

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

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-10-01 DEP *January 5, 2010, Honolulu, HI*
ARR *January 21, 2010, Apia, Samoa*
DEP *January 25, 2010, Apia Samoa*
ARR *February 11, 2010, Kwajalein, RMI*

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

Shannon McArthur

National Data Buoy Center

Building 1007

Stennis Space Center, MS 39529

228-688-2830

Email: shannon.mcarthur@noaa.gov

TAO Operations Manager

Lex LeBlanc

National Data Buoy Center

Building 3203

Stennis Space Center, MS 39529

228-688-7465

Email: lex.leblanc@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 *January 4, 2010*. The ship departed on *January 5, 2010* and conducted operations as listed in Section 2.1. A short port call at *Apia Samoa* was made *January 21 – 25, 2010*. The ship arrived in *Kwajalein, RMI* on *February 11, 2010*.

1.0 PERSONNEL

1.1 CRUISE LEAD AND PARTICIPATING SCIENTISTS:

Cruise Lead: Brian Lake, Leg 1 and Dr. Richard Crout, Leg 2

Participating Scientists:

Name	Gender	Nationality	Affiliation
Brian Lake, Leg 1	M	US	NOAA/NDBC
Dr. Richard Crout, Leg 2	M	US	NOAA/NDBC
James Rauch, Legs 1 and 2	M	US	NOAA/NDBC
Alan Lossett, Legs 1 and 2	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: 8N 155W, ATLAS	Mooring Depth: 5243 m
Mooring Operation: Visit	Mooring ID#: PM810A
Deployed Location: 07 58.72 N 154 59.96W	Deployed Date: 5/9/2009
Visit Location: 07 58.7N 155 00.1W	Visit Date: 1/9/2010

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. Ship's TSG and RH sensors not recording to SCS.

Buoy Site: 8N 155W, Refresh	Mooring Depth: 5237 m
Mooring Operation: Refresh Deployment	Mooring ID#: DM006A
Deployed Location: 07 54.9N 154 57.9W	Deployed Date: 1/9/2010
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 155W, ATLAS	Mooring Depth: 4593 m		
Mooring Operation: Recovery	Mooring ID#: PM811A		
Deployed Location: 05 00.3N 154 55.6W	Deployed Date: 5/10/09		
Recovered Location: 04 59.95N 154 55.01W	Recovered Date: 1/10/2010		
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: T200, SN 13892			
Sensors Damaged/Fouled: SSC fouled			
Fishing/Vandalism: None			
Sensors/Tubes Not Downloaded: All sensors successfully downloaded with the exception of T25, SN 12662 – no communications.			
General Comments: None.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

Buoy Site: 5N 155W, ATLAS	Mooring Depth: 4603 m
Mooring Operation: Deployment	Mooring ID#: PM866A
Deployed Location: 05 00.3N 154 54.5W	Deployed Date: 1/11/2010
Pre-Deployment On Deck Instrument Failures: None.	
Sensors/Equipment Lost at Sea: None.	
Sensors Damaged During Deployment: None.	
General Comments: Routine deployment.	

Buoy Site: 2N 155W, ATLAS	Mooring Depth: 4663 m
Mooring Operation: Visit	Mooring ID#: PM812A

Deployed Location: 01 59.17N 154 57.7W	Deployed Date: 5/12/2009
Visit Location: 01 59.3N 154 58.2W	Visit Date: 1/12/2010
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: 0 155W, ATLAS/CO2	Mooring Depth: 4656 m		
Mooring Operation: Recovery	Mooring ID#: PM758A		
Deployed Location: 00 00.63N 154 58.19W	Deployed Date: 8/15/08		
Recovered Location: 00 00.2N 154 58.7W	Recovered Date: 1/12/2010		
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None.			
Sensors Damaged/Fouled: SSC, T25, T50 fouled.			
Fishing/Vandalism: None			
Sensors/Tubes Not Downloaded: All sensors successfully downloaded with the exception of T150, SN 13926 – flooded.			
General Comments: Initial problems releasing the mooring. Anchor released during haulback.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

Buoy Site: 0 155W, ATLAS	Mooring Depth: 4647 m		
Mooring Operation: Deployment	Mooring ID#: PM867A		
Deployed Location: 00 00.28N 154 57.3W	Deployed Date: 1/13/2010		
Pre-Deployment On Deck Instrument Failures: None.			
Sensors/Equipment Lost at Sea: None.			
Sensors Damaged During Deployment: None.			
General Comments: Fishing vessel ~1.5 nm away from buoy upon deployment. Failed to communicate with said vessel (Spanish speaking).			

