

TROPICAL ATMOSPHERE-OCEAN (TAO) PROGRAM
FINAL CRUISE REPORT
WE-10-01

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:

WE-10-01 DEP *March 1, 2010, Newport, OR*
ARR *March 31, 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.

Special thanks to the University of Oregon, teachers at sea, and the crew of the RV *Wecoma* for outstanding support to the NDBC personnel during this cruise to service NOAA's TAO array.

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 110°W and 95°W meridians.

The scientific complement for the cruise embarked on **R/V *Wecoma*** at **Newport, OR** on **February 28, 2010**. The ship departed on **March 1, 2010** and conducted operations as listed in Section 2.1. The ship arrived in **Manzanillo, MX** on **March 31, 2010**.

1.0 PERSONNEL

1.1 CRUISE LEAD AND PARTICIPATING SCIENTISTS:

Cruise Lead: **Error! Reference source not found.**

Participating Scientists:

Name	Gender	Nationality	Affiliation
Leonard Quigley	M	US	NOAA/NDBC
Alan Lossett	M	US	NOAA/NDBC
James Haden	M	US	NOAA/NDBC
James Rauch	M	US	NOAA/NDBC
Annie Thorp	F	US	OSU/Teacher at Sea
Michael Courtney	M	US	OSU/Teacher at Sea

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: 8N 110W	Mooring Depth: 4176 m
Mooring Operation: Recovery	Mooring ID#: PM801B
Deployed Location: 08 03.4N, 110 09.1W	Deployed Date: 1/1/2009

Recovered Location: 08 02.64N, 110 10.07W		Recovered Date: 3/11/2010	
Previous Repair Date: 9/16/2009			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: SSC fouled, SSC on Pickle fork fouled, broken mounts on 20m T SN#13411, 100m T SN#13415, 140m T SN# 13417.			
Fishing/Vandalism: None			
Sensors/Tubes Downloaded: All sensors downloaded successfully.			
General Comments: Buoy full of water and some small cracks			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Salinity	2/20/10	Data erratic and high.	

Buoy Site: 8N 110W		Mooring Depth: 4208 m	
Mooring Operation: Deployment		Mooring ID#: PM881A	
Deployed Location: 08 2.32N, 110 09.41W		Deployed Date: 3/11/2010	
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 110W		Mooring Depth: 3967 m	
Mooring Operation: Recovery		Mooring ID#: PM800B	
Deployed Location: 05 02.34N, 109 59.33W		Deployed Date: 12/30/2008	
Recovered Location: 05 01.99N, 109 58.86W		Recovered Date: 3/13/2010	
Previous Repair Date: 9/17/2009			
Sensors/Equipment Lost at Sea: SSC on pickle fork SN# 14909, tube SN# 694, AT/RH SN# 133380, Wind SN# 37701			
Sensors Damaged/Fouled: Upper poison puck missing and fouled, Broken mount at 180m			
Fishing/Vandalism: Tower was unbolted and missing, long line gear on third and fifth nylon spools.			
Sensors/Tubes Downloaded: All sensors successfully downloaded except for the missing SSC SN# 14909			
General Comments: None			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Buoy/Tube	12/17/09	Transmission failure.	Missing tower and pickle fork SSC

Buoy Site: 5N 110W		Mooring Depth: 4245 m	
Mooring Operation: Deployment		Mooring ID#: PM882A	

Deployed Location: 04 59.62N, 110 04.29W	Deployed Date: 3/12/2010
Pre-Deployment On Deck Instrument Failures: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: None	
General Comments: Deployment went well.	

Buoy Site: 2N 110W		Mooring Depth: 3717 m	
Mooring Operation: Recovery		Mooring ID#: PM799A	
Deployed Location: 02 00.70N, 110 02.13W		Deployed Date: 12/29/2008	
Recovered Location: 02 00.99N, 110 12.96W		Recovered Date: 3/14/2010	
Previous Repair Date: None.			
Sensors/Equipment Lost at Sea: SSC SN# 14151			
Sensors Damaged/Fouled: Broken module mounts at 80m, 180m, 300m, and 500m			
Fishing/Vandalism: Fishing net wrapped around on one tower leg.			
Sensors/Tubes Downloaded: All sensors were successfully downloaded with the exception of SSC SN# 14151.			
General Comments: Routine recovery.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Salinity	4/5/09	Data too high.	Missing SSC.
Buoy	10/22/09	Flagged as moved/off station.	

