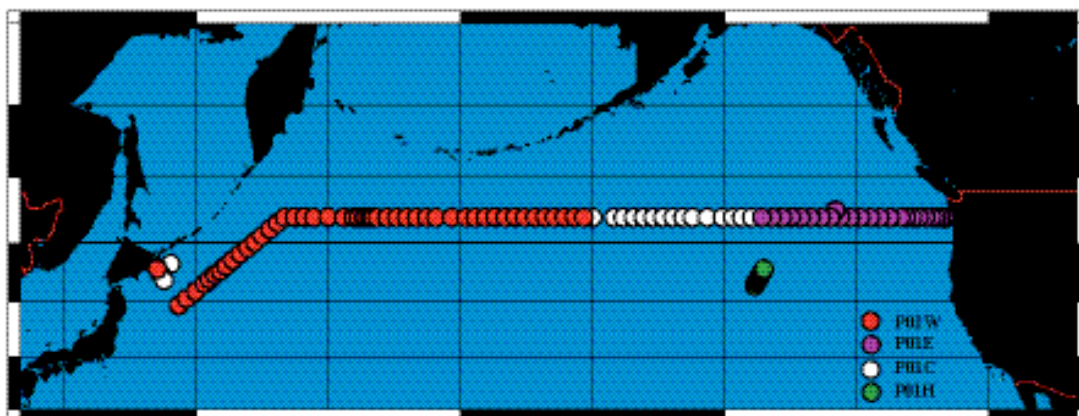


## A. CRUISE REPORT: P01H

(Last Update 2008 DEC)



### A.1. HIGHLIGHTS

#### CRUISE SUMMARY INFORMATION

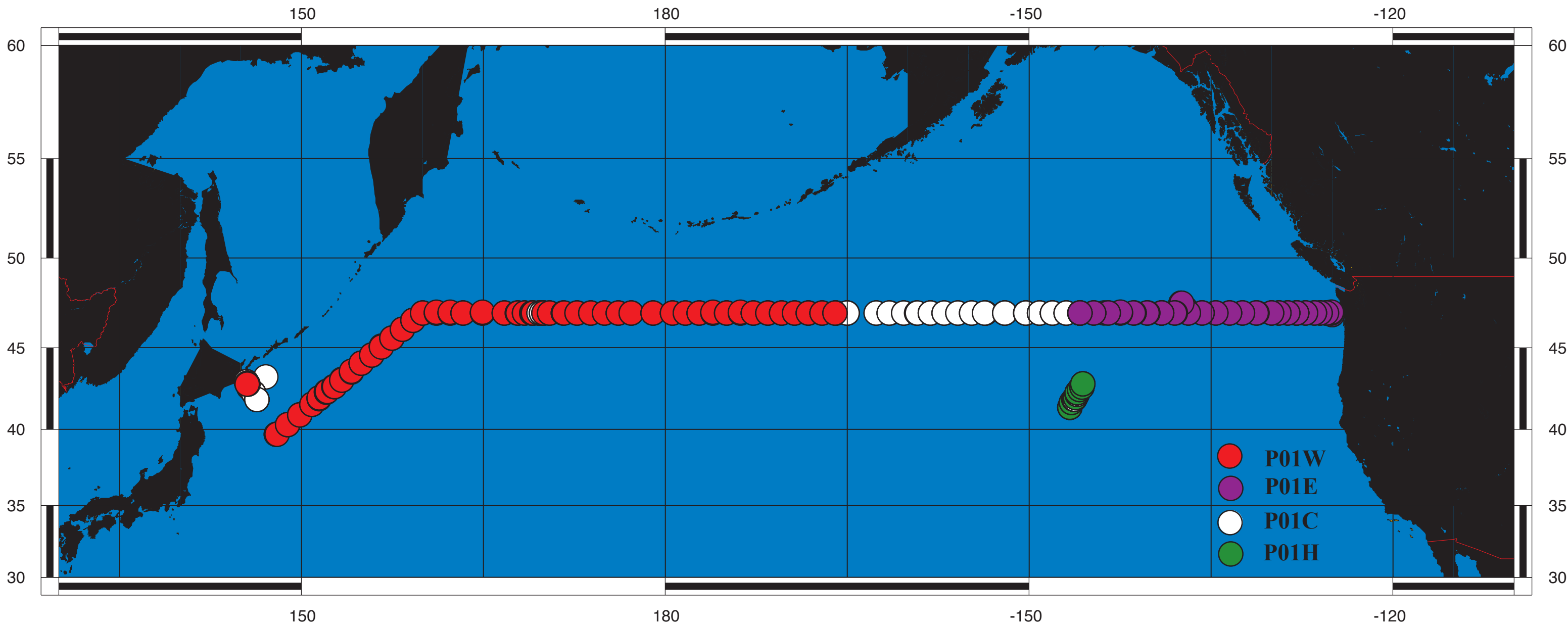
WOCE section designation	<b>P01H</b>
Expedition designation (EXPCODE)	<b>49NZ199909_2</b>
Chief Scientist & affiliation	<b>Takatoshi Takizawa/JAMSTEC*</b>
Dates	1999 SEP 11 - 1999 OCT 06
Ship	R/V Mirai
Ports of call	unk
Number of stations	13
Geographic boundaries (stations)	41°21.54'N 145°34.81'E 146°41.47'E 42°48.43'N
Floats and drifters deployed	0
Moorings deployed or recovered	0
Contributing Authors	Masao Fukasawa (Tokai Univ.)

