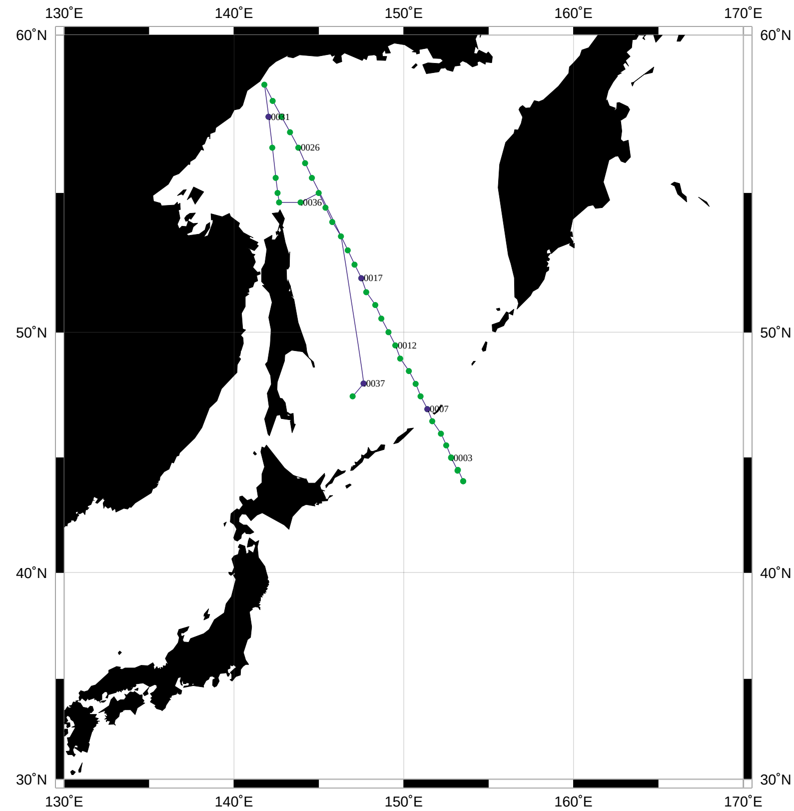
A. Cruise Narrative, Line P01W, Sea of Okhotsk Section



A.1. Highlights

WHP Cruise Summary Information

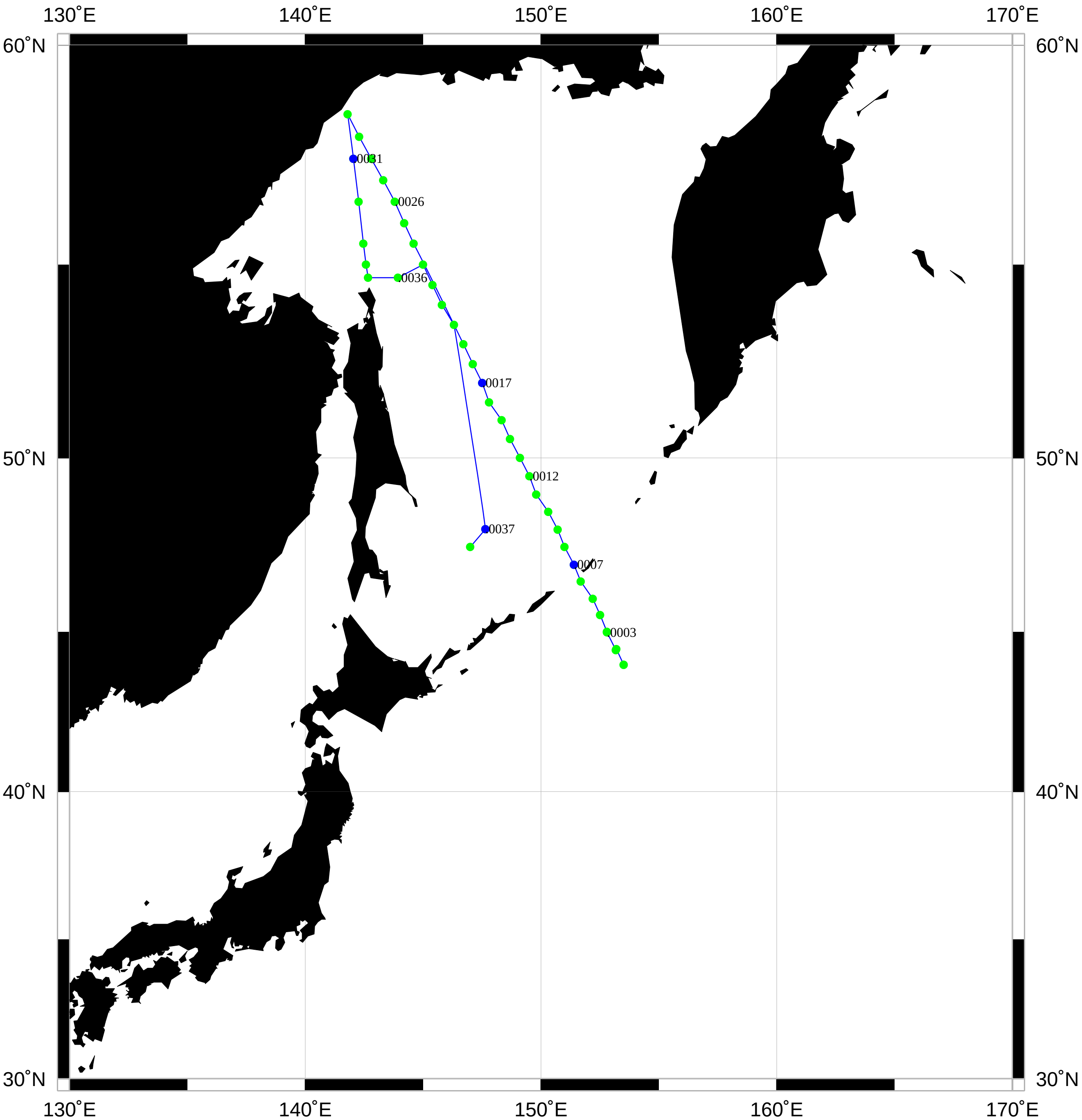
WOCE section designation	**P01W**
Expedition designation (EXPOCODE)	**90BM9316_1**
Chief Scientist(s) and their affiliation	**Alexander Bychkov, Frank Whitney**
Dates	1993.08.30 - 1993.09.21
Ship	Akademician Alexander Nesmeyanov
Ports of call	Vladivostok, Russia to Vladivostok
Number of stations	38
Geographic boundaries of the stations	58° 29 .92 N 141° 48 .23 E 153° 31 .18 E 43° 59 .24 N
Floats and drifters deployed	3 Surface Drifters
Moorings deployed or recovered	None
Contributing Authors	None Listed

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
	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	Nutrients
	CFCs
Principal Investigators for all measurements	Helium
Cruise Participants	Tritium
	Radiocarbon
Problems and goals not achieved	CO_2 system parameters
Other incidents of note	Other parameters
Underway Data Information	**Acknowledgments**
Navigation	**References**
Bathymetry	
Acoustic Doppler Current Profiler (ADCP)	**DQE Reports**
Thermosalinograph and related measurements	
XBT and/or XCTD	CTD
Meteorological observations	S/O2/nutrients
Atmospheric chemistry data	CFCs
	^{14}C
	Data Status Notes

Station Locations for P01W



Produced from .sum file by WHPO-SIO

A.2. Cruise Summary Information

Geographic boundaries

The *Nesmeyanov* sailed from Vladivostok to the beginning of Line P1W near Bussol Strait in the Kuril Islandsat 44°N 153°30'E. A complete section was sampled from this point roughly NNW into the Sea of Okhotsk, ending near the town of Okhotsk in the NW corner of the sea at 47°30'N 147°02'E (see figure 1).

