R/V Chofu Maru Cruise NC9407

1 Cruise Narrative

1.1 Highlights

Expedition Designation	Chofu Maru Cruise NC9407
Chief Scientist	Ryohei Okada, NMO
Ship	R/V Chofu Maru
Port of Call	None
Cruise Dates	Leg 1: July 20 to July 29, 1994

1.2 Cruise Summary

Observations of PR18 were carried out as a part of the R/V Chofu Maru Cruise NC9407 Leg 1. The ship sailed from Nagasaki at 0600 UTC on 20 July, 1994. By 2029 UTC on 22 July, the ship was at the first station of a section PR18. The cruise track and station locations are shown in Figure 1.

The observations of PR18 finished at 2124 UTC on 24 July. Water sampling on the cruise included measurements of salinity both by CTD and by water bottle samples, CTD temperature, bottle sample oxygen determination, and nutrients (nitrates, nitrites, and phosphates).

1.3 Principal Investigators for All Measurements

The principal investigators for all the parameters measured on the cruise are listed in Table 1.

Table 1. Principal Investigators for All Measurements

Name	Responsibility	Affiliation
T. Hinata	CTD,S	NMO
K. Kimura	O2,Nutrients	NMO

1.4 List of Cruise Participants

The cruise participants are listed in Table 2.

Table 2. Cruise Participants

Name	Responsibility	Affiliation
NC9407 Leg 1	Nagasaki to Naha	20 July to 29 July
R. Okada	Chief Scientist, CTD Hardware	NMO
K. Kimura	O2,Nutrients	NMO
M. Suzuki	CTD Hardware	NMO

N. Nagai	O2	NMO
J. Jifuku	O2,Nutrients	NMO
T. Chagihira	CTD Software	NMO
S. Siraishi	S	NMO
M. Ishizaka	Watch Stander	NMO
H. Nakane	Maritime Meteorology	NMO

T.H

2. CTD

The NBIS Mark III B CTD (1600 dbar sensor without oxygen sensor) mounted on the 12 x 1.7 Liter General Oceanics rosette multisampler frame was used for all of the vertical CTD work.

The performance of the CTD and multisampler were good throughout the cruise.

The details of the data collection and data processing methods are described in "CTD Full Sampling and Data Processing Method Used at Nagasaki Marine Observatory". These methods were based on Millard and Yang (1992).

The results of the laboratory calibration for the temperature and pressure are shown in Table 3.

Table 3. CTD calibration constants at laboratory

Temperature; linear fit

	Time	Bias	Slope
Pre -Cruise	6 Oct. 1993	0.0001789	1.0000217

Pressure increasing (0-1600 dbar range); linear fit

	Time	Bias	Slope
Pre -Cruise	6 Oct. 1993	-0.5510073	0.9990991

Pressure decreasing (0-1600 dbar range); linear fit

	Time	Bias	Slope
Pre -Cruise	6 Oct. 1993	-1.4895741	0.9998088

The conductivity scaling factor given in Table 4 is derived from a linear fit of CTD data to water sample data and were used for the final data load. The salinity determination of the water samples was with the Guildline AUTOSAL 8400A. Standard Seawater batch of P121 was used to standardize the AUTOSAL. The precision of the salinity determination of the water samples was 0.0006 PSS derived from the standard deviation of the twenty-three water samples collected from the same bottle.

Table 4. The conductivity scaling factor; linear fit

Station No.	Bias	Slope

PN-1 - PN-9 0.009904 0.999726

A temperature time lag was decided using the CTD time constant decision program, time lag was 0.192 seconds. The ITS-90 scale was used for the temperature and potential temperature scale.

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3. Oxygen measurements

The determination of dissolved oxygen was done by the modified version of the Winkler method described in "Kaiyou kansoku shishin (Manual of Oceanographic Observation)" published by the Oceanographical Society of Japan (1970). The reagent blank was not subtracted. The results of the estimation of precision are shown in Table 5. No estimation of accuracy has been made.

Table 5. The precision of oxygen analyses by three analysts

	Sample Number	Average umol/l	One sigma umol/l	precision %
Analyst A	10	196.5	0.21	0.10
Analyst B	10	197.9	0.25	0.13
Analyst C	10	197.2	0.31	0.16

K.K

4. Nutrient analyses

The nutrients analyses were done by the Technicon Auto Analyzer II described in "Kaiyou kansoku shishin (Manual of Oceanographic Observation)" published by the Oceanographical Society of Japan (1970).

