

TROPICAL ATMOSPHERE-OCEAN (TAO) PROGRAM
FINAL CRUISE REPORT
KA-11-05

Area: Equatorial Pacific between 5°S and 9°N latitude along 140°W longitude.

Itinerary:

KA-11-05 DEP *August 24, 2011 Papeete Tahiti*
ARR *September 10, 2011 Honolulu, HI*

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.

TAO Program Points of Contact:

| | |
|---|---|
| NDBC Program Manager | NDBC Operations Manager |
| Stephen Cucullu | Lex LeBlanc |
| National Data Buoy Center | National Data Buoy Center |
| Building 3205 | Building 3205 |
| Stennis Space Center, MS 39529 | Stennis Space Center, MS 39529 |
| 228-688-3804 | 228-688-7465 |
| Email: stephen.cucullu@noaa.gov | Email: lex.leblanc@noaa.gov |

TAO Cruise Objective and Plan:

The objective of this cruise was the maintenance of the TAO Array along the 140°W meridian.

The scientific complement for the cruise embarked at Papeete, Tahiti on **August 23, 2011**. The ship departed on **August 24, 2011** and conducted operations as listed in Section 2.1. The ship arrived in Honolulu, HI on September 10, 2011.

1.0 PERSONNEL

1.1 CRUISE LEAD AND PARTICIPATING SCIENTISTS:

Cruise Lead: Brian Lake

Participating Scientists:

| Name | Gender | Nationality | Affiliation |
|-----------------|--------|-------------|---------------------|
| Brian Lake | M | US | NOAA/NDBC |
| James Haden | M | US | NOAA/NDBC |
| James Rauch | M | US | NOAA/NDBC |
| Helmut Portmann | M | US | Director, 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: 5S 140W Legacy | | | |
| Mooring Operation: Recovery | | Mooring ID#: PM944A | |
| Deployed Location: 05 03.32S 139 54.09W | | Deployed Date: 11/29/2010 | |
| Recovered Location: 05 03.7S 139 55.2W | | Recovered Date: 8/30/2011 | |
| Previous Repair Date: None | | | |
| Sensors/Equipment Lost at Sea: TP300 lost at sea | | | |
| Sensors Damaged/Fouled: SSC, T1-T4 fouled with barnacles | | | |
| Fishing/Vandalism: None | | | |
| Sensors/Tubes Downloaded: T140 could not be downloaded (no communications). TP300 lost at sea. | | | |
| General Comments: Routine recovery. | | | |
| Site Sensor Failures | Date Sensors Failed | Why Sensors Failed | Field Service Observations |
| TP300 | 3/2/11 | Data missing | lost at Sea |

| | | | |
|--|----------------------------|----------------------------------|-----------------------------------|
| Buoy Site: 5S 140W Refresh | | | |
| Mooring Operation: Recovery | | Mooring ID#: DM015A | |
| Deployed Location: 05 00.1S 139 56.6W | | Deployed Date: 11/30/2010 | |
| Recovered Location: 04 59.43S 139 55.85W | | Recovered Date: 8/29/2011 | |
| Previous Repair Date: None | | | |
| Sensors/Equipment Lost at Sea: None | | | |
| Sensors Damaged/Fouled: Anemometer propeller broken post recovery, SSC and T40 fouled with barnacles. | | | |
| Fishing/Vandalism: None | | | |
| Sensors/Tubes Downloaded: All sensors downloaded successfully. | | | |
| General Comments: No communications with acoustic release – used line cutter to free mooring from the bottom. | | | |
| Site Sensor Failures | Date Sensors Failed | Why Sensors Failed | Field Service Observations |
| | | | N/A |

| | | | |
|--|--|---------------------------------|--|
| Buoy Site: 5S 140W Refresh | | Mooring Depth: 4360 m | |
| Mooring Operation: Deployment | | Mooring ID#: DM024A | |
| Deployed Location: 05 01.1S 139 54.8W | | Deployed Date: 8/30/2011 | |
| Pre-Deployment On Deck Instrument Failures: None | | | |
| Sensors/Equipment Lost at Sea: None | | | |
| Sensors Damaged During Deployment: None | | | |
| General Comments: Deployed with new “Zipper Fairings” | | | |

