R/V Shumpu Maru Cruise SU9508

# 1 Cruise Narrative

## 1.1 Highlights

Expedition Designation
Shumpu Maru Cruise SU9508

Chief Scientists
Leg 1:Kouji HAYASHI, Kobe Marine Observatory(KMO)

Ship
R/V Shumpu Maru

Ports of Call
Leg 1:Kobe to Kochi

Cruise Dates
Leg 1:August 21 to August 28, 1995

## 1.2 Cruise Summary

The cruise track and station locations of leg 1 are shown in Figure 1. The ship departed Kobe on August 21, 1995, and made 6 CTD/rosette stations of a section PR17. 4 XBT stations were made between CTD/rosette stations. To first CTD/rosette station the ship reached at 1935 UTC on August 23, from last station departed at 2250 UTC on August 24.

The CTD is EG&G NBIS Mark III B(6500 db type,no oxygen sensor). Water sampleswere collected from 1.7 liter Niskin bottles mounted on the General Oceanics
Rosette multisampler. However, surface water samples were collected by a bucket.

## 1.3 List of Principal Investigators

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 |
|---|---|---|
| Kouji KADONO | Oxygen, Nutrients, PH | KMO |
| Tatsushi SHIGA | CTD, Salinity | KMO |

## 1.4 List of Cruise Participants

The cruise participants for leg 1 are listed in Table 2.

Table 2: Cruise Participants for leg 1

| Name | Responsibility | Affiliation |
|---|---|---|
| Kouji HAYASHI | Chief Scientist<br>CTD Hardware | KMO |
| Kouji KADONO | Oxygen, Nutrients, PH | KMO |
| Tatsushi SHIGA | Salinity | KMO |
| Satoshi SUGIMOTO | CTD Software | KMO |
| Syuji TSUBAKI | Oxygen, Nutrients, PH | KMO |
| Tomoaki NAKAMURA | Oxygen, Nutrients, PH | KMO |
| Toshiaki BABA | Watch Stander | KMO |
| Kiyoshi MURAKAMI | Watch Stander | KMO |

## 2 Measurement Techniques and Calibrations

### 2.1 CTD

The CTD is EG&G NBIS Mark III B(6500 db type, no oxygen sensor).
NEC PC9801T with a 8 MByte of memory and 128MB type 3.5" MO unit was used as the primary data collection device, and all CTD data was backed up onto the degital audio tape.
A HP 9000 Series 300 model 330(Hewlett Packard) with a 4 MByte of memory was used as the data monitoring device.

The temperature and pressure sensor were calibrated at the calibration facility of S¥E¥A CO., LTD before the cruise. The results are shown in Table 3.
Temperature and pressure calibration values are used to correct CTD data, by polynominal fitting. The polynominal equation are shown in Table 4.
We decided that by the minimum AIC procedure.

Notice that the upcast pressure data is corrected by the equation with the observed maximum pressure value, because of the hystersis correction. See reference (1).

Table 3: The temperature and pressure sensor calibration values

Temperature(Caliblated on December 5, 1994, pre-creise)

| Standard Temperature | CTD Temperature |
|---|---|
| 1.0070 | 1.0000 |
| 2.0072 | 2.0004 |
| 3.0075 | 3.0009 |
| 4.0071 | 4.0006 |
| 5.0070 | 5.0005 |
| 6.0058 | 5.9995 |
| 7.0061 | 6.9998 |
| 8.0065 | 8.0002 |
| 9.0068 | 9.0002 |
| 10.0069 | 10.0002 |
| 11.0070 | 11.0002 |
| 12.0067 | 12.0000 |
| 13.0078 | 13.0010 |
| 14.0078 | 14.0008 |
| 17.5074 | 17.4993 |
| 20.0375 | 20.0295 |
| 25.2492 | 25.2397 |
| 30.1643 | 30.1531 |

Pressure(increasing, Caliblated on December 8, 1994, pre-cruise)

| Standard Pressure | CTD Pressure |
|---|---|
| 0.0 | 0.7 |
| 98.0 | 98.2 |
| 293.9 | 294.2 |
| 489.9 | 490.0 |
| 979.8 | 979.7 |
| 1959.5 | 1958.8 |
| 2939.3 | 2937.6 |
| 3919.0 | 3916.3 |
| 4898.8 | 4895.4 |
| 5878.5 | 5875.0 |

