Preliminary Report
of
The Hakuho Maru Cruise
KH-04-4
leg 1, leg 2

7 September ~ 31 October 2004

Tokyo – Guam – Tokyo

Ocean Research Institute
The University of Tokyo
2005

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Cruise for
observations of deep currents and water masses
in the western North Pacific

by

The Scientific Members of the Cruise

Edited by

Masaki KAWABE

CONTENTS

1. Cruise Narrative

The cruise KH-04-4 of R.V. *Hakuho Maru* was conducted for 70 days between September 7 and November 15 in 2004 for study of physical oceanography (legs 1, 2) and geophysics (leg 3) entitled "Physical oceanographic study on deep circulation currents and geophysical study on seafloor in the western North Pacific". We carried out the surveys for physical oceanography in the western North Pacific in legs 1 and 2 for 55 days from September 7 to October 31, with a port call at Guam (28 September—3 October).

Study subjects of the cruise KH-04-4 legs 1 and 2 are

(1) to study water characteristics and currents in deep layer (Ocean Research Institute, the University of Tokyo),
(2) to study the transport variations of heat and materials in deep and bottom currents near the Wake Island (Japan Agency for Marine-Earth Science and Technology, JAMSTEC).
(3) to study the processes of transport and conversion of water masses in surface layer (Tohoku University),
(4) to study the coefficient of diffusivity by measuring density ratios (Tokyo University of Marine Science and Technology),

The primary observations were full-depth casts of $CTDO_2$ (conductivity, temperature, depth, oxygen profiler) for measuring water temperature, salinity, and dissolved oxygen, LADCP (lowered acoustic Doppler current profiler) for current velocity, and water sampler with Niskin bottles for chemical parameters. The water sampler frame was equipped with $CTDO_2$ sensors, 24 Niskin bottles, and downward LADCP with a battery. At the CTD stations C001~C037, we equipped with the upward LADCP on the top of the frame, instead of removing two Niskin bottles from the water sampler. Salinity, dissolved oxygen, and nutrients of water samples were measured on board, and the sample values of salinity and oxygen were used for the calibration of sensor values of $CTDO_2$. Helium and tritium of sampled waters will be measured at land facilities after the cruise. At all CTD stations, water temperature, salinity, and dissolved oxygen at sea surface were measured by sampling surface water with a bucket, and salinity of the intake water was measured to correct the data of salinograph.

In order to avoid a touch and collision to sea bottom of the underwater instruments on the water sampler frame, we equipped the frame with an altimeter and a bottom-touch-switch. The altimeter monitored the distance from sea bottom within 30 m or more. The bottom-touch-switch hanging a 15-m string and a weight let us know that the instruments reached less than 15 m above bottom by ringing buzzer in the laboratory of the vessel.

Temperature and salinity data of CTD and XCTD (expendable CTD) were sent to the Japan Meteorological Agency by the TESAC telegram in quasi-real time. We measured current velocity in a surface layer with shipboard ADCP of the Furuno Electric Co., Ltd. and the RD Instruments throughout the legs of the cruise.

Leg 1 (Tokyo – Guam)

We departed from Tokyo, when Typhoon No. 18 swept the areas of Kyushu, Chugoku, and Kinki in Japan, and Typhoon No. 19 was approaching the Izu Islands. Big swells due to strong wind of the typhoons rolled our vessel. We proceeded southward along the Izu Islands and waited for several hours near Hachijo-jima. The first CTD cast was delayed for more than a half day from the original schedule.

We proceeded to the Shatsky Rise along 32°30′N eastward, casting CTD at C001~C022 between 141°E and 158°20′E. We turned southwest at the Shatsky Rise, made CTD casts at C023~C059, recovered two moorings at M3 and M4, and deployed nine moorings of current meters and CTDs at M2~M10, reaching the Mariana Ridge. Totally, $CTDO_2$ observations were made at 59 stations. XCTD casts were made at 32 points reducing the ship speed to 12 knots at the casts, and observations of turbulence and micro-structure of temperature, salinity, and velocity using TurboMap were made at five stations of C010, C013, C017, C023, and C034 (TM01~TM05).

Water sampling was made at all the CTD stations except for C005. Salinity, dissolved oxygen, and nutrients were measured for all the samplings. Water samples for helium and tritium were taken at seven stations (C002, C006, C013, C030, C043, C053, C059), at ten depths for helium (250, 500, 750, 1000, 1500, 2000, 2500, 3000, 4500 db, near-bottom) and three depths for tritium (250, 500, 750 db).

In the first half of leg 1, we suffered continual CTD troubles. At C005, the underwater CTD instrument was broken at near-bottom, and the communication with the onboard unit became impossible, so that we could not take water samples. Later we knew that it was due to a break of the fluorometer, and the underwater instrument of CTD would be usable by detaching the fluorometer. At C006~C009, another underwater instrument of CTD was used, which was equipped with the oxygen sensor used until C005. However, the oxygen sensor did not correctly work at C006 and C007 because of an incomplete connection to the underwater CTD instrument. Moreover, water temperature data were partly bad at C008 (777~1488 db) and C009 (711~2468 db), and did not reach to the onboard unit at full depth at C010 because of incomplete connection between the underwater CTD instrument and the temperature sensor. Then the underwater CTD instrument was changed at C010 to that used until C005. After that, the CTD instrument was in good shape until C022. But the pump for circulating seawater to the sensors did not work at C023. We changed the pump at C023 and the underwater CTD instrument at C024. After the CTD unit worked well from C024 to C054, temperature data were not sent to the on-board unit at C055. The underwater CTD unit for depth of 10500 m was used at C055 and C056, but the performance of oxygen sensor was bad. The underwater unit at C024~C054 was used again between C057 and C059.

We adjusted the time on the ship to the Guam time by forwarding one hour at 21:00 on September 11.

Leg 2 (Guam – Tokyo)

We left Guam at 14:00 on October 3. At the night, we arrived at the first CTD station in leg 2, C060 (13°52′N, 145°42′E), and started the CTD observations crossing the Mariana Trench southeastward. From C066, we proceeded eastward and made CTD casts along 12°40′N at intervals of 50-minute longitude. Total number of the CTD stations at 12°40′N were 28 (C066~C093). On this line, TurboMap casts were made at intervals of almost five-degree longitude, i.e., at five CTD stations of C067 (TM06), C074 (TM07), C080 (TM08), C086 (TM09), and C093 (TM10~TM17). At C093, TurboMap was casted eight times continuously, together with four-times XCTD casts (XC33~XC36). In the middle of this line (01:00 on October 9), we adjusted the time on the ship by forwarding one hour, and the difference from the Japan Standard Time increased to two hours.

At night on October 13, we began the observations on the northeastward line of the JAMSTEC moorings. We made mooring works in the daytime and CTD casts in the night-time during five days from 14 to 18 in October. The five moorings with current meters and CTDs, which were deployed more than one year ago on the cruise of R.V. *Mirai*, were recovered successfully, and five moorings in similar design were deployed at the same place (WM1~ WM5). We made CTD casts at 10 stations on this mooring line (C094~C103). We made three casts at C103, although the first cast was shallow down to 1549 db because of a machine accident. From C103, we proceeded north-northwestward casting CTD at C104~C106 and then northwestward casting CTD at C106~C119 at intervals of one-degree longitude.

The time on the ship was back one hour at 01:00 on October 21. At C111 just after the time adjustment, seawater leaked into the connecting part between the cable and the underwater CTD unit during the upward cast, and the communication between the underwater and onboard units became unstable. Therefore, the water sampling at C111 was incomplete. When we began to repair the cable connection part, a trouble occurred in the hydraulic pump for the

CTD winch and the stretching beam. The repair and inspection of the hydraulic pump system took more than one day during which we stayed at C112. During the stay, TurboMap casts were made twelve times in the daytime (TM20~TM31), the CTD cable was cut at about 10 m from the end, and the connecting part of the CTD cable to the underwater CTD instrument was entirely repaired. In the morning on October 22, we made a TurboMap cast (TM32) at first and a CTD cast at C112. Then we proceeded northwestward and made CTD casts at C113~C119 without any trouble. We ended CTD casts at 00:30 on October 25. On the way to Tokyo, we made TurboMap casts five times at 31°11′N, 148°31′E (TM33~TM37). The time on the ship was back one hour at 21:00 on October 26 and returned to the Japan Standard Time.

In leg 2, we made CTD casts at 60 stations totally with measurements of salinity, dissolved oxygen, and nutrients of water samples. Two conductivity sensors of CTD among the total three sensors for this cruise were broken at C072 and C095. Water samples for helium and tritium were taken at three stations (C065, C075, C099) at the same depths as in leg 1. Moreover, 32 casts of TurboMap and four casts of XCTD probe were made in leg 2.

Totally, we made $CTDO_2$ with water samples at 119 stations, 37 casts of TurboMap, and 36 casts of XCTD probe, recovered seven moorings, and deployed 14 moorings during legs 1 and 2 of the KH-04-4 cruise. Thus, we obtained valuable data for study of water circulations and properties in the western North Pacific.

Acknowledgements

I really express my gratitude to the captain and crew of R.V. *Hakuho Maru* and the scientists joining the KH-04-4 cruise for their cooperation throughout the cruise. Success in the observations was due to their devoted and complete work.

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2. Summary of the measurement and correction

A. Water Sample

A1. Instrument

Seawater was sampled from 12-liter Niskin bottles mounted at 24 (22 for C001－C037) places on a Sea-Bird Electronics Carousel water sampler (SBE 32).

A2. Conductivity

Leg 1: Conductivity of water samples was measured with a salinometer Guildline Portasal Model 8410A (Serial Number 63893) which was standardized by IAPSO Standard Seawater (Ocean Scientific International Ltd.) of Batch P144 (K_{15} = 0.99987). The measurement was done in Laboratory 5 in which air temperature was kept a little lower than water temperature in the salinometer water bath.

Leg 2: Conductivity of water samples was measured with a salinometer (Guildline Instruments Inc., Autosal model 8400B, S/N 66183), which was modified by addition of a peristaltic-type sample intake pump (Ocean Scientific International Ltd.). The salinometer was standardized by IAPSO Standard Seawater (Ocean Scientific International Ltd.) of Batch P144 (K_{15}=0.99987). The Standard Seawater was measured every 30 samples. Also sub-standard seawater, which was deep-sea water filtered by pore size of 0.45 micrometer and stored in two 20 liter cubitainers made of polyethylene and stirred for all the time, was measured every 15 samples. The measurement was done in the air-conditioned Laboratory 5, in which air-temperature was kept around 22°C, at the salinometer bath temperature of 24°C.

A3. Dissolved Oxygen

Leg 1: Dissolved oxygen of water samples was measured with an automatic recording titrator Metrohm Shibata 798 MPT Titrion. We used 0.02 mol l^{-1} Sodium Thiosulfate Solution (Wako Pure Chemical Industries Ltd.) (factor = 1.00) for titration.

Leg 2: Dissolved oxygen of water samples was measured with two automatic photometric titrators (Kimoto Electronic Co. Ltd., DOT-01, S/N 134351001 and 134351002) and two automatic burettes (Kyoto Electronic Co. Ltd., APB-510, S/N NUC14584 and NUC14589) with controlling software (Kimoto Electronic Co. Ltd., DOT controller version 2.1.1). We also used two automatic burettes (Metrohm Ltd., Model 725 and 765 Dosimat, S/N 15104 and 05135) for standardization and determination of the blank. Temperature of sampled water taken from a Niskin bottle into a calibrated clear glass bottle (ca. 100 cm^3) was measured with a digital thermometer (Sato Keiryoki Mfg. Co., Ltd., SK-1250MC

III) in order to correct volume of the bottle and to calculate density of sampled water. Two reagent solutions (pickling reagent I and II) of 0.5 cm^3 each were added into the sample bottle with glass dispensers (Fortuna Optifix 2410-1). To secure traceability on dissolved oxygen analysis, CSK standard solution of potassium iodate (Wako Pure Chemical Industries Ltd., Lot TCK8677, 0.001667 M) was measured three times during the cruise.

Reagents:

Pickling reagent I: Manganous chloride solution (3M)

Pickling reagent II: Sodium hydroxide (8M) / sodium iodide solution (4M)

Sulfuric acid solution (5M)

Sodium thiosulfate (0.025M): Wako Pure Chemical Industries Ltd.

Potassium iodate (0.001667M): Lot KLR3004, Wako Pure Chemical Industries Ltd.

A4. Nutrients

Leg 1: We analyzed Nitrate, nitrite, silicate, and phosphate using an auto analyzer Bran Luebbe AACS II. Nitrate, nitrite, and phosphate standard solutions were prepared in laboratory before the cruise. Silicate standard solution was 1,000 ppm Silicon Standard Solution for atomic absorption spectrometry (Kanto Chemical Co., INC.). For working standards and baseline solution, we used natural seawater of low nutrients which was filtered and analyzed in laboratory before the cruise.

Leg 2: Nutrients of seawater samples were measured with continuous-flow analysis systems (BRAN+LUEBBE, TRAACS 800 systems, S/N 9503973 and 9504201), which have 4-channel analyzing systems for nitrate, nitrite, silicate and phosphate. Samples were drawn into two of virgin 10 ml polyacrylates vials that were rinsed three times before sampling without sample drawing tubes. All regents were of very high purity such as "Analytical Grade", "Analyzed Reagent Grade" and others. Assay of nitrite was determined according JISK8019, and assay of nitrite salts was 99.0 %. That value was used to adjust the weights taken. For the silicate standards solution, commercial available silicon standard solution for atomic absorption spectrometry of 1000 mg/l was used. The standard solutions were measured every 12–13 samples and were used to evaluate precision of nutrients analysis during the cruise. Three concentrations of reference material for nutrients in seawater, RMNS (KANSO Co., Ltd., lots AS, AT and AU), were also used for all runs to secure traceability on nutrient analysis throughout the cruise. The measurement was done in the air-conditioned Laboratory 5, in which air-temperature was kept around 22°C.

B. $CTDO_2$

B1. Instrument

The $CTDO_2$ was a Sea-Bird Electronics instrument for 6500 db (SBE9plus). The sensor of conductivity was manufactured by the Sea-Bird Electronics, Inc. (SBE4) who claimed a resolution of 0.00004 S m^{-1} (0.0004 mmho cm^{-1}) and an accuracy of ±0.0003 S m^{-1} (±0.003 mmho cm^{-1}). The sensor of water temperature was manufactured by the Sea-Bird Electronics, Inc. (SBE3plus) who claimed a resolution of 0.0002°C and an initial accuracy of ±0.001°C. The sensor of pressure was manufactured by the Paroscientific Digiquartz (Model 4xK) with a resolution of 0.001% of full scale and an accuracy of ±0.015% of full scale (6000-db range). The sensor of dissolved oxygen was manufactured by the Sea-Bird Electronics, Inc. who claimed an accuracy of 0.1 ml l^{-1} and a resolution of 0.01 ml l^{-1} for SBE13 and an accuracy of 2 % of saturation for SBE43.

We used three sets of the $CTDO_2$ underwater instrument. Instrument No. 1 was CTD SBE9plus (S/N 34562-0750) equipped with conductivity sensor SBE4 (S/N 2496), temperature sensor SBE3plus (S/N 4378), pressure sensor (S/N 89961), oxygen sensor SBE43 (S/N 0628), and pump (S/N 53867, but 51267 for C023). This was used at C001−C005 and C010−C023. Instrument No. 2 was CTD SBE9plus (S/N 12545-0400) equipped with conductivity sensor SBE4 (S/N 1578, 2496, or 518), temperature sensor SBE3plus (S/N 2017 or 4378), pressure sensor (S/N 60965), oxygen sensor SBE43 (S/N 0628), and pump (S/N 51267). This was used at C006−C009 (C: S/N 1578; T: S/N 2017), C024−C054, C057−C072 (C: S/N 1578; T: S/N 4378), C073A−C095 (C: S/N 2496; T: S/N 4378), and C096−C119 (C: S/N 518; T: S/N 4378). Instrument No. 3 was CTD SBE9 (S/N 91894) for depth of 10500 m equipped with conductivity sensor SBE4 (S/N 518), temperature sensor SBE3plus (S/N 893), pressure sensor (S/N 48031), oxygen sensor SBE13 (S/N 0404), and pump (S/N 155). This was used at C055 and C056.

B2. Data Collection

Full signals of frequency digitized 24 times per second and sent from the underwater CTD unit SBE9plus were received with the onboard unit SBE11plus and converted to output sequences of RS232C. The data were collected with the Sea-Bird Electronics CTD operating software SEASOFT, using an IBM-compatible personal computer EPSON Endeavor Pro. The full signals of frequency were stored in the hard disc during the lowering stage of CTD cast and then were copied in magnetic optical discs at the deepest point of the cast.

B3. Calibration

The sensors of conductivity, temperature, and dissolved oxygen were calibrated by the Sea-Bird Electronics, Inc. The obtained new coefficients were used in the CTD operating software SEASOFT.

Pressure sensor (S/N 60965) was calibrated with a dead-weight piston gauge

(Budenberge Gauge model 480DA, S/N 23906) on 27 April 2004 by Marine Works Japan Ltd. Calibration coefficients for the sensor drift correction were determined as an offset (0.0517 db) at all pressure and a change of span slope (0.9999207).

Deep Ocean Standards Thermometer (Sea-Bird Electronics Inc. model SBE35, S/N 0022), used in leg 2, was standardized against Triple Point of Water and Gallium Melt Point cells on 2 July 2004 by Sea-Bird Electronics Inc. Like standards-grade platinum resistance thermometers (SPRT), the slow time drift of the SBE35 was adjusted by a slope (1.000038) and an offset (0.000258 degrees C) correction to the basic non-linear calibration equation. The SBE35 was used with the SBE32 Carousel Water Sampler and SBE911plus CTD system. The SBE35 makes a temperature measurement each time a bottle fire confirmation is received. The SBE35 has a time constant of 0.5 seconds and the acquisition time required per sample is 1.1×NCYCLES seconds. NCYCLES is the number of acquisition cycles per sample and was set to 4 in this cruise. RMS temperature noise for an SBE35 in a Triple Point of Water cell is typically 0.000041°C when NCYCLES is set to 4.

a. Pressure

Pressure data were corrected by subtracting the pressure-sensor value in the air of -0.7 db (Instrument No. 1), -1.6 db (Instrument No. 2), -0.7 db (Instrument No. 3) in leg 1 and -0.5 db (Instrument No. 2) in leg 2.

b. Conductivity

Conductivity data were moreover calibrated using water-sample data. The ratio of conductivity from water sample to that from CTD (*CF*) was calculated. Vertical change of *CF* was expressed with polynomials of pressure *P* (db) such as

$$CF = a + bP + cP^2 + dP^3 + eP^4 + fP^5.$$

The sensor value of conductivity was multiplied by *CF* computed from the above equation and the following coefficients a~f for station groups.

leg 1

1) C001~C005

a~f = 1.000112, .2673207E-7, -.1919985E-10, .2245589E-14, 0.0, 0.0

2) C006~C009

a~f = 1.000324, -.1206474E-6, .1535037E-10, 0.0, 0.0, 0.0

3) C010~C023

a~f = 1.000126, -.2256975E-7, .2835797E-11, 0.0, 0.0, 0.0

4) C024~C026

a~f = 1.000111, .1093520E-6, -.7170524E-10, .1049472E-13, 0.0, 0.0

5) C027~C031

$a \sim f$ = 1.000224, -.5450920E-7, .6296329E-11, 0.0, 0.0, 0.0

6) C032~C034

$a \sim f$ = 0.9999671, .2281634E-6, -.1058130E-9, .1751317E-13, -.9365557E-18, 0.0

7) C035~C037

$a \sim f$ = 1.000097, .1842573E-6, -.1188286E-9, .2551543E-13, -.1773170E-17, 0.0

8) C038~C040

$a \sim f$ = 1.000204, -.5527178E-7, .6811705E-11, 0.0, 0.0, 0.0

9) C041~C044

$a \sim f$ = 1.000204, -.6456920E-7, .7505063E-11, 0.0, 0.0, 0.0

10) C045~C051

$a \sim f$ = 1.000255, -.7329761E-7, .1084143E-10, -.4166134E-15, 0.0, 0.0

11) C052~C054, C057~C059

$a \sim f$ = 1.000211, .9330450E-8, -.1809040E-10, .2340747E-14, 0.0, 0.0

12) C055, C056

$a \sim f$ = 0.9998379, .4547753E-6, -.3242090E-9, .8243718E-13, -.6933805E-17, 0.0

leg 2

1) C060~C066

$a \sim f$ = 1.000313, -.2570003E-6, .9467000E-10, -.1522011E-13, .9065051E-18, 0.0

2) C067~C072

$a \sim f$ = 1.000437, -.4823735E-6, .2383649E-9, -.4805791E-13, .3363977E-17, 0.0

3) C073A~C077

$a \sim f$ = 1.000287, -.4515225E-6, .3443110E-9, -.1189009E-12, .1882195E-16, -.1105795E-20

4) C078~C082

$a \sim f$ = 1.000171, -.7240445E-7, .9495558E-11, 0.0, 0.0, 0.0

5) C083~C095

$a \sim f$ = 1.000180, -.7477222E-7, .1117381E-10, 0.0, 0.0, 0.0

6) C096~C103

$a \sim f$ = 0.9999561, -.5151597E-8, .1033434E-11, 0.0, 0.0, 0.0

7) C103B~C109

$a \sim f$ = 0.9999248, .1200039E-6, -.5655512E-10, .6865429E-14, 0.0, 0.0

8) C110~C119

$a \sim f$ = 0.9998327, .4432581E-6, -.3792855E-9, .1329753E-12, -.2073284E-16, .1197383E-20

c. Dissolved Oxygen

Oxygen data were obtained with the method in the World Ocean Circulation Experiment (WOCE) Operations Manual, WOCE Hydrographic Programme Office Report WHPO 91-1, WOCE Report No. 68/91.

For SBE13, dissolved oxygen was calculated from the polarographic oxygen sensor electric current and probe temperature with the algorithm

$$O_x = \left[A(O_c + B\frac{dO_c}{dt}) + C \right] O_x^*(T,S) \exp\left[D\{T + E(T_o - T)\} + FP \right]$$

where O_x is the concentration of dissolved oxygen (ml l^{-1}), O_c the oxygen electric current (mA), T_o the oxygen sensor temperature (°C), T, S, and P are water temperature (°C), salinity (psu), and pressure (db) measured with CTD, $O_x^*(T,S)$ the saturated oxygen for T and S, and t is time (sec).

For SBE43, dissolved oxygen was calculated from the polarographic oxygen sensor electric current with the algorithm

$$O_x = \left[A(O_c + B\frac{dO_c}{dt} + E) + C\exp(-0.03\,T) \right] O_x^*(T,S)\ \exp\left[DT + FP\right]$$

The six parameters *A~F* were determined with a nonlinear least squares fitting to the oxygen of water samples. The result of the coefficients is as follows.

leg 1

1) C001~C004, C008~C023

    A~F = 0.375, 0.0, 0.214, 0.007, -1.042, 0.000135

2) C024~C054

    A~F = 0.382, 0.0, 0.169, 0.006, -0.921, 0.000135

3) C057~C059

    A~F = 0.390, 0.0, 0.224, 0.007, -1.033, 0.000129

leg 2

4) C060~C071

    A~F = 0.391, 0.0, 0.105, 0.004, -0.746, 0.000133

5) C072~C119

    A~F = 0.407, 0.0, 0.070, 0.003, -0.671, 0.000136

The coefficient B was fixed to zero for SBE43.

C. XCTD

We used probes of TSK XCTD-1. The depth of a falling probe was computed with the equation that

$$z = 3.42543 \cdot t - 0.00047026 \cdot t^2.$$

The data were recorded with TSK MK-130 (Tsurumi Seiki Co., Ltd).

D. Shipboard ADCP

D1. ADCP (Furuno Electric Co., Ltd.)

Current velocities at three depths of 20 m, 50 m, and 100 m were measured at an interval of 15 seconds. The data were averaged for every minute and recorded with Doppler Sonar Current Profiler System CI-20H.

D2. ADCP (RD Instruments)

Current velocities at 64 levels at an interval of 16 m from 32–m depth down to about 1000 m were measured with Broadband 38 kHz ADCP and recorded every two minutes.

Uncertainty of the ship heading direction decreases accuracies of the measured flow direction relative to the ship head and the measured velocity components. The ship heading direction data by the gyrocompass was manually input with a resolution of one degree when the system was switched on. Inaccuracy of this input is a source of measurement error. Another error source is a deviation in direction of the shipboard transducer from the original design.

According to Joyce (1989; *Journal of Atmospheric and Oceanic Technology*, **6**, 169-172), the correct velocity (u_w, v_w) is given from a ship speed (u_s, v_s) and a measured ADCP velocity (u_d, v_d) as

$$u_w = u_s + (1+\beta)\,(u'_d \cos\alpha - v'_d \sin\alpha)$$

$$v_w = v_s + (1+\beta)\,(u'_d \sin\alpha + v'_d \cos\alpha),$$

where α is the error in orientation of transducer, and $1+\beta$ is the scale factor.

The values of α and β were estimated by comparing the ship speed obtained from bottom tracking with that from the Global Positioning System. For the comparison, 551 ensemble data were used. The result is

$$\alpha\ (\text{rad}) = -0.0040, \quad \beta = -0.0453.$$

The current velocity data from the RDI ADCP should be corrected with the above equations and coefficients.

E. Lowered ADCP

An ADCP instrument of 300 kHz Work Horse manufactured by RD Instruments was attached to the CTD-water sampler frame and used as a lowered ADCP in order to obtain vertical profiles of horizontal velocity. Two transducers were set downward at the bottom and upward at the top of the water sampler frame, and a buttery package was mounted on the frame. We selected 10-meter bins, 1 ping per ensemble, and 1 ping per a second (C001−C010, C038−C046) and two seconds (C011−C037, C047−C059). The ADCP placed upward at the top of the frame did not well work and was removed after the cast at C037.

Data were stored in the underwater ADCP unit and recovered on the deck after the cast. Noises and an influence of vertical move and rotation of the ADCP unit must be removed from the original data. Further processes of data should be made after the cruise to obtain correct data of current velocity.

F. Altimeter

An altimeter PSA-916T (S/N 1000) manufactured by BENTHOS was attached to the water sampler frame. It worked in 30 m or more above sea bottom and warned us that the downward cast should be ended soon, by indicating the distance from the bottom.

G. TURBOMAP

G1. Instrument

TURBOMAP is manufactured by Alec Electronics, Kobe, Japan. This instrument is equipped with two shear probes and FPO7 temperature, conductivity, chlorophyll, turbidity, acceleration and pressure sensors. The outline of sensors and observation items are as follows:

Channel	items	sensor	range	precision	resolutiom
1	du/dz	Shear probe	0 ~ 4 s^{-1}	5%	$1\times10^{-6}s^{-1}$
2	dT/dz	FPO7	-5 ~ 45 ℃	TBD	0.001°C/m
3	Temperature	Platinum Wire	-5 ~ 45 ℃	0.01°C	0.001°C
4	Conductivity	Electromagnetic Induction Cell	0 ~ 70 mS	0.01mS	0.001mS
5	Pressure	Semi-Conductor	0 ~ 500 db	0.2%	0.01db
6	*x*-axis Acceleration	Acceleration Sensor	$\pm 1G$	1%	$0.001G$
7	*y*-axis Acceleration				
8	*z*-axis Acceleration				
9	Chlorophyll	Laser	0 ~ 100 μg/l	$0.5\mu g/l$	$0.005\mu g/l$
10	Turbidity	Infrared Scattering	0 ~ 100 ppm	1ppm	0.005ppm
11	du/dz	Shear probe	0 ~ 4 s^{-1}	5%	$1\times10^{-6}s^{-1}$

G2. Operation

TURBOMAP is lowered freely with adjusted ballasts at 0.5 m/s – 0.4 m/s. Sea cable is attached at an opposite side of sensors through winch system to PC on board. Data is transferred through output sequence of RS485. The sampling rate is 512 KHz, and transferring frequency is 600 KHz. Essential point of the operation is that TURBOMAP should be operated freely without tension, which should contaminate the shear data. So, the ship must not be maneuvered while observation is going on. This is not the case when the observation is finished, and TURBOMAP is recovered by operating the winch.

G3. Data

Digital outputs from each channel data are stored in PC, and these N values are converted by using equations.

① Shear Probe (CH 1, CH11):

Probe Number	$S[V/(\mathrm{m/s})^2]$
M243(CH1)	0.1219
M244(CH11)	0.0872

The shear probe signal is converted to velocity shear by the equation below.

$$\frac{du}{dz}=\frac{5}{2^{16}}\frac{N}{2\sqrt{2}SW^2}$$

Here, W is the falling speed of TURBOMAP.

② FPO7

FPO7 data is calibrated by the third order regression against the platinum wire temperature data.

③ Temperature

$T=-7.14938+2.146235\times10^{-3}N-3.348212\times10^{-8}N^2+7.36823\times10^{-13}N^3$

④ Conductivity

$C=0.1595515+2.048077\times10^{-3}N$

⑤ Pressure

$P=-9.52396571+0.0227302284N$

⑥ Acceleration (x-axis, y-axis, z-axis)

$a_x=9.869\times10^{-3}+3.803\times10^{-5}N, a_y=-4.060\times10^{-2}+3.691\times10^{-5}N, a_z=-2.013\times10^{-2}-3.708\times10^{-5}N$

⑦ Chlorophyll

$Chl=-1.918397151+3.44416\times10^{-3}N$

⑧ Turbidity

$Turbidity=-5.466762+7.359085\times10^{-3}N$

After the cruise is finished, we analyze these data. Especially, the shear data are fitted on to the Nasymth spectral form to check the validity of data quality, and are used to calculate the energy dissipation, scaled dissipation rate, and the eddy diffusivities of heat and salt by using density ratio calculated from the temperature and salinity data.

Showing below are the photographs of TURBOMAP from various angles.

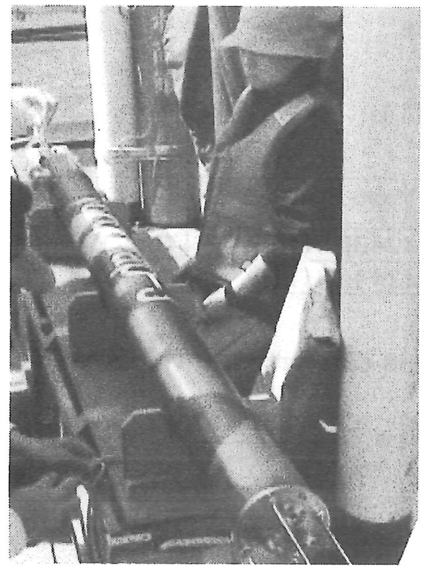

Photo 1 TURBOMAP from above. Length: 2426mm, Diameter: 405mm.
Weight: 43Kg on deck and 0.6-0.9Kg in water.

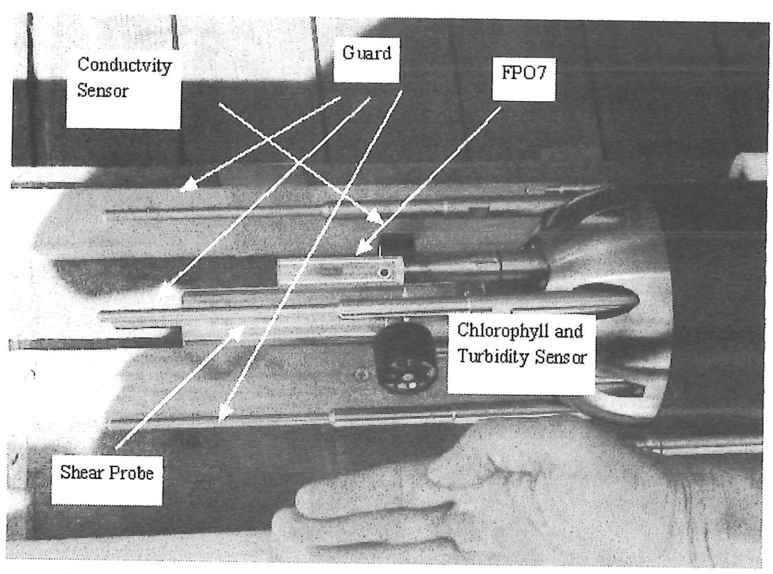

Photo 2 Close up view of sensors. Note that TURBOMAP used on board KH-04-4 has two shear probes. Another shear probe is mounted just beside the other one shown above. Pressure and standard temperature sensors are out of scope in this photograph.