Buoy Site: 2N 110W		Mooring Depth: 3773m	
Mooring Operation: Deployment		Mooring ID#: PM844A	
Deployed Location: 02 02.47N, 110 01.56W		Deployed Date: 3/14/2010	
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		Mooring Depth: 3803 m	
Mooring Operation: Deployment		Mooring ID#: PM885A	
Deployed Location: 00 00.07N, 109 54.34W		Deployed Date: 3/15/2010	
Pre-Deployment On Deck Instrument Failures: Short Wave Radiation SN#30368			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged During Deployment: None			
General Comments: SWR failed prior to deployment, exchanged with SN#35910			

Buoy Site: 0 110W		Mooring Depth: 3795 m	
Mooring Operation: Recovery		Mooring ID#: PM 855A	
Deployed Location: 00 02.9N, 109 55.6W		Deployed Date: 9/19/2009	
Recovered Location: 00 03.4N 109 54.7W		Recovered Date: 3/15/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: Tube SN#626, AT/RH SN#133369, Wind SN#88443, Rain Gage SN#1326, SWR SN#35781, LWR SN#35846, Barometer SN#101765.			
Sensors Damaged/Fouled: None.			
Fishing/Vandalism: Buoy had some chips out of it and a small piece of a towing pendant.			
Sensors/Tubes Downloaded: Tube, lost at sea.			
General Comments: Tower unbolted and removed.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Buoy/Tube	11/3/09	Transmission failure.	Tower missing

Buoy Site: 2S 110W		Mooring Depth: 3930 m	
Mooring Operation: Recovery		Mooring ID#: PM798B	
Deployed Location: 02 03.161S, 110 00.12W		Deployed Date: 12/26/2008	
Recovered Location: 01 59.9S, 110 05.9W		Recovered Date: 3/16/2010	
Previous Repair Date: 9/20/2009			
Sensors/Equipment Lost at Sea: 60m T SN#13685, 140m T SN#13236, 180m T SN#14178			
Sensors Damaged/Fouled: Fouled sensors at: SSC SN#14159, 20m T SN#13683, 40m T SN#13684			
Fishing/Vandalism: Tower ring cracked, and one tower leg unbolted which punched into the buoy.			
Sensors/Tubes Downloaded: All sensors downloaded successfully except those lost at sea, noted above.			
General Comments: None.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
T180	8/5/09	No data	Fishing vandalism
T140	10/1/09	No data	
T60	11/1/09	No data	

Buoy Site: 2S 110W		Mooring Depth: 3915 m	
Mooring Operation: Deployment		Mooring ID#: PM886A	
Deployed Location: 02 00.86S, 109 59.0W		Deployed Date: 3/16/2010	
Pre-Deployment On Deck Instrument Failures: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged During Deployment: None			

General Comments: Routine deployment.
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Buoy Site: 5S 110W		Mooring Depth: 3625 m	
Mooring Operation: Repair		Mooring ID#: PM797C	
Deployed Location: 04 59.15S, 109 59.49W		Deployed Date: 12/25/2010	
Repair Location: 04.58.94S, 110.01.221W		Repaired Date: 3/17/2010	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing Vandalism: There was a short piece of tow-rope attached to the buoy.			
Sensors/Tubes Downloaded: Tube downloaded successfully.			
General Comments: Performed tube, AT/RH, and wind swap.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
None			

Buoy Site: 8S 110W		Mooring Depth: 3411 m	
Mooring Operation: Recovery		Mooring ID#: PM796A	
Deployed Location: 08 00.2S, 110 04.0W		Deployed Date: 12/24/2008	
Recovered Location: 07 59.163S, 110 04.09W		Recovered Date: 3/18/2010	
Previous Repair Date: None.			
Sensors/Equipment Lost at Sea: 120m T SN#13625, 140m T SN#13626 & Anemometer SN# 34340			
Sensors Damaged/Fouled: None			
Fishing/Vandalism: Long line gear at 120m through 140m.			
Sensors/Tubes Downloaded: All sensors downloaded successfully except for 120m T SN#13625, 140m T SN#13626 & Tube 469. Tube had 0 bytes to download.			
General Comments: Anemometer and mast were ripped off and blue paint on tower ring.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Salinity	1/6/10	Data erratic and high.	
T120	1/29/10	No data.	
T140	1/31/10	No data.	
Buoy/Tube	3/15/10	Transmission failure.	Ship collision

Buoy Site: 8S 110W		Mooring Depth: 3414 m	
Mooring Operation: Deployment		Mooring ID#: PM887A	
Deployed Location: 07 59.283S, 110 04.597W		Deployed Date: 3/18/2010	
Pre-Deployment On Deck Instrument Failures: None			

Sensors/Equipment Lost at Sea: None
Sensors Damaged During Deployment: None
General Comments: Routine deployment.