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 • 2-15 Natsushima, Yokosuka 237 • JAPAN • Tel: 81-468-67-5571 (3811 direct)  
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## LINKS TO TEXT LOCATIONS

Shaded sections are not relevant to this cruise or were not available when this report was compiled

Cruise Summary Information	Hydrographic Measurements
Description of Scientific Program	<b>CTD Data:</b>
Geographic Boundaries	Acquisition
Cruise Track (Figure): PI CCHDO	Processing
Description of Stations	Calibration
Description of Parameters Sampled	Temperature/Pressure
Bottle Depth Distributions (Figure)	Salinities
	Oxygens
Floats and Drifters Deployed	<b>Bottle Data</b>
Moorings Deployed or Recovered	Salinity
	Oxygen
Principal Investigators	Nutrients
Cruise Participants	Carbon System Parameters
	CFCs
Problems and Goals Not Achieved	Helium / Tritium
Other Incidents of Note	Radiocarbon
Underway Data Information	References
Navigation Bathymetry	
Acoustic Doppler Current Profiler (ADCP)	
Thermosalinograph	
XBT and/or XCTD	
Meteorological Observations	<b>Acknowledgments</b>
Atmospheric Chemistry Data	
Data Processing Notes	



(Produced from .sum file by CCHDO)

## P1H

### I. Cruise Narrative

Masao Fukasawa (Tokai University)

The cruise of P1H was carried out as an appendix of the second leg of MR99K05 of Mirai. This leg was assigned for the arctic observation under the control of Dr. Takizawa who is the chief scientist of the leg. As is in the documentation of P1C, the first leg of MR9905, designated as SAGE P1 revisit cruise, could not complete stations off Hokkaido. Dr. Takizawa was so kind to try to back up those stations. As the result, nine stations were occupied, however, most of chemical tracers were not analyzed. The second leg of MR99K05 was not designed for WHP, so the number of observation item and their accuracy were decreased compared to other P1 revisit cruises.

The period of observation concerning P1C was from September 30, 1999 to October 1, 1999.

We would like to thank Dr. Takizawa for his kind efforts. Raw data including underway observations e.g. the ship board ADCP and meteorology are kept in DMO of JAMSTEC, however, the multi-narrow beam did not work well.

### II. Cruise summary

#### 1. Ship name

Mirai (Japan Marine Science and Technology Center)

#### 2. Cruise period

From 11 September 1999 to 6 October 1999

#### 3. Observation

9 stations along WHP P1 off Hokkaido

#### 4. Chief Scientist

Takatoshi Takizawa (Japan Marine Science and Technology Center)

e-mail: takizawat@jamstec.go.jp

#### 5. Observation Item and PI

CTD Masao Fukasawa (Tokai University): fksw@jamstec.go.jp

Bottle Salinity Hiroyuki Yoritaka (Hydrographic Department Japan Maritime Safety Agency): yoritaka@jodc.go.jp

Bottle Oxygen Masao Fukasawa (Tokai University): fksw@jamstec.go.jp

Nutrients Chizuru Saitoh (Japan Marine Science and Technology Center):  
saitoc@jamstec.go.jp

DIC\* Tsuneo Ono (National Research Institute of Fishery Laboratory):  
onot@jamstec.go.jp

\* Collected samples were freezed. Analyses were carried out a week after the collection.