Stations occupied

38 CTD/rosette stations were occupied along theP1W section. Using a Guildline 8737 CTD and 24 bottle General Oceanics Rosette, profiles to 3400 m were taken every 30' longitude from 44°N to 58.5°N. This depth permitted sampling to the bottom in the Sea of Okhotsk, while restricting loads placed on winches that were too light for deep ocean work.Onboard analyses included salinity, oxygen, nutrients, CFCs, alkalinity and pH. Additional samples were stored for TCO_2, ^{13}C, ^{14}C, tritium, ^{18}O, and alkalinity.

In addition to the WOCE program, Lloyd Keigwin (WHOI) and Sergei Gorbarenko (POI) took gravity and box cores between 3200 and 1000 m up the side of Akademician Nauk Rise in the center of the Sea of Okhotsk.

Floats and drifters deployed

Three surface drifters were deployed (with a drogue depth of 120 m).

Moorings deployed or recovered

No moorings were deployed or recovered on this cruise.

Table of Stations by Type

Sample type:	No. stations:	Max. depth:
Surface drifters	3	120 m
CTD/Rosette casts	38	3400 db

A.3. List of Principal Investigators

Alexander Bychkov	Alkalinity, pH	POI
Howard Freeland,	CTD, S, O2	IOS
Gennady Jurasov		POI
Frank Whitney	Nutrients	IOS
C.S. Wong	TCO_2, CFCs, ^{13}C, ^{14}C, tritium, ^{18}O	IOS

A.4. Scientific Programme and Methods

Our original cruise plan called for several days of coring up the slope of Nauk Rise in the Sea of Okhotsk, followed by a non-stop hydrographic section from south to north through Bussol Strait and the 2 major basins of the sea. However, delays caused by shipping and customs caused us to cut travel time by mixing hydro and core sampling. This permitted both programs to be completed.

Preliminary analysis of data shows that the deep waters of Kuril Basin (bottom depth about 3400 m) are similar to 2300 m (Bussol Strait sill depth) North Pacific waters in a variety of parameters including density, oxygen and nutrients. However, the waters of Deryugina Basin (bottom depth about 1600 m) in the western-central part of Okhotsk, have high Si levels, suggesting limited exchange with waters in Kuril Basin.

A shallow cold layer, between 20 and 150 m, was evident in all northern stations. Temperature gradients between the summer warm layer (12°C) and the near freezing shallow layer (-1.6°C) were as sharp as 10° in 10 m.

Goals Achieved

Section P1W was completed without omissions. Drifters were deployed at our first 3 stations in the region of the Oyashio Current.

A.5. Major Problems and Goals Not Achieved

Winches that could not be trusted to great depth restricted our sampling to 3400 m in the NW Pacific. High levels of CFCs in shipboard air affected our limit of detection for these measurements, and replacement of our primary regulator with one less suitable caused more variability in CFC standards than we normally see. The PO_4 colorimeter on our AutoAnalyzer was unstable many of the days we measured nutrients.

A.6. Other Incidents of Note

In addition to the WOCE program, Lloyd Keigwin (WHOI) and Sergei Gorbarenko (POI) took gravity and box cores in depths between 3200 and 1000 m up the sideof Akademician Nauk Rise in the center of the Sea of Okhotsk.

A.7 Cruise Participants & Affiliations

Name	Institute	Responsibility
Alex Bychkov*	POI	Chief scientist
Frank Whitney**	IOS	Co-chief scientist
Gennady Yurasov	POI	Principal Investigator
Wendy Richardson	IOS	CFCs
Bernard Minkley	IOS	Sampling, S & O data
Hugh MacLean	UBC	Rosette handling and sampling
Colin Taylor	UBC	CTD data processing, sampling
Andrei Andreyev	POI	Nutrients
Pavel Tishchenko	POI	CFCs
Ruslan Chichkin	POI	CFCs
Galina Pavlova	POI	Alkalinity
Nadezhda Sudakova	POI	Oxygen
Victor Savchenko	POI	Salinity
Anatoly Salyuk	POI	Hydro data processing
Valeri Tapinov	POI	CTD data processing
Yuri Shugla	POI	pH, sampling
Alexander Kalabukhov	POI	electronics

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UBC Department of Oceanography, University of B.C., Vancouver, B.C.
POI Pacific Oceanological Institute, Vladivostok, Russia

C. Hydrographic Measurements

C.1. Water sampling and CTD measurements

A General Oceanics Rosette holding 23 10 L Niskin samplers, and a Guildline Model 8737 CTD was used for routine sampling. Two pairs of reversing digital thermometers and a digital pressure sensor were used to check CTD measurements. Precruise calibrations and bottle salinity samples allowed us to process most of the CDT data. However, post-cruise calibrations are required for verification, when equipment returns from Russia.
On each satation, samples were drawn in the order CFCs, oxygen, TCO_2, ^{13}C, ^{14}C, alkalinity (stored), tritium, then in any order, pH, alkalinity (ananyzed onboard), nutrients, salinity and ^{18}O.

To supply a uniform assessment of analytical precision for all analyses routinely throughout the section, a pair of Niskin bottles was tripped at a single depth on most Rosette casts. The pooled standard deviation of data from these sample pairs is calculated by

$$Sp = (\Sigma d^2/2k)^{1/2},$$

where d is the difference between the pairs and k is the number of pairs.

Parameter	Sp	k
CTDPRS	1.1 dbar	34
CTDTEMP	0.018°C	34
CDTSAL	0.0032	34
SALNTY	0.0020	34
OXYGEN	0.79 μmol kg^{-1}	31
SILCAT	0.61 μmol kg^{-1}	32
NITRAT	0.28 μmol kg^{-1}	33
NITRIT	0.025 μmol kg^{-1}	32
PHSPHT	0.04 μmol kg^{-1}	33
CFC-11	0.114 pmol kg^{-1}	21
CFC-12	0.094 pmol kg^{-1}	21
alkalinity	2.387 μmol kg^{-1}	28
pH	0.004	31

CFCs

Water samples for CFC-11 and CFC-12 were drawn in 100 mL glass syringes. Samples were analyzed by gas chromatography following the procedure of Bullister and Weiss (1987). Since the *Nesmeyanov* was badly contaminated with CFCs, all CFC equipment was kept on the aft deck of the vessel. A make-shift laboratory was set up in our shipping container on the aft deck. Still the air held high concentrations of especially CFC-12 (2 to 4 times clean air).

