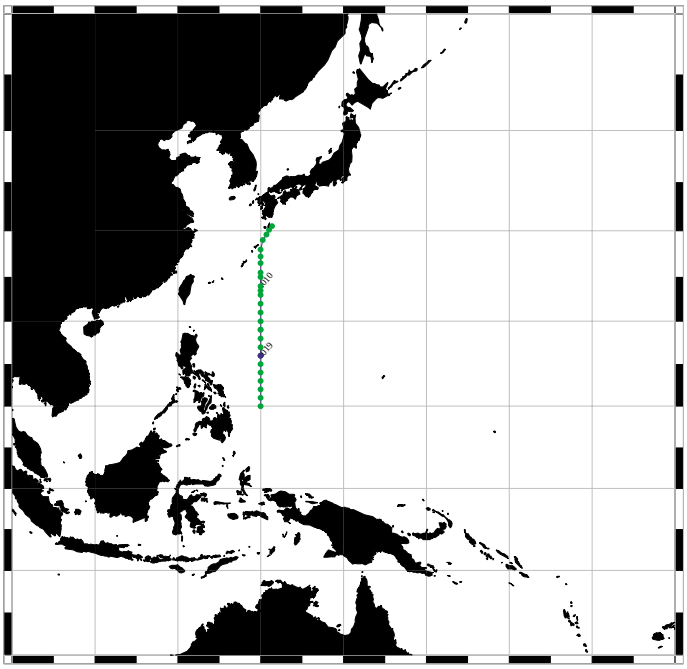
A. Cruise Narrative: P08N



A.1. Highlights

WHP Cruise Summary Information

WOCE section designation	**P08N**
Expedition designation (EXPOCODE)	**49K6KY9606_1**
Chief Scientist(s) and their affiliation	**Keisuke Mizuno***
Dates	1996.JUN.20 - 1996.JUL.15
Ship	Kaiyo Maru
Ports of call	Tokyo, Japan to Tokyo, Japan
Number of stations	25
Geographic boundaries of the stations	30°30' N 129°58.03' E 131°23.91' E 9°59.89' N
Floats and drifters deployed	0
Moorings deployed or recovered	0
Contributing Authors:	A. Ohno, T.Watanabe, K. Kawasaki, M. Mizuno, T. Tokieda, K. Kawahara, T. Amaoka, K. Yamada, N. Hagiwara, T. Kazama

