

TROPICAL ATMOSPHERE-OCEAN (TAO) PROGRAM

FINAL CRUISE REPORT

TT-16-01, R/V *Thomas G. Thompson*

Area: Equatorial Pacific: 8°N 95°W to 8°S 95°W and 8°S 110°W to 8°N 110°W

Itinerary:

TT-16-01 DEP *March 1, 2016, San Diego, CA*

ARR *April 25, 2016, 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 Ships and other contract vessels.

NDBC Points of Contact

NDBC Operations Branch Chief

NDBC Operations Manager

Steve Cucullu

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TAO Cruise Objective and Plan:

The objective of this cruise was the maintenance of the TAO Array along the 95°W and 110°W meridians. Due to mechanical issues with the R/V *Thompson*, northern half of the 110°W meridian was not completed.

DART station 32413 was also serviced during this cruise.

The scientific complement for the cruise embarked at San Diego, CA on February 29, 2016. The ship departed on March 1, 2016 and conducted operations as listed in Section 2.1. The ship arrived at San Diego, CA on April 25, 2016.

1.0 PERSONNEL

1.1 CRUISE LEAD AND PARTICIPATING SCIENTISTS:

Cruise Lead: James Rauch

Participating Scientists:

Name	Gender	Nationality	Affiliation
James Rauch	M	US	NOAA/NDBC
Edward Kendrick	M	US	NOAA/NDBC
Adam Herrin	M	US	NOAA/NDBC
David Ball	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 95W			
Mooring Operation: Recovery		Mooring ID#: DM127A	
Deployed Location: 08 01.87N / 094 57.9W		Deployed Date: 4/13/15	
Recovered Location: 08 02.227N / 094 58.386W		Recovered Date: 3/8/16	
Sensors/Equipment Lost at Sea: Payload, Iridium Modem, GPS/Iridium Antenna, Anemometer ATRH, SBE39 TP, Acoustic Release			
Sensors Damaged/Fouled: SSC, T80 fouled. Acoustic release did not respond.			
Fishing/Vandalism: Missing tower, tow line on buoy, and longline on mooring.			
General Comments: No comms with the acoustic release; attempted line cutter but did not cut line. Line tension became too great to recover the 500m sensor.			
Site Sensor Failures	Date Data Flagged	Why Data Flagged	Field Service Observations
SST/SSS, T20-TP500	6/6/15	Data missing	Longline on mooring
Winds	10/30/15	Dropped to zero	Tower missing

RH	10/30/15	Saturated	Tower missing
ATMP	11/5/15	Data missing/ active	Tower missing
Buoy	11/30/15	No xmits	Tower missing

Buoy Site: 8N 95W	Mooring Depth: 3679 m
Mooring Operation: Deployment	Mooring ID#: DM176A
Deployed Location: 08 02.169N / 094 58.182W	Deployed Date: 3/9/16
Pre-Deployment On Deck Instrument Failures: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: None	
General Comments: Two vessels 6 miles away from deployment location during operations.	

Buoy Site: 5N 95W			
Mooring Operation: Recovery		Mooring ID#: DM128A	
Deployed Location: 04 58.1N / 095 01.1W		Deployed Date: 4/15/15	
Recovered Location: 04 58.3N / 095 01.6W		Recovered Date: 3/10/16	
Sensors/Equipment Lost at Sea: N/A			
Sensors Damaged/Fouled: SSC fouled. T20 out of mount.			
Fishing/Vandalism: None			
General Comments: None			
Site Sensor Failures	Date Data Flagged	Why Data Flagged	Field Service Observations
T20-TP500	2/11/16	Data missing	None
SST, SSC	2/28/16	Data missing	Fouled

Buoy Site: 5N 95W	Mooring Depth: 3514 m
Mooring Operation: Deployment	Mooring ID#: DM177A
Deployed Location: 04 58.68N / 095 01.21W	Deployed Date: 3/10/16
Pre-Deployment On Deck Instrument Failures: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: None	
General Comments: None	

Buoy Site: 2N 95W	
Mooring Operation: Recovery	Mooring ID#: DM129A
Deployed Location: 01 55.8N / 095 19.2W	Deployed Date: 4/16/15
Recovered Location: N/A	Recovered Date: N/A
Sensors/Equipment Lost at Sea: All equipment lost at sea.	

