TROPICAL WESTERN PACIFIC 2000

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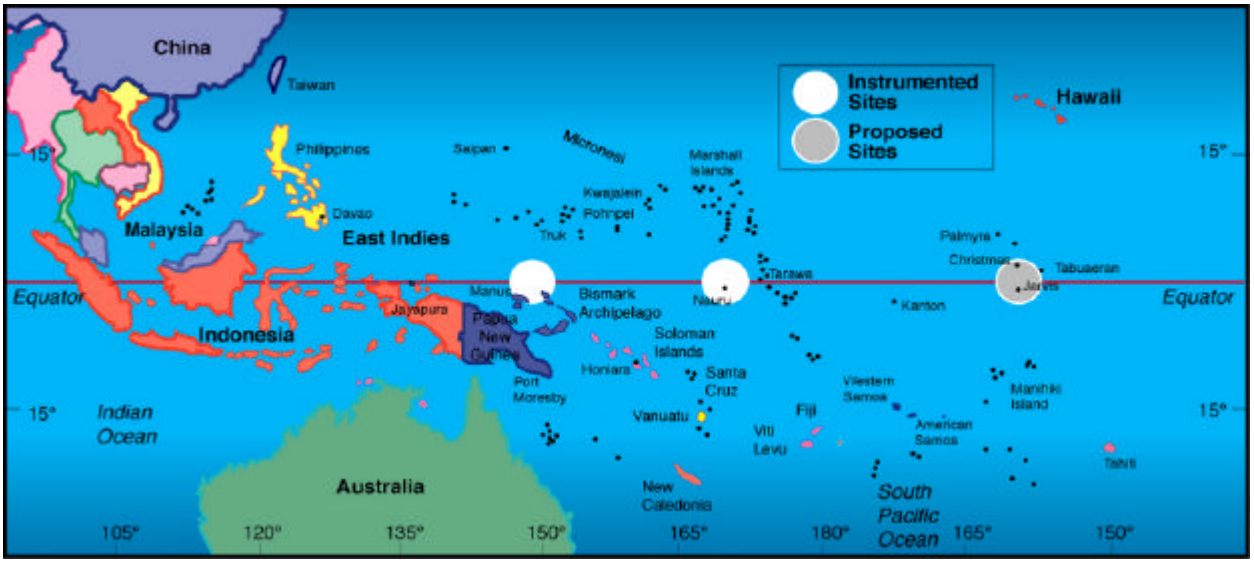
Introduction

The Atmospheric Radiation Measurement (ARM) Program's Tropical Western Pacific (TWP) Program is currently operating two Atmospheric Radiation and Cloud Stations (ARCS) in the TWP locale. The first ARCS site was installed on Los Negros Island in Manus Province, Papua New Guinea (PNG), in October 1996. The Tropical Western Pacific Program Office (TWPPO) and the PNG National Weather Service (NWS) have collaborated in operating the Manus site since its installation. Located on Nauru Island in the central Pacific, the second ARCS site began its operations in November 1998 in collaboration with the Nauruan Department of Island Development and Industry (IDI). During June and July of 1999, the Nauru site hosted the Nauru99 Scientific Research Campaign, an Intensive Operational Period (IOP) to study climate in the tropical western/central Pacific region. Figure 1 shows ARCS sites in the TWP locale.

Figure 1: ARCS Sites in Tropical Western Pacific



ARCS Measurements and Instruments

The two ARCS sites in the TWP locale are equipped with a full range of instruments that measure solar and terrestrial radiation, cloud properties, column water vapor and liquid water, optical depths, vertical structure of the atmosphere, and surface meteorology. The Nauru site also has an Atmospheric Emitted Radiance Interferometer (AERI). Table 1 summarizes ARCS measurements and instrumentation.

Table 1: ARCS Measurements and Instruments

Measurement	**Instrument**
Surface Radiation Balance	• Up- and down-looking pyranometers and pyrgeometers • Sun-shaded pyranometer and pyrgeometer using solar tracker • Normal incidence pyrheliometer • Up- and down-looking 9-11μm narrow-field-of-view radiometers • UV-B hemispheric radiometer • Broadband (solar and infrared) net radiometer
Surface Meteorology	• Temperature and relative humidity sensor • Barometer • Optical rain gauge • Propeller vane anemometer • Sea surface temperature measurement [2]
Cloud Properties	• Cloud lidar (523 nm) • Ceilometer (7.5 km maximum range) • 35 GHz cloud radar • Whole Sky Imager (WSI)
Aerosol Optical Depth	• Multi-filter rotating shadow band radiometer (total, direct, and diffuse irradiance in six 10-nm channels)
Column Water	• Dual channel (23.8 and 31.4 GHz) microwave radiometer
Vertical Structure of Atmosphere	• Rawinsonde • 915-MHz wind profiler with RASS [1]
Atmospheric Emitted Radiation	• Atmospheric Emitted Radiance Interferometer (AERI) [2]