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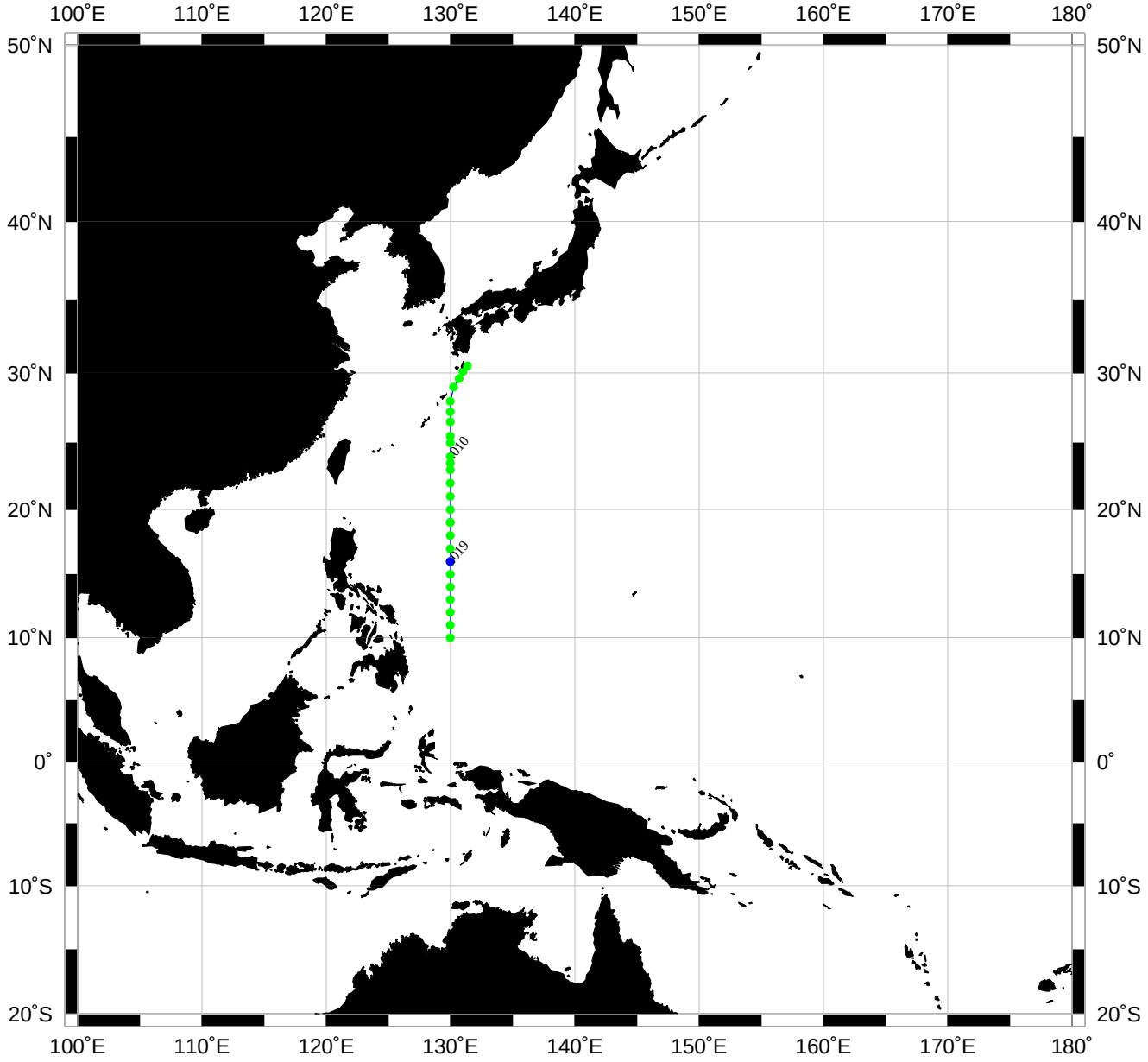
WHP Cruise and Data Information

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

Cruise Summary Information	**Hydrographic Measurements**
Description of scientific program	CTD - general
Geographic boundaries of the survey	
Cruise track (figure)	
Description of stations	
Description of parameters sampled	
	Salinity
Floats and drifters deployed	Oxygen
Moorings deployed or recovered	Nutrients
	CFCs
Principal Investigators for all measurements	
	Radiocarbon
Problems and goals not achieved	CO2 system parameters
Underway Data Information	
Navigation	**References (see each sect.)**
Acoustic Doppler Current Profiler (ADCP)	
Thermosalinograph and related measurements	
XBT and/or XCTD	
	Data Processing Notes

Station locations for P08N: SHOYO, 06/1996



Produced from .sum file by WHPO-SIO

A.2 Cruise Summary

This cruise was sponsored by JFA, and the agency allowed us to implement WHP one time survey within the ship time. Although the cruise includes several fisheries related investigations (primary production, fish larvae collection, fish stock survey etc.), most of the ship time was allocated to the task for WHP. The cruise track was placed on northern two thirds of WHP P8 Line (80N to 10N). Only small volume samples were taken.

Almost concurrently, JAMSTEC occupied southern part (10N to the equator). So, one station at 10N was overlapped for cross check of data quality between the cruises. Also JMS is to observe the same line as us by closer CTD/Rosette sampling (but no tracer). During our cruise, we returned from the southernmost station following the same track, in order to backup the sampling when necessary.

Number of Stations:
A total of 25 CTD/Rosette stations were occupied. A General Oceanics 24 bottle Rosette array equipped with 24 10-1iter Niskin water sample bottles, and a SBE 911Plus CTD system equipped with an oxygen sensor and an altimeter (Datasonics PSA-900D).

Sampling:
The following water sample measurements were made: salinity, oxygen, nutrients (total nitrate, phosphate, silicate), CFCs 11,12, total carbonate, alkalinity, and pH. CTD salinity and oxygen were measured. Also samples were prepared for 14C and 13C measurements in the future measurement. The sampled depths in db were as follows:

20, 50, 100, 150, 200, 250, 350, 500, 600, 700, 800, 900, 1000, 1250, 1500, (1750), 2000, (2250), 2500, 3000, 3500, 4000, 4500, 5000, 5500, 6000. For each station near bottom depths were sampled at about 10m over the bottom by using altimeter. No floats, drifters, or moorings were deployed on this cruise.

