preliminary data report
may 18, 1995

A.   Cruise Narrative

A.1   Highlights

A.1.a WOCE designation PR17
A.1.b EXPOCODE   49SU9107/2
A.1.c Chief Scientist   Koichi Ishikawa
                        Kobe Marine Observatory(KMO)

A.1.d Ship: R/V Shumpu Maru
A.1.e Port of Call   Kagoshima to Kochi
A.1.f Cruise Dates   July 18 to July 21, 1991

A.2   Cruise Summary

A.2.a Geographic boundaries

A.2.b Total number of stations occupied

A.2.c Floats and drifters deployed

A.2.d Moorings deployed or recovered

A.3   List of Principal Investigators

        Table 1: Principal Investigators for All Measurements
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                Name   Responsibility   Affiliation
            Nobuo SATO   Oxygen, Nutrients   KMO
            Koichi ISHIKAWA   CTD, S   KMO

A.4   Scientific Programme and Methods

The ship departed Kagoshima on July 18,1991, 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 1149 UTC on July 18, from last station departed at 1337
UTC on July 19.

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

A.5   Major Problems and Goals Not Achieved
A.6   Other incidents of Note
A.7   List of Cruise Participants

        Table 2: Cruise Participants

                Name   Responsibility   Affiliation

            Koichi ISHIKAWA   Chief Scientist   KMO
                                CTD Software
            Nobuo SATO   Oxygen, Nutrients   KMO
            Sukeyoshi TAKATANI Watch Stander   KMO

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              Ryohei OKADA          Watch Stander        KMO
              Yasuharu HATA         CTD Hardware         KMO
              Chiharu NAGAI         Watch Stander        KMO
              Atushi OBATA          Watch Stander        KMO
              Akiyoshi AWANO        Oxygen, Nutrients    KMO
              Hiroki SUZUKI         Oxygen, Nutrients    KMO
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B.   Underway Measurements

B.1   Navigation and bathymetry
B.2   Acoustic Doppler Current Profiler (ADCP)
B.3   Thermosalinograph and underway dissolved oxygen, fluorometer, etc
B.4   XBT and XCTD
B.5   Meteorological observations
B.6   Atmospheric chemistry

C.   Hydrographic Measurements

The CTD is EG&G NBIS Mark III B(6500 db type, no oxygen
sensor). A HP 9000 Series 300 model 330(Hewlett Packard) with a 4
MByte of memory was used as the primary data collection device.

The temperature and pressure sensor were calibrated at the
calibration facility of HAKUTO CO., LTD before the cruise. The
results are shown in Table 3. However, no correction with these
results has been made because the correction method are not
established.

Table 3: The temperature and pressure sensor calibration constants
      Temperature

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              Time                Bias         Slope
        -------------------------------------------------
        June 8(pre-cruise)     -0.0058077   0.9997071
        Pressure (increasing)
              Time                Bias         Slope
        June 9(pre-cruise)     -0.8717      1.000713
        Pressure (decreasing)
              Time                Bias         Slope
        June 9(pre-cruise)     -3.9656      1.001273
        -------------------------------------------------
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The conductivity sensor were calibrated at sea using data from the
analyses of salinity collected at 3 stations. The salinometer is
AUTOLAB model 1601 for the analyses of salinity of the water samples.
The results are shown in Table 4.

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        Table 4: The conductivity sensor calibration constants
           -------------------------------------------------
          Bias                  Slope
             0                  1.00030
           -------------------------------------------------
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Oxygen Measurements

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

Nutrients Analyses

The nutrients analyses were done by the Technicon Auto Analyzer II
described in "Kaiyo Kansoku Shishin (Manual of Oceanographic
Observation)" published by the Oceanographical Society of
Japan(1970). No estimation of accuracy and precision has been done.

D.   Acknowledgments
E.   References

Unesco, 1983. International Oceanographic tables. Unesco Technical Papers in
Marine Science, No. 44.

Unesco, 1991. Processing of Oceanographic Station Data, 1991. By JPOTS
editorial panel.

F.   WHPO Summary

Several data files are associated with this report. They are the su9107.sum,
su9107.hyd, su9107.csl and *.wct files. The su9107.sum file contains a
summary of the location, time, type of parameters sampled, and other pertient
information regarding each hydrographic station. The su9107.hyd file contains
the bottle data. The *.wct files are the ctd data for each station. The *.wct
files are zipped into one file called su9107.wct.zip. The su9107.csl file is a
listing of ctd and calculated values at standard levels.

The following is a description of how the standard levels and
calculated values were derived for the su9107.csl file:

Salinity, Temperature and Pressure: These three values were smoothed from
the individual CTD files over the N uniformly increasing pressure levels.
using the following binomial filter–

     $t(j) = 0.25ti(j-1) + 0.5ti(j) + 0.25ti(j+1)$ j=2....N–1

When a pressure level is represented in the *.csl file that is not
contained within the ctd values, the value was linearly interpolated
to the desired level after applying the binomial filtering.

Sigma-theta(SIG-TH:KG/M3), Sigma-2 (SIG-2: KG/M3), and Sigma-4(SIG-4:
KG/M3): These values are calculated using the practical salinity scale
(PSS-78) and the international equation of state for seawater (EOS-80)
as described in the Unesco publication 44 at reference pressures of the
surface for SIG-TH; 2000 dbars for Sigma-2; and 4000 dbars for Sigma-4.

Gradient Potential Temperature (GRD-PT: C/DB 10-3) is calculated as the
least squares slope between two levels, where the standard level is the
center of the interval. The interval being the smallest of the two
differences between the standard level and the two closest values.
The slope is first determined using CTD temperature and then the
adiabatic lapse rate is subtracted to obtain the gradient potential
temperature. Equations and Fortran routines are described in Unesco
publication 44.

Gradient Salinity (GRD-S: 1/DB 10-3) is calculated as the least squares
slope between two levels, where the standard level is the center of the
standard level and the two closes values. Equations and Fortran
routines are described in Unesco publication 44.

Potential Vorticity (POT-V: 1/ms 10-11) is calculated as the vertical
component ignoring contributions due to relative vorticity, i.e.
pv=fN2/g, where f is the coriolius parameter, N is the bouyancy
frequency (data expressed as radius/sec), and g is the local
acceleration of gravity.

Bouyancy Frequency (B-V: cph) is calculated using the adiabatic leveling method, Fofonoff (1985) and Millard, Owens and Fofonoff (1990). Equations and Fortran routines are described in Unesco publication 44.

Potential Energy (PE: J/M2: 10-5) and Dynamic Height (DYN-HT: M) are calculated by integrating from 0 to the level of interest. Equations and Fortran routines are described in Unesco publication, Processing of Oceanographic station data.

Neutral Density (GAMMA-N: KG/M3) is calculated with the program GAMMA-N (Jackett and McDougall) version 1.3 Nov. 94.

G.   Data Quality Evaulation