

---

# MR99-K03 Cruise Summary

---



## 1. Introduction

The R/V MIRAI MR99-K03 cruise was meant for the participation into the international field experiment Nauru99, that is a collaborative research campaign of three agencies ; the U.S. Department of Energy (DOE), the U.S. National Oceanic and Atmospheric Administration (NOAA), and the Japan Marine Science and Technology Center (JAMSTEC) for the better understanding of the influence of the tropics onto the global climate. Especially, Tropical Western Pacific, where the warmest sea surface temperature exists and is called the "warm water pool", is thought to play the role of heat engine for the climate variations of the entire globe. DOE's Atmospheric Radiation Measurement (ARM) Program, which is the sponsoring agency of Nauru99, has deployed and started to operate the Atmospheric Radiation and Cloud Station (ARCS) on Nauru island from November 1998. The island of Nauru is located just eastern edge of the warm water pool. The main objective of Nauru99 is to improve our understanding of radiant heat transfer and the effects of clouds on the ocean weather processes through land-, air-, and ocean-based measurements. In addition to the ARCS on Nauru island, JAMSTEC's R/V MIRAI and NOAA's R/V Ronald H. Brown served as platforms for taking intensive and simultaneous measurements. The Cessna aircraft from Flinders University of Australia and NOAA's TAO buoys were also playing key measurement roles.

The R/V MIRAI kept the position at three different phases for each particular purpose. From 17 through 19 June, we kept just off Nauru within 1 mile for the intercomparison of ship- and land-measurements. As second phase, we made stationary observation at (0, 165E) where TAO buoy is deployed to form the apex of "large triangle configuration" with Nauru ARCS site and R/V Ronald H. Brown (2S, 165E) from 20 through 30 June. This large triangle configuration was meant to provide the necessary data for a single column model, in addition to study the meso-scale phenomena and intercomparison with buoy data. Finally, as third phase we kept the position at (0.18S, 166.85E) to form the "small triangle configuration" while R/V Ronald H. Brown was at (0.52S, 166.72E) for the dual Doppler radar observation from 1 through 4 July. However, unfortunately, we had no significant rainfall during this small triangle phase. So, on 3 July, R/V Ronald H. Brown came to close R/V MIRAI and did an intercomparison of ship-to-ship measurement.

## 2. Project Name

The Study of Air-Sea Interaction in the Tropics  
and International field experiment Nauru99

## 3. Chief Scientist

Kunio Yoneyama (Ocean Research Department / JAMSTEC)

## 4. Periods and Ports of call(see [Fig.1](#))

Leg-1 From 08 June 1999 (Yokohama) to 13 June 1999 (Chuuk, F.S.M.)

Leg-2 From 14 June 1999 (Chuuk) to 06 July 1999 (Majuro, Marshall Islands)  
calling at Nauru from 17 through 19 June 1999

Leg-3 From 07 July 1999 (Majuro) to 17 July 1999 (Tsuruga)  
stopping at Guam, U.S.A. as emergency call on 11 July 1999