| | | | |
|--|----------------------------|---------------------------------|--------------------------------------|
| Buoy Site: 2S 140W Legacy | | | |
| Mooring Operation: Visit | | Mooring ID#: PM967A | |
| Deployed Location: 02 02.5S 139 59.6W | | Deployed Date: 4/23/2011 | |
| Visit Location: 02 02.2S 139 59.3W | | Visit Date: 8/31/2011 | |
| Sensors/Equipment Lost at Sea: None | | | |
| Sensors Damaged/Fouled: None | | | |
| Fishing Vandalism: None | | | |
| General Comments: 4 of 10 subsurface sensors not reporting. It was previously determined not to repair this mooring at this time due to time constraints. | | | |
| Site Sensor Failures | Date Sensors Failed | Why Sensors Failed | Field Service Observations |
| | | | All subsurface sensors intermittent. |

| | | | |
|--|----------------------------|---------------------------------|-----------------------------------|
| Buoy Site: 0 140W Refresh | | | |
| Mooring Operation: Repair | | Mooring ID#: DM022B | |
| Deployed Location: 00 01.7S 139 53.3W | | Deployed Date: 4/22/2011 | |
| Visit Location: 00 01.23S 139 53.23W | | Visit Date: 9/1/2011 | |
| Sensors/Equipment Lost at Sea: None | | | |
| Sensors Damaged/Fouled: None | | | |
| Fishing Vandalism: None | | | |
| General Comments: Replaced ATRH | | | |
| Site Sensor Failures | Date Sensors Failed | Why Sensors Failed | Field Service Observations |
| AT/RH | 4/22/11 | RH data too high | NA |

| | | | |
|--|----------------------------|----------------------------------|-----------------------------------|
| Buoy Site: 0 140W Legacy CO2 | | | |
| Mooring Operation: Recovery | | Mooring ID#: PM943B | |
| Deployed Location: 00 02.21S 139 52.28W | | Deployed Date: 11/26/2010 | |
| Recovered Location: 00 02.1S 139 52.3W | | Recovered Date: 9/1/2011 | |
| Previous Repair Date: 4/21/11 | | | |
| Sensors/Equipment Lost at Sea: TP500 lost at sea. | | | |
| Sensors Damaged/Fouled: SSC, T5 fouled with barnacles. | | | |
| Fishing/Vandalism: None. | | | |
| Sensors/Tubes Downloaded: All sensors except TP500 were downloaded successfully | | | |
| General Comments: None | | | |
| Site Sensor Failures | Date Sensors Failed | Why Sensors Failed | Field Service Observations |
| TP500 | 3/21/11 | Data missing | Lost at Sea |

| | | | |
|--|--|--------------------------------|--|
| Buoy Site: 0 140W Legacy CO2 | | Mooring Depth: 4348 m | |
| Mooring Operation: Deployment | | Mooring ID#: PM984A | |
| Deployed Location: 00 00.6S 139 54.75W | | Deployed Date: 9/2/2011 | |
| Pre-Deployment On Deck Instrument Failures: None | | | |
| Sensors/Equipment Lost at Sea: None | | | |
| Sensors Damaged During Deployment: None | | | |
| General Comments: No poison pucks were deployed on TC sensors at 80 m and 120 m (none available). | | | |

| | | | |
|--|----------------------------|----------------------------------|-----------------------------------|
| Buoy Site: 0 140W ADCP | | | |
| Mooring Operation: Recovery | | Mooring ID#: CA016 | |
| Deployed Location: 00 02.10N 140 02.03W | | Deployed Date: 11/26/2010 | |
| Recovered Location: 00 27.7N 140 01.58W | | Recovered Date: 9/2/2011 | |
| Sensors/Equipment Lost at Sea: None | | | |
| Sensors Damaged/Fouled: None | | | |
| 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 |
| | | | N/A |

| | | | |
|---|--|--------------------------------|--|
| Buoy Site: 0 140W ADCP | | Mooring Depth: 4314 m | |
| Mooring Operation: Deployment | | Mooring ID#: CA017 | |
| Deployed Location: 00 01.6N 140 02.37W | | Deployed Date: 9/2/2011 | |
| Pre-Deployment On Deck Instrument Failures: None | | | |
| Sensors/Equipment Lost at Sea: None | | | |
| Sensors Damaged During Deployment: None | | | |
| General Comments: None | | | |

| | | | |
|---|----------------------------|---------------------------------|-----------------------------------|
| Buoy Site: 2N 140W Legacy | | | |
| Mooring Operation: Visit | | Mooring ID#: PM966A | |
| Deployed Location: 02 01.2N 140 00.0W | | Deployed Date: 4/21/2011 | |
| Visit Location: 02 00.6N 140.01W | | Visit Date: 9/3//2011 | |
| Sensors/Equipment Lost at Sea: None | | | |
| Sensors Damaged/Fouled: None | | | |
| Fishing Vandalism: None | | | |
| General Comments: Planned dive repair to SSC and T20 aborted due to weather. Visit only. | | | |
| Site Sensor Failures | Date Sensors Failed | Why Sensors Failed | Field Service Observations |
| | | | SSC and T20 not reporting |

