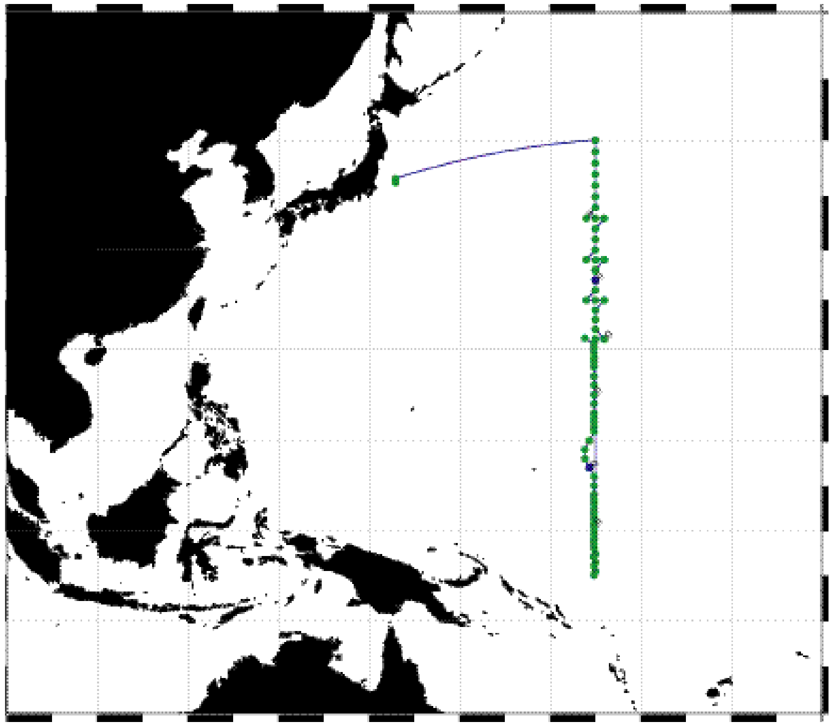
A. Cruise Narrative: P13C



A.1. Highlights

WHP Cruise Summary Information

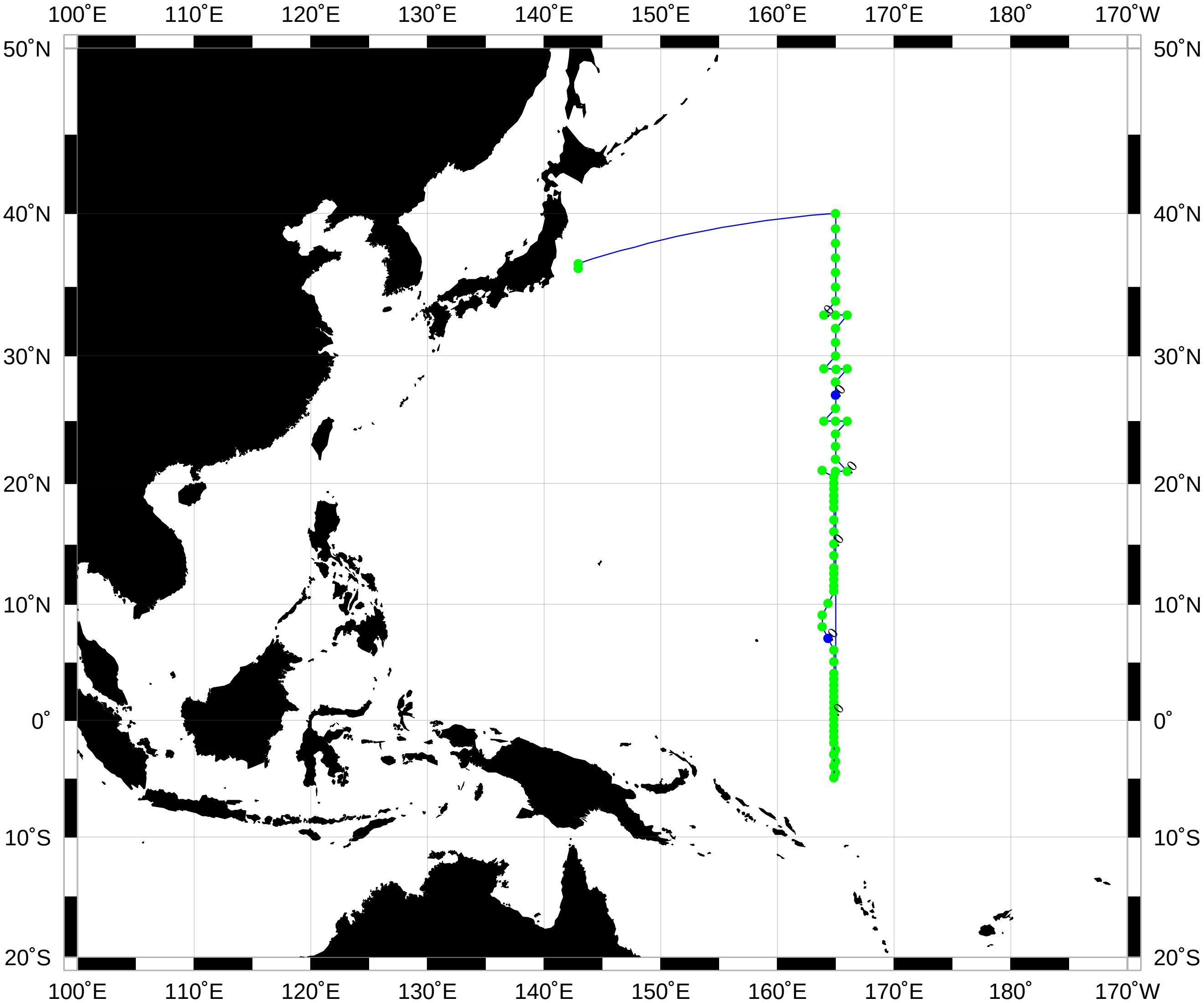
WOCE section designation	**P13C**
Expedition designation (EXPOCODE)	**49HH915_1-2**
Chief Scientist(s) and their affiliation	**Keisuke Taira**/ORI (Univ. of Tokyo)
Dates	1991.AUG.13 - 1991.OCT.02
Ship	R/V Hakuho Maru
Ports of call	Brisbane, Australia
Number of stations	73
Geographic boundaries of the stations	30°N 155°E 166°E 10°S
Floats and drifters deployed	Six SOFAR floats deployed
Moorings deployed or recovered	Three acoustic receiver moorings deployed for SOFAR; Five current meter moorings deployed; One current meter mooring recovered
Contributing Authors	none cited

WHP Cruise and Data Information

Instructions: Click on any item to locate primary reference(s) or use navigation tools above.

Cruise Summary Information	Hydrographic Measurements
	CTD - general
	CTD - pressure
Geographic boundaries of the survey	CTD - temperature
Cruise track (figure)	CTD - conductivity/salinity
Description of stations	CTD - dissolved oxygen
Description of parameters sampled	
Bottle depth distributions (figure)	Salinity
Floats and drifters deployed	Oxygen
Moorings deployed or recovered	
Principal Investigators for all measurements	
Cruise Participants	
Problems and goals not achieved	
	References
	DQE Reports
	CTD
	S/O2/nutrients
	CFCs
	14C
	Data Processing Notes

Station locations for P13C: TAIRA



Produced from .sum file by WHPO-SIO

A.2. Cruise Summary

A.2.a Stations occupied

CTDO2 casts with 24-place 12-liter rosette water sample were carried out at 68 stations along 165@E. Eight stations among them were occupied on 164-E and 166*E in order to calculate meridional geostrophic flows and zonal gradients of property concentrations. The other sixty stations were on 165 E, forming a part of the WHP P13. The interval of CTD stations was basically 60 n.miles, but it was shortened to 30 n.miles over the seamounts around 12°N and l9°N and near the equator between 5 S and 4°N

We shifted the CTD stations at 7°N and 10°N from 165°E to 164° 30'E and the stations at 8°N and 9°N to 164 E, in order to avoid the training area of US navy.

A.2.b Floats and drifters deployed

Six SOFAR floats were deployed at three locations in the Kuroshio Extension area just east of Japan.

A.2.c Moorings deployed or recovered

Three moorings of acoustic receiver for SOFAR were deployed in the Kuroshio Extension area just east of. Japan.

Five moorings of current meters were deployed on 165°E. Each mooring has four or-five current meters between the sea bottom and the depth of 800 m from the sea surface.

One mooring of current meters at 27°N, 168°E was recovered.

A.3 List of Principal Investigators

Name	Measurement responsibility	Affiliation
K.Taira	CTDO2/Salinity/Oxygen/Mooring/SOFAR float	ORI, Univ. of Tokyo
S.Watanabe	Nutrients/CFCs/Tritium/Other chemical properties	Hokkaido University

A.4 Major Problems and Goals not Achieved

During the cruise we were troubled with the General Oceanics rosette tripping mechanism which resulted in mis-firing and double-tripping of the water sampling bottles. This problem was traced to slippage between the stepping motor and the tripping mechanism, and a washer was added over the stepping motor to resist a excessive tripping. We got better action of the tripping mechanism for each of several trials of repair, but we could not complete. Closing depths of four Niskin bottles are known from data of reversing pressure meters mounted on the bottles, but the depths for the other twenty bottles must be inferred from comparing salinity and dissolved oxygen data between CTD and water-sample analysis.