1 – Operated in cooperation with NOAA's Aeronomy Laboratory
2 – Nauru only

Manus Site

Figure 2: Manus Site

Located on Los Negros Island (2.060°S, 147.425°E, 6 m MSL) in Manus Province, Papua New Guinea, the Manus site has been operating since October 1996 in collaboration with the PNG National Weather Service. Figure 2 shows the Manus site. Daily operations are conducted by a staff of four NWS Observers. The site has undergone a series of system updates since its installation:

- GPS Rawinsonde (BBSS) – 1997
- Whole Sky Imager (WSI) – 1998
- Cloud Radar (MMCR) – 1999
- Hydrogen generator to produce lift gas for the balloon soundings – 1999
- Remote Balloon Launcher (RBL) – 1999

Health and Status data, transmitted via satellite, are updated hourly on the World Wide Web. Higher resolution data are delivered to the ARM Experiment Center monthly on storage media via courier.

Nauru Site

Figure 3: Nauru Site

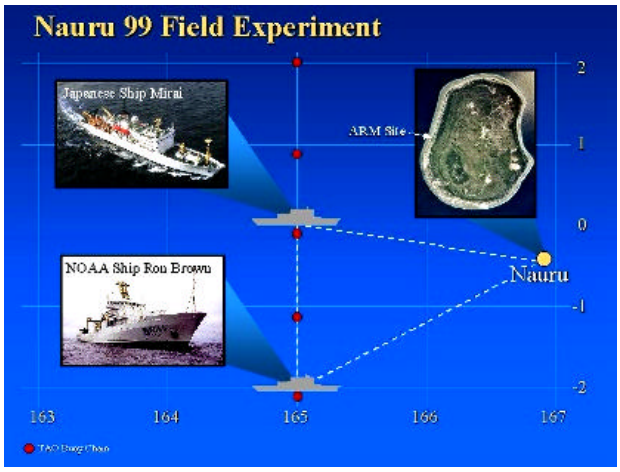
The second ARM TWP research station is located on Nauru Island (0.521°S, 166.916°E, 7.1 m MSL) in the central Pacific. Figure 3 shows the Nauru site. Since its installation in November 1998, the Nauru site has been operated in collaboration with the Nauru Department of Island Development and Industry (IDI). Four IDI Observers conduct the daily operations of the site. In addition to the standard set of instruments, the Nauru site has the following:

- Atmospheric Emitted Radiance Interferometer (AERI)
- A hydrogen generator to produce lift gas for the balloon soundings
- A remote balloon launcher.

Like the Manus site, the Nauru research station reports Health and Status data each hour and delivers higher resolution data monthly to the ARM Experiment Center.

Nauru99 Scientific Research Campaign

Figure 4: Nauru99 Research Triangle



During June and July of 1999, the Nauru ARM site hosted the Nauru99 Scientific Research Campaign. The campaign was an international study of climate in the vicinity of Nauru Island in the Tropical Western Pacific. Participants included the U.S. Department of Energy (DOE), the U.S. National Oceanographic and Atmospheric Administration (NOAA), the Japanese Marine Science and Technology Center (JAMSTEC), Airborne Research Australia, and the Nauruan Government. The main goal of Nauru99 was to collect data that would improve our understanding of radiant heat transfer and the effects of clouds on ocean weather processes in the tropics through land-, air- and ocean-based measurements. Figure 4 shows the "research triangle" of the campaign. Nauru99 also collected data to study possible island effects on the island-based measurements.

ARCS Technical Operations Support Site (ATOSS)

Figure 5: Data Systems Testing

The ARCS Technical Operations Support Site (ATOSS) is located at Sandia National Laboratory (SNL) in Albuquerque, New Mexico. It provides day-to-day support for operational needs of the two ARCS sites in the TWP locale. Operational support activities at ATOSS include:

- Daily support and trouble shooting for the remote sites via phone and fax
- Staging and testing of repair parts, new systems, and upgrades (Figures 5 and 6)
- Calibration testing and training
- Planning and preparation for site visits
- Site inventory tracking
- Shipping to and from the sites
- Engineering design verification, testing, and prototype development

Figure 6: Instrument Testing

ATOSS is also the home to the ARM TWP Regional Service Team (RESET). The RESET normally visits each of the two ARCS sites in the TWP locale two to three times per year with emergency visits as required.