The regulator that controls carrier gas flow leaked when the GC was first started. Attempts at repair resulted in the inevitable destruction of this regulator (it took us more than 24 h to accomplish this). We had no good replacement, so used an ancient piece of equipment that barely served our needs. As a result, gas flow was more variable than normal and blanks were higher.

C.2. Oxygen

An automated titration system (Brinkman Dosimat) using the micro-Winkler method (Carpenter, 1965) detected the iodine end-point colorimetrically. Standards were prepared as outlined in WOCE Report 73/91.

All 23 Niskin bottles were tripped between 1500 and 1502.6 db on September 16. O_2 results ranged between 54.7 and 56.6 µmol kg^{-1} with

SD = 0.49 µmol kg^{-1} (n=23). Sp = 0.64 µmol kg^{-1} (n=29).

C.3. Nutrients

Samples were collected in polystyrene tubes (16 x 125 mm) and refrigerated between 0 and 20 h before being analyzed. NO_3&NO_2, NO_2, PO_4 and Si were analysed by Technicon procedures.

C.4. Salinity

Samples were collected in glass bottles and analyzed onboard ship using a Guildline Model 8410 Portasal. The Portasal was standardized daily with IAPSO standard sea water. SD of 23 bottles tripped at 1500 m at an average salinity of 34.480 was 0.0013. For 29 paired Niskin samplers,

Sp = 0.0011.

C.5. TCO_2, ^{13}C, ^{14}C, alkalinity (stored)

These three sample types were collected in the same manner. Water was dispensed through Tygon tubing to the bottom of sample bottles. The bottles were allowed to overflow at least 50% of their volume. Water was poured off, to create an air space equal to about 1% of the bottle volume. Then 200µL of saturated HgCl2 solution per 250 mL of sample was added. TCO_2 and ^{13}C samples were collected in 250 mL GS bottles. Stoppers were greased then taped in place. Alkalinity samples were collected in 500 mL screw cap bottles. Caps were taped to prevent loosening. Carbon-14 samples were collected in 500 mL GS bottles that were stored with greased and taped stoppers. All samples were stored at 4°C onboard ship and at IOS. Shipping from Valdivostok to IOS, which took about 50 d (Sep 21 to Nov 10), was at ambient temperatures.

C.6. pH

The direct potentiometry was used for pH determination (Bates, 1973). Water was collected according to the recommendations for oxygen (Culberson, 1991) and measurements were conducted immediately after sampling. The analysis was made at 25±0.1°C with glass (OP-0718) and saturated calomel (OP-0830P) electrodes produced by Radelkis Co (Hungary). Tris-seawater prepared under Millero's prescription (Millero, 1986) was used as a standard before and after each set. pH value of this buffer and Nernst slope of electrode pair were controlled with Russian NBS commercial standards: 6.86 (phosphate buffer) and 4.01 (phtalate buffer).

C.7. Total alkalinity (onboard analysis)

The samples for total alkalinity were obtained in the same manner as described by Dickson and Goyet (1991). They were either analyzed immediately after sampling or treated by 50 µl of mercuric chloride and stored at + 4°C .

Total alkalinity was determined by direct titration of seawater with 0.02 N HCl in the open 25 ml cell (Methods ..., 1978) . The acid has been standardized daily with the solution of Na_2CO_3. dissolved in deionized water free of CO_2. To remove carbon dioxide, during titration the sample and standard were flushed into a cell together with a continuous stream of air free of CO_2. Theoretically in this case pH of the equivalence point should be 5.6, it Iso could be reached without HSO_4^-- ions involvement into titration process. In practice the mixture of methylene blue and methyl red was used as indicator. Titration was completed at pH 5.4÷5.5 when the green color of the solution turned into the light blue. To realize the procedure a motor-driven piston burette with ±0.01 ml scale (reproducibility) has been used. The concentrations obtained were converted from volumetric into weight units with the help of seawater density calculated at the temperature of measurements (Millero and Poisson, 1981)

C.8. ^{18}O

Samples were collected in 30 or 60 mL polyethylene bottles. When possible (on ship and at IOS) samples were refrigerated.

Analyses were performed by equilibrating 5 mL of sample with CO_2 of known isotopic composition. Samples were equilibrated for 15 h at 20°C before the gas was passes through a moisture trap, then fed into a Nuclide Radio Mass Spectrometer. $^{18}O/^{16}O$ ratios are expressed relative to the V-SMOW standard as $\delta^{18}O$. Details of the procedure are given in Paton et al (1994).

D. Acknowledgements

E. References

Bates, R.G., 1973. Determination of pH, theory and practice. Wiley. N.Y., 368 pp.

Bullister, J.L. and Weis, R.F. (1987). Determination of CCl3F and CCl2F2 in seawater and air. Deep-Sea Reserach Vol. 35, No. 5, 839-853.

Carpenter, J.H. 1965. The Chesapeake Bay Institute technique for the Winkler dissolved oxygen method. Limnol. Oceanogr., 10: 141-143.

Culberson, C.H., 1991. Dissolved Oxygen. In: WOCE Operations Manual. WHP Operations and Methods. WOCE Report No 68/91: 1-15.

Dickson, A.G., Goyet, C., 1991. Handbook of Methods for the Analysis of the Various Parameters of the Carbon Dioxide System in Seawater. DOE Publ., 89-7A, Version 1.0.

Millero, F.J., 1986. The pH of estuarine waters. Limnol. Oceanogr. 31: 839-847.

Millero, F. J., Poisson, A., 1981. International one-atmosphere equation of state for seawater. Deep-Sea Res., 28: 625-629 pp.

Paton, D.W., Abehennah, W. Grieve and R.W. Macdonald. 1994. NOGAP B.6, Oxygen isotope data from water and ice cores from the Beaufort Sea, September 1990, May 1991 and September 1991. Can. Data Rep. Hydrogr. Oc. Sci. No. 134.

Data Quality Evaluation: Hydrographic data
(Michio AOYAMA)
15 May 1996

The data quality of the hydrographic data of the WOCE P1W cruise (EXPOCODE: 90BM9316/1) are examined. The data files for this DQE work were P1W.sum and P1W.mka (this P1W.mka file is created for DQE, then it has a new column of quality 2 word) provided by WHPO.

General:
The station spacing are ca. 30 nautical miles and the sampling layer spacing was kept ca. 200 dbar in the deeper layers during the P1W cruise. Aside from the winch problem that restricted the sampling depth to 3400 meters at the stations 1 - 4 in the western North Pacific, the ctd lowering were made to ca. 100 meters to the sea bottom within the Sea of Okhotsk. Since these sea areas less high quality data historically, P1W data will improve our knowledge on the Sea of Okhotsk.

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

DQE examined 6 profiles and 7 property vs. property plots as listed below:

salinity, oxygen, silicate, nitrate, nitrite and phosphate profiles
theta vs. salinity plot
theta vs. oxygen plot
salinity vs. oxygen plot
nitrate vs. phosphate plot
salinity vs. silicate plot
theta vs. silicate plot
silicate vs. nitrate plot

1. CTD pressure and CTD temperature;

DQE did not find any descriptions on the CTD calibration. Please add the description on the CTD calibration to provide the information on the accuracy and precision of the CTD pressure and CTD temperature in .SEA file.