Large noises of CTDO2 signal during a lowering cast were generated after several casts were successful. We eventually traced this problem to unstable motion of the end portion of CTD wire connecting to the slip ring. We temporarily repaired everytime, but couldn't completely in the sea.

Fierce noise of O2 sensor signal was generated at depths around 500 db for all casts. In addition, step- like small shift of O2 signal occurred sometimes at deeper depths. Calibration of the O2-sensor data looks very difficult.

A.6 Other Incidents of Note

A.7 List of Cruise Participants

NAME	RESPONSIBILITY	AFFILIATION
Keisuke Taira	Chief Scientist/CTD Hardware/SOFAR Float	ORI
Hirotaka Otobe	CTD Hardware/Salinity	ORI
ShoJi Kitagawa	CTD Software/Current Meter/SOFAR Float	ORI
Masaki Kawabe	Assistant to Chief Scientist/CTD Processing	ORI
Katsuto Uehara	Watch Stander/ADCP	ORI
Shuichi Watanabe	Oxygen/Nutrients/CFCs/Tritium	Hokkaido Univ.
Hiroshi Ichikawa	Watch Stander (Leg 1)	Kagashima Univ.
Toru Yamashiro	Watch Stander	Kagashima Univ.

Seventeen graduate students joined this cruise for CTD watch and chemical analysis.

B. Underway Measurements

B.1 Navigation and bathymetry

B.2 Acoustic Doppler Current Profiler (ADCP)

B.3 Thermosalinograph and underway dissolved oxygen, etc

B.4 XBT and XCTD

B.5 Meteorological observations

B.6 Atmospheric chemistry

C. Hydrographic Measurements

C.1 CTD Measurements

Data Collection

The FSX analog signals sent from the underwater unit of CTD Neil Brown Mark III were received with the onboard unit, and were converted to digital signals with RS232 AD converter. Data collection was made with the Hakuto Inc. CTD operating software Ver. 4.2, using an NEC personal computer PC9801-RX with a 20 MByte hard disk and a 8 MByte RAM disk. Rate of data sampling was limited to 9 - 10 data per second due to the ability of the RS232 converter used here. The data were real time stored into the RAM disk, and were kept in a floppy disk after the end of each cast.

Full digital signals (32 data per second) coming through the EG&G 1401 onboard unit were collected using an IBM-compatible personal computer DAEW00, made in Korea, with a 40 MByte hard disk. The data stored in the hard disk were compressed with a software for data freezing, and were taken into a floppy disk.

In addition, the FSK analog signals were recorded in a SONY digital audio tape as backup data.

Calibrations and Processing

The CTD temperature sensor used during the cruise is manufactured by Rosemount who claim a resolution of 0.0005 C and an accuracy of +/-0.005 C. The sensor was calibrated at the ORI calibration facility before the cruise. The result shows that the sensor value must be added 0.0253 at the value of 0 C and 0.0083 at 23 C. The correction decreases almost linearly, and is ex- pressed with a quadratic equation of sensor value (T):

$$\Delta T = 0.121937\text{x}10\text{E-}4\text{xT}2 - 0.803083\text{x}10\text{E-}3\text{xT} + 0.0251885 \ (T < 9.1 \ C),$$

$$\Delta T = 0.179550\text{x}10\text{E-}4\text{xT}2 - 0.127571\text{x}10\text{E-}2\text{xT} + 0.0290126 \ (T > 9.1 \ C).$$

The CTD pressure sensor used during the cruise is manufactured by Paine Instruments and have a resolution of 0.1 dbar and an accuracy of +/- 6.5 dbar. The sensor calibrations before the cruise were done for five cases with maximum weighted pressure of 1000 dbar, 2000 dbar, 3000 dbar, 4000 dbar and 6000 dbar. Sixth-order polynomial fits were used for the correction:

for increasing pressure:

$$\begin{aligned}\Delta P = & -0.116484\text{x}10\text{E}^{-20}\text{xP}^6 + 0.287633\text{x}10\text{E}^{-16}\text{xP}^5 \\ & -0.289204\text{x}10\text{E}^{-12}\text{xP}^4 + 0.154059\text{x}10\text{E}^{-8}\text{xP}^3 \\ & -0.455414\text{x}10\text{E}^{-5}\text{xP}^2 + 0.699556\text{x}10\text{E}^{-2}\text{xP} - 2.69719\end{aligned}$$

for decreasing pressure from 2000 dbar:

$$\begin{aligned}\Delta P = & \ 0.849785\text{x}10\text{E}^{-19}\text{xP}^6 - 0.104276\text{x}10\text{E}^{-14}\text{xP}^5 \\ & +0.395952\text{x}10\text{E}^{-11}\text{xP}^4 - 0.567799\text{x}10\text{E-}^{8}\text{xP}^3 \\ & +0.223005\text{x}10\text{E}^{-5}\text{xP}^2 + 0.266200\text{x}10\text{E-}^{2}\text{xP} - 2.60042\end{aligned}$$

for decreasing pressure from 3000 dbar:

$$\Delta P = -0.311947\text{x}10\text{E}^{-19}\text{xP}^6 + 0.283531\text{x}10\text{E}^{-15}\text{xP}^5 -0.106755\text{x}10\text{E}^{-11}\text{xP}^4 + 0.249443\text{x}10\text{E}^{-8}\text{xP}^3 -0.385196\text{x}10\text{E}^{-5}\text{xP}^2 + 0.399053\text{x}10\text{E}^{-2}\text{xP} - 2.65158$$

for decreasing pressure from 4000 dbar:

$$\Delta P = -0.207116\text{x}10\text{E}^{-19}\text{xP}^6 + 0.269568\text{x}10\text{E}^{-15}\text{xP}^5 -0.137340\text{x}10\text{E}^{-11}\text{xP}^4 + 0.363514\text{x}10\text{E}^{-8}\text{xP}^3 -0.540009\text{x}10^{-5}\text{xP}^2 + 0.467332\text{x}10\text{E}^{-2}\text{xP} - 2.75144$$

for decreasing pressure from 6000 dbar:

$$\Delta P = -0.14996\text{x}10\text{E}^{-21}\text{xP}^6 + 0.394729\text{x}10\text{E}^{-17}\text{xP}^5 -0.542308\text{x}10\text{E}^{-13}\text{xP}^4 + 0.434294\text{x}10\text{E}^{-9}\text{xP}^3 -0.171657\text{x}10\text{E}^{-5}\text{xP}^2 + 0.328313\text{x}10\text{E}^{-2}\text{xP} - 2.49635$$

The corrections for pressure decrease from arbitrary pressure were approximated by interpolations of the adequate results from the experiments.

The conductivity sensor is manufactured by EG&G NBIS who claim a resolution of 0.001 mmho and an accuracy of +0.005 mmho. Cell factor, i.e., the ratio of conductivity from the sample to that from CTD, was calculated for each water sampling. The cell factor during Leg 1 is 0.99999 at the sea surface, increases to 1.00050 at 1000 dbar, and is almost constant at deeper than 2000 dbar with 1.00062 to 1.00067. The depth dependance is expressed by fifth-order polynomial of pressure:

For Leg 1,

$$CF = 0.5635438\text{x}10\text{E}^{-21}\text{xP}^5 -0.1199696\text{x}10\text{E}^{-16}\text{xP}^4 + 0.1009199\text{x}10\text{E}^{-12}\text{xP}^3 -0.4129447\text{x}10\text{E}^{-9}\text{xP}^2 + 0.8211021\text{x}10\text{E}^{-6}\text{xP} + 0.9999859$$

For Leg 2,

$$CF = 0.2578094\text{x}10\text{E}^{-2}\text{xP}^5 - 0.4151610\text{x}10\text{E}^{-16}\text{xP}^4 + 0.2540135\text{x}10\text{E}^{-12}\text{xP}^3 -0.7420515\text{x}10\text{E}^{-9}\text{xP}^2 + 0.1079275\text{x}10\text{E}^{-5}\text{xP} + 0.9998160.$$

Another kind of correction for conductivity was tried with the use of conductivity relation between CTD and water sample, using linear, quadratic or cubic equations of CTD-conductivity for sample-conductivity. However, RMS error of this method was larger than that of the P- polynomial fit of cell factor.

The oxygen sensor is manufactured by Sensormedics. The calibration will be tried with shipboard oxygen measurements on the 24 water samples collected at each station, although it is difficult due to noises described else- where in this report.

C.2 Salinity measurement

The water sample salinities were measured with a Guild- line Portasal Model 8410 salinometer that was standardized daily with IAPSO Standard Sea Water Batch P-112 and P-114. All of the salinity measurements during this cruise were made within a temperature controlled (+ 1 C) laboratory maintained a little below that of the salinometer water bath.