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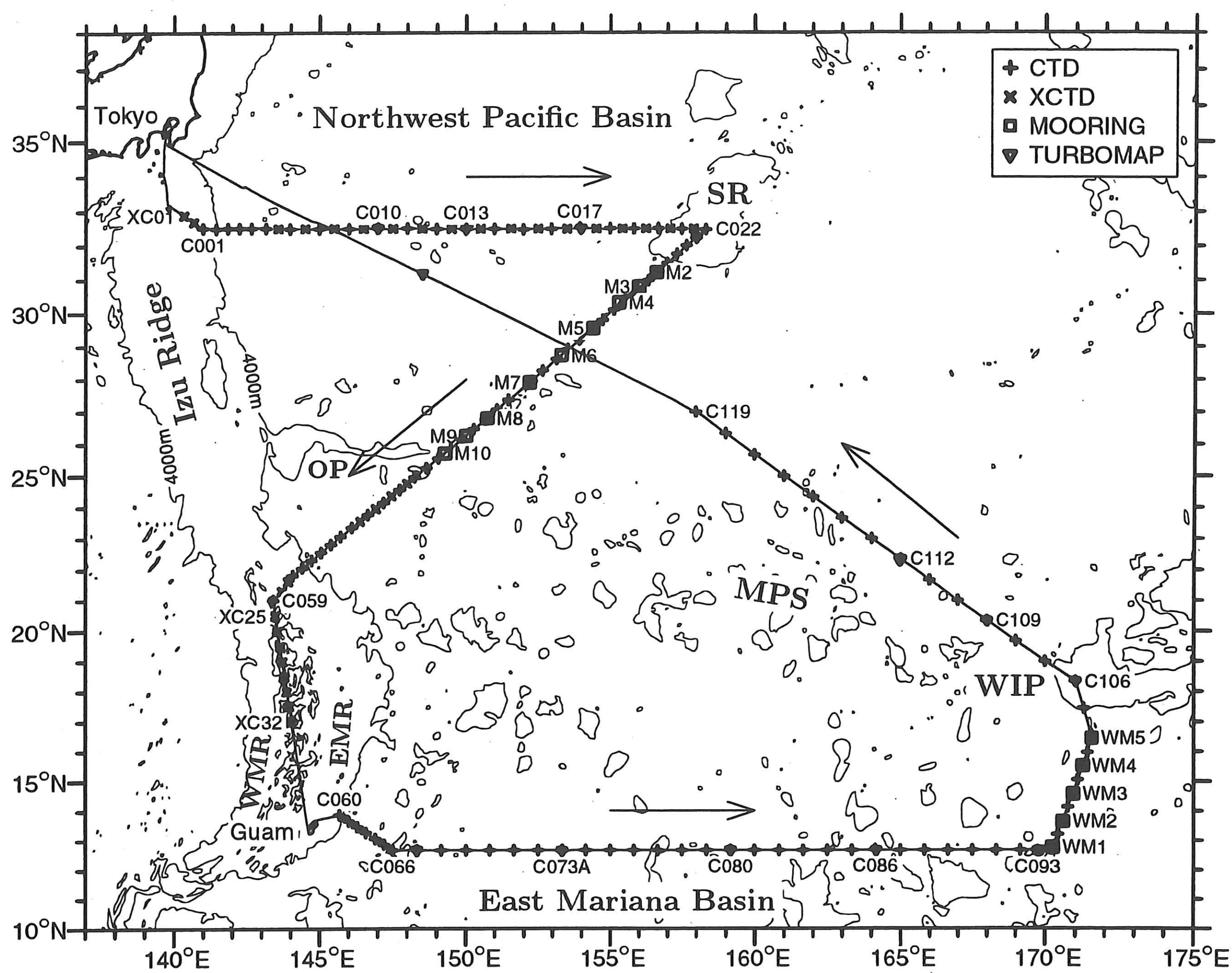
[1]Participationg leg 1 only. [2]Participationg leg 2 only.

4. Track Chart



SR:	Shatzky Rise;	**WIP**:	Wake Island Passage
EMR:	East Mariana Ridge;	**WMR**:	West Mariana Ridge
OP:	Ogasawara Plateau;	**MPS**:	Mid-Pacific Seamounts

5. Time Table

Leg-1 (Tokyo → Guam)

Columns: TIME (UTC) 0–24. Entries are listed in time order across each day (~~~ = transit, ↑ = event point).

	Date	TIME (UTC) 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
1	Sep. 7	↑ Tokyo ~~~
2	Sep. 8	~~~ ↑ XC01 ~~~ ↑ XC02 ~~~; C001; ~~~; C002; ~~~; C003
3	Sep. 9	~~~; C004; ~~~; C005; ~~~; C006; ~~~ ↑ XC03 ~~~; C007
4	Sep.10	C007; ~~~ ↑ XC04 ~~~; C008; ~~~ ↑ XC05 ~~~; C009; ~~~ ↑ XC06 ~~~; C010
5	Sep.11	C010; ~↑ TM01 ~~~ ↑ XC07 ~~~; C011; ~~~ ↑ XC08 ~~~; C012; ~~~ ↑ XC09 ~~~ ↑ TM02 ~~
6	Sep.12	C013; ~~~ ↑ XC10 ~~~; C014; ~~~ ↑ XC11 ~~~; C015; ~~~ ↑ XC12 ~~~; C016
7	Sep.13	C016; ~~~ ↑ XC13 ~~~ ↑ TM03 ~~; C017; ~~~ ↑ XC14 ~~~; C018; ~~~ ↑ XC15 ~~~; C019
8	Sep.14	C019; ~~~ ↑ XC16 ~~~; C020; ~~~ ↑ XC17 ~~~; C021; ~~~ ↑ XC18 ~~~; C022; ~~~ ↑ TM04 ~~~; C023
9	Sep.15	C023; ~~~; C024; ~~~; C025; ~~~; C026; ~~~; C027; ~~; M2 deploy
10	Sep.16	~~~; C028; ~~~; C029; ~~~; M3 deploy
11	Sep.17	~~~; M4 recover; ~~~; C031; ~~~; C030; ~~~; M3 recover; ~
12	Sep.18	~~~; M4 deploy; ~~~; C032; ~~~; C033; ~~~; C034; ↑~ TM05
13	Sep.19	~~~; M5 deploy; ~~~; C035; ~~~; C036; ~~~; M6 deploy
14	Sep.20	~~~; C037; ~~~; C038; ~~~; C039; ~~~; M7 deploy
15	Sep.21	~~~; C040; ~~~; C041; ~~~; C042; ~~~; M8 deploy
16	Sep.22	~~~; M9 deploy; ~~~; C043; ~~~; C044; ~~~; C045; ~~~
17	Sep.23	M10 deploy; ~~~; C046; ~~~; C047; ~~~; C048; ~~~ ↑ XC19 ~~~; C049; C049A
18	Sep.24	C049A; ~~~ ↑ XC20 ~~~; C050; ~~~ ↑ XC21 ~~~; C051; ~~~ ↑ XC22 ~~~; C052; ~~~; C053
19	Sep.25	C053; ~~~; C054; ~~~; C055; ~~~; C056; ~
20	Sep.26	~~; C057; ~~~; C058; ~~~ ↑ XC23 ~~~ ↑ XC24 ~~~; C059; ~~~ ↑ XC25 ~~~ ↑ XC26 ~~~ ↑ XC27 ~~~ ↑ XC28 ~~
21	Sep.27	~ ↑ XC29 ~~~ ↑ XC30 ~~~ ↑ XC31 ~~~ ↑ XC32 ~~~
22	Sep.28	↑ Guam

Leg-2 (Guam → Tokyo)

	Date	TIME (UTC) 0–24
1	Oct. 3	↑ Guam ~~~ C060 ~~~ C061 ~~~ C062 ~~
2	Oct. 4	~ C063 ~~~ C064 ~~~ C065 ~~~ C066 ~~~ ↑ TM06 ~
3	Oct. 5	C067 ~~~ C068 ~~~ C069 ~~~ C070
4	Oct. 6	C070 ~~~ C071 ~~~ C072 ~~~ C073 ↑~↑ TM07 ~
5	Oct. 7	C073A ~~~ C074 ~~~ C075 ~~~ C076
6	Oct. 8	C076 ~~~ C077 ~~~ C078 ~~~ C079 ~~~
7	Oct. 9	~~~↑ TM08 ~~ C080 ~~~ C081 ~~~ C082 ~~~
8	Oct.10	~~~ C083 ~~~ C084 ~~~ C085 ~~~ ↑ TM09 ~
9	Oct.11	C086 ~~~ C087 ~~~ C088 ~~~ C089
10	Oct.12	~~~ C090 ~~~ C091 ~~~ C092 ~~~
11	Oct.13	~↑~↑ ↑ ⇈ ↑~⇈ ↑↑ ↑ ~ TM10-17,XC33-36 C093 ~~~ C094 ~~~ C095 ~~~ WM1 recover ~~
12	Oct.14	~~~ WM1 deploy ~~~ C096 ~~~ C097 ~~~ WM2 recover ~~
13	Oct.15	~~~ WM2 deploy ~~~ C098 ~~~ C099 ~~~ WM3 recover ~~
14	Oct.16	~~~ WM3 deploy ~~~ C100 ~~~ C101 ~~~ WM4 recover ~~
15	Oct.17	~~~ WM4 deploy ~~~ C102 ~~~ C103 ~~~ C103A ~~~ WM5 recover ~~
16	Oct.18	~~~ WM5 deploy ~~~ C103B ~~~ C104 ~~~ C105 ~~~ ↑ TM18 ~
17	Oct.19	C106 ~~~ C107 ~~~ C108 ~~~ ↑ TM19 ~ C109
18	Oct.20	C109 ~~~ C110 ~~~ C111 ~~~
19	Oct.21	~↑~↑ ↑ ↑~~↑ ↑~~~ ↑ ↑↑ ↑↑ ↑ TM20-23 TM24-25 TM26-31 ~~~ ↑
20	Oct.22	~ C112 ~~~ C113 ~~~ C114 ~~~
21	Oct.23	~~~ C115 ~~~ C116 ~~~ C117 ~~~
22	Oct.24	~~~ C118 ~~~ C119 ~~~
23	Oct.25	~~~
24	Oct.26	~~~ ↑↑↑ ⇈ TM33-37 ~~~
25	Oct.27	~~~
26	Oct.28	~~↑ Tokyo

6. Summary of Observation Stations

STN:	Station number
TYPE:	CTD=CTDO only, ROS=CTDO plus water sampler, MOR=Mooring, XCTD=XCTD, TMAP=Turbomap
CODE:	BE=Beginning of cast or mooring deployment, BO=Bottom time for cast, EN=Time cast completed, DE=Time mooring, or XCTD or Turbomap was deployed
DEPTH:	Water depth in meters
MAXP:	Maximum pressures in decibars (for CTD/ROS)
PARAM:	Sampling parameters (for ROS) 1=Salinity, 2=Dissolved Oxygen, 3-6=Nutrients (PO_4,SiO_2,NO_2+NO_3,NO_2), 7=He, 8=^3H LADCP=Lowered ADCP
COMMENT:	*comments*

KH-04-4 LEG 1

STN	TYPE	DATE	GMT	CODE	LATITUDE	LONGITUDE	DEPTH	MAXPR	PARAM/*COMMENT*
XC01	XCTD	090804	0618	DE	32°52.79′N	140°20.70′E	985		*TSK XCTD-1*
XC02	XCTD	090804	0747	DE	32°41.62′N	140°41.07′E	2044		*TSK XCTD-1*
C001	ROS	090804	1008	BE	32°30.41′N	140°59.81′E	2781		LADCP
C001	ROS	090804	1116	BO	32°30.50′N	140°59.77′E	2778	2808	1-6 *SBE9p750 CTDO*
C001	ROS	090804	1213	EN	32°30.73′N	140°59.96′E	2766		
C002	ROS	090804	1421	BE	32°30.01′N	141°25.81′E	3526		LADCP
C002	ROS	090804	1549	BO	32°29.64′N	141°26.23′E	3585	3678	1-8 *SBE9p750 CTDO*
C002	ROS	090804	1711	EN	32°29.19′N	141°26.87′E	3666		
C003	ROS	090804	1907	BE	32°30.23′N	141°50.26′E	7248		LADCP
C003	ROS	090804	2130	BO	32°30.63′N	141°50.63′E	7284	6501	1-6 *SBE9p750 CTDO*
C003	ROS	090804	2340	EN	32°30.74′N	141°50.85′E	7312		
C004	ROS	090904	0139	BE	32°30.27′N	142°14.96′E	8296		LADCP
C004	ROS	090904	0335	BO	32°30.69′N	142°14.60′E	8268	6518	1-6 *SBE9p750 CTDO*
C004	ROS	090904	0526	EN	32°31.26′N	142°14.52′E	8612		
C005	CTD	090904	0730	BE	32°30.30′N	142°39.80′E	6144		LADCP
C005	CTD	090904	0923	BO	32°30.89′N	142°39.27′E	6213	6500	*SBE9p750 CTDO*
C005	CTD	090904	1116	EN	32°31.18′N	142°39.01′E	6253		
C006	ROS	090904	1559	BE	32°30.00′N	143°09.69′E	5613		LADCP
C006	ROS	090904	1743	BO	32°30.29′N	143°09.00′E	5612	5808	1-8 *SBE9p400 CTDO*
C006	ROS	090904	1920	EN	32°30.63′N	143°08.52′E	5474		
XC03	XCTD	090904	2110	DE	32°30.06′N	143°34.97′E	5351		*TSK XCTD-1*
C007	ROS	090904	2253	BE	32°30.00′N	143°59.79′E	5328		LADCP
C007	ROS	091004	0035	BO	32°29.92′N	143°59.10′E	5341	5507	1-6 *SBE9p400 CTDO*
C007	ROS	091004	0207	EN	32°29.84′N	143°59.14′E	5340		
XC04	XCTD	091004	0406	DE	32°30.01′N	144°30.14′E	5600		*TSK XCTD-1*
C008	ROS	091004	0636	BE	32°30.04′N	144°59.91′E	4540		LADCP
C008	ROS	091004	0818	BO	32°29.98′N	144°59.69′E	4537	4918	1-6 *SBE9p400 CTDO*
C008	ROS	091004	0941	EN	32°30.05′N	144°59.48′E	4518		
XC05	XCTD	091004	1137	DE	32°29.97′N	145°30.00′E	5732		*TSK XCTD-1*
C009	ROS	091004	1359	BE	32°30.02′N	145°59.95′E	5870		LADCP
C009	ROS	091004	1542	BO	32°29.97′N	145°59.89′E	5871	6081	1-6 *SBE9p400 CTDO*
C009	ROS	091004	1725	EN	32°30.01′N	145°59.23′E	5868		
XC06	XCTD	091004	1925	DE	32°30.08′N	146°30.63′E	5832		*TSK XCTD-1*
C010	ROS	091004	2253	BE	32°30.03′N	146°56.92′E	5883		LADCP

STN	TYPE	DATE	GMT	CODE	LATITUDE	LONGITUDE	DEPTH	MAXPR	PARAM/*COMMENT*
C010	ROS	091104	0048	BO	32°30.33′N	146°59.99′E	5882	6101	1-6 *SBE9p750 CTDO*
C010	ROS	091104	0230	EN	32°30.79′N	147°00.39′E	5892		
TM01	TMAP	091104	0304	DE	32°30.96′N	147°00.39′E	5892	350	*Turbomap*
XC07	XCTD	091104	0539	DE	32°30.04′N	147°30.35′E	5910		*TSK XCTD-1*
C011	ROS	091104	0740	BE	32°30.16′N	148°00.15′E	5855		LADCP
C011	ROS	091104	0923	BO	32°30.59′N	148°00.09′E	5851	6005	1-6 *SBE9p750 CTDO*
C011	ROS	091104	1105	EN	32°30.90′N	148°00.24′E	5856		
XC08	XCTD	091104	1255	DE	32°29.99′N	148°29.96′E	4914		*TSK XCTD-1*
C012	ROS	091104	1457	BE	32°29.72′N	148°59.76′E	5546		LADCP
C012	ROS	091104	1633	BO	32°29.34′N	148°59.47′E	5422	5479	1-6 *SBE9p750 CTDO*
C012	ROS	091104	1806	EN	32°29.07′N	148°58.87′E	5408		
XC09	XCTD	091104	2017	DE	32°29.93′N	149°29.92′E	5832		*TSK XCTD-1*
TM02	TMAP	091104	2235	DE	32°29.54′N	149°59.64′E	5702	335	*Turbomap*
C013	ROS	091104	2343	BE	32°29.83′N	149°59.90′E	5679		LADCP
C013	ROS	091204	0125	BO	32°29.98′N	149°59.70′E	5575	5740	1-8 *SBE9p750 CTDO*
C013	ROS	091204	0303	EN	32°30.05′N	149°59.19′E	5690		
XC10	XCTD	091204	0508	DE	32°29.95′N	150°30.05′E	5704		*TSK XCTD-1*
C014	ROS	091204	0712	BE	32°29.64′N	150°59.60′E	5615		LADCP
C014	ROS	091204	0851	BO	32°29.80′N	150°58.99′E	5630	5810	1-6 *SBE9p750 CTDO*
C014	ROS	091204	1027	EN	32°29.91′N	150°58.47′E	5638		
XC11	XCTD	091204	1252	DE	32°29.98′N	151°33.12′E	5682		*TSK XCTD-1*
C015	ROS	091204	1449	BE	32°29.48′N	151°59.60′E	5684		LADCP
C015	ROS	091204	1632	BO	32°28.96′N	151°58.45′E	5700	5896	1-6 *SBE9p750 CTDO*
C015	ROS	091204	1813	EN	32°28.65′N	151°57.44′E	5705		
XC12	XCTD	091204	2032	DE	32°29.95′N	152°29.58′E	5478		*TSK XCTD-1*
C016	ROS	091204	2250	BE	32°29.81′N	152°59.16′E	5453		LADCP
C016	ROS	091304	0034	BO	32°29.48′N	152°57.43′E	5418	5618	1-6 *SBE9p750 CTDO*
C016	ROS	091304	0216	EN	32°29.51′N	152°56.11′E	5408		
XC13	XCTD	091304	0505	DE	32°29.94′N	153°30.04′E	5283		*TSK XCTD-1*
TM03	TMAP	091304	0728	DE	32°30.72′N	153°59.32′E	5028	520	*Turbomap*
C017	ROS	091304	0823	BE	32°31.02′N	153°57.27′E	5055		LADCP
C017	ROS	091304	0957	BO	32°31.57′N	153°55.96′E	5176	5311	1-6 *SBE9p750 CTDO*
C017	ROS	091304	1132	EN	32°31.75′N	153°54.98′E	5162		
XC14	XCTD	091304	1405	DE	32°30.06′N	154°30.05′E	4832		*TSK XCTD-1*
C018	ROS	091304	1614	BE	32°30.23′N	154°59.74′E	4577		LADCP
C018	ROS	091304	1739	BO	32°30.75′N	154°59.14′E	4596	4700	1-6 *SBE9p750 CTDO*
C018	ROS	091304	1900	EN	32°31.00′N	154°59.06′E	4599		
XC15	XCTD	091304	2049	DE	32°30.03′N	155°24.98′E	4180		*TSK XCTD-1*
C019	ROS	091304	2237	BE	32°29.99′N	155°49.73′E	4507		LADCP
C019	ROS	091404	0000	BO	32°30.20′N	155°49.81′E	4510	4617	1-6 *SBE9p750 CTDO*
C019	ROS	091404	0118	EN	32°30.45′N	155°50.01′E	4520		
XC16	XCTD	091404	0302	DE	32°30.00′N	156°14.94′E	4728		*TSK XCTD-1*
C020	ROS	091404	0448	BE	32°30.10′N	156°39.85′E	4484		LADCP
C020	ROS	091404	0608	BO	32°30.36′N	156°39.57′E	4497	4611	1-6 *SBE9p750 CTDO*
C020	ROS	091404	0726	EN	32°30.45′N	156°39.53′E	4497		
XC17	XCTD	091404	1033	DE	32°29.96′N	157°04.94′E	3654		*TSK XCTD-1*
C021	ROS	091404	1218	BE	32°29.89′N	157°30.09′E	3012		LADCP
C021	ROS	091404	1312	BO	32°29.81′N	157°29.94′E	3015	3055	1-6 *SBE9p750 CTDO*

STN	TYPE	DATE	GMT	CODE	LATITUDE	LONGITUDE	DEPTH	MAXPR	PARAM/*COMMENT*
C021	ROS	091404	1407	EN	32°29.78′N	157°29.27′E	3021		
XC18	XCTD	091404	1551	DE	32°29.95′N	157°55.02′E	2688		*TSK XCTD-1*
C022	ROS	091404	1733	BE	32°29.59′N	158°19.77′E	2484		LADCP
C022	ROS	091404	1821	BO	32°28.96′N	158°19.48′E	2490	2512	1-6 *SBE9p750 CTDO*
C022	ROS	091404	1908	EN	32°28.58′N	158°19.31′E	2492		
TM04	TMAP	091404	2053	DE	32°14.95′N	158°00.80′E	2580	491	*Turbomap*
C023	ROS	091404	2302	BE	32°14.14′N	157°59.99′E	2596		LADCP
C023	ROS	091404	2352	BO	32°13.86′N	157°59.96′E	2598	2624	1-6 *SBE9p750 CTDO*
C023	ROS	091504	0041	EN	32°13.54′N	158°00.06′E	2598		
C024	ROS	091504	0517	BE	32°00.26′N	157°40.03′E	2956		LADCP
C024	ROS	091504	0613	BO	32°00.28′N	157°39.93′E	2957	2998	1-6 *SBE9p400 CTDO*
C024	ROS	091504	0706	EN	32°00.31′N	157°40.03′E	2958		
C025	ROS	091504	0910	BE	31°45.22′N	157°20.02′E	3714		LADCP
C025	ROS	091504	1022	BO	31°45.13′N	157°19.70′E	3685	3784	1-6 *SBE9p400 CTDO*
C025	ROS	091504	1129	EN	31°44.92′N	157°19.53′E	3664		
C026	ROS	091504	1350	BE	31°29.86′N	156°59.58′E	4006		LADCP
C026	ROS	091504	1508	BO	31°29.77′N	156°59.43′E	4013	4086	1-6 *SBE9p400 CTDO*
C026	ROS	091504	1621	EN	31°29.70′N	156°59.40′E	4017		
C027	ROS	091504	1841	BE	31°41.57′N	156°39.96′E	4359		LADCP
C027	ROS	091504	2003	BO	31°14.69′N	156°39.64′E	4342	4380	1-6 *SBE9p400 CTDO*
C027	ROS	091504	2118	EN	31°14.55′N	156°39.30′E	4339		
M2	MOR	091504	2231	BE	31°11.30′N	156°35.47′E	4435		*1 RCM11, 2 CM, 1 MicroCAT, 3 MnFiber*
M2	MOR	091504	2344	DE	31°12.82′N	156°36.62′E	4432		*Transmitter 43.528MHz, A/R 3A*
C028	ROS	091604	0135	BE	30°59.44′N	156°19.63′E	4677		LADCP
C028	ROS	091604	0303	BO	30°59.21′N	156°19.51′E	4680	4797	1-6 *SBE9p400 CTDO*
C028	ROS	091604	0428	EN	30°59.03′N	156°19.14′E	4682		
C029	ROS	091604	0709	BE	30°42.05′N	155°55.83′E	5437		LADCP
C029	ROS	091604	0919	BO	30°42.20′N	155°55.00′E	5435	5610	1-6 *SBE9p400 CTDO*
C029	ROS	091604	1103	EN	30°42.23′N	155°54.64′E	5418		
M3	MOR	091604	2250	BE	30°45.66′N	155°59.54′E	5321		*2 RCM11, 2 CM, 1 MicroCAT, 1 ADCP*
M3	MOR	091704	0022	DE	30°47.52′N	156°00.40′E	5086		*Transmitter 43.528MHz, A/R 3F*
M4	MOR	091704	0436	BE	30°19.22′N	155°19.01′E	5653		*1 RCM11, 3 CM, 1 3D-ACM*
M4	MOR	091704	0552	RE	30°18.27′N	155°17.91′E	5642		*Transmitter 40.100MHz, A/R 3C*
C031	ROS	091704	0709	BE	30°05.93′N	155°07.75′E	5708		LADCP
C031	ROS	091704	0919	BO	30°05.99′N	155°07.10′E	5714	5913	1-6 *SBE9p400 CTDO*
C031	ROS	091704	1052	EN	30°05.80′N	155°06.68′E	5717		
C030	ROS	091704	1328	BE	30°23.75′N	155°31.95′E	5613		LADCP
C030	ROS	091704	1513	BO	30°23.68′N	155°31.73′E	5614	5799	1-8 *SBE9p400 CTDO*
C030	ROS	091704	1652	EN	30°23.41′N	155°31.07′E	5619		
M3	MOR	091704	2211	BE	30°48.42′N	155°59.02′E	5300		*1 RCM11, 2 CM, 1 3D-ACM*
M3	MOR	091704	2314	RE	30°47.93′N	155°58.36′E	5356		*Transmitter 40.200MHz, A/R 3A*
M4	MOR	091804	0242	BE	30°18.13′N	155°16.76′E	5669		*2 RCM11, 3 CM, 1 3D-ACM, 2 MicroCAT*
M4	MOR	091804	0411	DE	30°18.95′N	155°18.41′E	5659		*Transmitter 43.528MHz, A/R 3F*
C032	ROS	091804	0800	BE	29°48.04′N	154°43.75′E	5741		LADCP
C032	ROS	091804	0943	BO	29°48.21′N	154°43.83′E	5735	5945	1-6 *SBE9p400 CTDO*
C032	ROS	091804	1124	EN	29°48.37′N	154°43.63′E	5743		
C033	ROS	091804	1346	BE	29°30.07′N	154°19.73′E	5768		LADCP
C033	ROS	091804	1534	BO	29°30.74′N	154°19.59′E	5777	5964	1-6 *SBE9p400 CTDO*

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C033	ROS	091804	1717	EN	29°31.28′N	154°19.41′E	5764			
C034	ROS	091804	1950	BE	29°12.14′N	153°55.73′E	5807		LADCP	
C034	ROS	091804	2136	BO	29°12.79′N	153°55.50′E	5795	6013	1-6	*SBE9p400 CTDO*
C034	ROS	091804	2320	EN	29°13.15′N	153°55.34′E	5780			
TM05	TMAP	091804	2330	DE	29°13.21′N	153°55.40′E	5782	470	*Turbomap*	
M5	MOR	091904	0234	BE	29°32.32′N	154°21.77′E	5766	*1 RCM11, 4 CM, 1 3D-ACM, 1 MicroCAT*		
M5	MOR	091904	0351	DE	29°33.10′N	154°24.39′E	5767	*6 MnFiber, Transmitter 43.528MHz, A/R 3C*		
C035	ROS	091904	0932	BE	28°54.22′N	153°31.70′E	5811		LADCP	
C035	ROS	091904	1118	BO	28°54.41′N	153°31.51′E	5808	6021	1-6	*SBE9p400 CTDO*
C035	ROS	091904	1300	EN	28°54.55′N	153°31.41′E	5807			
C036	ROS	091904	1531	BE	28°36.23′N	153°07.96′E	5574		LADCP	
C036	ROS	091904	1718	BO	28°36.61′N	153°08.03′E	5858	5916	1-6	*SBE9p400 CTDO*
C036	ROS	091904	1858	EN	28°37.07′N	153°07.87′E	5746			
M6	MOR	091904	2218	BE	28°41.69′N	153°15.17′E	5762	*1 RCM11, 4 CM, 1 3D-ACM, 1 MicroCAT*		
M6	MOR	091904	2354	DE	28°43.65′N	153°18.10′E	5780	*Transmitter 43.528MHz, A/R 3E*		
C037	ROS	092004	0439	BE	28°14.84′N	152°39.52′E	5858		LADCP	
C037	ROS	092004	0633	BO	28°15.35′N	152°39.33′E	5854	6047	1-6	*SBE9p400 CTDO*
C037	ROS	092004	0833	EN	28°15.67′N	152°39.51′E	5852			
C038	ROS	092004	1102	BE	27°56.91′N	152°16.00′E	4780		LADCP	
C038	ROS	092004	1244	BO	27°57.05′N	152°16.16′E	5110	5030	1-6	*SBE9p400 CTDO*
C038	ROS	092004	1413	EN	27°57.24′N	152°16.24′E	5015			
C039	ROS	092004	1641	BE	27°39.11′N	151°52.27′E	5769		LADCP	
C039	ROS	092004	1828	BO	27°39.73′N	151°52.02′E	5734	5985	1-6	*SBE9p400 CTDO*
C039	ROS	092004	2014	EN	27°40.22′N	151°52.18′E	5803			
M7	MOR	092004	2238	BE	27°53.93′N	152°08.59′E	5906	*1 RCM11, 4 CM, 1 3D-ACM, 1 MicroCAT*		
M7	MOR	092104	0018	DE	27°54.04′N	152°11.86′E	5409	*Transmitter 43.528MHz, A/R 3E*		
C040	ROS	092104	0506	BE	27°21.46′N	151°27.51′E	5584		LADCP	
C040	ROS	092104	0650	BO	27°21.90′N	151°27.13′E	5639	5801	1-6	*SBE9p400 CTDO*
C040	ROS	092104	0832	EN	27°22.61′N	151°26.89′E	5658			
C041	ROS	092104	1058	BE	27°03.27′N	151°03.64′E	5906		LADCP	
C041	ROS	092104	1246	BO	27°03.71′N	151°03.37′E	5905	6130	1-6	*SBE9p400 CTDO*
C041	ROS	092104	1429	EN	27°04.12′N	151°03.23′E	5920			
C042	ROS	092104	1704	BE	26°45.09′N	150°40.21′E	5754		LADCP	
C042	ROS	092104	1849	BO	26°45.62′N	150°40.48′E	5753	5947	1-6	*SBE9p400 CTDO*
C042	ROS	092104	2034	EN	26°46.21′N	150°40.38′E	5750			
M8	MOR	092104	2216	BE	26°47.93′N	150°40.64′E	5734	*1 RCM11, 4 CM, 1 3D-ACM, 1 MicroCAT*		
M8	MOR	092104	2344	DE	26°47.99′N	150°43.97′E	5735	*Transmitter 43.528MHz, A/R 3G*		
M9	MOR	092204	0403	BE	26°15.70′N	149°57.65′E	5836	*3 RCM11, 3 CM, 1 MicroCAT*		
M9	MOR	092204	0516	DE	26°14.91′N	149°59.89′E	5863	*Transmitter 43.528, A/R 3B*		
C043	ROS	092204	0713	BE	26°27.02′N	150°15.72′E	5746		LADCP	
C043	ROS	092204	0856	BO	26°27.35′N	150°15.45′E	5714	5936	1-8	*SBE9p400 CTDO*
C043	ROS	092204	1041	EN	26°27.54′N	150°15.57′E	5710			
C044	ROS	092204	1305	BE	26°08.80′N	149°51.91′E	5793		LADCP	
C044	ROS	092204	1454	BO	26°08.42′N	149°51.95′E	5815	6010	1-6	*SBE9p400 CTDO*
C044	ROS	092204	1634	EN	26°08.54′N	149°51.70′E	5804			
C045	ROS	092204	1852	BE	25°51.05′N	149°28.01′E	5764		LADCP	
C045	ROS	092204	2035	BO	25°51.36′N	149°28.13′E	5762	5957	1-6	*SBE9p400 CTDO*
C045	ROS	092204	2222	EN	25°51.50′N	149°28.05′E	5769			

