

1. Cruise Narrative

1.1 Highlights

Expedition Designation(EXPOCODE): 49RY9306

Chief Scientist: Michio Hirota,
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Ship: R/V Ryofu Maru

Ports of Call:

Leg 1: Tokyo, Japan to Rabaul, Papua New Guinea
Leg 2: Rabaul, Papua New Guinea to Cebu, Republic of the
Philippines
Leg 3: Cebu, Republic of the Philippines to Tokyo, Japan

Cruise Dates:

Leg 1: June 9, 1993 to June 26, 1993
Leg 2: June 29, 1993 to July 12, 1993
Leg 3: July 17, 1993 to July 31, 1993

1.2 Cruise Summary

Cruise Track

The cruise track and station locations are shown in Figure 1. Observations of PR4 were carried out as part of the R/V Ryofu Maru cruise RY9306 Leg 1, and those of PR2 were Leg 2 and Leg 3.

Number of Stations

A total of 35 CTD/rosette stations for PR4 and 32 stations for PR2 was occupied using a General Oceanics 12 bottle rosette equipped with 12 2.5-liter Niskin water sample bottles, and a Falmous Scientific Inc. Integrated CTD. No additional sensors were used with the CTD system.

Sampling

The following water sample measurements were made: salinity, oxygen, nitrate, nitrite and phosphate on all stations. The depths sampled were: 10, 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 400, 500, 600, 700, 800, 900, 1000, 1250, 1500, 2000, 2500, 3000, 4000 in meters at every 5 degrees in latitude. On other stations, samples were taken at shallower depths than 1250m. Surface water samples were collected by a bucket at every station.

1.3 List of Principal Investigators

The principal investigators responsible for each parameter measured on the cruise are listed in Table 1. (All the correspondence on these data should be addressed to the Director of the Oceanographical Division, Marine Department, Japan Meteorological Agency.)

Name	Responsibility	Affiliation
I. Kaneko	CTD, S	JMA/MD
I. Terashima	O2, Nutrients	JMA/MD

JMA/MD Marine Department, Japan Meteorological Agency

Table 1. Principal Investigators for all measurements.

2. Measurement Techniques and Calibrations

2.1 CTD

The CTD is Falmous Scientific Inc. Integrated CTD. A Compaq DeskPro 486/33 with 16 MByte of memory was used as the primary data collection device and all FSK signals of CTD data were backed up using the digital audio tape (DAT). All of the data was primary recorded in RAM disk, and after the observation, data was processed following Millard and Yang(1992).

The temperature and pressure sensor were calibrated at the calibration facility of FSI before the shipping and the calibration table in the facility is updated.

The conductivity sensor was calibrated at sea using data from the measurements of salinity collected at 9 stations on PR4 and 9 stations on PR2. The salinometer is Guildline Portasal model 8410 for the measurements of salinity of the water samples. We used the batch P118 of IAPSO as standard sea water to calibrate the salinometer. The results are shown in Table 3. The calibration constant is determined assuming that the bias zero.

	Bias	Slope
RY8462-8471	0.0	1.00010
RY8472-8476	0.0	1.00027
RY8477	0.0	1.00018
RY8478-8496	0.0	1.00027
RY8497-8508	0.0	1.00029
RY8511-8531	0.0	1.00036

Table 3. The conductivity scaling factor

The temperature in "-.SEA" and "-.CTD" files are described with the international temperature scale of 1990 (ITS-90).

2.2 Oxygen Measurements

The determination of dissolved oxygen was done by the modified version of the Winkler method described in "Kaiyo Kansoku Shishin (Manual on Oceanographic Observation)" published by the Japan Meteorological Agency(1970). The reagent blank was not subtracted. No estimation of accuracy and precision has been done.

Because no temperature data when samples were taken from bottles are recorded, it was assumed that the density of samples is 1022.156 kg/m³ (which assume the temperature for 28 degree C and salinity for 34.68) and use this value to convert from umol/l to umol/kg.

2.3 Nutrients Analyses

The nutrients analyses were done by the Technicon Auto Analyzer II described in "Kaiyo Kansoku Shishin (Manual on

Oceanographic Observation)" published by the Japan Meteorological Agency(1970). No estimation of accuracy and precision has been done.

Because no temperature data while analyses are recorded, it was assumed that the density of samples is 1022.156 kg/m³ (which assume the temperature for 28 degree C and salinity for 34.68) and use this value to convert from umol/l to umol/kg.

2.4 Noted for the -.SUM, -.SEA and -.CTD files

2.4.1 -.SUM

Since the surface water samples were taken by a stainless steel water bucket, "Number of bottle" includes this bucket sampling.

2.4.2 -.SEA

Our following parameters have the less precision than the required, we describe the last digit of data as blank to meet the data format: CTD salinity, oxygen and nitrates.

2.4.4 -.CTD

CTD temperature and salinity data have the less precision than the required, we describe the last digit of data as blank to meet the data format.

The number of samples averaged at the pressure level was not available because our final storage data files do not have the field of the number of samples and we processed CTD files from those.

3. References

- Japan Meteorological Agency, 1970: Kaiyo Kansoku Shishin (Manual on Oceanographic Observation). (in Japanese)
Millard, R and Keqi Yang, 1992: CTD Calibration and Processing Methods used by Woods Hole Oceanographic Institution. (Draft)