Sensors Damaged/Fouled: N/A			
Fishing/Vandalism: Buoy missing			
General Comments: No communication with the acoustic release and no visual signs of buoy after search.			
Site Sensor Failures	Date Data Flagged	Why Data Flagged	Field Service Observations
Buoy	6/17/15	No xmits. Possible vandalism	Buoy Lost at Sea

Buoy Site: 2N 95W	Mooring Depth: 2832 m
Mooring Operation: Deployment	Mooring ID#: DM178A
Deployed Location: 01 55.916N / 095 19.461W	Deployed Date: 4/16/15
Pre-Deployment On Deck Instrument Failures: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: None	
General Comments: No 5 ton swivel in mooring.	

Buoy Site: 0 95W			
Mooring Operation: Recovery		Mooring ID#: DM130A	
Deployed Location: 00 05.36N / 095 26.6W		Deployed Date: 4/17/15	
Recovered Location: N/A		Recovered Date: N/A	
Sensors/Equipment Lost at Sea: All equipment lost at sea			
Sensors Damaged/Fouled: N/A			
Fishing/Vandalism: Entire mooring lost at sea.			
General Comments: No communication with the acoustic release and no visual signs of buoy after search.			
Site Sensor Failures	Date Data Flagged	Why Data Flagged	Field Service Observations
T40	4/25- 5/2/15	Data int'm	Buoy Lost at Sea
SSC	6/10/15	Data missing	Buoy Lost at Sea
Buoy	6/25/15	No xmits	Buoy Lost at Sea

Buoy Site: 0 95W		Mooring Depth: 3261 m	
Mooring Operation: Deployment		Mooring ID#: DM179A	
Deployed Location: 00 05.430N / 095 26.342W		Deployed Date: 3/12/16	
Pre-Deployment On Deck Instrument Failures: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged During Deployment: None			
General Comments: Chipods at 9, 29, 49m.			

Buoy Site: 2S 95W			
Mooring Operation: Recovery		Mooring ID#: DM131A	
Deployed Location: 01 59.39S / 095 11.5W		Deployed Date: 4/18/15	
Recovered Location: 02 00.784S / 095 11.605W		Recovered Date: 3/13/16	
Sensors/Equipment Lost at Sea: Payload, Iridium Modem, GPS/Iridium Antenna, Anemometer ATRH, Camera Modem, Camera Antenna, Camera Enclosure, Camera Battery Box			
Sensors Damaged/Fouled: SSC-T20 fouled.			
Fishing/Vandalism: Missing tower, line wrapped up on mooring, and tow line on buoy.			
General Comments: Acoustic release responded horizontally.			
Site Sensor Failures	Date Data Flagged	Why Data Flagged	Field Service Observations
Winds, ATMP/RH	4/21/15	Data missing	Missing Tower
T20-TP500	4/22/15	Data missing/ Tower bent	BuoyCAM Image/ Line on mooring
SST/SSS	4/25/15	Data missing	Missing Tower

Buoy Site: 2S 95W		Mooring Depth: 3395 m	
Mooring Operation: Deployment		Mooring ID#: DM180A	
Deployed Location: 01 59.082S / 095 11.864W		Deployed Date: 3/14/16	
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 Operation: Recovery		Mooring ID#: DM132B	
Deployed Location: 04 59.7S / 094 59.37W		Deployed Date: 4/19/15	
Recovered Location: 05 00.4S / 094 58.3W		Recovered Date: 3/15/16	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: SSC-T100 fouled.			
Fishing/Vandalism: Line attached to tower and top socket of nilspin.			
General Comments: Top section hose damaged but cable in good shape.			
Site Sensor Failures	Date Data Flagged	Why Data Flagged	Field Service Observations
SST/SSS	6/30/15/ 11/3/15, 12/17/15	Failed (low)/ released then missing	Line on tower, top nilspin, Fouled

Buoy Site: 5S 95W		Mooring Depth: 3933 m	
Mooring Operation: Deployment		Mooring ID#: DM181A	

Deployed Location: 04 58.152S / 094 59.520W	Deployed Date: 3/15/16
Pre-Deployment On Deck Instrument Failures: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: None	
General Comments: Tower ring weldment cracked during deployment.	

Buoy Site: 32413 DART	Mooring Depth: 3971 m
Mooring Operation: Deployment	Mooring ID#: 32413
Deployed Location: 07 23.3S / 093 28.7W	Deployed Date: 3/17/16
Pre-Deployment On Deck Instrument Failures: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: None	
General Comments: Deployed surface buoy on new mooring. Recovered and Deployed a new BPR.	