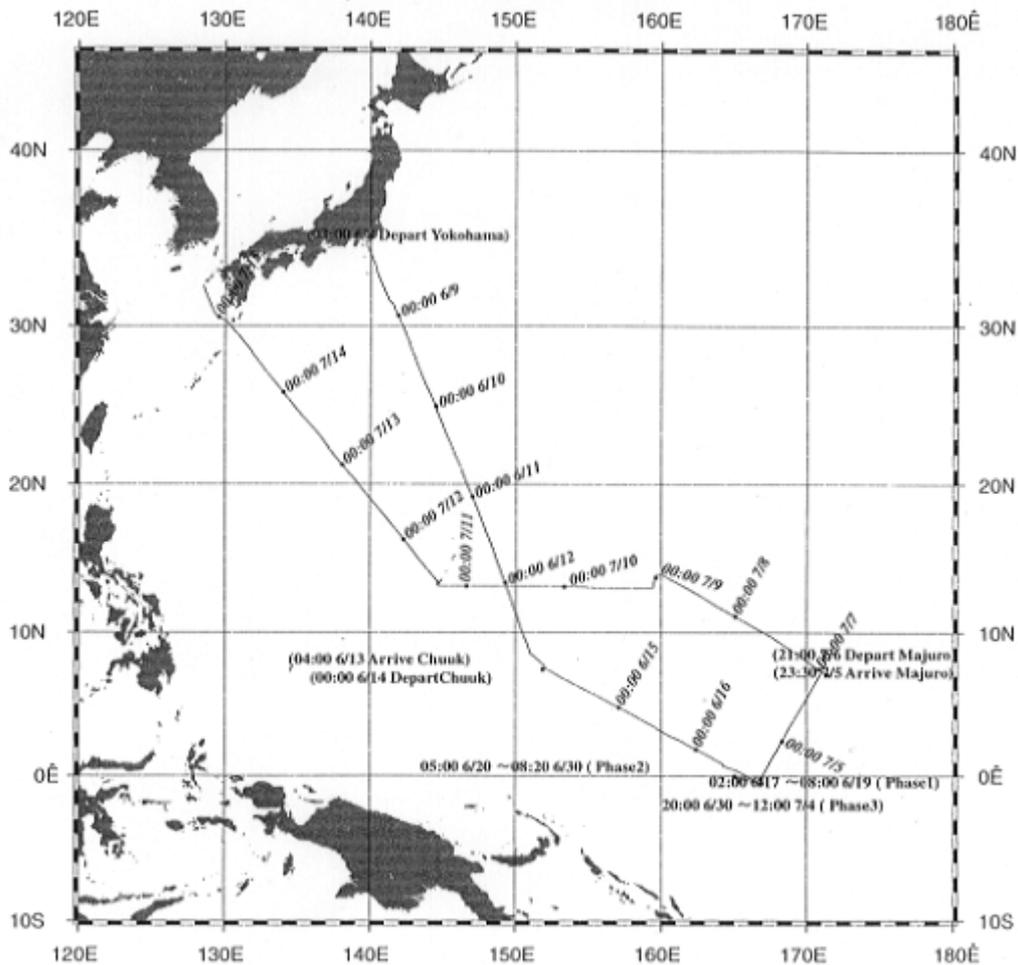
## 5. Observation Summary

C-band Doppler radar	continuously
Radiosonde launching	179 times
Wind Profiler with RASS	continuously
Ceilometer	continuously
Total Sky Imager	continuously
LIDAR	continuously
Surface Meteorology	continuously
Skin Sea Surface Temperature	continuously
Turbulent Measurement	continuously
Disdrometer	continuously
Aerosol sampling	continuously
CTD	129 castings
ADCP	continuously
Sea Surface Water Monitoring	continuously
pCO <sub>2</sub> measurement	continuously
Greenhouse effect gas measurement	continuously

## 6. Overview of Atmospheric/Oceanic conditions

During the entire Intensive Observation Period (IOP : 17 June - 4 July), the R/V MIRAI had been located just in the convectively suppressed area/period, although the Sea Surface Temperature (SST) showed always around 29°C. This period is considered as corresponded to the end of La Nina-like phase just after the largest 1997/98 El Nino event in its history. From the TAO buoy data, it is evident that high SST (>29°C) existed west of 160E and easterlies were prevailed along the equator. From the satellite (GMS) cloud images, ITCZ could be found along 5N and was very active. Convectively very active (cloud clusters) area existed west of our Nauru99 observation area. Apparently easterly (trade) wind blew into these clouds area in the lower troposphere and westerlies were prevailed in the higher troposphere, respectively (Fig.2). This convectively active area seemed to move eastward but did not reach us until we left there. Figure 3 shows the time-depth section of temperature during phase-2 (20 - 30 June). It is evident that the surface temperature gradually increased and mixed layer was deepened due to sufficient solar insolation without precipitation and the increase of wind, as seen that the isotherm of 28°C was deepened from 40m on 21 June to 90m on 28 June.

# Ship Track on MR99-K03



Cruise track on MR99-K03.

