

TROPICAL ATMOSPHERE-OCEAN (TAO) PROGRAM
FINAL CRUISE REPORT
WE-09-01

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-09-01 DEP *September 6, 2009, Newport, OR*
ARR *October 16, 2009, Newport, OR*

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 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 R/V *Wecoma* departed Newport, OR on September 6 and the scientific complement for the cruise embarked at San Diego, CA on September 10, 2009. The ship departed San Diego on September 11, 2009 and conducted operations as listed in Section 2.1. The ship arrived in San Diego on October 10, 2009 to refuel and debark the scientific party. *Wecoma* departed San Diego on October 12 and arrived back in Newport on October 16, 2009.

1.0 PERSONNEL

1.1 CRUISE LEAD AND PARTICIPATING SCIENTISTS:

Cruise Lead: Steve Kunze

Participating Scientists:

Name	Gender	Nationality	Affiliation
Steve Kunze	M	US	NOAA/PMEL
Dan Dougherty	M	US	NOAA/PMEL
Greg Foltz	M	US	NOAA/PMEL
Catherine Hoyle	F	US	NOAA/PMEL

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):

Buoy Site: 8N 110W (ATLAS)
Mooring Operation: Repair
Deployed Location: 08 03.42N 110 09.141W
Repair Location: 08 03.31N 110 08.55W
Sensors/Equipment Lost at Sea: None
Sensors Damaged/Fouled: None
Fishing Vandalism: None.
Sensors/Tubes Downloaded: Tube downloaded

Mooring Depth: 4177 m
Mooring ID#: PM801
Deployed Date: 1/1/09
Repair Date: 9/16/09

General Comments: Installed new anemometer, ATRH and SSC.

Site Sensor Failures **Date Sensors Failed** **Why Sensors Failed** **Field Service Observations**

Buoy Site: 5N 110W (ATLAS)

Mooring Operation: Repair

Deployed Location: 05 02.04N 110 00.22W

Repair Location: 05 02.33N 109 59.24W

Sensors/Equipment Lost at Sea: None

Sensors Damaged/Fouled: None

Fishing Vandalism: Float trailing buoy.

Sensors/Tubes Downloaded: Tube downloaded

General Comments: Installed SSC.

Site Sensor Failures **Date Sensors Failed** **Why Sensors Failed** **Field Service Observations**

Mooring Depth: 3967 m

Mooring ID#: PM800

Deployed Date: 12/30/08

Repair Date: B9/17/08

Buoy Site: 2N 110W (ATLAS)	Mooring Depth: 4321m
Mooring Operation: Visit	Mooring ID#: PM786A
Deployed Location: 2 02.1S 140 00.3W	Deployed Date: 10/28/2008
Visit Location: 2 02.1S 140 01.0W	Visit Date: 9/5/2009
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: 0 110W (Flux)

Mooring Operation: Recovery

Deployed Location: 00 02.03S 109 54.5W

Recovered Location: None, Buoy Lost at Sea

Previous Repair Date: 12/28/08

Sensors/Equipment Lost at Sea: All Sensors Lost at Sea

Sensors Damaged/Fouled: None

Fishing/Vandalism: Could not determine, probable vandalism

Sensors/Tubes Downloaded: None

General Comments: Buoy Lost at Sea

Site Sensor Failures **Date Sensors Failed** **Why Sensors Failed** **Field Service Observations**

Mooring Depth: 3814 m

Mooring ID#: PM754A

Deployed Date: 7/1/08

Recovered Date: None, Buoy Lost at Sea

Buoy Site: 0 110W (Flux/CO2) **Mooring Depth:** 3795 m
Mooring Operation: Deployment **Mooring ID#:** PM855
Deployed Location: 00 02.91N 109 55.65W **Deployed Date:** 9/19/09
Pre-Deployment On Deck Instrument Failures: None
Sensors/Equipment Lost at Sea: 10 m TC
Sensors Damaged During Deployment: 9 m Chipod
General Comments: Lifting line parted on initial pickup causing the above instrument loss/damage.

Buoy Site: 0 110W (ADCP) **Mooring Depth:** 3840 m
Mooring Operation: Recovery **Mooring ID#:** EA016
Deployed Location: 00 0.667 N 109 57.486W **Deployed Date:** 12/27/08
Recovered Location: 00 0.667 N 109 57.486W **Recovered Date:** 9/19/09
Previous Repair Date: None
Sensors/Equipment Lost at Sea: None
Sensors Damaged/Fouled: None
Fishing/Vandalism: None
Sensors/Tubes Downloaded: ADCP and CTD not downloaded at sea.
General Comments: Routine recovery.

Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
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Buoy Site: 0 110W (ADCP) **Mooring Depth:** 3823 m
Mooring Operation: Deployment **Mooring ID#:** E017
Deployed Location: 00 0.482N 109 57.454W **Deployed Date:** 9/19/09
Pre-Deployment On Deck Instrument Failures: None
Sensors/Equipment Lost at Sea: None
Sensors Damaged During Deployment: None
General Comments: No Argos beacon installed.