Pressure(decreasing, calibiated on December 8, 1994, pre-cruise)

| Standard Pressure | CTD Pressure |
|---|---|

| | |
|---|---|
| 0.0 | 1.5 |
| 98.0 | 99.6 |
| 293.9 | 295.9 |
| 489.9 | 492.3 |
| 979.8 | 982.8 |
| 1959.5 | 1962.1 |
| 2939.3 | 2940.6 |
| 3919.0 | 3918.9 |
| 4898.8 | 4897.1 |
| 5878.5 | 5875.0 |

Table 4: The Calibration equation

Real : Correctted value
Obs : Observed value

$$Real = a * ( Obs ^ 4 ) + b * ( Obs ^ 3 ) + c * ( Obs ^ 2 ) + d * Obs + e$$

| | Temperature | Pressure(increase) | Pressure(decrease) |
|---|---|---|---|
| a = | 0.193268E-7 | -.114242E-13 | 0.169394E-13 |
| b = | -.135107E-5 | 0.978989E-10 | -.270993E-9 |
| c = | 0.390830E-4 | -.190550E-6 | 0.164660E-5 |
| d = | 0.999648 | 1.000733 | 0.997075 |
| e = | 0.734023E-2 | 0.211994 | -.677825 |

The conductivity sensor were calibrated at sea using data from the analysis of salinity collected at 5 stations. The salinometer is AUTOSAL 8400B(Guildline) for the analyses of salinity of the water samples. The results are shown in Table 5.

We assumed that the bias equal 0 because that was less than 0.001. Standard Sea Water batch of P124 was used to standardize the Autosal. The precision of the salinity determination of the water samples was 0.00018 PSS derived from the standard deviation of the 18 water samples collected from the same bottle.

We find the slope value is less than usual, but we determined this by the samples from the bottom(more than 4000m depth) to the surface, and these calibration constants in Table 5 let the salinity value of CTD fit to that of the samples.

Table 5: The conductivity sensor calibration constants

| Bias | Slope |
|---|---|
| 0 | 0.99863 |

When calculating salinity, we use the response time 0.032 second of temperature sensor. We determined the time by the method described in reference (2).

The Fast Temperature sensor may have influence on the temperature data.

All the reported conductivity(salinity) is calibrated for the cell material deformations. See reference (1).

The temperature of "SU9508.SEA" and "SU????_?.CTD" files is 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 reference (3).No estimation of accuracy and precision and reagent blank has been done.

The concentration in umol/kg were converted from the concentration in umol/l using the density calculated from the temperature and salinity when rosette sampling.

## 2.3 Nutrients Analyses

The nutrients analyses were done by the Technicon Auto Analyzer II described in reference (3). No estimation of accuracy and precision has been done.

The concentration in umol/kg were converted from the concentration in umol/l using the density calculated from assuming the room temperature 20ßC and salinity 34.5 psu.

## 2.4 PH measurements

The PH measurements were done by the PH meter(Denki Kagaku keiki co.,ltd) described in reference (3). No estimation of accuracy and precision has been done.

Notice that the order of measurements is 0.01.

## 2.5 Notes for the SU9508.SUM, SU9508.SEA and SU????_?.CTD files

The first 2 characters of the file name of *.SUM, *.SEA and *.CTD files are SU for R/V Shumpu maru of Kobe Marine Observatory. These characters are followd by the last two digits of the year and the month for the *.SUM and *.SEA files. For the *.CTD files, the characters SU are followed by the unique station number and the cast number given by the Japan Meteorological Agency.

In "SU9508.SUM", we leave some position column blank(when bucket was used) because not recorded.

In "SU9508.SEA", we leave "sample number (SAMPNO)" column of the surface layer blank, because of using bucket.

All water sample quality flags during this cruise were "3",because the no estimation of accuracy and precision has been made.

## 2.6 References

(1) CTD calibration and Processing Methods used by Woods Hole Oceanographic Institution(DRAFT), Robert Millard and Keqi Yang, April 20, 1992.

(2) CTD Data Kousei no Tebiki, JODC manual guide No.4, Masaki KAWABE and Kiyoshi KAWASAKI, March, 1993.

(3) Kaiyo Kansoku Shishin(Manual of Oceanographic Observation), Oceanographic Society of Japan, 1970