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M10	MOR	092204	2356	BE	25°41.65′N	149°12.97′E	5661		*2 RCM11, 4 CM, 1 MicroCAT*	
M10	MOR	092304	0143	DE	25°42.11′N	149°16.33′E	5718		*6 MnFiber, Transmitter 43.528MHz, A/R 3D*	
C046	ROS	092304	0311	BE	25°33.17′N	149°03.94′E	5598		LADCP	
C046	ROS	092304	0453	BO	25°33.01′N	149°03.64′E	5586	5772	1-6	*SBE9p400 CTDO*
C046	ROS	092304	0629	EN	25°33.26′N	149°03.34′E	5590			
C047	ROS	092304	0847	BE	25°14.89′N	148°39.82′E	4330		LADCP	
C047	ROS	092304	1014	BO	25°14.94′N	148°39.21′E	4371	4471	1-6	*SBE9p400 CTDO*
C047	ROS	092304	1129	EN	25°14.99′N	148°39.19′E	4371			
C048	ROS	092304	1346	BE	24°56.95′N	148°15.65′E	3774		LADCP	
C048	ROS	092304	1457	BO	24°57.13′N	148°15.41′E	3778	3846	1-6	*SBE9p400 CTDO*
C048	ROS	092304	1604	EN	24°57.29′N	148°15.36′E	3861			
XC19	XCTD	092304	1730	DE	24°45.03′N	147°59.94′E	5709		*TSK XCTD-1*	
C049	CTD	092304	1924	BE	24°33.17′N	147°44.22′E	5713		LADCP	
C049	CTD	092304	2042	BO	24°33.38′N	147°44.34′E	5714	1416		*SBE9p400 CTDO*
C049	CTD	092304	2109	EN	24°33.43′N	147°44.36′E	5714			
C049A	ROS	092304	2112	BE	24°33.44′N	147°44.36′E	5714		LADCP	
C049A	ROS	092304	2253	BO	24°33.62′N	147°44.46′E	5712	5904	1-6	*SBE9p400 CTDO*
C049A	ROS	092404	0035	EN	24°34.00′N	147°44.38′E	5715			
XC20	XCTD	092404	0208	DE	24°21.04′N	147°28.00′E	5729		*TSK XCTD-1*	
C050	ROS	092404	0340	BE	24°08.71′N	147°12.20′E	5752		LADCP	
C050	ROS	092404	0527	BO	24°08.73′N	147°12.14′E	5751	5943	1-6	*SBE9p400 CTDO*
C050	ROS	092404	0707	EN	24°09.01′N	147°12.08′E	5753			
XC21	XCTD	092404	0837	DE	23°57.00′N	146°56.01′E	5771		*TSK XCTD-1*	
C051	ROS	092404	1009	BE	23°44.99′N	146°39.85′E	5801		LADCP	
C051	ROS	092404	1155	BO	23°45.17′N	146°40.01′E	5800	6001	1-6	*SBE9p400 CTDO*
C051	ROS	092404	1339	EN	23°45.22′N	146°40.14′E	5803			
XC22	XCTD	092404	1509	DE	23°32.99′N	146°24.00′E	5814		*TSK XCTD-1*	
C052	ROS	092404	1651	BE	23°21.32′N	146°07.49′E	5798		LADCP	
C052	ROS	092404	1836	BO	23°21.47′N	146°07.29′E	5798	5997	1-6	*SBE9p400 CTDO*
C052	ROS	092404	2021	EN	23°21.96′N	146°07.30′E	5795			
C053	ROS	092404	2243	BE	23°03.10′N	145°43.57′E	6132		LADCP	
C053	ROS	092504	0033	BO	23°03.35′N	145°43.41′E	6128	6354	1-8	*SBE9p400 CTDO*
C053	ROS	092504	0222	EN	23°03.69′N	145°43.51′E	6115			
C054	ROS	092504	0433	BE	22°48.26′N	145°24.11′E	7225		LADCP	
C054	ROS	092504	0628	BO	22°48.68′N	145°24.14′E	7215	6503	1-6	*SBE9p400 CTDO*
C054	ROS	092504	0824	EN	22°49.23′N	145°24.15′E	7186			
C055	ROS	092504	1521	BE	22°32.66′N	145°04.06′E	4876			
C055	ROS	092504	1654	BO	22°32.77′N	145°03.87′E	4884	5034	1-6	*SBE9pDEEP CTDO*
C055	ROS	092504	1820	EN	22°32.93′N	145°03.57′E	4888			
C056	ROS	092504	2027	BE	22°17.83′N	144°43.81′E	4546		LADCP	
C056	ROS	092504	2152	BO	22°18.15′N	144°43.77′E	4547	4649	1-6	*SBE9pDEEP CTDO*
C056	ROS	092504	2312	EN	22°18.37′N	144°43.80′E	4548			
C057	ROS	092604	0115	BE	22°03.02′N	144°24.08′E	3527		LADCP	
C057	ROS	092604	0222	BO	22°03.27′N	144°24.23′E	3520	3567	1-6	*SBE9p400 CTDO*
C057	ROS	092604	0326	EN	22°03.54′N	144°24.21′E	3524			
C058	ROS	092604	0536	BE	21°48.11′N	144°04.35′E	2126		LADCP	
C058	ROS	092604	0621	BO	21°48.44′N	144°04.40′E	2138	2168	1-6	*SBE9p400 CTDO*
C058	ROS	092604	0703	EN	21°48.74′N	144°04.36′E	2159			

STN	TYPE	DATE	GMT	CODE	LATITUDE	LONGITUDE	DEPTH	MAXPR	PARAM/*COMMENT*	
XC23	XCTD	092604	0820	DE	21°36.48′N	143°55.28′E	3503		*TSK XCTD-1*	
XC24	XCTD	092604	0948	DE	21°18.00′N	143°42.38′E	3837		*TSK XCTD-1*	
C059	ROS	092604	1144	BE	21°00.15′N	143°23.90′E	4996		LADCP	
C059	ROS	092604	1317	BO	21°00.40′N	143°23.91′E	4973	5149	1-8	*SBE9p400 CTDO*
C059	ROS	092604	1446	EN	21°00.71′N	143°23.88′E	5034			
XC25	XCTD	092604	1710	DE	20°30.08′N	143°28.86′E	3896		*TSK XCTD-1*	
XC26	XCTD	092604	1907	DE	19°59.95′N	143°33.60′E	3405		*TSK XCTD-1*	
XC27	XCTD	092604	2101	DE	19°29.81′N	143°38.41′E	4126		*TSK XCTD-1*	
XC28	XCTD	092604	2254	DE	19°00.00′N	143°43.25′E	3996		*TSK XCTD-1*	
XC29	XCTD	092704	0048	DE	18°30.07′N	143°47.97′E	4154		*TSK XCTD-1*	
XC30	XCTD	092704	0242	DE	18°00.07′N	143°52.72′E	3454		*TSK XCTD-1*	
XC31	XCTD	092704	0437	DE	17°30.09′N	143°57.35′E	3478		*TSK XCTD-1*	
XC32	XCTD	092704	0630	DE	16°59.95′N	144°02.07′E	3943		*TSK XCTD-1*	

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STN	TYPE	DATE	GMT	CODE	LATITUDE	LONGITUDE	DEPTH	MAXPR	PARAM/*COMMENT*	
C060	ROS	100304	1022	BE	13°51.92′N	145°41.98′E	3543		LADCP	
C060	ROS	100304	1128	BO	13°51.87′N	145°42.01′E	3547	3603	1-6	*SBE9p400 CTDO*
C060	ROS	100304	1228	EN	13°51.82′N	145°41.87′E	3539			
C061	ROS	100304	1421	BE	13°39.90′N	146°00.12′E	4787		LADCP	
C061	ROS	100304	1549	BO	13°39.76′N	146°00.18′E	4795	4969	1-6	*SBE9p400 CTDO*
C061	ROS	100304	1713	EN	13°39.49′N	146°00.12′E	4831			
C062	ROS	100304	1907	BE	13°27.84′N	146°18.05′E	7769		LADCP	
C062	ROS	100304	2059	BO	13°27.90′N	146°18.07′E	7757	6501	1-6	*SBE9p400 CTDO*
C062	ROS	100304	2249	EN	13°27.67′N	146°17.87′E	7794			
C063	ROS	100404	0035	BE	13°15.88′N	146°36.20′E	8976		LADCP	
C063	ROS	100404	0227	BO	13°15.92′N	146°36.31′E	8964	6502	1-6	*SBE9p400 CTDO*
C063	ROS	100404	0416	EN	13°15.52′N	146°36.76′E	8826			
C064	ROS	100404	0602	BE	13°03.98′N	146°54.19′E	6501		LADCP	
C064	ROS	100404	0753	BO	13°03.87′N	146°54.63′E	6484	6504	1-6	*SBE9p400 CTDO*
C064	ROS	100404	0945	EN	13°03.88′N	146°55.02′E	6465			
C065	ROS	100404	1134	BE	12°52.01′N	147°12.33′E	5513		LADCP	
C065	ROS	100404	1312	BO	12°52.02′N	147°12.69′E	5508	5681	1-8	*SBE9p400 CTDO*
C065	ROS	100404	1448	EN	12°52.07′N	147°13.01′E	5502			
C066	ROS	100404	1643	BE	12°40.28′N	147°30.32′E	4788		LADCP	
C066	ROS	100404	1811	BO	12°40.70′N	147°30.65′E	4796	4908	1-6	*SBE9p400 CTDO*
C066	ROS	100404	1940	EN	12°40.85′N	147°30.81′E	4793			
TM06	TMAP	100404	2317	DE	12°40.08′N	148°20.00′E	5393	530	*Turbomap*	
C067	ROS	100504	0013	BE	12°40.18′N	148°19.86′E	5397		LADCP	
C067	ROS	100504	0151	BO	12°40.19′N	148°19.98′E	5394	5566	1-6	*SBE9p400 CTDO*
C067	ROS	100504	0328	EN	12°40.61′N	148°20.07′E	5378			
C068	ROS	100504	0707	BE	12°39.93′N	149°10.05′E	5760		LADCP	
C068	ROS	100504	0852	BO	12°39.84′N	149°10.11′E	5760	5965	1-6	*SBE9p400 CTDO*
C068	ROS	100504	1032	EN	12°39.92′N	149°10.01′E	5762			
C069	ROS	100504	1413	BE	12°40.08′N	150°00.01′E	5866		LADCP	
C069	ROS	100504	1602	BO	12°39.96′N	149°59.90′E	5870	6080	1-6	*SBE9p400 CTDO*
C069	ROS	100504	1749	EN	12°39.92′N	149°59.89′E	5875			
C070	ROS	100504	2121	BE	12°39.98′N	150°50.10′E	5867		LADCP	
C070	ROS	100504	2307	BO	12°40.11′N	150°50.10′E	5872	6078	1-6	*SBE9p400 CTDO*
C070	ROS	100604	0049	EN	12°40.38′N	150°49.84′E	5869			

STN	TYPE	DATE	GMT	CODE	LATITUDE	LONGITUDE	DEPTH	MAXPR	PARAM/*COMMENT*	
C071	ROS	100604	0427	BE	12°40.13′N	151°39.87′E	5848		LADCP	
C071	ROS	100604	0610	BO	12°40.27′N	151°39.78′E	5851	6058	1-6	*SBE9p400 CTDO*
C071	ROS	100604	0755	EN	12°40.58′N	151°40.08′E	5851			
C072	ROS	100604	1134	BE	12°40.06′N	152°29.91′E	5851		LADCP	
C072	ROS	100604	1317	BO	12°40.12′N	152°29.87′E	5854	5987	1-6	*SBE9p400 CTDO*
C072	ROS	100604	1500	EN	12°39.94′N	152°29.80′E	5859			
C073	CTD	100604	1837	BE	12°39.95′N	153°20.00′E	5867		LADCP	
C073	CTD	100604	2022	BO	12°39.82′N	153°20.14′E	5865	6008		*SBE9p400 CTDO*
C073	CTD	100604	2204	EN	12°39.53′N	153°20.06′E	5861			
TM07	TMAP	100604	2222	DE	12°39.42′N	153°19.99′E	5862	500	*Turbomap*	
TM07A	TMAP	100604	2256	DE	12°39.17′N	153°19.79′E	5869	508	*Turbomap*	
C073A	ROS	100604	2345	BE	12°38.77′N	153°19.47′E	5858		LADCP	
C073A	ROS	100704	0131	BO	12°38.62′N	153°19.31′E	5866	5990	1-6	*SBE9p400 CTDO*
C073A	ROS	100704	0313	EN	12°38.54′N	153°19.30′E	5866			
C074	ROS	100704	0704	BE	12°39.99′N	154°09.90′E	5874		LADCP	
C074	ROS	100704	0853	BO	12°39.81′N	154°09.57′E	5873	6074	1-6	*SBE9p400 CTDO*
C074	ROS	100704	1035	EN	12°39.86′N	154°09.28′E	5867			
C075	ROS	100704	1424	BE	12°40.06′N	154°59.73′E	5863		LADCP	
C075	ROS	100704	1611	BO	12°39.98′N	154°59.55′E	5869	6069	1-8	*SBE9p400 CTDO*
C075	ROS	100704	1752	EN	12°40.01′N	154°59.64′E	5864			
C076	ROS	100704	2131	BE	12°40.03′N	155°49.88′E	5855		LADCP	
C076	ROS	100704	2316	BO	12°40.02′N	155°49.82′E	5853	6056	1-6	*SBE9p400 CTDO*
C076	ROS	100804	0057	EN	12°40.15′N	155°49.81′E	5846			
C077	ROS	100804	0442	BE	12°40.09′N	156°39.46′E	4106		LADCP	
C077	ROS	100804	0601	BO	12°40.32′N	156°39.02′E	4132	4176	1-6	*SBE9p400 CTDO*
C077	ROS	100804	0714	EN	12°40.41′N	156°38.83′E	4116			
C078	ROS	100804	1106	BE	12°39.96′N	157°29.89′E	6040		LADCP	
C078	ROS	100804	1253	BO	12°39.94′N	157°29.60′E	6040	6189	1-6	*SBE9p400 CTDO*
C078	ROS	100804	1435	EN	12°40.17′N	157°29.25′E	6042			
C079	ROS	100804	1824	BE	12°39.96′N	158°19.99′E	5728		LADCP	
C079	ROS	100804	2008	BO	12°39.92′N	158°19.87′E	5699	5845	1-6	*SBE9p400 CTDO*
C079	ROS	100804	2146	EN	12°39.98′N	158°19.93′E	5720			
TM08	TMAP	100904	0124	DE	12°40.05′N	159°09.94′E	5687	511	*Turbomap*	
C080	ROS	100904	0225	BE	12°40.07′N	159°09.91′E	5687		LADCP	
C080	ROS	100904	0539	BO	12°40.11′N	159°09.58′E	5688	5870	1-6	*SBE9p400 CTDO*
C080	ROS	100904	0732	EN	12°40.28′N	159°09.33′E	5688			
C081	ROS	100904	1130	BE	12°40.01′N	159°59.85′E	5571		LADCP	
C081	ROS	100904	1310	BO	12°39.98′N	159°59.74′E	0	5744	1-6	*SBE9p400 CTDO*
C081	ROS	100904	1455	EN	12°40.31′N	159°59.44′E	5572			
C082	ROS	100904	1847	BE	12°40.01′N	160°49.76′E	5586		LADCP	
C082	ROS	100904	2033	BO	12°40.07′N	160°49.66′E	0	5755	1-6	*SBE9p400 CTDO*
C082	ROS	100904	2213	EN	12°40.11′N	160°49.45′E	5586			
C083	ROS	101004	0206	BE	12°39.38′N	161°39.74′E	5355		LADCP	
C083	ROS	101004	0346	BO	12°40.07′N	161°39.27′E	0	5519	1-6	*SBE9p400 CTDO*
C083	ROS	101004	0526	EN	12°40.69′N	161°39.10′E	5362			
C084	ROS	101004	0924	BE	12°40.16′N	162°29.61′E	5431		LADCP	
C084	ROS	101004	1100	BO	12°40.21′N	162°29.28′E	0	5289	1-6	*SBE9p400 CTDO*
C084	ROS	101004	1231	EN	12°40.60′N	162°29.33′E	5162			

STN	TYPE	DATE	GMT	CODE	LATITUDE	LONGITUDE	DEPTH	MAXPR	PARAM/*COMMENT*
C085	ROS	101004	1621	BE	12°39.99′N	163°19.83′E	5023		LADCP
C085	ROS	101004	1755	BO	12°40.27′N	163°19.65′E	0	5147	1-6 *SBE9p400 CTDO*
C085	ROS	101004	1931	EN	12°40.64′N	163°19.42′E	4923		
TM09	TMAP	101004	2313	DE	12°40.17′N	164°09.83′E	5198	467	*Turbomap*
C086	ROS	101004	2358	BE	12°40.73′N	164°08.82′E	5201		LADCP
C086	ROS	101104	0140	BO	12°40.94′N	164°08.35′E	0	5346	1-6 *SBE9p400 CTDO*
C086	ROS	101104	0322	EN	12°41.29′N	164°08.13′E	5206		
C087	ROS	101104	0723	BE	12°40.07′N	164°59.74′E	5035		LADCP
C087	ROS	101104	0857	BO	12°40.12′N	164°59.33′E	0	5157	1-6 *SBE9p400 CTDO*
C087	ROS	101104	1026	EN	12°40.15′N	164°59.18′E	5030		
C088	ROS	101104	1419	BE	12°39.98′N	165°49.83′E	4710		LADCP
C088	ROS	101104	1551	BO	12°40.05′N	165°49.26′E	0	4813	1-6 *SBE9p400 CTDO*
C088	ROS	101104	1718	EN	12°40.17′N	165°48.84′E	4740		
C089	ROS	101104	2122	BE	12°39.96′N	166°39.52′E	4674		LADCP
C089	ROS	101104	2247	BO	12°39.81′N	166°39.34′E	0	4785	1-6 *SBE9p400 CTDO*
C089	ROS	101204	0009	EN	12°39.70′N	166°39.30′E	4671		
C090	ROS	101204	0404	BE	12°40.01′N	167°29.78′E	5042		LADCP
C090	ROS	101204	0541	BO	12°40.17′N	167°29.55′E	0	5040	1-6 *SBE9p400 CTDO*
C090	ROS	101204	0718	EN	12°40.40′N	167°29.24′E	4918		
C091	ROS	101204	1118	BE	12°39.97′N	168°19.69′E	4598		LADCP
C091	ROS	101204	1249	BO	12°40.07′N	168°19.60′E	0	4923	1-6 *SBE9p400 CTDO*
C091	ROS	101204	1418	EN	12°40.08′N	168°19.42′E	4745		
C092	ROS	101204	1818	BE	12°39.97′N	169°09.78′E	4971		LADCP
C092	ROS	101204	1954	BO	12°40.28′N	169°09.42′E	0	5107	1-6 *SBE9p400 CTDO*
C092	ROS	101204	2123	EN	12°40.74′N	169°09.07′E	5005		
TM10	TMAP	101304	0033	DE	12°40.03′N	169°49.72′E	5106	472	*Turbomap*
TM11	TMAP	101304	0102	DE	12°39.89′N	169°49.05′E	5065	463	*Turbomap*
TM12	TMAP	101304	0126	DE	12°39.75′N	169°48.48′E	4997	484	*Turbomap*
XC33	XCTD	101304	0129	DE	12°39.73′N	169°48.40′E	4994		*TSK XCTD-1*
TM13	TMAP	101304	0153	DE	12°39.59′N	169°47.88′E	5001	472	*Turbomap*
XC34	XCTD	101304	0157	DE	12°39.57′N	169°47.74′E	5006		*TSK XCTD-1*
TM14	TMAP	101304	0222	DE	12°39.43′N	169°47.27′E	4913	485	*Turbomap*
TM15	TMAP	101304	0250	DE	12°39.27′N	169°46.70′E	4855	504	*Turbomap*
XC35	XCTD	101304	0255	DE	12°39.24′N	169°46.59′E	4846		*TSK XCTD-1*
TM16	TMAP	101304	0317	DE	12°39.15′N	169°46.15′E	4807	495	*Turbomap*
XC36	XCTD	101304	0324	DE	12°39.14′N	169°46.00′E	4788		*TSK XCTD-1*
TM17	TMAP	101304	0345	DE	12°39.16′N	169°45.56′E	4644	480	*Turbomap*
C093	ROS	101304	0431	BE	12°39.15′N	169°44.64′E	4600		LADCP
C093	ROS	101304	0558	BO	12°39.28′N	169°44.39′E	0	4730	1-6 *SBE9p400 CTDO*
C093	ROS	101304	0725	EN	12°39.42′N	169°44.05′E	4586		
C094	ROS	101304	0957	BE	12°43.11′N	170°13.72′E	5042		LADCP
C094	ROS	101304	1120	BO	12°43.12′N	170°13.58′E	0	4488	1-6 *SBE9p400 CTDO*
C094	ROS	101304	1255	EN	12°43.13′N	170°13.31′E	4138		
C095	ROS	101304	1609	BE	12°45.90′N	170°13.99′E	5282		LADCP
C095	ROS	101304	1752	BO	12°45.98′N	170°13.75′E	0	5437	1-6 *SBE9p400 CTDO*
C095	ROS	101304	1947	EN	12°46.35′N	170°13.52′E	5273		
WM1	MOR	101304	2152	BE	12°47.50′N	170°13.57′E	5250		*1 3DACM, 1 RCM11, 1 RCM8, 5 MicroCAT*
WM1	MOR	101304	2250	RE	12°47.36′N	170°12.62′E	5259		*Transponder 13.0kHz/14.5kHz, A/R 1C/1A*

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WM1	MOR	101404	0211	BE	12°45.80′N	170°12.51′E	5258	*2 RCM11, 1 RCM8, 7 MicroCAT, 1 OPTODE*		
WM1	MOR	101404	0344	DE	12°45.90′N	170°14.90′E	5287	*Transponder 13.0kHz/14.5kHz, A/R 1F/1B*		
C096	ROS	101404	0635	BE	13°12.48′N	170°24.59′E	5319		LADCP	
C096	ROS	101404	0813	BO	13°12.58′N	170°24.35′E	0	5471	1-6	*SBE9p400 CTDO*
C096	ROS	101404	1002	EN	13°12.66′N	170°24.19′E	5317			
C097	ROS	101404	1241	BE	13°38.77′N	170°33.36′E	5426		LADCP	
C097	ROS	101404	1430	BO	13°38.91′N	170°33.23′E	0	5590	1-6	*SBE9p400 CTDO*
C097	ROS	101404	1651	EN	13°38.92′N	170°33.30′E	5426			
WM2	MOR	101404	2144	BE	13°39.99′N	170°33.69′E	5426	*1 3DACM, 1 RCM11, 1 RCM8, 5 MicroCAT*		
WM2	MOR	101404	2246	RE	13°39.77′N	170°33.06′E	5430	*Transponder 13.0kHz/15.0kHz, A/R 1H/3E*		
WM2	MOR	101504	0224	BE	13°38.26′N	170°32.04′E	5425	*2 RCM11, 1 RCM8, 8 MicroCAT, 1 OPTODE*		
WM2	MOR	101504	0351	DE	13°38.45′N	170°34.70′E	5426	*Transponder 13.0kHz/15.0kHz, A/R 3D/1C*		
C098	ROS	101504	0646	BE	14°07.37′N	170°44.56′E	5536		LADCP	
C098	ROS	101504	0831	BO	14°07.44′N	170°44.38′E	0	5705	1-6	*SBE9p400 CTDO*
C098	ROS	101504	1025	EN	14°07.36′N	170°44.36′E	5534			
C099	ROS	101504	1301	BE	14°33.93′N	170°54.57′E	5582		LADCP	
C099	ROS	101504	1448	BO	14°34.08′N	170°54.48′E	0	5756	1-8	*SBE9p400 CTDO*
C099	ROS	101504	1705	EN	14°34.65′N	170°54.23′E	5584			
WM3	MOR	101504	2105	BE	14°35.28′N	170°53.09′E	5586	*1 3DACM, 1 RCM11, 1 RCM8, 5 MicroCAT*		
WM3	MOR	101504	2218	RE	14°35.12′N	170°52.13′E	5584	*Transponder 13.0kHz/14.0kHz, A/R 1A/3G*		
WM3	MOR	101604	0227	BE	14°32.43′N	170°53.59′E	5578	*2 RCM11, 1 RCM8, 8 MicroCAT, 1 OPTODE*		
WM3	MOR	101604	0410	DE	14°34.24′N	170°55.30′E	5582	*Transponder 13.0kHz/14.0kHz, A/R 3F/3E*		
C100	ROS	101604	0717	BE	15°02.75′N	171°04.78′E	5579		LADCP	
C100	ROS	101604	0904	BO	15°02.94′N	171°04.34′E	0	5747	1-6	*SBE9p400 CTDO*
C100	ROS	101604	1101	EN	15°03.03′N	171°04.03′E	5566			
C101	ROS	101604	1354	BE	15°31.30′N	171°14.90′E	5518		LADCP	
C101	ROS	101604	1542	BO	15°31.37′N	171°14.50′E	0	5694	1-6	*SBE9p400 CTDO*
C101	ROS	101604	1756	EN	15°31.39′N	171°13.99′E	5515			
WM4	MOR	101604	2111	BE	15°30.23′N	171°13.63′E	5522	*1 3DACM, 1 RCM11, 1 RCM8, 5 MicroCAT*		
WM4	MOR	101604	2211	RE	15°29.91′N	171°12.83′E	5513	*Transponder 13.0kHz/13.5kHz, A/R 1D/1B*		
WM4	MOR	101704	0221	BE	15°29.72′N	171°13.93′E	5520	*2 RCM11, 1 RCM8, 8 MicroCAT, 1 OPTODE*		
WM4	MOR	101704	0345	DE	15°31.36′N	171°14.85′E	5520	*Transponder 13.0kHz/13.5kHz, A/R 3C/1F*		
C102	ROS	101704	0639	BE	15°57.66′N	171°24.65′E	5449		LADCP	
C102	ROS	101704	0822	BO	15°57.90′N	171°24.19′E	0	5615	1-6	*SBE9p400 CTDO*
C102	ROS	101704	1014	EN	15°58.05′N	171°24.01′E	5450			
C103	CTD	101704	1251	BE	16°25.95′N	171°32.75′E	5393		LADCP	
C103	CTD	101704	1325	BO	16°26.00′N	171°32.71′E	0	1550		*SBE9p400 CTDO*
C103	CTD	101704	1409	EN	16°26.00′N	171°32.67′E	5386			
C103A	ROS	101704	1553	BE	16°26.00′N	171°32.92′E	5389		LADCP	
C103A	ROS	101704	1733	BO	16°26.03′N	171°32.89′E	0	5546	1-6	*SBE9p400 CTDO*
C103A	ROS	101704	1933	EN	16°26.28′N	171°32.60′E	5388			
WM5	MOR	101704	2107	BE	16°24.51′N	171°32.24′E	5374	*1 3DACM, 1 RCM11, 1 RCM8, 5 MicroCAT*		
WM5	MOR	101704	2157	RE	16°24.29′N	171°31.72′E	5370	*Transponder 13.0kHz/14.5kHz, A/R 1E/3G*		
WM5	MOR	101804	0225	BE	16°24.69′N	171°31.81′E	5373	*2 RCM11, 1 RCM8, 7 MicroCAT, 1 OPTODE*		
WM5	MOR	101804	0343	DE	16°26.39′N	171°33.27′E	5385	*Transponder 13.0kHz/14.5kHz, A/R 1C/1D*		
C103B	ROS	101804	0501	BE	16°24.69′N	171°32.42′E	5546		LADCP	
C103B	ROS	101804	0648	BO	16°24.71′N	171°32.35′E	0	5537	1-6	*SBE9p400 CTDO*
C103B	ROS	101804	0843	EN	16°24.73′N	171°32.32′E	5375			