2. Salinity;

The CTD salinities in .SEA file show a larger difference to bottle salinity around 0.015 PSS. Since they are observed "not calibrated", DQE asks PI to calibrate them. Otherwise suggest flg. "1 - not calibrated".

3. Oxygen;

Bottle oxygen looks good.

4. Nutrients;

The nitrite concentrations of 0.04 - 0.07 µmol/kg at the deeper layers at stations 6 and 38 look very high and may have originated from the contamination during handling the samples or baseline drift of Auto analyzer during analyses. Suggest flg. "3".

The nitrate concentrations at the deeper layers ranging from 1600 dbar to 3200 dbar at station 38 look fluctuating. Suggest flg. "3".

Although this sea area shows complex structure and a higher variability, the phosphate - nitrate plot for whole data in .SEA file shows relatively larger fluctuations in the data than one might expect from usual analyses conditions. As noted in the cruise report, if problems clearly exist in the phosphate analysis, the data originator can easily recognize how and when the problems occurred using the data such as stability of baseline, reproducebility of the standards analyses, the actual high of the standards peak on the chart of the analyses, the actual absorbance values of standards and so on. DQE asks data originator to describe the problem in detail and flag out the questionable and bad data by themselves.

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

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

7/1/154	at 2999 dbar:	Nitrite concentration looks too high.	Suggest flg. "3".
9/1/180	at 50 dbar:	Bottle oxygen is missing.	Suggest flg. "5" or "9".
16/1/296	at 799 dbar:	Phosphate concentration looks high.	Suggest flg. "3".
33/1/410	at 150 dbar:	Bottle oxygen is missing.	Suggest flg. "5" or "9".
36/1/427	at 200 dbar:	Bottle oxygen is missing.	Suggest flg. "5" or "9".
38/1/528	at 2596 dbar:	Bottle oxygen looks low.	Suggest flg. "3".
38/1/515	at 302 dbar:	Bottle oxygen looks lower or should be at the different layer.	Suggest flg. "3".

Data Quality Evaluation: CTD data
(Michio AOYAMA)
15 May 1996

General
The data quality of WOCE P1W CTD data (EXPOCODE: 90BM9316/1) and the CTD salinity found in dot sea file are examined. The individual 2 dbar profiles were observed in temperature and salinity by comparing the profiles obtained from nearby stations. DQE did not find any descriptions on the CTD calibration. Please add the description on CTD calibration to provide the information on the accuracy and precision of CTD measurements during the cruise.

The CTD salinity calibrations are examined using the water sample data file P1W.mka. DQE used the original water sample data flagged "2" only for the DQE work.

Details

1. CTD profiles

CTD temperature and salinity look good in general.
DQE observed noisy salinity and temperature profiles for a few stations. Details for each problem are listed in Sec. 3.

2. Salinity calibration;

The salinity differences between CTD salinity in .SEA file and bottle salinity vs. pressure are shown in fig. 2. The salinity differences between CTD salinity in CTD files and bottle salinity vs. pressure are also shown in fig. 3. It is clear that the CTD salinities in both .SEA file and CTD files are not calibrated. The behaviors as shown in figures 2 and 3, however, look very strange. The salinity differences during upcast (fig. 2) show +0.01 - +0.02 PSS in the deeper layers while those during downcast (fig. 3) show -0.02 - 0.00 PSS, opposite sign to upcast, and show clear pressure dependency. Then the salinity in the deeper layers shows a difference of 0.03 PSS between CTD salinities in .SEA file and those in CTD files and this difference tend to decrease as the pressure decreases as shown in fig. 4.

Then, DQE asks data originator to calibrate them.

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

stn. 1:	from 990 dbar to 1030 dbar	CTD temperature and CTD salinity profiles look noisy and density inversions are observed.	Suggest flg. "3".
stn. 2:	from 1800 dbar to 1830 dbar	CTD temperature and CTD salinity profiles look noisy and density inversions are observed.	Suggest flg. "3".
stn. 4:	from 1800 dbar to 1820 dbar	CTD temperature and CTD salinity profiles look noisy and density inversions are observed.	Suggest flg. "3".
stn. 22:	from 1400 dbar to 1425 dbar	CTD salinity profile looks noisy.	Suggest flg. "3".