Fig.1

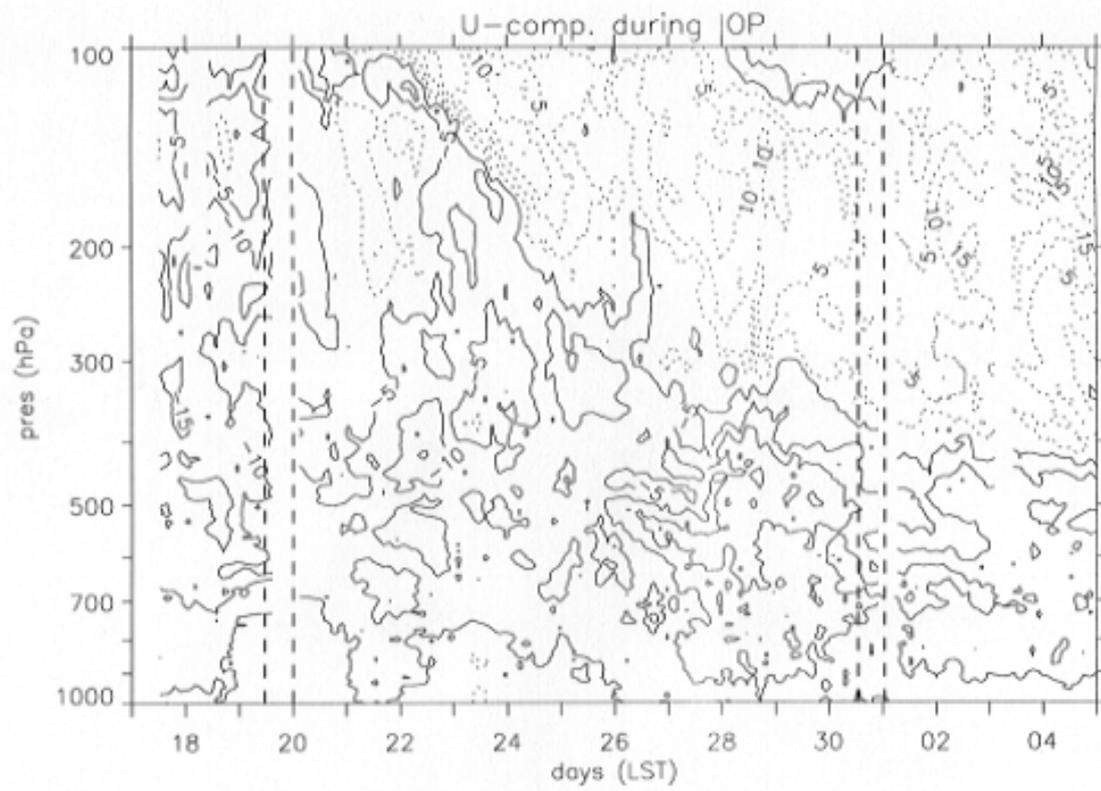


Fig.2

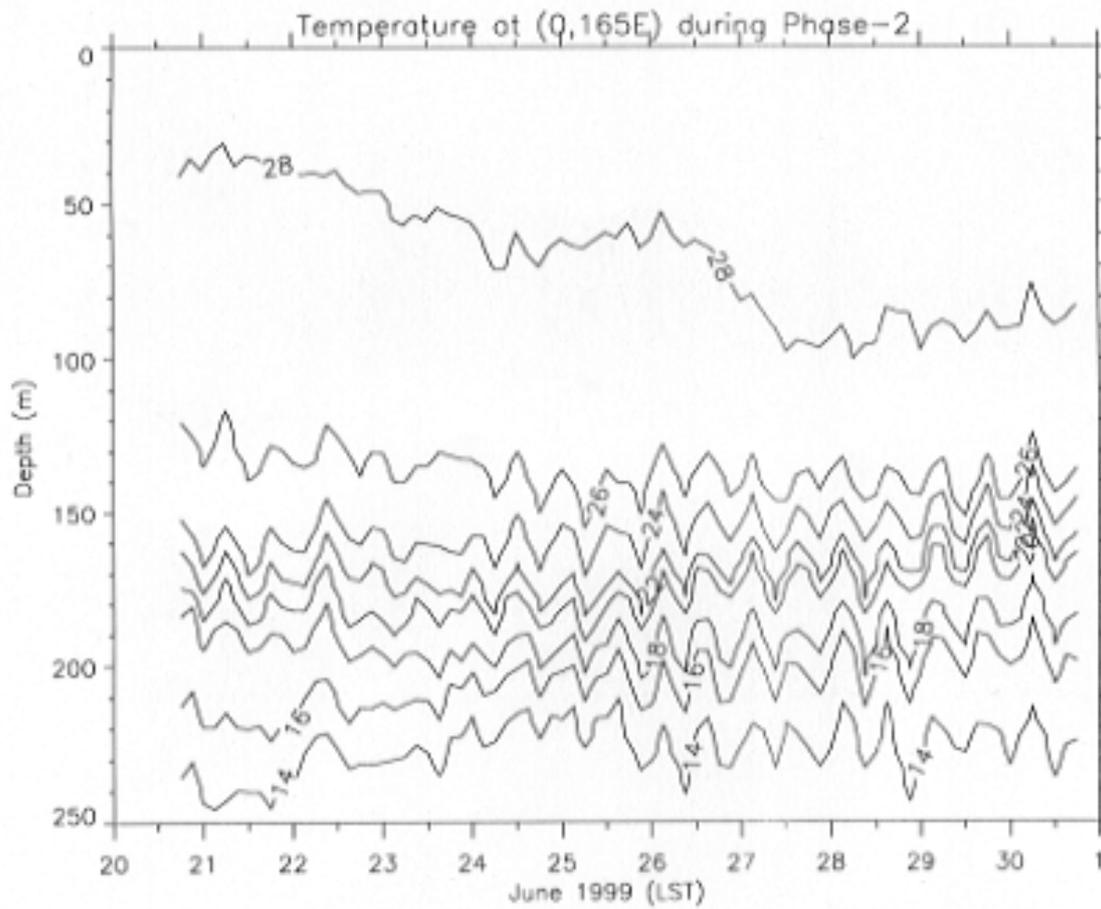


Fig.3