| | | | |
|---|----------------------------|---------------------------------|-----------------------------------|
| Buoy Site: 5N 140W Legacy | | | |
| Mooring Operation: Recovery | | Mooring ID#: PM965A | |
| Deployed Location: 04 57.7N 139 57.8W | | Deployed Date: 4/19/2010 | |
| Recovered Location: 04 58.3N 139 59.3W | | Recovered Date: 9/3/2011 | |
| Previous Repair Date: None | | | |
| Sensors/Equipment Lost at Sea: T140 lost at sea. | | | |
| Sensors Damaged/Fouled: SSC, T20 fouled with barnacles | | | |
| Fishing/Vandalism: None | | | |
| Sensors/Tubes Downloaded: All sensors except T140 downloaded successfully. | | | |
| General Comments: None | | | |
| Site Sensor Failures | Date Sensors Failed | Why Sensors Failed | Field Service Observations |
| AT/RH | 8/25/11 | Data too low, erratic | None |
| T140 | 8/13/11 | Data missing | Lost at Sea |
| Rain | 4/23/11 | Negative rain rate | None |

| | | | |
|---|----------------------------|---------------------------------|-----------------------------------|
| Buoy Site: 5N 140W Refresh | | | |
| Mooring Operation: Visit | | Mooring ID#: DM021A | |
| Deployed Location: 05 01.36N 139 57.35W | | Deployed Date: 4/19/2011 | |
| Visit Location: 05 01.68N 139 58.8W | | Visit Date: 9/3/2011 | |
| Sensors/Equipment Lost at Sea: None | | | |
| Sensors Damaged/Fouled: None | | | |
| Fishing Vandalism: None | | | |
| General Comments: Planned SSC repair aborted due to unsafe weather conditions. Visit only. | | | |
| Site Sensor Failures | Date Sensors Failed | Why Sensors Failed | Field Service Observations |
| | | | |

| | | | |
|---|----------------------------|----------------------------------|-----------------------------------|
| Buoy Site: 9N 140W Legacy | | | |
| Mooring Operation: Recovery | | Mooring ID#: PM942B | |
| Deployed Location: 09 00.38N 140 14.79W | | Deployed Date: 11/23/2010 | |
| Recovered Location: 09 00.4N 140 14.9W | | Recovered Date: 9/4/2011 | |
| Previous Repair Date: 4/17/2011 | | | |
| Sensors/Equipment Lost at Sea: None | | | |
| Sensors Damaged/Fouled: SSC, T20 fouled with barnacles | | | |
| Fishing/Vandalism: None | | | |
| Sensors/Tubes Downloaded: All sensors downloaded successfully. TP300 had no data stored in memory. | | | |
| General Comments: Acoustic release failed to give reply signal upon release. Nevertheless, the release did fire and was recovered. | | | |
| Site Sensor Failures | Date Sensors Failed | Why Sensors Failed | Field Service Observations |
| Tube | 8/4/11 | Low Voltage | Not transmitting |
| Rain | 6/21/11 | High % rain with 0 rain-rate | None |

| | | | |
|---|--|--------------------------------|--|
| Buoy Site: 9N 140W | | Mooring Depth: 4814 m | |
| Mooring Operation: Deployment | | Mooring ID#: PM985A | |
| Deployed Location: 09 00.16N 140 14.44W | | Deployed Date: 9/5/2011 | |
| 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 |
| 0502.075S | 13958.224W | 8/30/11 | KA50011 | 3000 m |
| 0159.473S | 14000.519W | 8/31/11 | KA50021 | 1000 m |
| 0000.750N | 13956.993W | 9/2/11 | KA50031 | 1000 m |
| 0201.630N | 14001.365W | 9/3/11 | KA50041 | 1000 m |
| 0500.869N | 13959.289W | 9/3/11 | KA50051 | 1000 m |
| 0902.121N | 14015.029W | 9/5/11 | KA50061 | 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

Three (3) 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 |
| 01 02.13 S 139 55.42W | 8/31/11 | 5409 | |
| 00 00.61N 139 57.5W | 9/1/11 | 5406 | |
| 01 01.62N 140 01.55W | 9/2/11 | 5311 | |