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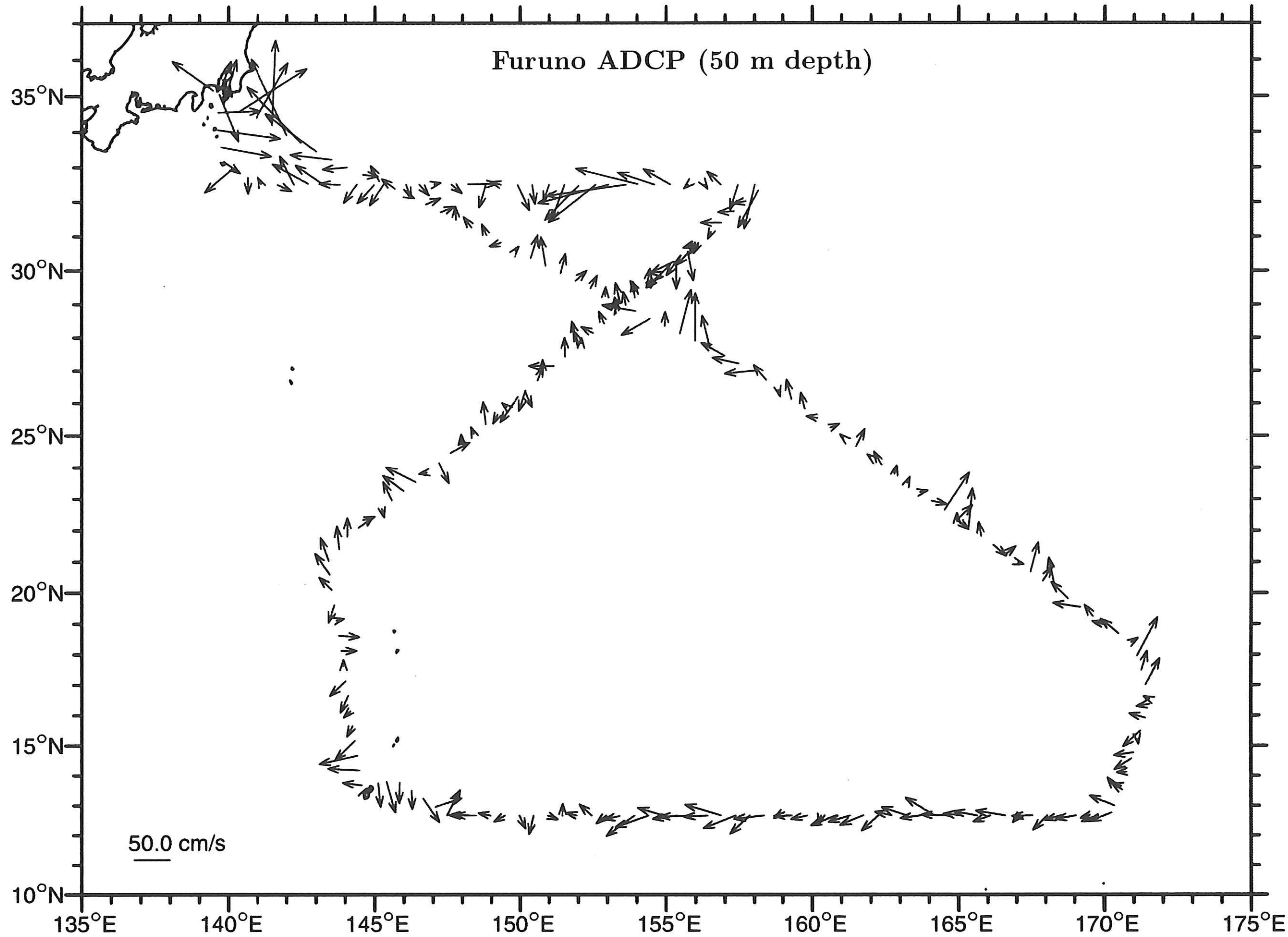
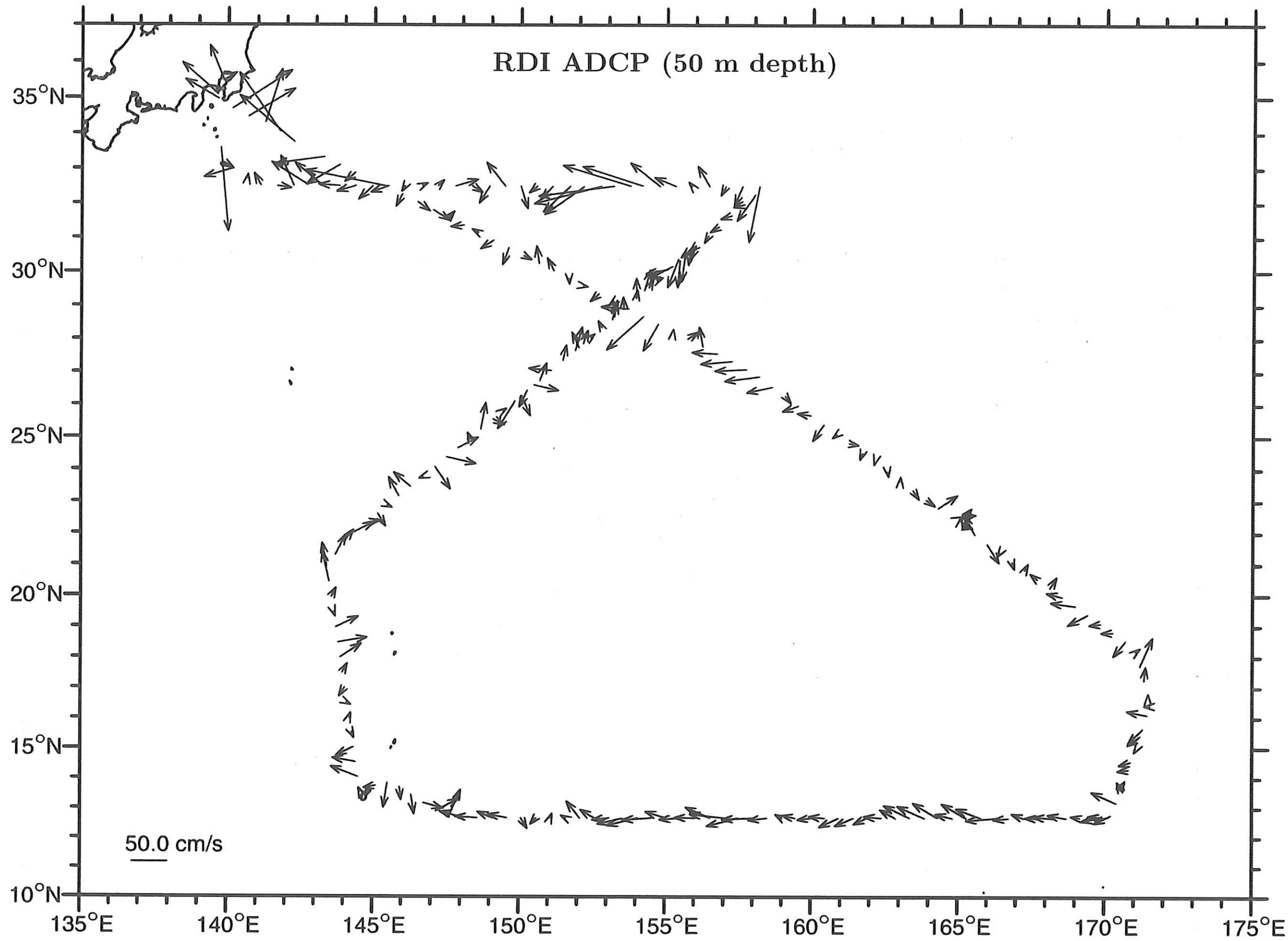
C104	ROS	101804	1012	BE	16°33.02′N	171°32.40′E	4236		LADCP	
C104	ROS	101804	1133	BO	16°32.98′N	171°32.40′E	0	4377	1-6	*SBE9p400 CTDO*
C104	ROS	101804	1307	EN	16°33.07′N	171°32.28′E	4243			
C105	ROS	101804	1717	BE	17°26.82′N	171°16.04′E	3727		LADCP	
C105	ROS	101804	1823	BO	17°26.80′N	171°16.13′E	0	3779	1-6	*SBE9p400 CTDO*
C105	ROS	101804	1933	EN	17°27.26′N	171°15.94′E	3712			
TM18	TMAP	101804	2322	DE	18°20.06′N	170°59.96′E	1638	589	*Turbomap*	
C106	ROS	101904	0012	BE	18°19.87′N	170°59.55′E	1643		LADCP	
C106	ROS	101904	0048	BO	18°19.94′N	170°59.50′E	0	1643	1-6	*SBE9p400 CTDO*
C106	ROS	101904	0127	EN	18°20.02′N	170°59.46′E	1629			
C107	ROS	101904	0613	BE	18°59.99′N	169°59.81′E	5038		LADCP	
C107	ROS	101904	0752	BO	19°00.10′N	169°59.41′E	0	5207	1-6	*SBE9p400 CTDO*
C107	ROS	101904	0922	EN	19°00.12′N	169°59.27′E	5036			
C108	ROS	101904	1407	BE	19°40.24′N	168°59.72′E	5268		LADCP	
C108	ROS	101904	1545	BO	19°40.26′N	168°59.66′E	0	5423	1-6	*SBE9p400 CTDO*
C108	ROS	101904	1722	EN	19°40.32′N	168°59.35′E	5265			
TM19	TMAP	101904	2200	DE	20°20.28′N	167°59.65′E	5270	630	*Turbomap*	
C109	ROS	101904	2246	BE	20°20.31′N	167°59.39′E	5272		LADCP	
C109	ROS	102004	0029	BO	20°20.29′N	167°59.17′E	0	5418	1-6	*SBE9p400 CTDO*
C109	ROS	102004	0214	EN	20°20.13′N	167°58.63′E	5252			
C110	ROS	102004	0713	BE	20°59.90′N	166°59.80′E	5430		LADCP	
C110	ROS	102004	0858	BO	20°59.84′N	166°59.29′E	0	5591	1-6	*SBE9p400 CTDO*
C110	ROS	102004	1034	EN	20°59.29′N	166°58.56′E	5413			
C111	ROS	102004	1542	BE	21°39.88′N	166°00.04′E	5679		LADCP	
C111	ROS	102004	1732	BO	21°39.77′N	166°00.07′E	0	5870	1-6	*SBE9p400 CTDO*
C111	ROS	102004	1948	EN	21°39.49′N	165°59.45′E	5678			
TM20	TMAP	102104	0045	DE	22°19.90′N	164°59.89′E	5484	403	*Turbomap*	
TM21	TMAP	102104	0112	DE	22°19.42′N	164°59.70′E	5492	406	*Turbomap*	
TM22	TMAP	102104	0139	DE	22°19.00′N	164°59.42′E	5504	403	*Turbomap*	
TM23	TMAP	102104	0205	DE	22°18.00′N	164°59.11′E	5508	394	*Turbomap*	
TM24	TMAP	102104	0300	DE	22°17.96′N	164°58.61′E	5505	345	*Turbomap*	
TM25	TMAP	102104	0324	DE	22°17.50′N	164°58.50′E	5643	359	*Turbomap*	
TM26	TMAP	102104	0502	DE	22°19.98′N	164°59.93′E	4934	310	*Turbomap*	
TM27	TMAP	102104	0525	DE	22°19.46′N	164°59.52′E	5494	312	*Turbomap*	
TM28	TMAP	102104	0547	DE	22°18.99′N	164°59.09′E	5507	332	*Turbomap*	
TM29	TMAP	102104	0608	DE	22°18.51′N	164°58.74′E	5510	337	*Turbomap*	
TM30	TMAP	102104	0628	DE	22°18.11′N	164°58.39′E	5510	320	*Turbomap*	
TM31	TMAP	102104	0648	DE	22°17.67′N	164°57.93′E	5510	354	*Turbomap*	
TM32	TMAP	102104	2356	DE	22°20.16′N	165°00.15′E	5474	576	*Turbomap*	
C112	ROS	102204	0042	BE	22°20.19′N	165°00.21′E	5477		LADCP	
C112	ROS	102204	0227	BO	22°20.54′N	165°00.14′E	0	5647	1-6	*SBE9p400 CTDO*
C112	ROS	102204	0412	EN	22°20.64′N	165°00.14′E	5480			
C113	ROS	102204	0917	BE	22°59.88′N	164°00.05′E	5703		LADCP	
C113	ROS	102204	1114	BO	22°59.96′N	164°00.19′E	5708	5832	1-6	*SBE9p400 CTDO*
C113	ROS	102204	1254	EN	22°59.65′N	163°59.98′E	5705			
C114	ROS	102204	1805	BE	23°40.01′N	162°59.93′E	5320		LADCP	
C114	ROS	102204	1944	BO	23°40.16′N	162°59.79′E	5282	5411	1-6	*SBE9p400 CTDO*
C114	ROS	102204	2123	EN	23°40.23′N	162°59.48′E	5304			

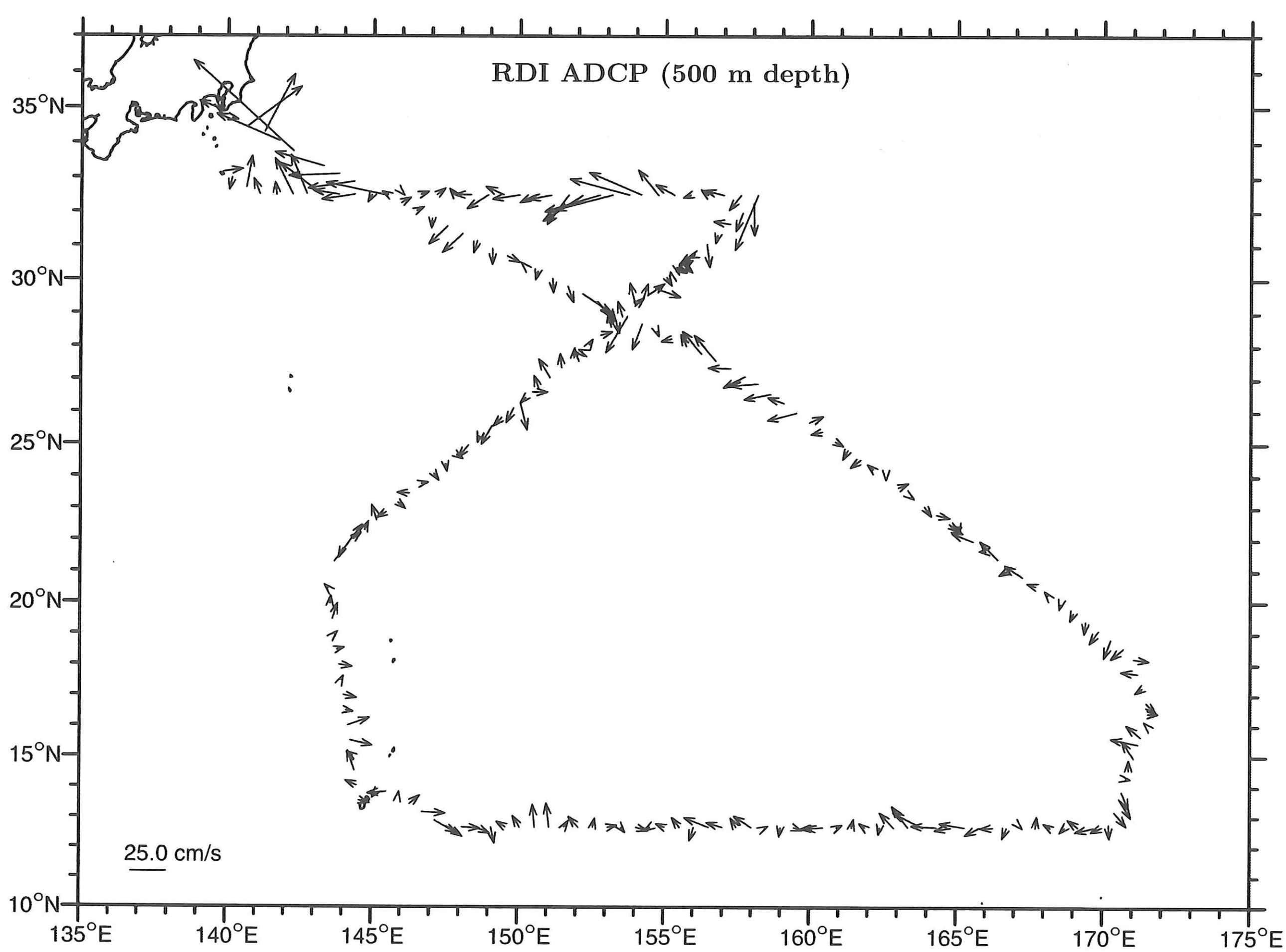
STN	TYPE	DATE	GMT	CODE	LATITUDE	LONGITUDE	DEPTH	MAXPR	PARAM/*COMMENT*	
C115	ROS	102304	0210	BE	24°20.09′N	161°59.66′E	5140		LADCP	
C115	ROS	102304	0344	BO	24°20.33′N	161°59.49′E	5075	5165	1-6	*SBE9p400 CTDO*
C115	ROS	102304	0519	EN	24°20.46′N	161°59.06′E	5044			
C116	ROS	102304	1014	BE	24°59.77′N	160°59.80′E	5634		LADCP	
C116	ROS	102304	1202	BO	24°59.78′N	160°59.53′E	5634	5754	1-6	*SBE9p400 CTDO*
C116	ROS	102304	1342	EN	24°59.86′N	160°59.34′E	5635			
C117	ROS	102304	1831	BE	25°39.81′N	159°59.68′E	5891		LADCP	
C117	ROS	102304	2020	BO	25°39.95′N	159°59.41′E	5894	6030	1-6	*SBE9p400 CTDO*
C117	ROS	102304	2203	EN	25°40.10′N	159°59.07′E	5894			
C118	ROS	102404	0248	BE	26°19.84′N	158°59.92′E	5869		LADCP	
C118	ROS	102404	0433	BO	26°19.99′N	158°59.40′E	5873	6012	1-6	*SBE9p400 CTDO*
C118	ROS	102404	0620	EN	26°20.14′N	158°58.32′E	5871			
C119	ROS	102404	1114	BE	26°59.86′N	157°59.54′E	5695		LADCP	
C119	ROS	102404	1304	BO	26°59.75′N	157°58.60′E	5804	5901	1-6	*SBE9p400 CTDO*
C119	ROS	102404	1452	EN	26°59.83′N	157°57.85′E	5819			
TM33	TMAP	102604	0243	DE	31°10.28′N	148°31.25′E	6093	300	*Turbomap*	
TM34	TMAP	102604	0303	DE	31°10.65′N	148°31.19′E	6096	200	*Turbomap*	
TM35	TMAP	102604	0315	DE	31°10.86′N	148°31.15′E	6090	100	*Turbomap*	
TM36	TMAP	102604	0336	DE	31°11.29′N	148°31.08′E	6101	150	*Turbomap*	
TM37	TMAP	102604	0346	DE	31°11.49′N	148°31.02′E	6100	150	*Turbomap*	

7. Chart of Surface Currents



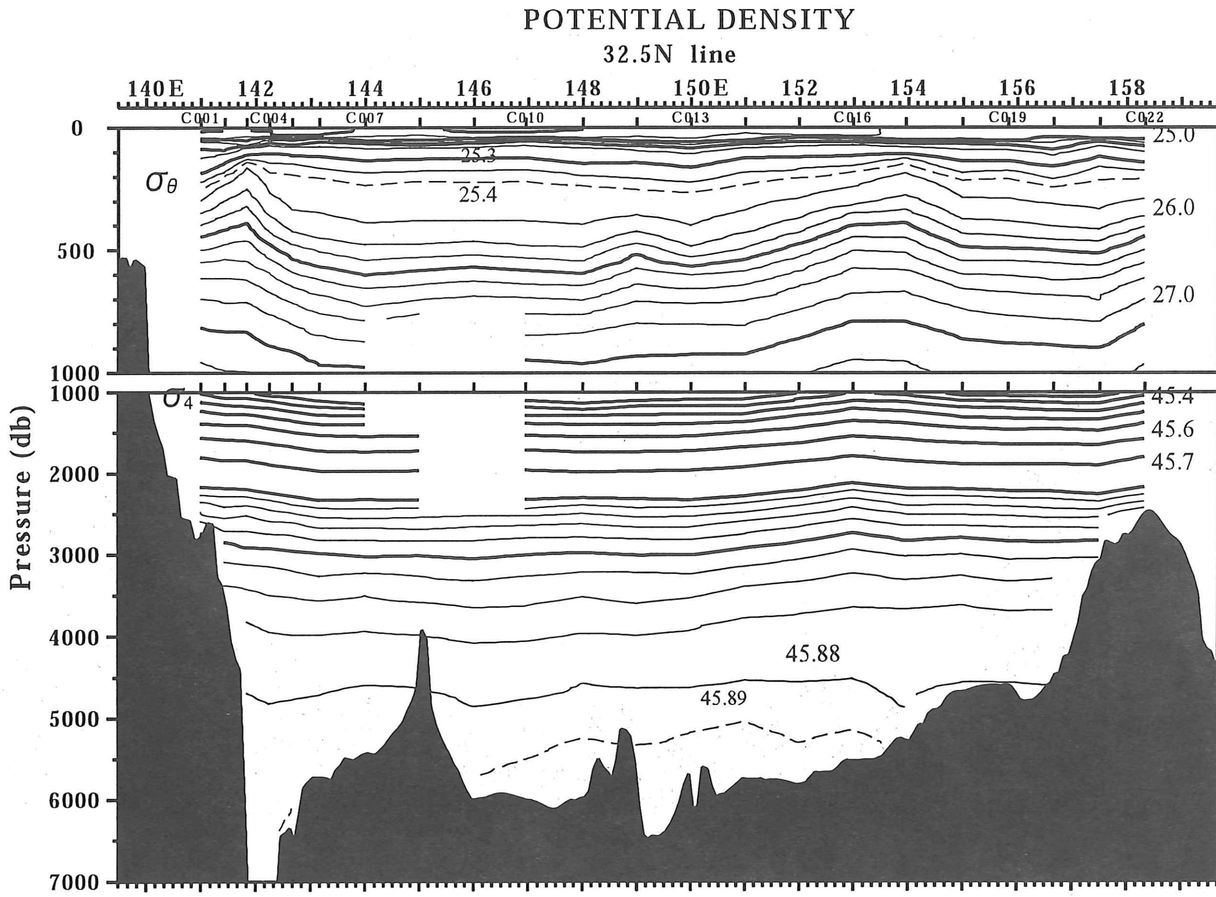


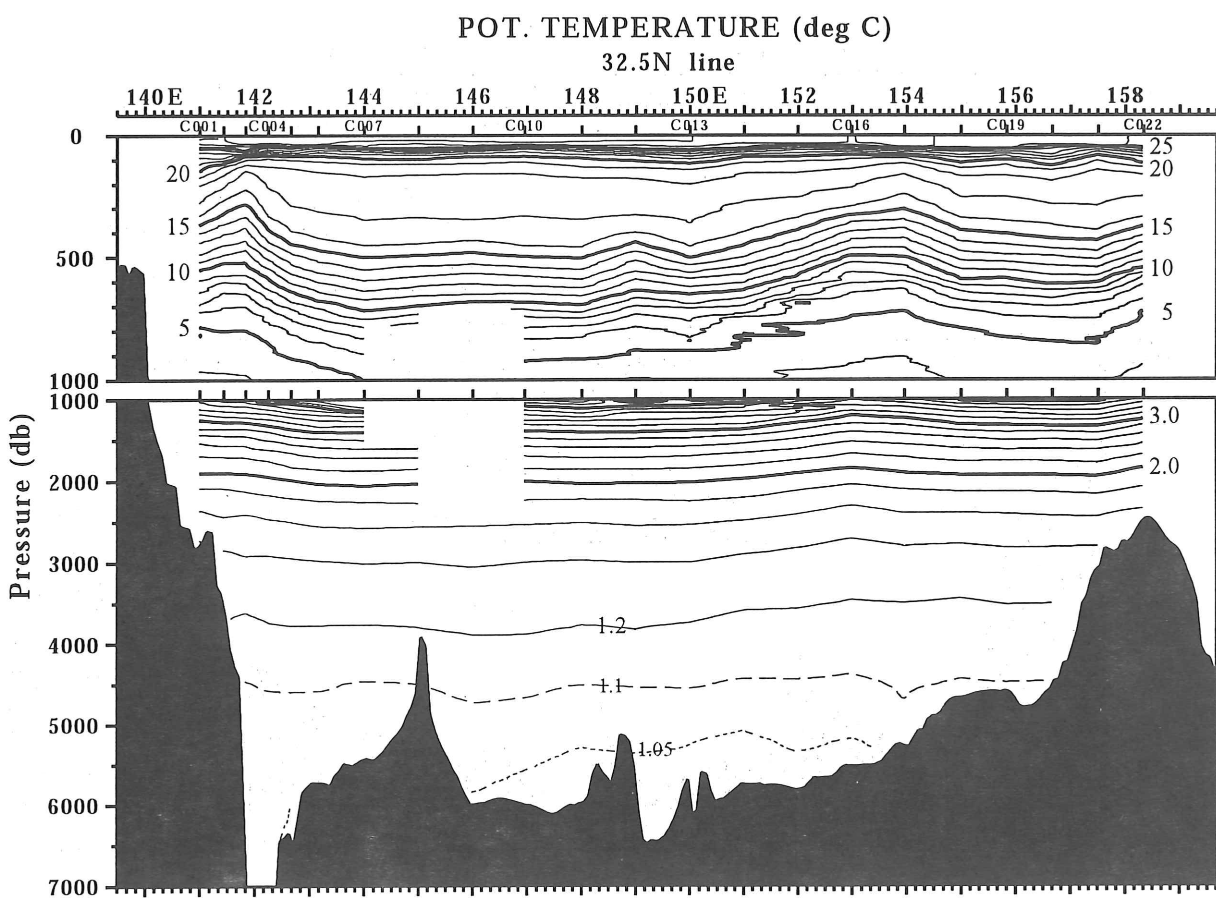
RDI ADCP (50 m depth)
35°N
30°N
25°N
20°N
15°N
10°N
50.0 cm/s
135°E
140°E
145°E
150°E
155°E
160°E
165°E
170°E
175°E



RDI ADCP (500 m depth)
35°N
30°N
25°N
20°N
15°N
10°N
25.0 cm/s
135°E
140°E
145°E
150°E
155°E
160°E
165°E
170°E
175°E

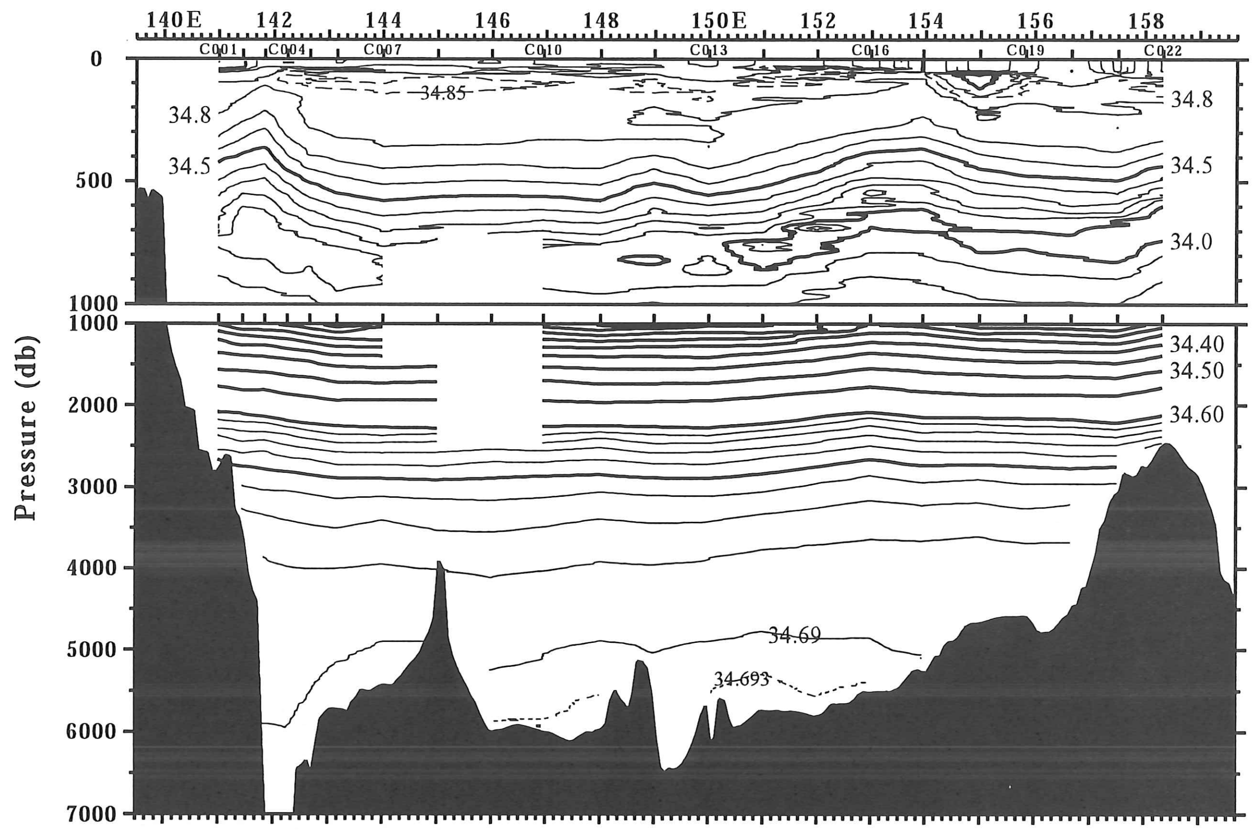
8. Vertical Sections of $CTDO_2$ Data





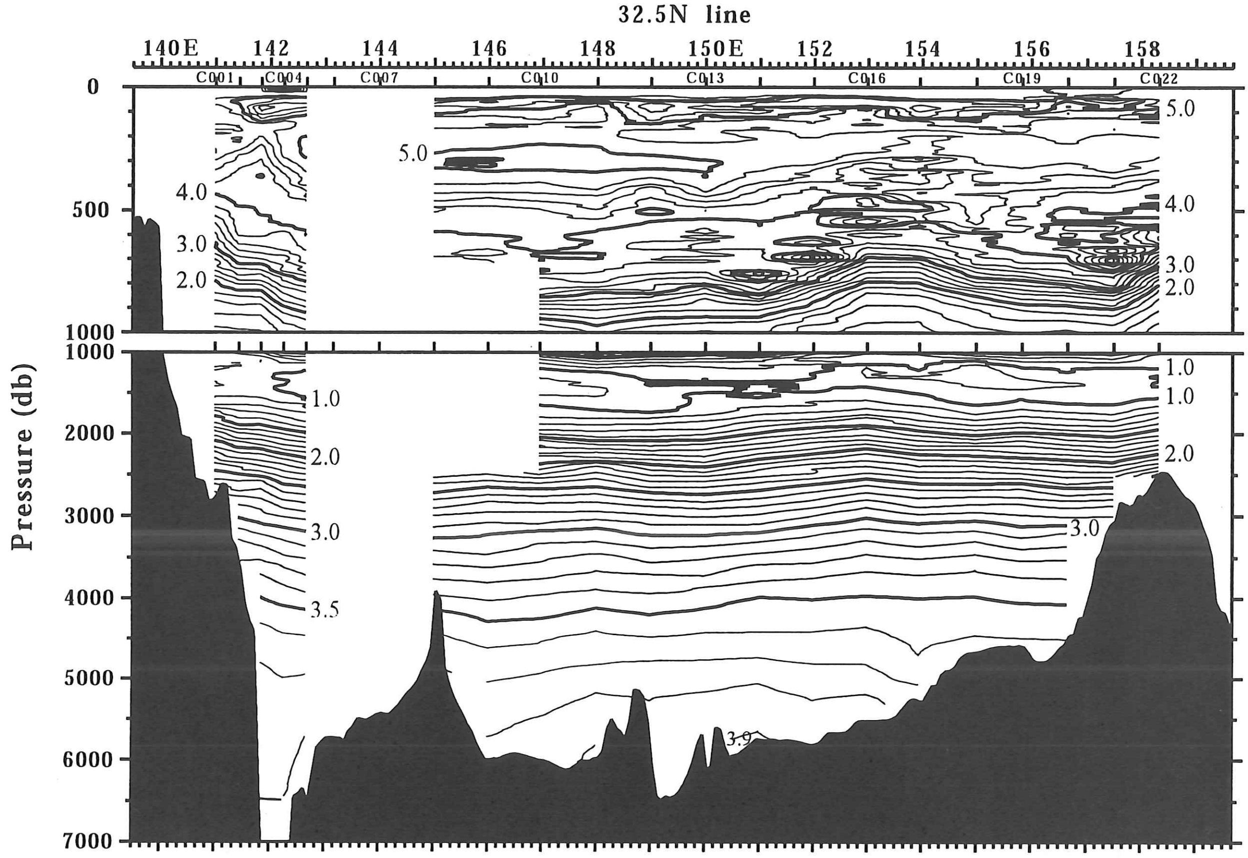
SALINITY (psu)