### III. Sample water salinity measurements

#### (1) Personal

Hiroyuki Yoritaka (Hydrographic Department, Maritime Safety Agency)

Satoshi Ozawa (Marine Works Japan)

Toru Idai (Marine Works Japan)

Hitoshi Yamanobe (Marine Works Japan)

Hiroyuki Nakajima (Tokai University)

Satoko Katsuyama (Tokai University)

Fujio Kobayashi (Marine Works Japan)

#### (2) Objective

Calibration of salinity measured by CTD.

#### (3) Measured Parameter

Sample water salinity

#### (4) Instruments and Method

The salinity analysis was carried out by a Guildline Autosol salinometer model 8400B, which was modified by addition of an Ocean Science International peristaltic-type sample intake pump. Data of salinometer was collected simultaneously by a personal computer. A double conductivity ratio was defined as a median of 15 readings of the salinometer. Data collection was started after 5 seconds and it took about 5 seconds to collect 15 readings by a personal computer.

The salinometer was operated in the air-conditioned ship's laboratory at a bath temperature of 24 degree C. An ambient temperature varied from approximately 23 to 24 degree C.

#### i) Standard Sea Water

Autosal model 8400B was standardized only before sequence of measurements by use of IAPSO Standard Seawater batch P135 whose conductivity ratio was 0.99992. After the standardization, 8400B was monitored by SSW ampoule before and after the measurements for samples of one station. Total 23 ampoules of SSW were measured for monitoring, whose standard deviation was 0.0004 psu.

#### ii) Salinity Sample Collection

The bottles in which the salinity samples are collected and stored are 250ml clear glass bottles with inner caps and outer screw caps. Each bottle were rinsed twice and filled with sample water. Salinity samples were stored by the end of leg 1 in the same laboratory as the salinity measurement was made.

#### iii) Replicate Samples

Replicate samples were drawn from several Niskin bottles for each station. Standard deviation in the measurements of replicate samples was 0.0013 psu for 54 pairs.

#### iv) Quality Flag

Quality flag was made according to difference from corrected salinity measured with CTD. CTD salinity was corrected by linear fitting with bottle salinity for pressure in the upper layer (<1000db) and the deep layer (>1000db) at each station (see CTD). For the bottle salinity exceeded double standard deviation, bad (4) or doubt (3) flag was made. RMS of residual difference was 0.001 between CTD salinity and good bottle salinity for deeper layer.

### IV. Sample water oxygen measurements

#### (1) Personal

Masao Fukasawa (Tokai University)

Katsunori Sagishima (Marine Works Japan)

Hiroaki Muraki (Marine Works Japan)

#### (2) Objective

To detect changes in the transect between 1985 and 1999.

#### (3) Measured Parameter

Sample water dissolved oxygen

### (4) Instruments and Method

#### (a) Instruments and Apparatus

Dispenser: Eppendorf Comforpette 480/ 1000 $\mu$ l.

OPTIFIX/ 2ml

Metrohm Model 725 Multi Dosimat/ 20ml

Titration: Metrohm Model 716 DMS Titrino / 10ml of titration vessel

Pt electrode/ 6.0403.100(NC)

Software: Data acquisition / Metrohm, METRODATA / 606013/000  
Endpoint evaluation

#### (b) Methods

Samples were collected from 12L Niskin bottles and a bucket for the surface into the volumetrically calibrated dry glass bottles. At least two times of bottle volumes of sample water were overflowed before each sampling. Sampling water temperatures for 4 or 5 bottles were measured by a thermistor-thermometer to calculate the change in the volume of sampled water at the time of the titration. For other samples of which temperature were not measured, potential temperatures derived from CTD data were used. The sampling bottles consist of ordinary BOD flask (ca. 200ml) and glass stopper with long nipple inside which is modified from the nipple in Green and Carritt (1966). Oxygen in the sample was fixed immediately after the collection. Bottles were kept in a wooden box in the temperature-controlled laboratory until the titration.

The analytical method and the preparation of reagents were carried out in the same way as described in WHP Operations and Methods (Culbertson, 1991). A 0.05N thiosulfate of titrant was adopted during the cruise. Volumetric apparatus except titration were calibrated before the cruise. A titration was started about one hour after the fixation of dissolved oxygen. Two sets of Metrohm titrators with the automatic piston burette of 10ml and Pt electrode were used for the titration in the temperature-controlled laboratory. The temperature of samples which had been stored was 21 deg. C  $\pm$  2 deg. C during the cruise. The end point was determined by the potentiometric method and evaluated by the second-derivative curve method. Concentration of dissolved oxygen was computed using the equation in WHP Operation and Methods (Culbertson, 1991).