Buoy Site: 8S 95W			
Mooring Operation: Recovery		Mooring ID#: DM133A	
Deployed Location: 07 59.2S / 095 14.9W		Deployed Date: 4/21/14	
Recovered Location: 08 00.0S / 095 14.9W		Recovered Date: 4/21/15	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: SSC-T20 fouled.			
Fishing/Vandalism: None			
General Comments: Top section severed just above boss fitting.			
Site Sensor Failures	Date Data Flagged	Why Data Flagged	Field Service Observations
T20-TP500	9/26/15	Data missing	T20 Fouled
RH	10/20/15	Saturated	None
SST/SSS	3/12/16	Data missing	Severed top section

Buoy Site: 8S 95W	Mooring Depth: 3969 m
Mooring Operation: Deployment	Mooring ID#: DM182A
Deployed Location: 07 59.4S / 095 14.413W	Deployed Date: 3/18/16
Pre-Deployment On Deck Instrument Failures: SSC, AT/RH, Anemometer, and Payload	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: None	
General Comments: Due to an improper tagline the buoy broke the lifting pendant and hit the deck. The SSC, AT/RH, Anemometer, and Payload were replaced before deployment with the spare system.	

Buoy Site: 8S 110W			
Mooring Operation: Recovery		Mooring ID#: DM134A	
Deployed Location: 07-58.5S/110-03.76W		Deployed Date: 4/25/15	
Recovered Location: 07 58.2S / 110 03.2W		Recovered Date: 3/21/16	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: SSC – T40 fouled.			
Fishing/Vandalism: None			
General Comments: Top section severed.			
Site Sensor Failures	Date Data Flagged	Why Data Flagged	Field Service Observations
T20-TP500	11/10/15	Data int'm then missing	T20/T40 Fouled

Buoy Site: 8S 110W		Mooring Depth: 3510 m	
Mooring Operation: Deployment		Mooring ID#: DM183A	
Deployed Location: 07 57.4S / 110 03.7W		Deployed Date: 3/21/16	
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 Operation: Recovery		Mooring ID#: DM135A	
Deployed Location: 04 58.3S / 109 59.0W		Deployed Date: 4/27/15	
Recovered Location: 04 58.1S / 109 59.0W		Recovered Date: 4/11/16	
Sensors/Equipment Lost at Sea: Acoustic release			
Sensors Damaged/Fouled: T20 broken ferrite core			
Fishing/Vandalism: None			
General Comments: No comms with acoustic release.			
Site Sensor Failures	Date Data Flagged	Why Data Flagged	Field Service Observations
SST/SSS	12/6/15	Erratic	None

Buoy Site: 5S 110W		Mooring Depth: 3722 m	
Mooring Operation: Deployment		Mooring ID#: DM184A	
Deployed Location: 04 57.30S / 109 57.83W		Deployed Date: 4/11/16	
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 Operation: Recovery		Mooring ID#: DM136A	
Deployed Location: 02-01.22S/110-02.18W		Deployed Date: 4/28/15	
Recovered Location: 01 59.9S / 109 59.0W		Recovered Date: 4/12/16	
Sensors/Equipment Lost at Sea: None			
Sensors Damaged/Fouled: SSC-T20 fouled, T40 Fishing net wrapped around sensor, T40 & T180 out of mount.			
Fishing/Vandalism: Fishing net wrapped under bridle and on first sensor.			
General Comments: Top section severed. Upper shackle missing cotter pin and nut. Several cracks in buoy.			
Site Sensor Failures	Date Data Flagged	Why Data Flagged	Field Service Observations
T100	10/5/15	Data missing	None
T20-T80, T120-TP500	11/24/15	Data missing	T20 net, Fouled, T40/T180 out of mount

Buoy Site: 2S 110W		Mooring Depth: 3947 m	
Mooring Operation: Deployment		Mooring ID#: DM185A	
Deployed Location: 01 59.01S / 109 58.28W		Deployed Date: 4/12/16	
Pre-Deployment On Deck Instrument Failures: None			
Sensors/Equipment Lost at Sea: None			
Sensors Damaged During Deployment: None			
General Comments: None			