The CTD is Neil Brown Mark III instrument equipped with a dissolved oxygen sensor. The temperature and pressure sensors were calibrated at the Ocean Research Institute, University of Tokyo before the cruise. The conductivity sensor was preliminary calibrated at sea using data from the analysis of the salinity samples collected at each station. Water samples were collected from twelve-liter Niskin bottles mounted on a General Oceanics Rosette Sampler. All of the water sample conductivity measure- ments and oxygen titrations were made with Portable Salinometer and an automated titration instrument soon after each cast was completed. Samples for the analysis of nutrients were collected at all CTD stations. Samples for CFCs, tritium, total carbon, alkality, PH, C-13 and CH4 were collected with a 1-degree interval along 165-E. Samples for C-14 were also collected, but we cannot measure them in Japan and don't have any plan to do it.

The salinity minimum indicating the North Pacific Intermediate Water exists in a lower part of the main thermocline. The depth is about 740 db at 33°N and shallows southward. The minimum structure can be traced to around 180 db at 10°N. These are typical characteristics in the North Pacific.

A curious structure is found north of 33°N; low salinity less than 34.0 forms two cores around 35°N and north of 39°N, and the isohalines go up and down largely, together with the isotherms. This suggests that the current of the Kuroshio Extension meanders with a shape like 'S' or that a cold low-saline eddy is detached.

Seeing south of 30°N, the main thermocline shallows in the southward direction, while the seasonal thermocline deepens with a gradual dispersion of the isotherms. The main and seasonal thermoclines are incorporated around FUN. The thermocline shallows southward and is shallowest at 8°N, corresponding to the North Equatorial Current. The isotherms at farther south show the structures corresponding to the North Equatorial Countercurrent and the Equatorial Undercurrent.

D. Acknowledgments

E. References

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

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

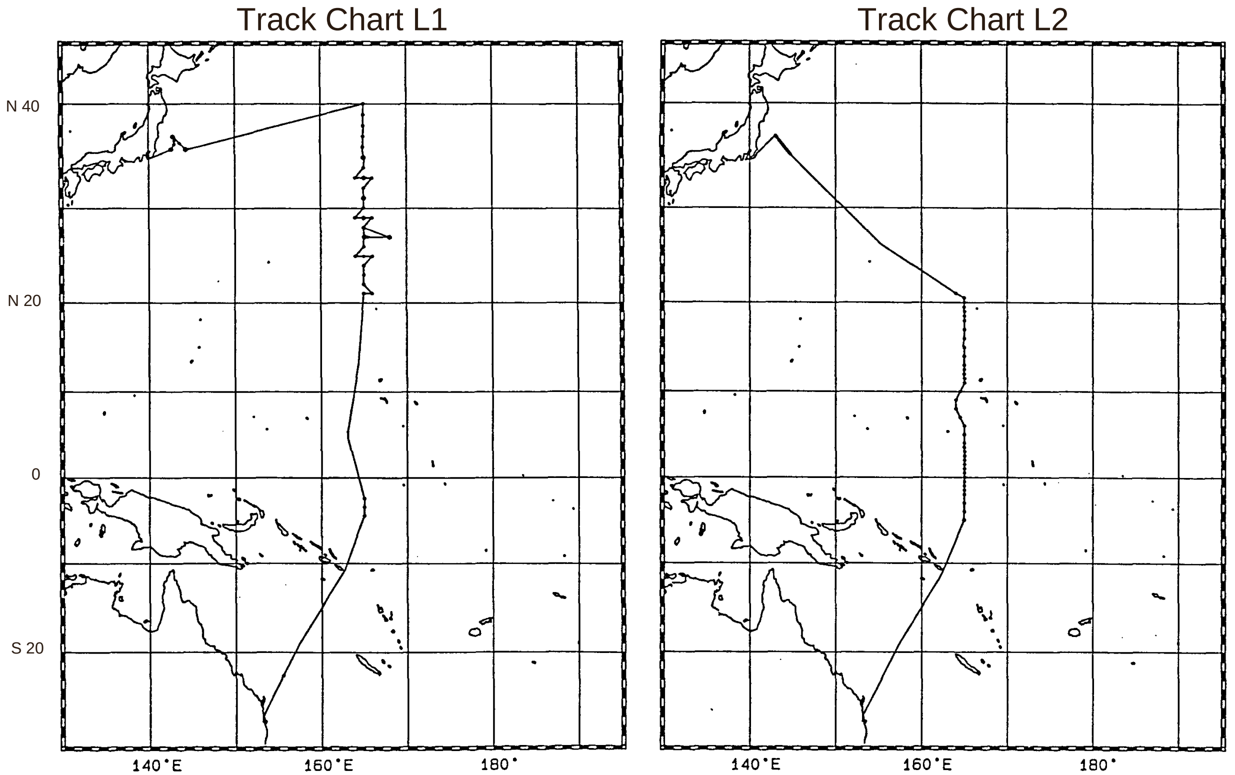


Figure 1 Cruise track in leg 1 (left) and leg 2 (right). The stations just east of Japan are for deployment of moored receivers of SOFAR floats in leg 1 and for XBT in leg 2.