Buoy Site: 8S 95W		Mooring Depth: 3987 m	
Mooring Operation: Visit		Mooring ID#: PM856A	
Deployed Location: 7 58.7S, 95 15.6W		Deployed Date: 9/25/2009	
Visit Location: 7 59.132S, 95 15.935W		Visit Date: 3/22/2010	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing Vandalism: None			
General Comments: Buoy riding well in the water.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
None			

Buoy Site: 5S 95W		Mooring Depth: 3836 m	
Mooring Operation: Repair		Mooring ID#: PM857B	
Deployed Location: 05 04.3S, 95 04.05W		Deployed Date: 9/27/2009	
Repair Location: 05 04.23S, 95 03.86W		Repaired Date: 3/23/2010	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing Vandalism: None.			
Sensors/Tubes Downloaded: Tube successfully downloaded.			
General Comments: Installed new SSC. Original SSC not recovered.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Salinity	9/27/09	Data too low.	

Buoy Site: 2S 95W		Mooring Depth: 3440 m	
Mooring Operation: Visit		Mooring ID#: PM858A	
Deployed Location: 02 01.09S, 95 10.94W		Deployed Date: 9/28/2009	
Visit Location: 02 01.299S, 95 11.47W		Visit Date: 3/23/2010	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing Vandalism: Towing pendant attached.			
General Comments: Buoy riding well in the water.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
None			

Buoy Site: 0 95W		Mooring Depth: 3317 m	
Mooring Operation: Recovery		Mooring ID#: PM859A	
Deployed Location: 00 00.265S, 94 59.34W		Deployed Date: 9/30/2010	
Recovered Location: 0 00.3S, 95 00.1W		Recovered Date: 3/24/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: AT/RH SN#112227, Wind SN#88451, Rain Gage SN#1096			
Sensors Damaged/Fouled: Payload tube damaged.			
Fishing/Vandalism: Towline on buoy with fishing net on bridle. Tower is severely damaged and radar reflector missing. Approximately 50 ft. of fishing line at 25 meters on Nilspin. When on scene, a fishing boat was present at the buoy.			
Sensors/Tubes Downloaded: All sensors downloaded successfully.			
General Comments: See above comments.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
Salinity	9/30/09	Data too low.	
Anemometer	10/6/09	Speed went to zero.	
Buoy/Tube	10/8/09	Transmission failure.	Buoy vandalized. See comments above.

Buoy Site: 0 95W		Mooring Depth: 3258 m	
Mooring Operation: Deployment		Mooring ID#: PM888A	
Deployed Location: 0 00.545S, 94 59.28W		Deployed Date: 3/24/2010	
Pre-Deployment On Deck Instrument Failures: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged During Deployment: None			
General Comments: Routine deployment.			

Buoy Site: 2N 95W		Mooring Depth: 3118 m	
Mooring Operation: Recovery		Mooring ID#: PM860A	
Deployed Location: 01 59.77N, 95 18.23W		Deployed Date: 10/1/2009	
Recovered Location: 01 59.363N, 95 18.076W		Recovered Date: 3/25/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: Anemometer has propeller shaft lose.			
Fishing/Vandalism: None			
Sensors/Tubes Downloaded: All sensors downloaded successfully.			
General Comments: None			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

Anemometer	11/4/09	Speed went to zero.	
AT/RH	11/7/09	ATMP too low.	