Figure 2

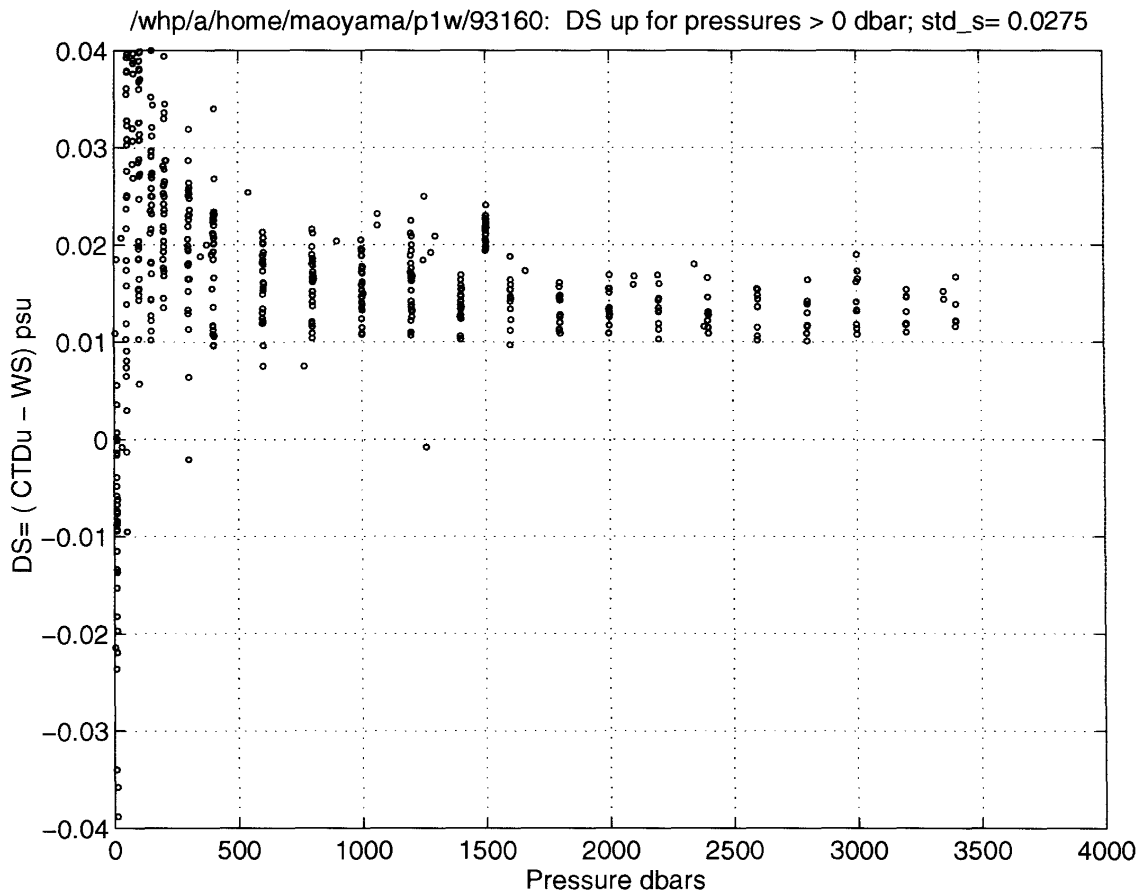


Figure 3

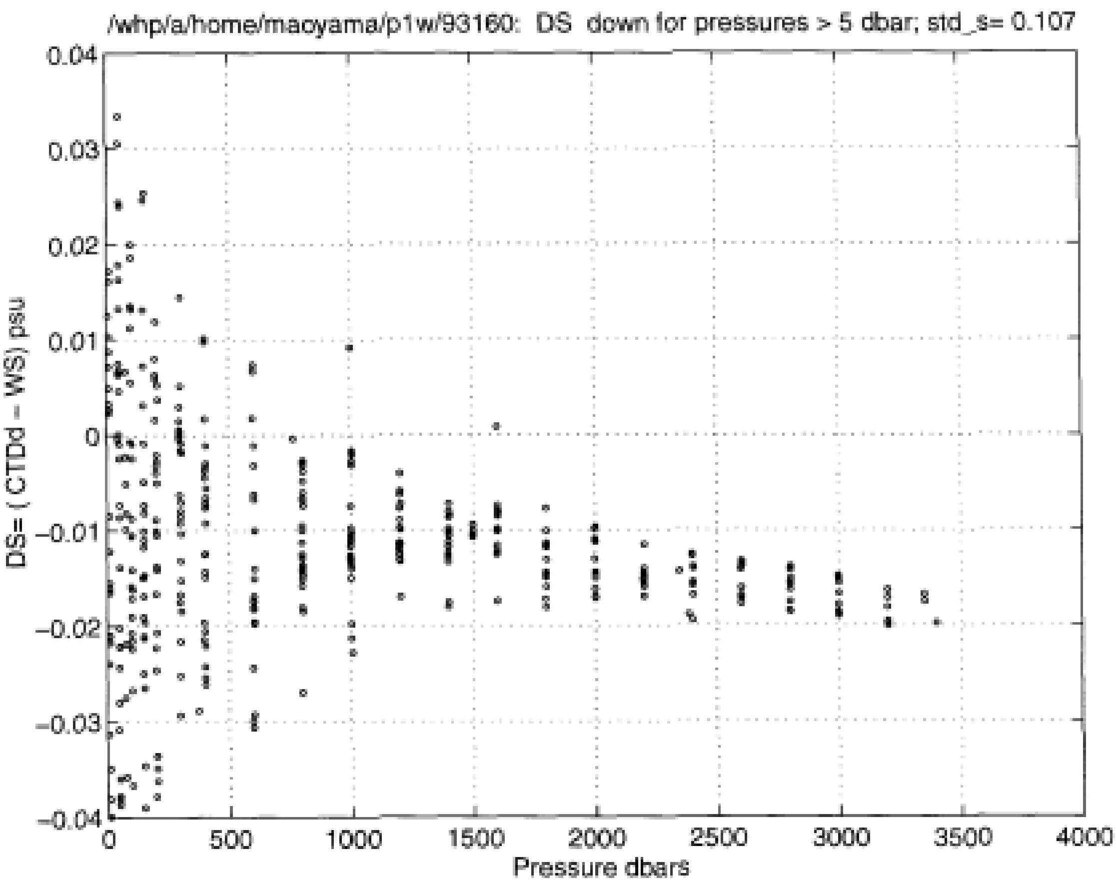
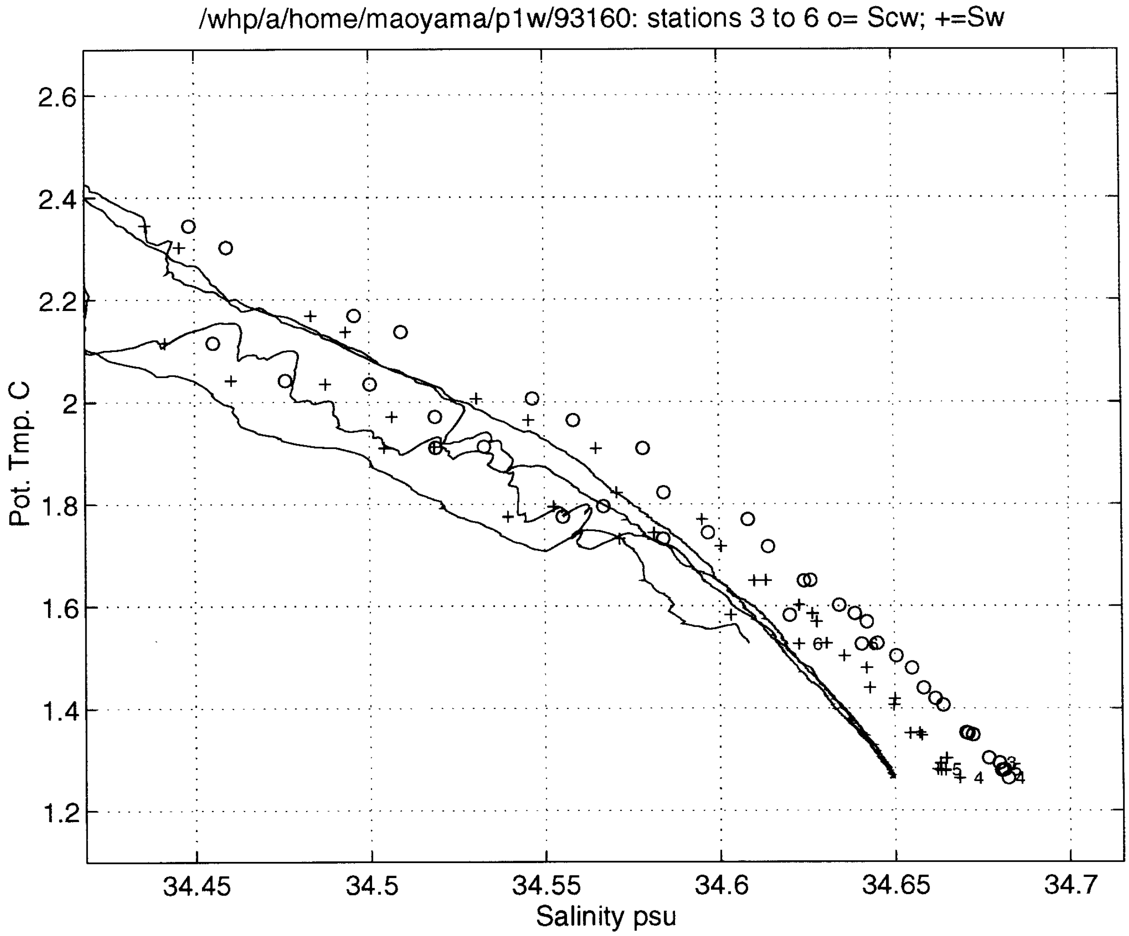

/whp/a/home/maoyama/p1w/93160: DS down for pressures > 5 dbar; std_s= 0.107
DS= (CTDd – WS) psu
Pressure dbars
0.04
0.03
0.02
0.01
0
–0.01
–0.02
–0.03
–0.04
0
500
1000
1500
2000
2500
3000
3500
4000

Figure 4



+ : Bottle salinity
o : CTD salinity in .sea file
- : CTD salinity in ctd files

PI Response to Nutrients DQE
CHECK NUTRIENT DATA FROM CRUISE 9316
(Janet Barwell-Clarke and Frank Whitney)

Phosphate data was examined as calculated by the analyst, Andree Andreev onboard Cruise 9316. Each day’s run was examined and the baseline drift and noise documented. The C2 factors from the regressions used for each day are noted, and the concentration of a 4.00 µM check standard (run as an unknown) is recorded.