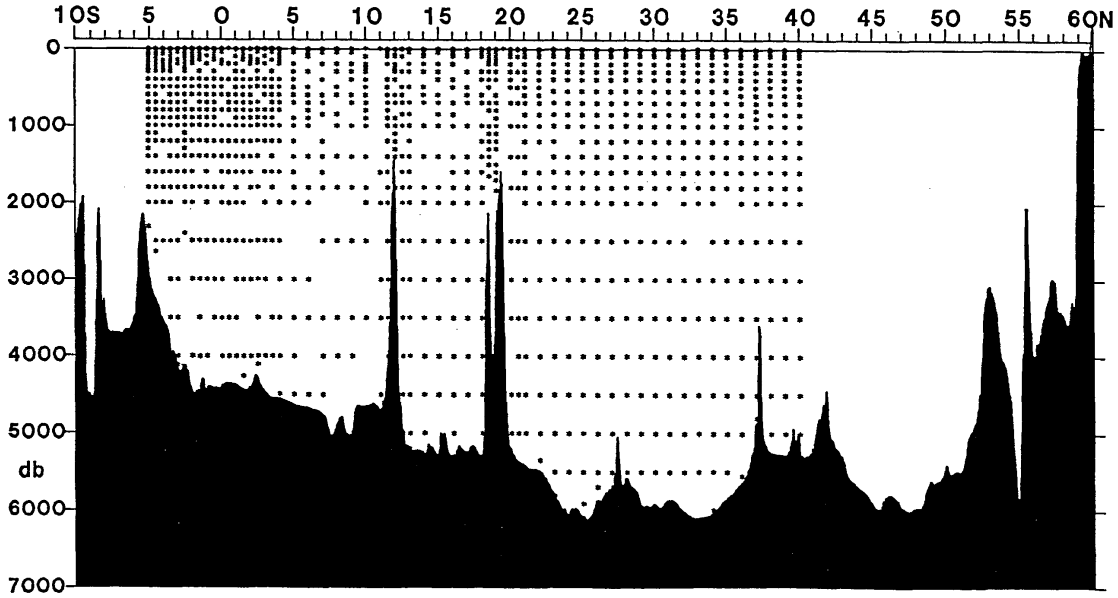


Figure 2 Vertical section along 165° E showing bottle depths

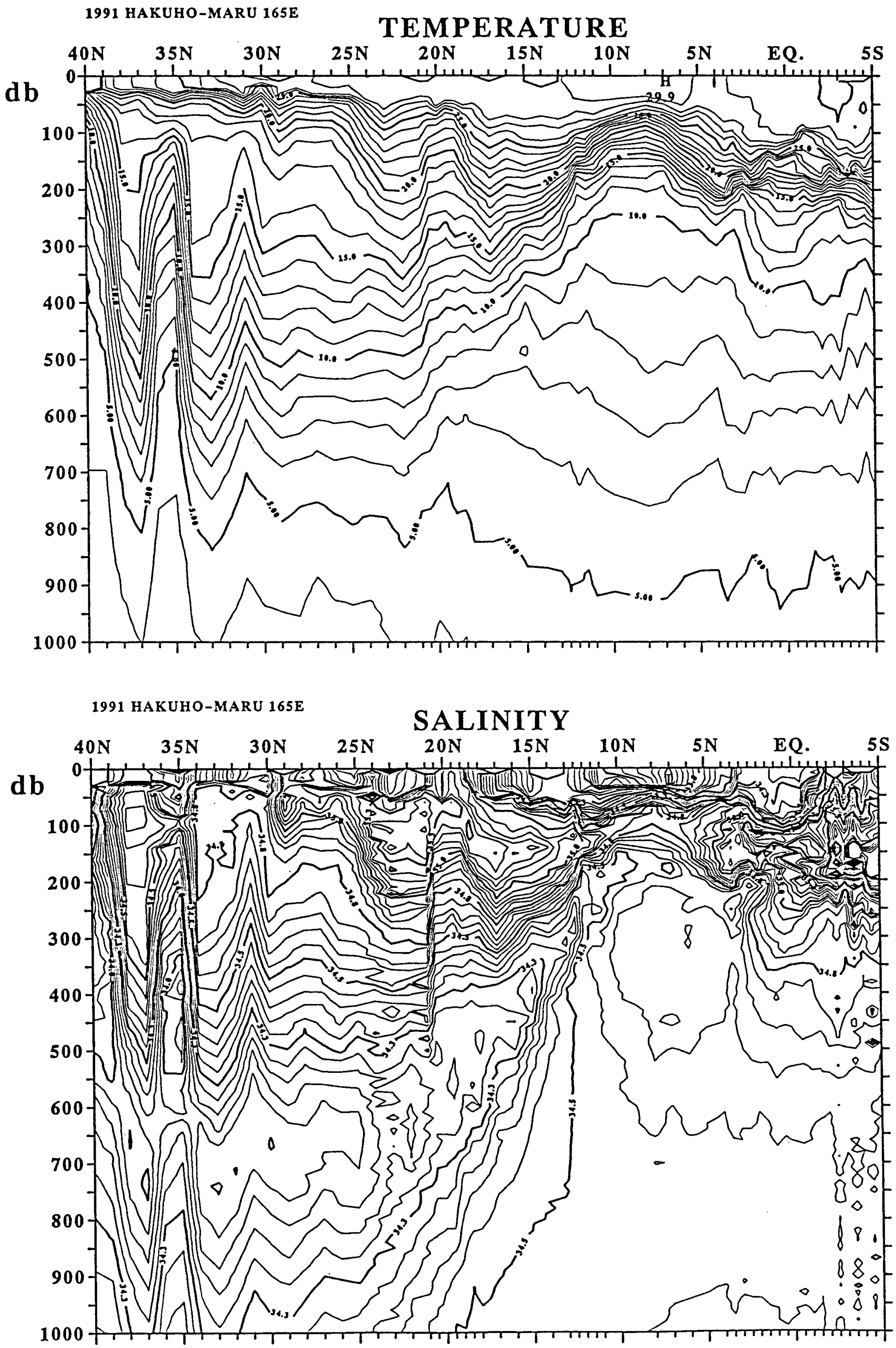


Figure 3 Vertical distribution of in-situ temperature (upper) and salinity (lower) at depths less than 1000 db along 165°E.

F. WHPO Summary

Several data files are associated with this report. They are the 49HH915_1.sum and 49HH915_2.sum, 49HH915_1.hyd and 49HH915_2.hyd, 49HH915_1.csl and 49HH915_2.csl and *.wct files. The *.sum file contains a summary of the location, time, type of parameters sampled, and other pertinent information regarding each hydrographic station. The *.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 *wct.zip. The *.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 *.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-

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

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 buoyancy frequency (data expressed as radius/sec), and g is the local acceleration of gravity.

Buoyancy 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 44.

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

G. Data Quality Evaluation

G.1 Evaluation of CTD data

(Michio AOYAMA)
1996.MAY.21

General:

The data quality of WOCE P13C CTD data (EXPOCODE: 49HH915_1 and _2) and the CTD salinity and oxygen found in dot sea file are examined. The individual 1 dbar profiles were observed in temperature, salinity and oxygen by comparing the profiles obtained in the same basin. The 71 profiles of P13C CTD data were divided into three groups as follows:

Latitude	**Corresponding basin name**
North of 20°N	Northwest Pacific Basin
from 12°N to 19°N	East Mariana Basin
from 12°N to 5°S	Melanesian Basin

The CTD salinity and oxygen calibrations are examined using the water sample data file p13c.mka. Since DQE could not get the information on 'OXYGEN' and 'OXYGN2', DQE used values at 'OXYGEN'. DQE used the water sample data flagged "2" only for the DQE work. DQE put serial number from 001 to 071 for the stations for the convenience of data treatments by DQE. Then in some of the figures presented by DQE, the station numbers are shown in serial number by DQE.

Original station #	Serial #
CJT1	001
CJT2	002
C01 - C18	003 - 20
C17S	021
C18S	022
C19 - C32	023 - 036
C33B	037
C34 - C68	038 - 071

Details

CTD profiles

The temperature profiles at 41 of 71 stations look noisy and/or have spikes. DQE observed that some spikes up to 0.01 deg. exist and an flagged "good" by the data originator. DQE shows one example in which the clear temperature spikes/noises are observed (fig 1). DQE asks the data originator to despike or flagged out the questionable/bad data.

The salinity profiles at 18 of 71 stations look noisy. DQE observed that many spikes up to 0.005 - 0.007 PSS exist and an flagged "good" by the data originator. DQE shows two examples in which the salinity bounced fresher (fig 1) and saltier (fig 2). DQE asks the data originator to despike or flag out the questionable/bad data.
As noted in the cruise report, the CTD oxygen profiles look noisy at 52 of 71 stations.

Evaluation of CTD calibrations to water samples

Salinity calibration

The onboard calibration for salinity looks good in general. DQE, however, observed a large station dependency for the distribution of Ds, Ds = CTD salinity in .SEA file minus bottle salinity. As shown in figure 4, the Ds has a large station dependency. The data originator calibrated the CTD conductivity in simply two station groupings, leg 1 and leg 2 only. However, DQE strongly suggests further correction for CTD salinity using several station groupings to improve the CTD salinity of P13C cruise. Further corrected CTD salinity may meet the WOCE WHP one-time survey standards for CTD measurements; at present they do not.

Oxygen calibration

Although the flg. of CTD oxygen in .CTD files are "3 - questionable measurement", DQE observed that the CTD oxygen in .CTD files are not calibrated and has an offset to bottle oxygen. However, the CTD oxygen in .SEA file is flagged "2 -good" and the histogram of Doxu, the oxygen difference between CTD oxygen and bottle oxygen in P13C.MKA file, shows that CTD oxygen in P13C.SEA file is calibrated. The histogram of Dox, the oxygen difference between CTD oxygen in .CTD files and bottle oxygen in P13C.SEA file shows that CTD oxygen in .CTD files is not calibrated.

DQE found a description that "The calibration will be tried with shipboard oxygen measurements on the 24 water samples collected at each station, although it is difficult due to the noises described elsewhere in this report." in the P13C cruise report. However, it is not clear whether the data originator calibrated the CTD oxygen data or not. DQE asks the data originator to revise the cruise report and describe how the data originator treat the CTD oxygen data in both CTD files and .SEA file.

When the CTD oxygen is not calibrated, the flags for CTD oxygen should be "1 - not calibrated", not "3 - questionable". It is hoped that the CTD oxygen in the CTD files would be properly calibrated for the WHP.

DQE observed both station dependency of Dox (fig. 5) and pressure dependency of Dox. (fig 6). Please pay attention to these behavior when the data originator calibrate the CTD oxygen.

The following are some specific problems that should be looked at:

Temperature profile

st. CJT1	from ca. 3900 dbar to ca. 4300 dbar:	Many temperature spikes/noises are observed.	Suggest flg. "3" or to despike.
st. CJT2	from ca. 3300 dbar to ca. 3500 dbar, at ca. 5150 dbar, at ca. 5800 dbar:	Many temperature spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C03	from ca. 2500 dbar to ca. 3000 dbar:	Temperature profile looks noisy.	Suggest flg. "3".
st. C04	from ca. 2500 dbar to ca. 3500 dbar:	Temperature profile looks noisy.	Suggest flg. "3".
st. C15	at ca. 4800 dbar:	Temperature spike/noise observed..	Suggest flg. "3".
st. C17S	from ca. 4800dbarto ca. 5100 dbar:	Temperature profile looks noisy.	Suggest flg. "3".
st. C21	from ca. 4200 dbar to ca. 5300 dbar:	Many temperature spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C22	from ca. 2500 dbar to ca. 3300 dbar, from 4300 dbar to 5500 dbar, at ca. 5800 dbar and near bottom:	Many temperature spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C23	at ca. 3000 dbar, at ca. 3800 dbar, at ca. 4200 dbar, at ca. 4700 dbar, at ca. 5000 dbar and at ca. 5200 dbar:	Many large temperature spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C24	in whole profile:	Temperature profile look noisy.	Suggest flg. "3".
st. C25	at ca. 3000 dbar, at ca. 4300 dbar and at ca. 4700 dbar:	Temperature spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C26	from ca. 2900 dbar to ca. 3100 dbar, from ca. 4000 dbar to ca. 4200 dbar and from ca. 470 dbar to bottom:	Many temperature spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C27	from ca. 3700 dbar to bottom:	Many temperature spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C29	in whole profile:	Temperature profile look noisy.	Suggest flg. "3".
st. C24	through st. C42 in whole profiles:	Temperature profile look noisy.	Suggest flg. "3".
st. C46	at ca. 3400 dbar and near bottom:	Temperature spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C51	from ca. 2500 dbar to 3300 dbar:	Temperature profile look noisy.	Suggest flg. "3".
st. C52	from ca. 3300 dbar to bottom:	Temperature spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C62	at ca. 3200 dbar and at ca. 5050 dbar:	Temperature spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C62	at ca. 3050 dbar, at ca. 4200 dbar and at ca. 4500 dbar:	Temperature spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C67	in whole profile:	Temperature profile looks noisy.	Suggest flg. "3".
st. C68	at ca. 4800 dba:	Temperature spikes/noises are observed.	Suggest flg. "3" or to despike.