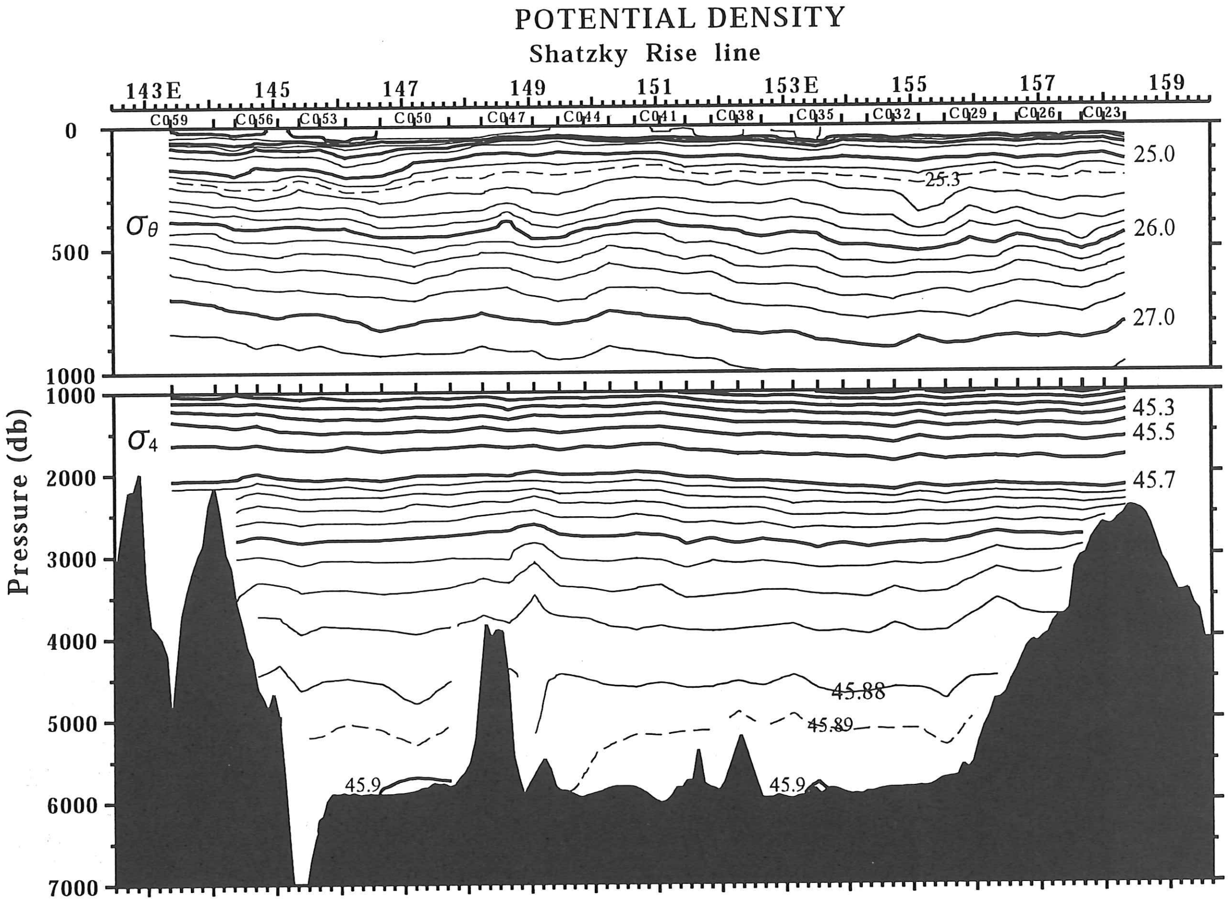
32.5N line

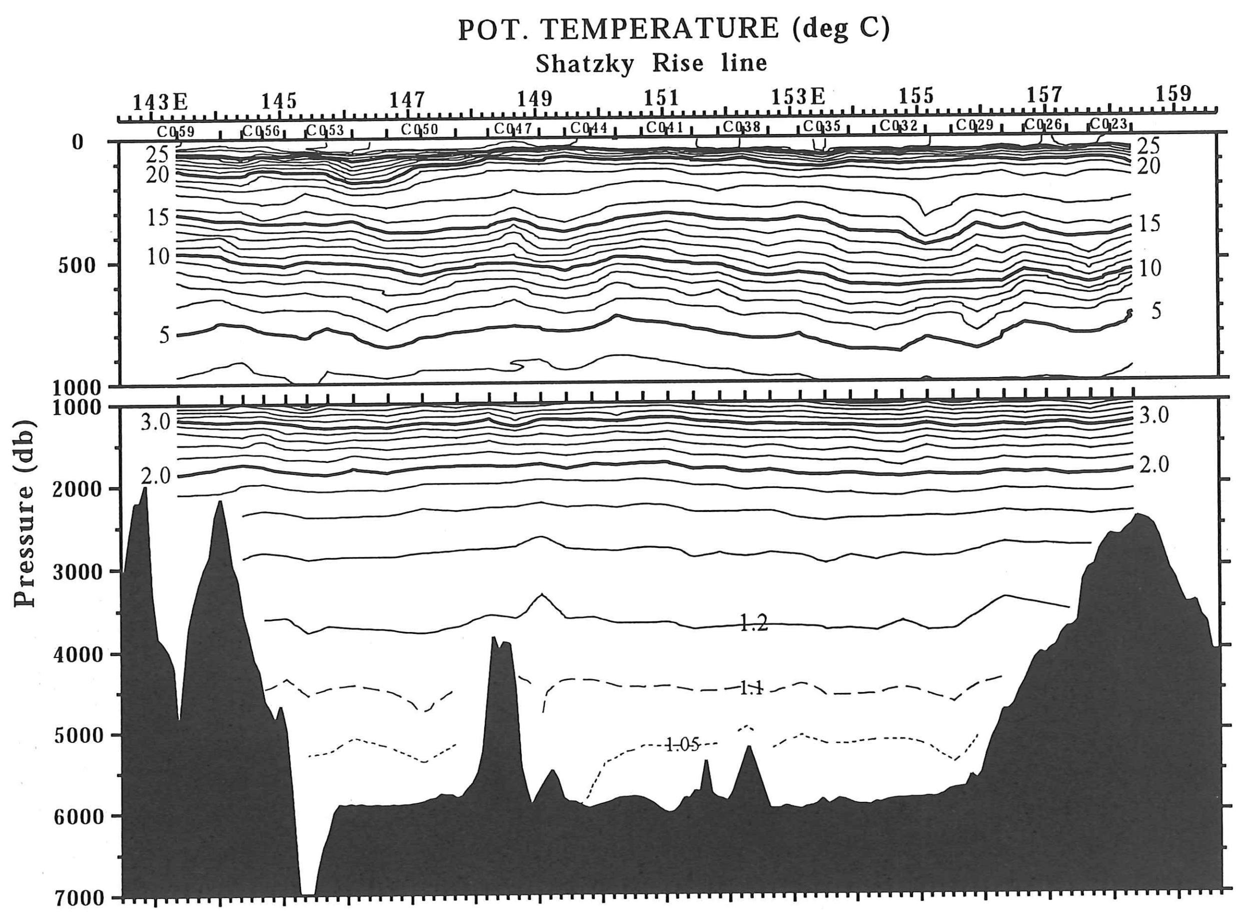


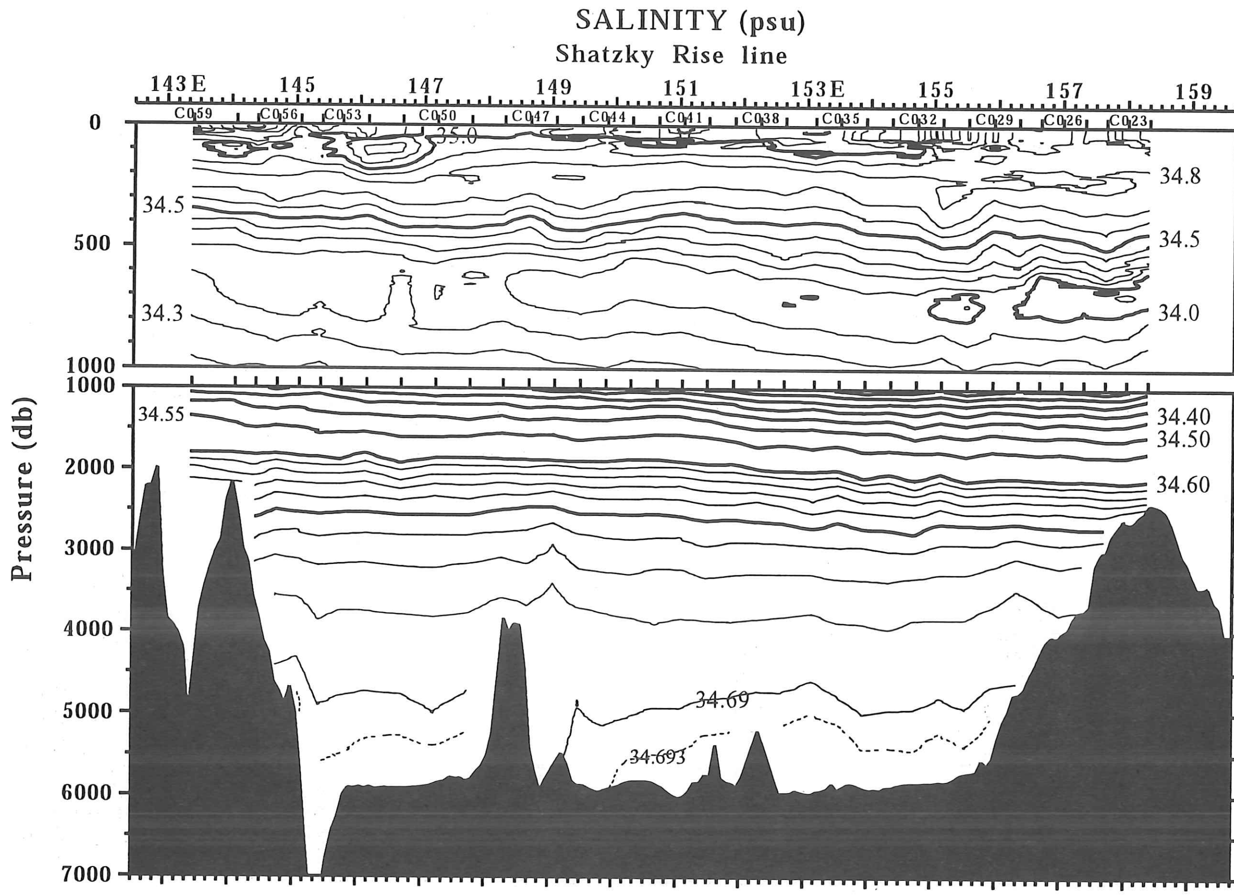
DISSOLVED OXYGEN (ml/l)

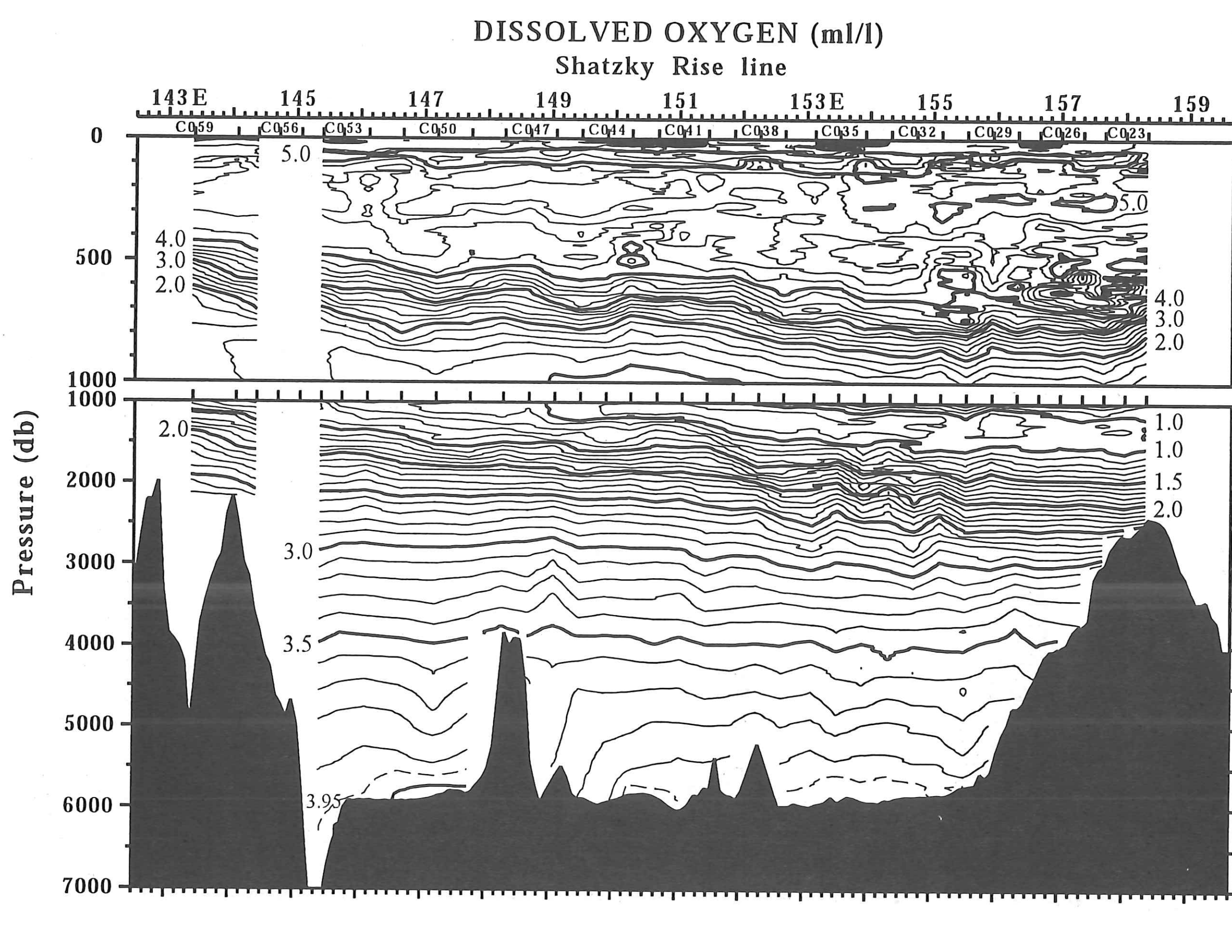
32.5N line

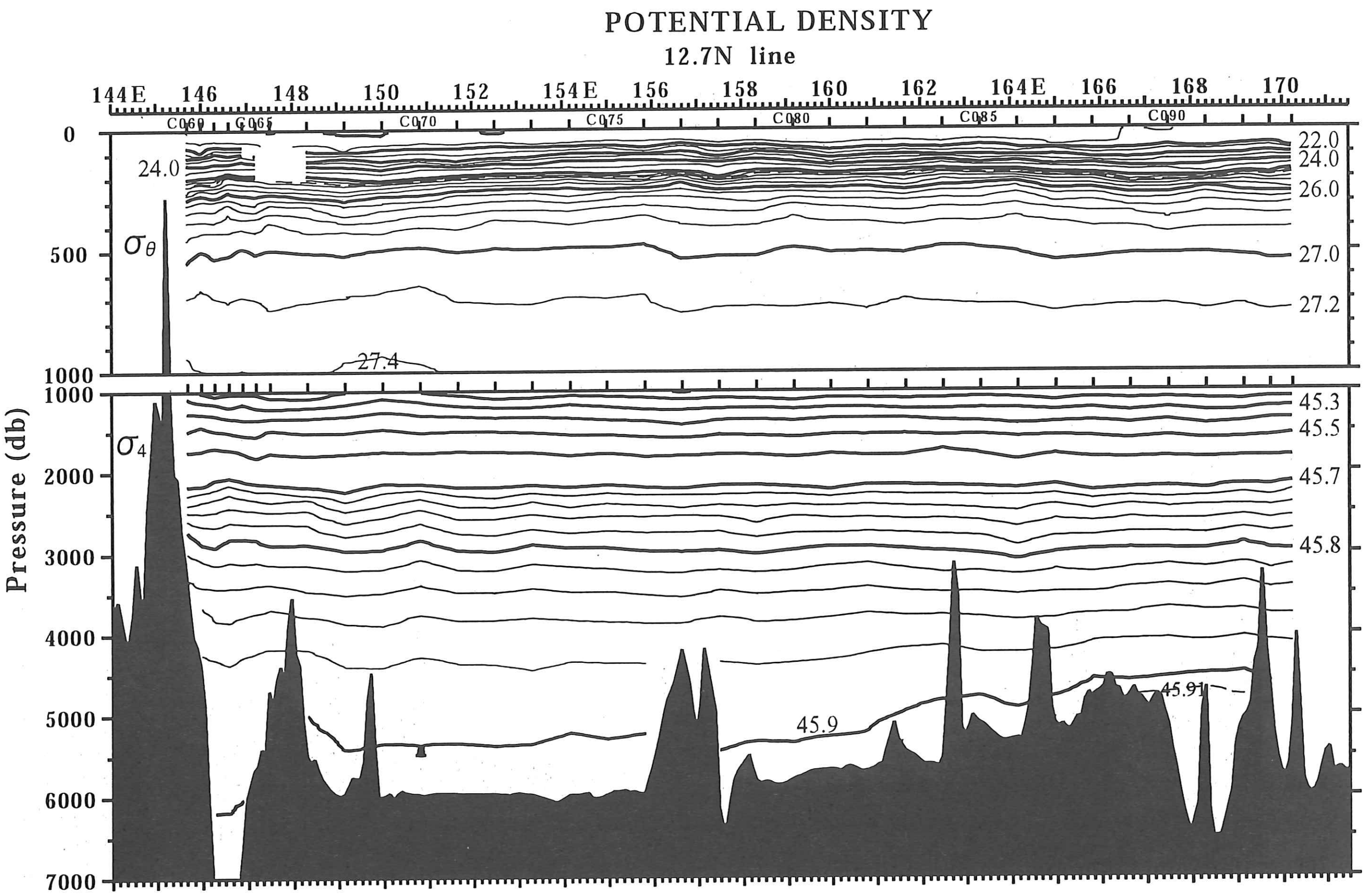


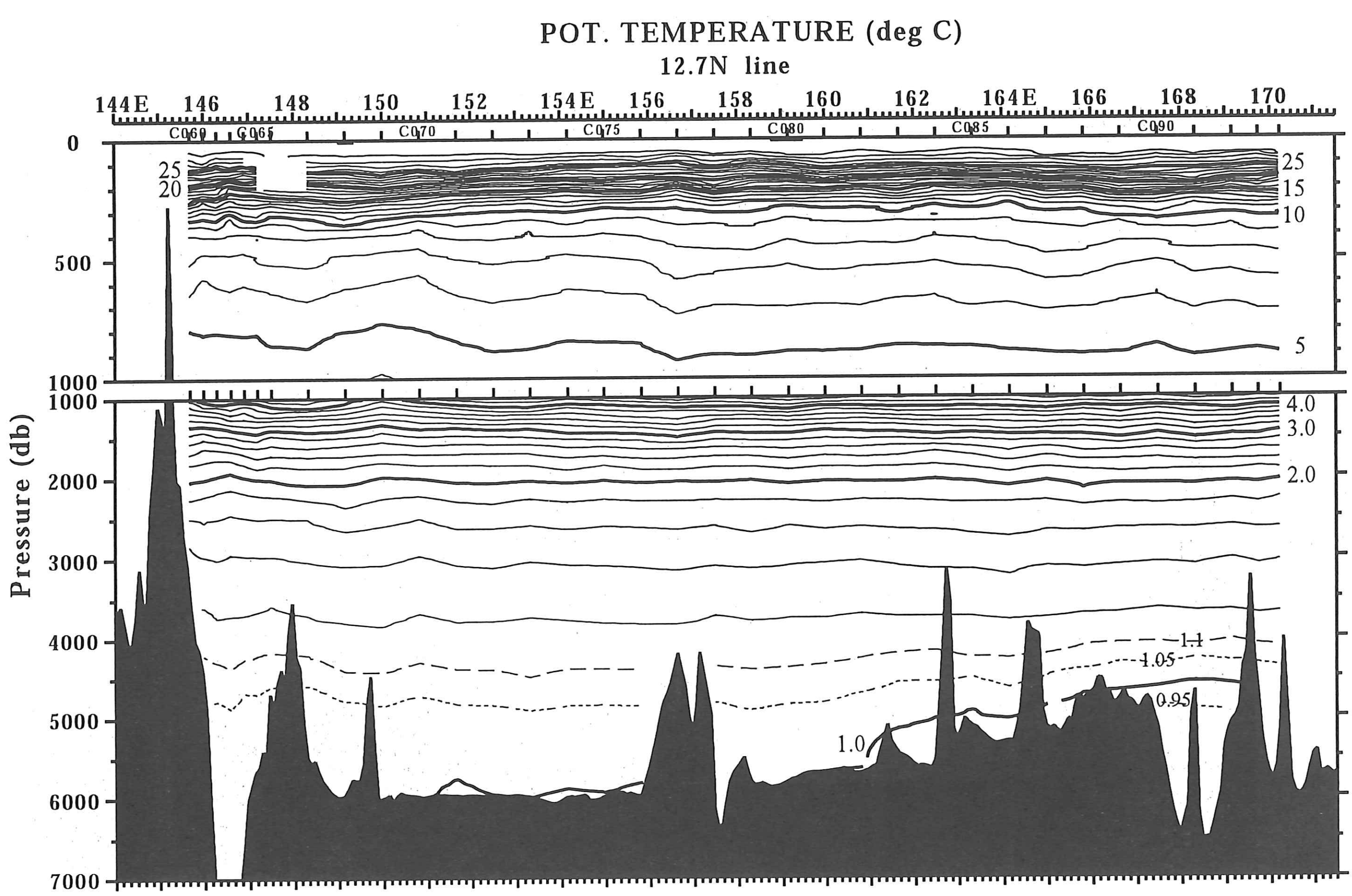

POTENTIAL DENSITY
Shatzky Rise line
143E
145
147
149
151
153E
155
157
159
C059
C056
C053
C050
C047
C044
C041
C038
C035
C032
C029
C026
C023
0
500
1000
2000
3000
4000
5000
6000
7000
Pressure (db)
σθ
σ4
25.0
25.3
26.0
27.0
45.3
45.5
45.7
45.88
45.89
45.9


POT. TEMPERATURE (deg C)
Shatzky Rise line
143E
145
147
149
151
153E
155
157
159
C059
C056
C053
C050
C047
C044
C041
C038
C035
C032
C029
C026
C023
0
500
1000
2000
3000
4000
5000
6000
7000
Pressure (db)
25
20
15
10
5
3.0
2.0
1.2
1.1
1.05

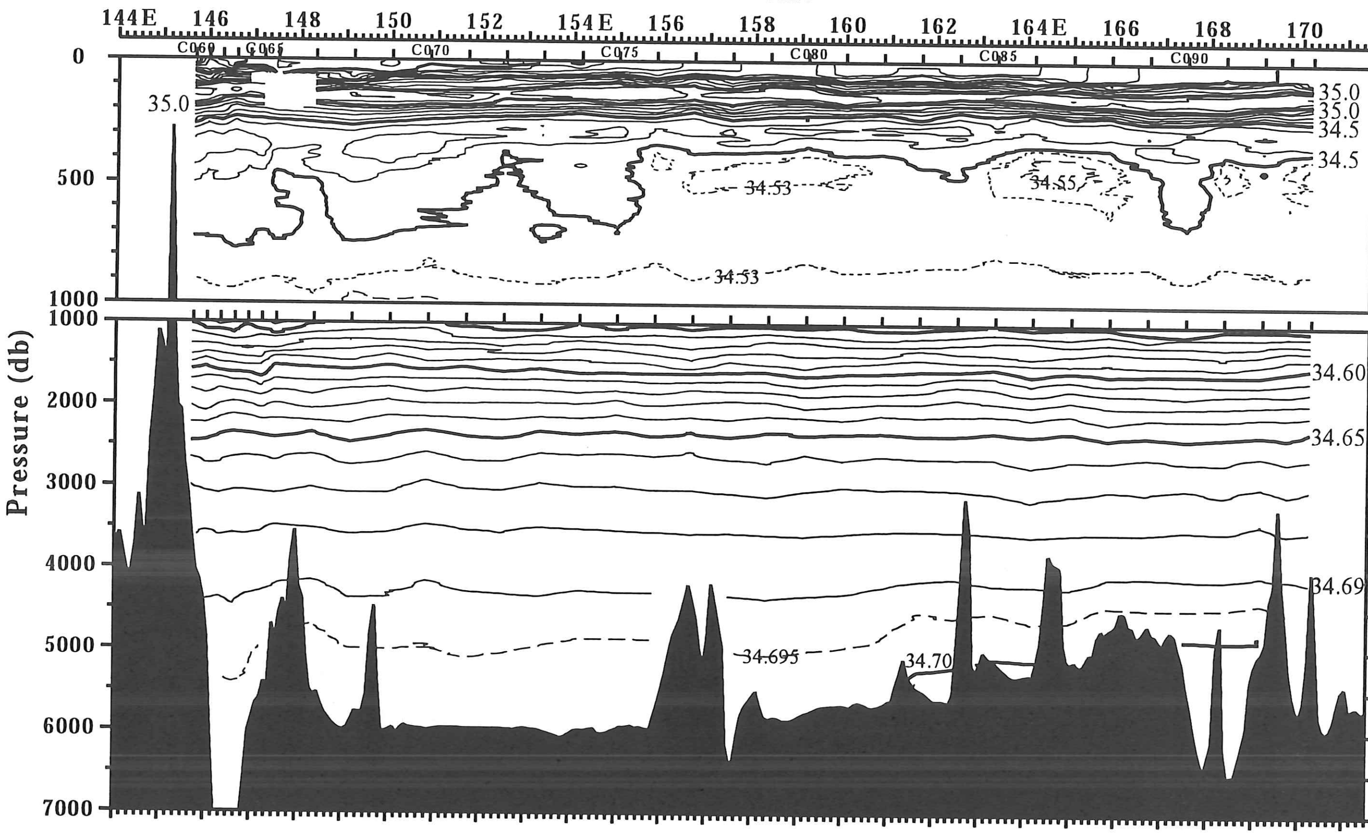

SALINITY (psu)
Shatzky Rise line
143E
145
147
149
151
153E
155
157
159
C059
C056
C053
C050
C047
C044
C041
C038
C035
C032
C029
C026
C023
Pressure (db)
0
500
1000
2000
3000
4000
5000
6000
7000
35.0
34.5
34.3
34.8
34.5
34.0
34.55
34.40
34.50
34.60
34.69
34.693


DISSOLVED OXYGEN (ml/l)
Shatzky Rise line
143E
145
147
149
151
153E
155
157
159
C059
C056
C053
C050
C047
C044
C041
C038
C035
C032
C029
C026
C023
Pressure (db)
0
500
1000
2000
3000
4000
5000
6000
7000
5.0
4.0
3.0
2.0
5.0
4.0
3.0
2.0
2.0
1.0
1.0
1.5
2.0
3.0
3.5
3.95

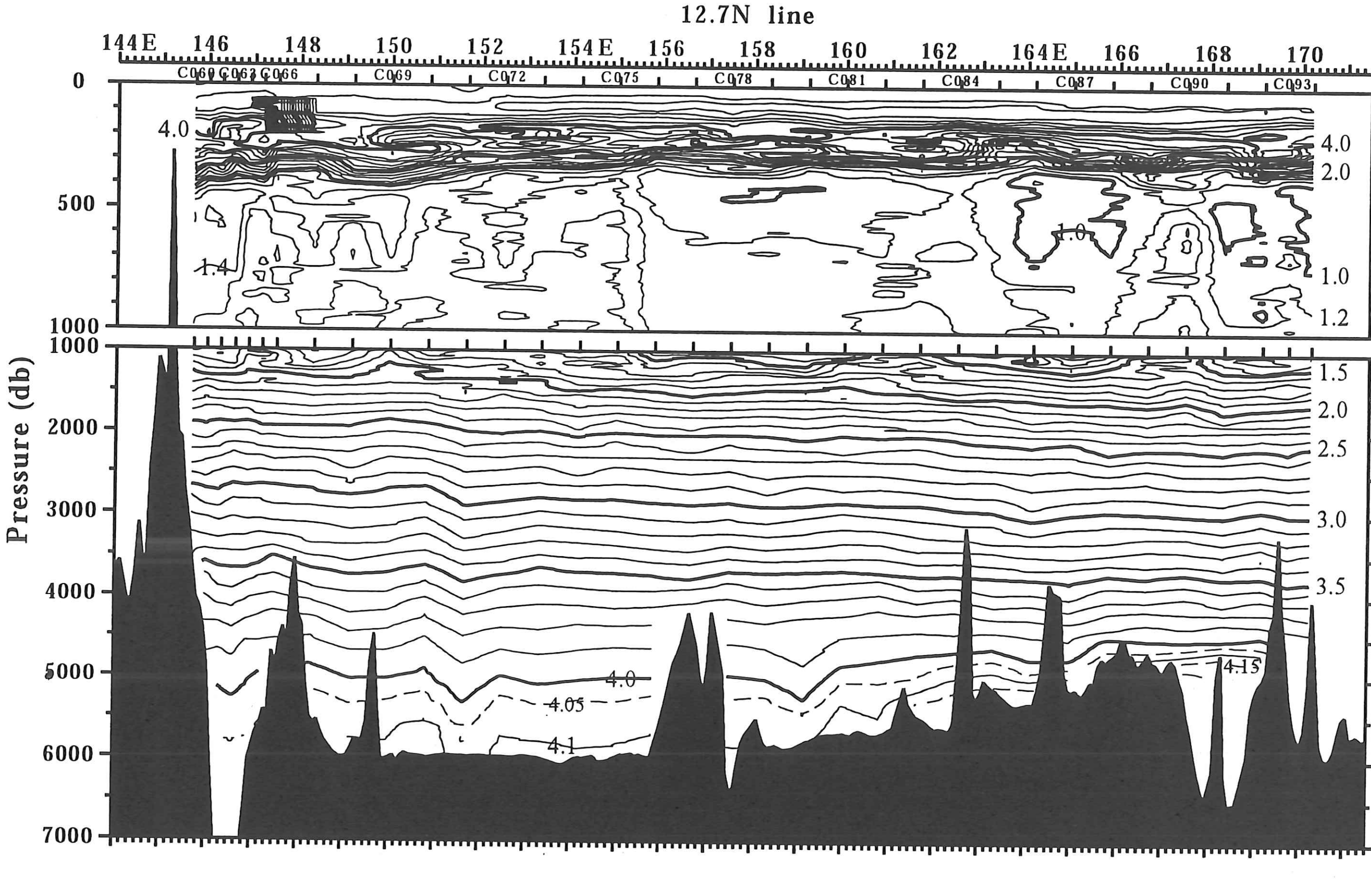

POTENTIAL DENSITY
12.7N line
144E
146
148
150
152
154E
156
158
160
162
164E
166
168
170
Pressure (db)
σ_θ
σ_4
22.0
24.0
26.0
27.0
27.2
27.4
45.3
45.5
45.7
45.8
45.9
45.91


POT. TEMPERATURE (deg C)
12.7N line
144E
146
148
150
152
154E
156
158
160
162
164E
166
168
170
Pressure (db)
25
20
15
10
5
4.0
3.0
2.0
1.1
1.05
1.0
0.95