It appears that some of the data has already been edited because the .SEA file submitted to WHPO and Andreev s calculations of µM/kg do not match up for several stations. I can find no documentation of this editing.

CHECK STANDARDS:
A check standard was run as an unknown usually at the end of a station profile, and the concentration recorded over the duration of the cruise. There was more variability than would be expected, on certain days data will be flagged 3 . The concentration should be within 1% of the expected concentration but was sometimes as much as 6% low.

DATA EVALUATION:

QUALIT1	Samples		Baseline		C2 Factor	Check Standard
(NEW)	STNBR	SMPNO	Drift	Noise	Value	Value
2	1	1-23	down	no	.003692	n.a.
2	2	24-46	up	no	.003373	3.94
2	3-6	47-133	↑↓↑	no	.003598	3.98, 3.99, 3.96, 4.11, 4.16
2	7-9	134-201	↑, then below zero	little at end of run	.003854 .003871	3.90, 4.01, 3.02, 4.00
3	10	202-219	↑↓	0.14 µM	.003422 .002686	3.66
3	11	220-233	↑	0.04 µM	.003973 .004991	3.72
3	12-14	234-271	↑ first reg.	noisy, but baseline visible	.003456	4.20, 4.15, 4.05
3	15-18	272-328	↑ to mid run	bit noisy 286-297	.003363 .002860	3.71, 3.76, 3.71, 3.77
2	19 24 25 26 27	329-373	steady↑ all day	no	.003621 .003436	3.91, 4.00, 3.99
3	28-33	374-412	no	0.06 µM	.002913 .002947	3.73
3	23, 34-36	431-443 413-430	no	0.04 µM	.002999 .002699	4.06, 4.11, 4.12, 4.10
2	20-22	472-457	↑ thru first reg & profile	no	.003759 .003542	4.15, 3.96, 3.94
9	37	497-509	-	-	-	-
2	38	510-531	↑ thru first reg & profile	bit noisy	.003737	n.a.

GENERAL COMMENTS:
It would appear that inadequate warm-up time was allowed for either the lamp and/or the phosphate bath - as indicated by a steadily increasing baseline at the beginning of most data files. The PO4 colorimeter was unstable for much of the cruise.

It appears that the same set of standard samples was used for standard regressions 1 (beginning of a run) and 2 (end of a run) - they were not replenished from the volumetric flasks. The same set of erratic standards appears in both regressions and sometimes on consecutive days.

The baseline was very noisy on several days, perhaps a bubble and/or some dirt had become lodged in the flowcell or the electronics were unstable.

On the basis of the above observations I would make the following recommendations on the phosphate data to WHPO. I would not edit the concentrations in the .SEA file with two exceptions - Stn 16, sample 296 and Station 38, samples 523-529 have been re-calculated due to an offset in the data. Much of the data has been downgraded, but I just can t see any way around it.

The phosphate data has been re-evaluated because the phosphate - nitrate plot shows larger fluctuations in the data than might be expected from usual analytical conditions .

PHOSPHATE DATA WAS RE-EVALUATED BASED ON THE FOLLOWING PARAMETERS.

Baseline Noise:
The baseline is usually very stable during a sample run. On this cruise the phosphate colorimeter worked well for the first 9 stations, then developed an electronic problem resulting in a noisy baseline off and on for the rest of the cruise. The baseline often drifted, particularly at the beginning of each run.

Standard Factors:
Standards are analyzed throughout the day to calculate regressions based on the following equation:

$$Y = C1*X^2+C2*X+C3$$

The regression factor C2 should remain relatively stable throughout the day and from day to day during a cruise. Due to baseline drift and unstability, and poor standard shapes and peak heights, the C2 factors showed much more variability.

Check Standard:
The check standard is a 4.00 µM standard run as an unknown sample and calculated with the samples. It usually agrees to within 1% of the expected concentration but more variability was encountered.

The data flagged 2 was found to have a stable baseline, standard factors and check standard values. Due to a combination of unstable baseline, questionable standard factors and/or check standards much data previously flagged 2 has been changed to 3 .

The phosphate data has been edited for two stations due to baseline shifts - Station 16, sample 296 and Station 38, samples 523-529.

NITRATE DATA.
Nitrate concentrations at the deeper layers ranging from 1600 dbar to 3200 dbar at Station 38 should be flagged 3 due to the standard and sample peaks having very irregular shapes.

NITRITE DATA.
Nitrite quality bits have been changed to 3 for all samples of a station if the deep water concentrations were not near 0.

COMMENTS BY M. AOYAMA NOT ADDRESSED:
Oxygen data from samples 515 and 528 were not degraded to Quality 3. Otherwise, we attempted to make all changes he recommended.

CFC Data Quality Evaluation

Final CFC Data Quality Evaluation (DQE) Comments on P01W.

The final CFC DQE review was completed in Dec 2000 by David Wisegarver. This data set does not meet the relaxed WOCE standard for CFCs. The original CFC flags (QUALT1) assigned by the PI have not been altered. During the DQE process, CFC QUALT1 flags of '2' (good) assigned by the PI have been given QUALT2 flags of '3' (questionable). Detailed comments on the DQE process have been sent to the PI and to the WHPO.

The CFC concentrations have been adjusted to the SIO98 calibration Scale (Prinn et al. 2000) so that all of the Pacific WOCE CFC data will be on a common calibration scale.

For further information, comments or questions, please, contact the CFC PI for this section (C. S. Wong, WongCS@pac.dfo-mpo.gc.ca) or David Wisegarver (wise@pmel.noaa.gov).

Additional information on WOCE CFC synthesis may be available at:

http://www.pmel.noaa.gov/cfc.

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Prinn, R. G., R. F. Weiss, P. J. Fraser, P. G. Simmonds, D. M. Cunnold, F. N. Alyea, S. O'Doherty, P. Salameh, B. R. Miller, J. Huang, R. H. J. Wang, D. E. Hartley, C. Harth, L. P. Steele, G. Sturrock, P. M. Midgley, and A. McCulloch, A history of chemically and radiatively important gases in air deduced from ALE/GAGE/AGAGE J. Geophys. Res., 105, 17,751-17,792, 2000.

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The information below was provided by the CFC PI for this section.
(None available at time of most recent update)

WHPO Data Processing History:

Date	Contact	Data Type	Data Status Summary
11/9/93	Whitney	SUM/DOC	Submitted on disk
4/29/94	Marie Robert		

39 original files, 38 processed.
Casts 1-38, plus test file HSA.
Cast HSA is just a header, it does not contain any data.
CAST NUMBERS ARE NOT SEQUENTIAL BUT MATE THE STATION NUMBERS.