Buoy Site: 2N 95W	Mooring Depth: 3117 m
Mooring Operation: Deployment	Mooring ID#: PM889A
Deployed Location: 01 59.47N, 95 18.87W	Deployed Date: 3/25/2010
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 95W	Mooring Depth: 3559 m		
Mooring Operation: Repair	Mooring ID#: PM802B		
Deployed Location: 04 58.191N, 094 58.461W	Deployed Date: 1/5/2009		
Repair Location: 4 58.4N, 94 58.7W	Repaired Date: 3/26/2010		
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing Vandalism: Small amount of fishing line on bridle.			
Sensors/Tubes Not Downloaded: Tube could not be downloaded.			
General Comments: Replaced the following: anemometer, tube, AT/RH, rain gage, and the SSC was replaced by a diver. Older SSC SN#14131 was recovered and downloaded.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
None			

Buoy Site: 8N 95W	Mooring Depth: 3653 m
Mooring Operation: Deployment	Mooring ID#: PM890A
Deployed Location: 8 02.875N, 94 56.562W	Deployed Date: 3/27/2010
Pre-Deployment On Deck Instrument Failures: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: None	
General Comments: Routine deployment.	

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 02.010N 110 10.493W	3/11/2010	WE-10011	3000m	
07 00.028N 110 00.007W	3/12/2010	WE-10021	1000m	
06 00.002N 109 59.997W	3/12/2010	WE-10031	1000m	
04 59.595N 110 06.090W	3/13/2010	WE-10041	1000m	
04 00.025N 110 00.010W	3/13/2010	WE-10051	1000m	
02 59.999N 110 00.000W	3/13/2010	WE-10061	1000m	
02 02.492N 110 01.500W	3/13/2010	WE-10071	1000m	
00 59.952N 109 59.971W	3/14/2010	WE-10081	1000m	
00 00.537S 109 54.010W	3/15/2010	WE-10091	3000m	
00 59.987S 109 59.871W	3/15/2010	WE-10101	1000m	
02 01.415S 109 58.926W	3/16/2010	WE-10111	1000m	
03 00.001S 109 59.998W	3/16/2010	WE-10121	1000m	
03 59.998S 110 00.006W	3/16/2010	WE-10131	1000m	
04 59.053S 110 02.245W	3/17/2010	WE-10141	1000m	
06 00.001S 110 00.003W	3/17/2010	WE-10151	1000m	
07 00.000S 109 59.996W	3/18/2010	WE-10161	1000m	
07 57.503S 110 03.580W	3/18/2010	WE-10171	3000m	
07 58.290S 95 15.300W	3/22/2010	WE-10181	3000m	
07 00.011S 94 59.993W	3/22/2010	WE-10191	1000m	
05 59.99S 95 00.000W	3/22/2010	WE-10201	1000m	
05 04.010S 95 04.752W	3/23/2010	WE-10211	1000m	
04 00.003S 95 59.994W	3/23/2010	WE-10221	1000m	
03 00.012S 94 59.998W	3/23/2010	WE-10231	1000m	
02 02.480S 95 11.620W	3/23/2010	WE-10241	1000m	
01 00.008S 94 59.979W	3/24/2010	WE-10251	1000m	
00 01.811S 95 00.103W	3/24/2010	WE-10261	3000m	
00 59.900N 94 59.900W	3/25/2010	WE-10271	1000m	
01 58.193N 95 17.563W	3/25/2010	WE-10281	1000m	
03 00.020S 94 59.981W	3/26/2010	WE-10291	1000m	
04 00.000N 94 59.997W	3/26/2010	WE-10301	1000m	
04 59.500N 94 59.100W	3/26/2010	WE-10311	1000m	
06 00.001N 95 00.003W	3/27/2010	WE-10321	1000m	

06 59.999N 95 00.003W	3/27/2010	WE-10331	1000m
08 01.857N 94 56.535W	3/28/2010	WE-10341	3000m

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
00 00.516S, 109 54.048W	3/15/2010	4657	
00 59.987S, 109 59.962W	3/15/2010	4656	
00 06.881N, 94 59.871W	3/25/2010	4658	
00 58.096N, 94 59.81W	3/25/2010	4667	

Pacific Marine Environmental Laboratory (PMEL) Underway pCO₂ system.

A PMEL pCO₂ underway system was installed on WECOMA during this cruise. This system continuously measures pCO₂ in the surface water while the ship is underway.

Questions concerning the pCO₂ underway system should be directed to:

Cathy Cosca, NOAA/PMEL
 Tel: (206) 526-6183
 E-mail: Cathy.Cosca@noaa.gov