A.3 List of Principal Investigators and Cruise Participants

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

TABLE 1: Principal investigators

Name	Responsibility	Affiliation	Name	Responsibility	Affiliation
K.Mizuno	Salinity and XBTs	NRIFSF	A.Ohno	Oxygen	Shizuoka U.
K.Kawasaki	CTD	NRIFS	T.Amaoka	Total Carbonate	Hokkaido U.
T.Watanabe	Salinity and ADCP	NRIFSF	K.Kawahara	CFCs	Hokkaido U.
N.Hagiwara	Nutrients	Tokai U.	K.Yamada	Alkalinity and pH	Hokkaido U.
T.Tokieda	CFCs	Hokkaido U.	T.Kazama	Nutrients	Tokai U.

A.4 Scientific Programme and Methods

The principal objectives of the cruise were:

1. To estimate the transport of heat, freshwater, nutrients and CFCs across the section which is located in the western most Part of the subtropical gyre in the Pacific Ocean.

2. To determine the water mass characteristics on the section and to determine whether and where secular changes are found.

3. The principal instruments used for the measurement consisted of a SBE 911Plus CTD system and General Oceanics Rosette mounted within a frame of dimensions 1.5m height x 1.3m diameter. Datasonic sonar altimeter (300m range; 200kHz) was attached to the frame for bottom finding. The weight was attached at bottom of the frame (4 pieces x 20kg) to give enough tension to the wire for smooth down cast. A-frame with holding/releasing controller of CTD/Rosette array designed by Mitsui Ship yard helped us to launch and recover of the array safely.

After a cast, the Rosette array was placed on deck, CFC samples were' drawn first, and samples for oxygen or total carbonate were taken, then alkalinity and pH were taken. Finally, nutrients and salinity samples were taken. Fortunately, we had no rain during water sampling throughout the cruise on P8 line. The Rosette array was pushed back on a railway to a shelter and stored it each time after water sampling.

Other than CTD/Rosette sampling, additional measurements were made throughout the cruise.

XBTs were launched between CTD stations. Current measurements by ADCP (75kHZ RD Instrument) were made. Underway measurements of surface temperature and salinity were made by a thermosalinograph (SBE T/S sensors) and navigation information was supplied by a JRC GPS receiver and these data were logged by networked workstations (NEC EWS4800). An echo sounder (NEC NS74S PDR, 12kHz) provided continuous water depth measurements.

B. Preliminary Results

B.1 Major Problems Encountered on the Cruise

Niskin bottles had troubles frequently at the early period of the cruise. Water leakage happened due to incomplete closing of the lids or O-ring problems. Troubled bottles were replaced each time after the leakage was found. Misfiring happened sometimes. It was checked by salinity/oxygen measurements. In the case of the misfiring was crucial, we re-occupied the station on the way back. Eventually, four stations were re-occupied.

Initially, we were anxious about the power of CTD winch and the strength of CTD wire. Because tension over 2 metric ton, which is nearly a safety limit of the gear, was loaded frequently in the previous WHP P2 cruise in 1994. Fortunately the sea state was almost calm during the cruise. The tension meter displayed 0.6t as highest load. However, the most serious problem was a winch trouble. The driving chain was broken, and no spare parts were available. Owing to the engineers of the ship, the parts were reproduced in the ship, and the winch was recovered.

B.2 Salinity (bottle sampled)

There were 32 pairs of replicate (i.e., from the same Rosette bottle) samples drawn; and 66 pairs of duplicate (i.e., from different Rosette bottles fired at the same depth) samples. Of the duplicate pairs, 23 were from below 2000m. The standard deviations of the three groups of sample pairs are given in Table 2 below.

TABLE 2: Salinity replicate and duplicate statistics

Quantity	Standard deviation	Number of pairs
Duplicates	0.0046	66
Duplicates	0.0008	23
from >2000 m		
Replicates	0.0013	32

B.3 Dissolved Oxygen (Bottle sampled)

(A.Ohno, T.Watanabe, K.Kawasaki and M.mizuno)
15 Jul 1996

B.3.a Equipment and Technique

Bottle oxygen samples were taken in calibrated 100ml clear glass bottles immediately following the drawing of samples for CFCs. The sample water was overflowed by three bottle volumes. The temperature of the water at the time of sampling was measured to allow corrections to be made for the change in density of the sample between the closure of the Rosette bottle and the fixing of the dissolved oxygen.