Salinity profile

st. CJT1	from ca. 2800 dbar to bottom:	Many salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. CJT2	from ca. 3300 dbar to bottom:	Many salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C03	at ca. 1800 dbar:	Salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C09	at ca. 1500 dbar and ca. 3950 dbar:	Salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C12	at ca. 4150 dbar:	Salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C14	at ca. 2700 dbar and ca. 3050 dbar:	Salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C15	at ca. 4700 dbar:	Salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C17S	at ca. 1300 dbar, from ca. 2050 to ca. 3000 dbar, at ca. 3600:	Salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C21	from ca. 4200 dbar to 5300 dbar:	Small salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C22	from ca. 1500 dbar to ca. 2200, from ca. 2700 to 3500 dbar, from 4100 dbar to 5500 dbar and at ca. 5800 dbar:	Salinity profile looks very noisy. Many salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C23	at ca. 2950 dbar, at ca. 3800 dbar, at ca. 4200 dbar, at ca. 4700 dbar, at ca. 5000 dbar and at ca. 5200 dbar:	Salinity profile looks very noisy. Many salinity spikes/noises are observed.	Suggest flg. "3" or to despike
st. C24	from ca. 2500 dbar to ca. 5500 dbar:	Salinity profile looks very noisy. Many salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C26	from ca. 2200 dbar to bottom:	Salinity profile looks very noisy. Many salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C27	from ca. 3800 dbar to bottom:	Salinity profile looks very noisy. Many salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C28	at ca. 2200 dbar:	Salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C29	at ca. 2200 dbar, ca. 3700 dbar and near bottom:	Salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C34	for whole profile:	Salinity profile looks very noisy. Many salinity spikes/noises are observed.	Suggest flg. "3" or to despike.
st. C44	at ca. 3200 dbar and ca. 3600 dbar:	Salinity spikes/noises are observed.	Suggest flg. "3" or to despike.

Figure 1 (CTD DQE)

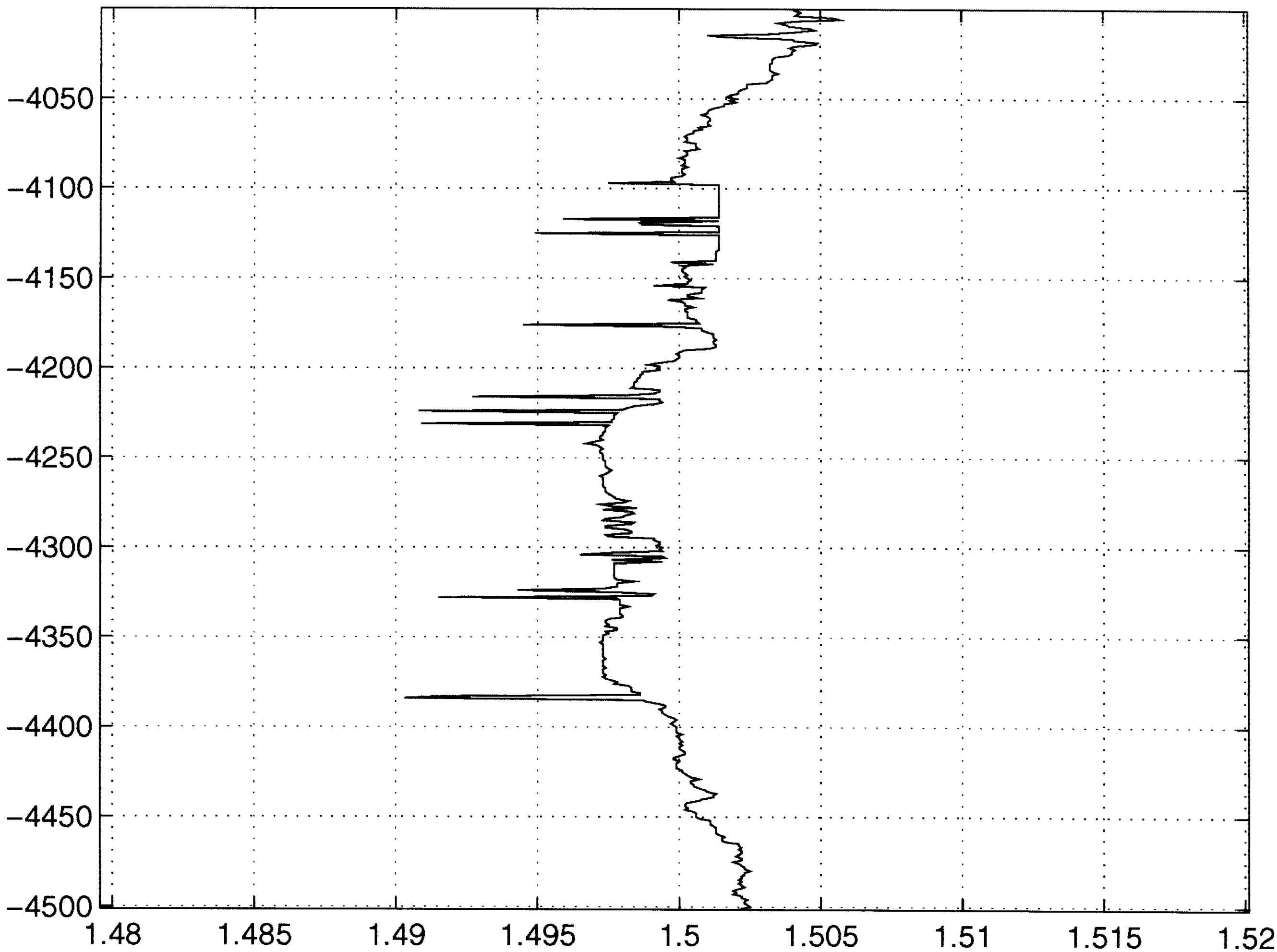


Figure 2 (CTD DQE)

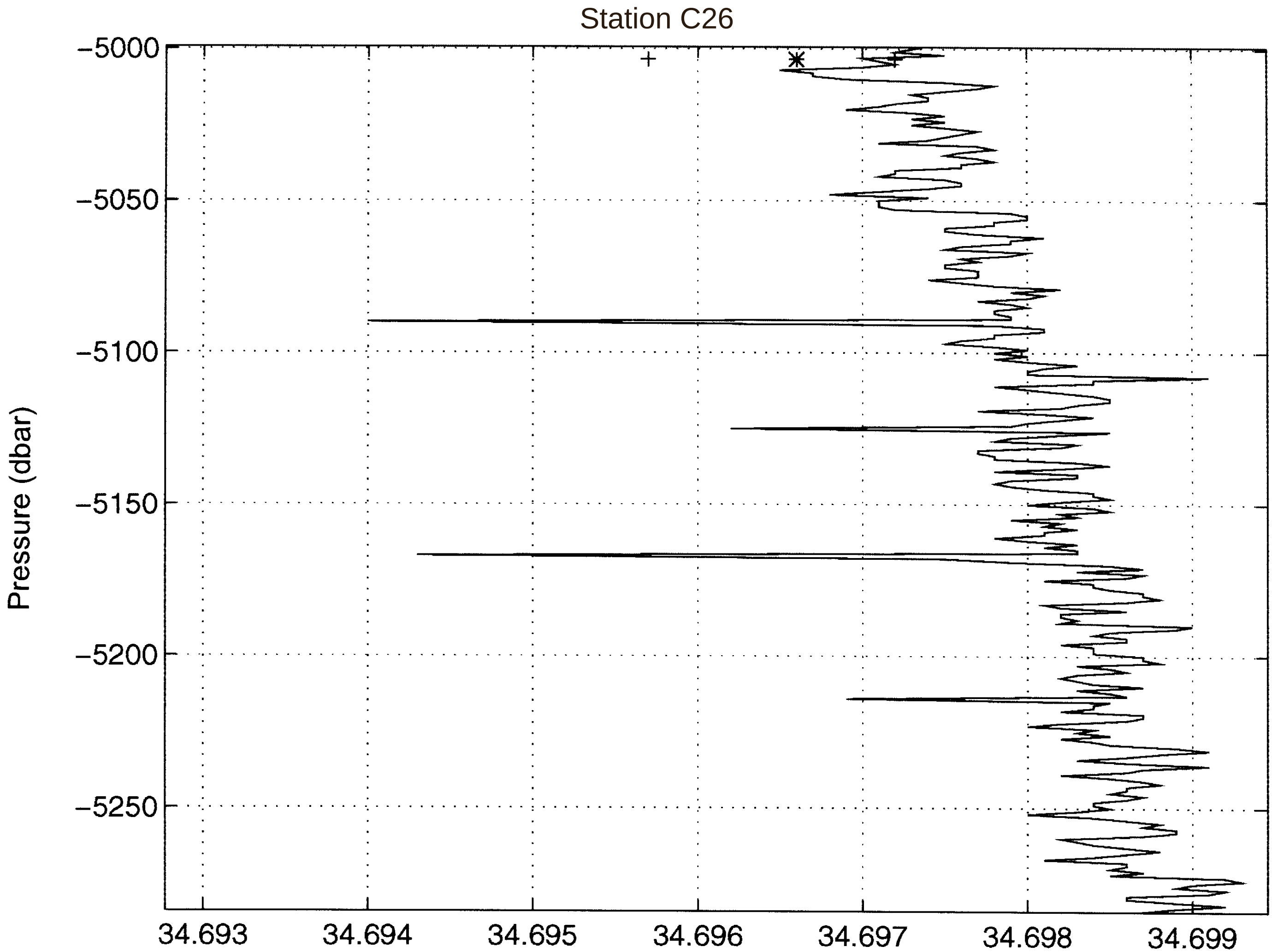


Figure 3 (CTD DQE)