Buoy Site: 2S 155W, ATLAS	Mooring Depth: 4897 m		
Mooring Operation: Visit	Mooring ID#: PM813A		
Deployed Location: 01 58.34S 154 59.57W	Deployed Date: 5/14/2009		
Visit Location: 01 58.5S 155 00.7W	Visit Date: 1/14/2010		
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 155W, ATLAS		Mooring Depth: 5028 m	
Mooring Operation: Recovery		Mooring ID#: PM760A	
Deployed Location: 04 59.39S 154 58.29W		Deployed Date: 8/17/08	
Recovered Location: 04 59.0S 154 59.6W		Recovered Date: 1/15/2010	
Previous Repair Date: 11/29/2009			
Sensors/Equipment Lost at Sea: T200, SN 13892			
Sensors Damaged/Fouled: SSC, T25 fouled			
Fishing/Vandalism: None			
Sensors/Tubes Not Downloaded: All sensors successfully downloaded with the exception of T150, SN 14175 and T200, SN 14176 – no communications.			
General Comments: Top 3 shackles missing cotter pins, top 2 shackles missing their retaining nut.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

Buoy Site: 5S 155W, ATLAS		Mooring Depth: 5038 m	
Mooring Operation: Deployment		Mooring ID#: PM868A	
Deployed Location: 04 58.8S 154 58.0W		Deployed Date: 1/16/2010	
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 155W, ATLAS		Mooring Depth: 5307 m	
Mooring Operation: Visit		Mooring ID#: PM814B	
Deployed Location: 08 15.86S 154 59.53W		Deployed Date: 11/29/2009	
Visit Location: 08 16.4S 154.59.3W		Visit Date: 1/9/2010	
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: 8S 170W, ATLAS		Mooring Depth: 5371 m	
Mooring Operation: Deployment		Mooring ID#: PM869A	
Deployed Location: 07 59.24N 170 01.118W		Deployed Date: 1/28/2010	
Pre-Deployment On Deck Instrument Failures: None.			
Sensors/Equipment Lost at Sea: Anemometer snapped off during deployment.			
Sensors Damaged During Deployment: None.			
General Comments: Anemometer snapped off during deployment, it was replaced with a			

spare.

Buoy Site: 8S 170W, ATLAS		Mooring Depth: 5373 m	
Mooring Operation: Recovery		Mooring ID#: PM815A	
Deployed Location: 08 00.20S 170 00.483W		Deployed Date: 5/28/09	
Recovered Location: 07 58.064N 170 00.90W		Recovered Date: 1/28/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None			
Fishing/Vandalism: None			
Sensors/Tubes Not Downloaded: All sensors downloaded successfully except Tube 439 – no communications.			
General Comments: None.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

Buoy Site: 5S 170W, ATLAS		Mooring Depth: 5417 m	
Mooring Operation: Visit		Mooring ID#: PM816A	
Deployed Location: 05 00.00S 169 59.583W		Deployed Date: 5/30/2009	
Visit Location: 04 59.5S 170 00.7W		Visit Date: 1/31/2010	
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 170W, Refresh		Mooring Depth: unk m	
Mooring Operation: Visit		Mooring ID#: DM001B	
Deployed Location: 04 58.30S 169 57.183W		Deployed Date: 1/23/2009	
Visit Location: 04 56.43S 169 57.48W		Visit Date: 1/31/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: None.			
Fishing/Vandalism: None			
General Comments: Visit only. Buoy position not determined by radar, ship position recorded.			

Buoy Site: 2S 170W, ATLAS		Mooring Depth: 4962 m	
Mooring Operation: Recovery		Mooring ID#: PM817B	
Deployed Location: 02 09.90S 170 00.483W		Deployed Date: 5/31/09	

Recovered Location: 02 08.40S 170 02.803W		Recovered Date: 2/01/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: Wind Sensor, SN 37781; T100: SN14675; T125, SN14676; T150, SN14677			
Sensors Damaged/Fouled: T250, SN14679 dropped on deck, case cracked.			
Fishing/Vandalism: Tower in water, held by lifting line			
Sensors/Tubes Not Downloaded: All sensors downloaded successfully except T250, SN14679, no communications.			
General Comments: Tower unbolted, three holes in buoy near eyelets. Fishing vessels nearby. Numerous cuts in nilspin from 50 to 125 m.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

Buoy Site: 2S 170W, ATLAS		Mooring Depth: 4962 m	
Mooring Operation: Deployment		Mooring ID#: PM870A	
Deployed Location: 02 09.2S 170 00.9W		Deployed Date: 2/2/2010	
Pre-Deployment On Deck Instrument Failures: None.			
Sensors/Equipment Lost at Sea: None.			
Sensors Damaged During Deployment: None.			
General Comments: Routine deployment.			