Buoy Site: 2S 110W (ATLAS) **Mooring Depth:** 3930 m
Mooring Operation: Repair **Mooring ID#:** PM798
Deployed Location: 02 03.161S 110 00.118W **Deployed Date:** 12/26/08
Repair Location: 02 00.58S 110 05.33W **Repair Date:** 9/20/09
Sensors/Equipment Lost at Sea: Anemometer missing
Sensors Damaged/Fouled: T1, T2 and T8 not reporting.

Fishing Vandalism: Evidence that a ship had tied to the buoy.

Sensors/Tubes Downloaded: Tube downloaded.

General Comments: Replaced ATRH and anemometer.

Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
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Buoy Site: 5S 110W (ATLAS)

Mooring Operation: Repair

Deployed Location: 04 59.154S 109 59.494W

Repair Location: 04 58.66S 110 01.35W

Sensors/Equipment Lost at Sea: None

Sensors Damaged/Fouled: None

Fishing Vandalism: None

Sensors/Tubes Downloaded: Tube downloaded.

General Comments: Replaced anemometer.

Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
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Mooring Depth: 3625 m

Mooring ID#: PM797

Deployed Date: 12/25/08

Repair Date: 9/21/09

Buoy Site: 8S 95W (ATLAS)

Mooring Operation: Recovery

Deployed Location: 08 01.79S 095 14.71W

Recovered Location: 08 01.12S 095 15.623W

Previous Repair Date: 12/16/08

Sensors/Equipment Lost at Sea: T100 and T120 missing

Sensors Damaged/Fouled: SSC fouled with barnacles

Fishing/Vandalism: None

Sensors/Tubes Downloaded: All recovered sensors downloaded successfully.

General Comments: None

Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
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Mooring Depth: 3693 m

Mooring ID#: PM752B

Deployed Date: 6/16/08

Recovered Date: 9/25/09

Buoy Site: 8S 95W (ATLAS)

Mooring Operation: Deployment

Deployed Location: 07 58.71S 095 15.629W

Pre-Deployment On Deck Instrument Failures: None

Sensors/Equipment Lost at Sea: None

Sensors Damaged During Deployment: None

General Comments: None

Mooring Depth: 3977 m

Mooring ID#: PM856

Deployed Date: 9/25/09

Buoy Site: 5S 95W (ATLAS) **Mooring Depth:** 3836 m
Mooring Operation: Recovery **Mooring ID#:** PM793
Deployed Location: 05 04.665S 095 03.886W **Deployed Date:** 12/17/08
Recovered Location: 05 08.05S 095 11.52W **Recovered Date:** 9/27/09
Previous Repair Date: None
Sensors/Equipment Lost at Sea: Tube, ATRH, anemometer, T100
Sensors Damaged/Fouled: None
Fishing/Vandalism: Tower missing, fishing net on bridle.
Sensors/Tubes Downloaded: All recovered sensors downloaded successfully with the exception of T140 – garbled data.
General Comments: Tower missing, hole in top of toroid.
Site Sensor Failures **Date Sensors Failed** **Why Sensors Failed** **Field Service Observations**

Buoy Site: 5S 95W (ATLAS) **Mooring Depth:** 3836 m
Mooring Operation: Deployment **Mooring ID#:** PM857
Deployed Location: 05 04.3S 095 04.05 **Deployed Date:** 9/27/09
Pre-Deployment On Deck Instrument Failures: None
Sensors/Equipment Lost at Sea: None
Sensors Damaged During Deployment: None
General Comments: None

Buoy Site: 2S 95W (ATLAS) **Mooring Depth:** 3446 m
Mooring Operation: Recovery **Mooring ID#:** PM794
Deployed Location: 01 59.28S 095 08.96W **Deployed Date:** 12/18/08
Recovered Location: 01 57.236S 095 12.15W **Recovered Date:** 9/29/09
Previous Repair Date: None
Sensors/Equipment Lost at Sea: Tube, ATRH, anemometer, rain gauge
Sensors Damaged/Fouled: T20 fouled with fishing line
Fishing/Vandalism: Tower missing, fishing line at 20 m.
Sensors/Tubes Downloaded: All recovered sensors downloaded successfully with the exception of T40 – No comms.
General Comments: Tower missing, hole in top of toroid.
Site Sensor Failures **Date Sensors Failed** **Why Sensors Failed** **Field Service Observations**

Buoy Site: 2S 95W (ATLAS) **Mooring Depth:** 3440 m

Mooring Operation: Deployment **Mooring ID#:** PM858
Deployed Location: 02 01.09S 095 10.94W **Deployed Date:** 9/28/09
Pre-Deployment On Deck Instrument Failures: None
Sensors/Equipment Lost at Sea: None
Sensors Damaged During Deployment: None
General Comments: None

Buoy Site: 0 95W (ATLAS) **Mooring Depth:** 3317 m
Mooring Operation: Deployment **Mooring ID#:** PM859
Deployed Location: 00 00.265S 094 59.34W **Deployed Date:** 9/30/09
Pre-Deployment On Deck Instrument Failures: None
Sensors/Equipment Lost at Sea: None
Sensors Damaged During Deployment: None
General Comments: SSC reads low after deployment.