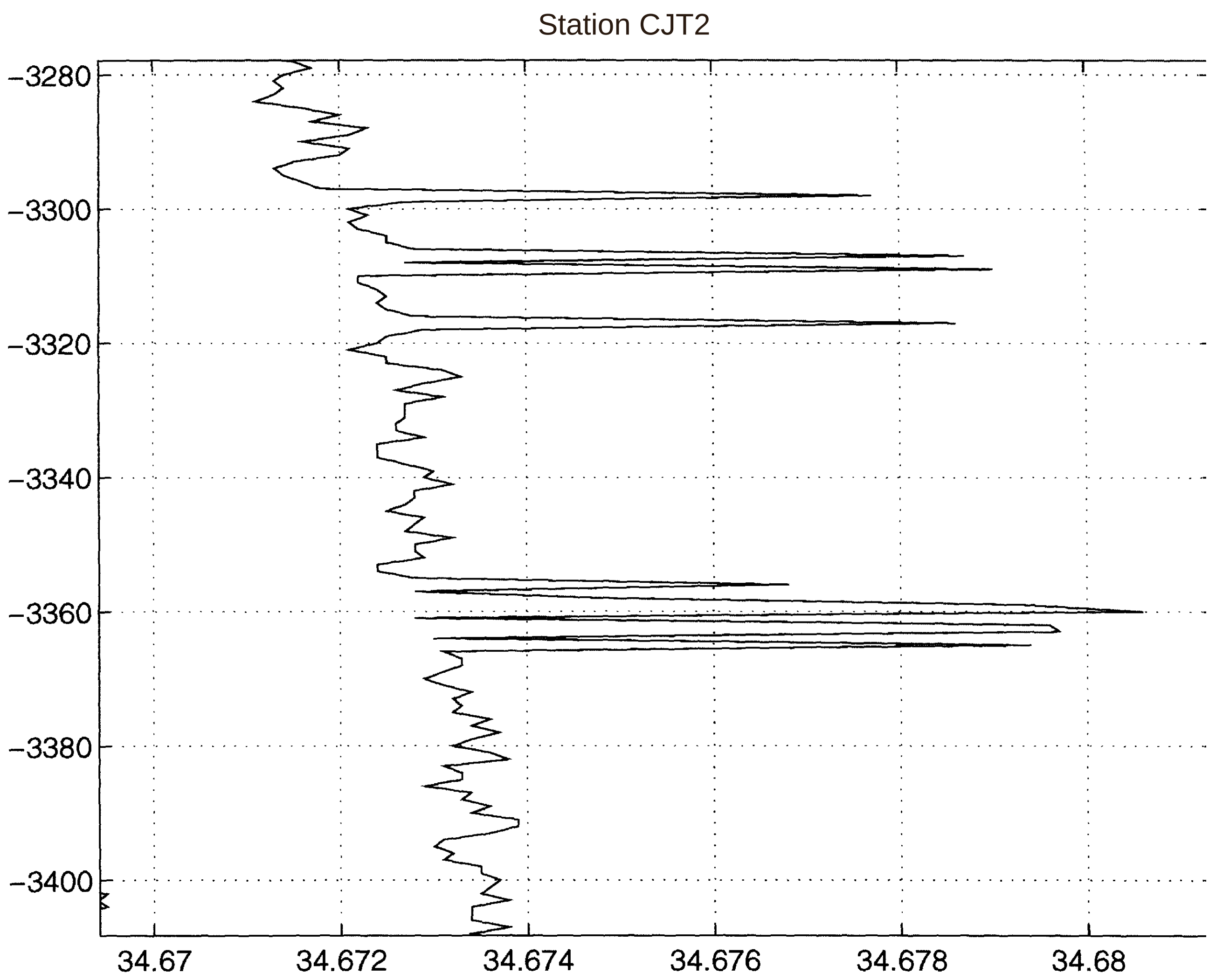


Figure 4 (CTD DQE)

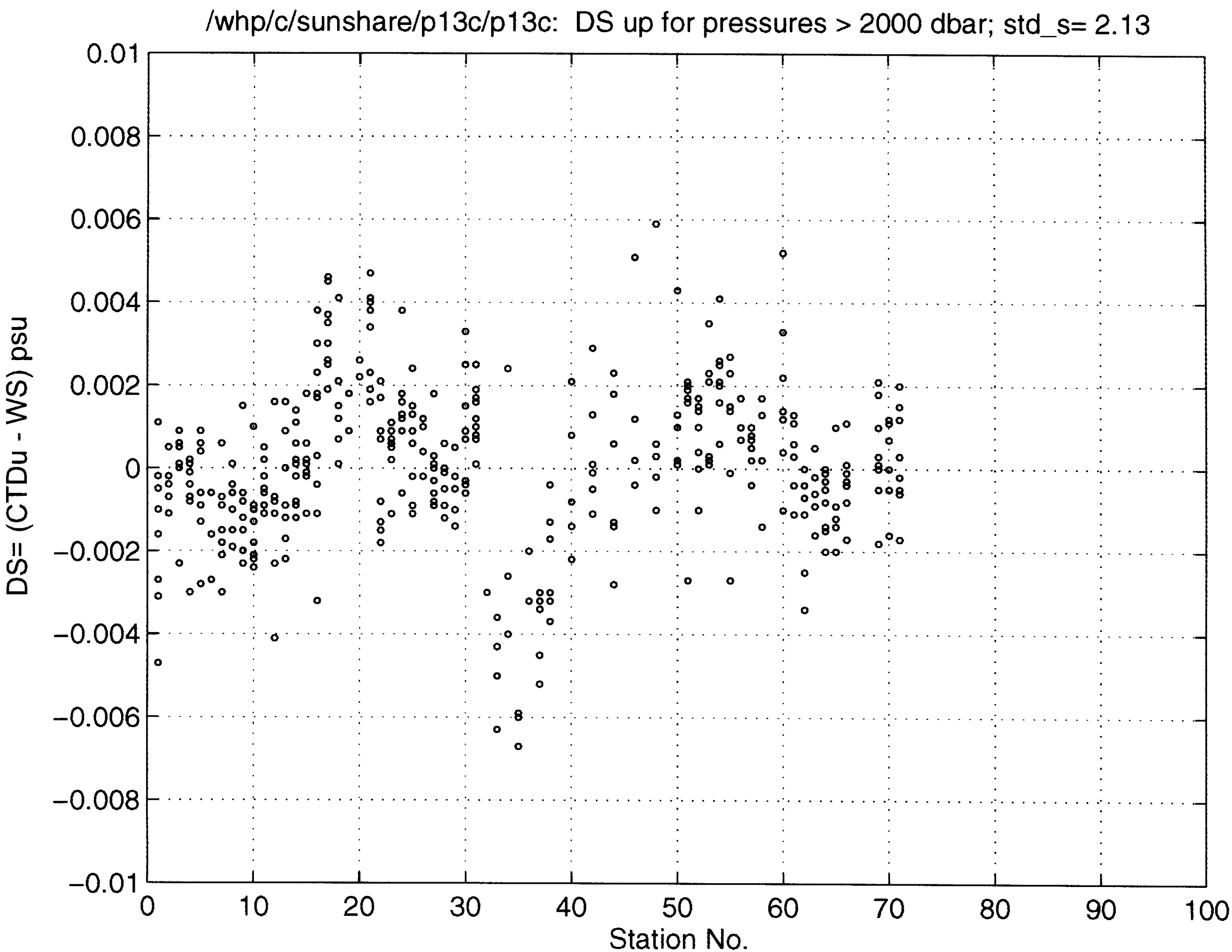


Figure 5 (CTD DQE)