### (5) Results

We carried out 366 analyses of DO. Results are shown in .sea file.

(a) Thiosulfate Standardization

Thiosulfate reagent was standardized when thiosulfate bottles of titrator were empty. A 0.0100N KIO<sub>3</sub> standard solution was used for the standardization e.g. Lot 990715(0.01002N). The averaged volumes of thiosulfate for the standardization were 1.973ml (titrator #1) and 1.974ml (titrator #2), with standard deviation of 0.001ml and 0.002ml, respectively.

(b) Pure water blank

The blank value comes from the presence of redox species aparted from oxygen in the reagents, which behaves equivalently to oxygen to be analysed. The pure water blank or the titration blank was determined using deionized water (Milli-Q SP, Millipore) at each thiosulfate standardization. The average of pure water blanks was -0.019ml (#1) and -0.018ml (#2) with standard deviation of 0.008ml and 0.005ml, respectively.

(c) Reproducibility

In the cruise, replicate samples were drawn from some Niskin bottles at each station to estimate the precision of the analysis. 30 pair of replicate samples are analyzed to show the standard deviation (2 sigma) of 0.018ml/l or 0.2% of maximum value of DO concentration of 7.314ml/l in the cruise.

## V. Carbon Isotope Ratios in dissolved inorganic carbon ( $\Delta^{14}\text{C}$ )

(1) Personnel

Masao Fukasawa (Tokai University): sample collection

Robert Key (Princeton University): sample analysis

(2) Sample collection

Sampling stations of <sup>14</sup>C are planned to be every five degrees except the western boundary area. Samples were collected from depth using 12 liter Niskin bottles. Sampling glass bottles of c.a. 500ml were baked at 450 degree C for tow hours after dipped into 1 N of HCl solution. After baking, each bottle was capped with an aluminum foil until the sampling on the shipboard. The seawater sample was siphoned into the glass bottle with enough seawater to fill the glass. Immediately after the collection, about 10 ml of seawater was removed from the bottle and

poisoned by 1 ml of saturated HgCl<sub>2</sub> solution. The bottle was put a screwed plastic cap on and sealed with butyl tape. Then the bottle was put in a wooden container.

51 samples were collected from 3 stations.

(3) Sample measurements

All samples were sent to Dr. Robert Key of Princeton University to be analyzed.

## VI. CTD measurement

(1) Personnel

Masao Fukasawa (Tokai University)

Satoshi Ozawa (Marine Works Japan)

(2) Apparatus

Body and Circuit: Sea-Bird CTD9 plus

Sensors

Temperature sensor (Primary): 1464

Temperature sensor (Secondary): 1525

Conductivity sensor: 041723,042271

Pressure sensor: Digiquartz 410k-105 s/n 59960

(3) Sensor calibration

(3)-1 Temperature sensor

(3)-1-1 Primary sensor

Temperature sensor was calibrated before and after the cruise on 29 Apr. 99 and 5 May 00 at Marine Works Japan and Sea-Bird Electronics, respectively. Post-cruise residuals defined as differences between the bath temperature and the instrument temperature were checked at eleven temperature points of -1.5122, 1.0477, 4.6234, 8.1302, 11.6341, 15.1945, 18.6585, 22.1588, 25.6863, 29.1576 and 32.6326 ITS-90 degree C.

The largest sensor drift during the period from the pre-cruise calibration to the post-cruise calibration was found to be +0.0011 deg C over the wide temperature band from 4.6243 to 29.1576 deg C. On the other hand, the absolute temperature difference between the bath and the instrument temperature was found to be largest as 0.0013 deg C at 32.6329 deg C using coefficients decided at the time of pre-cruise. As the result the drift of the temperature sensor was found to be +0.0011 of

average with 0.00013 of standard deviation.

Consequently, if we define the accuracy of the sensor as the sum of the drift and the absolute temperature difference at eleven bath temperature, the result can be expressed as follows;

bath temp (degC)	ambiguity (degC)
-1.41	0.0008
1.01	0.0009
4.59	0.0011
8.19	0.0011
11.62	0.0011
15.18	0.0011
18.68	0.0011
22.18	0.0011
25.74	0.0011
29.16	0.0011
32.69	0.0013

The resulted ambiguity is considerably larger than that for other P1 revisit cruises.