Only one CTD probe was used: the WOCE Guildline probe, model 8737.

1. Ron Perkin convert the original *.DAT file using program WOCE_C94.BAS .
   The converted files had extensions *.CNV

2. Program Woce_cnv

   Applied on *.cnv files.

3. Despike.

Program Despike was run a number of times with varying input.
It was decided to use the following values :

Channel Width	Fit lap	Over Value	Min Value	Max Stddev	Min Stddev	Max Tol	Spike	Rep
P	25	5	0.00	3500.0	0.2000	30.000	2.70	T
T	25	5	0.00	20.0	0.0050	3.000	2.70	T
C	25	5	0.00	1.0	0.0005	.005	2.70	T

4. Time compensation. (Program Timecomp).

   The following input parameters were used :

   Temp. Probe Dist above Cond. Cell Mouth 0.07 m
   Sample Period 0.04 s

5. Program Delete.

   The following values have been used :

   Pressure NOT filtered.
   Swells deleted.
   Low drop rates deleted : minimum drop rate : 0.5 m/s
   drop width : 11 samples.

6. Plots created with RAWPLOT and PLOT_CTD again.

7. Editing.

   Howard Freeland and Ron Perkin did the editing of the plots. Lots of changes have been made. Cast #38 was the worst one.

8. Averaging. (Program BINAVE).

The depth have been averaged at an interval of 1 m. The following parameters have been used :

Bin Channel : Pressure
Averaging interval : 1.0
Minimum bin value : 0.0
Average value will be used.
Interpolated values are NOT used for empty bins.

9. Filtering (Program LOWPASS).

After the depth have been averaged, Ron Perkin noticed that their were still some density inversions. So the data have been filtered using LOWPASS with the following parameters :

Channels to filter : Pressure, Temperature, Salinity.
Salinity will NOT be recalculated after filtering.
Sampling interval : 0.05 s
Cutoff frequency : 2.0 Hz

10. The program BINAVE has been run again with the same parameters.

11. SUMMARY and CRUISE_PLOT have been run.

12. IMPORTANT ERROR FOUND.

After SUMMARY has been run, it has been noticed that the Headers of some files did NOT correspond to the data within these files. So the headers (station name, latitude, longitude, date and time for both beginning and end of cast) of files 20 to 36, both included, have been corrected, for the files with extension .CAL, .EDT and .AVG.

13. NEWSTP and PAGE have been run.

The PAGE output all have "W" instead of "E" for the longitude. It should be East.

14. Program REMOVE CHANNEL (REMOVECH)

The channel Conductivity_Ratio has been removed from the .AVG files. The new files are the .REM files.

15. Particulars.

Cast 31, station HS35 : there was no latitude and longitude for the beginning of the cast, so the lat. and long. of the end of cast have been used in the program WOCE_CNV.

1/25/95	Whitney	BTL/DOC	Submitted; New DOC requested
	DOC not readable, please send new floppy		
5/15/96	Whitney	NUTs	DQE Report rcvd @ WHPO
5/15/96	Aoyama	CTD	DQE Report rcvd @ WHPO
5/15/96	Aoyama	BTL	DQE Report rcvd @ WHPO
6/12/96	Whitney	BTL	DQE Report sent to PI
6/21/96	Perkin	SALNTY	

The cell constant for these files was changed on June 21, 1996 from 1.15384(on the existing header) to 1.15434(from the original comparison work, bottlevs. ctd) and the salinity was re-computed using the following Quick Basic program. This new salinity corrected an offset picked up by the WOCE data quality analyst. Further work may bring more changes.

```
DECLARE FUNCTION SAL78! (CND!, t!, p!)
FOR FF = 1 TO 38
        fl$ = RIGHT$("0000" + MID$(STR$(FF), 2), 4)
        FLNMis$ = "m:\woce\okhotsk\9316" + fl$ + ".ctd"
        FLNMwoc$ = "m:\woce\okhotsk\9316" + fl$ + ".woc"
        PRINT FLNMis$
        flnminew$ = "m:\woce\okhotsk\9316" + fl$ + ".ntd"
        flnmwnew$ = "m:\woce\okhotsk\9316" + fl$ + ".noc"
        OPEN FLNMis$ FOR INPUT AS #1
        OPEN flnminew$ FOR OUTPUT AS #2
       OPEN FLNMwoc$ FOR INPUT AS #3
        OPEN flnmwnew$ FOR OUTPUT AS #4
skip:   LINE INPUT #1, hdstr$
        ncellk = INSTR(hdstr$, "1.15384")
        IF ncellk <> 0 THEN
                MID$(hdstr$, ncellk, 7) = "1.15434"
        END IF
        PRINT #2, hdstr$
        IF INSTR(hdstr$, "*END OF HEADER") = 0 THEN GOTO skip
        WHILE NOT EOF(1)
              INPUT #1, p, t, n1, s, n2
              rnext = (s - 35) / 40 * .7
              snext = SAL78(r, t, p)
redo:         rnext = rnext + (s - snext) * .7 / 40
              snext = SAL78(rnext, t, p)
              IF ABS(s - snext) > .00001 THEN GOTO redo
              rnew = rnext * (1.15434 + r * .0019407) /
              (1.15384 + r * .0019407)
              snew = SAL78(rnew, t, p)
              PRINT #2, USING "########.## ##.##### #####.
              ##.##### ###."; p; t; n1; snew; n2
        WEND
CLOSE 1
CLOSE 2
skip1:  LINE INPUT #3, hdstr$
        PRINT #4, hdstr$
        IF INSTR(hdstr$, "*******") = 0 THEN GOTO skip1
        WHILE NOT EOF(3)
              INPUT #3, p, t, s, n1, n2, n3
              rnext = (s - 35) / 40 * .7
              snext = SAL78(r, t, p)
redo1:         rnext = rnext + (s - snext) * .7 / 40
              snext = SAL78(rnext, t, p)
              IF ABS(s - snext) > .00001 THEN GOTO redo1
```

```
               rnew = rnext * (1.15434 + r * .0019407) /
               (1.15384 + r * .0019407)
               snew = SAL78(rnew, t, p)
               PRINT #4, USING "######.# ##.#### ##.####
               #####.# ####### #######"; p; t; snew; n1; n2; n3
        WEND
CLOSE 3
CLOSE 4
NEXT FF
STOP

FUNCTION SAL78 (XR, XT, XP)

10005 REM
10305 REM RANGE OF VARIABLES TRAP
10310 REM
10315       SAL78 = 0!
10320       IF XR <= .0005 OR XR > 2 THEN GOTO 10405
10321       IF XT <= -2.5 OR XT > 40 THEN GOTO 10405
10322       IF XP <= -10 OR XP > 10000 THEN GOTO 10405
10245 REM   POLNOMIALS OF RP: C(S,T,P)/C(S,T,0) VARIATION WITH
            PRESSURE
10255 REM
10260 NC = ((3.989E-15 * XP - 6.37E-10) * XP + .0000207) * XP
10265 NB = (.0004464 * XT + .03426) * XT + 1!
10285 NA = -.003107 * XT + .4215
10290 REM
10225 REM   NRT35 :  C(35,T,0)/C(35,15,0) VARIATION WITH
                     TEMPERATURE.
10235 NRT35 = (((1.0031E-09 * XT - 6.9698E-07) * XT +
              1.104259E-04) * XT + .0200564) * XT + .6766097
10240 REM
10340       dt = XT - 15!
10390       RT = XR / (NRT35 * (1! + NC / (NB + NA * XR)))
10395       RT = SQR(ABS(RT))
10195       SAL78 = ((((2.7081 * RT - 7.0261) * RT + 14.0941)
                    * RT + 25.3851) * RT - .1692) * RT +
                    8.000001E-03 + (dt / (1! + .0162 * dt)) *
                    (((((-.0144 * RT + 6.360001E-02) * RT -
                    .0375) * RT - .0066) * RT - .0056) * RT +
                    .0005)
10405
END FUNCTION
```