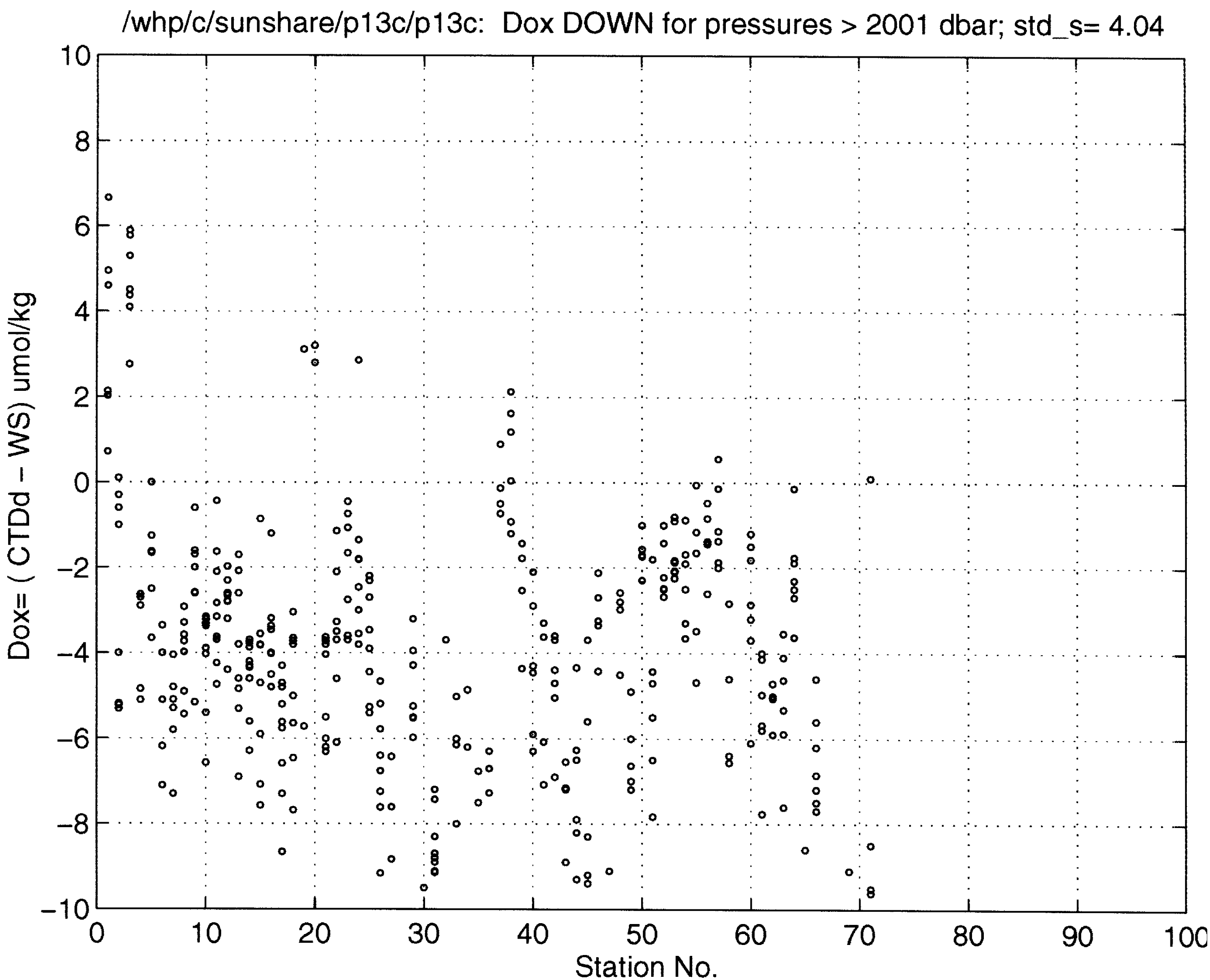
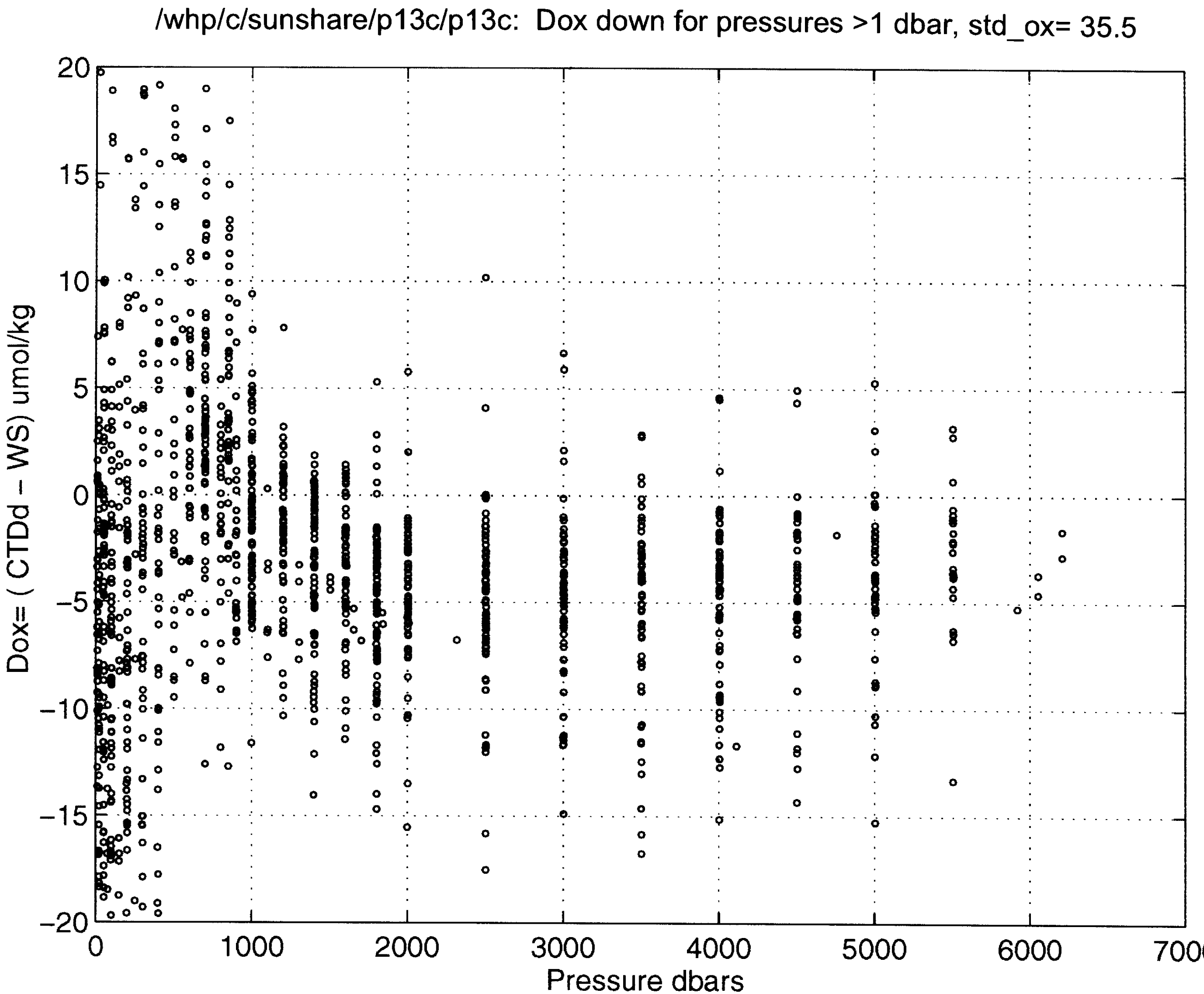


Figure 6 (CTD DQE)



G.2 DQ evaluation of WOCE P13C Hydrographic (salinity and oxygen) data

(Michio AOYAMA)
1996.MAY.21

The data quality of the hydrographic data of the WOCE P13C cruise (EXPOCODE: 49HH915_1 and _2) are examined. Since the nutrients data are not submitted yet at the time of DQE, DQE was done only salinity and oxygen. The data files for this DQE work was P13C.sum and P13C.mka (this P13C.mka file is created for DQE, then it has a new column of quality 2 word) provided by WHPO.

General

The station spacing was 60 nautical miles at the 3/4 of the cruise track and the sampling layer spacing was kept ca. 500 dbar in the deeper layers during this P13 cruise. Although P13C data does not meet the WOCE WHP cruise requirements on station spacing and the vertical sampling interval, P13C data will be an important part of the dataset of "WOCE one time line P13".

DQE used the data flagged "2" by data originator for this DQE work.

DQE examined 2 profiles and 3 property vs. property plots as listed below:

salinity and oxygen profiles
theta vs. salinity plot
theta vs. oxygen plot
salinity vs. oxygen plot

Salinity

Bottle salinity profile looks good. Salinity vs. oxygen and theta vs. salinity plots also look reasonable. DQE thinks that most of the flags of the bottle salinity data are reliable.

Oxygen

Bottle oxygen profile looks good. Salinity vs. oxygen and theta vs. oxygen plots also look reasonable. DQE thinks that the flags of the bottle oxygen data are reliable.