Analysis followed the Winkler whole bottle method. The thiosulfate titration was carried out in a controlled environment laboratory maintained at temperatures between 22 and 25 C. A triplicate determination the blank and standardization of titrant was measured every stations. Duplicate samples were taken on almost cast. For the every measurement, the end point was determined by automatic photometric titrater (ART-3 D0-1 manufactured by HIRAMA Laboratory).

The volume of oxygen dissolved in seawater was converted to mass fraction by use of the value of the density of seawater. Corrections for the volume of oxygen added with the reagents and for impurities in the manganese chloride were also made as described in the WOCE Manual of Operations and Methods (Culberson, 1991, WHPO 91-1).

B.3.b Accuracy of Measurement

Approximately 700 samples were taken during the cruise. In addition, a number of duplicates and replicates were analyzed. Replicates taken from the same bottle and duplicates taken from different bottles fired at the same depth. Statistics on the duplicates and replicates are as follows.

TABLE 3: DO replicate and duplicate statistics

Quantity	Standard deviation(ml/L)	Number of pairs
Duplicates	0.042	58
Duplicates	0.035	21
from >2000 m		
Replicates	0.021	30

B.3.c References:

Culberson, C.H. 1991. 15 pp. in the WOCE Operations Manual of WHP Operations and Methods. WHPO 9111, Woods Hole.

B.4 CFC-11 and CFC-12

(T. Tokieda and K. Kawahara)
MAG, Hokkaido Univ.

Seawater samples for the CFCs measurement were collected at 25 stations. The samplers used were 10 liter Niskin bottles whose "O"-rings and tops were washed with acetone solution before using. The samplers were installed in a CTD-RMS system and when a leakage was shown, the bottle was replaced. The CFCs contamination problem due to the sampler was not found throughout the cruise. The water samples were drawn first from the bottles to the 100ml glass syringes and stored under clean and cold seawater.

B.4.a Equipment and Technique

The concentrations of CFCs were determined on board the vessels with a gas-chromatography equipped with an electron capture detector (Shimadzu GC-14A). The purging and trapping system of CFCs was similar to that of Bullister and Weiss(1988). The analysis was completed mostly within 10 hours after sampling. Duplicate samples were run at 6 stations. Air samples collected with a glass syringes were run twice or three times a day.

B.4.b Calibration

The CFCs concentrations were calibrated using 9 points calibration curves constructed from a gas standard calibrated against the 1983 calibration scale of Scripps Institution of Oceanography (Bullister, 1984). After the sampling at station 13, due to the instability of the electric power supply in the ship, an instability of the base line of the chromatographic chart and a rise of the blank value due to the measurement system appeared. Consequently, for the samples at stations 13, 14, 15 and 16, it took about 24 hours to complete.

B.4.c References

Bullister, J. L. and R. F. Weiss (1988): Determination of CCIF3and CCI2F2 in seawater and air., Deep-Sea Res.,35, 839-853.

Bullister, J.L.(1984): Atmospheric chlorofluoromethanes as tracers of ocean circulation and mixing: measurement and calibration techniques and studies in the Greenland and Norwegian seas. Ph.D. Thesis, Univ. of California.

B.5 Total Dissolved Inorganic Carbon (CrC02), pH and Total Alkalinity

(T. Amaoka and K. Yamada)
MAG, Hokkaido Univ.

B.5.a Sample Collection

The seawater samples were collected into 200ml of glass bottle, which was usually used salinity measurement, and 150ml of plastic bottle, for TC02, and pH and total alkalinity measurements, respectively. The sample was filled smoothly using a drawing tube from the Niskin drain to the bottom of the sample bottle following rinse the bottle twice with a few ml of sample. The sample was overflowed by a half of bottle volume. The samples were stored in a cool and dark location.