Buoy Site: 2S 170W, Refresh		Mooring Depth: 4962 m	
Mooring Operation: Refresh Deployment		Mooring ID#: DM700A	
Deployed Location: 02 09.6S 170 02.7W		Deployed Date: 2/2/2010	
Pre-Deployment On Deck Instrument Failures: 25m T failed, replaced by PN 31296.			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged During Deployment: None			
General Comments: Routine deployment.			

Buoy Site: 00 170W, ATLAS/CO2		Mooring Depth: 5602m	
Mooring Operation: Recovery		Mooring ID#: PM764B	
Deployed Location: 00 00.40N 170 03.00W		Deployed Date: 6/01/09	
Recovered Location: 00 02.009S 170 03.147W		Recovered Date: 2/3/2010	
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: TV 13m, SN13494.			
Sensors Damaged/Fouled: None.			
Fishing/Vandalism: Long-liner gear on nilspin.			
Sensors/Tubes Not Downloaded: All recovered sensors were successfully downloaded.			
General Comments: 2 sensor mounts broken and 2 poison pucks missing.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

--	--	--	--

Buoy Site: 00 170W, ATLAS/CO2	Mooring Depth: 5609 m
Mooring Operation: Deployment	Mooring ID#: PM871A
Deployed Location: 01 01.298N 170 02.785W	Deployed Date: 2/3/2010
Pre-Deployment On Deck Instrument Failures: None.	
Sensors/Equipment Lost at Sea: None.	
Sensors Damaged During Deployment: None.	
General Comments: Nilspin not marked for 75 m sensor, estimated depth.	

Buoy Site: 2N 170W, ATLAS/CO2	Mooring Depth: 5387 m		
Mooring Operation: Recovery	Mooring ID#: PM765B		
Deployed Location: 02 00.800N 170 01.083W	Deployed Date: 6/2/09		
Recovered Location: 02 00.714N 170 01.166W	Recovered Date: 2/03/2010		
Previous Repair Date: None			
Sensors/Equipment Lost at Sea: T125, SN14454; T150, SN12565			
Sensors Damaged/Fouled: None			
Fishing/Vandalism: Long liner gear wrapped around nilspin.			
Sensors/Tubes Not Downloaded: None.			
General Comments: Several sensor mounts broken, cuts in wire, and fishing line. Top puck missing on SSC.			
Site Sensor Failures	Date Sensors Failed	Why Sensors Failed	Field Service Observations

Buoy Site: 2N 170W, ATLAS	Mooring Depth: 5387 m
Mooring Operation: Deployment	Mooring ID#: PM872A
Deployed Location: 02 00.90N 170 00.1W	Deployed Date: 2/4/2010
Pre-Deployment On Deck Instrument Failures: None.	
Sensors/Equipment Lost at Sea: None.	
Sensors Damaged During Deployment: None.	
General Comments: Mark at 300 m labeled as 400 m. Fathometer unreliable on fly-by, used previous deployment depth of 5387 m.	

Buoy Site: 5N 170W, ATLAS	Mooring Depth: 5667 m
Mooring Operation: Visit/Repair	Mooring ID#: PM818B
Deployed Location: 04 59.50N 169 58.383W	Deployed Date: 6/4/2009
Visit Location: 05 00.40N 169 58.30W	Visit Date: 2/5/2010
Previous Repair Date: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged/Fouled: None.	

Fishing/Vandalism: None
General Comments: Replaced AT/RH SN58366 with SN118819 and downloaded data from tube.

Buoy Site: 8N 170W, ATLAS	Mooring Depth: 5665 m
Mooring Operation: Visit	Mooring ID#: PM766A
Deployed Location: 08 00.20N 170 00.617W	Deployed Date: 8/27/2008
Visit Location: 08 00.054N 170 03.976W	Visit Date: 2/6/2010
Previous Repair Date: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged/Fouled: None.	
Fishing/Vandalism: None	
General Comments: Visit only. Buoy in good condition.	