The following are some specific problems that should be looked at:

INPUT FILE: P13C.MKA
THE DATE TODAY IS: 22-MAY-96

STNNBR	CASTNO	SAMPNO	CTDPRS	SALNTY	OXYGEN	QUALT1	QUALT2
CJT1	1	1	6032.6	34.6942		2~	3~
CJT1	1	2	5504.8	34.6931		2~	3~
CJT1	1	3	5004.3	34.6899		2~	3~
C02	1	1	5407.1	34.6927		2~	3~
C08	1	3	5004.1	34.6872		2~	3~
C17	1	2	5001.1		174.7	~2	~3
C17	1	3	4500.4		173.6	~2	~3
C17S	1	7	3002.8		136.7	~2	~3
C26	1	2	5003.4		179.4	~2	~3
C26	1	2	5003.4		180.9	~2	~3
C46	1	2	4003.7	34.6820		2~	3~
C47	1	1	4757.3	34.7013		2~	3~
C51	1	5	3502.5	34.6824		2~	3~
C67	1	5	4004.0		171.3	~2	~3

STNNBR XX/ CASTNO X/ SAMPNO XX at XXXX dbar:

st. CJT1/1/3	at 5004 dbar: Bottle salinity looks low.	Suggest flg. "3".
st. CJT1/1/2	at 5505 dbar: Bottle salinity looks high.	Suggest flg. "3".
st. CJT1/1/1	at 6033 dbar: Bottle salinity looks high.	Suggest flg. "3".
st. C02/l/l	at 5407 dbar: Bottle salinity looks low.	Suggest flg. "3".
st. C08/1/3	at 5004 dbar: Bottle salinity looks low.	Suggest flg. "3".
st. C17/1/3	at 4500 dbar: Bottle oxygen looks high.	Suggest flg. "3".
st. C17/1/2	at 5001 dbar: Bottle oxygen looks high.	Suggest flg. "3".
st. C17S/1/7	at 3003 dbar: Bottle oxygen looks low.	Suggest flg. "3".
st. C26/1/2	at 5003 dbar: Bottle oxygen looks high.	Suggest flg. "3".
st. C46/1/2	at 4004 dbar: Bottle salinity looks low.	Suggest flg. "3".
st. C47/l/l	at 4757 dbar: Bottle salinity looks high.	Suggest flg. "3".
st. C51/1/5	at 3503 dbar: Bottle salinity looks high.	Suggest flg. "3".
st. C67/1/5	at 4004 dbar: Bottle oxygen looks high.	Suggest flg. "3".

H. DATA PROCESSING NOTES

Date	Contact	Data Type	Data Status Summary
12/22/92	Yamada	CTD/BTL	Submitted for DQE; various probs:

It is my pleasure to inform you that Japan Oceanographic Data Center is sending you one reel of magnetic tape containing calibrated CTD data obtained at WHP P13 cruise (KH-91-5 Cruise), which was made from August to October in 1991. This tape was submitted by Dr. M. Kawabe of Ocean Research Institute, University of Tokyo. The water sample data submitted this time are limited to salinity and dissolved oxygen, and do not include chemical data. Chemical analysis needs some more time (PI: Dr. Watanabe, Hokkaido Univ.).

The bottle quality flag 4 (=Did not trip correctly) was not activated, since the tripping mechanism was not good and the flag 4 would have shown up too often. It is commented that bottle-closing depth was fairly well corrected.

The oxygen sensor data at 1db interval were not flagged except for the flags 6 (interpolated value) and 9 (not sampled), since the continuous oxygen data may not have high quality.

There are two datasets of 1db interval data at Stn. C33 (C33A.CTD and C33.CTD), reflecting two cast of CTD at the same station. The second cast was conducted, as water sampling was not made during the first one because of mechanical malfunction. Although the second cast was reported as Stn. C33 in the cruise report, Stn. C33A.CTD, the 1-db interval data from the first cast, was also included. Dr. Kawabe commented that as for the CTD data, the first cast had better quality. If you find any question, please do not hesitate to ask us at: [JODC.TOKYO/JODC] ATI/JAPAN

This address is accessible from OMNET.

Date	Contact	Data Type	Data Status Summary
01/26/93	Dunworth	CTD/BTL	Questions regarding submitted data:

Thank you very much for your recently submitted P13C hydrographic and CTD data. In looking over the data, however, I do have a few questions.

Hydrographic Data:

Station CJT2 and CJT1: BTLNR 24 has no variables sampled or measured, may I remove those records.

Station CJT2: BTLNBR 1 and 2 both have SAMPNO 3, and a CTDPRS of 9999.9. The bottle salts and oxygens are different. Could you please explain what happened

Station C02: BTLNBR 1 and 2 both have SAMPNO I and the same CTDPRS value. However, they have different salinities and oxygens. How did this happen.

CTD Data:

CTDCND is listed in every station, since it can be calculated from the other variables, it is superflous, may I eliminate it?

You indicated that the CTDOXY may be questionable. I have to have a quality flag, and will put a 131 in, unless you have objections.

01/31/93	Kawabe	CTD	answers to CTD questions above

In answer to your questions on the P13C data in the Jan. 26 telemail to JODC.

Hydrographic data:

(1) The no. 24 bottle did not close at Stas. CJT1 and CJT2, because the tripping mechanism to close the bottles did not work normally, and the trigger signals, which were made 24 times from the vessel, closed only 23 bottles. (SAMPNO shows the trigger number.) We set 24 bottles in the water sampler, and reported for all the bottles. Please decide it along the WHP policy of data-file editing whether you remove the records of BTLNBR 24.

(2) BTLNBR 1 and 2 at Sta. CJT2 were closed simultaneously by the third trigger signal (SAMPNO 3). However, we could not obtain the pressure data of CTD at the time of the third trigger due to noise. Therefore, CTDPRS, CTDSAL and CTDOXY are missing. SALNTY and OXYGEN are slightly different between the bottles 1 and 2 because of the difference of sampled water.

(3) As at Sta. CJT2, the bottles 1 and 2 at Sta. C02 were closed simultaneously by the first trigger signal, i.e., at the same depth (CTDPRS). We took water samples for salinity and oxygen from each bottle, and the measured values for the water samples are different. The definition of SAMPNO in our dataset may be different from the definition in the WHP. If so, would you tell me the correct definition?

CTD data:

(1) Please eliminate CTDCND, if it is along the file-editing policy in the WHP.

(2) Please put the flag 3 to CTDOXY. The data of CTDOXY have various data quality, corresponding to the flags 2, 3 and 4. The mean value of the flag numbers is 3. The flag 3 is not bad as a flag of CTDOXY.

03/26/93	Aoyama	CTD/BTL	DQE begun; No NUTs
05/21/96	Aoyama	CTD/S/O	DQE Report rcvd @ WHPO
06/12/96	Taira	CTD/S/O	DQE Report sent to PI; No NUTs
08/15/97	Uribe	DOC	Submitted

2000.12.11 KJU

File contained here is a CRUISE SUMMARY and NOT sumfile. Documentation is online.

2000.10.11 KJU

Files were found in incoming directory under whp_reports. This directory was zipped, files were separated and placed under proper cruise. All of them are sum files.

Received 1997 August 15th.

04/21/00	Anderson	CTD	Data in 2 diff files is identical

In going over the lines of one-time ctd & btl data submitted for DQE (Jerry sent me a list on 2 March) I note that for the ctd data for P13C, files p13cact.asc and p13cbct.asc are identical. It appears that the data for leg 2 - p13cb - is in both ctd files.

05/08/00	Taira	DELC14	Not Measured

Samples for C-14 were also collected, but we cannot measure them in Japan and don't have any plan to do it.

05/11/00	Kawabe	CTD/BTL	Data are Public
	I and my colleagues in the Ocean Research Institute (U. of Tokyo) made WHP cruises twice: WHP P13C (1991) and P13J (1993). I already opened (at least, I believed I opened) the calibrated CTDO2 data and sample data (not including nutrients and chemical data) in P13C and P13J several years ago, by submitting the data to the WHPO and the Japan Oceanographic Data Center (JODC). I don't remember that the WHPO asked me whether "not public" or "public". This question may have sent to Dr. Taira who was the chief scientist of the cruises. Anyway, I hope to open our data in the WOCE community with non-encrypted usual style.		
08/15/00	Diggs	CTD/BTL	Website Updated; data decrypted
	All data decrypted for both legs 1 and 2 (by permission). All associated tables and files updated as well.		
08/24/00	Diggs	CTD	Website Updated w/ new datafile
	Replaced CTD file with correct one for leg 1. Apparently, then original CTD file had stations for leg 2 (instead of leg 1). I found the correct file and put it up on the website. All relevant files and tables have been updated.		
06/22/01	Uribe	CTD/BTL	Website Updated w/CSV File
	CTD and Bottle files in exchange format have been put online.		
01/10/02	Diggs	CTD	Website Updated w/CSV File
	CTD Exchange file re-made with new software (rev#g). Some manipulation of the SUMfile was necessary, such as adding a Line name of 'Haku91' (by K. Uribe) for the non-p13c parts of the cruise and other minor modifications. All new files placed online.		