B.5.b Equipment and Reagents

Coulometer system:

UlC, C02 Coulometer CM5012

pH meter:

with a glass/reference electrode cell (Radiometer, Reference pH Meter PHM-93, PHC-2085)

Cathode solution:

A proprietary mixture which contains, 500ml of dimethyl sulfoxide, 25ml of DIW, 25ml of ethanolamine, 30g of tetra-ethyl-ammonium bromide (TEAB), and 2ml of thylmolphthalein solution (0.5g of thymolphthalein is dissolved in 100ml of DMSO)

Anode solution :

3.3g of KI dissolved in 5ml of DIW. This solution diluted with 20nil of DMSO

Phosphoric acid solution :

Concentrated phosphoric acid diluted with 20 nil of DIW. Tris buffer and 2-aminopyridine

According to the method by Dickson (1993).

B.5.c Calibration

For the calibration of TC02 concentration, two water standard solutions were prepared. The one was made at Hokkaido Univ. and the other was C02 Reference Material(CRM) which was supplied by the Scripps Institution Oceanography.

The solution made at H. U. and SIO were used as running standard every station and every two station, respectively. On H. U. standard solution, the standard deviation of 66 solutions used for calibration during stations 1 and 12 was 0.17%.

Consequently, the calibration for sample after station 12 were made with CRM. Values of pH and total alkalinity were calibrated using calibration line constructed with tris buffer (8.089pH at 25C) and 2-aminopyridine (6.767pH at 25C).

B.5.d Reference

Dickson A. G.(1998) pH buffers for sea water media based on the total hydrogen ion concentration scale. Deep-Sea Res. ~ 107-118.

B.6 13C and 14C

(T. Tokieda)
MAG. Hokkaido Univ.

A total of 2501 samples were collected from 24 stations for analysis of carbon isotopes, 13C and 14C, respectively. Samples were collected directly into 100ml glass vials for 13C and into 500 ml glass bottles for 14C. Mercurie chloride was added to the samples immediately after sampling.

B.7 Nutrients

(N.Hagiwara and T.Kazama)
Tokai Univ.

B.7.a Equipment and Technique

The nutrient analyses were performed on the Technicon AutoAnalyzer-II belongs to Kaiyo maru. Lines were reconstructed about A Suggested Protocol for Continuous Flow Automated Analysis of seawater Nutrients in the WOCE hydrographic Program and the Joint Global Ocean Fluxes study. But on the analysis of Phosphate, we used 880nm interference filter because there is not 830nm interference filter. AA-II belongs to Kaiyo maru have 3channels (1ch: Silicic acid, 2ch: Nitrate, 3ch:Phosphate). We used filtration surface seawater (at 176W, 0N) for dilution and wash water.

Silicic acid:
The method is based on that of Armstrong et al. (1967) as adapted by Atlas et al. (1971). The silicomolybdic acid was produced rapidly by reaction of the molybdic acid and the silicic acid. The reaction of silicomolybdic acid and stannous chloride what is the reducer produced molybdic blue. The colorimeter uses a 15mm flow-cell path-length, 660nm interference filters. Sodium lauryl sulfate was used for surface-active agent.

Nitrate:
Copperized cadmium reduced nitrate to nitrite. The reaction of nitrite and Sulfanilamide in 1.2 HCl formed diazonium salt. And N-1-Napthylethylene-diamine and the diazo-cuppling of the diazonium salt. Azo-dye was formed. The colorimeter uses 15mm flow-cell path-length, 520nm interference filters. Brij- 35 was used for surface-active agent.

Phosphate:
Phosphate and molybdic acid in sulfuric acid were condensed. Phospho-molybdic acid was formed. The phospho-molybdic acid was reduced by Hydrazine sulfate at 70C. And Molybdic blue was formed. After cooling the colorimeter used 50mm flow-cell path-length, 880nm interference filter.

B.7.b Sampling Collection

Seawater samples for the Nutrients were collected at 25stations. The samplers were 10 liter Niskin bottles. The Rosette samplers have CTD system. The sampling order was, 1:CFC, 2:Oxygen, 3:Total carbonate and pH, 4:14C and 13C, 5:Nutrients, 6:Salinity. Samples were drawn into virgin polystyrene 100ml vials that were immersed in 2N HCl in 24 hours and were rinsed by distilled water. These were rinsed two times before filling. Samples were then analyzed until 3- 4 hours. Samples cups of 2.5 ml capacity were used.

