010	KA40231	1000 m
0200.088S	09510.863W	8/1/2010	KA40241	1000 m
0100.418S	09508.534W	8/1/2010	KA40251	1000 m
0005.864N	09505.490W	8/2/2010	KA40261	3000 m
0059.976N	09510.175W	8/3/2010	KA40271	1000 m
0201.968N	09519.601W	8/3/2010	KA40281	1000 m

0259.717N	09512.514W	8/3/2010	KA40291	1000 m
0402.505N	09504.536W	8/3/2010	KA40301	1000 m
0455.621N	09457.713W	8/4/2010	KA40311	1000 m
0559.574N	09457.565W	8/5/2010	KA40321	1000 m
0659.731N	09456.905W	8/5/2010	KA40331	1000 m
0801.369N	09453.529W	8/6/2010	KA40341	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

One (1) Argo float 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:

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or

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The following outlines the Argo floats deployed during the cruise:

ARGO Floats			
Coordinates	Date	SN#	Comments
00 00.039S 94 59.447W	8/2/2010	4598	