Buoy Site: 8N 180, ATLAS	Mooring Depth: 3578 m
Mooring Operation: Visit	Mooring ID#: PM819A
Deployed Location: 07 59.60S 179 52.083W	Deployed Date: 6/8/2009
Visit Location: 07 59.40S 179.52.9W	Visit Date: 2/8/2010
Previous Repair Date: None.	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged/Fouled: None.	
Fishing/Vandalism: None	
General Comments: Visit only. Buoy in good condition.	

Buoy Site: 8N 180, Refresh	Mooring Depth: 5854 m
Mooring Operation: Visit	Mooring ID#: TM002A
Deployed Location: 07 58.30N 179 53.6W	Deployed Date: 2/2/2009
Visit Location: 07 57.50N 179 54.30W	Visit Date: 2/8/2010
Previous Repair Date: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged/Fouled: None.	
Fishing/Vandalism: None	
General Comments: Visit only. Buoy in good condition.	

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.

After the eleventh CTD cast, the CTD winch controller had mechanical problems that could not be repaired at sea. Therefore, only 11 CTD casts were performed on this cruise.

The following outlines the CTD casts completed during the cruise:

CTD Operations			
Nominal Position	Date	Cast #	Comments
8N 15W	1/9/10	KA011	3000 m
7N 155W	1/10/10	KA021	1000 m
6N 155w	1/10/10	KA031	1000 m
5N 155W	1/11/10	KA041	1000 m
4N 155W	1/11/10	KA051	1000 m
3N 155W	1/11/10	KA061	1000 m
2N 155W	1/12/10	KA071	1000 m
1N 155W	1/12/10	KA081	1000 m
0 155W	1/12/10	KA091	3000 m
1S 155W	1/14/10	KA101	1000 m
2S 155W	1/14/10	KA111	1000 m
3S 155W	1/14/10	KA0121	1000 m
4S 155W	1/15/10	KA0131	1000 m
5S 155W	1/15/01	KA0141	1000 m
6S 155W	1/16/10	KA0151	1000 m
7S 155W	1/16/10	KA0161	1000 m
8S155W	1/17/10	KA0171	3000 m
8S 170W	1/28/10	KA0181	1000 m
2S 170W	2/1/10	KA0192	1000 m
0 170W	2/3/10	KA0202	1000 m
2N 170W	2/4/10	KA0211	1000 m
5N 170W	2/5/10	KA0221	1000 m
6N 170W	2/5/10	KA0231	1000 m
7N 170W	2/5/10	KA0241	1000 m
8N 170W	2/6/10	KA0251	1000 m
8N 180	2/8/10	KA0261	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

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:

ARGO Floats				
Coordinates		Date	SN#	Comments
00 01.791S	154 58.073W	1/13/10	4602	
00 00.804S	170 02.737W	2/3/10	4604	

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:

AOML Floats				
Coordinates		Date	SN#	Comments
04 58.953N	15 454.450W	1/11/10	90399	
03 01.067N	154 57.054W	1/11/10	90409	
00 02.274S	154 57.917W	1/13/10	90404	
02 59.842S	155 01.140W	1/15/10	90400	
04 58.873S	154 58.843W	1/16/10	90413	

04 57.449S	169 56.052W	1/31/10	90396	
03 00.281S	170 01.028W	2/1/10	90395	
00 00.798S	170 02.809W	2/3/10	90407	
02 59.849N	170 00.650W	2/4/10	90406	
05 02.125N	169 58.410W	2/5/10	90402	
04 57.449S	169 56.052W	1/31/10	90396	
03 00.281S	170 01.028W	2/1/10	90395	
00 00.798S	170 02.809W	2/3/10	90407	
02 59.849N	170 00.650W	2/4/10	90406	
05 02.125N	169 58.410W	2/5/10	90402	
04 57.449S	169 56.052W	1/31/10	90396	

PCO2 and Nitrate Mapping System and Nutrient Samples

Eleven (26) 30ml water samples were collected on this cruise. The chief scientist verified and briefed the Operations Officer on the specifications of the water samples to be collected during CTD casts prior to the start of the cruise. All water samples were collected as scheduled.

Questions concerning Nutrient Samples should be directed to:

Cathy Cosca
NOAA/PMEL
7600 Sand Point Way NE
Seattle, Washington 98115
Tel: (206) 526-6183
E-mail: cathy.cosca@noaa.gov