B.7.c Calibration and Standards

1000ml, 500ml, 250ml, 100ml glass and polystyrene volumetric flasks and 50ml, 25ml, 20ml, 10ml hole pipettes and 5ml, 1ml Eppendorf pipettes were calibrator using room temperature distilled water.

B.7.d Nutrient Standards

A standards

silicic acid:	20,000 µM (3.7608g Na2SiF6)/1000ml)
nitrate:	37,500 µM (3.7922g KNO3/1000ml)
phosphate:	2,500 µM (0.3425g KH2PO4/1000ml)

The water temperature was 23.7°C.

Nutrient A standards were prepared from salts dried at 110C for five hours and cooled over silica gal in desiccator before weighing. Further these were dried at 110C for three hours and were weighted. To make sure that the salts were constant weights.

B standards

2,500 µM silicic acid:	125 ml "A" standard was diluted by distilled water to 1000 ml.
750 µM nitrate:	20 ml "A" standard was diluted by distilled water to 1000 ml.
50 µM phosphate:	20 ml "A" standard was diluted by distilled water to 1000 ml.

C standards

For calibration B standards were diluted by filtered sea water the following 7 concentrations.

Si:	150	125	100	75	50	25	0 µM
NO3:	45	37.5	30	22.5	15	7.5	0 µM
PO4:	3.0	2.5	2.0	1.5	1.0	0.5	0 µM

The filtered sea water contained Si: 0 µM, NO3: 0 µM, PO4: 0.7 µM.

B.7.e Quality Assurance

The duplicate samples were drawn from two water samplers at each station. One pair was to be drawn from one of the deepest depths, another pair from the nitrate/phosphate maximum. The five times analysis of the deepest depth samples ran the percent standard deviations.

These were: silicic acid 0.51%,nitrate 0.38%,phosphate 0.92%.

B.7.f References

Armstrong, F.A.j.,C.R. Srearns, and J.D.Stricland.1967. The measurement of upwelling and subsequent biological process by means of the Technicon AutoAnalyzer and associated equipment. Deep-Sea Res.14(3):381-389.

WHPO DATA PROCESSING NOTES

Date	Contact	Data Type	Data Status Summary
08/15/98	Mizuno	SUM	Submitted
03/09/99	Diggs	SUM	Website Updated
3/9/99	Mizuno	CTD/BTL	Data Requested by l.talley
09/14/99	Mizuno	CTD/BTL	Data Requested by l.talley
09/27/99	Mizuno	CTD/SUM	Submitted for DQE

Attached are the final CTD files (KY_P8_CTD.lzh) and *.sum file for P8N KAIYO-MARU cruise. The CTD data were corrected by bottle sampled D.O. and salinity data following WHP manual, although the data format does not follow the manual. Since the CTD file is compressed (*.lzh), please unpack it (32 individual files). Location of CTD stations are in *.sum file.

I searched also bottle data file (D.O., Salinity,Nutrients) but could no find the final version for sure. So, I will re-try to get it after the men in charge return from sea. They come back Oct. 10.

11/08/99	Diggs	CTD	Data Requested by scd

can't decode files already submitted

01/28/00	Mizuno	CTD/BTL	Data Requested by l.talley
09/25/00	Diggs	CTD	Reformatting Needed; sent to s. anderson (no .sum file)
10/05/00	Buck	CTD	Data added to website
10/06/00	Muus	CTD	Update Needed

found errors in recent ctd update file P08N_a Notes EXPOCODE 49K6KY966_1

CTD data converted to WOCE format.

1. No documentation available at WHPO other than column headers in original data files and transmittal message dated Sept 27, 1999, saying CTD oxygen and salinity corrected using bottle data per WHP manual.
2. Column two header is "T068". Assume this means 'ITS-68 temperature.' Multiplied this value by 0.99976 to get ITS-90 value for WOCE CTD format.
3. Column four header is "OxML/L" and column six header is "Sigma-t00". Used following to get oxygen in UMOL/KG for for WOCE CTD format:

   UMOL/KG = (OxML/L x 44.660)/(1 + .001(Sigma-t00))
4. Station 12 has three files in original data but only one cast in Summary file:

   K12D.ASC 4.0 to 2850 db
   K12E.ASC 2646 to 2998
   K12F.ASC 2998 to 4684

   Used all of first file, 2852-2998db of second file and 3000-4684db of third file.

   Agreement between files is off a little, possibly due to ship's drift during whatever caused the problem resulting in split files.