#### (3)-2-2 Conductivity sensors

Sensor 042256 was used before the stations 54. At station 54 the sensor was replaced with 041723. Sensor of 041723 was calibrated at Sea-Bird Electronics only on 6 Apr. 99 just before the cruise. On the other hand, the sensor of 042256 was calibrated only on 29 Jun. 99 after the cruise. For both of sensors, no non-linear response was detected which may affect the in-situ calibration of CTD salinity using the bottle salinity.

#### (3)-2-3 Pressure sensor

Pressure sensor was calibrated at the time of the perches in Aug. 97 and after the cruise on 15 Nov. 99. Calibration was carried out on six pressure values from 14 psia to 10000 psia. Any apparent hysteresis was found. Coefficients were decided so as to make the real pressure value and the CTD out put value are linear with the slope of 1 and the intersect of 0 at the time of newly equipped. Using the same coefficients, the slope value and intersect value were found to be shifted to 1.00010 and +1.54 psi or +1.0646 db.

The linearity of calibration line was so good that the largest offset of -0.12 db was found at around 2000 psi.

#### (3)-2-4 DO sensor

DO sensor was not used.

#### (4) Data calibration

##### (4)-3-1 Temperature

The residual which was detected at post-cruise sensor calibration at 14 temperature points were so large and it is impossible to know the history of the time drift. So, we gave up to add any artificial values to out put from CTD.

##### (4)-3-2 Salinity

Bottle salinity values of which flags were 2 were used for the salinity calibration. Differences between CTD salinity and bottle salinity were minimumized using the least square method against the pressure. Linear calibration equations were estimated for depths shallower than 1000 db and deeper than 1000 db, respectively. The calibration equation for deeper data was estimated first. The calibration value at 1000 db was calculated and used as a fix point for the calibration for shallower data. As the result, two calibration equations which were connected to each other at 1000 db were decided for every station. CTD salinity was re-produced using these equations. Standard deviation from the bottle salinity at each station is as follows;

stn	cast	SD(0-1000)	SD(1000-bottom)
		PSS-78	PSS-78
4	1	6.6727837e-003	N/A
5	1	8.6979969e-003	3.4647951e-004
6	1	1.5797235e-003	6.0450398e-004
7	1	1.2629831e-003	8.2629089e-004
10	1	6.7736760e-003	7.0933285e-004
13	1	1.2327109e-003	6.3209221e-004

As for the traceability of SSW P-135 was -15/10000 psu to Mantyla's value. Aoyama et al. (2002) also reported -16/10000, -14/10000, -14/10000 for P135. It must be noted that data calibration did not include the traceability.

#### (4)-3-3 Pressure

CTD outputs were re-produced using coefficients noted above.

## CCHDO DATA PROCESSING NOTES

Date	Contact	Data Type	Action
2004-04-10	Talley	SUM	Submitted
	<p>Danie - Masao Fukasawa sent me a CDROM with the P1 occupation from 1999. Here is a list of the cruises that make up the section, which they called SAGE. (Part of the Subarctic Gyre Experiment.)</p> <p>p1e - stations 92-115 R/V John Tully 6/2/99-6/10/99  p1c - stations 4-92 R/V Mirai 8/25/99 - 9/8/99  p1w - stations 1-74 R/V Kaiyo-Maru 5/23/99 - 6/11/99  p1h - stations 4-13 R/V Mirai 9/30/99 - 10/2/99</p> <p>The files are called things like p1wsum.txt, p1csum.txt, p1esum.txt, p1hsum.txt</p> <p>I don't have the data sets other than the sum files on my computer, but will look for the CDROM when I get in. I gather then that they weren't sent to the WHPO.</p>		
2006-11-02	Johnson, G.	CTD/BTL/SUM	available on JAMESTEC website
	<p>I note that P01 data are now in the public domain (see <a href="http://www.jamstec.go.jp/iorgc/ocorp/data/p01rev_1999/index.html">http://www.jamstec.go.jp/iorgc/ocorp/data/p01rev_1999/index.html</a>), but are listed on the CCHDO site as with the PI Would it be possible for these data to be served publicly on the CCHDO site now?</p>		
2006-11-06	Kappa	CTD/BTL/SUM	Website Updated
	<p>Justin was able to get all the p01_1999 data online this morning. Based on our time stamps, it looks like all the ctd files have been worked by our data specialists. 2 of the hyd files have time stamps, 2 don't. We'll be looking at them more closely in the next couple weeks and will let you know if we find any anomalies.</p>		