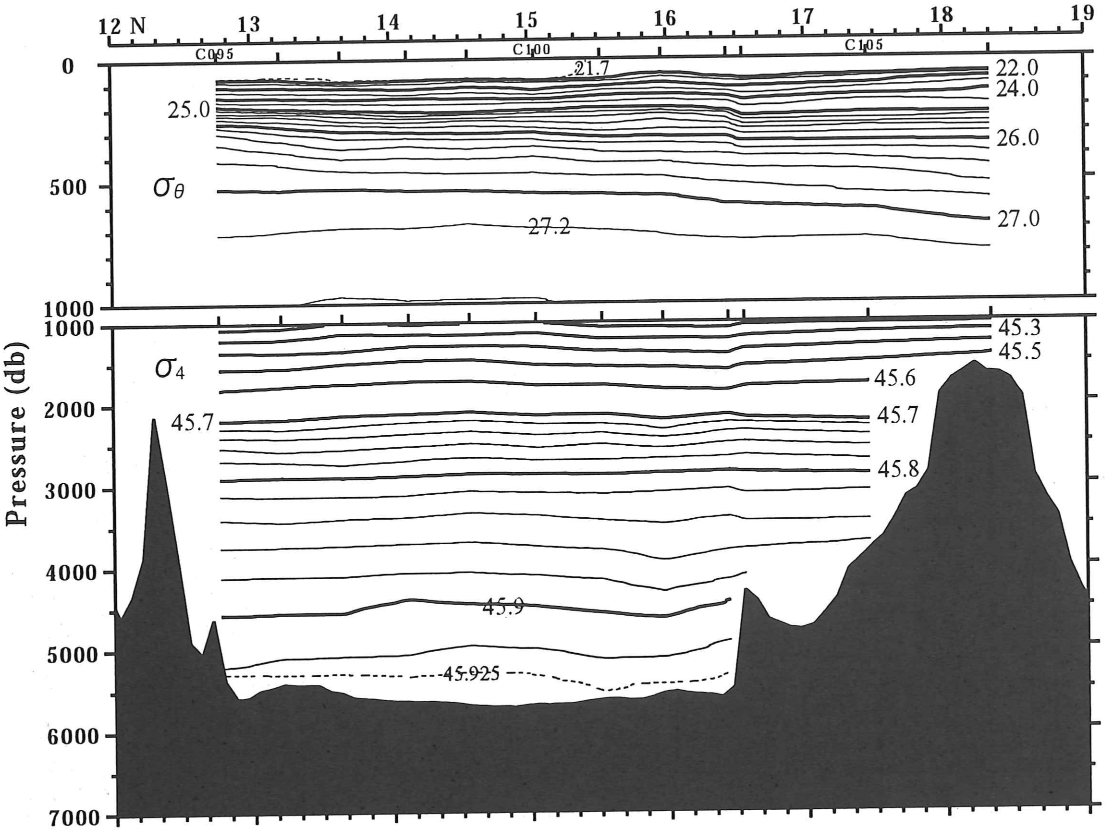
SALINITY (psu)
12.7N line



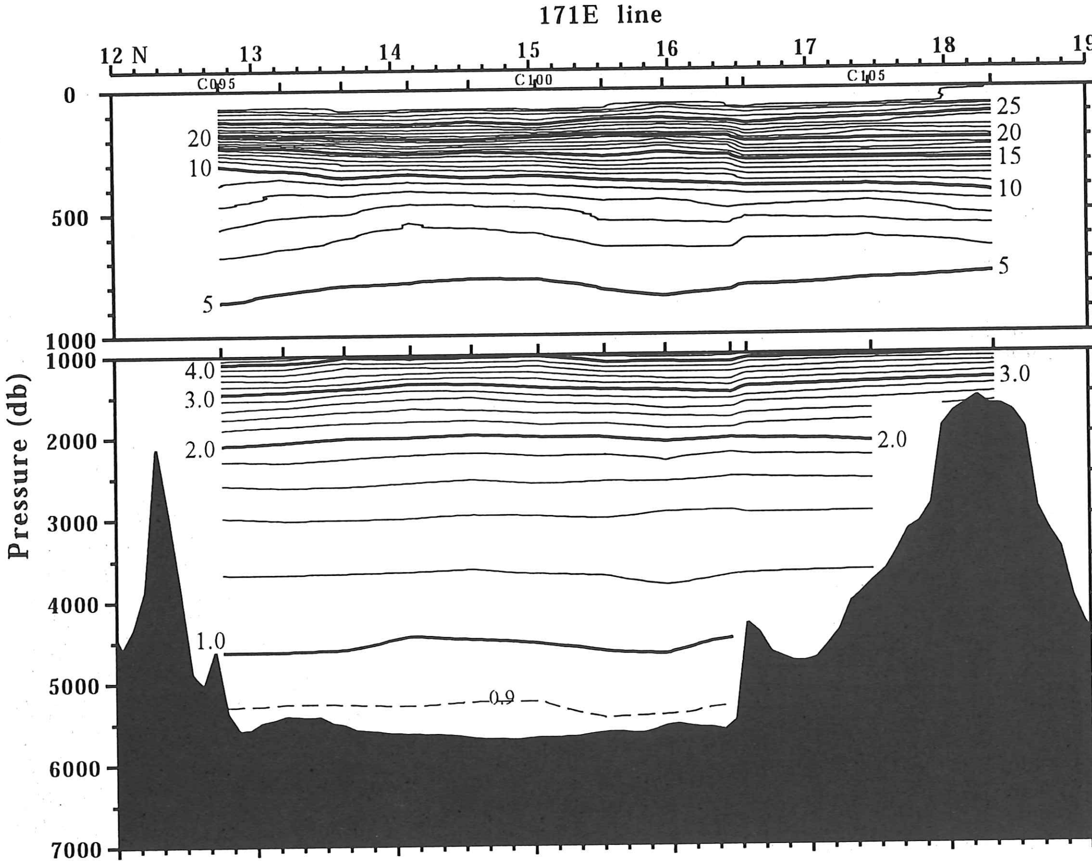
DISSOLVED OXYGEN (ml/l)
12.7N line



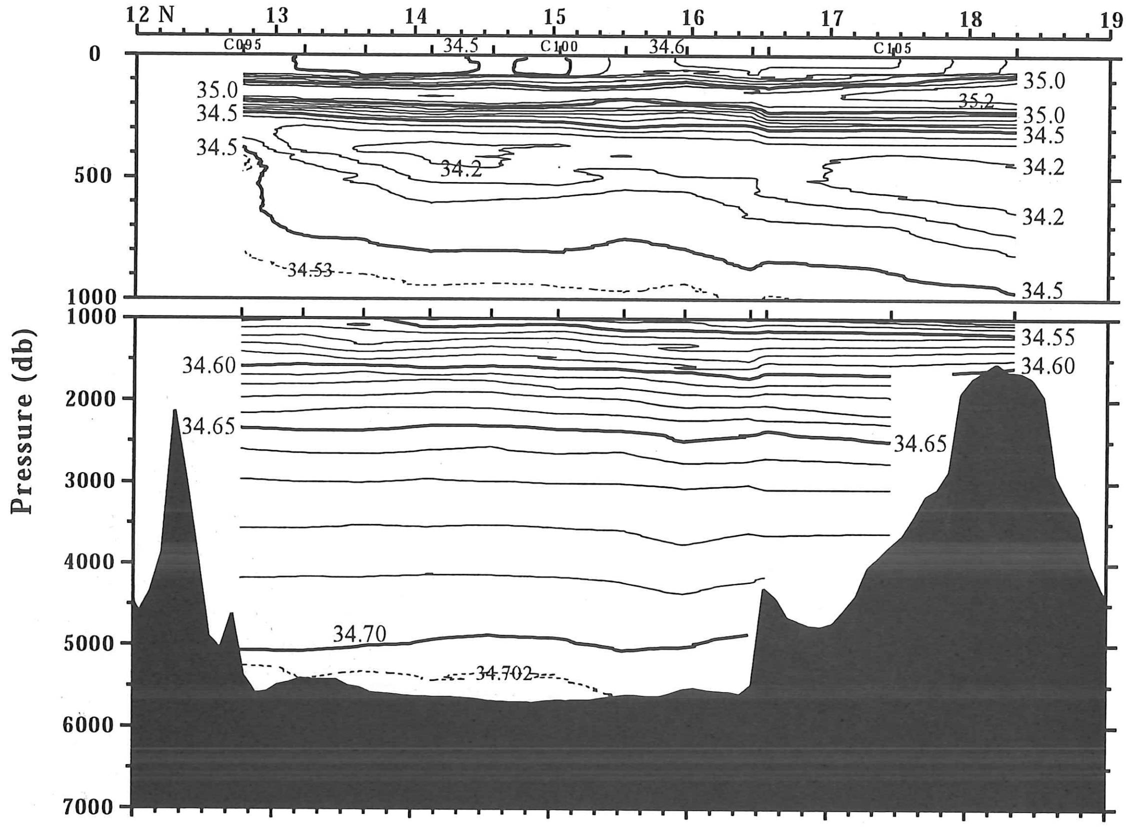
POTENTIAL DENSITY
171E line



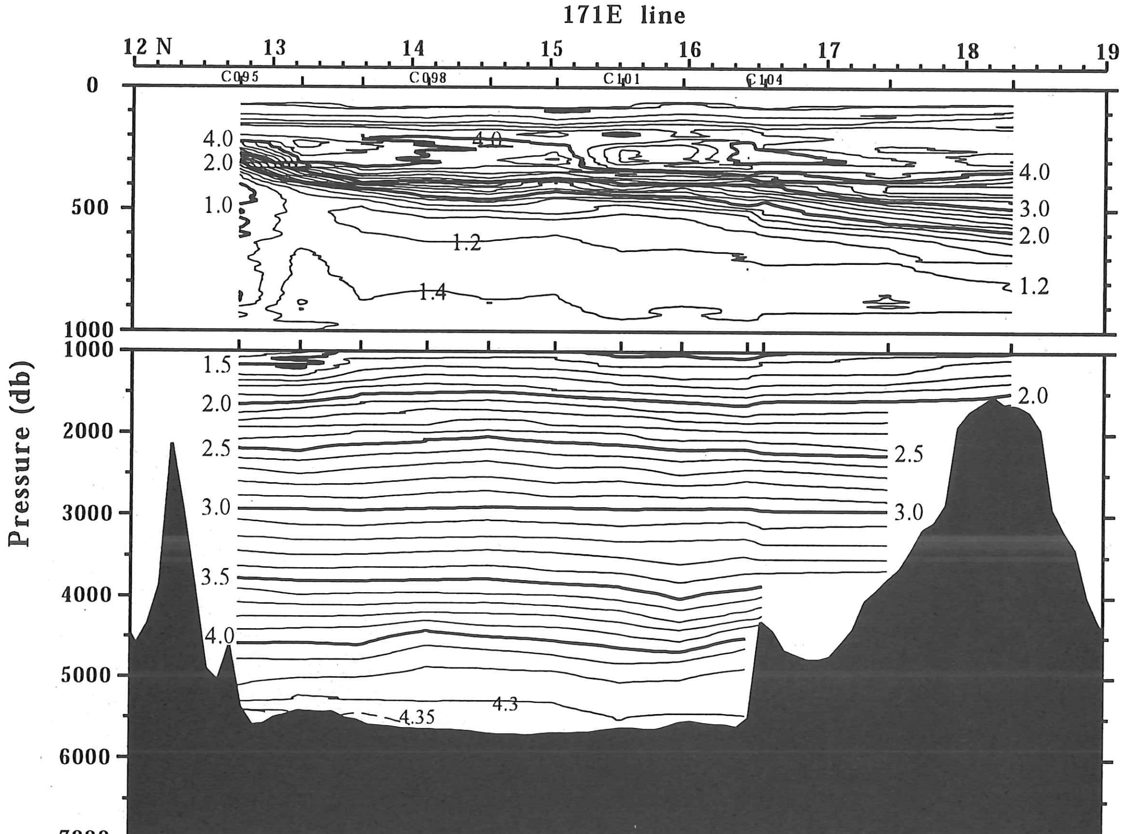
POT. TEMPERATURE (deg C)
171E line



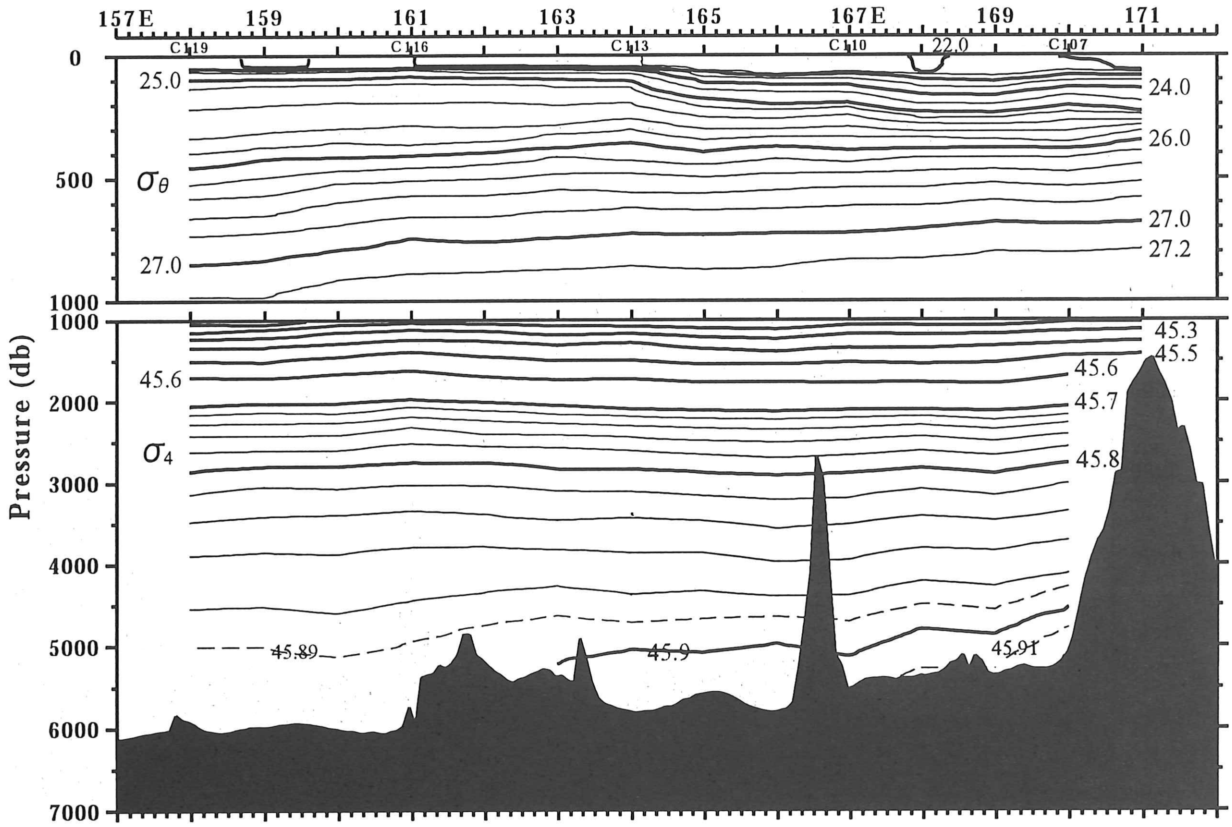
SALINITY (psu)
171E line



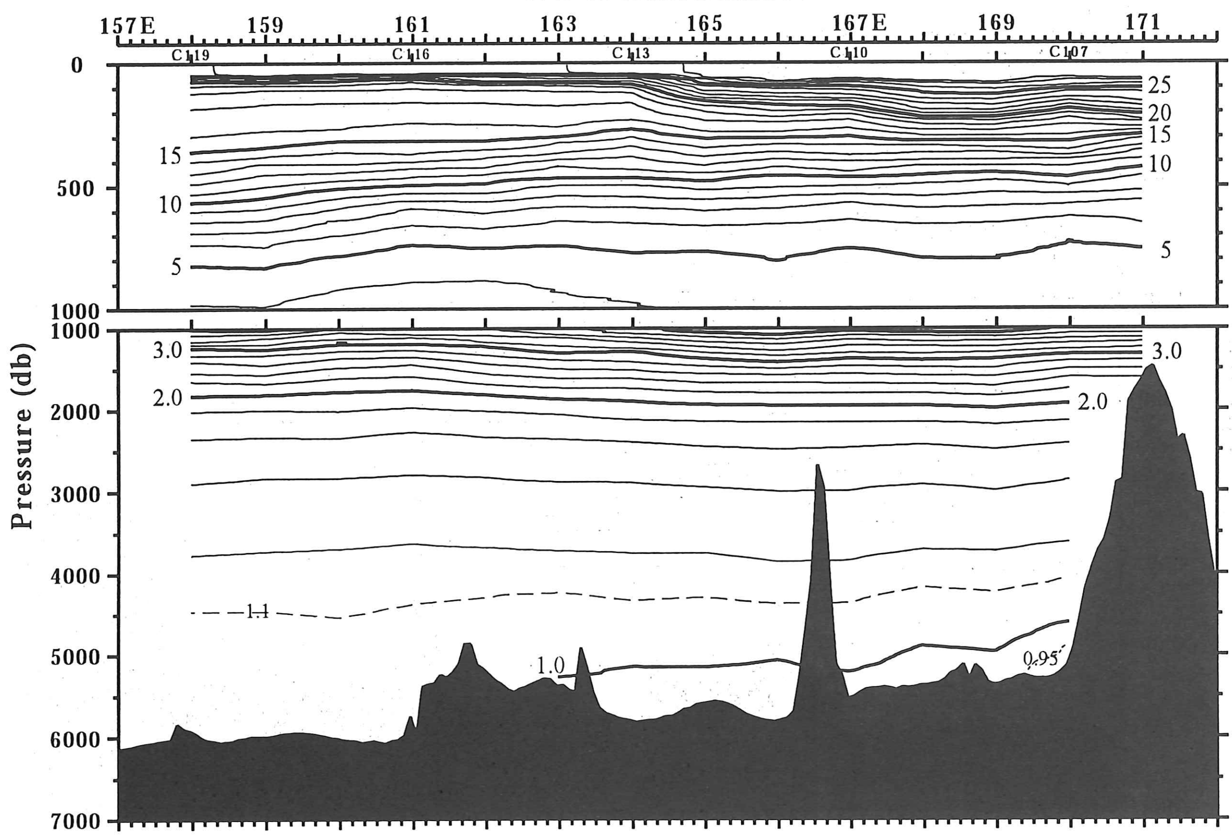
DISSOLVED OXYGEN (ml/l)
171E line

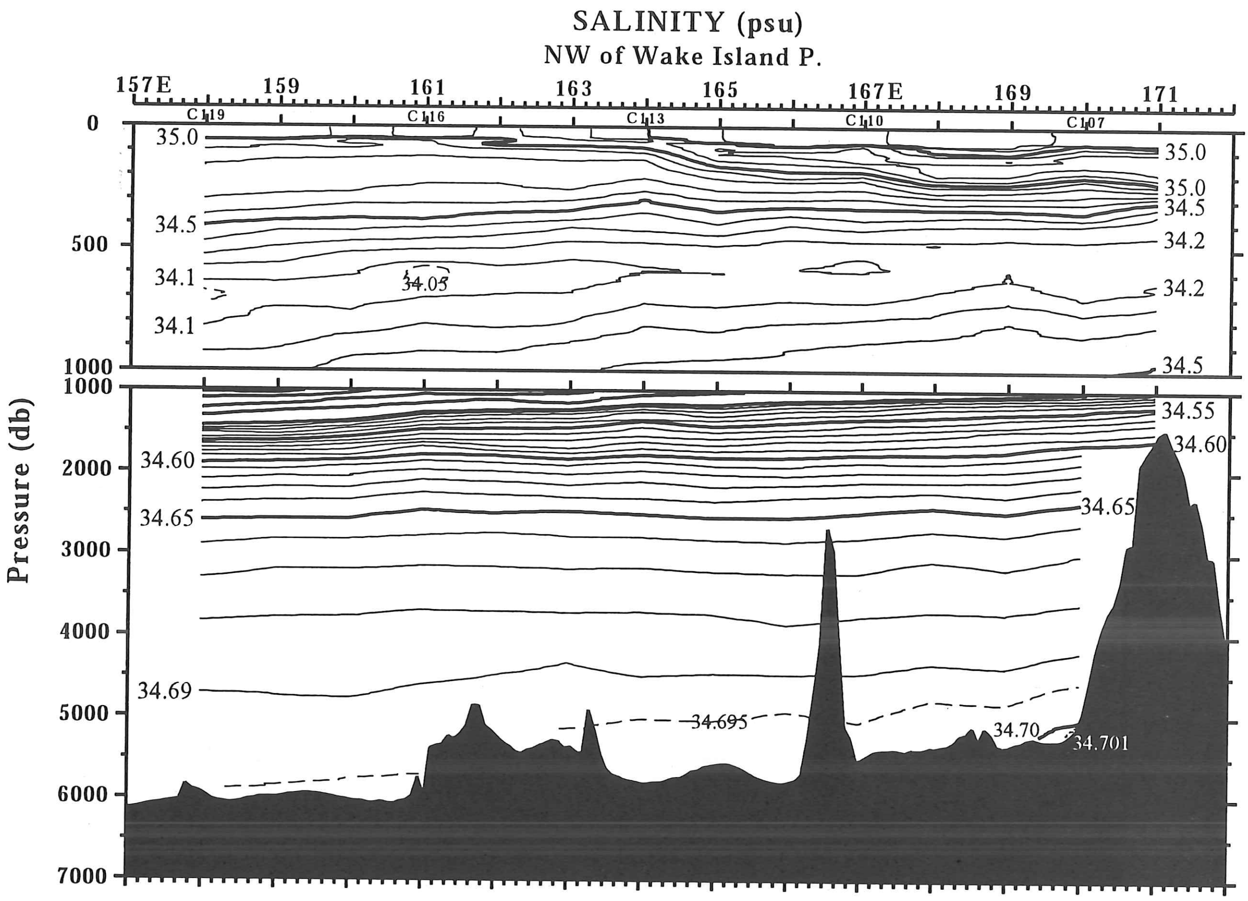


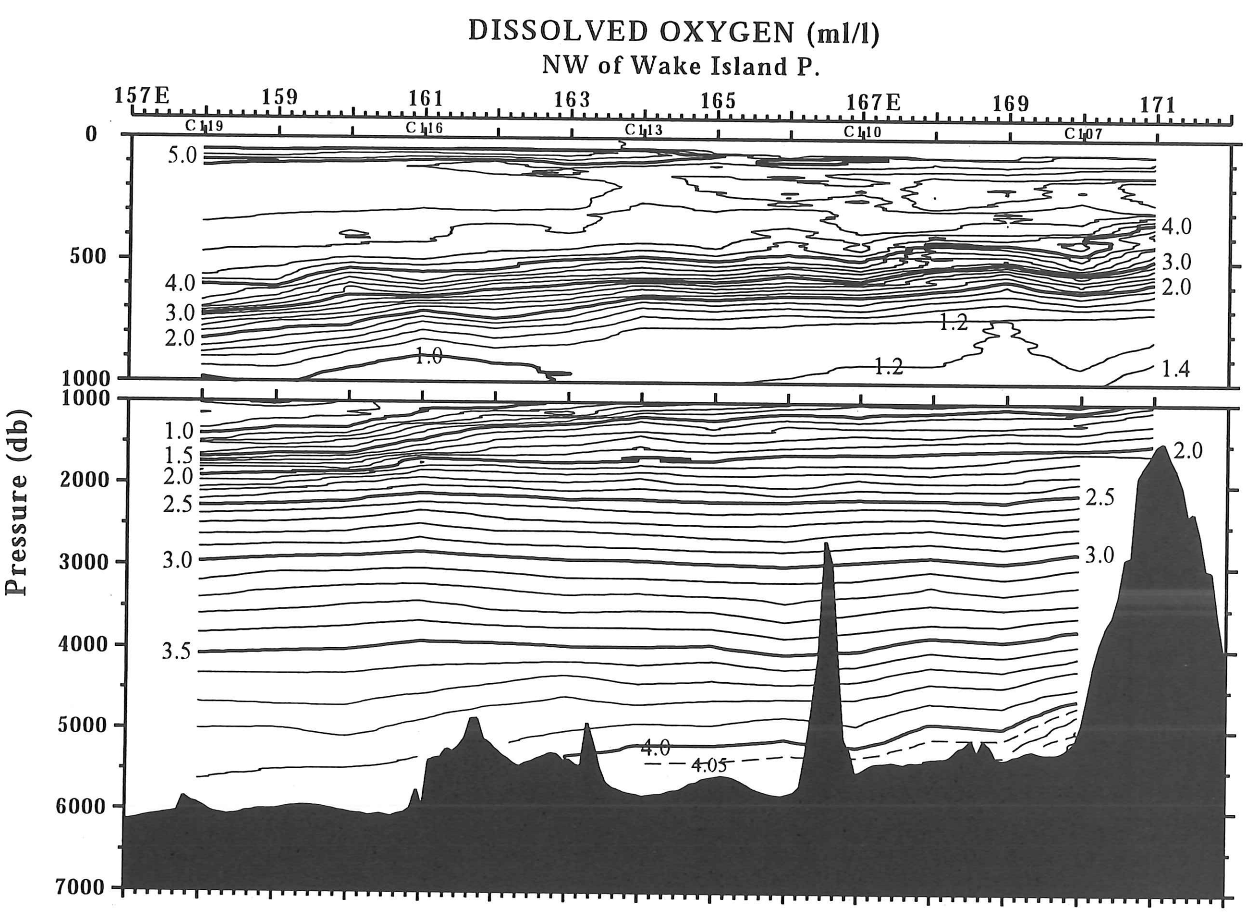
POTENTIAL DENSITY
NW of Wake Island P.



POT. TEMPERATURE (deg C)
NW of Wake Island P.

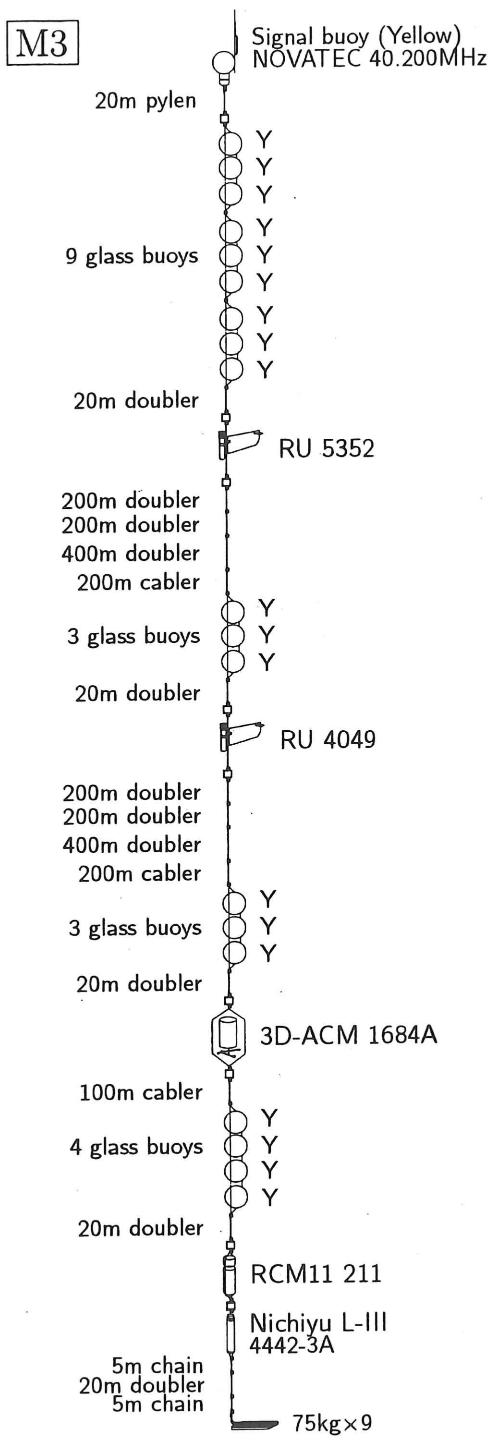



SALINITY (psu)
NW of Wake Island P.
157E
159
161
163
165
167E
169
171
C119
C116
C113
C110
C107
0
500
1000
2000
3000
4000
5000
6000
7000
Pressure (db)
35.0
34.5
34.1
34.05
34.2
34.55
34.60
34.65
34.69
34.695
34.70
34.701

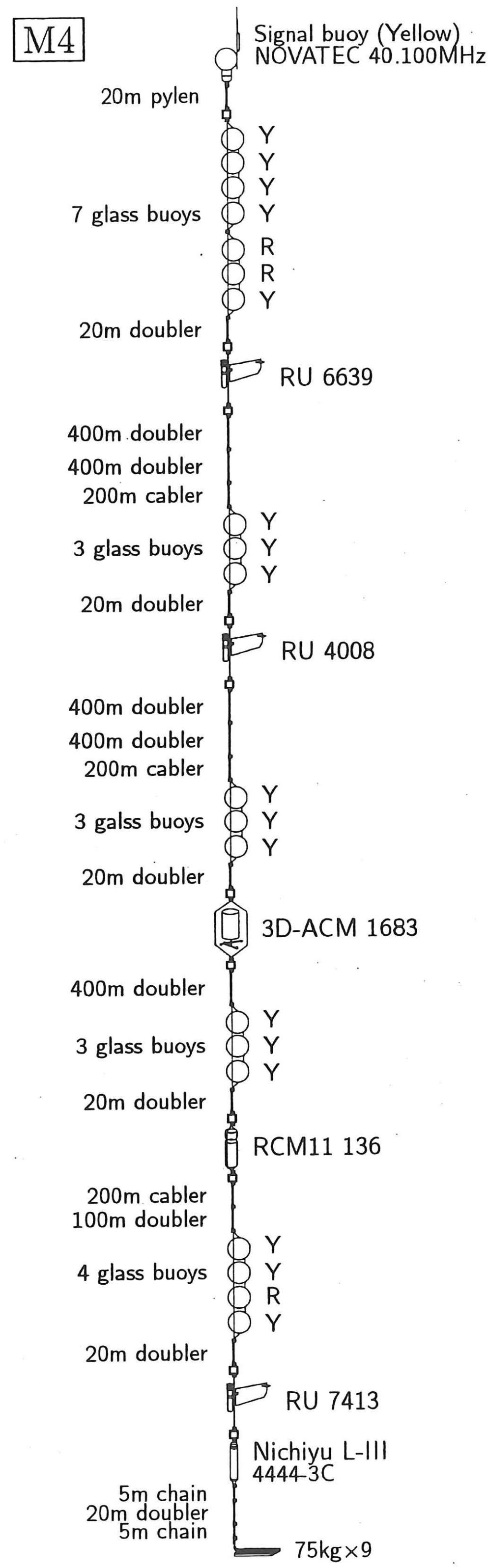

DISSOLVED OXYGEN (ml/l)
NW of Wake Island P.
157E
159
161
163
165
167E
169
171
C119
C116
C113
C110
C107
0
500
1000
2000
3000
4000
5000
6000
7000
Pressure (db)
5.0
4.0
3.0
2.0
1.0
1.2
1.4
1.5
2.5
3.5
4.05

9. Mooring Systems

Recovered ORI systems

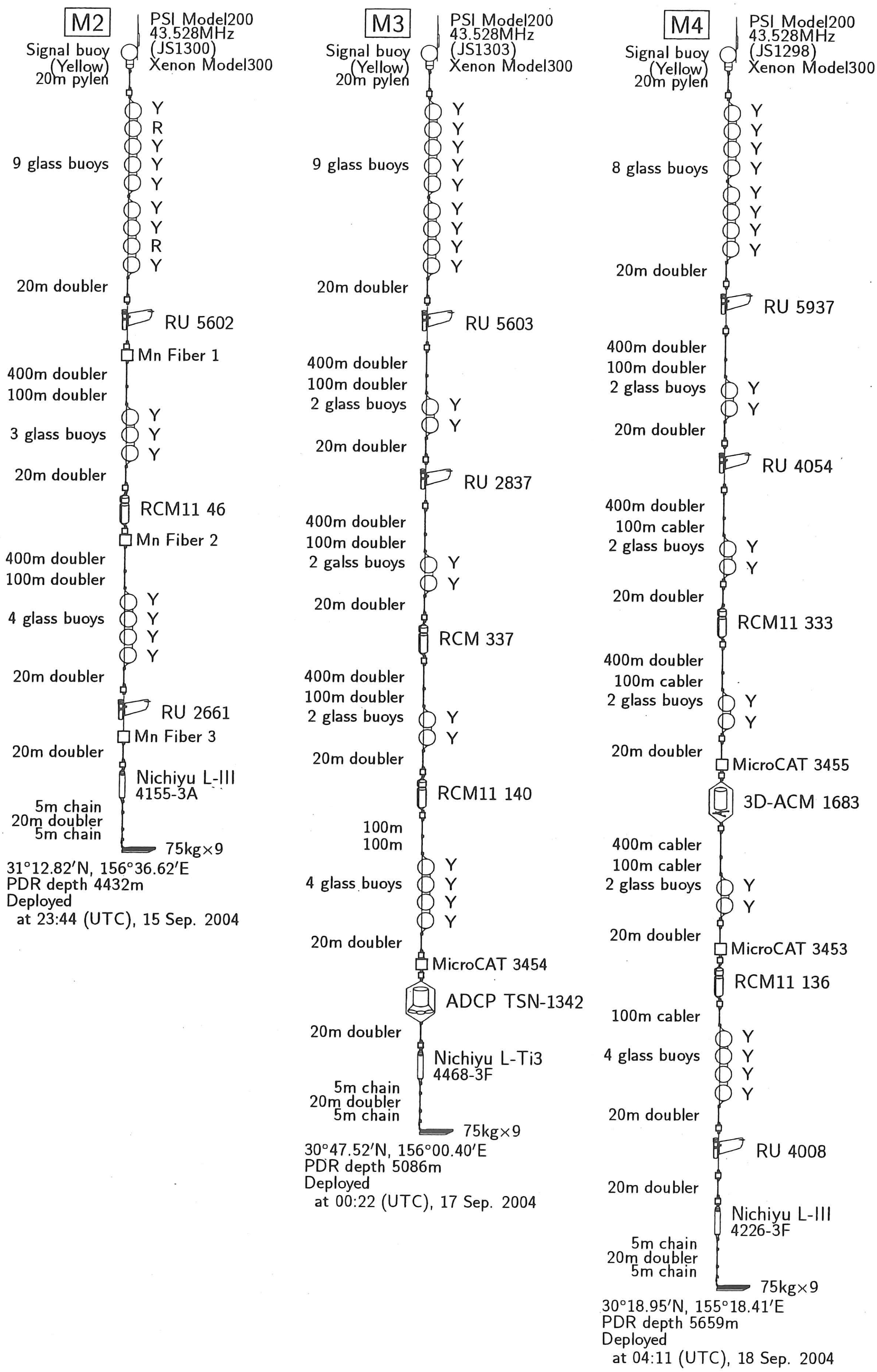


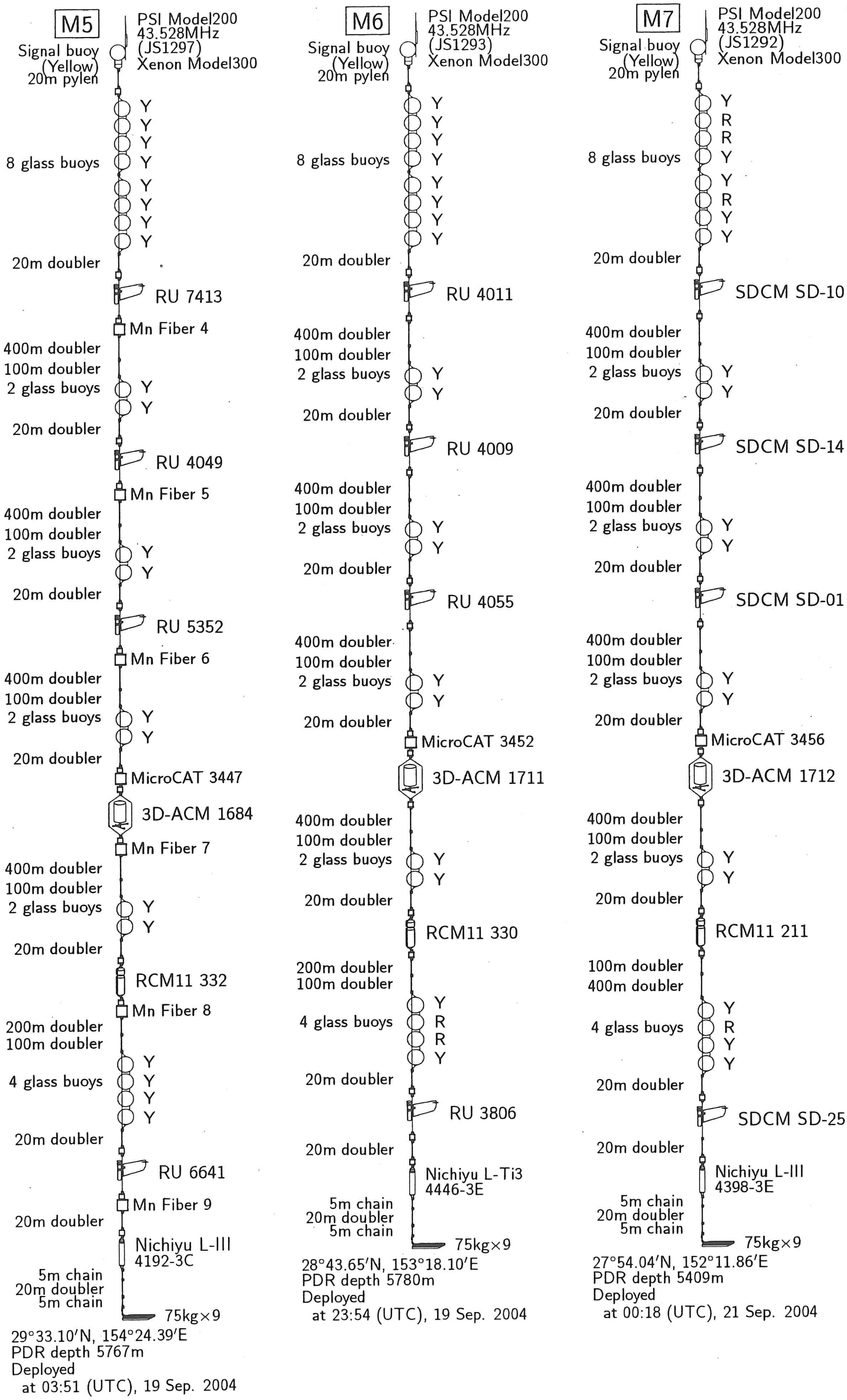
30°48.42′N, 155°59.61′E
PDR depth 5170m
Deployed at 05:17 (UTC), 16 May 2003
Recovered at 21:03 (UTC), 17 Sep. 2004