	CTDTMP	CTDSAL	CTDOXY UMOL/KG
K12D.ASC - K12E.ASC at 2850db	.0196	-.0020	2.8
K12E.ASC - K12F.ASC at 2998db	.0045	-.0002	0.1

5. Station 15 has two files in original data but only one cast in Summary file:

   K15D.ASC 4.0 to 5449 db
   K15E.ASC 5435 to 5969

   Used all of first file and 5450-5968db of second file. Agreement between the two files at 5448db is good for temperature and salinity but second file oxygen is 4.1 UMOL/KG lower than first file value at 5448db.

6. Station 16 has two files in original data and two casts in Summary file:

   K16D.ASC 4.0 to 5940 db
   K16E.ASC 3.0 to 1201

   Both files reformatted as casts 1 & 2.

   p08n_a0016.1.wct
   p08n_a0016.2.wct

7. Stations 18 and 20 each have two files in original data but only one cast each in Summary file:

   K18D.ASC 5.0 to 5270 db
   K18U.ASC 5269, 5270 & 5269 only
   K20D.ASC 4.0 to 5504
   K20U.ASC 5503, 5504 & 5505 only

   Second files ("U" up?) not used.

8. Station 21 has no CTD data file but Summary file shows one cast to max pressure 5930db with 23 bottles.

   Dave Muus Oct 3, 2000

9. Removed last data line of p08n_a0004.wct to leave only one set of data at 2416db.

10. p08n_a0012.wct pressure at 68.0db changed from k8.0 to 68.0.

    Dave Muus Oct 6, 2000

10/ 6/00	Buck	CTD	Website Updated as per Dave Muus's request
06/15/01	Mizuno	CTD/BTL/SUM	Submitted
07/13/01	Mizuno	CTD	Submitted; Status changed to Public

Contents and Comments

1. CTD file

   The data format is ASCII format but does not follow formal WOCE CTD format. Same one I sent before.

2. SUM file

   Same one I sent before.

3. SEA file

   1) The file is in Microsoft EXCELL format.
   2) Alkalinity and pH has not obtained yet. It may be available in the near future by asking Dr. Syuichi Watanabe.
   3) Nutrient data has not quality checked, because of man in charge was not available.
   4) Symbol (N/A) in salinity data is measured data but not available.

4. Report

11/30/01	Uribe	DOC	Initial pdf, txt versions online

PDF and text cruise reports for this cruise have been put online.

12/4/01	Diggs	CTD	CSV File Added to website	
	Converted CTD files to Exchange format, checked with JOA3.0. Placed files on website. NOTE: p08n_b/c still needs exchange CTD files.			
01/18/02	Anderson	CTD/BTL/SUM	Reformatted and CSV files put online	
	Got file from: …/onetime/pacific/p08/p08n/original/20010713_P08_BOTTLE_CTD_SUM. DIR File name is WHP_8_BTL_DATA2.xls. Converted to ascii, and then converted to WHP format. As noted in the p08su_new.txt file some salinity data had N/A as the value. I changed the N/A to -9.000 and the QC to 5 since they state the salinity was measured, but the data are not available. The BTLNBR, CTDSAL, and CTDOXY did not have a QC assigned to them. I set the QC's to 2's. The CTDOXY and bottle OXYGEN were in ml/l units. Converted to umol/l units. The QC flag for most of the nutrient values was set to 5. Changed the 5's to 2's where there were values, and left all other QC flags for nutrients as they appeared in the original file. Reformatted the .sum file to conform with the accepted WHP format. Removed the leading 0's from the station numbers. CTD files appear to be the same as those reformatted by Dave Muus on Oct. 4, 2000 except that this file has sta. 21. Reformatted sta 21, added header, converted O2 to umol/l, added QUALT flags (set all to 2), multiplied temps by .99976 (see Muus notes), and retained only every other decibar. Rezipped files to include sta. 21. The bottle file has been put in exchange format. All of the above files have been put online.			
02/05/02	Uribe	CTD	Website Updated	CSV File Added
	CTD has been converted to exchange and put online.			
06/26/02	Kappa	DOC	PDF & TXT cruise reports updated	
	Added WHPO Data Processing Notes to both PDF and Text versions; Table Of Contents, and linked TOC to appropriate text passages.			