Buoy Site: 2N 95W (ATLAS) **Mooring Depth:** 3118 m
Mooring Operation: Deployment **Mooring ID#:** PM860
Deployed Location: 01 59.218N 095 17.848W **Deployed Date:** 10/1/09
Pre-Deployment On Deck Instrument Failures: None
Sensors/Equipment Lost at Sea: None
Sensors Damaged During Deployment: None
General Comments: None

Buoy Site: 5N 95W (ATLAS) **Mooring Depth:** 3559 m
Mooring Operation: Visit **Mooring ID#:** PM802
Deployed Location: 04 58.19N 094 59.350W **Deployed Date:** 1/5/09
Visit Location: 04 58.08N 094 58.54W **Visit Date:** 10/1/09
Sensors/Equipment Lost at Sea: None
Sensors Damaged/Fouled: None
Fishing Vandalism: None
Sensors/Tubes Downloaded: None
General Comments: Visit only.

Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations
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Buoy Site: 8S 95W (ATLAS) **Mooring Depth:** 3650 m
Mooring Operation: Recovery **Mooring ID#:** PM750
Deployed Location: 08 03.4N 094 57.06W **Deployed Date:** 6/10/08
Recovered Location: 08 03.36N 094 56.52W **Recovered Date:** 10/02/09
Previous Repair Date: None
Sensors/Equipment Lost at Sea: Tube, ATRH, anemometer, rain gauge
Sensors Damaged/Fouled: None
Fishing/Vandalism: Tower missing, net in bridle.
Sensors/Tubes Downloaded: All recovered sensors downloaded successfully.
General Comments: Tower missing, recovery only at this site.
Site Sensor Failures **Date Sensors Failed** **Why Sensors Failed** **Field Service Observations**

2.2 CTD Casts Completed

A Sea-Bird 911plus CTD with dual temperature and conductivity sensors was provided by the Oregon State University. 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
08-03.945N 110 08.533W	9/16/09	1	1000 m
07-00.2N 110 0.0W	9/16/09	2	1000m
06 00.5N 109 59.99W	9/16/09	3	1000m
05 02.26N 109 58.28W	9/17/09	4	1000m
04 00.8N 110 00.5W	9/17/09	5	1000m
03 00.0N 110 00.4W	9/17/09	6	1000m
02 02.17N 110 03.62W	9/18/09	7	1000m
00 59.98N 110 00.68W	9/18/09	8	1000m
00 02.846N 109 56.13W	9/19/09	9	1000m
01 00.3S 109 59.95W	9/20/09	10	1000m
02 01.53S 110 05.37W	9/20/09	11	1000m
03 00.2S 110 00.2W	9/20/09	12	1000m
03 59.96S 10959.89W	9/21/09	13	1000m
04 59.59S 110 01.46W	9/21/09	14	1000m
06 00.1S 105 14.9W	9/22/09	15	1000m

07 00.1S 100 26.69W	9/24/09	16	1000m
07 58.744S 095 15.4W	9/25/09	17	1000m
07 00.5S 094 59.98W	9/26/09	18	1000m
06 00.53S 094 59.99W	9/26/09	19	1000m
05 04.85S 095 02.83W	9/27/09	20	1000m
04 00.0S 094 59.99W	9/28/09	21	1000m
03 00.88S 095 59.98W	9/28/09	22	1000m
01 58.36S 095 12.29W	9/28/09	23	1000m
00 59.97S 094 59.9W	9/29/09	24	1000m
00 00.636S 095 00.967	9/29/09	25	1000m
01 00.9N 095 00.24W	9/30/09	26	1000m
01 59.506N 095 18.0W	9/30/09	27	1000m
02 59.96N 095 59.963	10/1/09	28	1000m
03 54.993N 094 59.987W	10/1/09	29	1000m
04 56.986N 094 58.709W	10/1/09	30	1000m
05 59.829N 094 59.970W	10/02/09	31	1000m
06 59.975N 095 00.36W	10/2/09	32	1000m
08 02.416N 094 57.407W	10/2/09	33	1000m

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 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:

No Argo floats were deployed during this cruise.

Atlantic Oceanographic and Meteorological Laboratory (AMOL) Surface Drifting Floats

Twelve 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:

No AOML Drifting floats were deployed during this cruise.