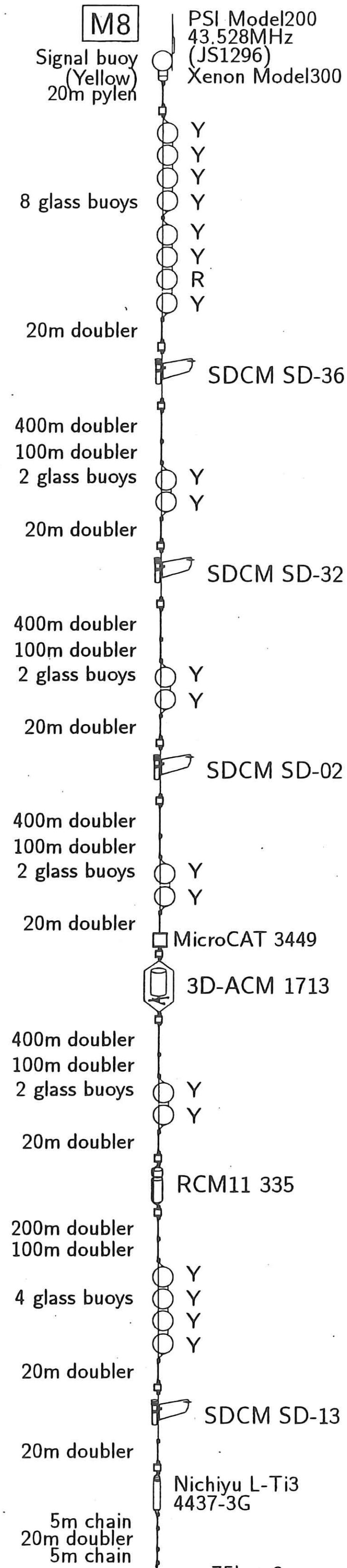


30°19.72′N, 155°19.22′E
PDR depth 5647m
Deployed at 23:48 (UTC), 15 May 2003
Recovered at 03:40 (UTC), 17 Sep. 2004

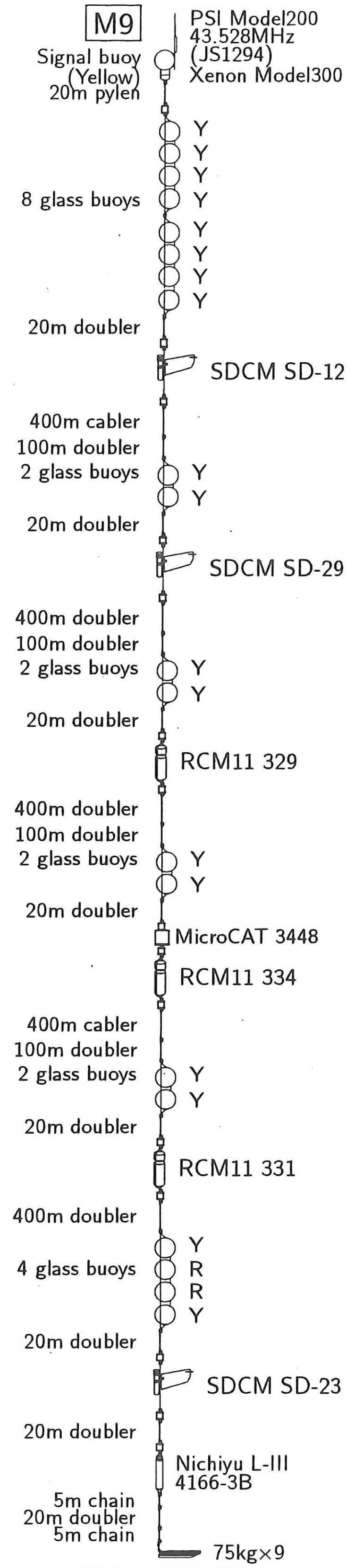
Deployed ORI systems



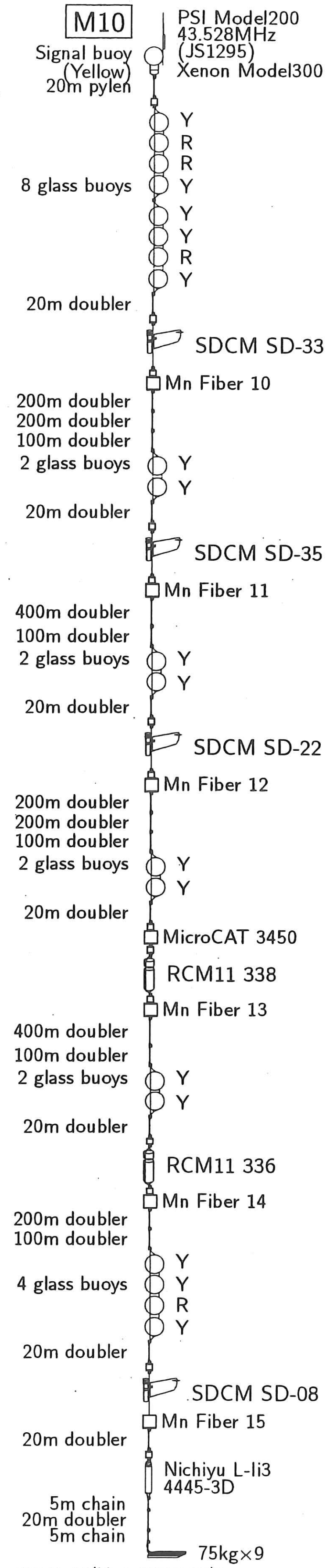

M5
PSI Model200
43.528MHz
(JS1297)
Xenon Model300
Signal buoy
(Yellow)
20m pylen
8 glass buoys
Y
Y
Y
Y
Y
Y
Y
Y
20m doubler
RU 7413
Mn Fiber 4
400m doubler
100m doubler
2 glass buoys
Y
Y
20m doubler
RU 4049
Mn Fiber 5
400m doubler
100m doubler
2 glass buoys
Y
Y
20m doubler
RU 5352
Mn Fiber 6
400m doubler
100m doubler
2 glass buoys
Y
Y
20m doubler
MicroCAT 3447
3D-ACM 1684
Mn Fiber 7
400m doubler
100m doubler
2 glass buoys
Y
Y
20m doubler
RCM11 332
Mn Fiber 8
200m doubler
100m doubler
4 glass buoys
Y
Y
Y
Y
20m doubler
RU 6641
Mn Fiber 9
20m doubler
Nichiyu L-III
4192-3C
5m chain
20m doubler
5m chain
75kg×9
29°33.10′N, 154°24.39′E
PDR depth 5767m
Deployed
at 03:51 (UTC), 19 Sep. 2004
M6
PSI Model200
43.528MHz
(JS1293)
Xenon Model300
Signal buoy
(Yellow)
20m pylen
8 glass buoys
Y
Y
Y
Y
Y
Y
Y
Y
20m doubler
RU 4011
400m doubler
100m doubler
2 glass buoys
Y
Y
20m doubler
RU 4009
400m doubler
100m doubler
2 glass buoys
Y
Y
20m doubler
RU 4055
400m doubler
100m doubler
2 glass buoys
Y
Y
20m doubler
MicroCAT 3452
3D-ACM 1711
400m doubler
100m doubler
2 glass buoys
Y
Y
20m doubler
RCM11 330
200m doubler
100m doubler
4 glass buoys
Y
R
R
Y
20m doubler
RU 3806
20m doubler
Nichiyu L-Ti3
4446-3E
5m chain
20m doubler
5m chain
75kg×9
28°43.65′N, 153°18.10′E
PDR depth 5780m
Deployed
at 23:54 (UTC), 19 Sep. 2004
M7
PSI Model200
43.528MHz
(JS1292)
Xenon Model300
Signal buoy
(Yellow)
20m pylen
8 glass buoys
Y
R
R
Y
Y
R
Y
Y
20m doubler
SDCM SD-10
400m doubler
100m doubler
2 glass buoys
Y
Y
20m doubler
SDCM SD-14
400m doubler
100m doubler
2 glass buoys
Y
Y
20m doubler
SDCM SD-01
400m doubler
100m doubler
2 glass buoys
Y
Y
20m doubler
MicroCAT 3456
3D-ACM 1712
400m doubler
100m doubler
2 glass buoys
Y
Y
20m doubler
RCM11 211
100m doubler
400m doubler
4 glass buoys
Y
R
Y
Y
20m doubler
SDCM SD-25
20m doubler
Nichiyu L-III
4398-3E
5m chain
20m doubler
5m chain
75kg×9
27°54.04′N, 152°11.86′E
PDR depth 5409m
Deployed
at 00:18 (UTC), 21 Sep. 2004



26°47.99′N, 150°43.97′E
PDR depth 5735m
Deployed
at 23:44 (UTC), 21 Sep. 2004



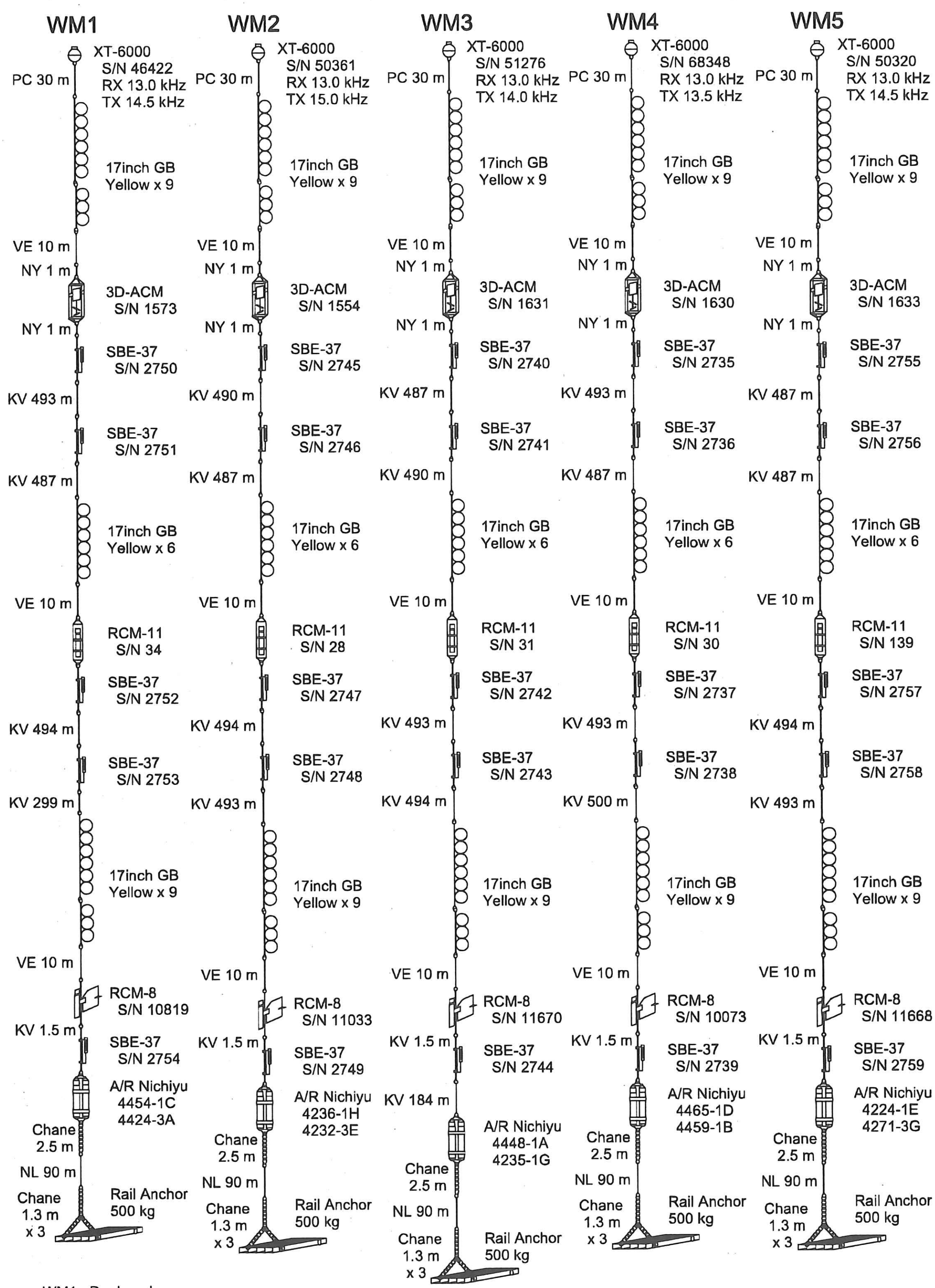
26°14.91′N, 149°59.89′E
PDR depth 5863m
Deployed
at 05:16 (UTC), 22 Sep. 2004



25°42.11′N, 149°16.33′E
PDR depth 5718m
Deployed
at 01:43 (UTC), 23 Sep. 2004

Recovered JAMSTEC systems

Wake Island passage Flux Experiment (WIFE) moorings, Period 1 (May 2003 - Oct 2004)



WM1 Deployed
31 May 2003
01:18 (UTC)
12° 47.42' N
170° 13.88' E
5356 m

Recovered
13 Oct 2004
22:50 (UTC)

WM2 Deployed
30 May 2003
05:20 (UTC)
13° 40.01' N
170° 34.02' E
5511 m

Recovered
14 Oct 2004
22:46 (UTC)

WM3 Deployed
29 May 2003
05:50 (UTC)
14° 35.10' N
170° 53.55' E
5676 m

Recovered
15 Oct 2004
22:18 (UTC)

WM4 Deployed
28 May 2003
22:47 (UTC)
15° 30.10' N
171° 14.18' E
5614 m

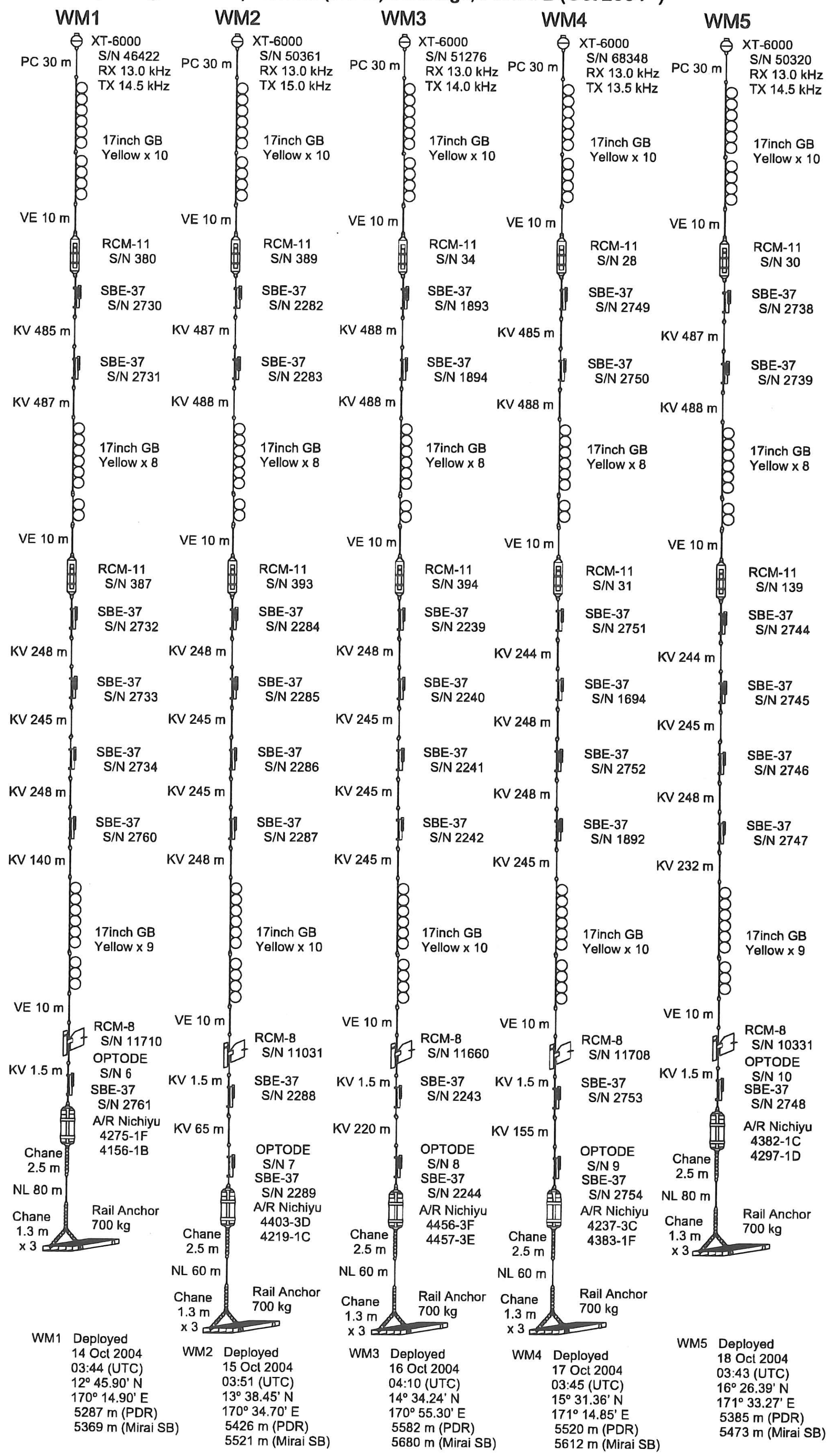
Recovered
16 Oct 2004
22:11 (UTC)

WM5 Deployed
28 May 2003
00:39 (UTC)
16° 24.60' N
171° 32.53' E
5458 m

Recovered
17 Oct 2004
21:57 (UTC)

Deployed JAMSTEC systems

Wake Island passage Flux Experiment (WIFE) moorings, Period 2 (Oct 2004 -)

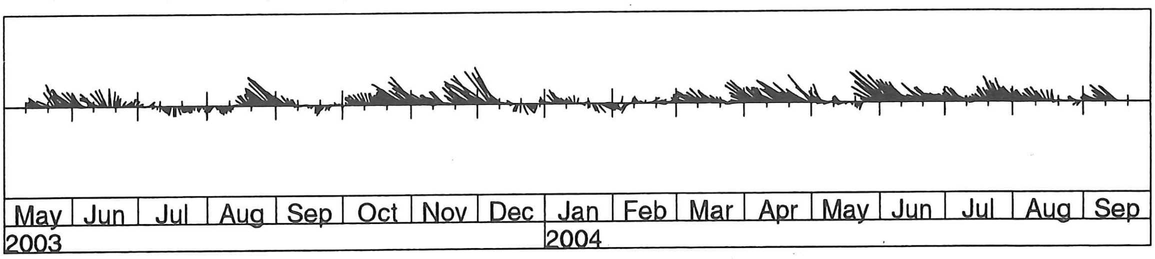


10. Results of moored current meters

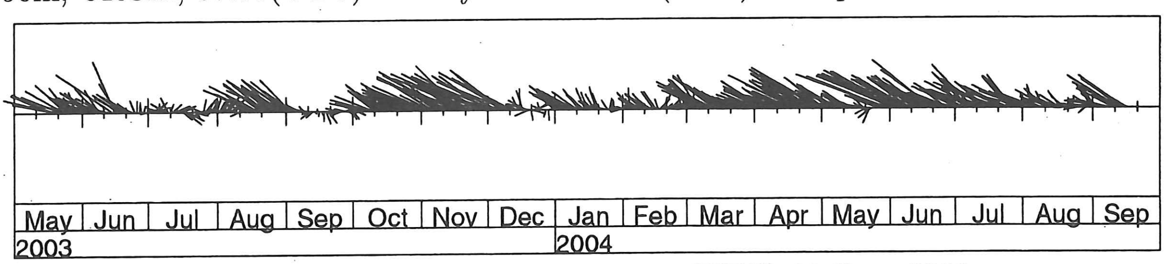
ORI current meters

M3 30°48.40′N, 155°59.60′E, Water depth 5170m

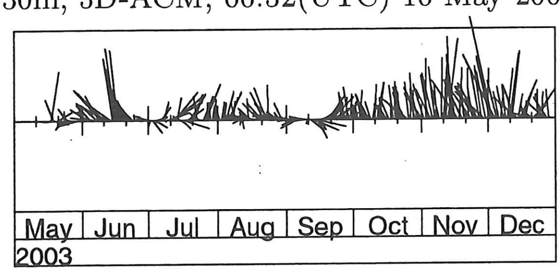
2950m, URCM, 07:00(UTC) 16 May 2003 – 20:00(UTC) 17 Sep. 2004

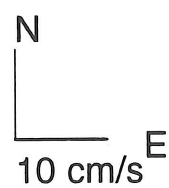


3990m, URCM, 07:00(UTC) 16 May 2003 – 19:00(UTC) 17 Sep. 2004

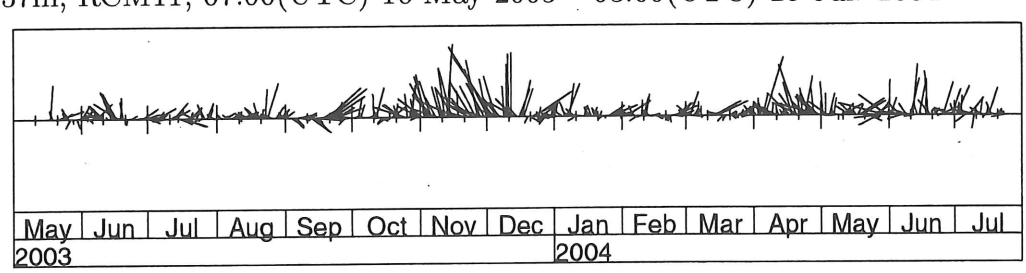


5030m, 3D-ACM, 06:32(UTC) 16 May 2003 – 18:02(UTC) 30 Dec. 2003



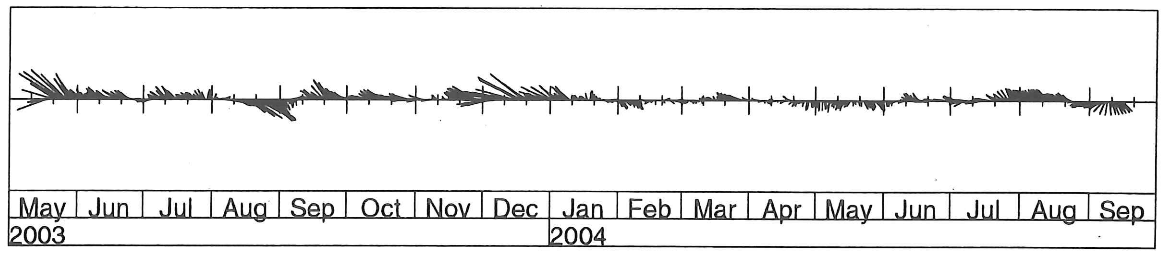


5137m, RCM11, 07:00(UTC) 16 May 2003 – 03:00(UTC) 25 Jul. 2004

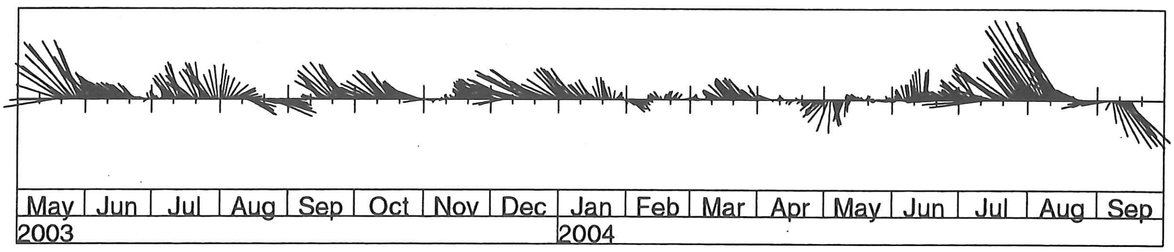


M4 30°19.7′N, 155°19.2′E, Water depth 5647m

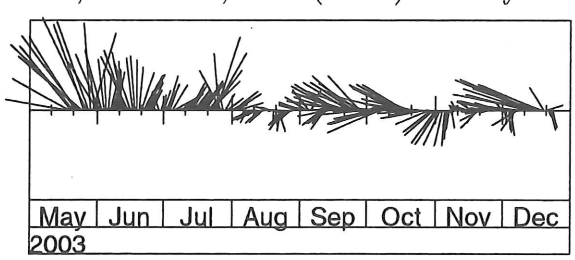
2870m, URCM, 02:00(UTC) 16 May 2003 – 03:00(UTC) 17 Sep. 2004

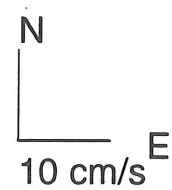


3850m, URCM, 02:00(UTC) 16 May 2003 – 03:00(UTC) 17 Sep. 2004

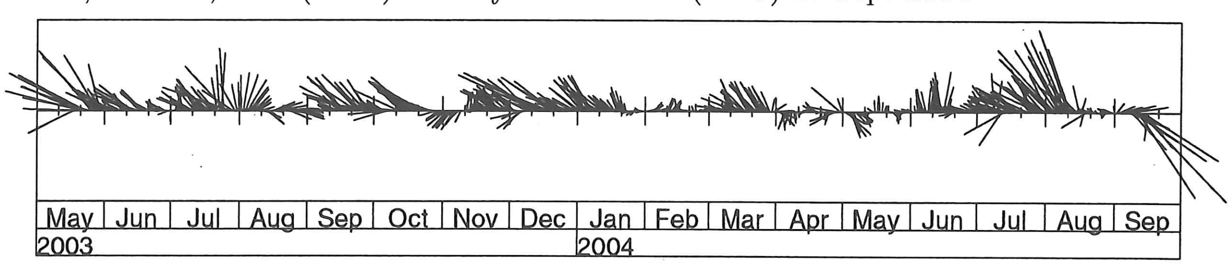


4865m, 3D-ACM, 01:02(UTC) 16 May 2003 – 08:32(UTC) 25 Dec. 2004

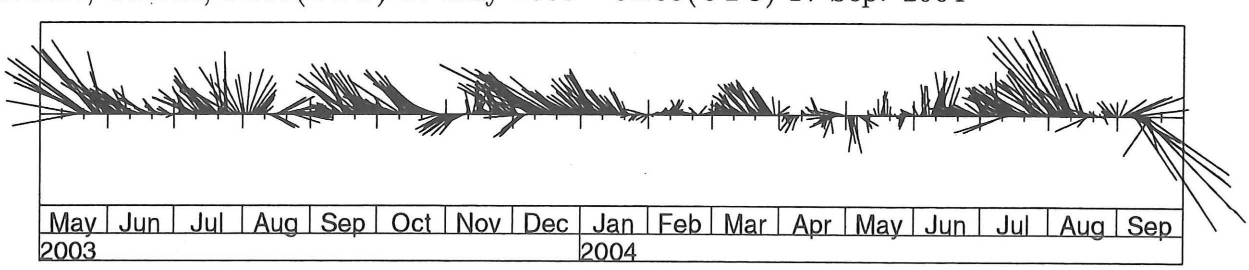




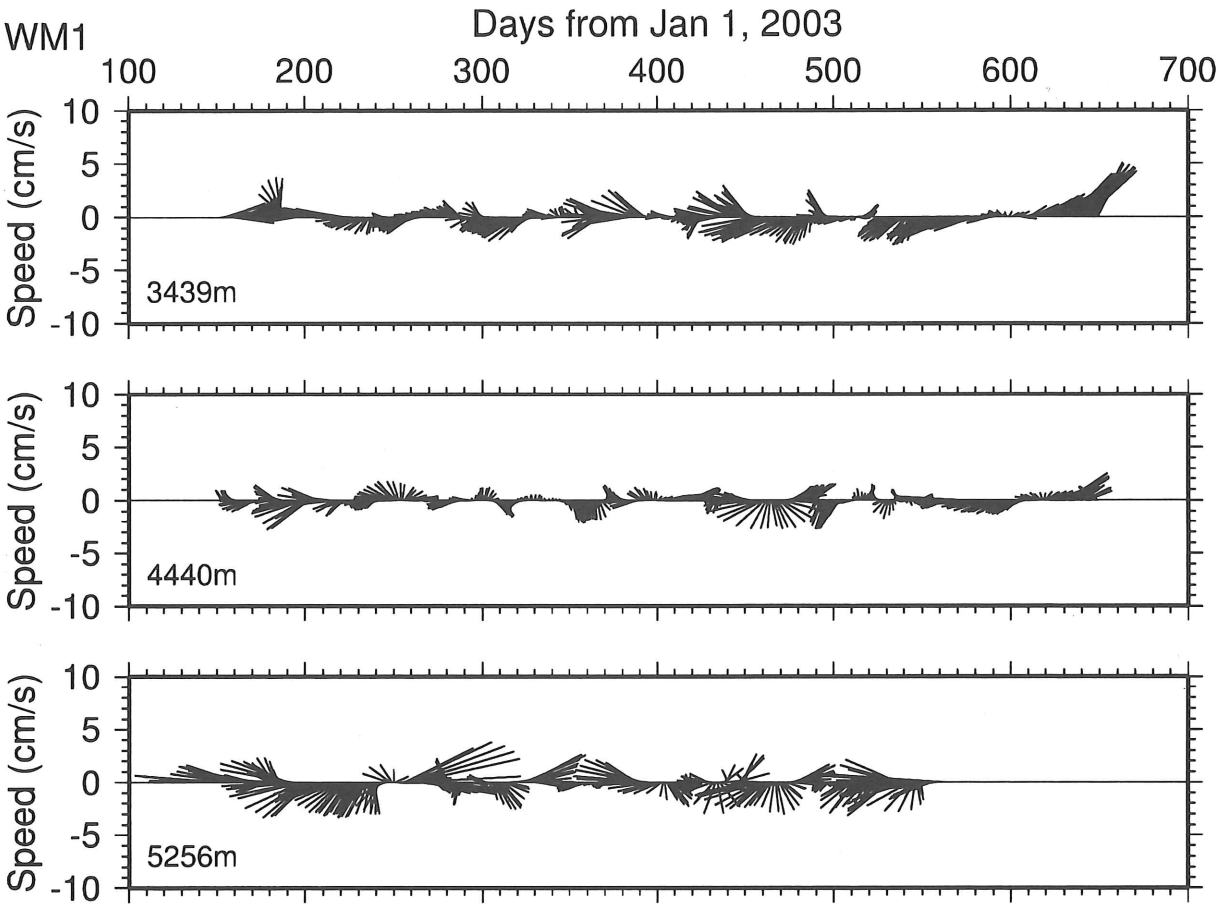
5290m, RCM11, 01:00(UTC) 16 May 2003 – 03:00(UTC) 17 Sep. 2004