Buoy Site: 0 110W FLUX/CO2			
Mooring Operation: Recovery		Mooring ID#: DM137A	
Deployed Location: 00 01.956S / 10954.93W		Deployed Date: 4/28/15	
Recovered Location: 00 02.7N / 109 55.6W		Recovered Date: 4/13/16	
Sensors/Equipment Lost at Sea: TC80			
Sensors Damaged/Fouled: SSC fouled. TC10 loose cage, TC20 Missing cage and damaged conductivity cell, TC60 Missing everything but Inductive Coupler, 82m Sontek missing fin and clamps loose, 123m SBE44 broken pin			
Fishing/Vandalism: Fishing float trailing buoy, long line on mooring.			
General Comments: None			
Site Sensor Failures	Date Data Flagged	Why Data Flagged	Field Service Observations
ATMP	3/5/16	Erratic	None
RH	11/01/15	Erratic	None

SST/SSS	9/25/15	Data missing	SSC Fouled
T100	8/2/15	Data missing	None
T40, T60, T80	5/1/15	Data missing	Sensor Missing
CT10	6/11/15	Int'm, missing	Damaged
V10	6/11/15	Missing	Long line

Buoy Site: 0 110W FLUX/CO2	Mooring Depth: 3796 m
Mooring Operation: Deployment	Mooring ID#: DM186A
Deployed Location: 00 02.00N / 109 54.09W	Deployed Date: 4/13/16
Pre-Deployment On Deck Instrument Failures: None	
Sensors/Equipment Lost at Sea: None	
Sensors Damaged During Deployment: SBE44 #20	
General Comments: Chipods at 9, 29, 49m.	

Buoy Site: 0 110W ADCP	
Mooring Operation: Recovery	Mooring ID#: EA022
Deployed Location: 00 00.869N / 109 55.761W	Deployed Date: 9/29/15
Recovered Location: 00 01.17S / 109 55.35W	Recovered Date: 4/12/16
Sensors/Equipment Lost at Sea: None	
Sensors Damaged/Fouled: None	
Fishing/Vandalism: None	
General Comments: None	

Buoy Site: 0 110W ADCP	Mooring Depth: 3819 m
Mooring Operation: Deployment	Mooring ID#: EA023
Deployed Location: 00 01.171S / 109 55.349W	Deployed Date: 4/13/16
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 R/V *Thompson*. Temperature and conductivity sensors are calibrated yearly at Sea-Bird and sent in for diagnostics as necessary.

The following outlines the CTD casts completed during the cruise:

CTD Operations				
Lat	Lon	Date	Cast #	Comments
08 02.459N	094 57.424W	03/09/16	TT10011	3000 m
06 59.981N	094 59.995W	03/09/16	TT10021	1000 m
06 00.059N	094 59.900W	03/09/16	TT10031	1000 m
04 58.718N	095 00.357W	03/10/16	TT10041	1000 m
04 00.057N	095 00.017W	03/10/16	TT10051	1000 m
03 00.025N	095 00.022W	03/11/16	TT10061	1000 m
01 57.454N	095 19.886W	03/11/16	TT10071	1000 m
01 00.170N	095 22.495W	03/12/16	TT10081	1000 m
00 07.240N	095 27.780W	03/12/16	TT10091	3000 m
00 59.981S	095 18.934W	03/13/16	TT10101	1000 m
01 59.970S	095 11.440W	03/13/16	TT10111	1000 m
03 00.017S	095 06.024W	03/15/16	TT10121	1000 m
04 00.130S	095 04.006W	03/15/16	TT10131	1000 m
04 58.300S	094 59.020W	03/16/16	TT10141	1000 m
05 59.930S	095 00.470W	03/16/16	TT10151	1000 m
07 00.050S	095 00.060W	03/16/16	TT10161	1000 m
08 00.000S	095 14.070W	03/17/16	TT10171	3000 m
07 57.930S	110 04.110W	03/21/16	TT10181	3000 m
04 56.920S	109 57.130W	04/11/16	TT10191	1000 m
01 58.800S	109 57.720W	04/12/16	TT10201	1000 m
00 02.781S	109 53.813W	04/13/16	TT10211	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

Four (4) Argo floats were scheduled for deployment on this 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
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 E-mail: pmel_floats@noaa.gov

The following outlines the Argo floats deployed during the cruise:

ARGO Floats			
Coordinates	Date	SN#	Comments

04-58.588N/095-00.181W	3/10/16	F0557	
03-00.00N/095-00.00W	3/11/16	F0558	
03-00.02N/108-29.14W	3/26/16	F0559	
04-59.30N/107-59.46W	3/26/16	F0560	

Atlantic Oceanographic and Meteorological Laboratory (AMOL) Surface Drifting Floats

No AOML Surface Drifters were deployed on this mission.

Questions concerning AOML Surface Drifters should be directed to:

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