10/4/96	Perkin CTD/BTL/SUM
	.ctdfiles were created in June, '96 with an interim recalibration: 1.15434, .0019407 to adjust for salinity errors in a referees report.Subsequent checking showed a pressure dependency. Raw files were re-run using woce_c96.bas and identical calibrations to obtain .sub and .bot. files.Differences between .sub and .ctd files showed that .ctd files had not been corrected for expansion/contraction of the glass cell. All bottle comparisons were re-done with the new .bot files showing that the term .0019407 was not needed when the above correction was included. Cell constants, typically 1.001, were determined for each cast as multipliers to the term 1.15434.
10/4/96	Linguanti
	Program COND_FIX version 2.0 was used to make the corrections. File MULT.LIScontains the multipliers for each cast

10/10/96	Whitney	hyd	PI Responded to DQE Report
10/18/96	Linguanti	SALNTY	values adjusted
	A further adjustment was made to salinity after Ron checked corrections applied above. 0.001 was subtracted from all salinities, for all casts. Although it isdifficult to pin down the reason for this offset, it has something to do withthe down cast .WOC files being systematically different from the up casts where the bottle calibrations are done - possibly better flushing on thedown cast.		
1/29/98	Brown, R.	CTD	Converted to WOCE format
	Joe Linguanti converted the original CTD data files (1 metre average) to WOCE format and 2 mere depth intervals.		
3/30/98	Whitney	CTD/BTL	Data are Public
	NO Tracers/CO2/C14 submitted yet		
2/17/99	Diggs	HELIUM	Data Reformatted
	Data Reformatted to facilitate merging, see note: 1999.02.17:tps47he_edt.txt is an edited version of the original file:tps47he.txt which contains helium data sent from Lupton at PMEL.The data were hand edited in order to be merged into the whpo p01hy.txt file. Missing data was set to -9.000 and the flags "flag4" were all set to the WOCE quality byte 3.		
3/1/99	Wong	cfc/HeTr/c14	Data Requested by scd:
	there are no Helium, Tritium or C14 data submitted. Could you please let us know the disposition of these data and when we might be able to receive them from you?		
3/2/99	Wong	HELIUM/c14	Measured, Not Analysed:
	Although samples were collected for He, H-3 and C-14 on the Russian cruise, I could not obtain the funding for these analyses. Thus, no data were submitted for these properties. C.S. Wong		
5/6/99	Bartolacci	ALKALI/TCO2	Data Requested by dmb
4/19/00	Diggs	Cruise ID	Data Update:
	change expocode prefix from"RUBM" to "90BM"I agree, please change all designations of "RU" to "90" for the Russian cruises. We agreed on this a long time ago.		
10/13/00	Kappa	DOC	Doc Update
	pdf, txt versions created txt version needs to be cleaned up.		
10/31/00	Huynh	DOC	Website Updated:
	pdf, txt versions online		
11/29/00	Wisegarver	CFCs	DQE Report rcvd @ WHPO
1/8/01	Huynh	DOC	Website Updated:
	cfc report online		
1/8/01	Kappa	DOC	Doc Update:
	cfc dqe report added		
2/22/01	Talley	ALKALI/TCO2	Submitted
	not yet "dqe'd" by Kozyr I have just received the carbon data files from C.S. Wong for section P1W. These were not sent to Alex Kozyr, so I would appreciate your advice on how to proceed with them - should I just merge them with David's or Sarilee's help for the atlas, or should we go ahead and merge them for the WHPO online files?		

3/15/01	Key	DELC14	Funding now available
	Got word from Eric this A.M. that he will fund NOSAMS at the rate of 1000/year to analyze previously collected, but unfunded C14 samples. Highest priority will be to fill in Pacific "holes" starting with P14S15S (NOAA), P15N (Wong) and P1 (Japan). Policy decision supported by WOCE SSC. Eric would, if possible, like these data to be included in the atlas. In reality I don't knowif this is possible/practical, but I will do everything possible to expedite. Scheduling at NOSAMS will be complicated, but order listed above is the "scientific" priority as of now.		
3/27/01	Uribe	CTD/BTL/SUM	Expocodes Updated
	Expocodes for sum and bottle were modified. Expocodes in all ctd files have been editted to match the underscored expocode in the sum and bottle files. New files were zipped and replaced existing ctd files online. Old files were moved to original directory.		
4/5/01	Kappa	ALKALI/TCO2	DQE Pending; See note
	Lynne - It might be worth while filling Alex in on the situation, just to see if he feels strongly that he "should" see the data before you use them. Of course, you're welcome to use them as they are if you're comfortable doing so. It's just that Alex is our carbon data guru.		
4/6/01	Talley	CO2	Will check w/ Alex Kozyr
6/22/01	Uribe	BTL	Website Updated: CSV File Added
	Bottle file in exchange format has been put online.		
8/21/01	Bartolacci	CFCs	Submitted: need to be merged
	I have placed the new files containing updated CFC values into the p01w subdirectory called original/20010709_CFC_WISEGARVER_P01W. data are in need of merging into the current online bottle file as of this date.		
8/23/01	Bartolacci	CFCs	Website Updated
	New online BTL files have merged CFC data. I have replaced current online bottle files with newfiles containing merged updated CFC values. Data was sent by Wisegarver and merged by D. Muus. All table entries reflect this replacement. previous files moved to original subdirectory. A copy of merging notes will be sent to J. Kappa under separate email.		
8/23/01	Muus	CFCs/SUM	Data Merged into BTL file
	CFC's merged into BTL file, SUM reformatted Notes on P01W CFC merging Aug 23, 2001. D. Muus 1. New CFC-11 and CFC-12 from: /usr/export/html-public/data/onetime/pacific/p01/p01w/original/20010709_CFC_WISEGARVER_P01W/20010709.164450_WISEGARVER_P01W_p01w_CFC_DQE.datmerged into web SEA file as of Aug 21, 2001 (20010326WHPOSIOKJU)SEA file QUALT2 words were mostly "1"s so changed QUALT2 to be identical to QUALT1 prior to merging. 2. SUMMARY file (20010326WHPOSIOKJU) missing NAV entry for Sta 35 BE. Entered UNK to make exchange file conversion work. Probably should be GPS but I cannot find any confirmation. 3. Exchange file checked using Java Ocean Atlas.		