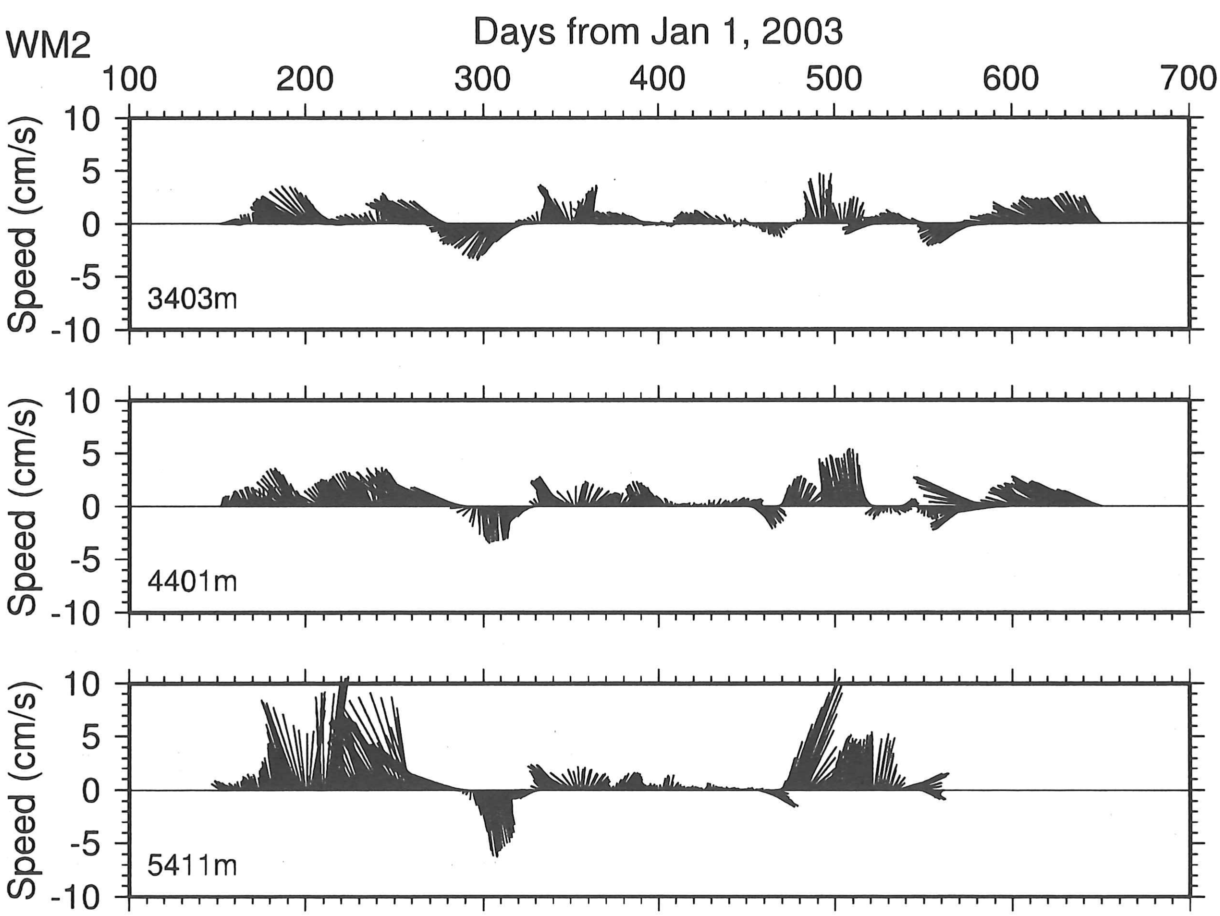


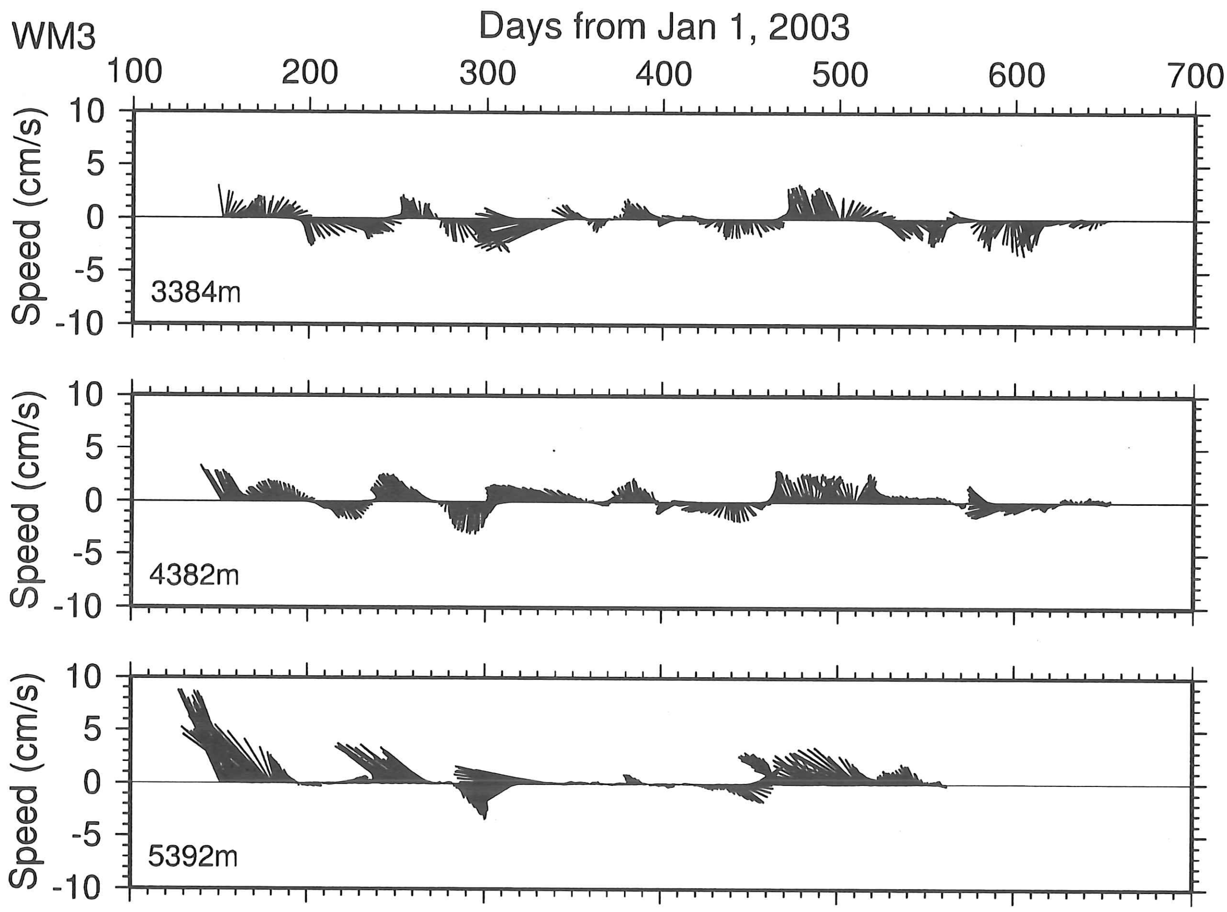
5615m, URCM, 02:00(UTC) 16 May 2003 – 02:00(UTC) 17 Sep. 2004

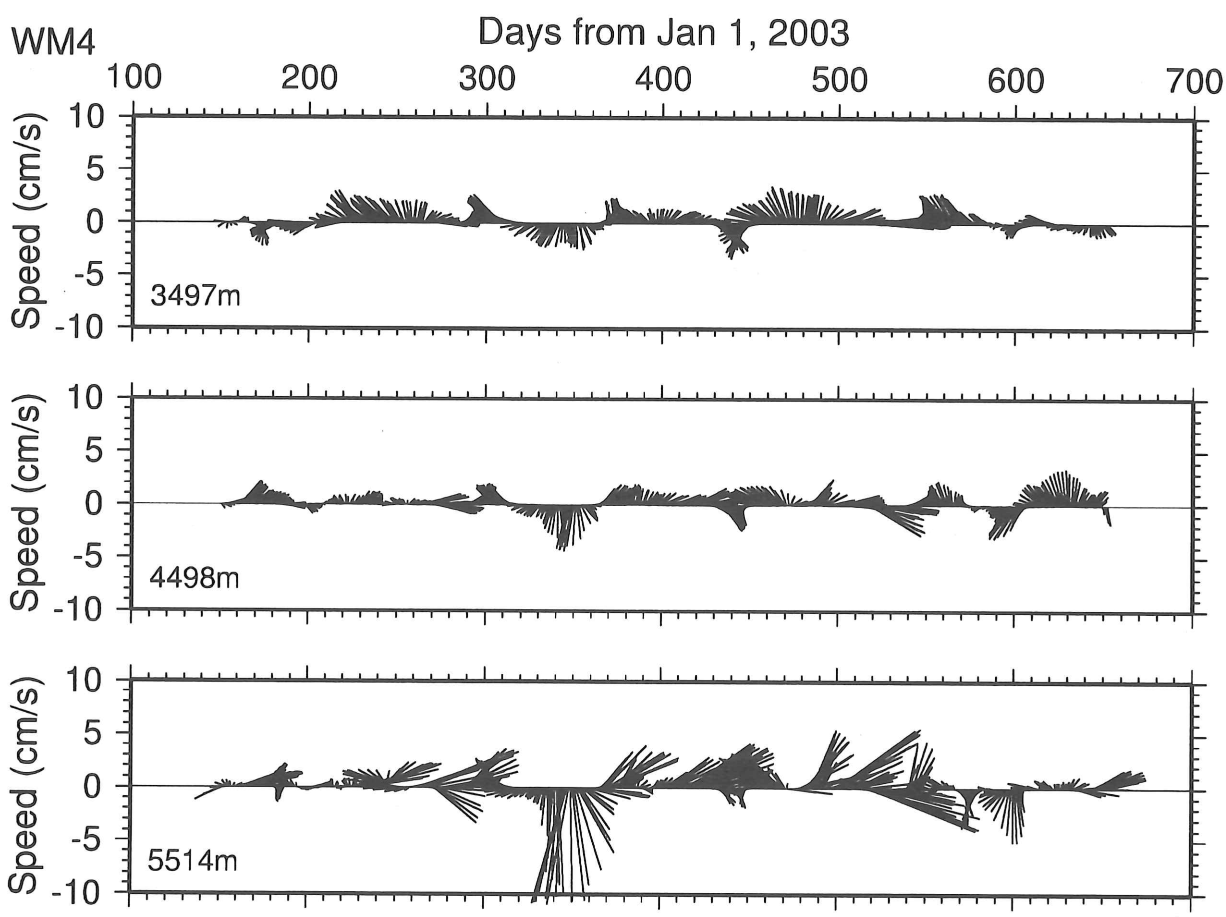


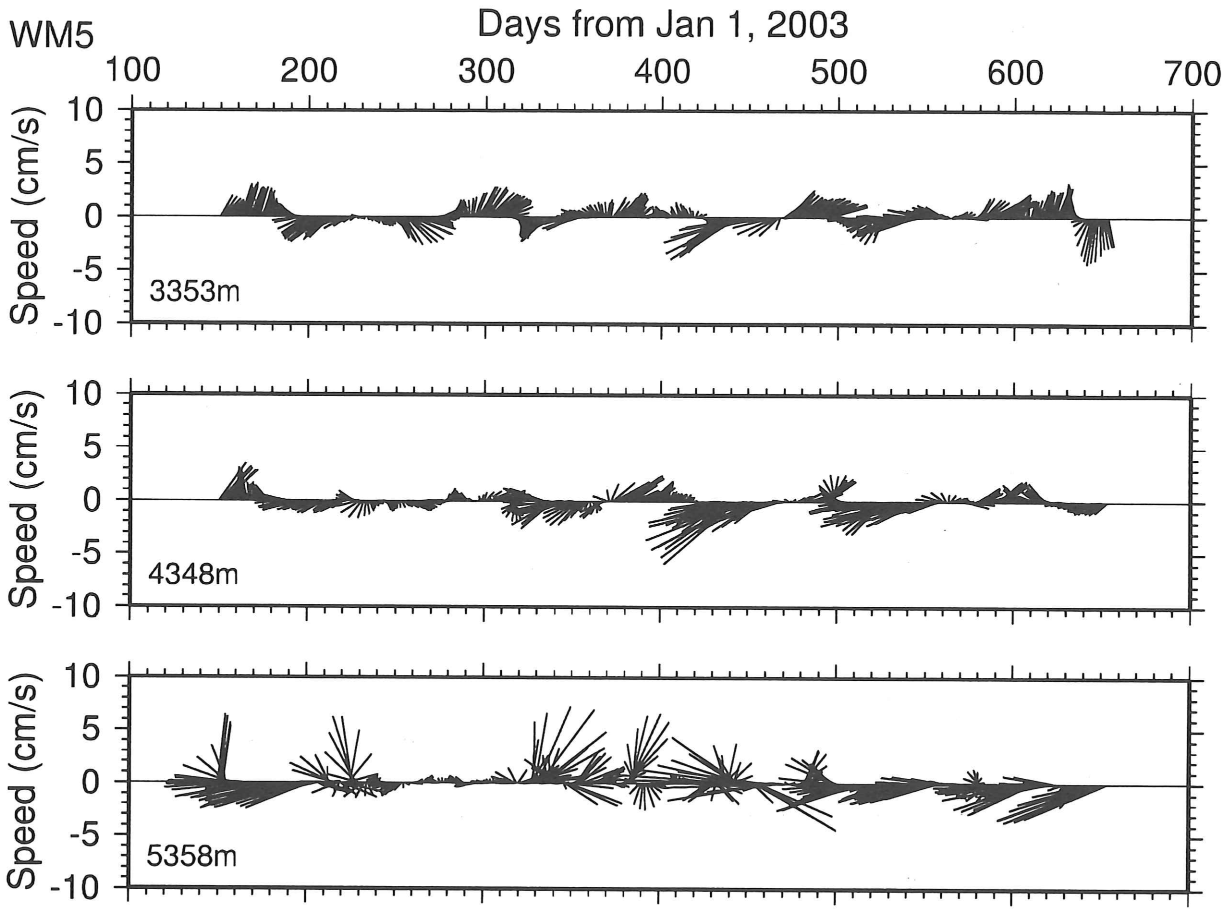
JAMSTEC current meters



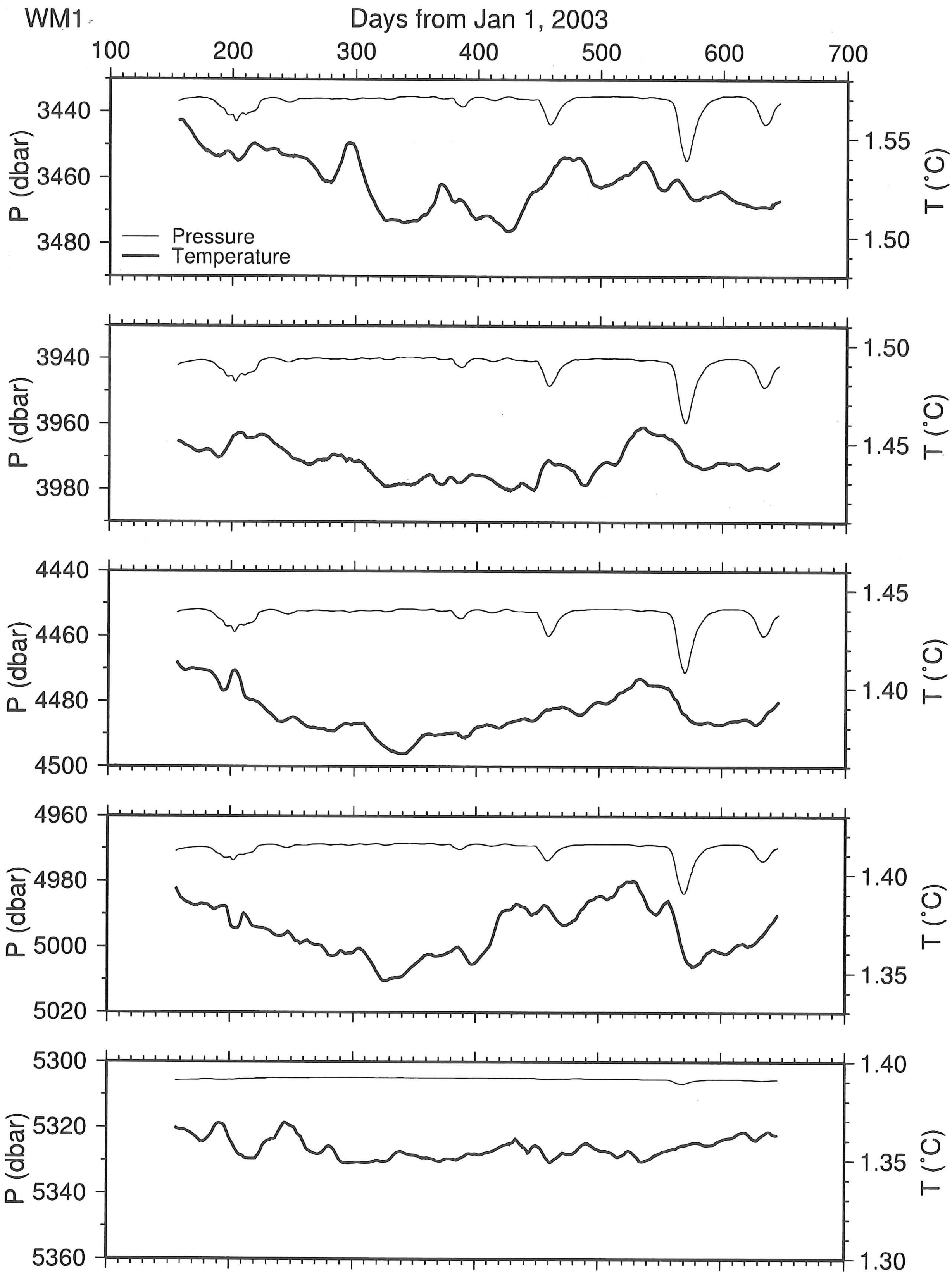


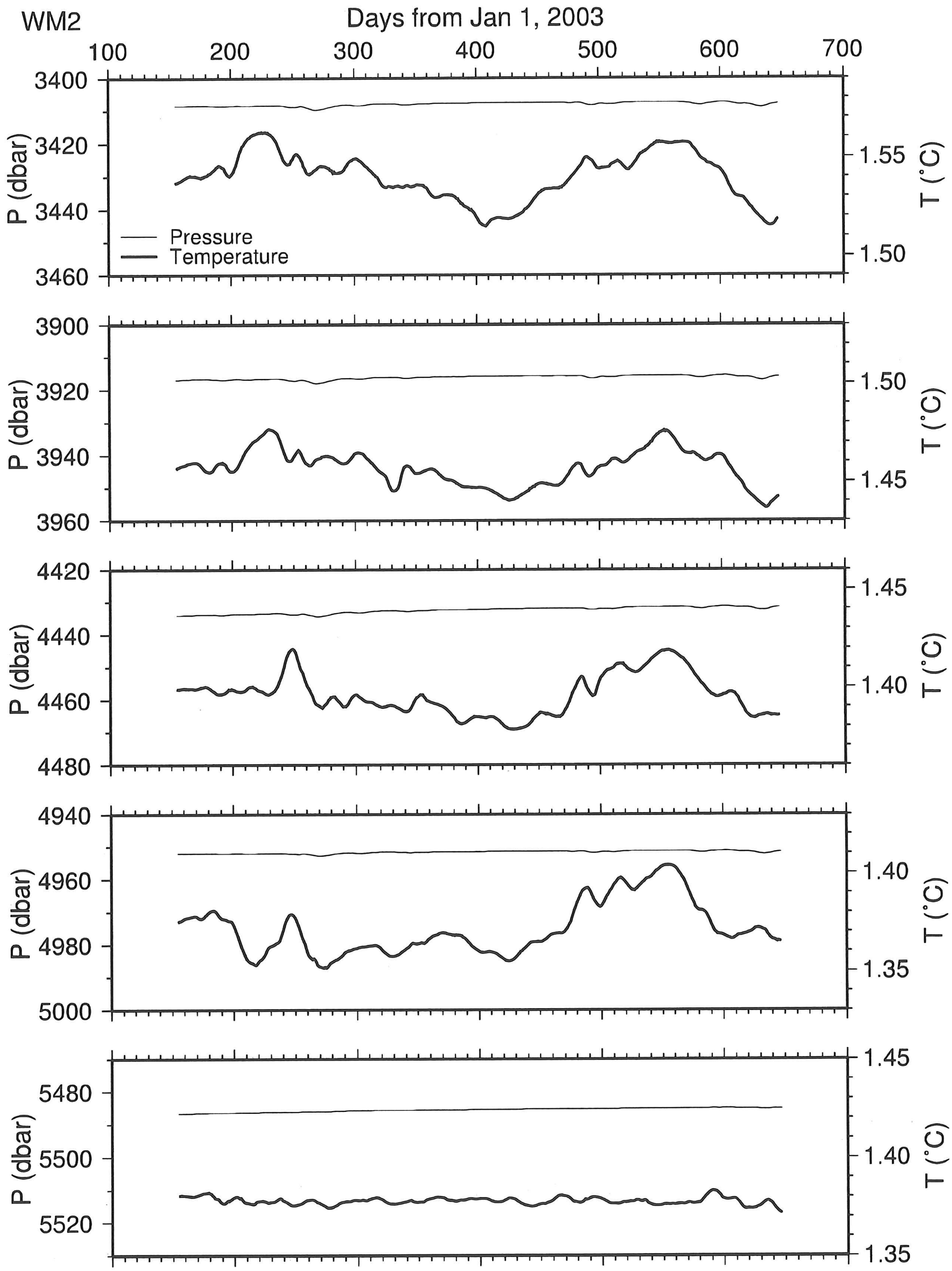

WM3
Days from Jan 1, 2003
100
200
300
400
500
600
700
Speed (cm/s)
10
5
0
-5
-10
3384m
4382m
5392m

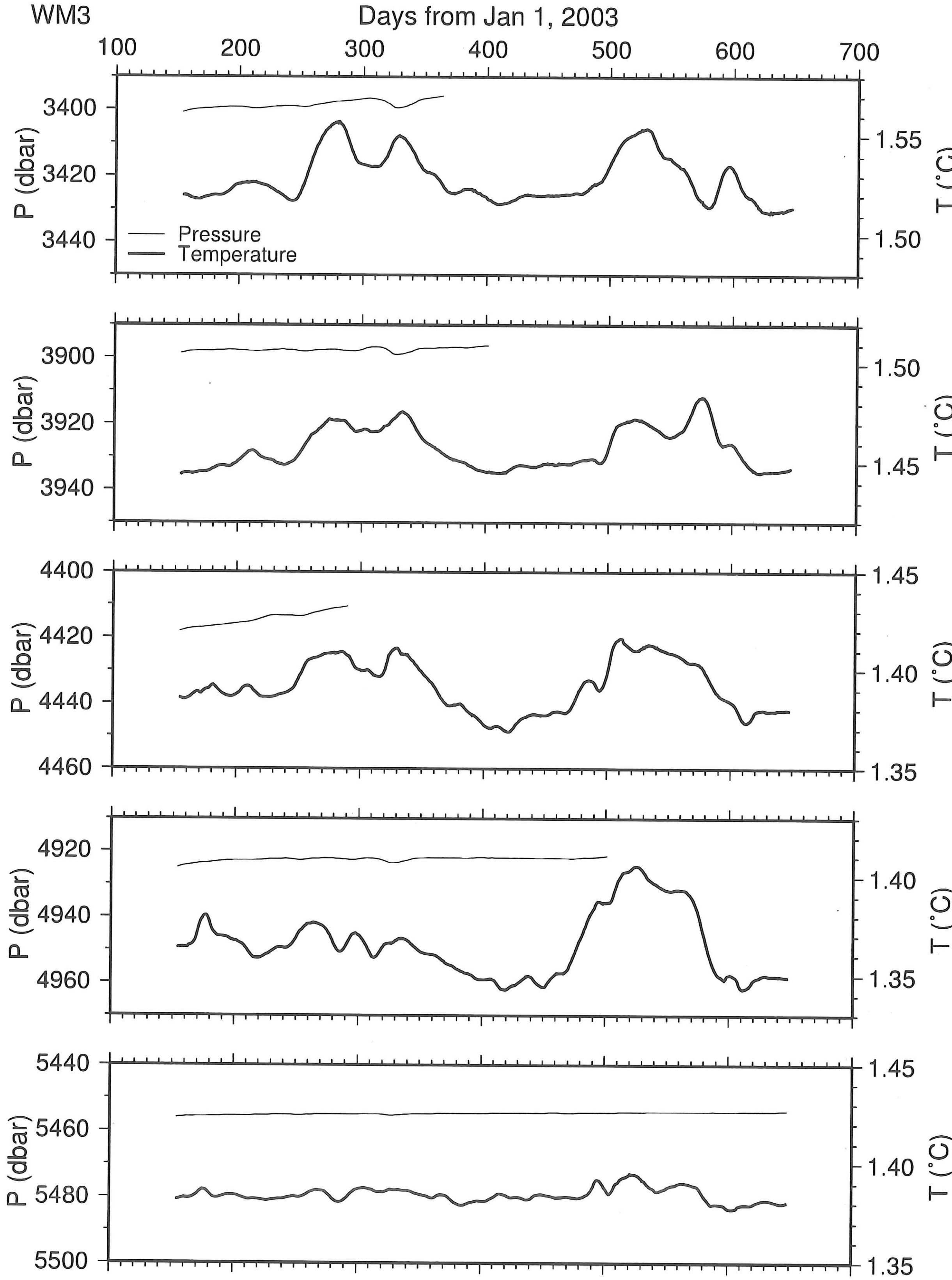

WM4
Days from Jan 1, 2003
100
200
300
400
500
600
700
Speed (cm/s)
10
5
0
-5
-10
3497m
4498m
5514m

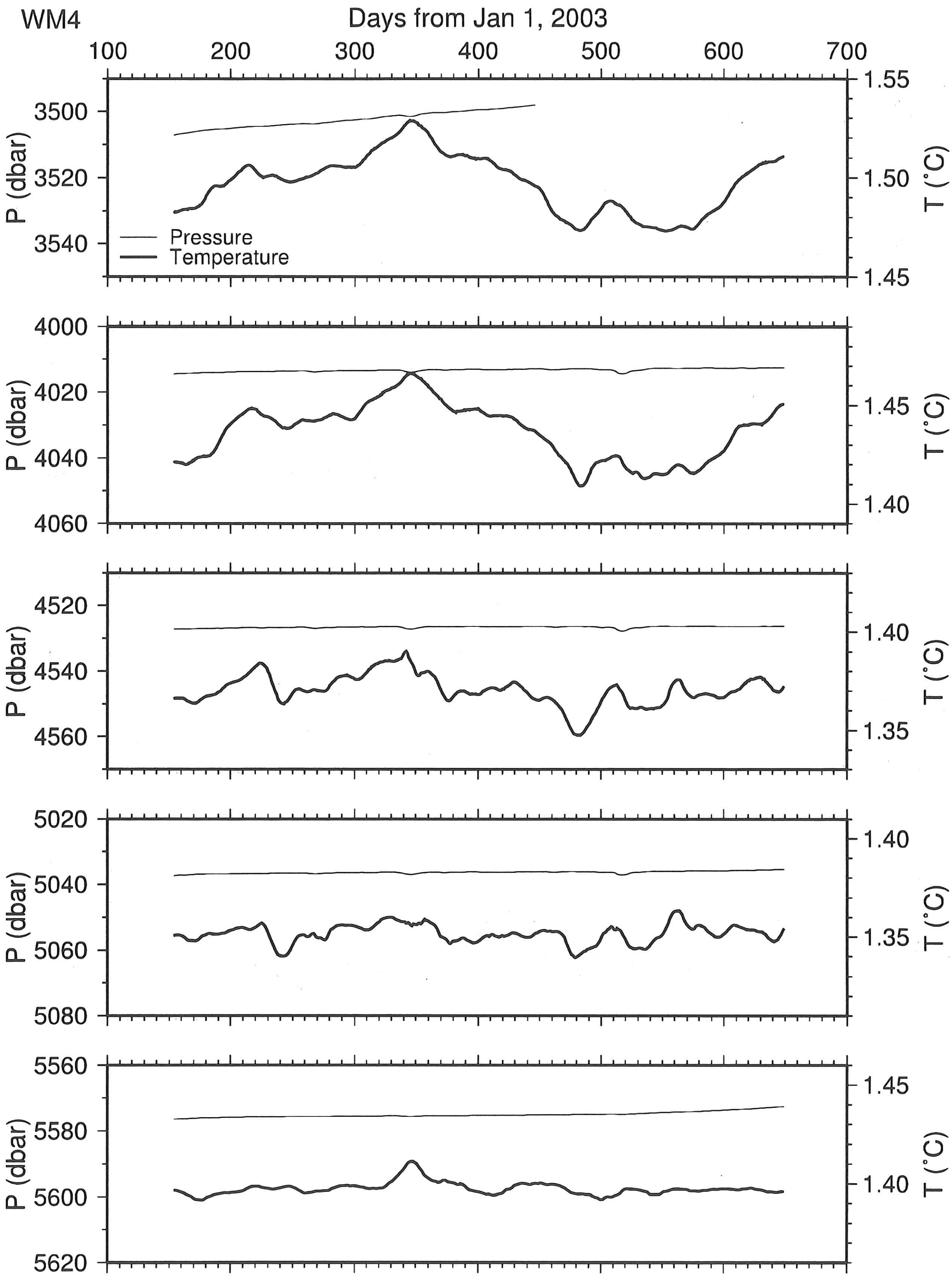

WM5
Days from Jan 1, 2003
100
200
300
400
500
600
700
Speed (cm/s)
10
5
0
-5
-10
3353m
4348m
5358m

JAMSTEC moored CTD data




WM2
Days from Jan 1, 2003
100
200
300
400
500
600
700
3400
3420
3440
3460
P (dbar)
1.55
1.50
T (˚C)
Pressure
Temperature
3900
3920
3940
3960
1.50
1.45
4420
4440
4460
4480
1.45
1.40
4940
4960
4980
5000
1.40
1.35
5480
5500
5520
1.45
1.40
1.35


WM3
Days from Jan 1, 2003
100
200
300
400
500
600
700
3400
3420
3440
P (dbar)
1.55
1.50
T (˚C)
Pressure
Temperature
3900
3920
3940
P (dbar)
1.50
1.45
T (˚C)
4400
4420
4440
4460
P (dbar)
1.45
1.40
1.35
T (˚C)
4920
4940
4960
P (dbar)
1.40
1.35
T (˚C)
5440
5460
5480
5500
P (dbar)
1.45
1.40
1.35
T (˚C)


WM4
Days from Jan 1, 2003
100
200
300
400
500
600
700
P (dbar)
T (˚C)
3500
3520
3540
1.55
1.50
1.45
Pressure
Temperature
4000
4020
4040
4060
1.45
1.40
4520
4540
4560
1.40
1.35
5020
5040
5060
5080
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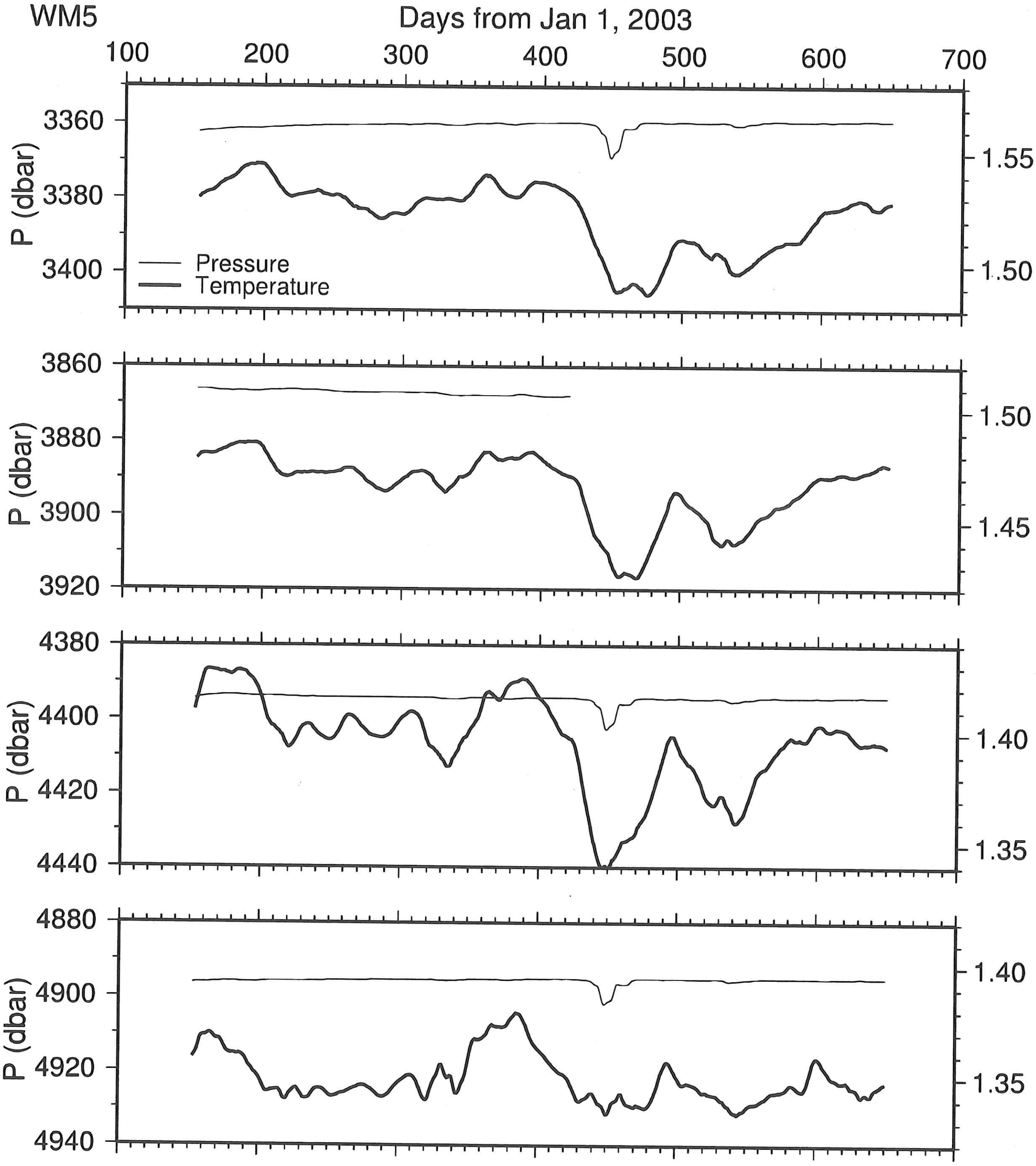
5580
5600
5620
1.45
1.40



WM5
Days from Jan 1, 2003
100
200
300
400
500
600
700
3360
3380
3400
P (dbar)
1.55
1.50
T (˚C)
Pressure
Temperature
3860
3880
3900
3920
P (dbar)
1.50
1.45
T (˚C)
4380
4400
4420
4440
P (dbar)
1.40
1.35
T (˚C)
4880
4900
4920
4940
P (dbar)
1.40
1.35
T (˚C)