Sampling for nutrients followed that for dissolved oxygen on average 10-20 minutes after the casts were on deck. Samples were drawn into 10 cm3 glass, narrow mouth, screw-capped bottles. Then they were immediately introduced on the sampler tray of the Technicon Auto Analyzer II for the analysis and generally the analyses were begun within one hour after the casts were on deck. If the delays were anticipated to be more than one hour, the samples were refrigerated. Samples were refrigerated and stored up to one hour on stations PN-8, PN-7, PN-6, PN-5, PN-4', PN-4, PN-3', PN-3 and PN-1.

The precisions of the onboard Nitrate and Nitrite analyses estimated from the standard deviation of the five samples from the same working standard solution on each analysis are shown in Table 6. The precision of the onboard Phosphate analysis estimated from the standard deviation of the five samples from the same working standard solutions are also shown in Table 6. The concentrations of the working standard of nitrate, nitrite and phosphate were 40 umol/l, 2 umol/l and 3 umol/l, respectively. No estimation of accuracy have been made.

Table 6. The median and the range (in the parentheses) of the precision of the onboard nutrients analyses.

Nitrate	Nitrite	Phosphate	unit:%
0.154	0.104	0.355	
(0.072-0.954)	(0.000-0.282)	(0.093-1.201)	

The concentrations in umol/kg of oxygen, nitrate, nitrite and phosphate were converted from the concentrations in umol/l using the density calculated from the room temperature and salinity of the water samples. The laboratory temperature for each station are given in Table 7.

Table 7. Laboratory temperature for each station.**********

Station	Temp.	Station	Temp.	Station	Temp.
PN-9	30.3	PN-8	30.3	PN-7	30.3
PN-6	30.4	PN-5	30.4	PN-4'	28.7
PN-4	29.3	PN-3'	29.1	PN-3	29.9
PN-2	29.4	PN-1	29.1		

K.K

5. Notes for the --.SUM, --.SEA and --.CTD files

The first 2 characters of the file name of --.SUM, --.SEA and --.CTD files are NC for R/V Chofu Maru of Nagasaki Marine Observatory. These characters are followed by the last two digits of year, the month and character R (R for PR18) or character S (S for PR19) for the --.SUM and --.SEA files. In addition, the leg of the cruise is appended in the file name of --.SEA files. For the --.CTD files the characters NC are followed by the unique station number and the cast number given in the Comments.

The file names of the --.SUM and --.SEA for this cruise are as follows;

NC9407R.SUM,
NC9407R1.SEA

5.1 --.SUM

Since some of the water depth of the cast were not recorded, we leave the column of them blank.

Since the surface water samplings were by a stainless steel water bucket, "Number of bottles" includes this bucket sampling.

The unique station numbers given by the Japan Meteorological Agency with the cast numbers, which are used as the --.CTD files name, are given in the "Comments".

5.2 --.SEA

We leave "the sample number (SAMPNO)" blank because the sample numbers are different among the salinity, oxygen and nutrients on our assignments.

Since the surface water samplings were by a stainless steel water bucket, we leave the column of "The Bottle Number (BTLNBR)" at the surface layer blank.

All water sample quality flags for the oxygen during this cruise were "3" because the precision did not exceed the WOCE standard of 0.1% and no estimation of accuracy has been made.

5.3 --.CTD

The files name were given in the Comments of --.SUM files.

T.H

6. GPS

For examine the accuracy of the position data of the GPS systems, standard deviations were calculated in after cruise. The position data were good throughout the cruise. The results are shown in Table 8.

Table 8. Standard deviation of position data

Date	Port	Standard deviation	
		Latitude	Longitude
July 20	Nagasaki	26.0m	11.9m

T.H

7. References

Aoyama,M, S.Saito, T.Kobuchi and S.Shiraishi, 1993: CTD full Sampling and Data Processing Method Used at Nagasaki Marine Observatory. (Draft)

Millard,R and Keqi Yang, 1992: CTD Calibration and Processing Methods used by Woods Hole Oceanographic Institution.(Draft)

Oceanographical Society of Japan, 1970: Kaiyou kansoku shishin (Manual of Oceanographic Observation). Ed. by the Japan Meteorological Agency. (in Japanese)